

CRAWLER CRANE OPERATOR'S MANUAL

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ZCC1500V Crawler Crane Operator's Manual

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To Users

We appreciate your selection of ZOOMLION crawler crane. Please read this manual book and make yourself fully acquainted with rules in this manual before operation.

Safety instructions, major technical data, and safe operations are described in this manual, aiming at helping users operate the crane safely with a high efficiency. Please keep the manual properly.

For the sake of normal operation and the personal safety of you and others, please read this manual in details before operating or carrying out maintenance for the crane. Please contact our local service technicians if there is any doubt, we will provide you timely and efficient technical support. Zoomlion shall bear no responsibility for any consequence brought by incorrect operations that violate rules in this manual.

The *OPERATOR'S MANUAL* is an important part of the crane. If the possession of the crane is transferred to others, please do make sure that this manual is also transferred with the crane.

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There might be differences between the manual and the product you purchased due to technological improvement, upgrading, or different specifications and models. Please contact local service engineers of Zoomlion for any doubt.

Zoomlion reserves the right to revise this manual because of technological improvement. We hope you understand if there is any modification without prior notice.

Thank you for your support and trust, and Zoomlion wish you all the best in future.

Safety instructions

Safety warning signs in this manual are as follows:



Indicates a potentially hazardous condition which, if not avoided, may result in death or serious injury.



Indicates an imminently hazardous condition which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous condition which, if not avoided, may result in moderate to minor personal injury, or property damage.

NOTICE

Indicates a risk that is unrelated to personal injury (such as property damage).

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Operator's Manual for Crawler Crane

Chapter 1 Safety



Chapter 1 Safety

1.1 Important cautions

This operator's manual is intended to instruct users operate the crane safely and correctly, bringing the efficiency of the crane into full play.

Some terminologies are illustrated in this operator's manual. Please make sure you understand them correctly in order to avoid misunderstanding during operation.

DANGER

- 1. Only qualified persons who have been trained can operate this crane.**
- 2. The probability of accidents will be increase greatly if operators are not trained before operation. It is strictly prohibited to assign untrained persons on duty.**

For all regulations and guidelines applicable to operations on site, detailed illustrations and provisions have been provided in this manual, which require strict observance.

All guiding principles for accident prevention are applicable to load lifting and transportation.

The owner of the crane or the operator shall be responsible for dangers caused by illegal or improper use of the crane.

CAUTION

- 1. Users must be familiar with this crane immediately.**
- 2. Users should avoid malfunctions caused by improper use.**
- 3. Observance of these rules helps to improve the reliability of the crane.**
- 4. Observance of these rules helps to extend the service life of the crane.**
- 5. Observance of these rules helps to reduce repairing cost and halt time.**

Please make sure that driver or operator can easily obtain this manual so that they can consult and handle failure conveniently. This operator's manual is an inseparable part of the crane. Only persons who thoroughly understand technique features and serviceable range of the crane and strictly observe service regulations are permitted to operate the crane.

Related information like technique documents sent out through communication mediums from ZOOMLION must be also performed and archived together with this manual.

For any incomprehension of this manual, please consult to ZOOMLION or agent before operation.

Persons operating or carrying out maintenance on the crane must read this manual carefully and follow related rules strictly.

Information concerning safety is specifically identified with terminological signs like "Danger", "Warning" and "Caution". Safety information concerned in this manual is conventional.

 **CAUTION**

It is strictly prohibited to carry out welding operation on the crane in general condition. Attaching plugs of all controllers must be pulled out and the power supply must be cut off in special circumstances when welding is needed. Otherwise, operator is responsible for the result.

 **DANGER**

Users must pay special attention to safety devices connecting with various components. Please carry out regular and frequent inspections to ensure that all safety devices on the crane are normal and reliable in performance. The crane must be stopped immediately once safety device functions abnormally. Operators must put safety first at all times.

1.2 Safety instructions

1.2.1 Notes

- a) Read this manual and familiarize yourself with related information;
- b) Make sure that persons carrying out assembly, operation and maintenance are familiar with this manual;
- c) Related personnel must be trained before operating the crane.
- d) Shut down the power supply before any maintenance, adjustment or dismantling of safety device in order to avoid electric shock.
- e) Do not take the risk of operating if there is any question.
- f) Assembly, setting, operation, maintenance and debugging of the crane can only be carried out by professionals.

1.2.2 Warnings

- a) Remaining dangers mentioned in this manual are identified on proper positions on the crane. Please make sure the machine is properly installed.
- b) Please follow safety instructions to avoid injuries and deaths.
- c) Safety instructions and warning signs in operating area must be complete and clear.
- d) Keep the cleanliness of safety instructions and warning signs.
- e) Replace blurred or worn signs timely to make sure the effectiveness.

 **DANGER**

1. Please observe all warning signs in order to ensure personal safety.
2. Refer to 3.10 in Chapter 3 for more details on warning signs. .

1.2.3 Safety devices

- a) Do not use the crane when protective devices are dismantled or installed securely.
- b) Do not use the crane when safety device are dismantled or installed securely.
- c) Make sure that the emergency stop button is effective (refer to 4.1.5 in Chapter 4).
- d) Provide safety devices such as footboard, handrail, supporting board and fixation protection for workers who need to climb up the crane.

1.3 Environmental safety

- a) The engine should be maintained at regular intervals strictly in line with the maintenance procedure to ensure that engine emission is at the minimum level.
- b) Diesel spillages must be dealt with immediately to prevent fire accident and contamination.
- c) Only lubricating oil and hydraulic oil recommended in the maintenance manual can be used.
- d) Dispose of wastes strictly in line with local and national laws and regulations.
- e) Potentially hazardous wastes involved include hydraulic oil, fuel oil, lubricating grease, filter, storage battery, etc.
- f) Use leak-proof containers for liquid discharging. Do not use food or beverage containers in order to avoid drinking by mistake.
- g) Do not pour waste into the ground, a drain or any water source.
- h) Ensure that all consumables and replaced parts are disposed of safely with a minimum influence on environment.
- i) Disposal of crane: the crane must be disposed of by professional dismantling machine.

1.4 Personal protective equipment (PPE)

- a) Loose clothes or clothes with pockets might be entangled in a running machine.
- b) To get close to the engine or operate on the crane, you need to stop the engine or the crane. If they cannot be stopped, please take along tools and testing equipment that keep you away from moving components.
- c) For safety reasons, please tie back your long hair or put on safety clothing. Do not wear jewelry because they might get stuck in moving parts.
- d) Correctly wear personal protective equipment.
- e) Personal protective equipment recommended includes: safety helmet, goggles, hearing protection equipment, fitting overalls, protective boots, industrial gloves, jacket with high visibility

1.5 Measured grade of noise

The measured grade of noise might be influenced by the condition of construction site.

The environmental radiation noise LP(A)/ LW(A) is 78.5/110.5dB (A), and the noise heard by driver is 77.8dB (A).

1.6 Vibration level

It is able to reduce the vibration of the whole machine by correct installation of bracket in accordance with current industrial standards.

1.7 Safety measures

- a) Driver and operator must be certificated. Certification must be approved by the nation where the operation is carried out.
- b) Know well the procedure before operation and keep the ground clean and dry.
- c) Do not lubricate, clean or adjust the machine during operation.
- d) Do not touch the driving unit or any clamping point with hand, foot or clothes.
- e) Make sure that all components are assembly correctly and safely and damaged parts are replaced immediately. Replace worn and damaged parts and clear away grease, oil and fragments timely.
- f) Cut off the power supply of storage battery and disconnect earth wire when the electrical system is being adjusted.
- g) Cut off the power supply of storage battery, disconnect earth wire and pull out all plugs of the controller before welding on the crane.
- h) Repair or maintain the machine with proper tools
- i) Do not make any modifications, additions or conversions that might have an influence on the safety performance without permission of manufacturer.
- j) If there is any change in safety performance of the machine, please stop and lock it immediately and report to relevant department or person.

1.8 Requirements on personnel

- a) Relevant operations of the crane must be carried out by authorized professionals who are trained and reliable.
- b) Maintenance must be carried out by engineers who are qualified and know well the machine.
- c) Hydraulic system must be operated by persons who are familiar with hydraulic system and have relevant experience.
- d) Electrical system must be operated by persons who are familiar with electrical system and have relevant experience.

1.9 Safety suggestions

1.9.1 For standard operations

- a) Take necessary preventive measures to make sure that the machine can be used safely and reliably.

- b) The crane is a regular machine for loading and lifting. Do not use it for other purposes.
- c) Operate the machine when protection device, safety device, emergency stop device and alarming device are all installed in place and fully functional.
- d) Erect barrier guards properly to avoid access of unauthorized vehicles and persons to the operating area.
- e) Make sure the safety before starting the machine.
- f) No standing under the boom and in slewing area.

1.9.2 For malfunctions

Please stop the crane immediately in the event of any malfunction or operational difficulty.

1.9.3 For unmonitored area

- a) Nip points of running machine might lead to serious injuries and deaths.
- b) Do not get close to unprotected equipment because your arms, hair and sleeves might get entangled.
- c) Please shut down the machine before dismantling safety devices or protection devices.
- d) Limit access of irrelevant persons to the machine by barrier guards to reduce potential risks brought by the machine, such as falling down of load.

1.10 Potential safety hazards

1.10.1 Power supply

1.10.1.1 External factors and dangers

Keep a safe distance from overhead electric wires during operation. A risk assessment must be carried out before operation if there are overhead electric wires nearby. If the crane touches a live line, you should:

- 1) Empty the site immediately.
- 2) Warn persons around to keep away from the crane.
- 3) Report to superiors and cut off the live line.

1.10.1.2 Electrical system

- 1) Check electrical equipment at regular intervals. Defects such as loose connections or scorched or otherwise damaged cables must be repaired immediately.
- 2) Use original fuses or fuses of the same standard with the specified current rating.
- 3) Switch off the crane if there is anomaly.
- 4) Make sure that the anode and the cathode are correctly connected.

1.10.1.3 Storage battery

- 1) Switch of battery must be off before maintenance.
- 2) Charge the battery in a well-ventilated area
- 3) Electrolyte of the battery has strong causticity that produces explosive gases. Avoid direct contact with skin, eyes or clothes.

- 4) Smoking and other behaviors that may produce combustion source are strictly prohibited during maintenance.
- 5) Equip with appropriate PPE.

1.10.2 Gas, dust, steam and smoke

- a) Always operate the engine outdoors or in a well-ventilated area
- b) Make sure that the crane is in a good ventilation condition when it is maintained in an enclosed area.
- c) Observe rules and regulations of different sites.
- d) Dust in equipment or produced during operation cannot be removed by blowing with compressed air.
- e) Poisonous dust or waste must be dampened and poured into sealed containers with marks by authorized persons for safe disposal.

1.10.3 Welding and naked fire

- a) There is a risk of explosion and fire for welding, flame cutting and grinding, which must be carried out with permission.
- b) It is prohibited to carry out welding work that affects the structural integrity of the crane.
- c) No naked fire around the crane.

1.10.4 Hydraulic devices

- a) Hydraulic devices must be operated by professionals or persons who are familiar with it.
- b) Check all lines, hoses and screwed connections regularly to avoid leakage and damage. Repair immediately so as to avoid injuries brought by spilled oil.
- c) Depressurize the hydraulic system before maintenance or adjustment.
- d) Hydraulic pipes must be installed and connected correctly. Length and quality of pipe joint must meet the technical requirements.
- e) Only components provided by the manufacturer can be used for replacement.
- f) Keep the cleanliness of hydraulic components.
- g) Spilled high-pressure oil will cause injuries to persons around. Please seek medical help immediately.

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Operator's Manual for Crawler Crane

Chapter 2 Description of Crane



Chapter 2 Description of Crane

2.1 Product model

2.1.1 Nameplate and its position

Information on the nameplate and its position are illustrated in the figure below:

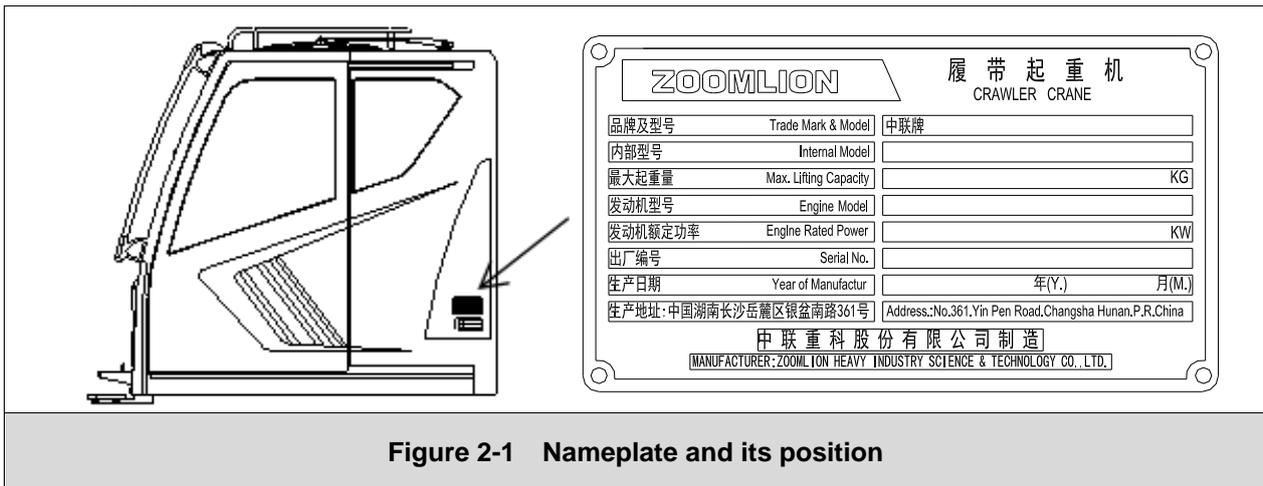


Figure 2-1 Nameplate and its position



Please provide information on the nameplate when you need service from us.

2.1.2 Intended use of the crane

The crawler crane is designed exclusively for load lifting.

It is prohibited to transport person with the crane. Transporting person with the crane (or even on the hook or the load) may lead to serious injuries. Persons being transported will not be protected from collision or falling down because they are unable to control the movement of the crane. Even a tiny error can lead to a vital injury. Please consult related organizations or safety supervision departments for regulation and permission in special cases.

It is strictly prohibited to use the crane for jumping with rubber rope (bungee jumping). There will be a risk of causing death or cripple if the crane is misused.

This crane is designed exclusively for general non-continuous load lifting. Manufacturer shall not be responsible for any damage caused by any kind of usage the goes beyond the specified limit, like load transportation or grabbing.

It can be only used for load lifting with two hoisting winches (twin-hook operation) with the permission of the crane manufacturer.

Intended use also includes the observation of *Lifting Capacity Chart*, *Operator's Manual* and *Maintenance Manual*.

2.1.3 Design calculation of the crane

2.1.3.1 General

As a high-risk special equipment, the crane might endanger operator's life or the life of a third party person or cause damage to the machine. Use the crane safely and strictly in accordance with the *Operator's Manual* and the *Maintenance Manual*. It must only be used for its intended use. Pay attention at all times to safety and potential hazards.



All malfunctions impairing safety must be repaired immediately.

2.1.3.2 Crane classification

The crane is classified as follows according to ISO 4301-2, GB/T 3811 and GB/T 14560:

- a) Operating class: U1
- b) Load collective class: Q2
- c) Crane group : A1

Design and manufacturer of all important components of the crane are based on the fact that the crane is used for correct installation and operation. Its usage and working conditions must be permitted by the manufacturer when it is not used for normal installation and operation.

2.1.3.3 Service life of the crane

The crane has a service life of 20 years under the following conditions:

a) The crane is used for assembly (general load lifting) but not continuous operations. Lifting capacity charts specified for the crane are for assembly operation only. Load transporting or grabbing can only be carried out with the permission of manufacturer under suitable conditions.

b) The entire number of the crane's load cycles is less than 32000.

A "load cycle" is a process which begins when a load is lifted and ends when the crane is ready to lift the next load. It is a complete process including operation and normal idle time of the crane.

c) The load spectrum coefficient of the crane should comply with the load collective class (lift the rated load rarely but medium load frequently).

For 1/6 of the load cycle, the crane is loaded with the maximum load.

For 1/6 of the load cycle, the crane is load with 73% of the maximum load.

For 1/6 of the load cycle, the crane is load with 47% of the maximum load.

For 3/6 of the load cycle, the crane is load with 20% of the maximum load.

The theoretical service life can be extended to 20 years if the crane is correctly maintained. Continuous operation, frequent full load, and bad working conditions will undoubtedly reduce the service life.



Some components (like wire rope, pulley, and bearing) are not designed for the entire service life of the crane, which must be replaced after being used for a certain period of

time. Please refer to *Maintenance Manual* for related information.

2.2 Terminology

2.2.1 Boom combinations

The crane has six operating modes. Please refer to the Figure 2-2 and the Table 2-1.

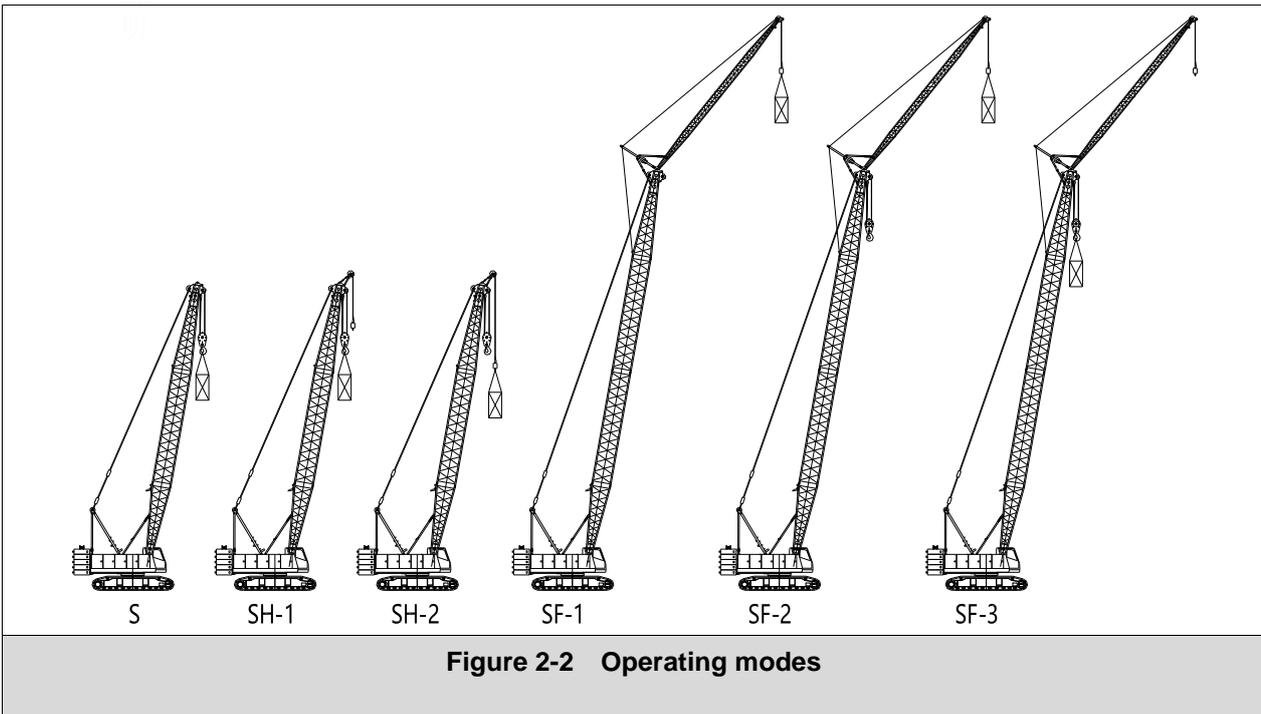


Figure 2-2 Operating modes

Table 2-1 Boom combinations

Code	Operating modes	Parameters	Notes
S	Main boom	Main boom length: 19m~76m	Lifting on main boom
SH-1	Main boom with tip boom	Main boom length: 19m~76m	Lifting on main boom No lifting on tip boom
SH-2	Main boom with tip boom	Main boom length: 19m~76m	No lifting on main boom Lifting on tip boom
SF-1	Main boom + fixed jib	Main boom length: 28m~64m Fixed jib length: 13m~31m	No lifting on main boom (without a hook) Lifting on jib
SF-2	Main boom + fixed jib	Main boom length: 28m~64m Fixed jib length: 13m~31m	No lifting on main boom (with a hook) Lifting on jib
SF-3	Main boom + fixed jib	Main boom length: 28m~64m Fixed jib length: 13m~31m	Lifting on main boom No lifting on jib (with a hook)

2.2.2 Major components

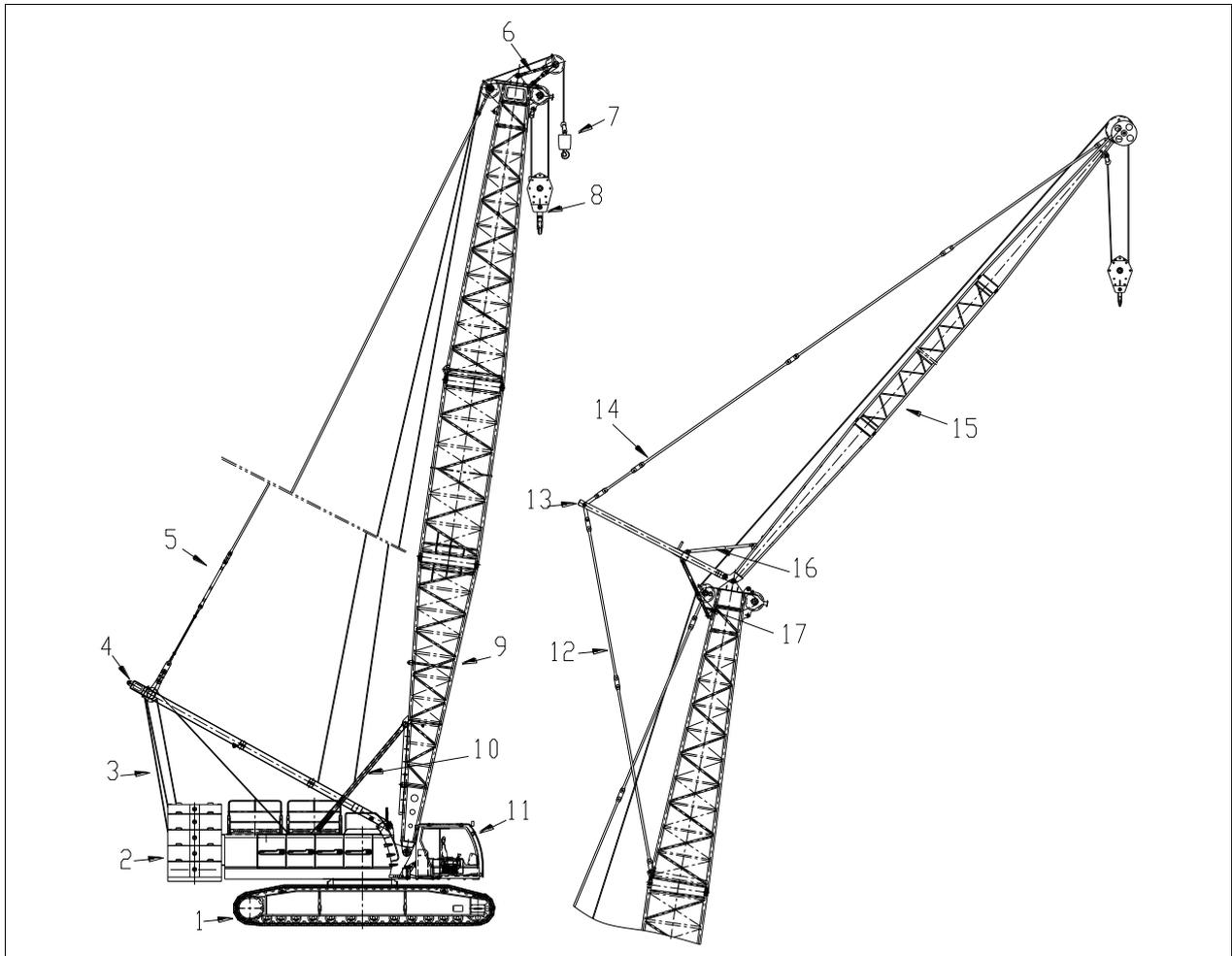


Figure 2-3 Major components

Table 2-2 Description on major components

No.	Components	No.	Components
1	Chassis	10	Main boom tilting-back support
2	Rear counterweight	11	Operator's cab
3	Derricking pulley block assy.	12	Rear anchoring rod of fixed jib
4	A-frame	13	FA-frame
5	Main boom anchoring rod	14	Front anchoring rod of fixed jib
6	Tip boom	15	Fixed jib
7	Auxiliary hook	16	Front tilting-back support of fixed jib
8	Primary hook	17	Rear tilting-back support of fixed jib
9	Main boom		

2.2.3 Layout of components of the slewing table

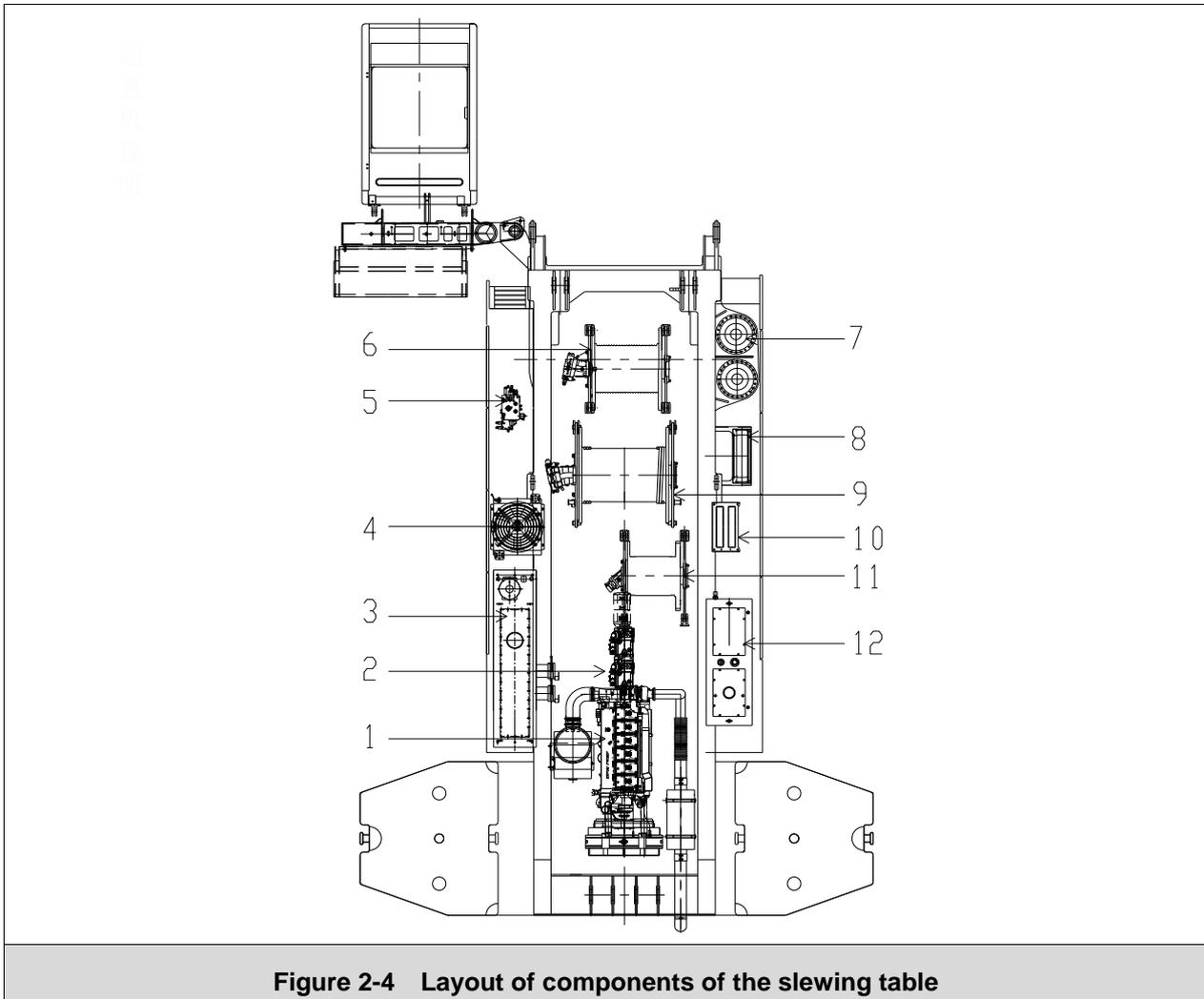


Figure 2-4 Layout of components of the slewing table

Table 2-3 Description on major components

No.	Components	No.	Components
1	Engine	7	Slewing mechanism
2	Main pump	8	Electric control box
3	Hydraulic oil tank	9	Primary hoisting mechanism
4	Hydraulic oil cooler	10	Battery
5	Main valve	11	Derricking mechanism
6	Secondary hoisting winch	12	Diesel oil tank

2.3 Description of product

2.3.1 Power unit

Engine:

Model: Weichai WP10G336E344

Type: in-line 6-cylinder, intercooled supercharged diesel engine

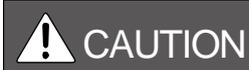
Displacement: 9.726L

Rated power: 247kW/1900r/min

Maximum torque: 1550N.m/(1100~1400)r/min

Emission standard: National stage-III (non-road)

Volume of fuel oil tank: 700L



1. There is no reduction of the rated power when the engine works below the elevation of 2500m. Yet it will be reduced when the engine works at an elevation of higher than 2500m. Please contact local service provider of the engine for details.

2. Actual conditions shall prevail if other optional engines are equipped.

2.3.2 Hydraulic system

Hydraulic pump: The main pump is a plunger pump and drives winches and the traveling mechanism. The triple gear pump is used for slewing, auxiliary movement and heat dissipation for hydraulic system.

Control: pilot proportional control hydraulic system with load feedback. Two cross-shaped hydraulic joysticks and a dual foot-operated traveling control valve are used for controlling different executive components.

Volume of hydraulic oil tank: 850L

2.3.3 Electrical system

DC of 24V, negative ground, two storage batteries of 200AH

Electrical system is composed of power supply, load moment system, video monitoring system, safety control system, illumination system, indicator light, alarm apparatus, fan, wiper, etc. Data communication between controller and controlling elements is realized through CAN bus. All these devices ensure a safe and good working environment for the crane.

The crane is equipped with a global position system (GPS/GPRS).

2.3.4 Hoisting mechanism

Table 2-4 Description on wire ropes of hoisting winches

	H1	H2
Rated single rope tension	13.5t (the 3 rd layer)	13.5t (the 3 rd layer)
Wire rope diameter	26mm	26mm
Wire rope length	355m	250m

Direction of twist	Left-hand lang-lay	Left-hand lang-lay
Single rope speed	140m/min (the 6 th layer)	110m/min (the 6 th layer)

Both the primary and the secondary hoisting winches are driven by an axial hydraulic variable-displacement piston motor through a built-in planetary reducer. Braking of the spring on winch motor is controlled by the balancing valve.

The drum with a double-rope groove guarantees that rope of multiple layers will not intertwine together.

Free-fall hook is optional for H2.

2.3.5 Derricking mechanism

The derricking winch is driven by an axial piston motor through a built-in planetary reducer and brakes through the spring on the motor end.

Cable drum lock: The winch is locked by ratchet wheel and ratchet pawl.

Table 2-5 Description on wire rope of the derricking mechanism

	Derricking mechanism
Rated single rope tension	99.5kN (the 2 nd layer)
Wire rope diameter	22mm
Wire rope length	255m
Direction of twist	Right-hand ordinary-lay
Single rope speed	66m/min (the 5 th layer)

2.3.7 Slewing mechanism

The slewing gear is driven by an axial constant-displacement piston hydraulic motor through a planetary gear reducer. Small gear of the output shaft rotates around the slewing bearing ring fixed on the chassis so that the slewing table makes slewing movement of 360°. It consists of a dual-hydraulic motor, a dual-slewing reducer, a control valve and a slewing ring. Lateral pulling force on boom can be effectively reduced through the function of free slewing.

✦ Slewing ring

Three-row-roller slewing ring; external gearing.

✦ Slewing braking

A spring braking controlled by balance valve is installed on the slewing motor.

✦ Slewing speed

The maximum slewing speed is 1.0 rpm.

2.3.8 Counterweight

Counterweight plates are piled up and locked by chains.

The rear counterweight is composed of a base and two types of counterweight plates. One is 7t (3 pieces) and weighs 21t in total; the other is 7t (3 pieces) and weighs 21t in total. The base weighs 9.3t. The total weight of the rear counterweight is 51.3t.

The central ballast is composed of two ballast plates, the total weight of which is 16t.

2.3.9 Operator's cab

The newly-designed operator's cab is 1.25m in width. The cab is an all-steel frame structure with tempered glass equipped all around and on the roof, providing a broad vision for the operator. The cab is equipped with a three-way adjustable seat, a cold/warm air conditioner, a color display of 10.4", a work light, rear-view mirrors, a radio, sun shields and wipers. An integrated panel for switches is equipped at the right side of the seat, which is convenient for operation.

The cab can be pitched up for 20°.

The cab can be horizontally swiveled inward for 90° manually.

✦ Armrest boxes

Both armrest boxes are equipped with various kinds of electrical switches and emergency-stop buttons and can be adjusted with the seat.

✦ Joysticks and control levers

Cross-shaped pilot hydraulic joysticks control primary and secondary winches, slewing, and boom derricking.

Control levers for traveling (equipped with foot pedals) control traveling and steering of the whole machine.

✦ Air conditioner

Air conditioner, optimized air flue and air vent are standard configurations.

2.3.10 Traveling mechanism

✦ Power for traveling

An independent hydraulic driving system is embedded in track carrier on each side, and each hydraulic driving system has a hydraulic motor that drives the driving wheel through the planetary reducer.

Movements like traveling straight, unilateral steering, differential steering and pivot steering are controlled by control levers or foot pedals.

✦ Track roller

Maintenance-free enclosed structure.

✦ Track pad

High-strength alloy-cast steel track pad; the width is 950mm.

✦ Traveling braking

Traveling braking is controlled by the balance valve through the spring braking on the traveling motor.

✦ Crawler tensioning

Crawlers are tensioner through the jack.

✦ Traveling speed

The maximum traveling speed is 1.1km/h.

✦ Gradeability: 30%

2.3.11 Safety devices

The crane is equipped with different types of safety and alarm devices, such as mechanical, electronic and hydraulic devices, that guarantee the safety of the machine.

✦ Load moment limiter

Main boom angle and load capacity will be automatically detected by load moment limiter, which gives a feedback according to the actual lifting condition that is to send out an alarm and limit the current movement when the normal working range of the crane is exceeded.

Information such as load moment percentage, main boom angle, main boom length, working radius, actual load capacity on the hook and permitted load capacity can be displayed on the screen as required.

✦ Limit on hoisting height

Limit switch and limiting weight fixed on boom end are used to prevent excessive hoisting of the hook. Limit switch sends out a signal when the hook is hoisted to a certain height to avoid excessive hoisting.

✦ Limit on main boom angle

When the main boom angle reaches the maximum, the limit switch of the pivot section will be activated, the upward derricking will be cut off, and a sound-light signal will be sent out from the buzzer and the indicator light.

✦ Protective device for over-unwinding of rope

The protective device will send out a signal and cut off the movement of lowering the hook when there are only three circles of rope left on the drum. A sound-light signal will also be sent out from the buzzer and the indicator light in the operator's cab.

✦ Tilting-back support for boom

A tilting-back support, composed of nested steel pipe and spring, is used to avoid backward tilting of the boom.

✦ Slewing locking device

The mechanical locking device is used to secure the superstructure and the undercarriage during transport.

✦ Mousing on hook

A mousing is used to close off a hook to prevent a load from slipping off.

✦ Anemometer

With the electronic anemometer, real-time wind speed can be presented on the display.

✦ Electronic gradiometer

The levelness of the whole crane is displayed on the screen.

✦ Aviation warning light

It is fixed on the top of the boom for warning in the upper air.

✦ Main boom angle indicator

Main boom angle indicator is fixed at the rear lower end of the pivot section. Operator is able to see the elevation angle of the boom clearly from the operator's cab.

✦ Rear-view mirror

One is located on the left front side of the cab and the other is on the handrail of the right hood.

✦ Automatic locking mechanism of the ratchet wheel on the derricking winch.

It is used to lock the derricking winch when the crane is stopped.

✦ Emergency stop button

Press this button to shut down the engine and cut off all movement in an emergency.

✦ Tri-color warning light

The warning light has three colors, red, yellow and green. The loading condition of the crane can be displayed simultaneously. Green indicates that the load rate is below 90%; yellow indicates that the load rate ranges between 90% and 100%; red means that the load rate is beyond 100% and the crane is overloaded.

⊛ Slewing alarm

It gives out a sound-light alarm during slewing.

⊛ Traveling alarm

It gives out a sound-light alarm during traveling.

⊛ Monitoring system (optional)

Camera and video displayer are optional, through which the real-time working condition of the hoisting winch and the blind area at the rear end of the crane can be monitored.



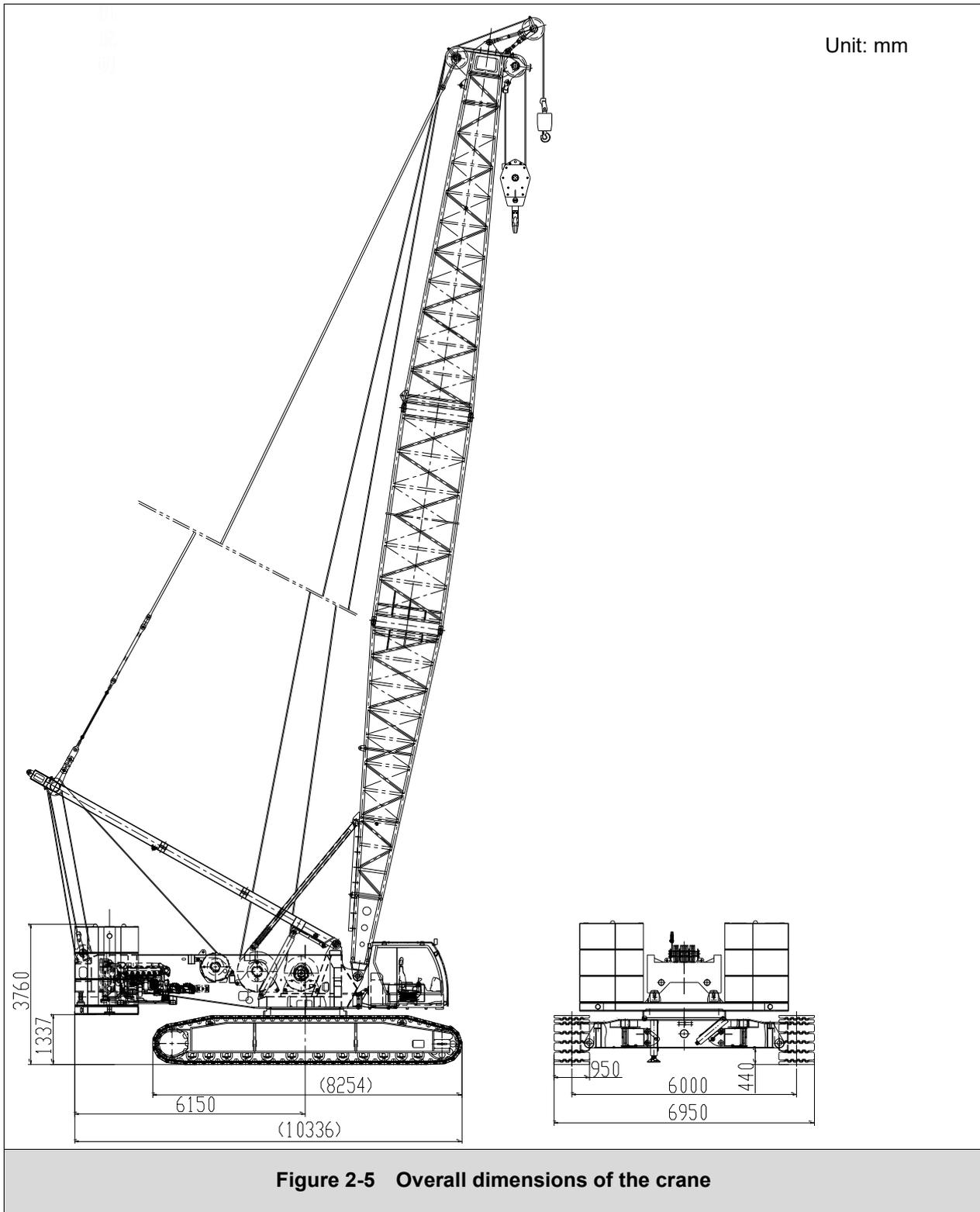
1. The working class of the crane is A1. Working classes of other mechanisms are respectively: hoisting mechanism M3, derricking mechanism M2, slewing mechanism M2 and traveling mechanism M1.

2. The crane is suitable for regular load lifting. It is prohibited to use the crane for dynamic compaction, dragline, electromagnetic grabbing, grabbing of secant pile wall, and weight piling. Otherwise the service life of the crane will be reduced.

2.4 Technical data

2.4.1 Overall dimensions

Overall dimensions of the crane are illustrated in Figure 2-5.



2.4.2 Main technical parameters

Main technical parameters of the crane are listed below. Items contained in the table are not standard configurations. A formally signed contract shall prevail.

Table 2-6 Main technical parameters

Items	Unit	Values	Notes
Max. lifting moment	t×m	906.5	
Max. lifting capacity	t	150	
Max. lifting capacity of fixed jib	t	20	
Main boom length	m	19~76	
Fixed jib length	m	13~31	
Max. length of main boom + fixed jib	m	64+31	
Main boom angle	°	30~80	
Fixed jib angle	°	10, 30	
Single rope speed of H1	m/min	140	The 6 th layer
Single rope speed of H2	m/min	110	The 6 th layer
Single rope speed of derricking winch	m/min	66	The 6 th layer
Slewing speed	rpm	0~1.0	
Traveling speed	km/h	0~1.1	
Gradeability	%	30	
Average ground pressure for S boom	MPa	0.1	
Dead weight of the crane	t	141	Basic boom with primary hook
Counterweight	t	51.3	
Overall dimensions L×W×H	mm	12460×3000×3270	With A-frame and main boom tilting-back support
Engine	Model		WP10G336E344
	Rated power/rotational speed	kW/rpm	247/1900
	Max. output torque /rotational speed	Nm/rpm	1550/(1100~1400)
	Emission standard	/	National Stage-III
Distance between two tracks × contact length of track × width of track pad	mm	6000×7205×950	
Noise in cab during operation	dB	194/2200	

 **CAUTION**

1. Single rope speed of winch, slewing speed and traveling speed vary with the weight of load.
2. The value of ground pressure is the mean value of the operating mode with the basic boom.

The actual maximum ground pressure is determined according to the actual operating mode.

2.4.3 Load hooks and reeving plans

Table 2-7 Load hooks and reeving plans

Specification of load hook	Number of pulley	Maximum reeving	Weight of load hook (kg)
160t	7	14	2377
100t	5	10	1935
80t	3	6	1713
50t	2	4	1355
30t	1	3	1085
12t	-	1	460

 **CAUTION**

Specifications of load hook in the above table are not standard specifications. A normally signed contract shall prevail.

2.5 Working radius and lifting capacity charts

2.5.1 Curves of hoisting height (S)

Unit: m

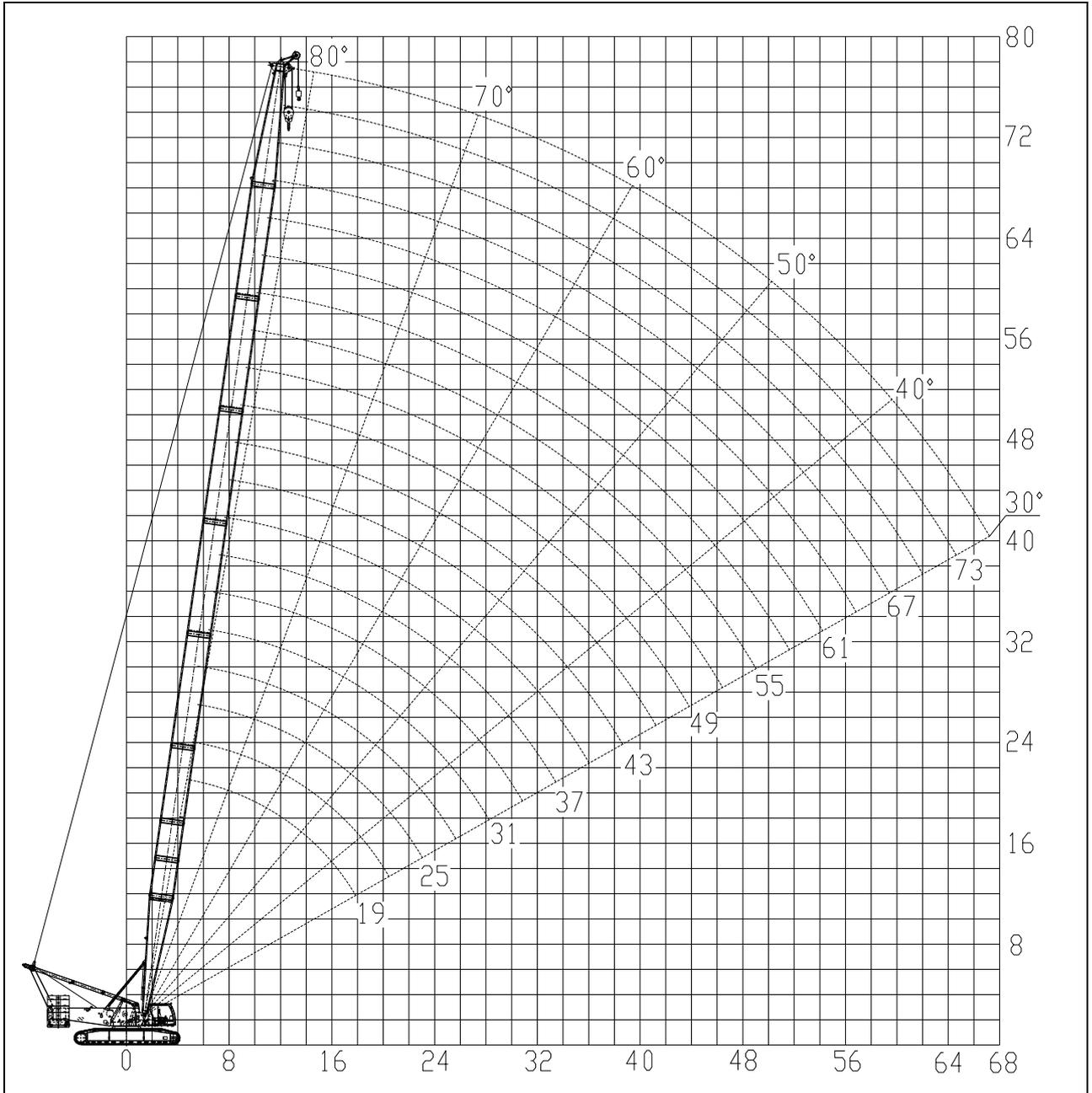


Figure 2-6 Curves of hoisting height (S)

! CAUTION

1. For the operating mode S, main boom length =19m~76m.
2. Boom deflection is not considered in the graph of lifting height of main boom.

2.5.2 Lifting capacity chart of of operating mode S



Main boom and tip boom cannot be used at the same time when the crane is equipped with a tip boom.

Table 2-8 Lifting capacity chart of main boom (S) (without tip boom)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Radius m	Main boom length: 19m~46m										Radius m	
	19	22	25	28	31	34	37	40	43	46		
5	150											5
6	145	145	135									6
7	129.5	126.5	118	114	110	104						7
8	104	103	101	97.6	94.7	91.8	89	86.3				8
9	86.1	86.1	86.2	84.9	82.8	80.6	78.4	76.3	74.3	70.5		9
10	73.3	73.3	73.4	73.3	72.7	71.7	70	68.3	66.6	65		10
12	56.3	56.3	56.3	56.3	56.3	56.2	56.1	55.3	54.7	53.8		12
14	45.5	45.5	45.5	45.4	45.4	45.3	45.3	45.1	45.1	44.6		14
16	37.9	38	38	37.9	37.9	37.8	37.7	37.6	37.6	37.4		16
18	32.4	32.5	32.5	32.4	32.4	32.3	32.2	32.1	32	31.9		18
20		28.2	28.2	28.2	28.2	28.1	28	27.9	27.8	27.7		20
22			24.9	24.8	24.9	24.8	24.7	24.5	24.5	24.3		22
24				22.1	22.2	22	22	21.8	21.8	21.6		24
26				19.9	19.9	19.8	19.7	19.6	19.5	19.4		26
28					18	17.9	17.8	17.7	17.7	17.5		28
30						16.3	16.2	16.1	16	15.9		30
32							14.8	14.7	14.7	14.5		32
34								13.5	13.4	13.3		34
36								12.4	12.4	12.2		36
38									11.4	11.3		38
40										10.4		40
Reeving	13	12	11	10	9	8	7	7	6	6		Reeving

Table 2-8 (continued) Lifting capacity chart of main boom (S) (without tip boom)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Radius m	Main boom length: 49m~76m										Radius m
	49	52	55	58	61	64	67	70	73	76	
9	67.2										9
10	63.5	58.2	55.4								10
12	52.7	51.5	50.4	48.1	46.9	43.9	39.7	36.5			12
14	44.1	43.5	43	42.2	40.5	39.2	37.2	35.1	33.6	30.4	14
16	37.3	37	36.5	36	35.6	35.1	33.9	32.6	31.9	29.3	16
18	31.8	31.6	31.6	31.2	30.8	30.4	30	29.4	28.7	27.4	18
20	27.5	27.4	27.3	27.2	27	26.7	26.3	25.9	25.4	24.8	20
22	24.2	24.1	24	23.8	23.7	23.5	23.3	23	22.6	22.1	22
24	21.5	21.3	21.3	21.1	21	20.8	20.7	20.5	20.2	19.8	24
26	19.3	19.1	19	18.9	18.7	18.6	18.5	18.3	18.2	17.9	26
28	17.4	17.2	17.1	17	16.8	16.7	16.6	16.4	16.3	16.1	28
30	15.8	15.6	15.5	15.4	15.2	15.1	15	14.8	14.7	14.5	30
32	14.4	14.2	14.1	14	13.8	13.7	13.6	13.4	13.3	13.1	32
34	13.2	13	12.9	12.8	12.6	12.5	12.4	12.2	12.1	11.9	34
36	12.1	12	11.9	11.7	11.6	11.4	11.3	11.1	11	10.8	36
38	11.2	11	10.9	10.8	10.6	10.5	10.4	10.2	10.1	9.9	38
40	10.3	10.2	10.1	9.9	9.8	9.6	9.5	9.3	9.2	9	40
42	9.6	9.4	9.3	9.2	9	8.9	8.8	8.6	8.4	8.3	42
44	8.9	8.7	8.6	8.5	8.3	8.2	8.1	7.9	7.8	7.6	44
46		8.1	8	7.9	7.7	7.6	7.5	7.3	7.1	7	46
48			7.4	7.3	7.2	7	6.9	6.7	6.6	6.4	48
50				6.8	6.6	6.5	6.4	6.2	6.1	5.9	50
52				6.3	6.2	6	5.9	5.7	5.6	5.4	52
54					5.7	5.5	5.5	5.3	5.1	5	54
56						5.1	5	4.9	4.7	4.6	56
58							4.7	4.5	4.4	4.2	58
60								4.1	4	3.8	60
62								3.8	3.7	3.5	62
64									3.4	3.2	64
66										2.9	66
Reeving	5	5	5	4	4	4	3	3	3	3	Reeving

Table 2-9 Lifting capacity chart of main boom (SH-1) (with tip boom)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Radius m	Main boom length: 19m~46m										Radius m
	19	22	25	28	31	34	37	40	43	46	
5	149.4										5
6	144.4	144.4	134.4								6
7	128.9	125.9	117.4	113.4	109.4	103.4					7
8	103.4	102.4	100.4	97	94.1	91.2	88.4	85.7			8
9	85.5	85.5	85.6	84.3	82.2	80	77.8	75.7	73.7	69.9	9
10	72.7	72.7	72.8	72.7	72.1	71.1	69.4	67.7	66	64.4	10
12	55.7	55.7	55.7	55.7	55.7	55.6	55.5	54.7	54.1	53.2	12
14	44.9	44.9	44.9	44.8	44.8	44.7	44.7	44.5	44.5	44	14
16	37.3	37.4	37.4	37.3	37.3	37.2	37.1	37	37	36.8	16
18	31.8	31.9	31.9	31.8	31.8	31.7	31.6	31.5	31.4	31.3	18
20		27.6	27.6	27.6	27.6	27.5	27.4	27.3	27.2	27.1	20
22			24.3	24.2	24.3	24.2	24.1	23.9	23.9	23.7	22
24				21.5	21.6	21.4	21.4	21.2	21.2	21	24
26				19.3	19.3	19.2	19.1	19	18.9	18.8	26
28					17.4	17.3	17.2	17.1	17.1	16.9	28
30						15.7	15.6	15.5	15.4	15.3	30
32							14.2	14.1	14.1	13.9	32
34								12.9	12.8	12.7	34
36								11.8	11.8	11.6	36
38									10.8	10.7	38
40										9.8	40
Reeving	13	12	11	10	9	8	7	7	6	6	Reeving

Table 2-9 (continued) Lifting capacity chart of main boom (SH-1) (with tip boom)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Radius m	Main boom length: 49m~76m										Radius m
	49	52	55	58	61	64	67	70	73	76	
9	66.6										9
10	62.9	57.6	54.8								10
12	52.1	50.9	49.8	47.5	46.3	43.3	39.1	35.9			12
14	43.5	42.9	42.4	41.6	39.9	38.6	36.6	34.5	33	29.8	14
16	36.7	36.4	35.9	35.4	35	34.5	33.3	32	31.3	28.7	16
18	31.2	31	31	30.6	30.2	29.8	29.4	28.8	28.1	26.8	18
20	26.9	26.8	26.7	26.6	26.4	26.1	25.7	25.3	24.8	24.2	20
22	23.6	23.5	23.4	23.2	23.1	22.9	22.7	22.4	22	21.5	22
24	20.9	20.7	20.7	20.5	20.4	20.2	20.1	19.9	19.6	19.2	24
26	18.7	18.5	18.4	18.3	18.1	18	17.9	17.7	17.6	17.3	26
28	16.8	16.6	16.5	16.4	16.2	16.1	16	15.8	15.7	15.5	28
30	15.2	15	14.9	14.8	14.6	14.5	14.4	14.2	14.1	13.9	30
32	13.8	13.6	13.5	13.4	13.2	13.1	13	12.8	12.7	12.5	32
34	12.6	12.4	12.3	12.2	12	11.9	11.8	11.6	11.5	11.3	34
36	11.5	11.4	11.3	11.1	11	10.8	10.7	10.5	10.4	10.2	36
38	10.6	10.4	10.3	10.2	10	9.9	9.8	9.6	9.5	9.3	38
40	9.7	9.6	9.5	9.3	9.2	9	8.9	8.7	8.6	8.4	40
42	9	8.8	8.7	8.6	8.4	8.3	8.2	8	7.8	7.7	42
44	8.3	8.1	8	7.9	7.7	7.6	7.5	7.3	7.2	7	44
46		7.5	7.4	7.3	7.1	7	6.9	6.7	6.5	6.4	46
48			6.8	6.7	6.6	6.4	6.3	6.1	6	5.8	48
50				6.2	6	5.9	5.8	5.6	5.5	5.3	50
52				5.7	5.6	5.4	5.3	5.1	5	4.8	52
54					5.1	4.9	4.9	4.7	4.5	4.4	54
56						4.5	4.4	4.3	4.1	4	56
58							4.1	3.9	3.8	3.6	58
60								3.5	3.4	3.2	60
62								3.2	3.1	2.9	62
64									2.8	2.6	64
66										2.3	66
Reeving	5	5	5	4	4	4	3	3	3	3	Reeving

Table 2-10 Lifting capacity chart of tip boom (SH-2)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Radius m	Main boom length: 19m~46m										Radius m
	19	22	25	28	31	34	37	40	43	46	
5	9										5
6	9	9	9								6
7	9	9	9	9	9	9					7
8	9	9	9	9	9	9	9	9			8
9	9	9	9	9	9	9	9	9	9	9	9
10	9	9	9	9	9	9	9	9	9	9	10
12	9	9	9	9	9	9	9	9	9	9	12
14	9	9	9	9	9	9	9	9	9	9	14
16	9	9	9	9	9	9	9	9	9	9	16
18	9	9	9	9	9	9	9	9	9	9	18
20		9	9	9	9	9	9	9	9	9	20
22			9	9	9	9	9	9	9	9	22
24				9	9	9	9	9	9	9	24
26				9	9	9	9	9	9	9	26
28					9	9	9	9	9	9	28
30						9	9	9	9	9	30
32							9	9	9	9	32
34								9	9	9	34
36									9	9	36
38										9	38
40											40
Reeving	1	1	1	1	1	1	1	1	1	1	Reeving

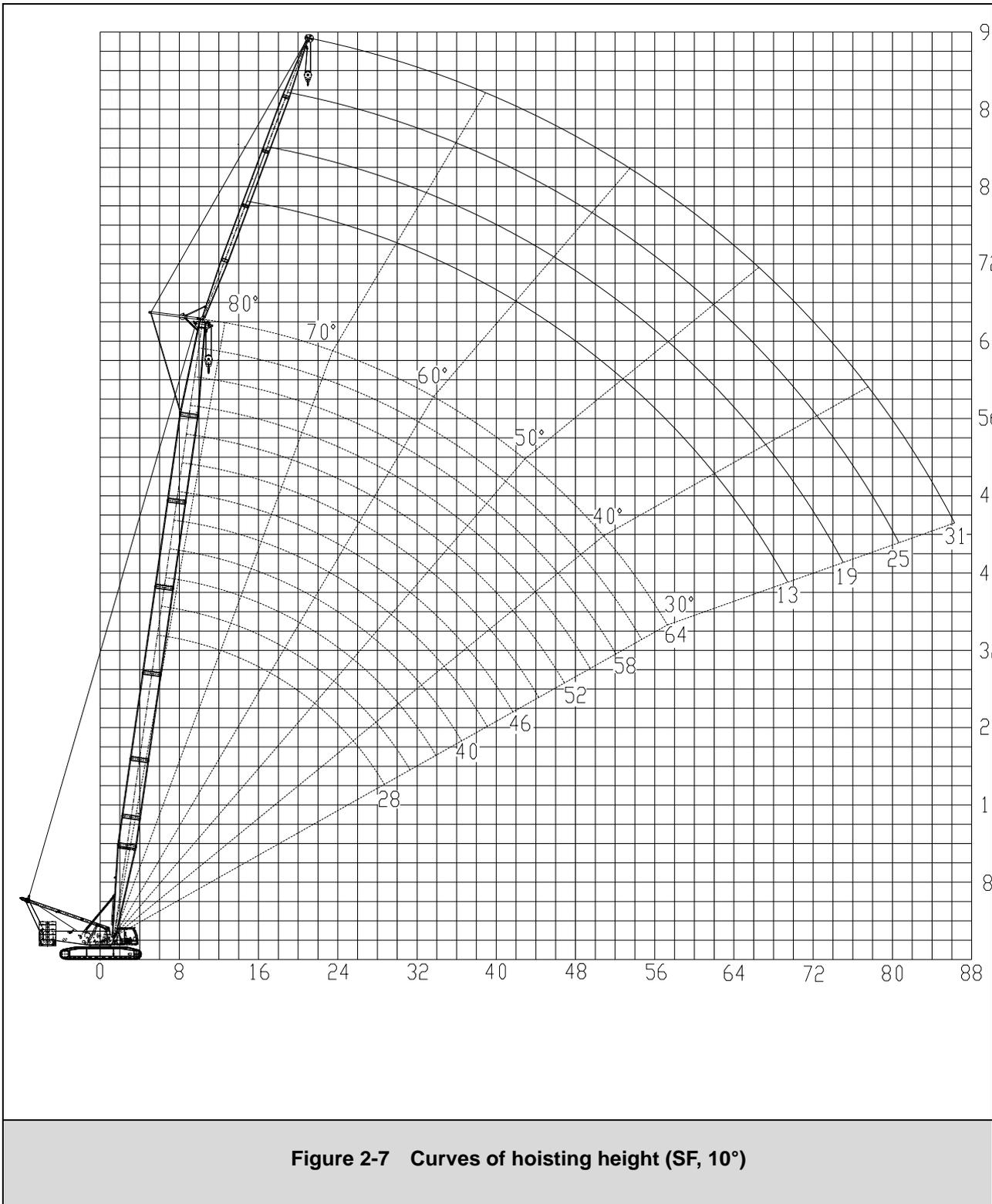
Table 2-10 (continued) Lifting capacity chart of tip boom (SH-2)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

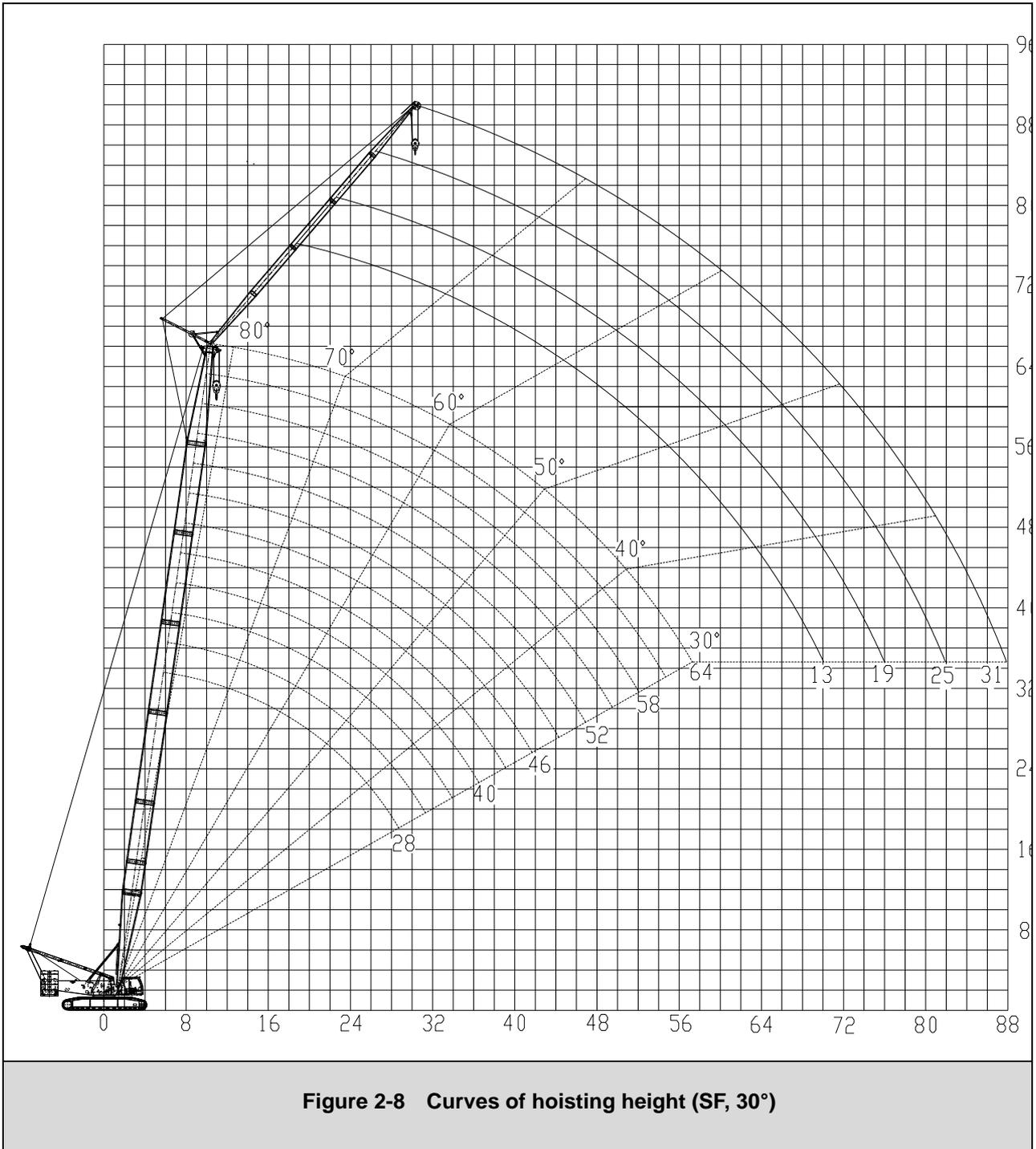
Radius m	Main boom length: 49m~76m										Radius m	
	49	52	55	58	61	64	67	70	73	76		
9	9											9
10	9	9	9									10
12	9	9	9	9	9	9	9	9				12
14	9	9	9	9	9	9	9	9	9	9	9	14
16	9	9	9	9	9	9	9	9	9	9	9	16
18	9	9	9	9	9	9	9	9	9	9	9	18
20	9	9	9	9	9	9	9	9	9	9	9	20
22	9	9	9	9	9	9	9	9	9	9	9	22
24	9	9	9	9	9	9	9	9	9	9	9	24
26	9	9	9	9	9	9	9	9	9	9	9	26
28	9	9	9	9	9	9	9	9	9	9	9	28
30	9	9	9	9	9	9	9	9	9	9	9	30
32	9	9	9	9	9	9	9	9	9	9	9	32
34	9	9	9	9	9	9	9	9	9	9	9	34
36	9	9	9	9	9	9	9	9	9	9	9	36
38	9	9	9	9	9	9	9	9	9	9	9	38
40	9	9	9	9	9	9	9	9	9	9	9	40
42	9	9	9	9	9	8.9	8.8	8.6	8.4	8.3		42
44	8.9	8.7	8.6	8.5	8.3	8.2	8.1	7.9	7.8	7.6		44
46		8.1	8	7.9	7.7	7.6	7.5	7.3	7.1	7		46
48			7.4	7.3	7.2	7	6.9	6.7	6.6	6.4		48
50				6.8	6.6	6.5	6.4	6.2	6.1	5.9		50
52				6.3	6.2	6	5.9	5.7	5.6	5.4		52
54					5.7	5.5	5.5	5.3	5.1	5		54
56						5.1	5	4.9	4.7	4.6		56
58							4.7	4.5	4.4	4.2		58
60								4.1	4	3.8		60
62								3.8	3.7	3.5		62
64									3.4	3.2		64
66										2.9		66
Reeving	1	1	1	1	1	1	1	1	1	1		Reeving

2.5.3 Curves of hoisting height (SF)

Unit: m



Unit: m



⚠ CAUTION

1. For the operating mode SF, main boom length =28m~64m, fixed jib length =13m~31m.
2. Boom deflection is not considered in the graph of lifting height of main boom.

2.5.4 Lifting capacity chart of of operating mode SF

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 1/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius	Fixed jib length: 13m; Included angle between main boom and fixed jib: 10°													Radius
m														m
10	18	18												10
12	18	18	18	18	18	18	18							12
14	18	18	18	18	18	18	18	18	18	18	18			14
16	18	18	18	18	18	18	18	18	18	18	18	18	18	16
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
20	18	18	18	18	18	18	18	18	18	18	18	18	18	20
22	18	18	18	18	18	18	18	18	18	18	18	18	18	22
24	18	18	18	18	18	18	18	18	18	18	18	18	18	24
26	18	18	18	18	18	18	18	18	18	18	18	18	18	26
28	18	18	18	17.9	17.8	17.7	17.5	17.4	17.2	17.1	16.9	16.8	16.7	28
30	16.7	16.6	16.4	16.3	16.1	16	15.9	15.8	15.6	15.5	15.3	15.2	15	30
32	15.3	15.2	15	14.9	14.7	14.6	14.5	14.3	14.2	14.1	13.9	13.8	13.6	32
34	14	14	13.8	13.7	13.5	13.4	13.3	13.1	13	12.8	12.7	12.5	12.4	34
36	13	12.9	12.7	12.6	12.4	12.3	12.2	12	11.9	11.8	11.6	11.5	11.3	36
38	12	11.9	11.8	11.7	11.5	11.4	11.2	11.1	10.9	10.8	10.6	10.5	10.3	38
40		11.1	10.9	10.8	10.6	10.5	10.4	10.2	10.1	9.9	9.8	9.6	9.5	40
42			10.1	10	9.9	9.8	9.6	9.5	9.3	9.2	9	8.9	8.7	42
44				9.3	9.2	9.1	8.9	8.8	8.6	8.5	8.3	8.2	8	44
46				8.7	8.5	8.4	8.3	8.1	8	7.8	7.7	7.5	7.4	46
48					7.9	7.8	7.7	7.6	7.4	7.3	7.1	7	6.8	48
50						7.3	7.2	7	6.9	6.7	6.6	6.4	6.3	50
52							6.7	6.5	6.4	6.3	6.1	6	5.8	52
54								6.1	5.9	5.8	5.6	5.5	5.3	54
56								5.7	5.5	5.4	5.2	5.1	4.9	56
58									5.1	5	4.8	4.7	4.5	58
60										4.6	4.5	4.3	4.2	60
62											4.1	4	3.8	62
64											3.8	3.7	3.5	64
66												3.4	3.2	66
68													2.9	68
Reeving	2	2	2	2	2	2	2	2	2	2	2	2	2	Reeving

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 2/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 19m; Included angle between main boom and fixed jib: 10°													Radius m
12	16	16.8												12
14	15.6	15.7	16.1	17.2	17.2	16.1	16.2							14
16	15.6	15.7	15.3	16.9	17.1	16.1	16	17.3	17.3	17.1	15.7	16.2		16
18	14.9	15.6	15.3	16.1	16.8	15.7	15.5	16.4	16.1	17.1	15.7	16.2	15.9	18
20	14.5	14.7	15.3	15	15.9	15.1	14.8	15.2	16.1	16.6	15.7	15.3	15.5	20
22	14.5	14.7	15.3	15	14.7	15.1	14.8	15.2	14.9	14.7	15.7	15.3	14.8	22
24	14	14.2	14.2	14.9	14.7	14.6	14.3	14.3	14.9	14.7	15.7	15.3	14.8	24
26	13.8	14.2	14	13.9	14.5	14.5	14.3	14.3	14.6	14.7	15.1	15.3	14.8	26
28	13.8	13.3	14	13.9	13.5	13.9	14	13.9	13.9	14.3	15.1	15.3	14.8	28
30	13.7	13.3	14	13.9	13.5	13.9	14	13.9	13.9	14.3	15.1	14.8	14.8	30
32	13.3	13.3	13.9	13	13.5	13.9	13.4	13.5	13.9	14.3	14.1	13.8	13.9	32
34	12.6	12.9	12.8	13	12.9	13.6	13.2	13.3	13.2	13.1	12.9	12.8	12.6	34
36	12	12.9	12.8	12.7	12.7	12.5	12.4	12.2	12.1	12	11.8	11.7	11.5	36
38	12	12.1	12	11.9	11.7	11.6	11.4	11.3	11.1	11	10.9	10.7	10.6	38
40	11.4	11.3	11.1	11	10.8	10.7	10.6	10.4	10.3	10.1	10	9.8	9.7	40
42	10.6	10.5	10.4	10.2	10.1	10	9.8	9.7	9.5	9.4	9.2	9.1	8.9	42
44	9.9	9.8	9.7	9.5	9.4	9.3	9.1	9	8.8	8.7	8.5	8.4	8.2	44
46		9.2	9	8.9	8.7	8.6	8.5	8.3	8.2	8	7.9	7.7	7.6	46
48			8.4	8.3	8.2	8	7.9	7.7	7.6	7.5	7.3	7.2	7	48
50				7.8	7.6	7.5	7.4	7.2	7.1	6.9	6.8	6.6	6.5	50
52					7.1	7	6.9	6.7	6.6	6.4	6.3	6.1	6	52
54					6.7	6.6	6.4	6.3	6.1	6	5.8	5.7	5.5	54
56						6.1	6	5.8	5.7	5.6	5.4	5.3	5.1	56
58							5.6	5.5	5.3	5.2	5	4.9	4.7	58
60								5.1	4.9	4.8	4.7	4.5	4.3	60
62									4.7	4.6	4.5	4.3	4.2	62
64										4.3	4.1	4	3.8	64
66											3.8	3.7	3.5	66
68												3.4	3.3	68
70													3	70
72													2.7	72
74														74
Reeving	2	2	2	2	2	2	2	2	2	2	2	2	2	Reeving

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 3/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 25m; Included angle between main boom and fixed jib: 10°													Radius m
14	9	9	9											14
16	9	9	9	9	9	9	9							16
18	9	9	9	9	9	9	9	9	9	9	9	9		18
20	9	9	9	9	9	9	9	9	9	9	9	9	9	20
22	9	9	9	9	9	9	9	9	9	9	9	9	9	22
24	9	9	9	9	9	9	9	9	9	9	9	9	9	24
26	8.8	8.9	9	9	9	9	9	9	9	9	9	9	9	26
28	8.8	8.9	8.5	9	9	9	9	9	9	9	9	9	9	28
30	8.6	8.5	8.4	8.6	8.9	8.9	9	9	9	9	9	9	9	30
32	7.9	8.4	8.4	8.5	8.5	8.9	8.7	9	9	9	9	9	9	32
34	7.9	7.8	8	8.5	8.2	8.9	8.5	9	8.6	9	9	9	8.9	34
36	7.8	7.8	8	8	8.2	8.5	8.2	8.6	8.6	8.5	9	9	8.9	36
38	7.6	7.7	7.8	8	8.2	8.5	8.2	8.6	8.6	8.5	9	8.7	8.8	38
40	7.4	7.4	7.7	8	7.8	8.3	8.2	8.6	8.1	8.2	8.4	8.7	8.5	40
42	7.2	7.4	7.6	7.8	7.6	7.8	7.9	8.4	8.1	8.2	8.4	8.7	8.5	42
44	7	7.1	7.4	7.3	7.6	7.8	7.9	7.7	7.9	8.2	8.4	8.4	8.4	44
46	6.8	7	7.2	7.3	7.5	7.5	7.5	7.7	7.8	8.2	8.1	7.9	7.8	46
48	6.7	6.9	7.1	7.2	7.3	7.5	7.5	7.7	7.7	7.6	7.5	7.3	7.2	48
50		6.8	6.9	7.1	7.2	7.3	7.5	7.4	7.2	7.1	6.9	6.8	6.6	50
52		6.7	6.8	6.9	7.1	7.2	7	6.9	6.7	6.6	6.4	6.3	6.1	52
54			6.7	6.8	6.8	6.7	6.6	6.4	6.3	6.1	6	5.8	5.7	54
56				6.6	6.4	6.3	6.1	6	5.9	5.7	5.6	5.4	5.3	56
58					6	5.9	5.8	5.6	5.5	5.3	5.2	5	4.9	58
60					5.6	5.5	5.4	5.3	5.1	5	4.8	4.7	4.5	60
62						5.2	5	4.9	4.8	4.6	4.5	4.3	4.2	62
64							4.7	4.6	4.4	4.3	4.1	4	3.8	64
66								4.3	4.1	4	3.8	3.7	3.5	66
68									3.8	3.7	3.6	3.4	3.3	68
70									3.6	3.5	3.3	3.2	3	70
72										3.2	3	2.9	2.7	72
74											2.8	2.7	2.5	74
76												2.4	2.3	76
78													2.2	78
80														80
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 4/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 31m; Included angle between main boom and fixed jib: 10°													Radius m
16	7.1	7.4	7.5											16
18	6.9	7.2	7.2	7.6	7.1	7.6	7.3	7.5						18
20	6.9	6.9	6.9	7.2	7.1	6.9	7	7.5	7.3	7.5	7.6	7.5		20
22	6.6	6.9	6.9	6.7	7.1	6.7	7	6.9	7	6.9	7.3	7.5	7.7	22
24	6.5	6.5	6.5	6.7	7	6.7	6.8	6.9	6.7	6.9	7	6.8	7.3	24
26	6.3	6.4	6.4	6.5	6.8	6.7	6.8	6.8	6.7	6.9	6.6	6.8	6.8	26
28	5.9	6.1	6.2	6.3	6.5	6.3	6.3	6.6	6.5	6.8	6.6	6.7	6.8	28
30	5.8	5.9	6.1	6	6.1	6.3	6.2	6.3	6.5	6.7	6.4	6.6	6.5	30
32	5.6	5.7	5.8	6	6.1	6.2	6.1	6.3	6.5	6.4	6.4	6.4	6.5	32
34	5.3	5.5	5.6	5.7	5.8	6	6.1	6.1	6.3	6.1	6.4	6.4	6.5	34
36	5.1	5.3	5.4	5.5	5.7	5.8	5.9	6	6.1	6.1	6.3	6.4	6.5	36
38	5	5.1	5.2	5.3	5.5	5.6	5.7	5.8	5.9	5.8	6.1	6	6.3	38
40	4.8	4.9	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6	6.1	40
42	4.7	4.8	4.9	5	5.1	5.3	5.4	5.4	5.6	5.7	5.8	5.9	6	42
44	4.5	4.6	4.8	4.9	5	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.7	44
46	4.4	4.5	4.6	4.7	4.9	5	5.1	5.2	5.3	5.4	5.5	5.6	5.7	46
48	4.3	4.4	4.5	4.6	4.7	4.9	4.9	5.1	5.1	5.2	5.3	5.4	5.5	48
50	4.1	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	5.3	5.4	50
52	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	5.3	52
54	4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	54
56		4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	56
58			4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.9	58
60			3.9	4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.7	4.6	60
62				3.9	4	4.1	4.2	4.3	4.4	4.5	4.6	4.4	4.3	62
64					4	4.1	4.1	4.2	4.3	4.4	4.3	4.1	4	64
66						4	4.1	4.1	4.2	4.1	4	3.8	3.7	66
68						3.9	4	4.1	4	3.8	3.7	3.5	3.4	68
70							3.9	3.8	3.7	3.6	3.4	3.3	3.1	70
72								3.6	3.4	3.3	3.2	3	2.8	72
74									3.2	3.1	2.9	2.8	2.6	74
76									3	2.8	2.7	2.5	2.4	76
78										2.6	2.5	2.3	2.2	78
80											2.3	2.1	2	80
82												1.9	1.8	82

84													1.6	84
86													1.4	86
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

起
重
机
说
明

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 5/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 13m; Included angle between main boom and fixed jib: 30°													Radius m
14	18	18												14
16	18	18	18	18	18	18	18							16
18	18	18	18	18	18	18	18	18	18	18	18			18
20	18	18	18	18	18	18	18	18	18	18	18	18	18	20
22	18	18	18	18	18	18	18	18	18	18	18	18	18	22
24	18	18	18	18	18	18	18	18	18	18	18	18	18	24
26	18	18	18	18	18	18	18	18	18	18	18	18	18	26
28	18	18	18	18	18	18	18	17.9	17.8	17.7	17.6	17.5	17.3	28
30	16.9	16.9	16.8	16.7	16.5	16.4	16.3	16.2	16.1	16	15.9	15.8	15.6	30
32	15.5	15.4	15.3	15.2	15.1	15	14.9	14.8	14.6	14.5	14.4	14.3	14.2	32
34	14.2	14.2	14.1	14	13.8	13.7	13.6	13.5	13.4	13.3	13.1	13	12.9	34
36	13.1	13	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.1	12	11.9	11.8	36
38	12.1	12	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.1	11	10.9	10.8	38
40		11.1	11	11	10.8	10.7	10.6	10.5	10.4	10.3	10.1	10	9.9	40
42			10.2	10.1	10	9.9	9.8	9.7	9.6	9.5	9.3	9.2	9.1	42
44			9.5	9.4	9.3	9.2	9.1	9	8.8	8.7	8.6	8.5	8.3	44
46				8.7	8.6	8.6	8.4	8.3	8.2	8.1	7.9	7.8	7.7	46
48					8	7.9	7.8	7.7	7.6	7.5	7.3	7.2	7.1	48
50						7.4	7.3	7.2	7	6.9	6.8	6.7	6.5	50
52						6.9	6.7	6.6	6.5	6.4	6.3	6.2	6	52
54							6.3	6.2	6	5.9	5.8	5.7	5.5	54
56								5.7	5.6	5.5	5.4	5.2	5.1	56
58									5.2	5.1	5	4.8	4.7	58
60										4.7	4.6	4.4	4.3	60
62										4.3	4.2	4.1	3.9	62
64											3.9	3.8	3.6	64
66												3.4	3.3	66
68													3	68
70													2.7	70
Reeving	2	2	2	2	2	2	2	2	2	2	2	2	2	Reeving

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 6/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 19m; Included angle between main boom and fixed jib: 30°													Radius m
18	9	9	9											18
20	9	9	9	9	9	9	9							20
22	9	9	9	9	9	9	9	9	9	9	9	9		22
24	9	9	9	9	9	9	9	9	9	9	9	9	9	24
26	9	9	9	9	9	9	9	9	9	9	9	9	9	26
28	9	9	9	9	9	9	9	9	9	9	9	9	9	28
30	9	9	9	9	9	9	9	9	9	9	9	9	9	30
32	9	9	9	9	9	9	9	9	9	9	9	9	9	32
34	9	9	9	9	9	9	9	9	9	9	9	9	9	34
36	9	9	9	9	9	9	9	9	9	9	9	9	9	36
38	9	9	9	9	9	9	9	9	9	9	9	9	9	38
40	9	9	9	9	9	9	9	9	9	9	9	9	9	40
42	9	9	9	9	9	9	9	9	9	9	9	9	9	42
44	9	9	9	9	9	9	9	9	9	9	9	8.9	8.7	44
46		9	9	9	9	8.9	8.8	8.7	8.5	8.4	8.3	8.2	8	46
48			8.6	8.5	8.4	8.3	8.2	8	7.9	7.8	7.7	7.6	7.4	48
50			8	7.9	7.8	7.7	7.6	7.5	7.4	7.2	7.1	7	6.9	50
52				7.4	7.3	7.2	7.1	7	6.8	6.7	6.6	6.5	6.3	52
54					6.8	6.7	6.6	6.5	6.3	6.2	6.1	6	5.9	54
56						6.2	6.1	6	5.9	5.8	5.7	5.5	5.4	56
58						5.8	5.7	5.6	5.5	5.4	5.2	5.1	5	58
60							5.3	5.2	5.1	5	4.9	4.7	4.6	60
62								4.8	4.7	4.6	4.5	4.4	4.2	62
64									4.4	4.3	4.1	4	3.9	64
66										3.9	3.8	3.7	3.6	66
68										3.6	3.5	3.4	3.3	68
70											3.2	3.1	3	70
72												2.8	2.7	72
74													2.4	74
76													2.2	76
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 7/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 25m; Included angle between main boom and fixed jib: 30°													Radius m
22	8.3	8.1	8.1											22
24	7.9	8	8.1	8.1	8.2	8.5	8	8.6						24
26	7.8	7.7	8.1	8.1	8.2	8.1	8	7.8	8	7.9	8.5	8.6	8.6	26
28	7.7	7.7	7.9	8	7.7	8.1	8	7.8	7.8	7.9	8.4	8.3	7.9	28
30	7.5	7.4	7.7	7.8	7.6	7.9	8	7.8	7.8	7.9	8.2	7.8	7.9	30
32	7.4	7.3	7.5	7.6	7.6	7.7	7.7	7.8	7.6	7.6	8	7.8	7.8	32
34	7.2	7.3	7.4	7.4	7.5	7.6	7.7	7.8	7.6	7.5	7.6	7.8	7.6	34
36	7	7.1	7.2	7.3	7.4	7.5	7.5	7.3	7.5	7.5	7.6	7.4	7.6	36
38	6.9	6.9	7	7.2	7.2	7.3	7.4	7.3	7.2	7.5	7.2	7.3	7.6	38
40	6.8	6.9	7	7	7.1	7.2	7.3	7.2	7.2	7.5	7.2	7.3	7.6	40
42	6.7	6.8	6.8	6.9	6.9	7.1	7.2	7.2	7.2	7.4	7.2	7.3	7.2	42
44	6.6	6.7	6.8	6.8	6.9	7	7	7.1	7.1	7.2	7.2	7.3	7.2	44
46	6.6	6.6	6.7	6.7	6.8	6.9	7	6.8	7.1	7.1	7.2	7.3	7.2	46
48	6.6	6.6	6.6	6.7	6.7	6.7	6.9	6.8	7	7.1	7.1	7.2	7.2	48
50	6.6	6.6	6.6	6.6	6.7	6.7	6.8	6.8	6.9	6.9	6.9	6.8	7.1	50
52		6.6	6.6	6.6	6.6	6.7	6.7	6.8	6.8	6.8	6.9	6.8	6.7	52
54			6.6	6.6	6.6	6.6	6.7	6.6	6.6	6.5	6.4	6.3	6.2	54
56			6.6	6.6	6.6	6.5	6.4	6.3	6.2	6.1	6	5.8	5.7	56
58				6.3	6.2	6.1	6	5.9	5.8	5.7	5.5	5.4	5.3	58
60					5.8	5.7	5.6	5.5	5.4	5.3	5.1	5	4.9	60
62						5.3	5.2	5.1	5	4.9	4.8	4.7	4.5	62
64						4.9	4.8	4.8	4.6	4.5	4.4	4.3	4.2	64
66							4.5	4.4	4.3	4.2	4.1	4	3.8	66
68								4.1	4	3.9	3.8	3.7	3.5	68
70									3.7	3.6	3.5	3.4	3.2	70
72										3.3	3.2	3.1	3	72
74										3	2.9	2.8	2.7	74
76											2.7	2.6	2.4	76
78												2.3	2.2	78
80													2	80
82													1.7	82
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-11 Lifting capacity chart of fixed jib(SF-1, 8/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 31m; Included angle between main boom and fixed jib: 30°													Radius m
26	5.2	5.3	5.3	5.3										26
28	5	5.1	5.1	5.2	5.2	5.2	5.3	5.3	5.3					28
30	4.9	4.9	5	5	5.1	5.1	5.1	5.2	5.2	5.2	5.3	5.3	5.3	30
32	4.7	4.8	4.8	4.9	4.9	5	5	5.1	5.1	5.1	5.2	5.2	5.2	32
34	4.6	4.7	4.7	4.8	4.8	4.9	4.9	4.9	5	5	5.1	5.1	5.1	34
36	4.5	4.5	4.6	4.7	4.7	4.7	4.8	4.8	4.9	4.9	4.9	5	5	36
38	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.9	4.9	4.9	38
40	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.7	4.8	4.8	40
42	4.2	4.2	4.3	4.3	4.4	4.5	4.5	4.5	4.6	4.6	4.7	4.7	4.7	42
44	4.1	4.1	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.5	4.6	4.6	4.7	44
46	4	4.1	4.1	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	46
48	3.9	4	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.4	4.4	4.5	4.5	48
50	3.9	3.9	4	4	4.1	4.1	4.2	4.2	4.3	4.3	4.4	4.4	4.5	50
52	3.9	3.9	3.9	4	4	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.4	52
54	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.2	4.2	4.2	4.3	4.3	54
56	3.8	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.1	4.2	4.2	4.3	56
58		3.8	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.1	4.2	4.2	58
60			3.8	3.8	3.9	3.9	3.9	4	4	4	4.1	4.1	4.2	60
62			3.8	3.8	3.8	3.9	3.9	3.9	4	4	4	4.1	4.1	62
64				3.8	3.8	3.8	3.9	3.9	3.9	4	4	4	4.1	64
66					3.8	3.8	3.8	3.9	3.9	3.9	3.9	4	4	66
68						3.8	3.8	3.8	3.9	3.9	3.9	3.9	3.8	68
70						3.8	3.8	3.8	3.9	3.8	3.7	3.6	3.5	70
72							3.8	3.7	3.6	3.5	3.4	3.3	3.2	72
74								3.4	3.3	3.3	3.1	3	2.9	74
76									3.1	3	2.9	2.8	2.7	76
78										2.7	2.6	2.5	2.4	78
80										2.5	2.4	2.3	2.2	80
82											2.2	2.1	1.9	82
84												1.8	1.7	84
86													1.5	86
88													1.3	88
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 1/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 13m; Included angle between main boom and fixed jib: 10°													Radius m
10	18	18												10
12	18	18	18	18	18	18	18							12
14	18	18	18	18	18	18	18	18	18	18	18			14
16	18	18	18	18	18	18	18	18	18	18	18	18	18	16
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
20	18	18	18	18	18	18	18	18	18	18	18	18	18	20
22	18	18	18	18	18	18	18	18	18	18	18	18	18	22
24	18	18	18	18	18	18	18	18	18	18	18	18	18	24
26	18	18	18	18	18	18	18	17.9	17.7	17.6	17.4	17.2	17.1	26
28	17.1	16.9	16.8	16.6	16.4	16.3	16.1	15.9	15.8	15.6	15.5	15.3	15.2	28
30	15.4	15.3	15.1	15	14.8	14.6	14.5	14.3	14.1	14	13.8	13.7	13.5	30
32	14	13.9	13.7	13.6	13.4	13.2	13.1	12.9	12.7	12.6	12.4	12.2	12.1	32
34	12.8	12.7	12.5	12.3	12.1	12	11.8	11.7	11.5	11.3	11.2	11	10.9	34
36	11.7	11.6	11.4	11.2	11.1	10.9	10.7	10.6	10.4	10.3	10.1	9.9	9.8	36
38	10.7	10.6	10.4	10.3	10.1	10	9.8	9.6	9.4	9.3	9.1	9	8.8	38
40		9.7	9.6	9.4	9.2	9.1	8.9	8.8	8.6	8.4	8.3	8.1	7.9	40
42			8.8	8.6	8.5	8.3	8.1	8	7.8	7.7	7.5	7.3	7.2	42
44				7.9	7.8	7.6	7.4	7.3	7.1	7	6.8	6.6	6.5	44
46				7.3	7.1	7	6.8	6.6	6.5	6.3	6.2	6	5.8	46
48					6.5	6.4	6.2	6.1	5.9	5.7	5.6	5.4	5.2	48
50						5.9	5.7	5.5	5.4	5.2	5	4.9	4.7	50
52							5.2	5	4.9	4.7	4.6	4.4	4.2	52
54								4.6	4.4	4.3	4.1	3.9	3.8	54
56								4.2	4	3.9	3.7	3.5	3.3	56
58									3.6	3.5	3.3	3.1	3	58
60										3.1	2.9	2.8	2.6	60
62											2.6	2.4	2.3	62
64											2.3	2.1	1.9	64
66												1.8	1.6	66
68													1.4	68
Reeving	2	2	2	2	2	2	2	2	2	2	2	2	2	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 2/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 19m; Included angle between main boom and fixed jib: 10°													Radius m
12	16	16.8												12
14	15.6	15.7	16.1	17.3	17.2	16.1	16.2							14
16	15.6	15.7	15.3	16.9	17.1	16.1	16	17.3	17.3	17.1	15.7	16.2		16
18	14.9	15.6	15.3	16.2	16.8	15.7	15.5	16.3	16.1	17.1	15.7	16.2	15.9	18
20	14.5	14.7	15.3	15	15.9	15.1	14.7	15.2	16.1	16.6	15.7	15.3	15.4	20
22	14.5	14.7	15.3	15	14.7	15.1	14.7	15.2	14.9	14.6	15.7	15.3	14.8	22
24	14	14.2	14.2	14.9	14.7	14.6	14.3	14.3	14.9	14.6	15.7	15.3	14.8	24
26	13.8	14.2	14	13.9	14.5	14.5	14.3	14.3	14.6	14.6	15.1	15.3	14.8	26
28	13.8	13.3	14	13.8	13.5	13.9	13.9	13.8	13.9	14.4	15.1	15.3	14.8	28
30	13.7	13.3	14	13.8	13.5	13.9	13.9	13.8	13.9	14.4	14.2	14.1	13.9	30
32	13.4	13.3	13.9	13	13.5	13.6	13.4	13.3	13.1	13	12.8	12.7	12.5	32
34	12.6	12.9	12.8	12.7	12.5	12.4	12.2	12.1	11.9	11.7	11.6	11.4	11.2	34
36	12.1	12	11.8	11.6	11.4	11.3	11.1	11	10.8	10.6	10.5	10.3	10.1	36
38	11.2	11	10.8	10.7	10.5	10.3	10.2	10	9.8	9.7	9.5	9.3	9.2	38
40	10.3	10.2	10	9.8	9.6	9.5	9.3	9.1	9	8.8	8.6	8.5	8.3	40
42	9.5	9.4	9.2	9	8.8	8.7	8.5	8.3	8.2	8	7.9	7.7	7.5	42
44	8.8	8.7	8.5	8.3	8.1	8	7.8	7.6	7.5	7.3	7.1	7	6.8	44
46		8	7.8	7.7	7.5	7.3	7.2	7	6.8	6.7	6.5	6.3	6.2	46
48			7.3	7.1	6.9	6.8	6.6	6.4	6.2	6.1	5.9	5.8	5.6	48
50				6.5	6.4	6.2	6	5.9	5.7	5.6	5.4	5.2	5	50
52					5.9	5.7	5.5	5.4	5.2	5.1	4.9	4.7	4.5	52
54					5.4	5.3	5.1	4.9	4.7	4.6	4.4	4.3	4.1	54
56						4.8	4.7	4.5	4.3	4.2	4	3.8	3.7	56
58							4.3	4.1	3.9	3.8	3.6	3.4	3.3	58
60								3.7	3.6	3.4	3.2	3.1	2.9	60
62								3.4	3.2	3.1	2.9	2.7	2.6	62
64									2.9	2.8	2.6	2.4	2.2	64
66										2.4	2.3	2.1	1.9	66
68											2	1.8	1.7	68
70												1.6	1.4	70
Reeving	2	2	2	2	2	2	2	2	2	2	2	2	2	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 3/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 25m; Included angle between main boom and fixed jib: 10°													Radius m
14	9	9	9											14
16	9	9	9	9	9	9	9							16
18	9	9	9	9	9	9	9	9	9	9	9	9	9	18
20	9	9	9	9	9	9	9	9	9	9	9	9	9	20
22	9	9	9	9	9	9	9	9	9	9	9	9	9	22
24	9	9	9	9	9	9	9	9	9	9	9	9	9	24
26	8.8	8.9	9	9	9	9	9	9	9	9	9	9	9	26
28	8.8	8.9	8.5	9	9	9	9	9	9	9	9	9	9	28
30	8.6	8.5	8.4	8.5	8.9	8.9	9	9	9	9	9	9	9	30
32	7.9	8.4	8.4	8.4	8.4	8.9	8.7	9	9	9	9	9	9	32
34	7.9	7.8	8	8.4	8.2	8.9	8.5	9	8.6	9	9	9	8.9	34
36	7.8	7.8	8	8	8.2	8.5	8.2	8.6	8.6	8.5	9	9	8.9	36
38	7.6	7.7	7.9	8	8.2	8.5	8.2	8.6	8.6	8.5	9	8.7	8.8	38
40	7.4	7.4	7.7	8	7.8	8.3	8.2	8.6	8	8.2	8.4	8.7	8.4	40
42	7.2	7.4	7.6	7.8	7.6	7.8	7.9	8.4	8	8.2	8.2	8	7.8	42
44	7	7.2	7.3	7.3	7.6	7.8	7.9	7.7	7.8	7.6	7.4	7.3	7.1	44
46	6.9	6.9	7.2	7.3	7.6	7.5	7.5	7.3	7.1	7	6.8	6.7	6.5	46
48	6.7	6.9	7.1	7.2	7.2	7.1	6.9	6.7	6.5	6.4	6.2	6.1	5.9	48
50		6.8	6.9	6.9	6.7	6.5	6.3	6.2	6	5.8	5.7	5.5	5.3	50
52		6.7	6.5	6.4	6.2	6	5.9	5.7	5.5	5.3	5.2	5	4.8	52
54			6.1	5.9	5.7	5.6	5.4	5.2	5	4.9	4.7	4.6	4.4	54
56				5.5	5.3	5.1	5	4.8	4.6	4.5	4.3	4.1	4	56
58					4.9	4.7	4.6	4.4	4.2	4.1	3.9	3.7	3.5	58
60					4.5	4.4	4.2	4	3.9	3.7	3.5	3.4	3.2	60
62						4	3.8	3.7	3.5	3.4	3.2	3	2.8	62
64							3.5	3.4	3.2	3	2.9	2.7	2.5	64
66								3	2.9	2.7	2.6	2.4	2.2	66
68									2.6	2.4	2.3	2.1	1.9	68
70									2.3	2.2	2	1.8	1.7	70
72										1.9	1.7	1.6	1.4	72
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 4/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 31m; Included angle between main boom and fixed jib: 10°													Radius m
16	7.1	7.4	7.5											16
18	6.9	7.2	7.2	7.6	7.1	7.7	7.3	7.5						18
20	6.9	6.9	6.9	7.2	7.1	6.9	7	7.5	7.3	7.5	7.6	7.5		20
22	6.6	6.9	6.9	6.7	7.1	6.7	7	6.9	7	6.9	7.3	7.5	7.7	22
24	6.5	6.5	6.5	6.7	7	6.7	6.8	6.9	6.7	6.9	7	6.8	7.3	24
26	6.3	6.4	6.4	6.6	6.8	6.7	6.8	6.7	6.7	6.9	6.6	6.8	6.8	26
28	5.9	6.1	6.2	6.3	6.5	6.3	6.3	6.6	6.5	6.8	6.6	6.7	6.8	28
30	5.8	5.9	6.1	6	6.1	6.3	6.2	6.3	6.5	6.7	6.4	6.6	6.5	30
32	5.5	5.7	5.8	6	6.1	6.2	6.1	6.3	6.5	6.4	6.4	6.4	6.5	32
34	5.3	5.5	5.6	5.7	5.9	6	6.1	6.1	6.3	6.1	6.4	6.4	6.5	34
36	5.1	5.3	5.4	5.5	5.7	5.8	5.9	6	6.1	6.1	6.3	6.4	6.5	36
38	5	5.1	5.2	5.3	5.5	5.6	5.7	5.8	5.9	5.9	6.1	6	6.3	38
40	4.8	4.9	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.9	6	6	6.1	40
42	4.6	4.8	4.9	5	5.1	5.3	5.4	5.4	5.6	5.7	5.8	5.9	6	42
44	4.5	4.6	4.8	4.9	5	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.7	44
46	4.4	4.5	4.6	4.8	4.9	5	5.1	5.2	5.3	5.4	5.5	5.6	5.7	46
48	4.3	4.4	4.5	4.6	4.7	4.8	5	5.1	5.1	5.3	5.3	5.4	5.5	48
50	4.1	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	5.3	5.4	50
52	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	5.1	52
54	4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.9	4.8	4.6	54
56		4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.7	4.5	4.3	4.2	56
58			4	4.1	4.2	4.3	4.4	4.5	4.4	4.3	4.1	4	3.8	58
60			3.9	4	4.1	4.2	4.3	4.2	4.1	3.9	3.7	3.6	3.4	60
62				3.9	4	4.1	4.1	3.9	3.7	3.6	3.4	3.2	3.1	62
64					4	3.9	3.7	3.6	3.4	3.2	3.1	2.9	2.7	64
66						3.6	3.4	3.3	3.1	2.9	2.8	2.6	2.4	66
68						3.3	3.1	3	2.8	2.7	2.5	2.3	2.1	68
70							2.9	2.7	2.5	2.4	2.2	2	1.9	70
72								2.4	2.3	2.1	2	1.8	1.6	72
74									2	1.9	1.7	1.5	1.4	74
76									1.8	1.6	1.5	1.3	1.1	76
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 5/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 13m; Included angle between main boom and fixed jib: 30°													Radius m
14	18	18												14
16	18	18	18	18	18	18	18							16
18	18	18	18	18	18	18	18	18	18	18	18			18
20	18	18	18	18	18	18	18	18	18	18	18	18	18	20
22	18	18	18	18	18	18	18	18	18	18	18	18	18	22
24	18	18	18	18	18	18	18	18	18	18	18	18	18	24
26	18	18	18	18	18	18	18	18	18	18	18	18	18	26
28	17.5	17.4	17.3	17.2	17	16.9	16.8	16.7	16.6	16.4	16.3	16.2	16.1	28
30	15.8	15.7	15.6	15.5	15.3	15.2	15.1	15	14.8	14.7	14.6	14.5	14.3	30
32	14.3	14.3	14.1	14	13.9	13.8	13.6	13.5	13.4	13.2	13.1	13	12.9	32
34	13	13	12.8	12.7	12.6	12.5	12.3	12.2	12.1	11.9	11.8	11.7	11.5	34
36	11.9	11.8	11.7	11.6	11.4	11.3	11.2	11.1	10.9	10.8	10.7	10.5	10.4	36
38	10.8	10.8	10.7	10.6	10.4	10.3	10.2	10	9.9	9.8	9.6	9.5	9.4	38
40		9.9	9.8	9.7	9.5	9.4	9.3	9.2	9	8.9	8.7	8.6	8.5	40
42			8.9	8.8	8.7	8.6	8.5	8.3	8.2	8.1	7.9	7.8	7.6	42
44			8.2	8.1	7.9	7.9	7.7	7.6	7.4	7.3	7.2	7	6.9	44
46				7.4	7.3	7.2	7	6.9	6.8	6.7	6.5	6.4	6.2	46
48					6.6	6.5	6.4	6.3	6.2	6	5.9	5.8	5.6	48
50						6	5.8	5.7	5.6	5.5	5.3	5.2	5	50
52							5.4	5.3	5.2	5.1	4.9	4.8	4.7	52
54								4.8	4.7	4.6	4.5	4.3	4.2	54
56									4.2	4.1	4	3.9	3.7	56
58										3.7	3.6	3.5	3.3	58
60											3.2	3.1	2.9	60
62												2.8	2.7	62
64													2.3	64
66														66
68														68
Reeving	2	2	2	2	2	2	2	2	2	2	2	2	2	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 6/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 19m; Included angle between main boom and fixed jib: 30°													Radius m
18	9	9	9											18
20	9	9	9	9	9	9	9							20
22	9	9	9	9	9	9	9	9	9	9	9	9	9	22
24	9	9	9	9	9	9	9	9	9	9	9	9	9	24
26	9	9	9	9	9	9	9	9	9	9	9	9	9	26
28	9	9	9	9	9	9	9	9	9	9	9	9	9	28
30	9	9	9	9	9	9	9	9	9	9	9	9	9	30
32	9	9	9	9	9	9	9	9	9	9	9	9	9	32
34	9	9	9	9	9	9	9	9	9	9	9	9	9	34
36	9	9	9	9	9	9	9	9	9	9	9	9	9	36
38	9	9	9	9	9	9	9	9	9	9	9	9	9	38
40	9	9	9	9	9	9	9	9	9	9	9	9	9	40
42	9	9	9	9	9	9	9	8.9	8.8	8.7	8.5	8.4	8.3	42
44	8.9	8.9	8.8	8.7	8.5	8.4	8.3	8.2	8	7.9	7.8	7.6	7.5	44
46		8.2	8.1	8	7.8	7.7	7.6	7.5	7.3	7.2	7.1	6.9	6.8	46
48			7.4	7.3	7.2	7.1	7	6.8	6.7	6.6	6.4	6.3	6.2	48
50			6.8	6.7	6.6	6.5	6.4	6.3	6.1	6	5.9	5.7	5.6	50
52				6.2	6.1	6	5.8	5.7	5.6	5.5	5.3	5.2	5	52
54					5.5	5.5	5.3	5.2	5.1	5	4.8	4.7	4.5	54
56						5	4.9	4.8	4.6	4.5	4.4	4.2	4.1	56
58						4.5	4.4	4.3	4.2	4.1	3.9	3.8	3.7	58
60							4	3.9	3.8	3.7	3.5	3.4	3.2	60
62								3.5	3.4	3.3	3.1	3	2.9	62
64									3	2.9	2.8	2.7	2.5	64
66										2.6	2.5	2.3	2.2	66
68										2.2	2.1	2	1.9	68
70											1.8	1.7	1.6	70
72												1.4	1.3	72
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 7/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius	Fixed jib length: 25m; Included angle between main boom and fixed jib: 30°													Radius
m														m
22	8.3	8.1	8.1											22
24	7.9	8	8.1	8.1	8.2	8.5	8	8.6						24
26	7.8	7.7	8.1	8.1	8.2	8.1	8	7.9	8	7.9	8.5	8.6	8.6	26
28	7.7	7.7	7.9	8	7.7	8.1	8	7.8	7.7	7.9	8.4	8.3	7.9	28
30	7.5	7.4	7.7	7.8	7.6	7.9	8	7.8	7.7	7.9	8.2	7.8	7.9	30
32	7.3	7.3	7.5	7.6	7.6	7.7	7.7	7.8	7.6	7.6	8	7.8	7.8	32
34	7.2	7.3	7.4	7.4	7.5	7.6	7.7	7.8	7.6	7.4	7.6	7.8	7.6	34
36	7	7.1	7.2	7.3	7.4	7.4	7.5	7.3	7.5	7.4	7.6	7.4	7.6	36
38	6.9	6.9	6.9	7.2	7.2	7.3	7.4	7.3	7.2	7.4	7.2	7.3	7.6	38
40	6.8	6.9	6.9	7	7.1	7.2	7.3	7.2	7.2	7.4	7.2	7.3	7.6	40
42	6.7	6.8	6.8	6.9	6.9	7.1	7.2	7.2	7.2	7.3	7.2	7.3	7.2	42
44	6.6	6.7	6.8	6.7	6.9	7	6.9	7.1	7.1	7.2	7.2	7.3	7.2	44
46	6.6	6.6	6.7	6.7	6.8	6.9	6.9	6.8	7.1	7.2	7.2	7.3	7.2	46
48	6.6	6.6	6.6	6.7	6.7	6.7	6.9	6.8	7	7.1	6.9	6.8	6.7	48
50	6.6	6.6	6.6	6.6	6.7	6.7	6.8	6.7	6.6	6.5	6.3	6.2	6.1	50
52		6.6	6.6	6.6	6.5	6.4	6.3	6.2	6	5.9	5.8	5.7	5.5	52
54			6.3	6.2	6	5.9	5.8	5.7	5.5	5.4	5.3	5.2	5	54
56			5.7	5.7	5.6	5.5	5.3	5.2	5.1	5	4.8	4.7	4.5	56
58				5.2	5.1	5	4.9	4.8	4.6	4.5	4.4	4.3	4.1	58
60					4.7	4.6	4.5	4.4	4.2	4.1	4	3.8	3.7	60
62						4.2	4.1	4	3.8	3.7	3.6	3.5	3.3	62
64							3.8	3.7	3.6	3.5	3.4	3.2	3.1	64
66								3.3	3.2	3.1	3	2.9	2.8	66
68									2.9	2.8	2.7	2.6	2.4	68
70										2.5	2.4	2.2	2.1	70
72											2.1	1.9	1.8	72
74												1.8	1.7	74
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-12 Lifting capacity chart of fixed jib(SF-2, 8/8) (with a main hook of 2.377t)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 31m; Included angle between main boom and fixed jib: 30°													Radius m
26	5.2	5.3	5.3	5.3										26
28	5	5.1	5.1	5.2	5.2	5.2	5.3	5.3	5.3					28
30	4.9	4.9	5	5	5.1	5.1	5.1	5.2	5.2	5.2	5.3	5.3	5.3	30
32	4.7	4.8	4.8	4.9	4.9	5	5	5	5.1	5.1	5.2	5.2	5.2	32
34	4.6	4.6	4.7	4.8	4.8	4.9	4.9	4.9	5	5	5	5.1	5.1	34
36	4.5	4.5	4.6	4.6	4.7	4.8	4.8	4.8	4.9	4.9	4.9	5	5	36
38	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.9	4.9	4.9	38
40	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.8	40
42	4.2	4.2	4.3	4.3	4.4	4.5	4.5	4.5	4.6	4.6	4.7	4.7	4.8	42
44	4.1	4.1	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.5	4.6	4.6	4.6	44
46	4	4.1	4.1	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	46
48	3.9	4	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.4	4.4	4.5	4.5	48
50	3.9	3.9	4	4.1	4.1	4.1	4.2	4.2	4.3	4.3	4.4	4.4	4.5	50
52	3.9	3.9	3.9	4	4	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.4	52
54	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.1	4.2	4.2	4.3	4.3	54
56	3.8	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.1	4.2	4.2	4.3	56
58		3.8	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.1	4.2	4.2	58
60			3.8	3.8	3.9	3.9	3.9	4	4	4.1	4.1	4.1	4.1	60
62			3.8	3.8	3.8	3.9	3.9	3.9	4	4	4	3.8	3.7	62
64				3.8	3.8	3.8	3.9	3.9	3.8	3.7	3.6	3.5	3.3	64
66					3.8	3.8	3.7	3.6	3.5	3.4	3.2	3.1	3	66
68						3.5	3.4	3.3	3.2	3	2.9	2.8	2.7	68
70						3.2	3.1	3	2.8	2.7	2.6	2.5	2.3	70
72							2.7	2.7	2.5	2.4	2.3	2.2	2	72
74								2.4	2.2	2.1	2	1.9	1.8	74
76									2	1.9	1.8	1.6	1.5	76
Reeving	1	1	1	1	1	1	1	1	1	1	1	1	1	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 1/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 13m; Included angle between main boom and fixed jib: 10°													Radius m
7	111	107	102											7
8	96.6	93.7	91	87	84.3									8
9	81.9	80.7	79.5	77.5	75.6	72.5	70.2							9
10	70.4	69.8	68.8	67.9	66.9	65.8	64.3	61.9	58.8	54.3				10
12	53.3	53.3	53.3	53.2	52.6	51.9	51.2	50.5	49.8	49.2	48.2	44.3	40.6	12
14	42.4	42.5	42.5	42.4	42.3	42.3	41.9	41.4	40.8	40.3	39.7	39.2	38.6	14
16	34.9	35	35	34.9	34.8	34.8	34.7	34.6	34.3	33.8	33.4	32.9	32.5	16
18	29.4	29.5	29.4	29.4	29.3	29.2	29.1	29.1	28.9	28.9	28.5	28.1	27.7	18
20	25.2	25.3	25.2	25.1	25.1	25	24.9	24.8	24.7	24.6	24.5	24.4	24	20
22	21.8	21.9	21.9	21.8	21.7	21.7	21.6	21.5	21.4	21.3	21.2	21	20.9	22
24	19.1	19.2	19.2	19.1	19	19	18.9	18.8	18.6	18.5	18.4	18.3	18.2	24
26	16.8	16.9	16.9	16.9	16.8	16.7	16.6	16.5	16.4	16.3	16.2	16.1	15.9	26
28		15.1	15	15	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.2	14	28
30			13.4	13.4	13.3	13.2	13.1	13	12.9	12.8	12.7	12.6	12.4	30
32				12	11.9	11.9	11.7	11.7	11.5	11.4	11.3	11.2	11	32
34					10.7	10.6	10.5	10.4	10.3	10.2	10.1	10	9.8	34
36					9.6	9.6	9.5	9.4	9.2	9.2	9	8.9	8.8	36
38						8.6	8.5	8.4	8.3	8.2	8.1	8	7.8	38
40							7.7	7.6	7.5	7.4	7.2	7.1	7	40
42								6.8	6.7	6.6	6.5	6.4	6.2	42
44								6.1	6	5.9	5.8	5.7	5.5	44
46									5.4	5.3	5.2	5.1	4.9	46
48										4.7	4.6	4.5	4.3	48
50											4.1	4	3.8	50
52											3.6	3.5	3.3	52
54												3	2.9	54
56													2.5	56
Reeving	9	9	8	7	7	6	6	5	5	5	4	4	4	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 2/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 19m; Included angle between main boom and fixed jib: 10°													Radius m
7	111	107	101											7
8	95.7	93	90.3	86.3	83.4									8
9	80.8	79.6	78.5	76.9	74.9	71.9	69.5							9
10	69.4	68.8	67.9	67	66	65	63.7	61.3	58	53.6				10
12	52.4	52.5	52.5	52.4	51.7	51.1	50.4	49.7	49	48.4	47.5	43.7	39.9	12
14	41.6	41.7	41.7	41.7	41.6	41.6	41.1	40.6	40	39.6	39	38.5	37.9	14
16	34.1	34.2	34.2	34.2	34.1	34.1	34	34	33.5	33.1	32.7	32.2	31.8	16
18	28.6	28.7	28.7	28.7	28.6	28.6	28.5	28.4	28.3	28.2	27.8	27.4	27.1	18
20	24.4	24.5	24.5	24.4	24.4	24.4	24.3	24.2	24.1	24	23.9	23.7	23.4	20
22	21	21.2	21.1	21.1	21	21	20.9	20.8	20.8	20.7	20.6	20.5	20.3	22
24	18.3	18.5	18.4	18.4	18.3	18.3	18.2	18.1	18.1	18	17.9	17.8	17.6	24
26	16.1	16.2	16.2	16.2	16.1	16.1	16	15.9	15.8	15.7	15.6	15.5	15.4	26
28		14.3	14.3	14.3	14.2	14.2	14.1	14	13.9	13.9	13.8	13.6	13.5	28
30			12.7	12.7	12.6	12.6	12.5	12.4	12.3	12.3	12.1	12	11.9	30
32				11.3	11.2	11.2	11.1	11.1	10.9	10.9	10.7	10.6	10.5	32
34					10	10	9.9	9.9	9.7	9.7	9.6	9.4	9.3	34
36					9	9	8.9	8.8	8.7	8.6	8.5	8.4	8.2	36
38						8	7.9	7.9	7.7	7.7	7.5	7.4	7.3	38
40							7.1	7	6.9	6.8	6.7	6.6	6.5	40
42								6.3	6.1	6.1	5.9	5.8	5.7	42
44								5.6	5.4	5.4	5.3	5.2	5	44
46									4.8	4.8	4.6	4.5	4.4	46
48										4.2	4.1	4	3.8	48
50											3.6	3.4	3.3	50
52											3.1	3	2.8	52
54												2.5	2.4	54
56													2	56
Reeving	9	9	8	7	7	6	6	5	5	5	4	4	4	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 3/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 25m; Included angle between main boom and fixed jib: 10°													Radius m
7	104	101	100											7
8	92.7	92.2	89.5	85.6	82.7									8
9	79.6	78.5	77.4	76.2	74.3	71.1	68.7							9
10	68.4	67.7	66.8	65.9	65	64.1	63.1	60.8	57.3	52.9				10
12	51.4	51.6	51.6	51.4	50.8	50.2	49.5	48.8	48.2	47.5	46.8	43	39.2	12
14	40.7	40.8	40.9	40.9	40.8	40.8	40.3	39.8	39.2	38.8	38.2	37.7	37.1	14
16	33.2	33.3	33.4	33.4	33.4	33.4	33.3	33.2	32.8	32.4	31.9	31.5	31	16
18	27.7	27.9	27.9	27.9	27.9	27.9	27.8	27.8	27.7	27.5	27.1	26.7	26.4	18
20	23.5	23.7	23.7	23.7	23.7	23.7	23.6	23.6	23.5	23.4	23.3	23.1	22.7	20
22	20.2	20.4	20.4	20.4	20.4	20.4	20.3	20.2	20.1	20.1	20	19.9	19.7	22
24	17.5	17.7	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.4	17.3	17.2	17.1	24
26	15.3	15.5	15.5	15.5	15.5	15.4	15.4	15.3	15.2	15.1	15.1	14.9	14.8	26
28		13.6	13.6	13.6	13.6	13.6	13.5	13.4	13.3	13.3	13.2	13.1	12.9	28
30			12	12	12	12	11.9	11.8	11.7	11.7	11.6	11.5	11.3	30
32				10.6	10.6	10.6	10.5	10.5	10.4	10.3	10.2	10.1	10	32
34					9.4	9.4	9.3	9.3	9.2	9.1	9	8.9	8.8	34
36					8.3	8.3	8.3	8.2	8.1	8	7.9	7.8	7.7	36
38						7.4	7.3	7.3	7.2	7.1	7	6.9	6.8	38
40							6.5	6.4	6.3	6.3	6.2	6.1	5.9	40
42								5.7	5.6	5.5	5.4	5.3	5.2	42
44								5	4.9	4.8	4.7	4.6	4.5	44
46									4.3	4.2	4.1	4	3.9	46
48										3.7	3.5	3.5	3.3	48
50											3	2.9	2.8	50
52											2.5	2.5	2.3	52
54												2	1.9	54
56													1.5	56
Reeving	9	8	8	7	7	6	6	5	5	5	4	4	4	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 4/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 31m; Included angle between main boom and fixed jib: 10°												Radius m	
7	101	97.9	97.9											7
8	90.7	89.5	87.5	84.6	81.6									8
9	78.3	77.2	76.1	75	73.4	70.3	67.9							9
10	67.2	66.5	65.6	64.8	63.9	63	62.1	60	56.5	52.1				10
12	50.3	50.5	50.6	50.4	49.8	49.2	48.5	47.9	47.2	46.6	45.9	42.3	38.5	12
14	39.6	39.8	39.9	40	40	39.9	39.4	38.9	38.4	37.9	37.4	36.8	36.3	14
16	32.2	32.4	32.5	32.5	32.5	32.6	32.5	32.4	31.9	31.5	31.1	30.7	30.2	16
18	26.8	27	27	27.1	27.1	27.1	27	27	26.9	26.7	26.3	26	25.6	18
20	22.6	22.8	22.8	22.9	22.9	22.9	22.9	22.8	22.8	22.7	22.6	22.3	22	20
22	19.3	19.5	19.6	19.6	19.6	19.6	19.6	19.5	19.4	19.4	19.3	19.2	19	22
24	16.6	16.8	16.9	16.9	16.9	16.9	16.9	16.8	16.8	16.7	16.6	16.6	16.4	24
26	14.4	14.6	14.7	14.7	14.7	14.7	14.7	14.6	14.5	14.5	14.4	14.3	14.2	26
28		12.8	12.8	12.9	12.8	12.9	12.8	12.8	12.7	12.6	12.6	12.5	12.3	28
30			11.2	11.3	11.3	11.3	11.2	11.2	11.1	11.1	10.9	10.9	10.7	30
32				9.9	9.9	9.9	9.9	9.8	9.7	9.7	9.6	9.5	9.4	32
34					8.7	8.7	8.7	8.6	8.5	8.5	8.4	8.3	8.2	34
36					7.6	7.7	7.6	7.6	7.5	7.4	7.3	7.3	7.1	36
38						6.7	6.7	6.6	6.5	6.5	6.4	6.3	6.2	38
40							5.8	5.8	5.7	5.7	5.6	5.5	5.4	40
42								5.1	5	4.9	4.8	4.7	4.6	42
44								4.4	4.3	4.2	4.1	4.1	3.9	44
46									3.7	3.6	3.5	3.4	3.3	46
48										3.1	3	2.9	2.8	48
50											2.5	2.4	2.3	50
52											2	1.9	1.8	52
54												1.5	1.3	54
Reeving	8	8	8	7	7	6	6	5	5	5	4	4	3	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 4/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 13m; Included angle between main boom and fixed jib: 30°													Radius m
7	111	107	101											7
8	95.9	93.3	90.5	86.6	83.6									8
9	81.1	79.9	78.7	77.2	75.2	72.1	69.6							9
10	69.6	69.1	68.2	67.2	66.2	65.3	64.1	61.6	58.2	53.8				10
12	52.7	52.7	52.7	52.7	52	51.4	50.7	50	49.3	48.6	47.7	43.8	40	12
14	42	42	42	41.9	41.8	41.8	41.5	40.9	40.4	39.9	39.3	38.8	38	14
16	34.6	34.6	34.5	34.5	34.4	34.4	34.3	34.2	33.9	33.5	33	32.6	32.1	16
18	29.1	29.2	29.1	29	28.9	28.9	28.8	28.7	28.6	28.5	28.2	27.8	27.4	18
20	24.9	25	24.9	24.8	24.7	24.7	24.6	24.5	24.4	24.3	24.2	24.1	23.7	20
22	21.6	21.7	21.6	21.6	21.4	21.4	21.3	21.2	21.1	21	20.9	20.7	20.6	22
24	19	19	18.9	18.9	18.8	18.7	18.6	18.5	18.4	18.3	18.2	18.1	17.9	24
26	16.7	16.8	16.7	16.7	16.6	16.5	16.4	16.3	16.2	16.1	16	15.8	15.7	26
28		14.9	14.9	14.8	14.7	14.7	14.5	14.4	14.3	14.2	14.1	14	13.8	28
30			13.3	13.2	13.1	13.1	12.9	12.8	12.7	12.6	12.5	12.4	12.2	30
32				11.9	11.7	11.7	11.6	11.5	11.3	11.3	11.1	11	10.8	32
34					10.5	10.5	10.4	10.3	10.1	10.1	9.9	9.8	9.7	34
36					9.5	9.5	9.3	9.2	9.1	9	8.9	8.8	8.6	36
38						8.5	8.4	8.3	8.2	8.1	7.9	7.8	7.7	38
40							7.6	7.5	7.3	7.2	7.1	7	6.8	40
42								6.7	6.6	6.5	6.4	6.2	6.1	42
44								6	5.9	5.8	5.7	5.6	5.4	44
46									5.3	5.2	5.1	4.9	4.8	46
48										4.6	4.5	4.4	4.2	48
50											4	3.9	3.7	50
52												3.5	3.4	52
54													3	54
56														56
Reeving	9	9	8	7	7	6	6	5	5	5	4	4	4	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 6/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 19m; Included angle between main boom and fixed jib: 30°													Radius m
7	106	106	100											18
8	94.2	92.4	89.7	85.7	82.5									20
9	79.6	78.4	77.3	76	74.4	71.3	68.6							22
10	68.2	67.8	66.8	65.9	64.9	64	63.1	60.9	57.3	52.8				24
12	51.4	51.5	51.5	51.5	50.9	50.3	49.6	48.9	48.2	47.6	46.7	42.8	39	28
14	40.9	40.9	40.9	40.9	40.8	40.8	40.5	39.9	39.4	38.9	38.3	37.8	37	30
16	33.5	33.6	33.6	33.5	33.4	33.4	33.3	33.3	33	32.6	32.1	31.7	31.2	32
18	28.1	28.2	28.2	28.1	28	28	27.9	27.8	27.7	27.6	27.4	27	26.6	34
20	24	24.1	24	24	23.9	23.9	23.8	23.7	23.6	23.5	23.4	23.3	22.9	36
22	20.8	20.8	20.8	20.7	20.6	20.6	20.5	20.4	20.3	20.2	20.1	20	19.9	38
24	18.1	18.2	18.1	18.1	18	18	17.8	17.8	17.7	17.6	17.4	17.3	17.2	40
26	15.9	16	16	15.9	15.8	15.8	15.7	15.6	15.5	15.4	15.3	15.1	15	42
28		14.2	14.1	14.1	14	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.1	44
30			12.6	12.5	12.4	12.4	12.3	12.2	12.1	12	11.8	11.7	11.6	46
32				11.2	11.1	11	10.9	10.8	10.7	10.6	10.5	10.4	10.2	48
34					9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9	50
36					8.8	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8	52
38						7.9	7.8	7.7	7.6	7.5	7.3	7.2	7.1	54
40							7	6.9	6.7	6.6	6.5	6.4	6.3	56
42								6.1	6	5.9	5.8	5.7	5.5	58
44								5.5	5.3	5.2	5.1	5	4.9	60
46									4.7	4.6	4.5	4.4	4.2	62
48										4.1	4	3.8	3.7	64
50											3.4	3.3	3.2	66
52											3	2.9	2.7	68
54												2.4	2.3	70
56													1.9	72
Reeving	9	9	8	7	7	6	6	5	5	5	4	4	4	Reeving

Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 7/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 25m; Included angle between main boom and fixed jib: 30°													Radius m
7	106	104	99.1											7
8	92.4	90.8	88.6	84.6	81.1									8
9	77.9	76.8	75.6	74.4	73.3	70.3	67.3							9
10	66.6	66.2	65.3	64.5	63.5	62.6	61.7	59.8	56.1	51.7				10
12	50.1	50.2	50.2	50.3	49.6	49	48.3	47.7	47.1	46.4	45.6	41.7	37.8	12
14	39.6	39.8	39.8	39.8	39.7	39.7	39.4	38.9	38.3	37.8	37.3	36.8	35.9	14
16	32.4	32.5	32.5	32.5	32.4	32.4	32.4	32.3	32	31.6	31.2	30.7	30.3	16
18	27.1	27.2	27.2	27.2	27.1	27.1	27	26.9	26.8	26.8	26.5	26.1	25.7	18
20	23	23.1	23.1	23.1	23	23	22.9	22.8	22.7	22.7	22.6	22.5	22.1	20
22	19.8	19.9	19.9	19.9	19.8	19.8	19.7	19.6	19.5	19.4	19.3	19.2	19.1	22
24	17.2	17.3	17.3	17.3	17.2	17.2	17.1	17	16.9	16.8	16.7	16.6	16.5	24
26	15.1	15.2	15.2	15.1	15	15	14.9	14.8	14.7	14.6	14.5	14.4	14.3	26
28		13.4	13.3	13.3	13.2	13.2	13.1	13	12.9	12.8	12.7	12.6	12.5	28
30			11.8	11.8	11.7	11.7	11.6	11.5	11.4	11.3	11.2	11.1	10.9	30
32				10.4	10.4	10.3	10.2	10.1	10	9.9	9.8	9.7	9.6	32
34					9.2	9.2	9.1	9	8.9	8.8	8.7	8.5	8.4	34
36					8.2	8.2	8	8	7.8	7.8	7.6	7.5	7.4	36
38						7.3	7.1	7.1	6.9	6.9	6.7	6.6	6.5	38
40							6.3	6.2	6.1	6	5.9	5.8	5.7	40
42								5.5	5.4	5.3	5.2	5.1	4.9	42
44								4.9	4.7	4.7	4.5	4.4	4.3	44
46									4.2	4.1	3.9	3.8	3.7	46
48										3.5	3.4	3.3	3.1	48
50											2.9	2.8	2.6	50
52											2.4	2.3	2.2	52
54												1.9	1.8	54
Reeving	9	8	8	7	7	6	6	5	5	5	4	4	4	Reeving

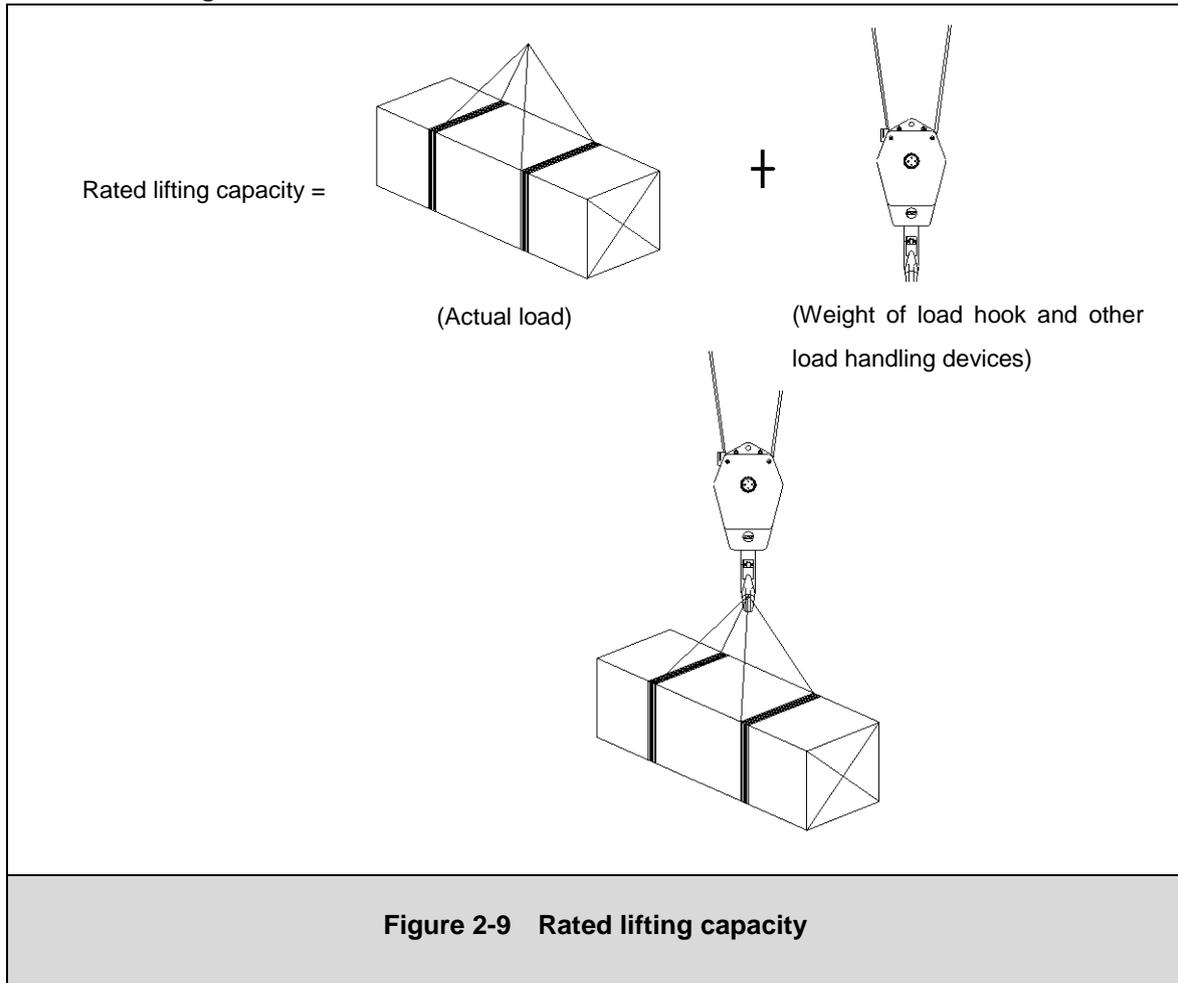
Table 2-13 Operation on primary hook (with a fixed jib and an auxiliary hook of 1.09t) (SF-3, 8/8)

Rear counterweight: 51.4t; Central ballast: 16t; Unit: t

Main boom	28	31	34	37	40	43	46	49	52	55	58	61	64	Main boom
Radius m	Fixed jib length: 31m; Included angle between main boom and fixed jib: 30°													Radius m
7	101	101	97.4											7
8	90.2	88.8	87.2	83.3	79.8									8
9	76	74.9	73.8	72.7	71.6	69.1	66.1							9
10	64.9	64.5	63.6	62.8	61.9	61	60.1	58.2	54.8	50.3				10
11	55.7	55.9	55.8	55.1	54.3	53.6	52.9	52.1	51.4	49.9	44.9	41		11
12	48.6	48.7	48.8	48.8	48.2	47.7	47	46.4	45.7	45.1	44.3	40.5	36.4	12
14	38.3	38.4	38.5	38.5	38.5	38.5	38.2	37.7	37.1	36.7	36.1	35.6	34.6	14
16	31.2	31.3	31.3	31.3	31.3	31.3	31.3	31.2	30.9	30.5	30.1	29.7	29.2	16
18	25.9	26.1	26.1	26.1	26	26	26	25.9	25.8	25.8	25.5	25.1	24.7	18
20	21.9	22.1	22.1	22.1	22	22	21.9	21.9	21.8	21.7	21.7	21.5	21.2	20
22	18.8	18.9	18.9	18.9	18.8	18.8	18.8	18.7	18.6	18.6	18.5	18.4	18.3	22
24	16.3	16.4	16.4	16.4	16.3	16.3	16.2	16.1	16	16	15.9	15.8	15.7	24
26	14.2	14.3	14.2	14.2	14.2	14.1	14.1	14	13.9	13.8	13.7	13.6	13.5	26
28		12.5	12.5	12.5	12.4	12.4	12.3	12.2	12.1	12.1	12	11.9	11.7	28
30			11	11	10.9	10.9	10.8	10.7	10.6	10.5	10.4	10.3	10.2	30
32				9.7	9.6	9.6	9.5	9.4	9.3	9.2	9.1	9	8.9	32
34					8.4	8.4	8.3	8.2	8.1	8.1	8	7.8	7.7	34
36					7.4	7.4	7.3	7.2	7.1	7.1	6.9	6.8	6.7	36
38						6.5	6.4	6.4	6.2	6.2	6	6	5.8	38
40							5.6	5.6	5.4	5.4	5.3	5.2	5	40
42								4.9	4.7	4.7	4.5	4.4	4.3	42
44								4.2	4.1	4	3.9	3.8	3.7	44
46									3.5	3.4	3.3	3.2	3.1	46
48										2.9	2.8	2.7	2.5	48
50											2.3	2.2	2.1	50
52											1.9	1.7	1.6	52
Reeving	8	8	8	7	7	6	6	5	5	5	4	4	3	Reeving

CAUTION

1. Values in lifting capacity charts are applicable to 360° working range.
2. Rated total lifting capacity listed in lifting capacity chart is the maximum permitted lifting capacity of various boom combinations. It includes the weight of load, load hook, wire rope and other load handling devices.



3. Radius in lifting capacity chart is the horizontal distance from central axle of slewing ring to centerline of hook when crane is loaded.
4. For fixed jib operating mode, it is prohibited to use main boom and fixed jib at the same time.
5. Rated lifting capacities refer to lifting capacities of different operating modes of the crane on a solid and flat ground with the load suspended freely.
6. Blank areas in lifting capacity charts are non-working areas, where crane operation is strictly prohibited.
7. The crane can travel with 100% load. The maximum traveling speed must not exceed 0.1m/s (6m/min).

ZOOMLION

Operator's Manual for Crawler Crane

Chapter 3 Safety Guidelines



Chapter 3 Safety Guidelines

3.1 Operation planning

In addition to a full-functional crane and a qualified crane operator, an operation planning is also an important precondition for safe and reliable crane operation.

The crane operator must know well all necessary information (Operator's Manual, basic knowledge about pneumatic, electrical and hydraulic drive, and notes for safe operation as well as operating environment) before starting the crane operation, including:

- a) Responsibility of all personnel concerned;
- b) Type of crane operation and required working mode;
- c) Safe distance between the lifting point and surrounding buildings;
- d) Influences brought by communal facilities (including overhead high/low voltage lines and underground gas pipes);
- e) Whether the space of the work site meets the operation requirement;
- f) Restriction of the surrounding on the range of operation (whether there is another crane nearby working);
- g) Quantity, material, dimensions and weight of the load to be lifted;
- h) Required lifting height and slewing radius;
- i) Load-bearing capacity and flatness of the soil and the surface of the work site;
- j) Height and width of the passageway to the work site.
- k) Other external factors affecting the working site (e.g. weather, live lines, etc.);
- l) Means of communication between the signalman and the crane operator.
- m) Take appropriate measures to keep unrelated people and equipment away from the working area.

Based on the above information, the crane operator is able to know required operating modes of the crane, such as operating modes of the crane and types of pulley blocks on hook.



1. A correct and complete operation planning is vital for the safe and problem-free operation of the crane. Persons in charge must know well all the information about the operation and the property of the crane, take into account all unsafe factors, and formulate a safe and reliable plan for related persons.

2. To finish the expected work, the crane operator must possess all necessary and required information of the crane. Otherwise, an accident may occur.

3.1.1 Working performance of the crane

Refer to Section 2.5 in Chapter 2 for working radius and lifting capacity charts of different operating modes.



There might be a risk of danger if the operator operates the crane without following the safety rules.

3.1.2 Appropriate use of the crane

Appropriate use of the crane is a fundamental safety requirement that can never be compromised. It is explicitly stipulated in the Operator's Manual and the Maintenance Manual that how to use the crane appropriately. The crane must only be used for the intended use. Safety precautions and protective measures related to the proper use of the crane during assembly and dismantling, commissioning and maintenance of the crane are listed in this manual.

Appropriate use of the crane includes:

- a) Comply with national safety regulations.
- b) Accept and know well the safety information in the Operator's Manual.
- c) All safety devices function normally.
- d) Proper use of fuel oils and lubricants as specified in the manual or related instructions.
- e) Proper maintenance and inspection of the crane (refer to the Maintenance Manual).



Any use of the crane without the written permission of the manufacturer will be regarded as inappropriate use. The owner of the crane or the operator shall be responsible for any problem.

3.1.3 Inappropriate use of the crane

It is prohibited to use the crane inappropriately.

Inappropriate use of the crane includes:

- a) Unauthorized modification of the crane structure without a written permission from the manufacturer.
- b) No acceptance test before commissioning.
- c) The crane is commissioned by unauthorized persons.
- d) Commission the crane without knowing the content of the manual.
- e) Use incomplete or untranslated operator's manual to guide commissioning or operation.
- f) Dangerous operations on the crane.
- g) Transport persons with the hoisting winch.
- h) Lift the load from the ground with the derricking winch.

- i) Drag the load on the ground.
- j) Diagonal pulling that exceeds 2% of the maximum load capacity.
- k) No specified safety devices such as load moment limiter, hoisting limiter, etc.
- l) Operate the crane without observing lifting capacity charts.
- m) Use spare parts that are not approved by the manufacturer.
- n) Tilt the crane.
- o) Carry out inappropriate hoisting when someone is standing on the assembling rack.
- p) Operate the crane in dangerous areas.

 **WARNING**

1. **Life-threatening injuries and even deaths.**
2. **Damages to the crane or other properties.**
3. **Cancellation of manufacturer's maintenance under warranty.**

3.1.4 Areas of responsibility

3.1.4.1 Responsibility of manufacturer

- a) Make sure that the crane, including accessories and related technical documents, is kept in good condition for the first time delivery.
- b) Supervise the product's property, update related technical documents, and maintain the product.
- c) Provide worldwide service and maintenance.
- d) Build a training center and provide operators and servicemen with trainings.

3.1.4.2 Responsibility of user

- a) Make sure that only well-trained and qualified personnel who have read and understood the Operator's Manual can use and maintain the crane.
- b) Clearly define duties and responsibilities of operators and servicemen.
- c) Provide necessary protective devices for operators and servicemen.
- d) Remind persons at the work site of safety.
- e) Quickly and properly shut down the crane as soon as possible when a safety risk is involved.
- f) Check the crane in line with local regulations.
- g) Check the crane as required by the manufacturer.
- h) Make sure that the crane is maintained at regular intervals.
- i) Inform the manufacturer immediately if lives or properties are threatened in accidents.
- j) Allow the access of manufacturer's personnel to the crane in order to supervise the product property.
- k) Formulate an operation planning for the crane.

3.1.4.3 Responsibility of crane operator

- a) Be responsible for safe operation of the crane.
- b) Wear necessary protective equipment to guarantee personal safety.
- c) Make sure that all control devices are in their neutral positions before starting the engine.
- d) Check to see if the brake and the emergency stop device are functional before daily operation.
- e) Operate the crane strictly in accordance with lifting capacity charts.
- f) Report all irregularities that may affect safe operation of the crane to the superior department or the user immediately.
- g) Stop the operation immediately if safe operation of the crane cannot be guaranteed.
- h) Make sure that all control devices are in their neutral positions and the engine is shut down before leaving the operator's cab.
- i) After the operation, turn the ignition key to the off position, pull out the cab key and the engine key, and lock the door of the cab to prevent unauthorized entries.
- j) Keep the windshield, the platform and steps clean and free from dirt and oil stain.

3.1.5 Working area

Only the operator is allowed to stay on the crane when it is working.

The operator must not leave the cab at any time when the crane is working.

The following requirements must be met in order to build a safe and comfortable working environment.

- a) Keep the cab clean. Clean foot pedals and ashtrays and put drinks in the designated place.
- b) Do not put magazines or other items on the control panel. The control panel or the display of the load moment limiter must not be covered.
- c) Do not put any tool in the cab.
- d) Do not put any article on the passageway to the cab, such as clothes, protective devices, personal belongings, etc.
- e) The passageway to the cab must be always free from snow, ice or any other obstacles.
- f) Keep all windows and rearview mirrors clean without condensed water and ice.

3.2 Safety and technical notes

3.2.1 Safety instructions for workers

3.2.1.1 Crane operator

An important duty of the crane operator is to control, operate and adjust the crane so as to protect persons around away from danger. A crane operator must obey the following rules:

- a) The operator must be familiar with the Operator's Manual, know the working principle, structure performance, and functions and adjusting methods of safety devices, and master

operation essentials and maintenance skills.

- b) The operator should check the brake, the load hook, the wire rope, and safety devices before operating the crane. Any irregularities detected must be eliminated immediately.
- c) The operator must be fully focused and not chat with others during operation. Generally, the operator only responds to signals from appointed persons. For a stop signal, however, the operator must respond to it at all times no matter who send it out. The operator must refuse to respond to any signal that violates the operation regulations. Stop the crane immediately if anyone is found climbing the crane.
- d) The operator who is in a poor state or a bad health condition is not allowed to operate the crane.
- e) The crane operator and the signalman should be familiar with safety rules, signals and symbols. It is prohibited to operate the crane after drinking.
- f) The operator should be qualified with the work in eyesight, hearing and reaction ability, be strong enough to operate the crane safely, and has the ability to estimate the distance, height and clearance correctly.
- g) The crane operator must be well trained in terms of using fire extinguishers and surviving in emergencies.
- h) Only authorized operators are allowed to operate the crane.

It is required to carry out routine safety inspections on the crane every time before operation in order to keep it in a good condition. Safety inspections include:

- a) Check the work log to make sure that all regular inspections and maintenances have been completed and all repairs have been done.
- b) Check hoisting limiter, boom angle indicator, tilting-back support warning device, etc.
- c) Check carefully load-bearing components, such as wire ropes (hoisting rope, derricking rope, anchoring rods, etc.), boom sections, outriggers, load hook, slings, etc.
- d) Check to see if there are missing bolts, nuts, pins and cracks and damages on components.
- e) Make sure that there is no unauthorized modification, such as increase and decrease of central counterweight, incorrect modification of boom section.
- f) Check to see if there is any leakage of fuel oil and hydraulic oil.
- g) Check all instruments after the engine is started.
- h) Check to see if all controlling mechanisms are normal.
- i) Check the braking system by lifting the load off the ground for a short while.
- j) Check if the crane is short of lubricating oil, grease or anti-freezing solution.
- k) Check if there is too much dirt.

The following improper operations should be avoided:

- a) Fast slewing or abrupt starting and stopping;

- b) Quick braking during lifting;
- c) Diagonal pulling of the load to be lifted, which is still on the ground.
- d) Loose wire rope on the ground.
- e) Overloading of the crane or improper binding of the load.
- f) Driving (or slewing) too fast with a load, or lifting the load on an uneven surface.
- g) Diagonal pulling or sudden losing of the lifted load.
- h) Swinging of suspended load.
- i) Colliding into a bridge, a roof or high voltage lines.
- j) Incorrect assembly or disassembly of the boom.

3.2.1.2 Rigger

The rigger is responsible for ensuring that the load is slung or released safely, and using the lifting devices and components correctly;

Qualifications of a rigger:

- a) Be qualified with the work in hearing, eyesight and reaction ability;
- b) Be strong enough to carry the lifting devices or components;
- c) Be able to estimate the weight of the load, balance the load and judge the distance, height and clearance correctly;
- d) Be trained in the skill of lifting;
- e) Be able to choose proper lifting devices and components according to the loading condition.
- f) Be trained in hand signals for operation and know how to use them.
- g) Be able to use audio equipment (such as interphone) safely to send out oral order exactly and clearly.
- h) Be capable of controlling and conducting the crane to move the load safely.
- i) Be authorized to operate the crane.

3.2.1.3 Signalman

The primary duty of a signalman is to assist the crane operator to carry out safe operation. Potential damage to property or personal injury could be avoided if the crane operator follows the instructions given out by the appointed signalman. The signalman can take place of the rigger to direct the operator to move the crane and the load. However, only one signalman or one rigger could work with the crane operator at a time.

Qualifications for a signalman:

- a) Be familiar with the lifting task so as to cooperate with the crane operator and other workers safely.
- b) Make sure that only authorized persons are allowed to carry out the work.
- c) Be qualified with the work in hearing, eyesight and reaction.
- d) Be able to estimate the distance, height and clearance correctly.
- e) Be well-trained in hand signals for crane operation and know how to use them.
- f) Use standard hand signals and use a radio device to send out correct and clear oral order

if necessary.

- g) Be capable of conducting the crane to move the load safely.
- h) Position himself in a safe location from where he can see the whole process of the operation and be clearly seen by all persons.



Operate the crane correctly for the sake of safety and be familiar with the possible dangers brought by the work.

3.2.2 Safety instructions for all related workers

- a) Any unsafe operation or dangerous situation must be corrected or reported to the supervisor immediately.
- b) All persons around the crane must observe all warning signals so as to ensure their own safety.
- c) All workers must know about the content of the task and the working sequence.
- d) Check whether dangerous situations occur during crane operation, and inform the operator and the signaller of unsafe factors such as high-voltage line, unauthorized persons and equipment, and poor conditions of ground.

3.2.3 Matters need attention during operation

Maximum loads and working radiuses stipulated in lifting capacity charts must be strictly followed during operation.

Any misoperation that could cause danger or accident must be strictly prohibited.



1. It is prohibited to operate the crane in working radiuses that are not stipulated in lifting capacity charts, which applies to the condition that the crane is not loaded. Otherwise, there might be a risk of danger.

2. Check if the reeving plan of the rope fits the maximum lifting capacity. Otherwise the rope might break.

3. Start or stop all movements of the crane slowly to avoid load swinging. There must be an observer who makes sure that there must be at least three windings of wire rope left on the drum. Otherwise there might be a serious accident.

4. The maximum load must not exceed the rated load capacity of the hook used.

3.3 Slings

3.3.1 Introduction

The performance of slings is determined by the component of slings. There are normally six categories of slings:

- 1) Chain
- 2) Wire rope
- 3) Metal mesh
- 4) Natural fiber rope
- 5) Synthetic fiber rope
- 6) Synthetic web

Slings can be also divided into the following three categories according to different usages and checking methods. Each category has its own advantages and disadvantages.

- 1) Chain
- 2) Wire rope and metal mesh
- 3) Fiber rope and fiber web

The following factors should be taken into account when slings are selected.

- 1) Dimensions of the load
- 2) Weight of the load
- 3) Shape of the load
- 4) Environmental temperature
- 5) Sensitivity of the load
- 6) Environmental condition
- 7) The minimum safety coefficient of slings is 5:1

3.3.2 Identification tag

All slings must be labeled with identification tags that contain such information as:

- 1) Manufacturer's name and trademark.
- 2) Dimensions of the sling.
- 3) Material of the sling.
- 4) Rated load of the sling.
- 5) Lifting angle of the sling (included angle between the sling and the horizontal line).

3.3.3 Angle of sling knot

Angle of sling knot has a direct influence on the lifting capacity of the sling, as shown in Figure 3-1 and Table 3-1.

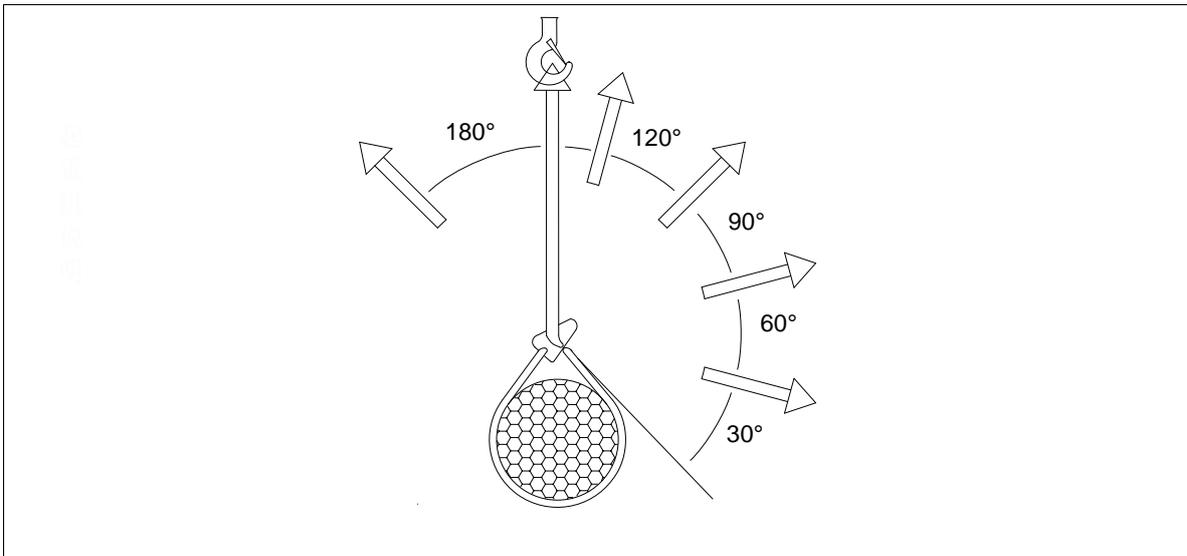


Figure 3-1 Angle of sling knot

Table 3-1 Lifting capacities of slings with different knot angle

Knot angle	90°-120°	60°-90°	30°-60°	0°-30°
Lifting capacity	87%	74%	62%	49%

3.3.4 D/d ratio

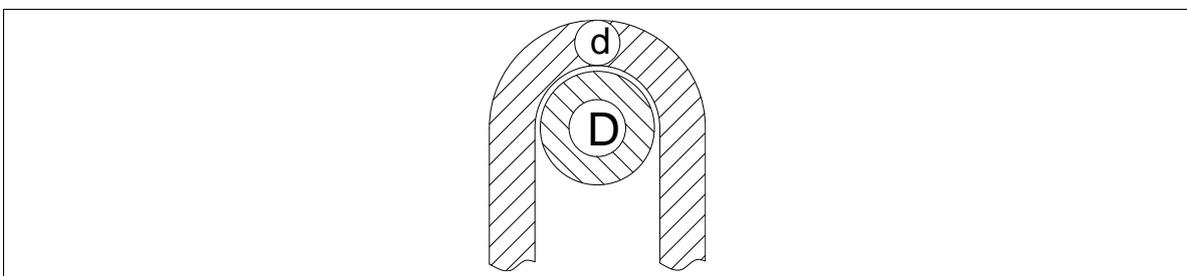


Figure 3-2 D/d ratio

Efficiency loss in the bending process of wire rope varies with different sling knots. The diameter of the sling of wire rope must be differentiated from the diameter of the load in order to determine the D/d ratio. As shown in Figure 3-2, D is the diameter of the load while d is the diameter of the sling of wire rope.

It is recommended to keep a D/d ratio of 6:1, which helps to make use of the efficiency of the sling by 80%. Only 50% of the efficiency of the sling can be utilized if the D/d ratio is 1:1.

Refer to D/d ratio in Table 3-2.

Table 3-2 D/d ratio

D/d ratio	40	30	20	15	10	8	4	2	1
Efficiency (%)	95	93	92	89	86	83	75	65	50

Note: D/s ratio must not be smaller than 1.

3.3.5 Distribution of load

For a symmetrical load to be lifted with a two-leg sling, formulas below can be used to calculate the bearing capacity of each leg of the sling.

Angle coefficient of load (k) = length (L) ÷ height (H)

Bearing capacity of a single leg of the sling (N) = weight of load (G) × angle coefficient of load (k) ÷ number of sling legs (n)

Distribution of load is illustrated in the figure below:

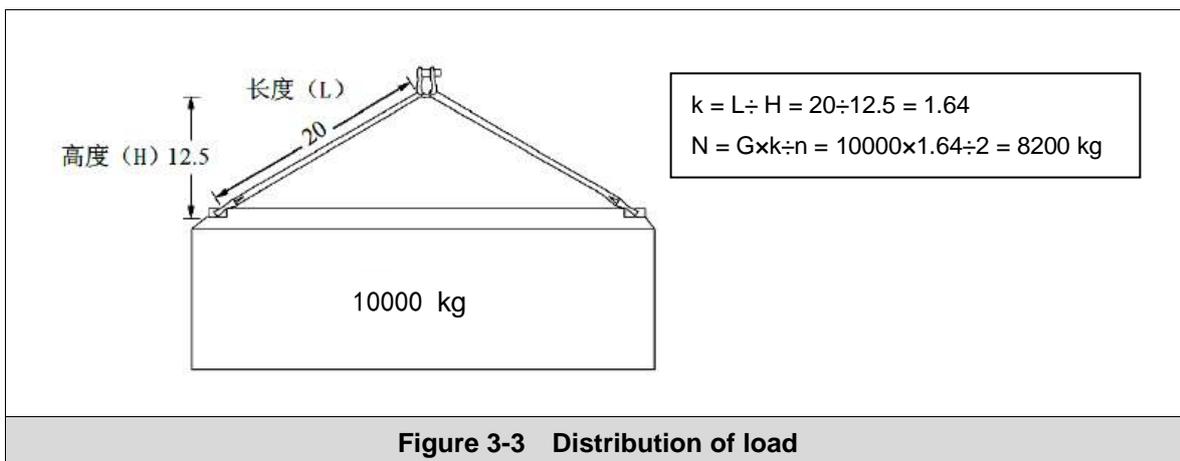


Figure 3-3 Distribution of load

3.3.6 Angle of coefficient of load

a) Adding more sling legs on the load to be lifted not only helps to better control the load but also helps to distribute more weight on legs.

b) The strength on the sling reach the maximum under the force of perpendicular. The sling bears larger strength if it is pulled with a certain angle. The rated bearing capacity of the sling reduces gradually with the decrease of the included angle between legs and the horizontal line.

c) If the sling is stretched with a certain angle, the bearing capacity of the sling stretched in a straight line multiplied by an appropriate load angle coefficient equals the bearing capacity of the sling.

If the load angle coefficient is determined, refer to the table below for sling angles of different coefficients. Sling angles of 60° or larger than 60° are recommended in all safety standards. Sling angles of smaller than 45° are not recommended.

Table 3-3 Load angle coefficient

Sling angle (°)	Load angle coefficient	Notes
90	1	Safe
85	1.004	Safe
80	1.015	Safe
75	1.035	Safe
70	1.064	Safe
65	1.104	Safe
60	1.155	Safe
55	1.221	Safe
50	1.305	Safe
45	1.414	Safe
40	1.555	Unsafe
35	1.742	Unsafe
30	2.000	Unsafe
25	2.364	Unsafe
20	2.924	Unsafe
15	3.861	Unsafe
40	1.555	Unsafe
35	1.742	Unsafe

3.3.7 Safety guidelines for slings

- a) Calculate the weight and the balancing point of the load before lifting to check if slings are properly selected. Check the slings to see if the load is properly secured.
- b) Do not drag the load if it is placed on the ground. Otherwise, the sling will be damaged.
- c) Position the hook directly over the load and put the sling on the load hook so as to achieve the maximum lifting efficiency without stressing the sling.
- d) Make sure that the load is not secured or frozen on the ground.
- e) Pull the sling straight slowly to guard against shock on the load. Start the hoisting mechanism carefully so as to avoid jerking at the beginning of lifting; accelerate or decelerate slowly.
- f) Check the tension of the sling. Lift the load off the ground for a few inches and then stop to check if the load is balanced; make sure that there is no obstacle around. It is prohibited to sit on the hook or the load.
- g) All persons at the work site must be informed of crane movements in advance, including hoisting, shifting and lowering. Operators and riggers should pay close attention to the load at all times.
- h) Sling must not be shortened with knots or shortened temporarily by other devices.

- i) Branches of the sling cannot be tangled together.
- j) Sling must not be overloaded.
- k) Sling with basket hitch can keep the balance of the load and avoid load slippage.
- l) Sling must be securely attached to the load.
- m) Pad a gasket between the sling and the sharp edge of the load to avoid damage.
- n) There is no obstacle piled around the suspended load.
- o) It is prohibited to approach the load to be lifted or the suspended load.
- p) Do not put hands or fingers between the sling and the load when the sling is about to be tensioned.
- q) Do not pull the sling below the load when the load is still suspended in the air.

! DANGER

No one shall ride on the hook or the load.

3.3.8 Downward pulling

For a rigger, a commonly used way to control a suspended load is downward pulling. As shown in the Figure below, downward pulling helps to avoid load swinging.

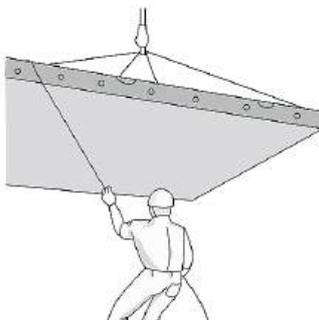


Figure 3-4 Illustration of downward pulling

! CAUTION

1. A rigger must not stand right below a suspended load. The rule of “No Standing Under the Boom” must be strictly observed.
2. The connecting point of downward pulling must be kept far away from the gravity center of the load.
3. The strength of downward pulling must be properly controlled. Otherwise the crane may topple over.
4. Do not tie the downward pulling rope to the body.

3.4 Requirements on work site

3.4.1 Selection of work site

It is extremely important to choose an appropriate work site for the crane in order to minimize the risk of accident at the very beginning. The following aspects should be considered:

- Crane operation is carried out in a radius as small as possible.
- No obstacle in the working radius.
- The ground has sufficient bearing capacity.

DANGER

The most important requirement for crane operation is that the operation must be carried out on a solid ground that provides sufficient bearing capacity.

3.4.2 Avoid slopes and trenches

The crane must not get too close to slopes or trenches. A safe distance must always be kept according to the category of soil.

A safe distance should be measured from the bottom of the trench and the following conditions must be met:

- Soft or backfilled soil = 2x depth of trench ($A_2 = 2 \times T$)
- Hard or natural soil = 1x depth of trench ($A_1 = 1 \times T$)

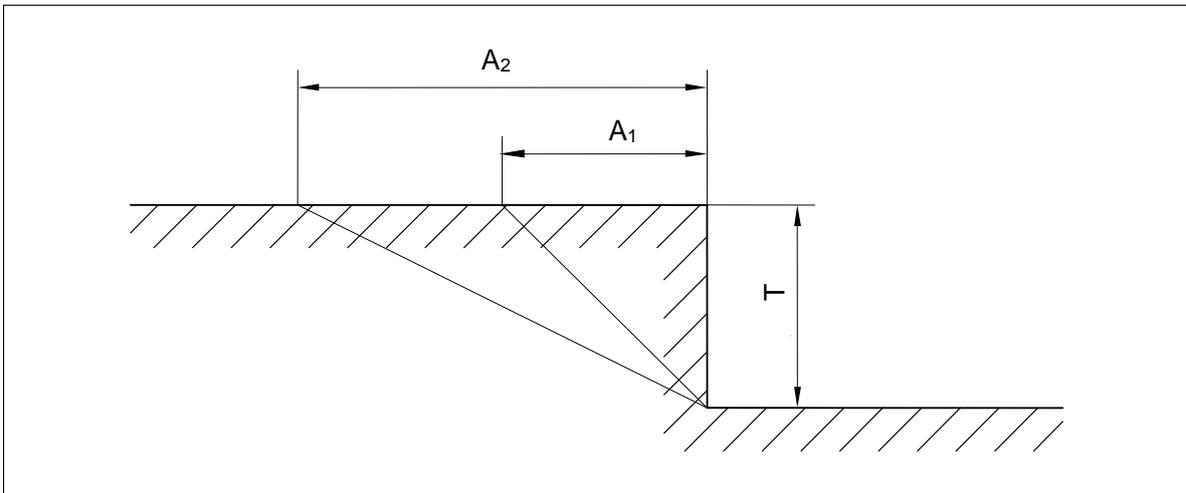


Figure 3-5 Safe distance from a slope or a trench

DANGER

The slope or the trench must be filled up firmly if it fails to keep a safe distance. Otherwise, there is a risk that the edge of the slope or the trench will collapse.

3.4.3 Requirements on the ground

Check the bearing capacity of the ground to see if it meets the requirement of the operating mode. The following must be satisfied:

$1.25 \cdot P_{max} < [\delta]$; P_{max} : the maximum grounding pressure of the crane; $[\delta]$: bearing capacity of the ground.

The bearing ground must not sink during operation. Take appropriate measures according to different bearing capacities of ground. Bearing capacities of different grounds are listed in the table below for reference:

Table 3-4 Bearing capacities of different grounds

Types of ground		Load bearing capacity [δ] MPa	
a) Soil, naturally compacted		0~0.1	
b) Clearly undisturbed natural soil	1. Mud, peat, marshy soil	0	
	2. Non-cohesive ground, compactly layered soil	Sand of medium quality	0.15
		A layer of gravel	0.2
	3. Cohesive ground	Sludgy	0
		Soft	0.04
		Firm	0.1
		Semi-compact	0.2
		Hard	0.4
	4. Solid rocks with fissures	not weathered and in favorable locations	1.0
		Compact and solid layer	1.5
Solid or column-shaped layer		3.0	
c) Artificial solid ground	1. Asphalt road	0.5~1.5	
	2. Concrete	Type B I	5~25
		Type B II	35~55



1. If there is any doubt about ground bearing capacity, the ground condition must be checked with tools

2. The ground of the work site must be able to support various types of loads that exceed 125% of the rated loading capacity of the crane.



It is prohibited to operate the crane when the ground bearing capacity is unknown. Otherwise there might be a risk of accident.

3.4.4 Safety inspection of work site

The ground of the work site must be firm and flat. The gradient must not exceed 1%.

The crane must be checked thoroughly before operation in the following aspects:

- a) Moment limiter must be set according to the actual operating mode of the crane.
- b) Operate the crane strictly in line with lifting capacity charts.
- c) Operator must know the weight and dimensions of the load before operation.
- d) All slings, riggings and fixed pulley blocks must meet the requirement of safety operation.
- e) Make sure that the total weight of slings, ropes and the actual load does not exceed the rated lifting capacity.



Lifting is a dangerous operation. Operator should be highly vigilant on the condition of the crane before and during operation.

3.5 Weather for operation

a) The permitted temperature range for crane operation is $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$. The humidity should not exceed 85%.

b) The permitted wind speed for the crane operation is at most 9.8 m/s when the crane is working.

c) The crane is fitted with main boom, and the out-of-service wind speed should not exceed 21 m/s. The crane is fitted with main boom as well as jib, and the out-of-service wind speed should not exceed 15 m/s. The whole boom frame must be laid on the ground.



1. It is prohibited to operate the crane not within the permitted ambient temperature.
2. It is prohibited to operate the crane with a non-working wind speed.
3. The crane operation must be stopped if the wind speed reaches the non-working wind speed and the boom must be lowered down onto the ground.

3.6 Electrical safety

If the crane is operated in the vicinity of transmission systems (e.g. transmitters), strong electromagnetic field will be generated there. In any case, contact Zoomlion representatives before

operating the crane near a transmitter. And also, please seek advice from experts of high-frequency.

- a) The whole crane must be totally grounded. Check visually or with a simple tester to ensure that ladder, cab and cable pulleys are grounded.
- b) All persons working on the crane or with large metal objects must protect themselves from burns by wearing non-conductive gloves and suitable clothing while working.
- c) If you feel a little increase in temperature, there is no need to panic. It is caused by the influence of high-frequency ray on the tools, structural steel member or undercarriage. At this time, stop the crane safely and leave it at once.
- d) The temperature of objects affected by high frequency radiation depends on their size. For example, the crane, the undercarriage, and coverings are hotter.
- e) Do not collide with loads of other cranes (arcing) when the crane is moving, because combustion damages the wire rope. Please contact with the supervisor immediately and check the rope once the combustion occurs.
- f) An insulator is required at all times between load hook and sling, which must not be removed away.
- g) The rope must not get in touch with the insulator!
- h) Do not touch the crane when it is lifting up or lowering down a load without an insulator.
- i) Do not work with a bare upper body or in short pants.
- j) If it is possible, move the load horizontally to reduce the absorption of high-frequency radiation.
- k) The load must be grounded or insulated first (place a rubber cloth between the tool used and gloves) when manual operations are required.
- l) Fasten the belt to avoid accident when working high above the ground.
- m) Inflammables must be disposed of (such as refueling) at least 6m away from the place where sparks are very likely to form due to the large metal plate. Only rubber hoses of high quality can be used for refueling.
- n) Any accident or unexpected event must be reported immediately to the local project manager or safety engineers.



These electromagnetic fields can pose direct or indirect danger to persons or objects, for example:

- 1. Effect on human organs due to too high temperature.**
- 2. Danger of burns or inflammation due to too high temperature.**
- 3. Spark or electric arc formation.**

3.7 Protection of underground cables

With special equipment, the crane can be also used underground.

Possible damages when working underground:

- a) Underground electric cables.
- b) Coal gas or natural gas pipes.
- c) Synchronized transmission cable of telephone, TV and data.
- d) Sewage pipes, district heating supply pipes, etc.

Measures should be taken to avoid damages on underground facilities when the working plan is made:

- a) The responsible unit for the construction is in charge of collecting accurate information of underground cables that may exist at the working site of the crane so as to guarantee the safety of the crane working near cables.
- b) Obtain related information from relevant public-service companies.
- c) Examine completed planar graphs of:
 - 1) Public service companies (including electric power companies, gas companies, and water companies);
 - 2) Cable users (telecom companies, factories, and transport companies);
 - 3) Homebuilders.
- d) Only latest and effective planar graphs can be used.
- e) If there is any change of the construction plan or the construction area is enlarged, please consult companies of public utility about the condition of underground cables.
- f) Locate underground cables with a positioning device if it is not clear how the underground cables are distributed.
- g) Inform related public utility companies, cable users and local government of the construction and ask for a written permission from them.
- h) Construction units should consult together when there are more than one construction unit are involved. All construction units should know well the latest information of underground cables and pipes.

Safety precautions for underground operation:

- a) Do not start the operation until approvals from public utility companies and cable users are obtained.
- b) The crane operator must obtain all related information about exact locations of all underground cables before starting work. The planar graphs must be readily accessible at the construction site.
- c) Operations near underground cables and pipes must be carried out carefully. Observe all national safety guidelines and special guidelines of public service companies and take safety measures accordingly.
- d) In the event of any unexpected encounter with underground cables, warning signs or protective coverings, stop the crane immediately and inform superior department of the situation.

- e) It is prohibited to uncover underground cables with the crane, which must only be uncovered manually with blunt tools.
- f) All exposed underground cables must be secured so as to avoid swinging, sliding or even deformation.
- g) Stabilize cable ducts and secure the edges to avoid caving.

Precautions for operation near gas pipes:

- a) Report to the related gas company if the location of a gas pipe is changed or the protective casing is damaged. These gas pipes can only be reinstalled underground after inspection, maintenance and approval from professionals of the gas company.
- b) All devices (fittings, valve boxes, manhole covers, etc.) of the gas supply network around the work site must be accessible.
- c) Existing marks and information signs must not be covered, rearranged or removed.

Consequences brought by gas escaping from damaged gas pipelines:

- a) Forms an inflammable gas-air mixture around the affected area.
- b) Brings damages to persons or the equipment if it is in high pressure.
- c) Endangers not only persons and equipment at the work site but also passers-by and residents in the neighborhood.

If a gas pipe is damaged and the gas escapes or there is a possibility that the gas escapes, the operator should:

- a) Stop the operation immediately.
- b) Leave the crane after shutting down the engine and other fuel-powered units.
- c) Warn persons around not to smoke or make any spark.
- d) Shut down all equipment for the construction and engines of equipment around.
- e) Clear the dangerous area and secure a wide area with barriers or cordons. Do not allow accesses of unauthorized persons.
- f) Inform the gas company of the following information:
 - 1) Degree of damage on gas pipe.
 - 2) Specific location of the working site.
 - 3) Surroundings of the site.
 - 4) How long ago a similar accident occurs.
 - 5) A name and a phone number for a return call.
- g) If there is the slightest suspicion that the gas is leaking into a building, alert all the local residents by knocking on doors or yelling. Do not ring door bells or call them by telephone, which may trigger an explosion.
- h) Do not turn on any electrical device if gas can be smelt in the house, especially around the area where it leaks. Open all doors and windows widely for ventilation and leave the house

- immediately.
- i) Evacuate all the residents of and near the building with the help of the police and firemen if the gas pipe is severely damaged.
 - j) Persons working at the site:
 - 1) Should assist professionals from the gas company to repair the pipeline.
 - 2) Must not leave the working site without the permission of the gas company.
 - k) Operation on the site must not be carried out without the permission of the gas company.

 **WARNING**

- 1. It requires specialized knowledge to extinguish a gas fire.**
- 2. A gas fire that has already been extinguished can flare up again if more gas escapes continually.**
- 3. Measures to take in the event of a gas fire:**
 - a) Inform the local fire department.**
 - b) Never try to extinguish the fire before the arrival of firemen unless lives or major properties are threatened.**
 - c) It is better to let the gas burn if there is no danger caused by the fire. The fire will die out once the gas is cut off by the gas company.**

3.8 Measures of safety inspection

Operator must be sure of the fact that the crane is in a safe condition before operation. All safety devices, such as moment limiter, lowering limiter and brake, must be in a normal working condition.

- a) Moment limiter must be set according to the actual operating mode of the crane.
- b) Operate the crane strictly in line with lifting capacity charts and lifting height curves.
- c) Operator must know the weight and dimensions of the load before operation.
- d) All slings, riggings and fixed pulley blocks must meet the requirement of safety operation.
- e) Make sure that the total weight of slings, ropes and the actual load does not exceed the rated lifting capacity.

3.9 Safety operation of the crane

3.9.1 Working conditions for the crane

- a) All components of the crane are in the breaking-in period at the preliminary stage. So, for the first 100 operating hours, the working load should not be too large and the working speed should not be too high. The maximum lifting load cannot exceed 80% of its rated load. The maximum working speed is strictly prohibited.
- b) The crane must be operated with no malfunctions and maintained and inspected regularly.
- c) Ground of the jobsite must be firm and flat and the gradient must not be larger than 1/100. The crane should be level and the supporting ground should not collapse during operation. If the

ground is soft, a steel plate should be placed under the track pad.

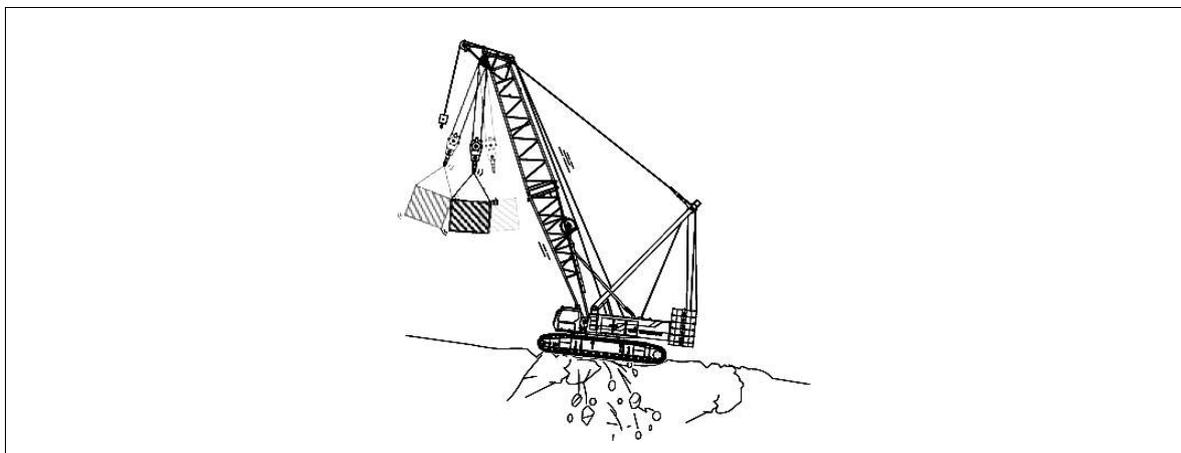


Figure 3-6 Pay attention to the ground

d) The permitted temperature range for crane operation is $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$. The humidity should not exceed 85%. However, high humidity up to 100% is only permitted for a short period of time. The crane should be operated and supported on a ground lower than 1000 m above sea level. If there are special needs for temperature and height above sea level, please consult professionals of Zoomlion.

e) The permitted wind speed for the crane operation is at most 9.8 m/s when the crane is working. The crane is fitted with main boom, and the out-of-service wind speed should not exceed 21 m/s. The crane is fitted with main boom as well as jib, and the non-working wind speed should not exceed 15 m/s. It is prohibited to use the crane when the wind speed exceeds the maximum limit and the boom must be lowered down onto the ground. Refer to Table 3-5 for different levels of wind speed.

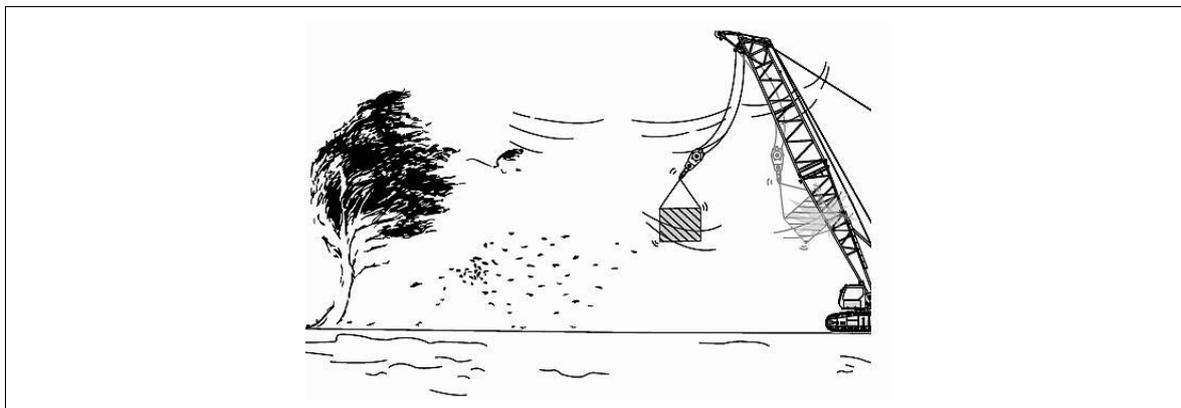


Figure 3-7 Pay attention to wind speed

Table 3-5 Reference for wind speed

Strength		Wind effect	
Grade	Type	Speed (m/s)	Visible effect
0	Breezeless	0~0.2	No wind, smoke rises straight up
1	Light air	0.4~1.4	Wind direction is shown only by observing the trail of smoke, not by the wind sock
2	Light breeze	1.6~3	Wind can be felt on the face, the leaves rustle, wind sock moves slightly
3	Gentle breeze	3.4~5.3	Leaves and thin twigs move. Wind extends a small breeze flag.
4	Moderate breeze	5.5~7.8	Swirls up dust and loose paper, moves twigs and thin branches
5	Fresh breeze	8~10.6	Small deciduous trees begin to sway, foam forms at sea.
6	Strong breeze	10.8~13.7	Thicker branches move; telephone lines begin to whistle, umbrellas are difficult to use
7	Stiff wind	13.9~17	Entire trees swaying; difficult to walk into wind
8	Gale force wind	17.2~20.6	Breaks twigs off trees, walking becomes difficult
9	Gale	20.8~24.5	Minor damage to property(chimney tops and roofing tile are blown off)
10	Severe gale	24.7~28.3	Trees are uprooted, significant damage to property



The operator must know well the wind speed before operation. Otherwise stop the operation and lower down the boom.

f) A safe distance must be kept between any part of the crane and a high-voltage power line. Otherwise there might be an accident of electric shock as shown in Figure 3-8.

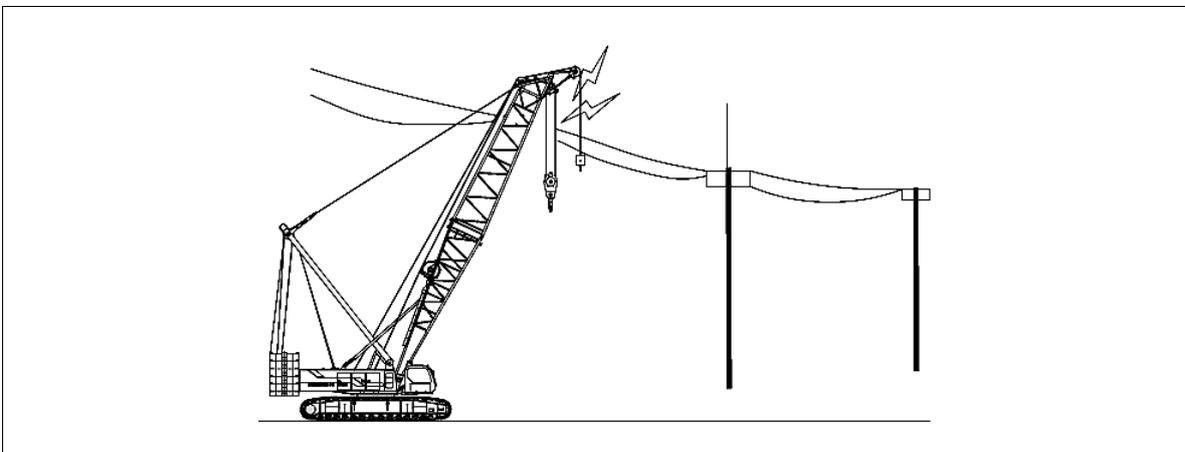


Figure 3-8 Pay attention to high-voltage power line

Safe clearance between the crane and high-voltage power lines (for reference):

Table 3-6 Safe clearance between the crane and high-voltage lines

Voltage of electric transmission line V,kV	$V \leq 1$	$1 < V \leq 15$	$15 < V \leq 40$	$40 < V \leq 100$	$100 < V \leq 200$
Safe clearance m	1.5	3	4	5	6

! CAUTION

If there is still electric discharge when all measures have been taken, you should:

1. Keep calm and do not leave the operator's cab.
2. Tell persons around not to move around or touch the crane.
3. Drive the crane out of the dangerous zone.

! DANGER

Failure to observe the above points will cause serious accident and damage!

3.9.2 Notes on safety operation

- a) No standing under the boom during operation.

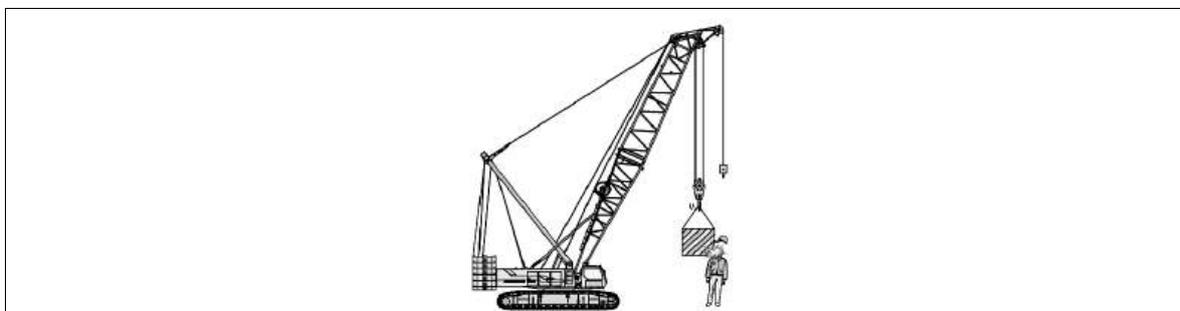


Figure 3-9 No standing under the boom during operation.

- b) No standing on the load.

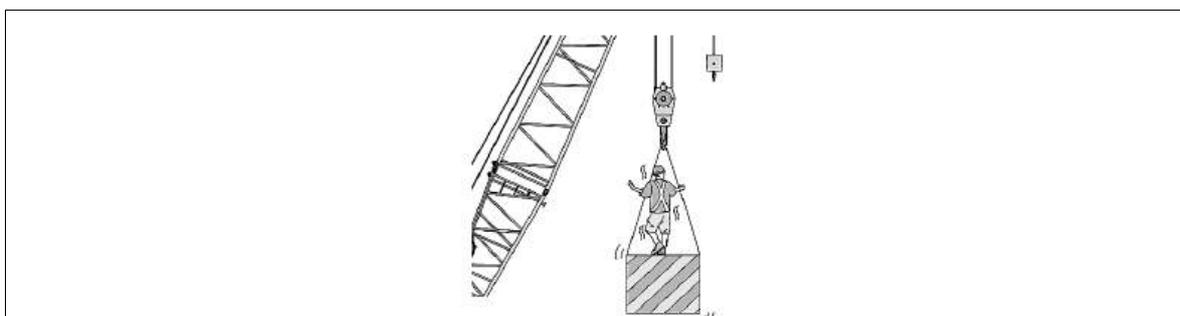
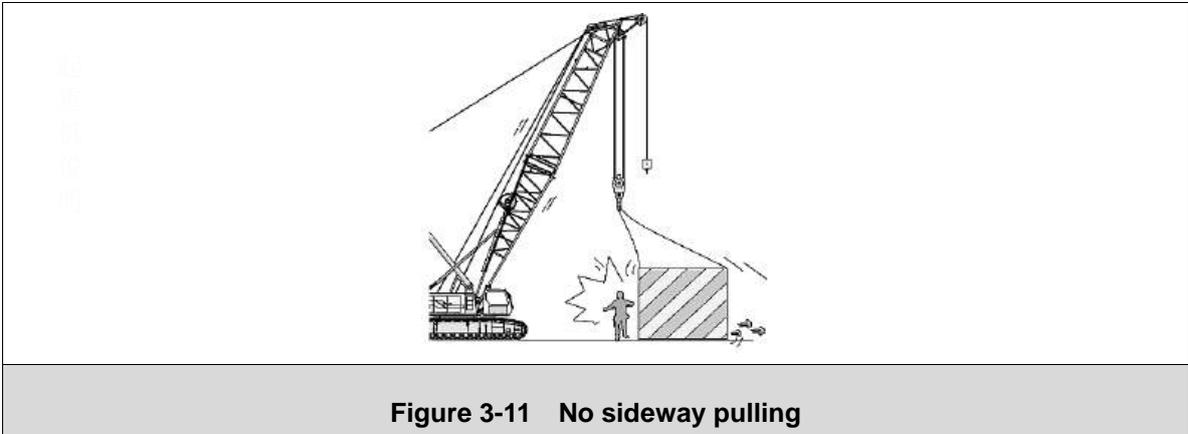
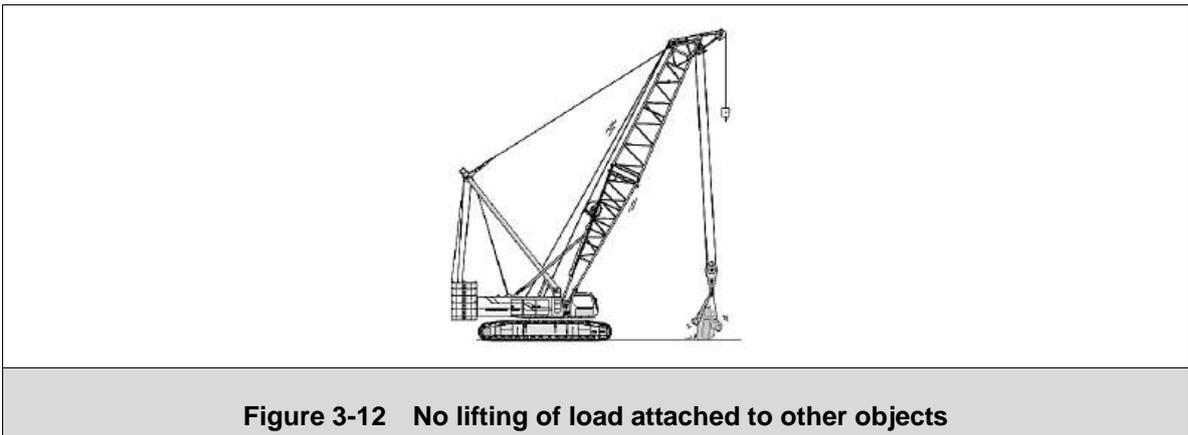


Figure 3-10 No standing on the load

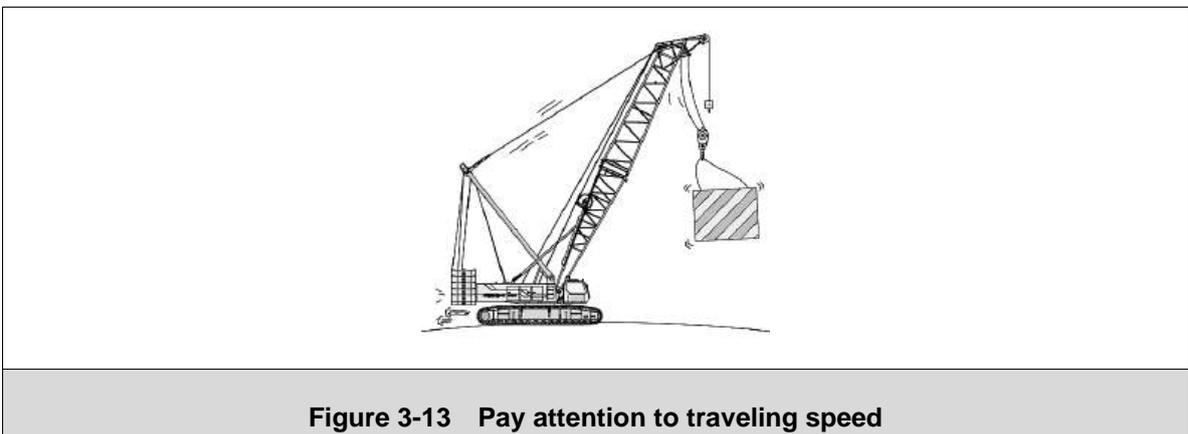
- c) Overloading, pulling sideways and lifting from stacked loads are strictly prohibited.



- d) It is strictly prohibited to lift a load buried or frozen under the ground. It might lead to crane tilting, damage on boom, or other accidents when the load to be lifted is adhered or frozen to other objects. Please make sure that the load is not connected with other objects before lifting.



- e) The crane can travel with a load. The ground must be firm with a gradient of smaller than 1%. The traveling speed must not exceed 0.1m/s. The boom must be right in front of the crane and the off-ground height of the load must not exceed 50cm. The longer the boom is, the slower the crane travels. Reduce the off-ground height of the load as much as possible.



f) If the crane is operated in the vicinity of transmission systems (e.g. transmitters), strong electromagnetic field will be generated there, so measures should be taken to protect the crane against high frequency interference and all workers who stand on large metal plate should wear special isolating gloves and clothes to avoid being burnt.

g) Rope on hoisting drum must be wined for no less than three circles in any circumstances.

h) Operator must not leave the cab when the load is still lifted in the air.

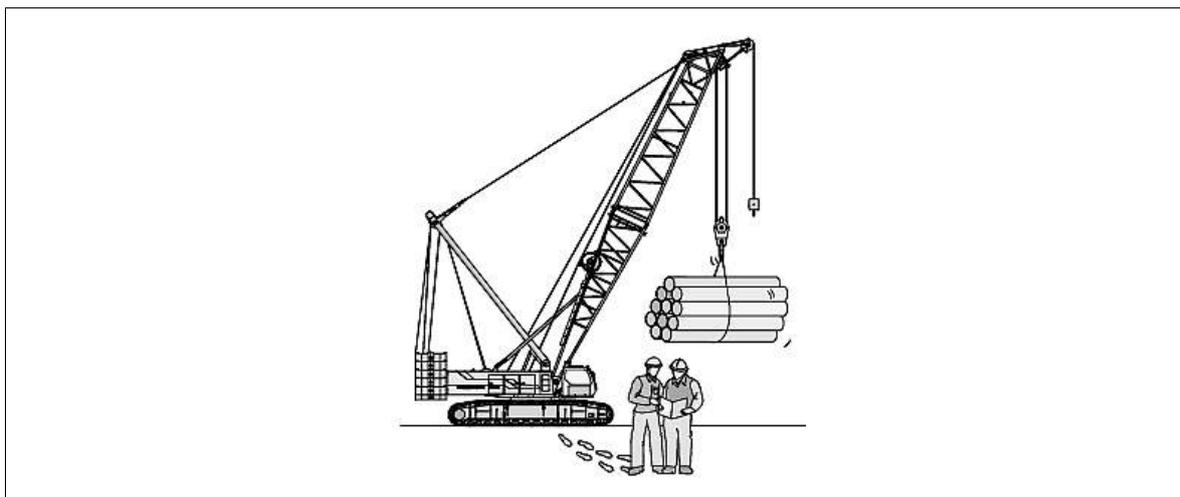


Figure 3-14 Do not leave the cab during operation

i) The operation should be carried out stably and gently. Never operate joystick jerkily and carry out switchover operation abruptly.

j) When the actual load reaches 90% of the rated lifting capacity, the load moment limiter will send out an alarm, to which high attention should be attached.

k) Climbing on/ down the crane with less attention might lead to serious accident. Please make sure that the crane has been stopped safely before climbing on/down the crane. Hold to the handrail tightly and stamp tightly when climbing.

l) It is prohibited to make any modification to the crane without permission. Otherwise one should be responsible for his/her own action. It is also strictly prohibited that the crane is maintained or components are alternated by nonprofessionals.

m) Stop the crane if one of the following conditions occurs:

- 1) The crane is overloaded or the weight of the load is uncertain.
- 2) The load falls down due to improper binding or hanging.
- 3) No protective mat is used between edges of the load and the wire rope.
- 4) Load or commanding signals cannot be recognized when the working site is dim and dusky.
- 5) There are defects or damages of the structure or components that might impair safe operation of the crane, for example, fail of brake and safety device, or damaged wire rope, etc.

n) Leave an ample space for stopping the crane, otherwise persons nearby may be hurt by

crane counterweight due to narrow distance between counterweight and surrounding building.

o) Keep the windows of crane operator's cab clean to ensure good visibility, stop crane operation immediately in case of poor visibility, and replace the broken window as soon as possible.

p) Keep the crane clean and dry because wet platform, ladder, tools, rubbish or other loose parts may lead to falling down.

q) Drive the crane carefully no matter when it is in the working area or not. Pay special attention to surroundings such as overhead power line, low-lying land, narrow clearance, restriction to bridge and road, uneven ground and gradient of road. If necessary, appoint a signalman to assist the operator to move the crane. Lock slewing mechanism during traveling.

r) It is more dangerous that two cranes carry out lifting operations together. Therefore, a careful calculation must be made before commencing the work, and the following important requirements for this type of operation must be observed:

1) The load is not casually attached to the crane. It must be calculated carefully so that the actual lifting capacity of the crane cannot exceed the rated lifting capacity.

2) Make sure that each lifting tackle can bear specified load weight which is calculated during design.

3) Crane operator, signalman and other workers must evaluate the operational planning together before operation.

4) Make sure that the crane can move properly in the whole process of operation.

s) It is obliged for the operator to take the following measures before leaving:

1) Lower the load on the ground and lower the boom if necessary;

2) Brake or lock the slewing gear;

3) Brake or lock the traveling gear;

4) Shut down the engine;

5) Lock the function-locking lever.

t) Do not wear clothes with loose collars or jewelry in order to avoid being dragged into a moving part of the crane.

u) Do not park the crane near a dyke that is possible to collapse or a low-lying area that might be washed by rainwater.

v) Pull out the key when the crane is unattended so that the crane will not be accidentally started by unauthorized persons.

w) It is strictly prohibited that the crane is maintained or components are alternated by nonprofessionals.

3.9.3 Inspections and measures for crane operation

3.9.3.1 Inspections and matters need attention before operation

Operator should check the crane in the following aspects before operation:

a) Check the work log to make sure that all routine inspections and maintenances are completed.

b) Check to see if hoisting limiter, boom angle indicator, tilting-back support and other safety

- devices function normally.
- c) Check load-bearing components, such as wire rope (hoisting rope, derricking rope, anchoring rods, etc.), outrigger for boom section, load hook, and slings.
 - d) Check to see if there are missing bolts, nuts and pins and if there are cracks or damages on components.
 - e) Make sure that there is no unauthorized modification, such as increase and decrease of counterweight, incorrect repair of boom section, etc.
 - f) Check to see if indicators on each instrument are normal after the engine is started.
 - g) Check fuel oil and hydraulic oil.
 - h) Check if all controlling mechanisms can function normally.
 - i) Check the brake and the clutch. Test the performance of the brake by lifting the load off the ground and keeping it suspended in the air for a short while.
 - j) Keep communications between the operator and riggers.
 - k) Estimate the weight and dimensions of the load to be lifted in advance.
 - l) Crane operation can be carried out within the minimum working radius. Make sure that there is no obstacle in the moving radius and the ground of the jobsite is able to support all kinds of loads.
 - m) Make sure that there is no obstacle within the working radius and the operator can see the load clearly from the cab. Use cordon to isolate the construction site from the outside, and check if the communication between operator and signaller is kept smooth so as to ensure that the operation is safe.
 - n) Crawler crane, the ground of the jobsite must be firm, level and flat. Never operate the crane on a soft and uneven surface or on a ground of high water content or covered with frozen soil. Trenches need to be strengthened or processed through slope settling if the crane is operated around in order to avoid collapse or landslide. The crane is very likely to tilt over if the ground does not have adequate load-bearing capacity. In this case, crosstie, steel plate and concrete base should be padded under crawlers to distribute load so that the load-bearing capacity of the ground will not be exceeded.
 - o) Make sure that the crane is level and the inclination should not exceed 1% ($\pm 0.57^\circ$).
Method of checking the levelness of the crane visually: when the crane is placed, lift the hook off the ground to a proper position where it can swing freely, and then stand in front of the crane to make observation.
 - 1) For short booms (<84m): there is basically no deviation between the hook center and the center of the slewing table and the boom system.
 - 2) For medium-long and long booms (<120m): the deviation between the hook center and the center of the slewing table and the boom system should be smaller than 1/4 of the boom width.
 - 3) For long booms (≥ 120 m): the deviation of the hook center and the center of the slewing table and the boom system should be smaller than 1/2 of the boom width.

- 4) If there is a deviation of the hook, put the gradiometer on the surface of the slewing ring to measure the gradient. The inclination of the slewing surface should not exceed 1% ($\pm 0.57^\circ$).

Operators should wear protective clothing and other protective equipment as far as possible. Protective equipment cannot provide protection of 100%, so you should keep the safety awareness at all times.

3.9.3.2 Inspections and matters need attention during operation

a) Estimate the weight and dimensions of the load to be lifted in advance. Make sure there is no illegal operation such as overloading, diagonal pulling and dragging and hoisting of fixed load. Stop the crane immediately and lower the load onto the ground immediately if there is any illegal operation.

b) Use slings (rope or chains) correctly and make sure that the vertical line passes through the center-of-gravity of the load.

c) If any part of the crane or load handling devices comes into contact with the high-voltage power line, or an emergent condition occurs, the operator should stop the vehicle at once.

d) Operation must be carried out strictly in accordance with lifting capacity charts. Avoid too fast traveling or slewing. Avoid lifting the load on an uneven surface or swinging of suspended load.

e) Avoid slewing and traveling when the load is still on the ground; avoid diagonal pulling of the load.

f) Avoid collision between the crane and the load or additional devices for load hoisting.

g) If the crane gets caught in a thunderstorm during operation, the following measures should be taken at once:

- Stop the operation immediately;
- Lower the load and the boom on the ground;
- Brake or lock winches and the slewing mechanism;
- Shut down the engine and cut off the power of the load moment limiter and limit switches.
- Inform everyone to leave the crane immediately.

h) Check the crane in the following aspects if it struck by lightning:

- Check if there are burnt or damaged components;
- Check the performance of electrical parts of the load moment limiter.
- Check if there are abnormalities.

i) Take the following measures immediately once an earthquake occurs during crane operation:

- Stop the operation immediately;
- Lower the load and the boom onto the ground;
- Brake or lock the winch and the slewing gear;
- Shut down the engine and cut off the power supply of the load moment limiter and limit switches.
- Inform everyone to leave the crane immediately.

j) A safe distance must be kept if the crane works in the vicinity of power cables that are not

insulated or when the dangerous zone is not fenced off.

k) If any part of the crawler crane or the sling gets in contact with a high-voltage line, the safest way for the operator is to stay still in the operator's cab until the danger is eliminated. No one should touch the crane. If the operator has to leave the crane, the best way is to jump off instead of climbing down.

l) The operators' cab should be equipped with an emergency hammer, which can be used to smash windows in an emergency so that the operator can run away from the cab.

m) The load moment limiter must be kept on once it is triggered until the crane is not overloaded.

n) The load moment limiter will not fulfill its function as a safety device if it is not set according to the actual operating mode of the crane.

o) Check to see if the pressure sensor, the angle indicator, and the tension force sensor are functional.

p) The crane may topple over backward if the load suddenly jumps out of the hook since the tension on the boom make it jerk back violently.

q) The operator should stare at the load at all times and pay close attention to the load hook or the hook pulley when the crane is moving without a load. The operator should follow instructions from the signalman. If he cannot see the load, the hook or the pulley. These instructions can be sent out in the form of hand signals or through interphones. Whatever method is used, both the operator and the signalman must be vigilant enough to eliminate the risk of misunderstanding.

3.9.3.3 Inspections after operation

a) When the crawler crane and auxiliary lifting devices are in non-working conditions, never park the crane near a dyke that is very likely to collapse or at a low-lying area that might be washed away by rainwater.

b) Lower down the load onto the ground or lower the boom if necessary. Brake or lock the slewing gear and the traveling gear.

c) Shut down the engine or cut off the power supply. Lock the function-locking lever.

d) Check if there is any leakage and repair it immediately.

e) Do some cleaning on moving parts, exposed areas of piston rods, etc., if necessary.

f) Check if bolts and nuts are fitted tightly. Any defect found should be eliminated at once.

g) Keep a record of operation conditions and abnormal symptoms.

h) Check if the quantity of tools and accessories meet the requirement.

i) Lock the operator's cab and safety devices.

j) Take precaution measures against storm and lightning strike.

k) Take anti-freezing measures in winter.



To avoid engine from freezing in cold winter. Drain all cooling water if the crane is not filled with anti-freezing solution.

3.10 Safety signs

Safety signs are attached on the crane and key parts of the crane.

3.10.1 Signs in operator's cab

Safety signs attached in the cab are as follows:

Table 3-7 Safety signs in the cab

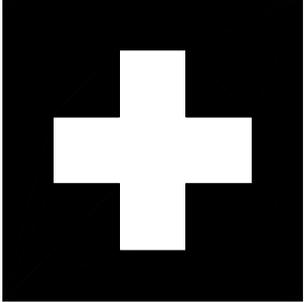
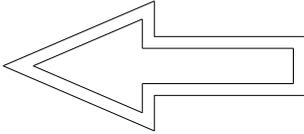
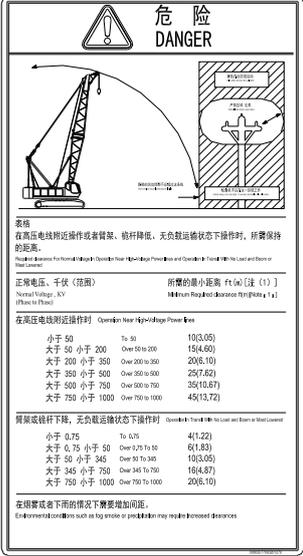
		
<p>First aid kit</p>	<p>Fire extinguisher</p>	<p>Drain port</p>
		
<p>Operation direction</p>	<p>No pushing</p>	<p>No climbing</p>
		
<p>Emergency exit</p>	<p>Attentions</p>	<p>Dangerous areas</p>

Table 3-7 Safety signs in the cab (continued)

<p>Caution for operation of fixed pin spindle</p>	<p>Caution for reading the operating manual</p>
<p>Warning for no free-falling during the operation of H1</p>	<p>Warning for no extending of crawler carrier when rear counterweight is attached</p>
<p>Nameplate of the crane</p>	<p>Label for environmental protection information</p>
<p>Signs for pedals</p>	

3.10.2 Signs on slewing table

Safety signs attached on the slewing table are as follows:

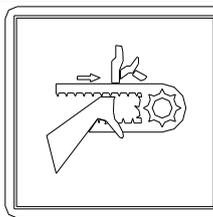
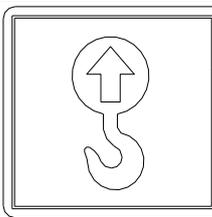
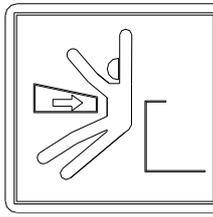
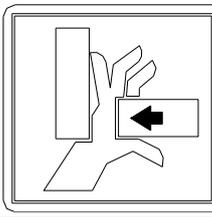
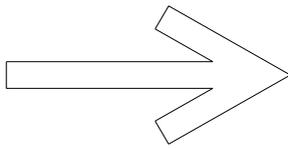
Table 3-8 Safety signs on the slewing table

Caution for stairs	Access prohibited	Warning for suspended load
Master switch of power	Risk of burning	Fire extinguisher
Hydraulic oil tank	Drain port	Oil level indicator (highest)
Diesel oil tank	Oil inlet port	Oil level indicator (lowest)
Warning for operating state	Direction of traveling	
Caution: Be careful in the working radius		

3.10.3 Signs on the chassis

Safety signs attached on the chassis are as follows:

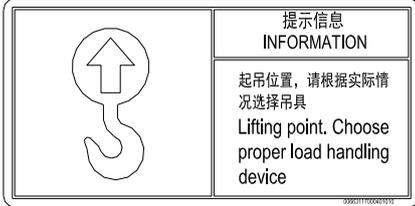
Table 3-9 Safety signs on the chassis

 <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">警告 WARNING</p> <p>运动部件绞手，切勿靠近 Keep away from moving parts</p> </div>	 <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">提示信息 INFORMATION</p> <p>起吊位置，请根据实际情况选择吊具 Lifting point. Choose proper load handling device</p> </div>
Warning for entanglement	Lifting point
 <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">危险 DANGER</p> <p>当心支腿外伸，工作区域 严禁站人 Keep off folding brackets/additional supports</p> </div>	 <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">注意 CAUTION</p> <p>活动部件，小心夹手 Keep away from moving parts</p> </div>
Caution for outrigger	Warning for moving parts
	
Direction of traveling	

3.10.4 Signs on the boom

Safety signs attached on the boom are as follows:

Table 3-10 Safety signs on the boom

	
Lifting point	No standing under the boom

CAUTION

1. When a safety sign is damaged or becomes illegible, please order a new one from the appointed service supplier.
2. Do not cover or take off any safety sign.
3. If safety signs are covered with dust and dirt, clean them in time.
4. The operator's cab should be equipped with an emergency hammer which can be used to smash the window in an emergency so that the operator can run away from the cab.

3.11 Hand signals for controlling crane operation

Hand signals are illustrated in Table 3-11.

Table 3-11 Illustration of hand signals

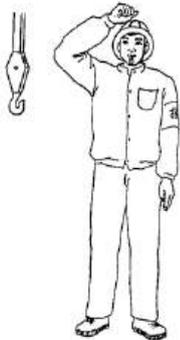
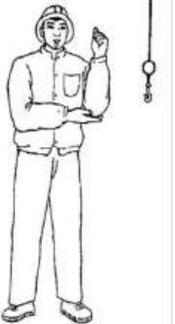
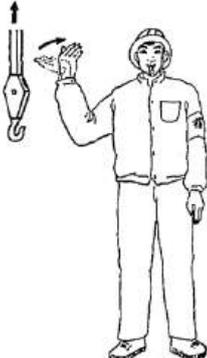
No.	1	2	3
Signal	Prepare	Use main hook	Use auxiliary hook
Gesture	Hold the right arm stretched out over the head, the palm facing forwards.	Tap fist on the safety helmet, then give further hand signals.	Bend the left hand and hold it upward, tap the underside of the elbow with the right hand, then give further hand signals.
Illustration			
No.	4	5	6
Signal	Lift hook	Lower down hook	Lift hook slightly
Gesture	Bend the right arm and hold it upwards. The palm faces forwards. The hand makes small, circular movements.	Hold the right arm down with a 30° angle to the body. The extended index finger points downwards. The hand makes small, circular movements.	Stretch out right arm. The palm faces upwards. Wave the hand up repeatedly.
Illustration			

Table 3-11 Illustration of hand signals (continued)

No.	7		8
Signal	Rotate hook		Lower down hook slightly
Gesture	Turn left: With right forearm vertical, the palm of the hand facing outwards, lower the forearm sideways horizontally, fingers pointing at the direction of rotation.	Turn right: With left forearm vertical, the palm of the hand facing outwards, lower the forearm sideways horizontally, fingers pointing at the direction of rotation.	With arm extended downwards with a 30° angle to the body, palm of the hand facing downwards, wave hand down repeatedly.
Illustration			
No.	9		10
Signal	Rotate hook slightly		Indicate landing location
Gesture	Turn left: With right forearm vertical, the palm of the hand facing outwards, move forearm horizontally and repeatedly, fingers pointing at the direction of rotation.	Turn right: With left forearm vertical, the palm of the hand facing outwards, move forearm horizontally and repeatedly, fingers pointing at the direction of rotation.	Extend the fingers to point at the position where the load should fall on.
Illustration			

Table 3-11 Illustration of hand signals (continued)

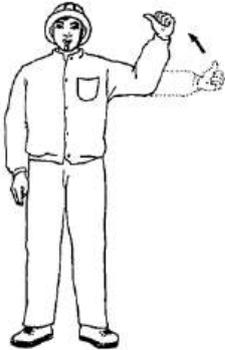
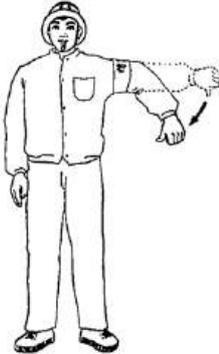
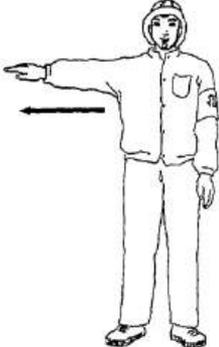
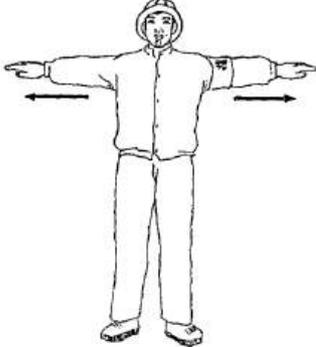
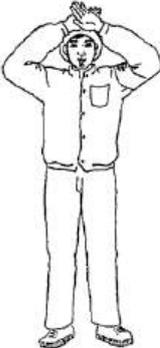
No.	11	12	13
Signal	Raise boom	Lower boom	Raise boom slowly
Gesture	With arm stretched sideways horizontally, thumb pointing upwards, the remaining fingers closed, wave forearm up.	With arm stretched sideways horizontally, thumb pointing downwards, the remaining fingers closed, wave forearm down.	Bend the left arm. Move the thumb up and down, pointing upwards. Place the right arm above it.
Illustration			
No.	14	15	16
Signal	Lower boom slowly	Stop	Emergency stop
Gesture	Bend the left arm. Move the thumb up and down, pointing downwards. Place the right arm below it.	Stretch out one arm horizontally. The palm faces downwards. Swing the arm to one side of the body.	Stretch out both arms horizontally. The palms face downwards. Swing the arms to both sides of the body.
Illustration			

Table 3-11 Illustration of hand signals (continued)

No.	17		
Signal	Stop operation		
Gesture	With fingers extended, cross both hands before the forehead.		
Illustration			

! CAUTION

1. Hand signals illustrated above are used only for reference. Specific usage of hand signals may vary from different countries and regions. Users can determine their hand signals according to actual conditions.
2. Hand signals must be first discussed and mutually agreed upon and clearly executed. Misunderstanding of hand signals may lead to serious accidents.
3. Local rules and regulations must always be observed when operating abroad.

ZOOMLION

Operator's Manual for Crawler Crane

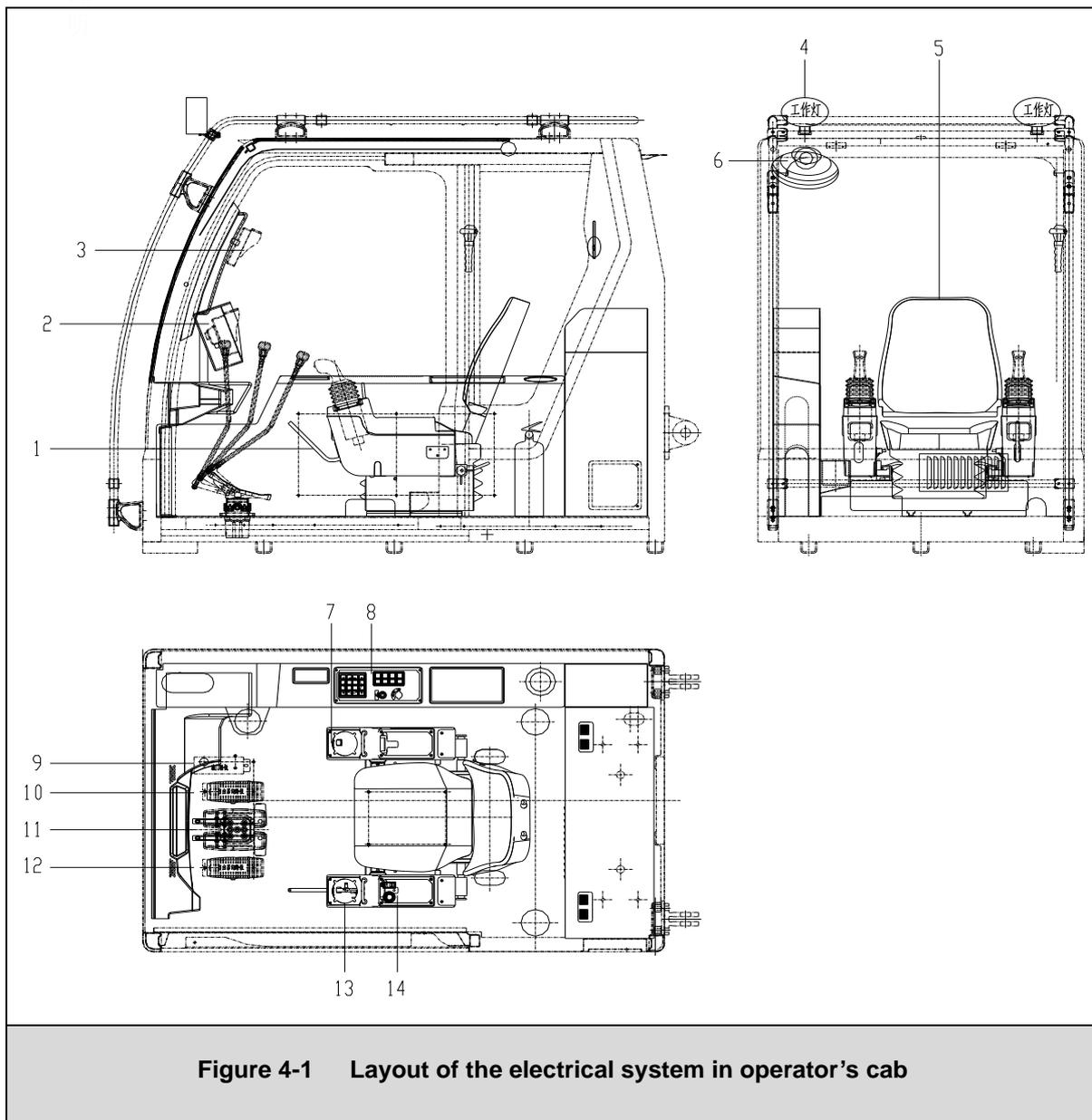
Chapter 4 Crane Operation



Chapter 4 Crane Operation

4.1 Electrical system of operator's cab

4.1.1 Layout of the electrical system in operator's cab



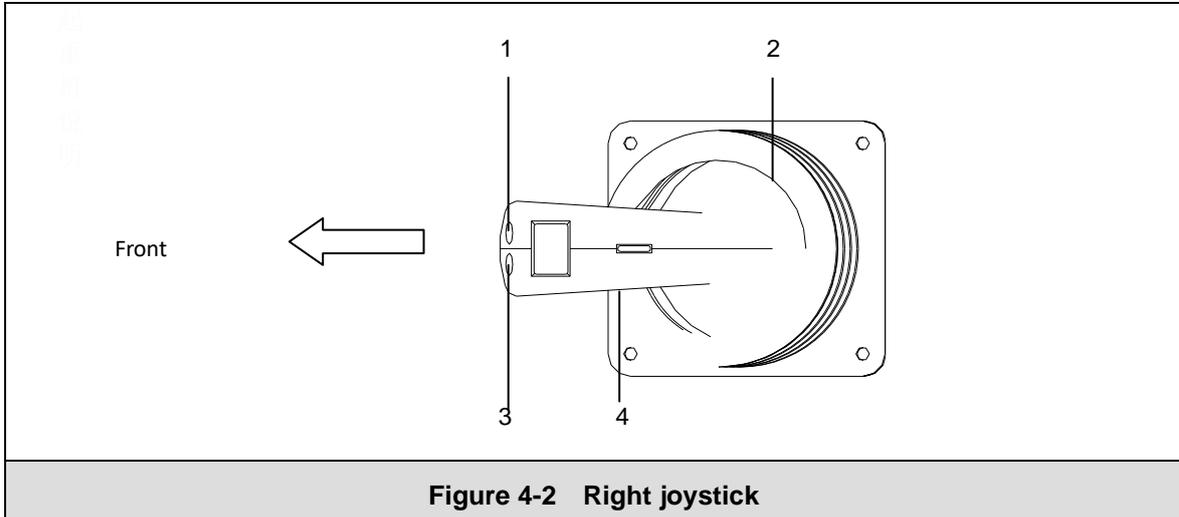
Refer to Figure 4-1 for the layout of the electrical system in operator's cab. Refer to Table 4-1 for descriptions.

Table 4-1 Descriptions on the electrical system of operator's cab

No.	Names	Descriptions
1	Function-locking lever	Pull up the lever before the driver's entry or leaving. The power of the crane is cut off but the engine is not shut down is the lever is pulled up. Pull down the lever before crane operation.
2	Display for load moment limiter	It displays information such as load moment, working condition of the crane, and alarms.
3	Display for monitoring system	It monitors real-time condition of winches and the rear end of the crane.
4	Work light	Both the two sides of the top front of the cab and the right side of the cab rear end are fitted with a work light. And work light switches are on the right control panel.
5	Seat	Adjustable.
6	Fan	On the rear right side of the cab top; used for cooling in the cab.
7	Right joystick	Please refer to Section 4.1.2 for details.
8	Right control panel	Please refer to Section 4.1.3 for details.
9	Accelerator pedal	It controls engine speed. Stamp on the pedal to increase engine speed or release it to get back to idling speed.
10	Pedal for the braking of H1 free-falling	An optional pedal for the braking of H1 free-falling. Press the switch (No.8 in Figure 4-4) on the right penal and the switch (No.4 in Figure 4-2) on the right joystick, the function of H1 hook free-falling is activated. Stamp on the brake pedal, the hook falls; release the pedal, the hook stops falling. Turn off the switch for free falling before hoisting.
11	Pedals for traveling mechanism	The left pedal controls the left crawler; The right pedal controls the right crawler.
12	Pedal for the braking of H2 free-falling	An optional pedal for the braking of H2 free-falling. Press the switch (No.8 in Figure 4-4) on the right penal and the enabling switch (No.4 in Figure 4-6) on the left joystick. The function of H2 hook free-falling is activated. Stamp on the brake pedal, the hook falls; release the pedal, the hook stops falling. Turn off the switch for free falling before hoisting.
13	Left joystick	Please refer to Section 4.1.4 for details.
14	Left control panel	Please refer to Section 4.1.5 for details.

4.1.2 Right joystick

The right joystick is illustrated as follows:



Descriptions on the right joystick are listed below:

Table 4-2 Descriptions on the right joystick

No.	Name	Description
1	Reserved	
2	Right joystick	Derricking: leftward, derricking up; rightward, derricking down H1: forward, unwind the winch; backward, wind the winch
3	Reserved	
4	Switch for H1 free-falling	Press the switch first for H1 free-falling.

4.1.3 Right control panel

Switches on the right control panel are illustrated in the figure below.

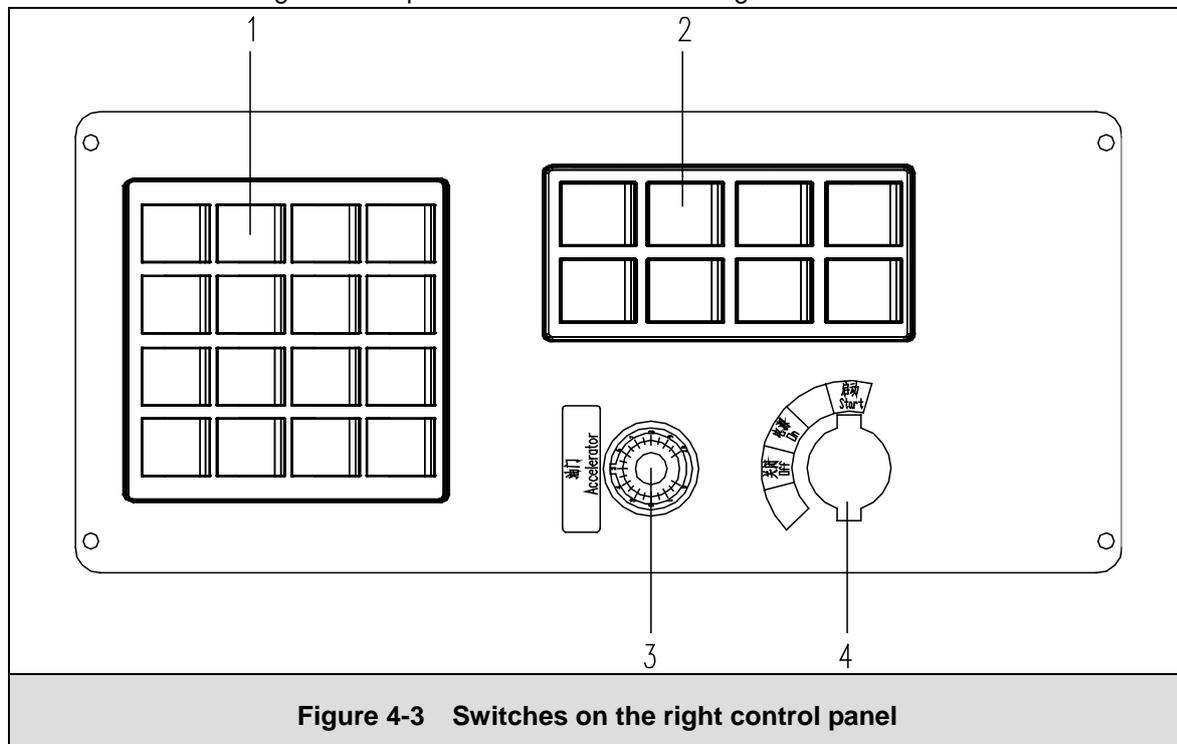


Figure 4-3 Switches on the right control panel

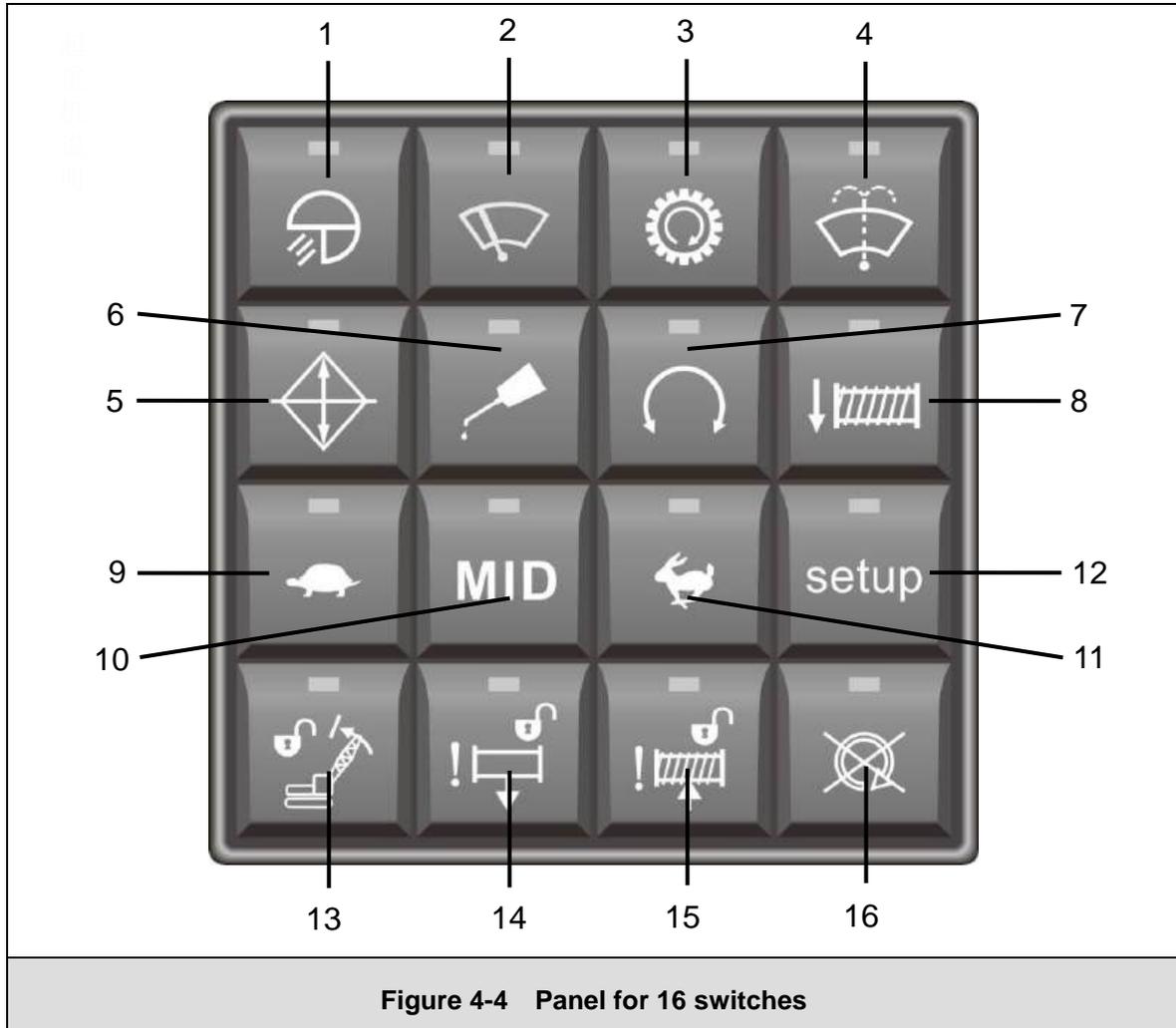
Functions of switches on the right control panel are listed below:

Table 4-3 Functions of switches on the right control panel

No.	Switch	Description
1	Panel for 16 switches	Refer to 4.1.3.1 for details
2	Panel for 8 switches	Refer to 4.1.3.2 for details
3	Throttle potentiometer	Control engine speed through the rotary knob: rotate clockwise to accelerate. Note: Engine speed is determined by the foot pedal and the throttle potentiometer.
4	"Ignition" switch	Three gears of the ignition switch: Off/On/Start

4.1.3.1 Panel for 16 switches

Panel for 16 switches is illustrated below:



16 switches on the panel are illustrated as follows:

Table 4-4 Descriptions on 16 switches on the panel

No.	Switches	Descriptions
1	Master lighting switch	Press the switch to turn on the overhead light and the working light for the slewing table and the indicating light is on. Press the switch again to turn off the overhead light and the working light for the slewing table and the indicating light is off.
2	Windshield wiper switch	Press the switch to turn on the windshield wiper and the indicating light is on; Press the switch again to turn off the windshield wiper and the indicating light is off.

3	Derricking ratchet pawl switch	<p>Press the switch to extend the derricking ratchet pawl cylinder and the indicating light is on;</p> <p>Press the switch again to retract the derricking ratchet pawl cylinder and the indicating light is off</p>
4	Washer switch	<p>Press the switch to activate the washer and the indicating light is on;</p> <p>Press the switch again to turn off the washer and the indicating light is off.</p>
5	Oil cooling switch	<p>Press the switch to activate the oil cooling device and the indicating light is on;</p> <p>Press the switch again to turn off the device and the indicating light is off.</p>
6	Centralized lubrication switch	Reserved
7	Free slewing switch	<p>Press the switch to activate and the indicating light is on;</p> <p>Press the switch again to turn it off and the indicating light is off.</p> <p>Protect the boom against damage by reducing the lateral force acting on the boom.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">  CAUTION </div> <p>Avoid violent swing of the load brought by a sudden stop of the load.</p>
8	Free-falling switch	<p>Press the switch to activate and the indicating light is on;</p> <p>Press the switch again to turn it off and the indicating light is off.</p> <p>Press the switch first before free-falling of the hook on H2.</p>
9	Microswitch	<p>Press the switch to activate and the indicating light is on;</p> <p>Press the switch again to turn it off and the indicating light is off.</p> <p>Press the switch to reduce speeds of all movements to 25% of original ones.</p>
10	Intermediate speed switch	<p>Press the switch to activate and the indicating light is on;</p> <p>Press the switch again to turn it off and the indicating light is off.</p> <p>Press the switch to activate the intermediate speed function of H1 when two pumps converge.</p>
11	High speed switch	<p>Press the switch to activate and the indicating light is on;</p> <p>Press the switch again to turn it off and the indicating light is off.</p> <p>Press the switch to activate the high speed function of H1, H2</p>

		and the crawling mechanism.
12	SetUp switch	When the crane is overloaded (below 110% of rated load) or main boom angle is smaller than 30°, the system sends out an alarm and corresponding movements are limited. Press this switch to bypass the limit and speeds of all movements are reduced to 25% of original ones. (Please refer to 4.4.3 for details).
13	Derricking bypass switch	When the crane is overloaded (100% < weight percent < 110%), the switch can be used to bypass the limit on derricking hoisting. (Refer to 4.4.3 for details)
14	Lowering bypass switch	If the system sends out an alarm of over-hoisting, press the switch the bypass the limit performed by over-lowering on hoisting of the hoisting winch and lowering of the derricking winch (refer to 4.4.6).
15	Hoisting bypass switch	If the system sends out an alarm of over-hoisting, press the switch the bypass the limit performed by over-hoisting on hoisting of the hoisting winch and lowering of the derricking winch (refer to 4.4.7).
16	Flameout switch	<p>Press the switch to shut down the engine.</p> <div data-bbox="715 1211 963 1285" data-label="Image">  </div> <ol style="list-style-type: none"> 1. After the engine is shut down, keep the switch on the flameout position for at least 30s before resetting the switch. Otherwise the working hour of the engine cannot be saved. 2. Reset the switch before another ignition.

4.1.3.2 Panel for 8 switches

Panel for 8 switches is illustrated below:

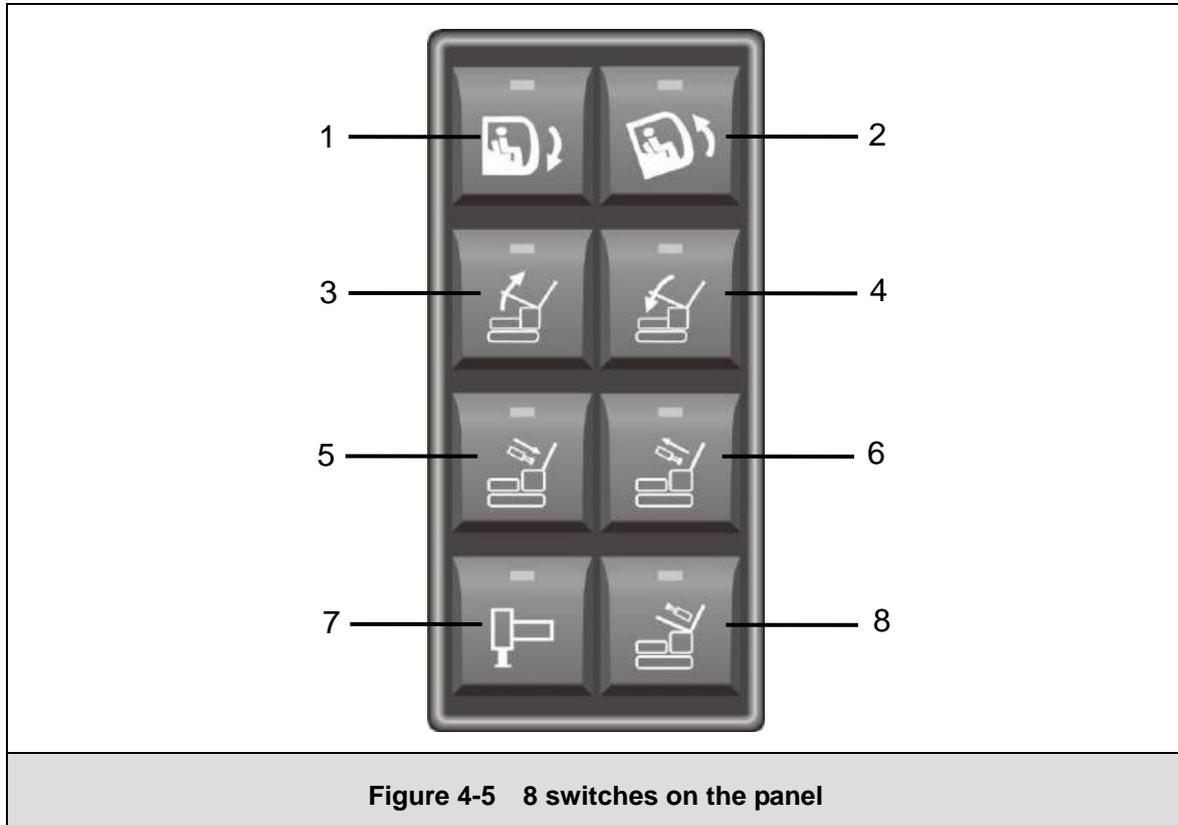


Figure 4-5 8 switches on the panel

Functions of 8 switches on the panel are illustrated in Table 4-5.

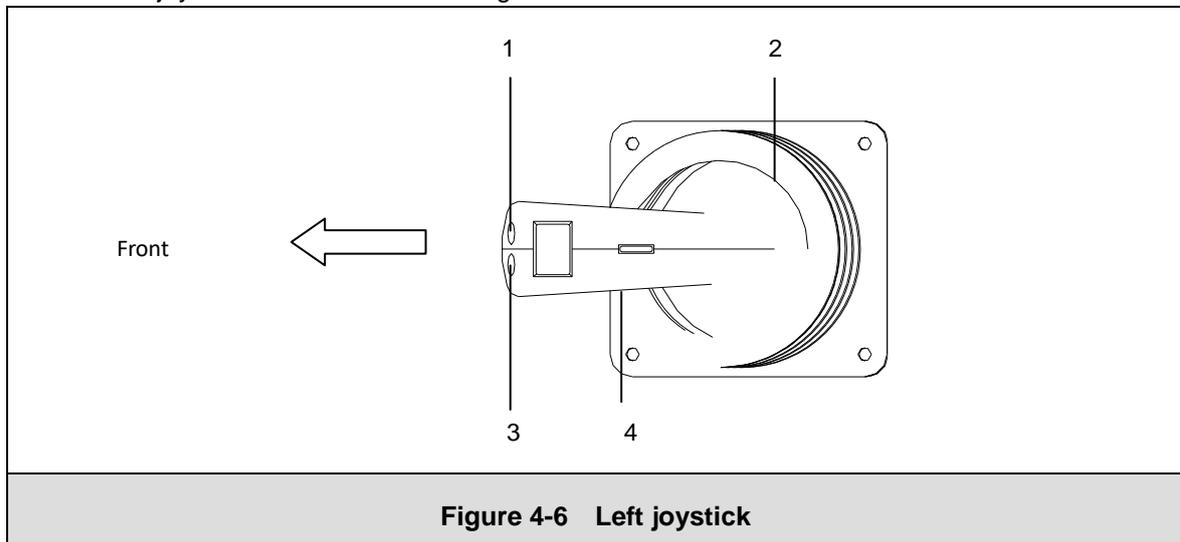
Table 4-5 Descriptions on functions of 8 switches

No.	Switches	Descriptions
1	Switch for cab pitching-down	Press the switch to extend the pitching cylinder to pitch down the cab and the indicating light is on.
2	Switch for cab pitching-up	Press the switch to retract the pitching cylinder to pitch up the cab and the indicating light is on.
3	Switch for A-frame erecting	Press the switch to extend the cylinder to erect the A-frame and the indicating light is on.
4	Switch for A-frame lowering	Press the switch to retract the cylinder to lower down the A-frame and the indicating light is on.
5	Switch for extending boom pin	Press the switch to extend the boom pin and the indicating light is on.
6	Switch for retracting boom pin	Press the switch to retract the boom pin and the indicating light is on.
7	Switch for undercarriage	Press the switch to activate it and the indicating light is on.

	auxiliary	Press the switch again to turn it off and the indicating light is off. Turn on the switch before operating undercarriage outriggers.
8	Switch for lifting cylinder	Press the switch to activate it and the indicating light is on; the joystick for H2 can be used to control the lifting cylinder. Press the switch again to turn it off and the indicating light is off; the joystick is used to control H2.

4.1.4 Left joystick

The left joystick is illustrated in the Figure 4-6.



Descriptions on the left joystick are illustrated as follows:

Table 4-6 Descriptions on the left joystick

No.	Items	Descriptions
1	Slewing braking button	A yellow button on the top of the left joystick. Press it to activate slewing and press it again to shut down the function of slewing.
2	Left joystick	Control slewing (Leftward: slew leftward; Rightward: slew rightward) Control H2 (Forward: lowering through H2 / extending of cylinder; Backward: hoisting through H2 / retracting of cylinder)
3	Horn button	The red button on the top of the joystick controls the

		warning horn.
4	Switch for H2 free-falling	Press the switch first for H2 free-falling.

4.1.5 Left control panel

The left control panel is illustrated below:

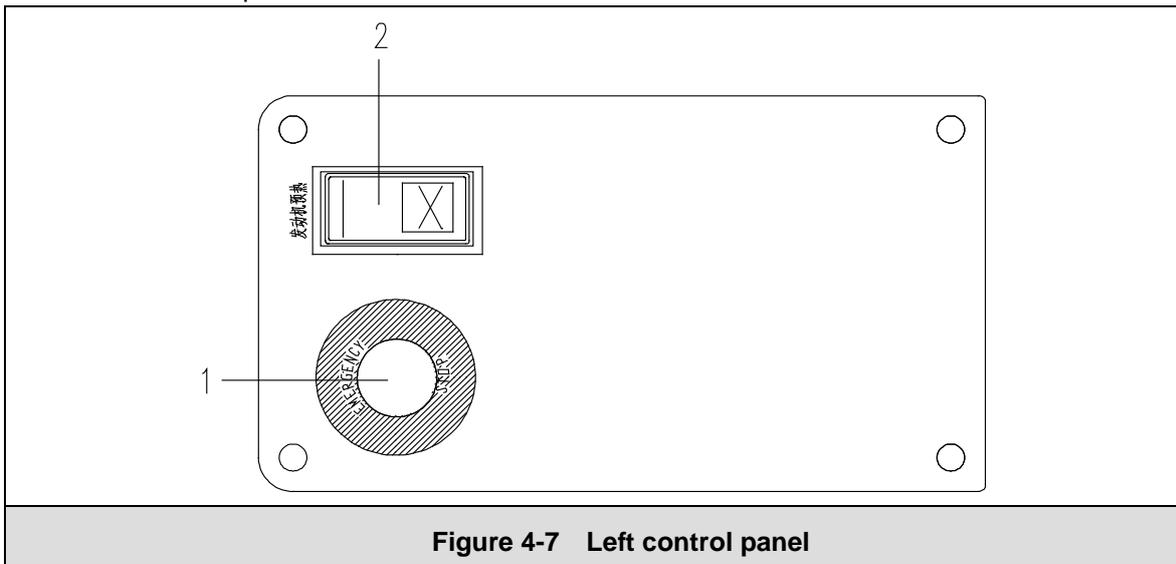


Figure 4-7 Left control panel

Functions of switches on the left control panel are listed in the table below:

Table 4-7 Descriptions on the left control panel

No.	Items	Descriptions
1	"Emergency stop" switch	<div style="background-color: #333; color: white; padding: 5px; display: inline-block;"> CAUTION </div> <p>Press the switch to stop the crane in an emergency. Press the red button to cut off the power supply of the crane and shut down the engine.</p>
2	Rocker switch for preheating	Press the switch to preheat the engine if the ambient temperature is below -15°.

4.2 Digital display system

4.2.1 Load moment limiter

Refer to *Operating Manual of Load Moment Limiter* for detailed operation. The main screen is shown in the figure below.

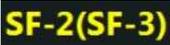
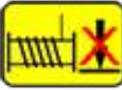
Load moment limiter displays working condition of the crane in real time, including engine speed, engine working hours, water temperature, oil pressure, oil level, pump pressure, etc. Warning icons flashes on the screen when abnormal conditions occur.

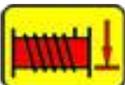
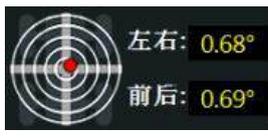


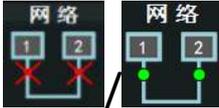
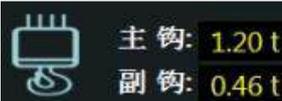
Figure 4-8 Main screen of load moment limiter

Table 4-1 Description of the main screen of load moment limiter

	
Slewing braking: Press the slewing braking button on the left joystick to activate slewing and the icon lights up; press the button again to shut	Free-falling of hook on H1: The icon will light up in green if the free-falling function of H1 is activated and the icon is grey if the function is

<p>down the function of slewing and the icon is grey.</p>	<p>shut down.</p>
	
<p>Free-falling of hook on H2: The icon will light up in green if the free-falling function of H2 is activated and the icon is grey if the function is shut down.</p>	<p>Micro switch (main pump): The icon lights up in green if the micro switch is turned on or in grey if it is turned off.</p>
	
<p>Free-falling of hook: The icon lights up in green if the switch is turned on or in grey if it is turned off.</p>	<p>55°C of hydraulic oil temperature: The icon lights up in green if the switch is turned on or in grey if it is turned off.</p>
	
<p>Current moment percentage: The column is green when moment percentage < 90%. The column is yellow when $90\% \leq$ moment percentage $\leq 100\%$. The column is green when moment percentage > 90%.</p>	<p>Code of the current operating mode: Main boom---S; Tip boom---SH-1(SH-2); Fixed jib (without primary hook)---SF-1; Fixed jib (with both primary and auxiliary hooks)--SF-2(SF-3).</p>
	
<p>GPS lock of level 1, level 2 and level 3. Icons become green, yellow and red respectively when GPS lock is activated. Otherwise icons are grey.</p>	
	
<p>If the crane is overloaded with a load capacity and the moment percentage ranges between 100% and 110%, press Setup switch and the grey icon becomes a yellow warning icon.</p>	<p>If the crane is overloaded without a load capacity and the moment percentage ranges between 100% and 110%, press Setup switch and the grey icon becomes a yellow warning icon.</p>
	
<p>If hoisting on H1 or H2 is limited, press the</p>	<p>if lowering on H1 or H2 is limited, press the</p>

<p>hoisting bypass switch and the grey icon becomes a yellow warning icon.</p>	<p>lowering bypass switch and the grey icon becomes a yellow warning icon.</p>
	
<p>The grey icon becomes a yellow warning icon if the limit on derricking-up is bypassed.</p>	<p>Press the overhauling switch in the electrical box when the crane is overloaded for more than 110% or over-hoisted or over-lowered, the grey icon becomes a yellow warning icon.</p>
	
<p>The grey icon becomes a yellow warning icon if main boom angle reaches 84°.</p>	<p>The grey icon becomes a yellow warning icon if there is an alarm of hydraulic oil clogging.</p>
	
<p>The grey icon becomes a yellow warning icon if the engine water temperature is higher than 96°C.</p>	<p>The grey icon becomes a yellow warning icon if the engine oil pressure is lower than 0.6bar.</p>
	
<p>The grey icon becomes a yellow warning icon if the fuel oil level is excessively low.</p>	<p>Alarm of hoisting height: The grey icon becomes a yellow warning icon if the hoisting height of H1 or H2 is limited.</p>
	
<p>The grey icon becomes a yellow warning icon when there are only three circles of wire rope left on the drum of H1 or H2.</p>	<p>Current fuel oil level of engine (unit: %).</p>
	
<p>Engine torque (unit: %).</p>	<p>Levelness of the crane. The red point in the center shifts with the inclination of the crane.</p>

	
<p>Engine speed (rmp/min).</p>	<p>Total work time (hour)</p>
	
<p>Bus condition: helps to judge whether communication between display and controller is normal. Green points represent normal communication while red X means abnormality.</p>	<p>Deadweights of the primary and the auxiliary hooks of the current operating mode.</p>
	
<p>Current wind speed and grade.</p>	<p>System voltage (V)</p>
	
<p>Water temperature of engine (°C)</p>	<p>Engine oil pressure (bar)</p>

! WARNING

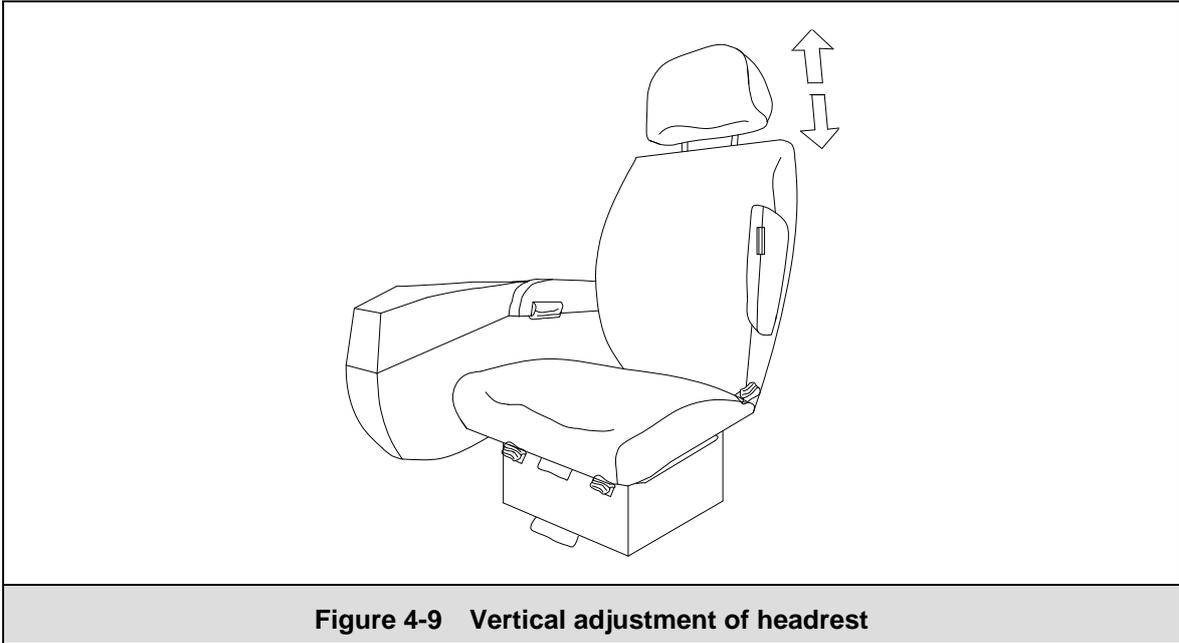
Observe safe operation rules and lifting capacity charts when adjusting the load moment limiter.

4.3 Start of the crane

4.3.1 Adjustment of operator's seat

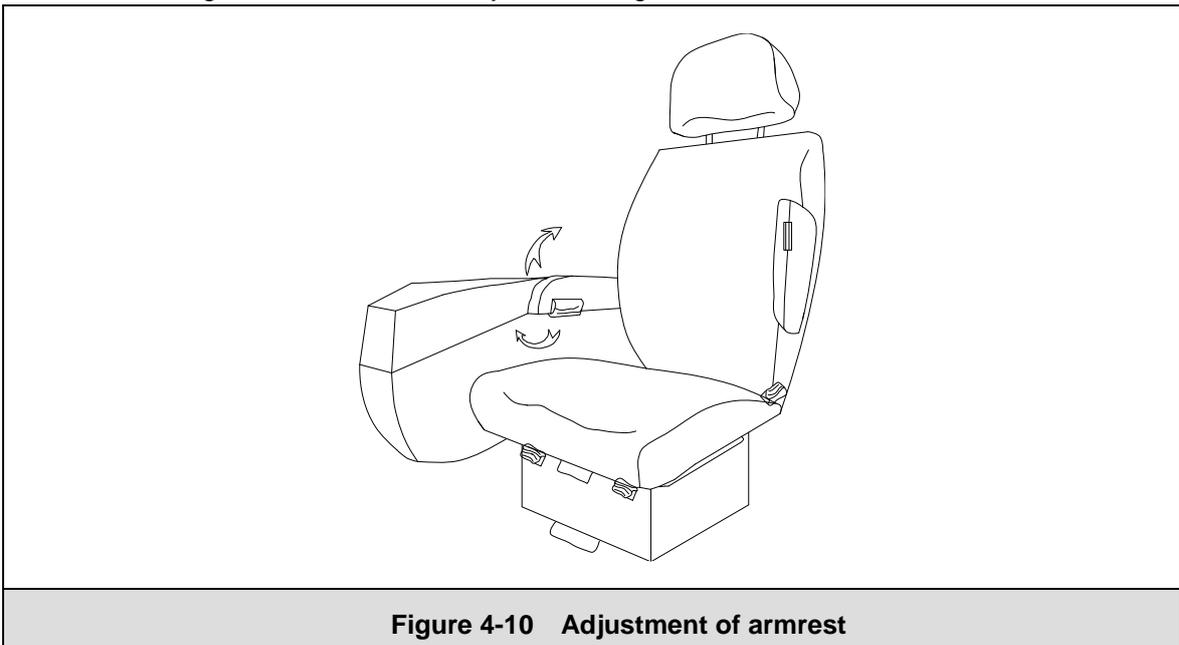
a) Vertical adjustment of headrest

As shown in the figure below, the height of the headrest can be adjusted manually with proper strength.



b) Adjustment of armrest

The height of armrest can be adjusted through the knob.



c) Horizontal adjustment of the seat

As shown in the figure below, pull the lever upwards and move the seat to required position; release the lever.

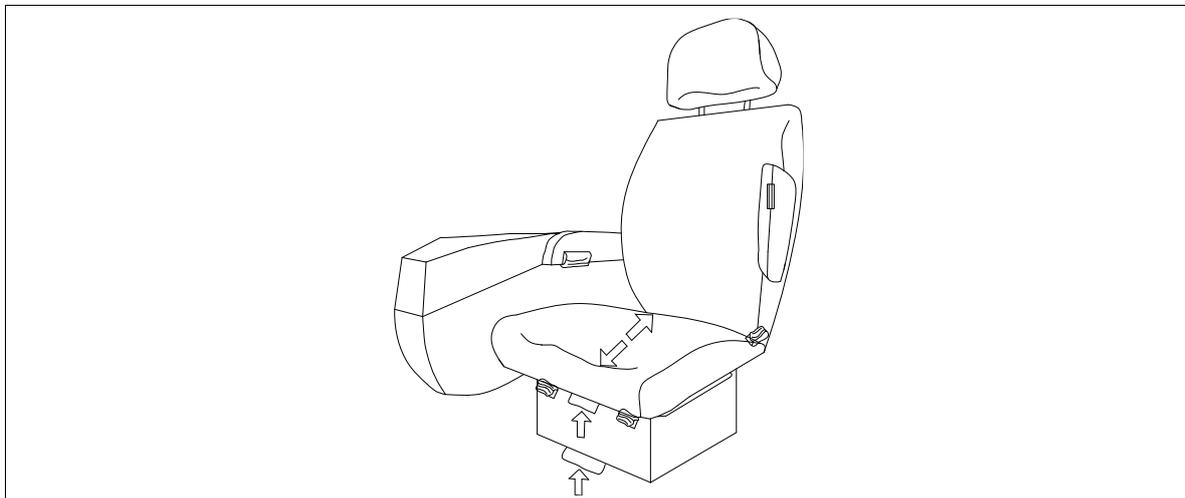


Figure 4-1 Horizontal adjustment of the seat

d) Adjustment of seat height

There are two switches for the adjustment of seat height. As shown in the figure below, pull up the switches to adjust the seat to a proper height and then release.

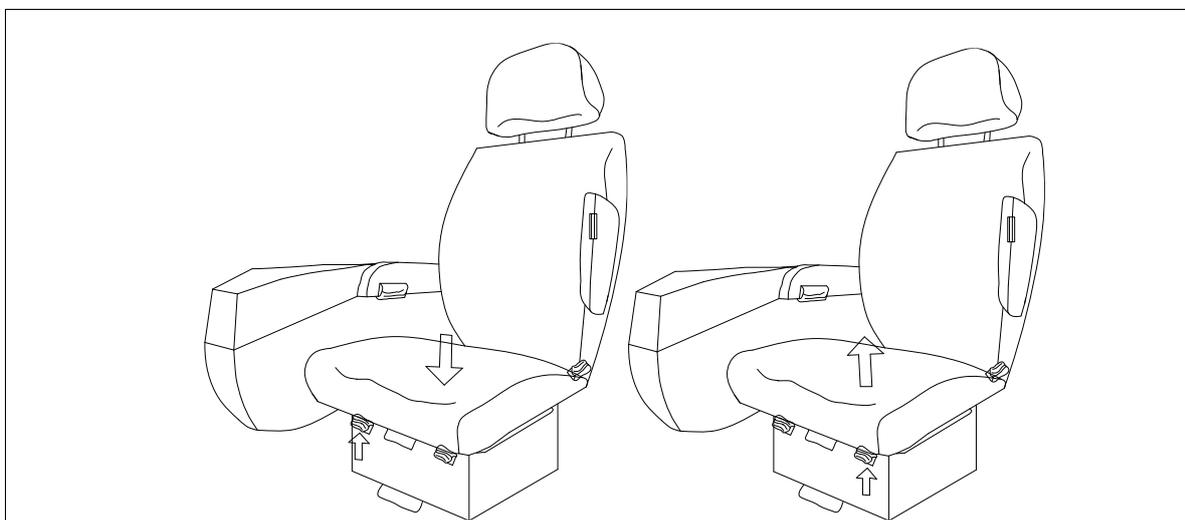


Figure 4-2 Adjustment of seat height

e) Adjustment of backrest

Pull the switch downward to adjust the backrest to a proper angle and then release.

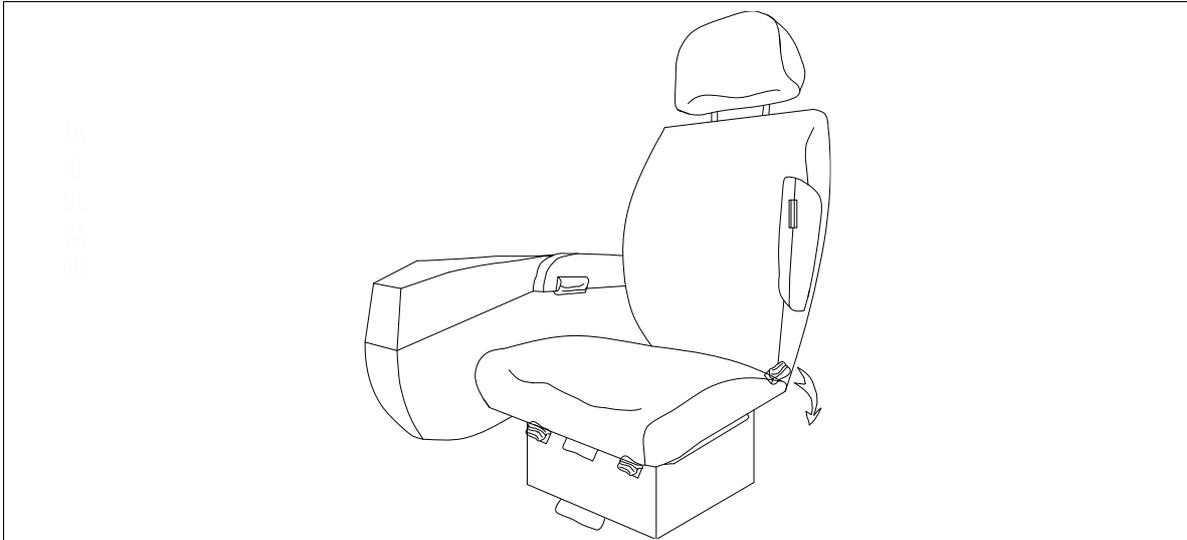


Figure 4-3 Adjustment of backrest

4.3.2 Inspections before the crane being electrified

Operator should check the overall condition of the crane before the crane being electrified.

- a) The crane is horizontally placed.
- b) The gear of slewing ring must be clean and greased.
- c) The slewing fixing pin is pulled out.
- d) Check the inclination of the crane.
- e) Air inlet of the oil cooler is not blocked.
- f) All covers and hoods on both sides are closed and locked.
- g) No person or object in the slewing radius.
- h) Make sure that wire rope, winding drum and limit switches are free of ice or snow.
- i) No loose part on the slewing table or the boom.
- j) Stop valve near the hydraulic oil tank must be opened.
- k) Check the engine oil level.
- l) Check the hydraulic oil level.
- m) Check the oil filter on the hydraulic oil tank.
- n) Check if the coolant is added to the specific position.
- o) The master switch of the power supply is turned to "ON".

! DANGER

1. Never check the coolant level if the engine is still warm. Otherwise, there is the danger of serious skin burns.

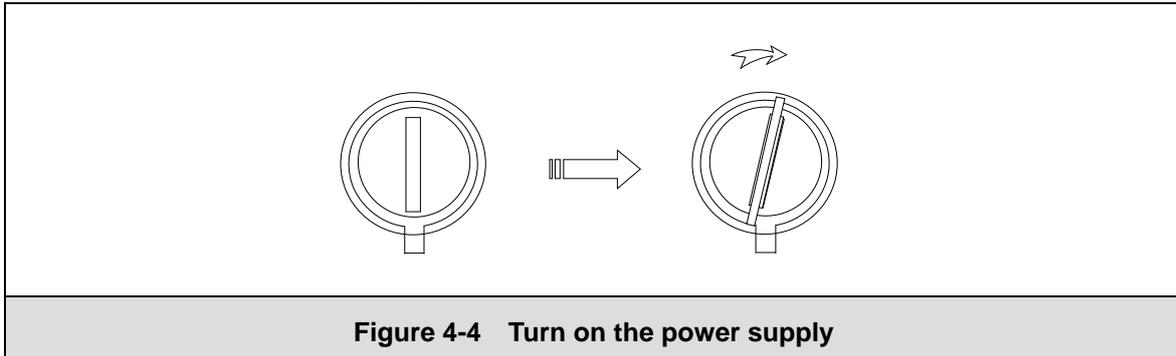
2. Make sure that there is no such loose part as pin spindle or retaining pin left on the boom. Otherwise, there will be a risk of falling-off and striking on person.

CAUTION

The horizontally permitted working range of the whole crane should be: $X < 1\%$, $Y < 1\%$. Please adjust its levelness if the range is exceeded.

4.3.3 Turn on the power supply

As shown in the figure 4-14, insert ignition key into ignition lock and turn it clockwise to the 1st position to turn on the power supply.



4.3.4 Air conditioning

Air conditioner in the cab is a heating & cooling air conditioner. Its control panel as shown in the figure 4-15 is located on the upper right side of the cab.

Make sure that the ball valve near the engine is opened before the heating mode is started. Switch the knob for mode to "Warm" and the indicating light for heating is on. Rotate the knob to control the speed.

Make sure that the ball valve near the engine is closed before the cooling mode is started. Switch the knob for mode to "Cool" and the indicating light for cooling is on. Rotate the knob to control the speed.

Turn on the switch for "defrost" when the windshield is moist with a bad view. Turn on the switch for ventilation to ventilate the air in the cab.

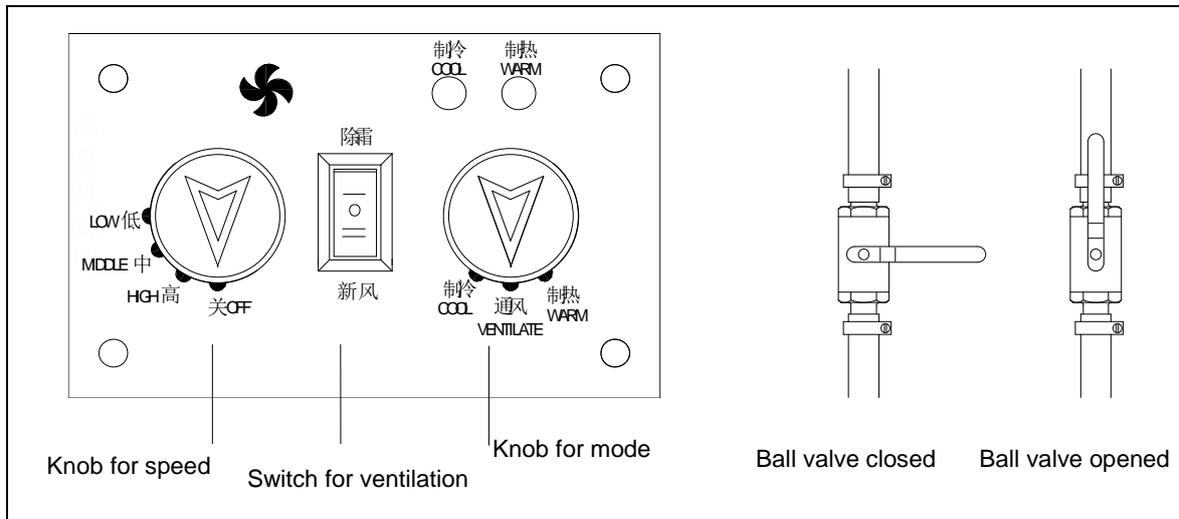


Figure 4-5 Air conditioning

4.3.5 Windshield wiper

Activate the windshield wiper in rainy days. Press the switch for windshield wiper on the 16-switch panel (Figure 4-4, No. 2) to activate the windshield wiper, which is shown in the Figure 4-16.



Figure 4-16 Switch for windshield wiper

The switch of the roof windshield wiper is located on the top of the seat. Press the switch to activate the roof windshield wiper.

4.3.6 Illumination

When the crane is working at night, press the master lighting switch on the 16-switch panel (Figure 4-4, No. 1) to turn on the overhead light in the cab and the working light on the slewing table.



Figure 4-17 Master lighting switch

4.3.7 Horn

Press the button of horn before operating the crane. The button is on the left joystick, as shown in the figure below.

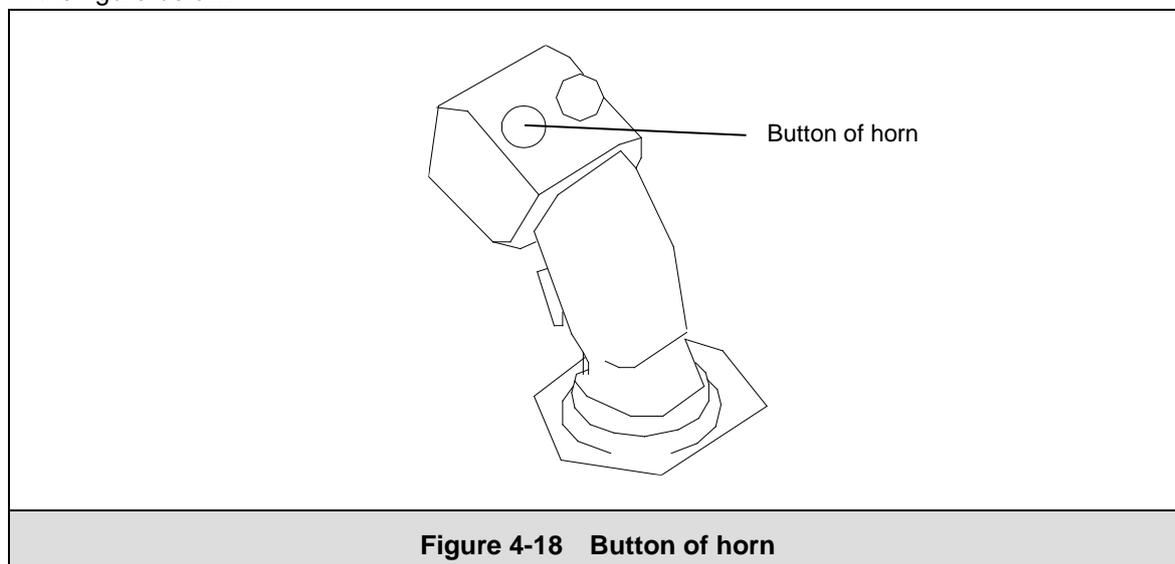


Figure 4-18 Button of horn

4.3.8 Checks before the starting of engine

4.3.8.1 Check function switches in the cab

- Check if both joysticks are in the neutral position.
- Check if switches on the control panel are in their original status.
- Check if the emergency stop button is in the original state.
- Check if the master switch for power is on.

4.3.8.2 Check signals and warning indications of the working state

The display of the load moment limiter is turn on after the crane is electrified. Check the signals and warning indication, including:

- Check the fuel oil level.
 - Check all winches to see if there is over-hoisting.
- Check the maximum main boom angle.



Please fill diesel oil immediately if the oil level is too low.

4.3.8.3 Check the load moment limiter

- Check if the load moment limiter functions normally.
- Check if current boom configuration is correctly set on the load moment limiter.

- c) Confirm that the crane is not overloaded.
- d) Check the current wind speed.

! CAUTION

The maximum wind speed for working state of the crane shall not exceed 9.8m/s; the maximum wind speed for non-working state of the crane shall not exceed 21m/s when the main boom is assembled only or 15m/s when the jib is assembled. If wind speed reaches or exceeds these values, the entire boom should be lowered down.

4.3.9 Start the engine

Insert the key and switch it clockwise to the second gear to start the engine.

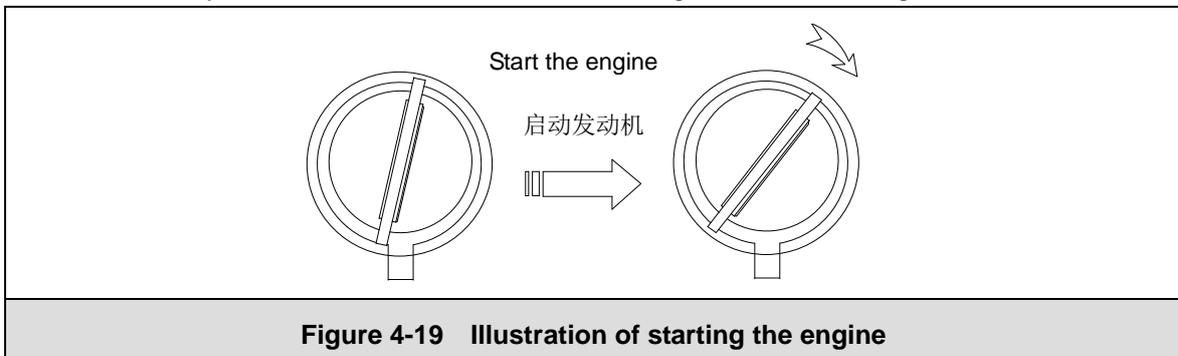


Figure 4-19 Illustration of starting the engine

After the engine is started, check the following parameters to make sure that the engine functions normally:

- a) Check if the engine speed is normal.
- b) Check if the engine oil pressure is normal.
- c) Check if the engine coolant temperature is normal.

! CAUTION

1. It is a normal phenomenon that there is a delay of certain period of time for the engine to start after preheating in cold weather.

2. Do not use accelerator when starting the engine. If the engine fails to start after about 5s, slowly depress the accelerator pedal all the way down. If the engine cannot be started within 5-10s, give up the starting attempt and wait for about 1 minute before trying again. If the engine still cannot be started for three times continuously, stop starting the engine at once and check it for fault. If the temperature of engine is high, do not depress accelerator pedal when starting the engine to avoid black smoke discharging. After the engine starts, release ignition key at once to let it return to initial position, and check the parameters of the engine at the same time.

3. The engine cannot work with full load until the running temperature is reached.

4.4 Safety devices

The crane operator must check all safety devices for functional work before every crane operation.



It is prohibited to operate a crane with malfunctioned safety devices.

4.4.1 Emergency stop button

If the crane needs to be stopped emergently, press the emergency stop button to cut off the power supply and shut down the engine. All movements will be stopped immediately. The emergency stop button (No.1 in the Figure 4-7) is on the left control panel.



Emergency stop button must only be used in emergencies. It must not be used as a device that shuts down the crane. Otherwise, there will be a risk of accident caused by load swinging.

4.4.2 Master switch of power supply

The battery master switch is installed above the battery box at the right side of slewing table. Set battery master switch in "OFF" position during long-time work breaks so as to prevent the electricity of battery from discharging excessively. The battery master switch is shown in the Figure 4-20.

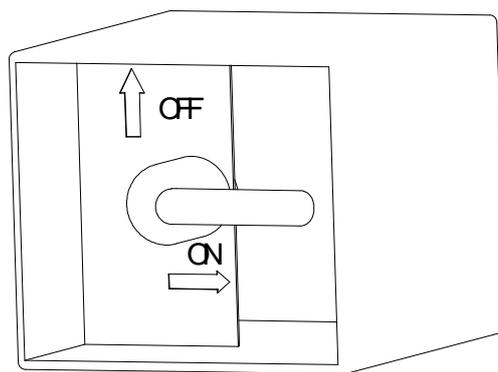


Figure 4-20 Master switch of power supply

4.4.3 Load moment limiter

When the permissible load moment is exceeded, the load moment limiter can immediately cut

off any crane movement that increases the load moment, and only the crane movement that reduces the load moment can be carried out. However, the presence of load moment limiter does not relieve the crane operator of his duties and responsibilities for safe crane operation. Before lifting a load, he must know the approximate weight of the load, and decide if the crane is in a position to carry out this job with the help of lifting capacity charts.

DANGER

The load moment limiter must be adjusted before using the crane to the current set up condition in accordance with the lifting capacity chart. Only in this way can it be able to fulfill its protective task. If crane operator does not observe this safety obligation, the crane may overturn and may be damaged beyond repair, despite the load moment limiter is working normally. The load moment limiter cannot monitor and control all possible operating conditions; this is still primarily the responsibility of the operator.

WARNING

“Bypass” means that the limited movement can be continued towards the dangerous direction temporarily after the alarm. It does not mean that the dangerous condition is eliminated.

4.4.3.1 Moment percentage between 90% and 100%

The load moment of the crane ranges between 90% and 100% if the moment percentage of the load moment limiter is between 90% and 100%. And the yellow light is on and the buzzer sends out an alarm continuously.

4.4.3.2 Moment percentage between 100% and 110%

The crane is overloaded for 100%-110% if the moment percentage of the load moment limiter ranges between 100% and 110%. At this time, hoisting of both the primary and the auxiliary hooks and derricking hoisting and lowering are cut off. The red light on the load moment limiter is on and the buzzer sends out and alarm continuously.

CAUTION

Limit on crane movement can be bypassed through the following operation.

1. Rotate the “repair” switch (in the electrical control box of slewing table) clockwise and then release it, icon  will be shown on the load moment limiter. After that, all limited movements can be bypassed and all bypassed movements will slow down.
2. Press the “Setup” switch (No. 12 in the Figure 4-4) on the 16-switch panel. Icon  will

be shown on the load moment limiter if the rated lifting capacity is specified. Hoisting of the hook can be bypassed. Turn the “derricking bypass” switch (No. 13 in the Figure 4-4) clockwise and keep it for a while, the derricking movement can be bypassed and slowed down. Icons  and  will be shown on the load moment limiter if the rated lifting capacity is not specified. All limits can be bypassed. The yellow light flickers and an alarming sound is sent out.

 **DANGER**

It is prohibited to operate the “repair” switch in normal conditions. Only professionals who are fully aware of the safety consequences can be allowed to operate the switch carefully in special conditions.

4.4.3.3 Moment percentage larger than 110%

It indicates that the crane is overloaded for more than 110% if the moment percentage on the load moment limiter is larger than 110%. At this time, hoisting of both the primary and the auxiliary hooks and derricking hoisting and lowering are cut off. The red light and the yellow light are on and the buzzer sends out an alarm continuously.

 **CAUTION**

Limit on crane movement can be bypassed through the following operation.

Rotate the “repair” switch clockwise and then release it. Icon  will be shown on the load moment limiter and all limits can be bypassed. The red light flickers and an alarming sound is sent out.

4.4.3.4 Unspecified rated lifting capacity

Please refer to 4.4.3.2 if the crane works in a range without a specified rated lifting capacity.

 **CAUTION**

1. Speeds of all the movements bypassed by the “repair” switch are reduced to 25%.
2. Press “Setup” switch, the bypass of cutoff is valid. After the limited movement is bypassed, return the control lever for 10s, or press “Setup” switch again, or the engine stops, or the controller is electrified again, the bypass of cutoff is invalid.
3. Press “repair” switch, the bypass of cutoff is valid for 30mins. If the switch is pressed again, or the engine stops, or the controller is electrified again, the bypass of cutoff is invalid.

4.4.4 Angle indicator

The angle indicator is on the lower bottom of the main boom pivot section (the right side of the cab). The operator can see the indicator clearly from the cab. The elevation of the boom can be accurately indicated by the angle indicator. The position of the indicator is shown in the Figure 4-21.

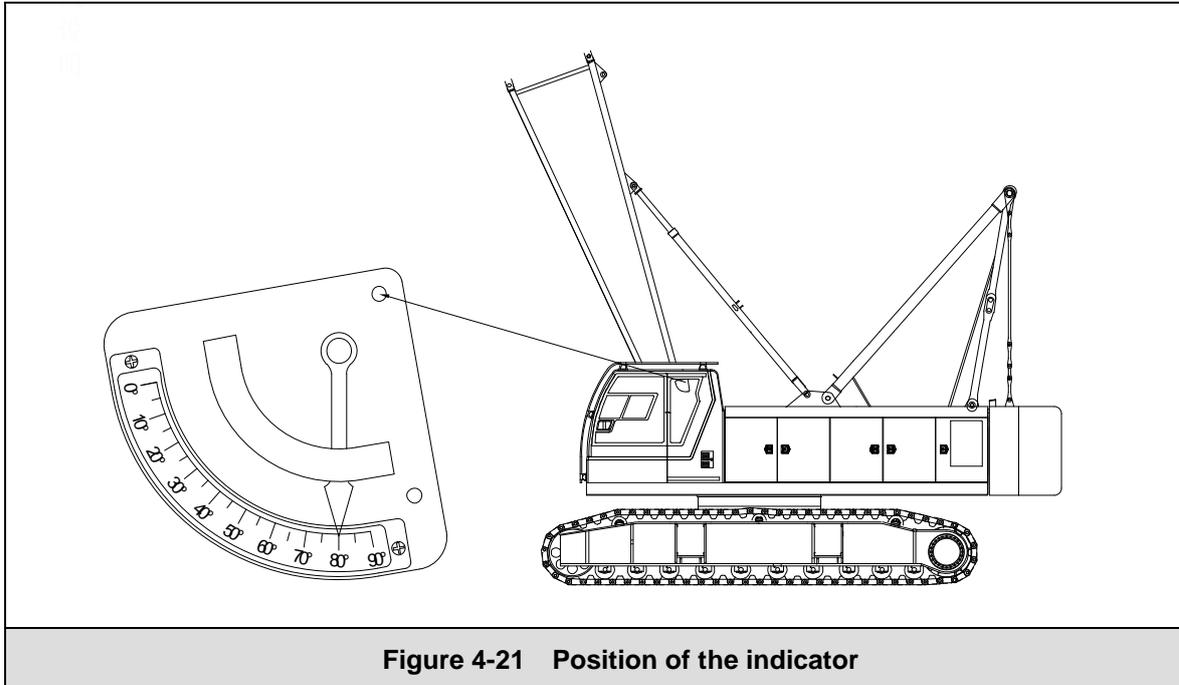


Figure 4-21 Position of the indicator

4.4.5 Derricking limiter

It is used to detect main boom angle in real time according to the data collected by the angle sensor. Once the detected angle exceeds the safe angle range, an alarm will be sent out and all dangerous movements will be switched off so as to ensure safe crane operation.

a) Main boom operating mode

The maximum main boom angle is 84°. When main boom is raised to 82°, the alarm will be sent out, but the movement “raise main boom” is still permitted. When main boom is raised to 83°, the movement “raise main boom” will be limited automatically. Icon  will be displayed on the load moment limiter. Press the “derricking bypass” switch to continue to raise the main boom. When main boom is raised to 84°, the movement “raise main boom” will be limited automatically and icon  will be displayed on the load moment limiter. At this time, only lowering main boom is permitted and the limited movement cannot be bypassed.

b) Fixed jib operating mode

The requirement for main boom angle in this operating mode is the same as that in “main boom” operating mode. The fixed jib can be fitted in the angle of 10° or 30°.

4.4.6 Lowering limiter

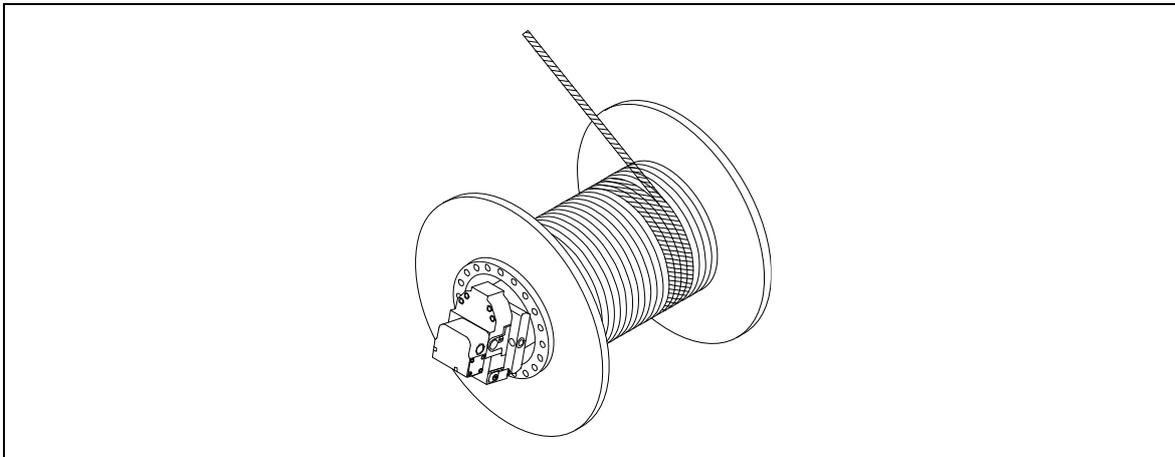


Figure 4-22 Lowering limiter

In order to prevent wire rope from being wound in the opposite direction after it is unwound completely, the lowering limit switches fitted on hoisting winches 1 and 2 are triggered when there are only 3 windings of wire rope left on the drums. At this time, the movement “reel off hoisting winches 1 and 2” will be limited, the icon  on the load moment limiter will flash, and the buzzer will sound. Only the movement “spool up hoisting winches 1 and 2” can be carried out.

CAUTION

The following operation can bypass limited crane movements temporarily.

1. Rotate the “repair” switch (in the electrical control box of slewing table) clockwise and then release it. The limited movement can be bypassed when the icon  is shown on the load moment limiter.

2. Rotate the “lowering bypass” switch (No.14 in the Figure 4-4) on left control panel clockwise and hold it until the icon  is shown on the load moment limiter. After that, the limited movement can be bypassed.

DANGER

1. Lowering bypass switch or repair switch can only be used for commissioning, maintenance, or avoiding accidents.
2. If the lowering limiter is bypassed, there is no device to prevent the wire rope from being unwound excessively, which will increase the risk of an accident!

4.4.7 Hoisting limiter

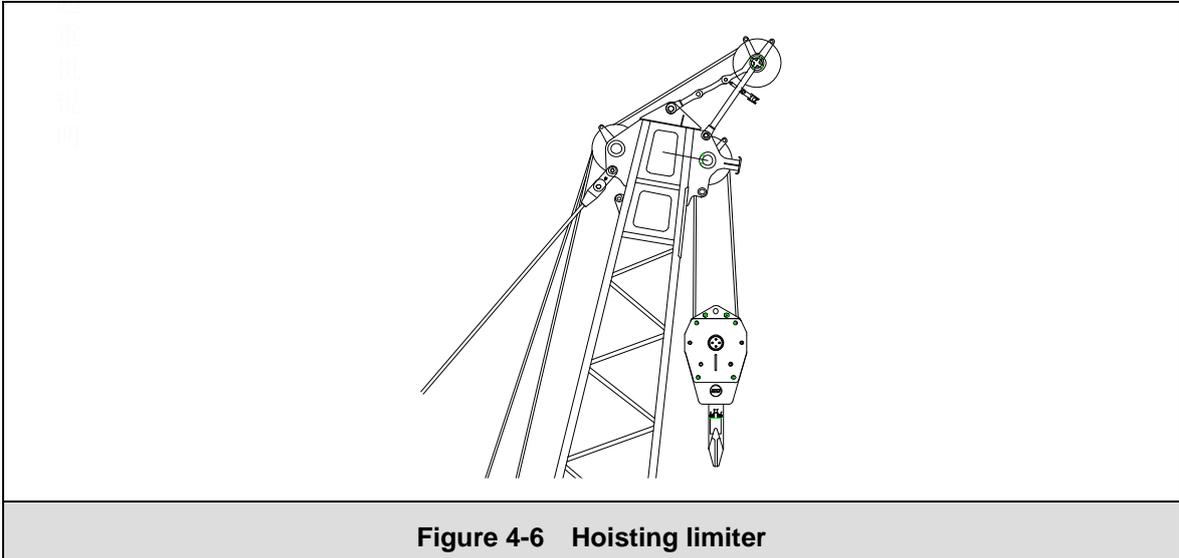


Figure 4-6 Hoisting limiter

A hoisting limiter is used to avoid the collision between hook pulley and boom head. It must be checked every time before operating.

If the load hook comes into contact with hoisting limit weight during its upward movement, the hoisting limit switch is triggered, the crane movements “spool up hoisting winch 1 (or 2)” and “lower the boom” are limited. Icon  is shown on the load moment limiter and the buzzer sounds continuously.

CAUTION

The following operation can bypass limited crane movements temporarily.

1. Rotate the “repair” switch (in the electrical control box of slewing table) clockwise and then release it. The limited movement can be bypassed when the icon  is shown on the load moment limiter.

2. Press the “hoisting bypass” switch (No. 15 in Figure 4-4) on the 16-switch panel. The limited movement can be bypassed when icon  is displayed on the load moment limiter. The buzzer sends out an alarm continuously after the bypass.

DANGER

1. Hoisting bypass switch or repair switch can only be used for commissioning, maintenance, or avoiding accidents.

2. If the hoisting limiter is bypassed, there is no device to prevent the wire rope from

being wound excessively, which will increase the risk of an accident!

4.4.8 Anemometer

The anemometer should be fixed on the boom head so that it can detect real-time wind speed on the boom head. Stop the operation if the wind speed is higher than 9.8m/s. When the out-of-service wind velocity under “main boom” configuration exceeds 21m/s, the entire boom should be placed on the ground. When the out-of-service wind velocity under “main boom with fixed jib” configuration exceeds 15m/s, the entire boom should be placed on the ground.

4.4.9 Gradiometer

A mechanical gradiometer is fitted in the front of undercarriage central section to measure the levelness of the crane.

4.4.10 Detection of safety devices

Table 4-9 Detection of safety devices

No.	Prerequisite	Limited movements	Methods of bypass	Movement speed
1	Over-winding of winch (including H1 and H2)	1. Cut off hook lifting. 2. Icon  displayed on moment limiter. 3. The buzzer alarms continuously.	1. Rotate the repair switch in the electrical control box clockwise and then release it, the icon  will be shown on the load moment limiter. After that, the limited movement can be bypassed and the buzzer alarms continuously. 2. Press the “hoisting bypass” switch and hold it until the icon  is shown on the load moment limiter. After that, the limited movements can be bypassed and the buzzer alarms continuously.	Speeds of all movements remain unchanged.
2	Over-unwinding of winch (including H1 and H2)	1. Cut off hook lowering. 2. Icon  displayed on moment limiter. 3. The buzzer	1. Rotate the repair switch in the electrical control box clockwise and then release it, the icon  will be shown on the load moment limiter. After that, the limited movement can be bypassed and	Speeds of all movements remain unchanged.

No.	Prerequisite	Limited movements	Methods of bypass	Movement speed
		alarms continuously.	the buzzer alarms continuously. 2. Press the “lowering bypass” switch and hold it until the icon  is shown on the load moment limiter. After that, the limited movements can be bypassed and the buzzer alarms continuously.	
3	$0 \leq \text{moment percent} \leq 90\%$	No movement is cut off; the green light is on.		
4	Lower down the boom until there is no rated lifting capacity displayed on load moment limit or the main boom angle < the lower limit	1. Cut off main boom lowering and hoisting of hook 1 and hook 2; 2. The buzzer alarms.	1. Rotate the “repair” switch clockwise and then release it. Icon  will be shown on the load moment limiter. After that, the movement can be bypassed and the buzzer alarms continuously. 2. Press the “Setup” switch and then release it. When icons  and  are shown on the load moment limiter, the buzzer alarms continuously.	1. Speeds of all winches and the slewing gear are reduced if the limit is bypassed by the “repair” switch. 2. Speeds of all movements remain unchanged if the limit is bypassed by the “Setup” switch.
5	Main boom angle $>82^\circ$	The load moment limiter sends out alarms continuously.		
6	Main boom angle $>83^\circ$	1. Cut off main boom erection. 2. Icon  is shown on the load moment limiter.	The bypass is invalid when main boom angle $>84^\circ$.	

No.	Prerequisite	Limited movements	Methods of bypass	Movement speed
		3. The buzzer alarms.		
7	Main boom angle > the upper limit	1. Cut off main boom erecting. 2. The buzzer alarms.	Rotate the "repair" switch clockwise and then release it. Icon  will be shown on the load moment limiter. After that, the movement of derricking up can be bypassed and the buzzer alarms continuously.	Speeds of all winches and the slewing mechanism are reduced.
8	$90\% \leq \text{weight percent} \leq 100\%$	The yellow light is on and a sound alarm is sent out continuously.		Speeds of all movements remain unchanged.
9	100% overload \leq weight percent \leq 110%	1. Cut off the hoisting of hook 1 and hook 2 and derricking up and down. 2. The red and yellow lights are on and a sound alarm is sent out continuously.	1. Rotate the "repair" switch clockwise and then release it. Icon  will be shown on the load moment limiter. After that, all movements can be bypassed. The red light is on and a sound alarm is sent out continuously. 2. Press the "Setup" switch on the right control panel, a) The limit on hook hoisting is cut off if icon  is shown on the load moment limiter (with lifting capacity). Press the "derricking bypass" switch and hold it, the limit on derricking movement is bypassed. The red and yellow lights are on and a sound alarm is sent out continuously. b) If icons  and  are shown on the load moment limiter (without lifting capacity), all movements can be bypassed. The yellow light is on and a sound	1. Activate the "Repair" switch; all winches and the slewing gear is reduced. 2. If the "Setup" switch is activated: a) All winches and the slewing gear are reduced if there is a lifting capacity. b) Speeds of all movements remain unchanged if there is no lifting capacity.

No.	Prerequisite	Limited movements	Methods of bypass	Movement speed
			alarm is sent out continuously.	
10	110% overload ≤ weight percent	The same as above	Rotate the “repair” switch clockwise and then release it. Icon  will be shown on the load moment limiter. After that, all movements can be bypassed. The red light is on and a sound alarm is sent out continuously.	Speeds of all winched and the slewing gear are reduced.

 **CAUTION**

1. Speeds of all the movements bypassed by the “repair” switch are reduced to 25%.
2. Press “Setup” switch, the bypass of cutoff is valid. After the limited movement is bypassed, return the control lever for 10s, or press “Setup” switch again, or the engine stops, or the controller is electrified again, the bypass of cutoff is invalid.
3. Press “repair” switch, the bypass of cutoff is valid for 30mins. If the switch is pressed again, or the engine stops, or the controller is electrified again, the bypass of cutoff is invalid.

4.5 Crane operation

4.5.1 Requirements before operation

- a) The boom and rear counterweight are assembled according to lifting capacity charts. Track carriers are fully extended.
- b) The crane is placed on a level ground with enough load-bearing capacity.
- c) The diesel engine is running.
- d) The hook pulley block is properly reeved in accordance with the reeving plan.
- e) All safety devices are correctly set according to lifting capacity charts.
- f) There are no persons or objects in dangerous zones.

 **CAUTION**

1. Always operate the control lever slowly and carefully. It not only ensures longer service life of the crane but also helps to avoid accidents.
2. Always make sure no obstacles or persons in the dangerous area during operation.
3. Send out at least one sound signal before operation.

4.5.2 Inspections during crane operation

- a) If the crane has been worked for a long time or the ambient temperature is too high, the oil cooling switch (No. 5 in the Figure 4-4) can be turned on to cool down the hydraulic oil.
- b) If any of the alarms mentioned in 4.2.1 is sent out during crane operation, it is necessary to stop the operation immediately and shut down the engine to check the corresponding mechanism and eliminate the fault in time.
- c) Check indicators on the load moment limiter and observe the load condition at any time during operation. In the case of overload or other alarms, it is necessary to immediately stop the operation for inspection and eliminate the fault in time.
- d) When the crane works at night, please turn on the master lighting switch and the work light switch so as to facilitate the operation of the operator and remind other people around the crane.

4.5.3 Setting of operating mode

As to specific setting procedures, please refer to *Load Moment Limiter Operating Manual*.



Operating modes must be set on the load moment limiter according to the actual condition. The setting of operating modes has a direct impact on the control of winch. Operating modes must be set accurately to avoid accidents.

4.5.4 Operation of the crawling mechanism

4.5.4.1 Components of the crawling mechanism

A crawling mechanism comprises a drive sprocket, a track-carrier roller, a track roller and track pads, a track carrier as well as a traveling reducer. Both right track carrier and left track carrier are fitted with an independent traveling reducer. The hydraulic oil in traveling motor is supplied by superstructure main pump through main valve and centre revolving joint. Components of a crawling mechanism are shown in Figure 4-24.

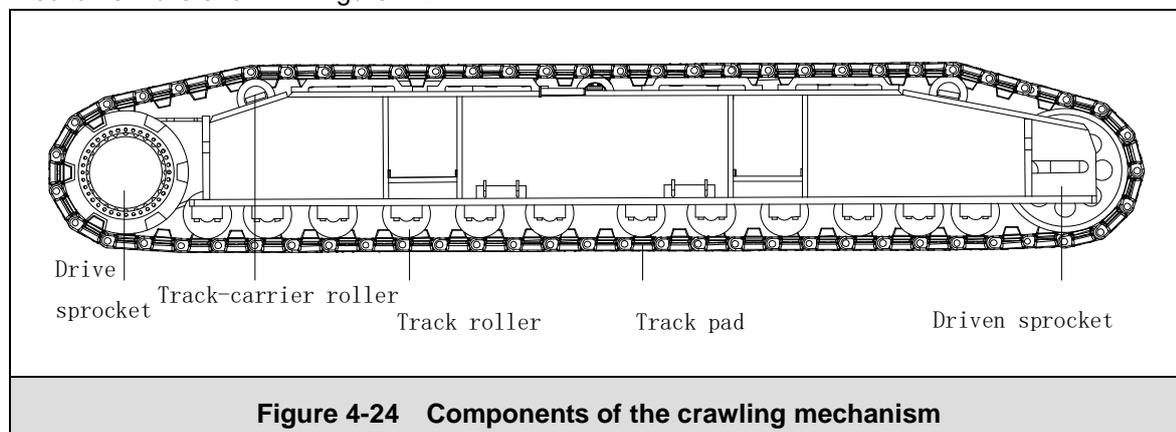
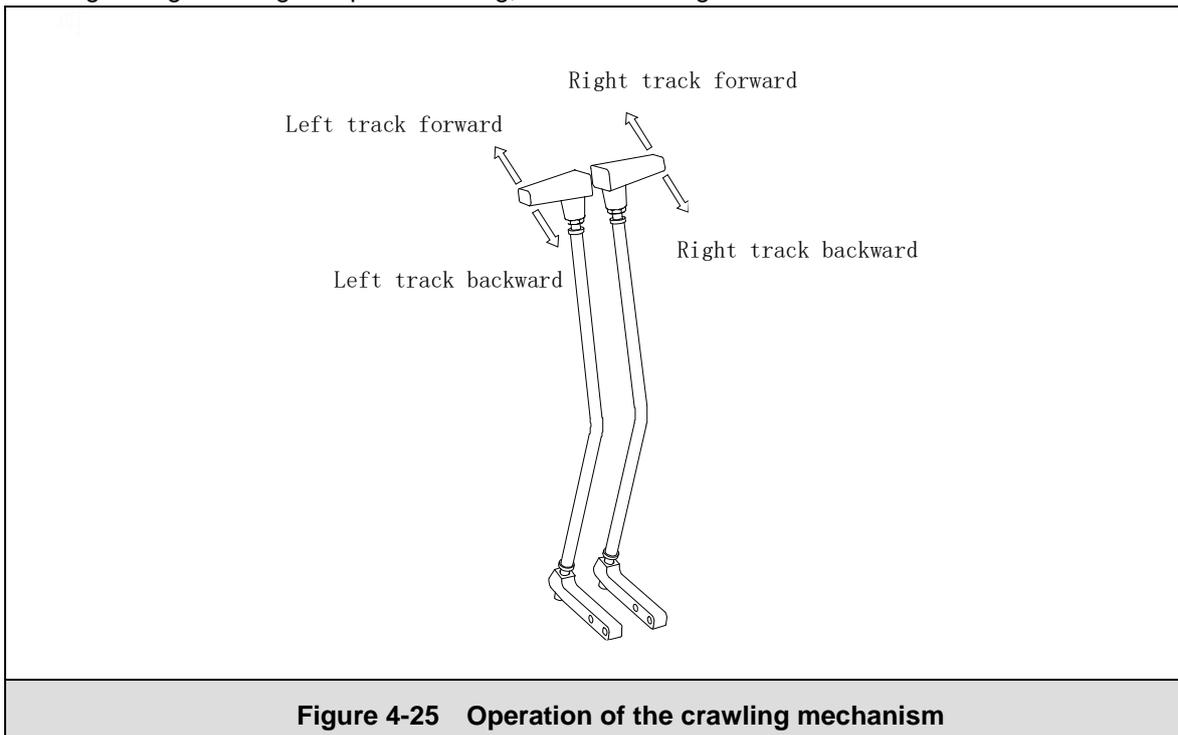


Figure 4-24 Components of the crawling mechanism

4.5.4.2 Operation of the crawling mechanism

Traveling movements are controlled by two control levers. Traveling forward and backward of the left track is controlled by the left lever. Traveling forward and backward of the right track is controlled by the right lever. It is able to make such movements as traveling in a straight line, steering during traveling and pivot steering, as shown in Figure 4-25.



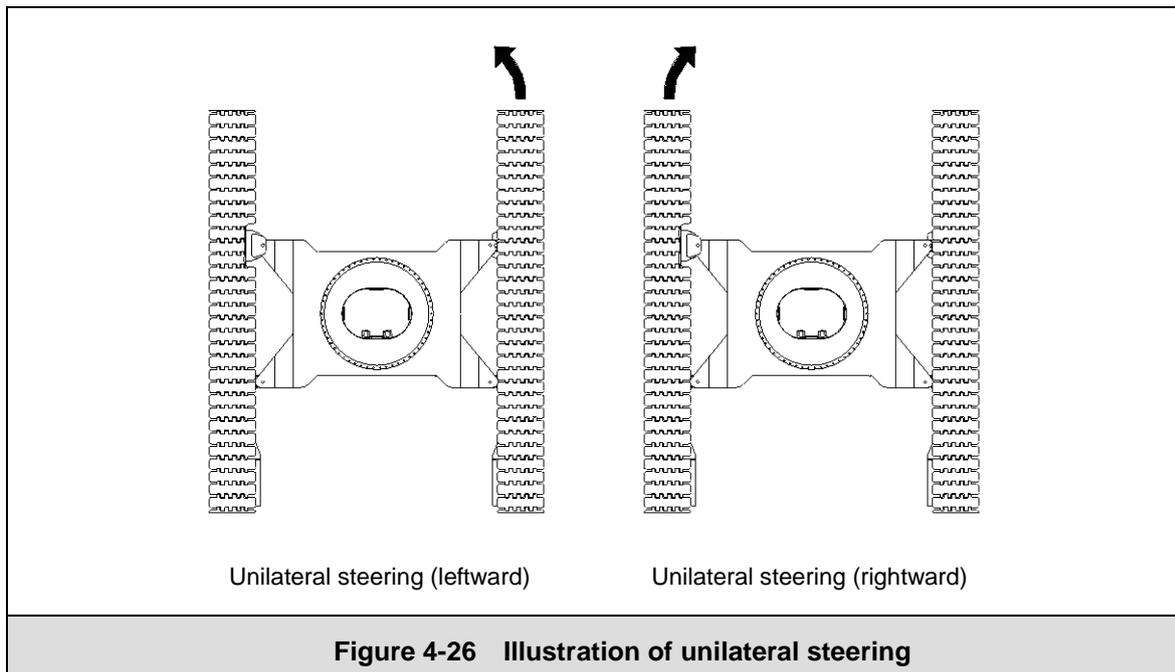
a) Traveling on a level surface.

Traveling straight forward: push both levers forward with approximately same distance and the two tracks travel forward simultaneously.

Traveling straight backward: pull both levers backward with approximately same distance and the two tracks travel backward simultaneously.

Unilateral steering (leftward): keep the left lever still and push the right lever forward.

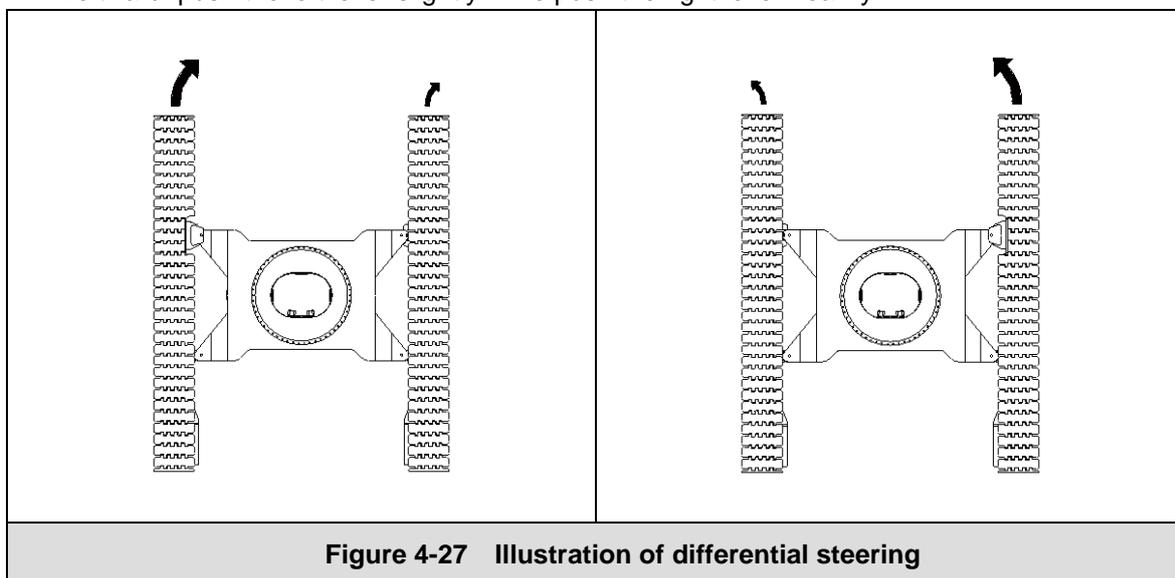
Unilateral steering (rightward): keep the right lever still and push the left lever forward.



b) Differential steering

Rightward: push the left lever heavily (the speed of the left track is higher) while push the right lever slightly (the speed of the right track is lower);

Leftward: push the left lever slightly while push the right lever heavily.



c) Steering with small radius (pivot steering)

Pivot steering (rightward): pull the right lever heavily and the right track steers backward; push the left lever heavily and the left track steers forward.

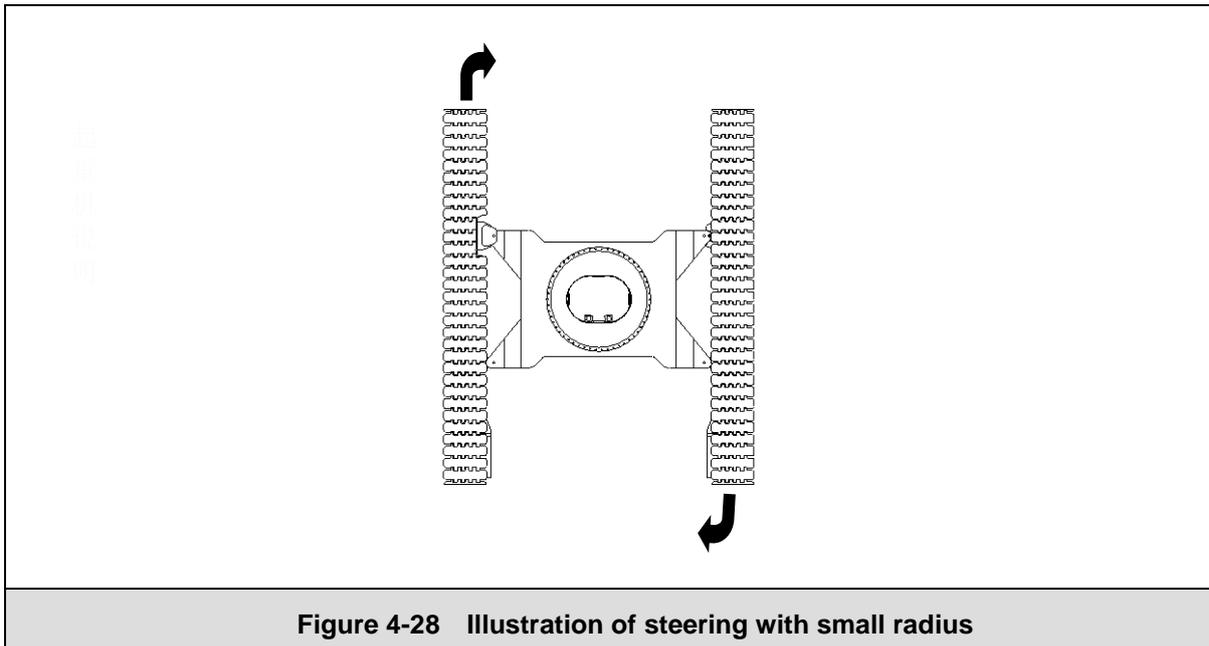


Figure 4-28 Illustration of steering with small radius

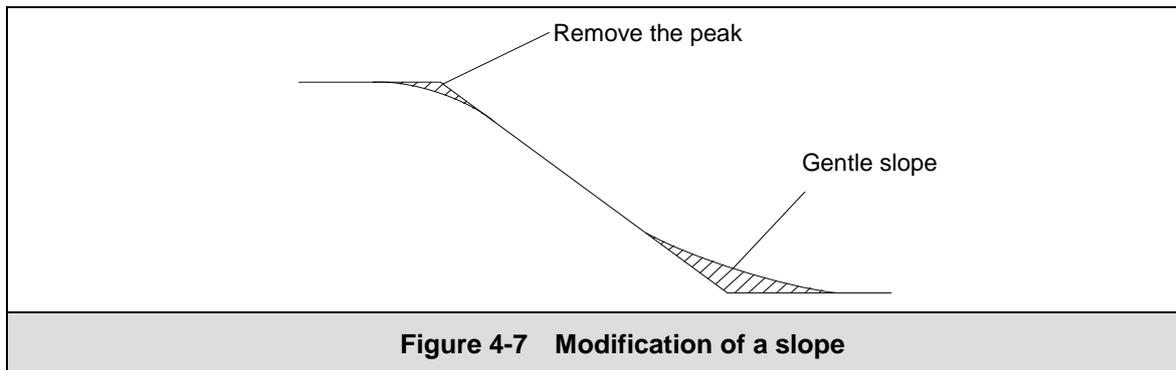
! CAUTION

1. Follow the same steps above to steer leftward.
2. If it needs to stop crawling or steering, return the crawling pedal back to the neutral (zero) position and the crawling brake will be activated automatically.
3. Make sure that the boom is located straight ahead and the crawling reducer is right behind the slewing table when the crane crawls with a load for a long distance.

d) Traveling on a slope

Face the crane forward and put the lever controlling slewing on the neutral (zero) position. If the crane crawls uphill, the engine speed should be controlled within a medium speed range. The crane must be only fitted with a basic boom and the counterweight should be placed uphill and drive sprockets should be placed downhill if the crane crawls on a slope of the maximum permitted gradient. Drive sprockets should be placed uphill if the crane crawls downhill.

Turning on a slope: If the crawler crane needs to turn on the slope when it is crawling uphill, some treatments should be taken to the slope to form a gentle slope curve (see the Figure 4-25), which can prevent crane's center of gravity from deviating and the load from concentrating on a section of crawler when the crawler crane is traveling over undulations.



! CAUTION

1. When the crane crawls from a level ground to a slope, it must be stopped for the adjustment of its gravity center that might deviates forward.
2. When the crane is crawling on a slope with a rated gradient, the counterweight and boom should be dismantled from the crane during crawling so as to assure safety if the ground condition is not clear.

e) Crawling with a suspended load

The crane is able to crawl with a suspended load, providing that the following precautions are taken:

- 1) The ground that supports the crane must be flat and level (without gradient). ■
- 2) The ground must be able to support the maximum weight of the crane during operation and the weight of suspended load.
- 3) The boom should be placed right ahead and only the lowest crawling speed is allowed.
- 4) Jerky movements that could cause vibration of the crane should be avoided. ■
- 5) Suspended load should be secured with rope so as to avoid swinging.
- 6) There is no need to use steering of crawler.

f) High-speed crawling

Press the "high speed" button (No. 11 in Figure 4-4) on the 16-switch panel and then operate both the left and the right control lever forward or backward to realize high-speed crawling.

! CAUTION

1. Put the control lever back to the neutral position to stop crawling when the crane works normally.
2. The "High speed" button can be only used to accelerate crawling when the crane is empty-loaded or traveling in a straight line.

4.5.5 Operation of the winch mechanism

4.5.5.1 Components of the winch mechanism

The winch mechanism consists of a hoisting mechanism and a derricking mechanism. The hoisting mechanism is composed of a hydraulic motor, a winch reducer, a normally closed brake, a lowering limiter, a hoisting limiter, wire rope, a primary hook, an auxiliary hook, etc. The derricking mechanism is composed of a derricking winch reducer, a drum, a motor, a brake, derricking rope, an A-frame assy., a derricking pulley block assy. and main boom anchoring rods. The winch mechanism is controlled by the two joysticks.

4.5.5.2 Operation of the hoisting mechanism

The hoisting mechanism consists of the primary hoisting winch (H1) and the secondary hoisting winch (H2). H1 and H2 locate on different positions and have different functions. H1 is used to operate the primary hook while H2 is used to operate the auxiliary hook or the luffing jib mechanism.

(1) Primary hoisting winch

Hoisting and lowering of H1: pull the joystick backward to hoist the load; push the joystick forward to lower the load.

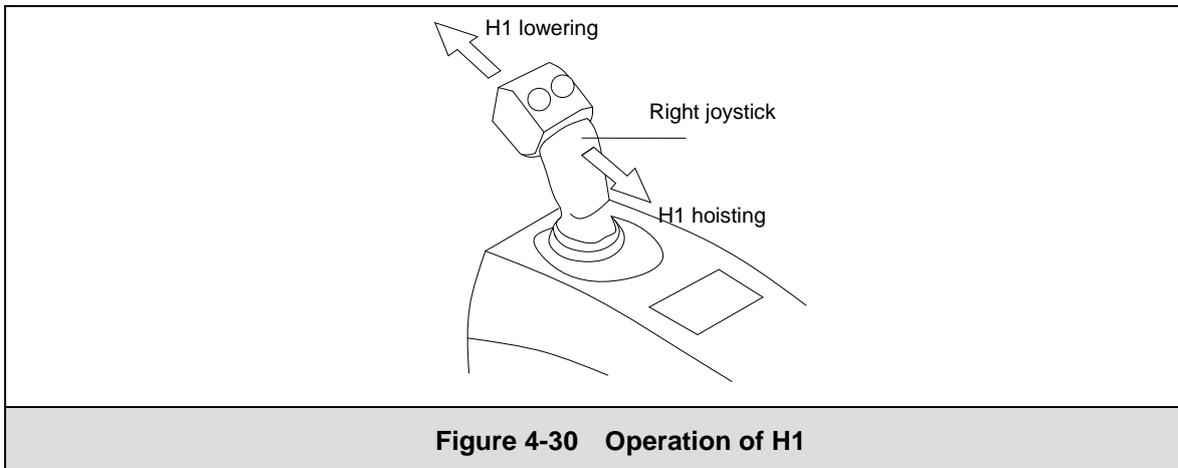


Table 4-10 Movements controlled by H1

Joystick	Operation	Movements
Right joystick	Forward	Unwinding H1 (hook lowering)
	Backward	Winding H1 (hook hoisting)
	Neutral position	H1 stops

(2) Secondary hoisting winch

Hoisting and lowering of H2: pull the joystick backward to hoist the load; push the joystick forward to lower the load.

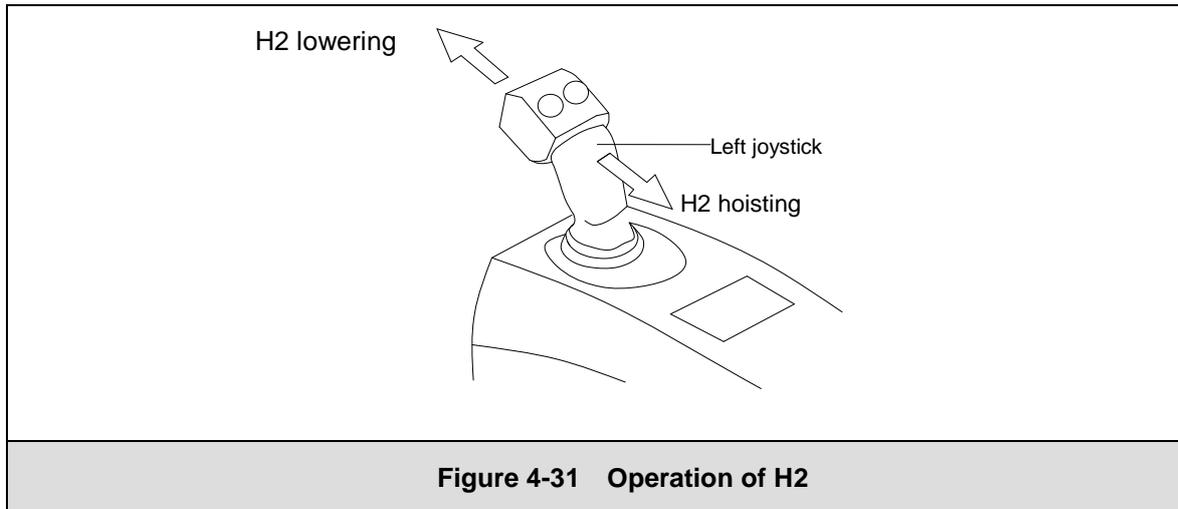


Figure 4-31 Operation of H2

Table 4-11 Movements controlled by H2

Joystick	Operation	Movements
Left joystick	Forward	Unwinding H2 (hook lowering)
	Backward	Winding H2 (hook hoisting)
	Neutral position	H2 stops

(3) High-speed hoisting and lowering and micro-inching function.

a) High-speed hoisting and lowering

Both H1 and H2 have high-speed hoisting and lowering function.

There are two gears for high-speed H1. If the medium speed is selected, high speed of H1 is realized through the convergence of two pumps when the medium-speed gear is selected. If the high-speed gear is selected, high speed of H1 can be realized through the change of H1 motor angular and the convergence of two pumps.

H2 has only one gear. If the high-speed button is pressed, high speed of H2 can be realized through the change of H2 motor angular.

b) Micro-inching function

H1, H2, the derricking mechanism and the slewing mechanism have micro-inching function.

Press the micro-inching switch (No. 9 in Figure 4-4), speeds of all movements is reduced to 25% of normal speeds.

! WARNING

1. High speed switch is only permitted when the crane works without a load or with a light load and only the hoisting winch is operated.

2. Engine speed must be controlled at around 1000rpm~1500rpm when micro-inching

function is used.

3. The hoisting mechanism has a perfect micro-inching function. The engine speed must be kept constant when micro-inching function is used. Otherwise there might be a risk of fluctuating speed of the hoisting mechanism and vibration of load.

4. There must be at least three windings of wire rope left on the drum under any circumstance.

5. Operation can be only continued towards the safe direction if the system sends out an alarm. Please refer to 4.4 if the movement needs to be continued. Any bypass operation must only be carried out by professionals during commissioning and inspection or in conditions of avoiding other accidents.



1. Choose proper rope reeving in accordance with boom length.

2. Lower down the load if the hook swings due to entangled rope, which cannot be lifted up until the rope is completely untied.

3. When a load is lifted off the ground, it must be first suspended in the air for a moment. Do not lift the load by derricking the boom up if the load is still in contact with the ground.

4. Do not switch the control lever between “hoisting” and “lowering” jerkily. The operator must return the control lever back to the neutral position and ensure that the winding drum has stopped before switching the control lever from “hoisting” to “lowering”. Otherwise, the machine will be damaged.

5. For the operating mode of S boom, the length of wire rope might not be long enough because the lifting height increases with the boom. At this time, the length of wire rope can be adjusted through the change of rope reeving, during which the limit weight must be installed well.

6. If the crane is overloaded or winches are over-hoisted or over-lowered, the safety device of the system will cut off the movement automatically and send out an alarm.

4.5.5.3 Operation of the derricking mechanism

Derricking mechanism adjusts boom angle and working radius through derricking winches by changing the length of wire rope between derricking pulley blocks (derricking crown block and derricking traveling block). Derricking winches are different for different operating modes.

(1) “Main boom” operating mode and “fixed jib” operating mode

For operating modes of “main boom” and “jib”, the derricking crown block is fixed at the rear end of the slewing table while the derricking traveling block is fixed at the top end of the A-frame. Main boom angle varies with the length of derricking rope between pulley blocks, which is between 0°~83°.

The included angle between the fixed jib and the main boom (10° and 30°) must not be

changed during operation. The working radius of the fixed jib varies with the main boom angle.

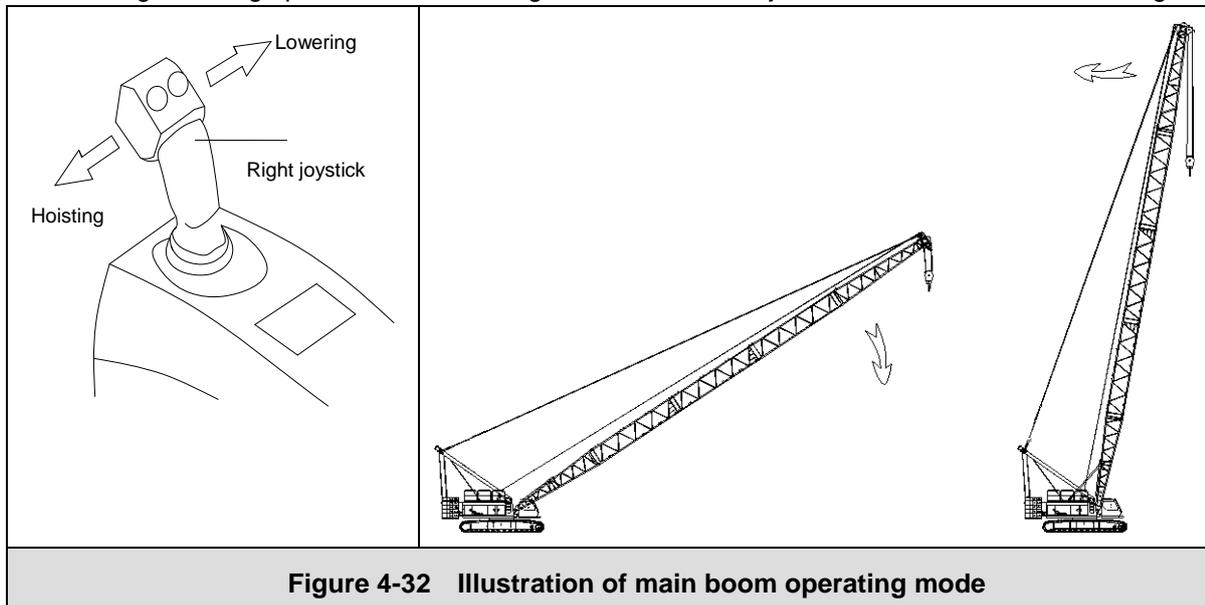


Figure 4-32 Illustration of main boom operating mode

Table 4-12 Movements controlled by the derricking winch

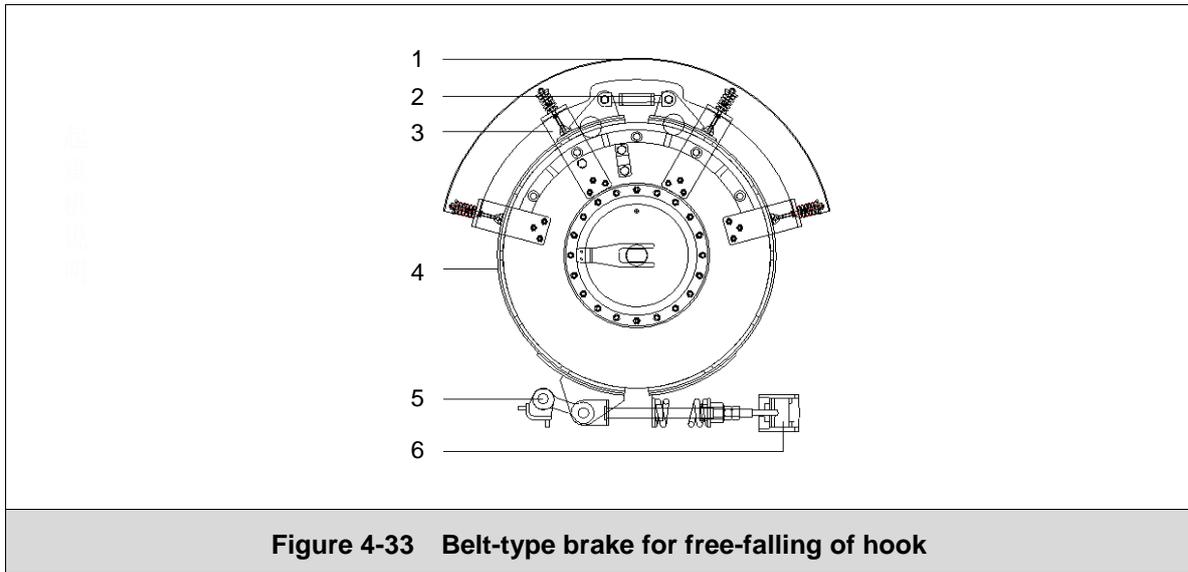
Joystick	Operation	Movements
Right joystick	Leftward	Wind the derricking winch and erect the main boom
	Rightward	Unwind the derricking winch and lower the main boom
	Neutral position	The derricking winch stops

CAUTION

- 1. The derricking winch must be operated stably. Abrupt operation brings a huge impact on the crane during lifting.**
- 2. Derricking towards a dangerous direction is prohibited when the crane is loaded to avoid tilting over.**

4.6.5.3 Operation of free-falling

Free-falling function is optional for the primary hoisting winch. Hoisting winch with the function of free-falling consists of hydraulic motor, winch reducer, winding drum, brake drum, normally closed brake, external belt brake, hoisting limiter, wire rope and load hook, etc. The external belt brake is mainly composed of brake cylinder, brake spring, connecting rod, brake belt, adjusting device, and waterproof cover, etc.

**Table 4-13 Components of brake for free-falling of hook**

No.	Components	Descriptions
1	Water-proof cover	Prevent water from getting into the friction surface between the braking belt and the brake drum.
2	Regulating device	The regulating device can be used to make up for the clearance brought by the abrasion of the braking belt.
3	Regulating device	The regulating device can be used to make up for the clearance between the braking belt and the brake drum during free-falling of hook.
4	Braking belt	It realized braking through the resistance produced by the friction between the braking belt and the brake drum.
5	Mechanism of braking spring and connecting rod	The brake is a normally-closed brake, which means the braking spring is being compressed all the time.
6	Braking cylinder	Release the braking effect of the belt-type brake.

Operating steps of H1 free-falling are as follows:

- a) Stop the movement of hoisting winch and the outside belt-type brake at this time is normally closed.
- b) Turn on the free-falling switch (No.8 in Figure 4-4) on the left control panel, and then press the H1 free-falling switch (No.4 in Figure 4-2) to release the reducer clutch.
- c) Step on the “pedal for H1 free-falling” and the winch will be reeled off quickly with the weight of the load hook.
- d) Slowly release the free-falling pedal after the hook is lowered for a certain height. The external belt-type brake starts to function and the lowering speed of the winch will be reduced until it

stops.

e) Turn off the free-falling switch on the left control panel or the H1 free-falling switch on the right joystick. .

f) A free falling is completed.

Operating steps of free-falling of H2 are as follows:

a) Stop the movement of hoisting winch and the outside belt-type brake at this time is normally closed.

b) Turn on the free-falling switch (No.8 in Figure 4-4) on the left control panel, and then press the H2 free-falling switch on the left joystick (No.4 in Figure 4-6) to release the reducer clutch.

c) Step on the "H2 free-falling pedal" and the winch will be reeled off quickly with the weight of the load hook.

d) Slowly release the free-falling pedal after the hook is lowered for a certain height. The external belt-type brake starts to function and the lowering speed of the winch will be reduced until it stops.

e) Turn off the free-falling switch on the left control panel or the H2 free-falling switch on the right joystick. .

f) A free falling is completed.



1. Free-falling operation is only permitted when the crane works without a load or with a light load.

2. The free falling of hook will be limited if the load weight exceeds 2t or 10% of the rated load. An accident may occur if free-falling operation is forced to be carried out.

3. It is prohibited to turn on the free-falling switch when the conventional operation of hoisting winch is controlled by the joystick.

4. Never reset the free-falling switch before the winding drum of the hoisting winch stops completely during a free-falling process.



1. Brake band is a consumable part. Please replace it immediately if the thickness of abrasion exceeds 3mm-4mm.

2. The braking torque of the brake can be controlled by adjusting the tension of big spring under the brake.

3. Braking of free falling must be carried out slowly and the pedal must be released gently as well.

4. Free-falling of hook stops only when the pedal is released in order to avoid misoperation on the joystick.

4.5.6 Operation of the slewing mechanism

4.5.6.1 Components and features of the slewing mechanism

The slewing mechanism is composed of a plunger hydraulic motor, a planetary gear reducer, a slewing brake valve, a built-in brake, drive gear, a slewing ring, etc. A slewing of 360° can be realized through the drive gear. An independent closed plunger pump is applied to supply oil, which can adjust the slewing speed accurately.

4.5.6.2 Operation of the slewing mechanism

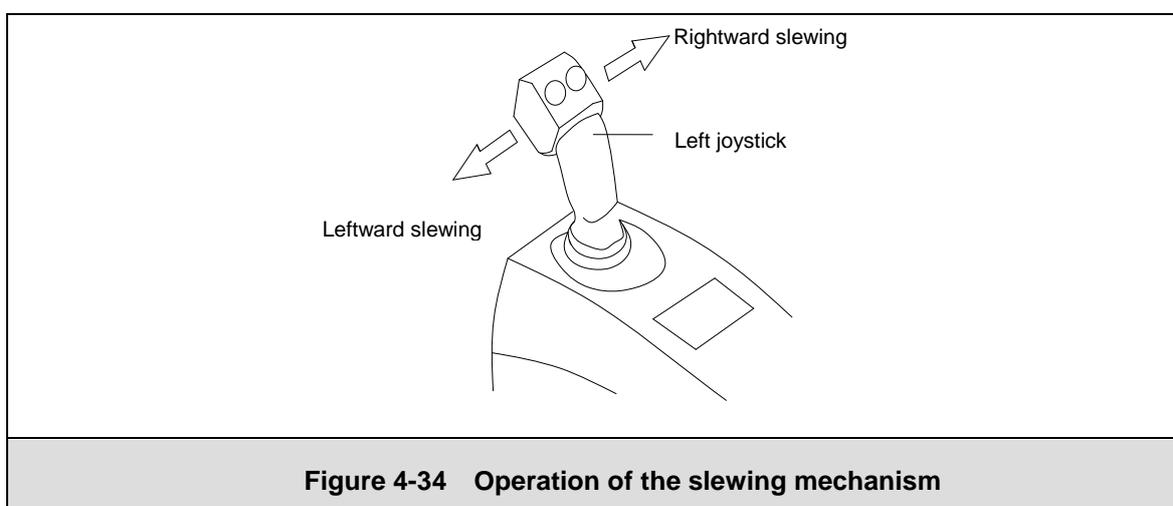


Figure 4-34 Operation of the slewing mechanism

Table 4-14 Movements of the slewing mechanism

Joystick	Operation	Movements
Left joystick	Leftward	Slewing leftward
	Rightward	Slewing rightward
	Neutral position	Stop slewing

a) Micro-inching function of slewing

Press the micro-inching switch (No. 9 in the Figure 4-4) on the 16-switch panel. The speed of slewing movement is reduced to 25%.

! CAUTION

1. The risk of accident will be increased if the crane slews with an excessively high speed.
2. Make sure that there is no obstacle within the slewing range. Otherwise, there is a risk of accident.

3. Lower slewing speed is preferable for longer booms or heavier loads.

4. Check the gradient of the ground within slewing range before slewing when the crane is hoisting a load.

b) Operation of free swinging

If the load hook is not positioned vertically over the load's center of gravity before lifting operation, the operator should actuate the "swing free running" switch (No.11 in the Figure 4-2) on the upper control panel. At this moment, the boom will enforce the slewing table, under the influence of lateral force of wire rope, to rotate toward the direction of load's center of gravity till the hoisting wire rope is vertical. In this way, the boom can be protected against damage due to the lateral force.

 **CAUTION**

1. Hoisting of a load hook must be carried out simultaneously with free swinging. In this way, a lateral force that pulls the load hook to a position vertical to the boom will be produced on the wire rope.

2. Make sure that there is no obstacle within the slewing range and honk to draw the attention of persons around before slewing. Otherwise, there is a risk of accident.

3. The crane must be operated stably. A sudden stop of slewing or an abrupt steering can be extremely dangerous, which must be avoided. It is prohibited to make the load in suspension swing.

4. Lower slewing speed is preferable for longer booms.

5. Lower slewing speed is preferable for heavier loads.

6. It is prohibited to slew the superstructure on a trailer.

4.5.7 Synchronized movement

Available synchronized movements include: primary hoisting and slewing, primary hoisting and derricking, slewing and derricking, secondary hoisting and slewing, secondary hoisting and derricking, primary hoisting and secondary hoisting, etc. It is recommended to operate two mechanisms at most at the same time for the sake of safety.

a) Hoisting winch 1 (H1) + slewing

Operate the left and the right joysticks simultaneously.

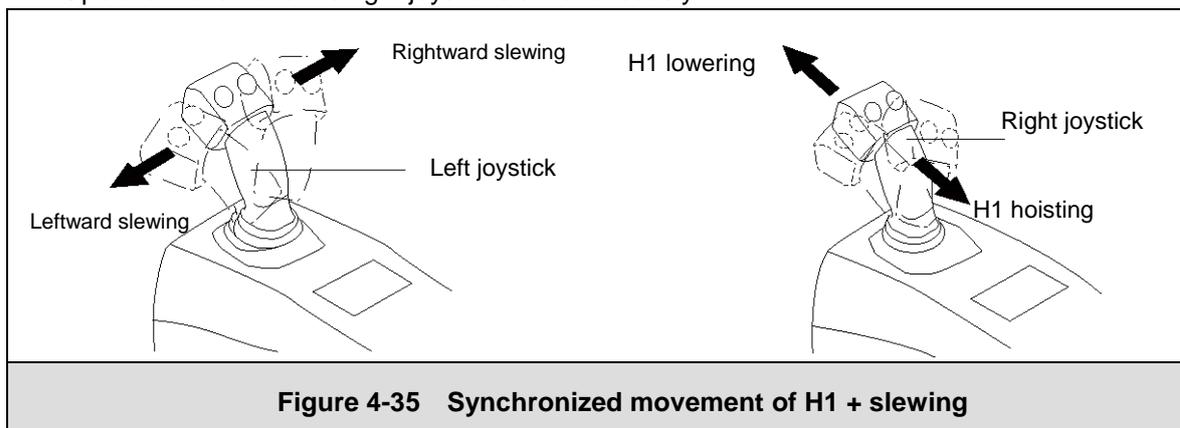


Table 4-15 Synchronized movement of H1 + slewing

Joystick and operation		Left joystick		
		Leftward	Neutral position	Rightward
Right joystick	Forward	Unwind H1 (lower hook 1) + slew leftward	Unwind H1 (lower hook 1)	Unwind H1 (lower hook 1) + slew rightward
	Neutral position	Slew leftward	No movement	Slew rightward
	Backward	Wind H1 (hoist hook 1) + slew leftward	Wind H1 (hoist hook 1)	Wind H1 (hoist hook 1) + slew rightward

b) Hoisting winch 1 (H1) + derricking

Both operations are controlled by the right joystick.

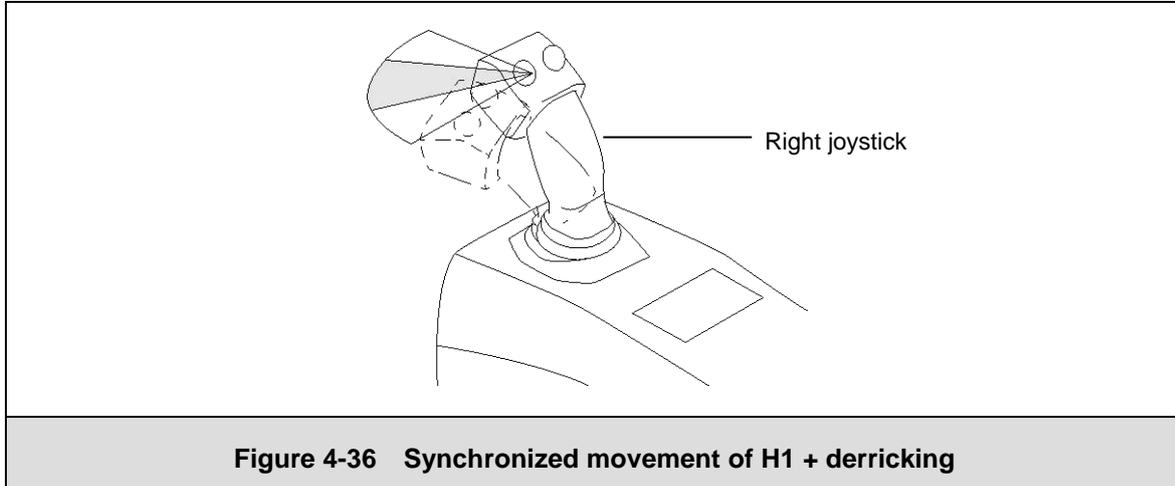


Figure 4-36 Synchronized movement of H1 + derricking

Table 4-16 Synchronized movement of H1 + derricking

Joystick and operation		Right joystick		
		Leftward	Neutral position	Rightward
Right joystick	Forward	Unwind H1 (lower hook 1) + wind derricking winch (erect main boom)	Unwind H1 (lower hook 1)	Unwind H1 (lower hook 1) + unwind derricking winch (lower main boom)
	Neutral position	Wind derricking winch (erect main boom)	No movement	Unwind derricking winch (lower main boom)
	Backward	Wind H1 (hoist hook 1) + wind derricking winch (erect main boom)	Wind H1 (hoist hook 1)	Wind H1 (hoist hook 1) + unwind derricking winch (lower main boom)

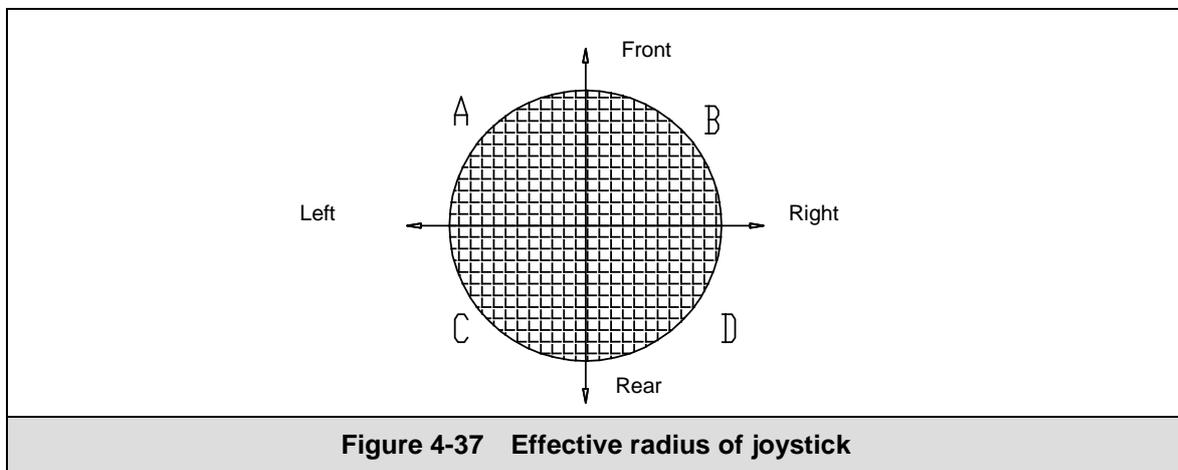


Figure 4-37 Effective radius of joystick

Note: Movements are proportionally controlled according to the excursion of the joystick when a synchronized movement is carried out by one joystick. The effective radius of a joystick can be divided into four parts: A, B, C and D (see the figure above).

- A: unwind H1 (lower hook 1), wind derricking winch (erect main boom)
- B: unwind H1 (lower hook 1), unwind derricking winch (lower main boom)
- C: wind H1 (hoist hook 1), wind derricking winch (erect main boom)
- D: wind H1 (hoist hook 1), unwind derricking winch (lower main boom)

c) Slewing and derricking

Operate the left and the right joystick simultaneously.

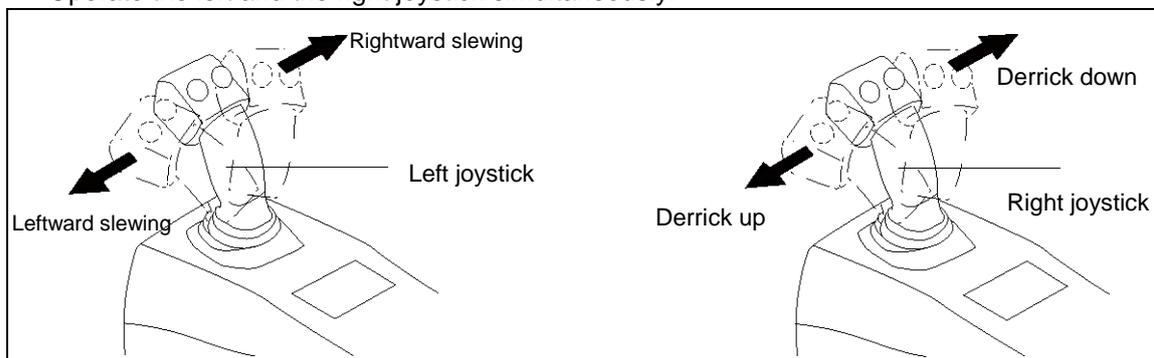


Figure 4-38 Synchronized movement of slewing + derricking

Table 4-17 Synchronized movement of slewing + derricking

Joystick and operation		Right joystick		
		Leftward	Neutral position	Rightward
Left joystick	Leftward	Slew leftward + wind derricking winch (erect main boom)	Slew leftward	Slew leftward + unwind derricking winch (lower main boom)
	Neutral	Wind derricking winch (erect main boom)	No movement	Unwind derricking winch (lower main boom)
	Rightward	Slew rightward + wind derricking winch (erect main boom)	Slew rightward	Slew rightward + unwind derricking winch (lower main boom)

d) Hoisting winch 2 (H2) + slewing

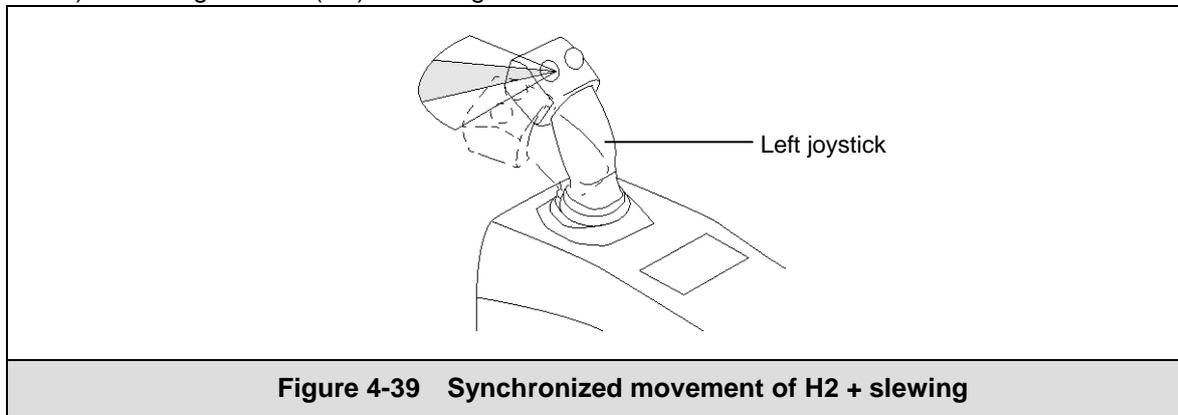


Figure 4-39 Synchronized movement of H2 + slewing

Table 4-18 Synchronized movement of H2 + slewing

Joystick and operation		Left joystick		
		Leftward	Neutral position	Rightward
Left joystick	Leftward	Unwind H2 (lower hook 2) + slew leftward	Unwind H2 (lower hook 2)	Unwind H2 (lower hook 2) + slew rightward
	Neutral	Slew leftward	No movement	Slew rightward
	Rightward	Wind H2 (hoist hook 2) + slew leftward	Wind H2 (hoist hook 2)	Wind H2 (hoist hook 2) + slew rightward

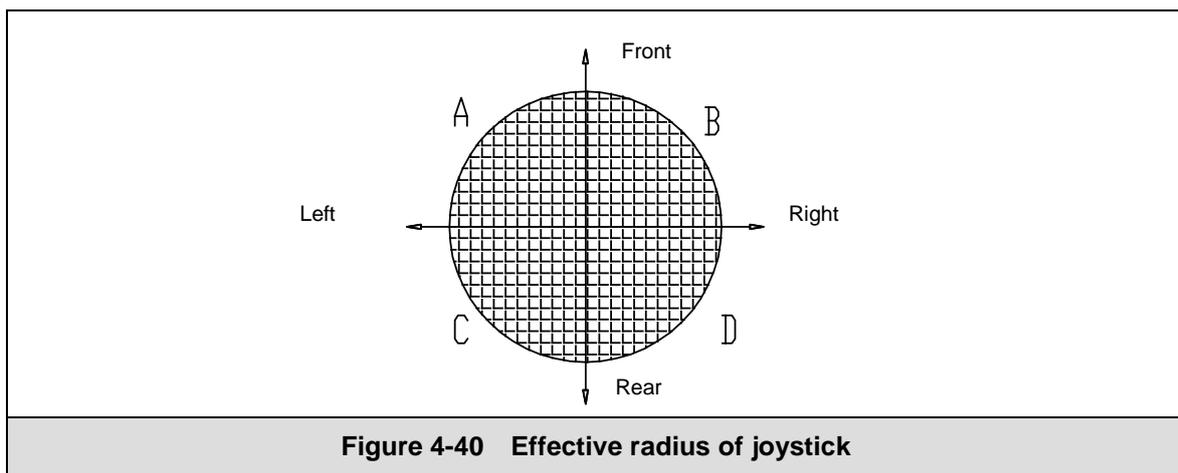


Figure 4-40 Effective radius of joystick

Note: Movements are proportionally controlled according to the excursion of the joystick when a synchronized movement is carried out by one joystick. The effective radius of a joystick can be divided into four parts: A, B, C and D (see the figure above).

A: unwind H2 (lower hook 2), slew leftward

B: unwind H2 (lower hook 2), slew rightward

- C: wind H2 (hoisting hook 2), slew leftward
- D: wind H2 (hoisting hook 2), slew rightward

e) Hoisting winch 2 (H2) + derricking

Operate the left and the right joystick simultaneously.

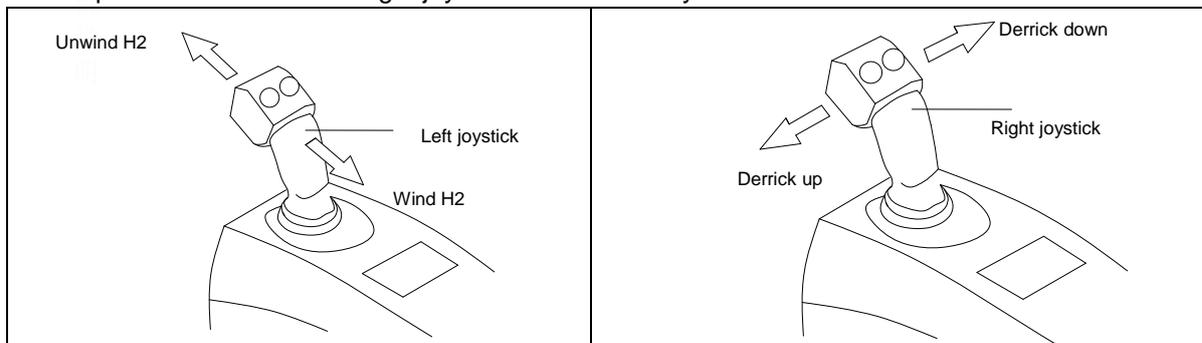


Figure 4-41 Synchronized movement of H2 + derricking

Table 4-19 Synchronized movement of H2 + derricking

Joystick and operation		Right joystick		
		Leftward	Neutral position	Rightward
Left joystick	Leftward	Unwind H2 (lower hook 2) + wind derricking winch (erect main boom)	Unwind H2 (lower hook 2)	Unwind H2 (lower hook 2) + unwind derricking winch (lower main boom)
	Neutral	Wind derricking winch (erect main boom)	No movement	Unwind derricking winch (lower main boom)
	Rightward	Wind H2 (hoist hook 2) + wind derricking winch (erect main boom)	Wind H2 (hoist hook 2)	Wind H2 (hoist hook 2) + unwind derricking winch (lower main boom)



Operate both left and right joysticks towards different directions to realize synchronized movements towards relative directions.

f) Hoisting winch 1 (H1) + hoisting winch 2 (H2)

Operate the left and the right joystick simultaneously.

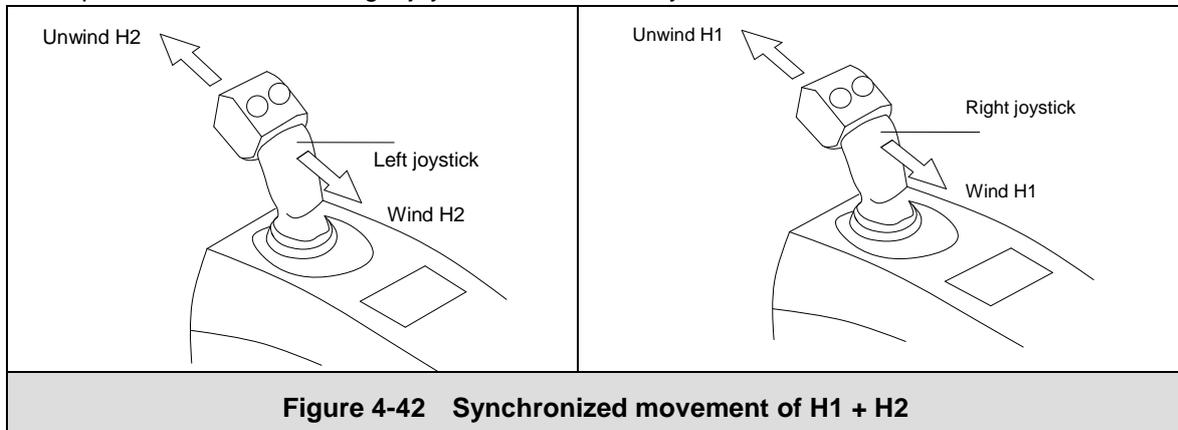


Figure 4-42 Synchronized movement of H1 + H2

Table 4-20 Synchronized movement of H1 + H2

Joystick and operation		Left joystick		
		Leftward	Neutral position	Rightward
Right joystick	Leftward	Unwind H1 (lower hook 1) + unwind H2 (lower hook 2)	Unwind H1 (lower hook 1)	Unwind H1 (lower hook 1) + wind H2 (hoist hook 2)
	Neutral	Unwind H2 (lower hook 2)	No movement	Wind H2 (hoist hook 2)
	Rightward	Wind H1 (hoist hook 1) + unwind H2 (lower hook 2)	Wind H1 (hoist hook 1)	Wind H1 (hoist hook 1) + wind H2 (hoist hook 2)



Operate both left and right joysticks towards different directions to realize synchronized movements towards relative directions.

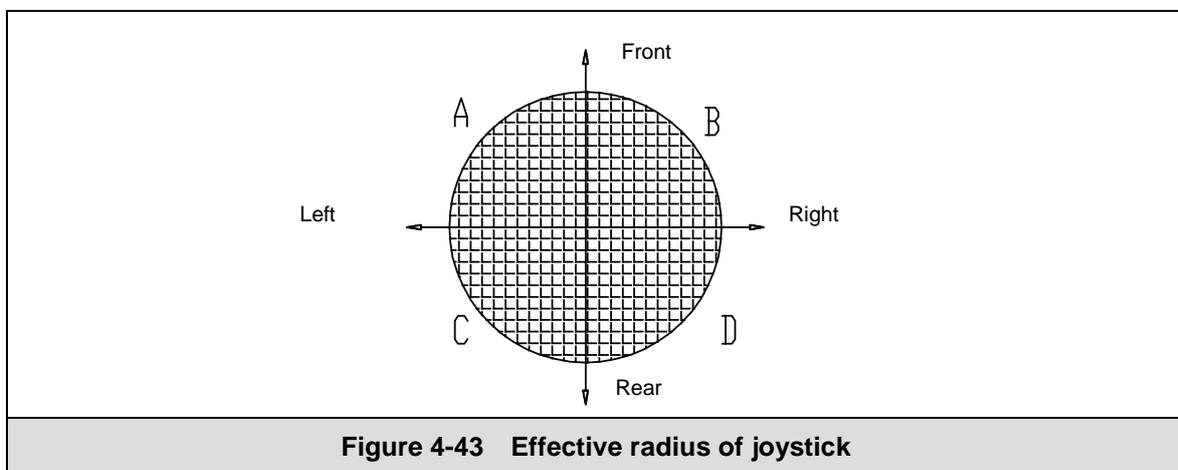


Figure 4-43 Effective radius of joystick

Note: Movements are proportionally controlled according to the excursion of the joystick when a synchronized movement is carried out by one joystick. The effective radius of a joystick can be divided into four parts: A, B, C and D (see the figure above).

- A: unwind H2 (lower hook 2), slew leftward
- B: unwind H2 (lower hook 2), slew rightward
- C: wind H2 (hoisting hook 2), slew leftward
- D: wind H2 (hoisting hook 2), slew rightward

Table 4-21 Operations of synchronized movements

No.	Synchronized movements	Operations
1	H1 + slewing	Right joystick (front & rear) + left joystick (left & right)
2	H1 + derricking	Operate the right joystick within areas of A, B, C and D.
3	Slewing + derricking	Left joystick (left & right) + right joystick (left & right)
4	H2 + slewing	Operate the left joystick within areas of A, B, C and D.
5	H2 + slewing	Left joystick (front & rear) + right joystick (left & right)
6	H1 + H2	Right joystick (front & rear) + left joystick (front & rear)



1. It is prohibited to push or pull levers violently whether a single movement or a synchronized movement is carried out.
2. It is prohibited to make a synchronized movement if the mechanism works with a high speed.
3. It is prohibited to make a synchronized movement consisting three mechanisms.

4.5.8 Operation of cab's movement

The control mechanism for operator's cab consists a cab, a swiveling arm, pin spindles fixing the swiveling arm and a cab pitching cylinder. The cab is an independent and mobile cabin. It can be pitched up and down during operation or swiveled laterally when the cab needs to be put into the transport position.

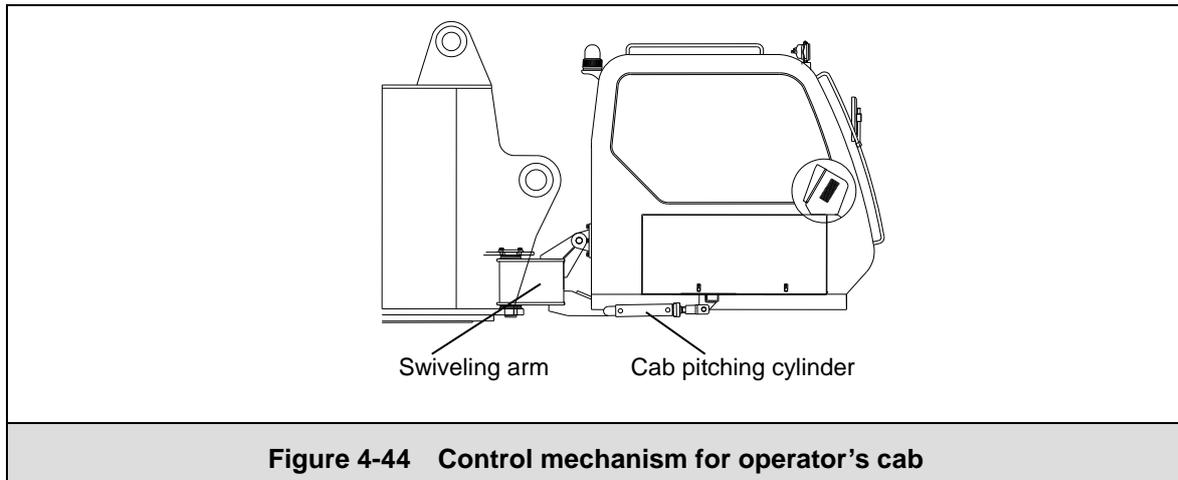


Figure 4-44 Control mechanism for operator's cab

4.5.8.1 Horizontal movement of the cab

Limited by the maximum transport width, the cab must be placed right in front of the slewing table during transport.

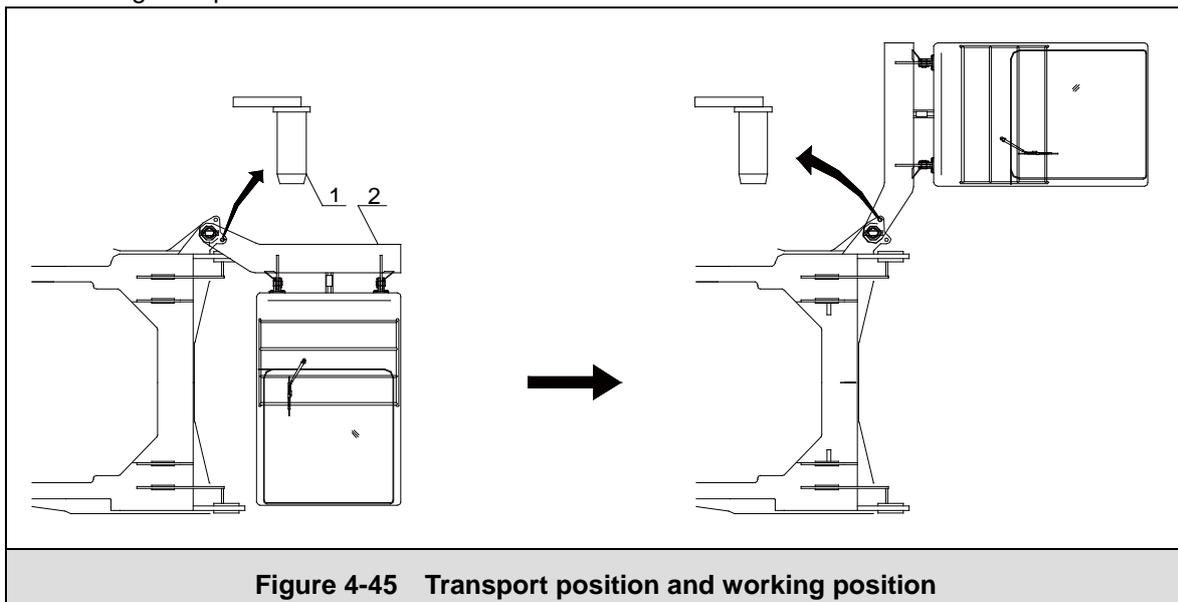


Figure 4-45 Transport position and working position

Before swiveling the cab from the position for transportation to the position for operation, the cab must be swiveled sideways 90 ° and then secured with fixing pin (1) of swivel arm (2).

Procedures for swiveling cab to the position for operation are:

- a) Pull out the fixing pin (1) of swivel arm.
- b) Push the swiveling arm (2) manually for 90°.
- c) Insert fixing pin (1) to secure the swivel arm after the cab is in working position.

CAUTION

1. Swiveling operator's cab to the position for transportation should be carried out in a reverse order.

2. Do not operate any other devices when swiveling operator's cab.

3. Close the door before swiveling operator's cab.

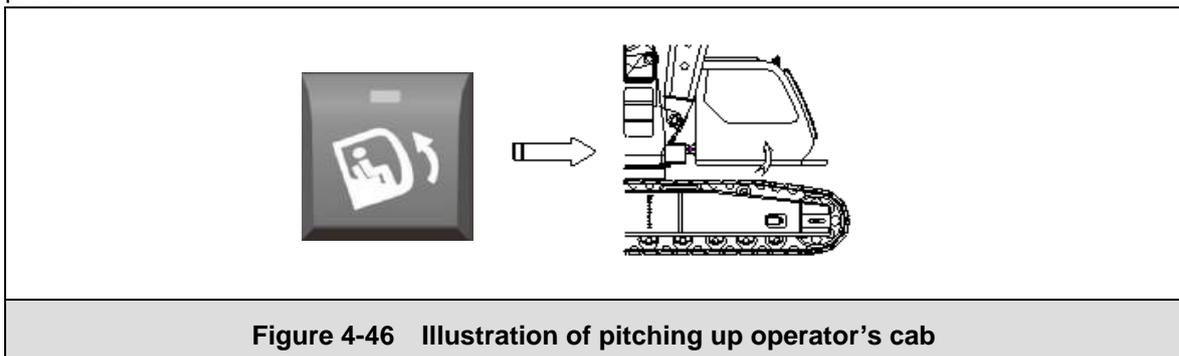
4. Take off the working floodlight on the roof of cab before swiveling operator's cab so as to prevent them from colliding with tilting-back support cylinder of main boom.

4.5.8.2 Pitching movement of the cab

The vertical viewing angle of operator can be adjusted through the pitching mechanism according to the height of lifted load. The cab is in a horizontal position when the pitching cylinder is extended completely. The cab pitches up with a maximum angle of 20° when the cylinder is retracted. This function can be simply realized by pulling the "Pitching" switch. The cab can be maintained within the range of 0° - 20°.

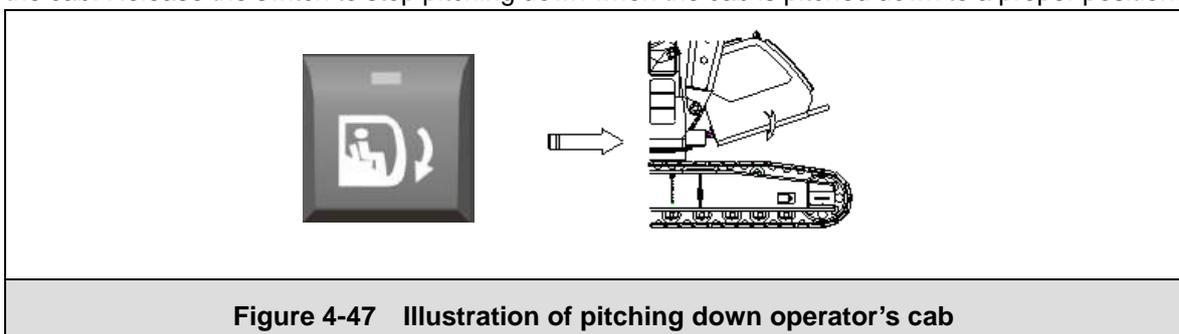
a) Pitching up the cab:

When the cab is in the horizontal position, press the "pitching up" switch (No. 1 in Figure 4-5) to pitch up the cab. Release the switch to stop pitching up when the cab is pitched up to a proper position.



b) Pitching down the cab:

When the cab is pitched up, press the "pitching down" switch (No. 2 in Figure 4-5) to pitch down the cab. Release the switch to stop pitching down when the cab is pitched down to a proper position.



4.5.9 Control valves of undercarriage

Control valves of undercarriage, right in the front of the chassis frame, are mainly used to control crawler carrier bolting cylinders or vertical cylinders through undercarriage control levers.

CAUTION

Press the undercarriage auxiliary switch (No. 7 in Figure 4-5) first before operating outriggers. Turn off the switch when operations of the undercarriage are finished.

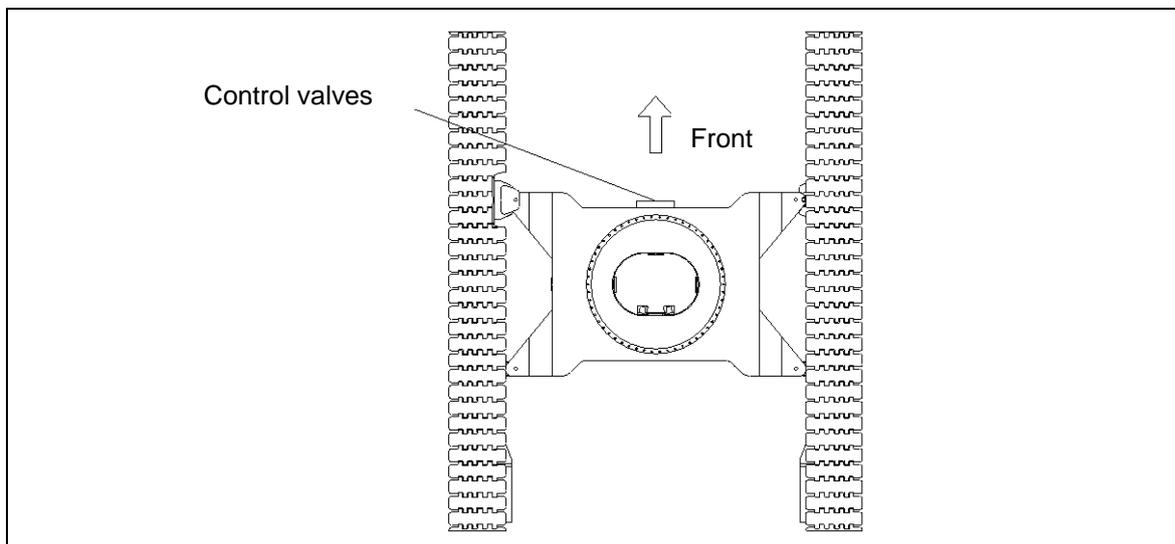


Figure 4-48 Position of undercarriage control valves

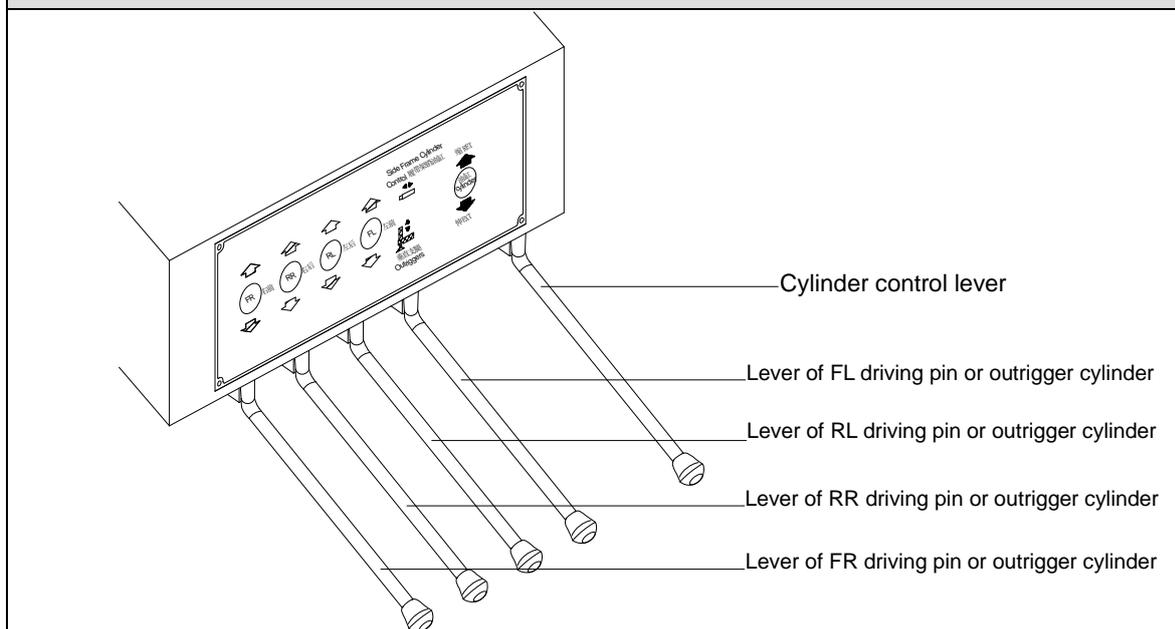


Figure 4-49 Illustration of undercarriage control valves

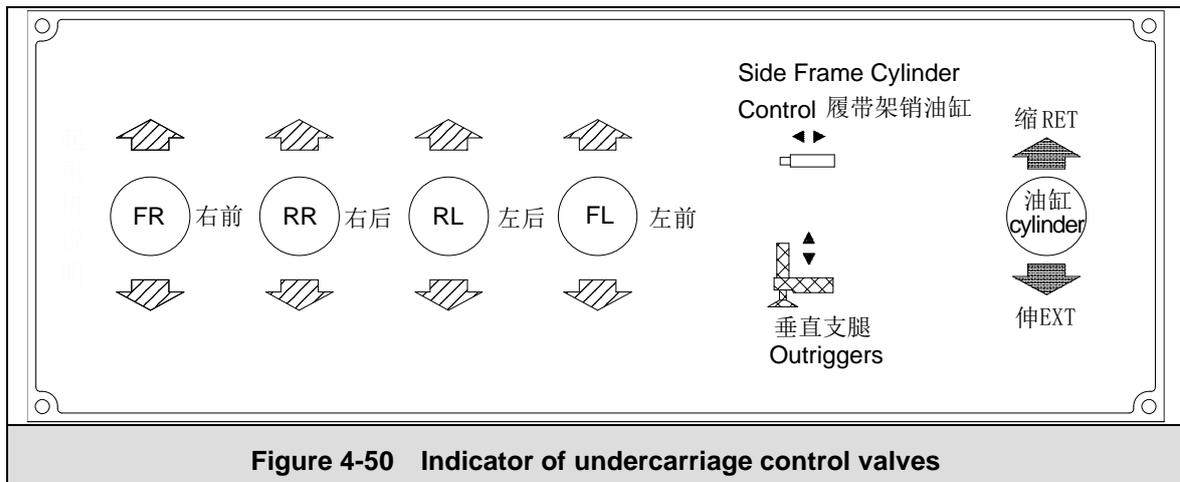


Figure 4-50 Indicator of undercarriage control valves

Operations:

FR, RR, RL and FL are four “selecting valves”.

- Related track carrier pin is selected if the “selecting valve” is pulled up,
For example, the FR track carrier pin is selected if the FR valve is pulled up.
- Related vertical outrigger is selected if the “selecting valve” is pushed down.
For example, the FR vertical outrigger is selected if the FR valve is pushed down.
- When the track carrier pin is selected by pulling up the valve:
Pull up “cylinder control valve”, the track carrier pin retracts;
Push down “cylinder control valve”, the track carrier pin extends;
- When the vertical outrigger is selected by pushing down the valve:
Pull up “cylinder control valve”, the vertical outrigger retracts;
Push down “cylinder control valve”, the vertical outrigger extends;

4.5.10 Self-mounting mechanism

- Operation of A-frame erecting mechanism

A-frame can be erected or lowered through the “A-frame erecting” switch (No. 3 in Figure 4-5) or the “A-frame lowering” switch (No. 4 in Figure 4-5).

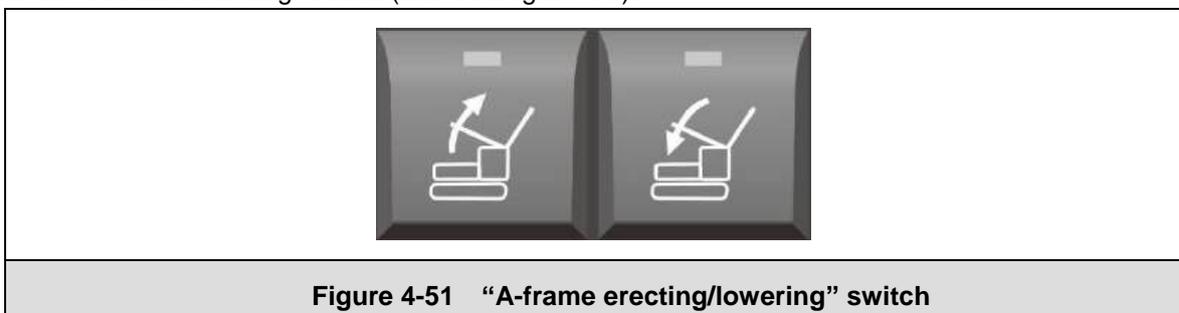


Figure 4-51 “A-frame erecting/lowering” switch

Operations of A-frame erecting/lowering

- Press the “A-frame erecting” switch to extend the A-frame erecting cylinder and A-frame is erected.

- 2) Press the "A-frame lowering" switch to retract the A-frame erecting cylinder and A-frame is lowered.

! CAUTION

The operation mentioned above must be performed by two persons. One gives guidance (observing the condition of A-frame, erecting cylinder and rope guiding on primary derricking winch) while the other carries out the operation.

b) Operation of lifting cylinder

The joystick for H2 is used to control the secondary hoisting winch or the lifting cylinder. Turn on the switch for lifting cylinder (No.8 in Figure 4-5) first before operating the lifting cylinder.

- 1) The joystick for H2 controls the lifting cylinder if the switch is turned on.
- 2) The joystick for H2 controls the secondary hoisting winch if the switch is turned off.



Figure 4-52 Switch for lifting cylinder

The joystick for H2 controls the lifting cylinder if the switch for lifting cylinder is turned on.

- 1) Push the joystick for H2 forward to retract the lifting cylinder and the load is lowered down.
- 2) Pull the joystick for H2 backward to extend the lifting cylinder and the load is hoisted.

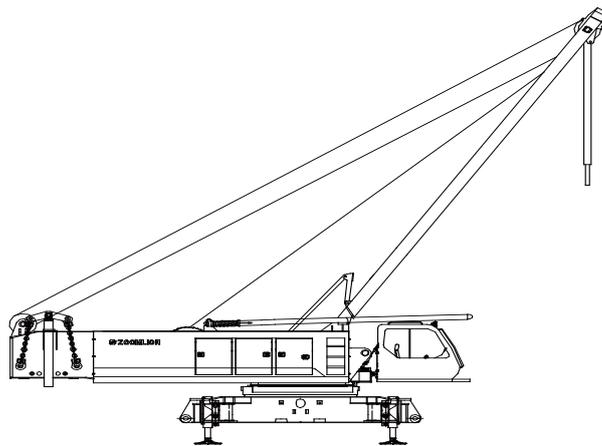


Figure 4-53 Illustration of self-mounting

4.6 Rope reeving

Choose appropriate load hook and rope reeving according to the operating plan and the actual needs of different operating mode.

Table 4-22 Load hooks and rope reeving plans

Load hooks	Numbers of pulleys	Max. reeving	Weight of load hook (kg)
160t	7	14	2377
100t	5	10	1935
80t	3	6	1713
50t	2	4	1355
30t	1	3	1085
12t	-	1	460

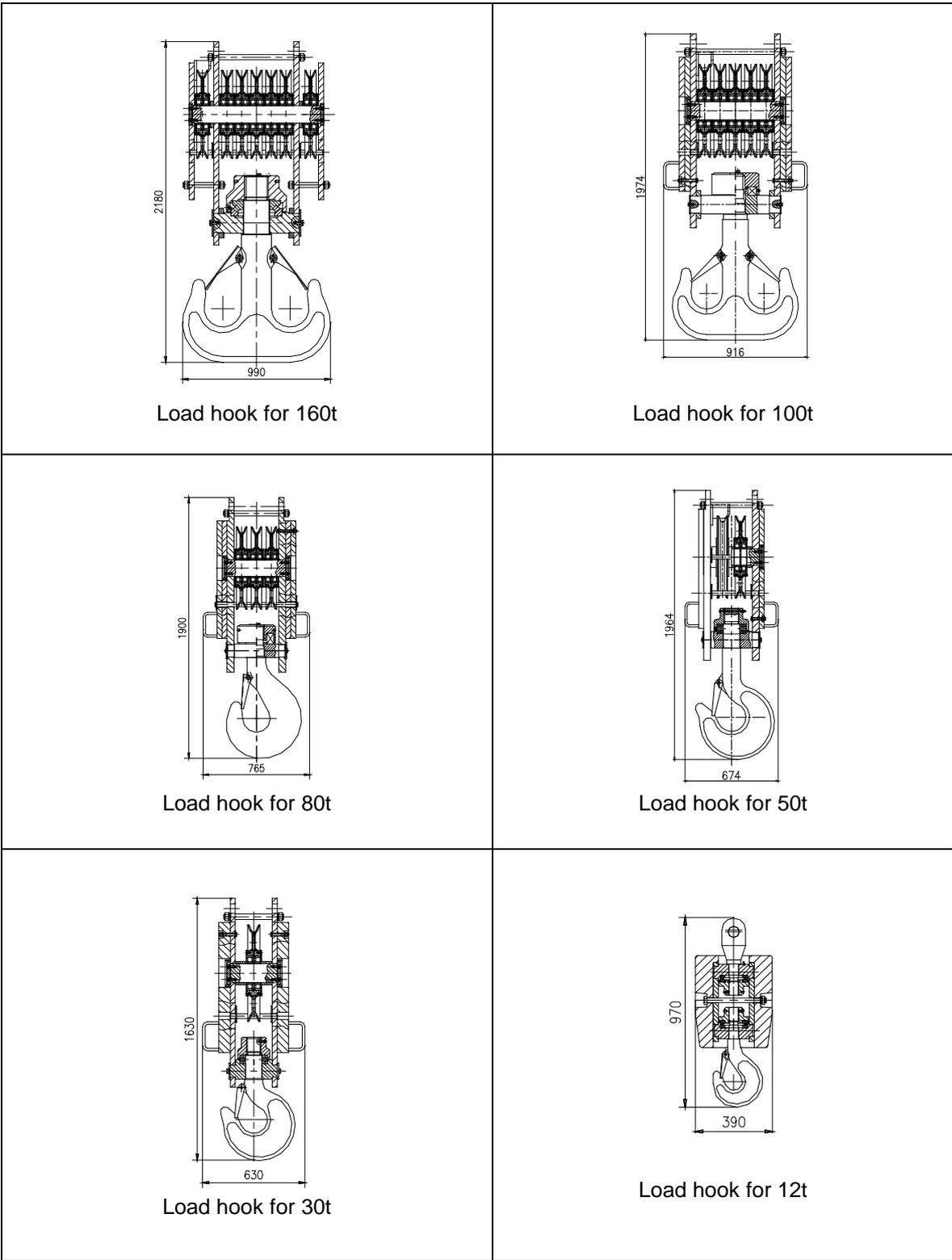


Figure 4-54 Load hooks

4.6.1 Main boom operating mode (S)

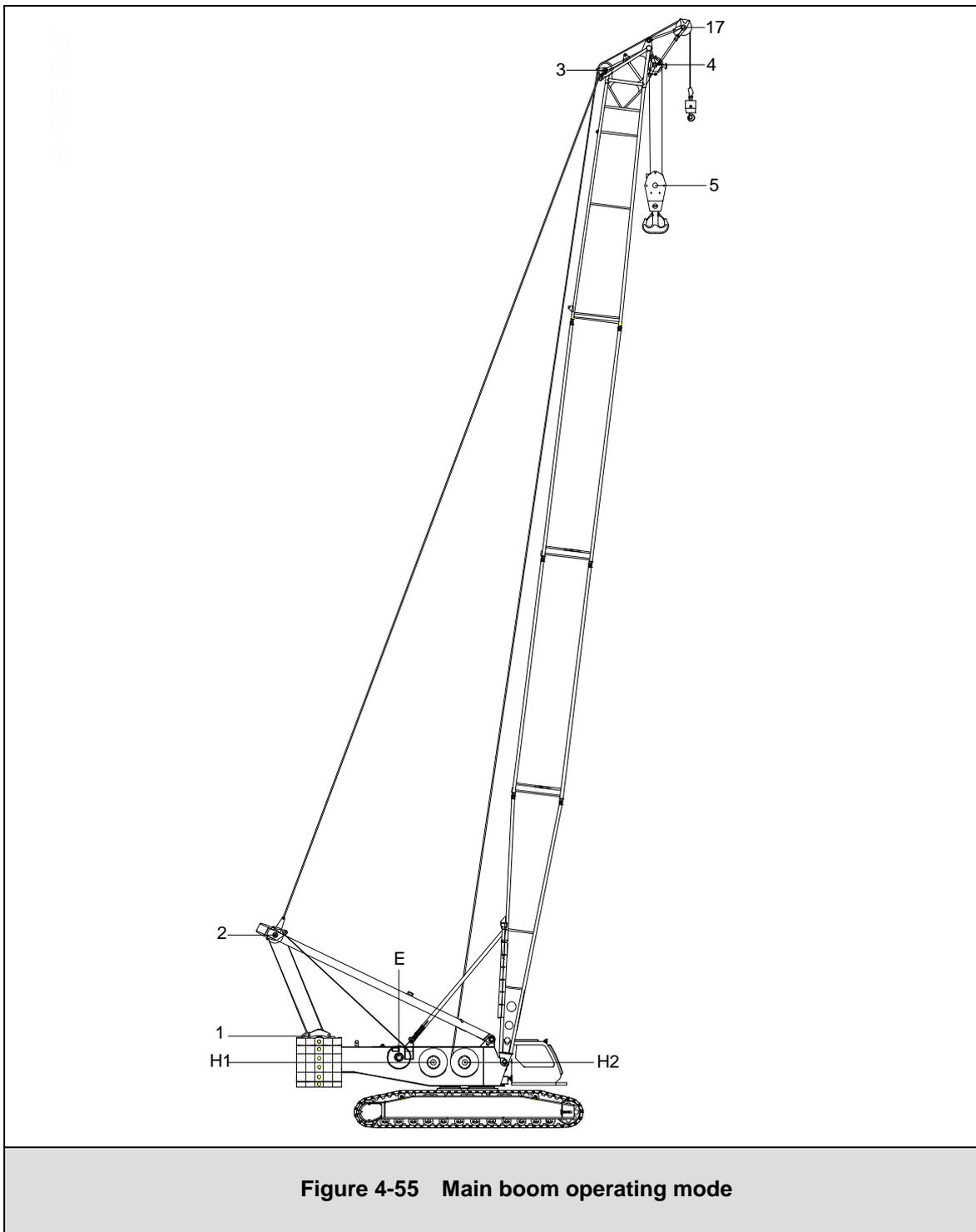
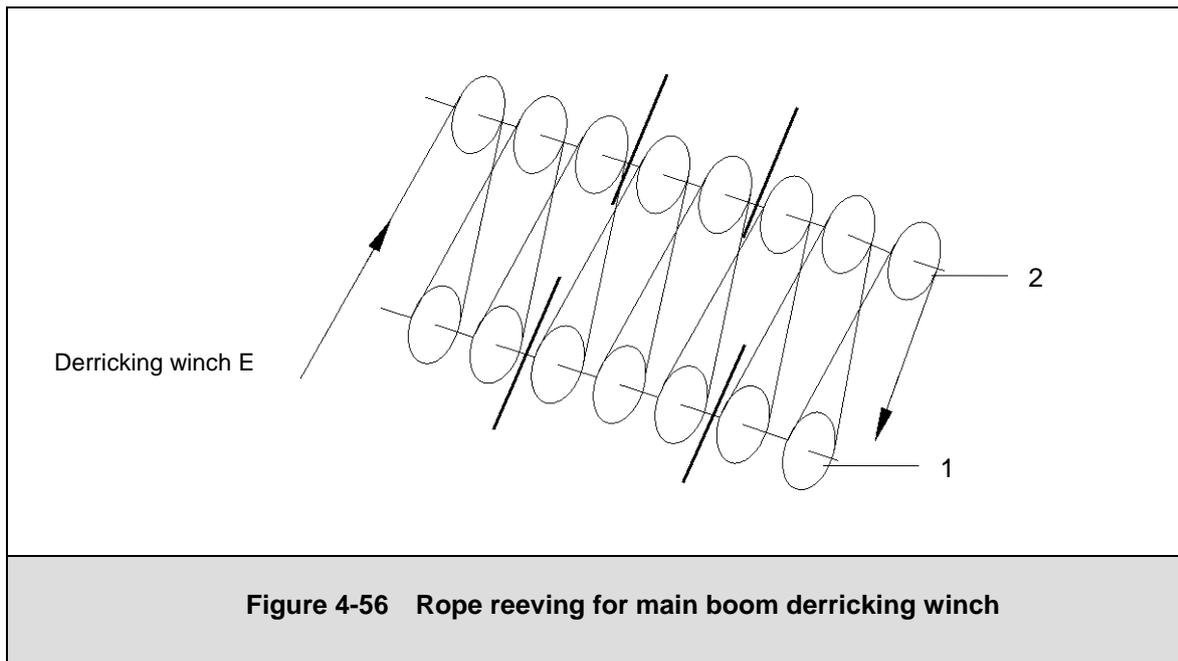


Table 4-23 Components of main boom operating mode

Component No.	1	2	3
Component	Crown pulley block on the slewing table	Pulley block on A-frame	Guiding pulley block on main boom head
Component No.	4	5	17
Component	Hoisting pulley block on main boom head	Pulley block on load hook	Pulley on tip boom
Component No.	H1	H2	E
Component	Primary hoisting winch	Secondary hoisting winch	Derricking winch

4.6.1.1 Rope reeving for main boom derricking winch



4.6.1.2 Rope reeving for main boom hook (160t)



x_ stands for rope reeving plan. x10 means the rope reeving is 10.

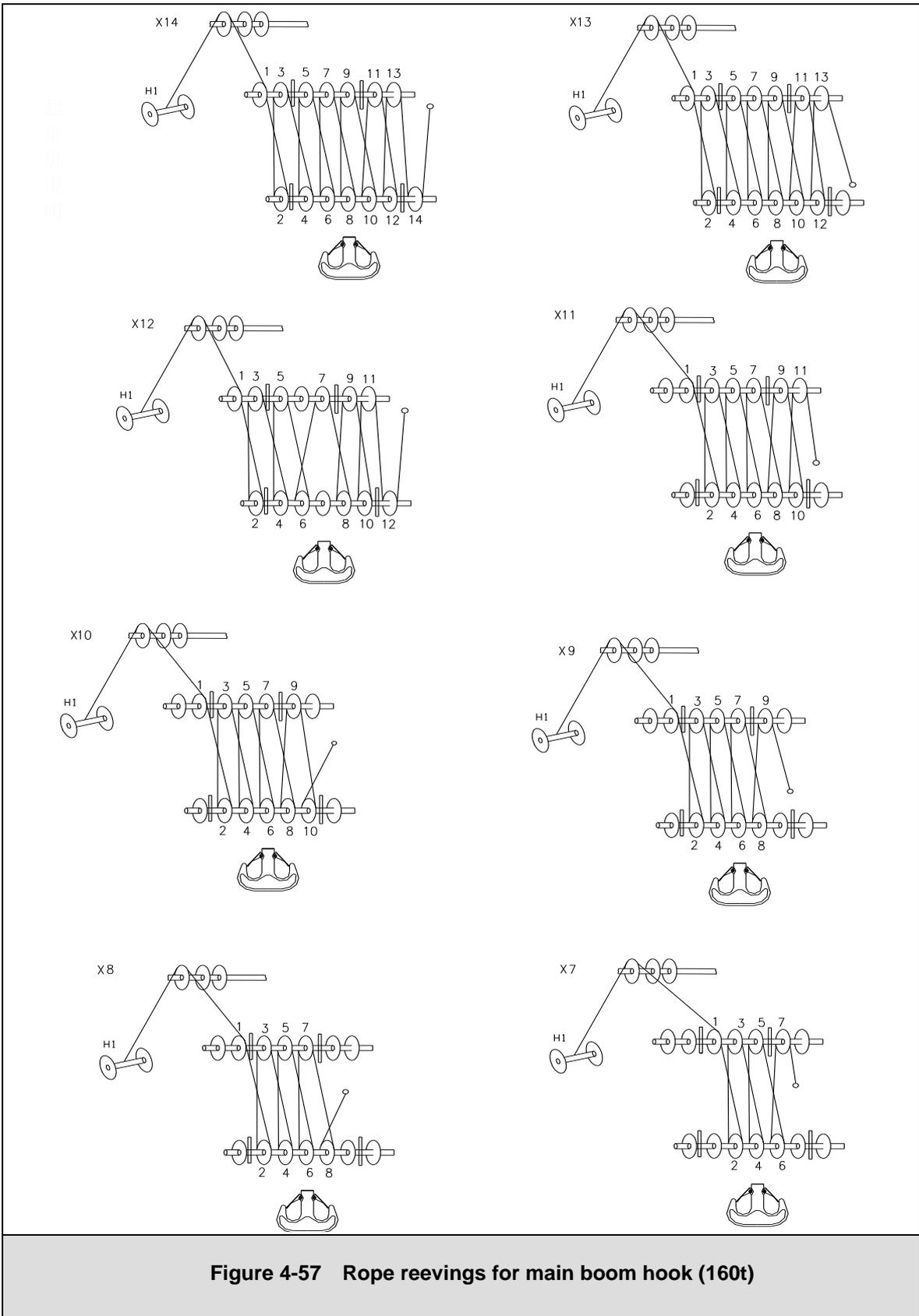


Figure 4-57 Rope reevings for main boom hook (160t)

4.6.1.3 Rope reeving for main boom hook (100t)

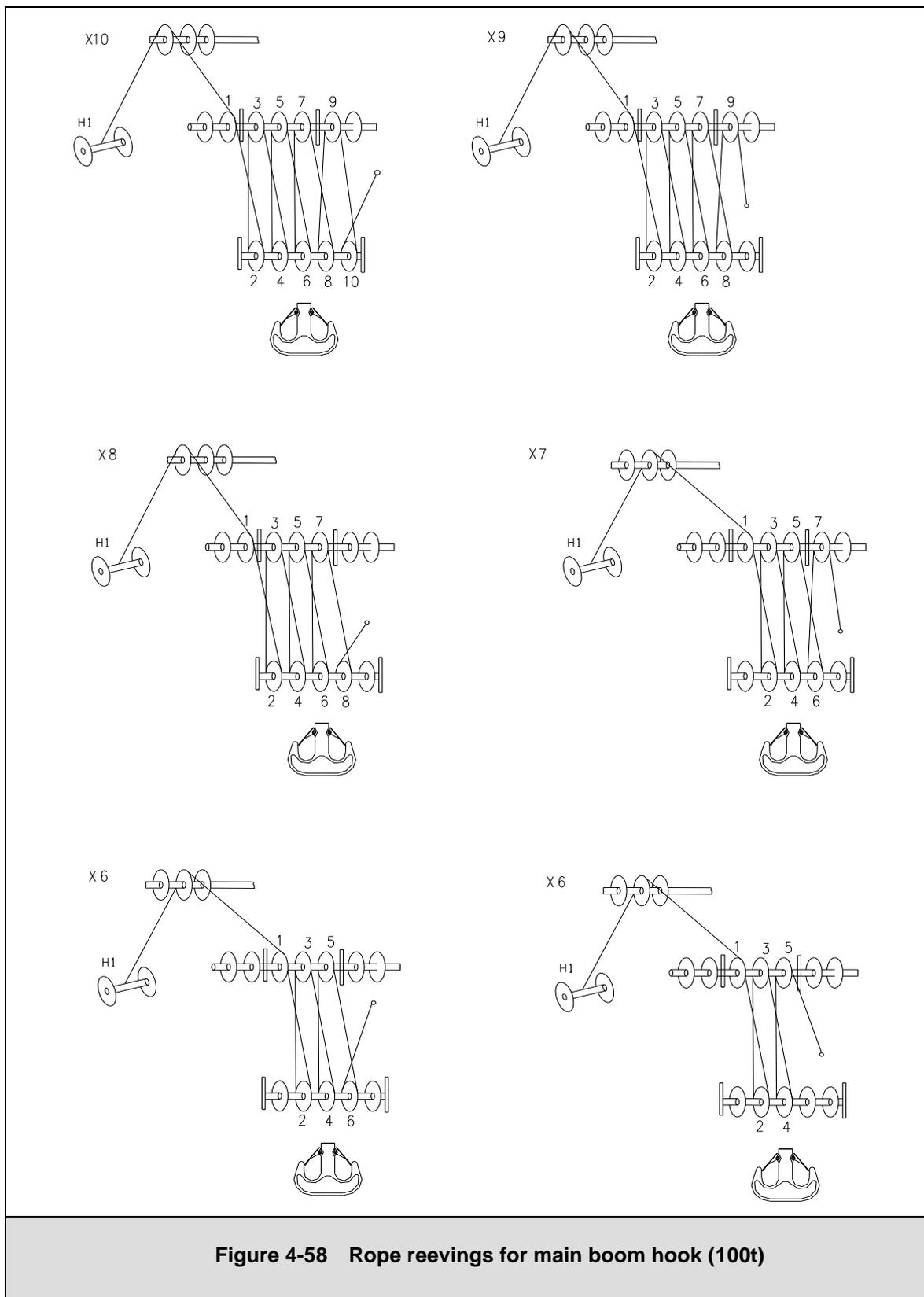
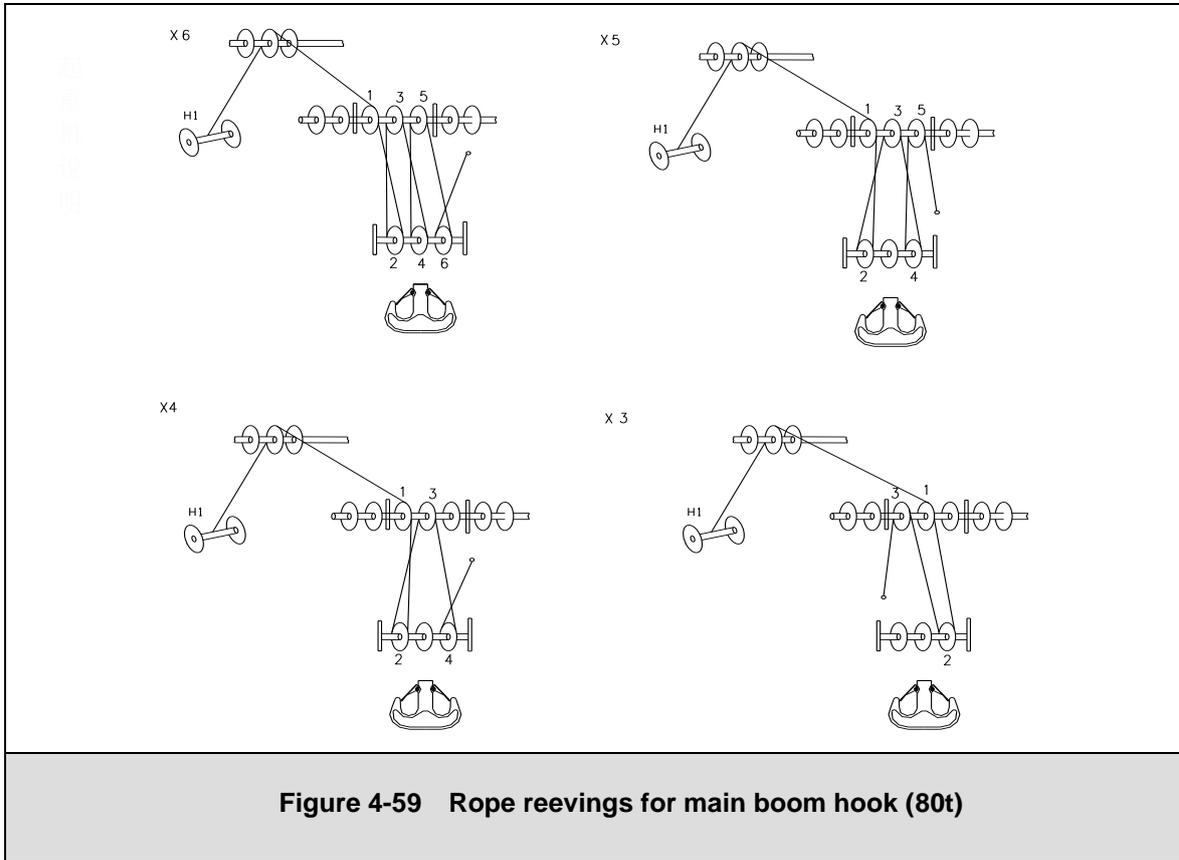
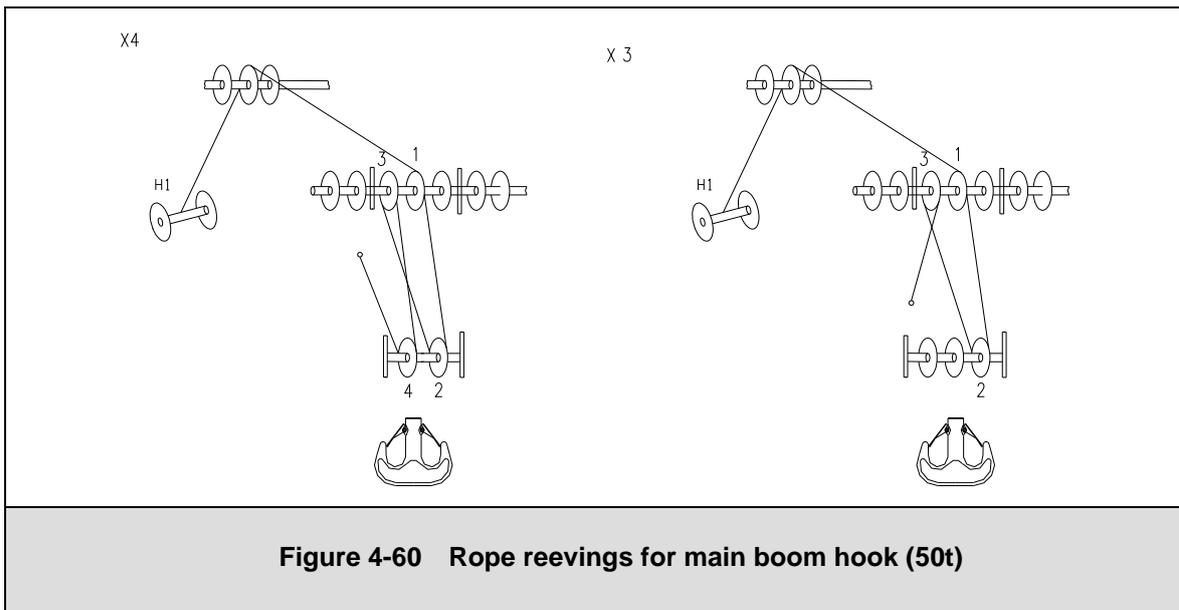


Figure 4-58 Rope reevings for main boom hook (100t)

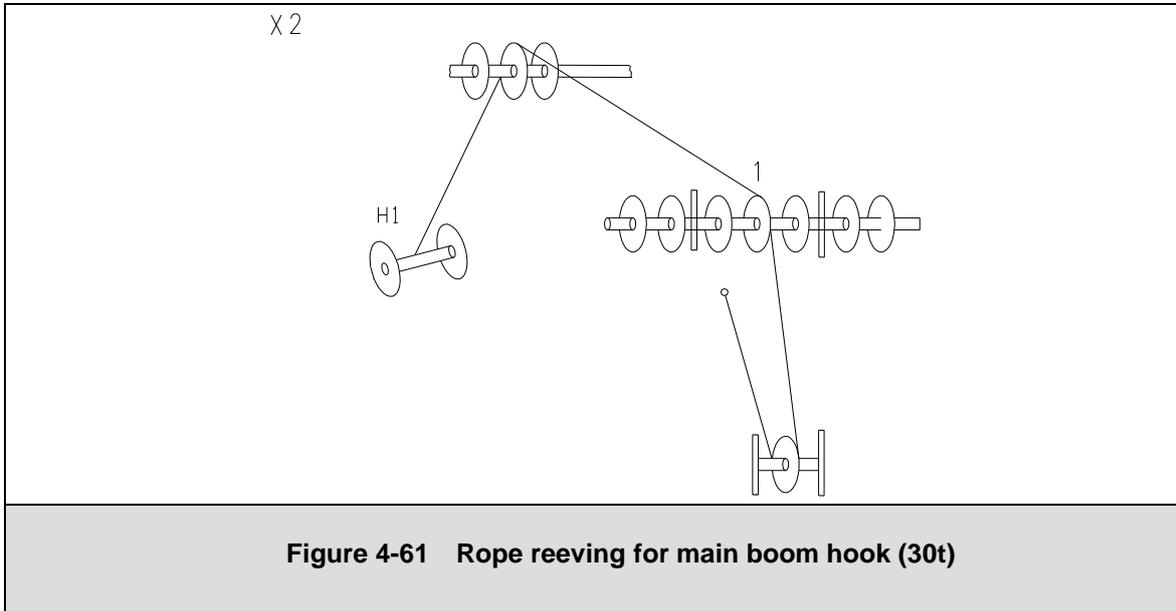
4.6.1.4 Rope reeving for main boom hook (80t)



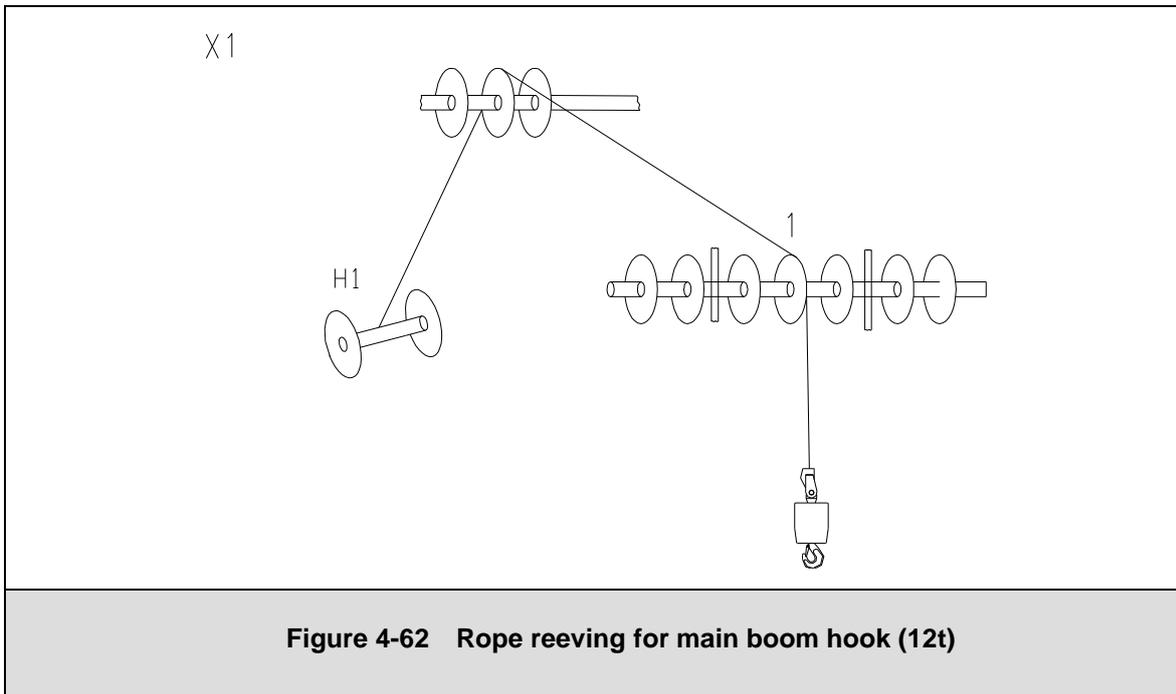
4.6.1.5 Rope reeving for main boom hook (50t)



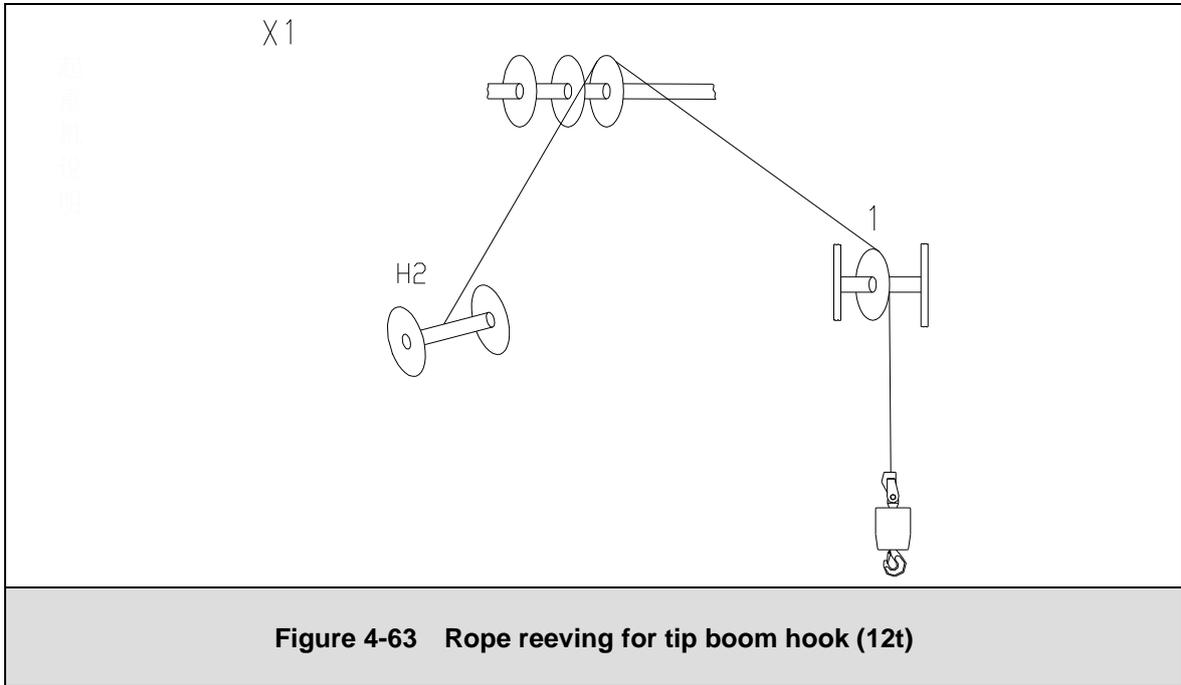
4.6.1.6 Rope reeving for main boom hook (30t)



4.6.1.7 Rope reeving for main boom hook (12t)



4.6.1.8 Rope reeving for tip boom hook (12t)



4.6.2 Fixed jib operating mode (SF)

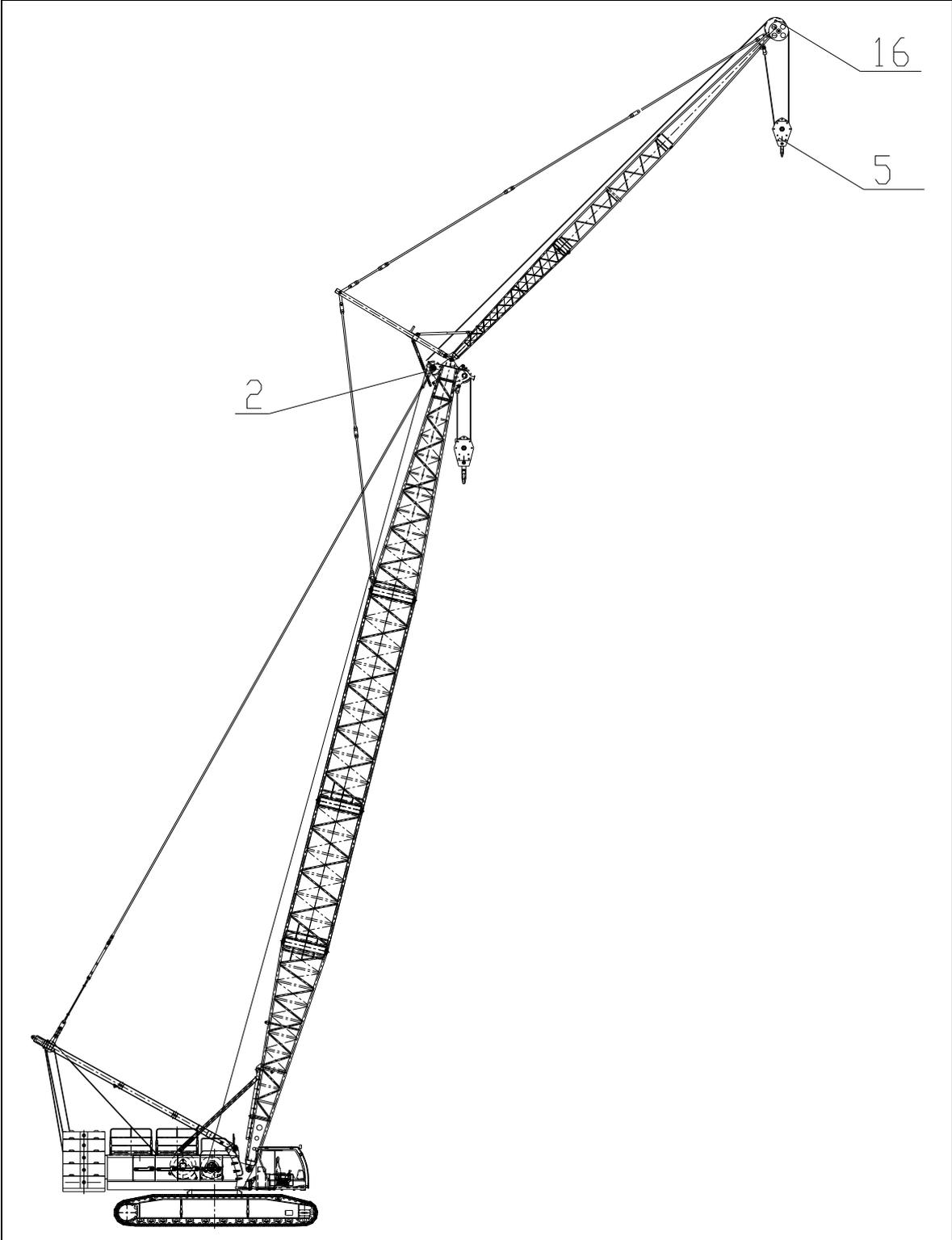


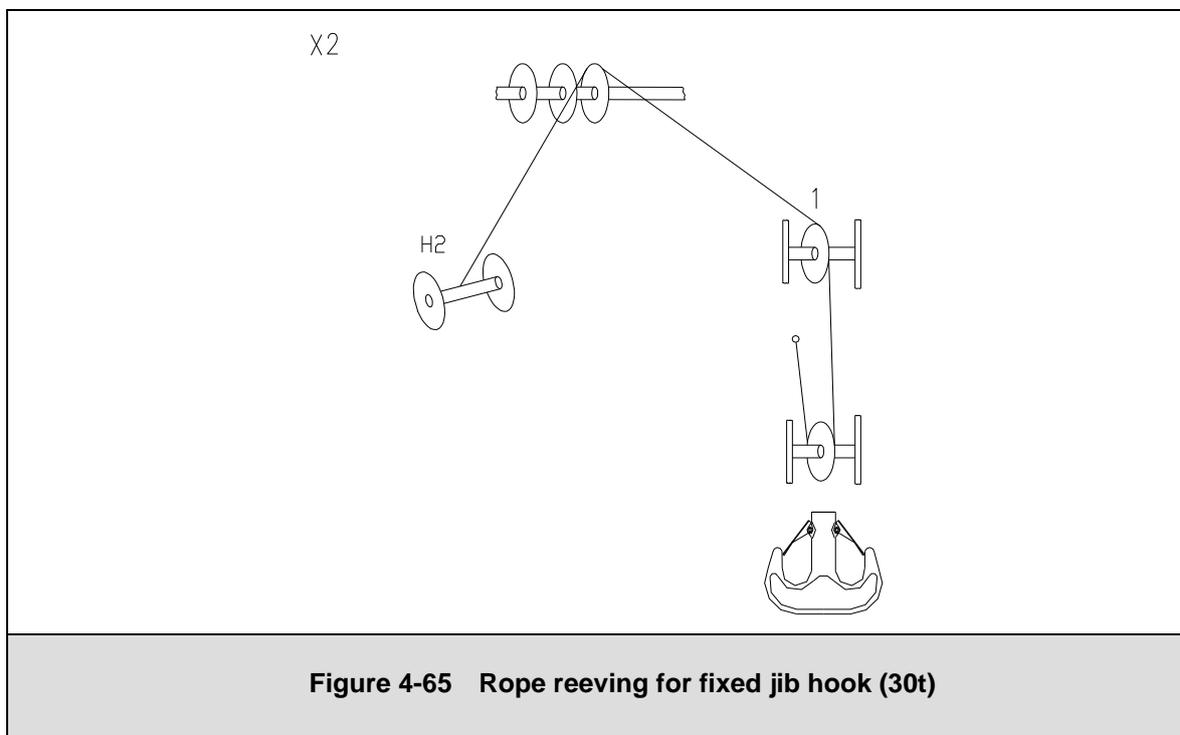
Figure 4-64 Fixed jib operating mode

Table 4-24 Component of fixed jib operating mode

No.	16
Component	Hoisting pulley on fixed jib head

! CAUTION

Refer to 4.6.1 for other components.

4.6.2.1 Rope reeving for fixed jib hook (30t)

4.6.2.2 Rope reeving for fixed jib hook (12t)

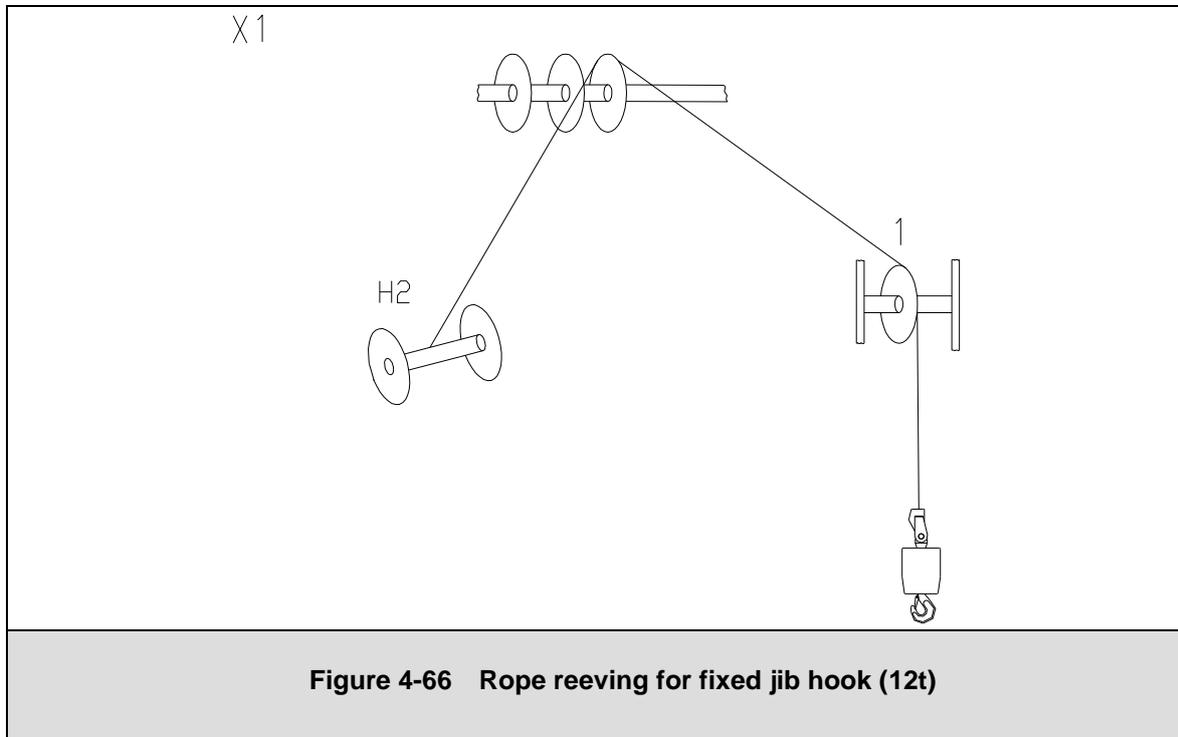


Figure 4-66 Rope reeving for fixed jib hook (12t)

4.6.3 Fixation of rope head

Fix the rope head properly according to the following steps:

Step 1: Put the wire rope (1) into the wedge socket (2) as shown below.

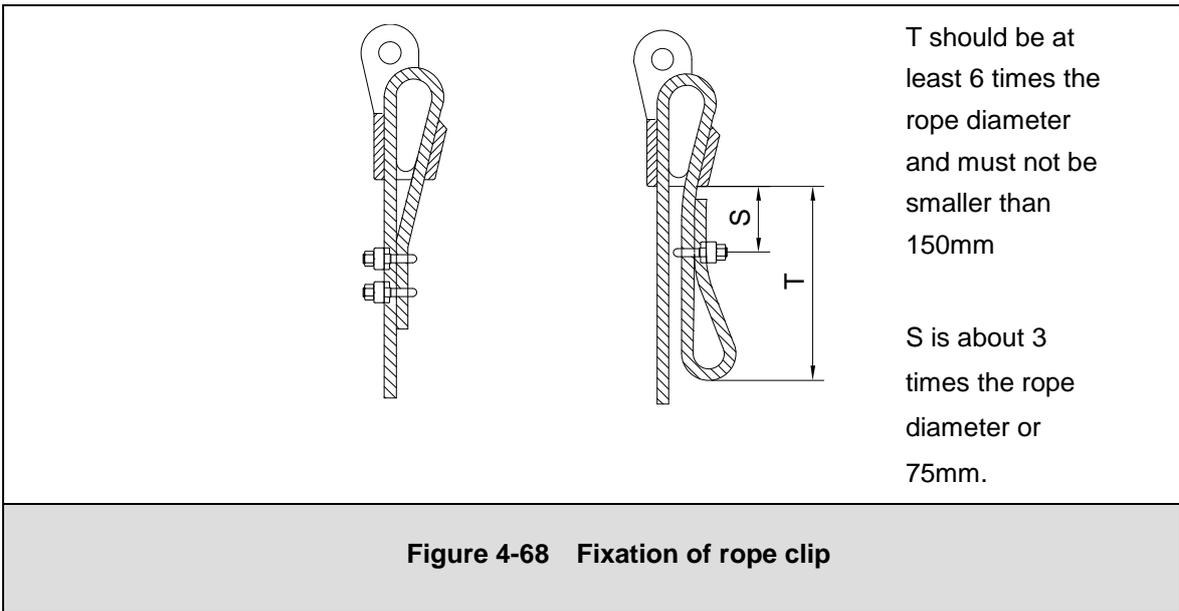
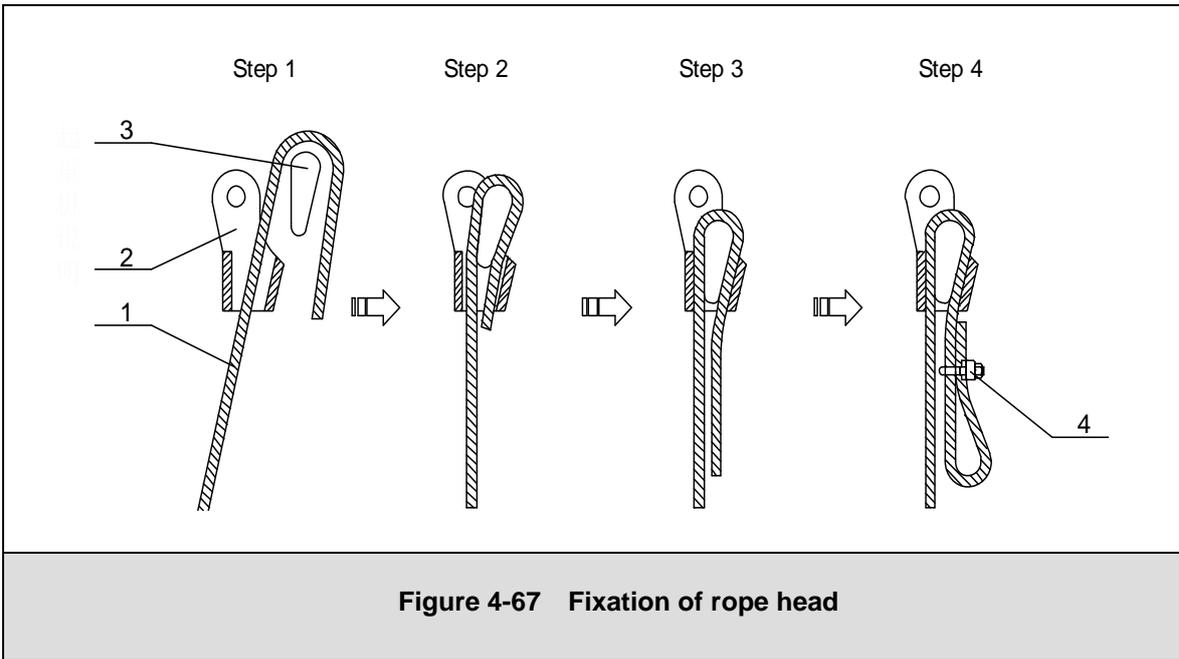
Step 2: Put the wire rope (1) on to the wedge block (3) and insert it reversely into the wedge socket (2).

Step 3: Tighten the wire rope (1) so that the rope is tightly stuck between the wedge block (3) and the wedge socket (2).

Step 4: Fix the wire rope with rope clip (4).

CAUTION

1. An improperly fixed rope head might damage the wire rope.
2. Rope head must be fixed strictly in accordance with the way illustrated in Figure 4-67 and 4-68.
3. Tightening torques of wire rope clips: clip for hoisting wire rope, 450N.m; clip for derricking rope, 230N.m
4. Rope clips must be tightened at regular intervals so as to avoid looseness of rope head caused by shrinking of rope diameter.



ZOOMLION

Operator's Manual for Crawler Crane

Chapter 5 Assembly and Dismantling



Chapter 5 Assembly and Disassembly

5.1 Safety-technical notes

5.1.1 Notes on assembly

- a) Normal assembly procedures are described in the *Operator's Manual*. And the crane must be dismantled completely in a reverse order (unless otherwise noted).
- b) Each component must be checked and maintained according to the requirements in *Maintenance Manual* before assembly.
- c) The assembly must be carried out strictly in line with instructions on the *Operator's Manual*.
- d) A normal assembly order requires that all components need to be transported separately should be handled with an auxiliary crane and load transporting devices.
- e) Operators must keep a sufficient safe distance from the crane during assembly.
- f) A safe platform for assembly should be used if necessary. It is prohibited to build up an unsafe platform temporarily. Otherwise there is a risk of falling off.
- g) Obstacles in the working area should be cleared up first before assembly and dismantling. The working area should also be fenced up to avoid entries of unrelated persons.
- h) Assembly and dismantling must not be carried out by untrained persons.
- i) Boom sections and anchoring rods must be combined in line with assembling figures in the *Operator's Manual*.
- j) Choose a flat working site. The well-assembled boom must be right in front of the undercarriage at a same level when it is lifted up from the ground.
- k) Main boom length must be strictly followed when the jib is assembled. Rope reeving plan must be strictly followed when wire rope is installed.
- l) Detachable parts should not only meet the requirement of load bearing in working condition but also the technical requirement in self-mounting process. Self-mounting is a complex lifting operation and must be carried out strictly in line with the design requirement.
- m) Boom sections must be supported firmly and properly if they do not touch the ground during assembly and dismantling.
- n) Make sure that no one stands under the boom especially when pins are being pulled out or inserted in.
- o) The crawler crane can be disassembled into several major parts for transport. Major parts include chassis frame, slewing table, A-frame, and derricking pulley block. The slewing table and the chassis frame must be placed in the same direction and the operator's cab must be swiveled for 90°. Crawler carriers are transported as a whole part. The boom can be disassembled into boom sections. The jib can be put into the main boom and fixed with two chains for transport. Otherwise the jib may fall out.

 **WARNING**

1. It is prohibited to combine boom sections and anchoring rods in any manner that is not stipulated in the *Operator's Manual*.
2. Rope reeving must be carried out according to the *Operator's Manual*.
3. Combination and setting of counterweights must be performed in accordance with lifting capacity charts and the *Operator's Manual*.
4. It is obliged to check whether there are tools left on the crane after assembly or dismantling, because falling tools might lead to serious accidents.

5.1.2 Check all safety precautions

- a) Clearly define the duty and area of responsibility of all personnel concerned.
- b) Check whether the crane is adjusted to be horizontal.
- c) Check whether there is sufficient safety clearance to slopes and trenches.
- d) Check the voltage of power lines in the vicinity of working area. Make sure that there is enough distance between the crane and power lines so that any components of the crane will not come into contact with the power lines when crane movement is carried out.
- e) Check whether an appropriate operating site has been selected so that the crane movements can be performed within maximum and minimum working radiuses.
- f) Check whether there are obstacles hindering operation.
- g) Check whether sufficient load bearing capacity is available at the work site.
- h) Clearly know about the type of crane operation and operating mode.
- i) The influence of communal facilities on the operating site (including high/low voltage lines and underground gas pipes).
- j) The movement restrictions due to surrounding structures (e.g. is there another crane nearby in working).
- k) Required lifting height and slewing radius.
- l) The height and width of thoroughfares leading to the site.
- m) Check the communication ways adopted by signalman and crane operator.
- n) Take appropriate measures to keep people and equipment unconcerned away from the danger area of the crane.

 **CAUTION**

All safety precautions must be checked according to the above requirements. Make a detailed operating plan in line with Section 3.1 in Chapter 3 in order to know well the actual situation and guarantee the safety of operation.

5.1.3 Inspection of wire rope, load hook, rope pulley and anchoring rod

Components should be inspected and maintained in accordance with *Maintenance Manual*.

5.1.4 Safe connection and disconnection of hydraulic quick-release couplings

Quick-release couplings for hydraulic pipelines must be connected or disconnected in correct procedures.

Correct procedures are as follows:

- a) Depressurize the hydraulic system before connecting and disconnecting hydraulic pipelines with quick-release couplings (switch off the engine and wait for about 5 minutes.).
- b) Keep the connection of quick-release coupling clean.
- c) Turn the nut until it reaches a tangible and fixed stop position.
- d) The hydraulic couplings may only be tightened or unscrewed by hand rather than by tools. Otherwise, the couplings may be damaged.

CAUTION

- (1) Before the quick-release coupling is connected, check whether the connection is clean, otherwise there will be oil leakage at the coupling!
- (2) Pay special attention to the connection of quick-release coupling on motor leak oil line.
 - If the quick-release coupling is a bayonet-type quick-release coupling, you must align the small notch on female end with the steel ball on the male end, and then plug the male end into the female end. After you hear a “click” sound, rotate the female end of quick-release coupling until the small notch is not aligned with the steel ball to avoid unintentional operation.
 - If the quick-release coupling is a screw-type quick-release coupling, you must screw it firmly until a tangible and fixed stop position is reached.
- (3) If the quick-release couplings on motor leak oil line are connected improperly, the motor leak oil line will be blocked, which will generate high pressure in the motor and thus cause damage to motor.

DANGER

- (1) Depressurize hydraulic system before you connect and disconnect hydraulic lines with quick-release couplings (switch off the engine and wait for about 5 minutes.)
- (2) Connect or disconnect the hydraulic pipelines via the quick releasing coupling. Correctly carry out the connection regulation.
- (3) Improperly connected couplings may lead to pressure loss or sudden leakage, thus leading to accidents.

5.2 Unloading and assembly of the basic machine

5.2.1 Inspection before operation

- a) Jobsite
 - 1) The ground should be solid and level. Steel plates should be padded if necessary.
 - 2) The jobsite must be large enough for trailer and auxiliary crane operation.
- b) Check operation procedures and safety regulations

All persons must be familiar with operating procedure and safety regulations and know well their own responsibilities before operation.
- c) Inspection before operation.

Inspect the basic machine before operation.

5.2.2 Operation of unloading the basic machine

- a) After the basic machine reaches the jobsite, remove fixing devices and the package. If the crane is transported by sea, the basic machine should be lifted from the transport vessel as a whole.

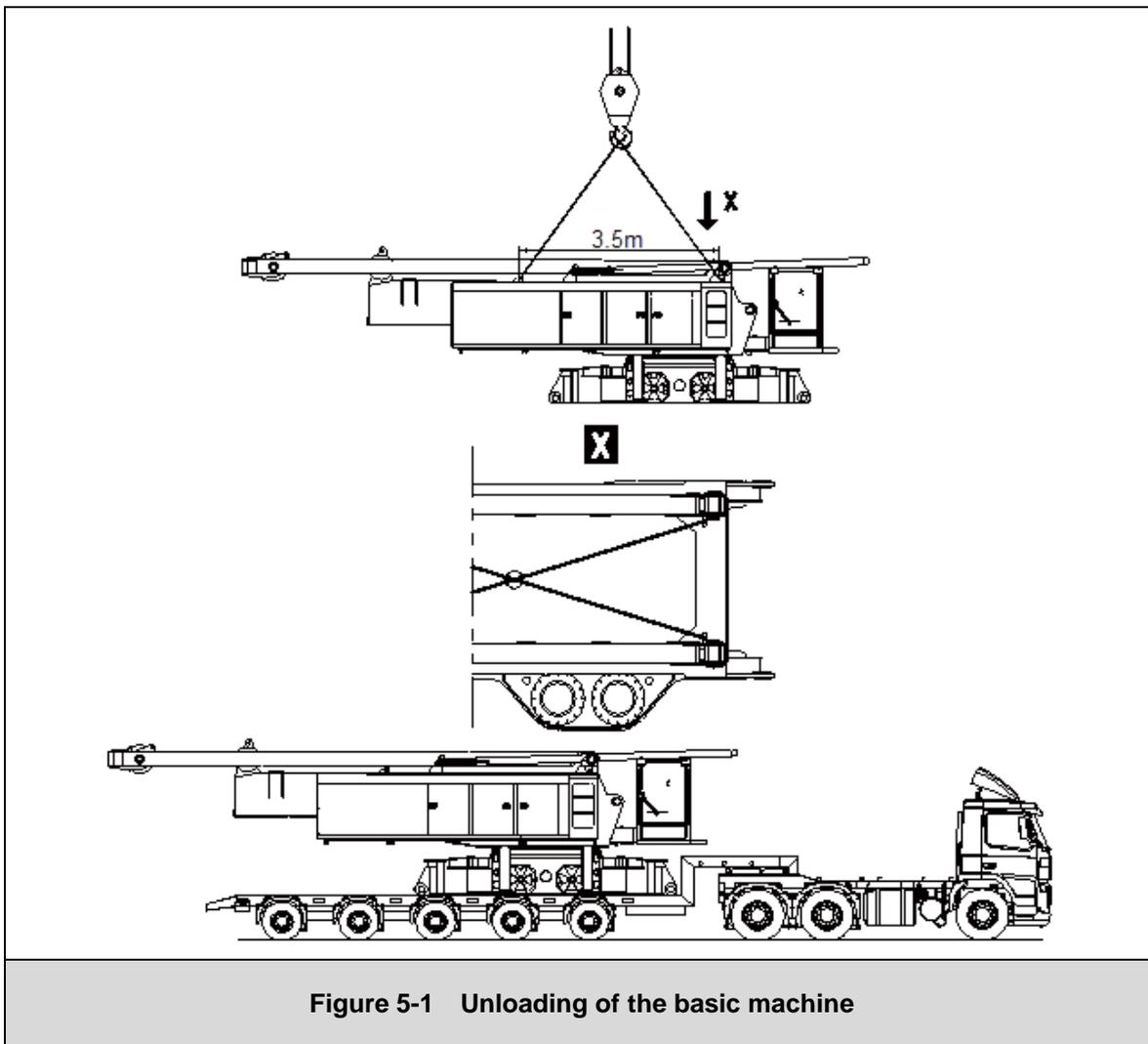
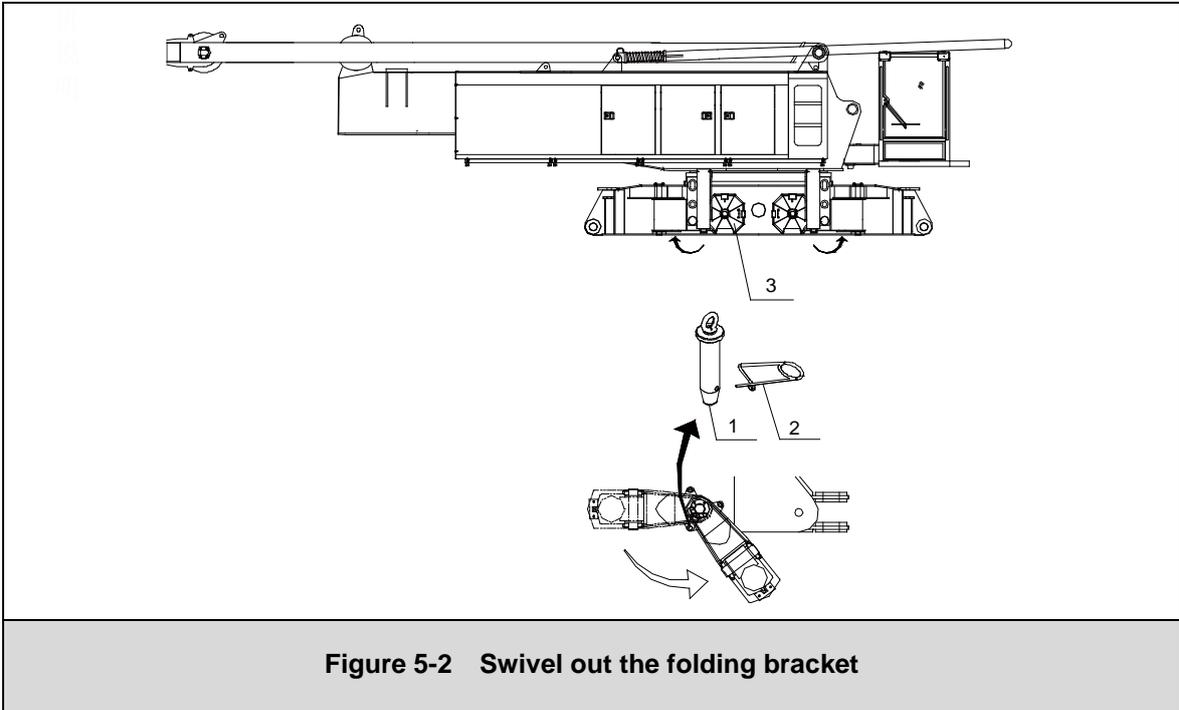
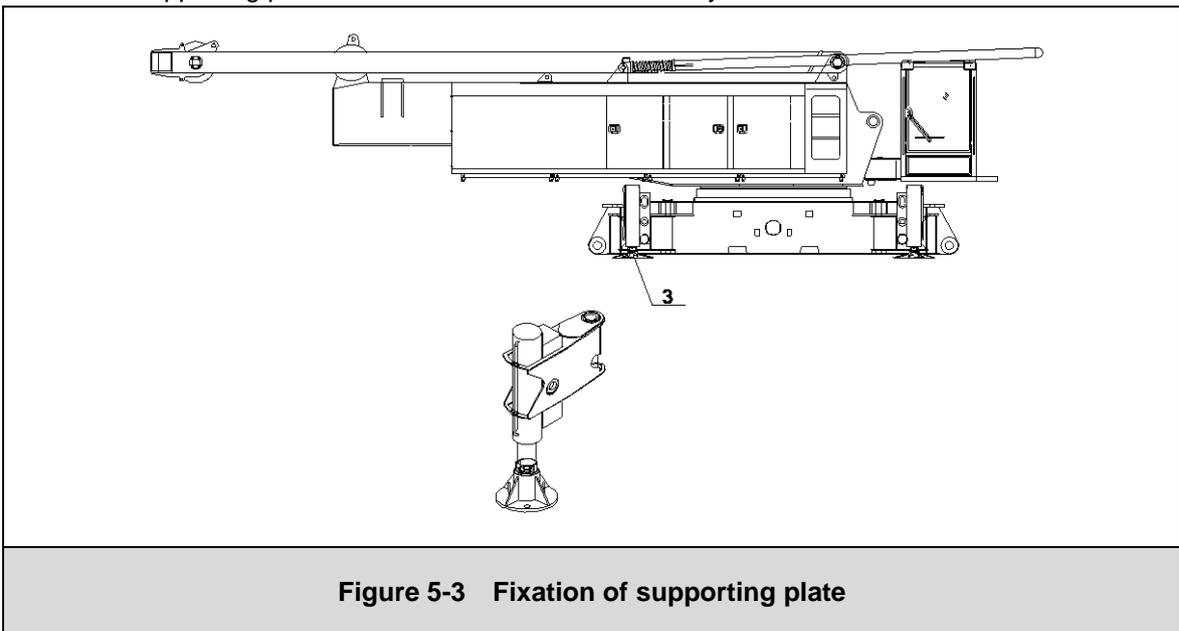


Figure 5-1 Unloading of the basic machine

- b) Dismantle the retaining clip (2) and pin (1) that connect the chassis frame and the folding bracket. Swivel the folding bracket for 128° so that the pin hole on the other side of the folding bracket aligns with the pin hole on the chassis. Then insert pin (1) and secure it with retaining clip (2).



- c) Unscrew the bolt used to fix the supporting plate (3) on the chassis frame and fix the supporting plate onto the bottom of the vertical cylinder.



- d) Put a steel plate or a wood plank under the supporting plate. Turn on the “undercarriage auxiliary” switch (No. 7 in Figure 4-5) on the right control panel; control vertical cylinders through undercarriage control valves by pulling the lever downward. Operate the control

lever for "cylinder extension and retraction" to extend the vertical cylinder. Vertical cylinder scan be operated independently or simultaneously (refer to 4.5.9).

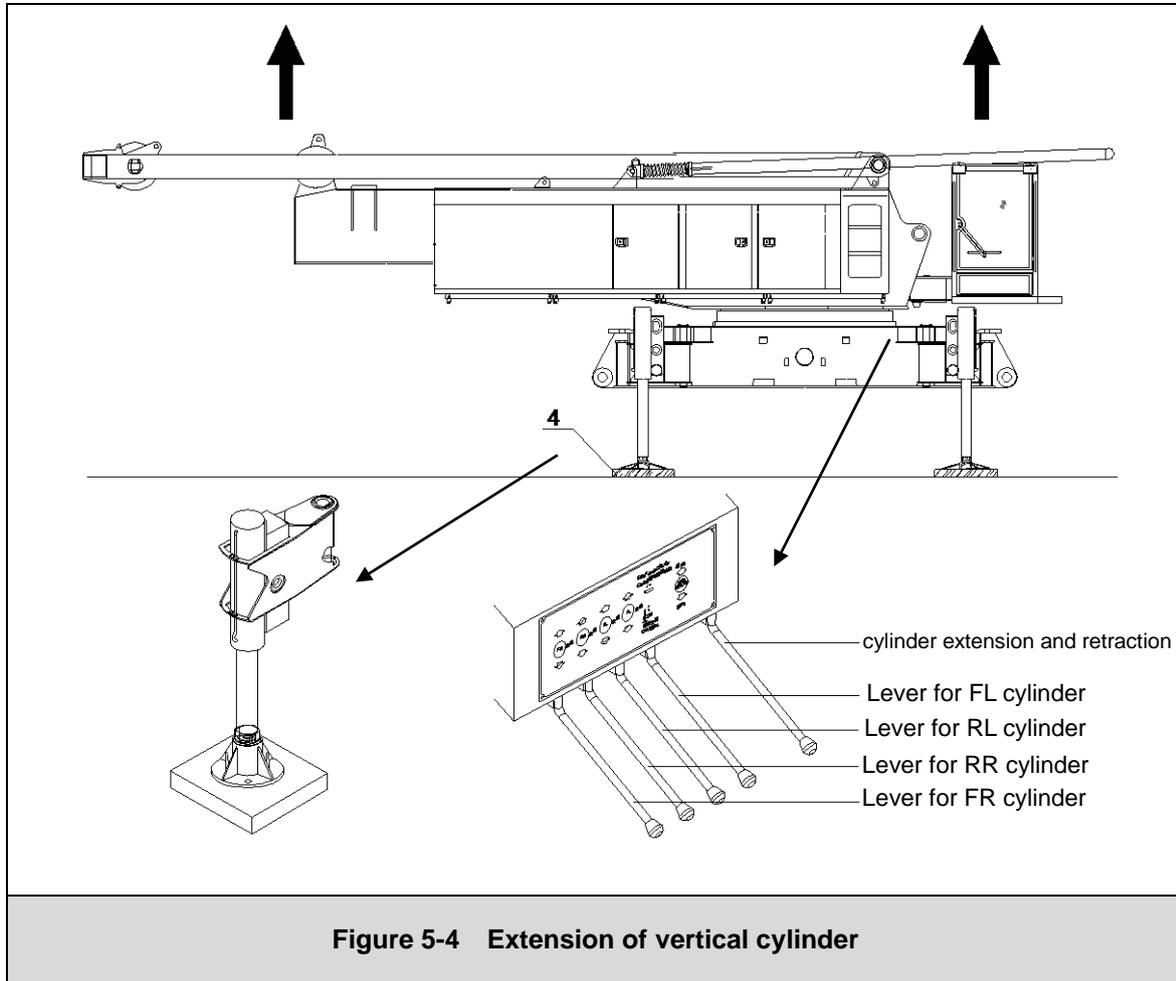


Figure 5-4 Extension of vertical cylinder

CAUTION

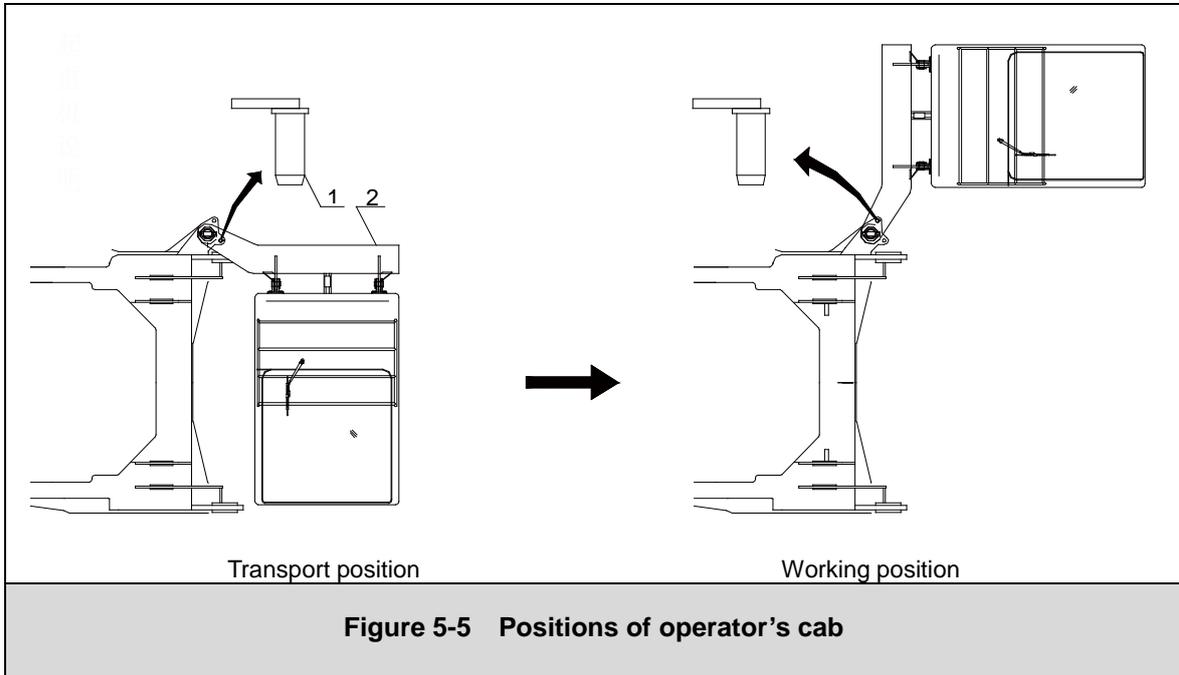
1. In any case, the assembly of outriggers, as well as outrigger extending and retracting, must be completed by at least two persons. It is prohibited to operate outriggers by only one person. When operating cylinders, one person controls the lever while the other observes whether outriggers are level.

2. Rotational speed of the engine must be kept at a medium-low speed (about 1000 - 1500rpm/min).

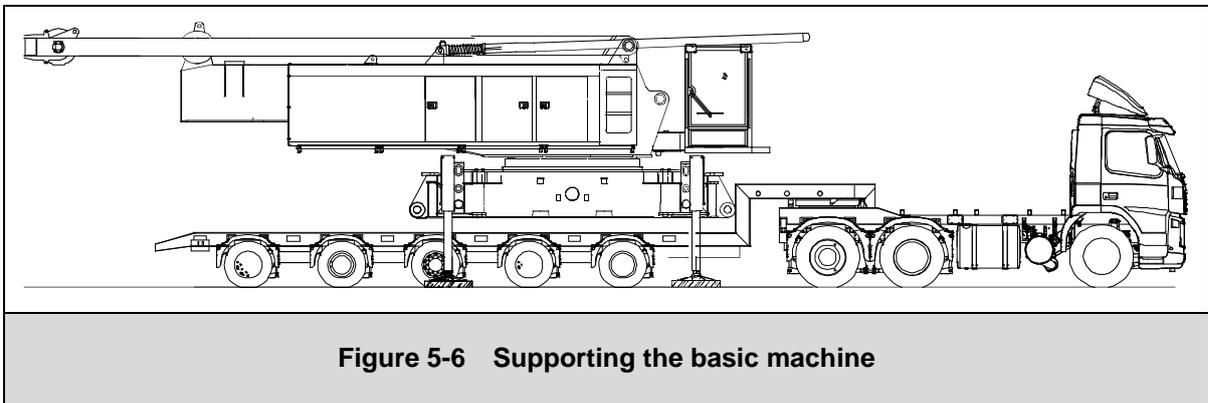
3. Outriggers should be extended or retracted on a firm and level ground. Pay attention to the levelness of the crane during operation.

- e) Swivel the operator's cab from the transport position to the working position (the cab can be also swiveled out when the trailer drives away). Limited by the maximum transport width, the cab must be placed right in front of the slewing table during transport. Pull out

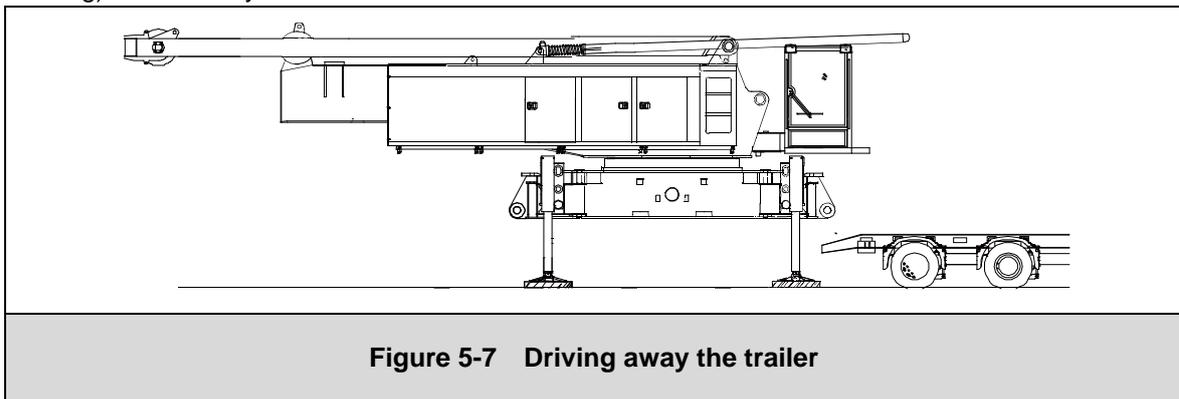
the fixing pin (1) for the swiveling arm and push the arm (2) for 90°. Then insert the fixing pin (1) to secure the cab.



- f) Extend the vertical cylinder completely so as to support the basic machine away from the flat-bed trailer. Cylinders must be extended simultaneously to keep the levelness of the basic machine.



- g) Drive away the flat-bed trailer.



5.3 A-frame

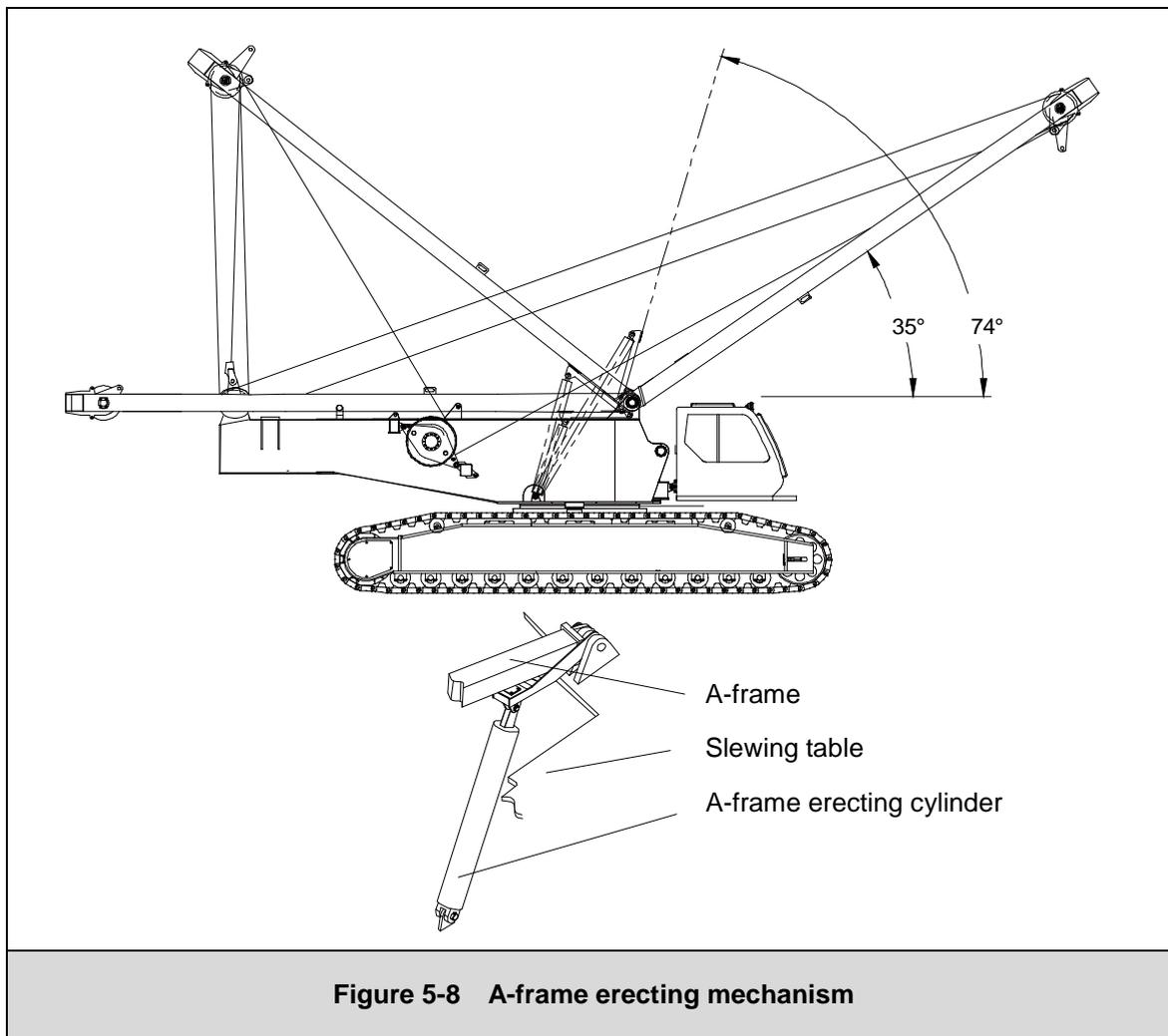


Figure 5-8 A-frame erecting mechanism

A-frame erecting mechanism consists of an A-frame, an A-frame erecting cylinder and an auxiliary hydraulic system. A-frame erecting mechanism is mainly used for self-mounting or transportation. Erect the A-frame from the horizontal position to the position of 106° (the included angle between A-frame and the front horizontal line is 74°). A-frame is lowered down on its own weight, and reel off the primary derricking winch at the same time. The maximum forward-tilting angle of the A-frame is 145° (the included angle between A-frame and the front horizontal line is 35°). It can be used to connect anchoring rods or assist the boom.

A-frame has two major functions:

- a) Functional parts of self-mounting: Outriggers and support plates are well assembled after the A-frame is erected. Boom sections, crawler carriers and counterweight plates can be lifted through the primary hoisting winch and the lifting cylinder. The maximum hoisting capacity of the A-frame in self-mounting is 20t (with a radius of 6m).
- b) Components for derricking mechanism: operate the primary derricking winch and adjust the distance between the pulley block on the A-frame and the pulley block on the slewing table

to realized main boom derricking.

5.3.1 Control of A-frame

A-frame is controlled through the “A-frame erecting” switch (No. 3 in Figure 4-5) and “A-frame lowering” switch (No. 4 in Figure 4-5) on the right control panel.

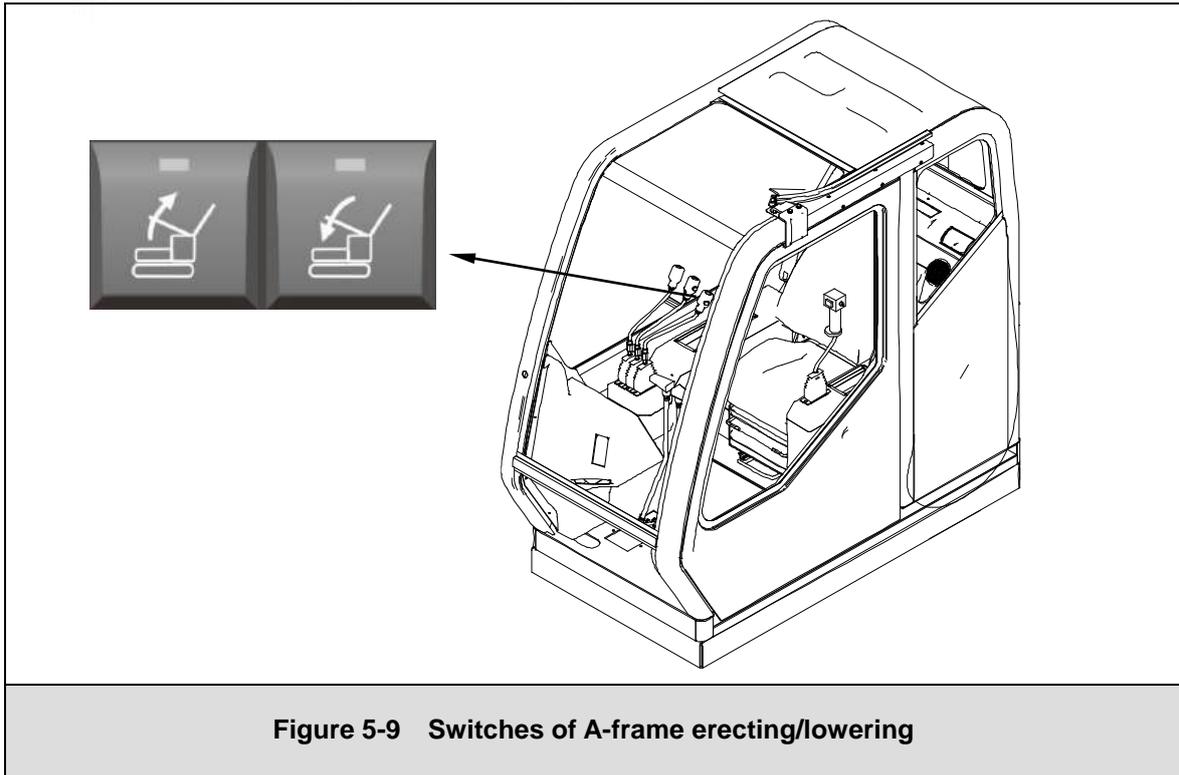


Figure 5-9 Switches of A-frame erecting/lowering

A-frame erecting/lowering:

- a) Press the “A-frame erecting” switch to extend the A-frame erecting cylinder and the A-frame is erected.
- b) Press the “A-frame lowering” switch to retract the A-frame erecting cylinder and the A-frame is lowered.

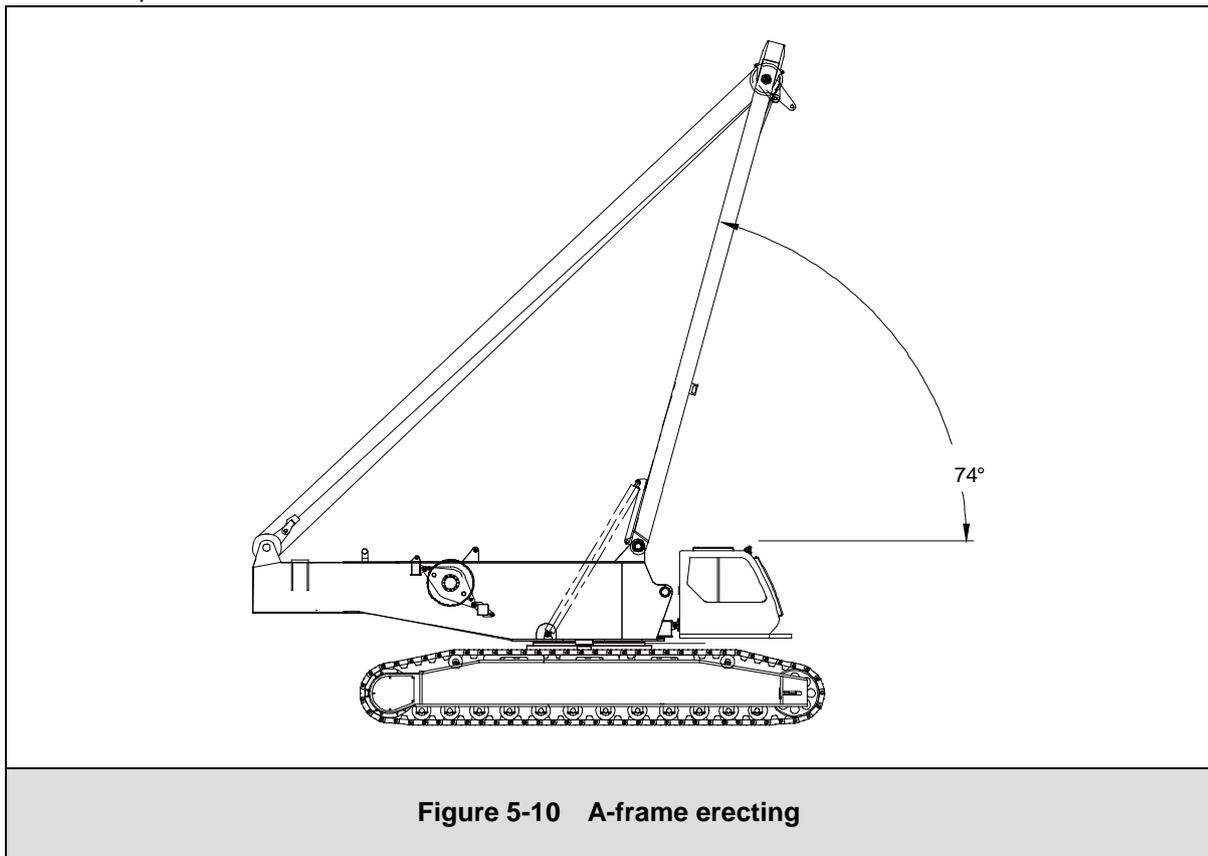


The operation of A-frame erecting/lowering must be carried out by two persons. One gives the command (observe the A-frame, erecting cylinder and derricking rope) while the other one operates.

5.3.2 A-frame erecting

- a) Press the “A-frame erecting” switch (No. 3 in Figure 4-5); the A-frame erecting cylinder pushes the A-frame from the horizontal position upward until the derricking rope is tensioned between the slewing table and the A-frame derricking pulley block. In the process of A-frame erecting, operate the joystick to reel off the primary derricking rope.

- b) Release the "A-frame erecting" switch when the A-frame is erected to the position of 106° . The cylinder stops extension and the A-frame continues to tilt forward on its own weight. Reel off the primary derricking rope at the same time.
- c) The A-frame continues to tilt forward on its own weight; continue to reel off the primary derricking rope at the same time. The A-frame reaches the limit position when it tilts forward for 145° . Return the joystick back to the neutral position to stop reeling off the derricking rope.



! CAUTION

1. Check to see if the primary derricking rope is reeved according to the requirements before operation and make sure that the derricking rope lies on the A-frame and the derricking pulley block on the slewing table.
2. The maximum forward-tilting angle of the A-frame must not exceed 145° (the included angle between the A-frame and the front horizontal line is 35°). Otherwise the A-frame may fall down forward.
3. The position of A-frame can be adjusted within its movable range according to the actual working condition.

5.3.3 A-frame lowering

- After the A-frame erecting cylinder is fully extended, operate the joystick to reel in the primary derricking rope and lower the A-frame.
- When the A-frame reaches the position of 106° , press the “A-frame lowering” switch (No. 4 in Figure 4-5) on the right control panel to retract the A-frame erecting cylinder. Operate the joystick simultaneously to reel in the primary derricking rope. And the A-frame is lowered down and the erecting cylinder is retracted as well.
- When the A-frame and the erecting cylinder return to their original position, release the “A-frame lowering” switch to stop the cylinder. In the meantime, return the joystick back to the neutral position to stop derricking.

CAUTION

- No standing within the moving range of the A-frame.
- Make sure that there is no looseness of the derricking rope during the movement of the A-frame.
- A-frame must be supported by the erecting cylinder and lowered down slowly. Otherwise the A-frame may fall down.

5.4 Assembly of crawlers

5.4.1 Assembly of the first crawler

- Tilt the A-frame forward according to the process mentioned in 5.3.2.
- Turn on the switch of “lifting cylinder” (No. 8 in Figure 4-5) on the right control panel. Then the lifting cylinder can be controlled by the joystick for the secondary winch. Operate the the joystick for the secondary winch to extend the lifting cylinder. Connect the lifting cylinder with the lug on the crawler carrier with a chain.
- Install chains to connect track pads.

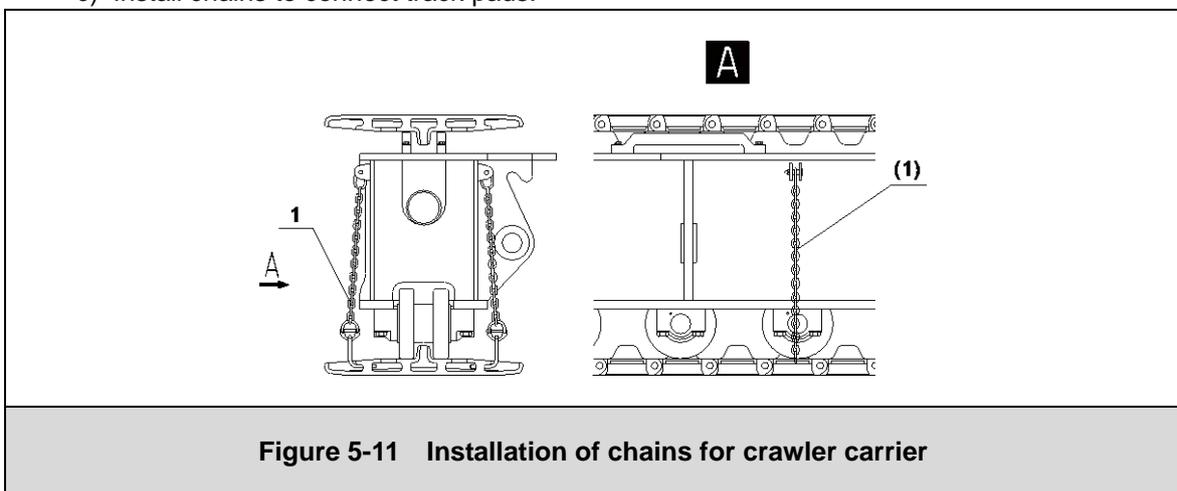


Figure 5-11 Installation of chains for crawler carrier

Table 5-1 Component

Component No.	1
Name	Chains for crawler carrier

CAUTION

1. When the track is hoisted, connect the chain with the hole on one side of the track pad to avoid suspension of track pads at the bottom.

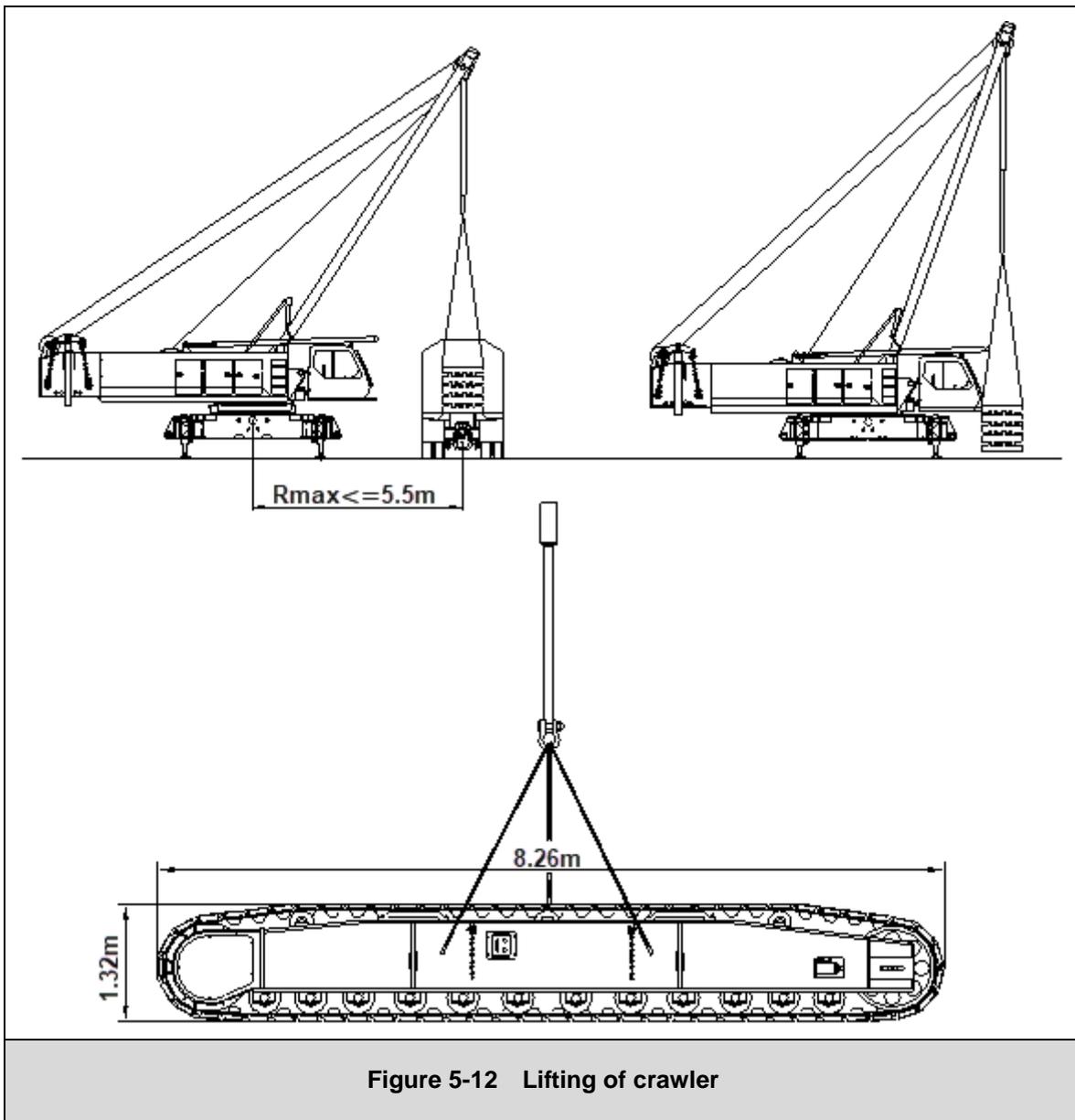


Figure 5-12 Lifting of crawler

- d) Assembly of crawler carrier
 - 1) Make sure that the chain is connected with the crawler on three points. Operate the joystick for the secondary hoisting winch to retract the lifting cylinder gradually.

- 2) Adjust the A-frame angle and the length of the self-mounting cylinder so that the crawler approaches the chassis slowly. Align the positioning hole on the chassis with the positioning hole on the crawler.

! CAUTION

Drive the trailer for the crawler towards the basic machine as close as possible. Make sure that the distance between the gravity center and the slewing center of the basic machine $\leq 5.5\text{m}$ (the slewing radius of the self-mounting cylinder $\leq 5.5\text{m}$; the included angle between A-frame and the front horizontal line is 60°).

- e) Insert pins for crawler carrier

Turn on the “undercarriage auxiliary” switch (No. 7 in Figure 4-5) on the right control panel, and then choose the bolting cylinder through the undercarriage control valve; pull the valve lever upward; operate the “lever for cylinder extension and retraction” to extend or retract the bolting cylinder of the pin. Pull the lever upward to insert the pin or push the lever downward to pull out the pin. Mounting cylinders can be operated independently or separately. (Refer to 4.5.9 for specific operations of undercarriage control valves)

- f) Locking of crawler carrier and fixation of pins

Put a pressing plate (10) on the stretching beam (7) of the chassis frame; insert pin (1) and put on washer (3) and bolt (2) to lock the crawler carrier tightly. Put a retaining plate (6) on the bolting pin (9); put on washer (5) and bolt (4) to secure.

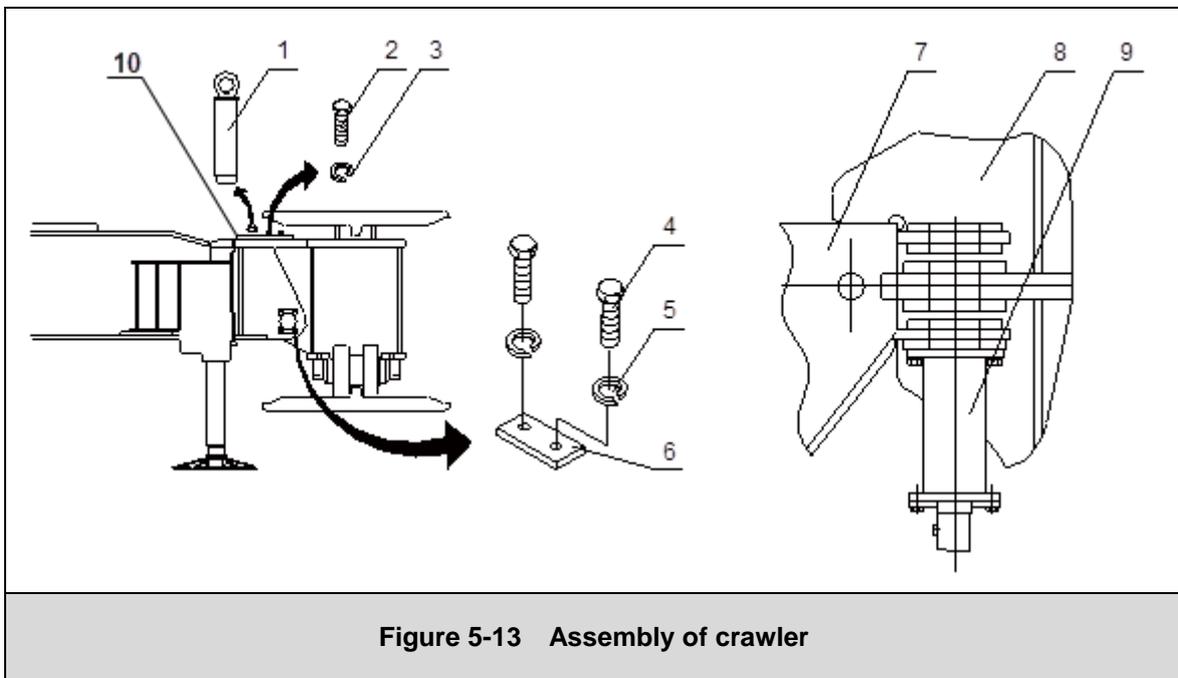
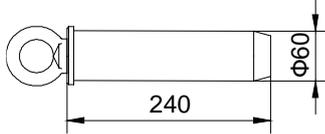
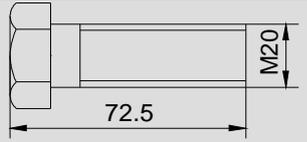
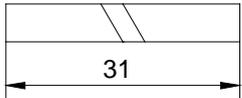
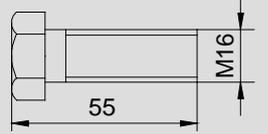
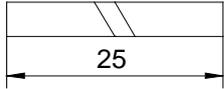


Figure 5-13 Assembly of crawler

Table 5-2 Components

No.	Name	Qty.	Dimensions (mm)
1	Pin	2	
2	Bolt	12	
3	Washer	12	
4	Bolt	8	
5	Washer	8	
6	Retaining plate	4	
7	Stretching beam of chassis	2	--
8	Limit plate for crawler carrier	2	--
9	Bolting pin for crawler carrier	2	--
10	Pressing plate	2	--

5.4.2 Assembly of the second crawler

- a) Slew the superstructure to the position for the second crawler. Assemble the second crawler in line with the assembly sequence of the first crawler.
- b) Slowly retract outriggers and lower down the crawler onto the ground through outrigger control levers after the second crawler is assembled.
- c) Dismantle the support plate from the outrigger and fix them on the chassis with fixing bolt (1).
- d) Retract the vertical outrigger completely and swivel the folding bracket back. Insert pin (2) into hole A to secure.

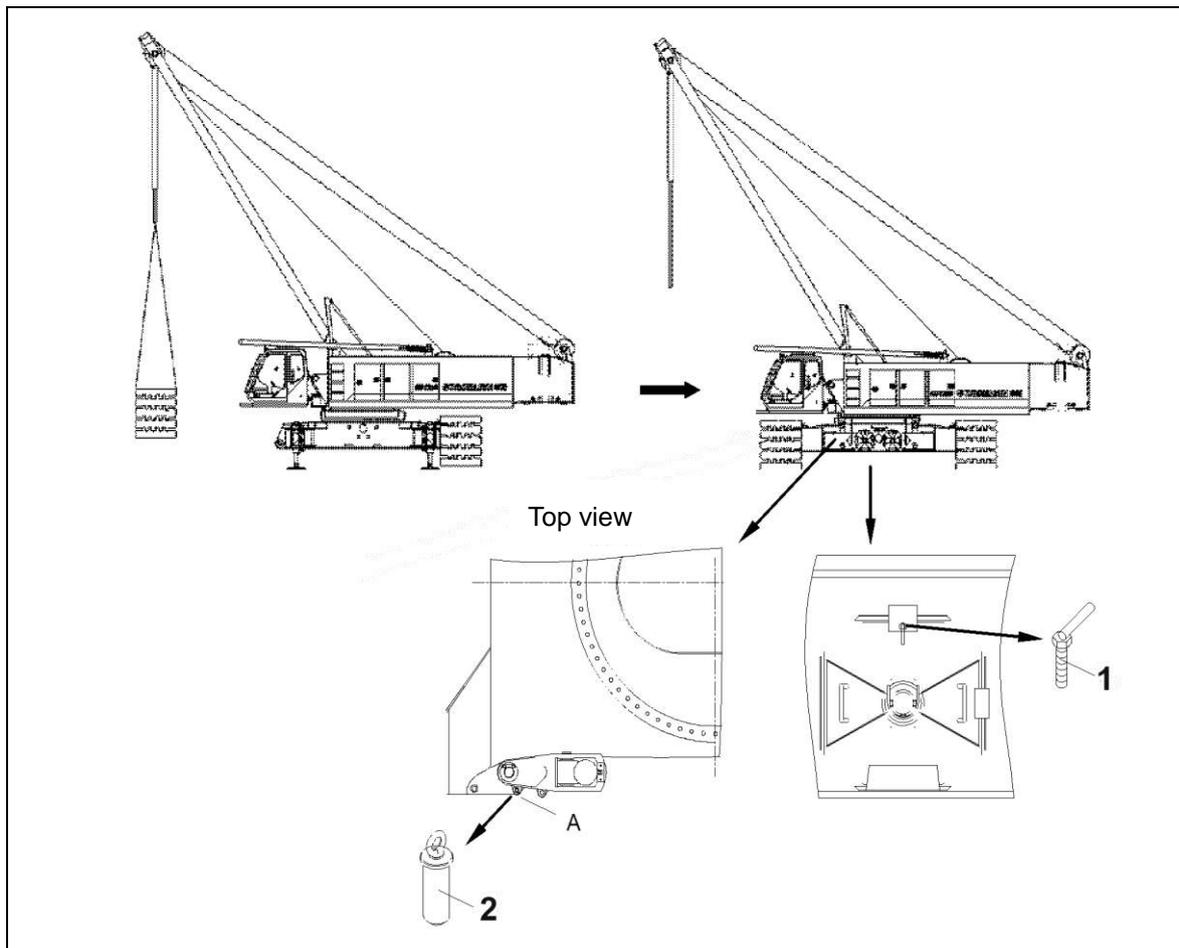


Figure 5-14 Assembly of the second crawler

! CAUTION

1. Slewing radius of the mounting cylinder must not exceed 5.5m if A-frame is used to lift crawlers. Otherwise, the crane may topple over.
2. No standing within the working radius when crawlers are lifted.
3. Cylinder-driven pins that connect chassis and crawlers need to be greased.

5.4.3 Connection of hydraulic pipelines of crawler carrier

There are 8 pipelines stretched out from steel pipes on two sides of the chassis that can be used to connect left and right crawler carriers. The assembly procedure of the right crawler carrier is presented below as an example:

Connect or disconnect hydraulic pipelines through quick-release couplings. Requirements on correct assembly are as follows:

- 1) The hydraulic system must be depressurized before connection or disconnection of hydraulic pipelines (five minutes after the engine is shut down).

- 2) Screw up the joint (socket and plug) with O-type nut.
- 3) Screw up the nut to a dead point.
- 4) Connection of quick coupling must be performed manually because tools could bring damages to couplings. Improper connection will lead to pressure loss or sudden leakage, thus causing an accident.



Improperly connected couplings might lead to pressure loss or sudden leakage, thus causing an accident.

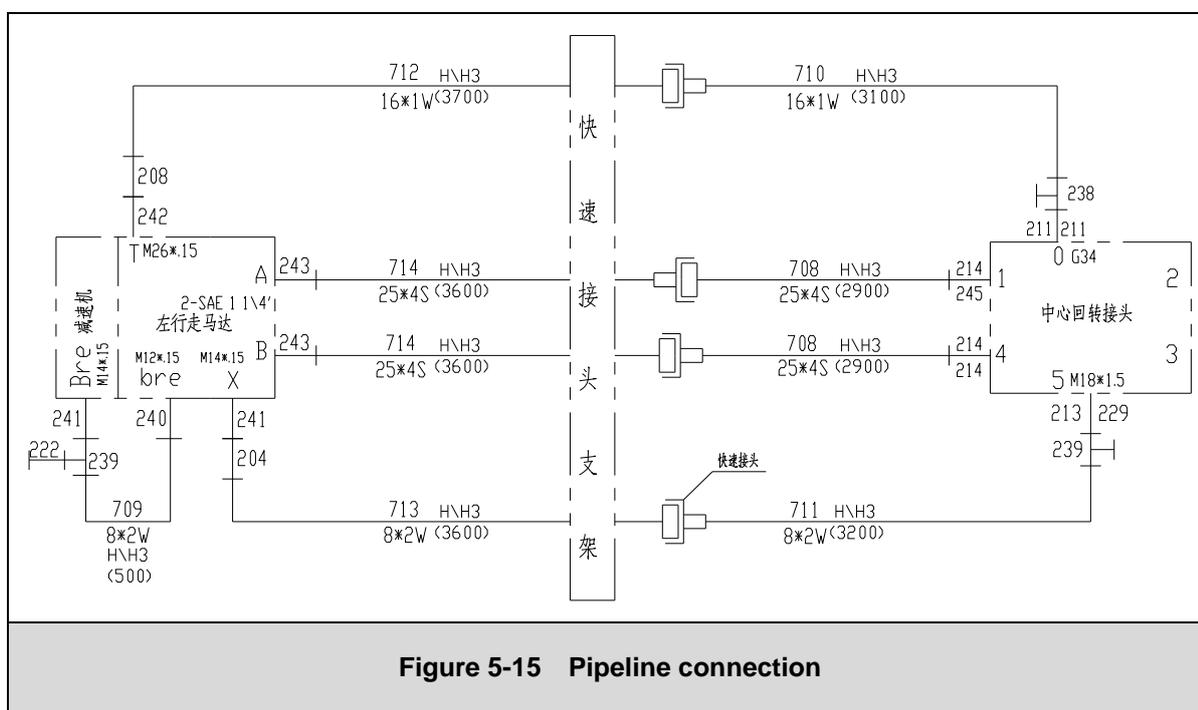


Figure 5-15 Pipeline connection



1. A quick coupling is the combination of a female end (internal thread) and a male end (external thread). It can be simply connected by jointing a female end and a male end of the same model.

2. Quick couplings on both ends of the mounting plate are designed to be mutually connected so as to avoid misconnection.

The mounting plate for quick-release couplings is fitted on the inner side of the crawler carrier, as shown below.

Quick-release coupling at 232 is the oil leakage of the traveling motor, it is interconnected with the oil leakage of the rotating collector and the oil leakage of the undercarriage.

Quick-release couplings at 216 and 217 are used to connect the main oil circuit between the traveling motor and the rotating collector. Port A of the traveling motor is connected to port 1 of the

rotating collector and port B is connected to port 4 of the rotating collector. Quick-release couplings at 216 and 217 are of the same model, so the coupling end at 217 is a male end while the coupling end at 216 is a female end.

The oil port P of the brake cylinder of the traveling reducer is connected to port 5 of the rotating collector through the quick-release coupling at 225.

Put dust-proof covers on after quick-release couplings are connected.

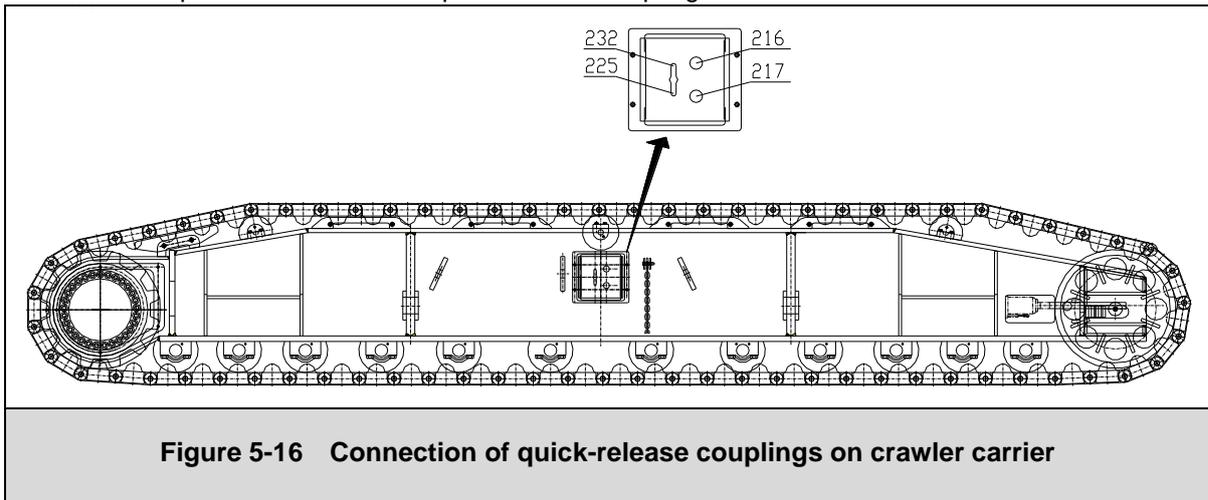


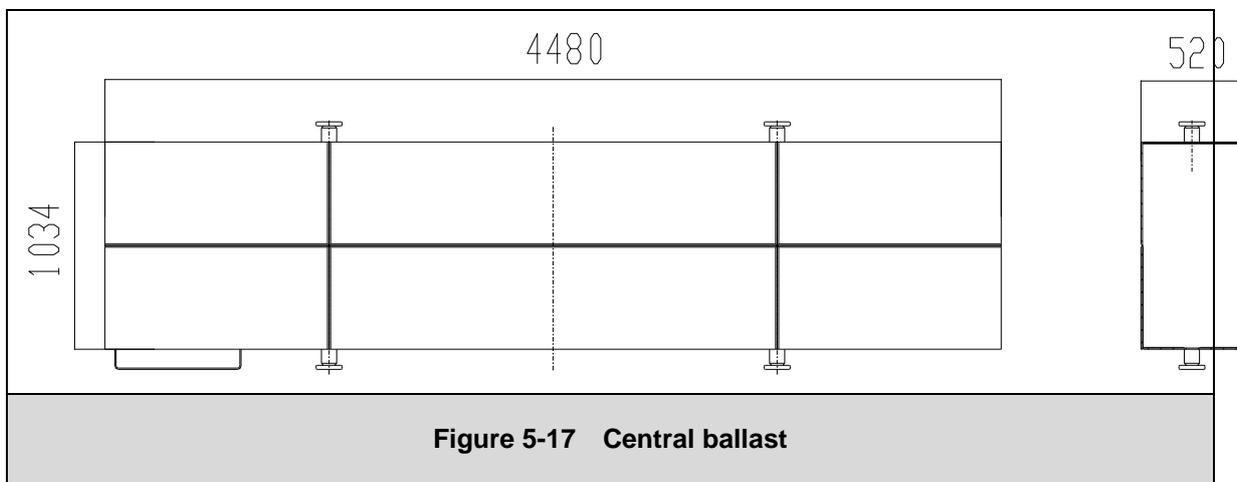
Figure 5-16 Connection of quick-release couplings on crawler carrier

CAUTION

1. The structure of his kind of quick-release coupling is quite strong, which will not be damaged by normal collisions. But knocking by blunt objects can also cause deformation.

2. Fit the protective cover immediately after the quick-release coupling is disconnected. When disconnecting the quick-release coupling outside door, position the disconnected coupling in a desired and clean place to protect it against contaminations which will scratch the O-ring. Long time working of quick release coupling with contamination will cause the O-ring out of work and leakage. Non-use of protective cover will not only pollute the hydraulic lines but also cause damage to expensive equipment.

5.5 Assembly of central ballast



There are two central counterweight plates that are symmetrically placed at the front and the rear of the crane. Each plate weights 8t.

- a) Slew the superstructure toward the direction of transportation after crawler carriers are well installed. Connect shackles on the mounting cylinder and lifting points on the central counterweight through sling.
- b) By changing the angle of A-frame and the length of mounting cylinder piston, a single central counterweight plate can be lifted from the transportation vehicle, slewed back to the front of the crane, and slowly placed on the crawler carrier.
- c) The other central counterweight plate is installed on the rear of the crane with the same method.

(Refer to Section 5.4 "Installation of crawler carriers" for operations and attentions of superstructure slewing, A-frame and mounting cylinder.)

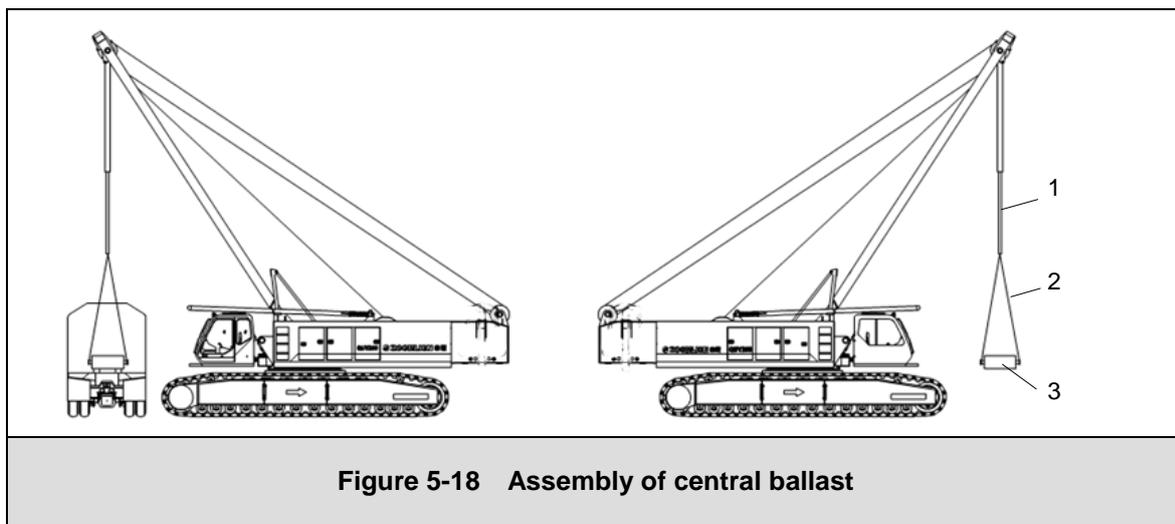


Table 5-3 Central ballast

No.	1	2	3
Names	Self-mounting cylinder	Sling	Central ballast

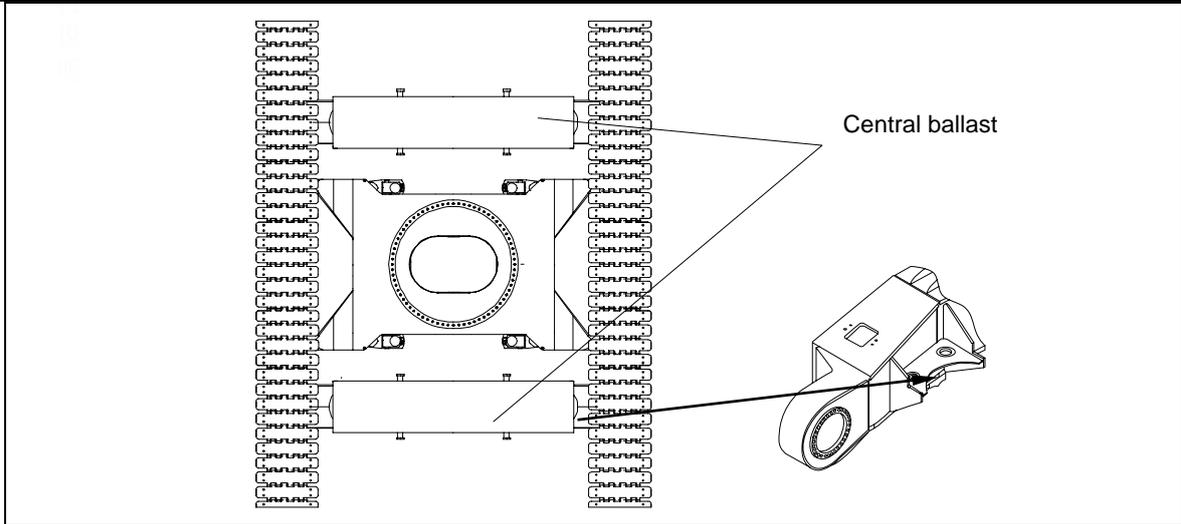


Figure 5-19 Position of central ballast

5.6 Assembly of rear counterweight

The rear counterweight, weighing 51.4t in total, consists of 8 counterweight plates of 4.8t each, 2 counterweight plates of 2t each and a counterweight base plate of 9t. All counterweights should be symmetrically installed on both sides of the rear end of the slewing table.

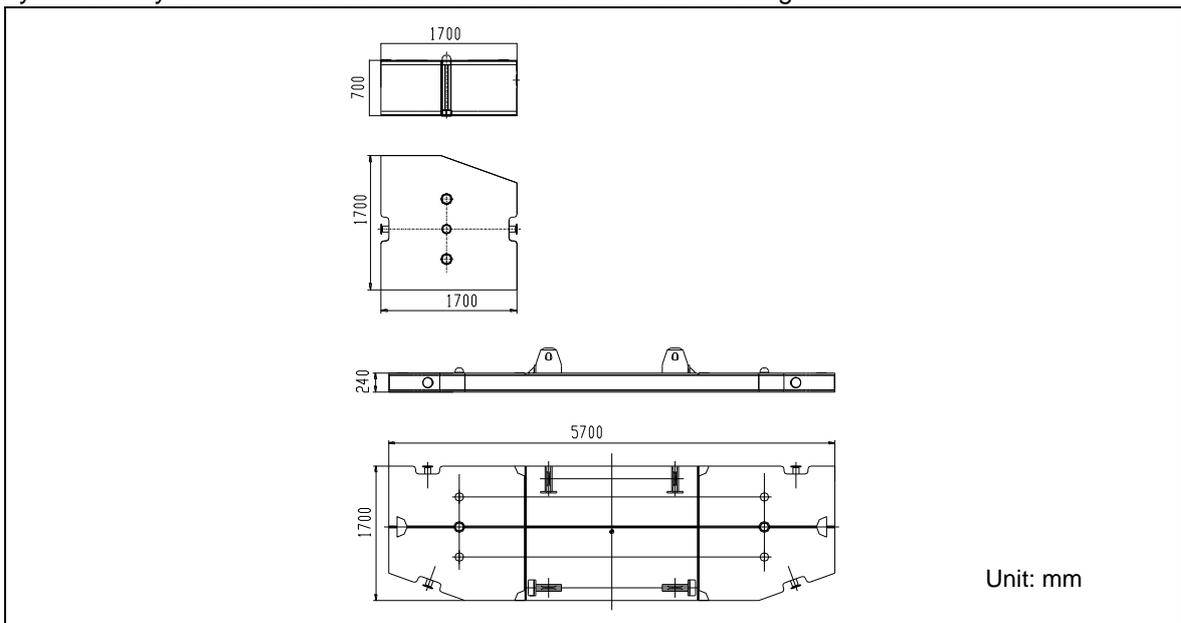


Figure 5-20 Dimensions of counterweight plate and base

Steps of installing rear counterweight:

- a) Unload the counterweight base plate from the transportation vehicle with the auxiliary crane and slowly lift it underneath the slewing table.
- b) Lift it up gradually until holes on the installation plate and the counterweight base plate are aligned.
- c) Insert the pin (1) and lock it with the retaining clip (2).

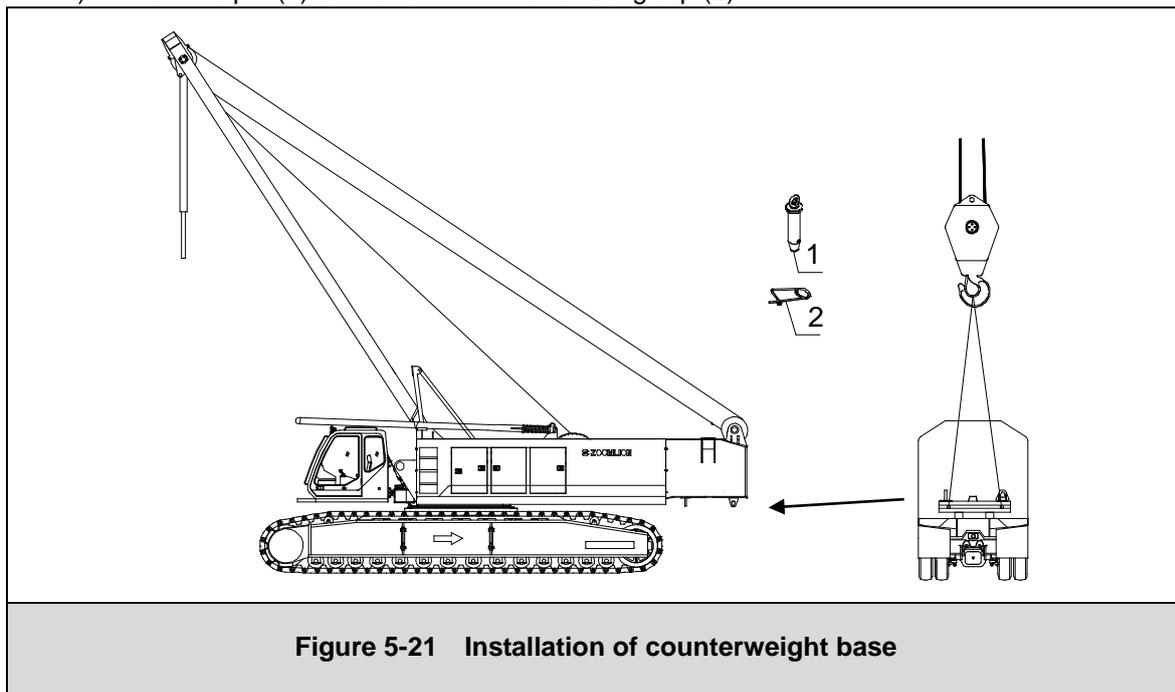
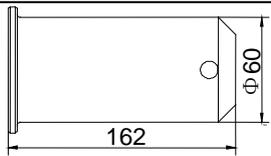
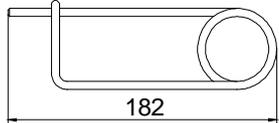


Table 5-4 Component

No.	Components	Qty.	Dimensions (mm)
1	Pin	4	
2	Retaining clip	4	

- d) Unload counterweight plates from the transportation vehicle one by one and then place them on both sides of the base plate (platform) in turns. Install counterweight plates of 4.8t first and the counterweight plates of 2t is placed on the topmost layer.

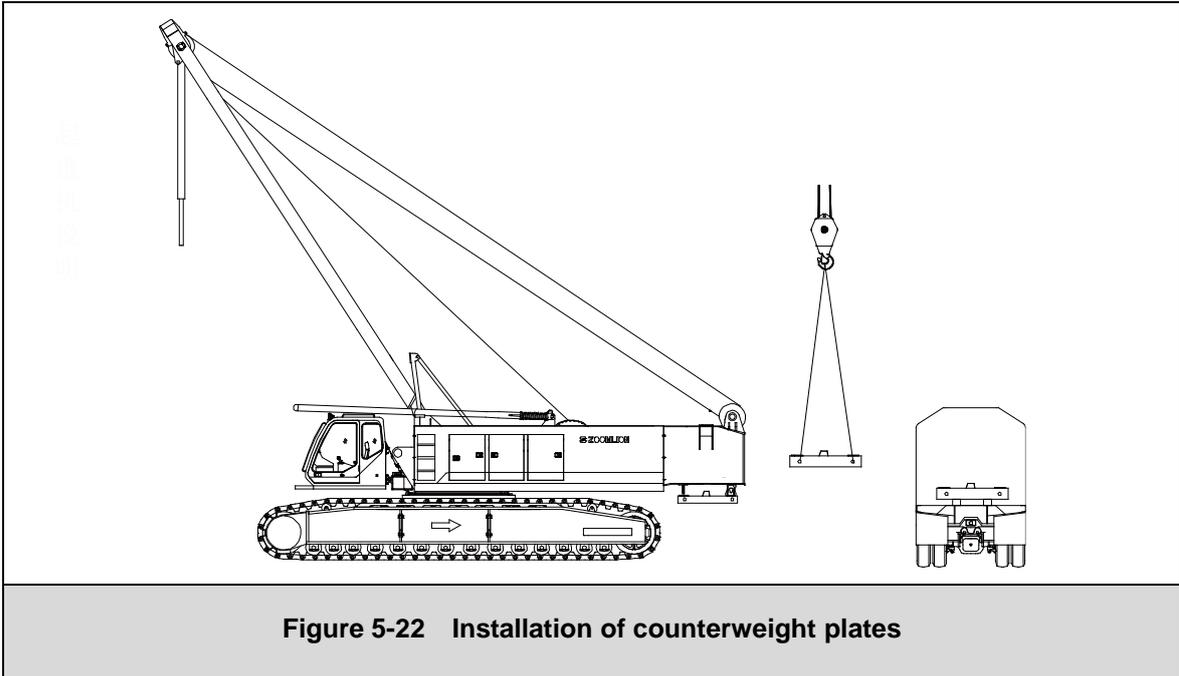


Figure 5-22 Installation of counterweight plates

e) Locking of counterweight plate

Insert the counterweight attachment chain (9) into the central hole of counterweight plates; Join bolt (8), base plate (7) and retaining plate (6) together and place them on the counterweight plate of 4t as shown in the following figure; Lock the attachment chain (9) by using retaining plate (11) and secure with Split pin (10); Mount locking plate (5) and secure it with bolt (3) and washer (4); Insert the round rod (2) into the hole of bolt (8) and rotate the round rod (2) until the attachment chain (9) is tensioned tightly. Insert the round rod (2) into the parallel holes of two bolts (8) and secure with Split pins (2).

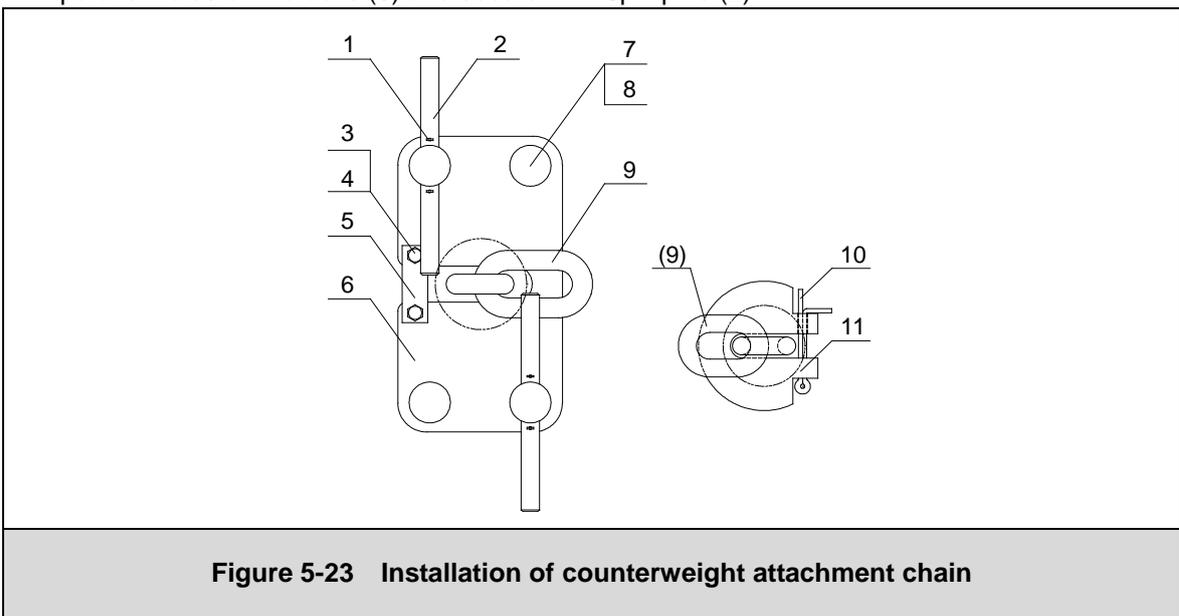
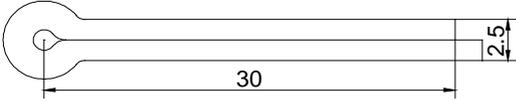
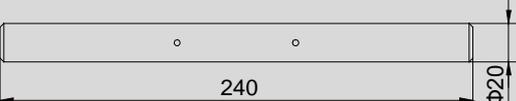
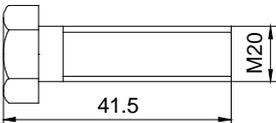
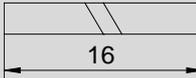
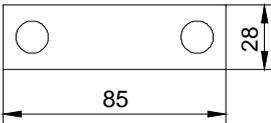
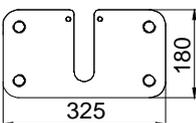
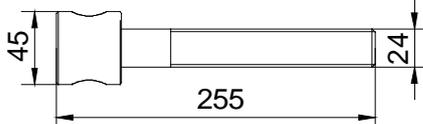
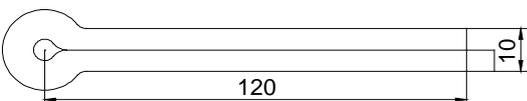
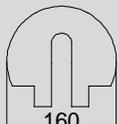


Figure 5-23 Installation of counterweight attachment chain

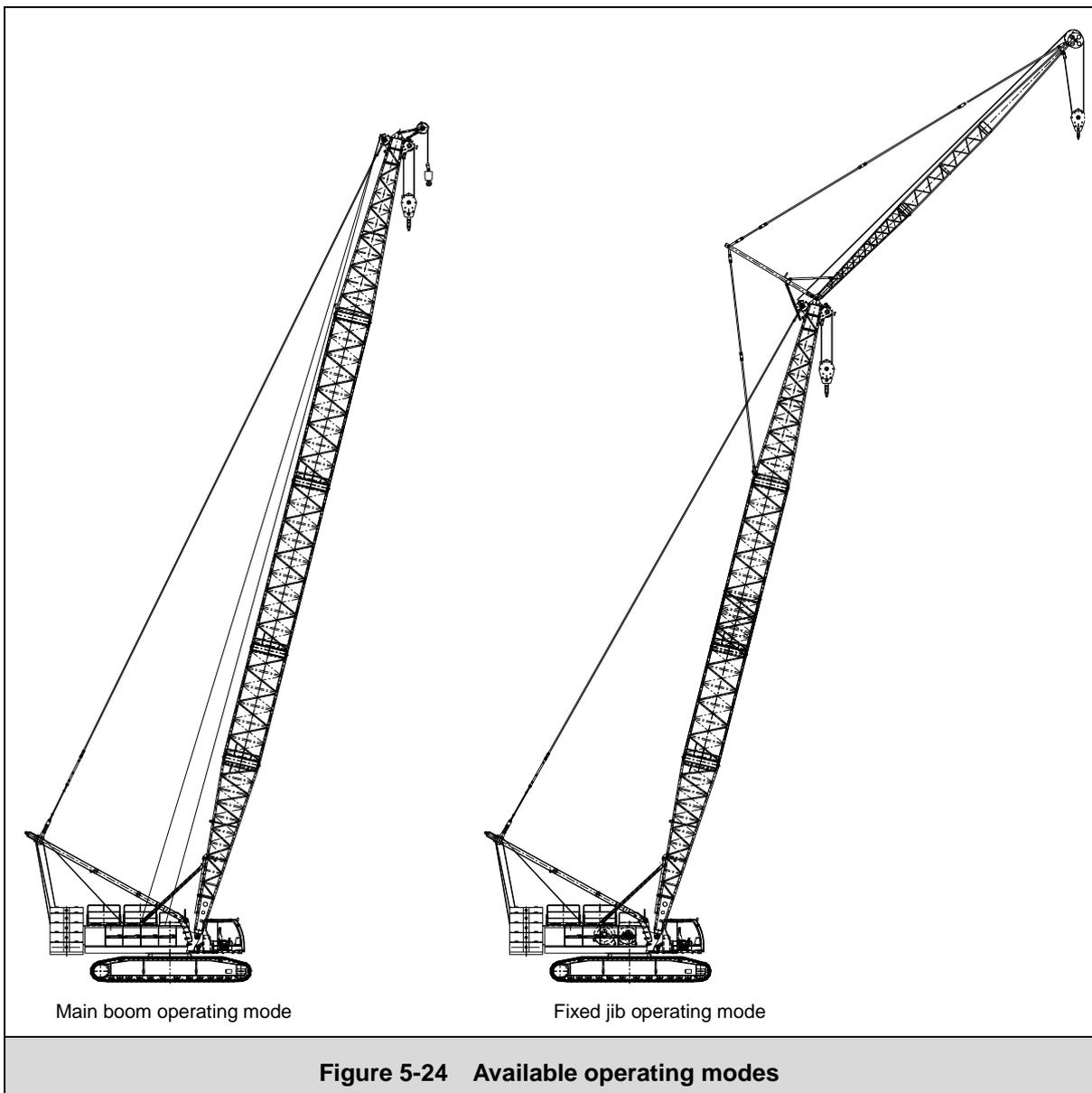
Table 5-5 Components

No.	Components	Qty	Dimensions (mm)
1	Split pin	8	
2	Round rod	4	
3	Bolt	4	
4	Washer	4	
5	Retaining plate	2	
6	Locking plate	2	
7	Base	8	
8	Bolt	8	
9	Counterweight attachment chain	2	--
10	Split pin	2	
11	Retaining plate	2	

! CAUTION

- (1) When stacking one counterweight plate on top of another plate, align the upper counterweight plate over the circular prominences at the two sides of lower counterweight plate and secure well.
- (2) The assembly and dismantling of counterweight plates must be carried out by more than two persons.
- (3) During the self-assembly of crane, A-frame can only be used to lift one counterweight plate at a time.

5.7 Available operating modes for this crawler crane





1. Any other kinds of boom configurations and anchoring rods combination that have not been stipulated in the operator's manual are prohibited.
2. When connecting boom sections, make sure that the intermediate sections are assembled to their specified positions. Otherwise there is a risk of accidents.

5.8 Combination of boom sections and anchoring rods

5.8.1 Main boom operating mode (S)

5.8.1.1 Components of main boom

S boom, of which the length varies from 19m to 76m, comprises a basic boom and main boom intermediate sections. The basic boom is 19m long, including main boom pivot section (G11), main boom head (G12) and tip boom (G10). There are three types of main boom intermediate section: 3m main boom intermediate section (G13), 6m main boom intermediate section (G14), 9m main boom intermediate section (G15). An incremental length is 3m.

The longest main boom operating mode (76m) is illustrated as follows:

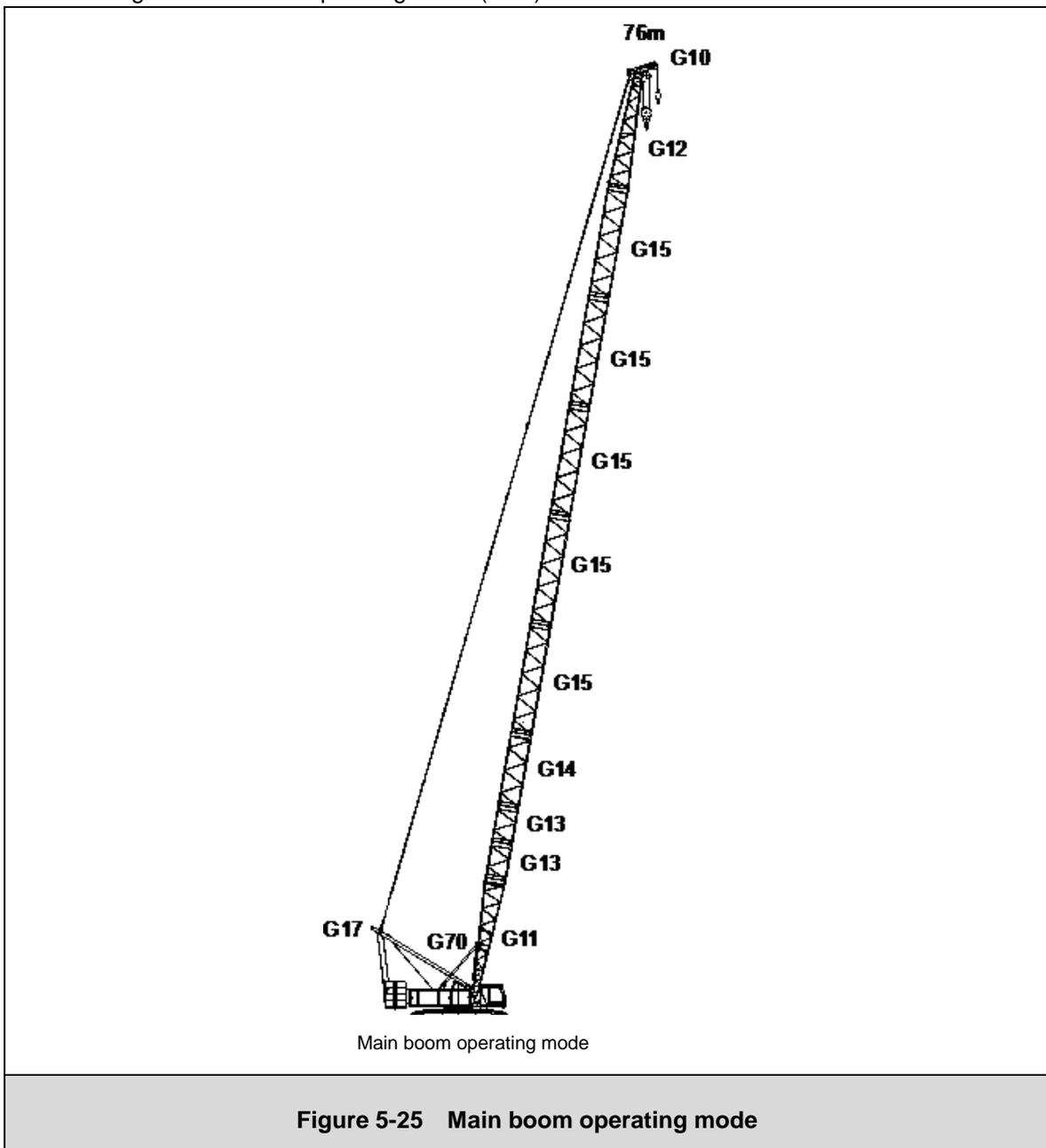


Table 5-6 Boom sections of main boom

No.	Boom sections	Length (m)	Weight (t)
G10	Tip boom	--	0.19
G11	Main boom pivot section	9.5	1.5
G12	Main boom head	9.5	2.2
G13	3m main boom intermediate section	3	0.48
G14	6m main boom intermediate section	6	0.82
G15	9m main boom intermediate section	9	1.18
G17	A-frame	8.6	2.52
G70	Tilting-back support of main boom	--	0.203

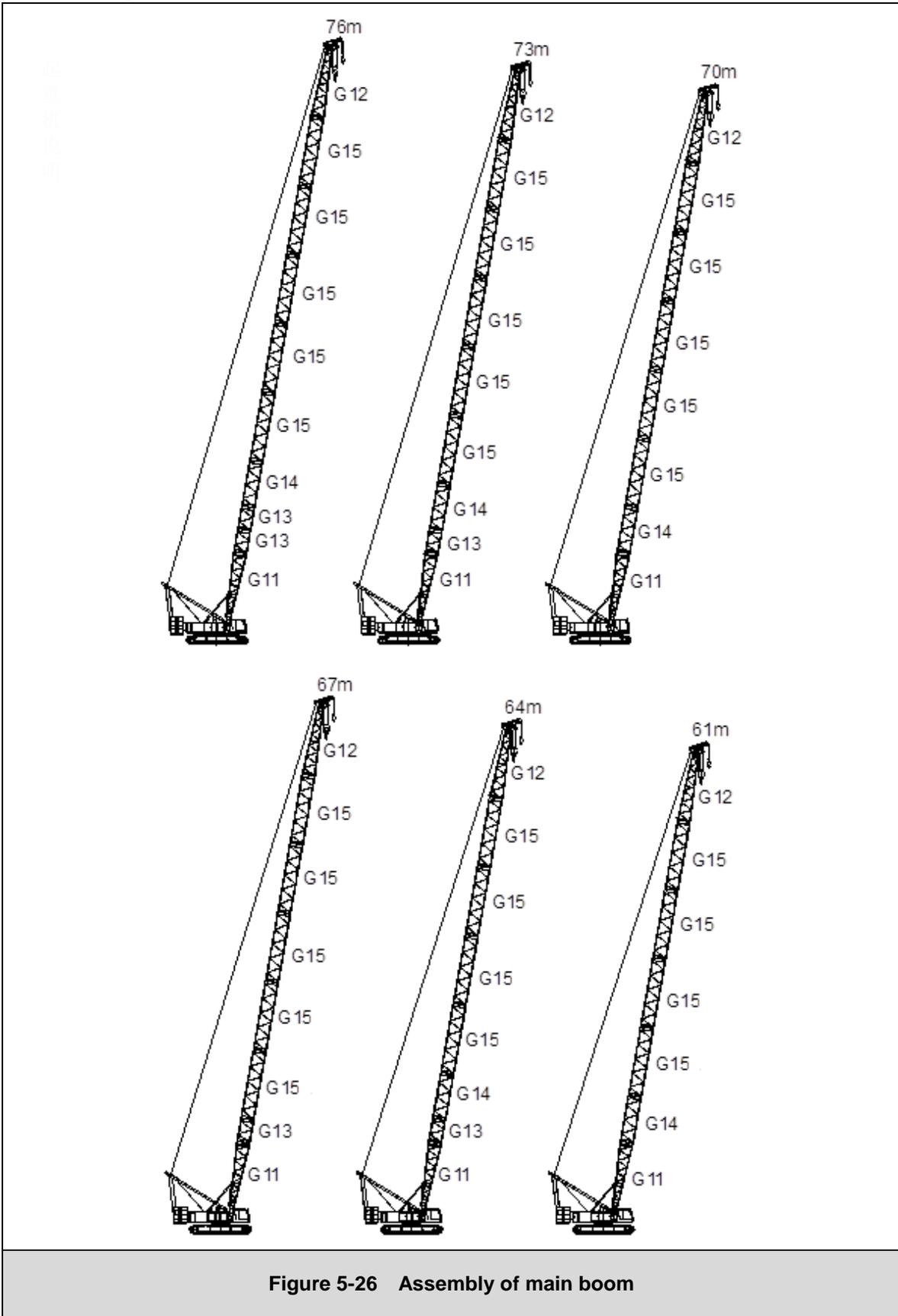
When different S boom length is required, crane operator only needs to disconnect main boom pivot section and main boom head, and then install main boom intermediate sections between them. In this way, S boom can be assembled to required length.

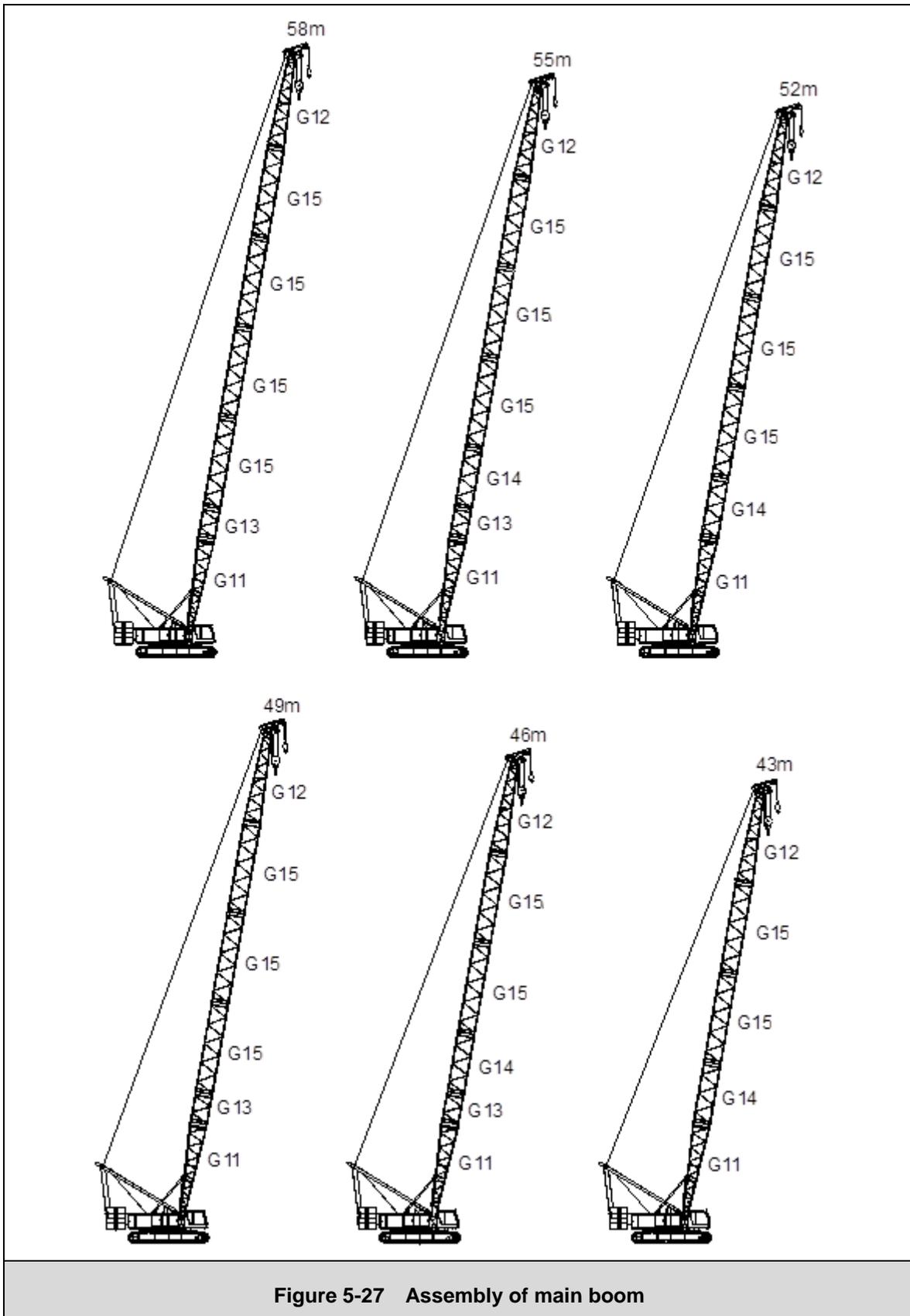
Table 5-7 Combinations of main boom sections

Main boom length (m)	Assembly sequence of boom sections	Main boom length (m)	Assembly sequence of boom sections
19	G11+G12	49	G11+G13+2xG15+G15+G12
22	G11+G13+G12	52	G11+G14+2xG15+G15+G12
25	G11+G14+G12	55	G11+G13+G14+2xG15+G15+G12
28	G11+G13+G14+G12	58	G11+G13+2xG15+2xG15+G12
31	G11+G13+G15+G12	61	G11+G14+2xG15+2xG15+G12
34	G11+G14+G15+G12	64	G11+G13+G14+2xG15+2xG15+G12
37	G11+G13+G14+G15+G12	67	G11+G13+2xG15+3xG15+G12
40	G11+G13+2xG15+G12	70	G11+G14+2xG15+3xG15+G12
43	G11+G14+2xG15+G12	73	G11+G13+G14+2xG15+3xG15+G12
46	G11+G13+G14+2xG15+G12	76	G11+2xG13+G14+2xG15+3xG15+G12

Assembly principle: Intermediate sections are connected in line with the above table (from short to long); the shortest intermediate section must be connected with the main boom pivot section.

According to the above assembly principle, the S boom can be assembled as follows:





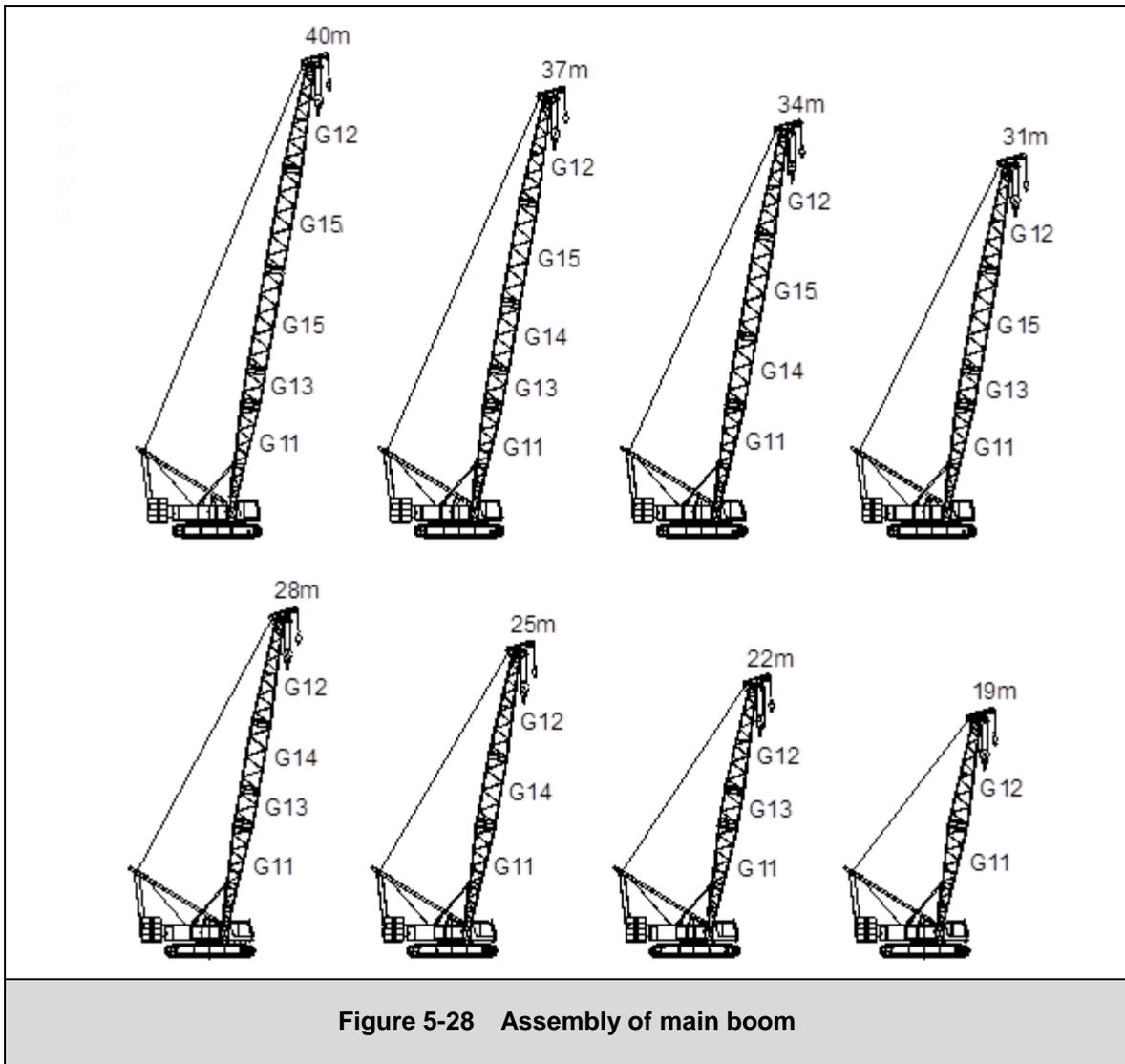


Figure 5-28 Assembly of main boom

! WARNING

1. Connect boom sections strictly in accordance with the table of main boom assembly.
2. No standing under the boom when boom sections are being pinned together.

5.8.1.2 Combination of main boom anchoring rods

Each kind of boom is assigned to anchoring rods of specific length, and the anchoring rods must be connected strictly in accordance with the given method.

! WARNING

Supports and pins for main boom anchoring rods must be assembled from the top down. Otherwise they may fall off.

Take the main boom of 76m as an example to illustrate the connection of main boom anchoring rods:

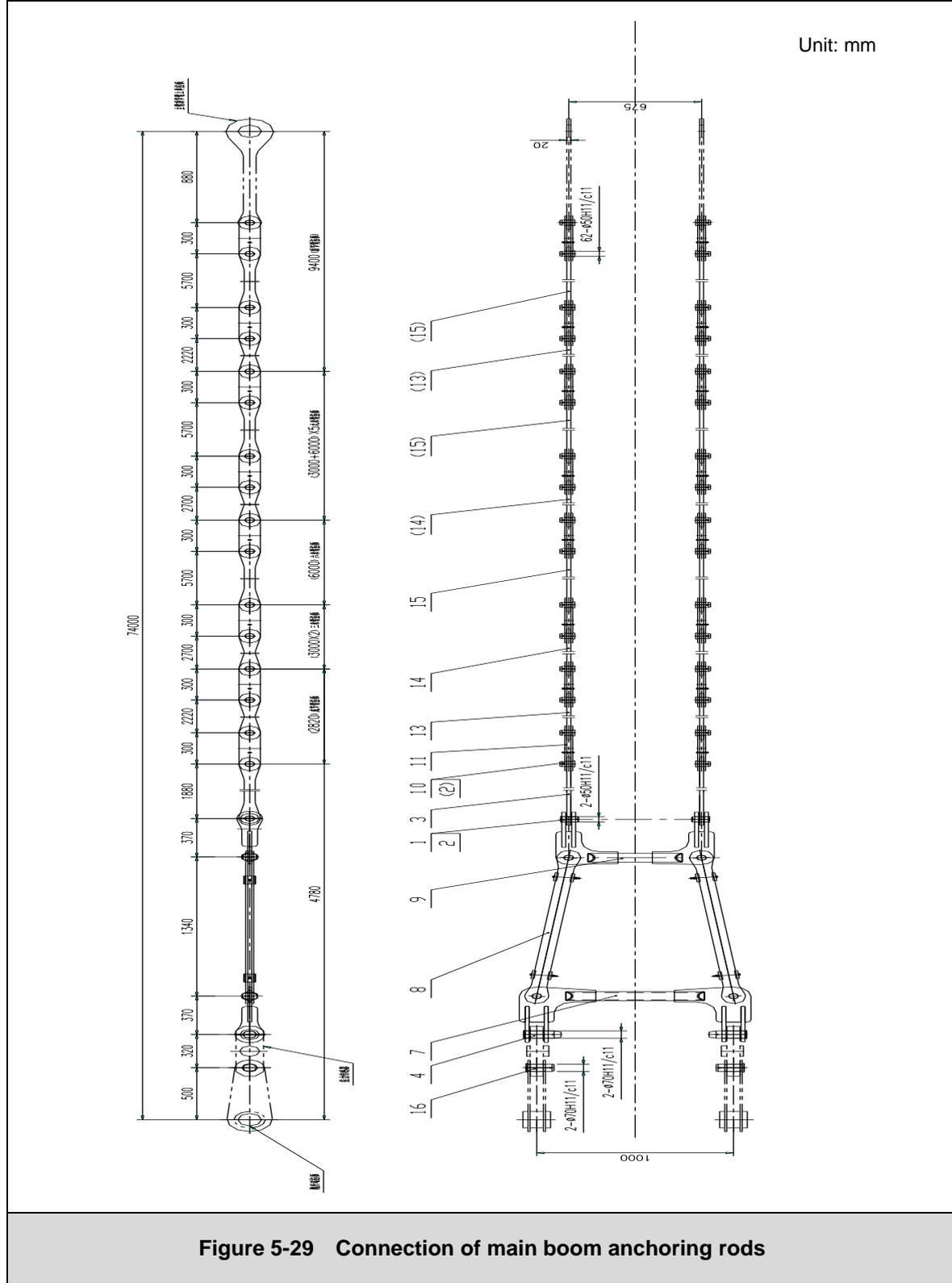
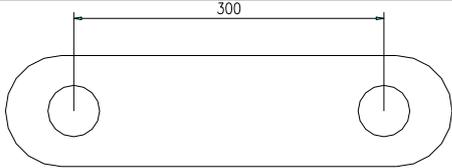
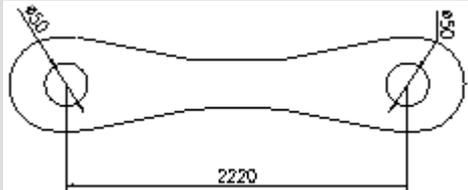
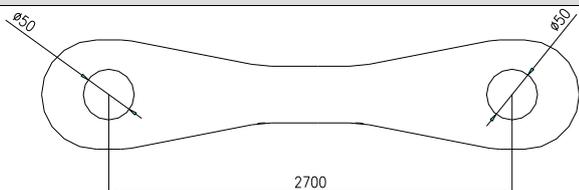
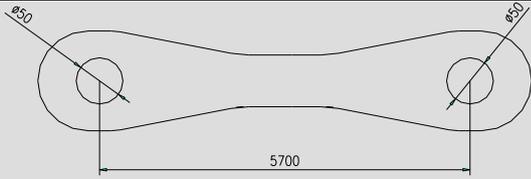
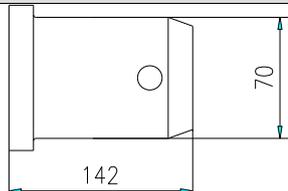


Table 5-8 Components

No.	Components	Qty	Dimensions (mm)
1	Pin	2	
2	Retaining clip	78	
3	Single anchoring rod	2	
4	Pin	2	
7	Coupling link	1	
8	Double anchoring rod	2	
9	Coupling link	1	
10	Pin	74	

11	Double anchoring rod	34	
13	Single anchoring rod	14	
14	Anchoring rod	14	
15	Double anchoring rod	14	
16	Pin	2	

Principles for determining the length of main boom anchoring rods:

- When basic boom is 19m long, the length of S-boom anchoring rods is 17000mm;
- When S-boom length increases by 3m, a 300mm-long double anchoring rod (14) and a 2700mm-long single anchoring rod (13) should be added accordingly.
- When S-boom length increases by 6m, a 300mm-long double anchoring rod (14) and a 5700mm-long single anchoring rod (15) should be added accordingly.
- When S-boom length increases by 9m, two 300mm-long double anchoring rods (14) and a 2700mm-long single anchoring rod (13) as well as a 5700mm-long single anchoring rod (15) should be added accordingly.

Table 5-9 Combination of main boom anchoring rods

Main boom length (m)	Length of A-frame anchoring rods (4780) (mm)	Length of anchoring rods on the pivot section (2820) (mm)	Length of anchoring rods on 3m intermediate section (mm)	Length of anchoring rods on 6m intermediate section (mm)	Length of anchoring rods on 9m intermediate section (mm)	Length of anchoring rods on boom head (9400) (mm)	Total length of anchoring rods (mm)			
19	(500)+300+320+300+370+1340+370+300+980	300+2220+300				2220+300+5700+300+880	17000			
22			A				20000			
25				B				23000		
28							A+B		26000	
31			A				A+B		29000	
34					B		A+B		32000	
37								2x(A+B)		35000
40			A				2x(A+B)		38000	
43					B		2x(A+B)		41000	
46								3x(A+B)		44000
49			A				3x(A+B)		47000	
52					B		3x(A+B)		50000	
55								4x(A+B)		53000
58			A				4x(A+B)		56000	
61					B		4x(A+B)		59000	
64								5x(A+B)		62000
67			A				5x(A+B)		65000	
70					B		5x(A+B)		68000	
73			A		B		5x(A+B)		71000	
76	2x A		B	5x(A+B)		74000				

Note: A=300+2700 B=300+5700

5.8.2 Fixed jib operating mode (SF)

5.8.2.1 Components of fixed jib

The fixed jib length varies from 13m to 31m. The fixed jib consists of fixed jib pivot section of 6.5m (G31), fixed jib head of 6.5m (G32) and an optional number of fixed jib intermediate sections of 6m (G34). The fixed jib can be assembled in the angle of 10° or 30° to heavy duty boom. When different fixed jib length is required, the operator only needs to disconnect fixed jib pivot section and

fixed jib head, and then install fixed jib intermediate sections between them. In this way, the fixed jib can be assembled to required length.

For fixed jib operating mode, main boom length = 28~64m. Refer to "5.8.1.1 Components of main boom".

The fixed jib operating mode (61m main boom + 31m jib) is illustrated in the figure below:

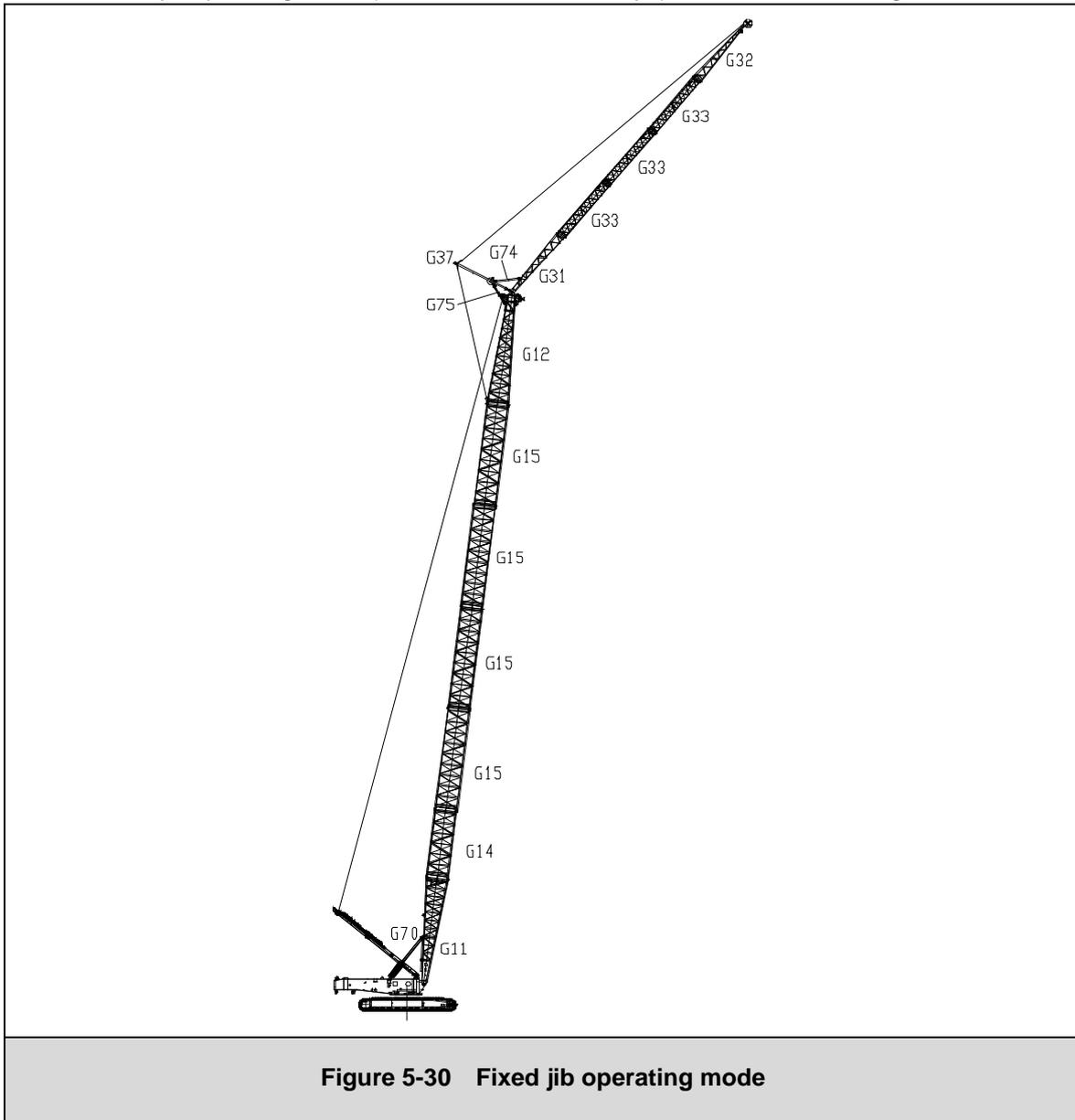


Figure 5-30 Fixed jib operating mode

Table 5-10 Boom sections of fixed jib

No.	Boom sections	Length (m)	Weight (t)
G31	Fixed jib pivot section	6.5	0.345
G32	Fixed jib head	6.5	0.445
G33	Fixed jib intermediate section of 6m	6	0.24

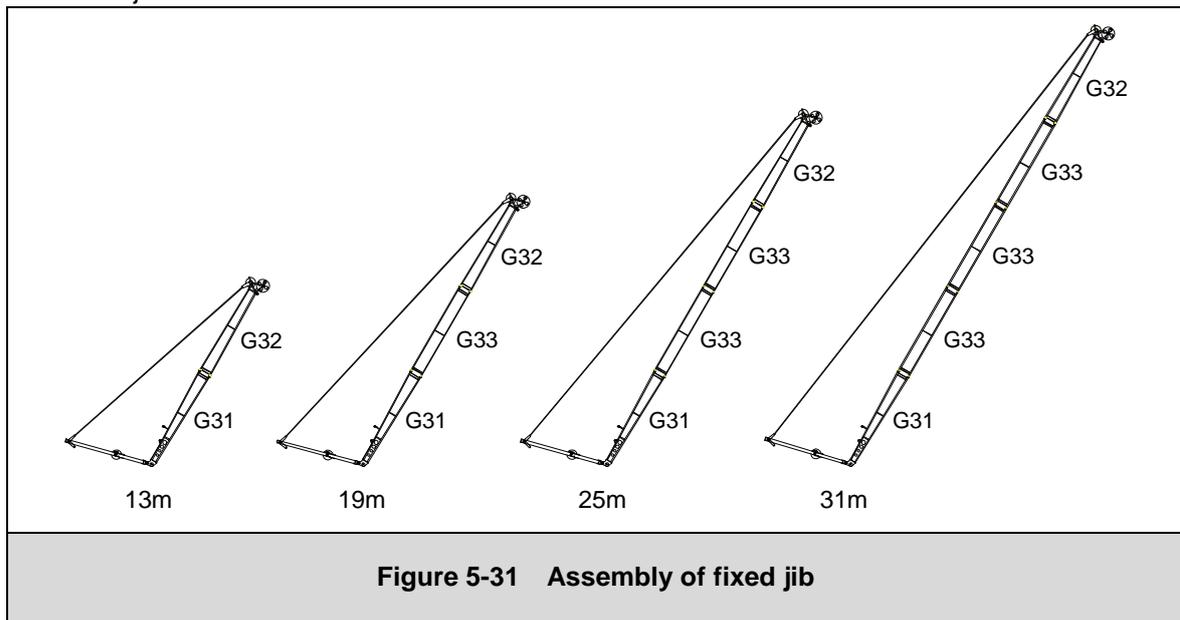
No.	Boom sections	Length (m)	Weight (t)
G37	FA-frame	5	0.5
G74	Front tilting-back support	--	0.046
G75	Rear tilting-back support	-	0.039

Refer to 5.8.1.1 for combinations of main boom sections.

Table 5-11 Combinations of fixed jib sections

Fixed jib length (m)	Combination of jib sections
13	G31+G32
19	G31+G33+G32
25	G31+G33×2+G32
31	G31+G33×3+G32

Fixed jib can be assembled as follows:



5.8.2.2 Components of fixed jib anchoring rods

Fixed jib anchoring rods consists of fixed jib front anchoring rods and fixed jib rear anchoring rods.

5.8.2.2.1 Components of front anchoring rods



Pins on triangle plates of fixed jib front anchoring rods must be assembled from the top

down. Otherwise there is a risk of falling off.

Components of front anchoring rods are illustrated as follows when fixed jib length is 31m.

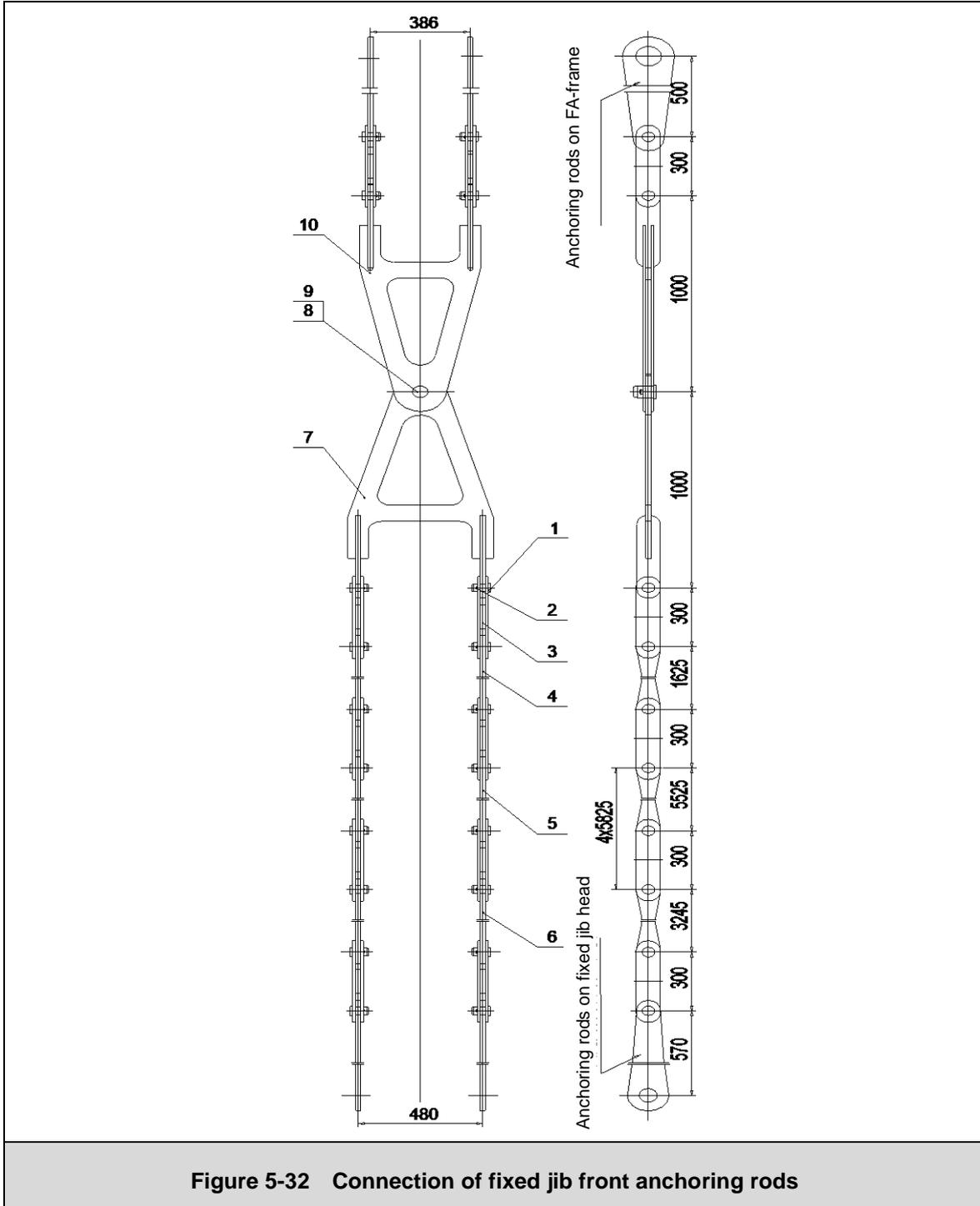
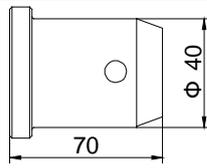
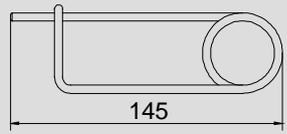
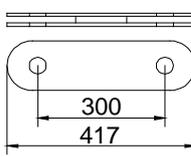
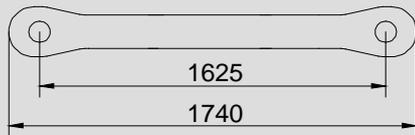
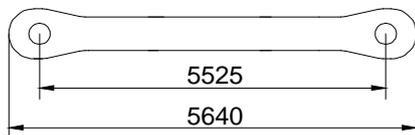
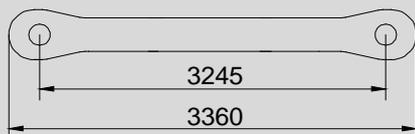
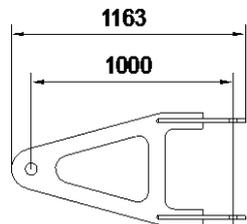
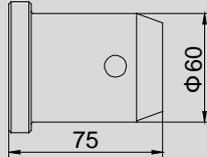
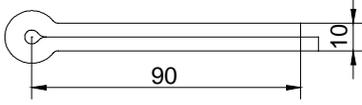
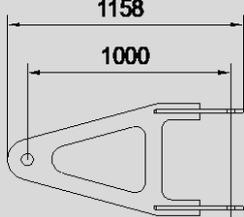


Figure 5-32 Connection of fixed jib front anchoring rods

Table 5-12 Components of fixed jib front anchoring rods

No.	Components	Qty.	Dimensions (mm)
1	Pin	32	
2	Retaining clip	32	
3	Double anchoring rod	16	
4	Single anchoring rod	2	
5	Single anchoring rod	8	
6	Single anchoring rod	2	
7	Single triangle plate	1	
8	Pin	1	

No.	Components	Qty.	Dimensions (mm)
9	Split pin	1	
10	Double triangle plate	1	

The length of fixed jib anchoring rods is 13895mm when the fixed jib length is 13m.

When the fixed jib length increases by 6m, a 300mm-long double anchoring rod and a 5525mm-long single anchoring rod should be added accordingly.

Table 5-13 Combination of fixed jib front anchoring rods

Jib length (m)	Total length of fixed jib front anchoring rods (mm)	Combination of anchoring rods (from FA-frame to intermediate section)
13	$500+13895+570=14965$	$3+10+7+3+4+3+ (5+3) +6+3$
19	$500+19720+570=20790$	$3+10+7+3+4+3+ (5+3) \times 2+6+3$
25	$500+25545+570=26615$	$3+10+7+3+4+3+ (5+3) \times 3+6+3$
31	$500+31370+570=32440$	$3+10+7+3+4+3+ (5+3) \times 4+6+3$

5.8.2.2.2 Components of rear anchoring rods

Fixed jib rear anchoring rods can be assembled in two ways: fixed jib angle of 10° and 30°.



Pins on triangle plates of fixed jib rear anchoring rods must be assembled from the top down. Otherwise there is a risk of falling off.

When fixed jib angle is 10°, fixed jib rear anchoring rods are assembled as follows:

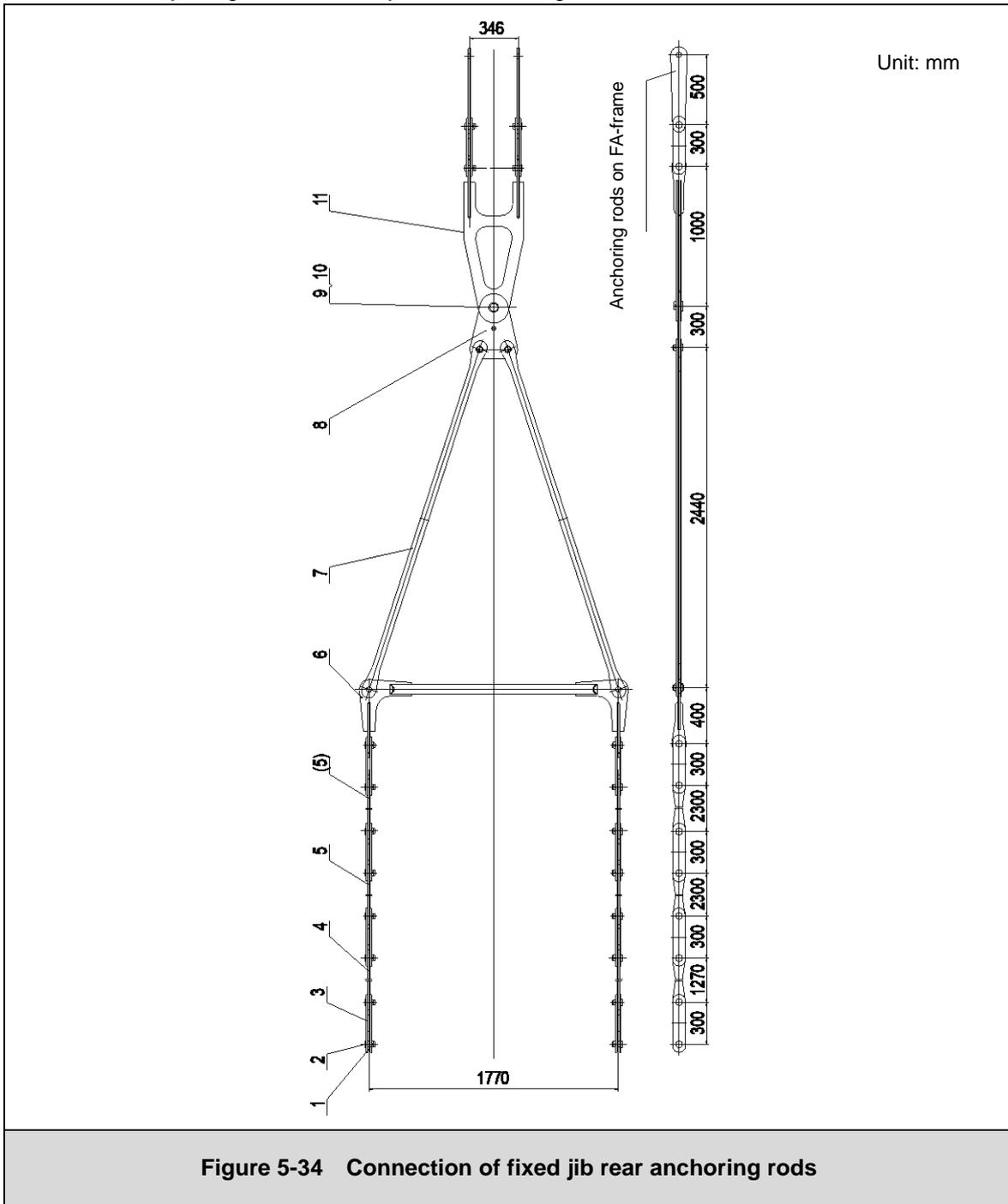
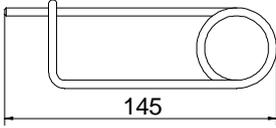
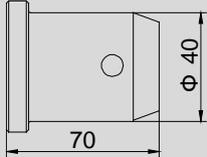
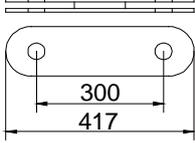
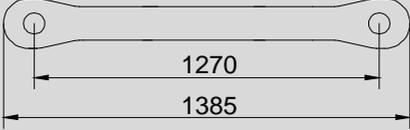
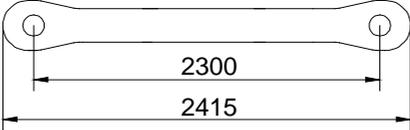
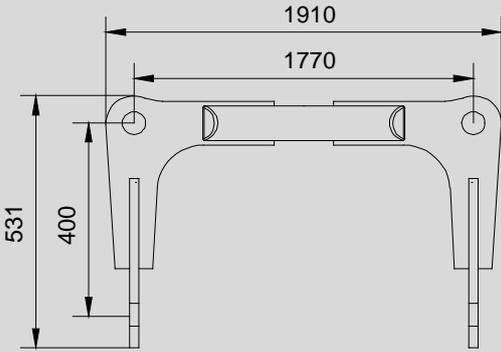
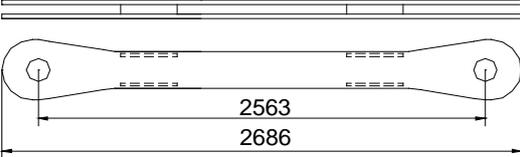


Figure 5-34 Connection of fixed jib rear anchoring rods

Table 5-14 Components of fixed jib rear anchoring rods

No.	Components	Qty.	Dimensions mm
1	Retaining clip	24	
2	Pin	24	
3	Double anchoring rod	10	
4	Single anchoring rod	2	
5	Single anchoring rod	4	
6	Coupling link	1	
7	Double anchoring rod	2	

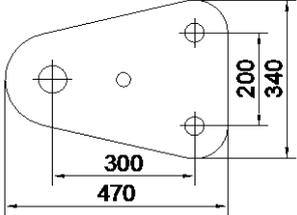
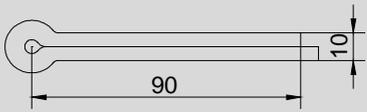
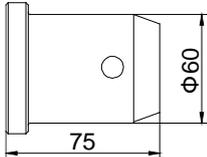
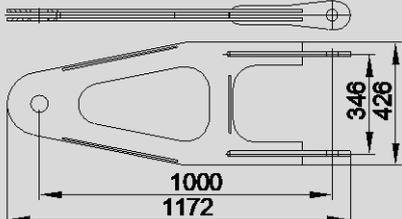
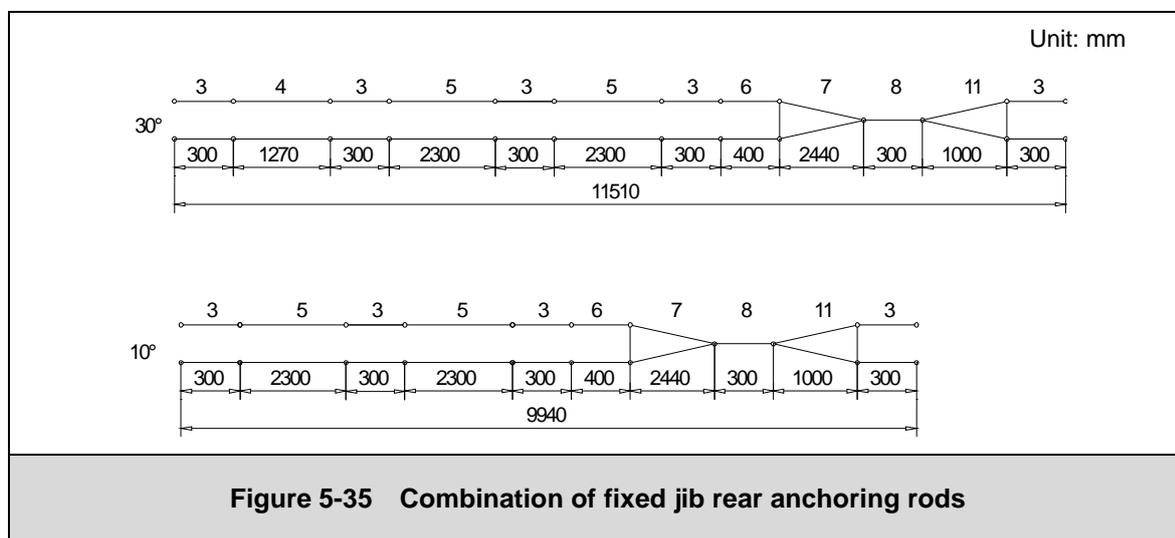
No.	Components	Qty.	Dimensions mm
8	Connecting plate	1	
9	Latch	1	
10	Pin	1	
11	Double triangle plate	1	

Table 5-15 Combination of fixed jib rear anchoring rods

Jib length (m)	Total length of fixed jib rear anchoring rods (mm)	Combination of anchoring rods (from intermediate section to FA-frame)
30°	12085	3+4+3+5+3+5+3+6+7+8+11+3
10°	10445	3+5+3+5+3+6+7+8+11+3



5.9 Assembly and disassembly of main boom

5.9.1 Preparation

- a) The crane must be properly supported and horizontally placed.
- b) Choose appropriate boom sections and anchoring rods according to operational plan and the table of operating modes.
- c) Choose appropriate load hooks and rope reevings in line with reeving plan.
- d) Make sure that central ballast and rear counterweight are correctly assembled.
- e) Provide an auxiliary crane for assembly, operators, and a safe working platform.
- f) Make sure that safety devices of load moment limiter are correctly set according to the table of operating modes.
- g) Switch the working mode to assembly mode.



1. Choose “main boom operating mode” on the display of the load moment limiter before operation.

2. All safety devices will become invalid if the “working mode” is switched to the “assembly mode”. Special attention must be paid during crane operation.



1. A safe working platform must be provided for the assembly. It is prohibited to build up a temporary platform. Otherwise, there will be a risk of accident.

2. It is prohibited to use combinations of boom sections or anchoring rods that are not stipulated in the *Operator's Manual*. Otherwise, there will be a risk of accident.

3. Intermediate sections must be assembled from short to long and make sure that the 9m intermediate section A must be connected with the pivot section.

4. Use at least two ropes to lift the boom head with an auxiliary crane. The tension of a single rope should be larger than or equal to 15t.

5. No standing on the boom during assembly.

6. No standing under the boom during assembly and disassembly of pins.

7. No wood support or wood plate should be padded under the central position of the chord member or the web member. Otherwise, boom sections will be damaged.

5.9.2 Assembly of main boom

After the unloading of basic machine and the assembly of crawler carrier, unload boom sections from the transport vehicle with the help of the mounting cylinder of A-frame or the auxiliary crane.

Assemble components like boom head, intermediate section, and anchoring rods, tilting-back support as required.

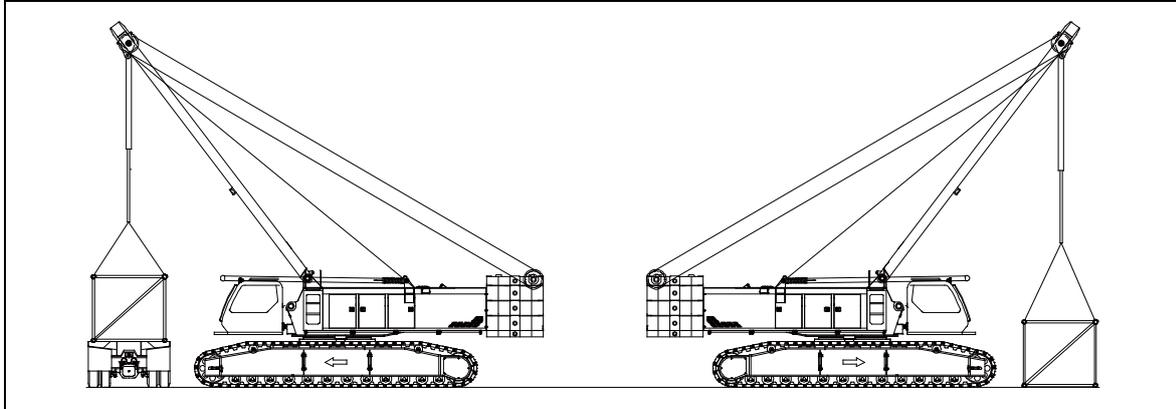


Figure 5-36 Unloading of boom section

5.9.2.1 Assembly of main boom pivot section

Unload the main boom pivot section from the trailer; connect the pivot section and the lifting cylinder with chains and lift the pivot section up; connect the pivot section and the slewing table through A-frame derricking and the lifting cylinder. After pin holes are well aligned, press the “bolting pin extending” switch (No. 5 in Figure 4-5) to fully extend the bolting pin (1) for pivot section, and then release the switch. Assemble the retaining plate (2) on and fix it with flat washer (4), spring washer (5) and bolt (3) to finish the connection of the pivot section and the slewing table.

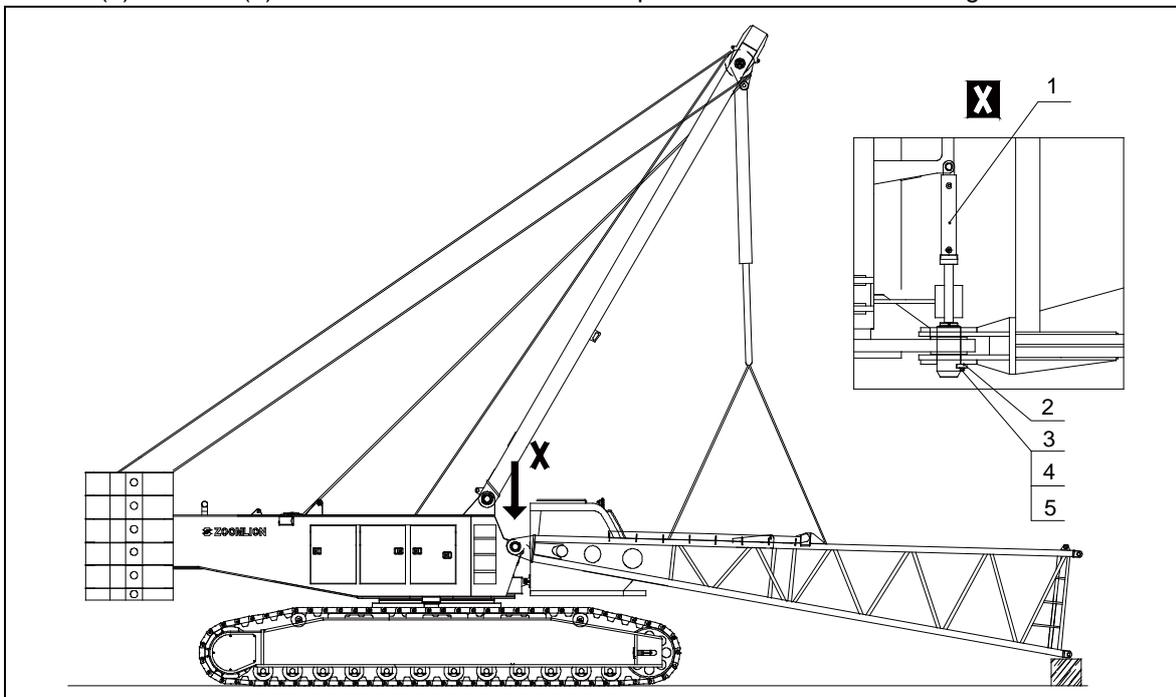
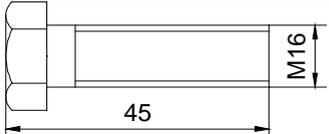
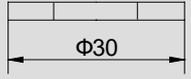
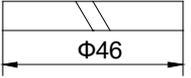


Figure 5-37 Assembly of main boom pivot section

Table 5-16 Components

No.	Components	Qty.	Dimensions mm
1	Bolting pin cylinder for boom	2	--
2	Retaining plate	2	
3	Bolt	4	
4	Flat washer	4	
5	Spring washer	4	

5.9.2.2 Connection of boom sections

a) Pre-assemble boom sections (except for main boom pivot section) in the assembly sequence mentioned in 5.8.1. Pre-assembly: Align lugs of main boom intermediate sections with relevant positions; insert pin (1) horizontally into the pin hole (as illustrated below) and lock it with retaining clip (2). Repeat the above steps to install pins in other holes.

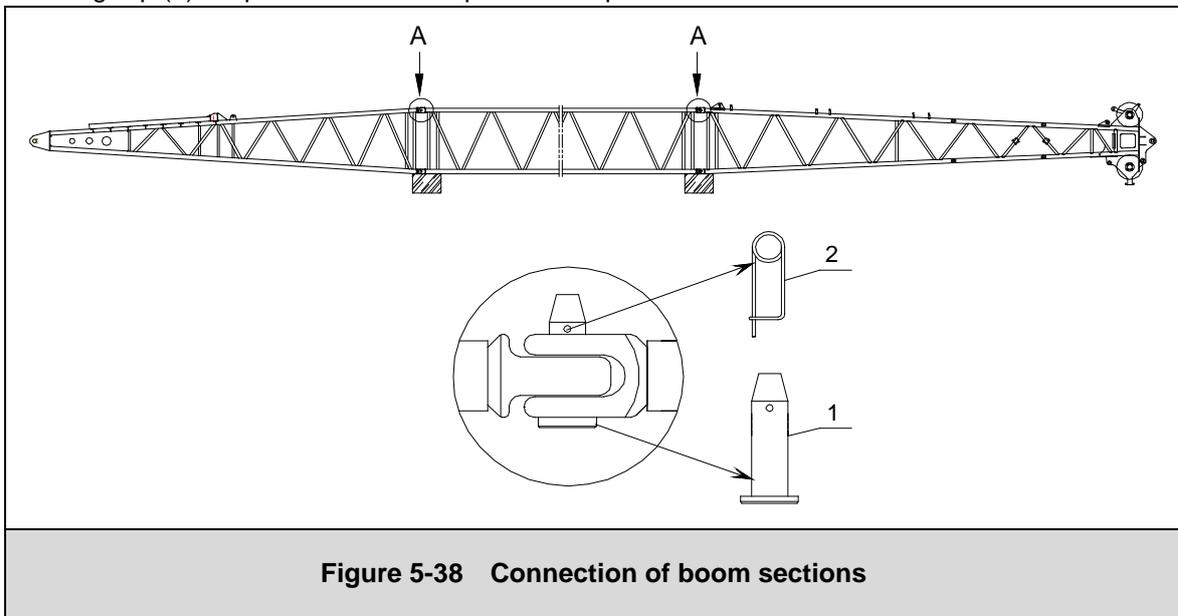
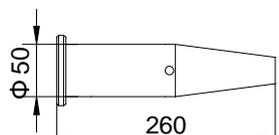
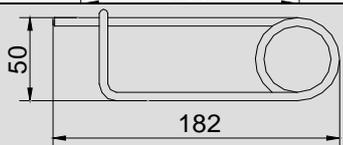


Figure 5-38 Connection of boom sections

Table 5-17 Components

No.	Components	Qty.	Dimensions mm
1	Pin	8	
2	Retaining clip	8	

b) Drive the crane slowly to the position that is right in front of the place where boom sections are pre-assembled; slowly adjust A-frame so as to align upper lugs of the pivot section and the neighboring boom section; connect the pivot section and the intermediate section with pin (1) and lock them with retaining clip (2); lift the connecting part between the pivot section and the neighboring boom section with an auxiliary crane (there might be a risk of fracture of the web member on lug (3) if the pivot section is lifted through lug (3)) to align lower lugs of the pivot section and the neighboring boom section; connect them with pin (1) and lock with retaining clip (2); dismantle the rope connecting the pivot section.

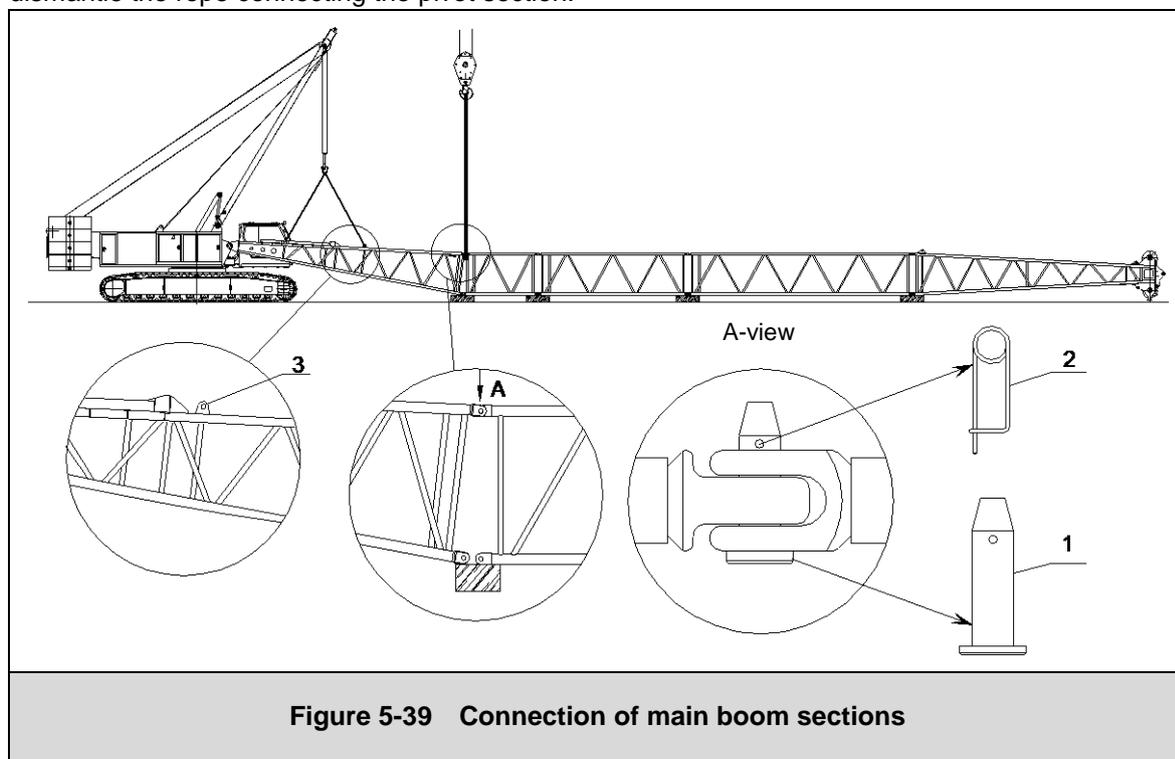
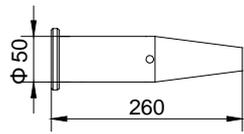


Table 5-18 Components

No.	Components	Qty.	Dimensions mm
1	Pin	4	
2	Retaining clip	4	
3	Lug on main boom pivot section	--	--

! DANGER

Lugs (3) on main boom pivot section can only bear the weight of the main boom pivot section. There might be a risk of fracture of the web member on lug (3) if it used to connect boom sections or the main boom pivot section is lift up with other boom sections on.

! CAUTION

1. It is prohibited to put hand or fingers into the connecting hole during assembly.
2. While the pin is being removed, no person is allowed to stand beneath or in the boom.
3. It is prohibited to climb up the boom, and stand or walk on the boom.
4. Use a ladder or other similar tools to carry out assembly operation.

5.9.2.3 Connection of anchoring rods and rope reeving

a) Lower down A-frame to the angle of 35°; dismantle fixing pins of anchoring rods on main boom pivot section, intermediate sections and main boom head; connect anchoring rods of A-frame and the pivot section, anchoring rods of the pivot section and intermediate sections, and anchoring rods of intermediate sections and the main boom head; secure them with pins and retaining clips. (Refer to 5.8.1.2 for the specific method of connection.)

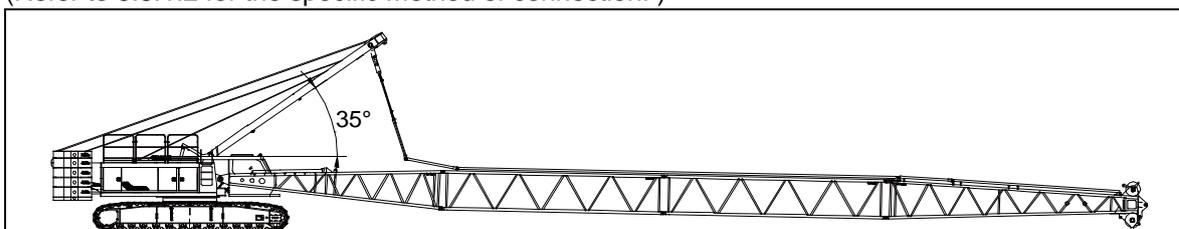


Figure 5-40 Connection of anchoring rods and rope reeving

b) Operate the derricking winch to hoist the main boom and the main boom head to a proper height (slightly higher than the hook) so that the hook is suspended below the boom head. Slowly reel off the primary hoisting winch and choose an appropriate reeving plan according to 4.6.1. Fix the rope head after reeving and lock it with a pin and a retaining clip.

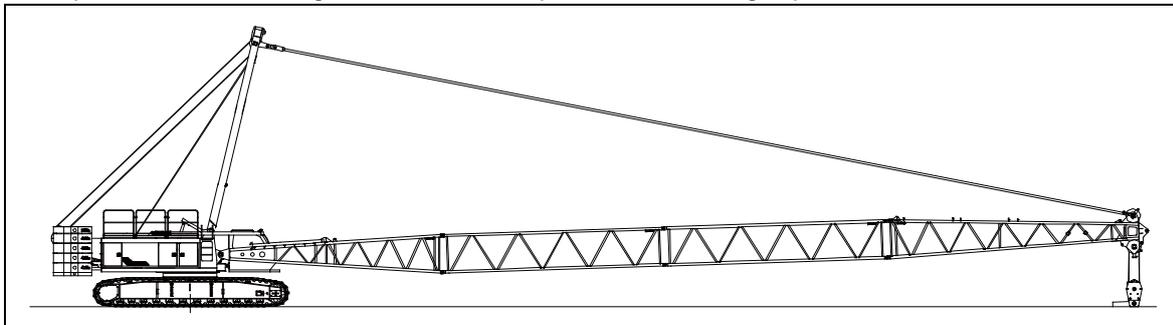


Figure 5-41 Connection of anchoring rods and rope reeving

5.9.3 Electrical connection

5.9.3.1 Electrical circuit connection



All electrical circuit connections and safety inspections must be completed before the erecting of main boom. Electrical components of the main boom are illustrated in the figure below:

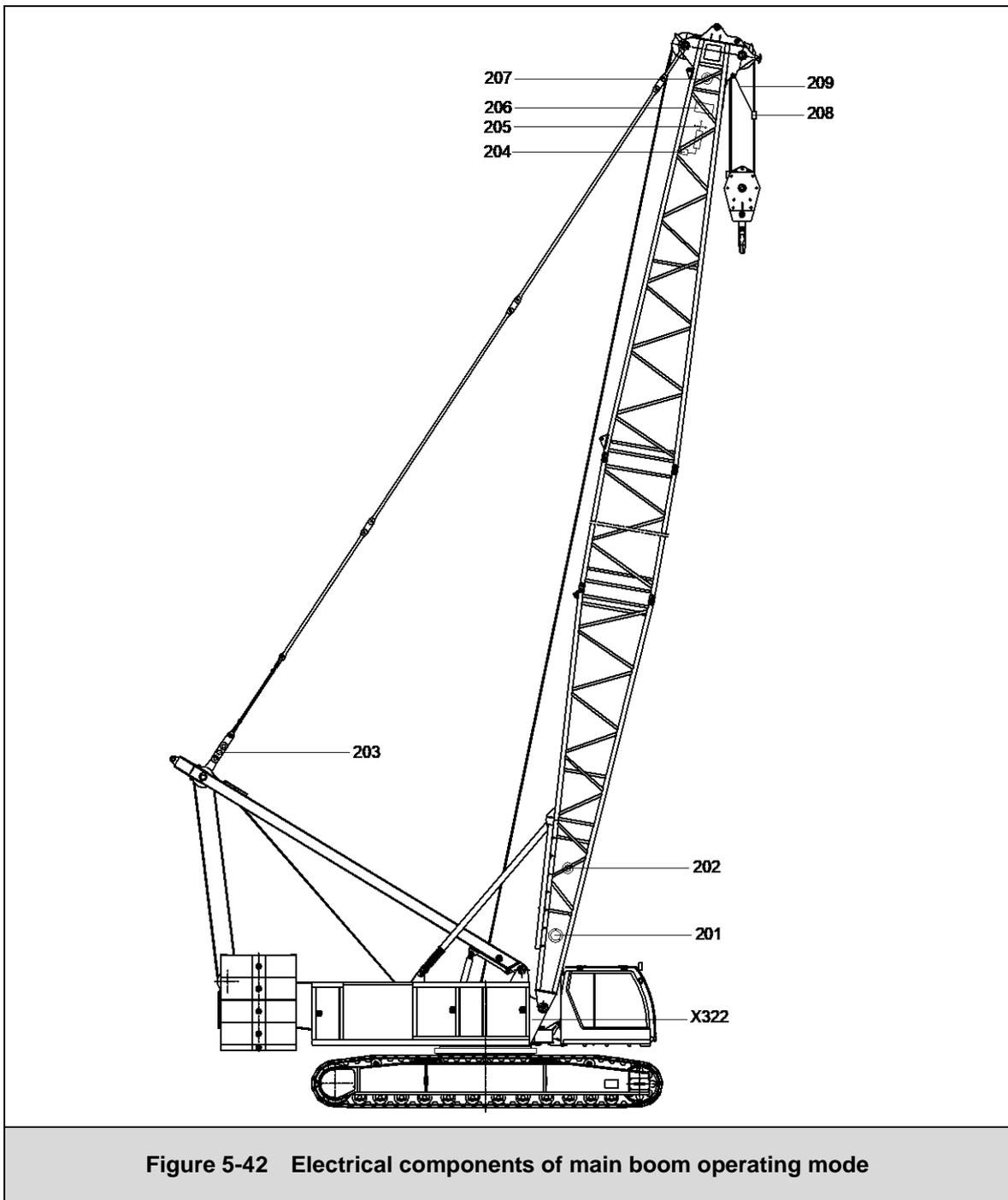


Table 5-19 Electrical components of main boom operating mode

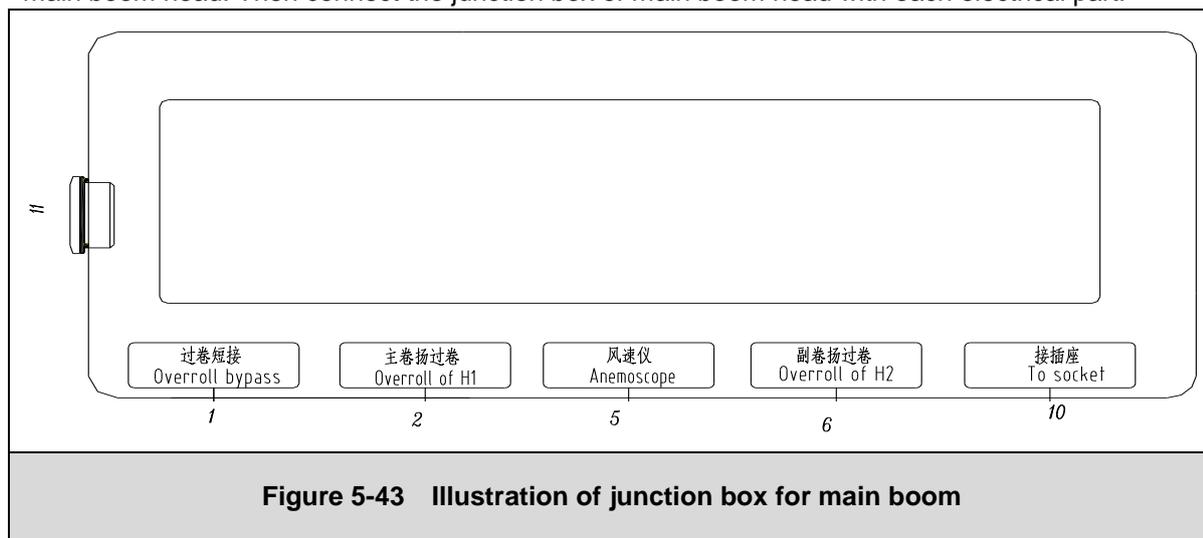
No.	Components	Position
X322	16-pin plug	Front end of the slewing table
201	Angle sensor	Main boom pivot section
202	Cable drum 1	Main boom pivot section
203	Tension sensor on main boom	Anchoring rod on A-frame head
204	Aviation warning light	Main boom head
205	anemometer	Main boom head
206	Junction box for main boom	Main boom head
207	Cable drum 2	Main boom head (with fixed jib on)
208	Hoisting limit weight	Wire rope on main boom head
209	Hoisting limit switch	On main boom head, connected with the hoisting limit weight

a) Electrical connection of main boom pivot section

Connect the plug of X15 with the socket X 15 in the front of the slewing table.

b) Electrical connection of main boom head

Pull out the plug of cable drum 2 and connect with the inlet socket (No.9) of junction box on main boom head. Then connect the junction box of main boom head with each electrical part.



c) Description on junction box for main boom

Main boom junction box is fixed on main boom head. There are altogether 10 inlet/outlet ports:

Left: "11", reserved;

Bottom:

- 1) "1": Over-hoisting bypass. The switch of H1 or H2 is connected here when there is

only one hook used.

- 2) "2": Over-hoisting of H1. The switch of H1 on main boom head is connected here.
- 3) "5": Anemometer. Anemometer on main boom head is connected here.
- 4) "6": Over-hoisting of H2. The switch of H2 on main boom head is connected here.
- 5) "10": Main boom cable drum 2 is connected here.
- 6) Others are reserved.

Connect the plug for over-hoisting of H1 with the socket of "Over-hoisting of H1" on the junction box on main boom head.

Connect the plug for over-hoisting of H3 (optional) with the socket of "Over-hoisting of H2" on the junction box on main boom head.

Connect the plug of the anemometer on main boom with the socket of "Anemometer" on the junction box on main boom head.



Plugs that are not used must be protected with sealed caps.

- d) Electrical connection of load moment limiter

Refer to the *Installation Guide & User's Manual* for Load Moment Limiter.

5.9.3.2 Checks before boom erecting

- a) Warning light

Check to see if the warning light is on. Shield the solar panel of the warning light to see if the light flashes. The light functions normally if it flashes.

- b) Anemometer

Rotate the vanes of the anemometer to check whether the wind velocity shown on the display in the operator's cab is normal.

- c) Hoisting limit switch for H1

Check to see if the "over-hoisting bypass" circuit (for H1) is well connected first. Then support and hold the hoisting limit switch weight for H1 to ensure that the switch is triggered, and then check that the Icon "upper limit switch on H1" on the screen will flash and the buzzer will sound.

- d) Hoisting limit switch for H2 (when tip boom is used)

Check to see if the "over-hoisting bypass" circuit (for H2) is well connected first. Then support and hold the hoisting limit switch weight for H2 to ensure that the switch is triggered, and then check that the Icon "upper limit switch on H2" on the screen will flash and the buzzer will sound.

If both H1 and H2 are equipped with a hook, support and hold the hoisting limit switch weight for H1 or H2 to ensure that the switch is triggered, and then check that the Icon "upper limit switch on H2" on the screen will flash.

 CAUTION

If the tip boom is not used, circuit on “6” must be connected with circuit on “1”.

5.9.4 Boom erecting

5.9.4.1 Requirements

- a) Make sure that the ground has sufficient bearing capacity. The ground must be level and firmly compacted.
- b) Make sure that counterweight plates are well assembled and the crane is horizontally placed.
- c) Select appropriate boom combination according to the load to be lifted and lifting capacity charts and make sure that boom sections are securely assembled. Check the A-frame, anchoring rods and intermediate sections one by one.
- d) All limit switches have been correctly fitted and are fully operational.
- e) Make sure that all pins, retaining clips and safety pins are securely connected.
- f) Rope must be reeved according to the requirement and secured with rope-guarding rod or safety pin to avoid slipping off.
- g) Confirm the safe distance between the working site and buildings around. No standing in the dangerous zone.
- h) No loose part on the boom.
- i) Main boom and associated components (limit switches, rope drums, warning lamp, anemometer etc.) must be kept free of ice and snow in winter.
- j) The well-assembled boom must be hoisted from the horizontal plane right in front of the chassis frame.

 DANGER

Incorrectly fitted or mal-functional limit switches and falling parts (pins, retaining clip, etc.) can cause injury.

5.9.4.2 Boom erecting

Choose “main boom operating mode” on the display of load moment limiter.

- a) Reel in the rope of the derricking winch by moving the right joystick leftward and main boom anchoring rods will be tensioned gradually. In order to avoid the moving of the load hook with the boom head during boom erecting, reel off the primary hoisting rope during boom erecting. Return the joystick back to the neutral position when the main boom angle reaches 30°.
- b) Continue to operate the joystick. When the main boom is raised to the required working position, return the joystick back to the neutral position. The main boom is completely erected.

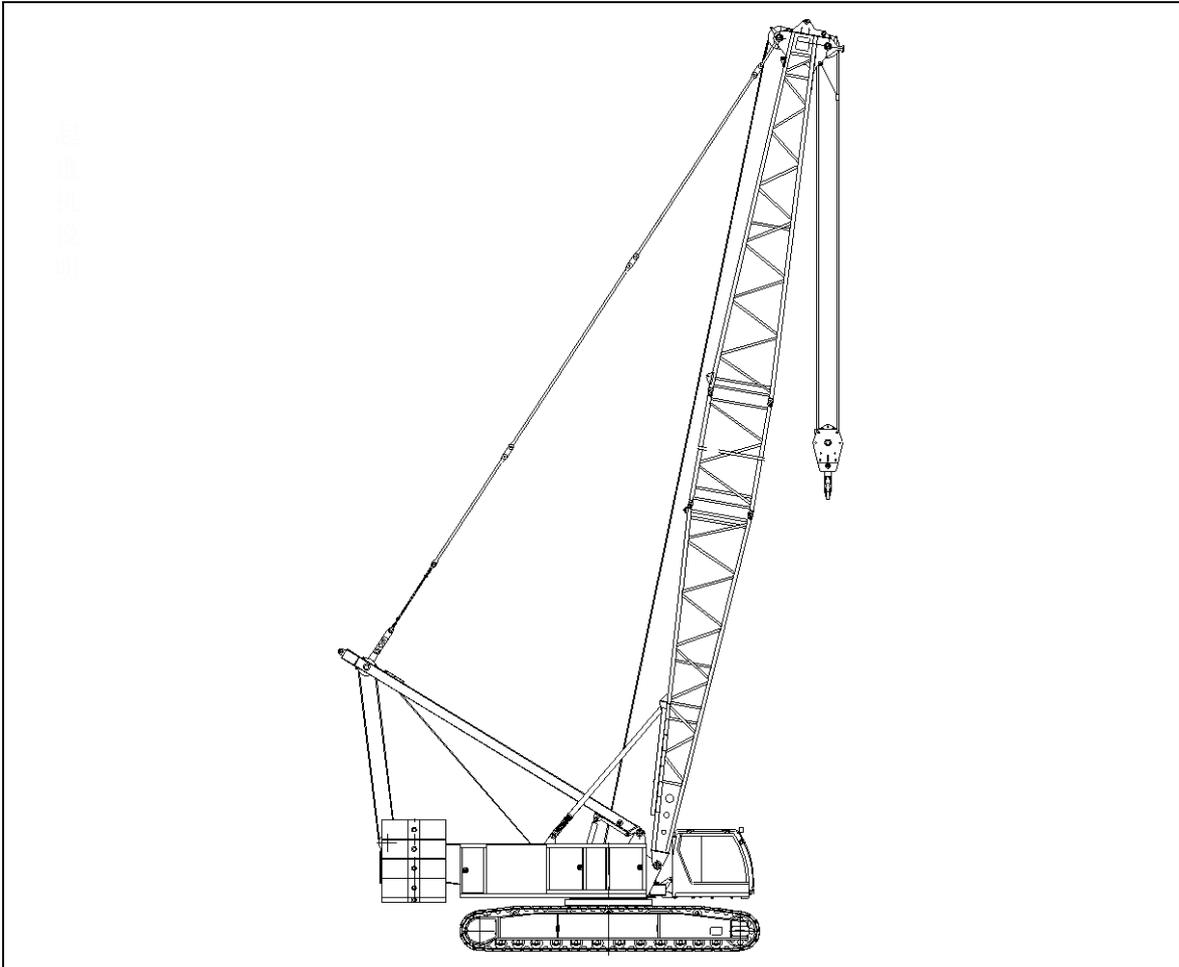


Figure 5-44 Illustration of main boom erecting

! DANGER

1. Main boom angle varies between 0° and 84° . When main boom is raised to 82° , the crane sends out a warning. The main boom can be still erected. When the main boom is raised to 83° , the erecting of main boom will be cut off automatically and a warning signal will be sent out. Press the “derricking bypass” switch to continue to erect the main boom. When the main boom is raised to 84° , the erecting of main boom will be cut off automatically and a warning signal will be sent out. And the “derricking bypass” switch is invalid.

2. It is prohibited to erect the boom with a load on. The total weight of the load should be borne by the ground in the whole process of main boom erecting.

3. Boom erecting must be performed slowly and stably. The crane operator must observe the data shown on the display during the operation. Other workers should also pay close attention to environmental changes.

4. No standing under the boom!

5. Working radius stipulated in the lifting capacity charts must not be exceeded, even if no load is attached on the load hook! Otherwise, the crane is very likely to tilt over.



1. "Safety bypass" switch can be only operated when the joystick is in the neutral position. Otherwise the operation is invalid.

2. "Safety bypass" switch is valid after being rotated for the first time. It becomes invalid after being rotated for the second time or the engine has been stopped or worked for 30 minutes.

3. Movements will be output with lower speed after safety limits are bypassed through the "Safety bypass" switch.

4. Icon  will be presented on the display of the load moment limiter when "Safety bypass" switch is functioning.

5. "Safety bypass" switch is installed on the electrical control box on the slewing table.

6. "Safety bypass" switch can be only operated by professionals. It cannot be used as a device for normal operations.

5.9.5 Boom lowering

5.9.5.1 Boom lowering

Choose "main boom operating mode" on the display of load moment limiter.

- a) Move the joystick to reel off the derricking winch, and the main boom will be lowered gradually. When main boom is lowered to 30°, return the joystick back to the neutral position.
- b) Operate the joystick to reel off H1 until the load hook is completely lowered on the ground. Move the load hook outside the radius of the boom.
- c) Continue to operate the joystick to reel off the derricking winch until the main boom head touches the ground. Return the joystick back to the neutral position to stop the movement.



1. Adjust the rope length of H1 to avoid the collision between load hook and pulley head in the process of boom lowering.

2. No standing within the radius of the boom.

3. Boom lowering must be performed slowly and stably. The crane operator must

observe the data shown on the display during the operation. Other workers should also pay close attention to environmental changes.

5.9.5.2 Dismantling boom sections and anchoring rods

- a) After the anchoring rods are lowered down on the anchoring rod supports, remove pins on anchoring rods, and then secure them on anchoring rod supports with pins for transportation.
- b) Dismantle boom sections with the help of assembling equipment or an auxiliary crane.
- c) Lower A-frame down on the slewing table.



1. Dismantling of main boom and anchoring rods is carried out in the reverse order of assembly.

2. Warnings and safety precautions for assembly should be also followed during dismantling operation.

5.10 Assembly and dismantling of fixed jib

5.10.1 Preparations

- a) The crane is properly supported and level.
- b) Choose appropriate boom combination and relevant anchoring rods combination according to operational planning and boom configuration.
- c) Main boom is well assembled.
- d) Choose the correct load hook and rope reeving according to reeving plan.
- e) Counterweight plates have been assembled according to the requirement.
- f) An auxiliary crane and a safe working platform are available.
- g) Safety device of load moment limiter is correctly set according to lifting capacity charts.
- h) "Operating mode" is switched to "assembly mode"



1. Assembly must be carried out on a safe working platform. Otherwise there is a risk of falling down.

2. Do not stand under the boom when it is being pinned or unpinned.

3. Please be careful if all safety devices become invalid when the "operating mode" switches to "assembly mode".

5.10.2 Assembly of fixed jib

Fixed jib pivot section and FA-frame are assembled as a whole for transport.

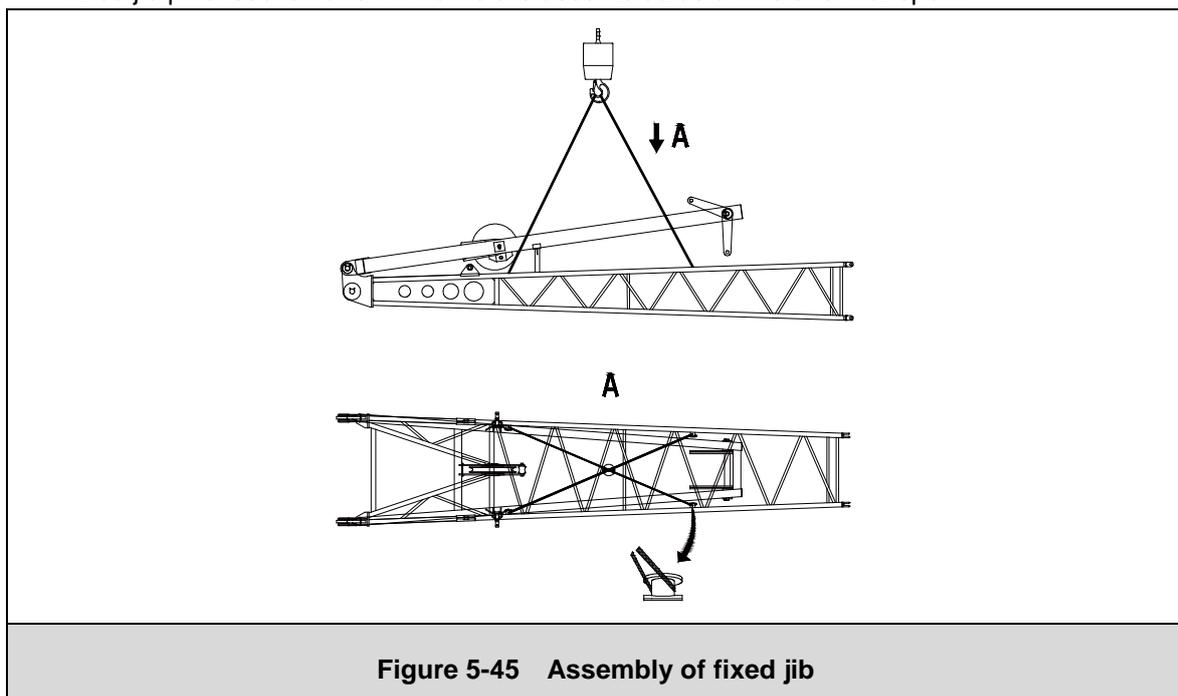


Figure 5-45 Assembly of fixed jib

- a) Connect the main boom and anchoring rods according to 5.8.1
- b) Lift the unit of fixed jib with an auxiliary crane and connect the main boom head and the luffing jib pivot section with bolt (1), washer (2), retaining plate (3) and pin (4).

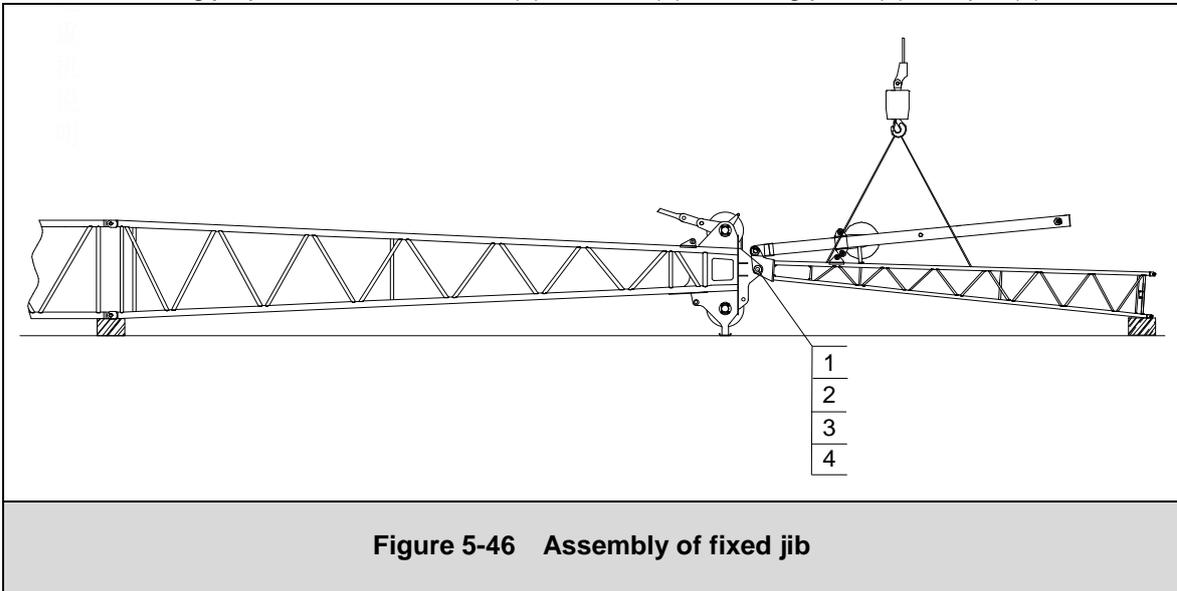
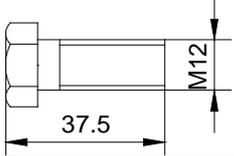
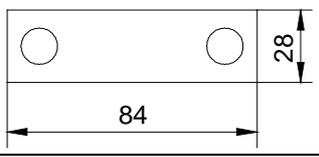
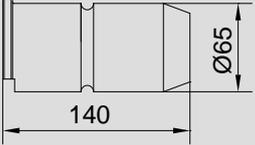


Figure 5-46 Assembly of fixed jib

Table 5-20 Components

No.	Components	Qty.	Dimensions (mm)
1	Bolt	4	
2	Spring washer	4	
3	Retaining plate	2	
4	Pin	2	

- c) Connection of fixed jib intermediate section

Connect fixed jib intermediate section of 6m of appropriate number as required. Align pin holes, insert pin (1), and secure with retaining clip (2). Boom sections of fixed jib are connected with pin (1) and retaining clip (2).

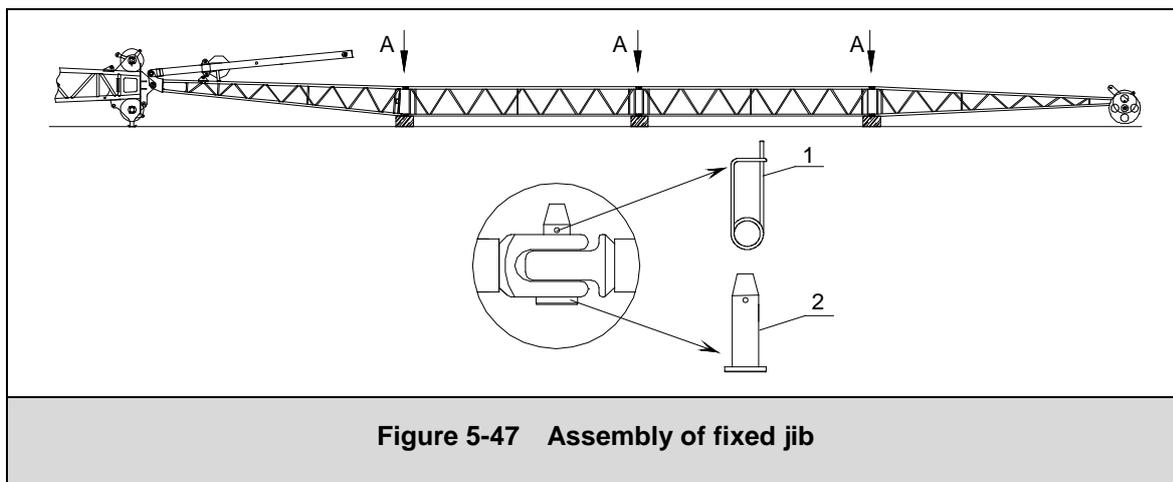
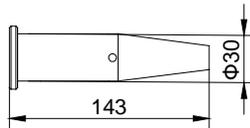
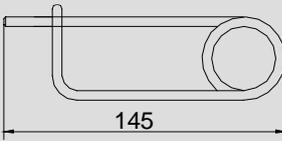


Figure 5-47 Assembly of fixed jib

Table 5-21 Components

No.	Components	Qty.	Dimensions (mm)
1	Pin	8	
2	Retaining clip	8	

d) Connect fixed jib front anchoring rods according to the fixed jib length (refer to 5.8.2.2);

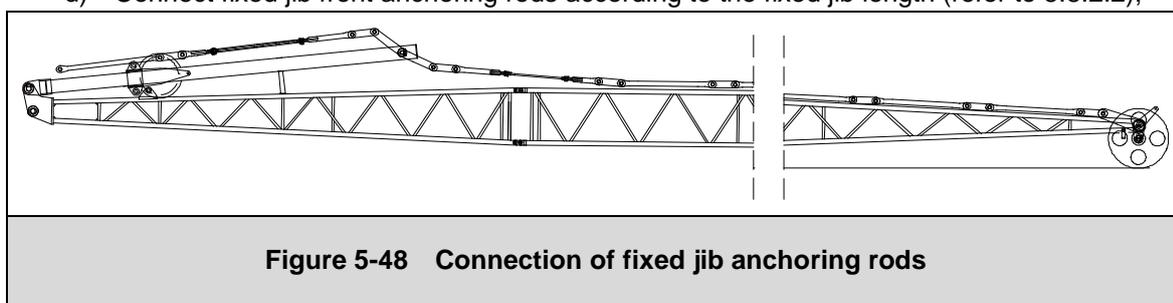


Figure 5-48 Connection of fixed jib anchoring rods

e) Assemble part of anchoring rods on FA-frame. The connection of pre-assembled anchoring rods is presented below (refer to 5.8.3.2):

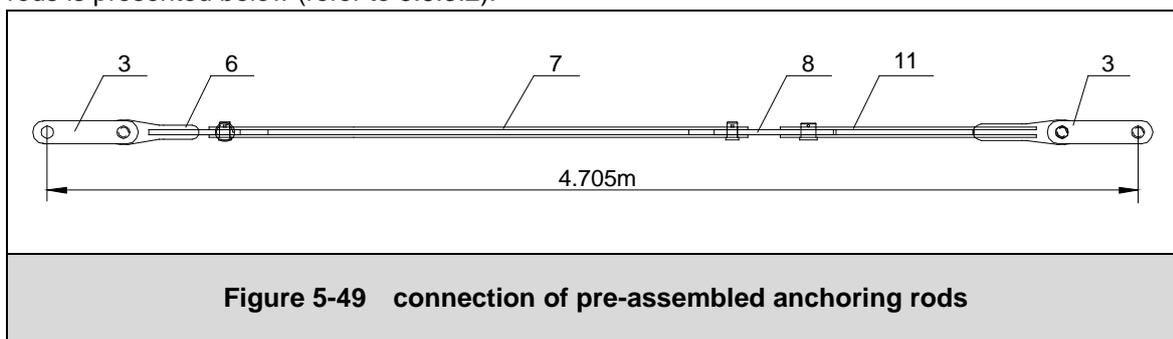


Figure 5-49 connection of pre-assembled anchoring rods

f) Reeving of hoisting rope

Reel off the rope on H2; reeve it through the guiding pulley on main boom head and then

connect it with the hoisting pulley on fixed jib head.

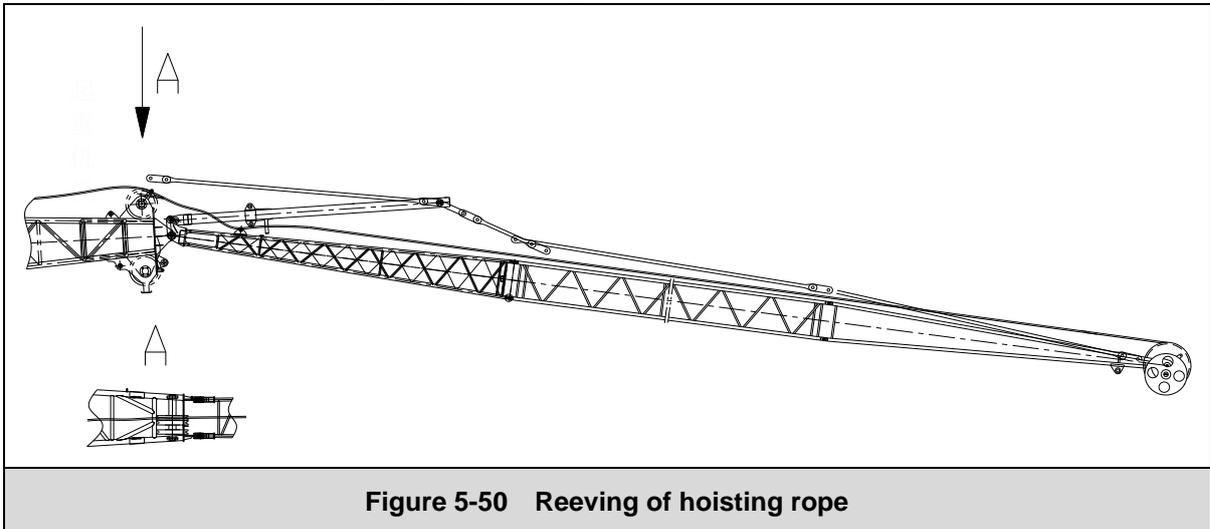


Figure 5-50 Reaving of hoisting rope

g) Connection of fixed jib rear anchoring rods

Lift the FA-frame with an auxiliary crane until the preassembled part of rear anchoring rods is vertically hanged down on the main boom head. Assemble the rest rear anchoring rods according to the operating mode selected (the included angle between the main boom and the fixed jib is 10° or 30°) (refer to 5.8.2.2.2).

h) Assembly of fixed jib tilting-back support

Connect single lugs on fixed jib tilting-back support with relevant pins, and lock them with retaining clip (2). Connect the lower pin hole on fixed jib tilting-back support with relevant pin holes on fixed jib pivot section and main boom head, and then lock them with pin (1) and retaining clip (2).

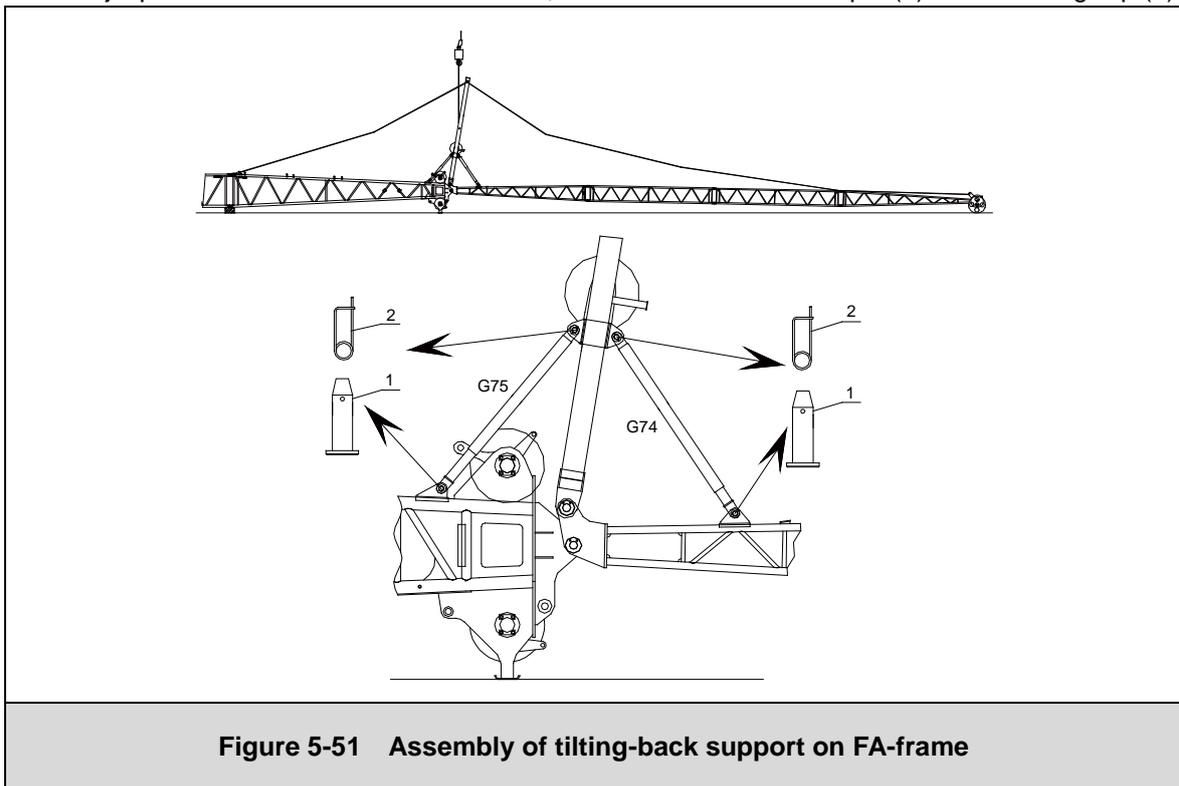


Figure 5-51 Assembly of tilting-back support on FA-frame

Table 5-22 Components

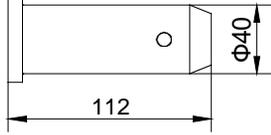
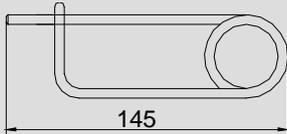
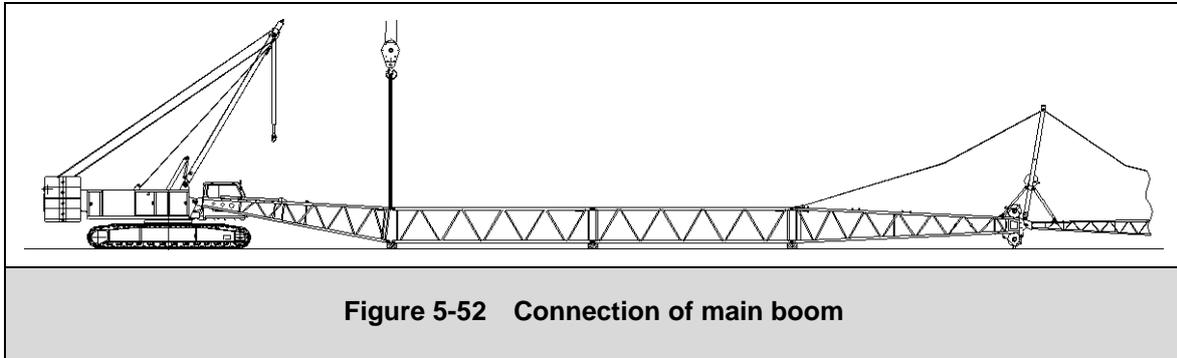
No.	Components	Qty.	Dimensions (mm)
1	Pin	8	
2	Retaining clip	8	

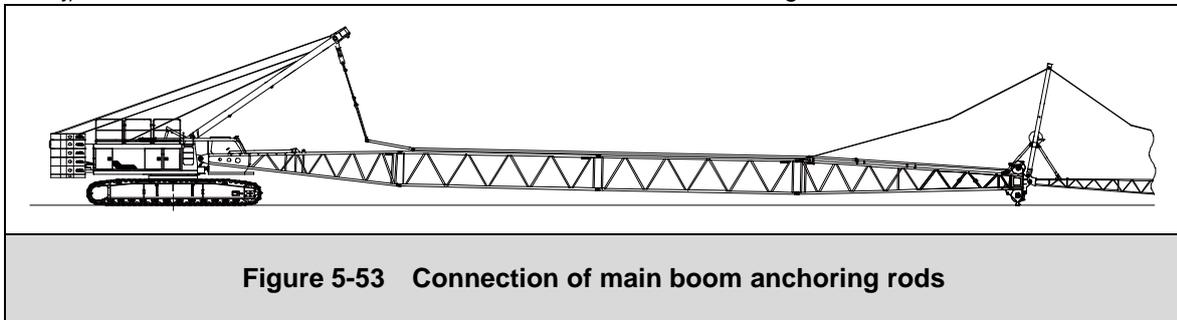
Table 5-23 Details on fixed jib tilting-back support

Tilting-back support	Effective length of outer pipe (mm)	Effective length of inner pipe (mm)	Length of spring (mm)
G74	1200	1690	199
G75	1240	1045	/

i) Drive the crane towards boom sections; connect the main boom pivot section with main boom intermediate sections and main boom head to finish the assembly of main boom.



j) Refer to 5.9.2.3 for the connection of main boom anchoring rods.



5.10.3 Electrical connection

5.10.3.1 Electrical circuit connection



Electrical connection of all components and circuits, as well as safety inspection, must be completed before the raising of fixed jib. Electrical components of the fixed jib are illustrated in the figure below:

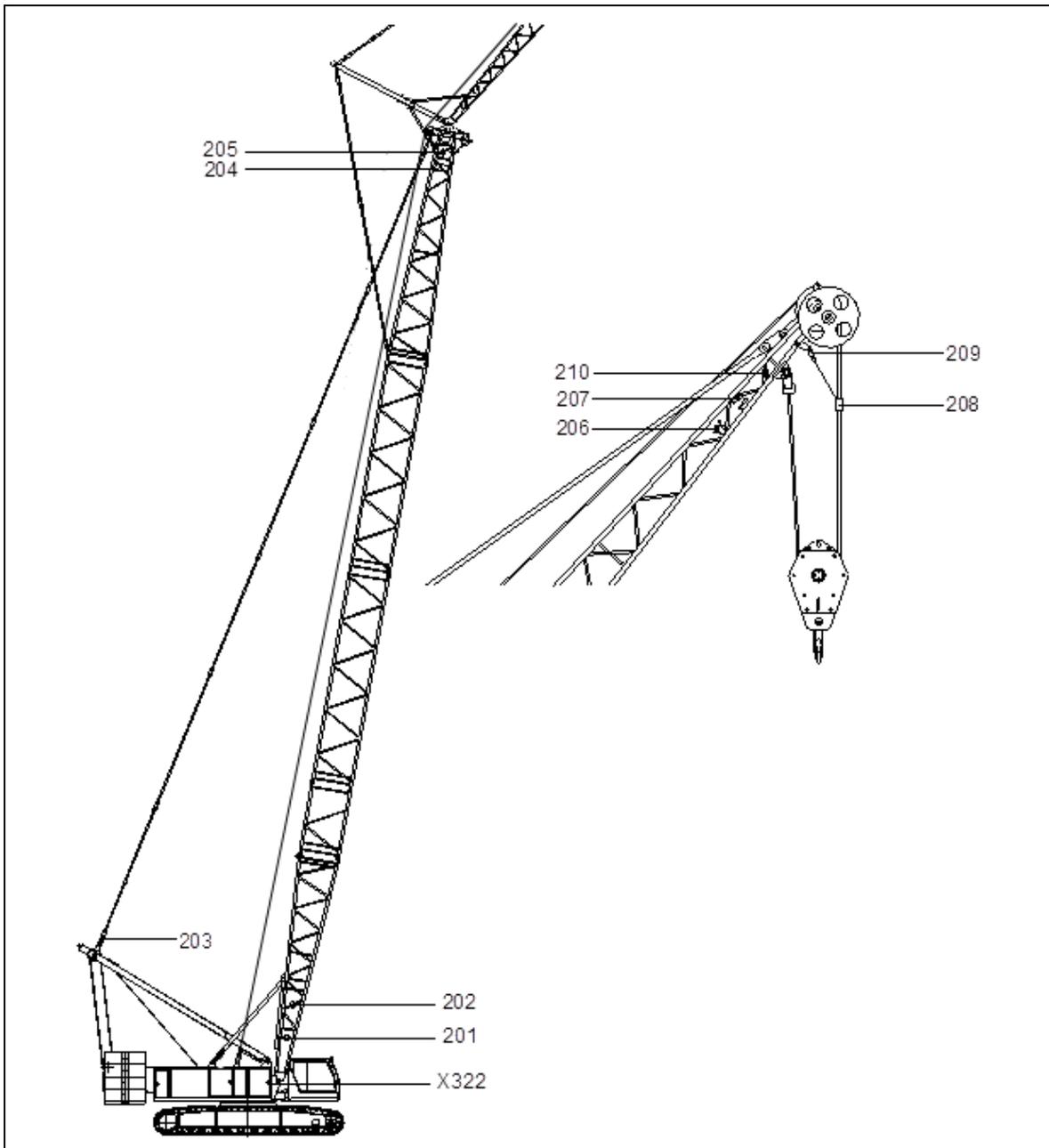


Figure 5-54 Electrical components of the fixed jib

Table 5-24 Electrical components of fixed jib operating mode

Code	Components	Position
X322	16-pin plug	Front end of the slewing table
201	Angle sensor	Main boom pivot section
202	Cable drum 1	Main boom pivot section
203	Main boom tension sensor	Anchoring rod on A-frame head
204	Junction box for main boom	Main boom head
205	Cable drum 2	Main boom head
206	Warning light on boom head	Fixed jib head
207	anemometer	Fixed jib head
208	Hoisting limit weight	Wire rope on jib head
209	Hoisting limit switch for jib	Jib head, connected with the hoisting limit weight
210	Junction box for jib	Fixed jib head

a) Electrical connection on main boom

Connect electrical components on main boom (except for anemometer, hoisting limit switch and warning light on boom head) according to the requirements of main boom electrical connection.

b) Electrical connection on fixed jib

Connect one end the plug of cable drum 3 on main boom head with the socket "9" on the junction box for main boom; pull the other end of the plug to the fixed jib head and connect it with the socket "5" on the junction box for fixed jib head.

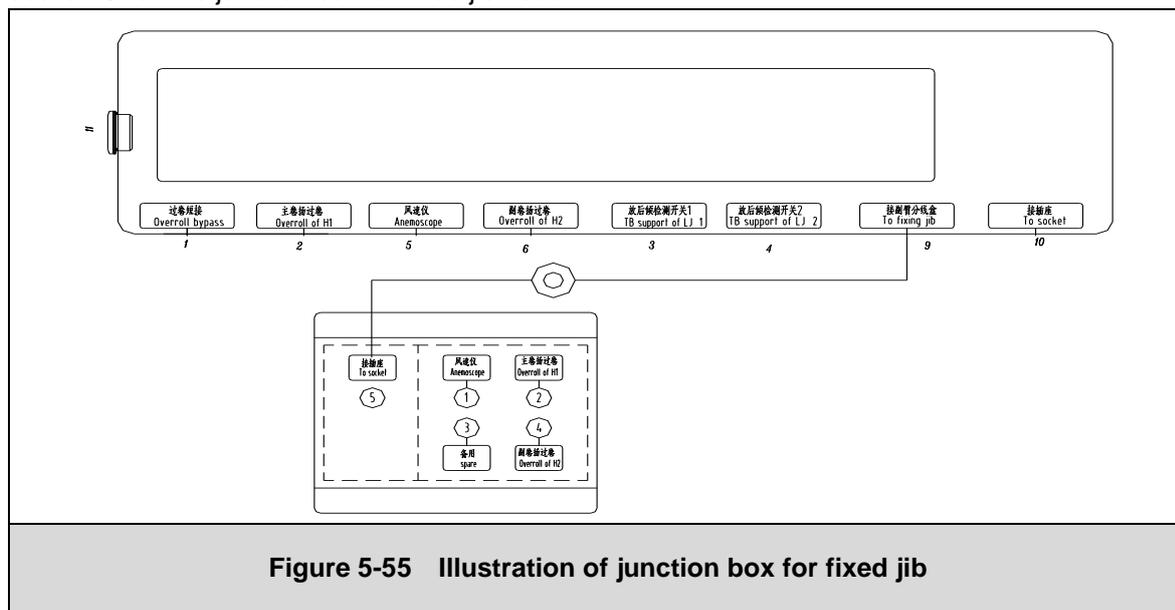


Figure 5-55 Illustration of junction box for fixed jib

c) Electrical connection of components on fixed jib head

Description on junction box for fixed jib:

Junction box for fixed jib is fitted on fixed jib head. There are altogether 5 inlet/outlet ports:

Left: "5", connect to main boom cable drum 3.

Bottom:

- 1) "1", connect to anemometer on fixed jib head.
- 2) "2", reserved.
- 3) "3", reserved.
- 4) "4", connect to hoisting limit switch for H2 on fixed jib head.

Connect the plug of the cable drum of main boom pivot section with the socket "10" of the junction box on main boom head.

Connect the plug for over-hoisting of H2 with the socket "4" of the junction box on fixed jib head.

Connect the plug of the anemometer on fixed jib with the socket "1" of the junction box on fixed jib head.



1. Plugs that are not used must be protected with sealed caps.

2. If main boom head is not fitted with a load hook, socket "2" on the main boom junction box must be connected with socket "1".

e) Electrical connection of load moment limiter

Refer to the *Installation Guide & User's Manual* for Load Moment Limiter.

5.10.3.2 Checks before boom erecting

a) Warning light

The warning light must be turned on.

b) Anemometer

Rotate the vanes of the anemometer to check whether the wind velocity shown on the display in the operator's cab is normal.

c) Hoisting limit switch for H2

Check to see if the "over-hoisting bypass" circuit (for H2) is well connected first. Then support and hold the hoisting limit switch weight for H2 to ensure that the switch is triggered, and then check that the Icon "upper limit switch on H2" on the screen will flash.

5.10.4 Erecting and lowering of fixed jib

5.10.4.1 Prerequisites

a) All electrical connections are completed.

b) Check to see if the triggering rod on the limit switch is sensitive and reliable.

- c) Check the aviation warning lamp.
- d) Check the rotation and other functions of the anemometer.
- e) Check the hoisting limit switch.
- f) Operate the hoisting winch and adjust the hoisting limit switch on the boom head manually.
Requirement: the movement of spooling up rope must be cut off automatically when it is in the limit position. The indicator light flashes and an alarm is sent out.

5.10.4.2 Requirements on the erecting of fixed jib

- a) Make sure that the ground surface has an enough bearing capacity and it must be flat, level, and compacted.
- b) Make sure that counterweights are assembled as required and the crane is horizontally placed.
- c) Choose a proper combination of boom sections according to the load to be lifted and lifting capacity charts; check A-frame, anchoring rod, front and WA-frame 2, intermediate section and other components in sequence in accordance with the table of boom section combination to see if they are well assembled.
- d) Make sure that all limit switches are correctly fitted and functional.
- e) Make sure that all pins, retaining clips and safety pins are well assembled.
- f) Reeve the wire rope as required and secure it with rope guarding rod or safety pin to avoid coming off from pulley groove.
- g) Confirm the safety distance between the operation area and surrounding buildings, and make sure that no person in dangerous zone.
- h) No loose part on the boom.
- i) In winter, main boom, jib and other components (including limit switch, cable drum, aviation warning light, anemometer, etc.) should be kept free of ice and snow.
- j) The well-assembled boom must be right in front the undercarriage at a same level when it is lifted up from the ground.



Incorrectly fitted or malfunctioning limit switches and loose parts (like pin and retaining clip) could cause serious accidents.

5.10.4.3 Erecting of fixed jib

- a) Set "fixed jib" operating mode on load moment limiter.
- b) Operate the joystick slowly to reel in the rope on the derricking winch so that the jib head is slightly higher than the load hook. Keep the load hook suspended below the jib head. Reeve the hoisting rope with a proper rope reeving plan (refer to 4.6.2.1 and 4.6.2.2) and fix the rope end.
- c) Continue to operate the joystick to reel in the rope on the derricking winch and erect the main boom. Operate the joystick for H1 simultaneously so that the load hook will not be

hoisted with the jib head. Return the two joysticks back to the neutral position when the main boom angle reaches 30°.

- d) Continue to operate the joystick for the derricking winch to reel in the derricking rope and the jib and the hook are hoisted. Return the joystick back to the neutral position when the jib is erected to the required working position.

! CAUTION

1. No slewing before the fixed jib is lifted off the ground.
2. The fixed jib must be erected slowly.

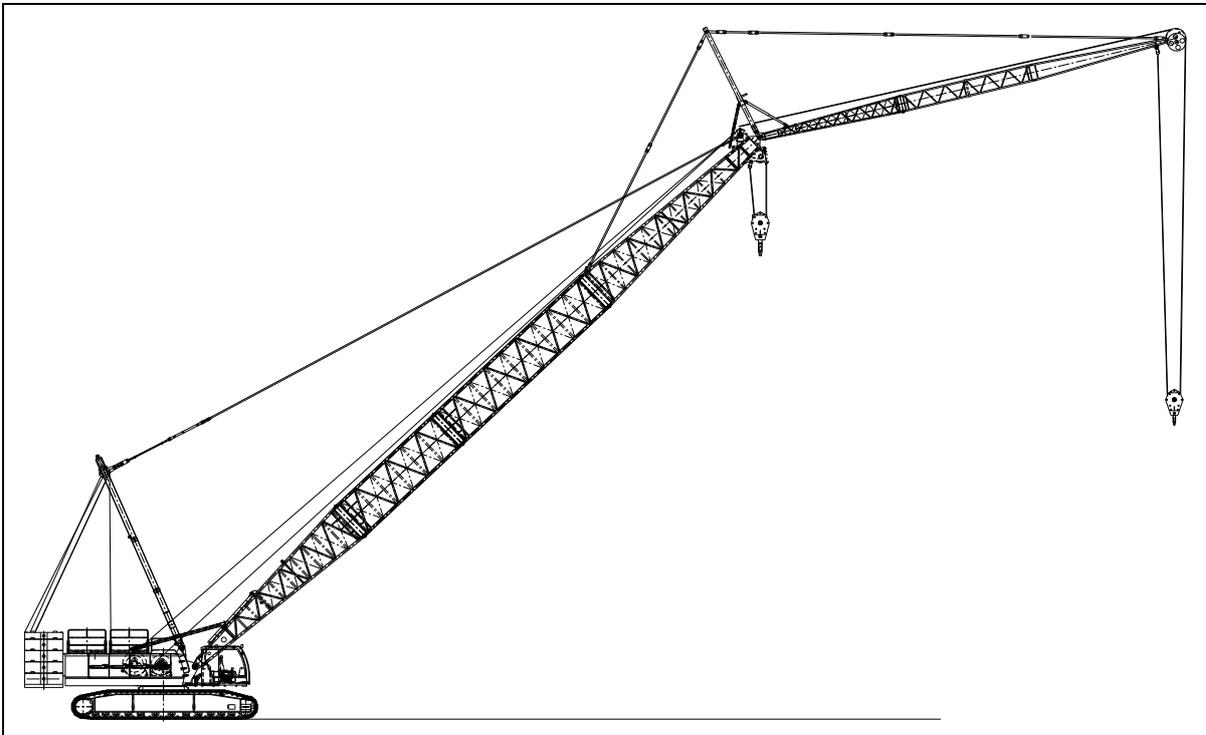


Figure 5-56 Illustration of the erecting of fixed jib

5.10.4.4 Lowering and dismantling of fixed jib

- a) Operate the joystick for the derricking winch to reel off the primary derricking rope and lower the fixed jib. Stop reeling off the rope when the main boom angle reaches 30° and return the joystick back to the neutral position.
- b) Operate the joystick for H1 and move the load hook outside the boom range when it is lowered down on the ground safely.
- c) Operate the joystick for the derricking rope to reel off the derricking rope and lower the fixed jib head onto the ground. Dismantle the positioning pin of the fixed jib tilting-back support manually.

- d) Continue to reel off the rope of the derricking winch and the fixed jib head rolls forward on the ground; stop reeling off the rope when the whole jib lies on the ground. Return the joystick back to the neutral position to stop the movement.
- e) Operate the joystick for H1 to reel in the hoisting rope and secure it on the winch.
- f) Lift the FA-frame with an auxiliary crane and dismantle the front and rear tilting-back supports. Dismantle the fixed jib front anchoring rods after the FA-frame tilts forward to a proper position.
- g) Dismantle the jib from the jib head to the pivot section successively.
- h) Disassemble components of the fixed jib pivot section as a whole from the main boom head.

 **CAUTION**

1. Load hook should not be lifted too high during the lowering of fixed jib in order to avoid collision between the load hook and the jib head pulley or the jib.

2. Operation must be carried out slowly and stably. Operator should keep an eye on real-time changes of data on the display and others should pay attention to the condition of surroundings.

3. No standing within the range of boom.

4. There must be a specially-assigned person monitoring the condition of rope spooling. No standing within the dangerous area.

5. Movements of the crane must be operated smoothly. Strictly follow all operation instructions and safety precautions to avoid accidents.

5.11 Assembly and dismantling of tip boom

- Lay the main boom head on the ground; lift the tip boom with an auxiliary crane; align the upper pin hole on tip boom with the pin hole on main boom head; insert pin (1) and secure it with retaining clip (2). Lay the tip boom on the ground and remove the auxiliary crane.
- Operate the joystick for H1 to reel off the primary hoisting rope. Pull the rope manually from the guiding pulley on main boom head to the pulley on tip boom.
- Operate the joystick for the derricking rope to reel in the primary derricking rope and lift the main boom slightly so as to align the pin hole on the bottom of the tip boom with the pin hole on main boom head. Insert pin (3) and lock it with retaining clip (2).

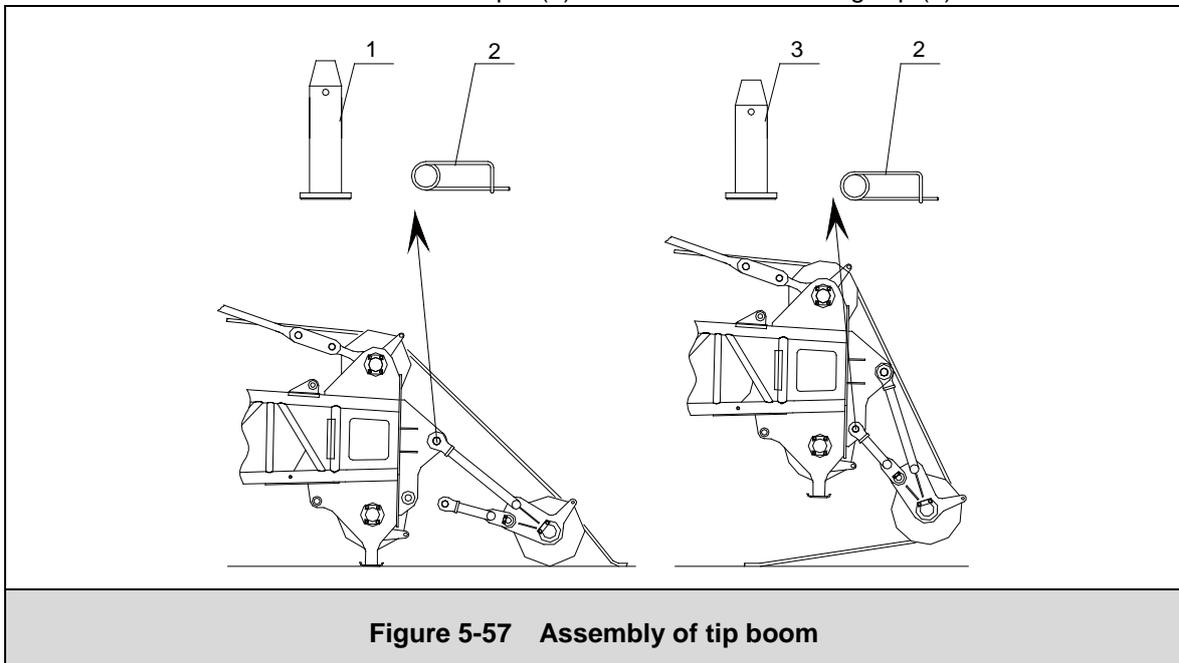
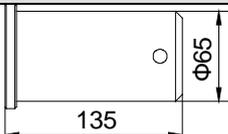
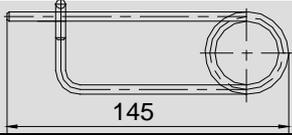
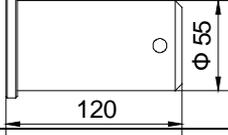


Figure 5-57 Assembly of tip boom

Table 5-25 Components

No.	Components	Qty.	Dimensions (mm)
1	Pin	2	
2	Retaining clip	4	
3	Pin	2	

! CAUTION

Tip boom can be only used for main boom operating mode and only the load hook for 12t can be used.

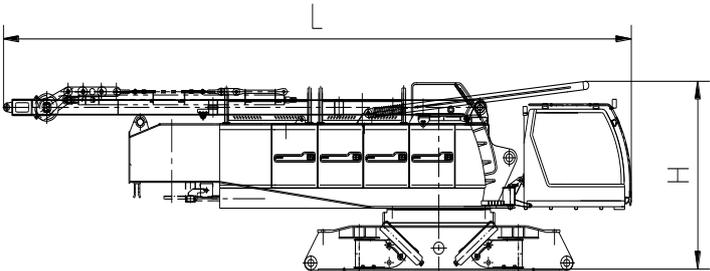
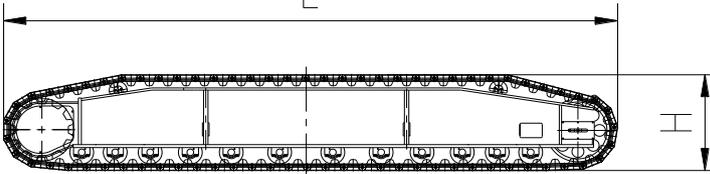
5.12 Parameters of major components in transport

The crawler crane can be disassembled into several major parts for transport. Major parts include chassis frame, slewing table, A-frame, and derricking pulley block. The slewing table and the chassis frame must be placed in the same direction and the operator's cab must be swiveled for 90°. Crawler carriers are transported as a whole part. The boom can be disassembled into boom sections. The jib can be put into the main boom and fixed with two chains for transport. Otherwise the jib may fall out.

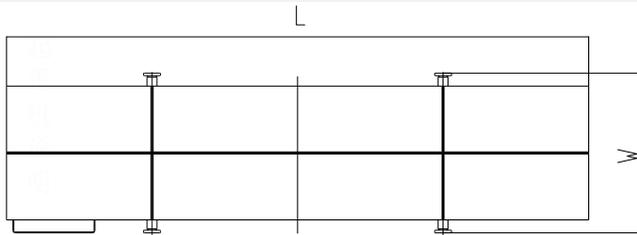
! CAUTION

1. Intermediate sections of the jib must be securely fixed. Otherwise, they may fall out and cause serious accidents.
2. Components above are illustrated in schematic diagrams
3. Weight of package is not included. There might be differences due to manufacturing error.
4. Dimensions and weights might vary because of improvements. Factory products shall prevail.

Table 5-26 Parameters of components in transport

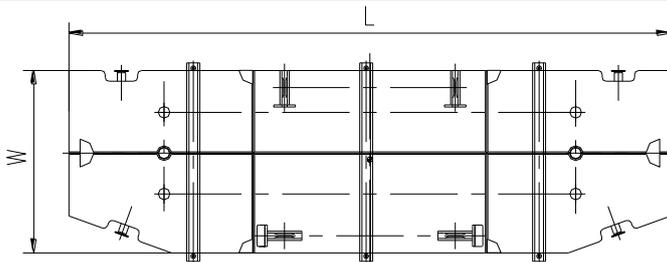
Basic machine	1 piece*
	length (L) 12460 mm
	Width (W) 3000 mm
	Height (H) 3240 mm
	Weight 35900 kg
	With A-frame and main boom tilting-back support
Crawler carrier assy.	2 pieces*
	length (L) 8260 mm
	Width (W) 1375 mm
	Height (H) 1320 mm
	Weight 15330 kg

Central ballast



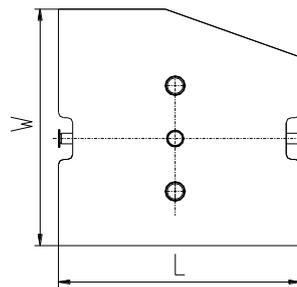
	2 pieces
length (L)	4480 mm
Width (W)	1234 mm
Height (H)	560 mm
Weight	8000 kg

Counterweight base



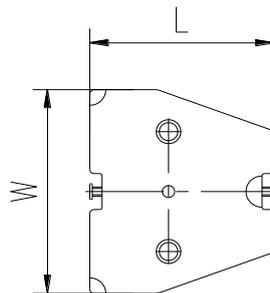
	1 piece
length (L)	5570 mm
Width (W)	1700 mm
Height (H)	558 mm
Weight	9300 kg

Counterweight plate 1



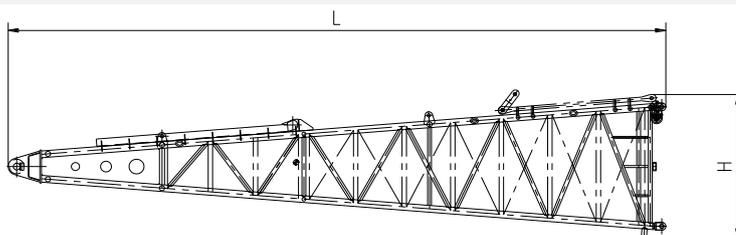
	3 pieces
length (L)	1700 mm
Width (W)	1700 mm
Height (H)	558 mm
Weight	7000 kg

Counterweight plate 2



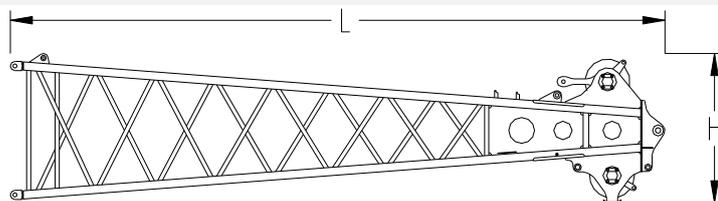
	3 pieces
Length (L)	1700 mm
Width (W)	1700 mm
Height (H)	558 mm
Weight	7000 kg

Main boom pivot section



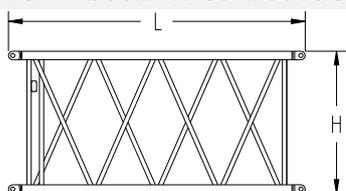
	1 piece*
Length (L)	9685 mm
Width (W)	2175 mm
Height (H)	2180 mm
Weight	1620 kg

Main boom head



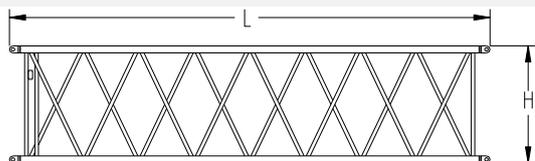
	1 piece
Length (L)	10175 mm
Width (W)	2120 mm
Height (H)	2300mm
Weight	2200 kg

Main boom intermediate section of 3m



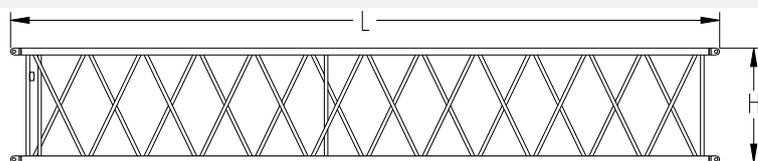
	2 pieces*
Length (L)	3120 mm
Width (W)	2120 mm
Height (H)	1920 mm
Weight	480 kg

Main boom intermediate section of 6m



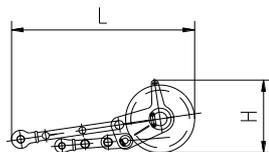
	1 piece*
Length (L)	6120 mm
Width (W)	2120 mm
Height (H)	1920 mm
Weight	830 kg

Main boom intermediate section of 9m



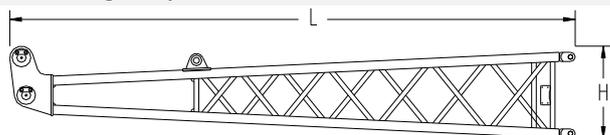
	5 pieces*
Length (L)	9120 mm
Width (W)	2120 mm
Height (H)	1920 mm
Weight	1180 kg

Tip boom



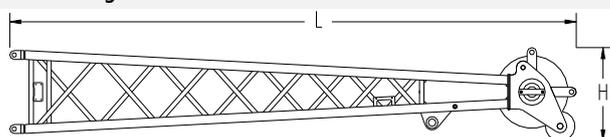
	1 piece
Length (L)	1600 mm
Width (W)	920 mm
Height (H)	650 mm
Weight	165 kg

Fixed jib pivot section



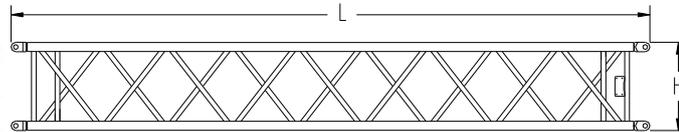
	1 piece*
Length (L)	6665 mm
Width (W)	960 mm
Height (H)	760 mm
Weight	325 kg

Fixed jib head



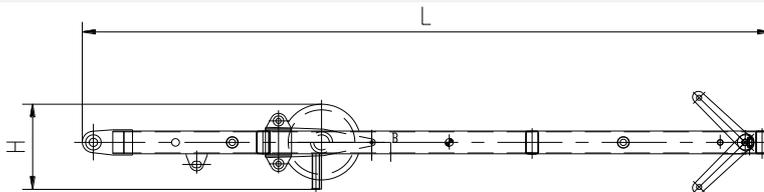
	1 piece*
Length (L)	6930 mm
Width (W)	960 mm
Height (H)	800 mm
Weight	430 kg

Fixed jib intermediate section of 6m



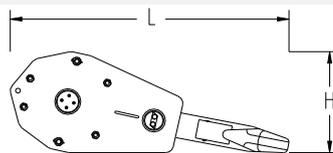
	3 pieces*
Length (L)	6060 mm
Width (W)	960 mm
Height (H)	860 mm
Weight	240 kg

FA-frame



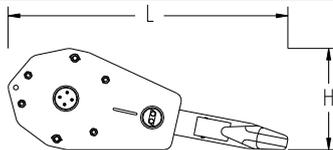
	1 piece*
Length (L)	5280 mm
Width (W)	900 mm
Height (H)	680 mm
Weight	495 kg

Load hook for 160t



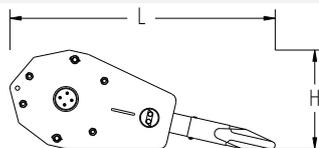
	1 piece*
Length (L)	2180 mm
Width (W)	810 mm
Height (H)	990 mm
Weight	2340 kg

Load hook for 100t



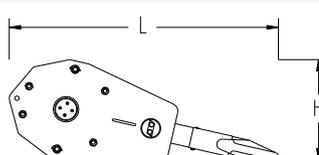
	1 piece*
Length (L)	1974 mm
Width (W)	810 mm
Height (H)	915 mm
Weight	1935 kg

Load hook for 80t



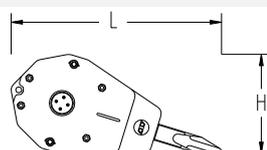
	1 piece*
Length (L)	1900 mm
Width (W)	810 mm
Height (H)	765 mm
Weight	1710 kg

Load hook for 50t



	1 piece*
Length (L)	1964 mm
Width (W)	810 mm
Height (H)	674 mm
Weight	1355 kg

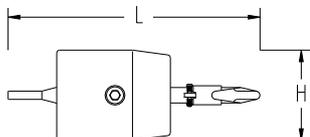
Load hook for 30t



	1 piece*
Length (L)	1630 mm
Width (W)	780 mm
Height (H)	630 mm
Weight	1090 kg

Load hook for 12.5t

1 piece*



Length (L)	970
Width (W)	390
Height (H)	390
Weight	460

5.13 Requirements on crane transportation

Transportation mode and matters needing attention:

- a) The crane can be disassembled and transported by trailer or other transportation tools in separate parts.
- b) Each part to be transported must be well secured with rope. The door and windows of operator's cab must be locked. Take necessary measures to avoid collision, rain and sliding.
- c) Separated parts must be transported in accordance with the permissible bearing capacity of transportation tool and weights and dimensions of parts to be transported. Overload transportation is strictly prohibited. Refer to Section 5.11 for weights and dimensions of separated parts
- d) Consult Zoomlion for more detailed transportation schemes. Take the following measures to take care of a crane that is not used for a long period of time (more than a half year):
 - 1) Wipe the dust and grease on the crane and keep the body clean;
 - 2) Fully retract all cylinders and piston rods;
 - 3) Remove the battery, keep it in a dry and ventilated place, and recharge it regularly;
 - 4) Grease all exposed surfaces to avoid rust;
 - 5) Clear away dust on wire rope and repaint ZG-3 calcium-based graphite grease on it;
 - 6) The crawler crane must be kept in a storeroom. The crane must be covered with a waterproof cloth if it is placed outdoors. Strengthen inspections in rainy season in order to avoid rust caused by leakage of rain. Avoid freezing in winter.
 - 7) Start the engine once a month and operate each mechanism idly so as to observe if the crane is still functional.
 - 8) There must be specially-assigned person(s) to be responsible for the good condition of the crane, which can be put into use as long as it is needed.
 - 9) Plastic tubes that are tied up must be secured on boom section.

ZOOMLION

Operator's Manual for Crawler Crane

Chapter 6 Appendix

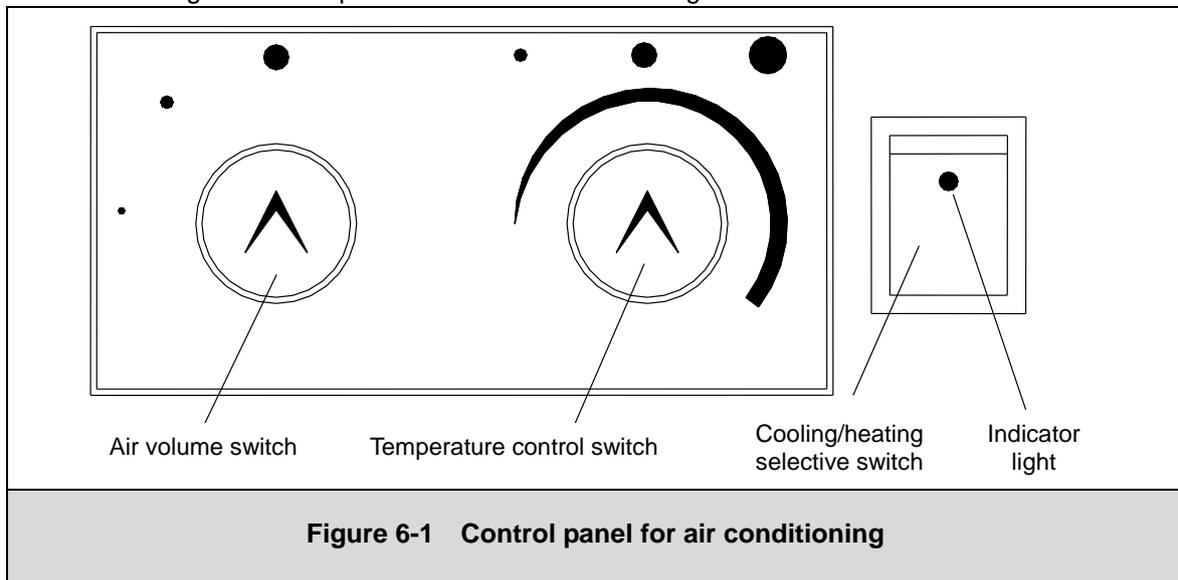


Chapter 6 Appendix

6.1 Air conditioning

6.1.1 Control panel for air conditioning

The air conditioning system mainly consists of compressor, condenser (including liquid reservoir), evaporator etc. In cooling mode, the power of air conditioning is supplied by the compressor which is driven by the engine. And the heating is achieved by utilizing the heat of engine circular water supplied by the evaporator fan. The air conditioning in the cab is a heating & cooling air conditioning. Its control panel is on the air conditioning cover behind the seats.



- a) Temperature control switch: adjust the temperature in the cab when cooling mode functions.
- b) Air volume switch: control the fan speed to obtain proper air volume.
- c) Cooling/heating selective switch:
Push the switch upwards, the heating mode is selected;
Push the switch downwards, the cooling mode is selected.
- d) Indicator light:
Push "cooling/heating selective switch" downwards, the indicator light will light up and the cooling mode is activated.

6.1.2 Methods for operating air conditioning

When the air conditioning is used for the first time, turn the air volume switch to high gear position and hold it for 5 minutes after the engine is started, and then turn the temperature control switch to "COOL" position. At this time, the temperature in the cab starts to fall down. When the required temperature is obtained, turn the temperature control switch anticlockwise slowly until the indicator light goes out and the compressor stops working. At this moment, the temperature in the cab is equal to the set value. If the temperature in the cab is higher than this value, the indicator light will light up, the compressor will start automatically and the cooling system will begin to work. If the temperature in the cab is lower than this value, the indicator light will go out, and the compressor and cooling system will stop working. Adjusting the angle of air outlet can change the direction and angle of cold wind. Adjust the air volume switch, one of three fan speeds can be set for the air conditioning, namely, high, medium and low. Do not turn the temperature control switch to "COOL" position while keeping the air volume switch in a low gear position during air conditioning working. Otherwise, the evaporator may get frosted and the cooling performance may be impaired.

CAUTION

- (1) During "three guarantee" period, it is forbidden to dismantle the air conditioning system without manufacturer's permission.
- (2) Check the tension of compressor strap periodically and adjust it in time.
- (3) Clean the surface of condenser radiating rib to avoid impairing the cooling performance.
- (4) When changing the components of air conditioning system, add freezing oil according to the requirements. As there's difference between compressors in the system, the type of new freezing oil should be the same as that of freezing oil originally used in the compressor. The freezing oil of different type, which is not given explanation of being capable of mixing with the freezing oil in the system, is never permitted to fill into the system.
- (5) The type of newly-added refrigerant should be the same as that of refrigerant originally used in the system.
- (6) Lower the temperature in the cab with the evaporator at high gear position, and keep the temperature in the cab at middle gear position or low gear position.
- (7) When the components in the system break down, they should be replaced with spare parts supplied or designated by manufacturer. Otherwise, the system may be damaged.

- (8) Under the condition of low temperature and high humidity, the evaporator should not work at low speed. Otherwise, it may be frozen.
- (9) If air conditioning is not used in winter, switch air conditioning on once a month and run it for about 10 minutes. This minimum running is required to keep the whole system adequately lubricated and prevent the refrigerant from leaking.

6.1.3 Regular maintenance of air conditioning system

Table 6-1 Regular maintenance of air conditioning system

Component	Maintenance content	Maintenance interval
Condensing fan motor	Check and repair	Quarterly
Evaporating fan motor	Check and repair	Quarterly
Condenser	Check condenser for blockage. If necessary, clean it.	Monthly or shorten the maintenance interval depending on actual working condition
Evaporator	Check evaporator for functional work and abnormal sound. Clean the air inlet.	Quarterly or shorten the maintenance interval depending on actual working condition
Electromagnetic clutch	Check whether it works properly. If necessary, clean it.	Quarterly
Connector	Check whether the wire connector is fitted tightly.	Monthly