Zenith Marinetech

CRANE TROUBLESHOOTING MANUAL

Our Troubleshooting Approach

At Zenith Marinetech, we offer a systematic and efficient approach to onboard crane troubleshooting

Crane Maker : DongNam

Hose Handling Crane

Ref No. Z23-210924105

Valid Upto: 31st Dec 2025

www.zenithmarines.com

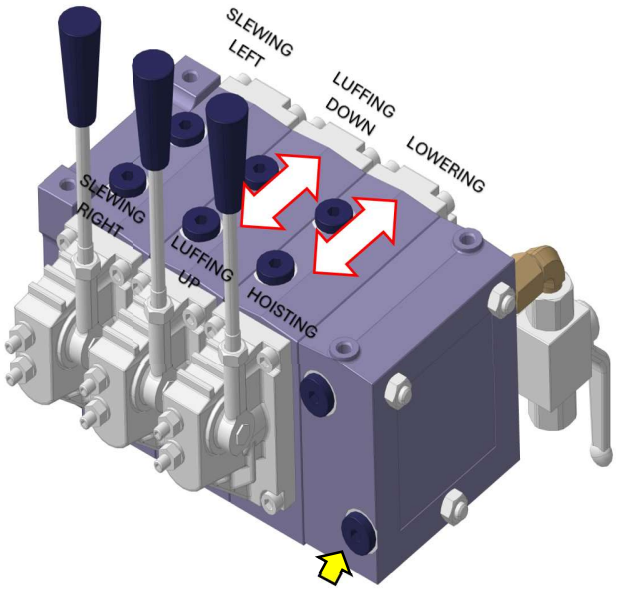
TABLE OF CONTENTS

1.1 MAIN CONTROL VALVE ADJUSTMENT

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.1.1. IDLE PRESSURE VERIFICATION (UNLOADED CONDITION)

To conduct a basic check of system response and idle pressure for each crane function:
- Ensure hydraulic system is at operating temperature.
- Individually actuate each control lever under no-load condition.
- Observe pressure gauge response for each function.



Pressure Gauge port

This allows for a quick diagnosis of system pressure behavior without applying load.

1.1.2. RELIEF VALVE ADJUSTMENT

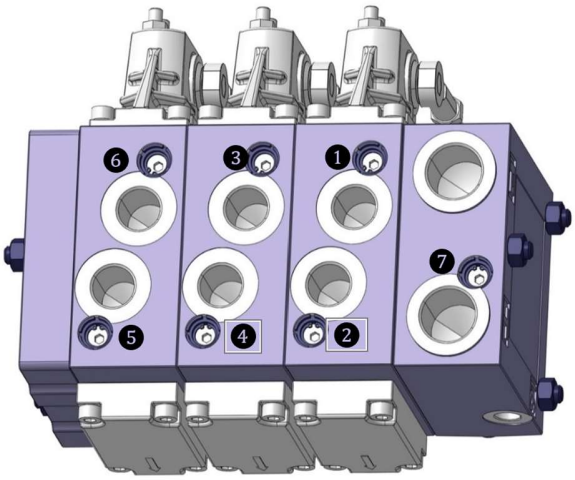
Each individual function has a dedicated relief valve. Follow the steps below to make pressure adjustments:

Adjustment Procedure:
- Tools Required: Allen key

Steps:
- Remove the black protective cap.
- To increase pressure: Turn the adjustment screw clockwise.
- To decrease pressure: Turn the screw counter-clockwise.
- Replace cap and verify system pressure.

1.1.3. MAIN RELIEF VALVE ADJUSTMENT

If individual function pressures remain low even after adjustment, the main relief valve may need correction.



1. Hoisting relief valve
2. Lowering relief valve
3. Luffing up relief valve
4. Luffing down relief valve
5. Slewing left relief valve
6. Slewing right relief valve
7. Main relief valve

- Turn clockwise to increase overall system pressure.
- Turn counter-clockwise to decrease it.

⚠ Warning: Main relief valve adjustment affects all hydraulic circuits simultaneously. Monitor all pressures during modification.

1.1.4. HOISTING PRESSURE ADJUSTMENT (LOADED CONDITION ONLY)

To ensure accurate lifting pressure setting:
- Always adjust hoisting pressure under loaded conditions.
- This ensures the crane attains its rated lifting capacity.

Detailed instructions and procedures are provided in the description on page 2/2.

1.1 MAIN CONTROL VALVE ADJUSTMENT

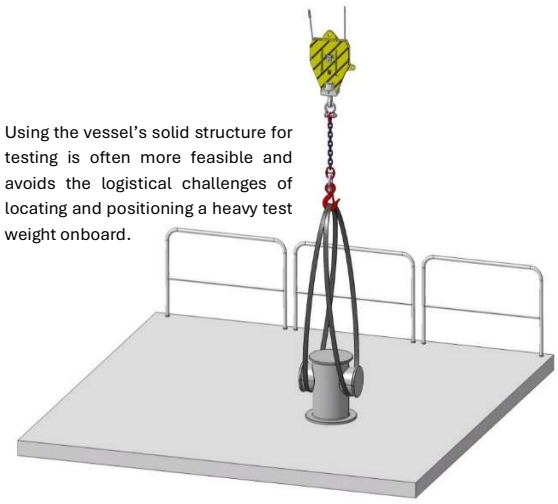
Troubleshooting And Technical Guide

1.1.5. CRANE HOISTING PERFORMANCE TEST PROCEDURE

To accurately assess the hoisting capability of the crane, the following steps must be followed:

Setup:

- The crane shall be securely connected to a solid structural part of the vessel capable of withstanding a minimum load of 30 tons.

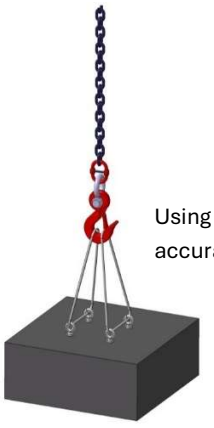


Using the vessel's solid structure for testing is often more feasible and avoids the logistical challenges of locating and positioning a heavy test weight onboard.

- Use a sling belt as shown in the illustration below to attach the crane hook to the structural point.

Simulated Load:

- A test weight of at least 1 ton may be used to simulate the load during the hoisting operation.



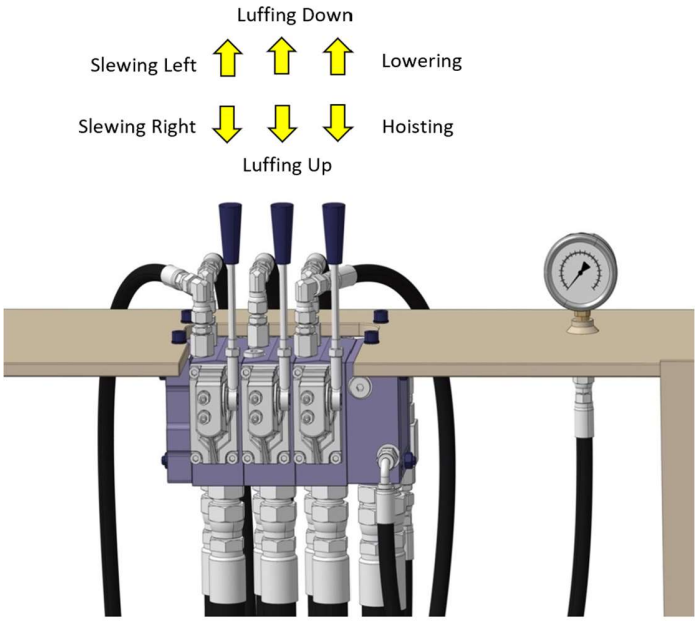
Using weight over **1ton** is more accurate and easy to handle

1.1.6. TESTING OBJECTIVE:

- The purpose of this test is to confirm the correct build-up of hoisting pressure under load conditions.

Pressure Verification:

- Operate the crane's hoisting function while monitoring the hydraulic pressure.
- Ensure that the hoisting pressure builds up to approximately 200 bar.
- It is not necessary to exceed 200 bar during this test.



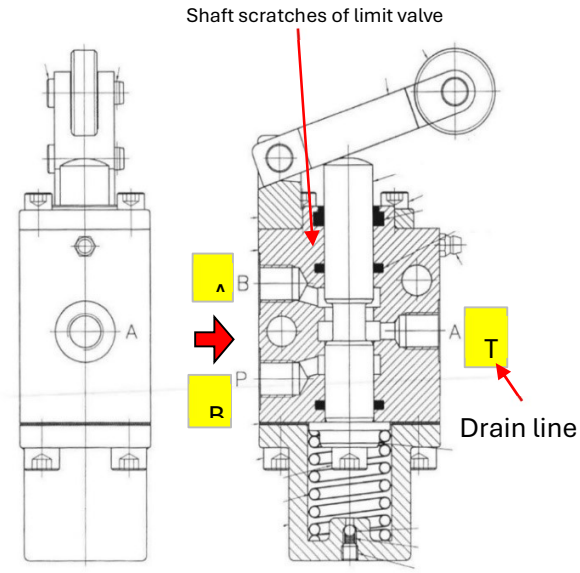
1.2 HOISITNG LIMIT MALFUNCTION

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.2.1. LIMIT VALVE MALFUNCTION

Cause:

Limit valve malfunctions are often caused by surface damage or scratches on the valve shaft, which can lead to the internal mechanism seizing.



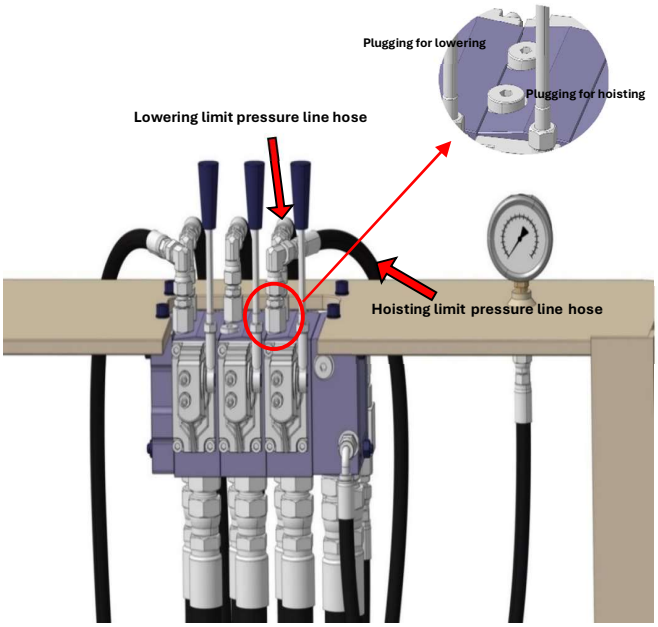
When this occurs, pressure oil from the limit pressure line may unintentionally drain back to the reservoir, resulting in the following operational issues:

- Complete failure of hoisting or lowering functions
- Reduced system pressure during operations

1.2.2. CORRECTIVE ACTION

To verify whether the malfunction originates from internal leakage within the limit valve, perform the following:

- Isolate the hoisting/lowering limit circuit by cutting off the limit line.
- Plug the port where the limit line was connected, as shown in the illustration above.
- This effectively bypasses the faulty limit valve, allowing you to confirm if the issue is related to the valve's internal leakage.

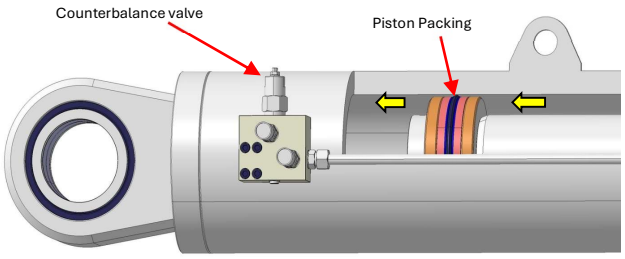


1.3 CYLINDER INTERNAL LEAKAGE AND DROP

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.3.1. CYLINDER INTERNAL LEAKAGE

Internal leakage within a hydraulic cylinder occurs when the **piston packing becomes worn or damaged**, allowing hydraulic fluid to bypass the piston — as illustrated by the arrow in the diagram. This condition reduces cylinder efficiency and causes unintended movement.



Symptoms & Diagnosis

- **Consistent Cylinder Dropping**
  Indicates that the Main Control Valve (MCV) is leaking internally and is not functioning effectively. It is recommended to replace the MCV.

- **Partial Dropping, Then Holding**
  Suggests that the MCV is working correctly, and the internal leakage is limited to the cylinder seals. MCV replacement is not necessary.

To permanently rectify the issue:

- Overhaul the hydraulic cylinder.

- Replace piston seals and inspect the piston and barrel for wear or scoring.

This ensures full sealing performance and restores proper operation of the hydraulic system.

1.3.2. COUNTERBALANCE VALVE MALFUNCTION

A malfunction in the counterbalance valve typically arises from improper adjustment or sticking due to prolonged inactivity. This can result in critical operational issues, including:
Symptoms

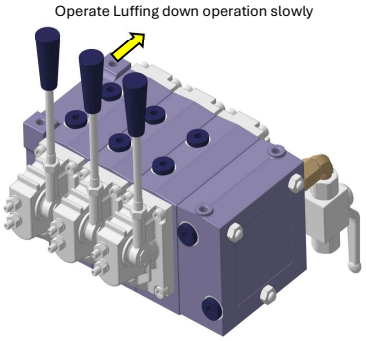
- Inability to perform luffing operations
- Gradual or sudden dropping of the cylinder

These symptoms indicate the valve is either not regulating pressure correctly or mechanically stuck in a closed or partially open position.

Corrective Action : To restore proper function:

- Check and service the counterbalance valve as per the standard maintenance procedure.
- Adjust the valve using an Allen key:
  - Turn the adjustment screw slowly counterclockwise to release pressure.

  - Simultaneously operate the luffing down lever to observe system response and ensure smooth fluid flow.

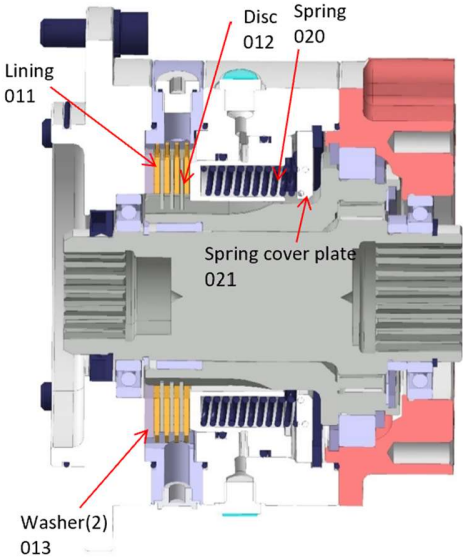


1.4 SLIPPING OF BRAKE

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.4.1. COMMON CAUSES

Brake slipping is a common issue that occurs when key components lose their original properties, such as the tensile strength of the spring.



This typically happens due to natural wear over time or when the brake adaptor, often made of aluminum, becomes heavily corroded. Aluminum is particularly vulnerable to corrosion when exposed to seawater or rain.

Ingress of Water

- Through damaged air vents.
- From corroded or open brake adaptor surfaces.
- Entry via slewing winch oil pot (tank) if sealing is compromised.

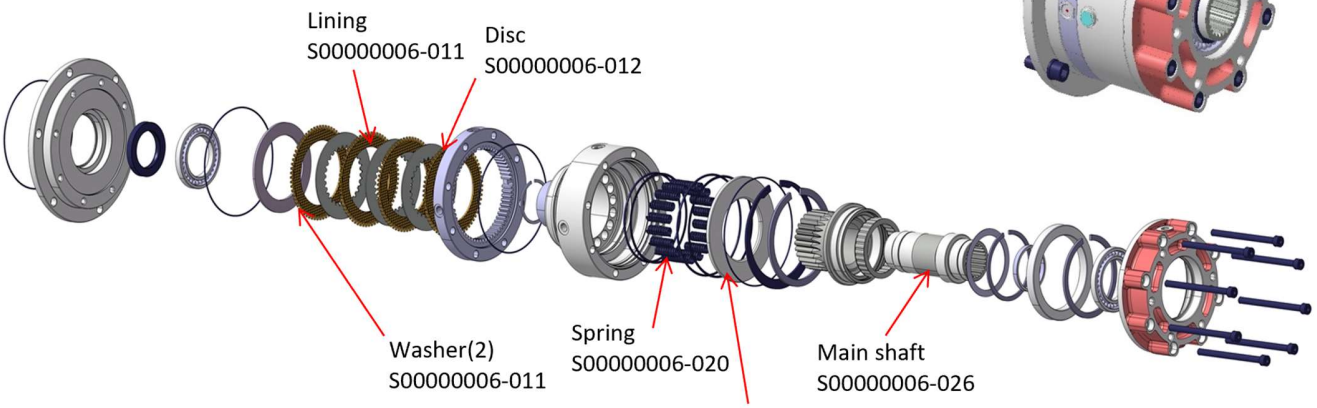
Once water infiltrates the brake, it mixes with the brake oil stored in the brake lining and disc area—oil that is intended to protect against corrosion.

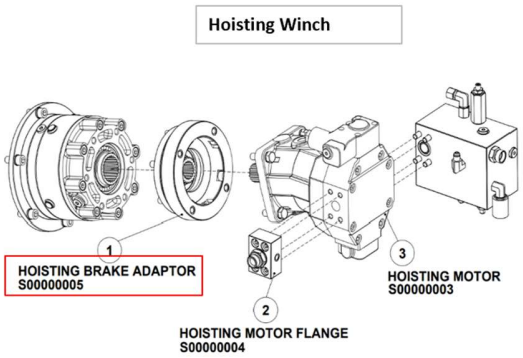
This contact initiates oxidation, causing the oil to become dirty and sticky. The sticky oil interferes with the smooth movement of the lining and disc, increasing friction and stress on internal components.

Over time, this leads to the deterioration of critical parts such as bearings, seals, and springs.

In severe cases, even the spring itself can snap due to the added resistance and corrosion.

Water can also enter the system through the slewing winch oil tank (oil pot) or through a damaged air vent, compounding the issue.





1.5 SLIPPING OF BRAKE

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.4.2. **ALTERNATE CAUSE: PILOT VALVE MALFUNCTION**

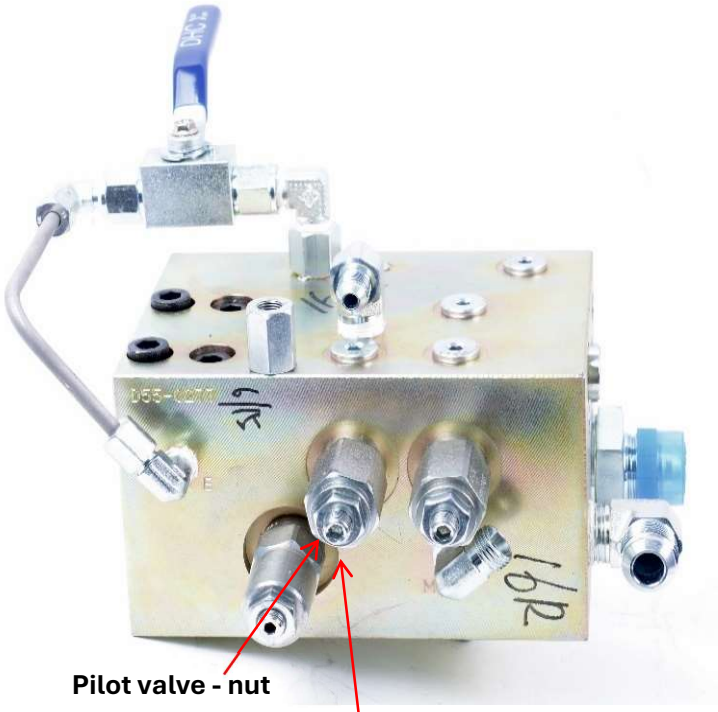
In some cases, brake slipping can occur even when internal brake components are intact. This happens due to issues with the pilot valve that controls the opening and closing of the brake.

Problem Description

- When the spring inside the pilot valve becomes stuck or jammed, it prevents timely release of hydraulic oil into the brake.
- This creates a delay in brake opening, especially noticeable during lowering operations.
- As a result, the brake does not fully disengage immediately — causing a momentary brake slip.

Corrective Action

- During lowering:
  - Slowly release the pilot valve by turning it anti-clockwise while the operation is ongoing.
- If the problem persists:
  - Replace the pilot valve as the internal spring may be permanently damaged or deformed.



Pilot valve - nut

Release nut and turn slowly allen bolt in anti-clock wise direction

1.5 LUFFING COUNTER BALANCE VALVE

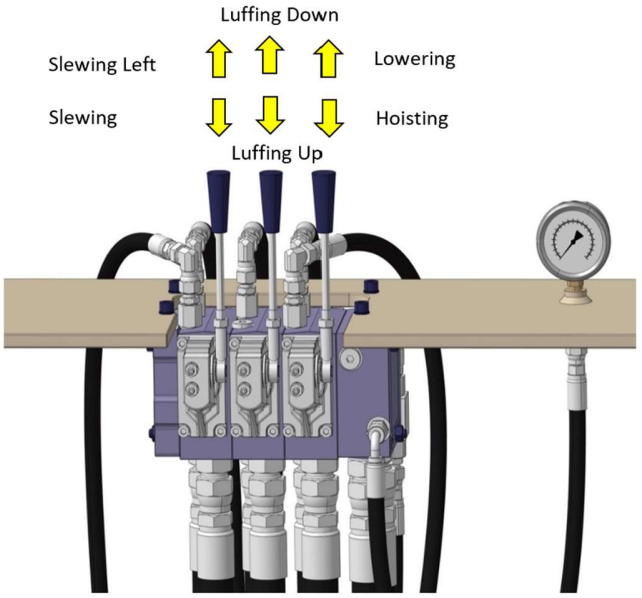
Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.5.1. SYMPTOMS OF MALFUNCTION

Condition	Typical Symptom
• **Cylinder Drop**	**Sudden free-fall or uncontrollable boom drop**
• **Sluggish Response**	**Delayed or slow luffing motion**
• **Jerking or Hunting**	**Irregular movement during lowering**

1.5.2. ADJUSTMENT PROCEDURE

Adjust the counterbalance valve gradually as shown below while operating the luffing down lever slowly.



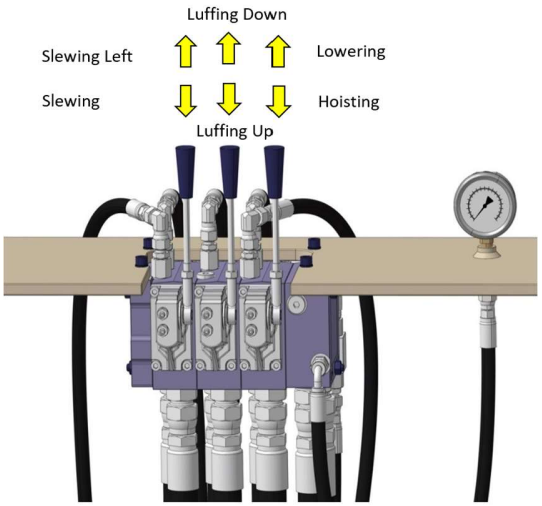
Continue adjustment until any signs of cylinder drop, jerking, or hunting completely disappearProblem Description.

Problem	Action
Cylinder Drop or Sluggish	1. Slowly release hex nut 2. Tighten Allen bolt slightly while operating luffing down
Jerking or Hunting	1. Slowly release hex nut 2. Slightly release Allen bolt while observing movement
Persistent Hunting	In some cases, tightening the Allen bolt instead of releasing may improve behavior

1.6 HUNTING OR JERKING (TREMBLING) DURING HOISTING

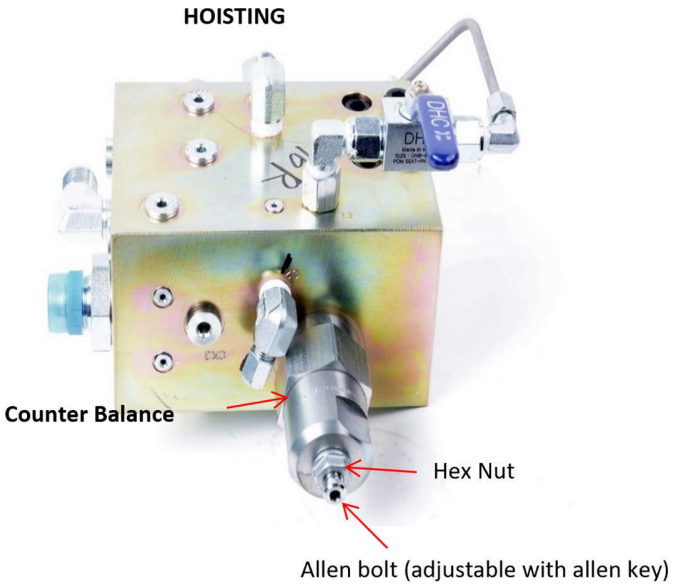
1.6.1. HUNTING (ABRUPT MOVEMENT DURING LOWERING)

Hunting occurs when hydraulic oil flows in an unbalanced manner during lowering. This is typically caused by incorrect adjustment of the counterbalance valve (as shown in the image below).below while operating the luffing down lever slowly.



Corrective Action

Adjust the Counterbalance Valve:
Slowly release the valve until the hunting stops. This adjustment must be done while operating the hoisting function very slowly under loaded crane conditions.



Procedure:

- Loosen the lock nut.
- Using an Allen key, slightly release the Allen bolt.
    - Do this gradually while observing the motion during hoisting.

1.6.2. JERKING (TREMBLING DURING LOWERING OR HOISTING)

Jerking or trembling occurs when the brake engages or releases unevenly due to issues in the pilot valve, which controls brake operation.

Corrective Action:

- Adjust the Pilot Valve:
  The pilot valve (which controls brake releasing and engaging) must be adjusted very slowly and gradually to prevent sudden release of high-pressure oil trapped in the brake line.

Procedure:

- Remove the steel cap covering the pilot valve.
- Slowly adjust the valve in the anti-clockwise direction.
    - Perform this while operating the lowering function gently to allow pressure to bleed off gradually.
- Observe for any reduction in jerking or trembling.

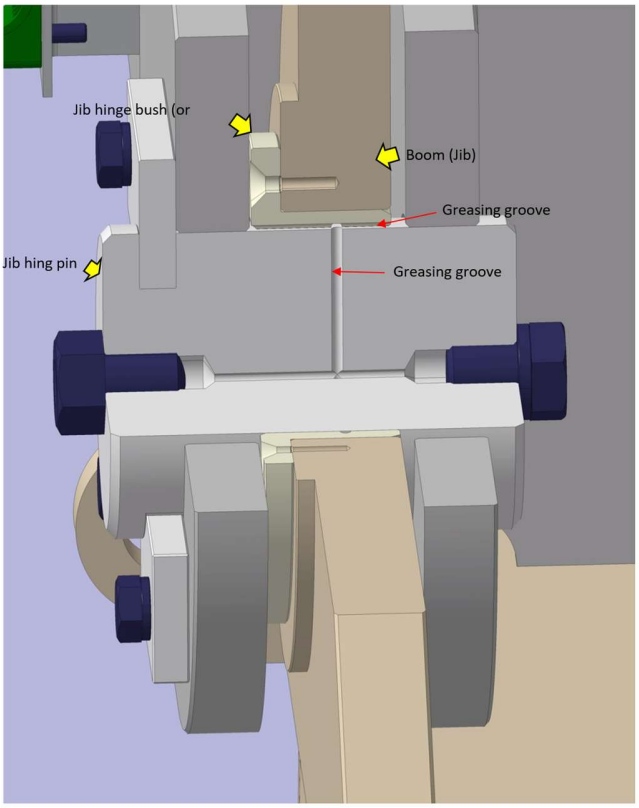
1.7 JIB HINGE NOISE

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1. 7.1. JIB HINGE BUSH – FUNCTION, MAINTENANCE, AND REPLACEMENT

The jib hinge bush is typically made of brass, which serves as a bearing material due to its ductile properties and ability to reduce wear under heavy jib movements. This ductility helps absorb impact and minimize breakdowns. However, if not adequately greased, its lifespan is significantly reduced.

JIB HINGE



1.7.2. COMMON ISSUES AND FAILURE MODES

The most frequent form of damage is uneven wear on one side of the bush. This is usually caused by irregular jib movement—often due to a broken or seized component. Such wear results in harsh noises during luffing operations and is a clear indicator of damage.

While the expected service life of the jib hinge bush is approximately 10–12 years, premature failure is common when proper lubrication is neglected or if mechanical irregularities persist.

There is no precise measurement or maximum allowable wear limit to assess the bush's condition. Therefore, any unusual sound during operation is a practical indicator for inspection or replacement.

1.7.3. RECOMMENDATION:

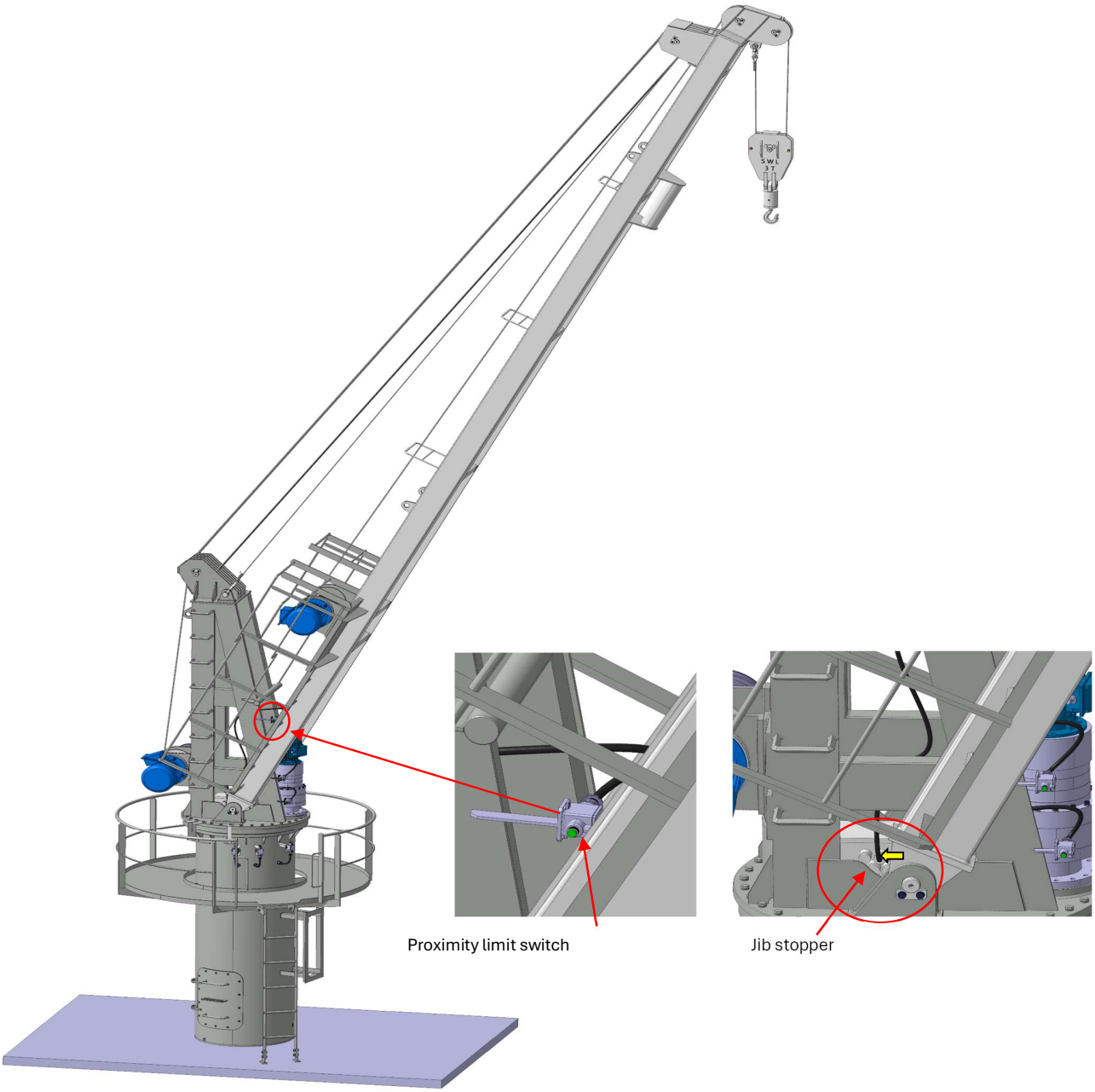
Replace the jib hinge bush during the 10-yearly Docking & Survey (DD) even if no critical symptoms are observed, to prevent in-service failure and costly downtime.

1.8 JIB BEND

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1. 8.1. **LUFFING OPERATION LIMITATION AND RISK OF DAMAGE**

The luffing operation is restricted to a maximum of 80 degrees by a proximity limit switch installed below the boom. If this switch malfunctions, the jib may exceed the 80-degree limit during careless operation. Once the crane surpasses this angle, the jib can strike the mechanical stopper. This impact, combined with the luffing force, may result in the jib bending or sustaining structural damage.

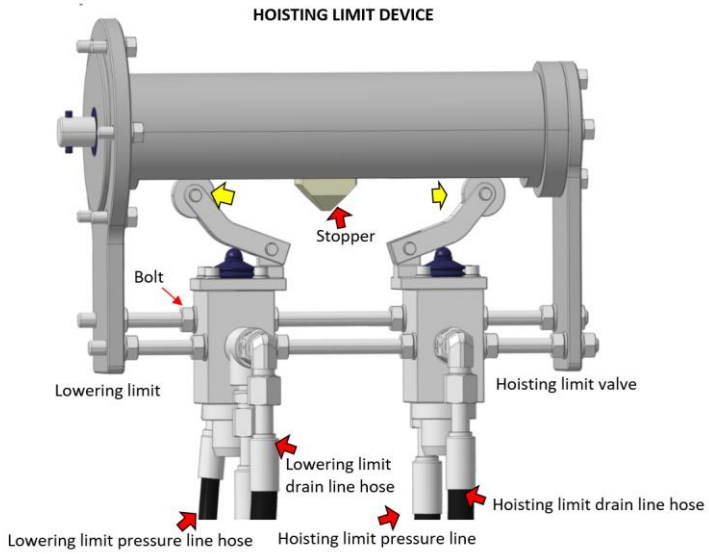


1.9 HOISTING LIMIT DEVICE

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.9.1. HOISTING LIMIT DEVICE DESCRIPTION

The hoisting limit device is designed to restrict both hoisting and lowering operations to prevent the hook block from colliding with the jib during hoisting, or from touching the sea during lowering.



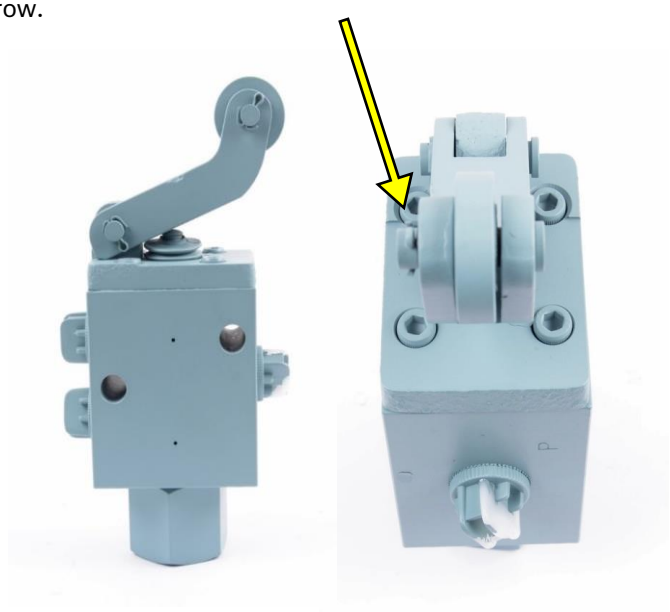
1.9.2. LIMIT VALVE MAINTENANCE PROCEDURE

To ensure continuous safe operation of the crane and protection of personnel, **limit valves must be periodically inspected and maintained**. The following steps are essential:

1. **Visual Inspection**: Check the limit valves for any signs of corrosion, salt deposits, or physical damage.
2. **Cleaning**: Remove any accumulated debris or salt deposits using a soft brush and a suitable cleaning solvent. Avoid high-pressure water jets to prevent damage to internal components.
3. **Functional Test**: Use a spanner or wrench to gently depress the knob on each valve. Confirm that the valve actuates freely and returns smoothly to its original position.
4. **Test Confirmation**: Ensure that each valve activates its associated hydraulic signal when depressed. This verifies full functionality.

1.9.3. ADJUSTMENT PROCEDURE

The limit position can be adjusted by loosening the four bolts and moving the limit valve to the desired position. The limit function is activated when the stopper presses the roller of the limit valve, as indicated by the yellow arrow.



Release the Allen bolts and rotate the top cover with the roller arm up to 180 degrees to properly align and position the limit valve.

1.10 SLEWING LIMIT VALVE

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.10.1. SLEWING LIMIT VALVE CHECKS

The slewing limit valve can be checked by following methods:

- **Operational Slewing Test**

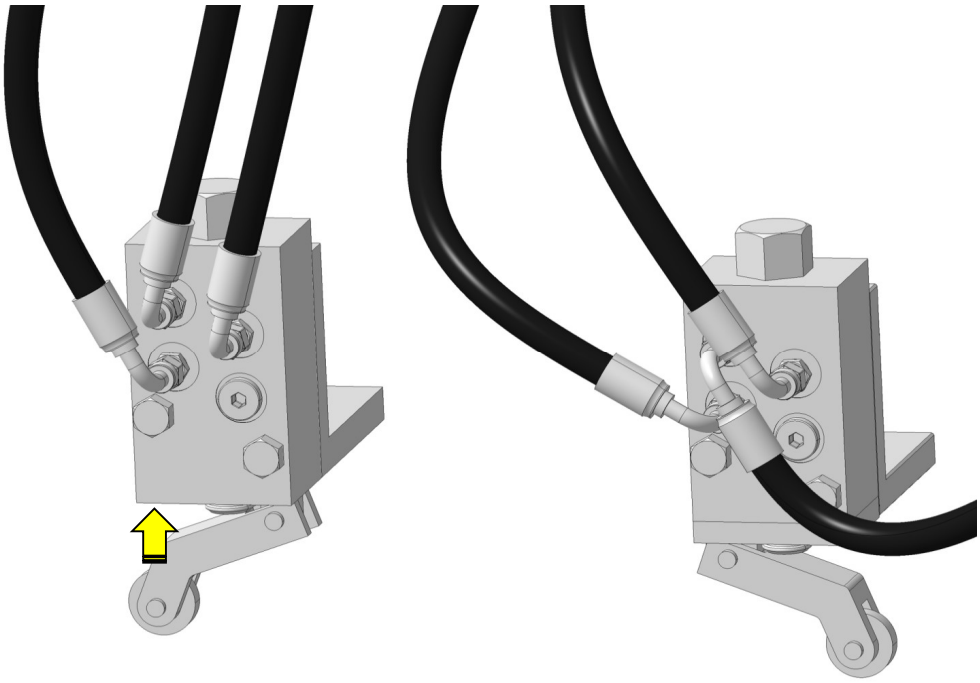
  Observe the valve function during the slewing operation. If the valve does not actuate or the motion fails to stop at the intended limit, the valve may be faulty or stuck.

- **Manual Actuation Test**

  Manually push the arm of the slewing limit valve using a spanner or similar tool (as indicated in the diagram).
  - If the valve actuates, the mechanism is mechanically responsive.
  - If there is no movement or resistance, the internal components may be seized or damaged.

.

Note: DongNam slewing limit valves are available in two designs as shown. Refer to page 11/11.

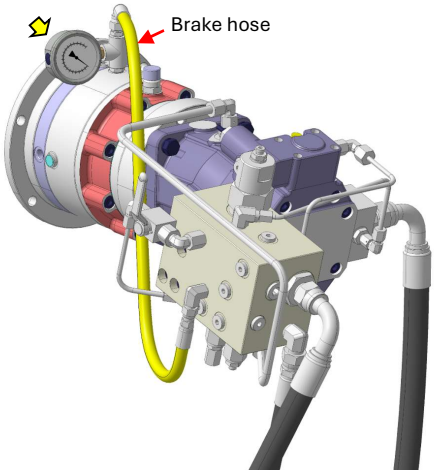


1.11 HOISTING AND SLEWING BRAKE PRESSURE

Troubleshooting And Technical Guide for DongNam, HHC -10 T

1.11.1. BRAKE PRESSURE VERIFICATION

- **Purpose**
  To accurately check the brake pressure of the winch system (hoisting or slewing) under near-operational conditions.



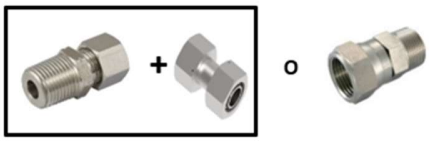
Hoisting Winch

Slewing Winch

- **Recommended Conditions**
  Although brake pressure can be measured during idle running (no load), it is strongly recommended to perform the check under loaded conditions for improved accuracy.
- **Test Load Requirement**
  - Apply a test load of approximately 0.5 ton at the hook.
  - This simulates the actual working condition of the brake system and ensures more precise pressure readings.

1.11.2. GAUGE CONNECTION PROCEDURE

- Prepare a calibrated pressure gauge.
- Connect the pressure gauge directly to the brake port using standard fittings (refer to fitting type below).
- Ensure that the fittings are securely tightened to avoid leaks or false readings.
- Refer to the photo below for correct gauge connection layout.



- BSPT 1/4" + DIN 10S
- Both swivel female DIN 10S for brake

OR

- BSPT 1/4" + UNF(JIC 37°) 1/4" Swivel for brake

BSPT 1/4" + DIN 10S or UNF(JIC 37°) 1/4" for brake hose

Attachement for fitting specification drawing in page 11,12/13