Essentials

Before any maintenance of this machine, you should read, understand and comply with these safety rules, operation instructions and maintenance instructions. Only trained and authorized personnel can be allowed to repair this machine. Do keep this Manual as part of this machine and always keep it together with this machine. If in doubt, please contact Hunan Sinoboom Heavy Industry Co., Ltd. by phone.

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Please contact us:
Website: www.sinoboom.com
E-mail: overseas@sinoboom.com.cn
Service hotline: 400-601-5828
Fax: 0086-731-87116516

The First Edition , Nov. 2013

Importance

Before any attempt to maintenance or repair of the GTJZ0408S and GTJZ0608S products, please carefully read, understand and comply with the relevant safety regulations and operating instructions.

This Manual provides product owners and operators with detailed information for maintenance, and provides qualified professional maintenance personnel with methods and procedures for inspection, maintenance and troubleshooting.

To perform any maintenance procedure, you must know about mechanical, hydraulic, electrical and other basic knowledge, and at the same time, some maintenance procedures require specialized skills, tools, lifting equipment and proper working site. Therefore, we strongly recommend that maintenance and repair be made in our designated service center.

Hunan Sinoboom Heavy Industry Co., Ltd. will make greatest effort to provide you with accurate information and excellent services, but continuous improvement on our products should be the policy of Sinoboom, so any change of the product technical specifications shall be subject to no early notice. Please regularly update your product maintenance manual.

Hunan Sinoboom Heavy Industry Co., Ltd. encourages customers to point out the inadequacies of our products and put forward the measures of improvement, we will seriously consider all opinions and use as reference for preparation of maintenance manual and other manuals. Please contact us by E-mail or fax.

Safety Rules

Danger

Any disobedience to this Manual and the corresponding operation manual instructions will result in death or serious injuries.

During implementation of maintenance and repair procedures, equal attention shall be paid to the unsafe operations mentioned in the operation manual.

Do not operate, unless:

- You understand and follow the safety operation rules in this operation manual.
- You should read, understand and follow
  - Manufacturer's instructions and safety rules
  - User's safety rules and work site regulations
  - All applicable governmental regulations
- You must have proper tools, lifting equipment and appropriate working site.

Personal safety

Anyone working on or around the machine must be aware of the potential safety hazards. Personal safety, as well as sustainable and safe operation of the machine is of greatest importance.

Read the procedures carefully. The labels used in this manual and on the machine mean as follows:

Safety warning sign - used to indicate the presence of potential personal injury. All safety messages after this sign shall be followed to avoid personal injuries or death.

Danger — Red sign - used to indicate the presence of emergency situations. Any disobedience will result in death or serious injuries.

Warning — Orange sign - used to indicate the presence of potential hazardous situations. Any disobedience will result in death or serious injuries.

Caution — Yellow sign followed by a safety warning sign - used to indicate the presence of potential hazardous situation. Any disobedience will result in slight or moderate personnel injuries.

Caution — Yellow sign not followed by a safety warning sign - used to indicate the presence of potential hazardous situation. Any disobedience will result in damage to properties.

Attention — Green sign - used to prompt operation or maintenance information.

You need to wear protective glasses and working clothes.

Potential hazards, such as: moving parts, components able to rotate freely or not fixed, weights lifting or moving. Do remember to wear work shoes.

Work site safety

Ensure that no spark, flame or lit cigarette butt is close to any flammable or explosive material, such as battery and motor fuel. Qualified fire extinguishers shall be equipped around.

Maintain the working site and all tools for later use. Ensure that the work environment is clean to prevent impurities or debris falling into the machine parts to result in damages.

Make sure that your working site and working area well ventilated with good lighting conditions.

Ensure that any forklift, travelling crane or other lifting and supporting device has the capacity enough for support and lifting. Make sure to use intact wire ropes or belts with enough bearing capacity.

Ensure that the disposable fasteners (such as the cotter pins and self-locking nuts) are not repeatedly used. Otherwise, the components may fail.

Use qualified containers for proper treatment of the hydraulic oil and other liquid waste. Please pay attention to protect environment against pollution.

Product specifications

Specifications	Unit	GTJZ0408S	GTJZ0608S
Dimensions			
Overall length	m	1.78	1.78
Overall width	m	0.78	0.78
Overall height	m	1.90	1.88
Ground clearance	mm	70	70
Ground clearance (Pit protection device expanded)	mm	19	19
Overall weight	kg	1248	1328
Parameter			
Max. platform height	m	4.6	5.8
Max. working height	m	6.6	7.8
Extension outreach	m	0.9	0.9
Load Capacity	kg	280	230
Wheel base	m	1.3	1.3
Turning radius			
inside	m	0	0
Outside	m	1.48	1.48
Manual force	N	400	400
Voltage	V	24	24
Platform size			
Length	m	1.65	1.65
Width	m	0.75	0.75
Tire			
Dimension	mm	305	305
Width	mm	115	115
Hydraulic volume			
Hydraulic tank volume	L	12	12
Hydraulic system volume	L	16	16
Hydraulic system pressure	bar	240	240
Voltage(DC)	V	24	24
Aerial noise radiance, maximum noise level	dB	72	72
Driving Speed			
stowed	km/h	0～4	0～4
raised	km/h	0～0.8	0～0.8
Gradeability	%	30	30
Lift/Down speed（idling）	s	18/31	18/27
Max. allowable wind speed	m/s	0	0
Max allowable slope			
front and rear		3°	3°
left and right		1.5°	1.5°

Hydraulic system descriptions

Hydraulic oil	L-HM46
Hydraulic pump	
Type	Gear pump
Flow (3000r/min)	12/min
Maximum driving pressure	248bar
Drive motor	
Type	Cycloid motor
Displacement	230cc/r
Functional valve	
Pressure of functional main safety valve	248bar
Pressure of lifting relief valve	172bar
Pressure of steering relief valve	150bar
Pressure of walking relief valve	248bar
Walking drive	
Brake opening pressure	28 bar
Auxiliary pump	None
Hydraulic filter	
Return Oil filter of hydraulic oil tank	SP-06×10
Return oil filter bypass pressure	2.5bar

Hydraulic hose and pipe joint installation instructions

When removing or installing any hydraulic hose or pipe joint with O seal rings, do follow the torques as specified in the specification.

Pipe joint	
Screw thread	Torque Nm
M10×1	15
M12×1.5	25
M14×1.5	35
M16×1.5	50
M18×1.5	70
M22×1.5	125
M27×2	145
M33×2	210

Hydraulic hose	
Screw thread	Troque Nm
M12×1.5	15~17
M14×1.5	15~17
M16×1.5	25~28
M18×1.5	35~39
M22×1.5	45~50
M27×1.5	85~94
M30×2	110~121
M36×2	130~143

Tightening procedure

1. Replace the O seal ring. When the seal is damaged, the O seal ring must be replaced. If the pipe joint or hose is tightened, the O seal ring can not be reused.
2. Lubricate the O seal ring before installation.
3. Make sure that the sealing O seal ring is properly placed and fixed.
4. Align the hose nuts to the pipe joint, and tighten the nuts.
5. Tighten the nuts or pipe joint according to the torque as provided in the table above.
6. Implement all machine functions and check the hose, pipe joint and related components to ensure no leakage.

Working principle

Power source

4 lead-acid batteries (6V each) in series are adopted to drive a 24V DC motor. The gear pump and the motor output shaft are connected through a spline to power the system.

Hydraulic system

All machine functions are driven by the hydraulic system, and the whole hydraulic system can be divided into two parts: one part for walking and steering functions, and the other for the lifting function of the platform.

When the motor works, the hydraulic pump will send pressure oil to each functional valve block, on which the direction valve and the flow regulating valve are arranged and used to accomplish different movements and adjust the speed. In order to protect the related parts and avoid overload of the system pressure, the valve block is provided with a relief valve.

Electrical system

In the system, 4 separate 6V batteries are used to drive the hydraulic pump and the controller to control the lifting function of the scissor boom. The batteries are charged through the external power supply.

Machine control

This system controls the machine functions by means of a controller installed in the ground control box. The controller completes data exchange through a high-speed data bus.

Safety measures

A series of angle sensors and limit switches provide signals to the controller. The level sensor measures the angle of the body X-axis and Y-axis, when the X-axis angle is greater than 1.5 degrees or the Y-axis angle greater than 3 degrees, it will give alarms and can't rise, walk or steer.

The height potentiometer is used to measure the platform height and mainly restrict the driving speed.

The travel switch is used to confirm whether the pit protection mechanism is extended in place, if the platform rises to about 1.5 meters from the ground, the pit protection plate is not expanded and the sensor does not detect any relevant signal, the platform will stop rising.

Regular maintenance procedures

Observe and obey

- The maintenance and checks shall be completed by qualified personnel after professional training.
- The regular maintenance and checks can be divided into daily, quarterly, semi-annual, annual and biennial regular maintenance. The maintenance and inspection personnel must carry out inspection and maintenance according to the maintenance and inspection report and fill in the report.

Warning Warning: If the maintenance procedures provided in this Manual are not timely or regularly implemented, death, serious injury or damage to the machine may happen.

- Timely label and remove the damaged or faulty machine.
- Before any operation, the damaged or faulty machine must be repaired in advance.
- All inspection records shall be kept more than three years.
- The machine without maintenance more than three months must accept quarterly inspection.
- Unless otherwise specified, the maintenance procedures shall be implemented according to the following provisions:
  Place the machine on a flat level surface;
  Let the platform in its loaded conditions;
  Turn the key switch to the "OFF" position and remove the key;
  Place the red emergency stop buttons on the platform controller and ground controller to the "OFF" position;
  Disconnect all AC power supply on the machine;
  Lock the tires.

Instructions

This part provides detailed procedures for regular maintenance and inspection, and each procedure includes descriptions, safety warnings and procedure instructions.

Symbol legends

Safety warning sign - used to indicate the presence of potential personal injury. All safety messages after this sign shall be followed to avoid personal injuries or death.

Danger Red sign - used to indicate the presence of emergency situations. Any disobedience will result in death or serious injuries.

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Caution Yellow sign not followed by a safety warning sign - used to indicate the presence of potential hazardous situation. Any disobedience will result in damage to properties.

Attention Green sign - used to prompt operation or maintenance information.

Maintain symbol legends

Attention The following symbols in this Manual are used to help understand the manual intentions. When one or more symbols appear before the maintenance procedure, it means as follows:


It indicates that tools are needed for performing this operation.


It indicates that new parts are needed for performing this operation


It indicates that the hydraulic motor must be stopped before performing this operation.


It indicates that the hydraulic motor must be started before performing this operation.


It indicates that the implementation of this operation must be subject to the supplier's approval.

Maintenance schedule

There are five types of inspection and maintenance compulsorily subject to the schedule: daily, quarterly, semi-annual, annual and biennial. Considering the repeated procedures, the "part of regular maintenance procedures" and "maintenance inspection report" can be divided into five sections - A, B, C, D and E. Follow the table below to determine the required procedure combinations for performance of regular inspection.

Inspection interval	Inspection procedure
Daily or every 8 hours	A
Quarterly or every 250 hours	A+B
Semi-annually or every 500 hours	A+B+C
Annually or every 1000 hours	A+B+C+D
Biennially or every 2000 hours	A+B+C+D+E

Maintenance inspection report

The maintenance inspection report contains the check list of each periodic inspection.

Replicate the maintenance inspection report for each test later on. The completed check lists shall be kept more than three years.

Pre-delivery inspection:

Attention

It is quite necessary to carry out preparatory work before delivery.

Before each delivery, this step must be performed, in order to discover whether there is any obvious mistake of the machine before use.

Damaged or faulty machines should not be used. If any machine is found damaged or abnormal, label and remove it immediately.

The machine must be repaired by qualified maintenance personnel in strict accordance with the maintenance manual.

Routine maintenance should be done by qualified operators according to the provisions of this Manual.

Instructions:

Use the operation manual of this machine.

The preparation work before delivery includes inspections, maintenance procedures and function tests before delivery.

Record the inspection results, if any inspection result is N, stop using the machine, repair and check the machine again, and mark it with R.

Notes:

Y - Yes, the machine is intact.

N - No, the machine is faulty.

R - Repaired, the machine has been repaired.

Preparation before delivery	Y	N	R
Inspection before delivery			
Maintenance procedures			
Function checks			

Model _____

S/N _____

Date _____

User _____

Verifier’s signature _____

Verifier’s post _____

Verifier’s unit _____

Maintenance log:

Model _____

S/N _____

Date _____

User _____

Verifier's signature _____

Verifier's post _____

Verifier's unit _____

Instructions:

Each inspection result should be recorded.

Inspection interval	Inspection procedure
Daily or every 8 hours	A
Quarterly or every 250 hours	A+B
Semi-annually or every 500 hours	A+B+C
Annually or every 1000 hours	A+B+C+D
Biennially or every 2000 hours	A+B+C+D+E

Check according to the steps in this Chapter to familiarize the inspection procedures.

Record the inspection results, and if any inspection result is N, stop using the machine, repair and check the machine again, and mark it with R.

Notes:

Y - Yes, the machine is intact.

N - No, the machine is faulty.

R - Repaired, the machine has been repaired.

Record form A	Y	N	R
A-1 Check each manual			
A-2 Check each label			
A-3 Check the damaged, loose or missing parts			
A-4 Check the hydraulic oil level			
A-5 Check the hydraulic oil leakage			
A-6 Check the functions			
Check after 40 hours' work of a new vehicle			
A-7 Perform maintenance in 30 days			
Perform inspection in 125 hours			
A-8 Check the battery			

Record form B	Y	N	R
B-1 Check the electric wire			
B-2 Check the wheel rims and tires (including mounting nuts)			
B-3 Test the key switch			
B-4 Test the emergency stop button			
B-5 Test the horn			
B-6 Test the brake devices			
B-7 Test the driving speed (with the platform lifted)			
B-8 Test the driving speed (with the platform fully stowed)			
B-9 Test the lifting or falling speed			
B-10 Check the hydraulic oil			
B-11 Check the ventilation system of the hydraulic oil tank			

Record form C	Y	N	R
C-1 Replace the vent filter of the hydraulic oil tank			
C-2 Check the weighing system of the platform (optional)			

Record form D	Y	N	R
D-1 Check the mounting bearings of the scissor boom			
D-2 Check the chassis sliders			
D-3 Replace the return oil filter of the hydraulic oil			

Record form E	Y	N	R
E-1 Check and replace the hydraulic oil			

Procedure A

A-1 Check each manual

It is very important for safe operation to keep the operation manual and maintenance manual at a proper place, so such manuals should be stored in the box on the platform special for manual storage. Illegible or defective manuals cannot provide necessary security and operation information for safe operation.

1. Check and confirm that the storage box is appropriately mounted on the platform.
2. Check and confirm that the operation manual and maintenance manual are kept intact in the storage box on the platform.
3. Check the manual pages and confirm that the words are clear and intact.
4. Put the manual back into the storage box after use.

Attention If any manual needs to be replaced, please contact Hunan Sinoboom Heavy Industry Co., ltd.

A-2 Check each label

That all security and suggestive labels are well maintained is crucial to the safe operation of the machine. The labels will remind the operator of possible dangers during operations, and at the same time, they will provide users with information about operation and maintenance. Illegible labels cannot correctly instruct operators and may cause unsafe operations.

1. Refer to the labels in "GTJZ0408S&GTJZ0608S Operation Manual" and use the label list and chart to correctly locate each label.
2. Check whether all labels are clear with no damage, and timely replace any damaged or illegible label.

Attention If any label needs to be replaced, please contact Hunan Sinoboom Heavy Industry Co., ltd.

A-3 Check the damaged, loose or missing parts

Daily checks of the machine conditions are crucial to safe and reliable operation of the machine. If any damaged, loose or missing part is not found or maintained in time, unsafe operation may occur.

Observe the whole machine to see if there is any part damaged, missing or improperly installed, with check contents included as follows:

- ✧ Electrical components, wiring and cables
- ✧ Hydraulic power unit, oil tank, joint, hose, hydraulic cylinder and valve block
- ✧ Batteries and connections
- ✧ Drive motor and brake devices
- ✧ Non-slip paste
- ✧ Tires
- ✧ Power unit
- ✧ Limit switch and horn
- ✧ Alarm and indicator lamp (if equipped)
- ✧ Nuts, bolts and other fasteners
- ✧ Platform access middle hurdle or door
- ✧ Platform access chains
- ✧ Pit protection device
- ✧ Platform extensions
- ✧ Scissor boom pin shaft and fixed fasteners
- ✧ Platform control lever

A-4 Check the hydraulic oil level

It is very important for normal operation of the machine to have the hydraulic oil kept at an appropriate level. Inappropriate hydraulic oil level may damage the hydraulic components. Daily check can make the observer understand the oil level changes and find the hydraulic system problems.

Note: Open the revolving door on the chassis left to execute this procedure.

Observe the liquidometer on the side panel of the hydraulic oil tank.

Attention The hydraulic oil level should be up to the "FULL" level at the top of the liquidometer.

A-5 Check the hydraulic oil leakage

It is very important for safe operation and normal work of the machine to prevent leakage of the hydraulic oil. If any existing leakage is not found, dangerous situations may occur to weaken the machine performance and damage its parts.

Observe whether there is any hydraulic oil spill, drop or residue on or around the following parts:

Hydraulic oil tank - filter, pipe joint, oil tube, power unit
All hydraulic cylinders, pumps and manual release valves
All hydraulic valve blocks
The machine around

A-6 Function test

Check the platform and ground controllers

It is very important for safe operation of the machine to test its functions and the emergency stop switch. If any function can not work properly or the emergency stop switch can not stop all functions, unsafe conditions may happen. Any function should be working stably and reliably with no shake, violent and abnormal noise.

Detect the ground controllers

1. Switch the key switch to its ground control.
2. Turn all functional switches on the ground control panel.

Result: All the functions should be normally executed. (For the specific function instructions, refer to the “Operation Manual”)

Detect the platform controller

1. Switch the key switch to its platform control.
2. Ty to press all functional control handles of the machine and turn the switch or button.

Result: All the functions should be normally executed. (For the specific function instructions, refer to the “Operation Manual”)

A-7 Perform maintenance in 30 days

The 30 days’ maintenance refers to the one-time maintenance performed after the new equipment has been used for 30 days or 40 hours. After completion of the maintenance, the relevant maintenance should be implemented in accordance with the normal interval of time.

Implement according to the following procedures:

B-1 Replace the element of the return oil filter.
B-3 Check the tightening torque of the tire fastening nuts.

A-8 Check the battery

Attention This procedure shall be implemented once every 125 hours.

Good battery conditions are very important for equipment normal and safe operation. Inappropriate electrolyte level, cable damage and loose connection may result in equipment damage and dangerous situations. The 24V working voltage of the machine is provided by four 6V batteries in series.

Warning Any contact with the battery charger wire may result in death or serious injury. Remove all earrings, watches and other jewelry.

The battery contains acidic liquid, so you should avoid acidic liquid leakage and contact. Use soda water to neutralize the spilled acid liquid.

Attention Before this operation is performed, the battery must be charged at first.

Attention In order to judge the battery status more accurately, please fully charge the battery and keep it idle for 24 hours.

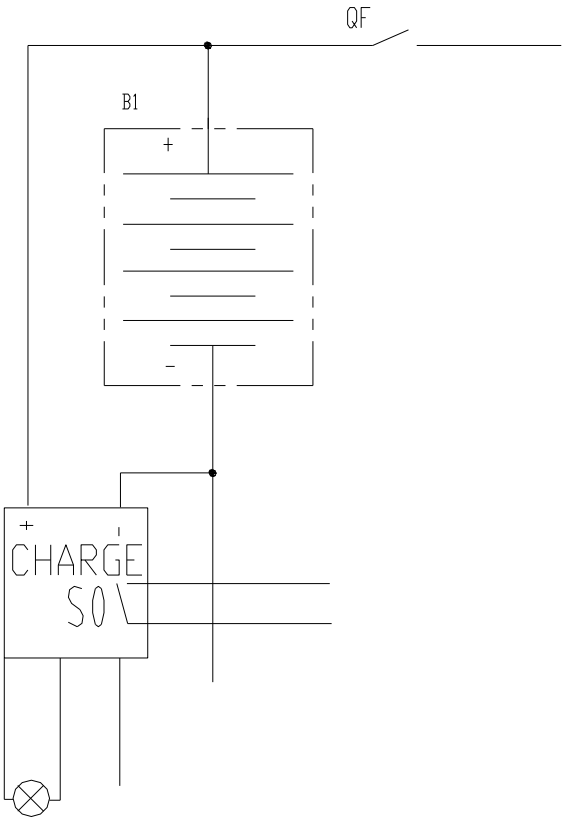
1. Do wear protective clothing and protective goggles.
2. Ensure that the battery cable connectors are not corroded.
3. Ensure that the battery is firmly installed with its cables reliably connected.
4. Open the exhaust covers of the two groups of batteries and use a fluid densimeter to check the electrolyte density of each group of batteries.

Result: If any group of battery has its electrolyte density less than 1.026, it must be replaced.

5. Check the electrolyte level. If necessary, add distilled water from the water inlet at the top of the battery. Take care not to spill any water.
6. Install the battery drain cover in place.
7. Check the battery line connection and ensure the lines are properly connected.
8. Connect the charging plug to a 220V socket.

Result: The battery can be normally charged with the charging indicator light up.

Attention When the level is about 20%, the battery must be charged. Never have the battery exhausted before charged.

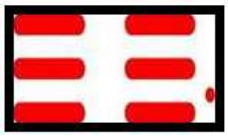
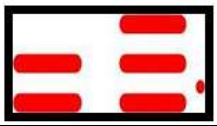
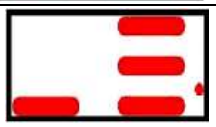
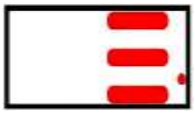


S0 Charger

QF Power-off switch

Charging indicator

Description of battery power:

Display	Proportion	Description
	90-100%	Full power
	70%	70% power
	50%	50% power
	30%	30% power
	20%	Battery in low power must charge immediately
	10%	Battery in low power will slow the machine's movements.

wire:

Battery wiring harness

Charger wire harness

Scissor boom wiring harness

Power unit wire harness

Ground controller wiring box

Platform controller wiring box

2. Check whether any movable joint is loose and confirm whether there is any sensor circuit damaged.

Procedure B

B-1 Check the electric wire

The electric wire maintenance is very important for normal and safe operation of electrical machines. If any burned, abraded, corroded or broken wire is not timely found and replaced, unsafe operation or serious injury may occur.

Warning Contact with live wires may cause death or serious injury. Remove all earrings, watches and other jewelry.

1. Check the following areas to see if there is any burned, abraded, corroded or loose

B-2 Check the wheel rims and tires (including mounting nuts)

Good maintenance of the wheel rims and tires is crucial for normal and safe performance. If any wheel rim or tire has failed, it may result in overturning of the machine, and if it is not timely detected or maintained, damages to components may happen.

The machine uses solid tires, with no inflation needed.

1. Check to make sure that all tires are free of cuts, cracks, punctures and other abnormal wears.
2. Check whether any rim is suffering from

damages, buckling deformation and welding cracks.
3. Remove the cotter pin and check whether the mounting nuts are tightened at a correct tightening torque.

Attention While checking the fastening nuts, you often need to change the cotter pin.

4. Replace the cotter pin and bend it to the locking position.

B-3 Test the key switch

Flexible use of the key switch is very important for safety operation of the machine. The key switch failure may cause dangerous situations.

The ground control panel of the machine is equipped with a key switch used to control the power on / off and achieve control options of the platform and chassis.

Attention To perform this check, please operate on the ground, but never stand on the platform.

1. Release the emergency stop switch for the platform and chassis.
2. Switch the key switch to the position for chassis control.

Result: The power supply indicator will light up and the platform control will become invalid.

3. Switch the key switch to the position for platform control.

Result: The power supply indicator will light up and the chassis control will become invalid.

4. Turn the switch to the neutral position ("OFF").

Result: All actions do not function.

B-4 Test the emergency stop button

The function of the emergency stop button is crucial for safe operation of the machine. If the emergency stop button has failed, you can not shut down the hydraulic pump and stop the machine functions in case of emergency, which will then endanger the platform and ground crew.

Attention Selection and operation of the ground controller is prior to the platform controller (including the emergency stop button).

1. Release the platform and chassis emergency stop switch, and switch the key switch to the position for ground control.
2. Press the emergency stop switch on the ground operation panel.

Result: Any action of the machine cannot be carried out.

3. Release the platform and chassis emergency stop switch, and switch the key switch to the position for platform control.
4. Press the emergency stop switch on the platform.

Result: Any action of the machine cannot be

carried out.

Attention The ground and platform emergency stop switch can stop all actions of the machine, even if the key switch is turned to the platform controller.

B-5 Test the horn

The horn function is crucial for safe operation of the machine. Press the horn button on the platform controller and it will sound on the chassis to warn the ground staff. If the horn has failed, the operator will not be able to warn the ground crew of dangers.

1. Release the platform and chassis emergency stop switch, and switch the key switch to the position for platform control.
2. Press the horn button on the platform controller.

Result: The horn will sound.

B-6 Test the brake devices

The correct brake devices are crucial for normal and safe operation of the machine.
It requires that the brakes should be smooth, with no impact or noise.
This machine brakes by means of its rear wheel brakes.

Attention The vehicle is idling to stop.

1. Switch the key switch to the position for platform control.
2. Operate the handle to have the vehicle running at its maximum speed on an allowable maximum slope (30%), and then release the handle as quickly as possible.
3. Measure the vehicle braking distance. The braking distance should be less than 0.6 meters as required.

Attention The vehicle must be able to stop on the maximum slope it can climb up (30%) and not to fall.

4. Let the vehicle fully rising with load and driving on a flat surface at its allowable maximum speed, then quickly release the handle, and the vehicle stopping distance should be less than 0.2 meters.

B-7 Test the driving speed (with the platform lifted)

Reasonable driving speed is very important for safe operation of the machine. The driving function should be able to respond to the operator quickly and smoothly, with no shaking, impact or abnormal noise.

Attention The machine is parked on a flat and horizontal solid ground free of obstacles.

1. Mark two lines on the ground about 12 meters each from the starting point to the end point.
2. Switch the key switch to the platform control.
3. Have the platform rising about 2m above the ground, with the pit protection device enabled.
4. Operate the control handle to drive the vehicle from the starting point to the end.

Result: Driving speed of the vehicle (0.8km/h)

5. Operate the high and low speed selector switch once (rabbit symbol), push the control handle to its maximum position, and drive the vehicle from the starting point to the end.

Result: Low-speed driving (0.8km/h)

B-8 Test the driving speed (with the platform fully stowed)

Reasonable driving speed is very important for safe operation of the machine. The driving function should be able to respond to the operator quickly and smoothly, with no shaking, impact or abnormal noise.

Attention The machine is parked on a flat and horizontal solid ground free of obstacles.

1. Mark two lines on the ground about 12 meters each from the starting point to the end point.
2. Switch the key switch to the platform control.
3. Have the platform fully contracted, with the pit protection device retracted.
4. Operate the control handle to drive the vehicle from the starting point to the end.

Result: Low-speed driving (2km/h)

5. Operate the high and low speed selector switch once (rabbit symbol), push the control handle to its maximum position, and drive the vehicle from the starting point to the end.

Result: High-speed driving (4km/h)

B-9 Test the lifting or falling speed

Appropriate rising or falling speed is crucial for safe operation of the machine. The control and execution should be able to respond to the operator quickly and smoothly, with no shaking, impact or abnormal noise.

Attention Choose a solid and horizontal test area free from obstructions.

1. Release the emergency stop switch and switch it to the chassis control position.
2. Turn the platform rise / fall switch to its rise position until the platform has risen up to its maximum height.

Results:
GTJZ0408S: The platform rise time should be controlled within 18s.
GTJZ0608S: The platform rise time should be controlled within 17s.

3. Turn the platform rise / fall switch to its fall position until the platform has fallen down to its minimum height.

Results:
GTJZ0408S: The platform fall time should be controlled within 31s.
GTJZ0608S: The platform fall time should be controlled within 27s.

B-10 Check the hydraulic oil

It is very important to check and replace the hydraulic oil for normal operation and longer service life of the machine. Dirty hydraulic oil may have the machine unable to normally implement its actions, and continuous use of such oil may cause damages to hydraulic parts. Any unusually dirty working environment requires more frequent replacement of the hydraulic oil.

Attention Before replaced, the hydraulic oil should be tested to confirm whether it needs to be replaced.

The procedures for replacement refer to Procedure E-1.

B-11 Check the ventilation system of the hydraulic oil tank

Good ventilation of the hydraulic oil tank cover is crucial for normal work and longer service life of the hydraulic pump. Dirty or plugged hydraulic oil tank breather filter may have the hydraulic pump unable to work normally, and continuous use may cause damages to the components. Any unusually dirty working environment requires more frequent checks of the hydraulic oil tank breather filter.

Attention Implement this procedure when the hydraulic motor is stopped.

1. Remove the hydraulic oil vent filter.
2. Check its ventilation hole.

Result: The air should be smoothly passing through the ventilation filter.
If the air can not smoothly pass through the vent filter, the filter should be cleaned as follows.

3. Use any neutral cleaning solvent to clean the vent filter and then use an air gun to blow it dry. Repeat Step 2.
4. Mount the vent filter on the oil tank cover.

Procedure C

C-1 Replace the vent filter of the hydraulic oil tank

It is very important to replace the hydraulic oil tank air filter for normal operation and longer service life of the machine. A dirty or clogged filter may have the machine unable to work properly, and continuous use of such filter may cause damages to components. Any unusually dirty working environment requires more frequent replacement of the filter.

1. Unscrew the filter.
2. Install a new air filter.

C-2 Check the weighing system of the platform (optional)

Attention The specification of Hunan Sinoboom Heavy Industry Co., Ltd. requires performance of this procedure once every 500 hours or 6 months.

Preparations before test:
Park the vehicle on a flat and solid ground. The bearings and slideways are well lubricated.
Control the platform to rise and fall for two times on the ground, and there should be no obvious shaking or abnormality.

GTJZ0408S

The scissor boom is fully retracted and lowered to the minimum height. Add a load of 280 kg onto the platform.
Result: When the weight is less than 280 kg, the platform can rise to the top normally.
The scissor boom is fully retracted and lowered to the minimum height. Add a load of 335 kg onto the platform.
Result: When the weight is 335 kg, the platform can rise no more than 2 meters.

GTJZGTJZ0608S

The scissor boom is fully retracted and lowered to the minimum height. Add a load of 230 kg onto the platform.
Result: When the weight is less than 230 kg, the platform can rise to the top normally.
The scissor boom is fully retracted and lowered to the minimum height. Add a load of 275 kg onto the platform.
Result: When the weight is 275 kg, the platform can rise no more than 2.8 meters.

Procedure D

D-1 Check the mounting bearings of the scissor boom

Good maintenance of the scissor boom mounting bearings is crucial to safe operation of the machine. Continuous use of any old bearing may cause damages to components and unsafe operation.

Attention This operation shall not be implemented before the scissor boom is fully retracted and lowered to its minimum height.

1. Use a plug gauge to measure the shaft and sleeve clearance.
2. The sleeve must be replaced if its measurement clearance is greater than 0.1mm or it is damaged.

D-2 Check the chassis sliders

Good maintenance of the sliders is crucial to safe operation of the machine. The chassis sliders are located at the friction pairs formed on the U-bar surface. Inappropriate sliders or continuous use of old sliders may cause damages to components and unsafe operation.

This operation shall not be implemented before the scissor boom is fully retracted and lowered to its minimum height.

1. Measure the distance between each slider bottom surface and the mounting shaft center.
2. Measure the distance between the fixed end pivot and the bottom mounting plate.
3. Compare the difference between the two measurement values of distance.

Result: When the thickness difference is greater than 2mm, the slider should be replaced.

D-3 Replace the return oil filter of the hydraulic oil tank

It is very important to replace the return oil filter of the hydraulic oil tank for normal operation and longer service life of the machine. A dirty or clogged filter may have the machine unable to work properly, and continuous use of such filter may cause damages to components. Any unusually dirty working environment requires more frequent replacement of the filter.

Caution Take care of the hot oil. Any contact with the hot oil may cause severe burns.

Attention Implement this procedure when the hydraulic pump has been shut down.

1. Open the chassis left side door and find the return oil filter.
2. Place a suitable container under the return oil filter of the hydraulic oil tank.
3. Use a special tool to unscrew the return oil filter.
4. Coat the new return oil filter gasket with a thin layer of oil film.
5. Install the new return oil filter and use a special tool to tighten it.
6. Check the filter and related components to ensure no leakage.

Procedure E

E-1 Check and replace the hydraulic oil

It is very important to check and replace the hydraulic oil for normal operation and longer service life of the machine. Dirty hydraulic oil or filter may have the machine unable to work properly, and continuous use of such filter may cause damages to components. Any unusually dirty working environment requires more frequent replacement of the hydraulic oil.

Attention Before replaced, hydraulic oil should be tested to confirm whether it needs to be replaced. If unqualified after testing, the hydraulic oil should be replaced.

Attention Implement this procedure when the platform is in its fully retracted position.

1. Open the chassis right door and remove the battery connecting wire.

Warning Risk of electric shock: Contact with hot or live wire may cause death or serious injury. Remove all earrings, watches and other jewelry.

2. Remove the oil drain plug to drain the oil into an appropriate container. The hydraulic oil tank is 23L.

Warning Physical damage warning: The spraying hydraulic oil will infiltrate or burn your skin. Slowly loosen the hydraulic connection device and never let the oil spray.

3. Disconnect and plug the oil suction pipe.
4. Disconnect and plug the return oil pipe at the return oil filter.
5. Remove the fastening bolts of the hydraulic oil tank.
6. Remove the oil tank from the machine.
7. Remove the return oil filter from the hydraulic oil tank.
8. Remove the oil suction filter from the oil tank and use appropriate solvent to clean it.
9. Use appropriate solvent to rinse the oil tank inside. And dry the hydraulic oil tank in the air.
10. Mount the hydraulic oil tank onto the machine.
11. Mount the fastening bolts of the oil tank.
12. Mount the return oil pipe onto the return oil filter.

Repair procedures

Observe and obey:

The repair procedures should be implemented by qualified personnel after professional repair training, any damaged or faulty machine shall be timely labeled and removed, and all faults shall be eliminated before operation of the machine.

Before starting any repair:

Read, understand and observe the safety regulations and operating instructions in the GTJZ0408S&GTJZ0608S Operating Manual.

Prepare all required tools and parts.

Thoroughly read the procedures and instruction attachments, and any shortcut behavior may cause dangerous situation.

Unless otherwise stated, the repair procedures of this machine shall be implemented according to the following tips.

1. Park the machine on a flat level surface;
2. Have the platform in the loading position;
3. Turn the key switch to the "OFF" position and remove the key;
4. Lock the wheels.

Instructions

Most procedures in this section should only be carried out by special repair service centers. After the fault has been detected, appropriate repair procedures should be selected.

Symbol legend

	Safety warning sign - used to indicate the presence of potential personal injury. All safety messages after this sign shall be followed to avoid personal injuries or death.
Danger	Red sign - used to indicate the presence of emergency situations. Any disobedience will result in death or serious injuries.
Warning	Orange sign - used to indicate the presence of potential hazardous situations. Any disobedience will result in death or serious injuries.
Caution	Yellow sign followed by a safety warning sign - used to indicate the presence of potential hazardous situation. Any disobedience will result in slight or moderate personnel injuries.
Caution	Yellow sign not followed by a safety warning sign - used to indicate the presence of potential hazardous situation. Any disobedience will result in damage to properties.
Attention	Green sign - used to prompt operation or maintenance information.

Platform components

1-1 How to remove the platform electronic control box

Warning Contact with live circuit may cause death or serious injury. Remove all earrings, watches and other jewelry.

Attention Perform this operation only when the scissor boom has been fully retracted and lowered to its minimum height.

1. Cut off the external power supply, and set the emergency stop switches of the platform and ground controllers at the "OFF" position.
2. Find out the cable connected to the bottom of the control box.
3. Disconnect the cable from the bottom of the control box and mark it.
4. Remove the platform control box assembly and mounting bracket.
5. Remove the platform control box assembly from the platform.

1-2 How to remove the platform

1. Let the platform rise about 1 meter.
2. Use appropriate support equipment to support the platform.
3. Remove the catch bolts of the platform and the scissor hinged shaft, and remove the catch bolts of the slider fixing shaft in the slideway at the bottom of the platform.
4. Lower the platform down to its loading position, cut off external power supply, set the emergency stop switches of the platform and ground control panels at the "OFF" position and find out the cable connected to the bottom of the platform control box.
5. Disconnect the cable from the bottom of the control box. Dismount the platform control box assembly and the mounting bracket, and remove the control cable away from the working platform.
6. Pull out the four pin shafts to fix the platform and slider.
7. Remove the platform.

1-3 How to remove the extension platform

1. Remove the platform referring to 1-2.
2. Loosen the fastening bolts of all guard rails, remove the fence, and put it aside.
3. Loosen the bolts of the fastening rollers at both sides of the extension platform.
4. Loosen the fastening bolts of the baffle on the fixed platform, and dismount the baffle.
5. Lift the extension platform from both ends of the extension platform and put it aside.

Scissor boom part

2-1 How to dismount the scissor boom as a whole

Attention Perform this operation only when the scissor boom has been fully retracted and lowered to its minimum height.

1. Remove the platform and its electrical equipment (see the part for platform).
2. Disconnect the circuit and oil tube on the chassis with the scissor boom.

Attention When dismounting the hose and pipe joints, you must dismount the O seal ring at the end of the hose or pipe joint, and make relevant marks.

3. Use a travelling crane to fix the scissor boom.
4. Unscrew the fastening bolts of the fixing stop pin.
5. Remove the stop pin.
6. Use a brass rod or other auxiliary tools to force the pin shaft out.

⚠ Caution Take care not to hurt your hand.

7. Move the travelling crane transversely to push the slider out of the slideway.
8. Dismount the scissor boom as a whole.

2-2 How to remove the lifting cylinder

Attention Hot or spraying hydraulic oil may cause harm to human body. So before dismounting the joint of the hydraulic cylinder, you should first confirm that the hydraulic oil has cooled.

1. Use a travelling crane to fix the scissor boom and lift it until the safety bar can be placed underneath.
2. Use the safety bar to support the boom.
3. Label, disconnect and plug the hose and pipe joints on the hydraulic oil cylinder.
4. Use special tools to unscrew the fastening bolts at the guide sleeve of the cylinder piston rod.
5. Remove the spring washer.
6. Remove the pin shaft.

⚠ Caution Take care to prevent the cylinder falling.

7. Use special tools to unscrew the fastening nuts at the joint between the cylinder end and the scissor boom.
8. Remove the bolts.
9. Use a brass rod or other auxiliary tools to force the pin shaft out.
10. Carefully pull out the cylinder.

Chassis parts

3-1 How to remove the arrester brake

The arrester brake is to brake and fix the rear wheels, so before dismounting the brake, fix the equipment onto an appropriate bracket or place a competent jack under the chassis platform.

Attention Note: While mounting hoses and pipe joints removed, you should follow the prescribed torque. The cotter pin removed can not be used repeatedly, and a new one must be used.

1. Remove the rear wheel cotter pin (which can not be reused).
2. Remove the slotted nuts for tire fastening and dismount the rear wheel engaged onto the arrester brake.
3. Label, disconnect and plug the hose on the arrester brake device, and plug the pipe joint on the arrester brake device.
4. Place the hose aside.
5. Loosen the nuts to connect the arrester brake and the chassis.
6. Remove the nuts.
7. Remove the fastening bolts of the arrester brake.
8. Remove the arrester brake.

3-2 How to remove the drive motor

The drive motor is to drive and fix the front wheels, so before dismounting the motor, fix the equipment onto an appropriate bracket or place a competent jack under the chassis platform.

Attention Note: While mounting hoses and pipe joints removed, you should follow the prescribed torque. The cotter pin removed can not be used repeatedly, and a new one must be used.

1. Remove the front wheel cotter pin (which can not be reused).
2. Remove the slotted nuts for tire fastening and dismount the front wheel engaged onto the drive motor shaft.
3. Label, disconnect and plug the hose on the arrester brake device, and plug the pipe joint on the drive motor.
4. Place the hose aside.
5. Loosen the nuts to connect the drive motor and the chassis.
6. Remove the nuts.
7. Remove the fastening bolts of the drive motor.
8. Remove the drive motor.

3-3 How to remove the battery

Attention Before removing the battery, you must cut off the charger power supply and the complete vehicle power supply.

1. Open the right door.
2. Label and disconnect the electric wires connected to the battery.
3. Remove the battery.

3-4 How to remove the hydraulic valve block

⚠ Caution Hot or spraying hydraulic oil may cause harm to human body. So before dismounting the hydraulic valve block, you should first confirm that the hydraulic oil has cooled.

Attention Note: While mounting the hoses and pipe joints removed, you should follow the prescribed torque, referring to Chapter 2 - Specifications of hose and joint torques.

1. Open the door at the side with the valve block mounted.
2. Label, disconnect and plug the hose and pipe joints on the valve block.
3. Unscrew the fastening screws mounted at the bottom of the valve block.
4. Remove the valve block.

3-5 How to remove the hydraulic power unit

Caution Hot or spraying hydraulic oil may cause harm to human body. So before dismounting the hydraulic pump, you should first confirm that the hydraulic oil has cooled.

Attention Note: While mounting the hoses and pipe joints removed, you should follow the prescribed torque, referring to Chapter 2 - Specifications of hose and joint torques.

1. Open the chassis left door at the side with the power unit mounted.
2. Label and disconnect the cables on the power unit.
3. Label, disconnect and plug the hose and pipe joints on the hydraulic pump.
4. Unscrew the fastening bolts mounted at the bottom of the power unit.
5. Remove the power unit.

3-6 How to remove the hydraulic oil tank

Caution Hot or spraying hydraulic oil may cause harm to human body. So before dismounting the hydraulic oil tank, you should first confirm that the hydraulic oil has cooled.

Attention Note: While mounting the hoses and pipe joints removed, you should follow the prescribed torque, referring to Chapter 2 - Specifications of hose and joint torques.

1. Open the revolving door at the chassis left.
2. Remove the oil drain plug from the hydraulic oil tank and discharge all the oil into a suitable container.
3. Label, disconnect and plug the hose and pipe joints on the hydraulic oil tank.
4. Unscrew the fastening bolts mounted at the bottom of the hydraulic oil tank.
5. Remove the fastening bolts.
6. Remove the hydraulic oil tank.

3-7 How to remove the front wheel steering cylinder

Attention Note: While mounting the hoses and pipe joints removed, you should follow the prescribed torque, referring to Chapter 2 - Specifications of hose and joint torques.

1. Label, disconnect and plug the hose and pipe joints on the steering cylinder.
2. Remove the nuts and gaskets to connect the steering connecting rod and the front wheel bracket.
3. Unscrew the fastening bolts at the upper part of the steering cylinder.
4. Remove the steering cylinder.

3-8 How to remove the front wheel bracket

Attention Note: While mounting the hoses and pipe joints removed, you should follow the prescribed torque, referring to Chapter 2 - Specifications of hose and joint torques.

Before dismounting the front wheel bracket, fix the equipment onto an appropriate bracket or place a competent jack under the chassis platform.

1. Label, disconnect and plug the hose and pipe joints on the hydraulic motor.
2. Remove the nuts and gaskets connected with the front wheel steering connecting rod.
3. Unscrew the fastening bolts of the front wheel bracket.
4. Remove the front wheel bracket.

Hydraulic system

4-1 Functional pump detection

The pump and motor are connected to form a hydraulic power unit.

How to check the hydraulic pump

Attention The hoses and joints removed must be installed according to the prescribed torque. Refer to Chapter 2 - Specifications of hose and joint torques.

1. Label and plug the oil outlet hose disconnected from the hydraulic pump.

⚠ Caution Risk of bodily injuries - The spraying oil may penetrate or burn your skin, so slowly loosen the hydraulic connections to relieve the oil pressure slowly. Never have the oil spraying out.

2. Connect a 0-35MPa pressure gauge to the hydraulic pump outlet.
3. Turn the key switch to its ground control position, and screw out the emergency stop switch for ground and platform control.
4. Let the ground controller drive the "Scissor Fork Up" button.

Correct result: The pressure gauge reading is 24.8MPa, with normal emergency stop and pump functions.
Incorrect result: The pressure value is less than 24.8MPa, and the pump needs maintenance or replacement.

⚠ Caution Caution: risk of part damages – There is no relief valve installed on the pump, and if the pressure is more than 24.8MPa, the pump may be damaged. Start the pump in a very short time interval and confirm the reading. Don't let the pump overloaded.

5. Remove the pressure gauge and connect the hose according to the prescribed torque.

⚠ Caution Risk of bodily injuries - The hot hydraulic oil may penetrate or burn your skin, so slowly loosen the hydraulic connections to relieve the oil pressure slowly. Never have the oil spraying out.

4-2 How to remove the hydraulic pump

Attention While removing the hoses and joints, you must replace the O-shaped ring and complete installation according to the prescribed torque. Refer to Chapter 2 - Specifications of hose and joint torques.

1. Disconnect the power supply.

⚠ Caution Risk of electric shock - Contact with live wires may cause death or serious injury. Remove all earrings, watches and other jewelry.

2. Label and loosen the cables on the drive motor.
3. Label, disconnect and plug the hose on the pump, and plug the connector on the pump.
4. Remove the mounting bolts of the power unit, and dismount the power unit.
5. Remove the pump mounting bolts and carefully dismount the pump.

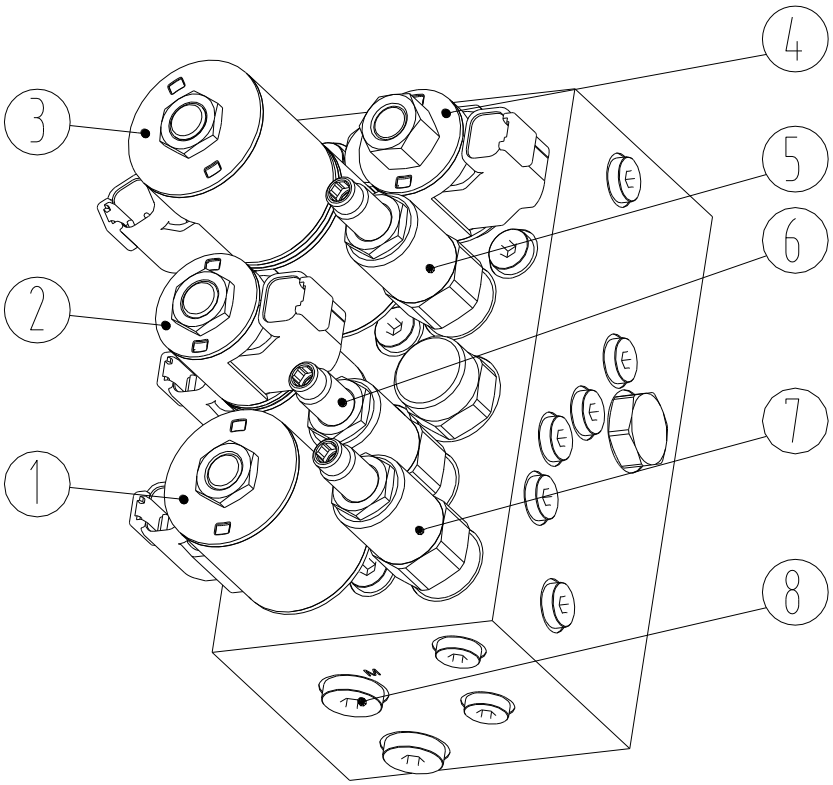
4-3 Platform control valve block

How to install the cartridge valve

1. Dip the valve into clean oil to lubricate its O seal ring.
2. Screw in the cartridge valve according to the specified torque until the O seal ring contacts with the valve body.
3. If necessary, install the valve solenoid coil onto the valve rod, mount the coil nut in place and tighten it according to the specified torque.

Name, position, function and torque specification of each valve

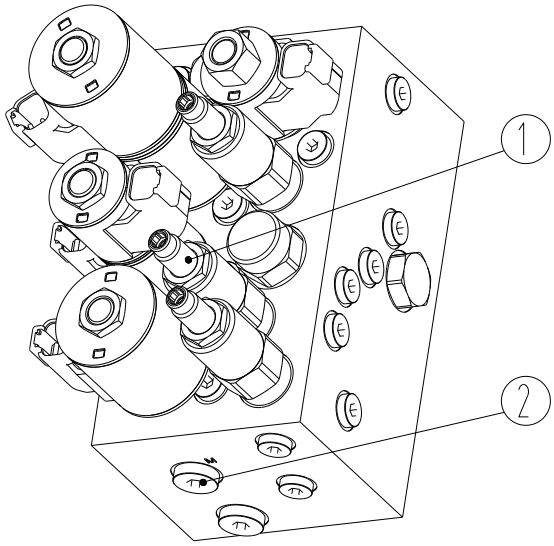
S/N ..... Name ..... Function..... Torque
1 ..... 2-position 4-way solenoid valve .....Platform Up/Down..... 34 Nm
2 ..... 3-position 4-way solenoid valve ..... Steering..... 34 Nm
3 ..... 3-position 4-way solenoid valve .....Forward and backward..... 34 Nm
4 ..... 2-position 2-way solenoid valve ..... Brake pressure relief..... 34 Nm
5 ..... Steering relief valve .....Steer pressure relief..... 24 Nm
6 ..... Main relief valve ..... System relief.....27Nm
7 .....Lifting relief valve .....Lifting relief..... 27 Nm
8 ..... Pressure test joint ..... Pressure test



How to adjust the system relief valve

Attention Make sure that the hydraulic oil level is at the "Full" mark on the oil tank.

1. Find the right place of the system relief valve on the functional valve.
2. Connect a 0-35MPa pressure gauge to the pressure test point (M) on the main relief valve.



1. Main relief valve
2. Pressure test port

3. Push against the two front wheels (drive wheels) at the ends of the steering shaft.
4. Take down the platform controller from the platform and operate it on the ground.

Attention Use the platform controller to implement this step on the ground but never stand on the platform.

5. Turn the key switch to the platform controller and unscrew the emergency stop switch button for ground and platform control.
6. Hold the handle, drive the control handle backward or forward, keep the handle at the position of its maximum walking speed, observe the pressure gauge reading, and record the reading. Refer to Part II Specifications.
7. Shut down the machine, use a wrench to lock the main relief valve, and unscrew the nuts.
8. Adjust its inner hexagon and rotate it clockwise to increase pressure while counterclockwise to decrease pressure.

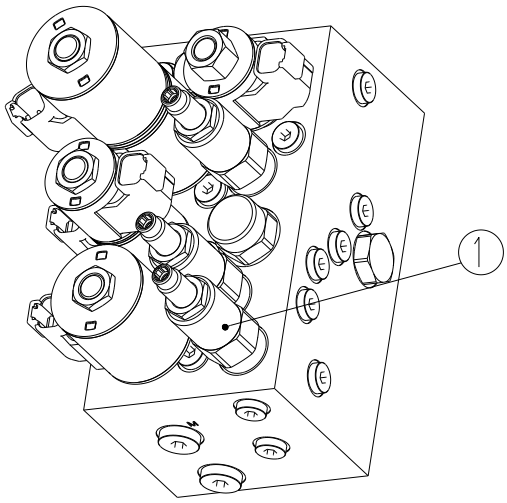
Warning Risk of rollover: Incorrect pressure adjustment may cause damages to the machine, resulting in death or serious injuries. Never have the adjustment pressure value higher than the specified value.

9. Install the nuts in place.
10. Repeat steps 5-7 to determine the pressure value.

How to adjust the platform rise relief valve

Attention Make sure that the hydraulic oil level is at the "Full" mark on the oil tank.

1. Adjust the system relief valve to the relief pressure as provided (The pressure has been well adjusted before installation of the valve block, so in general it needs no adjustment).
2. Place the maximum rated load on the platform and ensure that it is properly placed (See Part II - Specifications).
3. Turn the key switch to the position for ground control and unscrew the emergency stop switch button for ground and platform control.
4. Use a wrench to lock the lifting relief valve and unscrew the nuts.



1 Lifting relief valve

5. Shift the platform rise selection switch and clockwise adjust the inner hexagon inside until the platform rises to the highest position.
6. Let the platform fully retracted.
7. Add a weight (1.2 times of the rated load) onto the platform and place it properly.
8. Try to lift platform.
9. Correct result: The platform cannot rise.
10. Incorrect result: If the platform is still rising, adjust the inner hexagon counterclockwise until the platform cannot rise.
11. Install the nuts properly in place.
12. Remove the weight on the platform.
13. Have the platform rise to the highest position, and if the pump sucks air or the platform has failed to reach its highest position, add more hydraulic oil until the pump can work normally. Don't let any oil flow out of the tank.

Attention Risk of element damages - If the pump sucks air, don't always run the machine.

How to adjust the emergency fall handle

How to adjust the manual fall speed

1. Lift the platform to the height of 2.1-2.4m.
2. Hold up the safety bar.
3. Put down the platform and use the safety bar to support the scissor boom.

Warning Risk of crush: When the platform is lowering, put your hands far away from scissor boom.

4. Pull the emergency fall handle outward until you cannot further pull it.
5. Measure the distance from the end of the handle to the mounting nut.

Correct result: The measured distance should be no greater than 3mm.

If the result is correct, skip to Step 8.

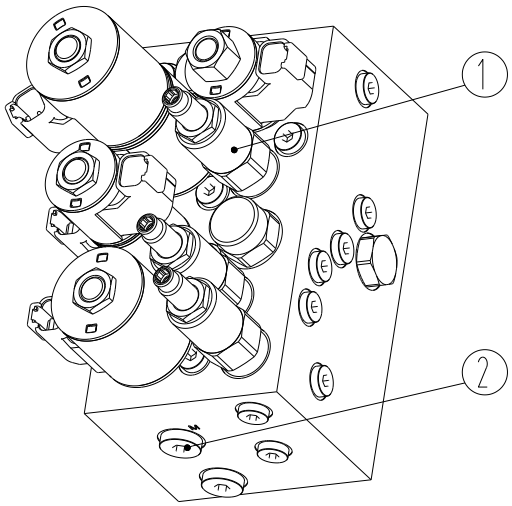
6. Adjust the mounting nuts.
7. Lift the platform and lower the safety bar.
8. Pull the handle outward and release it 2-3

times to ensure normal action.

How to adjust the steering relief valve

Attention Make sure that the hydraulic oil level is at the "Full" mark on the oil tank.

1. Find out the right position of the steering relief valve on the functional valve.
2. Connect a pressure gauge (M).



1 Steering relief valve
2 Pressure test port

3. Take down the platform controller from the platform and operate it on the ground.

Attention Use the platform controller to implement this step on the ground but never stand on the platform.

4. Turn the key switch to the platform controller and unscrew the emergency stop switch button for ground and platform control.
5. Hold the handle, drive the steering button to have the wheels turn to their right limits, hold the handle to see the reading, and write down the pressure value. (See Part II - Specifications)
6. Operate the handle, have the wheels turn to their left limits, hold the handle to see readings of the pressure gauge.
7. Shut down the machine, and unscrew the nuts of the steering relief valve.
8. Adjust its inner hexagon and rotate it clockwise to increase pressure while counterclockwise to decrease pressure.

Attention Risk of element damages: Never have the pressure value of the adjusting valve higher than the specified value.

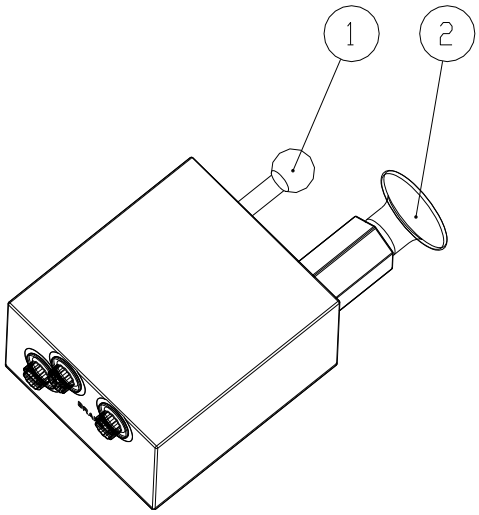
9. Install the nuts in place.
10. Repeat steps 5-6 to confirm the pressure value.

Manual brake release valve

The manual brake release valve is installed at the chassis rear. Press the reversing valve 1, repeatedly push and pull the manual pump, and then the brake can be relieved.

Diagram for manual brake release valve assembly

S/N	Name	Function
1	Reversing valve	Press it for reversing
2	Manual pump	Manual brake release



1 Reversing valve
2 Manual pump

Electrical system

Lead-acid battery use and maintenance manual

a. Required equipment

- Goggles and gloves
- Rubber handle wrench
- Baking soda
- Pole protector (i.e., vaseline, anti-corrosion sprays)
- Voltmeter (special for liquid-rich type / wet batteries, colloid and AGM batteries)
- Distilled water and purified water (i.e. Such water after deionization and reverse osmosis treatment)
- Discharge tester (if any)
- Hydrometer (special for liquid-rich type / wet batteries)

b. Notice to battery installation safety

- When dealing with any battery, do always wear protective clothing, gloves and goggles.
- Never smoke near any battery. Do keep the battery far from sparks, flames and metal objects.
- When connecting batteries, do use rubber handle wrenches.
- The electrolyte is the solution mixed with acid and water, so we should prevent it contaminating your skin.
- If your skin or eyes are contaminated with acid, immediately wash with clean water.
- Check whether the cables are firmly connected with the terminals, and too tight or too loose connection may have the pole damaged, melted or burned.
- To prevent short circuits, please do not put any object on the battery.
- The wet lead-acid batteries will release a small amount of gas during use and especially in the process of charging, so the battery must be charged at a well-ventilated place.
- Never add any acid to the battery.
- Please always have the battery vertically kept, and if it is placed sidelong or obliquely, the liquid in the battery may overflow.

c. Notice to battery connection

1. Battery cable and torque value

- The battery cable can connect the battery, electric equipment and charging system. We should use a soft cable to connect the battery, charging system and electric equipment. Incorrect connection may lead to poor performance or have the terminals damaged, melted or burned.
- Tightening torque of the cable fastening nuts: 9 ~ 11/Nm for M8 bolts, 18 ~ 23/ Nm for M10 bolts.
- Too tight connection with the terminals may lead to terminal damages, while too loose connection may have the terminals melted or burned.

⚠ Warning

A rubber handle wrench should be used to connect batteries.

2. Terminal protection

If the terminal is not kept clean and dry, it may be corroded continuously, so we can coat it with a thin layer of vaseline or apply a terminal protector to prevent corrosion.

d. Preventive maintenance

1. Check

- Check the battery appearance and keep the battery top and terminal connection clean and dry, free of dust and corrosion.

- If there is any liquid at the top of the battery, too much water may have been added in the battery.
- Check the connection of the battery cables and other sleeves, and tighten any loose connecter.
- Replace any damaged cable.
- Check whether all ventilation caps are correctly fixed on the battery.

2. Clean

- Use cloth or a brush, as well as baking soda and water mixture to clean the battery top, terminals and connections, but never have any cleaning solution into the battery.
- Clean it with water and dry it with cloth, and have it coated with a thin layer of vaseline or apply a terminal protector.
- Keep the battery peripherals clean and dry.

3. Add water

The battery needs additional water regularly subject to the battery use and working temperature and you should check the battery once every few weeks to determine the frequency to add water. Usually, the longer the battery is used, the more frequently it should be added with water.

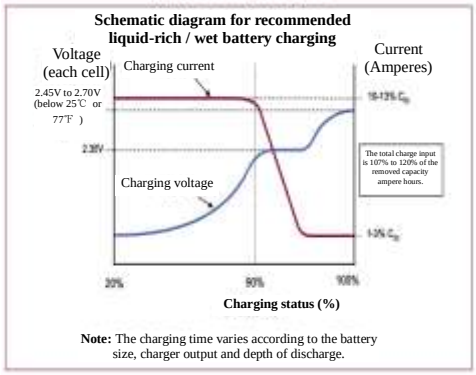
- Please have the battery fully charged before water is added. If any plate electrode is exposed, only the discharged or partially charged battery can be added with water, in this case, please add the water only just to have the plate electrode flooded, then charge the battery, and continue to add more water as follows.
- Remove the ventilation cap and have it upside down to prevent dust entering the ventilation cap downside, check the electrolyte level, if it is much higher than the plate electrode, it means no additional water is required, and if the electrolyte level has not yet flooded the plate electrode, please add some distilled water or deionized water.
- For standard batteries, please add water to the place 3mm lower the exhaust shaft (referring to the plastic cover in the vent hole)
- Please fix the vent cap on the battery again after water has been added.

e. Charge

Proper charging is a prerequisite for maximum battery performance. Both undercharge and overcharge can greatly shorten the battery life. Most chargers are automatic and preprogrammed and some chargers allow users to set the voltage and current values, with the information related to correct charging as follows:

- This equipment charger is automatic and preprogrammed, so users do not need to intervene in the charging process.
- The battery should be fully charged once used.
- The lead-acid battery has no memory effect, so it does need to be completely discharged before recharging.
- Please check the electrolyte level to ensure that the positive and negative electrode plates have been flooded in water before charging.
- Please check whether all vent caps have been correctly fixed on the battery before charging.
- The battery can only be charged in a well ventilated area.
- The battery will discharge gas (bubble) when it is going to be fully charged to ensure that the electrolyte could be fully mixed.
- Avoid recharging in any environment more than 49℃.

Here follows the diagram for state of the battery charging process.



Note: The charging time varies according to the battery size, charger output and depth of discharge.

f. Equilibrium

Equilibrium refers to excessive charging of the fully charged liquid-rich / wet batteries. It is recommended that only when the fully charged battery features a low proportion (lower than 1.25) or a large proportion range (larger than 0.030) can equilibrium be applied. Never perform equilibrium on any other battery. The conditions for equilibrium implementation are as follows:

- Confirm it is a liquid-rich / wet battery.
- Check the electrolyte level to ensure that the positive and negative electrode plates are flooded in water before charging.
- Before charging, confirm all vent caps have been properly fixed on the battery.
- Set the charger as its equilibrium model.
- The battery will discharge gas during the process of equilibrium.
- Measure its proportion once every hour and stop the equalization charging when the proportion is no longer increasing.

g. Storage

- Charge the battery before battery storage.
- Store the battery in a cool and dry place subject to no weather impact.
- Disconnect the power plug to eliminate the potential spurious load because of battery leakage.
- The battery will gradually discharge itself during storage. Monitor the proportion or voltage once every 4-6 weeks, with the charging state, proportion and open-circuit voltage as compared in the table below:

Percentage Charging	Proportion	Open-circuit voltage		
		Battery module	6V	12V
100	1.277	2.122	6.37	12.73
90	1.258	2.103	6.31	12.62
80	1.238	2.083	6.25	12.50
70	1.217	2.062	6.19	12.37
60	1.195	2.040	6.12	12.24
50	1.172	2.017	6.05	12.10
40	1.148	1.993	5.98	11.96
30	1.124	1.969	5.91	11.81
20	1.098	1.943	5.83	11.66
10	1.073	1.918	5.75	11.51

- The stored battery needs a quick charge when only 70% or less electricity is left.
- The battery should be recharged before use when removed from where it is kept.
- Storage in a thermal environment (higher than 32℃)

  Never have the battery directly exposed to

heat source during its storage period, because the battery itself will discharge faster under the high-temperature environment, and if the battery is stored in the hot summer, please monitor its proportion or voltage more frequently (about once every 2-4 weeks).

- Storage in a cold environment (lower than 0℃)

  Never have the battery stored wherever the temperature is expected to reach the freezing point. The battery may be frozen at a low temperature if not fully charged. It is very important to fully charge the battery if it is stored in the cold winter.

h. Troubleshooting

The following battery test steps are only used as the guidelines to determine whether the battery needs replacing.

① Voltage test in time of charging

- Disconnect and reconnect the DC plug to restart the charger.
- When charging the battery, please record the current during the last half hour's charging (if possible) and measure the battery pack voltage.
- If the current is below 5A at the end of charging and the battery pack voltage is higher than the following values: 56V for any 48V system; 28V for any 24V system; 14V for any 12V battery; 7V for any 6V battery; then please continue to charge. Otherwise, please check whether the charger output is correct and recharge the battery as required. If the battery pack voltage is still low, then the battery may have failed.
- When the battery is in its charging state, please measure its voltage. If any battery has its voltage lower than the following values: 7V for any 6V battery, the voltage difference between the battery and any other one in the battery pack is more than 0.5V; 14V for any 12V battery, the voltage difference between the battery and any other one in the battery pack is more than 1.0V, then it indicates that this battery may have failed.

② Proportion test

- Please fill and drain the hydrometer two or three times and then take one sample from the battery.
- Measure the proportion readings of all battery modules.
- When it is above 27℃, add 0.004 once 5℃ higher to correct the proportion readings, and when below 27℃, deduct 0.004 once 5℃ lower to correct the proportion readings.
- If each battery module in the battery pack is lower than 1.250, this battery pack may be insufficiently charged, and it needs recharging.
- If the proportion difference between any two battery modules in the battery pack is more than 0.050, please apply equilibrium to this battery pack.
- If the difference still exists, the battery in the pack may have failed.

③ Open-circuit voltage test (this method is not used commonly)

- To obtain accurate voltage readings, the battery must remain idle for at least 6 hours, but the best for up to 24 hours.
- Measure the voltage of each battery.
- If any battery has its voltage 0.3V larger than that of any other battery in the battery pack, please apply equilibrium to this battery pack.
- Measure the voltage of each battery again.
- If any battery has its voltage 0.3V larger than that of any other battery in the battery pack, this battery may have failed.

  Moreover, there are some other methods to test the battery for evaluation of its performance, such as discharge test method and other methods. Here follows no further

description in detail.

i. High-frequency battery charger

① Related technical parameters:

- Input voltage: AC100 - 240V
- Output voltage: 24V

② Notes：

- Input low-voltage protection: When the input AC voltage is lower than 85V, the charger will shut down protectively and automatically recover its work after the voltage has become normal.
- Reverse connection protection: When the battery is reversely connected, the charger will cut off the connection between its internal circuit and the battery, and will not start charging, so there should be no damage.
- Output short-circuit protection: When the charger output happens to be shorted, it will automatically cut off the output and restart charging with a 10-second delay after troubleshooting.
- Charging indicator: The indicator turns yellow in charging, green after charged and red in case of any fault.
- Charge braking device: In time of charging, the machine will have all its actions cut off.

Fault diagnosis (Deltatech system)

The machine equipped with this system has two display screens, located on the chassis ECU control box and the platform control box respectively and used to display the machine parameter data and fault types.

ECU control box

Display screen of the platform control box

Fault description and inspection (Deltatech system)

Display	Failure description	Action limit	Failure inspection
01	System initialization failure	All actions	ECU may have failed, and then should be replaced.
02	System communication failure	All actions	Check whether the communication cables are well connected. If the cables are well connected, replace the ECU and PCU.
03	Invalid mode setting failure	All actions	Set correct machine configuration parameters.
12	Prior to power connection, the chassis switch acts earlier.	Limit the chassis actions	Check whether the chassis swing switch and its wire harness are stuck.
18	Pit protection failure	Limit of lifting and walking	Check whether the pit protection is enabled and check the pit protection switch. Check the pit protection wiring harness and the lower in-place detection switch.
31	Pressure sensor failure	All actions	Check the failure of the pressure sensor and its wiring harness. At the same time, check and confirm that the correct machine mode has been selected.
32	Angle sensor failure	All actions	Check the failure of the angle sensor and its wiring harness. At the same time, check and confirm that the correct machine mode has been selected.
42	Prior to power connection, it prompts that the platform left turn button has been pressed.	Only the failure information is displayed	Confirm that the left turn button has been pressed prior to power connection, and if not, consider replacing the handle and PCU.
43	Prior to power connection, it prompts that the platform right turn button has been pressed.	Only the failure information is displayed	Confirm that the right turn button has been pressed prior to power connection, and if not, consider replacing the handle and PCU.
46	Prior to power connection, it prompts that the platform handle enabled button has been pressed.	Limit the platform action.	Confirm that the handle enabled button has been pressed prior to power connection, and if not, consider replacing the handle and PCU.
47	Prior to power connection, it prompts that the handle is no longer in its neutral position.	Slow lifting speed	Confirm that the handle has been in its neutral position prior to power connection, and if not, consider replacing the handle and PCU. Check whether the handle neutral parameters have been set through the LabView program. If not, consider replacing the handle and PCU.
52	Forward solenoid valve failure	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.
53	Backward solenoid valve failure	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.

Display	Failure description	Action limit	Failure inspection
54	Rising solenoid valve failure	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.
55	Falling solenoid valve failure	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.
56	Right-turn solenoid valve failure	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.
57	Left-turn solenoid valve failure	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.
58	Braking solenoid valve failure (unavailable)	Limit of lifting and walking	Check and confirm that the wire harness connected to the solenoid valve connector has been tightly inserted and the solenoid valve has been shorted and broken.
68	Failure of low voltage	Limit all actions	Check the battery voltage and have it charged. Check whether the battery cables are tightly connected.
80	Weight 80% alarm	Only alarm	The platform load is close to its rated weight, and it is recommended that no load could be added.
90	Weight 90% alarm	Only alarm	The platform load is rather close to its rated weight, and it is recommended that no load could be added.
99	Weight 99% alarm	Only alarm	The platform load has reached its rated weight, and it is recommended that no load could be added.
0A	Platform overload failure	Limit all actions	If the platform is overloaded, remove the overloaded weight.
AA	Tilt safety limit failure	Limit of lifting and walking	If the machine is tilted, never operate before it is leveled. If it is level, check whether the level switch has had its wiring harness reliably connected, and confirm whether it has any failure.

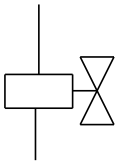
Troubleshooting of basic failures

Failure symptom	Failure cause	Failure coverage
The power indicator doesn't light up.	The device is not powered on.	1) The key switch is right in its neutral position. 2) The platform or chassis emergency stop switch is in the state of being pressed. 3) The platform controller is abnormal or always powered on after any program is downloaded. 4) The chassis controller is abnormal or always powered on after any program is downloaded.
The power indicator doesn't light up.	The CAN equipment has lost connection.	1) Whether the power and communication leads are not inserted correctly and firmly. 2) Whether the platform and chassis cables have their Deutsch plug pin wiring consistent with the drawing. 3) Whether the platform plug or the plugs of the platform and chassis connecting cables are well contacted. 4) The platform controller is abnormal. 5) Whether the chassis controller has its Deutsch plug connected correctly and firmly.
Chassis operation invalid	Not switched to the chassis operation / abnormal	1) The key switch is not placed at the position for chassis control. 2) The chassis controller is always powered on after any program is downloaded again.
Platform operation invalid	Not switched to the platform operation / abnormal	1) The key switch is not placed at the position for chassis control. 2) It is always powered on after any program is downloaded. 3) The platform controller is abnormal.
Continuous warning of level tilt	The level switch is disconnected or in failure.	1) Whether the level switch is not inserted correctly or firmly. 2) Whether the level switch is abnormal.
In case of unloading and level, the chassis can’t fall.	The falling valve is in failure.	1) Whether the on-off input plug is not inserted correctly or firmly. 2) Whether the plug switch is wired correctly. 3) The falling valve leads are wired wrongly or abnormally.
The platform can’t fall even if there is no alarm.	Limit of 1.2 meters’ falling	Reset the handle and implement the falling operation again.

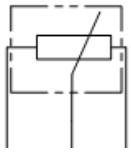
When the machine is unloaded and the platform is at its lowest level, the platform can not rise.	Height calibration error / rising valve failure	1) Whether the on-off input plug is not inserted correctly or firmly. 2) Whether the plug switch is connected correctly. 3) Calibrate the height again. 4) The rising valve leads are wired wrongly or abnormally.
In time of no load indoors, it can't rise to its maximum height.	The height is not calibrated / The travel switch is not set correctly.	1) Recalibrate the height. 2) Change the setting calibration of the travel switch.
The platform can't rise any more when reaching a certain position.	The travel switch is not set correctly.	Recalibrate the travel switch.
Overweight alarm in time of no-load	The load is not calibrated/ lift for the first time	1) Recalibrate the loading coefficient. 2) Force to lift and fall for several times
Forward function invalid in time of no alarm	The forward function is abnormal.	1) Whether the chassis controller PWM plug is not inserted correctly or firmly. 2) Whether the forward valve is connected right and normally. 3) The chassis controller is abnormal.
Backward function invalid in time of no alarm	The backward function is abnormal.	1) Whether the chassis controller PWM plug is not inserted correctly or firmly. 2) Whether the forward valve is connected right and normally. 3) The chassis controller is abnormal.
It cannot walk in time of tilt alarm.	Tilt angle / extension switch	The pit protection function has been enabled
No alarm when it has lowered to its minimum height or it can not travel at its high speed	Pit protection	1) The high-speed hydraulic valve is wired improperly. 2) The travel switch is not installed in place / abnormally. 3) The hydraulic valve is abnormal.
Beyond the detection angle, infinite action appears	The level detection is abnormal.	1) The level sensor has its parameters wrongly calibrated. 2) Whether the level sensor wiring is correct and inserted firmly. 3) Whether the analog input leads are not inserted correctly and firmly. 4) The level sensor is bad. 5) The chassis controller is abnormal.

Overload-free warning	The load is not calibrated or the height is wrong.	1） The sensor is not calibrated. 2） The load sensor is wired improperly. 3） The sensor is bad.
The vehicle runs and stops frequently.	The electric quantity is not enough / calibrated correctly.	1) Recalibrate the parameters. 2） The battery has no electricity, so the coulombmeter can only be used as reference.
The set parameters can not be saved after repeated try.	The storage is abnormal.	1） The parameters are beyond the limit. 2） The chassis controller is abnormal.

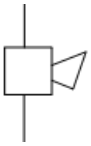
Electrical symbols



Solenoid coil

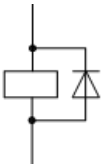


Sensor



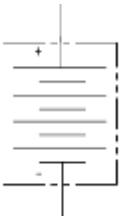
Horn

Coupler

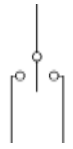


Relay

Emergency stop switch

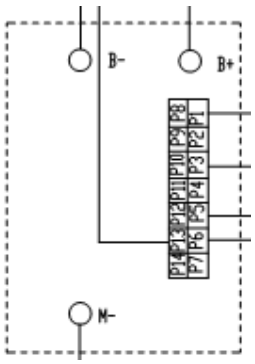


Battery

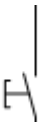


Toggle switch

Fuse

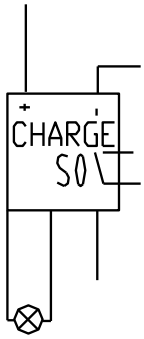


Motor controller

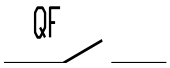


Button

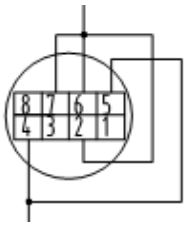
Oil pump motor



Charger



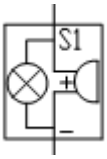
Power-off switch



Coulombmeter

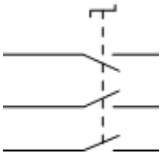
Limit switch

Warning lamp



Buzzer

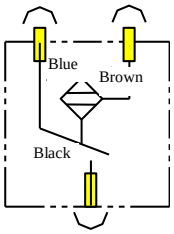
Indicator



Key switch

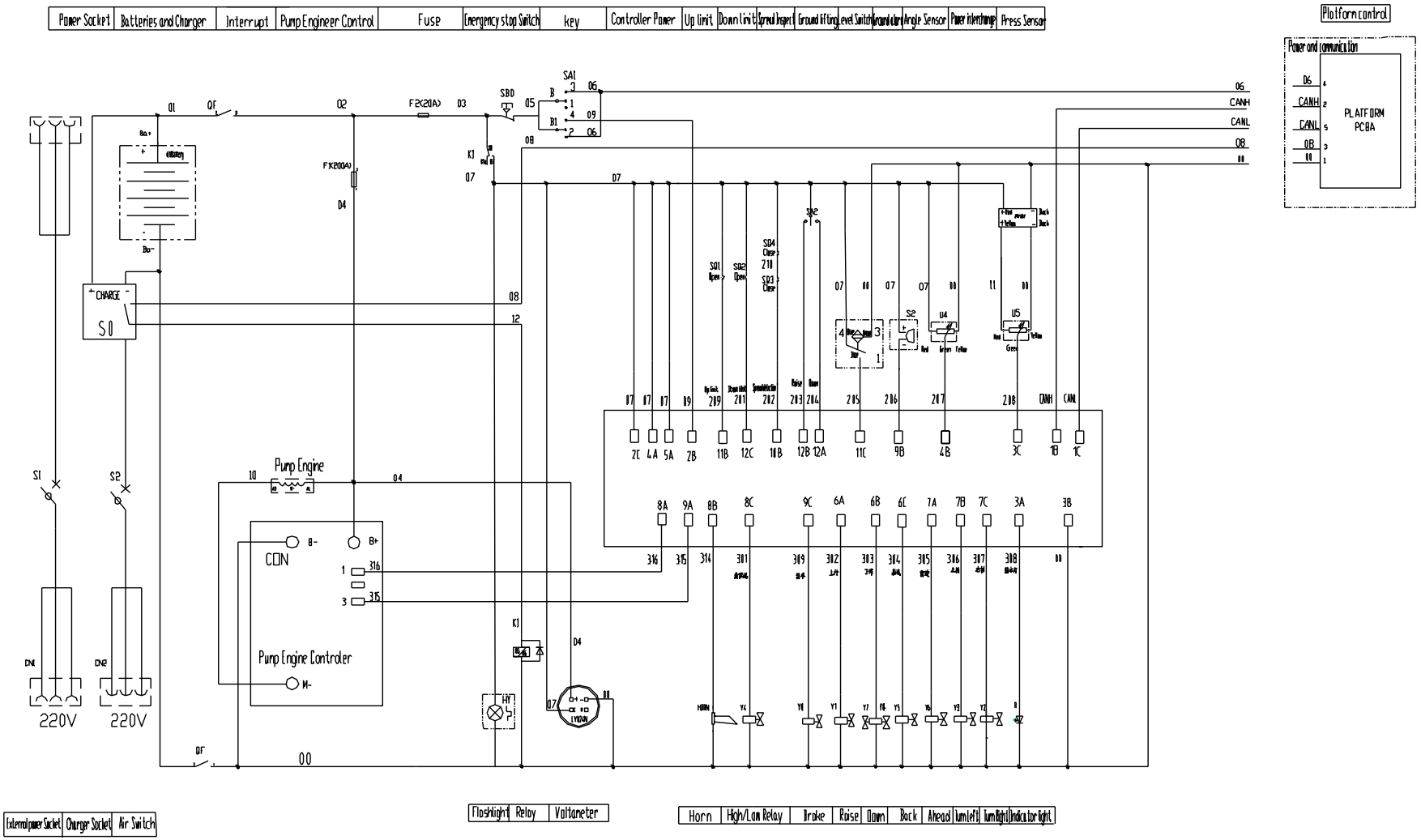
Two circuits are connected.

Two circuits are not connected.

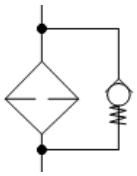


Level switch

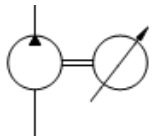
Electrical schematic diagram (Deltatech system)



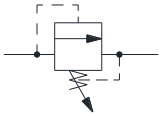
Hydraulic system symbols



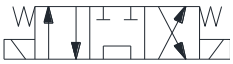
Filter



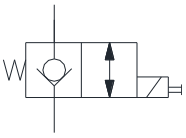
Power unit



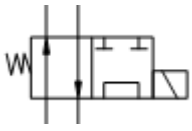
Relief valve



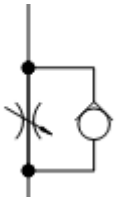
Three-position four-way solenoid reversing valve



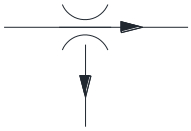
Manual fall release valve



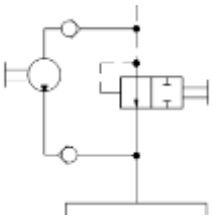
Walking high-low speed reversing valve



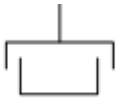
One-way throttle valve



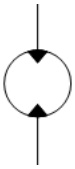
Priority valve



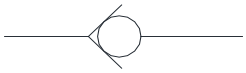
Manual brake release valve



Brake



Motor



One-way valve

Hydraulic schematic diagram