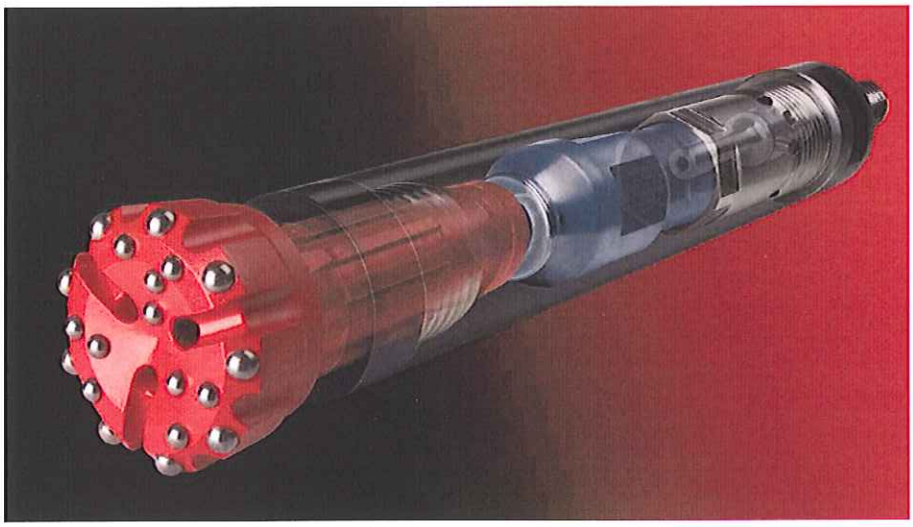
ROK SERIES DTH HAMMER

OPERATION & SERVICE GUIDE



Patented SonicFlow Technology

ROCKMORE
INTERNATIONAL

Rock Drilling Tools

Mining • Construction • Quarrying • Water-well • Geothermal

Revised 1-14-13

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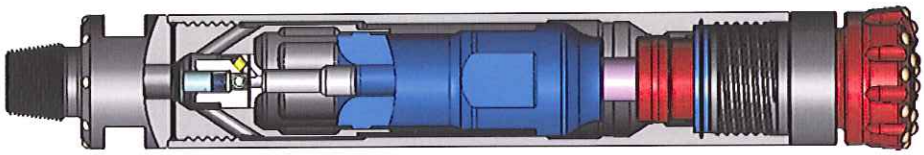
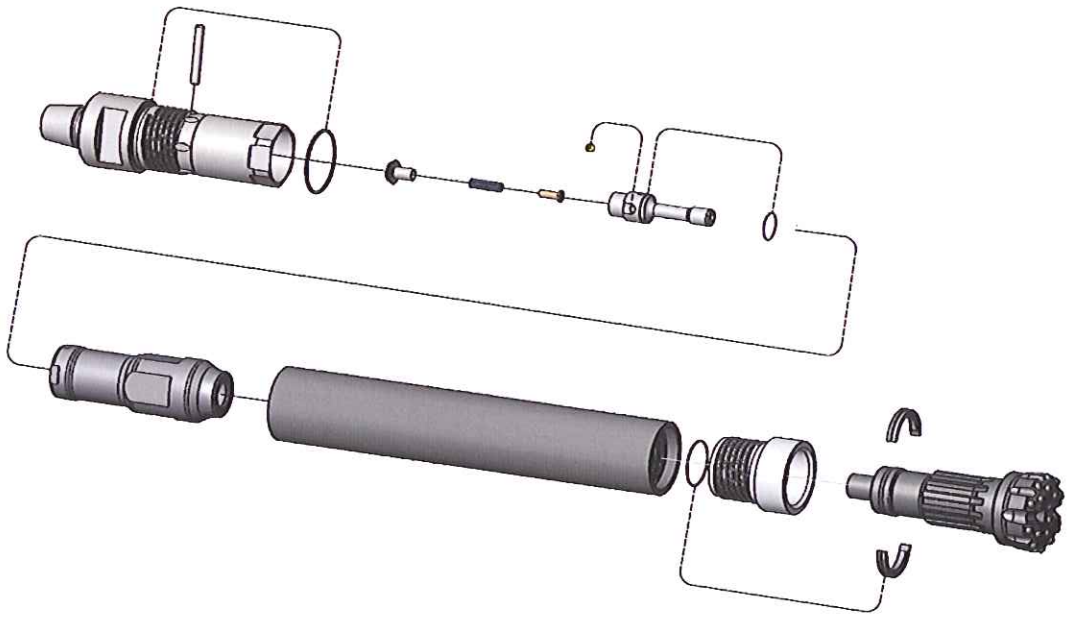
SONICFLOW



1. INTRODUCTION:

ROK Series High-Performance DTH Hammers

Optimal energy transfer is essential to DTH drilling efficiency – how much compressed air power is delivered to the bit. That's why we've revolutionized airflow management in the new ROK series high performance DTH hammers. Our patented SonicFlow technology minimizes back flow and turbulence, enabling the Piston to hit the bit harder and with greater frequency. That means increased efficiency, more power, and faster penetration. And streamlined design means fewer parts and easier maintenance. So, for greater productivity get ready to ROK!



SONICFLOW

2. OPERATION:

2.1 – Initial Hammer Inspection

All ROK hammers are factory tested to ensure each hammer operates correctly at delivery. Upon delivery, inspect the contents in the crate to make sure you have ordered the correct ROK Series DTH hammer.

- Please take notice of the serial number stamped in the key flats on the Top Sub. Any service or warranty issue will require this serial number in order to start our warranty procedure.

2.2 – Initiating the ROK Hammer

We recommend using DTH bits in good condition. Avoid using DTH bits that are overrun, as this will alter your drilling penetration rates and can cause premature wear on various components of the hammer.

Inspect threads of the drill pipe and ROCKMORE Top Sub to ensure proper fit between the two components. Apply thread grease to the threads prior to fitting the hammer onto the drill pipe in order to avoid any galling or corrosion in this area. While fitting the hammer onto the drill pipe, it is important to avoid debris, dirt, or dust. This type of contamination can weaken the thread connection and thus alter drilling performance.

It is important to apply thread grease to the DTH bit shank and the ROCKMORE Driver Sub to allow for easier disassembly of the hammer. Thread grease should be reapplied at every bit change.

Our hammers are stocked and shipped with an adequate supply of rock drill oil. Prior to starting the hammer, it is crucial to add additional rock drill oil through the Top Sub. When adding oil, the hammer should be held upright so that the oil can lubricate all internal components. Please reference section 3.1 below for minimum amounts of rock drill oil required for all ROK Series DTH Hammers.

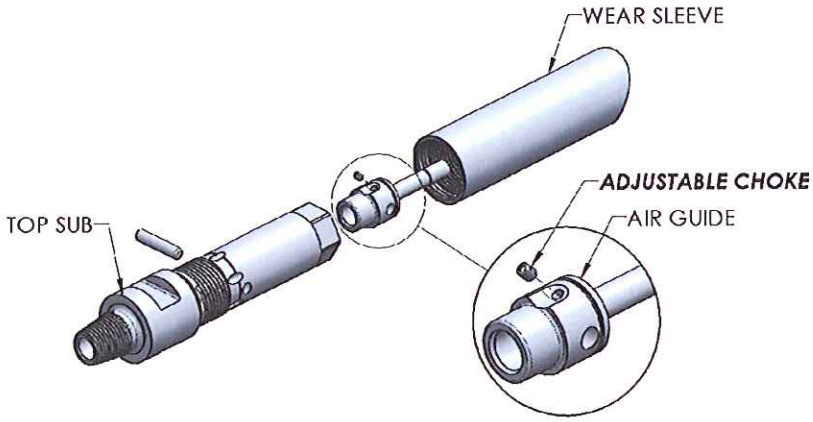
The percussive mechanism begins to operate as the air supply is turned on and when the drill bit is pushed firmly into the hammer. Excessive pressure is not needed to initiate the hammer. Rotate the hammer clockwise at approximately 30-rpm and the hammer will begin. The DTH bit will now push into the Driver Sub and percussive action begins. When the hammer is lifted from the rock face, the DTH bit extends from the Driver Sub and percussive action ceases. Extra air will pass through the hammer, which can be used to flush the hole clean. By adjusting airflow, air pressure, feed force and rotation optimal penetration rate and productivity can be achieved.

Rotation speed should be selected according to drilling conditions and drill rig capabilities. Please be aware that excessive rotation may result in premature wear on the drill bit and not better penetration rates.

2.3 – Adjustable Choke System

Our ROK Series DTH hammers are equipped with an adjustable Choke system, which allows you to adjust the volume of air that is used to power the Piston. After disassembling the Top Sub, remove the Air Guide in order to drill out the Choke.

Different size holes can be drilled into the steel Choke. A bigger hole will lower the power level and allow the excess air to help remove the cuttings and water. The Choke may be drilled with a maximum hole size of 0.4" (10mm).



3. HAMMER MAINTENANCE:

3.1 – Lubrication

Proper lubrication is necessary for effective and efficient drilling operations. Inadequate amounts of lubrication may damage the hammer resulting in premature hammer failure. With insufficient amounts of lubrication the temperatures of the Piston surface can exceed 1400° F (752° C). These excessive temperatures generate heat checks (fine cracks) on the surface finish that may propagate through impact and initiate Piston failure. Improper oil selection may result in decarburization, which greatly reduces the tensile strength of the material allowing fractures to initiate.

The minimum amount of rock drill oil required for the operation of all ROK Series DTH hammers is listed below.

Oil Consumption @ 350 psi (24.1 Bar)		
Hammer	l/hr	gal/hr
ROK 300	0.3	0.08
ROK 350	0.3	0.08
ROK 400	0.4	0.11
ROK 500 / 500Q / 500A	0.5	0.13
ROK 600Q / 600W / 600A / 60-360	0.7	0.18
ROK 650Q / 650A	0.7	0.18
ROK 800 / 875	0.8	0.21

3.1 – Lubrication (continued)

Pneumatic rock drill oils are the only acceptable lubricants for DTH hammers. In ambient temperatures of 80° Fahrenheit (27° Celsius) or higher, use SAE 50 rock drill oil.

Several acceptable rock drill oils listed below:

	Medium SAE 30	Heavy SAE 50
Exxon	Aroc 150	Aroc 302
Shell	Torcula 150	Torcula 320
Texaco	Rock Drill Lube 100	Rock Drill Lube 320
Chevron	Vistac 150	Vistac 320
Rockmore	Hammer Guard	

3.2 – Contamination

Contamination is another common cause of DTH hammer and bit failures. Be sure to keep all connections covered and clean at all times. It is a good idea when connecting a hammer to a drill string to cover the connection to the hammer and blow high-pressure air and water through the drill string for several seconds to remove any loose scale, rust or other foreign materials. When installing a bit in the hammer, take care to remove any cuttings or foreign material from the bit shank.

3.3 – Corrosion

Corrosion is another common cause of DTH hammer and bit failures. Corrosion is the deterioration of a material due to a reaction with its environment. The best preventative action against corrosion is to keep the DTH hammer well lubricated with rock drill oil. In addition, when finished drilling with foam/polymers, it is necessary to rinse all drilling tools with fresh clean water and lubricate them properly. Prolonged exposure to the atmosphere creates a corrosive reaction between the steel and the foam.

The most detrimental type of corrosion encountered in DTH hammers is oxidation cavitation (finite notches in the material surfaces). The easiest areas for this condition to exist are in the non-moving areas of the hammer. For example, thread roots and O-ring grooves are common places to find oxidation cavitation.

4. SERVICING:

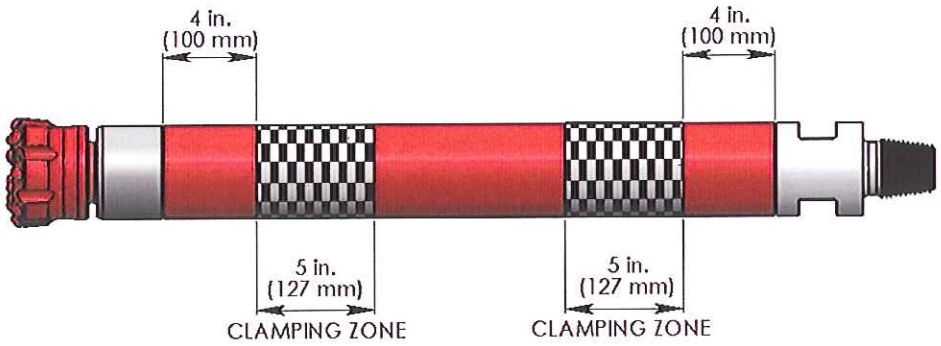
4.1 – Disassembly

The ROK hammers use right–hand threads.

Use tools appropriate for removing the Driver Sub and the Top Sub from the Wear Sleeve of the ROK hammer. Do not hit the hammer or apply excessive force with improper tools as this could initiate cracks, reduce operating life, and mostly importantly would void any warranty. Do not apply heat to the hammer.

4.2 – Clamp Zone

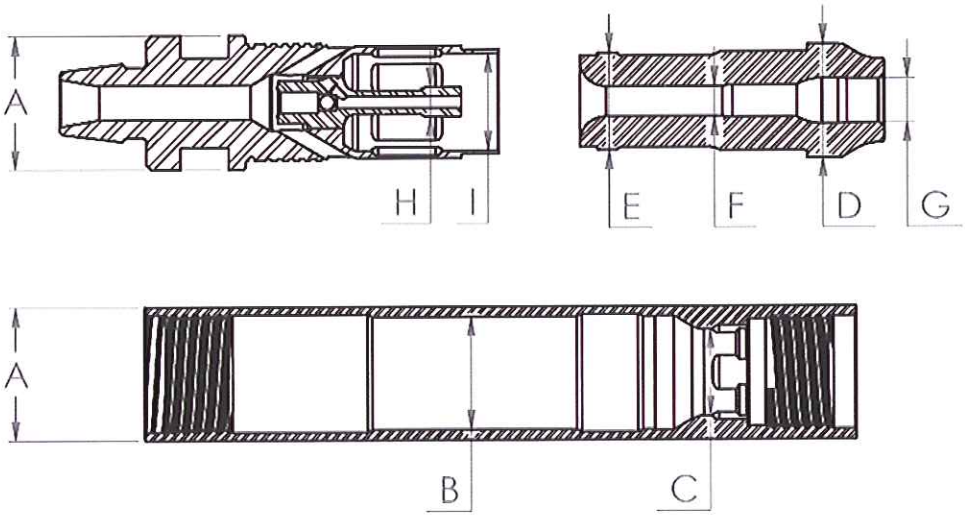
When disassembling the hammer, place the clamps in the area shown below away from threads. Placement of clamps on any other section of the Wear Sleeve can cause severe damage, alter drilling performance, and void any warranty.



4.3 – Routine Inspection

Regularly inspect all parts carefully for any signs of damage – galling, cracks, corrosion. Any sharp edges should be removed from the Piston striking face using emery paper or files. In cases of severe galling or cracking, we strongly recommend replacing the Piston to avoid further damage to the hammer. Galling and cracking can be signs of poor lubrication techniques or contamination. Please refer back to sections 3.1 and 3.2 on lubrication and contamination.

The amount of wear on all major components (Wear Sleeve, Piston, Air Guide, and Top Sub) should be regularly inspected and checked. Please refer to the following Wear Limits diagram and table for recommended discard limits.



		ROK 300		ROK 350		ROK 400		ROK 500		ROK 500Q		ROK 500A		ROK 600Q/600W	
		Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]
	WEAR SLEEVE														
A	Outer Diameter	3.071	2.795	3.346	3.071	3.858	3.504	4.921	4.291	4.921	4.291	4.921	4.291	5.571	5.118
B	Piston Bore	2.484	2.488	2.760	2.764	3.197	3.201	3.898	3.904	3.898	3.904	3.898	3.904	4.724	4.730
C	Bit Guide ID	N/A	N/A	N/A	N/A	N/A	N/A	3.024	3.031	3.024	3.031	3.012	3.019	3.622	3.632
	PISTON														
D	Large Outer Diameter	2.481	2.477	2.757	2.753	3.193	3.189	3.894	3.890	3.894	3.890	3.894	3.890	4.720	4.716
E	Small Outer Diameter	2.091	2.087	2.365	2.361	2.671	2.667	3.260	3.256	3.260	3.256	3.260	3.256	4.047	4.043
F	Air guide Bore Diameter	0.902	0.912	0.902	0.912	0.902	0.912	1.260	1.267	1.257	1.264	1.260	1.267	1.260	1.267
G	Blow Tube Bore Diameter	0.980	0.988	0.980	0.988	1.073	1.083	1.531	1.541	1.510	1.520	1.512	1.522	1.828	1.838
	AIR GUIDE														
H	Finger Outer Diameter	0.892	0.888	0.892	0.888	0.892	0.888	1.252	1.248	1.252	1.248	1.252	1.248	1.252	1.248
	TOP SUB														
I	Piston Bore Inner Diameter	2.094	2.098	2.370	2.375	2.677	2.682	3.268	3.273	3.268	3.273	3.268	3.273	4.055	4.060

(See Wear Limits diagram on page 5)

* The performance of the hammer is dependent on the amount of wear the critical seal surfaces have. These should be measured and recorded. Depending on the amount of available air, ROK hammer performance can deteriorate before the suggested limits in the Wear Limits Table.

		ROK 600A		ROK 60-360		ROK 650Q		ROK 650A		ROK 800		ROK 875	
		Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]	Nominal [in]	Discard Limit [in]
	WEAR SLEEVE												
A	Outer Diameter	5.551	5.098	5.551	5.098	5.858	5.118	5.827	5.087	7.165	6.890	7.402	6.890
B	Piston Bore	4.724	4.730	4.724	4.730	4.724	4.730	4.724	4.730	6.000	6.006	6.000	6.006
C	Bit Guide ID	3.622	3.632	3.622	3.632	3.622	3.632	3.622	3.632	4.648	4.660	4.648	4.660
	PISTON												
D	Large Outer Diameter	4.720	4.716	4.720	4.716	4.720	4.716	4.720	4.716	5.995	5.991	5.995	5.991
E	Small Outer Diameter	4.047	4.043	4.047	4.043	4.047	4.043	4.047	4.043	5.189	5.185	5.189	5.185
F	Air guide Bore Diameter	1.260	1.267	1.260	1.267	1.260	1.267	1.260	1.267	1.772	1.779	1.772	1.779
G	Blow Tube Bore Diameter	1.811	1.821	1.520	1.530	1.828	1.838	1.811	1.821	2.161	2.171	2.161	2.171
	AIR GUIDE												
H	Finger Outer Diameter	1.252	1.248	1.252	1.248	1.252	1.248	1.252	1.248	1.766	1.762	1.766	1.762
	TOP SUB												
I	Piston Bore Inner Diameter	4.055	4.060	4.055	4.060	4.055	4.060	4.055	4.060	5.197	5.202	5.197	5.202

(See Wear Limits diagram on page 5)

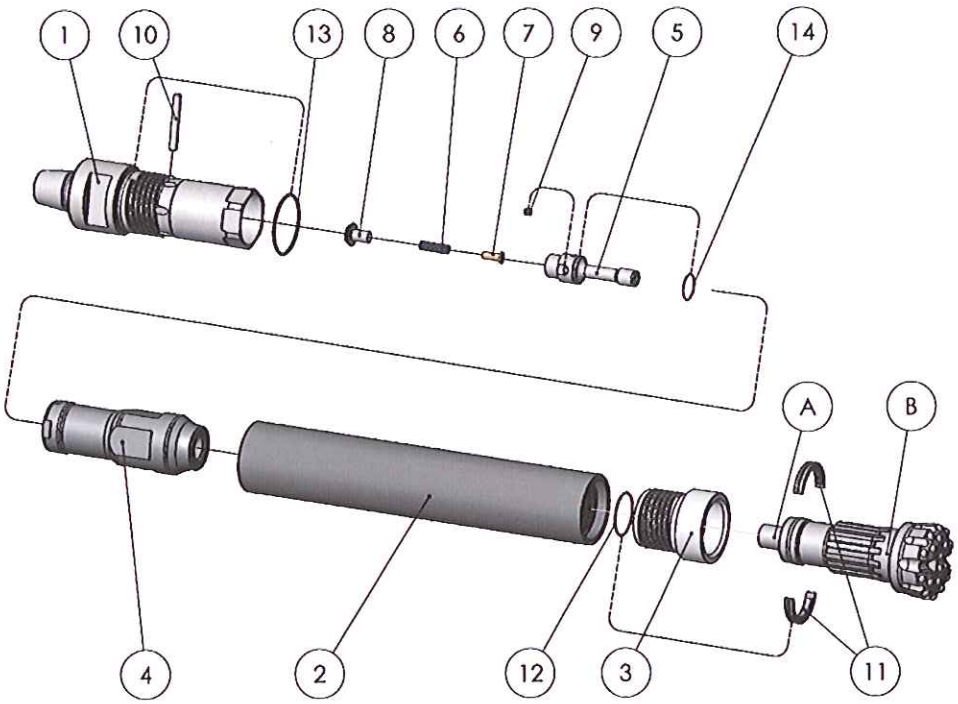
* The performance of the hammer is dependent on the amount of wear the critical seal surfaces have. These should be measured and recorded. Depending on the amount of available air, ROK hammer performance can deteriorate before the suggested limits in the Wear Limits Table.

4.5 – Assembly

Remove and polish all galling and burrs with emery paper. Particularly during the replacement of broken components, extra care must be taken to be certain that the mating surfaces were not damaged.

Carefully lubricate all internal hammer parts again with rock drill oil and coat threads with thread grease prior to reassembly. Use a soft-headed hammer tool to carefully tap components together to ensure proper alignment. Never use excessive force.

5. ROK SERIES HAMMER PARTS LIST:



Item Number	Part Name	Item Number	Part Name
1	Top Sub	9	Choke
2	Wear Sleeve	10	Pin
3	Driver Sub	11	Bit Retainer
4	Piston	12	O-ring (Bit Retainer)
5	Air Guide	13	O-ring (Top Sub)
6	Spring	14	O-ring (Air Guide)
7	Spring Rest	A	Blow Tube
8	Check Valve	B	DTH Bit

6. ROK SERIES HAMMER TECHNICAL DATA TABLE:

	ROK 300	ROK 350	ROK 400	ROK 500	ROK 500Q	ROK 500A	ROK 600Q	ROK 600W	ROK 600A
Operating Parameters									
Working pressure, Bar	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28
Working pressure, [PSI]	87 to 406	87 to 406	87 to 406	87 to 406	87 to 406	87 to 406	87 to 406	87 to 406	87 to 406
Air Consumption - m3/min									
10.4 bar [150 PSI]	4.1	4.9	5.8	8.5	7.2	5.5	10.6	12.5	7.4
17.2 bar [250 PSI]	5.6	8.5	10.4	18.3	15.4	14.4	19.8	21.0	16.7
24.1 bar [350 PSI]	9.0	12.3	15.3	28.6	24.1	23.7	29.1	31.3	26.5
Air Consumption - SCFM									
10.4 bar [150 PSI]	145	178	210	309	253	193	386	441	269
17.2 bar [250 PSI]	199	309	378	663	543	508	720	742	606
24.1 bar [350 PSI]	318	448	556	1038	850	837	1056	1105	962
Oil consumption at 24.1 bar [350 PSI], l/hr	0.3	0.3	0.4	0.5	0.5	0.5	0.7	0.7	0.7
Oil consumption at 24.1 bar [350 PSI], gal/hr	0.08	0.08	0.11	0.13	0.13	0.13	0.18	0.18	0.18
Recommended rotation speed, r/min	35 to 95	35 to 95	25 to 80	20 to 70	20 to 70	20 to 70	15 to 60	15 to 60	15 to 60
Minimum diameter difference between wear sleeve and bit, mm	10	10	10	10	10	10	12	12	12
Minimum diameter difference between wear sleeve and bit, [in]	0.39	0.39	0.39	0.39	0.39	0.39	0.47	0.47	0.47
Technical Specifications									
Bit shank	IR 3.5	IR 3.5	340A	QL5/QL50	QL5/QL50	QL5/QL50	QL6/QL60	QL6/QL60	QL6/QL60
Recommended bit size, mm	88 to 105	95 to 105	110 to 125	140 to 152	140 to 152	140 to 152	155 to 178	155 to 178	155 to 178
Recommended bit size, [in]	3.5 to 4.1	3.7 to 4.1	4.3 to 4.9	5.5 to 6.0	5.5 to 6.0	5.5 to 6.0	6.1 to 7.0	6.1 to 7.0	6.1 to 7.0
Outside diameter, mm	78	85	98	125	125	125	142	142	141
Outside diameter, [in]	3.1	3.3	3.9	4.9	4.9	4.9	5.6	5.6	5.6
Wear Limit Outside Diameter, mm	71	78	89	109	109	109	130	130	129
Wear Limit Outside Diameter, [in]	2.8	3.1	3.5	4.3	4.3	4.3	5.1	5.1	5.1
Wrench flat on top sub, mm	64	64	64	93	93	93	93	93	93
Wrench flat on top sub,[in]	2.5	2.5	2.5	3.66	3.66	3.66	3.66	3.66	3.66
Length without drill bit, mm	818	905	898	1028	1028	1028	1013	1013	1013
Length without drill bit, [in]	32.2	35.6	35.4	40.5	40.5	40.5	39.9	39.9	39.9
Length excl. threads, mm	742	829	822	936	936	936	921	921	921
Length excl. threads, [in]	29.2	32.6	32.4	36.9	36.9	36.9	36.3	36.3	36.3
Weight without drill bit, kg	21	24	32	60	60	60	76	76	76
Weight without drill bit, [lbs]	46	54	71	133	133	133	168	168	168
Piston diameter, mm	63	70	81	99	99	99	120	120	120
Piston diameter, [in]	2.5	2.8	3.2	3.9	3.9	3.9	4.7	4.7	4.7

6. ROK SERIES HAMMER TECHNICAL DATA TABLE: (CONTINUED)

	ROK 60-360	ROK 650Q	ROK 650A	ROK 800	ROK 875
Operating Parameters					
Working pressure, Bar	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28
Working pressure, [PSI]	87 to 406	87 to 406	87 to 406	87 to 406	87 to 406
Air Consumption - m3/min					
10.4 bar [150 PSI]	7.4	10.6	7.4	11.6	11.6
17.2 bar [250 PSI]	15.8	19.8	16.7	23.8	23.8
24.1 bar [350 PSI]	24.9	29.1	26.5	39.7	39.7
Air Consumption - SCFM					
10.4 bar [150 PSI]	268	386	269	420	420
17.2 bar [250 PSI]	575	720	606	864	864
24.1 bar [350 PSI]	905	1056	962	1440	1440
Oil consumption at 24.1 bar [350 PSI], l/hr	0.7	0.7	0.7	0.8	0.8
Oil consumption at 24.1 bar [350 PSI], gal/hr	0.18	0.18	0.18	0.21	0.21
Recommended rotation speed, r/min	15 to 60	15 to 60	15 to 60	14 to 50	14 to 50
Minimum diameter difference between wear sleeve and bit, mm	12	12	12	12	12
Minimum diameter difference between wear sleeve and bit, [in]	0.47	0.47	0.47	0.47	0.47
Technical Specifications					
Bit shank	360	QL6/QL60	QL6/QL60	QL8/QL80	QL8/QL80
Recommended bit size, mm	155 to 178	165 to 178	165 to 178	200 to 254	215 to 254
Recommended bit size, [in]	6.1 to 7.0	6.5 to 7.0	6.5 to 7.0	7.9 to 10.0	8.5 to 10.0
Outside diameter, mm	141	149	148	182	188
Outside diameter, [in]	5.6	5.9	5.8	7.2	7.4
Wear Limit Outside Diameter, mm	129	130	129	175	175
Wear Limit Outside Diameter, [in]	5.1	5.1	5.1	6.9	6.9
Wrench flat on top sub, mm	93	93	93	125	125
Wrench flat on top sub,[in]	3.66	3.66	3.66	4.9	4.9
Length without drill bit, mm	1092	1038	1038	1284	1284
Length without drill bit, [in]	43.0	40.9	40.9	50.6	50.6
Length excl. threads, mm	1000	921	921	1180	1180
Length excl. threads, [in]	39.4	36.3	36.3	46.5	46.5
Weight without drill bit, kg	83.9	88	88	153	184
Weight without drill bit, [lbs]	185	194	194	337	406
Piston diameter, mm	120	120	120	152	152
Piston diameter, [in]	4.7	4.7	4.7	6	6

7. SAFETY:

The percussive hammer drilling environment poses many opportunities for injury for the careless and unprepared. Be sure to work safely at all times. Rotating equipment can entangle loose clothing. Loud noises accompany the hammer operation and high-pressure air can throw dust and debris. Protect your sight and hearing with appropriate safety equipment. Keep your hands and feet clear of the borehole at all times. Keep fingers from getting trapped between the hammer and the bit.

8. WARRANTY:

ROCKMORE guarantees all ROK Series Hammers and spare parts to be free of raw material and manufacturing defects. Warranty coverage is valid for six months after date of shipment.

In order to be eligible for warranty service, you must first file a claim and obtain a Returned Goods Authorization number, authorizing you to return the goods to our facility. All goods returned to us, either new or used must be returned prepaid freight. Please contact your local salesman or the appropriate office directly for more information.

ROCKMORE reserves the right to refuse claims associated with the following problems:

- Damage caused by applying excessive force to any components of the hammer
- The use of non-original ROCKMORE hammer parts
- Any attempt to physically altering any components of the hammer, in particular but not limited to the application of heat or weld
- Failure to follow recommended operating and maintenance procedures (i.e. lubrication, contamination, corrosion, clamp zone)
- Failures due to abuse, misuse, careless maintenance and repairs
- Common wear and tear during normal drilling procedures

The recommended maximum operating air pressure level for our ROK Series hammers is 350 PSI (24.1 Bar). Although the ROK Series Hammers can handle air pressures more than this level, operating pressures above 350 PSI will invalidate the warranty.

Liability

ROCKMORE shall not be liable for any claims that occur from personal injury due to negligent procedures, handling, operation, and/or maintenance of ROCKMORE DTH hammers and bits. ROCKMORE will decline any liability for failure to disregard recommended health and safety measures, i.e. protective eye wear and clothing, safety glasses, etc.

For all your rock drilling tool needs contact

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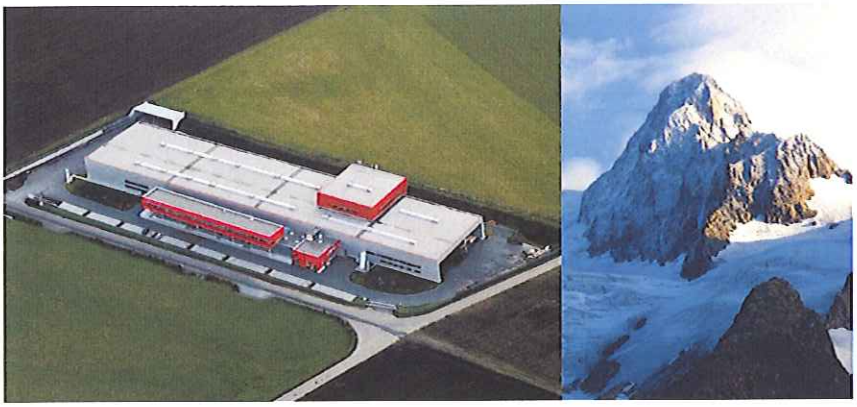

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