LASERBOND® | HAMMER

Series A - Long-Life DTH Hammer

Surface Engineered for Abrasive Hard Rock

LBH-100 (4″)

LBH-125 (5″)

LBH-150 (6″)

LBH-200 (8″)

Safe Operating Procedure
&
Maintenance Manual

Quality Environment Health & Safety

LASERBOND®
PRODUCTIVITY | INNOVATION | CONSERVATION

Contents

1. Introduction

Congratulations on choosing the most advanced DTH hammer available today.

Application of LaserBond's innovations in surface engineering technology to this hammer design(1) extends operational life in extremely abrasive hard rock conditions that wear out standard drilling tools prematurely when compared to LaserBond's DTH hammers.

"Surface engineering" is the science of modifying the working surface of components to improve life and performance. It produces a different surface metallurgy with properties that cannot be achieved from the substrate material used in standard hammer manufacture.

Externally this hammer is engineered with specially-developed wear-resistant metallurgy, applied using an advanced laser application method. (1) It dramatically extends wear-life.

Internal moving parts have also been designed for extended life.

Our products are built at our lean manufacturing facilities using advanced production techniques and highest quality materials that meet ISO 9001:2008 standards.

LaserBond's surface engineering expertise is well recognised across a range of mining, mineral processing and materials handling industries.

Important: Please read this manual carefully to achieve the long-life, low cost performance of your LaserBond®HAMMER.

The purpose of this manual is to promote intended safe, proper and economical use of the LaserBond DTH hammer. These instructions should assist the user in identifying, avoiding and preventing hazardous situations and related consequences.

Please keep this manual as a permanent part of your standard operating procedures.

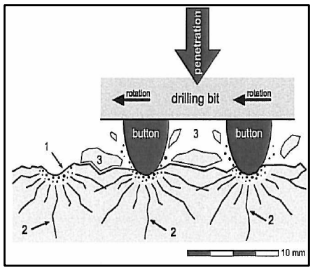
The specifications and instructions contained herein are based on up-to-date information as at publication date.

2. Installation & Operations

LaserBond's surfacing technology reduces the operating cost of drilling by extending wear life and performance of high cost components.

The "Down-The-Hole" (DTH) Hammer is a percussion hammer drill designed to work at the end of the drill string, 'down the hole' where its percussive force can be directly applied to the rock face. A heavy, air-powered piston within the hammer mechanism directly impacts the drill bit with the rock surface. DTH hammers drill faster and straighter than alternative methods.

Compressed air is fed to the hammer via the rotation spindle and the rotating drill pipes. After driving the piston the exhaust air from the hammer is used to flush the fractured rock around the drill bit to clear the drill hole.



The operation of a DTH Hammer requires a high volume of compressed air which creates high bailing velocity of abrasive material which can cause high wear of the hammer casing and chucks.

The LaserBond® hammer is specifically engineered to withstand this erosion and provide long-life, lost cost operation.

2.1 Safety

Operation and maintenance of DTH Hammer equipment can be hazardous and have the potential to cause personal injury if safe work practises are not followed. Be sure to work safely at all times. Wear personal protective equipment (PPE) and safety equipment as required by your employer, site-specific procedures or government regulations. At minimum the following PPE should be used;

Diesel:

Diesel is a fuel and is not a suitable lubricant or cleaning agent. It must not be used when servicing the hammer as high-pressure conditions inside the hammer may

cause internal combustion, or explosions, damaging the hammer and putting personal safety at risk. Evidence of use of diesel will void the warranty.

Heavy Lift:

Take note that DTH Hammers and their internal components can be heavy, and difficult to handle, especially larger models.

Always use proper and approved lifting equipment when handling or maintaining. Ideally use purpose built slings with a lifting eye coupling screwed to top sub.

Always secure hammer when transporting, preferably is a purpose-designed rack.

Refer to model weight chart below (with bit).

Model #	LBH-100	LBH-125	LBH-150	LBH-200
Weight (kg)	38 kg	72 kg	94 kg	176 kg

2.2 Preparation

For protection and easier dismantling coat hammer threads and bit shank with clean grease.

Clean drill tubes and head area of loose dirt prior to commencing a change. Pour about 250ml (capful) of premium quality rock oil into top of hammer.

Fit the hammer to the drilling rig ensuring no dirt or debris enters the hammer from the drill site, hammer tube or dirty air lines. Ensure coupling threads are the same specification and inspect for any damage. Clean prior to fitting.

Run the hammer at half airflow for several minutes to ensure oil lubrication is flowing and internal components are settled.

2.3 Lubrication

DTH Hammers are a mechanical device that relies on good quality lubrication for performance and longevity. A constant and uniform supply of rock oil lubricant delivered via the air supply ensures internal components work freely and provide a good air seal between the piston, inner cylinder and outer casing.

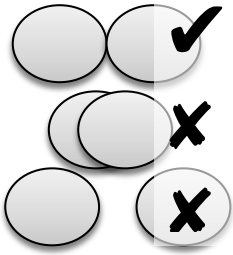
The correct consumption is dependent on drilling conditions and air volume. Please refer to chart in section 5.1 for dry conditions. Double them for wet drilling.

A good indication of adequate lubrication is visual evidence of oil around drill shank and within tube joints when changing tubes.

2.4 Operation

Safety Note: It is essential that the drilling rig is operated within the manufacturers recommendations. Failure may damage both rig and DTH hammer components.

Percussive Action



The action of the piston inside the hammer is initiated when the air supply is turned on and when the drill bit is pushed firmly into the hammer. The impact frequency is directly related to available air supply; the more the faster.

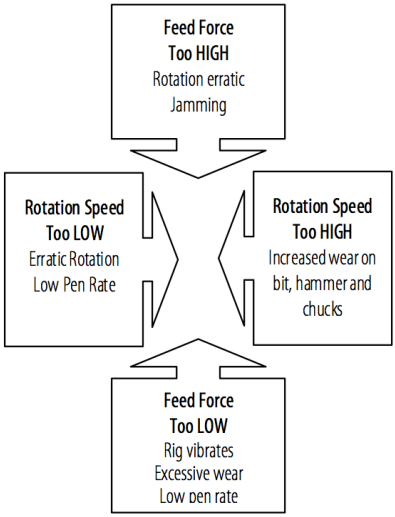
The key to efficient rock breaking is managing speed to ensure each strike just lands on new rock.

DTH hammers are relatively insensitive to small variations in airflow and pressure settings. Correct settings are indicated by smooth rotation of the drill string with steady penetration.

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

Feed Force

Thrust pressure is a combination of the weight of drill tubes and that applied from the rig, controlled by the operator.
Excessive thrust pressures are not needed to make hammer work efficiently.



Too low a feed force will make the hammer drill rotate easily but with excessive vibration and reduced penetration. It causes premature wear to the bit and chuck splines with likely damage to the hammer components and threads.

Too high a feed force causes erratic rotation and jamming in the hole. Subsequent high loading of components can bend the drill string, distort the hammer and damage the rig.

Feed force needs regular adjustments during drilling to take account of changes in rock formation and increasing weight of drill string down the hole.

Rotation Speed

Normal rotation speeds vary between 25 – 90 rpm depending on drilling conditions and drill bit diameters. A speed that ensures a full carbide diameter of rotation per hammer beat is optimum.

Too high rotation speeds do not offer fast drilling. It can cause premature wear of drill bits, hammers and tubes leading to high maintenance downtime. Too low a rotation speed can cause binding in the borehole, inefficient rock cutting and damage to drill bit inserts.

Slower speeds can be efficient when drilling in hard abrasive rocks, or when large diameter drill bits are used. Conversely, a higher rotation speed may produce more satisfactory results in soft, non-abrasive rock.

Water Injection

LaserBond® Hammers are designed to operate with water injection. Only use enough water to suppress dust when drilling dry holes. Too much water will dramatically reduce penetration rates.

Drilling Wet Holes

Water and some deep hole drilling can experience problems with either too much and too little water. Too much reduces drilling efficiency. Too little causes binding of drill cuttings into a paste, which can bind the drill pipes and hammer. This can be overcome by increasing the water injection.

Preventing Damage to Hammer

Some ground conditions cause binding within the hole, jamming the hammer and drill string. Applying excessive pullback forces, high torque or rotation speeds used in an attempt to recover the drill string may generate heat zones around the hammer, which can alter the metallurgy of the internal components leading to premature failure. Installation of a back reamer sub may help prevent jamming in bad ground conditions and prevent heat damage.

Changing Drill Bits

Before changing bits ensure that threads are clean and well greased and that there are no contaminants likely to enter the hammer to cause internal damage and wear.

Use proper drill guides and break-out systems sized to suit the diameter of the hammer.

Keeping the Hammer Internals Clean

Drilling is dirty tough work. It is important for maximum life of the hammer that steps are taken to ensure abrasive materials are kept out of the internals. Any dirt in the drill pipe falls straight through into the hammer.

To ensure long-life reliable operation of the LaserBond® DTH hammer system the following processes should be adopted:

- Keep drill pipes clean. Minimise the risk of dirt ingress by using off-the-ground racks for storage. Use thread covers wherever practical. Never stand hammers vertical on the ground;
- Keep open end of pipe covered until just prior to joining. Check the pipe is clean inside and, if in doubt, blow clean the pipe (after the in ground pipe is covered);
- Dirty threads should be cleaned with a strong bristle brush or cloth, wiping away from the hole;
- Clean around drive chucks before changing the bit. Best to do off the ground in drill or on a special purpose bench.

General Care & Service Principles

LaserBond® DTH Hammers are specifically designed for long service life in abrasive hard rock conditions. The following good operating and service principles help prevent premature failure;

- Clean dry air supply;
- Blow clean air hoses and connections before fitting;
- Maintain cleanliness during storage and maintenance;
- Use special racks to reduce risk of dirt ingress into drilling components;
- Use thread guards wherever practical;
- Maintain good quality oil lubrication;
- Regularly check wear on the drive chuck to ensure it is larger than the hammer casing;
- Do all maintenance in a clean workshop environment.
- Check threads, replace if worn or dmaged.

2.5 Storage

It is important that hammers are stored properly to ensure smooth operation when restarting. Using proper storage procedure will pay dividends when the hammers are put back into service. It is vital that all internal components are coated with rock oil prior to storage.

Short Term.

1. Blow the hammer clear of all water.
2. Pour at least 250ml of Rock oil into the back head, using a long wooden rod to depress the check valve to allow oil to flow into the piston chamber.
3. Apply compressed air into backhead for 10 seconds to distribute oil internally.
4. Ensure that thread protectors and a chuck cap are fitted to maintain a dust seal and prevent oil leakage.
5. Store hammers horizontally in a clean dry environment.

Long Term.

1. Blow the hammer clear of all water.
2. If possible, it is safer for the backhead and chuck to be broken loose using the drill rig, rather than in the workshop.
3. Disassemble the hammer (see section 3.2)
4. Inspect and wipe all parts clean.
5. Lubricate all internal parts with Rock oil. Reassemble.

6. Ensure that thread protectors and a chuck cap are fitted to maintain a dust seal and prevent oil leakage.
7. Store hammers horizontally in a clean dry environment.

Restarting.

1. If stored for prolonged periods, disassemble and inspect all internal components.
2. Remove any oxidisation, with a fine wet & dry. Wash each part, wipe dry, lubricate and reassemble.
3. Failure to inspect internal parts before restarting may lead to premature mechanical failure.
4. Using a long wooden rod push on the Check Valve through the Backhead and pour in 250 ml of quality rock oil into the hammer.

3. Service & Maintenance

LaserBond® DTH Hammers are designed and built for extended wear life. They are different to standard hammers. Therefore, if proper operating procedures have been followed regular mechanical servicing should not be required.

Your LaserBond® hammer should only require routine inspection if operated outside of recommended parameters and in severe drilling conditions.

Recommended service & inspection intervals when operating in severe conditions:

- Every 100 hours in hard abrasive drilling conditions.
- Every 100 hours where mud is encountered.
- Any time when solid impurities are suspected to have entered the hammer.

Occasionally some components do fail, requiring full disassembly, maintenance and component replacement.

3.1 Tools & Materials

The following tools are recommended for safe and efficient servicing.

- Recommended personal protective equipment. (see section 2.1)
- Hammer breakout bench.
- Non-carbide Jaw tongs.
- Slip-joint multigrips / pliers.
- Properly sized chain wrench.
- Medium to fine flat file.
- Long screwdriver
- Wood and or Brass dowel.
- Wire brush.
- Bit breaker

Service Materials

- Solvent or chemical cleaning compound (not diesel)
- Rock drill oil.
- Thread lubricant.

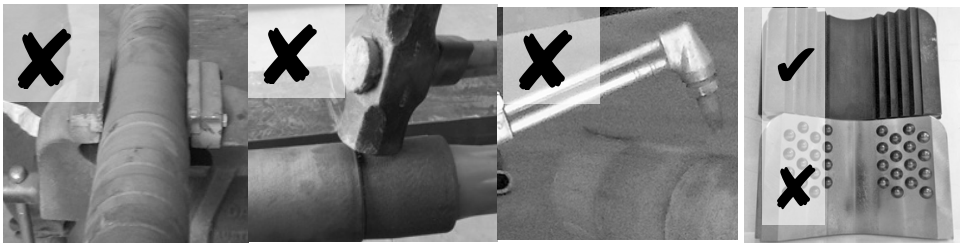
3.2 Disassembly & Assembly

Safety Notes:

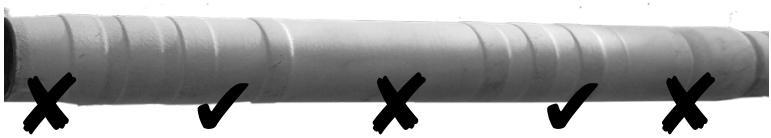
Heavy parts may fall out of the hammer. Use a proper assembly stand to hold hammer in safe position to avoid falling parts. Wear appropriate safety equipment when servicing hammers.

Important for long-life of LaserBond® DTH Hammers

1. Always use correct sized tongs to match the hammer outside diameter as this avoids putting deforming loads onto the hammer body.
   Grip in the hammer casing in the ribbed areas only.
2. Do not apply heat or heavy impact to the hammer body as they may induce cracks and reduce longevity of the component.
3. Never use button type carbide jaws on the hammer body or chucks, as they will reduce the wear resistance of the components.



4. Where possible, the backhead and chuck should be broken loose on the drill rig. This makes workshop maintenance safer and easier.
5. Maintenance should be undertaken in a clean workshop environment with recommended tools and handling equipment.
6. Acceptable clamping areas for the hammer casing are on the ribbed areas only. Clamp in the correct position, away from threads and mid area of the casing. Use a properly sized chain wrench or special jaws.
   Incorrect clamping will void the warranty.



Disassembly [refer Assembly diagram Sect. 4.2 pg 15]

1. Place hammer assembly horizontally on a hammer stand and secure.
2. Clean the outside of the hammer to ensure the surface offers a good grip.
3. Unscrew the Drive Chuck [12] from the Hammer Casing [8].
4. Remove Bit Retainer Ring [11] using O-ring [10] to keep halves together.
5. Remove Drive Chuck [12] from the Drill Bit [13].
6. Remove Alignment Sleeve [9] and Piston [7].

Complete disassembly of the backhead subassembly is not necessary for routine service.

7. Unscrew and remove Backhead [1] from the Hammer Casing [8], remove Top O-ring [2] from the Backhead.
8. Remove Check Valve [3], Spring [4] and Air Distributor [5].
9. Remove Inner Cylinder [6].

Clean, inspect and service as necessary. See section 3.2

Assembly [refer Assembly diagram Sect. 4.2 pg 15]

Complete the inspection and attending to any service needs as detailed in Sect 3.2. Before assembly ensure that all components are cleaned and greased, laid out in order of assembly.

1. Place Hammer Casing [8] horizontal on a hammer stand and secure.
2. Fit Inner Cylinder [6] from top end until it seats on land inside Hammer Casing.
3. Slide Air Distributor [5] into Inner Cylinder. Follow with Spring [4] and Check Valve [3].
4. Coat thread of Backhead [1] with grease and screw into Hammer Casing.
5. Liberally coat Piston [7] and slide into the Hammer Casing ensuring it fits smoothly over the Air Distributor.
6. Grease Alignment Sleeve [9] and insert into Hammer Casing.
7. Fit Drive Chuck [12] over the Drill Bit [13], then the Bit Retaining Ring [11] with the Bottom O-ring [10].
8. Coat thread of Drive Chuck and Bit assembly with grease and screw into Hammer Casing.
9. Reposition the hammer assembly to stand it vertically and secure.
10. Using a long wooden rod open the Check Valve through the Backhead and pour in 250 ml of quality rock oil into the hammer.

11. Fit protective cap over the open Backhead.

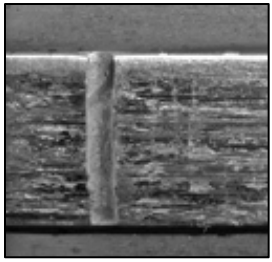
Update the maintenance record at the back of this manual with details of the inspection and service work undertaken.

3.3 Inspection & Service

Thoroughly clean all parts using a suitable cleaning agent, (not diesel).

All parts should be visually inspected for any signs of damage, wear or cracking.

1. 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 dull flat tone it may indicate cracking. The part can be further inspected using a dye penetrant test kit or equivalent. It is generally efficient to replace the part.
2. Inspect the internal bore of the casing for pick-up marks and galling. If these are present, the bore of the barrel should be honed out, using a hand hone to remove any marking.
3. Inspect surface of the piston for pick-up marks and galling (usually caused through poor lubrication or the presence of contaminants). Smooth out any damage with emery paper or a hand held grit stone. If significant galling of the piston has occurred, the heat generated may have initiated micro cracks that lead to premature fatigue failures and the piston should be replaced.



4. Check the strike face of the piston for cracking or damage.

3.4 General Maintenance

Under independent testing, LaserBond® DTH Hammers have been shown to last approximately 3 times longer than other leading brands of hammers in severe abrasive conditions.

End of life failure is most often due to internal mechanical failure, not wear of the hammer casing. Internal moving components are also engineered for extended life, thereby reducing maintenance.

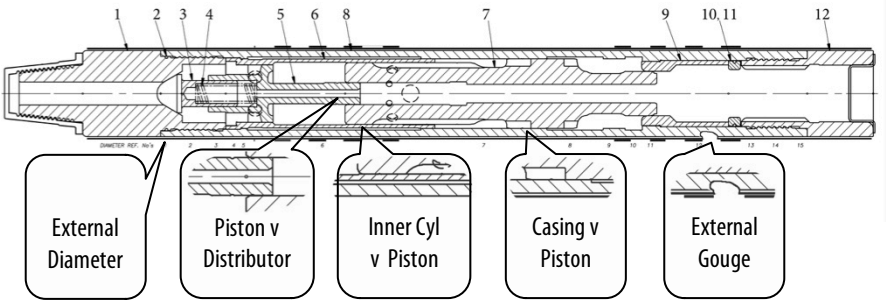
Operating life is maximised by observing good operating hygiene, ie clear air, clean water, quality oil lubrication and awareness by operators to prevent dirt ingress.

This reduces the need for full maintenance overhauls. We recommend a replacement rather than overhaul strategy.

Recommended Wear Limits

LaserBond® DTH Hammers have been manufactured with wear resistant laser modified surfaces for long-life in highly abrasive drilling environments. The long life of the external components is complemented with internal design features that assist extended operations without internal servicing and maintenance.

Externally, the most likely wear failure is erosion in a breach of the outer hard surface leading to gouging of base material. In this case measuring for the wear limit of the outer casing is not usually about overall outside diameter, but rather determining the resultant wall thickness of the casing at the base of any gouging. Whenever the hammer is dissembled the following wear points should be inspected.



- External Diameter: Unlikely but discard if overall outside diameter is
  - ≤ 88mm [LBH-100]
    ≤ 111mm [LBH-125]
    ≤ 133 mm [LBH-150]
    ≤ 186 mm [LBH-200]
- Piston ID v Distributor OD: Discard if clearance exceeds ≥ 0.25mm
- Inner Cylinder ID v Piston OD: Discard if clearance exceeds ≥ 0.25mm
- Casing ID vs Piston OD: Discard if clearance exceeds ≥ 0.25mm
- External Gouge: Discard if depth exceeds 6 mm

Other areas to inspect:

- Spring length / tension [Item 4]
- Retainer Ring & O-ring tension & alignment [Items 10 &11]
- Chuck / Bit Spline clearance [Items 12 & 13]

4. Parts Description

4.1 Technical Data

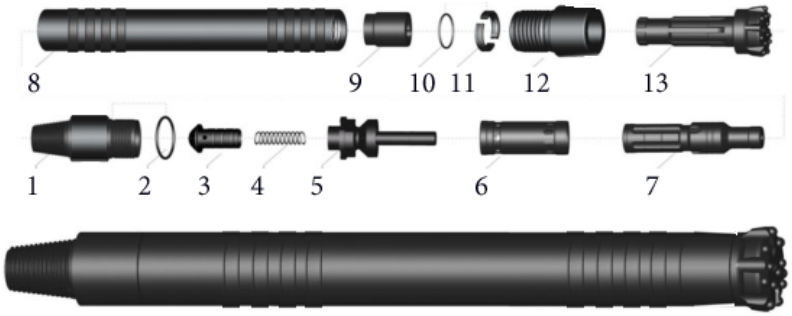
LaserBond® Hammer	LBH-100 (4″)	LBH-125 (5″)	LBH-150 (6″)	LBH-200 (8″)
Casing Diameter	98 mm + rib	126 mm+ rib	143 mm+ rib	180 mm+ rib
Hammer Length	985 mm	1105 mm	1238 mm	1354 mm
Hammer Weight	38 Kg	72 Kg	94 Kg	176 Kg
Working Pressure	10 – 25 bar	10 – 25 bar	10 – 25 bar	10 – 25 bar
Impact Frequency	30 Hz @17bar	28 Hz @17bar	25 Hz @17bar	22 Hz @17bar
Air Consumption	100 - 230 l/s	115 - 320 l/s	150 - 430 l/s	200 - 470 l/s
Bit Size	110 - 135 mm	135 - 155 mm	152 - 203 mm	195 - 254 mm
Thread Standard*	API (2 3/8)″ Reg	API (2 3/8)″ Reg	API (3 1/2)″ Reg	API (3 1/2)″ Reg

*Other Backhead Thread Connections Available on request

4.2 Assembly & Parts Diagram

LaserBond®HAMMER's are designed with minimum moving parts specifically for mid-high pressure, high frequency operation.

Item identification refers to Parts listing Section 4.3 (Hammer) & 4.4 (Bit)



Part Numbering refer to Sect 4.3 Parts List.

4.3 Parts List

Use part numbers when ordering; go to www.laserbond.com.au

Item	LaserBond® Hammer Part #	LBH-100 (4″)	LBH-125 (5″)	LBH-150 (6″)	LBH-200 (8″)
1	Backhead	LBH100-BH01	LBH125-BH01	LBH150-BH01	LBH200-BH01
2	Top O-Ring	LBH100-TO01	LBH125-TO01	LBH150-TO01	LBH200-TO01
3	Check Valve	LBH100-CV01	LBH125-CV01	LBH150-CV01	LBH200-CV01
4	Spring	LBH100-SP01	LBH125-SP01	LBH150-SP01	LBH200-SP01
5	Air Distributor	LBH100-AD01	LBH125-AD01	LBH150-AD01	LBH200-AD01
6	Inner Cylinder	LBH100-IC01	LBH125-IC01	LBH150-IC01	LBH200-IC01
7	Piston	LBH100-PS01	LBH125-PS01	LBH150-PS01	LBH200-PS01
8	Hammer Casing	LBH100-HC01	LBH125-HC01	LBH150-HC01	LBH200-HC01
9	Alignment Sleeve	LBH100-AS01	LBH125-AS01	LBH150-AS01	LBH200-AS01
10	Bottom O-Ring	LBH100-BO02	LBH125-BO02	LBH150-BO02	LBH200-BO02
11	Bit Retainer Ring	LBH100-BR01	LBH125-BR01	LBH150-BR01	LBH200-BR01
12	Drive Chuck * (see table below)	LBH100-DC01/…	LBH125-DC01/…	LBH150-DC01/…	LBH200-DC01/…

* Complete with Drive Spline designation as /…

12	DHD - 8 Spline	…/DHD340	…/DHD350	…/DHD360	…/DHD380
12	QL – 10 Spline	…/QL40	…/QL50	…/QL60	…/QL80
12	TD - 12 Spline	…/TD40	n/a	n/a	n/a
215	LBB215-DB01/…	195 - 254 mm	…/DHD380	…/QL80	n/a

Eg. Complete Unit LBH100-QL40. Maintenance Part LBH150-DC01/QL40

LaserBond DRILL BITS are available in a range of matching drive splines types.

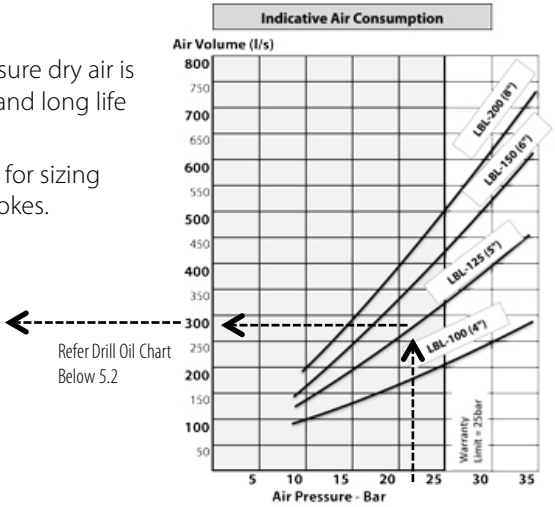
These are manufactured with added durability to suit the extended wear life of the DTH Hammer casing and chuck components. Refer to LaserBond®BIT product catalogue available on LaserBond.com.au website.

5. Air & Lubrication Specification

5.1 Air Consumption

Adequate volume of high-pressure dry air is essential to high performance and long life of LaserBond® DTH Hammers.

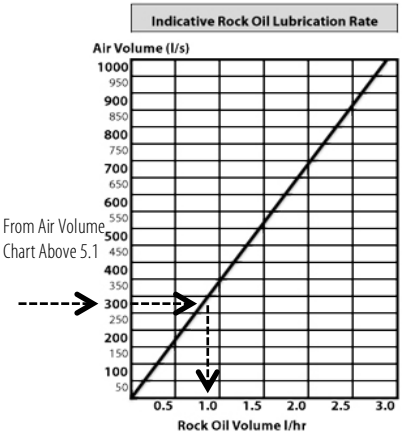
The chart provides information for sizing hammers, compressors and chokes.

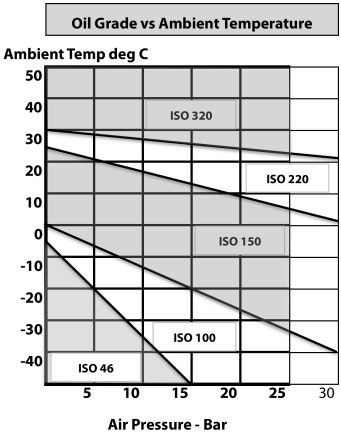


5.2 Rock Drill Oil Consumption

An adequate and reliable supply of good quality rock oil is essential for efficient operation and long-life of LaserBond® DTH Hammers. High performance moly based oils offer advantages.

The charts below offer indication of requirements for all models.

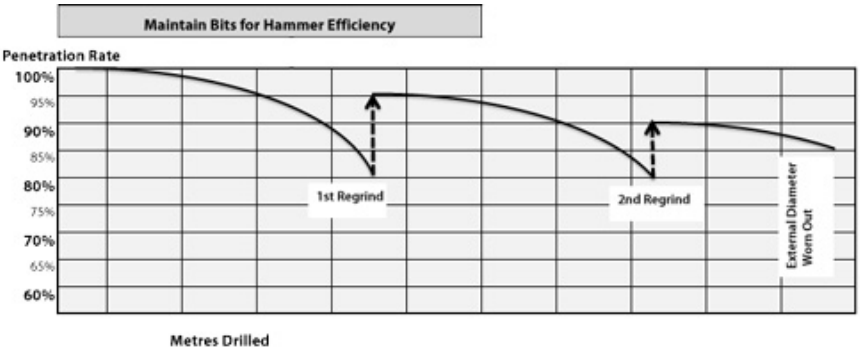




6. Drill Bit Care

LaserBond also offers are range of drill bits that have been developed in parallel with the DTH Hammer, LaserBond®DRILLBITS.

The tungsten carbide button inserts should be reground when necessary to maintain drilling efficiency.



Inspect buttons and regrind when button 'wear flat' reaches 30% of diameter of button.

Regrinding

- Grind off the microscopic fatigue cracks that appear on the worn surface of carbide buttons (snakeskin effect). If this is not done the micro cracks grow deeper quickly and button will break off.
- Do not grind too much off the top of buttons; leave a little flat as this extends life.
- Always grind broken buttons flat to ensure no chips come out to damage other buttons.
- Avoid grinding the diameter gauge buttons. Excessive grinding renders bit useless before cutting buttons have been utilised fully.
- If necessary, remove bit body steel to ensure buttons are sufficiently exposed.
- If flushing holes begin to deform through wear, reshape them with a rotary file or burr.

6. TROUBLESHOOTING

Observed Problem	Possible Cause	Recommended Solution
Hammer Fails to Start	Internal components are broken or damaged.	Remove, disassemble and inspect parts. Replace and repair as necessary.
	Hammer airflow obstruction	Remove, disassemble and clear obstruction.
	Lubrication oil is too thick	Run air through hammer to clear thickened oil. Use correct viscosity for operating temperature.
	Air blockage before hammer	Check all hoses and lines through to drill pipes and hammer to ensure they are clear.
Low Penetration Rate with HIGH pressure	Drive chuck shoulder length worn	Measure against wear length table and replace if necessary as this restricts air for up-stroke of piston.
	Air restriction in the hammer	Remove, disassemble and clear contamination.
	Water injection too high	Reduce amount of water flow.
	Too much back pressure	Add boost to compressor
Low Penetration Rate with LOW pressure	Excessive drill component clearances	Remove, disassemble and inspect parts. Compare critical dimensions to wear limit table. Replace components as necessary.
	Lack of oil film	Use correct injection rate and viscosity.
	Mismatch between hammer and compressor air	Check air consumption charts against compressor rating.
Rough or Erratic Operation	Incorrect feed pressure	Set feed pressure until bit starts to bind, then back off until hammer smooths out. This is usually accompanied by a rotation speed adjustment to ensure carbides are hitting new rock on each impact.
	Rotation speed too low	Note mark on drill rod to check advance per revolution. Adjust rotation until advance is = button diameter.
	Dull bit	Resharpen carbides.
	Too much water injection	Reduce amount of water flow
	Worn hammer components	Compare critical dimensions to wear limit table. Replace components as necessary.
Cracked Hammer Casing	Improper maintenance or abuse of LaserBond layer.	Do not, weld, heat or impact hammer casing. Proper use of torque wrench.
	Use of carbide button jaws	Replace with recommended serrated jaws.
	Applying breakout jaws to incorrect part of casing.	Ribbed area of casing is specifically designed for clamping. Only apply jaws to these areas

Observed Failure	Possible Cause	Recommended Solution
Worn Hammer Casing	Isolated wear points, typically adjacent chuck and bit.	Normal design wear associated with long-life. Replace entire drill is recommended as mechanical components may also becoming close to end of life.
Cracked Backhead Body	Bogged drill requiring excessive forces to recover	If such conditions are likely use a dig out sub.
Piston Cracked Through LARGE Diameter	Lack of lubrication causes galling & micro cracks	Ensure adequate oil lubrication and of the correct viscosity.
	Improper maintenance and clamping techniques distorts casing.	Always use proper tools and equipment when handling and servicing hammers. Do not weld, impact or abuse hammer components,
	Drill badly bogged where excessive force distorts casing body.	Always flood hole with water when attempting to clear bogged tools.
	Fast feeding though voids on broken ground	Use light feed and ensure hole remains clean and consolidated. Use foam or mud if necessary.
Piston Cracked Through SMALL Diameter (Strike end)	Insufficient down force	Set feed pressure until bit starts to bind, then back off until hammer smooths out.
	Contamination from excess or poor quality water causes pitting, leading to failure.	Avoid excess water, ensure it is neutral pH and filtered free from contaminations.
	Applying breakout jaws to incorrect part of casing.	Ribbed area of casing is specifically designed for clamping. Only apply jaws to these areas.

7. WARRANTY

To be read in conjunction with LaserBond Limited Standard Terms & Conditions of Sale.
LaserBond .Limited warrants that the LaserBond DTH Hammers (LaserBond®Hammers) and spare parts, manufactured by LaserBond and delivered to the initial user, to be free of defects in materials or workmanship for a period of three (3) months after initial operation or six (6) months from the date of shipment to the initial user, whichever occurs first.
LaserBond 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 authorised LaserBond distributor during normal working hours. The claimant 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

LaserBond will not accept any remedies to the user other than those set out under the provisions of warranty above. The total liability of LaserBond 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. LaserBond 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 LaserBond 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 component 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.

Warranty Note

Warranty against faulty workmanship and materials is only valid for operating pressures up to 25 bar. If the hammer is operated at pressures above 25 bar LaserBond will not be held responsible for component failure or premature wear.

Maintenance Notes

Model Number:

Serial Number:

Date	Drill Rig	Hours/ Metres	Air

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ORDERING

New DTH Hammers, Bits, Service and Repair Kits are available for all LaserBond Long-life DTH hammers.

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More Information on LaserBond Website

Our website offers more about LaserBond and what inspired the Long-life DTH Hammer development. Download the following

- Safe Operating Procedure & Maintenance Manual
- Product Brochure – LaserBond® DTH Hammers
- Case Studies
- Long-life DTH Hammer Development Whitepaper

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