



XR280D Rotary Drilling Rig Operation Instruction



XCMG Foundation Construction Machinery Co.,Ltd.



Introduction

Dear users:

Thank you for purchasing our XR280D rotary drilling rig.

This User's Guide is to provide you the relevant information and instructions concerning XR280D rotary drilling rig manufactured by XCMG.

This User's Guide covers the following items: introduction, general, safety instructions, technical specifications, manipulative control and display, operation, electrical system, hydraulic system, startup and shutdown, installation and disassembly, transportation, maintenance, lubrication, using the kelly bar, and some precautions.

Please fully read this User's Guide before starting construction.

For your smooth construction, every driver of the drilling rig shall fully read this User's Guide before operation, as the specific operational approaches may differ depending on different specifications and manufacturers. Despite the products manufactured by the same manufacturer, many modifications may be made to the structure of their components and control mode as time goes by and technology progresses. Therefore, each operator, even an experienced operator in construction and operation, shall carefully read this User's Guide before operating this drilling rig (whether it is new or used) which he has never operated before.

We shall assume no responsibility for the damages and safety accidents arising out of:

- unauthorized refitment to the machine;
- operation under a mode unsuitable to normal application;
- beyond the specified range of application.

We shall not pay any compensation for the damages arising out of:

- incorrect operation;
- non-scheduled or insufficient maintenance;
- using fuels and lubricating oils not recommended by XCMG.

The content, drawings and other details are subject to change depending on continuous design modifications of the machine and different demands of customers, which may affect the correct maintenance and repair to the drilling rig. The customers, especially the new ones, shall acquire the most updated and complete data before operating the machine. Please contact the manufacturer or the specified distributors for the latest information and your questions concerning this machine to get the most updated content.

Attention! Place and keep this User's Guide closely with the drilling rig to ensure it is accessible to the operator or other relevant personnel for their reading.



Contents

Introduction.....	I
Contents	II
Use of this User's Guide.....	V
Applications of the Product.....	VI
1. General	1-1
1.1 Application Range of the Machine.....	1-1
1.2 Names of the Main Components.....	1-2
1.3 Structural Features.....	1-3
2. Safety Instructions.....	2-1
2.1 Safety of the Machine	2-1
2.2 Main Dangers.....	2-2
2.3 Safety Inspection Before Startup.....	2-2
2.4 Precautions in Cold Regions	2-3
2.5 Safety Devices	2-3
2.6 Stability of the Machine	2-6
2.7 Permissible Wind Velocity	2-8
2.8 Working Area	2-9
2.9 Dangerous Area in Transferring and Borehole Drilling.....	2-10
2.10 Safety Signs and Descriptions	2-11
2.11 Operation Vision.....	2-13
2.12 Nameplate.....	2-13
3 Technical Specifications.....	3-1
3.1 Major Dimension of the Equipment	3-1
3.2 Major Parameters of the Equipment.....	3-2
3.3 Drilling State Parameter	3-3
3.4 Dimensions of Steel Wire Rope	3-3
4 Operation Control and Display	4-1
4.1 Operation Diagram.....	4-1
4.2 Layout Plan of the Cab.....	4-2
4.3 Pedal.....	4-3
4.4 Control Panel	4-4
4.5 Left Operation Box	4-5
4.6 Right Operation Box.....	4-6
4.7 Electrical Control and Diagnosis	4-7
5 Operation	5-1
5.1 Traveling	5-2
5.2 Derricking Mechanism.....	5-5
5.3 Slewing Platform	5-5
5.4 Mast	5-5
5.5 Main Winch	5-6
5.6 Rotary Drive	5-7
5.7 Pull-down cylinder	5-8
5.8 Elevating / Lowering the Auxiliary Winch	5-8
5.9 Drilling Tool	5-9
5.10 Transferring borehole site'.....	5-10
6 Display Operation.....	6-1
6.1 Home Page	6-1
7 Startup and Shutdown.....	7-1
7.1 Startup	7-1
7.2 Shutdown	7-2
8. Installation and Removal.....	8-1

8.1	Installation	8-1
8.2	Removal	8-8
8.3	Retracting the Caterpillar	8-10
8.4	Retracting the Outrigger (Optional)	8-11
9.	Transport.....	9-1
9.1	Transport size and Weight	9-1
9.2	Loading Diagram	9-2
9.3	Notes of Lifting, Loading and Transportation	9-2
9.4	Disassembled Transport	9-3
10.	Maintenance	10-1
10.1	Safety Measures	10-1
10.2	Repair and Maintenance Intervals.....	10-2
10.3	Repair and Maintenance Schedule	10-3
10.4	Use and Storage of Hydraulic Hose	10-5
10.5	Maintaining the Steel Wire Rope	10-6
10.6	Slewing Tie-in (elevator) of Steel Wire Rope	10-6
10.7	Maintaining the Rotary Drive	10-7
10.8	Maintaining the Hydraulic Cylinder.....	10-10
10.9	Hydraulic oil products.....	10-12
10.10	Pressure Test Port of Hydraulic System	10-12
10.11	Maintaining the Winch Reducer	10-14
10.12	Maintenance during the Shutdown.....	10-14
10.13	Tools List for Repair and Maintenance.....	10-15
10.14	List of Wearing Parts and Spare Parts	10-17
11.	Lubrication of Rotary Drilling Rig.....	11-1
11.1	Lubrication Diagram	11-1
11.2	Treatment of Waste Oil, Filter Core and Additive	11-1
11.3	Recommended Lubricating Oils (Greases) and Antifreezes	11-2
11.5	Lubricating Parts and Maintenance Period of Rotary Drilling Rig.....	11-5
11.6	Use and maintenance of centralized lubrication system	11-6
12.	Vibration and Noise:.....	12-1
13	Hydraulic System	13-1
13.1	Hydraulic Schematic Diagram	13-1
14	Electrical System.....	14-1
14.1	Electrical Schematic Diagram	14-1
	Conclusion.....	1

Appendix 1: Users' Guide for Steel Wire Rope

Appendix 2: Users' Guide for Kelly Bar and Drilling Tool

Use of this User's Guide

Quickly find the information you need!

This User's Guide is divided into 15 chapters

- 1 General
- 2 Safety instructions
- 3 Technical specifications
- 4 Manipulative control and display
- 5 Operation
- 6 Display operation
- 7 Startup and shutdown
- 8 Installation and disassembly
- 9 Transportation
- 10 Maintenance and repair
- 11 Lubrication and maintenance of the drilling rig
- 12 Vibration and noise of the complete machine
- 13 Hydraulic system
- 14 Electrical system
- 15 Conclusion

Each chapter is subdivided into several sections with page numbers arranged continuously and starting from "1". In the center bottom of each page shows the sequence of the specific content in the chapter for an easy reference.

For example:

Serial umber of the section	Title of the content described	Page number of the content in the chapter
2.	Safety Instructions	2-1
2.1	Safety of the Machine	2-1
2.2	Main Dangers	2-1
2.3	Safety Inspection Before Startup	2-2
2.4	Precautions in Cold Regions	2-3



Applications of the Product

Main applications and range of application

XR280D rotary drilling rig, a construction machine applicable to the concrete filling pile and boreholes in foundation engineering, may be widely used in the foundation construction for ports, railroad bridges and high-rise buildings.

Operating environment

XR280D rotary drilling rig is applicable in the working environment below 1000 m ASL and with a temperature range of $-15^{\circ}\text{C} \sim +40^{\circ}\text{C}$ and a wind velocity ≤ 20 m/s. It can not be used in combustible and inflammable, toxic, underground or dark (less than 100 lx) places, or the place with high wind velocity.

Operating conditions

Flat and solid ground with a gradient $\leq 2^{\circ}$

Precautions

- Operate the machine as per the "User's Guide".
- Don't use it for other purposes.
- Don't use its winches for other lifting rather than drilling.
- Perform the safety regulations formulated for the personnel during the assembling of the drilling rig.
- Don't allow untrained or unauthorized personnel to operate the drilling rig.
- Wear suitable clothing and don't wear rings, watch, necklace or non-fastened clothes to avoid any scratch.
- Keep the floor, pedal plate, handset and activity space in the driver's cab clean. Check the oil line, lubricating oil for dust and dirt to avoid the risks of cracking and winding.
- Don't jump up and down from the driver's cab. At least, two hands and one foot or two feet and one hand should contact the handset tightly.
- Don't hold the control lever or the rubber tube as handles as they are not fixed support. So, don't pull them to avoid incorrect operation.
- Operate and control the machine always in the driver's cab.
- Always place an emergency kit in the driver's cab.
- During operation, line out an operating area separated with fencing and arranged with a warning board.
- Operate and maintain the machine in an ambient temperature range of $-15^{\circ}\text{C} \sim 40^{\circ}\text{C}$. Moreover, the relative humidity should be less than 50% when the temperature is 40°C , and the temperature should be less than 20°C when the relative humidity is 90%. You should store the machine at a temperature from -25°C to 55°C and the highest temperature may rise to $+70^{\circ}\text{C}$ at a short period in 24 hours.
- When two operators operate and maintain the machine, both of them should be trained, and one operator should be at the master operating position to monitor the safety and operation of the other.



- Never operate and repair the machine alone unless it is shut down completely.
- The monitoring operator shall be able to touch the emergency stop switch in any circumstance.
- There should be sufficient illumination at the operating position of the driver on site.
- Sound and reliable communications should be built between the driver and monitoring operator on site.
- Check the emergency stop switch before using the machine.
- Warning: The tail gas of the engine is poisonous! Don't allow it to enter into the operating area to create a danger when the machine is used in a confined space.
- For stable operation, extend the crawler gauge to its maximum before startup. Don't operate until the crawlers are extended.
- Don't perform normal construction when the engine speed is less than 1500r/min to avoid carbon deposit, the blocking of orifice and piston ring of the fuel injector, valve sticking and other failures.
- The normal derricking range of XR280D rotary drilling rig is 4410-4950mm. If the derricking condition is limited, namely, the drill rod center is beyond the maximum derricking range, no construction is allowed.

General

1. General

1.1 Application Range of the Machine

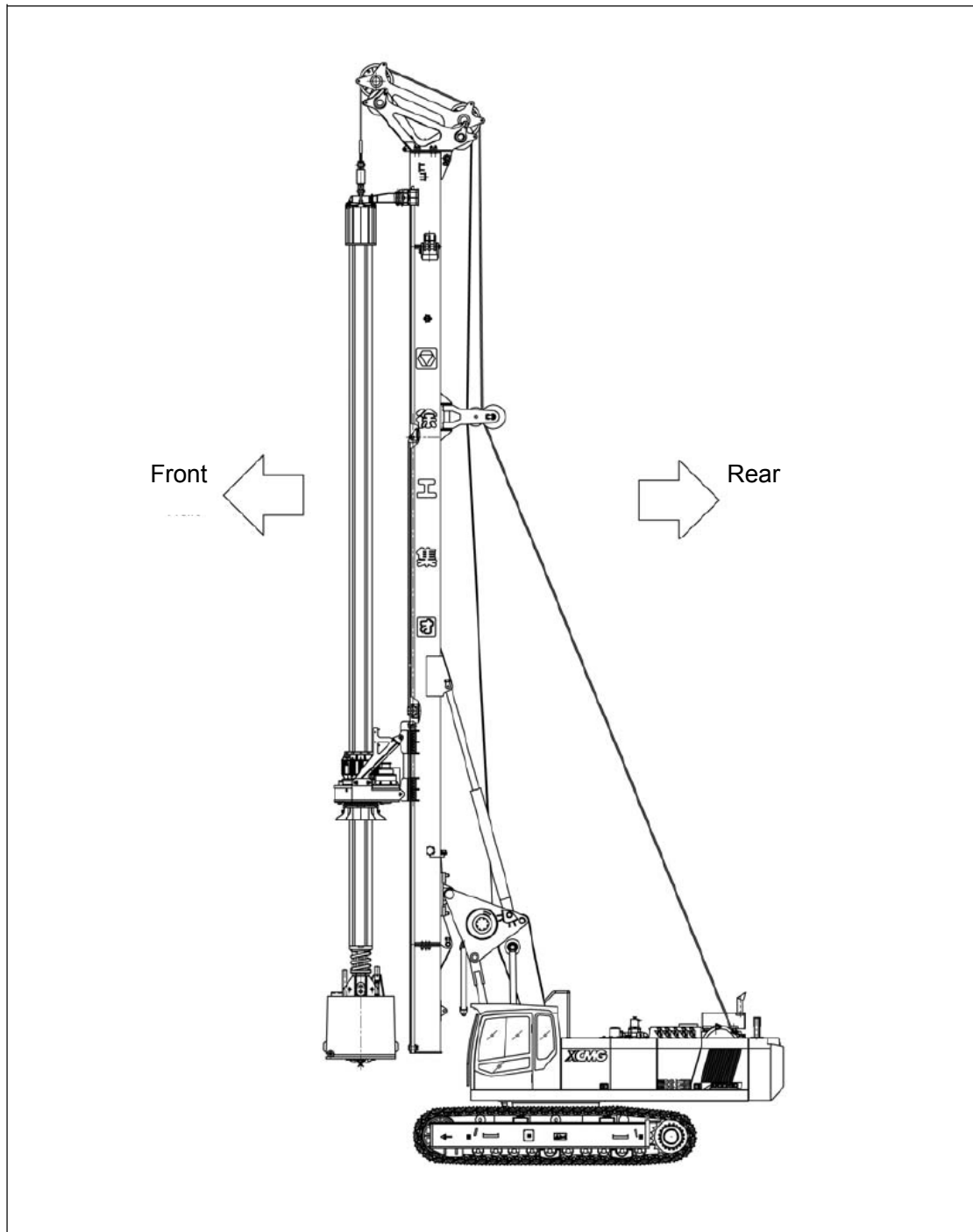


Figure 1-1 XR280D Rotary Drilling Rig

- Standard telescopic 6-section friction kelly bar: the maximum hole depth of 88 m and the maximum diameter of 2.5m.
- Optional telescopic 4-section interlocking kelly bar drilling: the maximum hole depth of 58 m and the maximum diameter of 2.5m.

Try to avoid operating the machine under a working condition that requires the maximum hole depth and the maximum diameter simultaneously.

General

1.2 Names of the Main Components

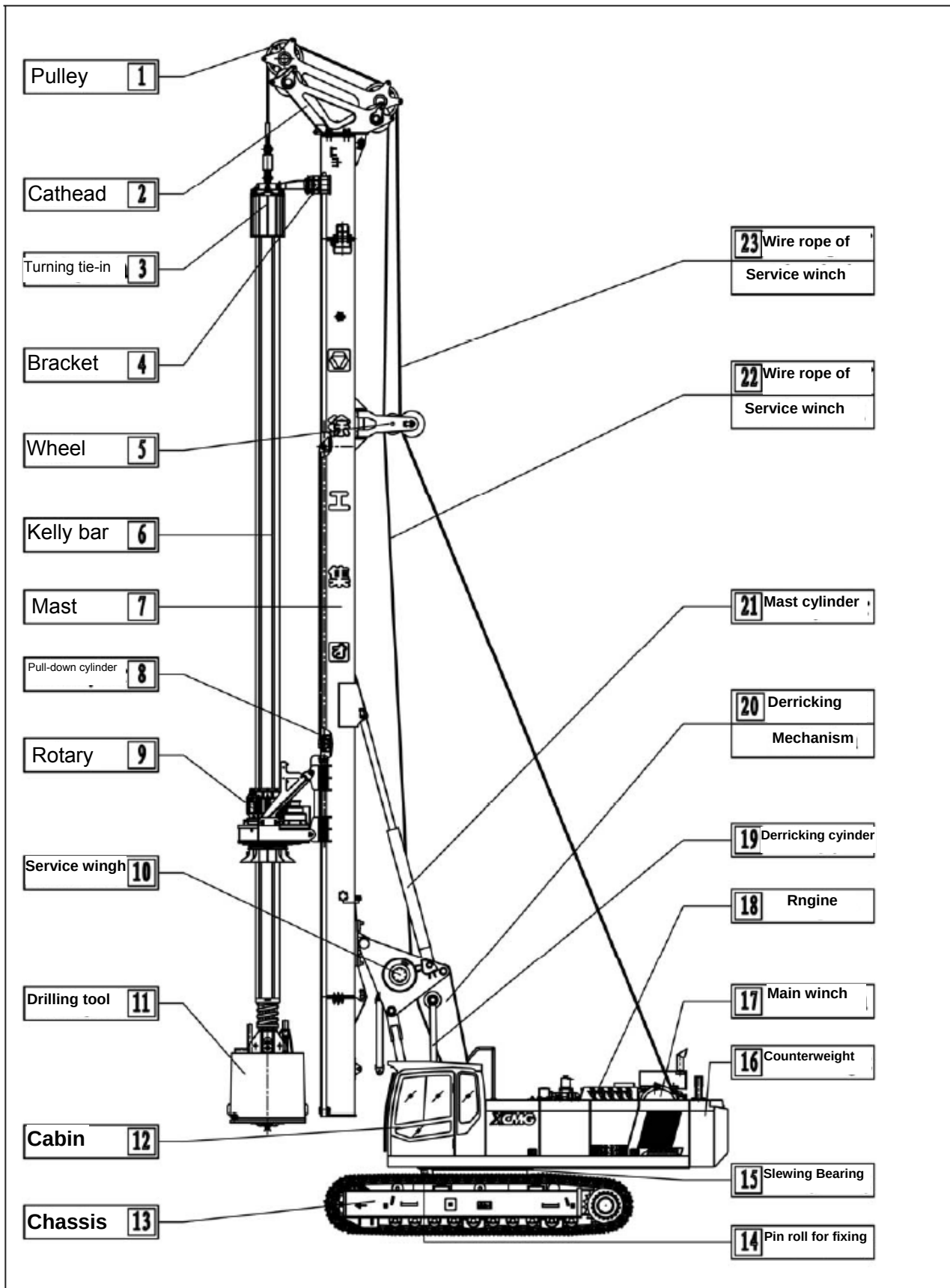


Figure1-2 Names of the main components of XR280D model rotary drilling rig

General

1.3 Structural Features

1.3.1 Compositions and operating principles

The XR280D rotary drilling rig is composed of the following components: chassis traveling mechanism, mast, derricking mechanism (4-bar mechanism), main winch, auxiliary winch, rotary drive, kelly bar, drilling tool, turntable, engine system, cab, machine shed, counter weight, hydraulic system, electrical system, etc.

The major functions of this drilling rig are borehole drilling of its superstructure and traveling of its undercarriage. When its undercarriage is traveling, the pressure oil will be supplied by the main hydraulic pump of the engine and transported to the traveling motor through the central slewing body to drive the driving wheels through the traveling reducer to fulfill such functions as the traveling, steering and braking of the chassis. The center distance of the crawlers can be adjusted at any time through the telescopic cylinder on the control chassis, where the maximum spacing shall be kept in operation all the time. In borehole drilling, the engine drives the oil pump for oil supply. Firstly the two-stage derricking cylinder is adjusted to lead the drilling tool to the proper drilling position and then the verticality of the mast is regulated manually or automatically on the basis of its monitoring results until it meets the requirements. And then the rotary drive is operated to rotate the motor and to drive the kelly bar and the drilling tool through the reducer and the drive socket to fulfill rotary drilling. Meanwhile, oil is supplied to the pull-down cylinder to create a vertical downward pressure for the rotary drive, thus improving the working efficiency. When the kelly bar is raised, the main winch rotates and the pull-down cylinder is lifted in the meantime. When the drilling tool is lifted onto the ground, the turntable returns to the dumping position. In case of a rotary bucket, it is required to lift the drilling tool to the bumping body of the rotary drive and press down the drive or lift the main winch to open the lower end of the rotary bucket to dump earth. The drilling depth is displayed digitally and operation can be stopped when the required drilling depth is reached.

1.3.2 Introduction of the main components

1.3.2.1 Rotary drive

Bumping body Power control box Air filter Drive socket Shock absorber assembly Bracket Slide block assembly



Figure1-3 Rotary drive assembly

General

The rotary drive is the power source of the rotary drilling rig to drive the kelly bar, which is composed of the following items: power control box, drive socket, shock absorber assembly, bracket, bumping body, slide block assembly, variable motor, reducer, axis pin and other spare parts.

The power is supplied by the two variable motors to the power control box and transferred to the drilling tool through drive socket. The pull-down cylinder can make the rotary drive slide up and down along the mast to fulfill drilling. The lubricating oil in the power control box ensures that gears and gear rings are always in best lubricating and cooling.

1.3.2.2 Derricking mechanism (4-bar mechanism)

The derricking mechanism is mainly composed of boom, pull rod, tripod and derricking cylinder. The front articulated point of the tripod and the articulated point on the two-stage derricking cylinder are both connected with the mast to supply oil to the two two-stage derricking cylinders (mast lifting cylinders) simultaneously or separately so as to control the laying and erection of the mast. The mast is always kept vertical to the horizontal plane in the operation in case of the working surface with a gradient less than 2°. The distance between the kelly bar center and the rotating center of the slewing platform can be adjusted flexibly in operation by controlling the length of one-stage derricking cylinder (permissible derricking range is 4410~4950 mm).

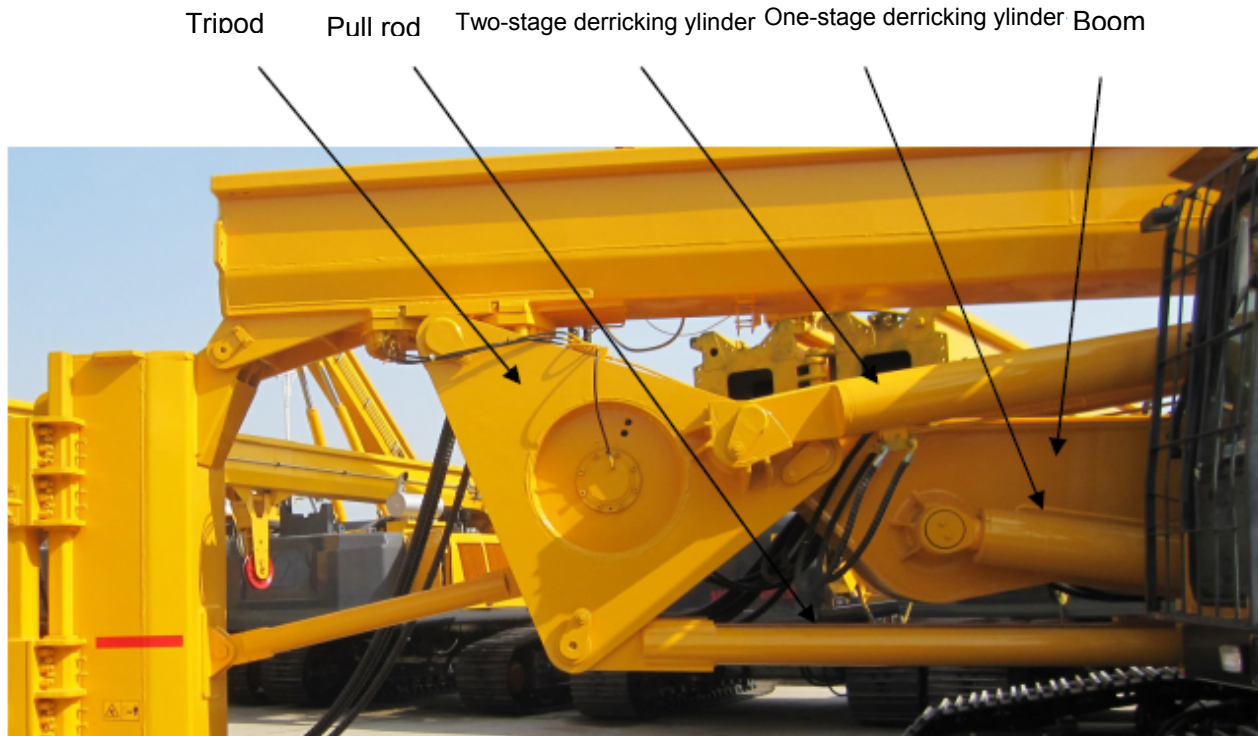


Figure1-4 Derricking Mechanism



Safety Instructions

2. Safety Instructions

Safety instructions are specially provided in this User's Guide, and users should conscientiously abide by such safety rules and requirements concerning the machine.

Prevention can reduce risks efficiently!

We recommend all personnel involved in the operation of this machine read previously and understand the relevant information of safety instructions, which will be helpful to operate the machine safely and prevent accidents.

The safety information contained in this User's Guide is classified as follows:



Danger

This sign is to remind you that if you don't operate as per the instructions in this User's Guide or neglect them, serious personal injury or even death may be caused immediately and the machine may be damaged as well.



Warning

This sign is to remind you that if you don't operate as per the instructions in this User's Guide or neglect them, potential risks may cause serious personal injury or death or damage the machine.



Caution

This sign is to remind you that if you don't operate as per the instructions in this User's Guide or neglect them, personal injury may be caused and the machine may be damaged as well.



Notice

This sign is to remind you of the details that should be paid attention to in the installation, maintenance and operation of the machine.

2.1 Safety of the Machine

All personnel, including the operator and maintenance personnel, shall obey seriously the safety instructions and requirements on the machine to eliminate hazards and accidents to ensure a correct and efficient construction. Otherwise, serious personal injury may be caused and the machine may be damaged as well.



Safety Instructions

2.2 Main Dangers

- Slewing components

As the machine is equipped with a rotating drilling tool, all personnel should keep a distance away from it; fatal injury may be caused in case of contacting it.

- Tilting and object falling

Do not endanger the stability of the machine. If you operate it beyond its capacity or use the damaged lifting limit switch, the machine will be tilted and serious personal injury and machine damage will be caused.

This machine is equipped with a FOPS cab, which can protect the safety of the driver in the cab in case of a falling object.

- Safety devices and limit switch

Never move safety devices or use the spare parts of a faulted safety system.

- Leakage of the hydraulic oil

Check the hydraulic system for hydraulic oil leakage carefully. If leakage is detected, find out its reasons and recover it immediately. If high pressure oil erupts from the leakage, serious burns and poisonings may be caused.

- Maintenance

Ensure the machine is shut down normally and stop all controllers, engines and the master power supply switch before maintenance, repair and cleaning.

- Leaving the machine

Remember to shut down the machine, take out the start key and lock up the doors and windows of the cab before leaving it for preventing other people from starting it without permission.

2.3 Safety Inspection Before Startup

Great importance should be attached to safety instructions.

The following routine inspection items should be conducted before starting the engine:

- Check if all the threaded connections are screwed down and all bolts and axis pin are secured at proper positions.
- Check if hydraulic oil and fuel pipeline leak.



Safety Instructions



Caution

Release the pressure of the hydraulic system before its inspection and cool down sufficiently all the spare parts to be contacted for inspection.

- Check the lubricating oil level of the rotary drive.
- Check the wear of the kelly bar drive ring and the guide carriage wear plate.
- Check the damage and wear of all ropes.
- Check the damage and wear of the kelly bar.
- Check the damage and wear of the drilling tool.

2.4 Precautions in Cold Regions

- Deice the machine efficiently before operating it at an ambient temperature lower than 0°C.
- Clean out the water, snow or sludge stuck on wires, wiring connectors, switches and sensors and their covering parts. If not, the moisture within them will freeze to fail the machine and cause unexpected breakdowns in its next use.
- Preheat the machine thoroughly. If not, the machine will work slowly and unimaginable accidents may be caused.
- Operate all the control levers to cycle the hydraulic oil in the hydraulic system (by raising the system pressure to the system set value, release it and let the oil flow back to the hydraulic oil tank) so as to heat the hydraulic oil, which will ensure a good operation of the machine and can prevent fault as well.
- Do not charge the storage battery if its electrolyte is frozen and do not start the engine using other power supply, as such operations are dangerous and the battery may catch a fire.
- Melt the electrolyte in the storage battery and check for leakage when it is charged or the engine is started using other power supply.

2.5 Safety Devices

2.5.1 Emergency exit

An emergency exit is set in the rear of the driver's cab, and the operator can break the rear window with a life hammer attached in the cab to leave the machine in case of a danger and the door being locked.

Safety Instructions

2.5.2 Fire extinguisher

The machine is equipped with three fire extinguishers, including one 1kg model and two 6kg models. The 1kg one is placed in the driver's cab, while one of the 6kg models is on the hood behind the cab and the other is on the rear left of the whole machine.

Instructions: In case of a fire, open the door of the machine, take out an extinguisher, pull out its safety pin, press down its handle and spray to the root of the flame.

Precautions:

The fire extinguishers should be stored in dry and ventilated places free of freezing, moisture or direct sunshine exposure.

The extinguishers should be checked every season from the time of its being arranged. If the pressure indicator of an extinguisher is detected beyond the green range, you should send it to a specified professional maintenance shop for maintenance and refilling. A hydraulic test must be given to the cylinder before refilling.

2.5.3 Emergency stop button

An emergency stop button (see Figure 2-1) is set on the right control panel in the cab, and the operator can press it down to immediately stop all the drilling functions in case of an emergency. Pull up this button to its normal operation position for restarting the machine.

Notice: Check if this button is reliable before and after moving the machine and drilling!



Figure 2-1 Emergency Stop Button

2.5.4 Safety handle

A safety handle (see Figure 2-2) is set on the left operation box in the cab. The hydraulic system will be shut down and all hydraulic operations be stopped when the handle is turned to a vertical position as shown in the figure below; while the hydraulic system will be started and all hydraulic functions be resumed when it is pulled to a horizontal position.

Safety Instructions

Safety handle



Figure2-2 Safety Handle

2.5.5 Seat switch

You can operate this machine only when you sit down on the seat in the cab.

2.5.6 Height limit switch

In the operation of the drilling rig, the height limit switch can avoid the winch being lifted excessively and the crash between the kelly bar and the mast cathead due to misoperation. For the height limit switch of the main winch, refer to Figure 2-3.

- Check the height limit switch of the main winch:

Lift the kelly bar to make its bracket contact the limit switch and then the lifting of the main winch should be stopped; otherwise, repair or replace the switch.

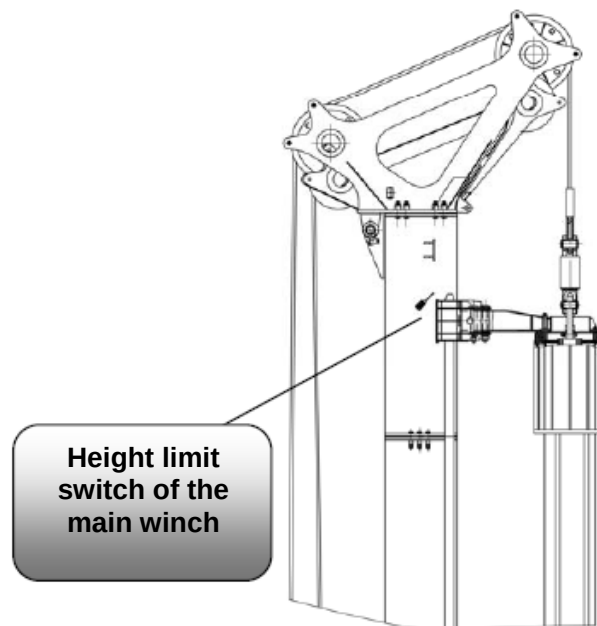


Figure 2-3 Height Limit Switch of the Main Winch

Safety Instructions

2.6 Stability of the Machine

The distance from the slewing center of the machine to the axis of the borehole is within the range of 4410~4950 mm.

On the basis of the following conditions, the stability of the machine is calculated as per EN791:

Component Name	Weight
Standard 6-section friction kelly bar	13.6t
Standard slewing drilling tool (diameter of the drilled borehole is 2.5 m)	5.6t

The practical applications and conditions of the above components will be described in detail in the following sections in order to maintain the stability of the machine.

2.6.1 Transferring a borehole

For the detailed operation procedures for transferring a borehole, refer to the section "5.10 Borehole Transferring" in Chapter 5 in this User's Guide.

General conditions:

- The superstructure and the crawlers of the machine are in a line;
- The rotary drive and the drilling tool are at the possible lowest position;
- The ground on the operation site or the operation platform should be a solid plane.

2.6.2 Rated load



Caution

The rated loads given in the following for the main/auxiliary winch ropes and the pull-down cylinder shall be in compliance with the above operation conditions. All the rated working loads can not be used simultaneously, and any other accessories can not be added.

The load relation of winches is listed in the following table:

Main Winch		Auxiliary Winch	
Pressure (bar)	Load (kN)	Pressure (bar)	Load (kN)
300	260	260	80
280	240	220	68
250	215	180	56
200	170	140	43
150	130	100	31
100	85	60	19

Safety Instructions

2.6.2.1 Vertical state of the mast

Main winch rope

The superstructure (the slewing platform) of the machine operates in a range of 5° left and right just ahead of the chassis when the permissible rated load on the main winch rope is 26t.

Conditions:

- The machine should be placed on a solid plane.
- The crawlers of the machine should be extended thoroughly.

Auxiliary winch rope

The machine can slew within 360° when the permissible rated load on the auxiliary winch rope is 8t.

Conditions:

- The machine should be placed on a solid plane.
- The crawler of the machine should be extended thoroughly.

Pressurization/lifting system

The upper machine of the equipment is in front of the car within the range of 5°, and the pressure in the system is 21 tons, and lifting power is 22 tons.

Conditions:

- The machine should be placed on a solid plane.
- The crawler of the machine should be extended thoroughly.

2.6.2.2 Tilting state of the mast

Main winch rope

The maximum permissible load of the main winch rope is 20t no matter what angles the superstructure of the machine presents.

Conditions:

- The machine should be placed on a solid plane.
- The crawler of the machine should be extended thoroughly.
- The machine should be in a stable condition.
- The front tilting angle of the mast should be less than 5° and its left-right tilting angle should be within 4°.

Auxiliary winch rope

The machine can slew within 360° when the permissible rated load on the auxiliary winch rope is 8t.

Conditions:

Safety Instructions

- The machine should be placed on a solid plane.
- The crawler of the machine should be extended thoroughly.
- The machine should be in a stable condition.
- The front tilting angle of the mast should be less than 5° and its left-right tilting angle should be within 4°.

2.7 Permissible Wind Velocity

The impact of the wind velocity should be taken into account when operating the machine in the places with a high velocity. The velocity should be measured at the cathead position of the machine.

Compare the measurements with the values listed in the following table to check if the wind velocity will impact the stability of the machine.

The maximum permissible wind velocity for the operation of the machine:

Wind Velocity Scale	Wind Velocity		Wind Pressure
8	20m/s	72km/h	250N/m ²



A risk of tipping!

Stop operating the machine before the wind velocity is expected to exceed the maximum permissible value.

Warning

Protect the machine as follows in case that the wind velocity increases to a value more than the one specified in the above table:

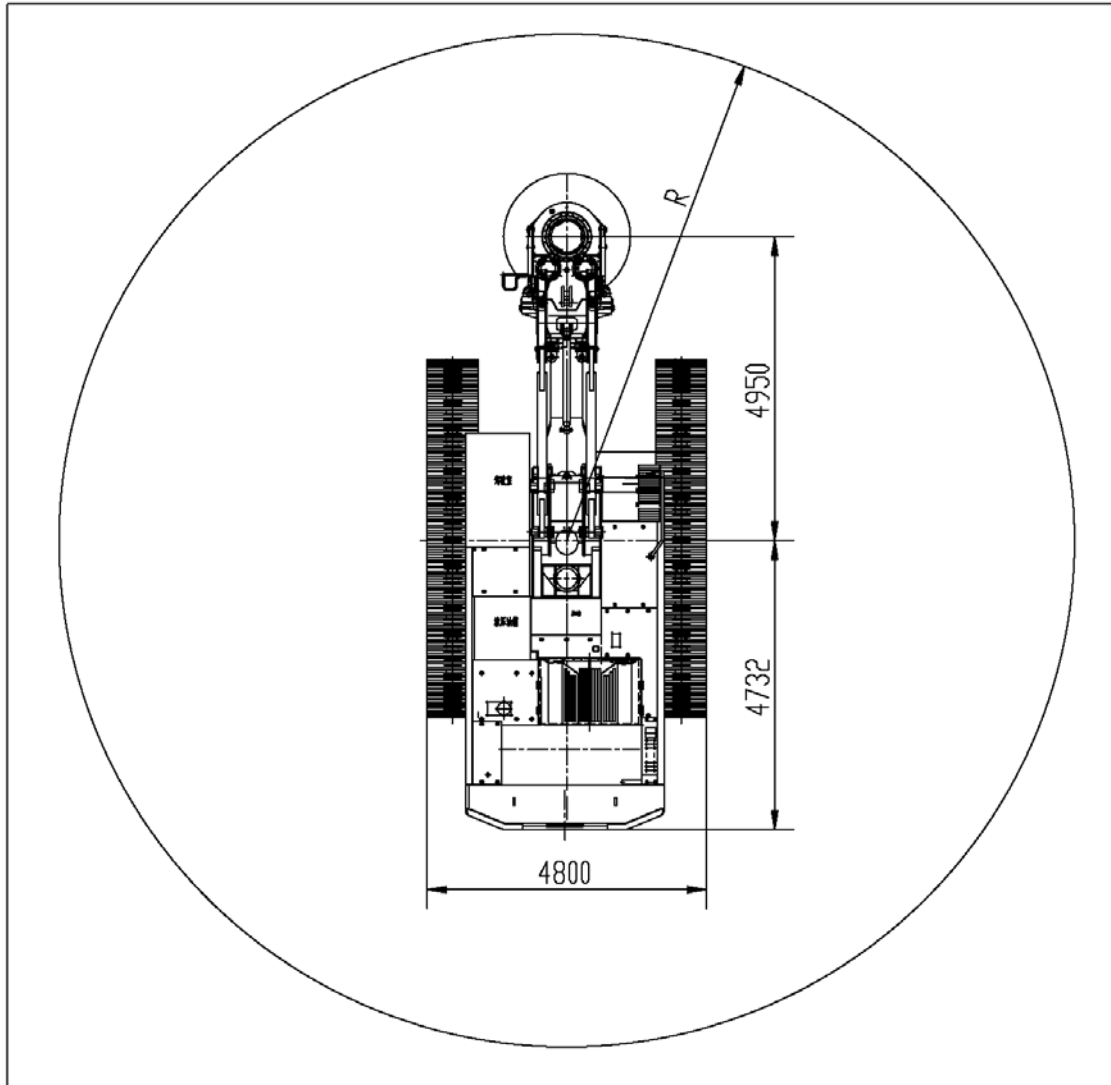
- Place the drilling tool (including other loads or heavy weights) onto the ground.
- Lower the rotary drive to its lowest position.
- Align the superstructure (slewing platform) of the machine with its crawlers and lock up the superstructure.
- Adjust the derricking mechanism to make the gravity center of the machine at a minimum working condition.

Safety Instructions

2.8 Working Area

2.8.1 Radius of the working area

A "No entry" warning sign shall be placed on the edge of the working area before construction to avoid dangers due to the entering of other personnel without permission. For the radius of the working area, see the following figure:



Radius of the Working Area

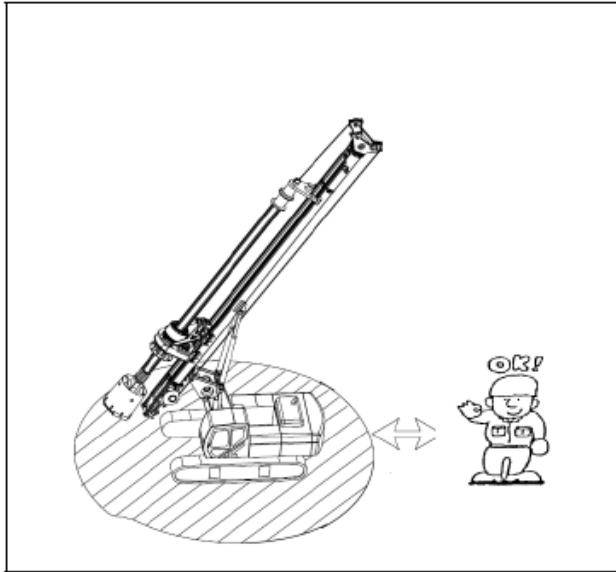
2.8.2 Preparation of working area

Level the site and place all tools, materials and necessities in appropriate positions before construction for a safe and convenient access. Place and secure all tools and materials in an orderly way to avoid accidents.

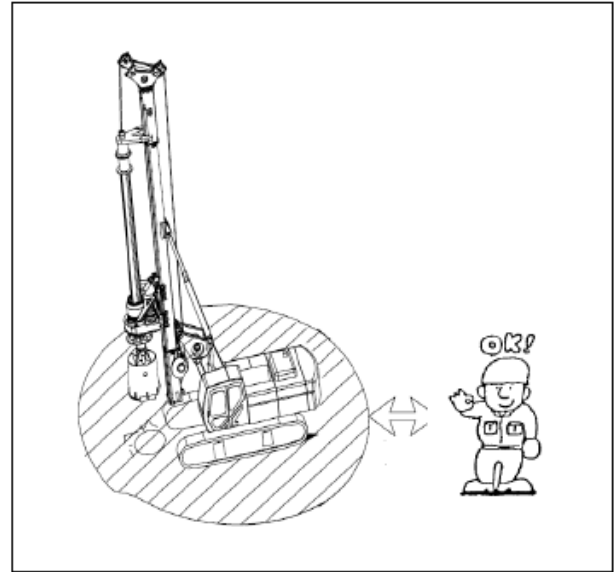
- Ensure nobody stands in the working area before operating the machine.
- Arrange illuminating system in the working area.
- Clear away all obstacles for the machine moving.
- Be more careful when the machine moves near a channel or high-voltage wires or on a soft ground.
- Ensure the positions of overhead or underground high-voltage wires, telephone lines, gas pipeline, water pipe, sewer, etc in operation to ensure a safe construction.

Safety Instructions

2.9 Dangerous Area in Transferring and Borehole Drilling



Dangerous Area in Transferring



Dangerous Area in Borehole Drilling

- The dangerous area in transferring (see the shaded part in the above figure) is the circle around the slewing center as center and with a diameter of 8 meters.
- The dangerous area in borehole drilling (see the shaded part in the above figure) is the circle around the slewing center and with a diameter of 7 meters.

Safety Instructions

2.10 Safety Signs and Descriptions

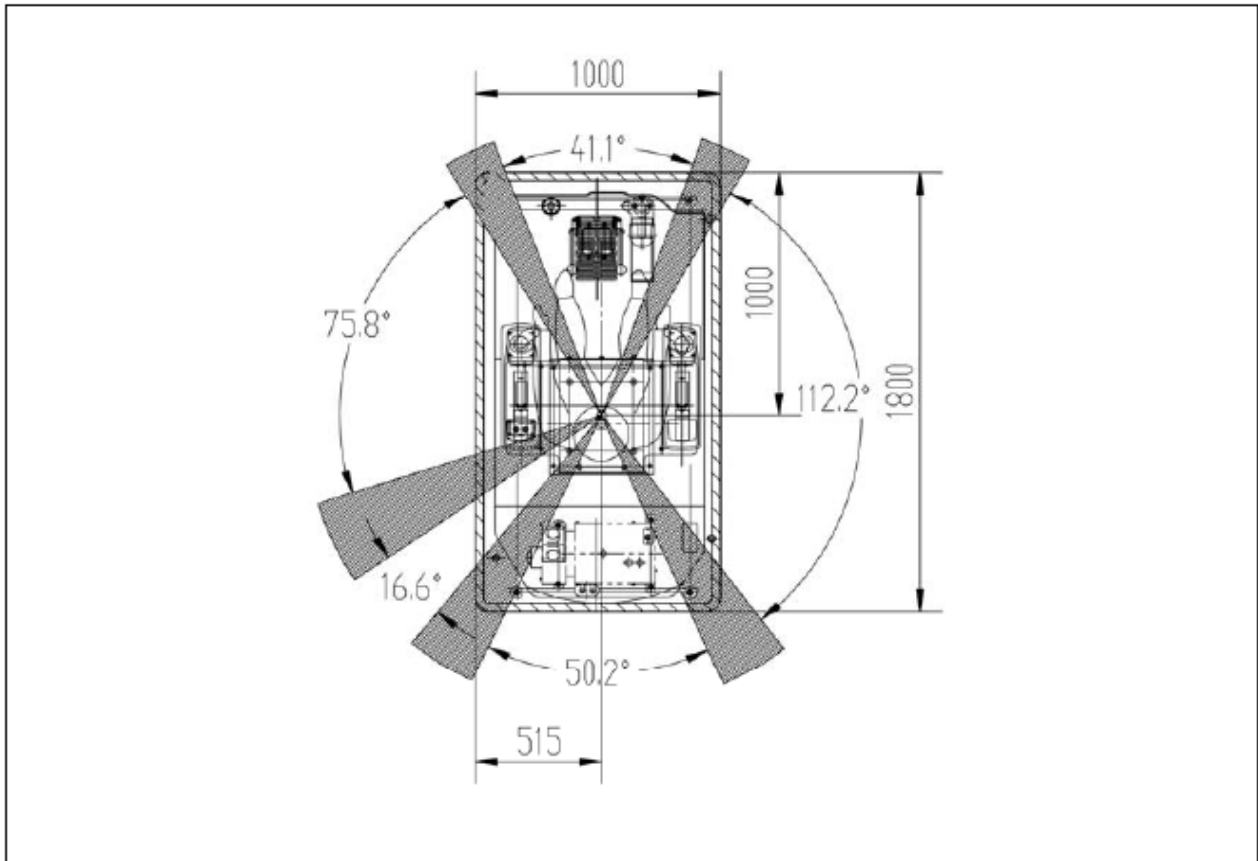
Safety Signs	Description	Safety Signs	Description
	Do not open or disassemble the safety protecting cover when the engine is running.		Stop the engine and take out the key before maintenance and repair.
	Stay a safety distance away from the machine to prevent your body being squeezed by the laterally-applied force.		Stay a safety distance away to prevent your body from being crashed by counterweights.
	No fire!		Stay a safety distance away to prevent your body being stricken by the cast or flying object.
	Hydraulic oil		Read and use the maintenance manual.
	Diesel		Stay a safety distance away to prevent your body being squeezed by the above-applied force.
	No passing without permission.		Heated surface. No touching.
	Risk of Electric shock		Seek and refer to the operation procedures in technical manual to avoid discharging liquids under pressure.

Safety Instructions

	Caution		No stepping!
	Fire extinguisher		Emergency exit
	Wear safety helmet.		Storage battery
	Place for lubricating grease filling		Tool kit
	Place for slinging		Place for fixing
	Traveling direction		

Safety Instructions

2.11 Operation Vision



2.12 Nameplate

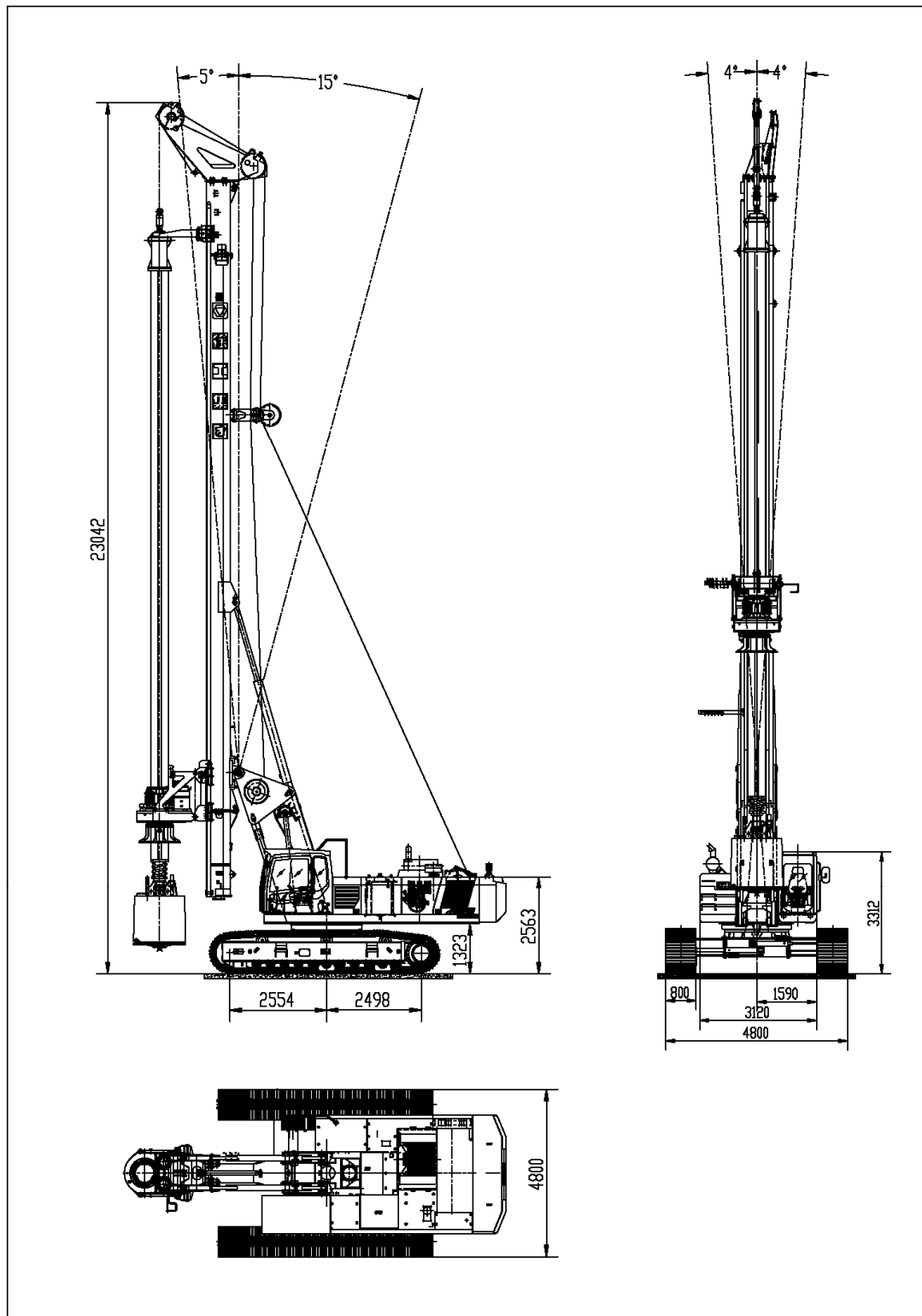
ROTARY DRILLING RIG			
MACHINE TYPE	ENGINE POWER	RATED VOLTAGE	TOTAL WEIGHT
XR280D	298 kW	24 V	82000 kg
MAX. TORQUE OUTPUT	WINCH HOOK LOAD		
280 kN.m	260 kN		
MAX. DRILLING DEPTH	MAX. DRILLING DIA.		
88m	2500 mm		
MANUF. NO.	MANUF. DATE		
Manufacturer: Xuzhou Construction Machinery Group CO., LTD.			
Address: No.1 Industry Area, Xuzhou Economic Development Zone, Jiangsu, P. R. China			

Technical Specifications

3 Technical Specifications

3.1 Major Dimension of the Equipment

Unit: mm



Technical Specifications

3.2 Major Parameters of the Equipment

Name		Unit	Parameter Value
Maximum drilling diameter		mm	2500
Maximum drilling depth		m	Standard equipment 88 (6-section), optional equipment 58m (4-section interlocking kelly bar)
Allowable safe drilling range (from the slewing center)		mm	4410~4950
Drilling rig's dimensions in working state (L*W*H)		mm	10770×4800×23000
Drilling rig's dimensions in transportation state (L*W*H)		mm	17380×3500×3520
Complete machine's weight (standard equipment, including drilling tools)		t	88
Engine	Engine model		CUMMINS QSM11-C400
	Rated power / rotation speed	kW	298 / (2100r/min)
Hydraulic system	Maximum working pressure of the main pump	Mpa	32
Rotary drive	Maximum torque	kN.m	280
	Rotation speed	rpm	7~22
Pull-down cylinder	Maximum pull-down force	kN	210
	Maximum lifting power	kN	220
	Stroke	mm	6000
Main winch	Lifting power	kN	260
	Maximum single-rope speed	m/min	60
	Steel wire rope's diameter	mm	32
Auxiliary winch	Lifting power	kN	80
	Maximum single-rope speed	m/min	65
	Steel wire rope's diameter	mm	20
Mast	Left / right inclination angle	o	4 / 4
	Forward inclination angle	o	5
	Backward inclination angle	o	15
Slewing platform	Slewing angle of the platform	o	360
Traveling	Maximum traveling speed of the complete machine	km/h	1.5
	Maximum gradeability of the complete machine	%	35
Crawler	Width	mm	800
	Outer width (minimum -maximum)	mm	3500~4800
	Center-to-center longitudinal distance between wheels	mm	5052

Technical Specifications

3.3 Drilling State Parameter

The picture in the lower right corner shows a drilling tool with a diameter of 2 m.

Unit: m

Kelly bar	L	T	W
4-section interlocking kelly bar	61.5	58.62	0.8
5-section friction kelly bar	91.5	88.62	0.8

The values given in the table are the parameters measured when the mast is in the minimum working (derricking) state. The drilling depth can be increased by 0.62 m when it is in the maximum working state.

L - Maximum extension length of the kelly bar

T - Maximum drilling depth

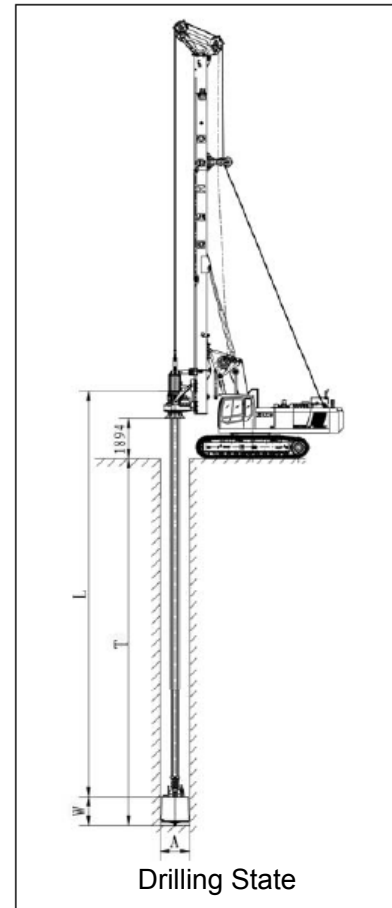
W - Height of the drilling tool

3.4 Dimensions of Steel Wire Rope

3.4.1 Steel wire rope of main winch

Main winch's rope should comply with GB8918-2006.

Length:	115 m
Nominal diameter:	32 mm
Allowable deviation of diameter:	+2% - +4%
Weight per meter:	5.22 kg/m
Tensile strength:	1960 N/mm ²
Rated breaking load:	1058 kN
Minimum breaking load:	823 kN
Quantity of bearing ropes:	245
Material of core:	Steel
Steel wire surface:	Plain wire (NAT)
Winding and direction:	Wind regularly according to the right hand screw rule (ZS).
Characteristics:	Low stress
Corrosion protection:	Lubricated with grease
Features:	Anti-slewing and facial contact lay shaped strand steel wire rope



Technical Specifications

The head collar of main winch should be modified according to heavy-duty collar described in GB/T5974.2-2006.

Bore diameter: 60 mm

3.4.2 Steel wire rope of auxiliary winch

Auxiliary winch's rope should comply with GB8918-2006.

Length:	70 m
Nominal diameter:	20 mm
Allowable deviation of diameter:	+2% - +4%
Weight per meter:	1.38 kg/m
Tensile strength:	1770 N/mm ²
Rated breaking load:	306 kN
Minimum breaking load:	252 kN
Quantity of bearing ropes:	114
Material of core:	Steel core (IWS)
Steel wire surface:	Plain wire (NAT)
Winding and direction:	Wind regularly according to the right hand screw rule (ZS).
Characteristics:	Low stress
Corrosion protection:	Lubricated with grease
Features:	Non-rotating and liner contact lay steel wire rope

The head collar of auxiliary winch should be made according to ordinary collar described in GB/T5974.1-2006.

Bore diameter: 50 mm

Rope cramps should be made and used according to GB/T5976-2006.

4 Operation Control and Display

4.1 Operation Diagram

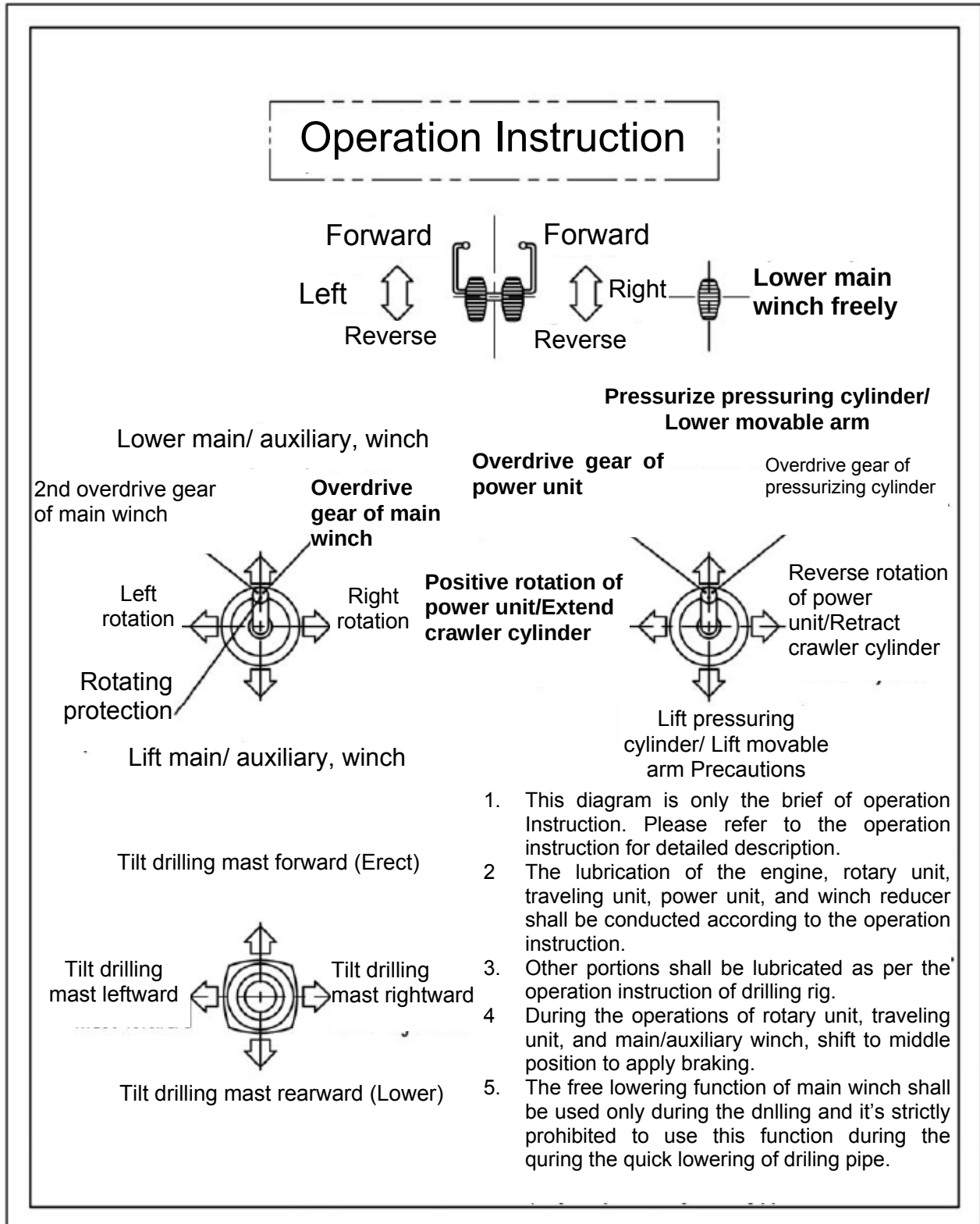


Fig. 4-1 Operation diagram

Operation Control and Display

4.2 Layout Plan of the Cab

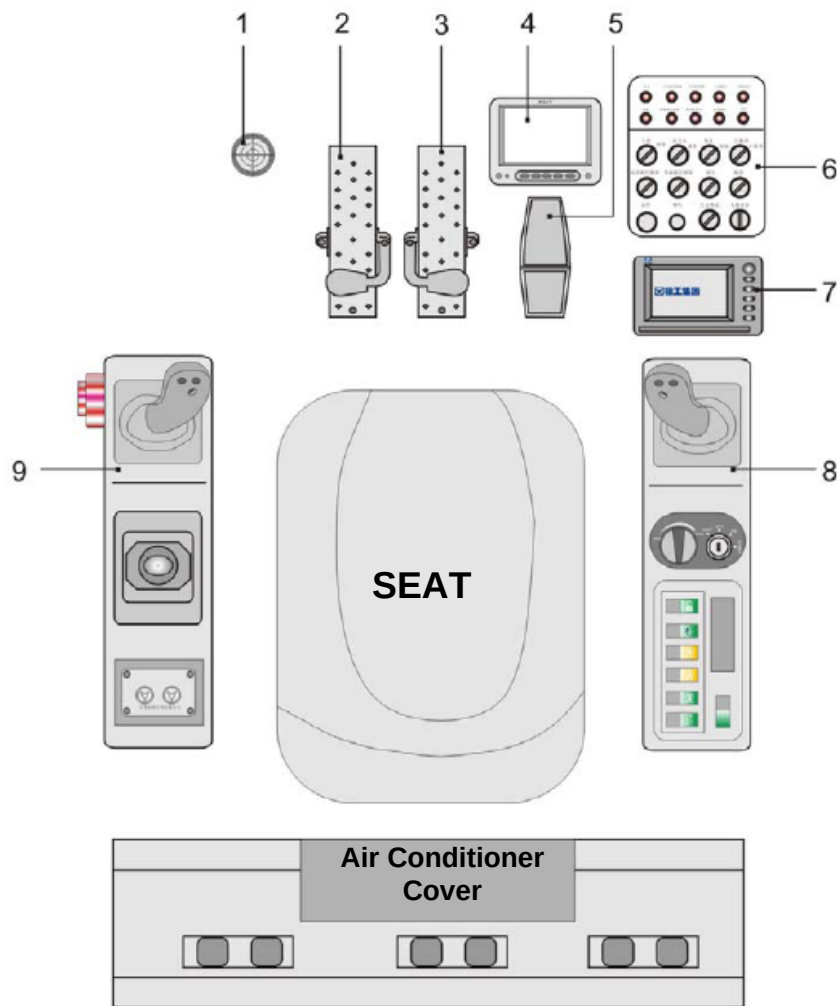


Fig. 4-2 Layout plan of the cab

Description:

No.	Name and Function	No.	Name and Function
1	Horizontal detector	6	Electrical appliance control panel
2	Left crawler traveling pedal	7	PLC display
3	Right crawler traveling pedal	8	Right operation box body
4	Monitor of main winch	9	Right operation box body
5	Free lowering (floating) pedal of main winch		

4.3 Pedal

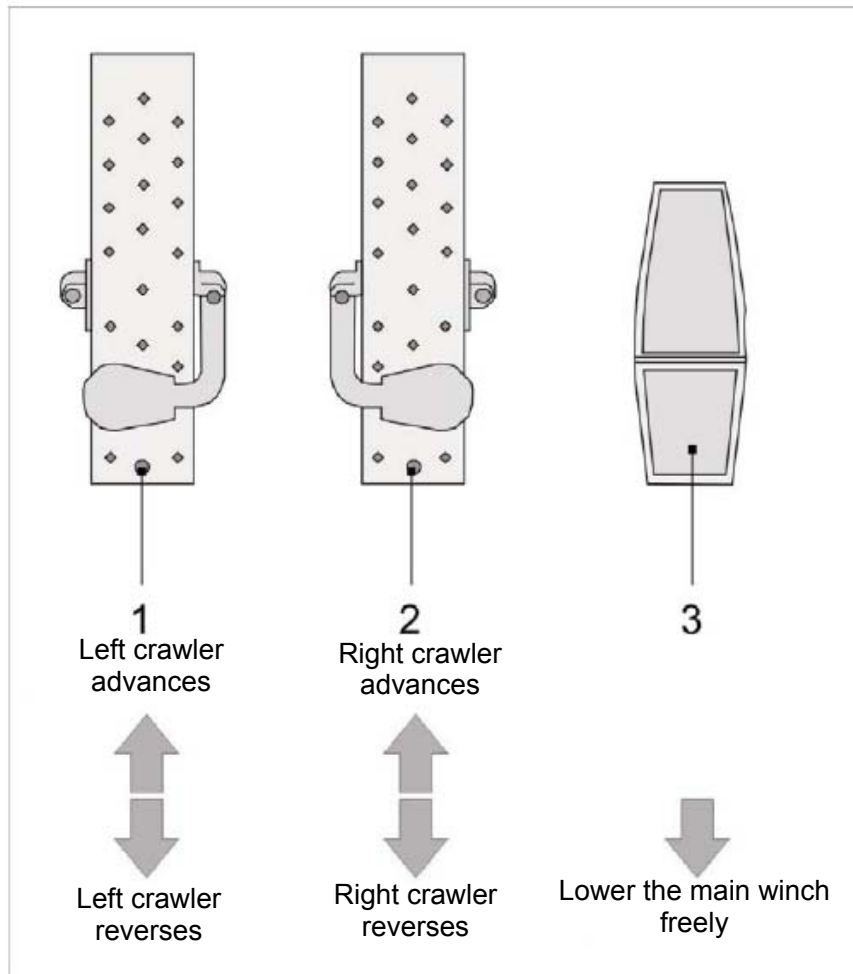


Fig. 4-3 Pedal switch

No.	Name	Function	No.	Name	Function
1	Pedal valve	Left crawler travels	3	Pedal switch	Lower the main winch freely
2	Pedal valve	Right crawler travels			



Notice

It is forbidden to step on pedal switch No. 3 when the kelly bar is being lowered fast.

Pedal switch No. 3 used to lower the main winch freely can only be used during drilling.

Operation Control and Display

4.4 Control Panel

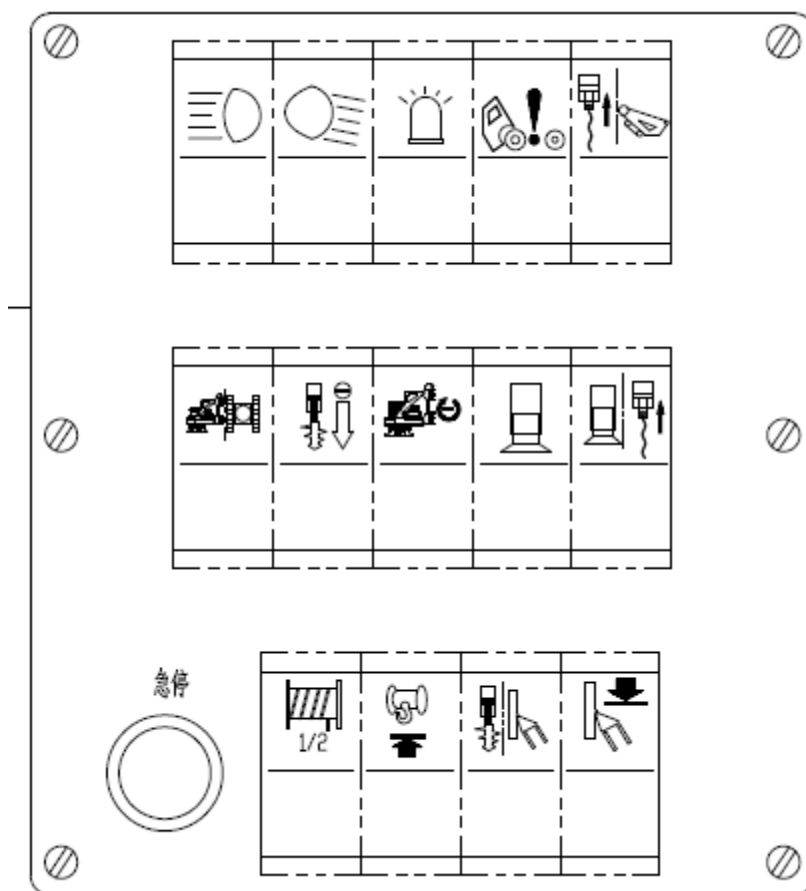


Fig. 4-4 Control panel

Description:

No.	Name	Function	No.	Name	Function
1	Switch	Headlight	12	Switch	Height limit relief
2	Switch	Back up lamps	13	Switch	Pressing and luffing control switch
3	Switch	Warning light relief	14	Switch	Luffing limit relief
4	Switch	Travel enabled			
5	Switch	Steel wire rope and forehead cylinder switch			
6	Switch	Power head and crawler belt control switch			
7	Switch	Pressure limiting			
8	Switch	Torque limiter			
9	Switch	Landing leg			
10	Switch	Landing leg and steel wire rope control switch			
11	Switch	Main winch and auxiliary winch control switch			

Operation Control and Display

4.5 Left Operation Box

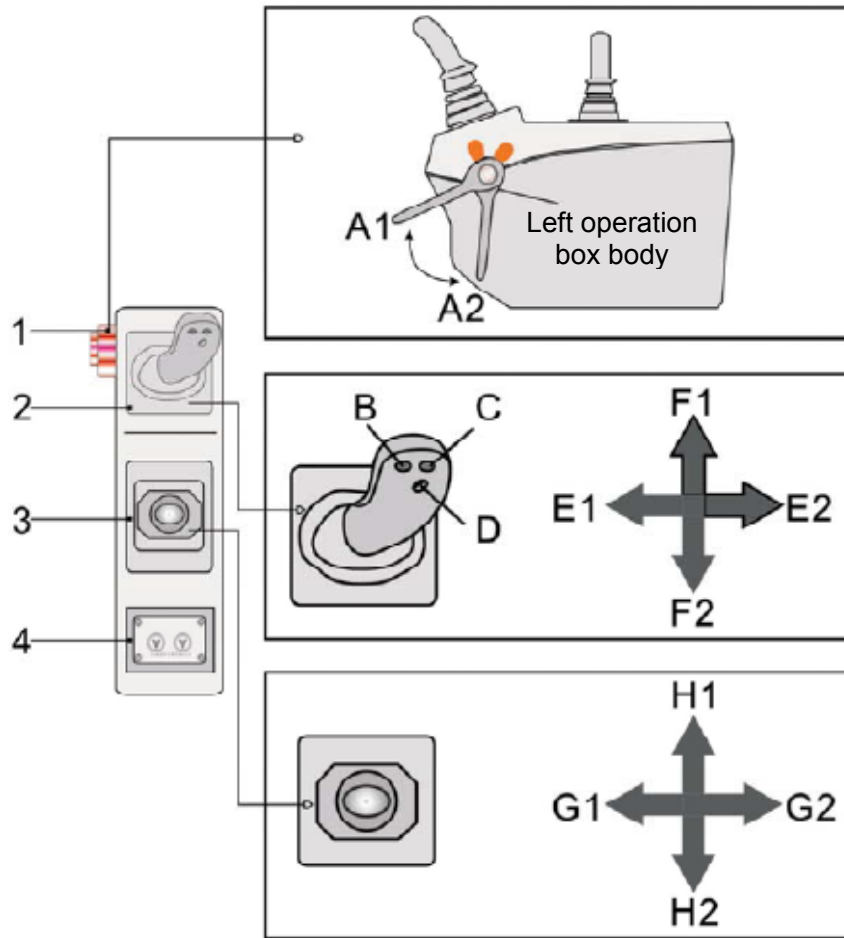


Fig. 4-5 Left operation box and joystick

Description:

No.	Name	Operation	Function
1	Dead-man's joystick	A1	Start the hydraulic system.
		A2	Cut off the hydraulic system.
2	Winch joystick	F1	Lower main/auxiliary winch.
		F2	Elevate main/auxiliary winch.
		B	Horn button
		C+F1	Lower main winch fast.
	Superstructure slewing joystick	C+F2	Elevate main winch fast.
		D+E1	The superstructure slews leftward.
3	Mast joystick	D+E2	The superstructure slews rightward.
		H1	The mast is elevated.
		H2	The mast is lowered.
		G1	The mast inclines leftward.
4	Control panel of air-conditioning system	G2	The mast inclines rightward.
		See the operating instructions of air conditioner	

Operation Control and Display

4.6 Right Operation Box

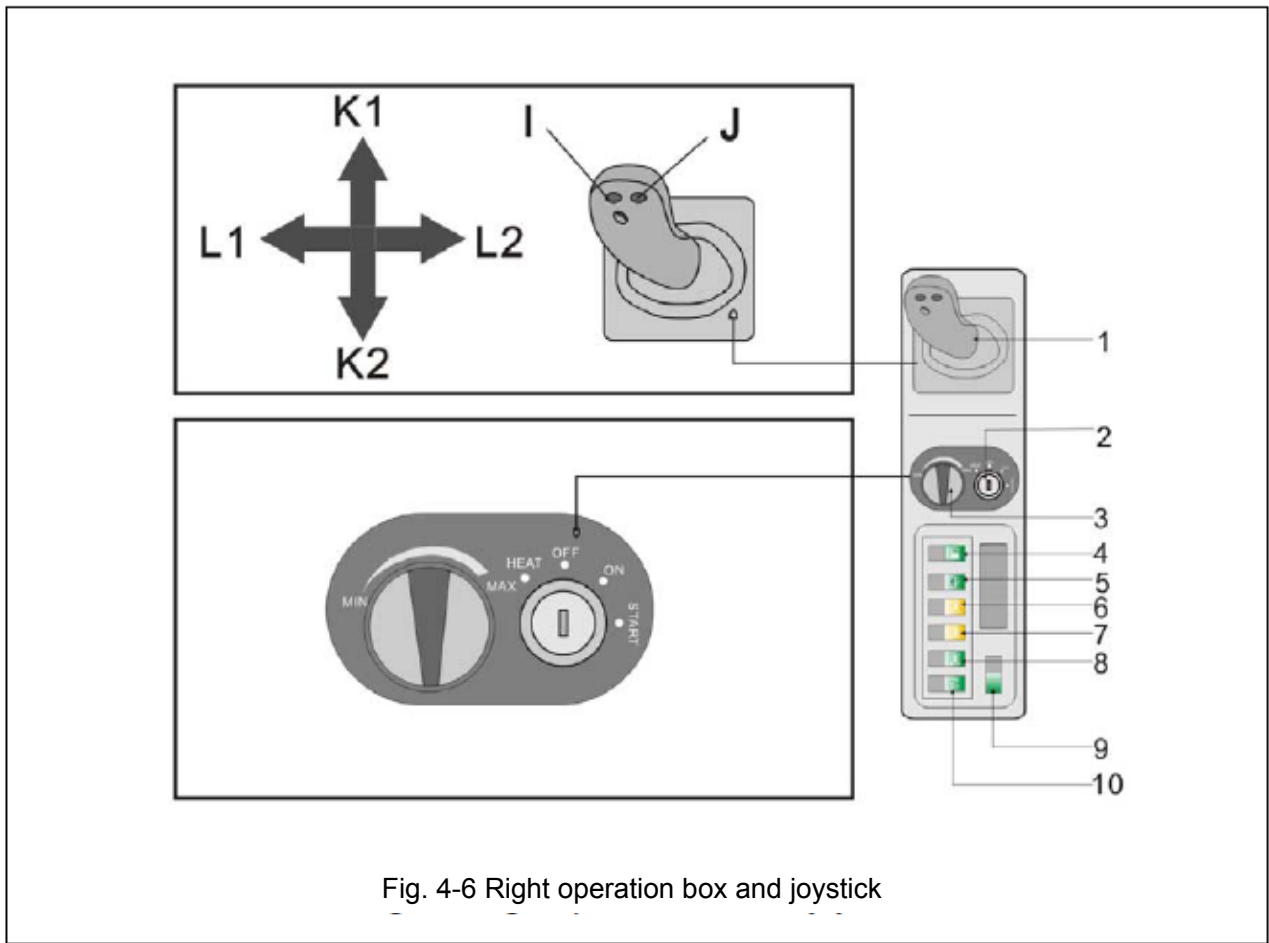


Fig. 4-6 Right operation box and joystick

Description:

No.	Name	Operation	Function	Remark
1	Operating joystick	I	Rotary works fast.	
		J	Pull-down cylinder works fast.	
		K1	Pull-down cylinder is pressurized / boom is lowered	
		K2	Pull-down cylinder is elevated / boom is elevated	
		L1	Crawler (outrigger) extends / rotary drive is in positive rotation	When the user chooses vertical outrigger parts additionally.
		L2	Crawler (outrigger) retracts / rotary drive is in reverse rotation	
2	Key switch		Start the engine.	
3	Throttle knob		Control the engine's throttle	
4	Switch		Windscreen wiper switch	
5	Switch		Wiper spray switch	
6	Switch		Automatic raising mast	

4.7 Electrical Control and Diagnosis



Fig. 4-7 Electrical control box wire harness

Function description:

Name	Function	Remarks	Name	Function	Remarks
F1	Engine	Fuse	K1	Air conditioning	Relay
F2	Headlight	Fuse	K2	Horn	Relay
F3	Self sucking pump power	Fuse	K3	Emergency stop	Relay
F4	Controller	Fuse	K4	Rotating alarm	Relay
F5	Luffing	Fuse			

5 Operation



Notice

Before the drilling rig starts rotary drilling, check carefully **the tightening torques of the fixed bolts for all the coupling pins and shafts, and the lubrication oil (grease) filling conditions at all lubrication points. Pay attention to the lubrication oil quantities of the hydraulic oil tank, traveling reducer, reducers of main winch and auxiliary winch, rotary drive box body, reducer and slewing platform's reducer. Check the fastening bolts (screws) of all the reducers timely and screw them all.** Moreover, check the liquid levels of the engine system's **coolant and the oil sump's engine oil, and check whether the slewing bearings of the slewing platform and kelly bar have sufficient lubrication grease.** Only when the drilling rig is ensured to meet the using requirements after the above-mentioned check and adjustment can the engine be started.



Caution

In order to prevent the starting elements from being damaged, the starting engine **should not be operated for more than 10 seconds** each time. If the engine cannot be started in two consecutive times, turn the key switch back to the OFF position, **wait for 2 minutes** and then start it again. After a starting failure, if the engine is **started repeatedly**, or if the waiting time to turn the key switch again is too short, the **starting engine will be damaged.**



Caution

Check the meters after the engine is started.

Important: (1) Protect the engine against possible damages. After the engine is started, if alarm lamp flashes or alarm sounds for relevant devices, stop the engine immediately and perform troubleshooting.

(2) When the engine is started normally, **keep it idling for 3 to 5 minutes** (the idling time is slightly longer in winter, but it should not be longer than 30 minutes).

Verify: (1) The (charging) indication lamp for AC generator is off.
(2) The low-pressure alarm for the engine's oil does not sound.
(3) The meters of electrical appliances give normal display.



Notice

If the complete drilling rig is equipped with outrigger cylinder, when it needs to operate the outrigger cylinder, switch button No. 9 in Fig 4-4 to the crawler position and switch button No. 2 in the same figure to the outrigger cylinder position first. Then operate joystick No. 1 in Fig. 4-6, and the extension and retraction of the outrigger cylinder can be achieved. When it needs to operate the crawler, switch both button No. 9 and button No. 2 in Fig. 4-4 to the crawler position, and then operate joystick No. 1 in Fig.4-6.

Operation

5.1 Traveling

5.1.1 Maximum allowable angle during traveling

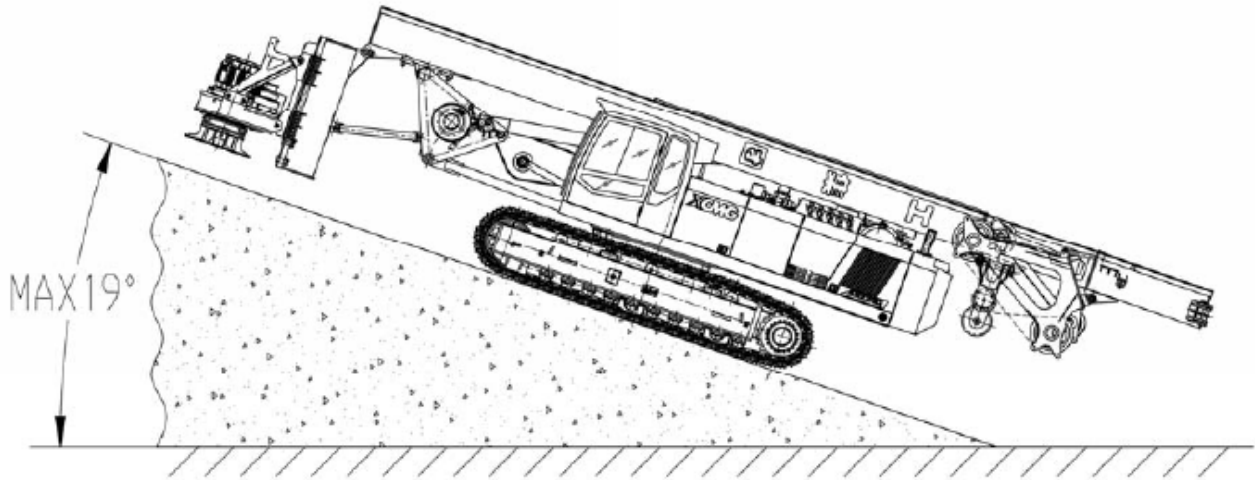


Fig. 5-1

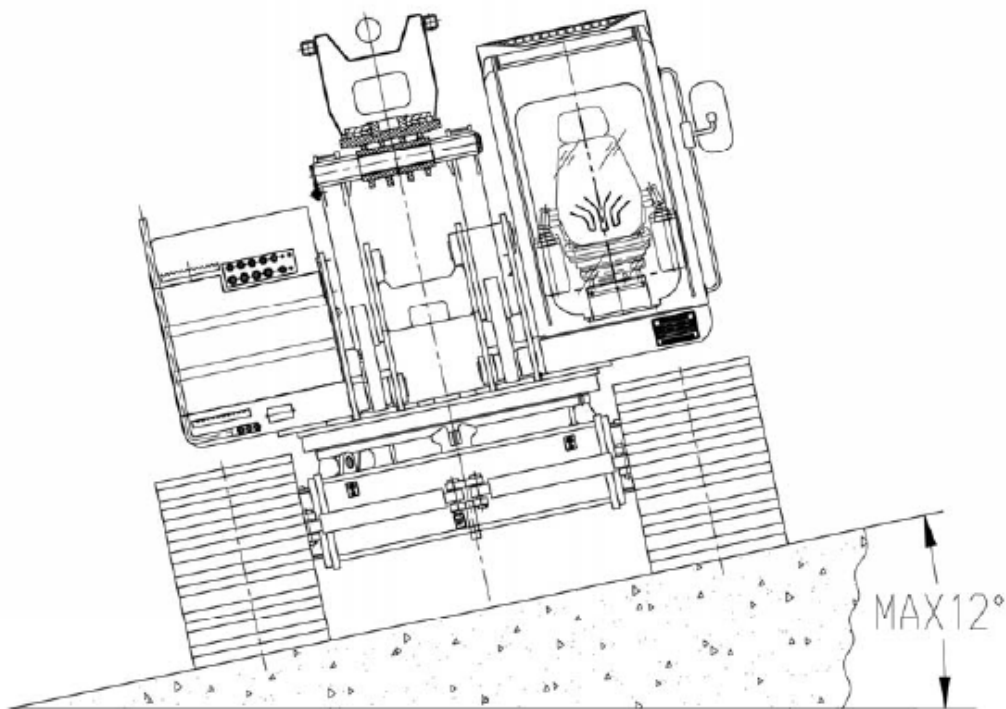


Fig. 5-2

Operation

5.1.2 Traveling forbidden status

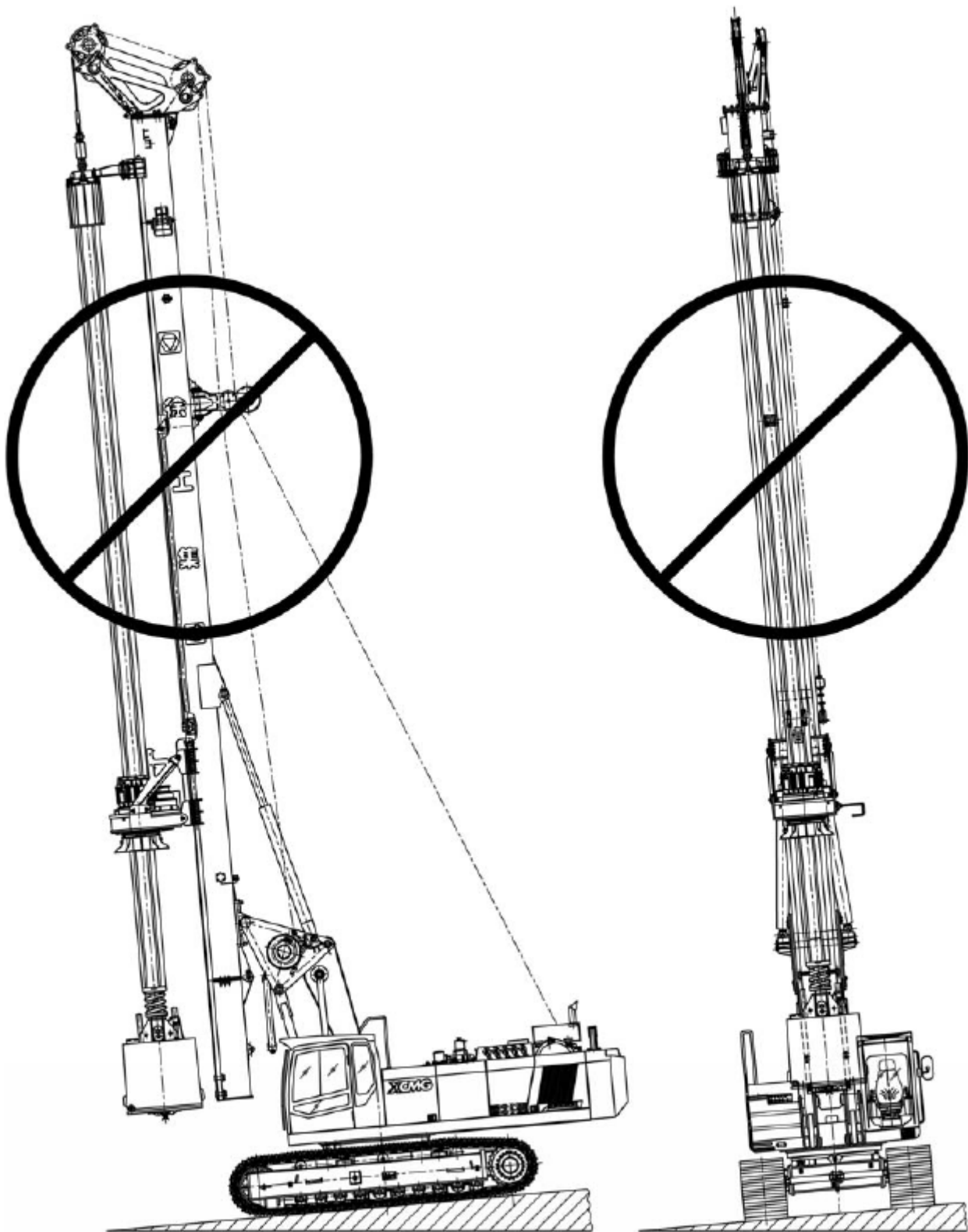


Fig. 5-3

Operation

5.1.3 Advancing/reversing the chassis

The operation procedures are as follows:

- (1) When the drilling rig's operators are in place, set the traveling locking knob (No.4 in Fig. 4-4) on the electrical appliance control panel to the working position (see Fig. 5-4).
- (2) Turn the dead-man's joystick outside the left operation box from vertical to horizontal (No. 1 in Fig. 4-5).



Fig. 5-4 Traveling locking

- (3) Turn the control knob of the engine's throttle clockwise (No. 2 in Fig. 4-6). Make sure that the engine's rotation speed rises steadily to and maintains within the range of 1900-2000 rpm.
- (4) Press the horn button (knob B in Fig. 4-5) to sound the horn, and then operate the traveling pedal (No. 2 and No. 3 in Fig. 4-2).
- (5) The advancing of the drilling rig can be achieved through operating the left and right crawler traveling pedals forward at the same time; the reversing of the drilling rig can be achieved through operating the two pedals backward at the same time.

5.1.4 Turning the chassis

Turning is frequent during the usage of drilling rig. The turning operation is as follows:

- (1) Apart from the left and right crawler pedals, all other switches and joysticks of the drilling rig should maintain the status described in 5.1.3.
- (2) Press the horn button to sound the horn, and then operate the crawler traveling pedal on one side to achieve turning (steering) to the desired direction. If it needs to turn left, keep the left pedal on the neutral position (motionless), operate the right crawler traveling pedal forward and the turning is achieved. If it needs to turn left, just operate the crawler pedal on the opposite side.
- (3) If the ground resistance is excessive, it is hard for the drilling rig to turn. Then operate the crawler pedals on both sides to the same direction at the same time. Through controlling the lean angles of both pedals (make the output pressures of the traveling pilot valves different), the turning of various slewing radiuses can be achieved.
- (4) Once the crawler traveling operation finishes, turn the traveling locking knob back to the non-working position immediately (see Fig. 5-5).



Fig. 5-5 Traveling locking disable

5.2 Derricking Mechanism

5.2.1 Adjusting derricking range

- (1) The mast is perpendicular to the ground. Put the switch for changeover between pull-down cylinder and derricking cylinder at the "Derricking" position (see No. 3 in Fig. 4-4), so as to make derricking work.
- (2) Pull the pilot joystick on the right operation box forward and backward to adjust the distance between the mast center and the slewing center of the slewing platform (the allowable range of the center-center distance is 4410~4950 mm).

5.2.2 Releasing the derricking limit

- (1) If the center of the mast is further than 4950 mm from the slewing platform center, no matter how you pull the joystick, the derricking mechanism will not act, and indication lamp No. 7 in Fig. 4-4 is on. This indicates the safe protection function of the derricking limit is working. At the same time, turn switch No. 7 in Fig. 4-4 to the "Derricking limit disable" position (see Fig. 5-6), and then operate No. 1 in Fig. 4-6.



Fig. 5-6 Derricking limit disable

- (2) Once the mast center is within the range of 4410-4950 mm, turn No. 7 in Fig. 4-4 back to the non-working position immediately.

5.3 Slewing Platform

When the drilling rig is working, the slewing operation of slewing platform is frequent. Its steps are as follows:

- (1) First, press the horn button (Knob B in Fig. 4-5) to sound the horn.
- (2) Press down the slewing protection button on the joystick of the left control box and pull the joystick outwards. Then the slewing platform can turn anticlockwise (leftwards); pull the joystick inwards, and then the slewing platform turns rightwards. During this operation, if button D has not been pressed, or if this button and the wiring are faulty, the platform will remain static. (No. 2 in Fig. 4-5)

5.4 Mast

One of the basic conditions for drilling rig's rotary drilling construction is that the mast must be raised and basically perpendicular to the ground. The following steps raise the mast or lay it flat:

- (1) The mast raising joystick (see No. 3 in Fig. 4-5) on the left control box is provided for raising or lowering the mast. Pull the joystick forward and the mast is raised; pull the joystick backward and the mast is laid flat.
- (2) During practical operation of the mast, it will lean leftward/rightward due to various reasons. If the mast leans, adjust it at all times according to the data displayed dynamically on the display. If the mast leans leftward during the raising operation, pull the joystick forward. Meanwhile, adjust the joystick's inclination angle inward properly to reduce the mast's leftward inclination. If the mast leans rightward, adjust the joystick's inclination angle on the opposite side. Perform these steps until the mast is raised as required by the operation. If the mast is inclined when it is being lowered, the same steps are applicable.

Operation

- (3) If the mast is inclined during construction, operate the joystick on a single direction (forward/backward or leftward/rightward), and the perpendicularity deviation on a certain direction (X or Y) can be rectified in time.

5.5 Main Winch

When the drilling rig is working, the main winch is always connected with the kelly bar and the drilling tool via steel wire ropes. The operation of main winch is quite frequent. The steps are given as follows:

5.5.1 Lowering the steel wire rope

- (1) Turn No. 10 in Fig. 4-4 to the "Main Winch" position (see Fig. 5-7).
- (2) Operate the pilot joystick of the left operation box forward (see No. 2 in Fig. 4-5) to release the steel wire rope of the main winch (lower the kelly bar and the drilling tool).



Fig. 5-7 Controlling main winch

- (3) If you want to lower the drilling tool fast, press down button B or button C on the top of knob B in Fig. 4-5 while the abovementioned operation is being carried out, and fast lowering of different positions can be achieved.

5.5.2 Depth reset

See relevant sections of *Operation Instructions for Display* for detailed information.

5.5.3 Floating function

When the rotary drilling rig is drilling, the drilling tool should always drill through earth without slipping under the gravity action of the kelly bar. At the same time, the main winch's rope should be released smoothly and freely according to the actual position of the kelly bar. This function can be achieved through operating No. 3 in Fig. 4-3 - "Free-lowering pedal of the main winch".

5.5.4 Preparation before elevating

When the muck in the bucket is confirmed to meet the requirements for elevating, stop the drilling tool's drilling operation and reverse the rotary drive for 2 -5 circles. Eliminate the Kelly bar's elastic deformation produced during the drilling first. Make sure the gate at the bucket bottom is closed, the drilling bucket teeth have been pulled out of the muck, and the bucket body is entirely separated from the ground (especially from the clay). Moreover, the Kelly bar should be prevented effectively from dropping during construction.

If an interlocking Kelly bar is used, it actually needs to reverse more circles to ensure all levels of the Kelly bar are completely unlocked.

Operation

5.5.5 Elevating the steel wire rope

Operate the pilot joystick on the left operation box (see No. 2 in Fig. 4-5), and then the main winch's steel wire rope can be elevated (to elevate the Kelly bar and drilling tool).

When the elevator approaches the main winch's pulley, if you continue to elevate the rope, the main winch cannot be elevated any more. At the same time, No. 8 in Fig. 4-4 turns bright, which indicates the main winch is too high and the joystick can only be operated reversely (to lower the rope). If it indeed needs to continue to elevate the main winch, turn switch No. 8 in Fig. 4-4 to the "Release height limit" position. You should be very careful when you continue to elevate the main winch. Observe carefully and ensure safety. Once this operation finishes, be sure to turn the switch to the **Non-working position** immediately!

5.6 Rotary Drive

When the drilling rig is working, the operation of rotary drive is the most frequent and important. It will directly influence the drilling depth of the drilling rig. Its working process is described as below:

5.6.1 Positive rotation

- (1) Turn switch No. 9 in Fig. 4-4 to the "Rotary drive" position (see Fig. 5-8).
- (2) Operate the pilot joystick on the right operation box inward (see No. 1 in Fig. 4-6), and positive rotation of the rotary drive (rotary drilling of the drilling tool) will be achieved.
- (3) If you want the rotary drive to rotate fast to increase the drilling tool's drilling speed, carry out the abovementioned operation, and press button I on the top of the joystick at the same time.



Fig. 5-8 Control switch of the rotary drive

5.6.2 Reverse rotation

The operation is similar to that of 5.6.1, but the operation direction of pilot joystick No. 1 in Fig. 4-6 is opposite (pull the joystick outward).

Every time a drilling operation is finished and the main winch should be elevated, **the rotary drive must be reversed for 2 to 5 circles** to make it easier to pull out the drilling tool and prevent the mast from dropping. In particular, the interlocking Kelly bar needs to reverse more circles.

Operation

5.7 Pull-down cylinder

If the drilling rig runs into a hard layer and the Kelly bar and drilling tool are not able to drill with their own gravity, then a pull-down cylinder is necessary to increase the drilling speed. The detailed operation process is given as follows:

5.7.1 Extension

- (1) When the rotary drive drives the kelly bar normally, turn switch No. 3 in Fig. 4-4 to the "Pull-down" position (see Fig. 5-9).
- (2) Operate the pilot joystick of the right operation box forward (see No. 1 in Fig. 4-6), and then the pull-down cylinder can be extended (to press the rotary drive down). If an interlocking kelly bar is used, during the extension of the cylinder, the internal-teeth insert plate of the rotary drive will come into the boosting groove of the kelly bar automatically from a proper position. Then the pull-down will be more effective.



Fig. 5-9 Control switch of the pull-down cylinder

- (3) If you want the piston rod of this cylinder to extend quickly, carry out the abovementioned operation and press down button J on the top of the joystick at the same time.

5.7.2 Retraction

Stop the rotary drive and reverse it properly. The retraction operation process is similar to that of 5.7.1, but the operation direction of pilot joystick No. 1 in Fig. 4-6 is opposite (pull this joystick backward). If an interlocking kelly bar is used, in order to retract the cylinder, stop the rotary drive and make it reverse before the operation. Make sure the rotary drive's pull-down button is completely pulled out of the boosting groove of the kelly bar.

5.8 Elevating / Lowering the Auxiliary Winch

- (1) Turn No. 10 in Fig. 4-4 to the "Auxiliary winch" position.
- (2) Pull the pilot joystick (see No. 2 in Fig. 4-5) of the left operation box forward, and the auxiliary winch's steel wire rope can be released.
- (3) Operate this pilot joystick backward and the auxiliary winch's steel wire rope can be elevated.

Operation

5.9 Drilling Tool

5.9.1 Opening the gate

- (1) During construction, when the bucket (drilling tool) full of muck is elevated to the ground, sufficient dumping space should be left between the bottom of the drilling tool and the ground.
- (2) The slewing platform is turned to the expected dumping position (usually on the right side of the drilling rig).
- (3) Operate the pull-down cylinder to extend it downward, and bring the bumping body at the bottom of the rotary drive into contact with the opening mechanism at the bucket bottom (act slowly when they are in contact and prohibit violent strikes). Operation continues, and the extension gate of the cylinder's piston rod will be opened. Then dumping can be carried out.

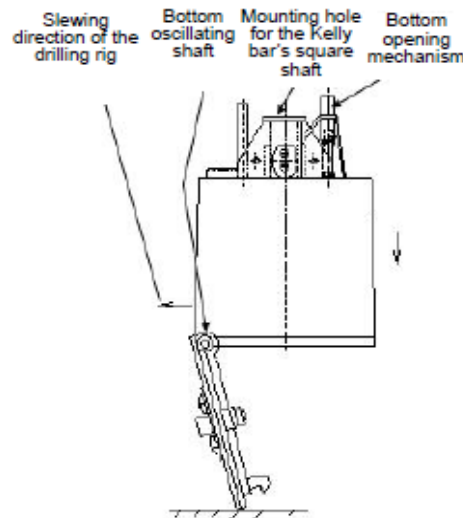


Fig. 5-10 Diagram of opening/closing the sand drilling tool (drilling tool)

5.9.2 Closing the gate

- (1) When the muck in the bucket is evacuated, lower the main winch immediately and operate the slewing platform to turn it to a suitable position until the lowest part at the bucket bottom comes into contact with the ground (see Fig. 5-10).
- (2) Rotate the rotary drive and keep the drilling tool's bottom oscillating shaft at the front side of the slewing platform's rotation direction (refer to Fig. 5-10). Then lower the main winch and rotate the slewing platform slowly.
- (3) Once the bucket bottom becomes parallel to the ground, stop operating the slewing platform and continue to release the rope. Then, the bucket bottom can be closed due to the gravity of the kelly bar and the drilling tool. If the bucket gate still has difficulty in closing after fine adjustment of the main winch's elevating and lowering distances repeatedly, remove the redundant muck on the bucket bottom timely or check the abrasion of its locking mechanism.

Operation

5.10 Transferring borehole site'

Once the rotary drilling operation of one borehole for pouring pile is finished, the drilling rig should be transferred to the next site to repeat this operation. The transferring operation of drilling rig between different borehole sites is frequent, too.

- (1) Check whether the emergency stopping button is reliable.
- (2) Adjust the kelly bar center to the maximum allowable dimension in operation state (maximum derricking state); set the rotary drive and drilling tool at the lowest position.
- (3) Make the mast lean back at an angle of about 30°, and then draw back the drilling rig to a proper position (see Fig. 5-11).
- (4) According to the operation process of "5.1 Chassis", adjust the position of drilling tool and the chassis properly, and then the transferring of drilling rig between borehole sites and preparation for new borehole operation can be achieved.

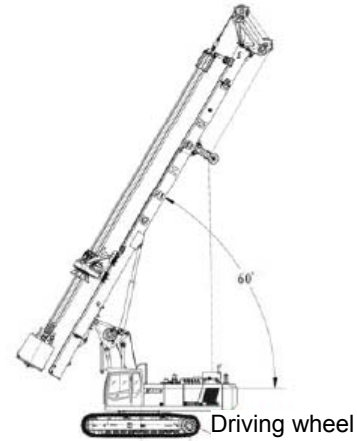


Fig. 5-11 Reference diagram of drilling rig postures during borehole site transfer

The whole operation process should be carried out slowly and orderly. Observe carefully and assume unified command.



Warning

Notice!

- (1) Since the operator's view is limited, he/she cannot see everything outside. There must be a signalman who cooperates with the operator to move the equipment on the work site.
- (2) The route and site for moving equipment should be free and unimpeded.
- (3) The site should be level and solid. Soft places should be covered by some hard materials such as wood.
- (4) It is forbidden to drive or turn the drilling rig laterally on any slope.
- (5) When the drilling rig passes a road section with slopes head-on ($\text{slope} \leq 15^\circ$), the mast should be retracted as in transportation state.
- (6) During the whole transferring operation of the drilling rig, the slewing platform is not allowed to be slewed; sudden starting and sudden stopping should be avoided.

Display Operation

6 Display Operation

6.1 Home Page



- "Depth zero": Where the drill approaches the borehole, press this button, and "Confirmation interface" will pop up. Press "OK", and the "Depth of pore forming", "Drill depth" and "Single feed" will be all zeroed. The depth sensor will calculate three depth values based on the position of the bit at this moment.
- "Slew zero": Press this button, and the "Confirmation interface" will pop up. Press "OK", and the pointer on "Rig slewing" meter will be reset to 0, as shown in the figure above. When the rig is slewing, the pointer will indicate the slewing angle of the rig.
- "Warning" and "Fault inquiry": In the case of any specific abnormality of the rig, for example, hydraulic oil temperature over 80°C, low engine water level, failure of tilting cylinder handle, the display will remind the operator in the form of warning sound, with the number of faulted points shown on right upper corner of the screen. Press "Warning", and the warning sound will disappear; press "Fault inquiry", and the warning inquiry page will be shown.
- "Parameter setting": Press this button, and the screen will change to the parameter setting password page. To enter this page, enter the password "331122". It is not recommended to modify the internal setting except where it is necessary to calibrate the perpendicularity, depth, slewing angle and oil level.
- "Mast action": Where it is required to adjust the mast perpendicularity, press this button, and the screen will change to the mast perpendicularity adjustment page.
- "Idle enable": Press the right "Idle enable" button, and "Idle enable" will change from grey into green. At this moment, the idling function is activated.
- When pressing ">>>", the screen will shift to the instrument display page.

Display Operation

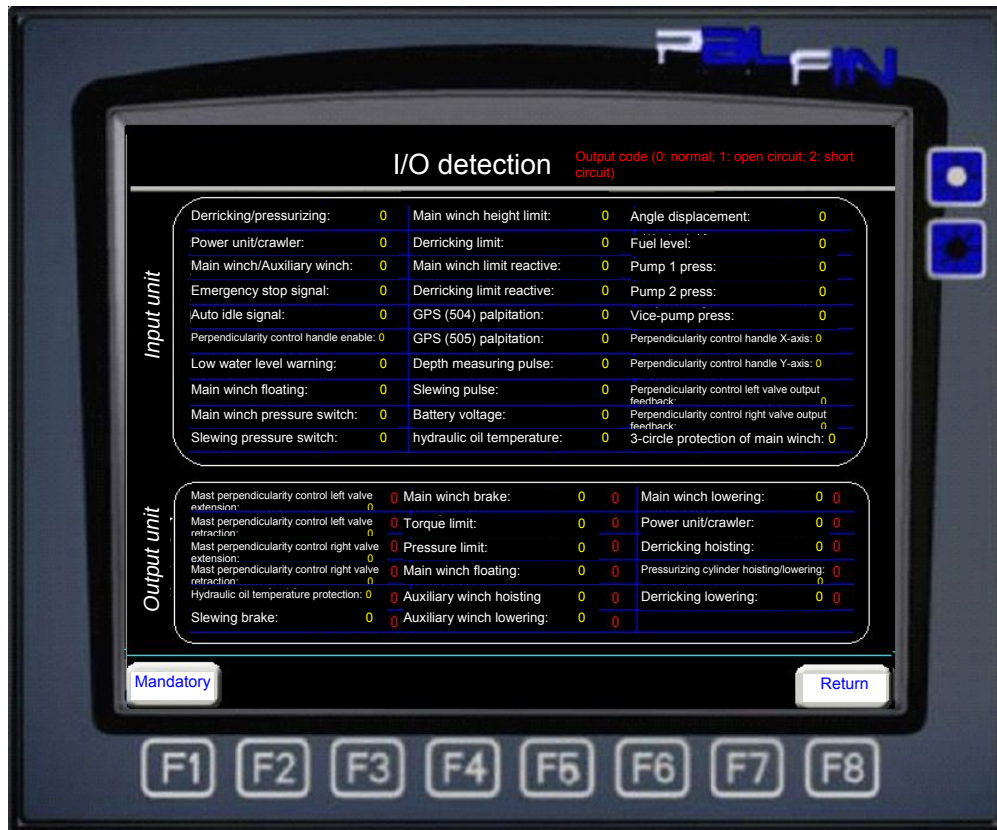
6.2 Fault inquiry page



This page covers a dozen of faults, such as GPS communication fault, to perform the inspection against the rig system based on the above-mentioned description.

- "I/O testing": In the case of any fault, press this button, and enter "PLG Input & Output Terminal Testing" page to perform quick and effective inspection based on indications.
- "QD decoding": If the fault code "00", "02" or "03" appears and continues, to avoid influencing the normal construction, the provisional work password will be provided by this rig. Press "QD decoding" key, and enter into the QD decoding page. Please contact the relevant technician for guidance. Where the client fails to solve this problem due to the arrearage, this company will lock the rig. In such a case, the fault code "01" will be shown on the display and "GPS lock" shown after the power supply is interrupted.

6.3 PLC input & output terminal testing page



- This page is divided into “Input unit” and “Output unit”. The values contained on this page are directly collected by PLC, used to quickly find and eliminate the fault. In the case of doubt, consult the relevant technician.
- On this page, the operation of tilting cylinder handle will be invalidated. Press “Mandatory” key, and the operation of tilting cylinder handle will be validated. At this moment, values of “Perpendicularity control handle x-axis” and “Perpendicularity control handle Y-axis” will vary with the handle action. “Mast perpendicularity control left valve extension”, “Mast perpendicularity control right valve extension”, “Mast perpendicularity control left valve retraction”, “Mast perpendicularity control right valve retraction”, “Perpendicularity control left valve output feedback” and “Perpendicularity control right valve output feedback” are generated with the handle. The fault can be identified depending on the value changes.

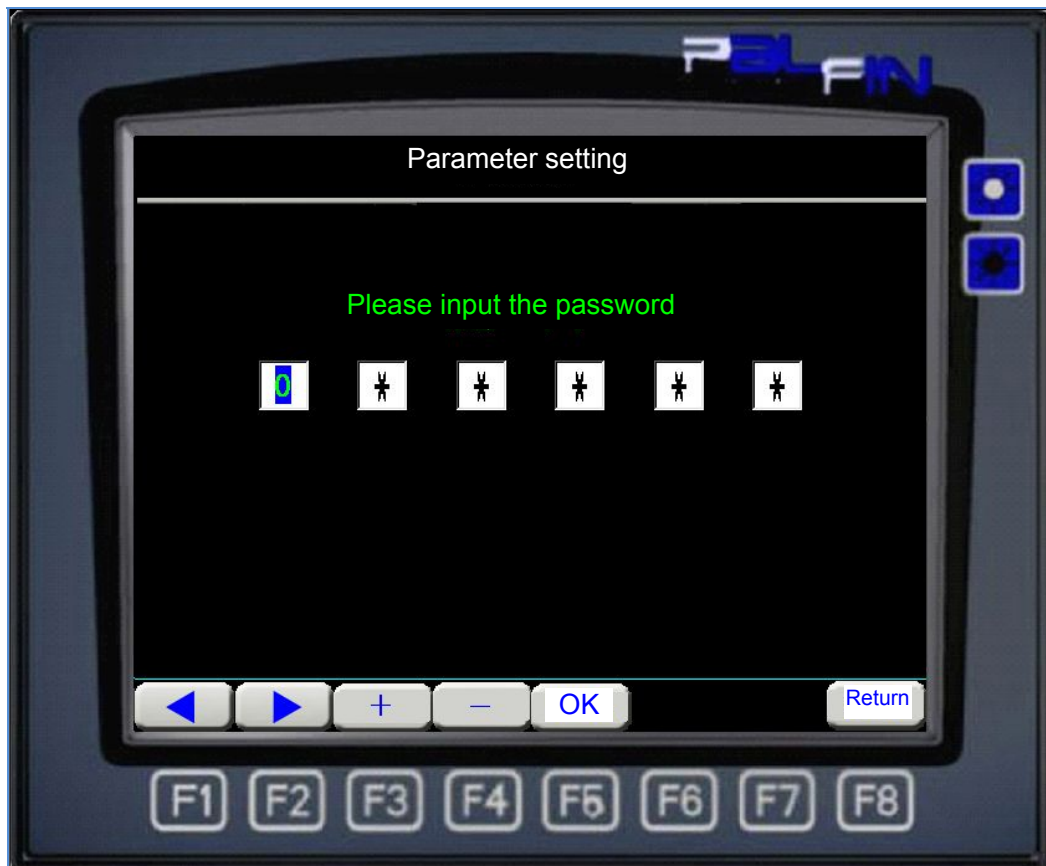
6.4 QD decoding page

During operation, where the rig works in the area with poor mobile telecommunication signals or the display indicates “02” or “03” warning, please fulfill following steps.

- Enter this page, and QD decoding value will appear on the left lower corner. Report this value to the technician, and a provisional decoding number will be obtained. Enter this decoding number, and after confirmation, the relevant prompt will pop up. After the successful decoding, turn off the key switch 5 minutes later. Thus, the decoding work is finished.

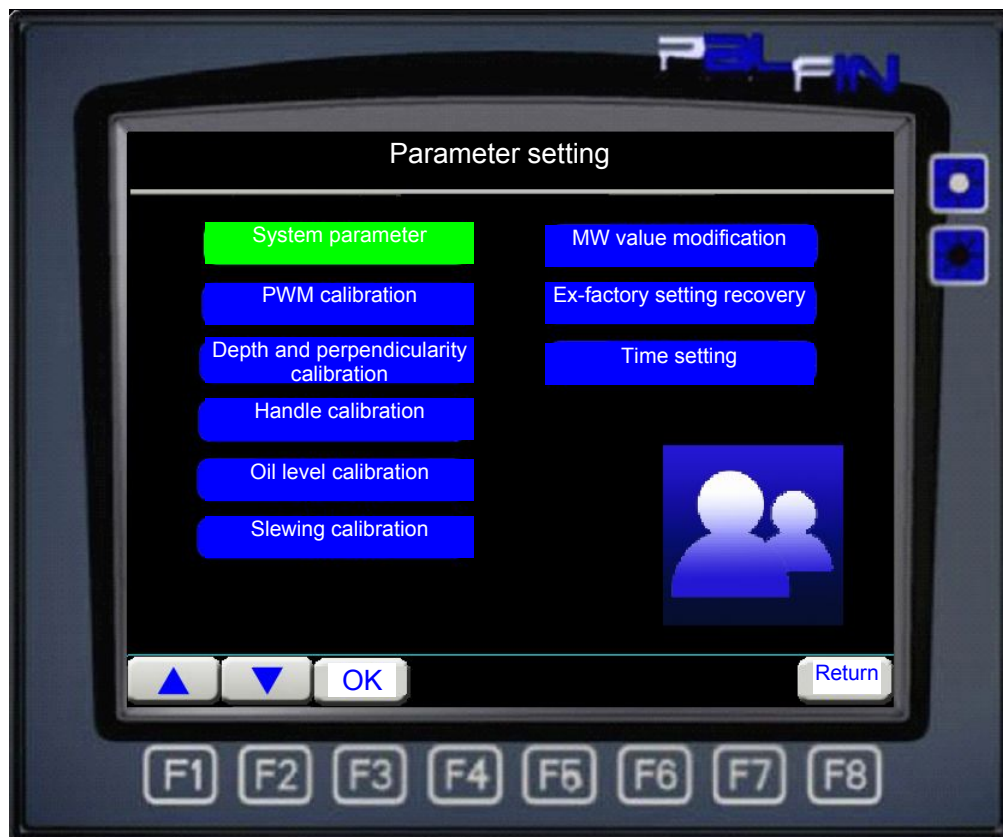


6.5 Parameter setting password page



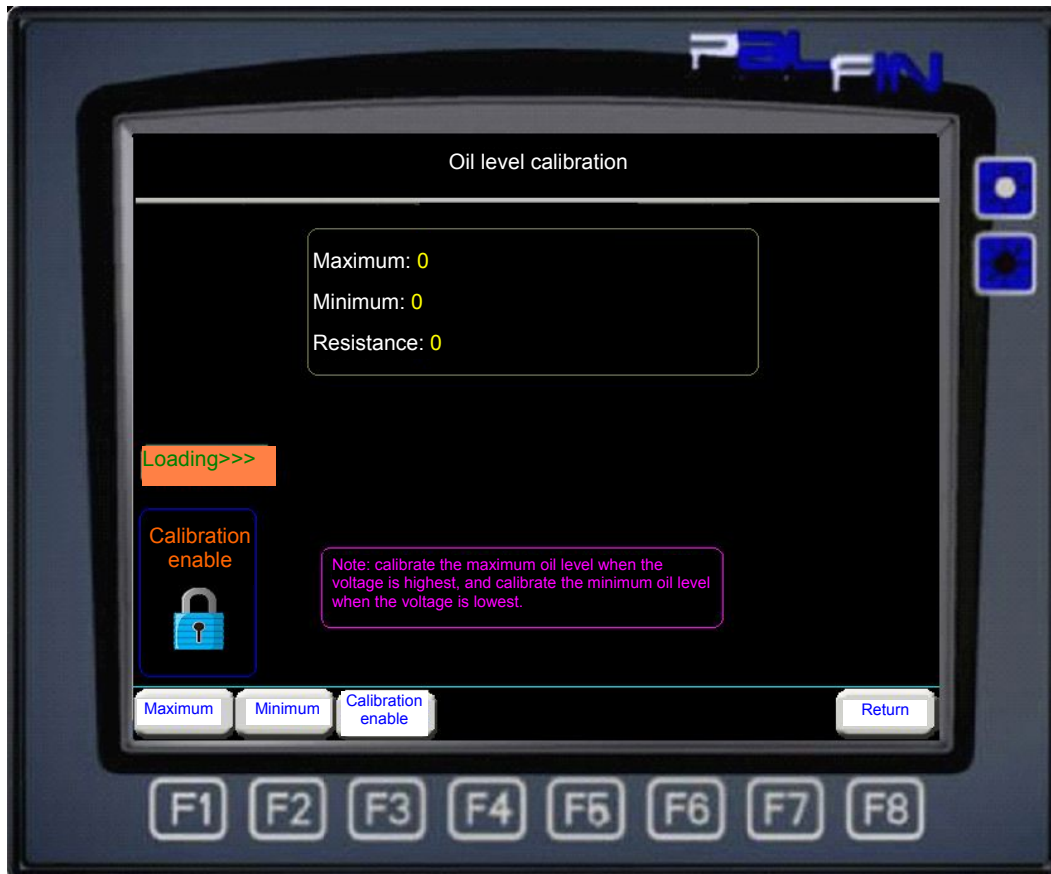
- a) Input the password 331122, and enter the parameter setting page.

6.6 Parameter setting page



- "System parameter": Press this key and enter the system parameter setting page. It is not recommended to modify these values without approval, but such values shall be modified under the guidance of relevant technicians.
- "PWM calibration": Press this button, and enter the PWM output calibration page. It is not recommended to modify these values without approval, but such values shall be modified under the guidance of relevant technicians.
- "Depth and perpendicularity calibration": Press this key and enter the depth and perpendicularity calibration page. The operation method will be further described on the depth calibration page.
- "Handle calibration": Press this key, and enter the depth and perpendicularity calibration page. The operation method will be further described on the depth calibration page.
- "Oil level calibration": Press this key, and enter the depth and perpendicularity calibration page. The operation method will be further described on the depth calibration page.
- "Slewing calibration": Press this key, and enter the depth and perpendicularity calibration page. The operation method will be further described on the depth calibration page.
- "MW value modification", "Ex-factory setting recovery" and "time setting": These parameters have been set at the delivery; if any adjustment is required, please do it under the guidance of the relevant technician.

6.7 Oil level calibration page



- a) If it is necessary to calibrate the oil level sensor, carefully remove the oil level sensor, connect the single line, move the oil float, and you will see that the “resistance value” varies as the float moves up and down. If the resistance reaches its maximum value, press “Calibration enable”, and then press “Minimum”. If the resistance reaches its minimum value, press “Calibration enable”, and then press “Maximum”.

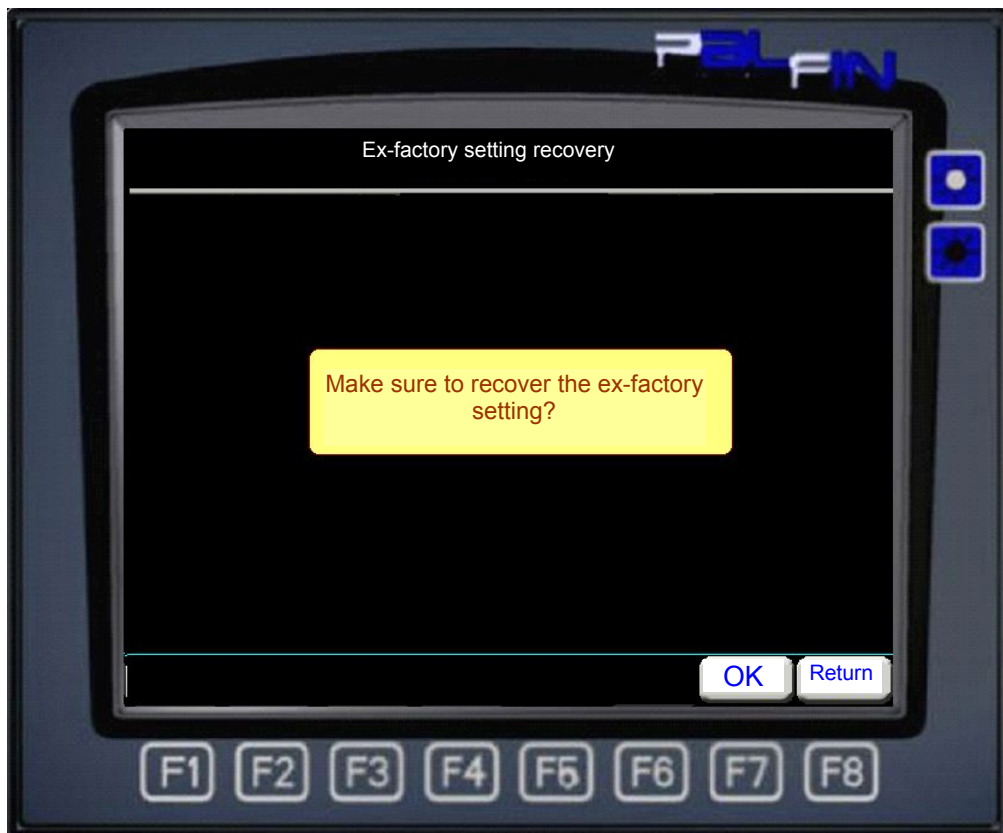
6.8 Slewing calibration page

- a) If it is required to calibrate the slewing operation, fulfill the slewing calibration in accordance with the prompts on the slewing calibration page.

Display Operation

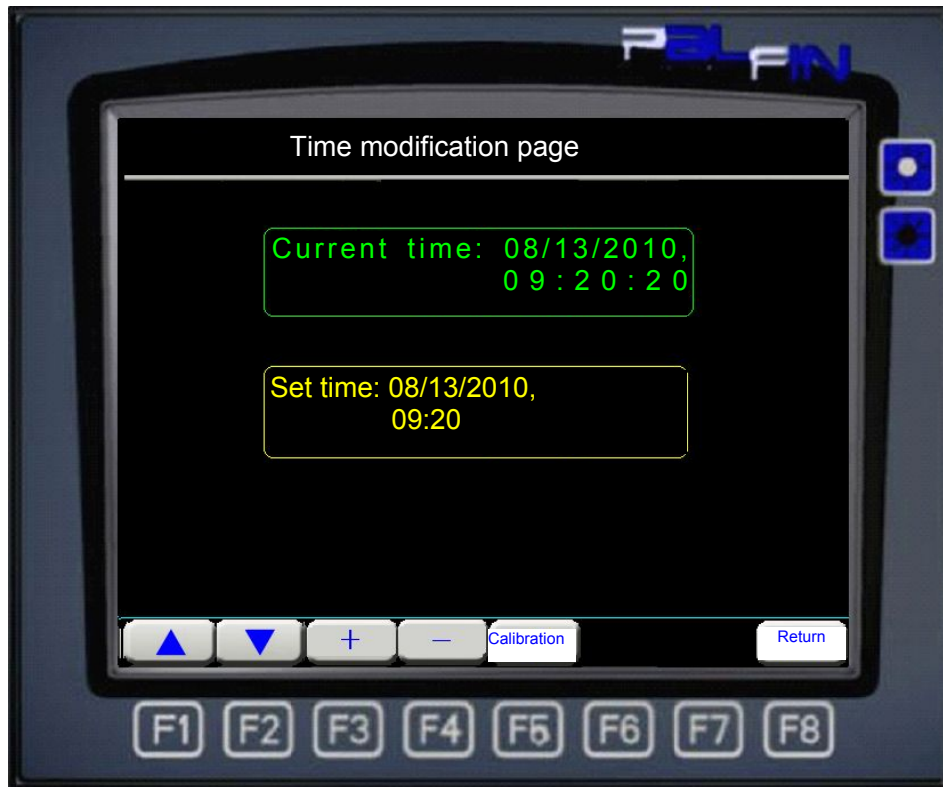


6.9 Ex-factory setting recovery page



- a) Press "OK" key, and "Reading>>>" will be shown on the picture. After the reading by controller is finished, press "Return". The program has been commissioned at the delivery. Please use this function cautiously.

6.10 Time modification page

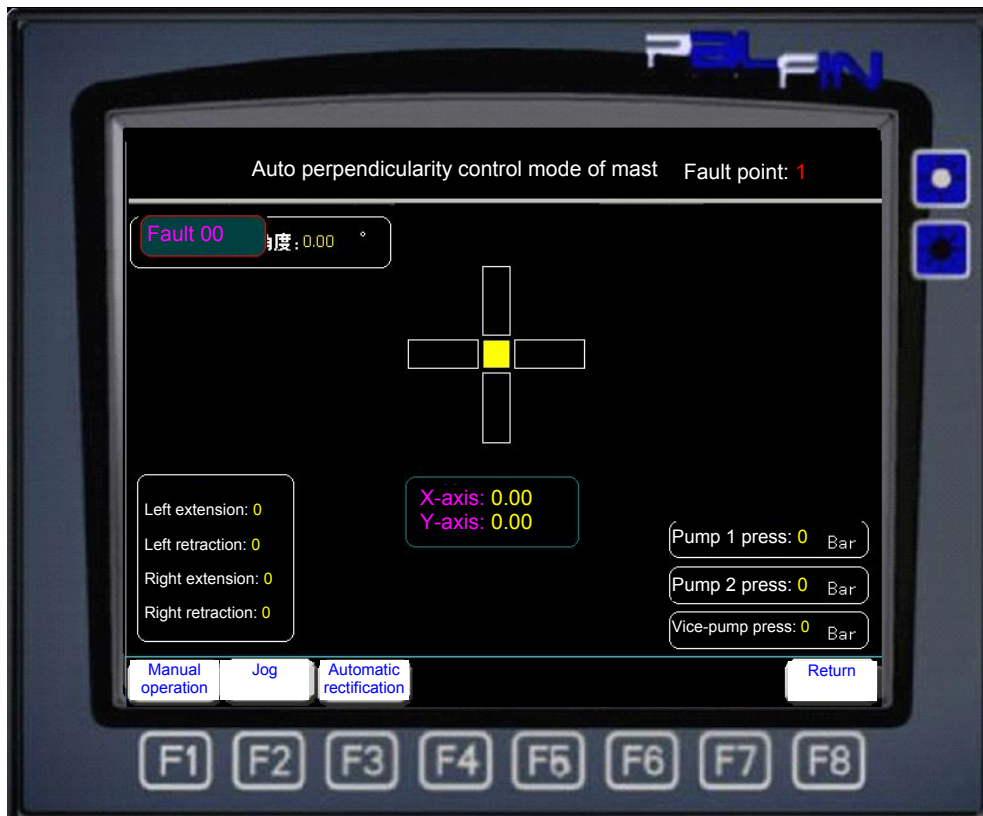


- a) Where the time error occurs, enter this page to set the system time. Move the cursor via ▲, ▼ and change the value via “+ -”. After the time adjustment is finished, press “Calibration”.

6.11 Mast manual operation page

- a) Where it is necessary to adjust the mast, the operation of perpendicularity control handle will be only validated on this page; otherwise the tilting cylinder will not act.
- b) Where the mast is adjusted to be close to the X axis and Y axis zero point, press “Jog”, and enter into the jogging mode. The micro adjustment of the mast is realized via “Front, rear, left and right” in the display. If the distance of mast angle from 0° is lower than 3°, it is permitted to press “Auto perpendicularity control”, and the controller will adjust the mast according to the data of inclination sensor till the zero point is reached.
- c) To raise and lower the mast, press “Automatic rectification”, and the controller will automatically move the mast toward X-axis zero point; at this moment, the mast will be raised or lowered by operating the handle Y-axis.

Display Operation



6.12 Instrument display page



On this page, “Derricking/pressurizing”, “Power unit/crawler”, “Main winch/Auxiliary winch” changeover will be indicated at this moment, in addition to the indication of fuel level, hydraulic oil temperature, cooling water temperature and engine oil pressure from time to time. “Pressure limitation cancellation”,



Display Operation

“Torque limitation cancellation” and “3-circle protection cancellation” are introduced below. Upon being pressed and with the power uninterrupted, these functions will remain valid.

- a) “Pressure limitation cancellation”: To protect the drilling equipment, where the depth exceeds 30m, the pressure of pressurizing cylinder will be limited; at this moment, press this button, and the limitation will be cancelled.
- b) “Torque limitation cancellation”: To protect the drilling equipment, where the depth exceeds 30m, the power of the power unit will be limited; at this moment, press this button, and the limitation will be cancelled.
- c) “3-circle protection cancellation” To avoid possible dangers due to the over-unwinding of the main winch steel wire rope, the main winch lowering action will be limited. If the 3-circle protection signal is triggered, the main winch can't be unwound; at this moment, the main winch unwinding limitation will be cancelled. Please use this function cautiously.

Precautions

- Ensure GPS antenna and other connecting wires are intact; otherwise, the vehicle can be locked due to GPS fault, which will affect the operation.
- The wiring of controller can only be conducted in the power-off situation.
- Keep far enough from the radio emitter.
- The lead must not be placed close to the power line.
- Multiple electromagnet of the drive should have multiple ground wires.
- Do not connect the lead of a ratio electromagnet to diodes.
- All plugs of the controller should be unplugged when the machine is undergoing electrical welding.

7 Startup and Shutdown

7.1 Startup

7.1.1 Initial startup

The initial startup of the equipment needs the common concerns of the manufacturer and the user. It needs the manufacturer's experience in practical on-site operation and requires the manufacturer to offer training. Before the drilling rig's first operation, the equipment operators must read through the **Instructions for Use** and get familiar with the functions of all the control joysticks and buttons, as well as the motion ranges and characteristics of the operating parts.

7.1.2 Regular Inspection

An overall regular inspection must be conducted before operating the equipment:

- Check whether any bolt, nut or hinge pin of the complete machine is loose or has dropped.
- Check whether the bolts of all protecting shields are loose or have dropped.
- Check whether the hydraulic oil or fuel oil leaks.
- Check whether the hydraulic oil level, fuel oil level, oil level in rotary drive box and in all reducers are at the required positions.

7.1.3 Daily startup operation



Caution

Equipment may be damaged!

Operate the equipment according to the instructions!

The engine may be damaged!

It is allowed to pre-heat the engine in idling for about 3-10 minutes (the preheating time is slightly longer in winter, but it should not exceed 30 minutes)!

- Switch on the power.
- Pull the dead-man's joystick to the horizontal position (Fig. 2-2).
- Pull out the emergency stopping button (Fig. 2-1).
- Press the horn button (knob B in Fig. 4-5) to sound the warning alarm, so as to make sure no unauthorized people stays at or near the equipment.
- Insert the startup key and turn it to the "ON" position (No. 3 in Fig. 4-4). The indication lamp of the main machine will flash.
- Put all the hydraulic joysticks at the "Neutral" position
- Turn the startup key to the "Start" position to start the engine.
- If the ambient temperature is too low, pre-heat the engine and hydraulic oil properly.
- Adjust the engine's rotation speed and check whether its operation is steady and normal.
- When the engine is working, shut all the machine shed doors.

7.1.4 Safety inspection before operating the equipment



Warning

Seriously dangerous accidents may be caused!

Before the operation begins, all the safety devices must be commissioned. All problems (if any) detected must be repaired in time. Only when all the safety devices work normally can the operation begin.

When the engine is working:

Check the emergency stopping function

Press the emergency stopping button (Fig. 2-1).

All the control functions are ineffective and the engine stops.

Check the dead-man's joystick

Push the dead-man's joystick (Fig. 2-2) to the vertical position.

All the hydraulic actions are stopped. The engine works normally.

Check the winch height limit

Check the main winch

Elevate the kelly bar slowly. When the kelly bar bracket contacts the limit switch, the main winch should stop elevation immediately.

7.2 Shutdown

When the equipment needs repairing or is to be put away, please shut down the equipment according to the following rules:

- Place the equipment on a solid horizontal plane.
- The mast is vertical.
- The drilling tools are at the lowest position. Put the suspended loads on ground.
- Adjust the superstructure and align it with the crawler.
- Lower the rotary drive to the lowest position.
- All the control buttons and brakes are at the closed position.
- Pull the dead-man's joystick down to the vertical position.
- Stop the engine and pull out the startup key.
- Switch off the power main switch.
- Lock the door and window of the cab.



Caution

The engine may be damaged when it is being shut down!

If the engine has run at high speed for some time, let it run at idle speed for about 5 minutes before shutting it down, so as to make sure the precisely fitted parts of the high-speed components can cool down properly.

8. Installation and Removal

8.1 Installation

When installing or removing (disassembling) the relative parts of rotary drilling rig, the rotary drilling rig should be parked on the **spacious, solid and ground, ensuring the safety of operation. During the operation period, it must be guaranteed that the longitudinal planes of turntable and chassis should coincide!**

Warning:

1. Participants should have the skills of controlling the rotary drilling rig and be familiar with the use and functions of parts.
2. When the mast is connected, the size of site should be not less than 22x8 m² and the site should be away from high-voltage power lines (cables).
3. It is optimum that three people participate in the operation, with at least one person familiar with the use and operation of equipment. This person should in charge of commanding.
4. If you operate the rotary drilling rig for the first time, you should fully read the manual and understand the functions of operating handles and buttons. You should fully grasp the functions of device before the operation.
5. The necessary spreader should be used to handle and move the relative parts.

8.1.1 Installation (connection) of Mast

Attention! First, ensure that the track has been extended to maximum width.

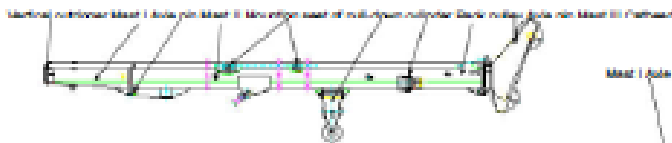


Fig. 8-1 Mast assembly without the kelly bar

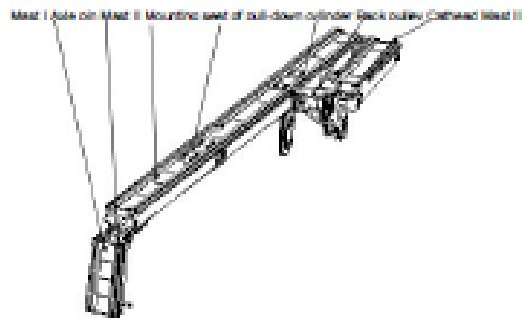


Fig. 8-2 Mast assembly

Installation and Removal

Under the non-transportation state, XR280D rotary drilling rig's mast assembly is in a structure of straight line (see Fig. 8-1), and in the folded state as shown in Fig. 8-2 during the transportation, still maintaining a connection with the slewing platform of host. When the rotary drilling rig arrives the destination, leaves the hauling vehicle and enters the construction site, first connect (install) the mast as the following steps:

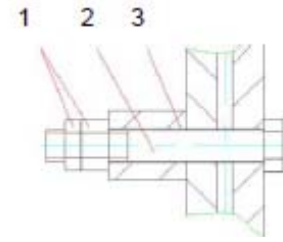


Fig.8-3 Connecting bolts of mast end panel
1.Fastening nut 2.bolt 3.Buffer sleeve

- ① Remove the fixing bolts of transport support between the masts II and III and push the cathead and mast III to rotate around the hinged axis pin between two masts counterclockwise for 165° . Make the machining planes of end panels of two masts (II and III) contact. Install and tighten the connecting bolts between the end panels (tighten them in two steps, with the torques respectively as 480 and 600 N.m). The tightening torque of locknut (thin nut) is 480 N.m, and the threads should be applied with a proper amount of glue.
- ② Use the necessary tools or equipment to support the cathead assembly, remove the connection rod between the cathead and mast III raise and make the bottom plate of cathead assembly fit with the end panel of mast III and install the connecting bolts between the plates. Install the connection screws between two plates. The tightening parameters and treatment method should be carried according to the requirements of ①

Cab handrail Tilt control handle A/C switch



Fig.8-4 Control handle of mast lifting cylinder (mast) and A/C switch

- ③ Erecting (lifting) the head and masts II and III

When the engine starts and runs normally, the instrumentation and electrical elements display normally. Clockwise rotate the front outside safety handle of left operation box to the level position (see Fig. 2-2), press the horn switch at the lower part of control panel, and operate the "Tilt" handle at Fig. 8-4 after the whistle. Push the handle forward to lift the mast II and pull the handle backward to descend the mast II. Manipulate the handle to the left and right to change the tilt angles of mast. You should concentrate on the operation, and pay attention to the signals from the command staff.

Rotary drive Caterpillar Switch of pull-down and derricking



Fig.8-5 Switch of pull-down cylinder on the control panel

Control handle of pull-down cylinder Fast pull-down button



Fig.8-6 Pull-down cylinder and quick button

④ Connecting the masts I and II

When the front end faces of the guide rails of masts I and II coincide, slow the lifting of mast II, avoiding the impact load caused by the collision of contacting end faces and even the damage of parts. Install the connecting bolts between the end panels of masts I and II. The tightening parameters and treatment method of threads should be consistent with the requirements of ①

⑤ Removing the tie rod between the mast I and triangular bracket

Adjust the front and rear dip angles of mast assembly to remove the external load at the tie rod between the mast I and triangular bracket. Pull out the connecting axle pin between the mast I and tie rod.

⑥ Operating the crowd cylinder

- a First, turn the "Pull-down and Derricking" switch knob on the control panel to the "Pull-down" position (see Fig. 8-5).
- b Operate the pilot handle of right control box handle forwards and backwards to control the telescopic operation of the crowd cylinder of rotary drive.
- c If you want to increase the telescopic speed of crowd cylinder at this time, while operating the handle, press down the "Fast" button on the top of handle (see Fig. 8-6).

⑦ Connecting the rotary drive bracket and the piston rod of crowd cylinder

Continue extending operation for the crowd cylinder. When the piston rod head gets close to the top lug of rotary drive bracket, timely adjust the direction of piston rod hole (3) in the Fig. 8-7 to ensure that its head can successfully enter into the inner crotch of lug. Slowly adjust the concentricity of piston rod head hole and lug hole. Insert the connecting axle pin (2) and lock it.

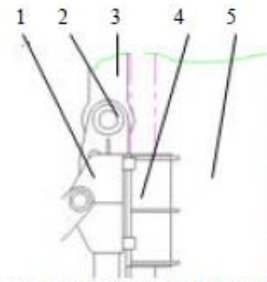


Fig. 8-7 Connection between the pull-down cylinder and rotary drive mounting

1. Rotary drive mounting 2 Connecting axle pin 3 Piston rod of pull-down cylinder 4 Nylon shoe assembly of mounting 5 Mast I

8.1.2 Installing the Steel Wire Rope

8.1.2.1 Steel Wire Rope of Main Winch

The installation steps are as follows:

- ① Operate the "Tilt" handle in the Fig. 8-4 to make the mast assembly level and place the lower end face on the bracket of mast.
- ② According to the direction of arrow shown in Fig.8-8, insert the free end of steel wire rope (not pressed or equipped with rope clip), from the top inner crotch of cathead bracket, along the main winch pulley groove and across the other pulley, and finally into the back pulley. When getting it through the pulley groove, pay attention to avoiding the limit pins in the vicinity of steel wire rope to ensure that the steel wire rope always fits with the pulley groove during the operation.
- ③ Relax the compression spring of main winch rope to ensure that the rope can pass through the gap between the rope holder and drum.
- ④ Continue pulling the rope along the pulley groove; until the free end gets through the wall hole from the inside of mounting flange of drum on the pressure plate (see Fig. 8-9). Install the pressure plate 3 and bolt 2, and tighten two bolts at the same central angle clockwise/anticlockwise. Tighten it in two steps, with the torques of 160 and 260 N.m respectively. Apply 262 Loctite sealant at the thread.
- ⑤ Adjust the tension of compression spring of main winch rope to keep the pressing force on the rope body within a reasonable range.
- ⑥ Turn the "Main Service Winch" switch on the control panel to the "Main Winch" position (see Fig. 8-10). Push the pilot handle of left control box to drive the main winch to rotate along the retraction direction (winding direction of rope). At this point, observe the inlet angle, position and rotary speed to prevent the disorder, until the winding circles of rope is consistent with the requirement.

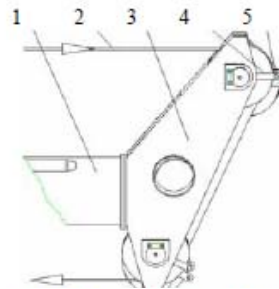


Fig. 8-8 Sequence for free end of rope getting through cathead nylon shoe

1. Mast 2. Rope 3. Cathead bracket
4. Nylon shoe 5. Limit pin

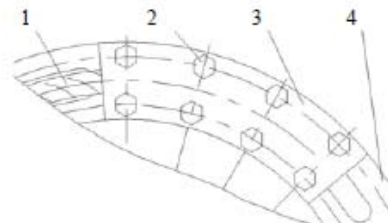


Fig. 8-9 Fixing for the free end of rope

1. Rope 2. Fastening bolt
3. Pressure plate 4. Drum



Fig. 8-10 Operation of main winch



Fig. 8-11 Operation of service winch

8.1.2.2 Service Winch Rope

The installing process and methods are basically same with the main winch rope. Make the mast assembly level, and turn the "Main Service Winch" switch on the control panel to the "Service Winch" position (see Fig. 8-11). The rope is across the service winch pulley on the cathead and the service winch back pulley under the mast. When fixing its free end on the outer end face of service winch drum, the two tightening torques for fastening screws of pressure plate twice are respectively 60 and 95 N.m. The other requirements are the same with ones in step ④ of step 8.1.2.1 for installing the main winch rope.

8.1.3 Installing the Slewing Tie-in (Elevator)

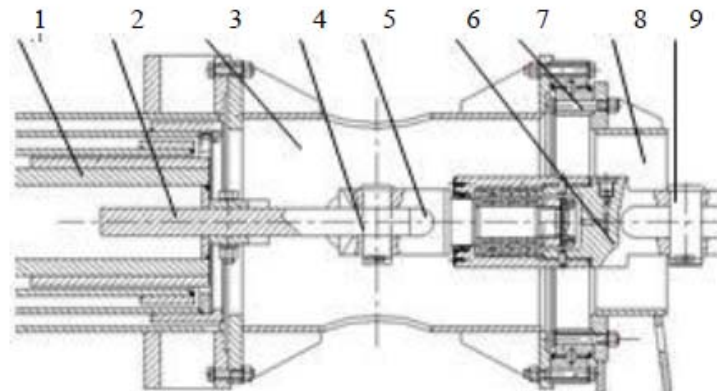


Fig.8-12 Placement of Kelly bar to be installed

1. Telescopic Kelly bar 2.Traction lug of Kelly bar 3.Sleeve of Kelly bar 4.Axle pin I
5. Elevator rotary body 6.Fixture of elevator 7.Slewing bearing 8.Mounting 9. Axle pin II

The installing steps are as follows:

- ① Install the parts No.1 and No.3 in Fig. 8-12, and keep the direction of hole (2) compatible with the position of observe hole (3).
- ② Two guides of Kelly bar bracket are supported on the ground. The hole (2) and observe hole (3) in Fig. 8-12 are at the horizontal direction.
- ③ Connect the rotary body of elevator (No.5 in Fig. 8-12) and Kelly bar traction lug with axle pin I. Lock the axle pin I (4) with a locking pin.
- ④ Notice! Both ends of elevator shall not be reversed! Otherwise, it will lead to the premature damage to the elevator!

Maintain the hole of elevator fixture level. When connecting the steel wire rope, assemble and fix the axle pin II (9).

8.1.4 Installing the Kelly Bar

Notice! Choose a firm, smooth and spacious site, which shall be away from high-voltage power lines. The operating steps are as follows:

- ① Make the elevator end of kelly bar assembly toward the front of rotary drilling rig (see No.4 in Fig. 8-13), keep two guides of kelly bar (nylon shoe assembly) supported on the ground and maintain the center line for elevator connecting the rope and the traction lug of kelly bar parallel to the horizontal plane (No.3 in Fig. 8-13).
- ② Turn the "Travel Lock" switch on the control panel to the working position (ensure the supply of pressure oil to the traveling pilot valve).
- ③ Erect and adjust the verticality of mast and descend the main winch rope. The derricking mechanism is at the maximum working amplitude (the center of sleeve of rotary drive is 4800 mm away from the slewing center of platform).
- ④ Control the travel leading valve in the cab to adjust the position of rotary drilling rig, ensuring the distance of 1~1.5 m between the kelly bar elevator end and rotary drive. The vertical plane of rotary drilling rig shall coincide with the center line of kelly bar. Place the rotary drive at the lowest position. Put the ring at the end of rope into the open crotch of the elevator. Insert the axle pin (3) to connect the elevator and ring, and take the measures to prevent the falling of axle pin.
- ⑤ Tilt the mast forwards for 5°, slowly lift the main winch rope and adjust the position of rotary drilling rig and the gesture of mast, ensuring that the vertical plane of mast coincides with the center line of kelly bar. Prevent the collision between the kelly bar bracket and mast and that the guide deviates from the mast rail far away.

Notice! When lifting the rope (before the lower end of kelly bar leaves the ground), only the elevator and traction lug of kelly bar can bear the tension load. Avoid the large bending moment. If the conditions shown in the upper part of Figure 8-14 occur, immediately stop the lifting operation and make the necessary adjustments to ensure that the load meets the requirement, and then continue to lift the main winch rope.



Fig.8-13 Placement of kelly bar to be Installed

1. Guide 2. Mounting 3. Axle pin 4. Elevator

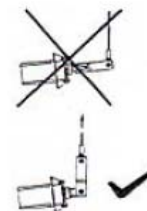


Fig.8-14 Positions of elevator and lug during the installation



Installation and Removal

- ⑥ When the lower part of kelly bar leaves the ground, pay attention to the lifting action. Prevent the collision between the lower end of Kelly bar and rotary drive, which would cause the damage of part.
- ⑦ Turn the "Height Limit Reactive" switch on the control panel to the working position.
- ⑧ The lower end face of Kelly bar exceeds the height of rotary drive shock absorber, observe the relative positions of lower guide of Kelly bar bracket and rails on both sides of mast, and control the swing amplitude of bracket. Once the lower end face of guide is higher than the top of rail, slowly reduce the forward tilt angle of mast until the front end face is vertical to the horizontal plane. When the grooves (nylon shoe) of guides on both sides of bracket definitely can stick the rail, gently descend the main winch rope to make the top of rail beyond the upper end face of guide. Further confirm if the rails and guides (nylon shoe assembly) on both sides of mast are assembled correctly.
- ⑨ Continue to descend the main winch rope. When the square shaft of kelly bar enter the inner space of shock absorber of rotary drive, observe and timely adjust the positions of outer key of kelly bar and inner key of rotary drive , ensuring the correctly installing position.

When the lower square shaft of Kelly bar exceeds the lower end face of dumping piece of rotary drive, the installation of Kelly bar comes to an end.

- ⑩ Return the "Height Limit Reactive" switch on the control panel to the non-working position.

8.1.5 Installing the Drilling Tool

The installing steps are as follows:

- ① Put the appropriate drilling tool around the rotary drilling rig and keep its drilling center line perpendicular to the ground.
- ② Properly lift the rotary drive, move the rotary drilling rig and timely adjust the positions of square shaft of kelly bar and hole of drilling tool. Put the square shaft into the hole of drilling tool.
- ③ Appropriately descend the kelly bar. When the square shaft of kelly bar and the pin hole of drilling tool reach certain coaxiality, the support staff shall insert the locking pin and take the measures to prevent the falling.

Notice! After the repeated adjustments, if the pin holes are able to be coaxial (the locking pin can not be inserted), check the actual effective depth of square hole and look for the remaining dirt and other foreign matters on the bottom. Take the necessary treatment before the installation.

8.2 Removal

8.2.1 Removing the Drilling Tool

Remove the parts of drilling tool before replacing the drilling tool or transporting the rig for a long distance during the construction. The operating steps are as follows:

- ① Clean the soil in the drilling tool, and close the bucket gate. If necessary, clean up the attachments (such as clay) on the outer wall of the bucket.
- ② Drive the rotary drilling rig to a spacious, smooth and solid site, which is away from the high-voltage cable (line). Clockwise rotate the slewing platform for 90°, descend the main winch to support the drilling tool on the ground, and ensure that steel wire rope is in a completely relaxed state. If necessary, rotate the rotary drive to properly bury bucket tooth or pack the bottom with the wood pad (ensure that the drilling tool would not hurt people after falling from the kelly bar).
- ③ Slowing lift the main winch (kelly bar) and timely adjust the height to ensure that the axle pin between the drilling tool and kelly bar is at no-load state.
- ④ Remove the stop pin on the connecting axle pin, and pull out the axle pin.
- ⑤ Continue to lift the kelly bar to make the square shaft on the bottom completely off the mounting hole of drilling tool. Anticlockwise rotate the slewing platform cab towards the front of rotary drilling rig.

8.2.2 Removing the Kelly Bar

After completion of above operation, remove the kelly bar. The steps are as follows:

- ① First, turn the "Height Limit Reactive" switch on the right front control panel to the workin position (see Fig. 8-15), and place the rotai drive to the lowest position (contacting wit the block at the bottom of mast).
- ② Pull back the left front pilot handle to slow lift the main winch rope (see Fig. 8-16). When the guide of mounting at the top of Kelly bar (nylon shoe assembly) leaves the top of mast rail, stop lifting the main winch.
- ③ Push the control handle of left rear mast (see Fig. 8-16), and slowly make the mast forward 5°. Observe if the guide of mounting leaves the mast rail, and if so, (if not, continue to slowly lift the kelly bar. Observe and pay attention to the safety), slowly descend the kelly bar until the square shaft of kelly bar touches the ground.



Fig. 8-15 Height limit reactive

- ④ After the lower end of kelly bar is supported on the ground, continue to descend the main winch rope, while returning the rotary drilling rig. Operate it slowly to prevent the fast descending of main winch, which would lead to the impact and harm, until the guide of kelly bar mounting is fully supported on the ground.



Safety and winch operation Control handle of mast

Fig.8-16 Control box and handle at the left side of seat

- ⑤ Keep the rope relax, remove the connecting pin between the rope and kelly bar elevator, and put the ring sleeve of rope into the drive sleeve of rotary drive (through the end of connecting pin). Keep the ring sleeve exposed from the lower end face of dumping piece of rotary drive.
- ⑥ Restore the vertical state of mast, lift the rotary drive to make the lower end face of dumping piece about 1.5 m away from the ground, and keep the lower end of mast touching the ground.
- ⑦ Turn the "Height Limit Reactive" switch in Fig. 8-15 to non-working position.

8.2.3 Folding the Mast

If the rotary drilling rig requires a long-distance transport, fold the mast before climbing the flatbed truck. The steps are as follows:

- ① Maintain the mast perpendicular to the ground, and connect the (transport) tie rod between the mast I and triangular bracket.
- ② Push the right front pilot handle, and extend the crowd cylinder. Put the rotary drive onto the limit block of mast I.
- ③ Appropriately adjust the extended length of pull-down cylinder rod, make sure that the connecting axle pin between the piston rod and rotary drive mounting bear no load, and remove the axle pin.
- ④ Retract the piston rod of crowd cylinder to a minimum size.
- ⑤ Remove the connecting bolts between the masts I and II, manipulate the control handle to place the masts II and III as well as cathead level, and ensure the mast correctly falls into the bracket and derricking mechanism is at the lowest position.
- ⑥ Use the necessary equipment or tools to support the cathead, remove the connecting bolts between the mast III and cathead, and properly descend the cathead.
- ⑦ Connect the connecting tie rod between the mast III and cathead; also remove the supporting tools of cathead.

Installation and Removal

- ⑧ Remove the connecting bolts between the masts II and III, and push the mast III and cathead to clockwise rotate around the hinged pin between the masts II and III for 165°. Connect the masts II and III with the transport lug and bolts.
- ⑨ Operate the main and service winches to wind the loose rope.

8.3 Retracting the Caterpillar

- ① Turn the "Rotary Drive Caterpillar" switch on the control panel to "Caterpillar" position (see Fig. 8-17).
- ② Turn the knob switch at the lower right corner of control panel to the "Caterpillar" position.



Fig. 8-17 Switch of rotary drive and caterpillar

- ③ Pull out the locking pins (totaling 4 ones, see Fig. 8-18) of left and right longitudinal beams of chassis.
- ④ Pull the right front pilot handle rightwards (see No.1 in Fig. 4-6) to retract the caterpillars on both sides (pull the handle leftwards to extend the caterpillar).
- ⑤ Insert the above locking pin into the locking hole with minimum span at the longitudinal beam, and lock the left and right longitudinal beam.

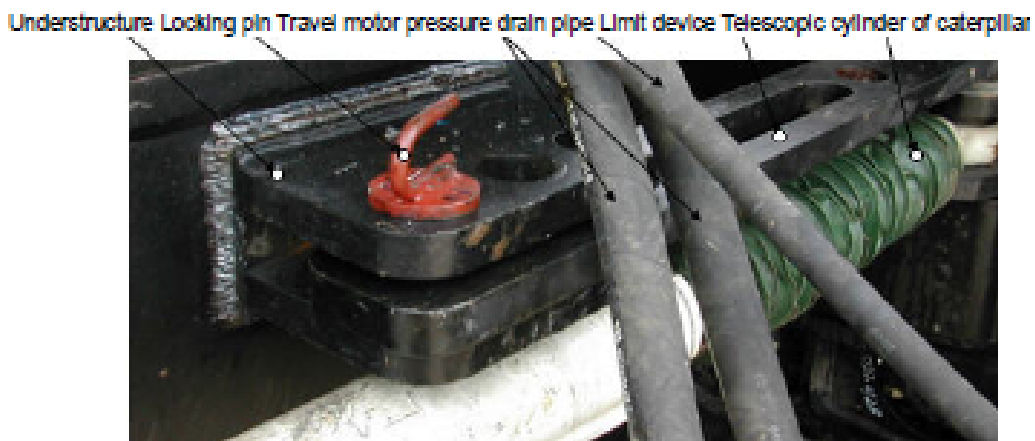


Fig.8-18 Locking mechanism of longitudinal beam

During the actual operation process, if the caterpillars on the both sides can not be retracted at the same time due to the surface roughness or if the one caterpillar is extended and the other fails, you can take the following measures:

- a. Erect the mast and adjust the derricking mechanism of rotary drilling rig to the maximum size. Slowly rotate the slewing platform to place the mast at the side of extended caterpillar, and continue to extend the caterpillar. Insert the locking pins for longitudinal beam on both sides.

If the caterpillar still can not be extended, take the following measures:

- b. Adjust the derricking mechanism to the minimum size, rotate the slewing platform to place the mast at the side of retracted caterpillar, and gradually increase the derricking size. Use the appropriate bracket to pack under the mast, and make sure that the retracted caterpillar leaves the ground. Continue the extending operation. For safety reasons, change the derricking size in two steps to fully extend the caterpillar.

If the caterpillars on both sides are not fully extended, take the following measures:



Mast Rotary drive Mast mounting Mast

Fig.8-19 Installation and removal of Kelly bar

- c. Erect the mast and adjust the derricking mechanism of rotary drilling rig to the minimum size. Slowly rotate the slewing platform to place the mast at the side of rotary drilling rig, and gradually increase its derricking size. Use the appropriate bracket to pack under the mast, ensuring that the caterpillar leaves the ground completely. Insert the locking pins of longitudinal beam. Adjust the derricking mechanism to the minimum size, and slowly place the mast to the other side of rotary drilling rig. Take the same procedures. **Notice! Pay attention to the operation. Slowly extend the caterpillar in steps! In particular, when the caterpillar gets close to the limit, prevent the caterpillar from extending suddenly, which may result in the damage of rotary drilling rig. Also be careful to retract the caterpillar according to this method!**

8.4 Retracting the Outrigger (Optional)

If the user selects the special vertical outrigger parts, the operation is as follows:

- ① Place the "Rotary Drive Caterpillar" switch on the electric control panel to the "Caterpillar" position (see Fig. 8-17).
- ② Turn the knob switch at the lower right corner of control panel (see No.2 in Fig. 4-4) to the "Outrigger" position.
- ③ Pull the pilot handle at the right control box rightwards (see NO.1 in Fig. 4-6) to retract the vertical outrigger of mast (pull the handle leftwards to extend the outrigger).

Transport

9. Transport

After the removal of kelly bar and rotary drive, you can begin preparing the equipment transport:

- Lock the superstructure slewing.
- Pull down the handle to the vertical close position.
- Turn off the engine
- Take off the ignition key and lock the doors and windows of cab.

With the necessary transfer procedures, the freight company will be responsible for the whole course of transport.

Clear message required for freight company:

- Transport size and weight
- Transport routes: starting point and destination

9.1 Transport size and Weight

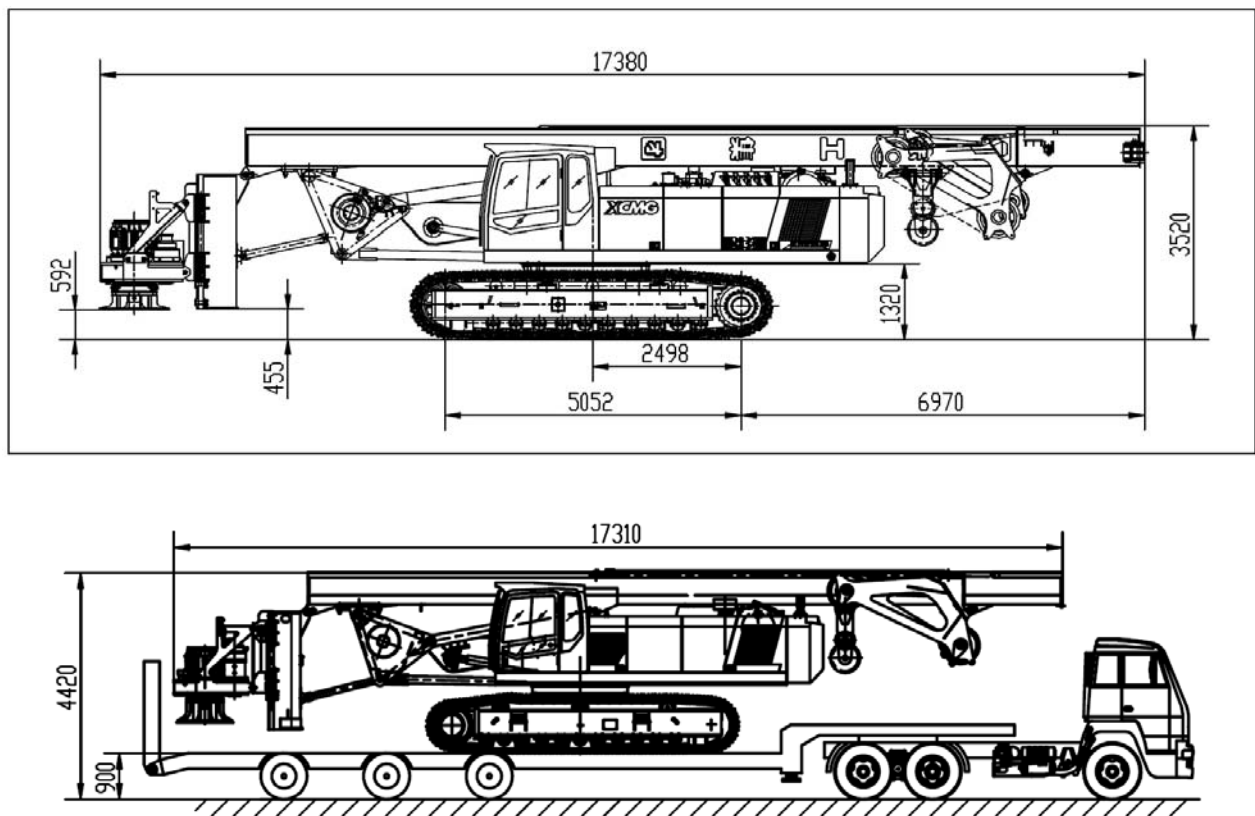


Fig. 9-1 Transport Size

Transport weight: 70t (not including the trailer, kelly bar and drilling tool)

Transport width: 3500mm

Caterpillar width: 800mm

9.2 Loading Diagram

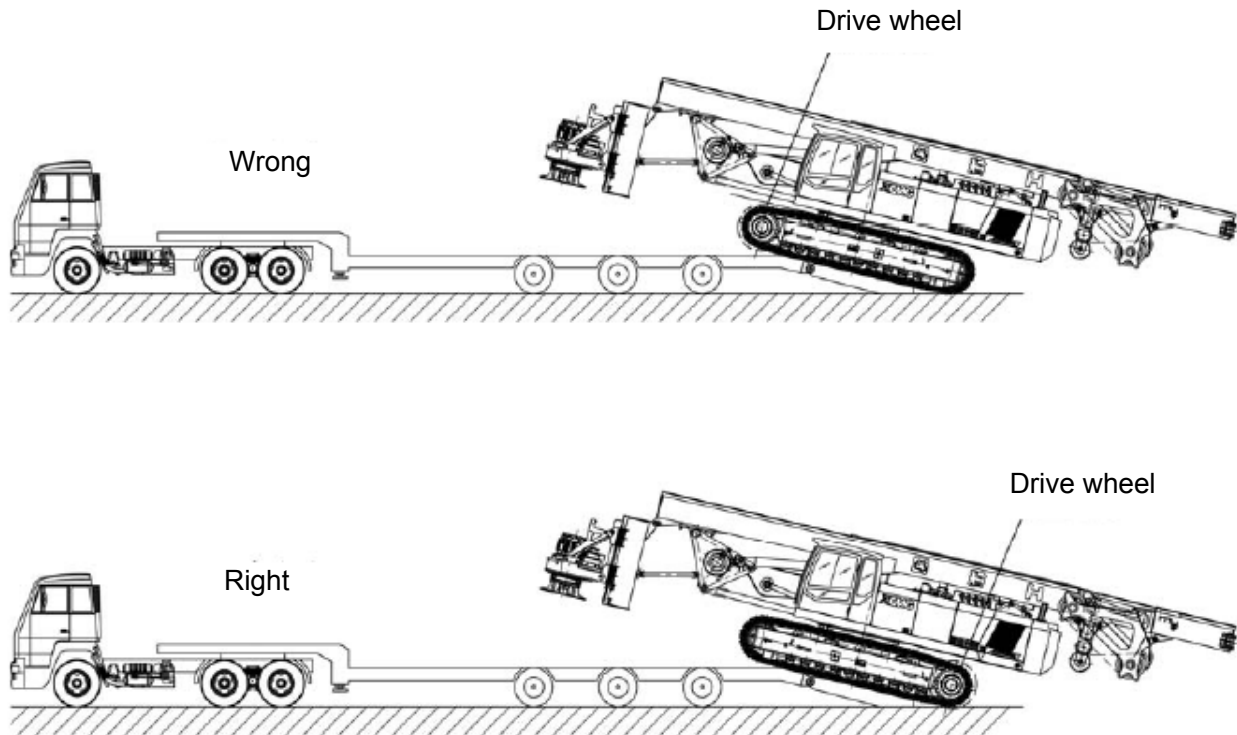


Fig. 9-2

9.3 Notes of Lifting, Loading and Transportation

- All the parts on the vehicle shall be bundled and fixed to ensure that the parts would not move and dislocate when the vehicle is traveling on the uneven road or is turning and braking, so as to prevent the roll-over or damage.
- Every time before the travel, the driver shall check if all the parts are well fixed on the plate of transport vehicle.
- Check the fixtures and safety devices of side and rear plates, as well as the tensioning chain.
- During the course of transportation, the compartment shall not have the passengers.
- During the loading and unloading process, ensure that the skew bridge height of two caterpillars is same with the angle and others are out of the dangerous range.
- Do not take the side plate of vehicle as the skew bridge between the vehicle and ground. When using the dumping bridge, prevent it from sliding.
- During the loading and unloading process with crane, ensure that the shackle, hook, etc. are safe and reliable.

**Caution**

During the lifting process, rope hook shall be vertical, or the weight will slide, rotate or tip!

During the lifting process, if the weight slides or rotates, stop lifting and readjust the rope hook.

- Properly take care of the small parts which are easily to be missed during the transport.
- Take appropriate protective measures for the parts with sharp corners and edges.

9.4 Disassembled Transport

When the weight is more than the tonnage limit of road, disassemble the equipment to transport the equipment for a long distance.

Removing the Weight

- Lift the mast and remove the mast bracket on the mast
- Dismount the connecting bolts of weight and turntable, and remove the weight.
- Install the connecting bolts of transport bracket and turntable, and tighten the nuts.
- Install the bolts between the transport bracket and mast bracket, and tighten the nut
- Put the mast on the bracket.

Remove the chassis, left and right longitudinal beams

- Remove the connecting axle pin between the caterpillar telescopic cylinder and left/right longitudinal beam.
- Remove the hoses of left and right travelling motors, and transport the hose with the host.
- Lift and remove the chassis and left/right longitudinal beam with the auxiliary crane.

Remove the rotary drive

- Remove the hose at the rotary drive valve block, and transport the hose with the rotary drive.
- Seal the hose with the appropriate tie-ins and plugs (VDT22L / N; VDT28L / N)
- Seal the valve block port with the board and plug (NVDT22L; NVDT28L)
- Use the auxiliary crane to lift and remove the rotary drive.

Lift the removed superstructure onto the trailer, with reference to the Transport Notes.



10. Maintenance

10.1 Safety Measures

Before or during the maintenance process, the safety standards listed below shall be complied with.

- Only the authorized and skilled maintenance personnel who are familiar with the equipment and understand the related content of the manual can engage in such work.
- Carry out the maintenance according to the required time interval.
- For the specific parts of the equipment, refer to the maintenance manual for the specific parts.

Specific measures:

- Park the drilling tool on the ground.
- Pull down the safety handle to the "Off" state, turn off the engine and take off the engine key.
- Mark the maintenance label on the equipment and maintenance parts to prevent accidents.
- Strictly observe the safety specifications, wear the protective equipment as well as some other protective measures, such as protective glasses, helmet, etc.
- The cleaning personnel who use the compressed air to clean must wear the work clothes and protective glasses; the pressure of compressed air shall not exceed 2 bar.
- Smoking and lighting fires are strictly forbidden surrounding the battery.
- Pay attention to the heating parts and lubricants.
- Never do welding on hydraulic oil tank, oil pipelines and other easy-to-fire places.
- When the engine is running or the equipment is working or traveling, do not make any adjustment to the equipment.
- Do not make any maintenance work before the hydraulic system pressure is released.
- When changing the hydraulic oil, prepare a large enough container, and properly handle the waste oil to prevent pollution to the environment.
- The hydraulic oil to be filled or changed shall be filtered before it is injected into the tank.
- Ensure the safety and reliability of maintenance tools and equipment.



Maintenance

10.2 Repair and Maintenance Intervals

As the various parts of equipment are used and worn differently, the parts shall be maintained according to the following intervals:

- Every 10 working hours or every day
- Every 50 working hours or every week
- Every 100 working hours or every two weeks
- Every 250 working hours or every month
- Every 500 working hours or every three months
- Every 1000 working hours or every year
- Every 2000 working hours or every year
- Every 3000 working hours or every two years

For the user's own interests, strictly and earnestly fulfill the maintenance according to the specified time intervals.

The maintenance intervals shall be cumulative, for example, when the interval of 100 hours is reached, you shall also carry out the maintenance of 10 working hours and 50 working hours.

Under the working conditions of extreme humidity or dust, shorten the maintenance interval properly.

All the maintenance records shall be recorded into the "Maintenance and Repair Record Table", and managed by the dedicated staff. After the completion of maintenance, the operator shall sign it.

Safety requirements:

- Clean the tools and workplace.
- Use the regular genuine parts.
- Use the licensed lubricating oil and grease.
- Carry the lubricating oil and grease in the jar with a lid.
- Before the lubrication maintenance, carefully check the nozzle and remove the dirt, grease and other debris.
- Open the filter only when fueling.
- Unless necessary, do not open a variety of protective covers or hoods to prevent the dust from entering. For the exposed hydraulic pipelines, tie-ins and electrical tie-ins, the dust treatment shall be carried out.
- For engine maintenance and repair, please refer to the manual from the engine manufacturer.

Maintenance

10.3 Repair and Maintenance Schedule

Content	Intervals								Remarks
	10h or every day	50h or every week	100h or every two weeks	250h or every month	500h or every three months	1000h or every six months	2000h or every year	3000h or every two years	
Item									
Check of complete machine									
Visual check	√								
Functional check									
- Control mechanism									
- Safety handle, emergency stop button, height limit switch, derricking limit switch, etc.	√								
To be checked by professional engineer							√		
Mast cathead									
Height limit	√								
Check the connection of bolts.			√						
Mast									
Lubricate the sliding rails.		√							
Connect the bolts									
- Check the connection.				√					
- Replace it.						√			
Derricking mechanism									
- Check the connecting axle pin.		√							
- Lubricate the connection.									
Disc seat of mast									
Lubricate the rotary disc.		√							
Lubricate the connecting axle pin.		√							
Connect the bolts.									
- Check the connection.			√						
- Replace it.						√			
Hydraulic cylinder									
- Check the cylinder.	√								
- Lubricate the connection points.		√							
Rotary drive									
Check the oil leakage.		√							
Gear box									
- Check the level.	√								

Maintenance

- Replace it.				√*		√			
Shock absorber									
- Check the buffer rubber pad for wear.		√							
- Check the connecting rod.		√							
Nylon shoe bracket of rotary drive									
- Fill the grease.		√							
- Check the nylon shoe for wear.			√						
Winch reducer Refer to the manual of winch reducer.									
- Check the lubricating oil level		√							
- Change the lubricating oil.				√*		√			
- Check the mounting bolts of winch bracket.				√					
- Replace the bolts.						√			
Steel wire rope and its accessories									
Check the steel wire rope for wear.	√								
Slewing tie-in									
- Lubrication	√								
- Check the connecting pin for tightness.	√								
- Check if the rotation is flexible.	√								
Rope holder									
- Check if it is parallel with the drum.		√							
- Check the wear.		√							
Check the steel wire rope pulley									
- Check the bearing.				√					
- Check the axle pin				√					
- Lubrication						√			
Check the connection at the end of steel wire rope.		√							
Drilling rig									
Clean it.	√	√							
Check the wear.									
Kelly bar									
Check the kelly bar for wear.		√*	√						

√*First maintenance for the new equipment

10.4 Use and Storage of Hydraulic Hose

- **Hose shall be stored at a dry and clean place freely, avoiding the direct exposure to sunlight or ultraviolet light.**

Even if the hose is properly stored and used, the hose will still age after a certain time and need to be replaced. If the manufacturer does not make the relative proposal, please refer to the content of table below. If the storage or service period is due, replace the hose. If the user has enough experience, determine the hose life according to the actual conditions.

Hose life also depends on the working environment and use conditions. Under the extreme working conditions (for example, it works under the high environment temperature and high pressure or it is moved frequently), the hose life will be shortened. If the user has such special requirements, he/she shall communicate and consult with the manufacturer during the procurement.

Name	Storage life	Service life
Hose	4 years	
Hose assembly	2 years	6 years

Recycle of hose:

The hose used for a period of time no longer meets the safety standards, and can not continue to be used; if it shall be recycled, adjust the end of hose and tie-in for the safety reasons.

The recycled hoses shall be marked as follows at the tie-in: the letters RP on behalf of repair, repair date and the maximum allowable working pressure.

Conduct the safety testing for the recycled hose before the use.

If the user adopts the recycled hose, the user shall take his/her own responsibility.

Check and Replacement Standards of Hose:

Immediately replace the hose or hose assembly with one of the following defects:

- The inner layer of hose is damaged (such as wear, cut or crack).
- The surface of hose becomes brittle (such as the cracks on the surface).
- Hose deformation or bent place, regardless of the pressure, which can not recover to its original shape (such as the burst, shedding or bubble).
- Hose leakage or loose connection.
- Damaged or deformed tie-in which can not be sealed.
- Shedding of hose head from the buckling place.
- Tie-in corrosion, resulting in the reduced sealing performance or material strength.
- Poor assembly of hose and tie-in.
- Over the storage life or service life.

10.5 Maintaining the Steel Wire Rope

For the maintenance and repair of steel wire rope, please refer to "Guide of Steel Wire Rope."

10.5.1 End Tie-in of Steel Wire Rope

Regularly check the tie-in of steel wire rope. If the problems are identified, you shall promptly remove (cut) it and rework it:

- Regularly check the dead end of rope, hanging point hole, tie-in clamp, etc. to ensure the solid and reliable steel wire rope.
- Check the end of steel wire rope for corrosion and check the steel wire rope around the tie-in clamp for the broken wire, shedding and corrosion.

10.5.2 Guide Pulley of Steel Wire Rope

Before installing the new steel wire rope, check the pulley, and then check it once every 250 working hours or monthly.

- Check if the pulley is rotating flexibly. If it is not flexible or stuck, it will lead to the improper work and quick wear of steel wire rope.
- Check the center axle pin of pulley.
- Check if the pulley groove matches with the rope diameter. If the pulley groove is too large or deformed, replace it.
- Check if the pulley groove is smooth. If the deckle edge is found, repair or replace the pulley.
- Check if the pulley scraps and wipes the roller of steel wire rope.
- If the pulley is worn excessively, replace it.

10.6 Slewing Tie-in (elevator) of Steel Wire Rope

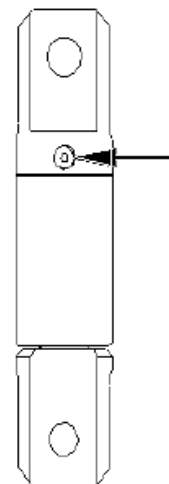
The slewing tie-in of steel wire rope can bear the tension load, with the free rotation function, eliminating the distorting force of steel wire rope.

Fill lubricating grease to the slewing tie-in of steel wire rope and check the working conditions for every 10 working hours or every day.

The slewing tie-in on the kelly bar shall be consistent with the specifications.

- Fill the lubricating grease as shown in the figure until the grease overflows from the connection of shell.
- Check if the slewing tie-in can rotate freely without the load, for example, rotate the tie-in manually.
- If the tie-in still can not freely rotate, repair or replace it.
- For the safety purposes, replace the parts with the ones of same specification.
- When filling the lubricating grease, check if the upper and lower axle pins of tie-in are installed correctly (upper one is connected with the steel wire rope and the lower one is connected with the kelly bar).

If the gap is too large or the axle pin, bolt, etc. are damaged, replace them.



10.7 Maintaining the Rotary Drive

10.7.1 Routine Maintenance

- Clean the rotary drive with water (with pressure) every day after the work; or the dust, mud and other debris will accumulate in the rotary drive and become difficult to remove. The mud will penetrate into the power case as the rotation of rotary drive, thus affecting the life of rotary drive.
- Check the rotary drive assembly appearance for damage, as well as the bolt and axle pin for looseness.
- The magnetic catch-all on the rotary drive is magnetic. Check the catch-all every 100 working hours, and clean the iron filings of gear. If you find an increase of iron filings or clay, stop the work to open the power case. Handle it timely to reduce the damage to a minimum.

10.7.2 Checking the Level of Rotary Drive Box

- Check if the front mast is vertical.
- Power case is equipped with an oil observe window, with the oil pointer to always observe the level.
- Check the oil level inside the power case.
- The oil level inside the power case shall always be at center-top position of oil pointer!



When the oil inside the power case gets muddy or the water penetrates into the case, replace the power case immediately: rinse the case repeatedly with the clean oil before the filling!

Caution

10.7.3 Changing the Oil of Rotary Drive Box

Precautions:

- For the new equipment, after 250 working hours, change the gear oil of rotary drive; change it every 1000 working hours or every year, whichever comes first.
- The grade of gear oil shall be (room temperature) Meropa 220 gear oil or (cold area) Meropa Synthetic EP 220 gear oil. When changing the new-grade gear oil, test the compatibility of the oils.
- It is better to change the oil after the rotary drive begins to rotate and the temperature is constant. If the outdoor temperature is low during the oil change, we recommend it to heat a certain amount of new oil (50 °C) to clean the rotary drive in order to flush out the remaining impurities and minerals in the rotary drive.
- If the working temperature of rotary drive exceeds 100 °C, the discharged oil would darken or blacken, aggravating the wear of lubricating oil and depriving it of the lubrication function. In this case, the oil change interval shall be correspondingly shortened.

Maintenance

- Check the oil for impurities and minerals (abrasives). The maximum permissible residual oil accounts for 0.15% of total oil.
- The largest size of particle in the lubricating oil shall not be more than 5 μ m. If so, whatever amount, be sure to move the rotary drive and carefully analyze.
- Rinse the rotary drive with the benzene or flushing oil other than the gasoline, oil or diesel.
- Inject the new oil after the flushing oil inside the rotary drive is completely discharged.



Heated oil could cause serious injury!

Warning!

Changing the oil

- Open the air cleaner on the upper cover plate (refer to the following figure).
- Prepare a proper container for the waste oil.
- Place the container under the oil-draining screw plug, screw off two screw plugs on the lower end cover and drain the lubricating oil.
- Remove the lower end cover, and check if the connecting bolts of slewing bearing are tight and reliable. Generally, do not unscrew the bolts. Otherwise, the locking seal of bolt would be damaged. If the looseness is found, tighten it with the torque of 900N.m.
- Install the lower end cover.
- Check or replace the seal of screw plug and tighten the oil-drain screw plug.
- Check and clean the magnetic catch-all.
- Fill the gear oil into the filter seat to the center-top position of oil pointer (about 85 L).
- Tighten the air cleaner.

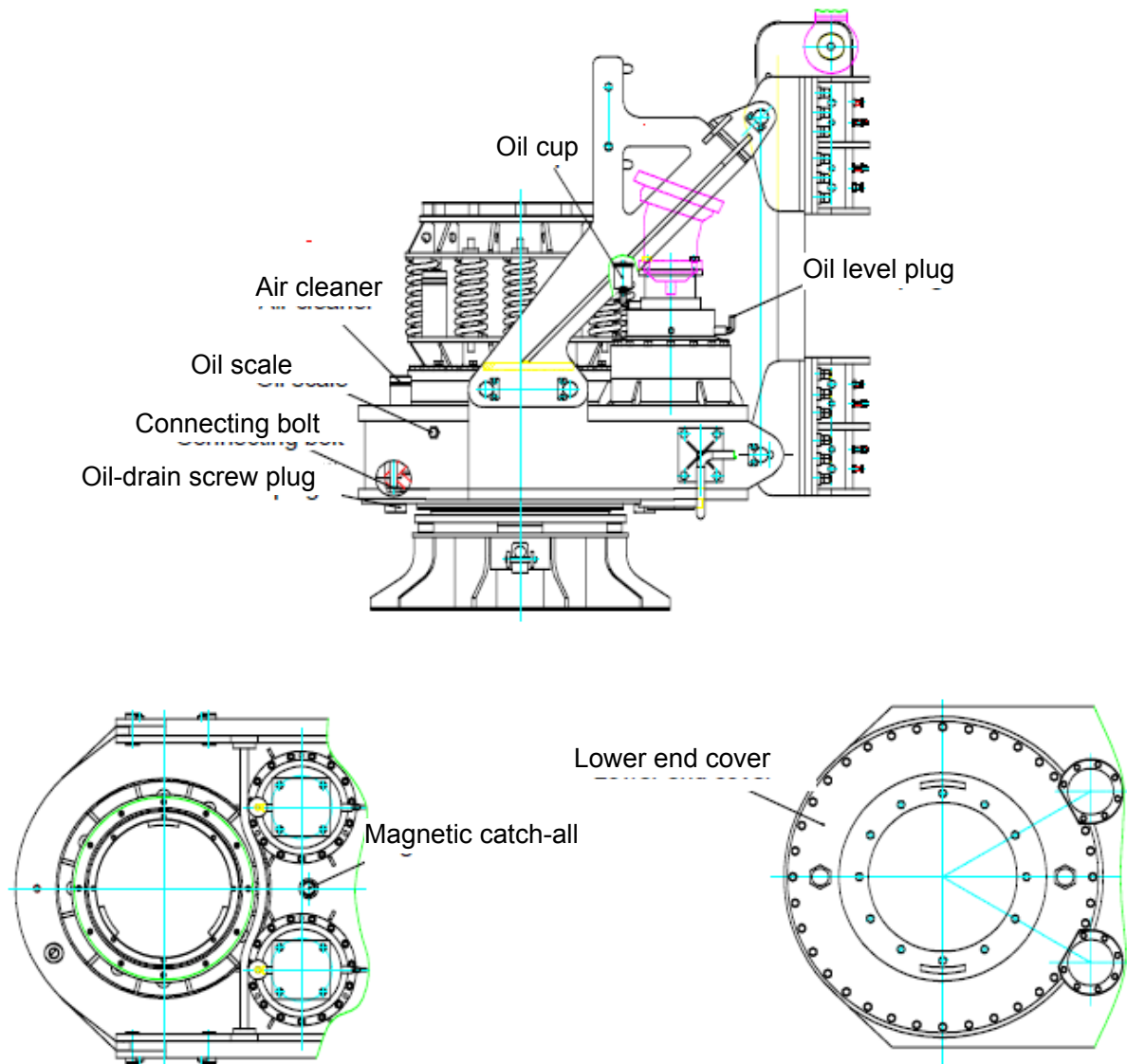


Fig. 11-1 rotary drive

10.7.4 Changing the Oil of Rotary Drive Reducer

Check the oil level of rotary drive reducer.

Screw off the level scale in the oil plug of reducer.

Check the level scale for oil.

Check the oil level of reducer daily.

Level scale shall have the oil.

Change the oil of rotary drive reducer.

- Place the rotary drive levelly.
- Screw off the lower screw plug of reducer.
- Drain the oil into the proper container.
- Tighten the screw plug.
- Place the rotary drive vertically.
- Screw off the permeable cap on oil cup and fill the gear oil into the oil cup to the middle position of oil plug scale.
- Tighten the permeable cap of oil cup.

10.7.5 Checking the Dental plate

- Check the dental plate of drive sleeve every 50 working hours or weekly.
- The edge wear of slewing drive face of drive sleeve dental plate is about 8 mm. It shall be welded by the skilled welder with the wear-resistant welding. The wear of lower pull-down face of dental plate is about 20 mm, and it shall be welded by the skilled welder with the wear-resistant welding.
- When it is worn seriously, replace the drive sleeve. Remove the shock absorber and drive sleeve, clean the new drive sleeve, and ensure that there is no dust, rust and oil on the connecting face. Assemble the new drive sleeve, screw down the bolts to the specified torque, and install the shock absorber.

10.7.6 Checking the Nylon Shoe inside the Bracket

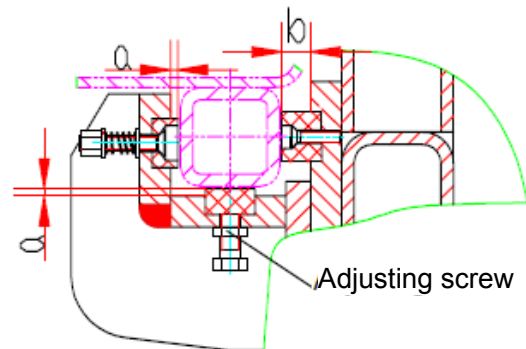
Check the nylon shoe every 50 hours or weekly.

- Check 3 nylon shoes inside the bracket.
- As shown in the figure, when the size a is less than 3 mm due to the wear of nylon shoe, replace the worn nylon shoe. If the size b is less than 18 mm due to the wear of nylon shoe, replace the worn nylon shoe. Replace the nylon shoe:
- Screw off the nuts, springs and screws.
- Take off the old nylon shoe and install the new nylon shoe.
- Turn the adjusting screw to make nylon shoe at the proper position.
- Retighten the screws, nuts and springs.

10.8 Maintaining the Hydraulic Cylinder

Repairing the Hydraulic Cylinder

- The hydraulic cylinder with the seal failure shall be immediately repaired or replaced.
- Only the trained professionals with skills can repair the hydraulic cylinder (do not repair the hydraulic cylinder in the dusty construction site).
- Connect the pipeline and cylinder when there is no pressure.
- The open tie-ins, hoses and hydraulic cylinders shall be immediately sealed with a plug.





Maintenance

- Maintaining the Hydraulic Cylinder
- Clean all the hydraulic cylinders and check them for the leakage daily or every 10 working hours, before the site change or long-time shutdown.

Notice:

Clean the piston rod with the hydraulic oil other than the water, steam, alkaline cleaning solution (including soda), abrasive materials or solid tools, avoiding the unnecessary damage.

Special maintenance for the oil cylinder for long-time shutdown

- Lubricate all the cylinder pin holes every 250 working hours or monthly.
- Wipe the exposed piston rod with the hydraulic oil once or twice weekly, or reciprocate the piston rod a few times.
- When the cylinder piston rod keep extended out for a long time, apply the anti-corrosion grease on the surface.

Warning!

In case of the serious leakage during the installation and removal process of rotary drilling rig, the auxiliary crane shall be used to ensure the safety of equipment during the removal process!

If the protective measures are available, the serious damage of equipment and the serious personal injury may occur.

Storage of oil cylinder

Pay attention to the following items when storing the oil cylinder:

- Seal all the oil ports with the plastic caps or plugs firmly.
- Inject the hydraulic oil into the cylinder.
- If the cylinder is out of service for a long time, apply the grease onto the exposed piston rod and lubricate the connecting pin hole.
- The indoor environment shall maintain ventilated, dry and non-corrosive, with the temperature more than 14-20 °C; if it is placed outdoor, take the necessary measures to prevent the sunshine and rain.
- For the long-term storage, rinse the exposed machined surface with the cleaning anti-rust oil every six months. For the storage more than a year, generally replace the static seal, and check the dynamic sealing elements for the sealing performance.

Warning!

For the outdoor cylinder exposed to the direct sunlight, especially the crowd cylinder, the chamber will have a very high pressure. In this case, be careful to open the tie-in and prevent the accidents.

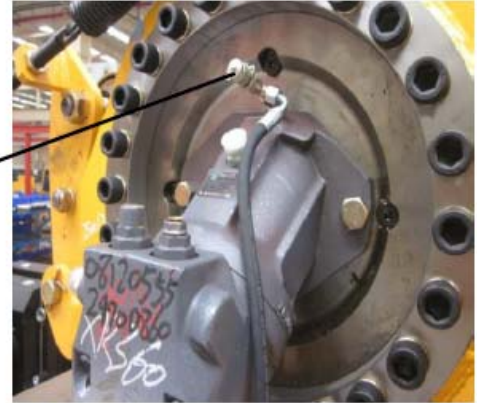
10.9 Hydraulic oil products

To ensure the normal operation of hydraulic system, check the hydraulic elements regularly. Change the hydraulic oil regularly in strict accordance with the Maintenance Interval. To ensure the using results, it is recommended to use the Caltex HD46 anti-wear hydraulic oil.

10.10 Pressure Test Port of Hydraulic System

Pressure test port of main winch reducer brake

Reference pressure: 35 ± 5 bar



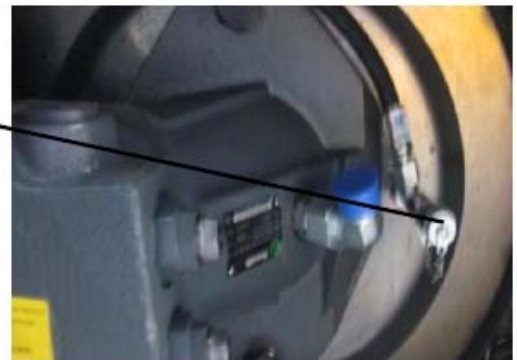
Pressure test port of service winch reducer brake

Reference pressure (bar): 21~25



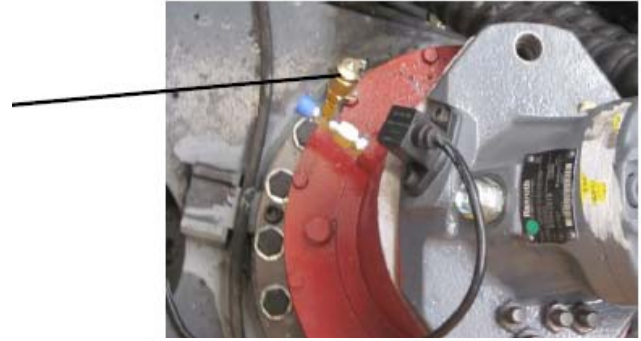
Right/Left travel reducer brake pressure testing port

Reference pressure (bar): 21~25



Maintenance

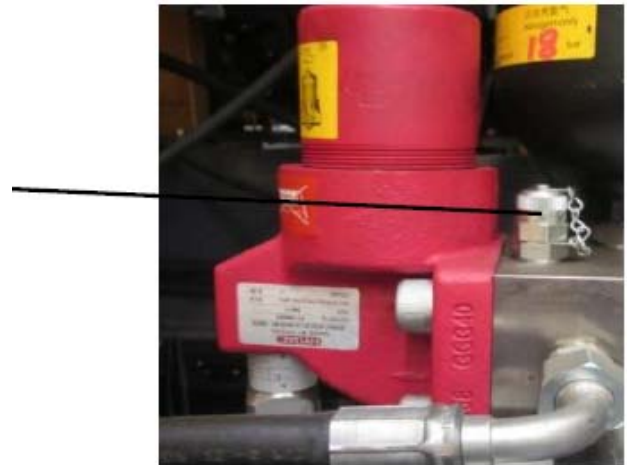
Slewing motor brake pressure testing port
Reference pressure (bar) : 35 ± 5



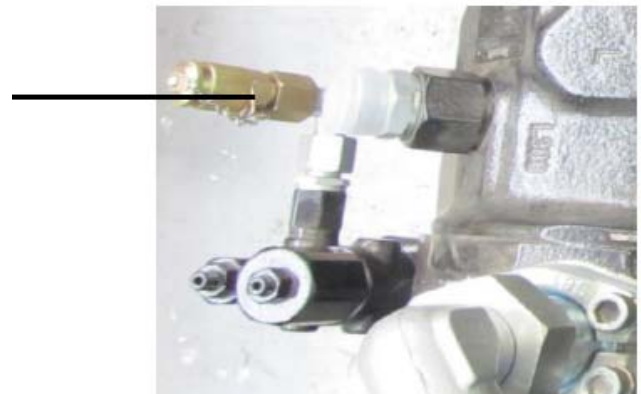
Fill valve pressure testing port:
Reference pressure (bar) : 25



Pilot oil source block pressure testing port
Reference pressure (bar) : 35 ± 5



Vice-pump LS pressure testing port:
Reference pressure (bar) : 300



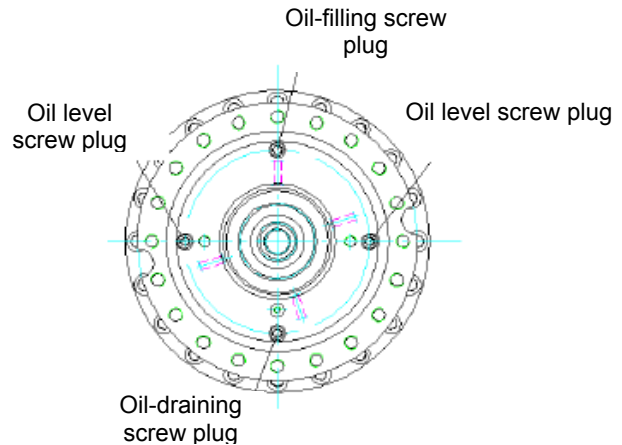
10.11 Maintaining the Winch Reducer

For the more detailed maintenance information about the winch reducer, refer to the manual of reducer.

- Check the main and service winch reducers for the oil level weekly or before the use after the long-time shutdown.
- Change the gear oil of reducer after first 250 working hours or a month, and afterwards, every 1000 working hours or every year.

Check the winch reducer for oil level:

- Remove the oil plug of reducer.
- Check the oil level hole for the oil spill.
- If there is no oil spilling from the hole, remove the oil filling plug, and fill the gear oil until the oil spills from the hole.
- Wipe the sealing face, check oil seal for the damage or wear, and replace it if necessary.
- Install and tighten the plug.



Only after the winch reducer stops working for 3-5 minutes, check the oil level.

Caution

10.12 Maintenance during the Shutdown

- During the long-time shutdown, take the following maintenance items to well maintain the various functions of equipment:
- When the equipment is off, retract all the piston rods of cylinder which no longer need to extend. Apply the grease on the exposed piston rod and carry out the anti-corrosion treatment.
- Clean the machine, and pay special attention to cleaning the travel part.
- Fill the lubricating grease on all hinge points and rusty positions, especially the rail.
- Every 2 to 3 weeks: start the engine and turn on the air conditioner to run the engine with medium speeds for 1 hour.
- If it is forbidden to start the engine and it is necessary to repair and maintain the engine, please refer to the Engine Manual.

Maintenance

10.13 Tools List for Repair and Maintenance

Accompanied Tools List

Table 2

No.	Code	Name	Specification	Q'ty	Remark
1	706100173	Tool & spare parts box	Q0-52	1	
2	840540464	Tool box TBC122B (XR series)	500*265*290	1	Tongrun
		Double spanner	6-32mm	1 set (23 pieces,	De-Li
		Plug pliers	200mm	1	De-Li
		Hammer of Locksmith	0.91P	1	De-Li
		Level Screwdriver	75*5	1	De-Li
		Level Screwdriver	250*8	1	De-Li
		Crisscross Screwdriver	250*8	1	De-Li
		Hammer of rubber	240Z	1	De-Li
		Adjustable spanner	450mm	1	Qite
		Spanner	250mm	1	Qite
		branch Pole	250mm	1	Qite
		branch Pole	250mm	1	Qite
		branch Pole	125mm	1	Qite
		Adjustable spanner	300mm	1	Qite
		Six sleeve	8-32mm	1 set (20 pieces, metric	Qite
		Hex Key set	1.5-10mm	1 set (9 pieces, metric	Shida
		Grease Gun	400cc	1	Shida
		Strap spanner		1	Aolide
		Double spanner	36-41	1	Yawei

Maintenance

No.	Code	Name	Specification	Q'ty	Remark
2	840540464	Single spanner	50mm	1	Yawei
		Single spanner	55mm	1	Yawei
		Single spanner	60mm	1	Yawei
		Single spanner	65mm	1	Yawei
		Lex. spanner	12mm	1	Jieke
		Lex. spanner	14mm	1	Jieke
		Lex. spanner	17mm	1	Jieke
		Lex. spanner	19mm	1	Jieke
		Lock		1	Sanhuan
		scutcheon		1	
		Heavy bend rod	300mmX100mm	1	Qinghai
		Heavy sleeve	M36mm	1	Shida
		Note: The above-mentioned items are covered in the tool list of the toolbox TBC122B (XR series).			
3	801138978	Pressure gauge G1/4	SPG063-0040-07-P-B04-F	1	
4	801138935	Pressure gauge G1/4	SPG063-00060-01-P-B04-F	1	
5	803374552	Pressure tie-in	SMK20-8L-PK	2	
6	803193000	Pressure tie-in	SMK20-10L-PK	2	
7	803679992	Pressure tie-in	SMS20/W1/4-2500A	2	
8	803374424	Tie-in	GES8LM-WD	1	For motor pressure test port
9	803374941	Tie-in	GS8L	2	Used in conjunction with the pressure test joint and can be used as pipe plug
10	803165624	Tie-in	GS10L	2	Used in conjunction with the pressure test joint and can be used as pipe plug

Maintenance

No.	Code	Name	Specification	Q'ty	Remark
11	803374634	Tie-in	ELSD8L	2	For pipeline pressure test
12	803166147	Tie-in	ELSD10L	2	For pipeline pressure test
13	803166149	Tie-in	ELSD15L (EL15L)	1	For pipeline pressure test
14	803374295	Tie-in	RESD15/8L	1	For pipeline pressure test
15	803375018	Plug	VDT15L/N	2	Joint plug
16	803191428	Plug	NVDT15L	2	Pipe plug
17	801540962	Heavy sleeve	M65mm	1	
18	801138946	Oil Lubricator	SJP-50	1	San lang
19	840935615	Work clothes	175	4	Use on May 1-September 30
20	840935616	Work clothes	175	4	Use on October 1 – April 30 of the next year

10.14 List of Wearing Parts and Spare Parts

No	Code	Name	Specification	Q'ty	Remark
1	801100336	Grease cup	M10X1	5	
2	803190073	Filter	V2. 1460-26	1	Main oil return filter element
3	803172728	Filter	0060D010BN4HC	1	Pilot oil filter element
4	803076596	Electro valve	RPE3-062X11/02400E1K1	1	Pilot changeover solenoid valve
5	803076597	Electro valve	RPE3-063Y11/02400E1K1	1	Pilot changeover solenoid valve
6	803375797	Rose assembly	F381CACF101005-600	1	For self drain
7	803375600	Rose assembly	F381CACF101005-800	1	For LS port of M4 valve

Maintenance

No	Code	Name	Specification	Q'ty	Remark
8	801336576	Pulley	YHH104-332	2	
9	801336562	Pulley	YHR904-315	1	
10	420100941	Slide block		8	For unit head
11	420100942	Slide block		4	For unit head
12	420100973	Slide block		6	For drilling stem
13	420300330	Shock absorber		1	For unit head
14	803271198	Breather	SMBT-80-S-10-0-B12-0	1	For unit head
15	420100233	Pin		2	For drilling stem
16	420100486	Check ring		4	For drilling stem
17	805600149	Split pin	10X100	2	For drilling stem
18	803374057	Engine diesel filter cartridge	FS1000 (3329289)	2	
19	803374058	Engine oil filter cartridge	LF9001 (3101869)	1	
20	803374086	Engine air filter cartridge	AA2960	1	
21	803374060	Diesel engine - water separation filter cartridge	PL420X	1	
22	803679964	Fuse 5A	0297005	10	
23	803679962	Fuse 10A	0297010	20	
25	803679965	Fuse 20A	0297020	10	
26	803379265	Fuse	142. 5631. 5802	1	
27	803645742	Fuse	0498100 (100A)	1	
28	803679963	Relay	898H-1CH-C-R1	1	
29	803677657	Relay	303-1AH-C-R1	3	
30	803611790	Pre-heating relay	SB2008	1	
31	819949534	Cylinder piston-rod cover	φ 250-2500	2	
32	819949533	Cylinder piston-rod cover	φ 250-1250	2	
33	803377324	Hydraulic seal box	MF01-ZXD	1	Table 3
34	420100274	Foot plate	RD18. 04. 12	2	

Maintenance

No	Code	Name	Specification	Q'ty	Remark
35	805100173	Nut M10X20	GB/T70. 1	12	
36	805300014	Dash 10	GB/T93	12	
37	803679847	Tie-in	FDFD1-250	4	
38	805004684	BoltM20X140-10. 9	GB/T5782	4	Drill mast connecting bolt
39	805238385	Nut M20-10	GB/6184	10	
40	805238655	Nut M20-10	GB/T6170	10	
41	420100833	Steel bushing	XR280. 17-1	10	
42	805005390	BoltM16X170-10. 9	GB/T5782	10	Drill pipe bracket connecting bolt
43	801737112	Disc spring	4Z50-M16	20	
44	805203851	Nut M16	GB/T889. 1	20	

11. Lubrication of Rotary Drilling Rig



Notice

It is only recommended to use the lubricating oils (greases) of the grades listed in the recommended table. The damage of parts caused by the use of non-recommended lubricating oils is not within the warranty. Confirm that the performance of lubricating oil (grease) matches with the formal lubricating oil (grease).

First, do not mix the synthetic lubricating oil (grease) and mineral-based lubricating oil (grease)!

The adopted lubricating oil (grease) shall be fresh and clean!

11.1 Lubrication Diagram

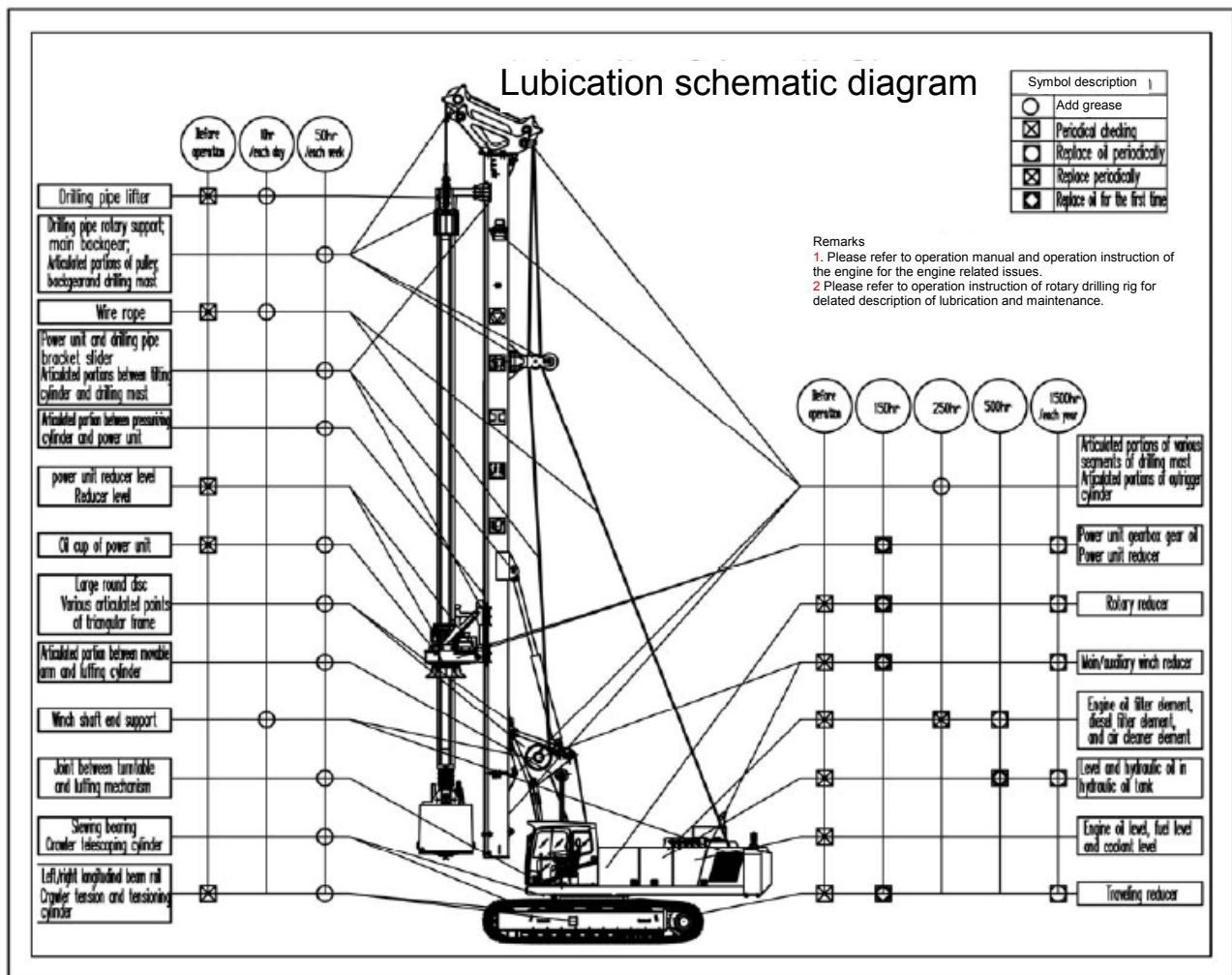


Fig. 11-1 XR280D Lubrication (reference) diagram of rotary drilling rig

11.2 Treatment of Waste Oil, Filter Core and Additive

Waste oil, filter core and additives shall be treated according to the following rules:

Store the waste oil separately:

- Available
- Combustible in the special place
- Treated as the special dangerous goods

Do not mix the waste oils of different grades!

Lubrication of Rotary Drilling Rig

- The waste oil shall be sent to an authorized processing company.
- Change the oil with an appropriate container.
- Be sure to treat the waste oil with the method allowed by the state. Do not mix it with the waste oil and do not burn it in places not allowed.
- When changing the filter core and waste oil around the engine, reducer, etc., please refer to the manual of relevant manufacturer.

Biodegradable lubricating oil (grease)

In case of the harm to the environment due to the leakage of lubricating oil (grease), such as the construction in the protected area, it is strongly recommended to use the biodegradable lubricating oil (grease).

When the environmentally friendly lubricating oil (grease) is used, it shall meet the following requirements:

- In the any case, synthetic fluid and the lubricating oil (grease) without the mineral oil or vegetable oil shall not be mixed with the lubricating oil (grease) with the mineral oil (grease).
- Before changing it with the biodegradable lubricating oil (grease), you shall first obtain the instruction from the manufacturers about the lubricating oil (grease) and sealing ring, hose, filter system and the paint compatibility inside the container.

11.3 Recommended Lubricating Oils (Greases) and Antifreezes

Table 1 Lubricating oils (greases) adopted by Xuzhou Construction Machinery Group Co., Ltd.

Applicable parts	Code Grade and	Amount (L)	Name	Manufacturer	Remarks		
Rotary drive box	Meropa 220	About 85	Gear oil	Caltex	To the medium place of level window		
Main winch reducer		About 8.5		Caltex	Until the oil spills from the check hole		
Service winch reducer		About 4		Caltex			
Rotary drive reducer		310 reducer About 8x3		Caltex	Until the scale in the level plug has oil		
		311 reducer About 11.25x2					
Traveling reducer		About 8.5x2				Caltex	Until the scale in the level plug has oil
Slewing reducer		About 5x2				Caltex	Fixed-amount filling
Steel wire rope	1#	About 2000g	Extreme-pressure lithium lubricating grease			Caltex	
Slewing bearing and elevator	2#	About 500g		Caltex			
Connecting hinge points and rail of all parts	2#	About 1500g	Extreme-pressure lithium lubricating grease	Caltex			

Lubrication of Rotary Drilling Rig

When the rotary drilling rig is adopted in the cold areas (ambient temperature within $-25\sim-27^{\circ}\text{C}$), the actual grades of oils and antifreezes for rotary drilling rig are recommended in the table 2.

Applicable parts	Code Grade	and	Amount (L)	Name	Manufacturer	Remarks
Rotary drive box	Meropa Synthetic 220	EP	About 85	Gear oil	Caltex	To the medium place of level window
Main winch reducer			About 8.5		Caltex	Until the oil spills from the check hole
Service winch reducer			About 4		Caltex	
Rotary drive reducer			310 reducer About 8x3		Caltex	Until the scale in the level plug has oil
			311 reducer About 11.25x2			
Traveling reducer			About 8.5x2		Caltex	Until the scale in the level plug has oil
Slewing reducer			About 5x2		Caltex	Fixed-amount filling
Steel wire rope	1#	About 2000g	extreme-pressure lithium lubricating grease	Caltex		
Slewing bearing and elevator	2#	About 500g		Caltex		
Connecting hinge points and rail of all parts	2#	About 1500g	extreme-pressure lithium lubricating grease	Caltex		

Note: Where the ambient temperature is lower than zero, the drilling rig must be defrosted properly before the operation.

Lubrication of Rotary Drilling Rig

Recommended torques of bolts (screws) N.m

Strength Grade	8.8		10.9		12.9	
Thread Specification	Min	Max	Min	Max	Min	Max
M6	10	12	14	17	17	20
M8	25	30	34	41	41	48
M10	49	59	68	81	81	98
M10×1	55	66	76	90	90	106
M12	86	103	119	141	141	167
M12×1.5	90	108	124	147	147	174
M14	137	164	189	224	224	265
M14×1.5	149	179	206	243	243	289
M16	214	256	295	350	358	414
M16×1.5	228	273	314	372	372	441
M18	294	353	406	481	481	570
M18×1.5	331	397	457	541	541	641
M20	417	500	576	683	683	808
M20×1.5	463	555	640	753	758	897
M22	568	680	786	941	918	1099
M22×1.5	624	747	863	1034	1009	1208
M24	722	864	998	1195	1167	1397
M24×2	785	940	1086	1300	1269	1520
M27	1056	1264	1461	1749	1707	2044
M27×2	1141	1366	1578	1890	1845	2208
M30	1434	1717	1984	2375	2318	2775
M30×2	1587	1900	2196	2629	2566	3072
M36	2506	3000	3466	4150	4051	4850
M36×3	2653	3176	3670	4394	4189	5135
M42	4008	5798	5544	6637	6479	7757
M42×3	4312	5162	5969	7141	6921	8345
M48	6020	7207	8327	9969	9732	11651
M48×3	6556	7848	9069	10357	10598	12688

Lubrication of Rotary Drilling Rig

11.5 Lubricating Parts and Maintenance Period of Rotary Drilling Rig

Lubricating Parts	10 h/daily	50 h/weekly	150 h	250 h	500 h	2000 h or yearly
Kelly bar elevator	Check it. Fill the lubricating grease.					
Slewing bearing of kelly bar		Fill the lubricating grease				
Hinge point of back gear bracket and mast						
Steel wire rope	Check and apply the lubricating grease					
Rotary drive, kelly bar nylon shoe		Fill the lubricating grease				
Hinge of mast lifting cylinder and mast						
Hinge of pull-down cylinder and mounting		Fill the lubricating grease.				
Rotary drive box and reducer	Check the level.					
Oil cup of rotary drive reducer	Check the level.	Fill the lubricating oil.				
Rotary drive box	Check the level.	Fill the lubricating oil.				
Big disc		Fill the lubricating grease				
Hinge point of triangular bracket						
Hinge point of derricking mechanism		Fill the lubricating grease.				
Bearing at the shaft end of main and service winches	Fill the lubricating grease.					
Connecting hinge point of derricking mechanism turntable		Fill the lubricating grease				
Lubricating grease of slewing bearing		Fill and coat the grease				
Axle pin of caterpillar telescopic cylinder		Fill the lubricating grease.				

Lubrication of Rotary Drilling Rig

Lubricating Parts	10 h/daily	50 h/weekly	150 h	250 h	500 h	2000 h or yearly
Rail of guide wheel		Coat the lubricating grease				
Sag of caterpillar	Check it.	Fill the lubricating oil according to the rag.				
Tensioning cylinder						
Traveling reducer	Check the lubricating oil level.		Replace it first time.			Replace it regularly.
Level of diesel and coolant	Check it.					
Cores of oil filter, diesel filter and air cleaner	Check it.			Replace it regularly.		
Level of hydraulic oil tank	Check it.				Replace it first time.	Replace it regularly.
Hydraulic filter core	Check it.	Replace it first time.				
Hydraulic pilot filter core	Check it.	Replace it first time.				
Main and service winch reducers	Check the lubricating oil level.		Replace it first time.			Replace it regularly.
Slewing reducer	Check the lubricating oil level.		Replace it first time.			Replace it regularly.
Rotary drive box	Check the lubricating oil level.		Replace it first time.			Replace it regularly.
Rotary drive reducer	Check the lubricating oil level.		Replace it first time.			Replace it regularly.
Hinge of various masts				Fill the lubricating grease.		

11.6 Use and maintenance of centralized lubrication system

11.6.1 Components of lubrication system

SLE progressive centralized lubrication system consists of SLE electric grease pump, JPQ progressive main distributor, JPQ progressive sub-distributor, main oil pipe, sub-oil pipe, displacement sensor and pipe joint accessories and controller.

11.6.2 Description of working principle of lubrication system

The controller issues a command to the lubricant pump unit according to set working time and stop time, the lubricant pump motor drives the cam, the cam drives the plunger piston to work to convey pressure grease to the distributor through main oil pipeline, and the grease is filled into auxiliary friction lubrication points through oil-separating pipeline after oil-separation through the distributor. The displacement sensor installed in the main distributor issues a displacement signal to the controller after reaching specified position. After receiving the displacement signal, the controller judges that the lubrication system works normally and can operate in a self-control way.

Lubrication of Rotary Drilling Rig

11.6.3 Parameters of SLE electric grease pump

Item Model	Number of applicable lubricating points n	Nominal pressure MPa	Fuel tank capacity L	Applicable grease NLGI	Rated voltage V	Rated power W
SLE10-24	≤60	20	1.2	00, 0, 1 and 2; if the ambient temperature is lower than -10°C, anti-freezing grease is recommended (greases of different brands and grades shall not be mixed).	24DC	20
SLE10-220			1.2		220AC	6
SLE25-24			2.5		24DC	20
SLE25-220			2.5		220AC	6

11.6.4 JPQ progressive distributor

JPQ progressive distributor is a component that can distribute the grease continuously and progressively. The lubricant pump provides pressure grease which enters the main distributor, the pressure grease in several passages is discharged after being subject to oil distribution via oil distributing valve core and then enters the sub-distributor for oil distribution and is filled to the lubrication point. If the lubricant pump works continuously, the sub-distributor will distribute the grease repeatedly in the order of progressive oil distribution.

11.6.5 Instructions for operation of SL-ECU13-EJ controller

Turn on the ignition switch (key), and the controller can display the stop time that was set when the product left the factory after an initialization of 2-3 s.

1) Unlocking

Press the “set” key once, and then press the “▲” key twice in 2 s to unlock the locked set function.

2) Setting of stop time

With the setting function unlocked, the “set” character will be displayed on the upper part of the display and the “stop” character will flicker simultaneously. Press the “▲” key or the “▼” key to change the stop time, a variation of 30 min can be set after each press, and the variation range is 30 min-24 h.

3) Setting of number of cycles



Lubrication of Rotary Drilling Rig

With the setting function unlocked, call out the setting function of number of cycles by pressing the “set” key, the “set” character will be displayed on the upper part of the display and the “” character will flicker simultaneously. Press the “▲” key or the “▼” key to change the stop time, a variation of once can be set after each press, and the variation range is from once to ten times. After the setting, press the “set” key to exit the setting mode and perform self locking.

4) Working status of debugging system

Press the “▼” key for more than 3 s and then release it and the system enters manual working status. The “manual” character is displayed on the top left of the display and the “” character and working indication “” are displayed on the bottom right. The timing begins with digit 1 and “second” is displayed on the right.

5) Alarm of overtime working

After working (manual or automatic) for 8 min continuously, if the number of working cycles does not reach the set value, judge that the pressure does not meet the requirements. Disconnect the motor; meanwhile, the controller gives an alarm and displays Err1 and the pressure switch mark flickers (below PS2).

6) Alarm of motor open circuit

In case of motor open circuit, the motor stops working (there is a delay of 3 s) and gives an alarm and displays Err2 and the symbol “” flickers. The alarm can be eliminated by pressing the “reset” key.

7) Alarm of motor short circuit

If high current (short circuit) occurs in the motor when it is working, the motor stops working (there is a delay of 3 s), gives an alarm and displays Err1 and the symbol “” flickers.

8) Alarm of minimum oil level

If the connecting line of liquid level sensor is connected to the ground wire (i.e. the oil level is too low), judge that the oil level is abnormal. Disconnect the motor; meanwhile, the controller gives an alarm and displays Err3 and the oil level switch mark flickers (below PS1).

9) Stop working

After the system starts to work (whether the system starts to work after the stop time reaches the set value or the system is under debugging operation after the “▼” key is pressed for more than 3 s), if the system is required to be stopped immediately, press the “reset” key such that the system can stop working and return to the stop status.

10) Alarm elimination

After the system gives an alarm, press the “reset” key to stop the alarm and the system can enter the stop status (notice that faults in the system have not been eliminated).

11) Inquiry of status and number of times

When the controller is in the stop status, press the “▲” key, and the display will show the information of the latest fault; press the “▲” key again, and total cumulative number of times regarding working of the system will be displayed; press the “▲” key again, the controller will return to the stop status (return to original stop status automatically after 10 s).

Lubrication of Rotary Drilling Rig

Comparison table of controller alarm

Alarm display character	Alarm description	Alarm cause	Solution
Err1	No action of the displacement sensor is detected after the system works for 8 min.	1. The pipeline ruptures. 2. The displacement sensor is damaged. 3. The oil is used up.	1. Check and repair the pipeline 2. Check and repair the displacement sensor 3. Add oil
Err2	The motor is open circuited or the motor current is too low (the current is less than 0.1 A).	1. The motor line is disconnected. 2. The motor is damaged. 3. The motor negative line and the power ground wire are short circuited.	1. Check and repair the motor line 2. Replace the motor 3. Disconnect the connection of the motor negative line and the power ground wire
Err3	Alarm of too low oil level	1. The oil is used up. 2. The oil level sensor is damaged.	1. Fill oil 2. Check oil level sensor
Err4	Working current of the motor is too high or the motor is short circuited (5A for 12V and 3A for 24V).	1. The motor is damaged. 2. The incoming end of the motor is short circuited. 3. The oil passage is blocked and the load is too heavy.	1. Replace the motor 2. Check and repair the motor line 3. Check the oil passage and unclog the clogging point

11.6.6.Manuals for SJP50 Oil Pump Nozzle



1. Hand grip 2. Handle 3. Pump body 4. Foot-pressing plate

Lubrication of Rotary Drilling Rig

5. Connection of oil filling pipe

6. Dust plug

Steps:

1. Unscrew Handle, insert Pump Body (3) into the oil drum, screw down Handle (2);
2. Unscrew Dust Plug (6), screw on Connection of Oil Filling Pipe (5) into the refueling end and screw down;
3. Use feet to press Foot-pressing Plate (4), use hands to slowly pull oil-taking Handle (1) to take oil; then, slowly press down Handle (1) to inject the oil into the oil tube of the pump, repeat the process till the oil tube of the pump is full;
4. Take down Connection of Oil Filling Pipe (5), screw on Dust Plug (6).

11.6.7 Notices for use

- 1) The grease used by the lubrication system must be clean and fresh and must not be recycled; filter screen in the oil filler shall be replaced or cleaned once a year.
- 2) When the grease in the lubricant pump is below the lower oil level of oil tank and minimum oil level of the controller starts to give an alarm, fill the grease timely.
- 3) To prevent entry of sundries in the oil tank, the grease must be filled from the oil filler of lubricant pump.
- 4) When filling grease to the oil tank with fuel charger, strictly observe the upper limit mark of oil level on oil tank of lubricant pump; otherwise, the structure of oil tank will be damaged.
- 5) It is prohibited to put heavy objects on the controller and immerse the controller in the water; otherwise, the electronic components will be damaged.
- 6) The lubricant pump and distributor shall be free from bump; otherwise, the parts will be damaged.
- 7) It is prohibited to pull the lubricating oil pipeline.
- 8) Pay attention to daily maintenance to ensure the system works normally.

12. Vibration and Noise:

For XR280D drilling rig, Under normal working conditions, the vibration of the arm shall not exceed 2.5m/s².

According to ISO 2631—1, the vibrations of the driver are A(1):8.4m/ s² , A(4):4.2m/ s² and A(8):3.0m/ s².

The uncertainty of vibration measurement is 1.5 m/s².

According to the test in ISO/DIS 6396:2004, the noise at the driver shall not exceed 80dB(A).

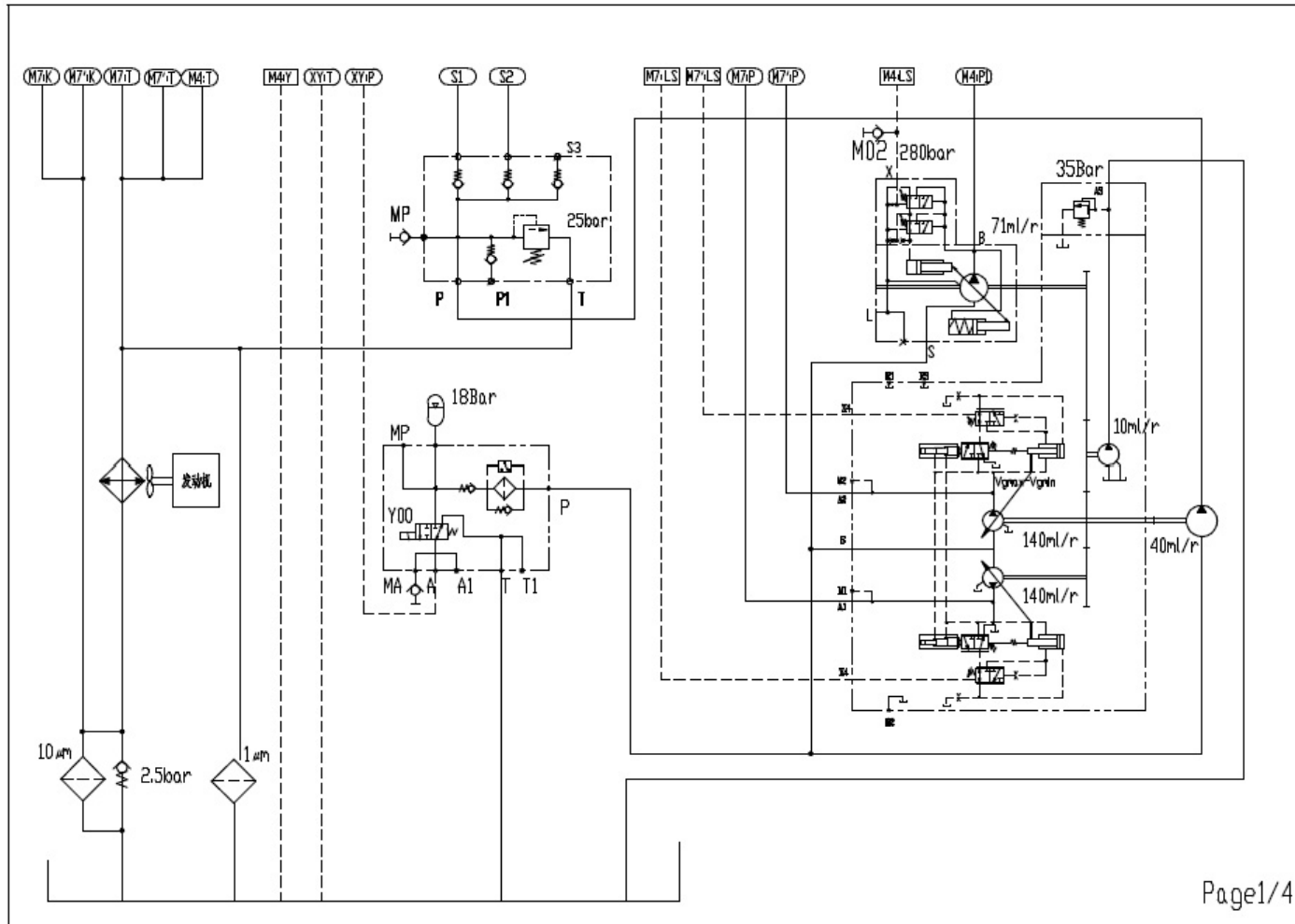
According to the test in 2000/14/EC, the external radiated noise shall not exceed 106dB(A).

The uncertainty of noise measurement is 2 dB(A).

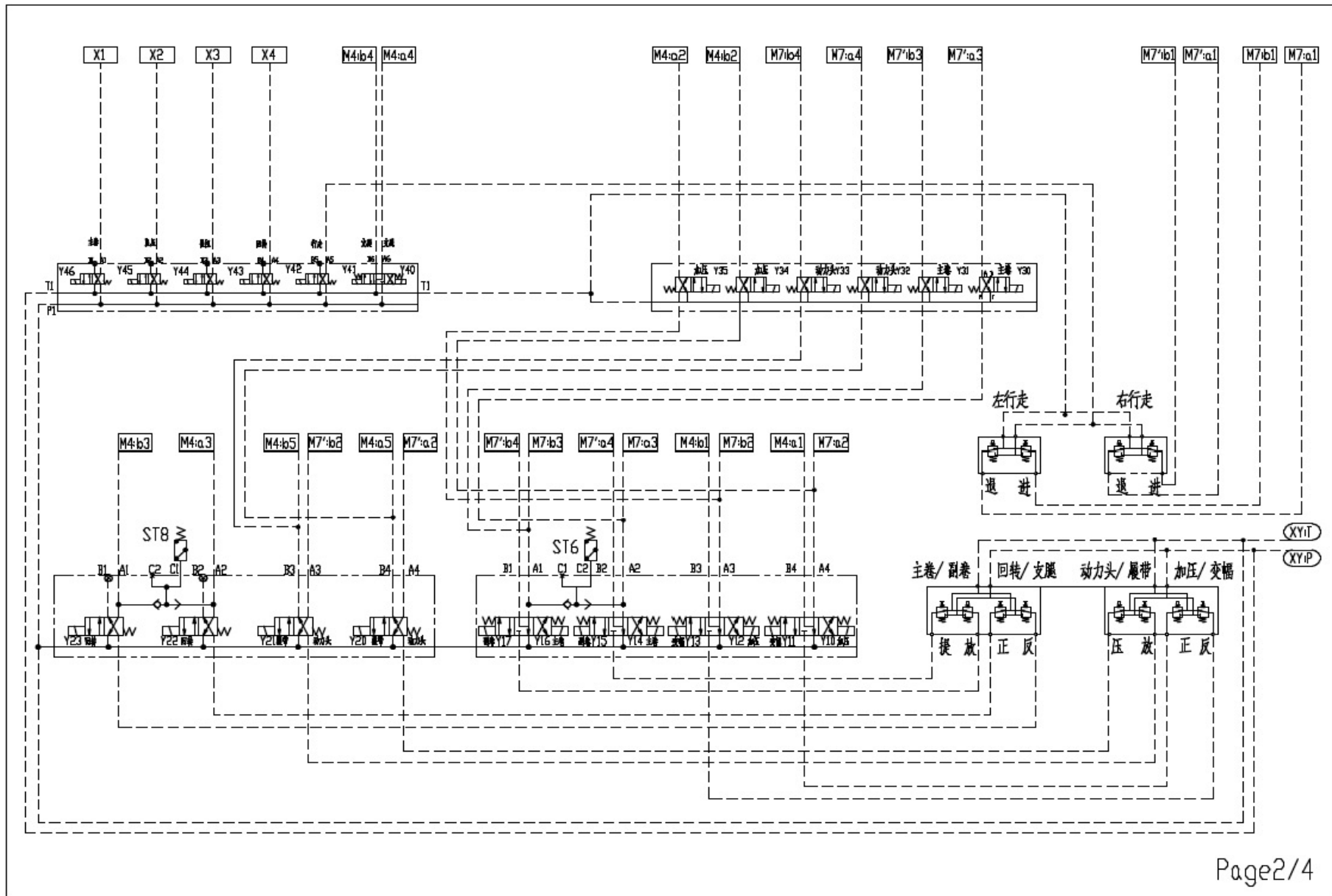
.

13 Hydraulic System

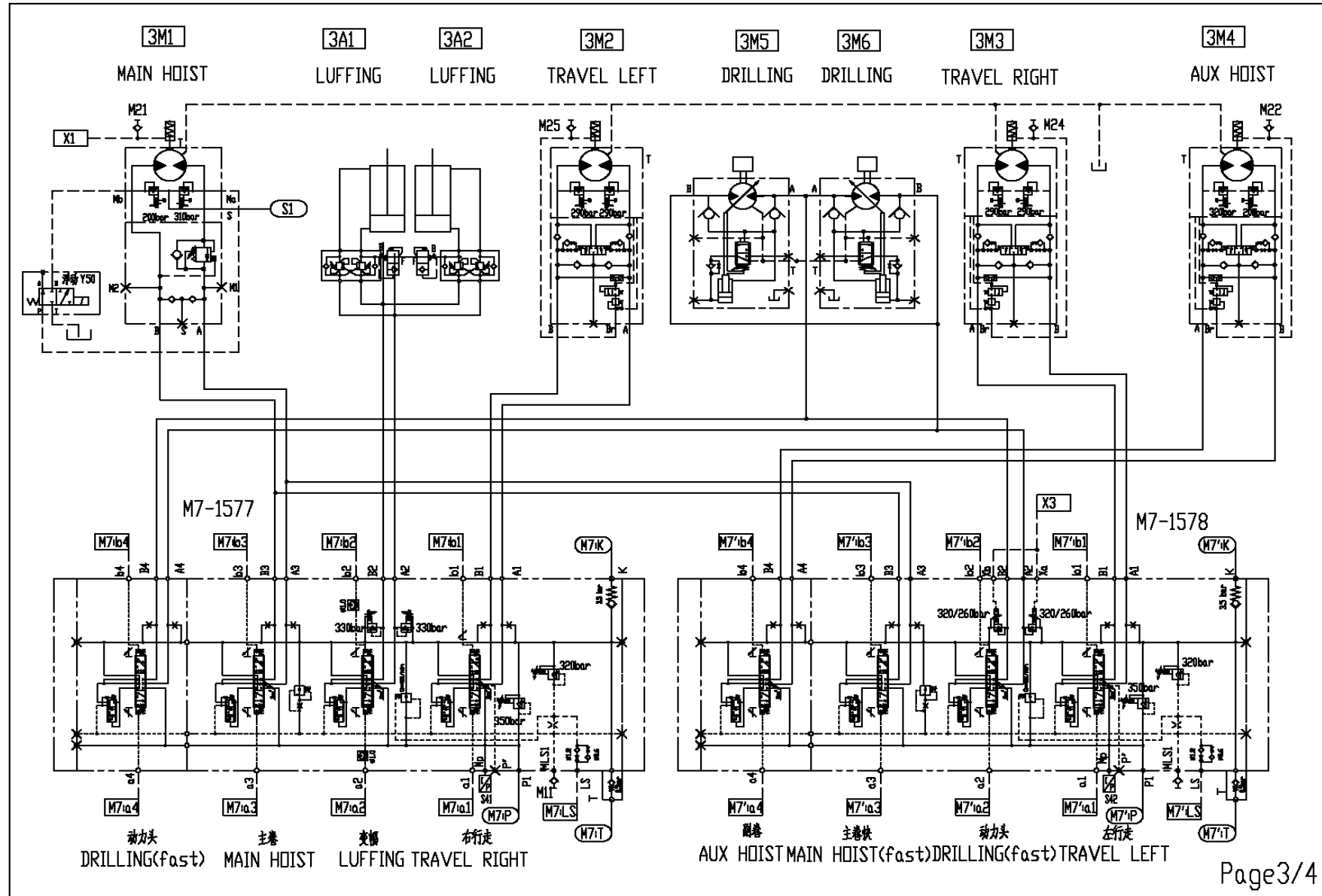
13.1 Hydraulic Schematic Diagram



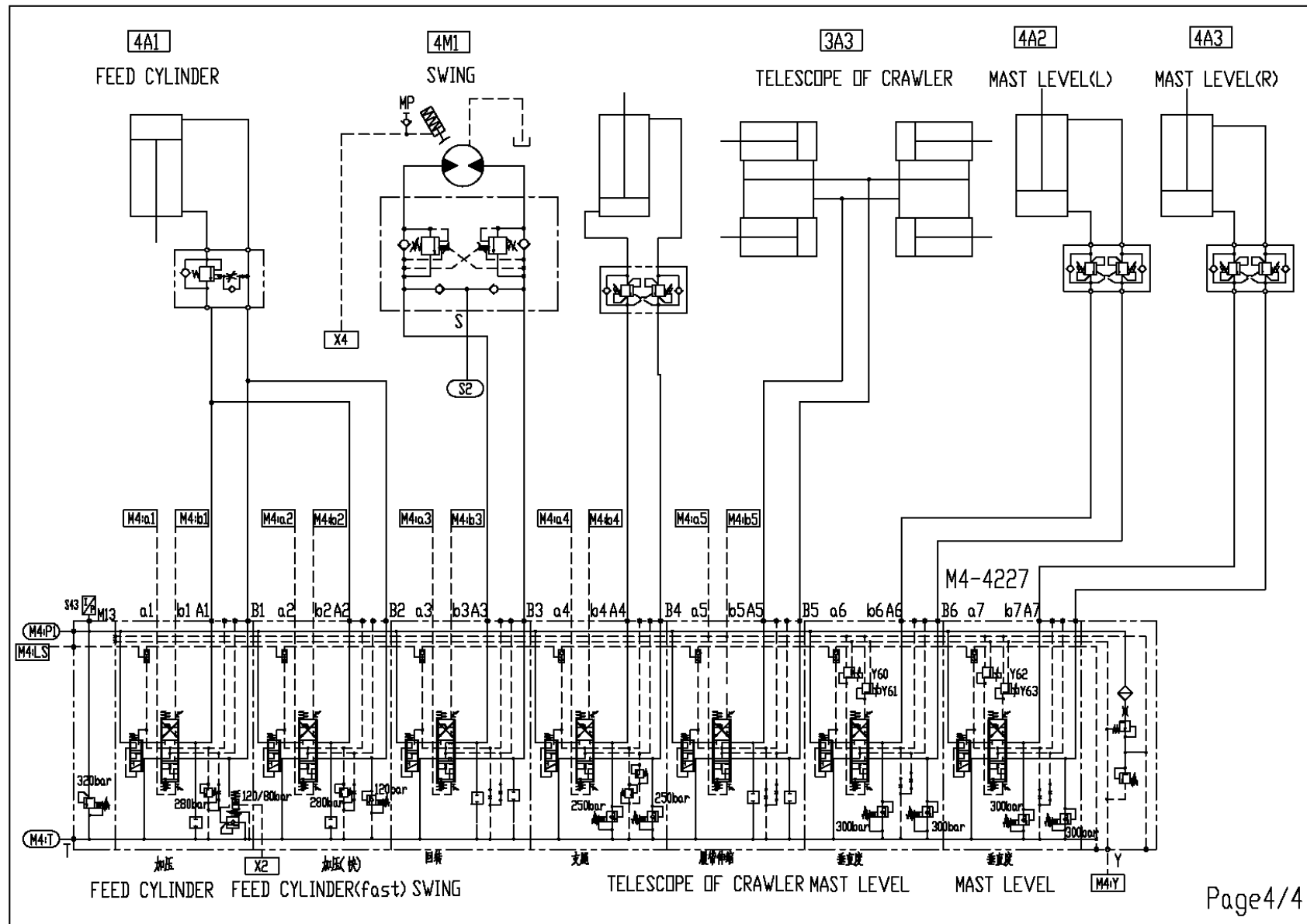
Hydraulic System



Hydraulic System

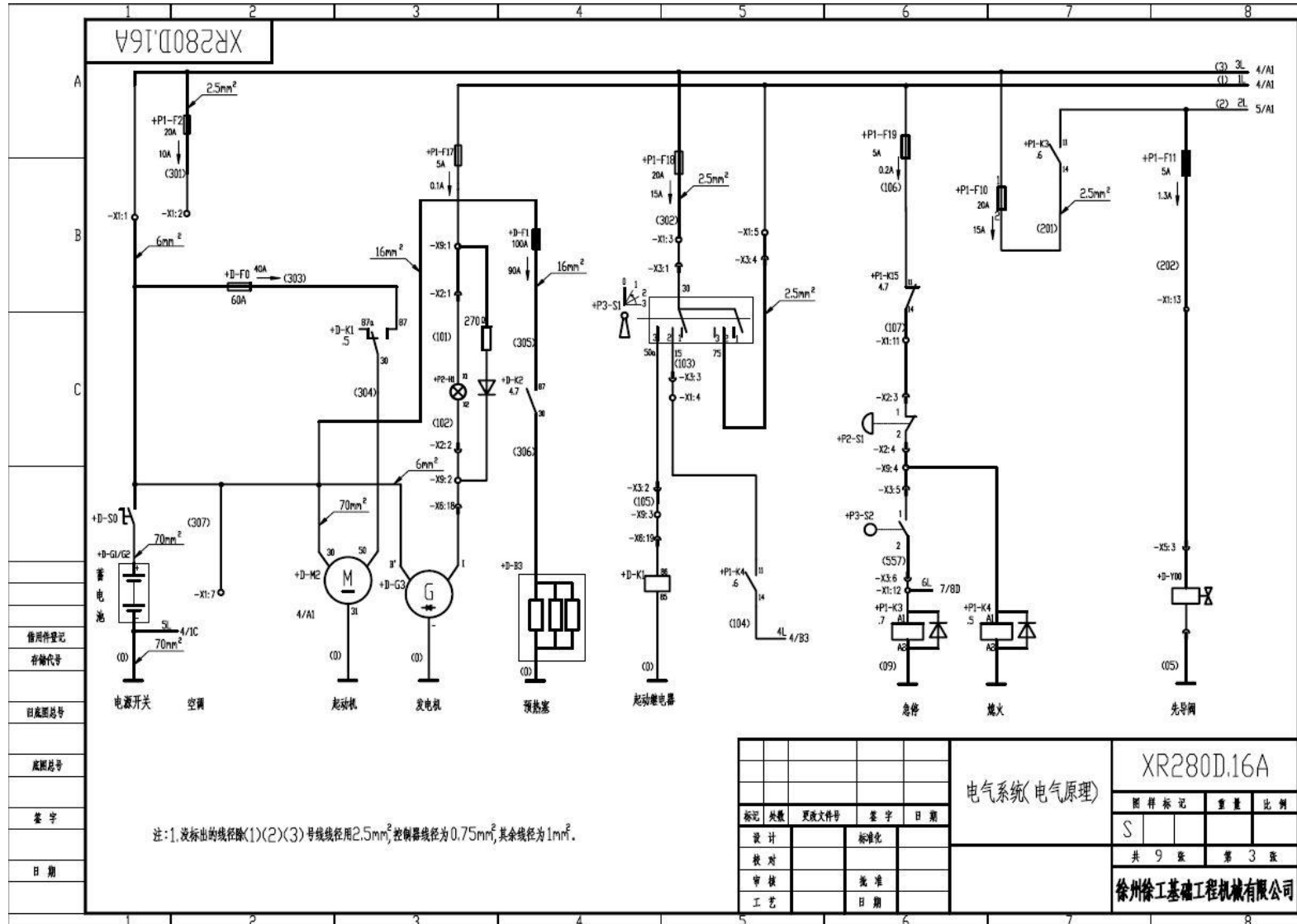


Hydraulic System

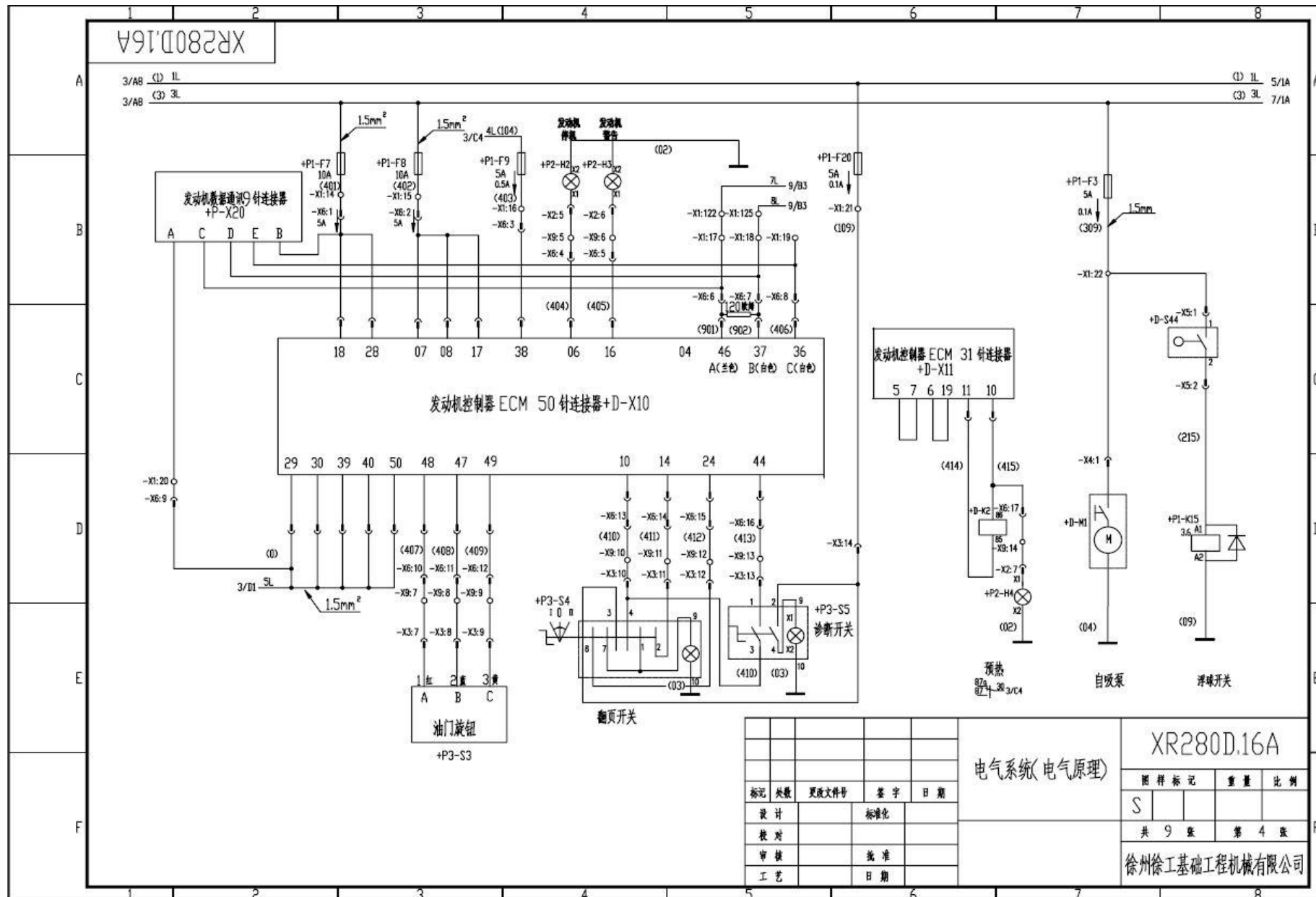


14 Electrical System

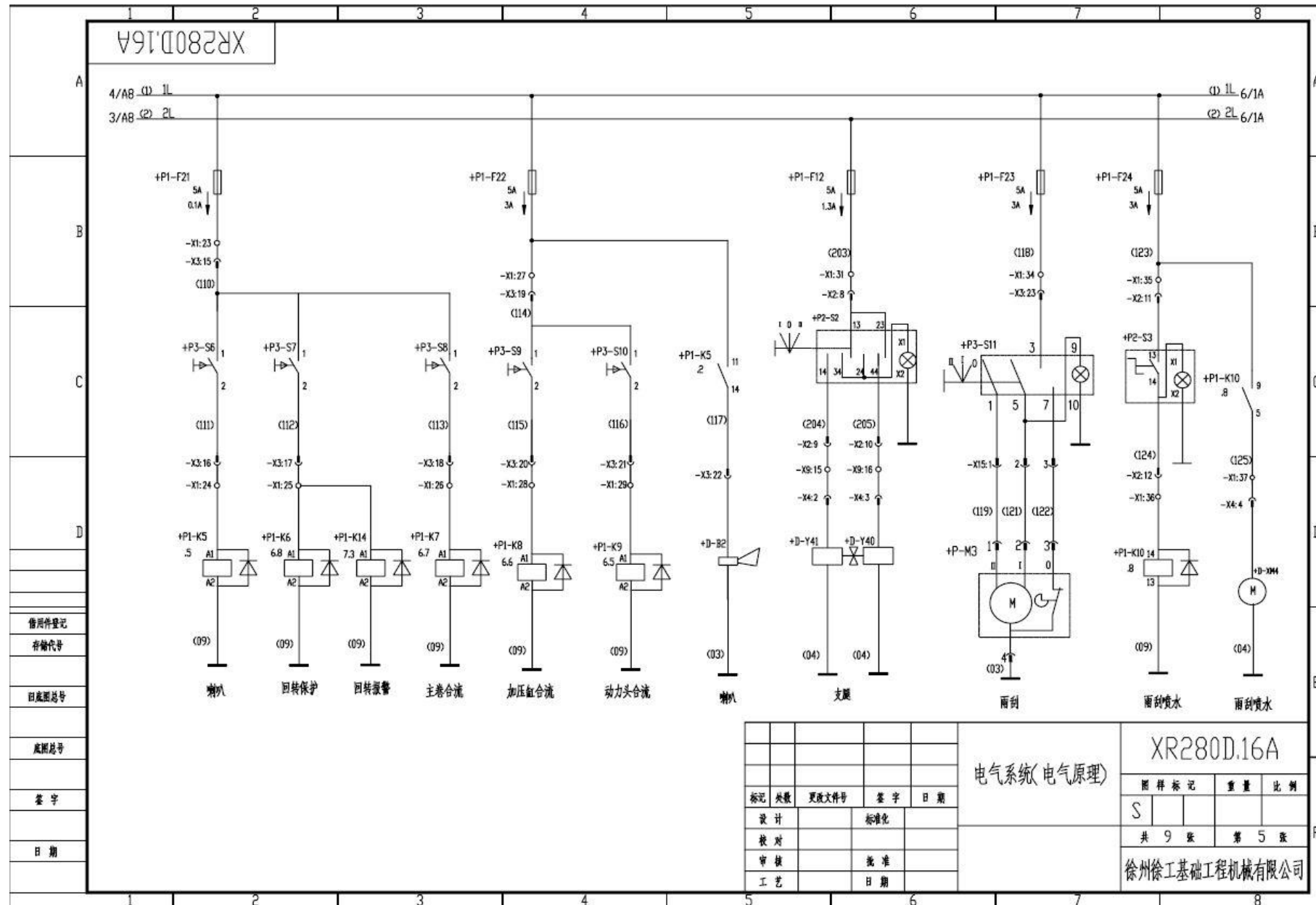
14.1 Electrical Schematic Diagram



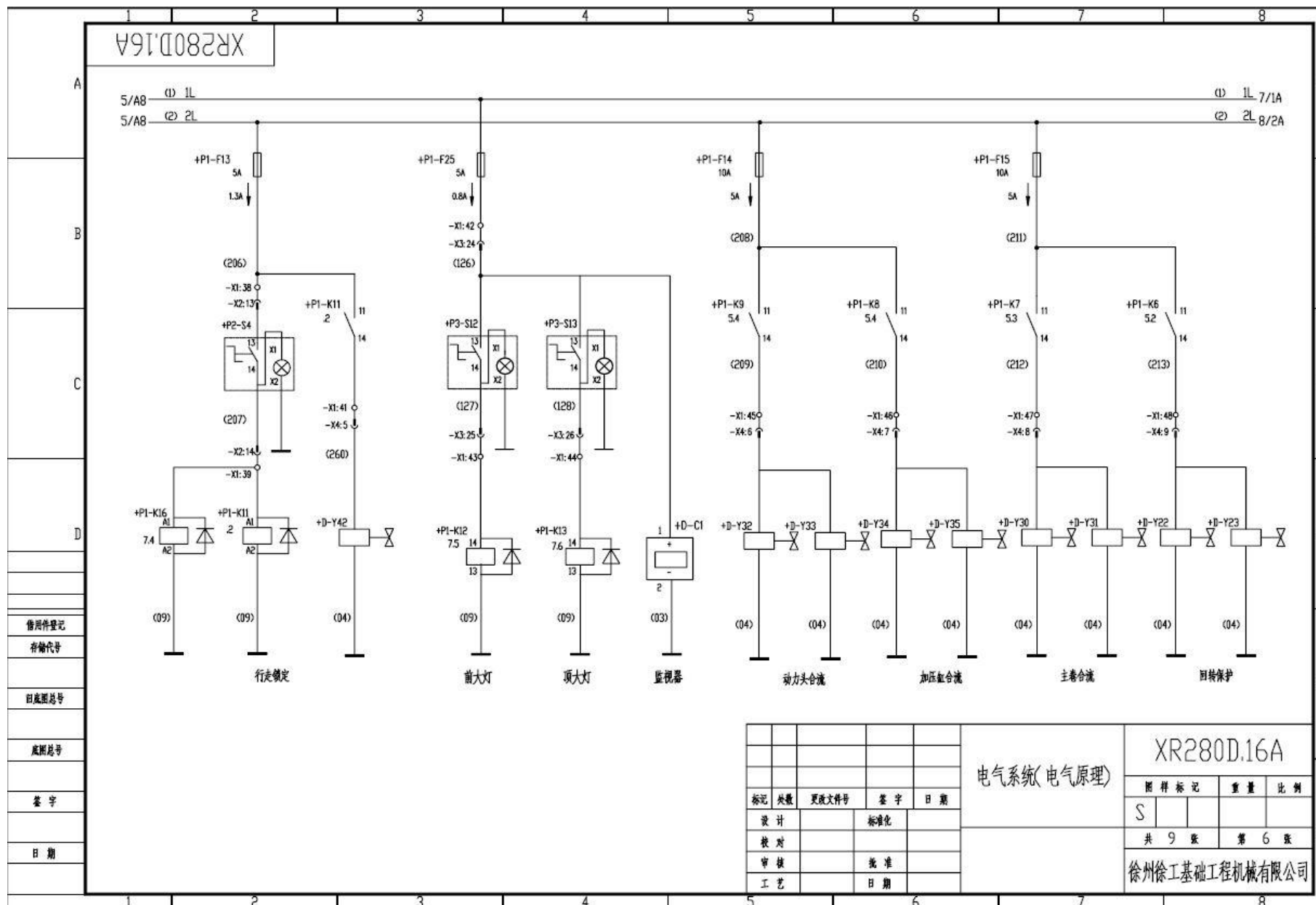
Electric System



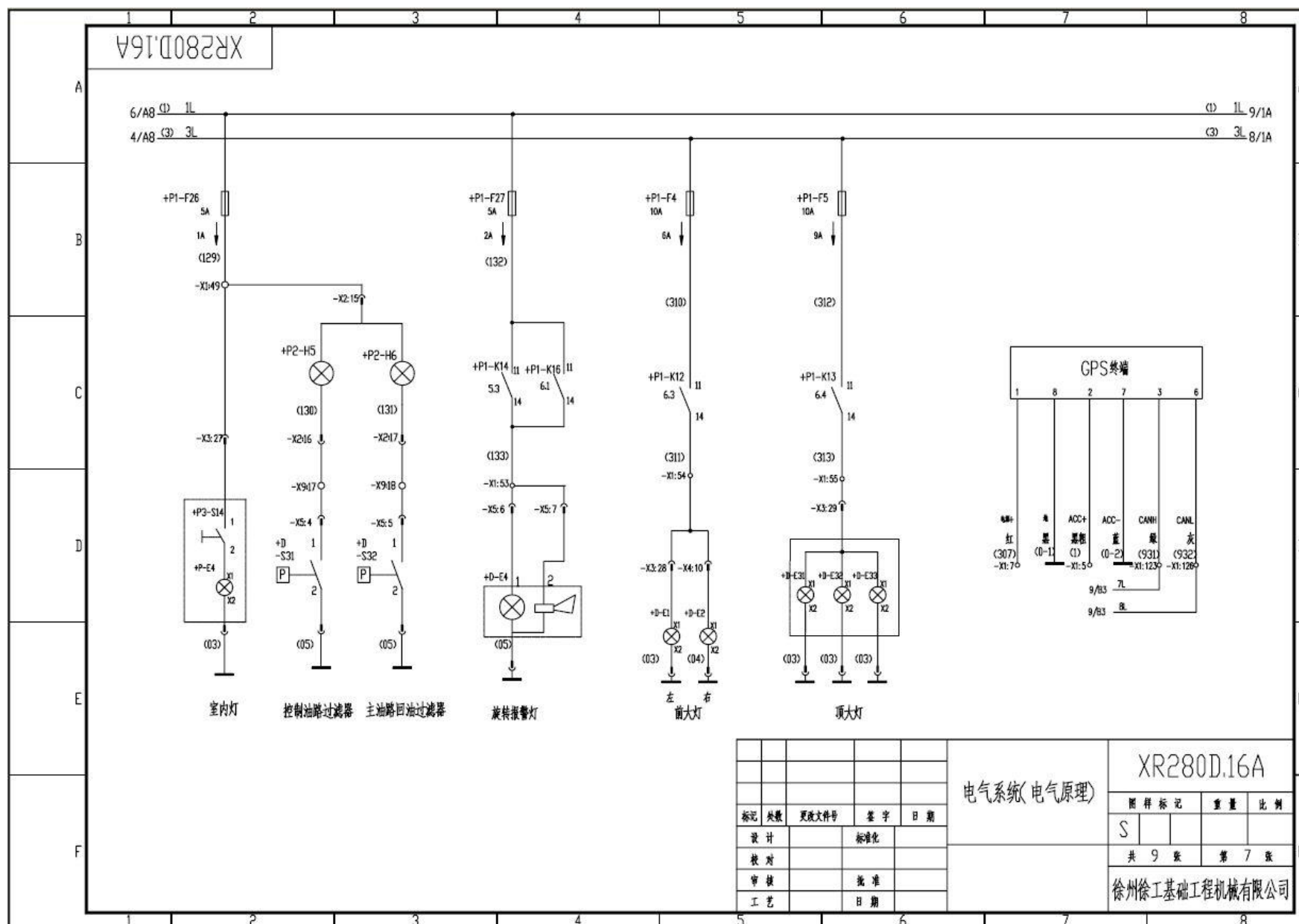
Electric System



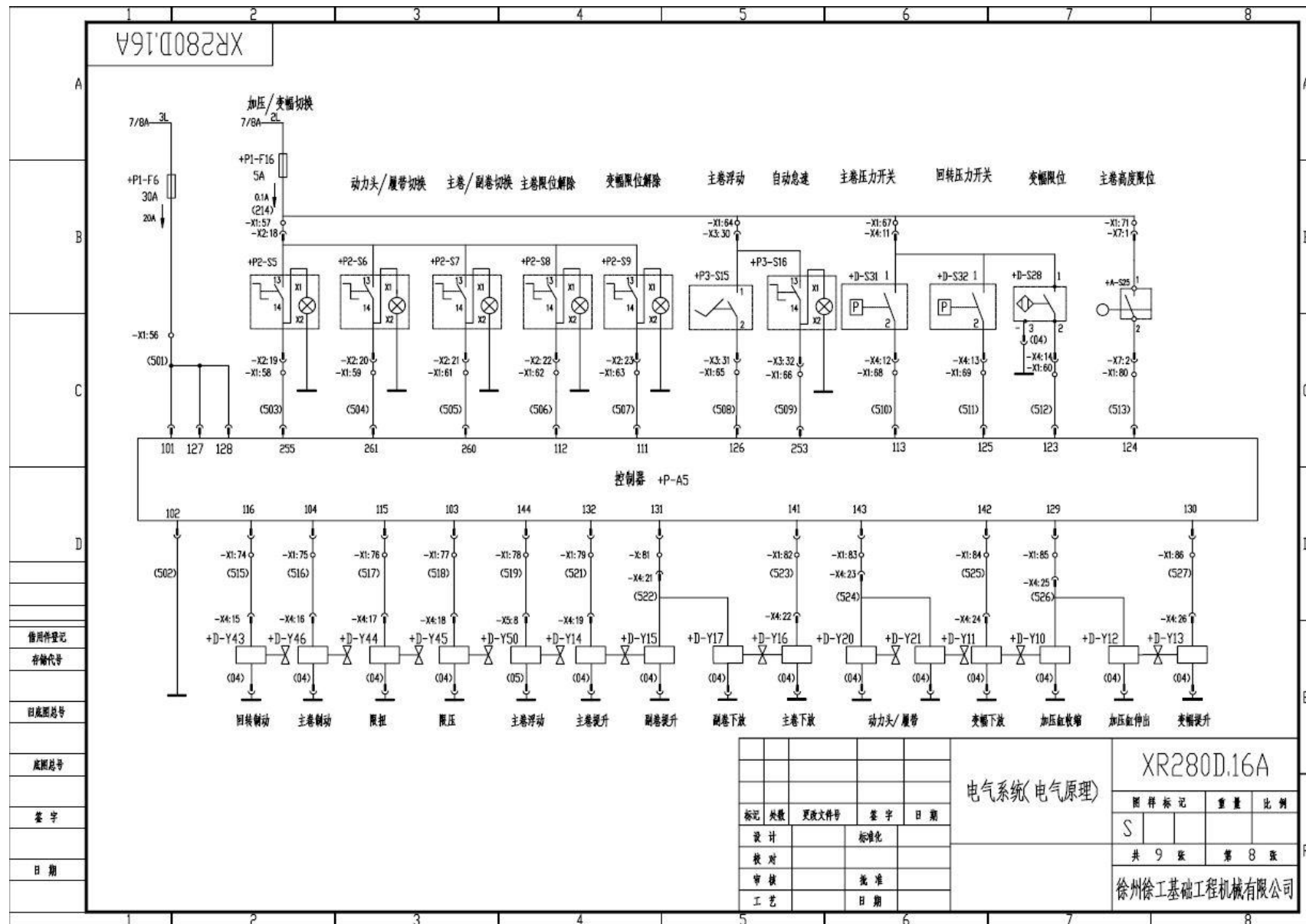
Electric System



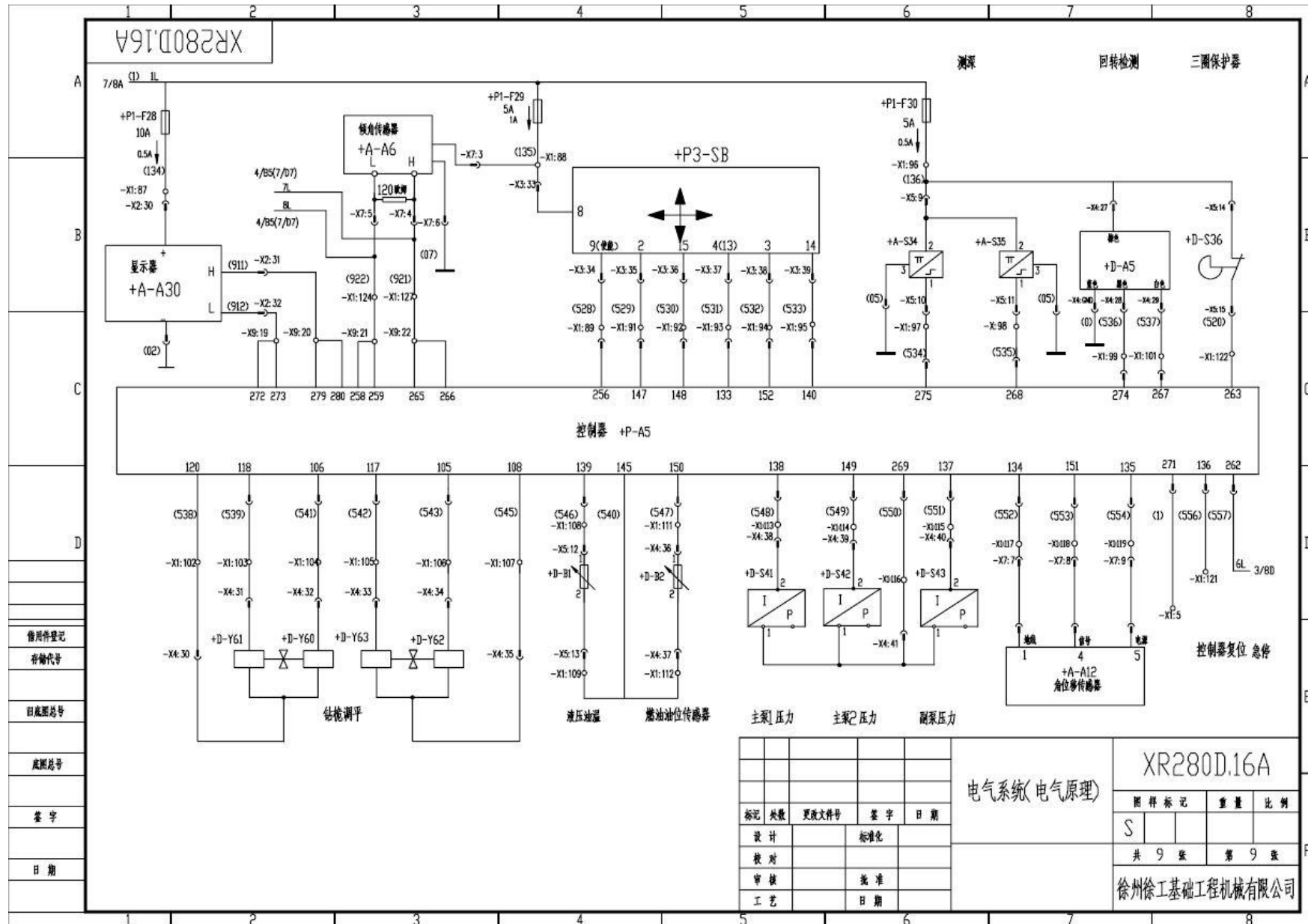
Electric System



Electric System



Electric System





Conclusion

Conclusion

Dear users,

Subject to preparation schedule and the selection and use of information and components, it is inevitable that there are more or less deficiencies and errors in this User's Guide. In order to ensure that users can be familiar with the structure of this drilling rig, properly handle and use it and achieve its full potential within a short period, the author shall welcome and appreciate your correction if you take time out of your busy schedule for such correction.

In order to ensure the normal work and better and timelier maintenance of the drilling rig, if any more proper operation and maintenance methods and new construction tools and technologies are found in your use of the drilling rig, we sincerely welcome your direct communication with us, so we can amend and perfect this User's Guide in time to benefit more users.

Show our sincere appreciation to your cooperation and help!

XCMG will help you succeed!

Author

April, 2011

Manufacturer: XCMG Foundation Construction Machinery Co., Ltd.

Add: No.1 XCMG Road,Qingshanquan Town, Jiawang District,Xuzhou,JiangSu,China

Nationwide unified customer service hotline: 400-110-9999.

Sales hotline: 0516-87738142 87893502 87892620

Service hotline: 0516-87892690 87738150

Fax: 0516-87738173

Spare parts hotline: 0516-87892668

Postcode: 221137

Website: <http://www.xcmgjc.com>

Version number: July, 2022

All rights reserved, Violators will surely be prosecuted