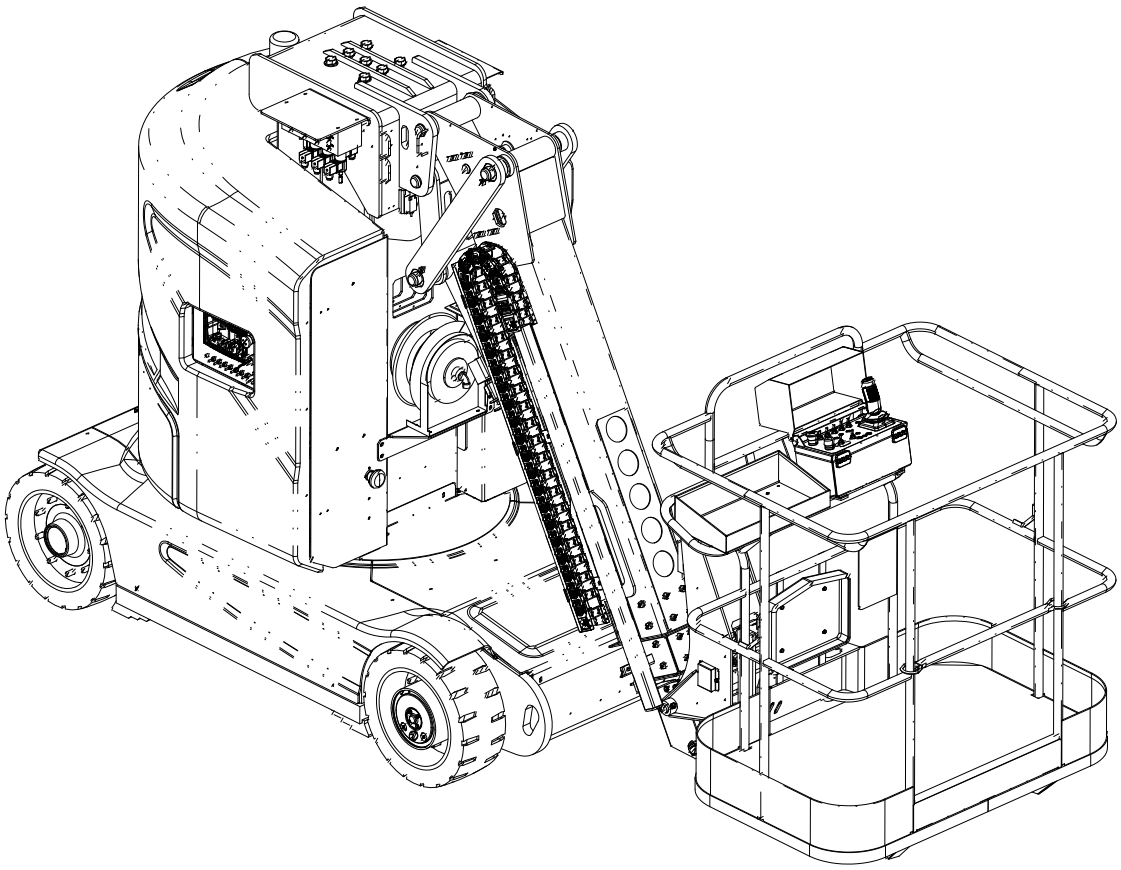
HV Series

Mast-type Aerial Work Platform

HV120AJ

Service Manual



Hangcha Group Co., Ltd.

March 2024

Foreword

Thank you for choosing the HV series aerial work platform of Hangcha Group Co., Ltd.

Before maintaining the machine, please read and understand this manual carefully, master the use and operation requirements of the machine, understand and abide by relevant safety rules and operation instructions. Only trained and authorized personnel are allowed to operate and maintain the machine. This manual should be part of the machine and kept with it at all times.

This manual is about the proper maintenance of the aerial work platform. It would guide you how to repair and maintain the machine, and also includes the working principle, fault diagnosis and troubleshooting of the machine. To ensure safety and fully utilize the performance of the product you purchased, operators and maintenance personnel concerned must read this manual thoroughly before use.

Since our product design shall have been continuously updated and improved, the contents of this manual may be different from your machine.

If there is any uncertainty, please contact the sales company or agent concerned of Hangcha Group Co., Ltd.

Contents

1 Product Specification

1.1 Main performance parameters

The technical data given below are standard. The Company reserves the right to change and supplement data.

HV120AJ Parameters

Parameter item	Metric Parameters	Imperial Parameters
Length	3.9 m	
Width	1.2 m	
Height	1.98 m	
Ground clearance	120 mm	
Ground clearance (to tipping	80 mm	
Machine weight	5000 kg	
Maximum working height	12 m	
Maximum platform height	10 m	
Maximum horizontal	5.5 m	
Maximum crossing height	5.99 m	
Maximum bearing capacity	200 kg	
Wheelbase	1.6 m	
Turning radius of inner wheel	0.75 m	
Turning radius of outer wheel	2.6 m	
Maximum allowable manual	400 N	
Length of working platform	0.8 m	
Width of working platform	1.2 m	
Tire diameter	454 mm	
Tire width	178 mm	
Hydraulic system pressure	20 Mpa	
System voltage (DC)	48 V	
Battery	48/160 (lithium battery) /200	
Charger current	40 A	
Running speed (rabbit speed)	6 km/h	
Running speed (working	0.5 km/h	
Gradeability	30 %	
Maximum allowable wind	12.5 m/s	
Maximum allowable tilt	2° for lateral/3° for	

1.2 Powertrain specification description

Specification of hydraulic oil system

Item	Working environment	Specification
Hydraulic oil	Normal temperature area (0°C~40°C)	L-HM32
	Cold area (-25°C ~ 25°C)	L-HV32
	High temperature area (>40°C)	L-HM68
	Extremely cold area (<-30°C [-22°F])	Require special customization

Powertrain specification

Item	Parameter	Specification
Main gear pump	Nominal displacement	6 ml/r
	Rated operating pressure	20.6 MPa
Manual pump	Maximum single displacement	20 cc
	Maximum pressure	35 MPa
Oil pump motor	Voltage/Power	AC 32V/6 KW
Function valve	Pressure of relief valve boom	21.4MPa
	Pressure of steering and slewing relief valves	13.8MPa
Traveling motor	Voltage/Power	AC 32V/1.5 KW
Travel brake	Voltage/Rated torque	DC 48V/85N.m
Travel reducer	Reduction ratio	62.33

Note: The machine could be filled with hydraulic oil according to the customer's requirements when it leaves the factory. Hydraulic oil of different specifications cannot be mixed.

1.3 Installation instructions for hydraulic hose and pipe joint

1.3.1 Hydraulic hose torque

Note: The hydraulic hose must be removed or installed according to the torque specified in the following table.

Hydraulic hose torque

Metric thread	L (light)	S (heavy)
M12×1.5	19± 1 Nm	
M14×1.5	26± 2 Nm	
M16×1.5	40± 3 Nm	
M18×1.5	50± 4 Nm	
M20×1.5	-	60± 4 Nm
M22×1.5	70± 5 Nm	-
M24×1.5	-	85± 6 Nm

1.3.2 Hydraulic pipe joint torque

Note: The hydraulic pipe joint must be removed or installed according to the torque specified in the following table.

Hydraulic pipe joint torque - metric system

Thread	Compounding material	Compounding material steel	
	ED and O-ring +	ED and O-ring +	O-ring seal
L (light)			
M10×1	18 ± 1 Nm	20 ± 2 Nm	18 ± 1 Nm
M12×1.5	30 ± 2 Nm	35 ± 2 Nm	30 ± 2 Nm
M14×1.5	42 ± 3 Nm	48 ± 4 Nm	35 ± 2 Nm
M16×1.5	55 ± 4 Nm	60 ± 4 Nm	40 ± 3 Nm
M18×1.5	75 ± 5 Nm	75 ± 5 Nm	45 ± 3 Nm
M22×1.5	90 ± 6 Nm	130 ± 8 Nm	60 ± 4 Nm
S (heavy)			
M12×1.5	33 ± 2 Nm	43 ± 3 Nm	35 ± 2 Nm
M14×1.5	42 ± 3 Nm	50 ± 4 Nm	45 ± 3 Nm
M16×1.5	55 ± 4 Nm	75 ± 5 Nm	55 ± 4 Nm
M18×1.5	75 ± 5 Nm	95 ± 6 Nm	70 ± 5 Nm
M22×1.5	90 ± 6 Nm	140 ±8Nm	100 ± 10 Nm
M48×2	280 ± 20 Nm	540 ± 30 Nm	420 ± 25 Nm

Hydraulic pipe joint torque - British (BSP)

Thread specification	Compounding material	Compounding material steel	
	ED and O-ring +	ED and O-ring +	O-ring seal
L (light)			
G1/8A	20 ± 1 Nm	20 ± 1 Nm	-
G1/4A	35 ± 2 Nm	40 ± 2 Nm	-
G3/8A	50 ± 3 Nm	75 ± 5 Nm	-
G1/2A	75 ± 5 Nm	95 ± 6 Nm	-
G3/4A	120 ± 8 Nm	185 ± 12 Nm	-
G1A	180 ± 10 Nm	320 ± 20 Nm	-
S (heavy)			
G1/4A	40 ± 3 Nm	43 ± 3 Nm	-
G3/8A	55 ± 3 Nm	85 ± 5 Nm	-
G1/2A	80 ± 5 Nm	120 ± 8 Nm	-
G3/4A	120 ± 8 Nm	185 ± 12 Nm	-
G1A	180 ± 10 Nm	320 ± 20 Nm	-

Hydraulic pipe joint torque - US (UNC/UNF)

Thread specification	Compounding material	Compounding
	O-ring seal	O-ring seal
L (light)		
7/16-20	21± 2 Nm	21± 2 Nm
9/16-18	34± 2 Nm	35± 2 Nm
11/16-12	40± 3 Nm	50± 4 Nm
3/4-16	50± 3 Nm	65± 4 Nm
7/8-14	75± 5 Nm	110± 8 Nm
S (heavy)		
7/16-20	21± 2 Nm	23± 2 Nm
9/16-18	34± 2 Nm	40± 3 Nm
11/16-12	40± 3 Nm	65± 4 Nm
3/4-16	50± 3 Nm	80± 6 Nm
7/8-14	75± 5 Nm	125±10Nm

1.3.3 Tightening procedure of hydraulic hose and pipe joint

Hydraulic hoses and pipe joints must be installed according to the following requirements.

1. The O-ring must be replaced when the seal is damaged or there is oil leakage at the seal. Once the tightening torque of pipe joint or hose exceeds the specified value, the O-ring cannot be reused.

2. Lubricate the O-ring before installation.

3. Install the O-ring correctly.

4. When connecting the hose nut with the pipe joint, align the pipe joint, hose and hose nut, and tighten the nut according to the torque requirements.

5. Tighten the nut or pipe joint according to the torque provided in the table above.

6. Operate all functions of the machine, and check the hoses, pipe joints and related components to ensure that there is no leakage.

1.4 Fastener installation instructions

Unless there are special torque requirements in the manual or other instructions, the general bolt tightening torque shall be referred to the following table.

Fastener tightening torque - Metric

Nominal	Thread pitch	Metric class	Metric class 10.9	Metric class 12.9
5	0.8	7 Nm	9 Nm	10 Nm
6	1	12 Nm	15 Nm	18 Nm
8	1.25	30 Nm	35 Nm	42 Nm
	1	30 Nm	37 Nm	45 Nm
10	1.5	55 Nm	75 Nm	85 Nm
	1.25	56 Nm	77 Nm	87 Nm
	1	60 Nm	80 Nm	92 Nm
12	1.75	95 Nm	125 Nm	150 Nm
	1.5	100 Nm	130 Nm	155 Nm
	1.25	105 Nm	135 Nm	160 Nm
14	2	150 Nm	200 Nm	230 Nm
	1.5	165 Nm	210 Nm	250 Nm
16	2	230 Nm	300 Nm	360 Nm
	1.5	250 Nm	320 Nm	380 Nm
18	2.5	320 Nm	420 Nm	500 Nm
	1.5	360 Nm	470 Nm	550 Nm
20	2.5	450 Nm	600 Nm	700 Nm
	1.5	500 Nm	650 Nm	770 Nm

Nominal	Thread pitch	Metric class	Metric class 10.9	Metric class 12.9
22	2.5	600 Nm	800 Nm	980 Nm
	2	650 Nm	850 Nm	1050 Nm
24	3	750 Nm	1050 Nm	1250 Nm
	2	800 Nm	1100 Nm	1300 Nm
27	3	1150 Nm	1500 Nm	1800 Nm
30	3.5	1500 Nm	2000 Nm	2400 Nm

Fastener tightening torque - US (UNC)

Nominal diameter	Opposite side	US class 5	US class 8
1/4-20	7/16"	10Nm	14 Nm
5/16-18	1/2"	21Nm	29 Nm
3/8-16	9/16"	37Nm	51 Nm
7/16-14	5/8"	60Nm	82 Nm
1/2-13	3/4"	90Nm	130 Nm
9/16-12	13/16"	130Nm	180 Nm
5/8-11	15/16"	178Nm	250 Nm
3/4-10	1-1/8"	315Nm	445 Nm
7/8-9	-	509Nm	715 Nm

Fastener tightening torque - US (UNF)

Nominal	Opposite side	US class 5	US class 8
1/4-28	7/16"	11.5 Nm	16Nm
5/16-24	1/2"	23 Nm	32Nm
3/8-24	9/16"	41 Nm	58Nm
7/16-20	5/8"	65 Nm	92Nm
1/2-20	3/4"	100 Nm	145Nm
9/16-18	13/16"	145 Nm	200Nm
5/8-18	15/16"	200 Nm	280Nm
3/4-16	1-1/8"	350 Nm	495Nm
7/8-14	-	560 Nm	780Nm

2 Safety Rules

2.1 Overview

This chapter covers how to use your machine correctly and safely in most applications. To achieve this purpose, we have established a set of daily inspection process charts, which are mandatory for routine maintenance by eligible quality inspectors in strict accordance with this chart, so as to ensure trouble-free working of the machine and safe operation of related personnel. Safety rules, work site requirements and government regulations shall be completely read, understood and obeyed.

No matter the owner, user or operator of the machine, before operating the machine for the first time, you must read through and comprehensively understand the contents of this manual. You can operate the machine independently only after operating it from beginning to end under the supervision of qualified personnel with practical operation experience. If you have any questions about the application or operation of the machine, please call us in time.

Most of the accidents involved in operation, maintenance and repair are caused by failure to comply with basic safety operation procedures and notes in actual operations. In fact, if the hidden dangers of construction could be analyzed and safety assurance measures can be taken before each operation, most accidents happened in real can be avoided. Therefore, before each use and operation, the trained safety personnel with hidden danger analysis experience should make an assessment to remind the operator to take necessary countermeasures to avoid danger.

Improper operation, lubrication and maintenance are very dangerous, which may even cause personal injury or casualty. Therefore, only after you read through the manual and fully understand the knowledge and information about operation, lubrication, maintenance and repair can you carry out maintenance on the equipment.

2.2 Symbol description

The symbols, color codes and symbol text used for product labels of Hangcha Group have the following meanings:

This safety alert symbol appears on most safety statements. This means attention and constant vigilance, since your safety would be compromised! Please read and observe the information on safety alert symbols.


Used to alert an imminently danger which, if not avoided, will result in death or serious injury.


Used to alert a potential danger which, if not avoided, could result in death or serious injury.


Used to alert a potential danger which, if not avoided, could result in minor or moderate injury.

Note
Indicates a situation that may cause damage to the power plant, loss of personal property or harm to the environment, or result in improper operation of the equipment.

2.3 Incident notification

Hangcha Group Co., Ltd. must be notified immediately in case of any accident involving our machine. Even if there is no personal injury or property damage in the accident, it is necessary to call Hangcha Group Co., Ltd. and provide all important details. Failure to notify the manufacturer after 48 hours of an accident involving a Hangcha Group Co., Ltd machine may invalidate the warranty for the product.

Note
After any accident, the machine and its functions shall be thoroughly checked. Test all functions first from the ground controller and then from the platform control box. Before all damages are repaired and all controllers can be operated normally, the lifting height shall not exceed 3m.

2.4 Danger of electric shock

The machine is not insulated and does not have protection against electric shock.

All operators and management personnel shall comply with relevant national or local regulations on the minimum safety distance of live conductors above the ground. If there is no such requirement, operators and management personnel shall follow the requirements of the minimum safety distance in the following table.

Danger of electric shock

★ Follow the relevant government rules and always keep a safe distance from power lines and electrical equipment, as shown in the table below.

★ Platform movement, wire swinging or sagging should be taken into account, and beware of strong winds or gusts. Do not operate the machine in case of lightning or rainstorm.

★ If the machine comes into contact with live wires, please stay away from it. Before cutting off the power supply, personnel on the ground or platform are forbidden to touch or operate the machine.

★ Do not use the machine as a ground wire during welding and grinding.

Minimum safety clearance of charged body

Voltage range (Phase to phase, kV)	Minimum approach distance
0～50	3（10）
50～200	5（15）
200～350	6（20）
350～500	8（25）
500～750	11（35）
750～1000	14（45）

2.5 Danger of tipping

Maximum rated bearing capacity of platform

Model	Maximum load of platform	Maximum bearing capacity	Maximum manual operating force
HV120AJ	200kg	Indoor: 2 persons/Outdoor: 1 person	Indoor: 400N/Outdoor: 200N

Danger of tipping

★ Personnel, equipment and material on the platform shall not exceed the maximum load capacity.

★ The platform can be raised or extended only when the machine is on a solid and flat ground.

★ Do not take the tilt alarm as a level indicator. The tilt alarm on the platform would sound only if the machine is heavily tilted. If the tilt alarm sounds: lower the platform very carefully and transfer the machine to a solid and flat ground. Do not change the level or limit switch.

★ The driving speed shall not exceed 0.5 km/h during the raising of the platform.

★ During the raising of the platform, the machine cannot run on uneven and unstable surfaces or under other dangerous conditions.

★Do not operate the machine during strong wind or gust, and do not increase the surface area of the platform or load. Increasing the area exposed to wind will reduce the stability of the machine.

★When the machine is running on uneven terrains, surfaces with gravels or other uneven surfaces, or running near caves and steep slopes, be careful and slow down.

★Do not drive the machine on a slope exceeding its maximum gradeability. The maximum gradeability 30% (16.5°) is applicable to retracted machine.

★Do not push or pull any object outside the platform. The maximum allowable lateral force is 400N indoors and 200N outdoors.

★Do not change any machine parts that may affect safety and stability.

★Do not replace key parts that affect the stability of the machine with parts of different weights or specifications.

★Do not modify or alter the aerial work platform without the prior written permission of the manufacturer.

★Do not install additional devices for placing tools or other materials on the platform or guardrail, otherwise the weight and surface area of the platform or the load will be increased.

★Do not place or fix any overhanging load on any part of the machine.

★It is forbidden to place ladders or scaffolds on the platform or against any part of the machine.

★Do not use the machine on moving or flexible surfaces or vehicles. Make sure that all tires are in good condition and the tire nuts are tightened.

★Do not use the platform to push the machine or other objects.

★Keep the platform away from adjacent members.

★Do not tie the platform to adjacent members with ropes or other binding materials.

★Do not place the load outside the perimeter of the platform.

★When the platform is tripped or stuck, or when other objects nearby hinder its normal movement, do not use the platform controller to lower the platform. If the platform is to be lowered by ground controllers, it cannot be operated until all personnel are clear of the platform.

★Do not use a battery whose weight is less than that of the original one. The battery not only provides power, but also serves as counterweight, so it is crucial to maintaining the stability of the machine.

Models equipped with lithium batteries have an additional counterweight of 192 kg. For models equipped with lead-acid batteries, the total mass of batteries shall not be less than 325 kg.

★Do not operate the machine when the rotary table cover is open.

2.6 Working environment hazards

Before or during the use of the machine, check the workplace for possible hazards and pay attention to environmental restrictions, including flammable and explosive gases or dusts.

Unsafe workplace hazards

★Do not operate the machine on surfaces, edges or pits that cannot bear the weight of the machine. Only raise or extend the platform when the machine is on solid and flat ground.

★Do not use the tilt alarm as a level indicator. The tilt alarm on the platform will ring only when the machine tilts seriously.

★When lifting the platform, if the tilt alarm rings, lower the platform carefully and do not change the level or limit switch.

★The driving speed shall not exceed 0.5 km/h when the platform is lifted.

★If the machine can be used outdoors, do not operate it in strong wind or gust. When the wind speed exceeds 12.5m/s, do not lift the platform; if the wind speed exceeds 12.5m/s after lifting the platform, immediately retract the platform and stop operation.

★When the platform is lifted, the machine cannot run on uneven terrains, unstable surfaces or under other dangerous conditions.

★When the retracted machine is running on uneven terrains, surfaces with gravels and unstable or slippery surfaces, on steep slopes and near caves, be careful and slow down.

★Do not drive or lift the machine on slopes, steps or arched ground that exceed its maximum gradeability.

Beaufort scale	Meter/Second	Mile/Hour	Description	Ground condition
0	0～0.2	0～0.5	Calm	There is no wind and smoke rises vertically
1	0.3～1.5	1～3	Light air	Direction shown by smoke drift
2	1.6～3.3	4～7	Light air	Wind felt on exposed skin Leaves rustle
3	3.4～5.4	8～12	Gentle breeze	Leaves and small twigs in constant motion
4	5.5～7.9	13～18	Moderate breeze	Raises dust and loose paper; small branches moved
5	8.0～10.7	19～24	Fresh breeze	Small trees in leaf begin to sway.
6	10.8～13.8	25～31	Strong breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas
7	13.9～17.1	32～38	Near gale	Whole trees in motion Inconvenience felt when walking against the wind
8	17.2～20.7	39～46	Gale	Twigs break off trees. Generally impedes progress
9	20.8～24.4	47～54	Strong gale	Slight structural damage

Note

The maximum gradeability 30% (16.5°) of HV120AJ The maximum gradeability is applicable to retracted machine on the platform. Gradeability refers to the maximum allowable inclination angle when the machine is on a firm ground and the platform only carries one person. The rated vale of slope is reduced as the weight of the platform increases.

2.7 Unsafe operation hazards

The machine shall be operated in strict accordance with the requirements of this manual and the maintenance manual, if there is more stringent industry or local regulations, follow the latter.

Danger of unsafe operation

★Do not push or pull any object outside the platform. Maximum allowable lateral force: 400 N indoors and 200N outdoors.

★Do not change any machine parts that may affect safety and stability.

★Do not replace key parts that affect the stability of the machine with parts of different weights or specifications.

★Do not modify or alter the aerial work platform without the prior written permission of the manufacturer.

★Do not install additional devices for placing tools or other materials on the platform or guardrail, otherwise the weight and surface area of the platform or the load will be increased.

★It is forbidden to place ladders or scaffolds on the platform or against any part of the machine.

★Do not use the machine on moving or flexible surfaces or vehicles. Make sure that all tires are in good condition and the tire nuts are tightened.

★Do not place or attach any suspended load on any part of the machine.

★Do not use the machine as a crane.

★Do not use the platform to push the machine or other objects.

★Do not make the platform contact or bind with adjacent members.

★Do not place the load outside the perimeter of the platform.

★When the platform is tripped or stuck, or when other objects nearby hinder its normal movement, do not use the platform controller to lower the platform. If the platform is to be

lowered by ground controllers, it cannot be operated until all personnel are clear of the platform.

★When one or more tires are off the ground, evacuate all personnel before attempting to stabilize the machine with a crane, forklift or other suitable equipments.

2.8 Falling hazards

The machine shall be operated in strict accordance with the requirements of this manual and the maintenance manual, if there is more stringent industry or local regulations, follow the latter.

Falling hazards

★Personnel on the platform must wear safety belts or use safety facilities that conform to government regulations. Attach ropes to anchor points on the platform, with up to one person tightened by ropes for each anchor point.

★It is forbidden to sit, stand or climb on the guardrail of the platform. Stand firmly on the platform floor at all times.

★Do not climb down the platform when it is lifted.

★Keep the platform floor free of obstacles.

★Do not enter or leave the platform unless the machine is fully retracted.

★Close the entrance door before operation.

★If the guardrail is not installed properly and the entrance door is not closed, do not operate the machine.

2.9 Collision hazards

The machine shall be operated in strict accordance with the requirements of this manual and the maintenance manual, if there is more stringent industry or local regulations, follow the latter.

Collision hazards

★When moving or operating the machine, pay attention to the range of sight and blind spots.

★Check the working area to avoid obstacles overhead or other possible dangers.

★Be careful when using the platform control box and ground controller. Directional arrows with color markings indicate travel, lifting and steering functions.

★Users must abide by the user, workplace and government regulations on "using personal

protective equipment" (safety helmet, safety belt and gloves, etc.).

★Before releasing the brake, the machine must be on a level surface or be fixed.

★The platform can only be lowered when there are no personnel and obstacles in the area below.

★Limit the traveling speed according to ground conditions, congestion degree, ground slope, personnel position and any other factors that may cause collision.

★Do not operate the machine on any crane or overhead travelling crane route unless the crane controller is locked or prevention measures have been taken to prevent any potential collision.

★Keep hands and arms away from places where they may be squeezed.

★When the safety rod is not in place, do not work under the platform or near the scissor arm.

★When the controller is used to operate the machine on the ground, keep correct judgment and planning. Keep a proper distance between the operator, the machine and fixed objects.

★Dangerous driving or playing are not allowed during machine operation.

2.10 Squeezing Hazards

There is a potential squeezing hazard during machine movement. Always keep body parts and clothing at a safe distance from the machine during operation.

Squeezing hazards

★Keep hands and arms away from places where they may be squeezed.

★When the safety rod is not in place, do not work under the platform or near the boom.

★When the controller is used to operate the machine on the ground, keep correct judgment and planning, and keep a proper distance between the operator, the machine and fixed objects.

2.11 Explosion and fire hazards

Explosion and fire hazards

★Do not use the machine, charge the battery or refuel the machine in dangerous places or places where flammable and explosive gases may exist.

2.12 Machine damage hazards

The use and maintenance requirements of parts in this manual and the maintenance manual shall be followed, otherwise the machine will be damaged.

Machine damage hazards

★Do not use damaged or faulty machines.

★Pre-operation inspection shall be carried out for the machine and all functions shall be tested before each shift. Damaged or faulty machines shall be marked immediately and operation shall stop.

★Make sure that all maintenance operations have been carried out in accordance with the provisions of this manual and the corresponding maintenance manuals.

★Make sure that all labels are properly positioned and easy to identify.

★Make sure that the operation manual and maintenance manual are intact and legible, and are stored in the file box on the platform.

2.13 Physical injury hazards

The use and maintenance requirements of parts in this manual and the maintenance manual shall be followed, otherwise the machine will be damaged.

★Dangers of unsafe operation

★Do not operate the machine in case of hydraulic oil leakage. Leaked hydraulic oil may penetrate and burn the skin.

2.14 Battery hazards

★**Lead-acid** batteries contain sulfuric acid and can produce explosive mixtures of hydrogen and oxygen. Keep any equipment that can generate sparks or flame (including cigarette/smoke materials) away from the battery to prevent explosion.

★Do not touch the battery terminal or cable clamp with a tool that can generate sparks.

★Wear protective clothing and goggles when using the battery. Take off all rings, watches and other accessories.

★Prevent the acid substance in lead-acid battery from overflowing or contacting with skin. If battery acid leaks, neutralize it with soda water. If the acid substances in battery contact the skin, rinse immediately with plenty of clean water and seek medical care immediately.

★When lifting the battery, use appropriate personnel and prompt methods.

★Please use the charger specified by the manufacturer to charge the battery.

★The charger can only be connected to a grounded single-phase AC power outlet.

★Check the cable for damage every day, and replace damaged objects before operation.

2.15 Hydraulic system hazards

★Do not touch the hydraulic system when it is hot! Hot hydraulic oil may cause serious personal injury.

★After the equipment is shut down, thoroughly clean the overflowed hydraulic oil. Do not spill hydraulic oil on the ground. Immediately wash any hydraulic fluid on the skin upon maintenance and repairs are done. Dispose of used hydraulic fluid in accordance with laws and regulations.

★It is forbidden to block the leaked hydraulic oil by hand. If there is any leakage, release the system pressure first and wait for the hydraulic oil to cool down before repairing. If you are injured by ignoring the danger of hydraulic fluid, please seek medical attention immediately. Serious complications may occur if not treated immediately.

2.16 Weldment and grinding safety

Before welding, grinding and polishing, the welder must obtain permission from the responsible department at the workplace.

★ Follow the welder manufacturer's recommendations regarding the proper use of welder procedures.

★ Wires or cables for welding or grinding can only be connected after the machine is powered off.

★ Operations such as welding and grinding can only be performed after the wires or cables are properly connected.

★ The machine cannot be used as a ground wire during welding.

★ At any time, it should be ensured that electric tools are completely stored on the work platform. Do not hang their wires on the guardrails of the work platform or in the work area outside the platform, or directly hang electric tools with wires.

2.17 Lock after use

1. Choose a safe parking position on solid horizontal ground without obstacles and avoiding traffic congestion.
2. Ensure that the boom is lowered to the lowest position and all panels and doors are closed and secured.
3. Do not let the hydraulic cylinder in a fully extended state before shutting down or when not in use for a long time.
4. Press the "Emergency Stop Switch" of platform control box to the "OFF" position.
5. Press the "Emergency Stop Switch" on the chassis control box to the "OFF" position.
6. Turn the "Key Switch" of the chassis control box to the "OFF" position and remove the key to avoid unauthorized use.
7. Turn off the power-off switch.
8. Charge the battery, and unplug the charging cable in time after it is fully charged.

Note
The power-off switch must be turned off after each use.

3 Principle and System Introduction

3.1 Power

The HV120AJ is powered by a set of 48V batteries to drive an AC main pump motor and two AC traveling motors, and is also equipped with a manual pump to drive the rotary table to rotate.

The gear pump is connected with the output shaft of the motor through splines to provide power for the hydraulic system. The traveling reducer is connected with the output shaft of the traveling motor through splines to provide power for the transmission system.

3.2 Hydraulic system

The whole hydraulic system of the machine can be divided into two parts, which are connected by duplex hydraulic reels: one is the main valve, which controls the traveling steering, rotary table rotation and main mast lifting, and the other is the platform valve, which controls the luffing, telescoping, fence leveling and horizontal rotation of the jib.

When the motor works, the hydraulic pump sends pressure oil to the function valve block, which is equipped with a directional switching valve to complete different actions. In order to protect relevant components and avoid system pressure overload, the valve block is equipped with a relief valve.

3.3 Electrical system

In the electrical system, a set of 48V batteries (standard lead-acid battery and optional lithium battery) are used as the power source to control the boom function and traveling function. The batteries are charged by an external power supply.

3.4 Control system

The system consists of two controllers to control the functions of the machine: one is installed on the left rotary table of the machine to control the action of the boom and the rotary table rotation function; the other is installed on the platform to control the traveling steering of the machine, the action of the boom and the rotary table rotation function. The controller performs data interaction through a CAN bus.

3.5 Safety measures

A series of angle sensors and limit switches provide signals to the controller.

1. The horizontal sensor measures the angles of the X-axis (longitudinal) and Y-axis (transverse) of the vehicle body. When the X-axis angle exceeds 3° or the Y-axis angle exceeds 2°, an alarm will be given and all actions will be restricted, which needs to be recovered through special procedures.
2. The travel switch at the telescopic jib detects the extension of the telescopic boom. After the extension, the rotary table rotation is limited to the slow gear.
3. The weighing system is used to limit the bearing weight of the platform. The platform is fixed on a four link mechanism supported by springs, and different platform loads correspond to different spring compression heights. 2 sets of travel switches are arranged in the parallel direction of the spring. When the load of the platform exceeds the maximum bearing capacity, any set of travel switches will be triggered to give an overload alarm, the buzzer will keep ringing, the warning light will flash, and the display screen will display overload (OL). At the same time, all actions will be limited. Only after the overloaded articles are removed can the movement be resumed.
4. The angle sensor on the steering wheel kingpin measures the steering angle of the tire to realize the electronic differential speed of the driving wheels. When the steering angle reaches the set value, the traveling speed is limited, i.e. steering deceleration function.
5. Two travel switches are installed side by side at the main mast to detect the lower limit and upper limit of the main mast respectively. The lower limit detection is used to judge the high and low speed switching of traveling. The upper limit switch limits the maximum lifting height of the main mast.
6. The travel switch at the boom is used to judge the high and low speed switching of traveling. There are three detection switches for switching between high and low speeds. As long as any switch detects a signal, the traveling speed will be immediately limited to low speed: not more than 0.8 km/h. These three detection switches are respectively the travel switch of telescopic boom, lower limit switch of main mast and luffing travel switch of jib.
7. There is an operator anti-extrusion device (optional), a steel wire rope with iron magnet and a proximity switch on the platform. When the operator is extruded by the

outside world, the steel wire rope falls off, the proximity switch is disconnected, and the vehicle stops moving to avoid further injury to the operator.

8. There is a height limit anti-collision device (optional) and a travel switch installed on the platform. When the switch touches an external object, the switch will be triggered and the vehicle will stop moving to avoid collision of the machine.

4. Maintenance

4.1 Overview

This section provides detailed operating procedures for regular maintenance and inspection.

Warning
 Danger of unsafe operation Improper maintenance may result in death, serious injury to or damage to the machine.

★ Maintenance and inspection must be conducted by professionally trained and qualified personnel.

★ Routine maintenance and inspection are the inspection items during daily normal operation of the machine. Maintenance inspection personnel must conduct maintenance and inspection according to the maintenance inspection report, and fill in the maintenance and inspection report in detail.

★ Regular maintenance and inspection shall be conducted quarterly, semi-annually and annually. Maintenance inspection personnel must conduct maintenance according to the maintenance inspection report, and fill in the maintenance inspection report in detail.

★ The damaged or faulty machines shall be removed and marked in time and operation shall be stopped at the same time.

★ Damaged or faulty machines must be repaired before operation.

★ All inspection records shall be kept for at least 10 years or until the machine is out of service or as required by the owner/company/custodian of the machine.

★ Quarterly inspection must be conducted for machines that have not been maintained for more than three months.

★ The parts and components replaced during maintenance shall be the same as or equivalent to those of the original machine.

Unless otherwise specified, maintenance procedures shall be conducted in accordance with the following terms:

★ Place the machine on a flat, horizontal and solid ground.

★ The machine shall be in non-working state.

★ Turn the "key switch" of the ground controller to the "OFF" position and remove the key, so that the equipment cannot be started.

★ Turn the red "emergency stop switch" on the platform control box and ground controller to the "OFF" position to avoid accidental startup of the operating system.

★ Turn off the power-off switch.

★ Disconnect all DC power supplies on the machine.

★ Lock all tires to prevent the machine from moving.

4.2 Maintenance and hazard precautions

★ Principle of safe operation

When conducting machine maintenance, the safety of you and others shall be considered first. Do not attempt to move heavy components without the assistance of

mechanical equipment. It is forbidden to place heavy objects in unstable positions. Ensure that there is sufficient support when lifting components of the machine.

★ Component removal and reinstallation

When removing or reassembling a component, please complete the steps in sequence. If the removal or assembly of one part has not been fully completed, do not start operation on another part. Please review your work at all times to ensure that there are no omissions. No adjustments (except for recommended adjustments) shall be made without approval.

1. If mechanical assistance is required, please use adjustable lifting devices as much as possible. All lifting tools (chains, slings, etc.) shall be parallel to each other and as perpendicular as possible to the top of the lifted part.

2. If the angle between the lifting tools to be removed and the lifted part is less than 90°, please note that the load capacity of eyebolts or similar brackets will decrease at this time.

3. If a component is difficult to remove, please check that all nuts, bolts, cables, brackets and wiring have been removed, and check that adjacent components do not hinder removal.

★ Machine cleaning

1. Preventing dirt or impurities from entering key components of the machine is crucial to prolong the service life of the machine. Preventive measures have been taken to protect this machine from such damage. Protective plates, seals and filters are used to keep the air and hydraulic oil clean. However, in order to ensure that the protective measures function properly, the machine shall be maintained according to the specified time.

2. When the hydraulic oil pipeline is disconnected, the adjacent area shall be cleaned and all openings shall be immediately covered to prevent foreign objects from entering.

3. During repair or maintenance, all parts and components shall be cleaned and checked to ensure that all pipelines and openings are unblocked. All parts and components shall be covered to keep them clean. All parts and components must be cleaned before installation. New parts shall be stored in containers before use.

★ Bearing

1. After removing the bearing, please cover it to avoid dust or wear. The bearing shall be cleaned with non-flammable cleaning solvent and dried in the shade.

Compressed air can be used, but the bearings cannot be rotated.

2. If there are pits, notches, or burn marks on the bearing race and ball (or roller), the bearing shall be scrapped.

3. If the bearing is still maintainable, it shall be coated with a layer of oil and wrapped with clean paper (or waxed paper). Do not unpack reusable or new bearings until they are ready for installation.

4. New or refurbished bearings shall be lubricated before installation. When the bearing is pressed into its bore, pressure shall be applied to the outboard bearing race. If the bearing is to be installed onto the shaft, pressure shall be applied to the inboard race. After installation, grease shall be applied to the bearing.

★ Use of fasteners

Note
Self-locking fasteners such as nylon insert nuts and tab washers shall not be reused.

1. When installing locking fasteners, new replacements shall always be used. Please use bolts of proper length. If the bolts are too long, they may push against relevant components before its head is tightened onto corresponding parts; if the bolts are too short, there will be no enough threaded parts to engage and fix parts. When replacing bolts, only bolts with the same or equivalent specifications as the original ones can be used.

2. Standard torque values shall be used except for the specific torque requirements given in this manual. (See 1.14 Instructions for use of fasteners in this manual)

★ Hydraulic pipeline and electrical wiring harness

The hydraulic pipelines and electrical wiring harnesses to be removed shall be clearly marked at both ends of the removal to ensure correct installation in the future.

Note
Hydraulic oil will pollute the environment, so it is necessary to properly dispose of the hydraulic oil flowing out when removing the hydraulic pipeline. After collection, the waste oil shall be disposed in a way that meets the local environmental protection standards.

If it is necessary to withdraw the pin of electrical wiring harness, insulation silicone grease shall be applied around the male and female pins inside the connector during reinstallation to avoid circuit failure caused by increased resistance after oxidation of the pin.

★ Cleaning of battery terminals

The wiring group of the battery pack can be washed with a non-metallic brush and clean water, and attention shall be paid to avoid water ingress inside the battery box. After cleaning, anti-corrosion adhesive shall be applied onto the terminal surface after it is completely dry.

Maintenance schedule

There are four types of maintenance that must be conducted according to a schedule: daily, quarterly, six-monthly and annual.

Maintenance Procedure	Interval
A	Every 8 hours of operation (or every day)
A+B	Every 250 hours of operation (or every quarter)
A+B+C	Every 500 hours of operation (or every half a year)
A+B+C+D	Every 1000 hours of operation (or every year)

Maintenance inspection report

★ The maintenance inspection report is divided into four sections (A, B, C and D) according to the maintenance procedure, the time requirements of the maintenance plan and the requirements of the maintenance procedure.

★ The maintenance inspection report includes a checklist for each type of regular inspection.

★ The maintenance inspection report shall be copied for each inspection. The forms to be completed shall be kept for at least 10 years or until the machine is out of service or as required by the owner/company of the machine.

★ The following table shall be used to record the results. After completing each section, check the marks in the corresponding boxes.

★ If the result of any inspection is "Fail", the machine must be taken out of service and re-inspected after the repair is completed, and the box marked "Pass after Repair" shall be checked. The appropriate inspection procedure shall be selected according to the type of inspection.

Maintenance Inspection Record Form A			
Item	Pass	Fail	Pass after repair
A-1 Check manuals and labels			
A-2 Inspection before operation			
A-3 Check the hydraulic oil level			
A-4 Functional test			
A-5 Perform a 30-day maintenance			

Maintenance Inspection Record Form B			
Item	Pass	Fail	Pass after repair
B-1 Check the battery			
B-2 Check the wire			
B-3 Check tires and hubs			

B-4 Check the emergency stop			
B-5 Lubricate chain mast			
B-6 Key switch			
B-7 Horn			
B-8 Driving brake			
B-9 Driving speed in retracted state			
B-10 Driving speed in lifting state			
B-11 Working indicator			
B-12 Running alarm			
B-13 Hydraulic oil analysis			
B-14 Hydraulic oil tank respirator			
B-15 Tension the lifting chain			
B-16 Check chain condition			

Maintenance Inspection Record Form C			
Item	Pass	Fail	Pass after repair
C-1 Check platform overload system			
C-2 Replace the hydraulic oil filter			

Maintenance Inspection Record Form D			
Item	Pass	Fail	Pass after repair
D-1 Hydraulic oil			

4.3 Maintenance procedure A

A-1 Check manuals and labels

The key to safe operation is to follow the operating and maintenance instructions. Each device has a manual stored in the box of the platform. Manuals with illegible writing or missing pages may not provide sufficient information to ensure safe operation.

In addition, make sure that all safety signs are in good condition. Labels should be applied to alert operators to potential safety hazards when using the machine. They also provide information on how to operate and maintain the machine. Unclear labels do not serve as warnings, resulting in dangerous operating conditions.

1 Check and ensure that the operation and maintenance manual is in the manual box of the platform.

2 Check the manual to ensure that the handwriting is clear and there are no missing pages.

⊙Result: The manual matches the model and all manuals are legible with no missing pages.

¤Result: The manual does not match the model, or the manual is illegible or has missing pages. Stop the machine before replacing the Manual.

3 Open the label inspection diagram and carefully check that the label is not blurred or damaged.

⊙Result: All labels are complete, clear and intact.

¤Result: The label is missing, blurred, or damaged. Stop the machine before replacing the label.

4 After use, return the manual to its original position.

Note
If it is necessary to replace the manual and label, please contact Hangcha Group Co., Ltd.

A-2 Inspection before operation

Performing pre-operational checks is critical to ensuring safe operation. The pre-operational check is a visual inspection performed before the machine runs. This inspection is used to determine if there are any obvious problems with the machine before the functional test and can also be used to determine if routine maintenance should be performed.

Refer to the Inspection before Operation section of the Operation Manual for the complete inspection procedure.

A-3 Hydraulic oil level

Proper hydraulic oil levels are critical to the operation of the machine. If the hydraulic oil level is incorrect, hydraulic components may be damaged. Daily checks allow the inspector to detect changes in hydraulic oil levels that may indicate problems with the hydraulic system. The machine adopts transparent plastic oil tank, and the oil level can be clearly seen after opening the side cover of the oil tank.

1 When the machine is in the collection state, the liquid level in the oil tank shall not be higher than the maximum liquid level line.

2 When the machine is lifted to the maximum operating height, the liquid level in the oil tank shall not be lower than the oil suction port.

3 Adjust the filling amount of hydraulic oil in the oil tank based on the above two states.

Note
Specification of ex-factory hydraulic oil: L-HM32. Customers shall select appropriate hydraulic oil according to the ambient temperature. For example: L-HV32 or L-HM68.

A-4 Conduct functional test

The purpose of the functional inspection is to find out whether there are functional defects or faults before starting to use the machine. Checking the functions of the machine is crucial for its safe operation. An unsafe situation will occur if any function fails to work normally. Any function shall work smoothly and reliably without shaking, violent or abnormal noise. As soon as a functional defect or fault is detected, the machine must be marked and taken out of service.

Refer to the "Functional Test" section of the Operation Manual for the complete operating procedure.

A-5 Perform a 30-day maintenance

The 30-day maintenance is a one-time maintenance performed after 30 days or 40 hours of use of new equipment. After this maintenance, relevant maintenance shall be performed at normal time intervals.

★ The following procedures shall be followed:

B-3 Check hubs and tires

C-2 Replace the hydraulic oil filter

4.4 Maintenance procedure B

B-1 Check the battery

Good battery condition is crucial for good machine performance and safe operation. Improper electrolyte levels or damaged cables and wiring may cause component damage and create a hazardous situation.

Danger of electric shock

Being exposure to live circuits may result in death or serious injury. Remove all rings, watches and other accessories.

Danger of physical injury

The battery contains acidic substances, which shall be prevented from leaking and avoid contact with them.

If the acidic substances in the battery leaks, soda water shall be used to neutralize the leaked acidic substances.

Note

After the battery is fully charged, wear protective gloves for inspection.

Make sure that the battery cable connections are not corroded.

Make sure that the battery is firmly installed and the cable is securely connected.

Batteries are divided into lead-acid batteries, maintenance-free lead-acid batteries and lithium batteries, among which lithium batteries and maintenance-free lead-acid batteries are all maintenance free batteries.

★ Check the lead-acid battery:

1. Wear protective clothing and goggles.
2. Make sure that the battery cable connections are not corroded.
3. Make sure that the battery is firmly fixed and the cable is securely connected.
4. Remove the battery ventilation cover, and check the density of electrolyte in each battery pack with a liquid densitometer. If the density of electrolyte in any battery pack is less than 1.24, replace the battery.
5. Check the acidic liquid level of the battery. If replenishment is required, replenish distilled water through the battery filler. Do not add too much.
6. Install the ventilation cover.

7. Connect the charging plug to a 220V socket.

Result: The charging indicator is on, and the battery can be charged normally.

Note: Adding terminal protectors and anti-corrosion sealant will help eliminate corrosion to battery connection terminals and cables. The electrolyte of the battery is corrosive, so it is necessary to avoid contact with spilled electrolyte by hands or other parts of the body to prevent injury. The spilled electrolyte shall be neutralized with baking soda water.

★ Check the maintenance-free battery:

1. Wear protective gloves.

2. Make sure that the battery cable connections are not corroded.

3. Make sure that the battery is firmly fixed and the cable is securely connected.

4. Connect the battery charger cable to the correct terminal of the battery (with the red end to positive terminal, black end to negative terminal).
5. Connect the charging plug to a 220V socket.

Result: The charging indicator is on, and the battery can be charged normally.

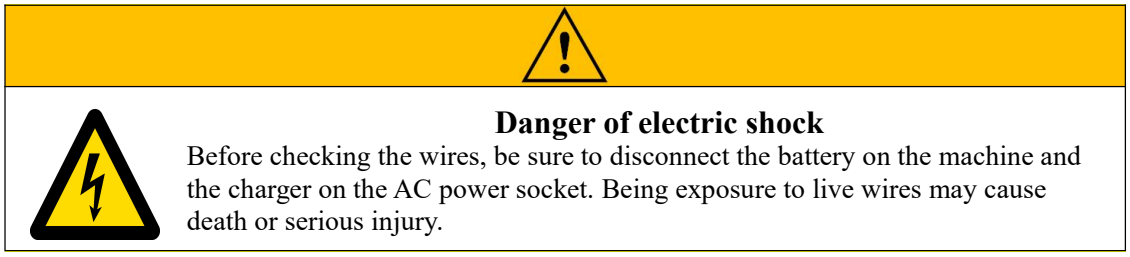
★ Precautions for battery replacement:

1. When removing or installing the battery, a wrench with rubber handle shall be used.

2. Tightening torque of cable fixing nut:
   Tightening torque of M8: 9~11 N.m,
   Tightening torque of M10: 18~23 N.m.
2. If the terminal is not kept clean and dry, it may be continuously corroded. To prevent corrosion, please apply a thin layer of Vaseline or use a terminal protector.

B-2 Check the wire

Maintaining wires is critical for the proper and safe operation of the platform. Burnt, damaged, corroded or broken wires not found and replaced in time may result in unsafe operation and even cause serious injury.



Danger of electric shock

Before checking the wires, be sure to disconnect the battery on the machine and the charger on the AC power socket. Being exposure to live wires may cause death or serious injury.

Being exposure to live conductors may cause serious injury or death. Remove all earrings, watches and other jewelry.

1. Check the following areas for burned, worn, corroded and loose wires:

——Battery wiring harness

——Charger wiring harness

——Boom wiring harness

——Rotary table wiring harness

——Ground controller

——Platform controller

2. Check all movable joints to confirm that there is no looseness and all sensor circuits are not damaged.

B-3 Check hubs and tires

Proper maintenance of rims and tires is critical for the proper and safe performance of the platform. Faulty rims or tires may cause the platform to tip over, and failure to detect and repair in time may also cause component damage.

This series of products use solid tires, which do not require inflation.

★ The following procedures shall be followed:

1. Check all tires for cuts, cracks, punctures, and abnormal wear.
2. Check and confirm that all rims are free of damage, distortion and weld cracking.
3. Check and confirm that the mounting bolts have been tightened with correct torque (≥200Nm).

B-4 Check the emergency stop function

Normal emergency stop function is essential for the safe operation of the machine. An abnormal red emergency stop button will not cut off the power supply and cannot stop all functions of the machine, resulting in dangerous situations.

As a safety function, the selection and operation of ground controls take precedence over platform controllers except for the red emergency stop pushbutton function on the platform.

1 Turn the key switch to the ground control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

2 Press the red emergency stop button of ground controller to the OFF position.

⊙ Result: The machine does not operate.

3 Turn the key switch to the platform control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

4 Press the red emergency stop button of platform controller to the OFF position.

⊙ Result: The machine does not operate.

Note: The red emergency stop button on the ground control can stop all machine operations, even if the key switch is set to the platform control.

B-5 Cleaning and lubrication of mast

Good cleaning and lubrication are very important for the performance and operational safety of the machine, and these operations must be performed more frequently in harsh working conditions.

1 Lift the mast to the maximum height.

2 Visually check the debris or foreign objects inside and outside the mast. Use a mild cleaning solvent if necessary.

3 Lubricate the bearing between sprocket and sprocket shaft with grease in the lifting state.

4 Apply oil between the chain and sprocket with an oil gun for lubrication.

5 Lubricate the guide rail between masts with grease in the lifting state

Warning Additional equipment is required to perform this procedure. Do not lean the ladder or scaffold against the machine during maintenance.

This procedure requires personnel with specific maintenance skills and appropriate tools. Serious injury or death may result if these instructions are not followed.

B-6 Test the key switch

The proper operation and response of the key switches is critical to the safe operation of the equipment. The key switch allows the machine to be operated by the ground controller or the platform controller. Dangerous operation may result from a failed key switch.

1 Pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

2 Turn the key switch to platform control.

3 Check the functions in the ground controller.

⊙ Result: The machine does not operate.

4 Turn the key switch to ground control.

5 Check the functions in the platform controller.

⊙ Result: The machine does not operate.

6 Turn the key switch to the OFF position.

7 Check the functions in the ground and platform controllers.

⊙ Result: The machine does not operate.

B-7 Test horns

The horn provides a sound used by personnel on the platform to warn ground personnel. Ground personnel will not be alerted to dangerous or unsafe conditions if the horn is malfunctioning.

1 Turn the key switch to the platform control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

2 Press the horn button in the platform controller.

⊙Result: The horn sounds.

B-8 Test the driving brake function

Proper braking is critical to operational safety. The brake should operate smoothly without delay, bump, or abnormal noise. There is no difference in the appearance of the wheels before and

after the brake is released.

To perform the brake function test, the machine must be on a firm, level surface with no obstructions to ensure that the machine is in the retracted position and the access platform is fully retracted.

1 Draw a reference test line on the ground.

2 Turn the key switch to the platform control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

3 Lower the platform to the retracted position.

4 Press the drive function selection button.

5 Select a point on the machine (such as the touchdown point on the wheel) as a mark for visually crossing the reference test line.

6 Run the machine to its maximum speed, and release the handle at the moment when the reference point crosses the ground test line.

7 Measure the distance between the reference point and the test line.

⊙ Result: The machine stops within the specified braking distance. No action is required.

¤ Result: The machine does not stop within the specified braking distance.

Note: The brake must be effective within the machine's gradeability limits.

8 Replace the brake and repeat the above process from step 1.

Maximum braking distance	
Maximum braking distance	61cm±30cm

B-9 Test drive speed - collection state

Proper drive function is essential for operational safety. The drive function shall respond quickly and smoothly to the operator. There shall be no delay, turbulence, or abnormal noise during normal operation.

To complete the drive speed test, the test must be performed on a firm, level surface free of obstacles.

1 Draw two lines 16 m apart on the ground as the starting and ending lines.

2 Turn the key switch to the platform control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

3 Lower the platform to the collection state.

4 Press the drive function selection button.

5 Select a point on the machine (such as the touchdown point on the wheel) as reference for visually crossing the starting and ending lines.

6 Run the machine to its maximum speed and start timing when the reference point crosses the starting line.

7 Keep running at full speed and record the time of crossing the ending line. The time is less than 10 seconds.

B-10 Test drive speed - lifting state

The normal driving function is very important for operational safety. The driving function must respond to the operator quickly and smoothly, without any delay, turbulence, or abnormal noise during normal operation and driving.

The speed test must be performed on a firm, level surface with no obstructions.

1 Draw two lines 8 m apart on the ground as the starting and ending lines.

2 Turn the key switch to the platform control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

3 Press the function selection button of the rotary table rotation/mast lifting.

4 Press and hold the function enabling switch.

5 Lift the mast by about 20cm.

6 Press the drive function selection button.

7 Select a point on the machine (such as the touchdown point on the wheel) as reference for visually crossing the starting and ending lines

8 Run the machine to its maximum speed and start timing when the reference point crosses the starting line.

9 Keep running at full speed and record the time of crossing the ending line. The time is less than 40 seconds.

10 Lower the mast to the retracted position.

11 Press the jib lifting/lowering function selection button.

12 Press and hold the function enabling switch.

13. Lift the jib to ensure that the platform is about 2m above the ground.

14 Press the drive function selection button.

15 Select a point on the machine (such as the touchdown point on the wheel) as reference for visually crossing the starting and ending lines.

16 Run the machine to its maximum speed and start timing when the reference point crosses the starting line.

17 Keep running at full speed and record the time of crossing the ending line. The time is less than 40 seconds.

18 Lower the jib to the retracted position.

B-11 Test working indicator

The work indicator is a reminder to ground personnel and operators that the equipment is being operated.

Turn the key switch to the ground control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

2 Activate the functions of the machine on the ground controller.

⊙ Result: The work indicator flashes.

3 Turn the key switch to platform control.

4 Activate the functions of the machine on the platform controller.

⊙ Result: The work indicator flashes.

Note: The work indicator only works when machine functions are activated on the ground or platform.

B-12 Test running alarm

The running alarm sound is a reminder to ground personnel and operators that the equipment is being operated.

1 Turn the key switch to the ground control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

2 Lift the platform by about 35cm.

⊙ Result: The alarm sounds when the platform is raised.

3 Lower the platform to the retracted position.

⊙ Result: The alarm sounds when the platform is lowered.

4 Turn the key switch to platform control.

5 Press the function selection button of the rotary table rotation/mast lifting.

6 Press and hold the function enabling switch, and push the handle back and forth.

⊙ Result: The alarm sounds.

7 Press the drive function selection button.

8 Press and hold the function enabling switch, and push the handle back and forth.

⊙ Result: The alarm sounds.

9 Press and hold the function enabling switch, and press and hold the thumb button on the handle.

Result: The alarm sounds.

B-13 Perform hydraulic oil analysis

Hydraulic fluid replacement or testing is essential for good machine performance and service life. Dirty hydraulic oil and suction filters affect machine performance. Continued use can cause damage to parts. Under severe working conditions, this operation should be performed more frequently.

Before changing hydraulic oil, verify the need for replacement with an oil separator.

If the hydraulic oil has not been changed for two years, it should be tested quarterly and changed if it fails the test.

Refer to D-1 to test or replace the hydraulic oil.

Danger of burns

Cool the hydraulic oil to room temperature before maintaining the hydraulic system.

The hydraulic oil shall be replaced in time when any of the following situations occurs:

1 The hydraulic oil is milky white and turbid.

2 The color of the hydraulic oil turns black.

3 When a part of the hydraulic oil is taken out and viewed in the sunlight, there are metal luminous points, or there is obvious graininess when two fingers dip into the hydraulic oil and rub against each other.

4 Hydraulic oil stinks

B-14 Check the hydraulic oil tank respirator

The hydraulic oil tank of the machine is a ventilated oil tank, which filters impurities in the air through the air filter inside the tank exhaust cover. If the air filter fails or is damaged, impurities may enter the hydraulic oil circuit and cause damage to the hydraulic components. Frequent replacement of air filters may be required when working under harsh conditions.

Note

This procedure must be performed with the pump motor shut down.

★ The following procedures shall be followed:

1. Remove the air filter of the hydraulic oil tank.
2. Check the ventilation hole.

Result: Air shall pass through the air filter smoothly. If the air cannot pass through the air filter smoothly, the air filter must be cleaned according to the following steps. The air filter shall be cleaned with a neutral solvent, and then dried with an air gun. Repeat step 2.

3. Install the air filter back to the oil tank ventilation cover.

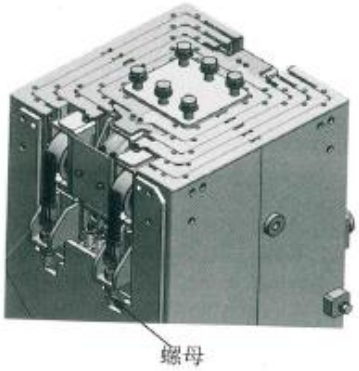
B-15 Check and adjust the lifting chain

Keeping the chain in good condition is essential for safe operation and good machine performance.

The overall length of the chain will increase as a direct result of chain wear.

Visually inspect the used conveyor chain every three months to check for stretching. The mast connected to the long chain will be in a lower position, resulting in uneven tops of each mast when the machine is retracted. If this problem is severe, the sprocket will be damaged.

Note
Once the chain is found to be loose or damaged, please immediately stop using the equipment and contact the dealer as soon as possible.



1 When adjusting the chain length, please select the mast that needs to be raised.

As shown in the figure above, tighten the nut to move the previous section of the mast

upwards. After adjusting the chain length, tighten the double

nuts together.

2 Two chains pull the same mast and bear the weight

lifted at the same time. If one chain fails,

the other chain will play a very important role in safety. Therefore, when adjusting the chain length, try to keep the tightness of the two chains the same. The method to judge the tightness of the chain is to squeeze the chain by hand when the platform is lifted to compare the tension.

B-16 Check chain condition

Keeping the chain in good condition is essential for safe operation and good machine performance.

Equipment required:

● Standard toolkit ● Goggles ● Gloves

●Place barriers around the perimeter of the work area

Special and auxiliary tools must be used according to regulations. Always wear appropriate safety clothing.

Preliminary procedure

If disassembly is necessary, it should be performed on completely disconnected equipment and should be entrusted to personnel who have received the necessary technical training.

In addition to the safety instructions in this manual, the applicable laws and regulations for the prevention of accidents should be observed.

All preventive measures must be completed prior to working on the machine. The machine can then be accessed for maintenance.

Upon completion of the work, all covers and safety devices must be completely replaced and

in working order.

Lubrication

The chains must be lubricated at a minimum of every 250 hours or every 6 months. The frequency of use depends on the environment and the conditions and the frequency of use must ensure that a sufficient amount of lubricant is present in the chain links.

Immediately clean and lubricate the chain if exposed to corrosive liquid.

Note: Lubricating the chain requires extending and retracting the mast.

Remove all foreign material from the chain before applying new lubricant.

Observe environmental requirements when cleaning the chain.

Check chain condition

To perform the following operations, a complete telescoping action shall be performed.

Check to make sure the lifting chain is clean.

Check chain and guide plate for foreign objects.

Inspect the chain for any signs of corrosion.

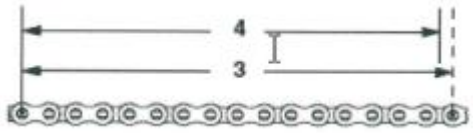
Chains with any of the following defects must be replaced.

Check the chain for elongation.

The chain length of 12 sections must not exceed 2% of the original chain length.

Measure the value of the length (3) by a suitable method. Compare with the value of length (4) shown in the table below.

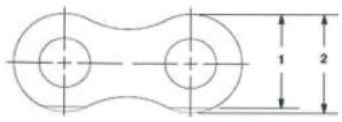
Model	Chain width (2)	Chain length of
LH0822	12.08mm	152.40mm
LH0844	12.08mm	152.40mm
LH0866	12.08mm	152.40mm
LH1066	15.1mm	222.96mm



Check for external wear on rollers and chain rings.

The size of the external wear must not exceed 2% of the original chain width (2), see table above.

Measure the value of (1) by a suitable method.



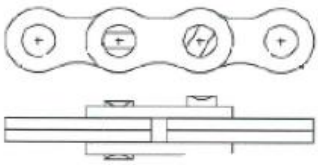
Check to make sure that none of the lines or components is damaged or missing.

Check to see if the link is twisted, deformed, or damaged.

Distortion Cracking

Damaged Folded

Check the connection points of the flights (center lines must be parallel).



Replace the chain

Chains should be replaced every 7 years.

For more opinions and suggestions, please contact Hangcha's After-sales Service Department.

4.5 Maintenance procedure C

C-1 Test platform overload system

Frequent testing of the platform overload mechanism is very important for the safe operation of the machine. Continuous misoperation of the platform will cause the system to fail to detect the overload information of the platform, and the stability of the machine will be affected, resulting in equipment overturning.

Note
This test shall be conducted on a stable and level ground.

1 Turn the key switch to the platform control, pull out the red emergency stop button on the ground to the "ON" position, and turn the red emergency stop button on the platform clockwise to the "ON" position.

2 Confirm the maximum load of the tested equipment.

3 Use a suitable lifting device to safely and reliably place the heavy block equivalent to the maximum load of the equipment in the central position of the platform.

⊙ Result: No alarm sounds and the system is normal.

¤ Result: The alarm sounds. Calibrate the platform overload system.

4 Add a heavy block equal to 25% of the maximum load on the platform.

⊙ Result: The alarm sounds. The system functions normally.

¤ Result: The alarm does not sound and the platform overload system is calibrated.

5 Test all functions on the platform controller.

⊙ Result: All functions of the platform controller are not in operation.

6 Turn the key switch to ground control.

7 Test all functions on the ground controller.

⊙ Result: All functions on the ground controller are not in operation.

8 Use a suitable lifting device to safely and reliably remove the loaded heavy block.

⊙ Result: The alarm does not sound. The system functions normally.

¤ Result: The alarm sounds and the platform overload system is calibrated.

9 Test all functions on the ground controller.

⊙ Result: All functions on the ground controller are in operation.

10 Turn the key switch to platform control.

11 Test all functions on the platform controller.

⊙ Result: All functions on the platform controller are in operation.

C-2 Replace the hydraulic oil tank filter

The hydraulic oil tank of the machine is a ventilated oil tank, which filters impurities in the air through the air filter inside the tank exhaust cover. If the air filter fails or is damaged, impurities may enter the hydraulic oil circuit and cause damage to the hydraulic components. Frequent replacement of air filters may be required when working under harsh conditions.

Note
This procedure must be performed with the pump motor shut down.

Danger of burns

Cool the hydraulic oil to room temperature before maintaining the hydraulic system.

★ The following procedures shall be followed:

1. Unscrew the air filter on the upper part of the oil tank.
2. Install a new air filter.
3. Clean all oil stains splashed during replacement.
4. Check the filter and related components to ensure that there is no leakage.

4.6 Maintenance procedure D

D-1 Replace the hydraulic oil

Checking and replacing hydraulic oil is crucial for the proper operation and extended service life of the platform. Dirty hydraulic oil and filter screen may cause abnormal operation of the platform, and continued use may cause damage to hydraulic system components. Frequent replacement of hydraulic oil is required when under extremely dirty working environment.

Note
This procedure can only be performed when the boom is fully retracted.

Danger! High voltage

The hydraulic components shall be slowly removed to reduce the hydraulic oil pressure. Excessive hydraulic oil pressure may penetrate the skin. In case of injury, please seek medical attention immediately.

Danger of burns

Cool the hydraulic oil to room temperature before maintaining the hydraulic system.

Danger of component damage

Operation without oil may result in damage to the hydraulic pump. To avoid cavitation in the hydraulic system, pump the oil tank carefully when filling the hydraulic system.

★ The following procedures shall be followed:

1. Disconnect the main power supply of the machine, and remove rings, watches and other accessories during operation.
2. Open the left cover plate of the rotary table and find the oil drain plug at the bottom of the oil tank;
3. Remove the oil drain plug and drain the oil into a suitable container.
4. Disconnect and plug the oil suction pipe with a plug.

5. Disconnect and plug the oil return pipe with a plug.
6. Remove the fastening bolts of the hydraulic oil tank and take out the hydraulic oil tank.
7. Remove the oil suction filter from the oil tank, rinse the inside of the oil tank with a suitable liquid, and dry the hydraulic oil tank.
8. Install a new oil suction filter and screw the oil drain plug.
9. Install the hydraulic oil tank back to the side door of the oil tank and tighten the fixing bolts.
10. Connect and tighten the oil suction and oil return pipes.
11. Fill the oil tank with hydraulic oil.
12. Turn on the power switch, lift the control platform to its highest position, observe the liquid level in the oil tank, and replenish a proper amount of hydraulic oil until the liquid level completely submerges the oil suction filter.
13. Repeat the lifting and lowering actions of the boom several times to exhaust the air in the hydraulic pipeline.

5 Maintenance procedure

Maintenance procedures must be conducted by professionally trained and qualified personnel.

Damaged components shall be replaced or repaired immediately. Do not operate the machine with damaged components.

Before operating the machine, it is necessary to perform appropriate maintenance.

Before starting the machine:

Read, understood and follow the safety rules and operating instructions in the Operation Manual.

Read all procedures and rules.

Unless otherwise specified, the maintenance procedures of this machine shall be conducted under the following conditions.

Place the machine on a flat, horizontal and solid ground.

Make the platform in the retracted state.

Turn the key switch to "OFF" position and remove the key.

Fix all wheels.

5.1 Platform components

5.1.1 Removal of platform control box

Danger of electric shock

Before performing this procedure, be sure to disconnect the battery on the machine and the charger on the AC power socket. Being exposure to live conductors may cause death or serious injury.

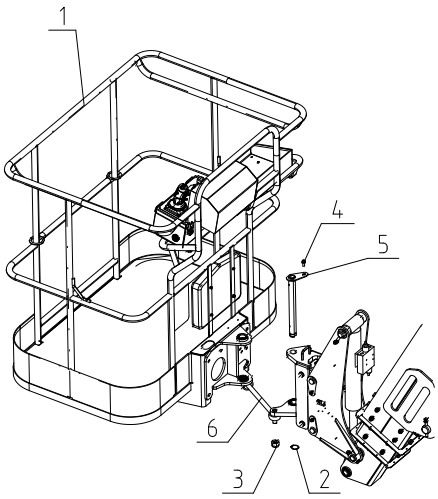
Note

This procedure can only be performed when the boom is fully retracted.

1. Disconnect the external power supply, and place the emergency stop switches of platform control box and ground controller in the "OFF" position.
2. Find the cable connecting the bottom of platform control box.
3. Disconnect the cable from the bottom of platform control box and mark it.
4. Remove the platform control box and mounting bracket.
5. Remove the platform control box and mounting bracket from the platform.

5.1.2 Removal of platform

1. Lift the fence (1) with lifting equipment.
2. Remove the retaining ring (2) and nut (3) at the bottom of the fence rotating shaft.
3. Remove the fixing bolt (4) of the fence fixing shaft (5), and
then pull out the pin shaft.
4. Lift the platform vertically with lifting equipment and place it on a flat ground.



5.2 Boom components

5.2.1 Removal of leveling cylinder

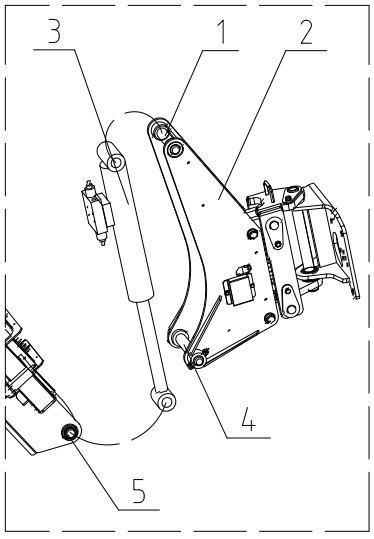
Note

This procedure can only be performed when the platform is removed or fixed reliably.

Squeezing hazards

Keep any body parts and clothing away from moving machine components.

1. Lift the leveling joint (2) with lifting equipment.
2. Remove the circuit and oil pipe fixed on the leveling joint.
3. Remove the pin shafts at both ends of the leveling cylinder.
4. Pull out the pin shaft with an auxiliary tool.
5. Lift the leveling cylinder upward.



5.2.2 Removal of luffing cylinder of jib

Note

Be careful when removing the oil cylinder to prevent it from falling and causing damage.

Danger! High voltage

The hydraulic components shall be slowly removed to reduce the hydraulic oil pressure. Excessive hydraulic oil pressure may penetrate the skin. In case of injury, please seek medical attention immediately.

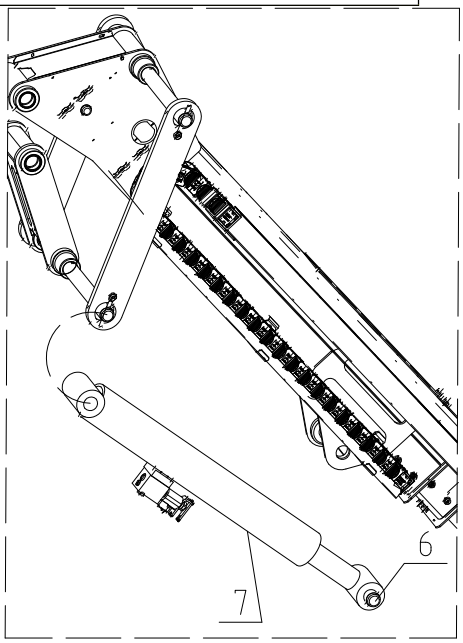
Danger of moving objects

Please wear protective goggles when striking the brass rod with a mallet.

1. Luff the jib until the luffing cylinder is parallel to the horizontal ground.
2. Support the jib against the platform end with a reliable and stable bracket.
3. Bundle with the lifting rope of the lifting equipment after crossing the jib assembly

Tie the luffing cylinder, and tighten the lifting rope until it is unstressed.

4. Disconnect and plug the hose and joint on the luffing cylinder.
5. Loosen and remove the fixing bolt of pin shaft at the piston rod end of luffing cylinder.
6. Knock out and remove the pin shaft at the piston rod end with a mallet and a copper bar.



7. Loosen and remove the fixing bolt of pin shaft at the lifting cylinder barrel end.
8. Knock out and remove the pin shaft at the cylinder barrel end with a mallet and a copper bar.
9. After lowering the cylinder to the ground with lifting equipment. .

5.2.2 Removal of telescopic cylinder of jib

Danger! High voltage

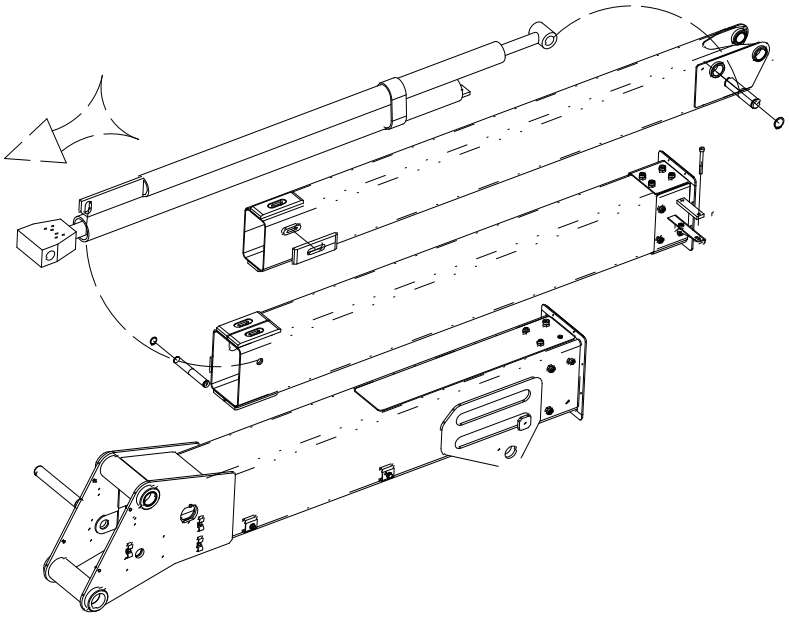
The hydraulic components shall be slowly removed to reduce the hydraulic oil pressure. Excessive hydraulic oil pressure may penetrate the skin. In case of injury, please seek medical attention immediately.

Danger of moving objects

Please wear protective goggles when striking the brass rod with a mallet.

Note

The piston rod end of the telescopic cylinder shares the same pin shaft with the connection between the leveling joint and the telescopic boom. Please remove the leveling joint and the working platform before removing the telescopic cylinder.



1. Luff the jib to its lowest position.
2. Disconnect and plug the hose and joint on the telescopic cylinder.
3. Remove the 3 connecting pin shafts of the telescopic cylinder and the boom in turn.
4. Pull out the telescopic cylinder from the cylinder barrel end.

5.3 Chassis components

5.3.1 Tire replacement

Hangcha Group Co., Ltd. recommends replacing with tires of the same dimension, ply rating and brand as the original tires of the machine. Please refer to the Parts Catalogue of the corresponding machine for tire part numbers of specific machine models. If the tire for replacement recommended by Hangcha Group Co., Ltd. is not used, the tire for replacement shall have the following characteristics:

1. Ply/load ratings and dimensions are equal to or better than those of the original tires.
2. The tread ground contact width is equal to or better than that of the original tires.
3. The wheel diameter, width and compensation dimensions are equivalent to those of the original tires.
4. Such applications are permitted by the tire manufacturer (including application scope, use occasions, maximum vehicle speed and maximum tire load, etc.)
5. Due to the size differences between tires of different brands, two tires on the same axle shall use the same brand.

Danger of unsafe operation

The tires and rims on the machine are strictly designed and selected based on the requirements of overall performance and load stability of the machine. Therefore, their model specifications, rim width, installation center plane, diameter, etc. shall not be changed; otherwise it will cause serious danger of instability during operation.

Installation of tire and rim

It is very important that the pre-tightening torque of rim bolts meets the requirements.

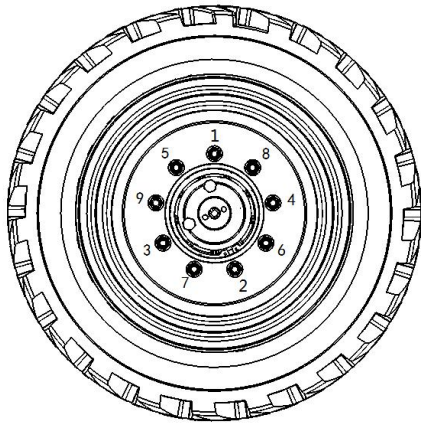
Danger of unsafe operation

Special nuts for tires matching the rim bolts must be used. The nuts must meet the requirements of pre-tightening torque, and anti-loosening measures shall be taken to prevent the risk of rim loosening, bolt breakage and tire detachment from the axle. Be sure to only use nuts that match the cone angle of the wheel.

Tighten the nuts to the proper torque to prevent the wheels from loosening. Tighten the fasteners with a torque wrench. If you do not have a torque wrench, please use a socket wrench to tighten the fasteners, and then immediately ask the service station or dealer to tighten the nuts to the correct torque. Over-tightening will cause bolt breakage or permanent deformation of bolt holes on the wheel.

The correct steps to tighten tire nuts are as follows:

1. Apply Loctite 272 on the bolts and nuts first, and then tighten all nuts by hand to prevent incorrect thread. Do not apply lubricant to threads or nuts.
2. Please tighten the nuts in the order shown below.



3. The nuts shall be tightened in steps. Tighten the nuts by referring to the recommended torques in the table below and in the recommended order.

Model		Step 1	Step 2
HV120AJ	Front wheel	150N.m	250N.m
	Rear wheel	100N.m	200N.m

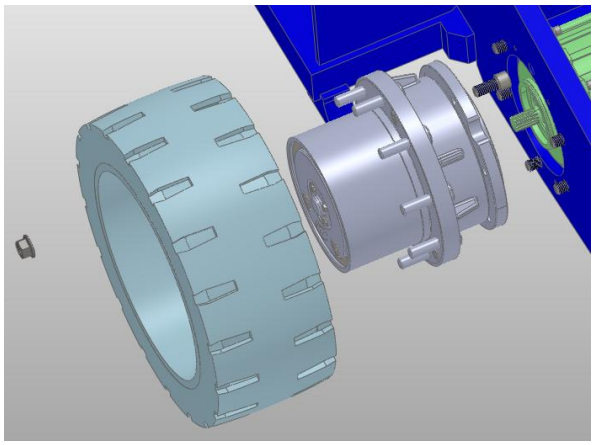
Note

Tire nuts shall be tightened before first use and after each tire is removed. The torque shall be checked and adjusted every 3 months or 150 h of operation.

5.3.2 Removal of traveling reducer

The traveling reducer and traveling motor not only play a role in driving, braking but also in tire installation and fixing. Before removal or installation, the equipment shall be fixed on a suitable rack or a jack with sufficient capacity shall be placed under the frame.

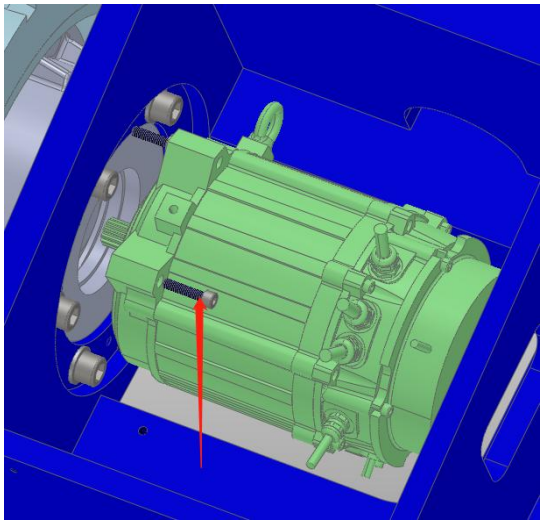
1. Remove the tire nuts fixing the wheels, and remove the wheels with appropriate lifting equipment.
2. Remove the bolts and washer fixing the traveling reducer
3. and frame, remove the traveling reducer, and then lift the traveling reducer with a suitable
4. lifting equipment and
5. place it stably.
6. Separate the reducer from the frame with a crowbar, and tie
7. the reducer with straps.
8. Lift the reducer to the ground with lifting equipment.



9.

5.3.3 Removal of traveling motor

Before removing or installing the tire hub, the equipment shall be fixed on a suitable rack or a jack with sufficient capacity shall be placed under the frame.

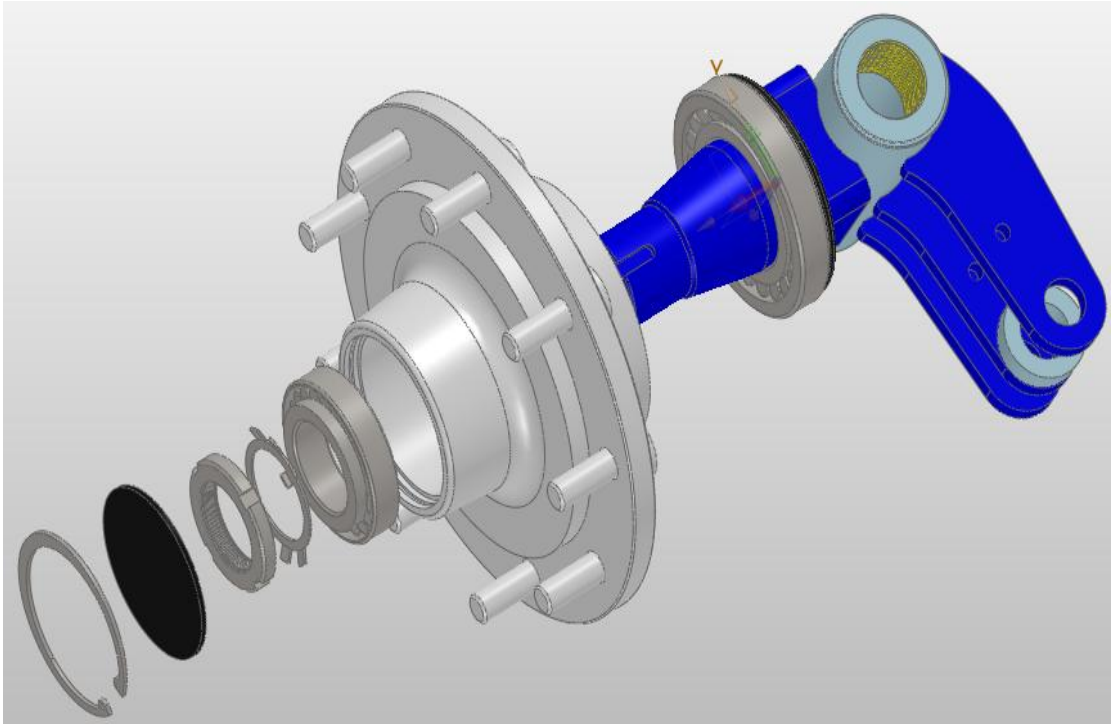


1. Mark and disconnect the wires connected to the motor.
2. Remove the fixing bolts of traveling motor.
3. Carefully remove the traveling motor.

5.3.4 Removal of steering hub

Ensure that lifting equipment with sufficient capacity is used to lift the underframe, and place the lifting equipment in an appropriate position on the frame.

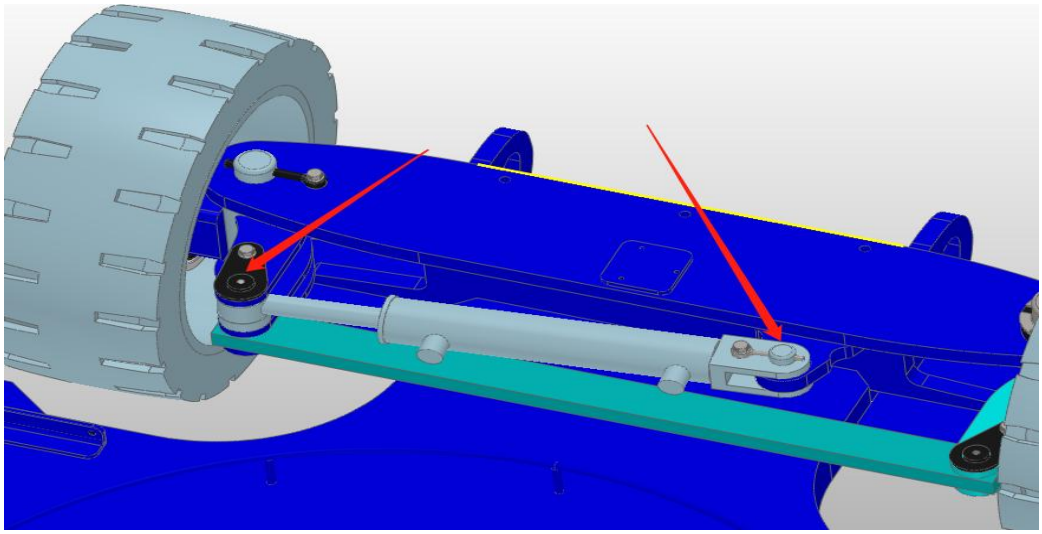
1. Remove the retaining ring fixing the end cover and then remove the end cover.
2. Remove the nut and tab washer.
3. Evenly knock the hub disc diagonally with a rubber hammer or copper bar to remove the hub.



5.3.4 Removal of steering cylinder

Note
When installing the removed hoses and pipe joints, they must be tightened according to the specified torque.

1. Disconnect and plug the hose and joint on the steering cylinder, and mark them.
2. Remove the cotter pin and pin shaft connecting the steering cylinder and the steering link.
3. Remove the cotter pin and pin shaft connecting the steering cylinder and the frame.
4. Remove the steering cylinder.



5.3.4 Removal of battery

Note
Before removing the battery, it is necessary to cut off the power supply of the charger and the working power supply of the machine.

1. Open the two hoods of the rotary table to find the batteries.
2. Mark and disconnect the wires connected to the battery.
3. Wrap the exposed wires in time to prevent short circuit.
4. Remove the battery with the assistance of lifting equipment.

5.4 Hydraulic system

5.4.1 Removal of hydraulic pump

Note

When installing the removed hoses and pipe joints, they must be tightened according to the specified torque.

1. Disconnect the main power supply and open the hood of rotary table.
2. Unscrew the oil drain port at the bottom of the hydraulic oil tank to drain the hydraulic oil.
3. Disconnect and plug the hose and joint of the hydraulic pump, and mark them.
4. Remove the fixing bolts of the hydraulic pump and take out the hydraulic pump.

5.4.2 Removal of hydraulic oil tank

Danger of burns

Cool the hydraulic oil to room temperature before maintaining the hydraulic system.

Danger! High voltage

The hydraulic components shall be slowly removed to reduce the hydraulic oil pressure. Excessive hydraulic oil pressure may penetrate the skin. In case of injury, please seek medical attention immediately.

Note

When installing the removed hoses and pipe joints, they must be tightened according to the specified torque.

1. Disconnect the power supply and open the hood of rotary table.
2. Unscrew the oil drain port at the bottom of the hydraulic oil tank to drain the hydraulic oil.
3. Disconnect and plug the hose and joint on the hydraulic oil tank, and mark them.
4. Remove the fixing bolts at the bottom of the hydraulic oil tank and take out the hydraulic oil tank.

5.4.3 Removal of hydraulic valve block

Danger of burns

Cool the hydraulic oil to room temperature before maintaining the hydraulic system.

Danger! High voltage

The hydraulic components shall be slowly removed to reduce the hydraulic oil pressure. Excessive hydraulic oil pressure may penetrate the skin. In case of injury, please seek medical attention immediately.

Note

When installing the removed hoses and pipe joints, they must be tightened according to the specified torque.

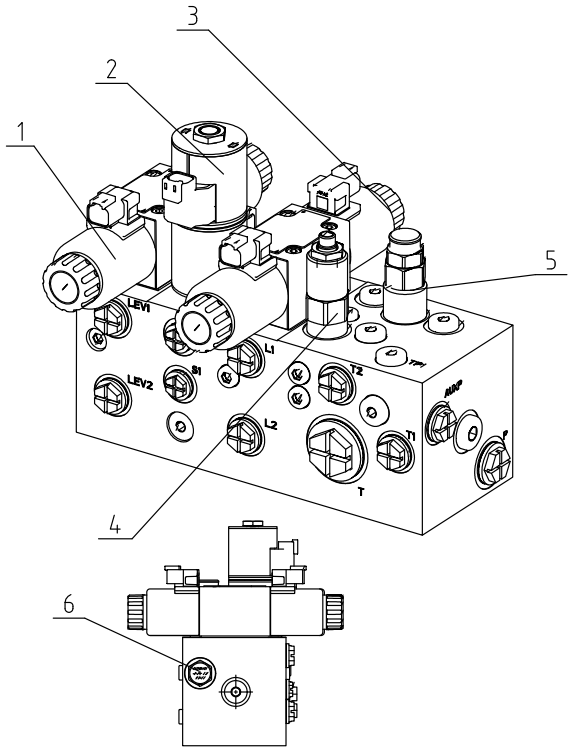
The machine has two main hydraulic valve blocks, namely the main valve on the rotary table and the platform valve on the head cover.

1. Disconnect the power supply and open the hood of rotary table.
2. Disconnect and plug the hoses and joints on the hydraulic valve block, and mark them.
3. Remove the fixing bolts of the hydraulic valve block and take out the hydraulic valve block.

5.4.4 Installation of valve element and coil

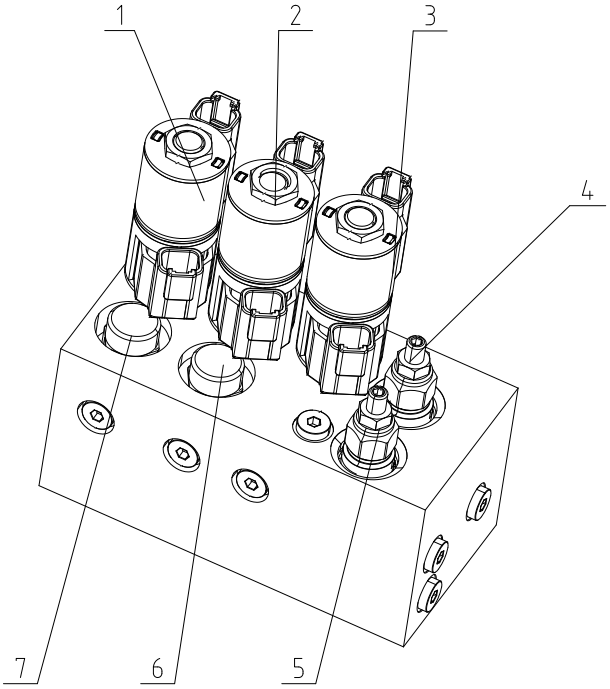
1. Immerse the valve in clean oil and lubricate the O-ring.
2. Screw in the plug-in valve by hand until the O-ring contacts the valve body, and tighten it to the specified torque.
3. Install the valve solenoid coil onto the valve stem, install the coil nut, and tighten it to the specified torque.

5.4.4.1 Main valve



S/N	Name	Function	Tightening torque
1	WE solenoid directional	Rotation control of	8Nm
2	Solenoid directional	Traveling steering	8Nm
3	Solenoid directional	Switching between main	32-35Nm
4	Pressure relief valve	Steering pressure	32-35Nm
5	Relief valve	System pressure control	26-29Nm
6	Throttle valve	Limit the rotation flow	26-29Nm

5.4.4.1 Platform valve



S/N	Name	Function	Tightening torque
1	Solenoid directional	Jib telescoping control	43-47
2	Solenoid directional	Fence rotation control	43-47
3	Solenoid directional	Manual leveling of	43-47
4	Balancing valve	Leveling lock	40-45
5	Balancing valve	Leveling lock	40-45
6	Flow valve	Limit the rotation flow	30
7	Flow valve	Limit the telescopic	30

5.4.5 Adjustment of steering relief valve

Note
Before performing this operation, it is necessary to ensure that the hydraulic oil in the tank is sufficient.

1. Connect a 0-40 MPa pressure gauge to the pressure measuring joint of the main valve.
2. One person is required to operate the tire steering on the platform, switch the key switch to platform control, and pull out the emergency stop switch button on the ground controller and platform control box to the "ON" position.
3. Hold the platform controller, press and hold the steering button to rotate the tire to the right limit position and keep it stable, and record the pressure value on the pressure gauge.

4. Hold the platform controller, press and hold the steering button to rotate the tire to the left limit position and keep it stable, and record the pressure value on the pressure gauge.

5. If the measured value is inconsistent with the specified value, proceed to steps 6-9.

6. Press the emergency stop button.

7. Loosen the steering relief valve nut.

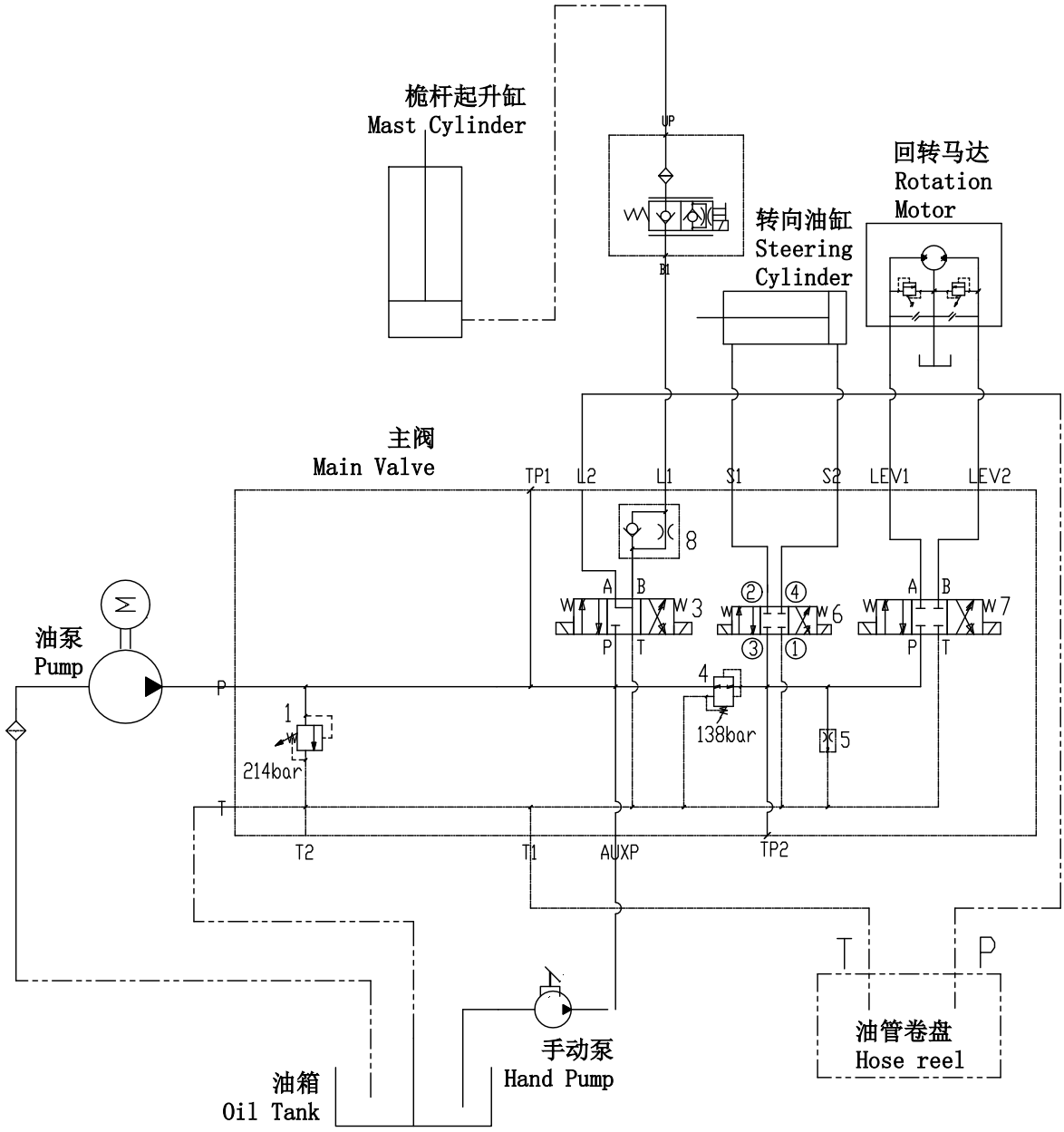
8. Adjust the hex socket at the end of steering relief valve, and rotate it clockwise to increase pressure or counterclockwise to reduce pressure.

9. Repeat steps 3-5.

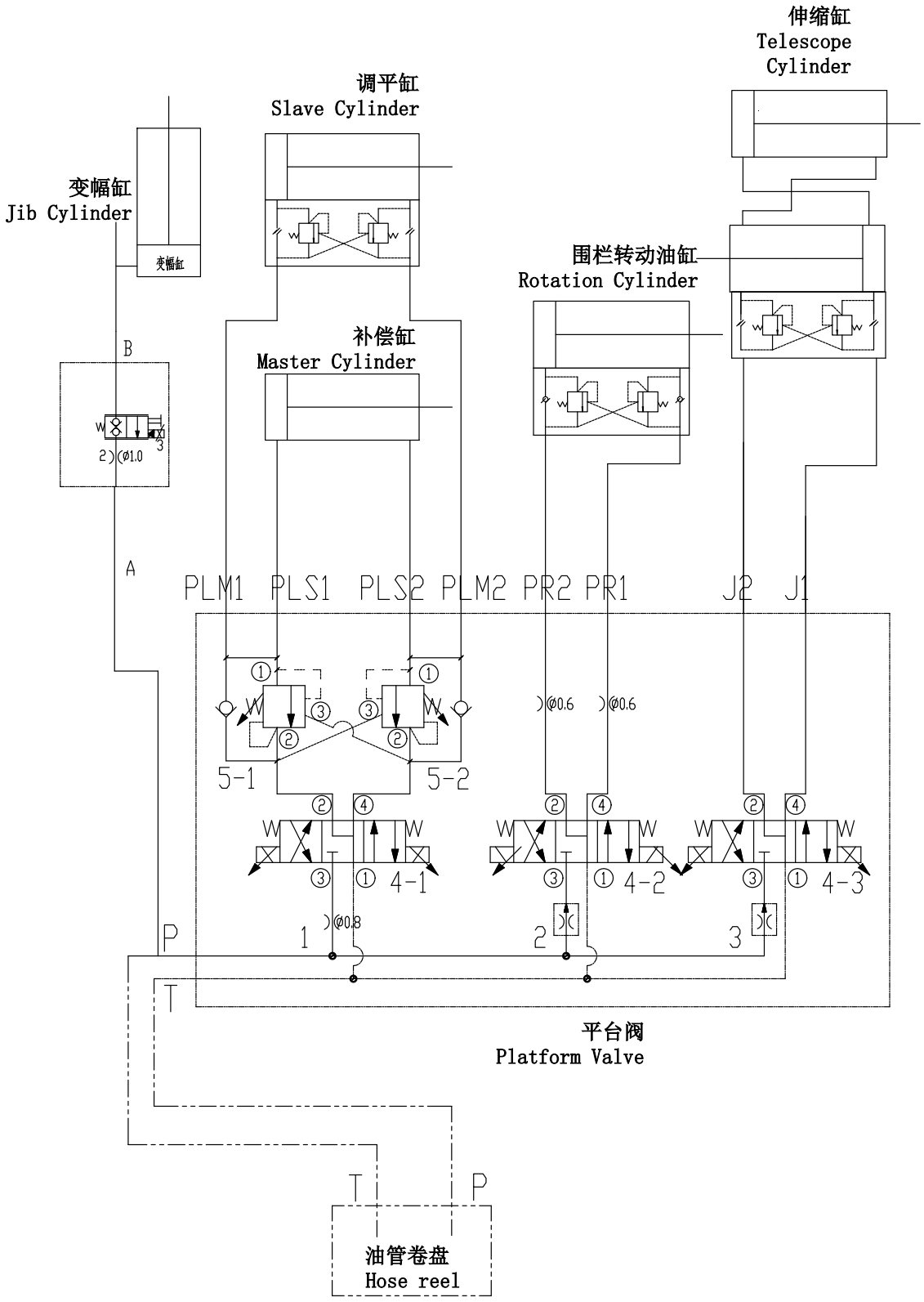
10. Tighten the steering relief valve nut and remove the pressure gauge.

5.4.9 Hydraulic schematic diagram

Hydraulic schematic diagram of rotary table



Hydraulic schematic diagram of platform



5.4.10 Hydraulic troubleshooting

The table below lists the possible faults that may occur in the hydraulic system, which can help operators or maintenance personnel determine the fault location and then check it according to the corresponding measures, and adjust or replace with new parts based on the inspection results.

Description of Phenomenon		Cause Analysis	Inspection Measure
The output oil pressure of pump is low		Damage of gear and O-ring	Replace the faulty parts
		Wrong adjustment of relief valve	Check and adjust the pressure with a pressure gauge
		Bubbles in oil pump	Add hydraulic oil to the oil tank, and then use the oil pump after the bubbles in the oil tank disappear
There is noise from oil pump		Cavitation due to blockage of filter screen	Adjust or replace the hose and clean the filter screen
		Cavitation due to too high viscosity of hydraulic oil	Replace with new hydraulic oil with viscosity suitable for the operating speed of the oil pump, and work only when the oil temperature is normal
		Insufficient hydraulic oil	Add hydraulic oil to the oil tank, and then use the oil pump after the bubbles in the oil tank disappear
Boom can not rise	The motor operates	Insufficient lifting pressure	Check and adjust the pressure with a pressure gauge
		Solenoid valve fault or wrong pipe connection	Check the solenoid valve and pipeline
	The motor does not operate	Electrical component or circuit fault	Check the electrical component and circuit
Failure to can turn	The motor operates	Insufficient steering pressure	Check and adjust the pressure with a pressure gauge
		Solenoid valve fault or wrong pipe connection	Check the solenoid valve and pipeline
	The motor does not operate	Electrical component or circuit fault	Check the electrical component and circuit
Unstable pressure or pressure drop		Looseness of pressure regulating screw	Re-adjust the pressure and lock
		Deformation or damage of pressure regulating spring	Replace
		Wear or jamming of safety valve element	Replace or remove, clean and reassemble
		Wear of gear pump	Repair or replace the gear pump

5.5 Electrical system

5.5.1 Fault diagnosis

When the electrical system fails, the corresponding DTC will be displayed on the display screen of the chassis controller. The following table lists the fault conditions corresponding to the DTC. It can help the operator or maintenance personnel to determine the fault location, then check the parts and their connecting accessories at the fault location, and decide to adjust or replace with new parts according to the inspection results.

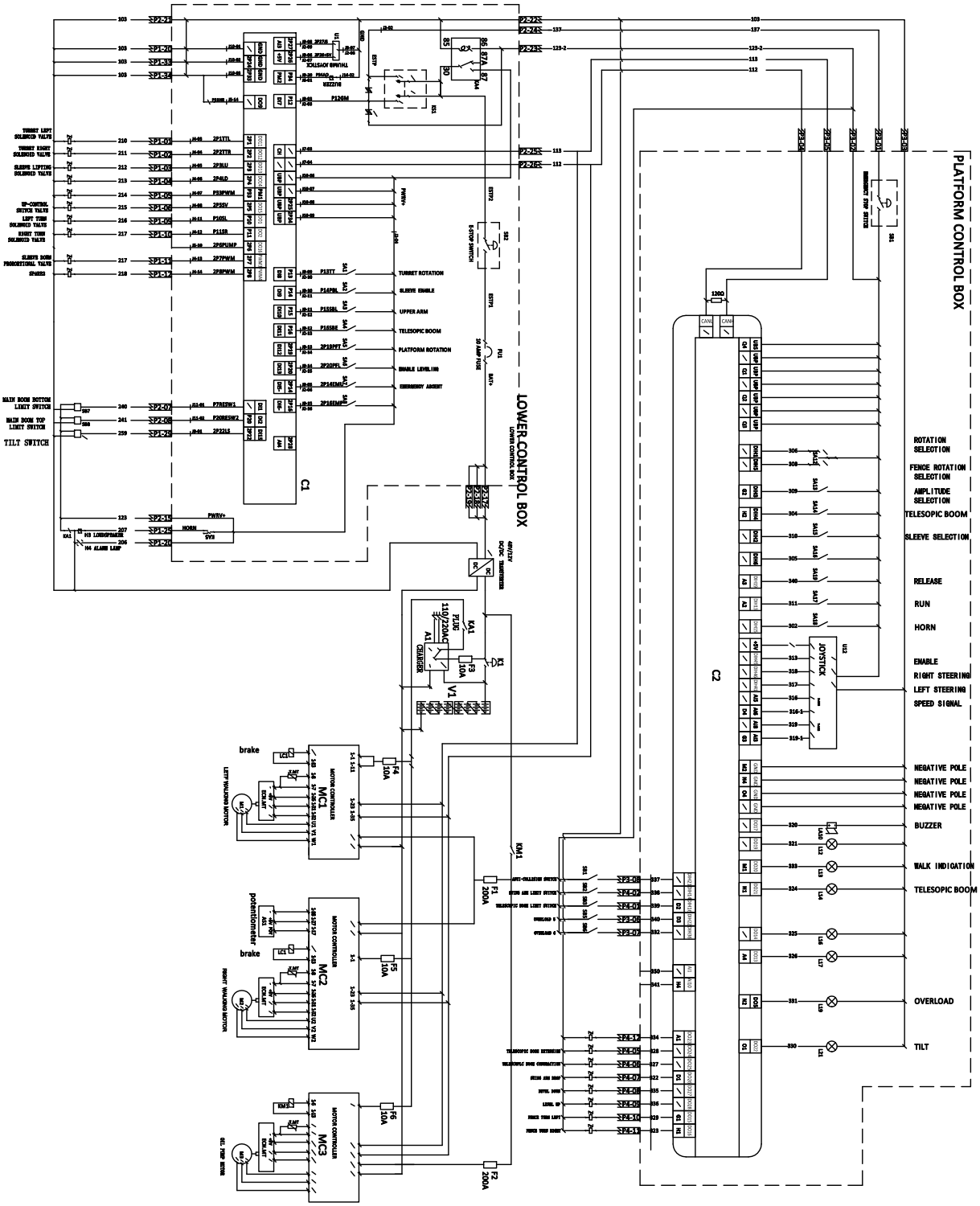
Code	Fault description	Action limit
E01	Failure to connect platform control box	Upper control limits all actions
E02	Platform handle fault	Upper control limits all actions, and lower control does not limit actions
E03	Travel drive fault	Limit all actions
E05	BMS communication fault	Limit the action of boom, and can forcibly retract the vehicle
E07	Body tilt alarm	Limit all actions when getting-off
E08	Left motor driver communication fault	No differential speed and no action limit during traveling
E09	Steering angle sensor fault	Limit all actions when getting-off
E10	Lower control operation handle fault	Limit all actions
E11	Steering angle sensor fault	The alarm does not limit the action
E12	Lower control operation handle neutral position fault	Limit all actions in remote control mode
E13	Platform handle median value fault	Limit all actions, and can forcibly retract the vehicle
E14	Low battery	Limit all actions
E16	Remote control communication fault	Limit traveling action
E17	Platform overload	Limit traveling action
E19	Anti-collision switch fault	Limit the lifting action of jib
E25	1A5 drive communication fault	Limit traveling action
E26	1A6 drive communication fault	Limit traveling action
E27	Pump driver communication fault	Limit the lifting action of jib
E35	2A5 traveling motor fault	Limit all actions
E36	2A6 traveling motor fault	Limit all actions
E39	Pump motor fault	Limit all actions
E41	Rotary selector switch of lower control box platform fault	Limit all actions
E42	Leveling selector switch of lower control box platform fault	Limit all actions

E43	Rotary selector switch of lower control box turntable fault	Limit all actions
E44	Lower control box mast selector switch fault	Limit all actions
E45	Luffing selector switch on the upper arm of lower control box fault	Limit all actions
E46	Telescopic selector switch of lower control box fault	Limit all actions
E47	Jib selector switch of lower control box fault	Limit all actions
E51	Upper control box mast selector switch fault	Limit all actions
E52	The upper arm luffing selector switch of the upper control box fault	Limit all actions
E53	Telescopic selector switch of upper control box fault	Limit all actions
E54	Leveling selector switch of upper control box platform fault	Upper control limits all actions
E55	Upper control traveling selector switch fault	Upper control limits all actions, and lower control does not limit actions
E56	Upper control jib selector switch fault	Limit all actions

5.5.2 Basic troubleshooting

Description of Phenomenon	Cause Analysis	Inspection Measure
The power indicator is not on	The device is not powered on	1. Whether the key switch is in the center position 2. Whether the emergency stop switch of upper and lower control is pressed 3. Whether the upper and lower controls are abnormal 4. Whether the program is restarted without power off after updating
	CAN device is disconnected	1. Whether the leads of power supply and communication are inserted correctly and firmly 2. Whether the plug wiring of upper and lower controls is consistent with that in the drawing 3. Whether the upper control plug or the upper and lower control connecting cable plug is in good contact 4. Whether the platform controller is abnormal 5. Whether the chassis controller plug is connected firmly and correctly
The upper control operation is invalid	The key switch is not switched to the upper control	1. Whether the key switch is in the control position of the platform 2. Whether the platform controller is restarted without power off after re-downloading the program 3. Whether the platform controller is abnormal
The lower control operation is invalid	The key switch is not switched to the lower control	1. Whether the key switch is in the control position of the chassis 2. Whether the chassis controller is restarted without power off after re-downloading the program 3. Whether the chassis controller is abnormal
Tilt alarm in horizontal state	Tilt angle switch is abnormal	1. Whether the tilt angle switch is inserted correctly and firmly 2. Whether the tilt angle switch is abnormal
No-load and horizontal, unable to lower	The lowering valve fails	1. Whether the DI/DO input plug is inserted correctly and firmly 2. Whether the plug switch wiring is abnormal 3. Whether the lowering valve lead is connected incorrectly and whether the lowering valve is abnormal
No alarm and no traveling function	The traveling function is abnormal	1. Whether the controller plug is inserted correctly and firmly 2. Whether the controller is abnormal
No overload alarm	The load is not calibrated or the height is incorrect	1. Whether the sensor is calibrated 2. Whether the wiring of load sensor is incorrect 3. Whether the sensor is faulty

5.5.3 Electrical schematic diagram



5.6 Use and maintenance of lead-acid battery (maintenance required)

5.6.1 Required equipment

Protective goggles and gloves

Wrench with rubber handles

Baking soda

Pole protectors (i.e. Vaseline, anti-corrosion spray. etc.)

Voltmeter (for flooded/wet batteries, gel and AGM battery)

Distilled and purified water (i.e., water treated with deionization, reverse osmosis, etc.)

Discharge tester (if any)

Hydrometer (for flooded/wet batteries)

5.6.2 Safety instructions for battery installation

- Always wear protective clothing, gloves and goggles when handling batteries.
- Do not smoke near the battery, and keep the battery away from sparks, flames and metal objects.
- A wrench with rubber handle shall be used when connecting the batteries.
- The electrolyte is a mixed solution of acid and water, so it shall be avoided from coming into contact with the skin.
- If the acid solution comes into contact with skin or eyes, rinse immediately with clean water.
- Please check whether the cable connection with the terminal is firm. If the connection is too tight or too loose, it may cause damage, melting, or fire to the pole.
- Please do not place objects on the battery to prevent short circuit.
- Wet lead-acid batteries can emit small amounts of gas during use, especially during charging, so they must be charged in a well-ventilated area.
- Do not add acid to the battery.
- Please always keep the battery upright. If the battery is placed sideways or obliquely, the liquid in the battery may overflow.

5.6.3 Instructions for battery connection

Battery cables and torque values:

- Battery cables can provide connections among batteries, devices, and charging systems. Soft cables shall be used to connect batteries, charging systems, and devices. Improper connection may lead to reduced performance and terminal damage, melting or fire.
- The tightening torque of the cable fixing nuts shall be performed according to the following table:

Nut Model	Tightening torque
M8	9～11Nm(80～97ft-lb)
M10	18～23Nm(160～204ft-lb)

Connecting too tightly to the terminal may cause damage to the terminal, while connecting too loosely may lead to melting or fire.

- If the terminal is not kept clean and dry, it may be continuously corroded. To prevent corrosion, please apply a thin layer of Vaseline or use a terminal protector.

5.6.4 Preventive maintenance

Inspection

- Check the appearance of the battery. The top, terminals and connections of the battery shall be kept clean, free of dust and corrosion, and dry.
- If there is liquid on top of the battery, it may indicate that there is too much water in the battery.
- Check the connection of battery cables and other components, and tighten all loose connections.
- Replace the damaged cables.

Check whether all ventilation covers are properly fixed onto the battery.

Cleaning

- Clean the top, terminals, and connections of the battery with a cloth or brush, as well as a mixture of baking soda and water. Do not allow the cleaning solution to enter the interior of the battery.
- Clean with water and wipe dry with a cloth, and apply a thin layer of Vaseline or use terminal protector.
- Keep the area around the battery clean and dry.
- Add distilled water
- The battery needs to be added with distilled water regularly, and the frequency of adding water depends on the purpose and operating temperature of the battery. Please check the battery frequently to determine the frequency of adding water to the battery. In general, the longer the battery is used, the more frequently water will be added.
- Please fully charge the battery before adding distilled water. If the plate is bare, please add distilled water only to the discharged or partially charged battery. In this case, add distilled water only until it is just above the plate terminals and then charge the battery according to the following steps:
- Before removing the ventilation cover, please clean it to prevent dust and debris from entering the battery. Check the electrolyte level, add water when it is higher than the plate, and add distilled water or deionized water when it is lower than the plate.
- For standard batteries, please add water to 3 mm (0.12 in) below the exhaust well (referring to a plastic cover inside the exhaust hole).
- After adding water, please re-fix the ventilation cover to the battery.

5.5.5 Charging

Correct charging is a prerequisite for maximizing battery performance. Undercharging or overcharging may significantly shorten battery life. Most chargers are automatic and pre-programmed, and some chargers allow users to set the voltage and current. The information about correct charging is as follows:

The charger of this device is automatic and pre-programmed, without the need for user intervention in the charging process.

- The battery shall be fully charged after each use.
- Lead-acid batteries have no memory effect, so they do not need to be fully discharged before recharging.
- Please check the electrolyte level to ensure that the positive and negative plates are covered by water before charging.
- Before charging, please check whether all ventilation covers are properly fixed onto the battery.
- Charge only in well-ventilated areas.
- Gas emission (bubbling) will occur near the end of battery charging to ensure that the electrolyte is fully mixed.

Avoid charging at temperatures above 49°C (120°F).

5.6.6 Equalization

Equalization is the overcharging of a flooded/wet battery after it is fully charged. It is recommended to perform equalization only when the specific gravity of a fully charged battery is low (less than 1.25) or the range of specific gravity is large (greater than 0.030). Do not perform equalization on other batteries. The following are the conditions for performing equalization:

Confirm that the battery is of flooded/wet type.

Check the electrolyte level to ensure that the positive and negative plates are covered by water before charging.

Before charging, ensure that all ventilation covers are properly fixed onto the battery.

Set the charger to equalizing mode.

The battery will discharge gas (bubble) during equalization.

Measure the specific gravity every hour, and stop equalizing charge when the specific gravity no longer increases.

5.6.7 Storage

Charge the battery before storing it.

Store the battery in a cool, dry place that is not affected by the weather.

Disconnect the power-off plug to eliminate potential hazards that may cause battery leakage.

- The battery will gradually self-discharge during storage. Monitor the voltage every 4~6 weeks,
- Stored batteries shall be subject to a fast charging at 70% SOC or less.
- After the battery is removed from storage, it shall be recharged before use.

Storage in hot environment (above 32°C [90°F]): During storage, the battery shall be avoided from being directly exposed to hot environments. The self-discharge rate of battery is faster under high temperature environment. If the battery is stored in hot summer, its specific gravity or voltage shall be monitored more frequently (approximately every 2-4 weeks).

Storage in cold environment (below 0°C [32°F]): During storage, the battery shall be avoided from being placed in a place where the temperature is expected to reach freezing point. If it is not fully charged, the battery may freeze at low temperatures. It is important to fully charge the battery if storing it during the freezing winter months.

5.6.8 Troubleshooting

The following battery test steps are only guidelines for determining whether a battery needs to be replaced.

Voltage test during charging

1. Disconnect and reconnect the DC plug to restart the charger.
2. When charging the battery, please record the current during the last half hour of charging
(if possible) and measure the voltage of the battery pack.
3. If the current at the end of charging is lower than 5A and the voltage of the battery pack is higher than the following values:

For a 48V system, it shall not be higher than 56V; for a 24V system, it shall not be higher than 28V; for a 12V battery, it shall not be higher than 14V; for a 6V battery, it shall not be higher than 7V, then please proceed to the next step. Otherwise, check whether the output of the charger is correct and recharge the battery as required. If the voltage of the battery pack is still low, the battery may fail.

4. When the battery is charged, please measure the voltage of each battery. If any battery voltage is lower than the following values, this battery may fail:

For a 6V battery, if the voltage is lower than 7V, the voltage difference between the battery and any other battery in the battery pack is greater than 0.5 V; for a 12V battery, if the voltage is lower than 14V, the voltage difference between the battery and any other battery in the battery pack is greater than 1.0 V.

Specific gravity test

1. Fill and drain the hydrometer two or three times, then take a sample from the battery.
2. Measure the specific gravity reading of all batteries.
3. Correct the specific gravity reading by adding 0.004 for every 5°C (40°F)

increase when the temperature is above 27°C (80°F), and subtracting 0.004 for every 5°C (40°F) decrease when the temperature is below 27°C (80°F).

4. If the specific gravity of each battery in the battery pack is less than 1 .250, this battery pack may be undercharged. Please recharge it.

5. If the difference in specific gravity of any battery in the battery pack is more than 0.050, please equalize this battery pack.

6. If there is still a difference, the batteries in the battery pack may fail.

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

1. To get an accurate voltage reading, the battery must be out of service for at least 6 hours, but preferably up to 24 hours.

2. Measure the voltage of each battery.

3. If the voltage of any battery is 0.3V higher than that of any other battery in the battery pack, then perform equalization for this battery pack.

4. Re-measure the voltage of each battery.

5. If the voltage of any battery is 0.3V higher than that of any other battery in the battery pack, then this battery may be fail.

6. There are other test methods to evaluate the performance of batteries, such as discharge test, which will not be described in detail here.

7. High-frequency battery charger

Relevant technical parameters:

Input voltage: AC100~240V

Output voltage: 48V

Notes for attention:

Input low-voltage protection: When the input AC voltage is lower than 85V, the charging protection will be turned off, and it will automatically resume operation after the voltage becomes normal.

Reverse polarity protection: When the battery is reversely connected, the charger will disconnect the internal circuit from the battery and will not start charging, and there will be no damage.

Output short circuit protection: When the charger output is accidentally short-circuited, the charger will automatically turn off the output. After troubleshooting, it will restart charging with a delay of 10 seconds.

Charging indication: The indicator is yellow during charging and green when the charging is completed.

Charging brake device: All actions of the machine are cut off during charging.

5.7 Use and maintenance of lithium battery

The requirements for the use and maintenance of lithium batteries are as follows:

Preliminary preparation

Before fault inspection, the operator must wear insulating gloves, safety helmets， and other necessary safety articles, and prepare special tools such as multimeter, communication tool (CAN) and computer.

Check the appearance of the battery system box, such as deformation of the box, breakage of positive and negative terminal blocks, looseness of communication aviation connectors, etc.

Check whether the wiring harness on the communication aviation connector socket is misaligned.

The system is powered on and reads battery information through CAN communication.

Check and confirm the fault phenomenon, and analyze the cause.

Notes for attention

Do not disconnect the key at will to forcibly disconnect the main relay of battery system during driving (traveling or lifting), unless there is an emergency.

When the low battery alarm is displayed on the display screen, please charge the battery in time to prevent the battery from being over-discharged.

After the battery is used continuously for a long time, please charge the battery in time before it is not used for a long time to prevent the battery from being over-discharged due to self-consumption of the battery system for a long time.

If the battery becomes hot, deformed, leaks, has a strange odor, or emits smoke during use, immediately stop using the battery and place it in an open area away from people.

The battery is intended for use with the support equipment only. Do not use it for any other purpose.

Short-circuiting the battery pack output port directly with wires is prohibited.

It is strictly forbidden to immerse the battery in water, acidic, alkaline or saline solutions. It should also not be exposed to rain.

Do not use or store the battery in corrosive, explosive, or high-temperature environments (heating, near fire sources, or exposed to sunlight, etc.).

Please use a special charger when charging and avoid charging in direct sunlight. Do not recharge the battery after it is fully charged. Keep children away from the charger while it is charging.

The battery system shall be stored in a suitable environment (with a temperature of less than 40 ℃ and a humidity of less than 90%) when not used for a long period of time. The battery capacity shall be kept above 50% and charged with a special charger at least once every three months.

Used batteries may be hazardous to humans and the environment. Please comply with

workplace and local regulations when disposing of batteries.

Do not apply any external force to the battery pack or allow it to fall from a great height.

The lithium battery has an automatic protection function. The BMS will automatically turn off the contactor protection if the cell voltage is higher than 3.4V and the battery system is activated for a long time without outputting current (≤5A) for 12 hours. The battery must be charged before use.

6 Maintenance Record Form

Date	Repair and Maintenance Content	Maintenance Personnel

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