HYPER 121

Maintenance and Operating Manual

N120

ISOQAR REGISTERED
UKAS MANAGEMENT SYSTEMS
0026
Certificate No. 2448/00

CONTENTS

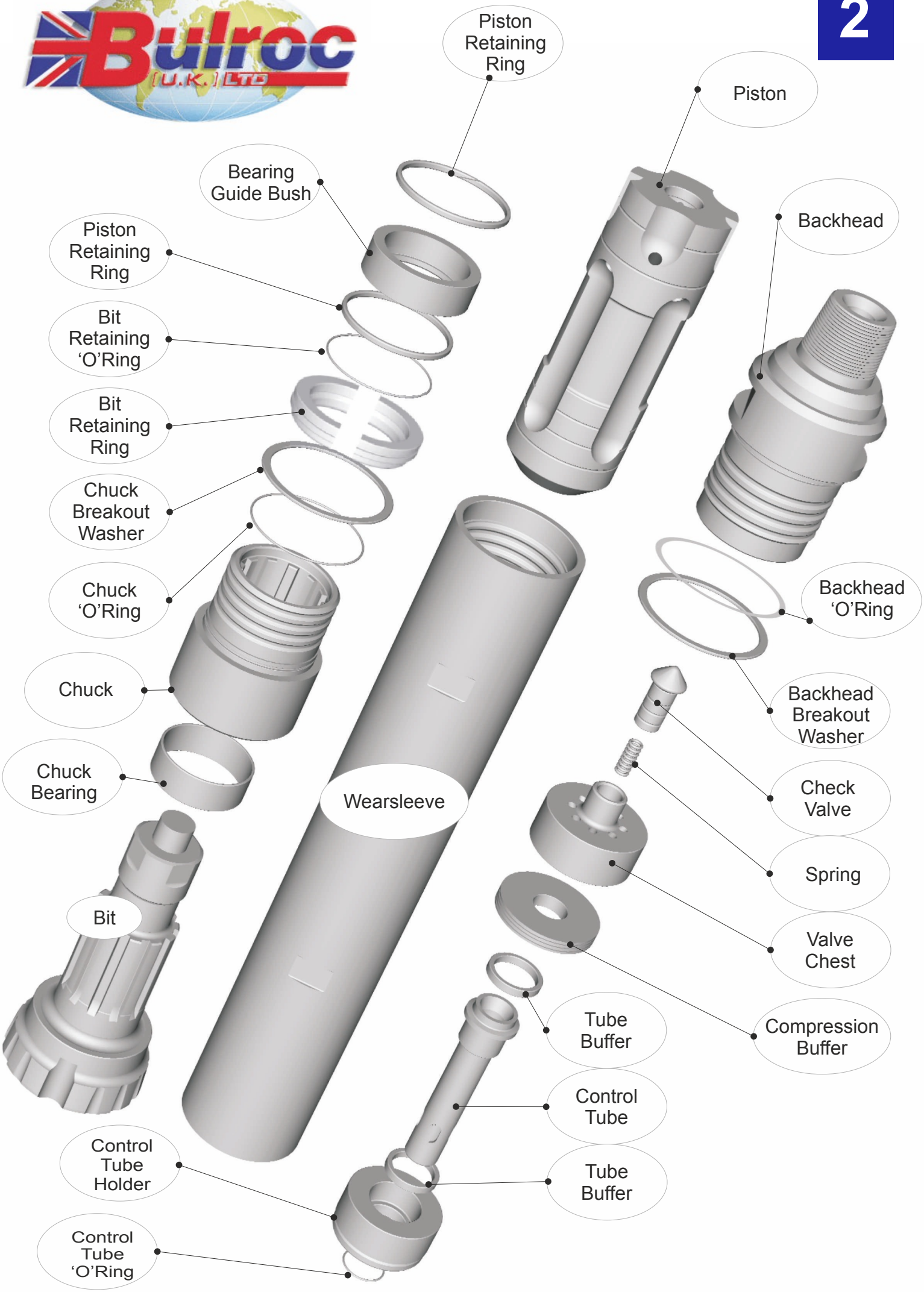
1.INTRODUCTION

The Bulroc Hyper 121 is a strong, robust tool of a simple and straight forward design to provide maximum performance with a minimum of maintenance. The Hyper 121 Hammer is designed to operate efficiently at air pressures between 100 PSI (7 Bar) and 250 PSI (17.2 Bar).

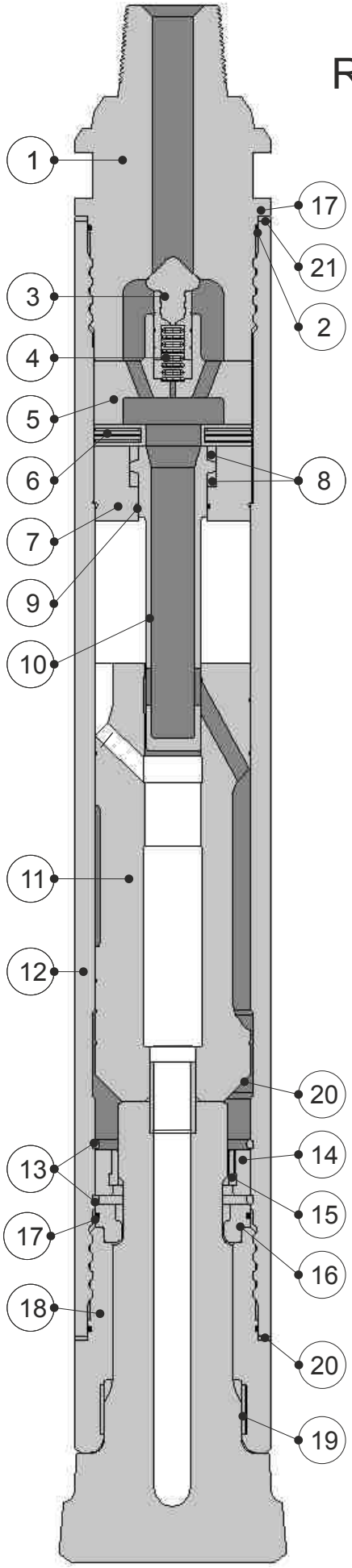
The Hyper 121 hammer is designed as standard with a check valve arrangement which is designed to maintain the pressure inside the hammer when the air is switched off and so help prevent contaminated water from entering the hammer.

The Hyper 121 hammer is designed to give optimum performance with the minimum consumption of compressed air. If however, for particular deep-hole applications, the hammer is designed with a soft faced control tube, that can be drilled through to give extra flushing.

ALWAYS THINK SAFETY FIRST!

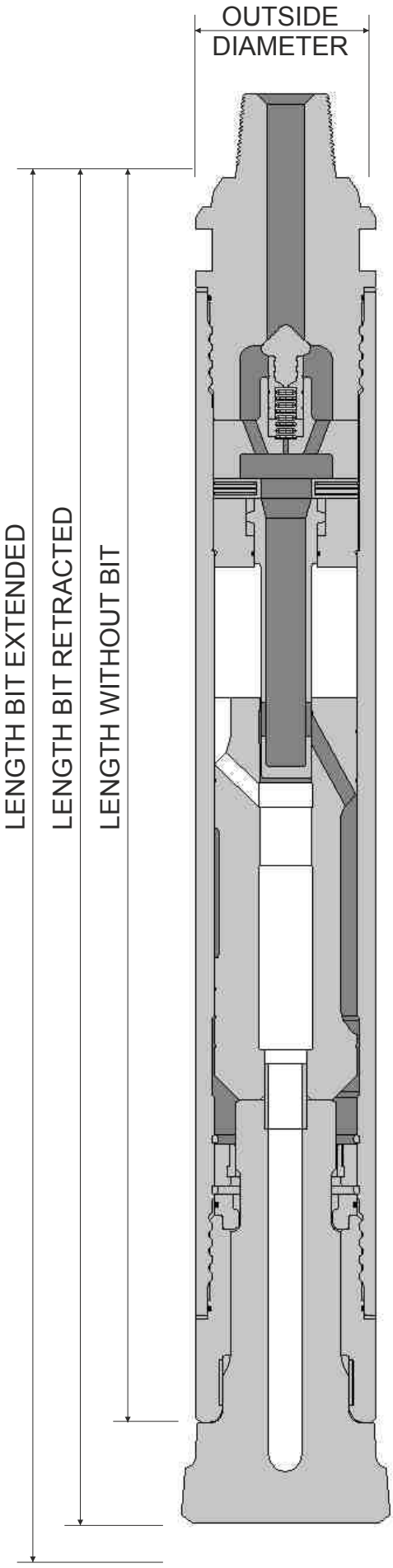

Piston Retaining Ring
Piston
Bearing Guide Bush
Backhead
Piston Retaining Ring
Bit Retaining 'O'Ring
Bit Retaining Ring
Chuck Breakout Washer
Chuck 'O'Ring
Backhead 'O'Ring
Chuck
Backhead Breakout Washer
Chuck Bearing
Wearsleeve
Check Valve
Spring
Bit
Valve Chest
Tube Buffer
Compression Buffer
Control Tube
Control Tube Holder
Tube Buffer
Control Tube 'O'Ring

3. HAMMER PARTS



REF	DESCRIPTION	PART
1	Backhead $6^{5}/_{8}$ Reg Pin.	HSH1213880M
2	Backhead 'O' Ring	HSH121140
3	Check Valve	HSH12108
4	Check Valve Spring	HSH12110
5	Divertor	HSH12107
6	Compression Buffer	HSH12128
7	Tube Holder	HSH12131
8	Tube Buffers (2)	HSH12129
9	Tube 'O' Ring	HSH12130A
10	Control Tube	HSH12130
11	Piston	HSH12103050
12	Wearsleeve	HSH12100
13	Piston Retaining Rings (2)	HSH12132
14	Bearing Guide Bush	HSH12186
15	Bit Bearing	HSH12186BEA
16	Bit Retainer (pair)	HSH12137050
17	Bit Retainer 'O' Ring	HSH12137AST
18	Chuck	HSH12135050
19	Chuck Bearing	HSH12135050BE
20	Breakout Washer (Chuck)	HSH12125
21	Breakout Washer (Bkhd)	HSH12126
	COMPLETE HAMMER	**BR121H01**

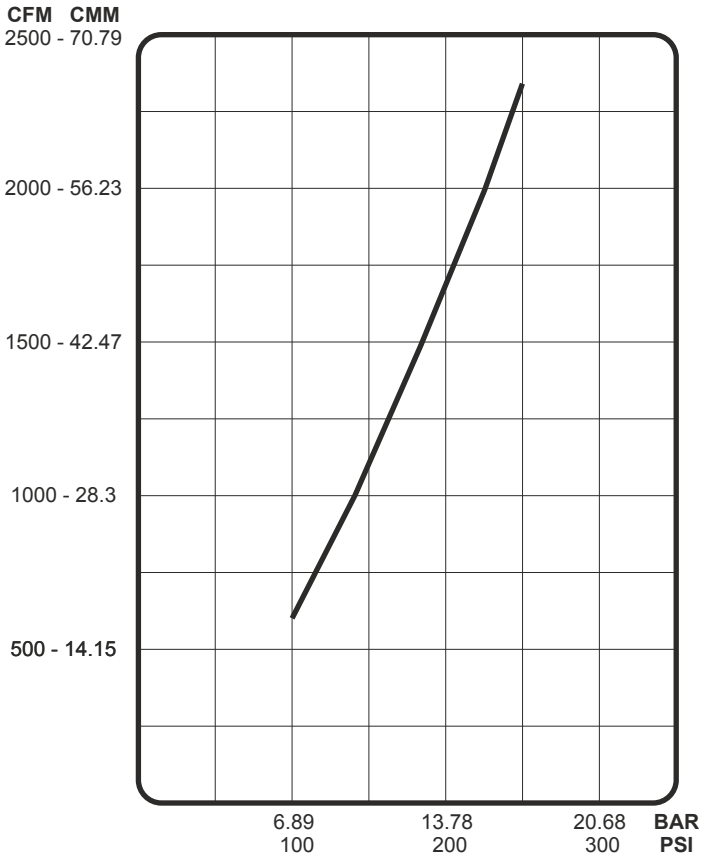
4. HAMMER SPECIFICATIONS



Standard Backhead Connection	6 5/8" API REG PIN
Chuck Connection Configuration	N120
Length without Bit	73.6" 1869mm
Length Bit Extended	83.8mm 2128mm
Length Bit Retracted	81.4" 2067mm
Outside Dia Hammer	10.7" 272mm
Outside Diameter Chuck	10.7" 272mm
Bore Diameter	8.5" 216mm
Piston Stroke	5" 127mm
Piston Weight	246lbs 112kg
Complete Hammer weight without bit	1487lbs 676kg

NB LENGTHS BASED ON A 445mm dia BUTTON BIT

5.AIR CONSUMPTION



Working Pressure

Drill through this face should extra flushing be required see below

Extra flushing air for a choke in cubic feet per min

Hole Size	100 psi	150 psi	200 psi	250 psi
6mm	68	98	128	157
10mm	152	220	287	352
13mm	270	390	510	627
16mm	422	593	796	980
19mm	607	855	1147	1410

Extra flushing air for a choke in cubic metre per min

Hole Size	100 psi	150 psi	200 psi	250 psi
6mm	1.92	2.77	3.62	4.44
10mm	4.30	6.22	8.12	9.96
13mm	7.64	11.04	14.44	17.75
16mm	11.94	16.79	22.54	27.75
19mm	17.18	24.21	32.47	39.92

Total air requirements for chokes in cubic feet per min

Hole Size	100 psi	150 psi	200 psi	250 psi
blank	591	1087	1673	2338
6mm	660	1185	1801	2495
10mm	743	1307	1960	2690
13mm	861	1477	2183	2965
16mm	1013	1680	2469	3318
19mm	1198	1942	2820	3748

Total air requirements for chokes in cubic metre per min

Hole Size	100 psi	150 psi	200 psi	250 psi
blank	16.75	30.78	47.41	66.22
6mm	18.67	33.55	51.02	70.67
10mm	21.05	37.01	55.52	76.19
13mm	24.39	41.82	61.84	83.98
16mm	28.70	47.57	69.94	93.97
19mm	33.94	54.99	79.88	106.15

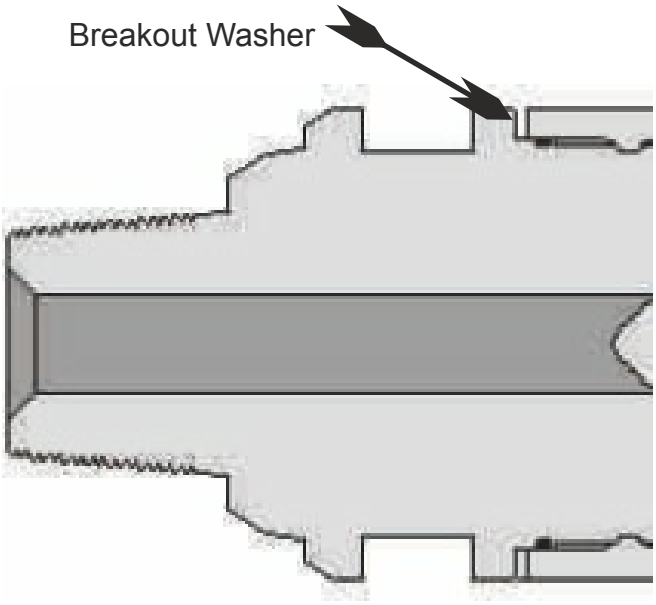
Additional Flushing

The Hyper 121 has a control tube with a softened face which can be easily drilled through to allow foe extra flushing air should this be required.
In certain drilling conditions extra flushing air may be required to overcome increasing back pressure and maintain the necessary up hole velocity to ensure efficient hole cleaning. In such conditions, a small hole can be drilled into the face of the control tube which will allow extra live air to be delivered directly to the bit face. The size of the hole will determine the extra volume of air delivered to the bit face depending on the operating pressure.

The top two tables show the extra flushing air which can be expected with the chokes drilled.

The lower two tables shows the total air required for optimum hammer performance with the chokes drilled.

6.STRIPPING THE HAMMER



NOTE:- All components must be washed clean and laid out on a dirt free surface to enable inspection to take place. The stripping pocedure is explained in the following section,

Assuming both the Chuck and the Backhead threads have been loosened either on the Drilling Rig or by using a Hydraulic Splitter, the stripping procedure is as follows

Note:- On no account should the wearsleeve be impacted by a hand hammer or splitting be assisted by use of localised heat: ie. Welding/blow torch. Should splitting prove difficult, The breakout washers can be ground out, taking care not to deface other pieces of the drill, to relieve pressure and help splitting,

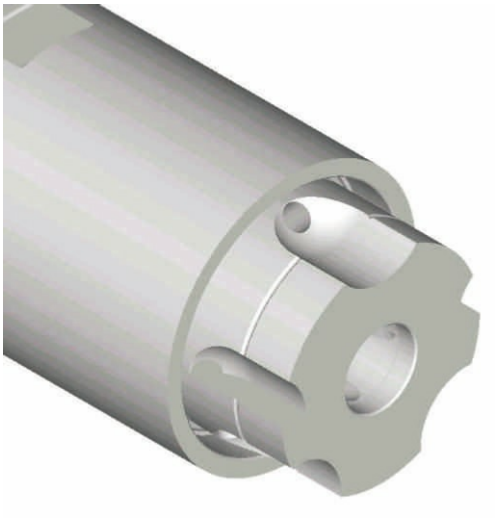
1. First remove the chuck assembly. This comprises the Button Bit, Chuck Release Washer, Chuck 'O' Ring, and Bit Retainers.

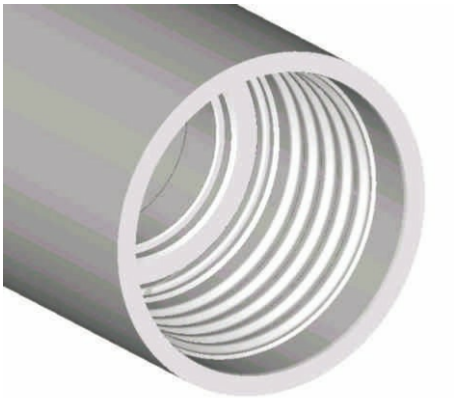
2. With the hammer laid horizontal, unscrew the Backhead and remove it from the Wearsleeve.

3. The Valve Chest along with the Check Valve arrangement can now be pulled from the Backhead end. The reamaining control tube buffers etc, will also come out at this stage. Should these parts be stuck, lifting the wearsleeve at the chuck end slowly, should allow the piston to fall onto the back parts and allow these parts to move and allow them to be removed.

7.STRIPPING THE HAMMER

4. Lifting the Chuck end of the Wearsleeve again will allow the Piston to slide to the end face from where it can be removed.





5. At the chuck end of the wearsleeve, the bit bearing needs to be removed and replaced if necessary. Prising out the forward bit retaining ring will allow the bearing and bearing holder to move forward and out of the wearsleeve.

6. If the bearing is worn or damaged, it should be replaced by inserting a blade into the bearing slot and prising out the old bearing.

7.The bearing in the chuck can be removed in exactly the same way. Check the condition of the chuck bearing and replace if necessary.

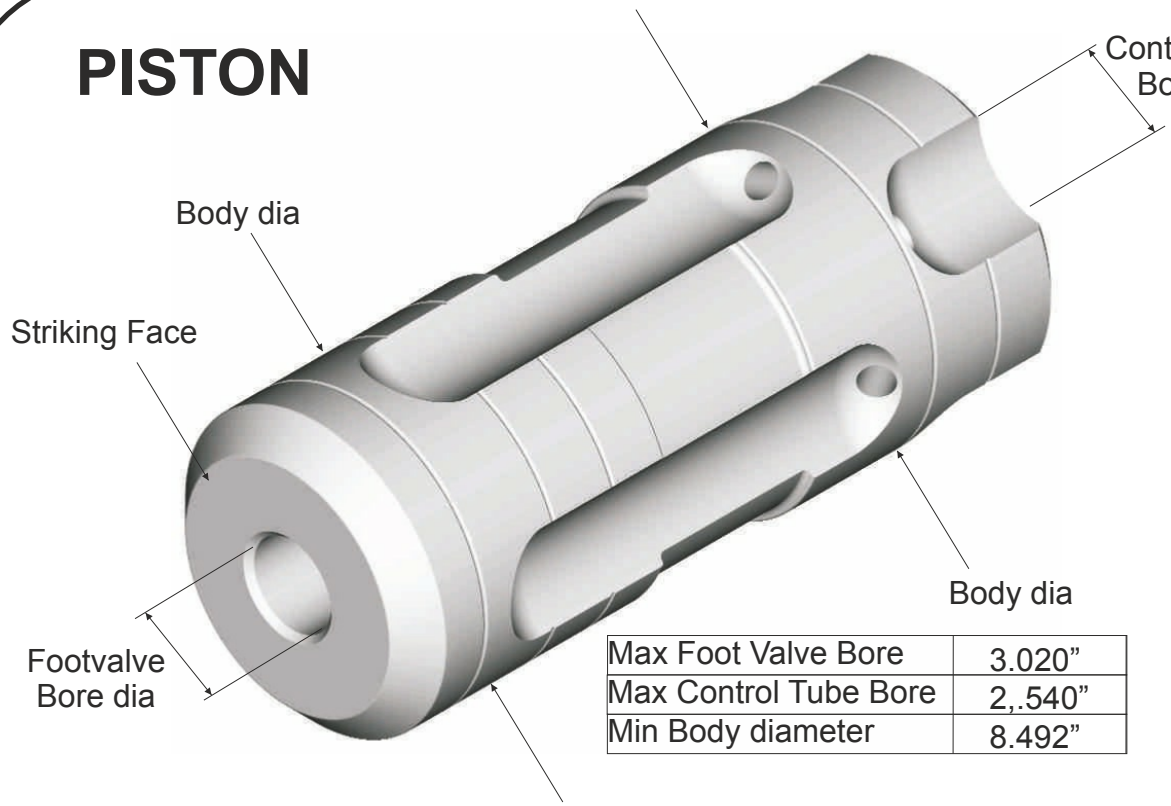
8.CHECKING FOR WEAR AND DAMAGE .

Premature wear to internal parts is a result of either:-

1. Insufficient or incorrect lubrication.
2. The ingress of debris in the hammer.
3. Incorrect service and storage.

The maximum wear allowance shown in this section are a guide as to when to replace parts. In certain conditions parts may need to be replaced before they reach the sizes shown.

PISTON



Max Foot Valve Bore	3.020”
Max Control Tube Bore	2,.540”
Min Body diameter	8.492”

1. There are two main areas to examine on a used piston:-

Check the body diameter for signs of pick-up and burning (both are signs of poor lubrication). Using a micrometer, measure the diameter and refer to the quoted minimum size above.

Any light ‘Pick up’ marks can be removed using emery cloth, however if there are signs of overheating and cracking, the piston should be replaced and the lubrication system examined.

2. Secondly, using a micrometer, measure the diameter of the bore at both ends of the piston and refer to the maximum quoted sizes.

3. Examine the striking face. Some degree of distortion is acceptable providing there are no signs of cracking. If distortion has affected the chamfer and possibly distorted the footvalve bore diameter, this needs to be reformed on a lathe and the footvalve bore re-ground to its original diameter. Burrs and dents can be removed with an emery stone.

8. CHECKING FOR WEAR AND DAMAGE

Maintaining the Piston Face

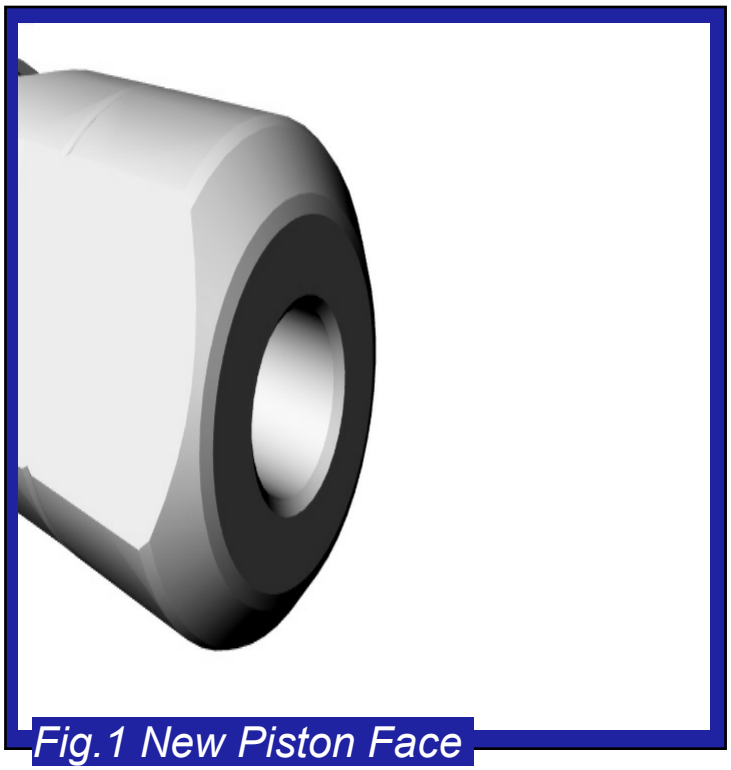


Fig.1 New Piston Face

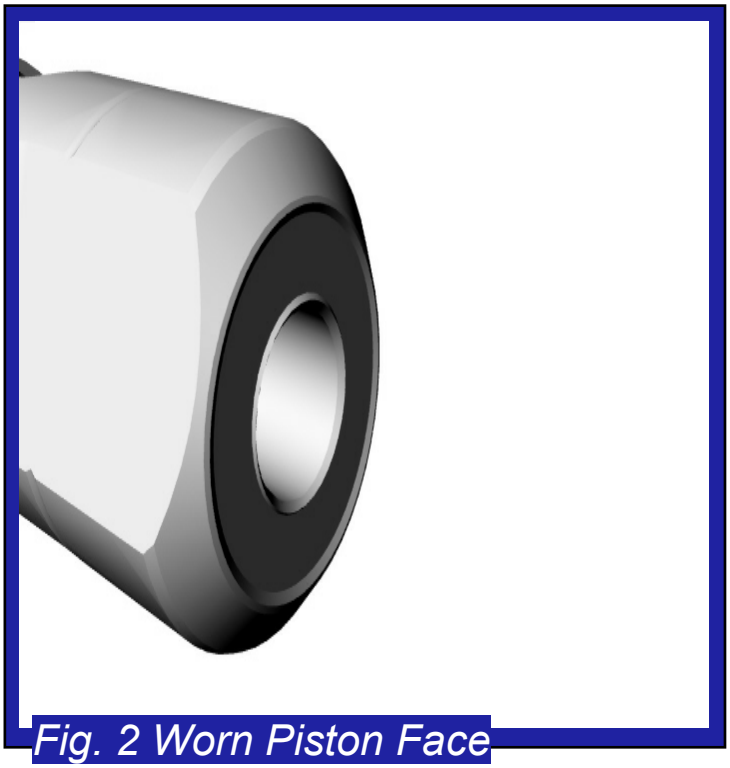


Fig. 2 Worn Piston Face

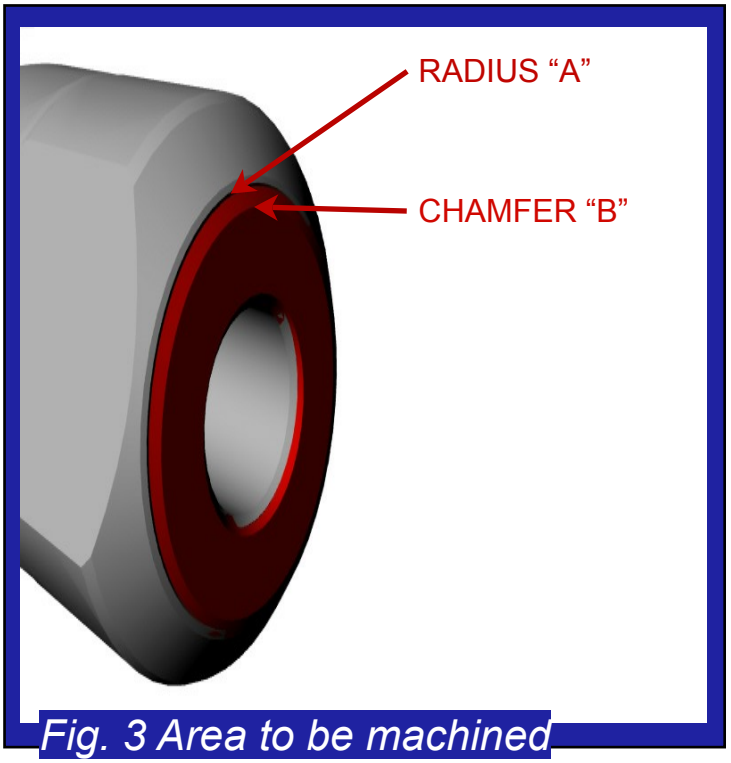


Fig. 3 Area to be machined

During the working life of the hammer the Striking Face on the Piston may become dented or deformed *(see fig.2)*. To prevent this face from cracking, or chipping, the Piston should be returned to a lathe where the strking face can be re-machined flat and then have the outer radius and inner chamfer reformed *(see fig.3)*..

Care should be taken to remove the minimum amout of material during this re-machining process and at no point should more than 2mm be removed from the face. **Pistons with wear patterns, or indentations deeper than 2mm should be replaced.**

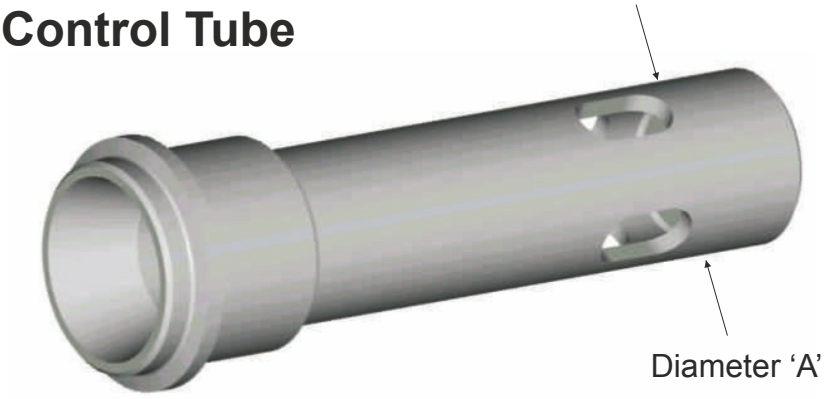
The table below contains useful machine information for reforming the piston face.

MACHINE DETAIL		
HAMMER	**RADIUS “A”**	**CHAMFER “B”**
HYPER 121	0.125”	0.250” @45

9. CHECKING FOR WEAR AND DAMAGE

Control Tube

Control Tube
Minimum Dia
2.992” (76mm)

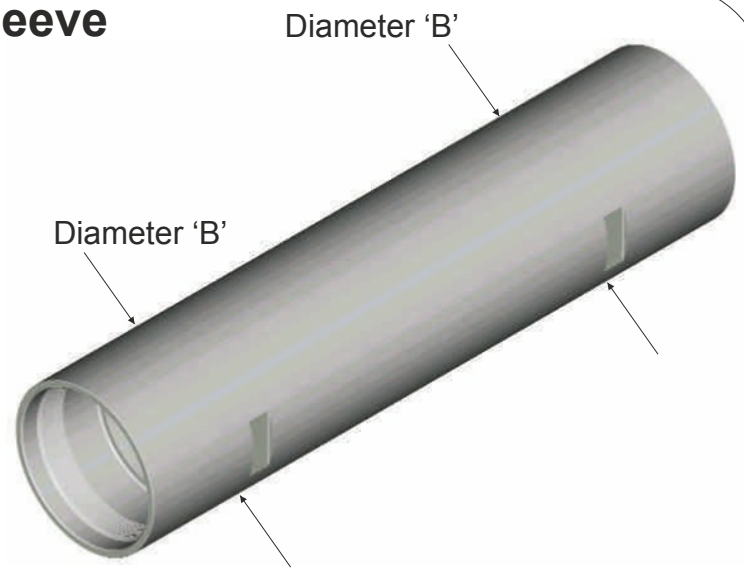


Examine the control tube diameter ‘A’, using a micrometer, check the diameter has not worn under the specified minimum.
If there are signs of pick-up they should be removed by using emery cloth.

Wearsleeve

Using either a micrometer or vernier, measure the outer diameter ‘B’ of the wearsleeve. If it is below the minimum it must be replaced. The wear rate of the wearsleeve can be slowed by replacing the chuck before the wear areas reaches the wear sleeve
If there are signs of pick-up in the bore they should be removed by using emery cloth.

Wearsleeve
Minimum Dia
10.45” (265mm)



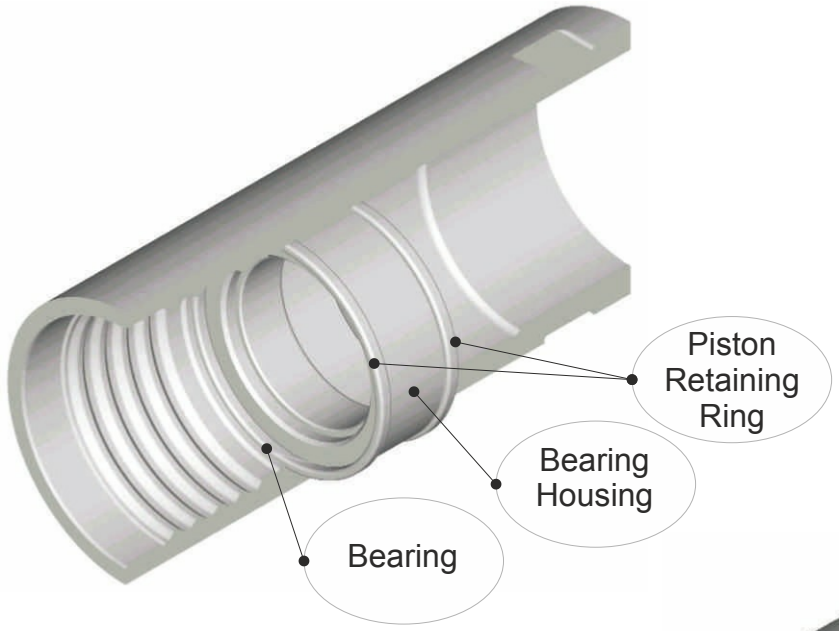
NOTE

If a piston has broken within the wearsleeve, it is imperative that the bore is honed to remove any burrs or ‘pick-up’

Failure to do so will result in ‘pick-up’ on the replaced piston and will lead to early failure of this component

10. REBUILDING THE HAMMER

Before rebuilding the hammer, check the wearsleeve, the back piston retaining should be checked for wear and damage. The easiest way to remove this is to invert the piston, and let it fall. The piston retaining ring will be dislodged.



1. Replace the parts in the wearsleeve.

Bearing, Housing, and piston retaining rings.

Ensure all the maintenance work outlined in the previous section has been completed.

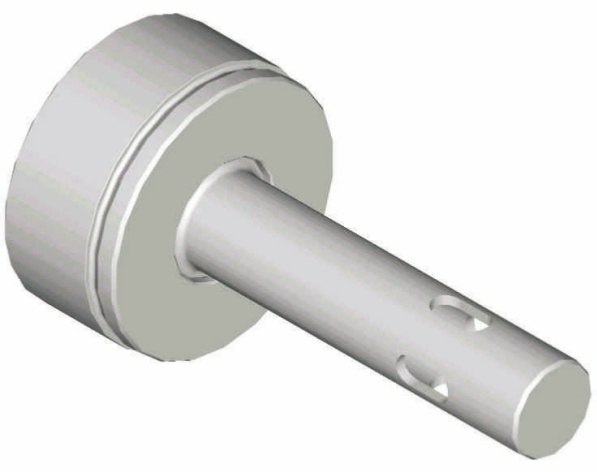
2. Replace the bearing in the chuck

3. Lay the Wearsleeve on two wooden blocks, support the chuck end so as to raise the sleeve 50mm - 70mm off the ground this will make it easier to screw in the chuck assembly.

4. Assemble the Chuck, Chuck Release Washer and Bit Retainers around the Bit ensuring the Chuck and Bit Retainers are fitted with new ‘O’ Rings.. Cover the threads with a Copper based grease. Then screw the Chuck fully in until there is no gap between the Wearsleeve and the Chuck Release Washer.

Coat the piston with rock drill oil and slide it into the backhead end of the wearsleeve. Ensure the piston striking face enters first.

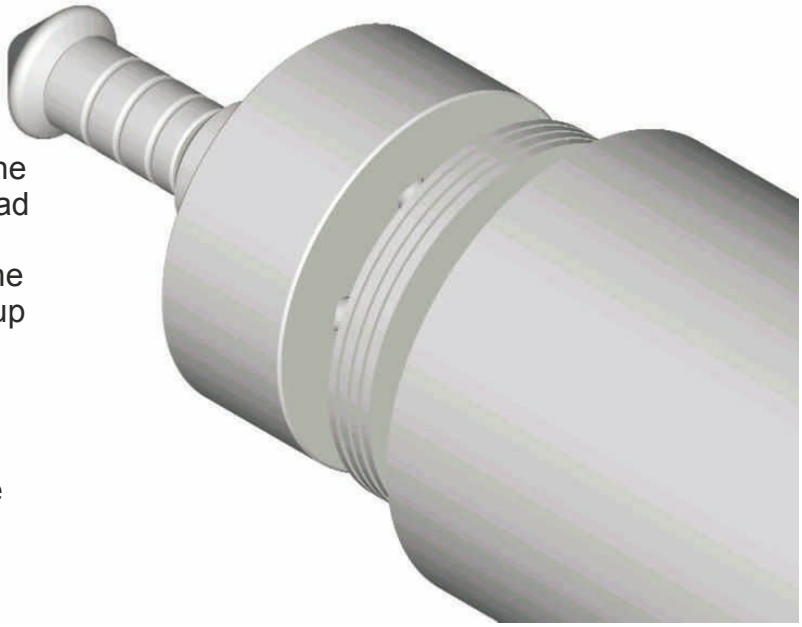
11. REBUILDING THE HAMMER



5. Assemble the two Control Tube Buffers and the ‘O’ Ring around the Control Tube, then push the assembly into the Tube Holder. Coat the outside of the assembly with rock drill oil and insert it into the Backhead end of the Wearsleeve

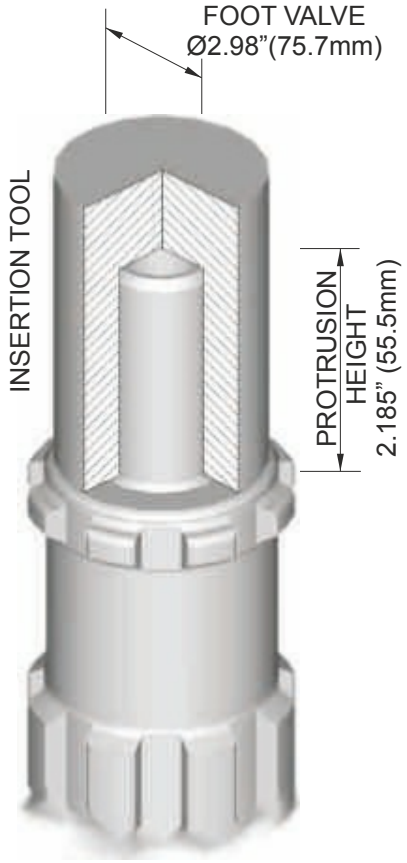
6. Slide the Compression Ring on to the Control Tube Assembly.

7. Insert the Spring into the Check Valve and then slide the assembly into the Valve Chest. Fit the Buffer Cover to the Valve Chest. Push the whole assembly down onto the Compression ring.



8. Fit a new ‘O’ Ring to the Backhead and coat the threads in Copper based grease. Fit the Backhead Breakout Washer. Screw the Backhead into the Wearsleeve until it is hand tight, then measure the gap between the Wearsleeve face and the lock-up face on the Backhead. This gap should be a minimum of 2mm, - if the gap is smaller the ring should be removed and replaced with a new Compression ring. When the gap exceeds 2mm the Backhead should be fully tightened using the appropriate Backhead Spanner.

12. BUTTON BIT FOOTVALVES



The Hyper 121 Hammer is designed to accept button bits with a N120 footvalve.
The correct footvalve must be fitted otherwise the performance of the hammer will be seriously affected.
Using a footvalve which is larger in diameter than specified will result in the rapid failure of the footvalve.
Using a footvalve which is smaller in diameter than the size shown will greatly reduce the performance of the hammer.
The protrusion height is also important and to ensure the correct height and prevent damage when replacing the footvalve, it is recommended that the correct insertion tool (Part number ITN120) is used.

13. LUBRICATION

The Hyper 121 piston oscillates at 850 bpm at 150 psi (10bar). It is therefore extremely important that an adequate supply of the correct type of rock drill oil is constantly fed to the hammer whilst it is operating.
Failure to do so will quickly lead to excessive component wear and if the oil supply is cut of for any reason, the piston will quickly seize inside the wearsleeve, resulting in irreparable damage to both components.
An air line lubrication system should be installed, preferably on the drill rig. The lubricator reservoir should be of sufficient capacity to supply the required volume of rock drill oil for a full shift. With larger hammers, this may be impractical but the capacity should be sufficient for at least half a shift.
This is equally important that the lubricator system must be adjustable and have a visual check to ensure the lubricator does not run out of oil.
As a good general guide, all Bulroc Hyper hammers require a third of a pint of oil per hour, per 100cfm of air through the hammer (0.07 litre per metre cubed)

Eg Hyper 121 operating at 150psi = 1087cfm = 3.62 pints per hour
10.3bar = 2.77cmm = 2.1 litre per hour

The amount of lubricating oil should be increased by 50% when drilling with water or foam.
When new drill pipes are added to the drill string, it is recommended that a half pint (a quarter of a litre) of rock drill oil is poured into the pipe to provide a good internal coating and helps prevent the hammer from running dry at any time. The grade of rock drill oil will be determined by the ambient temperature at the drilling site. If the ambient temperature is between 0 and 25 degree centigrade, then a 30 grade oil should be used. If the ambient temperature is greater than 25 degree centigrade, use a 50 grade oil.
Bulroc supply their own recommended rock drill oil and this is detailed below, together with other brands of suitable oils.

MAKE	MEDIUM SAE 30 ISO VG 100	HEAVY SAE 50 ISO VG 220
BULROC	T220	T320
BP	ENGERGOL RD-E 100	ENERGOL RD-E 300
CHEVRON	ARIES 100	ARIES 320
SHELL	TORCULA 100	TORCULA 320
ESSO/EXXON	AROX EP100	AROX EP320

13. STORAGE

We recommend following the points listed below when removing a 'Down hole hammer' from service. This will ensure trouble free operation once the hammer starts work again.

The hammer should be stripped and cleaned and free of all water/moisture as possible.
Bulroc T220 or similar rock drill oil should be poured into backhead (see chart below for quantity) allowing all parts to be coated throughout the hammer.
Both ends of the hammer should be then covered to prevent the ingress of dirt, etc.
It should be then laid horizontally in a dry environment ready for use next time.

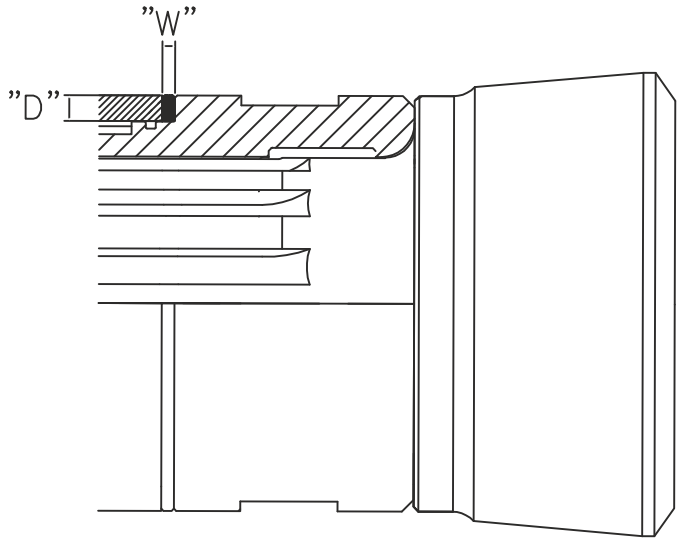
Model	Qty in UK Pints	Qty in liter's
Hyper 121	1¾	1

If this procedure is followed then apart from protecting the hammer from corrosion it will protect the parts from premature wear and of course reduce 'down time' and eventual repair costs.
However we strongly recommend that the hammer, especially if stored for any long periods of time should be stripped, cleaned, inspected and re-oiled prior use to be sure of smooth drilling.

15. TROUBLESHOOTING

INOPERATIVE DRILL	Drill bit blow holes Blocked	Unblock holes
	Dirt inside drill	Strip and clean drill
	Worn or damaged parts	Replace damaged parts
	Insufficient lubrication	Check oil level, adjust lube needle valve
	Excessive lubrication	Adjust lube valve needle
	Hanging piston	Piston stuck, polish out bores
	Insufficient air pressure	Check Compressor discharge and increase to operational pressure
SLOW PENETRATION	Insufficient air pressure	Check Compressor discharge and increase to operational pressure
	Blunt drill bit	Re-grind or change bit
	Worn drill bits	Replace worn parts
	Too much or to little lubrication	Check oil level and if necessary adjust tube needle valve
	Dirt in drill	Strip and clean
LOW RETURN AIR VELOCITY	Low air pressure	Increase air pressure
	Insufficient hole flushing air passing through hammer	Drill or increase hole size through the piston
	Drill bit exhaust holes blocked	Clean out blockage
SPASMODIC OPERATION	Failed or damaged parts	Overhaul drill
	Lack of oil	Check lubrication
	Drill bit broken	Replace bit
	Dirt in drill	Strip and clean

A. CHUCK RELEASE WASHERS



CHUCK RELEASE WASHERS		
HAMMER MODEL	"W"	"D"
HYPER 121	0.250" - 6.35mm	0.660" - 16.83mm

Chuck Release Washers are fitted to the Bulroc Range of Hyper Hammers to assist the removal of the Chuck from the Wearsleeve after drilling.

The Chuck Release Washer is manufactured from a composite material that reduces the friction between the lock up faces on the Chuck and Wearsleeve making it easier to overcome the tensional loading applied to these parts during the drilling process.

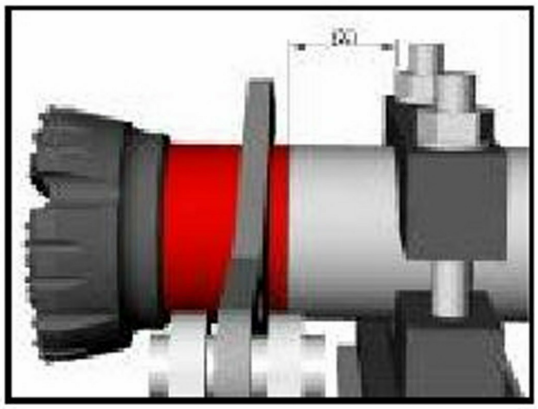
Due to the forces applied to the Chuck Release Washer you may find that its thickness ("W") is reduced during the drilling cycle and it is therefore recommended that a new Washer be fitted each time the Chuck is removed.

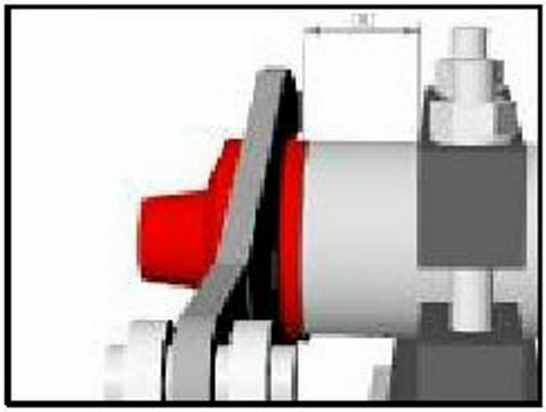
It is possible that on some of the larger Hammers in the Bulroc range, when drilling with large diameter Button Bits or Overburden Systems, certain conditions can generate higher torques than normally expected, resulting in difficulties when trying to remove the Chuck from the Wearsleeve. Should this occur then the removal of the Chuck can be achieved by cutting away the Chuck Release Washer. We do however stress at this point that cutting away the Chuck Release Washer is a final option and should not be done until all other options have proved unsuccessful.

If the cutting away of the Chuck Release Washer is necessary for the removal of the Chuck then it must be done with extreme care to avoid damage to either the Chuck or the Wearsleeve. The composition of the Chuck Release Washer allows for it to be cut with either a hacksaw or a small hand grinder equipped with a slitting wheel. The hacksaw method is much safer and less likely to damage the Chuck or Wearsleeve, but obviously much slower than the hand grinder with a slitting wheel. To remove the Chuck Release Washer a cut must be made in the centre of the washer all the way around it's circumference, and completely through the Washer, thus transforming the single washer into two thinner washers that will then spin freely. Great care must be taken, especially if the Washer is cut with a slitting wheel, to ensure that the cut only penetrates the Washer and does not pass through into the body of the Chuck.

The size shown as 'D" in the above table should be your MAXIMUM depth of cut, and it is recommended that either the saw blade or the slitting wheel are marked in some way so as to indicate when they have achieved this depth.

B. CLAMPING POSITIONS





CLAMP POSITIONS	
HAMMER MODEL	“X” DISTANCE FROM WEARSLEEVE END FACE
Hyper 121	10.500” / 267mm

There are many different “Splitting” Machines available for unscrewing the threaded connections on a Bulroc Hyper Hammer, some are attachments to the Drill Rig, others are independent hydraulic units, or purpose made Bench arrangements. Regardless of which machine is chosen they all require some method of securing the Wearsleeve whilst applying a torque to either the Chuck or Backhead.

The most common machines use either Clamps or Chains around the O/D of the Wearsleeve and the positioning of these is very important, if they are placed too close to the joint being “Split” they will in effect increase the frictional forces on the threaded connection making it impossible to unscrew the component from the Wearsleeve.

The above table shows the correct position for the clamping mechanism to ensure no additional load will be applied to the threaded connection, thus making the joint easier to split.

Due to the high torque loads applied to a Hammer during its drilling cycle, equally high loads are required to “Split” the Chuck and Backhead away from the Wearsleeve and because of this the clamping arrangement around the Wearsleeve must generate enough friction to prevent it from spinning during the process.However great care must be taken to make sure the clamps or chains are not over-tightened as this can cause deformation to the Wearsleeve that can result in both Wearsleeve failure and Piston seizure once the Hammer is returned to service.

To help increase the Wearsleeve’s resistance to deformation it is recommended that the Hammer Piston is first slid to the end of the Hammer being “split”, before clamps of chains are attached. By doing this the Piston O/D will limit the amount of deformation in the Wearsleeve bore if too much clamping pressure is applied.

NOTE:

The use of Chain type Hydraulic Breakers can leave deep intrusions in the O/D of the Wearsleeve which may result in stress concentrations that could lead to premature failure of the Wearsleeve.

ALWAYS THINK SAFETY FIRST!

Manufacturers of Rock Drilling Equipment
Turnoaks Business Park, Burley Close, Chesterfield ,Derbyshire S40 2UB
Tel: +44(0) 1246 544700 Fax: +44(0) 1246 544701
E-mail: info@bulroc.com website bulroc.com
HYPER 121/N120 09/07/14