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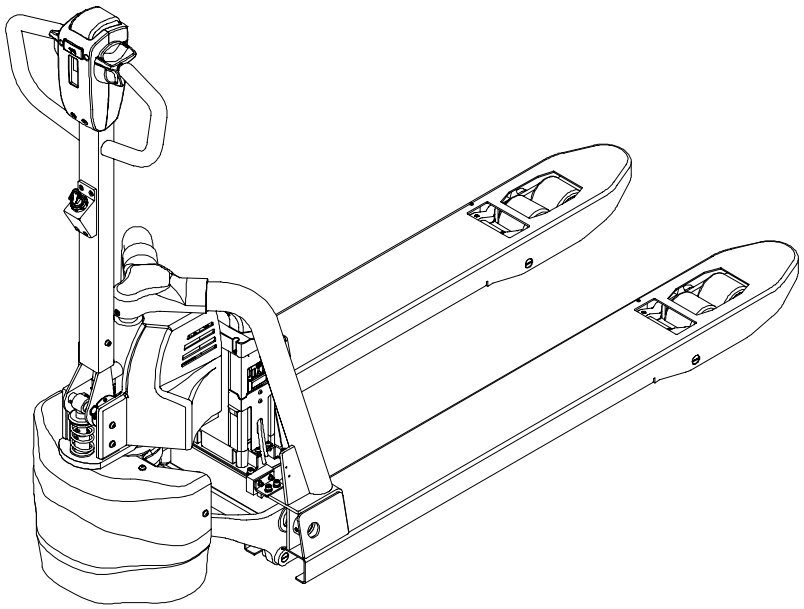
HANGCHA

Mini Range

ELECTRIC PALLET TRUCK

CBD12-AMC1-I

OPERATION AND MAINTENANCE MANUAL



Original Instruction

HANGCHA GROUP CO., LTD.

3/2018

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FOREWORD

Thank you very much for purchasing the A series mini range electric pallet truck of Hangcha Group.

A series mini range electric pallet truck is a newly developed product for warehouse logistic, it owns characteristics as advanced performance, comfort operation, safety and security, low maintenance cost, and is an ideal tool for handling goods in warehouse, supermarket and workshop.

Before use the truck, relative persons must read and understand the manual, get to know how to safely operate and maintain the truck.

Part one of this manual is about the brief introduction and correct operation of the mini range electric pallet truck, which will tell you how to operate safely and maintain preventively; part two will tell you the structure, working principle and maintenance of the electric pallet truck. To ensure safety and exert the truck's potential, all the personnel that in charge of operation maintenance and management must read this manual thoroughly.

As the improvements of products of our company, there may be some differences between this operation manual with your forklift truck.

If you have any questions please keep touches with HANGCHA GROUP CO., LTD. sales department or let the agents know.

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Part Ⅰ：Operation and Maintenance

1 Notice for use

1.1 General

Truck in this manual is only for lifting and transporting loads.

This truck is not designed for heavy-duty.

It must be used, operated and maintained according to the information in this manual. Any other uses are outside the design envelope and can lead to injury to persons or damage to equipment and property.

1.2 Use as required

- Light to medium duty, indoor truck operations without ramps.
- Pick and place goods with trays.
- Transport goods with trays.
- Do not carry people.
- Do not over load.
- Do not push or pull loads.
- Do not work together on the same goods by multiple pallet trucks.

1.3 Approved application conditions

- Used in specified area as factory, tourist attraction and recreation place.
- Operation only on secure, level surfaces with sufficient capacity.
- Operation only on routes that are visible and approved by the proprietor.
- Use in specified rated load.
- Working environment temperature is -10℃～+45℃.
- Charging environment temperature is 0℃～+40℃.
- Altitude: ≤2000m.
- Keep the truck dry, prohibit the rain.
- The big wheel version of this truck can climb gentle slope below 4% at full load, 10% at no load. Small wheel version can climb gentle slope below 2% at full load, 8% at no load.
- Long time climbing is not recommended. It is prohibited to travel crosswise or obliquely. When going uphill with loads, keep the loads in front; when going downhill, keep people in front.

Please read others safety rules in this manual, it is important to your personal safety, working staff and goods safety.

WARNING

- **Do not charge lithium battery below 0℃.**
- **It's prohibited to use the truck in the area of the explosion.**
- **When operate the truck in extreme environment like freezer, install special equipment and get the permission from the manufacturer.**

1.4 Attachment installation or modification to the truck

Without authorization by the manufacturer, it is not allowed to modify the truck privately.

The mounting or installation of any attachments which will interfere with, or supplement, the functions of the truck is permitted only after written approval by the manufacturer has been obtained. If necessary, the approval of local authorities has to be obtained.

Without the prior written approval of the original manufacturer, its authorized representative or its successor, any change to the truck that may influence its performance, such as rated capacity, stability or security, is not allowed. Changes include brake, steering, vision or dismountable attachment. When the manufacturer or its successor approve to changes of the vehicle, it also needs to make corresponding modification to vehicle nameplate, decals, logo and brochures.

In the event the truck manufacturer is no longer in business and there is no successor in the interest to the business, the user may arrange for a modification or alteration to a powered industrial truck manufacturer and the user shall:

a) Arrange for the modification or alteration to be designed, tested and implemented by an engineer(s) expert in industrial trucks and their safety;
b) Maintain a permanent record of the design, test(s) and implementation of the modification or alteration;
c) Approve and make appropriate changes to the capacity plate(s),decals, tags and instruction handbook;
d) Affix a permanent and readily visible label to the truck stating the manner in which the truck has been modified or altered together with the date of the modification or alteration, and the name and address of the organization that made the modification or alteration.

2 Truck introduction

2.1 General

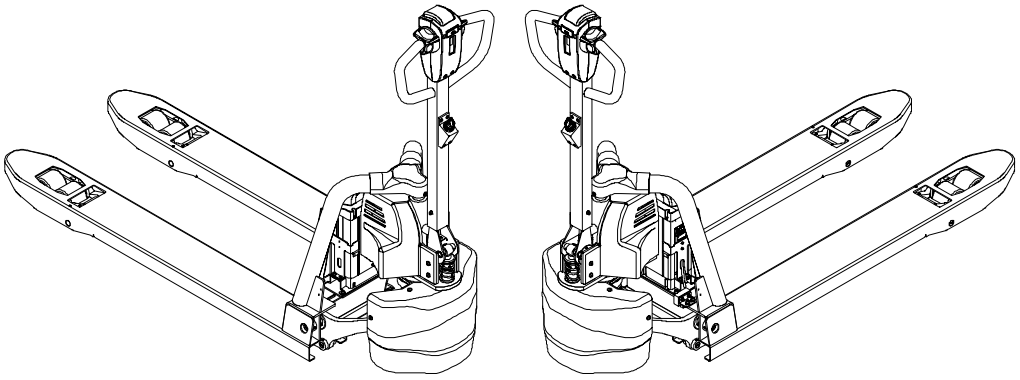
A series mini range electric pallet truck described in this manual should work under low working strength and its continuous working time should not surpass one hour.

Users can get relevant information as rated load from the product model.

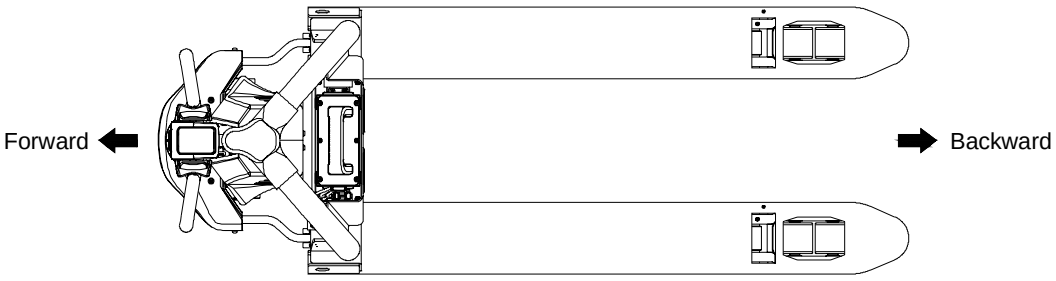
This manual describes the A series mini electric pallet truck, suitable for use in places where work intensity is relatively low.

Users can get rated load and other information from the product model.

Model	Meaning
CBD	Electric pallet truck
12	Rated load capacity×100kg
A	Product serial number
M	Mini Range
C1	Controller type
K	Small wheel version
I	Lithium battery



The description of the direction of travel is defined as follows:



2.2 Functional description

Truck frame

- Three-point design, compact, simple and reliable structure.

Driving system

- Wheel drive unit, with permanent magnetic motor and high performance electromagnetic brake, compact, reliable and powerful.

Electric system

- 24V lithium battery, efficient work, easy to change.
- The latest CURTIS permanent magnetic control system, control performance, efficient and stable.

Braking system

- It owns three emergency braking functions as release brake, reverse brake and electromagnetic brake to ensure travelling safety.
- It owns slope anti-slide function to ensure safety.

Operation steering system

- New ergonomics designed control handle owns acceleration, reversing, horn, braking, lifting/lowering, emergency reverse functions, thus makes operation easier.
- Emergency reversing button on the control handle head can prevent driver from hurt when encountering emergency in backward driving.
- Steering angle +/- 90°.

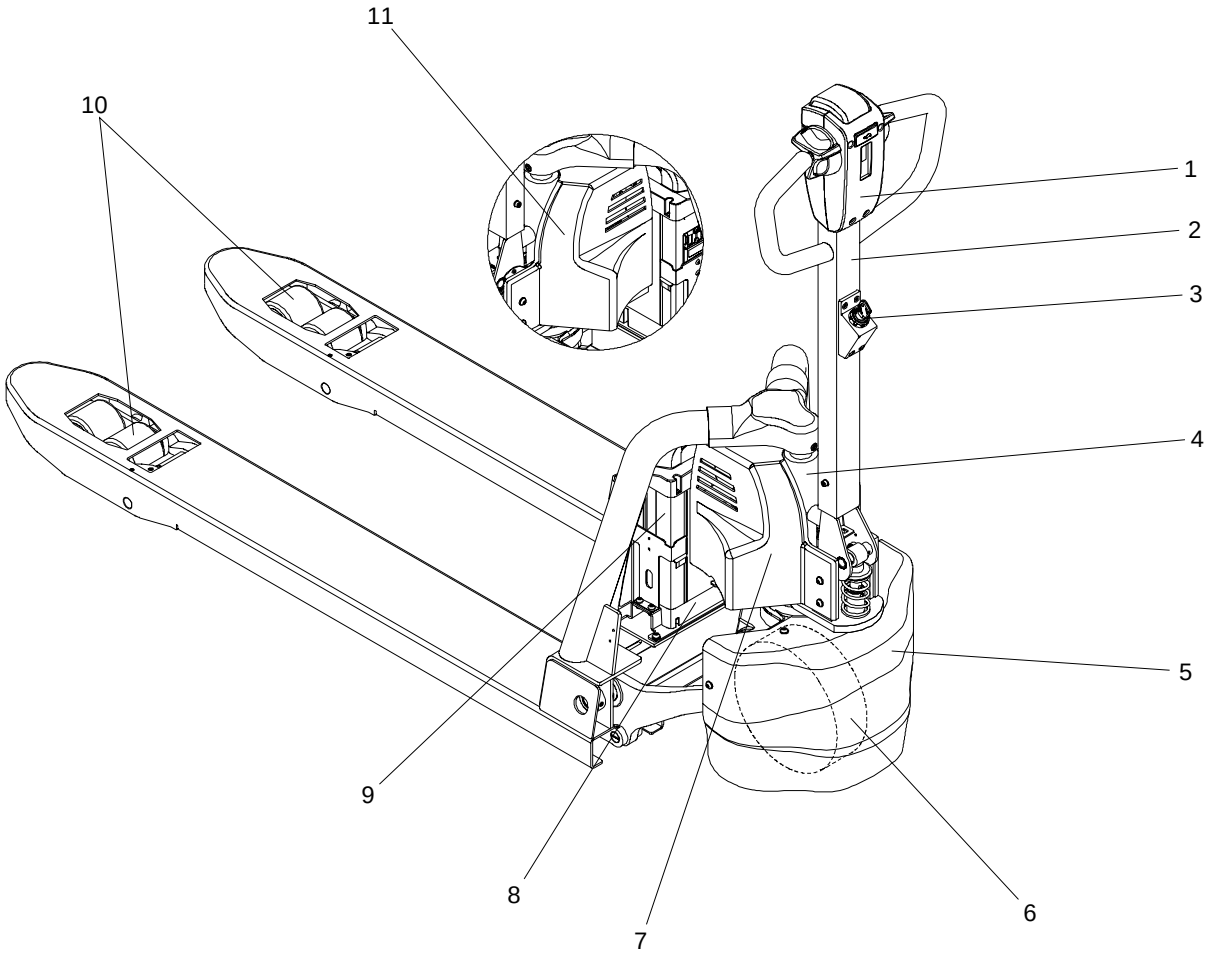
Hydraulic system

- Modularization hydraulic power unit owns low noise, low vibration, stable and reliable lifting and lowering.

Lifting system

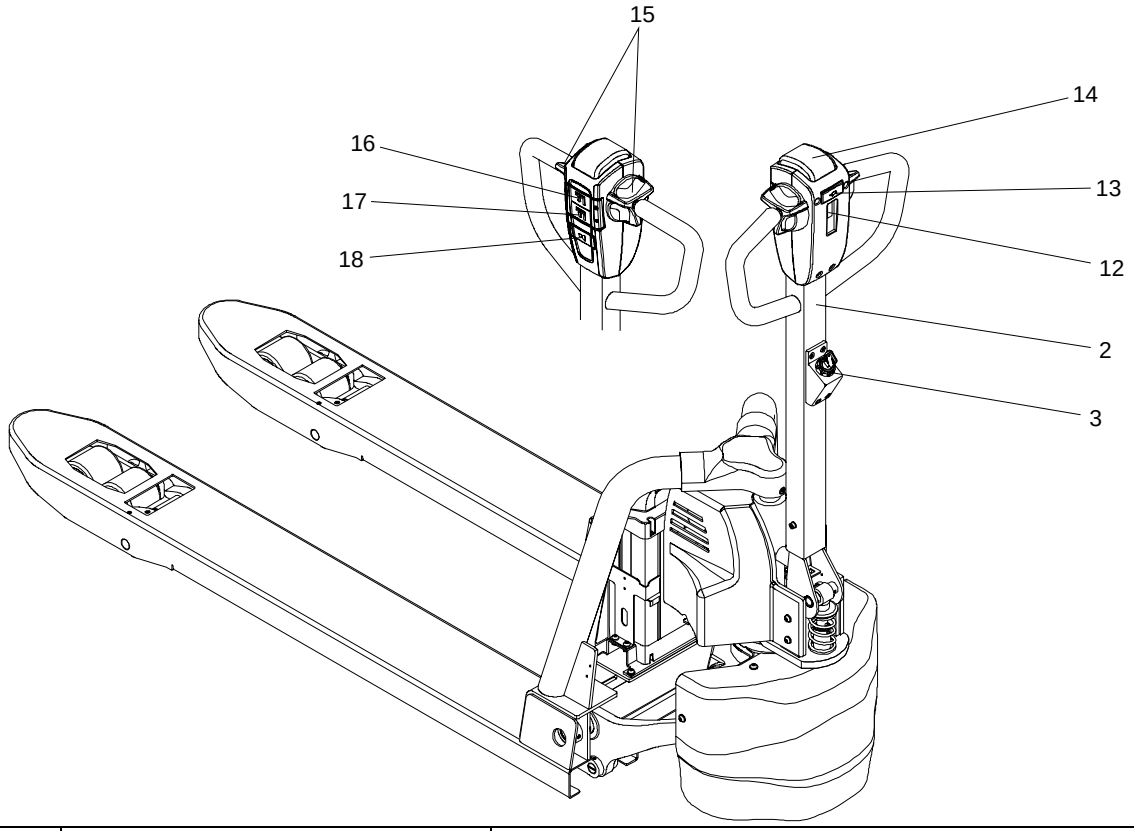
- Adopted single-cylinder two-connecting rod structure is simple and reliable, with good lifting synchronism.

2.3 Main part introduction



Item	Description	Item	Description
1	Tiller handle	7	Left hydraulic cover
2	Control lever	8	Battery seat
3	Key switch（with key）	9	Battery
4	Lift cylinder	10	Load wheels
5	Drive cover	11	Right hydraulic cover
6	Drive wheel		

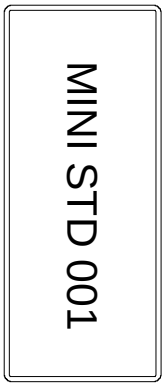
2.4 Display and control



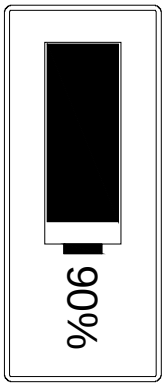
Item	Designation	Function
2	Control lever	Used for steering and braking the truck.
3	Key switch	Switches the control current ON and OFF. Removing the key prevents the truck from being switched on by unauthorized personnel.
12	Display instrument	Hourmeter. Battery charge status.
13	Crawl button	Pressing the crawl button reduces the travel speed and acceleration. If the control lever is set to the brake zone (B1), you can press this button to override braking; the truck will travel at slow speed.
14	Collision safety switch	Truck moves away from operator. Protect the operator from extrusion damage under emergent circumstances.
15	Travel switch	Controls travel direction and speed.
16	Lift button	Raises the load device. When the battery is consumed about 80%, lifting function will be locked.
17	Lower button	Lowers the load device.
18	Horn button	Give out sound warning signal.

2.4.1 Display instrument

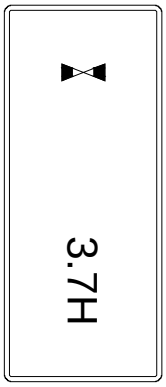
Shows the battery charge status and the truck total travel time.



Start normal power up



Remaining battery level is displayed



Total travel time

2.5 Standard technical data

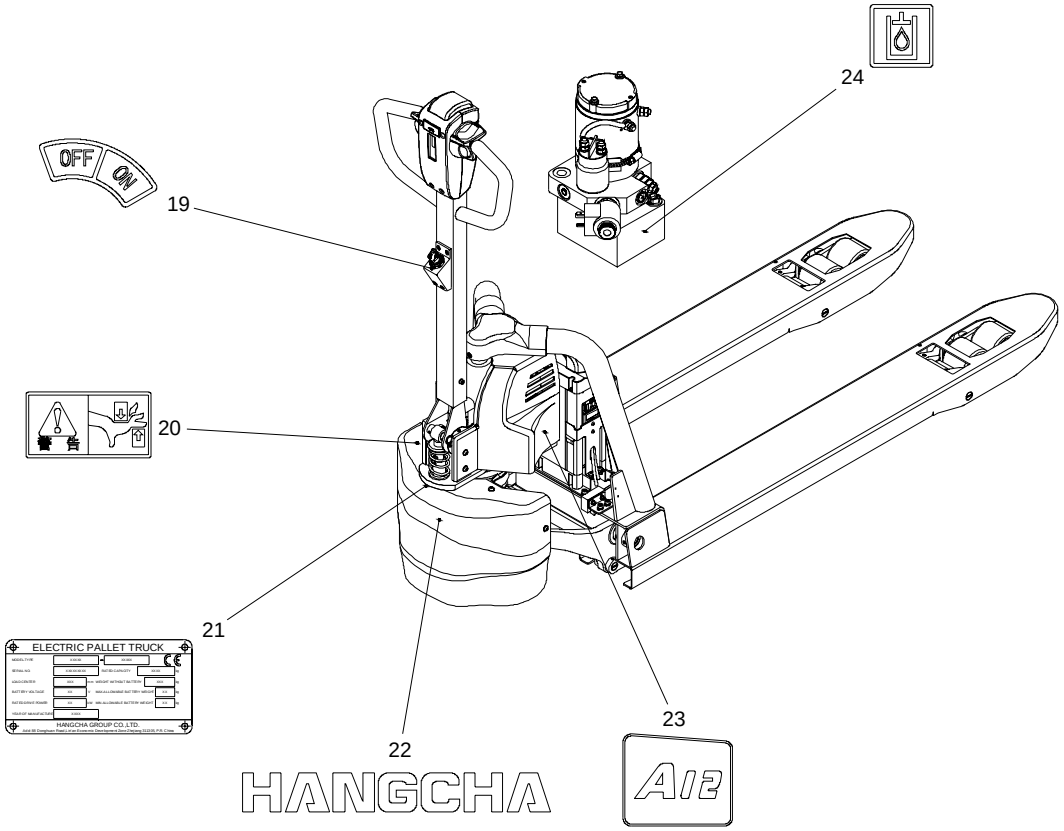
The following technical data are all standard data. Our company reserves the right of alteration and extension.

Characteristics	Model		CBD12-AMC1-I
	Operator type		Pedestrian
	Rated capacity	Q (kg)	1200
	Load center distance	c (mm)	600
	Load distance, centre of drive axle to fork	x (mm)	950
	Wheelbase	y (mm)	1220
Weight	Service weight (Including battery)	kg	130
	Battery weight	kg	4.8
Wheels & Tyres	Tyres type		PU
	Tyre size, front	mm	Φ210×70
	Tyre size, rear	mm	Φ75×65
	Wheels, number front/rear (x=driven wheels)		1x/4
	Tread, front	b11(mm)	410
Dimensions	Lift height	h3(mm)	115
	Fork height, lowered	h13(mm)	75
	Overall length	l1(mm)	1580
	Overall width	b1(mm)	560
	Fork dimensions	s/e/l(mm)	53×150×1150
	Distance between fork-arms	b5(mm)	560
	Ground clearance, center of wheelbase	m2(mm)	22
	Turning radius, min	Wa(mm)	1330[1)]
Performance	Travel speed, laden/unladen	km/h	4/4.5
	Lift speed, laden/unladen	m/s	0.015/0.023
	Lowering speed, laden/unladen	m/s	0.064/0.021
	Max Gradeability, laden/unladen	%	4/10
Motor & Battery	Drive motor rating at S3 60 min	kW	0.65
	Lift motor rating at S3 15%	kW	0.36
	Battery voltage, rated capacity	V/Ah	24 / 20
Controller	Type of drive control		DC
	Manufacturer		Curtis

2.6 Product plates and warning labels location

Plates and labels, such as nameplate, warning labels must be legible, if identification is unclear, and must be replaced.

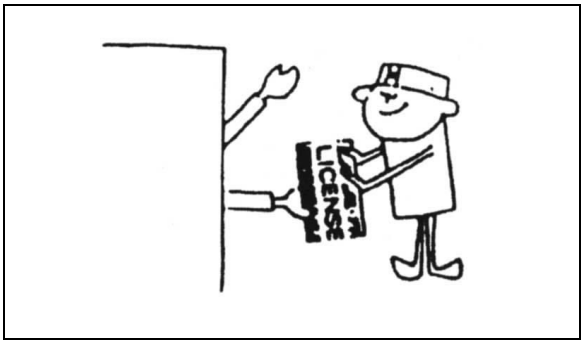
The figure below shows the approximate location of the various identity resides. Before operating the truck, please understand the meaning of the various identities.



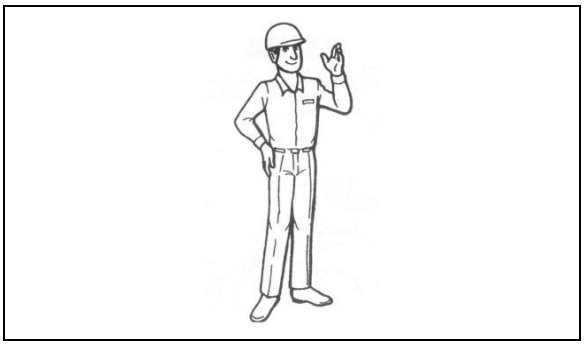
Item	Description
19	Key switch：“OFF” position is off，“ON” position is on.
20	Warning label: Stay clear of all moving parts. Moving parts can cut or crush hands, feet, arms or legs.
21	Nameplate: The rated capacity on the nameplate is the max. load capacity by the label listed equipment. Any change to the forklift or other equipment may change rated capacity.
22	Manufacturer’s logo
23	Series tonnage label：A series, rated capacity is 1.2t.
24	Add hydraulic oil decal.

3 Safety Instructions

1) Only trained and authorized operator shall be permitted to operate the truck.

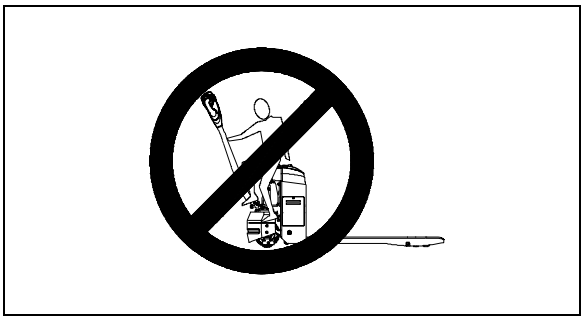


2) Operator must wear helmet, working shoes and uniform



3) Do not overload.

4) Never carry people.



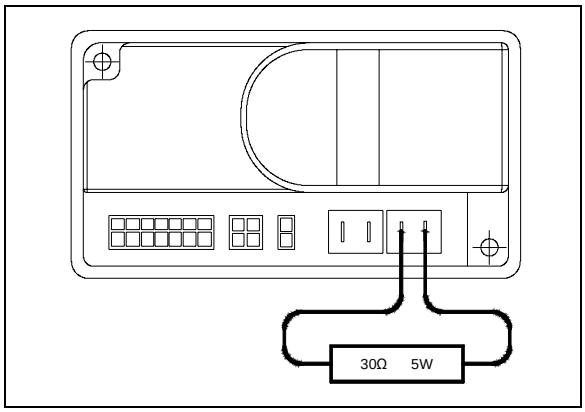
5) It is not allowed to reconfigure the truck without manufacturer's permission.

6) Do not work in flammable and combustible environment.

7) Check the oil, fluid leakage, deformation, flexibility in certain time. If neglected, service life of forklift will be shorted and in serious condition there will be accident.

- Make sure change the "safety parts" during the schedule maintenance.
- Wipe off the oil, grease or water on the soleplate, foot pedal and control lever.
- No smoking or any spark, smoke near the battery when checking.
- Be careful of scald when checking motor and controller.

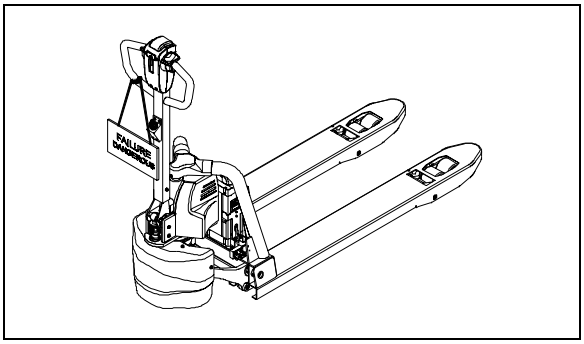
8) The controller equips with energy accumulator, do not touch between B+ and B- to avoid electric injury. If you need check or clean the controller, connect load(like contactor coil or horn or bulb or resistance) between controller B+ and B- to discharge the controller capacity.



9) Whenever you find the forklift abnormal, stop the truck, put on the DANGEROUS or FAULT sign to the truck, remove the key, and report to the managing person. Only after eliminating the fault can you

use the truck.

- If there occurs to fault, battery electrolyte, hydraulic oil leakage when lifting loads, going up and down the slope, please organize staff to repair.

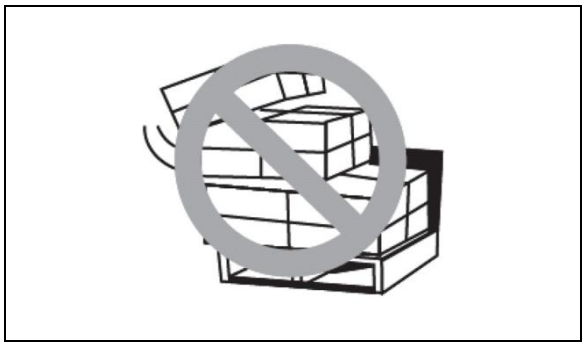


10) Internal battery may generate explosive gas, it's prohibited any flame close the battery. Never allow the tools close two poles of the battery to avoid spark or short circuit.

11) The work ground of forklift shall be solid and smooth concrete surface or similar ones. Pre-check the ground condition of working site. Tidy the working site, clean obstacle, sweep macadam, muddy sand and wipe off greasy dirt.

12) Before start, press the horn and make sure no people around.

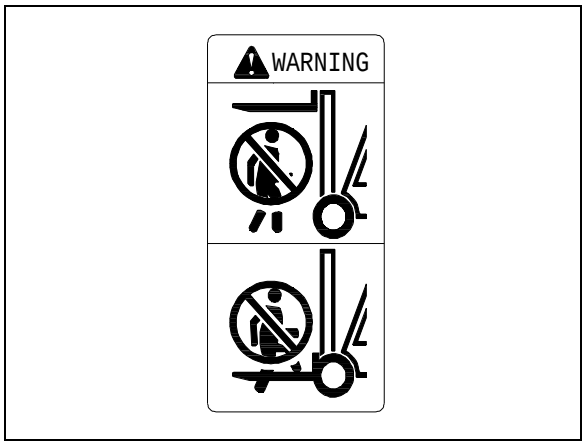
13) Goods are not allowed to deviate the fork center, when goods is deviating the fork center, turn or pass uneven road, you are easily to fall. Meanwhile, possibility of turnover will increase.



14) Avoid sudden drive, stop or turn.

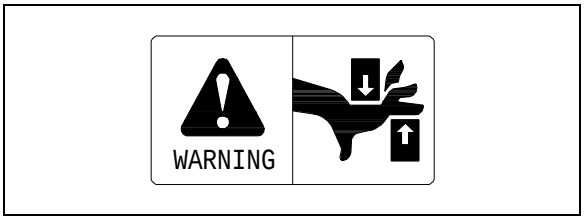
15) When handling bulky loads, which restrict your vision, please operate the machine in reverse or have a guide.

16) It's forbidden to put the head, hand, foot or body under the forks. Never stand on the fork.



17) It's forbidden to put the head, hand, foot or body into the space between the chassis and lifting component, once clipped, it is dangerous to your life. It's forbidden to put the head, hand, foot or body into the space between fork and

link mechanism.

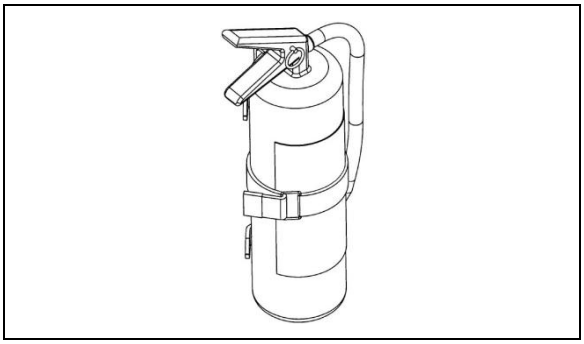


18) Make the loads in front when climbing the slope. It's prohibited to turn on the slope, or there's danger of tipping over. Avoid working on the slope.

19) **After power off, brake works and the truck can not be towed(dragged).**

20) Please obey the requirement in this manual and the truck label when operation. Check label, identification plate, replace damaged or fallen ones.

21) Fire extinguisher shall be equipped at the work site. Users can choose truck equipped with fire extinguisher. Driver and manger should be familiar with the fire extinguisher position and application method.



22) Use tray when carrying small items, do not place on the fork directly.

23) Do wash the inner of the truck, do not place the truck outdoors and exposed to the rain.

24) Before dismantle or repair the truck, lift the battery out of the truck firstly.

25) When working environment is not enough light, please add extra lighting of the working area.

4 Transport

The forklift truck is designed for short-distance lifting,lowering and transporting load units, not suitable for long-distance travel. If needed, the forklift truck must be transported by using lifting device or platform to place on truck or trailer.

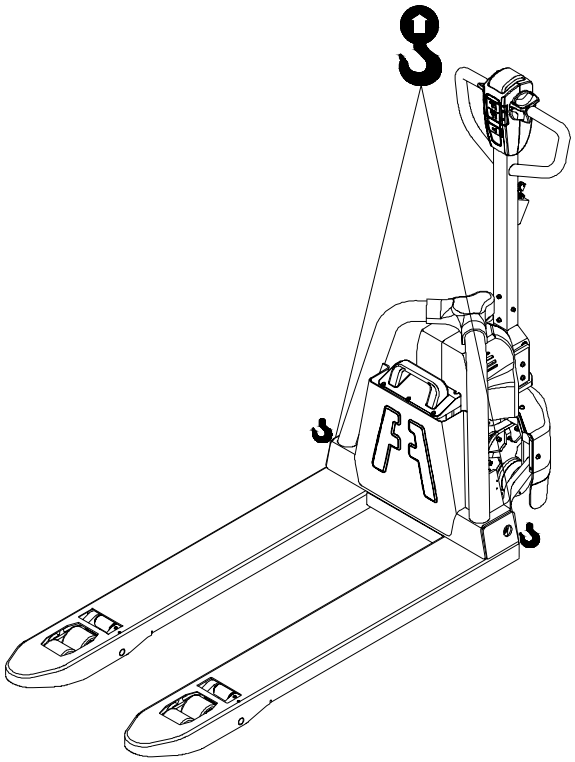
4.1 Lifting by crane

⚠ WARNING

- **Only use lifting gear with sufficient capacity (for truck weight see truck nameplate).**
- **Do not stay under the truck when hoisting the truck.**
- **When hoisting or laying down, it should be stable and slow to avoid collision or accident.**

Procedure:

- Park the truck securely.
- Secure the lifting slings to the strap point, and prevent them from slipping. Crane slings should be fastened in such a way that they do not come into contact with any attachments when lifting.
- Load the truck and park it securely at its destination.



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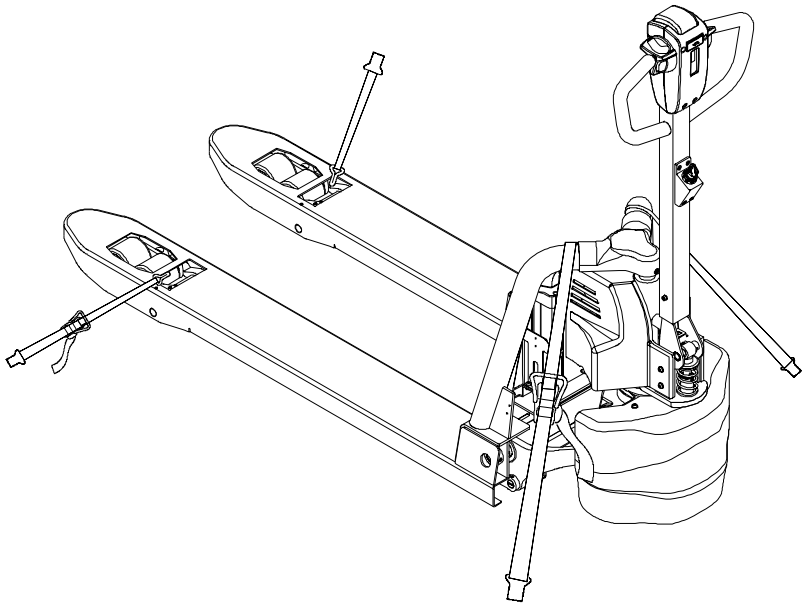
4.2 Securing the truck during transport

Correctly fix the forklift truck to avoid move when using truck or trailer.

Procedure:

- Park the truck securely.
- Sling the tensioning belt around the truck and attach it to the fastening rings of the transporting vehicle.
- Use wedges to prevent the truck from moving.
- Tighten the tensioning belt with the tensioner.

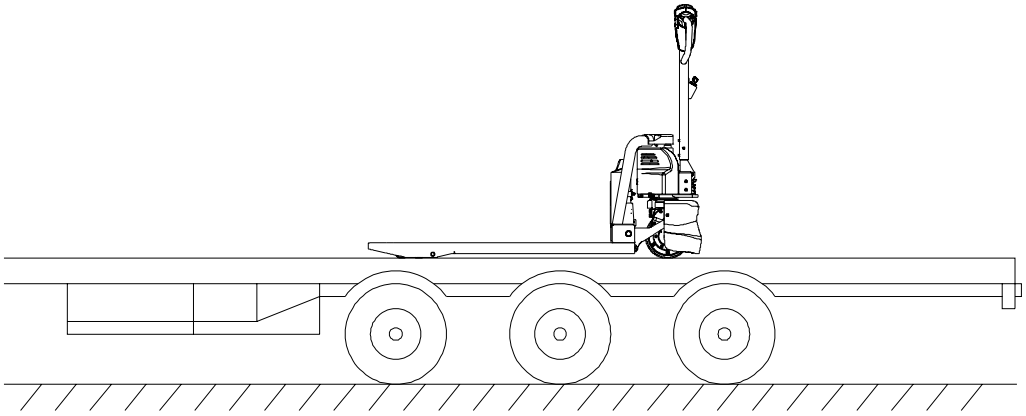


WARNING

- **The truck or trailer must have fastening rings.**
- **Use wedges to prevent the truck.**
- **Only use tension belt or fastening belt of good nominal strength.**

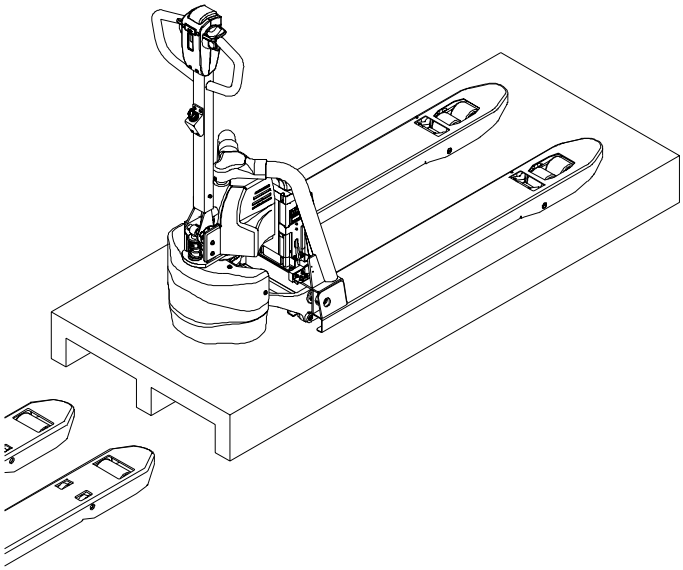
4.3 Transport

The pallet truck is designed for short-distance material handling only and is inappropriate for long-distance transportation. If needed, the truck must be transported by using lifting device or platform to place it on truck or trailer. Before operation, fix the pallet truck firmly on the transport vehicle with belt, and block the wheel to avoid relative motion during transportation.



How to remove a broken truck

It's not allowed to tow the forklift truck on the ground directly when the truck is broken down or damaged since the brake of the truck is closed under normal circumstances. Appropriate vehicles should be used to remove the broken trucks.



WARNING

- **After power off, brake works and the truck can not be towed(dragged), or else the braking system would be damaged.**

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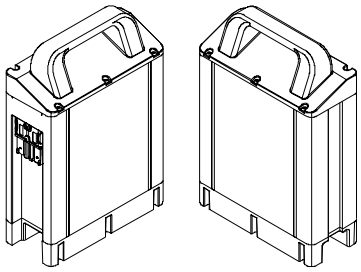
5 Battery and charger

Battery

The truck comes standard with a 24V/20Ah lithium battery pack, lithium battery pack weighs about 5kg. When the battery temperature reaches 25℃～30℃, its service life is the longest. Lower temperature reduces battery available capacity and higher temperature shortens battery service life.

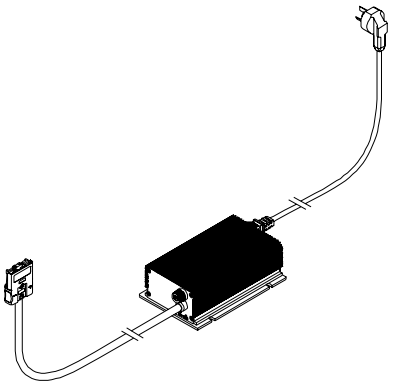
Battery capacity to the ambient temperature 25℃ as the standard, with the temperature drop continued the corresponding reduction of mileage is a normal phenomenon. Each drop of 1℃ temperature, the battery capacity decreased by about 1%, try to avoid the -10℃ below the use of the environment.



Charger

- Input voltage: 85Vac～265Vac
- Input frequency: 50Hz/60Hz
- Output voltage/current: 24Vdc/10A

Charger and battery parameters match or not have a significant impact on battery performance and life expectancy, so the user should choose the original charger with the same model when replacing the charger.



WARNING

- **Risk of electric shock. Do not expose to liquid, vapor or rain.**

5.1 Safe operation rules for battery use

- Please charge the battery at an ambient temperature of 0℃ to 40℃.
- Do not decompose the battery in any way!
- Please prevent the battery from water or infiltration of any corrosive liquid.
- Do not charge the battery in a fire or high temperature environment!
- Do not let the battery close to any open flame, heat, flammable and explosive objects.
- Do not use or store the battery near heat sources (such as fire or heat)!
- Do not short-circuit the battery with wires or other metal objects!
- Do not pierce the battery case with nails or other sharp objects.
- No impact or foot battery!
- Before starting to charge, check the cable connection and plug connector for obvious damage.
- Do not smoke or use open flame while charging the battery. Do not place flammable materials and working equipment that may cause sparks.
- When the vehicle is not in use, it must be stored after charging the battery. If not, it is recommended to charge it once a week.
- After battery scrap, please return to the recycle bin unified handling, may not arbitrarily discarded.

WARNING

- **Do not charge the lithium battery below 0℃.**
- **In case of the lithium battery fault, please contact the dealer to make appointment for repair, never attempt to disassemble the lithium battery.**
- **Please strictly follow the rules to use the lithium battery. Improper operation may cause lithium battery to generate leakage, heat, smoke, and may cause serious fire or explosion.**
- **Disposal to the waste battery should accord with local environment regulation.**
- **The truck should use a lithium battery complying with EN 62619. When replacing the lithium battery, ensure that the lithium battery of the same specification, dimension and weight is fitted.**

5.2 Battery charging

That is, during truck operation the battery discharge process, the battery over-discharge is prohibited. After the truck is running, it is timely to charge the battery.

WARNING

- **You must use the original charger provided by our company to charge the battery. Before the battery is full, try not to interrupt the charging process.**

Charging Procedure:

- Park the truck securely.
- Lift the battery out of the vehicle.
- Insert the charger power plug into a suitable power outlet.
- Insert the charger charging plug into the battery plug.
- The charge indicator lights up, the battery is charging, the battery is fully charged for about 2 hours.

  LED 1: Red power on

  LED 2: Red charging

  LED 2: Green charged
- Remove the charger power plug and charging plug respectively after charging, and put the battery back into the forklift.

CAUTION

- **Before plugging the battery back, please make sure that the truck is still in the power off state.**
- **Due to the particularity of lithium batteries, under low-temperature environment, the battery capacity will have a certain attenuation.**

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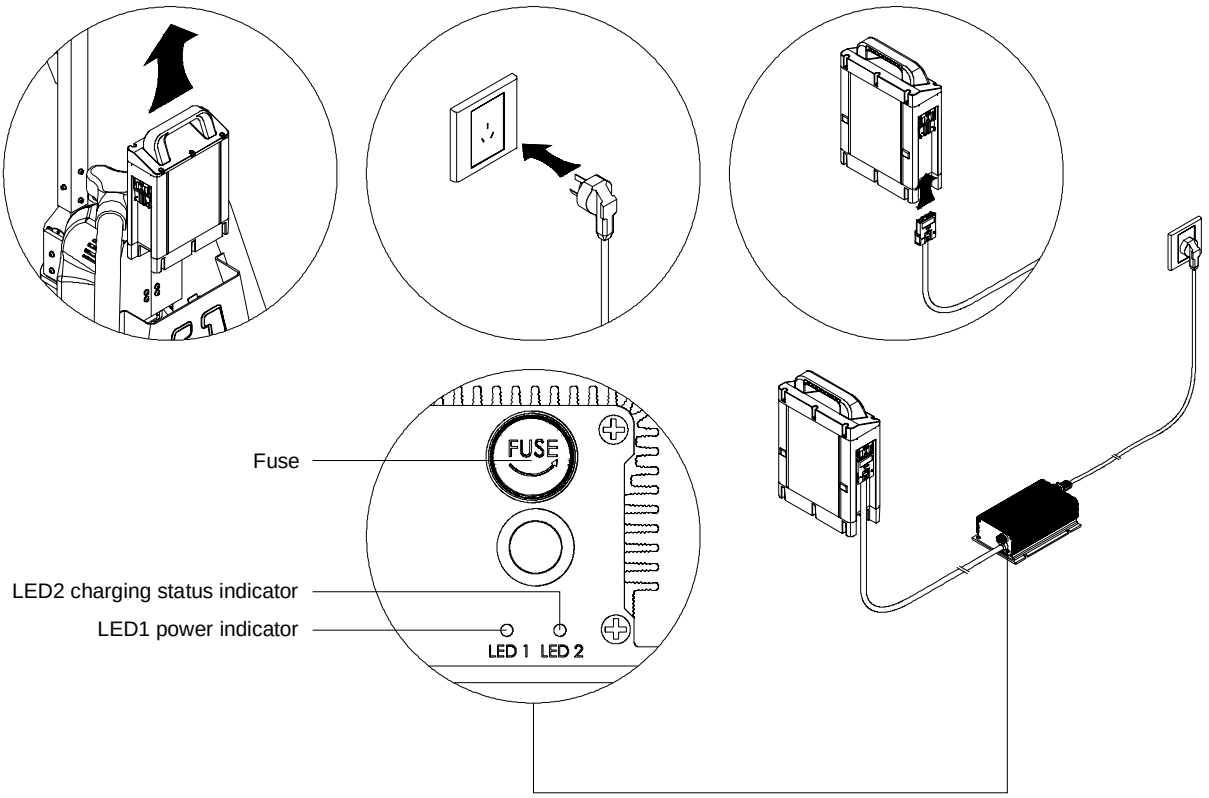


6 New truck breaking-in

We recommended operating the truck under light load conditions for the first stage of operation to get the most from it. Especially the requirements given below should be observed while the truck is in a stage of 100 hours of operation：

- Avoid the new battery over discharging in early period.
- Perform specified preventive maintenance services completely.
- Avoid sudden stop, start or turn.
- Limited load is 70%～80% of the rated load.
- Often check and fasten the fasteners of each joint part.
- After the break-in ends, replace hydraulic oil.

7 Operation

7.1 Check before operation

In order for the safety truck operation and keep the truck in good condition, before starting the truck, you must check it carefully.

1) Oil leak and liquid leak check

Park the truck and check oil leakage.

2) Fork check

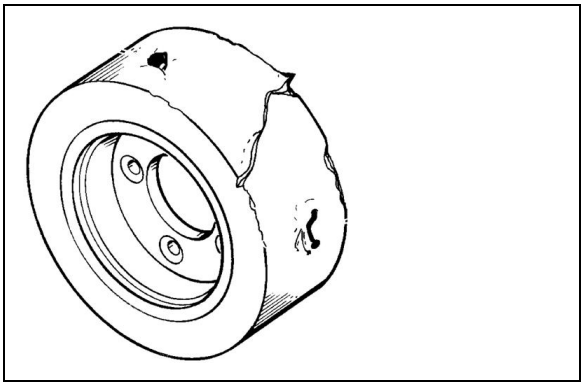
Check the fork and see whether bended or crazed.

3) Front/rear wheel check

Check the wheel and see whether there is any craze, damage, or abnormal wear.

Check the wheel fasteners for looseness.

Inspect whether there is rope on the wheel.

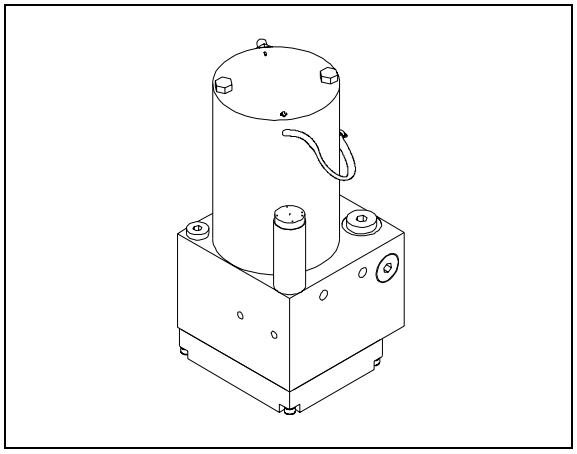


4) Check front fork and linkage mechanism

Check the fork and linkage mechanism, see whether bended or crazed. Whether appear interfere when move, movement point wear whether severe.

5) Hydraulic oil check

Open the hood, check if the oil level within the scales. Add oil when insufficient.

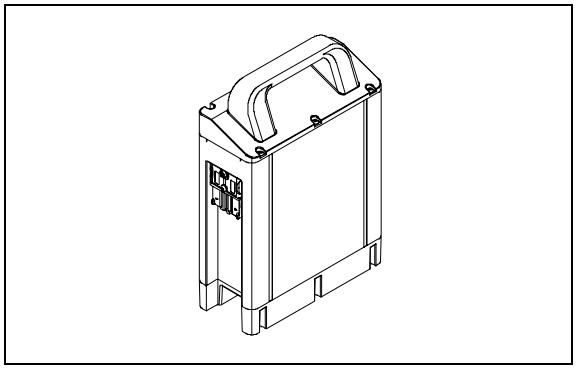


6) Battery check

Check the battery cover board. See whether the battery fixed reliably.

Check the terminal for loose or damage.

Otherwise adjust or replace.



7) Instrument display check

Refer to instrument part.

8) Lifting and lowering button

Press the lifting button and check the fork lifting condition. Press the lowering button, check the fork lowering condition. Check if the lifting system has abnormal sound.

9) Forward and reverse running condition

Tilt the handle to some degree, gradually press the accelerator button to the outside of

the body with thumb, and inspect the forward running condition; gradually press the accelerator button to the inside of the body with thumb, and inspect the reverse running condition.

10) Brake system

When the truck run forward or backward, push the handle to vertical position or press to level position to check the brake condition.

11) Steering system

Left or right turn the handle to make the truck run around 3 turns, and then check if the steering system is normal.

12) Horn

Press the horn button to check sound.

13) Appearance

Check the truck appearance for clean, rust or paint spalling.

14) Others

Check whether there is any abnormal noise, whether wiring is regular or fastener loosens etc.

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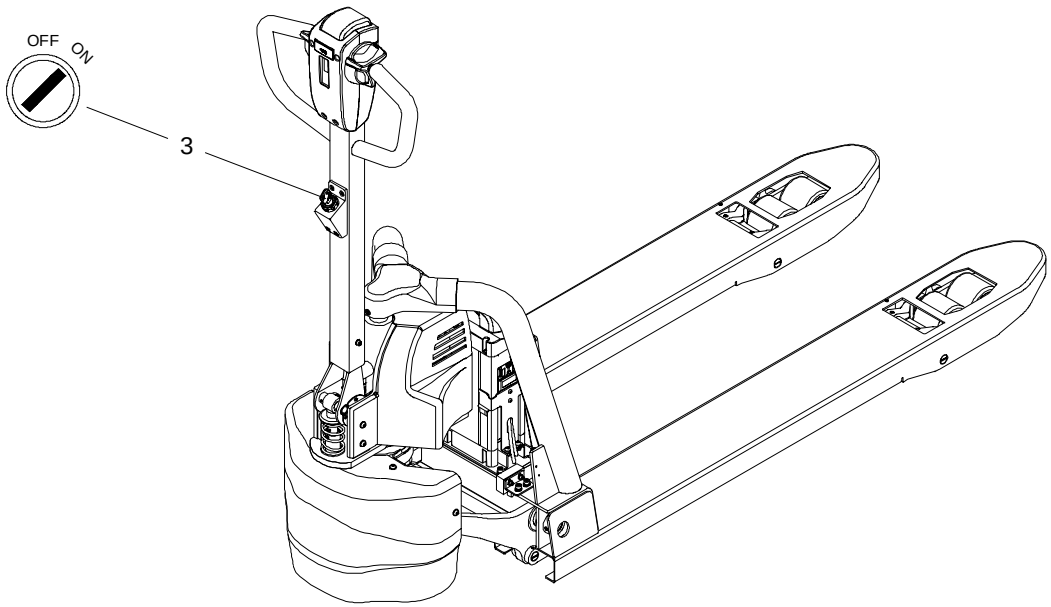
7.2 Start up the truck

Procedure:

- Carry out check before operation and make sure each function and state is normal.
- Insert the key in the key switch (3), and turn it clockwise as far as it will go to the “ON” position.

The truck is now operational.

The display instrument shows the battery charge status and the truck total travel time.



7.3 Travel

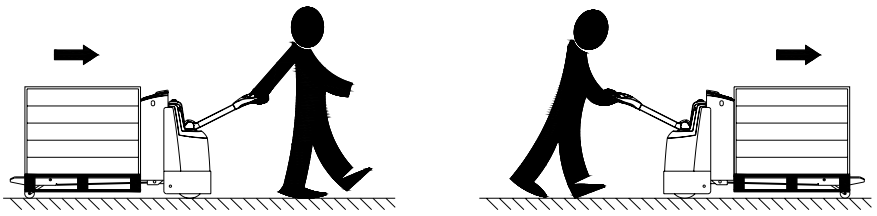
Do not drive the truck unless the panels are closed and properly locked. Do not carry passengers on the truck.

Procedure:

- Start up the truck.
- Set the control lever (2) to the travel zone (F). Travel is only released in the travel zone (F).
- Set the travel switch (15) to the required direction (Forward or Backword).

  The truck travels in the required direction.
- Control the travel speed with the travel switch (15).

Driver should walk in front of the truck and keep at the side front of the truck when travelling. One hand holds the handle, and operates travel switch with thumb. Always watch moving direction and guide the truck. Or hold the handle with both hands and push the truck go forward.



CAUTION

- **Operator must wear protective boots.**
- **When enter narrow area as lift, first get fork go.**
- **Travel according to regulated route. Keep road clean and no slipping.**

Slow travel

When you apply the slow travel speed button in the travel zone (F) and brake zone (B1), the truck travels at reduced speed and acceleration.

Procedure:

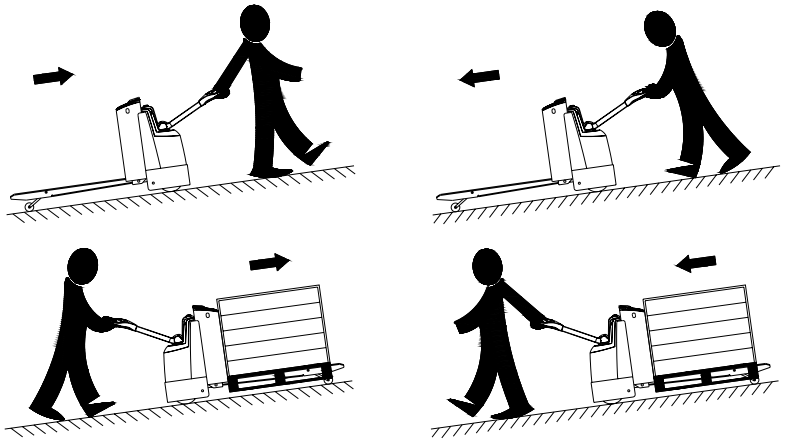
- Press the slow travel speed button (13).

  The driver must be particularly careful when applying the “slow travel speed” button (13).

  The truck can be operated with a control lever (2) (e.g. in congested areas/travel seat).
- Set the travel switch (15) to the required direction (forward or backward).
- The brake is released. The truck travels at slow speed.

Travelling on inclines:

When going uphill and downhill without load, keep the fork to downhill direction; when going uphill and downhill with load, keep the fork to uphill direction.



WARNING

- **Never park on the slope. No turn, inclines when going uphill and downhill.**
- **Slow down when going downhill and ready for braking.**

Safety collision switch

Procedure:

- Press the safety collision switch (14). The truck accelerates in the travel direction (Backward) and then brakes to a halt. Lifting and lowering are deactivated.

  The safety collision switch (14) prevents the operator from being jammed between the truck and other objects.

  The safety collision switch (14) only operates when the truck is travelling forward.

Horn

- Press the horn (18) to activated the audible warning signal.

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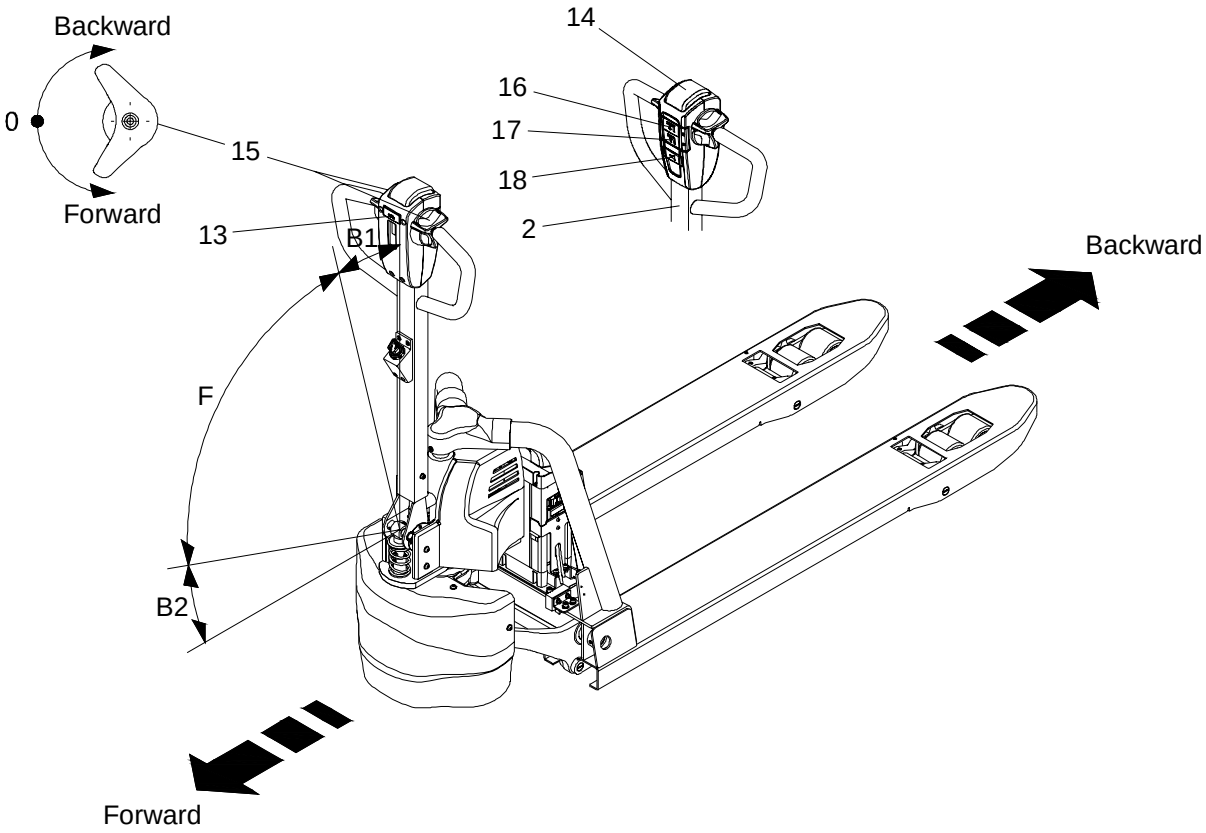

7.4 Steering

Procedure:

- Move the control lever (2) to the left or right.

7.5 Braking

The brake pattern of the truck depends largely on the travel route conditions. The driver must take this into account when travelling. In hazardous situations set the control lever to the brake position.

The truck can brake in different ways:

- Automatic braking
- Braking witch the service brake (With the control lever in zone "B1 or B2")
- By inversion braking (travel switch)
- By regenerative braking (coasting)

Automatic braking

Procedure:

- The truck brakes automatically as soon as the control lever is released. The control lever moves automatically to the upper braking zone (B1).

> ⚠ **CAUTION**
>
> - **If the control lever moves slowly or not automatically to the upper brake zone, the cause of this fault must be rectified. Replace the gas pressure spring if necessary.**

Braking with the service brake

Procedure:

- Set the control lever (2) up or down to one of the brake zones (B1 or B2).

The service brakes is the regenerative brake. The truck will decelerate at the maximum rate and the brake will apply.

Inversion braking

Procedure:

- During travel, set the travel switch (15) to the opposite direction.

The truck brakes are regenerative until it starts to move in the opposite direction.

Regenerative braking

Procedure:

- If the travel switch (15) is set to 0, the truck automatically uses regenerative brakes.

The truck brakes to a halt regeneratively via the coasting brake. The brake then applies.

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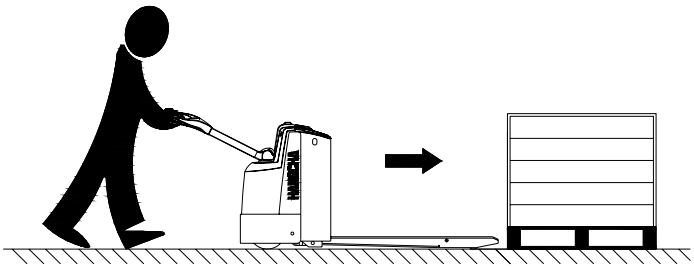
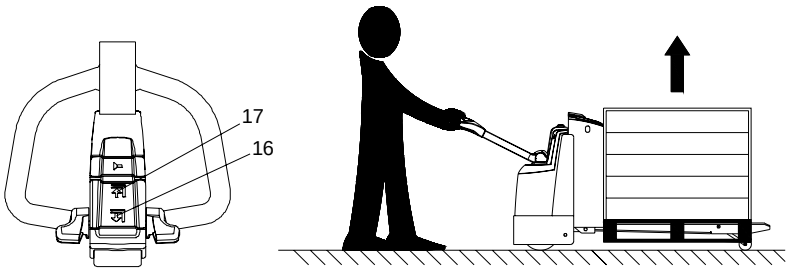
7.6 Lifting loads

Procedure:

- Fully insert the load handler underneath the load unit.



- Press the lift button (16) until you reach the desired lift height.



CAUTION

- **The lift speed cannot be changed. Release the button (16) as soon as you reach the limit position of the load handler.**

7.7 Transporting loads

- Drive the truck with the load unit its destination.

  Take care to accelerate and decelerate gently and travel at constant speed. Adapt you travel speed to the conditions of the route and the load unit you are transporting.

- Drive carefully up to the storage location.

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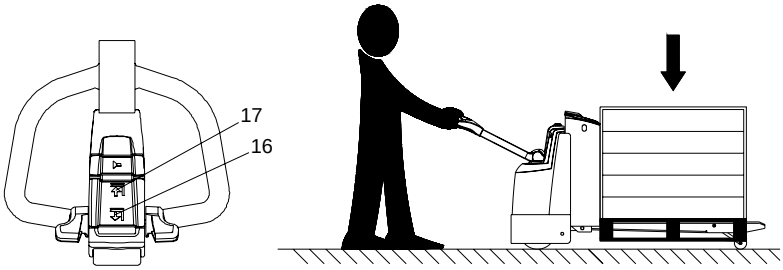
7.8 Depositing loads

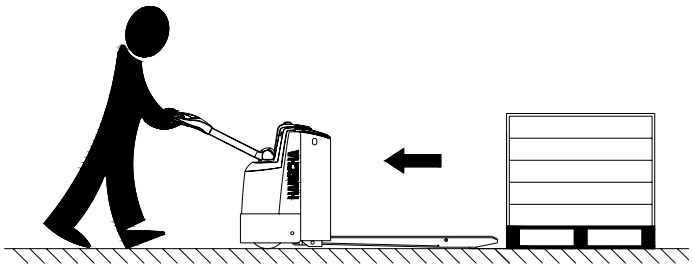
Procedure:

- Press the lower button (17).

  Carefully lower the load handler so that the forks are clear of the load.



- Carefully remove the forks from the load unit.



CAUTION

- **Avoid depositing the load suddenly. The lower speed cannot be adjusted.**

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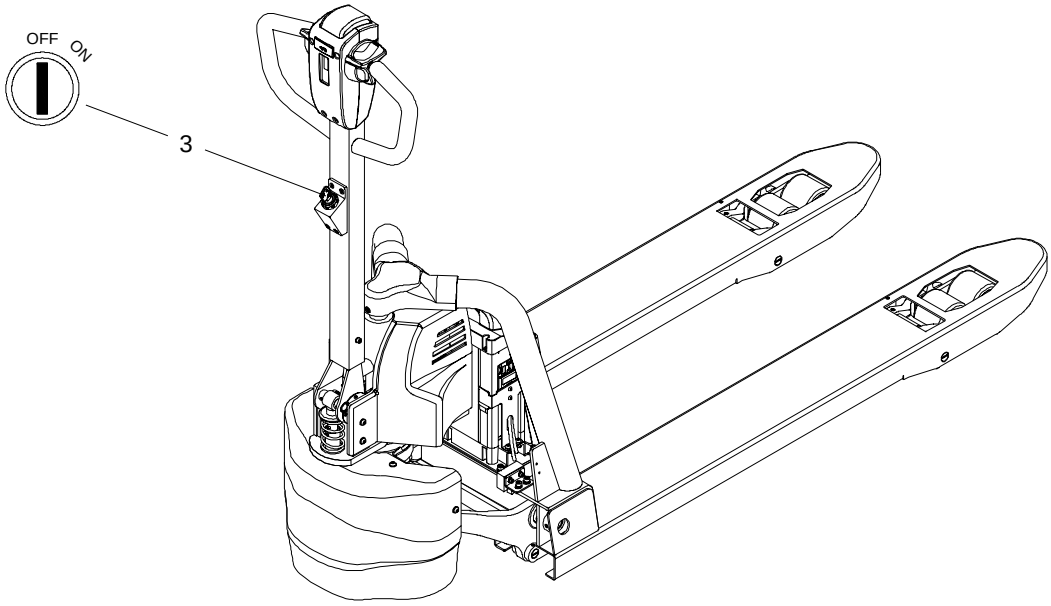
7.9 Parking the truck securely

Procedure:

- Drive the truck to safe area or appointed area.
- Lower the load handler.
- Set the key switch (3) to the “OFF” position and remove the key.



CAUTION

- **When you leave the truck it must be parked securely even if you only intend to leave it for a short time.**
- **Do not park the truck on an incline. The load handler must always be fully lowered.**

8 Deposit the truck for long time

8.1 Deposit for long time

- Fully check the truck, especially check the wheel damage.
- Check fluid oil for leakage.
- Apply lubrication grease.
- Check the joint face of cylinder piston rod for looseness, and if scratch on the piston rod surface. Apply anti-rust oil to piston rod or easily rusty axle.
- Cover the whole truck.
- At least once a month to fully charge

8.2 Start running after deposit for a long time

- Remove rust preventive oil on exposed parts.
- Clean impurity and water of the hydraulic oil tank.。
- Recharge battery, fit on truck and connect.
- Carefully check before start. Inspect starting, travelling, slowing down, steering, braking and parking etc. function.

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9 Maintenance

9.1 Maintenance general

- The forklift truck needs inspection and maintenance periodically, to make it in good working condition.
- Inspection and maintenance are usually ignored, you'd better find out the problems early and solve it in time.
- Use authentic parts of Hangcha Group.
- Don't use different oil when changing or adding oil. Don't rave about oil and electrolyte used at will, and carry on handling according to the local environmental protection laws and regulations.
- Draw up complete maintenance plan.
- After you make maintenance, you'd better make a record.
- Forbid to repair the forklift truck if you haven't been trained.

CAUTION

- **No fire.**
- **You should shut off key switch and pull off the plug before service.（except some trouble shooting）.**
- **Clean the electric part with compress air, and do not with water.**
- **Do not stretch your hands, feet or any part of body into the gap between the mast and instrument.**
- **When the working environment is severe, maintain in advance.**

9.2 Periodic maintenance schedule

The service intervals stated are based on single shift operation under normal operating conditions. They must be reduced accordingly if the truck is to be used in conditions of extreme dust, temperature fluctuations or multiple shifts.

The following servicing checklist indicates the operations to be performed and the respective intervals to be observed. Maintenance intervals are defined as:

D = Every 8 service hours, at least daily

W = Every 40 service hours, at least weekly

M = Every 250 service hours, or at least every 1.5 months

T = Every 500 service hours, or at least trimonthly

S = Every 1000 service hours, or at least semiannually

Y = Every 2000 service hours, or at least annually

● = Standard maintenance interval

Battery		**D**	**W**	**M**	**T**	**S**	**Y**
1	Check the battery and battery components.	●					
2	Check the battery capacity.	●					
3	Check the battery fixed situation.	●					
4	Check battery cable connections are secure.	●					
5	Clean the battery surface.	●					

Chassis and super structure		**D**	**W**	**M**	**T**	**S**	**Y**
1	Check covers.	●					
2	Check chassis and screw connections for damage.	●					
3	Check labels are legible and complete.	●					

Travel		**D**	**W**	**M**	**T**	**S**	**Y**
1	Check the gear unit for noise and leakage.	●					
2	Check wheel suspension and attachment.	●					
3	Change wheels for wear and damage.					●	

Brakes		**D**	**W**	**M**	**T**	**S**	**Y**
1	Test brakes.	●					
2	Check magnetic brake air gap.					●	

Steering		D	W	M	T	S	Y
1	Test electric steering and its components.	●					
2	Check tiller recuperating function.	●					
3	Bearing lubrication					●	

Electrical system		D	W	M	T	S	Y
1	Test warning and safety devices in accordance with operating instructions	●					
2	Test the displays and controls.	●					
3	Check the function of micro switch and sensor.	●					
4	Test cable and motor attachments.			●			
5	Check contactors and/ or relays.			●			
6	Check fuse ratings.			●			
7	Check electric wiring for damage. Make sure wire connections are secure.			●			
8	Check the carbon brushes, replace if necessary.					●	

Hydraulic system		D	W	M	T	S	Y
1	Test hydraulic system.	●					
2	Check that hydraulic ports, hose and pipe lines are secure, check for leaks and damage.	●					
3	Check cylinders and piston rods for damage and leaks, and make sure they are secure.		●				
4	Check hydraulic oil level and top up if necessary.			●			
5	Test relief valve and adjust if necessary.					●	
6	Lubricate the truck according to the lubrication schedule.						●
7	Replace the hydraulic oil after 2000 service hours/ biannually.						●

Lifting assy		D	W	M	T	S	Y
1	Check link mechanism for tension, damage or rust	●					
2	Check if there is abrasion between shaft and bearing of front and rear fork.			●			
3	Check if there is deformation or fracture on the upper and down connecting rod.			●			
4	Check if there is crack or fracture on front fork or rear fork.	●					
5	Check for looseness of each joint.			●			
6	Add lubricating grease to the pin roll.			●			

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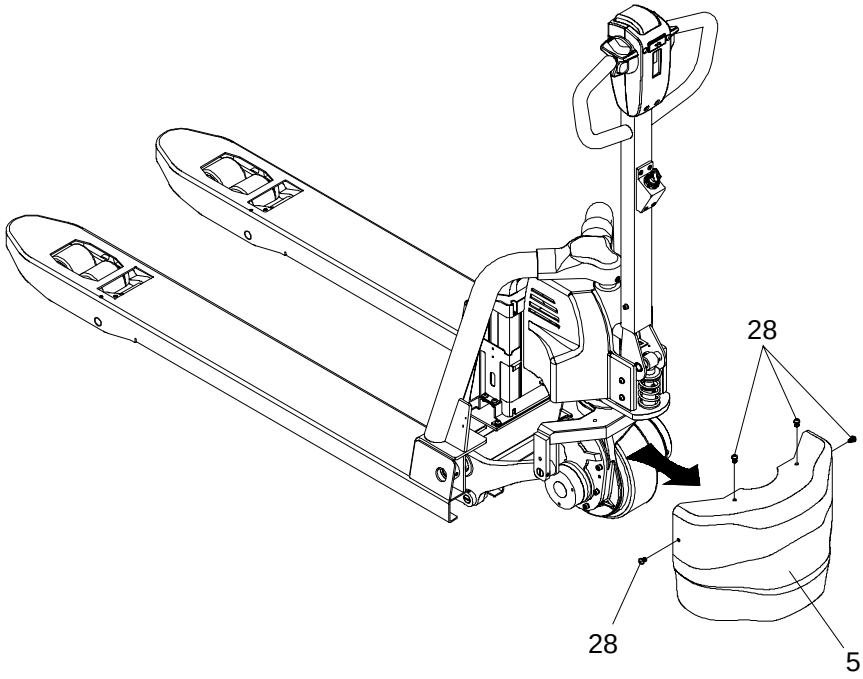
9.3 Remove or installing the drive cover

Remove the drive cover

Procedure:

- Parking the truck securely.
- Unscrew the drive cover (5) of the four screws (37).
- Remove the drive cover.

The drive cover is removed. Installation and removal process is reversed.



WARNING

- **Remove or installing the drive cover, carefully clip hand !**
- **When the drive cover is removed, it is dangerous and does not allow operation of the truck.**

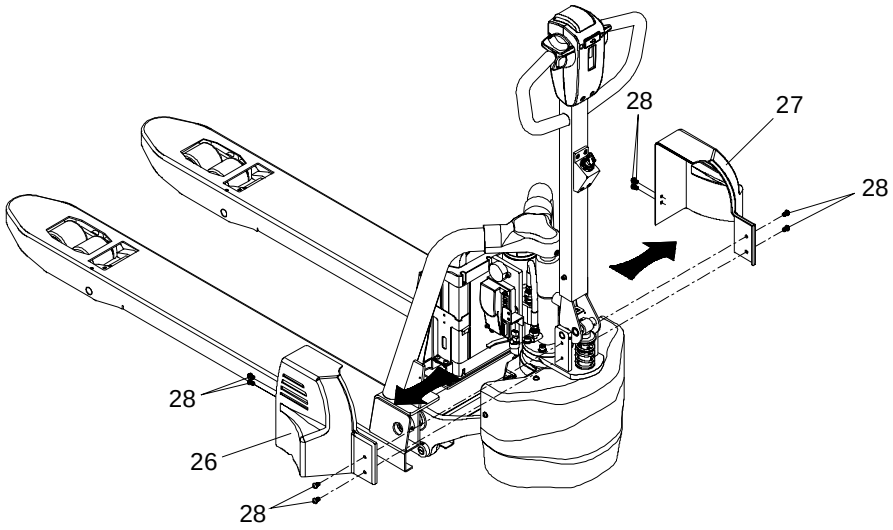
9.4 Remove or installing the left/right hydraulic cover

Remove the left/right hydraulic cover

Procedure:

- Parking the truck securely.
- Unscrew the left hydraulic cover (26) and the right hydraulic cover (27) of the eight screws (28).
- Remove the left/right hydraulic cover.

The left/right hydraulic cover is removed. Installation and removal process is reversed.



WARNING

- **Remove or installing the left/right hydraulic cover, carefully clip hand!**
- **When the left/right hydraulic cover is removed, it is dangerous and does not allow operation of the truck.**

9.5 Replace wheels

Procedure:

- Dismantle the drive unit from the truck.

- Remove the 12 socket hexagon screws which is used to fix the driving wheels with a S=5mm hex wrench.

CAUTION

- **Use equal strength to unscrew the bolts. Do not overexert which might do damage on the thread.**
- **Loosen the bolts in a symmetrical way when unscrewing the bolts and remove the bolts respectively.**

- Strike the edge of the driving wheels with a rubber hammer and remove the old driving wheels from the drive unit.

CAUTION

- **Strike the edge of the driving wheels evenly and symmetrically.**
- **Do not scratch the outer surface of inner ring gearbox and the inner surface of the driving wheels.**

- Install new driving wheels. Apply lubricating oil to the outer surface of inner ring gearbox and the inner surface of the driving wheels in favor of fast installment.

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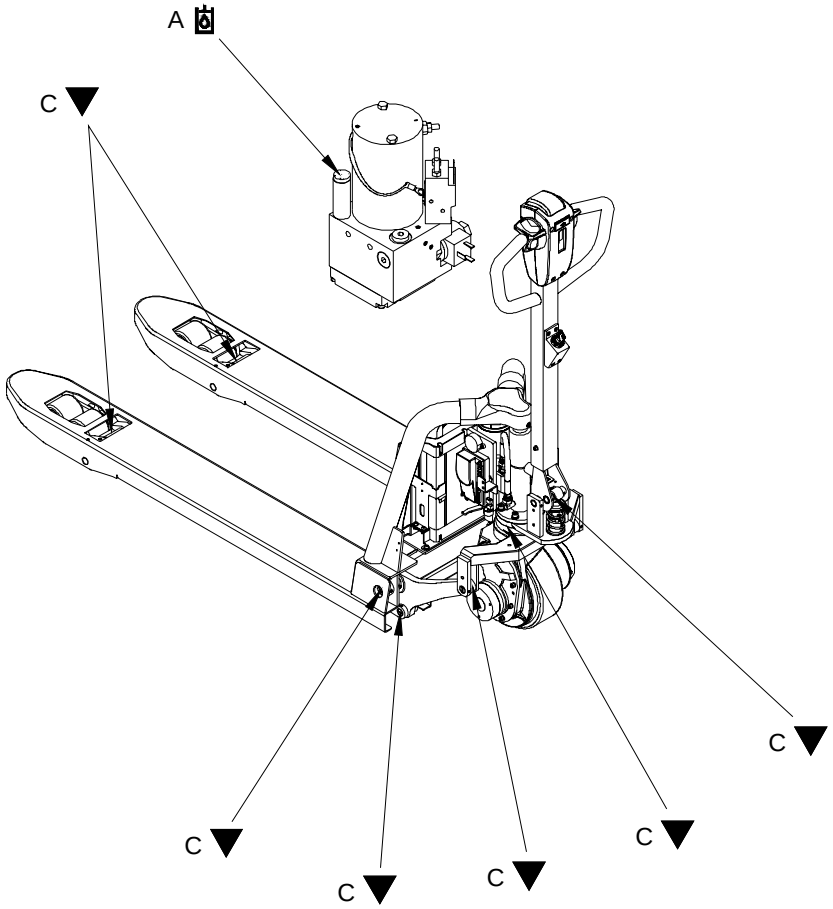
9.6 Truck used oil and lubrication



Filler plug for hydraulic oil

Gliding surfaces

Code	Designation	Mark, code	Remark
A	Hydraulic oil	Normally: L-HM32 High and cold environment: L-HV32	Hydraulic system
C	Grease	Automobile general 3 # lithium base lubricant	Nozzle and lubrication

CAUTION

- **Into the fuel tank of hydraulic oil must be filtered, and the injection volume of the hydraulic oil tank does not exceed the maximum scale.**

10 Relevant safety directive or standard (CE)

After CE certificated, the truck meets the following directive and standard:

- 2006/42/EC machinery directive（namely *Directive of the council of the laws of the member states concerning machinery* ）, 2000/14/EC Noise Directive（Namely *Directive of the council of the laws of the member states concerning noise radiation of outdoor equipment*）;
- EN ISO3691-1:2015（Industrial trucks -- Safety requirements and verification -- Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks）、EN16307-1:2013+A1:2015（Industrial trucks. Safety requirements and verification. Supplementary requirements for self-propelled industrial trucks,other than driverless trucks,variable-reach trucks and burden-carrier trucks）.
- EN1175-1:1998+A1:2010（Safety of industrial trucks - Electrical requirements - Part 1: General requirements for battery powered trucks）、EN1726-1:1998（*Safety standard for machinery industrial vehicle*）, EN12053:2001, EN1175-1:1998, EN13059:2002, EN1757-2：2001 harmonized standard;
- Main safety elements are in accordance with 2006/42/EC machinery directive as well as EN1175-1:1998+A1:2010, EN1726-1:1998,EN1757-2：2001 standard;

  Electronic components design and manufacture meet low-voltage apparatus directive 2006/95/EC;

  Noise is calculated according to EN12053:2001+A1:2008: pallet truck noise, sound pressure value.

  Lifting: right ear 65.8dB, left ear 65.1dB

  Driving: right ear 68.5dB, left ear 68.4dB
- Vibration data are calculated according to the EN13059:2002+A1:2008（Safety of industrial trucks - Test methods for measuring vibration）,ISO5349-2:2001 and ISO2631-1:1997 standard, meet 2002/44/EC directive: handle vibration amplitude is 0.0558m/s^2.
- Electromagnetic compatibility is calculated according to EN12895:2000 and meet 2004/108/EC directive.

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DECLARATION OF CONFORMITY
EG-KONFORMITÄTSERKLÄRUNG

Business name of the manufacturer: **HANGCHA GROUP CO., LTD.**
Firmenbezeichnung des Herstellers:

Full address of the manufacturer: 666 Xiangfu, Hangzhou, Zhejiang 311305, P.R. China
Vollständige Adresse des Herstellers:

Name and address of the person (established in the Community) compiled the technical file:
Name und Adresse der Person (innerhalb der Gemeinschaft), die das technische Datenblatt erstellt hat
NAME: Samuk Lift Trucks Ltd. ADDRESS: Toddington, Bedfordshire, LU5 6HJ, U.K

We declare that the machinery
Wir erklären hiermit, dass die Maschine

product name: Electric Pallet Truck
Produktbezeichnung:

commercial name:
Handelsbezeichnung:

function:
Funktion:

model: CBD12-AMC1-I, CBD12-AMC1K-I
Modell:

type:
Typ:

serial number:
Seriennummer:

fulfills all the relevant provisions of Directives
entspricht allen relevanten Anforderungen folgender Richtlinien

2006/42/EC

tested in accordance with below standards
wurde gemäß folgender Normen geprüft

EN ISO 3691-1:2015
EN 16307-1:2013+A1:2015
EN 1175-1:1998+A1:2010

place and date of the declaration:
Ausstellungsort und Datum der Erklärung

signature of the person:
Unterschrift des Ausstellers

Part Ⅱ：Structure, Principle and Maintenance

1 Drive Unit

1.1 Data sheet

Speed ratio of reduction gear box			24.6857
Max. wheel torque		N•m	250
Max. wheel load		kg	1000
Drive motor	Rated voltage	V	24
	Rated power	kW	0.65
	Rated current	A	38
	Rated speed	r/min	2900
	Working system		S2=45min
	Insulation grade		F
	Protection grade		IP44
	Using the environment temperature	℃	-10～+40
	The service life of the brush	h	＞1200
Brake	Rated voltage	V	24
	Rated power	W	20
	Rated braking torque	N•m	4
	Rated Air Gap	mm	0.15～0.30
	Pre-tension torque of the mounting screw	Nm	2.8

1.2 Assemble and use notice

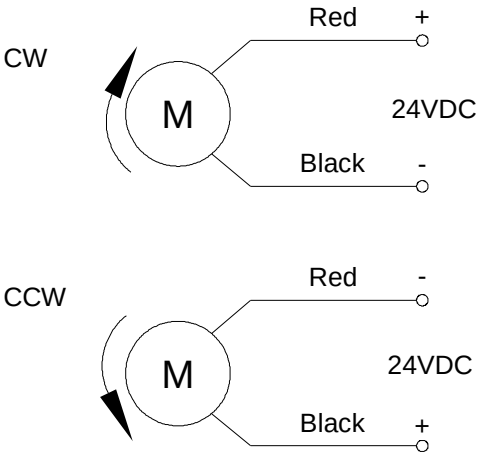
- Whn assemble, scrub the oil seal on the product. Avoid product damage, no disassemble at will.
- Avoid each fitting surface and exposed gear impact, thus influence installation.
- Normal working oil temperature is ≤70℃.
- Drive wheel is maintenance free drive device, if need grease, dismantle the drive unit, and add from the top.
- Added amount of grease(SHELL ALVANIA R3) is 2/5-2/3 space of the inner chamber.

1.3 Fault and troubleshooting

Fault	Probable cause	Corrective action
Abnormal gear noise when travelling	Over large gear clearance	Adjust
	Lack grease	Replenish
	Over large gear wear	Replace
Abnormal noise when turning	Rotary rolling bearing damage	Replace
	Insufficient rotary rolling bearing grease	Add grease
Brake ineffective or invalid	Inching switch loosen or damage	Fasten or replace
	Over large brake clearance	Adjust
	Brake disc over wear	Replace
	Brake loosen	Fasten
	Circuit damage	Repair
Large vehicle vibration	Damper assembly damage	Replace

1.4 Drive Motor

Wiring Diagram of Motor



Motor use notice

- Keep clean and dry around the motor, and do no place other objects on or in the motor.
- Do not use with overload.
- Never coexist with strong magnetic object.
- Input voltage grade should be correct.
- If there is abnormal odour in the motor, park to check.
- Wire between motor and controller should be as short as possible.
- During motor travelling, if there happen electric leakage, speed drops suddenly, severely vibrate, too hot with smoke, or electric contact sparking smoke, turn off the power immediately for check.
- Often check if the motor over heats.
- Often check motor wiring contact screw for looseness, sparking smoke or insulation aging.

Use and maintenance

Stator parts and brush neutral position has been adjusted before sold, so users should not dismantle or adjust at will.

- Check if motor rotates flexibly or abrades.
- Check if motor outlet(or terminal) connection is correct or reliable.
- Brush should slide easily in the brush box.
- Check if commutator segments are clean, if necessary, clean the minor groove of commutator segments and carbon powder on the commutator surface with soft clean white

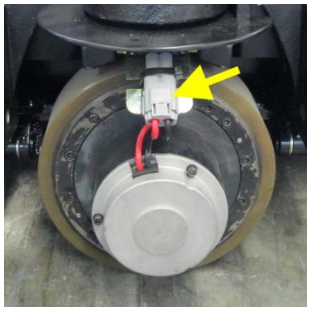
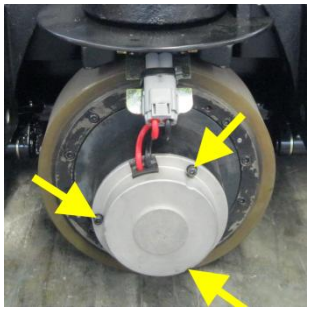
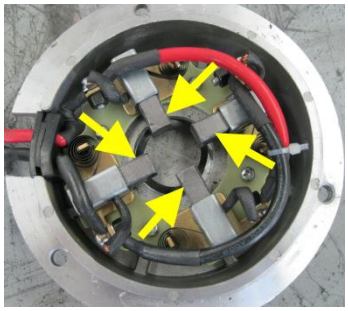
cloth, when there is grease on the surface, immerse the cloth in alcohol to wipe(park).

- Check if all fasteners are tight.
- Brush carrier should be fastening and no loose. If turn or remove the brush carrier needed, only mark can loosen the end cap bolt. Aim at marker line to tighten screw when brush carrier reset to keep the brush in neutral position.
- Check the coil insulation resistance regularly, when close to working temperature, it should not be lower than defined data, otherwise dry.
- Open the shutter regularly and check if the inner parts deformation or reversing part is normal.
- Often clean sand and other adhesion on the motor in order not to affect its heat dissipation.
- Check the motor at least once half year according to the following way：
  a. Check the outer part and clean dust on the motor;
  b. Clean and replace bearing, listen if there is abnormal noise during running;
  c. Check brush abrasion and replace if necessary.

Replacement of the Brushes

Brushes must be replaced when they are seriously worn or damaged. All brushes should be replaced at the same time with a same specification.The newly replaced brushes needs to be connected with the commutator closely and the contact area should be assured for 75%.

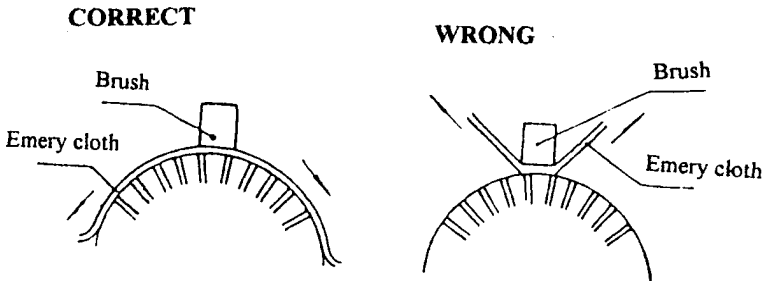
- Remove the connecting plug of the motor.
- Screw out the three fixed bolts on the motor hood.
- Take down the motor hood and replace the new brushes.

Brush abrasion：

- When replace brush, use 00 crocus cloth to polish, pull abrasive cloth to left or right when polishing.

- After polishing crocus cloth and cleaning commutator, motor should work under limited speed to ensure safety until the brush working surface polishes.

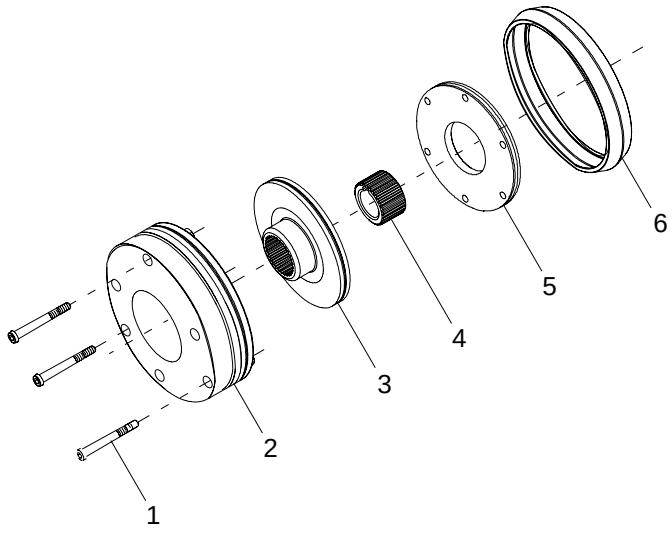


Fault diagnosis

Fault	Probable cause
All copper sheet blacken	Pressure of the brush is not right
Commutator segments blacken in group according to certain sequence	Short circuit of commutator segments.
	Short circuit of armature coils.
	The welding of commutator segments and armature coils is not good or short circuit.
Commutator segments blacken, but without sequence	Center line shift of the commutator
	Rough, un-round of the commutator surface.
Wear, color change and fracture of brush	Motor vibrate.
	Gap between brush and brush box is too large.
	The distance between brush box and commutator working surface is too long.
	The mica between commutator segments extrudes.
	Brush material is not good.
	Trade mark of brush is not right.
Large spark	Overloaded of motor.
	Commutator is not clear.
	Commutator is not smooth or round.
	Mica plate or part commutator segment extrude.
	Brush does not grind well.
	Brush pressure is not large enough.
	Incorrect brush trade mark.
	Brush locked in the brush box.
	Brush carrier loosen or vibrate.
	Incorrect pole polarity and sequence.
Brush and brush wire overheat	Large brush spark.
	Electrical brush and flexible conductor have bad contact.
	Small flexible conductor area.
Noise in the brush	Uneven commutator surface

1.5 Electromagnetic brake

The spring-loaded electromagnetic brake is applied in the truck which is a single disk brake with double friction surfaces. By use of the pressure spring, powerful braking torque would be generated when power off. The brake could be released by the electromagnetic effect.

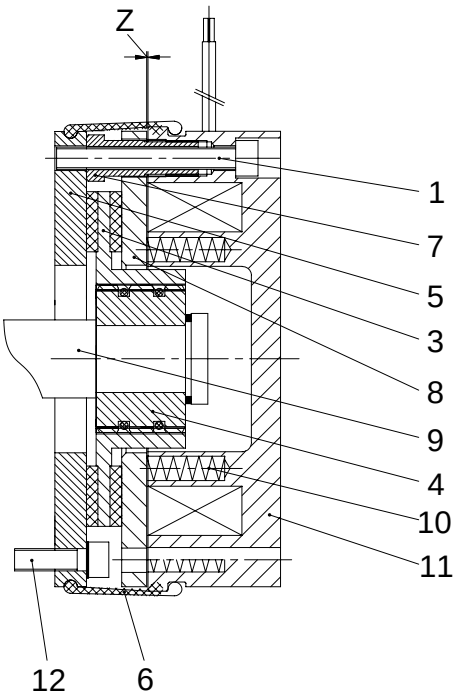


1.Mounting Bolt of the Brake	2.Stator Module
3.Brake Pad	4.Shaft Sleeve
5.Friction Disk	6.Dustproof Cover

Fig. 2-3 Electromagnetic brake parts

1.5.1 Electromagnetic brake working principle

Motor shaft (9) is connected with shaft sleeve (4) by passing through the flat key. And shaft sleeve (4) is connected with brake pad (3) by passing through the splines. When the stator (11) is block out, the force produced by the pressure spring (10) would act on the armature (8) which makes rotated the brake pad (3) driven by the motor shaft connected closely between the armature (8) and cover plate (5). As a result the braking torque is created. There will be a air gap Z between the armature and the stator at that moment. When the brake needs to be relaxed, the stator is applied with direct current and the magnetic field would attract the armature (8) to move towards the stator. The movement of armature compresses the pressure spring (10) which cause the loosening of the brake pad (3) by that time and the brake is released.



1.Mounting Bolt of the Brake

3. Brake Pad

4. Shaft Sleeve

5. Friction Disk

6. Dustproof Cover

7. Hollow Screw

8. Armature

9. Motor Shaft

10.Pressure Spring

11.Stator

12.Mounting Bolt of Friction Disk

Z. Air Gap

Fig.2-4 Electromagnetic Brake Structure

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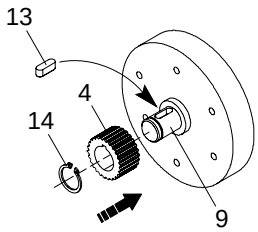
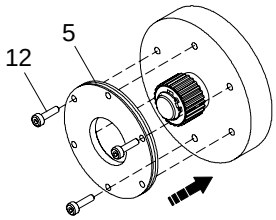
1.5.2 Electromagnetic brake installation

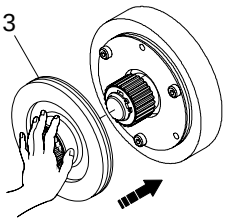
- Put the flat key (13) into the key groove of the motor shaft (9). Press the shaft sleeve (4) to the motor shaft (9) and fasten it with the inner spring.



- Install the friction disk (5) to the end face of the motor by using three mounting bolts of the friction bolts (12).

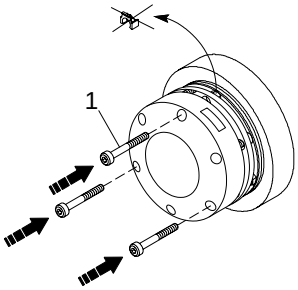


- Cover the shaft sleeve with the friction disk (3).

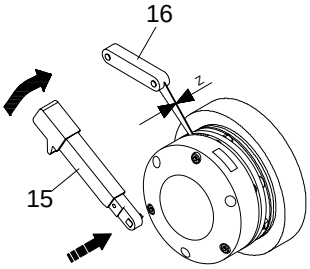


- Install the stator module (2) to the friction disk (5) with three mounting bolts of the brake (1).

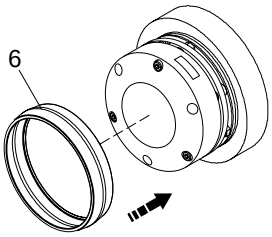
Note: Remove the three rubber mats of the stator module which is for stable transportation.



- Screw down the three mounting bolts (1) with a torque wrench (15) and check the air gap (Z) of the brake with a feeler gauge (16).



- Put on the dustproof cover(6).
- Connect the brake wiring.



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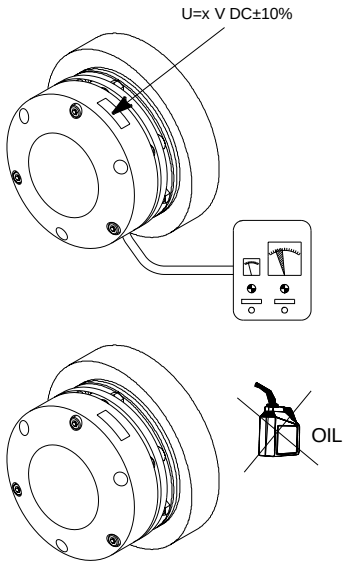
WARNING

- **No broken wire sheath, or else the circuit might be damaged.**
- **Do not process the locating surface or the holes of the production without authorization, or else the magnet loop would be influenced.**
- **Do not over press when fitting the motor shaft. Make sure no damage on the friction surface and wipe off the burr of the mounting holes and surfaces. Put the shaft sleeve on the motor shaft and fasten the axial clamp spring.**
- **Measure the direct voltage of the connecting brake and compare the value to the rated voltage on the nameplate. Deviation should not be more than 10%.**
- **Make sure it is free from oil and dirt when installing and using the brake.**



1.5.3 Maintenance

- Avoid rusting When truck is used in a high temperature for a long time. The actuation side with rust would affect the performance.
- Do not touch the friction surface with your hand directly. Make sure it is free from oil and dirt, or else the maximum torque could not be achieved.
- Generally the working environment temperature is around -10℃～+40℃.
- Conduct a periodical inspection. It concludes the items as follow. Is it smooth to switch? Is there any noise or any abnormal heating? Is there any dirt or grease that came to the section of friction and rotation? Whether the gap is appropriate between the frictions? Any problem with the exciting voltage ?

1.5.4 Adjust the Air Gap of the Brake

Rated air gap Z grows with the friction. In order to there is sufficient braking torque, the air gap must be set before it reaches to the maximum value. The air gap can be adjusted by several times. When the thickness of brake pad becomes the minimum value(see the specification table below), the brake pad must be replaced.

Once the air gap reaches the top value, the brake might not be released and the brake pad would be burn out. It will also cause the decrease of braking force and the retention and the noise increase and even big accidents. It is prominent to do the periodical inspection and adjust the air gap. Disconnect the power. Through adjusting 3 hollow bolts (8) and the mounting bolts of stator (9), set the air gap between stator (1) and armature (2) to the rated Z by a feeler gauge.Ensure air gap at all directions are same.

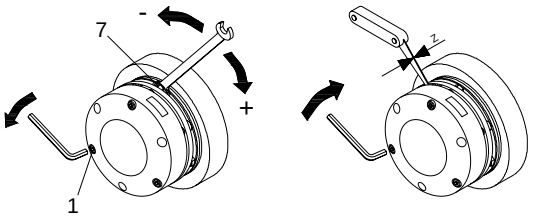
Specification Table

Rated Current (V)	Rated Power (W)	Rated Torque (N.m)	Rated Air Gap (mm)	Minimum Thickness of Rotor (mm)	Pre-tension Torque of the Mounting Bolt (N.m)
24	20	4	0.15～0.30	6.15（＋0/－0.03）	2.8

On the condition of power disconnected, through adjusting 3 mounting bolts of brake (1) and the hollow bolts (7), set the air gap between stator (11) and armature (8) to the rated Z by a feeler gauge. Ensure air gap at all directions are same.

Set the air gap in the following sequence:

- Unscrew the mounting bolts of brake (1) with a hex wrench.
- Adjust the hollow bolts (7) with a spanner.
- Screw up the three mounting bolts of brake (1).
- Check if the air gap Z is within the standard range with a feeler gauge.
- Adjust the mounting bolts and hollow bolts respectively according to the following figures. Set the air gap and screw up the mounting bolts of brake.



Under the general operating conditions, the first set of the air gap is usually after 1500 to 2000

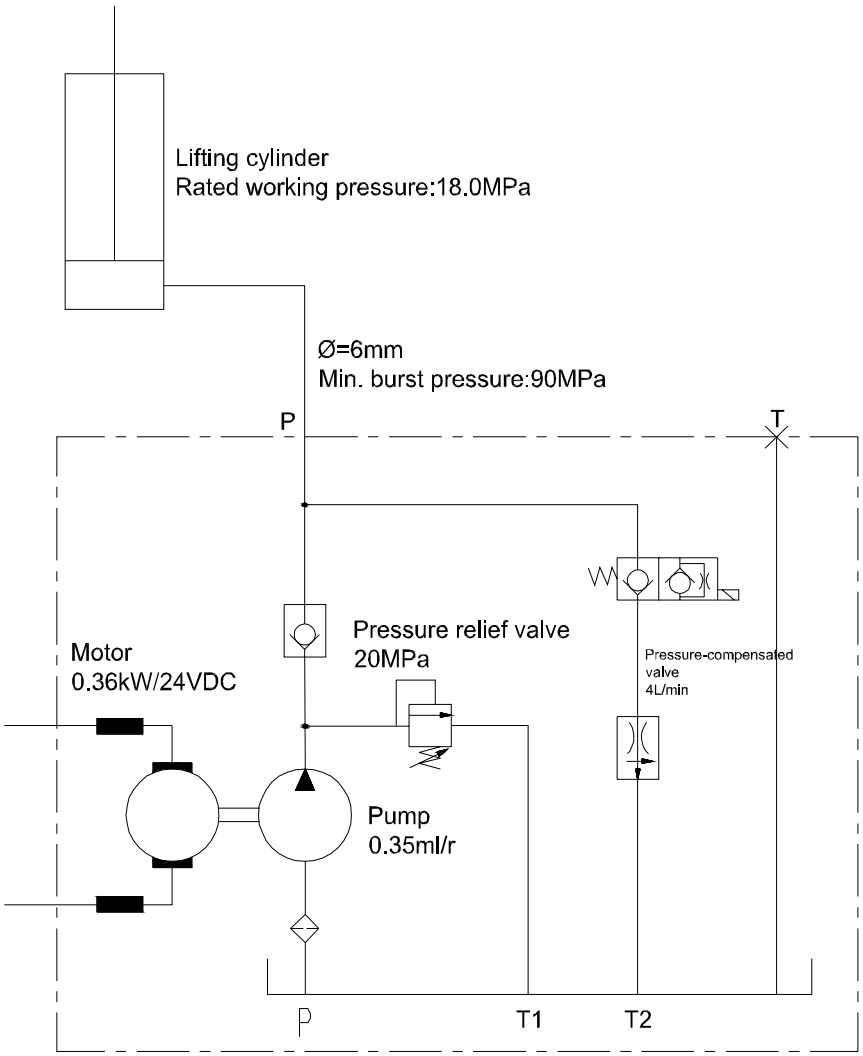
hours service of the brake and it is suggested to adjust the air gap every 6 months. If it comes to a poor working condition, such as frequent use of brake and repeated emergency stops，the air gap should be set when the brake the shorten the adjustment interval for the first time.

1.5.5 Common fault and troubleshooting

Fault	Probable cause	Corrective action
Brake does not work	Power is obstructed	Connect
	Too low exciting voltage	Check voltage and adjust.
	Improper air gap	Adjust air gap
	Stator coil breaks	Replace stator
	Oil dirt mixed in	Clean oil dirt
Long brake time	Switch installed to AC circuit	Install the switch to the DC circuit after rectifying
	Improper air gap	Adjust air gap
	Oil dirt mixed in	Clean oil dirt
Slipping	Unstable operation in previous use	Breaking-in for a while
	Oil dirt mixed in	Clean oil dirt
	Large load	Reduce load or replace large specification
	Large load change	Adjust load peak or large the specification
High temperature	Too high exciting voltage	Check voltage and adjust.
	Clutch or motor interfere to the brake	Check control circuit, eliminate interference
	High environment temperature	Set ventilation
	High operating frequency	Adjust to proper frequency
	Over large load	Reduce load
Large noise	Product service environment needs silence	Silence design
	Impurity mixed in.	Clear away the impurity
	Bad mounting	Replace mounting surface or shaft
	Large rotational inertia or dynamic unbalance value	Reduce rotational inertia or dynamic unbalance value.

2 Hydraulic system

2.1 Hydraulic system working principle

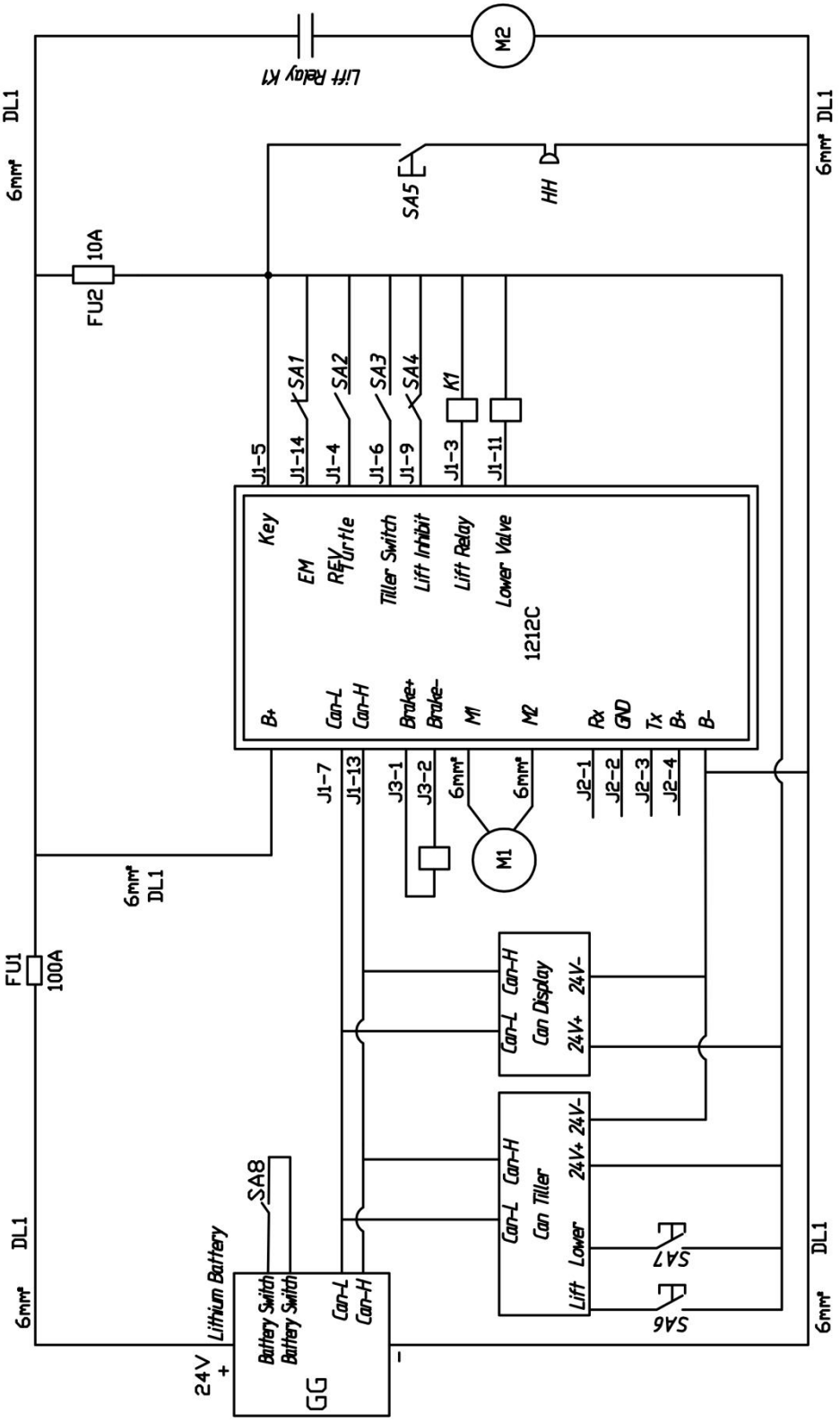


2.2 Hydraulic system fault diagnosis and correction

Fault		Probable cause	Corrective action
No oil pumps from the pump		Low oil level	Fill to the specified oil level
		Blocking of strainer	Clean oil pipe and oil tank. If hydraulic oil is dirty, please change it.
Low oil pressure of oil pump output		Bearing worn; retainer, O-ring damage	Change the bad spare parts
		Adjustment failure of safety valve	Rise pressure with pressure gage
		Air in the oil pump	Fill hydraulic oil to the oil tank, use the pump after bubble vanishing
Noise of oil pump		Cavitation arising from the strainer blocking	Adjust or replace soft tube and clean the strainer
		Cavity caused by the high viscosity of hydraulic oil	Replace new hydraulic oil, whose viscosity suits pump running speed. Work only when the oil temperature is normal
		Bubble in the hydraulic oil	Check the reason for the bubble and then take measures
Forks can't lift	Gear pump works	Oil way block or damage	Repair or replace
	Gear pump no work	Lifting inching switch loosen or damage	Re-fix or replace
		Motor or circuit fault	Repair
Forks do not drop down		Solenoid valve block or damage	Repair or replace
Pressure of safety valve is unstable or can't be adjusted		Pressure adjusting screw loosen	Re-adjust and lock.
		Pressure adjusting spring deformation or damage.	Replace
		Safety valve spool wear or sticking	Replace or clean to reassemble.
		Pump failure	Repair pump

3 Electric system

3.1 Electrical schematic diagram



3.2 Drive motor controller

3.2.1 Maintenance

Controller has no user repair parts. Do not try to open, repair or alter the controller. Otherwise it may damage the controller and also invalid the guarantee.

It's suggested to keep the controller clean and dry, periodically check and get rid of diagnose historical files.

Cleaning

Periodically clean the outside controller is good for preventing corrosion or other controller fault from dirty, dust and chemical, which is part of the environment and always exist in battery power supply system.

Be careful when operating the truck power supplied by battery. Including but not limit to the following: correct training, wear goggles, do not wear loose clothing and jewelry.

Carry out maintenance according to the following cleaning procedure. Never clean the controller with high pressure washer.

- Remove battery to disconnect power.
- Connect load(like contactor coil or horn) between controller B+ and B- to discharge controller capacity.
- Clean dirt or corrosive on the power and signal binding post. Wipe the controller with wet cloth, dry the controller before connecting the battery. Controller can't suffer the water impact with pressure.
- Make sure the wiring is correct and fastened.

Warning

- **Strictly prohibit water in the product.**
- **Strictly prohibit operating with electricity.**
- **Strictly prohibit reverse polarity.**
- **Strictly prohibit motor short circuit.**

3.2.2 Diagnostics and Troubleshooting

When faults happen, try to restart by resetting the key switch after confirmed that faults are not caused by faulty wiring connection or mechanical failure. If the faults are still on, shut down the key, check for incorrect connection or corruption of the pin 35 connecter, reconnect after repaired and cleared, and then restart again.

The controller provides diagnostics information to assist technicians in troubleshooting drive system problems. The diagnostics information can be obtained in two ways: by reading the appropriate display on the programmer or by observing the fault codes issued by the status LED.

Led Diagnostics

During normal operation, with no faults present, the status LED is steadily on. If the controller detects a fault, the status LED flashes a fault identification code continuously until the fault is corrected. Refer to the troubleshooting chart for suggestions about possible causes of the various faults. Faults are listed alphabetically.

Note: The status LED can only indicate one fault at a time. If multiple faults are detected, the highest priority fault code flashes until it is cleared.

Programmer Diagnostics

The programming devices present complete diagnostic information in plain language. Faults are displayed in the Faults/Diagnostics menu, and the status of the controller inputs/outputs is displayed in the Monitor menu.

Additionally, the fault history file in the Faults/Diagnostics menu provides a list of the faults that have occurred since the file was last cleared. Checking (and clearing) the fault history file is recommended each time the vehicle is brought in for maintenance.

Refer to the troubleshooting chart for suggestions about possible causes of the various faults. Faults are listed alphabetically.

Fault Handling

When a fault is detected, the controller operates in a manner that is safe in the presence of that fault. Depending on the severity of the fault, the response can range from reduction of current to complete shutdown of drive. The status LED uses a 2-digit code. For example, code “1,4”—undervoltage—appears as:

¤ ¤¤¤¤	¤ ¤¤¤¤	¤ ¤¤¤¤
（1,4）	（1,4）	（1,4）

Troubleshooting Chart

Led Codes	Fault indicator status	Fault	Possible Cause
Off On	■ □	no power or defective controller controller powered up; No faults	
1,1	¤ ¤	Thermal Fault	1）Temperature >8℃C or < -10℃. 2）Battery contact bad.. 3）Work under extreme severe environment. 4）Electromagnetic brake does not release normally.
1,2	¤ ¤¤	Throttle Fault	1）Throttle input wire open or shorted. 2）Throttle potentiometer fault. 3）Throttle potentiometer fault.
1,3	¤ ¤¤¤	Speed Pot Fault	1）Speed limit potentiometer wiring open or short. 2）Speed limit potentiometer open.
1,4	¤ ¤¤¤¤	Undervoltage Fault	1）Battery voltage <17 volts. 2）Battery or controller bad contact.
1,5	¤ ¤¤¤¤¤	Overvoltage Fault	1）Battery voltage >31 volts. 2）Still connect the charger when truck running. 3）Battery bad contact.
2,1	¤¤ ¤	Main Off Fault	1）Main contactor coil wrongly turn on.
2,2	¤¤ ¤¤	(no used)	
2,3	¤¤ ¤¤¤	Main Fault (①)	1）Main contactor adhere or open. 2）Main contactor coil drive wrong.
2,4	¤¤ ¤¤¤¤	Main On Fault	1）Main contactor coil wrongly turn off.
2,5	¤¤ ¤¤¤¤¤	(no used)	
3,1	¤¤¤ ¤	Wiring Fault (①)	1）Incorrect throttle operation. 2）Throttle port or its mechanical part has fault.
3,2	¤¤¤ ¤¤	Brake On Fault	1）Electromagnetic brake coil open.. 2）Electromagnetic brake drive short..
3,3	¤¤¤ ¤¤¤	Precharge Fault (①)	1）Controller fault. 2）Low battery voltage.
3,4	¤¤¤ ¤¤¤¤	Brake Off Fault	1）Electromagnetic brake coil short. 2）Electromagnetic brake drive open.
3,5	¤¤¤ ¤¤¤¤¤	HPD fault	1）Throttle, key switch, push or prohibit input, some actions in wrong operation order. 2）Wrongly adjust accelerator.
4,1	¤¤¤¤ ¤	Current Sense Fault (①)	1）Motor or motor wiring short. 2）Controller fault.
4,2	¤¤¤¤ ¤¤	Hardware Failsafe (①)	1）Motor voltage can't match throttle input. 2）Motor or motor wiring short. 3）Controller fault.
4,3	¤¤¤¤ ¤¤¤	Eeprom Checksum Fault (②)	1）EEPROM fault or failure.
4,4	¤¤¤¤ ¤¤¤¤	(no used)	
4,5	¤¤¤¤ ¤¤¤¤¤	Battery Disconnect Fault (①)	1）Battery does not connect. 2）Battery contact bad.
①= Must cycle keyswitch to clear. ②= Must use programmer to clear, as follows: select Program menu, alter data value of any parameter, cycle key switch.			

Attachment：Table for bolt’s tightening torque

If not specified, select the tightening torque from the below table：

Unit：N·m

Bolt’s diameter	Grade			
	4.6	**5.6**	**6.6**	**8.8**
6	4～5	5～7	6～8	9～12
8	10～12	12～15	14～18	22～29
10	20～25	25～31	29～39	44～58
12	35～44	44～54	49～64	76～107
14	54～69	69～88	83～98	121～162
16	88～108	108～137	127～157	189～252
18	118～147	147～186	176～216	260～347
20	167～206	206～265	245～314	369～492
22	225～284	284～343	343～431	502～669
24	294～370	370～441	441～539	638～850
27	441～519	539～686	637～784	933～1244

Note： ·Use entirely 8.8 grade bolt in the important joint position.

·Bolt’s grade can be found in the head of the bolt, if it can’t be found, the grade is 8.8.

Maintenance Record

Date	Repair, maintenance content	Serviceman

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