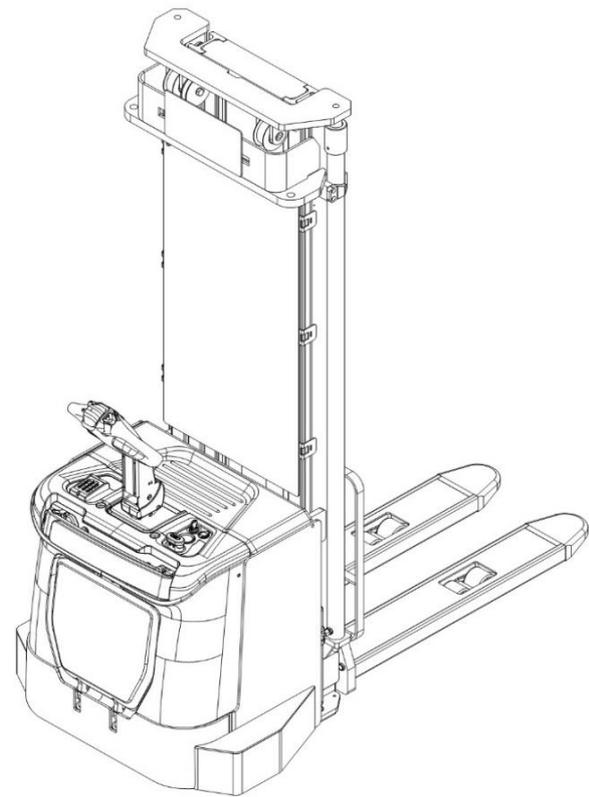


## Service Manual

### Electrical Stacker

#### PSXXNW



#### **WARNING**

Do not use the electric stacker before reading and understanding these operating instructions.

#### **NOTE:**

- Please check the designation of your present type at the last page of this manual as well as on the ID-plate.
- Keep this manual for future reference.

**This stacker can only be used in factories, tourist attractions and amusement places.**

Version 12/2023

PS XX NW -SM-002-EN

## FOREWARD

Before operating the electric stacker, read this ORIGINAL INSTRUCTION HANDBOOK carefully and understand the usage of the stacker completely. Improper operation of the stacker may cause danger.

This handbook describes the usage of different electric stackers. When operating and servicing the stacker, make sure, that it applies to your type.

Keep this handbook for future reference. If this handbook or the warning/caution labels are damaged or lost, please contact your local dealer for replacement.

### ATTENTION:

- Environmentally hazardous waste, such as batteries, oil and electronics, will have a negative effect on the environment or health, if handled incorrectly.
- The waste packages should be sorted and put into solid dustbins according to the materials and be collected disposal by local special environment protection bureau. To avoid pollution, it's forbidden to throw away the wastes randomly.
- To avoid leaking during the use of the products, the user should prepare some absorbable materials (scraps of wooden or dry duster cloth) to absorb the leaking oil in time. To avoid second pollution to the environment, the used absorbable materials should be handed in to special departments in terms of local authorities.
- Our products are subject to ongoing developments. The information written in this handbook is provided as reference for operating and servicing the stacker and may vary in terms of description of particular features of the truck.



NOTE: On this manual, the left sign indicates warning and danger, which can lead to death or serious injury if not followed.

### **Copyright**

The copyright remains with the company, mentioned on the CE- certificate at the end of this document.

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# 1. CORRECT APPLICATION

It is only allowed to use this electric stacker according to this instruction handbook.

The stackers described in this handbook are self-propelled pedestrian controlled electric powered stackers, with electrically powered lifting function. The stackers are designed for stacking operations in dedicated racking by lifting and lowering the palletized loads up to the desired lifting height.

Improper use can cause personal injury or damage to the machine.

The operator/operating company needs to ensure the correct use, and at the same time ensure that the stacker is only operated by personnel who have been trained and authorized to use the stacker.

This stacker needs to be used on a firm, flat, intact and proper surface. This stacker is designed for indoor applications with ambient environment from +5°C to +40°C (41°F to 104°F).

It is used under light load conditions without crossing permanent obstacles or potholes. The goods must be placed approximately at the load center of the stacker during operation.

It is strictly forbidden to lift or carry personnel. If carried, the goods must be lowered to the lifting point.

It is not allowed to use this stacker on tail lifts or loading ramps.

The capacity is marked on the load diagram as well on the identification plate. The operator has to consider the warnings and safety instructions.

The operating lighting must be at least 50 lux

## Modification

Any modifications or changes that may affect the rated capacity, stability or safe operation of the stacker must be approved in advance in writing by the original manufacturer or its authorized representative or its successor. This includes the effects of changes, such as: braking, steering, visibility and the increase in movable accessories.

After the manufacturer or its successor has approved the modifications or changes, the capacity plate, labels, identification mark, operation and maintenance manual must be changed accordingly.

Damage to the stacker caused by not following these instructions will make the warranty invalid.

## MAINTENANCE SAFETY PRECAUTIONS

Maintenance work may cause injuries. Always take care to perform work safe, at least observing the following. It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves, others or damage to the equipment. A maintenance program must be followed to ensure that the machine is safe to operate.

The specific precautions to be observed during maintenance are inserted at the appropriate point in the manual. These precautions are, for the most parts, those that apply when servicing hydraulic and larger truck component parts.

 MODIFICATION OF THE TRUCK WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE TRUCK IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED, IS A SAFETY VIOLATION.

 SINCE THE TRUCK MANUFACTURER HAS NO DIRECT CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA RESPONSIBIUTY OF THE OWNER OR OPERATOR.

 FAILURE TO COMPLY WITH SAFETY PRECAUTIONS, LISTED IN THIS SECTION MAY RESULT.

**Only specially trained personnel are allowed to operate the vehicle.**

Please read the operation and maintenance manual carefully before operating or maintaining the vehicle.

Read all the precautions given on the decals which are fixed to the truck.

Be sure you fully understand the content of the operation. It is important to prepare necessary tools and parts for maintain the truck.

Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

It should be noted that the machines hydraulic systems operate at extremely high potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system. Relieve system pressure by cycling the applicable control several times with the engine(motor) stopped and ignition on, to direct any line pressure back into the reservoir. Pressure feed lines to system components can then be disconnected with minimal fluid loss.

Remove all rings, watches and jewelry when performing any maintenance.

Wear well-fitting helmet, safety shoes and working clothes when drilling grinding or hammering always. Wear protective goggles. Always do up safety clothes properly so that they do. Not catch on protruding parts of machines. Do not wear oily clothes. When checking, always release battery plug. **DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.**

During maintenance do not allow any unauthorized person, to stand near the machine.



Flames should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil or electrolyte.

Immediately remove any oil or grease on the floor of the operator's compartment or on the handrail. It is very dangerous if someone slips while on the machine.

Always use pure oil or grease, and be sure to use clean containers.

Oil is a dangerous substance. Never handle oil, grease or oily clothes in places where there is any fire or flame. As preparation for use of fire extinguishers and other fire-fighting equipment.

Keep the battery away from fire hazards. The generated gases are explosive.

Store all the oils in a specified place.

Keep the flammable things away from the machine. Do not smoke at the working place.

Battery should always be disconnected during replacement of electrical components.

Always use the grades of grease and oil recommended by NOBLELIFT choose the viscosity specified for the ambient temperature.

Exhaust gas is dangerous provide ventilation when working in a closed space.

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Wear a gas mask if necessary.

When working on top of the machine, be careful not to lose your balance and fall.

Hand a caution sign in the operator's compartment (for example "Do not start" or "Maintenance in progress"). This will prevent anyone from starting or moving the machine by mistake.

When welding on the machine or working on the electrical system, ALWAYS turn the key switch OFF and remove the battery plug from the battery. Park the machine on firm, flat ground. Lower the fork to the min. height and stop the motor.

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin and eat holes in clothing. If you spill acid on your clothes or skin, immediately flush with large quantities of water.

When working on the battery, wear goggles or safety glasses. If splashed into the eyes, flush with water and get medical attention immediately.

Battery terminals touched by metal objects can cause short circuit and burn you. Keep tools away from the terminals.

Keep sparks, lighted matches, and open flame away from the top of battery. Battery (hydrogen) gas can explode.

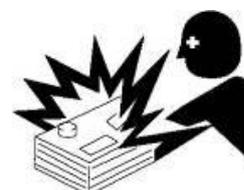
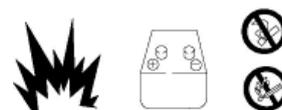
When disassembling and assembling the battery, make sure that the battery terminals (+, -) are correctly connected.

If water gets into the electrical system, abnormal operation or failure can result. Do not use water or steam on sensors, connectors and instruments in the cab.

Do not handle electrical equipment while wearing wet gloves, or in wet places, as this can cause electric shock.

When working with other, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.

Unless you have special instructions to the contrary, maintenance should always be carried out with the motor stopped. If maintenance is carried out with the motor running,



there must be two technicians present: One operating the stacker and the other one performing the maintenance. In such a case, never touch any moving part.

Before making adjustment, lubricating or performing any other maintenance, shut off all power controls.

When removing parts containing O-ring Gaskets or seal clean the mounting surface and replace with new sealing parts.

Thoroughly clean the machine. In particular, be careful to clean the grease fittings and the area around the dipsticks. Be careful not to let any dirt or dust into the system.

Use only approved nonflammable cleaning solvents.

When changing the oil or filter, check the drained oil and filter for any signs of excessive metal particles or other foreign materials.

Always use NOBLELIFT genuine parts for replacement. ENSURE REPLACEMENT PARTS OR COMPONENTS ARE IDENTICAL OR EQUIVALENT TO ORIGINAL PARTS OR COMPONENTS.

When checking an open gear case, there is a risk of dripping things in. Before removing the covers to inspect such cases, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.



## 2. DESCRIPTION OF THE STACKER

### a. Overview of the main components

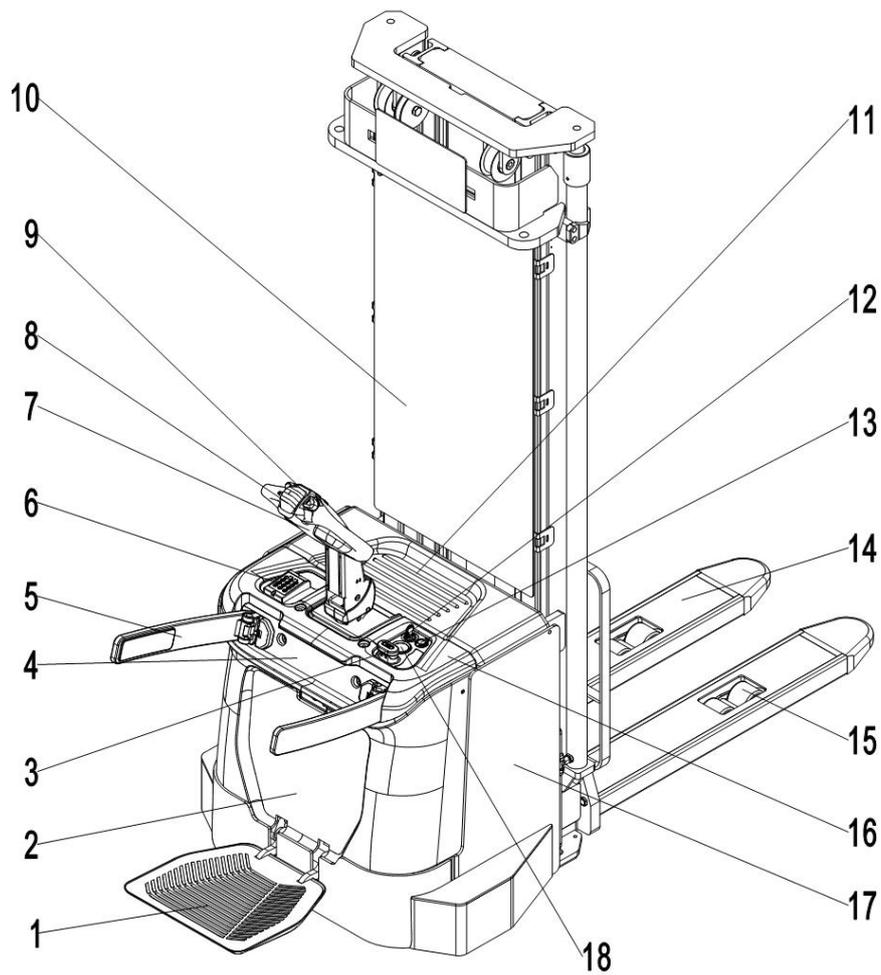


Fig. 1: Overview of the main components

- |                                |                   |
|--------------------------------|-------------------|
| 1. Platform                    | 10. Mast          |
| 2. Main cover                  | 11. Battery panel |
| 3. Emergency stop              | 12. Key switch    |
| 4. Protection arm cover        | 13. USB interface |
| 5. Protection arm              | 14. Fork          |
| 6. Pin code                    | 15. Load roller   |
| 7. Tiller                      | 16. Top cover     |
| 8. Safety button/ Belly button | 17. Chassis       |
| 9. Accelerator                 | 18. Display       |

## b. Main technical data

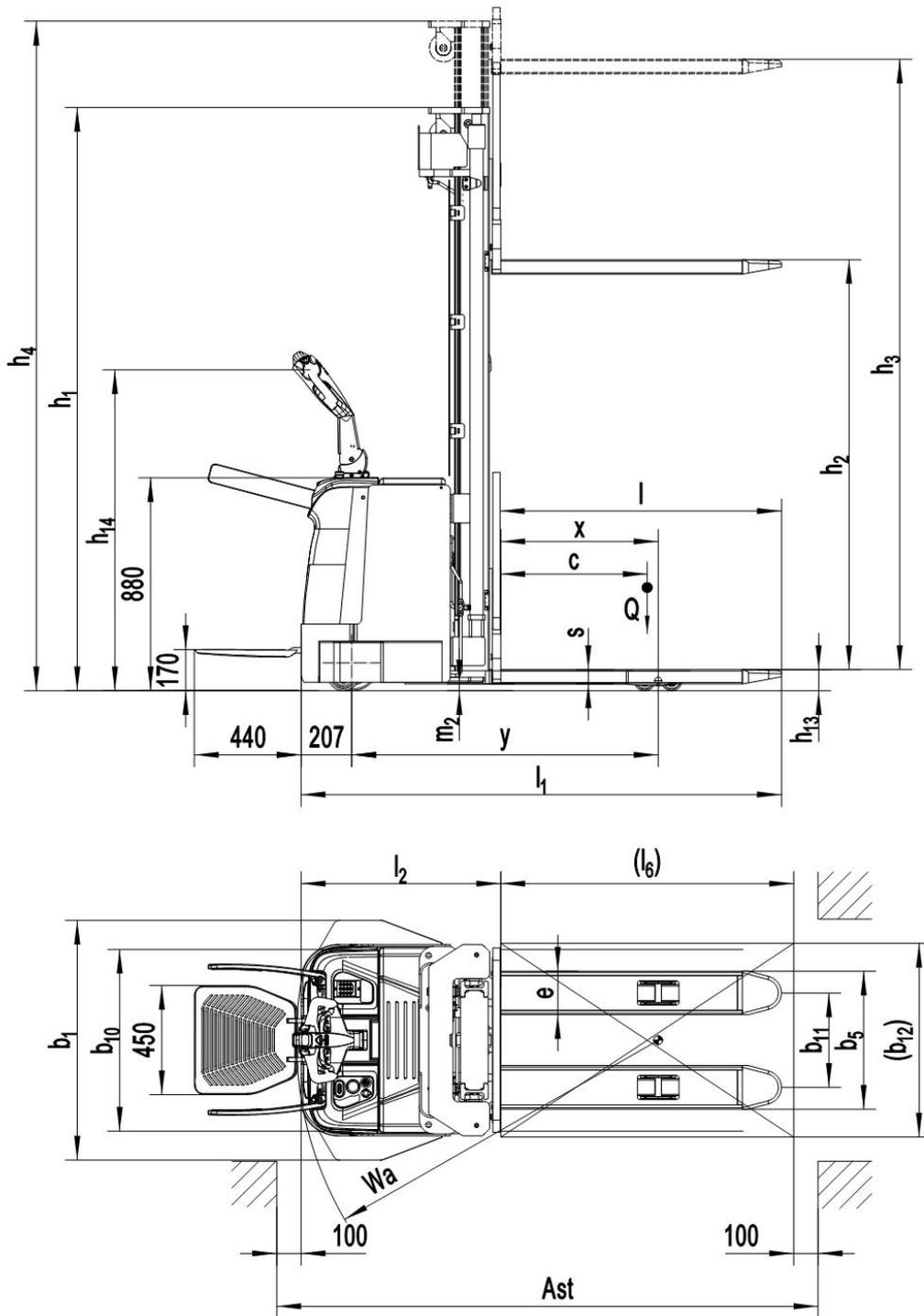


Fig. 2: Technical data

Table1: Main technical data for standard version

Type sheet for industrial stacker acc. to VDI 2198					
Distinguishing mark	1.2	Manufacturer's type designation		PS16NW(5500)	PS20NW(4600)
	1.3	Drive: electric (battery type, mains, ...), diesel, petrol,		Battery	
	1.4	Operator type: hand, pedestrian, standing, seated,		Pedestrian	
	1.5	Rated capacity/ rated load	Q (t)	1.6	2.0
	1.6	Load centre distance	c (mm)	600	
	1.8	Load distance, centre of drive axle to fork	x (mm)	647	650
	1.9	Wheelbase	y (mm)	1256	1392
Weight	2.1	Service weight	kg	1365	1630
	2.2	Axle loading, laden front/ rear	kg	1000/1965	1124/2506
	2.3	Axle loading, unladen front/ rear	kg	943/422	1067/563
Tyres	3.1	Tires		Polyurethane wheels	
	3.2	Tire size, front	∅ x w (mm)	∅230x70	
	3.3	Tire size, rear	∅ x w (mm)	∅84x70	
	3.4	Additional wheels (dimensions)	∅ x w (mm)	∅124x60	
	3.5	Wheels, number front/ rear(x=driven wheels)		1x+2/4	
	3.6	Tread, front	b <sub>10</sub> (mm)	750	
	3.7	Tread, rear	b <sub>11</sub> (mm)	390/505	
Dimensions	4.2	Height, mast lowered	h <sub>1</sub> (mm)	2410	2228
	4.3	Free lift	h <sub>2</sub> (mm)	1820	1520
	4.4	Lift	h <sub>3</sub> (mm)	5430	4530
	4.5	Height, mast extended	h <sub>4</sub> (mm)	6110	5200
	4.9	Height drawbar in driving position min./ max.	h <sub>14</sub> (mm)	950/1350	
	4.15	Height, lowered	h <sub>13</sub> (mm)	90	
	4.19	Overall length	h <sub>1</sub> (mm)	1968 <sup>1)</sup>	2101 <sup>1)</sup>
	4.20	Length to face of forks	h <sub>2</sub> (mm)	818 <sup>1)</sup>	951 <sup>1)</sup>
	4.21	Overall width	b <sub>1</sub> (mm)	990	
	4.22	Fork dimensions DIN ISO 2331	s/e/ l (mm)	60/180/1150	
	4.25	Fork spread	b <sub>5</sub> (mm)	570/685	
	4.32	Ground clearance, centre of wheelbase	m <sub>2</sub> (mm)	28	28
	4.33	Aisle width for pallets 1000x1200 crossways	A <sub>st</sub> (mm)	2396 <sup>1)</sup>	2530 <sup>1)</sup>
	4.34	Aisle width for pallets 800x1200 lengthways	A <sub>st</sub> (mm)	2382 <sup>1)</sup>	2516 <sup>1)</sup>
	4.35	Turning radius	W <sub>a</sub> (mm)	1500 <sup>1)</sup>	1634 <sup>1)</sup>
Performance	5.1	Travel speed, laden/ unladen	km/h	7.0/8.0	6.0/7.0
	5.2	Lift speed, laden/ unladen	m/s	0.09/0.14	0.09/0.14
	5.3	Lowering speed, laden/ unladen	m/s	0.25/0.20	0.25/0.20
	5.8	Max. gradeability, laden/ unladen	%	6/12	6/12
	5.10	Service brake		Electromagnetic Braking	

<b>Electric-engine</b>	6.1	Drive motor rating S2 60min	kW	1.4	1.4
	6.2	Lift motor rating at S3 10%	kW	3.0	3.0
	6.3	Battery acc. to DIN 43531/35/36 A, B, C, no		3VBS	3PZS
	6.4	Battery voltage/ nominal capacity K <sub>5</sub>	V/Ah	24/270	24/350
	6.5	Battery weight	kg	230	288
	6.6	Energy consumption acc. to DIN EN 16796	kWh/h	0.94	1.32
<b>Additional data</b>	8.1	Type of drive unit		AC	
	8.4	Sound pressure level at driver's seat	dB (A)	<70	
1) For stacker with platform extended, +440mm					

Type	Height, mast lowered h1 (mm)	Free lift h2 (mm)	Lift h3 (mm)	Height, mast extended h4 (mm)
<b>PSN Series (PS16NW)</b>				
<b>Two stage mast</b>	1958	—	2830	3380
	2108	—	3130	3680
	2308	—	3530	4080
<b>Two stage mast FFL (Full-Free-Lift)</b>	1958	1410	2830	3380
	2108	1560	3130	3680
	2308	1760	3530	4080
<b>Three stage mast</b>	2008	—	4230	4780
	2108	—	4530	5080
<b>Three stage mast FFL (Full-Free-Lift)</b>	1708	1120	3330	3880
	1908	1320	3930	4480
	2008	1420	4230	4780
	2108	1520	4530	5080
	2343	1756	5230	5780
	2410	1820	5430	6110
<b>PSN Series (PS20NW)</b>				
<b>Two stage mast</b>	2078	—	2830	3500
	2228	—	3130	3800
	2428	—	3530	4200
<b>Two stage mast FFL (Full-Free-Lift)</b>	1978	1310	2630	3300
	2078	1410	2830	3500
	2228	1560	3130	3800
	2428	1760	3530	4200
<b>Three stage mast</b>	2128	—	4230	4900
	2228	—	4530	5200
<b>Three stage mast FFL (Full-Free-Lift)</b>	1978	1310	3930	4600
	2128	1420	4230	4900
	2228	1520	4530	5200

### **c. Description of the safety devices and warning labels (Europe and other, except USA)**

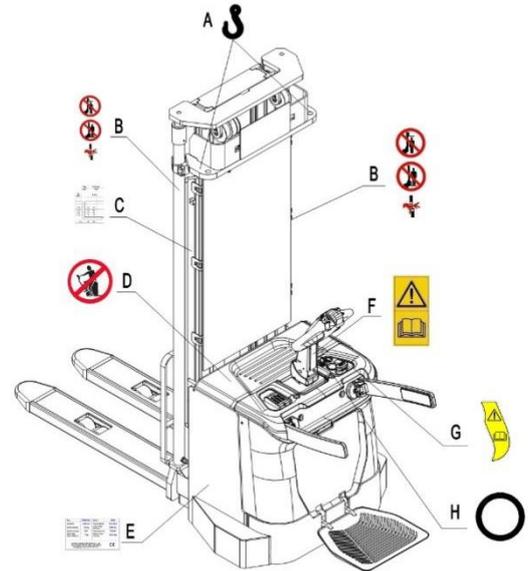
The description of the safety and warning labels for USA market is indicated in chapter 11.

- A Crane hook decal
- B Warning labels: Do not step under or on the forks
- C Residual capacity label
- D No passengers label
- E Identification plate (ID-plate)
- F Sticker to observe and follow these instructions
- G Warning sticker
- H Indicating decal

The stacker has an emergency button (18) which stops all lifting-, lowering-, driving- functions and engages the fail-safe electromagnetic brake when it is pressed. By pulling this button, the stacker can be operated after the controller checked the functions. Before operating, insert the key and turn the switch (16) clockwise or, in case the stacker is equipped with pin-code panel, press the start button and enter the pin-code passwords or use RFID access card to activate the stacker.

To prevent unauthorized access, turn the key anti-clockwise

and remove it if you do not operate this stacker or, in case the stacker is equipped with pin-code panel, press the start-button or press "X" button of pin-code panel. The stacker is equipped with a safety (belly) button (7) which switches the stacker driving away from the operator, if the stacker travels towards the operator and the tiller is in its operating zone. Follow the instructions given above. Replace the labels and decals if they are damaged or missed.



**Fig.3:** Safety and warning labels

## d. VIN Location

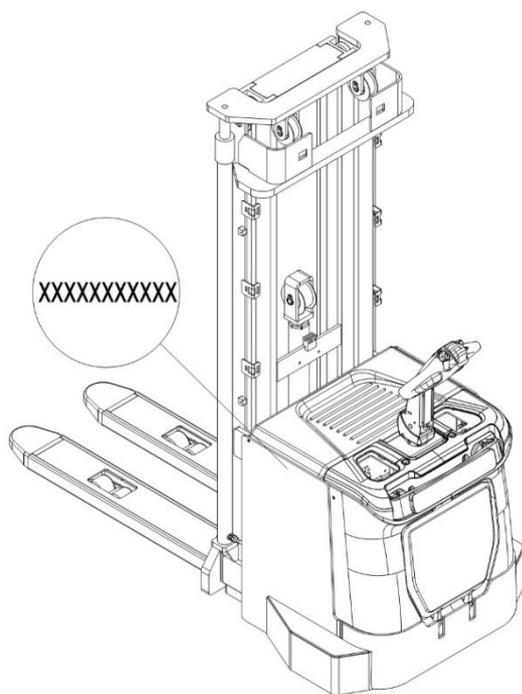


Fig. 4: Position of Identification plate

The vehicle identification number is located on the body of the vehicle.

## e. Identification plate

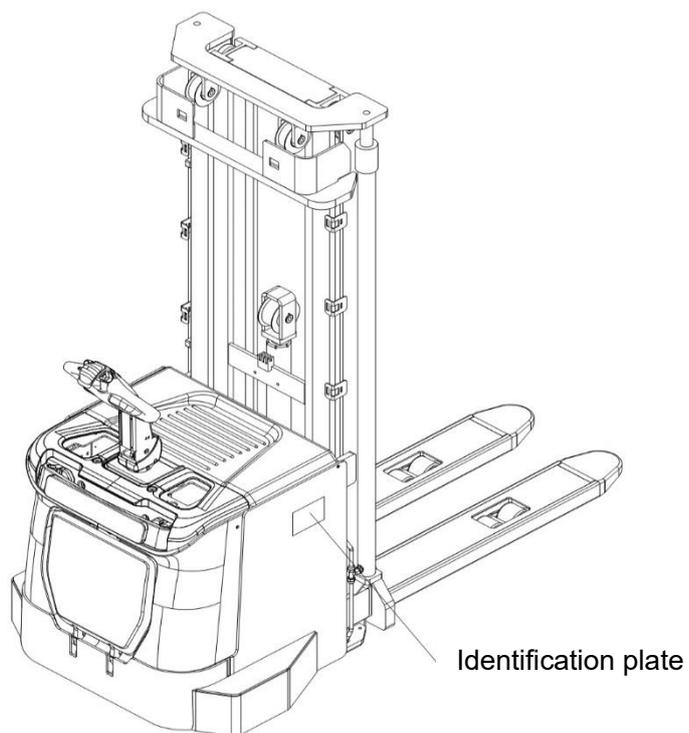


Fig. 5: Identification plate location

The Identification plate is located on the left or right side of the vehicle body.

<b>Pallet Stacker</b>			
Special Equipment Manufacturing License No. :			
Type	xxxx	Rated capacity	xxxx kg
Rated voltage	xx V	Service weight without battery	xxxx kg
Battery weight maximum	xxx kg	Battery weight minimum	xxx kg
Net weight (without load and battery)	xxx kg	Lift height maximum	xxxx mm
Serial number	xxxxxxxxxx	Equipment code	xxxxxxxxxx
Manufacturer Name XXXXXXXXXXXXXXXXXXXX Manufacturer Address XXXXXXXXXXXXXXXXXXXX			

Fig. 6: Identification plate

### 3.WARNINGS, RESIDUAL RISK AND SAFETY INSTRUCTIONS



#### **DO NOT**

- Stack a lifted load higher than the lifting point when driving outdoors.
- Put feet or hands under or into the lifting mechanism.
- Allow other person than the operator to stand in front of or behind the stacker when it is moving or lifting/lowering.
- Overload the stacker.
- Put foot in front of the wheels, which may cause injury.
- Lift people. People could fall down and suffer severe injury.
- Push or pull loads.
- Use the stacker without a protection screen.
- Place the load at the side or end of forks. Load must be distributed evenly on the forks.
- Use the stacker to load unstable or unbalanced goods.
- Use the stacker without the written consent of the manufacturer.
- Supply on board charger with AC voltage other than 100V or 240V.

Observe different ground conditions while driving, the load may fall or the stacker may lose control. Please check the condition of the load from time to time. Immediately stop operating the stacker if load becomes unstable. When the load slides on/off the stacker, immediately brake the stacker and press the emergency button (18). If the stacker has any malfunctions, follow the instructions of chapter 10.

Perform maintenance work based on regular inspections. This stacker is not waterproof, please use it under dry condition. Prolonged continuous operation may damage the power pack. Stop operation when the hydraulic oil temperature is too high.



- When operating this stacker, the operator has to wear safety shoes.
- This stacker is suitable for indoor applications with ambient temperature between +5°C (41°F) and +40°C (104°F).
- Operation lighting must be minimum 50 Lux.
- It is not allowed to operate the stacker on ramps.
- In order to prevent accidental movements when not operating the stacker (i.e. caused by another person, etc.), turn off the power of the stacker and remove the key.
- Lifted loads could become unstable at wind forces and influence the stability. Do not lift loads in windy conditions.
- Lifted loads will affect the field of view, adopt all necessary safety measures, and use auxiliary tools to ensure the view if necessary.
- Avoid collision of the foldable platform against surrounding objects, especially when driving forward, there is a risk of collision and shearing. Always maintain a safe operating speed according to different environments.

## 4. COMMISSIONING, TRANSPORTING, DECOMMISSIONING

### a. Commissioning

Table 2: Commissioning data

Type	PS16NW/5500	PS20NW/4600
Commissioning weight [kg]	1385	1650
Lift [mm]	5500	4600

After receiving our new stacker or when re-commissioning is required, please perform the following steps before operating the stacker (for the first time):

- Check if all parts are included and not damaged.
- Install and charge the battery (see chapter 8).
- Carry out daily inspections and machine function inspections.

### b. Hoisting/ transportation

For transporting, remove the load, lower the forks to the lowest position and fix the stacker safe with dedicated hoisting equipment according to Fig. 7.

#### Hoisting



USE DEDICATED CRANE AND HOISTING EQUIPMENT.  
DO NOT STAND UNDER THE SWAYING LOAD.  
DO NOT WALK INTO THE HAZARDOUS AREA DURING HOISTING.

Park the stacker safely and fasten it according to the points shown in Figure 7.

Hoist the stacker and move it to the destination, and place the stacker safely and remove the hosting equipment.

Refer to Figure 8 for the fixing points for dedicated lashing belts.

◦

#### Transportation



DURING TRANSPORTATION ON A LORRY OR stacker, ALWAYS FASTEN THE STACKER SECURELY.

Lower the forks and park the stacker securely.

Fasten the stacker by dedicated lashing belts according to fig. 8 and fasten the other side at the transporting vehicle.

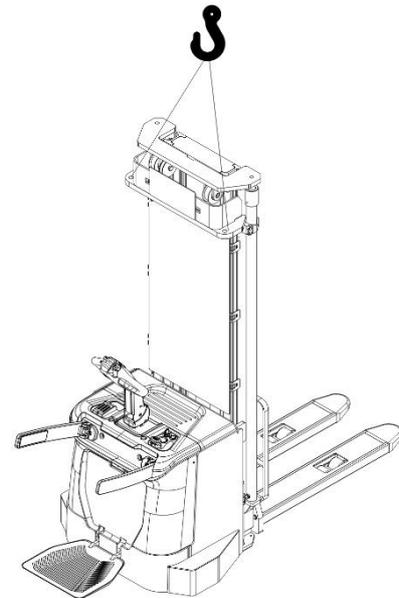


Fig.7: Lifting with a crane

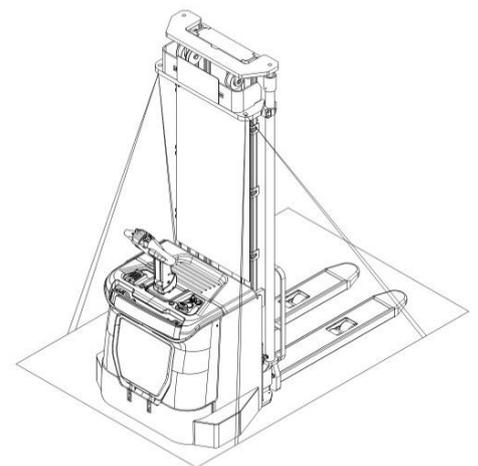


Fig. 8: Fixing points

## **c. Decommissioning**

Remove the load and lower the forks to the lowest position for storage. Apply grease to all lubrication points mentioned in this manual (regular inspection) to prevent rust, corrosion and dust on the stacker. Remove the batteries and jack the stacker safely, so that there will be no flattening of wheels after storage.

For final decommissioning hand the stacker to a designated recycling company. Oil, batteries and electric components must be recycled according to regulations.

## 5. DAILY INSPECTION

This chapter describes the pre-shift inspections required before operating the stacker.

Daily inspections can effectively find faults or malfunctions in this stacker. The following points of the stacker should be checked before operation.



**MOVE THE LOAD AWAY FROM THE STACKER AND LOWER THE FORKS.  
DO NOT USE THE STACKER IF YOU FIND ANY MALFUNCTIONS.**

- Check for scratches, deformation or cracks.
- Check if there is any leaks of hydraulic cylinder.
- Check the longitudinal driving condition of the stacker.
- Check the chain and rollers for damages or corrosion.
- Check whether the wheels can move smoothly.
- Press the emergency button to check the condition of emergency brake.
- Check the lifting/lowering function by operating the button.
- Check whether the protection screen is damaged and whether it is assembled correctly.
- Check the buzzer.
- Check whether all bolts and nuts are tightened.
- Check the condition of the key switch.
- Check the speed limit switch.
- Visually check for any damaged hoses or wires.
- If the stacker is equipped with a load backrest, check whether it is damaged and whether it is assembled correctly.

## 6. OPERATING INSTRUCTIONS

 BEFORE OPERATING THIS STACKER, PLEASE FOLLOW THE WARNINGS AND SAFETY INSTRUCTIONS (SEE CHAPTER 3).  
BEFORE OPERATING THIS STACKER, ENSURE THAT THE LOAD OR OTHER EQUIPMENT WILL NOT CAUSE INSUFFICIENT VISIBILITY!

Make sure that the load is palletized horizontally and stably, and that the daily inspection is carried out. For starting, insert

the key and turn it clockwise to “ON” position. Eventually before activating the key switch (12), the emergency button (3) must be pulled carefully.

Press the horn button (22) to activate the audible warning signal.

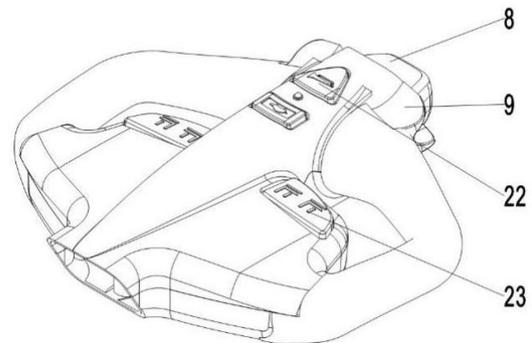


Fig.7: Control handle

### a. Parking

 DO NOT PARK THE STACKER ON INCLINED SURFACES.

The stacker is equipped with an electromagnetic fail-safe stopping and parking brake.

Always lower the forks fully and drive the stacker to a safe area. Turn the key anti-clockwise to “OFF” position and remove the key.

## b. Residual lift diagram

The residual lift diagram indicates the maximum capacity  $Q$  [kg] for a given load centre  $c$  [mm] and the corresponding lift height  $H$  [mm] for the stacker with horizontal load. The white mark on the mast indicates the reachable lifting height. For instance, the stacker with a load centre of gravity distance  $c$  of 600 mm and a maximum lift height  $H$  of 5500 mm, its max. capacity  $Q$  is 600 kg.

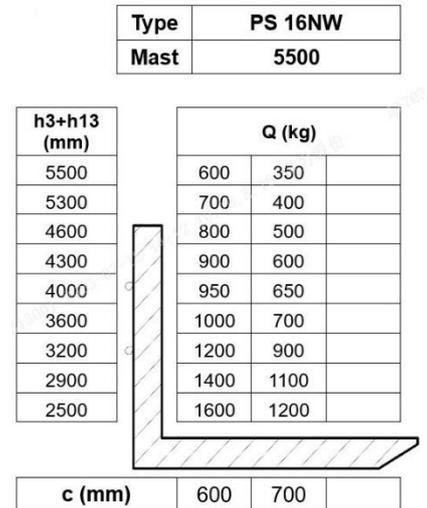


Fig. 10: Residual lift diagram

## c. Lifting



CAPACITY IS 1600/2000 kg WHEN THE LOAD CENTER IS 600MM.

LIFT ONLY CAPACITIES ACCORDING TO THE RESIDUAL LIFT DIAGRAM.

Travel with the fully lowered forks and press the lifting button (Fig. 7, 23) until the forks reach your desired lifting height.

In case the protection arms are open, the maximum lifting height is 1800 mm. If you want to lift forks higher, please retract the protection arms.

## d. Lowering

If the forks are in the racking, firstly move the stacker out of the racking carefully with/without pallet, take care that the forks will not touch the racking.

Press the lowering button (Fig. 9, 23) carefully.

Lower the load until the forks are clear of the pallet, then drive the stacker carefully away from the load.

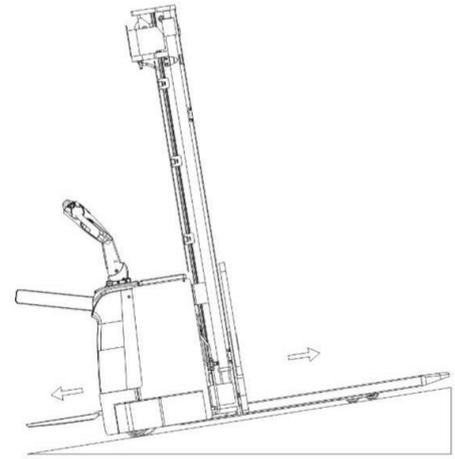


Fig.11: Load facing uphill

## e. Travelling



TRAVEL ON INCLINES ONLY WITH THE LOAD FACING UPHILL(fig.11).

DO NOT TRAVEL ON INCLINES MORE THAN SPECIFIED WITH THE TECHNICAL DATA.

TRAVELLING IS ONLY ALLOWED IF THE FORKS ARE LOWERED DOWN TO THE LIFTING POINT (<300MM).

Start the stacker by turning the inserted key to "ON" position or by activation from Pin-code panel, then carefully pull up the emergency button. Move the tiller to the operating zone ('F', fig.12).

Turn the accelerator to the desired direction forward 'Fw.' Or backwards 'Bw.'(fig. 12).

Control the travelling speed by moving the accelerator (9) carefully until you reach the desired speed.

If you move the accelerator back to the neutral position, the controller decelerates the stacker until the stacker stops, and the parking brake will be engaged.

Carefully drive the stacker to the destination. Observe the floor conditions and adjust the travelling speed through the accelerator.

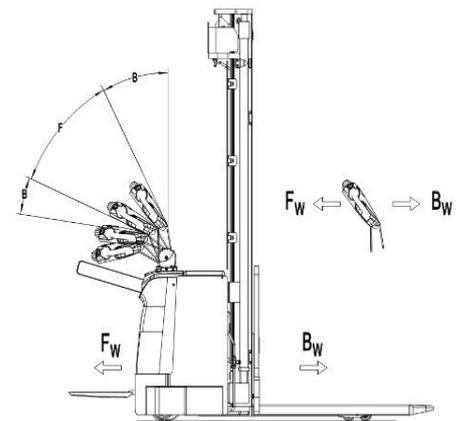


Fig.12: Operating direction



THE STACKER EQUIPS WITH A FOLDABLE PLATFORM AND PROTECTION ARMS. NOTE THAT THE WORKING MECHANISM OF PLATFORM AND PROTECTION ARMS OF RIDE-ON MODE IS DIFFERENT TO PEDESTRIAN MODE.

In addition to the pedestrian mode, the stacker can also be operated in the following modes:

- With unfolded platform (1) and protection arms (5) in activated position, operate the stacker travelling at maximum speed.
- With unfolded platform (1) and protection arms (5) retracted, reduce the speed to be less than 6km/h. Travelling speed of the stacker depends on the the controllers parameter settings.
- With platform (1) folded and protection arms (5) retracted, reduce the speed to be less than 6km/h. Travelling speed of the stacker depends on the the controllers parameter settings.

## f. Steering



The stacker can be equipped with Electric Power Steering (EPS) system. Be careful when operating the stacker with EPS system, as it is different to operate the stacker with EPS system and the stacker without EPS system.

Steer the stacker by moving the tiller to the left or right.



## g. Braking



THE BRAKING PERFORMANCE DEPENDS ON THE FLOOR CONDITIONS AND THE LOAD CONDITIONS OF THE STACKER.

The braking function can be activated in the following ways:

- By moving the accelerator (9) to '0' position or releasing the accelerator, the regenerative braking is activated and the stacker brakes until it stops.
- By directly moving the accelerator (9) from one driving direction to the opposite direction, the stacker regeneratively brakes until it starts travelling into the opposite direction.
- The stacker brakes when the tiller is operated up and down to the braking area ('B'). When the tiller is released, it will automatically move to the upper braking zone ('B'). And the stacker will brake until it stops.
- The safety (belly) button (8) prevents the operator from being crushed. If this button is activated, the stacker will slow down and/or start driving a certain distance backwards ('Bw.') and stop. If the tiller is in operating area and the stacker does not move, please consider that this button still works in this situation.

## h. Malfunctions

If there is any malfunction or the stacker is inoperable, please stop using the stacker and press the emergency button (18). If possible, please park the stacker in a safe area, turn the key counterclockwise and remove the key from the key switch (16). If it is a stacker with optional pin-code panel, please press the start button or press "X" button on the pin-code panel. Notify the manager immediately or contact your after-sales service personnel. If necessary, use dedicated towing/lifting equipment to move the stacker out of the operating area.

## **i. Emergency**

In an emergency or when the stacker turns over, keep a safe distance. If possible, press the emergency button (18), and all electrical functions will be stopped.

## **j. Pressure on drive wheel**



The stacker is equipped with a drive wheel pressure adjustment mechanism, and only the after-sales personnel of the company or the authorized personnel of the company are allowed to perform related operations. Otherwise, it may cause malfunctions to the stacker or injury to personnel.

## 7. PIN-CODE PANEL

The stacker can be equipped with an optional pin-code panel (5). Then a button (26) will replace the key switch (16) if the stacker is equipped with pin-code panel.

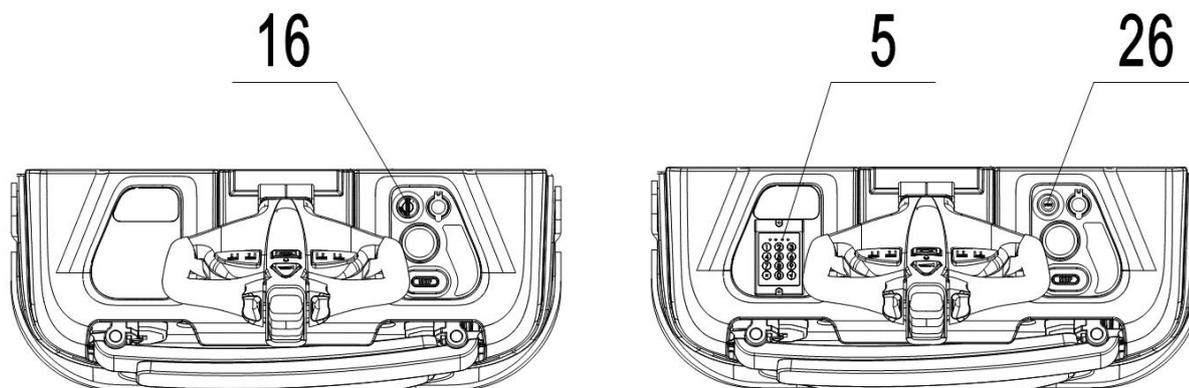


Fig.13: Pin-code panel

### a. Introduction

The pin-code panel is an electronic system for access device. Before entering the authorized password, the stacker will not be allowed to start. The main function is to prevent unauthorized personnel from operating the stacker. In addition to being easy to use, this product is also a great help to the security of the stacker.

### b. Main parameters

Working voltage: 12V-60V

Ambient temperature: -40°C to +90°C (-40°F to 194°F)

IP level: IP65

### c. Main functions

This pin-code panel supports up to 5 ID cards and 1 set of input password. The password consists of four numbers (0-9).



Please check the administrator password on the product instruction manual. Default user password is “1234”. Check the instruction manual for changing the password.

## d. Operation

### 1. ID card Access

Place the ID card close to the pin-code panel, there will be a short beep if it is a valid ID card, then the blue indicator light will be on, which indicates the pin-code panel works normally. The red indicator light will flash when the card is invalid and the stacker can't be used.

### 2. Password Access

- Enter the password, press "√" button. If the password is correct, the stacker can be operated.
- Press and release "×" button, and the stacker will shut down
- Enter the password again if you want to operate the stacker again.

## e. Pin-code panel indicators

Red indicator --- Fault code

Yellow indicator --- Waiting for instructions

Blue indicator --- Active status

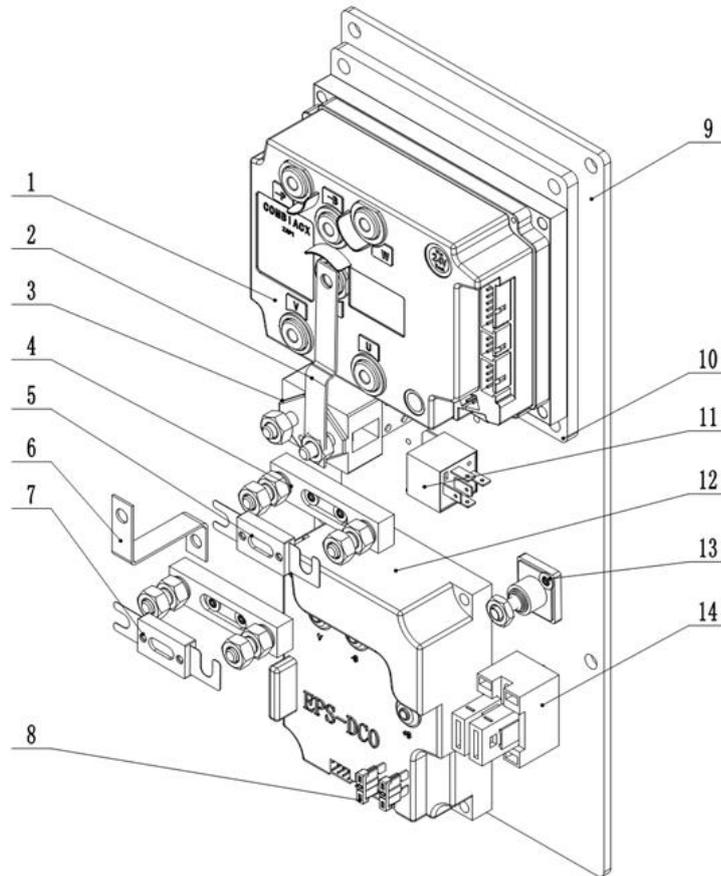
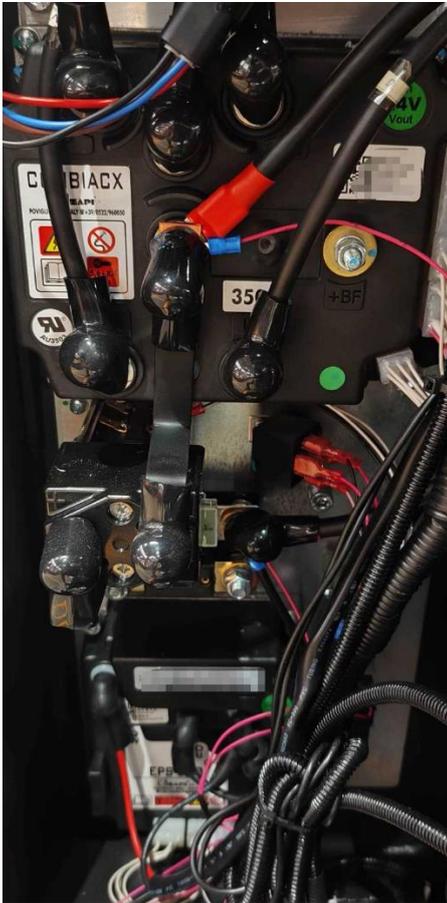
Green indicator --- Power on



## 8. Controllers and related devices

### a. Controller appearance

This section uses COMBIACX as an example. For details about other controllers, see the parts manual



No.	Item Description	Qty.
1	Controller	1
2	Copper Busbar	1
3	Contactor	1
4	Fuse Holder	2
5	Fuse	1
6	Copper Busbar	1
7	Fuse	1
8	Fuse	1
9	Mounting Plate	1
10	Plate	1
11	Relay	1
12	Controller	1
13	Fuse Holder	1
14	Fuse Holder	1

## b. WIRING/ CIRCUIT DIAGRAM

### b-1 Circuit diagram (ZAPI Manual steering)

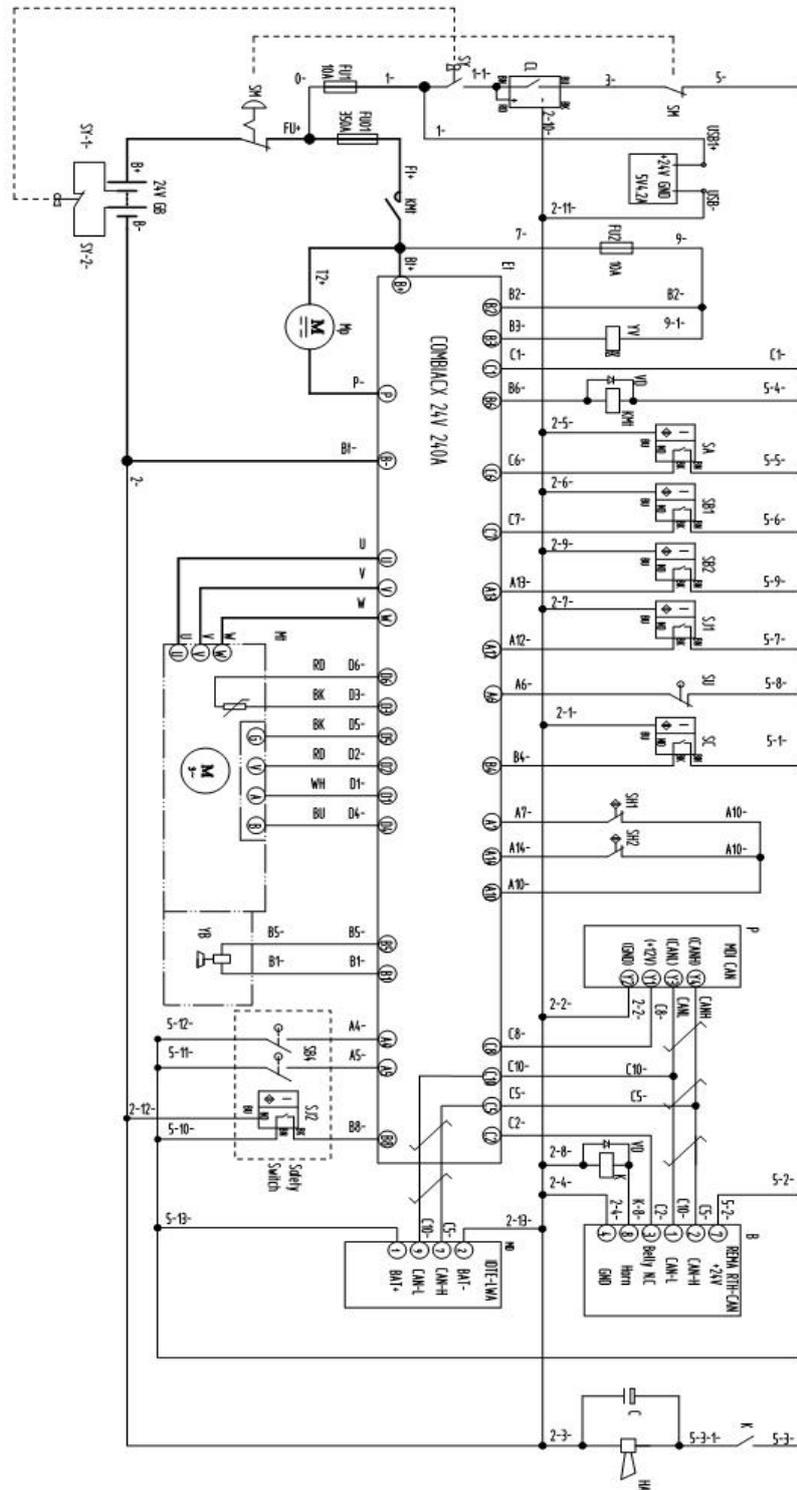


Fig.14: Circuit diagram for manual steering stacker with ZAPI controller

Table 3: Description of circuit diagram

Code	Item	Code	Item
GB	Battery	SA	Interlock switch
SM	Emergency switch	P	Battery indicator
FU01	80A fuse	B	Tiller
FU02	130A fuse	C	Capacitor
FU1	10A fuse	HA	Horn
FU2	0.5A fuse	SU	Microswitch
SY	Key switch	YV	Electromagnetic valve
KMt	Main contactor	VD	Diode
Et	Controller	SB	Guard switch
Mp	Pump motor	SJ	Foot switch
Mt	Traction motor	R	Resistor
YB	Electromagnetic brake	SC	Speed reduction on curves
K	Relay	LED	Light emitting diode
MD	Telematics module		

## b-2 Circuit diagram (ZAPI electric steering)

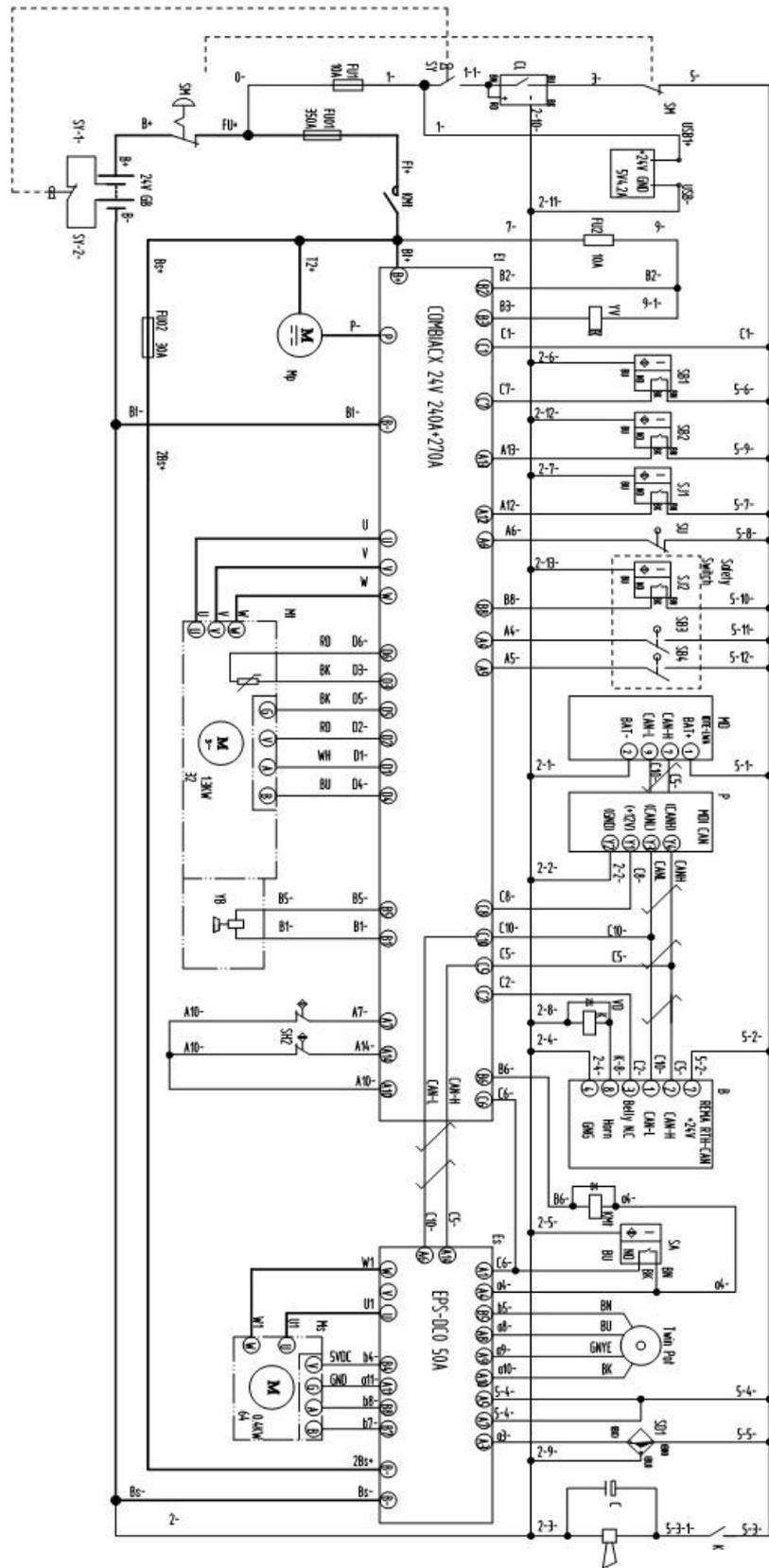


Fig. 15: Circuit diagram for EPS stacker with ZAPI controller

Table 4: Description of circuit diagram

Code	Item	Code	Item
GB	Battery	SA	Interlock switch
SM	Emergency switch	P	Battery indicator
FU01	80A fuse	B	Tiller
FU02	130A fuse	C	Capacitor
FU1	10A fuse	HA	Horn
FU2	0.5A fuse	SU	Microswitch
SY	Key switch	YV	Electromagnetic valve
KMt	Main contactor	VD	Diode
Et	Controller	SB	Guard switch
Mp	Pump motor	SJ	Foot switch
Mt	Traction motor	R	Resistor
YB	Electromagnetic brake	SC	Speed reduction on curves
K	Relay	LED	Light emitting diode
MD	Telematics module		

b-3 Circuit diagram (Qiantuo manual steering)

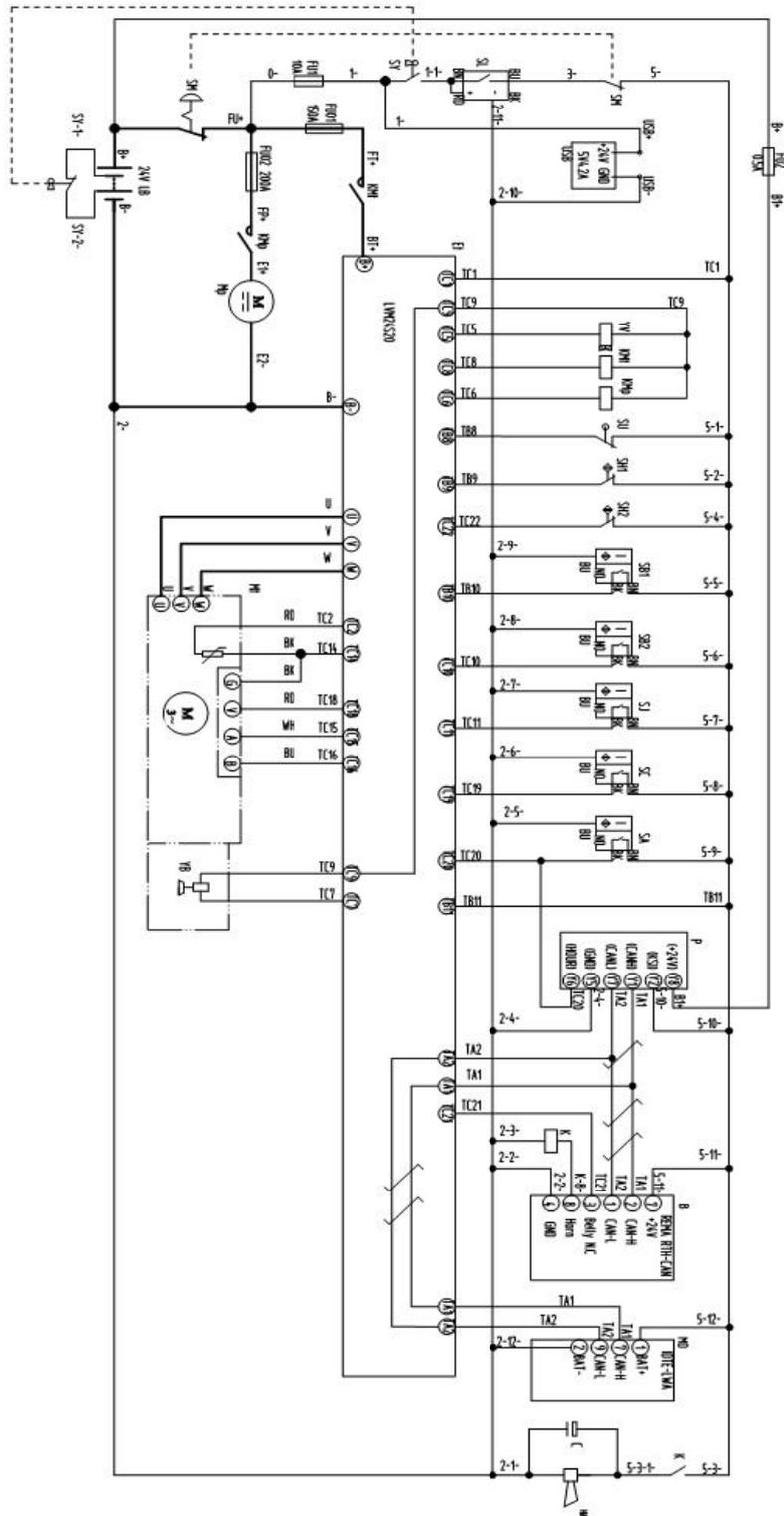


Fig.16: Circuit diagram for manual steering stacker with Qiantuo controller

Table 5: Description of circuit diagram

Code	Item	Code	Item
GB	Battery	SA	Interlock switch
SM	Emergency switch	P	Battery indicator
FU01	80A fuse	B	Tiller
FU02	130A fuse	C	Capacitor
FU1	10A fuse	HA	Horn
FU2	0.5A fuse	SU	Microswitch
SY	Key switch	YV	Electromagnetic valve
KMt	Main contactor	VD	Diode
Et	Controller	SB	Guard switch
Mp	Pump motor	SJ	Foot switch
Mt	Traction motor	R	Resistor
YB	Electromagnetic brake	SC	Speed reduction on curves
K	Relay	LED	Light emitting diode
MD	Telematics module	SL	Pin-code panel

b-4 Circuit diagram (Qiantuo electric steering)

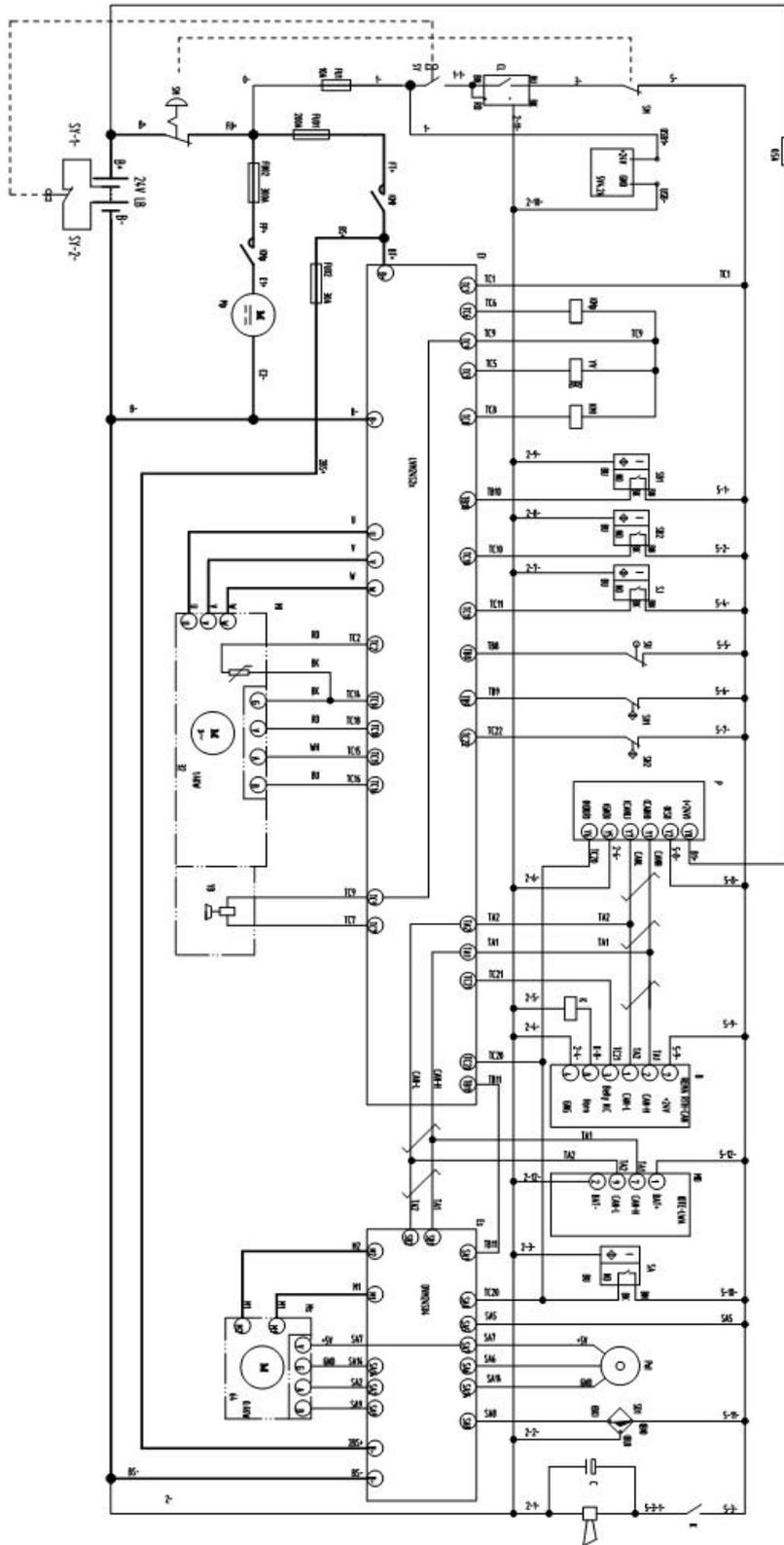


Fig. 17: Circuit diagram for EPS stacker with Qiantuo controller

Table 6: Description of circuit diagram

Code	Item	Code	Item
GB	Battery	SA	Interlock switch
SM	Emergency switch	P	Battery indicator
FU01	80A fuse	B	Tiller
FU02	130A fuse	C	Capacitor
FU1	10A fuse	HA	Horn
FU2	0.5A fuse	SU	Microswitch
SY	Key switch	YV	Electromagnetic valve
KMt	Main contactor	VD	Diode
Et	Controller	SB	Guard switch
Mp	Pump motor	SJ	Foot switch
Mt	Traction motor	R	Resistor
YB	Electromagnetic brake	SC	Speed reduction on curves
K	Relay	LED	Light emitting diode
MD	Telematics module	SL	Pin-code panel
SD1	Zero position switch	ES	Steering controller
Pot	Potentiometer		

## c. Test and troubleshoot

Fault codes can be viewed directly in the dashboard, or the current fault information can be viewed with a handheld programmer.



### Test

#### A. Controller

Measure the diode voltage of the AC MOSFET (ZAPI for example) circuit in the controller, and check whether it is burnt or damaged.

Each test item must be tested repeatedly for more than 3 times.

item	Multimeter		Normal range	
	Red pen	Black pen	Determination of polarity value	Resistance measurement
1	B+	U/V/W/B-		Over 1MΩ
2	B-	U/V/W		Over 1MΩ
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

- 1) Pull the multimeter to  $\Omega$  Turn the multimeter to diode (polarity measurement)
- 2) Remove the cables and wiring harness connected to the controller, and fully discharge the internal capacitor (with resistance 30)  $\Omega$ / 5W to discharge B + and b-terminals).
- 3) Use a multimeter to measure the voltage of the diode (0.3-0.6 V) and check whether it is normal.

Test 1: measure the diode voltage, red wire is B -, black wire is u, V and W.



Test 2: measure the diode voltage to U, V and W with red lead, and B + with black lead.



Note: The multimeter pointer cannot be reversed

### B. line contactor and fuse measurement



For line contactors and line fuses, connect an ohmmeter (multimeter set to Ohm) at the point shown in the figure and check that it measures the specified value.

## 9. BATTERY SAFETY, CHARGING AND REPLACEMENT

### a. Battery Safety



- Only qualified personnel is allowed to service or charge the batteries. The instructions of this handbook and from the battery manufacturer must be observed.
- Lead-acid batteries and lithium batteries are allowed.
- Be aware about the risk of accumulation of hydrogen under battery cover, keep it opened during charging.
- Recycling of batteries undergoes with national regulations. Please follow these regulations.
- By handling batteries, open fire is prohibited, gases may cause explosion!
- In the area of battery charging neither burning materials nor burning liquids are allowed. Smoking is prohibited and the area must be ventilated.
- Park the truck securely before starting charging or installing/changing the batteries
- Before finishing the maintenance work, make sure, that all cables are connected correctly and not disturbed towards other components of the truck.



LEAD-ACID TRACTION BATTERIES WITH LIQUID ELECTROLYTE AND LITHIUM BATTERIES ARE ALLOWED. THE WEIGHT OF THE BATTERIES HAS AN INFLUENCE TO THE TRUCKS OPERATING BEHAVIOR. PLEASE CONSIDER THE MAXIMUM OPERATING TEMPERATURE OF THE BATTERIES.

### b. Maintenance for lead-acid battery

Lead-acid battery terminals, cable terminals and battery caps must be fasten and clean, and properly grease these parts.

- For normal operation, add water once every 2 weeks; under high temperature or high intensity working conditions, add water once a week.
- Water should not exceed the maximum level.
- Better to add water in the last period of charging.
- Add deionized water (distilled water), do not add purified drinking water or acid liquid.
- Check details in the battery manual for other maintenance requirements.



The stacker can be equipped with optional aquamatic watering system. Please keep in mind the following important points:

### 1. Replenish water after charging

Electrolyte levels drop during discharge and rise during charge. In addition, charging generates heat, fluid expansion and explosive gases. Watering a battery before charge (or with a low charge level) can lead to boil over resulting in potential damage of the watering system, battery and stacker. Water must be added to a fully charged battery. Prior to charging, there must be sufficient water to cover the plates. If the battery has been discharged (partially or fully), the water level should still be above the plates.

### 2. Water replenishment interval

Watering intervals are dependent on the local climate, charging methods, application, and age of batteries. It is recommended for new batteries to be checked once a month and older batteries be checked weekly until you get a feel for your water consumption rate.

Typically for a heavy use application, watering a maximum of once per week is recommended, and for light use applications once per month. Do not water a battery that has been sitting for an extended period of time with no activity (non-use or not on charge) such as a battery that has sat idle over the weekend.

Water quality is important to maintain the life of your battery and watering system. Always use water that meets the quality requirements of your battery's manufacturer.

### 3. Operation

#### 1). Remove dust cover



Fig.14: Remove dust cover



Fig.15: Mate connector

#### 2). Mate connector

Insert the male connector on the single point watering system into the female connector on the end of the water supply.

#### 3) Observe flow indicator

As the cells fill, the red balls inside the flow indicator will spin. As the valves close, the balls will begin to spin slower until they come to a stop. This indicates that all valves have closed and filling is complete.



Fig.16: Observe flow indicator



Fig.17: Disconnect connector

#### 4) Disconnect connectors

When the red balls stop spinning, and not before, immediately disconnect the connectors by depressing the push button on the female connector.

 This system is still connected after the water is filled, which will cause water overflow. Disconnecting the connector before the red ball stops completely will cause the battery failed to be fully filled with water.

#### 5) Dust cover reset

Place dust cover back over the male connector and place feed tube on top of battery.



Fig.18: Replace dust cover

## c. Description of lithium-ion battery

- A lithium-ion battery is a type of battery with a rechargeable high-performance energy cell.
- The battery is designed for industrial vehicles and can withstand severe shocks and knocks.
- Batteries have special interfaces for charging and discharging to prevent the use of incorrect batteries and chargers.
- The battery has an intelligent battery management system, including voltage, temperature detection, under-voltage, overvoltage, over-temperature, overcurrent, short circuit and other safety functions.
- The internal resistance of the battery is very low, which minimizes heat generation and maximizes the available power of the car.

### Battery operating temperature range

- The best battery life is achieved when the battery is operated at +5°C to +40°C.
- Low temperatures will reduce the available capacity of the battery, and high temperatures will reduce the service life of the battery.
- The temperature difference between the two ends of the battery must not exceed 5 ° C.

### Battery charger

Use only approved battery chargers to charge lithium-ion batteries.

## Lithium-ion battery Decals

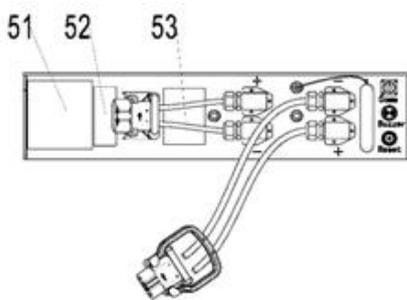


Figure 19: Battery label

Table 3: Battery Decals

Item	Description
51	Identification plate
52	Bar code and two-dimensional code
53	Warning Label

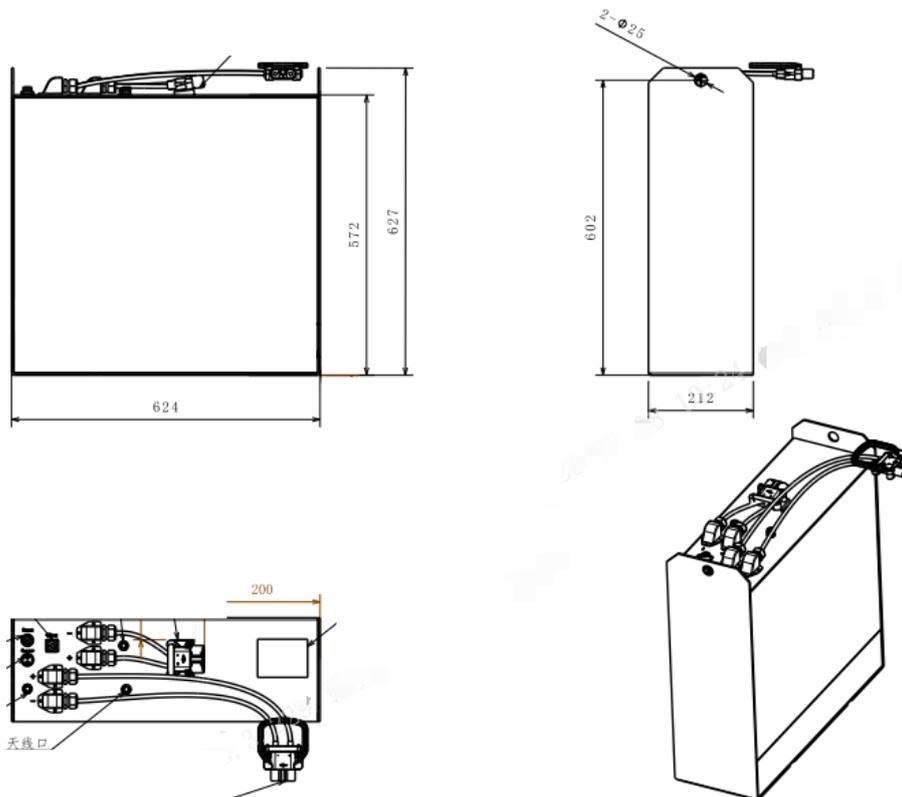
### Identification plate and Warning label

54	• LOGO	
55	• Model	xxx
56	• Nominal Voltage	xx V
57	• Rated Capacity	xx Ah
58	• Energy	xx kWh
59	• Weight	xx kg±xx kg
60	• HW REV	G-CH-FK-R
61	• TCP	xxx
62	• Serial No.	xxx
63	• Date of manufacture	20xx.*
64	• Manufacturer:	
65	• Address:	

Fig. 20: Identification plate

Table 4: Identification plate

Item	Description
54	Manufacturer trademark
55	Model designation
56	Rated voltage
57	Rated Capacity
58	Energy
59	Battery weight
60	Hardware revision
61	TCP
62	Serial No.
63	Production date
64	Battery manufacturer
65	Manufacturer's address



Outline diagram (24V 200Ah as an example)

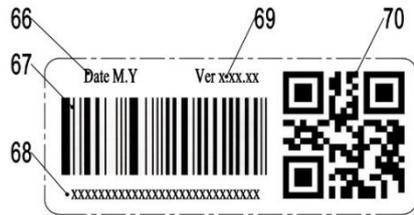


Fig. 21: Bar code and QR code

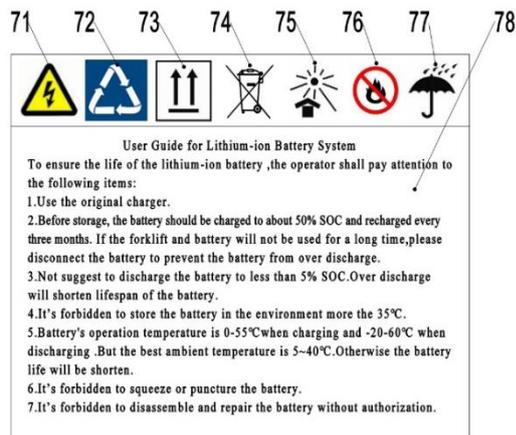


Fig. 22: Warning label

Table 5: Barcode and QR code

No.	Description
66	Production date
67	Battery information bar code
68	Bar code interpretation
69	Software version of battery
70	Battery information QR code

Table 6: Warning label

No.	Description
71	Electrical hazard marker
72	Rechargeable logo
73	Vertical upward packing,
74	No putting into ordinary garbage
75	No long-term exposure to
76	Stay away from fire
77	Keep out of the rain
78	Guide to use

## d. Safety Instructions, Warning Indications and other Notes

### Safety regulations for handling lithium-ion battery

Do not try to make any repairs or servicing of lithium battery



#### Risk of electric shock and burning

The battery's charging and discharging connectors have open terminals, avoid any body contacts, contamination or direct contacts with objects which can cause short circuit connection of terminals. Use necessary pre-cautions and protective caps to secure the open terminals. The connectors should be maintained in clean and dry conditions.



#### Use only batteries designed and approved by the manufacturer for the truck.

Do not try to modify or alter the battery.



#### Any damage or defects to the charger can result in accidents. Use only charger approved by the manufacturer of the truck, which is suitable for used battery

In case charger has any damages or defects, exclude the charger from operation and contact your service provider. Do not modify or try to repair the charger.

 Improper use of charger or use of wrong charger can cause damages to a battery or charger. Follow the required charger specifications; If the operation voltage of the charger is out of the applicable voltage range, the charger or battery may be damaged causing serious safety risks. The charger in use must be approved by the battery (truck) manufacturer.

Reversed connection of charging plug is prohibited. Follow the instruction for correct connection. For disconnection of charging plug use dedicated grip and never pull out the plug by means of cable.

Stop charging immediately if any abnormalities are detected, e.g. severe temperature increase, deformation of battery case, smoke, noise etc.

#### **Intermediate charging**

 Lithium batteries support so called opportunity charging. The lithium battery, which is not fully discharged can be charged in any time. However, frequent opportunity charging not to the full charging state and stop of charging process before the appearance of corresponding indication of charger may result in dis-balance voltage of cells which increases the battery BMS calculation error. In order to effectively deal with this phenomenon, charge the battery in full allowing the automotive balancing process to be completed at least once a week.

#### **Do not charge a fully charged battery**

 Note that in order to prevent the battery from continuing restart of charging under fully charged condition causing reduction of battery lifetime, the BMS has a protection function that prohibits recharging of fully charged battery. The charger will not work while battery is fully charged.

## **Potential hazards**

If equipment is used according to its design purpose, following the correct operations procedures, there are no hazards anticipated.

The following hazards can arise in the event of improper use:

- Physical damage to the battery in case a battery falls or is deformed through impacts. Mechanical damages can cause leakages of harmful materials, fire or battery explosion.
- Short circuits may be caused by connecting the two battery terminals, for instance caused by water or intentional/unintentional connections.
- Temperature damages caused by location of batteries in overheated locations or being exposed to impact of fire, open sunlight etc. can cause leakages of harmful materials, fire or battery explosion.

In order to avoid fire, explosion and leakage of harmful materials, a safe place for storing batteries until the service arrives on site must satisfy the following criteria:

- Do not store in places where personnel is located.
- Do not store in places with valuable objects and close to valuable objects.
- A Class D fire extinguisher must be available on demand.
- There should not be any fire or smoke detectors in the storage area in order to ensure that an automatic fire detection system is only activated in the event of actual danger (e.g. naked flames).
- No ventilation intake pipes should be in the facility to exclude spreading of discharged content within a building.

Examples of where to store a non-functional battery:

- Roofed outdoor position.
- Ventilated container.
- Covered fire resistant box with pressure and smoke discharge option.

## Symbols - Safety and Warnings

Table 7: Symbols - Safety and Warnings

	Caution! Battery short-circuit is prohibited.
	The battery can be recharged cyclically
	Vertical upward packing, transportation and use
	Used lithium-ion batteries must be treated as hazardous waste. Lithium-ion batteries marked with the recycling symbol and the sign showing a crossed-out waste bin must not be disposed of with ordinary household waste.
	Avoid fire and short circuits causing overheating. Do not ignite or locate batteries close to open flame, heat sources or sparks. Keep lithium-ion batteries away from heat sources.
	Protect the lithium-ion battery from solar radiation or other forms of heat radiation. Do not expose the lithium-ion battery to heat sources.
	Keep out of the rain.

### Explosion and fire hazard



Physical damage, thermal effects or incorrect storage in the event of a defect can result in explosions or fire. The battery materials can be flammable.

### Particular hazard from combustion products

The lithium batteries may be damaged by a fire. When extinguishing a lithium battery fire, the following information must be taken into consideration.

#### Contact with combustion products can be hazardous



Fire produces combustion products, which can occur in the form of smoke, through leaking fluids, escaping gases, debris as well decomposition products of certain chemicals. These combustion products are substances that enter the body through the respiratory tract and/or the skin can produce and adverse effects such as choking.

#### Avoid contact with combustion products.



Use protective equipment.

## Special firefighting protective equipment

Use self-contained breathing apparatus.

Wear protective equipment.

## Additional firefighting instructions

To prevent secondary fires, the lithium-ion battery must be cooled from the outside. Fluids or solids must never be directed into the lithium battery.

Suitable extinguishing agents

- Carbon dioxide extinguisher (CO<sub>2</sub>)
- Water (not on mechanically opened or damaged batteries)

Unsuitable extinguishing agents

- Foam
- Grease fire extinguishing agents
- Powder extinguishers
- Metal fire extinguishers (PM 12i extinguishers)
- Metal fire powder PL-9/78 (DIN EN 3SP-44/95)
- Dry sand

## Instructions for cooling an overheated, non-physically damaged battery

This type of damage may be caused by a short circuit inside the battery, which may result in leakage of harmful materials, fire or battery explosion.

## Material discharge

### Battery electrolyte fluid can be hazardous



Electrolyte fluid can be discharged if the battery is physically damaged. Avoid its contact with skin or eyes. If the contact happened:

- Rinse the affected parts with big amount of water and request for medical assistance immediately.
- In case of skin irritation or if any substances are breathed in request the medical assistance immediately.

## Precautionary measures for personnel

- Keep personnel away, avoid any contact with smoke or discharged materials.
- Block off the affected area and ensure its reasonable ventilation.
- Wear personal protective equipment. If vapors, dust or aerosols are presented use self-contained breathing apparatus.

## Precautionary measures for the environment

Do not allow spilled fluids to enter the water system, drainage system or the underground water.

## Cleaning measures

The leaked fluid must be removed professionally following the related protocols.

## Lithium Battery maintenance

The lithium-ion batteries are maintenance-free.

### Deep discharge can damage the battery

Self-discharge can cause the battery to fully discharged state. Full discharge shortens the service life of the battery and can cause deep discharge and activation of related safety protocols when battery will not be able to be charged anymore.

Before a long period of inactivity, the battery must be charged to 40%~60%.

Re-charge the battery at least every 12 weeks.

The temperature range for storing of the battery should be within the range of 0°C to 30°C.

If the battery is deeply discharged or if the battery temperature is below the permissible level, the battery will not charge. Deep discharged batteries can never be charged. Due to the risk of condensate formation, batteries that have been stored at 0°C or below must only be charged after natural warming up to at least +5°C, forced heating is forbidden.

## Instructions for safe handling

New lithium-ion battery is transported and stored with a charge status of at least <70 %.

- Do not modify the battery.
- Do not open, damage, drop, penetrate or deform the battery.
- Do not throw the battery into a fire.
- Protect the battery from overheating.
- Protect the battery from direct sun light.
- Follow storage and charging procedures

Failure to comply with these safety instructions can result in fire and explosion or the leakage of harmful materials.

## Pre-shift checks before the system is put into operation

Check that the battery is in its normal condition, has no evidence of damages, leakages, abnormal findings, e.g. high temperature, smell, smoke etc. The surface of the battery should be clean and dry, without evidence of water damages, marks of rust on terminals and housing (if applicable). Connecting cables and plugs are in good condition.

## Faults



If any damage is found to the battery or battery charger contact the service provider immediately.

Do not open the battery.

## **Disposal and transport of a lithium-ion battery**

### **Instructions for disposal**

Lithium-ion batteries must be disposed of in accordance with the relevant national environmental protection regulations. Batteries must be treated as hazardous waste. Batteries must not be disposed with ordinary waste.

### **Shipping information**

The lithium-ion battery is a hazardous material. The applicable regulations must be fulfilled during transportation.

### **Shipping functional battery**

Functioning battery can be shipped in accordance with the related regulations

### **Shipping faulty battery**

To transport faulty lithium-ion batteries, contact the service provider. Faulty lithium batteries require following of special transporting procedures.

## e. Charging the battery

### Display (807)



Fig.23: Display (807)

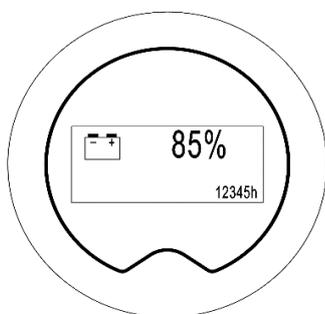
When the stacker is in normal condition, the display shows the battery charge;

- The battery icon and the state of battery charge (%) are shown on the screen.
- If stacker malfunctions, the fault code will be shown on the display with flashing red indicator;
- The second row of figures in the middle of the display shows the working hours of the stacker;

Table 8: Display symbols

	<p><b>Turtle Symbol</b></p> <p>It is normally off. It appears when the “slow travel mode” is active.</p>
	<p><b>Monkey Wrench Symbol</b></p> <p>It appears when scheduled maintenance is required or if fault code exists.</p>
	<p><b>Hourglass</b></p> <p>It is normally off. It flashes when the hour meter is active.</p>

### Display (D13L)



Battery discharged



Fault code alarm



Fig. 24: Display (D13L)

When the stacker is in normal condition, the state of battery charge is shown on the display screen, and the interface is in green. When the battery charge is less than 20%, the battery icon blinks.

- The number indicates the working hour of the stacker, the maximum is 5-digit number in hours;
- The battery icon and the state of battery charge (%) are shown on the screen.
- When the stacker is working normally, the display aperture is in green and the display is in home screen.
- When stacker malfunctions, the display aperture is in red, fault code(s) will be shown on the screen.

## Charging the Battery with External Charger

### Maintenance personnel

Batteries may only be charged, serviced or replaced by trained personnel. These operating instructions and the battery manufacturer's instructions must be observed when performing these operations.

Park the truck securely before carrying out any work on the batteries.

### General information

- The charging time depends on the battery charge status. The time it takes to charge an almost fully depleted battery depends both on the battery capacity and the charge current. The approximate duration can be calculated as follows:  
Charging time = capacity of battery / charge current of battery charger.
- The lithium-ion battery can also be used when not fully charged. In this case, the remaining operating time is reduced.

The battery temperature rises by approx. 13°C during charging. Battery charging should only start when the battery temperature is below 40°C. The battery temperature before charging should be at least 5°C.



- Before charging ensure that you are using an appropriate charger for charging the installed battery.
- The room, where you are charging, must be ventilated.
- The exact charge status can be only checked from the discharge indicator. To control the status, the charging must be interrupted and the truck must be started.
- Optional built-in charger can only be used with 110V or 220V.

The trucks are equipped with the following batteries:

Table 9: Available battery

Vehicle type	Battery type	Battery Capacity	Battery Weight	Max. dimensions
PS16NW	Lead-acid battery	3VBS-24V210Ah	185kg	752x172x657mm
	Lead-acid battery	3VBS-24V240Ah	210kg	752x172x657mm
	Lead-acid battery	3VBS-24V270Ah	230kg	752x172x657mm
	Li-battery	24V150Ah	72kg	752x172x657mm
	Li-battery	24V200Ah	81kg	752x172x657mm
PS20NW	Lead-acid battery	3PZS-24V270Ah	230kg	624x284x627mm
	Lead-acid battery	3PZS-24V350Ah	288kg	624x284x627mm
	Li-battery	24V200Ah	90kg	624x284x627mm

## Charging the battery

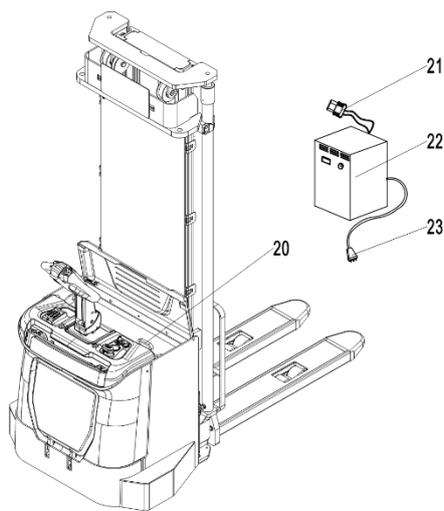


Fig. 25: Lead-acid battery charging

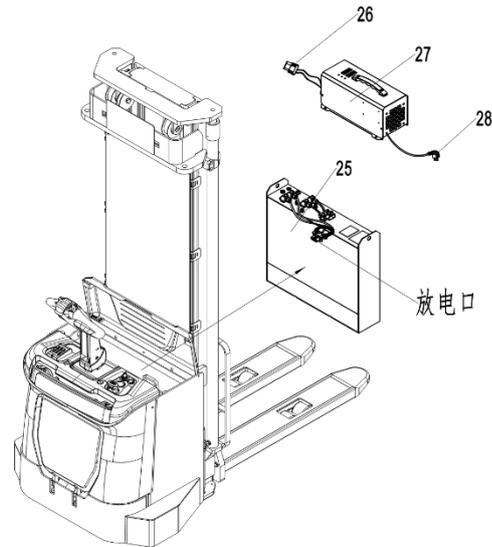


Fig.26: Li-battery charging

### Requirements

- The truck is parked securely.  
Lower the forks and remove the load, park the truck at a dedicated secured area with a dedicated power supply.
- The battery charger is approved for the battery type in use.

### Tools and Material Required

- Battery charger

### Procedure

#### Lead-acid battery charger

- Switch the truck off. Open the battery cover and let it stay upright.
- Pull out the battery plug(20) and connect it (20) to the charging plug of the charger(23).
- Then connect the main plug (21) of the battery charger to the power supply.
- The battery start being charged
- Once the battery is charged, disconnect the battery charger from the power supply before unplugging it from the battery.
- Connect the battery plug with the plug at the truck. Close the battery cover.

#### External Li-battery charger

- Switch the stacker off. Open the battery cover and let it stay upright.
- Connect the the battery plug(25) and the charging plug of the charger(29) .
- Then connect the main plug (28) of the battery charger to the power supply.
- The battery start being charged
- Once the battery is charged, disconnect the battery charger from the power supply.
- Close the battery cover.

The vehicles are equipped with the following chargers:

Table 10: Available external charger

Vehicle type	Battery type	Battery Specification	Charger specification
PS16NW	Lead-acid battery charger	3VBS-24V210Ah	24V/30A
	Lead-acid battery charger	3VBS-24V240Ah	24V/30A
	Lead-acid battery charger	3VBS-24V270Ah	24V/35A
	Li-battery charger	24V150Ah	24V/80A
	Li-battery charger	24V200Ah	24V/80A
PS20NW	Lead-acid battery charger	3PZS-24V270Ah	24V/35A
	Lead-acid battery charger	3PZS-24V350Ah	24V/45A
	Li-battery charger	24V150Ah	24V/80A
	Li-battery charger	24V200Ah	24V/80A

## f. Battery replacement

### PS 16/20NW without sideways battery

#### Requirements

- The truck is parked securely.
- Switch off the stacker. (by the key or start-button))
- The emergency disconnect switch(fig1.3) is actuated.

#### Procedure

- Open the battery cover and pull out its hinge. Then
- remove the battery cover.
- Pull out the battery plug (②).
- Take the battery out with a crane.

The installation is in the reverse order.

### PS 16/20NW with sideways battery (option)

#### Requirements

- The truck is parked securely.
- Switch off the stacker. (by the key or start-button))
- The emergency disconnect switch(fig1.3)
- is actuated.

#### Procedure

- Open the battery cover and let it stay upright.
- Disconnect battery plug (②)
- Pull out the lock pin (⑤), turn up the battery locker (⑥)
- Pull out the battery from side.

The installation is in the reverse order.

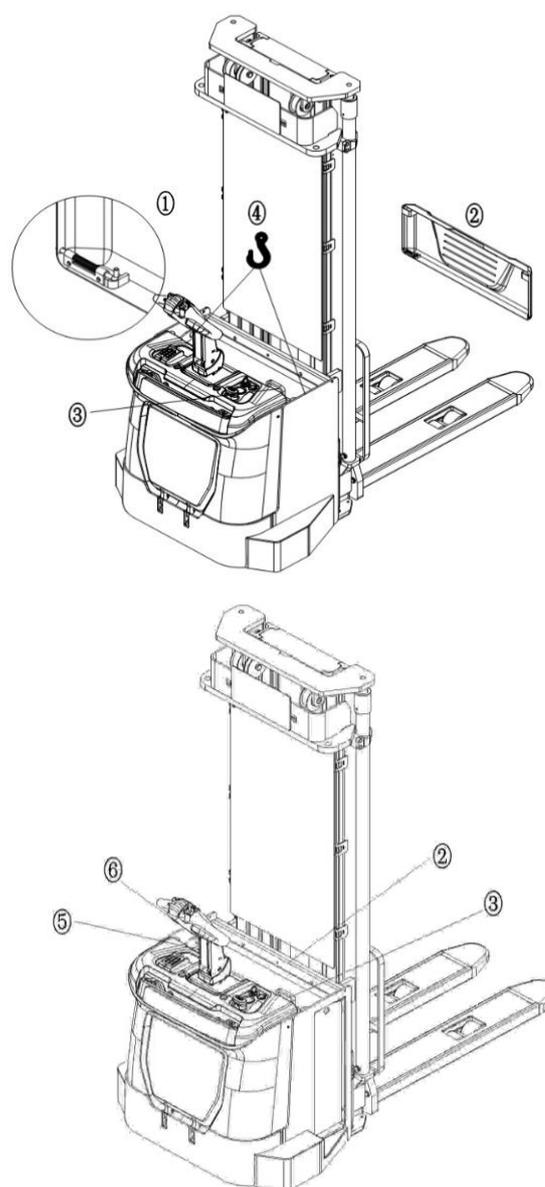


Fig.25: Battery replacement with sideways battery

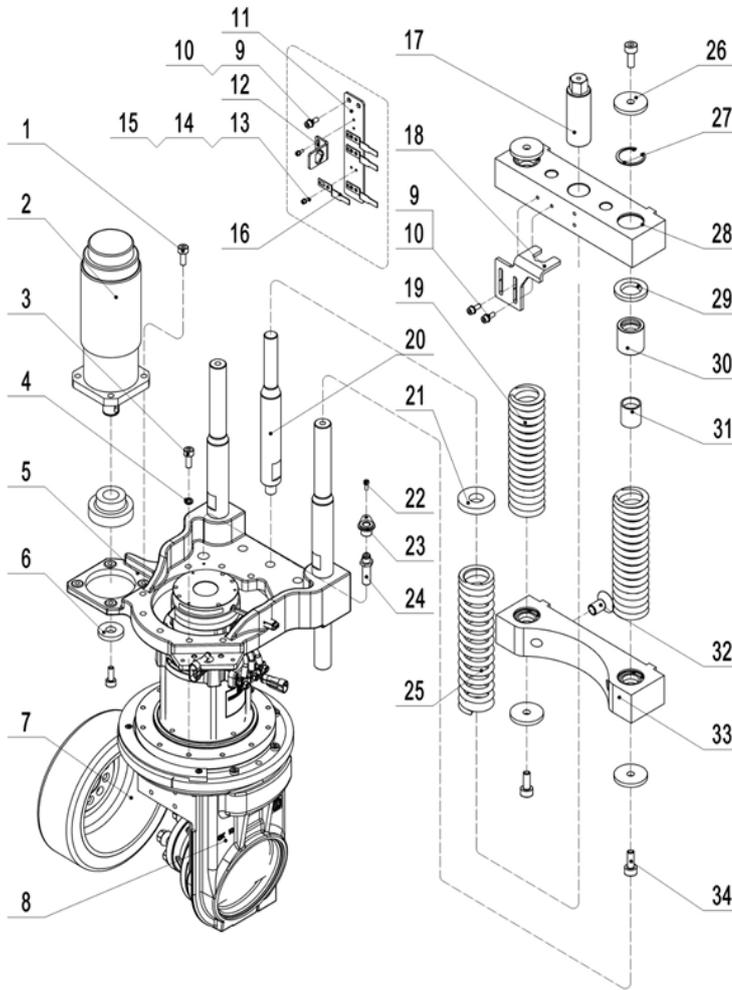
# 10. Drive/brake system

## a. Overview

The drive/brake system includes the following:

- 1) The drive motor controlled by the controller transmits the rotating power to the drive shaft (electric-mechanical power)
- 2) The drive shaft converts the rotational power transmitted from the drive motor through its gear set into the torque and speed suitable for the drive, and sends it to the corresponding wheels (mechanical power). They also contain service brakes, which are electromagnetic brakes controlled by a controller to generate braking power (friction).
- 3) The accelerator sends the CAN number to the drive motor controller to accelerate the motor (CAN signal)

a-1 Drive Unit (electric steering as for example)



No.	Item Description	Qty.	Note
1	Screw	5	
2	Motor	1	
3	Screw	9	
4	Spring Washer	9	
5	Wheel Mount	1	
6	Retaining Ring	1	
7	WheelΦ230x70	1	
8	Drive Unit	1	
9	Screw	4	
10	Flat Washer	4	
11	Mounting Plate	1	
12	Holder	1	
13	Screw	10	
14	Flat Washer	10	
15	Spring Washer	10	
16	Connector Holder	4	
17	Sleeve-stop	2	
18	Fixing Plate	1	
19	Spring	2	
20	Guide Rail	1	
21	Washer	1	
22	Screw	1	
23	Bushing	1	
24	Proximity Switch	1	
25	Spring	1	
26	Washer	4	
27	Circlip	4	
28	Fixing Plate	1	
29	Check Ring	4	
30	Mounting Base	4	
31	Bushing	4	
32	Screw M16x30	4	
33	Fixing Plate	1	
34	Screw M10x20	4	

## Operation

The drive motor operates when the following conditions are met:

- 1 Open the emergency stop switch, start the power supply, unlock the code lock, and power the vehicle.
2. Move the tiller to the operating area.
3. Determine the driving direction.
4. Twist the accelerator on the tiller.

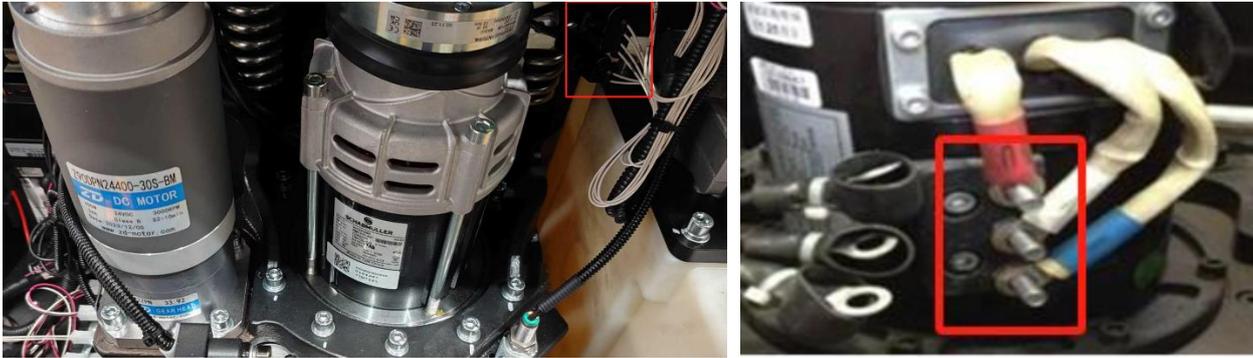
## a-2 Drive assembly and drive wheel disassemble and installation

### Preliminary steps

- 1 Park the vehicle safely and remove the electrical cover
- 2 Turn off the emergency stop switch and key switch
- 3 Disconnect the battery connector

### Disassembly procedure

- 1) Unplug the motor harness connector and remove the power cord



- 2) Then remove the screw connecting the motor and the car body, lift the car body, and the drive assembly can be removed from below



- 3) Move 5 screws fixing the PU rim with 17mm wrench, and then you can remove and replace it



- 4) Installation is the reverse process of disassembly

## b. Brake

### Appearance



### Brake removal and installation

Remove the 3 screws fixed on the drive motor with an Allen wrench and remove the dust-proof rubber sleeve to disassemble the brake.



Installation is the reverse process of disassembly

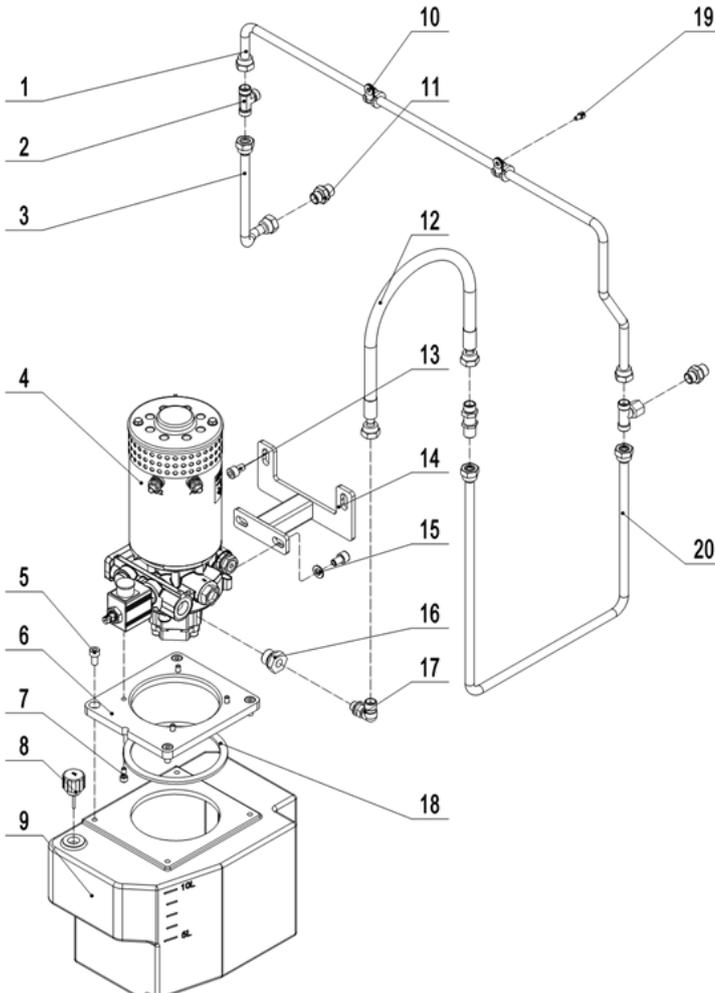


# 11. Hydraulic system

## a. Overview

The hydraulic system is composed of working oil pump, lifting cylinder and pipeline. Hydraulic oil is supplied by a pump directly connected to the motor. The pump sends the hydraulic pump to the cylinder.

### 1) Components



The hydraulic system uses pressurized hydraulic oil from the main hydraulic pump to operate the lifting cylinders and draw out the oil discharged from these cylinders.

1. The pump motor controlled by the controller drives the main hydraulic pump.
2. The main hydraulic pump uses the rotational force output from the motor to pressurize the oil in the hydraulic oil tank and deliver the oil to the lifting cylinder.
3. The hydraulic oil tank stores the hydraulic oil returned from the lifting cylinder. The stored oil is sucked by the main hydraulic pump for reuse.

## Hydraulic oil circulation

The hydraulic oil tank stores hydraulic oil, which is supplied to the main hydraulic pump through a filter. The main hydraulic pump pressurizes the supplied oil and sends it to the lifting cylinder.

When hydraulic oil is received, these systems perform their functions and then drain the waste oil to the tank through a return filter.

## 2) Test

The pump motor transmits power to the main hydraulic pump electrically to pump hydraulic oil to operate the hydraulic system.

The pump motor is connected to the controller through a motor contactor. The controller operates the pump motor contactor based on inputs from multiple switches and sensors and internal parameter settings.

When the following conditions are met, the pump motor runs:

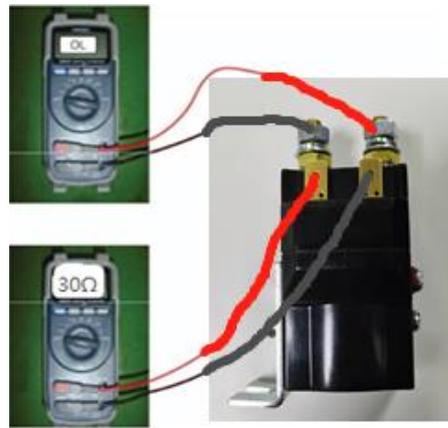
The key emergency stop switch is turned off.

The limit switch and the up button are closed.

Pump motor contactor suction

### Detection of pump motor contactor:

For the pump motor contactor, as shown in the figure, And check whether it measures the specified value.



#### ! DANGER:

Pressurizing the hydraulic oil can cause severe burns and even amputation infection. Before performing the following steps, make sure that the pressure has been released from the system

**The pressure of the safety valve has been adjusted before delivery, and the user is not allowed to adjust and disassemble.**

## b. Hydraulic circuit diagram

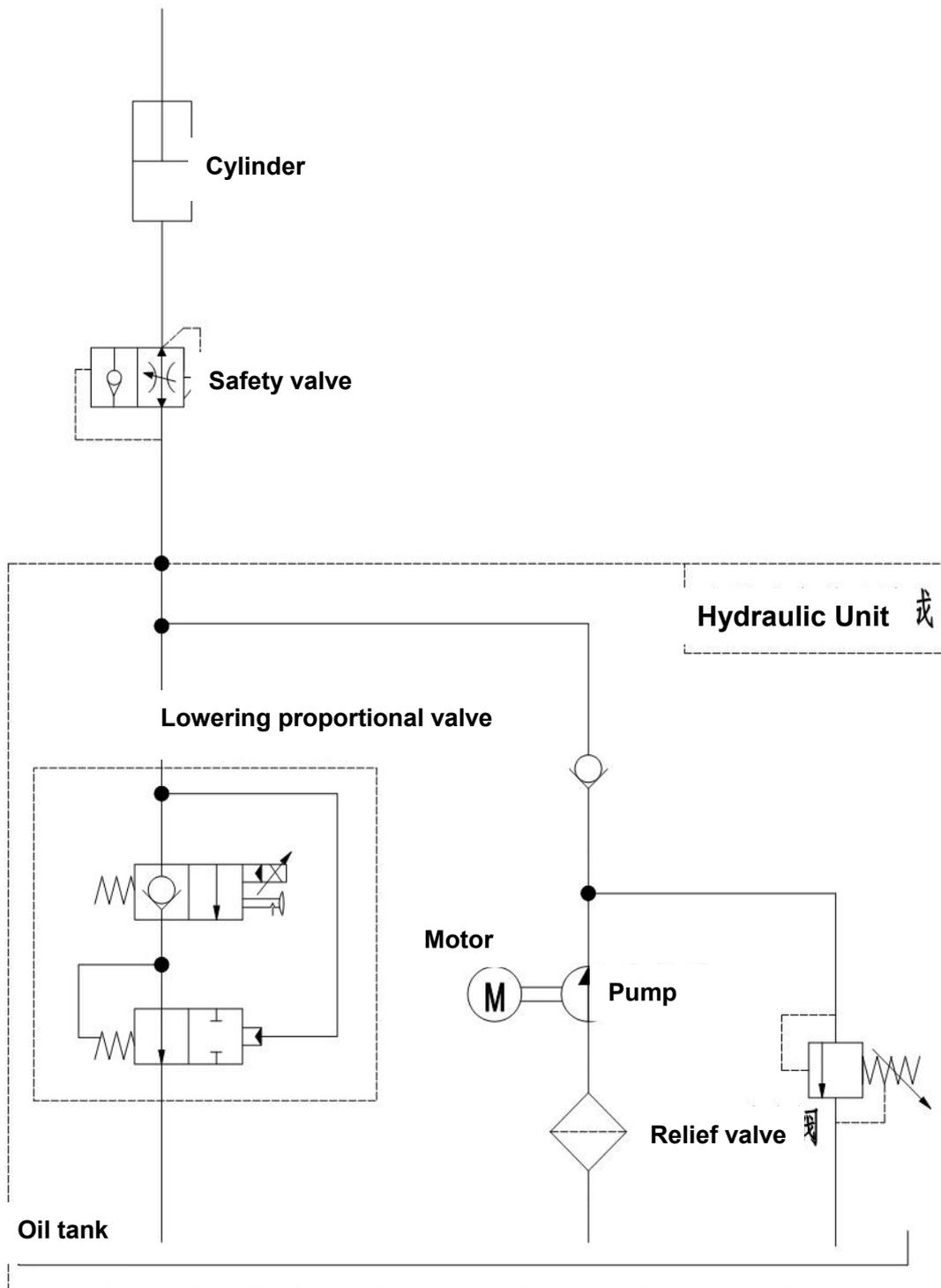


Fig. 27: Hydraulic diagram

## c. Troubleshooting

### Pump motor

Fault phenomenon	Possible reason
The hydraulic pump motor does not work	<p>Poor connection or blown fuse.            Check the battery connection.            Check the key fuse.            Check whether the hydraulic pump motor cause the fusing</p>
	<p>The key switch, upper limit switch, and line contactor are not closed.            Turn off the key switch. Use a multimeter to check the power flow through the key switch, line contactor coil and line contactor. The key switch must be turned off.</p>
	<p>The voltage is not enough.            Charge the battery or replace the battery. Check whether the cable terminals are tightly matched with the battery terminals and the control panel connector.            Check whether the wires inside the cable are broken.</p>
	<p>Incorrect operation of lifting and drive systems.</p>
	<p>During the battery charging operation, the battery is not fully charged.</p>
	<p>The hydraulic system consumes excessive battery power due to incorrect lifting or hydraulic control for the working cycle.</p>
	<p>The hydraulic pump motor is overheated. If the motor temperature reaches 155°C (311°F)</p>

## Hydraulic pump

Fault phenomenon	Possible reason
Noise in the pump	Oil level is low
	The oil is very thick (too viscous)
	Pump inlet line is limited
	Worn parts in the pump.
	Oil is very dirty
	Air leaked into the inlet pipeline
The oil temperature is too high	Oil level is low
	The oil duct is restricted
	The oil is too thin
	There is a leak in the system
	There is too much wear and tear on the pump
	The system operates under too much pressure
The pump shaft seal is leaking	The shaft seal has worn away
	Internal wear of pump body
	Operating at too low an oil level in the tank can cause suction on the seals
	During installation, the seal is cut at the shoulder of the pump or keyway.
	Seal lips are dry and hardened by heat.
The pump is unable to move fluid	The oil content in the tank is low
	Pump inlet line is limited
	There is a leak in the pump inlet line. Loose bolts. Defects in inlet line of bay
	The viscosity of the oil is wrong
	There is too much wear and tear on the pump
	Pump shaft failure
	The pump bolt does not have the correct torque

## 12. REGULAR MAINTENANCE



- Only qualified and trained personnel is allowed to do maintenance on this stacker.
- Before maintaining, remove the load and lower the forks to the lowest position.
- If you need to lift the stacker, follow chapter 4 b by using designated lashing or jacking equipment. Before working, put safety devices (for instance designated lift jacks, wedges or wooden blocks) under the stacker to protect against accidental lowering, movement or slipping.
- Please pay attention by maintain the tiller arm, platform or protective arms. The gas pressure springs are pre-loaded by compression. Carelessness can cause injury.
- Use approved and from your dealer released original spare parts.
- Please consider that oil leakage of hydraulic fluid can cause failures and accidents.
- It is allowed to adjust the pressure valve only from trained service technicians.

If you need to change the wheels call your service partner as the procedure requires use of special lifting equipment and needs to be performed by trained personnel. The castors must be round and they should have no abnormal abrasion.

Check the items emphasized maintenance checklist.

### a. Maintenance checklist

Table 11: Maintenance checklist		Interval (Month)			
		1	3	6	12
	Hydraulic				
1	Check the hydraulic cylinder, piston for damage noise and leakage		•		
2	Check the hydraulic joints and hose for damage and leakage		•		
3	Inspect the hydraulic oil level, refill if necessary		•		
4	Refill the hydraulic oil ( 12 month or 1500 working hours)				•
5	Check and adjust the function of the pressure valve (1600/2000 kg +0/ +10%)				•
	Mechanical system				
6	Inspect the forks for deformation and cracks		•		
7	Check the chassis for deformation and cracks		•		
8	Check if all screws are fixed		•		
9	Check mast and chain for corrosion, deformation or damages, replace if necessary	•			
10	Check the gearbox for noise and leakage		•		
11	Check the wheels for deformation and damages, replace if necessary		•		
12	Lubricate the steering bearing				•
13	Inspect and lubricate the pivot points		•		
14	Lubricate the grease nipples	•			
15	Replace the guarding and/or protective screen if it is damaged	•			
	Electric system				
16	Inspect the electric wiring for damage		•		
17	Check the electric connections and terminals		•		

18	Test the Emergency switch function		•		
19	Check the electric drive motor for noise and damages		•		
20	Test the display		•		
21	Check if correct fuses are used, if necessary replace		•		
22	Test the audio warning signal		•		
23	Check the contactors		•		
24	Check the frame leakage (insulation test)		•		
25	Check function and wear of the accelerator		•		
26	Check the electrical system of the drive motor		•		
Braking system					
27	Check brake performance, if necessary replace the brake disc or adjust the air gap		•		
Battery					
28	Check the battery voltage		•		
29	Clean and grease the terminals and check for corrosion and damage		•		
30	Check the battery housing for damages		•		
Charger					
31	Check the main power cable for damages			•	
32	Check the start-up protection during charging			•	
Function					
33	Test the audio warning signal	•			
34	Check the air gap of the electromagnetic brake	•			
35	Test the emergency braking	•			
36	Test the reverse and regenerative braking	•			
37	Test the safety (belly) button function	•			
38	Check the steering function	•			
39	Check the lifting and lowering function	•			
40	Check the tiller arm switch function	•			
41	Test the key switch of damages and function	•			
42	Test the speed limitation switch (lifting height >~300mm)	•			
General					
43	Check labels for legibility, completeness and plausibility	•			
44	Check if the protective screen and or guarding is not damaged	•			
45	Inspect the castor, adjust the height or replace it, if worn out		•		
46	Carry out a test run	•			

## b. Lubrication points

Lubricate the marked points according to the maintenance checklist. The required grease specification is: DIN 51825, standard grease

- 1 Load roller bearing
- 2 Mast
- 3 Chain
- 4 Hydraulic system
- 5 Steering bearing
- 6 Platform rotating part

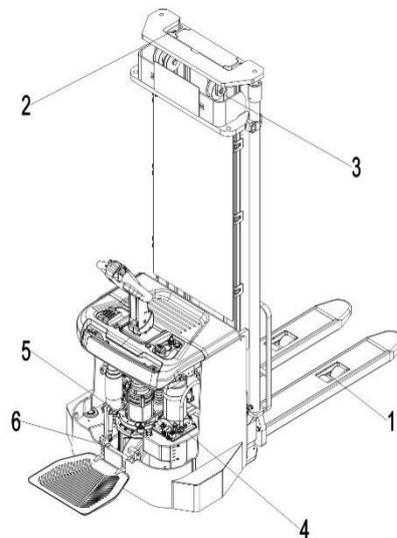


Fig. 28: Lubricating points

## c. Check and refill hydraulic oil

It is recommended to use hydraulic oil in connection with temperature:

Environment temperature	-5°C~25°C	>25°C
Type	HVLP 32, DIN 51524	HLP 46, DIN 51524
Viscosity	28.8-35.2	41.4 - 47
Amount	9.4L (depends on model of the stacker)	

Waste material like oil, used batteries or other must be probably disposed and recycled according to the national regulations and if necessary brought to a recycling company.

The oil level height shall be in the not lifted position min. 9.3L to 9.5L.

If necessary add oil at the filling point.

## d. Checking electrical fuses

Remove the main cover. The fuses are located according to Fig. 29;  
Check the specification in table 12.

Table 12: Specification of the fuses

	Specification	Controller
FU01	350A	ZAPI controller
	200A	QT controller
FU02	30A	ZAPI steering controller
	150A	QT controller
FU03	30A	QT steering controller
FU1	10A	
FU2	0.5A	QT controller

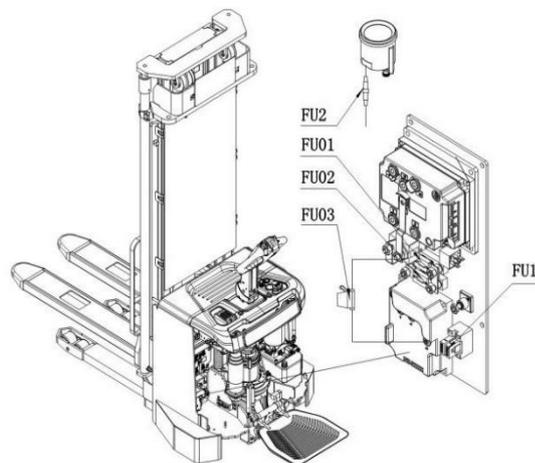


Fig. 29: Location of fuses

## e. Removing and reattaching the protection screen



**DO NOT USE THIS STACKER IF THE PROTECTION SCREEN IS DAMAGED OR NOT CORRECTLY ASSEMBLED!**

If the protection screen/mesh needs to be removed, remove the fixing clamps carefully. For reattaching, place the screen/mesh to correct position and assemble the holding clamps to the original position properly. If you need to replace parts, please call the service nearby. Please make sure that the screen/mesh is fixed correctly and it is not damaged.

## 13. TROUBLE SHOOTING



If the stacker has malfunctions, follow the instructions mentioned in chapter 6.

Table 13: Trouble shooting

TROUBLE	POSSIBLE CAUSE	REPAIR
Load can't be lifted	Load weight is too heavy	Lift the load less than the maximum capacity marked on the ID-plate.
	Battery is discharged	Charge the battery.
	Defective lifting fuse	Check and eventually replace the lifting fuse.
	Hydraulic oil level too low	Check and eventually refill hydraulic oil.
	Oil leakage	Repair the hoses and/or the sealing of the cylinder.
	Lifting inoperable at 1800mm	Retract the protection arms.
	Lifting inoperable at 1800mm	Check the sensors for the protection arms.
	Defective height sensor at 1800mm	Check the height sensor on the mast.
Oil leakage from air breathing	Excessive quantity of oil	Reduce oil quantity.
Stacker inoperable	Battery is charging	Charge the battery completely and then disconnect main power plug from socket.
	Battery disconnected	Connect the battery correctly.
	Defective fuse	Check and eventually replace fuses.
	Battery discharged	Charge the battery.
	Emergency switch is activated	Deactivate the emergency switch.
	Tiller in operating zone	Move the tiller firstly to braking zone.
	Protection arms are open and platform is folded	Retract the protection arms.
	Either the foldable platform or the protection arm is in correct position	Check the proximity sensors on the protection arms and the platform.
	Neither the protection arms nor the foldable platform is in wrong position	Check the conditions of the protection arms and/or the platform.
Travelling in one direction only	Defective accelerators and connectors	Check the accelerators and the connectors.
Travelling very slowly	Discharged battery	Check the display for state of charge of battery.
	Activated electromagnetic brake	Check the electromagnetic brake.
	Disconnected or damaged cables on the tiller	Check the cables and connections.
	Defective sensor, reduced speed at 300mm height	Check the sensor.
	Electric system is overheated	Stop operation and cool down the stacker.
	Defective heat sensor	Check the sensor and replace it if necessary.
Starting accidentally	Defective controller	Replace the controller.
	The accelerator failed to move back to its neutral position.	Repair or replace the accelerator.
Slipping or shaking	Pressure on drive wheel is too large or too small.	Adjust the drive wheel pressure.

If the stacker has malfunctions and can't be operated out of the working zone, jack the stacker up, place a load handler under the stacker and make sure about the security of the stacker. Then move the stacker out of the aisle.

## 14. The ZAPI handheld console

### a. The use of ZAPI handheld console

#### The power supply

In the battery car, the traction battery can be used as the power supply voltage for the handheld programmer. For lead-acid batteries, the nominal battery voltage is 12V-80V.



***For batteries with a nominal voltage greater than 80V, the intelligent controller can be powered by internal batteries. Do not connect the source voltage beyond the maximum rating or the controller will be damaged!***

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#### 1) Handheld programmer turns on

2) Connect the wire harness to the ZAPI handheld programmer CNX connector. Figure 1 shows the wire Harness

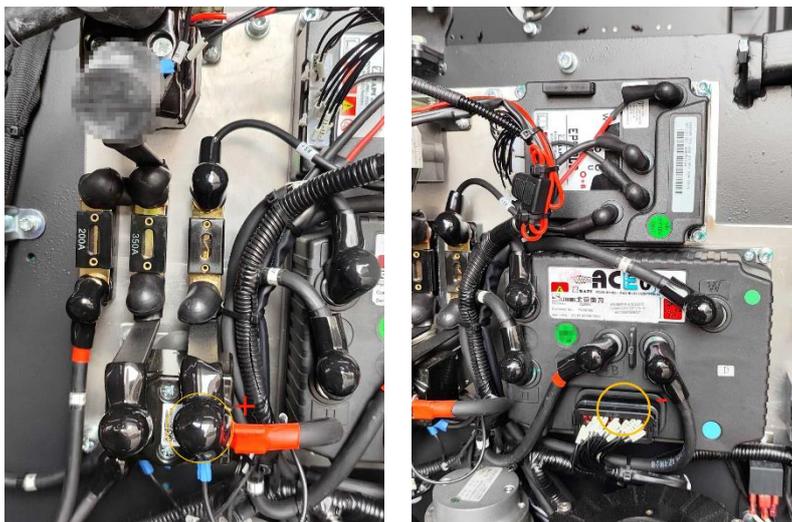


3) Emergency side screw to avoid accidental disconnection

4) CONNECT the ZAPI manual programmer wire harness TO the vehicle CAN line (CONNECT TO) You CAN insert the connector before opening the vehicle or when the vehicle is already running.



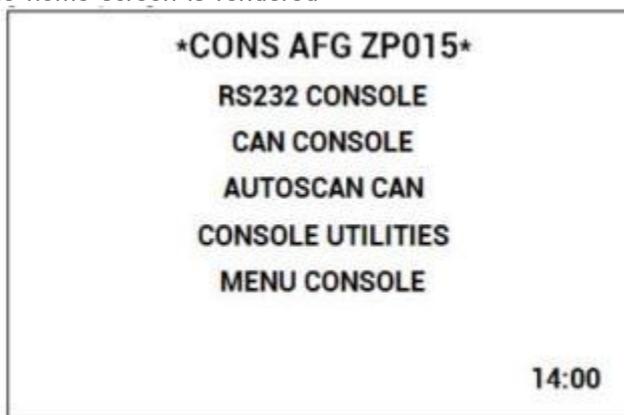
5) Cable red crocodile clipping vehicle power positive pole, black crocodile clipping vehicle power negative pole.



6) Once the CNX8 voltage is available, the ZAPI manual programmer opens and the home screen appears. The handheld programmer CAN connect to the ZAPI controller inside the CAN line

### The main screen

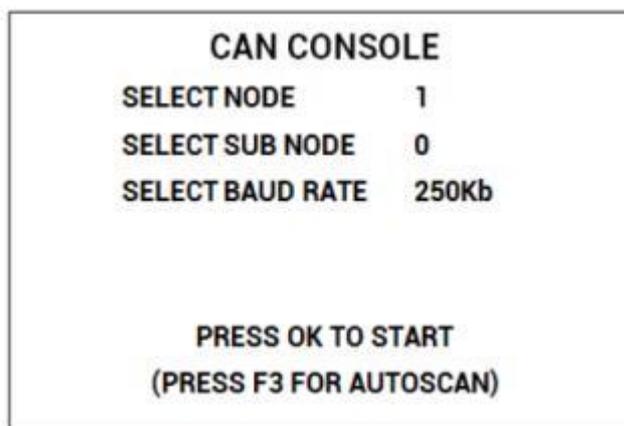
When the ZAPI logo appears, the home screen is rendered



In addition, the green LED must be turned on and kept bright.

### Connection methods: CAN CONSOLE

Select CAN CONSOLE and press OK: a new menu will appear.



New menu requests CAN node and child node connections: the current value appears on the right. The third line requests the connection speed.

Use the up/down keys to move between rows and the left/right keys to change the value of each item.

Once the correct value is set, press OK to try to communicate with the node/child node.

**SELECT NODE 2 Is the connection point of the traction controller.**

**SELECT NODE 6 Is the connection point of the electric steering controller (If the vehicle with EPS)**

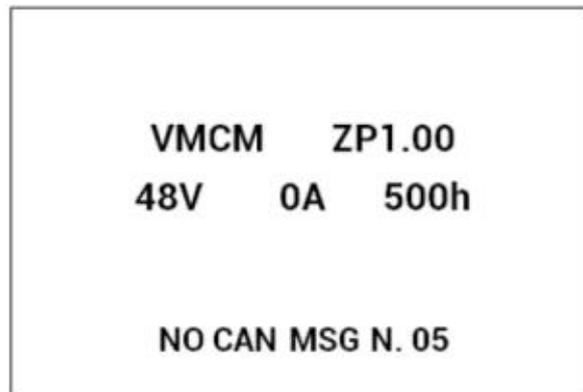


*Press ESC to abort connection attempts at any time.*

If the connection fails, a "no communication" warning will appear: press the ESC key to find the reason for blocking the connection

### The connected

If the connection is successful, the monitor will display an image similar to the following.



This menu presents basic information about the controller in a manner similar to that of a super controller.

- The first line describes the controller firmware
- The second line presents the controller voltage, current, and hour meter
- The last line shows the current alarm code, (if any)

Press OK to enter the main menu



The main menu includes a complete list of menus available to the controller. In contrast to the super controller, only the controller has no "hide" menu, which requires pressing multiple buttons immediately to reach: all menus are now visible.

Use the up and down keys to browse the list: Press OK when you find the menu you want.

### Change the parameters

Go to the parameter change menu from the main menu.

PARAMETER CHANGE	
ACCELER DELAY	1.0
E. ACCELER. DELAY	1.5
SPEED LIMIT BRK	2.2
E. SPD. LIMIT BRK	2.2
RELEASE BRAKING	4
E. RELEASE BRAKING	2.5
CURVE BRAKING	3

Use up and down keys to scroll through the list: Once the parameter you want to change is selected, use left or right to reduce or increase the value of the parameter.

---

Press left/right to change the value repeatedly.



Automatic repetition: This feature will speed up the program if many parameter values have to be changed.

You can press ESC to exit the menu at any time. If some parameters have been changed, the controller prompts the request to confirm/remove the changes.

PARAMETER CHANGE	
ACCELER DELAY	1.0
E.	
S	
E.	
R	
E. RELEASE BRAKING	2.5
CURVE BRAKING	3

**APPLY CHANGES?**

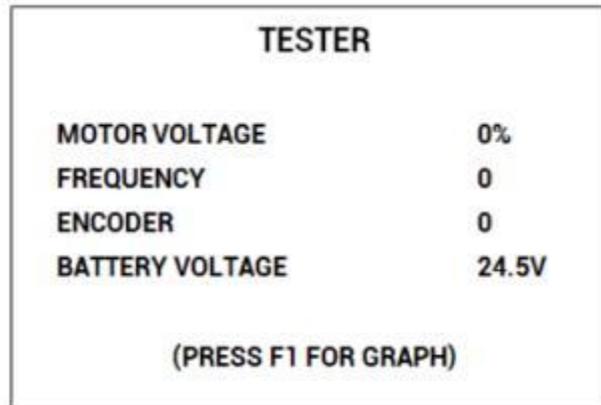
YES=OK      NO=ESC



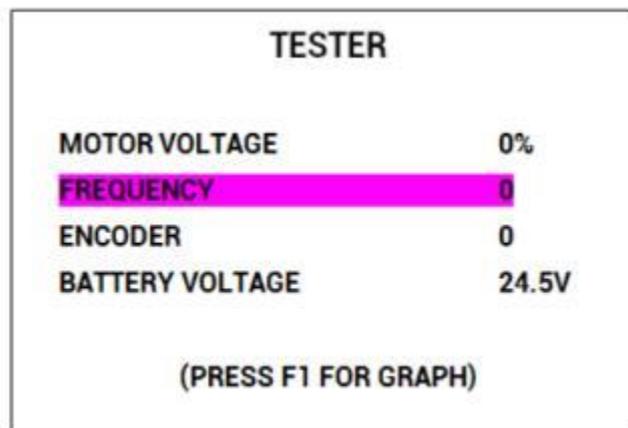
*The above descriptions are valid for every menu that contains parameters and options such as setup options, adjustments, hardware settings, etc.*

## Monitoring menu

The monitoring menu has changed significantly compared to the standard handheld. Immediately display four variables: scroll the menu as usual using the up/down key.

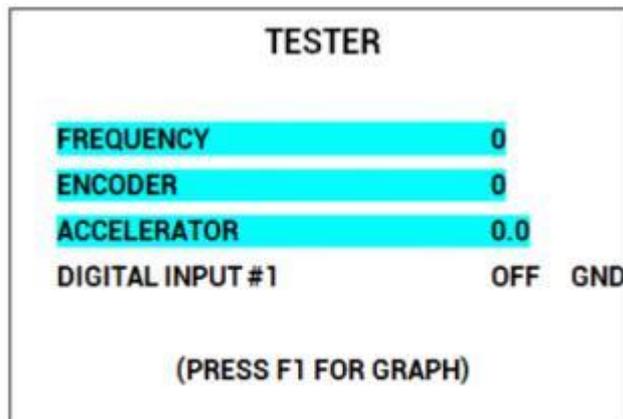


A variable may be "stuck" and it will keep scrolling. Once the desired variable is selected, right-click: it will be selected in a different color.



Once Start scrolling up or down again, and the "stuck" variable will appear on the top first line: From now on, it will no longer move, but will update the current value as usual. "Stuck: variables will be highlighted in light blue.

The block program can be repeated up to three times, so that three variables are fixed on the screen as the fourth variable scrolls. See the following example



In this way, it is possible to record four variables that are far apart from each other in the full list in a single view.



Press the left button to "unlock" the last locked variable. Pressing the left button up to three times will unlock all variables.

Press ESC to return to the main menu.

Note that pressing the F1 key activates the time-exceeded graphical representation of the selected variable.

---



The graphics tester is not fully functional: it will be activated in future firmware.

---

## Alarm

The alarm menu is different from the older handheld programmers. The display immediately renders all alarms of the controller.

ALARMS	
NO CAN MESSAGE	10h
INCORRECT START	2h
NONE	0h
NONE	0h
NONE	0h
F1 TO CLEAR LOGBOOK	



*The maximum number of alarm codes stored in the controller is 5.*

---

Use different colors to distinguish between recurrent alarm codes and rare events. In order of alarm names according to the increased frequency:

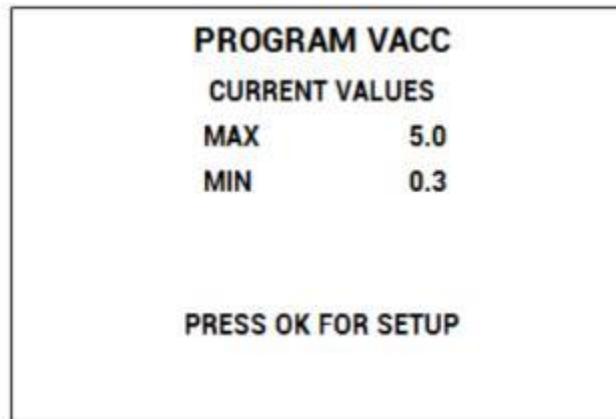
- White: up to 5 events
- Yellow: up to 20,
- Orange: Up to 40,
- Red: greater than 40.

Use the up/down key to select an alarm in the list: If you press OK, other information about the alarm will be displayed.

Press F1 to delete the controller alarm log: When the key is pressed, the controller will request confirmation.

## Program VACC

The program VACC menu has changed slightly compared to the old controller. Upon entering this menu, the controller renders the current set value.



When you press OK, the VACC program will start: The controller will invite you to:

- Select the start switch, if any
- Select direction switch (forward or backward)
- Press and hold the pedal until it reaches its maximum range.

The display value changes with the input of the operator.

*The above sequence can be changed slightly depending on the controller firmware. However, the logic remains consistent: before setting the minimum/maximum, perform any necessary start sequence, and then press the pedal/push lever.*

When ESC is pressed, the controller asks to store or delete the set value.

### End connections

Return to the home screen to end the connection: at this point, the cable may be removed from the target controller. If the cable is removed from another menu, the controller will return to a no communication alarm state.

### Controller shutdown

Once the cable is removed, the controller will automatically shut down.

## b. Trouble shooting for ZAPI system (COMBIACX+EPS-DC0)

### Troubleshooting for COMBIACX

No.	MDI CODE	CAN CODE	ALARM	Solution	Source
1	0	200	TEACH ERROR		COMBIACX
2	0	201	END TEACH OK		COMBIACX
3	0	202	END TEACH ERROR		COMBIACX
4	0	228	TILLER OPEN	When the handle input switch is disconnected, after a while, about 30S, the main contactor is disconnected and a warning is given. The next time you run the warning, the warning will disappear.	COMBIACX
5	0	247	DATA ACQUISITION	This fault is activated to prove that it is in the data fetch phase, please wait for the data fetch to complete.	COMBIACX
6	0	249	CHECK UP NEEDED	When the maintenance time is up, it needs to be overhauled,	COMBIACX
7	8	8	WATCH DOG	On startup, the watchdog circuit is activated before the software starts. In the spare or The watchdog signal is invalid when it is running (alarm state). Failure analysis: The watchdog hardware circuit or microcontroller output part is broken Bad. In both cases, it is not related to external parts, replacing the controller.	COMBIACX
8	8	221	FLASH CHECKSUM	When the key is turned on, the program has a positive value in the flash memory, or a negative value if it is negative A fault signal is generated. Failure Analysis: The problem is with the microcontroller's flash memory. Flash memory may have been has been corrupted, or the stored program has been corrupted. Try setting it up again Logic card program. If the fault persists, the fault exists in the microcontroller in the maker. Replace the controller.	COMBIACX

9	8	231	WATCH DOG#2	Cause: On startup, the watchdog circuit is activated before the software starts. at The watchdog signal is invalid when in standby or running state (alarm state). Failure analysis: The watchdog hardware circuit or microcontroller output part is broken bad. In both cases, it is not related to the external parts to replace the controller.	COMBIACX
10	10	212	WRONG RAM	An error was found when performing a test on the main memory: the registered address is "DIRTY", which limits the vehicle's maneuverability. Failure analysis: turn off the key switch and then turn it on, if the fault is still there, change the controller.	COMBIACX
11	11	211	STALL ROTOR	1. The motor stops. 2. Motor encoder failure. 3. The wiring harness is damaged or the wiring is wrong. 4. There is a problem with the power supply of the encoder.	COMBIACX
12	12	239	CONTROLLER MISM.		COMBIACX
13	13	208	EEPROM KO	The vehicle cannot walk, the storage area of the parameters has problems, and the fault causes the vehicle to stop working. If the fault still exists after repeatedly closing the electric lock, replace the logic card. If the failure disappears, the original stored parameter is replaced by the wrong parameter, which needs to be reset.	COMBIACX
14	13	209	PARAM RESTORE	Just walk the vehicle, this fault is eliminated.	COMBIACX
15	17	17	LOGIC FAILURE #3	The logic card current protection function is faulty. The controller should be replaced.	COMBIACX
16	21	195	BMS HIGH TEMP.		COMBIACX
17	22	190	RESET A14 SENSOR	Press the down switch, turn the a14 switch off and close again, or use the magnet to pass through the a14 switch from the top to the bottom.	COMBIACX
18	22	230	RESET A7 SENSOR	Press the down switch, turn the a7 switch off and close again, or use the magnet to pass through the a7 switch from the top to the bottom.	COMBIACX
19	23	198	TR. SPEED OPEN	After the 300mm and 1800mm switches are reset, the fault is eliminated.	COMBIACX

20	28	28	PUMP VMN LOW	<p>Reason: When the machine is turned on, the low-end voltage of the MOS tube is higher than the normal battery voltage</p> <p>10%, or the phase voltage is higher than 1/2 of the battery voltage.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> <li>1. The motor wiring is wrong, or there is a problem with the motor circuit; Check the motor for three whether the connection is correct; Whether there is leakage from the motor to the ground, and whether there is a motor Coil break.</li> <li>2. Replace the controller.</li> </ol>	COMBIACX
21	29	29	PUMP VMN HIGH	<p>Reason: When the machine is turned on, the low-end voltage of the MOS tube is higher than the normal battery voltage</p> <p>10%, or the phase voltage is higher than 1/2 of the battery voltage.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> <li>1. The motor wiring is wrong, or there is a problem with the motor circuit; Check the motor for three whether the connection is correct; Whether there is leakage from the motor to the ground, and whether there is a motor Coil break.</li> <li>2. Replace the controller</li> </ol>	COMBIACX
22	31	31	VMN HIGH	<p>Reason: When the machine is turned on, the low-end voltage of the MOS tube is higher than the normal battery voltage</p> <p>10%, or the phase voltage is higher than 1/2 of the battery voltage.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> <li>1. The motor wiring is wrong, or there is a problem with the motor circuit; Check the motor for three whether the connection is correct; Whether there is leakage from the motor to the ground, and whether there is a motor Coil break.</li> <li>2. Replace the controller.</li> </ol>	COMBIACX
23	31	206	INIT VMN HIGH		COMBIACX

24	32	203	PUMP VMN NOT OK	Detection time: standby status this alarm shows that the voltage of the lifting speed regulation sensor is more than 1 v larger than the minimum value set in the accelerator signal range (program vacc). Possible reason: 1. The upper and lower limits of the voltage of the lifting speed regulation sensor are not collected, enter the program vacc menu to collect again. 2. The lifting speed regulation sensor is wrong. 3. Controller failure	COMBIACX
25	40	254	AUX DRIV.SHRT.	The drive circuit for the electromagnetic brake or auxiliary electric brake is shorted. Check if there is short circuit between A16 and - BATT. Logical card driver circuit failure, replace controller	COMBIACX
26	41	251	WRONG BATTERY	At start-up, the controller detects the battery voltage and checks if it is within the nominal voltage range. 1. Check if the value of the battery voltage parameter in the Tester menu is in line with the value displayed by the voltmeter. If they do not match each other, the battery voltage is changed to the same as the measured value using the adjust battery function. 2. Replace the battery	COMBIACX
27	42	246	AUX DRIV.OPEN	The auxiliary coil drive circuit cannot drive the load. The device itself or the drive wire loop is broken. Replace the controller	COMBIACX
28	46	196	LIFT+TRAC	Only in the case of lithium batteries.	COMBIACX
29	48	240	EVP DRIVER OPEN	Check the proportional valve if it is open-circuit.	COMBIACX
30	49	241	LIFT + LOWER	the controller will always detect and alarm when there are two request signals at the same time. Possible reasons: 1. Wire breakage. 2.Switch failure 3. Improper operation 4. If the fault cannot be eliminated, the controller needs to be replaced	COMBIACX
31	50	214	EVP COIL OPEN	Check the proportional valve coil if it is open circuit.	COMBIACX
32	50	215	EVP DRIV. SHORT.	Check if the low end of the ev1/ ev2/ ev3 is in contact with the b short circuit, and if it is normal, replace the controller;	COMBIACX

33	52	52	PUMP I=0 EVER	Check whether the power wire of the oil pump motor is in good condition, and if it is in good condition, replace the controller	COMBIACX
34	53	53	STBY I HIGH	The signal output from the current sensor detected by the micro control system exceeds the allowable range of the non-operating current. This fault does not involve peripheral components, and the controller needs to be replaced.	COMBIACX
35	53	252	WRONG ZERO	the high-end voltage feedback value of vmn at startup. not around 2.5v. the controller circuit is broken. failure analysis: suggest to check the following items. motor internal connection motor power cable connection. cable between motor and vehicle housing. If the motor is well connected, the problem is inside the controller, replace the controller	COMBIACX
36	54	19	LOGIC FAILURE #1	failure in the event of low voltage or overvoltage protection. In a 24v system, the controller detects a voltage exceeding 45V or less than 9v; in a 48v system, the controller detects a voltage exceeding 65V or less than 11v. Possible reasons: 1. There is no short circuit phenomenon in the circuit system, such as dc-dc, brake coil, or whether the input power contact of the controller is good. 2. Whether the battery voltage is too low or too high. 3. Check whether the power cable on the main connector is fastened. 4. Whether the voltage calibration parameters of the controller are consistent with the actual voltage. 5. Replace the controller for the hardware circuit failure of overvoltage protection on the logic card	COMBIACX
37	55	18	LOGIC FAILURE #2	The phase voltage feedback hardware circuit part of the logic card is faulty and the controller is replaced.	COMBIACX
38	56	217	PUMP I NO ZERO	Replace the controller	COMBIACX
39	59	197	NO CAN MSG. BMS		COMBIACX

40	60	60	CAPACITOR CHARGE	<p>When the electric lock is switched on, the controller will charge the capacitor and detect whether the capacitor is sufficiently charged within the specified time. If there is not enough electricity, the capacitor voltage is still less than 20% of the battery voltage, the controller will alarm and the main contactor will not be closed.</p> <p>Possible cause:</p> <p>1, peripheral equipment, such as dc-dc, motor or other equipment interfere with the charging process of the controller, need to eliminate the interference caused by these equipment.</p> <p>2, charging resistance disconnected, charging circuit failure, power module problems, need to replace the controller</p>	COMBIACX
41	61	250	THERMIC SENS. KO	The output signal from the controller temperature sensor is out of range. This fault is independent of the external components and the controller is replaced.	COMBIACX
42	62	62	TH. PROTECTION	The temperature of the controller itself is reduced to less than 85 °. If this fault still exists, it may be a temperature sensor failure or a logic board failure of the controller itself. At this time, the controller needs to be replaced.	COMBIACX
43	63	204	WAIT MOT.P STILL		COMBIACX
44	64	238	TILLER ERROR	Replace the controller	COMBIACX
45	65	65	MOTOR TEMPERAT.	<p>1, this fault occurs if the motor temperature digital switch is turned on, or if the analog signal exceeds the cut value.</p> <p>2, when the motor temperature reaches 120 °C, the controller alarms, at this time the vehicle can still walk, but the maximum current is reduced and the performance of the vehicle is reduced. When the temperature of the motor reaches 125 °C, the motor stops working. Efforts should be made to cool the motor at this time.</p> <p>3. When the motor cools, the fault still exists, check the line. If all are good, replace the controller</p>	COMBIACX
46	66	66	BATTERY LOW	If the "battery check" parameter of battery detection function is not set to 0, when the battery power is less than 15%, when there is no grid on the instrument, the fault alarm and the lifting function are locked. Charging should be made in time at this time. If the battery is found to have electricity, the	COMBIACX

				value of the controller's "adjust battery" parameter is detected to be consistent with the battery voltage.	
47	67	218	SENS MOT TEMP KO	Phenomenon: The output signal of the motor temperature sensor is out of range. Solution: Check the value of the sensor and the connection of the wire. If there is no problem, the problem is within the controller	COMBIACX
48	67	248	NO CAN MSG.	There is a failure of the can communication between steering and traction. Detect the settings and version information of the can wiring and software	COMBIACX
49	68	222	SMARTDRIVER KO	Check if there is short-circuit between EM brake and B-. If it is ok, the drive module id broken.	COMBIACX
50	68	224	WAITING FOR NODE	In can communication, one controller receives a signal that another controller cannot communicate normally, and the controller is always in a waiting state until the can communication network is all normal. Check the wiring of those modules which cannot communicate and see if the software version or parameter settings are correct	COMBIACX
51	70	205	EPS RELAY OPEN	Check to see if there are any internal failures in traction and eps, and this failure will be eliminated after troubleshooting restarts	COMBIACX
52	71	13	EEPROM KO	The vehicle cannot walk, the storage area of the parameters has problems, and the fault causes the vehicle to stop working. If the fault still exists after repeatedly closing the electric lock, replace the logic card. If the failure disappears, the original stored parameter is replaced by the wrong parameter, which needs to be reset.	COMBIACX
53	71	210	WRONG RAM MEM.		COMBIACX
54	72	30	VMN LOW	reason: when starting, the high terminal voltage of MOS tube is less than 66% of the capacitance voltage or the voltage is less than the required value during the operation of the motor. Possible reasons: 1. There is something wrong with the motor connection, or there is a problem with the motor circuit; check that the three-phase connection of the motor is correct; whether the motor has leakage to the ground, and whether there is a circuit break of the motor coil. 2. Whether the main contact suction is firm or not. Contact is worn or not. 3. Replace the controller	COMBIACX

55	72	207	INIT VMN LOW		COMBIACX
56	74	74	DRIVER SHORTED	When the electric lock is closed, the microprocessor will detect whether the driver of the main contactor is short-circuited and will give an alarm if it is shorted; Check whether the positive electrode of main contactor coil is shorted to b6 or negative power supply. If everything is normal, replace the controller	COMBIACX
57	74	213	AUX BATT. SHORT.	Check if b2 and drive connection is correct, if correct, replace controller;	COMBIACX
58	74	234	DRV. SHOR. EV	Check if the low end of the ev1/ ev2/ ev3 is in contact with the b short circuit, and if it is normal, replace the controller;	COMBIACX
59	75	37	CONTACTOR CLOSED	before closing the main contact coil, the controller must first detect whether the main contact is adhered. Try to discharge the capacitance. If the capacitance voltage reduces the battery voltage by 20%, the failure may occur. 1. It is recommended to check the contactor contact for adhesion, or to replace the contactor	COMBIACX
60	75	75	CONTACTOR DRIVER	When the electric lock is closed, the microprocessor will detect whether the driver of the main contactor is short-circuited and will give an alarm if it is shorted; Check whether the positive electrode of main contactor coil is shorted to b6 or negative power supply. If everything is normal, replace the controller	COMBIACX
61	75	232	CONT. DRV. EV	Replace the controller	COMBIACX
62	76	220	KEY OFF SHORTED	The fault is displayed when the controller detects a low logic level signal after the key switch is turned off at the start-up stage. Fault analysis: the voltage is too low. - The key switch is based on an external load, such as the start-up of the dc-dc converter, the relay or contactor switch input signal is lower than the start-up voltage. -Check the connection between the power cable and the positive negative pole of the battery and the-batt and batt+ of the same main contactor and the controller, and the torque range shall be 13nm to 15nm. -If no voltage drop is detected on the supply line, a fault signal is generated each time the key switch is on. The fault may occur in the hardware of the	COMBIACX

				controller, so it is necessary to replace the controller	
63	76	223	COIL SHOR. MC-EB	1. Check whether the controller output and load are too large; 2. Replace the controller;	COMBIACX
64	76	235	COIL SHOR. EV.	In the coil driven by pev, there is a fault if the coil driven by pev is connected to the coil itself.	COMBIACX
65	77	38	CONTACTOR OPEN	the logic card has driven the main contact coil, but the contactor is not closed, which may be due to: 1. Contactor mechanical failure, stuck dead, etc. 2. Contactor point is not good. 3.If the contactor is working properly, replace the controller	COMBIACX
66	77	199	CARD TILLER ERR.		COMBIACX
67	78	78	VACC NOT OK	Detection time: standby status this alarm shows that the accelerator voltage is more than 1 v larger than the minimum value set in the accelerator signal range (program vacc). Possible reason: 1. The upper and lower limit values of the accelerator voltage are not collected, enter the program vacc menu to collect again. 2. Accelerator error, acceleration pedal no return position, or accelerator internal error. 3. Controller failure	COMBIACX
68	79	79	INCORRECT START	the boot sequence is not correct, reasons: 1. The direction switch has been closed before starting. 2. The operation sequence is wrong. 3. The wire connection is incorrect. 4. If the fault cannot be fixed, the controller needs to be replaced 5. Steering does not report failure, press down the interlock report failure, the steering motor is abnormal.	COMBIACX
69	79	242	PUMP INC START	The startup sequence of the oil pump is not correct. Possible cause: 1. The switches such as lifting and tilting have been closed before starting up. 2. The operation order is incorrect. 3. The wire connection is not correct. 4. If it is not possible to correct the problem, the controller needs to be replaced	COMBIACX

70	80	80	FORW + BACK	<p>the controller will always detect and alarm when there is a request to run the signal in two directions at the same time.</p> <p>Possible reasons:</p> <ol style="list-style-type: none"> <li>1. Wire breakage.</li> <li>2. Directional switch failure</li> <li>3. Improper operation</li> <li>4. If the fault cannot be eliminated, the controller needs to be replaced</li> </ol>	COMBIACX
71	82	82	ENCODER ERROR	<p>the controller detects a great difference between the two consecutive speed readings of the encoder: because the internal encoder in the system cannot change the speed greatly in a very short period of time, the encoder may fail (the line of one or two encoders is worn out or disconnected), check the mechanical and circuit functional parts of the encoder, and may alarm caused by electromagnetic interference on the sensor bearing. If none of the above is true, replace the controller.</p> <p>Please note that artificial operation may also cause the controller to display this failure, when power outage is required to restart the vehicle.</p> <p>For example, the following cases:</p> <ol style="list-style-type: none"> <li>1, the vehicle suddenly hit an obstacle, making the vehicle unable to walk;</li> <li>2, when the vehicle is driving at high speed, suddenly slam on the brakes</li> </ol>	COMBIACX
72	85	226	VACC OUT RANGE	<ol style="list-style-type: none"> <li>1, the upper and lower limit values of the voltage of the accelerator are not collected correctly, and enter the PROGRAM VACC menu to collect it again.</li> <li>2, check whether the accelerator connection line is connected correctly.</li> </ol>	COMBIACX
73	86	86	PEDAL WIRE KO	<p>Check whether the positive and negative electrodes of the accelerator are connected to the controller;</p>	COMBIACX
74	86	229	POS. EB. SHORTED	<p>When the interlock is not closed, the electromagnetic brake drives the high-end output high voltage.</p> <ol style="list-style-type: none"> <li>1, see if any other high-voltage lines are connected to the high-end output of the electromagnetic brake;</li> <li>2, if the high-end output of the electromagnetic brake is not connected, the high voltage still exists, and the controller has been damaged;</li> </ol>	COMBIACX
75	88	233	POWER MOS SHORT	<p>if the change of the phase voltage value is inconsistent with the instruction, the fault signal is generated. Replace the controller.</p>	COMBIACX

76	89	245	PUMP VACC NOT OK	<p>Detection time: standby state this alarm shows that the voltage of the lifting speed regulation sensor is more than 1 V larger than the minimum value set in the accelerator signal range (PROGRAM VACC).</p> <p>Possible reasons:</p> <ol style="list-style-type: none"> <li>1. The upper and lower limits of the voltage of the lifting speed regulation sensor are not collected and are collected again by entering the PROGRAM VACC menu.</li> <li>2. The lifting speed regulation sensor is wrong.</li> <li>3. The controller is out of order.</li> </ol>	COMBIACX
77	90	191	BMS LOW CAP.		COMBIACX
78	90	243	PUMP VACC RANGE	<ol style="list-style-type: none"> <li>1, the voltage upper and lower limit of the hoisting speed sensor is not collected correctly, go to the PROGRAM VACC menu to collect again;</li> <li>2, check whether the hoisting speed sensor connection line is connected correctly;</li> </ol>	COMBIACX
79	90	244	PROGRAM TOOTH	Check that the motor is consistent with the parameters.	COMBIACX
80	91	192	BMS VOLT.DIFF		COMBIACX
81	92	193	BMS MONOMER OV		COMBIACX
82	92	236	CURRENT GAIN	<p>The maximum current gain parameter is the factory setting value.</p> <p>It indicates that the maximum current has not yet been enabled.</p> <p>Solution: the current gain parameters are programmed correctly by ZAPI technicians.</p>	COMBIACX
83	93	194	BMS MONOMER UV		COMBIACX
84	94	0	NONE	<p>In the system in use, if the instrument or traction controller is replaced, the failure will be reported.</p> <p>After starting, wait 5 minutes, the instrument and traction controller hours consistent, this fault is automatically eliminated.</p>	COMBIACX
85	95	98	INPUT ERROR #2		COMBIACX
86	96	237	ANALOG INPUT	<p>The fault signal is generated when the (A ≤ D ) input of all analog signals is converted to a fixed value, with a delay of more than 400 milliseconds. This function is used to detect A / D converter failure or analog signal conversion fault analysis: if the fault persists, replace the controller.</p>	COMBIACX

87	97	99	INPUT ERROR #1		COMBIACX
88	98	219	PEV NOT OK	Check if B2 is connected to B behind the contactor;	COMBIACX
89	99	253	SLIP PROFILE	SLIP PROFILE parameter selection error. Check the settings for these values in the hardware settings parameters.	COMBIACX

### Troubleshooting for EPS-DC0

No.	MDI CODE	CAN CODE	ALARM	Solution	Source
1	0	85	STEER HAZARD	1. Reduce the steering angle and restart the key; 2. Change the angle parameter setting inside the steering controller;	EPS DC0 Controller
2	0	224	EMERGENCY	After the emergency reverse is over, the interlock switch needs to be closed again, and the fault disappears.	EPS DC0 Controller
3	0	237	WAITING DATA	1. Check whether the CANBUS communication line is connected properly; 2. Check whether the baud rate of the communication is consistent; 3. Turn off the COMBICANPROT under Set Options. It can make the vehicle work normally, but there may be hidden dangers, abnormal steering deceleration.	EPS DC0 Controller
4	0	238	EPS NOT ALIGNED	1. Check whether the zero proximity switch is installed in place; 2. Check whether the zero proximity switch is selected correctly; 3. Check whether the output data of the zero proximity switch is correct;	EPS DC0 Controller

5	0	239	WAITING FOR TRAC	<ol style="list-style-type: none"> <li>1. Check whether the CANBUS communication cable is connected in good condition;</li> <li>2. Check whether the interlock switch connection line is correct;</li> <li>3. IF THE INTERLOCK SWITCH IS CONTROLLED BY A HANDLE, THE TILLERSEITCH SHOULD BE SET TO THE HANDLE;</li> </ol>	EPS DC0 Controller
6	0	240	KEY OFF	<ol style="list-style-type: none"> <li>1. Check whether the key switch voltage receives the pulse of low voltage when the external load is turned on;</li> <li>2. Check B+. B- Whether the connection with the controller is firm;</li> <li>3. If this fault is reported every time you open the key, replace the controller;</li> </ol>	EPS DC0 Controller
7	1	70	HIGH CURRENT	<ol style="list-style-type: none"> <li>1. Check whether the steering controller matches the motor;</li> <li>2. Replace the controller</li> </ol>	EPS DC0 Controller
8	2	73	POWER FAILURE #1	<ol style="list-style-type: none"> <li>1. Check whether the controller insurance is normal;</li> <li>2. Check whether the power cord is firmly connected to the controller;</li> <li>3. Check whether the W phase wire of the controller is well connected;</li> <li>4. Replace the controller;</li> </ol>	EPS DC0 Controller
9	3	72	POWER FAILURE #2	<ol style="list-style-type: none"> <li>1. Check whether the controller insurance is normal;</li> <li>2. Check whether the power cord is firmly connected to the controller;</li> <li>3. Check whether the U-phase cable of the controller is well connected;</li> <li>4. Replace the controller;</li> </ol>	EPS DC0 Controller

10	4	71	POWER FAILURE #3	<ol style="list-style-type: none"> <li>1. Check whether the controller insurance is normal;</li> <li>2. Check whether the power cord is firmly connected to the controller;</li> <li>3. Check whether the V-phase cable of the controller is well connected;</li> <li>4. Replace the controller;</li> </ol>	EPS DC0 Controller
11	5	53	STBY I HIGH	<p>The controller checks whether the motor current is zero in the standby state of the vehicle. If it is not zero, this fault occurs and the vehicle immediately stops working. Possible reasons are:</p> <ol style="list-style-type: none"> <li>1. The terminal-end is directly connected to another load and not to the travel motor, such as the lifting motor.</li> <li>2. The current sensor or logic card is damaged. Replace the logic card first, and if the fault still exists, replace the power part.</li> </ol>	EPS DC0 Controller
12	6	243	D LINE SENSOR KO	<ol style="list-style-type: none"> <li>1. Check whether the stepper motor connection line is in good condition;</li> <li>2. The resistance between the D line and the B- is too small (close to 30Ω);</li> </ol>	EPS DC0 Controller
13	7	242	Q LINE SENSOR KO	<ol style="list-style-type: none"> <li>1. Check whether the stepper motor connection line is in good condition;</li> <li>2. The resistance between the Q line and B- is too small (close to 30Ω);</li> </ol>	EPS DC0 Controller
14	8	13	EEPROM KO	<p>The vehicle does not walk, there is a problem with the storage area of the parameters, and the failure stops the vehicle from working. If the fault persists after repeatedly closing the electric lock, replace the logic card. If the fault disappears, the previously stored parameters are replaced by the wrong parameters and need to be set again.</p>	EPS DC0 Controller
15	9	32	VMN NOT OK	Replace the controller;	EPS DC0 Controller

16	10	61	HIGH TEMPERATURE	<p>At full permissible power, the temperature of the controller exceeds 85°C (this temperature is related to the parameter "MAXIMUMCURRENT"). The correspondence is as follows:  Parameter setting alarm temperature  MAXIMUMCURRENT=50%96°C  MAXIMUMCURRENT=60%94°C  MAXIMUMCURRENT=70%92°C  MAXIMUMCURRENT=80%90°C  MAXIMUMCURRENT=90%88°C  MAXIMUMCURRENT=100%86°C</p> <p>In this case, the maximum current of the controller decreases as the temperature increases. When the temperature is 105 °C, the controller current is reduced to 0.</p> <p>If the chopper is in a cold state, the fault occurs:</p> <ol style="list-style-type: none"> <li>1. The temperature calibration parameters of the logic card are incorrect, and the detection parameters are detected.</li> <li>2. The temperature sensor inside the controller is faulty,</li> <li>3. Check the temperature sensor itself for damage.</li> </ol>	EPS DC0 Controller
17	11	245	DATA ACQUISITION	<p>This fault is activated to prove that it is in the data fetch phase, please wait for the data fetch to complete.</p>	EPS DC0 Controller
18	12	19	LOGIC FAILURE #1	<p>Faults that occur when a low-voltage or over-voltage protection function occurs. In a 24V system, the controller detects that the voltage is over 45V or below 9V; In a 48V system, the controller detects a voltage over 65V or below 11V.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> <li>1. Whether there is a short circuit in the circuit system, such as DC-DC, brake coil, etc., or whether the controller input power supply contact is good. (Travel Controller)</li> <li>2. Whether the battery voltage is too low or too high. (Travel Controller)</li> <li>3. Detect whether the power cables on the binding posts such as B+, B, and main contactors are tightened. (Travel Controller)</li> <li>4. Whether the voltage calibration parameters of the controller are consistent with the actual voltage.</li> </ol>	EPS DC0 Controller

				(Travel Controller) 5. If the hardware circuit of the overvoltage protection on the logic card fails, replace the controller. (Travel Controller) 6. The voltage between W and U does not meet the requirements, and the controller needs to be replaced; (Steering Controller)	
19	13	18	LOGIC FAILURE #2	The voltage between W and V does not meet the requirements, and the controller needs to be replaced; (Steering Controller)	EPS DC0 Controller
20	14	17	LOGIC FAILURE #3	If the output VU-VV of the voltage amplifier exceeds 2.2V-2.8V, the controller needs to be replaced.	EPS DC0 Controller
21	15	16	LOGIC FAILURE #4	If the output VW-VV of the voltage amplifier exceeds 2.2V-2.8V, the controller needs to be replaced.	EPS DC0 Controller
22	16	254	KS CLOSED	The main contactor detects that the safety contactor from the contactor is engaged in advance, and the controller needs to be replaced; The steering controller A4 is energized immediately after starting, which may be the main contactor adhesion	EPS DC0 Controller
23	17	253	KM CLOSED	The main contactor detects that the safety contactor from the contactor is engaged in advance, and the controller needs to be replaced;	EPS DC0 Controller
24	18	252	KS OPEN	The main contactor detects that the safety contactor from the contactor is not engaged in time, and the controller needs to be replaced;	EPS DC0 Controller
25	19	251	KM OPEN	The main contactor detects that the safety contactor from the contactor is not engaged in time, and the controller needs to be replaced;	EPS DC0 Controller

26	20	48	MAIN CONT. OPEN	The logic card has driven the main contactor coil, but the contactor is not closed, which may be caused by: 1. Contactor mechanical failure, stuck, etc. 2. Poor contact of contactor contact 3. If the contactor is working properly, replace the controller.	EPS DC0 Controller
27	21	250	MICRO SLAVE	The controller needs to be replaced;	EPS DC0 Controller
28	22	248	S.P OUT OF RANGE	If a single potentiometer, such as the CPOC1 terminal, is out of range by 0.8V-4.2V, an alarm will be given. When the dual potentiometer is selected, the sum of the two slides (CPOC1+CPOC2) exceeds the range of 4.4V-5.5V, and an alarm will be generated. Check the connection of the potentiometer.	EPS DC0 Controller
29	23	249	F.B OUT OF RANGE	Feedback potentiometer (CPOT connected to CNB#6) is faulty, generating an alarm. If the range of CPOT is out of range 0.3V-4.7V, an alarm will be generated. Check whether the encoder of the steering motor is connected correctly and whether there is a line disconnection;	EPS DC0 Controller
30	24	246	MICRO SLAVE KO	1. When using a stepper motor, the direction of the main microprocessor is inconsistent with the stepper motor detected from the microprocessor; 2. In the closed-loop control system, the direction of the stepper motor detected by the main contactor is wrong, and the direction of the stepper motor detected from the contactor is inconsistent; 3. The steering limit is not detected by the main contactor, but the steering limit is detected from the contactor; 4. Steering motor encoder failure (initial normal, handle rotation, turn to a certain position, report 06A24 and 06A40 failure)	EPS DC0 Controller
31	25	241	ENCODER ERROR	The controller detects a significant difference between the two successive speed readings of the	EPS DC0 Controller

				<p>encoder: since it is not possible for the encoder inside the system to change the speed very much in a very short time, it is possible that the encoder is faulty (the wiring of one or both encoders is worn or broken), and the encoder mechanical and circuit functions are checked; Alarms may be caused by electromagnetic interference on the sensor bearings. above</p> <p>Neither, replace the controller.</p> <p>Please note that human operation may also cause the controller to display this fault, and the vehicle needs to be powered off and restarted. For example, in the following cases:</p> <ol style="list-style-type: none"> <li>1. The vehicle suddenly hits an obstacle, causing the vehicle to be unable to walk;</li> <li>2. When the vehicle is driving at high speed, suddenly slam on the brakes.</li> <li>3. The connector at the controller is not plugged in.</li> </ol>	
32	26	83	BAD ENCODER SIGN	Switching encoder A.B phase;	EPS DC0 Controller
33	27	244	GAIN EEPROM KO	Replace the controller;	EPS DC0 Controller
34	28	247	CAN BUS KO	<ol style="list-style-type: none"> <li>1. Check whether the CANBUS communication line is connected properly;</li> <li>2. Check whether the baud rate of the communication is consistent;</li> <li>3. Check if the CAN communication is turned on;</li> <li>4. Check if the CAN communication loop resistance is 60Ω.</li> </ol>	EPS DC0 Controller
35	29	236	ANT. MISSING		EPS DC0 Controller
36	30	235	WRONG ANT. RECEP		EPS DC0 Controller
37	31	229	LOOK. FOR PATH		EPS DC0 Controller
38	32	230	PATH OUT		EPS DC0 Controller
39	33	231	LATERAL OUT		EPS DC0 Controller
40	34	232	ANGLE		EPS DC0 Controller

41	35	233	LOSING PATH		EPS DC0 Controller
42	36	234	LOSING STRAIGHT		EPS DC0 Controller
43	38	228	POSITION ERROR	1. Check whether the connection of the encoder A.B of the steering motor is loose; 2. Check whether the A.B phase of the steering motor is interfered with;	EPS DC0 Controller
44	39	6	SERIAL ERROR #1	Replace the controller;	EPS DC0 Controller
45	40	221	MICRO SLAVE #4	Replace the controller;	EPS DC0 Controller
46	41	227	SLAVE COM. ERROR	Replace the controller;	EPS DC0 Controller
47	42	226	NO SYNC		EPS DC0 Controller
48	43	225	CURRENT GAIN	Replace the controller;	EPS DC0 Controller
49	44	218	CLOCK PAL NOT OK	Replace the controller;	EPS DC0 Controller
50	45	84	STEER SENSOR KO	View the dual corner potentiometer wiring. Whether the output is correct.	EPS DC0 Controller
51	46	223	JERKING FB	Replace the feedback potentiometer;	EPS DC0 Controller
52	47	222	FB POT LOCKED	1. Check whether the feedback angle potentiometer is mechanically loose; 2. Check whether there is a mechanical limit; 3. Check whether the feedback angle potentiometer reaches its own limit point; 4. If this fault occurs during installation because the direction of the steering wheel is opposite, adjust the direction of the steering wheel;	EPS DC0 Controller

53	48	65	MOTOR TEMPERAT.	<p>1. This fault occurs when the motor temperature digital switch is turned on, or when the analog signal exceeds the cut-off value.</p> <p>2. When the motor temperature reaches 120°C, the controller alarms, and the vehicle can still walk at this time, but the maximum current is reduced, and the vehicle performance is reduced. When the motor temperature reaches 125°C, the motor stops working. At this point, you should try to cool down the motor.</p> <p>3. When the motor is cool, the fault still exists, check the line. If it's all good, replace the controller.</p>	EPS DC0 Controller
54	49	220	MOTOR LOCKED	The maximum continuous current time of the steering motor exceeds 1s;	EPS DC0 Controller
55	50	219	STEPPER MOT MISM	Replace the controller;	EPS DC0 Controller
56	51	217	MICRO SLAVE #3		EPS DC0 Controller
57	52	216	MICRO SLAVE #8	Replace the controller;	EPS DC0 Controller
58	53	99	INPUT ERROR #1	Check if the CAN#4 cable is correct;	EPS DC0 Controller
59	54	215	CAN BUS KO SL.	Replace the controller;	EPS DC0 Controller
60	55	214	SL EPS NOT ALL.	Replace the controller;	EPS DC0 Controller
61	56	213	SL CENTERING	Replace the controller;	EPS DC0 Controller

## 15. The Qexpand handheld programmer

### a. The use of Qexpand handheld programmer

#### 1. Product overview



#### General specifications

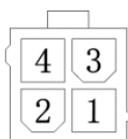
- **Electrical specifications**

Input voltage	5V
Power consumption	1W
Battery capacity	2600mAh
CAN electrostatic protection	Contact discharge 8kV, air discharge 15kV

- **Environmental conditions**

Ambient temperature	-30° ---70°
Protection level	IP45

- **Definition of communication harness interface**



1	CAN_H	2	CAN_L
3	CAN Terminating resistor	4	CAN Terminating resistor

## Operation panel and interface

The front of the handheld includes an LCD screen, a membrane key board, an SD card slot at the top, a USB interface and a CAN communication port at the bottom.



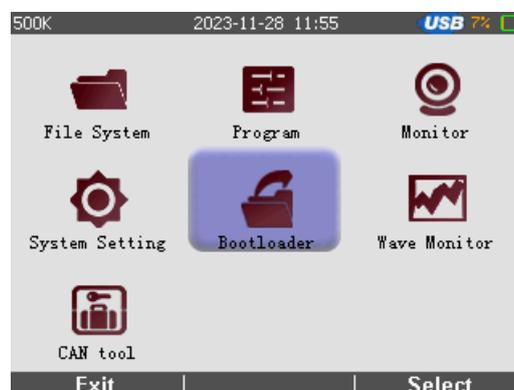
## Introduction to the basic functions of buttons

Up	Navigate up key, used to select items.
Down	Navigation down button, used to select items.
Left	After selecting an item and entering a function, it is used to enter the next level of directory, and the function is similar to the confirmation key.
Right	After selecting an item and entering a function, it is used to return to the upper level directory, and the function is similar to the return key.
Parameters +	Parameter plus key, used to modify parameters, with the hot key, you can complete the ones digit addition or the tens and hundreds digit addition.
Parameters-	The parameter minus key is used to modify the parameter. With the hot key, you can subtract the ones digit or tens and hundreds digits.
Function hotkey	The three function hot keys switch according to the content displayed in the corresponding position on the screen.
Power button	Power button, long press to shut down, double click to force shut down.
Enter	A specific interface is used for confirmation.
Shift	The specific interface is used to switch the input focus.
Shift +Enter	Screenshot
Power + Enter	When booting up, enter the program upgrade mode

## 2. Function introduction

### Home page display

At the top of the display is a status bar, which displays CAN baud rate, system time, battery power, network connection and USB connection status, etc. The middle is the homepage desktop icon, the bottom is the function hot key prompt bar, and the corresponding buttons are the three blank function keys on the top of the keypad. The functions of the function keys follow the system hot key bar prompts. Use the navigation keys to select a function item, and press the hot key corresponding to "Select" to enter the corresponding function.



## File system

- Flash is an internal 512M non-volatile storage space, parameter configuration information and controller firmware files can be placed in this storage.
- The internal 32M independent space is used to store fonts and key files. The user cannot view it on the handheld, but can connect to the PC via USB to view this part of the space.
- If an SD card is inserted, the file system can view the contents of the SD internal files, the USB cable is connected to the PC, and it can also be used as a card reader in the hand to read and write SD on the computer.

**Note:** The parameter file in the internal or SD card must be placed in the PARA folder of the root directory, and the firmware file must be placed in the Bin folder of the root directory, otherwise other interfaces cannot be accessed.

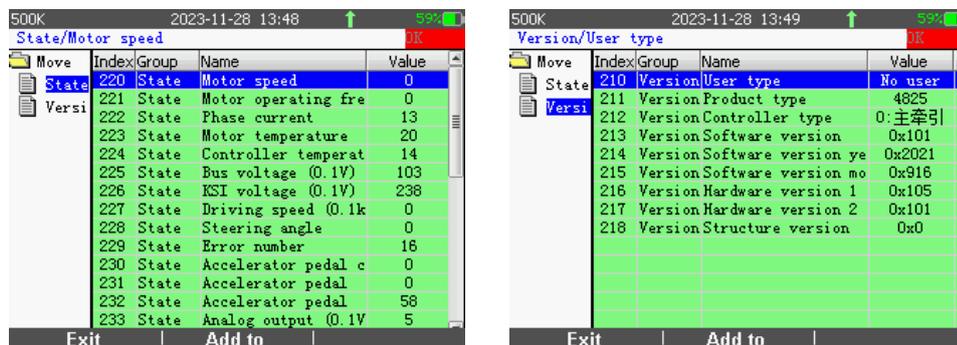
## File browsing

The file browser supports browsing of txt text files and picture files. Open the file path, select the file and press the right button to open the file. When browsing text files, you can use the up and down keys to turn pages. Some basic documentation and information will be placed in the handheld to facilitate users to understand the operation steps and controller information.



## Parameter monitoring

The monitoring interface is mainly used to view the running status information and version of the controller.



View the running status and enter the state parameter group. The interface is shown on the left side of the figure above. The status bar above the parameter box displays the currently selected parameter group and parameter name, and the right side of the status bar displays the operating state. The status is divided into reading and reading. If the current device has an alarm, the background on the right side of the status bar will turn red to indicate that there is an alarm currently. Check the fault parameters for details.

Check the current controller version and enter the version parameter group. The interface is shown on the right of the figure above.

Check the current controller version and enter the version parameter group. The interface is shown on the right of the figure above.

### System Settings

Different user authority can view and edit the parameter content differently, authority SYS>OEM>USER.

Support baud rate 100K, 125K, 250K, 500K, 800K, 1M. When Auto Check is selected, if the handheld is connected to the CAN bus with data interaction, the handheld can automatically recognize the current communication baud rate of the bus and display it in the configuration column. If you want to take effect next time, you need to save it.

#### Screen rest and shutdown time

The screen rest time, when there is no button operation and exceeds the set time, the system will automatically reduce the brightness of the backlight, press any button, the backlight will return to normal.

Set the shutdown time. When there is no key operation and the set time is exceeded, the system will automatically shut down.

Setting appropriate shutdown and rest screen time can effectively increase battery life.

### Firmware upgrade

It is used to update the controller program, and the program update process cannot be interrupted. The upgrade procedure must be carried out in accordance with the following steps.

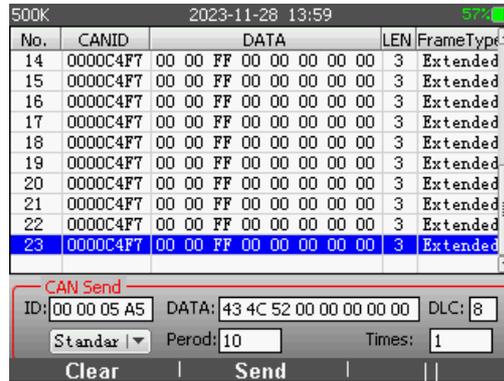
- First select the CAN baud rate (usually 500K), and power off the controller.
- Select the corresponding Device ID according to the product type. If there is no program, select Undefined.
- Press the "Tab" key to switch to the firmware file selection box, and select the firmware file to be loaded.
- The selected file is displayed in red font. After confirming the file name, click Start to start downloading the program.
- When the controller is powered on, the progress bar begins to change, and the controller lights flash alternately, indicating that the firmware is being updated.
- When the progress bar reaches 100% and the controller light no longer flashes, the upgrade is complete, and the controller can be powered on again.

### Waveform monitoring

To monitor the data fluctuation and change process, you can adjust the X axis (time) interval through DIV+ and DIV-. The longer the interval, the longer the recording time. The Y-axis interval (amplitude) will be automatically adjusted according to the size of the data to ensure that the complete waveform and change process can be displayed. This function needs to be developed and perfected.



## CAN Tool



This interface can support the sending and receiving of CAN data, which is convenient for users to analyze the content of bus data. At the bottom of the sending editing area, users can modify the sending data content and sending time interval through the system soft keyboard, and the sent data will not appear in the upper receiving display area.

The sending area ID represents the CAN frame ID sent, DATA is 8 data, DLC represents the length of the sent data, the default is 8 bytes, Period represents the sending period (unit: ms), and Times represents the number of sending.

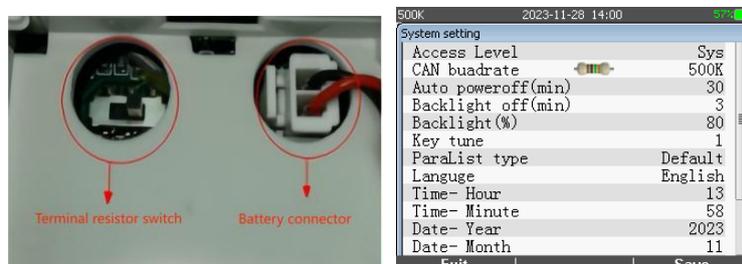
The bottom function keys include Clear to clear the screen, send to send, || means to pause receiving and refreshing, and |> means to continue to display.

To modify the data in the sending area, you need to press the Shift key on the keypad to switch the current focus to the corresponding edit box, and then press the Enter key to pop up the system software disk, select the input information through the navigation keys, and select the OK key on the keyboard. Press Enter to confirm and exit. Shift continues to switch to the next edit box. When exiting, switch the focus to the receiving area and press the left button to exit the interface.

## 3. Other functions

### CAN Optional terminal resistance

Open the back cover of the battery compartment at the back of the handheld, you can see that there is a DIP switch in the hole, as shown on the left side of the figure below. If the switch is set to the 0 position, the 120Ω resistance is not connected; if it is set to the 1, the resistance is connected. Whether the resistance is connected can also be checked in the middle of the CAN baud rate item of the configuration interface. If there is a resistance icon, the terminal resistance is connected, otherwise, it is not connected.



## Handheld program update

The handheld can view the software version information through the About in the system setting interface. If you need to upgrade the handheld program, you can obtain the latest program file through Qiantuo Company, then rename it to update. bin and put it in the UPDATE folder of the SD card (If there is no such folder, please create a new one), insert the handheld.

Upgrade steps:

1. Make sure that the update. bin file is placed in the UPDATE folder of the SD card, and insert the SD card

2. In the case of hand-held shutdown, press the lower right key (Enter key) and the power key at the same time, and wait for the white screen to flicker, indicating that the upgrade is in progress. Please do not shut down during this process.

3. After the screen stops flashing, the upgrade is successful, and it will automatically enter the program interface.

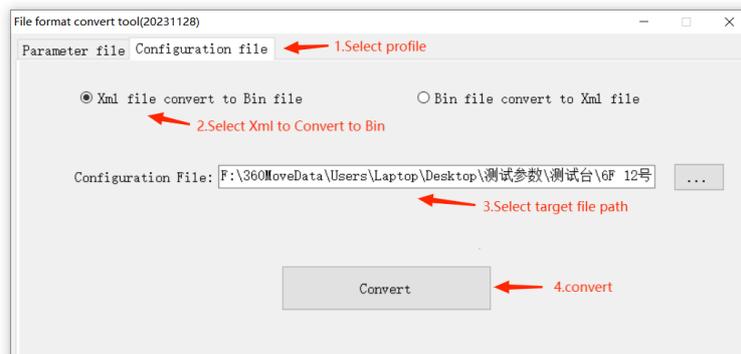
## 4. Parameter file format conversion

The xml parameter file used by the host computer configuration software HMI Platform cannot be directly recognized by the handheld. It can be recognized only when the X2BTool.exe host computer software is used to convert the parameter format and put into the handheld. Similarly, the parameter bin file exported by the handheld should be converted into an xml file by the software, so that it can be used with the host computer.

The converted files can be connected to the computer via a USB cable and placed directly under the PARA folder of the handheld internal storage, or directly placed under the PARA folder of the SD card through the SD card.

### Parameter configuration xml file to bin file

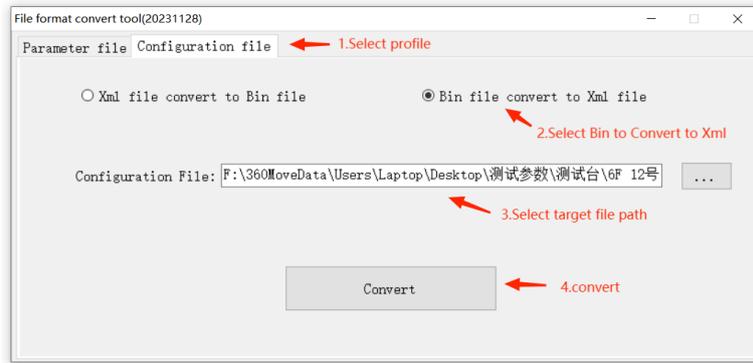
The xml parameter file used by the host computer is converted into a handheld recognizable bin file, the name remains unchanged after the conversion, and the suffix becomes .bin.



### Parameter configuration bin file to xml file

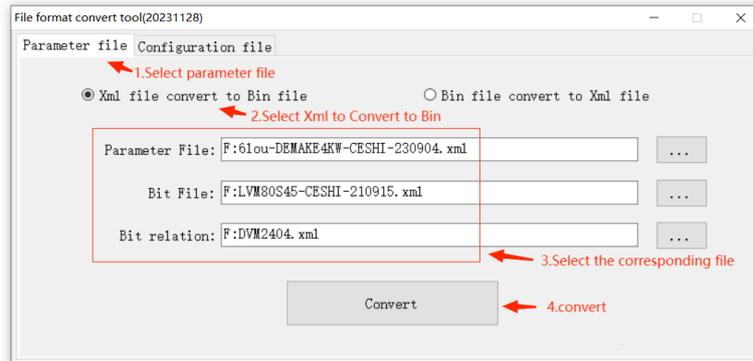
In order to make the hand-held export parameter file common to the PC host computer, the exported parameter bin file needs to be converted into an xml format file.

The steps are shown in the figure below. The difference is that when the bin file is converted to an xml file, step 2 selects the bin to xml option. The selected target file must also be a bin format file.



### Convert system xml file to bin file

Params.xml, bits.xml, and relations.xml are system files that describe basic attributes such as the type of parameters, user permissions, and maximum and minimum values. Generally, users do not need to change them. The handheld file system is also not accessible, and it can only be seen when connected to a computer via USB. The file is placed in the internal 32M small-capacity Flash.



## 5. Notice

Non-professionals should not disassemble the shell.

Try to avoid direct rain on the equipment.

Do not connect the CAN communication interface to high voltage.

Please use the attached USB cable when charging, otherwise the charging may be too slow or not charging normally.

Hand-held relevant documents and host computer conversion tools are all in the SD card, please read the manual carefully before use. Please keep the SD card in a safe place.

## b. Trouble shooting for Qiantuo system (LVM24S25+DVM24S04)

### Troubleshooting for LVM24S25

No.	Display Fault Code	Fault Name	Fault Description	Solution	Fault Source
1	FCC12	The controller is overloaded	<ol style="list-style-type: none"> <li>1. The external U, V, and W connections of the motor are short-circuited</li> <li>2. The motor parameters do not match</li> <li>3. Controller failure</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the U, V, and W lines</li> <li>2. Re-import parameters</li> <li>3. Replace the controller</li> </ol>	LVM24S25 Controller
2	FCC13	The current sensor is faulty	<ol style="list-style-type: none"> <li>1. The motor U, V, W short-circuits the car body through the stator. Resulting in leakage</li> <li>2. Controller failure</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the U, V, and W lines</li> <li>2. Replace the controller</li> </ol>	LVM24S25 Controller
3	FCC14	Pre-charge failed	<ol style="list-style-type: none"> <li>1. Capacitor positive end external load. This prevents the capacitor from charging properly</li> </ol>	<ol style="list-style-type: none"> <li>1. Check if the KSI port (J3-1) is in good contact If there is no abnormality, please replace the controller</li> </ol>	LVM24S25 Controller
4	FCC15	The controller temperature is too low	<ol style="list-style-type: none"> <li>1. The working environment of the controller is too harsh</li> </ol>	<ol style="list-style-type: none"> <li>1. When the temperature rises above -40°C, restart the key switch or interlock switch</li> </ol>	LVM24S25 Controller
5	FCC16	The controller temperature is too high	<ol style="list-style-type: none"> <li>1. The working environment of the controller is too harsh</li> <li>2. Overloading of vehicles</li> <li>3. The controller is installed incorrectly</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduce the temperature to below 95°C. Restart the key switch or interlock switch</li> <li>2. Check for overload</li> <li>3. Check if the controller is installed correctly</li> </ol>	LVM24S25 Controller

6	FCC17	The voltage is too low	<ol style="list-style-type: none"> <li>1. The battery parameters are set incorrectly</li> <li>2. Non-controller system consumes power</li> <li>3. The battery impedance is too large</li> <li>4. The battery connection is disconnected</li> <li>5. The fuse is disconnected or the main contactor is not connected</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the battery voltage, charging or battery import parameters, and replace the battery</li> <li>2. Check the fuse or main contactor connection</li> </ol>	LVM24S25 Controller
7	FCC18	The voltage is too high	<ol style="list-style-type: none"> <li>1. The battery parameters are set incorrectly</li> <li>2. The battery impedance is too high</li> <li>3. The battery connection is disconnected during regenerative braking</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the battery parameters, re-import the parameters or replace the battery</li> <li>2. Check the battery connection, restart the key switch or interlock switch</li> </ol>	LVM24S25 Controller
8	FCC21	The controller temperature is too low, resulting in performance cuts	<ol style="list-style-type: none"> <li>1. The controller works under restricted conditions</li> <li>2. The controller works in a harsh environment</li> </ol>	<ol style="list-style-type: none"> <li>1. When the temperature rises above -25°C, restart the key switch or interlock switch</li> <li>2. Check the controller parameters and re-import the parameters</li> </ol>	LVM24S25 Controller
9	FCC22	The controller temperature is too high, resulting in performance cuts	<ol style="list-style-type: none"> <li>1. The controller works in a harsh environment</li> <li>2. Overloading of vehicles</li> <li>3. The controller is not installed correctly</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduce the temperature to below 85°C. Restart the key switch or interlock switch</li> <li>2. Check for overload</li> <li>3. Check if the controller is installed correctly</li> </ol>	LVM24S25 Controller

10	FCC23	The voltage is too low, resulting in reduced performance	<ol style="list-style-type: none"> <li>1. The battery is low</li> <li>2. The battery parameters are set incorrectly</li> <li>3. The non-controller system runs out of power</li> <li>4. The battery impedance is too large</li> <li>5. The battery connection is disconnected</li> <li>6. The fuse is disconnected or the main contactor is disconnected</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the battery voltage, charging or battery import parameters, and replace the battery</li> <li>2. Check the fuse or main contactor connection</li> </ol>	LVM24S25 Controller
11	FCC24	Too high a voltage leads to a reduction in performance	<ol style="list-style-type: none"> <li>1. During regenerative braking, the regenerative braking current causes the battery voltage to rise</li> <li>2. The battery parameters are set incorrectly</li> <li>3. The battery impedance is too large</li> <li>4. The battery connection is disconnected during regenerative braking</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the battery parameters, re-import the parameters or replace the battery</li> <li>2. Check the battery connection, restart the key switch or interlock switch</li> </ol>	LVM24S25 Controller
12	FCC25	The 5V power supply of the controller fails	<ol style="list-style-type: none"> <li>1. The impedance of the external load is too low</li> </ol>	<ol style="list-style-type: none"> <li>1. Check whether there is an open circuit or a short circuit in the J3-13 port line</li> </ol>	LVM24S25 Controller

13	FCC28	The motor overheats and causes performance to be reduced	<ol style="list-style-type: none"> <li>1. The temperature of the motor reaches or is higher than the warning temperature set by the program. This results in a decrease in the current output</li> <li>2. The temperature parameter of the motor is set incorrectly</li> </ol>	<ol style="list-style-type: none"> <li>1. Restart the key switch or interlock switch when the motor cools down</li> <li>2. Check the motor temperature parameters and re-import the parameters</li> </ol>	LVM24S25 Controller
14	FCC29	The motor temperature sensor is faulty	<ol style="list-style-type: none"> <li>1. The motor temperature sensor is incorrectly connected</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the motor temperature sensor connection</li> </ol>	LVM24S25 Controller
15	FCC31	Drive 1 open circuit or short circuit	<ol style="list-style-type: none"> <li>1. Connect the load open circuit or short circuit</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct open/short-circuit errors. Restart the output</li> </ol>	LVM24S25 Controller
16	FCC31	Main contactor coil open/short	<ol style="list-style-type: none"> <li>1. Connect the load open circuit or short circuit</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the main contactor coil line and restart</li> </ol>	LVM24S25 Controller
17	FCC32	Drive 2 open or short circuit	<ol style="list-style-type: none"> <li>1. Connect the load open circuit or short circuit</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct open/short-circuit errors. Restart the output</li> </ol>	LVM24S25 Controller
18	FCC32	Electromagnetic brake coil open/short circuit	<ol style="list-style-type: none"> <li>1. Connect the load open circuit or short circuit</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the electromagnetic brake coil line and restart</li> </ol>	LVM24S25 Controller
19	FCC33	Drive 3 open or short circuit	<ol style="list-style-type: none"> <li>1. Connect the load open circuit or short circuit</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct open/short-circuit errors. Restart the output</li> </ol>	LVM24S25 Controller

20	FCC34	Drive 4 open or short circuit	<ol style="list-style-type: none"> <li>1. Connect the load open circuit or short circuit</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct open/short-circuit errors. Restart the output</li> </ol>	LVM24S25 Controller
21	FCC36	The encoder fails	<ol style="list-style-type: none"> <li>1. Motor encoder failure</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the encoder line</li> <li>2. Replace the motor encoder</li> </ol>	LVM24S25 Controller
22	FCC37	The motor is open-circuited	<ol style="list-style-type: none"> <li>1. The motor is out of phase</li> <li>2. Wrong wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the phase circuit of the motor U, V and W</li> </ol>	LVM24S25 Controller
23	FCC38	Main contactor adhesion	<ol style="list-style-type: none"> <li>1. Main contactor contact welding</li> <li>2. The motor you or V or W is disconnected or out of phase</li> <li>3. There is a situation where the circuit connected to the B+ terminal charges the capacitor</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the phase circuit of the motor U, V and W</li> <li>2. Replace the main contactor</li> </ol>	LVM24S25 Controller
24	FCC39	The main contactor is not closed	<ol style="list-style-type: none"> <li>1. The main contactor is not closed</li> <li>2. Oxidation of the main contactor contact. melt Change. Or the connection status is unstable</li> <li>3. The capacitor is charged by an external device</li> <li>4. The fuse is disconnected</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the fuse (fuse)</li> <li>2. Replace the main contactor</li> </ol>	LVM24S25 Controller
25	FCC42	The accelerator output is on the high side	<ol style="list-style-type: none"> <li>1. The output voltage of the accelerator potentiometer is too high</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the accelerator potentiometer output voltage</li> </ol>	LVM24S25 Controller
26	FCC42	The accelerator output is on the low side	<ol style="list-style-type: none"> <li>1. The output voltage of the accelerator potentiometer is too low</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the accelerator potentiometer output voltage</li> </ol>	LVM24S25 Controller

27	FCC46	EEPROM EEPROM fails	1. Write to EEPROM memory failed. This may be due to VCL writing to EEPROM storage. Either CAN BUS. or the programmer parameters are adjusted and programmed into the controller by an error	1. Download the correct software (OS), set the correct parameters to control it, and restart the key switch	LVM24S25 Controller
28	FCC47	High pedal protection/operation sequence failed	1. Key start. Interlocks. Direction. and the accelerator input order is set incorrectly 2. Wiring. Switch keys. Interlocks. Direction. or accelerator input failure	1. Re-enter each item in the correct order	LVM24S25 Controller
29	FCC47	Emergency reverse high-speed pedal protection	1. The emergency reverse operation has ended. But the accelerator. Neither the forward nor the reverse input nor the interlock have been reset yet	1. Reset and re-operate in the correct order	LVM24S25 Controller
30	FCC49	Parameter change failure	1. To ensure the safety of the vehicle Changes to certain parameters must not take effect until the key switch is reactivated	1. Restart the key switch	LVM24S25 Controller
31	FCC51	Bus communication failure	1. The CAN bus line is disconnected 2. The CAN bus line is reversed 3. CAN bus resistance matching problem 4. Node device failure	1. Measure the on-off of the bus and the resistance value of CANH and CANL (generally 60 ohms)	LVM24S25 Controller
32	FCC52	The handle CAN communication timed out	1. Handle malfunction 2. Handle harness problem	1. Check the handle and the CAN communication line from the handle to the controller 2. Replace the handle	LVM24S25 Controller

33	FCC53	The CAN bus communication of lithium battery has timed out	1. The lithium battery cannot be started or the BMS is faulty 2. Communication cable problem from lithium battery to controller	1. Check whether the lithium battery is working properly; Check whether the CAN communication of the lithium battery is normal; Check whether the communication cable from the lithium battery to the controller is normal	LVM24S25 Controller
34	FCC54	Emergency reverse switch = off before power-on (normal should be On)	1. The handle emergency reverse switch detects abnormalities 2. Handle to main control harness problem	1. Check whether the belly switch of the handle is normal; Check whether the handle to the main control harness is normal	LVM24S25 Controller
35	FCC56	Before power-on, interlock switch=On (normal is off)	1. Check if the interlock switch is normal 2. Check whether the wiring of the interlock switch is correct and whether the power supply is normal	1. Check the interlock switch and wiring	LVM24S25 Controller
36	FCC58	The handle is not pressed, the accelerator has an output	1. Program logic error	1. Check if the program version is correct	LVM24S25 Controller
37	FCC59	The serial communication between the steering controller and the main controller is faulty	1. Line communication failure 2. Failure of the steering controller or main controller	1. Check the communication line 2. Check whether the steering controller or main controller is working properly, replace the controller	LVM24S25 Controller
38	FCC64	Lithium battery overvoltage	1. Line communication failure 2. Failure of the steering controller or main controller	1. Check the lithium battery and charger	LVM24S25 Controller
39	FCC65	Lithium battery low voltage	1. The voltage of the lithium battery cell is too low	1. Lithium battery charging	LVM24S25 Controller
40	FCC66	Lithium battery is low AH	1. The power of the lithium battery is too low	1. Lithium battery charging	LVM24S25 Controller

41	FCC67	The voltage difference between lithium battery cells is too large	1. The pressure difference between the cells of the lithium battery is too large	1. Replace the lithium battery	LVM24S25 Controller
42	FCC73	Motor stalled	1. Motor stalled 2. The motor encoder fails 3. Wrong wiring 4. The power supply of the input motor encoder is faulty	1. Check if the drive wheel is stuck 2. Check the motor encoder wiring 3. Replace the motor encoder	LVM24S25 Controller
43	FCC93	Encoder restricted operation status	1. Due to motor stall or encoder failure. Causes the restricted operation state to be activated 2. Wrong wiring 3. Vehicle stalling	1. Check if the drive wheel is stuck 2. Check the motor encoder wiring 3. Replace the motor encoder	LVM24S25 Controller

## Troubleshooting for DVM24S04

No.	Display Fault Code	Fault Name	Fault Description	Solution	Fault Source
1	FCC101	Feedback overdrive	1. The actual speed is inconsistent with the command speed	1. Check if the encoder connection is normal.	DVM24S04 Controller
2	FCC102	Kernel running error	1. Controller failure	1. Replace the controller	DVM24S04 Controller
3	FCC103	The controller and motor are overloaded for a long time	1. Check whether the controller matches the motor and whether the controller is too small	1. Check whether the controller matches the motor and whether the controller is too small	DVM24S04 Controller
4	FCC105	The position after the electronic gear ratio is indicated The change exceeds the maximum speed of the motor	1. Controller failure	1. Replace the controller	DVM24S04 Controller
5	FCC106	In speed mode, the speed command is exceeded The maximum speed of the motor	1. Controller failure	1. Replace the controller	DVM24S04 Controller
6	FCC107	In torque mode, the torque command exceeds the maximum torque of the motor	1. Controller failure	1. Replace the controller	DVM24S04 Controller
7	FCC108	The location command is incorrect	1. Back to the center error	1. Detect whether the voltage configuration parameters of the position command are appropriate	DVM24S04 Controller

8	FCC109	The speed sensor is in the wrong direction.	1. The direction of the AB phase of the speed sensor is inconsistent with the direction of the motor M1 and M2	1. Modify the parameter P3.0 encoder commutation 2. Controller M1 and M2 switch positions 3. The speed sensor AB is connected to the wire to exchange positions	DVM24S04 Controller
9	FCC110	The steering wheel encoder is wrong	1. When the dual encoder input of the steering wheel is enabled, the two encoders are not synchronized	1. Replace the encoder	DVM24S04 Controller
10	FCC111	Motor 2 minutes maximum current protection	The motor current lasts for more than 2 minutes and the maximum current for more than 2 minutes 1 Motor stalled 2 Improper controller parameter setting	1. Check whether the brake is open, and check whether there is a foreign object stuck in the driving mechanism 2. Motor parameter adjustment	DVM24S04 Controller
11	FCC112	The controller is overcurrent	1. The controller is selected incorrectly 2. Or controller failure	1. Replace the controller	DVM24S04 Controller
12	FCC113	Bus capacitor charging failure	1. Controller failure	1. Replace the controller	DVM24S04 Controller
13	FCC114	The main contactor connection is faulty	1. The main contactor cannot be suction normally	1. Check whether the main contactor line is normal 2. Replace the main contactor	DVM24S04 Controller
14	FCC115	Electromagnetic brake connection failure	1. The electromagnetic brake cannot be opened normally	1. Check whether the electromagnetic brake is connected normally	DVM24S04 Controller

15	FCC116	The battery voltage is seriously too low	1. Check the battery level 2. The controller battery voltage level is set incorrectly	1. Check the battery level 2. Check the controller parameter settings	DVM24S04 Controller
16	FCC117	The battery voltage is too high	1. Check the battery level 2. The controller battery voltage level is set incorrectly	1. Check the battery level 2. Check the controller parameter settings	DVM24S04 Controller
17	FCC118	The power board is severely overheated	1. Controller protection, suspension of use	1. Restart after the temperature is normal	DVM24S04 Controller
18	FCC119	The motor is severely overheated	2. Controller protection, suspension of use	1. Restart after the temperature is normal	DVM24S04 Controller
19	FCC121	Main contactor contact welding	1. Check whether the main contactor is damaged	1., 1. Check whether the main contactor is damaged and replace the main contactor	DVM24S04 Controller
20	FCC122	5V output failure	1. Motor encoder short circuit 2. Other 5V external devices are short-circuited 3. Controller failure	1. Check the motor encoder 2. Check other 5V external devices 3. Replace the controller	DVM24S04 Controller
21	FCC123	MACID assay failed	1. The controller CAN network ID number is set to be duplicated	1. Reset the CAN network ID	DVM24S04 Controller
22	FCC124	Main contactor drive failure	1. The main contactor is damaged	1. Check whether the main contactor is damaged and replace the main contactor	DVM24S04 Controller
23	FCC125	The power module is faulty	1. Controller failure	1. Replace the controller	DVM24S04 Controller
24	FCC126	The motor is short-circuited	1. The motor stops working	1. Check if the winding between M1 and M2 is short-circuited	DVM24S04 Controller
25	FCC127	Back to the center error	1. Back to the center error	1. Check whether the zero switch is installed properly	DVM24S04 Controller

26	FCC128	The position command sensor is incorrect	1. Back to the center error	1. Check whether the analog input 1 connection is normal (the voltage of analog input 1 is less than 0.3V or greater 4.8V)	DVM24S04 Controller
27	FCC129	Wrong heartbeat (AGV mode only)	1. CAN communication error	1. Check if the CAN bus is connected properly	DVM24S04 Controller
28	FCC131	The battery voltage is too low	1. The battery is low	1. Reduce load use.	DVM24S04 Controller
29	FCC132	The power board is overheated	1. The controller works with high load or the working environment is too high	1. Reduce load use. 2. Reduce the controller temperature and reboot	DVM24S04 Controller
30	FCC133	The power board is low-temperature	1. The ambient temperature is too low	1. Reduce load use	DVM24S04 Controller
31	FCC134	The motor is lightly overheated	1. 1. The motor works under high load	1. 1. Reduce load use	DVM24S04 Controller
32	FCC135	12V output fault	1. The power supply of the handheld terminal is short-circuited 2. Controller failure	1. Check the power line of the handheld terminal 2. Replace the controller	DVM24S04 Controller
33	FCC136	Drive3 connection failure	1. Driver 3 connection failure	1. Check the driver 3 connection line	DVM24S04 Controller
34	FCC137	Drive4 connection failure	1. Driver 4 connection failure	1. Check the driver 4 connection line	DVM24S04 Controller
35	FCC138	EEPROM read and write parameters are incorrect	1. Controller failure	1. Replace the controller	DVM24S04 Controller
36	FCC139	The parameter is out of limit error	1. Parameter setting failure	1. Reset the parameters	DVM24S04 Controller

37	FCC140	Operation Timing Error The operation timing error is incorrect	1. After reset, the key signal is not in place (accelerator switch, direction switch, lift/lower, safety switch)	1. Reduce load use 2. Reduce the controller temperature and reboot	DVM24S04 Controller
38	FCC141	The power board is lightly overheated	1. The controller works with high load or the working environment is too high	1. Reduce load use 2. Reduce the controller temperature and reboot	DVM24S04 Controller
39	FCC142	The power board is mildly low-temperature	1. The working environment temperature of the controller is too low	1. After the controller temperature rises, restart	DVM24S04 Controller
40	FCb01	The lithium battery capacity is too low	1. The lithium battery is too low level 1 serious alarm	1. Stop using and charge the lithium battery in time	Lithium battery
41	FCb02	The differential pressure of lithium batteries is too large	1. The pressure difference of the single body is too large, and the alarm is serious at level 1	1. If the fault occurs when the battery power is extremely low, stop working and fully charge; 2. If the fault occurs when the battery power is high, stop working, put it on hold for more than 10min and restart use; 3. Other or 1&2 can not solve the situation: contact after-sales	Lithium battery
42	FCb03	The charging temperature is too low	1. The charging temperature of the battery cell is too low, and the alarm is level 1	1. Drive the battery or forklift into the environment above 0°C to warm up; 2. Carry out routine operations to increase the temperature of the cell; 3. Charge in time after use in low temperature weather.	Lithium battery
43	FCb04	The temperature is too high	1. The charging temperature of the unit is too high, and the level 1 serious alarm is serious	1. Stop working and continue to use after the temperature returns to normal;	Lithium battery

44	FCb05	Monomer overpressure	1. The cell voltage is too high level 1 serious alarm	1. Restart the battery and carry out regular operations, the battery voltage will be reduced and returned to normal due to discharge use;	Lithium battery
45	FCb06	Cell under-voltage	1. The cell voltage is too low level 1 serious alarm	1. Stop using and charge the lithium battery in time	Lithium battery
46	FCb07	The lithium battery capacity is too low	1. The lithium battery is too low 2-level alarm	1. Charge the lithium battery in time	Lithium battery
47	FCb08	The differential pressure of lithium batteries is too large	1. The pressure difference of the monomer is too large, and the level 2 alarm	1. If the fault occurs when the battery power is extremely low, stop working and fully charge; 2. If the fault occurs when the battery power is high, stop working, put it on hold for more than 10min and restart use; 3. Other or 1&2 can not solve the situation: contact after-sales	Lithium battery
48	FCb09	The charging temperature is too low	1. The charging temperature of the unit is too low, and there is a level 2 alarm	1. Drive the battery or forklift into the environment above 0°C to warm up; 2. Carry out routine operations to increase the temperature of the cell; 3. Charge in time after use in low temperature weather.	Lithium battery
49	FCb10	The temperature is too high	1. The charging temperature of the unit is too high, and the level 2 alarm	1. Stop working and continue to use it after the temperature returns to normal	Lithium battery
50	FCb11	Monomer overpressure	1. Level 2 alarm of high cell voltage	1. Restart the battery and carry out regular operations, the battery voltage will be reduced and returned to normal due to discharge use;	Lithium battery
51	FCb12	Cell under-voltage	1. The cell voltage is too low level 2 alarm	1. Stop using and charge the lithium battery in time	Lithium battery