

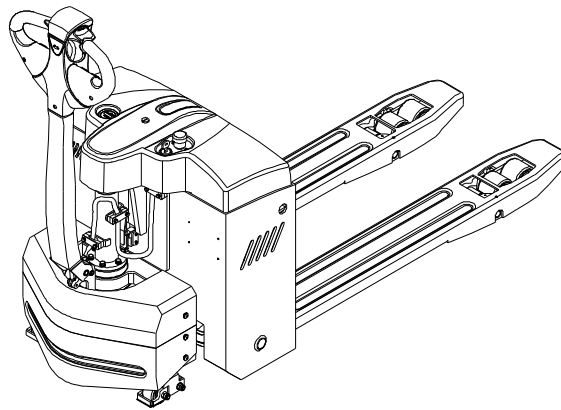


**Mini Range**

**ELECTRIC PALLET TRUCK**

**CBD15-A2MC1  
CBD15-A3MC1  
CBD15-A3MC2  
CBD15-A3MC1-I  
CBD15-A3MC2-I**

# **OPERATION AND MAINTENANCE MANUAL**



Original Instruction

**HANGCHA GROUP CO., LTD.**

**11/2022**

# 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.

# Contents

<b>Part I : Operation and Maintenance .....</b>	<b>1</b>
1 Notice for use .....	1
1.1 General .....	1
1.2 Use as required .....	1
1.3 Approved application conditions .....	2
1.4 Attachment installation or modification to the truck .....	3
2 Truck introduction .....	4
2.1 General .....	4
2.2 Functional description .....	5
2.3 Main part introduction .....	7
2.4 Display and control .....	8
2.4.1 Display (battery charge level indicator) .....	9
2.5 Standard technical data .....	11
2.6 Product plates and warning labels location .....	12
3 Safety Instructions .....	14
4 Transport .....	17
4.1 Lifting by crane .....	17
4.2 Securing the truck during transport .....	18
4.3 Transport .....	19
5 Battery and charger .....	20
5.1 Safe operation rules for battery use .....	21
5.2 Battery charging .....	22
6 New truck breaking-in .....	24
7 Operation .....	25
7.1 Check before operation .....	25
7.2 Start up .....	27
7.3 Travelling .....	28
7.4 Braking .....	29
7.5 Steering .....	29
7.6 Stopping .....	29
7.7 Loading .....	30
7.8 Unloading .....	30
7.9 Park the truck securely .....	32
8 Deposit the truck for long time .....	33
8.1 Deposit for long time .....	33
8.2 Start running after deposit for a long time .....	33
9 Maintenance .....	34
9.1 Maintenance general .....	34
9.2 Periodic maintenance schedule .....	35
9.3 Remove or installing the hood .....	37
9.4 Remove or installing the drive wheel cover .....	38
9.5 Truck used oil and lubrication .....	39

9.6	Check the fuses .....	40
9.7	Replace wheels .....	41
10	Relevant safety directive or standard (CE) .....	42
<b>Part II : Structure, Principle and Maintenance .....</b>		<b>43</b>
1	Drive Unit .....	43
1.1	Data sheet .....	43
1.2	Assemble and use notice .....	44
1.3	Fault and troubleshooting .....	44
1.4	Drive Motor .....	45
1.5	Electromagnetic brake .....	49
1.5.1	Electromagnetic brake working principle .....	50
1.5.2	Electromagnetic brake installation .....	51
1.5.3	Maintenance .....	52
1.5.4	Adjust the Air Gap of the Brake .....	53
1.5.5	Common fault and troubleshooting .....	55
2	Hydraulic system .....	56
2.1	Hydraulic system working principle .....	56
2.2	Hydraulic system fault diagnosis and correction .....	57
3	Electric system .....	58
3.1	Electrical schematic diagram .....	58
3.2	Drive motor controller .....	63
3.2.1	Maintenance .....	63
3.2.2	Diagnostics and Troubleshooting .....	73
Attachment: Table for bolt's tightening torque .....		85

# **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.
- Average environment temperature under continuous operating condition +25°C.
- The highest environment temperature in the short term (≤1h) +40°C.
- The lowest environment temperature under normal indoor conditions when operation +5°C.
- The lowest environment temperature under normal outdoor conditions when operation -20°C.
- Altitude: ≤2000m.
- Max. uphill grade when driving is 8%..
- When going uphill with loads, keep the loads in front; when going downhill, keep people in front. It is prohibited to travel crosswise or obliquely.

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

## **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.

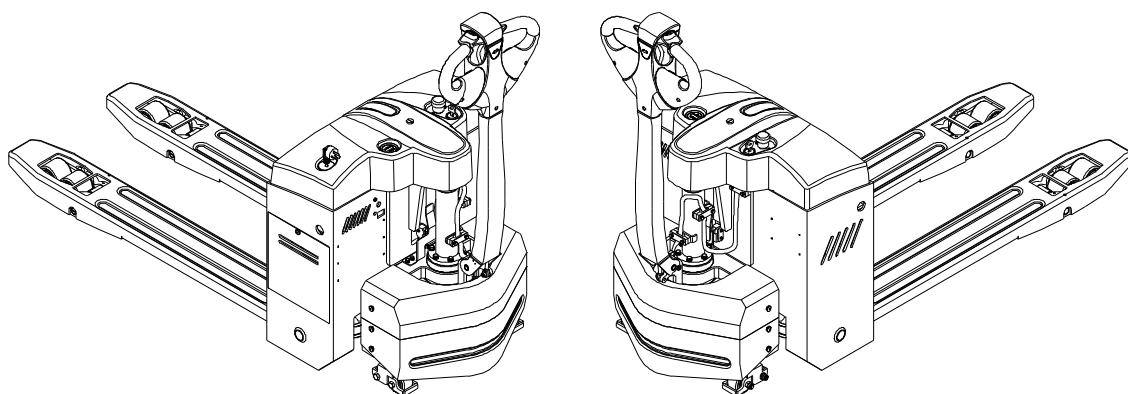
## 2 Truck introduction

### 2.1 General

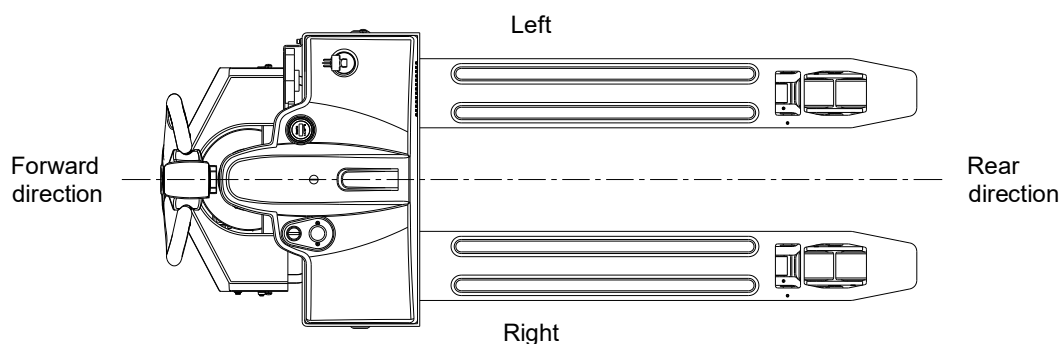
A series mini range electric pallet truck described in this manual should work under low working strength and its continuous working time should not surpass one hour.

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

CBD15-A3MC1-I	Meaning
CBD	Electric pallet truck
15	Rated load capacity×100kg
A	Product serial number
3	Third-generation products
M	Mini Range
C1	Controller type
I	Lithium battery



The following determinations have been made for travel direction specification.



## **2.2 Functional description**

### **Frame**

- Beautiful and compact outline, concise and fluent line.
- Adopted steel stamping and injection moulding process is sturdy and durable.

### **Driving system**

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

### **Electric system**

- 24V(48v) lithium battery, efficient work, easy to change.
- The latest CURTIS permanent magnetic control system, control performance, efficient and stable.

### **Comfort**

- Simple and beautiful tiller to make the operator feel comfortable, all the operation can be completed by one hand.
- Adopt maintenance-free lithium battery, which is very convenient to use.
- The compact body and semicircular design provide an ideal operation in limited space, and the ability of walking upright greatly increases the convenience in the container.
- Side battery change is standard feature.

### **Reliability**

- 5-pivot design provide longer working life.
- Imported waterproof connectors, all wires and cables are protected, greatly improve the reliability of the electric system.
- Top quality hydraulic power unit applied to provide low noise, low vibration, smooth lifting and landing reliable operation.
- Punch formed forks to provide more strength and tip guide to provide higher efficient operation.
- Using non-contact proximity switch, improves safety and reliability.

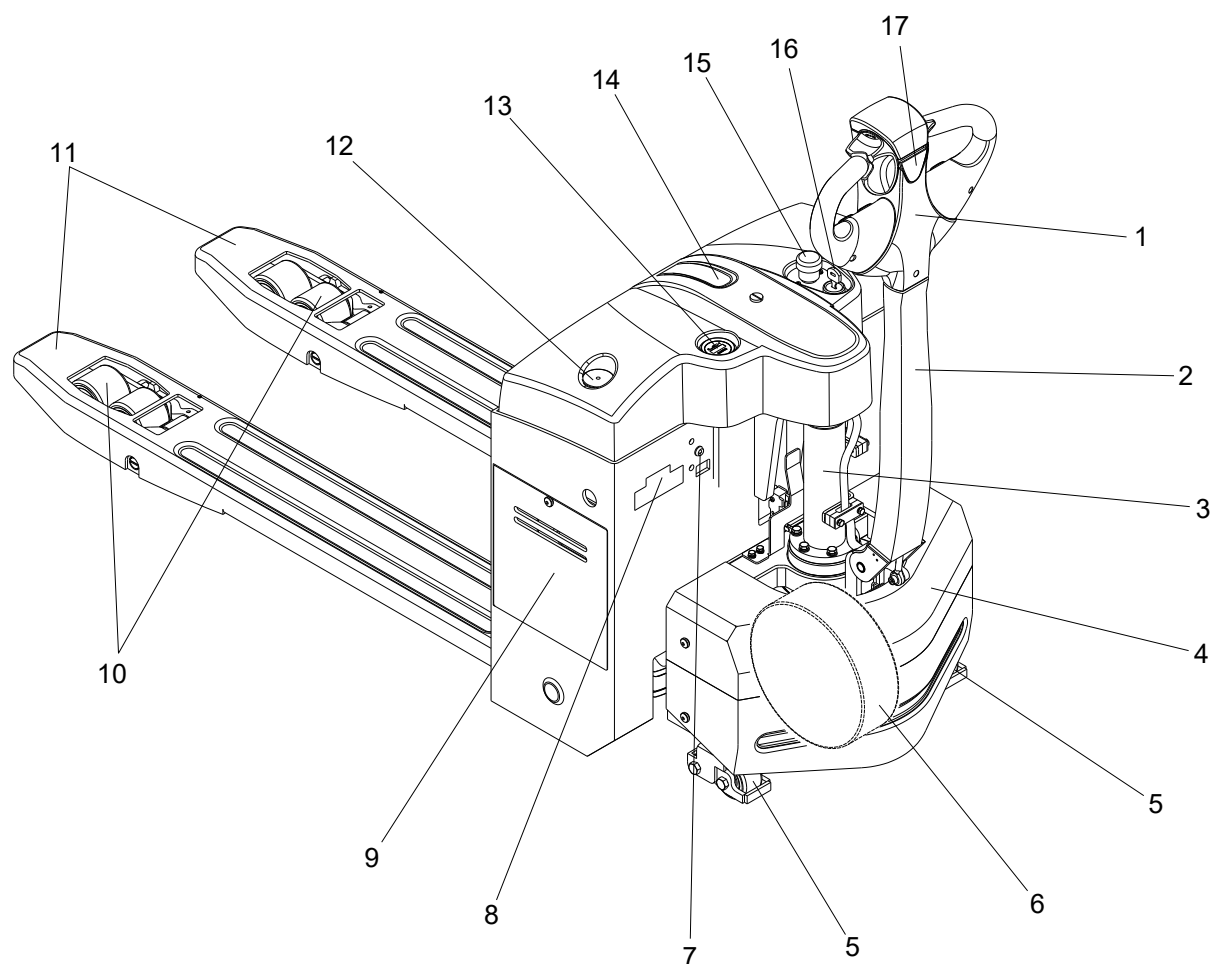
### **Safety**

- Three braking system of regenerative braking, reverse current braking, parking brake, insures the safe operation.
- Anti-slope on gradient can keep the safety.
- The emergency button on the tiller head can effectively avoid the harm to the driver.
- The standard equipped electronic lifting limitation protect the pump motor from damaging dramatically and more energy saving.

### **Maintenance**

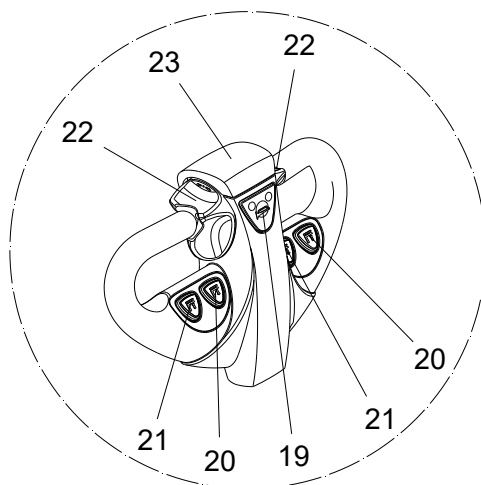
- Integrated battery indicator, hour meter and self-diagnostic instrument.
- Full openedhood, easy accessibility of all components, is easy for service.
- All shafts installed lubricated shaft sleeve and oil cup, provide convenient maintenance and long service life.

## 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	Display (battery charge level indicator)
5	Caster wheel	14	Hood
6	Drive wheel	15	Emergency stop switch
7	Fault indicator	16	Key switch
8	charging port	17	Upright traveling button
9	Side door (built-in battery)		

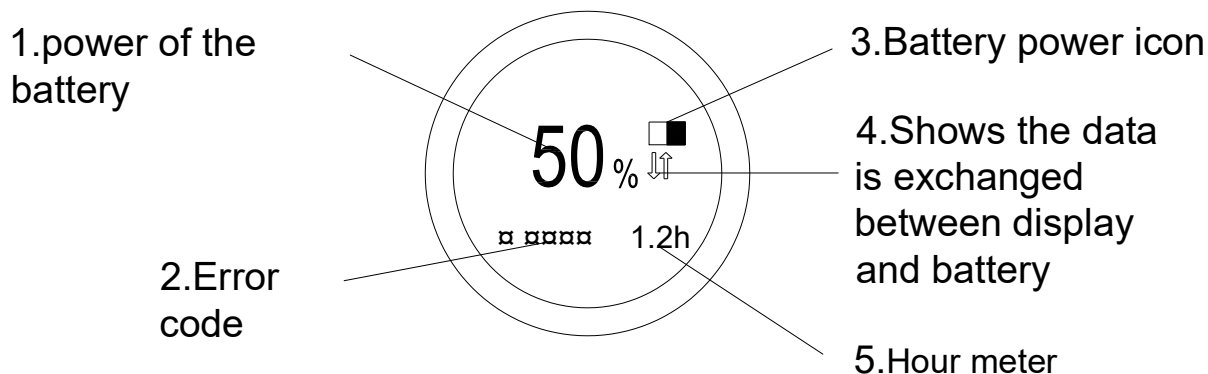
## 2.4 Display and control



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.
13	Display(battery charge level indicator)	Display the Battery charge level indicator and the truck total work hour indicator
14	Emergency stop switch	Cut the connection with the battery, close all electric function and brake.
16	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.
17	Upright traveling button	When the button and the travel switch are pressed, the vehicle can walk with the joystick installed vertically.
19	Horn button	Give out sound warning signal.
20	"Lift" button	Raise lifting device. When the battery is consumed about 80%, lifting function will be locked.
21	"Lower" button	Lower lifting device.
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 (battery charge level indicator)

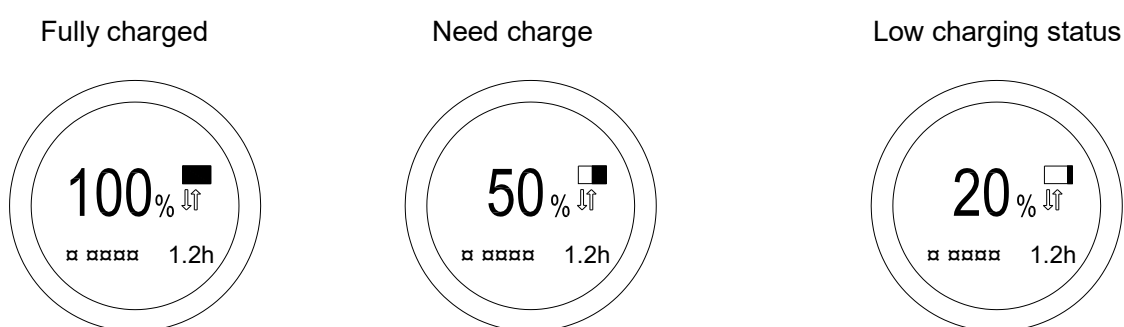
Display the Battery charge level indicator and the truck total work hour indicator



#### Battery charge level indicator (1) (3)

When the discharge reaches 80%, the two red LED flashes, giving a “out of charge” warning; when the battery discharges up to 85%, the normally closed relay is disconnected and the controller is locked to ensure that the battery is not Overdischarge. The battery's discharge status is displayed through the instrument's 10-cell LED bar. A grid of LED bars corresponds to 10% of the battery capacity. As the capacity of the battery decreases, the 10-cell LED lights up from right to left.

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.



#### WARNING

- When the charge level reaches 20% the third LED starts to flash.
- When the charge reaches 15% the first two LED'S start to flash simultaneously and the fork lift system is immediately inhibited.

**Error code (2)**

The fault code is displayed in the lower left corner of the instrument, which can be compared according to the Troubleshooting Chart below.

**Hour meter (5)**

This meter indicates the actual usage time of the truck, thus enabling the correct maintenance to be performed according to the set schedule.

In the middle of the quadrant there is an alphanumerical display which shows the work hours.

## 2.5 Standard technical data

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

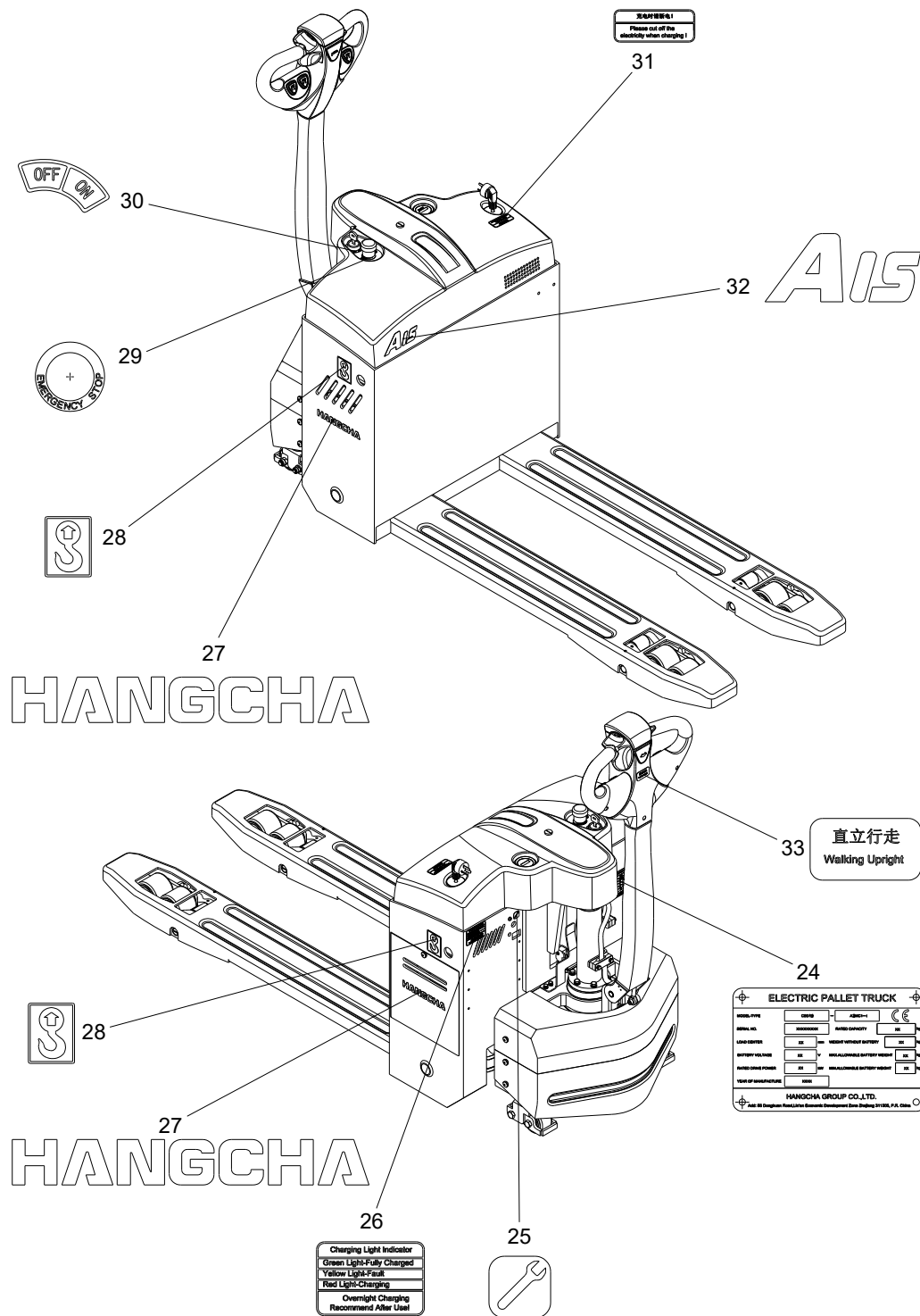
Characteristics	Model	CBD15-A2MC1 CBD15-A3MC1 CBD15-A3MC2	CBD15-A3MC1-I CBD15-A3MC2-I
	Operator type	Pedestrian	Pedestrian
	Load capacity Q (kg)	1500	1500
	Load center c(mm)	600	600
Weight	Service weight with battery kg	180	180
Wheels & Tyres	Tyres type	PU	PU
	Tyre size, front mm	1×Φ210×70	1×Φ210×70
	Tyre size, rear mm	2×Φ80×90	2×Φ80×90
	Additional wheels(dimensions) mm	/	/
	Wheels, number front rear(x=driven wheels)	1×/4	1×/4
Dimensions	Lift height h3(mm)	120	120
	Overall length L1(mm)	1640	1640
	Overall width b1(mm)	568	568
	Ground clearance, center of wheelbase m2(mm)	30	30
	Outer turning radius, min Wa(mm)	1400 <sup>1)</sup>	1400 <sup>1)</sup>
Performance	Travel speed, laden/unladen km/h	4.8/5.0	4.8/5.0
	Lift speed, laden/unladen mm/s	36/53	36/53
	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
	Controller mode	Curtis DC	Curtis DC

Note: 1) Load section lowered+56mm.

## 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.

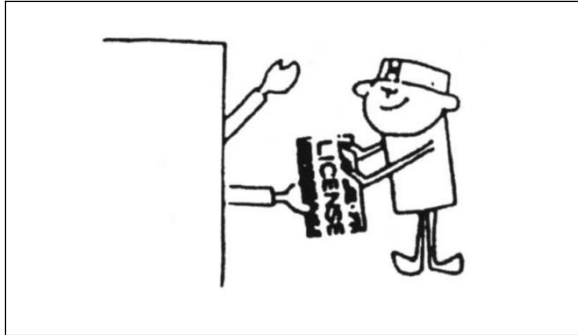
The figure below shows the approximate location of the various identity resides. Before operating the truck, please understand the meaning of the various identities.



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	Charging light indicator. Overnight charging recommend after use !
27	Manufacturer's logo
28	Hoist label: Strap points for crane lifting.
29	Emergency stop label: press this button when in emergency, thus the truck power is off.
30	Key switch: "OFF" position is off, "ON" position is on.
31	Please cut off the electricity when charging!
32	Series tonnage label: A series, rated capacity is 2t.
33	Walking upright.

### 3 Safety Instructions

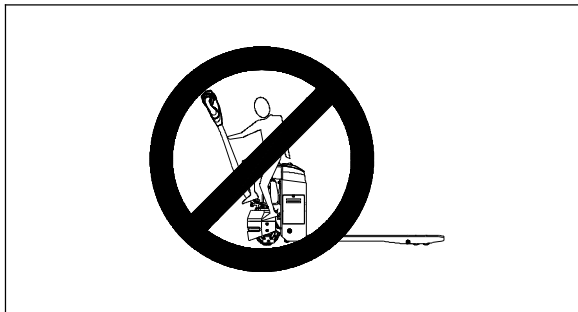
- 1) Only trained and authorized operator shall be permitted to operate the truck.



- 2) Operator must wear helmet, working shoes and uniform



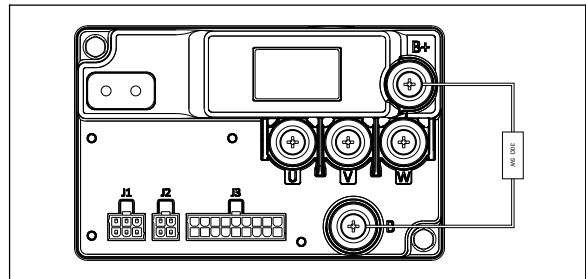
- 3) Never carry people.



- 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

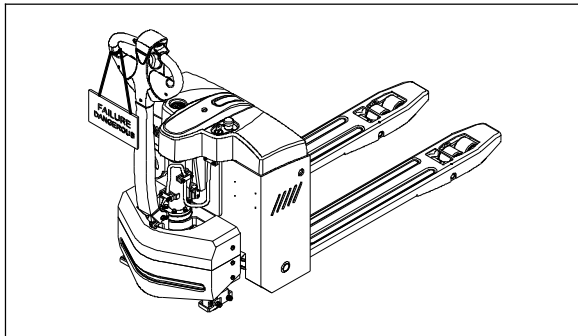
accident.

- 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) 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.
- 10) Do not overload.
- 11) Before start, press the horn and make sure no people around.
- 12) 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.

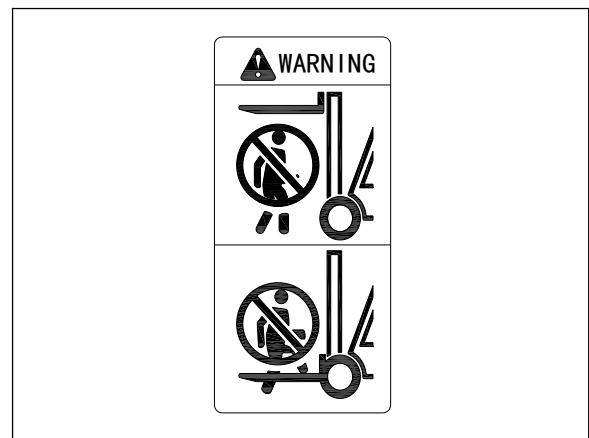


- 13) Avoid sudden drive, stop or turn.
- 14) Do not drive the truck when the forks in high position.

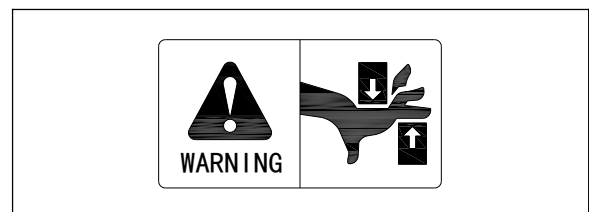
15) When handling bulky loads, which restrict your vision, please operate the machine in reverse or have a guide.

16) 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.

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



18) 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.



19) 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.

- 20)** Do not use truck under the weather of sand, snow, thunder, storm, typhoon, etc.

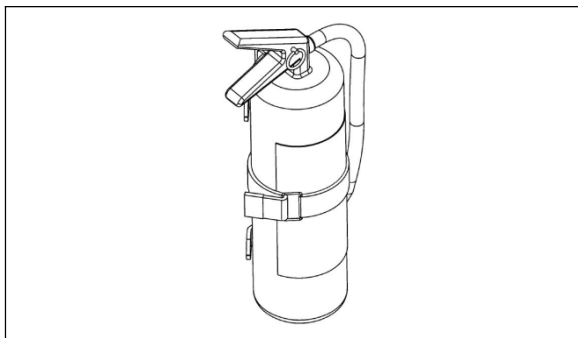
Avoid using the truck when the wind speed is larger than 5m/s.

- The weather condition: temperature:  $-5^{\circ}\text{C} \sim 40^{\circ}\text{C}$ , wind speed: less than 5m/s; air relative humidity: less than 90% (  $20^{\circ}\text{C}$  ) . Altitude should not exceed 2000m.

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

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

- 23)** 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.



- 24)** Use tray when carrying small items, do

not place on the fork directly.

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

- 26)** Before dismantle or repair the truck, take down the battery plug firstly.

- 27)** 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

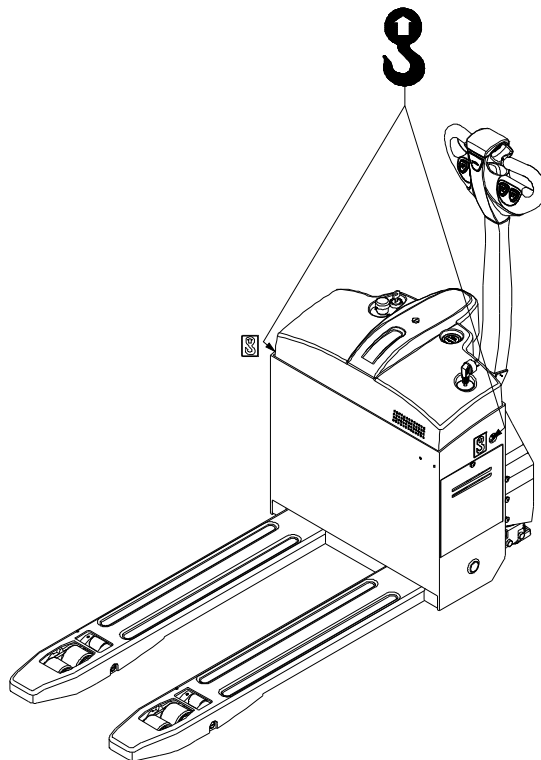


#### **WARNING**

- 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.

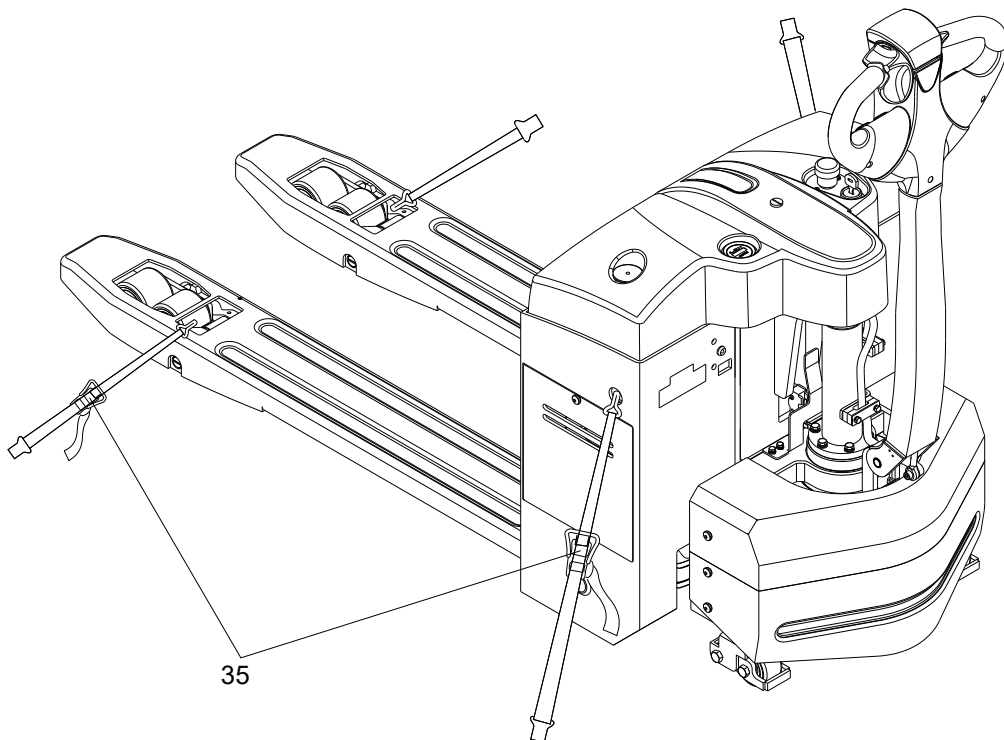


## 4.2 Securing the truck during transport

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.

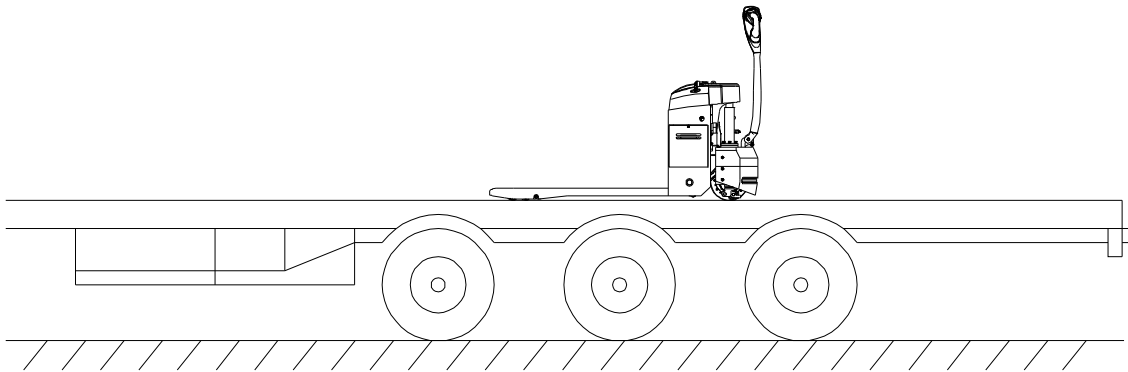


### **WARNING**

- 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.

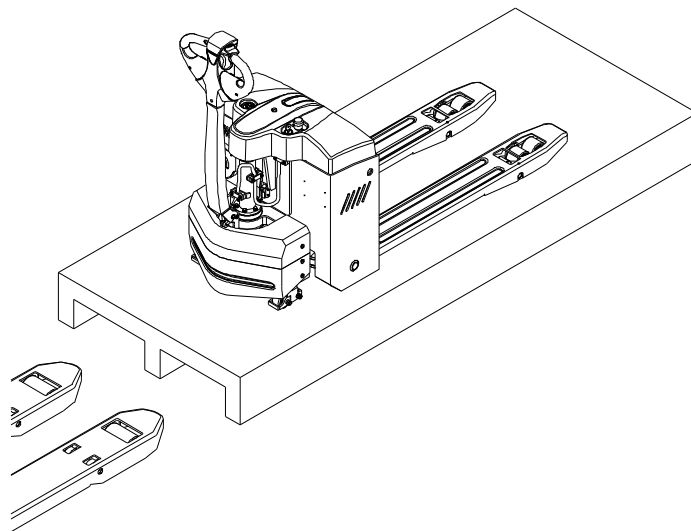
### 4.3 Transport

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

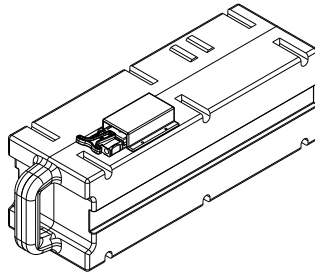
- Do not tow the broken trucks on the ground directly, or else the braking system would be damaged.

## 5 Battery and charger

### Battery

The 1.5T truck comes standard with a 24V/40Ah lithium battery pack, lithium battery pack weighs about 5kg. When the battery temperature reaches  $25^{\circ}\text{C} \sim 30^{\circ}\text{C}$ , its service life is the longest. Lower temperature reduces battery available capacity and higher temperature shortens battery service life.

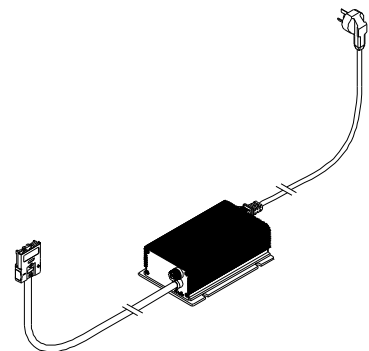
Battery capacity to the ambient temperature  $25^{\circ}\text{C}$  as the standard, with the temperature drop continued the corresponding reduction of mileage is a normal phenomenon. Each drop of  $1^{\circ}\text{C}$  temperature, the battery capacity decreased by about 1%, try to avoid the  $-10^{\circ}\text{C}$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



### Charger

- Input voltage: 220Vac
- Input frequency: 50Hz/60Hz
- Output voltage/current: 24Vdc/20A

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°C to 40°C.
- 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°C.**
- **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 must not be carried out in a warehouse to prevent fire.**

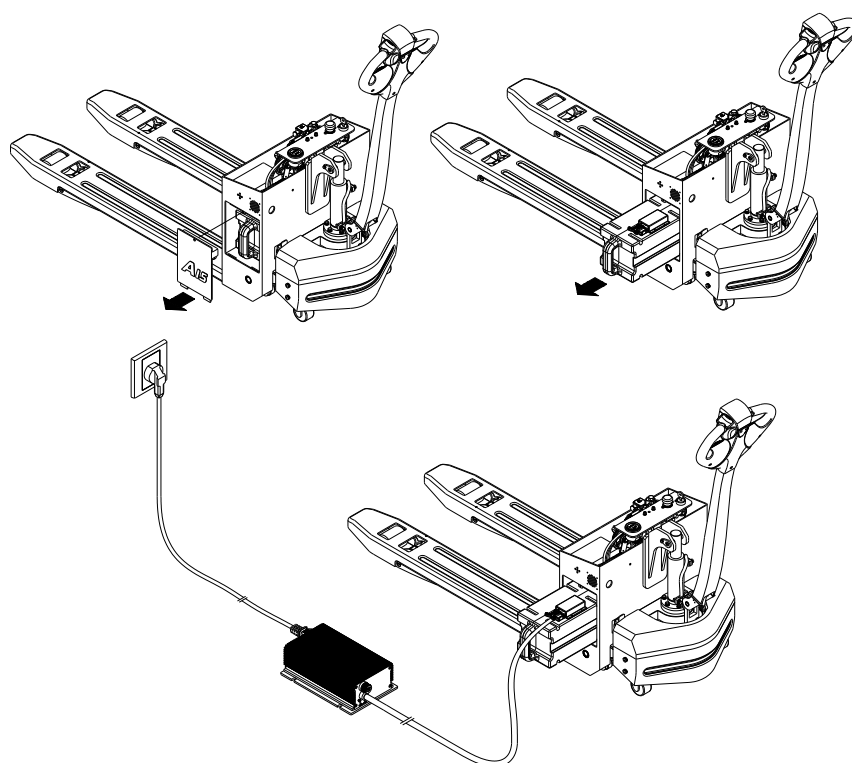
### **Charging Procedure:**

- Park the truck securely.
- Remove the side door from the body in the direction of the arrow.
- Pull the lithium battery out of the body
- 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.
- Remove the charger power plug and charging plug respectively after charging, and put the battery back into the forklift.

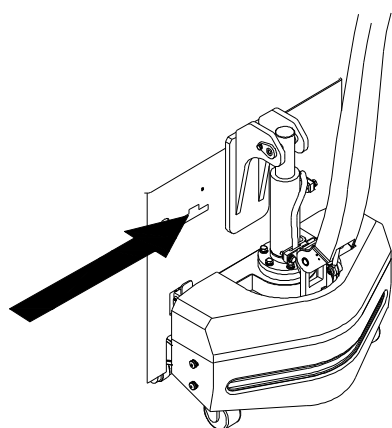


### **CAUTION**

- **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.**



At the same time, the charging cable can be inserted into the reserved charging port for charging without removing the lithium battery.



## **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

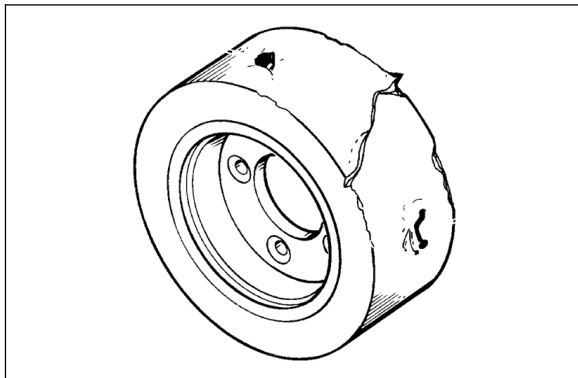
Park the truck and check oil leakage.

#### 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.



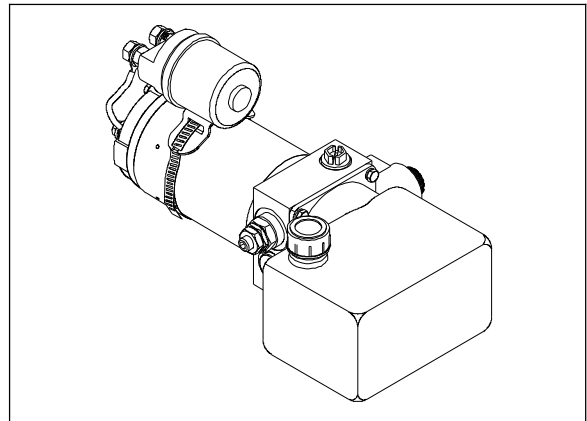
#### 4) Check front fork and linkage mechanism

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

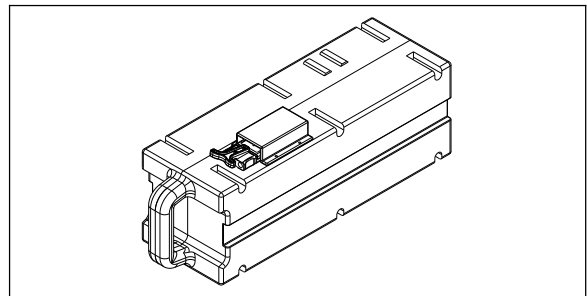
the scales. Add oil when insufficient.



#### 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**

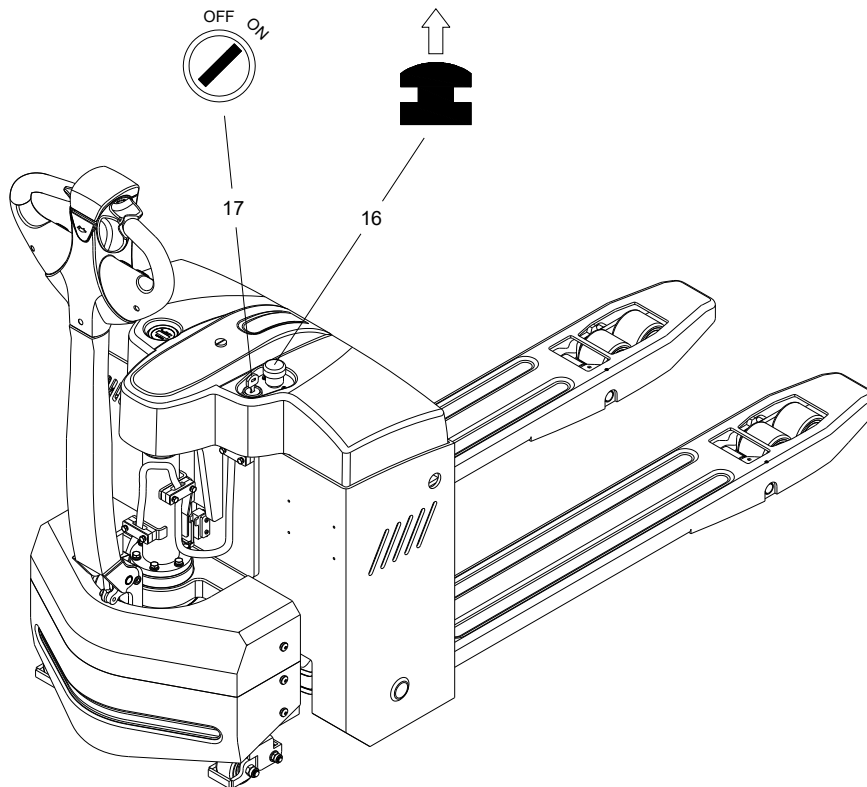
Check whether there is any abnormal noise, whether wiring is regular or fastener loosens etc.

## 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.

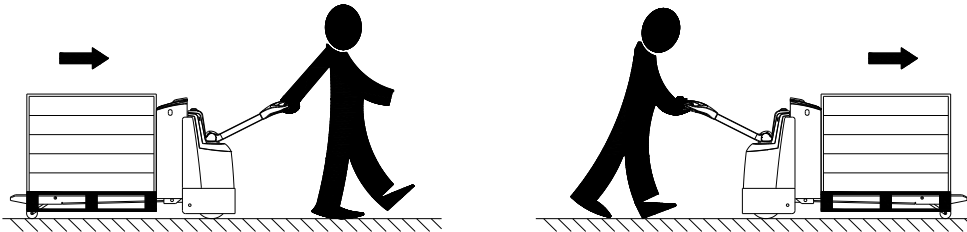


### CAUTION

- If the truck is not operated for 30 minutes, it will automatically hibernate. If the forklift is used again, it needs to be restarted.

## 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.

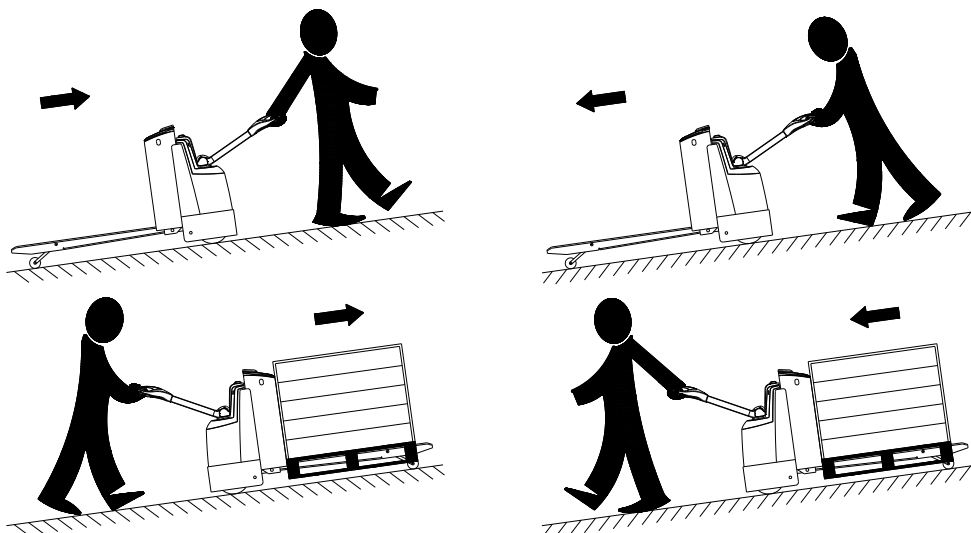


### CAUTION

- 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.

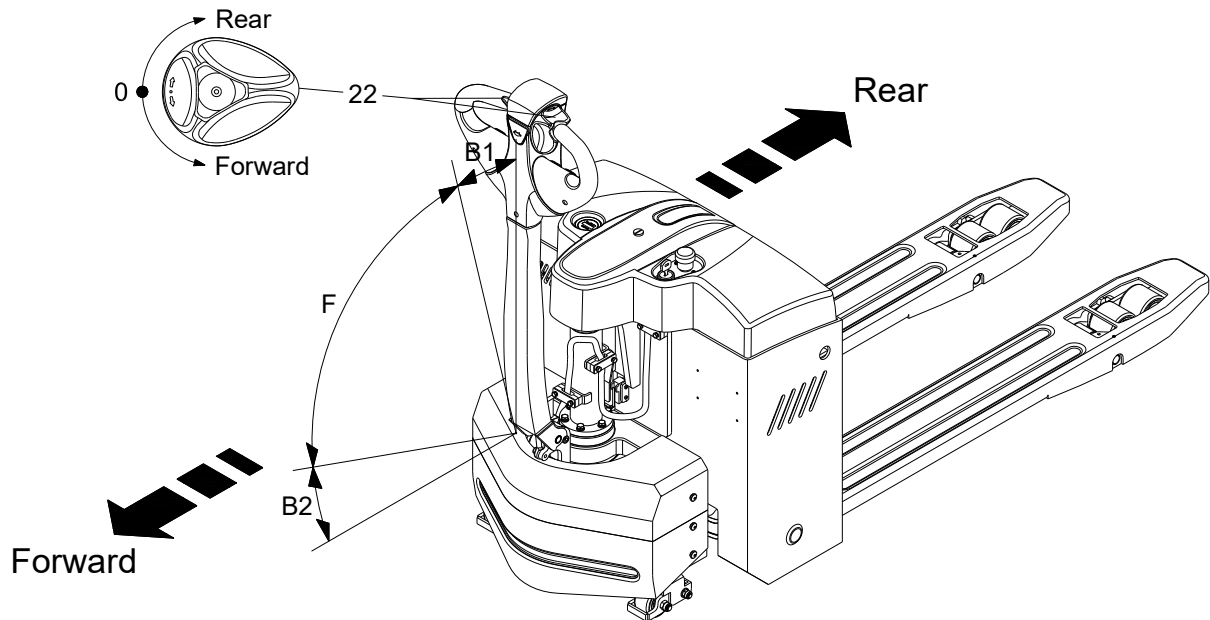


### WARNING

- 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

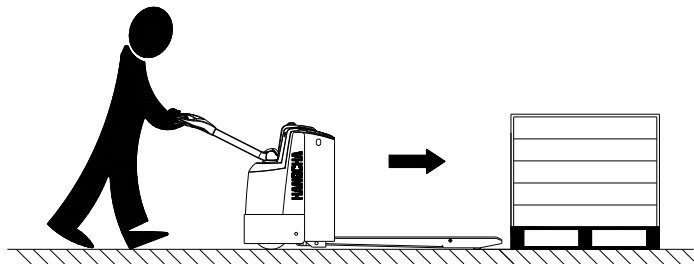
- Release the direction-speed knob. Decrease the speed.
- Return the control handle to vertical position.

- 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

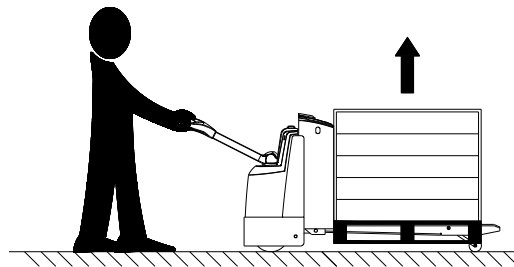
## 7.7 Loading

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.

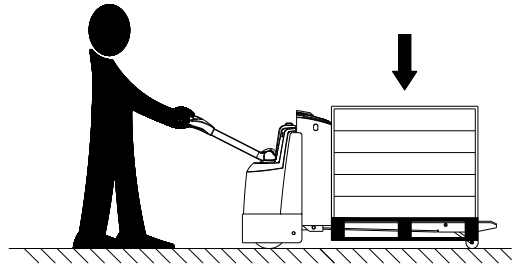


- Travel the truck off the area.
- Drop the load to lower position.

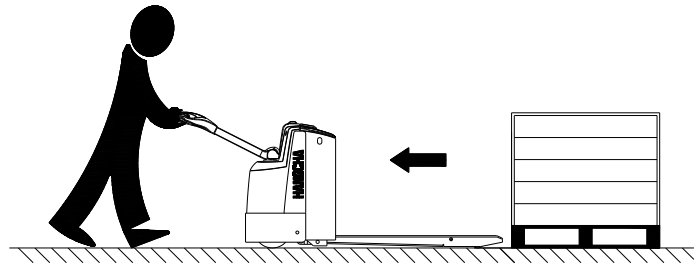
## 7.8 Unloading

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.

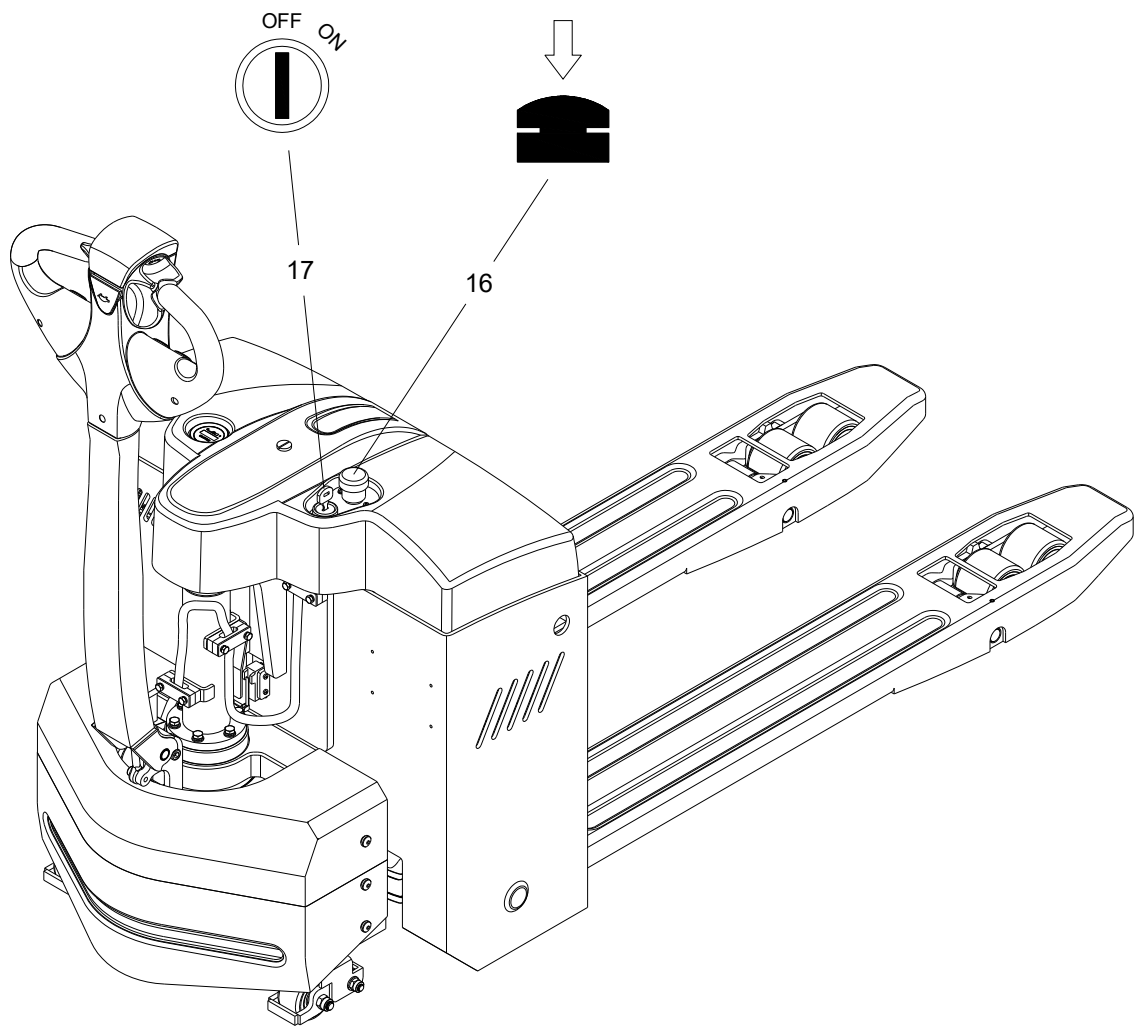


- Drop down the forks to proper position.

## 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

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.			●			

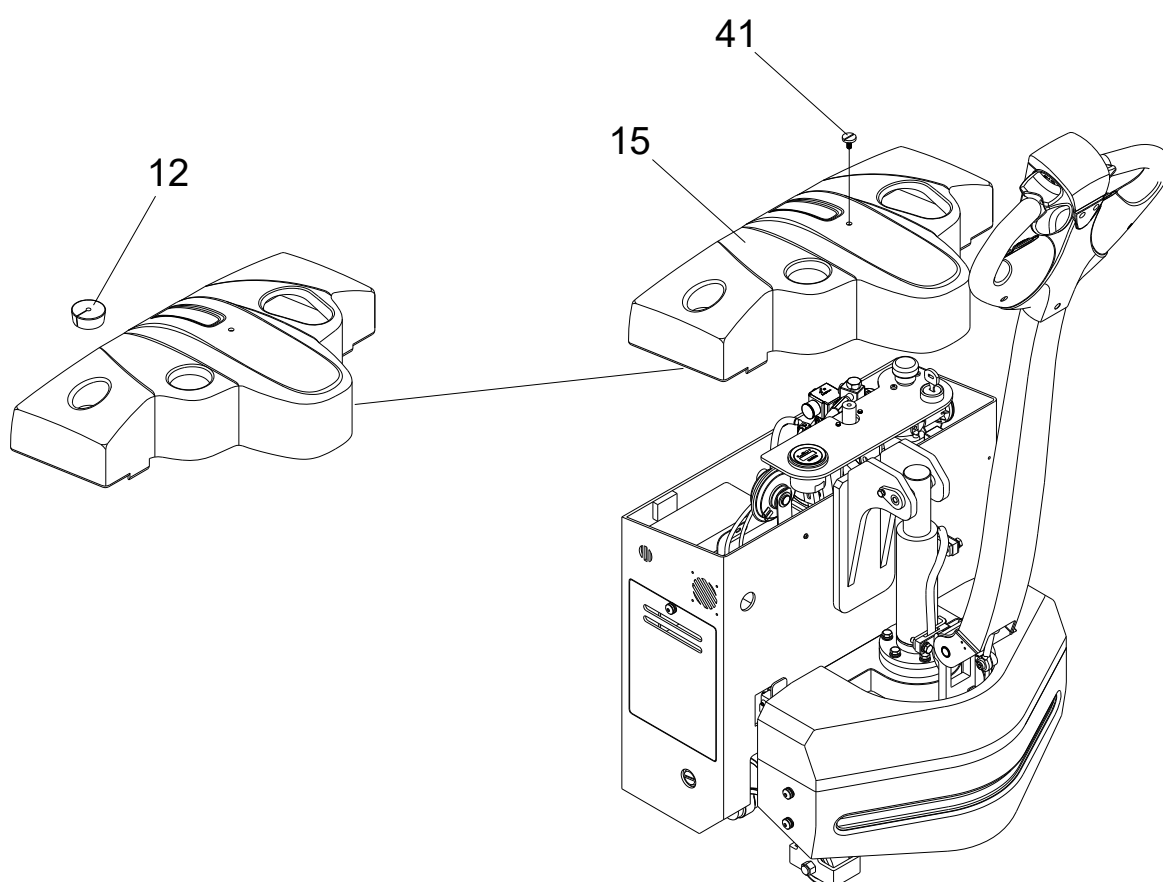
## 9.3 Remove or installing the hood

### Remove the hood

Procedure:

- Park the truck securely.
- Unscrew the hood screws (41).
- Lift the hood (15).
- The wire fixate (12) 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 !

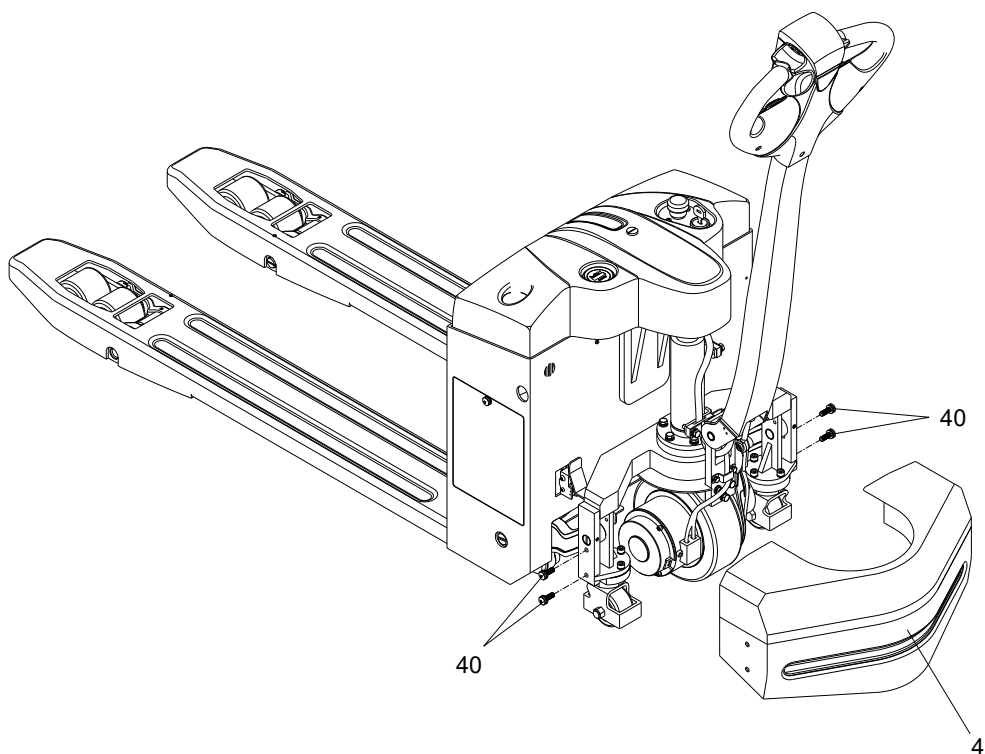
## 9.4 Remove or installing the drive wheel cover

### Remove the drive wheel cover

Procedure:

- Unscrew the drive wheel cover (4) of the four screws (40), remove the drive wheel cover.

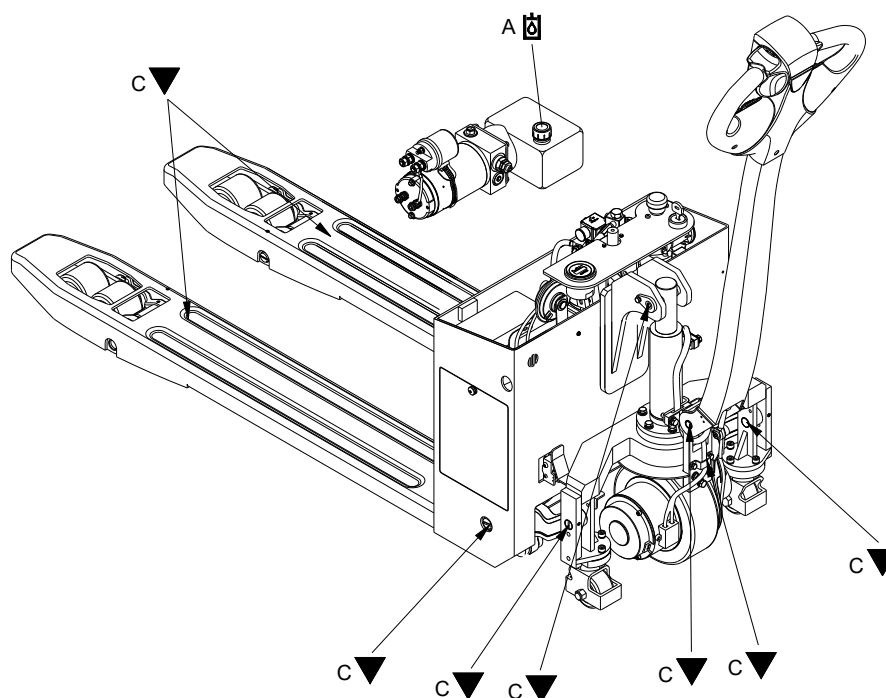
The drive wheel cover is removed. Installation and removal process is reversed.




### 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



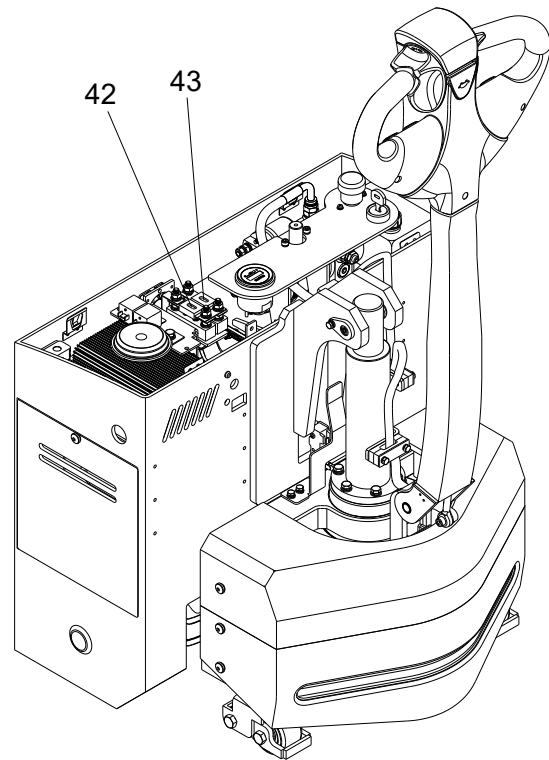
### CAUTION

- 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 (42,43) values are correct, if necessary, replace.



No.	Designation	Control circuit	Specification
42	Fuse	Pump motor	50A
43	Fuse	Controller	50A

## 9.7 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.



## 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+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)、EN16307-1:2020 (Industrial trucks. Safety requirements and verification. Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks) .
- EN1175:2020 (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+A1:2008, EN1175:2020, EN 13059:2002+A1:2008, EN1757-2: 2001 harmonized standard;
- Main safety elements are in accordance with 2006/42/EC machinery directive as well as EN1175:2020, EN1726-1:1998 standard;  
Electronic components design and manufacture meet low-voltage apparatus directive 2006/95/EC;  
Noise is calculated according to EN 12053:2001+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<sup>2</sup>.
- Electromagnetic compatibility is calculated according to EN12895:2015+A1:2019 and meet 2014/30/EU 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	48
	Rated power	kW	0.8
	Rated current	A	21
	Rated speed	r/min	3300
	Working system		S2=45min
	Insulation grade		F
	Protection grade		IP44
	Using the environment temperature	℃	-10~+40
Brake	Rated voltage	V	24
	Rated power	W	25
	Rated braking torque	N•m	8
	Rated Air Gap	mm	0.15~0.30
	Pre-tension torque of the mounting screw	Nm	5.5

## 1.2 Assemble and use notice

- When 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  $\leq 70^{\circ}\text{C}$ .
- 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.

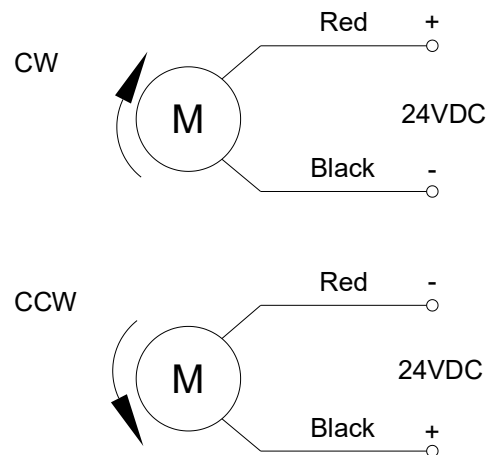
## 1.3 Fault and troubleshooting

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 not 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

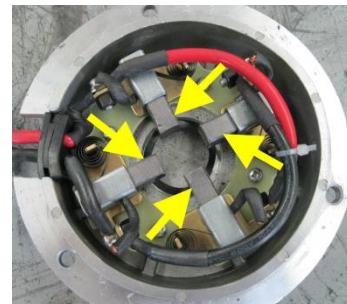
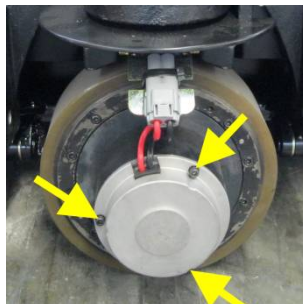
cloth, when there is grease on the surface, immerse the cloth in alcohol to wipe (park).

- 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 need to be connected with the commutator closely and the contact area should be assured for 75%.

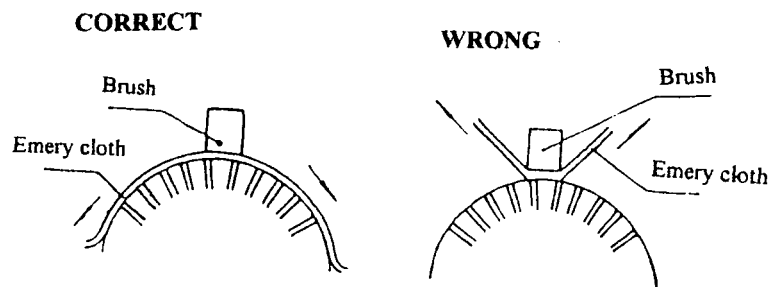
- Remove the connecting plug of the motor.
- Screw out the three fixed bolts on the motor hood.
- Take down the motor hood and replace the new brushes.



## 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.

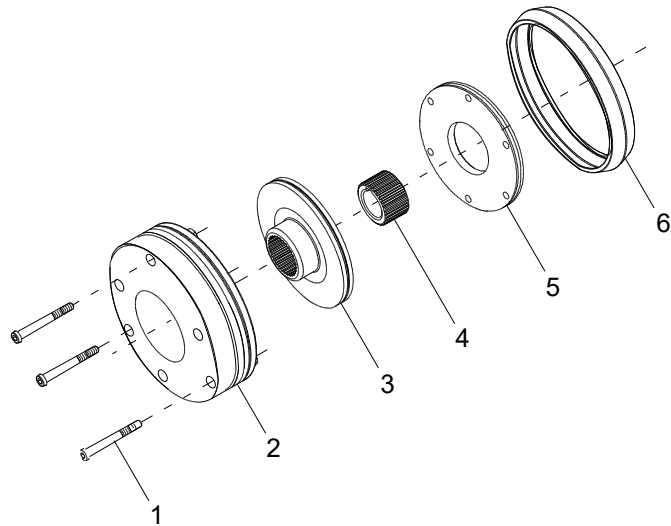


**Fault diagnosis**

<b>Fault</b>	<b>Probable cause</b>
All copper sheet blacken	Pressure of the brush is not right
Commutator segments blacken in group according to certain sequence	<ul style="list-style-type: none"><li>·Short circuit of commutator segments</li><li>·Short circuit of armature coils</li><li>·The welding of commutator segments and armature coils is not good or short circuit.</li></ul>
Commutator segments blacken, but without sequence	<ul style="list-style-type: none"><li>·Center line shift of the commutator</li><li>·Rough, un-round of the commutator surface</li></ul>
Wear, color change and fracture of brush	<ul style="list-style-type: none"><li>·Motor vibrate</li><li>·Gap between brush and brush box is too large</li><li>·The distance between brush box and commutator working surface is too long</li><li>·The mica between commutator segments extrudes.</li><li>·Brush material is not good.</li><li>·Trade mark of brush is not right</li></ul>
Large spark	<ul style="list-style-type: none"><li>·Overloaded of motor</li><li>·Commutator is not clear</li><li>·Commutator is not smooth or round</li><li>·Mica plate or part commutator segment extrude</li><li>·Brush does not grind well</li><li>·Brush pressure is not large enough</li><li>·Incorrect brush trade mark</li><li>·Brush locked in the brush box</li><li>·Brush carrier loosen or vibrate</li><li>·Incorrect pole polarity and sequence</li></ul>
Brush and brush wire overheat	<ul style="list-style-type: none"><li>·Large brush spark</li><li>·Electrical brush and flexible conductor have bad contact</li><li>·Small flexible conductor area</li></ul>
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.

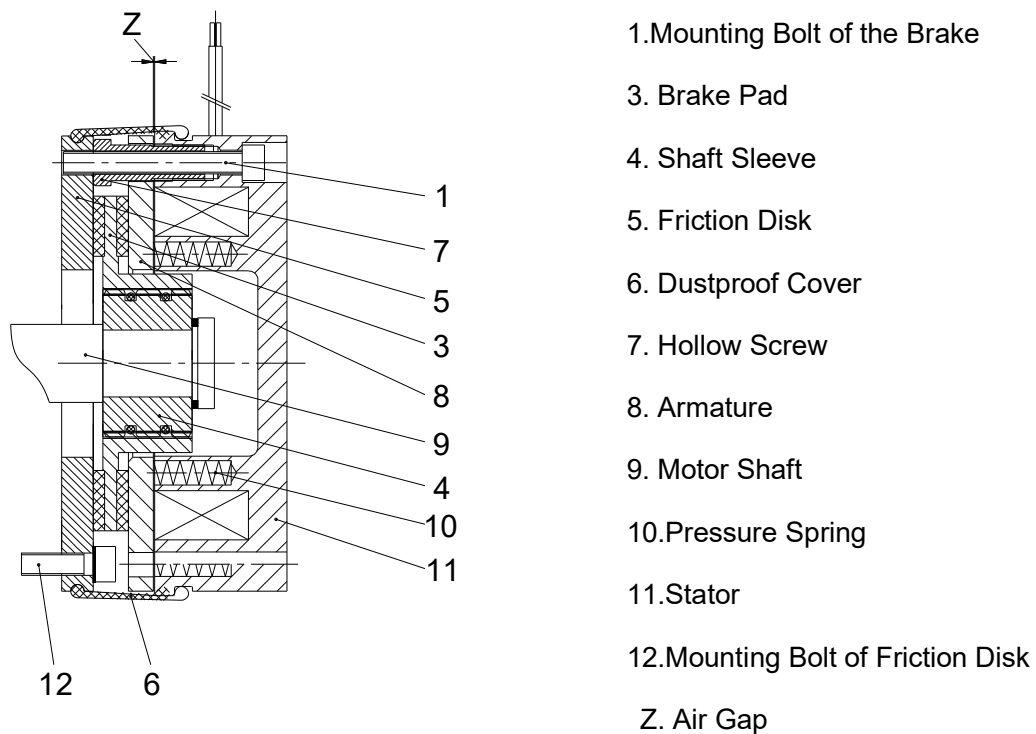
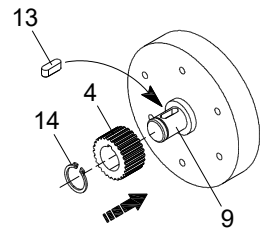


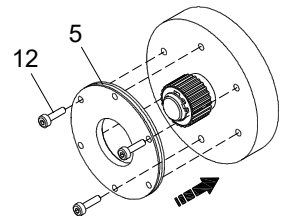
Fig.2-4 Electromagnetic Brake Structure

### 1.5.2 Electromagnetic brake installation

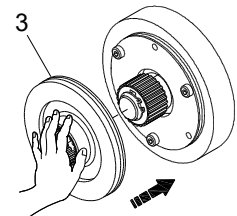
- Put the flat key (13) into the key groove of the motor shaft (9). Press the shaft sleeve (4) to the motor shaft (9) and fasten it with the inner spring.



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

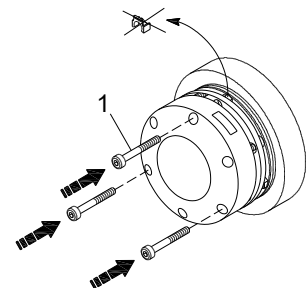


- Cover the shaft sleeve with the friction disk (3).

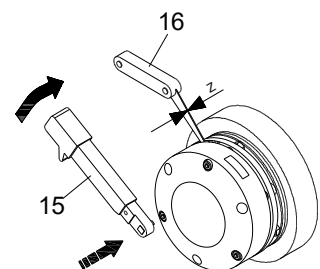


- Install the stator module (2) to the friction disk (5) with three mounting bolts of the brake (1).

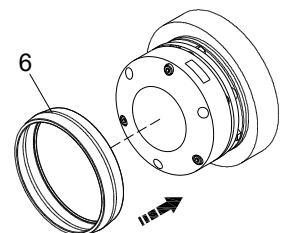
**Note: Remove the three rubber mats of the stator module which is for stable transportation.**



- 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).

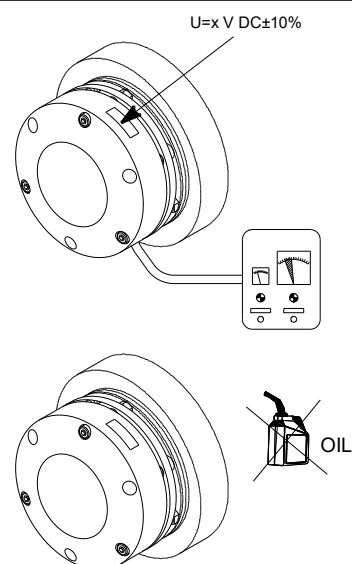


- Put on the dustproof cover(6).
- Connect the brake wiring.



**⚠ 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

- If work in high temperature environment for long time, please prevent rust, it may influence use if there is rust on the suction surface.
- Do not touch the friction surface with hand, no oil stain, otherwise it cannot reach the maximum torque.
- General use environment temperature is  $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$ .
- Please check periodically, and the check item : if the switch motion is normal; if there is noise; if there is abnormal heating; if any impurity, oil stain mixed into friction part or rotating part; if clearance of friction part is proper, exciting voltage normal.

### 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.

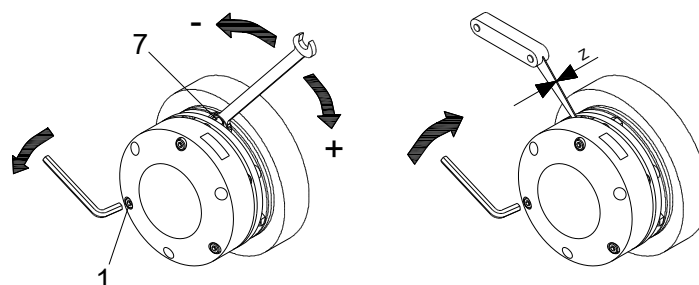
Specification Table

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	25	8	0.15~0.30	6.4	5.5

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.



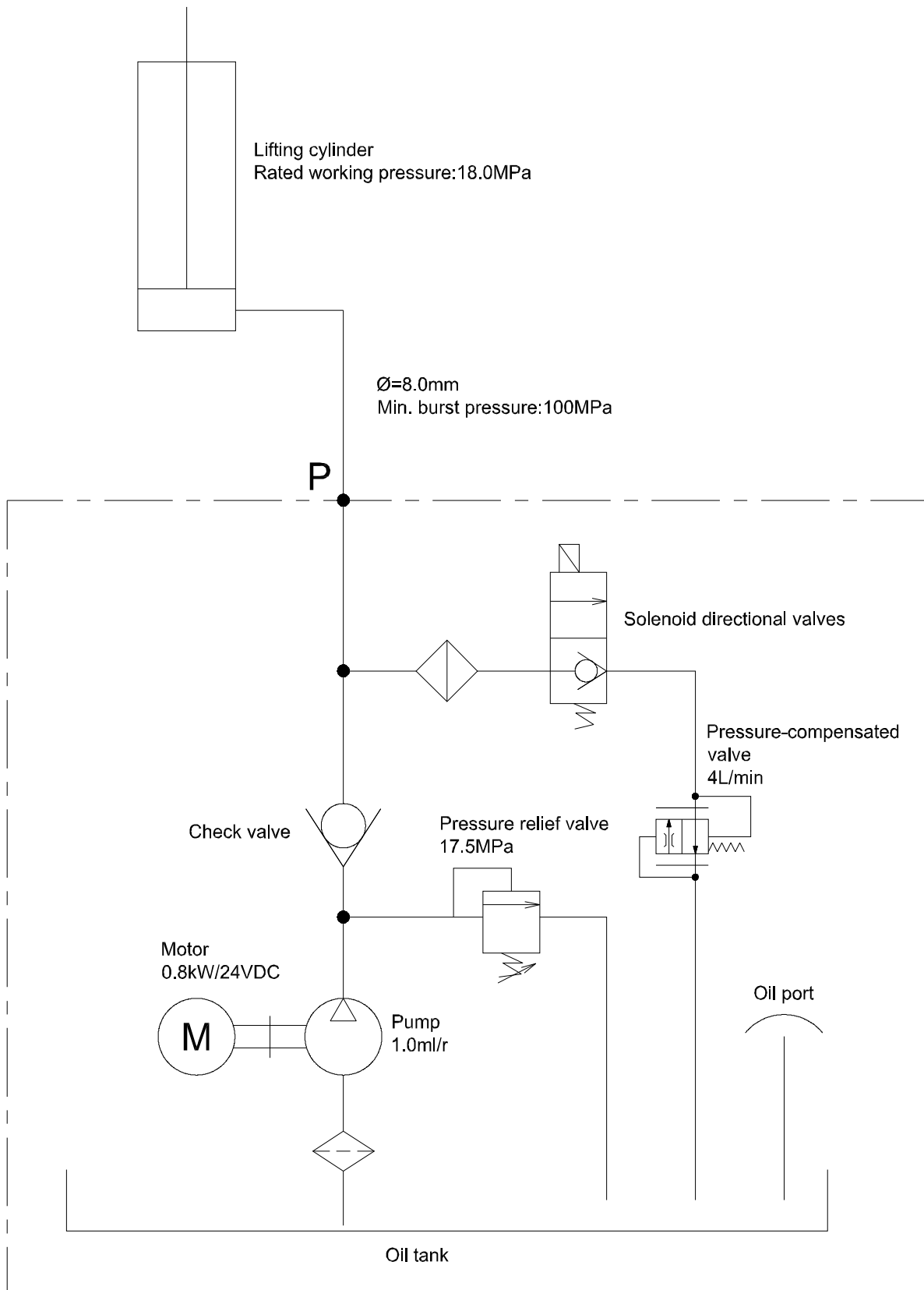
Under the general operating conditions, the first set of the air gap is usually after 1500 to 2000 hours service of the brake and it is suggested to adjust the air gap every 6 months. If it comes to a poor working condition, such as frequent use of brake and repeated emergency stops, the air gap should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

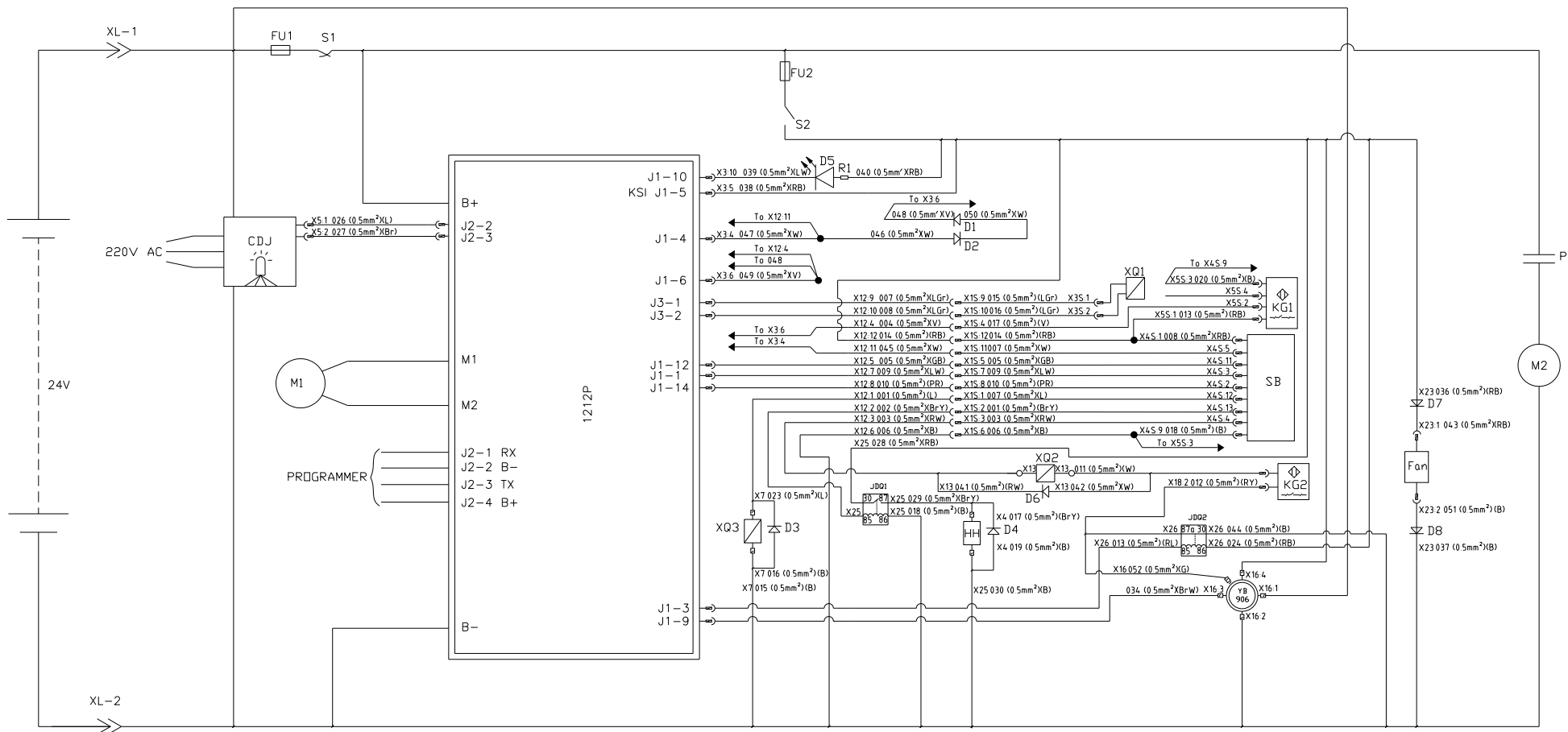
### 2.1 Hydraulic system working principle



## 2.2 Hydraulic system fault diagnosis and correction

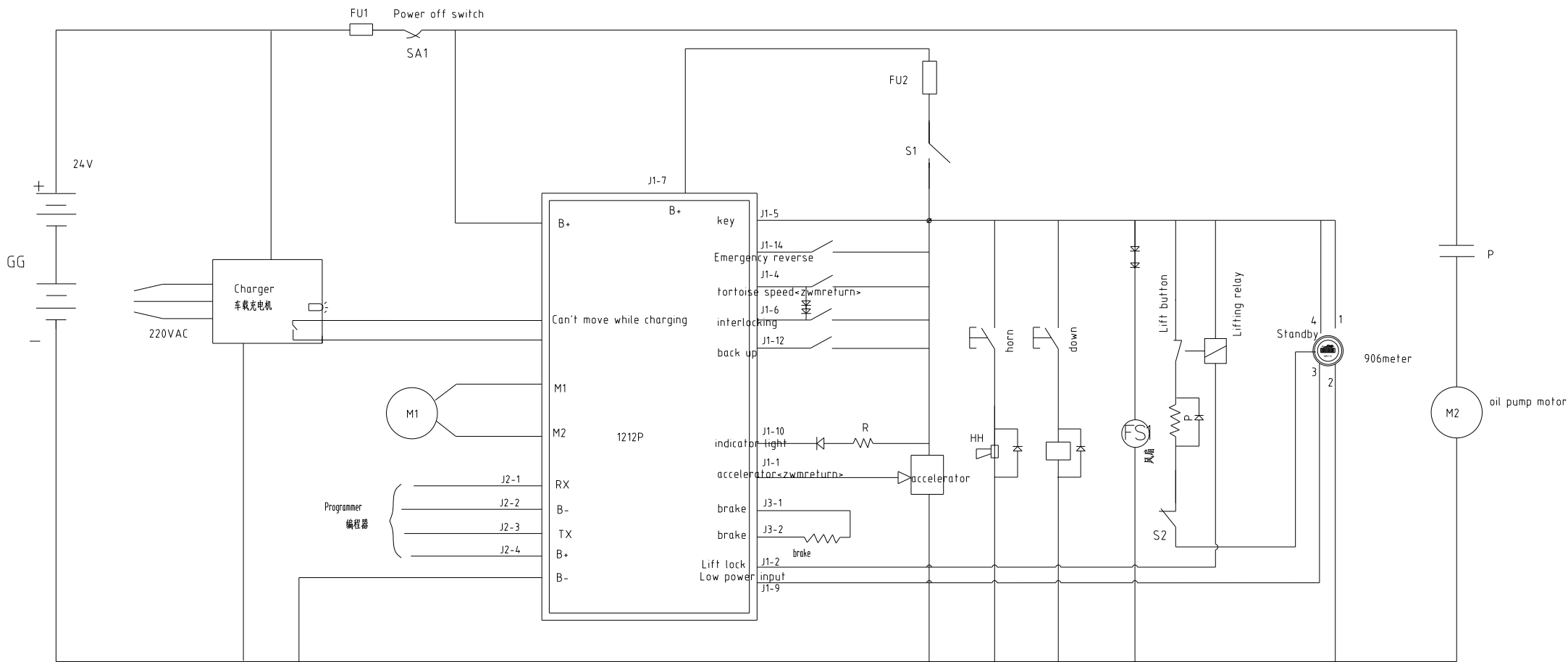
Fault		Probable cause	Corrective action
No oil pumps from the pump		Low oil level	Fill to the specified oil level
		Blocking of strainer	Clean oil pipe and oil tank. If hydraulic oil is dirty, please change it.
Low oil pressure of oil pump output		Bearing worn; retainer, O-ring damage	Change the bad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

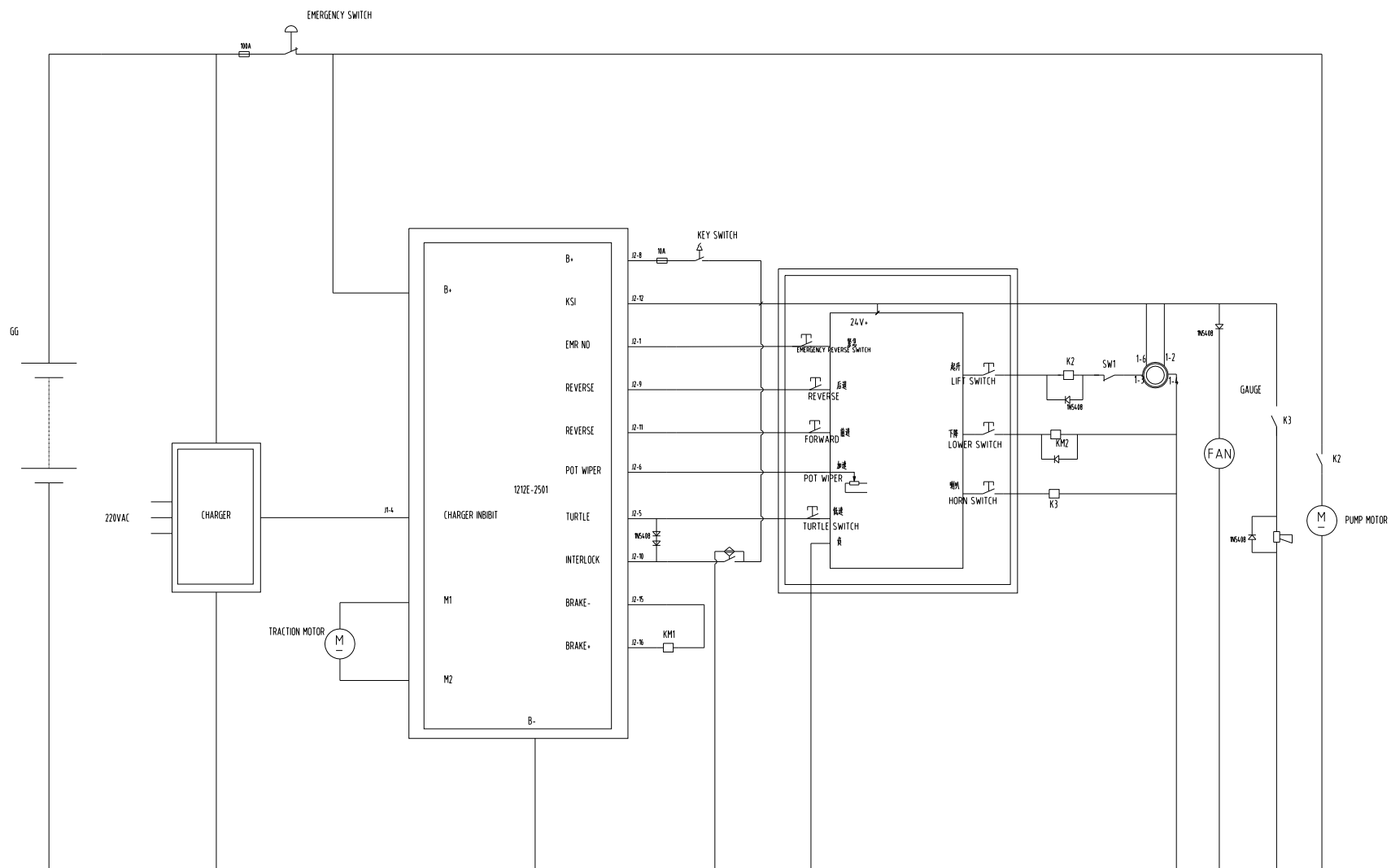


### 3.1 Electrical schematic diagram

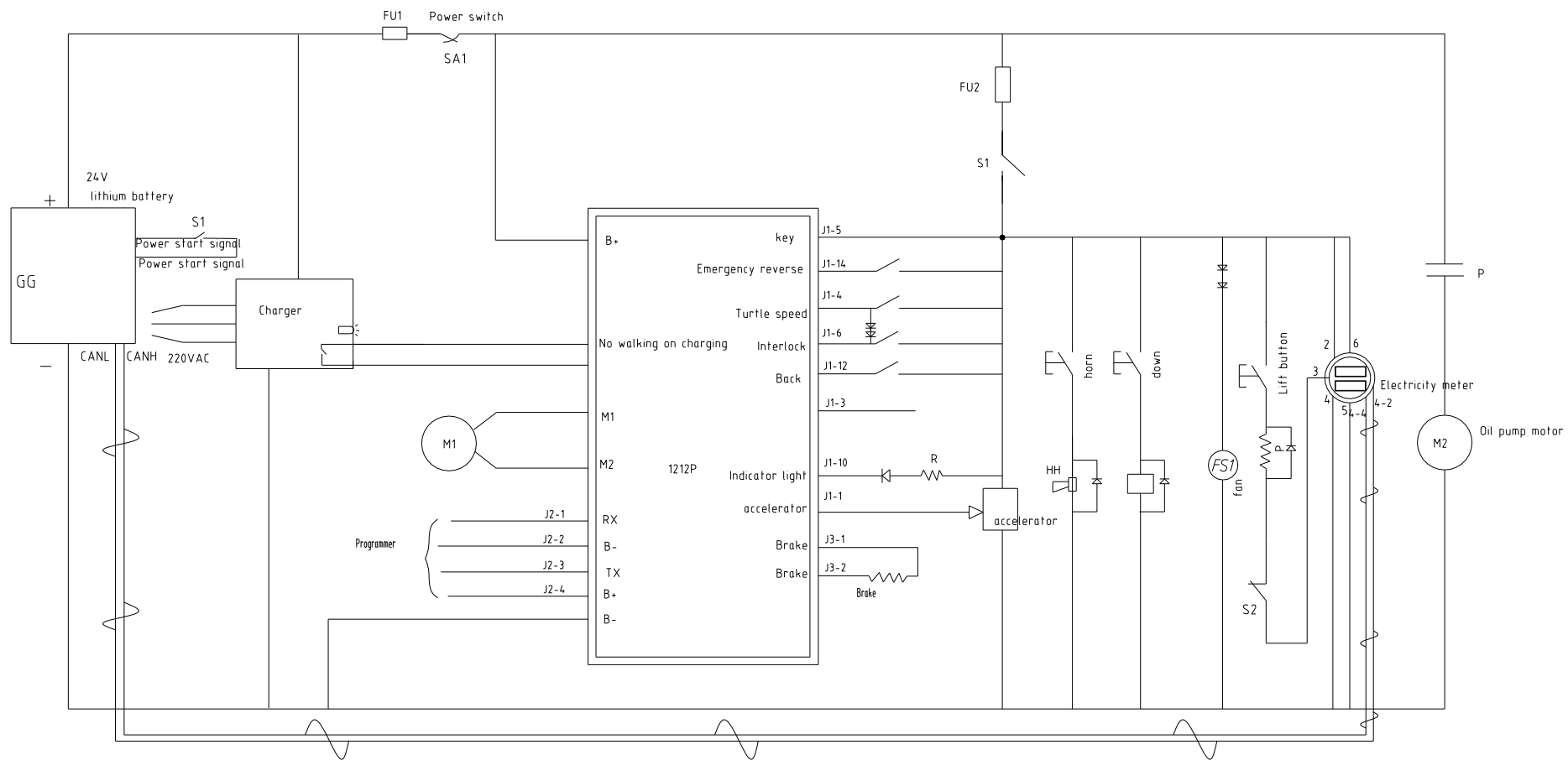
CBD15-A2MC1



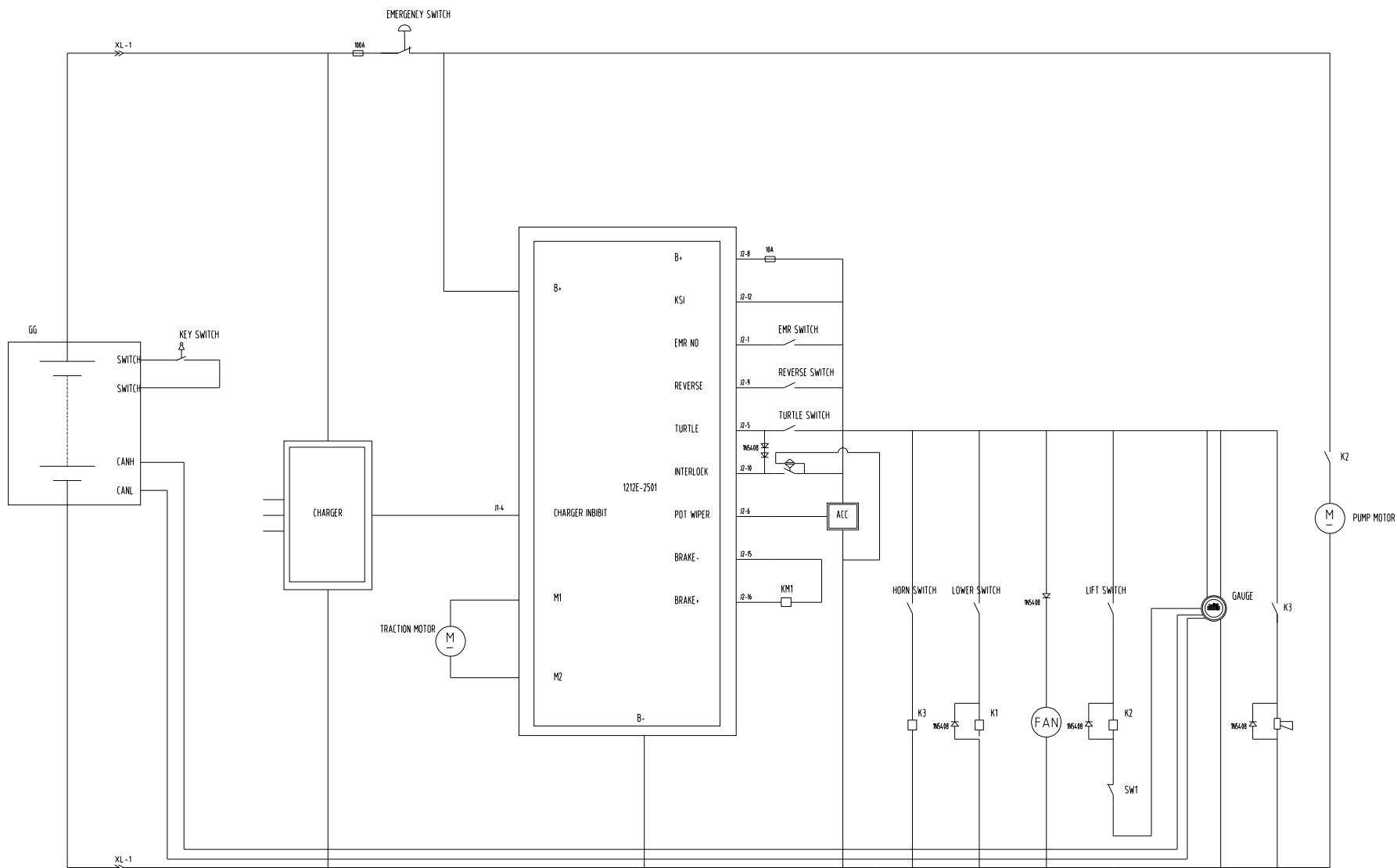
CBD15-A3MC1



CBD15-A3MC2



CBD15-A3MC1-I



CBD15-A3MC2-I

## 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 connector, 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.

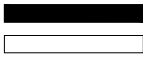




















Refer to the troubleshooting chart for suggestions about possible causes of the various faults. Faults are listed alphabetically.

#### 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.			

## 1212E FAULTS

When the controller detects a fault, the controller operates in a manner that is safe in the presence of that fault. Depending on the severity of the fault, the controller's response can range from reducing current to shutting down the vehicle.

Some faults are set by multiple conditions. The controller uses *fault types* to distinguish these conditions. All faults have a fault type of 1; faults with multiple causes have additional fault types. Curtis programming devices indicate the fault type.

The emergency messages transmitted when faults occur include the fault type. See Emergency Message Format.

The following table describes the controller's faults.

Table 7-1 Fault Chart

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
11 Severe Undervoltage 0x2120	<ul style="list-style-type: none"> <li>Defective controller</li> <li>Defective battery</li> </ul>	1	The undervoltage cutback is 0 for 64ms with the main relay on.	Raise the Keyswitch Voltage above the brownout voltage.	Shut down throttle
12 Undervoltage Cutback 0x2121	Low battery	1	The undervoltage cutback is less than 100% with the main relay on.	Raise the Keyswitch Voltage above the user undervoltage threshold.	<i>Cut back the current limit</i>
13 Severe Overvoltage 0x2130	<ul style="list-style-type: none"> <li>Incorrect battery voltage</li> <li>Defective main relay</li> <li>Defective controller AD</li> </ul>	1	The capacitor voltage is 10V above the allowed maximum voltage.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down EM brake</i>
		2	The keyswitch voltage is 4V above the allowed maximum voltage.		
14 Overvoltage Cutback 0x2131	<ul style="list-style-type: none"> <li>Incorrect battery voltage</li> <li>Defective main relay</li> </ul>	1	The battery voltage is greater than the user overvoltage threshold for 64ms during the regen state or when the motor speed is greater than 2V.	Lower the battery voltage until it is under the user overvoltage threshold.	<i>Cut back the current limit</i>
15 Controller Severe Undertemp 0x2141	<ul style="list-style-type: none"> <li>Defective temperature sensor</li> <li>Low ambient temperature</li> </ul>	1	The controller temperature is less than or equal to -40°C for 48ms.	Raise the controller temperature above -40°C.	<i>Shut down throttle</i>
16 Controller Overtemp Cutback 0x2140	<ul style="list-style-type: none"> <li>Defective temperature sensor</li> <li>High current for an extended period</li> </ul>	1	The controller temperature is greater than or equal to the temperature cutback point for 48ms.	Lower the controller temperature to under the temperature cutback point.	<i>Cut back the current limit</i>

17 Controller Severe Overtemp 0x2142	Defective temperature sensor	1	The controller temperature is at least 15°C higher than the temperature cutback point for 48ms.	Lower the controller temperature to under the temperature cutback point.	<i>Shut down throttle</i>
--	------------------------------	---	---	--	---------------------------

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
21 Throttle Fault 0x2210	<ul style="list-style-type: none"> <li>Throttle wiring fault</li> <li>Incorrect throttle type setting</li> <li>Incorrect throttle operation</li> <li>Steering angle pot wiring fault</li> </ul>	1	The throttle AD data is out of range for 48ms.	Cycle the keyswitch.	<i>Shut down throttle</i>
		2	The HPD Sequencing fault is active for 10s.		
		3	The steering angle AD data is out of range for 48ms.		
		4	The throttle calibration process failed.		
22 HPD Sequencing 0x2211	<ul style="list-style-type: none"> <li>Incorrect throttle operation</li> <li>Defective throttle</li> </ul>	1	At least 10% throttle is applied for 48ms before the interlock state changes to on.	Release the throttle before 10s expires. If the HPD Sequencing fault is active for more than 10s, the Throttle Fault is generated.	<i>Shut down throttle</i>
23 Main Relay Welded 0x2220	Defective main relay	1	The Capacitor Voltage is greater than (Keyswitch Voltage – 0.7V), and the capacitor bank voltage drop is less than 1.5V after the Main Welded PWM is applied to the motor for 96ms.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
24 Main Relay Did Not Close 0x2221	<ul style="list-style-type: none"> <li>Defective main relay</li> <li>Incorrect Pull In Voltage</li> </ul>	1	The difference between the keyswitch voltage and capacitor voltage is greater than the DNC Voltage Threshold for 96ms when the relay is engaged.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
		2	The difference between the keyswitch voltage and capacitor voltage is greater than the DNC Voltage Threshold for 96ms after the relay is on.		
25 Main Driver Fault 0x2222	Defective main relay driver	1	Main relay feedback is high when the relay is on for 100ms.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
		2	Main relay feedback is low when the relay is off for 100ms.		
26 Precharge Failed 0x2223	The PTC resistor in the precharge circuit is defective.	1	The Capacitor Voltage is less than 65% of the Keyswitch Voltage for 500ms after the Keyswitch Voltage is greater than 60% of the nominal voltage at startup.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
		2	The Capacitor Voltage is less than (Keyswitch Voltage – 4V) before the relay is engaged.		

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
31 Stall Detected 0x2231	<ul style="list-style-type: none"> <li>Defective motor</li> <li>Defective controller</li> </ul>	1	The armature current is greater than 90% of the current limit and the motor speed is less than 10% of the maximum speed for the Stall Fault Time.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
32 Motor Fault 0x2240	The motor is open or shorted.	1	The capacitor voltage drop is greater than 1V after 10% PWM was applied to the motor for 500µs at startup.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down EM brake</i> <i>Shut down throttle</i> <i>Shut down interlock</i> <i>Open armature</i>
		2	The motor is shorted.		
		3	The motor was open when the system was powered on.		
		4	The voltage on motor phase M1 is less than 3.5V after the main relay has been engaged.		
33 Battery Disconnect Fault 0x2320	The battery is not connected.	1	The battery is disconnected.	Make sure the battery is connected, then cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down EM brake</i> <i>Shut down throttle</i> <i>Shut down interlock</i> <i>Open armature</i>
34 EM Brake Failed To Set 0x2321	Defective EM brake	1	The motor speed is greater than the Fault Motor Revs parameter for 80ms when the EM brake is engaged.	The throttle is applied.	<i>No action</i>
42 Interlock SRO Fault 0x2532	<ul style="list-style-type: none"> <li>Incorrect operation sequence</li> <li>Defective controller</li> </ul>	1	The interlock input is on when the keyswitch is turned on and the Interlock Type parameter is not set to KSI Interlock.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
43 Low BDI 0x2630	Low battery	1	The BDI percentage is less than the Low BDI Threshold parameter value.	Charge the battery until the BDI percentage is greater than Low BDI Threshold.	<i>Maximum speed reduced to Low BDI Max Speed</i>
44 Speed Supervision 0x2533	The speed is outside of the allowed range.	1	The motor speed is greater than 120% of the allowed maximum speed for more than 500ms.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down EM brake</i> <i>Shut down throttle</i> <i>Shut down interlock</i> <i>Open armature</i>
		2	The motor speed is greater than the ramped speed curve for more than 80ms while the vehicle is decelerating.		

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
		3	The motor speed is greater than the ramped speed curve for more than 80ms during interlock braking.		
		4	The motor speed is greater than the ramped speed curve for more than 80ms while the vehicle is decelerating during emergency reverse.		
		5	The motor speed is greater than the following for more than 2s: Ramped throttle command * percentage maximum speed + 20% of maximum speed		
51 Over Current Fault 0x2241	<ul style="list-style-type: none"> <li>Defective controller</li> <li>Defective current sensor</li> </ul>	1	The armature current is greater than 120% of the current limit for 160ms.	Cycle the keyswitch.	Shut down motor Shut down main contactor Shut down EM brake Shut down throttle Shut down interlock Open armature
52 Current Sense Fault 0x2250	Defective current sampling circuit	1	The zero current point is out of range for 160ms (the range is 812±32).	Cycle the keyswitch.	Shut down motor Shut down main contactor Shut down throttle Shut down interlock
		2	The AD data for the current is out of the allowed range.		
53 Driver Fault 0x2410	Driver is open or shorted	1	EM Brake driver is open or shorted.	Cycle the keyswitch.	Shut down motor Shut down main contactor Shut down EM brake Shut down throttle Shut down interlock
		2	Lift driver is open or shorted.		Shut down lift
		3	Lower driver is open or shorted.		Shut down lower
		4	Horn driver is shorted.		Shut down horn

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
54 Pump SRO Fault 0x2330	<ul style="list-style-type: none"> <li>Incorrect operation sequence</li> <li>Defective switch</li> </ul>	1	The lift input is active when the keyswitch is turned on.	Cycle the keyswitch.	<i>Shut down lift</i>
		2	The lower input is active when the keyswitch is turned on.	Cycle the keyswitch.	<i>Shut down lift and lower</i>
		3	The controller did not receive CAN lift or CAN lower PDO messages within 2s after startup.	The Lift Input State and Lower Input State must both be off.	<i>Shut down lift and lower</i>
		4	The Lift On Interlock parameter specifies On and the lift input is active when the interlock state changes to on.	The Lift Input State and Lower Input State must both be off.	<i>Shut down lift</i>
		5	The Lower On Interlock parameter specifies On and the lower input is active when the interlock state changes to on.	The Lift Input State and Lower Input State must both be off.	<i>Shut down lift and lower</i>
55 EMR SRO Fault 0x2340	<ul style="list-style-type: none"> <li>Defective emergency reverse switch</li> <li>Incorrect operation sequence</li> </ul>	1	The emergency reverse switch is active when the keyswitch is turned on.	Cycle the keyswitch.	<i>Shut down throttle</i>
		2	The emergency reverse switch is active when the interlock input is turned on.	Turn off the emergency reverse switch.	
		3	The absolute value of the throttle demand is greater than 10% after an emergency reverse operation.	Release the throttle.	
56 Creep SRO Fault 0x2350	Incorrect operation sequence	1	The creep input is on when the keyswitch is turned on.	Turn off the creep input.	<i>Shut down throttle</i>
		2	The creep input is on but the interlock state has been off for 40ms.	Turn off the creep input.	
		3	The interlock state is on for 40ms during creep mode.	Turn off creep mode and the interlock.	
		4	The controller cannot abort the creep brake state after the Interlock Brake Timeout expires.	Turn off creep mode and the interlock.	
57 Inching SRO Fault 0x2351	Incorrect operation sequence	1	The inching forward or inching reverse input is on when the keyswitch is turned on.	Turn off the inching forward and inching reverse inputs.	<i>Shut down throttle</i>
		2	The inching forward or inching reverse input is on but the interlock state has been off for 40ms.	Turn off the inching forward and inching reverse inputs.	
		3	The interlock state is on for 40ms during inching mode.	Turn off inching forward, inching reverse and interlock inputs.	

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
61 PDO Timeout 0x2541	CANbus is overloaded.	1	During the operational NMT state, RPDO1 did not receive a message before the RPDO1 Event Time expired.	Cycle the keyswitch or send an NMT reset command.	Shut down throttle Clear related data
		2	During the operational NMT state, RPDO2 did not receive a message before the RPDO2 Event Time expired.		
		5	During the operational NMT state, RPDO2 did not receive a message from the node specified with BMS Node ID before the BMS PDO Timeout expired.		
62 PDO Mapping Error 0x2542	<ul style="list-style-type: none"> <li>Incorrect data size</li> <li>Incorrect read/write mode</li> <li>Invalid CAN index</li> </ul>	An SDO abort code	<ul style="list-style-type: none"> <li>Incorrect data size specified for an object</li> <li>Incorrect access mode</li> <li>Invalid CAN index</li> </ul>	Cycle the keyswitch.	No action
71 Hardware Fault 0x2610	<ul style="list-style-type: none"> <li>Defective MOSFET</li> <li>Defective microprocessor</li> </ul>	1	The motor voltage is out of range for 64ms while the final PWM output is between 25–75%.	Cycle the keyswitch.	Shut down motor Shut down main contactor Shut down EM brake Shut down throttle Shut down interlock
		3	The belly button check is enabled and the emergency reverse NO or NC input's voltage is less than 1.5V for 100ms.		
		4	UID encryption failed or the microprocessors are not in productive mode.		
		5	The CAN programming device's OEM code differs from the hardware's OEM code.		
72 Software Fault 0x2620	<ul style="list-style-type: none"> <li>Internal communication failed</li> <li>Incorrect firmware</li> </ul>	1	Unmatched supervisor firmware.	Cycle the keyswitch.	Shut down motor Shut down main contactor Shut down EM brake Shut down throttle Shut down interlock
		2	Test mode was exited.		
	Received an NMT Node Reset command while the vehicle was operating.	3	The Node Reset command is received when the motor speed is greater than 1.00V or the armature current is greater than (1/16 * Drive Current Limit).		
81 Parameter Out Of Range 0x2811	Invalid parameter value	CAN index of parameter	A parameter's value is outside of its allowed data range.	Cycle the keyswitch.	Shut down motor Shut down main contactor Shut down throttle Shut down interlock

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
82  Parameter Fault 0x2812	<ul style="list-style-type: none"> <li>Invalid parameter value</li> <li>Defective FRAM</li> </ul>	1	A parameter marked as [PCF] in the Programming Menu Parameters chapter was set but the keyswitch has not been cycled.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down throttle</i> <i>Shut down interlock</i>
		2	The Steering Input Type parameter specifies an analog input but the Throttle Type parameter does not specify a CAN throttle.	Cycle the keyswitch.	
		3	Two or more flexible switch inputs are assigned to the same function.	Reconfigure the flexible switch inputs, then cycle the keyswitch.	
		4	<ul style="list-style-type: none"> <li>The Steering Angle 1 parameter is greater than or equal to Steering Angle 2.</li> <li>The Steering Angle 1 or Steering Angle 2 parameter is greater than Steering Angle Max.</li> <li>The speed mode's Fwd Max Speed parameter is less than or equal to Fwd Min Speed.</li> <li>The speed mode's Rev Max Speed parameter is less than or equal to Rev Min Speed.</li> <li>Speed Limit HPD specifies On, and mode 1's Fwd Max Speed is greater than mode 2's Fwd Max Speed, and mode 1's Rev Max Speed is less than mode 2's Rev Max Speed, or vice versa.</li> <li>The Forward Deadband parameter is greater than Forward Max.</li> <li>The Reverse Deadband parameter is greater than Reverse Max.</li> </ul>	Adjust the parameter, then cycle the keyswitch.	
		5	<ul style="list-style-type: none"> <li>The EMR Input Type parameter specifies NC Switch Input but the emergency reverse NC function is not assigned to a flexible switch input.</li> <li>The Steering Input Type parameter specifies NC Switch Input but the steering function is not assigned to a flexible switch input.</li> </ul>	Assign the function to a flexible switch input, then cycle the keyswitch.	

FLASH CODE NAME CAN INDEX	POSSIBLE CAUSES	FAULT TYPE	SET CONDITION	CLEAR CONDITION	FAULT ACTIONS
		6	The Pot Hi Switch Function parameter specifies a value other than Pot Hi Input but the Throttle Type parameter specifies a 3-wire pot throttle.	Cycle the keyswitch.	
		7	The Inching Input Source parameter specifies Inching Switch but the inching function is not assigned to a flexible switch input.	Cycle the keyswitch.	
83 NV Failure 0x2830	FRAM operation failed	Block number	Read FRAM failed.	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down EM brake</i> <i>Shut down throttle</i> <i>Shut down interlock</i> <i>Shut down DRIVERS</i>
		2	Write FRAM failed.		
		3	Restore parameters failed during flashing.		
		4	Saving the brownout flag failed.		
		5	Block number is out of range.		
84 Supervision 0x2840	Cross check failed.	See Table 7-2	Cross check failed	Cycle the keyswitch.	<i>Shut down motor</i> <i>Shut down main contactor</i> <i>Shut down EM brake</i> <i>Shut down throttle</i> <i>Shut down interlock</i> <i>Shut down DRIVERS</i>

The following table lists the fault types for the Supervision fault.

Table 7-2 Supervisor Fault Types

Fault Type	Fault Type Variable
2	SUPERVISOR_FIFTEEN_V_SUPPLY_FAILURE

8	SUPERVISOR_HARDWARE_FAULT
11	PRIMARY_INIT_CAN_OBJ
12	PRIMARY_INIT_ILLEGAL_CAN_SIZE
13	PRIMARY_INIT_CAN_SIZE
14	PRIMARY_INIT_TIMEOUT
15	PRIMARY_WRITE_OBJECT
16	PRIMARY_WRITE_SIZE
17	PRIMARY_WRITE_TIMEOUT
18	PRIMARY_WRITE_CRC
19	PRIMARY_WRITE_ACK

## 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

[illegible]

## 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](mailto:sales@hcforklift.com)