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MODEL: XTG168

350 Ton Casing Running System

MAINTENANCE AND OPERATION MANUAL

Foreword

Based on the wellbore structure, casing string needs to be set for each wellbore interval accordingly. The drilled borehole (especially the open hole) encounters undersizing, collapsing, cuttings depositing and many other issues frequently, however, during the conventional rotary rig casing running process, operations like mud circulation, casing rotation, raising or lowering the casing, cannot be performed simultaneously and will not adapt to the wellbore very well, thus the casing may not be able to reach the bottom of the hole. With the development of the drilling industry, casing running equipment and technology is advancing rapidly. With more and more focus on drilling speed and efficiency, the application of more advanced top drive casing running system is becoming highly necessary, and this will surely bring the drilling industry remarkable social and economic benefit.

The performance and operating time of the top drive Casing Running System (CRS) depends not only on the design and manufacturing of this product, but also the proper operation by the operators. We will provide you products with high quality in compliance with the specification of the quality assurance system of ISO 9001:2000. At the mean time, to make sure you are operating this equipment properly, please read this operation manual carefully before you start. The reliability and performance data may change as the operation and service of the equipment goes on, and it relies on the proper operation and quality level of the maintenance work.

This manual is intended for the operation and maintenance of the CRS manufactured by the company. It may not serve for special applications, so the operator should make the right judgement on the selection and applications of the CRS. As the products upgrade, the actual product may not be exactly the same as the one mentioned in the manual, but this will not affect the understanding of the structure, performance and operation of the product, and also the function. If in doubt, please contact us immediately, and we will give you detailed instructions.

As the drilling technology continuous improves, the customers will have new requirements on the application. We will improve our products continuously to meet your special requirements. We value your comments and suggestions. Welcome to contact us by the following methods.

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1. Safety Information

The top drive Casing Running System (CRS) should be operated by personnel with top drive experience. Please read this manual and relevant technical documents before the operation.

Notes, Cautions and Warnings provide user with additional information, and to advise the user to take specific action to avoid personal injury and damage to the equipment. Please pay close attention to these advisories.

Note The note symbol indicates that additional information is provided about the current topic.

Caution The caution symbol indicates that potential damage to equipment, or injury to personnel exists. Follow instructions explicitly.

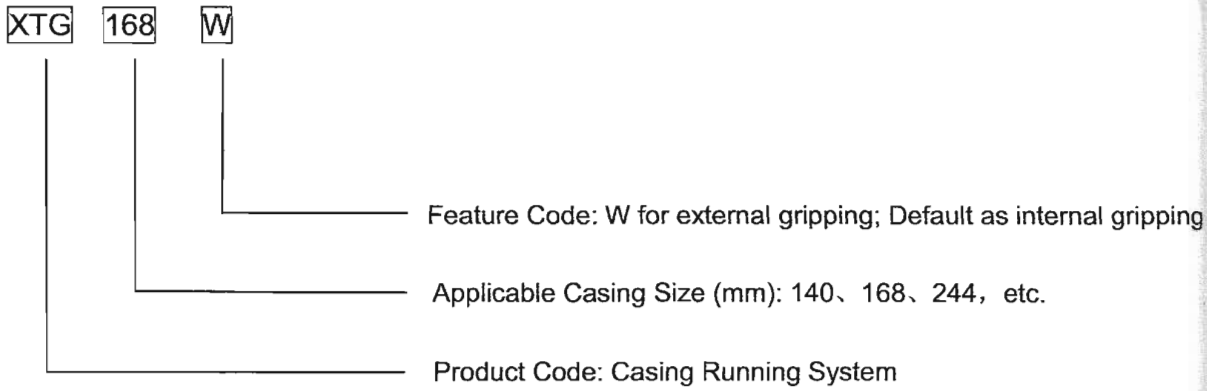
Warning The warning symbol indicates a definite risk of equipment damage or danger to personnel. Failure to follow safe work procedures could could result in serious or fatal injury to personnel, significant equipment damage, or extended rig down time.

2. General Information

Integrating mechanical and hydraulic system, the CRS has emerged recently as a casing running device based on the top drive drilling system. A series of products have been developed for different sizes of casings, so they are applicable for running casing with regular wall thickness. It replaces casing tongs and other casing running equipment which is widely used in drilling operation. Fully utilizing the advantage of the top drive, CRS makes automatic connection of the casing string possible, and it provides the ability of casing rotation and mud circulation, which greatly reduces the chances of stuck casing and other potential safety hazards, thus improves the efficiency of the casing running operation. CRS makes sure to set the casing to the expected depth, and minimizes the number of casing crews that are required, so it is safe and effective.

The successful application of the CRS is a technology advance of the domestic drilling equipment, and it will boost the mechanization and automatization level of the Chinese drilling equipment. The CRS expands the range of application of the top drive, and has great potential for further promotion and market outlook.

3. Model Description



4. Structure and Working Principles

The CRS is divided into two categories, namely, the internal gripping and external gripping structure depending upon the casing size. When the diameter of the casing is smaller than 168mm, external gripping equipment will be used, and when the diameter is equal to or greater than 168mm, internal gripping equipment will be used. Both of the devices have main structure such as: the connecting thread with the top drive, hydraulic mechanism to actuate the slips to engaged or disengaged position, slip mechanism to transfer work load (tensile and torque load), sealing packer for mud circulation and stabbing guide for casing connection. The internal structure is shown in Figure 1. In order to achieve a reliable connection and for the sake of safety, there is anti-rotation mechanism and ect. The schematic drawing for the top drive and the CRS is shown in Figure 2.

This device is connected with the main shaft of the top drive at the upper end, so the make-up torque is precisely controlled during the casing running operation. The working principles are as follows: through the hydraulic supply of the top drive, the upper or lower chamber of the actuating cylinder is filled up with fluid and when the working pressure is reached, piston will move up or down to drive the slip mechanism to disengage or engage, so as to release or grip the casing, transfer torque and hoisting load, accomplish casing make-up and hoisting or lowering operation. This device employs self-sealing cup packer mechanism, which enables the mud circulation during casing running operation, so as to reduce or avoid tragic accident.

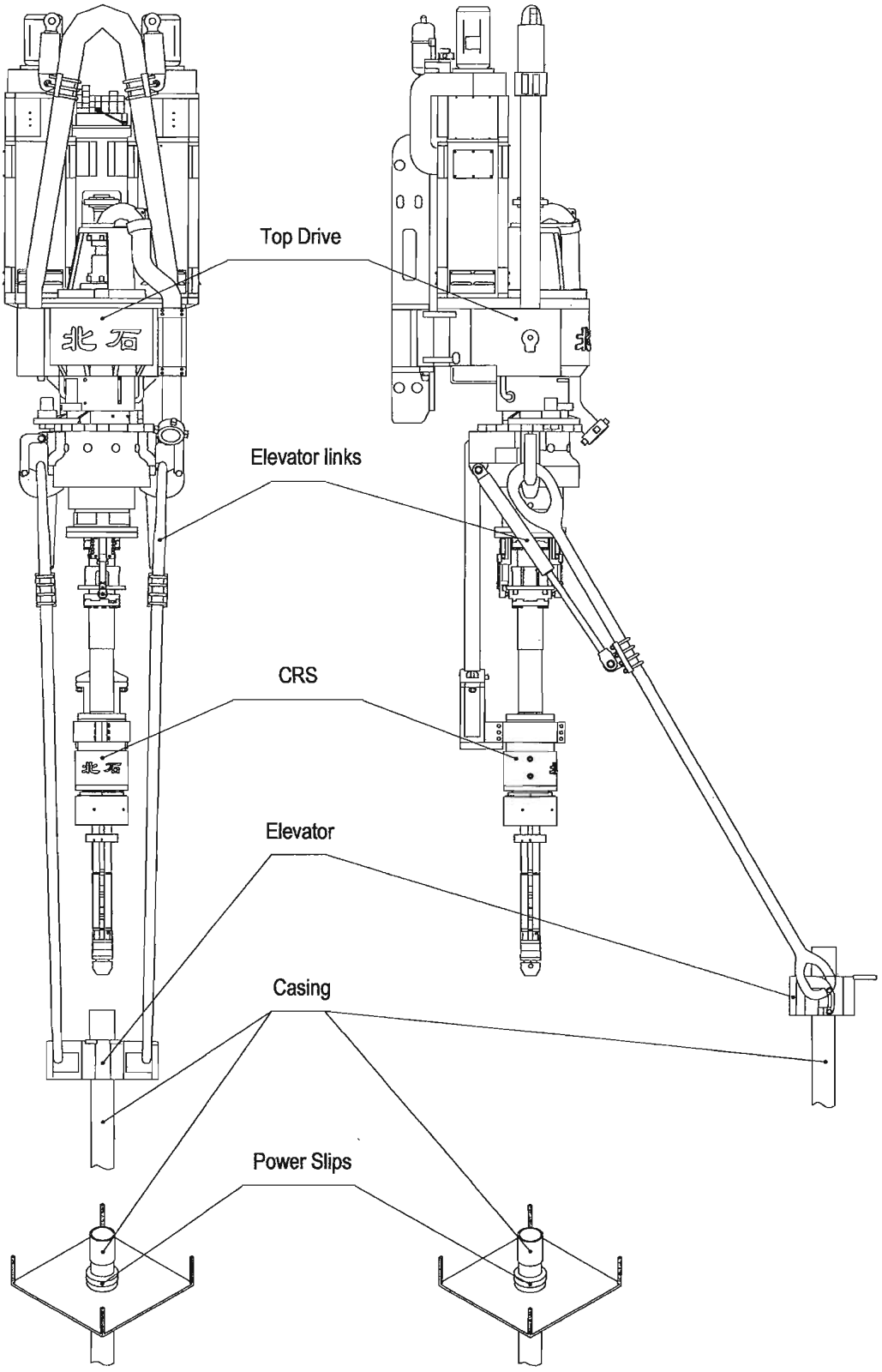


Fig. 2 Top Drive and CRS Working Schematics

5. Technical Specifications

Technical speicifications of the CRS are listed in Table 1.

Table 1 Technical Specifications of the CRS

Technical Content		Technical Data				
Product Model		XTG89W	XTG140W	XTG168	XTG178	XTG340
Applicable Casing	mm	60~89	102~140	168~244	178	340
Nozzle Diameter	mm	25	38	38	57	76
Max. Tensile Load	kN	1 350	3 150	1 350	3 150	4 500
Max. Torque Load	kN·m	25	25	30	50	50
Nozzle Pressure	MPa	—	14	14	35	35
Upper Connection Thread	API	6 5/8 REG	6 5/8 REG	6 5/8 REG	6 5/8 REG	6 5/8 REG
Hydraulic Supply Pressure	MPa	16				
Hydraulic Supply Flow Rate	L/min	40				
System Height	mm	2 540				

6. Hoisting and Storage

As the CRS is a hydraulically actuated device, there are strict requirements for safety and reliability in the field. It is necessary to follow the rules of hoisting, shipping and storage strictly:

1) Make sure the hoisting device is working properly, the ancillary equipment is in good condition, and the lifting height satisfies requirement.
2) Based on the recommended hoisting point on the equipment, hoist slowly and smoothly.

⚠ Caution: Do not damage the connection thread, hydraulic ports, surface strenthening area.

3) Have wood blocks around the equipment during shipping; avoid bumping of the vehicle to minimize rolling and colliding of the equipment.
4) The products should be kept horizontally in a dry, clean and ventilating storage. If kept outdoors, a cover is recommended to protect the products from corrosion.
5) Rubber sealing element should be kept in a dry and cool storage place, and should not be kept more than 18 months.

6) If the assembly is kept for more than 18 months, sealing components and perishable medium should be replaced before operation.

7. Installation and Testing

The installation and testing of the CRS should be performed by certified and experienced personnel, who has also received training on drilling operation and drilling safety. Please be aware of the following guidelines:

⚠ Wear protection appliances in accordance with the rules (such as gloves, apparel, safety hat, etc.)

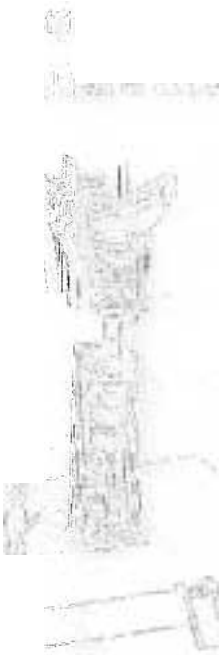
⚠ When work high above the ground, please wear a safety belt, and the tools and components should be tied with safety rope or put in a tool bag to avoid falling off.

7.1 Installation

1) Preparation before Insallation
   a) The technical and safety supervisor installation should be assigned, and meetings should be arranged for technical communication, and technical plan should be discussed and finalized, making sure that everyone for this job knows the installation plan and safety measures clearly.
   b) It is necessary to check all the equipment and accessories according to the shipping list, and to make sure they are in place and in good condition, and that the lubricating product, tools and other accessories are readily available, so as to avoid work interruption because of insufficient preparation during the installation process.
2) Installation Procedure
   a) Shut down the power and hydraulic supply of the top drive.
   b) Remove the regular 120″ elevator links of the top drive, determine whether to remove the torque wrench, hydraulic hoses and fittings.

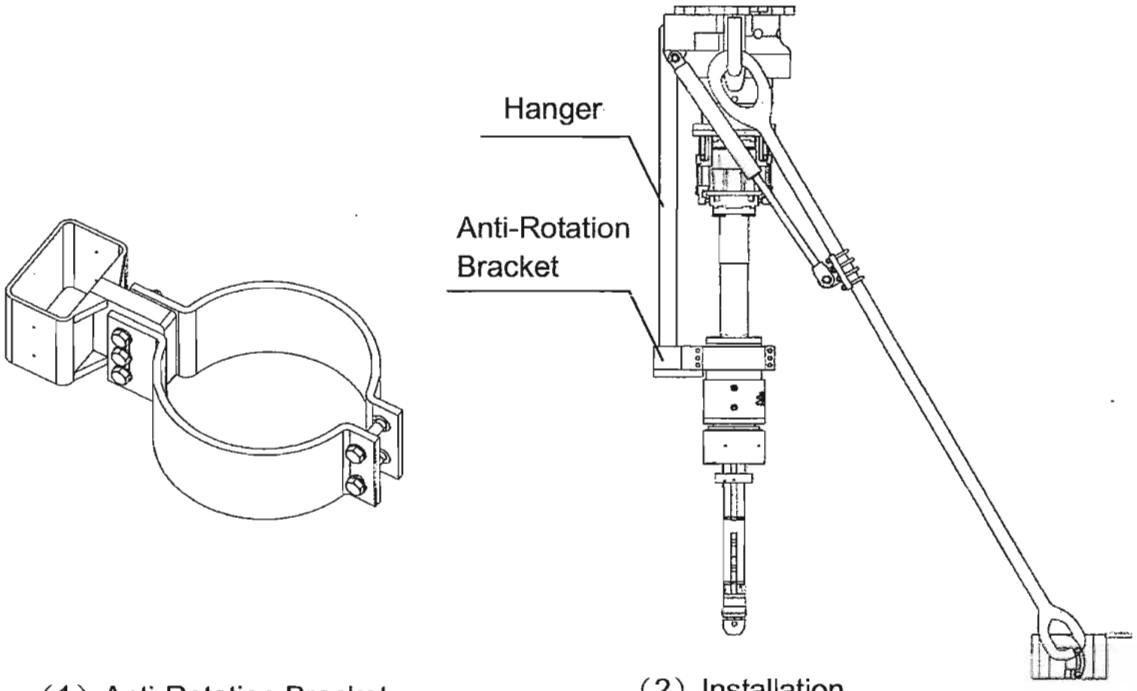
ⓘ Note: Before removal of the hydraulic hoses, prepare suitable containers, cotton cloth and plugs to avoid the hydraulic oil spill and contaminating the equipment and surrounding environment.

❗ Warning: Shut off valves in the system and relieve the system pressure slowly before removing the hydraulic hoses.



with the main shaft of the top drive, and thread on through the top drive shaft rotation. Remove the shipping frame and make up the connection between the CRS and top drive through torque wrench.

f) Have the CRS connected to the top drive through anti-rotation bracket.



（1）Anti-Rotation Bracket （2）Installation

Fig. 4 CRS Anti-Rotation Bracket and Installation

g) Connect hydraulic hoses between the power supply and CRS actuating cylinder through proper fittings.

h) Adjust the CRS (originally torque wrench system) upper inlet pressure to 16MPa.

i) Install the proper elevator links and casing elevator.

7.2 Testing

1) Inspect the installation and connections, and make sure they are correct before testing.

2) Perform functional test in accordance with the testing procedures of the top drive operation manual, making sure the top drive works properly.

3) Raise and lower the CRS along the top drive rail all the way and turn the rotating head for 360° to make sure the CRS and the hydraulic hoses do not have any interference anywhere.

4) Open the hydraulic supply, pressure up the upper and lower chamber of the actuating cylinder, and monitor whether the pressure is normal and the slips can perform disengaged and engaged function.
5) Rotate the main shaft of the top drive for a few minutes continuously, and see whether the CRS works properly.

8. Application and Operations

Well completion is a project that requires close coordination and cooperation to accomplish. From the wellbore quality to the drilliing mud properties, from the well completion plans to operations, every single step is essential and there will be no guarantee for quality if any step is problematic. Casing running operation is the most significant step of all and it will determine the well completion quality.

As it is going to be the first time for some casing crews to run casing with top drive and casing running equipment, it will be totally different from the conventional casing running operation. So to ensure a successful casing job, please read the following materials thoroughly and follow the exact procedures listed here.

8.1 Preparation before Running Casing

Because of the process of the casing job and all the hazards that will be confronted with, it is important to be able to run the casing continuously. So it is essential to be fully prepared for the following aspects:

1) Casing preparation, such as making a record of the quantity, specification, size, and labeling the casing.
2) Surface equipments preparation, such as examining the derrick, crown block, top drive, braking system, transimission system, pneumatic system, hoisting system, circulation system, weight indicator, pump pressure indicator, blowout preventer equipment, electrical equipment and electric circuit, so as to make sure that the surface equipment works properly. Casing running equipment and the tools should be in place, and spare parts should be ready.
3) Elevator links preparation, normally 180" elevator links are configured for CRS. Please user or drilling contractor prepare the proper elevator links for this application.

4) Wellbore preparation, such as flushing the wellbore based on the design and drifting with drill bit.

5) Before casing running, drilling supervisor should organize a meeting for engineering personnel to communicate with the casing crews for technical details, also make sure the job is clearly assigned, and safety precaution, work standard and project schedule is clear.

8.2 Casing Running

(1) Casing Job Precautions:

a) Take care of the connection thread on the casing, prevent damage or dirt which could lead to bad connection.

b) Operate smoothly, control the speed when lowering, apply the assited braking in time. Any abrupt raising, lowering and braking is prohibited.

c) It is prohibited to throw casing protectors from the drill floor to the ground to avoid injuries. Casing protectors should be collected and send to the ground with winch.

d) Casing should be centralized before making the connection. Turn the casing slowly at the beginning, and if there is any sign that the casing cannot be made up, break out the connection, examine or rework the thread, and then stab the casing, make up the connection and lower the casing into the wellbore.

e) During make-up, if the casing vibrates too much, the make-up speed should be slowed down. If the problem still exists, then it might be caused by disalignment of the axis of the thread and the casing, and this is an indication of quality issue, therefore the casing should not be run into the wellbore.

f) When lowering the casing, avoid impact load which could lead to casing body, coupler shoulder and thread damage.

g) When lowering the casing, perform the automatic mud fill-up timely, and if necessary, inject the drilling mud after each casing is run.

h) When lowering the casing, minimize the inactive time, and move the casing up and down.

i) When lowering the casing, if stuck casing or other complex situation happens,

take advantage of the top drive, for example, rotate the casing, raise or lower the casing, circulate the mud and etc. Avoid the situation getting worse, and ensure a smooth casing running job.

j) There should be assigned personnel to watch and record the drilling mud return, record the changes of the suspending load, and if there is abnormal situation, take measures accordingly.

(2) Casing Running Procedure:

a) Field personnel should roll the casing to the catwalk, tie the rope sling to the casing firmly 1.5m away from the female thread, have the thread protector on and have it hung from the air hoist, tie down the rope sling.

b) Hoist operator should follow the instructions of the rope sling operator, start the air winch to tighten the rope sling, wait till the field personnel to step to the safety zone, bring the casing to the catwalk, stop the movement when the female thread portion get onto the rig floor for around 2m, the casing operator remove the casing thread protector and rope sling.

c) Operate the elevator link to forward position so that the casing elevator is close to the coupler of the casing that will be lowered, then the elevator hold the casing under the assistance of a rig floor crew, and lock up the elevator.

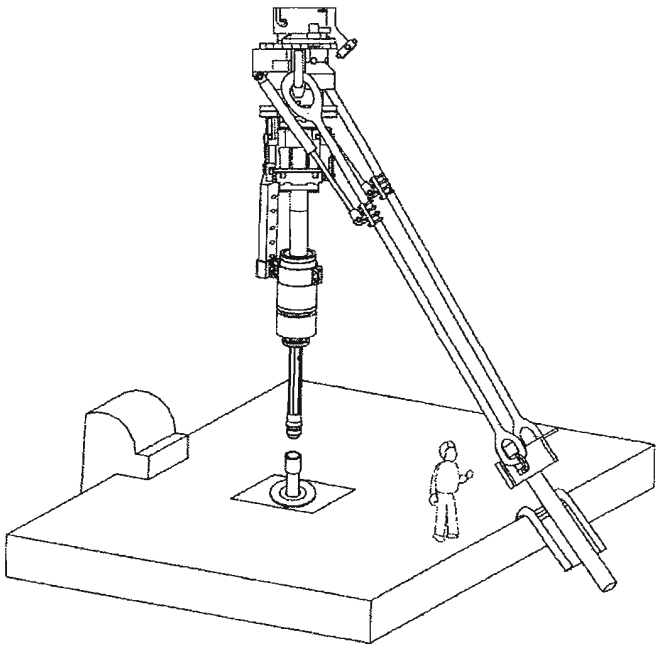


Fig.5 Have the Casing Held in Elevator

d) Hoist the top drive and the casing, operate elevator link to backward position. When it returns to the center of the wellbore approximately, operate the elevator link to neutral position and tilt cylinders will be in unload mode.

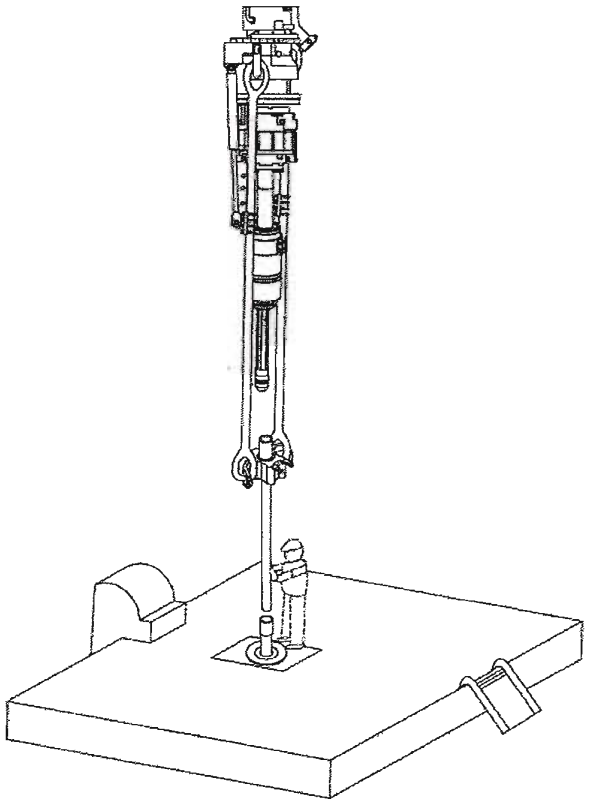


Fig.6 Hoist the Casing and Prepare for Connection Make-up

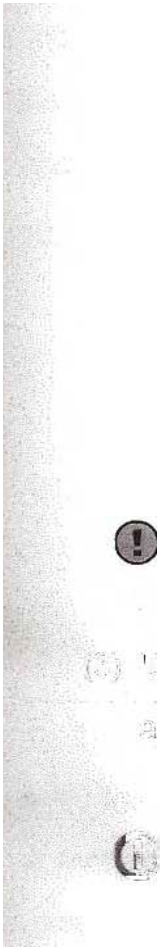
e) Hoist the casing to return it to a center position. Remove the thread protector, apply casing grease and thread sealant evenly.

f) Tighten up the casing guide shoes with the hydraulic tongs.

g) Driller releases the brake, and the first casing will be set. Repeat the previous steps to hoist the second casing to a point where its male thread is 0.2m higher than the female thread of the previous casing segment.

h) Rig crews remove the thread protector, and the driller releases the brake. Stab carefully to avoid cross threading. Avoid dust or dirt falling into the thread, and take care of the metal sealing area.

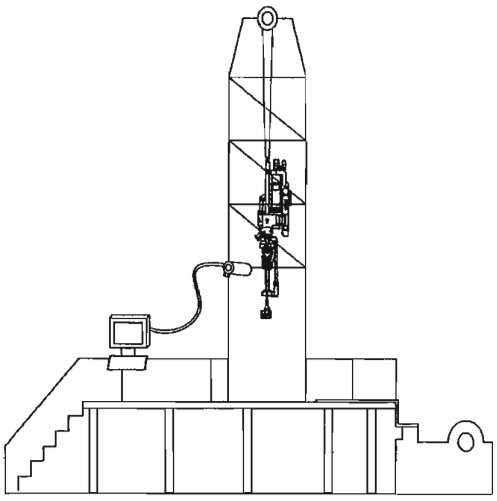
i) After stabbing, operate the "Engage" button, start the CRS to actuate the slips to grip the casing, and then make up the connection to the specified



been integrated into the system design.

9.1 Video Monitoring System

In order to increase the visual monitoring ability in the casing running process, to decrease the labor intensity, to monitor the CRS insertion into and lower the casing, and to ensure the operation precision, the CRS is equipped with a Video Monitoring System: a color video camera that is infrared and explosion-proof is installed on the derrick, a monitor and a graphics controller are installed in the driller's console to achieve point to point video monitoring (refer to the figure on the right).



The installation height of the video camera should be about the same as the length of a casing stand above the drill floor. The video camera focus on the casing coupling that is hoisted, the casing hoisting, CRS lowering and inserting into the casing, slips engaging, casing rotation, casing string lowering, circulation are under monitoring. The zoom in ability of the video camera will surpass the eyes of a human for observing closely, so the working conditions of the slips and the abrasion of the cup packer can all be mastered in time.

10. Maintenance and Repair

A safe and reliable CRS determines whether the casing job will be successful or not and the benefit. So to ensure a properly working CRS during the casing job, there is relatively high requirements for the quality level of the routine maintenance and repair work.

Notes: The CRS maintenance should be done in accordance with the requirements, it will inCRSase the service life of the system and is very important for operation safety.

Warning: The repair quality of the CRS is related to safety and reliability of this product, so the maintenance personnel must be trained and has valid certification for repair work from the equipment manufacturer, and written approval needs to be obtained for the repair work environment. It is strictly prohibited to disassemble the hydraulically actuating section for maintenance and replace the relevant parts for any company or individual without the authority and permission from the manufacturer. Otherwise, the maintenance personnel

should take full responsibility of the associated consequences. The normal replacement of the slips is not covered by this caution, but the repair personnel must be trained, qualified, and received the repair authority from the manufacturer.

10.1 Routine Inspection and Maintenance

1) Inspection Items:
   a) Check if the engage/disengage of the slips is normal.
   b) Check if there is any leakage of the hydraulic fluid.
   c) Check if there is any loose fastners or damage of the fastners.
   d) Check the abrasion condition of the seals.
   e) Check if there is abnormal condition of the surface-treated locations.
   f) Check the locations where grease is needed.
2) Maintenance Items:
   a) Remove the oil contamination and foreign matters timely, avoid plugging the pressure balance orifice on the actuating cylinder.
   b) Ensure the fastners are tightened and locked. Replace the damaged parts in time.

   Warning: Prevent the fastners from loosening up and hurting someone.
   c) There are bearings inside the actuating cylinder and slip coupler, so pump lithium based grease through the grease nipple and gaps regularly.
   d) If there is excessive wear or flake, then it needs repair or replacement.
   e) Watch the pressure gauge closely each time setting the casing, if the pressure is not stable, then it should be disassembled and repaired. In principle, all the seals and backup rings need to be replaced for each disassembly and repair.

   Warning: Avoid the hydraulic fluid leaking, as it might cause injury and slipping of slips.

Note: After each completion of the casing job by the CRS, inspect each component carefully; make sure the hydraulic cylinder is working properly and leak free, and the slips are in good condition. If necessary, disassemble and repair the equipment to ensure a safe operation.

10.2 Repair Preparation

1) Disassembly and assembly frame, and proper tools (including special tools, pipe

7)

8)

9)

10)

11)

12)

13) Flush all the

14)

10.4 Assembly

Caution

surface

seals.

1) Remove

2)

install the other inner ring of the bearing, then install the outer rings of the bearings from each side.

c) Thread the clamping nut onto the mandrel, and tighten the thread with the groove on the outiside, make sure the bearing has been pressed tight, and then install the elastic lock washer. Apply lithium based grease around the bearing.

d) Install the backup ring, o-ring and wear band at the right place, and apply calcium based grease at the groove.

e) Install the wear band inside the piston, Turcon Roto-glyd ring and Turcon Double Delta Seal Ring, then apply calcium based grease at the groove.

⚠ Caution: Ensure each part is clean, and it is prohibited to heat the seals with hot water.

f) Push the piston assembly slowly into the actuating cylinder, pay attention to the seals and wear band, make sure it is clean inside the cylinder, the orifices, and there are no foreign matters in the orifices and injection ports.

3) Slips Assembly

a) Mount the mandrel on the bench clamp of the disassembly and assembly frame, hoist the actuating cylinder and piston assembly slowly and push the assembly from the right side of the slip mandrel till the face of the actuating cylinder inner bore aligns with the face of tapered roller bearing.

b) Install the backup ring, o-ring, backup ring, o-ring, wear band, wiper ring at the corresponding locations, apply calcium based grease at the groove.

c) Push the lower housing assembly onto the mandrel from the right side, pay attention to the seals, make sure to align the thread holes of the lower housing and the actuating cylinder.

d) Slide the spring washer onto the hex head bolt, thread the bolts into the tapped holes in a diametrically staggered pattern following the instructions of Table 3.

e) Fix the outer housing, and try to rotate the mandrel to make sure the mandrel can rotate smoothly and easily.

f) Measure and remachine the upper housing to adjust the axial clearance of the bearing.

g) Install the wiper ring in the upper housing, and push the upper housing

assembly from the left side of the mandrel. Make sure to align the tapped holes of the upper housing and the actuating cylinder. Apply Loctite 510 at the interface between the upper housing and the actuating cylinder.

h) Fit the spring washer onto the hex head bolt, thread the bolts into the tapped holes in a diametrically staggered pattern following the instructions of Table 2.

i) Install the direct injection grease nipple at the corresponding location, and make sure the orifice is clean and clear.

j) Measure and remachine the spacer to adjust the axial clearance of the thrust ball bearing.

k) Fix the mandrel, mount the assembly on the bench clamp of the disassembly and assembly frame, support in the middle if necessary. Install the spacer, thrust ball bearing from the right side of the slip mandrel (pay attention to the direction), and then install the slips sequentially into the spline grooves, and hold them together with iron wire. Install the other thrust ball bearing (pay attention to the direction, and apply enough lithium based grease), then install the bearing housing to hold the bearing and slips.

l) Adjust the spacing between the piston and the bearing housing, connect the piston and the coupler ring with the split type coupler. Slide the sleeve onto the coupler and fasten with hex. socket set screws following the instructions of Table 2.

m) Slide the inner sleeve of the retainer ring onto the slips from the right side, install the four-pieces retainer ring onto the slip mandrel, and install four leaf springs at the corresponding locations of the retainer ring, then push the inner sleeve to the right so it touches the retainer ring and make sure the leaf spring is compressed. Slide the outer sleeve on from the right side, tighten the hex. socket set screws between the inner sleeve and the outer sleeve in accordance with the requirements of Table 2.

4) Sealing Components Assembly

a) Pick the proper cup packer based on the Appendix A.

b) Apply a thin layer of calcium based grease on the stabbing guide, heat the cup packer with hot water, wipe it and install the packer while it is still hot. Install the

Issue 2: Mud circulation or casing pressure test cannot be performed normally:

Solutions:

a) Compare the cup packer in application with the one specified Table 2 and see if the cup packer fits the application. If it does not fit, please replace the packer.

b) If the cup packer fits the casing, then it might be caused by severe wear. Please replace the cup packer in time.

12. Spare Parts and Corollary Tools

Generally, after the operation of the CRS, all the seals should be replaced during each repair. Check the mandrel, cylinder, actuating cylinder, slip mandrel and the slips and other parts that are under loads, and parts under abrasion, and replace the damaged parts. Please refer to the spare parts list and special tools list (See Appendix B).

13. Corollary Equipment

To ensure a smooth and safe operation of the CRS, it is equipped with the following corollary equipments:

Table 3 CRS Corollary Equipment List

No.	Item	Order No.	Qty.	Notes
1	Casing Centralizer	9559500300	1	
2	Video Monitoring System	9556900510	1	to assist the driller for stabbing
3	Anti-Rotation Bracket	9559500100	1	
4	Casing Position Indicator	9556900500	1	to monitor the position of casing
5	Lifting Sub	9557001826	1	for Lifting
6	Hydraulic Hose	9556900008	6	1m
7	Cup Packer		one set	
8	Stabbing Guide		one set	
9	Slip		one set	
10	Seal Cap		one set	

14. Order Notice

The reliability, service life and performance of the CRS are not only based on the manufacturing quality, but also on the right operation and repair. To make sure the products and components you need can be delivered to you correctly and timely, please pay attention to the following aspects:

1) Please write down the product model clearly, so if the model that the customer has ordered is revised, then the newest model will be provided and there will be no additional notice.

2) If there are special requirements for the products, please specify the details while ordering. If there is no instruction, the standard products will be provided.

3) If the components are ordered, then please specify part name, order number and quantity.

Appendix A: Slips, Cup Packer, Stabbing Guide and Seal Cap Selecting Guide

Casing Specification					Selecting CRS Components			
Size	O.D.	Wall Thick	I.D.	Drift Dia.	Slip	Cup Packer	Stabbing Guide	Seal Cap
6-5/8	168.28	7.32	153.64	150.46	9556900138	5303940220 (7B)	9556901158	9556902158
6-5/8	168.28	8.94	150.40	147.22				
6-5/8	168.28	10.59	147.10	143.92		5303940460 (7C)	9556901138	9556902138
6-5/8	168.28	12.06	144.16	140.98				
7	177.80	5.87	166.06	162.88	9556900158	5303940210 (7A)	9556901158	9556902158
7	177.80	6.91	163.98	160.80				
7	177.80	8.05	161.70	158.52				
7	177.80	9.19	159.42	156.24				
7	177.80	10.36	157.08	153.90	9556900138	5303940220 (7B)		
7	177.80	11.51	154.78	151.60				
7	177.80	12.65	152.50	149.32				
7	177.80	13.72	150.36	147.18				
7	177.80	15.88	146.04	142.86		5303940460 (7C)	9556901138	9556902138
7	177.80	17.45	142.90	139.72				
7-5/8	193.68	7.62	178.435	175.26	9556900158	5303940430 (75A)	9556901178	9556902178
7-5/8	193.68	8.33	177.015	173.84				
7-5/8	193.68	9.52	174.635	171.46				
7-5/8	193.68	10.92	171.835	168.66		5303940440 (75B)		
7-5/8	193.68	12.7	168.275	165.10				
7-5/8	193.68	14.27	165.135	161.96		5303940210 (7A)	9556901158	9556902158
7-5/8	193.68	15.11	163.455	160.28				
7-5/8	193.68	15.88	161.915	158.74				
7-5/8	193.68	17.45	158.775	155.60		5303940450 (75C)		
7-5/8	193.68	19.05	155.58	152.40	9556900138			

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Appendix A: Slips, Cup Packer, Stabbing Guide and Seal Cap Selecting Guide

Casing Specification					Selecting CRS Components			
Size	O.D.	Wall Thick	I.D.	Drift Dia.	Slip	Cup Packer	Stabbing Guide	Seal Cap
7-3/4	196.85	15.11	166.63	163.45	9556900158	5303940440 (75B)	9556901178	9556902178
8-5/8	219.08	6.71	205.66	202.48	9556900198	5303940400 (9D)	9556901198	9556902198
8-5/8	219.08	7.72	203.64	200.46				
8-5/8	219.08	8.94	201.20	198.02		5303940410 (8A)	9556901188	9556902188
8-5/8	219.08	10.16	198.76	195.58				
8-5/8	219.08	11.43	196.22	193.04	9556900178			
8-5/8	219.08	12.70	193.68	190.50		5303940420 (8B)		
8-5/8	219.08	14.15	190.78	187.60				
9-5/8	244.48	7.92	228.64	224.66	9556900215	5303940240 (9A)	9556901215	9556902215
9-5/8	244.48	8.94	226.60	222.63				
9-5/8	244.48	10.03	224.42	220.45				
9-5/8	244.48	11.05	222.38	218.41		5303940250 (9B)		
9-5/8	244.48	11.99	220.50	216.54				
9-5/8	244.48	13.84	216.80	212.83	9556900198			
9-5/8	244.48	15.11	214.26	210.29		5303940390 (9C)	9556901198	9556902198
9-5/8	244.48	15.47	213.54	209.58				
9-5/8	244.48	17.07	210.34	206.38				
9-5/8	244.48	18.64	207.20	203.23		5303940400 (9D)		
9-5/8	244.48	20.24	204.00	200.02				

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Appendix B: Spare Parts and Corollary Tools

1. XTG168 Spare Parts List

No.	Part Name	Model	Part No.	Qty.	Notes
1.1	7" Casing Cup Packer	Type A	5303940210	1	covering 6-5/8″ casing
		Type B	5303940220	1	
		Type C	5303940460	1	
		Type D	5303940470	1	
1.2	7-5/8" Casing Cup Packer	Type A	5303940430	1	covering 7-3/4″ casing
		Type B	5303940440	1	
		Type C	5303940450	1	
1.3	8-5/8" Casing Cup Packer	Type A	5303940410	1	
		Type B	5303940420	1	
1.4	9-5/8" Casing Cup Packer	Type A	5303940240	1	
		Type B	5303940250	1	
		Type C	5303940390	1	
		Type D	5303940400	1	
1.5	Slip		9556900138	1	covering casing I.D. 138~158 (mm)
1.6	Slip		9556900158	1	covering casing I.D. 158~178 (mm)
1.7	Slip		9556900178	1	covering casing 178~198 (mm)
1.8	Slip		9556900198	1	covering casing 198~218 (mm)
1.9	Slip		9556900215	1	covering casing 215~238 (mm)
1.10	Thrust Ball Bearing		9557001200	2	
1.11	Hex. Socket Cap Screw		4201120120	8	
1.12	Hex. Socket Set Screw		4201030840	2	
1.13	Hydraulic Hoses		9556900008	6	1m
1.14	Seals Pack		9556900900	1	one set

2. Corollary Tools

No.	Part Name	Model	Part No.	Qty.	Notes
2.1	Corollary Tools		9556900913	1	