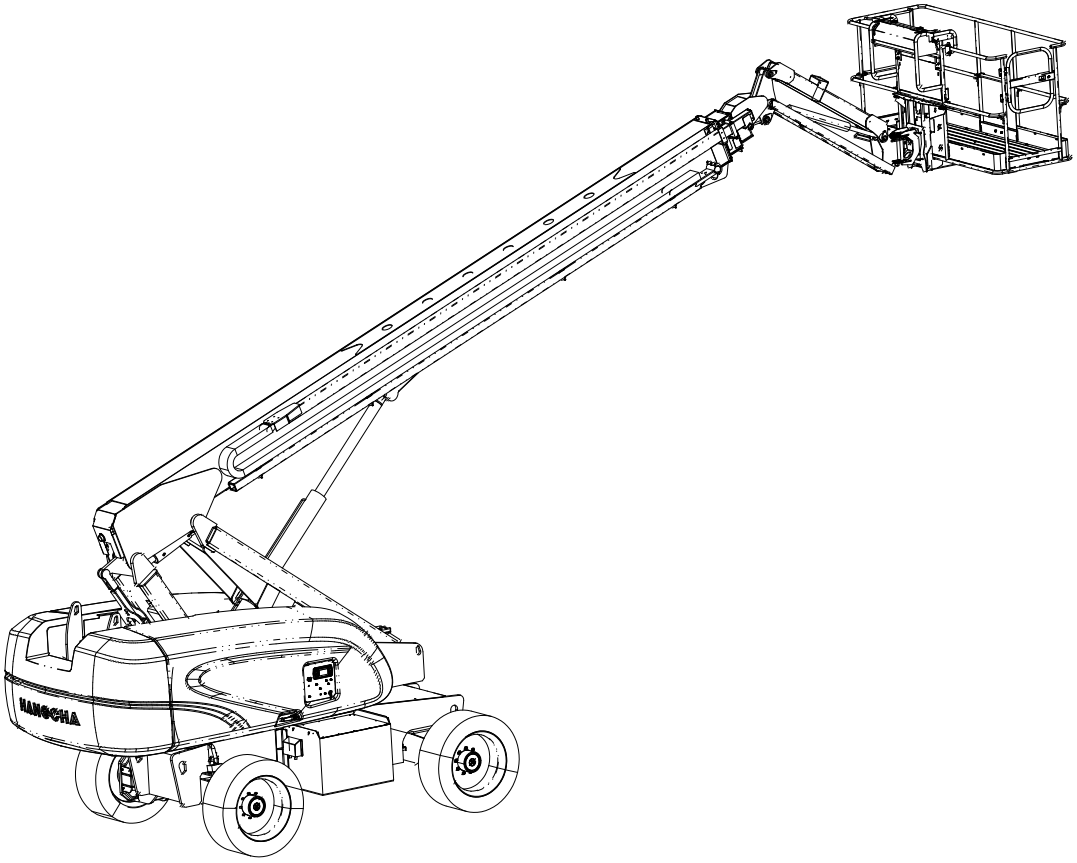
HB Series

Telescopic boom work platform

HB280P
HB250P
HB230P

Repair manual



HANGCHA GROUP CO., LTD

June. 2024

The operation manual shall be kept permanently, and the operator Shall read and understand it carefully.

Catalogue

Preface

Thank you for purchasing the machine from Hangcha Group. Before using the machine, you should master the use and operation requirements of the machine! Any operation of the machine is risky. Only by mastering the safety rules and carefully operating can we effectively prevent personal injury, property damage and accidents. Your safety needs our joint efforts!

The machine is limited to transporting people and tools to the working position and carrying out operations on the working platform. Human safety is closely related to the operation and use of the machine. It is very important to train competent and careful personnel to use the machine and carry out safe operation of the machine. Only trained and authorized personnel are allowed to operate the machine.

This manual is used to guide users/operators to operate and use the machine. It is the responsibility of the user/operator to read, understand and follow this manual and manufacturer's instructions before operating and using the machine. Operators should read, understand and comply with the safety rules and operation instructions, consider the operating parameters and expected environment of the equipment, and strictly comply with the requirements for safe use.

This manual, together with the *Operation Manual* and the *Parts Manual*, should be taken as a part of the machine and kept with the machine at all times! And the manager of the machine shall ensure that all necessary information about operation and routine inspection/maintenance is provided to each lessee by the machine manufacturer. If the sale shall be distributed randomly, the machine manager shall also provide the manufacturer's maintenance information to the trained maintenance personnel responsible for the machine.

Our product design will be constantly updated and improved, the content of this manual may be different from the equipment in your hand.

In case of any ambiguity, please contact the sales company or agent of Hangcha Group Co., Ltd.

Chapter 1 Product Performance Parameters

1.1 Product Performance Parameters

Table 1-1 HB280P product performance parameters

HB280P parameters	
Dimension parameters	
Maximum platform height	25.95m
Maximum working height	27.95m
Maximum horizontal extension	22.75m（19.35m Limited）
Maximum horizontal working distance	23.25m（19.85m Limited）
Length	12.19m
Length（Transportation status）	11.95m
Width	2.49m
Width（Transportation status）	2.30m
Height	2.86m
Height（Transportation status）	2.59m
Wheelbase	2.85m
Maximum ground clearance	0.43m
Platform width (length × width × height)	2.44m×0.91m×1.1m
Tire model	385/45-28
Performance parameter	
Rated load	310kg（460kg Limited）
Maximum number of operators	3 persons
Maximum manual force	400N
Maximum driving speed (retracted state)	6km/h
Maximum driving speed (lifting state)	0.8km/h
Turn radius (inner /outer)	3.66m/6.55m
Gradeability	45%
Maximum chassis tilt angle	5°
Body rotation	360° continuous
Turntable tailswing	1.6m
Maximum allowable wind speed	12.5m/s

Platform rotation angle	±90°
Jib luffing angle	77° /-58°
Power parameters	
Drive mode (drive × Steering)	4WD×2WS
Drive motor	7.9kW
Pump Motor	26kW
Pump	45cc
Oil Tank Capacity	170L
Hydraulic system pressure	28Mpa
Battery specification (voltage, capacity)	80V, 544Ah (80V, 540AH lead-acid)
System voltage	80V
Control voltage	12V
Weight	
Total weight	18800kg (lithium)
	18900kg (lead-acid)
Ground bearing information	
Maximum tire load	9200kg

Table 1-2 HB205P product performance parameters

HB250P parameters	
Dimension parameters	
Maximum platform height	23m
Maximum working height	25m
Maximum horizontal extension	17m (15m Limited)
Maximum horizontal working distance	17.5m (15.5m Limited)
Length	10.9m
Length (Transportation status)	10.9m
Width	2.49m
Width (Transportation status)	2.30m
Height	2.82m
Height (Transportation status)	2.58m
Wheelbase	2.5m

Maximum ground clearance	0.4m
Platform width (length × width × height)	2.44m×0.91m×1.1m
Tire model	355/55D625
Performance parameter	
Rated load	310kg (460kg Limited)
Maximum number of operators	3 persons
Maximum manual force	400N
Maximum driving speed (retracted state)	6km/h
Maximum driving speed (lifting state)	0.8km/h
Turn radius (inner /outer)	2.05m/5.35m
Gradeability	35%
Maximum chassis tilt angle	5°
Body rotation	360° continuous
Turntable tailswing	1.6m
Maximum allowable wind speed	12.5m/s
Platform rotation angle	±90°
Jib luffing angle	77° /-58°
Power parameters	
Drive mode (drive × Steering)	4WD×2WS
Drive motor	7.6kW
Pump Motor	26kW
Pump	28cc
Oil Tank Capacity	170L
Hydraulic system pressure	28Mpa
Battery specification (voltage, capacity)	80V, 460Ah (80V, 400AH lead-acid)
System voltage	80V
Control voltage	12V
Weight	
Total weight	13400kg (Lithium)
	13600kg (Lead-acid)
Ground bearing information	
Maximum tire load	6700kg

HB230P parameters	
Dimension parameters	
Maximum platform height	21.4m
Maximum working height	23.4m
Maximum horizontal extension	15.5m（12.5m limited）
Maximum horizontal working distance	17m（14m limited）
Length	10.2m
Length（Transportation status）	10.2m
Width	2.49m
Width（Transportation status）	2.30m
Height	2.82m
Height（Transportation status）	2.58m
Wheelbase	2.5m
Maximum ground clearance	0.4m
Platform width (length × width × height)	2.44m×0.91m×1.1m
Tire model	355/55 D625
Performance parameter	
Rated load	310kg（460kg limited）
Maximum number of operators	3 persons
Maximum manual force	400N
Maximum driving speed (retracted state)	6km/h
Maximum driving speed (lifting state)	0.8km/h
Turn radius (inner/outer)	2.05m/5.35m
Gradeability	35%
Maximum chassis tilt angle	5°
Body rotation	360° continuous
Turntable tailswing	1.55m
Maximum allowable wind speed	12.5m/s
Platform rotation angle	±85°
Lifting arm luffing speed(upward)	
Lifting arm luffing speed(downward)	
Telescopic arm lifting speed	

Telescopic arm retracted speed	

Table 1-3 HB230P product performance parameters

Note：

a. Calculated according to the height of personnel equal to 2m, the working height is equal to the height of working platform plus 2m.

b. The ground bearing information is myopia information, and different selection configuration factors are not included. Use this information only if you have a sufficiently high safety factor.

c. Add hydraulic oil and lubricating oil suitable for the environment according to the ambient temperature in different regions.

a) Auxiliary devices are required to start the machine in cold climates;

b) The rated load capacity of the platform includes personnel, auxiliary equipment, tools, and other heavy objects.

1.2 Operation Scope Diagram

Table 1-1 HB280P Operation scope diagram

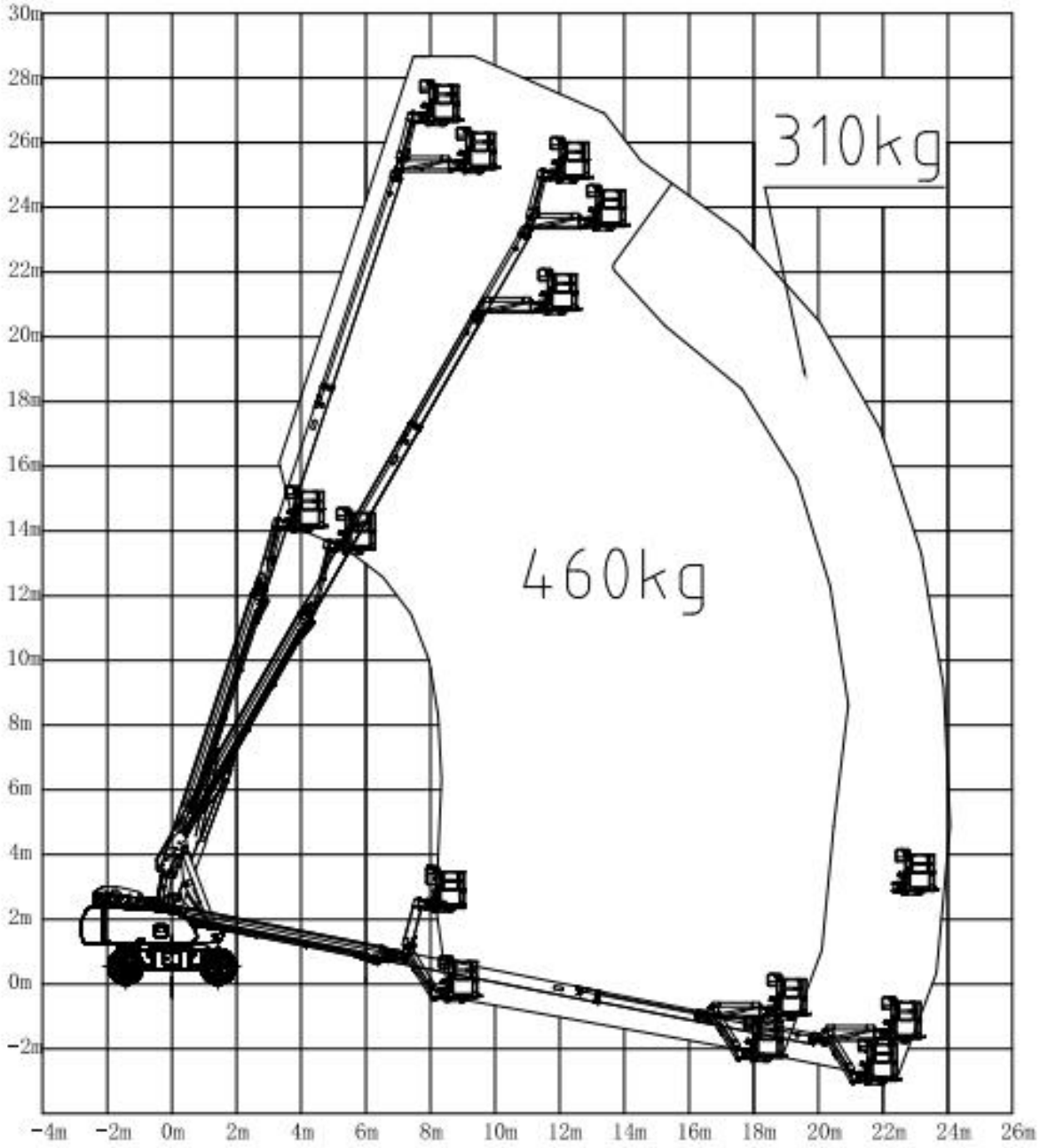


Table 1-2 HB250P Operation scope diagram

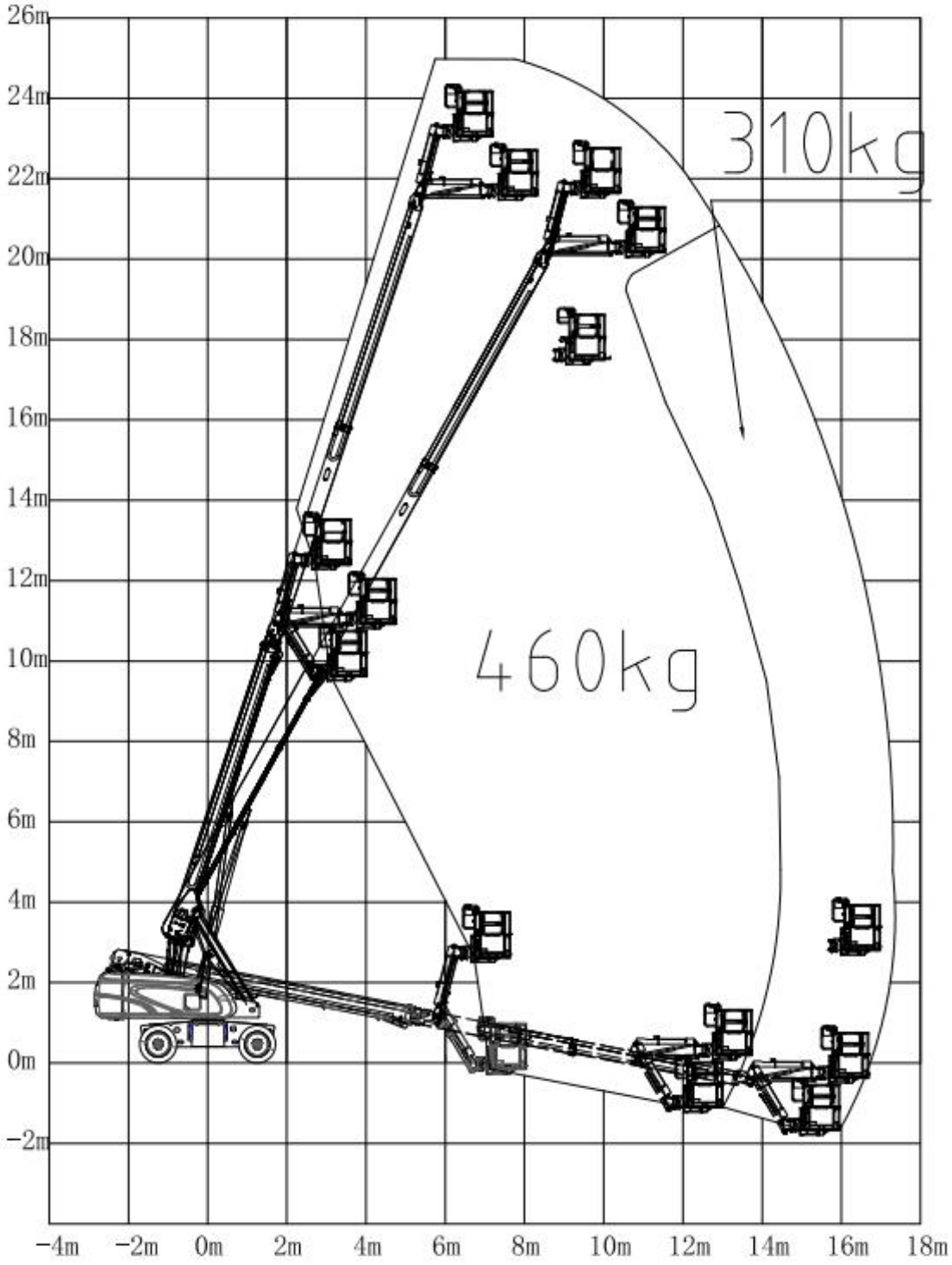
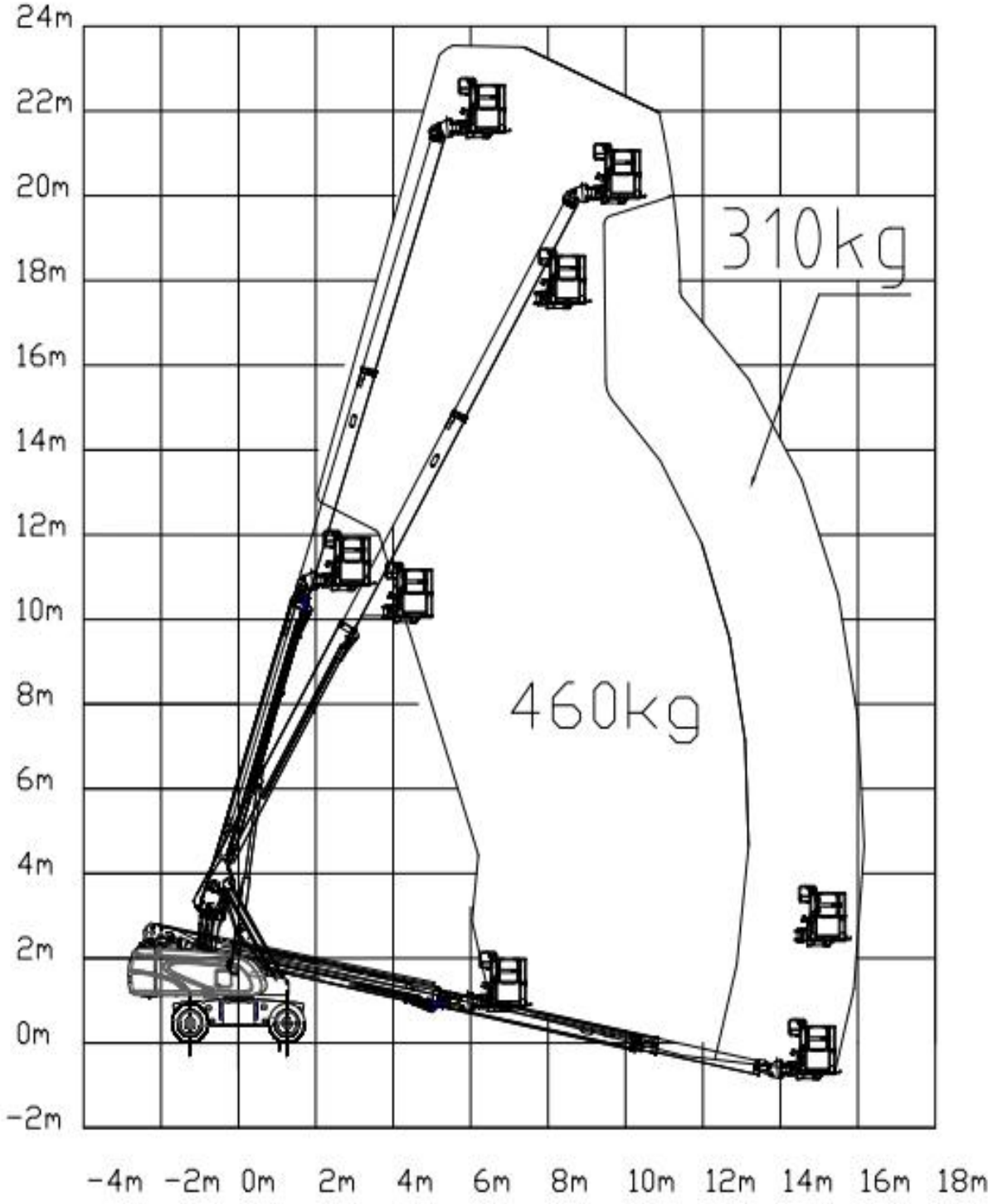


Table 1-3 HB230P Operation scope diagram



1.3 Action Time

Parameter items	HB280P	HB250P	HB230P
Upper luffing of main arm			
Lower luffing of main arm			
Extension of telescopic arm			
Retraction of telescopic arm			
Turntable rotation (360 °) - working state			
Rotary table rotation (360 °) - retracted status			
Platform swings left or right (180 °)			
Upper luffing of the flying arm			
Lower luffing of the flying arm			
Maximum walking speed - working state (30m)			
Maximum walking speed - Retracted state (30m)			

Table 1-4 Action Time

a. The start and end depends on the action, not on the controller or switch.
b. Walking test results vary with tire specifications.
c. All speed tests shall be conducted on the platform control box, and there will be differences in the operation of the ground control box.
d. All tests shall be carried out when the hydraulic oil temperature is higher than 40 ℃ . If the hydraulic oil temperature is too low, the test results will be affected

1.4 Test Requirements

- Main boom amplitude: The main boom amplitude is lowered to the correct position, and the telescopic arm is fully retracted. Move the main arm up twice (from the lowest point to the maximum angle) and down twice (from the maximum angle to the lowest point).
- Telescopic arm extension: The main arm is raised to the level of the telescopic arm, extending from fully retracted to fully extended twice, and retracting from fully extended to fully retracted twice.
- Tower rotation: The boom is located in the center position, rotates once, and tests twice.

- Platform swing: The work platform is horizontal, and the platform rotates from the leftmost to the rightmost twice, and from the rightmost to the leftmost twice.
- Flying arm amplitude: Starting from the lowest position of the flying arm. Raise the flying arm twice and lower the forearm twice.
- Walking - retracted state: The test should be conducted on a horizontal plane. Switch to the high-speed walking mode in the retracted state, and push the walking handle to the maximum stroke. Drive forward 30 meters twice and backward 30 meters twice.
- Walking - working state: The test should be conducted on a horizontal plane. Push the walking handle to the maximum stroke while working. Drive forward 30 meters twice and backward 30 meters twice.

1.5 Dynamic Parameters

Table 1-5 Dynamic parameters

Parameter	Specifications
Hydraulic oil	
Normal temperature area（0℃～40℃）	L-HM46
Cold area（-25℃～25℃）	L-HV32
High temperature area（＞40℃）	L-HM68
Extremely cold area（＜-30℃[-22℉]）	Special customization required
HB280P Hydraulic pump	
Type	Gear pump
Flow	99L/min
Rated working pressure	28 MPa
HB230P-HB250P Hydraulic pump	
Type	Gear pump
Flow	61L/min
Rated working pressure	28 MPa
Function valve	
Maximum working pressure of main valve	28 MPa

1.6 Installation Instructions for Hydraulic Hose and Pipe Joint

1.6.1 Hydraulic Hose Torque

When removing or installing the hydraulic hose, it must be removed or installed according to the torque specified in the table below.

NOTE
When the machine leaves the factory, the manufacturer can fill different hydraulic oils according to customer's requirements. Different hydraulic oils cannot be mixed.

Table 1-6 Torque of hydraulic hose

Metric thread	L	S
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
M26×1.5	90± 6 Nm	-
M30×2	120± 8 Nm	140± 10 Nm
M36×2	150± 12 Nm	180± 12 Nm
M42×2	-	260± 16 Nm
M45×2	240± 15 Nm	-
M52×2	250± 16 Nm	280± 18 Nm

1.6.2 Hydraulic Pipe Joint Torque

When removing or installing the hydraulic pipe joint metric thread, it must be removed or installed according to the torque specified in the table below.

Table 1-7 Hydraulic pipe joint torque-Metric

Thread specification	Al	Steel	
	ED+O Ring	ED+O Ring	O Ring
	L		
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
M27×2	120 ± 8 Nm	185 ± 12 Nm	100 ± 7 Nm
M30×2	140 ± 8 Nm	245 ± 15 Nm	135 ± 8 Nm
M33×2	180 ± 10 Nm	320 ± 20 Nm	160 ± 10 Nm
M42×2	240 ± 15 Nm	450 ± 25 Nm	210 ± 13 Nm
M48×2	280 ± 20 Nm	540 ± 30 Nm	260 ± 15 Nm
S			
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 ±8 Nm	100 ± 10 Nm
M27×2	120 ± 8 Nm	185 ±12 Nm	160 ± 10 Nm
M30×2	140 ± 8 Nm	245 ±15 Nm	210 ± 13 Nm
M33×2	180 ± 10 Nm	320 ± 20 Nm	260 ± 15 Nm
M42×2	240 ± 15 Nm	450 ± 25 Nm	330 ± 20 Nm
M48×2	280 ± 20 Nm	540 ± 30 Nm	420 ± 25 Nm

When removing or installing the hydraulic pipe joint - Inch BSP thread, it must be removed or installed according to the torque specified in the table below.

Table 1-8 Hydraulic pipe joint torque-British system（BSP）

Thread specification	Al	Steel	
	ED+O Ring	ED+O Ring	O Ring
L			
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	-
G1-1/4A	240 ± 15 Nm	450 ± 25 Nm	-

G1-1/2A	280 ± 20 Nm	540 ± 30 Nm	-
S			
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	-
G1-1/4A	240 ± 15 Nm	450 ± 25 Nm	-
G1-1/2A	280 ± 20 Nm	540 ± 30 Nm	-

When removing or installing the hydraulic pipe joint - American UNC / UNF thread, it must be removed or installed according to the torque specified in the following table.

Table 1-9 Hydraulic pipe joint torque - American system (UNC / UNF)

Thread specification	Al	Steel
	O Ring	O Ring
L		
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
1-1/16-12	110 ± 8 Nm	140 ± 10 Nm
1-5/16-12	160 ± 10 Nm	210 ± 15 Nm
S		
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±10 Nm
1-1/16-12	110± 8 Nm	185±15 Nm
1-5/16-12	160± 10 Nm	280±20 Nm

1.6.3 Tightening Procedure of Hydraulic Hose and Pipe Joint

When installing hydraulic hose and pipe joint, it must be installed according to the following requirements.

1. Replace the O-ring when the seal is damaged or there is oil leakage at the seal. Once the tightening torque of the pipe joint or rubber hose exceeds the specified tightening torque value, the O-ring cannot be reused.
2. Lubricate the O-ring before installation.
3. Install the O-ring correctly.
4. When butting the rubber hose nut and pipe joint, align the pipe joint, rubber hose and rubber 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. Perform all functions of the machine and check the rubber hose, pipe joint and related parts to ensure there is no leakage.

1.6.4 Tightening Torque of Fasteners

Unless there are special torque requirements in the manual or other instructions, the general tightening torque of metric bolts shall be implemented according to the following table.

Table 1-10 Tightening torque of fasteners - Metric

Diameter (mm)	Pitch (mm)	8.8 Grade	10.9Grade	12.9Grade
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
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

Unless there are special torque requirements in the manual or other instructions, the tightening torque of general American bolts (thread mark: UNC) shall be implemented according to the following table.

Table 1-11Tightening torque of fasteners - American (UNC)

Diameter（in）	Opposite dimension of nut（s）	American grade 5	American grade 8
1/4-20	7/16″	10 Nm	14 Nm
5/16-18	1/2″	21 Nm	29 Nm
3/8-16	9/16″	37 Nm	51 Nm
7/16-14	5/8″	60 Nm	82 Nm
1/2-13	3/4″	90 Nm	130 Nm
9/16-12	13/16″	130 Nm	180 Nm
5/8-11	15/16″	178 Nm	250 Nm
3/4-10	1-1/8″	315 Nm	445 Nm
7/8-9	-	509 Nm	715 Nm

Unless there are special torque requirements in the manual or other instructions, the tightening torque of general American bolts (thread mark: UNF) shall be implemented according to the following table.

Table 1-12 Tightening torque of fasteners - American (UNF)

Diameter（in）	Opposite dimension of nut（s）	American grade 5	American grade 8
1/4-28	7/16″	11.5 Nm	16 Nm
5/16-24	1/2″	23 Nm	32 Nm
3/8-24	9/16″	41 Nm	58 Nm
7/16-20	5/8″	65 Nm	92 Nm
1/2-20	3/4″	100 Nm	145 Nm
9/16-18	13/16″	145 Nm	200 Nm
5/8-18	15/16″	200 Nm	280 Nm
3/4-16	1-1/8″	350 Nm	495 Nm
7/8-14	-	560 Nm	780 Nm

Chapter 2 Important Safety Rules

2. 1 Summary

This chapter covers how to use your machine correctly and safely in most applications. In order to achieve this goal, we have established a set of daily checklist, which is mandatory for qualified quality inspectors to carry out daily maintenance in strict accordance with this checklist, so as to ensure that the machine can operate without fault and ensure safe operation. Read, understand and comply with safety rules, job site requirements and government regulations.

Whether you are the owner, user or operator of the machine, before operating the machine for the first time， you must read and correctly understand the contents of this manual. The machine can only be operated independently after the whole process is operated from beginning to end under the supervision of qualified personnel with practical operation experience. If you have any questions about the use or operation of the machine, please call Hangcha group in time for consultation.

Most of the accidents involved in the operation, maintenance and repair process are caused by the failure to follow the basic safety operation procedures and precautions in the actual operation. In fact, if we can analyze the applied construction safety hazards and take corresponding safety measures before each construction operation, most accidents in practice can be completely avoided. Therefore, before each use and operation, it should be evaluated by the safety officer who has been trained and has the experience and ability of safety hazard analysis, and remind the personnel operating the machine to take necessary countermeasures to avoid the occurrence of danger.

Incorrect operation, lubrication, maintenance and repair are very dangerous, which may cause personal injury or casualties. Therefore, only after you read the manual thoroughly and fully understand the knowledge and information about operation, lubrication, maintenance and repair, can you take maintenance for the equipment.

2. 2 Symbol Description

This safety symbol appears in most safety statements. This means that you need to pay attention and be vigilant at all times, and your safety will be affected! Please read and observe the relevant information of safety warning symbols.

Indicates an imminent danger. If not avoided, it could result in death or serious injury.

Indicates a potential danger. If not avoided, it could result in death or serious injury.

Indicates a potential danger. If not avoided, may cause slight or moderate injury to personnel.

Attention

Conditions that may cause damage to the power plant,loss of personal property or Harm to the environment,or lead to improper operation of the equipment.

Note： these steps,instructions or conditions should be followed in order to make the Power unit or component work in the expected way.

2. 3 Accident Notification

In case of any accident involving the machinery of Hangcha Group Co., Ltd., Hangcha Group Co., Ltd. must be notified immediately. Even if there is no personal injury or property damage in the accident, Hangcha Group Co., Ltd. must be contacted by telephone and all necessary details must be provided.If the manufacturer is not notified within 48 hours after the accident involving the machinery of Hangcha Group Co., Ltd., the warranty of the product may be invalidated.

Attention

After any accident, thoroughly check the machine and its function. First test all functions from the ground controller, and then test from the platform controller. Before all damages are repaired and all controllers can be operated correctly, the lifting height must not exceed 3m.

2. 4 Electric Shock Hazard

Note: This machine is not insulated and does not have the function of electric shock protection

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

Electric Shock Hazard

- Follow relevant government rules and always keep a safe distance from power lines and electrical equipment. See 2-1 for details.
- Platform movement, wire swinging or sagging shall be considered, and strong wind or gust shall be avoided. Do not operate the machine in case of lightning or rainstorm.
- If the machine contact with live wires, stay away from the machine. Personnel on the ground or on the platform are not allowed to touch or operate the machine until the power is cut off.
- Do not use the machine as ground wire during welding, grinding and other operations.

Chart 2-1 Minimum safety distance of electrified body

Voltage range（Phase to phase， kV）	Minimum approach distance m（ft）
0～50	3.05（10）
50～200	4.60（15）
200～350	6.10（20）
350～500	7.62（25）
500～750	10.67（35）
750～1000	13.72（45）

2.5 Tip-over Hazard

Chart 2-2 Maximum rated load of platform

Rated load	
Rated load (not limited)	310kg（683lb）
Rated load (limited)	460kg（1014lb）
Maximum number of people allowed	3persons
Maximum manual operating force	400N（90lbf）

Tip-over Hazard

- Personnel, equipment and materials on the platform shall not exceed the maximum load capacity.
- The platform can only be lifted or extended when the machine is on solid and flat ground.

Tip-over Hazard

- Do not use the tilt alarm as a level indicator. The tilt alarm on the platform will sound only when the machine is heavily tilted. If the tilt alarm sounds: be very careful to lower the platform and transfer the machine to a solid and level ground. Do not change the level or limit switch.
- If the tilt alarm sounds when the machine is uphill, follow the following steps to lower the boom and transfer the machine to a sturdy and level ground. Remember not to rotate the boom during the descent process.

1. The main boom amplitude is downward;
2. Retract the telescopic arm.

- If the tilt alarm sounds when the machine is going downhill, follow the following steps to lower the boom and transfer the machine to a sturdy and level ground. Remember not to rotate the boom during the descent process.

1. Retract the telescopic arm;
2. The main boom amplitude is lowered.

- Do not drive faster than 0.8 km / h （0.5mph）when the platform is lifted.
- When the platform is lifted, do not drive on uneven, unstable surfaces or 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 the wind will reduce the stability of the machine.
- When the machine is driving in uneven areas, with gravel or other uneven surfaces, or near openings and steep slopes, it is necessary to maintain a distance of at least 0.6m (2ft) and reduce the speed.
- Do not push or pull any object outside the platform. The maximum allowable lateral force is 400N（90 lbf）.
- The machine can only be towed from the tying/lifting points on the chassis.
- Do not use arms or platforms to stabilize or support any objects outside the machine.
- 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 change the aerial work platform without the written permission of the manufacturer.
- Do not install additional devices for placing tools or other materials on the platform or guardrail, which will increase the weight and surface area of the platform or increase the load.
- Do not place or fix any suspended load on any part of this machine.
- Do not place ladders or scaffolds in the platform or lean against any part of the machine.
- Do not use the machine on moving or moving surfaces or on vehicles. Ensure that all tires are in good condition and that the tire nuts are tightened.
- Do not use batteries that weigh less than the original battery or lithium battery, and do not remove or modify other components such as counterweights in the battery box without authorization. The battery not only provides power, but also plays a crucial role in balancing the stability of the machine.
- Do not use the platform to push the machine or other objects.
- Do not allow the platform to contact adjacent components.
- Do not tie the platform to adjacent components with ropes or other binding materials.
- Do not place loads outside the perimeter of the platform.
- Do not use the platform controller to lower the platform when the platform is tripped, stuck, or other nearby objects hinder its normal movement.If it is intended to lower the platform using the ground controller, it must be operated after all personnel leave the platform.

2.6 Working Environment Hazard

Unsafe Workplace Hazard

- Do not operate on surfaces, edges, or potholes that cannot support the weight of the machine. Only when the machine is on firm, level ground can the platform be lifted or extended.
- Do not use the tilt alarm as a level indicator. The tilt alarm on the platform sounded only when the machine tilted heavily.
- When the platform is lifted, if the tilt alarm sounds, carefully lower the platform and do not change the level or limit switch.
- If the tilt alarm sounds when the machine is uphill, follow the following steps to lower the boom and transfer the machine to a sturdy and level ground. Remember not to rotate the boom during the descent process.

  1. The main boom amplitude is downward;
  2. Retract the telescopic arm.

- If the tilt alarm sounds when the machine is going downhill, follow the following steps to lower the boom and transfer the machine to a sturdy and level ground. Remember not to rotate the boom during the descent process.

1. Retract the telescopic arm;

2. The main boom amplitude is lowered.

- Do not drive over 0.8km/h (0.5mph)with the platform lifted.
- Do not operate the machine outdoors when there is strong winds or gusts. Do not lift the platform when the wind speed exceeds 12.5m/s(28mph). If the wind speed exceeds 12.5m/s(28mph) after lifting the platform, immediately retract the platform and stop the operation.
- Do not drive on uneven terrain, unstable surfaces, or other dangerous conditions with lifted platform.
- When the machine is driving in uneven areas, with gravel, unstable or smooth surfaces, steep slopes, and near openings, it is necessary to maintain a distance of at least 0.6m (2ft) and reduce the speed.
- Do not drive or lift the machine on slopes, steps, or arched ground that exceed its maximum slope rating.

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

Chart 2-3 The Beaufort Scale

scale	m/s	mile/h	Description	Ground conditions
0	0～0. 2	0～0. 5	Clam	No wind, smoke vertically up.
1	0. 3～1. 5	1～3	Light air	Smoke indicates wind direction.
2	1. 6～3. 3	4～7	Light breeze	Bare skin feels windy. Leaves rustle slightly
3	3. 4～5. 4	8～12	Gentle breeze	Twig began to shake.
4	5. 5～7. 9	13～18	Moderate breeze	Dust and scraps of paper kicked up and twigs began to shake.
5	8. 0～10. 7	19～24	Fresh breeze	Saplings shook.
6	10. 8～13. 8	25～31	Strong breeze	Swaying branches, whistling overhead power lines, and difficult to open an umbrella.
7	13. 9～17. 1	32～38	Near gale	Tree shakes. Difficulty walking against the wind.
8	17. 2～20. 7	39～46	Gale	Broken branches. Vehicle offset direction.
9	20. 8～24. 4	47～54	Strong gale	Minor damage to the building.

Attention
Maximum slope rating applies to machines in the retracted position. Climbing capacity refers to the maximum slope rating when the machine is on firm ground and the platform is carrying only one person. The rating of the ramp decreases as the platform increases in weight.

Maximum gradeability:

Model	Platform uphill	Platform downhill	Platform side slope
HB280P	45%/24°	30%/17°	25%/14°
HB230/250P	35%/19°	30%/17°	25%/14°

2. 7 Unsafe Operation Hazard

The operation shall strictly comply with the requirements of this manual and maintenance manual. If the industry or local has more stringent regulations, the latter shall be followed.

Unsafe Operation Hazard

- Do not push or pull any object outside of the platform. Maximum allowable side force：Indoor 400N (90 lbf)
- The machine can only be towed from the tying/lifting points on the chassis.
- Do not use arms or platforms to stabilize or support any objects outside the machine.
- Do not change any machine components that may affect safety and stability.
- Do not replace parts critical to machine stability 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 to hold tools or other materials on the platform or guardrail. It will increase the weight and surface area of the platform or the load.
- Do not place ladder or scaffolding inside the platform or against any part of the machine.
- Do not operate machine on moving or mobile surfaces, or on vehicles. Ensure that all tires are in good condition and the tire nuts are properly tightened.
- Do not use batteries that weigh less than the original battery or lithium battery, and do not remove or modify other components such as counterweights in the battery box without authorization. The battery not only provides power, but also plays a crucial role in balancing the stability of the machine.
- Do not place or fix any overhang load on any part of the machine.

- Do not use the machine as a crane.
- Do not push the machine or other objects with the platform.
- Do not allow the platform to contact adjacent components.
- Do not tie the platform to adjacent components.
- Do not place loads outside the platform perimeter.
- Do not operate the platform controller to lower the platform when it is tripped, stuck, or blocked from normal movement by other nearby objects. If the platform is to be lowered by ground controllers, the operation must be performed only after all personnel have left the platform.
- When one or more tires are off the ground, evacuate all personnel before stabilizing the machine, and use crane, forklift, or other suitable equipment to stabilize the machine.

2.8 Fall Hazard

The operation of the machine shall strictly comply with the requirements of this manual and maintenance manual. If the industry or local has more stringent regulations, the latter shall be followed.

Fall Hazard

- Wear seat belts or use safety facilities in accordance with government regulations. Attach the lanyard to the anchor on the platform, and only one person can tie on an anchor.
- Do not sit, stand or climb on the platform guard rails. Maintain a firm footing on the platform floor at all times.
- Do not use the boom to enter or leave the platform.
- Keep the platform floor unobstructed.
- Do not allow sludge, oil stains, lubricating grease, and other slippery substances to remain on work shoes and work platform floors.
- Do not enter or exit the platform unless the machine is fully retracted.
- Close the entrance door before operation.
- Do not operate the machine unless the guard rails are properly installed and the entry is secured.

2.9 Collision Hazard

The operation of the machine shall strictly comply with the requirements of this manual and maintenance manual. If the industry or local has more stringent regulations, the latter shall be followed.

Collision Hazard

- Be careful about limited sight distance and blind spots when driving or operating.
- During driving or turning, non workers must be at least 1.8m (5.9ft) away from the machine.
- When moving a machine, the working platform is about 2 meters (6.6 feet) away from an obstacle, the lifting and variable amplitude functions of the boom should be used to approach the obstacle, and the driving function of the machine should not be used.
- When driving in high gear, switch to low gear before stopping.
- High gear cannot be used when driving in limited space, enclosed areas, or in reverse.
- Check the work area for overhead obstacles or other possible hazards.
- Be careful when using the platform controller and ground controller. The color marked direction arrows show the driving, lifting and steering functions.
- Users must comply with user, workplace and government regulations on "use of personal protective equipment" (Safety helmet, safety belt and gloves, etc）.
- Before releasing the brakes, the machine must be level or fastened.
- Lower the platform only when there are no people and obstacles in the bottom area.
- When the machine is working at heights, it is necessary to warn workers/non workers not to work, stand, or walk under the raised boom or work platform. If necessary, set up roadblocks on the ground.
- Limit travel speed based on ground conditions, congestion, ground slope, personnel location and any other factors that may cause a collision.
- Do not operate the machine in the range of any crane or mobile overhead unless the crane controller is locked or precautions have been taken to prevent any potential collision.
- No dangerous driving or horseplay when operating machine.

2. 10 Crushing Hazard

There is a potential crushing hazard when moving the machine. Body parts and clothing should be kept at a safe distance from the machine at all times during operation.

Crushing Hazard

- Do not place your hands and arms near where they may be squeezed.
- Do not work under the platform or in the scissor arms without the safety bar in place.
- Please maintain correct judgment and planning when operating the machine with the controller on the ground and keep a proper distance between the operator, the machine and the fixed object.

2. 11 Explosion and Fire Hazard

Explosion and Fire Hazard

- Do not charge the battery, operate or fuel the machine in places that are dangerous or where flammable and explosive gases may exist.

2. 12 Damaged Machine Hazard

Attention

Comply with the operation and maintenance requirements of the parts in this manual and the maintenance manual, otherwise the machine may be damaged.

Damaged Machine Hazard

- Do not use damaged or malfunctioning machines.
- Conduct a thorough pre-operation inspection of the machine and test all functions before each work shift. Damaged or faulty machines should stop work and be marked immediately.
- Ensure that all maintenance operations have been performed according to this manual and related maintenance manual.
- Ensure that all labels are properly positioned and easily identifiable.
- Ensure that the operation and maintenance manual are complete, legible and kept in the storage container located on the platform.

2. 13 Body Injury Hazard

Comply with the operation and maintenance requirements in this manual and the maintenance manual.

Body Injury Hazard

- Do not operate the machine with a hydraulic oil leak. Hydraulic oil leak can penetrate or burn skin.

Attention: Operators must perform maintenance during pre operation inspections. Only trained maintenance personnel can open the turntable cover to repair the machine.

2. 14 Battery Hazard

Battery Hazard

Fire and explosion hazards:

- The battery contains sulfuric acid and can produce an explosive mixture of hydrogen and oxygen. Any equipment that can cause sparks or flames (including cigarette / smoke materials) should be kept away from the battery to prevent explosion.
- Do not touch the battery terminals or cable clamps with spark generating tools.
- Do not charge the battery in direct sunlight.
- The battery charging area should maintain good ventilation.
- If the battery experiences heating, deformation, leakage, odor or smoke during use, it must be immediately stopped and placed in an open and away from crowds.
- Do not throw batteries into flames or heaters.

Electric shock hazard：

- Contact with live circuits may cause death or serious injury, so be sure to wear protective goggles, gloves, and clothing.
- Remove all rings, watches, and other accessories.

Chemical burn hazards:

- Avoid spillage of lead-acid battery acid or contact with unprotected skin. If the lead-acid battery acid solution comes into contact with the skin, please wash it immediately with plenty of water and seek medical attention immediately.
- If battery acid spills, use water mixed with bicarbonate (baking soda) to neutralize the acid.

Unsafe operation hazards:

- Please make sure to read and follow the battery manufacturer's recommendations for proper use and maintenance of battery procedures.
- The battery charger can only be connected to a grounded three wire AC power outlet. Please ensure that the charger is in the correct working state before charging.
- Please use the charger provided by the manufacturer to charge the battery.
- The battery is only suitable for supporting equipment and should not be used in other situations.
- Only trainees who have obtained workplace permission can remove the battery from the machine.
- Before replacing the battery, be sure to use the appropriate number of personnel and lifting methods.
- The outer packaging film of the battery is easily damaged by sharp parts, and it is prohibited to use sharp parts to collide with the battery.
- No other objects or tools should be placed on the battery to prevent short circuits.
- Please always keep the battery upright. If placed sideways or diagonally, liquid in the battery may overflow.

- It is strictly prohibited to short circuit the positive and negative terminals of the battery system.
- It is strictly prohibited to short circuit the positive and negative terminals of the battery system.
- It is prohibited to directly connect the battery to the power outlet.
- Striking, throwing, or stepping on batteries is prohibited.
- It is strictly prohibited to immerse the battery in water, acidic, alkaline, and salt containing solutions, avoid rain.
- It is prohibited to modify this battery system on your own to avoid serious accidents.
- If the machine is not used for a long time, the main power switch on the battery needs to be turned off.
- Waste batteries may cause danger, please do not dispose of them casually. If you need to dispose of them, please contact the battery recycling company.
- Non professionals are not allowed to perform maintenance or repair on the system, as this may cause personal injury or damage to the battery system.
- Non professionals are not allowed to modify parameters or detect signal lights during system operation, otherwise it may cause personal injury or damage to the battery system
- Non professionals should not disassemble the battery casing, otherwise it may cause system damage.

Attention

Due to customer reasons, battery over discharge (continued use below 10%) or battery loss caused by long-term non charging (failure to charge in a timely manner for more than three days below 10%), resulting in battery capacity degradation and failure, is not covered by the warranty.

2. 15 Hydraulic System Hazard

Hydraulic System Hazard

- Do not touch the hydraulic system when it is at high temperature. Hot hydraulic oil can cause serious injury.
- Thoroughly clean the spilled hydraulic oil after the equipment stops working. Do not spill hydraulic oil on the ground. Wash any hydraulic oil off the skin as soon as maintenance and repair are completed. Dispose of used hydraulic oil according to legal regulations.
- Do not plug the leaking hydraulic oil by hand. If leakage occurs, the system pressure should be released first, and the hydraulic oil should be cooled before maintenance. Injuries caused by ignoring the dangers of hydraulic oil require

immediate medical attention. Serious complications may occur if immediate treatment is not performed.

2. 16 Welding and Grinding Safety

Welding and Grinding Safety

- Follow welder manufacturer's recommendations for proper use of welder procedures.
- Only after the power is turned off can connect the wire or cable for welding or grinding operations.
- Only after the wire or cable is properly connected can welding and grinding be carried out.
- Do not use the machine as ground wire during welding operations.
- Ensure that power tools are fully stored in the working platform at all times. Do not hang its wires on the guardrail of the work platform and the work area outside the platform, or hang power tools directly with the wires.

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

2. 17 Lockout after Each Use

1. Select a safe parking location—firm level surface, clear of obstruction and traffic.
2. Ensure that all panels and doors are closed and secured.
3. Before shutting down or not using for a long time, the hydraulic cylinder is forbidden to be in a fully extended state.
4. Press the emergency stop button of the platform controls to the off position.
5. Cover the platform control box to protect the panel, switch handle and controller from being damaged by harsh environment.
6. Press the "emergency stop switch" of the turntable control box to the "off" position.
7. Turn the "key switch" of the turntable control box to the "off" position and pull out the key to avoid unauthorized use.
8. Disconnect the power-off switch.

Attention

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

Chapter 3 Working Principle and Each System

3.1 Energy

Driven by motor. It can be driven in the following ways:

The walking is driven by four 80V permanent magnet motors, and the arm movement is powered by a variable displacement piston pump driven by the 80V permanent magnet motor.

The auxiliary power is driven by a 12V battery and a 12V DC motor. The output shaft of the gear pump and motor is connected by splines to provide auxiliary power to the system.

3.2 Hydraulic System

The machine is driven by an electric motor, and its entire hydraulic system can be divided into two parts: one part is used for the upper arm function, and the other part is used for the steering and floating control of the lower body.

When the motor is working, the high-pressure oil at the outlet of the plunger pump drives the hydraulic actuator to move through the electric proportional flow valve and electromagnetic directional valve on the boom function valve group. The electronic control system adjusts the motor speed to output high-pressure oil with different flow rates for the arm movements required for different flow rates.

3.3 Electrical System

In the system, a 2V traction battery is used in series or an 80V lithium battery is used to drive an 80V permanent magnet motor to achieve functions such as arm movement, turntable rotation, and walking steering. A 12V control power supply is provided to the entire machine through a DC converter.

Use one 12V maintenance free battery in the system to provide emergency power supply for the entire machine.

The 80V battery can be charged through an external power source connected to the built-in charger, while the lithium battery can be charged through the fast charging interface on the box using an external charger.

The 12V maintenance free battery is charged by an 80V battery through a DC converter.

The machine protects the control system through a circuit breaker.

3.4 Machine Control

The system is controlled by two controllers. A controller is installed on the left side of the turntable of the machine to control the action of the boom; Another controller is installed on the platform to control the machine walking and boom action. The controller carries out data interaction through a CAN bus.

3.5 Safety Measures

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

- The angle sensor measures the angle of x-axis and Y-axis of the vehicle body. When the angle of x-axis or y-axis exceeds 5 °, an alarm will be sent out, and the functions of lifting, walking and steering will be limited.
- The travel switch detects whether the telescopic arm is fully retracted. When the telescopic arm is fully retracted, the limit arm frame continues to retract.
- The angle sensor measures the amplitude change angle of the main arm, which is used to recognize the working/walking status of the equipment and buffer control the boom in place.
- Overload sensors detect the load on the fence. When the platform load exceeds the rated bearing capacity, the buzzer will sound frequently, the overweight indicator will flash, so relevant actions will be limited.
- The rotary judgment switch detects the rotation angle of the turntable. When the turntable rotates to the left or right by more than 45 degrees, the driving function is limited to avoid the danger of reverse driving. The operator needs to toggle the reverse travel switch on the platform controller, which can travel for 15 seconds.

Chapter 4 Maintenance and Repair Guide

4.1 Summary

This section provides safety and necessary information to operators preparing to use this machine. In order to prolong the service life of the machine and ensure safe operation, ensure that all necessary inspections and maintenance work are completed before the machine is put into use.

Machine status description

- **Retracting status：** The lower boom of the main boom is in place, and the telescopic arm is retracted in place.
- **Non-working status：** The angle between the upper luffing of the main arm and the horizontal plane shall not exceed 5 ° , and the extension of the boom shall not exceed 1m.
- **Working status/lifting status：** The angle between the upper luffing of the main arm and the horizontal plane exceeds 5 ° , or the boom extends more than 1m.

4.2 Preparation, Inspection and Maintenance

It is essential to develop and comply with complete inspection and preventive maintenance procedures. This manual provides the regular maintenance and inspection items recommended by Hangcha Group Co., Ltd. in detail. At the same time, please first understand the relevant laws and regulations of your country, region or place on aerial work platform. The frequency of inspection and maintenance shall be increased accordingly according to the specific environment, requirements and use frequency.

4.3 Hangcha Approved Equipment Engineer

The equipment engineer recognized by Hangcha must have the following conditions: have a recognized educational background and certificate, have received comprehensive knowledge training on Hangcha products, and have the ability and level required for maintenance, repair and maintenance of relevant Hangcha product models.

4.4 Pre Operation Inspection

Before using every day or changing the operator every time, the user or operator should first conduct pre operation inspection. For the details of pre startup inspection, please refer to the chapter "pre operation inspection" in the operation manual, and be sure to read and understand the operation manual carefully.

4.5 Pre Delivery Inspection and Daily Inspection

The pre delivery inspection must be carried out by the equipment engineer approved by Hangcha Group Co., Ltd. The inspection contents of pre delivery inspection and daily inspection are the same, but the time is different. A pre delivery inspection must be

performed before each sale, lease or lease delivery. When the machine is used for 3 months or 150 hours (whichever comes first), or idle for more than 3 months, or purchased as second-hand equipment, daily inspection must be carried out. The frequency of inspection shall be increased accordingly according to the specific environment, requirements and use frequency.
Refer to the "preparation record before delivery" and "maintenance inspection report" in this manual to determine the items to be inspected. The inspection and maintenance steps shall be carried out with reference to the relevant contents of the "inspection procedures" in this manual.

4.6 Annual Inspection of Machine

The annual machine inspection must be carried out once a year and must not be more than 13 months from the date of the last annual machine inspection. Hangcha Group Co., Ltd. suggests that the factory's qualified maintenance engineer should carry out this work, and the maintenance engineer has received the relevant knowledge training of Hangcha products, and has the ability and level required to maintain, repair and maintain the relevant Hangcha product models.

Refer to the "maintenance inspection report" in this manual to determine the items to be inspected. The inspection and maintenance steps shall be carried out with reference to the relevant contents of the "inspection procedures" in this manual.

In order to obtain the safety report, Hangcha Group Co., Ltd. needs to update the ownership information of each machine. Please inform Hangcha group of the current ownership information of the machine every time you perform the annual inspection of the machine.

4.7 Preventive Maintenance

Preventive maintenance must be carried out by the equipment engineer approved by Hangcha Group Co., Ltd.

Refer to the "maintenance inspection report" and "maintenance schedule" in this manual to determine the items and time to be inspected. The inspection and maintenance steps shall be carried out with reference to the relevant contents of the "inspection procedures" in this manual.

Type	Frequency	Main responsibility	Maintenance Qualification	Reference
Preoperational inspection	Every day before use or every time the operator is changed	User or operator	User or operator	Operation manual
Advance delivery inspection	Before each sale, lease or lease delivery	Owner,agent or user	Hangcha approved equipment engineer	Maintenance manual, "preparation record before delivery" "maintenance and inspection report"

Daily inspection	Use for 3 months or 150 Hours (whichever comes first), or idle for more than 3 months, or purchased as second-hand equipment	Owner,agent or user	Hangcha approved equipment engineer	Maintenance manual, "maintenance inspection report"
Annual inspection of machine	Check every year and no more than 13 months from the date of the last annual inspection of the machine	Owner,agent or user	Factory qualified maintenance engineer	Maintenance manual, "preparation record before delivery", "maintenance and inspection report"
Preventive maintenance	According to the time interval specified in the manual	Owner,agent or user	Hangcha approved equipment engineer	Maintenance manual, "maintenance inspection report", "maintenance schedule"

4.8 Precautions for Maintenance and Repair

4.8.1 Summary

This section is used to assist you in using and applying the repair and maintenance procedures contained in this manual.

4.8.2 Safety and Operation Standards

➢ Before adjusting and repairing the machine, the following preventive measures should be taken:

1. Cut off the power source, put the equipment in a non starter state, and set clear markings.

2. All control devices should be in the "off" state to avoid accidental start-up of the control system.

3. If possible, lower the work platform to the lowest position; otherwise, ensure that it does not fall.

4. Before loosening or removing hydraulic components, the hydraulic oil pressure in the hydraulic pipeline should be released.

Some maintenance work may require the machine to be in a state other than the one described in 1-4 above, and safety measures related to machine maintenance and repair should be followed in the operation manual and this manual.

When carrying out machine maintenance, you should first consider the safety of yourself and others. Do not attempt to move heavy parts without the assistance of mechanical equipment. It is forbidden to park heavy objects in unstable positions. When lifting the components of the machine, ensure that there is sufficient support.

4.8.3 Clean

- The most important thing to prolong the service life of the machine is to prevent dirt or impurities from entering the key parts of the machine. Precautions have been taken to protect the machine from such violations. Protective plates, covers, seals and filters are used to keep the air, fuel and oil supplies clean. However, in order to ensure the normal function of protective measures, they should be maintained according to the specified time.
- When the air, fuel or oil pipelines are disconnected, the adjacent areas, openings and joints shall be cleaned. And immediately cover all openings to prevent foreign matters from entering.
- During repair or maintenance, all parts shall be cleaned and checked, and all pipelines and openings shall be unblocked. Cover all parts and keep them clean. All parts must be clean before installation. New parts should be stored in containers before use.

4.8.4 Component Removal and Installation

- The installation of the machine should develop a safe and reasonable construction plan according to this manual and on-site conditions.
- The personnel responsible for disassembly and installation should have the ability to disassemble and install this machine, and should be able to use their own safety protection devices correctly.
- Qualified personnel should inspect the ground and all concealed foundations and anchors, or provide reliable documentation to prove compliance with the manufacturer's requirements before installation.
- The wind speed at the installation site should not exceed 8 m/s.
- The power supply, foundation, track and other on-site conditions should be checked, and installation can only be carried out when they meet the requirements.
- All components should be inspected before installation to confirm that they are in good condition.
- High strength bolts should be tightened strictly in accordance with the requirements of this manual.
- The acceptance of machines installed on site should meet the following requirements:

• Relevant inspections and functional tests should be conducted to confirm that the machine has been correctly installed, specific functional requirements have been achieved, and all safety components are operating properly.

• Static and dynamic load tests should comply with relevant standards and

regulations.

• Qualified personnel should issue a transfer certificate confirming the integrity of the equipment before use. All test/results should be recorded and reported (including the name, title, organization, and date of the inspector).

- The dismantling of equipment should also comply with the corresponding safety requirements during installation.
- If mechanical assistance is required, please use adjustable lifting device as far as possible. All slings (chains, slings, etc.) shall be parallel to each other and as perpendicular to the top of the lifted part as possible.
- If it is necessary to disassemble components at a certain angle, please note that the load capacity of eye bolts or similar supports will be reduced when the included angle between the supporting structure and components is less than 90 degrees.
- If a part is difficult to disassemble, please check whether all nuts, bolts, cables, supports and wiring have been removed, and check whether adjacent parts hinder disassembly.

4.8.5 Component Disassembly and Reassembly

When disassembling or reassembling a component, complete the steps in sequence. If the disassembly or assembly of one part has not been completed, do not start the operation of another part. Please always review your work to ensure that there are no omissions. No adjustments (other than those recommended) shall be made without approval.

4.8.6 Pressed Parts

When assembling pressed parts, lubricate the mating surface with anti-seize type or molybdenum disulfide based compound.

4.8.7 Bearing

- After removing the bearing, please cover it to avoid dust or wear. Clean the bearing with nonflammable cleaning solvent and dry it in the shade. Compressed air can be used, but do not rotate the bearing.
- If the bearing race and ball (or roller) have pits, notches or burn marks, the bearing shall be scrapped
- If the bearing can still be maintained, apply a layer of oil and use clean paper (or wax paper) package. Do not unpack reusable bearings or new bearings until they are ready for installation.
- Before installation, lubricate the new bearing or refurbished bearing. When pressing the bearing into the bearing support or boring, apply pressure on the outer bearing race. If the bearing is to be installed on the shaft, apply pressure on the inner race.

4.8.8 Washer

Check that the hole in the washer is aligned with the opening of the mating part. If the gasket needs to be made by hand, the gasket material or other materials of equivalent material and thickness shall be used. Make sure that the hole is opened in the correct position, otherwise the gasket is not sealed, which may cause serious system damage.

4.8.9 Bolt Usage and Torque Application

Attention
Do not reinstall self-locking fasteners, such as nylon inserts and thread deformation lock nuts, after removal.

- When installing locking fasteners, always use new replacements. Please use bolts with appropriate length. If the bolt is too long, it may be pushed on relevant parts before tightening its head on corresponding parts; If the bolt is too short, there will not be enough threaded parts to bite and fix the parts. When replacing bolts, only bolts with the same or equivalent specifications as the original bolts can be used.
- In addition to the specific torque requirements given in this manual, standard torque values shall be used on heat treated bolts, studs and steel nuts in accordance with recommended factory practices.

4.8.10 Hydraulic Pipeline and Electrical Wiring

When unplugging or removing the hydraulic pipeline and electrical wiring from the equipment, the hydraulic pipeline and electrical wiring and their sockets shall be clearly marked. This ensures proper reinstallation.

4.8.11 Hydraulic System

- Pollutants are the primary factor endangering the hydraulic system. Pollutants can invade through various ways, such as improper use of hydraulic oil, and water, grease, metal chips, sealing elements, sand, etc. enter the system during maintenance.
- Keep the hydraulic system clean. If signs of metal or rubber particles are found in the hydraulic system, drain and flush the whole system immediately.
- Disassemble or reassemble parts on a clean worktable. Clean all metal parts with nonflammable cleaning solvent. Lubricate components as needed to facilitate assembly

4.8.12 Lubrication

The relevant parts shall be lubricated at specified intervals with the lubricant of the quantity, type and grade recommended in this manual. If the recommended lubricant cannot be obtained, contact the local supplier to purchase the recommended lubricant or qualified lubricant.

4.8.13 Battery

Leas-acid battery：Clean the battery with non-metallic brush, sodium bicarbonate and aqueous solution, and then rinse with clean water. After cleaning, after the battery is completely dry, coat the battery terminals with anti-corrosion compound.

Lithium batteries, maintenance free batteries: No maintenance required.

4.9 Pin Shaft and Composite Bearing

- In case of one of the following situations, the connecting pin shall be disassembled and inspected:
  - The connector is too tilted.
  - Noise at joints during operation.
- In case of any of the following situations, the composite bearing shall be replaced:
  - Wear or separation of fibers on the bushing surface.
  - Broken or damaged bearing liner support.
  - The bearing has moved or rotated into the bearing pedestal.
  - Debris is embedded in the bushing surface.
- Replace the pin shaft in case of any of the following situations (clean the pin shaft correctly before inspection):
  - Wear found in bearing area.
  - There are flakes, peeling, scratches or scratches on the surface of the pin shaft.
  - The pin shaft in the bearing area is rusted.
- Reassemble the connecting pin and composite bearing：
  - Dirt and debris should be blown off the bearing pedestal. There shall be no foreign matters on the bearing and bearing seat.
  - Bearings and pins shall be cleaned with cleaning agent to remove all grease and lubricating oil. The composite bearing is a dry joint and does not need lubrication.
  - During installation and operation, the pin shaft shall be checked to ensure that there are no burrs, notches or scratches that may damage the bearing.

4.10 Use Insulating Silicone Grease at the Electrical Connection Position

Insulating silicone grease shall be used for all electrical connections in order to:

- Prevent the mechanical connector between male and female pins from being oxidized.
- Prevent electrical failure caused by low conductivity between rows of needles due to humidity

Please use insulating silicone grease at the electrical connection position according to the following steps. This procedure is applicable to all plug connections installed outside the distribution box. Silicone grease is not suitable for external sealing connectors.

1.In order to prevent oxidation, silicone grease shall be applied around the male and female pins inside the connector before machine assembly. It can be operated with a syringe.

Attention
Oxidation for more than a certain time will increase the resistance of the connector and eventually cause circuit failure.

2.In order to prevent short circuit, each wire exposed to the connector housing shall be coated with silicone grease. In addition, silicone grease shall also be used at the joint where the male plug and female plug are connected to each other. Other joints that may cause water to enter the connector (around the anti-pull buckle, etc.) shall also be sealed.

Attention
Since the conductivity of cleaning solvent is stronger than that of water, this kind of situation is particularly easy to occur when using pressure cleaning method to clean the machine.

3.Connectors suitable for battery box and battery charger shall be sealed with silicone grease.

Attention
Solidified sealant can also be used to prevent short circuits and help keep them clean, but it will be more difficult to remove pins later.

4.11 Storage

To ensure good performance of the oil cylinder during operation and avoid corrosion during long-term storage (outdoors or indoors), please follow the following recommendations:

- The machine should be stored in the retracted state and ensure that the tires are aligned.
- Perform two full lifting and lowering actions of the boom and tire left and right turning actions per week to lubricate the cylinder.

Chapter 5 Maintenance

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

⚠Warning

Unsafe operation hazard

Failure to perform proper maintenance may result in death, serious injury or machine damage.

⚠Warning

High pressure hazard

Before loosening or removing the hydraulic element, release the pressure inside the element, especially the balance valve on the cylinder.

Follow the following rules:

- Maintenance inspection must be carried out by professionally trained and qualified personnel.
- Routine maintenance inspection refers to the inspection items during normal operation of the machine every day. The maintenance and inspection personnel must carry out inspection and maintenance according to the maintenance and inspection report and fill in the maintenance and inspection report in detail.
- Regular maintenance and inspection shall be carried out quarterly, semiannually and annually. The maintenance and inspection personnel must carry out inspection and maintenance according to the maintenance and inspection report and fill in the maintenance and inspection report in detail.
- Remove the damaged or faulty machine in time, mark it in time, and stop the operation at the same time.
- The damaged or faulty machine must be repaired before operating the machine.
- All inspection records shall be kept for at least 10 years or until the machine is out of use or as required by the machine owner / company / custodian.
- Machines that have not been maintained for more than three months must be inspected quarterly.
- The parts replaced during maintenance shall be the same as or equal to the parts of the original machine.

Unless otherwise specified, maintenance procedures shall be performed in accordance with the following provisions:

- Place the machine on a flat, level and firm ground.
- The machine is not working.
- Place the "key switch" of the ground controller in the "off" position and remove the

key to make the equipment unable to start.

- Place the "key switch" of the platform controller and ground controller in the "off" position and remove the key to make the equipment unable to start.
- Set 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.
- Disconnect the power-off switch.
- Disconnect all DC power on the machine.
- Lock all tires to prevent the machine from moving.

5.1 Pre Delivery Inspection

When the machine owner / company changes, in addition to the pre delivery inspection, the corresponding inspection shall be carried out according to the maintenance inspection time requirements and inspection procedures.

The pre delivery inspection shall comply with and comply with the following requirements:

- It is the responsibility of the machine owner / company to perform pre delivery inspection.
- This step must be performed before each delivery in order to find out whether there are obvious errors before the machine is put into use.
- Damaged or faulty machines shall not be used. Once a damaged or abnormal machine is found, it must be labeled and removed.
- The maintenance of the machine must be completed by qualified maintenance technicians in strict accordance with this manual.
- Routine maintenance must be completed by qualified maintenance Technicians according to the provisions of this manual.

Before delivering the machine, fill in the following records according to the following instructions:

- Preparations before delivery include pre operation inspection, maintenance procedures and function test.
- Use this form to record the results. After completing each part, tick the corresponding box.
- If any inspection result is "no", the machine must be stopped, and the machine must be rechecked after maintenance, and a mark must be ticked in the box marked "repaired".

Table 5-1 preparation record before delivery

Preparation record before delivery			
Product model			
Factory number			
Inspection items	YES/(The machine is in good condition)	NO/(Machine damage or failure)	REPAIRED/(The machine has been repaired)
Pre operation inspection			
Maintenance procedure			
Function check			
Machine buyer / lessee			
Signature of inspector			
Inspection date			
Inspector post			
Inspector unit			

5. 2 Maintenance Schedule

Regular maintenance inspections must be carried out every day, every quarter, and every year. Use this form to help you comply with the routine maintenance plan.

Inspection interval	Inspection procedure
Every day or every 8 hours	A
Quarterly or every 250 hours	A+B
Quarterly or every 500 hours	A+B+C
Every year or every 1000 hours	A+B+C+D

Table 5-2 Maintenance schedule

5. 3 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 contains a checklist for each type of periodic inspection.
- Copy the maintenance inspection report for each inspection. The completed form shall be kept for at least 10 years or until the machine is out of use or at the request of the machine owner / company.
- Use the table below to record the results. After completing each part, tick the corresponding box.
- If any inspection result is "no", the machine must be stopped, and the machine must be rechecked after the maintenance is completed, and a mark must be ticked in the box marked "repaired". Select the appropriate inspection procedure according to the inspection type.

Table 5-3 Maintenance inspection report

Maintenance inspection report					
Product model					
Factory number					
Inspection procedure A					
NO.	**Project**	YES The machine is in good condition	NO Machine damage or failure	REPAIRED The machine has been repaired	**Problem description**
A-1	Check each manual				

A-2	Check each label				
A-3	Check for damaged loose or missing parts				
A-4	Check the hydraulic oil level				
A-5	Check hydraulic oil leakage				
A-6	Function check				
A-7	Perform floating cylinder exhaust				
A-8	Perform 30 day maintenance				
Inspection procedure B					
NO.	**Project**	YES The machine is in good condition	NO Machine damage or failure	REPAIRED The machine has been repaired	**Problem description**
B-1	Check hydraulic oil				
B-2	Check the hydraulic oil tank air filter				
B-3	Check and replace the hydraulic oil tank return filter element				
B-4	Replace the high-pressure filter element				
B-5	Check the oil level in the drive reducer				
B-6	Check the oil level in the rotary reducer				
B-7	Check the connecting bolts of slewing support				
B-8	Regularly lubricate the rotary bearing				
B-9	Check the wheels, tires, and their fasteners				
B-10	Check the tightness of the platform swing oil cylinder				
B-11	Balance valve locking inspection				
B-12	Check the cylinder offset				
B-13	Check the emergency decent function				
B-14	Check length and angle sensors				

B-15	Check the tilt protection system				
B-16	Test the floating legs and inspect the floating valve				
B-17	Test travel speed				
B-18	Check the wires				
B-19	Check the battery				
Inspection procedure C					
NO.	**Project**	YES The machine is in good condition	NO Machine damage or failure	REPAIRED The machine has been repaired	**Problem description**
C-1	Replace the hydraulic oil tank air filter				
C-2	Check the telescopic steel wire rope and sheave of the boom				
C-3	Check the weighing system				
Inspection procedure D					
NO.	**Project**	YES The machine is in good condition	NO Machine damage or failure	REPAIRED The machine has been repaired	**Problem description**
D-1	Replace the gear oil in the drive reducer.				
D-2	Replace the gear oil in the swing reduce.				
D-3	Change hydraulic oil				
D-4	Replace the hydraulic oil tank suction filter				
D-5	Check the boom slider				
User unit					
Signature of inspector					
Inspection date					
Inspector post					
Inspector unit					

5.3.1 Inspection Procedure A

A-1 Check each manual

Putting the operation manual and maintenance manual in a proper place is very important for the safe operation of the machine and should be placed in the document box specially storing the manual on the platform. If the manual is missing or illegible, it will not provide necessary safe operation information.

- Check and confirm that the document box is installed in a proper place on the platform.
- Check and confirm that the operation manual and maintenance manual are intact in the document box on the platform.
- Check the pages of each manual to ensure that the handwriting is clear and intact
- Put the manual back into the document box after use.

Note: If you need to replace the manual, please contact Hangcha Group Co., Ltd.

A-2 Check each label

Ensuring that all labels are in good condition is essential for the safe operation of the machine. Labels remind operators of the dangers they may encounter during operation, and they provide users with operation and maintenance information. Illegible labels cannot correctly guide operators, which may lead to unsafe operation.

- Refer to the "label / nameplate inspection" section in the operation manual and use the label list and chart to determine the correct position of the label.
- Check whether all labels are legible and damaged, and replace the damaged and illegible labels in time.

Note: if the label needs to be replaced, please contact Hangcha Group Co., Ltd. In time.

A-3 Check all damaged, loose or missing parts

Check the following components or areas for damage, improper installation, loose or missing parts and unauthorized changes:

- Electrical components, wiring and cables.
- Hydraulic hose, pipe joint, hydraulic cylinder and valve block group.
- Hydraulic oil tank.
- Battery pack and its connection.
- Walking motor, rotary motor and reducer.
- Boom slider and telescopic shaft slider.
- Limit switch and horn.
- Tires and rims.
- Alarms and lights (if equipped).
- Platform guardrails and doors.
- Cracking of structural members and welds.
- Nuts, bolts and other fasteners.

Attention
In case of damage, improper installation or missing parts, replace them immediately and install them correctly; If the fastener is found to fall off or loose, it shall be fastened immediately

A-4 Check the hydraulic oil level

Maintaining the hydraulic oil at the proper level is very important for the operation of the machine. If the hydraulic oil level is too high, the oil will overflow from the oil tank during the use of the equipment; If the hydraulic oil level is too low, the oil pump will be empty and the hydraulic components will be damaged during the use of the equipment. Through daily inspection, the inspector can determine the change of

Customer requirements	Hydraulic oil brand
Normal temperature area 0℃～40℃ （32℉～104℉）	L-HV46
Cold temperature area -25℃～25℃ （-13℉～77℉）	L-HV32
High temperature area ＞40℃ （104℉）	L-HM68
Extremely cold area ＜-30℃ （-22℉）	Special scheme needs to be determined

hydraulic oil level, which can indicate potential problems in the hydraulic system.

When the boom is in the retracted state, perform the following steps:

- Open the left cover and visually inspect the side of the hydraulic tank. The hydraulic oil level shall be within the scale area.
- Ensure that there is no leakage between the hydraulic oil tank body and the connector.
- Add hydraulic oil as needed, do not add too much.

A-5 Check hydraulic oil leakage

Preventing hydraulic oil leakage is very important for the safe operation and normal operation of the machine. If a leak is not found, a dangerous situation will occur, weaken the performance of the machine and damage the components.

Observe whether hydraulic oil overflows, drips or remains on or around the following components:

- Hydraulic oil tank, filter, pipe joint, oil pipe, manual pump
- All hydraulic cylinders, hydraulic valve groups and pumps
- Boom part
- Slewing bearing
- Drive chassis
- Area around the machine

A-6 Function check

Checking the functions of the machine is very important for the safe operation of the machine. If any function fails to work properly, unsafe conditions will occur. Any function shall work stably and reliably without shaking, violence and abnormal noise.

Unsafe operation hazard

Be sure to follow the instructions and safety rules in this manual and operation manual. Failure to follow the instructions and safety rules in this manual and operation manual may lead to death or serious injury.

Refer to the operation manual "pre operation function test" for the complete steps of the machine function check. Before performing this function check, be sure to fully read and understand the safety rules in the operation manual.

Control and indication description

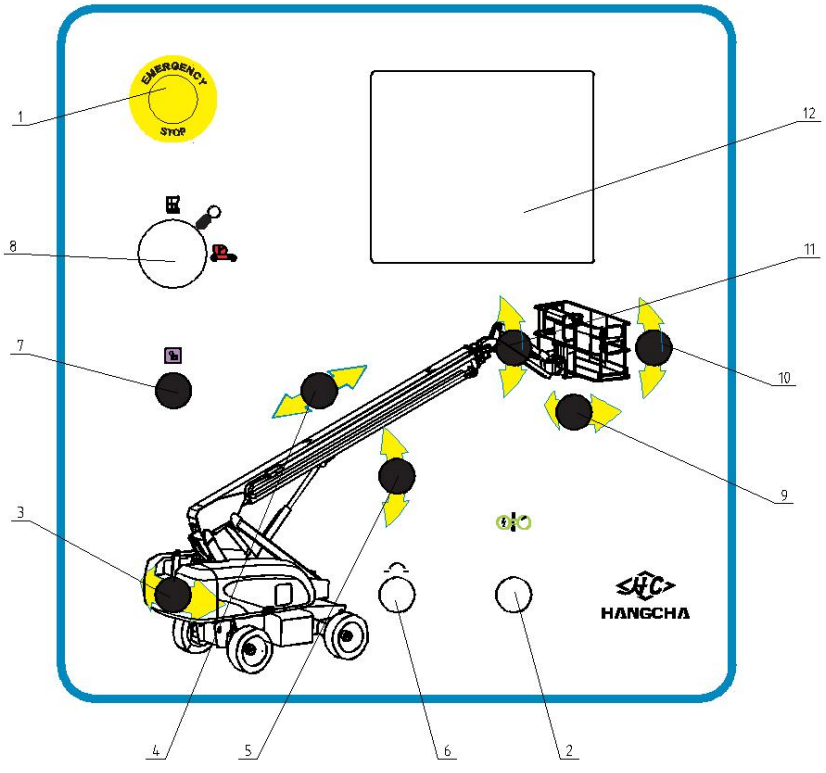


Table 5-5 Description of Lower Control Panel

NO.	Name	No.	Name
1	**Emergency stop switch**	2	**Emergency switch**
3	**Rotary table rotation control switch**	4	**Telescopic control switch**
5	**Main boom amplitude control switch**	6	**Current overload protector**
7	**Enable switch**	8	**Up/Down Control Switch**
9	**Platform swing control switch**	10	**Leveling control switch**
11	**Flying arm amplitude control switch**	12	**Display screen**

Upper control box

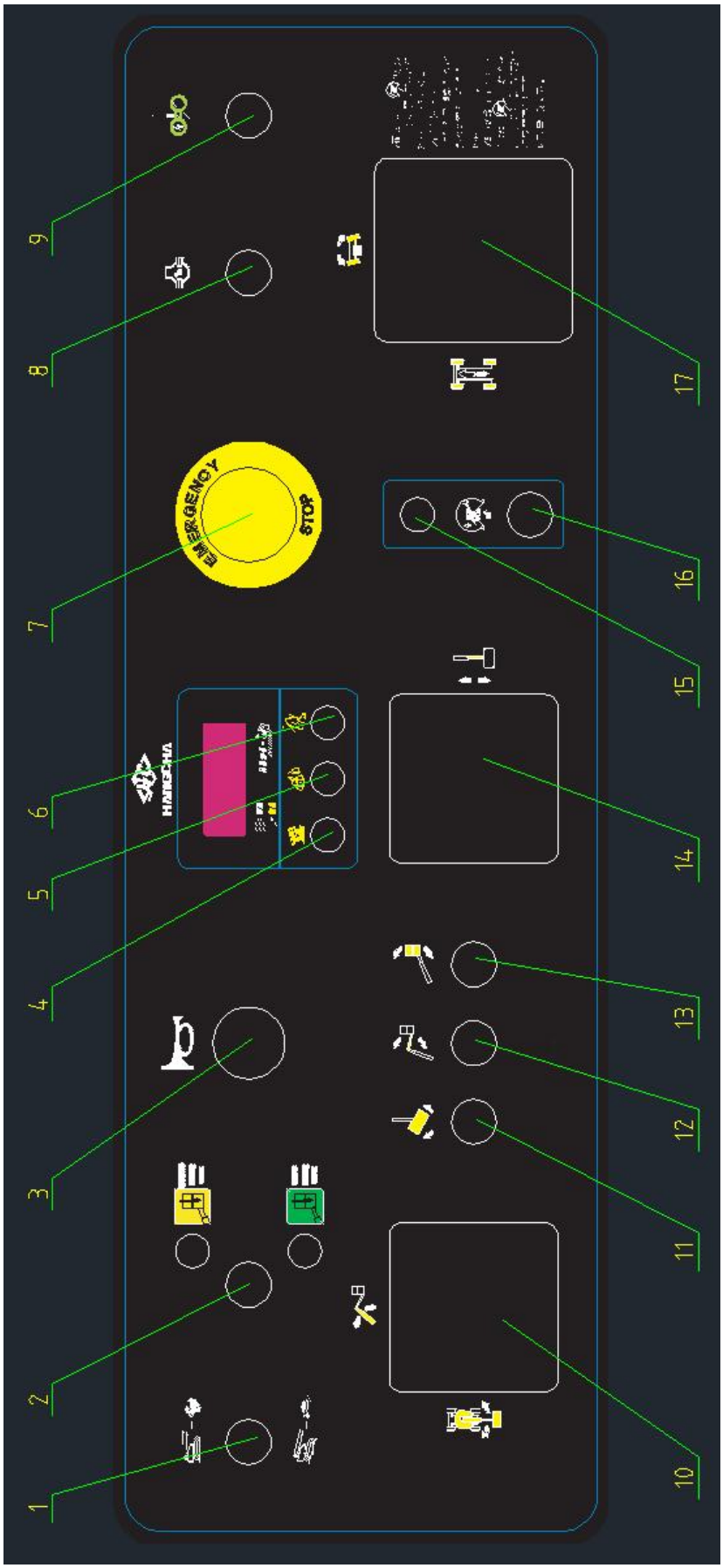


Table 5-6 Upper Control Panel Description

No.	Name	No.	Name
1	**Turtle speed/rabbit speed selection switch**	2	**Load selection switch**
3	**Horn button**	4	**Tilt warning indicator light**
5	**Overload indicator light**	6	**Load over limit indicator light**
7	**Emergency stop switch**	8	**Forced action switch**
9	**Emergency switch**	10	**Tower body rotation/main arm amplitude control handle**
11	**Platform swing control switch**	12	**Flying arm amplitude control switch**
13	**Platform leveling control switch**	14	**Telescopic control joystick**
15	**Machine rotation indicator light**	16	**Driving direction confirmation switch**
17	**Travel/steering control handle**		

A-7 Perform floating cylinder exhaust

Attention
During the process of discharging the floating cylinder, please ensure that the platform is in a retracted state

1. Loosen the rubber hose joint above the floating balance valve on the left side of the machine until oil flows out.
2. Place a 120mm (4.7in) wooden block with a sloping surface in front of the left front wheel of the machine.
3. Drive the machine to move the left front tire onto a wooden block.
4. During this process, there should be a mixture of hydraulic oil and air flowing out at the loosened joint.
5. Repeatedly drive the machine to the inclined wooden block and drive from it, and tighten the joint after only hydraulic oil flows out of the loosened joint.
6. At this time, the left floating oil cylinder is successfully vented.
7. Drive the machine off the blocks.
8. Follow the above steps to exhaust the right floating cylinder.
9. Conduct a balance valve locking inspection.

A-8 Perform 30 day maintenance

30 day maintenance refers to a one-time maintenance performed after 30 days or

50 hours of new equipment use. After performing this maintenance, perform relevant maintenance at normal intervals.

Perform the following 30 day maintenance procedures:

- B-3 check and replace the hydraulic oil tank return filter
- B-8 Check the connecting bolts of the rotary bearing
- B-9 check the rim and tire and their fasteners
- B-10 Check the fasteners of the platform swing oil cylinder

5.3.2 Inspection Procedure B

B-1 Check hydraulic oil

Regular replacement of the filter element of the return oil filter of the hydraulic oil tank is very important for the normal operation of the hydraulic system and prolonging the service life of the equipment. A filter with poor cleanliness or blockage may cause the machine to work abnormally, and the continued use may cause component damage. Working in a particularly harsh working environment requires frequent replacement of the filter element of the oil return filter.

Attention: Due to the wear of hydraulic components, metal particles may appear in the hydraulic oil or filters of new machines.

When any of the following situations occur, the hydraulic oil should be replaced in a timely manner：

- Hydraulic oil appears milky white and cloudy.
- The color of the hydraulic oil turns black.
- Take out a part of the hydraulic oil and observe it under sunlight. There are metal luminescent spots, or use two fingers to dip in the hydraulic oil and rub it to create a noticeable particle sensation.
- Hydraulic oil smells bad.

Refer to procedure for replacement steps: D-3 Replacing hydraulic oil.

B-2 Check the hydraulic oil tank air filter

Good ventilation of the hydraulic oil tank cover is crucial for the normal operation and extended service life of the hydraulic pump. Hydraulic oil tank air filters with poor

cleanliness or blockage may cause poor oil suction of the hydraulic pump, and continued use may lead to component damage. The extremely harsh working environment requires frequent inspection of the hydraulic oil tank air filter.

Attention
The inspection must be carried out with the machine switched off.

1. Remove the hydraulic oil tank air filter.
2. Check the air filter element of the hydraulic oil tank.
3. The air should pass through the air filter smoothly.
4. If the air cannot pass through the air filter smoothly, the air filter must be cleaned according to the following steps.
5. Clean the air filter with neutral solvent and then blow dry with an air gun. Repeat the second step.
6. Install the air filter on the fuel tank.

B-3 Inspection and replacement of hydraulic oil tank return oil filter element

Regular replacement of the hydraulic oil tank return oil filter element is crucial for the normal operation of the hydraulic system and the extension of equipment service life. A poorly cleaned or clogged filter may cause the machine to malfunction, and continued use may result in component damage. Working in particularly harsh working environments requires frequent replacement of the return oil filter element.

Burn hazard

Allow the hydraulic oil to cool to room temperature before servicing the hydraulic system.

Attention
The inspection must be carried out with the machine switched off.

High pressure hazard

Slowly remove the hydraulic components to reduce the hydraulic oil pressure. High hydraulic oil pressure may penetrate the skin. If you are injured, please see a doctor immediately.

Check as follows：
1. Open the left cover of the machine turntable.
2. Find the oil return filter at the hydraulic oil tank.
3. Remove the oil return filter with a wrench.
4. Loosen the top end cover of the filter and take out the filter element.
5. Apply a thin oil film on the gasket of the new oil return filter.
6. After cleaning the oil return filter housing and installing a new filter element, reinstall the oil return filter.
7. Clean up the spilled hydraulic oil during execution.
8. Start the machine from the ground controller.
9.Check the filter and related parts to ensure no leakage

B-4 Replace the high-pressure filter element

Regularly replacing the high-pressure filter element is crucial for the normal operation and extended service life of the machine. A poorly cleaned or clogged filter may cause the machine to malfunction, and continued use may result in component damage. The extremely harsh working environment requires frequent replacement of the high-pressure filter element.

High temperature hazard

Be careful of hot hydraulic oil. If your body comes into contact with hot hydraulic oil, it may cause serious burns.

Attention

Inspection must be carried out with the machine turned off

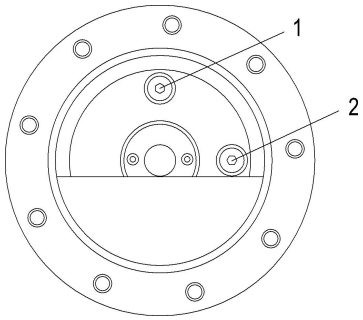
1. Open the cover on the right side of the turntable and locate the high-pressure filter.
2. Place a suitable container below the filter.
3. Remove the high-pressure filter from the mounting bracket.
4. Replace the filter element as needed.
5. Clean hydraulic oil that spills during the execution process.
6. Start the machine from the ground.
7. Check that there are no leaks in the high-pressure filter and related components.

B-5 Check the oil level in the walking reducer

Inappropriate gear oil level in the drive reducer can reduce the working

performance of the machine, and continued use can lead to component damage.

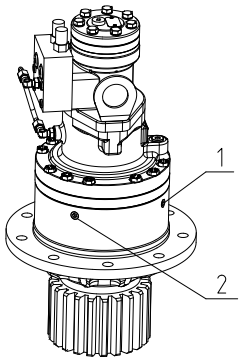
1. Drive the machine to rotate the gearbox to position, with one bolt at the top and the other at a 90 ° angle.
2. Remove the bolt 2 in the right image and check the oil level.
3. The oil level should be level with the bolt opening.
4. If the oil level is lower than the bolt port, add oil.
5. Remove bolt 1 and add gear oil from bolt 1 until the oil level is level with bolt 2.
6. Install the removed bolts.
7. Clean up any gear oil that spills during the inspection process.
8. This inspection operation is required for all drive deceleration of the machine.



B-6 Check the oil level in the rotary reducer

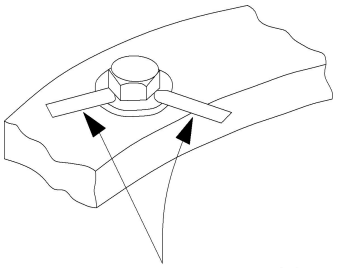
Inappropriate gear oil level in the rotary reducer can reduce the working performance of the machine, and continued use can lead to component damage.

1. Open the cover on the left side of the turntable and locate the rotary reducer.
2. Open the oil filler bolt shown in Figure 1 or 2 on the right and check the oil level.
3. The oil level should be level with the oil filling port.
4. If the oil level is lower than the oil filling port, add oil.
5. Add gear oil from the oil filling port until the oil level is level with the oil filling port.
6. Install the removed bolts.
7. Clean up gear oil that spills during the inspection process.



B-7 Check the connecting bolts of the slewing support

Regular inspection of the connecting bolts of the slewing support is crucial for the normal operation of the machine. After the first 50 hours of operation, a check must be conducted every 600 hours thereafter. If the bolt is found to be loose or loose during inspection, a new bolt should be used for replacement. Apply Loctite 272 thread locking adhesive to the bolt thread and tighten the bolt according to the value in the torque table. After replacing the bolts and re torque, recheck the firmness of the existing bolts.



Check the connecting bolts between the chassis and the slewing support

1. The upper arm has the maximum amplitude, and the main arm is horizontal and fully extended.
2. Find the connecting bolts between the chassis and the slewing support.
3. As shown by the arrow in the above figure, insert a 0.04mm plug gauge between the bolt and washer.
4. Ensure that the plug gauge does not pass through the periphery of the bolt head to reach the bolt rod.
5. Rotate the turntable position until all bolts are checked.

Check the connecting bolts between the turntable and the slewing support.

1. Fully retract the boom and adjust the amplitude to the highest position.
2. Find the connecting bolts between the turntable and the slewing support.
3. As shown by the arrow in the above figure, insert a 0.04mm plug gauge between the bolt and washer.
4. Ensure that the plug gauge does not pass through the periphery of the bolt head to reach the bolt rod.
5. Lower the main arm to the horizontal position and fully extend the main arm.
6. As shown by the arrow in Figure 5-3, insert a 0.04mm plug gauge between the bolt and washer.
7. Ensure that the plug gauge does not pass through the periphery of the bolt head to reach the bolt rod.

B-8 Regular lubrication of rotary bearings

Regular remote lubrication of the rotary bearing is crucial for the normal operation of the machine. When the equipment operates on multiple shifts or is exposed to harsh environments, the lubrication frequency and amount should be increased accordingly.

Lubrication point: 1 lubricating oil cup

- **Volume：** As needed

- **Lubricant:** ZL-3 lithium base grease

B-9 Check the rims and tires and their fasteners

Maintaining the rims and tires and their fasteners is very important for the normal and safe operation of the machine. Problems with rims or tires may cause the machine to tip over. Any problems with rims and tires need to be repaired before operating the machine.

This machine uses solid tires or foam tires and does not need inflation

1. Check the tire every day. If any of the following conditions are found, take immediate measures to stop using the machine and replace the tire or tire assembly (including rim).

- Tyre delamination, i.e. circumferential cracks or delamination between rubbers.
- Off ring, that is, the rubber is separated from the steel ring.
- The rubber surface falls off locally.
- The rubber cracks along the diameter direction.
- The rubber is worn to the wear line.

2. Check whether the tire nuts are tightened with the specified torque of 600Nm(442ft-lb)

Attention
Tire nuts should be tightened before first use and after each tire is removed. Check and adjust the torque every 3 months or 150 hours of operation.

B-10 Inspection of platform swing oil cylinder fasteners

Regular inspection of the platform swing cylinder fasteners is crucial for the normal and safe operation of the machine.

1. The machine is in a retracted state.
2. Find the swing motor at the platform.
3. Check if the bolt at position 1 in the right image has been tightened with the correct torque of 100Nm.
4. If bolts need to be replaced, they should be tightened according to the specified torque and coated with Loctite 272 adhesive.
5. Check if the nut at position 2 in the right figure has been tightened with the correct torque of 630Nm.
6. If bolts need to be replaced, they must be tightened according to the specified torque.

B-11 Balance valve locking inspection

Attention
After performing a float cylinder exhaust, perform a balance valve lock check, and perform a float system check every quarter, when replacing any system components or discovering abnormal system operation

1. Place a 120mm (4.7in) wooden block with a sloping surface in front of the left front wheel of the machine.
2. Extend the boom to put the machine in working condition.
3. Drive the machine to drive the left front tire onto a wooden block.
4. Slowly rotate the turntable to the right by approximately 90 degrees.
5. At this point, the rear inspection indicator light is on, and the corresponding function is operated to make the arm stand horizontal and fully extended.
6. Observe the floating oil cylinder, and the force side floating oil cylinder is not allowed to retract. And retract the boom.
7. After turning the "reverse drive switch", drive the machine off the cushion block.
8. Auxiliary personnel should check on the ground whether the left or right front wheel is still off the ground and keep it lifted.
9. Slowly operate the turntable to rotate and return it to the center position (between the two drive wheels).
10. When driving the machine forward or backward, the left front wheel floating cylinder should be released to lower the wheel to the ground and tightly adhere to the ground.
11. Repeat the above steps to check the right front wheel floating cylinder.
12. If the floating oil cylinder is working abnormally, the fault should be resolved by qualified maintenance personnel before further operation.

B-12 Check cylinder offset

Platform sinking

Measure the offset from the platform to the ground. Fully extend the main arm with the platform's rated load and power off. The maximum allowable deviation within 10 minutes is 50mm (1.97 in). If the machine offset exceeds the maximum allowable value, please perform the following operations.

Cylinder sinking

Table 5-7 Reference Table for Cylinder Sinking

Cylinder diameter size (mm/in)	Maximum allowable subsidence (10min) (mm/in)
63/2.48	0.96/0.037
80/3.15	0.63/0.025

100/3. 94	0. 39/0. 015
125/4. 92	0. 23/0. 009
160/6. 30	0. 14/0. 006
180/7. 09	0. 13/0. 005
200/7. 87	0. 10/0. 0038
220/8. 66	0. 08/0. 0030

1. Use a calibrated dial gauge to measure the sinking amount at the piston rod of the oil cylinder.

2. The oil in the cylinder must be at ambient temperature and at a stable temperature.

3. The oil cylinder must have a normal load and be the normal platform load applied by the platform.

4. If the oil cylinder passes this test, it is acceptable.

Note: This information is based on a cylinder leakage of 6 drops per minute. Due to the physical properties of thermal expansion and contraction in hydraulic oil, there may be an error of 7/10000 in the measurement of sinking for every 1 ℃ temperature change.

B-13 Check the emergency descent function

When the motor power device fails, the manual pump can be used as the power source according to the actual situation. According to the emergency operation, the boom can be controlled to perform the corresponding action by flipping the relevant action switch at the same time.

Attention
➢ The "emergency power unit switch" is only used for a short time (lowering the work bar into place from the maximum angle and maximum length position) when the engine / electric cannot work. ➢ When operating emergency power, do not use two or more action functions at the same time, as operating multiple functions at the same time can overload the auxiliary motor and pump.

Operating on the ground:

1. Turn the "ground/platform control switch" of the turntable control box to the left to the "ground control position".

2. Turn the "emergency stop switch" button on the turntable control box to the "ON" position.

3. Turn the "emergency power unit switch" on the turntable control box and hold it.

4. Move the corresponding boom function switch on the turntable control box to lower the platform.

Operating on the platform:

1. Turn the "ground/platform control switch" of the turntable control box to the "platform control position" to the right.

2. Turn the "emergency stop switch" buttons on the turntable control box and platform control box to the "ON" position.

3. Turn the "emergency power unit switch" on the platform control box and hold it.

4. Move the corresponding boom function switch on the platform control box to lower the platform.

B-14 Check length and angle sensors

Regular inspection of length and angle sensors and travel switches is crucial for the safe operation of the machine. If the sensors and travel switches cannot work properly, unsafe situations will occur.

Check the length sensor

0kg≤Platform load capacity≤310kg

1. Turn the "ground/platform control switch" of the turntable control box to the left to the "ground control position".

2. Turn the "emergency stop switch" button on the turntable control box to the "ON" position.

3. Turn the "key switch" of the turntable control box to the right to the "ON" position.

4. Use the main arm and fly arm amplitude functions to adjust the amplitude of the main arm and fly arm to the horizontal position.

5. Use the telescopic arm telescoping function to extend the boom frame.

6. When the boom reaches the farthest position (the display screen of the turntable control box shows a length of 22.7m), it stops. The upper and lower control buzzers sound, and the boom cannot continue to extend. The boom can be retracted and cannot change amplitude. The turntable can rotate slowly.

7. Use the telescopic arm telescoping function to retract the boom frame.

8. The boom can be retracted into place.

310kg≤Platform load capacity≤460kg

1. Turn the "ground/platform control switch" of the turntable control box to the left to the "ground control position".

2. Turn the "emergency stop switch" button on the turntable control box to the "ON"

position.

3. Turn the "key switch" of the turntable control box to the right to the "ON" position.

4. Use the main arm and fly arm amplitude functions to adjust the amplitude of the main arm and fly arm to the horizontal position.

5. Use the telescopic arm telescoping function to extend the boom frame.

6. When the boom reaches the farthest position (the display screen of the turntable control box shows a length of 19.7m), it stops. The upper and lower control buzzers sound, and the boom cannot continue to extend. The boom can be retracted and cannot change amplitude. The turntable can rotate slowly.

7. Use the telescopic arm telescoping function to retract the boom frame.

8. The boom can be retracted into place.

Check the angle sensor

1. Turn the "ground/platform control switch" of the turntable control box to the left to the "ground control position".
2. Turn the "emergency stop switch" button on the turntable control box to the "ON" position.
3. Turn the "key switch" of the turntable control box to the right to the "ON" position.
4. Use the main arm and fly arm amplitude functions to make the main arm horizontal and the fly arm upward to the highest position.
5. Use the main boom luffing function to maximize the amplitude of the main boom.
6. Stop the amplitude change when the main arm upper luffing reaches the maximum angle (the display screen of the turntable control box shows an angle of 68 °).
7. Stop the amplitude change when the main boom lower luffing reaches the maximum angle (the display screen of the turntable control box shows an angle of -11 °).
8. Use the main arm and fly arm amplitude functions to adjust the amplitude of the main arm and fly arm to the retracted state.
9. The boom amplitude is in place.

B-15 **Check the tilt protection system**

1. Turn the "ground / platform control switch" of the turntable control box to the left to the "ground control position".
2. Turn the "emergency stop switch" button on the turntable control box to the "on" position.
3. When the machine is in the non-working state, pull the horizontal switch for more than 5 ° in the X (left and right) / Y (front and rear) direction.
4. At this time, there is a tilt alarm, "non horizontal indicator" flashes, and all actions are not limited.
5. When the machine is in the working state, pull the horizontal switch for more than

5 ° in the X (left and right) / Y (front and rear) direction.
6. At this time, a tilt alarm appears, and the "non horizontal indicator light" flashes, limiting some actions, allowing the boom to retract and lower luffing, and allowing the turntable to slowly rotate.
7. When the machine is in the non working state, put these two pieces of wood under the two wheels in front (or behind) of the machine, and then drive the machine onto these two pieces of wood. Size of wood block (length) × wide × Height: 750×250×218mm（29.5 in.×9.8 in.×8.6 in.)
8. At this time, there is a tilt alarm, "non horizontal indicator" flashes, and all actions are not limited.
9. Drive the machine down and remove the wood block
10. When the machine is in the working state, put these two pieces of wood under the two wheels in front (or behind) of the machine, and then drive the machine onto these two pieces of wood. Size of wood block (length) × wide × Height: 750×250×262mm（29.5 in.×9.8 in.×10.3 in.)
11. At this time, the tilt alarm appears, and the "non horizontal indicator" flashes, limiting some actions, allowing the boom to retract and lower luffing, and allowing the turntable to rotate slowly
12. After the boom is retracted, lower the luffing. After the machine is in non working state, drive down and remove the wood block.

B-16 Testing the Floating Support Legs and Checking the Floating Valve Rod

Overturning danger
This test must be performed while the machine is in a retracted state.

1. Before starting the machine, check whether the floating multi way valve lever is tightened properly.
2. Use the platform control box to start the machine.
3. Drive the machine to move the right turn tire onto a 12cm (4.7 in) high pad or curb.
4. The remaining three tires of the machine should be in close contact with the ground.
5. Drive the machine to move the left turn tire onto a 12cm (4.7 in) high pad or curb.
6. The remaining three tires of the machine should be in close contact with the ground.
7. Drive the machine to move two steering tires onto a 12cm (4.7 in) high pad or curb.
8. The non steering tires of the machine should be in close contact with the ground.

B-17 Test travel speed

1. Turn the "ground / platform control switch" of the turntable control box to the right to the "platform control position".
2. Turn the "emergency stop switch" button on the turntable control box and platform

control box to the "on" position.
3. Switch the mode to electric mode.
4. Turn the "travel high/low speed switch" on the platform control box to switch from high/low speed to high speed.
5. Press the "foot switch".
6. Slowly push the "walking/turning ratio control joystick" forward to the full drive position.
7. The test results are shown in Table 5-6.
8. Turn the "travel high/low speed switch" on the platform control box to switch from high/low speed to low speed.
9. Press the "foot switch".
10. Slowly push the "walking/turning ratio control joystick" forward to the full drive position.

The test results are shown in Table 5-8.

Table 5-8 Driving speed

Model	Test result
HB280P/HB250P	When the boom is not in working condition, the maximum driving speed is 6km/h, and when the boom is in working condition, the maximum driving speed is 0.8km/h.

Attention
If the running speed of the machine is higher than the test results in the above table, stop using it immediately and mark it.

B-18 Check the wires

The maintenance of electrical equipment is very important to the normal and safe operation of the machine. Allowing the machine to continue to operate in a damaged and corrosive environment may lead to unsafe operation or serious injury. Replace or repair damaged or corroded wires before operation.

Electric shock

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

1. Check whether the wires in the following areas are damaged or corroded:

- Rotary table valve group harness
- Ground controller junction box
- Platform controller junction box
- Drag chain system harness

2. Check all movable connectors to ensure that they are not loose and the sensor lines are not damaged.

B-19 Check the battery

Good battery condition is essential for good machine performance and safe operation. Improper electrolyte level or damaged cables and wiring may cause component damage and dangerous situations.

Attention
Always wear protective gloves for inspection.

Electric shock

Contact with 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 should be prevented from leakage and contact.
If the acid in the battery leaks, use soda water and the leaked acid.
。

Attention
After the battery is fully charged, wear protective gloves for inspection. Ensure that the battery cable connections are not corroded

Note: add terminal protectors and anti-corrosion sealants to help eliminate corrosion of battery terminals and cables.

Attention: *Before testing, please ensure that the battery is fully charged and let it stand for 24 hours to balance the battery unit.*

- **Check lead-acid battery：**

1、wear protective clothing and glasses.
2、ensure that the battery cable connections are not corroded

3、ensure that the battery is firmly installed and the cable connection is tight
4、Remove the battery ventilation cover and use a liquid density meter to check the density of the electrolyte in each group of batteries. If the electrolyte density in any group of batteries is less than 1.24, the batteries must be replaced.
5、check the electrolyte level. If necessary, make up distilled water from the water inlet on the top of the battery. Be careful not to spill.
6、install the battery ventilation cover.
7、connect the charging plug to the 220V socket.
result: the battery can be charged normally and the charging indicator light is on.

Attention: Adding terminal protectors and anti-corrosion sealants will help eliminate corrosion on battery connection terminals and cables. The electrolyte of a battery is corrosive, so it is important to avoid contact with spilled electrolyte by hands or other parts of the body to prevent injury. Neutralize the spilled electrolyte with baking soda water.

- **Check maintenance free batteries:**

1. Wear protective gloves.

2. Ensure that the wiring of the battery cables is not corroded.

3. Ensure that the battery is securely fixed and the cable connections are secure.

4. Connect the battery charger cable to the correct terminal of the battery (red to positive, black to negative).

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

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

- **Precautions for storage battery replacement:**

1. When disassembling or installing batteries, a wrench with a rubber handle should be used.

2. Tightening torque of cable fixing nut:

M8 Tightening torque 9-11 N.m (6.6-8.1 ft lb),

M10 Tightening torque 18-23 N.m (13.2-17 ft lb).

3. If the terminals are not kept clean and dry, they may continue to be corroded. To prevent corrosion, apply a thin layer of Vaseline or use a terminal protector.

5.3.4 Inspection procedure C

C-1 Replace the hydraulic oil tank air filter

Checking hydraulic oil is crucial for the normal operation and extended service life of the machine. Hydraulic oil with poor cleanliness may cause abnormal machine

operation, and continued use may result in damage to hydraulic components. The extremely harsh working environment requires frequent replacement of hydraulic oil.

Good ventilation of the hydraulic oil tank is crucial for the normal operation of the hydraulic system and the extension of the service life of hydraulic components. Hydraulic oil tank air filters with poor cleanliness or blockage may cause poor oil suction of the hydraulic pump, and continued use may lead to component damage. Frequent replacement of hydraulic oil tank air filters is required in harsh working environments.

1. Use a wrench to remove the hydraulic oil tank air filter.
2. Install a new air filter and tighten it.

C-2 Check the telescopic steel wire rope and sheave of the boom

The telescopic steel wire rope of the boom is responsible for extending and retracting the boom. The extension and retraction functions of the boom should be performed smoothly, without shaking, violent or abnormal noise.

Attention
Inspection must be carried out with the motor turned off

1. Remove the cover plate located at the end of the boom.
2. Check the following conditions:

- The steel wire rope and sheave need to be replaced in case of wear, breakage, corrosion or entanglement, as well as damage to the sheave.
- Any external debris on the steel wire rope needs to be cleaned immediately.
- If the steel wire rope is outside the sheave, it needs to be adjusted to the appropriate position.
- Manually guide the wire rope and check the tightness of the wire rope. A correctly tensioning wire rope should not be able to move or difficult to move.

3. After checking and confirming that there are no issues, install the cover plate at the end of the boom.
4. Extend the boom by approximately 0.6m.
5. Retract the boom and observe the movement of the second and third arms.
6. The displacement of the second arm contraction should not exceed 1/2 of the displacement of the third arm contraction.

C-3 Check the weighing system

Before performing this test, it is necessary to fully adjust the amplitude and retract the boom twice to ensure proper lubrication between the sheave and the track.

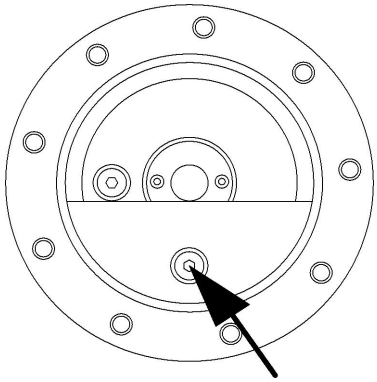
Model	Test result
HB280PH B250P	**Under restricted working conditions on the work platform:** When the load does not exceed 460 kg (1014 lb), the platform can be lifted to the highest position. When the platform load exceeds 460 kg (1014 lb), the buzzer will sound continuously, the overweight indicator light will flash, and the display screen will show overweight, limiting all actions. After removing overloaded objects, the machine can resume all actions. **Under unrestricted working conditions on the work platform:** When the load does not exceed 310 kg (683 lb), the platform can be lifted to the highest position. When the platform load exceeds 310 kg (683 lb), the buzzer will sound continuously, the overweight indicator light will flash, and the display screen will show overweight, limiting all actions. After removing overloaded objects, the machine can resume all actions.

5.3.5 Inspection procedure D

D-1 Replace the gear oil in the drive reducer

Regularly replacing the gear oil in the drive reducer is crucial for improving the machine's performance and extending the reducer's service life.

1. Drive the machine to rotate the reducer to the position shown in the diagram, with a drain plug located at the bottom.



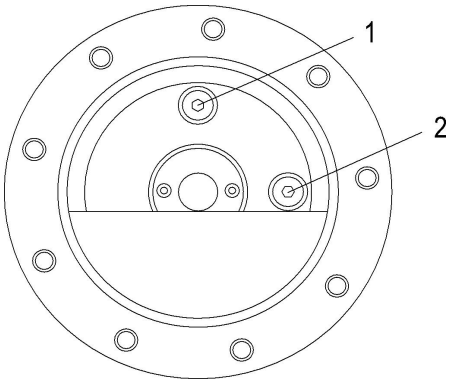
2. Place a suitable container below the oil drain plug indicated by the arrow in the diagram.

3. Remove the oil drain plug indicated by the arrow in the diagram.

4. Until all the gear oil in the drive reducer flows out into the designated container.

5. Install the removed oil drain plug.

6. Drive the machine to rotate the gearbox to the position shown in the diagram, with one oil drain plug located at the top and the other at a 90 ° angle.



7. Remove the No.1 and No.2 oil drain plugs.

8. Add new gear oil from port 1 until the oil level is level with the second oil drain plug.

9. Install the removed oil drain plug.

10. Clean up gear oil that spills during the inspection process.

11. This inspection operation must be carried out for all driving reducer of the machine.

D-2 Replace the gear oil in the rotary reducer

Regularly replacing the gear oil in the rotary reducer is crucial for improving the machine's performance and extending the reducer's service life.

1. Open the cover on the left side of the turntable and locate the rotary reducer.

2. Place a suitable container below the oil outlet plug of the rotary reducer.

3. Open the oil outlet plug.

4. Until all the gear oil in the rotary reducer flows out into the designated container.

5. Install the oil outlet plug.

6. Open the fuel filler plug and add new gear oil from the filler until the oil level is level with the plug.

7. Install the fuel filler plug.

8. Clean up gear oil that spills during the inspection process.

D-3 Replace hydraulic oil

Regular replacement of hydraulic oil is crucial for the normal operation and extended service life of the machine. Hydraulic oil with poor cleanliness may cause the machine to malfunction, and continued use may damage hydraulic components. The extremely harsh working environment requires frequent replacement of hydraulic oil.

Burn hazard

Before maintaining the hydraulic system, let the hydraulic oil cool to room temperature.

Attention

Inspection must be carried out with the machine turned off.
When removing the rubber hose and pipe joint, the O-ring on the rubber hose and pipe joint must be replaced.

1. Open the left cover of the turntable, locate the hydraulic oil tank, and close the two ball valves at the oil suction point.

2. Remove the oil drain plug at the bottom of the oil tank and drain all the oil into a suitable container. The volume of the hydraulic oil tank can be found in the product performance parameters.

High pressure danger

Slowly disassemble hydraulic components to reduce hydraulic oil pressure. Excessive hydraulic oil pressure may penetrate the skin. If injured, please seek medical attention immediately

3. Disconnect and plug the oil suction pipe.

4. Disconnect and plug the oil return pipe.

5. After removing the fastening bolts of the hydraulic oil tank, remove the hydraulic oil tank from the machine.

6. Clean the inside of the oil tank with neutral solvent and air dry the hydraulic oil tank.

7. Install the hydraulic oil tank onto the machine.

8. Connect the suction and return pipes to the hydraulic oil tank.

D-4 Replace the hydraulic oil tank suction filter

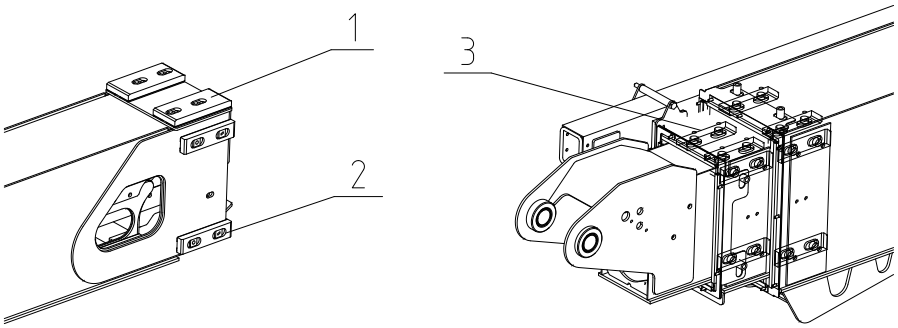
Regular replacement of the hydraulic oil tank suction filter is crucial for the normal operation and extended service life of the machine. Hydraulic oil with poor cleanliness may cause the machine to malfunction, and continued use may damage

hydraulic components. The extremely harsh working environment requires frequent replacement of hydraulic oil.

When replacing hydraulic oil, follow the procedure to replace the hydraulic oil tank suction filter.

D-5 Check the boom slider

Regular inspection of the boom slider is crucial for safe machine operation. Each slider forms a friction pair with the surface of the telescopic arm. Improper slider pads or continuous use of old sliders may cause component damage and unsafe operation.



1. Remove the cover plates or dust brushes at both ends of the boom.
2. Measure the thickness of each slider in the above diagram. The following table shows the specified thickness of each slider.

No.	Slide thickness
1	17mm（0.67in）
2	17mm（0.67in）
3	17mm（0.67in）

3. When the wear of the slider is more than or equal to 3mm, it is necessary to replace the slider assembly in a timely manner.

Attention
The disassembled slider cannot be reused and must be replaced with a new slider assembly.

Chapter 6 Maintenance procedures

- Maintenance procedures must be carried out by personnel who have undergone professional training and are qualified.
- Immediately replace or repair damaged parts, and do not operate the machine with damaged parts.
- Before operating the machine, appropriate maintenance should be carried out.
- Before starting the machine：
  - ➢ Please read, understand, and comply with the safety rules and operating instructions in the operating manual.
  - ➢ Read all the procedures and rules.
  - ➢ Unless otherwise specified, the maintenance procedure for this machine should be carried out under the following circumstances.
  - Place the machine on a flat, level, and sturdy ground.
  - -The platform is in a retracted state.
  - -Turn the key switch to the "OFF" position and remove the key.
  - Lock all wheels.

6.1 Boom and platform components

6.1.1 Boom and platform components

\Wire rope breakage detection system

The boom used on this machine is a 3-stage proportional drive telescopic boom. The first telescopic arm inside the boom is directly driven by the telescopic oil cylinder. The second telescopic arm is driven by a separate wire rope system, and each wire rope system provides spare wire ropes, allowing the operator to continue using the machine in the event of a wire rope breakage. The retracted steel wire rope is installed on the outside of the boom, making it easy for the operator to detect any malfunctions in a timely manner. To extend the steel wire rope, a broken rope detection system needs to be installed to promptly alert the operator when the steel wire rope is damaged. The system uses a travel switch sensor to detect excessive movement of the steel wire rope, in order to determine whether the steel wire rope is faulty. The result of the rope breakage detection is displayed on the turntable display screen, and an alarm is issued at the same time, limiting the extension and upward amplitude of the boom, only allowing the boom to retract and downward amplitude. Necessary measures should be taken by the operator.

Platform Control Function Authorization System

The platform control system of the machine adopts time-dependent support circuits to limit the time availability of active or enabled controllers. After pressing the foot switch, the controller is activated and the operator can operate any control within 60 seconds. As long as the operator continues to use any function, the controller will remain enabled and will also remain enabled for 60 seconds after the

last function is used. When the controller is active, the work lights on the platform display panel will light up. After the specified time, the illuminated work light will turn off, and the controller will turn off or be disabled. To continue using the device, the controller must be reactivated to restart the timing system. To restart the timing system, follow these steps: Release all control buttons, joystick, and foot switches, and then press the foot switch again.

Working state sensing system

The working state sensing system is achieved through angle sensors and length sensors installed on the head of the basic arm. When the angle sensor detects that the angle between the upper luffing of the boom and the horizontal plane exceeds 5 °, or when the length sensor detects that the boom extends more than 1 meter, it is judged as in working state. Otherwise, it is considered non working state. The position of the flying arm was not taken into consideration.

This system is used to control the following systems：

- Walking deceleration system
- Leg floating system

Walking deceleration system

When the boom is in working status, the driving speed is automatically limited to a low-speed state.

6.1.2 Platform control box disassembly

Electric shock hazard

Before executing this program, be sure to disconnect the battery on the machine and the charger on the AC power outlet. Contact with live conductors may cause death or serious injury.

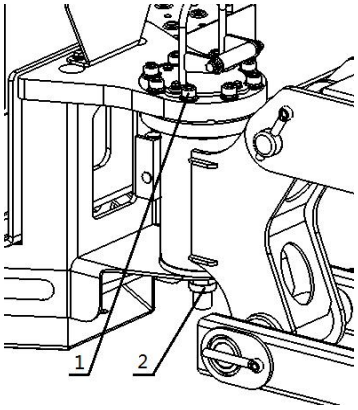
Attention

This operation should be carried out when the machine is in the retracted state

1. Disconnect the external power supply and place the emergency stop switches of the platform control box and ground controller in the "OFF" position.
2. Find the cable that connects to the bottom of the platform control box.
3. Disconnect the cable from the bottom of the platform control box and mark it properly.
4. Remove the fastening bolts from the platform control box.
5. Remove the platform control box.

6.1.3 Work platform disassembly

Attention
This operation should be carried out when the machine is in the retracted state



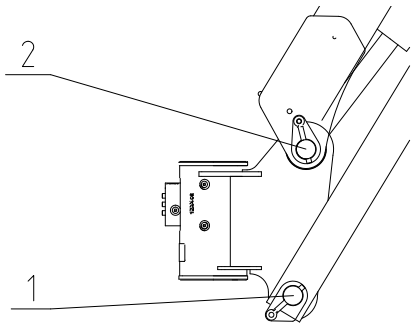
1. Remove the foot switch.
2. Use appropriate lifting equipment and straps to tie the work platform.
3. Remove the fixing bolts 1 and nuts 2 from the fence base and swing oil cylinder.
4. Use lifting equipment to slowly move the platform and fence base away.

6.1.4 Disassembly of swing oil cylinder

Attention
This operation should be carried out when the machine is in the retracted state

Attention
When removing the rubber hose and pipe joint, the O-ring at the end of the rubber hose or pipe joint must be removed and marked properly. Be careful when disassembling the oil cylinder to prevent it from falling and causing damage

1. Remove the platform;
2. Use appropriate supports to support the swing oil cylinder;
3. Mark, disconnect and plug the rubber hoses of the two oil ports on the swing cylinder, and plug the pipe joints on the valve group.



4. Remove the fixing bolts and nuts at the connecting pins 1 and 2 of the swing oil cylinder and the flying arm.
5. Remove the swing oil cylinder.
6. Check the inner diameter of the connecting bearing of the platform swing oil cylinder for scratches, twisting, wear, or other damage. Replace bearings if necessary.

6.1.5 Dismantling of the flying arm assembly

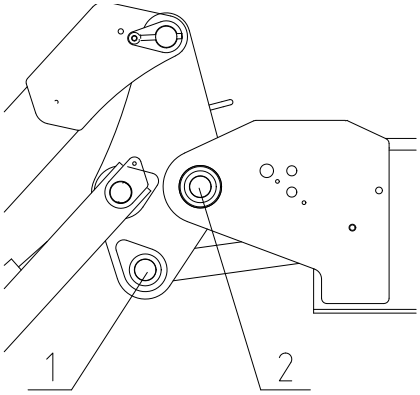
Danger of moving objects

When striking a brass rod with a wooden hammer, please wear protective goggles.

Attention

When removing the rubber hose and pipe joint, the O-ring at the end of the rubber hose or pipe joint must be removed and marked properly. Be careful when disassembling the oil cylinder to prevent it from falling and causing damage

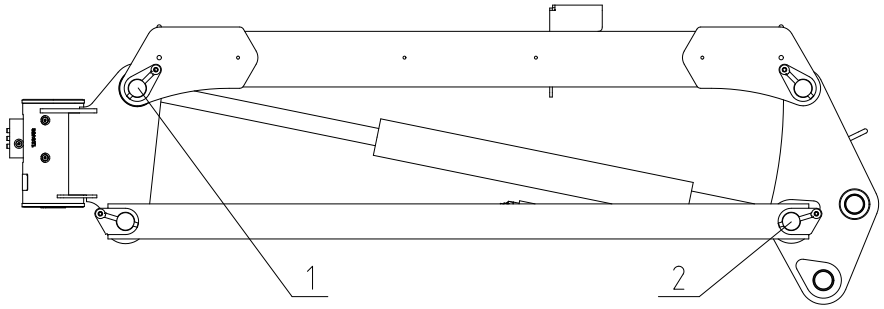
1. Remove the platform and swing oil cylinder to make the main arm level with the ground;
2. Use appropriate lifting equipment to lift the flying arm assembly and support the leveling oil cylinder with appropriate equipment.
3. Mark, disconnect and plug the rubber hoses of the two oil ports on the forearm oil cylinder, and plug the pipe joints on the valve group.



4. Remove the retaining rings and washers at positions 1 and 2 of the pin shaft, and use a brass rod and mallet to knock out the pin shaft.
5. Use lifting equipment to separate the flying arm assembly from the main arm and slowly move it away.
6. Check all pins for wear, scratches, taper, ovality, or other damage. Replace the pin shaft if necessary.
7. Check the inner diameter of the liner for scratches, twisting, wear, or other damage. Replace bearings if necessary.
8. Before installation, confirm that the surface of the pin shaft has been protected. Replace the pin shaft if necessary.
9. Check all threaded components for damage such as stretching, thread deformation, or twisting. Replace if necessary.
10. Check the structural device of the flying arm assembly for bending, cracks, welding separation, or other damage. Replace the flying arm if necessary.

6.1.6 Dismantling of flying arm oil cylinder

1. Remove the flying arm assembly;
2. Place the flying arm assembly flat and stable;



3. 3. Remove the stop pin at the pin shaft 1 of the forearm oil cylinder, and use a brass rod and mallet to drive out the pin shaft 1.
4. 4. Use appropriate supports to support the flying boom cylinder.
5. 5. Remove the stop pin at pin 2 and use a brass rod and mallet to drive out pin 2.
6. 6. Remove the flying boom cylinder.

6.1.7 Dismantling of upper leveling oil cylinder

Danger of moving objects

When striking a brass rod with a wooden hammer, please wear protective goggles.

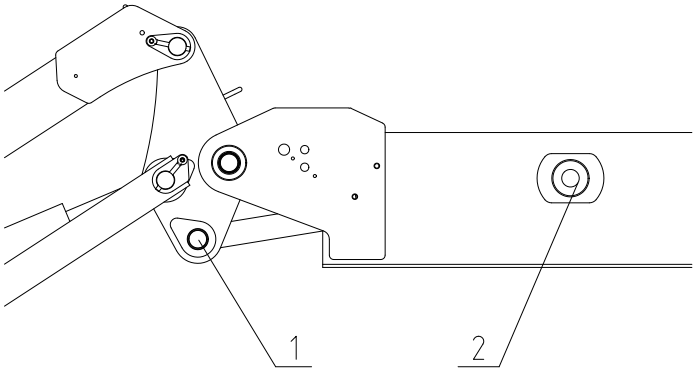
Attention

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

The machine has two leveling cylinders, located above and below the boom.

The platform leveling oil cylinder ensures that the arm remains level throughout the entire range of motion of the platform. The platform remains level relative to the turntable.

1. Extend the boom until the connecting pin at the end of the platform leveling oil cylinder can be reached.
2. Slightly raise the boom and place support under the platform.
3. Lower the boom until the platform falls onto the support, being careful not to press the entire weight of the boom onto the support.
4. Disconnect and plug the hydraulic hose located inside the boom and on the oil cylinder. Close the pipe joint.



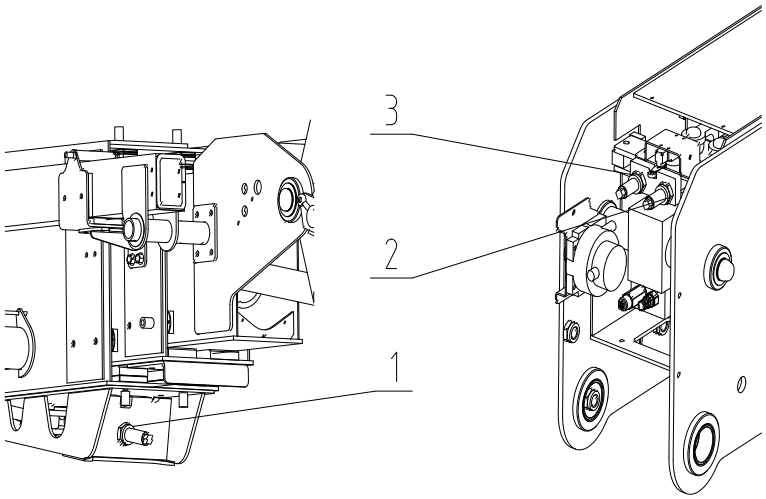
5. Remove the retaining ring and washer at the connecting pin shaft # 1 of the upper leveling oil cylinder piston rod end. Do not move the pin shaft at this time.
6. Remove the retaining ring and washer at shaft # 2. Do not move the pin shaft at this time.
7. Use appropriate support equipment to support the upper leveling oil cylinder. Protect the piston rod from damage.
8. Use a brass rod and mallet to drive out the pin shaft 1.
9. Use a brass rod and mallet to knock out shaft 2.
10. Carefully remove the oil cylinder from the boom.

6.1.8 Dismantling of drag chains

Attention
When removing the rubber hose and pipe joint, the O-ring at the end of the rubber hose or pipe joint must be removed and marked properly

1. Mark, disconnect and plug all hydraulic hoses and cables from the boom drag chain guide to the work platform.
2. Remove the hydraulic pipeline and cable from the drag chain guide rail.
3. Use appropriate lifting equipment to fully support the drag chain assembly along its entire length.
4. Remove the bolts that secure the drag chain and cable conduit.
5. Use lifting equipment to slowly remove the drag chain assembly from the boom.

6.1.9 Steel wire rope tensioning adjustment



1. Adjust the boom to the horizontal position and extend it 1.5-1.8m (5ft-6ft).
2. Use a wrench to tighten the locking nut 1 on the retracted steel wire rope to a torque of 112 Nm (82.68 ft lb).
3. Retract the boom to a position that extends 0.6-0.9m (2ft-3ft).
4. Use a wrench to alternately tighten the two adjusting nuts 2 and 3 extending from the steel wire rope to a torque of 112 Nm (82.68 ft lb).

6.1.8 Dismantling of the main arm assembly

Unsafe operation hazards

Before disassembling the main arm assembly and the luffing oil cylinder, it is necessary to:

- Rotate the arm frame parallel to the direction of travel of the base frame and ensure that the rotary pin of the turntable is locked.
- Use a solid and reliable rigid support below the counterweight to support it.

Danger of moving objects

When striking a brass rod with a wooden hammer, please wear protective goggles

Attention

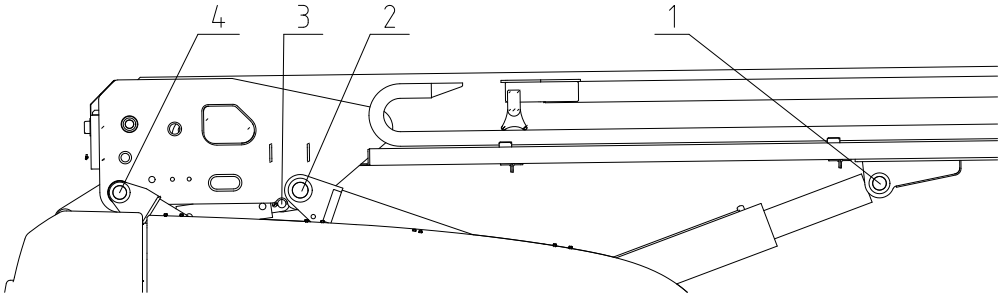
When removing the rubber hose and pipe joint, the O-ring at the end of the rubber hose or pipe joint must be removed and marked properly

1. Remove the flying arm assembly and lift the main arm to a horizontal position.

2. Slightly raise the boom until the main boom luffing cylinder and platform leveling cylinder can be fully reached.

3. Mark and remove the hydraulic hoses and cables connected to the chassis/turntable.

4. Use suitable lifting equipment (with a lifting capacity of no less than 5 tons) and tie the end of the main arm with a sling.



1. Remove the retaining ring and washer at the pin shaft 1 connecting the piston rod end of the main boom luffing oil cylinder to the main boom.

2. Use a brass rod and a mallet to drive out the pin shaft 1.

3. Remove the stop pin at pin 3 that connects the piston rod end of the lower leveling oil cylinder to the main arm.

4. Use a brass rod and mallet to drive out the pin shaft 3.

5. Use suitable lifting equipment (with a lifting capacity of no less than 5 tons) and tie the rear end of the main arm with a sling.

6. Remove the retaining rings and washers at pin shafts 2 and 4 that connect the main arm assembly to the support arm.

7. Use a brass rod and mallet to drive out the pins 2 and 4.

8. Use lifting equipment to slowly remove the main arm assembly from the turntable.

6.1.9 Dismantling of telescopic oil cylinder

Danger of moving objects

When striking a brass rod with a wooden hammer, please wear protective goggles.

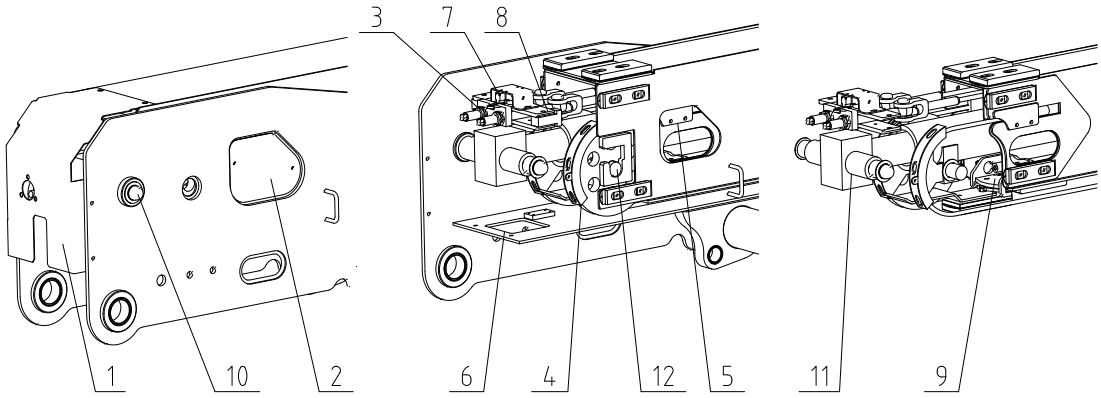
Unsafe operation hazards

During the process of removing the telescopic oil cylinder, the ceiling of the lifting equipment should be adjusted to the appropriate position in a timely manner to ensure the smooth and safe lifting process.

Be careful to prevent the telescopic cylinder from rotating.

Attention

When removing the rubber hose and pipe joint, the O-ring at the end of the rubber hose or pipe joint must be removed and marked properly.



1. Lift the main arm to a horizontal position.
2. Remove the fixing bolts of the main arm tail cover plate 1 and remove the cover plate.
3. Remove the maintenance cover plate 2 fixing bolts on both sides of the main arm and remove the maintenance cover plate.
4. Completely loosen the locking nut 3 that extends out of the steel wire rope, but do not remove the nut.
5. Loosen the locking nut on the retracted steel wire rope, remove the steel wire rope joint, and let it hang naturally.

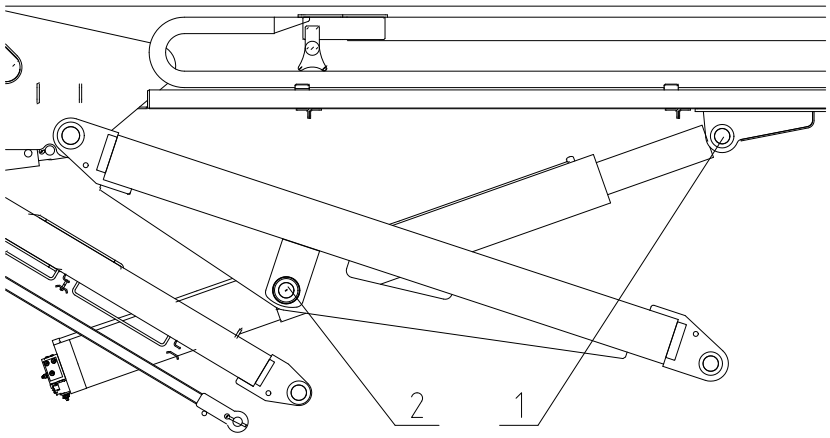
6. Remove the fixing bolts of sheave cover 4 and remove the sheave cover.
7. Fine tune the third telescopic arm and locate the wire rope limit block on the third arm through the maintenance port on the side of the main arm.
8. Remove the fixing bolts of the steel wire rope limit block 5 and remove the limit block. Pull out the steel wire rope and lay it flat.
9. Remove the fixing bolts of the telescopic oil cylinder valve block and remove the valve block through the maintenance port 6 at the bottom of the main arm.
10. Disconnect the wiring harness connected to the rope break switch 7.
11. Remove the fixing bolts of the extended steel wire rope fixing plate 8 on the main arm and remove the fixing plate.
12. Pull the extended steel wire rope fixing plate backwards until it exceeds its installation position.
13. Lift the steel wire rope fixing plate upwards and push it towards the platform direction to loosen the extended steel wire rope. The top of the telescopic oil cylinder is equipped with a steel wire rope roller assembly.
14. Find the extended steel wire rope bracket located on the third telescopic arm.
15. Remove the fixing bolts of the extended steel wire rope bracket 9 and remove the steel wire rope bracket.
16. Push the extended steel wire rope bracket towards the platform and pull the extended steel wire rope fixing plate in the opposite direction.
17. Secure the wire rope bracket and wire rope to the oil cylinder to prevent them from falling off during disassembly.
18. Remove the retaining ring and washer from the fixed pin shaft 10 at the end of the telescopic oil cylinder.
19. Use a brass rod and mallet to drive out the pin shaft.
20. Use suitable lifting equipment (with a lifting capacity of no less than 2 tons) and tie the end of the telescopic oil cylinder 11 with a lifting strap.
21. Use lifting equipment to lift the telescopic oil cylinder until its other fixed end leaves the oil cylinder seat 12 of the second arm.
22. Carefully support the telescopic cylinder and slowly slide it out of the main arm.
23. Place the telescopic cylinder on a suitable support.

6.1.10 Dismantling of lifting oil cylinder

Danger of moving objects

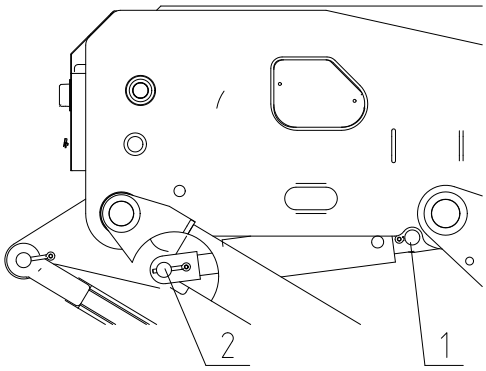
When striking a brass rod with a wooden hammer, please wear protective goggles.

Attention
When removing the rubber hose and pipe joint, the O-ring at the end of the rubber hose or pipe joint must be removed and marked properly



1. Lift the main arm to a horizontal position.
2. Slightly raise the boom until the main boom lifting cylinder can fully reach it.
3. Use suitable lifting equipment (with a lifting capacity of no less than 5 tons) and tie both ends of the main arm with lifting straps.
4. Use a second crane or similar lifting device to support and secure the two ends of the main boom lifting cylinder.
5. Remove the retaining ring and washer from the fixed pin shaft 1 at the top of the lifting cylinder.
6. Use a brass rod and mallet to drive out the pin shaft 1.
7. Use auxiliary power to control the action of the lifting oil cylinder, retract the piston rod until the end of the piston rod leaves the oil cylinder mounting seat on the main arm.
8. Mark, disconnect and plug the rubber hose on the oil port of the lifting cylinder valve, and plug the pipe joint on the valve group.
9. Remove the retaining ring and washer on the fixed pin shaft 2 at the bottom of the lifting cylinder, do not remove the pin shaft.
10. Use a brass rod and a mallet to drive out the pin shaft 2.
11. Move the lifting cylinder towards the counterweight end, rotate the lifting cylinder until the cylinder barrel leaves the mounting hole on the vehicle body.
12. Carefully lift the lifting cylinder and slowly move it to a flat surface.

6.1.11 Dismantling of lower leveling oil cylinder

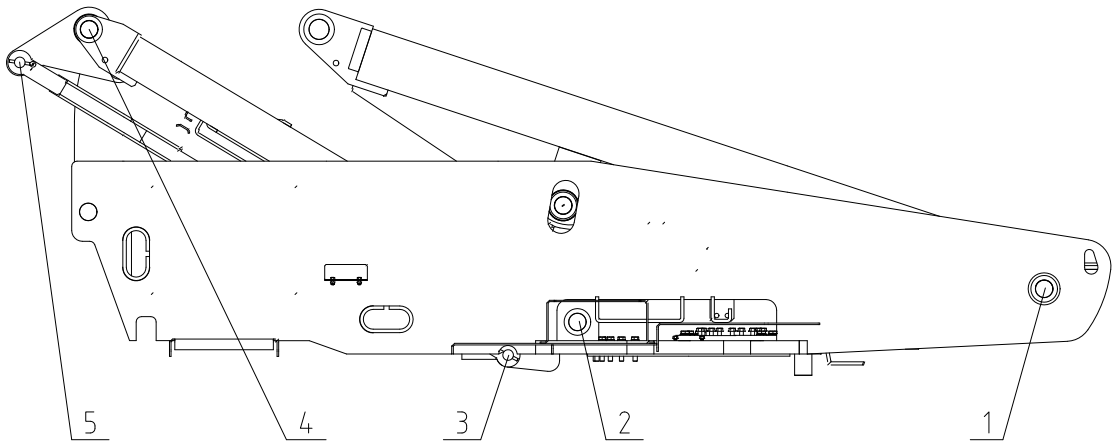


1. Lift the main arm to a horizontal position.
2. Slightly raise the boom until the lower leveling cylinder can fully reach it.
3. Use suitable lifting equipment (with a lifting capacity of no less than 5 tons) and tie both ends of the main arm with lifting straps.
4. Use a second crane or similar lifting device to support and secure the two ends of the lower leveling oil cylinder.
5. Mark, disconnect and plug the rubber hose on the oil port of the lifting cylinder valve, and plug the pipe joint on the valve group.
6. Remove the stop pin at pin 1 that connects the cylinder end of the lower leveling oil cylinder to the main arm.
7. Use a brass rod and mallet to drive out the pin shaft 1.
8. Remove the stop pin at the piston rod end of the lower leveling cylinder and the pin shaft 2 of the leveling joint.
9. Use a brass rod and a mallet to drive out the pin shaft 2.
10. Carefully lift the lower leveling oil cylinder and slowly move it to the ground.

6.1.12 Disassembly of support arm and tower arm

Danger of moving objects

When striking a brass rod with a wooden hammer, please wear protective goggles.



1. Remove the main arm assembly, lifting cylinder, and lower leveling cylinder.

2. Remove the retaining ring and washer at pin 1 connecting the upper tower arm to the turntable.

3. Use suitable lifting equipment to lift the tower arm, and use a brass rod and mallet to knock out the pin shaft 1.

4. Carefully lift the tower arm and slowly move it to the ground.

5. Remove the retaining ring and washer at the connecting pin shaft 4 of the leveling joint of the support arm.

6. Use appropriate lifting equipment to lift the leveling joint, and use a brass rod and mallet to knock out the pin shaft 4.

7. Remove the retaining ring and washer at pin 2, which connects the support arm to the turntable.

8. Use appropriate lifting equipment to lift the support arm, and use a brass rod and mallet to knock out the pin shaft 2

9. Carefully lift the support arm and slowly move it to the flat ground.

10. Remove the stop pin 5 that connects the lower leveling rod to the leveling joint.

11. Use suitable lifting equipment to lift the leveling joint, and use a brass rod and mallet to knock out the pin shaft 5.

12. Carefully lift the leveling joint and slowly move it to the flat ground.

13. Remove the locking pin of the connecting pin 3 between the lower leveling rod and the turntable.

14. Use suitable lifting equipment to lift the leveling joint, and use a brass rod and mallet to knock out the pin shaft 3.

15. Carefully lift the leveling rod and slowly move it to the ground.

6.2 Chassis and turntable components

6.2.1 Tires and rims

Tire and Rim Replacement

Hangcha Group Co., Ltd. recommends using tires of the same size, grade, and brand as the original machine tires for replacement. For tire part numbers for specific machine models, please refer to the corresponding machine's Parts Catalogue. If the replacement tire recommended by Hangcha Group Co., Ltd. is not used, the replaced tire should have the following characteristics:

1. The level/rated load and size are equal to or better than the original tires.
2. The tread grounding width is equal to or better than the original tire.
3. The diameter, width, and compensation dimensions of the wheels are equivalent to the original tires.
4. Tire manufacturers allow such applications (including application scope, usage scenarios, maximum vehicle speed, and maximum tire load).
5. Due to the size differences between tires of different brands, two tires on the same axle should use the same brand.

Unsafe operation hazards

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

Tire and rim installation

It is very important for the bolt pre tightening torque of the wheel rim to meet the requirements

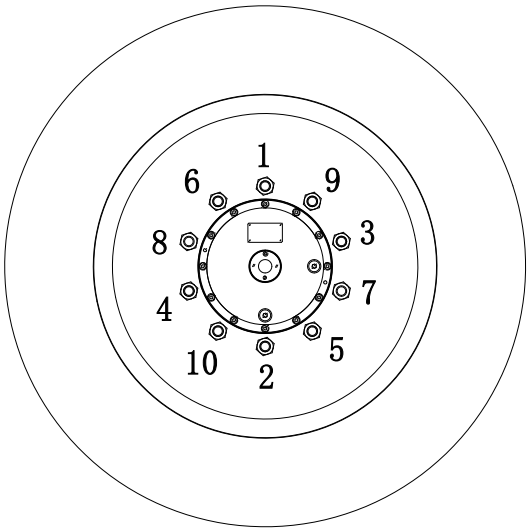
Unsafe operation hazards

- Tire specific nuts that match the wheel rim bolts must be used. The nuts must meet the pre tightening torque requirements and anti loosening measures must be taken to prevent the risk of wheel rim loosening, bolt breakage, and tire detachment from the axle. Be sure to only use nuts that match the wheel cone angle.
- Tighten the nut to the appropriate torque to prevent the wheel from loosening. Use a torque wrench to tighten the fasteners. If you do not have a torque wrench, use a socket wrench to tighten the fasteners, and immediately ask the service station or dealer to tighten the nuts to the correct torque. Excessive 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. First, apply Loctite 272 to the bolts and nuts, and then tighten all nuts by hand to prevent thread misalignment. Do not use lubricating oil on threads or nuts.

2. Please tighten the nuts in the following order as shown in the diagram.



3. The tightening of nuts should be carried out in steps. Refer to the recommended torque in the table below and tighten the nuts in the recommended order.

Model	Step 1	Step 2	Step 3
HB280P	180N.m	360N.m	600N.m
HB230P/250P	54N.m	135N.m	270N.m

Attention

Before the first use and after each tire is disassembled, the tire nuts should be tightened. Check and adjust torque every 3 months or 150 hours of operation

6.2.2 Walking reducer

The walking reducer serves both as a driving device and as a tire mounting fixture. The walking motor is also fixed to the walking reducer. Before removing the walking reducer, the machine should be fixed on a suitable lifting frame or a jack with sufficient capacity should be placed under the chassis platform.

Dismantling of walking reducer

1. Place the machine on a sturdy and level ground.

2. Place a lifting jack with sufficient capacity on the side under the machine frame to be disassembled. Lift the jack to lift the wheels off the ground.

3. Remove the tire nuts used to secure the wheels to the reducer. Use appropriate lifting equipment to remove the wheels.

4. Mark and disconnect the wires connected to the motor.

5. Remove the bolts and washers that fix the motor and reducer, remove the motor and take it out.

6. Remove the bolts and washers that fix the walking reducer to the fixed flange, remove the walking reducer and lift it off the chassis.

Installation of walking reducer

1. Use lifting equipment with sufficient capacity to support the legs.

2. Clean the installation surface, lift the walking reducer, align the position of the reducer (the phase of the reducer is the same as before disassembly), and fit the reducer with the flange installation surface.

3. Apply Loctite 272 thread sealant to the bolts and install the bolts and washers one by one.

4. Tighten the bolts with a torque wrench.

5. Clean the installation surface, lift the motor, and align the position of the reducer: the motor spline shaft meshes with the internal teeth of the reducer, slowly rotate the motor housing, and align the motor installation groove with the reducer installation screws.

6. When installing the wheels, pay attention to the orientation of the tires

7. Install the tire nuts in sequence (refer to 6.2.1).

8. Connect the wires on the motor.

9. Check the gear oil inside the reducer and add it if necessary (refer to inspection procedure D-1)

6.2.2 Rotary reducer

Dismantling of rotary reducer

1. Insert the locking pin shaft of the turntable into the locking position to prevent the turntable from rotating.
2. Mark, disconnect and plug the hydraulic hose on the rotary reducer.
3. Loosen the top tightening bolt.
4. Use appropriate lifting equipment to lift the rotary reducer.
5. Remove the fixing bolts connecting the rotary reducer to the turntable and slowly lift the rotary reducer from the turntable.

Installation of rotary reducer

1. Clean the external objects and burrs on the installation surface and gear of the rotary reducer.
2. Place the rotary reducer on the installation surface of the turntable and check the tooth side clearance with a plug gauge to ensure that the tooth side clearance is between 0.15-0.25mm (0.006-0.01in).
3. If the tooth side clearance exceeds the required value, the top nut can be used to

adjust it to the specified value.

4. After installing the washer on the bolt, apply Loctite 272 thread adhesive and install the bolts one by one to fix the rotary reducer and turntable. After installation, pre tighten the diagonal.
5. Ensure that the rotary reducer is completely in contact with the mounting surface of the turntable.
6. Tighten the bolts diagonally with a wrench.
7. Add gear oil to the rotary reducer until it covers the gear surface.
8. Clean the installation surface of the rotary reducer and fit the rotary motor pin shaft with the reducer pin hole.
9. Rotate the motor housing to align the bolt holes of the rotary motor with the bolt holes of the reducer. After installing the washer on the bolt, apply Loctite 272 thread sealant, install the bolt and tighten it.

6.2.3 Slewing bearing

Dismantling of slewing bearings

1. Insert the locking pin shaft of the turntable into the locking position to prevent the turntable from rotating.

2. Use appropriate lifting equipment to lift the turntable.

3. Remove the fixing bolts connecting the slewing bearings to the turntable, slowly lift the turntable and move it away.

4. Remove the fixing bolts connecting the slewing bearings to the chassis.

5. Use appropriate lifting equipment to slowly lift the slewing bearings and move it away.

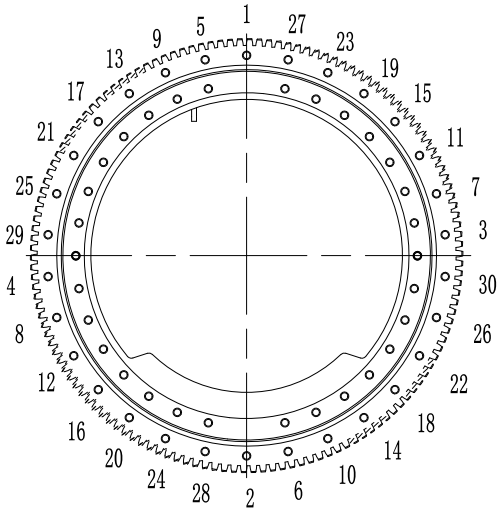
Installation of slewing bearings

1. Use appropriate lifting equipment to lift the slewing bearing onto the mounting surface of the chassis.

2. Use a plug gauge to check the gap between the installation surface of the slewing bearing and the installation surface of the chassis, ensuring that the gap is $\leqslant$ 0.2mm (0.008in).

3. Use high-strength washers that match high-strength bolts, fit the washer plane with the installation surface, apply Loctite 272 thread adhesive to the bolts, and install them one by one.

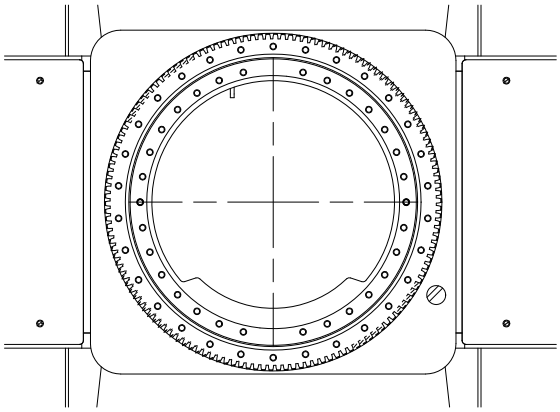
4. Tighten the bolts in the following order as shown in the diagram.



1. The tightening of bolts should be carried out in steps. Refer to the recommended torque in the table below and tighten the bolts in the recommended order.

Step 1	Step 2	Step 3
180N. m	360N. m	600N. m

2. Rotate the inner ring of the slewing bearings by hand to ensure smooth operation.
3. Remove the lifting equipment from the slewing bearings.
4. Rotate the inner ring of the slewing bearings so that the installation holes on the inner ring are as shown in the following figure.



5. Use lifting equipment to lift the turntable to the installation surface of the slewing bearings.
6. Use high-strength washers that match high-strength bolts, fit the washer plane with the installation surface, apply Loctite 272 thread adhesive to the bolts, and install them one by one.

6.2.4 Battery

Electric shock hazard

- Before removing the battery box or battery, it is necessary to cut off the power supply of the charger and the working power of the entire machine.
- Contact with live circuits may cause death or serious injury, so be sure to wear protective goggles, gloves, and clothing.
- Remove all rings, watches, and other accessories.

Disassembly of battery box

This machine is equipped with a battery box located on the right side of the frame.

1. Find the battery box.
2. Mark and disconnect the wires connected to the battery box.
3. Use appropriate forked equipment and place it at the bottom of the battery box to provide support for the battery box.
4. Remove the fixing bolts connecting the battery box and the frame.
5. Slowly raise the battery box to separate the bottom of the battery box from the chassis, and move the battery box away from the chassis.

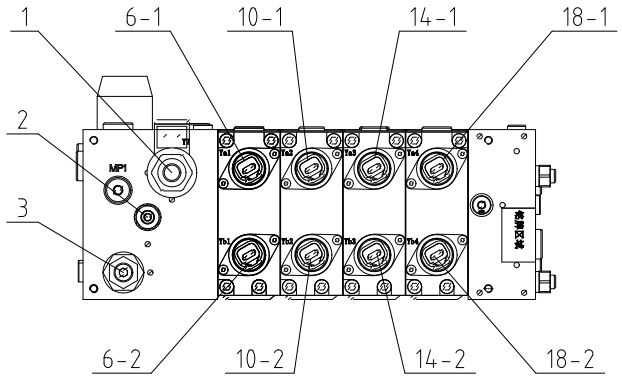
Disassembly of backup battery

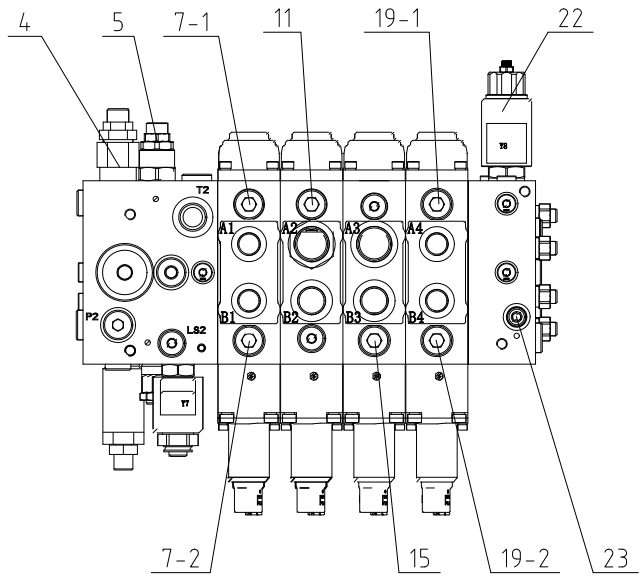
This machine is equipped with a backup battery, located on the left side of the turntable.

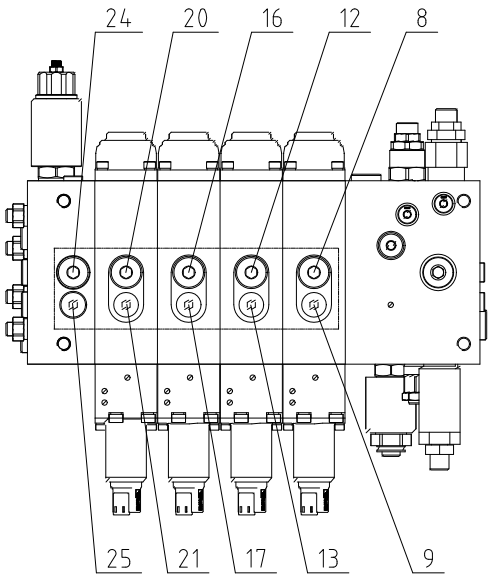
1. Open the left hood of the turntable and locate the backup battery.
2. Mark and disconnect the wires connected to the battery.
3. Use appropriate lifting equipment and remove the backup battery.

6.3 Hydraulic system

6.3.1 Main valve (HB280/250/230P)



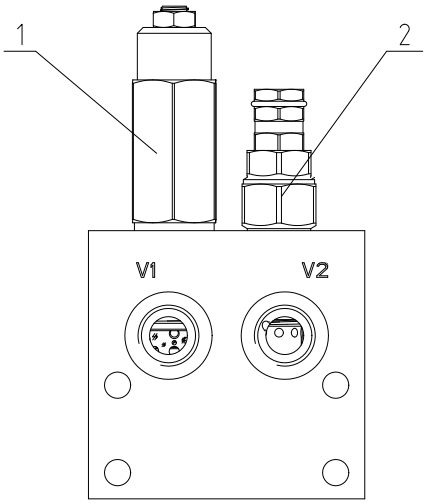




No.	Name	Function	Tightening torque
1	solenoid valve	Pump unloading	30-35Nm
2	relief valve	Limiting the operating oil circuit pressure	27Nm
3	pressure reducing	Limiting control of oil circuit pressure	34Nm
4	relief valve	Limiting the total pressure of the system	27Nm
5	logic valve	Control action sequence	24Nm
6-1	proportional pressure reducing valve	Control steering direction	34Nm
6-2	proportional pressure reducing valve	Control steering direction	
7-1	relief valve	Limiting steering pressure	

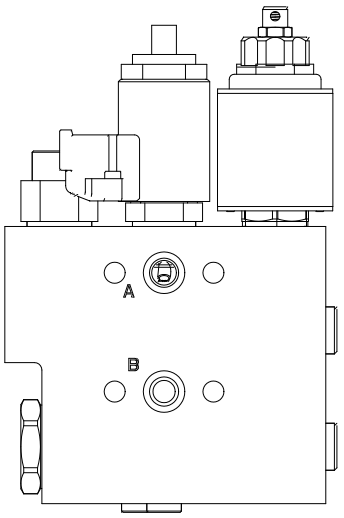
7-2	relief valve	Limiting steering pressure	
8	pressure compensator	Compensating steering pressure	
9	One-way valve	Maintain the direction of the steering oil circuit	
10-1	proportional pressure reducing valve	Control arm extension	
10-2	proportional pressure reducing valve	Control arm retraction	
11	relief valve	Limiting boom extension pressure	
12	pressure compensator	Compensation arm extension pressure	
13	One-way valve	Maintain the direction of the telescopic	
14-1	proportional pressure reducing valve	Control the boom to upper luffing	
14-2	proportional pressure reducing valve	Control leveling oil cylinder	
15	relief valve	Limit leveling pressure	
16	pressure compensator	Compensation luffing pressure	
17	One-way valve	Maintain luffing/level oil path direction	
18-1	proportional pressure reducing valve	Control the direction of rotation	
18-2	proportional pressure reducing valve	Control the direction of rotation	
19-1	relief valve	Limiting rotary pressure	
19-2	relief valve	Limiting rotary pressure	
20	pressure compensator	Compensating for rotary pressure	
21	One-way valve	Maintain the direction of the rotary oil circuit	
22	proportional throttle valve	Control platform valve flow rate	
23	Flow valve	Restrict platform valve flow rate	
24	pressure compensator	Compensation platform valve pressure	
25	One-way valve	Maintain the direction of the platform oil circuit	

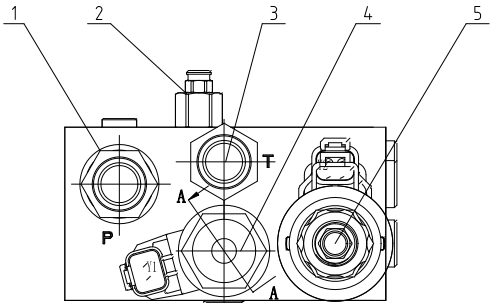
6.3.2 Telescopic balance valve(HB280/250/230P)



No.	Name	Function	Tightening torque
1	Balance valve	Locking the telescopic arm oil cylinder	30-35Nm
2	Balance valve	Locking the telescopic arm oil cylinder	27Nm

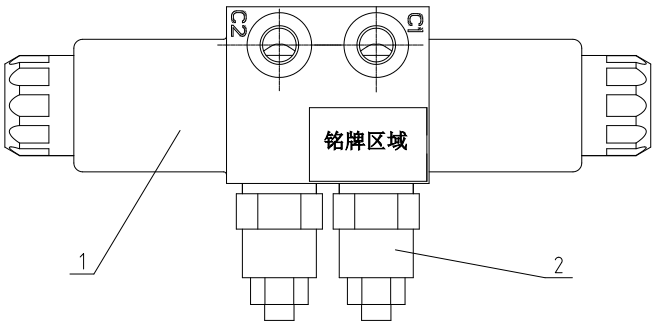
6.3.3 Luffing gravity valve(HB280/250/230P)





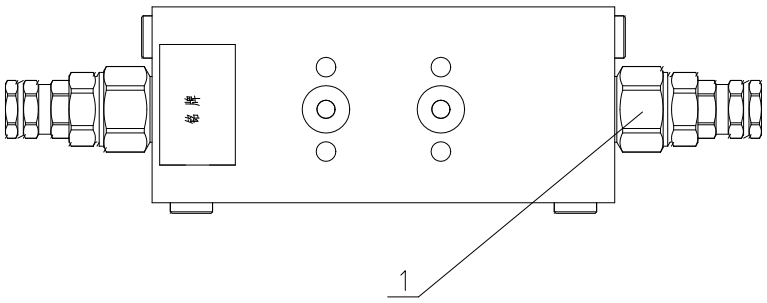
No.	Name	Function	Tightening torque
1	One-way valve	Maintain the direction of the luffing oil circuit	30-35Nm
2	relief valve	Lock the telescopic arm oil cylinder	27Nm
3	solenoid valve	Lock the luffing cylinder	
4	Proportional Solenoid Valve	Luffing action speed control	
5	logic valve	Control action sequence	

6.3.4 Leveling switching valve(HB280/250/230P)



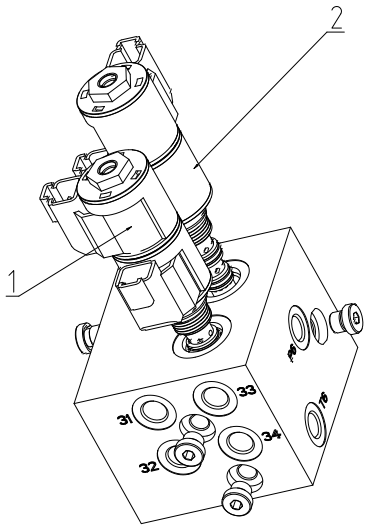
No.	Name	Function	Tightening torque
1	Reversing Valve	Switch leveling mode	30-35Nm
2	Balance valve	Lock leveling oil circuit	27Nm

6.3.5 Leveling balance valve(HB280/250/230P)



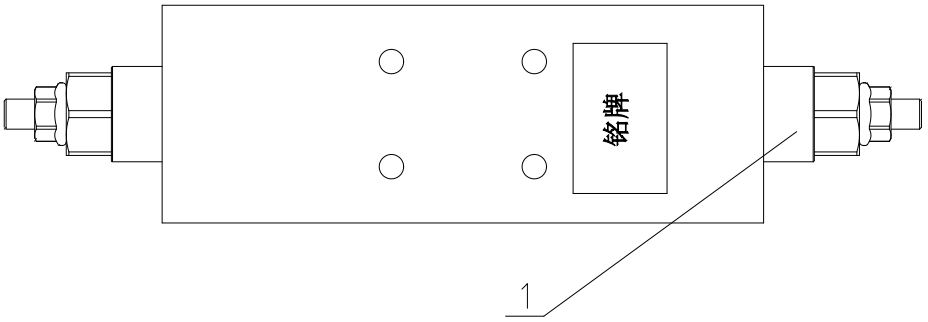
No.	Name	Function	Tightening torque
1	Balance valve	Lock leveling oil circuit	30-35Nm

6.3.6 Platform valve(HB280/250/230P)



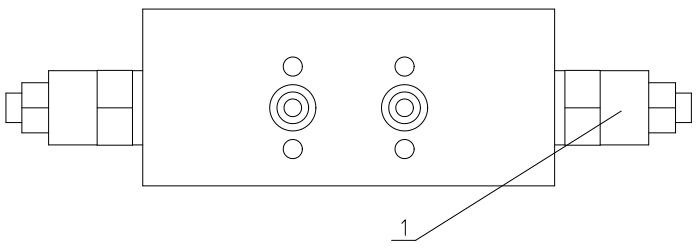
No.	Name	Function	Tightening torque
1	Reversing Valve	Switch the direction of the flying arm	30-35Nm
2	Reversing Valve	Switch platform rotation direction	27Nm

6.3.7 Swing arm balance valve(HB280P/HB250P)



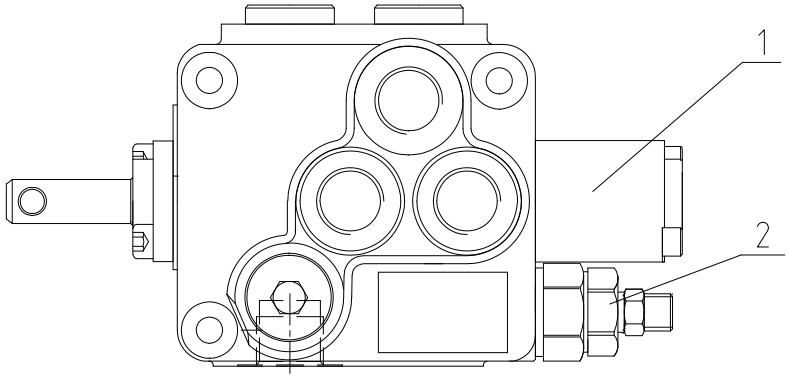
No.	Name	Function	Tightening torque
1	Balance valve	Lock the swing arm oil circuit	30-35Nm

6.3.8 Floating balance valve(HB280P)



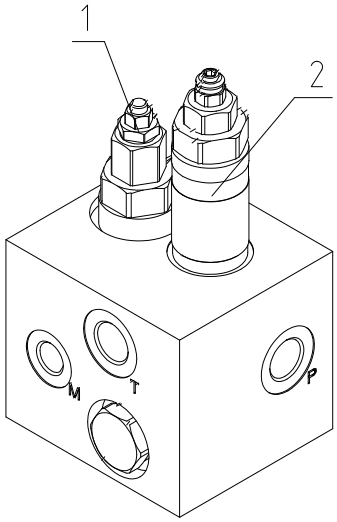
No.	Name	Function	Tightening torque
1	Balance valve	Lock the floating oil circuit	30-35 Nm

6.3.9 Floating cable valve(HB280P)



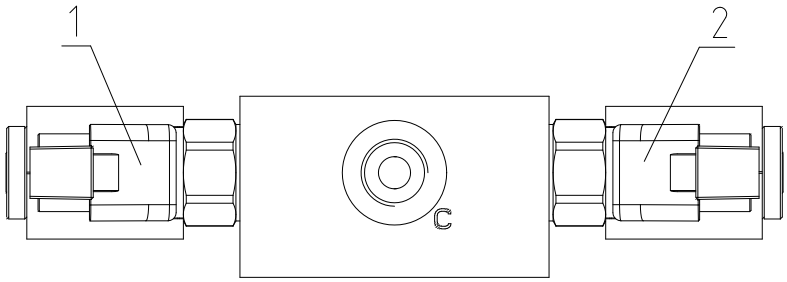
No.	Name	Function	Tightening torque
1	Reversing Valve	Switch the direction of the floating oil	30-35Nm
2	Relief valve	Limit the opening pressure of the floating oil circuit	27Nm

6.3.10 Floating pressure reducing valve(HB250P/HB230P)



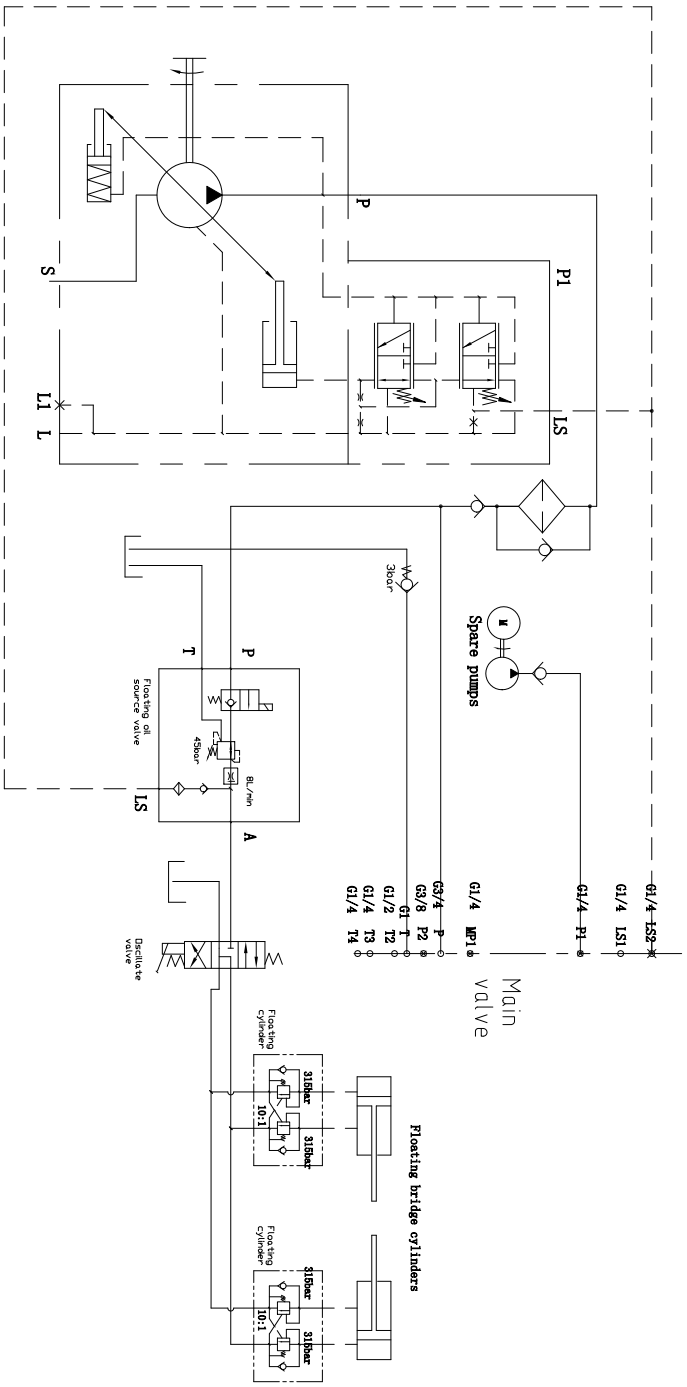
No.	Name	Function	Tightening torque
1	Overload oil replenishment valve	Floating oil circuit refueling	70-80Nm
2	Pressure reducing	Limit floating oil circuit pressure	40Nm

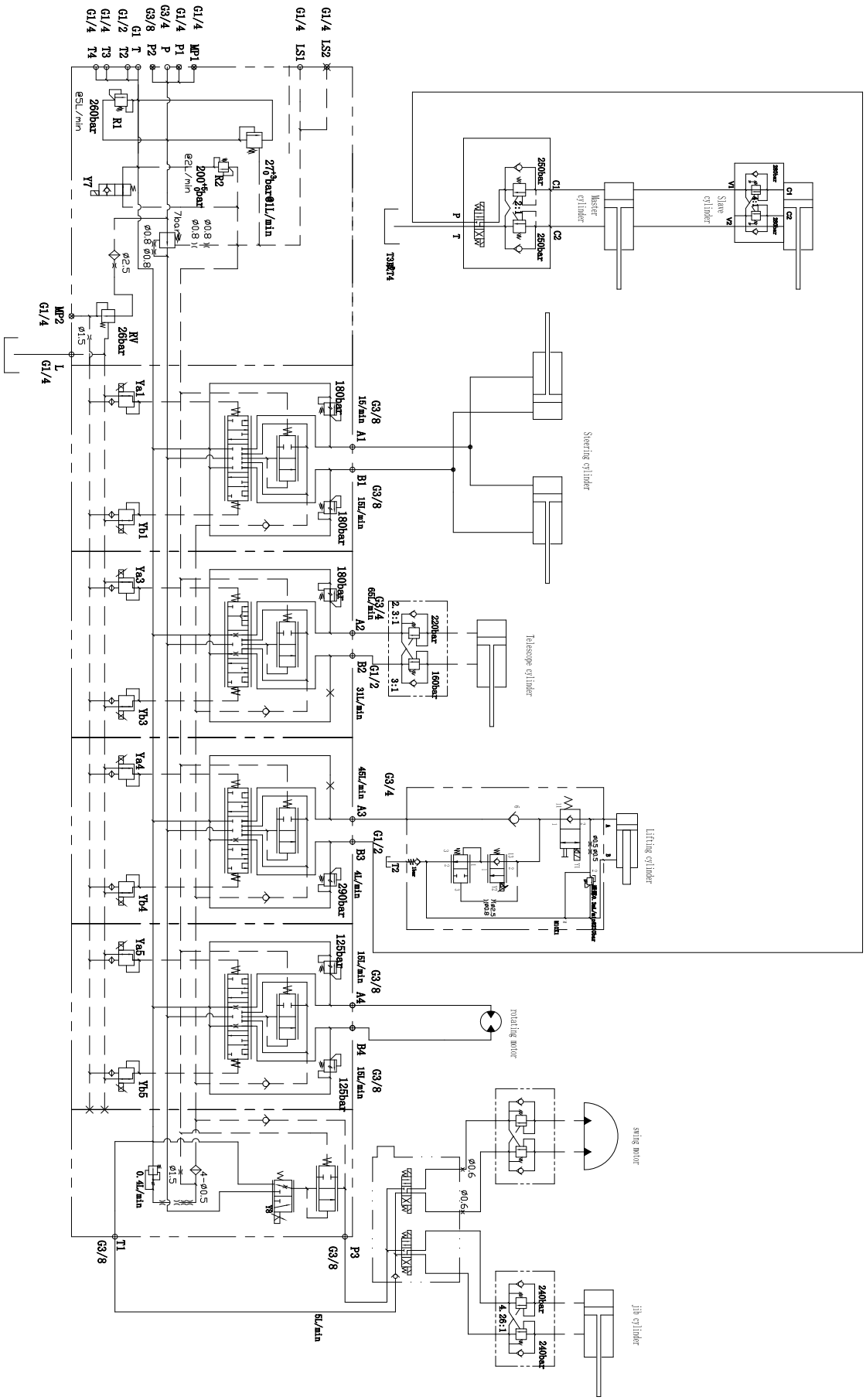
6.3.11 Axle floating valve (HB250P/HB230P)



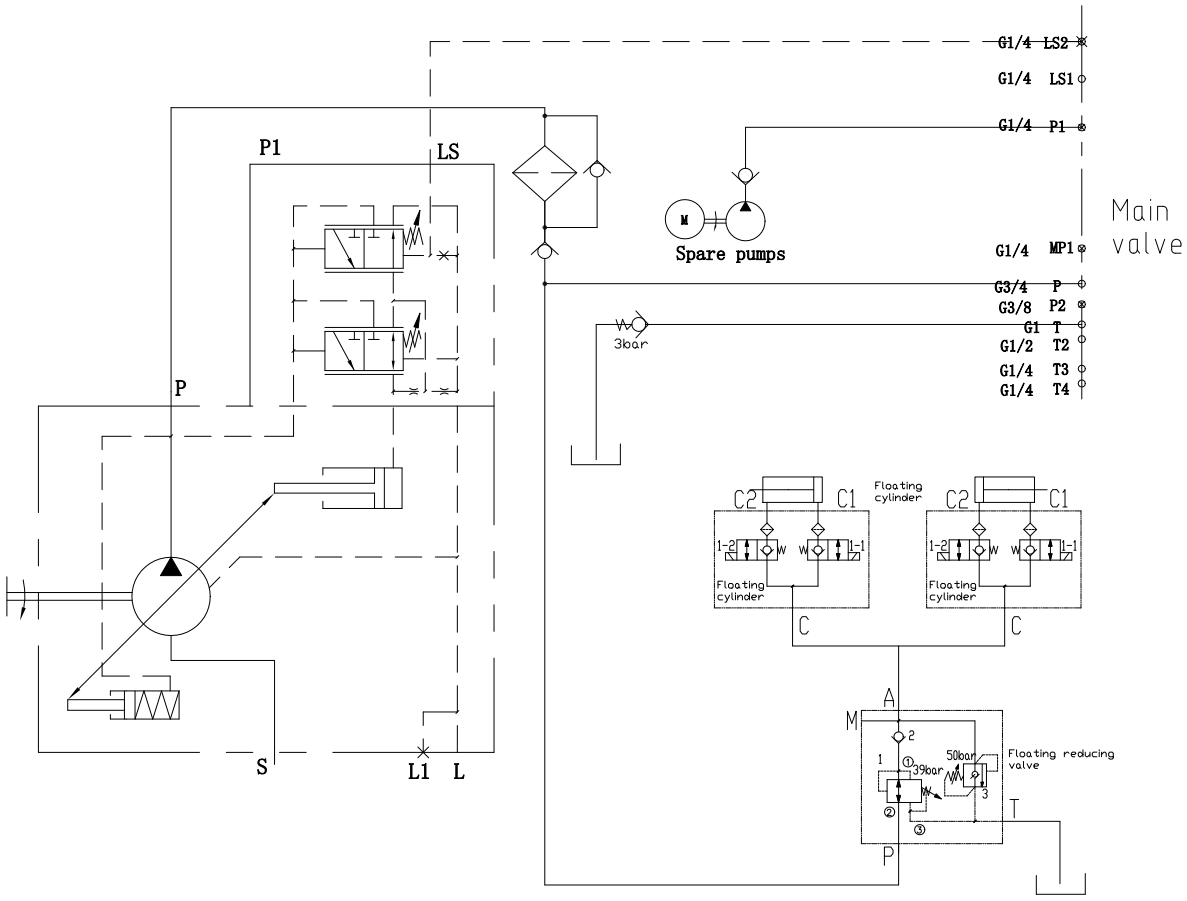
No.	Name	Function	Tightening torque
1	Reversing Valve	Switch the direction of the floating oil circuit	40-45Nm
2	Reversing Valve	Switch the direction of the floating oil circuit	40-45Nm

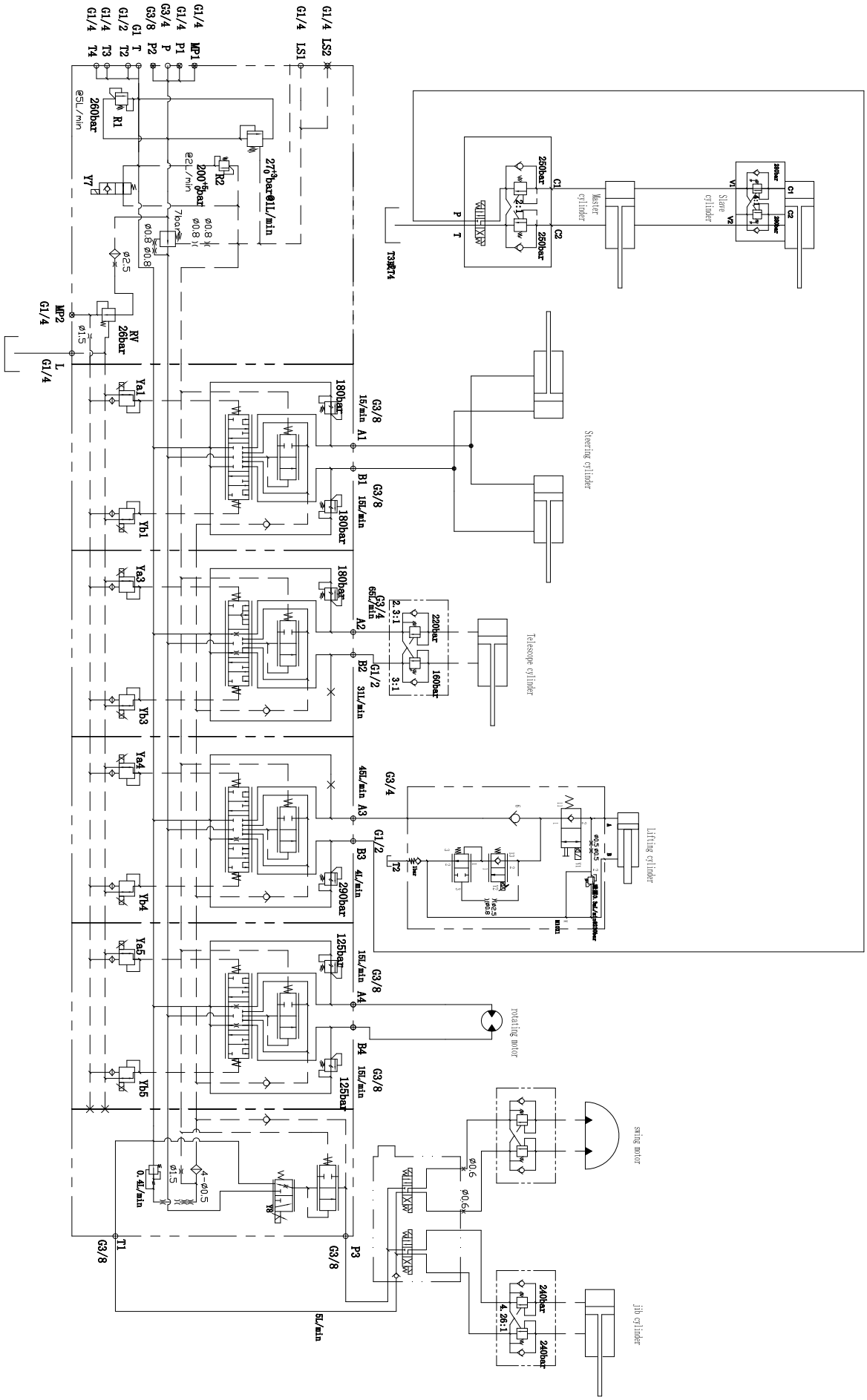
6.3.12 Hydraulic schematic diagram（HB280P）



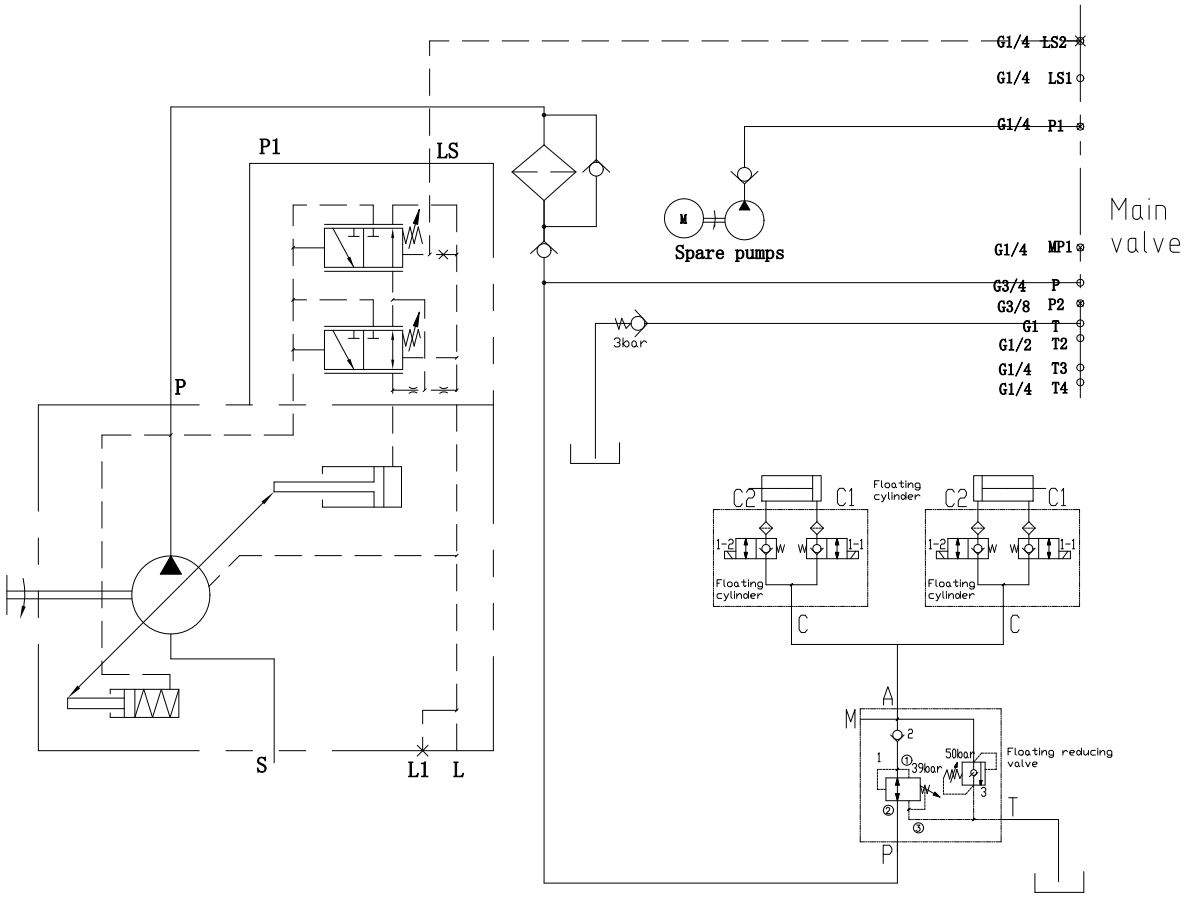

Steering cylinder
Telescope cylinder
Lifting cylinder
rotating motor
swing motor
jib cylinder
Master cylinder
Slave cylinder

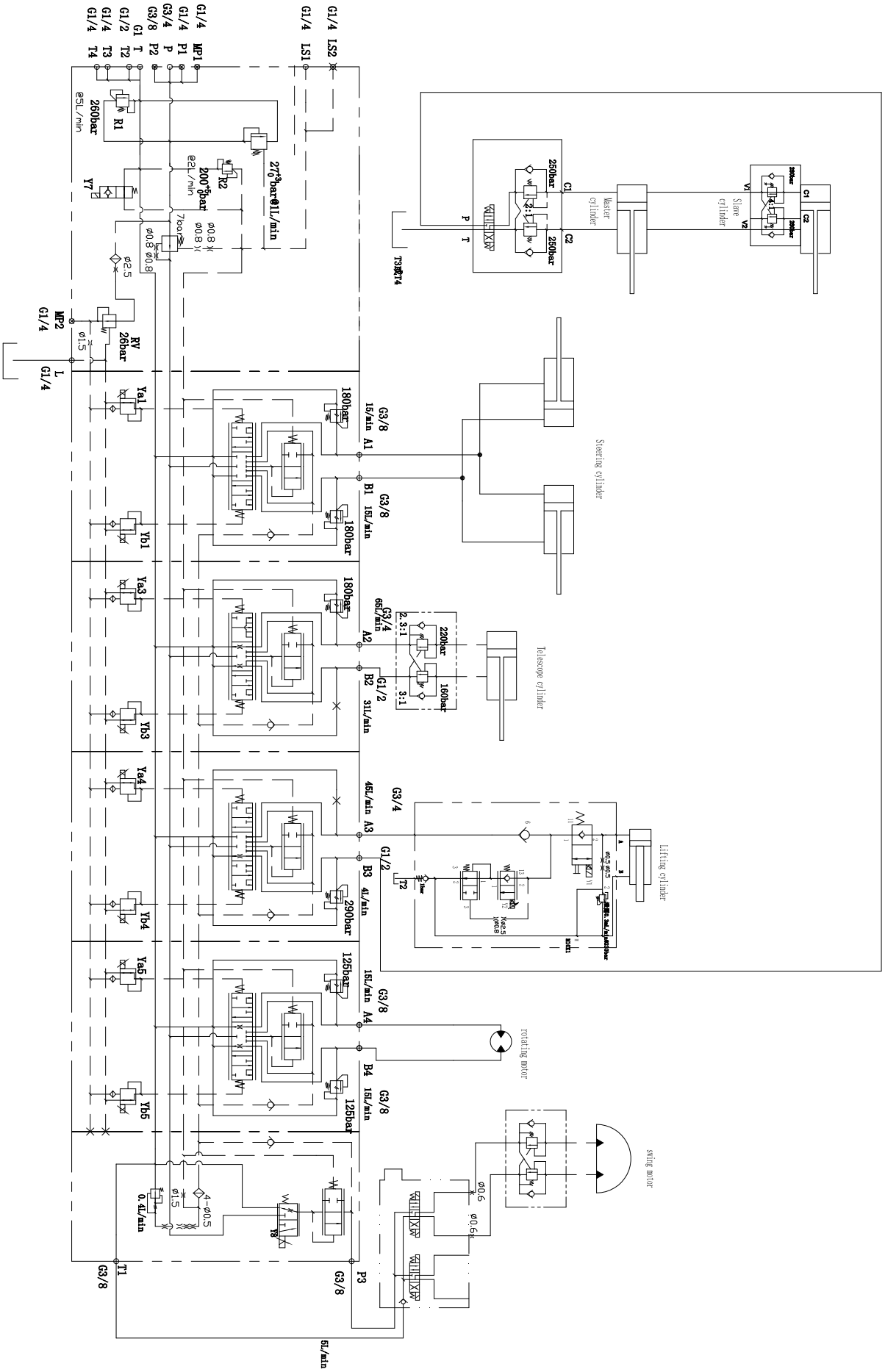
6.3.13 Hydraulic schematic diagram(HB250P)




G1/4 MP1
G1/4 P1
G3/4 P
G3/8 P2
G1 T
G1/2 T2
G1/4 T3
G1/4 T4
G1/4 LS2
G1/4 LS1
260bar
@5L/min
R1
Y7
R2
200+5bar
@2L/min
270+5bar 91L/min
ø0.8
ø2.5
RV
26bar
MP2
G1/4
L
G1/4
ø1.5
Ya1
Yb1
Ya3
Yb3
Ya4
Yb4
Ya5
Yb5
180bar
G3/8
15L/min
A1
B1
180bar
180bar
G3/4
65L/min
A2
B2
G1/2
31L/min
45L/min
A3
B3
4L/min
290bar
125bar
G3/8
15L/min
A4
B4
125bar
0.4L/min
Y8
T1
G3/8
P3
G3/8
5L/min
250bar
C1
2.3:1
260bar
C2
P
T
T3
T4
Master cylinder
Slave cylinder
V1
V2
Steering cylinder
Telescope cylinder
2.3:1
220bar
160bar
3:1
Lifting cylinder
rotating motor
swing motor
240bar
4.26:1
240bar
jib cylinder

6.3.14 Hydraulic schematic diagram(HB230P)




G1/4 MP1
G1/4 P1
G3/4 P
G3/8 P2
G1 T
G1/2 T2
G1/4 T3
G1/4 T4
G1/4 LS2
G1/4 LS1
260bar
R1
@5L/min
Y7
R2
200*5bar
@2L/min
270bar@11L/min
MP2
G1/4
RV
26bar
L
G1/4
Ya1
Yb1
Ya3
Yb3
Ya4
Yb4
Ya5
Yb5
180bar
G3/8
15/min
A1
B1
15L/min
180bar
180bar
G3/4
65L/min
A2
220bar
160bar
2.3:1
3:1
B2
G1/2
31L/min
Steering cylinder
Telescope cylinder
G3/4
45L/min
A3
G1/2
B3
4L/min
290bar
Lifting cylinder
125bar
G3/8
15L/min
A4
B4
G3/8
15L/min
125bar
rotating motor
swing motor
0.4L/min
T8
T1
G3/8
P3
G3/8
5L/min
250bar
C1
C2
250bar
Master cylinder
Slave cylinder
V1
V2
T3
T4
P
T

6.3.15 Hydraulic troubleshooting

The table lists the possible faults that may occur in the hydraulic system, which can help operators or maintenance personnel identify the fault area, and then inspect the fault area according to corresponding measures. Based on the inspection results, adjusts or replaces new components.

Description		Analysis	Measures
Low oil pump output pressure		Damaged plunger and O-ring	Replace faulty parts
		Overflow valve adjustment error	Use a pressure gauge to check and adjust the pressure
		There are bubbles in the oil pump	Add hydraulic oil to the fuel tank and wait for the bubbles to disappear, then use the oil pump
Oil pump emits noise		Filter clogging causing cavitation phenomenon	Adjust or replace hoses and clean filters
		Cavitation caused by high viscosity of hydraulic oil	Replace with new hydraulic oil with viscosity suitable for the operating speed of the oil pump, when the oil temperature is normal.then work
		Insufficient hydraulic oil	Add hydraulic oil to the fuel tank and wait for the bubbles to disappear, then use the oil pump
Boom unable to luffing	The motor has action	Insufficient lifting pressure	Use a pressure gauge to check and adjust the pressure
		Solenoid valve malfunction or incorrect pipeline connection	Check the solenoid valve and pipelines
	Motor no action	Electrical component or circuit fault	Check electrical components and wiring
Unable to steer	The motor has action	Insufficient steering pressure	Use a pressure gauge to check and adjust the pressure
		Solenoid valve malfunction or incorrect pipeline connection	Check the solenoid valve and pipelines
	Motor no action	Electrical component or circuit fault	Check electrical components and wiring
Pressure instability or decrease		Loose pressure regulating screw	Re-adjust the pressure and lock
		Pressure regulating spring deformed or damaged	Replace
		Wear or jamming of safety valve core	Replace or disassemble and reassemble
		Wear of plunger pump	Repair or replace the plunger pump

6.4 Electrical system
6.4.1 The use and maintenance of batteries

Electric shock hazards

Contact with live circuits may result in death or serious injury.
Remove all rings, watches, and other accessories.

Danger of bodily injury

Batteries contain acidic substances that should be prevented from leaking and avoid contact with them.
If the acidic substance in the battery leaks, use soda water and the leaked acidic substance.

Attention

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

Ensure that the battery cable connections are not corroded.

Ensure that the battery is securely installed and the cable connections are secure

There are three types of batteries: lead-acid batteries, lead-acid maintenance free batteries, and lithium batteries. Among them, lithium batteries and lead-acid maintenance free batteries belong to maintenance free batteries.

★Check lead-acid batteries：

1. Wear protective clothing and protective glasses.
2. Ensure that the wiring of the battery cables is not corroded.
3. Ensure that the battery is securely fixed and the cable connections are secure.
4. Remove the battery ventilation cover and use a liquid density meter to check the density of the electrolyte in each group of batteries. If the electrolyte density in any group of batteries is less than 1.24, the batteries must be replaced.
5. Check the acidic liquid level of the battery. If needed, add distilled water through the battery filling port and do not add too much.
6. Install the ventilation cover.
7. Connect the charging plug to a 220V socket.

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

Attention: Adding terminal protectors and anti-corrosion sealants will help eliminate corrosion on battery connection terminals and cables. The electrolyte of a battery is corrosive, so it is important to avoid contact with spilled electrolyte by hands or other parts of the body to prevent injury.

Neutralize the spilled electrolyte with baking soda water.

★Check maintenance free batteries：

1. Wear protective gloves.

2. Ensure that the wiring of the battery cables is not corroded.

3. Ensure that the battery is securely fixed and the cable connections are secure.

4. Connect the battery charger cable to the correct terminal of the battery (red to positive, black to negative).

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

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

★Precautions for replacing storage battery：

1. When disassembling or installing batteries, a wrench with a rubber handle should be used.

2. Tightening torque of cable fixing nut:

M8 tightening torque 9-11/N.m,

M10 tightening torque is 18-23/N.m.

2. If the terminals are not kept clean and dry, they may continue to corrode. To prevent corrosion, apply a thin layer of Vaseline or use a terminal protector.

★Storage precautions for batteries：

1. Charge the battery before storing it.

2. It is recommended to store the battery in a cool and dry environment that is not affected by weather (temperature 10-25 ℃, humidity less than 90%), and charge it every three months.

3. Disconnect the power outage plug to eliminate the potential danger of battery leakage.

4. The stored battery should be charged quickly once when it is at 70% or lower.

5. After removing the battery from the storage, it should be recharged before use.

6. Storage in hot environments (above 32 ° C [90 ° F]): During storage, batteries should be avoided from being directly exposed to hot environments. The self discharge rate of batteries in high temperature environments is faster. If batteries are

stored in hot summer, they should be monitored more frequently for specific gravity or voltage (approximately every 2-4 weeks).

7. Storage in cold environments (below 0 ° C [32 ° F]): During storage, batteries should be avoided from being placed in places where temperatures are expected to reach freezing point. If not fully charged, the battery may freeze at low temperatures. If storing batteries in cold winter, it is important to fully charge them.

6.4.2 Fault codes

Fault code description

In case of malfunction, the fault code can be queried on the fault query interface of the turntable control box.

Table 6-7 Instruction of Machine Fault Codes

Fault code	Fault description
E1	Platform IO communication fault
E7	Chassis tilt fault
E8	Left front driver CAN communication fault
E9	Left rear driver CAN communication fault
E10	Right front driver CAN communication fault
E11	Right rear driver CAN communication fault
E12	Pump motor CAN communication fault
E13	Anticollision faulty
E17	Platform overload
E18	Dual load alarm
E19	Low startup battery power
E41	Main arm length sensor fault
E42	Main arm angle sensor fault
E43	Turntable rotation joystick fault
E44	Lower arm luffing joystick fault
E45	Walk joystick fault

E46	Steering switch fault
E47	Upper arm luffing joystick fault
E48	Upper arm telescopic joystick fault
E49	Turntable button switch fault
E50	Platform button switch fault
E68	Low battery alarm
E70	Left rear walking driver fault
E71	Left front walking driver fault
E72	Right rear walking driver fault
E73	Right front walking driver fault
E74	Pump motor fault
E94	ECU communication fault
E102	Voltage collection fault
E103	Temperature collection fault
E104	SOC too low 1
E105	SOC too low 2
E106	SOC too low 3
E107	Discharge total voltage too low 1
E108	Discharge total voltage too low 2
E109	Discharge total voltage too low 3
E120	Charging total under voltage 3
E121	Charging overcurrent 1
E122	Charging overcurrent 2
E123	Charging overcurrent 3
E124	Discharge overcurrent 1
E125	Discharge overcurrent 2
E126	Discharge overcurrent 3
E127	Discharge unit overvoltage 1
E128	Discharge unit overvoltage 2
E129	Discharge unit overvoltage 3
E130	Charging unit overvoltage 1
E131	Charging unit overvoltage 2

E132	Charging unit overvoltage 3
E133	Room temperature discharge unit undervoltage 1
E134	Room temperature discharge unit undervoltage 2
E135	Room temperature discharge unit undervoltage 3
E136	Low temperature discharge unit undervoltage 1
E137	Low temperature discharge unit undervoltage 2
E138	Low temperature discharge unit undervoltage 3
E139	Charge unit undervoltage 2
E140	Charge unit undervoltage 3
E141	Charging temperature too high 2
E142	Charging temperature too high 3
E143	Charging temperature too low 1
E144	Charging temperature too low 2
E145	Charging temperature too low 3
E146	Discharge temperature too high 1
E147	Discharge temperature too high 2
E148	Discharge temperature too high 3
E149	Discharge temperature too low 1
E150	Discharge temperature too low 2
E151	Discharge temperature too low 3
E152	Discharge temperature difference too large 1
E153	Discharge temperature difference too large 2
E154	Discharge temperature difference too large 3
E155	Charging temperature difference

	too large 1
E156	Charging temperature difference too large 2
E157	Charging temperature difference too large 3
E158	Discharge voltage difference is too large 1
E159	Discharge voltage difference is too large 2
E160	Discharge voltage difference is too large 3
E161	Charging voltage difference too large 1
E162	Charging voltage difference too large 2
E163	Charging voltage difference too large 3
E164	Insulation fault 1
E165	Insulation fault 2
E166	Insulation fault 3
E167	ECU communication fault

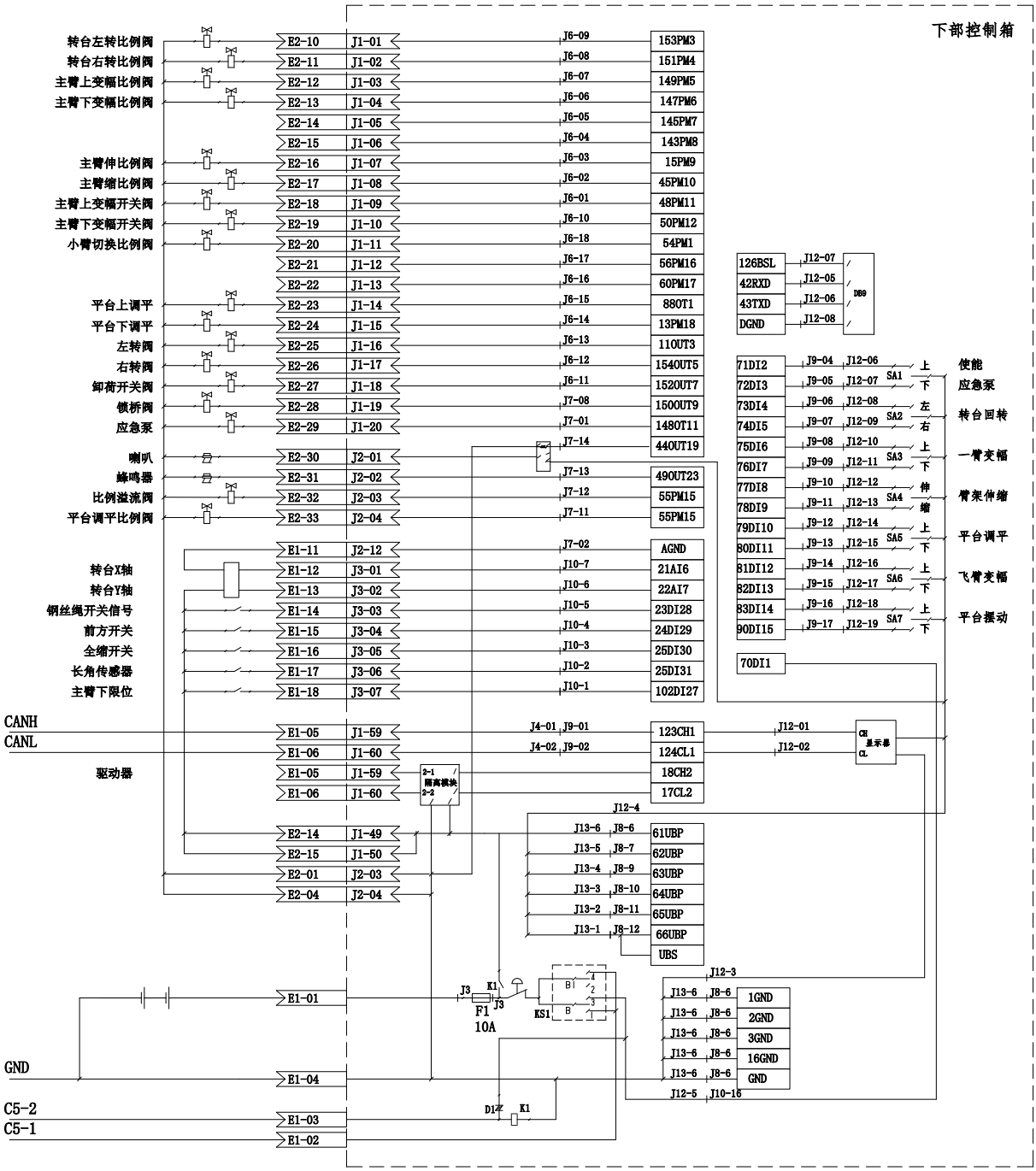
Table 6-8 Instruction of Driver Fault Codes

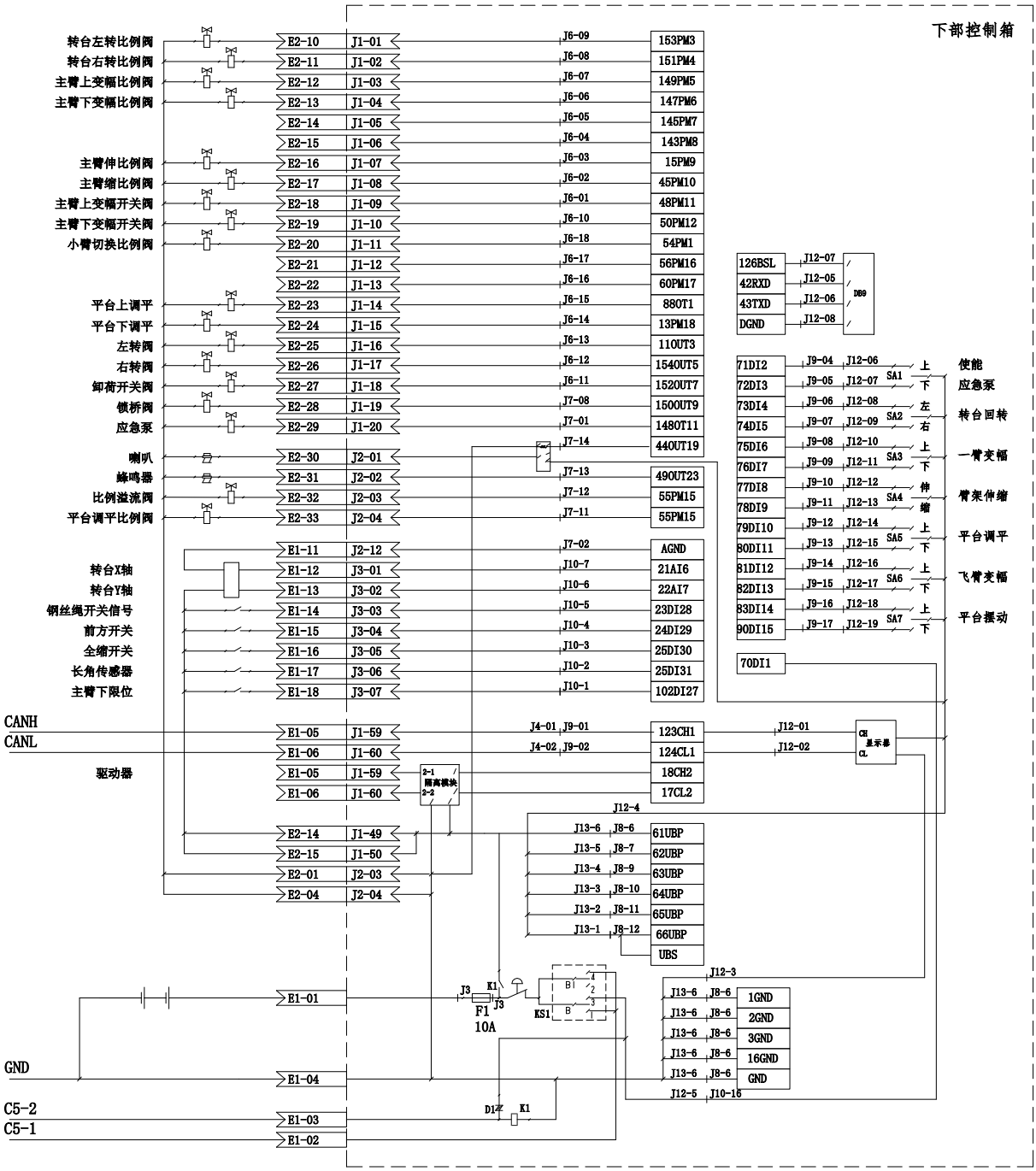
Fault codes	Fault description
11	Bus overvoltage
17	Hardware EEP verification fault
7	Hardware overcurrent
6	Fault in phase current sensor
20	Electromagnetic brake fault
5	Rotary transformer fault
2	Current sensor zero bias fault
4	Hardware overvoltage
1	IGBT fault

3	Bus undervoltage
12	Overspeed fault
10	Software overcurrent
8	Controller over temperature
13	Locked rotor fault
318	Left rear controller VCU communication loss
418	Right rear controller VCU communication loss
419	Right rear controller and left rear controller
319	Left rear controllers and right rear controller
14	Motor temperature sensor fault
9	Motor over temperature
15	Controller temperature sensor fault
23	Controller over temperature warning
21	Bus under voltage warning
22	Bus over voltage warning
24	Motor over temperature warning

When the electrical system faults, corresponding fault codes will be displayed on the chassis panel and platform joystick screens. The table below lists the fault conditions corresponding to the fault codes, which can help operators or maintenance personnel determine the fault location, and then inspect the components and their connecting accessories at the fault location. Based on the inspection results, adjusts or replaces new components.

6.4.3 Electrical Schematic diagram




下部控制箱
转台左转比例阀
转台右转比例阀
主臂上变幅比例阀
主臂下变幅比例阀
主臂伸比例阀
主臂缩比例阀
主臂上变幅开关阀
主臂下变幅开关阀
小臂切换比例阀
平台上调平
平台下调平
左转阀
右转阀
卸荷开关阀
锁桥阀
应急泵
喇叭
蜂鸣器
比例溢流阀
平台调平比例阀
转台X轴
转台Y轴
钢丝绳开关信号
前方开关
全缩开关
长角传感器
主臂下限位
CANH
CANL
驱动器
GND
C5-2
C5-1
126BSL
42RXD
43TXD
DGND
DB9
使能
应急泵
转台回转
一臂变幅
臂架伸缩
平台调平
飞臂变幅
平台摆动
隔离模块
显示器
F1
10A
K1
KS1
D1
1GND
2GND
3GND
16GND
GND

Chapter 7 Inspection and Maintenance Record Form

7.1 Maintenance Record Form

Date	Repair and maintenance content	Maintenance personnel

7.2 Preparation work record form before delivery

Preparation work record form before delivery			
Product model			
Factory number			
Inspection items	**YES** The machine is in good condition	**NO** Machine damage or failure	**REPAIRED** The machine has been repaired
Pre-operation inspection			
Maintenance procedure			
Functional check			
Machine buyers/lessees			
Signature of inspector			
Inspection date			
Inspector post			
Inspector unit			

7.3 Maintenance inspection report

Maintenance inspection report					
Product model					
Factory number					
Inspection procedure A					
NO.	**Project**	**YES** The machine is in good condition	**NO** Machine damage or failure	**REPAIRED** The machine has been repaired	**Problem description**
A-1	Check each manual				
A-2	Check each label				
A-3	Check for damaged loose or missing parts				
A-4	Check the hydraulic oil level				
A-5	Check hydraulic oil leakage				
A-6	Function check				
A-7	Perform floating cylinder exhaust				
A-8	Perform 30 day maintenance				
Inspection procedure B					
NO.	**Project**	**YES** The machine is in good condition	**NO** Machine damage or failure	**REPAIRED** The machine has been repaired	**Problem description**
B-1	Check hydraulic oil				
B-2	Check the hydraulic oil tank air filter				
B-3	Check and replace the hydraulic oil tank return oil filter element				
B-4	Replace the high-pressure filter element				
B-5	Check the oil level in the walking reducer				
B-6	Check the oil level in the rotary				

	reducer				
B-7	Check the connecting bolts of the slewing bearing				
B-8	Regularly lubricate the slewing bearing				
B-9	Check the rim, tires, and their fasteners				
B-10	Check the tightness of the platform swing oil cylinder				
B-11	Balance valve locking inspection				
B-12	Check oil cylinder offset				
B-13	Check the emergency descent function				
B-14	Check length and angle sensors				
B-15	Check the tilt protection system				
B-16	Test the floating legs and inspect the floating valve				
B-17	Test travel speed				
B-18	Check the wires				
B-19	Check the battery				
Inspection procedure C					
NO.	**Project**	**YES** The machine is in good condition	**NO** Machine damage or failure	**REPAIRED** The machine has been repaired	**Problem description**
C-1	Replace the hydraulic oil tank air filter				
C-2	Check the telescopic steel wire rope and sheave of the boom				
C-3	Check the weighing system				
Inspection procedure D					
NO.	**Project**	**YES** The machine is in good condition	**NO** Machine damage or failure	**REPAIRED** The machine has been repaired	**Problem description**
D-1	Replace the gear oil in the drive				

	reducer				
D-2	Replace the gear oil in the rotary reducer				
D-3	Replace hydraulic oil				
D-4	Replace the hydraulic oil tank suction filter				
D-5	Check the boom slider				
User					
Signature of inspector					
Inspection date					
Inspector post					
Inspector unit					

Explain:

1.The maintenance inspection report shall include a checklist for each type of periodic inspection.

2.Copy the maintenance inspection report for each inspection. The completed form shall be kept for at least 10 years or until the machine is out of use or at the request of the machine owner / company / custodian.

3.Use this form to record the results. After completing each inspection procedure, tick the corresponding box.

4.Record the inspection results. If any inspection result is "no", you must stop using the machine, recheck the machine after maintenance, and tick the mark in the box of "repaired".

Select the appropriate inspection procedure according to the inspection type.

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