HYPER 331
DTH HAMMER

HYPER 331 – MAINTENANCE, OPERATING AND SERVICE MANUAL

11/06/2018

Robit®
www.robitgroup.com

CONTENTS

1. Introduction

The Robit range of Hyper down the hole hammers are strong and robust tools of a simple and straight forward design to provide maximum performance, with a minimum of maintenance.

Please Note:
Unlike other Robit Hammers the Hyper 331 uses Button Bits WITHOUT FOOTVALVES.

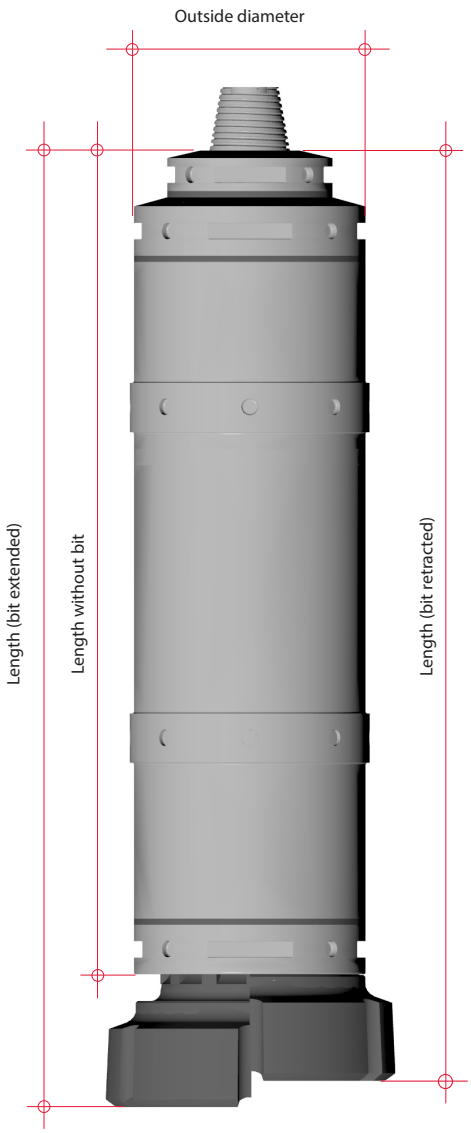
Robit Hyper hammers are supplied as standard with a Check Valve arrangement which is designed to maintain the pressure inside the hammer when the air is switched off and so help prevent contaminated water from entering the hammer.

Robit Hyper hammers are designed to give optimum performance with the minimum consumption of compressed air. If, however, particular deep-hole application require extra air flushing. This can be achieved by drilling through the soft end face of the Control Tube.

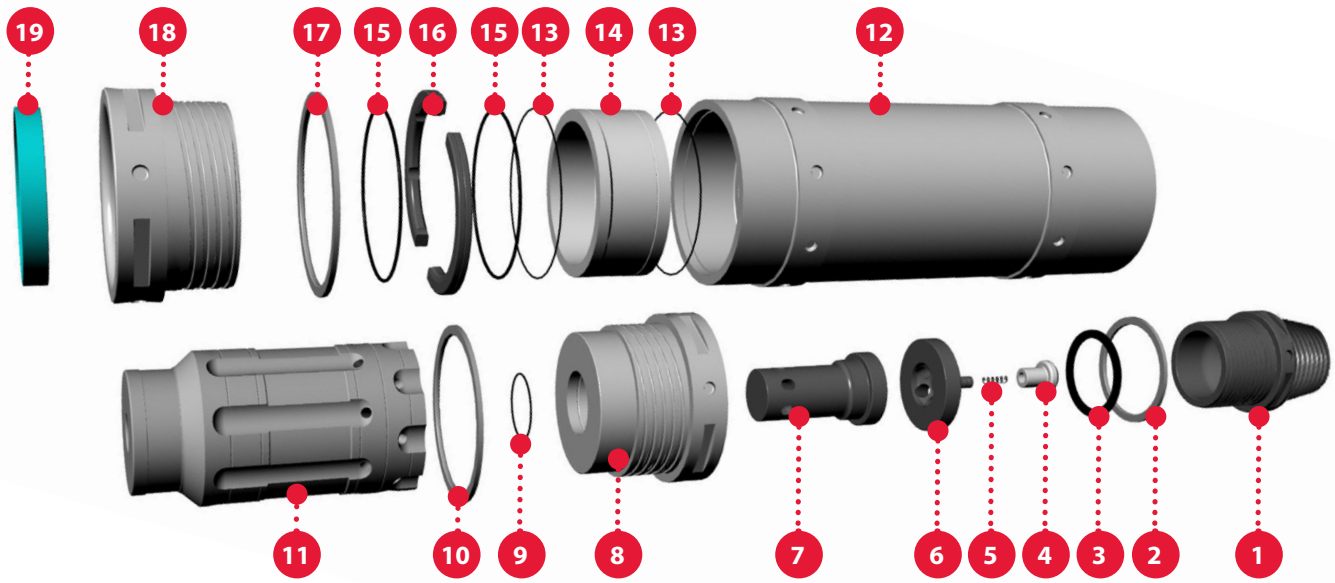
ALWAYS THINK
SAFETY FIRST!

2. Hammer Components

Ref	Description	Part number
1	Backhead adaptor	HSH3313683M
2	Breakout washer	HSH33127
3	Compression buffer	HSH33128
4	Check valve	HSH18108
5	Check valve spring	HSH18110
6	Diverter	HSH33120
7	Control tube	HSH33130
8	Backhead	HSH33138
9	Backhead internal 'O' ring	HSH33114A
10	Backhead breakout washer	HSH33126
11	Piston	HSH33103
12	Wearsleeve	HSH33100
13	Bit bearing 'O' ring (2)	HSH33186A
14	Bit bearing	HSH33186
15	Bit retainer 'O' ring (2)	HSH33137A
16	Bit retainer	HSH33137
17	Chuck breakout washer	HSH33126
18	Chuck	HSH33135
19	Chuck bearing	HSH33135BE
	Complete Hammer	**BR331H01**



NOTE: The Hyper 331 is supplied with a 10" BECO Pin thread as standard but other connections are available on request.



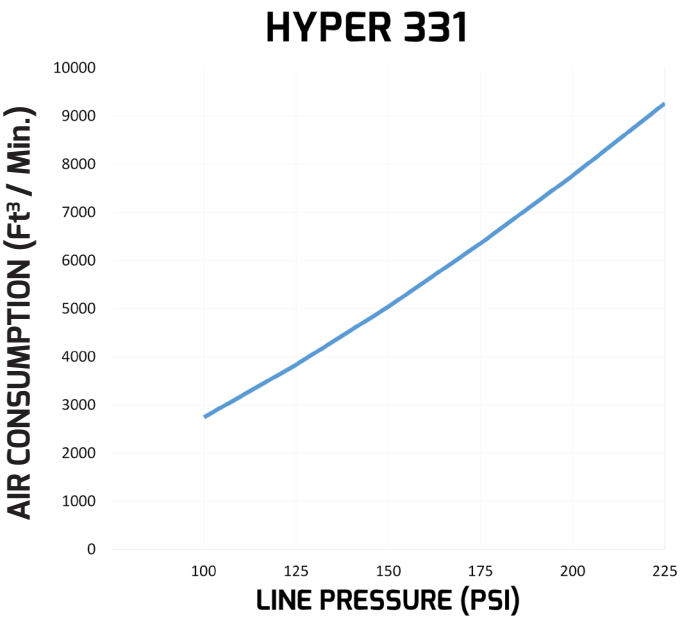
3. Hammer Specification & Air Consumption

Hammer Specification

Key information	Imperial	Metric
Length (without bit)	99.71 "	2533 mm
Length (bit extended)	119.37 "	3032 mm
Length (bit retracted)	115.71 "	2939 mm
Outside diameter	29.00 "	737 mm
Bore diameter	23.01 "	584 mm
Piston stroke	5.51 "	140 mm
Piston weight	3414 lbs	1552 kg
Complete hammer weight (without bit)	12273 lbs	5567 kg

The Hyper 331 is supplied with a 10" BECO Pin thread as standard but other connections are available on request.

Air Consumption



Additional flushing

The Hyper 331 has a control tube with a softened face which can be easily drilled through to allow for extra flushing air should this be required.

In certain drilling conditions extra flushing air may be required to over come 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.

Extra flushing air for a choke in cubic feet per min

Hole Size	100 psi	125 psi	150 psi	175 psi	200 psi	225 psi
6 mm	104	126	150	174	196	218
10 mm	294	284	338	390	441	492
13 mm	415	506	600	692	784	874
16 mm	649	790	910	1068	1225	1367
19 mm	934	1138	1315	1540	1764	1967

Extra flushing air for a choke in cubic metre per min

Hole Size	100 psi	125 psi	150 psi	175 psi	200 psi	225 psi
6 mm	2.95	3.57	4.25	4.93	5.55	6.17
10 mm	8.33	8.04	9.57	11.04	12.49	13.93
13 mm	11.75	14.32	16.99	19.60	22.2	24.75
16 mm	18.38	22.37	25.76	30.24	34.69	38.71
19 mm	26.45	32.22	37.24	43.61	49.95	55.70

Total air requirements for chokes in cubic feet per min

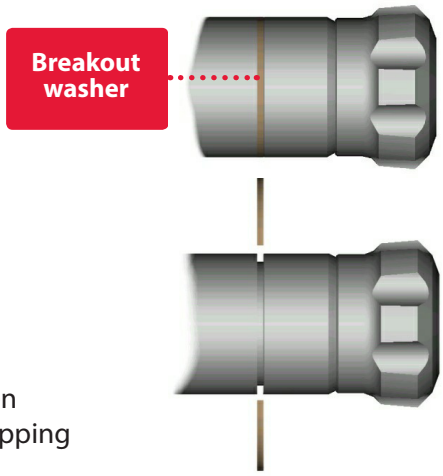
Hole Size	100 psi	125 psi	150 psi	175 psi	200 psi	225 psi
Blank	2633	3679	4837	6095	7447	8885
6 mm	2737	3805	4987	6269	7643	9103
10 mm	2927	3963	5175	6485	7888	9377
13 mm	3048	4185	5437	6787	8231	9759
16 mm	3282	4469	5747	7163	8672	10252
19 mm	3567	4817	6152	7635	9211	10852

Total air requirements for chokes in cubic metre per min

Hole Size	100 psi	125 psi	150 psi	175 psi	200 psi	225 psi
Blank	74.55	104.20	137	172.6	210.9	251.6
6 mm	77.5	107.77	141.25	177.53	216.45	257.77
10 mm	82.88	112.24	146.57	183.64	223.39	265.53
13 mm	86.3	118.52	153.99	192.2	233.1	275.35
16 mm	92.93	126.57	162.78	202.84	245.59	290.31
19 mm	101	136.42	174.24	216.21	260.85	307.3

4. Stripping the Hyper 331 Hammer

After extensive drilling the chuck might become to tight to loosen on a Robit Bench Splitter or the drill rig. If this problem occurs the breakout washer can be ground or drilled out, which will relieve the pressure and enable the chuck to be removed.

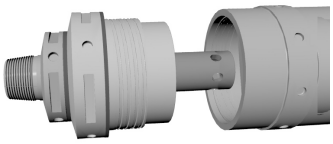


(NB On no account should the wearsleeve be impacted by a hand hammer. Splitting should not be assisted by the use of localised heat i.e. Blow torch.)

Assuming now both the Chuck and Backhead threads have been loosened either on the drilling rig, or a hammer splitter. The stripping procedure is as follows.

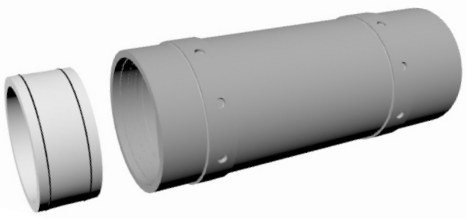
1. On large diameter Hammers such as the Hyper 331 it is often easier, because of component weights, to strip the unit whilst it is vertical rather than horizontal. So once the Breakout washers have been removed, and thread connections loosened the Hammer can be returned to the vertical position and suspended from either a over head crane using a swivel connection or re attached to the drill rig. In this position the chuck assembly, which incorporates the Button bit, can be secured whilst the Wearsleeve is rotated and lifted to enable the chuck, bit retainers and button bit to be removed from the wearsleeve.

2. Still in the vertical position the wearsleeve can now be secured whilst the backhead assembly is rotated and lifted allowing it to be removed from the wearsleeve.

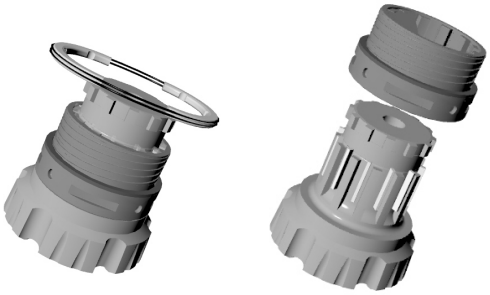


3. The Wearsleeve and its remaining internal components can now be returned to a horizontal position. By raising the chuck end of the Wearsleeve into a slightly elevated position the Piston will slide easily from the backhead end of the Wearsleeve.

4. With the Wearsleeve returned to the horizontal position the Bit Bearing can now be removed from the chuck end of the Wearsleeve.



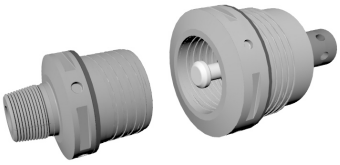
STRIPPING THE CHUCK ASSEMBLY



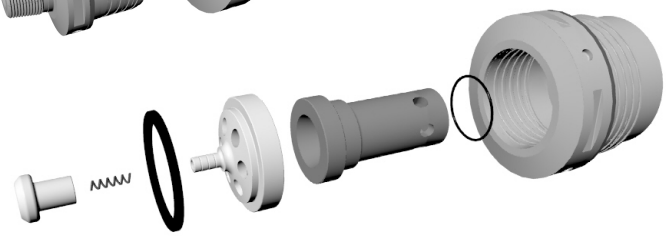
1. Remove the 'O' rings around the bit retainer, allowing the bit retainers to be removed.

2. The bit can now be removed from the chuck.

STRIPPING THE BACKHEAD ASSEMBLY



1. Remove the Adapter from the backhead. This will expose the internals of the backhead.



2. The Check Valve assembly can now be removed.
A slight tapping on the control tube will assist this. The control tube assembly can now be removed.

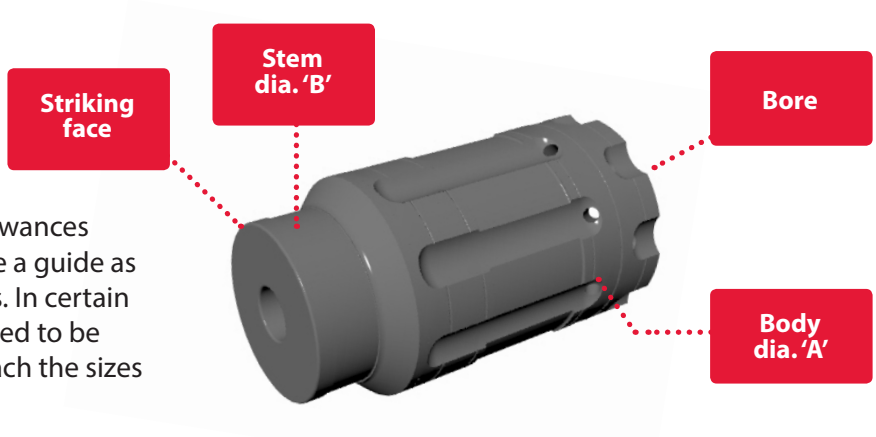
5. Checking for Wear and Damage

5.1 PISTON

Premature wear to internal parts is a result of either:

1. Incorrect or insufficient lubrication.
2. The ingress of debris into the hammer.
3. Incorrect service and storage.

The maximum wear allowances 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 on the right.



Minimum Major Body Diameter (A)	Minimum Stem Diameter (B)	Maximum Bore Size (C)
22.610 " (574.29 mm)	18.235 " (463.17 mm)	9.025 " (229.24 mm)

1. There are three main areas to examine on a used Piston. Check the Body diameter 'A', and the Stem diameter "B" for signs of 'Pick-up' and burning (both are signs of poor lubrication.) Using a micrometer, measure the diameters and refer to the table above for the minimum size.
Any light 'Pick-up' marks can be removed by 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 the Control Tube end of the piston and refer to the maximum quoted size "C".

3. Examine the striking face. Distortion is acceptable proving there are no signs of cracking. Burrs and dents can be removed with an emery stone

5. Checking for Wear and Damage

Maintaining the piston

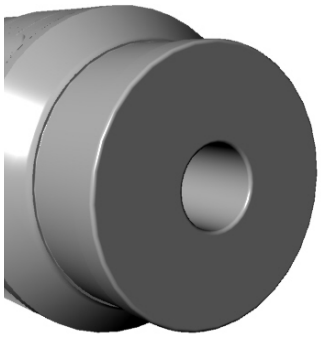


Fig. 1

New Piston Face

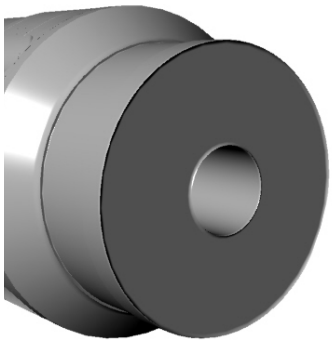


Fig. 2

Worn Piston Face

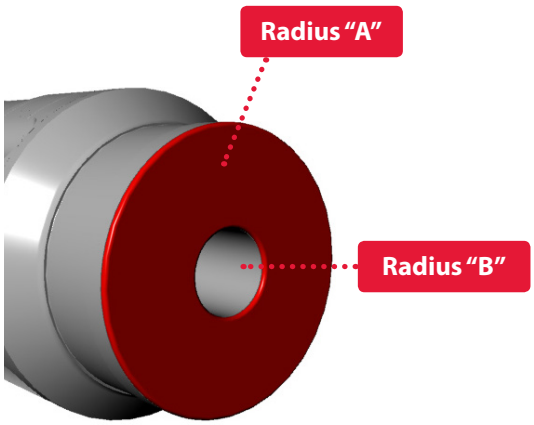


Fig. 3	Radius "A"	Radius "B"
Area to be machined	6 mm	6 mm

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 striking face can be re-machined flat and then have the the outer and inner radii reformed (see Fig. 3).

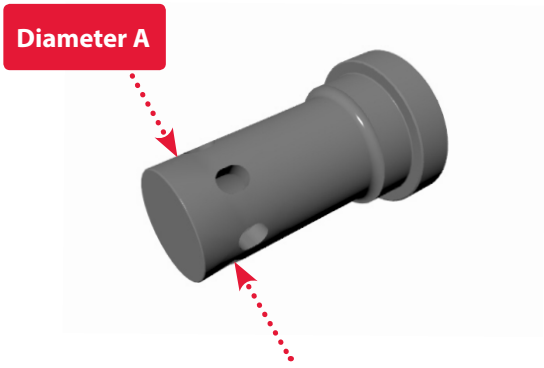
Care should be taken to remove the minimum amount of material during this re-machining process and at no point should more than 2mm be removed from the face. Pistons with wear patterns, or indentations deeper than 2mm should be replaced.

The table "Fig. 3" contains useful machine information for reforming the piston face.

5.2 CONTROL TUBE

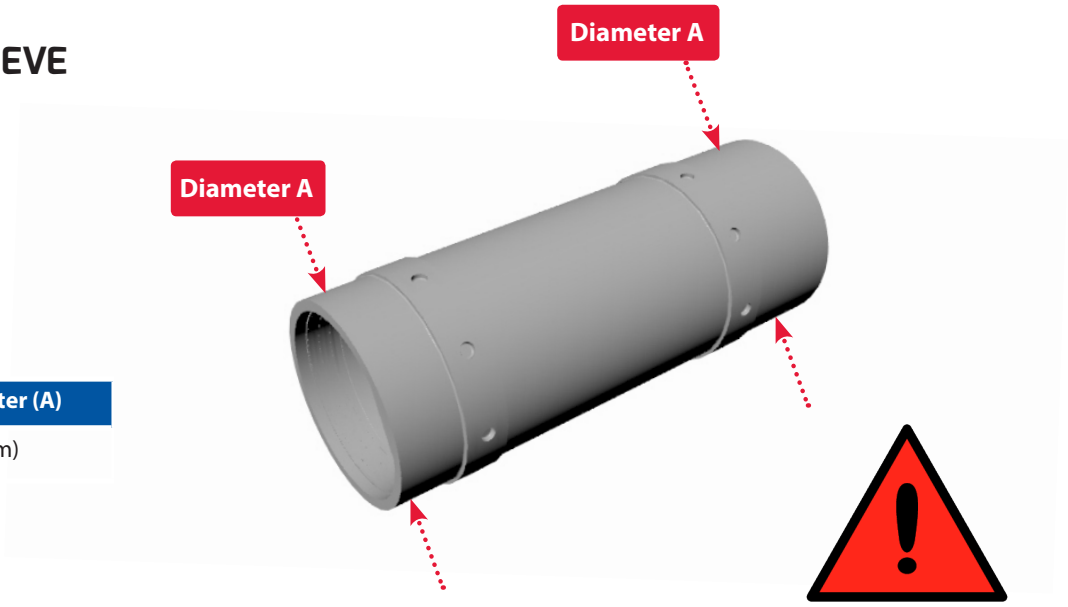
Minimum diameter (A)
8.990 " (228.34 mm)

Examine the control tube dia. '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.



5. Checking for Wear and Damage

5.3 WEARSLEEVE



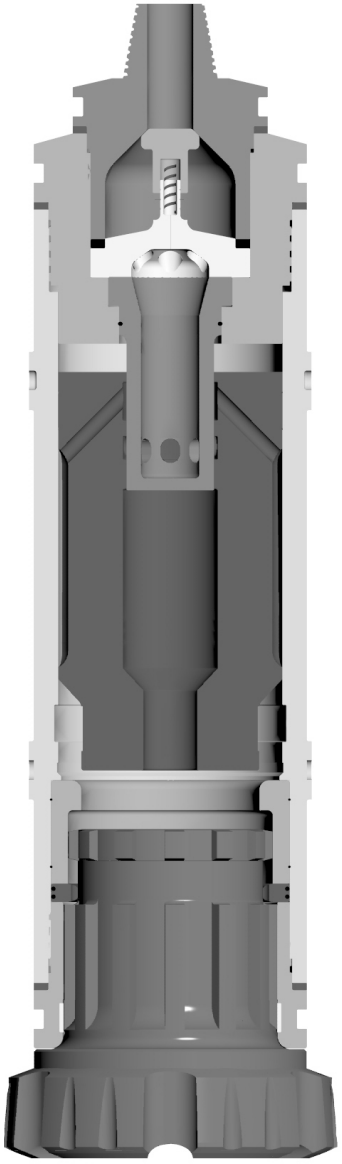
Minimum diameter (A)
27 ” (685.8 mm)

Using either a micrometer or a vernier, measure the outer diameter ‘A’ 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 area reaches the Wearsleeve.

The bore of the Wearsleeve should be periodically checked for any signs of ‘Pick-up’.

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.

6. Rebuilding the Hyper 331



As a preventative maintenance measure, it is suggested that all 'O' rings be checked at this stage, and be examined for cuts, burrs etc. and if need replaced. There are five "O" Rings in the H331 Hammer. One in the bore of the Backhead, Two around the O/D of the Bearing and two around the Bit Retainers.

The Chuck Bearing should also be checked for damage and if necessary replaced.

Due to the weights involved it is recommended that the hammer be assembled in a vertical position with the wearsleeve being secured at all times to prevent it from falling.

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

2. Coat the Piston with rock drill oil and lower it into the Backhead end of the Wearsleeve. (Ensure the Piston striking face enters first.)

3. Assemble together the chuck end of the Hammer by greasing the splines of the button bit and then lowering the chuck with the chuck bearing, over them until it sits of the back face of the Bit head.

4. Insert the Button bit Drive plates into the chuck, add a new breakout Washer to the assembly, and coat the chuck threads with a copper based grease.

5. Assemble the Bit retainers along with their new "O" Rings around the bit shank and lower them until they sit on the back face of the chuck.

6. Fit the new 'O' Rings to the Bearing and then lower this over the bit shank until it sits on the bit retainers. Make sure the bearing is fitted the correct way around with its smallest bore facing upwards.

7. Lower the Wearsleeve, chuck end downwards over the Chuck and Bit assembly until the threads engage at which point the wearsleeve should be rotated and lowered until its end face locks against the breakout washer.

8. Fit a new 'O' Ring into the bore of the backhead then coat the control tube with rock drill oil and slide it into the bore of the backhead.

9. Coat the Diverter with rock drill oil and lower it into the backhead until it sits on the top face of the control tube.

10. Insert the rubber buffer into the backhead and then around its location diameter on the diverter.

11. Insert the checkvalve and checkvalve spring into the diverter and then coat with rock drill oil.

12. Fit a new breakout washer to the Backhead adapter and coat it threads with a copper based grease.

13. Screw the backhead Adapter into the Backhead and tighten the two parts together until there are no gaps at the joint.

14. Fit a new breakout washer to the backhead assembly and coat its threads with copper based grease.

15. Screw the backhead assembly into the backhead end of the wearsleeve, then pre-torque the entire assembly to 4500kgm torque.

8. Lubrication

Inadequate supply of the correct type of oil is a major contributor to excessive component wear and consequently, a rapid fall off in performance. An In Line Lubricator should be installed, preferably on the drill rig. This should be of sufficient capacity to supply the required volume of oil for a full shift. The lubrication must be adjustable and set to ensure the correct flow of oil required by the hammer. The amount of lubricating oil will vary with the operating pressure and volume of air used by the hammer. As a general guide, any Robit Hyper hammer will require 1/3 rd of a pint per 100 CFM through the hammer (0.07 ltr per 1.0 M3/min per hour).

Eg Hyper 331 operating at 150psi = 699cfm = 23.3 pints per hour
Bar = 10,3 M³/min = 13.9 litre per hour

When drilling with foam or water, the amount of lubricating oil should be increased by 50%. When new drill tubes are put into use, it is recommended that 1/2 a pint of oil (0.25 ltrs) be poured into each new tube to give them a good coating of oil and to prevent the hammer from running dry at any time. Ambient temperatures will determine the grade of Rock Drill oil to be used. Should the ambient temperature be between O°C and 25°C, use a 30 grade oil. When the ambient temperature is over 25°C, use a 50 grade oil. A selection of recommended Rock Drill oils suitable for Robit Hyper hammers is given below.

MAKE	TYPE 30 GRADE	TYPE 50 GRADE
ROBIT	T220	T320
BP	ENERGOL RD-E 100	ENERGOL RD-E 300
CHEVRON	ARIES 100	ARIES 320
SHELL	TORCULA 100	TORCULA 320
ESSO / EXXON	AROX EP 100	AROX EP320

9. Hyper 331 Storage Procedure

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. Robit 320 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.

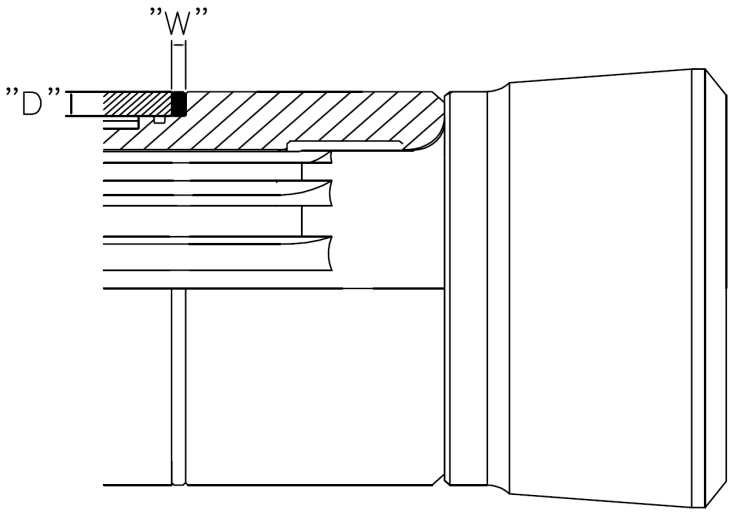
Model	Qty in UK Pints	Qty in liter's
Hyper 331	3	1,42

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.

10. Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
INOPERATIVE DRILL	Drill bit blowholes 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 value
	Excessive lubrication	Adjust lube needle value
	Hanging Piston	Piston stuck. Polish out the score marks.
	Insufficient air pressure	Check compressor discharge and increase to operational value
SLOW PENETRATION	Insufficient air pressure	Increase discharge pressure
	Dull drill bit	Re-grind or charge bit
	Worn drill parts	Replace worn bit
	Too much or too little lubrication	Check oil level and if necessary adjust lube needle value
	Dirt in drill	Strip and clean
LOW RETURN AIR VELOCITY	Insufficient hole flushing air passing through hammer	Drill or increase hole size through the Control Tube
	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 331	0.75" - 19 mm	1.5" - 38.1 mm

Chuck Release Washers are fitted to the Robit 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.

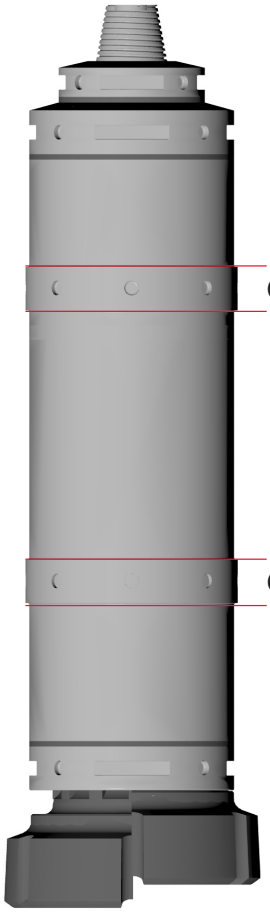
Due to the forces applied to the Chuck Release Washer you may find that its thickness ("W") is reduced during the drilling cycle and it is therefore recommended that a new Washer be fitted each time the Chuck is removed.

It is possible that on some of the larger Hammers in the Robit 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



There are many different "Splitting" Machines available for unscrewing the threaded connections on a Robit 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 diagram on the left 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.

NOTES:

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