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Installation, Operating and Maintenance Manual

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Rockbreaker – BOOMER-HD

Installation, Operating and Maintenance Manual

OZ MINERALS

WEST MUSGRAVE PROJECT - MINERALS PROCESSING PLANT

Boomer HD 160/70/70 & 90kW HPU

Contract Ref: WM-BOD-D8-V-CP034-001

Contract Date: 25/01/2023

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FOREWORD

Thank you for your purchase of this Transmin Rockbreaker Boom System.

Transmin is a world-class provider of innovative engineered equipment, supplies and services to the mining-resources and bulk materials handling industries.

Transmin has specialised in hydraulic boom systems for the past 30 years. Our engineering and manufacturing expertise is unrivalled in the mining industry, with some of the largest hydraulic boom systems in the world, deployed in the toughest, most arduous conditions imaginable. The Boomer-HD (Heavy Duty) range is engineered for large-scale mining and minerals processing plants.

With correct use and regular maintenance, the Rockbreaker Boom System will be a reliable investment and this manual contains the instructions for installing, operating, and maintaining the Rockbreaker Boom System.

Additional support is available with Transmin Service Advantage providing the option for commissioning and servicing by Transmin trained and certified service technicians.

This manual must be made accessible for personnel working on or with the equipment and contains important information regarding safety hazards located on or around the equipment.

Before proceeding further please read this manual in its entirety.

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BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

1 ABOUT THE MANUAL

1.1 General Information

This manual is arranged to give you a good understanding of the equipment and its safe operation. It also contains maintenance information and technical specifications. Read this manual from front to back before installing, operating, or maintaining the product for the first time.

In this manual, the units of measurement are metric. For example, weights are given in kg.

1.2 Reference

Co-relate this manual with the below mentioned drawings for better understanding.

Reference drawing for equipment number: **3110-RCB0001**- BoomerHD 160-70-70 are as follows.

Roy Hill Part number	Description
WM-3110-V-CP034-B4-001	Scope of supply
WM-3110-V-CP034-B3-001	Boom Mounting and loading
WM-3110-V-CP034-B5-001	Reach profile
WM-3110-V-CP034-B3-002	Rockbreaker GA
WM-3110-V-CP034-B3-003	HPU GA
WM-3110-V-CP034-E3-002	Interconnecting piping
WM-3110-V-CP034-E3-003	Hydraulic schematic
WM-3110-V-CP034-E4-001	Lubrication schedule
WM-3110-V-CP034-E2-001	Piping & Instrumentation
WM-3110-V-CP034-13-001	Lifting GA

1.3 Warranty

The standard warranty applies as defined in Transmin Pty Ltd Terms and Conditions of Trade see warranty extract in APPENDIX A: WARRANTY CONDITIONS.

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1.4 Glossary

TERM	DESCRIPTION
AFFF	- Aqueous film forming foam. Used in the optional HPU fire suppression system.
Controller	- Controller used to control the Rockbreaker Boom System. Available as either Radio version, mobile or fixed or Hard wired version. All Controllers require line of sight except Rockbreaker Boom Systems fitted with RockLogic.
Deadman operation	- Release of control command – the Deadman button on the top of the Controller joysticks only has to be pressed in zero position and can then be released. The output will reset when the joystick is returned to the neutral position.
HPU	- Hydraulic Power Unit: a standalone plant item that provides pressurised oil flow that powers the Rockbreaker Boom System.
JHA	- Job Hazard Analysis.
Local Mode - HPU	- Local mode on the HPU is selected for maintenance or testing activities and enables the individual to start and stop of pumps, coolers, heaters etc. Local mode is NOT intended for normal use. The Controller will not function in this mode.
Manual Mode	- Operation of the Rockbreaker Boom System without the use of the Controller by directly manipulating the main hydraulic valve.
MCC	- Motor Control Centre: a dedicated sub-station for electric motors that provides the necessary power distribution, motor control units and metering equipment.
Normal Envelope	- The area that is directly accessible by the Rockbreaker Boom System during normal operation.
Off Mode – HPU	- Off mode disables the HPU so that it cannot be started by a Controller.

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TERM	DESCRIPTION
Reach Envelope	- The entire directly reachable area of the Rockbreaker Boom System. This is considered a dangerous area and necessary precautions should be taken
Receiver	- The electronic device mounted in the slew frame that converts radio waves into a form that can be used to drive the Rockbreaker Boom System hydraulic control valves.
Release of control command	The Spectrum 1 controller joysticks are complete with deadman buttons that operate as 'Release of Control' command. The deadman button once de-pressed whilst the joystick is in the zero position can then be released. The output will reset when the joystick is returned to the neutral position.
Remote Mode - HPU	- Remote mode on the HPU selected for normal operation of the Rockbreaker Boom System by the Controller.
RF	- Radio Frequency: the range of radio wave frequencies that are used to carry radio signals, which are used in radio communications.
RockLogic	- Boom System control technology developed by Transmin Pty Ltd. RockLogic includes collision avoidance and automated movement features and allows remote control of the Boom System from a position not within line-of-sight, such as an office that may be several kilometres away.
ROM	- Run of Mine: the raw material extracted from the ore body.
Slew Frame Control Panel	- The IP-rated panel mounted on the Slew Frame that houses the Receiver and mount for the external receiver aerial.
Soft Slew Limits	- Non-safety rated limits for the Rockbreaker Boom System slew movement.
SWP	- Standard Work Practise.
Tube	- Tubing may be tube or pipe.
Tool	- The working attachment fitted to the hydraulic hammer. Different tool profiles are used for different rock types.
IEC	- International Electrotechnical Commission

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1.5 Information for the Final Installer or End-User

The Transmin produced Rockbreaker is a critical product in the bulk material handling process. It is the responsibility of the final installer or end-user to:

- Provide complete technical documentation including operating instructions.
- Check to see if integrating the Rockbreaker into the overall material system requires additional operating instructions.

1.6 Information for the User

Ensure that the instruction manual is always available at the site of the Rockbreaker install and its contents are applied exclusively to its equipment.

The owner of the Rockbreaker should ensure that the personnel entrusted with operating the equipment understand and abide by all operating and safety instructions given in this manual and other associated contract documents.

If your Rockbreaker is interlinked with other devices or processes in the plant, additional information needs to be made available to the operators that will augment this instruction manual. If the operation of the Rockbreaker has the potential to cause residual risks in conjunction with other plant components, then the user must develop and implement additional safety information.

Ensure that only competent person operate and/or service your Rockbreaker in compliance with these instructions.

The instructions given in this manual will help you to:

- Avoid dangerous situations for yourself and other persons.
- Reduce repair costs and downtimes.
- Increase the reliability and service life of your plant.

If the instructions given in this manual are not observed, Transmin does not assume any liability whatsoever for any resulting damage. If you are not sure, contact Transmin for advice.

2 SAFETY INFORMATION



This manual must be made accessible for personnel working on or with the equipment and contains important information regarding safety hazards located on or around the equipment.

Where specific attention is required at any point in the manual, the general warning icon and statement arrangement will be used as shown below:



General warning

2.1 General Safety Rules

The Transmin Rockbreaker is designed in accordance with the latest safety standards. However, its use has the potential to endanger the life of the user and third/parties and/or damage to itself or other material assets.

The following general safety rules should be observed along with all other safety instructions and warnings:

- Before working on your Rockbreaker, ensure that the operators understand and follow the instructions given in this manual and any associated manual. Improper operation, handling and maintenance can cause severe personal injury, danger to life and/or damage to the Rockbreaker
- Only use the Rockbreaker when it is in perfect technical condition and as originally intended. Follow all instructions given in this manual with regard to safety and potential risks. Ensure that any defects relevant to safety are immediately rectified.
- Ensure that workmen and operators use the protective equipment required or specified by the applicable regulations.
- Observe all-hazard symbols provided on the system.
- If you discover any changes in the system or its operating behaviour that are relevant to the safety, switch it off immediately and report the defect to the responsible personnel.
- Observe and adhere to the maintenance schedule specified in this manual.

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2.2 Symbols and Terms

2.2.1 Hazard Warning

Safety hazards and warnings in this manual and on the equipment are categorised as follows



Danger Signs

Used where there is a possibility of death



Mandatory Signs

Specify an instruction that must be carried out



Warning Signs

Warn of hazards or hazardous conditions that are not likely to be life-threatening

A number of safety signs are located around the machine and in this manual to mark potential safety hazards which can result in damage to equipment or injury to personnel.

When you see these safety signs be alert to the potential risks.

Always follow the recommended precautions and safe operating procedures.

DANGER



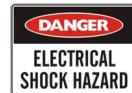
Equipment starts automatically



High-pressure hydraulic hoses



Isolate Drive before removing guard



Electrical Shock Hazard



Electrical Hazard
Authorised Entry Only

MANDATORY ACTION



Isolate Machine



Machine guard required

DANGER



General Warning

2.3 Qualifications of Operating and Service Personnel

Installation, operation, and maintenance personnel must possess all necessary qualifications or training to install, operate and maintain the equipment.

Lifting of the equipment (or any parts) will need to be carried out by qualified rigger or personnel suitably trained in Safe Lifting procedures.

Personnel must be instructed in the use of slings or cables on machined or finished surfaces to avoid damage to the equipment

Mechanical installation and maintenance will need to be carried out by qualified personnel suitably trained in the installation and maintenance of mechanical equipment.

Electrical installation and maintenance will need to be carried out by a qualified electrician.

Hydraulic installation and maintenance will need to be carried out by qualified hydraulic personnel suitably trained in the installation and maintenance of hydraulic equipment.

2.4 Safe Working Environment

A safe working environment is important and can be achieved only if the Rockbreaker is used for the intended purpose and all safety precautions are followed.

2.4.1 Work on Electrical Equipment

Electrical installations and electrical components are potentially hazardous and there is a risk of electrocution or dangerous operational situations.

2.4.2 Cleaning

Clean your Rockbreaker of dust build-up at regular intervals or whenever necessary in order to provide a safe functional system. It is very important to clean the HPU oil cooler of dust build-up to protect the HPU internals from overheating.

2.4.3 Inspection, Maintenance and Repair

Inspection, maintenance and repair work on the Rockbreaker not described in this manual or associated contract documents should be performed by Transmin service personnel or workers authorised by Transmin.

2.5 Defective Components

To maintain the Rockbreaker at peak functionality and safety, immediately replace defective components using genuine Transmin or Transmin distributed spare parts. The use of non-approved components could lead to safety and functionality problems.

2.6 Design Notes

The documents specifically provided with the rest of your order take priority over this manual. Please observe all order-specific detail descriptions of your Rockbreaker.

2.7 Component Use

If the Rockbreaker is interlinked with other devices or processes in the plant, the end-user must take additional precautions to develop instructions that will augment this instruction manual and then make this information available to operators and other personnel who work on this equipment.

2.8 Residual Hazards and Risks

The scope of supply of Transmin often means that other parties are responsible for addressing items that are related to health and safety.

In addition, using the Rockbreaker for its intended purpose always attracts certain residual hazards and risks. In the present documentation, the user is informed about these residual risks that are foreseeable.

Unforeseeable risks, however occurring in normal operation cannot be excluded, therefore the Rockbreaker must always be operated with extreme caution with consideration of its condition and potential consequences.

Items that need to be addressed by the Rockbreaker purchases or end-user are:

- Adequate and sufficient means of access to components that need regular adjustment, fitting, inspection and maintenance.
- Suitable electrical supply

2.9 Using the Equipment for its Intended Purpose

The Rockbreaker has been designed to operate as per its specific order documentation. In general, it must only be used for the breaking down of oversize material lumps in the certain client application. Refer to the contract document for further information.

2.10 Other Specific Hazards

Occasionally there are features of a site Rockbreaker system where potential hazards are not reasonable to include in this manual. Examples of these hazards could be biological, radiation and heat. In any case, the operator should be aware of the characteristics of the products in the working zone of the Rockbreaker.

3 TRANSPORT AND STORAGE



BEFORE ANY PACKAGING, LIFTING, TRANSPORT, RECEIPT AND STORAGE REFER TO SECTION 1.5, AND SECTION 1.6

3.1 Initial Inspection Upon Receipt

Transmin assembles, calibrates, tests and quality checks every Rockbreaker before dispatch. Due to the overall dimensions of the Rockbreaker depending on the site location, it may not be possible to ship the Rockbreaker as a complete unit.

On receipt, immediately verify the completeness of the equipment supplied and inspect your system for any damage during transit. If damage to the system is discovered contact the carrier immediately.

3.2 Safe Handling and Transit

Heavy-duty material handlines devices such as an overhead crane(s) will be required to unload and handle the Rockbreaker after transit. Check to see that the lifting devices used are rated for the load in the situation. Transmin will supply lifting diagrams as a part of the VDDR that identify loads, the centre of gravity, and lifting lug ratings.



DANGER FALLING OBJECTS, CRUSHING RISK, ITEMS
INCLUDING THE ROCKBREAKER MAY FALL IF HANDLED OR
LIFTED INCORRECTLY

USE SAFE LIFTING METHODS AND EQUIPMENT

ALL PERSONNEL MUST STAY CLEAR OF THE SPACE UNDER A
SUSPENDED LOAD

3.3 Intermediate Storage

If the Rockbreaker is placed in intermediate storage before installation in the intended location, ensure that the place of intermediate storage is clean, dry and safe.

Make sure the Rockbreaker components are not repositioned during storage, in the case of extended storage use warning signs.

Protect the Rockbreaker components from atmospheric influences, dust and grime during storage.

Provide additional preservation measures if the storage period exceeds 6 months to any vulnerable of bare surfaces that are not already protected.

3.4 Unpacking and Disposal of Packaging

Carefully remove any packaging and protective material supplied with the Rockbreaker and its ancillary components, please dispose of the material in an environmentally friendly manner and in accordance with local regulations.

Packaging materials are identified accordingly.

3.5 Storage when not in use

Due to the nature of the Rockbreaker installation, it will essentially be stored in its working location. However, where possible steps should be taken to minimise the effects of weather and the environment.

If the Rockbreaker is to be stored in place for more than 6 months without operation, exposed cylinder surfaces should be adequately protected by a manually applied grease or plastic wrapping to mitigate any corrosion build-up.

4 ROCKBREAKER SYSTEM

4.1 Overview of the Rockbreaker System

The Rockbreaker is an essential product in the bulk material handling process in mining. Its purpose is to break down oversized lumps, rocks or boulders to be suitable for downstream equipment. The primary example of this is above a plant crusher or in a ROM bin.

4.2 Capacities and Performance

The specific capacities and performance information of the Rockbreaker(s) supplied, will be contained in the datasheet of the VDDR.

4.3 Features of the Rockbreaker

The Rockbreaker consists of two main parts, the boom system and the hydraulic power unit (HPU). The boom system consists of a rotating slew base which is secured to a foundation, then articulating boom and jib arms to allow the manoeuvrability and reach of the working area, attached at the end of the jib is the hammer or other attachments. The HPU supplies hydraulic power to the boom system to rotate the assembly at the slew base, to control the positions of the boom, jib and hammer using their cylinders, and to fire the hammer or operate other attachments.

4.3.1 Slew

The slew base of the Rockbreaker assembly uses ring and pinion gears connected to a hydraulic motor and gearbox to turn the base and the rest of the connected boom system. The reaction forces and loads from the moving Rockbreaker are transferred into the secure foundation that the slew is bolted to. The foundation can either be concrete or a steel structure. Transmin has supplied a loading diagram as a part of the VDDR, this document specifies the civil engineering recommendations to be followed by the end-user or third party responsible for developing the foundation.

4.3.2 Boom

The boom is a component of the boom system of the Rockbreaker, it is the typically larger and is the first arm of the system. The boom is moved up and down using hydraulic cylinders mounted on the slew base, the pivot motion occurs at the pivot pin where the boom joins the slew. Hydraulic and lubricant pipes run along the boom to service the jib and the hammer. Cabling for instruments and controls run along the boom also.

4.3.3 Jib

The jib is much like the boom, it is attached to the boom at a pivot pin and by the hydraulic cylinder that controls its position relative to the boom. The hydraulic and lubricant pipes run from the boom continue along the jib to the hammer, and any

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jib or hammer related instruments and controls wiring will pass along the jib to the boom and back to the ground.

4.3.4 Hammer Bracket

The hammer bracket is the pivot point that controls hammer articulation and dynamics. It is a structural member with pivot pins and the acting point of the hammer cylinder. To the other side of the hammer bracket mounts the quick hitch assembly.

4.3.5 Quick Hitch

The quick hitch coupler facilitates quick and easy change out of attachments. The lower part of the quick hitch is attached to the grapple and the hammer. Control of the quick hitch is via the radio remote control.

4.3.6 Hammer E

The Hydraulic hammer is used to break and manipulate rocks and, consists of:

- Hydraulic hammer module
- Removable hammer short blunt tool



Figure 1 Hydraulic Hammer and Removable Chisel Tool

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The additional hammer tools available are;



Blunt tool



Moil point



Chisel

Figure 2 Additional Removable Hammer Tools

4.3.1 Scrapper

The Scrapper shall be used for moving various materials.



Figure 3 Scrapper

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4.3.2 HPU

The Hydraulic Power Unit (HPU) is used to provide hydraulic power to both the Rockbreaker Boom System and the hydraulic hammer and consists of the following components:

- Variable displacement axial piston pump with IEC framed electric motor
- Oil reservoir
- Oil cooler
- Oil filters
- Condition monitoring instrumentation
- Control Panel
- Roofing panes
- Integrated drip tray



Figure 4 Hydraulic Power Unit

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Figure 5 Hydraulic Power Unit MCC

HPU Options

Refer Scope of Supply drawing (WM-3110-V-CP034-B4-001) for the options included with each Rockbreaker Boom System.

The following HPU options are available:

- Heater for HPU Reservoir
 - An immersion-style 3kW heater complete with thermostatic control.
- Isolation Valves
- Tank Breather
- Pressure and Return filters
- Skid mounting
- Hydraulic Reservoir

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- Blocked filter Indication
- HPU Control Panel

The HPU Control Panel is supplied complete with schematics, labelling of cables and supply of control panel nameplate to Transmin standards

The HPU control panel is used to control the HPU functions.

4.3.3 Slew Panel

The slew panel houses the Io controller for the rockbreaker, the radio receiver for local operation and serves as a marshalling panel for the rockbreakers instrumentation. This includes the slew limiting sensors, the imu positionings, slew encoder, slew verification proxy and the quick hitch release sensor.

4.3.4 Quick Hitch

The quick hitch is essentially an adaptor on the end of the jib, attached to the hammer bracket. The hammer is then attached to the quick hitch. The purpose of the quick hitch is to allow much faster tool change-out time if the end-user needed to swap out hammers for service and maintenance purposes or to swap to secondary hammer with a different moil configuration, shovel, grapple or other special tools. The advantages of the quick hitch are well worth the initial investment for increased mine site productivity. The entire tool changing process can be done from the radio controller. Refer Section 9 for more detail.

4.3.5 RockLogic

RockLogic is a controls program implemented on the Rockbreaker for safety and functionality purposes. The key functions of the system are collision avoidance using proximity sensors on the boom system, and auto-deploy / auto-park whereby the Rockbreaker, when commanded from the controller, will automatically power up and deploy itself from the parked location into the working area to a pre-determined deployed location such as the middle of the bin or pit. Auto-park will take the Rockbreaker from any position to the park position automatically, this is a productivity and a safety advantage as the Rockbreaker will quickly and accurately leave the working zone to allow operations to continue with minimal disturbance.

4.3.6 Description of Operation

The technical operation guide, the functional description (WM-BOD-D8-V-CP034-001) of the Rockbreaker is a supplied VDDR item. It has in-depth controls information including start and stop procedures, warnings and alarms.

5 ASSEMBLY AND INSTALLATION

5.1 Rockbreaker Assembly

Depending on transport and site requirements, the Rockbreaker Boom System may be delivered in a partially disassembled state typically at the pivot joint between the boom and jib.



Maintain a high level of cleanliness when working with open hydraulic components in an uncontrolled environment

- A. Refer to the lifting diagram (WM-3110-V-CP034-13-001)
- B. Assemble the Rockbreaker Boom System following the procedures laid out in the assembly
- C. Assemble the hydraulic and lubricant lines where disconnected
Flush the hydraulic lines and purge the system of air. Refer section 8 Inspection and Maintenance
- D. Purge the lubricant line of air.

HPU

The HPU is supplied fully assembled with the connections capped for onsite connection to the Rockbreaker Boom System.

- A. Ensure all service components remain accessible when positioning the HPU
- B. Ensure the pipe run between HPU and Rockbreaker Boom System is less than the maximum allowable figure
 - Refer Interconnecting Piping Hydraulic Schematic Drawing (WM-3110-V-CP034-E3-002, WM-3110-V-CP034-E3-003)
 - Contact Transmin if maximum allowable figures are exceeded
- C. Ensure the HPU is mounted with the correct fasteners on all four corners
- D. Ensure the HPU is mounted level.

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Tubing

Installation Tubing

The Rockbreaker Boom System and HPU will be terminated at all inlet/outlet ports.

Interconnecting hydraulic and lubricant lines.

The hydraulic and lubricant lines are provided by Transmin and are to be fitted on-site by the client

The interconnecting piping shall be installed as per the following drawings;

Refer Hydraulic Schematics Drawings (WM-3110-V-CP034-E3-002, WM-3110-V-CP034-E3-003)

Flushing

All site installation tubing must be flushed before being connected to the HPU and Rockbreaker Boom System.

All lines, including leak lines, on the Rockbreaker Boom System will already be flushed upon assembly.

If the Rockbreaker Boom System is dismantled for transport or handling purposes, the disconnected lines, including the leak lines must be flushed clean before re-connecting to the system.

 Check all hydraulic hoses and ports have remained capped during transport.

Any hoses and ports with missing caps must be properly flushed with clean oil before final connection

 Contact Transmin for information regarding the flushing of any components

Attaching the hydraulic hoses to the support stand (not included)

The flexible hydraulic hosing that runs between the main control valve on the Slew Frame and the hard site installation tubing is hung from a steel Hose Support Stand.

- A. Position the Hose Support Stand to ensure the arm from which the hoses hang is facing the centre of the total slew arc (including all maintenance and working zones).
- B. Position the hose bunch binder to ensure the loop created by the hoses is immediately behind the main control valve when the Rockbreaker Boom System is in its centre slew position

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- C. Ensure hoses remain hanging slack at the extents of the slew limits to prevent undue hose strain at any position of the slew arc
- D. Monitor the interaction between the hoses during commissioning for excessive binding or rubbing



Figure 6 Examples of Hose Support Stand

Hydraulic oil



When filling the Rockbreaker Boom System for the first time the oil level in the HPU must be monitored and topped up as required until all hoses and hydraulic cylinders are filled with oil

Filling

Refer Lubrication schedule document number WM-3110-V-CP034-E4-001 for first fill quantities and viscosity grade selection

Ensure the HPU reservoir is clean prior to filling. Check the reservoir inspection cover seal and any reservoir port plugs are intact.

Priming

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Ensure the main pump and the oil cooler pump casings are primed before start-up. Priming the main pump will prevent damage to the top bearings

Purging

The system must be purged of air before use.

Ensure the oil level in the reservoir is monitored and topped as required during and after purging

5.2 Rockbreaker Installation

Depending on the type of Rockbreaker purchased, there may be some requirements to assemble the machine with other equipment. Information on any equipment assembly and installation requirements are contained within separate order documentation, attached to the appendix.

6 COMMISSIONING AND SETTING UP FOR FIRST USE



General Warning: Improper commissioning can produce several malfunctions and endanger the operating, maintenance and repair personnel.

Therefore commissioning should be performed only by trained experts.

6.1 General Comments

Competent personnel must carry out the initial start-up and trial runs.

The initial start-up has a substantial influence on the optimal functioning of the Rockbreaker. Since numerous factors are involved, we recommend you use the services of Transmin for commissioning. This is not for guarantee reasons, but allows:

- Checking of the Rockbreaker equipment for possible transportation damage and/or faults caused during installation
- Determining and calibrating optimal RockLogic settings for the site
- Instruction of the operators
- Transfer of additional knowledge of the Rockbreaker in operation, maintenance and servicing aspects.

6.2 Checks Before Start-Up

Check that the Rockbreaker has not been damaged in transit. Section 3 Transport and Storage. Check that the Rockbreaker components are correctly assembled see section 5 Assembly and Installation.

6.3 Running-in the Rockbreaker

Connect the Rockbreaker HPU to the power supply. A plug and socket arrangement is the normal method.

When carrying out an electrical connection to the mains;

- Observe the regulations and standards of the local and country laws;
- Ensure protection of the power supply in accordance with the local regulations;
- Verify that the operating voltage corresponds to those on the technical data sheet, (WM-DAT-G1-V-CP034-001, WM-REG-G2-V-CP034-002) in the order specific documentation.

7 OPERATION

Before bringing your Rockbreaker system into operation, make sure the system is properly installed and commissioned and in technically perfect condition.

7.1 Start-Up

To start the Rockbreaker system, first energise the HPU, and turn it on from the control panel. Once the hydraulic oil is at working temperature (heating may be required in ambient temperatures under 15°C) the boom system can begin to be operated from the radio controller.

Operating the Rockbreaker Boom System

Operate the Rockbreaker Boom System with the Controller.

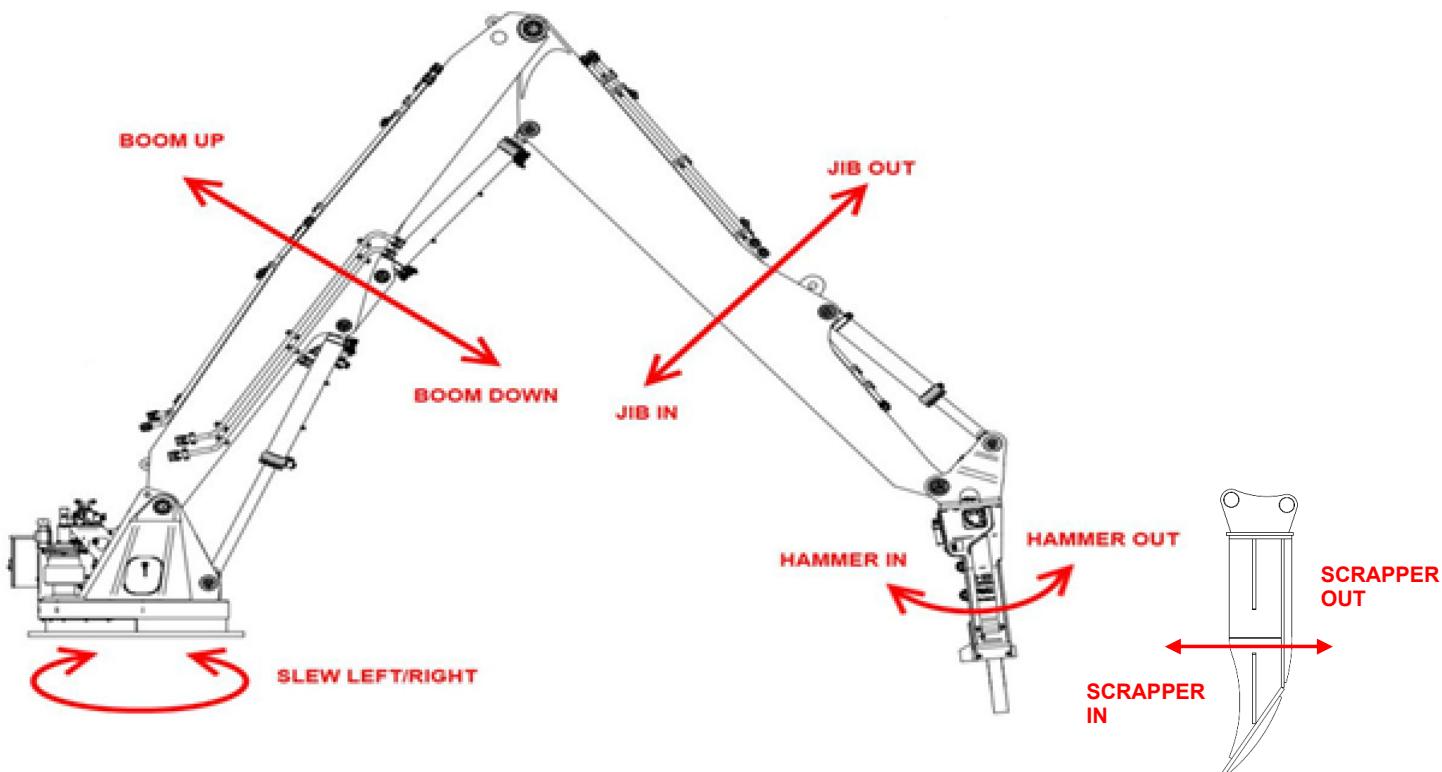


Figure 7 Boom System Movements

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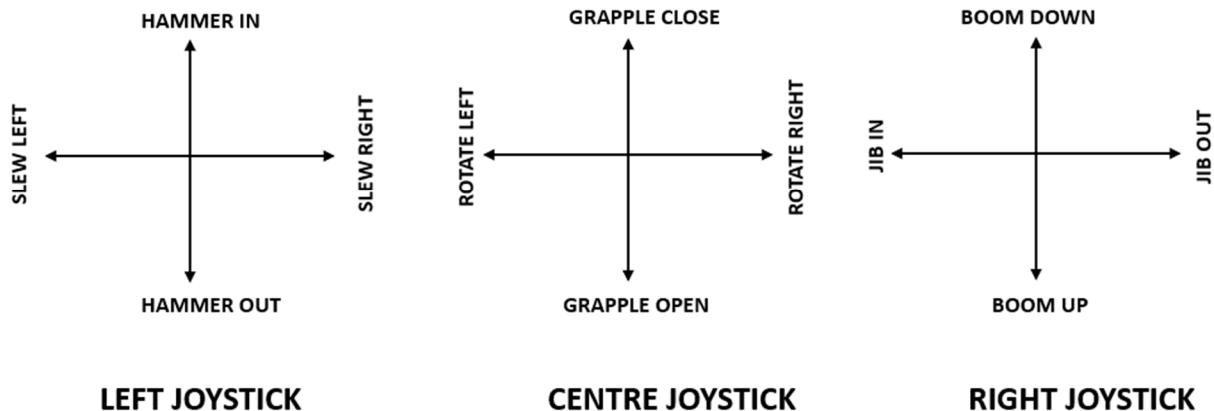


Figure 8 Controller Movements

The three joysticks give full proportional control over the boom, jib, hammer/grapple and slew movements. That is, the further the joystick is pushed the faster the machine will react to the function.

Soft Slew Limits



The Soft Slew Limits are not safety rated. Soft Slew Limits will not shut down the HPU

The Soft Slew Limits comprise

- 2 off non-safety rated inductive proximity sensors
- 2 off lengths steel track

The proximity sensors are arranged horizontally and face the steel track that is to be fixed to the slew frame.

The Soft Slew Limits will stop slew movement beyond a pre-configured operational zone

Soft Slew Limits will allow slew movement back toward the operational zone.

The Soft Slew Limits are determined during commissioning.

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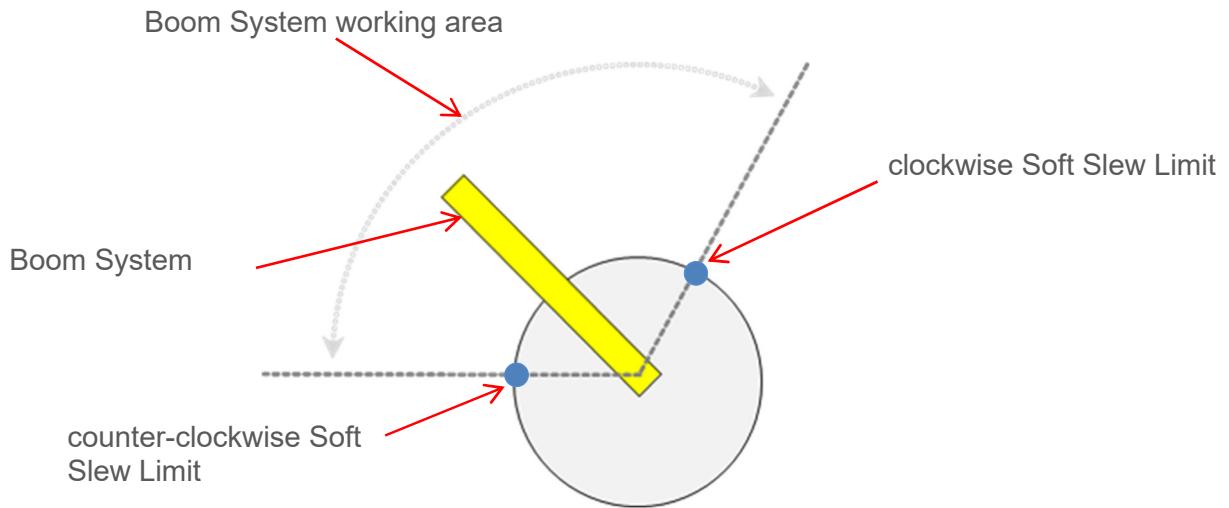


Figure 9 Soft Slew Limits

Operating Guidelines

When operating the Hammer, the manufacturer guidelines and manual should be followed. Transmin does not make hammers and a Rockbreaker can be supplied with any number of makes and models of hammers. This will vary with your preferences and specification requirements.

Transmin Rockbreaker cannot be used for moving rocks by hitting them from a distance.

A mild push and pull can be done by keeping the hammer close to rock as shown in the Figure 10.

Refer to Hammer vendor manual in **Error! Reference source not found.**, for correct operating guidelines and safe practise rules.

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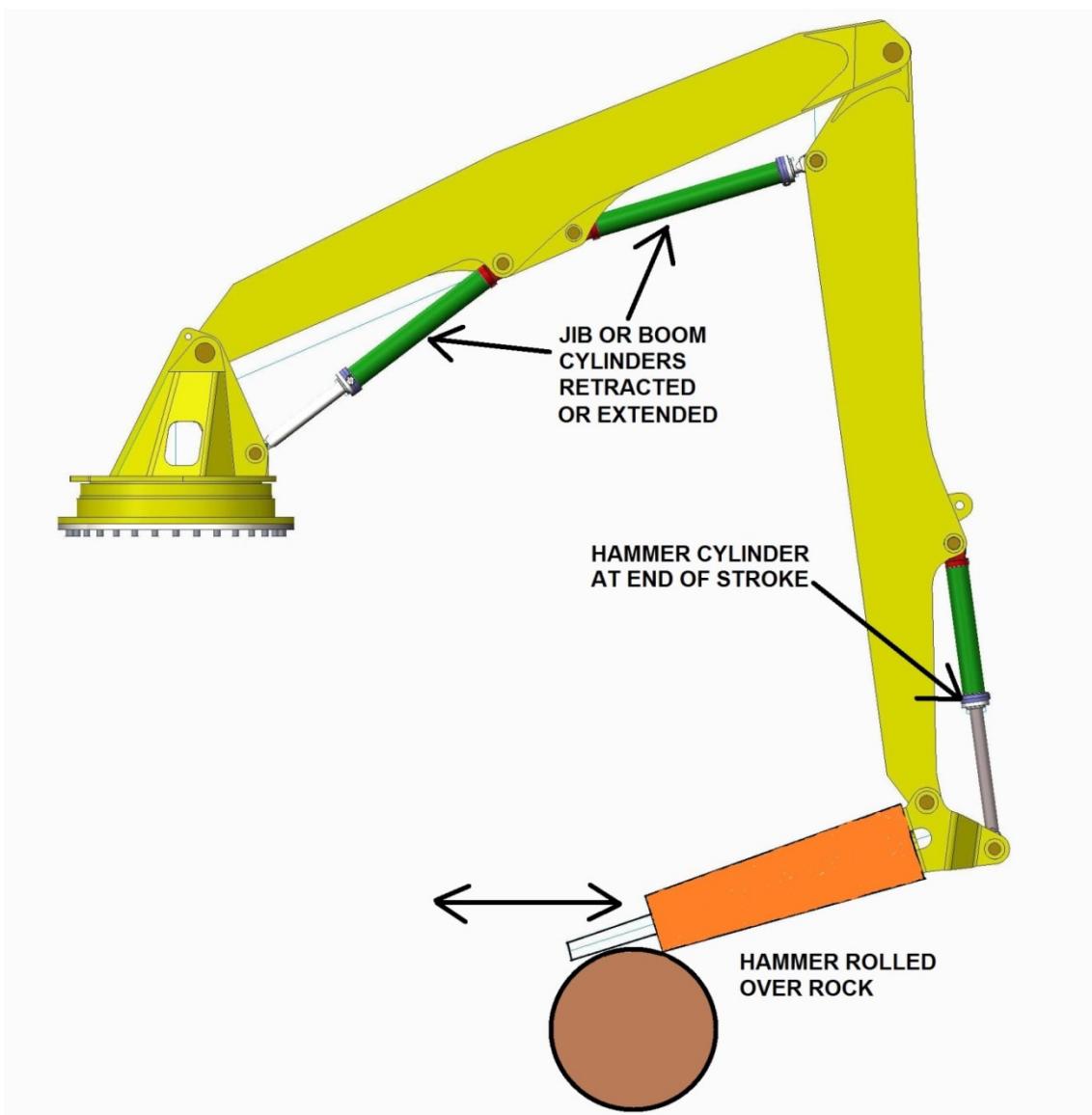


Figure 10 Rock Manipulation Guidelines

Operating the Automatic Lubricant System

With an automatically operated lubricant pump, there are no operational inputs required from the operator.

The operator should however lookout for any signs of Lubricant System malfunction in the HPU panel.

The automatic lubricant pump is switched on all the time that the Transmin HPU is running. The lubricant pump alternates between pumping and pause cycles. These cycles are pre-set in the lubricant pump program. Every time the HPU is started, the lubricant pump starts with a pump cycle. If the Transmin HPU is switched off before one complete lubricant cycle is completed, the lubricant pump continues until all points are lubricated.

7.2 Finish Operation

Shutting Down Rockbreaker Boom System

To shut the Rockbreaker Boom System down

- A. Park the Rockbreaker Boom System in its dedicated parked position using the Controller.

If no such position is used, park the Rockbreaker Boom System in a position where it is protected from damage by other operations.

- B. Ensure the hammer is placed on a supportive surface and not suspended in the air.

Parking the hammer on a supportive surface will increase the life of the hydraulic cylinder seals.

- C. Press the stop button until it locks on the Controller to shut down the Controller and the HPU pump.

After the HPU has shut down, the Rockbreaker Boom System cannot be operated with the Controller until the HPU is started again.

Emergency Stop

The HPU can be shut down by pressing the Emergency Stop button on the HPU control panel. This will stop all movement of the Rockbreaker Boom System.

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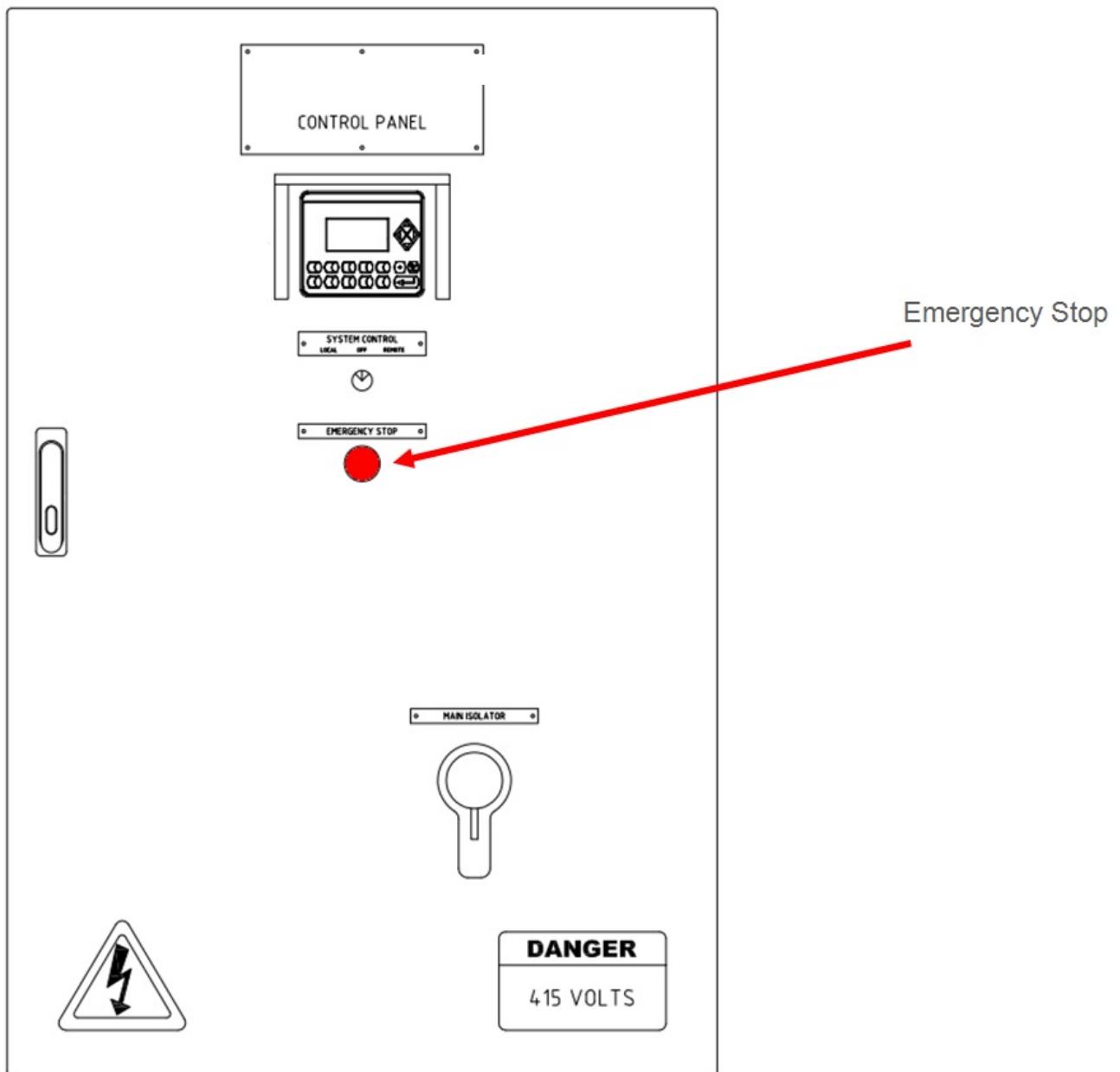


Figure 11 Typical HPU Control Panel - Emergency Stop Button

8 INSPECTION AND MAINTENANCE

8.1 General Remarks

To ensure that the Rockbreaker Boom System operates correctly and safely, the operator must carry out and abide by Transmin's recommended inspection and maintenance procedures outlined throughout this section.

Any procedure having task-specific risks, permits, PPE or special tools and equipment in addition to those detailed below will be listed immediately prior to the specified procedure.

Prepare for the following significant risks

- Crane operations
- Hydraulic tools
- Fluids under high pressures
- Heavy Loads
- Heat Exposure / Sun
- Working at heights
- Working in a confined space



Permits and Isolation Requirements

Rockbreaker Boom System and HPU to be isolated and de-isolated during some procedures



PPE Requirements in addition to area standard

- Nitrile Gloves



Special Tools and Equipment

- Hydraulic pin pulling equipment
- Spill Pack
- Container to capture excess hydraulic fluid

- A. Completely read through the procedure
- B. Complete site-specific JHA and SWP
- C. Check the work area is approved for personnel to enter
- D. Remove obstacles or potential hazards from the site work area
- E. Isolate upstream equipment where appropriate
- F. Fit rock crusher safety covers if available on site

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- G. Move the Rockbreaker Boom System to a position that provides clear access and is suitable for performing the procedure. Typically, the maintenance or other safe work zone The Rockbreaker Boom System must be **either mechanically self-supporting or is independently supported by crane or by maintenance stands**

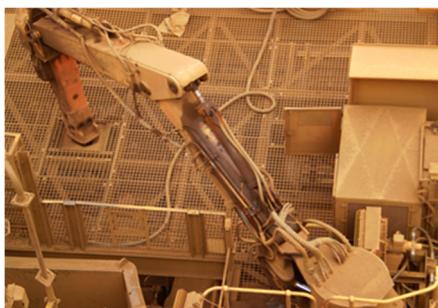


Figure 12 Examples of Boom Systems in maintenance position

- Fit isolation locks
 - Electrically isolate
 - Hydraulically isolate
 - Fit crusher covers if applicable and/or available
- H. Confirm, with control room if applicable, the Rockbreaker Boom System and HPU is off and fully isolated
- I. Clean Rockbreaker Boom System down with high-pressure cleaner
 - Avoid any control panels or fixed controllers
- J. During work, label clearly all hoses and/or piping to assist in reassembly



8.2 Maintaining and Repair

8.2.1 Hammer

The hammer is an integral part of the Rockbreaker, its maintenance and repair should be followed correctly in order to keep the hammer components in optimal working condition.

For information on hammer maintenance, repair and cleaning refer to the hammer manual in **Error! Reference source not found.**

8.2.2 Boom and Jib

The boom and jib require no maintenance, routine inspection of the Rockbreaker will identify any major issues such as structural issues or surface protection compromise. Cleaning of the boom and jib is not specifically required, it is more significant to remove dust and debris build up in and around pins and hoses.

8.2.3 Pivot Pins

Pivot pin maintenance is limited to only greasing through the automatic greasing system. Through routine checks and following Transmin's recommended preventative maintenance in section 8.5, identification of any issues early will save furthermore catastrophic failures during operation.

Pivot pins are not wearing parts but can be replaced if necessary.

8.2.4 Hydraulic Cylinders

Hydraulic cylinders do not require lubrication or periodic maintenance. Thorough inspections of all cylinders checking for leaks, signs of fatigue and compromised surface protection.

8.2.5 Slew Gearbox

The slew gearbox has some basic maintenance relating mostly to its lubrication to prevent wear of internals and catastrophic failure.

Emptying the slew gearbox oil is done through the lower drain plug. If oil is particularly dirty or fails sampling tests, internal cleaning is advised before refilling the new oil. This must be done using a suitable cleaning liquid, Transmin recommends Shell Flushing Oil 32.

The slew gearbox needs to be filled through the upper plug of the gearbox housing with approximate quantity and oil specified in the Lubrication Schedule (WM-3110-V-CP034-E4-001). Correct practise is to fill to the midpoint of the sight glass. The breather must be removed during the filling process to allow purging of air.

The gearbox comes with from factory with grease, this should be manually re-applied into the lower bearing greasing point. See the lubrication schedule (WM-3110-V-CP034-E4-001) for further information.

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Figure 13 Filling the Gearbox with Oil



Figure 14 Typical gearbox lower bearing greasing point

8.2.6 HPU

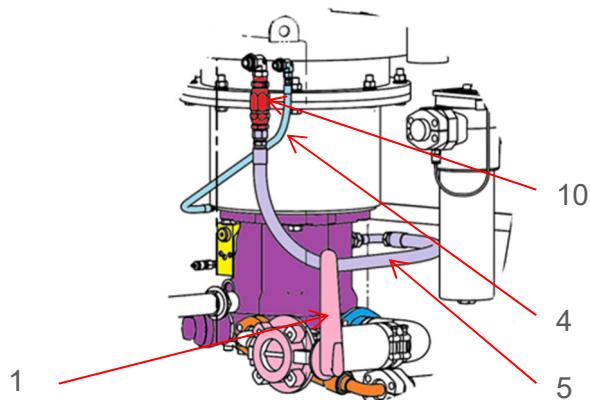


Figure 15 Pump Priming

HPU Pump

The HPU pump requires priming this is done by the following process:

- A. Remove Item 5 Leak Line from Item 10, Check Valve, at the tank
The pump will be primed through this line
- B. Remove Item 4, Leak Line from the fitting on the tank
- C. Tie the end of Item 4, Leak Line to the HPU such that the end is lower than the end on Item 5, Leak Line.
Air will be purged from the pump casing through Item 4, Leak Line.
- D. Slightly undo/crack the fitting of Item 4, Leak Line, where it meets the pump casing
- E. Insert a funnel into the end of Item 5, Leak Line, and slowly pour oil down the line
To effectively prime the pump, the end of Item 5, Leak Line, must remain higher than the pump casing
- F. Continue to pour oil into Item 5, Leak Line until oil begins to leak out of the cracked fitting on the pump casing
- G. Tighten the fitting on the pump casing
- H. Reconnect Item 4, Leak Line to the tank
- I. Continue to pour oil into Item 5, Leak Line until the line is full.

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- Ensure the fill point remains higher than the tank
- J. Reconnect Item 5, Leak Line

To determine if the Main Hydraulic Pump Motor is turning in the right direction, a bump test is performed with the following process:

- A. Ensure the pump suction and pressure line isolation valves are open and the pump is primed
 - B. Check the HPU is fully assembled and operational
 - C. Start the motor very briefly and only enough to start the Main Hydraulic Pump Motor turning
 - D. Visually check the Main Hydraulic Pump Motor is turning clockwise as viewed onto the fan
- If the Main Hydraulic Pump Motor is turning anti-clockwise
- a. Stop the motor
 - b. Swap 2 of the power cable phase wires around
- E. Confirm correct rotation with another bump test
- Wrong rotation for this brief test will not damage the pump

Hydraulic Filters

The Pressure Filter Element on the HPU has a high dirt holding capacity ensuring a long service life

The Pressure Filter Element will require changing in accordance with section 8.5 Preventative Maintenance, the frequency for required changing varies significantly depending on operational load and usage requirements.

To change the element:

- F. Ensure the system is de-energised and the HPU is isolated.
- G. Ensure the Pressure Filter housing is clean before unscrewing the bowl

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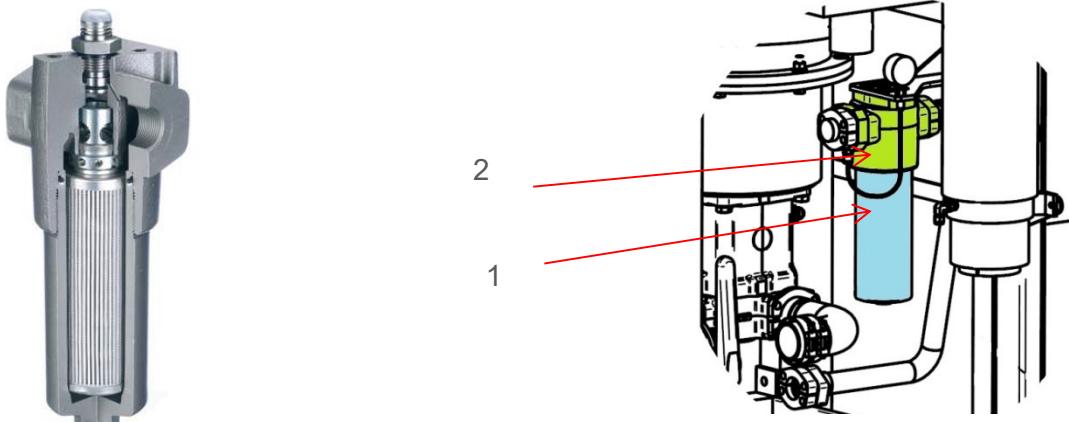


Figure 16 Pressure Filter

- H. Unscrew Item 1, Pressure Filter bowl, from Item 2, Pressure Filter head
 - Note: The Pressure Filter bowl will be full of oil and that some oil will flow from the hydraulic lines through the Pressure Filter housing
- I. Remove the Pressure Filter element and replace with a new Pressure Filter element
- J. Screw the Pressure Filter bowl back into the Pressure Filter head tightly.
- K. Purge system of air.
 - The most effective way to purge the system of the introduced air is to lift the hammer off the ground and dry fire it for about 30 seconds.

The Return Filter is a tank top style filter with a flange connection directly to the top of the HPU reservoir.

To change the element:

- A. Ensure that the Return Filter housing is clean before removing the cover
- B. Remove Item 1, Housing Cover, from Item 2, Return Filter Head by undoing the bolts on the top.
 - When the housing cover is removed, it will pull the Return Filter element out of the filter bowl

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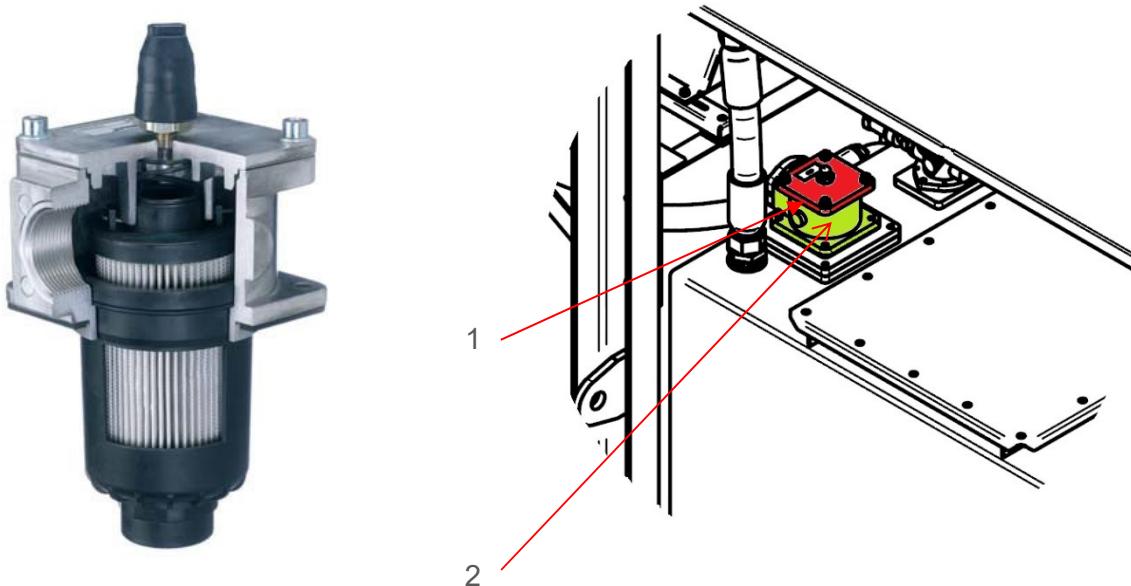


Figure 17 Return Filter

- C. Detach the Return Filter element from the housing cover.
- D. Attach a fresh Return Filter element to the filter housing
- E. Insert the Return Filter element back into the filter bowl and reattach the housing cover to the filter head. Tighten the bolts.
- F. There is no need to purge the system of air introduced during this operation

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Reservoir - Filling Filter – Replacement

When filling the HPU Reservoir with oil, it must be filled through the Reservoir top-mounted filling filter. Although the Reservoir is not refilled often, it is still important to ensure the filter is in good order, and to replace when required.

Because the filling filter is not used often, the visual indicator shown below will not be fitted.

To change the filter element:

- A. Ensure the filter housing and surrounding area is clean before opening the cover
- B. Remove the Item 1, Housing Cover from the Item 2, Filter Body by loosening the hex fitting on the top

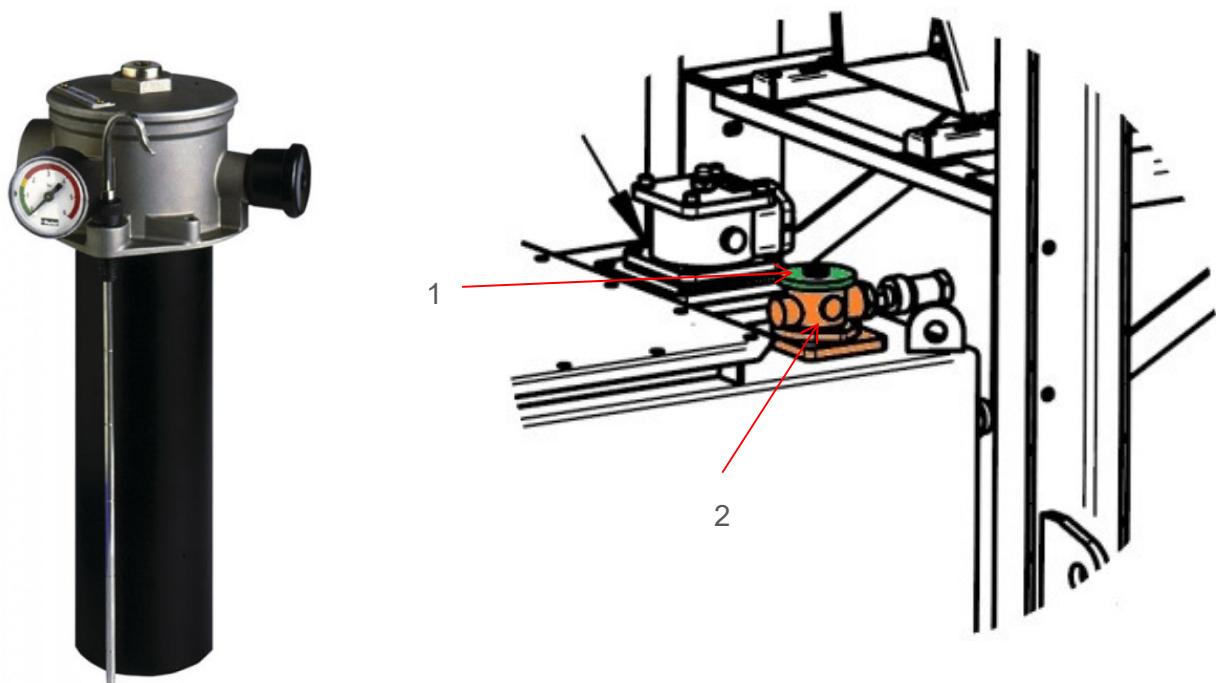


Figure 18 Reservoir Filler Filter

- C. Remove and replace the filter element.
- D. Refit the housing cover to the body

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Reservoir – Breather Replacement

The Breather is located on top of the HPU Hydraulic Oil Reservoir.

Ensure the Breather and surrounding area is clean before replacing

The Breather is removed by simply turning it anti-clockwise by hand or with a filter strap wrench.

To replace, screw the new filter on by hand. The Breather should be only hand tightened.

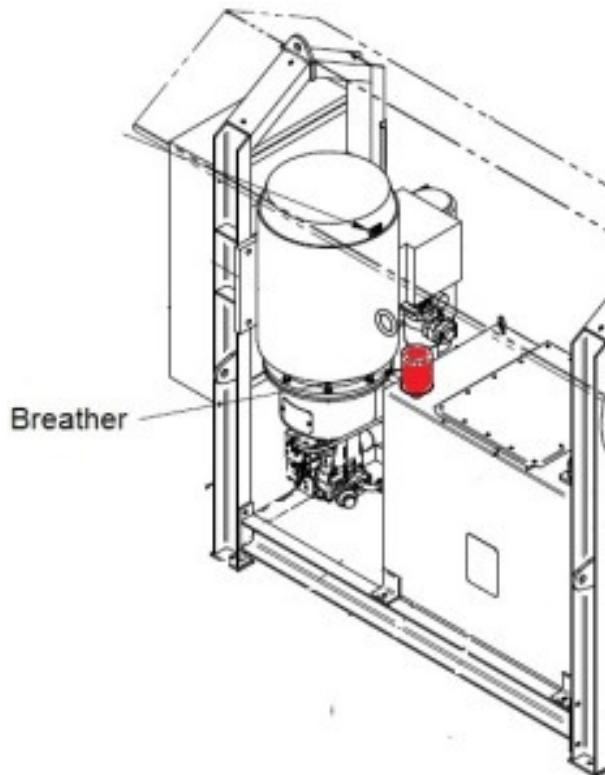


Figure 19 HPU Reservoir Breather location

8.3 General Information

Depressurising Hydraulic System



When the Rockbreaker Boom System is stationary, there may be

- High pressure contained within the hydraulic cylinders and the lines between the hydraulic cylinders and the main control valve.
- Low residual pressure between the slew motor and the slew motion control valve.

The remainder of the hydraulic installation bleeds off all pressure as the HPU is shut down.

Depressurising Hydraulic Cylinders or Cylinder Lines



Oil at high pressure is dangerous. Exercise caution when removing any hydraulic lines.



Support of Rockbreaker Boom System members must be either side of and independent of the hydraulic cylinder being removed



Wrap fitting with cloth rag to contain pressure before cracking the fittings

- A. Wrap flow and return fittings with cloth rag to contain pressure
- B. Crack fittings carefully whilst keeping cloth rag in position and wait for the oil pressure to drop via this leak
- C. Drain hydraulic oil to a container



Drain oil slowly to avoid oil spray and to enable the valve to be closed quickly if the Rockbreaker Boom System moves under its own weight

- D. Cap hoses and ports
- E. Use spill kit to clean up any spills

Depressurising Hydraulic Cylinders with Locking Valves

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Figure 20 Example of Boom Cylinder Locking Valve Test Point

- I. Place one end of oil test hose in a container
- II. Attach the other end of oil test hose to locking valve test point



Proceed with caution as the Rockbreaker Boom System moves under its own weight

- III. Drain hydraulic oil to a container
- IV. Remove oil test hose from locking valve test point and replace locking valve test point cap
- V. Cap hoses and ports
- VI. Use spill kit to clean up any spills

8.4 Hosing Assembly Details

The hosing assembly details are given in Appendix E of this manual.

8.5 Preventative Maintenance and Lubrication

Lubrication Schedule

Regular and correct lubrication and maintenance are essential to ensure correct and reliable operation of the Rockbreaker.

The lubrication system-specific installation, operation, maintenance and filling information must be followed from the lubrication system manufacturer's manual which is included in **Error! Reference source not found..**

The following lubricant errors must be avoided



- Overfilling
- Underfilling
- Incorrectly filling
- Using contaminated lubricants
- Using incorrect lubricants



In the event of a lubricant/grease spillage follow site guidelines/procedures to avoid environmental impact and the potential of personnel injury.



Dispose of waste lubricant/grease responsibly in accordance with site environmental guidelines/procedures



The grease quantities are given in the Lubrication Schedule (WM-3110-V-CP034-E4-001) are to be regarded as basic values only and must be increased accordingly in the event of prolonged extreme temperatures or if there has been added risk of impurity or water ingress.

Refer to: Lubrication System manual

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Preventive Maintenance

This section details the minimum preventive maintenance required to keep the machine in a safe and serviceable condition.

The preventative maintenance schedule lists the maintenance items with their recommended intervals.

The recommended intervals are based on standard operating conditions and an average forty-hour operating week or approximately 2000 operating hours per year.

Under no circumstances are the recommended intervals to be exceeded.

When operating under extreme weather conditions and/or higher operating rates, the intervals are to be reduced accordingly.

Refer **Error! Reference source not found.**, vendor manual for detailed maintenance guidelines.

8.6 Troubleshooting

To help diagnose digital IO faults, the HPU HMI includes screens to display the current state of all inputs and outputs.

All inputs and outputs on the electrical schematic (**Client ref TBA**) are listed in the screens. Green dots indicate ON and grey dots indicate OFF position.

8.7 Troubleshooting Chart with Remedial Suggestions

Table 2 Overall Troubleshooting

SYMPTOM	PROBABLE CAUSE	REMEDY
HPU cannot be started via Controller	Wrong operating mode set on HPU	Change operating mode switch on HPU control panel to “Remote”
	Controller battery low (if battery powered)	Charge battery
	Controller external power supply disconnected (if mains powered)	Insert battery eliminator plug into Controller
	Controller external power supply faulty (if mains powered)	Contact maintenance personnel

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SYMPTOM	PROBABLE CAUSE	REMEDY
Rockbreaker Boom System does not respond to remote control	Wrong Controller for current Rockbreaker Boom System position.	Use correct Controller
	Another Controller still logged with Receiver	Toggle the 'Fixed / Remote" switch on the Fixed Remote Controller to enable or disable the radio component of the Receiver
	HPU shut down due to fault condition	Check for warning or alarms in the HMI panel
	Electrical fault	Contact maintenance personnel
Rockbreaker Boom System does not respond to remote control	Controller battery low (if battery powered)	Charge battery
	Deadman button not depressed	Depress and then release deadman button whilst joystick in zero position
	Emergency stop button on HPU control panel depressed	Find out why button was depressed. Reset stop button and start HPU if safe to do so
	HPU shut down due to main motor breaker tripped	Reset trip on HPU control panel. If tripped again, contact maintenance personnel
	HPU shut down due to fault condition	Refer to Maintenance Manual – Fault Finding/Electrical, rectify fault. Start HPU if safe to do so. Alternatively contact maintenance personnel
	HPU pump suction isolation valve closed	Stop HPU, open valve and start HPU again. If any unusual noise from pump or abnormal Rockbreaker Boom System movement is detected, contact maintenance personnel

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SYMPTOM	PROBABLE CAUSE	REMEDY
	Hydraulic fault	Contact maintenance personnel
	Electrical fault	Contact maintenance personnel
Hammer will not fire	Controller battery low (if battery powered)	Charge battery
	Hammer tool is seized in bushings	Contact maintenance personnel
	Hydraulic fault	Contact maintenance personnel
	Electrical fault	Contact maintenance personnel
No excess lubricant evident at pivot pins	Lubricant reservoir empty	Contact maintenance personnel, as lubricant lines need to be purged
	Faulty automatic lubrication	initiate manual lubricant cycle and contact maintenance personnel
	Blocked or burst supply line. Or Supply line fittings loose.	Contact maintenance personnel
Noise coming from pivot pins	Faulty automatic lubrication	initiate manual lubricant cycle and contact maintenance personnel
	Damaged pin	Contact maintenance personnel
Abnormal Rockbreaker Boom System movement	Controller battery low (if battery powered)	Charge battery
	Hydraulic fault	Contact maintenance personnel
	Plug disconnected from main control valve solenoid	Re-connect plug to solenoid. If more than one plug disconnected and the orientation of the disconnected plugs are not certain, contact maintenance personnel

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SYMPTOM	PROBABLE CAUSE	REMEDY
	Electrical fault	Contact maintenance personnel
HPU HMI shows warning	System warnings will not stop or prevent the HPU from starting, however warnings may be indicative of worsening conditions that should be rectified at the earliest possible opportunity.	Refer to Maintenance Fault Finding-Mechanical/Electrical, Rectify fault. Alternatively contact maintenance personnel
HPU running but Rockbreaker Boom System is not moving	Faulty Load Sensing Pressure Solenoid not allowing pump to increase volumetric displacement	Contact Electrical personnel

Electrical Control System

Plant Signals

Five digital signals provide basic state information to the host Plant Control System (PCS) via interposing relays located in the HPU control panel.

The PCS should provide 24 V DC power to the top (T) row of the corresponding terminals listed below and monitor the response from the bottom (B) terminal.

Table 3 State Information Signals to Plant Control System (PCS)

Signal Name	Description
NO HPU ALARMS	Relay closed: no alarms active Relay open: one or more alarms active
NO HPU WARNINGS	Relay closed: no warnings active Relay open: one or more warnings active
HPU PUMP RUNNING	Relay closed: pump motor is running Relay open: pump motor is not running
HPU TEST MODE ACTIVE	The combination of the two mode signals indicate the HPU mode as detailed in
HPU REMOTE MODE ACTIVE	Table 4 Combination signals

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Table 4 Combination signals

Relay State: HPU TEST MODE ACTIVE	Relay State: HPU REMOTE MODE ACTIVE	HPU Mode
OPEN	OPEN	System is OFF
OPEN	CLOSED	System in REMOTE mode
CLOSED	OPEN	System in LOCAL mode
CLOSED	CLOSED	Fault

Maintenance Fault Finding

Table 5 Mechanical Troubleshooting

Symptom	Probable Cause	Remedy
Noise coming from pivot pins	Faulty automatic lubrication	See section on lubrication
	Damaged pin	Repair bush surfaces and replace pin
Sloppy movement in pivot joints	Worn pivot pin	Repair bush surfaces if required and replace pin
Excessive backlash in slew	Worn slew pinion or slew bearing outer race	Adjust slew bearing outer race backlash
		Replace pinion or slew bearing outer race if required

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Hammer Fault Finding

Table 6 Hammer Troubleshooting

Symptom	Probable Cause	Remedy
Impact rate too low	Return line back pressure too high	Check for blockage in return line
		Check for and replace blocked return filter element
	Gas pressure in piston accumulator too high	Reset to correct value (refer hammer section)
	Oil flow insufficient	Ensure hammer fire spool in main control valve is not stuck
		Ensure solenoid gets right current
		Ensure pump supplies full flow
	Hammer fire pressure setting too low	Ensure port pressure limiting valve is set correctly
		Ensure port pressure relief valve is set correctly (if installed)
	High pressure accumulator faulty. Hammer pressure hose jerks violently when hammer is fired.	Have hammer HP accumulator replaced by authorised dealer
Impact force too low	Oil flow insufficient	Ensure hammer fire spool in main control valve is not stuck
	Oil flow insufficient No gas in piston accumulator	Ensure solenoid gets right current
		Ensure pump supplies full flow

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Symptom	Probable Cause	Remedy
		Have hammer fixed or overhauled by authorised dealer
Impact rate too high and impact force too low	Internal leakage in hammer	Have hammer HP accumulator replaced by authorised dealer
	High pressure accumulator faulty	Have hammer fixed or overhauled by authorised dealer
Hammer pressure hose jerks violently when hammer is fired	Seals damaged or fittings loose inside hammer	Tighten tie rods (refer hammer vendor manual)
Oil leaks inside hammer	Hammer tie rods loose	Charge battery
	Controller battery low (if battery powered)	Push hammer down on rock before firing. Hammer will not fire with tool suspended in order to protect hammer against dry firing
Hammer does not fire when button is depressed	Hammer tool is seized in bushings	Ensure pressure line, that starts at a working port on the main control valve, is connected to the inlet port on the hammer
	Hydraulic lines swapped around at hammer	Switch plug over to correct solenoid
	Electrical plug connected to wrong solenoid on hammer fire section of main control valve. The load sensing pressure will jump up to the maximum setting when hammer is fired, without any flow going to hammer.	Ensure hammer fire spool in main control valve is not stuck

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Symptom	Probable Cause	Remedy
	Flow insufficient to activate hammer	Ensure solenoid gets right current
	Flow insufficient to activate hammer Hammer fire pressure setting too low	Ensure pump supplies full flow Ensure port pressure limiting valve is set correctly
	Hammer fire pressure setting too low Electrical signal not supplied to main valve solenoid	Ensure port pressure relief valve is set correctly (if installed)
	Gas pressure in piston accumulator too high	Find and fix electrical fault Reset to correct value (refer hammer section) Have reset to correct value by authorised dealer

HPU – Variable Displacement Pump

Table 7 HPU Troubleshooting

Symptom	Probable Cause	Remedy
Pump motor runs but does not supply any flow	Pump controller faulty	Have pump fixed or overhauled
	Pump suction isolation valve closed	Stop motor, open valve and restart. Check pump for damage
	Drive coupling damaged	Replace coupling
	Motor turning in wrong direction	Swap 2 supply phases over and restart. Check pump for damage

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

Symptom	Probable Cause	Remedy
	Pump damaged	Have pump fixed, overhauled or replaced
	Pump cavitating due to restriction in inlet	Fix pump inlet
Pump noisy	Pump cavitating due to entrained air	Ensure all oil returns are below oil level in reservoir
	Pump cavitating due to entrained air Pump drive coupling damaged or misaligned	Fix leaks in hydraulic system
		Fix leaks in pump inlet line
		Fix or replace coupling and align correctly
	Pump damaged or worn	Have pump fixed, overhauled or replaced
All Rockbreaker Boom System movements slow	Relevant spools in main control valve mechanically limited	Screw mechanical spool limiter out
One or more Rockbreaker Boom System movements slow	Pump damaged or worn	Have pump fixed, overhauled or replaced
	Electrical current supplied to solenoid low	Check that output is not limited at Receiver (by use of each battery)
	Relevant spool sticky due to dirty oil	Have control valve overhauled, flush system and replace oil
	Relevant spool damaged	Have control valve fixed or overhauled, flush system and replace oil
	Hydraulic cylinder leaking internally past piston seal	Have hydraulic cylinder fixed or overhauled
	Pressure inadequate due to worn or damaged pump	Have pump fixed, overhauled or replaced

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

Symptom	Probable Cause	Remedy
Jib or boom cannot be extended fully or slows down substantially towards horizontal position	Pressure inadequate due to worn or damaged hydraulic cylinder piston seals	Have hydraulic cylinder fixed or overhauled
	Port pressure relief settings incorrect	Adjust to correct value by Transmin
	Port pressure limiting settings incorrect	Adjust to correct value by Transmin
	Main pressure relief in control valve setting incorrect	Adjust to correct value by Transmin
	Main pressure limiter in pump controller setting incorrect	Adjust to correct value by Transmin
	Air in hydraulic cylinder	Bleed hydraulic cylinder by fully retracting and extending a few times
One or more Rockbreaker Boom System movements erratic	Air in hydraulic cylinder locking valve pilot line	Bleed pilot line properly
	Hydraulic cylinder locking valve faulty	Replace hydraulic cylinder locking valve
	Hydraulic cylinder or motor damaged	Have hydraulic cylinder or motor fixed or overhauled
Significant lag between joystick operation and hydraulic response	Air in hydraulic cylinders	Fully extend and retract hydraulic cylinders a few times to purge them of air
	Sticky valve due to contaminated oil	Have valve stripped and cleaned
Operation continues after joystick is released	Sticky valve due to contaminated oil	Replace oil filters if required
		Replace system oil if required

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

Symptom	Probable Cause	Remedy
	Sticky valve due to damage to valve spool surface	Flush complete hydraulic system Have valve overhauled
	Oil cooler motor not working	Repair electrical fault
HPU trips because of high oil temperature	Oil cooler motor not working	Replace oil cooler motor
	Pump worn	Have pump fixed, overhauled or replaced
	Pump not bled	Bleed pump. Check pump for damage after running dry
	Oil viscosity too low, causing lower efficiency and more heat input	Switch to higher viscosity grade, but still maintaining oil kinematic viscosity within the range 15-30cSt during operation Maintain this viscosity by maintaining oil temperature within the following limits; 30 to 50°C for ISO22 oil 40 to 60°C for ISO32 oil 50 to 70°C for ISO46 oil 60 to 80°C for ISO68 oil
	One or more port relief valves set too low and blowing oil off during operation of that function	Ensure all port relief settings are correct
	Heater control faulty and heater stays on all the time	Fix heater control system

Lubrication – Automatic

Table 8 Lubrication System Troubleshooting

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

Symptom	Probable Cause	Remedy
One or more greasing points not receiving any grease	Blockage in supply line to injector, or between injector and grease point, including drillings in pin. Check by greasing manually at injector grease nipple	Fix blockage
One or more greasing points not receiving enough grease, or too much grease	Injector setting incorrect	Adjust to correct value
Pump does not start	Fault in electrical supply	Find and fix electrical fault
	Pump faulty	Replace pump
Lubricant does not reach system pressure in one pump cycle	Air in grease lines	Purge all grease lines
	Leak in grease lines	Repair leak and purge lines
	Pump power supply voltage too low	Fix bad connections
		Increase pump power supply wiring size
Some injectors do not vent	Wrong grease used	Change to specified grease with correct vent meter viscosity value
	Pause time not long enough for all injectors to vent	Increase pump pause time
	Injector faulty	Replace injector

9 CHANGING QUICK HITCH ATTACHMENTS

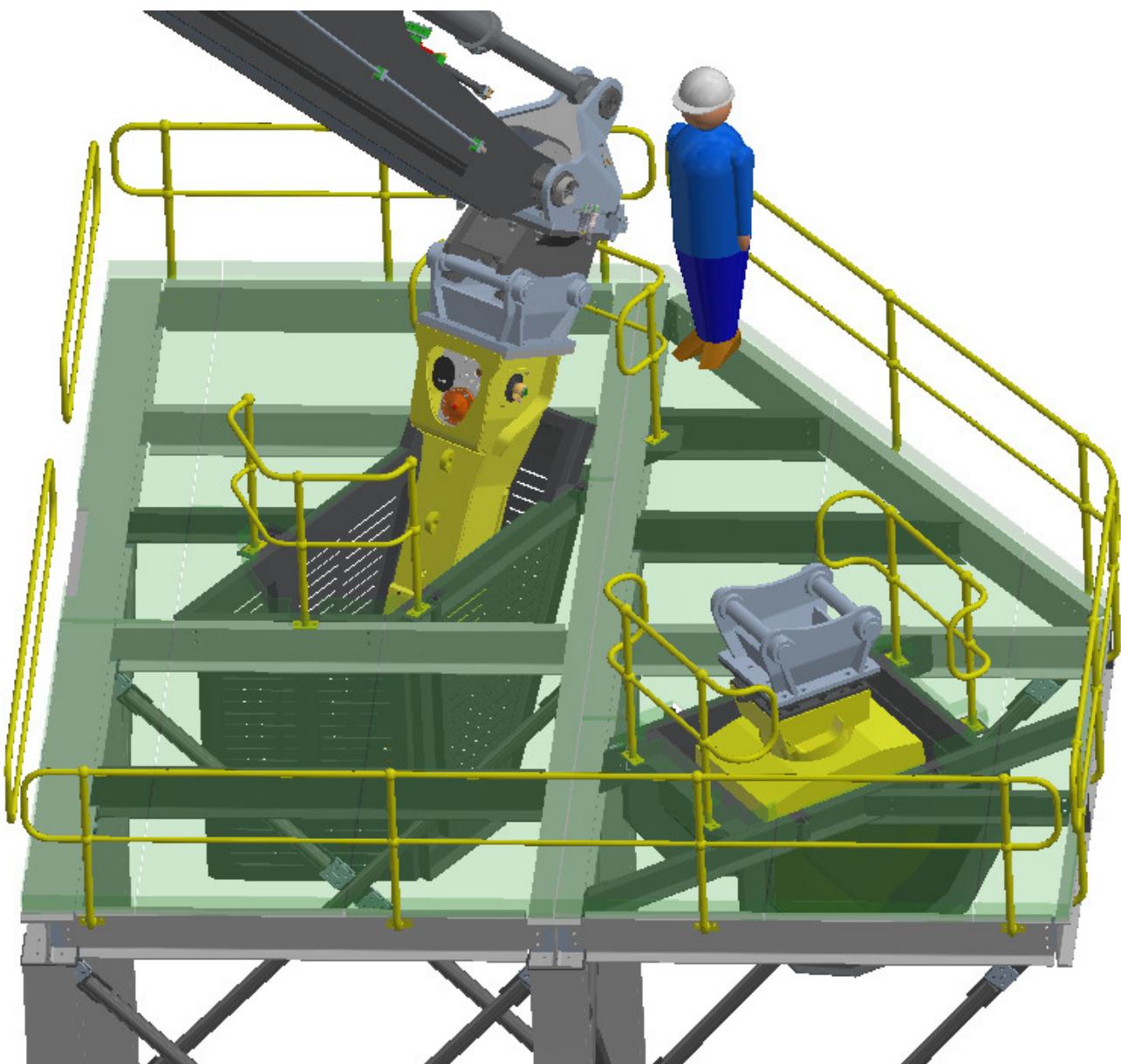


Visual inspection required to confirm tool latching.
while doing this operation



Radio Controller Quick Hitch Release toggle works only when slew position is in maintenance platform.

Figure 21 Designated maintenance platform for quick hitch operation



9.1.1 Tool changing (Scrapper/Hammer)

- A. Park the Hammer in tool changing platform designated location that allows easy detachment and re-attachment. It is difficult to attach the Hammer when it is lying flat on the ground with the Lower Quick Hitch Bracket orientated vertically.
- B. Switch off the HPU to depressurise the hydraulic system.
- C. Use the coupling spanner to rotate the hydraulic hose couple spindles anticlockwise and release the hydraulic hoses. Undo the locking spindle first to turn off the supply of oil to the Hammer (See image below).

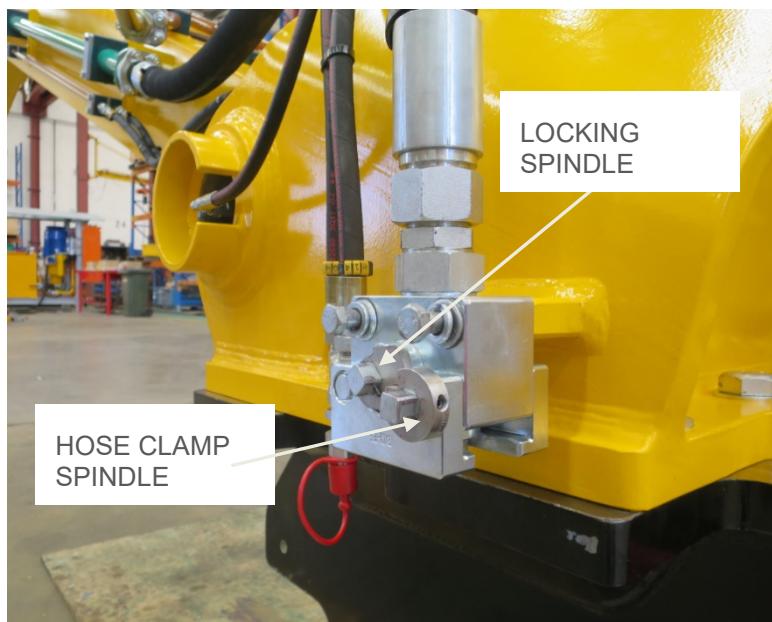
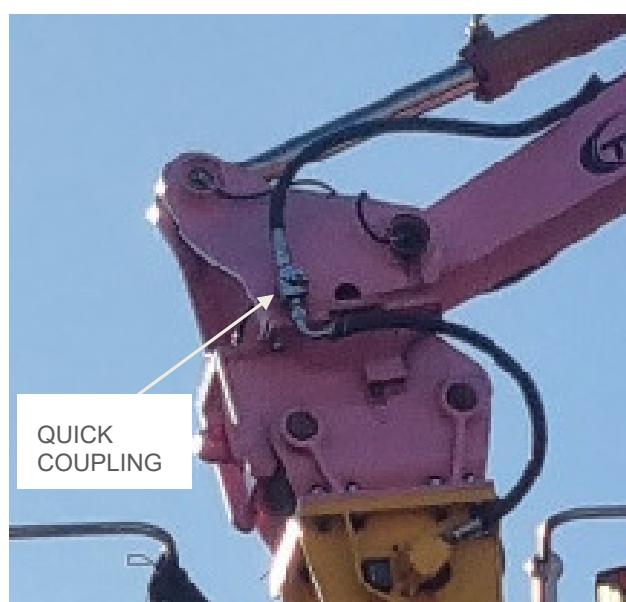


Figure 22 Spindle detail



BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE



Figure 23 Plug hose as shown

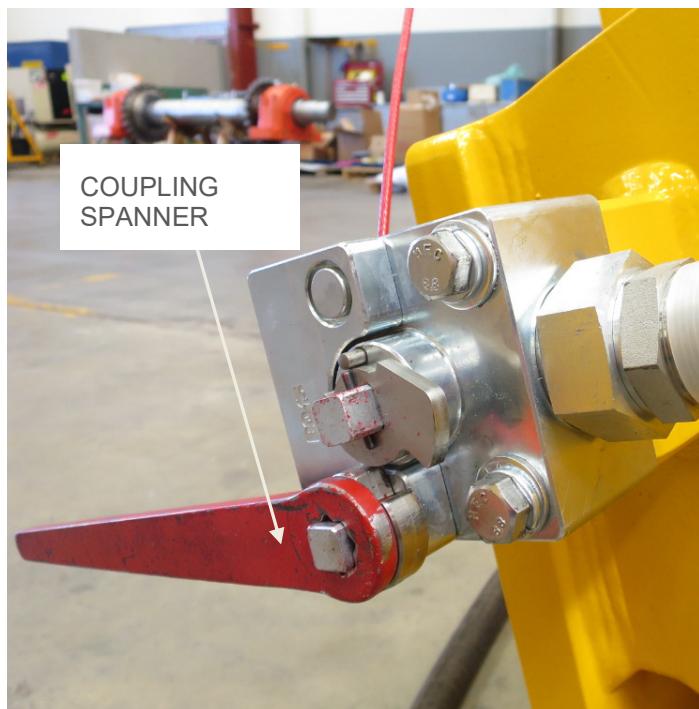


Figure 24 Spindle detail

- D. Secure plugs on the hydraulic hose couplings detached with the hammer/Grapple. Ensure all couplings are kept free of foreign matter.

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE



Figure 25 Plug as shown

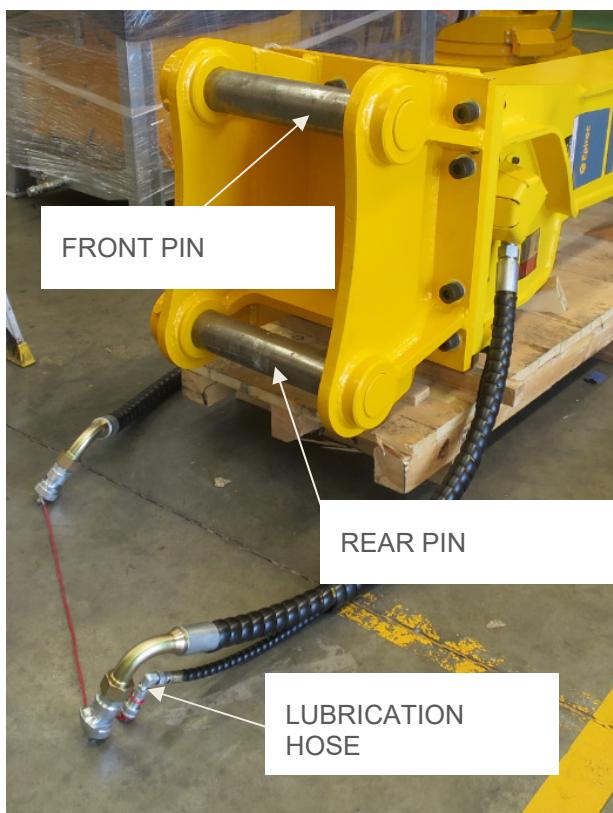
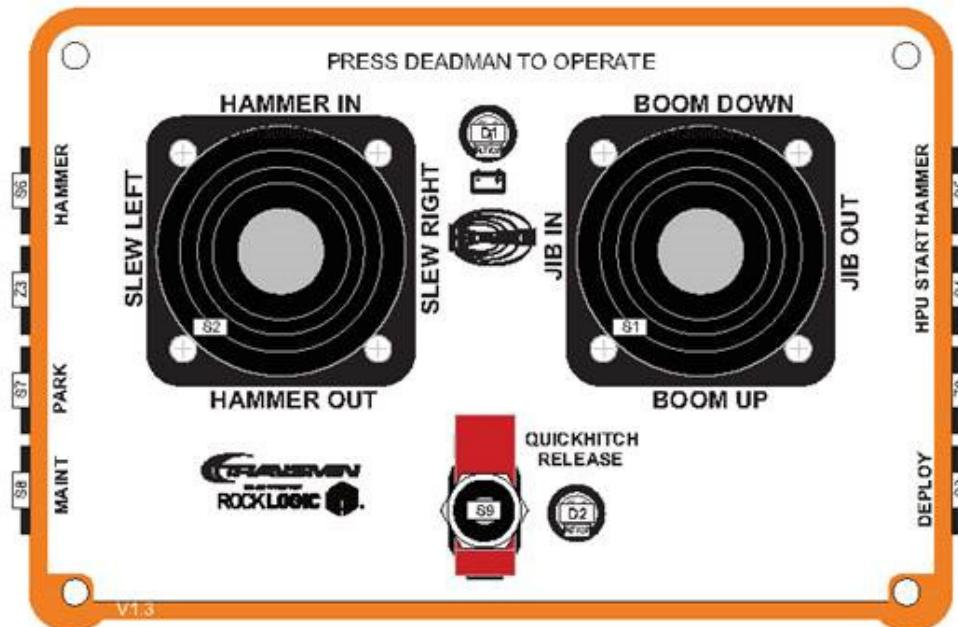


Figure 26

- E. Secure plugs on the Upper Quick Hitch Bracket hydraulic couplings to prevent ingress of foreign material.
- F. Uncouple the hammer lubrication hose.

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- G. Set RockLogic to bypass mode & start the HPU with the Radio Controller.
- H. Next, turn the Radio Controller Quick Hitch Release toggle switch up to activate the release. The Quick Hitch release light will flash fast & siren sound fast when the Quick Hitch Release is activated. Once activated the front and rear pins on the Lower Quick Hitch Bracket are released.
- I. Bump the control joystick to activate the hydraulic pump on the HPU ensuring only limited movement of the Rockbreaker.



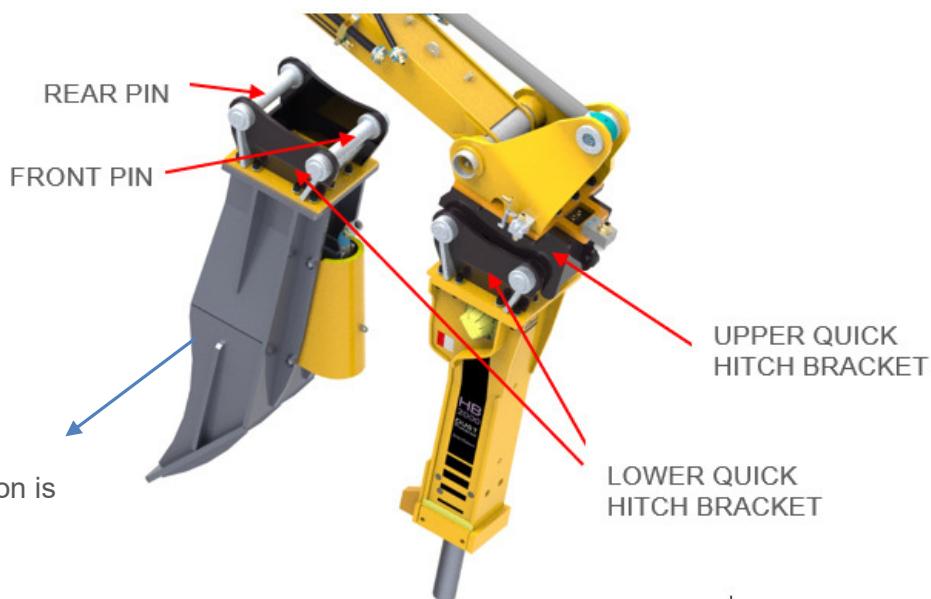
- J. Ensure that all flexible hoses are free. Using Radio Control joysticks move the Rockbreaker Boom and Jib to lift the Upper Quick Hitch Bracket free from the Hammer. Move off the front pin first and then lift off the rear pin.
- K. Once the toggle switch is pushed, there is a 60 second delay before the safety lock on the Upper Quick Hitch Bracket re-engages. If safety locks too soon, restart release procedure.
- L. Radio QH release light flashes slowly & Siren sounds slowly

9.1.2 Connection attachment

- M. With the HPU still running, position the Upper Quick Hitch Bracket on the Rockbreaker so that it engages with the rear pin on the Lower Quick Hitch Bracket.

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

- N. When approaching the Hammer, in a plan view, the jib must be perpendicular to the pins on the Lower Quick Hitch Bracket to ensure correct alignment.
- O. Ensure that all flexible hoses are clear.
- P. Move the boom and jib until the Lower Quick Hitch Bracket latches onto the rear pin.
- Q. Extend the Upper Quick Hitch Bracket hydraulic cylinder and latch onto the front pin of the Lower Quick Hitch Bracket.
- R. Switch the Radio Control Console QH Rel toggle switch DOWN to extend the Upper Bracket QH Wedge. Confirm the wedge is engaged correctly.



- S. To connect hoses, de-energise the HPU and ensure that all hoses to the Upper Quick Hitch Bracket are depressurised.
- T. Remove hose plugs and covers and connect the hammer hydraulic and lubrication hoses to the Rockbreaker.
- U. Ensure that the hydraulic hose connections are placed into the slot on the Rockbreaker hose coupling such that the bore of the hose is aligned with the bore of the coupling. If not, remove the hose and re-orientate as required.
- V. Refer to Section 9.1.1 for diagrams of hydraulic hose couplings mounted on the Rockbreaker. After sliding the hose from the Hammer into position in the Rockbreaker coupling, first turn the clamp spindle clockwise using

the Coupling Spanner and then turn the locking spindle clockwise. Ensure the locking spindle cam locks into the cam on the clamp spindle.

- W. Connect the lubrication hose.

10 DECOMMISSIONING, DISMANTLE AND DISPOSAL

Observe section 2 Safety Information during decommissioning, dismantle and disposal processes.

10.1 General Information

Upon termination of the useful life of the Rockbreaker, dismantle it in the reverse sequence of the installation and dispose of the components in accordance with this manual.

Dismantling requires expert knowledge and correct tools. Contact Transmin for assistance if in any doubt.

Shut down, disassemble and dispose your components in accordance with environmental legislation and local regulations.

Seek to dispose of components by material types and transfer metals, plastics and hydrocarbons to the respective waste management centres.

Furthermore, collect used oil, grease and other contaminants in suitable vessels and dispose of them correctly in accordance with local legislation.

APPENDIX A: WARRANTY CONDITIONS

Standard warranty extracted from Transmin Pty Ltd Terms and Conditions of Trade

9

Warranty

9.1

The Company gives no warranty other than that contained herein, in connection with the sale or use of its Goods or Services. The Company's liability on its warranty shall in no event exceed the contract order value in correcting defects in the Goods and/or the Services supplied.

9.2

No warranty is expressed or implied as to fitness or purpose, or operating performance of the Goods where such performance is conditional on empirical factors or on the whole installation or on the individual or overall operation or on the skills of an operator. When suitability, performance, size, number or capacity of a product (and if applicable, ancillary attachments whether supplied by the Company or not) is recommended, quoted or selected by the Company to perform a duty either specified by the Customer or estimated by the Company, such recommendation, quotation, or selection shall be based on the Company's best experience, but liability for failure to perform the specified or estimated duty will not be accepted by the Company.

9.3

Subject to the conditions of warranty set out in Clause 9.4 the Company warrants that if any defect in any workmanship manufactured by the Company becomes apparent and is reported to the Company in writing within the sooner of either twelve (12) months from commencement of Service or eighteen (18) months of the date of delivery (time being of the essence), or in the case of repaired or replaced Goods, within the sooner of either three (3) months from commencement of Service or six (6) months of the date of delivery (time being of the essence), then the Company will either (at the Company's sole discretion) repair or replace the defect.

9.4

The conditions applicable to the warranty given by Clause 9.3 are:

a) *The warranty shall not cover any defect or damage which may be caused or partly caused by or arise through:*

- i) *Failure on the part of the Customer to properly install or maintain any Goods; or*
- ii) *Failure on the part of the Customer to follow any instructions or guidelines provided by the Company; or*
- iii) *Any use of any Goods otherwise than for the original intended application for which the Goods has been specifically designed, including modifications to the Goods or changes in operation which have not been specifically approved by the Company in writing; or*

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

- iv) *The continued use of any Goods after any defect becomes apparent or would have become apparent to a reasonably prudent operator or user; or*
 - v) *Ingress of tramp or extraneous material; or*
 - vi) *Fair wear and tear, any accident, or act of God.*
- b) *The warranty shall cease, and the Company shall thereafter in no circumstances be liable under the terms of the warranty if the workmanship is repaired, altered or overhauled without the Company's approval in writing.*
 - c) *The Customer shall afford the Company an opportunity to inspect the Goods within a reasonable time following delivery if the Customer believes the Goods are defective in any way.*
 - d) *The defective part is promptly returned to the Company's designated service centre. Expenses incurred in transport of Goods or travel by personnel to or from the installation site to the Company approved repair workshop will be to Customer's expense.*
 - e) *Any defective part replaced will become the Company's property and the repaired or new part will be delivered to the Customer's site via means selected by the Company.*
 - f) *In respect of all claims the Company shall not be liable to compensate the Customer for any delay in either replacing or repairing the workmanship/Goods or in properly assessing the Customer's claim.*
 - g) *Where The Company elects to replace faulty parts, this warranty covers the supply of the replacement parts only and does not cover the changeover costs of replacement parts.*
 - h) *The Company does not provide any warranty with regard to any Customer specified or supplied Goods or materials unless specifically approved in writing and will endeavour to have the supplier provide any warranties on these Goods direct to the Customer.*
 - i) *Warranties will be conditional upon carrying out the site pre-commissioning inspection and commissioning in accordance with the Company's requirements as detailed in the I,O&M manuals as a minimum, and the timely submission of properly completed forms to the Company prior to any warranty claims.*

9.5

For Goods not manufactured by the Company, the warranty shall be the current warranty provided by the manufacturer of the Goods. The Company shall be under no liability whatsoever, except for the express conditions as detailed and stipulated in the manufacturer's warranty.

9.6

In the case of second hand Goods, the Customer acknowledges that he has had full opportunity to inspect the same and that he accepts the same with all faults and that no warranty is given by the Company as to the quality or suitability for any purpose and any implied warranty, statutory or otherwise, is expressly excluded. The Company shall not be responsible for any loss or damage to the Goods, or caused by the Goods, or any part thereof however arising.

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

APPENDIX B: REFERENCES

Drawings

IBO Drawing Number	Title
WM-3110-V-CP034-D4-001	HPU Control Panel
WM-3110-V-CP034-D4-003	Slew Frame Control Panel
WM-3110-V-CP034-D4-002	RockLogic Control Panel
WM-3110-V-CP034-D4-005	Safety Gate Panel

Document References

IBO Document Number	Title
WM-BOD-D8-V-CP034-001	Functional Description - RCS
WM-REG-K1-V-CP034-010	Spare Part List
WM-DAT-G1-V-CP034-001	Rockbreaker Datasheet

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APPENDIX C: BOLT TORQUE REQUIREMENTS

Description	Bolt Details	Torque	Comments
160 and 130 series Fixed Base Mounting Bolts Steel and Concrete mounting Structure	M36x4 Gr8.8	2300Nm	Tighten sequentially, crosswise
HPU Mounting Bolts Steel and Concrete mounting Structure	M16x2, Gr8.8	220Nm	Tighten sequentially, crosswise
Pivot and hydraulic cylinder Clevis Pin Caps	½" UNF, Gr 8 Bolts	141Nm	-
160 series Pivot and hydraulic cylinder Clevis Pin Caps	5/8" UNF, Gr8	283Nm	-

APPENDIX D: VENDOR MANUAL

APPENDIX D: VENDOR MANUALS

- D1: Hammer
- D2: Lubrication Pump
- D3: Radio Controller and Receiver
- D4: Filters
- D5: Breathers
- D6: Drive Motor
- D7: Pump
- D8: Slew Motor

BOOMER-HD – INSTALLATION, OPERATION AND MAINTENANCE

APPENDIX D1: HAMMER

Safety and operating instructions Hydraulic breakers

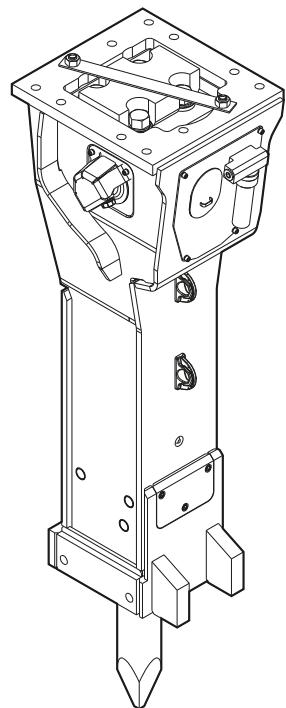


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1 Introduction

Epiroc is a leading productivity partner for the mining, infrastructure and natural resources industries. With cutting-edge technology, Epiroc develops and produces innovative drill rigs, rock excavation and construction equipment, and provides world-class service and consumables.

The company was founded in Stockholm, Sweden, and has passionate people supporting and collaborating with customers in more than 150 countries.

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1.1 About these Safety and Operating Instructions

The aim of these Instructions is to familiarise you with the safe and effective operation of the hydraulic attachment. You will also find instructions for regular maintenance activities for the hydraulic attachment in this document.

Please read these Instructions carefully prior to the first attachment and use of the hydraulic attachment.

In these instructions, the DustProtector version of the hydraulic breaker will be referred to by the abbreviation DP.

The different designation of the texts means as follows:

►	Action step in a safety instruction
◆	Action step
1. 2.	Established operation process
A B C	Explanation of the elements of a drawing
• • •	Listing

Symbols used in illustrations have the following meanings:

	permitted operation
	prohibited operation

2 Safety instructions



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Read these Safety and operating instructions and specifically all safety instructions before using the hydraulic attachment. This will:

- prevent the risk of injuries and fatal accidents for yourself and others,
- protect the environment against environmental damage.
- protect the hydraulic attachment and other property against material damage,

Follow all instructions in these Safety and operating instructions.

Store these Safety and operating instructions in the document compartment of the carrier cab.

Anyone

- transporting,
- installing or removing,
- operating,
- maintaining,
- repairing,
- storing or
- disposing of

the hydraulic attachment must have read and understood these Safety and operating instructions.

These Safety and operating instructions belong to the hydraulic attachment. Keep it for the life of the product. Ensure, if applicable, that any received amendment is incorporated in the instructions. Hand over the Safety and operating instructions if ever you lend, rent out or sell the hydraulic attachment.

All safety regulations listed in this manual comply with the laws and regulations of the European Union. Also observe the additional national/regional regulations.

Hydraulic attachment operation outside the European Union is subject to the laws and regulations valid in the country of use. Please observe any other, more stringent regional regulations and legislation.

Read the carrier manufacturer's Safety and operating Instructions before attaching the hydraulic attachment to the carrier and operating it. Observe all instructions.

2.1 Signal words

The signal words Danger, Warning, Caution, and Notice are used as follows in these Safety and operating instructions:

DANGER	indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	The signal word NOTICE is used to address practices related to possible property damage but not related to personal injury.

2.2 Qualification

Transporting the hydraulic attachment is only permitted if carried out by people who:

- are authorised to operate a crane or a forklift truck according to the applicable national provisions,
- know all the relevant national/regional safety provisions and accident prevention rules,
- have read and understood the safety and transport chapter of these Safety and operating instructions.

Installing, maintaining, storing and disposing of the hydraulic attachment are only permitted if carried out by people who:

- know all the relevant national/regional safety provisions and accident prevention rules,
- have read and understood these Safety and operating instructions.

Operating the hydraulic attachment is only permitted if carried out by qualified carrier drivers. Carrier drivers are qualified if they:

- have been trained to operate a carrier according to the national regulations,
- know all the relevant national/regional safety provisions and accident prevention rules,
- have read and understood these Safety and operating instructions.

Testing the hydraulic installation is only permitted if carried out by professionals. Professionals are people who are authorised to approve a hydraulic installation for operation according to the national regulations.

Repairing the hydraulic attachment is only permitted if carried out by professionals trained by Construction Tools GmbH. These professionals must have read and understood these Safety and operating instructions.

They must follow all safety instructions and guidelines for repair. Otherwise the operational safety of the hydraulic attachment is not guaranteed.

2.3 Intended use

Only attach the hydraulic breaker to a hydraulic carrier of a suitable load-bearing capacity.

Only use the hydraulic breaker function of the device to break or fragment concrete, stone and rocks.

Using the hydraulic breaker in and under water, in tunnels, under the ground and for hot applications is only possible if it has been fitted out with special safety equipment.

Intended use also implies observing all instructions in these Safety and operating instructions.

2.4 Use other than intended

Never operate the hydraulic breaker in an environment where there is a risk of explosions. Explosions will result in serious injury or death.

Never use the hydraulic breaker

- to transport or lift objects. The lifted object can fall and cause serious injuries or death.
- as a sledge hammer. This will damage the hydraulic breaker, the working tool and the carrier.
- as a crowbar. This can cause the working tool to break.
- to push debris. This damages the hydraulic breaker.

2.5 Protective equipment

Personal protective equipment must comply with the applicable health and safety regulations.

- Do not work wearing jewelry or with loose long hair. Moving machine parts could catch your hair or jewelry causing serious injury.
- Wear comfortable, close-fitting work clothes. The moving machine parts can snag loose clothing and cause serious injury.

Always wear the following personal protective equipment:

- protective helmet
- safety glasses with side protectors
- protective gloves
- protective shoes
- warning vest
- hearing protection

2.6 Carrier, precautions

▲ WARNING Falling carrier

If the load-bearing capacity of the carrier used is insufficient, the carrier will not be stable. It can topple over and cause injuries and damage.

Using a carrier whose load-bearing capacity is too high will greatly burden the hydraulic attachment causing it to wear faster.

- ▶ Only attach the hydraulic attachment to a hydraulic carrier of a suitable load-bearing capacity.
- ▶ The carrier must remain stable at all times.
- ▶ Read the carrier manufacturer's Safety and operating Instructions before attaching the hydraulic attachment to the carrier and operating it. Observe all instructions.

NOTICE Damage to the hydraulic attachment

Working with a hydraulic attachment mounted to a long reach boom may cause damage to the hydraulic attachment.

- ▶ Before working with a hydraulic attachment mounted to a long reach boom consult the Epiroc Customer Center / Dealer in your area.

2.7 Transport, precautions

▲ WARNING Risk of death due to suspended loads

When lifting loads these can swing out and fall. This can result in serious injuries or even death.

- ▶ Never stand underneath or in the swinging range of suspended loads.
- ▶ Only move loads under supervision.
- ▶ Only use approved lifting equipment and lifting gear with sufficient load bearing capacity.
- ▶ Do not use worn lifting gear (ropes, belts, chains, shackles etc.).
- ▶ Do not place lifting gear such as ropes and belts on sharp edges or corners, do not knot these or twist them.
- ▶ When leaving the workplace, set down the load.

▲ WARNING Injury due to swivelling load

When transporting the load by crane it can swivel and cause severe injuries and considerable damage to property.

- ▶ Ensure that no personnel, objects or obstacles are located in the swivel range of the load.

NOTICE Air freight restrictions

HATCON contains an activated SIM card (radio transmitting device) and an encased lithium ion battery after activation step has been finalized. Both parts are regulated for air transport.

- ▶ Consult your forwarder or local customer center/ dealer about any restrictions for air freight.

2.8 Hydraulic installation, precautions

▲ WARNING Hydraulic pressure too high

If the hydraulic pressure is too high, the parts of the hydraulic attachment will be exposed to excessively high loads. Parts can break loose or burst causing serious injuries.

- ▶ Lay the drain line of the pressure relief valve directly in the tank to ensure the safe functioning of the pressure relief valve!
- ▶ The pressure relief valve must be set at the maximum static pressure.
- ▶ The pressure relief valve setting must be checked to ensure that the maximum static pressure (see chapter **Technical specifications**) of the hydraulic installation is not exceeded at any time. Attach a lead seal to the pressure relief valve.
- ▶ Prior to their first use, the safety facilities on the hydraulic installation must be checked by a professional/authorised monitoring body for their quality (CE mark etc.), suitability and proper functioning.
- ▶ If any significant changes are made to the hydraulic installation, a new acceptance inspection is to be carried out in accordance with the relevant national safety provisions.

▲ WARNING Hot hydraulic oil squirting out

The hydraulic system is under high pressure. Hydraulic lines may spring a leak or burst. Hydraulic oil squirting out can lead to serious injury.

- ▶ When attaching the hydraulic attachment do not lay any hydraulic lines through the carrier's cab.
- ▶ Only use hydraulic lines which comply with the following quality requirements:
 - Hydraulic hoses with 4 reinforcement steel wires according to DIN EN 856 4SH,
 - Hydraulic pipes, seamless cold-drawn steel pipes according to DIN EN 10305

2.9 Special parts, precautions

2.9.1 HP-accumulator

▲ DANGER Danger of explosions

The HP-accumulator of the hydraulic breaker is filled with nitrogen (N_2). Filling it with any other gas may trigger an explosion and lead to serious, possibly fatal, injuries.

- ▶ Only fill the HP-accumulator with nitrogen (N_2).
- ▶ Do not carry out any welding and soldering work to the HP-accumulator.
- ▶ Check the HP-accumulator in accordance with the national safety provisions.

▲ WARNING Component coming loose abruptly Risk of bursting

The HP-accumulator is under pressure, even when the hydraulic system has been depressurised. Screw connections might come loose unexpectedly and cause injuries.

- ▶ Never unscrew the cover or the upper shell from a pressurised HP-accumulator.
- ▶ Never carry out mechanical processing to the HP-accumulator.

2.9.2 Piston accumulator

▲ DANGER Danger of explosions

The integrated piston accumulator is filled with nitrogen (N_2). Filling it with any other gas may trigger an explosion and lead to serious, possibly fatal, injuries.

- ▶ Only fill the piston accumulator with nitrogen (N_2).

▲ WARNING Component coming loose abruptly

The piston accumulator is under pressure, even when the hydraulic system has been depressurised. The filling valve might come loose unexpectedly and cause injuries.

- ▶ Never unscrew the filling valve »G« from the pressurised piston accumulator.

2.10 Media/consumables, precautions

▲ WARNING Hot hydraulic oil under high pressure

Hydraulic oil will squirt out under high pressure if there is a leakage. The jet of oil might penetrate people's skin and cause permanent damage. Hot hydraulic oil can cause burns.

- ▶ Never use your hands to find leaks.
- ▶ Always keep your face away from a possible leak.
- ▶ If hydraulic oil has penetrated your skin consult a doctor immediately.

▲ WARNING Hydraulic oil spills

Spilt hydraulic oil can make a floor slippery. If people slip they can be injured. Hydraulic oil is environmentally harmful and must not penetrate the ground or enter the water table or water supplies.

- ▶ Make sure not to spill any hydraulic oil.
- ▶ Immediately clean the floor if you have spilt hydraulic oil.
- ▶ Observe all safety and environmental protection provisions when handling hydraulic oil.

▲ WARNING Skin infections/diseases due to oil and grease

Hydraulic oil and grease can cause rashes (or even eczema) if they come into contact with the skin.

- ▶ Avoid all skin contact with hydraulic oil and grease.
- ▶ Use a suitable skin protection product.
- ▶ Always wear safety gloves when working with hydraulic oil or grease.
- ▶ Immediately clean any skin that has been contaminated by oil or grease with water and soap.

2.11 Explosion and fire, precautions

▲ DANGER Explosion and fire

Explosions cause serious injury or death. If the working tool hits explosives, an explosion may be the result.

- ▶ Never operate the hydraulic breaker in the direct vicinity of explosives.
- ▶ Make sure that no explosives are hidden in the rocks and stones.
- ▶ Check gas line position plans of the entire construction area.

▲ DANGER Explosion and fire

Operating the hydraulic breaker may create sparks which ignite highly flammable gases. This may lead to fire or an explosion.

- ▶ Never work in an environment with highly flammable substances.
- ▶ Make sure that there are no hidden sources of gas in the work area.
- ▶ Check gas line position plans of the entire construction area.

▲ DANGER Explosion and fire

Dust-rich air can form an explosive atmosphere which may ignite when operating the hydraulic breaker. This may lead to fire or an explosion.

- ▶ Never use the hydraulic breaker in an explosive atmosphere.
- ▶ Always provide sufficient ventilation when working in buildings or in a confined area.

2.12 Electrical shock, precautions

▲ DANGER Electrical shock

Any contact of the hydraulic attachment with electric circuits or other sources of electricity will lead to an electric shock, resulting in serious injury or death. The hydraulic attachment is not electrically insulated.

- ▶ Never work in the vicinity of electric circuits or other sources of electricity.
- ▶ Make sure that there are no hidden circuits in the work area.
- ▶ Check wiring diagrams.

2.13 Falling stones, precautions

▲ WARNING Fragments flying around

Fragments of material which come loose while operating the hydraulic attachment may be flung away and can cause serious injury if people are hit by them. Small objects falling from a great height can also cause serious damage.

During hydraulic attachment operation the danger zone is considerably greater than during the excavation operation due to fragments of stone and pieces of steel flying around, and for this reason the danger zone must, depending on the type of material to be worked on, be enlarged correspondingly, or secured in a suitable manner through corresponding measures.

- ▶ Secure the danger zone.
- ▶ Stop the hydraulic attachment immediately if anyone enters the danger zone.
- ▶ Close the windscreens and the side windows of the driver's cab.

2.14 Emissions, precautions

▲ WARNING Noise hazard

Operating the hydraulic attachment creates a loud noise. Long term high sound pressure level can affect your hearing.

- ▶ Wear suitable hearing protection.

▲ WARNING Lung disease

Dust may be generated when operating the hydraulic attachment. If dust from rocks or silica dust, produced when operating the hydraulic attachment on rocks, concrete, asphalt or other such materials, is inhaled this may lead to silicosis (dust lungs, a severe lung disease). Silicosis is a chronic disease which may lead cancer and death.

- ▶ Wear a suitable breathing mask.

2.15 Handling machines, precautions

▲ WARNING Narcotics, alcohol and drugs

Narcotics, alcohol and medicinal drugs make their users less alert and affect their ability to concentrate. Negligence and incorrectly assessing a situation can result in serious injury or death.

- ▶ Never work on or with the hydraulic attachment when under the influence of narcotics, alcohol or drugs which affect your alertness.
- ▶ Never allow other people who are under the influence of narcotics, alcohol or drugs which affect their alertness to work on or with the hydraulic attachment.

2.16 Repair, precautions

▲ WARNING Heavy parts falling

The main parts of the hydraulic breaker are heavy. Unsuitable lifting attachments (e.g. ring or eye bolts) may fail and cause heavy parts to fall. Falling parts may cause serious injury.

- ▶ Never pull the percussion unit out of the breaker box. Dismounting the percussion unit is only permitted if carried out by professionals trained by Construction Tools GmbH. These professionals must follow all safety instructions and guidelines for repair.
- ▶ These professionals are only permitted to repair the percussion unit if they use the sling gears prescribed by Construction Tools GmbH when:
 - removing the complete percussion unit.
 - mounting or dismounting parts of the percussion unit.

2.17 Changes to the hydraulic attachment, precautions

▲ WARNING Changes to the hydraulic attachment

Changes to the hydraulic attachment or the adapter plate may lead to serious injury.

- ▶ Never carry out any changes to the hydraulic attachment or the adapter plate.
- ▶ Only use original parts or accessories approved by Epiroc.
- ▶ Modifications that entail new hazards may require a new procedure for assessing conformity.

▲ WARNING Changes to the HP-accumulator

Changes to the HP-accumulator may lead to serious injury.

- ▶ Never carry out any changes to the HP-accumulator.
- ▶ Any modification will result in immediate invalidation of the operating licence.

2.18 Environmental pollution, precautions

NOTICE Environmental pollution due to hydraulic oil

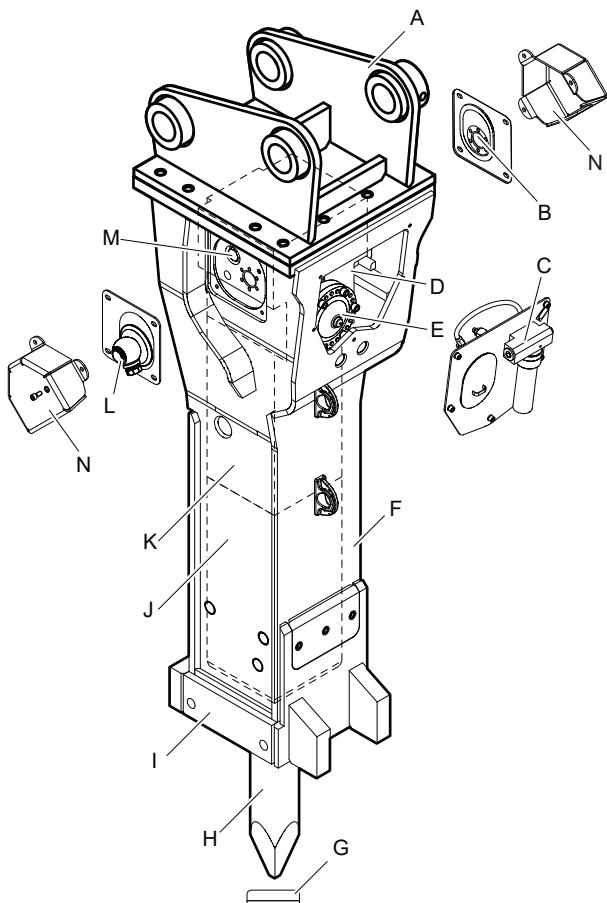
Hydraulic oil is permanently environmentally harmful. Escaped hydraulic oil will lead to groundwater and soil contamination. Organisms may die.

- ▶ Collect any hydraulic oil which escapes to avoid environmental pollution. For minor volumes use an absorbing medium (in case of an emergency use soil). In case of major leakages contain the hydraulic oil. It must not drain off and penetrate the ground or enter the water table or water supplies.
- ▶ Collect contaminated absorbing medium or soil in a watertight box/container and close it tight.
- ▶ Contact an authorized waste management company.
- ▶ Dispose of all contaminated material in accordance with the applicable environmental regulations.

3 Overview

3.1 Equipment description

The illustration gives an overview of the main parts and components of the hydraulic attachment. Actual details may differ.



- A. The hydraulic breaker is connected to the carrier by the **adapter plate**. The adapter plate is not included in the scope of supply of the hydraulic breaker.
- B. Tank line »T«
- C. Automatic lubrication system **ContiLube® II**
- D. The **cylinder cover** houses the nitrogen gas (N_2) filled piston accumulator and the control mechanism.
- E. The **HP-accumulator** compensates pressure variations in the hydraulic system.
- F. The **breaker box** protects the percussion unit.
- G. Working tool aperture **protective cap**
- H. The **working tool** can be replaced as required. The working tool is not included in the scope of supply of the hydraulic breaker.
- I. The **DustProtector system** prevents dust from entering the percussion compartment (only on the DP version).

- J. The working tool is retained in the **lower breaker part**.
- K. The percussion piston is guided in the **cylinder**.
- L. Pressure line »P«
- M. **Non-return valve** of percussion compartment ventilation
- N. The **swivel joint covers** protect the swivel joints.

3.2 Function

The operation of a hydraulic breaker is described in a greatly simplified version below:

The pressure line »P« supplies oil at the operating pressure of the carrier to the hydraulic breaker. The tank line »T« returns the oil to the tank of the carrier. The HP-accumulator compensates pressure variations in the hydraulic system.

The percussion piston moves up and down in the cylinder. When the percussion piston is in its lower position, it impacts the working tool. The percussion energy is transferred to the material to be broken via the working tool.

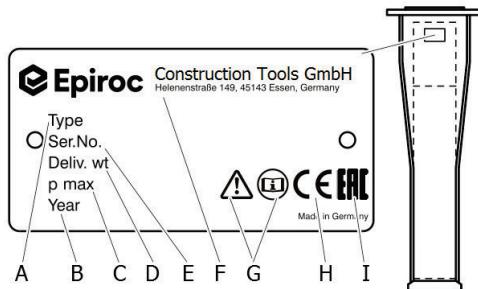
3.3 Signs / labels

⚠ WARNING Missing warnings

The name plate and the labels on the hydraulic attachment contain important information about the hydraulic attachment and for personal safety. A missing warning can lead to overlooking or misinterpretation of possible risks and cause personal hazards. The signs and labels must always be clearly legible.

- ▶ Immediately replace any defective name plates and labels.
- ▶ Use the spare parts list to order new name plates and labels.

3.3.1 Name plate



- A. Model
- B. Year of construction of hydraulic attachment
- C. Max. permissible operating pressure
- D. Weight of hydraulic attachment
- E. Serial number
- F. Name and address of manufacturer
- G. The warning symbol and the book symbol indicate that the Safety and Operating Instructions must be read prior to use of the hydraulic attachment and in particular the chapter on Safety.
- H. The CE symbol indicates that the hydraulic attachment was produced in conformity with CE. You can find further information about this in the enclosed EC Declaration of Conformity.
- I. The EAC symbol means that the machine is EAC approved.

3.3.2 Labels

Sound Power



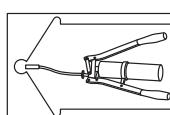
The label states the guaranteed sound power level in accordance with EC directive 2000/14/EC.

Transport warning



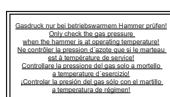
Never lift the hydraulic breaker by the transport safety device. This was not designed for lifting and might break, causing the hydraulic breaker to fall.

Lubrication symbol



The label identifies a lubrication point.

Gas pressure



The label indicates that the gas pressure can only be checked if the breaker has reached operating temperature.

3.3.3 Signs



The warning symbol and the book symbol indicate that the Safety and Operating Instructions must be read prior to use of the hydraulic attachment and in particular the chapter on Safety.

3.4 Applications

Field	Type of application
General construction work	Trenchwork for utilities, foundation work
Demolition	Heavily reinforced concrete, demolition of power stations and bridges
Rock mining / breaking	Primary breaking
	Secondary breaking, bench leveling foundation work
Tunneling*, mining*	Bench levelling
	Tunnel driving
High temperature applications*	Breaking up slag
Underwater applications*	Demolition, Deepening shipping channels

* only after consulting the Epiroc Customer Center / Dealer in your area

3.5 Guarantee

The guarantee or product liability will be invalidated by the following:

- Use other than intended
- Maintenance work not being carried out or being carried out incorrectly
- The use of incorrect consumables
- The use of non-approved parts
- Damage due to wear
- Damage due to improper storage
- Changes not carried out by or in consultation with the manufacturer

3.6 Removing the packaging

- Remove all the packaging material.
- Dispose of it in accordance with the applicable provisions.
- Check that the delivery is complete.
- Check the delivery for visual damage.
- If any defects are found, consult the Epiroc Customer Center / dealer in your area.

3.7 Scope of delivery

The hydraulic breaker is delivered complete with:

- Hydraulic breaker
- Test gauge lower wear bush
- Safety and Operating instructions
- Spare parts list
- EC Declaration of Conformity

Accessories as ordered:

- Working tool
- Hoses
- Service box

Special accessories as ordered:

- e.g. adapter plate with Allen screws and pairs of lock washers
- e.g. base plate to construct an adapter plate with Allen screws and pairs of lock washers
- e.g. hydraulic fittings for the carrier
- e.g. calliper upper wear bush

4 Transport

⚠ WARNING Hoist tipping over / hydraulic attachment falling

The hydraulic attachment is heavy. The hoist/lifting equipment and/or hydraulic attachment tipping over or falling may cause serious injury and material damage.

- ▶ Only transport the hydraulic attachment with lifting equipment with the right load-bearing capacity for the weight of the hydraulic attachment.
- ▶ Only lift and secure the hydraulic attachment with lifting gear (ropes, chains, shackles etc.) with the right load-bearing capacity for the weight to be lifted.
- ▶ Make sure that there is nobody near or under the suspended hydraulic attachment.

⚠ WARNING Percussion unit falling

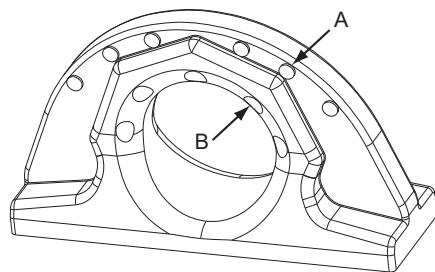
The percussion unit slides out of the breaker box if not secured by the adapter plate or the transport safety device. The falling percussion unit may cause serious injury and material damage.

- ▶ Never transport a hydraulic breaker without mounted adapter plate or transport safety device.
- ▶ Immediately mount the transport safety device after removal of the adapter plate.
- ▶ The percussion unit must not move in the breaker box even if the transport safety device is mounted. A sliding percussion unit can destroy the transport safety device.
- ▶ Replace a missing elastic pad, if necessary e.g. with a wooden block. This keeps the percussion unit fixed in the breaker box during transport.
- ▶ Immediately replace a defective transport safety device. Use the spare parts list to order a new transport safety device. If not in use save the transport safety device for future use.

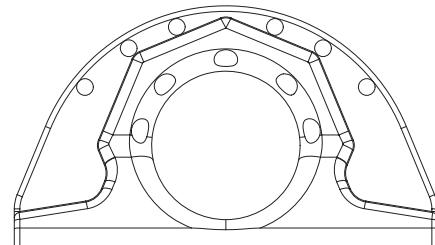
⚠ WARNING Hydraulic breaker falling

The lifting eye may fail and cause the hydraulic breaker to fall. This may cause serious injury and material damage.

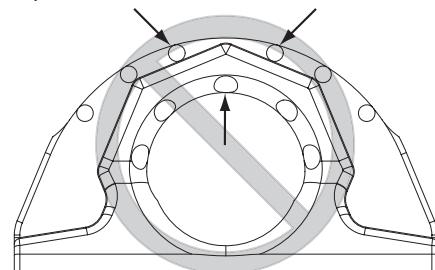
- ▶ Check the lifting eye before you lift the hydraulic breaker. Never lift the hydraulic breaker with the lifting eye if:
 - the checkpoints (A) are worn and not protruding anymore
 - or
 - the checkpoints (B) are worn and not recessed anymore.



- the material is worn up to the checkpoints (A, B).



Use permitted

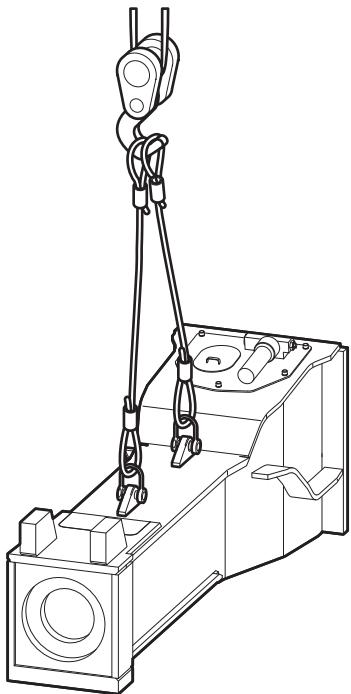


Use prohibited

- the lifting eye is bent.
- you detect cracks in the lifting eye or the weld seam.
- ▶ Contact the Epiroc Customer Center / Dealer in your area if the lifting eye is worn in any way.

4.1 Transport using a crane

- Secure the hydraulic attachment with ropes or chains as shown in the following illustration.



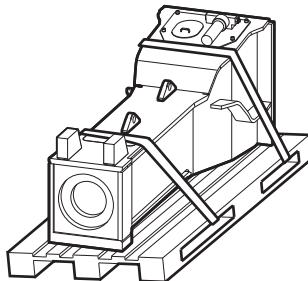
- Slowly lift the hydraulic attachment.
- Place the hydraulic attachment on timber support blocks.

4.2 Transport using a forklift truck

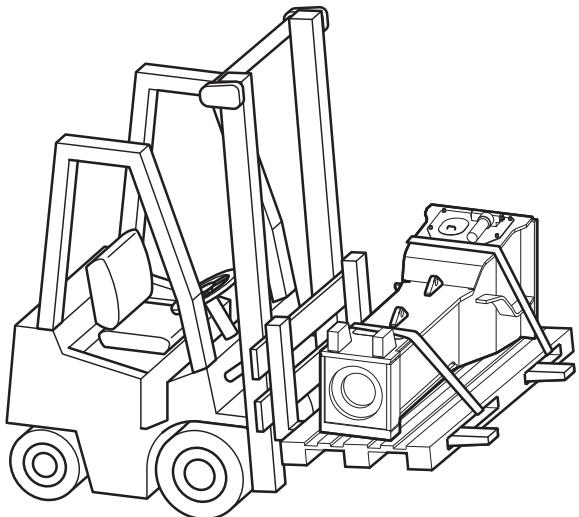
▲ WARNING Hydraulic attachment tipping over

The hydraulic attachment tipping off the fork of the forklift truck or the pallet may cause serious injury.

- ▶ Place the hydraulic attachment on a pallet.
- ▶ Strap the hydraulic attachment to the pallet using suitable strapping, as shown in the illustration below.
- ▶ Move the fork of the forklift truck under the pallet so that the centre of gravity is between the prongs.



- Move the fork of the forklift truck under the pallet so that the hydraulic attachment cannot tip over.



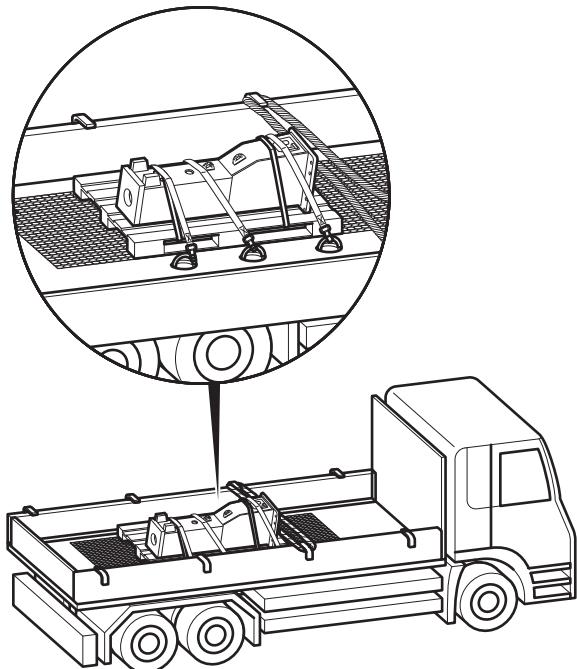
- Slowly lift the pallet with the hydraulic attachment.
- Transport the pallet with the hydraulic attachment to the location provided for.

4.3 Transport using a truck

⚠ WARNING Hydraulic attachment tipping over / slipping

The hydraulic attachment slipping or tipping over and falling from the loading area of a lorry may cause serious injury.

- ▶ Place the hydraulic attachment on a pallet.
- ▶ Strap the hydraulic attachment to the pallet using suitable strapping (see illustration in chapter **Transport using a forklift truck**).
- ▶ Place the pallet with the hydraulic attachment on an anti-slip mat.
- ▶ Secure the hydraulic attachment to the loading area with ropes or chains; use any available transport lugs.
- Secure the hydraulic attachment on the pallet and the loading surface as shown in the following illustration.
- Observe all the applicable national/regional regulations on securing loads.



5 Installation

▲ WARNING Hot hydraulic oil squirting out

The hydraulic system is under high pressure. If hydraulic connections come loose or are disconnected, hydraulic oil will squirt out under high pressure. Hydraulic oil squirting out can lead to serious injury.

- Depressurise the hydraulic system before connecting or disconnecting the hydraulic circuits of the hydraulic attachment (see chapter **Depressurising the hydraulic system**).

NOTICE Environmental damage due to hydraulic oil

Hydraulic oil is environmentally harmful and must not penetrate the ground or enter the water table or water supplies.

- Collect any hydraulic oil which escapes.
- Dispose of it in accordance with the applicable environmental regulations.

NOTICE Damage to the hydraulic attachment

Working with a hydraulic attachment mounted to a long reach boom may cause damage to the hydraulic attachment.

- Before working with a hydraulic attachment mounted to a long reach boom consult the Epiroc Customer Center / Dealer in your area.

5.1 Media/consumables

The following consumables are used when operating the hydraulic attachment:

5.1.1 Mineral hydraulic oil

All hydraulic oil brands prescribed by the carrier manufacturer are also suitable for use when operating the hydraulic attachment.

However, the oil should comply with viscosity class HLP 32 or higher.

In summer and in hot climates, oils of viscosity class HLP 68 or higher should be used.

In all other respects the regulations of the carrier manufacturer are to be taken into consideration.

Optimum viscosity range	= 30 - 60 cSt
Max. start viscosity	= 2000 cSt
Max. oil temperature	= 80 °C

Special conditions apply to using the hydraulic attachment at low temperatures (see chapter **Low ambient temperature**).

- Check the oil filter!

An oil filter must be integrated in the tank line of the hydraulic system. The maximum mesh width allowed for the oil filter is 50 microns; it must have a magnetic separator.

5.1.2 Non-mineral hydraulic oil

NOTICE Mixed hydraulic oil

Never mix mineral and non-mineral hydraulic oils! Even small traces of mineral oil mixed in with non-mineral oil can result in damage to both the hydraulic attachment and the carrier. Non-mineral oil loses its biodegradability.

- Only use one type of hydraulic oil.

If you are using non-mineral oil it is imperative that the name of the oil in use be indicated when returning the hydraulic attachment for repair.

In order to protect the environment or on technical grounds, hydraulic oils are currently being used which are not classified as HLP mineral oils.

Before using hydraulic oils of this kind it is imperative to ask the carrier manufacturer whether operations with such fluids are possible.

Our hydraulic attachments are basically designed for use with mineral oils. Consult the Epiroc Customer Center / Dealer in your area before using other hydraulic oils approved by the carrier manufacturer. Following initial assembly and after any workshop repairs, our hydraulic attachments are subjected to a test run on a test bed powered by **mineral oil**.

5.1.3 Grease

- When handling oils and greases observe the safety instructions that apply to these products.

Media / consumables	Part number
Chisel paste (for ContiLube® II)	3363 1223 56 (Bio) 3363 0912 00
Parker O-Lube	

5.1.4 Gas

Normal nitrogen, purity degree 99.8 %

Media / consumables	Part number
Nitrogen bottle 2 l	3363 0345 04
Nitrogen bottle 5 l	3363 0345 06

5.2 Manufacturing the adapter plate

Construction Tools GmbH also supplies base plates to manufacture adapter plates alternatively to the adapter plates supplied.

NOTICE Adapter plate cracking

The adapter plate may crack if it is not designed for the high load.

- ▶ Take not only the weight of the hydraulic attachment but also the crowd force of the carrier, possible vibration etc. into account when dimensioning the adapter plate.
- ▶ Ensure that the design conforms to the state of the art.
- ▶ Have the web plates welded to the adapter plate base plate by a qualified welding specialist.

The base plate is made of the material EN10025-S355 J2G3.

- Have the web plates designed and manufactured or procure web plates to fit your carrier.
- Ensure that the web plates are welded to the base plate side marked "TOP".

The adapter plate must not strike in any position during operation of the hydraulic attachment.

Construction Tools GmbH does not design, manufacture or sell web plates for adapter plates.

5.3 Installing the adapter plate

NOTICE The adapter plate can come loose

The adapter plate can come loose if the fastening screws are not designed for local high loads.

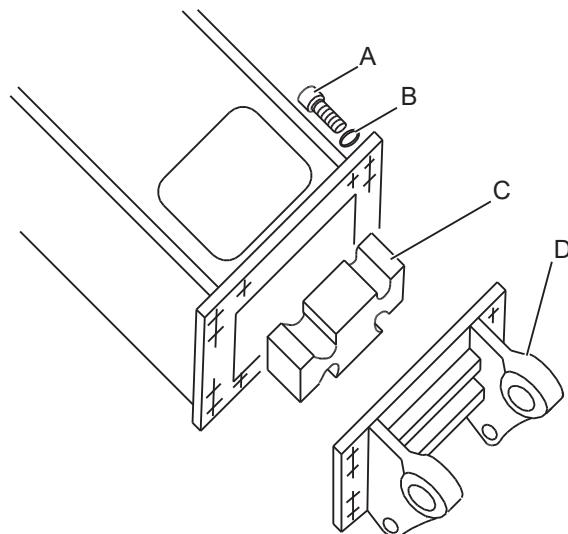
- ▶ Only use the Allen screws of strength category 8.8 and the pairs of lock washers included in the delivery to attach the adapter plate or the base plate.
- Place the hydraulic breaker on timber support blocks within the range of the carrier. The breaker box service opening must be facing upwards.
- Remove the transport safety device which keeps the elastic pad (C) and the percussion unit in the breaker box.
- Apply Anti-Seize to the Allen screw threads (A) before inserting them.

The contact faces of the screw head and the lock washers (B) must not be lubricated.

⚠ WARNING Hands and fingers being cut off or hurt

Bores and surfaces can act like a pair of scissors and cut off or hurt parts of your body.

- ▶ Never use your fingers to check bores or fitting surfaces.
- Align the adapter plate (D) to the hydraulic breaker as shown.



- Fit a pair of lock washers (B) onto every screw.
- Tighten the Allen screws (A) with an Allen key.
- Tighten the Allen screws (A) with the required tightening torque.

Type	Key size	Tightening torque
HB 2000 HB 2000 DP	22 mm (0.89 in.)	1500 Nm (1106 ft lbs)
HB 2500 HB 2500 DP	22 mm (0.89 in.)	1500 Nm (1106 ft lbs)

5.4 Attaching the hydraulic attachment to the carrier

5.4.1 Mechanical mounting aspects

You need an assistant to attach the hydraulic attachment to the carrier.

- Agree on hand signals with your assistant, to enable him to help you placing the carrier in the proper position to attach the hydraulic attachment.
- Lower the stick of the carrier into the holder provided on the adapter plate.

⚠ WARNING Injury by impacts

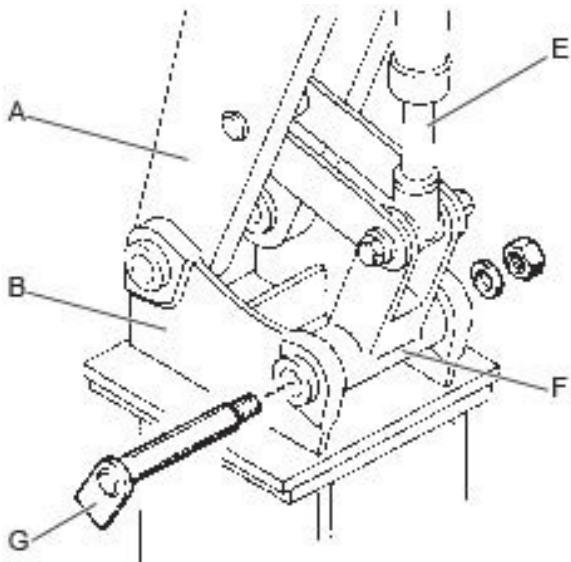
A sudden movement of the carrier may cause your assistant to be hit and injured by the boom or the hydraulic attachment.

- ▶ Only move the boom very slowly and in a controlled manner while an assistant is within the danger zone.
- ▶ Always keep sight of your assistant.

⚠ WARNING Hands and fingers being cut off or hurt

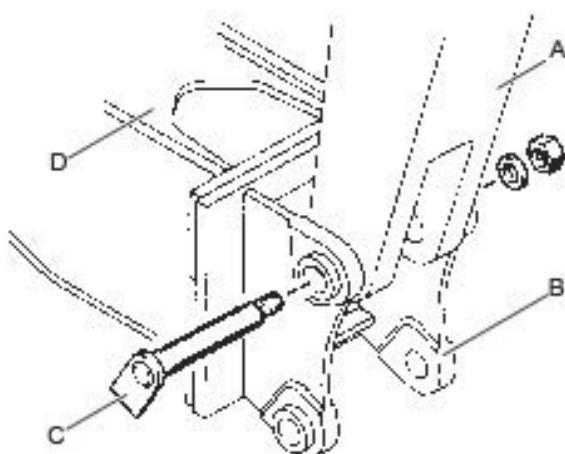
Bores and surfaces can act like a pair of scissors and cut off or hurt parts of your body.

- ▶ Never use your fingers to check bores or fitting surfaces.
- Let your assistant instruct you until the bores in the adapter plate (B) and in the stick (A) are properly aligned.
- Install the stick bolt (C) and lock it.



- Extend the bucket cylinder (E) until the bore in the linkage (F) links up with the bore in the adapter plate (B).
- Install the linkage bolt (G) and lock it.
- Carefully move the bucket cylinder (E) into both end positions.

The adapter plate must not be stopped by mechanical stops in either position. Consult the Epiroc Customer Center/Dealer in your area if the adapter plate is stopped by a mechanical stop.



- Lift the hydraulic attachment (D).

5.4.2 Making the hydraulic connections

NOT/ICE Faulty hydraulic installation

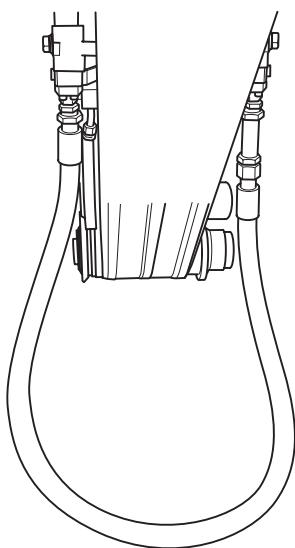
The carrier must have a suitable hydraulic installation to operate the hydraulic attachment. Improperly installed lines and incorrectly rated sizes may cause the oil to heat up and the hydraulic attachment to be damaged.

- ▶ Only use hydraulic lines of the rated sizes as instructed (see chapter **Technical Specifications**).
- ▶ Check the rated size of the hydraulic lines on existing hydraulic installations! All supply and return lines for the hydraulic oil must have a sufficient inside diameter and wall thickness.
- ▶ Route all hydraulic hoses in a torsion-free manner.
- Switch off the carrier.
- Depressurise the hydraulic system according to the manufacturer's safety and operating instructions for the carrier.
- If no quick couplings are used, close all shut-off valves in the installation at the boom.

NOTICE Total damage to the hydraulic attachment

Polluted hydraulic lines and connections may enable sand, fragments of material and dirt to penetrate the hydraulic attachment and damage it completely.

- ▶ Clean the hydraulic lines and connections before connecting the hydraulic hoses. Lay all hydraulic hoses so that they are torsion-free.
- Install the pressure and tank hoses.
- Connect the pressure and tank hoses.



- If no quick couplings are used, open the shut-off valves in the installation at the boom.
- Switch on the carrier.
- Let the hydraulic oil run through the carrier oil filter for approx. three minutes to make sure that the hoses are clean.
- Switch off the carrier.
- Depressurise the hydraulic system according to the manufacturer's safety and operating instructions for the carrier.
- If no quick couplings are used, close all shut-off valves in the installation at the boom.
- Disconnect the pressure and tank hoses.

⚠ WARNING Components bursting

Components of the swivel joint may burst. Metal parts may become projectiles and cause serious injuries and damage property.

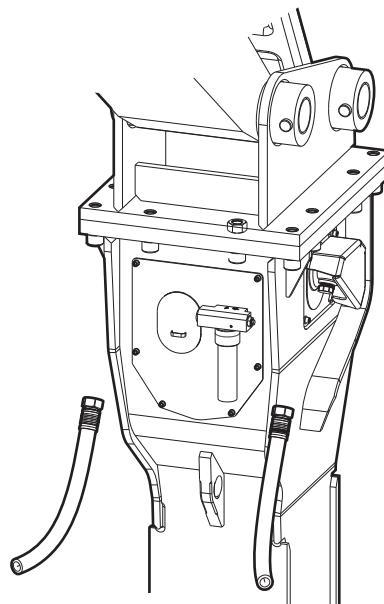
- ▶ Always check the swivel joint covers are fitted properly when attaching the hydraulic breaker to the carrier.
- ▶ Tighten loosen screw connections (see chapter **Bolt connections / Tightening torques**).
- ▶ Immediately replace a defective swivel joint cover.
- Remove the caps from the ports »P« and »T« and save them for future use.
- The pressure port »P« has been marked with red paint as an extra reference.
- Check that the ports and connections on the hydraulic breaker and/or on the hydraulic hoses are not damaged.
- Replace any damaged connections.
- Connect the pressure hose to port »P«, making sure it is torsion-free.
- Connect the tank hose to port »T«, making sure it is torsion-free.

⚠ WARNING Hydraulic hose flailing about

Pressurised hydraulic hoses will flail about if a bolted connection comes loose or becomes loosened. A hydraulic hose flailing about may cause serious injuries.

- ▶ Tighten the fastening screws with the right tightening torque.

Tightening torque (see chapter **Bolt connections / Tightening torques**).



5.5 Removing the hydraulic attachment from the carrier

- Place the hydraulic attachment on timber support blocks.

5.5.1 Dismantling the hydraulic connections

⚠ WARNING Unexpected movement

Sudden movements of the carrier may cause serious injury.

- ▶ Secure the carrier such that it cannot move unexpectedly.
- ▶ Observe the carrier manufacturer's instructions.

⚠ WARNING Hydraulic hose flailing about

Pressurised hydraulic hoses will flail about when bolted connections have come loose or have been loosened. A hydraulic hose flailing about may cause serious injuries.

- ▶ Depressurise the hydraulic system before disconnecting a hydraulic hose (see chapter **Depressurising the hydraulic system**).

⚠ WARNING Hot parts

The percussion unit, the working tool, hoses, pipes and fittings become very hot during operation. Touching them may lead to burns.

- ▶ Never touch hot parts.
- ▶ If you have to carry out activities where you have to touch the parts, wait for them to cool down first.
- Close all shut-off valves in the installation at the boom if no quick couplings are used.
- Disconnect the hose lines to and from the hydraulic attachment at the boom side.
- Close off all open hose ends.

5.5.2 Mechanical disassembly

- You need an assistant to remove the hydraulic attachment.
- Agree on hand signals with your assistant, to enable him to help you move the boom.

⚠ WARNING Injury by impacts

A sudden movement of the carrier may cause your assistant to be hit and injured by the boom or the hydraulic attachment.

- ▶ Only move the boom very slowly and in a controlled manner while an assistant is within the danger zone.
- ▶ Always keep sight of your assistant.

⚠ WARNING Metal chips shooting off

When hammering out bolts, chips may shoot off and cause serious eye injuries.

- ▶ Wear safety glasses when hammering out the bolts.
- Remove the bolt locks from the stick and linkage bolts.
- Drive out the linkage bolt with a steel arbor and a hammer.
- Switch on the carrier.
- Retract the bucket cylinder.
- Drive out the stick bolt with a steel arbor and a hammer.
- Move the carrier stick out of the adapter plate.

5.6 Removing the adapter plate

- Loosen the fastening screws of the adapter plate.
- Lift the adapter plate with a suitable lifting equipment and put it down on timber support blocks.
- Lock the elastic pad with the transport safety device.
- Save the fastening screws and the pairs of lock washers for future use.

5.7 DustProtector

- Place the hydraulic breaker on timber support blocks.

⚠ WARNING Unexpected movement

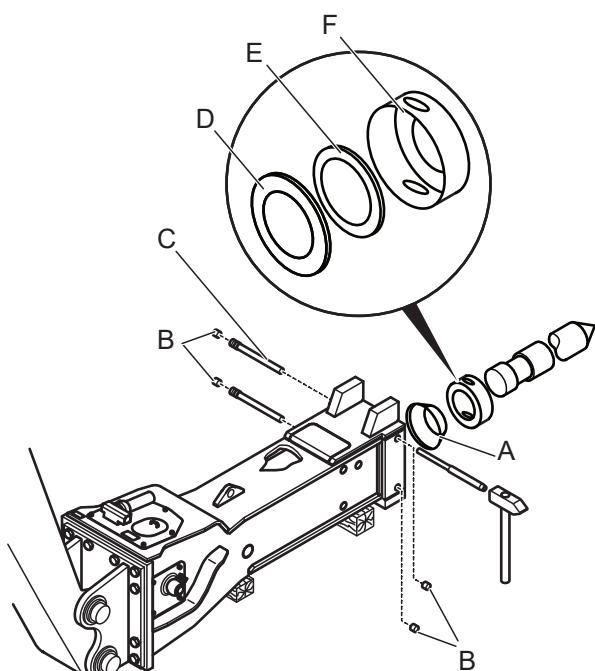
Sudden movements of the carrier may cause serious injury.

- Secure the carrier such that it cannot move unexpectedly.
- Observe the carrier manufacturer's instructions.

⚠ WARNING Metal chips shooting off

When hammering out bolts, chips may shoot off and cause serious eye injuries.

- Wear safety glasses when hammering out the bolts.



5.7.1 Removal

- Remove the working tool (see chapter **Working tool/Removal**) before removing the DustProtector.

- Remove the plugs (B) from the breaker box.
- Drive out the lock bolts (C) of the DustProtector using a pin punch and a hammer.
- Remove the guide ring (F), floating ring (E) and counter ring (D) of the DustProtector system.
- Remove the wiper (A).

To make the wiper (A) easier to remove: Push the sealing lip of the wiper inwards with your thumb. This pushes the wiper out of the wiper sleeve ring groove.

5.7.2 Installation

- Before installing the DustProtector, install the working tool (see chapter **Working tool/Installation**).
- Manually push the wiper (A) over the working tool and let it click into place in the wiper sleeve ring groove.
- Use a tool (hammer handle) to push on the wiper (A) at several points.
- Use your thumbs to push the wiper into place along its circumference.
- Apply chisel paste to the guide ring (F), floating ring (E) and counter ring (D).
- Install the floating ring (E) and counter ring (D) in the guide ring (F).
- Push the rings over the working tool and install them in the lower part of the breaker box.
- Turn the guide ring (F) so that the apertures in the breaker box and the guide ring are lined up.
- Drive the lock bolts (C) into place using a pin punch and a hammer.
- Seal the apertures in the breaker box with the plugs (B).

5.8 Working tool

⚠ WARNING Unexpected movement

Sudden movements of the carrier may cause serious injury.

- ▶ Secure the carrier such that it cannot move unexpectedly.
- ▶ Observe the carrier manufacturer's instructions.

⚠ WARNING Metal chips shooting off

When hammering out bolts, chips may shoot off and cause serious eye injuries.

- ▶ Wear safety glasses when hammering out the bolts.

⚠ WARNING Heavy working tool

The working tool is heavy; if it falls it may cause serious injury. Lifting the working tool without suitable lifting equipment may lead to physical injury.

- ▶ Lift the working tool with lifting equipment designed for the weight of the working tool.

⚠ WARNING Hands and fingers being cut off or hurt

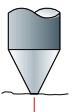
Bores and surfaces can act like a pair of scissors and cut off or hurt parts of your body.

- ▶ Never use your fingers to check bores or fitting surfaces.
- ▶ Do not reach into the aperture in the lower breaker part or between the working tool and the lower breaker part.

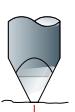
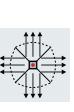
5.8.1 Selecting the right working tool

The standard available working tools are shown. The different cutter geometries may influence the production result, depending on the actual use. Please consult the following table for recommended uses.

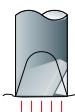
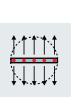
Conical moil point

		<p>Suitable for universal use</p> <p>Very good penetration Even splitting effect distribution No torsion effect</p>
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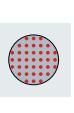
Pyramidal moil point

		<p>Suitable for universal use</p> <p>Very good penetration Even splitting effect distribution Slight torsion effect</p>
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Chisel and spade

		<p>Mining, demolition work, ground work, foundations</p> <p>Very good splitting effect distribution Very good penetration Torsion effect</p>
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Blunt tool

		<p>Mining, block holing, demolition work</p> <p>Very good energy transfer Optimum in-cutting effect No torsion effect</p>
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