



Truck Mounted Crane

Use And Maintenances Manual

Model: BS360-4

RHINO MACHINERY SDN BHD (1097988-X)

Lot 404-406, Batu 15 ½, Jalan Kuala Selangor,
47000 Sungai Buloh, Selangor D.E., Malaysia
Tel: +603-6038 6866, 6566 Fax: +603-6038 6166
Email: rhinomachinery.co@gmail.com
Website: www.rhinobscrane.com.my

Content

Introduction	
Hydraulic Truck Crane Operation Manual.....	
Foreword	
1. Safety Instruction	
1.1 Safety Regulation.....	
1.2 Warning Plate.....	
2. Specifications	
2.1 Function of the Machine	
2.2 Machine Noise	
2.3.1 Safety Devices	
2.3.2 Hydraulic Articulated Extension.....	
2.3.3 Stabilizers (Outriggers)	
3. Installation	
3.1 Safety Rules for Machine Movement	
3.2 Lifting the Machine.....	
3.3 Selection of Location	
3.4 Installation	
3.5 Installations and Levelling	
3.6 Oil Pressure Supply Connection.....	
4. Operation.....	
4.1 Operator Position	
4.2 Control Panel	
4.3 Emergency Stop.....	
4.4 Operation Procedures.....	
4.5 Adjustment of the Machine/ Parts	
5. Maintenance	
5.1 Day/ Week/ Month / Year Maintenance	
5.2 Lubrication	
5.3 Trouble Shooting	
5.4 Waste Disposal.....	
6. Technical Specification.....	

Introduction

Our company production of fully hydraulic crane is mainly based on GB3811-83 "Crane design specifications", "Crane Design Manual" ISBN7-113-02571-4/TH.62 and QC/T549-2004 "Truck Crane Transporter "and refer to the world's advanced countries in the production of similar crane truck features and design.

Our products are in full compliance with the PRC State Administration of Quality Supervision, Inspection and Quarantine issued "TSG special equipment safety specifications, TSG Q7005-2008"; 2009 - 08 - 11 REPUBLIC OF CHINA National Construction Machinery Quality Supervision and Inspection Center of the Company in accordance with specifications product field testing, issuing a certificate.

The crane is a flexible, simple operation, safe and reliable ideal lifting equipment. Widely used in vehicle lifting, ship, warehouses, docks, construction sites and other workplaces.

Truck Mounted Crane Operation Manual

Purpose of This Manual

Along with each new crane our Company supplies the Customer with this USE AND MAINTENANCE manual in order to provide the operator with the necessary and essential directions concerning the crane use, daily maintenance, lubrication, tests and adjustments.

This manual has been drawn up by the Manufacturer and is enclosed within the machine.

The information contained is intended for skilled operators (only experienced people having the proper ability and knowledge of the regulations and laws will be able to carry out the necessary operations and to identify and avoid possible dangers in the lifting and handling field).

This manual defines the purpose for which the machine has been manufactured and contains all the necessary information for safe, correct use.

Constant observance of the stated standards guarantees both machine and personnel safety, economic running and longer working life.

This machine is only destined to the use for which it has been conceived. Any other use is to be regarded as being improper and hazardous.

The Manufacturer shall not be regarded as liable for any damages caused by improper, wrong and unreasonable use.

The Manufacturer is only responsible for the machine according to its original configuration.

No actions altering the structure or the operating cycle of the machine shall be allowed unless they are carried out or authorized by the Technical Department.

To facilitate its reading, it has been divided into 6 sections pointing out the most important operations. For a quick research of the topics, it is recommended to consult the table of contents.

1 Safety Instruction

1.1 Safety Regulation

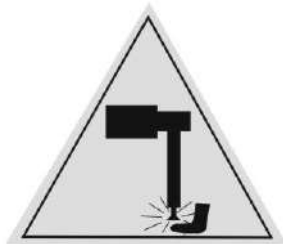
Please follow the safety regulations in order to minimize the risk of possible injuries and damage to the crane:

- Only experienced people having the proper ability and knowledge of the regulations and laws will be able to carry out the necessary operations and to identify and avoid possible dangers in the lifting and handling field are allowed to operate the crane.
- Ensure that there is no other equipment, goods or any unauthorized personnel in the crane work area before starting operation of the crane.
- Make sure that the minimum safe working distances from power lines according to the government regulations are observed.
- Only people specifically charged with the crane running shall be allowed to enter the crane work area.
- Checking the Operation of the Safety Devices. Every day, before starting to work, the operator shall perform safety checks. If the safety devices prove to be defective, apply to an authorized workshop.
- Ensure that the load is accurately measured and securely fastened.
- Make sure that the loads to be hoisted, with regard to the reach, do not exceed the values indicated on the load curve (See technical information of each crane model). Never hoist any loads exceeding the values indicated on the load curve.
- Ensure the vertical and horizontal cylinders are fully extended on a stable surface to maintain the balance of the vehicle before starting crane operation.
- Do not operate the crane sudden movements; operate the control levers gently and gradually.
- The crane is conceived for load hoisting, do not hoist loads slantwise, and do not drag the load on the ground by means of telescoping cylinder or the slewing system. These functions are only allowed when the load is hanging over ground.
- At the end of the work, check for the lock of the stabilizing beams (outriggers) in the resting position in order to prevent them from extending dangerously during the vehicle travel. The power of the crane hydraulic system must be switched off completely.
- Do not utilize the crane with wind speed exceeding Beaufort scale degree 7.
- The load must be removed and the boom must be adjusted to the front or rear before adjusting the stabilizers.
- Do not use the crane for constrained load hoisting; tree uprooting, pole drawing.
- The operator shall not attend to any activity that could distract him from the crane running; He shall not leave a suspended load unattended, unless any specific precautions have been adopted and actuated.
- Personnel working in the crane area and the environment in the area must be covered and protected. The operator must wear personal protections. Always wear the safety hamlet when operating with the crane.
- Use of the crane is allowed within ambient temperature included between -20°C and $+40^{\circ}\text{C}$.

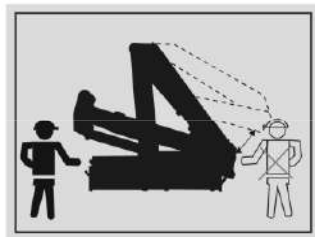
1.2 Warning Plate



1. Danger of body crushing. Mind the stabilizer (outrigger) extension.



2. Danger of lower limbs crushing. Mind the stabilizers (outrigger).



3. Danger of impact. The opening and closing operations of the crane shall not be carried out by means of the controls next to the main boom stowed position.



4. Danger of suspended loads. Keep out of the crane work area.



5. Danger: Do not stand under the crane. Keep out of the crane work area.



6. Danger: Keep a minimum safety distance from the overhead power line. If there are overhead power lines within the working area, keep a minimum safety distance from them according to the related regulations of the government.

2. Specifications

2.1 Function of the Machine

This crane operates in the field of vertical hoisting of free, non-constrained loads. This crane is not manufactured for the purpose of constrained load hoisting: tree uprooting or pole drawing.

The crane offers no degree of limitation of rotation and movement. It features a fold-under boom design, allows the maximum amount of reach range with the most space efficient stowed dimension. It is manufactured in compliance with the National Standard of CHINA, GB3811-83 'Design rules for cranes', and ISBN 7-113-02571-4/TH.62 'Design Handbook for cranes'.

Please refer to the enclosures for technical specification data, dimension diagram, legend diagram and load curve of each crane.

2.2 Machine Noise

Noise from crane operation and the actuating motor of truck: ≤ 70 dB.

2.3.1 Safety Devices

Safety devices are fitted in this crane to minimize the risk of human injury and economic loss. Operators are advised to observe the stated standard constantly for the purpose of safe and correct use, guarantees both machine and personnel safety.

- **Moment limiting device with lock of the functions increasing the load reach (CE, Optional).**

The moment limiting circuit, connected to the main cylinder, is designed to block the crane movements that would increase the load reach.

Under overload conditions, the only movements allowed are those reducing the work reach, i.e. the distance between the load and the crane mast axis.

When the main cylinder extension is actuated, attaining the end-of-stroke condition could actuate the moment limiting device owing to the pressure generated inside.

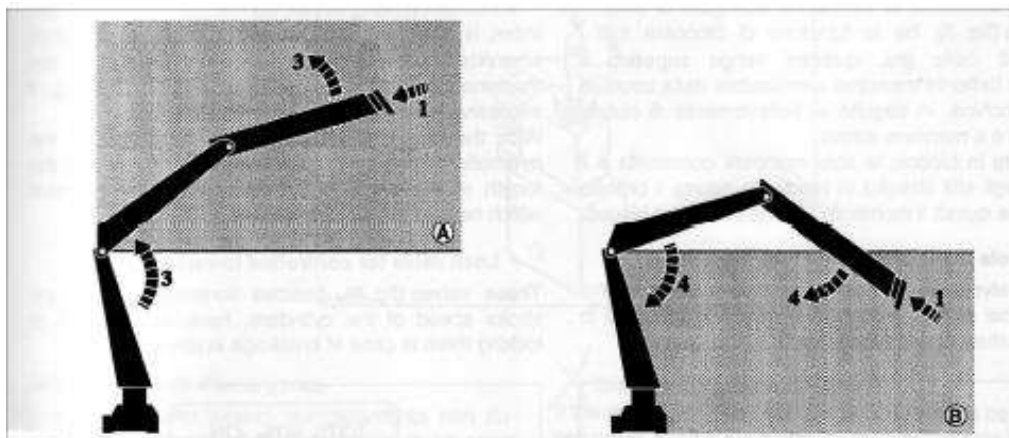


Figure 1

- **(LMT) Moment limiting device fully hydraulic (CE, Optional)**

Under overload conditions, the moment limiting circuit, connected to the main cylinder, will lock those crane movements, which would increase the reach of the crane. Under locked condition, in order to restore proper crane operation, perform the following operations (Fig. 1):

1 - retraction of auxiliary boom;

If the extension are at, or reach, the position of complete retraction, then

2 - perform some manoeuvres by means of the telescopic segment control lever of the auxiliary boom, then, if the crane is in the A configuration (over the horizontal line)

3 - lift the main and auxiliary boom;

If the crane is in configuration B (below the horizontal line),

4 - lower the main and auxiliary boom;

Should manoeuvres 3,4 have been performed improperly, the crane will lock again. During the extension manoeuvre for the main cylinder, when its end-of-stroke position is reached, the moment limiting device could intervene because of the pressure generated inside it.

- **Moment limiting device with lock of all functions (CE, Optional)**

The moment limiting circuit, connected to the main cylinder, is designed to block all the crane movements when its maximum bending moment allowed by the machine structure is exceeded as a result of lifting of excessive loads or of incorrect manoeuvres.

With the crane locked, only the retraction of the hydraulic segments is allowed, so as to reduce the length of the crane boom and hence the moment, which caused the locking condition.

- **Lock valve for controlled lowering of load**

These valves (Fig. 2 and Fig. 3), besides controlling the down-stroke speed of the cylinders, have the function of locking them in case of breakage in any piping. Balanced valve within the hydraulic system can lock hydraulic oil from the rod-less side of the cylinder in order to prevent the booms from lowering and guarantee the safety for working.

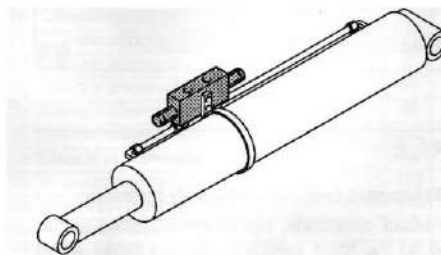


Figure 2

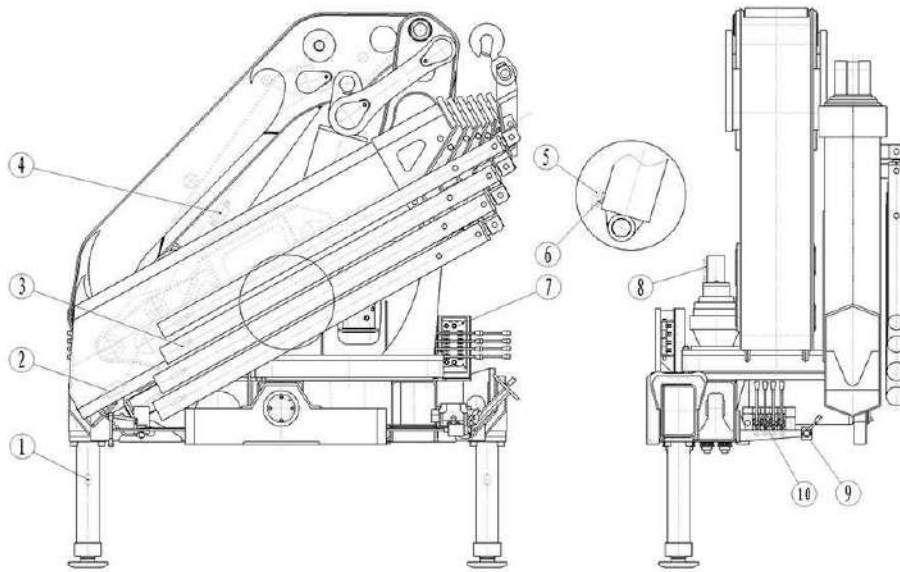


Figure 3 shows the protective devices of the crane as follows:

1. Dual Check Valve
2. Extension Overcenter Valve
3. Sequence Valve
4. Dual Overcenter Valve
5. Single Overcenter Valve
6. Relief valve
7. Directional Control Valve
8. Slew Overcenter Valve
9. 5-Position, 4-way valve
10. Directional Control Valve

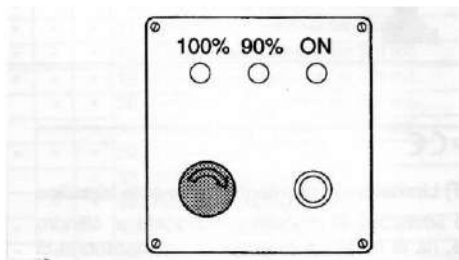


Figure 4

- **Rated Capacity Indicator (Optional)**

A rated capacity indicator (Fig. 4) with visual and audible system is fitted on the crane. Graphic display alerts the operator the current lift capacity through a series of green, yellow and red lights indicating the reach of the percentage of allowable load registered. Green light indicates that the current lift capacity not exceeding 90% of lifting capacity. Yellow light indicates that the current lift capacity reaches 90% of the lifting capacity. The rated capacity indicator will warn the operator in red light when the operator has reached or exceeded 100% of capacity. The indicator will also have an audible warning when the operator has reached or exceeded the full capacity.

- **Emergency (CE, Optional)**

The emergency push button has the function of stopping the crane operations in case of danger. Rotate the push button clockwise to restore the crane movements.

WARNING: Before releasing the push button, make sure that all dangerous conditions have been eliminated.

- **Stop Devices for stowed crane**

These mechanical stops prevent the crane booms from all rotation and lowering movements during the vehicle travel (shown in the highlighting squares in Fig. 5 & Fig. 6).



Figure 5



Figure 6

2.3.2 Hydraulic Articulated Extension

The hydraulic articulated extension or third articulation is an extremely useful attachment, as it allows long distances to be covered with all the hydraulic movements, even ensuring high work accuracy.

2.3.3 Stabilizers (Outriggers)

Stabilizers, also named as outrigger in this manual, of the base crane are installed to ensure freight stability sufficiently.

3. Installation

3.1 Safety Rules for Machine Movement

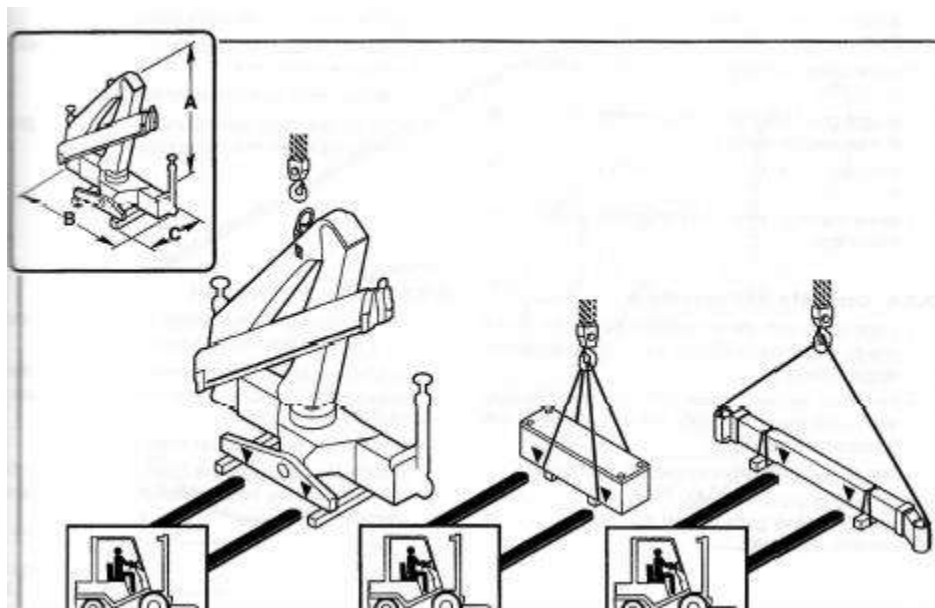
Before lifting or uploading, the operator shall know:

- The overall dimensions including the wooden beams;
- The weight of the crane;
- The position of the barycentres.

Lifting of the crane shall be carried out by means of equipment of suitable lifting capacity. When locating any cranes and attachments on the vehicle you must always check for their suitability during travel; make use of fastenings if required.

3.2 Lifting the Machine

Before transport, the crane is fastened on two wooden beams with the jack outriggers turned upwards. It is equipped with a case containing the material for installation on the vehicle or means of equipment of suitable lifting capacity as shown in the figure below.



3.3 Selection of Location

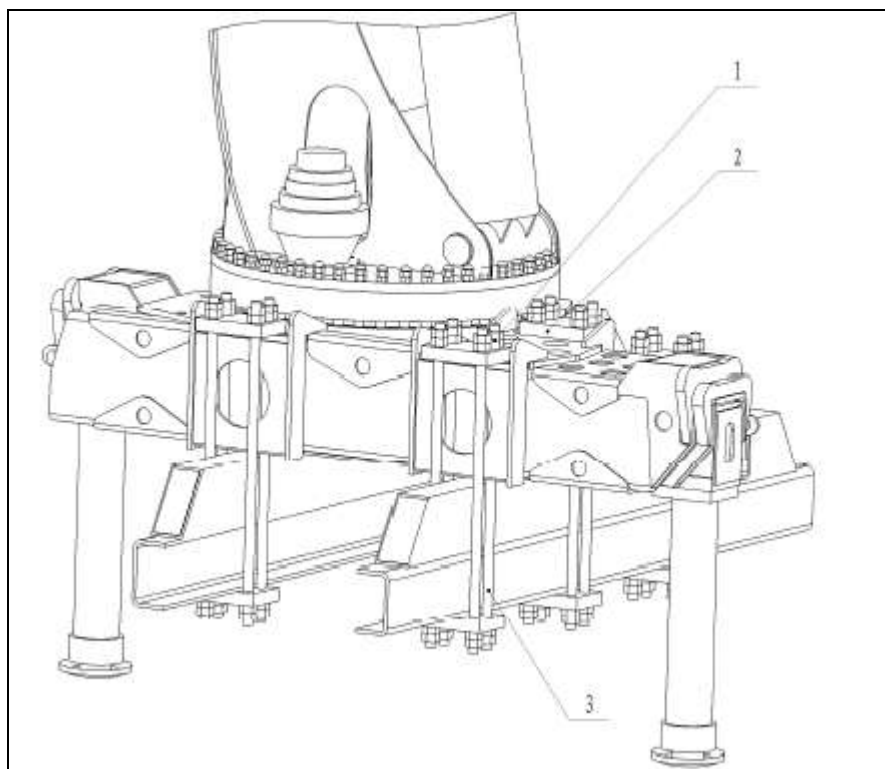
The crane should be installed on a flat and stable surface. The location must be equipped with essential equipment for the assembly of the crane. Other than the personnel charged with the crane running and installation, the operator must ensure that there is no other personnel allowed to enter the crane work area. He must ensure that the minimum safety distance to the power lines according to the government regulations is observed.

3.4 Installation

- **Installation of the Crane (Installation Diagram 2)**

For a safe and accurate assembling of the crane on the lorry caisson, behind the cabin, only experienced people having the proper ability and knowledge of the regulations and laws will be able to carry out the necessary operations of the installation. It is recommended to execute the following procedures:

- Place the crane on the loading platform parallel to the cabin.
- Place the slot of crane in the centre of the lorry side sills.
- Introduce the respective tie rods and tighten with nuts and counter nuts.
- Use the respective plate provided by the manufacturer for the brackets of tie rods union.
- union.



1. High Strength Proof Nut

2. High Strength Proof Plate

3. Stud Bolt

Installation Diagram 1

- **Installation of P.T.O and pump transmission devices. (CHART 4)**

The effect of P.T.O. and pump transmission devices is to transmit the power from the motor to the oil pump in order to get high-pressure oil and supply working power to the crane. While assembling, make sure the angle between the transmission shaft and ground level is less than 3° . Before operation, fill oil to the oil pump and rotate 15-20 cycles in order to get rid of the air.

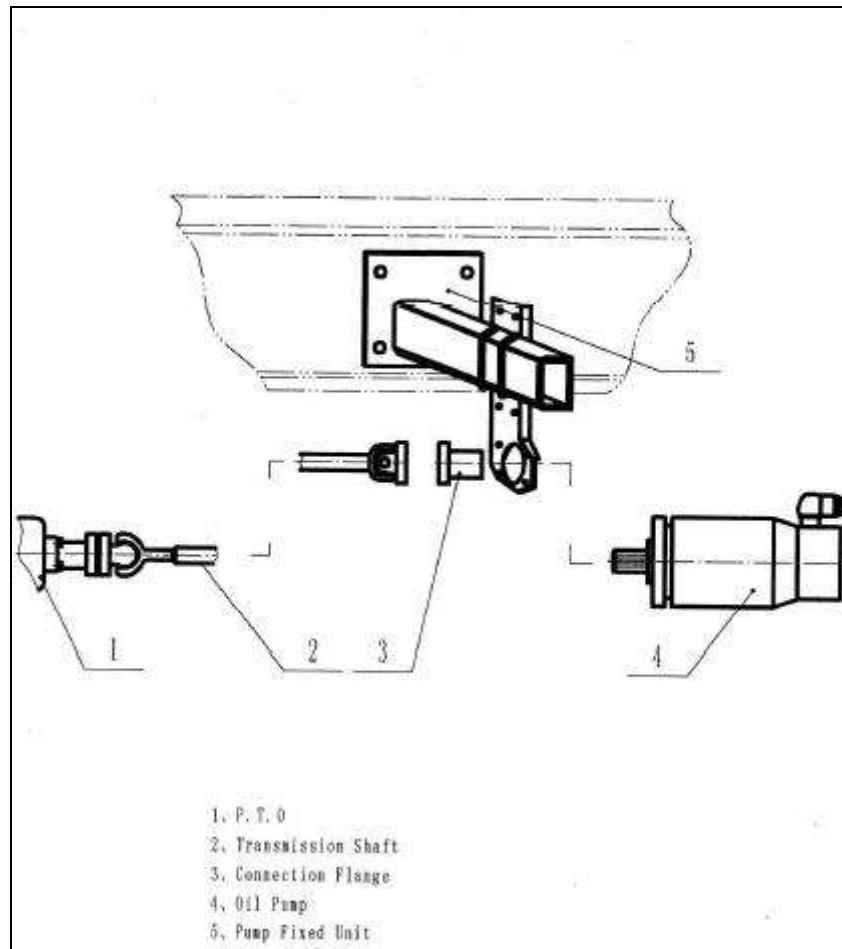
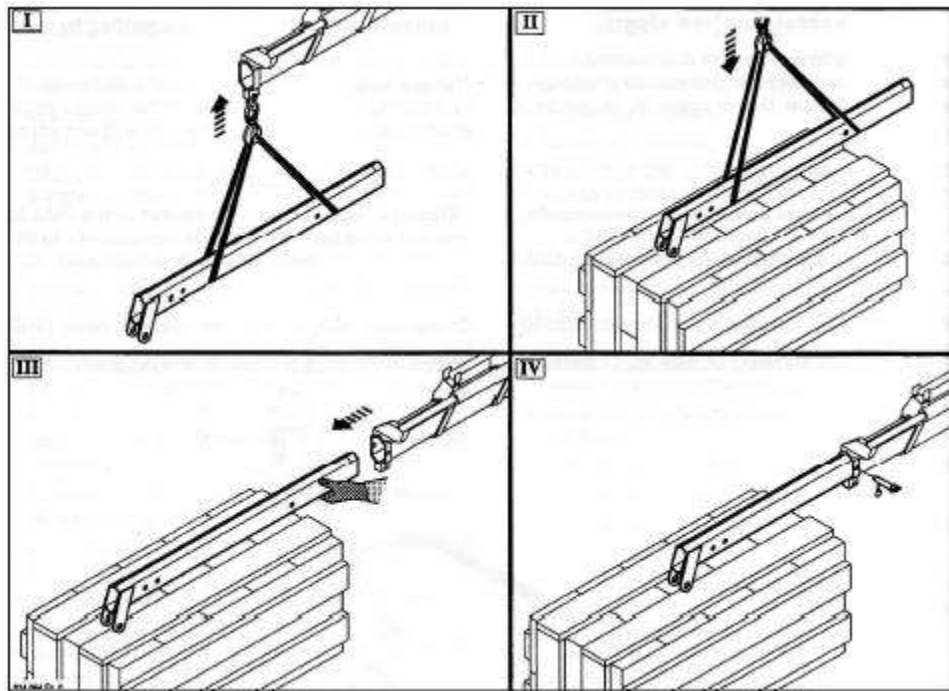


Chart 4

- **Installation of manual extension**



Before assembling the extensions, the operator shall check the weight of each of them.

Assembly:

1. Sling the extension and hoist with the crane.
2. Lay it on stands or a stable surface and remove it with the slings.
3. Approach the crane telescopic segment and fit the extension; make the holes for
4. the pin coincide.
5. Lock the extension with the suitable pin and safety peg.

3.5 Installations and Leveling

After installing the crane, place the spirit level on the car beam. Adjust the jack to the horizontal level according to the position of the spirit level. Tighten the screw bolts.

3.6 Oil Pressure Supply Connection

- **Connection of the Crane Hydraulic System to the vehicle pump**

The Pump connected to the power takeoff of the vehicle delivers the oil flow rate required to actuate the crane.

Make sure that the flow rate of the pump corresponds to the one recommended. This can be achieved with the help of a litre-counter.

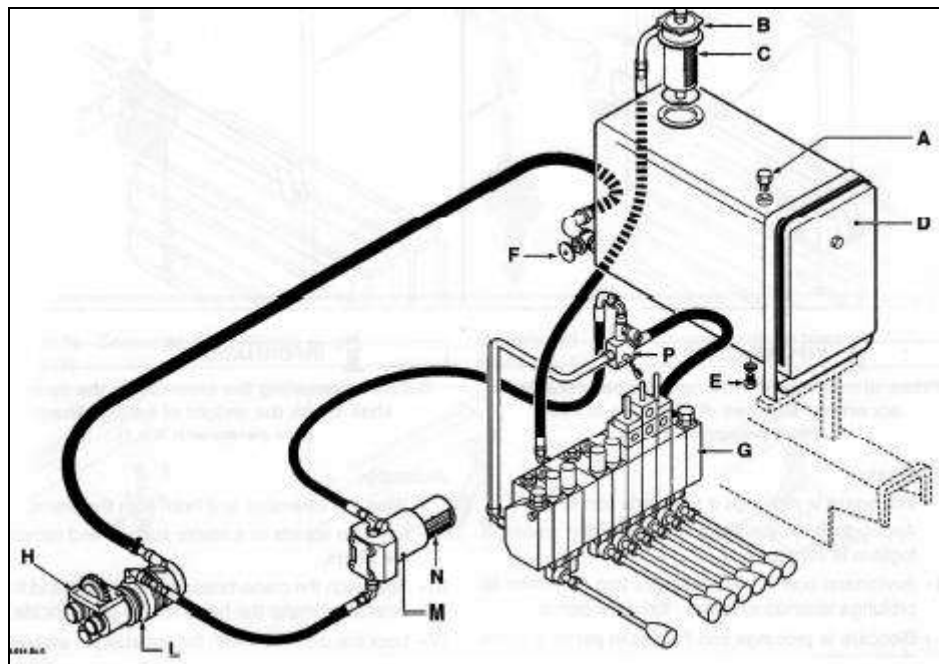


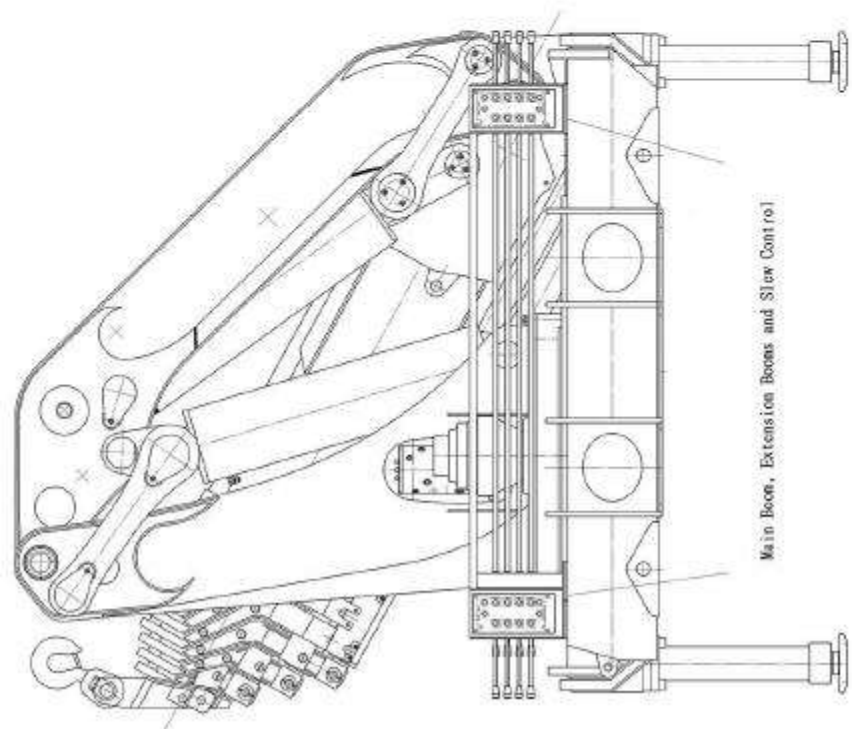
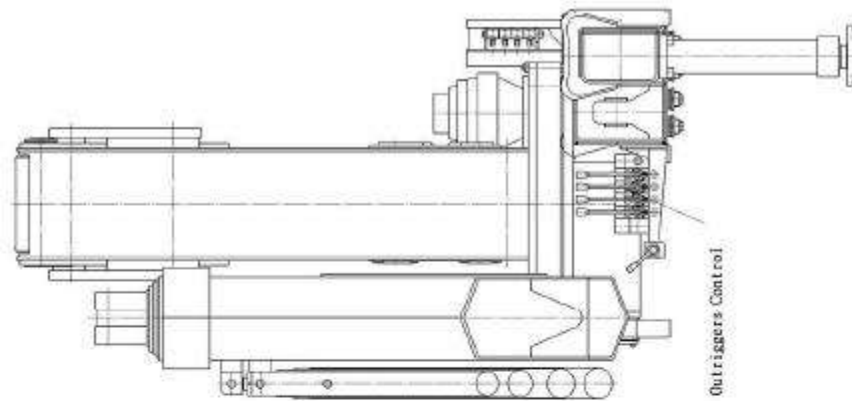
Figure shows the connection with a separate control valve (stabilizer control).

Legend:

- A. Oil filling plug
- B. Return Filter
- C. Return Filter Cartridge
- D. Oil Tank
- E. Drain Plug
- F. Gate Valve
- G. Control Valve
- H. Power takeoff
- I. Pump
- J. Filter on Delivery (recommended option)
- K. Filter Cartridge
- L. 3-way diverter

4.Operation

4.1 Operator Position



4.2. Control Panel

The crane can be remote controlled by a radio control.

Description of Controls

Symbol	Control	Element
	1. Retraction	Outriggers (Horizontal cylinders)
	2. Extension	
	1. Retraction	Outriggers (Vertical cylinders)
	2. Extension	
	1. Clockwise rotation	Slew
	2. Counterclockwise rotation	
	1. Fall	Inner Boom
	2. Rise	
	1. Fall	Outer Boom
	2. Rise	
	1. Extension	Extension
	2. Retraction	

4.3 Emergency Stop (CE, Optional)

Emergency push button:

The emergency push button has the function of stopping the crane operations in case of danger. Rotate the push button clockwise to restore the crane movements.

WARNING: Before releasing the push button, make sure that all dangerous conditions have been eliminated.

4.4 Operation Procedures

4.4.1 General Rules for the Use of the Crane

- Read the safety instruction and check the operation of safety devices carefully before starting any operation.
- The operator must ensure there are no unauthorized personnel to be allowed in the crane working area. Keep distance from the crane or the load during operation to avoid any possible danger.
- Make sure that the loads to be hoisted, with regard to the reach, do not exceed the values indicated on the load curve (See technical information of each crane model). Never hoist any loads exceeding the values indicated on the load curve.
- The operator shall absolutely avoid hoisting loads, when manoeuvring, at positions such as to expose himself and the encharged people to danger. The vehicle must be located in such a way as to allow the operator the unobstructed view of the whole work area of the crane.
- The crane is to be used by operating the control levers gently in order to avoid sudden movements and water hammerings, which would be very harmful for the life and efficiency of the crane. Whenever a cylinder reaches its end of stroke, stop actuating the control lever immediately in order to avoid oil overheating.
- The crane must be used on stable, horizontal surface. Stabilize the vehicle by the horizontal and vertical outrigger. Make sure the working area is adequate and the outriggers rest on a solid base. If it is an un-solid or un-smooth base, place a suitable wood under the outrigger.
- Lubricate all lubrication points according to the Lubrication Chart. Check the oil level in the tank and it must not be lower than the minimum.
- Check the tightening state of different parts and components.
- Keep a minimum safety distance from the overhead power line according to the regulations of the government. If there are overhead power lines within the working area, keep a minimum safety distance from them according to the related regulations of the government.
- Upon work start, carry out some maneuvers without load in order to allow the oil to reach proper flow and to check for regular operation. Operate in a low speed when starting the hydraulic pump in order to warm-up the machine. Operate unloaded for a few minutes before lifting and check whether there is oil leak or abnormal situation.
- During the very beginning of operation for the new crane, all components and mechanisms are in the adjusting state. In order to guarantee a long life to the crane, the maximum load for the first 100 working hours should not exceed 80% of the maximum lifting capacity of the crane and the maximum working speed is not allowed.
- Operator should be aware that control levers located on both sides are within the same control system. Thus, controlling on both sides at the same time are forbidden. (See Chart 2)

- At the end of the work, check for the lock of the stabilizing beams (outriggers) in the restricted position, in order to prevent them from extending dangerously during the vehicle travel.
- Utilize the crane without fully extending the outriggers resting on a solid base is forbidden. Do not adjust the outrigger or move the levers controlling the outrigger while the crane is working. Remove the load and move the crane booms to the front or rear before adjusting the outriggers.

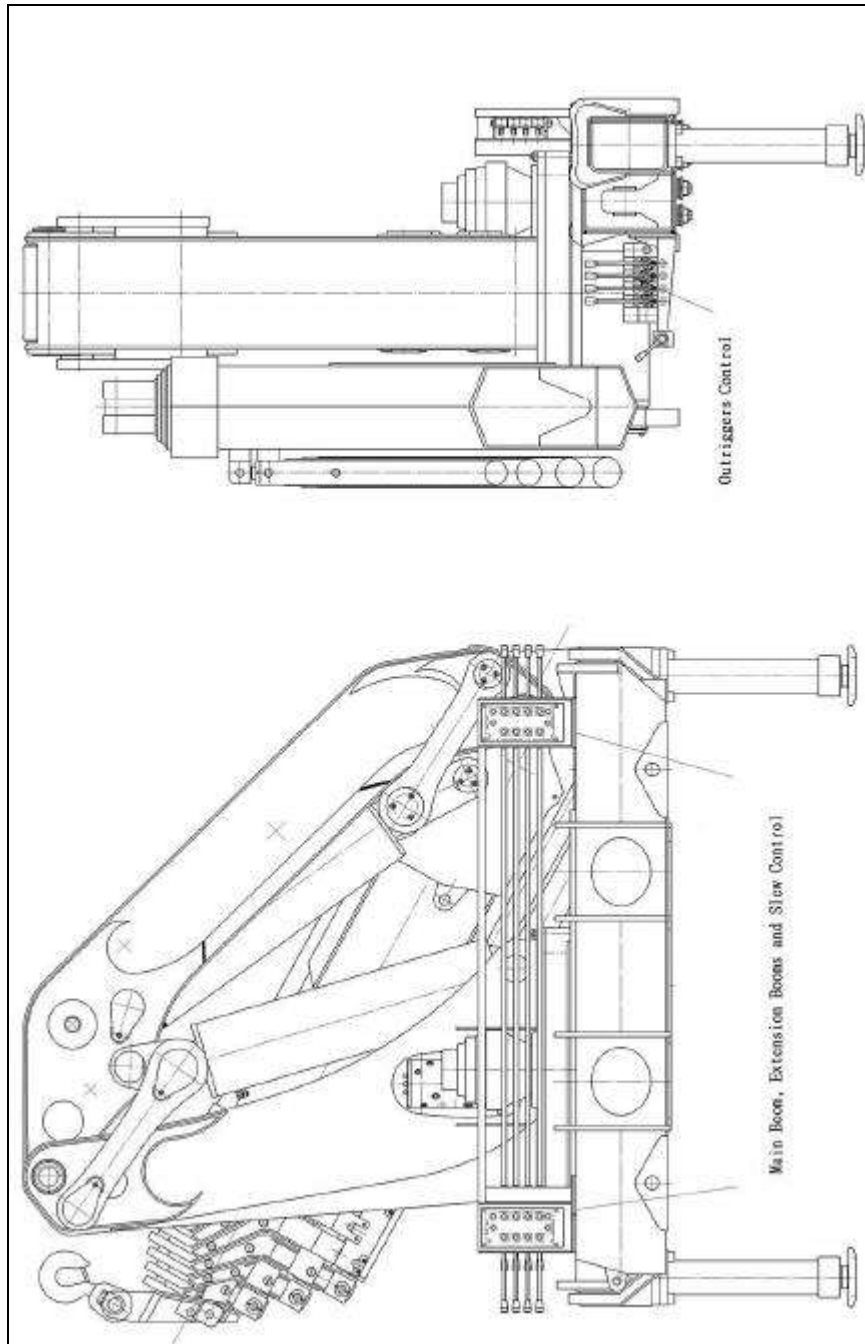
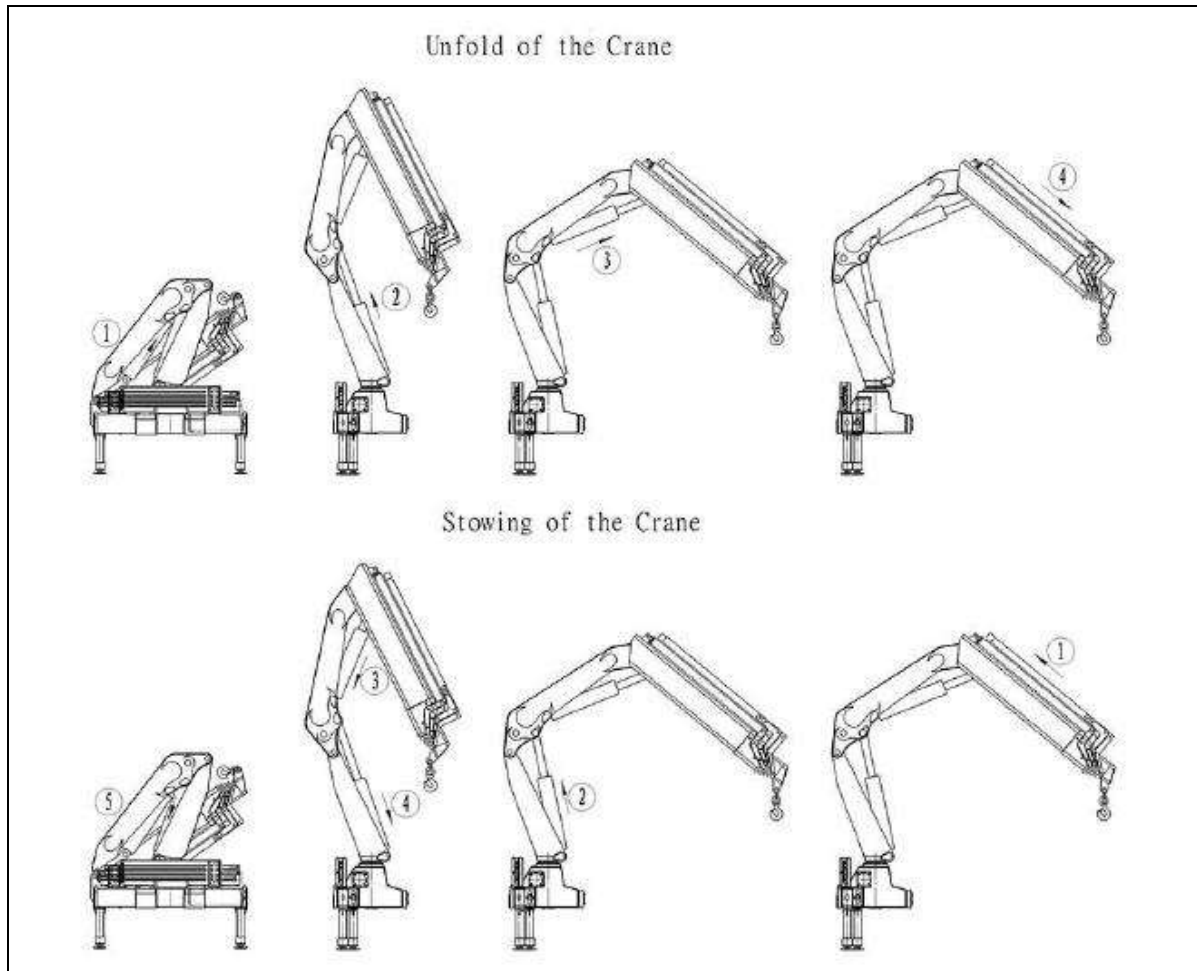


Chart 2

4.4.2 Use of the Crane

- **Crane Work Position**



- **Outrigger and its control device. (CHART 5)**

Outrigger and other parts' control devices are tied up together as a six-way directional control valve in order to control the whole machine. The outrigger system includes two horizontal outriggers, two vertical outriggers, one outrigger support and two outrigger cylinders, and a four-way oil-dividing valve.

The six-way directional control valve is divided into front, middle and back positions. The control levers are always in the middle position (when not working) because of the springs. And they will return to the middle position automatically after every movement. All crane movements will stop while levers are in the middle position.

- **Slewing Mechanism**

Slewing Mechanism achieve slewing through transmission from gear rack.

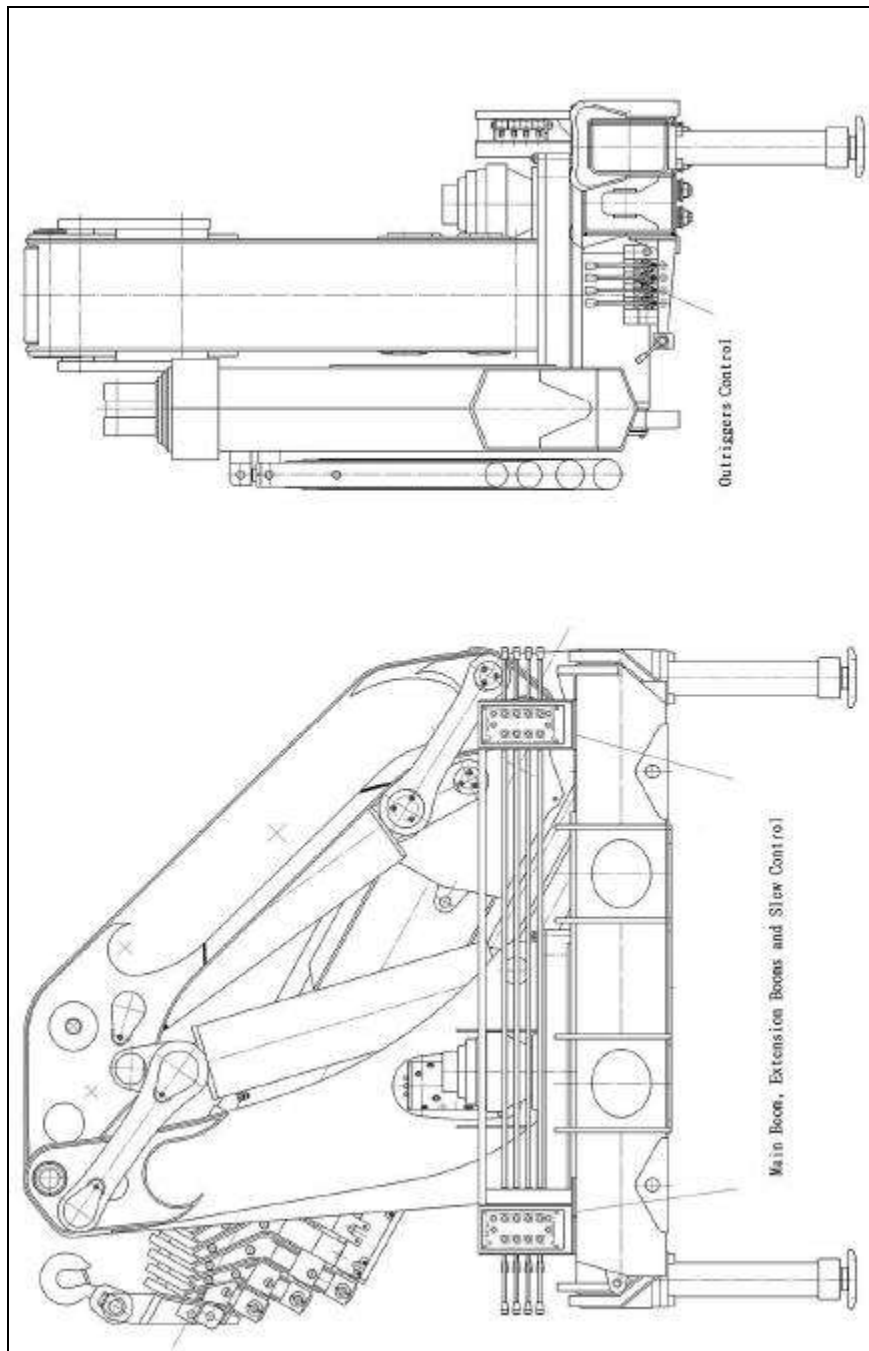


Chart 5

- **Extension Mechanism**

- One Outer Boom, four Extension Booms and Boom Extension Cylinder compose the extension mechanism.
- Outer Boom and Extension Booms are welded to six-angular box structure by high-strength low-alloy steel plates.
- Extension of the Extension Booms is achieved through the Boom Extension Cylinder.

- **Derricking mechanism**

The derricking of crane booms and change of working breadth is achieved through the extension and re-enter movements of the Inner and outer cylinders, which change the working angles of the crane booms.

4.5 Adjustment of the Machine / Parts

- Adjustment and Testing conditions
 - All attachments required while working should be safely fixed in accordance with the design.
 - No other equipments or un-necessary things are within 18 M² around the crane.
 - Testing should be proceeded on solid and flat ground. Crane should be placed on stable surface.
 - Lubricate as required. Check oil level on the tank and it should not lower than the minimum.
 - Testing cannot proceed while wind speed exceeds 8 m/s.
 - Environmental temperature should range between -20°C — +40°C.
 - Tolerance for load weight is $\pm 2\%$.
- Preparation for testing
 - Visual check
Check the outlook and workability of all parts of the crane in order to make sure they are in compliance with the technical specification. Such check includes those parts to be operated by hand. This does not mean to demolish the components of the crane, although coverings may have to take over.
 - Check whether all components are well assembled, connections are reliable, levers are flexible.
 - Check all the hoses and make sure there is no oil leak.
 - Make sure that the hook is always free to rotate on its pin. Check the efficiency of the hook safety catch.
- Adjusting items (All parameters for the system and operation mechanisms are well set before delivery and no further adjustment is required in normal cases.) include the following:
 - System total pressure: 30Mpa
 - Working pressure for Inner Cylinder: Extend-30Mpa, Re-enter-20Mpa
 - Working pressure for Outer Cylinder: Extend-30Mpa, Re-enter-20Mpa
 - Working pressure for Boom Extension Cylinder: Extend-23Mpa, Re-enter –30Mpa
 - Working pressure for Slewing Cylinder: Clockwise-16Mpa, counter clockwise-16Mpa
 - Working pressure for Outrigger Cylinder: Extend-21Mpa, Re-enter-21Mpa
 - Adjust sequence valve to make sure extension booms extends sequentially as follows:
 - Extend: Extension Boom 1→Extension Boom 2→Extension Boom 3→
Extension Boom 4→Extension Boom 5→Extension Boom 6
 - Re-enter: Extension Boom 6→Extension Boom 5 → Extension Boom 4→
Extension Boom 3→Extension Boom 2→Extension Boom 1
 - Adjust speed-control valve for slewing cylinder to make sure its slewing speed is 0-2.5r/min.

- Testing Procedures

- Testing without load

Test at least twice for each working situation by high and low speed separately. Check whether there is any abnormal situation.

- Testing with fixed load

* Test at least twice for each working situation by high and low speed separately in respect to the load capacity chart. .

Movements for testing:

One testing cycle: Lift the load to 200mm height. Adjust the breadth of Inner Boom to 1.5m through Inner cylinder. Then move back to the previous position. Slew fully both left and right side. Extend the Boom Extension cylinder for three times. Lift the load to the MAX height, then put the load down on the ground. Stop once randomly during this process.

B. Outer Boom, while crane is on a positive side direction. Outreach is 4.73m and load as specified in the Load Capacity chart. (Hoisting, Derricking, Slewing)

One testing cycle: Lift the load to 200 mm height. Adjust the breadth of Inner Boom to 1.5 m through Inner Cylinder. Then move back to previous position. Slew fully both left and right side. Lift the load to the MAX height, then put the Load down on the ground.

C. Inner Boom, while crane is on a positive side direction. Outreach is 2.5m and Load as specified in the Load Capacity Chart (Hoisting, Slewing).

One testing cycle: Lift the load from ground to the MAX height (stop randomly once). Lower the load to the height level 1m (stop randomly one to two times). Slew fully both left and right side (stop randomly one to two times). Put the load back on the ground (stop randomly once).

5. Maintenance

All servicing operations not included in this chapter shall be carried out by an authorized workshop. The calibration pressure and efficiency of the crane valves should be periodically checked (at least once a year) by an authorized workshop.

5.1

- Periodically check for the tightening of the stay bolts that secure the crane to the vehicle chassis, in particular after the first loading cycles.
- Periodically check for proper tightening of the locking screws of the gear-motor on the base. If you notice any loosening, tighten the locking screws.
- If any oil leaks are noticed through the fittings of the hydraulic system, tighten the fittings. It is advisable to check for tightening of such fittings whenever servicing is carried out on the crane.
- Check for tightening of all pins at least once a year in an authorized workshop.
- Every day make sure that the oil level in the tank is included between the minimum and maximum allowed. Top up if required. Use leaching mesh to top up oil. Do not mix oil of different brands or mix the oil with water or any other impurities.
- Should the crane be provided with a reducer for rotation, check for the oil level in the reducer every 250 hours.
- Every two months (assuming a daily use of 3 hours approximately), it is necessary to visually check that the crane structure and in particular welding are not damaged nor affected by micro-cracks, that could cause irreparable damages over time. In this case apply to an authorized workshop. Wash the crane carefully before inspection.
- Check for conditions of the flexible pipes every 30 hours, in particular the areas next to the unions. The pipe must be replaced whenever the following defects are noticed:
 - Deterioration due to normal aging
 - Abrasions
 - Piercing
 - Slits
 - Breaks
 - Localized distortion
 - SwellingAvoid pipe exposure to radiant heat and contact with corrosive materials.
- Check the filter spool after 250 working hours. Clean or replace it when necessary.
- Remove water and impurities from the outlet at the bottom of the oil tank every two weeks. Renew all the oil every year or after 2000 working hours. If the quality of the oil remains in good condition, period for renewal can be extended relatively. If the crane is working in an extreme environment, period for renewal should be shortened relatively.
- Prevent dirt from depositing on the cylinder rods. Should the crane be inactive for a period, set it in stowed position so that the cylinders are closed. If this is not possible, lubricate the rod sections exposed to weathering and all the unpainted parts.

5.2 Lubrication

The crane must be always lubricated properly in order to reduce corrosion and prolong the life of the crane.

Lubricate all lubrication points according to the Lubrication Chart in the enclosures. Clean the inlet points and containers for lubrication oil before filling lubrication oil. While lubricating the gasket, shaft and bearing, keep filling until the used lubrication oil is completely forced out.

Selection of Hydraulic Oil:

	N32 Hydraulic Oil (HV/HS)	N46 Hydraulic Oil (HV/HS)	N68 Hydraulic Oil (HV/HS)	N100 Hydraulic Oil (HV/HS)
Kinematic viscosity 40°C [mm ² /s]	28~35	41~50	61~74	41~50
Kinematic viscosity 100°C [mm ² /s]	3~9	5~11	9~14	11~17
Suitable for use in environment range -20°C~40°C				

Please refer to the Chart 6 for lubrication chart of each crane.

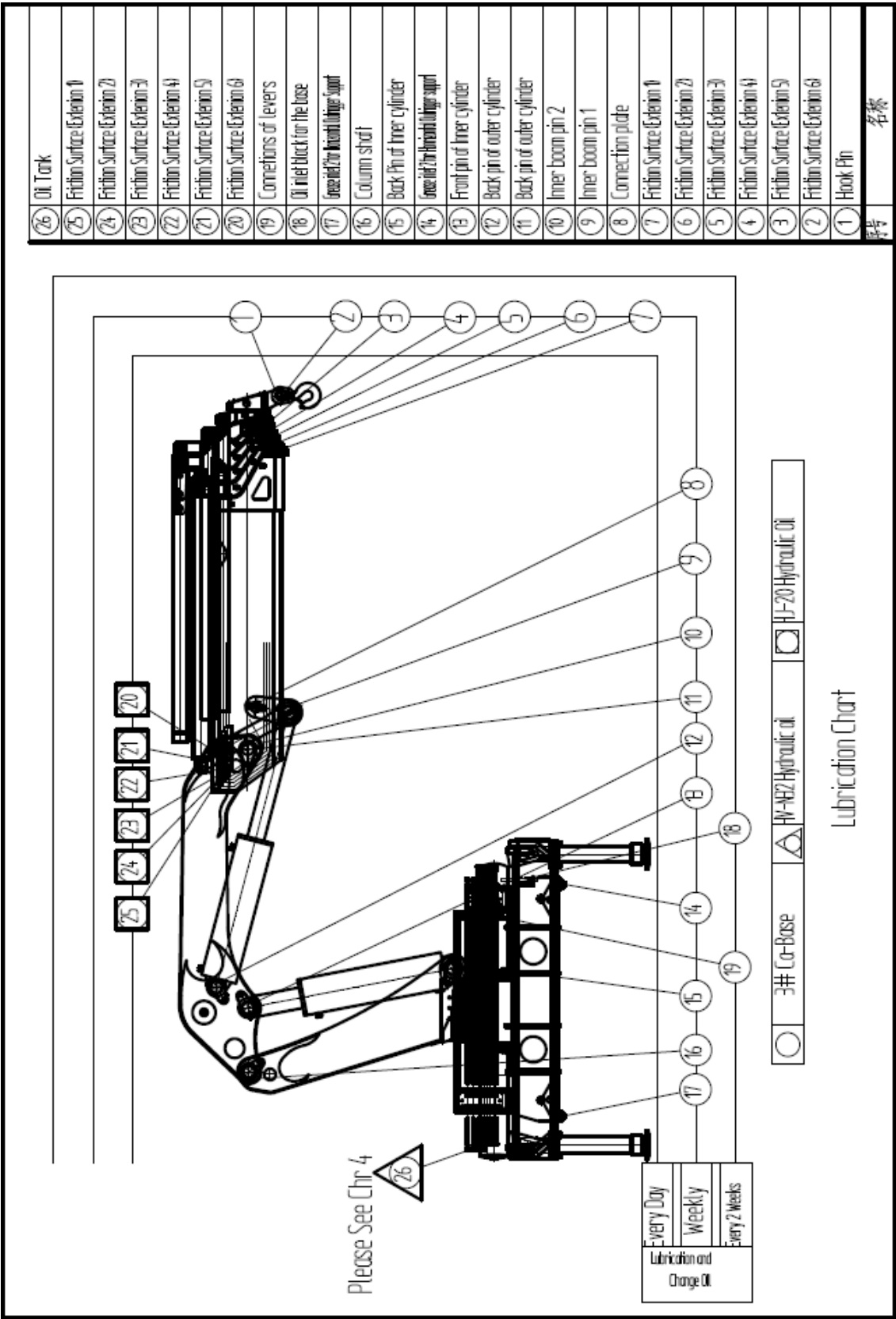


Chart 6

5.3 Trouble Shooting

If breakdown occurs during operation, stop the machine and check different parts of the machine carefully. Analyze and find out reasons for the breakdown. Take appropriate remedies to clear the breakdown. Table hereunder concludes the most frequent breakdowns and our suggested remedies for users' reference only.

Troubles and Remedies

Item	Trouble	Cause	Remedies
1	Oil leak in the oil loop	(1) Loose connections (2) Broken seals (3) Broken pipes	(1) Tighten the connections (2) Replace seals (3) Weld or replace the pipes
2	Lower Performance of Crane	(1) Relief valve of directional control valve (2) Damage of oil pump. (3) Exceeding oil temperature	(1) Check pressure of directional control valve (2) Repair oil pump (3) Stop the machine
3	Serious noise from oil loops/ Slow or jerking movement of booms	(1) Air inside pipes or hoses (2) Low oil temperature (3) Obstructed filter (4) Deteriorate or Inadequate oil in oil tank. (5) Loosening pipes, hoses or hydraulic components (6) Oil pump damage (7) Incorrect setting of the extension part valves	(1) Conduct several maneuvers in order to get rid of the air in the oil tank; (2) Check oil level (3) Check and clean or replace filter spool (4) Replace or Refill oil (5) Tighten pipes, hoses and hydraulic components. (6) Repair oil pump (7) Reset the valves
4	Unable to perform all maneuvers in lifting movement	(1) Damage oil pump (2) Damage or wear of control valves (3) Wear or dirt in relief valve	(4) Check hydraulic lock (5) Check cylinder seals or inner surface situation of cylinders bore
5	Outtrigger re-enter by itself while lifting, or loosen by itself while the vehicle is moving	(1) Breakdown of hydraulic lock (2) Internal oil leak in cylinders	(1) Check hydraulic lock (2) Check seals or inner surface situation of cylinders bore
6	Inner cylinder lower progressively while the crane is in lifting movement	(1) Pressure set for the relief valve is too slow (2) Internal oil leak in balance valve (3) Internal oil leak in cylinders	(1) Reset the pressure for relief valve (2) Clean or replace valve (3) Replace seals

It is less possible to have serious problems during operation if the crane is operated and maintained properly. When problems occur in the hydraulic system, if there is potential risk of accident to follow remedies listed above, emergent actions can be carried out before taking the remedies above. But these emergent actions should be operated very carefully. (Note: This actions need to be taken by experienced operators only with extreme care. Remove the load before performing any remedies. Otherwise oil may eject at high pressure.)

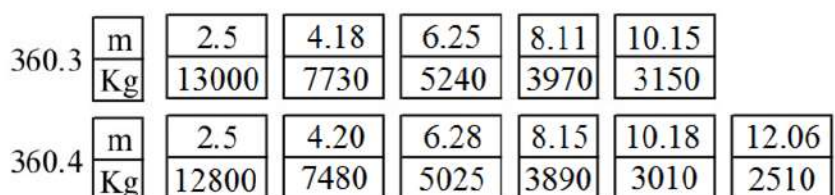
If Inner and Outer Booms cannot lower, open the inlet oil pipe connector on the rod-side of Inner and Outer Cylinders. Loose the oil. If problem persists, apply to the authorized workshop.

- In case of the crane boom cannot lower because of damage in oil tank, loosen the adjusting spring of the relief valve. Crane boom will lower gradually due to the weight of the crane and hydraulic oil will flow back into the oil tank slowly.
- In case of extension booms cannot be retracted, unscrew the inlet oil pipe connector of the rod-side of extension cylinders, then unscrew the oil pipe connector between the balance valve and extension cylinder. Raise the boom and retract the extension boom. If problem persists, apply to the authorized workshop to repair.

5.4 Waste Disposal

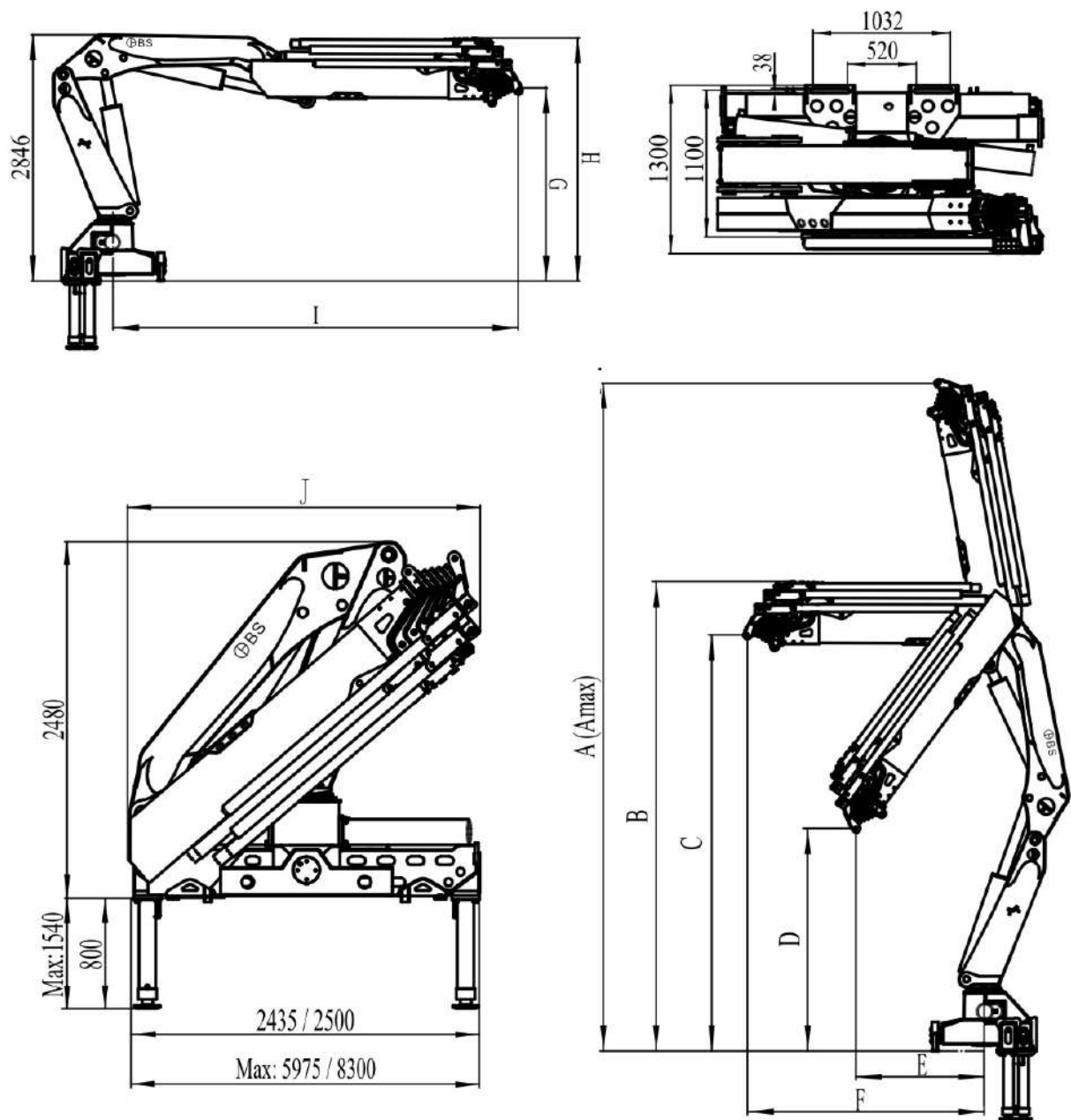
Oily debris and waste oil are generated when working on cranes. The operator should have programs specific to hazardous waste collection, labeling and disposal. Oily debris shall be collected, stored in containers and transported to local waste disposal facilities. Oil filters are fitted on the crane to drain out the oil from the waste. Used oil can be collected, labeled and marketed. Waste oil marketed by authorized waste disposal companies can be burned for energy recovery.

BS 360



	Lifting capacity (K N.m)	Outrigger Extension(m)	Rotation	Working pressure(MPa)	Pump capacity(cc/r)	Oil tank capacity(L)	Crane weight(kg)
360.3	340	3.54/5.8	385°	33	40~80	160	4140±50
360.4							4400±50

BS 360



	A	A _{max}	B	C	D	E	F	G	H	I	J
360.3	7227	12703	5286	4583	2939	1500	2344	2132	2827	4314	2420
360.4	7309	14695	5294	4604	2839	1500	2425	2172	2857	4404	2430