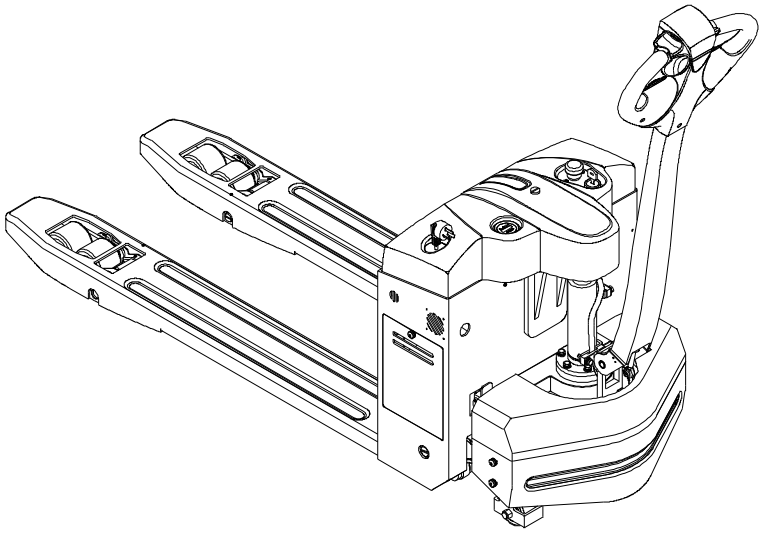
HANGCHA

Mini Range

ELECTRIC PALLET TRUCK

CBD15-A3MJ
CBD15-A3MJ-I
CBD20-A3MA
CBD20-A3MA-I
CBD15-A3MJ2

OPERATION AND MAINTENANCE MANUAL



Original Instruction

HANGCHA GROUP CO., LTD.

1/2023

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.

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

- 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.
- Average environment temperature under continuous operating condition +25℃.
- The highest environment temperature in the short term (≤1h) +40℃.
- The lowest environment temperature under normal indoor conditions when operation +5℃.
- The lowest environment temperature under normal outdoor conditions when operation -20℃.
- Altitude: ≤2000m.
- Negotiating inclines up to a maximum of 6 %.
- 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.

WARNING

- **It's prohibited to use this equipment in the anti-explosion area.**
- **Special equipment and authorisation are required if the truck is to be used in extreme conditions (e.g. cold stores).**

Cold-storage truck should meet the followings when working:

According to different grade of cold-storage truck, operate in cold storage based on standard continuous working time. The recommended working times of our trucks are as follows:

- **Do not work continuously over 2 hours in the** cold storage **above -18℃;**
- **Do not work continuously over 15 minutes/hour in the -18℃～-30℃** cold storage**.**

1.4 Cautions for the use of cold storage truck

- Use special oil for cold storage, maintain and replace periodically.
- All cold storage trucks cannot be shut down or parked in cold storage, or it may cause damage of hydraulic system and electric system.
- Before entering the cold storage, do necessary hydraulic and traction motion to the cold-storage truck, and then enter the cold storage after temperature rises.
- If there is condensate water on the truck surface after the truck left the cold storage, only after the surface is dry or the condensate water is complete dry can the truck enters the cold storage again.
- Shorten the maintenance period of the lubricating point to avoid its premature wear.
- Battery cannot be empty for a long time after discharging, charge in time to keep high electrolyte proportion and avoid electrolyte freezing.
- Different truck models with operations can improve each truck functions in the cold storage.
- If the truck malfunctioned in the cold storage, remove it from the cold storage immediately and repair in buffer zone or maintenance area.

1.5 Proprietor responsibilities

For the purposes of the present operating instructions the “proprietor” is defined as any natural or legal person who either uses the industrial truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting) the proprietor is considered the person who, in accordance with existing contractual agreements between the owner and user of the industrial truck, is charged with operational duties.

The proprietor must ensure that the industrial truck is used only for the purpose for which it is intended and that there is no danger to life and limb of the user and third parties. Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The proprietor must ensure that all users have read and understood these operating instructions.

Failure to comply with the operating instructions shall invalidate the warranty. The same applies if improper work is carried out on the truck by the customer or third parties without the permission of the manufacturer.

1.6 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.

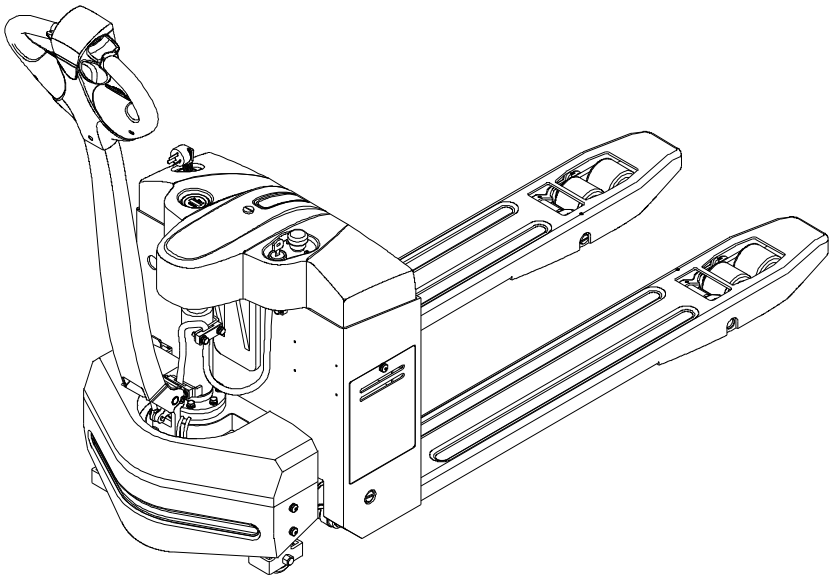
2 Truck introduction

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.

Model	Meaning
CBD	Electric pallet truck
15/20	Rated load capacity×100kg
A	Product serial number
3	The third version
M	Mini Range
A	Controller type
J	Controller type
I	Lithium battery models
2	Upgrade electronic control



2.2 Functional description

Truck body system

- Beautiful and compact outline, concise and fluent line.
- Adopted steel stamping and injection moulding process is sturdy and durable.
- The chassis adopts 3-wheel structure, and equips with side supporting system, it is safe and reliable.

Driving system

- Drive unit adopts wheel type, with compact and simple structure.
- Permanent-magnetic drive motor owns excellent performance.
- High performance electromagnetic brake.

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

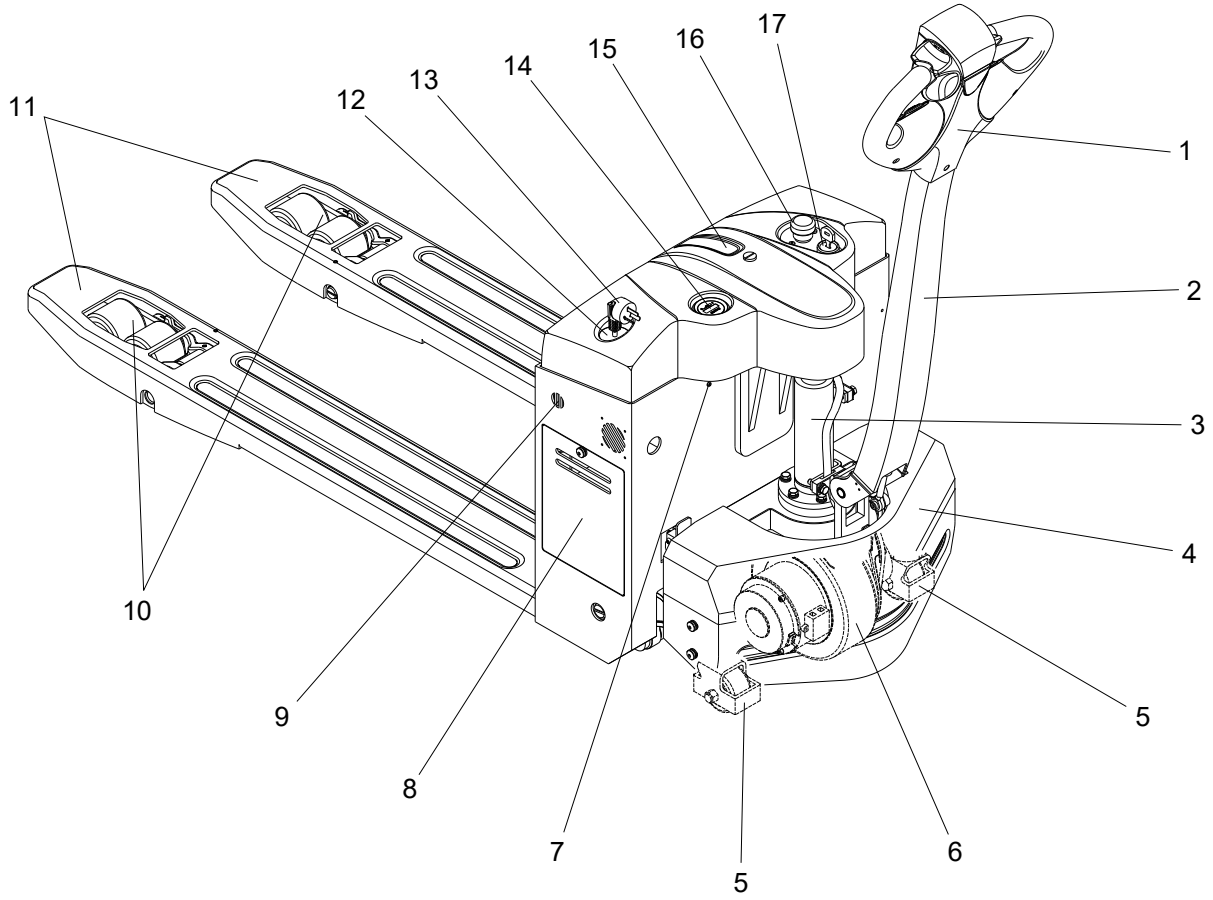
- Adopted single-cylinder two-connecting rod structure is simple and reliable, with good lifting synchronism.

Electric system

- 24V Electric system.
- Latest CURTIS permanent magnetic control system.

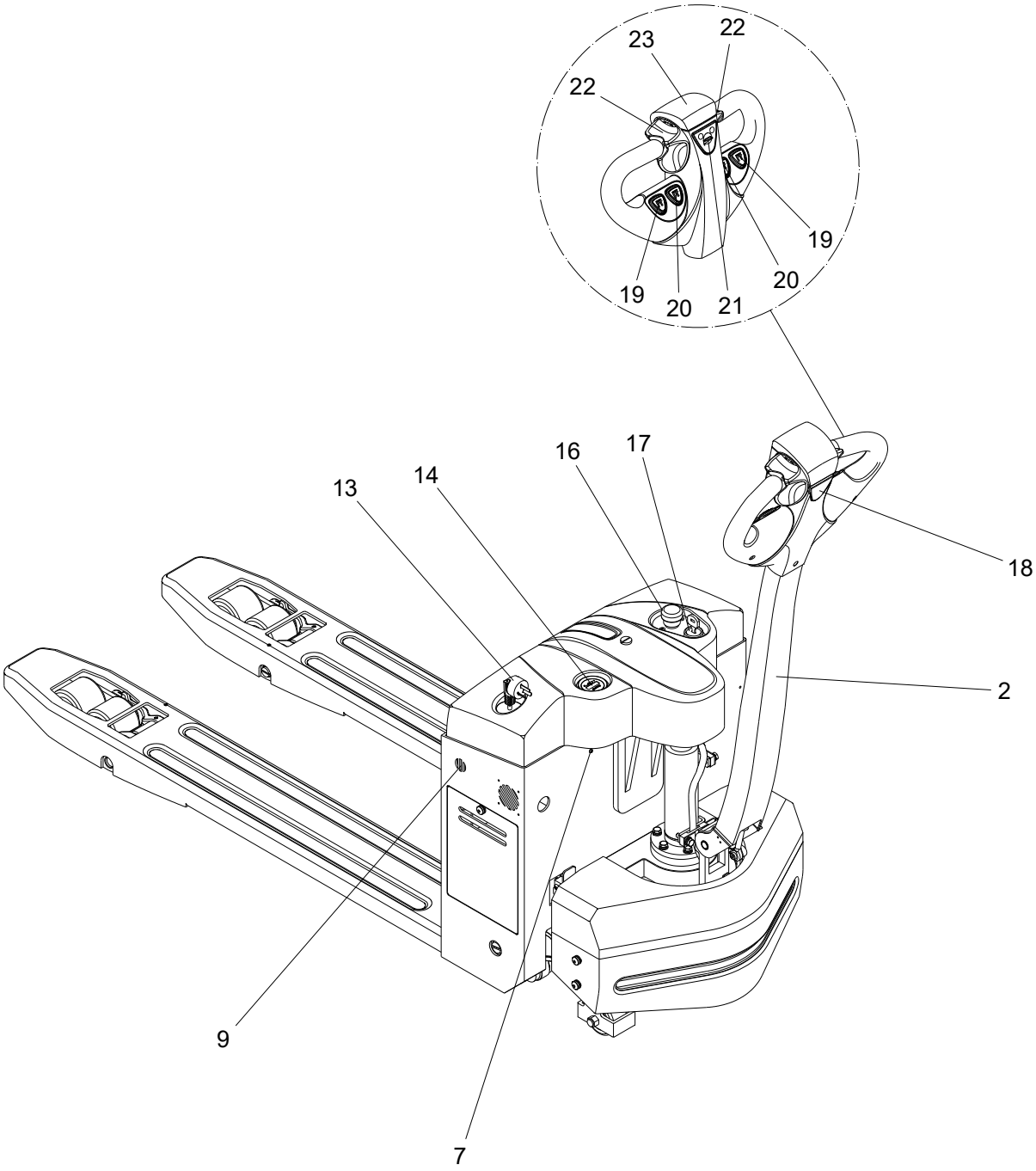
- Built in charger, maintenance-free colloidal battery.
- Electric quantity display meter and charging indicator indicates battery quantity and charging process.
- Emergency disconnect switch.
- The standard equipped electronic lifting limitation and soft landing system protect working motor and loads from damaging

2.3 Main part introduction



Item	Description	Item	Description
1	Control handle	10	Load wheel
2	Control lever	11	Fork
3	Lift cylinder	12	Wire fixator
4	Drive wheel cover	13	Battery charging plug（built-in plug）
5	Caster wheel	14	Instrument
6	Drive wheel	15	Hood
7	Fault indicator	16	Emergency stop switch
8	Side door (built-in battery)	17	Key switch
9	Charging light indicator (with built-in charger)		

2.4 Display and control



Item	Designation	Function
2	Control lever	Control the steering and brake of the truck.
7	Fault indicator	Normally on normal condition. Failure regularity, see the failure code.
9	Charging light indicator	Green light: Fully charged. Yellow lingth: Fault Red light: Charging
13	Battery charging plug（built-in plug）	Insert the plug into the power outlet for battery charging.
14	Instrument	Shows the accumulated operating hours of the truck, the residual capacity of the battery and the fault code(refer to “Instrument” part)
16	Emergency stop switch	Cut the connection with the battery, close all electric function and brake.
17	Key switch	Switches the control current ON and OFF. The truck cannot be operated by unauthorized persons when the key has been removed from the switch.
18	Upright traveling button	Press the button, the control lever in vertical state truck can run.
19	“Lower” button	Lower lifting device.
20	“Lift” button	Raise lifting device. When the battery is consumed about 80%, lifting function will be locked.
21	Horn button	Give out sound warning signal.
22	Travel switch	Control travelling direction and speed.
23	Collision safety switch	Truck moves away from operator. Protect the operator from extrusion damage under emergent circumstances.

2.4.1 Display

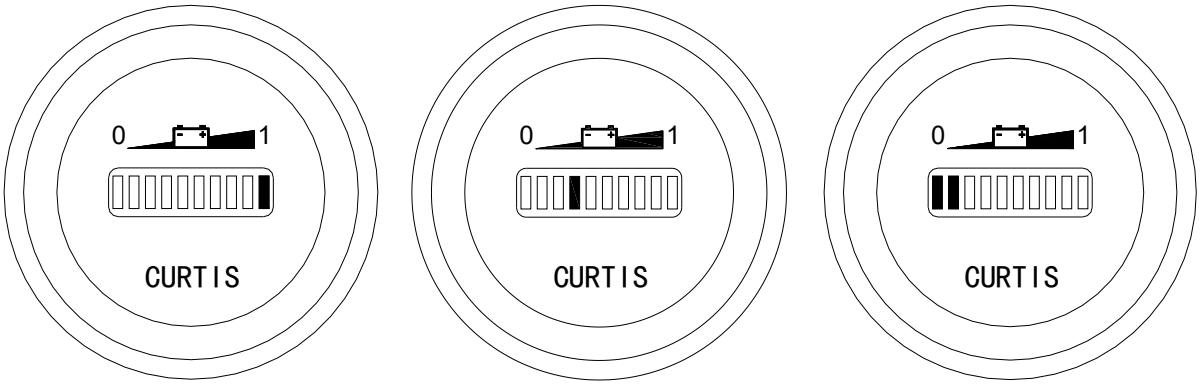
Instrument [14]

It displays battery power.

10 LED display bars display battery discharging status. One LED means 10% battery power. As the battery power reduces, 10 LED will light up one by one from right to left.

When the remaining capacity is less than 40%, need to stop charging.

Fully charged　　Need charge　　Low charging status



One red LED flashing means the truck start to use reserve power (30～20% of battery power). When it is lower than 20% of battery power(low charging status), two red LED flashes and power is locked. Only after the battery power recovered to 20% or above can re-use the lifting function.

Charging light indicator [9]

It displays charger running state.

- Red light flashes-it is charging.
- Yellow light is on- charging fault.
- Green light is on- charging finishes.

Notes: Overnight charging recommend after use !

2.5 Standard technical data

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

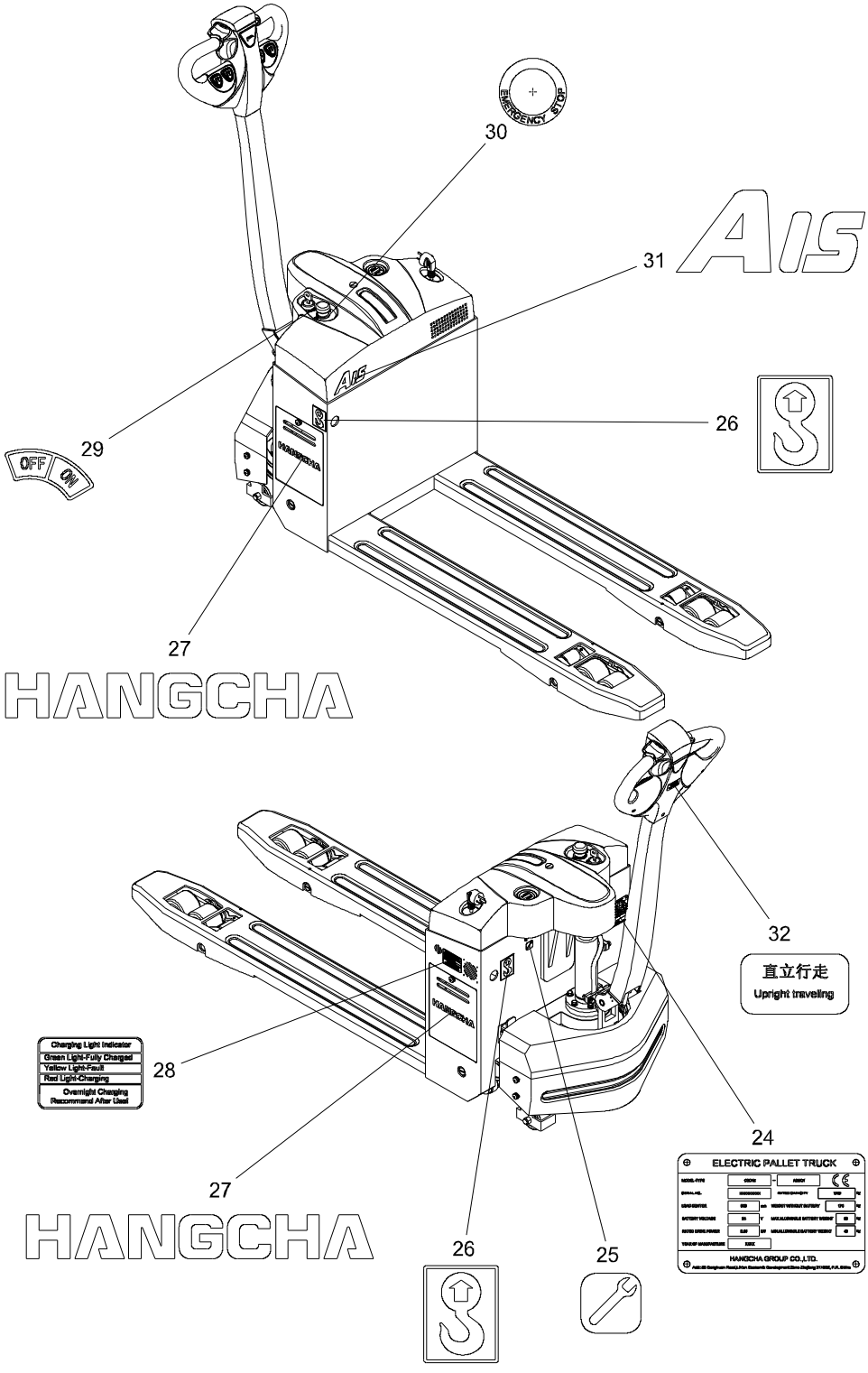
Characteristics	Model		CBD15-A3MJ	CBD15-A3MJ-I	CBD15-A3MJ2
	Operator type		Pedestrian	Pedestrian	Pedestrian
	Load capacity	Q (kg)	1500	1500	1500
	Load center	c(mm)	600	600	600
	Wheelbase	y(mm)	1225	1225	1225
Weight	Service weight with battery	kg	220	220	220
Wheels & Tyres	Tyre type		PU	PU	PU
	Tyre size/Quantity,operator side	mm	Φ210×70/1	Φ210×70/1	Φ210×70/1
	Tyre size/Quantity,load side	mm	Φ80×64/4	Φ80×64/4	Φ80×64/4
	Tyre size/Quantity,Additonal wheels	mm	Φ70×40/2	Φ70×40/2	Φ70×40/2
	Tread, operator side	b10(mm)	404	404	404
	Tread, load side	b11(mm)	400	400	400
Dimensions	Lift height	h3(mm)	120	120	120
	Fork height, lowered	h13(mm)	80	80	80
	Overall length	L1(mm)	1669	1669	1669
	Overall width	b1(mm)	568	568	568
	Fork size	s/e/L(mm)	50×160×1150	50×160×1150	50×160×1150
	Outside fork width	b5(mm)	560/680	560/680	560/680
	Ground clearance, center of wheelbase, min	m2(mm)	30	30	30
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	1850[1)]	1850[1)]	1850[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	1900[2)]	1900[2)]	1900[2)]
	Outer turning radius, min	Wa(mm)	1400[3)]	1400[3)]	1400[3)]
Performance	Travel speed, laden/unladen	km/h	4.5/4.8	4.5/4.9	4.5/4.8
	Lift speed, laden/unladen	mm/s	50/60	50/60	50/60
	Lowering speed, laden/unladen	mm/s	40/45	40/45	40/45
	Max Gradeability, laden/unladen	%	6 / 15	6 / 15	6 / 15
Motor & Battery	Drive motor power	kW	0.65	0.65	0.65
	Lift motor power	kW	0.8	0.8	0.8
	Battery voltage, rated capacity	V/Ah	2×12/85	24/40	2×12/85

Characteristics	Model		CBD20-A3MA	CBD20-A3MA-I
	Operator type		Pedestrian	Pedestrian
	Load capacity	Q (kg)	1500	1500
	Load center	c(mm)	600	600
	Wheelbase	y(mm)	1225	1225
Weight	Service weight with battery	kg	220	220
Wheels & Tyres	Tyre type		PU	PU
	Tyre size/Quantity,operator side	mm	Φ210×70/1	Φ210×70/1
	Tyre size/Quantity,load side	mm	Φ80×64/4	Φ80×64/4
	Tyre size/Quantity,Additonal wheels	mm	Φ70×40/2	Φ70×40/2
	Tread, operator side	b10(mm)	404	404
	Tread, load side	b11(mm)	400	400
Dimensions	Lift height	h3(mm)	120	120
	Fork height, lowered	h13(mm)	80	80
	Overall length	L1(mm)	1669	1669
	Overall width	b1(mm)	568	568
	Fork size	s/e/L(mm)	50×160×1150	50×160×1150
	Outside fork width	b5(mm)	560/680	560/680
	Ground clearance, center of wheelbase, min	m2(mm)	30	30
	Min, right angle stacking aisle width1000×1200 across forks	Ast(mm)	1850[1)]	1850[1)]
	Min, ringht angle stacking aisle width 800×1200 across forks	Ast(mm)	1900[2)]	1900[2)]
	Outer turning radius, min	Wa(mm)	1400[3)]	1400[3)]
Performance	Travel speed, laden/unladen	km/h	4.5/4.9	4.5/4.8
	Lift speed, laden/unladen	mm/s	50/60	50/60
	Lowering speed, laden/unladen	mm/s	40/45	40/45
	Max Gradeability, laden/unladen	%	6 / 15	6 / 15
Motor & Battery	Drive motor power	kW	0.65	0.65
	Lift motor power	kW	0.8	0.8
	Battery voltage, rated capacity	V/Ah	2×12/70	24/40

2.6 Product plates and warning labels location

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

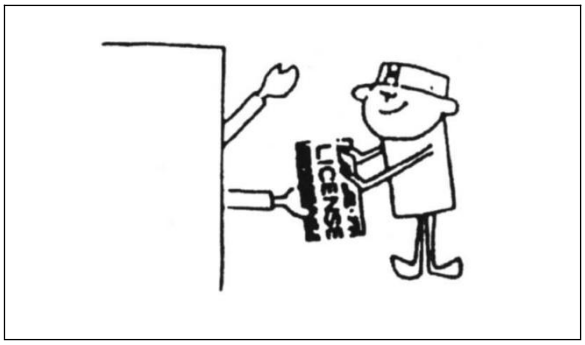
The figure below shows the approximate location of the various identity resides. Before operating the truck, please understand the meaning of the various identities.



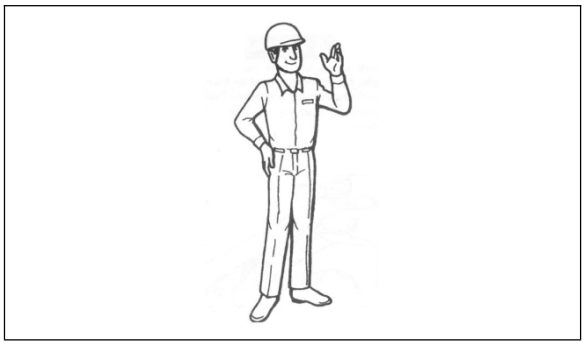
Item	Description
24	Nameplate: The rated capacity on the nameplate is the max. load capacity by the label listed equipment. Any change to the forklift or other equipment may change rated capacity.
25	Fault indicator
26	Hoist label: Strap points for crane lifting.
27	Manufacturer’s logo
28	Charging light indicator. Overnight charging recommend after use !
29	Key switch：“OFF” position is off，“ON” position is on.
30	Emergency stop label: press this button when in emergency, thus the truck power is off.
31	Series tonnage label：A series, rated capacity is 1.5t.
32	Walking upright.

3 Safety Instructions

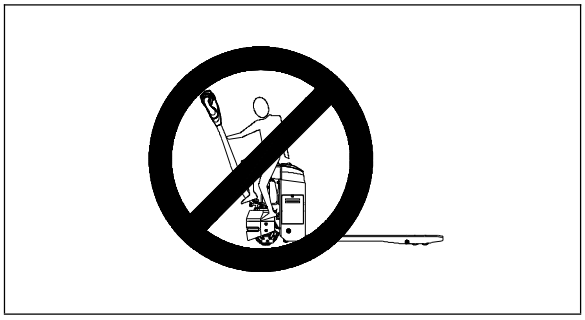
1) Only trained and authorized operator shall be permitted to operate the truck.



2) Operator must wear helmet, working shoes and uniform



3) Never carry people.



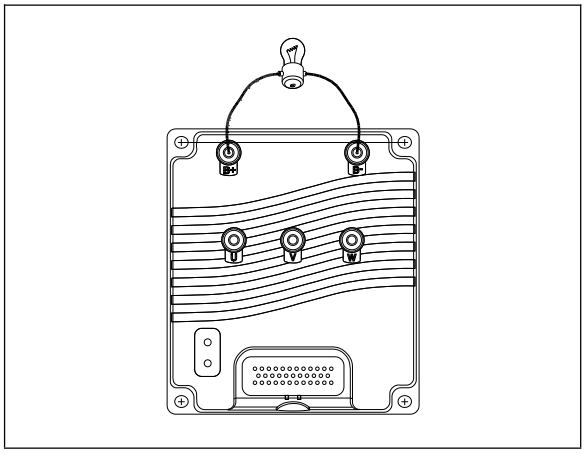
4) It is not allowed to reconfigure the truck without manufacturer's permission.

5) Do not work in flammable and combustible environment.

6) 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.

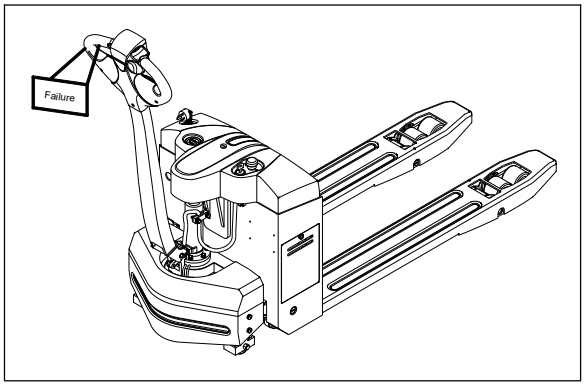
- Make sure change the "safety parts" during the schedule maintenance.
- Wipe off the oil, grease or water on the soleplate, foot pedal and control lever.
- No smoking or any spark, smoke near the battery when checking.
- Be careful of scald when checking motor and controller.

7) 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.



8) 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.



9) 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.

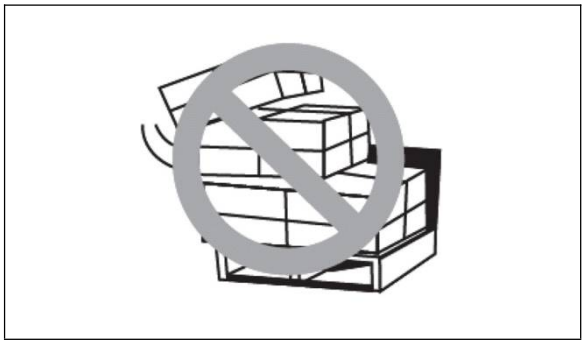


10) The work ground of forklift shall be solid and smooth concrete surface or similar ones. Pre-check the ground condition of working site. Tidy the working site, clean obstacle, sweep macadam, muddy sand and wipe off greasy dirt.

11) Do not overload.

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.



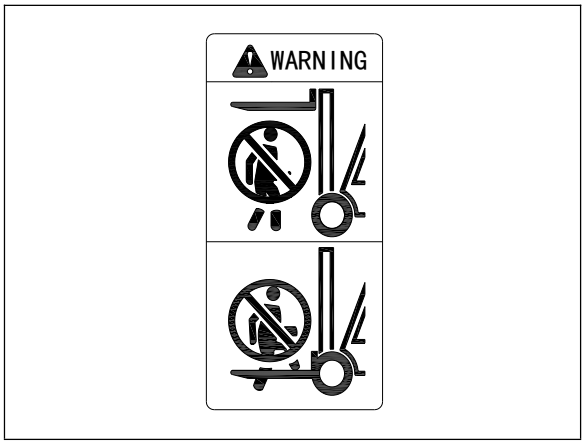
14) Avoid sudden drive, stop or turn.

15) Do not drive the truck when the forks in high position.

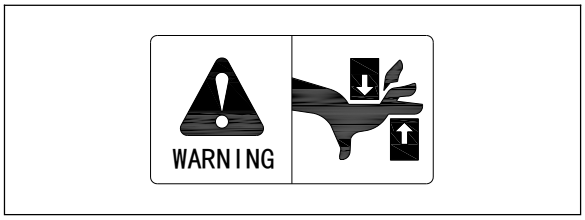
16) When handling bulky loads, which restrict your vision, please operate the machine in reverse or have a guide.

17) Cause the wheels of pallet truck is small, it is not allowed to run on the street, and only for driving in specified stacking place.

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



19) 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.



20) 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.

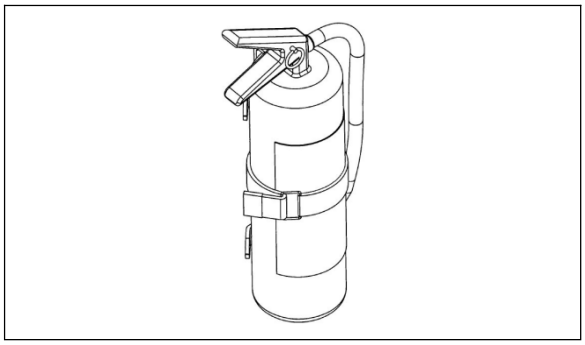
21) Do not use truck under the weather of sand, snow, thunder, storm, typhoon, etc. Avoid using the truck when the wind speed is larger than 5m/s.

– The weather condition: temperature: -5℃～40℃, wind speed: less than 5m/s; air relative humidity: less than 90%（20℃）. Altitude should not exceed 2000m.

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

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

24) 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.



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

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

27) Before dismantle or repair the truck, take down the battery plug firstly.

28) Truck modification by user, which can introduce hazards or risk not considered by manufacturers, will invalidate the existing truck risk

assessments. Truck modification outside Europe is subject to regional requirements (see ISO/TS 3691-8)

–

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.

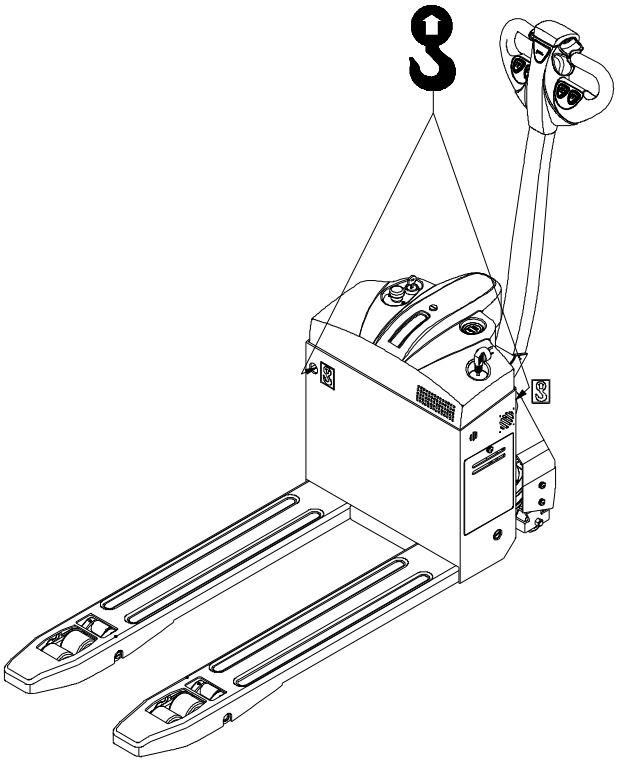
4.1 Lifting by crane

⚠ 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.

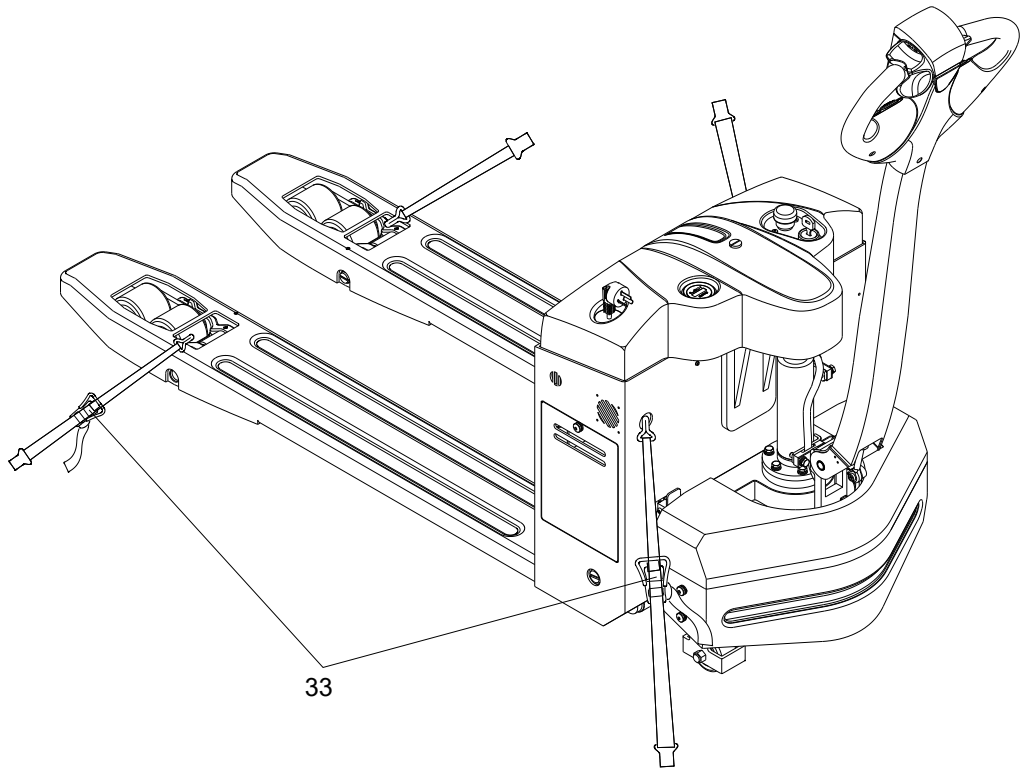


4.2 Securing the truck during transport

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.

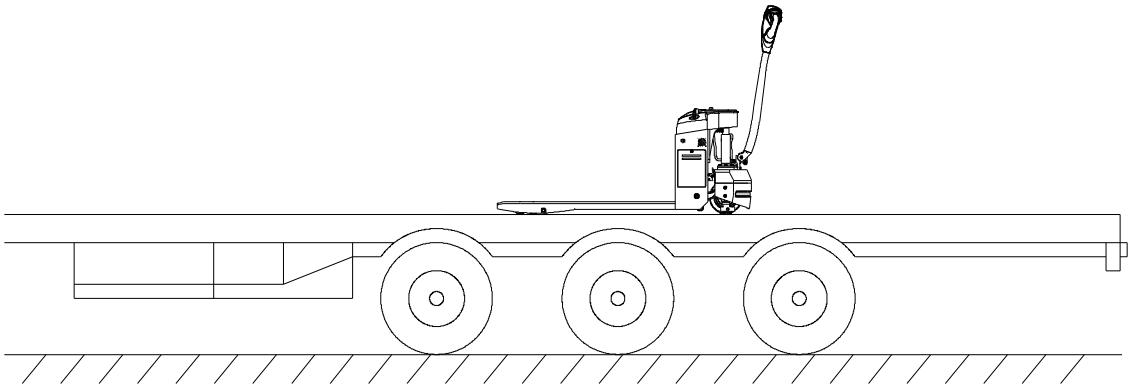


WARNING

- **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.**

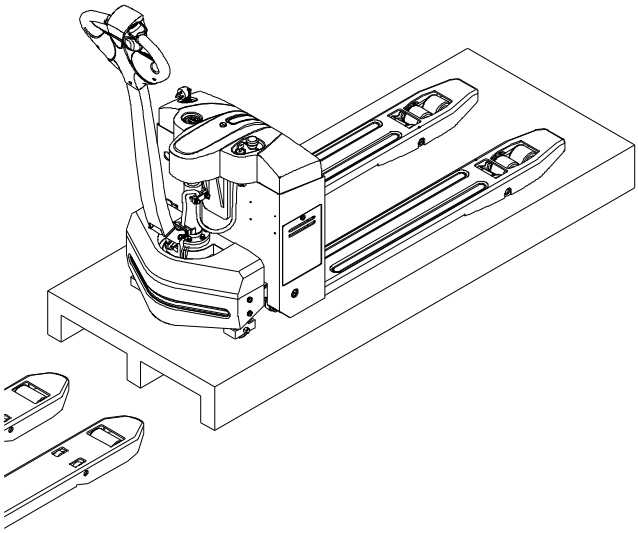
4.3 Transport

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

- **Do not tow the broken trucks on the ground directly, or else the braking system would be damaged.**

5 Battery

The truck equips with two 12V/70Ah maintenance-free colloidal batteries. 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.

Per battery weighs about 25kg.

5.1 Safe operation rules for battery use

- Before charging, check if there is damage on cable connection and plug connection pieces.
- Charge in the well-ventilated place.
- No smoking or open fire around when charging.
- No inflammable substances or spark-generating materials being present or stored within a distance of 2 metres of the truck parked for battery charging.
- Fire-fighting equipment must be kept in the charging place.
- No mental objects placed on the battery.
- If the battery is used over 4 years, please replace it. Do not mix the old and new batteries.
- Do not use when under overload, high humidity, or heavy grade.
- When charging, do not wrongly connect the battery polarity, otherwise it may damage the battery.
- After battery scrap, please return to the recycle bin unified handling, may not arbitrarily discarded.

5.2 Maintenance of the Battery

- Do not fill water for battery maintenance when it is in service.
- Inspect the battery leakage, damage and clean the surface periodically.
- Inspect every joint of the battery for solidness to avoid sparks or short circuit between the positive and negative poles.
- Keep the battery upright and no headstand. Make sure it is against vibration, pressing and well fixed. Keep the batter away from violent vibration, collision and friction.
- The maximum starting current of the truck should not exceed 1.25 times of its rated capacity. For instance, the maximum starting current should not exceed 87.5Ah for a battery with 70Ah rated capacity. Do not operate a truck when the working current is far higher than its rated

capacity, or else it would shorten the endurance of the truck and the service life of the battery as well.

- The matching between batteries and the chargers: matching on the charging parameter of the battery plays a significant role on the battery performance and its service life. Users should choose the qualified charger with same charging parameter as previous one when replacing the chargers.
- Over discharge, overcharged and insufficient charging should be prevented when the battery is in service, or else the battery would be damaged. Recharge the battery timely whenever available. No operation of the truck when the warning of low battery shown on the dashboard. It is normal that depth of discharge is around 50%. It should not be more than 80%.
- Make the battery fully charged and store it if the truck remains unused. It is also suggested to charge the battery once a week when the truck is unused.
- Battery capacity is based on environmental temperature 25 ℃. Therefore it's a normal phenomenon that the range decreases when the temperature goes down. The battery capacity decreases by 1% when the temperature goes down by 1℃. Avoid using the truck in the environment with a -10℃ below temperatures as far as possible.
- Charge the battery in a well ventilated environment with temperature between -5℃ and +40℃. Charge the battery indoor when it is in winter to make sure the battery can be charged sufficiently.
- Battery is a kind of consumable product. It is normal that the capacity would decrease after a period of charging and discharging and so does the endurance of the truck.

5.3 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

- **The truck comes with charger, the charger charging power supply must be single-phase power frequency AC power. It's prohibited to use DC, AC two phase/three phase and other non single phase AC to charge the battery.**

5.3.1 Power interface

- Input voltage: 85VAC～265VAC
- Input frequency: 47Hz～63Hz
- Input current: 1.8A～3.5A

5.3.2 Battery charging steps

Procedure:

- Park the truck securely.
- Remove the charging plug (13), together with the wire fixator (12) from the hood (15).
- The battery charging plug (13) is inserted into the appropriate electrical outlet.
- To charge the battery until the charging light indicator(9) green on, the battery is full charged.

  LED red on—Charging mode

  LED green on—Full charged

  LED yellow flash—Charger fault

  LED yellow on—Battery fault
- Remove charging plug (13) with the wire fixator (12) from the power socket and plug into the hood (15).

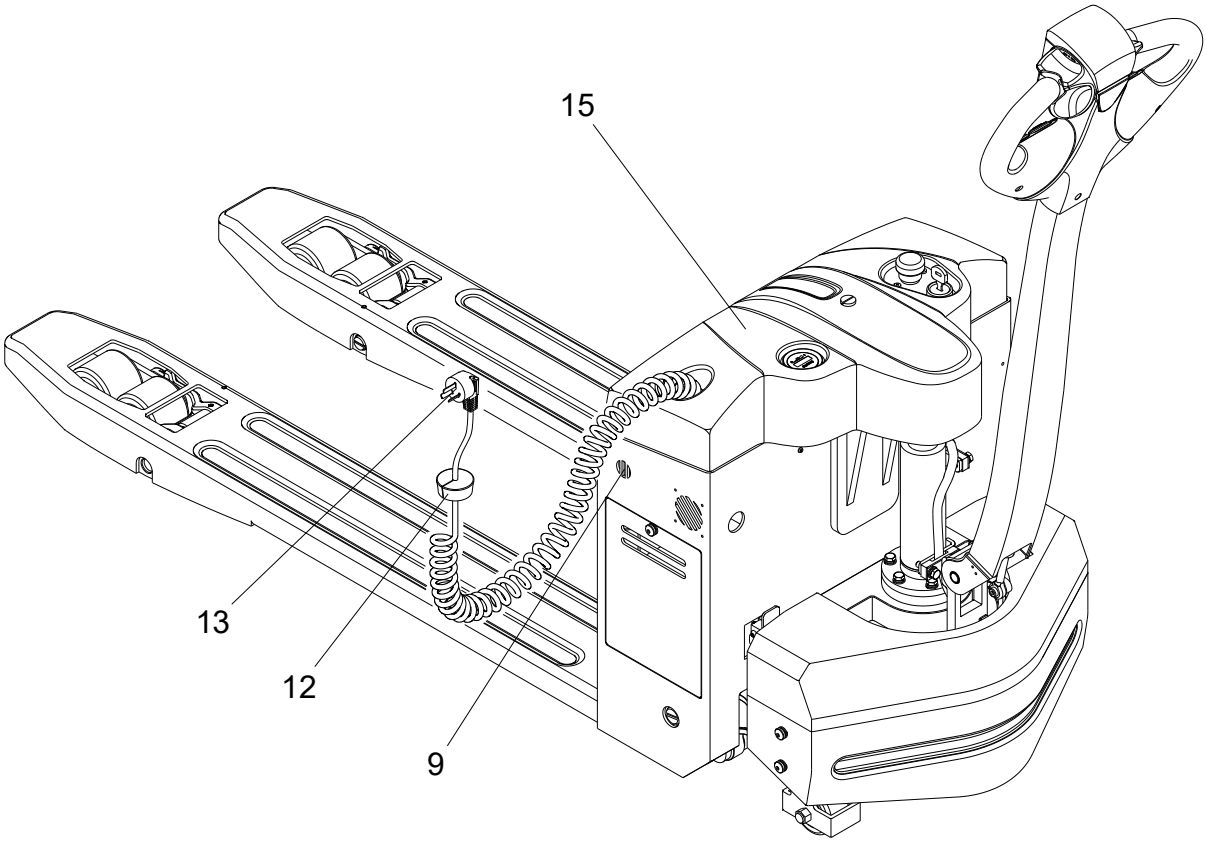
CAUTION

- **When the battery capacity is less than 3 grid please charge, otherwise will damage the battery, not the warranty !**
- **Truck travelling function is prohibited when charging.**

- **Do not suspend charging before fully charged.**

5.3.3 Additional charge

Charger structure enables to continue charging the partially charged battery in use.

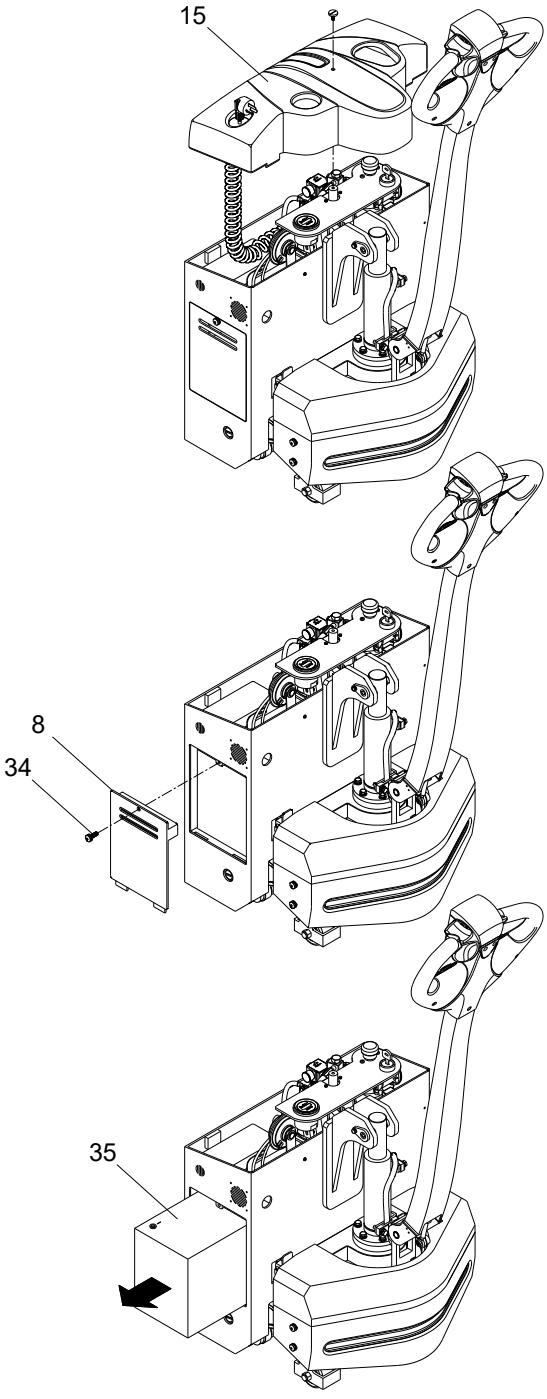


5.4 Replacing battery

Procedure:

- Park the truck securely.Before dismantle or repair the truck, take down the battery plug firstly.
- Remove the hood (15). See “Removing the hood”.
- Remove the screws (34), and then remove the side door(8).
- Remove the battery positive and negative electrode.
- From the left and right sides, respectively, pull the battery (35).

Install the battery in the reverse order. Pay attention to the battery loading position and wiring is correct.



WARNING

- **Battery box is very heavy, be careful to avoid damage.**
- **Disposal to the waste battery should accord with local environment regulation.**
- **When replacing the battery, ensure that a battery of the same specification, dimension and weight is fitted.**

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

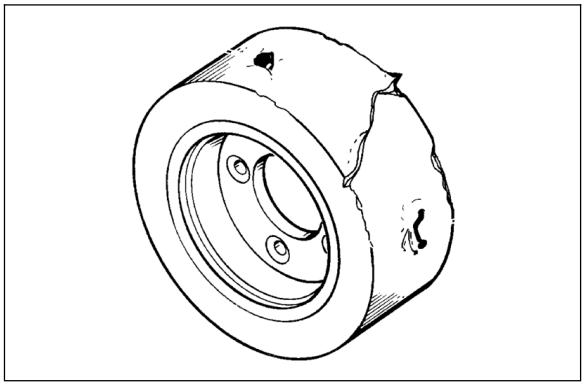
Park the truck and check oil leakage.

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

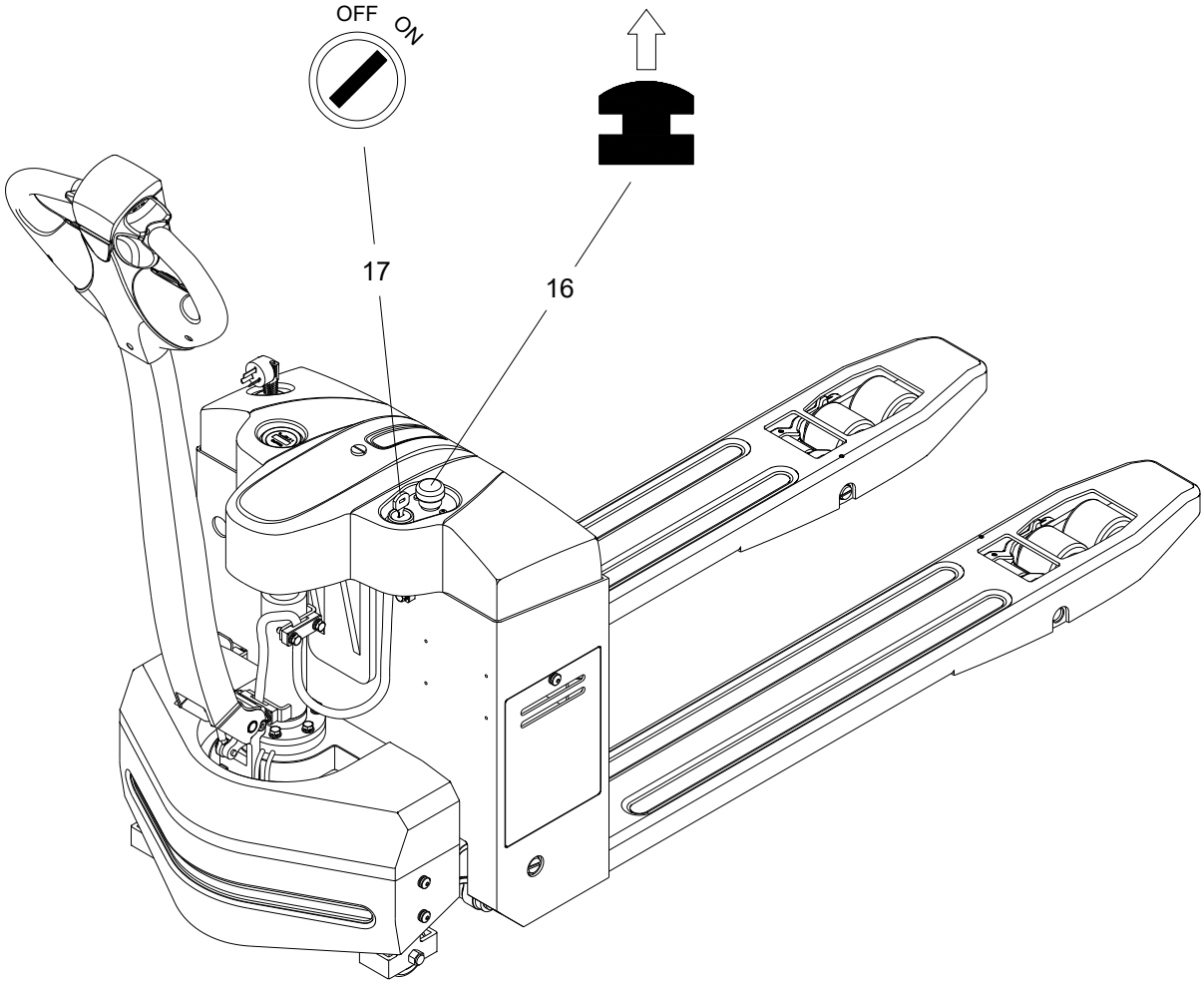
Check whether there is any abnormal noise, whether wiring is regular or fastener loosens etc.

7.2 Start up

Procedure:

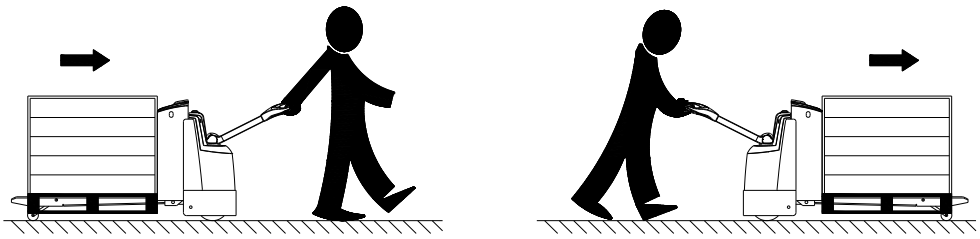
- Carry out check before operation and make sure each function and state is normal.
- Pull up the emergency stop switch (16).
- Plug the key into key switch (17), turn to “ON” position in clockwise. The instrument displays battery capacity.

Truck goes into running state.



7.3 Travelling

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.

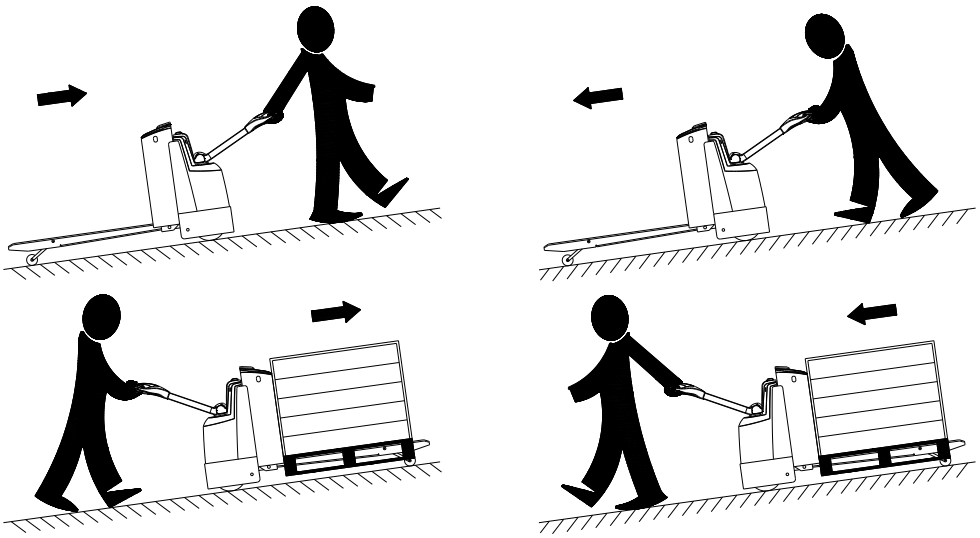


CAUTION

- **Operator must wear protective boots.**
- **When enter narrow area as lift, first get fork go.**
- **Keep road clean and wipe greasy dirt, water or other dirty easily causes slipping.**

Travelling on the slope：

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.

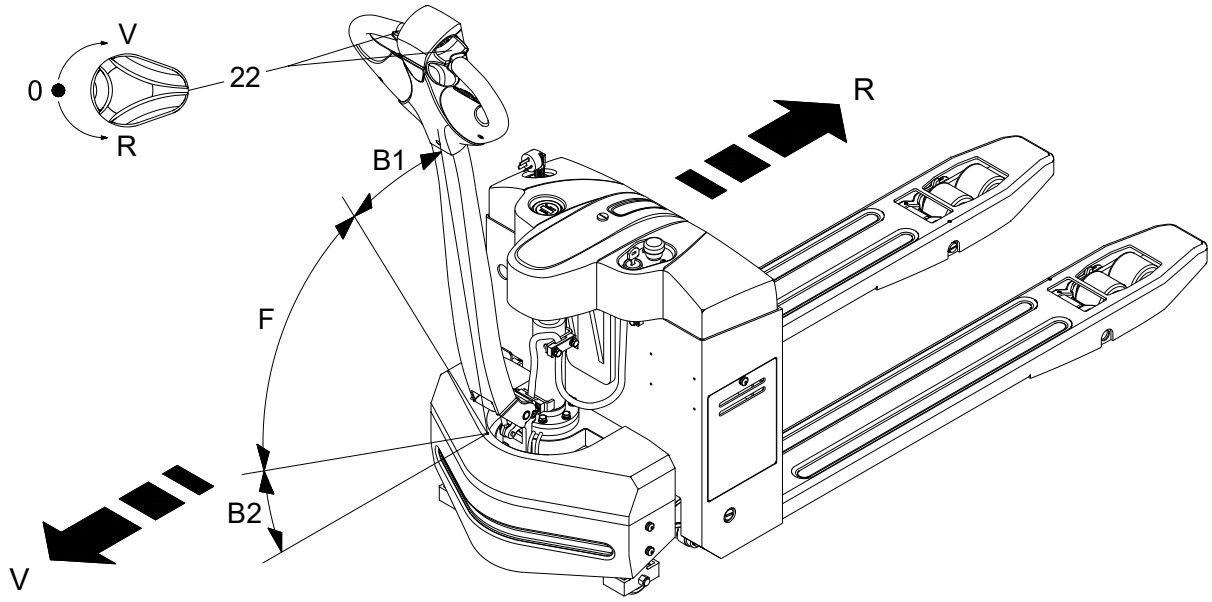


WARNING

- **No turn, inclines when going uphill and downhill.**
- **Never park on the slope.**
- **Slow down when going downhill and ready for braking.**
- **Travel according to regulated route.**
- **The road should keep clean, no slipping.**

Slow down

Slowly loosen the thumb, the direction speed control button will return automatically and the truck slows down.



7.4 Braking

When the thumb off the direction speed control button, pull the handle to braking range (B1 or B2) position or vertical position, the truck brakes.

> ⚠ **CAUTION**
>
> - **When release the control handle, the handle swivel into the braking range slowly or nor enter braking range, do check the reason and eliminate the fault. Replace gas spring if necessary.**

7.5 Steering

Hold the left and right handle of control handle with both hands, and decline to some degree, move the handle to left or right to release truck steering.

- When turn to left, the truck turns left.
- When turn to right, the truck turns right.

7.6 Stopping

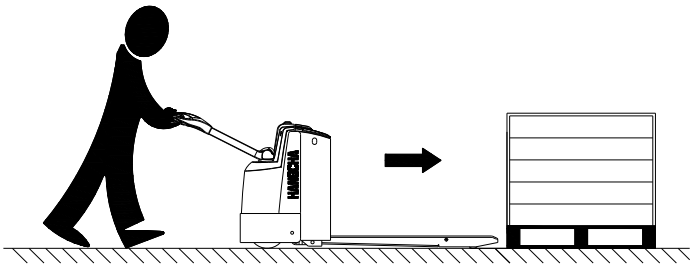
- Release the direction-speed knob. Decrease the speed.
- Return the control handle to vertical position.

- Drop the fork to the lowest position.
- Turn off the switch to “OFF” position, press down the emergency disconnect switch, pull out the battery plug, and take off the key.
- Fold up

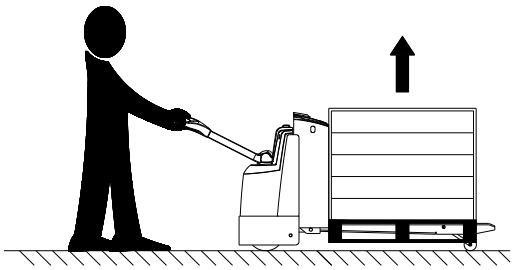
7.7 Loading

Procedure:

- Drive the truck carefully up to the loads.



- Adjust fork height to make the forks are in the tray.
- Raise the loads several centimeters to make sure if the loads are firm.

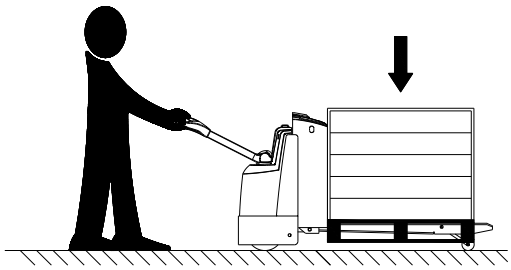


- Travel the truck off the area.
- Drop the load to lower position.

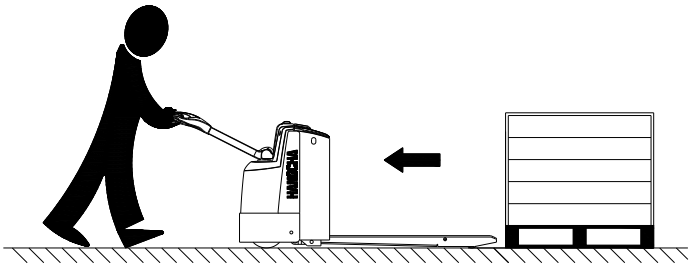
7.8 Unloading

Procedure:

- Approach the deposit area.
- Raise the loads to correct height.
- Travel forward, put the load on the unloading position and then stop.
- Make sure the loads are right above, drop the forks slowly until the forks are out of the load.



- Travel backward and make the fork out of the load.

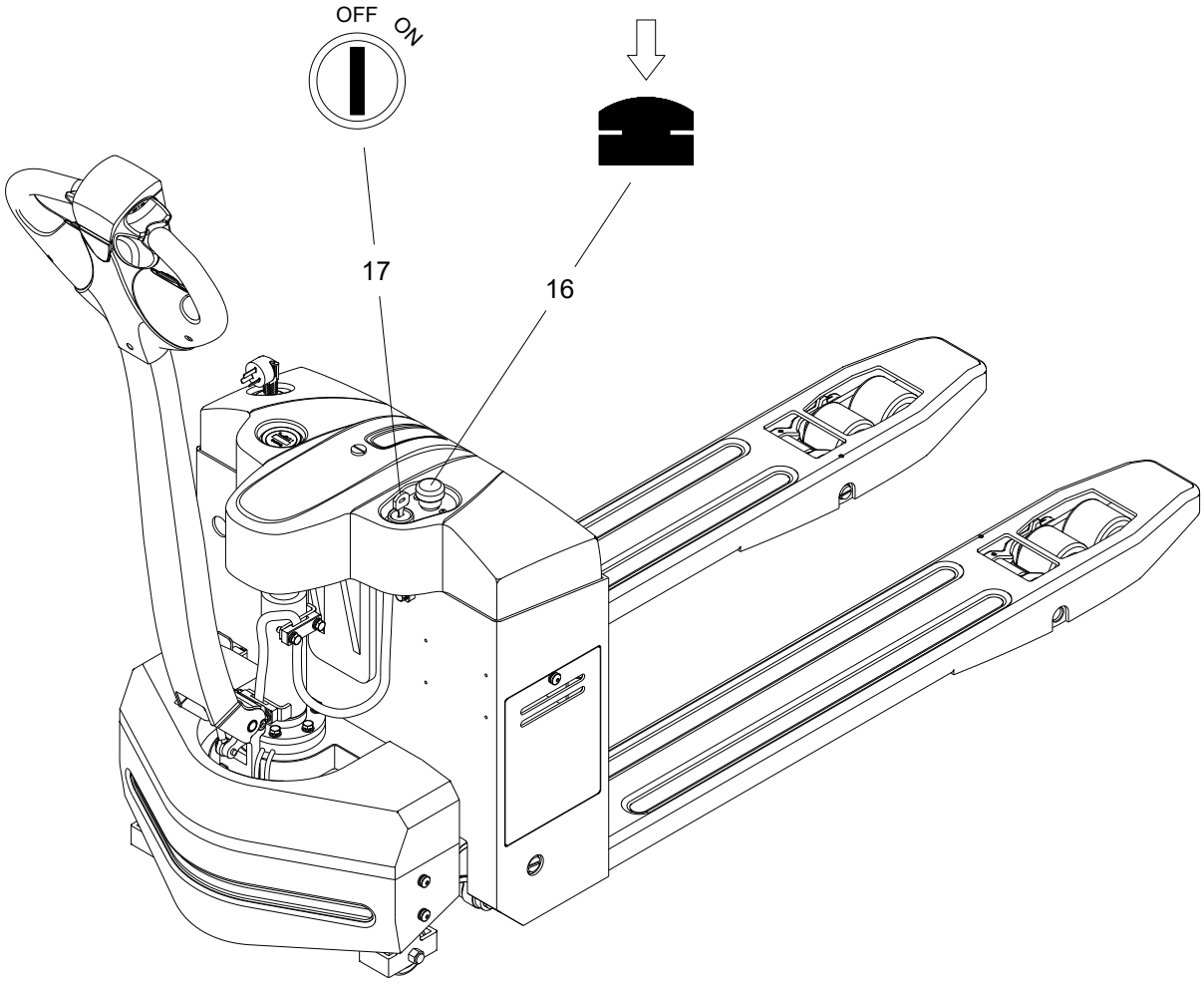


- Drop down the forks to proper position.

7.9 Park the truck securely

Procedure:

- Drive the truck to safe area or appointed area.
- Fully lower the forks.
- Turn off the key switch (17), and remove the key.
- Press the emergency stop switch (16).



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.

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
○ =Cold store maintenance interval (in addition to standard maintenance interval)

Battery		**D**	**W**	**M**	**T**	**S**	**Y**
1	Battery quantity	●					
2	Terminal looseness	●					
3	Looseness of connecting wire	●					
4	Cleanness of the battery surface		●				
5	Far away from firing	●					

Controller		**D**	**W**	**M**	**T**	**S**	**Y**
1	Check connector for worn				●		
2	Check contactor for running				●		
3	Check micromove switch for running				●		
4	Check the connection among motor, battery and power unit.				●		
5	Check the controller error diagnose system (First check 2 years)						●

Motor		D	W	M	T	S	Y
1	Clean the foreign body on the motor			●			
2	Clean or replace the bearing						●
3	Check the carbon brush and commutater for worn, whether spring is normal			●			
4	Whether the connection is correct and firm.			●			
5	Brush carbon powder on shift plate and shift device.				●		

Transmission		D	W	M	T	S	Y
1	Check for noise	●					
2	Check for leakage	●					
3	Change oil				○	●	

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					●	

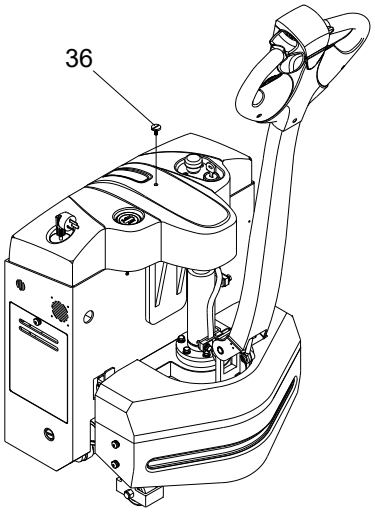
Wheels		D	W	M	T	S	Y
1	Check whether the wheels fastening	●					
2	Check wheels for wear and damage	●					

Electrical system		D	W	M	T	S	Y
1	Test displays and controls.	●					
2	Check the function of micro switch and sensor.	●					
3	Check fuse ratings.			●			
4	Check electric wiring for damage. Make sure wire connections are secure.		●				
5	Test Emergency Disconnect switch.	●					

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 emergency lowering system.				●		
6	Test relief valve and adjust if necessary.					●	
7	Replace hydraulic oil.					○	●
8	Clean hydraulic oil filter.					○	●

9.3 Remove or installing the hood

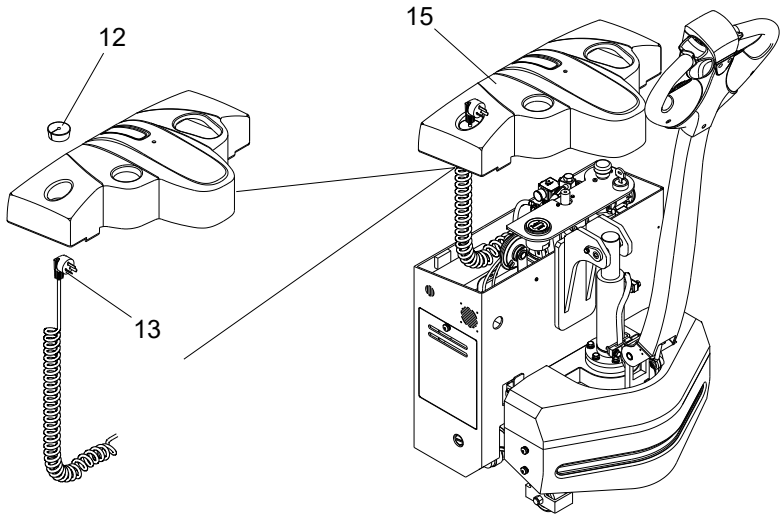
Remove the hood



Procedure:

- Park the truck securely.Before dismantle or repair the truck, take down the battery plug firstly.
- Unscrew the hood screws (36).
- Lift the hood (15).
- The wire fixator (12) and the battery charging plug (13) from the hood (15) to take off on.

The hood is removed. Installation and removal process is reversed.



WARNING

- **Remove or installing a hood, carefully clip hand !**

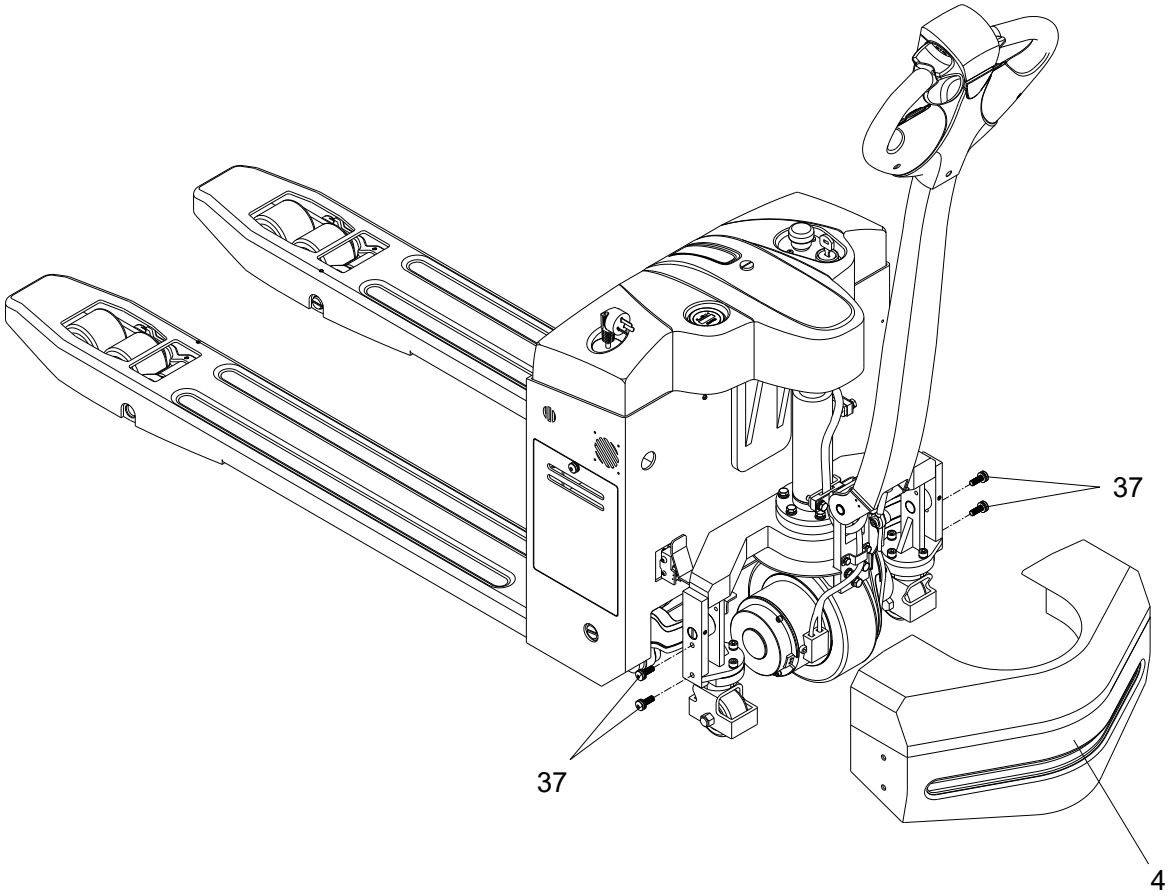
9.4 Remove or installing the drive wheel cover

Remove the drive wheel cover

Procedure:

- Unscrew the drive wheel cover(4) of the four screws(37), remove the drive wheel cover.

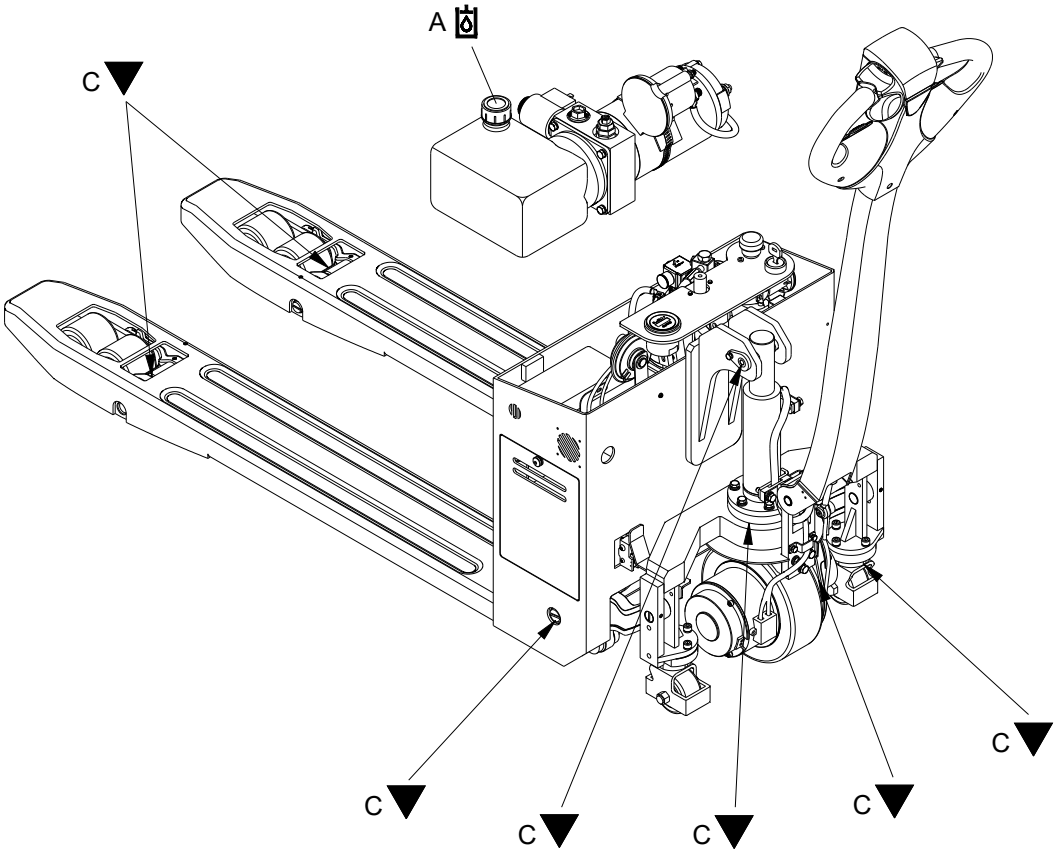
The drive wheel cover is removed. Installation and removal process is reversed.



WARNING

- **Remove or installing the drive wheel cover, carefully clip hand !**

9.5 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.**

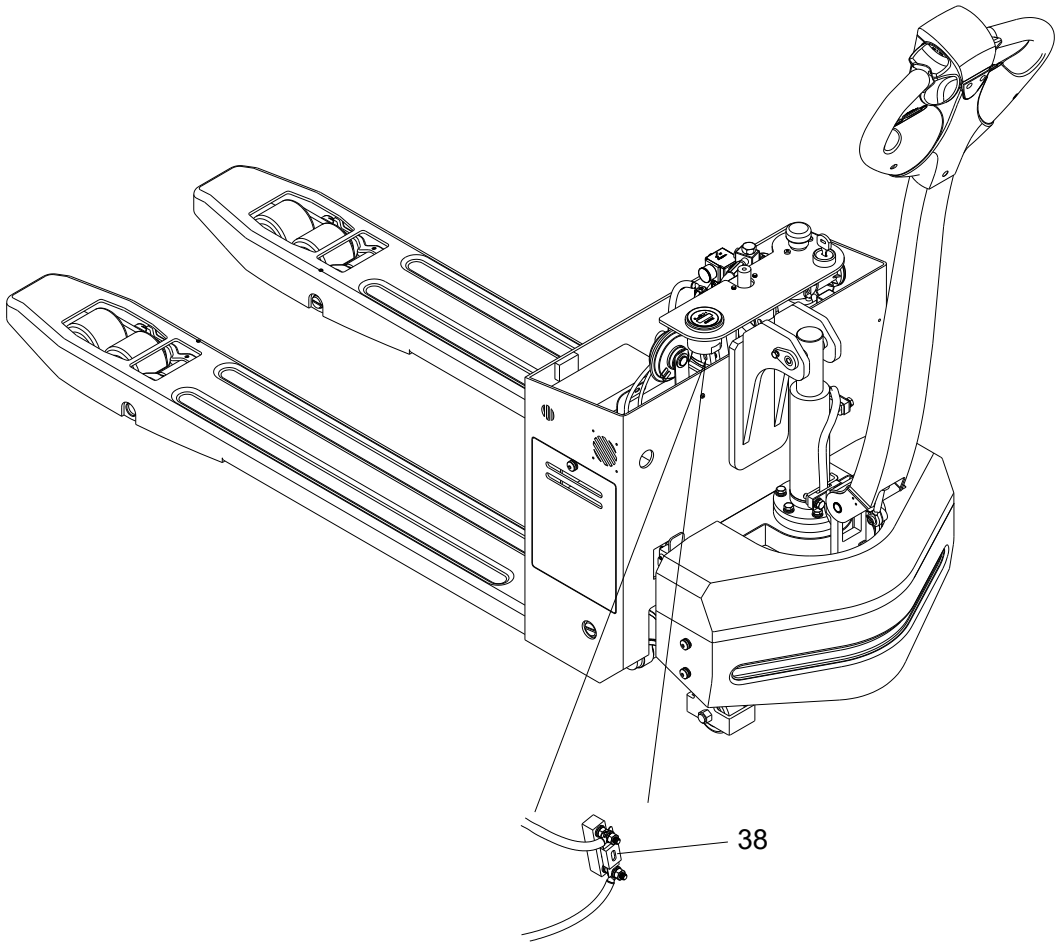
9.6 Check the fuses

Procedure:

— Maintenance work to complete preparations before the operation.

— Remove the hood.

— Check the fuse (38) values are correct, if necessary, replace.



No.	Designation	Control circuit	Specification
38	Fuse	Control the truck power	100A

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 ISO 3691-1:2015+A1:2020 Industrial trucks -- Safety requirements and verification— Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks
- EN 16307-1:2020 Industrial trucks. Safety requirements and verification. Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks)
- EN1175-1:2020 Safety of industrial trucks - Electrical requirements - Part 1: General requirements for battery powered trucks）, EN1726-1:1998（Safety standard for machinery industrial vehicle）, EN1757-2: 2001 harmonized standard;
- Main safety elements are in accordance with 2006/42/EC machinery directive as well as EN1726-1:1998, EN1175-1:2020， EN1757-2：2001 standard;
- Electronic components design and manufacture meet low-voltage apparatus directive 2014/35/EU;
- Noise is calculated according to EN12053:2001+A1:2008: pallet truck noise, sound pressure value

  Lifting: right ear73.4dB, left ear72.5dB

  Going forward: right ear72.4dB, left ear71.5dB
- Vibration data are calculated according to the EN13059:2002+A1:2008 Safety of industrial trucks - Test methods for measuring vibration, ISO5349-2:2001, ISO2631-1:1997 standard, meet 2002/44/EC directive: handle vibration amplitude is 0.2977m/s^2.
  Electromagnetic compatibility is calculated according to EN12895:2000 and meet 2004/108/EC directive.

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	3100
	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.

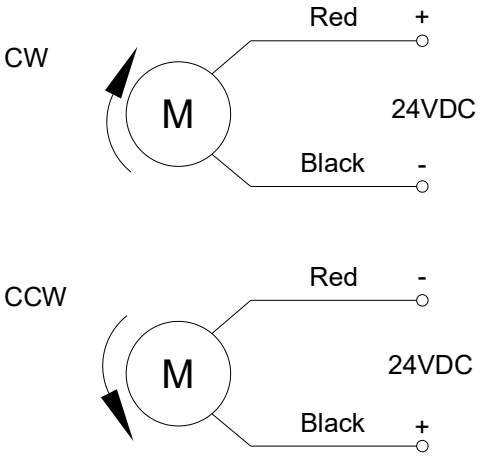
1.3 Fault and troubleshooting

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;

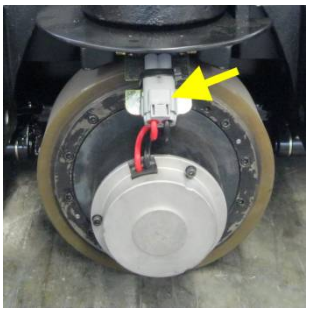
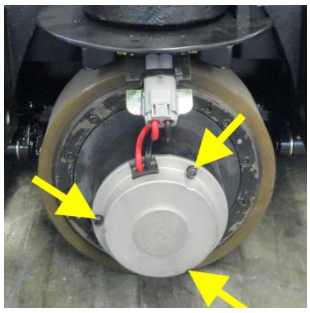
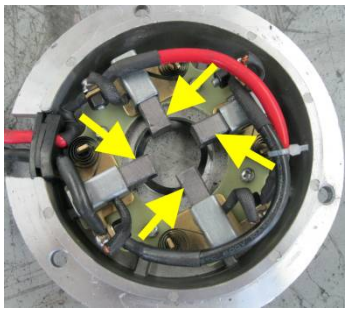
  b. Clean and replace bearing, listen if there is abnormal noise during running;

  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%.

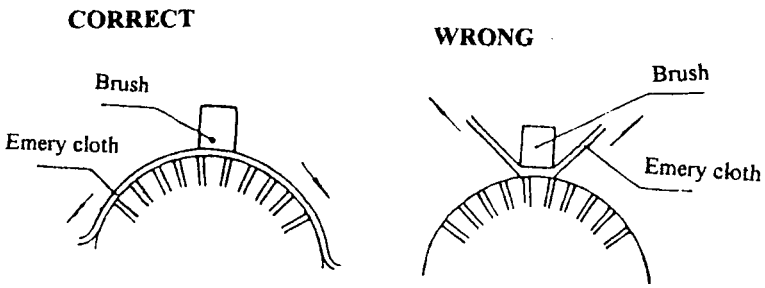
- Remove the connecting plug of the motor.
- Screw out the three fixed bolts on the motor hood.
- Take down the motor hood and replace the new brushes.

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.

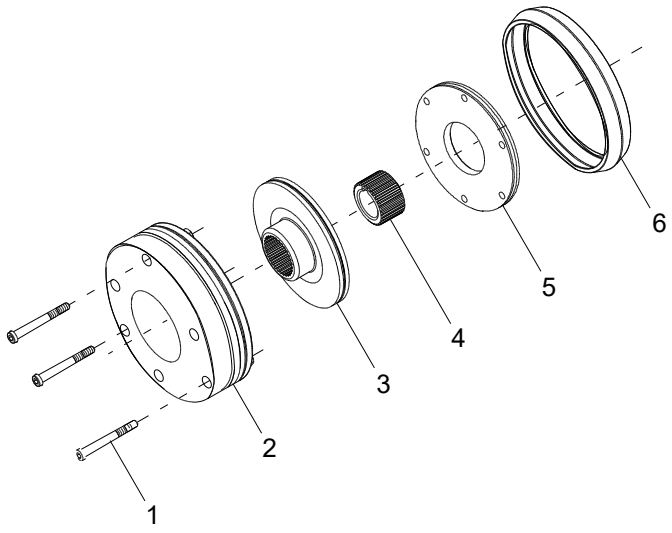


Fault diagnosis

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.

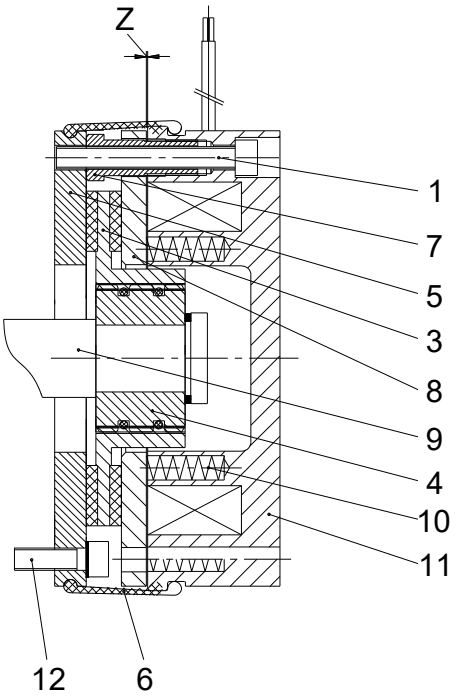


1.Mounting Bolt of the Brake	2.Stator Module
3.Brake Pad	4.Shaft Sleeve
5.Friction Disk	6.Dustproof Cover

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

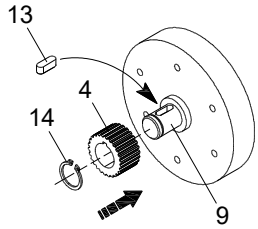
12.Mounting Bolt of Friction Disk

Z. Air Gap

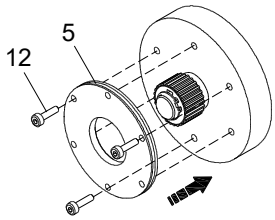
Fig.2-4 Electromagnetic Brake Structure

1.5.2 Electromagnetic brake installation

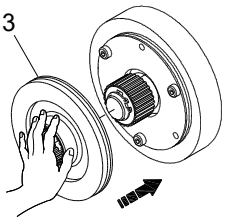
– Put the flat key (13) into the key groove of the motor shaft (9). Press the shaft sleeve (4) to the motor shaft (9) and fasten it with the inner spring.



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

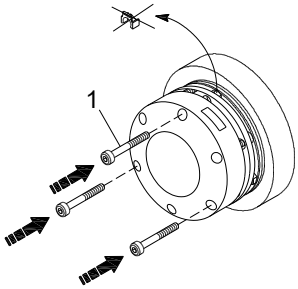


– Cover the shaft sleeve with the friction disk (3).

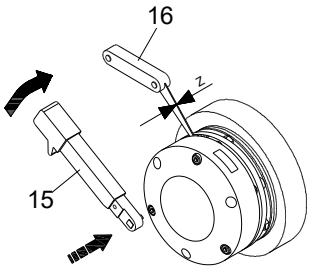


– Install the stator module (2) to the friction disk (5) with three mounting bolts of the brake (1).

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

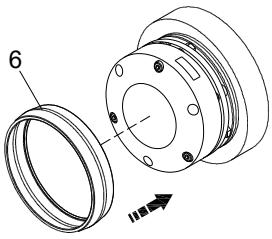


– Screw down the three mounting bolts (1) with a torque wrench (15) and check the air gap (Z) of the brake with a feeler gauge (16).



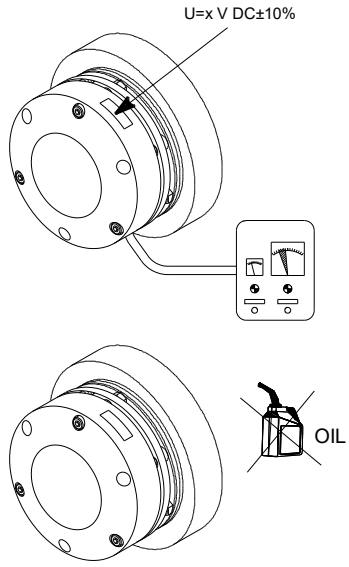
– Put on the dustproof cover(6).

– Connect the brake wiring.



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.

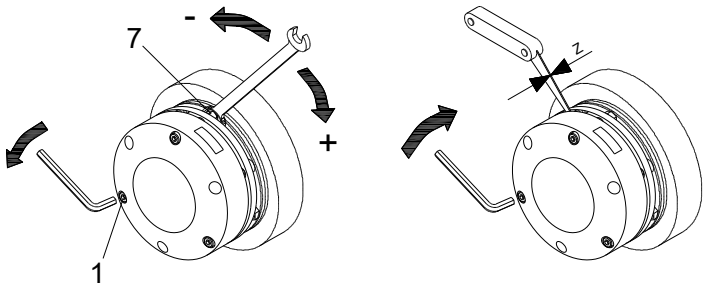
Specification Table

Rated Current (V)	Rated Power (W)	Rated Torque (Nm)	Rated Air Gap (mm)	Minimum Thickness of Rotor (mm)	Pre-tension Torque of the Mounting Bolt (Nm)
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.



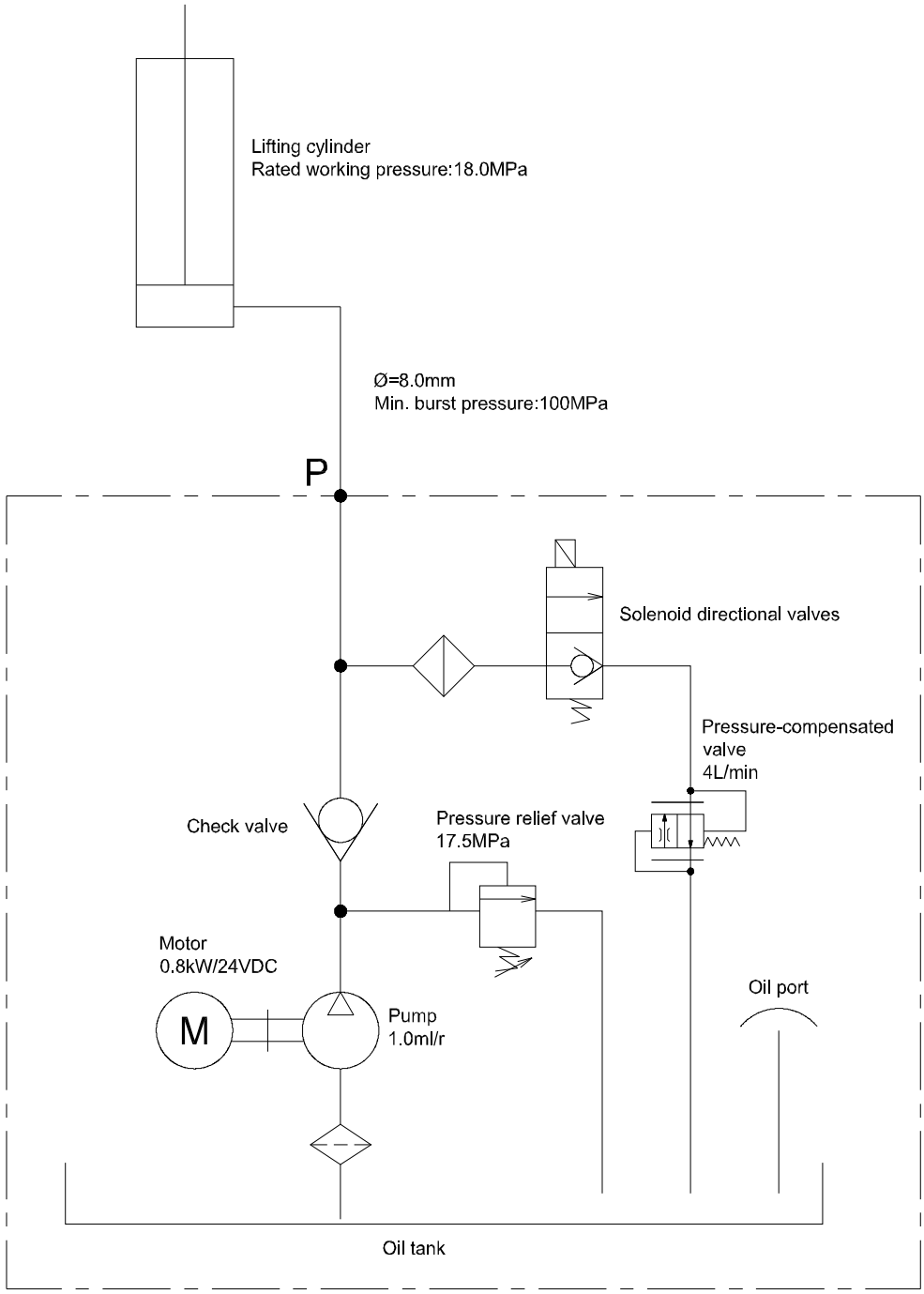
Under the general operating conditions, the first set of the air gap is usually after 1500 to 2000 hours service of the brake and it is suggested to adjust the air gap every 6 months. If it comes to a poor working condition, such as frequent use of brake and repeated emergency stops，the air gap should 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

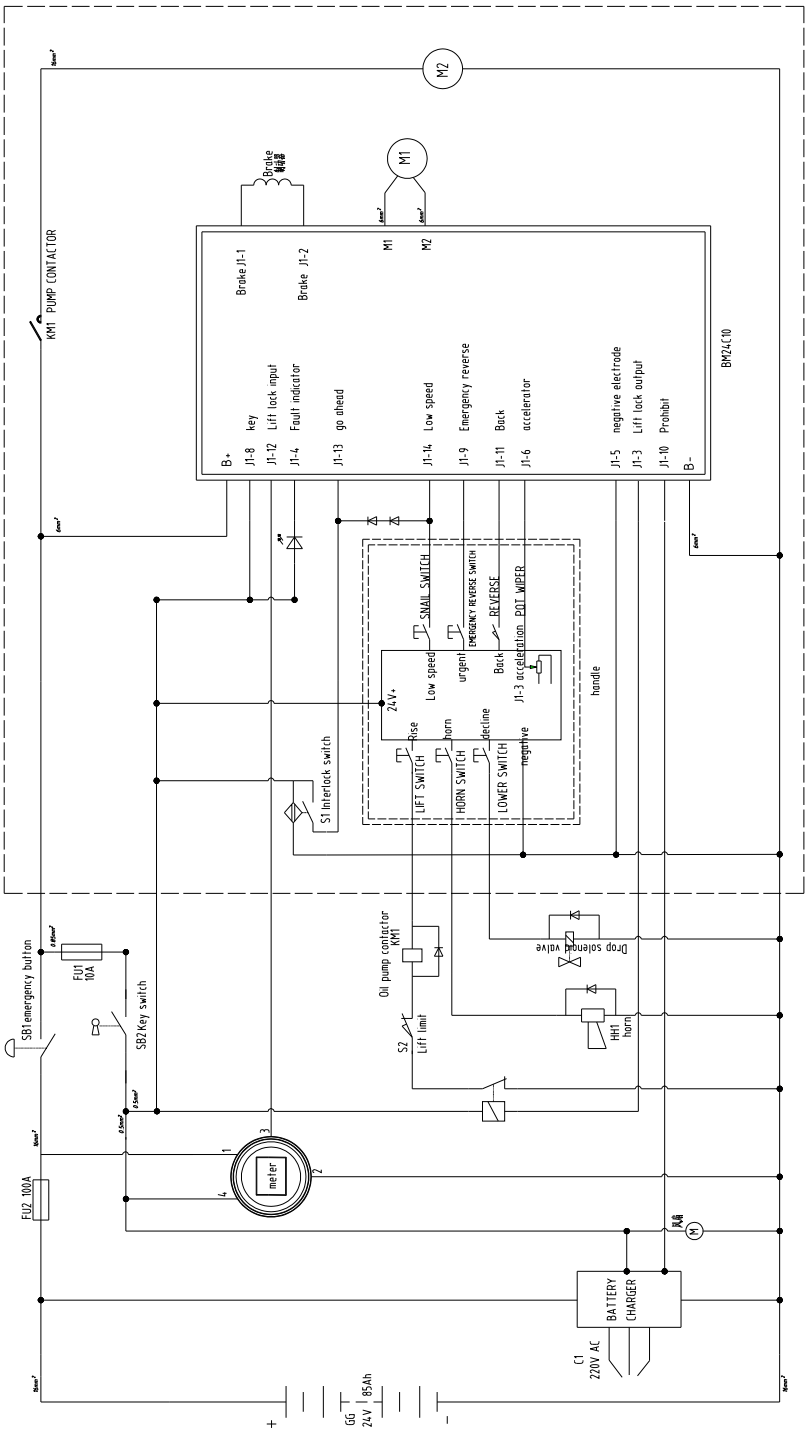


2.2 Hydraulic system fault diagnosis and correction

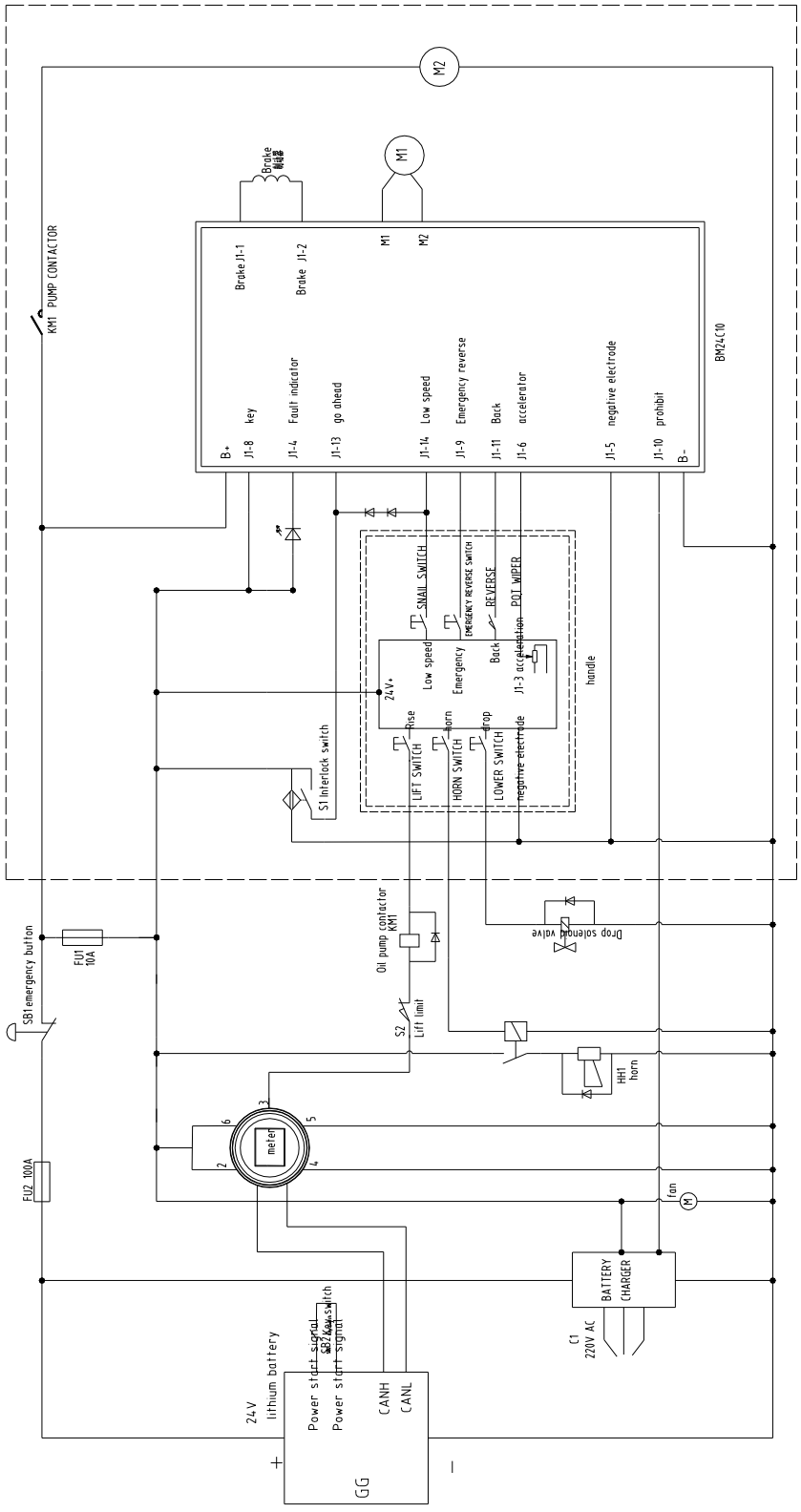
Fault		Probable cause	Corrective action
No oil pumps from the pump		Low oil level	Fill to the specified oil level
		Blocking of strainer	Clean oil pipe and oil tank. If hydraulic oil is dirty, please change it.
Low oil pressure of oil pump output		Bearing worn; retainer, O-ring damage	Change the bad 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

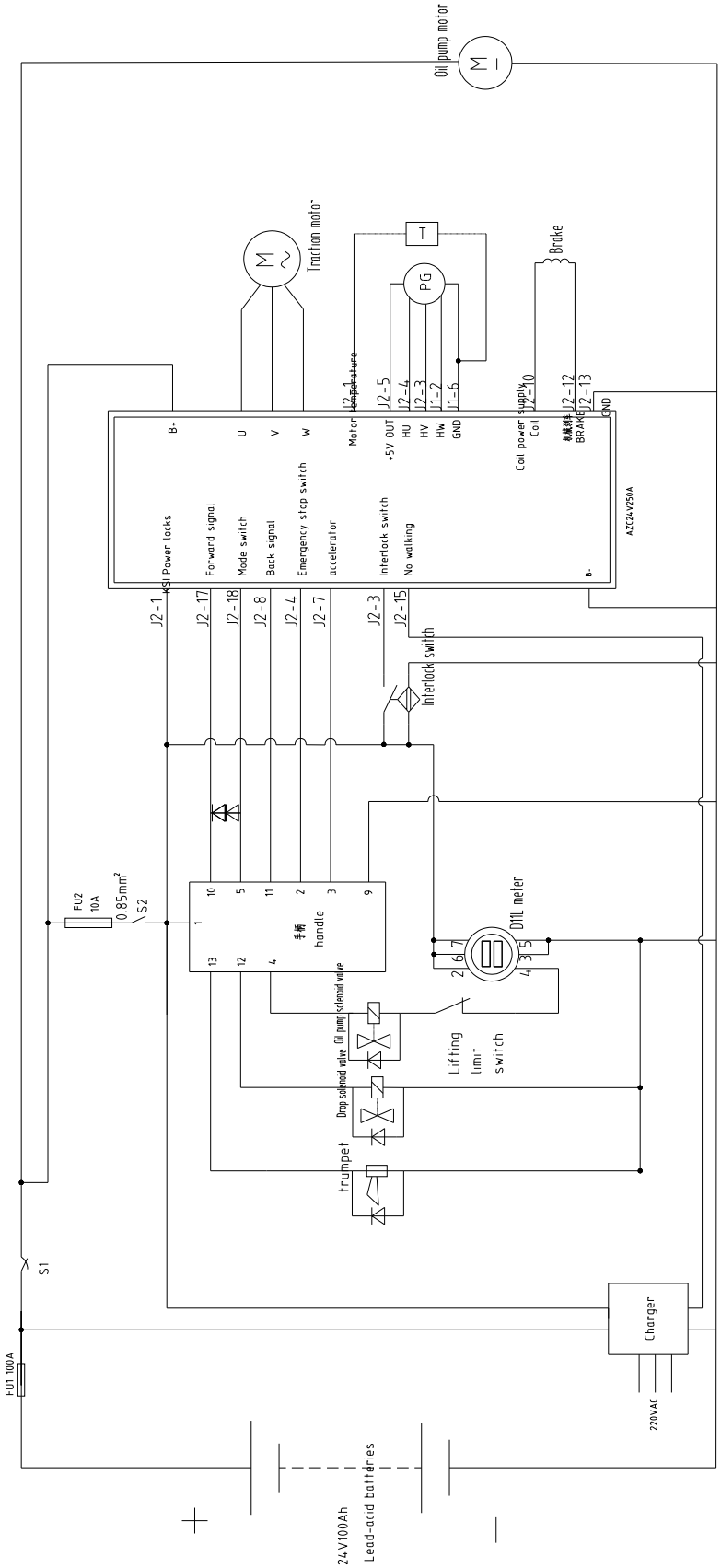
3.1 Electrical schematic diagram



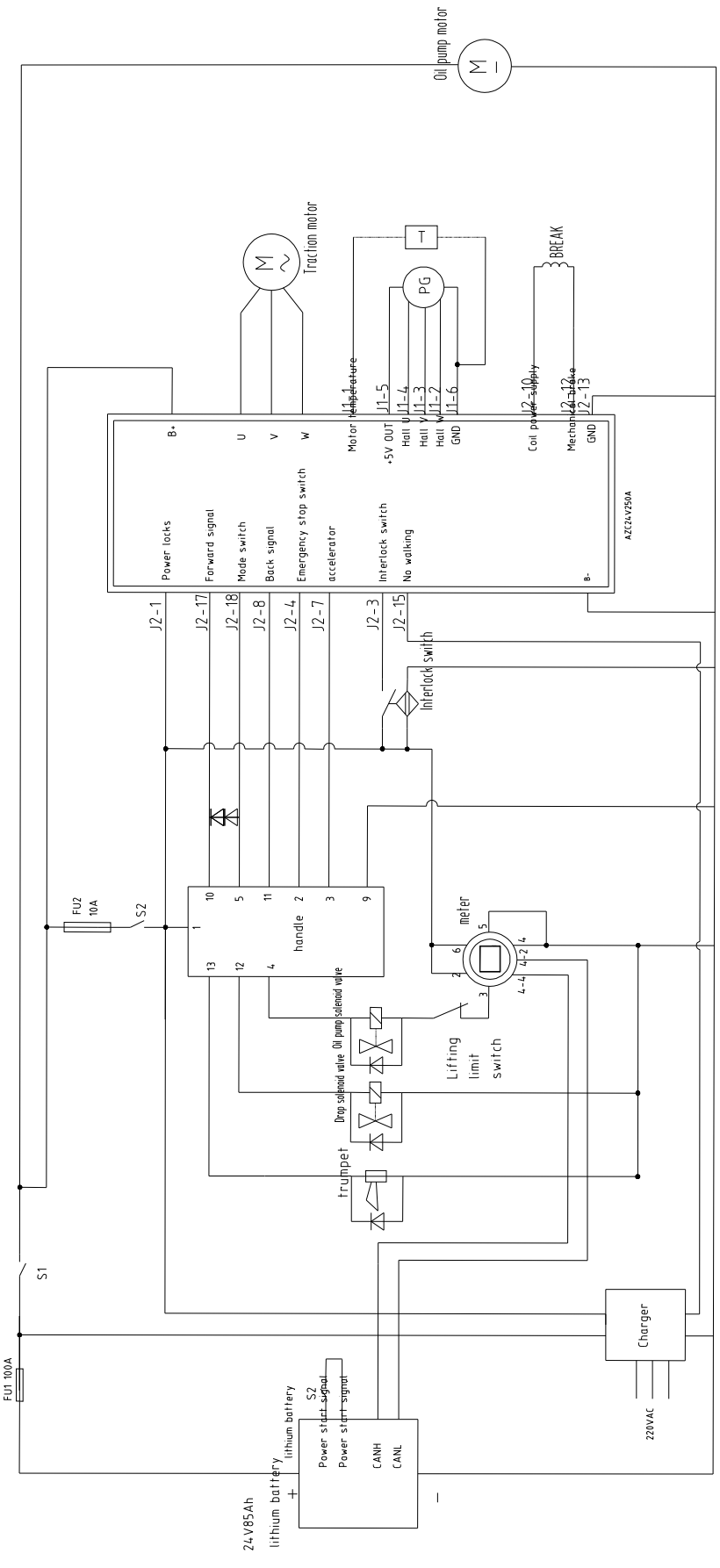
CBD15-A3MJ


M2
M1
Brake
KM1 PUMP CONTACTOR
Brake J1-1
Brake J1-2
M1
M2
B+
J1-8 key
J1-4 Fault indicator
J1-13 go ahead
J1-14 Low speed
J1-9 Emergency reverse
J1-11 Back
J1-6 accelerator
J1-5 negative electrode
J1-10 prohibit
B-
BM24C10
SNAIL SWITCH
EMERGENCY REVERSE SWITCH
REVERSE
POT WIPER
24V+
Low speed
Emergency
Back
J1-3 acceleration
handle
Rise
horn
drop
negative electrode
LIFT SWITCH
HORN SWITCH
LOWER SWITCH
S1 Interlock switch
SB1 emergency button
FU1 10A
Oil pump contactor KM1
Drop solenoid valve
S2
Lift limit
HH1 horn
FU2 100A
meter
fan
BATTERY CHARGER
C1 220V AC
24V lithium battery
Power start signal
Power start signal
S3 Key switch
CANH
CANL
GG
+
-

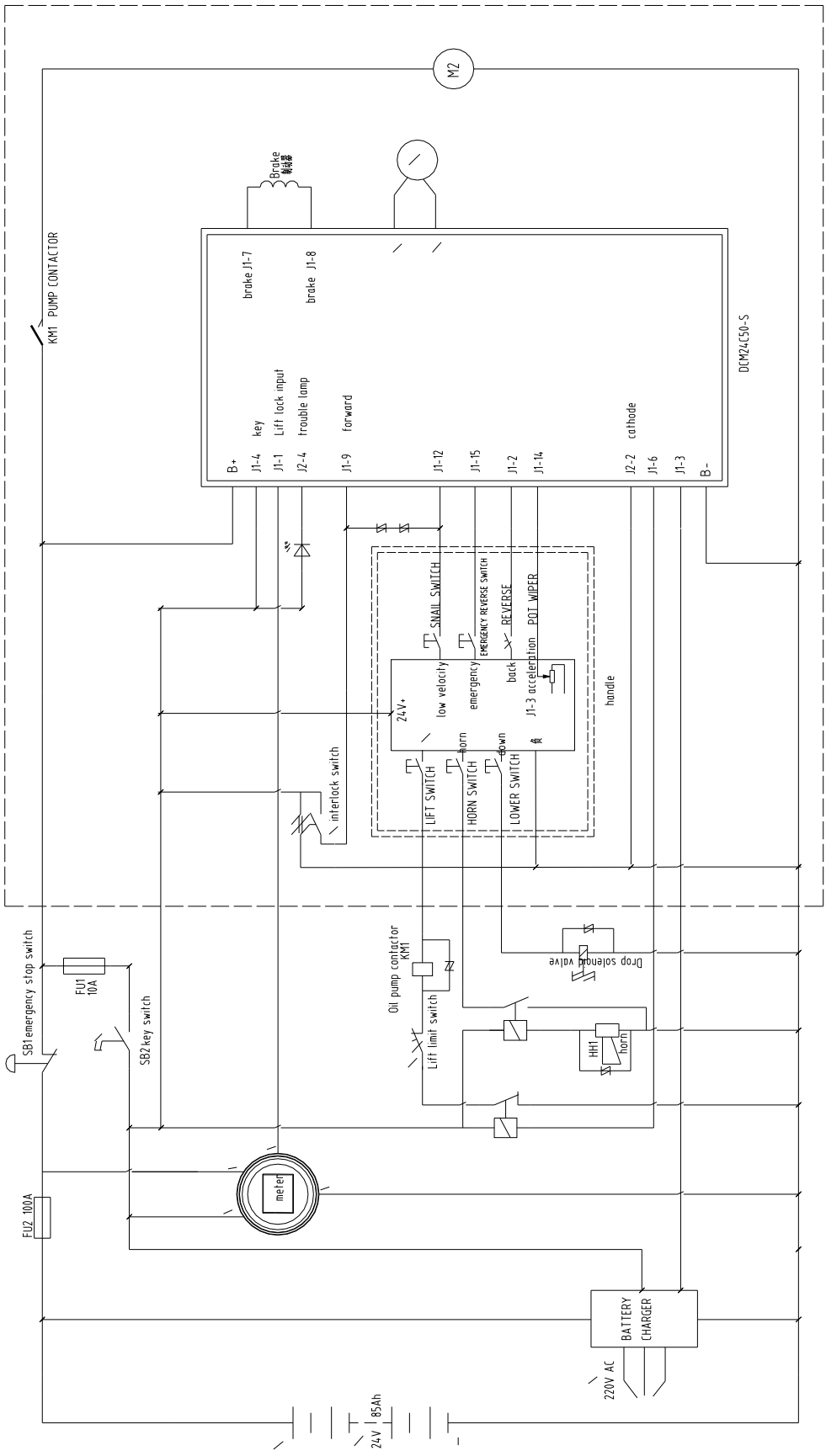
CBD15-A3MJ-I


Oil pump motor
M
Traction motor
T
PG
Brake
Motor temperature
+5V OUT
HU
HV
HW
GND
Coil power supply
Coil
BRAKE
GND
B+
U
V
W
Power locks
Forward signal
Mode switch
Back signal
Emergency stop switch
accelerator
Interlock switch
No walking
B-
AZC24-V250A
J2-1
J2-17
J2-18
J2-8
J2-4
J2-7
J2-3
J2-15
J2-5
J2-4
J2-3
J1-2
J1-6
J2-10
J2-12
J2-13
Interlock switch
FU2
10A
0.85mm²
S2
handle
DTL meter
Oil pump solenoid valve
Drop solenoid valve
trumpet
Lifting
limit
switch
S1
FU1 100A
Charger
220VAC
24V100Ah
Lead-acid batteries

CBD20-A3MA


Oil pump motor
M
Traction motor
T
PG
BREAK
Motor temperature
+5V OUT
Hall U
Hall V
Hall W
GND
Coil power supply
Mechanical brake
GND
B+
U
V
W
Power locks
Forward signal
Mode switch
Back signal
Emergency stop switch
accelerator
Interlock switch
No walking
B-
AZCZ4V250A
J2-1
J2-17
J2-18
J2-8
J2-4
J2-7
J2-3
J2-15
J1-5
J1-4
J1-3
J1-2
J1-6
J2-10
J2-12
J2-13
Interlock switch
FU2
10A
S2
handle
meter
Oil pump solenoid valve
Drop solenoid valve
trumpet
Lifting
limit
switch
S1
FU1 100A
Charger
220VAC
lithium battery
S2
Power start signal
Power start signal
CANH
CANL
24V85Ah
lithium battery
+
-

CBD20-A3MA-I


M2
Brake
KM1 PUMP CONTACTOR
DCM24C50-S
brake J1-7
brake J1-8
key
Lift lock input
trouble lamp
forward
cathode
B+
J1-4
J1-1
J2-4
J1-9
J1-12
J1-15
J1-2
J1-14
J2-2
J1-6
J1-3
B-
SNAIL SWITCH
EMERGENCY REVERSE SWITCH
REVERSE
POT WIPER
24V+
low velocity
emergency
back
J1-3 acceleration
handle
horn
down
LIFT SWITCH
HORN SWITCH
LOWER SWITCH
interlock switch
Drop solenoid valve
Oil pump contactor KM1
Lift limit switch
HH1
horn
SB1emergency stop switch
FU1 10A
SB2 key switch
FU2 100A
meter
BATTERY CHARGER
220V AC
24V 85Ah

CBD15-A3MJ2

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

CBD20-A3MA（-I） error code

B.1 Description of the fault indicator of the controller. The controller status indicator is displayed by blue and red LED lights. The flashing time of the indicator is different in the normal state and the fault state. In the normal state, only the blue light flashes for 1 second. In the fault state, the flashing time of the red and blue lights is The 0.5 second cycle interval is 1 second. In the fault state, the red light indicates single-digit failure, blue light indicates tens-digit failure, each flash of red light indicates 1, and each flash of blue light indicates 10.
B.2 Normal state: the red light is off, and the blue light flashes at 1 Hz;
B.3 Fault status: Red and blue lights flashing frequency 2Hz, the number of flashing blue lights in one cycle represents ten digits, and the number of flashing red lights represents everyone. The fault table is shown in Table B1:

Table B1 System failure status

NO.	Fault light code	Accident details
1	1	Stall error
2	2	Hall error
3	3	Motor over temperature
4	4	Drive tube over temperature
5	5	Drive tube up to warning temperature
6	6	U-phase overcurrent hardware error
7	7	V phase overcurrent hardware error
8	8	W phase overcurrent hardware error
9	9	Bus overvoltage hardware error
10	10	Bus overcurrent hardware error
11	11	Hardware error
12	12	Battery voltage overvoltage
13	13	Battery undervoltage error
14	14	Motor reaches warning temperature
15	15	low battery
16	16	Bus voltage is too high

17	17	Bus voltage is too low
18	18	Bus overcurrent
19	19	Error after Iq reaches the maximum value and times out
20	20	Power-on accelerator did not return to zero error
21	21	The lever interlock signal is lost during travel
22	22	The accelerator started incorrectly before the lever was set
23	23	Emergency reverse touch error
24	24	Positive and negative switch error
25	25	Speeding error
26	26	EEPROM abnormal
27	27	Travel error while charging
28	28	Current sampling is damaged
29	29	Deceleration timeout error
30	30	Accelerator push to trigger emergency reverse -> emergency stop
31	31	Motor temperature sensor open circuit
32	32	Motor temperature sensor short circuit
33	33	IGBT temperature sensor open circuit
34	34	IGBT temperature sensor short circuit
35	35	IU phase software overcurrent
36	36	IV phase software overcurrent
37	37	IW phase software overcurrent
38	38	Relay open circuit failure
39	39	Relay short circuit fault
40	40	Mechanical brake open circuit failure
41	41	Mechanical brake short circuit failure

CBD15-A3MJ(-I)(D) error code

The controller has a fault diagnosis function and is equipped with an external fault indicator port. When the controller fails, the fault indicator flashes in the form of a two-digit code. The specific fault type information and fault code are executed in accordance with Table B1.1.

The format of the controller fault code is as follows:

¤ ¤¤¤ ¤¤ ¤¤¤ ¤¤¤ ¤¤

(1,3) (2,3) (3,2)

The fault codes represented above are (1,3), (2,3) and (3,2).

表 B1. 1

Error code	**Fault type**	**Reason**
1,1	Temperature failure	1. The temperature of the bottom plate is too high. 2. The motor is overloaded. 3. The ambient temperature is too high or too low. 4. The electromagnetic brake is released.
1,2	Accelerator failure	1. The accelerator wiper is disconnected. 2. The accelerator is damaged. 3. Wrong choice of accelerator type.
1,3	Undervoltage fault	1. The battery voltage is <17 volts. 2. The connection of battery B+ and B- loop is loose.
1,4	Overvoltage fault	1. Battery voltage>31 volts. 2. When the vehicle is running, the battery is in a charging state. 3. Poor connection of battery B+ and B- circuits.
1,5	Emergency reverse switch operation error	1. Before the KSI is powered on, the emergency reverse switch is closed.
2,1	Main contactor adhesion failure	1. The main contactor is stuck or stuck. 2. The main contactor drive failure.
2,2	Main contactor open circuit fault	1. The main contactor drive circuit is open.

2,3	Brake disconnection fault	1. The brake drive circuit is short-circuited. 2. The brake coil is open.
2,5	Precharge failure	1. The pre-charge circuit is damaged. 2. The MOSFET is damaged.
3,1	Brake closure failure	1. The brake drive circuit is open. 2. The brake coil is short-circuited.
3,2	Overcurrent fault	1. The motor is short-circuited. 2. The controller is damaged.
3,3	EEPROM failure	1. EEPROM read and write failure.
3,4	Battery connection failure	1. The battery is not connected. 2.Battery B+, B- loop connection is bad.
3,5	Lift switch operation error	1. Before the KSI is powered on, the lift switch is closed.
4,1	Interlock switch error	1. Before the interlock switch is closed, the forward or backward switch is closed
4,2	Internal power failure	1. 15V voltage>18 volts or <10 volts.
4,3	M1 bridge arm failure	1. M1 bridge arm failure MOSFET is damaged.
4,4	M2 bridge arm failure	1. M2 bridge arm failure MOSFET is damaged.

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

HANGCHA GROUP CO. , LTD.

■ Address: 666 Xiangfu Road, Hangzhou, Zhejiang, China
■ Fax: 0086-571-88926789 0086-571-88132890 ■ ZIP:311305
■ Web: http://www.hcforklift.com ■ E-mail: sales@hcforklift.com