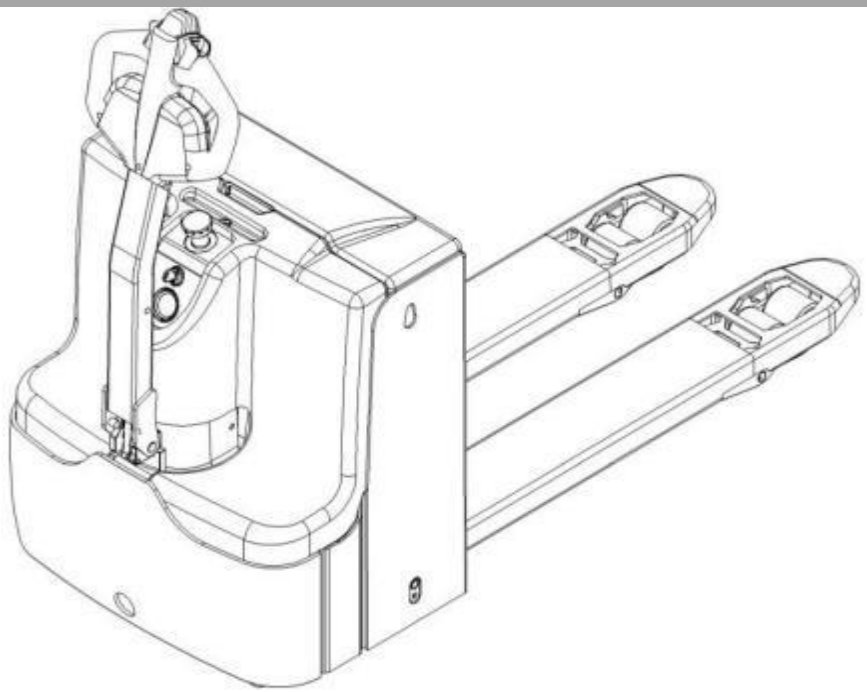
NOBLELIFT 诺力

NOBLELIFT

Electric Pallet Truck

PT16 L 20L Service Manual



Version 012/2023

PT 16 L 20L

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CONTENT

Foreword

This manual briefly introduces the technical parameters of our vehicles, the structure, working principle and operation, maintenance, maintenance and other aspects of the requirements and content. Before operation,
please read this manual carefully so as to ensure safe and effective material handling through proper driving and maintenance. At the same time can help operators to use battery vehicles reasonably, so that the battery vehicle to maximize efficiency! Hope operators and equipment management personnel in the operation of battery vehicles before careful reading! Please strictly comply with the provisions and precautions in this manual, driving carefully, careful operation, careful use, so that your vehicle in the best working condition for a long time, give full play to the efficiency. When you rent or transfer your car, please rent or transfer the car with this manual.
For emphasis, the following ICONS are used in this manual：

1.  Indicates a potentially dangerous state that, if not avoided, may cause serious bodily injury, or serious damage to a vehicle, or fire, etc.

2.  Indicates a potentially dangerous state that, if not avoided, may cause minor personal injury, or partial damage to a vehicle, etc.

3.  General notes and instructions for use.

Most of the products are made of recyclable steel. The wastes generated in the process of use, maintenance, cleaning and disassembly must be pollution-free recovered and treated in accordance with local regulations. The waste must be recycled by professionals in designated areas, and waste such as hydraulic fluids, batteries and electronic equipment, if not properly disposed of, can be hazardous to the environment and human health.

Clarify this：

1) The product is strictly prohibited to be used in the environment with potential explosion danger.

2) The noise level of the product in normal use complies with international standard EN 12053.

3) the vibration level of the product in normal use conforms to international standard EN13059.

4) Environmental requirements for normal use of this product: altitude is no more than 2000 meters, temperature range is -5°C -- +40°C, humidity is no more than 90%, and wind speed is no more than 5m/s.

If you need to use in the cold storage or special environment for a long time, you need to add a special attachment, please contact our technical personnel.

5) In case of batch problems of this product, product recall service shall be implemented

For continuous product improvement, the manufacturer reserves the right to change its product design and specifications without prior notice. If you want to know the latest product parameters, please contact us. All parameters of this manual are subject to the date of publication of the manual.

1. Overview

1.1 Introduction - Maintenance of safety precautions

Maintenance work can lead to injury. Operators should operate vehicles in accordance with the following rules to avoid injury or damage to their vehicles. The vehicle must be maintained to ensure safe operation.

Each section of the manual contains specific protective measures, most of which can be used to repair hydraulic and large truck parts

Unauthorized alteration of vehicle is a safety violation.

Since the truck manufacturer does not have direct control over site inspections and vehicle maintenance, the responsibility rests with the vehicle owner.

Failure to observe safety measures resulting in machine damage, injury or death of persons is a violation of safety regulations.

- Only specially trained personnel can operate the vehicle.

- operation or maintenance vehicle please read it carefully before the operation and maintenance manual.
- Read all the preventive measures on the vehicle labels.
- Make sure you fully understand what you're doing. It is important to have the necessary tool box components before maintaining the vehicle.

- The first consideration when maintaining a vehicle is the safety of oneself and others. Do not move large parts without mechanical equipment. Do not place heavy objects in unstable positions. Ensure adequate support is provided when raising part of the equipment.

- It should be noted that the hydraulic system of the machine operates under extremely dangerous pressures. Make every effort to relieve system pressure before disconnecting or removing any part of the system. Control motor stop and start through multiple cycles to reduce system pressure.
- Remove rings, watches and jewelry while maintaining the vehicle.

- Wear helmets, safety shoes and work clothes and protective glasses when drilling or hammering. In order to avoid being injured by the protruding parts of the vehicle, the staff should wear safety clothes. Don't wear oily clothes. Check to unplug the battery plug-in. Do not wear loose clothing and ties to prevent clothing from getting involved in equipment.

- No unauthorized persons are allowed to stand near the machine during maintenance.

- Do not replace lamps with flames. Do not use open flame to check leaks, oil levels or electrolytes.

- Immediately remove grease from operating areas or hand guards, which can be dangerous if someone slips on the vehicle.

- Use pure oil and a clean container.

- Oil is a dangerous substance. Do not use grease or oily clothes where there is a fire. Make good use of fire extinguishers and other fire extinguishing equipment.

- Keep the battery out of danger of fire, and the gas generated will explode.

- Keep flammable items away from vehicles and smoking is prohibited in the workplace.

- Disconnect the battery when replacing electrical components.

- Use Noblelift recommended grease grades and choose viscosity based on ambient temperature.

- The exhaust is dangerous in the enclosed space.

- Avoid inhaling dust from processing components and wear a gas mask if necessary.

- When working at the top of the vehicle, be careful not to lose your balance and fall.

- Putting warning signs in the operating area (such as "Do not start" or "Under maintenance") prevents people from starting or moving the vehicle.

- When welding or power system work, turn off the key switch and unplug the battery plug. Park your car on a firm, flat surface. Reduce the fork to the lowest height and stop the motor.

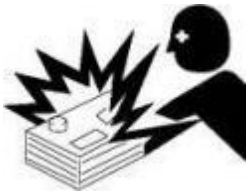
- The sulfuric acid in the battery electrolyte is toxic and can burn skin and corrode clothes. If the acid splashes on the operator's clothing or skin, rinse immediately with plenty of water.

- Wear goggles or protective glasses for battery work. If you splash into your eyes, rinse immediately with water and seek medical attention.

- Metal objects touching the battery terminal may cause a short circuit and burn workers. Keep tools away from the battery terminal.

- Keep sparks, lighted matches and open fires away from the battery, where the battery (hydrogen) gas can explode.

- Make sure the battery terminal posts (+,-) are properly connected when removing and assembling the battery.



- If water enters the electrical system, it will cause a failure of operation. Do not use water on sensors, connectors or vehicle instruments.

- Do not handle electrical equipment while wearing wet gloves, which can cause an electric shock.

- When working with others, choose a team leader and work according to his instructions. Do not perform any maintenance work other than as specified.

- Unless otherwise instructed, maintenance must be carried out after the motor has stopped. If maintenance is carried out while the motor is running, two technicians must be present: one to operate the stacker and the other to carry out maintenance work. In this case, do not touch any moving parts.

- Lubricate and maintain and turn off all power switches before adjustment.

- When removing a part that contains an O-ring gasket or seal, clean the mounting surface and replace the seal with a new one.

- Clean the machine thoroughly, especially the area near the grease assembly and measuring tape. Be careful not to let any dirt or dust into the system.

- Use only permitted non-combustible cleaning solvents.

- When changing the hydraulic oil or strainer, check the hydraulic oil and strainer for excess metal particles or other external substances.

- Replace with parts supplied by Nori to ensure that the parts or components are the same as the original parts.

- If you check the open gearbox, something might fall into it. Make sure there are no pockets before removing the cover for inspection. Then carefully remove the nut.

1.2 Measuring the conversion

The length

unit	cm	m	km	in	ft	yd	mile
cm	1	0.01	0.00001	0.3937	0.03281	0.01094	0.000006
m	100	1	0.001	39.37	3.2808	1.0936	0.00062
km	100000	1000	1	39370.7	3280.8	1093.6	0.62137
in	2.54	0.0254	0.000025	1	0.08333	0.02777	0.000015
ft	30.48	0.3048	0.000304	12	1	0.3333	0.000189
yd	91.44	0.9144	0.000914	36	3	1	0.000568
mile	160930	1609.3	1.6093	63360	5280	1760	1

1mm=0. 1cm, 1 m=0.001mm

area

unit	cm2	m2	km2	a	ft2	yd2	in2
cm2	1	0.0001	_	0.000001	0.001076	0.000012	0.155000
m2	10000	1	0.000001	0.01	10.764	1.1958	1550.000
km2	_	1000000	1	10000	1076400	1195800	_
a	0.01	100	0.0001	1	1076.4	119.58	_
ft2	_	0.092903	_	0.000929	1	0.1111	144.000
yd2	_	0.83613	_	0.008361	9	1	1296.00
in2	6.4516	0.000645	_	_	0.006943	0.000771	1

1ha=100a, 1mile2=259ha=2.59km2

capacity

unit	cm3 = cc	m3	*l*	in3	ft3	yd3
cm3 = m *l*	1	0.000001	0.001	0.061024	0.000035	0.000001
m3	1000000	1	1000	61024	35.315	1.30796
l	1000	0.001	1	61.024	0.035315	0.001308
in3	16.387	0.000016	0.01638	1	0.000578	0.000021
ft3	28316.8	0.028317	28.317	1728	1	0.03704
yd3	764529.8	0.76453	764.53	46656	27	1

1gal(US)=3785.41 cm3=231 in3=0.83267gal(US)

The weight

unit	g	kg	t	oz	lb
g	1	0.001	0.000001	0.03527	0.0022
kg	1000	10	0.001	35.273	2.20459
t	1000000	1000	1	35273	2204.59
oz	28.3495	0.02835	0.000028	1	0.0625
lb	453.592	0.45359	0.000454	16	1

1 tone (metric)= 1.1023 ton(US)=0.9842 ton(UK)

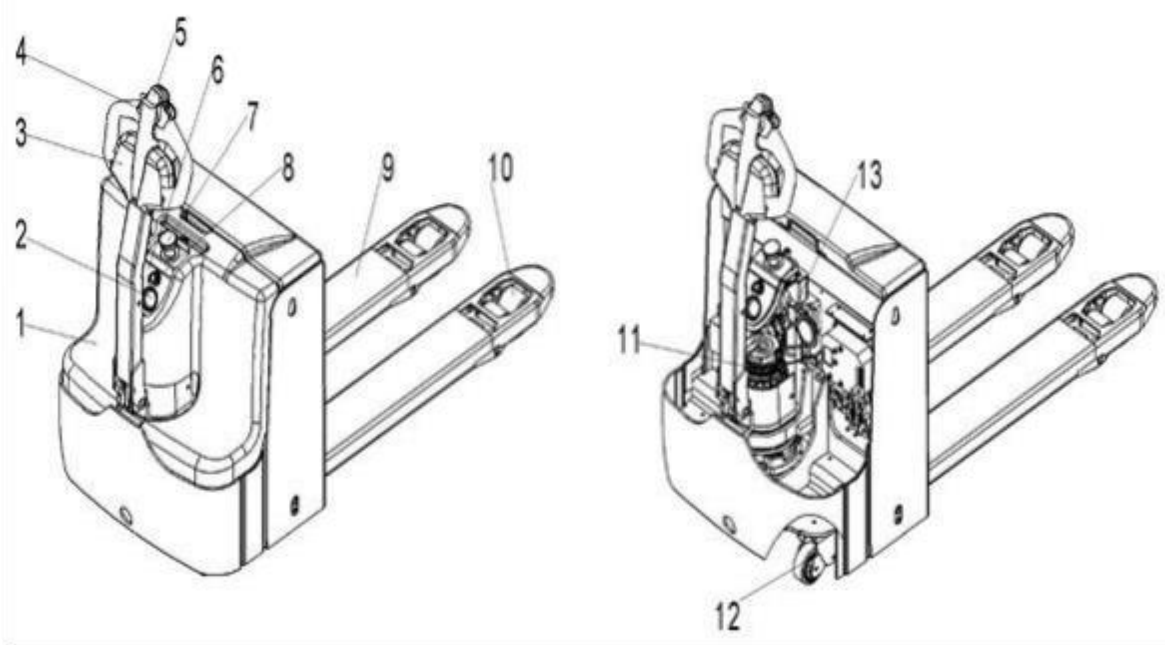
pressure

unit	kgf/cm2	bar	Pa=N/m2	kPa	lbf/in2	lbf/ft2
kgf/cm2	1	0.98067	98066.5	98.0665	14.2233	2048.16
bar	1.01972	1	100000	100	14.5037	2088.6
Pa=N/m2	0.00001	0.001	1	0.001	0.00015	0.02086
kPa	0.01020	0.01	1000	1	0.14504	20.886
lbf/in2	0.07032	0.0689	6894.76	6.89476	1	144
lbf/ft2	0.00047	0.00047	47.88028	0.04788	0.00694	1

kgf/cm2=735.56 Torr(mmHg)=0.96784atm

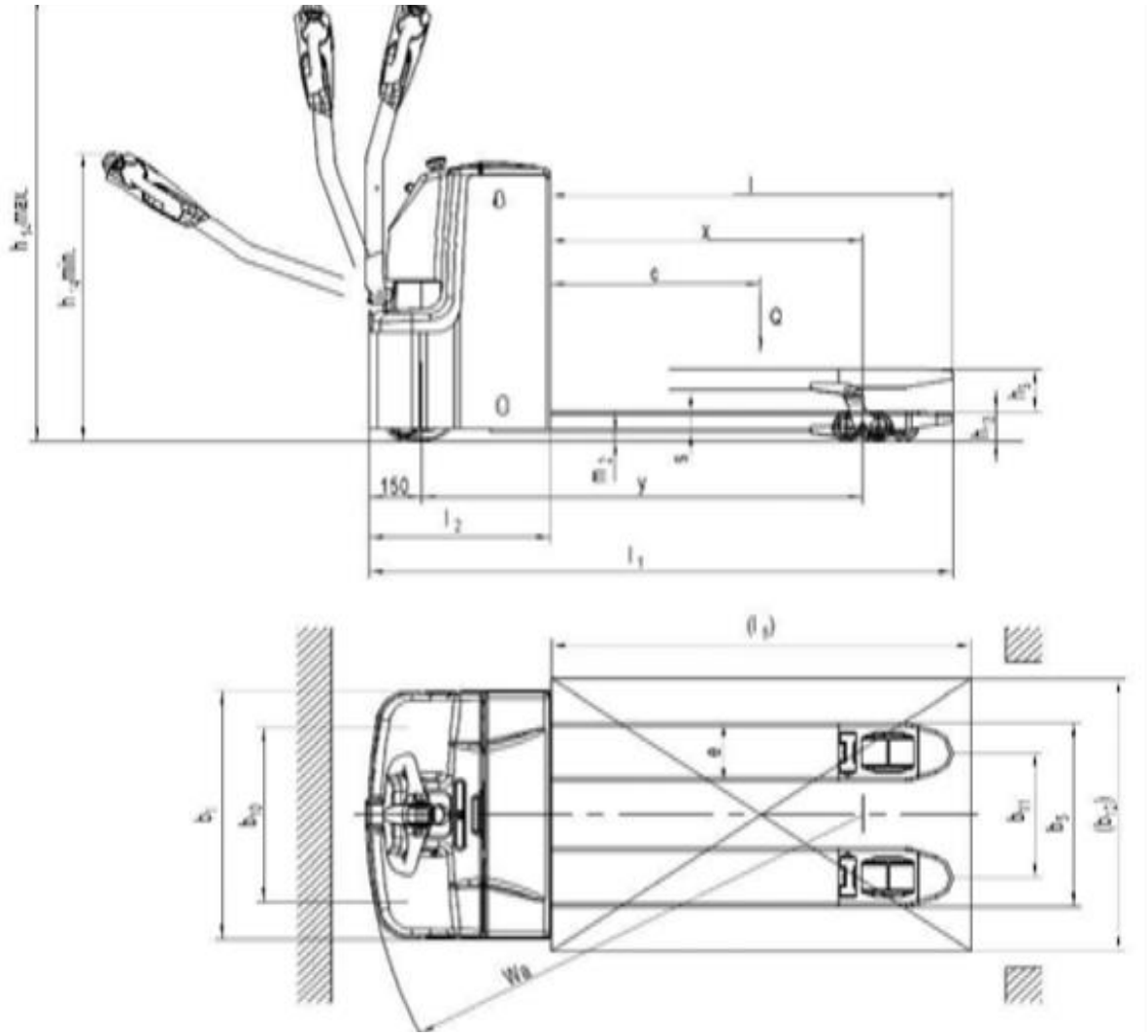
2.specifications

2.1 Overview of Main Components



1.	Electrical case cover	8	Key switch
2.	Discharge indicator, LED charging indicator	9	Pallet fork chassis
3.	The handle	10	Truck wheel
4.	Drive control switch (Butterfly switch)	11	Driving wheel
5.	Safety button/ belly switch	12	Steering wheel assembly
6.	Instrument panel cover	13	The hydraulic oil cylinder
7.	Joint emergency button		

2.2 Specification table



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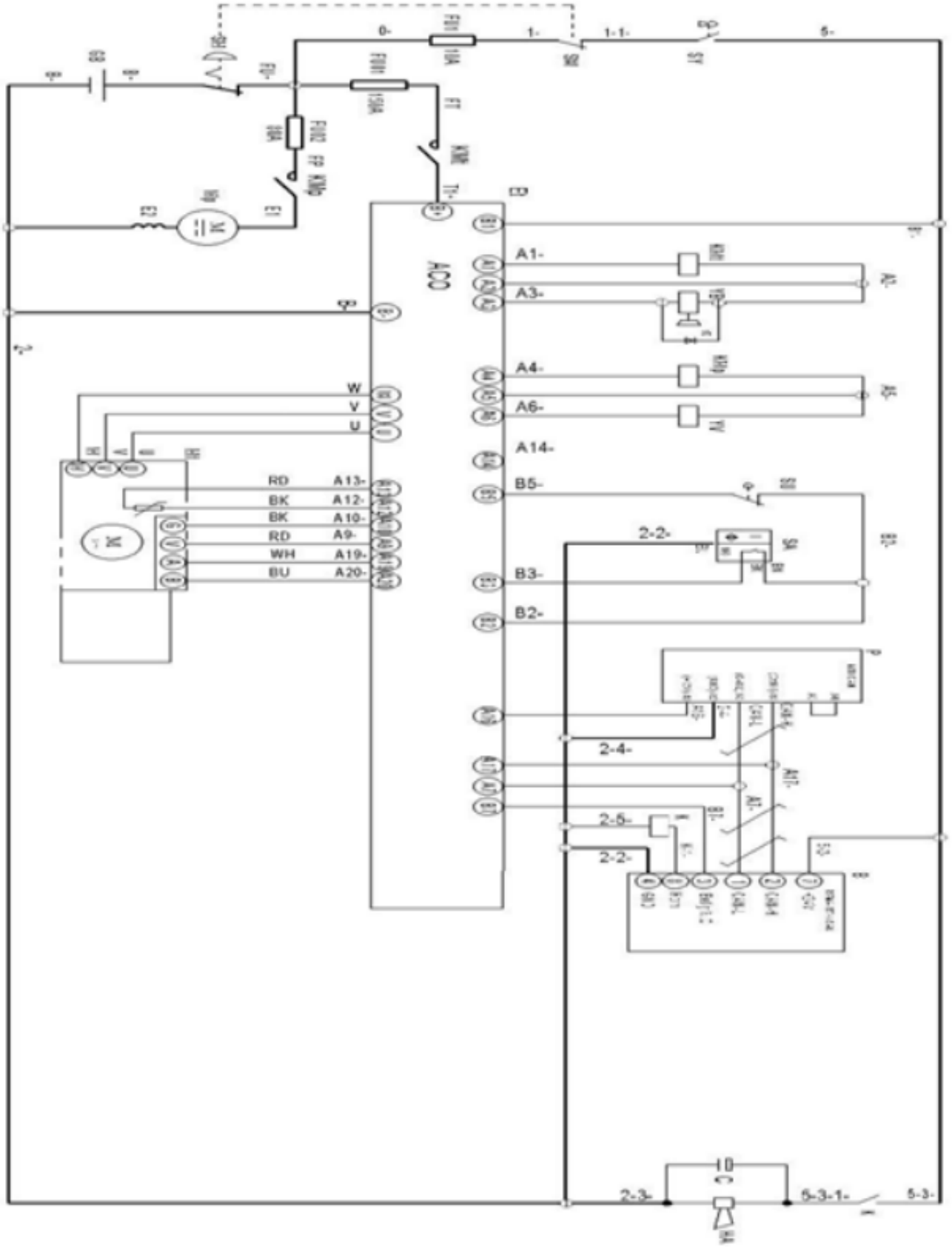
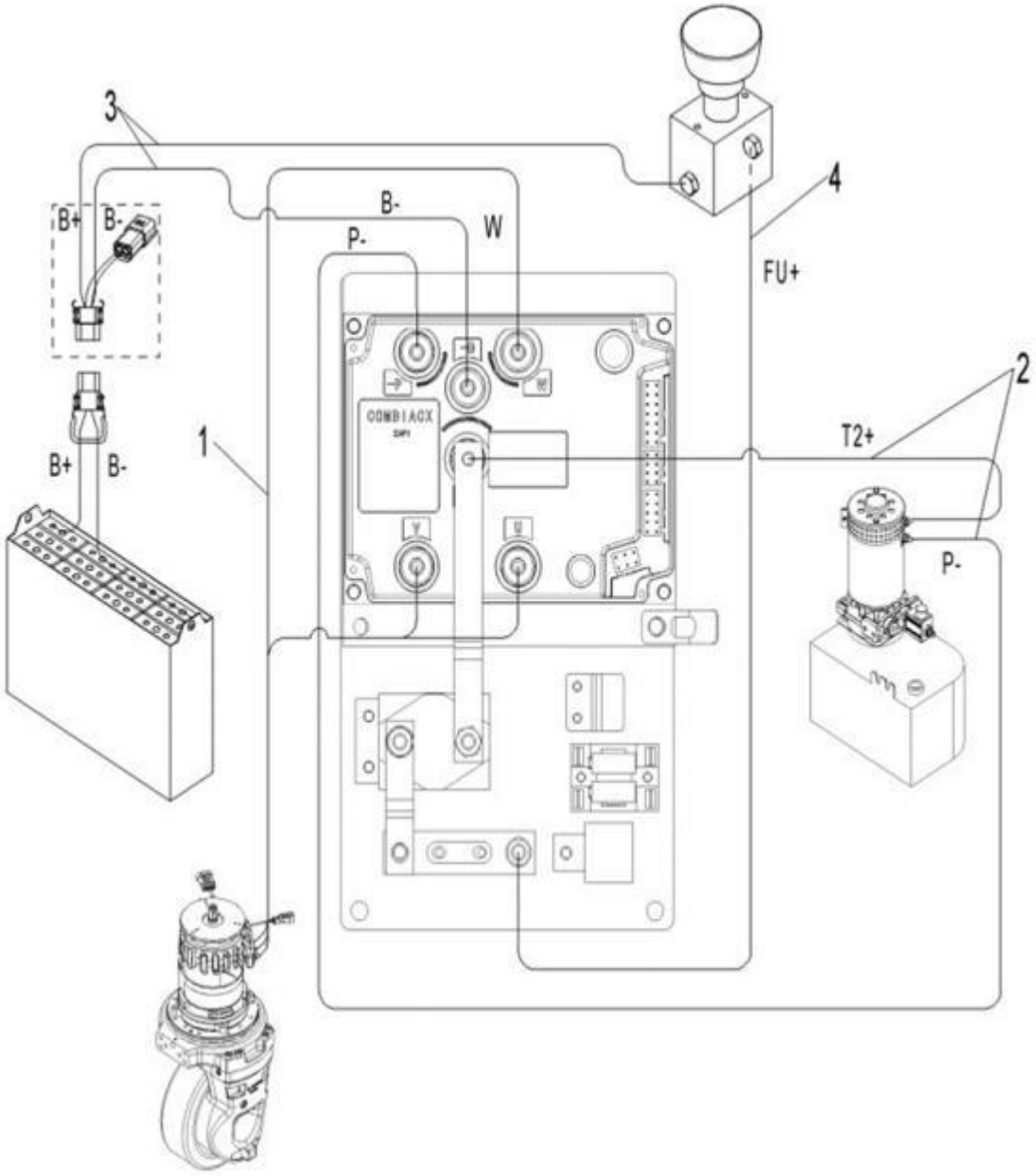
According to the VDI 2198 standard industrial vehicle type table					
features	1.2	model		PT 16L	
				Fixed the	Collapsible pedal
	1.3	Power (Electric, diesel, gasoline, LPG, electrical)		electric	
	1.4	Driving mode (manual, walking, station driving,		Ride truck	Ride truck
	1.5	Nominal carrying capacity	Q (t)	2.5	
	1.6	Load center distance	C (mm)	600	
	1.8	Before hanging from	X (mm)	965	
	1.9	The wheelbase	Y (mm)	1595	
weight	2.1	Weight (including battery)	kg	1085	950
	2.2	Load driving side/ load bearing side of bridge at	kg	1555/2030	1370/2080
	2.3	Load driving side/load bearing side of bridge	kg	885/200	730/220
wheels	3.1	under no load tire		PU	
	3.2	The wheel size Drive side	∅ x w (mm)	∅82X82	
	3.3	The wheel size Bearing side	∅ x w (mm)	∅250X82	
	3.4	Steering wheel size	∅ x w (mm)	∅124X60	
	3.5	Number of wheels (x= drive wheel) Drive		1×+2/4	
	3.6	Wheel pitch (front) Drive side	b_{10} (mm)	530	
	3.7	Wheel pitch (rear) Bearing side	b_{11} (mm)	367/512	
size	4.4	Hoisting height	h_3 (mm)	120	
	4.9	The height at which the handle is in neutral	h_{14} (mm)	1235	1005/1445
	4.15	Minimum height of fork	h_{13} (mm)	85	
	4.19	Overall length	l_1 (mm)	2667	2122
	4.20	Body length	l_2 (mm)	1516	971
	4.21	The overall width	b_1 (mm)	790	
	4.22	Pallet fork size	s/e/l (mm)	60/173/1150	
	4.25	Fork outside distance	b_5 (mm)	540/685	
	4.32	Minimum ground clearance	m_2 (mm)	25	
	4.33	Working channel width,1000X1200 pallet(1200 Straddle fork placement)	Ast (mm)	3084	2550
	4.34	Working channel width,800X1200 pallet(1200 Place along the fork)	Ast (mm)	2945	2410
	4.35	Turning radius	Wa (mm)	2520	1980
performance	5.1	Speed, full load/no load	km/h	9/12	9.5/12.5
	5.2	Increased speed, full load/no load	m/s	0.038/0.058	
	5.3	Descent speed, full load/no load	m/s	0.050/0.048	
	5.8	Maximum climbing capacity, full load/no load	%	8/10	8/15
	5.10	Crane brake		EM Brake	
motor	6.1	Driving motor power	kW	2.7	
	6.2	Lifting motor power	kW	2.2	
	6.3	battery, according DIN 43531/35/36 A,B,C, no	mm	B,3PzS	
	6.4	Battery voltage/ capacity	V/ Ah	24/375	
	6.5	Battery weight	kg	300	
	6.6	Energy consumption (VDI cycle)	kWh/h	1.83	1.75
th	8.1	Drive control mode		AC speed control	
	8.4	Driver ear noise level according to EN12053	dB(A)	69	

3. Electrical system

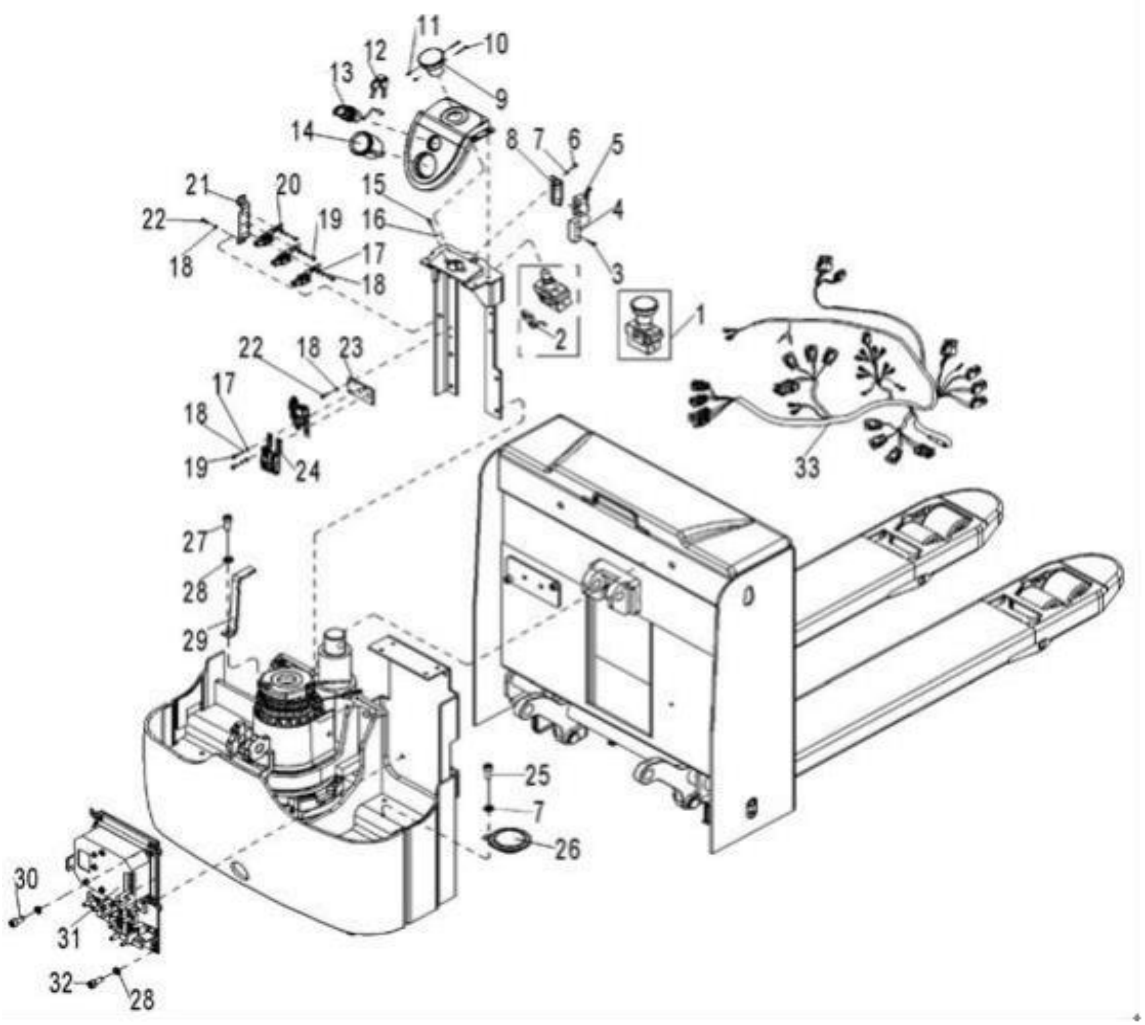
3.1 Circuit diagram



3.2 Electrical assembly



3.3 The main wire



NO	The name of the	quantity	notes
1	Dc power switch	1	ZDK32-350
2	Dc power switch ZDK32-350 micro switch	1	
3	Cross grooved disc head screw	2	M4×25
4	Micro witch protection cover	1	
5	Micro switch	1	RZ- 15GW2S-B3
6	Hexagon socket cylindrical head screw	2	M6x12
7	Standard spring washer	4	6
8	Limit switch mounting plate	1	
9	Dc power switch	1	ZDK32-350 The mushroom head
10	Cross grooved disc head screw	2	M3×25
11	Type I hexagon nut	2	M3
12	Universal key switch	1	LKS- 101A switch
13	Universal key switch	1	LKS- 101A
14	Electricity meter	1	CURTIS 803
15	Hexagon socket cylindrical head screw	2	M5×16
16	Standard spring washer	2	5
17	Flat washer class C	2	4
18	Standard spring washer	9	4
19	Cross grooved disc head screw	5	M4×12
20	Amp two core connector seat	4	
21	Plug-in bending plate	1	
22	Hexagon socket cylindrical head screw	4	M4x12
23	Plug-in transition board	1	
24	Plug seat	3	
25	Hexagon socket cylindrical head screw	2	M6×20
26	The horn	1	DC24V
27	Hexagon socket cylindrical head screw	1	M8×16
28	Standard spring washer	5	8
29	Thread holder	1	

4. Usage of battery

Battery charging

Use nori's original charger to charge the battery, and operate in strict accordance with the use and Maintenance instructions of the charger.

A) Battery electrolyte should not be kept too low level.

⚠ **· Should keep the battery electrolyte to the specified level, otherwise it will lead to the battery overheat or burn.**

· When battery electrolyte is insufficient, battery life will be shortened.

B) Add distilled water, the new battery only needs to be supplemented with distilled water within 1-1.5 years of normal use, and the acid solution only needs to be supplemented later.

C) Overcharging is strictly prohibited

D) The charging place should be kept well ventilated

⚠ **· The battery charging process should be carried out in a well-ventilated place and should avoid dampness.**

E) Open the battery cover

⚠ **· Hydrogen will be produced during the battery charging process, the battery cover should be opened when charging.**

F) Check wiring terminals, cables and connectors.

· Connectors and cables should be checked before charging to ensure there is no damage. · Do not charge when:

The connector electrode is damaged.

Wire terminals and cables are corroded.

These conditions can lead to sparks, burns and explosions.

G) Turn off the key switch and charge

H) Check specific gravity

Before charging should be measured in all single cell battery electrolyte specific gravity, so that the battery can be found abnormal conditions. Knowing the specific gravity first and then charging it will prevent some accidents.

I) When plugging or unplugging the power connector, hold the plug-in or handle but not the cable. Reference value of battery measurement:

Full charge: specific gravityρ=1.28- 1.30g/cm³； Monomer voltage≥2. 1V

Under voltage: specific gravityρ=1.16- 1. 17g/cm³； Monomer voltage≤1.7V

Temperature C°	-15	0	15	30	45
The proportion of g/ cm³	1.31	1.30	1.29	1.28	1.27

· Do not unplug the cable.

When cables and power connectors are damaged, contact our after- sales department to replace the damaged cables and power connectors.

J) Disconnect the charging process

· The steps of disconnecting the charging process must be operated in strict accordance with the "Operation and Maintenance Instructions" of the charger.

· Do not unplug the charger during charging, otherwise it will generate electric spark and cause danger.

4.1 Replacement of battery

When the vehicle continuous use of a working cycle, battery power is completely used up, should be in

a timely manner with another group of fully charged battery on the original vehicle battery, and the replacement of the battery for charging.

⚠ **· When replacing the battery, ensure that the battery and the vehicle to match. The use of a battery that does not match the vehicle will shorten the working time of the vehicle or the vehicle will roll over when running.**

· Battery replacement shall be carried out on the designated working platform.

Follow these steps to replace the battery：

⚠ **· When another forklift is used as lifting equipment to replace the battery, appropriate spreader should be used.**

· The battery hoisting shall be operated by professionals.

A) Unplug the battery.

B) Open the upper cover of the battery.

Use air spring or other means to ensure that the upper cover of the battery is locked, so as to avoid the fall of the upper cover of the battery injured human body or body.

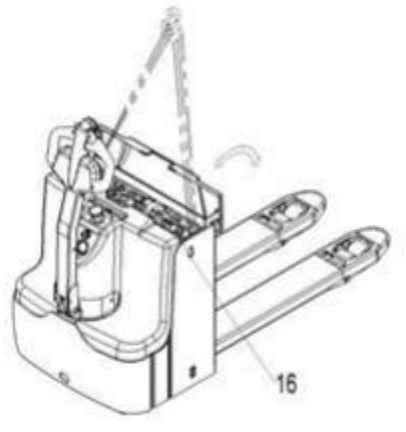
C) Care should be taken not to touch the handle assembly or other vehicle components when the battery is lifted out of the vehicle.

D) After a set of fully charged batteries have been placed, the battery plug should be firmly connected.

E) Cover the upper cover of the battery.

⚠ **· When the battery is covered. Care should be taken not to press on fingers.**

· When lifting the battery, care should be taken to avoid damaging the car body due to the swing of the battery box



4.2 Battery maintenance (lead-acid battery)

1. Battery water replenishment

the late charging stage, the battery will produce an electrolytic effect, making the moisture part of the electrolyte electrolytic. Battery after a long time of charging and discharging use, the water will electrolyze more, so that the electrolyte concentration increased, liquid level down. At this time, it is necessary to add distilled water to restore the original height of the liquid level and maintain the normal concentration of electrolyte to ensure the service life of lead-acid battery.

2. Notes:

(1) Remember that the liquid level should not fall below the partition before starting to replenish water. When the

separator is exposed to air, it will seriously affect the battery performance.

(2) In order to reduce The Times of water replenishment, the battery charging should be strictly required by the operating instructions for charging, do not overcharge. Overcharge will aggravate the battery water loss.

3. Water replenishment materials and tools

(1) Water requirements: it is recommended to use the battery special supplement liquid or distilled water. In case of emergency, pure water for drinking water from the market can also be used, but do not use tap water, mineral water and other water containing impurities.

(2) Water replenishment tools: water funnel and gourd ladle. The tools can be made of plastic or glass, not metal.

(3) For users who add large amount of water, a large bucket is adopted to make a self-made water filling device.

5. When the battery lacks water due to the lack of water in time:

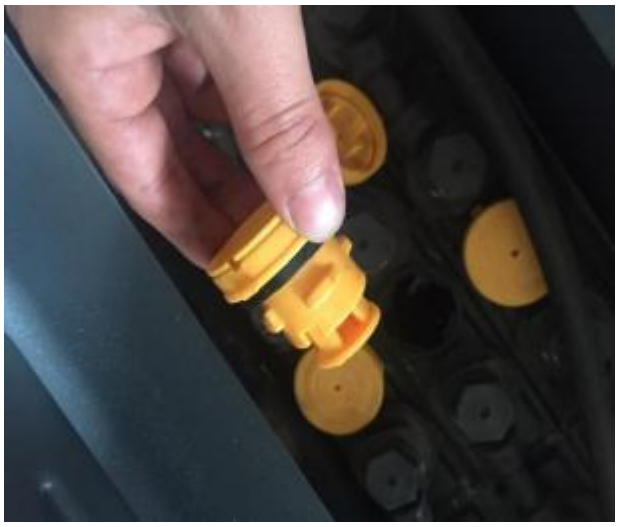
1) As the electrolyte level drops, the battery temperature rises very high during charging;

2) Battery capacity decreases;

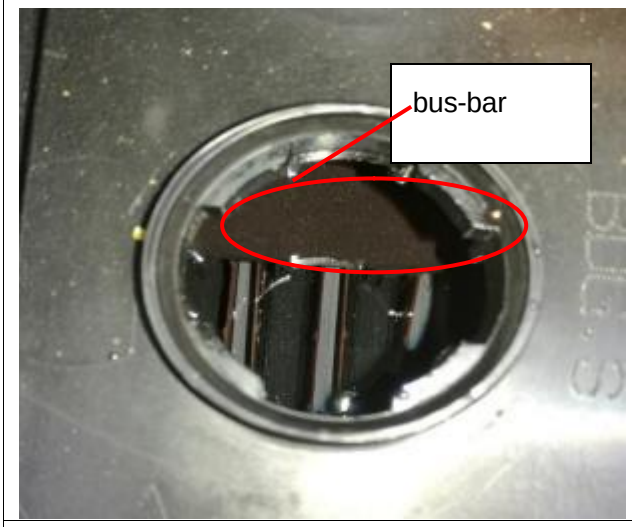
3) If the plate is exposed to the air, it will cause oxidation;

4) Increased electrolyte specific gravity, easy to lead to plate corrosion degradation.

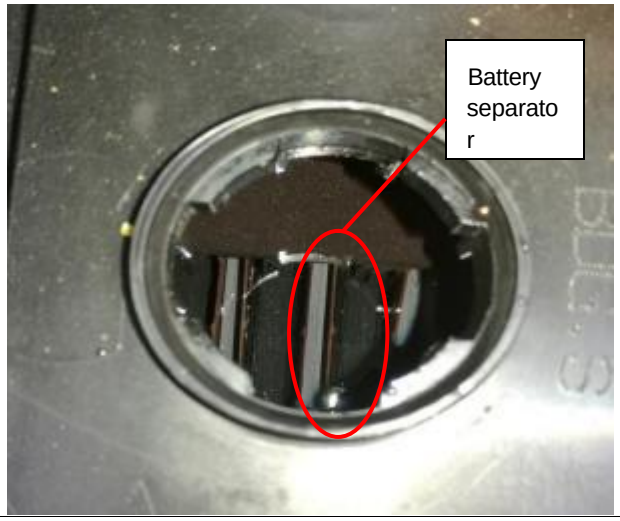
1. Unplug the power switch



2. Unscrew the battery water cap

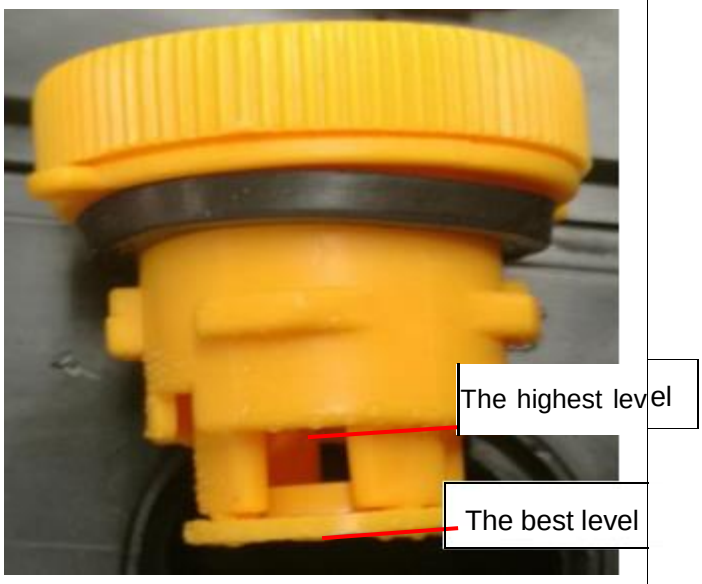


3. When the battery liquid level is lower than the busbar, water should be refilled



4. Some models of battery add liquid hole can not see the bus drain, liquid level drops to 10mm away from the battery separator, water replenishment

5 . Add water with a plastic funnel



6. Battery recharge height

inspection item	Maintenance requirements	tool	Daily (8 hours)	Once a week (50h)	A month (200h)	Every three months (600h)	Every 6 months (1200h)
battery	Electrolyte level	visual	√	√	√	√	√
	Electrolyte specific gravity	hydrometer		√	√	√	√
	electricity		√	√	√	√	√
	Is the pile head loose		√	√	√	√	√
	Is the cable loose		√	√	√	√	√
	Whether the surface is clean			√	√	√	√
	Whether there is foreign matter on the surface		√	√	√	√	√
	Is the breathable cover firm			√	√	√	√
	Away from the fire		√	√	√	√	√

4.3 Battery test

A. Battery status check

Weak batteries can cause or cause problems with the controller and power circuitry. Make sure the battery is in good condition before troubleshooting other areas.

Preliminary steps

Verify that the polarity on the battery connector and control panel is correct. The positive cable shall be located in the line fuse (fuse) and the negative cable shall be located in the negative of the control panel.

When the vehicle is running

Battery load test

Turn the range switch on the multimeter to read the battery voltage.

2 Connecting batteries

Connect the multimeter lead between the controller's B+ (1) and B- (2).

4. In a safe area, operate the hydraulic system (load) while reading the voltage indicated on the multimeter.

5 If the indication is less than the limit (19.0v), the battery needs to be charged or repaired before continuing with troubleshooting.

When the vehicle is not running and the battery is suspect

A Battery voltage drop test

1 Measure the voltage of each single battery when the vehicle is energized and the pump motor is running.

2 The normal voltage should be between 1.7V and 2. 1V for each single cell. If the voltage on each individual cell is less than 1.7V, the power must be checked first,he pool is charged or serviced before continuing with troubleshooting. .

3 The index between the cells should not exceed 0.15 volts. If so, the battery must be evenly charged or serviced

Vehicle wiring and bodywork of resistance between any point should be at least 10000 Ω or higher.

A short circuit in the battery case causes many problems. A short circuit in the chassis of a vehicle wiring may cause problems due to possible battery chassis leakage. To prevent problems caused by short circuits,

Please do as the following:

1 Disconnect the battery and cause the controller to discharge.

2 random measurement related to vehicle chassis any component or wiring connections, minimum resistance of 10000 Ω . Any test point with low resistance must remove the chassis short circuit.

3 Keep the battery clean at all times to minimize current leakage to the chassis.

4. Ensure that all accessories (such as speakers and lights) are designed with no chassis connection (two-wire system)

5.charger

5.1 Precautions for use

1 the battery polarity cannot be reversed, otherwise it will damage the smart charger and battery. The intelligent charger should be installed in the special place with good ventilation, dry, no serious dust, no corrosive gas, and no strong electromagnetic interference. The chassis shall be reliably grounded (there are grounding bolts at the rear part of the chassis).

2. The smart charger is suitable for indoor and outdoor use, not vehicle-mounted use, water is strictly prohibited inside the charger.

3. The input power of the intelligent charger is 110-220V two-phase,50HZ, and the cross-section of the input conductor is not less than 62.

4. The output line should be selected according to the distance, and the total voltage drop of the line should not be more than 5%.

5, the intelligent charger is suitable for the ambient temperature of - 10C~50C, the altitude is less than 1000 meters, the distance from the surrounding walls and other obstacles affecting its ventilation and heat dissipation should be more than 0.6 meters when the machine is used, regularly check whether the fan is running normally. 6. Plug in the battery before charging, switch on the power supply, cut off the power supply after charging and unplug the battery

5.2 Description of control panel

NO	Item	Digital display status	Description of status and method of fault discharge	notes
1	current	The last three digits of the digital tube represent the number of currents C-XXX	The four basic states displayed in the normal working cycle of the charger are: charging current, output voltage, charging schedule and charging time respectively.	The normal state
2	The battery voltage	The last three digits of the digital tube represent the end pressure U-XXX		
3	The progress of	The last two digits of the digital tube represent the progress percentage S--XX		
4	Charging time	The first two digits of the digital tube mean "time" and the last two digits mean "minute" XX-XX		
5	Transformer temperature protection	tr---	If the temperature of the transformer is too high, it will stop charging automatically and return to normal operation after the temperature drops.	Automatic recovery
6	The battery voltage is too low	UOL-L	The battery is damaged or does not match the charging model	unrecoverable
7	High battery voltage	UOL-H	The battery does not match the charging model	unrecoverable
8	Open communication	ACOFF	The alternating current is not on or the socket is out of power	
9	End of the charging	P-end	End of normal charging	The normal state
10	End of the charging	Ovend	Timeout charging ends, battery failure or ac voltage is too low	

5.3 Common faults of the charger

Failure 1. After the charger is switched on with the ALTERNATING current, the charger has no display. Discharge method: Nori external charger, only after connecting the battery, the digital tube will be displayed, if the battery is not shown, please check whether the battery is open.

2. After the charger is connected to the battery and the AC switch of the charger is turned on, the STATE of ACOFF is displayed all the time.
Discharge method: Please check whether the socket has alternating current, ACOFF stands for no alternating current.

3. After charging, the charger displays Ovend.

Discharge method: This state is the end of the charging timeout of the charger. The charging time exceeds 14 hours. Please check whether the battery has short circuit or ac voltage is too low.

Fault 4: In the process of charging the charger, accompanied by a sound.

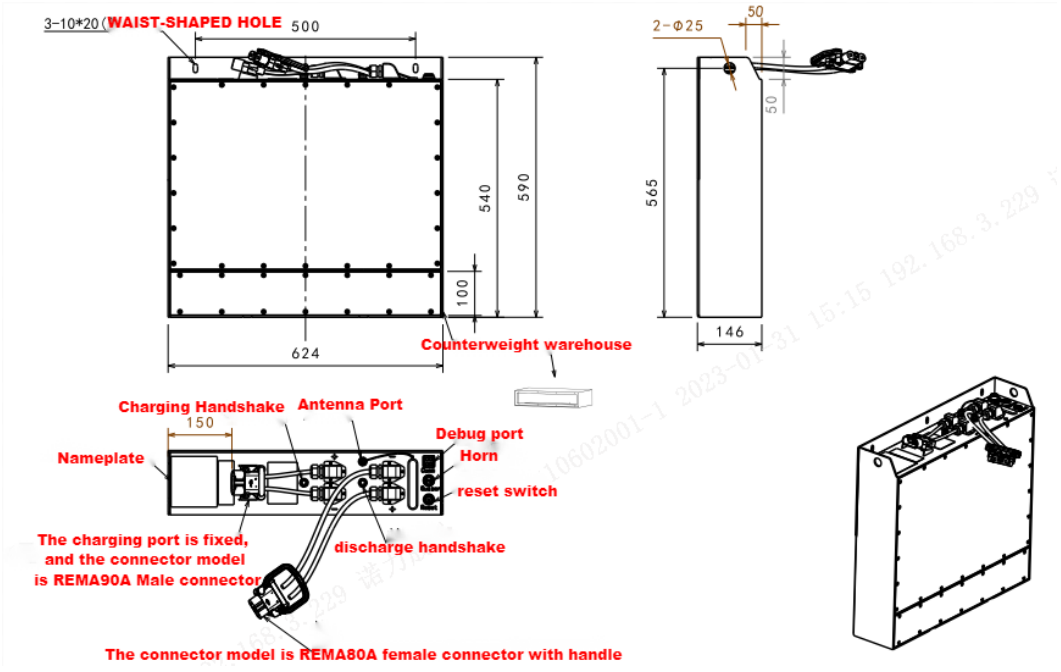
Discharge method: it is a normal phenomenon that the charger automatically adjusts the current or transformer noise.

6 Lithium battery

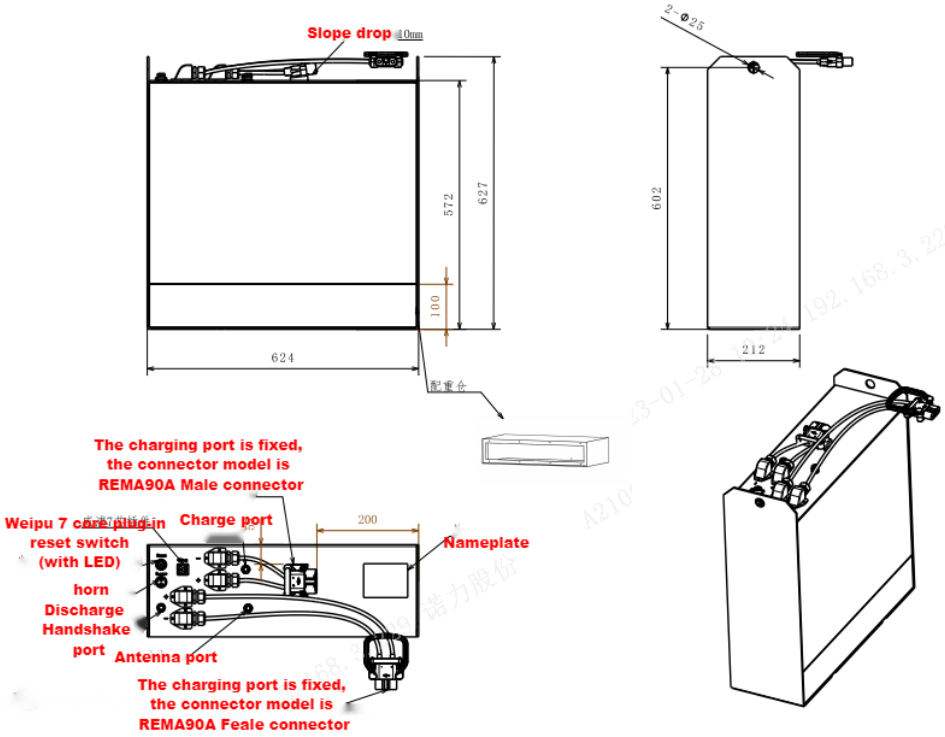
Introduction

a.Product characteristics

1).This product is designed for electric forklift, pure electric transport truck for special structural design strengthening, can withstand strong vibration and impact.
2).The battery pack is equipped with intelligent battery management system, which has the protection functions of voltage, temperature acquisition, under-voltage, over-voltage, over-temperature, over-current, short circuit and so on.
3).This product is a customized battery pack only for the NOBLELIFT series of products, ensuring the applicability of the product from the source of the design.
4).The internal resistance of the battery is very low, which can minimize the heating of the battery, provide more sufficient power for the forklift truck.



Outline diagram (24V 100Ah)



Outline diagram (24V 150Ah)

b.Technical parameter

		PT16L		PT20L	
Items		**Data**	**Note**	**Data**	**Note**
Specification		24V100Ah		24V150Ah	
Nominal voltage		24V		24V	
Nominal capacity		100Ah	0.5C discharge	150Ah	0.5C discharge
Weight		55kg		67kg	
Discharge	Maximum continuous discharge current	60A		80A	
	Maximum Pulse Discharge Current	140A	Not exceeding 1min	180A	Not exceeding 2 seconds
	Discharge cut-off voltage	≥20V		≥20V	
Charge	Standard charge current	60A		60A	
	Max charge current	60A		75A	
	Charge voltage	29.2V		29.2V	
Initial impedance		<25mΩ	Between positive and negative poles	<25mΩ	Between positive and negative poles
Charging temperature		0～55℃		0～55℃	
Discharge temperature		-20～60℃		-20～60℃	
Storage temperature range		-20～35℃		-20～35℃	

Safety Instructions

Before installation and use, please read carefully and strictly observe the following safety precautions, otherwise it may cause damage to your life and property.

●Prevent ignition

-It is forbidden to work at temperatures over 60 ℃.
-It is forbidden to place it beside heat sources, such as stoves, fireplaces, etc.
-Avoid direct sunlight.
-It is forbidden to place products near inflammable and explosive substances;

●Prevent explosion

-Do not hit the battery with something as a hammer.
-Do not drive a nail in products.
-Can't throw products into the fire or water.

●Prevent electric leakage

-Do not disassemble.
-Do not contact by wet hands.
-Do not expose it to moisture or liquids.
-Do not place it in a place easily touched by children or animals.

●Preventing damage to battery systems

-It is forbidden to contact liquids or corrosive chemicals.
-Prohibition of high temperature and high pressure.
-No trampling, dis assembly or smashing.
-Can’t charge from discharge terminals and can’t discharge from charging terminals.

Installation and use

a.Installation environment

Recommended installation environment: temperature 0-35℃, humidity 5% - 95%;

Avoid the excessive temperature difference between the two sides of the ∧ type battery（more than5℃）.

b.Method of erection

Downward installation. Avoid violent collision, impact and drop. Charging port orientation should be opposite to the vehicle discharge port, in order to facilitate charging.

c.Operating requirement

Use according to the table below, avoid exceeding the specified use requirements, otherwise may cause damage to the product.

		PT16L		PT20L	
Discharge	Maximum continuous	60A		80A	
	Maximum Pulse Discharge Current	140A	Not exceeding 1min	180A	Not exceeding 2 seconds
	Discharge cut-off voltage	≥20V		≥20V	
Charge	Standard charge current	60A		60A	
	Max charge current	60A		75A	
	Charge voltage	29.2V		29.2V	

Emergency management

During product storage, installation and use please follow the procedures provided in this section for the following emergencies.

a.Product fire

If the product smokes on fire, please stop the work of the product. Under the premise of ensuring the safety of personnel, we can use class D fire extinguisher or sand soil to extinguish the fire. It is forbidden to disassemble the machine for private maintenance. Please contact our company or authorized dealer to provide technical support as soon as possible.

b.The product is immersed in water

If the product is immersed in water, stay away from the site immediately. It is forbidden to dismantle and repair the machine privately. Please contact our company or authorized distributor to provide technical support as soon as possible.

c.Products produce peculiar smell

If the battery has a distinct odor (similar to liquor flavor), immediately remove the battery pack. Avoid contact with leaking liquids and gases. Once contacted, please clean in time.

d.Necessary safety equipment

Self-contained breathing apparatus and personal protective equipment.
Class D fire extinguishing system.
Other unknown circumstances may contact our company or authorized dealer to provide technical support.

Matters need attention

a.Charging requirements

Battery built-in protection system, when the system over discharge, the internal relay will cut off the output, showing a high resistance state (OD). The maximum charging voltage limit of charger is 29.2V. The battery BMS controls the voltage and current output of charger.

b.Matters needing attention

1).Batteries are forbidden to charge below 0℃. Otherwise, the performance of batteries will deteriorate seriously, and even safety incidents will occur.

2).The battery is forbidden to be charged at low temperature, and it should not be used at low temperature (cold storage or outdoor in winter). Especially in places where the ambient temperature changes drastically, condensation inside the battery will occur, and the water will destroy the internal electronic components of the battery. Unpredictable hidden dangers. After taking it out of the cold environment, it should be kept at room temperature for at least 4 hours before use.

3).The battery protection level is IP54. Do not flush the battery directly with water.

4).The battery should not be used in the marine salt spray environment, and should not be used in the humid environment for a long time (in the aquatic market, cold storage, ice making plant, bathroom, acid plant, etc.).

5).When the lithium battery pack is not used for a long time, please do not fully charge the battery and store it in the semi-electric state as much as possible (the battery voltage is about 26.4V)

7. Drive motor controller

7.1 Functions of the controller

The model is equipped with a drive motor and a pump motor controlled by a controller. The vehicles power the controllers by turning on the key switch and then turning them on. Once the controller is energized, the magnetic coil built into the line contactor receives power from the driven motor controller. The two contact points that work like switches will then touch each other, and then connect the wires between the battery and the controller. As a result, the controller becomes a three-phase three-wire AC power supply and is connected to the motor via each set of UVW. The line contactor is equipped with a 150A fuse to prevent overcurrent.

Drive controller

The controller is connected by the following sensors, switches, contactors, and actuators.

Key switch

The power switch

Forward/backward direction switch (Accelerator)

Handle access switch

These devices provide dc power and interact with controllers, who activate or receive data from them based on a number of parameter Settings to control the drive motor.

On the hardware side, controllers are programmed with different types of firmware to perform different functions. The safe and efficient working performance and complete operating function of the electric vehicle can be realized by correctly setting the technical parameters of the controller and the control technical parameters and function values.

1. The crawling speed of electric vehicles can be adjusted. The creep speed setting function of the controller enables the electric vehicle to run for a long time under low speed conditions.

2. The acceleration rate can be set. Acceleration rate refers to the "soft and hard" feeling of the accelerator when operating an electric vehicle. By setting the acceleration rate, the vehicle can meet the requirements of acceleration operation in different working conditions.

3. Anti-backsliding function of the ramp. Electric vehicles using AC traction motors have the excellent function of not sliding down the ramp.

4. The maximum driving speed can be adjusted. The maximum driving speed of electric vehicles can be set reasonably to prevent the driving motor from overloading due to high speed.

5. Safety protection function. If the power element of the controller is damaged during the operation of the vehicle, the controller will disconnect the main contactor in the shortest time. When the temperature of the controller rises too high, the controller will automatically limit the armature current of the motor. When the battery voltage is too low, the controller will stop working for safety.

6. The drive motor controller has self-diagnosis function. In the working process of the controller, once the fault occurs, the fault code will be displayed on the controller and the controller will stop working automatically to ensure the safety of the operating system.

7, the display meter will show the battery power and accumulated working hours

7.2 Fault code

When the vehicle fails, we can view the current failure code in the case of the dashboard and the handheld programmer: on each controller, there is an interface that connects TO the handheld programmer.

Each fault code is displayed on the meter and can be viewed through the fault code list for failure analysis

7.3 Controller test

Measure the diode voltage of AC MOSFET circuit inside the controller to check for burn out.

According to the following table, each test item must be tested more than 3 times.

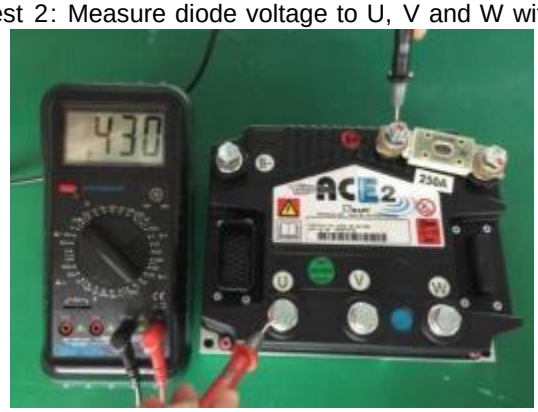
item	Multimeter terminal		Normal range	
	Red pens	Black pen	Polarity determination	Determination of resistance value
1	B+	U/V/W/B-		1MΩThe above
2	B-	U/V/W		1MΩThe above
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

Multimeter to pull Ω file (resistance) multimeter to pull diode file (polarity values)

1) Remove the cable and wire connected to the controller, and released in full internal power capacitor (with 30 Ω resistance / 5 w to discharge the B + and B - terminal).

2) Use a multimeter to measure the voltage of the diode (0.3-0.6V) and check whether it is normal. Test 1: Measure diode voltage with red lead for B- and black lead for U, V and W.

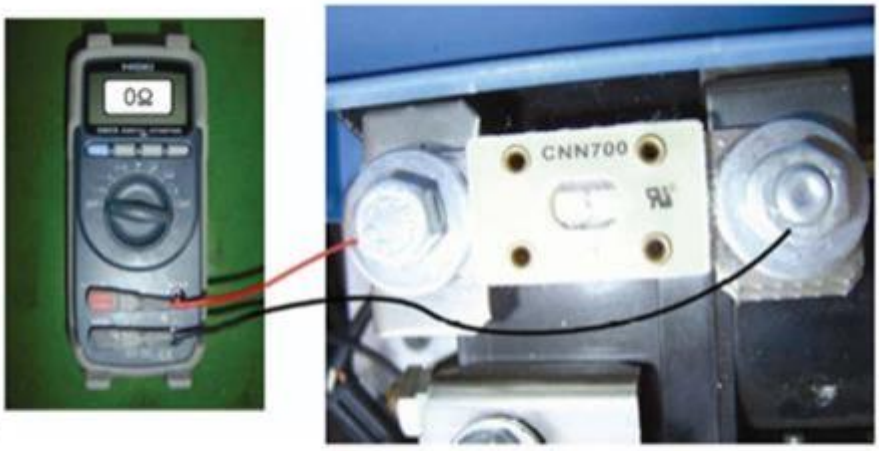
Test 2: Measure diode voltage to U, V and W with red lead, and B + with black lead.



Note: The multimeter pointer cannot be connected backwards

7.4 Line contactor and fuse measurement

线路接触器 图 2-22



线路保险丝 图 2-23

For line contactor and line fuse, connect an ohm meter (multimeter dials into ohm gear) at the point shown in the figure and check if it measures the specified value.

7.5 Drive motor controller removed/installed

1 Disconnect the battery connector..

2. Keep the key switch on to make the power module discharge. 30 seconds twice.

3 Turn off the key switch..

4 Remove the casing to enter the drive motor controller.

Note: Remember that the controller contains AN ESD (electrostatic discharge) sensitive component. Appropriate precautions should be taken when connecting, disconnecting and handling

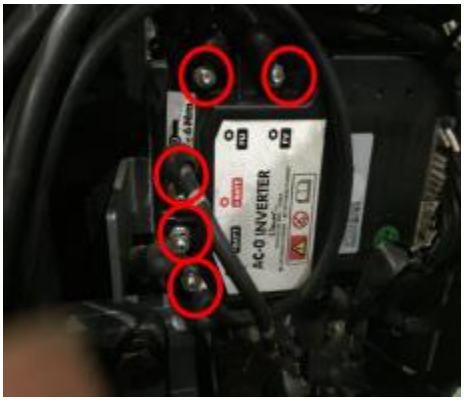
5 Disconnect the control harness from the controller connector port.

6 Disconnect the U, V, and W cables . Install torque：
9.5±1 N ·m (7.0±0.7 lb ·ft)

7 Remove the B + B negative connector from the drive motor controller

8 Loosen and remove the drive motor controller.

9 Do the above steps in reverse order to install the drive motor controller.



7.6 Common fault analysis of contactors and relays

The fault	Check the content	Reason for speculation
Relay not running	Is the input voltage up to the rated voltage of the device	· Circuit breaker or fuse falls off · Wiring errors and omissions · Weak installation of screw terminals
	Whether the relay specifications meet the input voltage	DC48V relays are used on DC24V voltage lines
	Whether the voltage of the input voltage drops	· Insufficient power supply capacity · Long distance wiring
	Whether the relay is damaged	The coil is broken · Mechanical damage caused by falling and impact
	There is no abnormal output circuit	· Output side power supply · Poor load · Wiring errors · Poor contact
	Bad contact	. Abnormal contact
		. Contact loss due to service life . Damage of mechanical properties
Relay out of position	Whether the input voltage is completely disconnected	The current that protects the circuit from leakage The voltage applied by a circuitous circuit Diode control circuit with residual voltage
	Relay anomaly	Contact oxidation Insulation aging Mechanical damage Induced voltage
Misoeration of relay	Whether an abnormal voltage is applied at the relay input terminal	Induced voltage Circuitous circuit caused by induced voltage
	Whether the vibration, impact is too large	Poor operating environment
burning	Whether the coil is burnt	The input exceeds the rated voltage
	Whether the contact point is burned	Current exceeding the contact rating Poor external contact Short circuit current

7.7 Controller fault code table

MDI Code	Alarm	The fault name	The solution
1	WRONG CONFIG	Configuration error	Check the internal parameters of the controller and see if the software matches the model.
8	WATCHDOG	The watchdog is out of order	On startup, the watchdog circuit is activated before the software starts. The standby or The guard dog signal is invalid in the running state (alert state). Fault analysis: Watchdog hardware circuit or microcontroller output part is broken The bad. In both cases it is independent of the external component, so change the controller
76	COIL SHORTED		
17	LOGIC FAILURE #3"	Logic card failure 3	Logic card current protection function malfunction. Controller should be replaced
60	CAPACITOR CHARGE	Capacitor charging error	When the electric lock is on, the controller will charge the capacitor through the power resistance, and detect whether the capacitor is fully charged within the specified time. If there is no sufficient charge, the capacitor voltage is still less than 20% of the battery voltage, the controller will alarm, and the main contactor will not close. Possible reasons: 1. Peripheral devices, such as DC-DC, motor or other devices, interfere with the charging process of the controller, and the interference generated by these devices shall be eliminated. 2. The controller needs to be replaced if the charging resistance is disconnected, the charging circuit fails and there is a problem with the power module

30	VMN LOW	VMN low	Reason: When starting, the high-end voltage of MOS tube is less than 66% of the capacitor voltage Or during the motor operation, the voltage is less than the required value. Possible reasons: 1. The motor is not connected correctly, or there is a problem with the motor circuit; Check whether the three-phase connection of the motor is correct; Whether the motor to the ground leakage, whether There is a motor coil break. 2. Whether the suction and closure of the main contactor is firm. Contact wear and tear. 3. Change the controller
70	ENCODER ERROR	Encoder fault	The controller detects a significant difference between the two consecutive speed readings of the encoder: since the encoder within the system cannot change the speed very much in a very short time, it is possible that the encoder fails (the lines of one or both encoders wear out or break), and checks the mechanical and electrical functional parts of the encoder; The alarm may be caused by electromagnetic interference on the sensor bearing. If none of the above, change the controller. Please note that manual operation may also cause the controller to display this fault, in which case power is required to restart the vehicle. For example: 1. The vehicle suddenly hits an obstacle, making the vehicle unable to walk; 2. When the vehicle is running at a high speed, suddenly slam on the brakes.
75	CONTACTOR DRIVER	Drive the short circuit	When the electric lock is closed, the controller will detect whether the driver of the main contactor is short circuit, if short circuit will alarm; Check whether the positive pole of the main contactor coil is short to A16 or the power supply is negative. If everything is normal on the periphery, change the controller.

31	VMN HIGH	VMN high	Reason: The low voltage of MOS tube is higher than that of normal battery when starting up 10%, or the phase voltage is higher than 1/2 of the battery voltage. Possible reasons: 1, the motor connection is wrong, or there is a problem with the motor circuit; Check whether the three-phase connection of the motor is correct; Whether the motor to the ground leakage, whether there is a motor coil circuit. 2. Replace the controller
49	I=0 EVER		
53	STBY I HIGH	High standby current	The microcontrol system detected an excess of the current sensor's output signal Operating current allowed range. This failure does not involve peripheral components, as required Change the controller.
38	CONTACTOR OPEN	The contactor does not latch	The logic card has driven the main contactor coil, but the contactor is not closed. Possible reasons: 1. Contactor mechanical failure, stuck, etc 2. Poor contact of contactor 3. If the contactor works normally, change the controller.
74	INPUT	Input mismatch	
	MISMATCH		
16	AUX OUTPUT KO	Auxiliary drive output failure	
19	LOGIC FAILURE #1	Logic card failure 1	Failure of low - or over-voltage protection. In the 24 v system

			, the controller detects the voltage exceeding 45V or below 9V; On a 48V system, the controller detects a voltage of more than 65V or less than 11V. Possible reasons: 1. Whether there is short circuit in the circuit system, such as DC-DC, brake coil, etc., or whether the controller's input power is in good contact. 2. Is the battery voltage too low or too high? 3. Check whether the power cables above terminal pillars such as B+, B and main contactor are fastened. 4. Whether the controller voltage calibration parameters are consistent with the actual voltage. 5. Hardware circuit fault of overvoltage protection on the logic card, replace the controller.
18	LOGIC FAILURE #2	Logic card failure 2	Phase voltage feedback on the logic card hardware circuit fault, replace the controller.
0	WAITING FOR NODE	Waiting node signal	In a CAN communication network, one controller receives another controller The controller is always in a waiting state for a signal that the producer cannot communicate properly State until the CAN communication network is all normal. Check those that cannot communicate Why are those modules wired incorrectly, check the software version or parameters Are the Settings correct.
67	CAN BUS KO	Communication failures	
80	FORW + BACK	Both forward and backward signals exist simultaneously (directional switch adhesion)	The controller will always detect and alarm when a request is running in two directions at the same time. Possible reasons: 1. Broken wire 2. Direction switch failure 3. Improper operation
			4. If the fault cannot be eliminated, the controller needs to be replaced
79	INCORRECT START	Startup sequence failure	Incorrect starting order. Possible reasons: 1. The direction switch is closed before starting the machine. 2. Wrong operation sequence. 3. The wires aren't connected right.

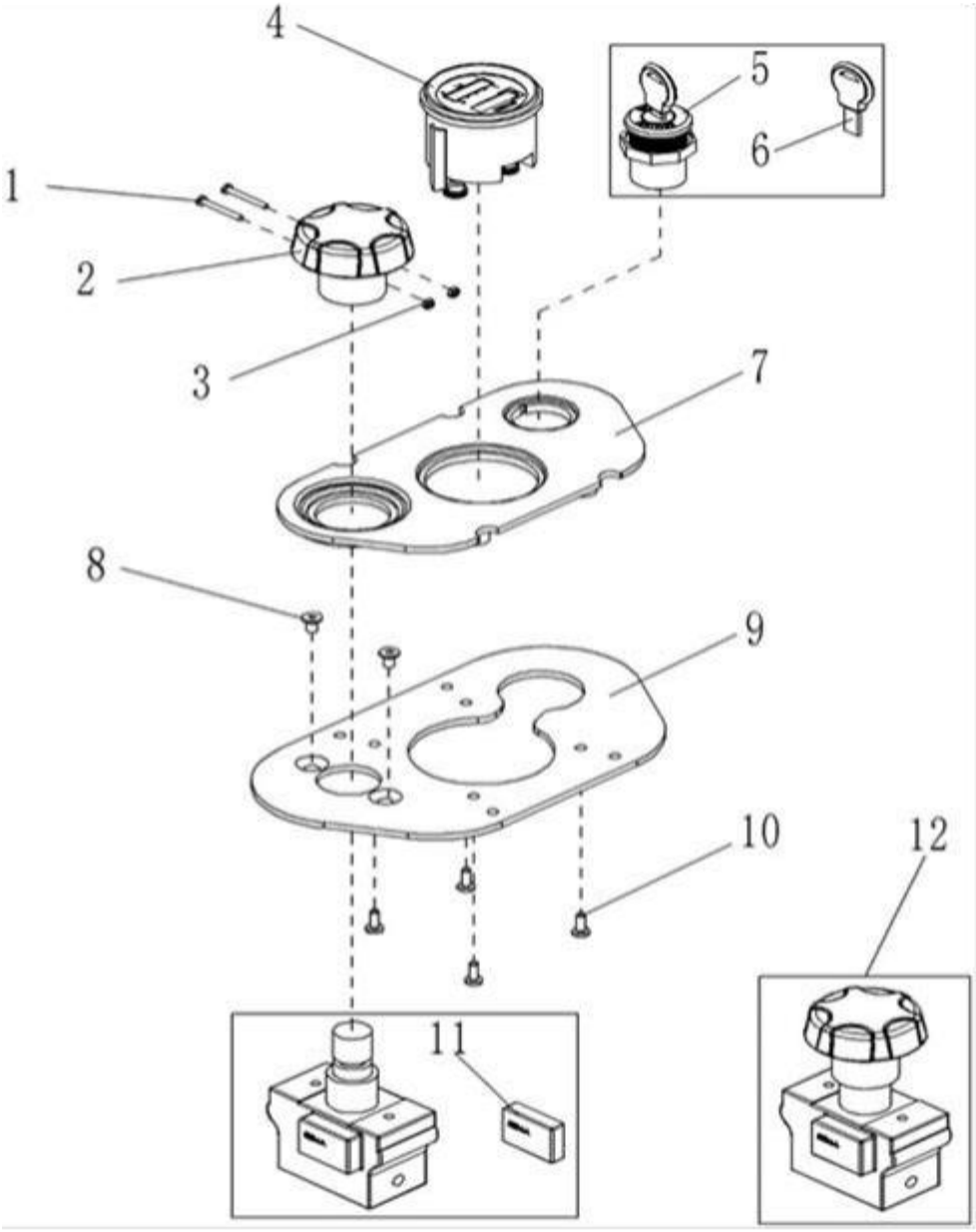
			4. If the fault cannot be fixed, the controller needs to be replaced.
78	VACC NOT OK	Accelerator failure	Detection time: standby state This alarm indicates that the accelerator voltage is more than 1V higher than the minimum set in the Accelerator signal range (PROGRAM VACC). Possible reasons: 1. The upper and lower voltage limits of the accelerator are not collected. Enter the PROGRAM VACC menu and collect again. 2. Accelerator error. There may be no return of accelerator pedal, or there may be an internal accelerator error. 3. Controller failure.
86	PEDAL WIRE KO	Accelerator anode and cathode connection failure	Check to see if the accelerator positive and negative poles are attached to the controller;
61	HIGH TEMPERATURE	Controller over temperature protection	Make the temperature of the controller drop below 85°. If the fault still exists, it may be the fault of the temperature sensor or the logic board of the controller. At this time, the controller needs to be replaced.
0	BATTERY LOW	The battery is low in charge	If the BATTERY CHECK parameter of BATTERY detection function is not set to 0, when the BATTERY power of the BATTERY is lower than 15% and there is no grid on the meter, the fault alarm will be given and the lifting function will be locked. It should be recharged in time. If it is found that the BATTERY is still charged, check whether the value of the controller's "ADJUST BATTERY" parameter is consistent with the BATTERY voltage.
13	EEPROM KO	Memory damage	When the vehicle does not move, there is a problem in the parameter storage area, and the fault stops the vehicle from working. If the fault still exists after repeatedly closing the electric lock, replace the logic card. If the fault disappears, the stored parameter is replaced by the wrong parameter and needs to be reset.

65	MOTOR TEMPERAT.	High motor temperature	1. If the motor temperature digital switch is on, or the analog signal exceeds the cut- off value, the fault will occur. 2. When the motor temperature reaches 120C, the controller alarms, and the vehicle can still walk. However, the maximum current is reduced and the vehicle performance is reduced. When the motor temperature reaches 125C, the motor stops working. You should try to cool the motor at this point. 3. Check the circuit if the fault still exists when the motor is cooled. If it's all good, change the controller.
71	HANDBRAKE	Hand brake closure	The handbrake switch is always on
73	THERMIC SENS KO	Temperature sensor failure	The output signal of the controller temperature sensor is out of range. The fault has nothing to do with external parts, replace the controller.
55	PROG LIFT LEVER		
98	CLEARING MDI HM		
99	CHECK UP KO	Maintain complete	When maintenance is over, report this failure and restart and it will disappear.
94	JOYSTICK ERR		
89	PEV NOT OK	PEV fault	Check if CNB#2 is connected to the B+ behind the contactor;
0	MDI VALVE2 SHORT		
0	MDI NEV NOT OK		
0	MDI PEV NOT OK		
0	MDI DRV2		
	OPEN		
0	MDI DRV2 SHORT		
15	LOGIC FAILURE #5		
97	CHECK UP NEEDED	Maintenance time	It's time for maintenance. It needs to be overhauled

37	CONTACTOR CLOSED	Contactor adhesion	Before closing the main contact coil, the controller should first detect whether the main contact is adhered to. Try to discharge the capacitor. If the capacitor voltage decreases by 20% of the battery voltage, a fault may occur. 1. It is recommended to check whether the contactor contacts adhere or to replace the contactor.
40	BRAKE CONT. OPEN"		
68	CAN BUS KO EPS	EPS has no CAN signal	CAN communication failure between steering and traction. Detect CAN wiring and software Settings and version information.
85	EPS RELE OPEN		
99	PROG ACCELERATOR		
0	TEACH TIL ERROR		
0	END TEACH ERROR		
77	END TEACH OK		
92	TILLER ERROR	The interlock does not match the H&S input	Replace the controller;
92	CAN BUS KO TIL		
98	INPUT ERROR #2		
22	RESET CUTBACK 1	Reset the speed cut switch	
99	PROGRAM TOOTHS		
93	BMS MONOMER UV		
92	BMS MONOMER OV		
91	BMS VOLT.DIFF	Lithium battery voltage error	
90	BMS LOW CAP.	Lithium ion batteries are low in power	
46	LIFT+TRAC	Lift and walk close at the same time	

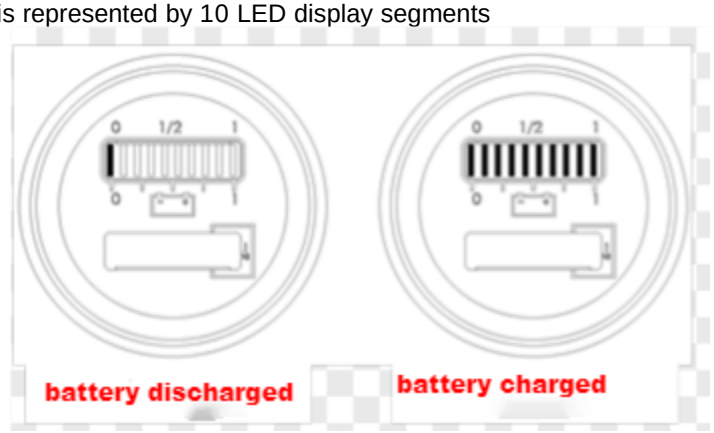
94	BMS HIGH TEMP.	Lithium batteries are too hot	
59	NO CAN MSG. BMS	Lithium batteries have no CAN information	

8. Instruments



8.1 Electricity meter

The discharge condition is represented by 10 LED display segments



Only when the battery is properly charged does the right-most LED light come on. As the battery's charge drops, the LEDS turn on, but only one at a time.

The second LED light from the left side of A flashes, indicating "energy reserve" (70% discharge depth). B. The two LED lights on the far left flicker alternately, indicating "empty power" (80% discharge depth). Common faults in electrical meters

A meter wire harness B+, and B- have 12V voltage, the meter does not show.

Please replace the electrical meter for the above malfunction

Common failure of power switch

When the power stop switch is closed, there is no conduction phenomenon or no 24V voltage at both ends of the emergency stop switch (the electric meter does not show). Please replace the power switch.

Common failure of key switch

Switch the key to ON (the electricity meter does not show), use the multimeter to measure the conduction phenomenon, if it does not work, please change the key switch.

8.2 Electrical meter removal/installation

1 Disconnect the battery connector..
2 Keep the key switch on to make the power module discharge. 30 seconds twice.
3 Turn off the key switch.
4 Disconnect the electrical meter port
5 Disconnect the meter port.
6 Unscrew the two fixing nuts of the electric meter by hand.
7. Remove the fixed metal ring of the meter and remove the meter
8 Follow the steps above to install the meter in reverse order.

8.3 Power switch removed/installed

1 Disconnect the battery connector..
2 Keep the key switch on to make the power module discharge. 30 seconds twice
3 Turn off the key switch.
4 Remove the casing
5 Remove the top cover
6 Remove the blade panel
7 Unscrew the power connection of the power switch.
8. Remove the mushroom head of the power switch
9 Unscrew the two fixing screws of the power switch and remove the power switch..
10 Do the above steps in reverse order to install the power switch..

8.4 Key switch removed/installed

1 Disconnect the
battery connector.
2. Remove the casing
3 Disconnect the cable of the key switch..
4 Unscrew the fixing screw of the key switch and remove the key switch.
5 Perform the above steps in reverse order to install the key switch..

9. Drive Assembly

On the electric side, the driving motors rotate their drive wheels so that the vehicle can move forward/backward

Controlled by the controller

The drive motor is connected to the controller via U, V and W wires. The controller runs the drive motor based on input from multiple switches and sensors and internal parameter Settings.

When the following conditions are met, the drive motor operates:

1 The key switch opens to power the controller,
2 Handle down (proximity switch in induction area),
3 Determine the direction of travel (accelerator button),
4 Wiggle accelerator button

9.1 Motor speed detection (Encoder operation)

Each drive motor is equipped with an encoder to act as a speed sensor for the motor. It includes two hole sensors and a gear is mounted on the drive shaft of the motor to interact with the two hole sensors. The gear rotates simultaneously with the drive shaft so that the gear tooth passes periodically through the magnetic field of each hole sensor. When the top platform of the gear passes through the magnetic field, it is close to the hole sensor, so the magnetic flux increases. On the other hand, as the bottom platform passes through the magnetic field, the distance increases and the magnetic flux decreases accordingly

The cycle occurs again and the magnetic flux has a waveform that generates a voltage pulse. The controller analyzes the amplitude of the pulse to calculate the motor's speed. The smaller the amplitude, the higher the motor speed.

Like other sensors, the encoder also generates the main signal (signal A) and the reference signal (signal B) through two hole sensors. The sequence of generated signals varies according to the direction of rotation.

9.2 Overheat protection (thermal sensor operation)

Each drive motor is equipped with a heat sensor to prevent overheating. Once the motor is heated to 145°C (293 °F), it activates an overheating alarm and limits the motor's performance.

The encoder

Item	specifications
PPR	There are 64 pulses per revolution
The connector	4 needle AMP

Thermal sensor

item	specifications
Part number	Included in the motor
resistance	At 25 ° C (77 ° F) 603 Ω plus or minus 3%
The connector	2 needle AMP

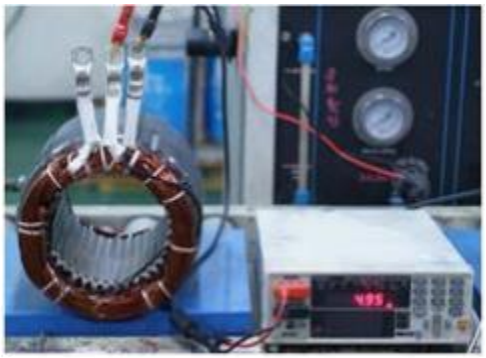
9.3 The test of the stator

1 Clean the stator surface with a clean cloth dampened with alcohol.

Note: Contaminants in the stator may damage the coil and thus the stator itself.

2 The resistance of each phase (UV, VW, WU) was measured using a milliohmmeter.

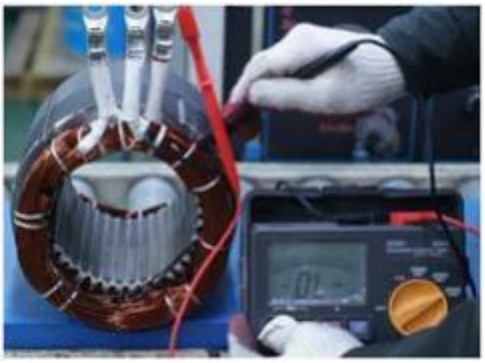
Nominalresistance:0.4Ω



3 Test insulation at 1000 Vac and Min. 10 m Ω use insulation tester.

If there is a problem with the insulation, please replace the stator with a new

one.



9.4 Drive assembly removed/assembled

1 Remove the motor U V W link.

2 Remove the motor encoder, temperature sensor and electromagnetic brake link.

3 Remove the drive assembly retaining bolts.

4 Remove drive assembly with lifting gear..

5 Perform the above steps in reverse order to assemble the drive motor..



9.5 Common fault analysis of drive motor

problem	Probable cause
The drive motor is not working	Switch not off (battery connector, key switch, proximity switch) : Turn off switch. If it still does not work, use a voltmeter to test the power supply on the control panel and the current on each switch.
	Bad signal. Fuse blown: Check the battery connection. Check the connection of the battery connector. Check fuses, drives and logic. Replace the retaining wire if it fuses. Check the drive motor and control panel for possible fuses. Some of the reasons are: Operating under excessive load, the current limit is too high
	Low battery voltage: Check the battery terminal voltage. If it's too low, charge the battery. Check all single batteries for one or more defective single batteries.
	Incorrect control operation：
The drive motor is not working	Encoder failure.
Traction does not operate during normal operation	A defective brake caused excessive resistance. The increased heat causes the motor to stop running. Check brake adjustment.
	There is too much heat in the control panel for the following reasons:

	Heavy traction load: Reduces duty cycle load. Thermal sensor failure: These may cause impediments to the driving motor, Failure of control handle or open drive fuse
Traction does not last throughout the normal operating period	The vehicle has too small a battery:
	Battery is not fully charged during battery charging: Check that the battery is charged Check the battery charger for faults.
	The battery replacement interval is too long or the battery cooling time is too short.
	The battery has one or more defective single cells, resulting in a lower than normal capacity and capability rating:
	Due to the failure of the drive system, the drive system consumes too much battery power. Check brake adjustment. Check wheel bearings, axles, and other mechanical components for correction and troubleshooting purposes. Switch to tires with less friction
	After a shift, the vehicle's working capacity exceeds its designed capacity and has no available power:
The positive (+) or negative (-) electrodes of the battery are in direct contact with the frame (body) of the vehicle or the drive motor	The battery is dirty and the electrolyte is on top of the battery and in contact with the frame. An electric current flows through the battery case, which applies a voltage to the forklift frame: clean the battery with baking soda and an aqueous solution.
	Wiring of the battery or control panel in contact with the frame of the vehicle: Conduct continuity tests and move wire contacts. Remove the wires in sequence until the fault is cleared. The fault will disconnect at the end of the wire
	Wet motor:
The vehicle did not reach its maximum speed	Battery is not fully charged or battery power is poor: Charge the battery. Check the single battery. Replace the single battery if necessary.
	Failure in the drive motor, control handle or transmission system: Check the vehicle speed in both directions. If you need to adjust the controller, follow the appropriate section of the manual programmer. If the drive motor fails, test the motor assembly
Slow acceleration	Drive control overheat, temperature sensing switch on. Note: The thermal switch will issue a warning if the temperature is 145°C (293°F).

10. Hydraulic system

The hydraulic system operates multiple actuators with pressurized oil from the autonomous hydraulic pump and draws oil from these actuators.

1 The pump motor controlled by the controller drives the main hydraulic pump.

2 The main hydraulic pump USES the rotary force output from the motor to pressurize the oil in the hydraulic oil tank and transfer the oil to the lifting cylinder.

3 The hydraulic tank stores the hydraulic oil returned from the cylinder. The stored oil is drawn in by the main hydraulic pump for reuse

The pump motor electronically transmits power to the main hydraulic pump for pumping oil to operate the hydraulic system.

The pump motor is connected to the pump motor controller by the pump contactor and b-line. The controller runs the pump motor according to the input of the lift switch and sensor.

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

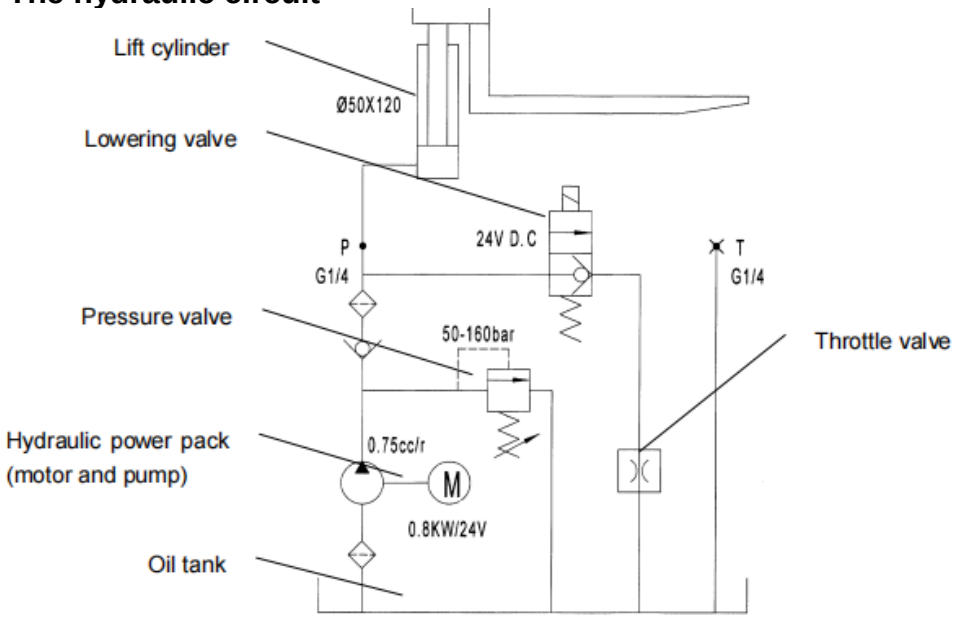
The key switch is on.

Upper limit switch closed

Handle rise switch closed

Pump contactor suction

10.1 The hydraulic circuit



10.2 Disassembly of pump motor

1. Disconnect the cable of B+ and B- terminals of the pump motor.
2. Disconnect the hose from the hydraulic pump
3. Remove the fixing bolts of the pump motor and pump and remove the motor. Mounting torque: 55±10 N ·m (40±7 lb ·ft).
4. Follow the reverse sequence to install the pump motor.
5. Fill the tank with hydraulic oil according to the specifications given in the manual

10.3 Replace the pump motor carbon brush

1. Unscrew the bolts with a 10mm open spanner

2. Lift the cover.

3. Remove the screws with a phillips screwdriver and take out the carbon brush for replacement. The installation process and the reverse process of the above process.

10.4 Replace the lifting cylinder sealing ring

1. Remove the cylinder head with a crescent wrench

2. Pull out the piston rod and remove the shaft at the bottom of the piston rod with the support ring

3. Remove the dust ring, baffle ring and Y-type seal ring from the cylinder head with a small one-word screwdriver

4. Remove the O-ring and baffle ring from the cylinder head to repair the entire tubing. The installation process is the reverse process of removal.

10.5 Common malfunction of hydraulic motor

The fault phenomenon	Probable cause
Hydraulic pump motor not working.	Bad connection or fuse blown. Check the battery connection. Check the key fuse. Check the hydraulic pump motor for possible fuses.
	Key switch or pump station contactor not closed. Turn off the key switch. Check the power flow of the pump station contactor coil and pump station contactor with a multimeter. Check the voltage output and upper limit switch of PIN4 in the meter. The key switch, rise key and pump station connector must be turned off to enable the power steering function to operate.
	The voltage is not enough. Charge or replace the battery. Check all cell cells for one or more defective cells. Check that the cable terminals are tightly compatible with the battery terminals and control panel connectors. Check the inside of the cable for broken wires. The lifting and driving systems are not operating correctly.
	The lifting and driving systems are not operating correctly.
	The battery in the car is too small. Study and question the use of the vehicle under its full
The battery will not last full normal operation Between.	working conditions, select and purchase the appropriate battery capacity to understand the working hours.
	The battery is not fully charged during the battery charging operation. Check that the battery is evenly charged (charging all batteries in the same proportion). Check the battery charger for defects.
	The battery charging interval is too long or the charging battery cooling time is too short. Reduce battery working duration. Please extend the battery cooling time before charging, and then put it into use.

	The battery has one or more defective cell cells, which may result in lower than rated capacity and battery capacity. Test and find defective cells. Replace defective batteries. Battery cells connected in series. A bad battery causes high resistance in series with other batteries. As the battery resistance increases, this reduces the speed of the motor. This can happen when other batteries are almost fully charged.
	Hydraulic pump motor overheat.

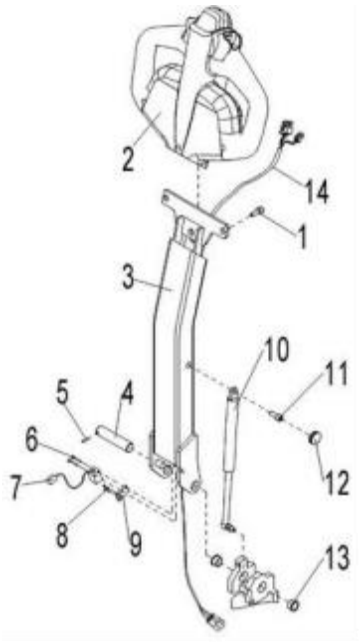
10.6 Hydraulic pump failure

The fault phenomenon	Probable cause
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 line.
The oil temperature is too high.	The oil level is low.
	The oil duct is restricted.
	The relief valve is set too low.
	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 safety valve setting is too high. Restrictions in flow control valves, check valves and oil lines.
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, seal the shoulder cut in 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 e is a leak in the pump inlet line. Loose bolts. Defects in inlet pipe line.
	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.

The pressure of the main safety valve has been adjusted before leaving the factory.

The user is not allowed to adjust and disassemble at will.

11.Handle Assembly



NO	name	quantity	notes
1	Hexagon socket cylindrical	2	M8x25
2	CanbusControl handle C	1	94300-90
3	Handle and lever fitting	1	
4	A shaft	1	
5	Elastic cylindrical pin -	1	4X16
6	Hexagon socket cylindrical	2	M3x20
7	Interlock switch	1	
8	Hexagon socket cylindrical	2	M4x12
9	Switching floor	1	
10	air spring	1	
11	Hexagon socket cylindrical	1	M8x20
12	envelope	1	
13	Shoulder compound sleeve	2	20X22X12
14	Handle control harness	1	

11.1 Handle the operation

Handle removal

1. Aim the punch at the hole and hammer out the elastic pin

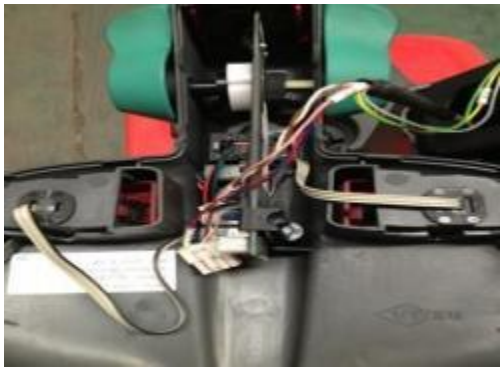
2. Punch the handle shaft out. Note: When the handle shaft is knocked out, pay attention to the hand injury caused by the handle falling off.

3. UNSCREW TWO BOLTS TO REMOVE THE PROXIMITY SWITCH AND REPLACE IT

4. REMOVE THE BOLT WITH A WRENCH TO REMOVE AND REPLACE THE AIR SPRING

5 REPLACEMENT OF HANDLE HEAD

1: Remove 3 screws to fix the handle and remove the back cover.



2: Pull out connector on handle.

3: The drive switch can be removed by removing 2 fixing screws.

4: Remove the drive switch shaft.

5: Remove the screws from the mounting plate, unplug the connector, and replace the circuit board.

12. The use of ZAPI handheld programmers

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!

1）**Handheld programmer turns on**

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

2）Emergency side screw to avoid accidental disconnection

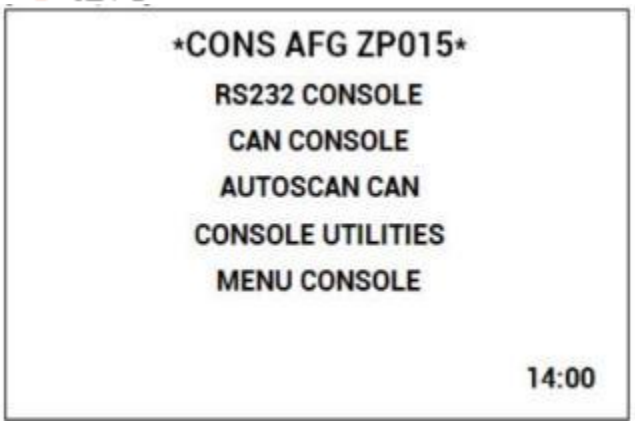
3） CONNECT the ZAPI manual programmer wire harness TO the vehicle CAN line (CONNECT TO) : You CAN insert the connector before opening the vehicle or when the vehicle is already running.

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

5） 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

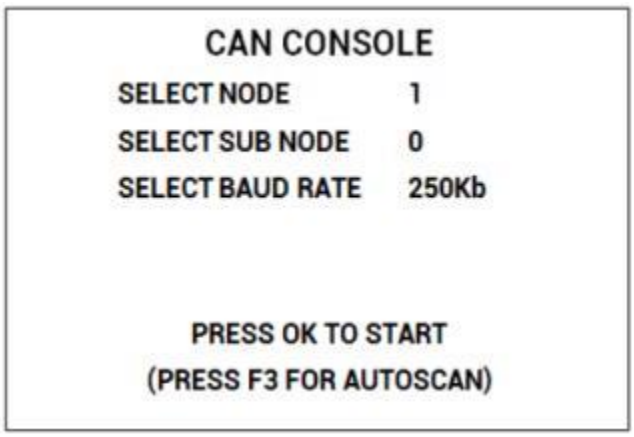
When the Zapi logo appears, the home screen is rendered



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 walking controller ,SELECT NODE 3 Is the

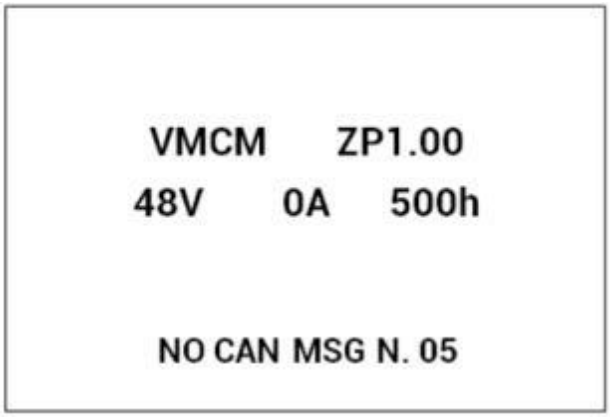
connection point of the pump station controller

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

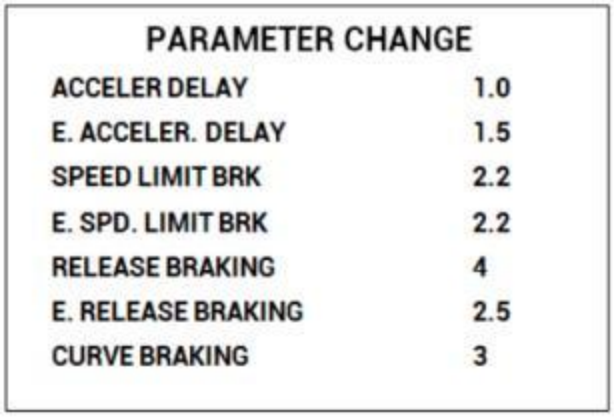
The main menu includes a complete list of menus available to the controller. In contrast to the super controller, only the controller has no "hide" menu, which requires pressing multiple buttons immediately to reach: all menus

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.

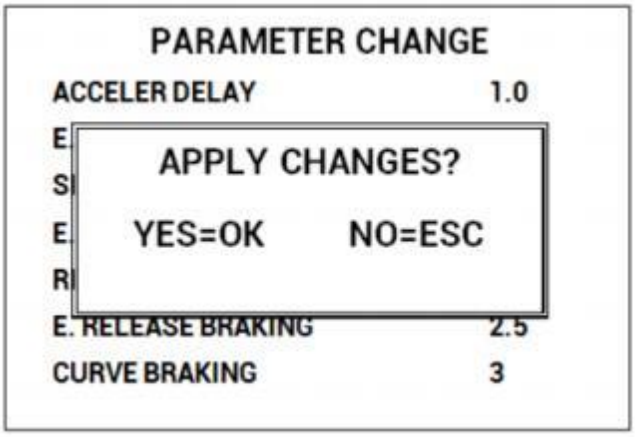


Use up and down keys to scroll through the list: Once the parameter you want to change is selected, use left or right to reduce or increase the value of the parameter.

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.

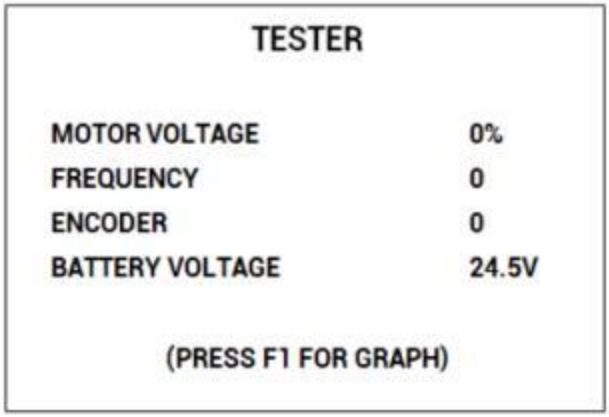


The above descriptions are valid for every menu that contains parameters and options such as setup options, adjustments, hardware settings, etc.

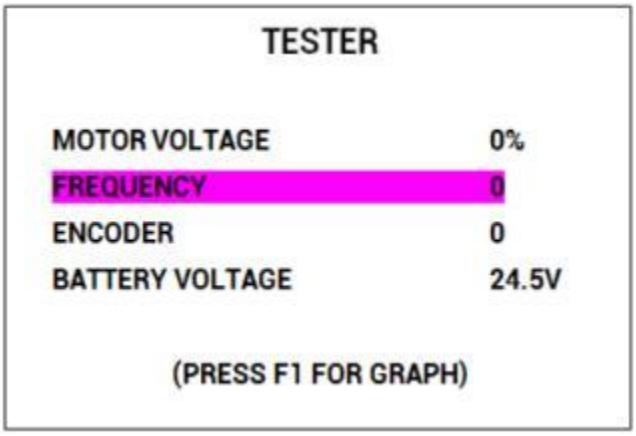
Monitoring menu

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.

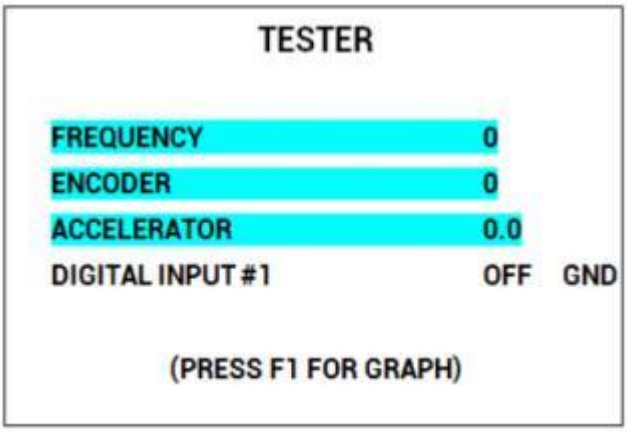


A variable may be "stuck" and it will keep scrolling. Once the desired variable is selected, right-click: it will be selected in a different color.



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.

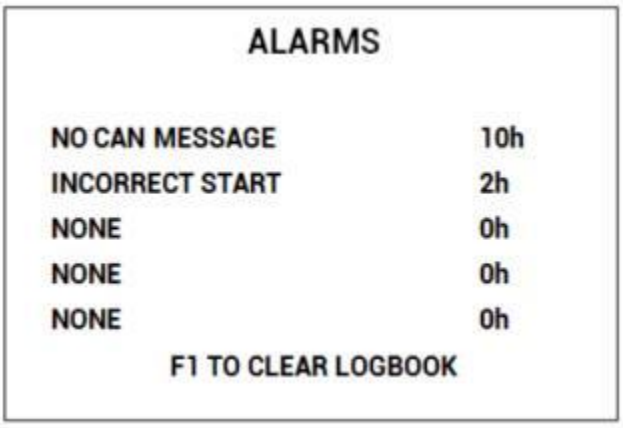
Press ESC to return to the main menu.

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.



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:

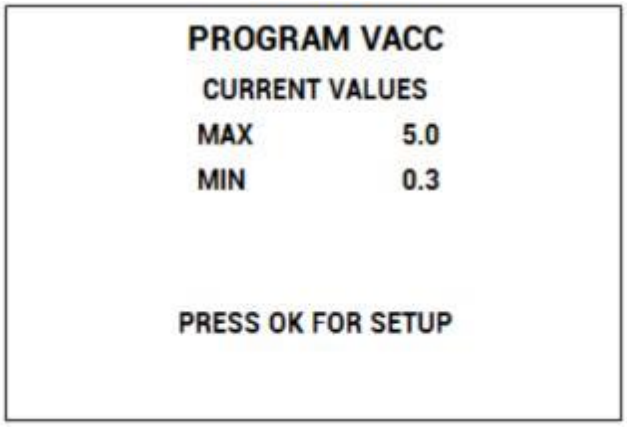
- White: up to 5 events
- Yellow: up to 20,
- Orange: Up to 40,
- Red: greater than 40.

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.

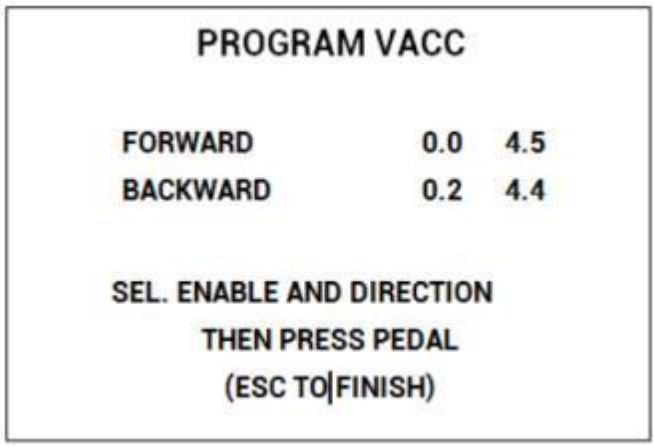


When you press OK, the VACC program will start: The controller will invite you to:

- 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.

13. Regular maintenance

- Only qualified and trained personnel are allowed to maintain the car
- Remove the cargo from the fork and lower the fork to the lowest position before maintenance
- To lift the vehicle, use the specified lashing or lifting equipment in accordance with Chapter 4. Prior to operation, place safety devices (e.g. designated lift jack, wedge or block) under the vehicle to prevent accidental fall, movement or sliding
- Please pay attention to maintaining the handle lever. By compression, the gas pressure spring has been pre-installed. Carelessness is apt to cause harm
- Please use the original spare parts approved and issued by the distributor
- Please consider possible machine failures and accidents caused by hydraulic oil leakage
- Only trained maintenance technicians are allowed to regulate pressure valves

If you need to replace the wheel, please follow the above instructions. Casters must be round and free from abnormal wear.

Check the key items on the maintenance list.

Maintenance list

Table 3: Maintenance checklist

		Interval (month)			
		1	3	6	12
The hydraulic system					
1	Check hydraulic cylinders and pistons for damage, noise and leakage		•		
2	Check hydraulic connectors and tubing for damage and leakage		•		
3	Check hydraulic oil level and refill if necessary		•		
4	Refilling hydraulic oil after 12 months or 1500 hours of service				•
5	Check and adjust the function of hydraulic valve (1600/2000/2500kg +0/+10%)				•
Mechanical systems					
6	Check fork for distortion and breakage		•		
7	Check chassis for deformation and breakage		•		
8	Check that all screws are securely in place		•		
9	Check the putter for distortion and damage		•		
10	Check the gearbox for noise and leakage		•		
11	Check the wheel for distortion and damage		•		
12	Lubricated steering bearing				•
13	Check and lubricate pivot points		•		
14	Lubricating grease nozzle	•			
Electrical system					
15	Check electrical wiring for damage		•		
16	Check electrical connections		•		
17	Detect emergency switch function		•		
18	Check electric drive system for noise and damage		•		
19	Detection display		•		
20	Check that the correct fuse is used		•		
21	Detect warning signal		•		
22	Check the current contactor		•		
23	Check frame for leakage (Insulation test)		•		
24	Check the function and wear of the drive controller		•		
25	Check the electrical system of the drive motor		•		
The brake system					
26	Check brake performance, if necessary replace brake disc or adjust air gap		•		
The battery					
27	Check the voltage of the battery		•		
28	Inspect terminals for corrosion and damage and lubricate terminals		•		
29	Check the battery cover for damage		•		
charger					
30	Check the main cable for damage			•	
31	Check the boot protection during charging			•	
function					
32	Check horn function	•			
33	Check air gap of solenoid valve	•			
34	Detect emergency braking	•			

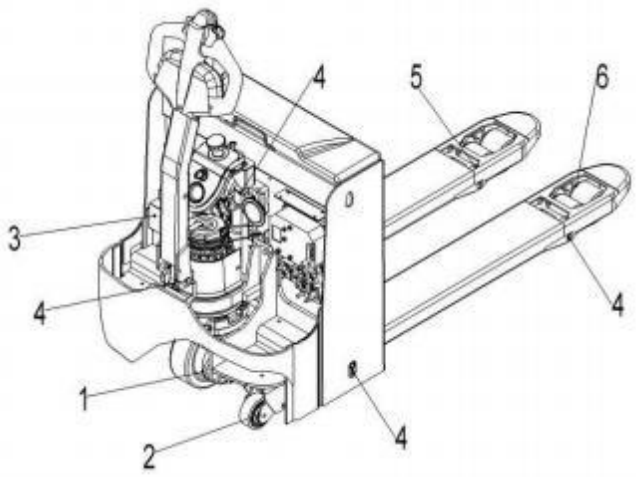
35	Detect reverse braking and regenerative braking	•			
36	Detect belly switch function	•			
37	Check steering function	•			
38	Check for ascending and descending functions	•			
39	Check handle proximity switch function	•			
comprehensive					
40	Check that all labels are clear and complete	•			
41	Check the bearing roller and adjust its height. Replace it if it is worn out		•		
42	Run a test run	•			

Lubrication points

Lubricate marked points according to maintenance list.

Grease specification required:

DIN 51825 standard grease.



1. Steering bearings
2. Supporting wheel bearing
3. The oil pump
4. The shaft
5. Junction
6. Load wheel bearing

Check and refill hydraulic fluid

The required hydraulic oil type is:

• H-LP 46, DIN 51524

• Viscosity is 41.4-47

• The oil quantity is 0,7L(PT 16/20L) and 1L (PT 25L) respectively according to the model.

Waste materials such as waste oil, waste batteries or other materials must be treated and recycled in accordance with the national regulations, if necessary, must be handed over to the recycling company for recycling.

The oil level should not be lower than the minimum required to start the vehicle. Add the oil to the refueling point if necessary.

Check electrical fuses

Remove the main cover and the fuse is located in the position shown in Figure 17.

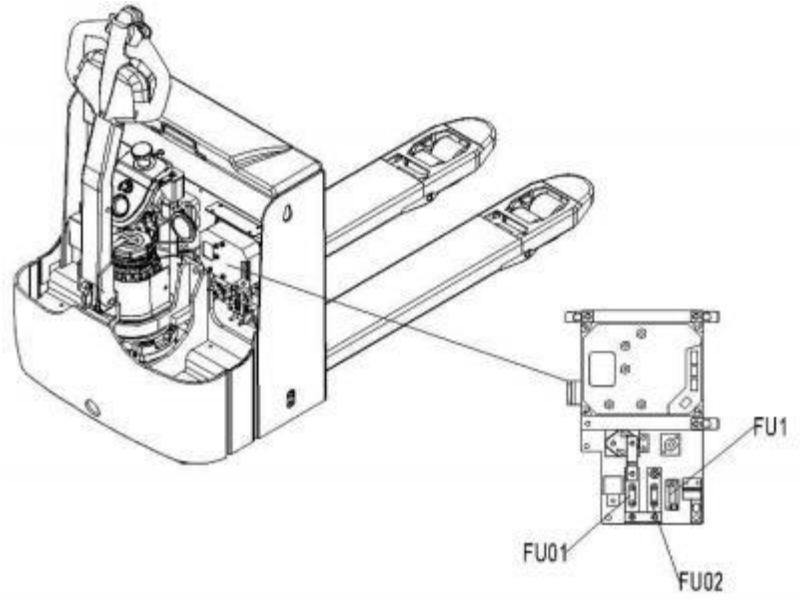


FIG. 17: Fuse location

Table 4: Fuse specifications

	specifications
The fuse FU01	150A
The fuse FU02	80A
The fuse FU1	10A