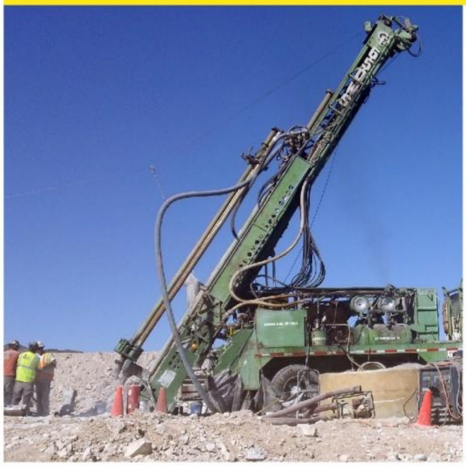







OPERATION & SERVICE MANUAL

Mincon MR92 RC Hammer

Mincon™

"The Driller's Choice Worldwide"

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Introduction

Thank you for choosing the Mincon MR92 Down-the-Hole hammer. Please read this manual carefully before using your hammer in the interests of safety, warranty and best operational care. The Mincon MR92 is ruggedly built with a hardened wear sleeve to withstand the stresses of drilling in the most extreme conditions. However, on the inside it is a precision tool with care taken in manufacture to ensure that the components meet finely matching tolerances to provide fast drilling, reliability and efficient use of air without waste. With correct care your Mincon MR92 hammer should provide you with top performance reliability and long service life.

- Warranty is provided by Mincon as per the warranty section 6.
- Please keep this instruction manual as a permanent part of your DTH Hammer.
- The specifications and instructions contained in this manual are based on the up-to-date information as at publication date.

1. Safety

Be sure to work safely at all times. Wear protective clothing and safety equipment and observe all safety regulations as prescribed by your employer, Government, or the site on which you work. Do not wear loose clothing that may get caught in rotating parts and cause serious personal injury.

Remember that a “Down-the-Hole” percussive hammer emits noise and you should therefore take every precaution to safeguard your hearing against damage by using proper hearing protection. Use eye protection at all times. Rock chips and dust which may be discharged from the face of the bit or bore hole at high velocities and can cause severe injury.

Hammers can be heavy – Always use proper and approved lifting equipment and take every precaution to safeguard yourself against injury. Keep hands clear at all times – Beware of getting fingers trapped between the chuck and bit and do not use hands or feet to clear the top of the borehole at any time.

Other safety advice is given throughout this document which you are advised to read.

2. Hammer Care.

2.1 Storage

It is important to take the following steps in order to ensure smooth operation when hammer is to be re used. When the hole is completed and the hammer is to be inactive for some time the following steps should be taken.

Short Term Storage (e.g. 1 -2 weeks)

- Using high pressure air, blow the hammer clear of all water.
- Turn automatic oiler up full and cycle hammer until oil is running out the shank of the drill bit.
- If there is not an automatic oiler, pour 1 litre (2 pints) of rock drill oil in to the backhead.
- Turn the air on and cycle for 10 seconds. This will lubricate the internal parts.
- Seal the hammer at the backhead and chuck end to exclude any dust or foreign particles.
- Store the hammer horizontally in a clean dry environment.

Long Term storage (e.g. 1 month or longer)

- Using high pressure air, blow the hammer clear of all water.
- Break out the back head and chuck on the rig as it is easier to do it here than back in the workshop.
- Disassemble the hammer.
- Inspect and clean all hammer components.
- Lubricate all the internal components with rock drill oil.
- Reassemble the hammer, and seal the backhead and chuck end.
- Store horizontally in a clean and dry environment.
- Periodically rotate the hammer as the oil will settle.

Before restarting any hammer after prolonged periods of inactivity, disassemble and inspect all internal parts. Clean and remove any oxidation with an emery cloth. Re-lubricate all internal components with rock drill oil and reassemble the hammer. Full assembly and disassembly instructions can be found further on in this manual.

3. RC DTH Hammer Set Up

It is important to remember that although the injection of water into the hammer will increase the pressure in the hammer, the water is a restriction in the hammer that will cause a drop in the drilling performance.

3.1 The Effect of Temperature and Altitude on Compressed Air

Both temperature and altitude have an effect on air and consequently on compressed air. Higher temperatures and higher altitudes result in air becoming thinner, less dense, and the effect of this is a reduction in a compressor’s delivery pressure.

The table below shows just how much operating pressure can be affected by these two factors. For example, if we take a compressor which will deliver 1000 cfm (28.3 M^3/Min) at sea level and a temperature of 68° F, this same compressor will only deliver 745 cfm (21.1 M^3/Min) at 9,000ft (2744m), given a temperature of 40° F (4.4° C). Method: 1000 cfm/1.341.

°F	°C	Sea Level	1000ft	3000ft	5000ft	7000ft	9000ft	11000ft	13000ft	15000ft
		Sea Level	305m	915m	1524m	2134m	2744m	3354m	3963m	4573m
-40	-40	0.805	0.835	0.898	0.968	1.043	1.127	1.217	1.317	1.426
-30	-34.4	0.824	0.855	0.920	0.991	1.068	1.154	1.246	1.349	1.460
-20	-28.9	0.844	0.875	0.941	1.014	1.092	1.180	1.275	1.380	1.494
-10	-23.3	0.863	0.895	0.962	1.037	1.117	1.207	1.304	1.411	1.528
0	-17.8	0.882	0.915	0.984	1.060	1.142	1.234	1.333	1.443	1.562
10	-12.2	0.901	0.935	1.005	1.083	1.167	1.261	1.362	1.474	1.596
20	-6.7	0.920	0.954	1.026	1.106	1.192	1.288	1.391	1.506	1.630
30	-1.1	0.939	0.974	1.048	1.129	1.217	1.315	1.420	1.537	1.664
40	4.4	0.959	0.994	1.069	1.152	1.241	1.341	1.449	1.568	1.698
50	10	0.978	1.014	1.091	1.175	1.266	1.368	1.478	1.600	1.732
60	15.6	0.997	1.034	1.112	1.198	1.291	1.395	1.507	1.631	1.766
70	21.1	1.016	1.054	1.133	1.221	1.316	1.422	1.536	1.662	1.800
80	26.7	1.035	1.074	1.155	1.244	1.341	1.449	1.565	1.694	1.834
90	32.2	1.055	1.094	1.176	1.267	1.365	1.475	1.594	1.725	1.868
100	37.8	1.074	1.114	1.198	1.290	1.390	1.502	1.623	1.756	1.902
110	43.3	1.093	1.133	1.219	1.313	1.415	1.529	1.652	1.783	1.936
120	48.9	1.112	1.153	1.240	1.336	1.440	1.556	1.681	1.819	1.970

3.2 Drill Bit Care and Installation

Your Mincon DTH drill bit is at the working end of drilling and just like the hammer, it will perform extremely well if cared for. Good drill bit care and maintenance helps ensure the longest life and best performance from that bit. The following gives recommendations on how to best care for your Mincon Drill Bits and install them correctly to maximize productivity and longevity.

3.2.1 Drill Bit Handling

A drill bit is capable of taking considerable punishment in drilling operations; however, care must be taken while handling them to ensure that the bit you are drilling with is in sound condition.

The tungsten carbide buttons on a bit are extremely hard to fracture the rock they are drilling in. Dropping the bits onto hard surfaces (such as metal) can cause the buttons to crack and break. All care must be made to ensure drill bit heads do not come in heavy contact as the buttons striking each other can also cause damage.

3.2.2 Drill Bits: Prior to Use

Prior to using a new or used drill bit it should be inspected for the following and lubricated with rock drill oil:

- Check the condition of all the carbides and ensure that no damage has occurred and that the carbides are sharp.
- Inspect the face and head of the bit for any cracking or damage that could be detrimental to the drill bit.
- Make sure the gauge row carbides have sufficient clearance from the head of the bit.
- Be sure to check the sample holes and bore of the RC drill bit for excessive wear. The use of a RC bit that is throated out will have a detrimental effect on the hammers ability to sample efficiently and most likely target depth will not be achieved.

3.2.3 Drill Bit Installation

When installing a new drill bit into a new hammer lubricate the splines on the bit with rock drill oil. Place the chuck and chuck sleeve over the bit and install the bit retaining ring. All MR models of Mincon Reverse circulation DTH hammers have reversible bit retaining rings. Be sure to match the gauge diameter to the required chuck sleeve (shroud) clearance for the drilling conditions you are operating in.

When using the drill machines rotary head to screw the chuck into the hammer, take care not to cross thread the chuck. With the head of the bit in the bit basket, torque up the bit in the hammer. See later for torque recommendations.

When installing a new bit on a used hammer it is important to inspect the chuck for wear to the body and splines. In soft and broken drilling conditions there is often excessive bit travel that results in increased wear to the chuck splines. As the sample tube will keep the drill bit evenly aligned against the splines the wear pattern is usually even. Always inspect the sample tube end and be sure to replace the sample tube before the wear has reached the tell-tale wear line on the outside of the sample tube.

In the case when a used or newly sharpened drill bit is installed on a used hammer (used bits should never be used on a new hammer), please ensure that the gauge diameter and chuck sleeve diameter are matched with the required drilling clearance for efficient sampling. Used chuck sleeves can be used with new drill bits so long as the clearance between the gauge diameter of the drill bit and chuck sleeve diameter are the required difference.

3.3 Torqueing Up an RC DTH Hammer

Mincon DTH hammers use a patented three piece seating ring system and a compression ring to ensure that the hammers top end components are held firmly in place. This is extremely important as any movement of these components will result in premature wear and loss of performance. When a Mincon hammer’s backhead is closed up by hand there is a gap between the wear sleeve and backhead shoulder known as stand-off. All Mincon hammers have 0.030” (0.76mm) stand-off except the Mincon XP120 12” hammer which has 0.080” (2.0mm) stand-off.

The stand-off must be completely closed as part of the locking system for the hammer. It is not recommended to use the hammer action of drilling to close up the gap as movement in the top end will occur that will be detrimental to the hammer and ultimately lead to premature wear and loss of performance.

Recommendations for closing the hammer are to have it torque to between 750 - 1000 ft.lb per inch of hammer diameter. Where the rotary head cannot apply the requisite torque, a Make-up and Break-out machine like the Mincon Sidewinder or Mincon DTH Break-out Bench should be used.

Fit the hammer to the drilling rig ensuring no debris or dirt enters the hammer from the site, dirty tubes or from unclean air lines. Make sure that the coupling threads from the drill are of the same specification to that of the hammer and they are in good condition. Run the hammer at half the air flow for a few minutes to allow the oil to flow through and for internal components to settle in.

3.4 Lubrication

There are two main types of lubricators in use on drill rigs, a plunger oiler and a venturi oiler. Plunger oilers operate on a timed plunger system that feeds a fixed amount of oil into the air stream at timed intervals. The main benefit with this type of system is that the oil tank does not need to be pressurized. The oil viscosity and temperature are also not a factor with these oilers. They are quite complex and not as reliable as venturi oilers. Moreover, the oil is not atomized to deliver it more evenly.

Venturi lubricators, or pig oilers as they are also known, work like a carburettor. A constricted area in the venturi creates a pressure drop which draws oil into the line. The oil is atomized and mixed very efficiently with the air allowing for excellent adherence to the hammer components. The volume of oil used is generally controlled with a needle valve. The rate of lubrication is dependent on oil viscosity which varies with temperature.

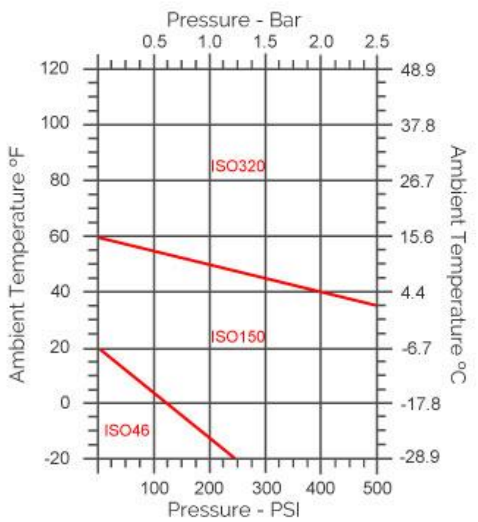
It is vital for DTH hammers to receive a constant supply of proper rock drill oil to protect the internal components and to provide a good air seal between the piston and the inner cylinder, and the piston and the wear sleeve for efficient drilling. Mincon recommends the use of Mincon Envirosafe® rock drill oil (RDO) to maintain optimal performance and extend the life of the internal components of your hammer.

The correct consumption of oil is dependent upon the air volume and conditions. Please refer to the lubrication graph below for recommendations. There should be visual evidence of oil around the drill bit shank and within the tube joints when changing tubes. When using the recommended Mincon Envirosafe® RDO the consumption can be reduced to 70 percent of the amount outlined in the consumption graph.

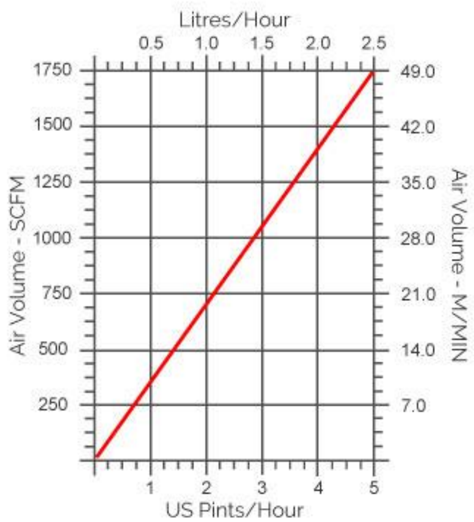
If using petroleum based rock drill oils, the recommended grade of oil is dependent on the ambient temperature in which drilling is taking place as well as the operating pressure. As a rule of thumb, ISO320 grade rock drill oil should be used whenever possible as the hammer is a high frequency tool, however, where the pump cannot pump the oil in colder conditions, a lower grade of oil can be used as per the graph below. The viscosity of Mincon Envirosafe® RDO is such that it can be used at any time without it becoming too tacky to pump.

When using water injection to flush and clean the hole, the quantity of rock drill oil being used must be increased. When drilling with 1 gallon (3.8 liters) a minute then the quantity of oil used should be increased by half. When drilling with 2 gallons (7.6 liters) a minute then the quantity of oil used should be doubled.

Rockdrill Oil Grade



Rockdrill Oil Consumption



Remember: Insufficient lubrication or incorrect lubrication grades may result in damage being caused to the hammer and it’s components. Hydraulic oils, engine oils, gear oils and diesel are not recommended for lubricating DTH hammers.

3.5 Operation

Be sure to familiarise yourself with the controls of the machine and work in accordance with the manufacturers recommendations. The percussive mechanism begins to operate as the air supply is turned on and when the drill bit is pushed firmly into the hammer. Excessive thrust pressures are not needed to make it work. The thrust controls on the drill should be adjusted to the correct pressure and should be readjusted to take account of the weight of any extra tubes added so that the thrust pressure remains constant and not excessive. Insufficient thrust pressure will make the hammer drill erratically and less efficiently and cause premature wear to the bit and chuck splines with likely damage to the hammer components and threads.

When the hammer is lifted from the rock face, the drill bit extends from the chuck and the percussive action ceases. Extra air will pass through the hammer, which can be used to flush the hole or the inner tubes clean. Whenever possible, the pressurized air in the hammer should be drilled out to avoid situations where back hammering can occur. This is not always possible in conditions where the rock is quite fractured and broken or where drilling depths require increased flushing pressure to lift samples up to the top of the hole.

When changing drill rods, ensure that the drill string has been depressurized before breaking the tool joint. Rapid depressurization of the drill string can cause a sudden pressure drop in the hammer forcing debris from the bottom of the hole into the hammer. Before adding drill tubes make sure that the threads are clean and well greased and that there are no contaminants likely to enter the hammer to cause damage and early wear. Always check inner tube O rings or urethane seals so that there is no pressure loss or sample blow out during the drilling process.

3.5.1 Commissioning a New RC DTH Hammer

Coat the drill bit shank and the hammer threads with rock drill oil for protection and easier break-out. Prior to use, lubricate the hammer with ½ pint (¼ liter) of rock drill oil. Install the hammer onto the drill machine’s rotary head, place a piece of cardboard on the table, locate the hammer’s drill bit just over the cardboard and turn the air on low. When the cardboard becomes wet with rock drill oil all internal components should be sufficiently coated with oil.

Fit the hammer to the drilling rig ensuring no debris or dirt enters the hammer from the site, dirty tubes or from unclean air lines. Make sure that the coupling threads from the drill are of the same specification to that of the hammer and they are in good condition. Run the hammer at half the air flow for a few minutes to allow the oil to flow through and for internal components to settle in.

3.5.2 Feed Force/Pressure

For shallow holes the hydraulic down pressure applied to the Rotary Head through the pull down cylinders provides the necessary additional force. This additional pull down force is usually shown as a PSI value on the Rig gauges. To convert this figure to a weight value you will need to multiply the PSI reading by the area of the pull down cylinders. This can then be added to the weight of the Rods, Rotary Head, and Hammer minus Piston, to give the total “Weight on Bit”.

As the hole deepens with the addition of extra rods, a point is reached where the pull down force needs to be reversed to create a “hold back force” thus preventing too much weight being applied to the Bit. Since there are so many different types and sizes of rigs, it is not possible to give specific guidelines on the amount of additional down pressure as shown by the gauge. This becomes part of the necessary tuning by the drill operator. Regarding the actual figures for required weight the easiest way to calculate this is to use the two simplified formulae below:

1. When working with air pressure below 250PSI, (17.2bar) multiply the Bit Head Diameter by 500 for inches and by 9 for millimeters. Example :- A Button Bit with a 6” (152mm) diameter Head would require 3000Lbs “weight on bit” or 1365Kg.

2. When working with air pressure at 250PSI (17.2bar) and above, multiply the Bit Head Diameter by 800 for inches and 14 for millimeters. Example:- A Button Bit with a 6” (152mm) diameter Head would require 4800Lbs “weight on bit” or 2182Kg. Since these formulae have been simplified to allow for quick calculation you may find that, dependent upon ground conditions, slight alterations may need to be made to these values. Again this is a necessary part of the tuning process performed by the drill operator.

It is also important to bear in mind that underfeeding, or insufficient weight on the bit will result in the bit “bouncing” up and down in the chuck. This will lead to a build-up of very high temperatures between the splines of the chuck and the bit which will eventually lead to “spot welding” and burning marks which will soon lead to bit shank failures.

Underfeeding also results in other types of failures, particularly button pop out and striking face failures. This is a result of the energy developed by the piston impacts not being transferred efficiently into the rock. As a result, a percentage of this energy is contained in the drill bit where it will eventually lead to failure through the weakest part of the bit. The percussive mechanism begins to operate as the air supply is turned on and when the drill bit is pushed firmly into the hammer. Excessive thrust pressures are not needed to make it work. The thrust controls on the drill should be adjusted to the correct pressure and should be readjusted to take account of the weight of any extra tubes added so that the thrust pressure remains constant and not excessive. Insufficient thrust pressure will make the hammer drill erratically and less efficiently and cause premature wear to the bit and chuck splines with likely damage to the hammer components and threads.

The best way to ensure the correct feed pressure is to start drilling the hole and continue to increase the hold-down pressure until the drill string begins to bind in the hole and then reduce the hold-down pressure to achieve smooth drilling. If there is a concern for voids, the drilling should be closely monitored so that the hold-down pressure can be turned off and the hole cleaned before resuming drilling. Another method to identify the point at which optimal hold-down pressure is applied is to increase the hold-down pressure until the rotation pressure gauge starts to pulse and then reduce the pull down pressure until the rotation pressure gauge stops pulsing. A combination of hold-down and holdback can be used to stop the drill string from advancing too rapidly when a significant change in the rock conditions is encountered. Ultimately whichever method is used, the optimum situation is to have enough weight on the bit to drill as fast as possible without having excessive rotational torque.

When the hammer is lifted from the rock face, the drill bit extends from the chuck and the percussive action ceases. Extra air will pass through the hammer, which can be used to flush the hole clean.

3.5.3 Rotation

The action of a percussive 'Down the hole button bit' is to make indentations in the rock which, with the rotation of the bit, make chippings and these need to be carried away to the surface by the hammer exhaust air as quickly as possible. Button bits have no cutting or tearing action as such and the effect of over rotation and overfeeding can have a serious effect on the life of the bit, especially in abrasive rock. This can wear away the outer carbide insert buttons or in more solid or dense material can cause the inserts to overheat causing micro-cracks which can lead to fracturing. If the drill string is rotated too slowly this will cause the button bit to re-drill previously cut chippings in the hole causing a drop in penetration rate and unnecessary wear on the buttons. As a guideline, the harder the rock and larger the bit diameter, the slower the rotation speed required. However it may be necessary to increase the RPM if in broken ground so as to prevent the bit jamming in the hole. Remember that this could also be caused by a badly worn bit and increasing RPM in these circumstances would only accelerate the problem. The controls of the drill should be adjusted in order to provide the largest drill chip size with the smoothest rotation and feed characteristics. Recommended rotation speeds would normally vary between 25 – 35 R.P.M. for most applications.

As the feed pressure is increased or decreased as rock conditions change, the rotation speed needs to be monitored and adjusted to maintain correct indexing of the bit face to new rock and maintain the largest chip size. To determine the correct rotation in relation to the feed pressure, adjust rotation so that it is ½” to $^{5}/_{8}$” (12-16mm) of penetration per rotation. The use of a piece of chalk or soapstone applied to the drill pipe during operation will create a spiral that indicates the amount of penetration per rotation. The rotation should be adjusted to keep this between the recommended to $^{5}/_{8}$” of penetration per rotation.

The effect of incorrect rotation speeds can be seen by observing the wear patterns on the drill bits carbides. Where the rotation is too slow, wear will be observed on the leading edge of the carbides (side facing direction of rotation), and rotation that is too fast shows wear on the trailing edge of the carbide.

It is essential to keep the hammer rotating clockwise at all times during drilling and tool recovery to avoid uncoupling of the drill bit, hammer and drill pipe or damage to the drill bit from point loading on anything that may fall back into the bore-hole.

3.5.4 Hole Cleaning, Flushing and Dust Suppression

Effective hole cleaning is essential to maintain a maximum penetration rate and extend the life of the drill bit, hammer and drill pipe. Ensure that sufficient air volume is available to maintain efficient sampling as well as lifting samples through the inner tubes to the cyclone.

Use of a small quantity of water, usually less than 1 gallon per minute (3.8 lpm) can be used for dust suppression injected directly in to the stuffing box and wetting any outside circulation coming out of the “Bluey line. In situations where water is encountered in the hole water injection at the top of the hole can be switched off or reduced to suit the conditions. In order to ensure a dry sample in these conditions always flush the hole at the start of each drill rod with the cyclone open and once the flushing air is running dry start drilling. Once the cuttings coming out of the cyclone are dry then you can shut the cyclone and start drill sampling again. It is important to remember that water injected into the hammer is a restriction in the operating cycle of the hammer and as such should be kept to a minimum as allowed by the conditions during drilling operations.

3.6 Hammer Service

3.7 General

Dismantling the Hammer for servicing or to change the bit can be made easier if the chuck threads are regularly greased and the backhead threads are well greased any time the hammer is opened for servicing. We recommend that a good quality thread grease be used. In acidic conditions, we do not recommend copper based greases as this can trigger a galvanic reaction with corrosive effect to damage the root of the threads and cause failure. Care should be taken when working on the hammer and all safety guidelines should be followed for the equipment being used. Personal protective equipment should also be worn while working.

3.8 Breaking Out Chuck and Backhead

Proper drill guides and break out systems must be used which suit the diameter of the hammer. All tools and spanners used for the drill bit and break out flats must fit properly. Make certain that the hammer is stationary when applying spanner or breakout tools. Do not rotate the hammer with a spanner attached to the drill string unless it is safely captivated within the breakout clamp.

The threads used in Mincon Hammers are right hand threads. Proper tools and break-out systems should be used at all times to dismantle DTH hammers, otherwise damage may be caused to the components which could result in eventual failure or affect the performance of the Hammer.

When using Petol wrenches or similar break-out systems, ensure that the wrench is not placed on the threaded section of the wear sleeve. Inspect the wrench jaws to confirm they are in good condition. It is good practice to keep a spare set of jaws with the rig. Do not strike or hit the outer components as this could weaken the heat treated steels. Hitting the hammer may also cause hard metal fragments to be chipped off which may be projected and cause personal injury or eyesight loss. Follow all instructions for the use of the break-out system being employed.

Do not apply heat to the hammer, as this can alter the metallurgical composition of the hammer and result in premature failure. Additionally, applying heat can also cause distortion to the wear sleeve, which in turn would lead to failure. Do not trap the hammer under drill rig tracks or vehicle wheels which could cause bending and distortion of the hammer body. Failures caused by these actions cannot be supported by warranty. Take care when dismantling the hammer to make sure that parts and drill bits do not become detached and cause damage or personal injury.

To open Mincon RC DTH hammers please adhere to the following instructions.

- The threads used in Mincon Hammers are right hand threads. Therefore they loosen in an anti-clockwise direction.
- Please use a bit breakout pot to hold the drill bit when opening the chuck.
- Please ensure that the wrench is not placed on the threaded section, or the piston running area of the Wear Sleeve.
- Break out wrench jaws should be in good condition. It is good practice to keep a spare set of jaws with the rig.
- Do not strike or hit the outer components as this could weaken the heat treated steels, and distort accurate running diameters.
- Hitting the hammer may also cause hard metal fragments to be chipped off which may be projected and cause personal injury or eyesight loss.
- Do not apply heat to the hammer, as this can alter the metallurgical composition and result in premature failure.
- Take care when dismantling the hammer to make sure that parts and drill bits do not become detached and cause damage or personal injury.

3.8.1 Breaking Out Chuck to Change Drill Bit

When changing the drill bit please follow this procedure.

- Please follow the opening instructions from section 3.8.
- Remove the bit retaining rings form around the top of the bit shank.
- Lift the chuck sleeve over the threads of the chuck.
- Remove the chuck from the shank of the bit.
- Inspect the splines and threads of the chuck for damage, excessive wear or galling.
- Inspect the sample tube end wear. Be careful checking sample tube wear as the end can be extremely sharp. Always change the sample tube before it is worn out.
- Inspect the face of the piston for any pitting or cracking on the strike face. If there is any damage then it should be replaced. Please do not inspect the piston while it is suspended on the drill rig. Always do this with the hammer in a horizontal position. If the piston nose is damaged it is likely that the Aligner/Bearing bush is damaged as well.
- Inspect the Aligner/Bearing bush for any damage. If there is any damage then it should be replaced.
- Grease the threads on the chuck and place the chuck down over the splines of the bit.
- Place the Chuck sleeve on to the chuck.
- Ensure that the gauge diameter of the drill bit and the diameter of the chuck sleeve have the running clearance you require for effective sampling.
- Place the bit retaining rings over the top of the bit shank.
- Screw the chuck bit assembly in by hand to ensure that the sample tube does not get jammed up in the bit when fully shouldered up.
- Torque up the hammer with the bit in a bit break out pot to ensure it does not run loose.

3.8.2 Disassembly for Full Servicing of Hammer

For full disassembly please follow these instructions.

1. Where possible carry out disassembly in a clean work shop environment.
2. Break out the back head and chuck as described previously.
3. Mark the ends of the wear sleeve as chuck and back head end.
4. Secure the hammer in a chain vice to hold steady.
5. Remove the check valve and spring from the top of the Sample tube.
6. At the chuck end of the hammer, push the sample tube end in to the hammer with a piece of wood. Be careful as this end can be very sharp from wear.
7. From the opposite end pull the sample tube out of the hammer.
8. Remove the sample tube spacer from the sample tube and then remove the Lock ring from inside the hammer on top of the Sample tube mount.
9. From the chuck end, insert a soft steel drift in to the hammer against the piston strike face.
10. Carefully knock the piston out the back head end of the hammer**.** This will push the Inner cylinder/sample tube mount assembly out of the hammer as well. **Do not use the sample tube for this process as it would damage it**.
11. To remove the Aligner bearing bush, reverse the direction of the piston (the strike face towards the back head end) and with the soft steel drift against the piston strike face, carefully knock the Aligner out the chuck end of the hammer.
12. Push the piston out of the back head end of the hammer.
13. As the wear sleeve for MR series RC hammers are not reversible, it is not necessary to remove the piston retaining ring. However, if required, please do as follows.
14. Insert a long flat head screw driver in to the groove in the piston retaining ring and lever the ring clear from the wear sleeve groove. Using a hook, pull the ring out of the wear sleeve.
15. The back head is disassembled as so: remove the circlip from its groove and lift the adaptor tube out with the screen assembled around it.

3.8.3 Inspection

Prior to inspection, thoroughly clean all parts using a suitable cleaning agent. Diesel is not recommended for cleaning as it can cause erosion to components, and damage to health.

All parts should be visually inspected for any signs of damage, wear or cracking. The inner cylinder, wear sleeve and lock rings can be checked for unseen cracking by suspending them and lightly tapping with a screw driver. If they emit a ringing tone then they should be sound. However, a dull flat tone if emitted may indicate cracking, and the part should be replaced.

Take particular care to check the internal bore of the wear sleeve for pick-up marks and galling. If these are present, the barrel of the wear sleeve should be honed out, using a hand hone to remove them.

Inspect the surface of the piston for pick-up marks and galling (usually caused through poor lubrication or the presence of contaminants) and smooth out with emery paper or a hand held grit stone. Where galling of the piston has occurred, substantial heat has been generated and quite often, micro cracking has occurred on the piston. In these cases, the piston should be replaced if there is evidence of such cracking. Check the strike face of the piston for cracking or damage. If the piston has strike face damage, the face can be turned on a lathe to remove this up to 1/16” (1.5mm).

Inspect the threads of the chuck and backhead paying close attention to the locking side of the threads. The locking side of the chuck and backhead threads is the side facing away from the top of the wear sleeve. Look for signs of galling which would indicate that the chuck or backhead is coming loose during drilling and there is friction in the threads. Any galling can lead to the failure of the chuck, backhead and/or wear sleeve.

3.8.4 Checking Wear Limits

The performance of the hammer is dependent on the amount of wear the critical components have. These should be measured and recorded in the Service log in the appendix. The service log gives the location of where measurements should be taken. Depending on how many parts need to be replaced, it may be economical to replace the hammer all together.

IF the hammer’s wear sleeve is reversible and the reverse wear limit has been reached on the outer diameter at the chuck end of the wear sleeve, the hammer can be reassembled with the backhead end becoming the chuck end. Additionally if the internal running surface in the wear sleeve for the piston is excessive, the wear sleeve can be reversed.

3.8.5 Reassembly

The hammer can be reassembled in the following manner, referring to the exploded view of the hammer in the appendix. Ensure all components, except for the sample tube, are liberally coated with good quality rock drill oil and threads with thread grease. Replace all O rings and check valve seal before re assembly.

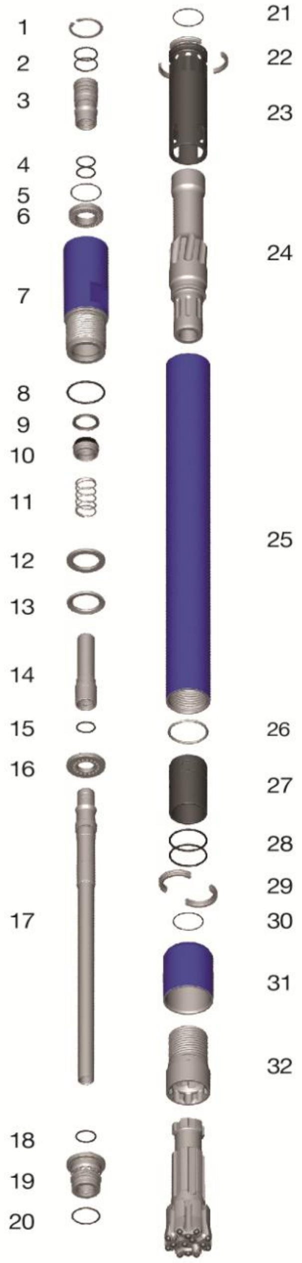
1. Identify the chuck end of the hammer and stand with the chuck end facing up. Insert the piston retaining ring in to the groove provided. Ensure the extraction groove on the retaining ring is facing the chuck end of the hammer.
2. Insert the Aligner (with the smaller outside diameter facing the piston retaining ring) in to the wear sleeve. Using a soft steel drift, tap the aligner in to place against the piston retaining ring.
3. Place the bit retaining rings on top of the aligner.
4. Screw the chuck (with the chuck sleeve assembled on it) in to the wear sleeve.
5. Seal up the chuck end of the hammer.
6. Turn the hammer over so the back head end is facing up.
7. Insert the Piston in to the wear sleeve (refer to the exploded view for orientation).
8. Insert the Sample tube mount in to the inner cylinder and fit the seating rings around the round holes on the inner cylinder.
9. Insert the Inner cylinder assembly in to the wear sleeve. Tap the assembly in to place using a soft steel drift.
10. Place the lock ring on top of the sample tube mount.
11. Fit the spacer on to the sample tube with the flat face facing down to the drill bit end of the sample tube. Place the check valve spring on to the locating recess on the spacer and fit the check valve in to place.
12. Spray the area under the rings of the sample tube with penetrating oil (e.g. CRC / WD40). If hammer oil is used then the sample tube will not go in to place properly because a hydraulic lock will occur between the sample tube shoulder and the sample tube mount.
13. Insert the sample tube assembly in to the hammer.
14. Pour hammer oil in to the hammer.
15. Fit the screen to the adaptor tube and insert the assembly in to the back head. Insert the circlip in to the back head to lock the assembly in to place.
16. Screw the back head assembly in to the wear sleeve. There should be a standoff gap of between 0.5mm - 1mm (0.020” – 0.040”) between the back head and wear sleeve shoulders. If the shoulders meet up then the lock ring needs to be replaced so that all internal parts are properly locked in place. Seal up the top of the hammer.
17. Store the hammer on its side and rotate it periodically if it is being stored for an extended period of time.
18. If a hammer is to be stored for a long period of time, we would recommend that the hammer be disassembled, oiled up, and stored in a clean, dry environment.

4. Trouble Shooting

Problem	Possible cause	Remedy
Low penetration and high pressure	External drill clearances are worn.	Change or re-sharpen the drill bit. Make sure that the running clearance on the bit seal is what you need for the drilling conditions.
	Contamination in hammer	Open hammer and clean the obstruction
Rough or erratic operation	Too much feed pressure	Set the feed pressure until the rotation starts to bind. Then back off the feed pressure until the rotation runs smoothly
	Rotation speed too slow	Drill bit peripheral rotation speed of 12 – 15" per second (300-380mm). Place chalk mark on drill rod and check the advance revolution. If greater than ½" (12mm) per revolution increase rotation until the advance per revolution is a maximum of between 3/8" – ½" (10-12mm)
Low penetration / Low pressure	Worn drill clearances	Inspect piston, inner cylinder, wear sleeve and bearing against discard measurements, and discard as necessary
	Lack of oil	Ensure there is an oil film coming from bit spline and bit parts. (Place cardboard under bit to check)
Sudden loss of pressure	Over run/ blown out sample tube.	Check sample tube wear regularly, and change before it is worn out.
PART FAILURE		
Problem	**Possible cause**	**Remedy**
Cracked wear sleeve/ external part distortion.	Abuse of wear sleeve	Avoid welding, heating or torque wrenching in the wrong place as outlined in section 1.4. Note also section 1.6
	Worn wear sleeve	Outside diameter has worn beyond the discard point. Measure casing O/D approx. 75mm (3") from chuck end and backhead end and replace if necessary.
	Corrosion	If drilling in a corrosive environment wash internal and external parts regularly to avoid corrosive impact on the drill.
	Bogged Drill can lead to reaming and overheating distortion of the drill.	If such danger is imminent use a dig out sub.
	Drill bogged can lead to chuck, wear sleeve and chuck sleeve to distort.	Inspect all parts thoroughly if drill is recovered, and replace parts where necessary.
Piston cracked through large diameter	Lack of lubrication causes micro-cracks leading to breakage	Check lubricator and ensure oil film on the bit splines.
	Feeding hard through voids on broken ground can cause wear sleeve to distort causing heat cracks and galling on the piston	Use light feed and ensure the hole is kept clean and consolidated. Use foam or mud if necessary
	Using wrench over wrong area to open drill can cause the wear sleeve to distort.	Use wrench only in the Area indicated.
Piston strike end breaking	Insufficient down-force	Increase feed until rotation binds and pressure pulses and then back off until the rotation and pressure becomes smooth
	Over running sample tubes will allow ingress between the two striking faces and cause piston nose to crack.	Replace sample tubes before they are worn out.

5. Appendix

5.1 Reverse Circulation Hammer exploded view and Parts List and Technical Data



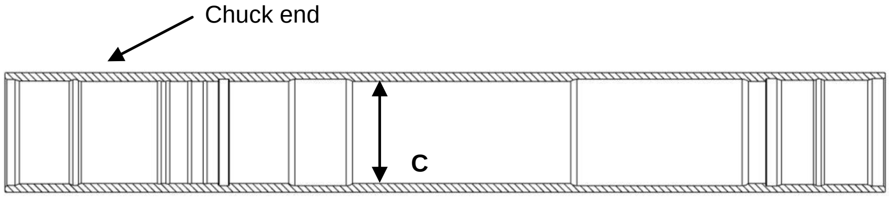
Item	Description	Part Number
	Mincon MR92 (3 1/2" Remet)	MR92AS01
1	Internal Circlip	D1300-0700
2	O Ring x 2	BS 132
3	Adaptor Tube 3 1/2" Remet	MX4044AT01
4	O Ring x 2	BS 126
5	O Ring	BS 036
6	Air Screen	MX4044SC01
7	Backhead 3 1/2" Remet	MX4044BH01
8	O Ring	BS 233
9	Check Valve Seal	8405-137
10	Check Valve Plunger	MX4044CV01
11	Check Valve Spring	MX4044SP01
12	Steel Make Up Ring	MX4044SM01
13	Lock Ring	MX4044LR01
14	Top Tube	MX4044TT01
15	O Ring	BS 126
16	Spacer	MX4044SS01
17	Sample Tube	MX4044ST01
18	O Ring	BS 128
19	Sample Tube Mount	MX4044DR01
20	O Ring	BS 138
21	O Ring	BS 036
22	Seating Ring	MX4044SR01
23	Inner Cylinder	MX4044IC01
24	Piston	MX4044PN01
25	Wear Sleeve	MR92WS01
26	Piston Retaining Ring	MX4044PR01
27	Aligner Bearing Bush	MR92BB01
28	O Ring x 2	BS 232
29	Bit Retaining Rings	MR92BR01
30	O Ring x 1	BS 139
31	Chuck Sleeve	MR92CSxxx
32	Chuck	MR92CK01

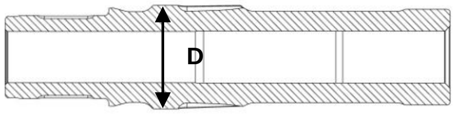
NB: For Chuck Sleeve part number "xxx" indicates head size in mm.

Specifications	Metric	Imperial
Hammer Outside Diameter	92mm	3.62”
Hammer Length (Less Drill Bit)	1146mm	45.1”
Backhead Spanner Flat Size	76mm	3”
Drill Bit Shank Type	MR92	
Backhead Thread	3.5 ” Remet	
Drill Bit Size Range	102mm - 115mm	4” – 4.5”
Hammer Weight (Less Bit)	47 Kgs	103 Lbs
Maximum Drill Bit Weight	11 Kgs	24.4 Lbs
Piston Weight	12 Kgs	26.4 Lbs
Make up Torque	3687-4921 NM	2720-3630 FT Lbs
Backhead Stand Off	0.75mm	0.030”
Recommended Minimum Air Package	25.5m3/min @ 24.1Bar	900cfm @ 350psi

5.2 Hammer Service Log

<table>
<tr><th colspan="10">WEARSLEEVE / PISTON CLEARANCE</th></tr>
<tr><th>Part</th><th colspan="2">New Dimension</th><th colspan="2">As Measured</th><th colspan="2">Wear</th><th colspan="2">Actual Clearance</th><th>Discard Clearance</th></tr>
<tr><td>Wearsleeve ID</td><td>A</td><td>3.080" (78.23mm)</td><td>C</td><td></td><td>C-A</td><td></td><td rowspan="2">C-D</td><td rowspan="2"></td><td rowspan="2">≥ 0.010" (0.25mm)</td></tr>
<tr><td>Piston OD</td><td>B</td><td>3.075" (78.09mm)</td><td>D</td><td></td><td>B-D</td><td></td></tr>
</table>





<table>
<tr><th colspan="10">INNER CYLINDER / PISTON CLEARANCE</th></tr>
<tr><th>Part</th><th colspan="2">New Dimension</th><th colspan="2">As Measured</th><th colspan="2">Wear</th><th colspan="2">Actual Clearance</th><th>Discard Clearance</th></tr>
<tr><td>Cylinder ID</td><td>A</td><td>2.756" (70.00mm)</td><td>C</td><td></td><td>C-A</td><td></td><td rowspan="2">C-D</td><td rowspan="2"></td><td rowspan="2">≥ 0.010" (0.25mm)</td></tr>
<tr><td>Piston OD</td><td>B</td><td>2.751" (68.87mm)</td><td>D</td><td></td><td>B-D</td><td></td></tr>
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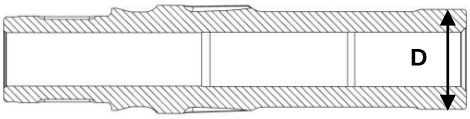
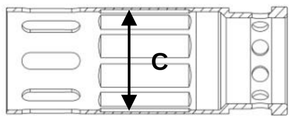
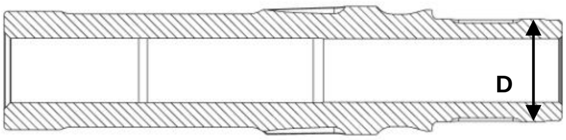
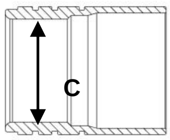




<table>
<tr><th colspan="10">ALIGNER / PISTON NOSE CLEARANCE</th></tr>
<tr><th>Part</th><th colspan="2">New Dimension</th><th colspan="2">As Measured</th><th colspan="2">Wear</th><th colspan="2">Actual Clearance</th><th>Discard Clearance</th></tr>
<tr><td>Aligner ID</td><td>A</td><td>2.373" (60.27mm)</td><td>C</td><td></td><td>C-A</td><td></td><td rowspan="2">C-D</td><td rowspan="2"></td><td rowspan="2">≥ 0.015" (0.38mm)</td></tr>
<tr><td>Piston Nose OD</td><td>B</td><td>2.362" (60.00mm)</td><td>D</td><td></td><td>B-D</td><td></td></tr>
</table>





6. Warranty

Mincon DTH HAMMERS
Warranty, January 2016

Mincon warrants that the Mincon DTH Hammers and spare parts therefore, manufactured by Mincon and delivered to the initial user to be free of defects in materials or workmanship for a period of 3 months after initial operation or 6 months from the date of shipment to the initial user, whichever occurs first. Mincon may elect to repair the defective part or issue full or partial credit towards the purchase of a new part. The extent of credit issued will be determined on a pro-rata basis bearing in mind the service life of the defective part against the normal service life of that part. The part will be replaced or repaired without charge to the initial user at the place of business of an authorized Mincon distributor during normal working hours. The user must present proof of purchase at the time of exercising the warranty.

The warranty applies only to failures resulting from defects in the material or workmanship and does not apply to failures occurring as a result of abuse, misuse, corrosion, erosion, negligent repairs and normal wear and tear. Failure to follow recommended operating and maintenance procedures which result in component failure will not be considered for warranty.

This warranty is in lieu of all other warranties, other than title, expressed or implied.

Limitation of Liability

Mincon will not accept any remedies to the user other than those set out under the provisions of warranty above. The total liability of Mincon or its distributors with respect to the sale of DTH Hammers or spare parts therefor, whether based on contract, negligence, warranty, indemnity or otherwise shall not exceed the purchase price of the product upon which such liability is based. Mincon and its distributors shall in no event be liable to any party relating to this sale for any consequential, indirect, special or punitive damages arising out of this sale or any breach thereof, or any defects in or failure of or malfunction of the Mincon DTH Hammer or spare parts.

Warranty will be voided where:

- There is evidence of damage resulting from insufficient or incorrect lubrication.
- There is evidence of misuse through the application of heat, welding or of being struck.
- There is evidence of distortion or bending however caused.
- There is damage caused as a result of using incorrect servicing tools or procedures.
- If it is evident that the hammer or its components have achieved a reasonable proportion of their anticipated life.