Drilling Motors

BENEFITS AND FEATURES

* Sealed and oil filled bearing assembly
* 0 - 2 Degree adjustable housing
* Developed to achieve higher build rates at rotatable bend settings
* Utilizes Maxi-torque driveline
* Capable of transmitting extremely high torque
* Suitable for use with even wall technology, hard rubber and other high torque power sections.
* Patents pending.

PREDICTED BUILD RATES & MAXIMUM ROTATABLE BUR (for 8 3/4" Hole Size)

* BUR Predictions are based on data from a small sample of actual wells. Many factors can affect BUR. Values are provided for information only.
* The above chart is based on 8 3/4" Hole Size, 8 1/2" Near Bit Stabilizer, and 6 1/2 3.0 Stage 7:8 Power Section.

BEND SETTING (degrees)	PREDICTED BUILD RATE (deg/100 ft.)	MAX. HOLE CURVATURE FOR ROTARY DRILLING (deg/100 ft.)
0.00	0	24
0.26	3	22
0.52	6	20
0.77	9	18
1.00	11	16
1.22	14	15
1.41	16	13
1.59	18	12
1.73	19	11
1.85	20	10
1.93	21	9
1.98	22	9
2.00	22	9

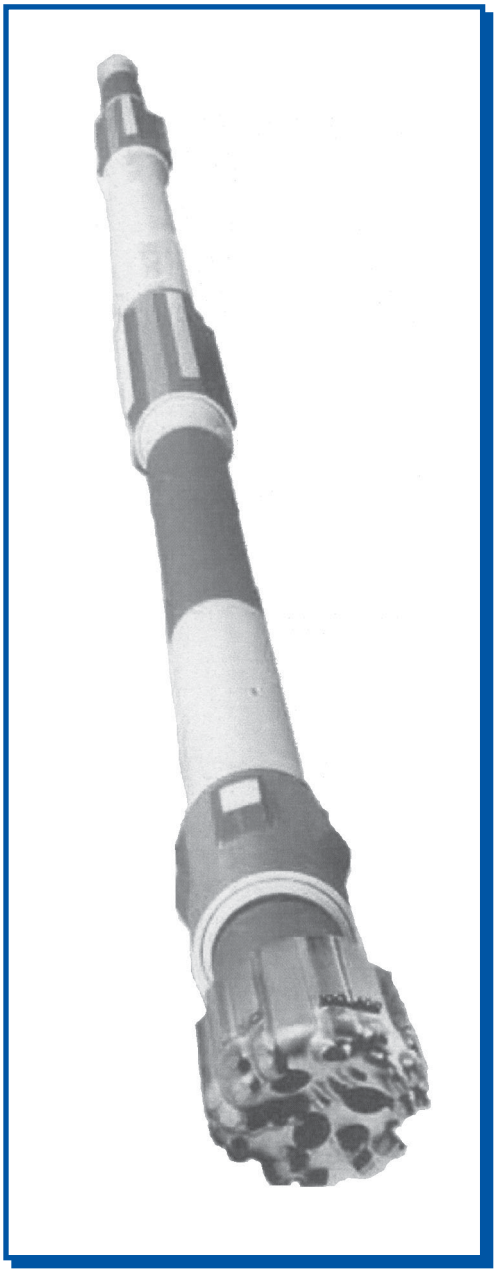
Classic Motor Assemblies

POWER SECTION PERFORMANCE

SIZE		CONFIGURATION	FLOW RATES		SPEED RATIO		BIT SPEED	STALL TORQUE		MAXIMUM RECOMMENDED DIFFERENTIAL	
(in.)	(mm)		(gpm)	(lpm)	(Rev / Gal)	(Rev / l)	(rpm)	(ft. lbs.)	(N.m)	(Psi)	(kPa)
2 7/8	73	7/8 2 stg. Air	70 - 130	264 - 492	2.154	0.569	150 - 280	545	739	300	2,069
2 7/8	73	7/8 3 stg.	50 - 100	189 - 378	2.700	0.714	135 - 270	690	936	450	3,103
3 1/8	79	7/8 ml 3.7 stg.	60 - 130	227 - 492	2.300	0.608	138 - 229	1,100	1,491	733	994
3 1/2	89	7/8 3.8 stg.	75 - 150	284 - 568	1.570	0.415	118 - 235	1,655	2,243	665	4,585
4 3/4	121	5/6 6 stg.	150 - 350	568 - 1325	0.850	0.225	127 - 296	4,820	6,535	1,050	7,240
4 3/4	121	5/6 8.3 stg.	100 - 275	379 - 1041	1.030	0.270	103 - 283	4,650	6,305	1,130	7,797
4 3/4	121	7/8 2.2 stg. Slow	100 - 300	379 - 1136	0.300	0.079	30 - 92	4,093	5,550	385	2,655
4 3/4	121	7/8 3.8 stg.	150 - 300	568 - 1136	0.510	0.135	76 - 152	4,215	5,715	665	4,585
4 3/4	121	7/8 5 stg.	150 - 300	568 - 1136	0.630	0.166	94 - 189	4,789	6,493	875	6,033
4 3/4	121	7/8 3.7 stg.	150 - 300	568 - 1136	0.350	0.092	23 - 123	7,232	9,804	875	6,033
4 3/4	121	7/8 5 stg.	150 - 300	568 - 1136	0.630	0.166	94 - 189	4,789	6,493	875	6,033
4 3/4	121	9/10 2.1 stg.	150 - 300	568 - 1136	0.170	0.037	26 - 51	7,983	10,825	362	2,496
6 1/2	165	6/7 5 stg.	200 - 500	757 - 1893	0.350	0.090	68 - 169	9,978	13,528	875	6,033
6 1/2	165	7/8 3 stg.	300 - 600	1136 - 2271	0.200	0.053	59 - 118	9,797	13,282	525	3,620
6 1/2	165	7/8 3 stg. Slow	200 - 600	757 - 2271	0.150	0.040	30 - 90	13,406	18,175	525	3,620
6 1/2	165	7/8 4.8 stg.	200 - 500	757 - 1893	0.320	0.085	64 - 161	10,215	13,850	840	5,792
6 1/2	165	7/8 6 stg.	300 - 600	1136 - 2271	0.260	0.069	78 - 157	14,288	19,375	1,050	7,239
6 1/2	165	9/10 3.5 stg.	350 - 625	1325 - 2366	0.150	0.040	53 - 94	16,128	21,866	619	4,268
7 3/4 + 8	197 + 203	7/8 2.5 stg. Slow	300 - 900	1136 - 3407	0.070	0.018	22 - 66	19,224	26,064	438	3,020
7 3/4 + 8	197 + 203	7/8 3 stg.	300 - 900	1136 - 3407	0.170	0.045	51 - 153	11,325	15,354	525	3,620
7 3/4 + 8	197 + 203	7/8 4 stg.	300 - 900	1136 - 3407	0.160	0.042	48 - 143	17,203	23,324	700	4,826
7 3/4 + 8	197 + 203	8/9 6 stg.	300 - 900	1136 - 3407	0.220	0.058	65 - 196	18,821	25,518	1,050	7,239
9 5/8	244	5/6 4 stg.	600 - 1200	2271 - 4542	0.110	0.029	65 - 130	25,188	34,149	700	4,826
9 5/8	244	5/6 5 stg. HR	600 - 1200	2271 - 4542	0.128	0.034	77 - 154	53,175	72,095	1,250	8,618
9 5/8	244	6/7 3.5 stg. ERT	600 - 1200	2271 - 4542	0.107	0.028	65 - 125	54,000	73,225	1,300	8,965
9 5/8	244	6/7 5 stg.	600 - 1200	2271 - 4542	0.120	0.032	76 - 148	27,674	37,520	875	6,033
9 5/8	244	7/8 2.5 stg Slow	300 - 900	1136 - 3407	0.070	0.018	22 - 66	19,224	26,064	438	3,020
11 1/4	286	5/6 4.6 stg.	600 - 1100	2271 - 4164	0.160	0.042	96 - 176	19,642	26,631	805	5,550
11 1/4	286	6/7 3.5 stg. ERT	600 - 1200	2271 - 4542	0.107	0.028	65 - 125	54,000	73,225	1,300	8,965

Specifications are based on as new condition and are subject to change without notice.

Multi-Point Stabilized Motor



The Multi-Point Stabilized motor is designed to reduce deviation in areas where unintentional wellbore deviation is a frequent problem.

Replaceable, integral blade stabilizers are located at the top, center and lower end of the motor, to enhance stiffness and provide optimized wellbore contact.

A DCR sub can also be added to the Multi-Point Motor for additional deviation control when drilling through extremely faulted formations.

Multi-Point Motors have successfully reduced deviation in locations where formation conditions have a tendency to deflect the wellbore.

HOLES

Tools are available for a range of holes sizes from 6 1/8" (156mm) to 12 1/4" (311mm) hole diameters with the power sections shown on the next page.

MILLENNIUM MOTOR SPECIFICATIONS

IMPERIAL	4 3/4" BEARING ASSEMBLY	6 1/2" BEARING ASSEMBLY	8" BEARING ASSEMBLY
Max. WOB	53,300 lbs.	90,200 lbs.	105,000 lbs.
Maximum Pull while Back Reaming	52,400 lbs.	50,500 lbs.	175,000 lbs.
Absolute Overpull	515,000 lbs.	780,000 lbs.	1,116,000 lbs.

METRIC	121mm BEARING ASSEMBLY	165mm BEARING ASSEMBLY	203mm BEARING ASSEMBLY
Max. WOB	23,700 daN	40,100 daN	46,700 daN
Maximum Pull while Back Reaming	23,300 daN	22,500 daN	77,800 daN
Absolute Overpull	229,100 daN	346,900 daN	496,400 daN

PERFORMANCE SPECIFICATIONS

IMPERIAL

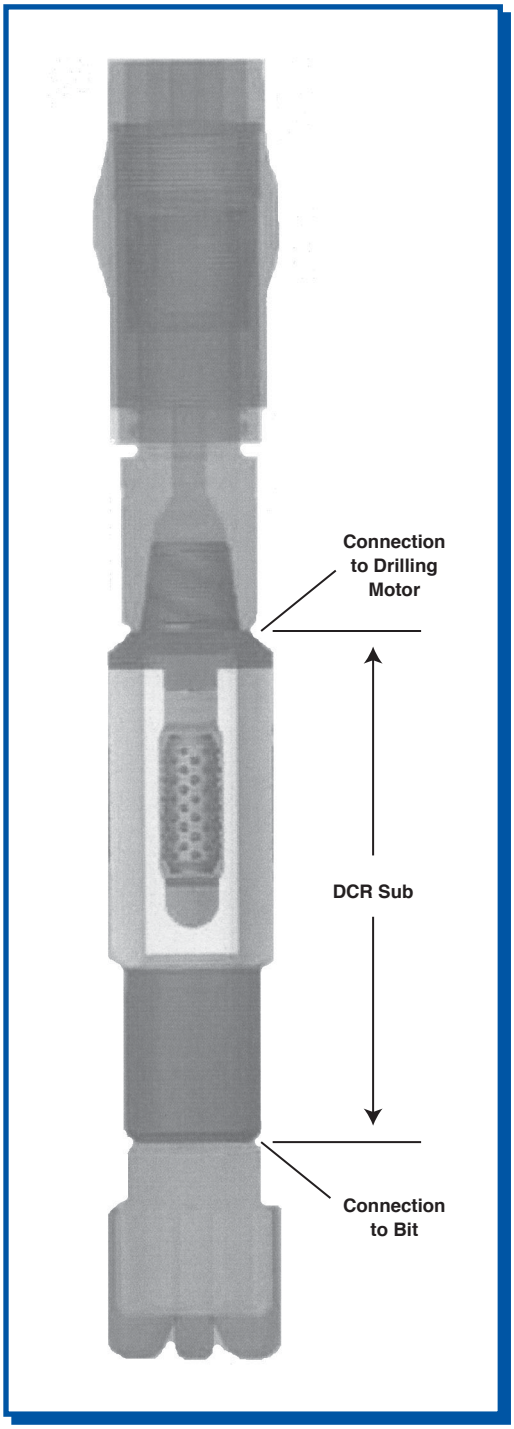
SIZE (inch)	CONFIGURATION	FLOW RATES (gpm)	SPEED RATIO (rev/gal)	BIT SPEED (rpm)	MAXIMUM TORQUE (ft-lbs)	STALL TORQUE (ft-lbs)	MAXIMUM DIFFERENTIAL (psi)
4 3/4	7/8 ml 2.2 stg. Slow	100 - 300	0.300	30 - 92	2,729	4,093	385
4 3/4	7/8 ml 3.8 stg.	150 - 300	0.510	76 - 152	2,810	4,215	665
5	9/10 2.1 stg.	150 - 300	0.170	26 - 51	5,322	7,983	362
6 1/2	6/7 ml 5 stg.	200 - 500	0.350	68 - 169	6,652	9,978	875
6 1/2 - 6 3/4	6/7 ml 5 stg.	300 - 600	0.290	87 - 174	7,280	10,920	875
6 1/2	7/8 ml 3 stg.	300 - 600	0.200	59 - 118	6,531	9,797	525
6 1/2	7/8 ml 3 stg. Slow	200 - 600	0.150	30 - 90	8,937	13,406	525
8	8/9 ml 6 stg.	300 - 900	0.220	65 - 196	12,548	18,821	1,050

METRIC

SIZE (mm)	CONFIGURATION	FLOW RATES (lpm)	SPEED RATIO (rev/l)	BIT SPEED (rpm)	MAXIMUM TORQUE (n-m)	STALL TORQUE (n-m)	MAXIMUM DIFFERENTIAL (kPa)
121	7/8 ml 2.2 stg. Slow	379 - 1136	0.079	30 - 92	3,701	5,550	2,655
121	7/8 ml 3.8 stg.	568 - 1136	0.135	76 - 152	3,810	5,715	4,585
127	9/10 2.1 stg.	568 - 1136	0.037	26 - 51	7,217	10,825	2,496
165	6/7 ml 5 stg.	757 - 1893	0.090	68 - 169	9,018	13,528	6,033
165 - 171	6/7 ml 5 stg.	1136 - 2271	0.077	87 - 174	9,870	14,806	6,033
165	7/8 ml 3 stg.	1136 - 2271	0.053	59 - 118	8,855	13,282	3,620
165	7/8 ml 3 stg. Slow	757 - 2271	0.040	30 - 90	12,117	18,175	3,620
203	8/9 ml 6 stg.	1136 - 3407	0.058	65 - 196	17,012	25,518	7,239

Specifications are based on as new condition and are subject to change without notice.

Downhole Deviation Control Reamer



DESCRIPTION

The Downhole Deviation Control Reamer (DCR Sub) acts as a near bit reamer / stabilizer. The three-point sealed bearing cutters maintain hole gauge and also function as a low torque stabilizer to control hole deviation. The extremely short length of this sub is possible due to the unique patented cutter retention method.

BENEFITS AND FEATURES

* Sealed and lubricated reamer cutters with internal bushings provide the greatest durability in a near bit environment.
* Cutter pins are produced from hardened steel for long life.
* Cutter types; domed button or straight ridge.
* Replaceable thrust washers are installed at each end of the cutters.
* Cutter blocks are precision machined to ensure correct gauge. They are manufactured from alloy steel and finished hardened for a superior combination of strength and wear resistance.
* No bolts or screws are used to retain the reamer blocks.