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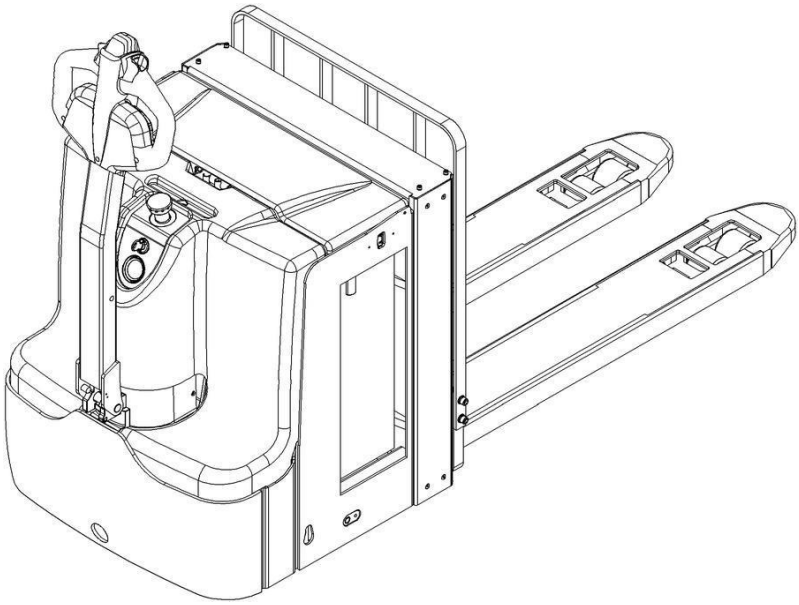
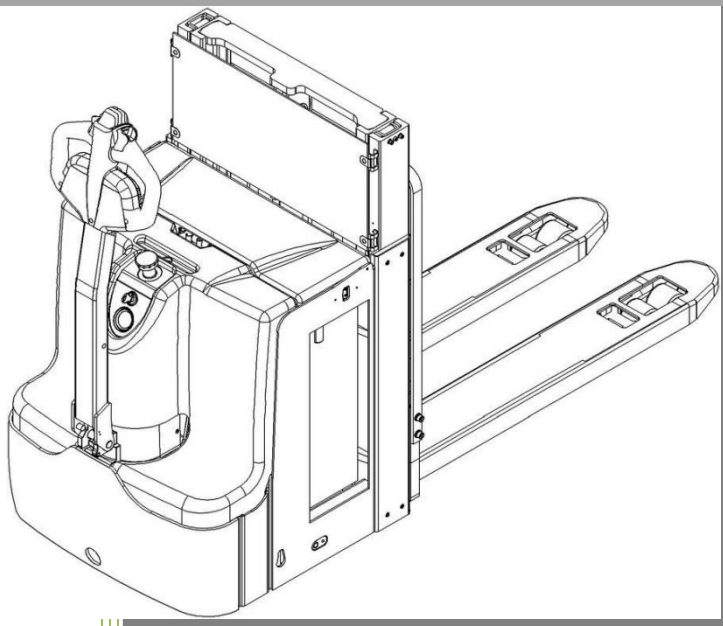
Service& Maintenance Manual

Pallet Truck
PT20I/PT20D





WARNING

Do not use the pallet truck before reading and understanding these operating instructions.

NOTE:

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

Update version 12/2022

PT 20I/D-SM-008-EN

FOREWORD

Before operating the truck, read this ORIGINAL INSTRUCTION MANUAL carefully and understand the usage of the truck completely. Improper operation could create danger.

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

Chapter 11 describes specialized stipulations and regulations for the American market. Follow these instructions and stipulations if you operate the truck within the American market!

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

This truck complies with the requirements according to EN 3691-1(Industrial trucks- safety requirements and verification, part1), EN 12895 (Industrial trucks- electromagnetic compatibility), EN 12053 (Safety of industrial trucks- test methods for measuring noise emissions), EN 1175-1 (Industrial truck safety – electrical requirements), assumed the truck is used according to the described purpose.

The noise level for this machine is <70 dB(A) according to EN 12053.

ATTENTION:

Environmentally hazardous waste, such as batteries, oil and electronics, will have a negative effect on the environment, or health, if handled incorrectly.

The waste packages should be sorted and put into solid dustbins according to the materials and be collected disposal by local special environment protection bureau. To avoid pollution, it's forbidden to throw away the wastes randomly.

To avoid leaking during the use of the products, the user should prepare some absorbable materials (scraps of wooden or dry duster cloth) to absorb the leaking oil in time. To avoid second pollution to the environment, the used absorbable materials should be handed in to special departments in terms of local authorities.

Our products are subject to ongoing developments. Because this handbook is only for the purpose of operating /servicing the pallet truck, therefore please have understanding, that there is no guarantee out of particular features out of this handbook.

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

Copyright

CATALOGUE

1. CORRECT APPLICATION

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

The trucks described in this handbook are self propelled electric power pallet trucks, with electrically powered low height lifting function. The trucks are designed to lift, lower and transport palletized loads.

A wrong usage can cause human injuries or damage equipment.
The operator/ the operating company has to ensure the correct usage and has to ensure, that this pallet truck is used only by staff, which is trained and authorized to use this truck.

The pallet truck has to be used on substantially firm, smooth, prepared, level and adequate surfaces.
The truck is intended to be used for indoor applications with ambient temperatures between +5 C and + 40 C and for medium load without crossing permanent obstacles or potholes. Operating on ramps is not allowed. While operating, the load must be placed approximately on the longitudinal centre plane of the truck.
Lifting or transporting people is forbidden.

If used on tail lifts or loading ramps, please ensure that these are used correctly according to the operating instructions.

The capacity is marked on capacity sticker as well on the Identification plate. The operator has to consider the warnings and safety instructions.
Operating lighting must be minimum 50 Lux.

Modification

No modifications or alterations to this pallet truck which may affect, for example, capacity, stability or safety requirements of the truck, shall be made without the prior written approval of the original truck manufacturer, its authorized representative, or a successor thereof. This includes changes affecting, for example braking, steering, visibility and the addition of removable attachments. When the manufacturer or its successor approves a modification or alteration, they shall also make and approve appropriate changes to capacity plate, decals, tags and operation and maintenance handbooks.
By not observing these instructions, the warranty becomes void.

2. DESCRIPTION OF THE PALLET TRUCK

a. Overview of the main components

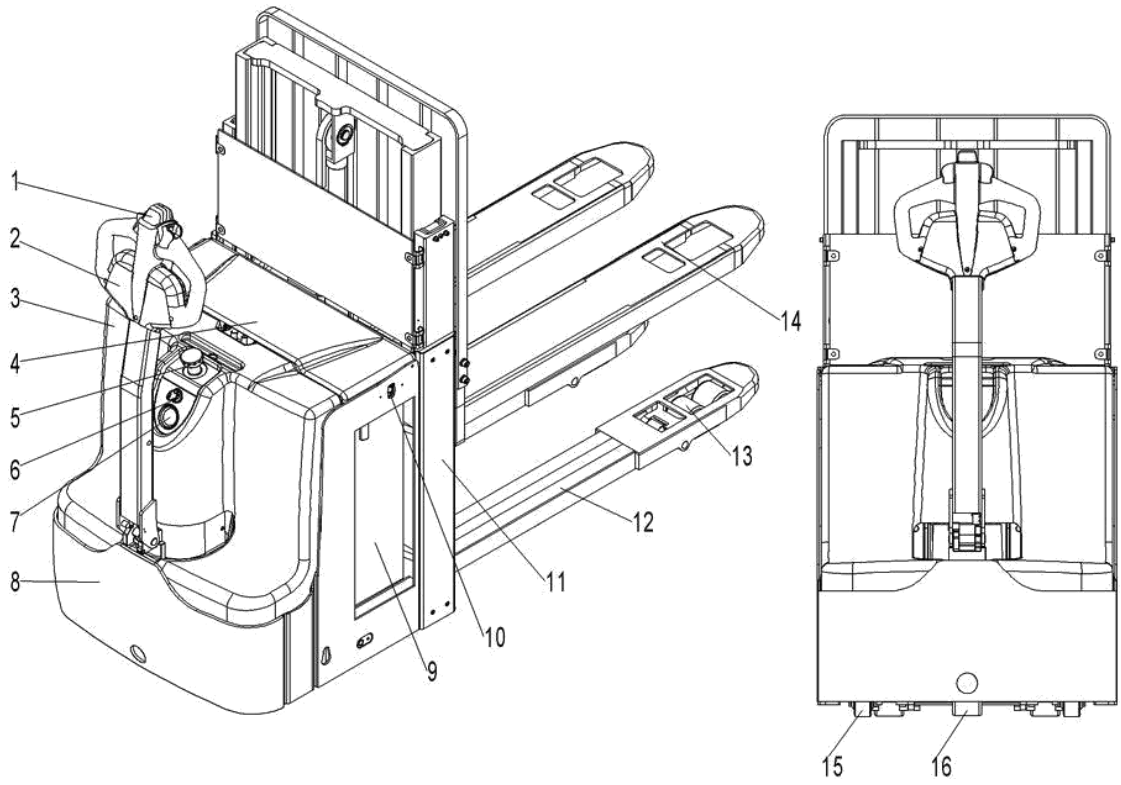


Fig. 1: Overview main components

1. Safety (belly) button
2. Tiller
3. Main cover
4. Battery cover
5. Emergency button
6. Key switch
7. Indicator
8. Truck body
9. Battery
10. Switch
11. Mast
12. Support arms
13. Load roller
14. Mast
15. Steering wheel
16. Drive wheel

b. Main technical data

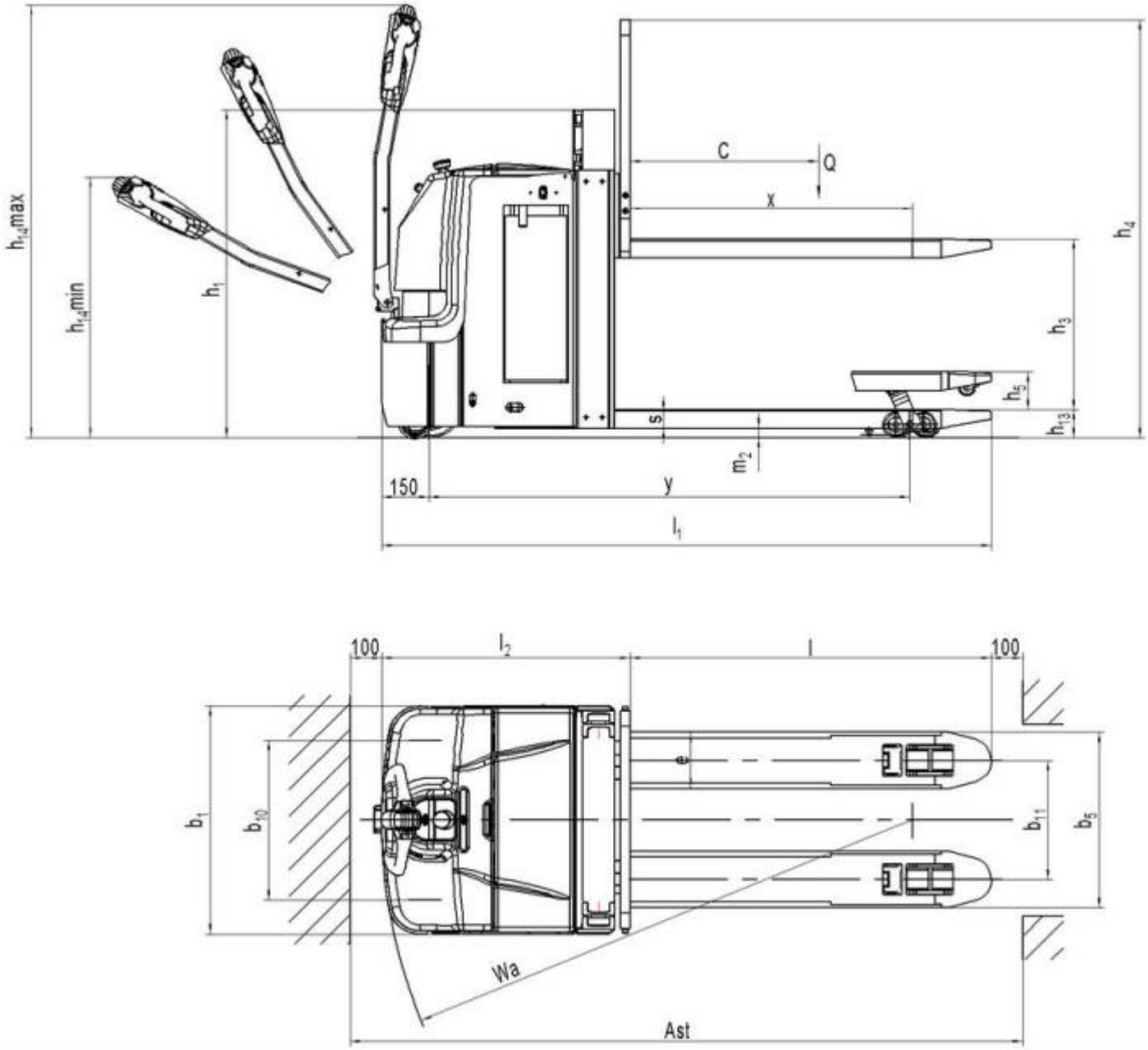


Fig. 2: Technical data

Table 1: Main technical data for standard version

Type sheet for industrial truck acc. to VDI 2198							
Distinguishing mark	1.2	Manufacturer`s type designation		PT 20I	PT20D		
	1.3	Power(battery,diesel,petrol gas,manual)		Battery			
	1.4	Operator type		Pedestrian			
	1.5	Load Capacity / rated load	Q (t)	2.0			
		Load capacity at mast lift	Q (t)	1.0 [1)]			
		Load capacity at support arm lift	Q (t)	2.0 [1)]			
	1.6	Load centre distance	C (mm)	600			
	1.8	Load distance, centre of drive axle to fork	X(mm)	916			
	1.9	Wheelbase	Y (mm)	1532			
Weight	2.1	Service weight (incl. battery)	kg	855	990	1010	1060
	2.2	Axle loading, laden front/rear	kg	845/2010	880/2110	890/2120	925/2
	2.3	Axle loading, unladen front/ rear	kg	612/243	648/342	658/352	695/3
Tires, chassis	3.1	Tires		PU			
	3.2	Tire size, front	∅ x w (mm)	∅ 230 x70			
	3.3	Tire size, rear	∅ x w (mm)	∅ 80x70			
	3.4	Additional wheels (dimensions)	∅ x w (mm)	∅ 100x40			
	3.5	Wheels, number front/ rear(x=driven wheels)		1x+2/4			
	3.6	Tread, front	b10 (mm)	510			
	3.7	Tread, rear	b11 (mm)	380			
Dimensions	4.2	Lowered mast height	h_1 (mm)	855	1178	1378	1233
	4.4	Lift height	h_3 (mm)	550	1400	1800	2300
	4.5	Extended maximal height	h_4 (mm)	1558	2528	2928	3475
	4.6	Initial lift height	h_5(mm)	120			
	4.9	Height of tiller in drive position min./ max.	h_{14} (mm)	820/1335			
	4.15	Lowered height	h_{13} (mm)	88			
	4.19	Overall length	l_1 (mm)	1940			1955
	4.20	Length to face of forks	l_2 (mm)	790			
	4.21	Overall width	b_1 (mm)	729			
	4.22	Fork dimensions	s/e/l (mm)	60 / 180 / 1150			
	4.25	Distance between fork-arms	b_5 (mm)	560/530			
	4.32	Ground clearance, centre of wheelbase	m_2 (mm)	28			
	4.33	Aisle width for pallets 1000x1200 crossways	Ast (mm)	2040			2155
	4.34	Aisle width for pallets 800x1200 lengthwise	Ast (mm)	2190			2205
	4.35	Turning radius	Wa(mm)	1682			
Performance	5.1	Travel speed, laden/ unladen	km/h	6.0/6.0			
	5.2	Lift speed, laden/ unladen	mm/s	85/140			
	5.3	Lowering speed, laden/ unladen	mm/s	80/65			
	5.8	Max. gradeability, laden/ unladen	%	8/20			
	5.10	Service brake		Electromagnetic brake			
Motors	6.1	Drive motor rating S2 60min	kW	1.3			
	6.2	Lift motor rating at S3 7.5%	kW	2.2			
	6.3	Battery acc. to DIN 43531/ 35/ 36 A, B, C		3VBS			
	6.4	Battery voltage, nominal capacity K5	V/ Ah	24/210			
	6.5	Battery weight	kg	185			
	6.6	Energy consumption acc: to VDI cycle	kWh/h	1.0			
Additional data	8.1	Type of drive control		AC-speed control			
	8.4	Sound level at driver`s ear acc. to EN 12053	dB(A)	<70			
1) in double-deck operation: mast lift 1.0t, support arms lift 1.0t							

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

For the USA－market, the description of the safety and warning labels is mentioned in chapter 11.

A Sticker to read and follow this instruction

B “No passengers” decal

C Capacity sticker

D Crane hook label

E Identification plate (ID-plate)

F Sign oil filling point

M Warning decal: Do not step under or on the forks

Q Warning decal: When truck is used only as stacker, driving is prohibited when lifting height with load is higher than 500mm.

R Warn sticker

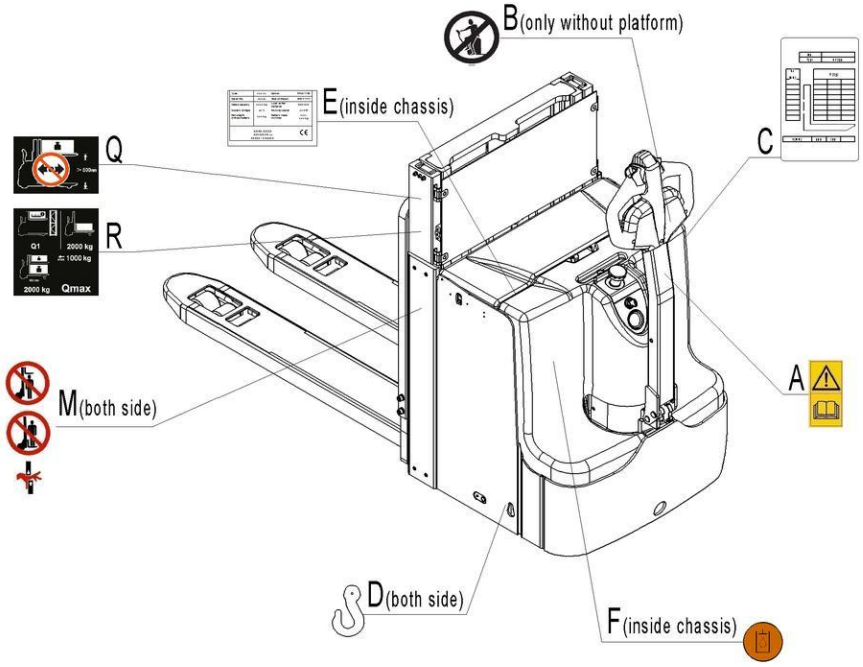


Fig.3: Safety and warning labels

The truck has a key switch (6) which stops all lifting-, lowering-, driving- functions and engages the failsafe electromagnetic brake when it is pushed. The truck is equipped with a safety (belly) button (1) which switches the driving direction away from the operator, if the truck travels towards the operator and the tiller is activated in the tillers operating zone. Follow also the instructions given on the decals. Replace the decals if they are damaged or missing.

d Nameplate

Pallet Truck

Type	xxxx		Rated load weight	xxxx	kg
Rated voltage	xx	V	Dead weight	xxxx	kg
Maximum battery weight	xxx	kg	Minimum battery weight	xxx	kg
Weight without load and battery	xxx	kg	Maximum lifting height	xxxx	mm
serial number	XXXXXXXXXX		Equipment code	XXXXXXXXXX	

Malnufacter: XXXXXXXXXXXXXXX

Malnufacter: XXXXXXXXXXXXXXX

Fig. 4: Nameplate

The content of nameplate format shall be subject to the equipment posting.

3.WARNINGS, RESIDUAL RISK AND SAFETY INSTRUCTIONS

DO NOT

- Put foot or hand under or into the lifting mechanism.
- Allow other person than the operator to stand in front of or behind the truck when it is moving or lifting/lowering.
- Overload the truck.
- Put foot in front of the wheels, could result in injury.
- Lift people. People could fall down and suffer severe injury.
- Push or pull loads.
- Use this truck on ramps.
- Side or end load. Load must be distributed evenly on the forks.
- Use the truck to load unstable, unbalanced goods.
- Use truck without manufacturer's written consent.
- Lifted loads could become unstable at wind forces. In the case of wind forces, please do not lift the load.
- When truck is used only as stacker, driving is prohibited when lifting height with load is higher than 500mm.
- When truck is used as pallet truck and stacker at the same time, load on the bottom fork must be heavier than the top fork.

Watch difference in floor levels when driving. Load could fall down or the truck could get uncontrollable.
Keep watching the condition of load. Stop operating the truck if load becomes unstable.
Stop the truck by brake and activate the emergency button (5) by pushing when load sliding on or off the truck. If the truck has any malfunctions, follow chapter 6.
Practice maintenance work according to regular inspection. This truck is non watertight, please use the truck in dry condition. Prolonged continuous operation might cause damage of the power pack. Stop operation if temperature of hydraulic oil is too high.

- When operating the electric pallet truck, the operator has to wear safety shoes.
- The truck is intended to be used for indoor applications with ambient temperatures
- between +5°C and +40°C.
- The operating lighting must be minimum 50 Lux.
- It is not allowed to use the truck on ramps.
- To prevent unintended sudden movements without operating the tuck (i.e. from another person, etc.) switch off the truck when not operating it.

4.COMMISSIONING, TRANSPORTING, DECOMMISSIONING

a. Commissioning

Table 2: Commissioning data

Type	PT 20I	PT20D		
Commissioning weight [kg]	855 kg	990 kg	1010 kg	1060 kg
Dimensions [mm]	1934X729X895	1940X729X1178	1940X729X1378	1955X729X1233

After receiving our new pallet truck or for re-commissioning you have to do following before (firstly) operating the truck:

- Check if are all parts included and not damaged
- Eventually installation of the multifunction tiller
- Eventually installation and charging the batteries (follow chapter 7)
- Do the work according to the daily inspections as well as functional checks.

b. Lifting/transportation

For transporting, remove the load, lower the forks to the lowest position and fix the truck safely with dedicated lifting gear according to the following figures.

Lifting

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

Park the truck securely and lash the truck according to the points identified in fig. 5. Lift the truck to its destination and place the truck securely before removing the lifting gear. Use the lashing points according to the fig. 5.

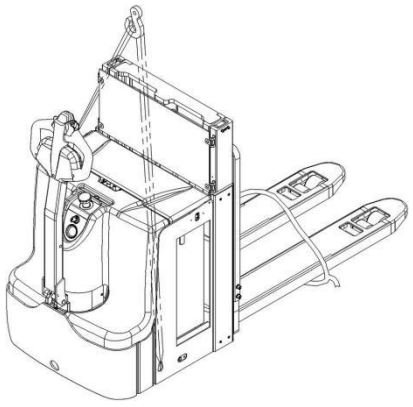


Fig.5 Lifting with a crane

Transportation

DURING TRANSPORTATION ON A LORRY OR TRUCK
ALWAYS FASTEN THE TRUCK SECURELY

Lower the forks and park the truck securely.
Fasten the truck according to fig. 5 by fixing dedicated lashing belts to each side of the trucks crane hook holes and fasten the other side to the transporting truck.

c. Decommissioning

For storage, remove the load, lower the truck to the lowest position, grease all in this handbook mentioned greasing points (regular inspection), eventually protect the truck against corrosion and dust. Remove the batteries and jack the truck safely, so that there will be no flattening after storage.
For final decommissioning hand the truck to a designated recycling company. Oil, batteries and electric components must be recycled due to legal regulations.

5.DAILY INSPECTION

This chapter describes pre-shift checks before putting the truck into operation.

Daily inspection is effective to find the malfunction or fault on this truck. Check the truck on the following points before operation.

Remove load from truck and lower the forks.

DO NOT USE THE TRUCK IF ANY MALFUNCTION IS FOUND.

- Check for scratches, deformation or cracks.
- Check if there is any oil leaking from the cylinder.
- Check the vertical creep of the truck.
- Check the smooth movement of the wheels.
- Check the function of the emergency brake by activating the emergency button.
- Check, the tiller proximity switch braking function
- Check the lifting and lowering functions by operating the buttons.
- Check if all bolts and nuts are tightened firmly.
- Visual check if there are any broken hoses or broken electric wires.

6. OPERATION INSTRUCTION

BEFORE OPERATING THIS TRUCK, PLEASE FOLLOW THE WARNINGS AND SAFETY INSTRUCTIONS (CHAPTER 3). BE SURE THE GOODS ARE STABILITY PLACED ON THE PALLET AND MAKE DAILY CHECKS.

Make sure, that the load is palletized and stable and that the daily inspection is carried out.
Insert the key switch (6) and turn on it.
Press the horn button (18) to activate the audible warning signal.

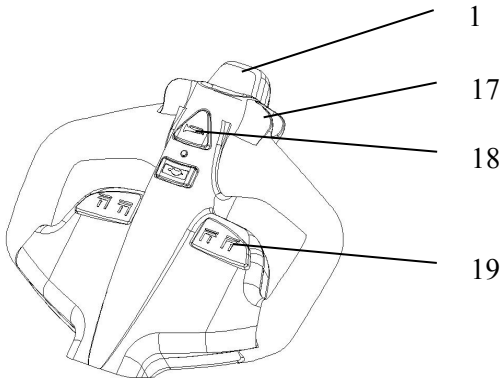


Fig.6: Tiller operating controls

a. Parking

DO NOT PARK THE TRUCK ON INCLINED SURFACES

The truck is equipped with an electromagnetic fail safe stopping and parking brake.
Be sure to lower the forks fully. Press the emergency switch (5), rotate the key counterclockwise for 90 ° then remove the key.

b. Residual lift diagram

The residual lift diagram indicates the maximum capacity Q [kg] for a given load centre c [mm] and the corresponding lift height H [mm] for the truck with horizontal load.

The white markings on the mast indicate if the specific lifting limits reached.

For instance with a load centre of gravity distance c of 600 mm and a maximum lift height H of 1600 mm, the max. Capacity Q is 1000 kg.

Figure 8 shows when the truck is used as pallet truck and stacker at the same time, the load capacity of fork and pallet is both 1000kg, so the total load capacity is 2000kg. When the fork lift height is within 120mm, the maximum stack height is 1800mm.

	Type	PT 20D	
	Mast	2500 mm	
h3 (mm)	Q (kg)		
2500	1000	800	
2000	1000	900	
1600	1000	1000	
c(mm)	600	700	

Fig. 7: Residual lift diagram (stacking)

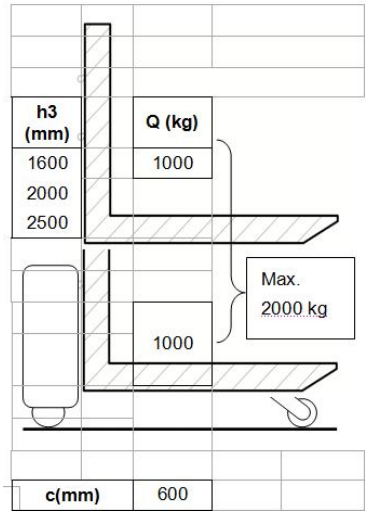


Fig. 8: Residual lift diagram (double lifting)

c. Lifting

DO NOT OVERLOAD! THE MAX. CAPACITY OF THIS TRUCK IS 2000KG

Travel with the forks lowered fully underneath the pallet until lift the load. Press the lifting button (19) until you reach the desired lifting height.

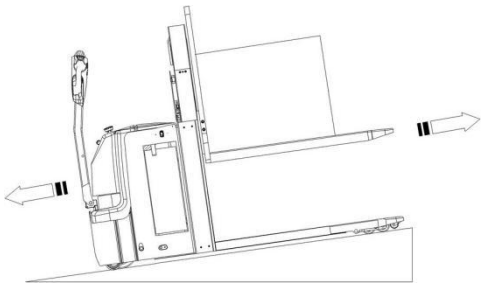


Fig. 9: Load facing uphill

d. Lowering

Press the lowering button (19) carefully.

Lower the load until the forks are near the chassis, and then drive the truck carefully out of the load area.

e. Travelling

TRAVEL ON SLOPE ONLY WITH THE LOAD FACING UPHILL.

DO NOT TRAVEL ON SLOPE WHEN EXCEEDING THE SPECIFIED TECHNICAL DATA.

WHEN TRUCK IS USED ANLY AS STACKER, TRAVELLING IS ONLY ALLOWED IF THE FORKS ARE LOWERED DOWN TO THE LIFTING POINT (<500MM). WHEN LIFTING HEIGHT IS HEIGHER THAN 500MM, TRAVELLING SPEED IS 2.5km/h, ACCELERATION WILL DECREASE.

WHEN TRUCK IS USED AS PALLET TRUCK AND STACKER AN THE SAME TIME, LOWER THE TOP FORK AS LOWER AS POSSIBLE, BUT DO NOT TOUCH THE LOAD ON THE BOTTOM FORK.

After starting the truck by turning on the key switch (6), move the tiller to the operating zone ('F', fig.10). Turn the accelerator button to the desired direction forward 'Fw.' or backwards Bw.'(fig. 10).

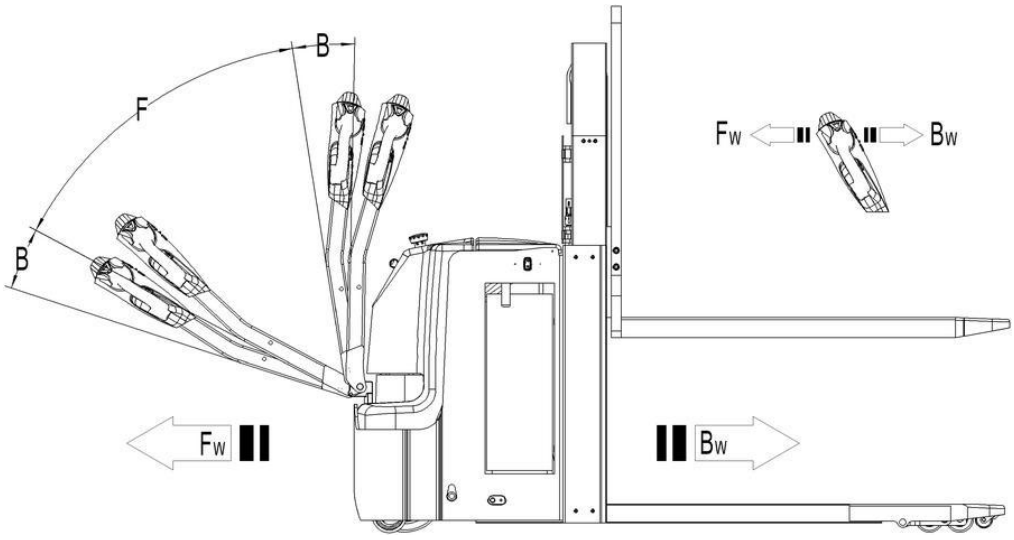


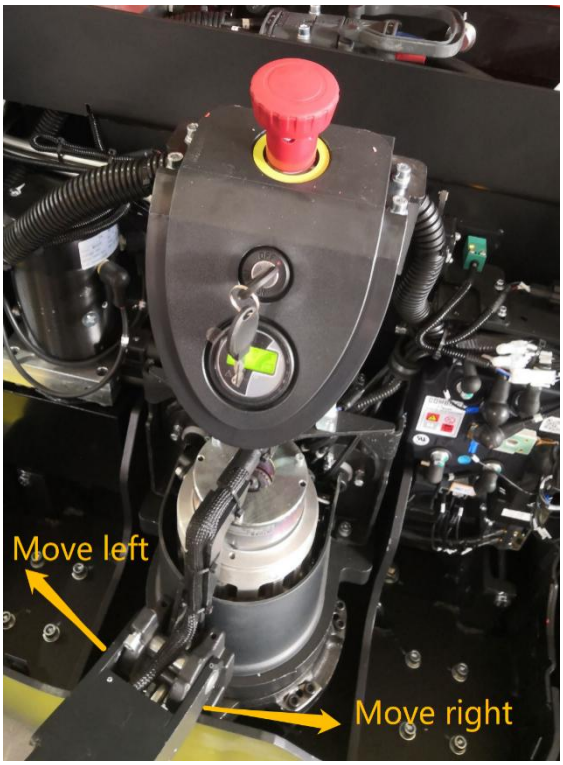
Fig. 10: Operating direction

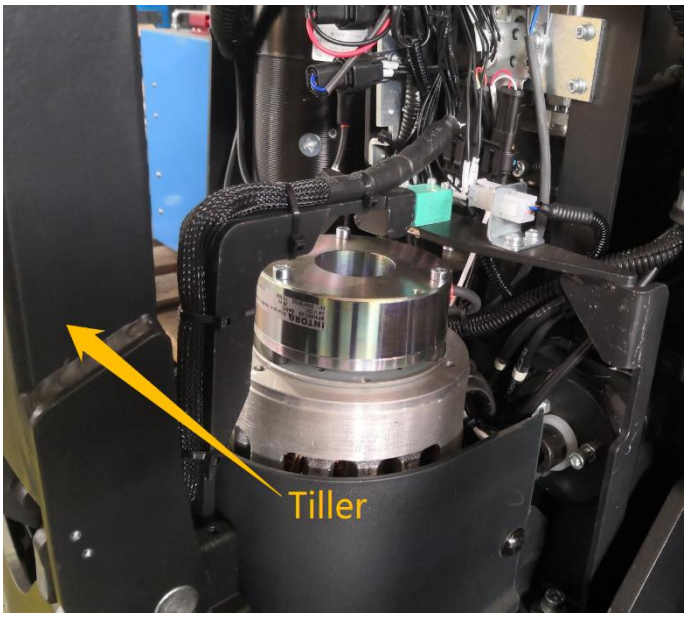
Control the travelling speed by moving the accelerator button (17) carefully until reaching the desired speed. If you move the accelerator button back to the neutral position, the controller decelerates the truck until it stops. If the truck stopped, the parking brake will be engaged.

Drive the truck carefully to the destination. Watch the route conditions and adjust the travelling speed with the accelerator-button.

f. Steering

Make the truck turn by moving the tiller to the left or right side.





g. Braking

⚠ THE BRAKING PERFORMANCE DEPENDS ON THE TRACK CONDITONS AND TRHE LOAD CONDITONS OF THE TRUCK

The braking function can be activated in several ways:

- By moving the accelerator button (17) back to the initial ‘0’ position or by releasing the button, the regenerative braking is activated. The truck brakes until it stops.
- By directly moving the accelerator button (17) from one driving direction to the opposite direction, the truck brakes regenerative will be activated until it starts travelling into the opposite direction.
- The truck brakes, if the tiller is moved up or down to the braking zones (‘B’). If the tiller is released, the tiller moves automatically up to the upper baking zone (‘B’).
- The truck brakes until it stops.
- The safety (belly) button (1) prevents the operator from being crushed. If this button is activated, the truck decelerates and/or starts travelling into the backwards direction (‘Bw.’)

for a short distance and stops. Please consider, that this button also operates, if the truck is not travelling and the tiller is in the operating zone.

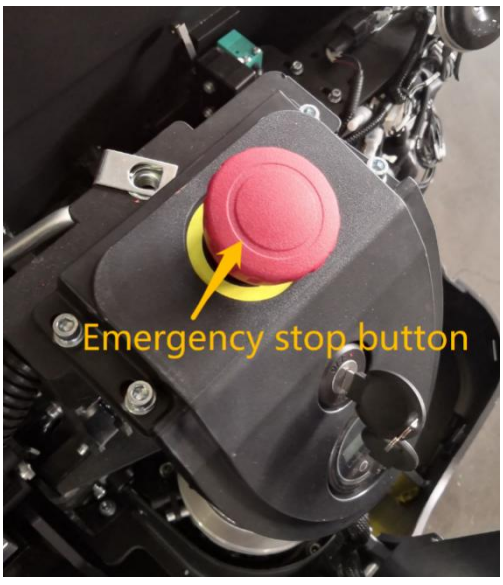
h. Malfunctions

If there are any malfunctions or the truck is inoperative, please stop using the truck and push the emergency button (5). If possible, park the truck on a safe area and rotate the key (6) counterclockwise as well as remove it.

Immediately inform the manager or aftersales service employees. If necessary, tow the truck out of the operating area by dedicated towing/lifting equipment.

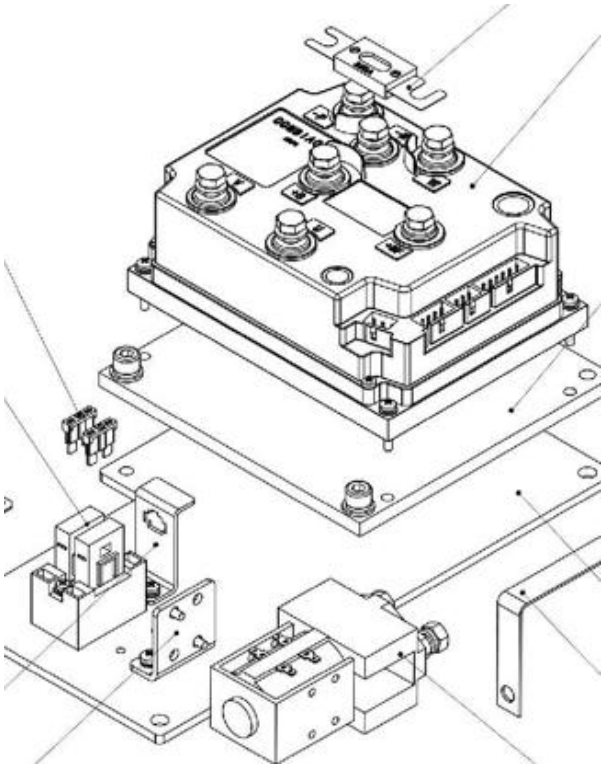
i. Emergency

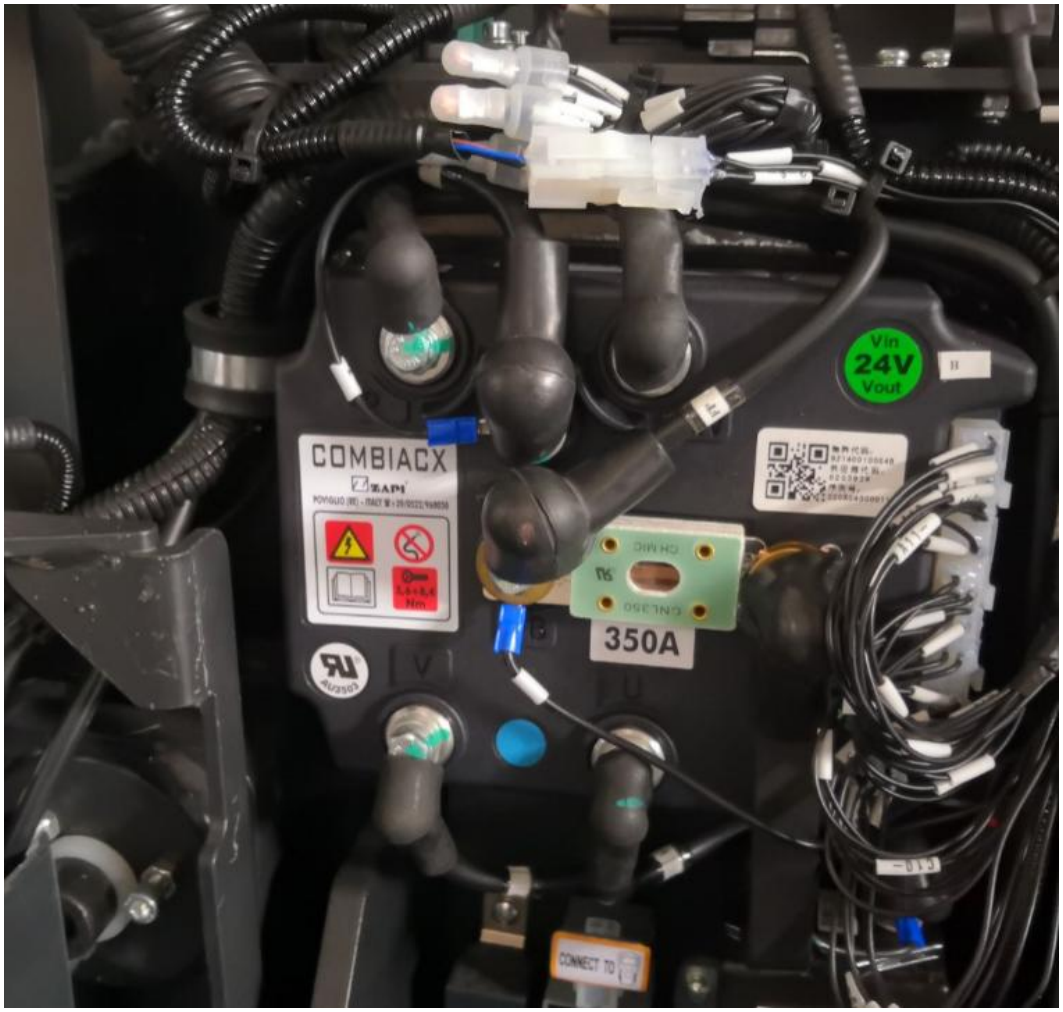
Keep a safe distance in emergencies or in the event of tip over. If possible, push the emergency button (5) and all electrical functions will be stopped.



7.CONTROLLER AND RELATED DEVICES

a.Controller appearance

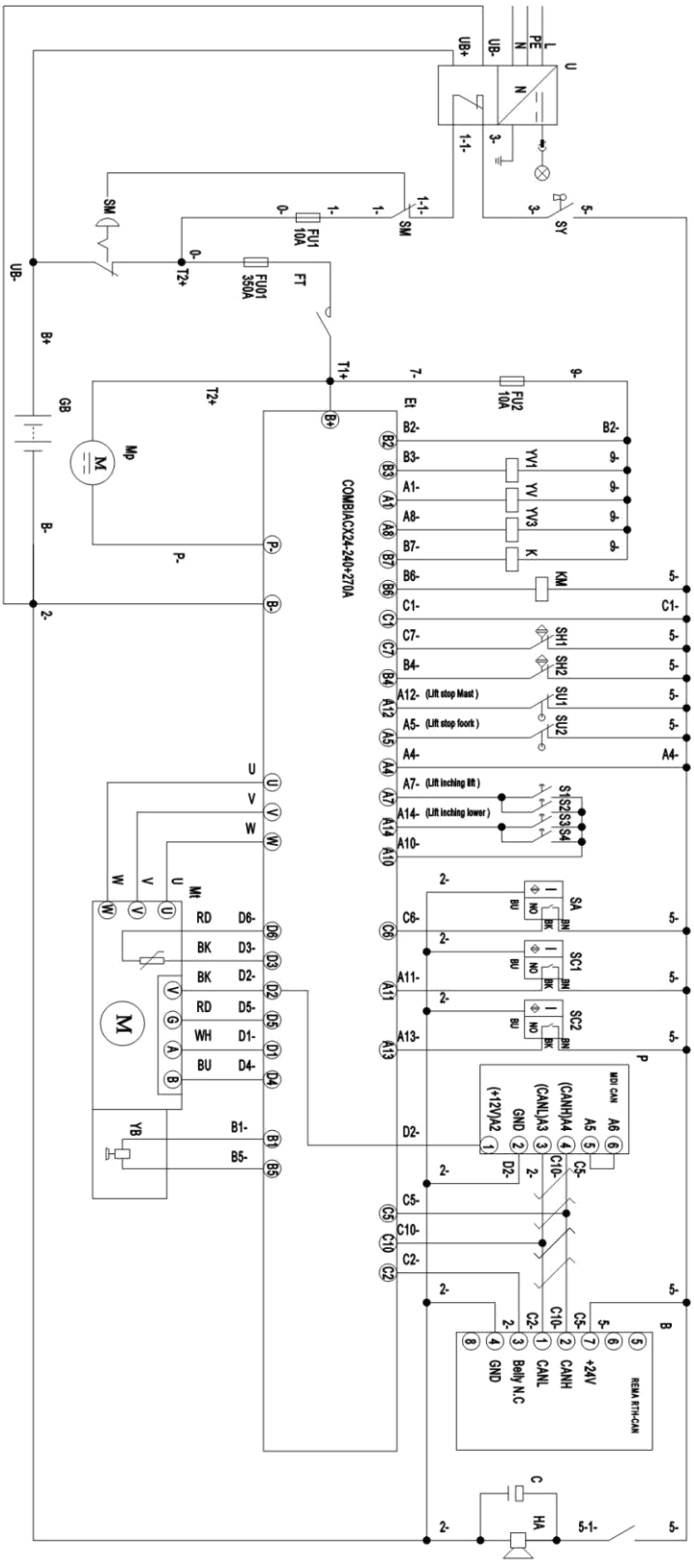




WIRING/ CIRCUIT DIAGRAM

CIRCUIT DIAGRAM

Fig.11 Diagram



FU1 : 10A
FU2 : 10A
FU01: 350A

Code	Item	Code	Item
GB	Battery	SA	Proximity switch
SM	DC power switch	P	Indicator
Et	Controller	B	Tiller
KMt	Main contactor	C	Capacitor
FU01	Fuse 350A	HA	Horn
FU1	Fuse 10A	SU1、SU2	Micro switch
FU2	Fuse 10A	YV、YV1、YV2	Electromagnetic valve
SY	Key switch	S1、S2、S3、S4	Inching switch
KMp	Lifting contactor	SH、SH2	Magnetic switch
Mp	Pump motor	Mt	Traction motor
K	Relay	YB	Electromagnetic brake

Table 6: Description of electrical diagram

b.DIAGNOSIS AND TROUBLESHOOTING

The current fault code can be viewed on the instrument panel and hand-held programmer.

TEST

A. Controller

B. Measure the diode voltage of the AC MOSFET circuit inside the controller and check whether there is burning damage.

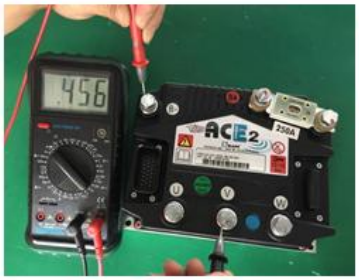
The test shall be carried out according to the following table. Each test item must be tested repeatedly for more than 3 times.

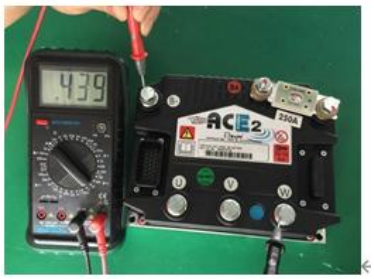
	Multimeter terminals		Normal value range	
No	Red	Black	Polarity value determination	Resistance measurement
1	B+	U/V/W/B-		1MΩ+
2	B-	U/V/W		1MΩ+
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

1）Pull the multimeter to Ω (resistance measurement), pull the multimeter to diode (polarity measurement)Remove the cable and harness connected to the controller, and completely discharge the internal capacitor (discharge B+and B - terminals with a resistance of 30 Ω/5W).

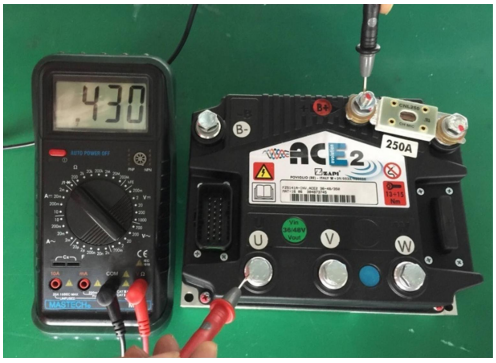
2）U.V.W.Use a multimeter to measure the diode voltage (0.3-0.6 V) and check whether it is normal.

Test 1: Measure the diode voltage. The red wire is B -, and the black wire is U, V and W





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



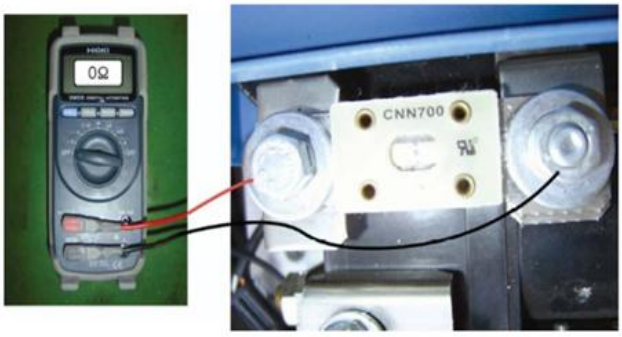
+

Note: Multimedia pointer cannot be reversed

A. Line contacts and fuses

线路接触器

图 2-22



线路保险丝

图 2-23

For line contacts and line fuses, connect an ohm table at the point shown in the figure and check if it measures the specified value.

8.CHARGING AND REPLACEMENT OF BATTERY

- Only qualified personnel are allowed to service or charge the batteries. You must observe the instructions of this handbook and from the battery- manufacturer.
- Recycling of batteries undergoes national regulations. Please follow these regulations.
- While handling batteries, open fire is prohibited, for gases could cause explosion!
- In the area of battery charging neither burning materials nor burning liquids is allowed. No smoking and ensure good ventilation.
- Park the truck securely before starting charging or installing/changing the batteries
- Before finishing the maintenance work, make sure that all cables are connected correctly and will not disturb other components of the truck.

Regarding as standard batteries, this truck is equipped with following lead batteries:

1 pc 3VBS 24V/210Ah

ONLY LEAD BATTERIES ARE ALLOWED TO USE.
THE WEIGHT OF BATTERIES HAS SOME INFLUENCE ON OPERATING BEHAVIOR OF THE TRUCKS.
PLEASE CONSIDER THE MAXIMUM OPERATING TEMPERATURE OF THE BATTERIES.

a. Replacement

Park the truck securely, turn off the key switch (6) and push the emergency button (5) to off the truck. Open the battery cover (20), disconnect the battery plug (22) and battery lock (21), then move the battery (23) out according to fig. 11.

Installation is in the reverse order of removal.

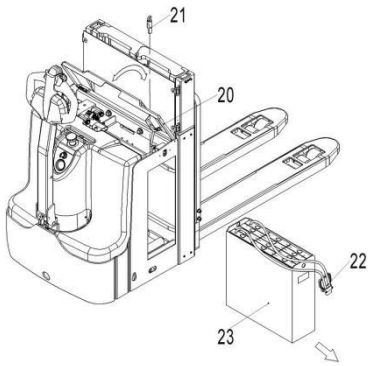
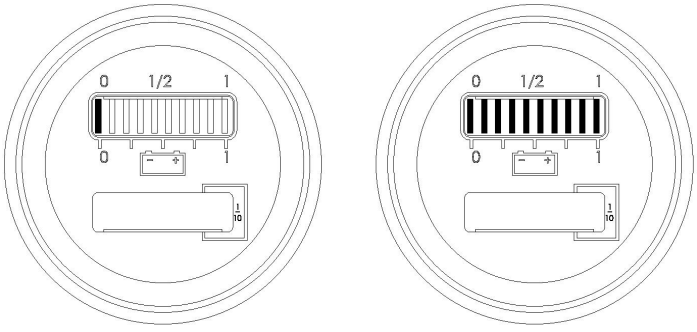


Fig. 11: Battery replacement

b. Battery indicator

Discharge status is indicated by ten red LED segments.



Battery discharged Battery charged

Fig.12: Battery discharge indicator

Only when the battery is properly charged, the most right LED lit. As the battery's state-of-charge decreases, LEDs light up successively, only one on at a time.

- The 2nd from left LED flashes, indicating "energy reserve" (70% depth of discharge).
- The 2 most left LEDs alternately flash, indicating "empty" (80% depth of discharge).

c. Charging

- Only well-matched charger can be use to charge the battery.
- Before using the charger, please fully understand the instructions of the charger instructions.
- Always follow these instructions!
- The room, where you are charging must be well ventilated.
- The exactly charge status can be only checked from the discharge indicator. To control the status, you must interrupt charging process and the start truck.

Park the truck at a dedicated secure area with a dedicated power supply.
Lower the forks and remove the load.
Remove the battery cover.
Off the truck and connect the battery plug to the port of external charger. Then connect the charger to the main power supply.
The charger starts charging.
Disconnect the battery plug after charge is completed, disconnect the connector from the socket and place it in the designated pocket.
Connect the battery plug with the plug on the truck, and install the battery cover back.

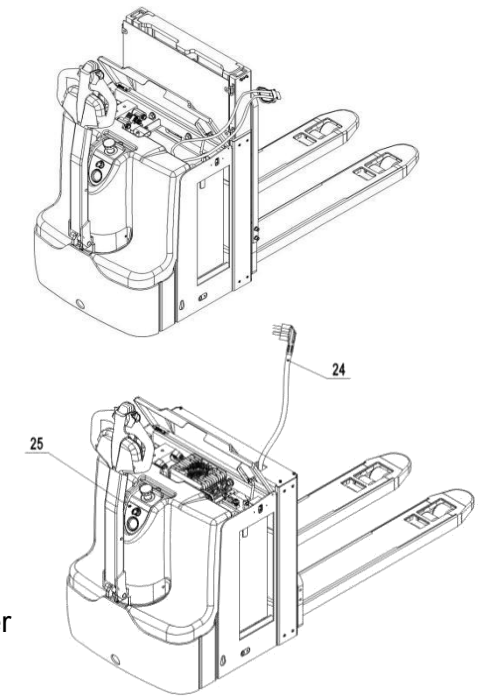


Fig.13: Battery charging

Built-in charger (PT20I only optional)
Park the vehicle in a special safety area that provides dedicated power supply. Lower Fork, Remove Goods.
Turn off the car power, pull out the power cord (24) and connect directly to the rechargeable socket. Charge
The charger starts charging.
the green light is displayed continuously until the charging LED light (25) indicates that the charging is complete. Charger will enter
Enter a floating mode to prevent battery damage. After charging, plug the power cord back into the truck body.

The following table shows the functions of the LED lamp scenario:

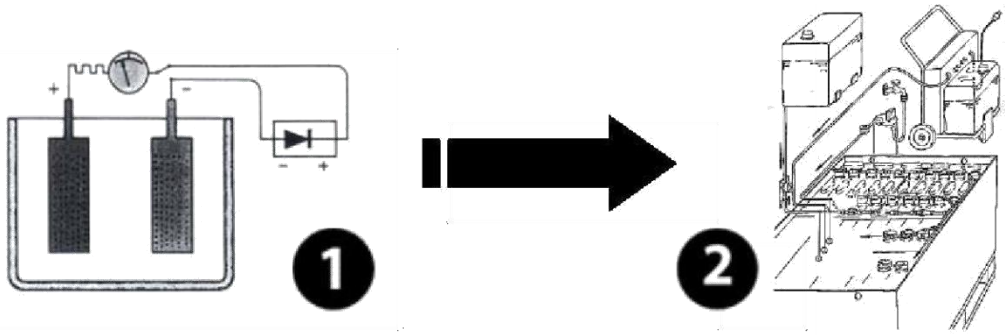
LED Signal	Function
Red	Discharge
Orange	Charging
Green	Fully charge

4．Water supply system (PT20I only optional)

Truck can be equipped with an automatic refill system.

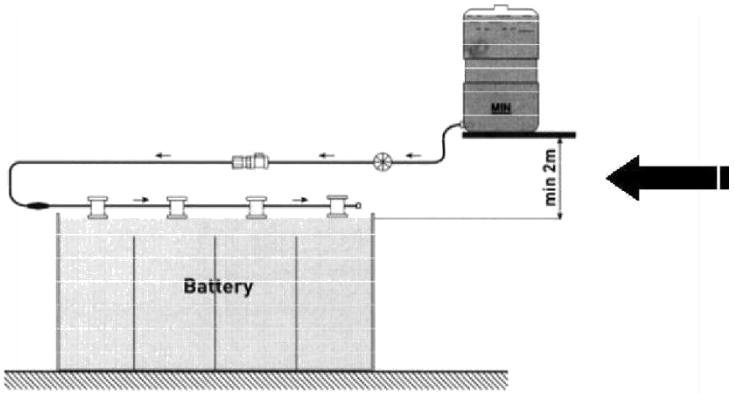
Refill after charging

It is recommended to add water to the battery at the end of the charging time. Never fill the battery with distilled water before charging it.



Water tank placement height

Water tank position too low_Minimum effective filling height 2 m (80") = 200 mbar (3.0 psi)



Water quality is important for maintaining the life of batteries and water replenishing systems. Always use clean water that meets the battery manufacturer's requirements.

Refill Indicator

After charging, check the Indicator light on the plug!

Indicator on top after charging

Water is sufficient

Indicator on bottom after charging

Water is insufficient

Do not refill before charging!

Failure Source Caused by Application or User Errors

Do not add liquid to the battery until the charging is completed.

The water tank is placed too low → the effective liquid filling height should be greater than 2m=200 mbar/80 "=3.0psi.

Filling shall be completed at relatively high pressure within a short time interval. (The pressure in the hose may not be released → the valve in the plug is not opened, so the liquid cannot be added, and the battery is drying

Filling shall be completed at relatively high pressure within a short time interval. (The battery may be overfilled. Due to the leakage probability of the valve system, the hose will flow empty and there is too much water left in the battery.)

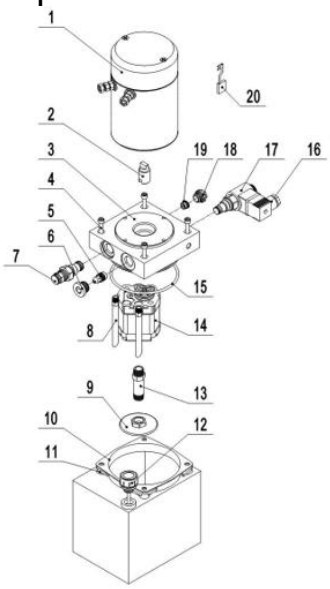
The vent hole of the electric core is blocked → the electrolyte will be pressed out of the vent hole of the plug.

9.HYDRAULIC SYSTEM

a.Overview

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

1-1component



The hydraulic system operates the lifting cylinders with pressurized hydraulic oil from the main hydraulic pump and extracts the oil discharged from these cylinders.

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

2 The main hydraulic pump pressurizes the oil in the hydraulic oil tank with the rotating force output from the motor, and sends the oil to the lifting cylinder.

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

Hydraulic oil circulation

The hydraulic oil tank stores hydraulic oil, which is supplied to the main hydraulic pump through a filter. The main hydraulic pump pressurizes the supplied oil and sends it to the lifting cylinder. When hydraulic oil is received, these systems perform their functions and then drain the waste oil to the tank through the return filter.

1-2Detection

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

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

The pump motor operates when the following conditions are met:

The key emergency stop switch is turned off.

The limit switch and the raise button are closed.

Pump motor contactor closed

Detection of pump motor contactor:

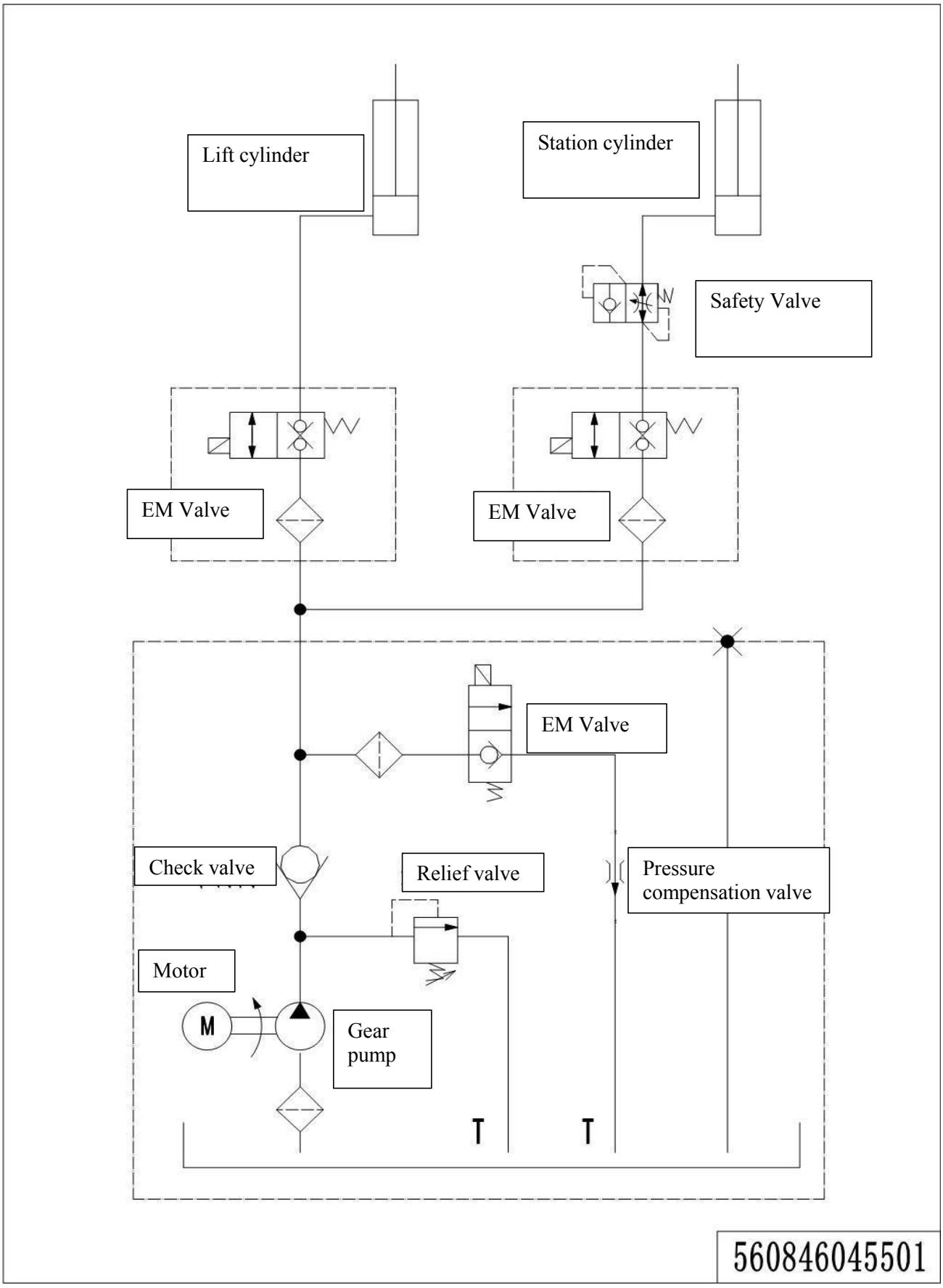
For the pump motor contactor, as shown in the figure,

And check whether it measures the specified value.

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

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

b.Hydraulic schematic diagram



c.TROUBLE SHOOTING

Pump Motor

Trouble	Possible cause
The hydraulic pump motor does not work	Poor connection or blown fuse. Check the battery connection. Check the key fuse. Check whether the fuse of the hydraulic pump motor may be blown。
	Key switch, upper limit switch and line contactor are not closed. Turn off the key switch. Use a multimeter to check the power flow through the key switch, line contactor coil and line contactor. The key switch must be turned off.
	Insufficient voltage. Charge or replace the battery. Check whether the cable terminal fits closely with the battery terminal and the control panel connector. Check whether the wires inside the cable are broken.
	The lifting and drive system is not operating correctly.
	During the battery charging operation, the battery is not fully charged.
	The hydraulic system uses too much battery power because the lift or hydraulic control is not correct for the duty cycle.
	The hydraulic pump motor is overheating. If the motor temperature reaches 155 ° C (311 ° F)

Hydraulic Pump

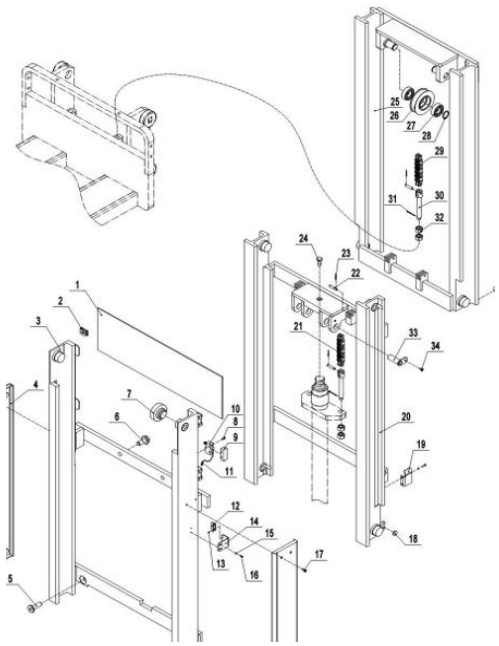
Trouble	Possible cause
Noise in the pump.	The oil level is low.
	Oil is very thick (viscosity is too high)
	The pump inlet pipeline is restricted.
	Worn parts in the pump.
	The oil is dirty.
	Air leaks into the inlet line.
The oil temperature is too high.	The oil level is low.
	The oil passage is restricted.
	The oil is too thin.
	Air leakage exists in the system.
	The pump is too worn。

	The system operates under too high pressure.
Leakage at pump shaft seal.	The shaft seal is worn out.
	The pump body is worn internally.
	Operation with low oil level in the tank will cause the seal to be sucked.
	During installation, the seal is cut at the shoulder of the pump or keyway.
	The sealing lip is dry and hardened by heat.
The pump cannot deliver fluid.	The oil content in the tank is low.
	The pump inlet pipeline is restricted.
	There is air leakage in the pump inlet pipeline. Loose bolts. Defects in the suction line of the bay.
	The viscosity of the oil is wrong.
	The pump is too worn.
	Pump shaft failure
	The bolts for the pump do not have the correct torque.

10.. Lifting system

1 . Mast

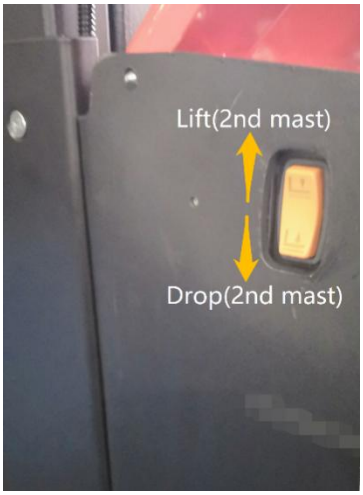
Appearance



Mast lifting

The mast assembly uses two masts and a single acting cylinder to lift the load. The rollers installed on the inside and outside of the fork and mast respectively facilitate these up/down movements.

Operation method



Cylinder

After receiving the hydraulic oil from the pump station, the rod of the oil cylinder stretches out and pushes the inner mast upwards. At the same time, the fork is also pulled by the lifting chain, which is connected to the outer mast to lift with the chain.

Lowering

If the operator presses and holds the lower button, the oil output from the cylinder will begin to flow to the tank by gravity.

When the oil is drained, the cylinder rod and the attached internal mast will retract. When the inner mast is lowered, the tension of the lifting chain will be relaxed, and the fork will also be lowered.

2．chain

A. Chain wear inspection

To check the chain wear, you must first find the chain spacing

1. Lift the bracket enough to apply tension to the lifting chain.

2. Place the stationary pointer of the chain wear gauge on the upper pin of the chain link.

3. Place the sliding pointer on the lower pin of the chain link.

4. Make sure that the two pointers are placed in the same position on the two pins to obtain accurate readings.

5．Fix the sliding pointer in place and read the scale on the instrument to find out the chain pitch.

After locating the chain spacing, start the wear inspection:

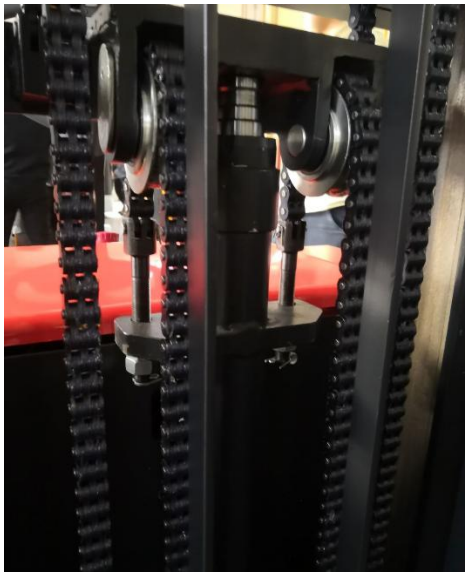
1. Place the sliding pointer on one of the three boxes at the bottom of the meter scale. promote

2. Place the pointer window on the square containing the chain spacing found above

3. Fix the measuring instrument on the other side of the lifting chain again, so that the fixed pointer rests on the upper pin of one of the chain links.

4. Place the entire length of the indicator against the lifting chain, and move the sliding pointer until it is aligned with the upper pin of another chain link, so that the pointer window remains on the correct square found in step 2.

5. If the chain is excessively worn, replace the lifting chain.



B.Chain tension adjustment

1.Lower the fork to the lowest position.

2. Push the lifting chain gently by hand to check the tension. If the tightening force is not tight, please follow the adjustment procedure below.

3. Lift the fork and place a 10cm thick sleeper under it.

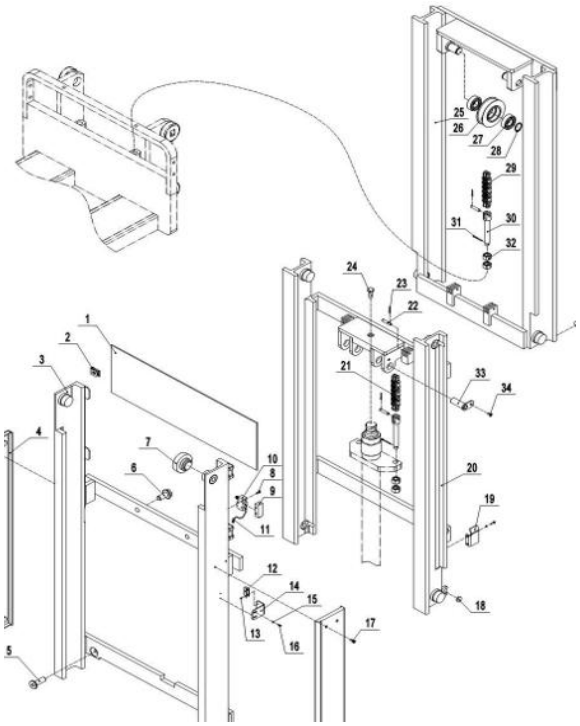
4. Lower the fork onto the sleeper block to release tension from the chain.

5. Tighten or loosen the lock nut at the connection between the chain and the mast to increase or reduce the chain tension as required.

6．After adjustment, place the screw thread sealant on the thread of the lock nut.

Lift cylinder

Cylinder Removal/Installation



1. Raise the fork and place the sleeper under it.

2. Lower the fork onto the sleeper to release tension from the main lifting chain.

3. Remove the chain

4. Disconnect the oil pipe connected with the oil cylinder.

5. Remove the relevant components of the sprocket (26)

6. Remove bolt M12x25 (24)

7. Take out the oil cylinder downward and perform the above steps in reverse order to install the oil cylinder.

11. Regular Maintenance

Only qualified and trained personnel are allowed to carry out maintenance work on this vehicle

Before maintenance, please remove the goods from the fork and lower the fork to the lowest position

If the vehicle needs to be lifted, please use the specified binding equipment or lifting equipment according to Chapter 4. Before operation, please place safety devices (such as designated lifting jacks, wedges or wooden blocks) under the vehicle to prevent them from falling, moving or sliding accidentally

Please pay attention to the maintenance handle. The gas pressure spring is pre fitted by compression. Carelessness is easy to cause damage

Please use the original spare parts approved and issued by the dealer

Please consider possible machine failures and accidents caused by hydraulic oil leakage

Only trained service technicians are allowed to adjust the pressure valve

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

Check the key items on the maintenance list.

a . Maintenance list

table 4: Maintenance list

			Internal (Month)			
			1	3	6	12
Hydraulic system						
1	Check the hydraulic cylinder and piston for damage, noise and leakage			•		
2	Check the hydraulic connector and oil pipe for damage and leakage			•		
3	Check the hydraulic oil level and refill if necessary			•		
4	Refill hydraulic oil after 12 months or 1500 hours of operation					•
5	Check and adjust the function of the hydraulic valve (2000kg +0/+10%)					•
mechanical system						
6	Check whether the fork is deformed and cracked			•		
7	Check whether the chassis is deformed and cracked			•		
8	Check whether all screws are fixed properly			•		
9	Check the push rod for deformation and damage			•		
10	Check the gearbox for noise and leakage			•		
11	Check the wheels for deformation and damage			•		
12	Check and lubricate the steering bearing					•
13	Check and lubricate the pivot point			•		
14	Grease nipple		•			

electrical system

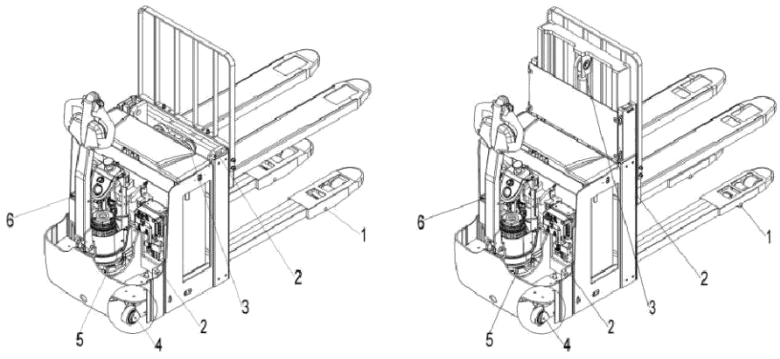
15		Check the power wiring for damage		•		
16		Check electrical connections and terminals		•		
17		Detect emergency switch function		•		
18		Check the electric drive system for noise and damage		•		
19		Detection display		•		
20		Check whether the correct fuse is used		•		
21		Detect warning signal		•		
22		Check the current contactor		•		
23		Check the frame for leakage (insulation test)		•		
24		Check the function and wear of the drive controller		•		
25		Check the electrical system of the drive motor		•		
Brake system						
26		Check the brake performance, replace the brake disc or adjust the clearance if necessary		•		
Battery						
27		Check the voltage of the battery		•		
28		Check the terminals for corrosion and damage, clean and lubricate the terminals		•		
29		Check the battery cover for damage		•		
30		Check the battery and add distilled water if necessary	•			
Charger						
31		Check the main cable for damage		•		
32		Check the starting protection procedure during charging		•		
Function						
33		Check the horn function	•			
34		Check the air gap of the solenoid valve	•			
35		Detect emergency braking	•			
36		Detect reverse braking and regenerative braking	•			
37		Detect belly switch function	•			
38		Check the steering function	•			
39		Check the lifting and lowering functions	•			
40		Check the function of handle proximity switch	•			
comprehensive						
41		Check whether all labels are clear and complete	•			
42		Check the small bearing wheel and adjust its height. If it is worn, replace it			•	
43		Run a test run	•			

b . Lubrication point

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

Standard grease.

1. Load wheel bearing
2. Roller
3. Roller bearing
4. Steering bearing
5. Gearbox
6. Oil pump



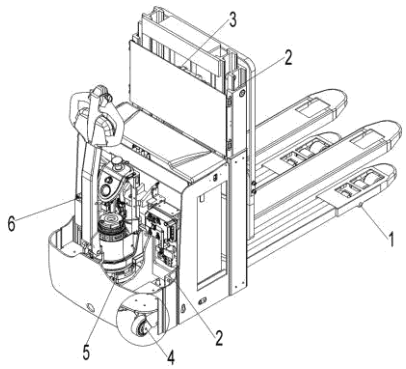


fig. 15: PT20I/D Lubrication point

c . Check and refill hydraulic oil

According to the temperature, the recommended hydraulic oil type is:

Environment Temp	–5℃~25℃	>25℃
Type	HVLP 32, DIN 51524	HLP 46, DIN 51524
viscosity	28.8-35.2	41.4 - 47
Oil quantity	1.0L	

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

The oil level shall not be lower than the minimum oil required for starting the vehicle.

If necessary, add oil to the refueling point.

d . Check the electrical fuse

Remove the main cover, with the fuse at the position shown in Figure 16.

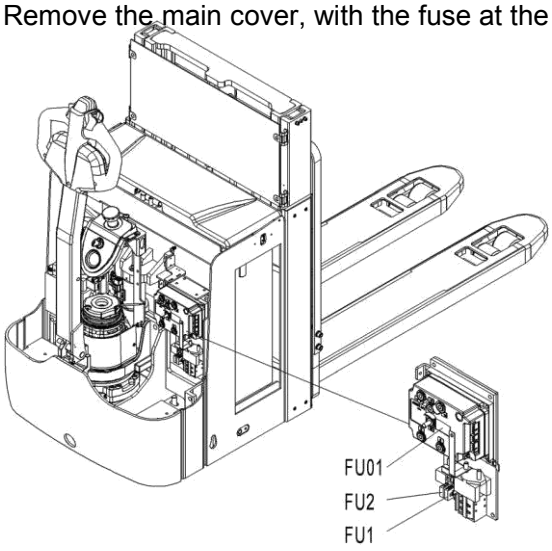
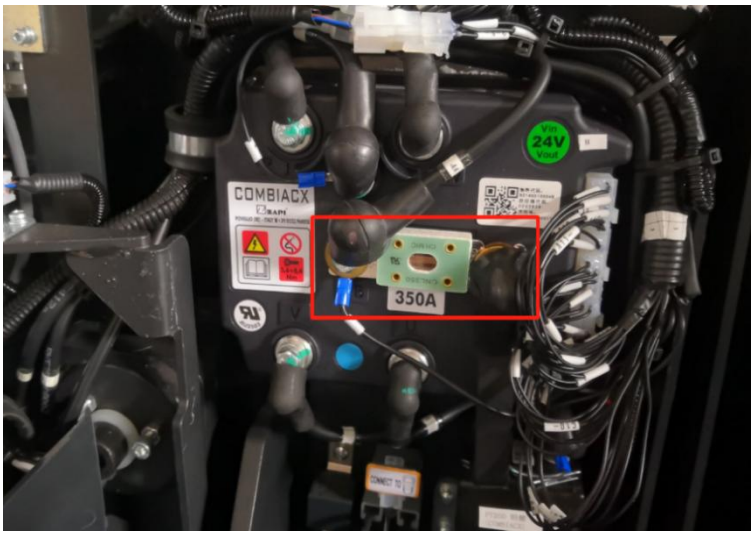


Figure 16: Fuse location

fig 5: fuse value

	value
FU1	10 A
FU2	10 A
FU01	350A



e . Remove and reinstall the protective plate

Do not use the vehicle if the guards are damaged or not installed correctly

Remove the clip that protects the shield and remove the shield. The installation procedure is reverse. Please confirm that the protective plate is properly fixed and not damaged. If you need to replace parts, please contact our after-sales service center.

f . Disassembly/assembly instructions

The disassembly/assembly part includes the following subsections: preparations before disassembly, inspection and testing before disassembly, precautions during disassembly, precautions after disassembly, precautions during assembly, handling of general parts, and hydraulic pipeline accessories. Precautions to be taken to perform disassembly/assembly work correctly are listed under each heading

Preparation before disassembly

Remove dust and pollutants from the vehicle before sending it to a repair center. Dust or contaminants entering the repair center may stain the components and enter them to cause damage.

Electric vehicles operate based on electrical systems. Do not let any water enter the system.

To avoid unnecessary disassembly work, prepare the necessary tools, place the boxes for the parts, and give priority to ensuring the cleanliness of the site

Check and test before disassembly

Before starting disassembly, be sure to record any problems. This prevents unnecessary disassembly, loss of replacement parts, and repeated failures caused by the same problem.

To prevent malfunction, please record the malfunction and the parts required for replacement.

Also make sure to check and record the following information

Vehicle model, serial number and business hours

The reason why the vehicle needs to be disassembled

Check the symptom, location and cause of the malfunction.

(If necessary, reproduce the same failure).

Check if any parts are inappropriate.

Check for damage or loose parts.

If possible, check the maintenance of the vehicle

Precautions when disassembling

Disassemble

Determine the assembly method of the parts (front/rear, left/right and top/bottom connection) to determine the disassembly sequence.

Before starting to disassemble the parts, pay attention to the connection points of the parts and mark them with arrows to avoid incorrect placement of the parts during assembly.

Use the right tools to delete specific parts.

If you have not removed any parts, even the mounting bolts and nuts, do not use excessive force. Check and find the reason.

Put the disassembled parts on one side in the order of disassembly, and put labels or marks on the parts with similar appearance.

Store bolts, nuts and other common parts in an orderly manner.

Check and test during disassembly

Sometimes the cause of the failure will be discovered during the disassembly process. Therefore, it is very important to carefully check the condition of the friction surface and the contact parts。

During the disassembly process, measure and record the gap, deformation, projection and other factors that may cause the failure.

Keep the gap

Ensure that the installed gaskets and washers produce the required specified clearance value.

Remove press parts

Remove any dents or marks caused by hammering and polishing the area.

If you loose any press-fitted parts, please determine and eliminate the cause to avoid problems during the assembly process.

Disassemble the bearing

Do not use force to disassemble the bearing, but use a bearing puller.

Precautions after disassembly

Clean

Clean the disassembled parts and keep them away from contaminants.

Pay special attention to removing contaminants from the oil pipeline or component pipeline.

When cleaning special parts, increase the number of detergent containers and clean them several times.

Kerosene or neutral anhydride diesel oil is suitable for cleaning the viscous oil in the bearing.

When using hazardous chemical cleaners, please be careful not to contact your skin or eyes.

Use designated containers to dispose of used oil at designated locations.

Dust-proof

Use a dust cover to place the cleaned parts in a place free of dust and contaminants, and block the ends of all pipes.

Before installing again, any parts you may store must be rust-proof.

Precautions during assembly

Parts installation

Keep all parts clean before assembly. Check the surface for defects and repair as needed. Make sure not to smear or rub the surface on any part, otherwise the service life of the part may be shortened.

Before starting the assembly, use a cleaning agent to remove the rust inhibitor from the components.

Before starting the assembly, determine the mark that will assemble the parts together.

Use press-fit tools to assemble bearings, bushings and oil seals, and use designated tools to process specific parts.

Before press-fitting parts, lubricate their surfaces with lubricating oil.

Tighten the bolts and nuts

To ensure the even torque of the bolts and nuts, tighten them in the order shown in Figure 1-19, and then tighten the other side on the other side. This method is called the ‘template method” and it gradually repeats loosening and tightening to ensure uniform contact.

Use the wires, split pins, lock washers or other parts shown in Figure 1-20 to fix bolts, nuts or other important fasteners that cannot be visually inspected.

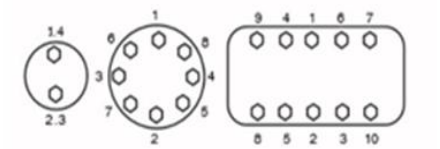


图 1-19

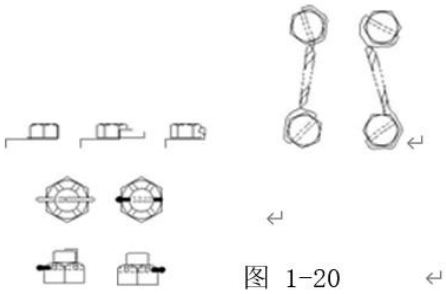


图 1-20

Check during assembly

In each step of the assembly process, check and record each part number.

Reassemble the gasket

Install gaskets and washers in the same positions as before, and then check if the gap is correct

Assembly adjustment link

If there is no need to adjust, please assemble them to the same length as before.

Assemble press parts

Repair scratches and dents as needed, and keep parts clean before insertion.

Note that press-fit parts that are not sufficiently tightened may loosen.

Assemble the key and keyway

Check whether the keyway and key are loose and whether they are in contact with the key head. If the key head touches the keyway, remove the remaining part of the key head.

Handling general parts

Handling packaging

Packaging, gaskets and copper packaging should be replaced as directed. After using the adhesive, please assemble the gasket specified in this service manual. When applying adhesive to the gasket, please pay attention to the following:

Thoroughly remove the old adhesive, scratches, dust, paint and grease on the surface of the gasket.

Apply a suitable sealant evenly on both sides of the gasket and wait a few minutes until it is dry.

Once the sealant is dry to the touch, it won't stick to your hands, assemble the parts.

Soak the leather packaging in oil before use.

Handle O-ring

Remember to check the condition of the O-ring. Do not use O-rings that have hardened.

Only use the O-ring specified in the parts list. For example, O-rings used for engine oil are made of special materials, such as silicone rubber, and are resistant to heat and aging. In this case, installing different types of O-rings may cause serious damage to the system and its components.

Lubricate the O-ring to avoid scratching its surface during installation. Silicone rubber O-rings are easily damaged, so be careful not to stretch them excessively.

Deal with the oil seal

Prevent the oil seal from collecting dust, especially dust on the lips, and make sure that there is no hardening or scratching.

Evenly lubricate the lip surface opposite to the oil seal.

Check whether the surface of the shaft where the oil seal is installed is contaminated, rusted or scratched, and then apply grease or lubricant so that the oil seal can be installed easily.

Check the surface of the oil seal lip for scratches. If there are scratches, replace the oil seal.

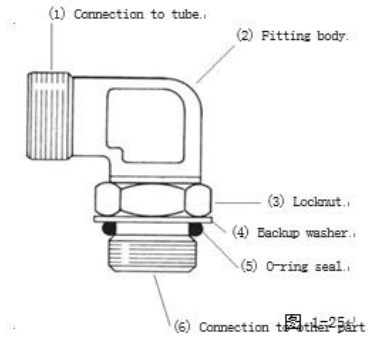
When inserting the oil seal, use guides and clamps to avoid damage to the oil seal.

After inserting the oil seal, check the inclination (inclination tolerance: 0.2 mm/00 mm, diameter 0.008 inch/3.937 inch).

When applying adhesive to the oil seal, make sure that no adhesive is in contact with the lip surface. Before inserting another seal, completely remove residual adhesive on the rails and clamp.

Handling the bearings

To assemble the bearing correctly and avoid damage to the bearing, please pay attention to
the following：



Thoroughly remove dust and other contaminants that may shorten the life of the bearing. Keep the bearing package until it is installed.

Do not rotate the bearing excessively in order to clean the purifier by blowing in compressed air. Ensure that the oil seal ring is installed in the correct direction.

Please pay attention to the following when installing the bearing：

Neither the outer ring was hit with a hammer to install it, nor the inner ring was hit to insert the outer ring. Hammering like this can cause damage to the bearing track.

When you insert the inner ring of the bearing with a reasonable tolerance, use a clamp and apply pressure to the inner ring. When performing hot insertion with a press-in tolerance, heat the bearing to 120°C (248°F). However, please note that excessive heating will reduce the hardness of the bearing surface.

When you insert a non-split bearing with an inner ring and an outer ring with a reasonable tolerance, use a clamp while pressing the inner ring and the outer ring at the same time.

Handling the retaining ring

When removing or installing the fixing ring, please use a pair of right ring pliers, being careful not to put too much pressure on the fixing ring.

After installing the fixing ring, check whether the fixing ring is inserted correctly.

Assembly of accessories with straight thread and O-ring seal (suitable for different applications)

1. Seal the lock nut (3), support washer (4) and O-ringPlace the piece (5) as far as possible on the main body (2) of the accessory.

2. Turn the joint to the part it uses until the support washer (4)Just touched the surface of the part.

3. To place the joint assembly in the correct position place the joint body (2)Rotate outward (counterclockwise) up to 359°.

4. Tighten the lock nut (3) to the correct diagram of the accessory used The torque shown.

5. If the shape of the pipe end of the fitting body is shown in Figure 1-25 (elbow or Straight body), put the sleeve on the tube before connecting the tube to the end.

Note: If the connector is a connector (direct connector), the hexagon on the body replaces the lock nut. To install this type of connector, tighten the hex connector to the surface of the part it enters.

Tighten other accessory types

High-load (shear casing) pipe fittings: After the pipe passes through the nut and contacts the pipe shoulder in the fitting body, turn the nut with a wrench until you feel a slight decrease in torque.

High-sealing fittings: Place the nut and sleeve on the pipe with the short and heavy end of the sleeve facing the end of the pipe. Place the end of the pipe against the counterbore in the main body of the fitting and tighten it until the nut is above the last thread on the main body. Just remove the accessory and install it again, and the remaining space will be used.

Flexible fittings: Put the nut and sleeve on the pipe, and push the pipe into the counterbore of the fitting body as much as possible. Tighten the nut until it touches the hexagonal part of the connector body.

f-1 Standard torque

Standard torque of bolts and nuts

Be careful to avoid mixing metric and imperial size fasteners. Mismatch or incorrect The fasteners may cause vehicle damage or malfunction, or may cause personal injury.
If necessary, exceptions to these torques can be given in the service manual.

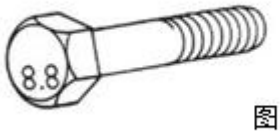
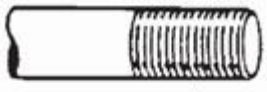


图 1-30



Standard bolt.

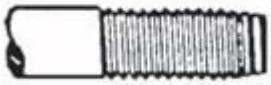


图 1-31

Taperlock stud.

Before installing any hardware, make sure that the components are in a near new state. Screw.The bolt and nut threads must not be worn or damaged. The hardware must be free of rust and corrosion.Use non-corrosive cleaners to clean the hardware and apply engine oil to the threads and bearings Surface. If you want to use thread glue or other compounds, do not use engine oil.After loosening the fasteners, keep them in good condition and only reuse them under delicate conditions.When replacing a new one, be sure to select fasteners of the same size and grade.

Generally, you can identify it based on the number marked on the head (such as 8.8 or 10.9) The strength of the bolt is shown in Figure 1-30. The following table lists standard bolts and nuts.The standard torque, and the tapered bolt shown in Figure 1-31.

For metric fastener

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 ± 16	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

f-2 **Standard torque for fastening accessories**

Standard torque for O - ring sealing fittings

Thread size(inch)	Accessories for straight thread o-ring	
	（N · M）	Pounds/feet
5/ 16-24	5.0 ± 1.5	45 ± 15
3/ 8-24	12 ± 2	110 ± 20
2/7 - 16	20 ± 4	15 ± 3
1/ 2-20	40 ± 5	30 ± 4
9/ 16-18	40 ± 5	30 ± 4
3/ 4-16	100 ± 15	75 ± 10
7/ 8-14	135 ± 15	100 ± 10
1 1 / 16-12	200 ± 25	150 ± 20
1 3 / 16-12	250 ± 25	185 ± 20
1 5 / 16-12	300 ± 40	225 ± 30
1 5 / 8-12	300 ± 40	225 ± 30
1 7 / 8-12	300 ± 40	225 ± 30
2 1 / 2-12	300 ± 40	225 ± 30

Thread size(inch)	Sealing joint nuts for O-ring face	
	（N · M）	Pounds/feet
9/ 16-18	16 ± 3	12 ± 2
1 / 16-16	30 ± 4	22 ± 3
1 / 16-16	50 ± 7	37 ± 5
1 14	90 ± 10	65 ± 7
1 3 / 16-12	120 ± 15	90 ± 10
1 7 / 16-12	160 ± 20	120 ± 15
1 11 / 16-12	190 ± 20	140 ± 15
2-12	215 ± 25	160 ± 20

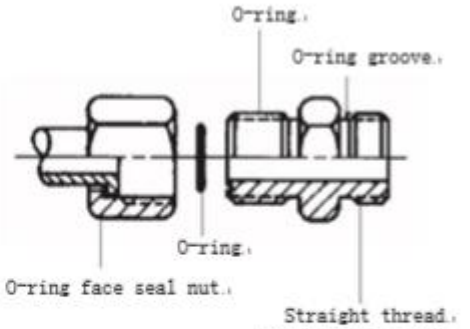


图 1-32

Thread size(in.) Straight thread O-ring accessories (Pound in.)

Hose clamp - belt type

Clamp width	New hose torque	Torque for re-tightening
7.9 mm (0.312 in)	0.9±0.2 N·m (8±2 lb·in)	0.7±0.2 N·m (6±2 lb·in)
10.5 mm (0.531 in)	4.5±0.5 N·m (40±5 lb·in)	3.0±0.5 N·m (25±5 lb·in)
16.9 mm (0.625 in)	7.5±0.5 N·m (65±5 lb·in)	4.5±0.5 N·m (40±5 lb·in)

图 1-33

37° bell and straight threaded O - ring accessories

Pic 1-34

图 1-34

37℃ bell and straight threaded O - ring accessories（Sealing accessories for O - ring surface are excluded）				
Nominal pipe external diameter		Thread diameter（in）	Standard torque	
Metric	Inch	Inch	(N·M)	Ponds/Feet
3.18	0.125	5/16	5.0±1.5	4±1
4.76	0.188	3/8	11.0±1.5	8±1
6.35	0.250	7/16	16±2	12±1
7.94	0.312	1/2	20±5	15±4
9.52	0.375	9/16	25±5	18±4
9.52	0.375	5/8	35±5	26±4
12.70	0.500	3/4	50±7	37±5
15.88	0.625	7/8	65±7	48±5
19.05	0.750	1-1 / 16	100±10	75±7
22.22	0.875	1-3 / 16	120±10	90±7
25.40	1.000	1-5 / 16	135±15	100±11
31.75	1.250	1-5 / 8	180±15	135±11
38.10	1.500	1-7 / 8	225±15	165±11
50.80	2.000	2-1 / 2	320±30	240±22

45° bell shape and 45° inverted bell fittings

45° inverted bell

45° bell

| 1-35

45° bell shape and 45° inverted bell fittings				
Nominal pipe external diameter		Thread diameter (in)	Standard torque	
Metric	Inch	Inch	(N · M)	Ponds/Feet
3	0.125	5/16	5.0±1.5	4±1
4	0.188	3/8	8.0±1.5	6±1
6	0.250	7/16	11±2	8±1
7	0.312	1/2	17±3	13±2
9	0.375	5/8	30±3	22±4
11.11	0.438	11/16	30±3	22±3
12.70	0.500	3/4	38±4	28±3
15.88	0.625	7/8	50±5	37±4
19.05	0.750	1-1 / 16	90±8	65±6
22.22	0.875	1-1 / 4	100±10	75±7

Taper pipe threaded fittings

Thread fittings for conical pipes				
Thread diameter (in.)	Threads with le2200e sealant		Threads without sealant	
	(N · M)	Ponds/Feet	(N · M)	Ponds/Feet
1/ 16-27	15	11	20	15
1/ 8-27	20	15	25	18
1/8-14	25	18	35	26
3/ 8-18	35	26	45	33
1/ 2-14	45	33	60	45
3/ 4-14	60	45	75	55
1-11 1/2	75	55	90	65
1-1 / 4-11 1/2	95	70	110	80
1-1 / 2-11 1/2	110	80	130	95
2-11 1/2	130	95	160	120

12.Fault Analysis and Controller Fault Code Table

If the vehicle still has the fault mentioned in Chapter 6

Table 6: Fault Analysis

fault	cause	maintenance
Laod cannot be lifted	Excessive load weight	Only lift the maximum capacity shown on the nameplate
	Discharge battery	Charge battery
	Lift fuse failure	Check and replace the lifting fuse
	Hydraulic oil level is too low	Check and refill hydraulic oil
	Oil leakage	Check the sealing condition of oil pipe and/or oil cylinder
Aspiration type oil leakage	High oil quality	Reduced oil quality
The vehicle cannot be operated	The battery is charging	Fully charge the battery, and then unplug the main power plug from the power socket
	Battery not connected	Connect the battery correctly
	Fuse failure	Check and replace the fuse
	Low battery	Battery charging
	Combined emergency switch activated	Insert the key and pull the knob to deactivate the combined emergency switch
	The handle is in the operation area	First move the handle to the brake area

If the vehicle fails and cannot be operated outside the work area, jack up the vehicle, place a load handling device under the vehicle and ensure that

The vehicle is safe, then move the vehicle out of the tunnel.

ZAPI COMBIACX(ACEX)Controller Fault Code Table

MDICODE	CANCODE	ALARM	Display	Solution
0	200	TEACH ERROR	TEACH ERROR	This fault occurs when the operator recompiles the REMA tiller.
0	201	END TEACH OK	END TEACH OK	This fault occurs when the operator recompiles the REMA tiller.
0	202	END TEACH ERROR	END TEACH ERROR	This fault occurs when the operator recompiles the REMA tiller.。
0	228	TILLER OPEN	Tiller is opened	When the handle input switch is disconnected, after a period of time, about 30S, the main contactor is disconnected, and a warning occurs. The next time you run the warning, it will disappear.
0	247	DATA ACQUISITION	data acquisition	This fault is activated to prove that it is in the data acquisition stage. Please wait for the data acquisition to complete.
0	249	CHECK UP NEEDED	Need maintenance	Maintenance time is up, and maintenance is needed

8	8	WATCHDOG	Watchdog fault	At startup, the watchdog circuit is activated before the software starts. The watchdog signal is invalid in standby or running state (alarm state). Fault analysis: the watchdog hardware circuit or the output part of the microcontroller is damaged. Both of these conditions are irrelevant to external components. Replace the controller.
8	221	FLASH CHECKSUM	Flash memory failure	After turning on the key, the program value in flash memory is positive, and if it is negative, a fault signal will be generated. Fault analysis: The problem lies in the flash memory of the microcontroller. The flash memory may have been damaged, or the stored program may have been damaged. Try resetting the logical card program. If the fault still exists, the fault exists in the microcontroller. Replace the controller.
8	231	WATCHDOG# 2	WATCHDOG fault #2	Cause: During startup, the watchdog circuit is activated before software startup. The watchdog signal is invalid in standby or running state (alarm state). Fault analysis: the watchdog hardware circuit or the output part of the microcontroller is damaged. Both of these conditions are irrelevant to external components. Replace the controller
10	212	WRONG RAM	RAM failure	During the detection of main memory, the error content is found: the registered address is "DIRTY", which will limit the operability of the vehicle. Fault analysis: turn off the key switch and turn it on again. If the fault persists, replace the controller.
11	211	STALL ROTOR	Rotor stalled	1. The motor is stalled 2. Motor encoder fault. 3. The harness is damaged or the wiring is wrong. 4. There is a problem with the encoder power supply.
12	239	CONTROLLE R MISM.	Controller does not match software	Please use the matched software
13	208	EEPROM KO	EEPROM corruption	The vehicle does not move, there is a problem in the parameter storage area, and the fault causes the vehicle to stop working. If the fault still exists after repeatedly closing the electric lock, replace the logic card. If the fault disappears, the previously stored

				parameters will be replaced by the wrong parameters, which need to be reset.
13	209	PARAM RESTORE	Parameter storage	The fault is eliminated after the vehicle moves for a while.
17	17	LOGIC FAILURE #3	LOGIC FAILURE #3	The current protection function of the logic card is faulty. The controller should be replaced
21	195	BMS HIGH TEMP.	Lithium battery temperature is too high	
22	190	RESET A14 SENSOR	Reset 1800mm height detection switch A14	Press the lowering switch to open and close the A14 switch again, or use a magnet to pass the A14 switch from top to bottom.
22	230	RESET A7 SENSOR	Reset 300mm height detection switch A7	Press the lowering switch to open and close the A7 switch again, or use a magnet to pass the A7 switch from top to bottom.
23	198	TR. SPEED OPEN	Abnormal magnetic switch	300mm and 1800mm switches, after reset, the fault is eliminated.
28	28	PUMP VMN LOW	PUMP VMN LOW	Cause: When starting up, the MOS tube low terminal voltage is 10% higher than the normal battery voltage, or the phase voltage is higher than 1/2 of the battery voltage. Possible causes: 1. The motor wiring is incorrect, or there is a problem with the motor circuit; Check whether the three-phase connection of the motor is correct; Check whether the motor leaks electricity to the ground and whether the motor coil is open circuited. 2. Replace the controller.
29	29	PUMP VMN HIGH	PUMP VMN HIGH	Cause: When starting up, the MOS tube low terminal voltage is 10% higher than the normal battery voltage, or the phase voltage is higher than 1/2 of the battery voltage. Possible causes: 1. The motor wiring is incorrect, or there is a problem with the motor circuit; Check whether the three-phase connection of the motor is correct; Check whether the motor leaks electricity to the ground and whether the motor coil is open circuited. 2. Replace the controller

31	31	VMN HIGH	VMN high	Cause: When starting up, the MOS tube low terminal voltage is 10% higher than the normal battery voltage, or the phase voltage is higher than 1/2 of the battery voltage. Possible causes: 1. The motor wiring is incorrect, or there is a problem with the motor circuit; Check whether the three-phase connection of the motor is correct; Check whether the motor leaks electricity to the ground and whether the motor coil is open circuited. 2. Replace the controller. 3. The three-phase connection of the motor is abnormal, which causes the connection column to be heated and damaged.
31	206	INIT VMN HIGH	The power line voltage of traveling drive motor is too high	Before the main contactor is pulled in, the software checks the voltage of the drive axle without driving the power axle. The software expects this voltage to be in a stable state. If the voltage is too high, this fault will be reported. To be checked: 1. Motor U/V/W internal connection; 2. Motor power line connection; 3. Whether the motor U/V/W leaks electricity to the vehicle body; 4. If all the above are correct, replace the controller.
32	203	PUMP VMN NOT OK	Oil pump lifting speed control sensor fault	Detection time: in standby state, this alarm shows that the voltage of the lifting speed regulation sensor is more than 1V greater than the minimum value set in the accelerator signal range (PROGRAMVAC). Possible causes: 1. The upper and lower voltage limits of the lifting speed regulating sensor are not collected. Enter the PROGRAMVAC menu to collect again. 2. Lifting speed regulation sensor error. 3. Controller failure.

40	254	AUX DRIV. SHRT.	Auxiliary drive short circuit	The drive circuit of electromagnetic braking or auxiliary electric braking is short circuited. Check for short circuit or low impedance push-pull output between A16 and - BATT. The driver circuit of the logic card fails. Replace the controller.
41	251	WRONG BATTERY	Battery setting fault	When starting, the controller detects the battery voltage and checks whether it is within the nominal voltage range. 1. Check whether the value of BATTERYVOLTAGE parameter in the TESTER menu is consistent with the value displayed by the voltmeter. If they do not match each other, use the ADJUSTBATTERY function to change the battery voltage to be consistent with the measured value. 2. Replace the battery.
42	246	AUX DRIV. OPEN	Auxiliary output drive fault	The auxiliary coil drive circuit cannot drive the load. The device itself or drive coil is damaged. Replace the controller。
43	218	SENS MOT TEMP KO	temperature sensor failure	The output signal of the controller temperature sensor is out of range. The fault has nothing to do with external components. Replace the controller.
46	196	LIFT+TRAC	Lift+trac close at the same time	Only in the case of lithium battery。
48	240	EVP DRIVER OPEN	Proportional valve drive open circuit	Check whether the proportional valve is open circuit.
49	241	LIFT+LOWER	Lifting and lowering signals exist at the same time	The controller will always detect and alarm when there are two request signals at the same time. Possible causes: 1. The conductor is damaged 2. Switch fault 3. Improper operation 4. If the fault cannot be eliminated, replace the controller
50	214	EVP COIL OPEN	Proportional valve coil open circuit	Check whether the proportional valve coil is open circuit.
50	215	EVP DRIV. SHORT.	EV coil short circuit	Check whether the low end of EV1/EV2/EV3 is short circuited to B -. If it is normal, replace the controller;
51	228	TILLER OPEN	Tiller open	When the handle input switch is disconnected, the main contactor will be disconnected after a period of time, about 30s, and the warning will occur. The warning will disappear next time。
52	52	PUMP I=0 EVER	Oil pump I=0 fault	Check whether the power line connection of the oil pump motor is intact. If it is intact, replace the controller;

53	53	STBY I HIGH	High standby current	The current sensor output signal detected by the micro control system exceeds the allowable range of the non operating current. This fault does not involve peripheral components, and the controller needs to be replaced.
53	252	WRONG ZERO	Zero voltage error	The high-end voltage feedback value of VMN during startup is not about 2.5V. The controller circuit is damaged. Fault analysis: It is recommended to check the following items. 1. Internal connection of motor 2. Motor power cable connection. 3. Leakage current between motor and vehicle shell. 4. If the motor is well connected and the problem is inside the controller, replace the controller.
54	19	LOGIC FAILURE #1	LOGIC FAILURE #1	Failure caused by low-voltage or overvoltage protection function. In a 24V system, the controller detects that the voltage is more than 45V or less than 9V; In the 48V system, the controller detects that the voltage exceeds 65V or is lower than 11V. Possible causes: 1. Whether there is short circuit in the circuit system, such as DC-DC, brake coil, etc., or whether the controller input power contact is good. 2. Whether the battery voltage is too low or too high. 3. Check whether the power cables on the B+, B, main contactor and other terminals are fastened. 4. Whether the controller voltage calibration parameters are consistent with the actual voltage. 5. If the hardware circuit of overvoltage protection on the logic card fails, replace the controller.
55	18	LOGIC FAILURE #2	LOGIC FAILURE #2	The hardware circuit of the phase voltage feedback on the logic card is partially faulty. Replace the controller.
56	217	PUMP I NO ZERO	The current exceeds the limit when the pump motor does not act	In the standby state (the pump motor is not driven), the feedback from the current sensor in the pump chopper gives a value that exceeds the allowable range because the pump current is not zero.

				Replace the controller;
59	197	NO CAN MSG. BMS	Lithium battery has no CAN information	Whether the CAN communication line between the battery end and the car body end is abnormal
60	60	CAPACITOR CHARGE	Capacitor charging error	When the electric lock is connected, the controller will charge the capacitor through the power resistance, and detect whether the capacitor is fully charged within the specified time. If there is no sufficient power, the capacitor voltage is still less than 20% of the battery voltage, the controller will alarm, and the main contactor will not close. Possible causes: 1. Peripheral devices, such as DC-DC, motor or other devices, interfere with the charging process of the controller, so the interference generated by these devices should be eliminated. 2. The charging resistor is disconnected, the charging circuit is faulty, and the power module is faulty. The controller needs to be replaced.
61	250	THERMIC SENS. KO	Temperature sensor failure	The output signal of the controller temperature sensor is out of range. The fault has nothing to do with external components. Replace the controller.
62	62	TH. PROTECTION	Controller over temperature protection	Reduce the temperature of the controller to below 85 °. If the fault still exists, it may be the temperature sensor fault or the logic board fault of the controller itself. In this case, the controller needs to be replaced
63	204	WAIT MOT. P STILL	Unstable P-terminal voltage	If the TRUCK TYPE parameter is set to LEVEL=1, the software expects the output on - P to be a stable value before the main contactor is pulled in. If the voltage value is unstable, it is most likely that - P has not stabilized. In view of this, the software expects this value to reach a stable value within 30 seconds (the oil pump can stop). After this period of time, the software will assume that this problem is caused by the oil pump is not stationary, and display this fault. If - P is still working, please wait for it to stop. If it does not stop after 30 seconds, this fault will be reported.
64	238	TILLER ERROR	Interlock does not match H&S input	There is no such fault code in the configuration

65	65	MOTOR TEMPERAT.	Motor overtemp	1. If the motor temperature digital switch is opened, or the analog signal exceeds the cut-off value, this fault occurs. 2. When the motor temperature reaches 120 ℃, the controller will give an alarm. At this time, the vehicle can still walk, but the maximum current is reduced and the vehicle performance is reduced. When the motor temperature reaches 125 ℃, the motor stops working. At this time, try to cool the motor. 3. If the fault still exists when the motor is cooled, check the circuit. If all are good, replace the controller.
66	66	BATTERY LOW	Low battery power	If the battery detection function "BATTERYCHECK" parameter is not set to 0, when the battery power is lower than 15% and there is no grid number on the instrument, the fault alarm will occur and the lifting function will be locked. At this time, it should be charged in time. If the battery is still charged, check whether the value of the parameter "ADJUSTBATTERY" of the controller is consistent with the battery voltage.
67	218	SENS MOT TEMP KO	Temperature sensor failure	Phenomenon: The output signal of the motor temperature sensor is out of range. Solution: Check the sensor value and wire connection. If there is no problem, the problem is inside the controller. (The resistance of the temperature sensor of the N series controller is 600 ohms)
67	248	NO CAN MSG.	No CAN signal	CAN communication failure between steering and traction. Detect CAN wiring and software settings and version information.
68	222	SMARTDRIVE R KO	Electromagnetic brake drive fault	Check whether the high end of the electromagnetic brake drive (CNB # 1) is short circuited to B -. If it is normal, the internal drive module may be damaged. (CBC # 1) Abnormal input
68	224	WAITING FOR NODE	Wait for node signal	In the CAN communication network, when a controller receives a signal that another controller cannot communicate normally, the controller is always in a waiting state until all the CAN communication networks are normal. Check why the wiring of those modules that cannot communicate is abnormal, and check whether the software version or parameter settings are correct.

70	205	EPS RELAY OPEN	EPS Internal contactor disconnected	Check whether there is a fault in the traction system and EPS. After the fault is eliminated and restarted, the fault will be eliminated。
70	218	SENS MOT TEMP KO	Temperature sensor failure	Phenomenon: The output signal of the motor temperature sensor is out of range. Solution: Check the sensor value and wire connection. If there is no problem, the problem is inside the controller.
71	13	EEPROM KO	Memory corruption	The vehicle does not move, there is a problem in the parameter storage area, and the fault causes the vehicle to stop working. If the fault still exists after repeatedly closing the electric lock, replace the logic card. If the fault disappears, the previously stored parameters will be replaced by the wrong parameters, which need to be reset.
71	210	WRONG RAM MEM.		
72	30	VMN LOW	VMNlow	Cause: When starting up, the high-end voltage of MOS tube is less than 66% of the capacitor voltage or the voltage is less than the required value during motor operation. Possible causes: 1. The motor wiring is incorrect, or there is a problem with the motor circuit; Check whether the three-phase connection of the motor is correct; Check whether the motor leaks electricity to the ground and whether the motor coil is open circuited. 2. Check whether the main contactor is closed firmly. Check the contacts for wear. 3. Replace the controller.
72	207	INIT VMN LOW	Controller internal alarm	Replace the controller
74	74	DRIVER SHORTED	DIVER SHORTED	When the electric lock is closed, the microprocessor will detect whether the driver of the main contactor is short circuited, and if so, it will alarm; Check whether the positive pole of the main contactor coil is short circuited to B6 or the negative pole of the power supply. If everything is normal, replace the controller.
74	213	AUX BATT. SHORT.	Auxiliary drive voltage fault	Check whether the B2 and drive connecting lines are correct, and if so, replace the controller;
74	234	DRV. SHOR. EV	EV coil short circuit	Check whether the low end of EV1/EV2/EV3 is short circuited to B -. If it is normal, replace the controller;

75	37	CONTACTOR CLOSED	CONTACTOR CLOSED	Before closing the main contact coil, the controller shall first detect whether the contact of the main contactor is stuck. Try to discharge the capacitor. If the capacitor voltage decreases by 20% of the battery voltage, a fault may occur. 1. It is recommended to check the contact of the contactor for adhesion or replace the contactor。
75	75	CONTACTOR DRIVER	Driver closed	When the electric lock is closed, the microprocessor will detect whether the driver of the main contactor is short circuited, and if so, it will alarm; Check whether the positive pole of the main contactor coil is short circuited to B6 or the negative pole of the power supply. If everything is normal, replace the controller.
75	232	CONT. DRV. EV	Controller EV drive not available	This fault is reported when one or more switching valves cannot be driven normally. Drive connection, if there is no problem, replace the controller
76	220	KEY OFF SHORTED	KEY OFF SHORTED	In the startup phase, this fault is displayed when the controller detects a low logic level signal when the key switch is turned off. Fault analysis: It is likely that the voltage is too low. It is recommended to check the following items. 1. The key switch is based on external load (such as the starting of DC-DC converter, and the input signal of relay or contactor switch is lower than the starting voltage). 2. Check the connection between the power cable and the positive and negative poles of the battery end, as well as with the - BATT and+BATT of the main contactor and controller. It must be connected with screws, and the torque range is 13NM ÷ 15NM 3. If no voltage drop is detected on the power supply line, a fault signal will be generated each time the key switch is ON. The failure may occur in the hardware of the controller, so it is necessary to replace the controller。
76	223	COIL SHOR. MC-EB	The load of main contactor or electromagnetic brake is too large	1. Check whether the controller output and load are too large; 2. Replace the controller;
76	235	COIL SHOR. EV.	PEV coil fault	If there is a fault in the coil driven by PEV, check whether the connection between the coil driven by PEV and the coil itself is intact;

77	38	CONTACTOR OPEN	Contactor does not pull in	The logic card has driven the main contactor coil, but the contactor is not closed. Possible causes: 1. Contactor mechanical failure, jamming, etc 2. Poor contact of contactor 3. If the contactor works normally, replace the controller.
77	199	TILLER ERROR		
78	78	VACC NOT OK	Accelerator failure	Detection time: in standby mode, this alarm shows that the accelerator voltage is more than 1V greater than the minimum value set in the accelerator signal range (PROGRAMVAC). Possible causes: 1. The upper and lower voltage limits of the accelerator are not collected. Enter the PROGRAMVAC menu to collect again. 2. Accelerator error. The accelerator pedal may not return to its original position, or there is an internal error in the accelerator. 3. Controller failure.
79	79	INCORRECT START	INCORRECT START	The starting sequence is incorrect. Possible causes: 1. The direction switch has been closed before starting. 2. The operation sequence is wrong. 3. The wires are not connected correctly. 4. If the fault cannot be eliminated, replace the controller. 5. The steering motor is abnormal if the steering does not report a fault and the interlocking is pressed to report a fault.
79	242	PUMP INC START	PUMP INC START	The starting sequence of oil pump is not correct. Possible causes: 1. Before starting the machine, the lifting and tilting switches have been closed. 2. The operation sequence is wrong. 3. The wires are not connected correctly.

				4. If the fault cannot be eliminated, replace the controller.
80	80	FORW+BACK	Both forward and backward signals exist (direction switch sticky)	The controller will always detect and give an alarm when there are two direction request operation signals at the same time. Possible causes: 1. The conductor is damaged 2. Direction switch fault 3. Improper operation 4. If the fault cannot be eliminated, replace the controller
82	82	ENCODER ERROR	ENCODER ERROR	The controller detects that two consecutive speed readings of the encoder are very different: because the encoder inside the system cannot change a lot of speed in a very short time, the encoder may be faulty (the circuit of one or two encoders is worn or broken), check the encoder mechanism and circuit functions; The alarm may be caused by electromagnetic interference on the sensor bearing. If none of the above is true, replace the controller. Please note that manual operation may also cause the controller to display this fault. At this time, it is necessary to power off and restart the vehicle. For example: 1. The vehicle suddenly collides with an obstacle, which makes the vehicle unable to walk; 2. When the vehicle is running at high speed, suddenly step on the brake.
85	226	VACC OUT RANGE	Accelerator input out of range	. If the upper and lower voltage limits of the accelerator are not collected correctly, enter the PROGRAMVAC menu to collect again; 2. Check whether the accelerator connecting line is correctly connected;
86	86	PEDAL WIRE KO	Accelerator positive and negative pole connection fault	Check whether the positive and negative electrodes of the accelerator are connected to the controller;
86	229	POS. EB. SHORTED	Advanced output of electromagnetic brake drive high-end	When the interlock is not closed, the electromagnetic brake drives the high-end to output high voltage. 1. Check whether other high-voltage lines are connected to the high-end output port of the electromagnetic brake;

				2. If the high-end output port of the electromagnetic brake is not connected, the high voltage still exists, and the internal drive circuit of the controller has been damaged;
88	233	POWER MOS SHORT	Power MOS tube short circuit	Before the main contactor is closed, the software will check the power bridge: convert it to the low end power of MOS transistor, and the phase voltage value drops to - BATT (rises to+BATT). If the change of the phase voltage value is inconsistent with the command, the fault signal will be generated. Replace the controller.
89	245	PUMP VACC NOT OK	Oil pump lifting speed control sensor fault	Detection time: in standby state, this alarm shows that the voltage of the lifting speed regulation sensor is more than 1V greater than the minimum value set in the accelerator signal range (PROGRAMVAC). Possible causes: 1. The upper and lower voltage limits of the lifting speed regulating sensor are not collected. Enter the PROGRAMVAC menu to collect again. 2. Lifting speed regulation sensor error. 3. Controller failure.
90	191	BMS LOW CAP.	Low lithium battery	Verify whether the lithium battery capacity is really too low
90	243	PUMP VACC RANGE	Oil pump lifting speed control sensor out of range	. The upper and lower voltage limits of the lifting speed regulating sensor are not collected correctly. Enter the PROGRAMVAC menu to collect again; 2. Check whether the connecting wire of the lifting speed control sensor is correctly connected;
90	244	PROGRAM TOOTHS	Wrong motor type	Check whether the motor actually used is consistent with the parameters.
91	192	BMS VOLT. DIFF	Lithium battery voltage error	Verify that the voltage difference of lithium battery is too large.
92	193	BMS MONOMER OV	BMS feedback battery voltage is too high	Verify whether the lithium battery voltage is really too high. (Normal voltage 22-25.6V)
92	236	CURRENT GAIN	Current gain fault	The maximum current gain parameter is the factory setting value. Indicates the maximum current adjustment The parameter program has not been enabled. Solution: ZAPI technicians should correct the current gain parameters settings

93	194	BMS MONOMER UV	BMS feedback battery voltage is too low	Verify whether the lithium battery voltage is really too low. (Normal voltage 22-25.6V)
94	0	NONE	The instrument hour meter is inconsistent with the controller	If the instrument or traction controller of the system in use is replaced, this fault will be reported. After starting up, wait for 5 minutes. After the hour meter of instrument and traction controller are consistent, this fault will be eliminated automatically.
94	195	BMS HIGH TEMP.	BMS Overtemp	Verify whether the lithium battery temperature is really too high. Or lithium battery temperature sensor failure
95	98	INPUT ERROR #2	The emergency reverse CAN signal is inconsistent with the actual state	Verify the handle emergency reverse switch wiring (C2 pin)
96	237	ANALOG INPUT	Analog signal input fault	Generated when A/D of all analog signal inputs is converted to a fixed value The fault signal has a delay of more than 400ms. This function is used to detect A/D Converter failure or analog signal conversion Failure analysis: If the failure persists, replace the controller.
98	98	INPUT ERROR #1	The emergency reverse CAN signal is inconsistent with the actual state	Verify the handle emergency reverse switch wiring (C2 pin)
98	219	PEV NOT OK	PEV fault	Check whether B2 is connected to B+behind the contactor;
99	99	INPUT ERROR #2	The emergency reverse CAN signal is inconsistent with the actual state	Verify the handle emergency reverse switch wiring (C2 pin)
99	253	SLIP_PROFILE	Slip fault	SLIP PROFILE parameter selection error. Check the settings of these values in the hardware setting parameters.