



# DTH HAMMER

## Operation and Maintenance Guidelines

Hammer Type — Air Consumption	MISSION 40B		MISSION 40B (with optional low volume tuning ring)	
	cfm	m <sup>3</sup> /min.	cfm	m <sup>3</sup> /min.
150 psi / 10 bar	180	5.10	151	4.28
250 psi / 18 bar	370	10.48	315	8.92
350 psi / 24 bar	560	15.86	466	13.20



Operating Pressure: 150 - 350 psi / 10 - 24 bar

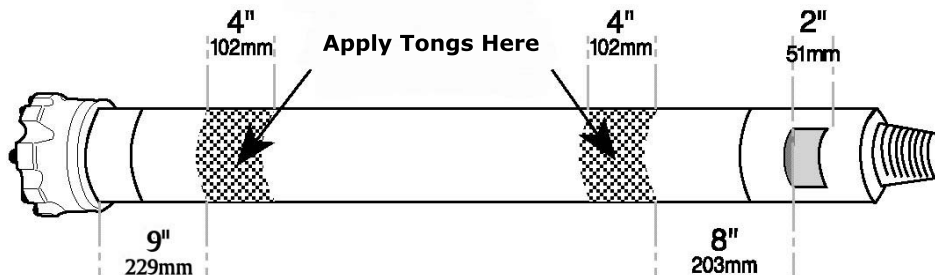
Hammer Length: 36" / 914mm

Hammer Outside Diameter: 3.86" / 98mm

Wrench Flats: 2.56" / 65mm

### Hammer break-out

To avoid damage on the Piston Case, use chain wrench or petol tongs and place it as shown in the illustration below.



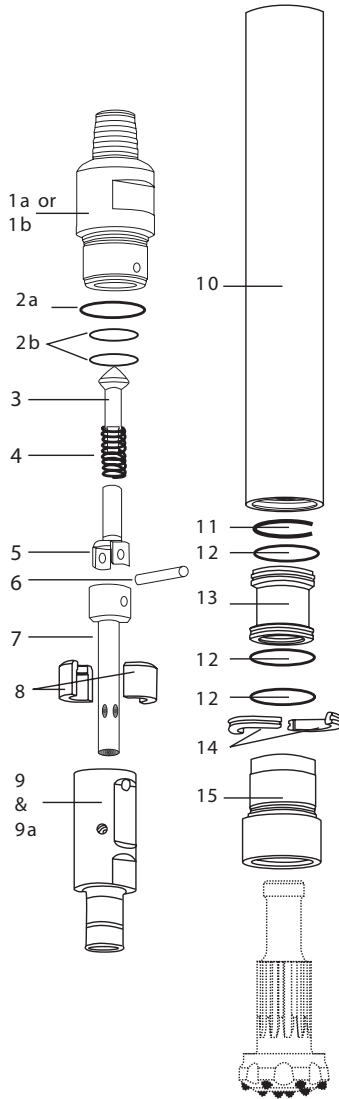
# MISSION 40B MISSION 40BH

## Hammer Description

	Weight		Part No.
	(lb)	(kg)	
Mission 40B (2-3/8 API Reg Pin)	83	38	32-M40B/16
Mission 40B (2-7/8 API Reg Pin)	83	38	32-M40B/11
Mission40BH (Horizontal) (2-3/8 API Reg Pin only)	83	38	32-M40BH/16
Rebuild Kit (2-3/8 API Reg Pin) <i>Includes items 1a, 10 &amp; 15</i>	??	??	38-48001/16
Rebuild Kit (2-7/8 API Reg Pin) <i>Includes items 1b, 10 &amp; 15</i>	??	??	38-48001/11

## Replacement Parts

1a. Top Sub with 3 O-Rings, 2-3/8" API Reg. Pin	22	10	33-48001-1/16A
1b. Top Sub with 3 O-Rings, 2-7/8" API Reg. pin	22	10	33-48001-1/11A
2a. O-Ring Top Sub	(Spares in Seal Kit)		
2b. O-Rings Top Sub (inside)	(Spares in Seal Kit)		
3. Check Valve Dart	0.6	0.3	25-99001A
4. Check Valve Dart Spring	0.04	0.02	22-99072
5. Check Valve Guide	0.7	0.3	39-48001-1
6. Feed Tube Retainer Pin	0.05	0.03	12-99014
7. Feed Tube with Retainer Pin & Blank Choke,	1.5	0.7	37-48001-1A
7a. Choke Set, Blank 1/8", 3/16", & 1/4" (not shown)	0.25	0.1	29-48017A
8. Tuning Ring for low volume (Not Included)	0.5	0.03	56-48552
9. Piston (for 32-M40B/16 & 32-M40B/11)	15.2	7	36-48081
9a. Piston (for 32-M40BH/16)	15.2	7	36-48H01
10. Piston Case with Retainer Ring	33	15	35-48006A
11. Piston Retainer Ring	0.1	0.05	23-99029
12. O-Rings Guide Sleeve & Bit Ret. (3)	(Spares in Seal Kit)		
13. Guide Sleeve with 2 O-rings (Item #12)	4	1.8	26-48010A
14. Bit Retainer Ring w/O-ring (Item #12)	0.5	0.23	27-48006A
15. Driver Sub (O-ring not required)	7	3.2	34-48006
Not shown			
Seal Kit - Includes 1 x item 2a, 2 x item 2b, & 7 x item 12	1	0.45	38-48056
16. Piston Retainer Ring Extractor (Not Included)	0.5	0.23	38-55061

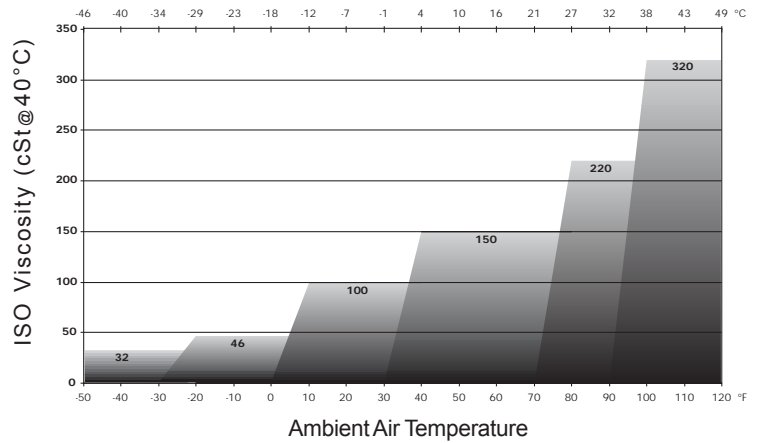


**Lubrication**

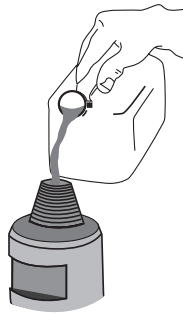
Correct lubrication during drilling operations is extremely important. Inadequate lubrication is a major cause of hammer wear and failure. Excessive lubrication slows piston and makes startup difficult.

- Use rock drill oil only. Use Figure 1 to select the correct grade of rock drill oil.
- The recommended amount of rock drill oil for reliable operation is shown in Figure 2. An alternative method is 0.15-0.25 quarts/hour per 100 cfm (0.04 - 0.07 liters/hour per m<sup>3</sup>/min.)

**- Fig. 1 -  
Rock drill oil chart**



**Use good quality Rock Drill Oil**



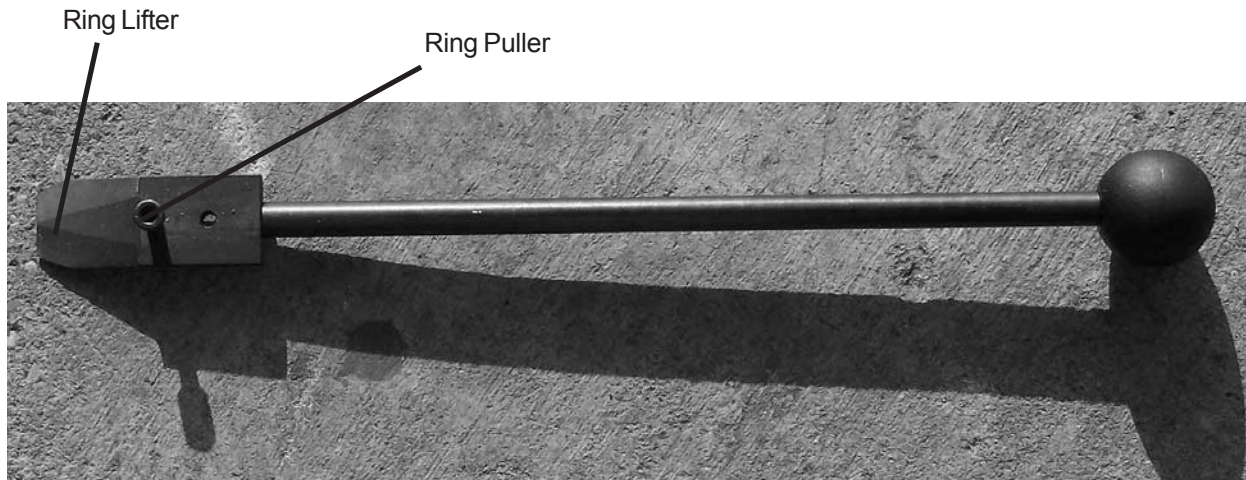
**- Fig. 2 -**

**Recommended Oil Lubrication**

Air Pressure		Flow Rate	
psi	bar	l/hr	qt/hr
150	10	0.6	0.6
250	18	1.1	1.1
350	24	1.6	1.6

**Piston Retaining Ring Extractor - p/n 38-55061**

see next page for more details



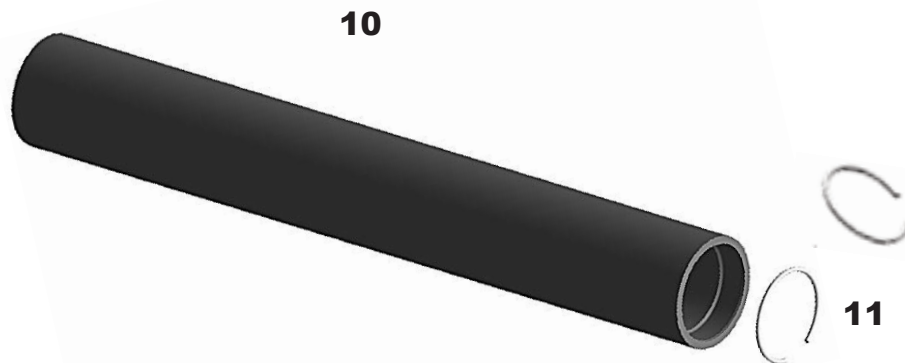
# Hammer Maintenance

## Piston Case

The piston case (10) is reversible and assembles in either direction. Measure outside diameter regularly. The piston case life is extended up to 50 percent longer if reversed in a timely manner.

Reversal must be done before wear limit is reached (see Common Procedures section). The best point to reverse is based on experience in a particular application. Note: The reversal diameter published in this manual is a recommendation only.

- Regularly inspect all parts carefully for burrs, galling or cracks. Replace any parts which are cracked. Use a file or emery paper to remove any burrs. *Any parts which show signs of galling will also have a mating part with similar damage.* If the piston is galled it should be replaced and careful inspection is required inside the piston case. It is strongly recommended to hone or polish inside the piston case to smooth the galled surfaces. Look for causes of galling such as poor lubrication or contamination and take corrective measures to avoid future damage. Neglecting to hone the galled piston case before installing a new piston will lead to early and repeated piston failures.
- Premature thread failure usually results from galling and corrosion and these two problems can be avoided by using a good quality copper based “Thread Grease” every time the driver sub is removed for bit changes. It is also recommended that “Thread Grease” be applied to the top sub thread every 100 hours or after 10,000 feet (3000 metres) of drilling.
- Never grip hammer with any type of tongs over the piston case threads. Gripping with tongs over the piston case threaded areas makes the threads very difficult to unscrew and can lead to premature cracking due to jaw marks. Never use excessive force with a steel hammer or apply any weld to the piston case as this may lead to premature failure and will be denied in the event that a claim is made for warranty.



## Piston Retainer Ring

Only one piston retainer ring is used. The piston retainer ring (11) is the first component to be installed during hammer assembly. Insert the piston retainer ring into piston case at same end as the driver sub (15) will be fitted.

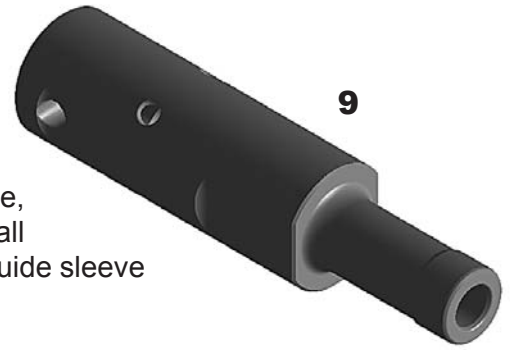
- Place the piston retainer ring at 90° to its final position and using the bolt on the back of the extractor tool (16), push the ring so it slides inside the piston case. When it is close to the groove, again use the bolt to manoeuvre the ring 90° so it snaps into the groove.
- To remove the piston retainer ring, simply place the curved side of the extractor tool against the wall of the piston case, in line with the split in the ring and push forward until the ring lifts out of the groove. Continue pushing until the ring turns sideways inside the piston case and then pull it out with the retriever bolt on the back of the extractor tool.
- When reversing the piston case, it is strongly recommended to replace the piston retainer ring to ensure the “Gap” is maintained between the driver sub and piston case. (see pg.6)

## Piston

Wipe the piston with rockdrill oil. Install piston (9) into piston case through top sub end with nose end down (as shown).

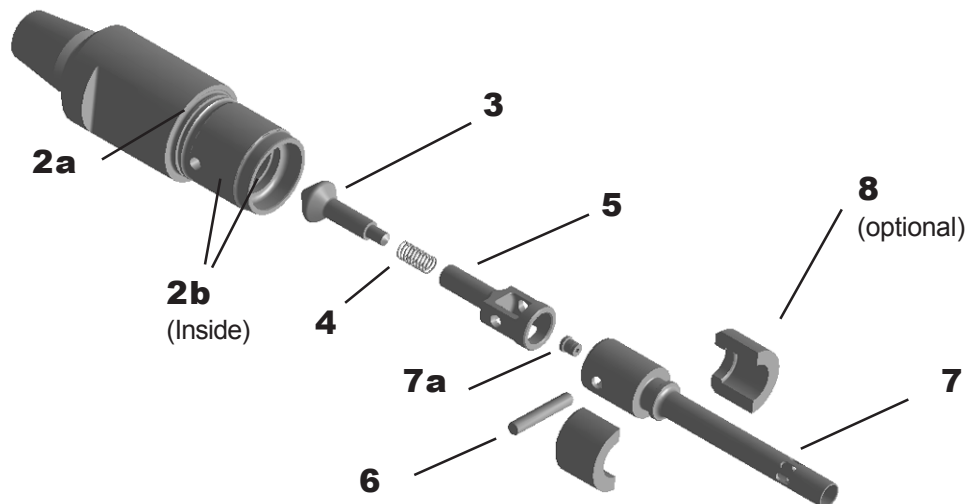
Inspect used pistons for galling against piston case, guide sleeve, or feed tube inside the center air hole. Polish as necessary. Install used pistons with the piston case horizontal to avoid knocking guide sleeve out of place.

Regularly inspect the piston striking face and remove any burrs (Peening) with a fine buffing or flap wheel. DO NOT use a grinding wheel as the rough surface finish will propagate cracks and lead to premature piston failure.



## Top Sub Assembly

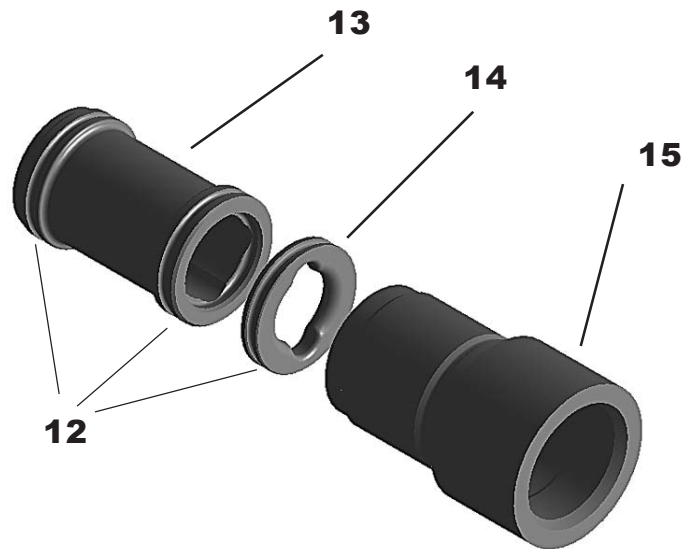
- Oil and assemble parts before installation,
- Pull the top sub o-ring (2a) over the top sub threads all the way to its groove,
- Insert feed tube o-ring (2b) into the groove inside the top sub,
- Assemble dart (3) and spring (4) into the check valve guide (5),
- Install desired choke (7a) through feed tube (7) top,
- Insert the check valve guide (5), dart (3), and spring (4) into to the feed tube (7)
- Carefully line up pin holes,
- Install tuning ring (8), if equipped, between the two shoulders on the feed tube (7),
- Insert assembly into the top sub until seated, line up retainer pin holes and install feed tube retainer pin (6),
- Make sure the pin does not protrude into threads on either side,
- Apply copper based thread grease on threads and install top sub assembly into the piston case,
- Ensure feed tube lines up in the piston center,
- Never force assembly, and
- Turn clockwise to tighten.



## Guide Sleeve

Install two O-rings (12) on guide sleeve (13). These O-rings are critical for proper hammer alignment and for holding guide sleeve in place when changing bits.

- The guide sleeve will install correctly into the piston case only in *one* direction. Coat the guide sleeve with oil and insert with the shoulder that fits against the piston retaining ring.
- Use the shank of a discarded Mission Bit to push the guide sleeve into piston case. Continue to push the guide sleeve until it will go no further and then it is in the correct position.
- To remove guide sleeve, stand piston case vertically with guide sleeve nearest the ground.
- From the top sub end, insert a wooden or aluminium bar which is the same length as the piston case and 1/4" (6mm) smaller in diameter than the piston and tap against the guide sleeve until it can be removed from the driver sub end of the piston case. Carefully inspect guide sleeve inside where it seals against the piston nose. Polish if surface is galled. Replace if cracked or otherwise damaged.



## Driver Sub

Install driver sub (15) using only copper-based thread grease on its threads. During storage, the bit retainer ring (14), made up of two half rings plus an O-ring (12), may be inserted without a drill bit installed.

- When assembling the hammer without a drill bit, use a cover to prevent contamination from entering hammer.
- Inspect used driver subs for nicks or burrs in the thread. Polish as needed.
- Inspect interior spline for wear. Replace driver sub if spline is at one third or less of original width.
- Check the driver sub's remaining outside diameter and discard if appropriate. Most of the time, the driver sub will wear more rapidly than other hammer components; two spare driver subs are typically used per piston case. Never install a used driver sub on a new piston case.
- Sometimes vertical channels are eroded adjacent to drill bit flushing groves. When replacing the bit, always index the driver sub to alleviate this problem. Some operators rebuild driver subs by adding weld material. This is not recommended as it may cause warping or cracking. Welding, as described herein, cancels any remaining driver sub or piston case thread warranty.

## The Gap

When the Driver Sub has been screwed into the Piston Case with the Guide Sleeve and Bit Retainer Rings installed, a gap must be visible where the Piston Case and Driver Sub join. The dimension of this gap is not critical, but it should not be less than 0.020" (0.5mm) and not more than 0.040" (1.00mm). When this gap is no longer visible, the Piston Retainer Ring should be replaced. If hammer operation continues with no visible gap, there is a high risk of component failure. Warranty claims for broken parts may be denied in this situation.

## Common Procedures

### Start-up

The MISSION hammer line has a large contact surface between the piston and the inside of the piston case. This improves lubrication and increases wear life. It also requires attention during new hammer and cold hammer start-up. Before starting a brand new hammer or a used hammer which has not been used for more than 2 days, flush hammer thoroughly with clean, lubricated air from the compressor before attempting to drill. This will warm the hammer and remove any oil buildup that has migrated down from the drill pipe. This procedure is essential in cold climates with tight hammer clearances and thick oil.

### Wear Limits and Case Reversal

- Piston Case Outside Diameter (New)..... 3.86" (98mm)
- Piston Case Outside Diameter (Recommended Time to Reverse).....3.62" (92mm)
- Piston Case Outside Diameter (Time to Replace).....3.39" (86mm)
- Piston Case Inside Diameter Wear Limit.....3.0595" (77.711mm)
- Piston Diameter Wear Limit.....3.0465" (77.381mm)
- Maximum Piston Case/Piston Clearance.....0.013" (0.33mm)
- Driver sub length (Recommended Time to Replace or Rebuild).....2.380" (60.4mm)
- Minimum Used Bit Diameter.....3.78" (96mm)

### Rotation Speed

Rotational speed is largely determined by drilling conditions, typically 20-60 RPM for a 4-inch hammer. As a result of its higher piston frequency and penetration rate, the MISSION 40B should have a higher rotation speed than conventional hammers. Depending on the rock type and conditions, it may be necessary to increase rotation speed 10-15 percent to achieve the smoothest and most efficient drilling.

### Choice of Choke

<b>HAMMER FLOW RATES WITH VARIOUS CHOKE</b>				
<b>HIGH VOLUME - Without Tuning Ring (Donut) in Top Sub</b>				
	<b>Blank</b>	<b>1/8"</b>	<b>3/16"</b>	<b>1/4"</b>
<b>150 psi</b>	<b>180</b>	<b>206</b>	<b>239</b>	<b>284</b>
<b>250 psi</b>	<b>370</b>	<b>412</b>	<b>464</b>	<b>538</b>
<b>350 psi</b>	<b>560</b>	<b>618</b>	<b>690</b>	<b>791</b>
<b>10 bar</b>	<b>5.10</b>	<b>5.83</b>	<b>6.77</b>	<b>8.04</b>
<b>18 bar</b>	<b>10.48</b>	<b>11.67</b>	<b>13.14</b>	<b>15.23</b>
<b>24 bar</b>	<b>15.86</b>	<b>17.50</b>	<b>19.54</b>	<b>22.40</b>
<b>LOW VOLUME - With Tuning Ring (Donut) in Top Sub</b>				
	<b>Blank</b>	<b>1/8"</b>	<b>3/16"</b>	<b>1/4"</b>
<b>150 psi</b>	<b>151</b>	<b>177</b>	<b>210</b>	<b>255</b>
<b>250 psi</b>	<b>315</b>	<b>357</b>	<b>409</b>	<b>483</b>
<b>350 psi</b>	<b>466</b>	<b>524</b>	<b>596</b>	<b>697</b>
<b>10 bar</b>	<b>4.28</b>	<b>5.01</b>	<b>5.95</b>	<b>7.22</b>
<b>18 bar</b>	<b>8.92</b>	<b>10.11</b>	<b>11.58</b>	<b>13.68</b>
<b>24 bar</b>	<b>13.20</b>	<b>14.84</b>	<b>16.88</b>	<b>19.74</b>



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## Weight on Bit

For efficient drilling it is important that the buttons on the face of the bit are in close contact with the rock at all times. Drilling feed weight on bit must be sufficient to keep the bit closed against the driver sub allowing the maximum amount of piston energy to be transferred to the rock.

If drilling feed weight is insufficient, the rock breaking energy stays within the hammer and will cause premature component failure.

Several problems can occur if drilling feed weight is excessive. The buttons will penetrate too deep into the rock resulting in bit face damaged, the rotation torque will increase, flushing will be reduced in softer ground and in some conditions, hole deviation could occur.

The optimum weight on bit will vary according to many conditions, such as the type of rock, bit design, rotation speed. The optimum weight on bit is best determined by the driller, but below is a guide for weights at various operating pressures.

### Minimum recommended weight on bit.

<b>psi</b>	150	200	250	300	350
<b>lbs</b>	1500	2000	2500	3000	3500
<b>bar</b>	10	14	17	20	24
<b>kgs</b>	680	910	1140	1360	1590

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### WARRANTY NOTICE

If the Mission40 hammer is operated at pressures above 350 psi (24 bar), greatly increased productivity can be achieved, but Driltech Mission will not be held responsible for component failure or premature wear.

The warranty against faulty workmanship and materials on the

Mission40 Hammer and Bits is only valid

for operating pressures up to 350 psi (24 bar) only.

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