ROTATING CONTROL DEVICE

WDXK35/192-17.5/35

SERVICE MANUAL

Ⅰ. INTRODUCTION

1.1 Model Name

Model name's meaning, for example:

WDXK—Rotating Control Device No.

35—Nominal Diameter 350mm

17.5—Max dynamic working pressure 17.5Mpa

35—Max static working pressure 35Mpa

192—Central tube bore 192mm.

1.2 Configuration and Features

Rotating Control Device consists of rotating assembly, shell, and hydraulic power unit. Rotating assembly consists of rotating bushing assembly, central tube, Spheric rubbers and bearing room etc; shell consists of shell, hydraulic clamp and cylinder, rotating assembly and shell are connected by clamp; hydraulic power unit consists of power unit and hoses.

1.3 Main Working Principle

By rotating power bushing assembly on the rotating control device, Kelly rotates running shell, central tube, spheric rubbers and drill stem. Spheric rubbers seal the drill column by itself flexibility and well pressure assisting seal. Dynamic sealing between central tube and rotating assembly is achieved by up and down dynamic sealing assembly.

Hydraulic power unit is used to control open and close of hydraulic clamp, and to provide lubricant to cool down spare parts in rotating assembly and dynamic sealing assembly; to provide circulate liquid to cool down up dynamic sealing assembly.

1.4 Application

Rotating control device is installed on the annular BOP or ram BOP to seal rotating drill tools and influent division when operating non-balance drillings. When it's used together with hydraulic BOP, drilling tools check valve, oil and gas division equipment and non-killing drilling pressure device etc., it can operate with pressure drilling and non-killing drilling. It plays a very important

part in special operations such as liberating low pressure oil and gas layer, leakage proof drilling, air drilling, non-killing well repair etc.

XK35.192—17.5/35 Rotating Control Device application as follows:

1. Applicable drilling tools: 127mm(5in), 89mm(3-1/2in), 73mm(2-7/8in) drill pipes and Kellys;
2. Applicable medium: air, foam and other kinds of drilling fluid;
3. Rotating control device central tubing maximum drilling tool dimension: 179.4mm(7-1/16in);
4. Drilling machine rotary plate open diameter: ≥440mm(17.5in).

The hydraulic cooling power unit of this type rotating control device provides control oil, lubricant, cooling circulating fluid for rotating control device at work, to make sure its normal working. Its hydraulic clamp can automatically open and close by cylinder, reducing time and dangers of the workers working on the well. The power of controlling cylinder is provided by hydraulic power unit high pressure oil pump, to control clamp open and close by system control handles. If there is accident during working, cylinder loses power (for example, the high pressure hose between hydraulic power unit and cylinder is broken), hydraulic control lock inside the cylinder will protect automatically, and safety locking bolt will lock to make sure clamp will not be pushed by down well pressure (maximum 35Mpa).

XK rotating control device main technical specifications as follows:

Model	XK35-192-17.5/35
Hull Diameter	350mm（13 5/8in）
Bottom Flange	346mm(13 5/8in)—35Mpa 6BX flange
Side Diameter	180mm(7 1/16”)
Side Outlet Connections	180mm(7 1/16”)—21MPa 6B flange
Side Inlet Connections	52mm（2 1/16）—35MPa 6B flange
Central Tube Bore	192mm
Working Pressure	Max dynamic working pressure 17.5MPa
	Max static working pressure 35MPa
Maximum Rotate Speed	100r / min
Applicable Drilling Tools	5 1/4in Kelly +5in drill column，4 1/2in Kelly +3 1/2in drill column, 3 1/2in Kelly +3 1/2in drill column, 3in Kelly +2 7/8in drill column
Working Medium	Air, foam and various drilling liquids

Overall Size	Total high：1778mm Rotating assembly diameter：440mm Hull height：930mm

Ⅱ. HYDRAULIC CONTROL SYSTEM

2.1 Application and Feature

1. Application: Oil supply system is used to control the open and close of the shell clamp, and supply lubricant for rotating assembly. The cooling system is used for the cooling of rotating assembly.
2. Feature: This system is full closed structure. In the oil tank there are air cleaner, oil filter, liquid level measure, clean hole, oil outlet hole etc. In the cooling liquid tank there are water measure etc. This system adopts assembly structure with small volume and tightened structure, and has the advantages of working stable, operating convenient, and no degree adjustment of pressure and flow.

2.2 Working Principle

In the oil supply system, the motor drives the oil pump, turns mechanical energy into hydraulic pressure energy. The pressure goes to the executive institution through the oil routine which consists of assembly block and hydraulic pressure valve, and drive the executive institution move to realize the open and close of shell clamp and oil injection.

Main Technical Parameters:

Rating Pressure	28	MPa
Working Pressure	15~20	MPa
Rating Flow Rate	2.5	L/min
Motor Power	（Oil）2.2	KW
	（Coolant）2.2	KW
Manual Valve	DMG—02—3C2	O
Cooling Liquid Tank Volume	280	L
Oil Tank Volume	280	L
Inlet and Outlet Connection	M16*1.5	A

2.3 Using

1. Fix the bottom framework of the power unit, clean the air cleaner, then inject oil into the oil tank.
2. Connect oil hoses, cylinder and electrical machines tank as drawing 2.2 to form a complete oil pressure system.
3. Pipeline connection method: hydraulic power unit pipeline outlet has obvious marks. "Hydraulic cylinder open" connects the connector of oil cylinder fixed side (room without shaft); and "Hydraulic cylinder close" connects the connector of oil cylinder flexible side (room with shaft); clamp control handle turns right is opening, and turns left is closing. "Circular cooling (in)" and "Circular cooling (out)" two pipelines respectively connect the two connectors on the 180 degree symmetry part of the center of rotating assembly; "sealing tank" connects another connector on the centre of rotating assembly.
4. Check all electric circuit and oil routing to make sure they are safe.
5. Adjust the flow valve to low pressure, adjust the pressure measure to small flow rate, start the motor, check the turn of electric starter to make sure it is OK. If not, please adjust any two of live lines.
6. Start the motor, run emptily for three minutes, if there is no problem, rise the pressure slowly.
   (1) Rise pressure: After the motor runs normally, loose the flow valve, then push or pull the manual valve to low position, and adjust the handle of flow valve, stop rising of pressure when the system can operate. When in position, adjust the pressure to the required pressure.
   (2) Turn direction: Choose the oil pump automatic shaft (or manual shaft) button, push or pull open/close handle of cylinder. Press the stop button of the oil pump automatic shaft (or manual shaft), keep the oil cylinder position unchanged.

2.3.1 Maintenance

1. Hydraulic cooling power unit oil using and working conditions: suggest to use item46 anti-attrition hydraulic oil, the suitable temperature is 10~65℃. When the temperature is below 10℃or above 80℃, do not open the machine until heating up or cooling. When the power unit connects electricity, anti-explosion heat up assembly will operate automatically

when the temperature is below 5℃(designed by the computer), cooling should be set manually.

2. Hydraulic cooling power unit oil and oil tank maintenance: Hydraulic oil should be filtered and changed periodically. At first time oil should be filtered every one to two months, after that filtered every six to twelve months and clean the oil tank. Oil should be changed in time according to the using conditions. You can use 38℃, viscosity 20 penetrate oil to clean the hydraulic power unit.
3. Cooling fluid choosing: Generally we use light lubricant as cooling fluid, and check the clean degree of cooling fluid periodically and change in time.

2.3.2 Notice of oil using

1. Using designated hydraulic oil only.
2. Using different kinds of hydraulic oil is prohibited, mixture using of hydraulic oil and lubricant is prohibited.
3. Using hydraulic oil in the scope of viscosity specified in the technical specifications.
4. Keep the clean degree of hydraulic in the scope specified in the technical specifications. If the machine uses unclean hydraulic oil constantly, it will course problems and damages of the equipments.
5. Hydraulic oil will degrade by time, it should be changed periodically.
6. Add oil into the machine through designated oil hole to avoid mixture of water or other things.
7. If the oil level drops too large, it may cause damages or problems. The oil storage volume of equipments should be maintained during the maximum oil levels, at least can be seen from the oil measures.
8. May use soaps etc to clean the oil on the skin.
9. Too high oil temperature will cause burning. May low down the oil temperature by changing oil.
10. Because many hydraulic oils have the possibility of burning, welding and using fire near to equipments and operation systems are prohibited.

Ⅲ. Using Method

Equipments' lifting and transportation

1. When lifting and loading the shell of rotating control device, make sure the clamp is closed first, then lift through the two rings on the clamp. Rotating control device should be transported stand. Horizontal transportation may lead damages of spare parts.
2. Hydraulic power unit can be lifted by two steel ropes hitching four corners, or be lifted from the bottom.
3. The total weight of rotating control device is 2.5 tons. The weight of hydraulic power unit is 1.5 tons when empty, and about 2 tons when fully loaded.

Between the hydraulic power unit and rotating control device there is high pressure hose of 30 meters. The hydraulic power unit should be located far from the wellhead. The connection between them can be seen on the drawing s 2.2A, 2.2B. The hydraulic unit uses 3 phases 5 lines 380V electricity supply, the zero line must connect the earth to avoid electricity broken or instability of electricity supply. There must be someone on duty when the system is working, to make sure all systems are running normally.

4. Installation Technology

1. The well which needs non-balance drilling means when almost drill to the destination level in the normal drilling, stop normal drilling; at the same time, install the non-balance wellhead device—rotating control device, then adjust the performance of drilling influent (density, viscosity, cut power, PH value etc.); use rotating control device and drilling influent density which is lower than stratum pressure to drill the well—non-balance drilling;
2. Figure 1

   When almost drill to the destination level in the normal drilling, stop the normal drilling. The wellhead device is the primary wellhead device showed in the figure; begin to install the non-balance rotating control device, return the square tile and square bushing of the drilling rotating plate to the beginning, seen in the non-balance drilling wellhead installation process 1;
3. Figure 2

   Use pneumatic winch to lift the shell of rotating control device up to the well head, and put on the annular BOP, seen in the non-balance drilling wellhead installation process 2;

Install the shell on the annular BOP on the wellhead, realize the sealing through the steel ring on the bottom of the shell with the annular BOP, seen in the non-balance drilling wellhead installation process 3;

4. Figure 3

   Startup the cylinder on the shell, open the clamp board through cylinder, lift the pressure test plug into the shell and put on the triangle gasket in the shell, startup the cylinder, close the shell clamp board through cylinder; realize the shell's sealing and blocking to the pressure test plug; notice: at this time cylinder keeps a certain pressure; seen in the non-balance drilling wellhead installation process 4;

   Install the pressure test pipelines on the 2 1/16" bypass hole of the shell to test pressure, testing pressure is 70% of the shell nominal pressure (shell pressure is 35MPa, testing pressure is 24MPa), time is about 20 minutes; the purpose is to test the sealing between the shell and annular BOP, the shell and the pressure test plug, the shell and the hydraulic slab valve and the hydraulic slab valve itself; notice: the shell and pressure test plug are sealed by triangle gasket, if they can be sealed pressure, then the sealing between shell and bearing assembly can be reached; seen in the non-balance drilling wellhead installation process 5;

5. Figure 4

   After the pressure test is qualified, startup the cylinder, open the clamp board of shell through cylinder, lift the pressure test plug out of shell; notice: now the cylinder is releasing pressure; seen in the non-balance drilling wellhead installation process 6;

   Drilling the well, open the clamp board on the shell, drilling tool connects the drill bit and drill to the end of the well; seen in the non-balance drilling wellhead installation process 7;

6. Figure 5

   When the drilling tool reaches to the well end, use the angle to hang the drilling tool, put the square tile and square bushing into the open of the rotating plate, seen in the non-balance drilling wellhead installation process 8;

Put the clamp on the rotating plate to hold the drilling tool, use hook to lift up the swivel and the Kelly connected under the swivel to the wellhead; seen in the non-balance drilling wellhead installation process 9;

7. Figure 6

   Kelly connects the guide shoes in the bottom, seen in the non-balance drilling wellhead installation process 10;

   Put the bearing assembly on the drilling desk stand, put the Kelly with guide shoes through the bearing assembly; seen in the non-balance drilling wellhead installation process 11;

8. Figure 7

   After the Kelly got through the bearing assembly, take off the guide shoes; seen in the non-balance drilling wellhead installation process 12;

   Connect the Kelly to the drilling tool on the wellhead, seen in the non-balance drilling wellhead installation process 13;

9. Figure 8

   Lift the drilling tool, take out the clamp, seen in the non-balance drilling wellhead installation process 14;

   Take out the square tile and square bushing, seen in the non-balance drilling wellhead installation process 15;

10. Figure 9

    Low down the drilling tool, and put the bearing assembly into the shell, and put it on the triangle sealing gasket in the shell; seen in the non-balance drilling wellhead installation process 16;

    Startup the cylinder, close the shell clamp board through cylinder; realize the shell's sealing and clamp to the bearing assembly; (Notice: as long as bearing assembly is in the shell, cylinder will keep a certain pressure condition;), then put the square tile and square busing into the open of rotating plate; seen in the non-balance drilling wellhead installation process 17;

11. Figure 10

Connect the pipelines of cooling fluid and oil pressure; startup the mud pump, use drilling fluid which non-balance drilling needs to replace the original slurry in the well; seen in the non-balance drilling wellhead installation process 17;

Startup the cooling lubricant device to inject cooling fluid and lubricant into the bearing assembly; the cooling fluid is circular between the cooling lubricant device and the bearing assembly; inject the lubricant into bearing assembly and link to the well, use variable fluid injection pump to inject more at the beginning, after the sealing tank and pipelines are full of lubricant, low down the flow rate to keep 2 to 5 drops per second for a long time, (notice: lubricant has pressure, generally its pressure keeps about 150psi); at this time the non-balance drilling begins; seen in the non-balance drilling wellhead installation process 19;

12. Pressure test

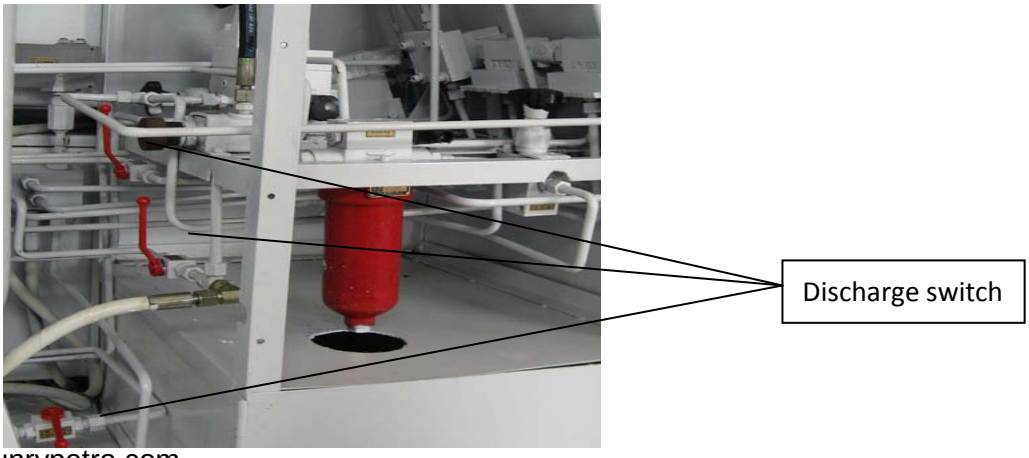
Startup the cooling lubricant device to inject cooling fluid and lubricant into bearing assembly; startup the drilling machine, rise the pressure in the well respectively to 2Mpa, 5Mpa, 8Mpa, 12Mpa, then to 17.5Mpa and keep 10 minutes at this pressure. In the whole process of pressure test, when the pressure of pipeline reaches to 1Mpa, stop supplying oil. If there are no pressure decreasing, no leakage, it’s qualified.

5. Installation of power unit

5.1 Check the connection between cylinder open/close system and rotating control head;

5.2 Observe the fluid level measure to check the cooling circulate fluid tank, oil tank fluid in the specified scope;

5.3 Check “accumulator discharge switch”, “sealing discharge switch”, “high pressure cleaner discharge switch” in close condition, as in picture 1;



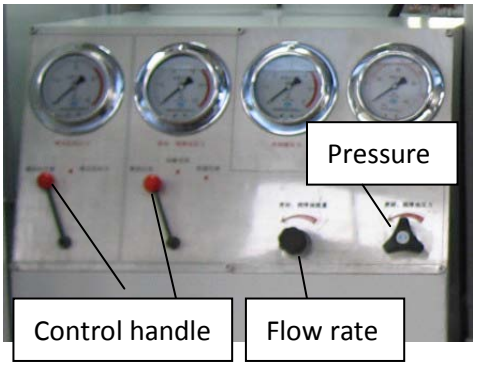
5.4 Connect the power supply connector plug with power unit and rotate the nut, connect the other side to the site power switch, (notice: line headers marked with 1, 2, 3 connect respectively power 3 phases liners L1, L2, L3; line header 4 connects the middle line N; line header 5 connects the earth line), open “supply power chief switch”, try to open the fan machine to watch the rotating direction. If it runs oppositely, change any two lines of L1, L2, L3. If it can not run, check the electric pressure in the connection.

5.5 Pull the control handle of sealing lubricant to the “oil routine close” position, and open the “supply power chief switch”, startup hydraulic pump motor, system oil pump works automatically.

5.6 Operate the “cylinder open/close handle” to control the rotating control head, clamp, and cylinder freely.

6. Start and stop assembly hydraulic system

6.1 Turn the control handle of sealing lubricant to the “oil routine close” position and turn the pressure control knob to the minimum side, then startup the hydraulic pump, if the oil temperature is above the designed minimum temperature, the oil pump starts to work, hydraulic oil starts to inject to the clamp cylinder and accumulator. About 6-10 minutes later, the system oil pressure rises to the designed maximum working pressure 21Mpa, open the circulating cooling pump and fan electric machine, pull the control handle of sealing lubricant to “quick oil injection” position, and adjust the pressure control handle to the required pressure (for example 2Mpa), then pull the control handle of sealing lubricant to the “slow oil injection” position to inject oil slowly. Oil flow rate can be adjusted by flow rate control knob, method as follows: if after the system has operated for a time, the pressure of the sealing lubricant tank follows: increase the flow rate, if the pressure rises, decrease the flow rate. As picture 2.



6.2 Watch the system to see whether it’s working properly, when the system pressure rises to 21Mpa, oil pump stops to works. When the system pressure

follows to 15Mpa, oil pump starts automatically. (The start and stop pressure of equipment is 15-21Mpa when it exits from workshop). If not, please stop the machine to examine, for details see maintenance and problems removing;

6.3 Prevent high pressure oil injection for a long time, when the wellhead annular pressure is far below 5Mpa, do not keep pressure for a long time, please adjust the pressure through pressure control knob.

6.4 After the pressure and flow rate parameters are adjusted, the system starts to circular work automatically. In the normal working condition, oil pump electric machine works for about 1 minute and stops for about 8 to 10 minutes.

6.5 Stop hydraulic system, open the cylinder (notice: the clamp locknut looses now), close oil pump motor, cooling pump, fan, then open slowly the accumulator discharge switch. When the cylinder pressure gauge shows pressure is zero, open the sealing lubricant switch (Picture 1). When the sealing tank pressure gauge shows the pressure is zero, pull the control handle of sealing lubricant to " oil routine close" position, then dismantle all the pipeline connections on the rotating control head and cover anti-dust plug. Collect pipelines and cut off power supply.

7. Operating procedures of lifting rotating assembly

The operating procedures of lifting drilling tools are opposite to the procedures of installing rotating assembly, but should notice following points:

1. After stop drilling, open the hydraulic gate valve to release slurry in the wellhead, there should be no person near the wellhead for safety.
2. Dismantle clamp safety locknut on the shell, open hydraulic clamp.
3. Power unit stops to work, release pressure in the sealing tank (oil pipeline), make the oil injection pressure gauge back to zero, pull the three pipelines connected with rotating assembly (quick loose connector).
4. Lift the rotating assembly out of shell, must use wind power winch to hang the assembly, can not lift the rotating assembly directly by friction between spheric rubbers and drill pipe.
5. After lifting the rotating assembly out of rotating assembly, should discharge the drill pipe clamp quickly. If there is no check valve in the rear of drilling tool, should connect

the check valve on the drill platform to prevent slurry rushing out from the well to hurt persons.

8. Lift drill pipe out of rotating assembly

1. Discharge the clamp of drill pipe around the rotating assembly, divide from down part of drill pipe.
2. Use steel pipe to bind one head of rotating assembly, the other side bind the lift clamp on the well head.
3. Lift up the drill pipe, then use wind power winch to hold rotating assembly, to prevent the slip of rotating assembly from the drill pipe.
4. After lifting the drill pipe out of rotating assembly, use wind power winch to put the rotating assembly slowly to the drill platform.
5. Put the rotating assembly flat on the suitable place on the drill platform for further examination.
6. Or: If the sealing performance of spheric rubbers is good, can don't lift the drill pipe out of rotating assembly, discharge the drill pipe directly and put it on the ramp. When drill to this place connect the drill pipe again.

Ⅳ. Maintenance

4.1 Regular examination and maintenance of rotating assembly

1. The working principle of this serial of rotating control device is to use spheric rubbers and pressure dynamic sealing assembly to seal the down hole pressure, so there is lots of abrasion in using. The operator should exam the condition of rotating assembly before every time of drilling.
2. Exam the spheric rubbers of rotating assembly. If spheric rubber is damaged or life time is short, change upper and down spheric rubbers.
3. During the working of rotating assembly, if there is oil leakage on the upper pressure sealing assembly, can use down pressure sealing assembly to maintain for a time temporarily, until lift drilling tool, open upper and down pressure board, change sealing rings of upper and down pressure boards.

4. Exam the oil routine is smooth or not. If the oil volume in the oil tank decreases a lot, please reduce the injection volume.
5. During the drilling process, when lift the drilling tool or change spheric rubbers, should clean the sealing incline of shell, keep the clean condition, and clean the chippings gathered under rotating assembly.

4.2 Pressure testing procedure before use of rotating control device.

(See installation procedure 12---test pressure)

4.3 Maintenance of hydraulic power unit

After the use of hydraulic power unit, exam all the pipelines connectors and gauges to make sure there is no leakage, make sure all electric components are good.

Before the transportation of hydraulic power unit, make follow working procedures:

1. Stop working of all oil and water pumps, close “power supply total switch”.
2. Cut off all pipeline connections with rotating control device, collect hydraulic pipelines, and cut off power supply connection.
3. Open “high pressure accumulator pressure discharge valve”, to discharge pressure of hydraulic power unit high pressure oil system completely.

4.4 Other notices

1. When drilling through rotating assembly, protect the spheric rubbers to extend its lifetime. Before the drilling tool goes through the rotating assembly, you should exam carefully whether there is tong tooth trace on the drilling tool connections which will damage the spheric rubbers. If there is, polish the drilling tools. The spare of spheric rubbers should prevent shining or freezing, or the rubber performance will decrease quickly.
2. For better sealing and extension of spheric rubbers of life time, during the process of drilling and lifting of drilling tools, fill the annular space between central pipe and drilling tool with soap suds or water mixed with machine oil in order to lubricate and temperature dropping.
3. Various drilling bits can not go though inside hole of rotating assembly and spheric rubbers assembly, to avoid damage on spheric rubbers and central pipe.
4. When there is pressure in the wellhead, and the BOP valve board is close, when it’s drilling, the total length of drilling bits or other tools connected under rotating assembly should

shorter than the distance from full-closed board to the end of rotating assembly, or the rotating assembly cannot be installed.

5. When the rotating assembly lifts up or put down through drilling platform, should be vertical and slow, in order to avoid damages on sealing rings and sealing face.
6. When in drilling, should keep the cooling circular fluid and lubricant of equipments continuing. Open fluid and oil first, then start drilling. Stop drilling, then stop fluid and oil.
7. After drilling, in order to extend the lifetime of cylinder, please dismantle the quick connector on the cylinder or keep the inlet and outlet connected with air, do not keep the pressure.

Ⅴ. Hydraulic system maintenance and problem solution

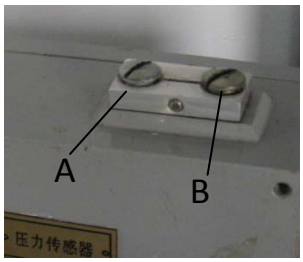
5.1 Oil application and maintenance

1. Use specified hydraulic oil only, when the temperature is between -5 to 70℃, use N32 or N 46 anti wear hydraulic oil. When the temperature is under -5℃, use correspond anti curdle hydraulic oil, or it will affect normal use of equipment.
2. Forbid using different kinds of hydraulic oil, mixture using or mixture using of hydraulic oil and lubricant.
3. Use hydraulic oil whose viscosity is in the scope of specified requirements.
4. Keep the clean degree of hydraulic oil in the scope of specified technical requirements. The use of unclean hydraulic oil of machine will lead to the problems and damages of equipment.
5. The hydraulic oil will deteriorate. Should change hydraulic oil timely.
6. Add the oil into the machine from designated oil hole to avoid water or sundries.
7. If the oil level drops too large, it may cause damages or problems. The oil storage volume of equipments should be maintained during the maximum oil levels.
8. May use soaps etc to clean the oil on the skin.
9. Too high oil temperature will cause burning. In the working under high pressure environment, watch the oil temperature index. When it is over working temperature, may low down the oil temperature by changing oil or out compulsive cooling system.

10. Because many hydraulic oils have the possibility of burning, welding and using fire near to equipments and operation systems are prohibited.
11. Hydraulic cooling power unit oil and oil tank maintenance: Hydraulic oil should be filtered and changed periodically. At first time oil should be filtered every one to two months, after that filtered every six to twelve months and clean the oil tank. Oil should be changed in time according to the using conditions. You can use 38℃， viscosity 20 penetrate oil to clean the hydraulic power unit.
12. Cooling fluid choosing: Generally we use light lubricant as cooling fluid, and can use attenuant lubricant according to different environmental temperatures and conditions.

5.2 Parameters setting

1. System working temperature scope setting; (details seen in instruction of temperature control gauge)
2. System start and stop pressures setting: as picture 3, knob A is the knob of highest pressure knob, when turn right, the system highest pressure decreases, and the opposite the system pressure increases; knob B is differential setting knob, when turn right, differential increase, and the opposite the differential decreases.



3. Overflow valve is the protective valve of the whole system, setting method is: first close the flow valve to the maximum, then adjust the maximum pressure of the pressure sensor to a little higher than the setting overflow valve pressure (seen in the last item), startup the hydraulic pump to watch the pressure gauge, when the pressure rises to the designed overflow valve pressure, open the overflow valve, and adjust to the overflow condition. When the pressure doesn't rise, the adjustment of protective pressure is finished, at last close hydraulic pump, open accumulator discharge switch to discharge system pressure, restart hydraulic pump and adjust the maximum working pressure of pressure sensor. (notice: the working pressure of pressure sensor must be lower than system protection pressure). The EXW protection pressure is set by 22MPa.

4. The function of sealing lubricant pressure protection valve is: when the pressure in the sealing lubricant chamber rises suddenly because previous problems of choke valve, can protect it from damages. The setting method is: plug up the sealing lubricant pipelines, pull the control handle of sealing lubricant to “quick oil injection”, open the pressure control knob completely, to adjust the handle of protection to watch the index on the pressure gauge is the same with designed pressure. (The designed EXW pressure is 10MPa)

5.3 General problems examination and elimination

Item	Description	Problem Causes	Problem Elimination Methods
1	Hydraulic motor cannot startup	1. Pressure sensor problem.	1. Change pressure sensor.
		2. Motor over loading heat relay action.	2. Open electric control tank and press return knob of heat relay.
		3. Power supply switch problem.	3. Repair or change switch.
2	Hydraulic motor cannot stop working	1. Pressure sensor incorrect setting or damage.	1. Reset parameter of pressure sensor (details seen in “parameter setting”) or change.
		2. Setting pressure of system protection valve over flow is lower than working pressure of pressure sensor.	2. Reset parameter of pressure protection valve (details seen in “parameter setting”).
		3. Filter plug or oil absorbing on the pump is not smooth.	3. Clean filter, and check pump oil absorbing hole.
3	Hydraulic cylinder does not work	1. Hydraulic cylinder speed control valve is closed.	1. Open hydraulic cylinder speed control knob.
		2. Quick connector valve needle is clamped.	2. Open accumulator discharge switch, change quick connector.
		3. Hydraulic lock is clamped.	3. Dismantle, clean, repair or change after releasing pressure.
4	Hydraulic cylinder can not open.	1. Quick connector valve needle is clamped.	1. Change quick connector after releasing pressure.
		2. Hydraulic lock is locked.	2.1 Pull the control handle of hydraulic cylinder to the open position, open accumulator discharge valve to release the system pressure to 5MPa, then slowly loose the nut between hydraulic cylinder and hydraulic lock connection oil pipeline.
			2.2 Clean, repair hydraulic lock and filter or change hydraulic oil.
5	The oil pump works normally, but the system	1. High pressure filter is plug.	1. Close oil pump, open accumulator and high pressure filter discharge switch, and dismantle high pressure filter net and clean.

	pressure rises slowly.	2. System protection valve and hydraulic cylinder speed control valve are closed.	2. Open system protection valve and hydraulic cylinder speed control valve.
		3. Environmental temperature is low, the viscosity of hydraulic oil is high.	3. Examine heater and temperature control gauge, change anti-coagulate hydraulic oil.
		4. Plunger pump is damaged.	4. Change plunger pump.
6	Sealing lubricant tank pressure can not rise.	1. The pressure adjustment of sealing lubricant tank protection valve is too low.	1. Readjust.
		2. Pressure-reduce valve is damaged.	2. Change new pressure-reduce valve.
7	Hydraulic oil temperature rises quickly.	1. Temperature control system has problem, causes heater works abnormally.	1. Stop machine immediately, and ask professional to repair.

Ⅵ. Notice

a) Although this equipment can work automatically, there should be someone supervise for safety. Especially in the high temperature, high temperature and long time working conditions, should examine the equipments parameters times, such as pressure, hydraulic oil temperature, cooling fluid temperature, pressure and circular airiness condition.

b) All running electric equipments and airiness are forbidden of covering. Equipments should in good airiness.

c) The hydraulic cylinder control handle should take off in equipments' normal working condition to avoid misoperation.

d) In the extreme working condition, at the beginning the oil pump motor may startup intermittently. This is normal. It's because the temperature of heated hydraulic oil is not equal in the short time.

e) In the normal working condition of equipments, when adjust the sealing lubricant pressure, the pressure control valve may makes noise. This is normal. It's the damp noise arise from the high pressure oil goes through the pressure release hole when the system reduces pressure.

f) We suggest the equipment adjustment and repair should be completed by professionals.

Ⅶ. Equipment safety requirements

1. When using on site and maintaining the XK35-192-17.5/35 rotating control device, people should apply with the SINOPEC Ⅱ SE Specifications strictly, wear working protection equipments for safety.
2. Before drilling, build platform in the rotating control device if applicable. If not applicable, the operating works should wear safety belt for convenient operation.
3. Before drilling, adjust the wellhead to avoid abrasion of rotating assembly.
4. When the XK35-192-17.5/35 rotating control device is working normally on site, there should be specified workers in specified positions, usually 1-2 operators, checking the functions of equipments timely as required (such as the flow smooth condition of water and oil, temperature etc), and hand over the work properly.
5. During the process of drilling, usually there are 3-4 workers, one is commanding on the platform, 1-2 workers are operating on the platform on the wellhead, and another worker is managing the hydraulic cooling power unit.
6. Other unspecified safety requirements should apply with the SINOPEC Ⅱ SE Specifications strictly.

Installation Technology Process Figures

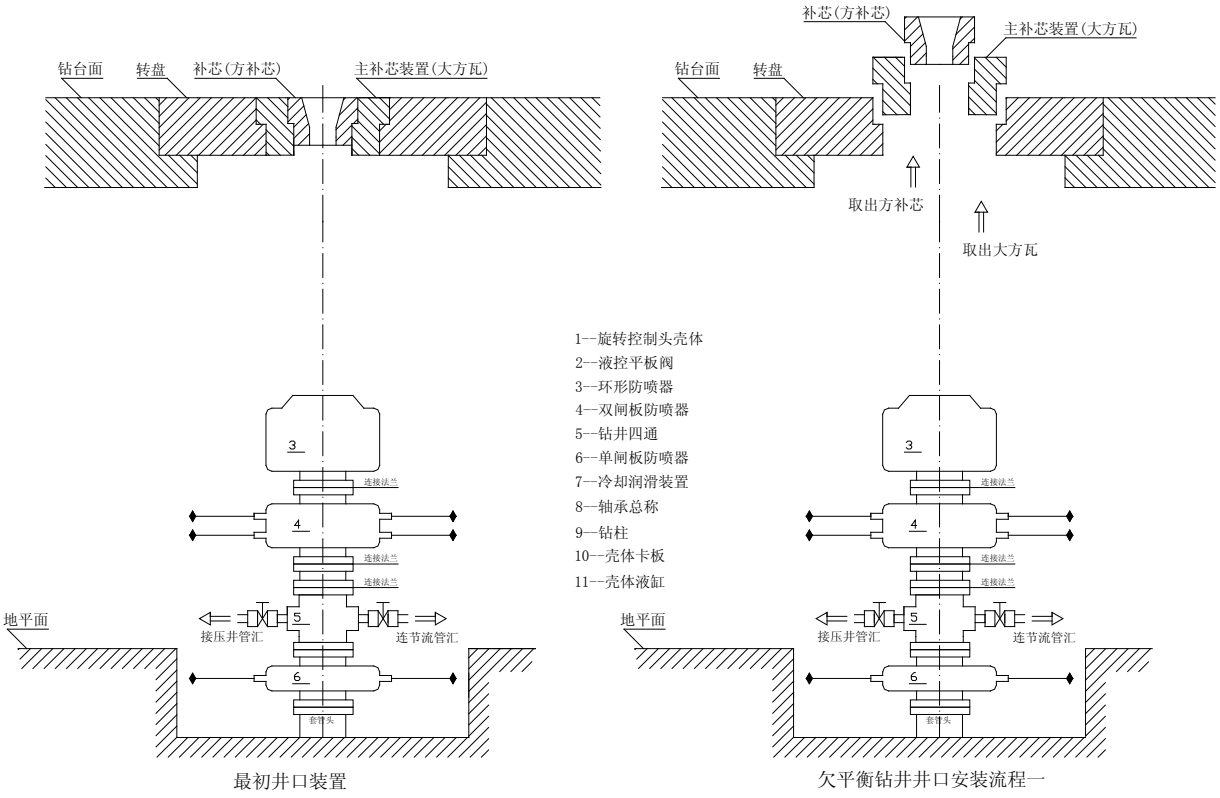
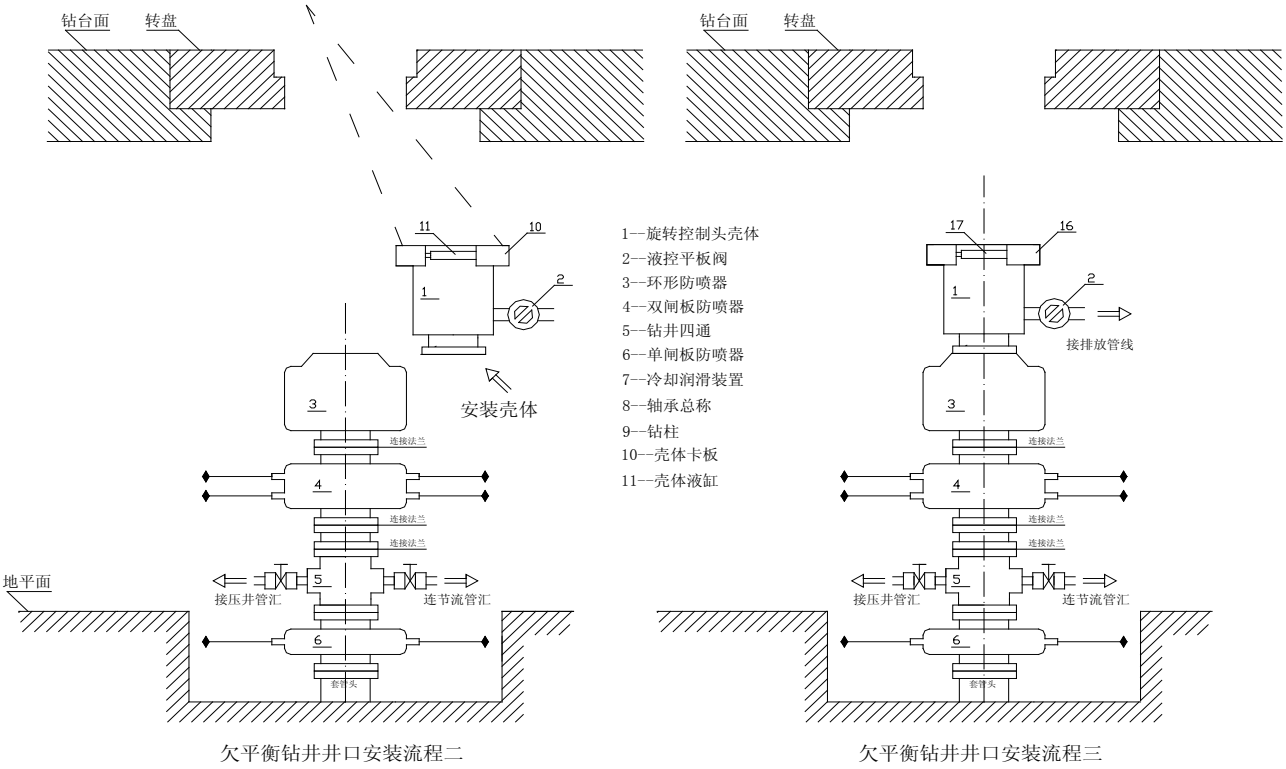


Figure 1



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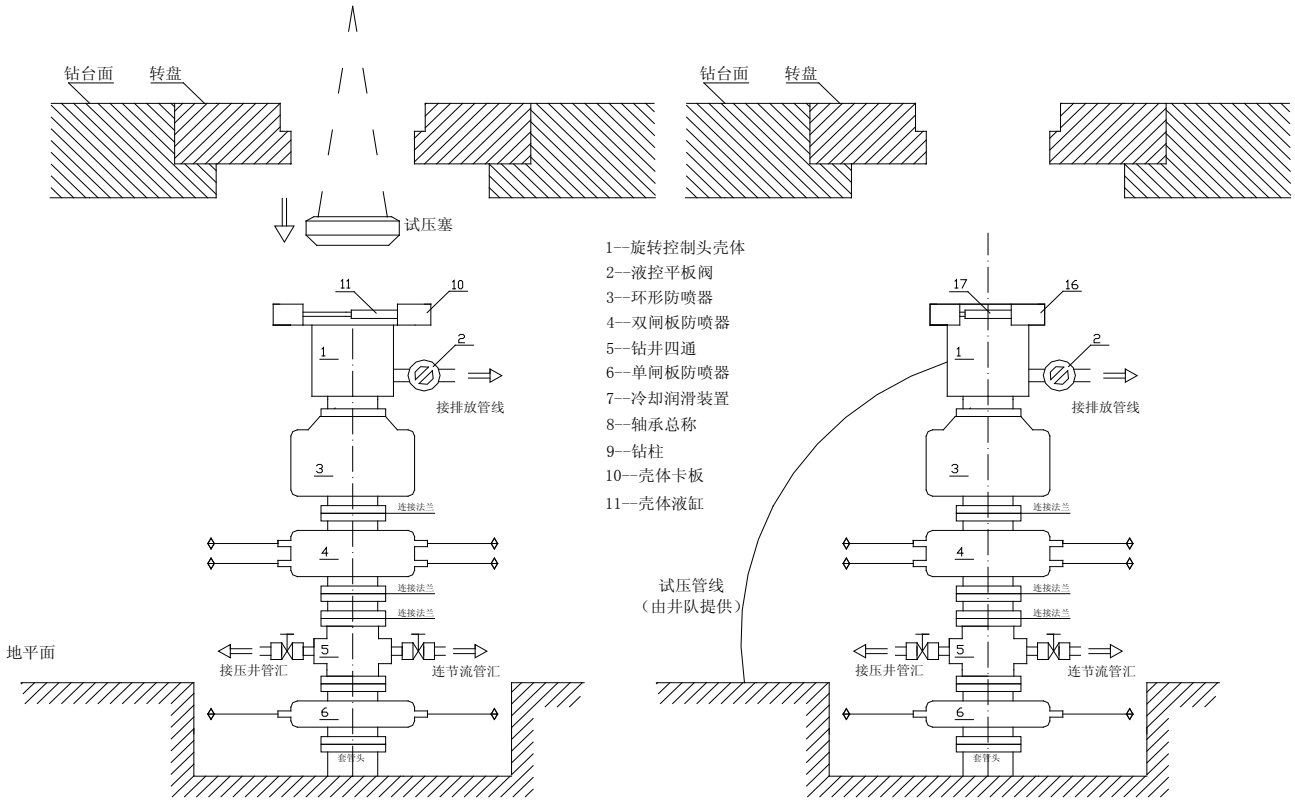
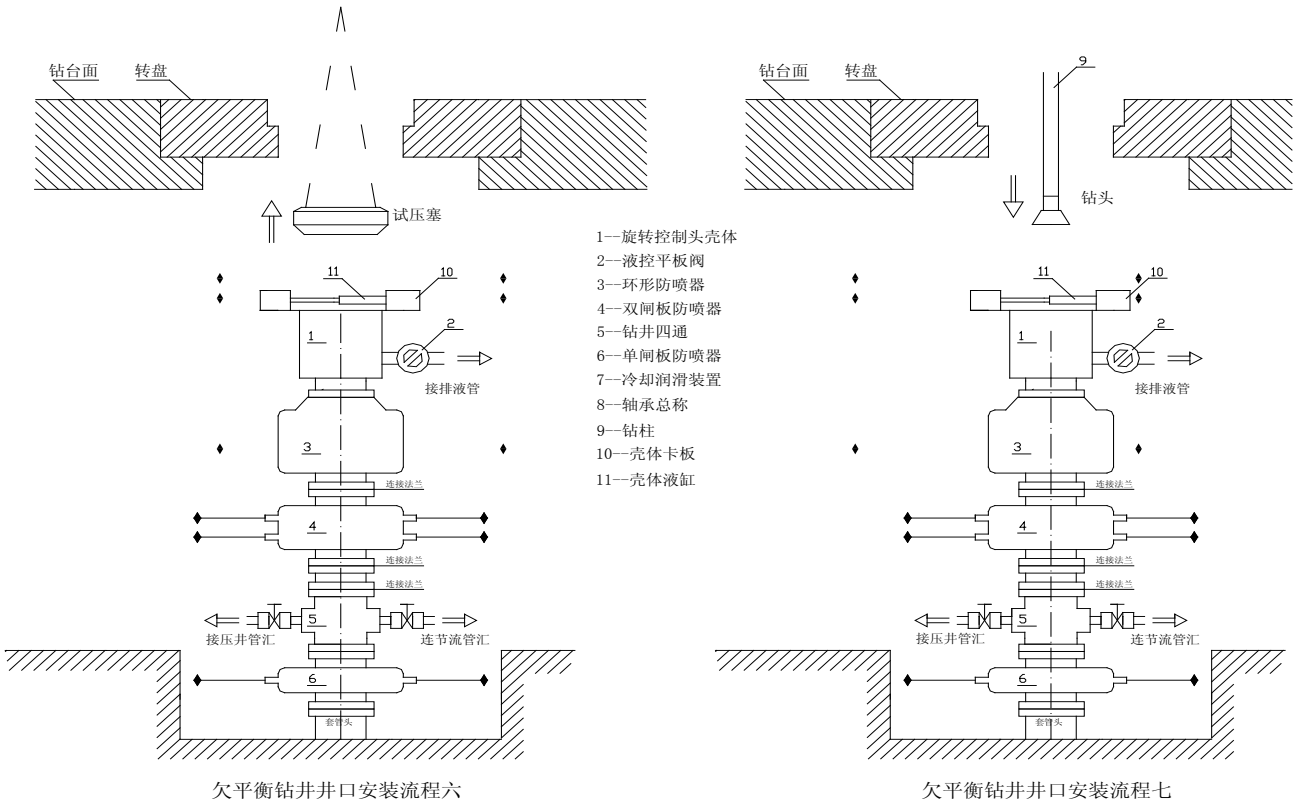


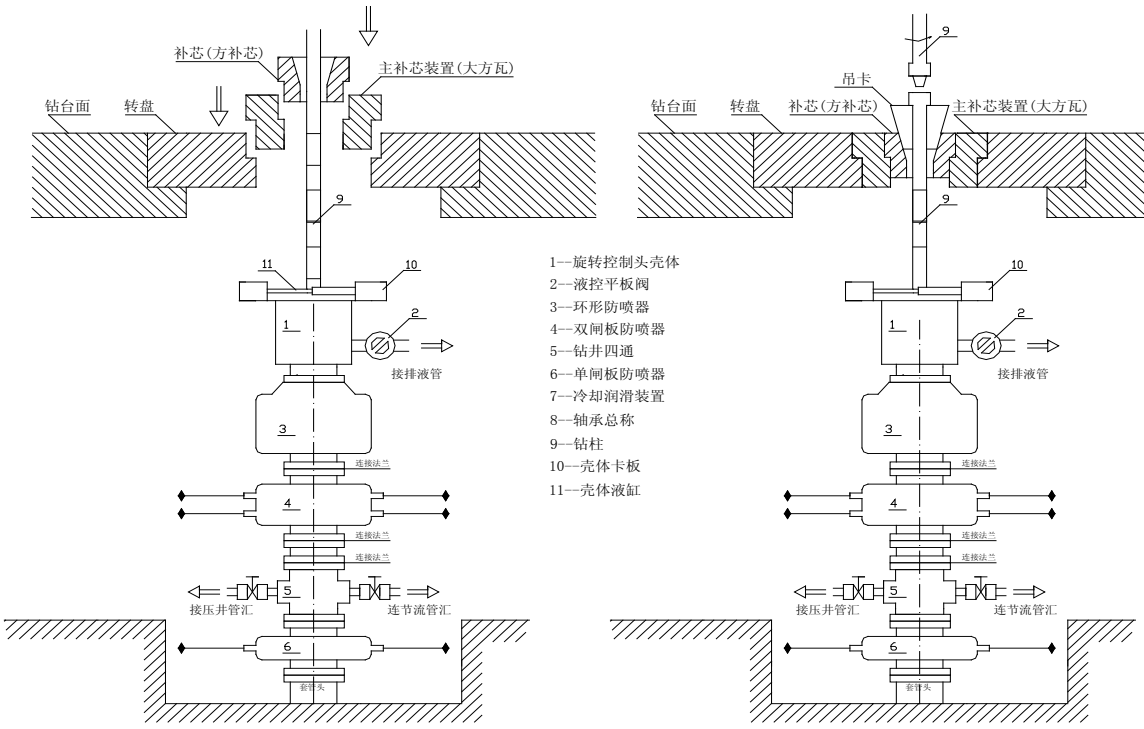
欠平衡钻井井口安装流程四　　欠平衡钻井井口安装流程五

Figure 3



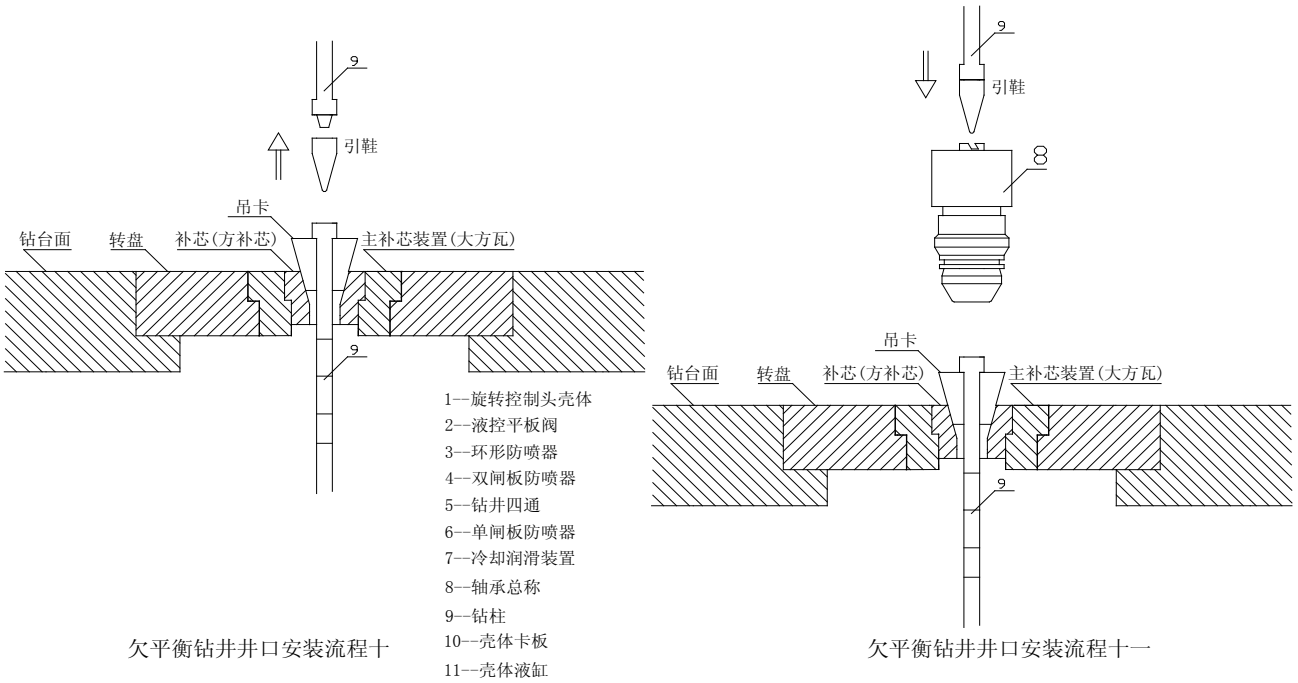
欠平衡钻井井口安装流程六　　欠平衡钻井井口安装流程七

Figure 4



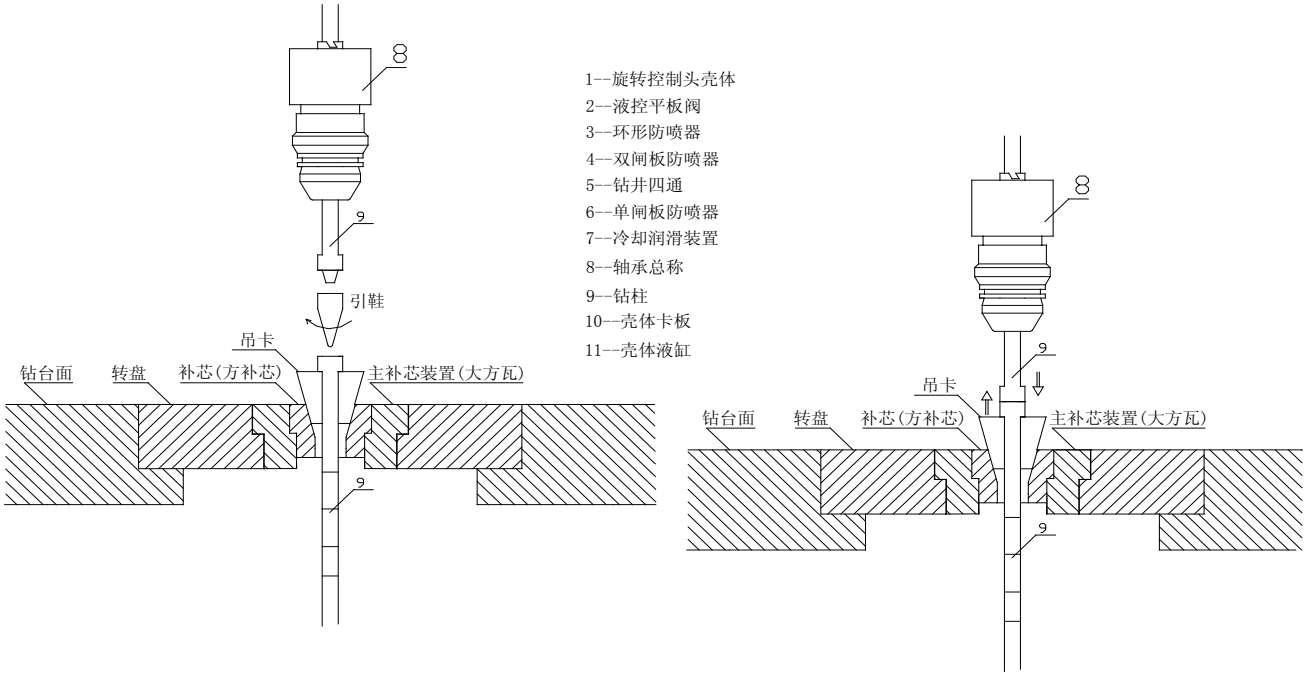
欠平衡钻井井口安装流程八　　欠平衡钻井井口安装流程九

Figure 5



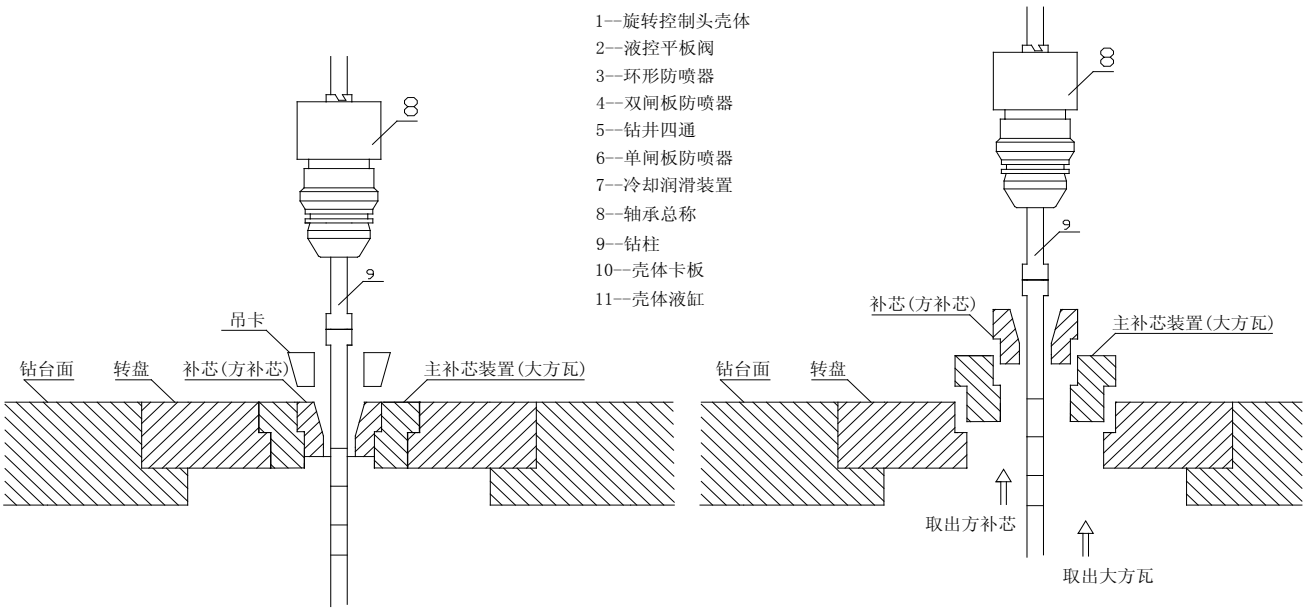
欠平衡钻井井口安装流程十　　欠平衡钻井井口安装流程十一

Figure 6



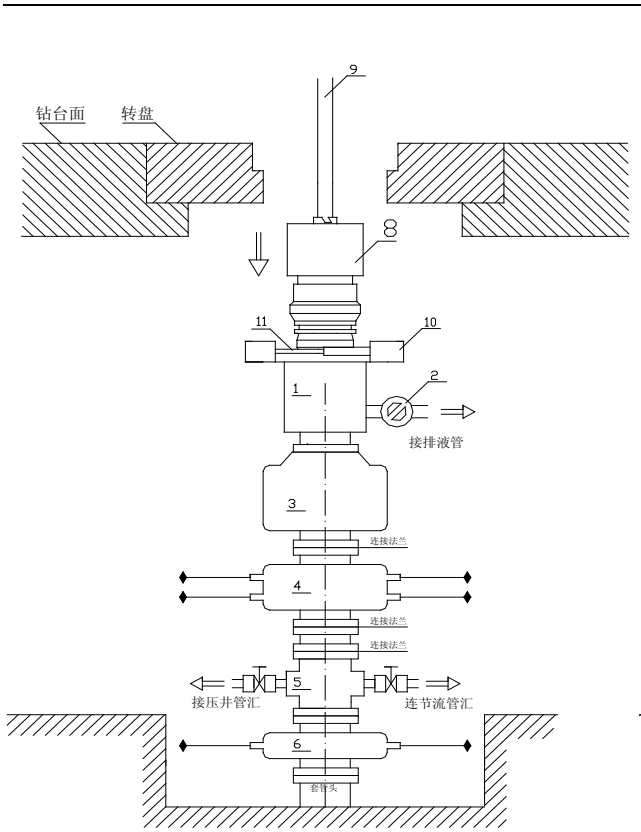
欠平衡钻井井口安装流程十二　　欠平衡钻井井口安装流程十三

Figure 7

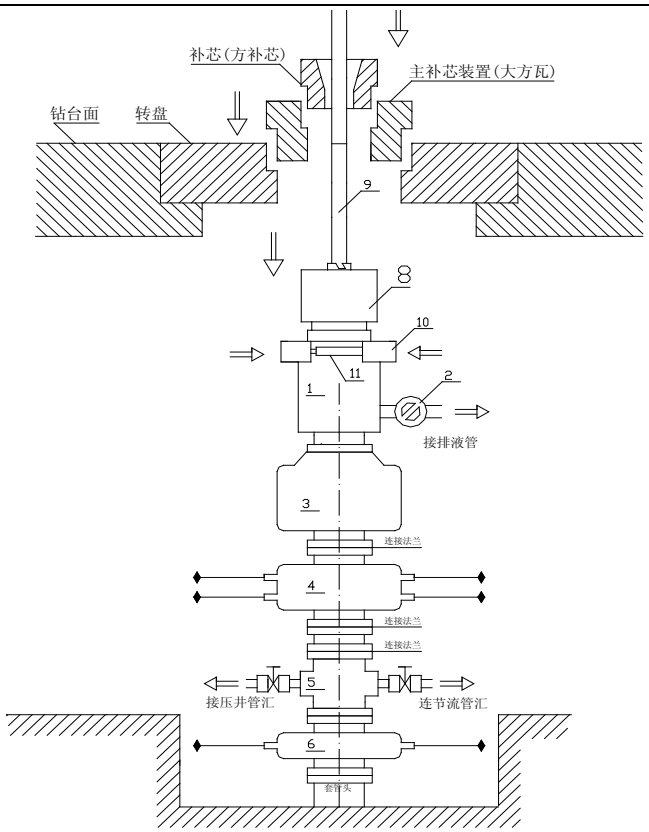


欠平衡钻井井口安装流程十四　　欠平衡钻井井口安装流程十五

Figure 8

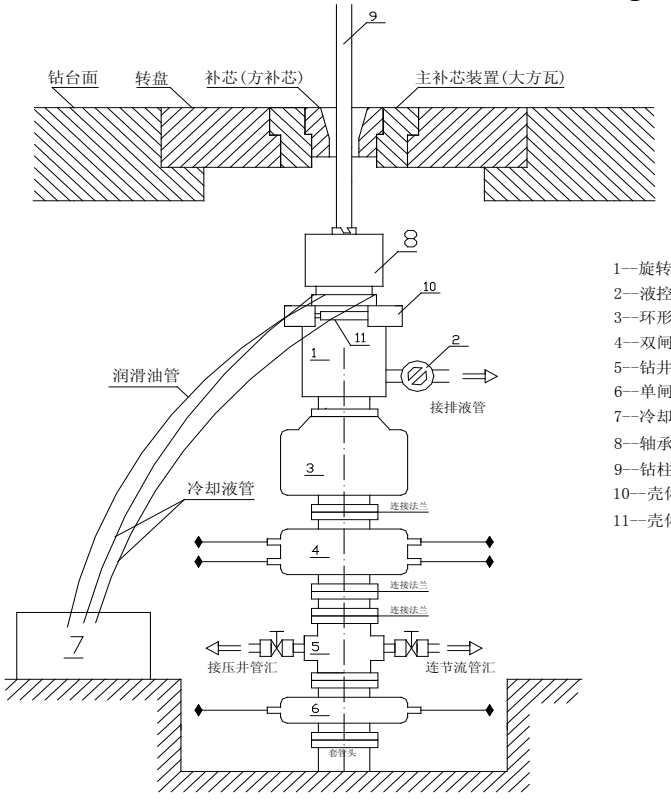


欠平衡钻井井口安装流程十六



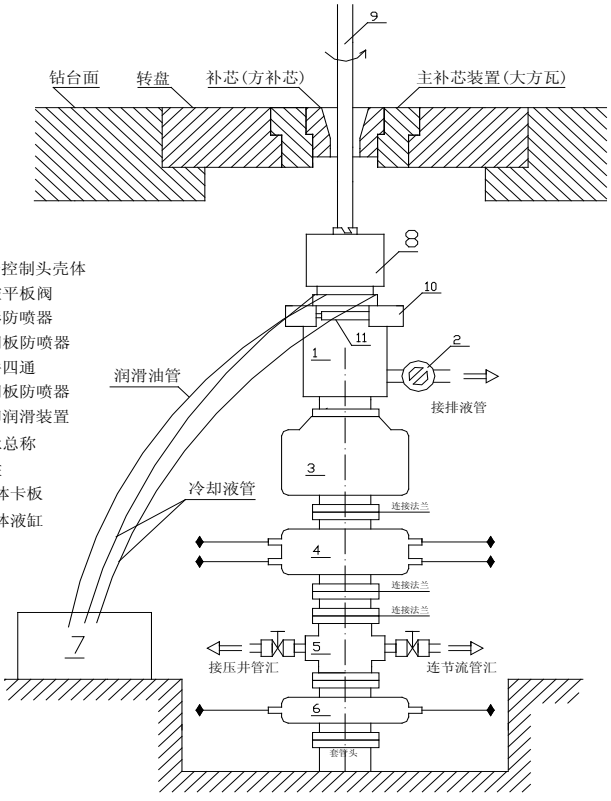
欠平衡钻井井口安装流程十七

Figure 9



欠平衡钻井井口安装流程十八

1—旋转控制头壳体
2—液控平板阀
3—环形防喷器
4—双闸板防喷器
5—钻井四通
6—单闸板防喷器
7—冷却润滑装置
8—轴承总称
9—钻柱
10—壳体卡板
11—壳体液缸



欠平衡钻井井口安装流程十九

Figure 10