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**HYPER 141**  
Manufacturers of Rock Drilling Equipment

# HYPER 141

MAINTENANCE, OPERATING  
AND SERVICE MANUAL

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## 1. INTRODUCTION

The Bulroc Hyper 141 is a strong and robust tool of a simple and straight forward design to provide maximum performance within a minimum of maintenance. This Hyper 141 is designed to operate efficiently at air pressures between 100psi (7bar) and 250psi (15bar) and accepts Hyper 141 button bits (N125) as standard.

The Hyper 141 hammer is supplied as standard with a check valve arrangement. This is designed to maintain pressure inside the hammer when the air is switched off and so help prevent contaminated water from entering the hammer.

The Hyper 141 hammer standard backhead is 6<sup>5</sup>/<sub>8</sub>" api Reg. Pin.

The Hyper 141 hammer is designed to give optimum performance with the minimum consumption of compressed air. If however, for particular deep hole applications extra flushing air is required, the hammer can be fitted with a choke system, that can easily be applied to suit your operational requirements.



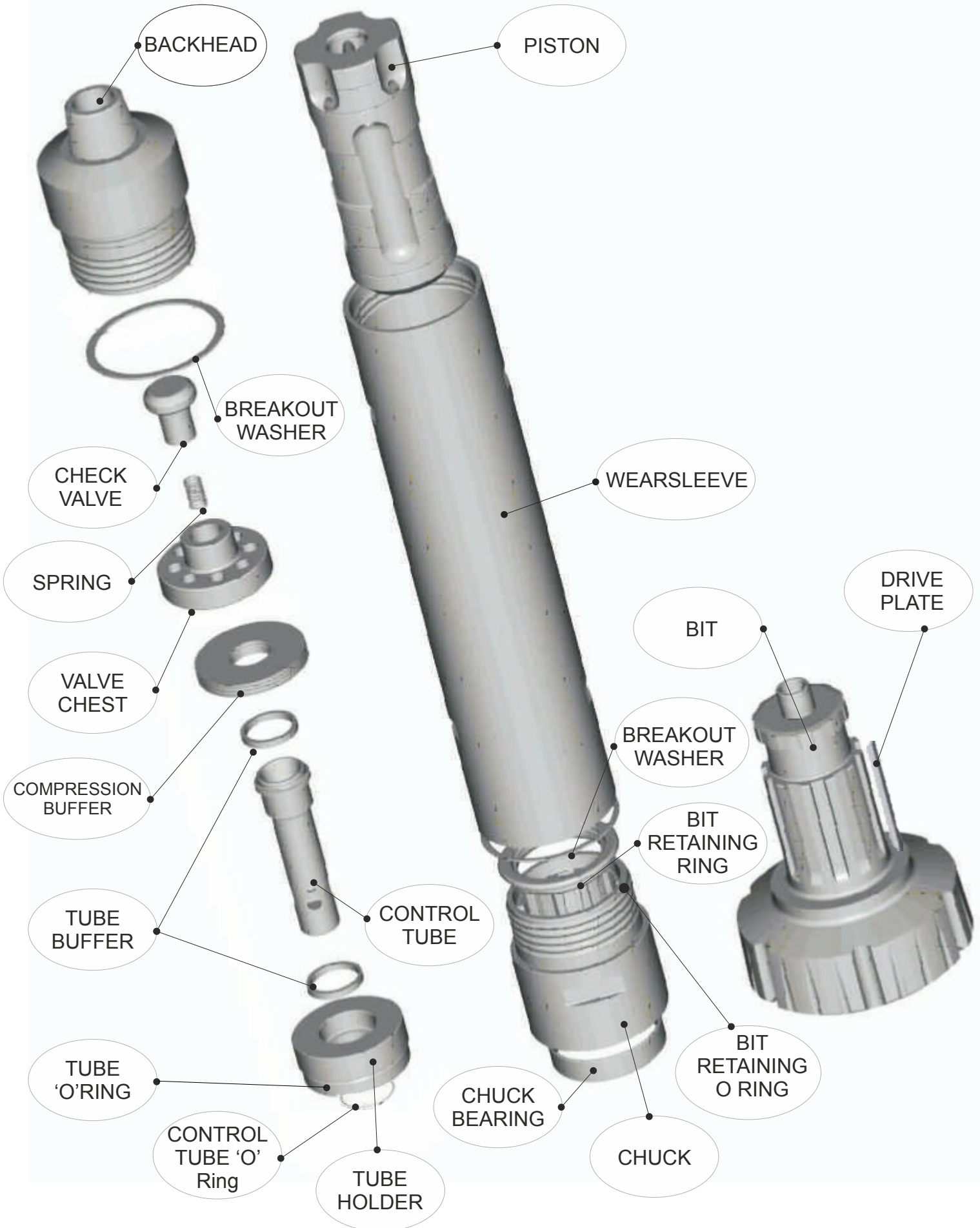
**ALWAYS THINK  
SAFETY FIRST!**



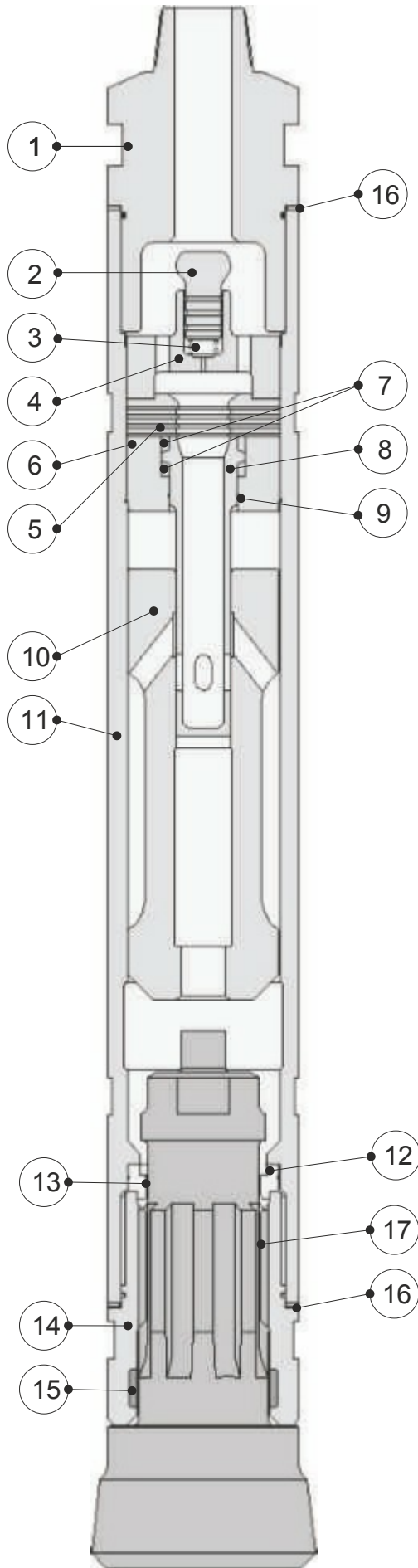
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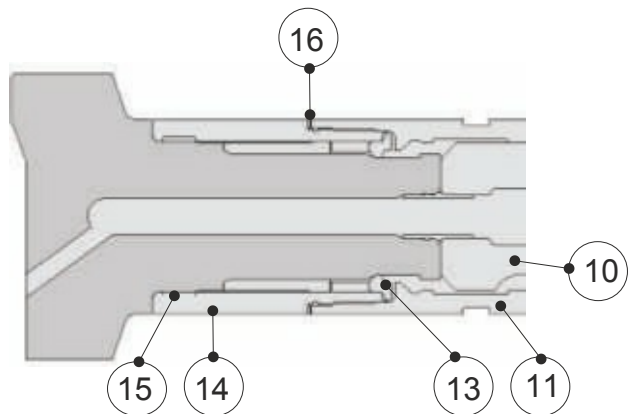
# HYPER 141

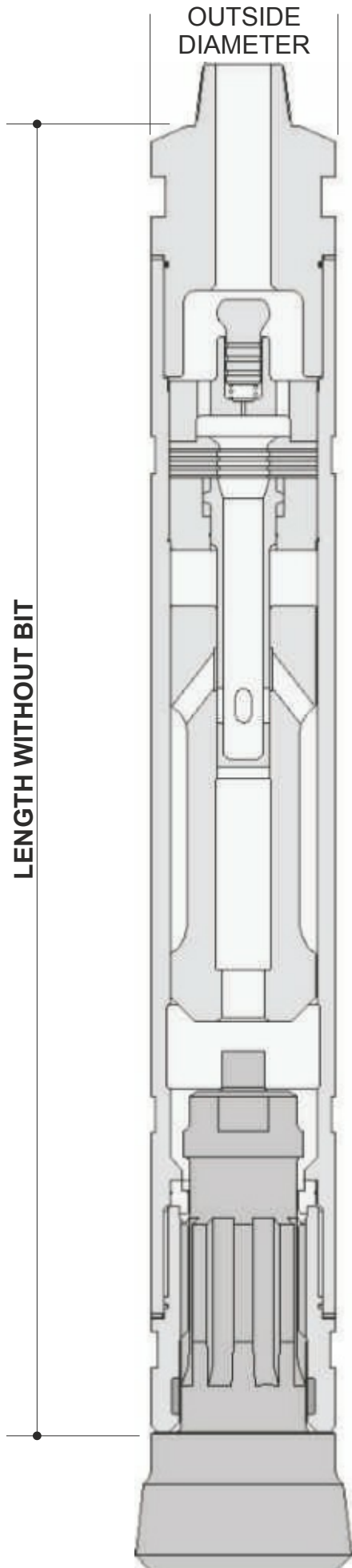


# 3 HAMMER PARTS



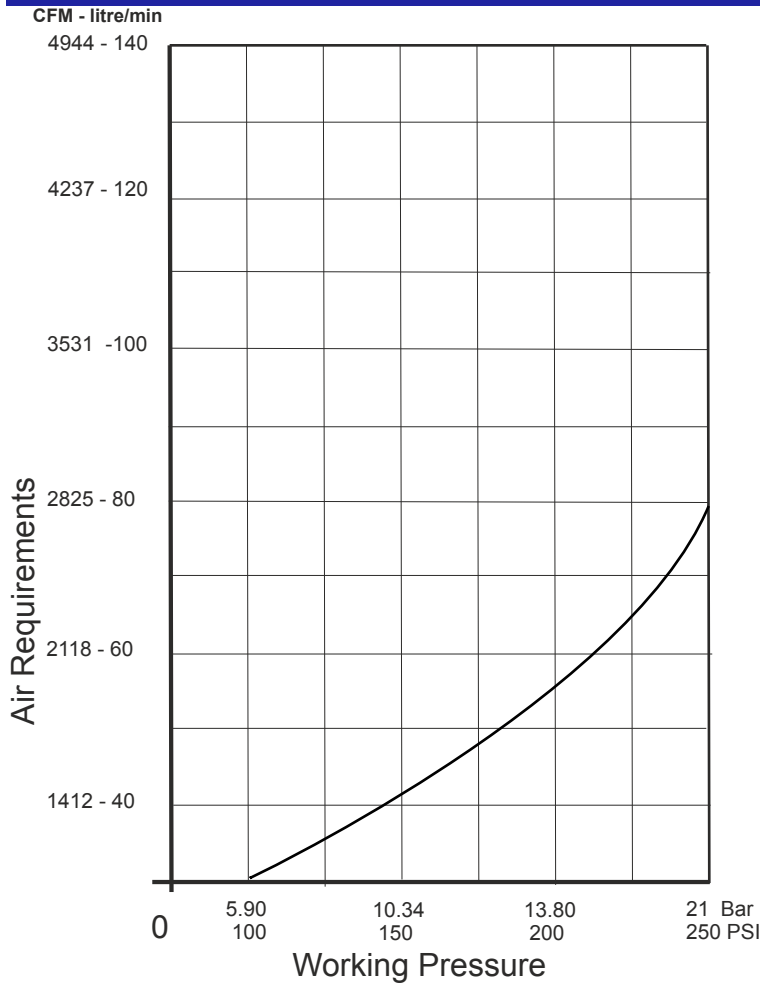
| Ref | Description                       | Part Number   |
|-----|-----------------------------------|---------------|
| 1   | Backhead 6 5/8" Reg. Pin          | HSH1413880M   |
| 2   | Check Valve                       | HSH12108      |
| 3   | Check Valve Spring                | HSH12110      |
| 4   | Diverter                          | HSH14120      |
| 5   | Compression Buffer                | HSH14128      |
| 6   | Control Tube Holder               | HSH14131      |
| 7   | Control Tube Buffers (2)          | HSH14129      |
| 8   | Control Tube                      | HSH14130      |
| 9   | Control Tube "O" Ring             | HSH14130A     |
| 10  | Piston                            | HSH14103125   |
| 11  | Wearsleeve                        | HSH14100      |
| 12  | Bit Retainer (pair)               | HSH14137125   |
| 13  | Bit Retainer "O" Ring             | HSH14137AST   |
| 14  | Chuck (N125 C/W drive plate slot) | HSH14135125   |
| 15  | Chuck Bearing                     | HSH14135125BE |
| 16  | Breakout Washer (chuck)           | HSH14126      |
| 16  | Breakout Washer (Backhead)        | HSH14126      |
| 17  | Drive Plate N125 (10)             | DP125         |
|     | Complete Hammer                   | BR141H01      |





|                                | Specification                              |
|--------------------------------|--|
| STANDARD BACKHEAD CONNECTION   | 6 <sup>5</sup> / <sub>8</sub> "API reg pin |
| CHUCK CONNECTION CONFIGURATION | N125                                       |
| LENGTH LESS BIT                | 76.4"<br>1941mm                            |
| OUTSIDE DIAMETER OF HAMMER     | 12.6"<br>320mm                             |
| BORE DIAMETER                  | 9.75"<br>248mm                             |
| PISTON STROKE                  | 5"<br>127mm                                |
| PISTON WEIGHT                  | 414lbs<br>188kgs                           |
| WEARSLEEVE ACROSS FLATS SIZE   | 12.125"<br>308mm                           |
| WEIGHT OF HAMMER LESS BIT      | 2420lbs<br>1100kgs                         |

# 5 AIR CONSUMPTION



Drill through this face should extra flushing be required see below

## Additional Flushing

The Hyper 141 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 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 show the total air required for optimum hammer performance with the chokes drilled.

Additional flushing air through orifice (CFM)

| HOLE SIZE | 100PSI | 150PSI | 200PSI | 300PSI |
|-----------|--------|--------|--------|--------|
| 6mm       | 104    | 150    | 196    | 287    |
| 10mm      | 294    | 338    | 441    | 646    |
| 13mm      | 415    | 600    | 784    | 1148   |
| 16mm      | 649    | 910    | 1225   | 1795   |
| 19mm      | 934    | 1315   | 1764   | 2583   |

Additional flushing air through orifice (cubic meter per minute)

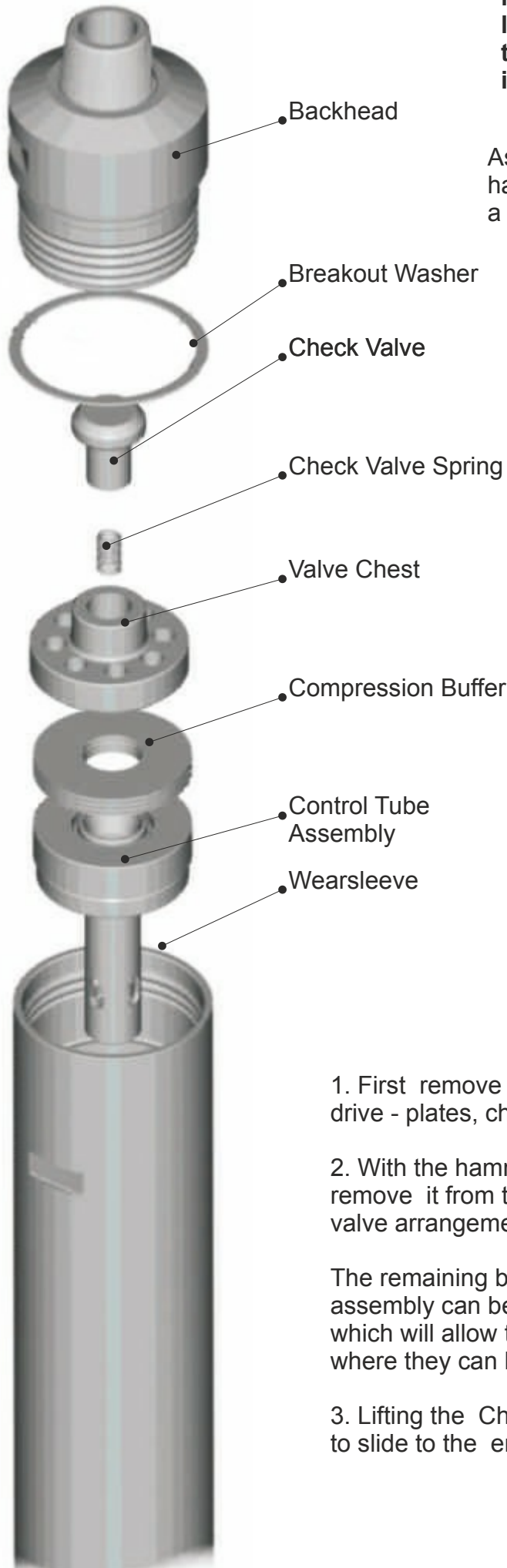
| HOLE SIZE | 100PSI | 150PSI | 200PSI | 300PSI |
|-----------|--------|--------|--------|--------|
| 6mm       | 2.95   | 4.25   | 5.55   | 8.13   |
| 10mm      | 8.33   | 9.57   | 12.49  | 18.29  |
| 13mm      | 11.75  | 16.99  | 22.2   | 32.51  |
| 16mm      | 18.38  | 25.76  | 34.69  | 50.83  |
| 19mm      | 26.45  | 37.24  | 49.95  | 73.15  |

Total air through hammer (CFM)

| CHOKE SIZE | 100PSI | 150PSI | 200PSI | 300PSI |
|------------|--------|--------|--------|--------|
| Blank      | 714    | 1311   | 2018   | 3708   |
| 6mm        | 818    | 1461   | 2214   | 3995   |
| 10mm       | 1008   | 1649   | 2459   | 4354   |
| 13mm       | 1129   | 1911   | 2802   | 4856   |
| 16mm       | 1363   | 2221   | 3243   | 5503   |
| 19mm       | 1648   | 2626   | 3782   | 6291   |

Total air through hammer (cubic meter per minute)

| CHOKE SIZE | 100PSI | 150PSI | 200PSI | 300PSI |
|------------|--------|--------|--------|--------|
| Blank      | 20.2   | 37.13  | 57.16  | 105.01 |
| 6mm        | 23.15  | 41.38  | 62.71  | 113.14 |
| 10mm       | 28.53  | 46.7   | 69.65  | 123.3  |
| 13mm       | 31.95  | 54.12  | 79.36  | 137.52 |
| 16mm       | 38.58  | 62.89  | 91.85  | 155.84 |
| 19mm       | 46.65  | 74.37  | 107.11 | 178.16 |

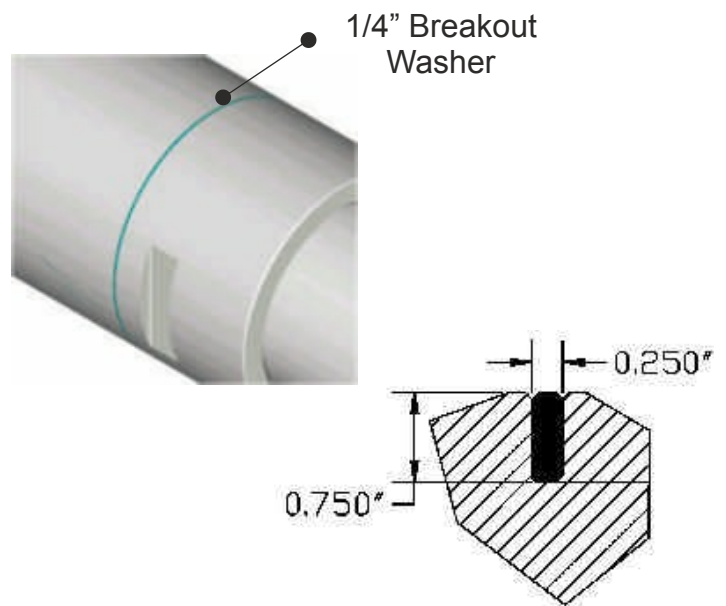


**NOTE:- All components must be washed clean and laid out on a dirt free surface to enable inspection to take place. The stripping procedure is explained in the following section,**

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, this will invalidate the warranty.

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, drive - plates, chuck release washer, and bit retainers.

2. With the hammer laid horizontal, unscrew the backhead and remove it from the wearsleeve. The valve chest along with the check valve arrangement can now be pulled from the backhead end.

The remaining buffer cover, compression buffer and control tube assembly can be removed by lifting the chuck end of the wearsleeve which will allow the piston to push the parts up to the end face, from where they can be removed by hand.

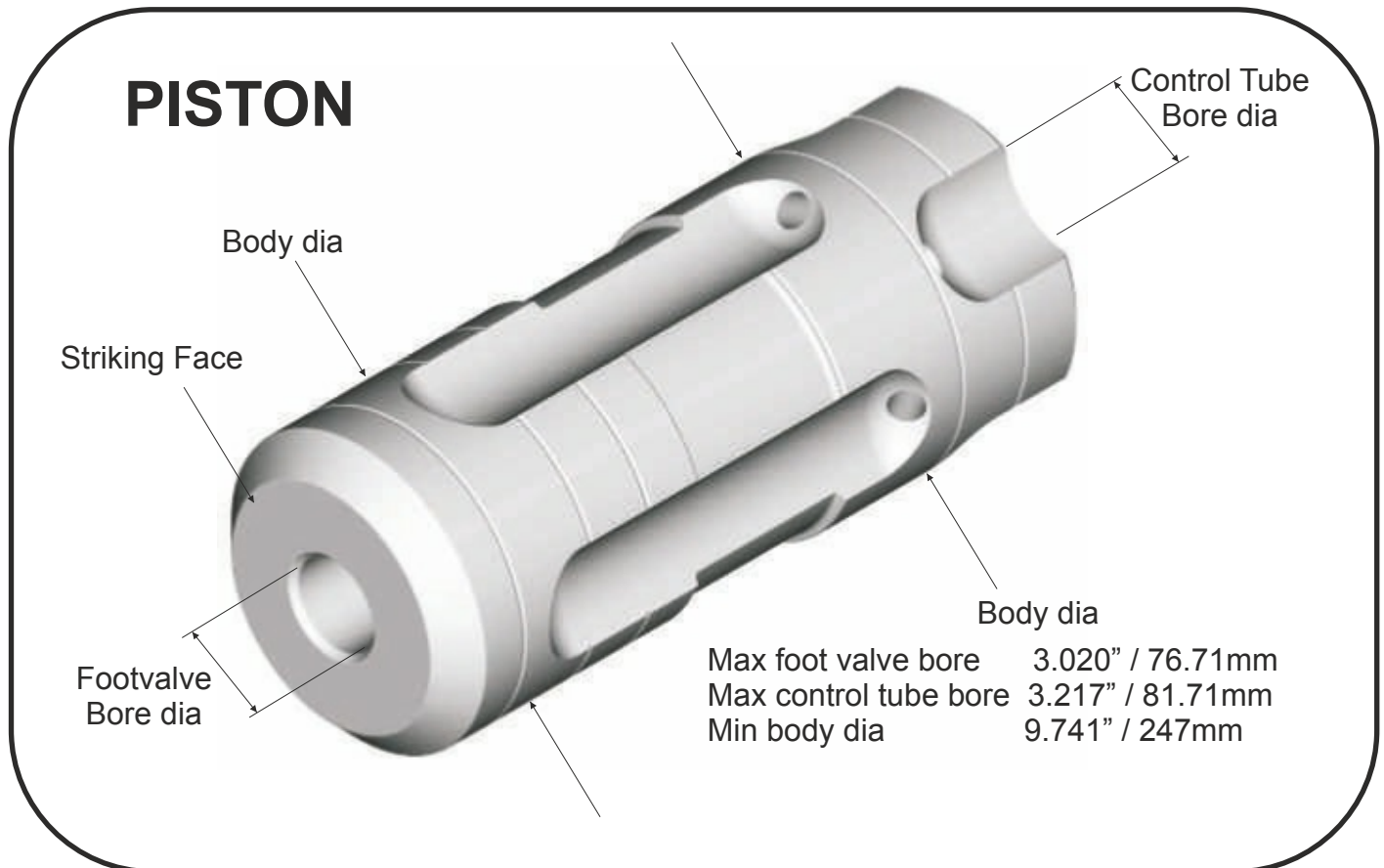
3. Lifting the Chuck end of the Wearsleeve again will allow the Piston to slide to the end face from where it can be removed.

# 7 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.



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. Distortion is acceptable providing there are no signs of cracking. Burrs and dents can be removed with an emery stone.

# 7 CHECKING FOR WEAR AND DAMAGE

## MAINTAINING THE PISTON

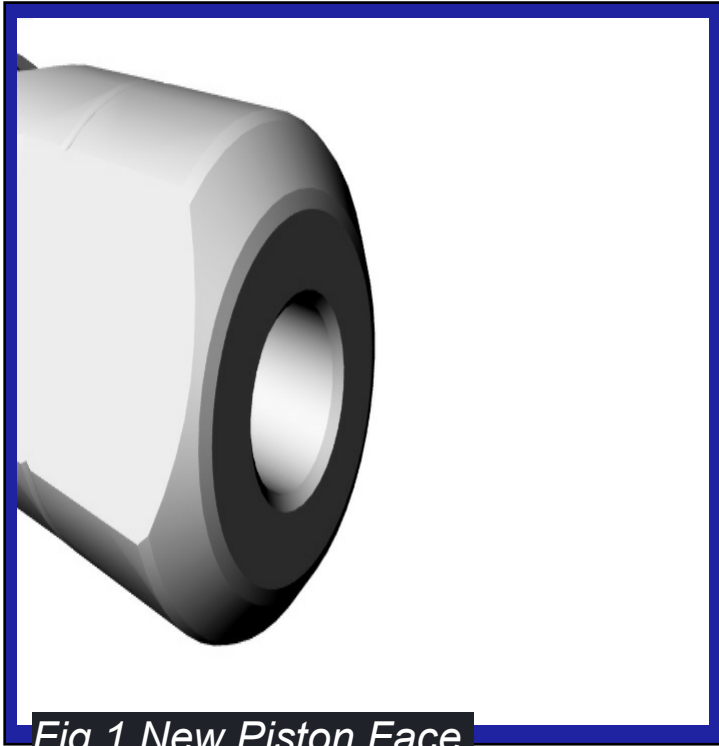


Fig. 1 New Piston Face

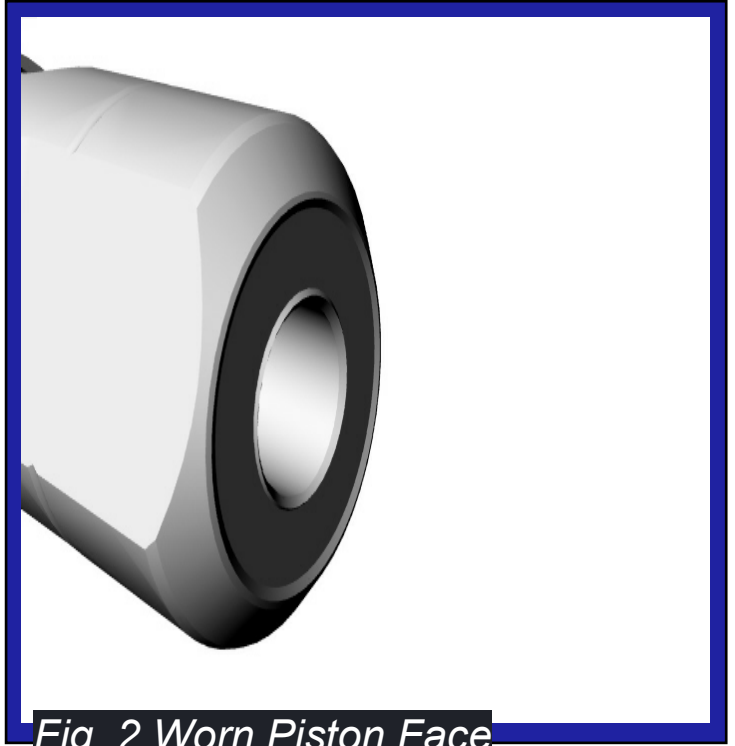


Fig. 2 Worn Piston Face

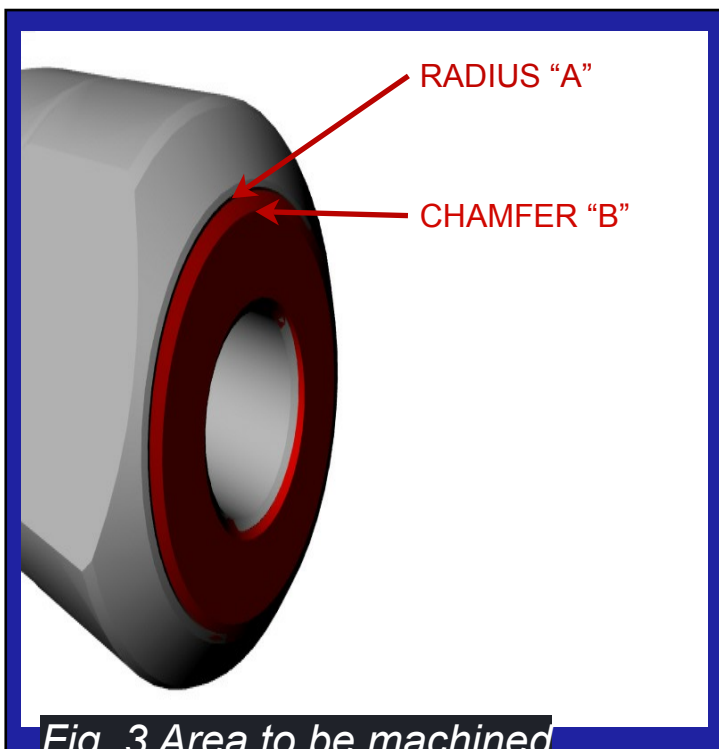


Fig. 3 Area to be machined

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 striking face can be re-machined flat and then have the outer radius and inner chamfer reformed (see *fig.3*).

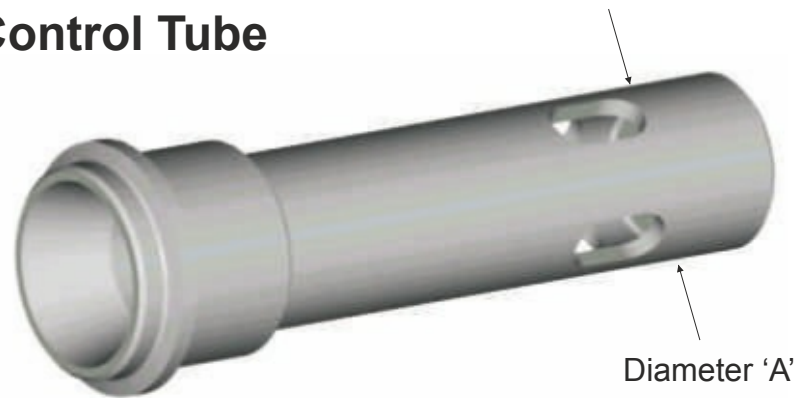
Care should be taken to remove the minimum amount of material during this re-machining process and at no point should more than 2mm be removed from the face. **Pistons with wear patterns, or indentations deeper than 2mm should be replaced.**

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

| MACHINE DETAIL |            |             |
|----------------|------------|-------------|
| HAMMER         | RADIUS "A" | CHAMFER "B" |
| HYPER 141      | 0.125"     | 0.250" @45  |

## Control Tube

Control Tube  
Minimum Dia  
3.190" / 81mm



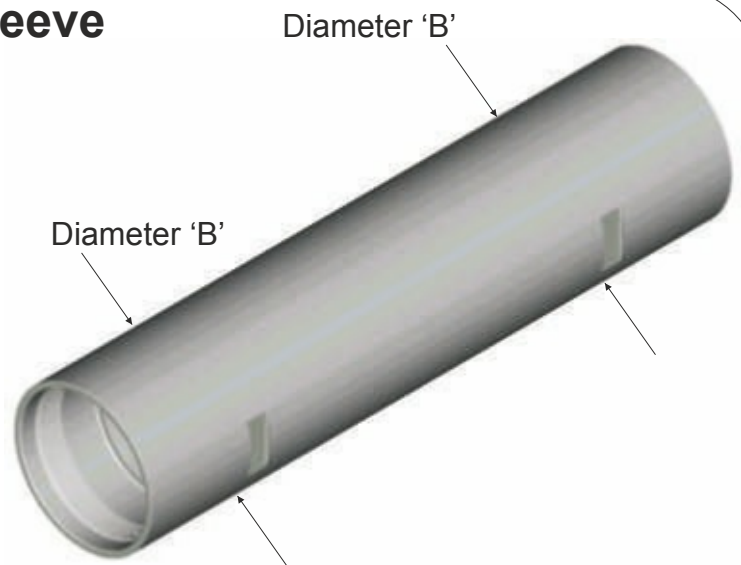
Examine the control tube diameter 'A', using a micrometer, check the diameter has not worn under the specified minimum.  
If there are signs of pick-up they should be removed by using emery cloth.

## 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 they should be removed by using emery cloth.

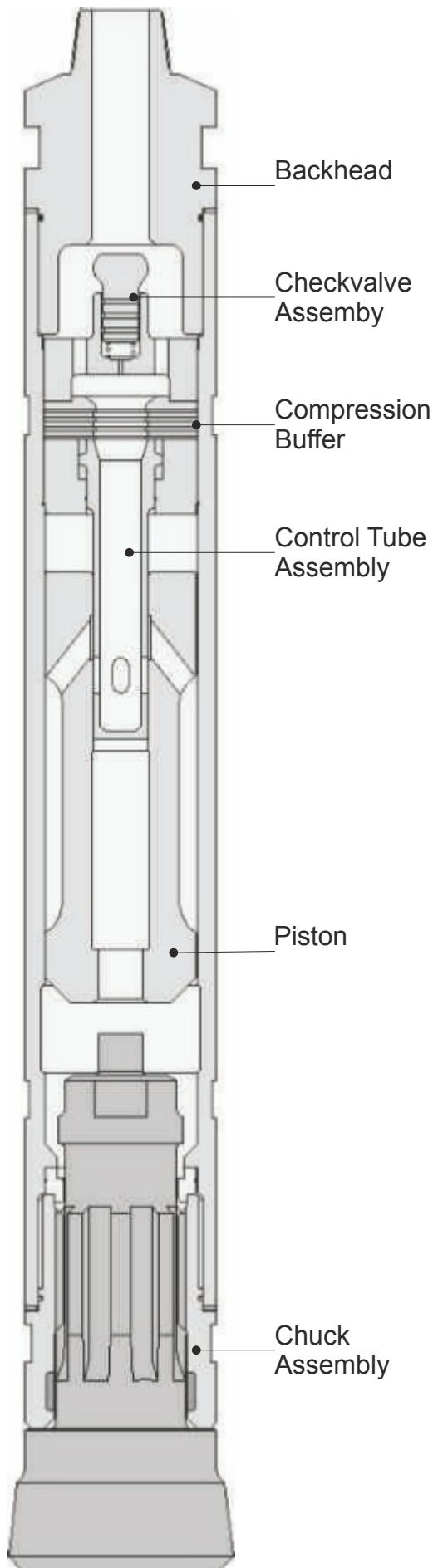
Wearsleeve  
Minimum Dia  
12.350" / 313.7mm



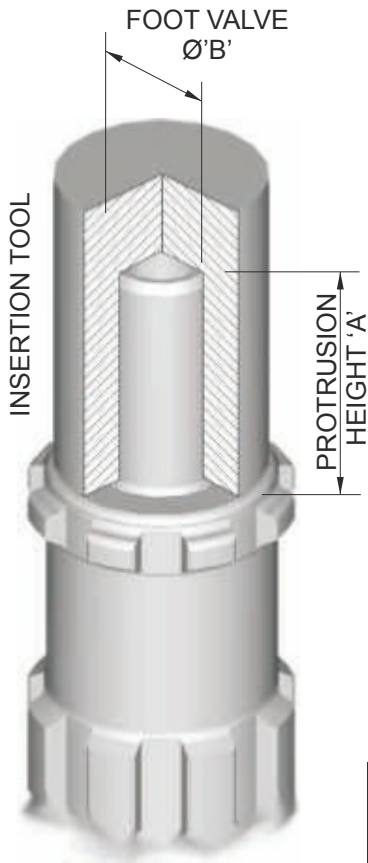
If a piston has broken within the wearsleeve it is imperative that the bore is honed to remove any burrs or 'pick-up'

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

# 9 REBUILDING THE HYPER 141



1. Ensure all the maintenance work outlined in the previous section has been completed.
2. 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.
3. Assemble the chuck, chuck release washer and bit retainers around the bit ensuring the bit retainers are fitted with new 'O' rings. Check the condition of the drive plates and the chuck bearing and replace if necessary. 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.
4. Coat the piston with rock drill oil and slide it into the backhead end of the wearsleeve. (Ensure the piston striking face enters first).
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. Coat the backhead 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.



The Bulroc Hyper 141 hammer is designed to be used with Foot Valves that are to the following specifications:

| SHANK TYPE | PROTUSION HEIGHT 'A' | FOOTVALVE DIAMETER 'B' |
|------------|----------------------|------------------------|
| N125       | 2.973" / 75.5mm      | 2.250" / 57.2mm        |

To guarantee the diameter and protrusion height are correct it is recommended the correct insertion tool is used.

Using Foot Valves which are larger in diameter than the sizes shown, will result in premature failure of the Foot Valve.

Foot Valves which are much smaller in diameter than the sizes shown will reduce the performance of the hammer.

## 11 LUBRICATION

The Hyper 141 piston oscillates at 650 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 100cfm of air through the hammer ( 0.07 litre per metre cubed)

*Eg Hyper 141 operating at 150psi = 1311cfm = 4.3 pints per hour  
10.3bar = 37.13cmm = 2.44 litres 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       | TYPE 30 GRADE    | TYPE 50 GRADE    |
|------------|------------------|------------------|
| BULROC     | T220             | T320             |
| BP         | ENERGOL RD-E 100 | ENERGOL RD-E 300 |
| CHEVRON    | ARIES 100        | ARIES 320        |
| SHELL      | TORCULA 100      | TORCULA 320      |
| ESSO/EXXON | AROX EP100       | AROX EP320       |

# 12 HAMMER STORAGE PROCEDURES

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 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 litre's |
|-------|-----------------|----------------|
|-------|-----------------|----------------|

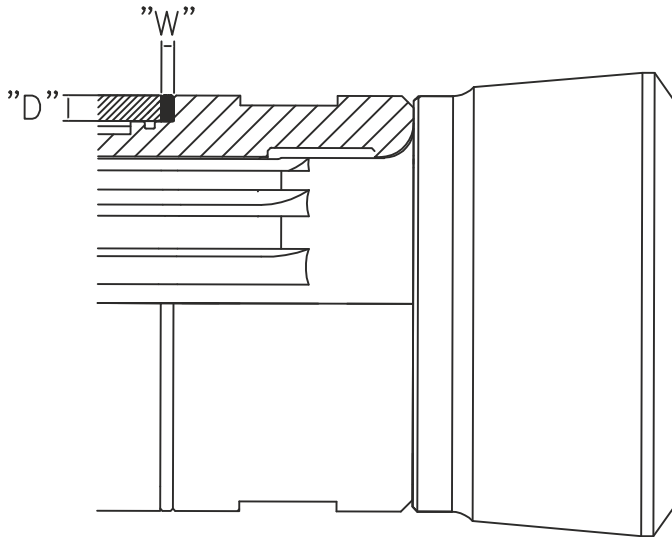
|           |                 |      |
|-----------|-----------------|------|
| Hyper 141 | 1 $\frac{3}{4}$ | 1.00 |
|-----------|-----------------|------|

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.

# 13 TROUBLESHOOTING

| PROBLEM                        | PROBABLE CAUSE  | REMEDY   |
|--------------------------------|---|--|
| <b>INOPERATIVE DRILL</b>       | 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 |
| <b>SLOW PENETRATION</b>        | Insufficient air pressure                             | Increase discharge pressure                                  |
|                                | Dull drill bit  | Re-grind or change bit                                       |
|                                | Worn drill parts                                      | Replace worn parts   |
|                                | Too much or too little lubrication                    | Check oil level and if necessary adjust lube needle value    |
|                                | Dirt in drill   | Strip and clean  |
| <b>LOW RETURN AIR VELOCITY</b> | Insufficient hole flushing air passing through hammer | Drill or increase hole size through the piston               |
|                                | Drill bit exhaust holes blocked                       | Clean out blockage   |
| <b>SPASMODIC OPERATION</b>     | 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 141             | 0.330" - 8.38mm | 0.860" -21.97mm |

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.

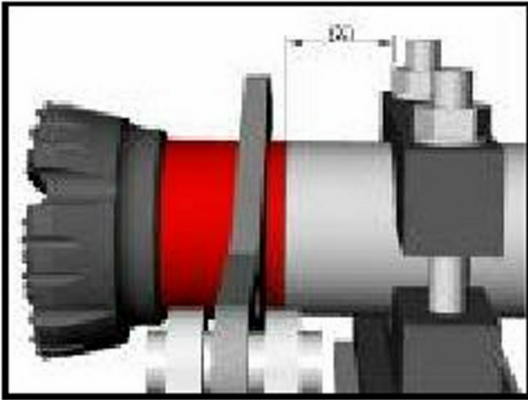
Due to the forces applied to the Chuck Release Washer you may find that its thickness ("W") is reduced during the drilling cycle and it is therefore recommended that a new Washer be fitted each time the Chuck is removed.

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.

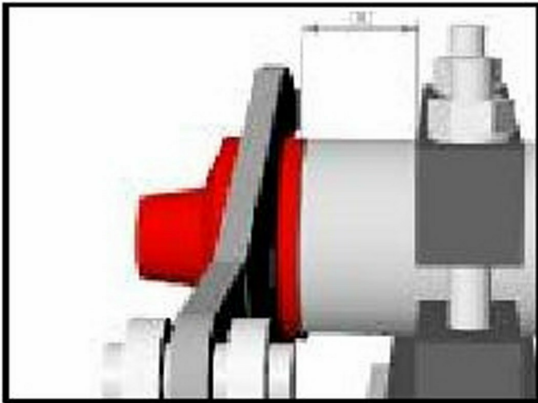
If the cutting away of the Chuck Release Washer is necessary for the removal of the Chuck then it must be done with extreme care to avoid damage to either the Chuck or the Wearsleeve. The composition of the Chuck Release Washer allows for it to be cut with either a hacksaw or a small hand grinder equipped 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 its 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 141       | 10.000" / 254mm                       |



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 or 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.





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