T30N/T50N Electric Stand-in Tow Traction

Service Manual

Warning

Understanding to this manual

and all kinds of warning signs on the truck shall be

ensured before use!

Care to these signs shall be taken for future use!

Content

1-1 How to use this manual

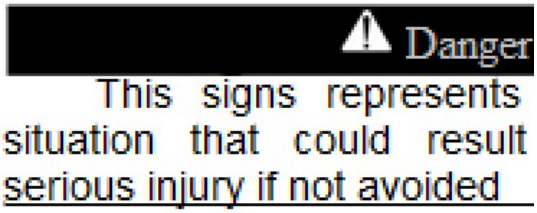
1-1-1 Composition of this manual

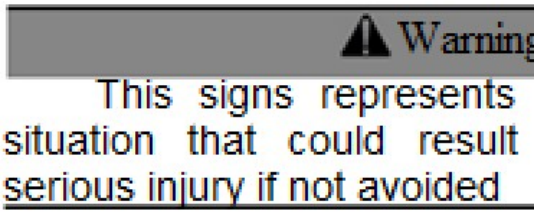
This service manual mainly provides engineers and technicians service information for forklift repair and maintenance, which excludes vehicle operation instructions.
The introduction section of this manual introduces the functions of the vehicle with attention to its different components. More detailed specific information is available in the main body of this manual for you, including the schematic diagram of the vehicle components, the principle they work, the check lists, the maintenance procedures as well as the data and information as needed for maintenance and repair
To facilitate a quick and easy access to the services and training information as required by the readers, the sections of this manual are categorized as per different systems of the vehicle (Please refer to the table below).

Section	Headings
1	General
2	Electronic System
3	3 Driving/Braking System
4	Steering System
5	Battery Charger

1-1-2 Definitions of Warning Signs

The following three warning signs are applicable to this Manual: "Danger", "Warning" and "Caution". Each label is intended to indicate the severity and nature of the potential hazard, the consequences, as well as preventive measures against hazards. You will find these signs throughout this manual. Please ensure your careful attention to such signs, as they are included for your safety intensively.





1-2 Glossary

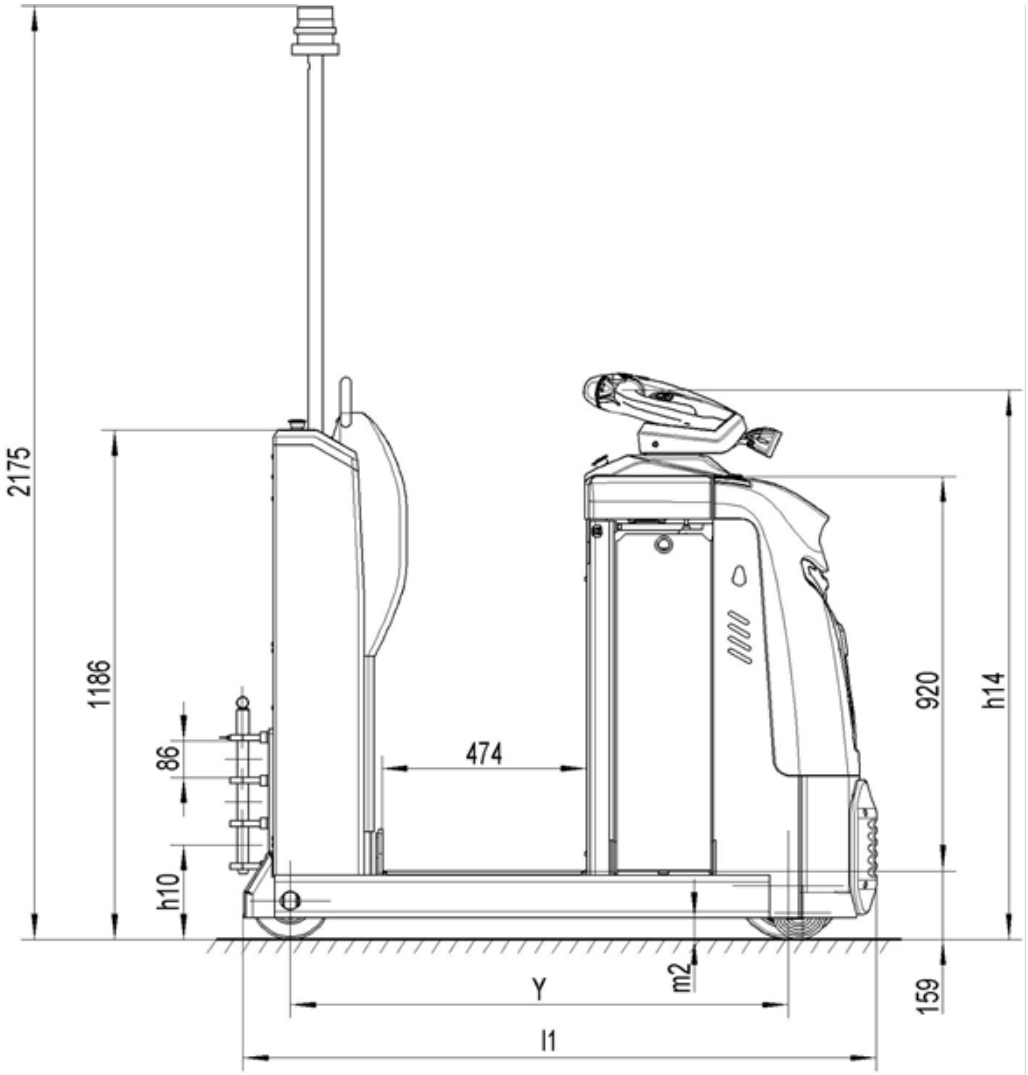
The terms referred in this service manual and their descriptions are as follows.

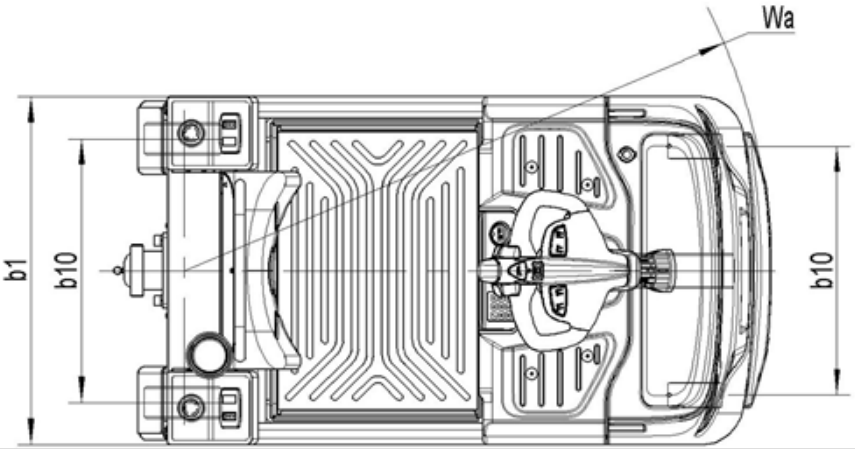
Item	Descriptions
Accelerator	A device that converts mechanical motion to an analog voltage mode and transmit to a controller to control the speed at which a vehicle is driven
Ampere (A)	A measurement unit of current. The current of a voltage passing through an ohmic resistor.
Battery	Two or more batteries which are inter-connected with each other to provide current.
Coulomb meter	(Battery Discharge Indicator) an electrically controlled display that shows the operator the current charge of a battery.
Busbar	A re-conducting conductor that wired to other smaller conductors.
Communication Modes	CAN (Controller Area Network) is the standard for communication among microcontrollers and/or devices.
Condenser	A device for short-time electrical energy storage.
Circuit	A path along which current can travel from the positive (+) side of the source to the negative (-) side. This can be obtained with wires and electrical components.
Connector	A part of a wire assembly or harness wired to another wire assembly or harness to for a easier Disassembly and Assembly operation.
Co-contactor	A switch, relay, or part of a contactor that opens or closes a circuit.
Components of Co-contactor	An electrical element consisting of an electromagnetic coil and a set of heavy contact tips, which controls current flow through the coil, create a magnetic field, and close or open contact tips
Coil of Co-contactor	An electromagnet used to open or close contact tips in a contactor component.
Counterweight	The weight mounted on the back of the forklift to ensure a stable status, especially when lifting heavy loads
Current Limiting	The maximum permissible armature current of the stopped drive motor during the pulse.
DC-DC Convertor	A device that converts a high-voltage DC onto a low-voltage DC.
Digital Signal	A signal in which the element can be either of two different values, e.g. high voltage and low voltage.
Diode	A semiconductor device that allows current to flow from the anode to the cathode in one direction
Instrument	An electrical device that converts voltage input into an visual output.
Drive Axle	A device that receives power from a driving motor
Driving Controller	A control device to drive an electric motor, which includes an inverter and a logic circuit.
Handheld	A maintenance tool program to calibrate and diagnose CURTIS

Programmer	controllers of trucks.
Encoder	A device that detects the direction and speed of a motor to produce a pulse signal.
Fan	A device that generates an airflow to cool an electric motor and a controller.
Friction Plate	When meshing with helical gears, the friction disc stops the drive shaft movement when it is compressed by the steel plate
Fuse	A component of a circuit that opens upon an overlarged current flowing through a given part of the circuit
Fixture	A fitting o secure an assembly consisting of two or more wires
Radiator	A mounting frame for cooling semiconductors.
Mandatory Sign	A symbol indicating the state of a vehicle when it is on or flashing.
Seat Switch	A switch to disable the vehicle movement when the operator leaves the seat.
Portal	The front vertical structure of the forklift extends and retracts to lift and lower the load.
Normal State	A term used with switches or relays. Their "normal state" means that they are not under any control of stress,temperature, pressure or electricity.
Ohm (Ω)	A resistance unit. The resistance will be such that one volt shall push one ampere of current through it only.
Timely	The time it takes for a current to flow through a transistor.
Open Circuit	A connection or component of a circuit without continuity.
Overload	A condition that the existing voltage or current is greater than the capacity of a given circuit or component.
Suffocated	The part of an electric brake in which the current generated is directed back to the armature.
Power Socket	A connecting socket that installed on the forklift.
Pressure	a fluid force as per unit area
Proximity Detector	A sensor which can detect the presence of objects nearby without any physical contact.
Resistance	A component made of a material with a specific current impedance.
Rotor	A part of rotating motor.
Outline	A bar chart of an electrical or electronic component that uses symbols to show the individual components as well as how the wires and connectors work electrically
Serial Port	A port that communicates one-to-one with the controller.
Service Brake	A pair of brakes built into the drive shaft to enable the vehicle when the operator applies the pedal for stationary
Short Circuit	An unwanted electrical connection between two or more components.
Socket	The male contact of the connector which slides over the male contact of

	the other connector (pin).
Magnetic Valve	A directional valve that moves the valve element when the magnetic coil is equipped with a magnetic valve.
Solid State	A term that refers to semiconductor components or circuits that wired without moving parts, e.g. diodes and transistors.
Stator	a fixing part in the motor
Steering Shaft	A column that connects the steering wheel to the steering gear to allow the operator to use steering wheel controller
Steering System	element loop, including steering unit, circuit and actuator
Steering Gear	A axle mounted on the rear wheel of a vehicle
Switch（SW）	The component to control a circuit by opening or closing the circuit.
System	Electrical components, circuits, and connections that provide power for specific tasks.
Thermal Sensor	a sensor activated at a pre-conditioned temperature.
USB	A connecting device providing a power supply of 5V.
Voltage	A measurement unit of electrodynamic force. A volt is the force that required for an ampere of current to pass through an ohmic resistor in a circuit.
Watt	A unit of power measurement. The power for one volt to push one ampere of current through an ohmic resistor. The outcomes of amperage (current) multiplied by volts (voltage) is watts (power).
Wire	A path of conductors to provide for current flow in and out of different electrical components.
Wiring Diagram	A visualized figure that represents a component in the way it actually looks. which is used to show the locations of components, and the connections between them.
Zener Diode	A special diode to regulate voltage or protect a system from overvoltage.

1-3 Appearance and Specifications





Type sheet for industrial truck. To VDI 2198					
Distinguishing mark	1.2	Type		T30N	T50N
	1.3	Power (battery,diseal,petrol gas, manual		Battery	Battery
	1.4	Operator type		Stand-in	Stand-in
	1.5	Load Capacity / rated load	Q(t)	3.0	5.0
	1.7	Rated pull force	F(N)	800	1000
	1.9	wheel base	Y(mm)	1155	1155
Weight	2.1	Service weight	kg	950	1020
	2.3	Diving wheel/loading wheel,unladen	kg	550/400	610/410
Tires, chassis	3.1	Tires		实心橡胶轮	实心橡胶轮
	3.2	Tire size, driving wheel	∅ x w (mm)	∅230×70	∅250×80
	3.3	Tire size, loading wheel	∅ x w (mm)	∅180×76	∅180×76
	3.4	Stable wheel (size)	∅ x w (mm)	-	∅124×60
	3.5	Number of wheels (x= drive wheels) drive side/load-bearing side		1x+2/2	1x+2/2
	3.6	Wheel space, idriving wheel	b10 (mm)	580	580
	3.7	Wheel space, Loading whel	b11 (mm)	614	614
Dimensions	4.9	Height of tiller in drive position min./ max.	h14 (mm)	1280	1280
	4.12	Traction bolt (hook center off ground) height	h10(mm)	230/330/430	230/330/430
	4.19	Overall length	l1 (mm)	14291)	14291)
	4.21	Overall width	b1 (mm)	810	810
	4.32	Ground clearance, centre of wheelbase	m2 (mm)	50	50
	4.35	Turning radius	Wa (mm)	13332)	13332)
Performance	5.1	Travel speed, laden/ unladen	km/h	6/9	7/12
	5.5	Pull capacity, full/no load	N	800	1000
	5.6	Max Pull capacity, full/no load	N	2000	3000
	5.10	Service brake		Electromagnetic	Electromagnetic

Motor	6.1	Drive motor rating	kW	1.9	2.6
	6.3	Battery standards DIN 43531/35/36 A, B, C, no standard		无	无
	6.4	Battery voltage, nominal capacity	V/Ah	24/375	24/465
	6.5	Battery weight	kg	292	352
Other	8.1	Type of drive control		AC- speed control	AC- speed control
	8.4	Sound level at driver's ear	dB(A)	<70	<70

1-4 Safety Notes

The following safety sections contains the following subsections: general, personal safety, maintenance safety, compressed air hazards, mechanical hazards, electrical hazards, and fire & burning hazards. Each heading are attached with the precautions you should take for your safety while working in your vehicle.

Readers are advised with responsibility to read this manual thoroughly, and understand and follow all the following precautions. Please also note that the safety instructions listed below are not only for the safety of the readers, but also for those around them. Therefore,, please be sure to read the following instructions carefully for the purpose of your own personal safety and the safety of those around you:

General
Safety Instructions

Please be familiar with the visible safety instructions on the vehicle, which includes warning signs, stickers, carvings, etc. Make sure to read the them before operating, lubricating, or repairing the vehicles (Please refer to the safety section of the Operations and Maintenance Manual).

Make sure that all safety rules, regulations and instructions are followed when performing maintenance tasks. Special attention is required to the danger warning in this manual, which will detail you the potential dangerous conditions.

Do not assume that you can replace the steps outlined in this manual with your previous maintenance experience of similar models. Weight and specifications vary from different models and care is required to avoid any dangerous condition, injury and/or component damage.

Personal Safety

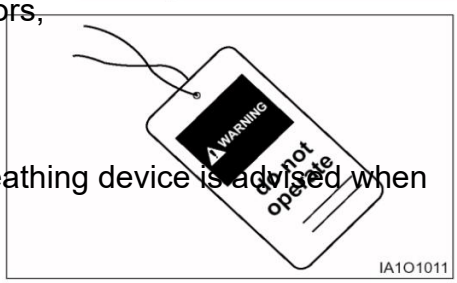
Do not operate or service a vehicle without authorization or training
Do not operate or service a vehicle after alcohol or drugs taking which will impair your judgement.

If you have any disease or condition that restricts physical activity, please do not operate or service the vehicle.

Working Garment

If you are wearing baggy clothes or have long hair that is not handled safely, please do not operate the vehicle or carry out maintenance.
Both can be caught by any moving part and cause serious injuries

Appropriate protective equipment is required when performing maintenance tasks. Protective gear may include a hard helmet, glasses/visor, ear protectors, gloves and protective shoes.



Masks are required when polishing the body and an air breathing device is advised when painting.

Welder gloves, welding masks/goggles, aprons and other suitable welding clothing are required when welding.

Security of Service
Pre-service
Make sure that the vehicle is kept in a clean, open environment, and is free from any traffic and personnel.

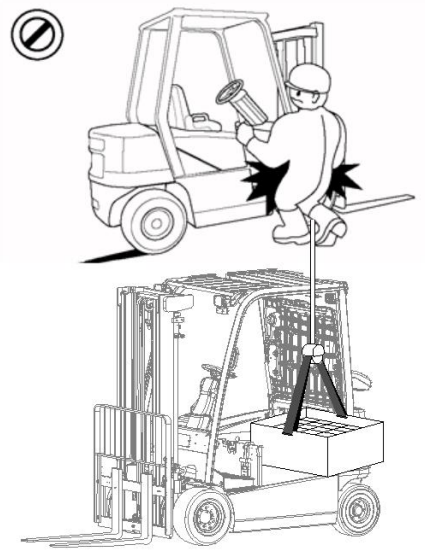
Please ensure that the vehicle is parked safely and will not move suddenly.
Place the wooden props in front and back of the wheels and make sure that the parking brakes will mesh correctly.

Make sure that the vehicle is empty and unoccupied, all the controls are in neutral position and the key is switched to OFF. Place a "do not operate" or similar warning signs to the start switch or the controller before repairing or servicing the forklift.
Make sure the tools are in good condition.

Disassembly and Installation

Make sure the working environment is clean, clean and dry before installing the vehicle.
When using steps, ladders or walkways for installation or removal,
please face the vehicle.
Please follow these steps and grab the handle to install or remove parts.
When you are unable to follow these steps, please use a ladder, scaffold, or work platform to perform maintenance operations safely.
Work platform is advised to perform maintenance for safe operations.

Lifting



Check the weight of each component before removal. Partial components of the vehicle may so heavy that it may cause serious injuries
When removing any components, please use appropriate lifting procedures
A hoist is required avoid back injuries when lifting parts weighing 23kg (50lbs) or more.
Ensure all chains, hooks, slings and the like are in good condition and in correct capacity. Make sure the hook is positioned correctly. Lifting ring bolts should not be loaded laterally during lifting operation.

Disassembly/Assembly

Make sure that the assembly/disassembly site is kept clean and dry and that hand tools are kept clean.

When tightening/loosening bolts and nuts, please use a properly sized wrench and always pull towards the body. A wrench with the wrong size or pushing off the body to loosen/tighten the bolt or nut may cause an accident as the handle slips.

If two or more people are working together, signs or signals are required for communication so that the work is done in an agile manner as if it were done by one person.

Be careful when removing the cover. Slowly loosen the last bolt or two opposite direction nuts from the cover plate unit, twist the cover plate to loosen tension or other pressure, and then completely remove the last bolt or two nuts.

Re-install all fasteners with the same numbered part. If any fasteners need to be replaced, please use qualified fasteners and be careful to not use metric system fasteners with British fasteners together.

Hazards of Compressed Air

Please wear protective mask, protective clothing and protective shoes in cleaning operation。

The maximum air pressure for cleaning must be less than 205 kPa (30 psi).

Mechanical Hazards

Keep all the objects away from the fan blades, or they will throw or cut any object or tool that falls or is pushed in.
Do not operate the machine when any rotating parts are damaged and do not touch any other parts during the operation. Please check the balance of any damaged or changed high-speed rotating part before re-use.

Debris or other debris will fly away from the object upon impact.
Make sure the flying debris doesn't hurt anyone before hitting the object.

Electrical Hazards

Do not damage any wire during disassembly operation. When re-installing wiring, make sure it is installed correctly
Do not wire to any oily cable.
Do not smoke or expose batteries to any spark or flame when checking, charging or repairing the batteries.
The chain and metal tools shall be kept away from the top of the battery.
Electrolyte is an acid that can cause injury if it comes into contact with the skin or eyes.

Fire and Burning Hazards

Attention shall be paid to the hot parts on the machine that has just stopped and to the hot oil in the pipes and compartments to avoid scalding.
Many lubricants and some coolant mixtures are flammable. If the pipe is loose or damaged, there may be a fire.
Lubricants shall be stored in appropriately marked containers and be away from unauthorized personnel.
Other flammable materials shall be stored in a protective container and kept in a safe place.
Do not weld or flame cut pipes or pipe containing easy fuel.
Before welding or flame cutting, please clean them thoroughly with a nonflammable solvent.
Remove all residual flammable materials from the forklift and then collect, like fuel and oil.

1-5 Maintenance

The following provides the key items and replaceable components to be checked during maintenance intervals.
Note: all maintenance and repair should be carried out by a qualified authorized engineer except for the routine inspection of the vehicle driver.
Note: careless disposal of waste oil is not only harmful to the environment, but also to human health. Waste oil should always be kept in containers and disposed of by authorized personnel at a designated locations.
Necessary Check as Required

Item	Inspection Standard and Method
Instrument Board	Press Enter KEY3 You can access diagnostic mode by pressing this button while driving
The power module	must be fully discharged before contact with any electrical components.
Fuse Holders	Check the removed components fuses and replace if necessary. 5A: Backup/parking light, relay/power supply, fan, strobe, flash, rear/headlight 10 A: key switch 20 A: DC-DC Convertor and Horn 350 A: main fuse
Wheel bolting	Make sure that the wheel bolts and nuts are fixed as follows: Tightening torque of rear wheel : 85 Nm Tightening torque of drive wheel: 85±5 N·m
Drive axle gear box	Check gear box for lubricant Refill the lube oil into the plug opening for shell level inspection.

Check every10 service hours or daily

Item	Inspection Standard and Method
Check by walking around	Check for loose parts and fasteners. Check the indicator lights of instrument board for abnormalities. Check if the speakers and other alarms are working properly. Check tires, valves and wheels for abnormalities. Check driving wheel is oil leakage.

	After adjusting the driver's seat and placing the control lever in neutral, please open the key switch and check the overall operation of the system.
Battery	Check the battery box for loose connections, worn cables and limits on properly secured battery limits. Clean the top of the battery. If necessary, clean the top of the battery with a solution of 0.5 kilograms (1 pound) of baking soda and 4 liters (1 gallon) of hot water. Check the density of the battery. If the specific gravity reading is below 1.150, the battery must be charged. Check the electrolyte levels of all cells. Keep the electrolyte level about 13 mm (0.50 in) above the plate. Add water as needed. Use distilled water only. Water should be added to the battery after charging
Indicator lights of instrument board	Check whether the parking brake light is working normally and all the indicator lights
Tyres and wheels	Check tires and wheels for wear, cutting, grooves and contamination.

First check shall be made after 50-100hours or a week later

Item	Inspection Standard and Method
Gear box	Replace gear oil

Check every 500 service hours or ever 3 months

Item	Inspection Standard and Method
Gear box	Replace gear oil
Control Panel	Clean control panel. Maximum allowable pressure：205 kPa（29.7 psi）
F / R switch	Check the tightness of the F/R switch mounting bracket and adjust as needed. Check for loose wiring and secure it as needed.
Parking Brake	Check the parking brake to ensure that the vehicle is stationary at a 15% gradient and repair or replace if necessary.

Check every 1,000 service hours or every 6 months

Item	Inspection Standard and Method
Drive motor	De-dust and check drive motor and end cover area. Maximum allowable pressure：205 kPa（29.7 psi）
Tyres and wheels	Check tires for worn, cuts, grooves, contaminants and the like. Check the wheel components for cracks, wear, damage, corrosion and the like. Standard torque of drive wheels：180 N·m （133 lb·ft）

Check every2,000 service hours or annularly

Item	Inspection Standard and Method
Rear wheel	Remove and assemble the rear wheels to re-assemble the bearings.
Basic maintenance	A regular check-up shall be made at least every 12 months under normal circumstances. If the vehicle are working with long hours or under heavy load, please check the vehicle every 6 months in regularly. If any of the following conditions are found, please replace: the crack healing on the fork, welding, bracket and so on

1-6 Lube

The following is a detailed description of the lubricant as required.

1-6-1 Lubricating Oil Specification

The following lubricants are recommended for chains and connecting rods:

Item	Specification
1	DIN 51825 Standard Oil and Grease

Gear oil

Failure to comply with recommendations will result in excessive wear of gears leading to shortened service life.
API GL-4 or SAE 80W oil is acceptable

Note: Noblelift does not mix multi-stage oils for transmissions. Multistage oils with high molecular weight polymers as vi improvers lose their viscosity effectiveness due to the permanent and temporary shear of vi improvers and hence are not recommended for use in drives and compartments of drive system

1-7 Instructions of Disassembly/Assembly

The following parts of Disassembly/Assembly include the following sections: the preparation before disassembly,
the inspection and test before disassembly, the matters to be attended during disassembly, the matters to be attended after disassembly, the matters to be attended during assembly, the handling of common parts.
The precautions to be taken for proper disassembly/assembly operations are listed in each heading.

Preparation before disassembly
Remove dust and contaminants from the vehicle before transferring to the maintenance centre. Dust or contaminants that enter the maintenance centre may contaminate parts and enter inside to introduce scratches. The electric machines are operating on an electrical system.
No water shall be allowed inside the system.
To avoid unnecessary disassembly, please prepare necessary tools and place parts inside boxes with priority to site cleaning

Check and test before disassembly
Be sure to record any problems before starting the disassembly, which can prevents unnecessary disassembly, loss of replacement parts, and repeated failures as caused by the same problem.
To prevent failures, record failures and replace required parts are required.
The following information shall be also checked and recorded:
Vehicle model number, serial number and operation hours
Reasons of the vehicle needs to be dismantled
Check for symptoms, locations and causes of failures (repeat the same failure if needed)
Check any part which is not suitable.
Check the parts for damage or looseness.
If possible, check the maintenance condition of the vehicle.

Figure1-17

Notes for disassembly

Disassembly：

Determine the way of parts assembly (front/rear, left/right and up/down) for the sequence of disassembly.
Before starting to disassemble parts, attention shall be paid to the join points of parts with arrow marks to avoid misplacing parts during assembly
Please use the right tools to remove specific parts.
If no part is removed, even when mounting bolts and nuts, do not use excessive force.
Do not overstrain. Check and find the causes
Put the disassembled parts on one side in the order of disassembly, and place signs or marks on similar parts.
Store bolts, nuts and other common parts in an orderly manner.
Check and test in disassembly
The cause of the fault is sometimes found in the process of disassembly. Therefore, it is important to carefully examine the condition of the friction surfaces and the contact parts.
During disassembly, gaps, deformations, projections and other factors that may cause failures shall be measured and recorded.

Keep the distance
Make sure that the installed spacers and gaskets will produce the required specific clearance.

Remove pressure fittings
Remove any dent or mark that caused by area hammering and polishing.
If any pressing part is released, please identify and eliminate the cause to avoid problems during assembly.

Bearing Disassembly
Do not remove the bearing forcibly, and a bearing puller is advised.

Notes after disassembly
Be clean
Clean disassembled parts and keep them away from contaminants.
Special attention should be paid to removing contaminants from the oiling or component lines.
When cleaning special parts, increase the number of detergent containers and clean several times.
Kerosene or neutral anhydride diesel is suitable for cleaning viscous oils in bearings.
When using dangerous chemical cleaners, be careful to avoid a skin or eye contact.
Used oil should be disposed of in designated containers at designated locations.

Dustproof

A dust cover is advised to keep cleaned parts free of dust and contaminants and to block up the ends of all pipes.
Any part you may store should be rust-proof before re-installing.

Notes for assembly

Parts installation

All parts shall be kept clean before assembly. All surfaces shall be checked for defects and repaired if necessary. Any contaminant shall not be smeared or rubbed on the surface, which may shorten the service life of the parts.
Before starting assembly, a cleaner is required to remove the rust inhibitor from the parts.
Before assembly, the markings that put the parts together shall be identified.
Bearings, bushings, and seals shall be assembled with press tools and specific parts shall be handled with specified tools.
Before pressing parts, the surface shall be lubricated with lube.

Tighten the bolts and nuts

To ensure a uniform torque of bolts and nuts, the tighten order shown in figure 1-19 shall be followed and then the other end of the other side shall be tightened. This method is known as the "template method", which gradually repeats loosening and fastening to ensure even contact.

Fix the bolts, nuts or other important fasteners that cannot be visually inspected with wires, cotter pins, lock washers or other components as shown in figure 1-20.

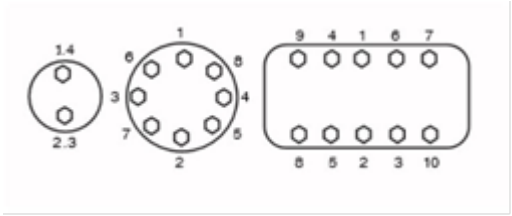


Figure 1-19

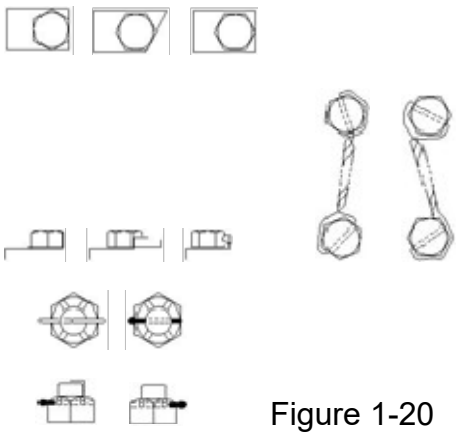


Figure 1-20

Assembly Inspection
At each step of the assembly process, each part's number shall be checked and recorded.

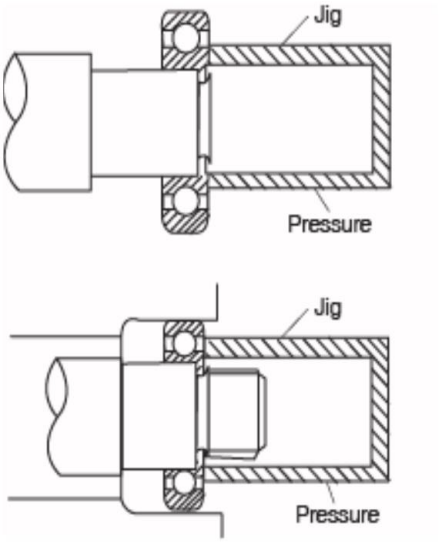
Reassemble the gaskets
Install the gasket and washer in the same position as before, and then check the gap for correctness.

Assembly adjustment
If no adjustments are required, assemble them to the same length as before

Assemble pressed parts
Scratches and dents shall be repaired as needed and be kept clean before insertion.
Please note that press fittings that are not adequately tightened may become loose.

Assemble keys and keyways
Check if the keyway and key are loose and in contact with the key head. If the keyhead touches the keyway, then the rest of the keyhead shall be removed.
Handling the general parts

Handling the packaging
Packing, as well as gaskets &copper packing should be replaced as instructed. After using the adhesive, please assemble the gasket specified in this maintenance manual. The followings shall be noted when applying the adhesive to the gasket:
Old adhesive, scratches, dust, paint and grease shall be thoroughly removed from the washer surface.
Apply appropriate sealant evenly to both sides of the washer and wait a few minutes until dry.
Once the sealant is dry enough to touch, it won't stick to your hand.



Assemble the parts
Please soak the leather package in oil before use.

Handling the O-rings
Please remember to check the condition of the O rings.
Hardened O-rings shall not be stored for long.
The O-rings to be used shall be the specified once in the parts list.
For example, the O rings used in engine oil are made of special materials, such as silicone rubber, and are resistant to heat and aging.
Installing different types of O-rings in this situation can cause serious damage to the system and its components.

The O-rings shall be lubricated to avoid surface scratching during installation. Silicone rubber O rings are prone to damage, hence attention is required to avoid overstretch.

Handling the oil seal

Oil seals shall be prevented from dust sedimentation, especially on the lips, and there shall be no rust or scratch.
Lips opposite to the seal shall be lubricated evenly.
The surface of the shaft where the seal is installed shall be checked for contamination, rust, or scratches and grease or lubricant shall be applied so that the seal can be easily installed.
Oil seal installation.
By gently rubbing the wire on the surface, please check the surface of the oil seal lip for scratches.
If there is any scratch, please replace the oil seal.
When inserting the oil seal, please use the guide device and fixture as shown in figure 1-22 to avoid any damage to the oil seal.
After the oil seal is inserted, the inclination shall be checked (tilt tolerance: 0.2 mm /00 mm, diameter 0.008 in. /3.937 in.).When applying adhesive to oil seal, make sure that there is no adhesive in contact with the lip surface. All residual adhesive shall be removed from the guide and fixture before inserting another seal.

Bearing handling

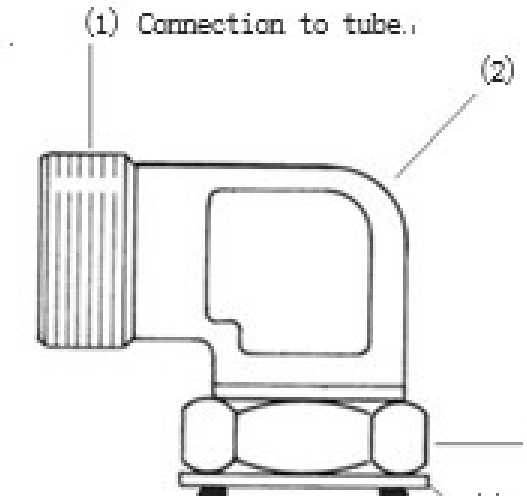
The followings shall be noted to properly assemble bearings and avoid damage to bearings:
The dust and other contaminants that may shorten the service life of the bearing shall be thoroughly removed.
The bearing shall be kept packaged until it is installed.
Do not affect the bearing.
Do not over-turn the bearing to remove the purifier by compressed air.
The oil seal ring shall be installed in the correct direction.
Please note the following when installing the bearing.
Neither hit the outer ring with a hammer for installation, nor hit the inner ring to insert the outer ring. Such hammer strike may damage the bearing track.

When you are insert the inner ring of the bearing with a reasonable tolerance, the fixture shown in figure 1-23 is required with pressure to the inner ring. For hot insertion, the bearing shall be heated to 120℃（248℉）. However, please note that excessive heating can reduce the hardness of the bearing surface.
When inserting non-split bearings with inner and outer rings with reasonable tolerances, the fixture shown in figure 1-24 shall be applied and both inner and outer rings shall be pressed.

Handle the retainer

When removing or installing the retainer, a pair of right ring tongs is required and attention shall be paid against over-pressure on retainer. After installing the retaining ring, the retaining ring shall be checked for correct insertion.

Fitting assembly with straight thread and O rings (for different applications)
1.Place the lock nut (3), support washer (4) and o-ring seal (5) as far away from the fitting body (2) as possible.
2. Tie the joints to the part it is using until the support washer (4) just touches the surface of the part.
3. Place the joint assembly in the correct position, and turn the joint body (2) outward to 359°(counter-clockwise) .
4. Tighten the locking nut (3) to the torque as shown in the correct diagram for the used fitting.
5. If the end shape of the fitting body is the same as shown in figure 1-25 (elbow or straight), please place the sleeve over the tube before connecting the tube to the end.



Note: if the joint is a connector (direct connector), then the lock nut on the main body shall be replaced by the hexagon nut. To install this type of joint, the hexagon joint shall be tightened to the surface of the parts into which it enters.

Tighten accessories of other types
Pipe fittings (shear sleeve) of high load: please turn the nut with a wrench until a slight reduction in torque is felt after the pipe passes through the nut and touches the shoulder in the fitting body, which indicates that the sleeve has been removed from the nut

High seal fittings: place the nut and sleeve on the pipes with the short end of the sleeve toward the end of the pipes. Press the pipe end against the counterbore in the body of the

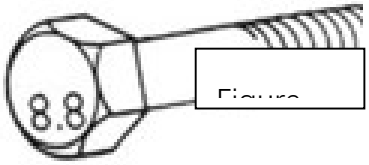
fittings and tighten the nut until it is above the last thread of the body. As soon as the fitting is removed and reinstalled, the remaining space will be available.

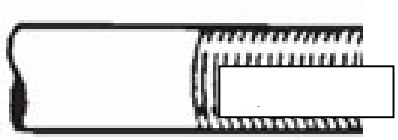
Flexible fittings: please place the nuts and sleeves on the pipes and push the pipes as far as possible into the countersunk holes of the fitting bodies. Tighten the nut until it touches the hexagonal part of the body.

1-8 Standard Torque

1-8-1 Standard torque of bolts and nuts

Be careful that the metric and British size fasteners shall not be mixed in used. Mismatched or incorrect fasteners may cause damages or malfunctions to the vehicle or personal injuries. Exceptions to these torques may be provided in the service manual if required.
Before installing any hardware, make sure that the components are close to a new state. Threads of bolts and nuts shall not be worn or damaged. Hardware shall be free from rust and corrosion.
Hardware shall be cleaned with a non-corrosive cleaner with oil application to threads and bearing surfaces. Oil shall be not applied if thread locks or other compounds are to be used.
The fastener shall be kept in good condition and reused only in fine conditions after loosening.





Standard bolt

Make sure to choose the same size and grade of fasteners for replacement.
Generally, you can identify the strength of the bolts based on the numbers marked on the heads
(e.g. 8.8 or 10.9) as shown in figure 1-30. The following table are listing the standard torques for typical bolts, nuts and the taper bolts as shown in figure 1-31.

For metric fasten .

Thread size(mm)	Metric nuts and bolts		Metric taperlock stud	
	（N·M）	Pounds/feet	（N·M）	Pounds/feet
M6	12±3	9±2	8±3	6±2
M8	28±7	20±5	17±5	13±4
M10	55±10	40±7	35±5	26±4
M12	100±20	75±15	65±10	48±7
M14	160±30	120±22	-	-
M16	240±40	175±30	110±20	80±15
M20	460±60	340±44	170±30	125±22
M24	800±100	600±75	400±60	300±45
M30	1600±200	1200±150	650±80	480±60
M36	2700±300	2000±225	870±100	640±75

For British fasteners

Thread size(inch)	British nuts and bolts		British taperlock stud	
	（N·M）	Pounds/feet	（N·M）	
1/4	12±3	9±2	8±3	6±2
5/16	25±6	18.0±4.5	17±5	13±4
3/8	47±9	35±7	35±5	26±4
7/16	70±15	50±11	45±10	33±7
1/2	105±20	75±15	65±10	48±7
9/16	160±30	120±20	-	-
5/8	215±40	160±30	110±20	80±15
3/4	370±50	275±35	170±30	125±22
7/8	620±80	460±60	260±40	190±30
1	900±100	660±75	400±60	300±45
1 1 / 8	1300±150	950±100	500±70	370±50
1 1 / 4	1800±200	1325±150	650±80	480±60
1 3 / 8	2400±300	1800±225	750±90	550±65
1 1 / 2	3100±350	2300±250	870±100	640±75

2 Electronic System

2-1 General

This model is equipped with an electrical system with the following components:

1． The battery supplies the power to the electrical system [Section 2-2]

2． The emergency switches may be pressed in emergency to turn off all DC and AC circuits [Section 2-3]

3．Motors, controllers, and associated equipment are providing the necessary drive to the vehicle based on their interactions with sensors,
switches, relays, actuators, as well as various parameter settings. [Section 2-4]

4． When the load is supplied at a current above the limit, the fuse will protect all DC loads from overcurrent by cutting off the load's power supply. [Section 2-5-1]

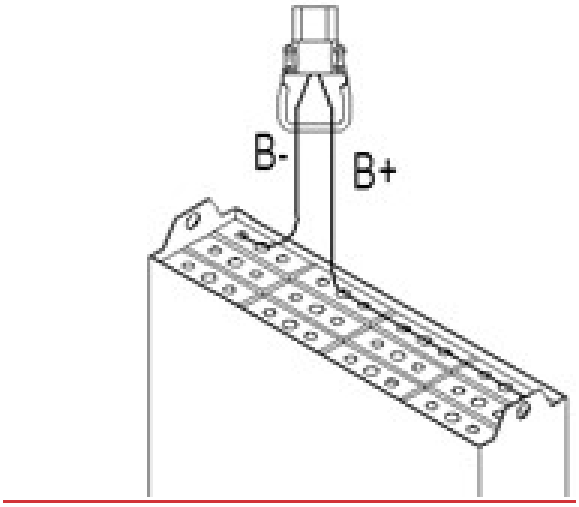
5． Other DC loads that activated by the operator's direct requirements will work independently of the controller. First, such DC loads not regulated by controllers and are not the purpose of controllers' signals. However, they may interact with controllers in some configuration. Such loads include light sets and horns.[Section 2-5-3 to 2-5-5]

6． The instrument board monitors the vehicle, informs the user of its condition and provides basic functions for mode setting, diagnosis and calibration [Sections 2-6]

7． The handheld programmer provides the same functions as the instrument board, but are detailed [sections 2-7]

2-2 Battery (Lead Battery)

2-2-1 Appearance and Specifications



Item	Specification
Dimension of battery compartment	800x212x784 (LXWXH)
Total battery Voltage	24V
Battery connector	Socket connector REMA95044-01
Battery cable capacity	465Ah/375AH
Battery cable size	More then 2/0 GA（60 mm 2 ）

Specific gravity depends on temperature

Temperat	温度				Charging	
-15° C（5 ° F）	-5° C（23 ° F）	0° C（32 ° F）	5° C（41 ° F）	15° C（59 ° F）	25 ° C（77 ° F）	35 ° C（95 ° F）
108%	1.101	1.098	1.094	1.087	1.08	1.07
118%	1.111	1.108	1.104	1.097	1.09	1.08
128%	1.121	1.118	1.114	1.107	1.1	1.09
138%	1.131	1.128	1.124	1.117	1.11	1.10
148%	1.141	1.138	1.134	1.127	1.12	1.11
158%	1.151	1.148	1.144	1.137	1.13	1.12
168%	1.161	1.158	1.154	1.147	1.14	1.13
178%	1.171	1.168	1.164	1.157	1.15	1.14
188%	1.181	1.178	1.174	1.167	1.16	1.15
120%	1.191	1.188	1.184	1.177	1.17	1.16
121%	1.201	1.198	1.194	1.187	1.18	1.17
1.218	1.211	1.208	1.204	1.197	1.19	1.18
1.228	1.221	1.218	1.214	1.207	1.2	1.19

2-2-2 Function

Characteristics of lead batteries
This model uses a lead battery as a power source for its electrical system.
The lead battery is mainly composed of positive plate, negative plate, electrolyte, separator, battery tank, battery cover, electrode, liquid injection cover, etc. The electrode of the exhaust battery is composed of lead and lead oxide, of which the electrolyte is an aqueous solution of sulfuric acid. Main advantages: stable voltage, cheap price; Disadvantages: low energy density (i.e, energy stored per kilogram of battery), short service life and high frequency of daily maintenance. The service life of the old ordinary battery life is generally about 2 years, of which the height of electrolyte shall be checked and the distilled water shall be added. However, With the development of technology, lead-acid batteries have become more durable and easier to maintain.

The plastic covers that can be unscrewed at the top with a vent hole is the most apparent feature of the lead-acid batteries. These caps are designed for distilled water refilling, and electrolytes and gases checking. Theoretically, lead-acid batteries shall be checked for the density of electrolyte and liquid level height during each maintenance, and distilled water should be added if reduced

2-2-3 Test

Battery condition check
Weak batteries can cause problems in the controller and power circuit.
The battery shall be ensured with a good condition before troubleshooting other areas.

Preliminary steps
Verify the polarity on the battery connector and control panel for correctness.
The positive terminal cable shall be located at the line fuse while the negative terminal shall be located at
the negative terminal of the control panel.

When the vehicle is in operation
Battery load test >
1. Turn the range switch on the multimeter to read the battery voltage.
2. Connect the battery
3. Connect the multimeter leads with B+ (1) and B- (2) of the controller.
4. Please operate the hydraulic system (temporarily keeping the tilting lever at its maximum position) in the safe area while reading the voltage indicated on the multimeter.
5. If the indication is below the limit (19.0v), the battery shall be charged or repaired before the troubleshooting.

When the vehicle does not work and the battery is suspicious. Battery pressure drop test

1.The voltage of each battery shall be measured when the vehicle is powered on and the drive motor is running.
2. The normal voltage of each battery should be between 1.95V and 2.12V. If the voltage on each battery is below 1.95V, the battery shall be charged or repaired before troubleshooting resumption.
3. The readings between batteries should not exceed 0.05 volts. If so, the battery shall be properly charged or repaired

Hydrometer test >
1. Test each individual cell of the battery with a hydrometer
2. If any specific gravity indicator is below 1.140, the battery shall be charged.
3. If any reading is 1.265 to 1.285, then the battery is fully charged.
4. The readings between monomers should not exceed 1.020. If so, the battery shall be properly charged or repaired

Insulation check of battery case
Any resistance between any point of the wiring in forklift truck and car body should be at least 10000 Ω or higher.
A short circuit in the battery case may cause many faults. Because the battery may have chassis leakage,
A chassis short circuit in the forklift wiring may cause problems. To avoid any problem as caused by the short circuit, the followings shall be attended:
1. Disconnect the battery and discharge the controller.
2. Measure any component connection or wiring that associated with the forklift chassis or wiring connection randomly, and the minimum resistance shall be 10000 Ω.
Any test point with low resistance shall removed from the chassis against any short circuit.
3. The battery shall be always kept clean to minimize the leakage of current into the case.
4. Make sure that all accessories (e.g. horn and lights) are designed to be chassis free (dual wire system)

2-2-4 Maintenance

Battery maintenance and service is essential to maximize the service life of battery and efficient vehicle operation. Regular inspection and maintenance will extend the service life of the battery.

Special attention should be paid to the following rules:

1. The battery shall be always kept clean Being cleaning can prevent corrosion, current leakage and case short circuit. Please tighten all ventilation plugs, clean batteries with water and brush, and then dry with air hose.
2. Distilled water shall be fully refilled to cover the plate before charging, which will ensure a chemical reaction on the entire surface of the plate. After charging, the water shall be added to 12.7mm (0.50in) above the top of the plate. Distilled or mineralfree water is required.
3. Charge properly. The battery should be discharged to 80% of its capacity and then fully charged. Batteries should be charged evenly once a month to ensure that all batteries are fully charged. Correctly battery charging should be identified to prevent low power in the vehicle installation.
4. Low power operation shall be avoided. Low battery power may damage batteries and cause higher-than-normal currents in electrical systems. High current consumption due to low battery power may damage the contactor tip and shorten the service life of the motor brush.
5. The highest temperature of the battery is essential. The electrolyte temperature shall not exceed
55°C (131°F) during operation or charging. Overcharging of the battery will lead to an overheating of the battery, causing the battery bulge and other adverse phenomena. The battery has the longest service life when the electrolyte temperature is maintained at 25 ° C (77°F). Most charging devices are fully automatic, but should be checked regularly to ensure a normal operation.
6. Maintain accurate battery records. Battery tester or voltmeter should be used to read and record the battery index regularly. The specific gravity and voltage of each cell should be checked at least once a month. This inspection should be carried out after a balanced charge. After adding water, the reading should not be taken directly. Maintenance of all batteries should be recorded to identify batteries that are in deficit or wear.

2-2-5 Disassembly and Installation

Warning

Careless use of the battery may result in an electric shock

The safety precautions given in sections 1-4 shall be followed

Warning

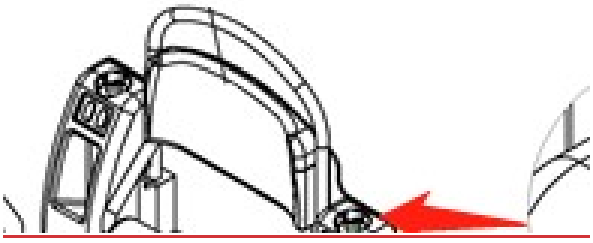
A short circuit may occur during the removal, transportation, and installation of the battery

Make sure that the battery is covered with insulation material (poly) and that no metal material touches the top of the battery before disassembling, transporting, and installing the battery

1. Vehicles Parking
2. Close key switch
3. Open the key of battery cover
4. Lift the battery cover
5. close battery connector
6. Keep the key switch open to discharge the power module. Twice for 30 seconds.
7. Remove the battery using battery rack truck
8. To install the battery, perform the above steps in reverse order.

2-3 Emergency Switch

2-3-1 Appearance and Specifications



2-3-2 Function

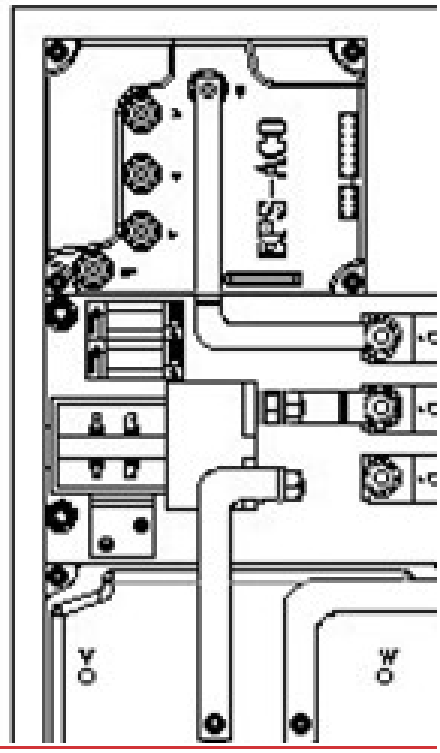
The emergency switch is used to shut off the current in the electrical system in case of emergency,
and thereby stopping the operation of the vehicle. When pressed the key, all DC and AC circuits are open except the speaker circuit.

When the emergency switch is opened, the positive terminal of the battery is disconnected from the key switch, thus cutting off all the load power supplied through the key switch. As a result, all DC loads except the horn will be cut off

The tractor has a combined emergency stop switch and two series emergency stop switches, which turn off any one and can stop all hoisting, dropping and driving functions.

2-4 Controller and Related Equipment

2-4-1 Appearance and Specification



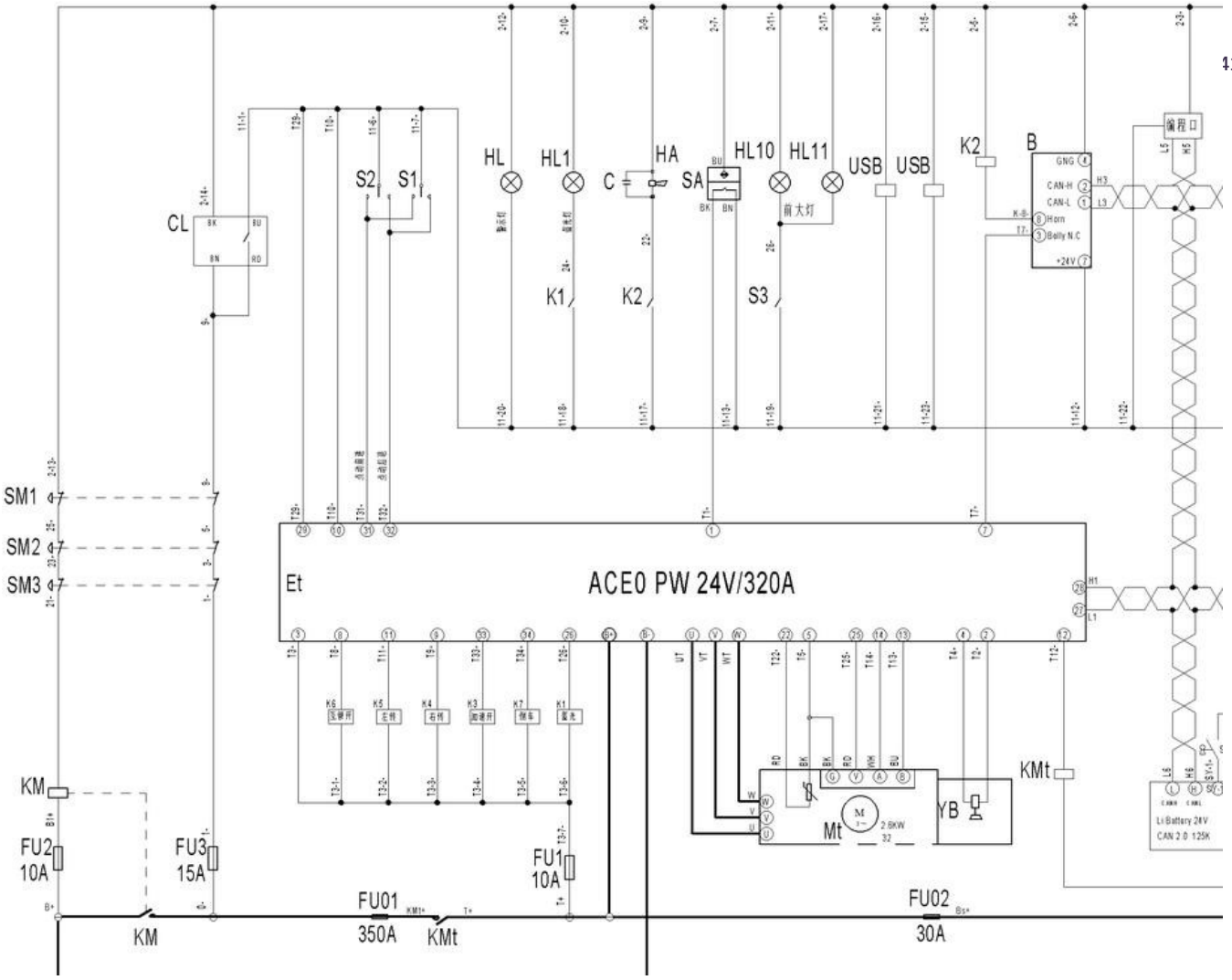
Technical specifications

No.	Description	Specification	Serial Number	Description	Specification
1	PWM Working frequency	10KHZ	8	Accelerator control signal	2 lines of 0-5KΩ/5KΩ-0, 3 lines of potentiometer, 0-5V, current source, electron accelerator
2	Insulation strength with radiator	>500Vac	9	Speed control type	Single end/swing /VCL input
3	Logical port input voltage	If the falling edge > 1.5v, then the voltage is high; if the	10	Operating ambient temperature	-40℃ to 50℃

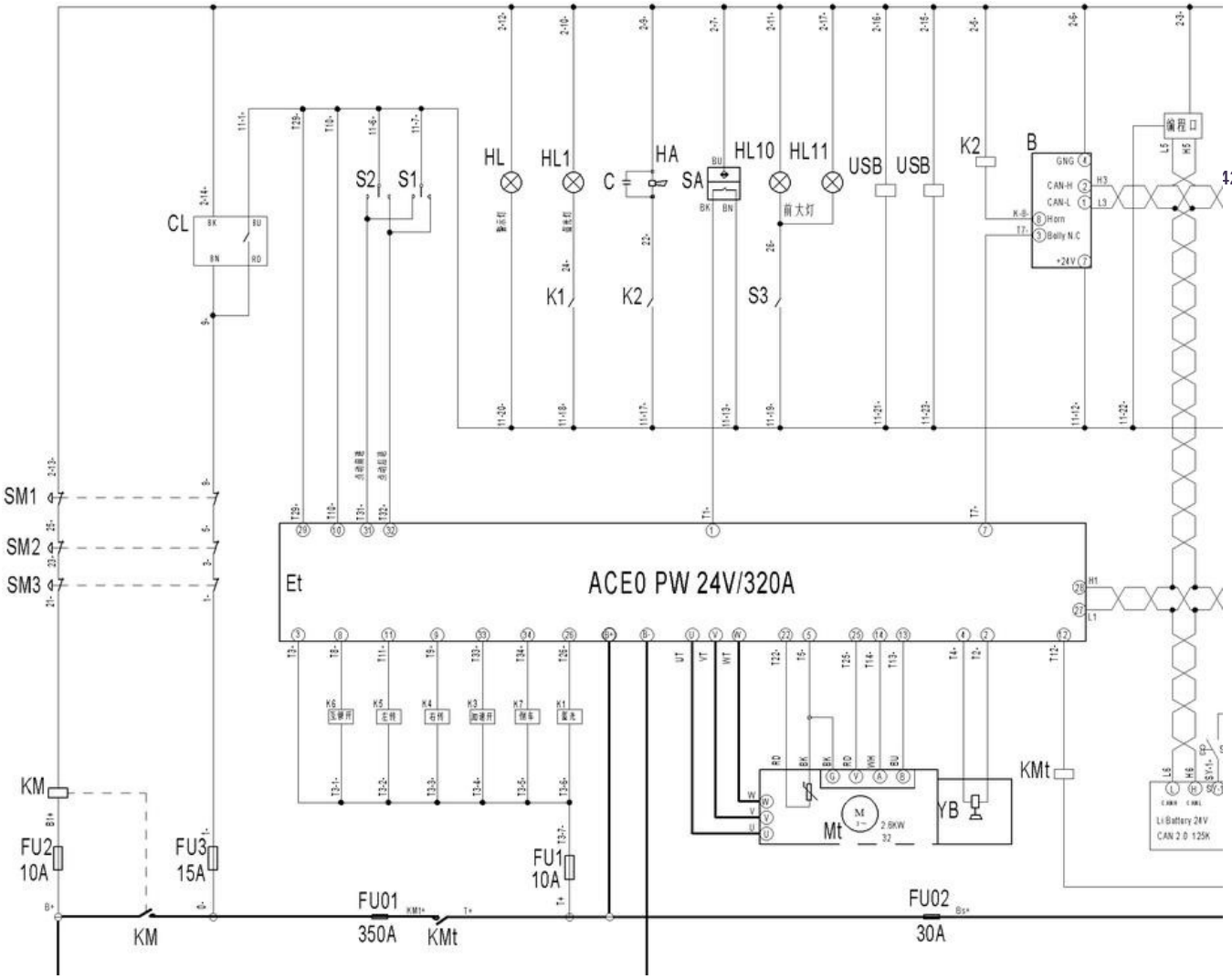
		rising edge >4.4V, then the voltage is high			
4	KSI input current	<1.0A	11	Storage ambient temperature	-40℃ to 50℃
5	Input current of logical end	<10mA	12	Current limit of overtemperature	The current is limited at 85℃ and will cut off at 95℃
6	Maximum output frequency	300Hz	13	Current limit of low temperature	The current will cut off at 40℃
7	Total drive current	<10A	14	Sealing	IP65perIEC529
15	Relevant standards	EMC Interference: EN50081-2/08.93; Anti-interference: EN50082-2:1995 Safety and Anti-flying: EN1175 UL Component Authentication Satisfy the UL583 insulation test			

2-4-2 Circuits and Functions

T50N



T30N



Contactor

This model is equipped with a drive motor,the contatcor control the power to to controller

Once the controller is energized, a magnetic coil built into the line contactor will receive power from the driven motor controller. The two contact points, which act like switches, will then touch each other and connect the lines between the battery and the two controllers. Therefore, the controller becomes a three-phase and three-wire AC power supply and is transmitted to the motor through each UVW connections. The line contactor is equipped with 350A fuse to prevent

Overcurrent.
The controllers are connected through the following sensors, switches, relays and actuators.
Key switch
Emergency Switch
Forward/revise units
Accelerator
Brake pedal switch
Horn relay
These devices provide DC power and interact with controllers that activate or receive data based on a number of parameter settings to control the motor.
Each controller is programmed with different types of firmware to achieve different functions.

The safety & high efficiency performance and complete operation function of electric forklift can be realized by properly setting the motor technical parameters and control technical parameters and function values of the controllers.
1.The crawling speed of electric forklift is adjustable The crawl speed setting function of the controller enables the a long-time operation of electric forklift at a low speed.
2. The acceleration rate is adjustable. The acceleration rate refers to the "soft and hard" feeling of accelerator pedal when operating electric forklift. By setting the acceleration rate, the forklift can meet the requirements of acceleration operation in different working conditions.
3.Plug braking and regenerative braking. The reverse braking signal will be generated when the direction bar is in opposite position, which controls the traction motor to give a braking torque through the motor driver for the purpose of vehicle deceleration. The power level is controlled by the accelerator pedal. Regenerative braking is generated by the controller under the condition that the speed of the vehicle is relatively higher than the speed of the traction motor, of which the braking energy of the vehicle will be converted into electric energy and fed

back to the battery. Especially when the electric forklift is on the downhill slope, the regenerative braking to properly reduce the speed of the vehicle on the downhill slope can be achieved through a proper lifting and releasing accelerator foot plate, which thus extends the driving distance of the battery for any single charge.

4.Slope anti-backward slip function. The electric forklift with AC traction motor has the excellent function of staying non-slip on the slope.

5. The maximum driving speed is adjustable. Reasonable setting on maximum driving speed of electric forklift can prevent any overloading of traction motor due to high speed.

6.Static reply switch off. In the event that the seat switch or key switch is disconnected, the control will be turned off and the directional control lever shall be pushed back into the neutral position to restart. If the driver leaves the vehicle and returns at any time, the direction control lever shall be pulled back into the neutral position before restarting. This function may help to avoid any unexpected unsafe operation A time delay of several seconds is provided at the input end of the seat switch to allow instantaneous disconnection of the seat switch against turbulence.

7.Safety protection function If the power component of the controller is damaged during operation, the controller will disconnect the main contactor in the shortest time, and the controller will automatically limit the armature current of the motor upon the temperature over rise of the controller . When the battery voltage is too low, the controller will also stop working to ensure safety.

8.Traction motor controller is functioned with self-diagnosis When the lead controller come across a fault during operation, the fault code will be displayed on the display instrument and the controller will stop working automatically for the safety of the operating system.

Meter will show error code when controller does self-diagnose and find there is error after start the machine.

9.The amount of battery power and accumulated working hours will be indicated in display instrument.

2-4-3 Diagnosis and Troubleshooting

Controller

The diode voltage of AC MOSFET circuit inside the controller shall be tested and checked for any burn out damage.

According to the table below, each test item shall be tested repeatedly for more than 3 times.

Item	Multimeter terminals		Range of normal value	
	Red indicating pen	Black indicating pen	Polarity measurement	Resistance measurement
1	B+	U/V/W/B-		1MΩand above
2	B-	U/V/W		1MΩand above
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

Pull multimeter to Ω mode (resistance)　Pull the multimeter to the diode mode (polarity measurement)

Remove the cables and wires that connected to the controller, and release all the internal power of capacitor (discharge the B + and B - terminals with 30 Ω resistance).

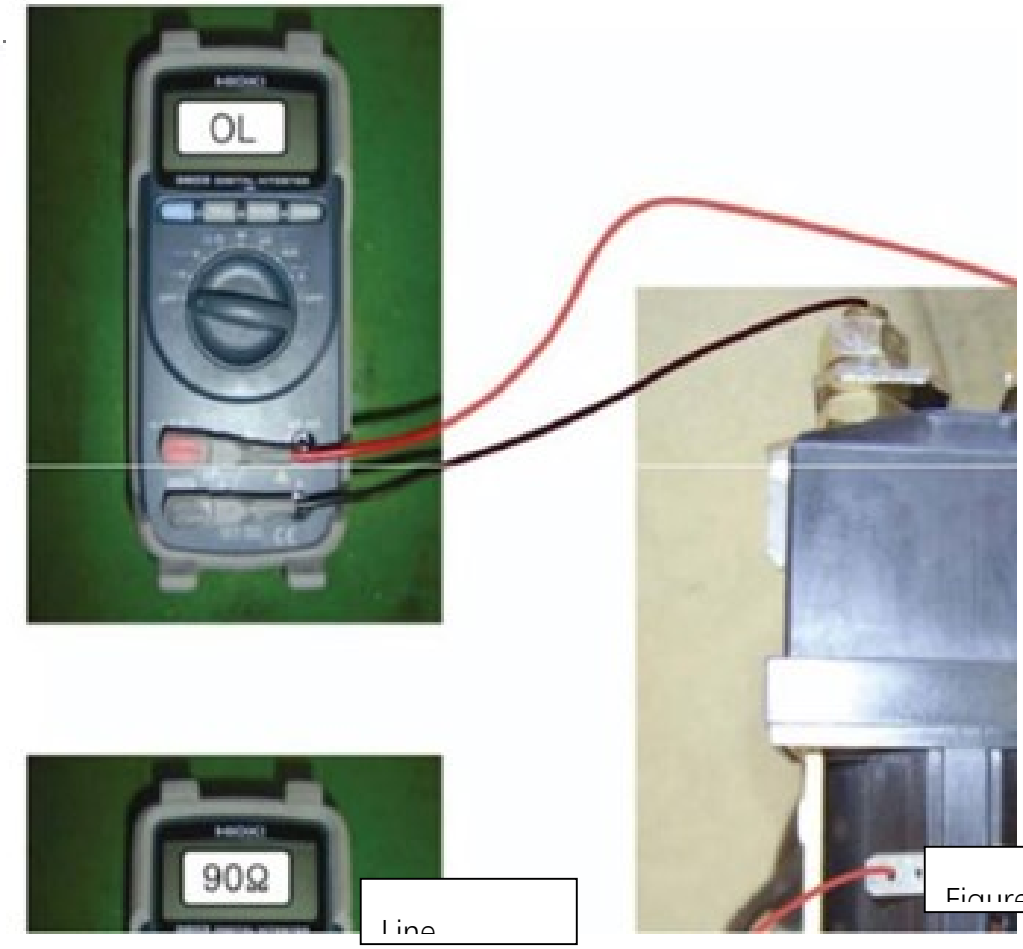
Test the diode voltage (0.3-0.6v) with a multimeter and check if it is normal.

Test1：Read the diode voltage, through which the red wire is B-, the black wires are U, V and W.

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

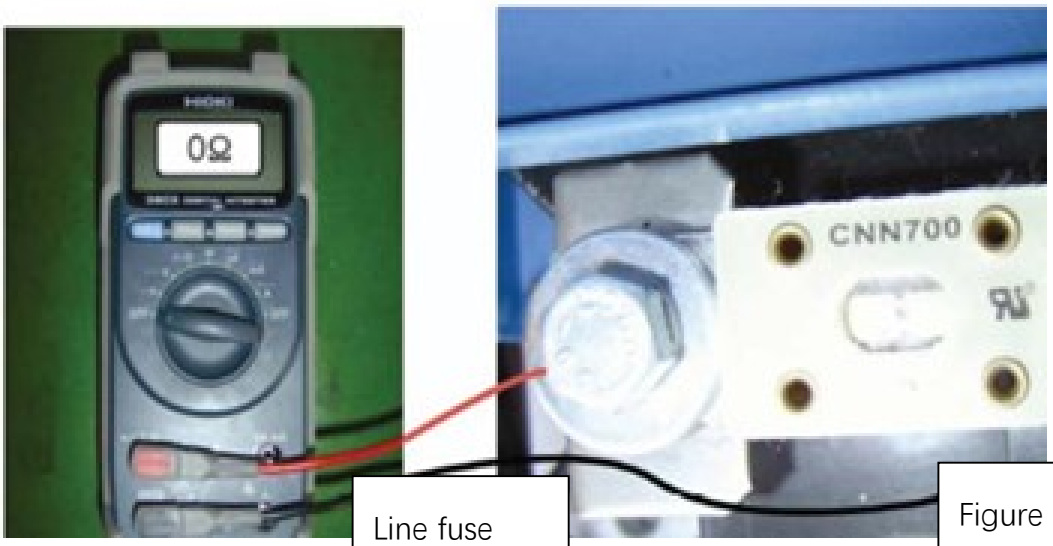
Notes: The multimeter pointers shall not be inverted in use

Line contactor and fuse



Line

Figure



Line fuse

Figure 2-23

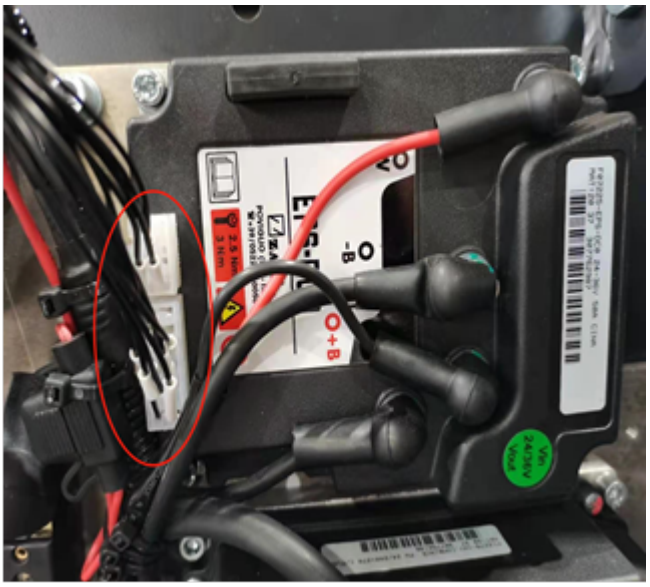
For line contactors and line fuses, an ohmmeter shall be connected at the point shown in the figure and shall be tested for the specified value.

2-4-4 Disassembly and Installation

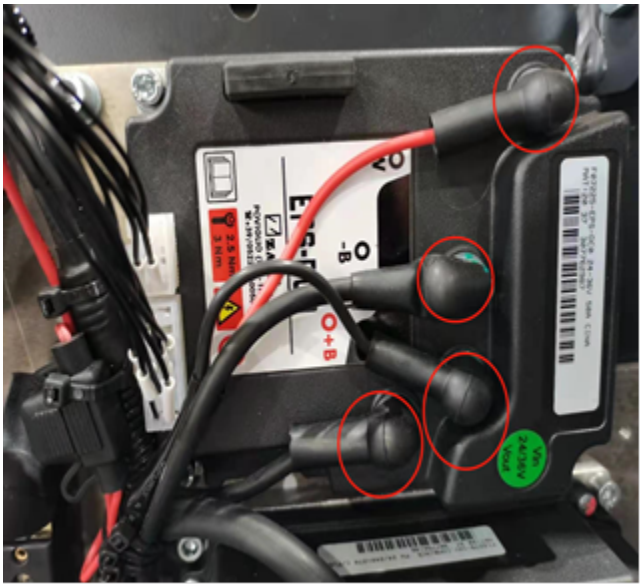
Disassemble/install drive motor controllers

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

1.Disconnect the control wire harness from the controller connector port



2. disconnect U, V and W cables.



Tightening torque: 9.5 ± 1n m (7.0 ± 0.7 lb ft)

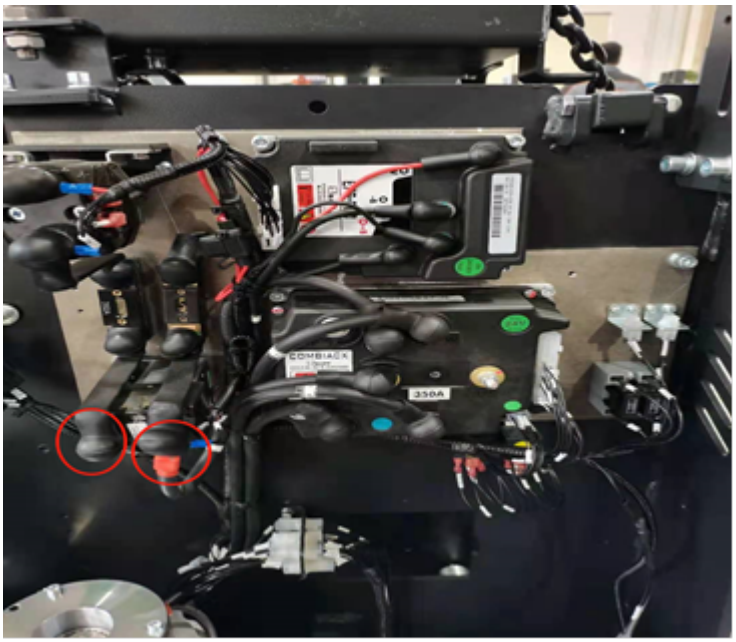
3. Remove B+ and B- wires from the drive motor controller

4. Loosen and remove the drive motor controller

5. Perform the above steps in reverse order to install the driver Motor controller.

Disassembly/installation of line contactor

1 . Disconnect the cable from both terminals.



2 . Remove the line B+ from the line contactor.

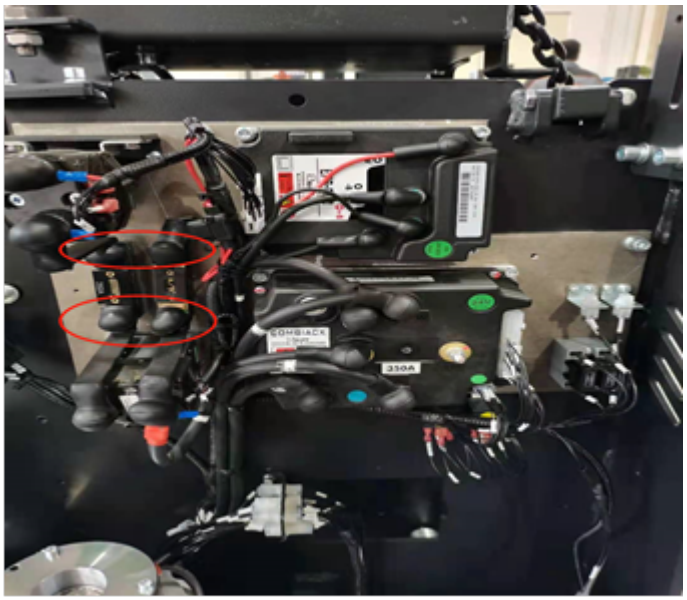
3 . Loosen the bracket screw.

4 . Remove the line contactor

5 . Perform the above steps in reverse order to install the line contactor

Disassembly/installation of line fuse

1 . Remove B+x line from line fuse.



2 . Remove the line fuse.

3 . Perform the above steps in reverse order to install the line fuse

2-5 Display

2-5-1 Appearance

The left side is the main interface of the instrument. The main boardd contains battery power display, cumulative working hours and driving speed.
The right side is the fault interface, which contains fault code.

When the battery's remaining power is 20%, the power starts to flash.
When the battery remains 10 and the speed is reduced.
The light of meter will be red instead of green, also error code:02A66

When the battery surplus is higher than 70, if the battery is charged, the meter shows the power before charging.
Only when the battery surplus is less than 70, the battery charge, the instrument will normally display the battery power.

Electricity meter removal/installation
1 Disconnect the battery connector.
2.Keep the key switch on and discharge the power module. Twice for 30 seconds.
3.Turn off the key switch.
4.Remove the key
5. Remove casing
6.Disconnect the connection of the meter port.
7.Screw off the two fixed nuts of the meter by hand.
8.Remove the fixed metal ring of the meter and remove the meter
Do the above steps in reverse order to install the power meter.

Code lock
a. Product Description
The password ignition switch (hereinafter referred to as the "code lock ") is an electronic system like an electronic burglar alarm.Before authorizing the password, the machine will not be allowed to start, the main function is to prevent unauthorized people from operating the machine. In addition to the convenience of use, it is also of great help to the theft and safety of the machine.

b. main specification parameters
Operating voltage range :12 V-60V
Working environment :-40℃ to 90℃
Class of protection: IP65

c. Main Control Code and Functions
At present, the password lock supports up to 5 ID cards and 1 group of manual password operation. Each set of passwords consists mainly of four digits,the number range is between 0-9.
Administrator password please check the separate instructions. The default password for this product is "1234, password change steps please
Refer to separate instructions.

d. operation steps
1.ID card operation
Keep the ID card close to the lock button panel and if the ID card is valid, the lock will emit a brief beep sound, then the blue indicator lights, indicating that the code lock normal operation, that is, the normal output of the switch signal. (Credit Card Error:the red indicator will flicker).
2. Password Operation
Enter the password, then press the √ button and loosen it. If the password is correct, the vehicle can start operation.
Press the panel "×" button to loosen and the vehicle closes.
Enter the password again if you want to re-operate the vehicle.

e. Code Lock Indicator
Red light -- fault indication
Blue Light - Status Indicator
Yellow Light - Waiting for Instruction
Green light - Power indication

Error code List

MDI CODE	ALARM	Solution
0	TILLER OPEN	When the handle is input switch, over a period of time, about 30 s, Lord Contactor is disconnected, warning occurs. Run again next time warning disappears.
0	DATA ACQUISITION	The fault is activated to prove in the data acquisition phase, please wait for the data acquisition to complete.
0	CHECK UP NEEDED	The maintenance time, need to repair,
5	TILLER ERROR	Repalce controller
8	WATCHDOG	Startup, before starting the watchdog circuit in the software is activated. When standby or running state guard dog signal is invalid (alarm). Failure analysis: watchdog hardware circuit or micro controller output part was damaged. Both of which have nothing to do with external components, replace the controller.
8	FLASH CHECKSUM	After turn on the key procedures in the flash memory value is positive, if is negative The fault signal is produced. Failure analysis: the problem on the flash memory of microcontrollers. Flash memory may have After destruction, damage to or stored procedures. Try to set up Logic card program. If the fault still exists, the fault exists in the micro control In the controller. Replace the controller.
8	WATCHDOG#2	Reason: startup, before starting the watchdog circuit in the software is activated. in Standby or running state guard dog signal is invalid (alarm). Failure analysis: watchdog hardware circuit or micro controller output part was broken The bad. Both of which have nothing to do with external components, replace the controller.

10	WRONG RAM	The discovery of the error detection of main memory in the implementation of the content: the registered address As a "DIRTY", the fault will limit the vehicle's operation. Failure analysis: close the key switch to open, if the fault is still there, and more In the controller.
11	STALL ROTOR	1. The motor stalling. 2. The motor encoder failure. 3. The wire damaged or wrong wiring. 4. The encoder power supply problems.
17	LOGIC FAILURE #3	Logic card fault current protection function. A controller should be replaced
26	CURRENT SENS. KO	Repalce controller
28	PUMP VMN LOW	Reason: When starting up, the low voltage of MOS tube is higher than 10% of normal battery voltage, or the phase voltage is higher than 1/2 battery voltage。 Possible reasons: 1, electrical wiring is wrong, or there is something wrong with the motor circuit; Check the motor of the three Connecting is correct; Motor of whether there is leakage, whether to have the motor Coil circuit. 2, replace the controller.
29	PUMP VMN HIGH	Reason: When starting up, the low voltage of MOS tube is higher than 10% of normal battery voltage, or the phase voltage is higher than 1/2 battery voltage。 Possible reasons: 1, electrical wiring is wrong, or there is something wrong with the motor circuit; Check the motor of the three Connecting is correct; Motor of whether there is leakage, whether to have the motor Coil circuit. 2, replace the controller

31	VMN HIGH	Reason: When starting up, the low voltage of MOS tube is higher than 10% of normal battery voltage, or the phase voltage is higher than 1/2 battery voltage。 Possible reasons: 1, electrical wiring is wrong, or there is something wrong with the motor circuit; Check the motor of the three Connecting is correct; Motor of whether there is leakage, whether to have the motor Coil circuit. 2, replace the controller. 3, motor three-phase connection exception, cause fever down bad connection column.
40	AUX DRIV.SHRT.	Electromagnetic braking or auxiliary driving circuit short circuit of electric braking. Check the A16 and - whether there is a short circuit or low impedance between BATT push-pull lose And out the other. Logic card drive circuit fault, replace the controller.
41	WRONG BATTERY	Starts, the controller detection and check whether the battery voltage in the range of nominal voltage. 1, check the TESTER menu of BATTERYVOLTAGE whether the value of the parameter and the voltage meter shows that the value of the agreement. If they don't match each other, then use ADJUSTBATTERY feature the battery voltage is consistent with the measured values instead. 2. Replace the battery.
42	AUX DRIV.OPEN	Auxiliary coil drive circuit can't drive load. The device itself or drive line The ring was damaged. Replace the controller.
44	BMS HIGH TEMP.	check with supplier
47	EVP2 NOT OK	Check to see if proportional valve 2 open circuit.
48	EVP1 NOT OK	Check to see if proportional valve 1 open circuit.
49	LIFT + LOWER	Controller will always test, when there are two request signal at the same time will report to the police. Possible reasons: 1. The wire breakage 2. Switch failure 3. The improper operation

		4. If the fault can't be ruled out, it is need to change the controller
50	**EVP1 COIL OPEN**	**Check to see if proportional valve 1 open circuit.**
51	**EVP2 COIL OPEN**	**Check to see if proportional valve 2 open circuit.**
52	**PUMP I=0 EVER**	**Connect the power cord to check the oil pump motor is in good condition, if in good condition, replace the controller;**
53	**STBY I HIGH**	**Micro control system detects current sensor output signal is beyond the scope of not running current allowed. This failure isn't related to the peripheral components, should be Replace the controller.**
53	**WRONG ZERO**	**High voltage feedback value of the startup VMN. Not about 2.5 V. control Circuit is destroyed. Failure analysis: it is recommended that check the following. The motor internal connection The motor power cable connection. The drain current between the motor vehicles and housing. If the motor connection is good, the problem within the controller, the change of control Device.**

54	LOGIC FAILURE #1	Low voltage or over voltage protection function when the fault. In the 24 v system Detects the voltage, the controller more than 45 v or below 9 v. In 48 v system, the controller detected voltage exceeds 65 v or below 11 v. Possible reasons: 1. For the short circuit in the circuit system, such as DC - DC, brake coil, etc., or the controller input power contacts are in good condition. 2. The battery voltage is too low or too high. 3. Test B, B, above the main contactor and terminal power cable is tighten. 4. Whether controller voltage calibration parameter and the actual voltage. 5. Hardware circuit fault overvoltage protection logic card, replace the controller.
55	LOGIC FAILURE #2	Logic card photogenic voltage feedback circuit hardware part failure, replace the controller.
60	CAPACITOR CHARGE	When the electric lock, controller will be via the power resistor capacitor charging, and whether the detection capacitance within the prescribed time, adequate electricity, if there is no sufficient electricity, capacitor voltage is less than 20 % battery voltage, the controller will call the police, main contactor will not be closed. Possible reasons: 1, peripheral devices, such as DC - DC motor or other equipment interferes with the controller of the charging process, to eliminate these devices to produce interference. 2, charging resistor disconnected, charging circuit fault, power supply module has a problem, need to change the controller
61	THERMIC SENS. KO	The controller temperature sensor output signal is beyond the scope. The fault has nothing to do with external components, replace the controller.
62	TH. PROTECTION	Make the controller temperature dropped to below 85 ° itself, if the problem still exists, is likely the temperature sensor failure or the controller itself logic board failure, at this point, the need to replace the controller.
64	TILLER	Replace controller

	ERROR	
65	MOTOR TEMPERAT.	1, if the motor temperature digital switch, or analog signal than the cut-off value, the fault is generated. 2, motor temperature reaches 120 ℃, alarm controller, the vehicle can also walk, but the maximum current is cut, the vehicle performance. When the motor temperature reaches 125 ℃, the machine stop working. At this point should try to cool the motor. 3, when the motor cooling failure still exist, check the wiring. If all is good, replace the controller.
66	BATTERY LOW	If battery detection "BATTERYCHECK" parameter is not set to 0, when the battery capacity is less than 15 %, instrument when there is no case number, fault alarm, ascension to be locking function. At this point it shall timely charging. If it is found that the battery has electricity, the detection of the controller "ADJUSTBATTERY" the value of this parameter for consistency and battery voltage.
67	NO CAN MSG. BMS	Check Can wire
67	SENS MOT TEMP KO	The controller temperature sensor output signal is beyond the scope. The fault has nothing to do with external components, replace the controller.
67	NO CAN MSG.	The CAN communication failure between steering and traction. Testing CAN wiring and software Set up and version information.
68	SMARTDRIVER KO	See if electromagnetic brake drive high-end CNB# (1) and B - short circuit, if normal, internal driver module may be damaged.
68	WAITING FOR NODE	In CAN communication network, a controller to another point Controller can't normal communication signals, the proposed controller has been waiting for All normal state, until CAN communication network. Check cannot communication Why don't the module connection is normal, check the software or this edition parameters Settings are correct.

71	EEPROM KO	Vehicles don't walk, parameter storage area of the existing problems of failure to make the vehicle stop working. If the fault is still there, after repeated closed electric lock logic card is replaced. If the fault disappear, previously stored parameters was wrong, should be set anew.
72	VMN LOW	Reason: boot, MOS tube high voltage capacitor voltage of less than 66 % or in the process of the motor running, the voltage less than the required value. Possible reasons: 1. Electrical wiring is wrong, or there is something wrong with the motor circuit; Check the motor Three-phase connection is correct; The motor of whether there is leakage, whether or not A motor coil circuit. 2. Whether the main contactor and firm. Contact with and without abrasion. 3. Replace the controller.
74	DRIVER SHORTED	Electric locking timeliness, the microprocessor will test drives are main contactor No short circuit, if a short circuit will alarm; Testing main contactor coil the anode Whether negative short circuit of the B6 or power, if everything is in order, the periphery Replace the controller.
74	AUX BATT. SHORT.	View the B2 and drive cable is correct, if correct, replace the controller;
74	DRV. SHOR. EV	Check to see if the EV1 / EV2 / EV3 low-end and B - short circuit, if is normal, need to change controller;
75	CONTACTOR CLOSED	When closing the main coil before contact, controller to test main contactor whether contact adhesive. Try to discharge the capacitor, if the capacitor voltage reduces the battery 20 % of the voltage fault may be produced. 1, advice, check whether contactor contact adhesion, or change the contactor.
75	CONTACTOR DRIVER	Electric locking timeliness, the microprocessor will test drives are main contactor No short circuit, if a short circuit will alarm; Testing main contactor coil the anode Whether negative short circuit of the B6 or power, if everything is in order, the periphery Replace the controller.

75	CONT. DRV. EV	One or more of the switch valve drive properly when the faults. Drive connections, if no problem, replace the controller;
76	KEY OFF SHORTED	In the startup phase, when the controller to detect the key switch low Logic level signal, according to the fault. Failure analysis: very may be due to the voltage is too low, suggest to check the following Items. - key switch based on external load (such as DC - DC converter of rev Still, relay or contactor switch input signal is lower than the start-up electricity Pressure). - check the power cable with the cathode, and with the main contactor and the battery Controller - BATT, the connection between BATT situation, must be With screw connection, the scope of the torque for 13 nm present 15 nm. - if there is no test on power lines to the pressure drop, at a time when the key Can produce fault signal switch to ON. Failure may occur in the control Of hardware, so it is necessary to replace the controller.
76	COIL SHOR. MC-EB	1, whether the view controller output and the load is too large; 2, replace the controller;
76	COIL SHOR. EV.	Driven by PEV coil, a failure, see the PEV drive coil connected with coil itself are in good condition;
77	CONTACTOR OPEN	Logic card drive main contactor coil, but didn't closed contactor, possible reasons: 1. The contactor mechanical failure, stuck, etc 2. Touch the point contact undesirable contactor 3. If the contactor work is normal, replace the controller.

78	VACC NOT OK	Testing time: standby mode The alarm display than accelerator accelerator voltage signal range (PROGRAMVACC) in the setting of the minimum 1 v above. Possible reasons: 1. The accelerator voltage upper limit and lower limit of no collection, gathering into PROGRAMVACC menu again. 2. The accelerator error, may not have return accelerator pedal, or accelerator internal error. 3. The controller failure.
78	BACKING INPUT	Replace controller
79	INCORRECT START	Startup sequence is wrong, possible reasons: 1. In front of the boot, the direction switch has been closed. 2. The sequence of operation error. 3. The wire connection is not correct. 4. If we can't rule out the fault, the need to replace the controller.
79	PUMP INC START	Oil pump startup sequence is wrong, possible reasons: 1. Before turning, lifting, such as tilt switch is closed. 2. The sequence of operation error. 3. The wire connection is not correct. 4. If we can't rule out the fault, the need to replace the controller.
80	FORW + BACK	Controller will detect when running at the same time, there are two directions request signal will report to the police. Possible reasons: 1. The wire breakage 2. The direction of the switch failure 3. The improper operation 4. If the fault can't be ruled out, it is need to change the controller
80	EMERGENCY	After the emergency reverse, needs to be closed interlock switch.

82	ENCODER ERROR	Controller to detect the speed of encoder two consecutive readings have very big difference, because the system internal encoder can't change a lot of speed in a very short period of time, possible encoder failure (one or two encoder line wear or broken), check the encoder mechanical and circuit function part; May cause electromagnetic interference of the sensor on the bearing of the police. The above Are not, then replace the controller. Please note that the artificial operation may cause the controller according to the fault, the need to restart the power of the vehicle. Such as the following: 1, car suddenly hit the barrier, which leads to the vehicle cannot walk; 2, when car speeding, nasty brake suddenly.
85	VACC OUT RANGE	1, accelerator voltage upper limit and lower limit of no acquisition, right into the collection PROGRAMVACC menu again; 2, check the accelerator cable is properly connected;
86	PEDAL WIRE KO	Check the accelerator is negative if they pick up on the controller;
86	POS. EB. SHORTED	Interlock without closing, electromagnetic brake drive high-end high output voltage. 1, see if any other high voltage lines connected to the electromagnetic brake high-end outlets; 2, if the electromagnetic brake high-end outlet connection, the high voltage is still exists, the controller internal drive circuit is damaged;
89	POWER MOS SHORT	In front of the main contactor closing, the software will check the power bridge: converting MOS The low end of the power, voltage drop to - BATT (up to BATT), if the instruction is inconsistent with the change of phase voltage value, are produced by the fault signal. Replace the controller.
89	PUMP VACC NOT OK	Testing time: standby mode The alarm display hoisting speed sensor voltage than the accelerator signal range (PROGRAMVACC) in the setting of the minimum 1 v above. Possible reasons: 1. The lifting speed sensor voltage upper limit and lower limit value no acquisition, into the collection PROGRAMVACC menu again. 2. The lifting speed sensor error.

		3. The controller failure.
90	**BMS LOW CAP.**	**Verify the lithium battery capacity is too low**
90	**PUMP VACC RANGE**	**1, lifting speed sensor voltage upper limit and lower limit value no acquisition, right into the collection PROGRAMVACC menu again; 2, check the lifting speed sensor cable is properly connected;**
91	**BMS VOLT. DIFF**	**Verify the lithium battery internal monomer voltage differential pressure is too large.**
92	**BMS MONOMER OV**	**Verify the lithium battery voltage is too high. Normal voltage (22-25.6 - V)**
92	**CURRENT GAIN**	**Maximum current gain parameters for the factory Settings. Shows that maximum current adjustment Parameter program has not yet been enabled. Solution: by ZAPI technology personnel to correct current gain parameters The application Settings.**
96	**ANALOG INPUT**	**When all analog signal input of the A/D conversion to A fixed value The fault signal, the time delay of more than 400 milliseconds. This function is used to detect the A/D Converter fault or analog signal Failure analysis: if the failure, replace the controller.**
99	**SLIP_PROFILE**	**SLIPPROFILE parameter selection error. Check the hardware setup parameters, these values are set.**

Instrument internal parameters adjustment, the company has completed commissioning before leaving the factory, if need to change, contact the company after-sales department to modify.

2.6 ZAPI Use of handheld programmers

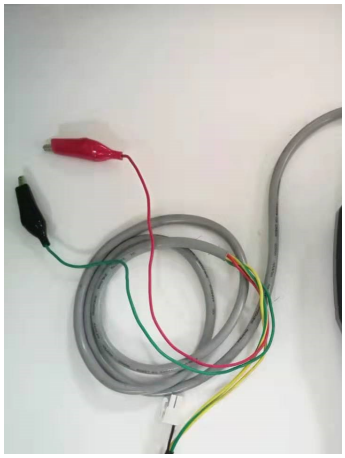
Battery

The battery voltage can be used in programmer for pallet. The acid-lead battery voltage is 12V-80V

For batteries with a nominal voltage of more than 80V, the intelligent controller can be powered by an internal battery. Do not connect the source voltage that exceeds the maximum rating, or the controller will be damaged!

Programmer connects

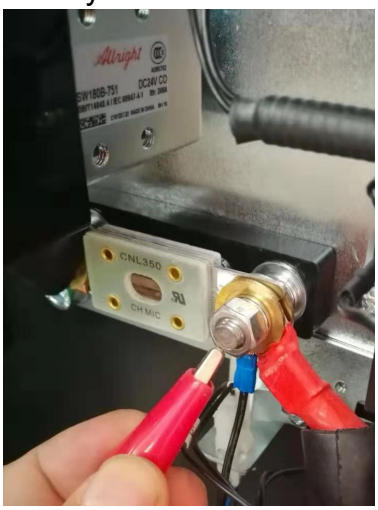
Wire connects with Zapi , the pic 1 is nuoli-made wire

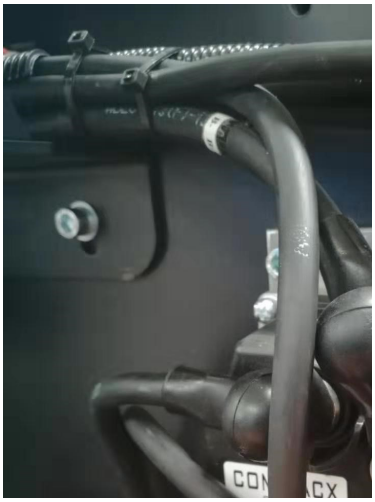


2） Emergency lateral screws to avoid accidental disconnection

3） Zapi connects with Can wire before or when pallet works

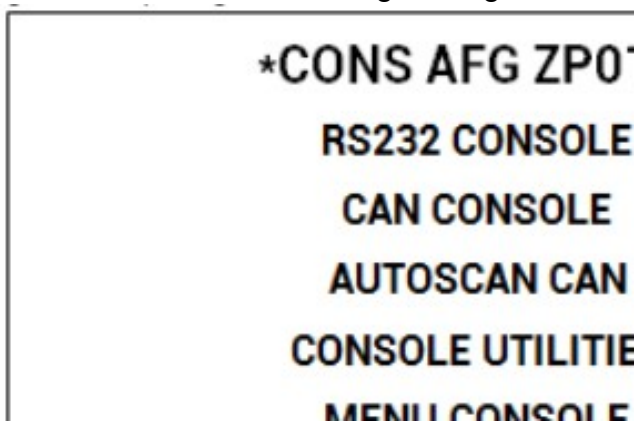
4）Red wire connects with positive pole of battery, black wire connects with negative pole of battery





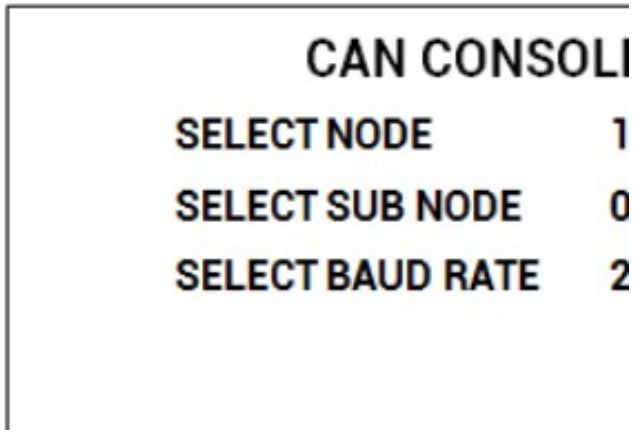
5） Once CN8 get voltage, screen of programmer will show

Programmer can access to controller by wire
Screen
Scree will show as following, LED green will light



Connecting way ： CAN CONSOLE

Choose CAN CONSOLE, Enter ”OK”

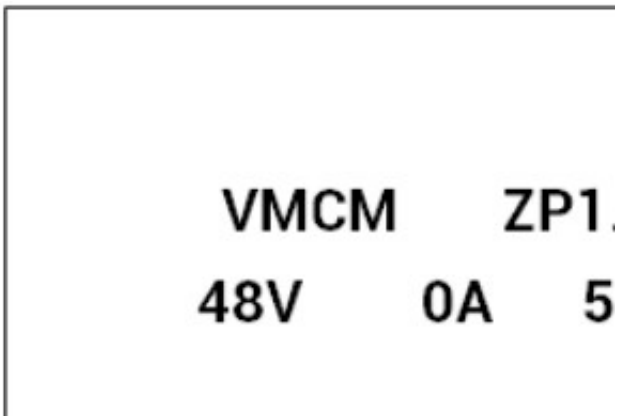


New menu request CAN node and point node connection: current value appears on the right.
The third line requests connection speed
Use the up / down key to move between rows and change the value of each item to the left / right.
Once the correct value is set, press ok to try to communicate with the node / Point

SELECT NODE 2 Drive module , SELECT NODE 3 Pump module

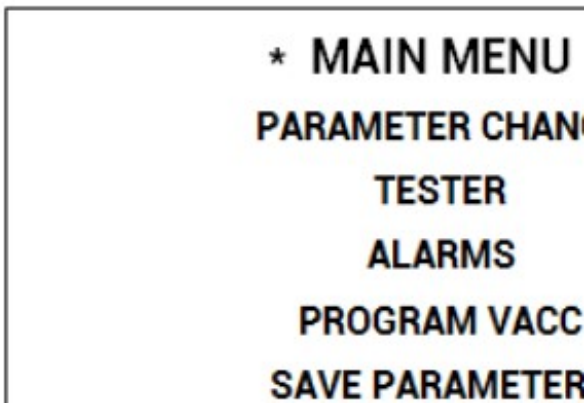
Press“ESC” cancel connecting

If the connection fails, "no communication" warning appears: press the ESC key to find out why the connection is blocked
Connected
If connecting well, screen will show

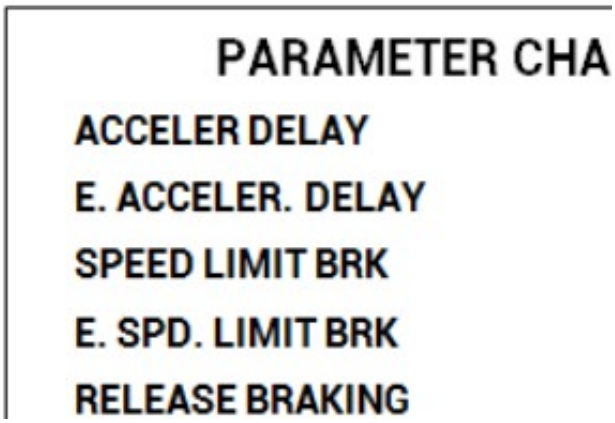


This menu presents basic information about the controller, similar to the super controller.
The first line describes the controller firmware
The second line presents the controller voltage, the current and the hourly meter
The last line presents the current alarm code

Press “OK”,Enter into main menu



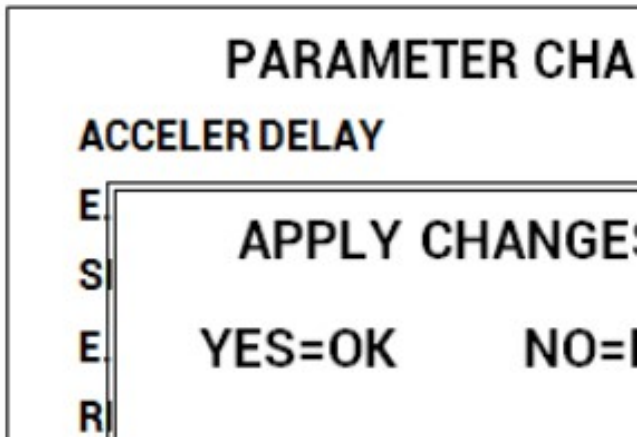
The main menu includes a complete list of menus available. Contrary to the supercontroller, only the controller does not have a hidden menu. The hidden menu needs to be accessed by pressing multiple buttons immediately: now all menus are visible.
Browse the list using the up and down keys: press “OK” to enter when you find the desired menu.
Change parameters
Enter the parameter change menu from the main menu.



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

Press left/right button to change the value repeatedly.
(" Auto-Repeat "function): If you have to change many parameter values, this function will accelerate the program.

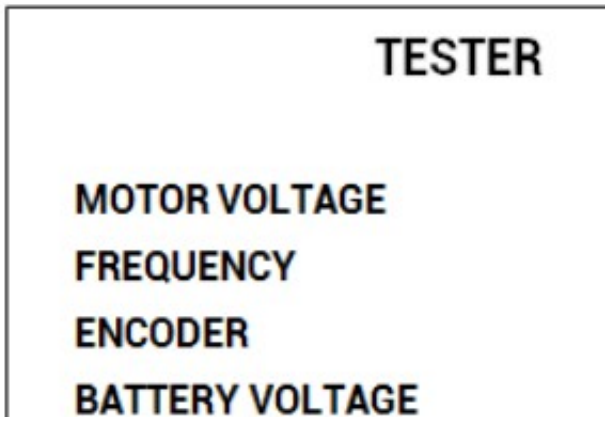
You can press the ESC key at any time to exit the menu. If certain parameters have been changed, the controller prompts for confirmation/delete of the change.



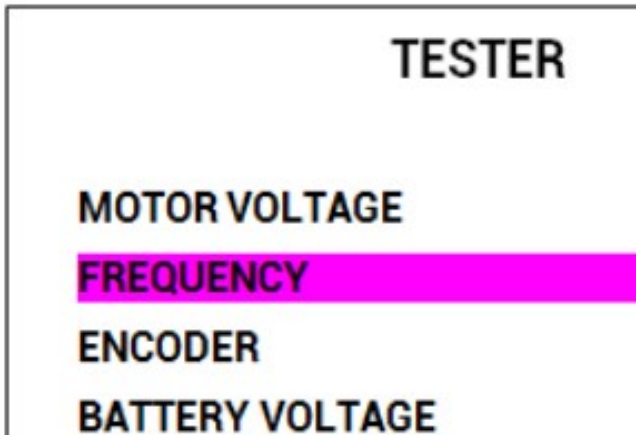
The above instructions are valid for each menu that contains parameters and options such as setting options, adjustments, hardware settings

Tester

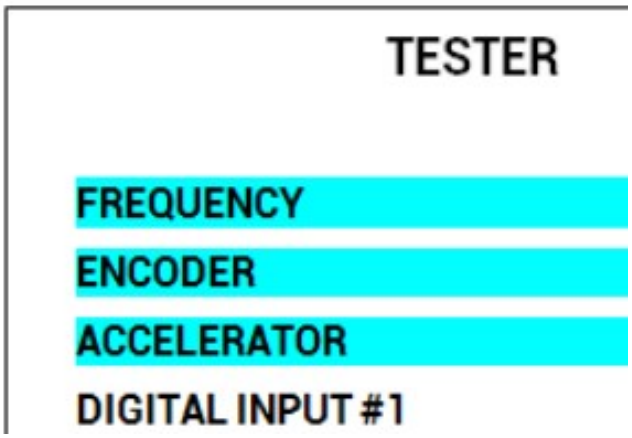
Compared with standard handheld, the monitoring menu has changed significantly. Four variables are displayed immediately: scrolling the menu with the up / down keys as usual



The variable may be “stuck” and then the variable will always appear in the scroll. Once the desired variable is selected, right-click: it will be shown in a different color.



Once you start scrolling up or down again, the "stuck" variable appears on the top first line: from now on, it will no longer move, but will be the current value as usual. "stuck: the variable will be highlighted in light blue.
It is possible to repeat the blocking program up to three times, so that when the fourth variable scrolls, three variables are fixed on the screen. See the following example.

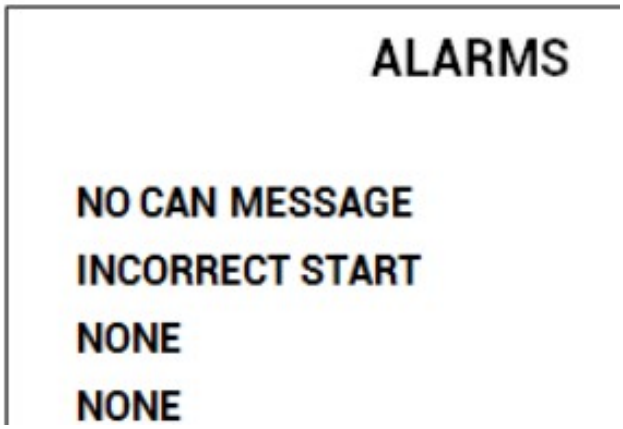


Thus, it is possible to record four variables, and in a single view, the four variables in the complete list are far apart.
Press the left button to "unlock" the last locked variable. Pressing the left button up to three times will unlock all variables.
Press ESC to return to the main menu.

Note that pressing F1 activates the graphical representation of the selected variable in excess of time.

The function of the graphics tester is not yet fully operational: it will be activated in the future firmware.

Alarm
The alarm menu is different from the old handheld programmer. The display immediately presents 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 code and rare events. In order of increasing frequency alarm name:

- White: maximum 5 events
- Yellow: maximum 20,
- Orange: maximum 40,
- Red: greater than 40.

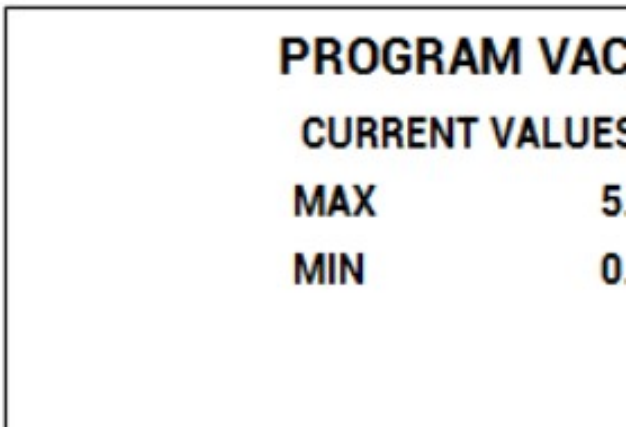
Use the up / down key to select an alarm in the list: if you press OK, additional information about the alarm will be showing.

Press F1 to delete the controller alarm log: when you press button, the controller will request confirmation.

Program VACC

Compare with old controller , the menu of Program VACC changes little

As soon as you enter this menu, the controller presents the current set value.



When the ok key is pressed, the program vacc program will start: the controller will invite you to select the boot switch,

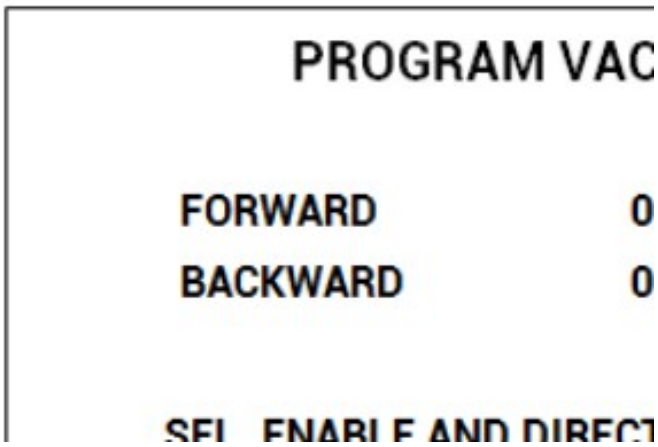
Choose start switch

Choose direction switch (forward or backward)

Hold down the pedal until its farthest journey.

The display value varies with the operator's input.

The above order can be slightly changed according to the controller firmware. In any case, the logic is consistent: perform any necessary startup order before setting the minimum / maximum value, and then press the pedal / push lever



When the ESC is pressed, the controller asks to store or delete the set value.
End of connection
Return to the home screen to end the connection: at this point, the cable may be removed from controller.
If the cable is removed from another menu, the controller returns no communication alarm status.

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

3 Drive / Brake System

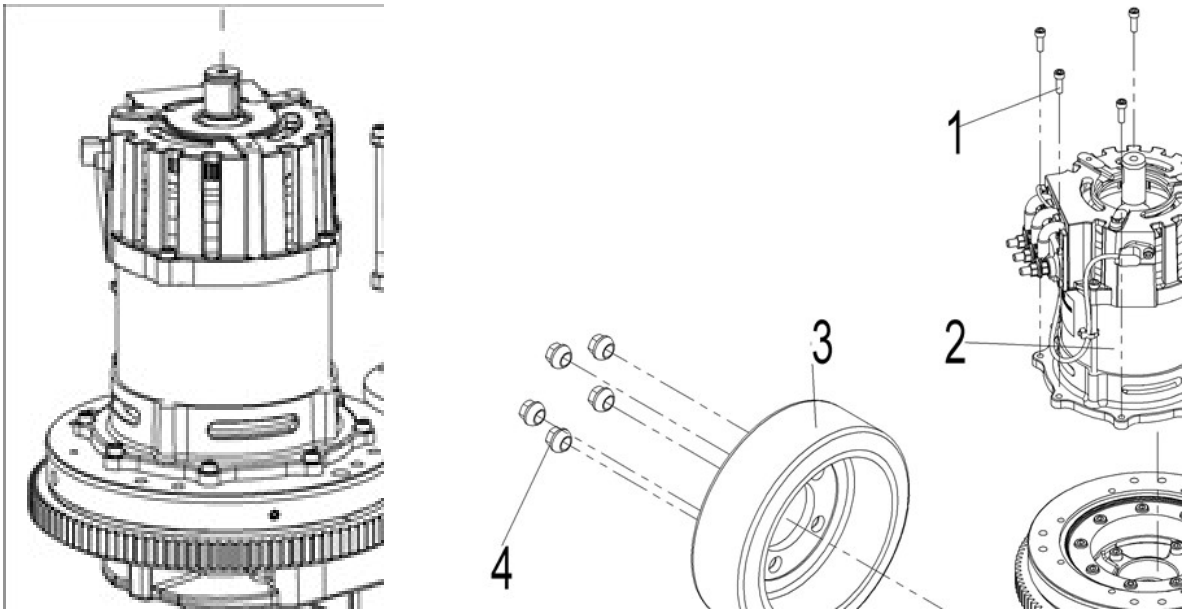
3-1 Overview

3-1-1 Assembly

The drive/brake system consists of the followings:
1.The drive motor regulated by the respective controller transmits the rotating force to the left and right drive shafts (electric power/ mechanical power).[Section 3-2]
2.The drive shaft converts the rotating force transmitted from the drive motor into the torque and speed suitable for driving through its gear set, and sends them to the corresponding wheel (mechanical power). They also contain the service brakes, which are actuated by magnetic brake pedal to produce braking force (/friction). [Section 3-3]
3.The accelerator sends an electrical signal to the drive motor controller to accelerate the motor.[Section 3-4]
4.The F/R unit sends an electrical signal to the drive motor controller to determine the drive direction of the motor.[Section 3-5]

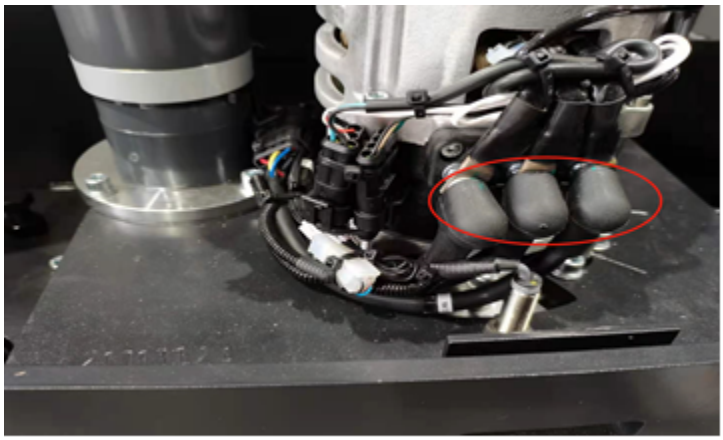
3-2 Drive motor

3-2-1 Appearance and specification

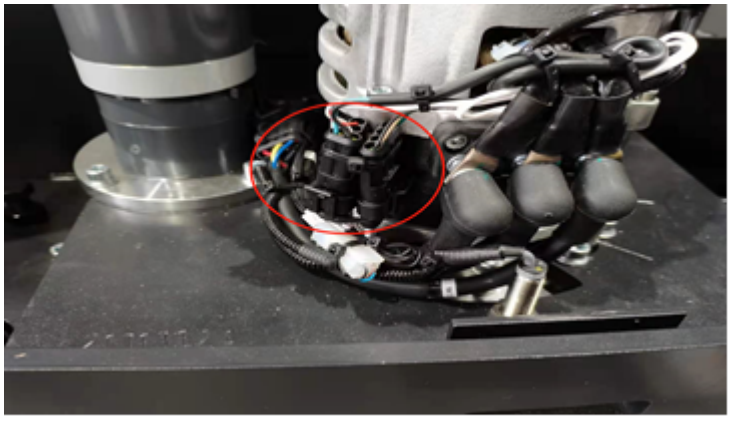


3-2-2 Drive motor disassembly

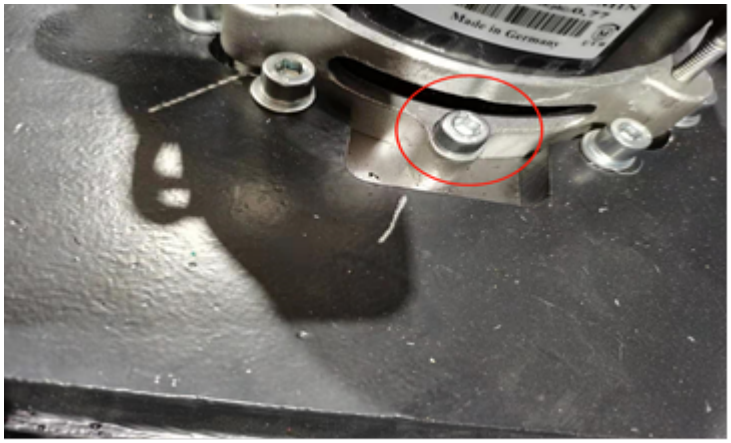
1. Remove UVW cable



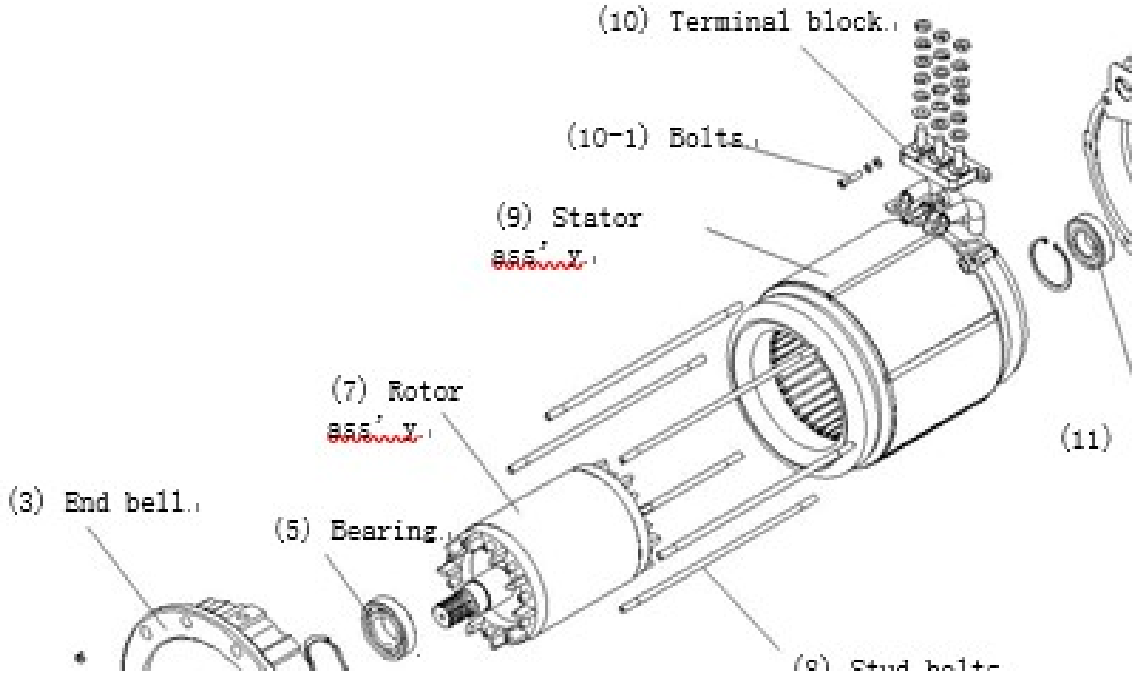
2. Remove encoder wire and temperature sensor wire



3. Remove the fixing bolt and take it



3-2-3 Disassembly/assembly and test of drive motor



Disassembly/assembly

1.After removing the terminal protector, loosen the screws (10-1) and remove the terminal block (10).

2.Loosen the bolts (13-1) and remove the encoder (13).

3.Remove the O-ring (4) and the oil seal (1).

4.Loosen the back nut (2) and remove the lower cover (3).

5.Remove the stator assembly (9) by hand or using a tool.

6.Remove the wave washer (6) and the bearing (5) from the rotor assembly (5).

7.Remove bearing (11) and rotor assembly (7) from end cap (12).

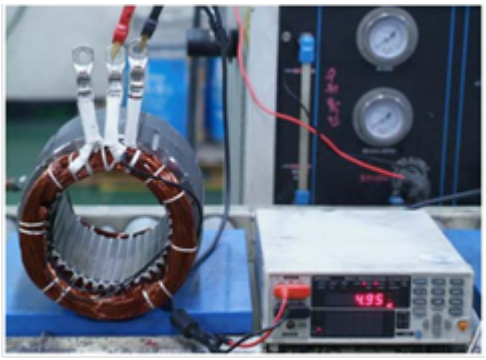
The bearing puller recommended is as shown in the figure.

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

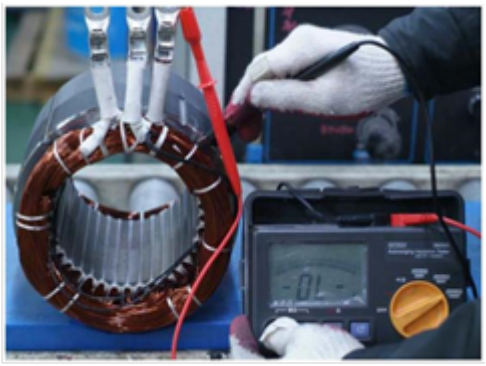
Note: before reassembling the motor, you can test its components as follows.

Stator test

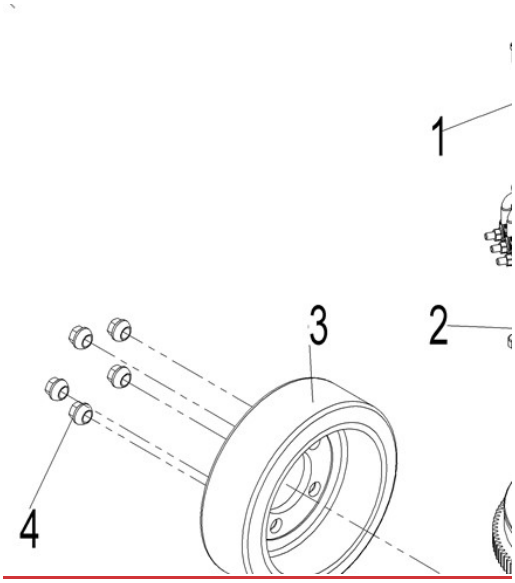
1.Carefully wipe the contamination on the stator surface with a clean cloth dipped in alcohol.
Note: contamination in the stator can cause coil damage and therefore damage to the stator itself.
2.Use a milliohmmeter to measure the resistance of each phase (UV, VW, Wu).
Rated resistance: 0.4 Ω



3. Test insulation at 1000 VAC and minUse insulation tester for 10m Ω.
If there is a problem with the insulation, replace the stator with a new one.



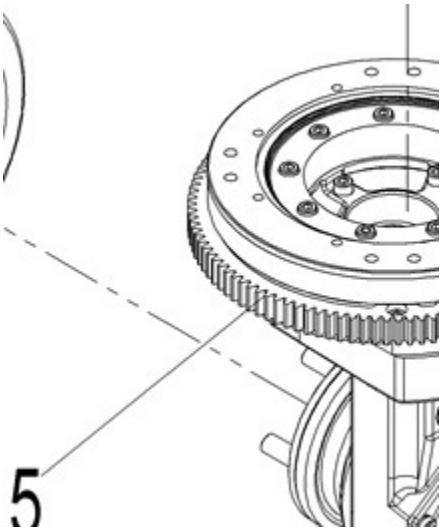
3-2-4 Removal / installation of drive wheel



1.Place a jack or block of wood under the forklift to empty the wheel and loosen the nut (1).
Installation torque: 450 ± 70 n · m (331.9 ± 51.6 LB · ft)
2.Remove the nut (1) and drive the tire (2).
3.Perform the above steps in reverse order to install the drive wheels.

3-3 Drive axle

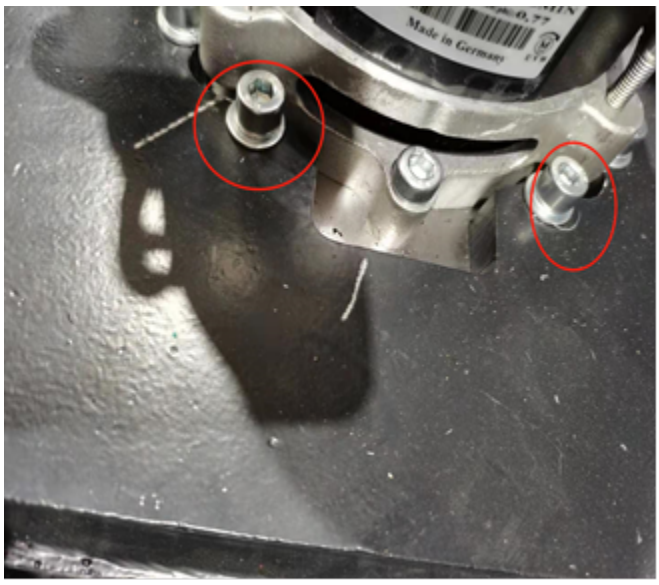
3-3-1 Appearance and specifications



3-3-2 Variable box disassembly

1. Remove the drive motor to lift the body

2. Remove the connecting bolt between the gearbox and the body and then take it



Note: Steady gearbox to prevent tipping

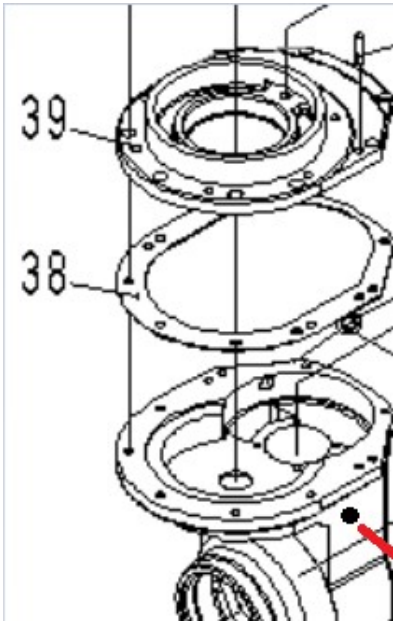
3-3-3 Replacement of drive gear oil

Initial steps

1.Park the vehicle on level ground.Close start-key and emergency switch

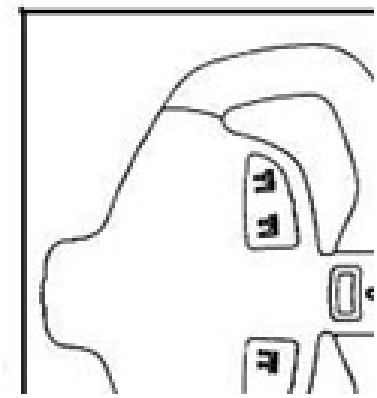
Process

1. Turn off the key switch.
2. Unscrew the oil level check plug and remove the drain plug to drain the oil.
3. Clean drain plug and install.
4. Unscrew fill-oil plug.
5. Add oil and screw the plug



3-4 Knob

3-4-1 Appearance and specifications



3-4-2 How does it work

Electric vehicle is powered by a drive motor. As a result, the accelerator that determines the vehicle's travel speed is connected to the drive motor controller.

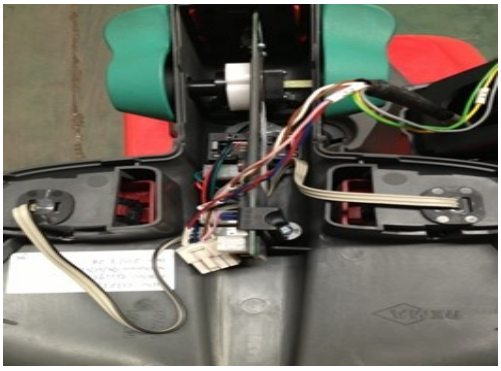
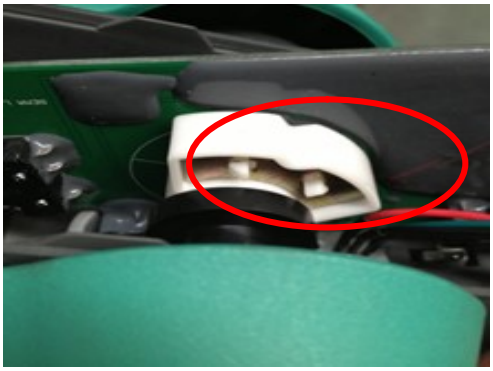
The accelerator is powered by 24 V from the drive motor controller, and generates Signal A in gear F and Signal B in gear R. This output determines that the speed of the vehicle is proportional to the angle at which the accelerator button is pressed.

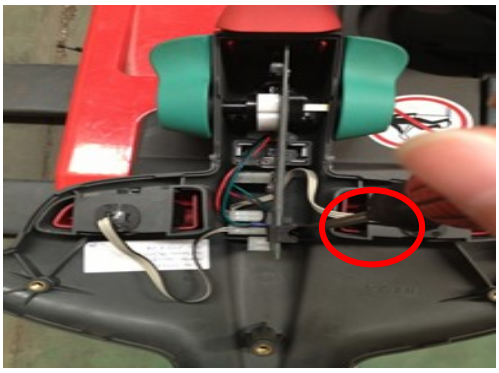
As shown above, Signal A or B sent by the accelerator are communicated to the controller by CAN. In principle, the values of the two signals shall be the same. If they differ by more than the tolerance, it will be identified as a problem in the electrical system or accelerator and a fault code will appear on the display.

3-4-3 Disassembly and installation

Initial steps
1.Turn off the key switch.

Process

	
1: loose bolt and remove back cover	
	
2: loose connector	3: loose bolt and remove accelerator cover
	
4: Remove the switch shaft	

	
5.remove the bolts ,take out connector and replace the board.	

3-5 Brake

3-5-1 Overview

The electromagnetic brake system consists of electromagnetic coil, brake disc and gear.

1. gap regulating mechanism
After the safe parking of the vehicle, the braking operation is carried out, the spacing adjusting rod is adjusted, the adjusting rod becomes longer, and the gap decreases. The clearance adjustment range is 0.40 mm~0.45 mm.

2. Inspection of brakes
Inspection of parts, maintenance or replacement of damaged parts.
(1) Check the surface of the electromagnetic coil and the periphery of the gear; then determine the gap between the piston and the pump body.
Standard Size :0.3 mm—0.4mm; Limit Size :0.45 mm
(2) The thickness of the friction plate shall be measured and replaced when the wear limit is exceeded. Standard value :8.0 mm; limit value :2.0 mm

3 Brake assembly
(1) Apply grease to the surface of the gear and set the brake disc, gear and electromagnetic coil in sequence.
(2) Install gear on the drive motor.
Install the brake disc on the gear.
(4) Apply heat-resistant grease to the gear,
Be careful not to apply to the brake disc.

4 Operational test for automatic clearance adjustment
(1) First bring the brake disc clearance close to the specified mounting dimensions.
(2) Park the vehicle on a slope of 15°. If the vehicle glides, adjust the brake disc spacing.

(3) On-plane vehicles, hand-held monitoring vehicle speed, if not up to the set value, please adjust the brake disc spacing.

3-6 troubleshooting

Problem	Reason
Drive motor doesn't work	Switch is not off (battery connector, key switch, proximity switch): Turn off switch. If still not running, use a voltmeter to test the power of the control panel and the current of each switch.
	Bad signal. fuse burned: check battery connection. Check the connection of the battery Check fuse, driver and logic. Replace fuse if burned. Check the drive motor and control panel which possible cause fuse breakage. Some of the reasons are: operating under excessive load, the current limit is too high.
	Battery voltage low: Check the battery terminal voltage. Charge the battery if too low. Check if there is one or more defective cell cells.
	Incorrect operate
Drive motor doesn't work	Speed sensor fault
Traction does not work during normal operation	The brake is defective, resulting in excessive resistance. The heat increases, causing the motor to stop. Check braking adjustment
	Too much heat in the control panel for the following reasons: Overweight traction load: Reduced duty cycle load. Heat sensor failure: These may cause malfunction of the drive motor, failure of the control handle or opening of the drive fuse
Traction does not last throughout the normal working period.	The pallet is equipped with too small batteries
	Battery not charged fully during battery charging: Check if battery charges Check if battery charger is malfunction.

	Battery replacement interval is too long or battery replacement cooling time is too short.
	The battery has one or more defective single batteries, causing the rated capacity and capacity of the battery to be below normal:
	Due to the failure of the drive system, the drive system consumes too much battery power. Check the brake adjustment. Check the wheel bearings, axles and other mechanical parts for correction to eliminate the failure. Replace the smaller friction tire.
	After a work shift, the pallet capacity exceeds its designed capacity without the power available:
Battery positive (+) or negative (-) is in direct contact with the vehicle frame (body) or drive motor	The battery is dirty, the electrolyte is on top of the battery. The current flows through the battery box, which applies voltage on the forklift frame: clean the battery with baking soda
	Battery or control panel wire connection in contact with frame: Conduct continuity test and move wire. Remove wire in sequence until troubleshooting. Fault will be disconnected at the end of the wire.
	Wet motor
The vehicle did not reach its maximum speed	The battery is not fully charged or the battery is poor charge the battery. Check the cell of battery. If necessary, please replace the cell of battery
	Failure in driving motor, control handle or transmission system Check speed in both directions. If you need to adjust the controller, follow the corresponding part of the manual programmer. If the drive motor fails, test the motor assembly.
Slow acceleration of vehicles	Drive control overheat, temperature induction switch on. Note: If temperature is 145°c (293°f), heat – sensoe will issue warning.

3-6-2 Gear box

Problem	Possible causes
Noise or vibration in the transmission	Incorrect oil level: Meet the correct oil level
	Use non-standard oil: Replace the oil with standard oil.
	Gear damaged or dented: Replace the gear.
	Bearing damage: Replace the bearing.
	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.
Noise or vibration in the brake disc pack	Use non-standard oil or friction materials: Replace oil or friction materials with standard materials.
	Incorrect oil level: Meet the correct oil level
	Foreign matter (water) introduced into oil: Replace the oil.
	Friction plate wear: Replace the friction plate.
Leakage of installation part	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.
	Damaged mounting surface: After removal, readjust or replace the components.
	O-ring damage: Replace the O-ring.
Hub leakage	Damaged oil seal: Oil seal replacement
	O-ring damage: Replace the O-ring.
Input shaft leakage	Damaged oil seal: Replace the oil seal.

	Motor O-ring damaged: Replace the motor O-ring.
	Damaged motor mounting part or housing: Replace the components.
Air respirator leakage	Too much oil: Meet the correct oil level
	Air respirator damaged: Clean or replace vent
	Use non-standard oil: Replace the oil with standard oil.
Brake disc pack leakage	Brake seal damaged: Replace sealing ring
	Brake seal not installed correctly: Reinstall or replace the seal.
	The sliding parts of the brake seal (damaged shaft, bearing seat or piston: Replace damaged components.
	The outer particles are placed on the sliding parts of the seal: Clean sliding parts and master cylinder and replace them if damaged parts are found
	Material or oil passage damage: Replace damaged parts
	Gear damaged or dented: Replace the gear.
	Bearing damage: Replace the bearing.
	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.

4 Steering system

4-1 Overview

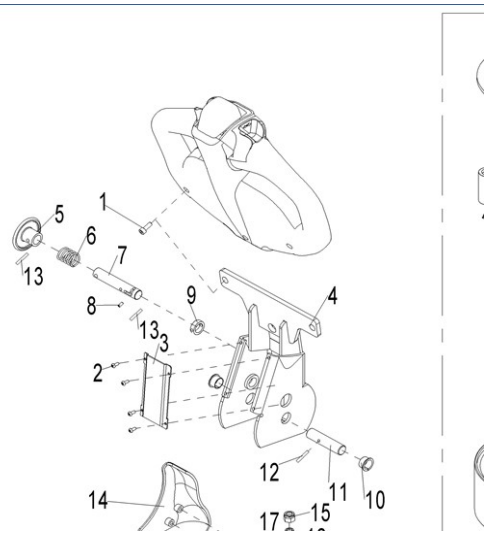
The steering system is a set of devices that turn the vehicle left or right.In this model, the steering system is mechanically operated and consists of a control group and an actuator group:

1. The control group determines the speed and direction of steering This group includes knob and potentiometer.

2. The actuator sends the signal from the potentiometer to the steering controller, which drives the steering motor to realize the steering.

4-2 Steering control group

4-2-1 Appearance and specifications



4-2-2 How does this work

Steering control mechanism
Once the handle rotates, the steering unit also rotates through a potentiometer connected with a spline between them. The potentiometer sends the corresponding signal to the steering controller, which drives the steering motor to realize the steering.

A. turn left
When the handle turns

When the potentiometer is connected to the steering wheel, turning the steering wheel makes the potentiometer rotate to produce the corresponding signal to the steering driver, and the steering controller drives the steering motor to turn left.

When the steering wheel is still

Once the operator stops turning the handle, the steering system devices stop working and the steering angle of the wheel remains the same.

B.turn right

When the handle turns
When the potentiometer is connected to the steering wheel, turning the steering wheel makes the potentiometer rotate to produce the corresponding signal to the steering driver, and the steering controller drives the steering motor to turn right.

5 Battery charger

5-1 Introduction of Battery Charger

This model adopts the intelligent charger of energy application
Normal working conditions:
1) Altitude not more than one kilometer
2) The surrounding medium temperature is not higher than 40 ℃ and not lower than - 10 ℃
3) The relative humidity of air shall not be greater than 85% (when the medium temperature is 20 ± 5 ℃)
4) Place without conductive dust and environment without explosion risk
5) Environment free of gas and steam that can corrode metal and insulation
6) Where there is no rain or snow
7) Where the vertical plane is not inclined more than 5 degrees and there is no violent vibration and impact

5-2 Introduction of Control Panel

1) Power switch - used to turn on or off the power grid
2) Information window (LED screen) - display various charging parameters, fault code information, etc
3) Information content indicator light - each light is on, and the corresponding information window will display the information of the corresponding content
4) Charging status indicator——
A) "Working" indicator light: the light is on, indicating that the charger is charging
B) "80%" indicator light: the light is on, indicating that the capacity of charger charging battery is more than 80%
C) "100%" indicator light: the light is on, indicating that the charger is charged and the battery is sufficient
D) "Equalizing charge" indicator: the light is on, indicating that equalizing charge will be carried out in this charge; the light flashes, indicating that equalizing charge is in progress
E) "Initial charge" indicator light: it lights up together with the working indicator light, indicating that the charger is in initial charge

5-3 Common faults of charger

Serial No.	Trouble code	Cause of failure	Processing method
1	----	The battery has not been connected or the connection is poor	Connect the battery and make sure the connection is reliable
2	E-03	The positive and negative polarity of the battery are reversed	Connect battery polarity correctly
3	E-04	Charging current over-current, sudden change of power grid or short circuit damage of rectifier module of charger	Check whether the power supply of power grid is normal; Replace the rectifier module
4	E-05	Battery Specification mismatch (average cell voltage is less than 1.5V or battery capacity is too large) or battery fault	Check whether the capacity and voltage of the charged battery match the specifications of the charger; Replace the matched battery; Replace faulty battery
5	E-06	During the charging process, the charging connecting line falls off, and the battery is disconnected from the charger	Check the connection points in the charging circuit and clear the oxide layer to ensure good contact
6	E-07	Power supply failure: low power supply voltage, power supply failure or input fuse damage Charger fault: charger has no current output, rectifier module or control board is damaged	Check the input power supply voltage and restore the normal power supply Replace the failed fuse Replace the faulty rectifier module Replace damaged control panel
7	E-08	The fan is damaged or the ambient temperature is too high, which causes the module temperature in the fan to be too high	Replace the damaged fan Check whether the vent of charger is blocked Improve working environment of charger
Note: when the "" indicator light on the panel is on, the fault code will be displayed in the information window			