BREAKTHROUGH PERFORMANCE

Technical Site Support & Training

HAICO Rock Tools

BREAKTHROUGH PERFORMANCE

Contents

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INFORMATION GATHERING FOR NEW AND EXISTING CUSTOMERS

Site Assesment

Type of rock , crushing strength , rock strata

Drilled hole dia and depth drilled

Type of rig used

Size of compressor pressure and volume

Drill rod dia and thread type

Depth of sub drill /broken ground/overburden

Will water be encountered if so at what depth?

Do they operate on a cost per mtr or outright purchase?

Is the site at altitude

Site Trial Information

What equipment currently used (hammer make and model and type of drill bit)

Life and penetration figures of current equipment

Are the bits reground and at what intervals

Operating and Recording Trials

Establish benchmark on competitor's equipment currently in use

Observe rotation speed,thrust pressure and hammer operating pressure(what pressure is the compressor holding).Guidance can be found in the A-Z pages 46/47

Make sure the correct type and qty of hammer lubrication is used guidance can be found in the A-Z page 35

Gather all relevant drilling info and enter record on the HAMMER AN D DRILL BIT DATA COLLECTION FORM

Trouble Shooting

Most common problems can be identified in the A-Z trouble shooting section

Regular site visits to ensure equipment is meeting customer requirements and expectations

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INFORMATION GATHERING FOR NEW AND EXISTING CUSTOMERS

Service and Operating

Onsite workshop training should be carried out by Halco

Provide maintenance charts with wear limits

Provide the relevant tools for stripping and servicing hammers and bits

Health and Safety

Ensure you have the correct PPE for site requirements

Consult manufactures operating instructions prior to operating any type of equipment

Make sure you receive the site induction

Always sign in and out when visiting and leaving the site

Always obey specific site regulations failure to do so will result in you being banned from site

On every visit note the blasting times (these can change daily)

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Rotation Speeds

Where drill bit life and cost is the prime consideration on a drill site, rotation speeds should be carefully monitored.

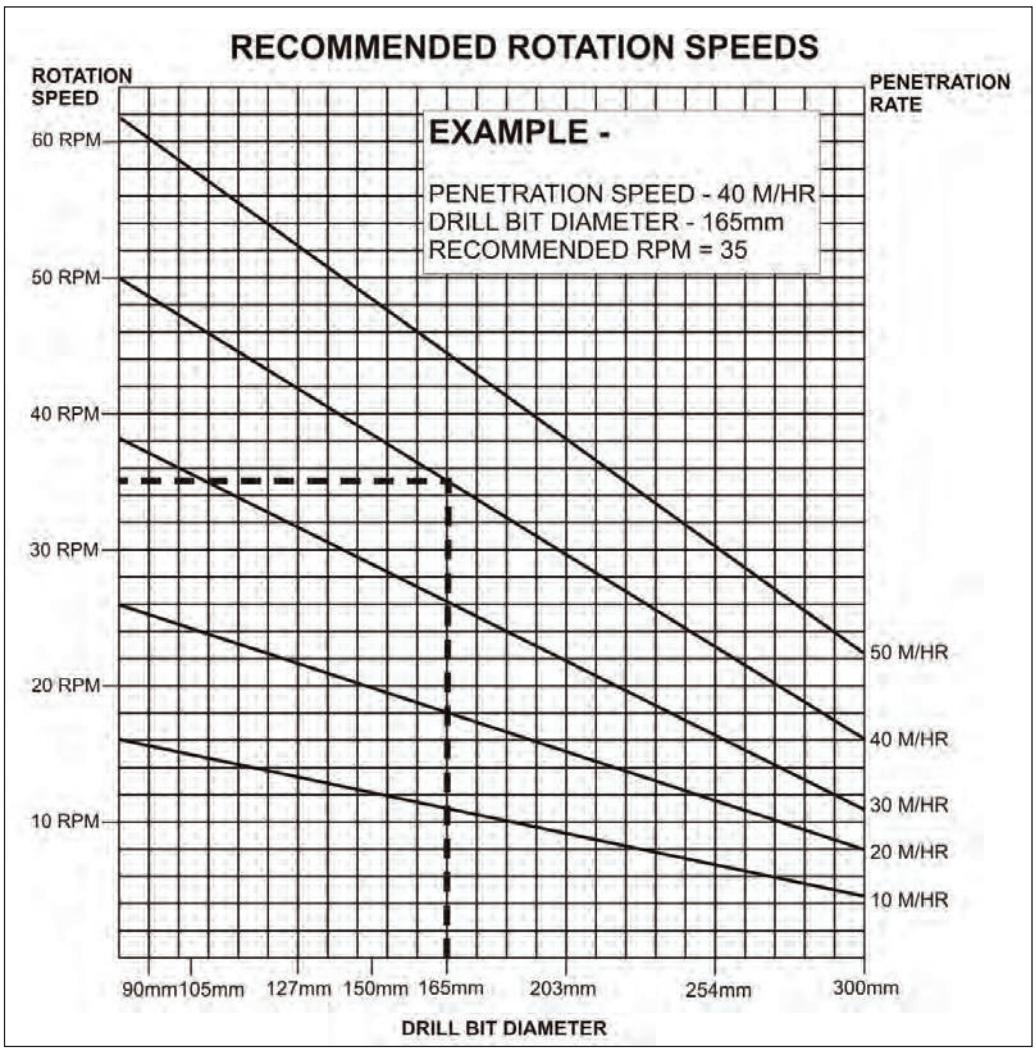
DTH drill bits are rotary - PERCUSSIVE tools with the emphasis on PERCUSSIVE. Their function is to fracture the material being drilled which should then be immediately carried away by the exhaust air. Button bits have no cutting or tearing action as such and the effect of rapid rotation can be prejudicial rather than beneficial to the life of the bit, especially in abrasive rock which wears away fast moving peripheral inserts or in solid dense material which causes the peripheral inserts to overheat and spall due to friction.

If the string is rotated too slowly, this will cause the buttons to impact previously chipped areas of the hole with a resultant drop in penetration speed.

As a general guide - the harder the rock or the larger the bit diameter - the slower the rotation speed required.

It may be necessary however to increase the rotation speed where the rock is badly fissured in order to prevent stalling.

It should be remembered however that stalling in the bore hole could be the result of a very badly worn bit and increasing the rotation speed in these circumstances will only accelerate the problem.



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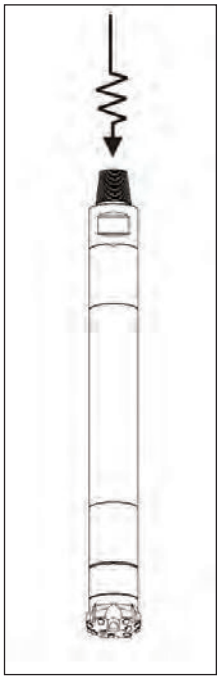
Thrust (Pulldown)/ Holdback/ Torque

Thrust should be kept as low as possible at all times avoiding excessive vibration in thedrill string. Hold back should be increased more and more as additional rods are added, as drilling progresses. DTH drilling is primarily percussive drilling using the energy imparted by the hammer piston to the rock through the bit and any attempts to apply too much weight could damage the bit, hammer and drill string and impair the drilling rate.

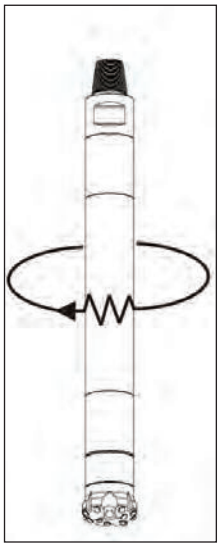
Although the base of the hammer should maintain contact with the drill bit, there should be neither excess thrust nor vibration due to reaction between the hammer and drill bit. Insufficient thrust will cause the hammer to bounce resulting in a low blow energy to the rock causing vibration and also possible damage.



Recommended Thrust Capacities

Hammer Size	Min. Thrust	Max. Thrust
3″	150 KG (330 Lbs)	300 KG (660 Lbs)
4″	250 KG (550 Lbs)	500 KG (1100 Lbs)
5″	400 KG (880 Lbs)	900 KG (1980 Lbs)
6″	500 KG (1100 Lbs)	1500 KG (3300 Lbs)
8″	800 KG (1760 Lbs)	2000 KG (4400 Lbs)
12″	1600 KG (3520 Lbs)	3500 KG (7700 Lbs)

When the total weight of the drill string including the weight of the rotary head exceeds the optimum thrust level, the drill string should be put in tension by gradually applying holdback as more tubes are added.



Recommended Torque Ratings

Down the Hole drill bits unlike rotary tricones require very little rotation torque.

Drill Bit Dia.	Torque (Recommended)
105 mm (4.1/8″)	50 KGM (360 Ft/Lbs)
127 mm (5″)	120 KGM (865 Ft/Lbs)
165 mm (6.1/2″)	250 KGM (1800 Ft/Lbs)
200 mm (7.7/8″)	300 KGM (2170 Ft/Lbs)
300 mm (11.7/8″)	350 KGM (2530 Ft/Lbs)
445 mm (17.1/2″)	425 KGM (3075 Ft/Lbs)

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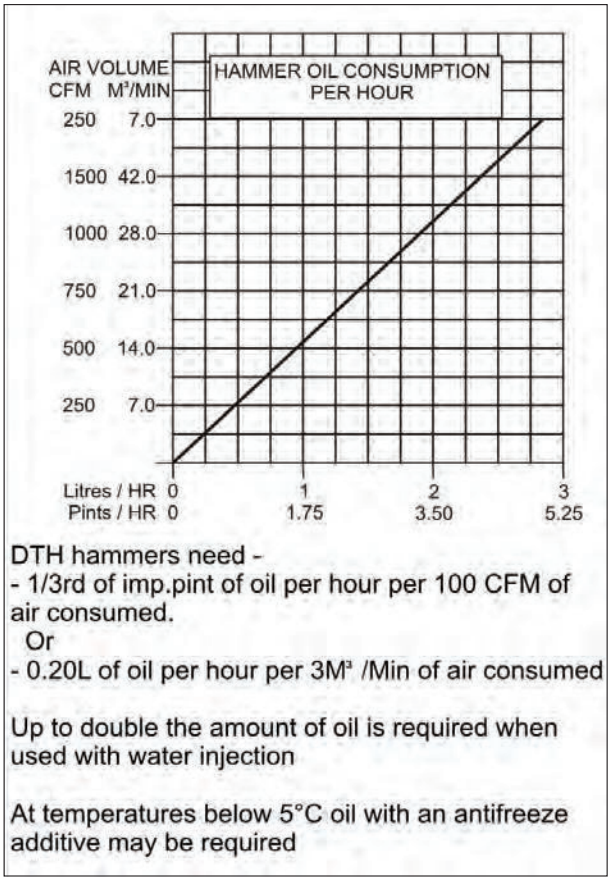
Lubricants



DTH hammers need -
- 1/3rd of imp.pint of oil per hour per 100 CFM of air consumed.
Or
- 0.20L of oil per hour per 3M³ /Min of air consumed

Up to double the amount of oil is required when used with water injection

At temperatures below 5°C oil with an antifreeze additive may be required

LUBRICATING OIL

Just like any other piece of precision machinery, the DTH hammer must be lubricated and small quantities of oil should be injected into the air stream at regular interval whilst the hammer is working. Rock drill oils are recommended because these contain the emulsifying and viscosityadditives necessary to deal with high pressure and high air flow conditions in which water is usually present, if only from condensation in the air line.

Oil not only provides slip to prevent pick up and premature failure of components but it also acts as a seal on the surface of running parts to use air efficiently without pressure loss. It is therefore of paramount importance that the correct grade of oil is used at the appropriate consumption rate to suit volume and pressure, in line with the hammer manufacturers recommendation. Most modern valveless hammers, particularly when operating at high pressures need a heavy oil providing of course that ambient temperatures allow the oil to run through the airline.

Halco for example recommend the following -

Halco Lubricating Oils

MAKE	AMBIENT TEMPERATURE			HAMMER GREASE	
	BELOW 10ºC	FROM 10ºC TO 32ºC	ABOVE 32ºC	HAMMER THREAD GREASE	HAMMER 'O' RING GREASE
HALCO	HS3	HS200	HS200	FAXENE CP COMPOUND	FAXANE H76
MOLYBOND	MOLYHAMMER 320			GOG	-
BP	ENERGOL RD-E100	MACCURAT D220	MACCURAT D220	ENERGREASE AS11	-
CALTEX	CALTEX ARIES 100	CALTEX ARIES 320	CALTEX ARIES 320	THREADTEX	-
CASTROL	RD OIL 100	RD OIL 150	RD OIL 150 or MAGNA CF220	-	RED RUBBER GREASE
ELF	PERFORA 100	PERFORA 220	PERFORA 220	TIFORA CA	NATURELF GEP2
ESSO	AROX EP46	AROX EP150	AROX EP150 or FEBIS K220	-	-
GULF	GULFSTONE	GULFSTONE HEAVY	GULFSTONE HEAVY	ANTI NO.2	-
MOBIL	ALMO 527	ALMO 529	VACTRA OIL NO.4	MOBILTEMP SHC460	-
SHELL	TORCULA 100	TONNA TX220	TONNA TX220	HIGH PRESS. THREAD	-
TEXICO	AIRES 100	WAY LUBRICANT X220	WAY LUBRICANT X220	-	-

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Trouble Shooting

HAMMER MALFUNCTION

FLUSHING

ROTATION

VIBRATION

PENETRATION RATES

DRILL TUBE & DRILL BIT OPERATION

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Trouble Shooting

HAMMER MALFUNCTION

Fault	Cause	Solution / Action
Hammer does not start operating after tube change.	• Excess oil drained down into hammer. • Foreign particles in hammer. • Hammer filled with water and mud, especially if drilling under water level	• Lift off and flush. Add • small amount of diesel to flush through if necessary. • Pull out and inspect hammer. • Pull out and clean hammer. Ensure that hole is 'clean' before uncoupling tubes for tube change. • Ensure non-return valve is fitted to hammer or fit intertube non return valve, if drilling in deep water.
Hammer operates on the surface but fails to work when lowered into the hole	• Drill bit flushing holes blocked with clay, or debris whilst lowering into the hole. • Lowering into soft clay or similar, thereby not allowing bit to be pushed up into the hammer.	• Inspect and strip if necessary. • Increase rotation speed and perhaps thrust to force through soft ground, keeping full air on at all times and lifting constantly to flush. Water injection can be used to break up soft clay.
Hammer operates intermittently on surface test or down-the-hole	• Hammer parts worn, broken or seized • Hammer incorrectly assembled. • Dirt or foreign particles in hammer. • Excessive lubricating oil or other oil coming through the system. • Excessive water in the compressed air. • Hammer freezing.	• Strip, Inspect and service. • Strip and re-assemble correctly. • Strip, clean and re-assemble. • Check quantity of lubricating oil and for signs of Compressor oil in the air line. • Check moisture trap and water injection pump, if in use. • Use antifreeze type oil - check for signs of excessive water in system.

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Trouble Shooting

HAMMER MALFUNCTION CONT.

Fault	Cause	Solution / Action
Hammer does not operate on surface test or down-the-hole.	• Insufficient or no air reaching hammer. • Hammer incorrectly assembled • Dirt or foreign particles in hammer. • Retained oil or anti-sieze grease in hammer. • Hammer parts worn, broken or siezed up. • Blockage in shock absorber. • Flushing holes in drill bit blocked.	• Check compressor operation • Strip and re-assemble correctly. • Strip, clean and re-assemble. • Flush through hammer by lifting off the bottom of the hole. • Add a small amount of diesel to the hammer to clear the oil. • Strip, inspect and service. • Unscrew hammer and check. • Strip shock absorber if necessary. • Clean out holes.
Hammer deviates at the start of hole	• Insufficient or no air reaching hammer. • Hammer incorrectly assembled • Dirt or foreign particles in hammer. • Retained oil or anti-sieze grease in hammer. • Hammer parts worn, broken or siezed up. • Blockage in shock absorber. • Flushing holes in drill bit blocked.	• Fit or replace bushes. • Secure mast. • Ensure machine is rigid. Place wood blocks under jack leg if ground is soft. • Ensure there is sufficient weight on jack legs. • Repair jackleg • Remove any obstructions before drilling continues. • Reduce feed force to correct level.

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Trouble Shooting

FLUSHING

Fault	Cause	Solution / Action
Flushing air insufficient for good hole cleaning.	• Operating pressure at hammer too low. • Too low up-hole velocity. • Collar or blockage in hole. • Flushing air being lost in fissures.	• Check air pressure as near to hammer as possible. Check compressor operation. • Dependant on possibilities - Increase air volume or air pressure. Increase drill tube diameter. Reduce drill bit diameter. • Flush more regularly. Check for air leaks. Pull drill string up past blockage to clear collar. Drill slowly until beyond fissures. Flushing then returns.
Flushing of debris from hole reduces or stops completely	• Collar or blockage in hole. • No air to hammer. • Build-up of debris. • Ground water reached causing mud collar.	• Pull drill string up past blockage to clear collar. • Check compressor operation. • Lift and flush, pull up as far as required to resume flushing. • Lift and flush, pull up to clear. If necessary. Use foam, if available.
Flushing action of hammer not working when hammer lifted into flushing position.	• Insufficient or no air reaching hammer. • Hammer incorrectly assembled. • Dirt or foreign particles in hammer. • Drill bit not dropping into flushing position. • Blockage in shock absorber. • Flushing holes in drill vbit blocked.	• Check compressor operation. • Strip and re-assemble correctly. • Strip, clean and re-assemble. • Remove drill bit and chuck to ascertain cause. • Unscrew hammer and check. Strip shock absorber if necessary. • Clean out holes.

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Trouble Shooting

ROTATION

Fault	Cause	Solution / Action
• Rotation stiff or stalls easily.	• Excessive feed force. • Collar or stone in the hole, which is binding on the drill tubes. • Drill bit worn. • Hole has moved 'out of line'. • Faulty rotation head.	• Reduce feed force to recommended level. • Lift to flush clear. Pull out if necessary. • Pull out and re-grind or renew drill bit. • Re-align machine over hole carefully. Pull out if necessary. • Repair or adjust rotation head.

VIBRATION

Fault	Cause	Solution / Action
• Vibration / Squealing noises from bore hole.	• Too low a feed force. • Too high a rotation speed. • Difficult ground conditions. • Drill bit worn out. • Drill bit broken in hole. • Obstruction in the hole. • Loss of gauge on drill bit head. • Metal particles in the bore hole.	• Adjust feed force to recommended level. Reduce rotation speed to recommended level. • Drill carefully, flushing often and keeping feed force and rotation speed low. • Pull up and re-grind or renew bit. • Pull up and check. Pull back to allow obstruction to fall below hammer. • Re-face gauge with die grinder. • Pull out drill string and use magnet to retrieve particles from hole.

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Trouble Shooting

PENETRATION RATE

Fault	Cause	Solution / Action
• Penetration rates low or zero	• Low operating pressure. • Hole not clear. Blocked with drilling debris. • Hard band of rock. • Hammer blocked, parts worn, seizing up or broken. • Drill bit excessively worn or broken. • Too low a rotation speed. • Excessive lubricating oil or water Injection being used. • Faulty feed mechanism on drill rig. • Large head of water in hole.	• Check air pressure at hammer and compressor operation. Check for air leaks inair line. • Lift and flush, pull up to clear. • Time the penetration rate over next two drill tubes and compare with expected penetration rate. • Pull up and inspect. • Pull up, check drill bit. Re-grind if necessary. • Keep rotation speed to recommended level. • Check quantities of both being injected.Check drill rig feed operation. • Flush to see how much water in hole. Increase operating pressure to compensate if possible. Use foam to assist with cutting evacuation.

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Trouble Shooting

PENETRATION RATE

Fault	Cause	Solution / Action
Hammer does not operate on surface test or down-the-hole.	• Insufficient or no air reaching hammer. • Hammer incorrectly assembled • Dirt or foreign particles in hammer. • Retained oil or anti-sieze grease in hammer. • Hammer parts worn, broken or siezed up. • Blockage in shock absorber. • Flushing holes in drill bit blocked.	• Check compressor operation • Strip and re-assemble correctly. • Strip, clean and re-assemble. • Flush through hammer by lifting off the bottom of the hole. • Add a small amount of diesel to the hammer to clear the oil. • Strip, inspect and service. • Unscrew hammer and check. • Strip shock absorber if necessary. • Clean out holes.
Hammer deviates at the start of hole	• Insufficient or no air reaching hammer. • Hammer incorrectly assembled • Dirt or foreign particles in hammer. • Retained oil or anti-sieze grease in hammer. • Hammer parts worn, broken or siezed up. • Blockage in shock absorber. • Flushing holes in drill bit blocked.	• Fit or replace bushes. • Secure mast. • Ensure machine is rigid. Place wood blocks under jack leg if ground is soft. • Ensure there is sufficient weight on jack legs. • Repair jackleg • Remove any obstructions before drilling continues. • Reduce feed force to correct level.

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PENETRATION RATE

Fault	Cause	Solution / Action
• Drill tube joints excessively tight especially the last few near to the Hammer.	• Excessive feed force. • Collaring in the hole. • Worn or broken drill bit. • Insufficient anti-seize grease on thread joints. • Excessive tightening when making-up joints with rotation head.	• Adjust feed force to correct recommended level. • Flush regularly in order to keep hole clear. • Pull out, re-sharpen or renew. • Clean and re-grease all joints. • Tighten sufficiently. Do not apply full forward rotation torque to joint.

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Project	

HAMMER AND DRILL BIT DATA COLLECTION FORM

REGION	
HALCO REPRESENTATIVE	
DRILL OPERATOR	
MINE / QUARRY NAME	
COUNTRY	
AREA	
RIG TYPE	
RIG/CONTRACTOR	

DATE	

HAMMER DATA	
SERIAL NUMBER	
HAMMER NAME	
HAMMER SIZE	
MANUFACTURER	

DRILL BIT DATA	
SERIAL NUMBER	
SHANK	
BIT SIZE	
FACE DESIGN	
BUTTON TYPE	
MANUFACTURER	
RUN DATE	

OPERATING PARAMETERS			
DEPTH IN		*AIR PRESSURE*	
DEPTH OUT		*OIL TYPE*	
INTERVAL DRILLED		*OIL VOLUME - L/HR*	
BENCH NUMBER		*WATER PRESENT?*	
ROD LENGTH		*ALTITUDE*	
TIME TO DRILL ROD		*DRILL PIPE SIZE*	
TOTAL HOURS		*DRILL PIPE LENGTH*	
RATE OF PENETRATION		*DRILL PIPE DIAMETER*	
THRUST / FEED			
RPM ROTARY (min/max)			

TUBE NUMBER	DEPTH OF TUBE DRILLED (M)	ENGINE RPM	AIR PRESSURE PSI	INSTANTANEOUS DRILLING TIME	TOTAL DRILLING TIME	PENETRATION RATE (M/HR)	REMARKS / NOTES

RUN EVALUATION / COMMENTS

Site Assesment Form

Customer Name | Mine Site

Application- e.g. Blasthole, Exploration, Presplit etc...

Site Assesment		
Annual Metres Drilled	Metres (M)	
Hammer Size	Inch (")	
Hole Size	Inch (")	
Bit Type/ Style/ Button Dia.	FF/ CVX/ CC	
Hole Depth	Inch (")	
Will water be encounted?	Yes* / No	
* If yes at what depth?	Metres (M)	
Sub Grade	Metres (M)	
Hole Angle	Degrees (0)	
Type of Rock	e.g. Granite/ Limestone	
Crushing Strength of Rock	Mpa	
Water Injection	Yes / No	
Ambient Temperature- Min / Max	Centigrade	
Will the equipment be used at high altitude?	Yes* / No	
* If yes at what altitude?	Feet or Meters	

Rig Make & Model		
Rig Quantity on Site		
Air Pressure	Psi	
Air Volume	Cfm	
Oil Grade Used		
Drill Pipe Diameter & Length	OD x M	
Drill Pipe Thread Form	Example: 2 3/8 API REG	

Current Life of Hammers	Metres (M)	
Current Life of Bits	Metres (M)	
Current Actual Penetration Rate	Metres (M) / Hour	

Additional Comments

Signed by: | Date: / /

Halco Rock Tools
Quality Management System
is Certified to ISO9001: 2008

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