



OPERATIONS MANUAL

INTRODUCTION

The Prescott Drilling Motors Operations Manual covers basic procedures and principals in the operation of Prescott positive displacement mud motors. This manual includes basic operating information, specifications and tool parameters and also provides general information for the user to operate our equipment safely and effectively. As always, specific applications may dictate changes in procedures, therefore this manual is to be used as a guideline only. If there are any questions, please contact your nearest Prescott Drilling Motors representative.

This manual includes basic engineering data for use at the rig. In addition, specifications for each motor power section are available to help the user identify the proper power section for optimum drilling performance.

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NQL Energy Services Prescott Mud Motor

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NQL Energy Services Complete Product Line

NQL Energy Services newest addition is **Prescott Drilling Motors** who manufacture a high quality mud lubricated motor. The mud lubricated motor is a distinct and separate product from the oil lubricated and sealed motor designs also offered by **NQL Energy Services**

NQL has a complete line up of Drilling Motors including the **BlackMax** line of quality drilling tools includes drilling motors, shock tools, two types of mechanical drilling jars, a hydraulic mechanical drilling jar, and a hydraulic drilling jar. In sizes ranging from 1 11/16" OD to 11 1/4" OD, NQL has a drilling tool for any application.

BlackMax Mud Motors range in size from 1 11/16"OD to 11 ¼" OD. With over 80 different configurations, **BlackMax** Mud Motors provide our customers with the versatility to tailor the motor to a specific bit and drilling application. With our combinations of power sections, rugged drive shafts, and sealed thrust bearing assemblies **BlackMax** can build the exact tool to perform the job to the highest quality expected of their customers.

BlackMax Mud Motors have drilled hundreds of thousands of feet of hole by marrying the power section you need with the bit required in the application.

Black Max Shock Tools range in size from 2 7/8" OD to 11" OD. Designed to cushion heavy axial loading and reduce bit vibrations, **BlackMax** Shock Tools will extend drillstring component and bit life to help reduce drilling costs. **BlackMax** Shock Tools are sprung for compression and tension, are pressure balanced from hydrostatic pressures, and come in string or bottom hole configurations.

BlackMax Rayson Mechanical Jars and **Best Hitter Mechanical Jars** are designed to create powerful mechanical jarring action to free drill strings that have become stuck. They are oil lubricated and are designed to work in the harshest of drilling environments.

BlackMax Hydraulic Mechanical Jars have a mechanical latch feature that keeps the jar in the neutral position and prevents unexpected jarring while tripping in or out of the hole. The jars have a hydraulic valve that creates a time delay when the jar is in operation and the latch is disengaged.

BlackMax "Rig Rattler" Jars are a hydraulic tool that jars up and has a mechanical "bump" down. The **Rig Rattler** has been a proven solution to stuck pipe in many applications, and provides a maximum jar action when needed most.

In 2005 **NQL Energy Services** also introduced the **Stabeco** product line to compliment its' existing drilling products - Please refer to the **Stabeco Motor Manual** (available Fall 2006) or **Brochure** for more information

PRESCOTT MUD MOTOR DESIGN

(A) Bearing Assembly

The Prescott Bearing assemblies are a reliable and proven flow-thru design. The bearing pack is very rugged and will stand up to the harshest drilling conditions. The bearing race stack uses the toughest tool steel material specially heat treated to a Prescott proprietary specification which maximized toughness while increasing wear resistance resulting in a longer bearing's life. Upper and lower radial bearing support bushing are case hardened and are very cost effective. All these features result in a longer lasting and very reliable bearing pack.

(B) Jaw Clutch Transmission

Prescott incorporates the proven and long lasting jaw clutch transmission to transmit torque from the rotor to the output shaft and eliminates side loading caused by rotor eccentricity. The patented (US 7,004,843) innovative double-pinned design results in longer component life, higher tensile strength and can be used up to 4 degrees.

(C) Adjustable bent Housing/Fixed Housing

The Prescott ABH is a patented (US 6,554,083) one of a kind tool, which allows for easy adjustment of the bend angle. Simple yet effective design is very strong and a single setscrew locks the desired angle in place until the unit is torqued. The ABH is available up to 3 degree in ¼ degree increments. Always follow the specifications for proper torquing of the assembly.

(D) Power Sections

Prescott power sections are made up of a lobed rotor that fits inside an elastomer lined housing (stator). The rotor has one less lobe than the stator creating a continuously sealing chamber. Drilling fluid or gas is forced through the motor, thereby turning the rotor and generating torque.

Where drilling requirements call for circulation rates exceeding maximum recommended rates, rotors are jetted to allow excessive fluid to flow down a parallel path, thereby reducing damage to the elastomer in the stator.

PROCEDURES

Introduction

This section describes basic operating procedures, which are used in the field and will facilitate proper operation of Prescott motors.

Bit Selection

An important aspect of any planned down hole motor run, is properly matching the bit and hydraulics to the motor in order to achieve the desired results. Attention must be given to TFA (total flow area) to see that proper parameters are maintained with regard to pressure drop across bit, annular velocity needed for hole cleaning, maximum standpipe pressure, and adequate hole cleaning at the bit/formation interface. Keep in mind that stalls pressure of a motor may approach pump relief valve limits in some cases. In larger hole sizes, a bored rotor may be necessary to accommodate fluid requirements mentioned above. Generally, all motor sizes have adequate torque to run any cone type bit. Aggressive PDC bits may cause stalling in rough and broken formations. If the purpose of the run is to build angle, or otherwise achieve significant deviation, gauge length on the bit is very important. Gauge protection is necessary if the motor is bent, since continual side loading occurs at the bit.

PRESCOTT MUD MOTORS

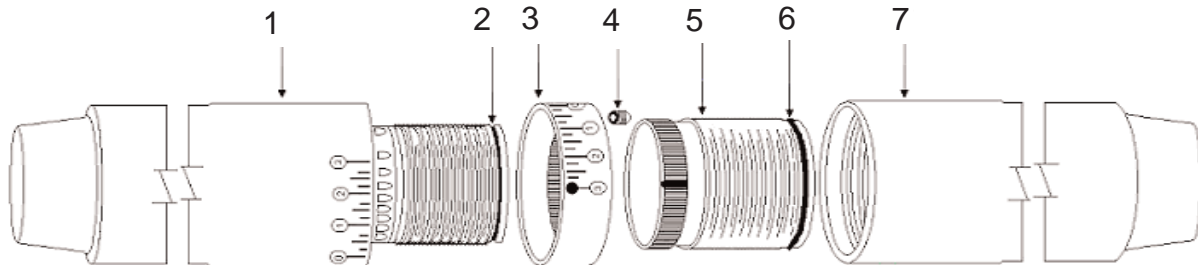
For More Information
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www.nql.com

TORQUE CONNECTIONS

| (Dim. In ft-lb) | 1 11/16" | 2 1/8" | 2 3/8" | 2 7/8" | 3 3/4" | 4 3/4" | 6 1/4" | 6 1/2" | 6 3/4" | 7 3/4" | 8" | 9 5/8" |
|------------------|-----------|---------|-----------|---------|---------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| HOUSING (ABH) | 330 | 900 | 1200 | 2000 | 3100 | 7500-8000 | 17000-19000 | 18000-20000 | 20000-25000 | 35000-40000 | 35000-40000 | 60000-65000 |
| HOUSING (ENDNUT) | | | | | | 7000-7500 | 17000-17500 | 18000-20000 | 18000-20000 | 35000-40000 | 35000-40000 | 60000-65000 |
| STABILIZER | | | | | | 4500 | 8000 | 8500 | 8500 | 12500 | 12500 | 25000 |
| FLOW DIVERTER | 150 | 320 | 345 | 700 | 1000 | 2500 | 6500 | 7000 | 7500 | 11000 | 11000 | 20000 |
| TRANSMISSION | 150 | 320 | 345 | 700 | 1000 | 2200 | 6000 | 6000 | 6000 | 8500 | 8500 | 20000 |
| CATCH | | | | | | 2000 | 2200 | 2200 | 2200 | 2500 | 2500 | 2500 |
| COMPRESSION | .010-.015 | .02-.03 | .025-.035 | .03-.04 | .04-.05 | .05-.06 | .06-.075 | .06-.075 | .06-.075 | .075-.09 | .075-.10 | .09-.105 |

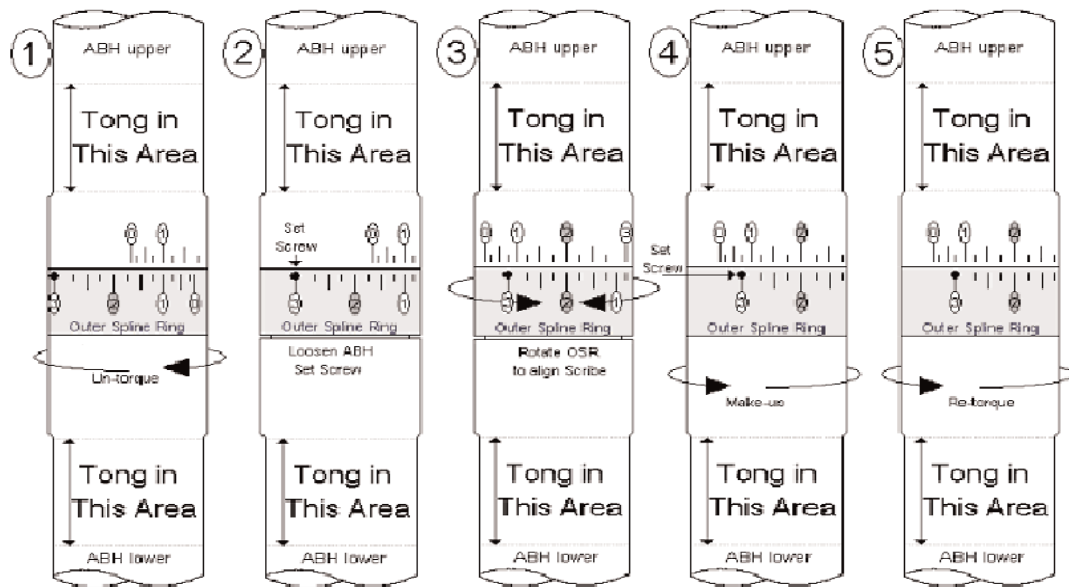
Build Rates

| Stab | PDM Size (in.) | Hole Size (in) | 0.25° | 0.5° | 0.75° | 1° | 1.25° | 1.5° | 1.75° | 2° | 2.25° | 2.5° | 2.75° | 3° |
|------|----------------|----------------|-------|------|-------|-----|-------|------|-------|------|-------|------|-------|------|
| | 3 3/4 | | | | | | | | | | | | | |
| | 4 3/4 | 6 | 1 | 2 | 4 | 5.8 | 7.7 | 9.3 | 10.6 | 12.5 | 14.8 | 16.2 | 18.7 | 20.4 |
| | | 6 1/4 | 1 | 1.8 | 3.2 | 5 | 6.9 | 8.5 | 9.8 | 11.7 | 14 | 15.6 | 17.9 | 19.6 |
| | | 6 3/4 | 1 | 1.4 | 2.8 | 4.1 | 5.8 | 6.9 | 8.8 | 10.4 | 13.6 | 14.2 | 16.1 | 17.8 |
| | 6 1/4 | 7 7/8 | 1 | 1.5 | 2.7 | 4.7 | 6.7 | 7.4 | 9.6 | 11 | 13 | 14.2 | 15.8 | 17.2 |
| | | 8 1/2 | 1 | 1.5 | 2.5 | 4.1 | 5 | 6.8 | 9 | 10.4 | 12.4 | 13.6 | 15.1 | 16.5 |
| | | 8 3/4 | 1 | 1.4 | 2.5 | 3.7 | 4 | 4.8 | 6.4 | 7.9 | 9.5 | 11 | 12.4 | 13.8 |
| | 6 1/2 | | | | | | | | | | | | | |
| | 6 3/4 | 8 1/2 | 1 | 1.5 | 2.7 | 4.7 | 6.7 | 7.4 | 9.6 | 11 | 13 | 14.2 | 15.8 | 17.2 |
| | | 8 3/4 | 1 | 1.5 | 2.5 | 4.1 | 5 | 6.8 | 9 | 10.4 | 12.4 | 13.6 | 15.1 | 16.5 |
| | | 9 7/8 | 1 | 1.4 | 2.5 | 3.7 | 4 | 4.8 | 6.4 | 7.9 | 9.5 | 11 | 12.4 | 13.8 |
| | 7 3/4 | 9 7/8 | 1 | 2 | 2.4 | 3.6 | 5.2 | 6.3 | 7.3 | 9.5 | 10.8 | 12.5 | 14.1 | 15.5 |
| | | 10 5/8 | 1 | 1.8 | 2.3 | 3 | 4.3 | 4.8 | 6.6 | 7.6 | 9.8 | 11 | 12.5 | 13.9 |
| | | 12 1/4 | 0.9 | 1.7 | 2 | 2.8 | 4 | 4.4 | 5.2 | 5.8 | 6.8 | 7.6 | 9.3 | 10.6 |
| | 8 | | | | | | | | | | | | | |
| | 9 5/8 | | | | | | | | | | | | | |



Adjustable Bent Housing Parts List/Parts Numbers

| Item Number | Part Description | Quantity Required | Motor Size /Part Number | | | |
|-------------|-------------------|-------------------|-------------------------|---------|---------|---------|
| | | | 4.3/4" | 6.3/4" | 8." | 9.5/8" |
| 1 | ABH Upper | 1 | 475-401 | 675-401 | 800-401 | 962-401 |
| 2 | Upper O-Ring | 1 | | | | |
| 3 | Outer Spline Ring | 1 | 475-403 | 675-403 | 800-403 | 962.403 |
| 4 | ABH Set Screw | 1 | | | | |
| 5 | Inner Spline Ring | 1 | 475-405 | 675-405 | 800-405 | 962-405 |
| 6 | Inner O-Ring | 1 | | | | |
| 7 | ABH Lower | 1 | 475-407 | 675-407 | 800-407 | 962-407 |



1. Locate desired ABH scribe setting and mark for future reference. With the ABH in torqued, or un-torqued, position the break out unit or rig tongs in the required place on the ABH body. (See Figure 7.4). Untorque, (RIGHT HAND THREAD), and rotate the ABH lower one (1) complete revolution (360°).

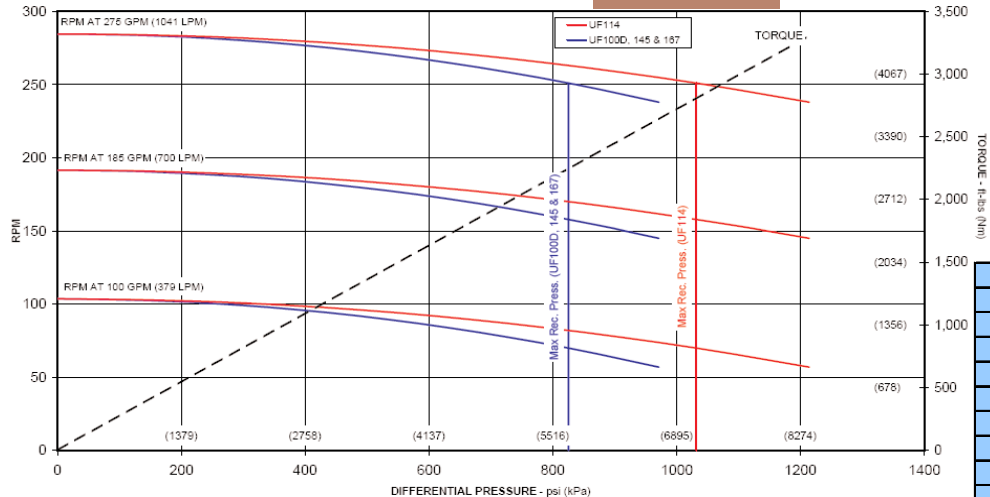
2. Locate the scribe mark on the desired bend angle on the ABH upper and the Outer Spline Ring.
Loosen the ABH Set Screw three (3) to four (4) rounds to allow the ABH Set Screw to be raised out of a recess in the I.D...

4. Rotate the Outer Spline Ring to the right, (to increase angle), or to the left, (to decrease angle), in order to align the scribe line on the ABH upper with the scribe line on the Outer Spline Ring.

5. When the desired bend scribe lines are aligned with each other, tighten the ABH Set Screw until the ABH Set Screw is flush with the ABH O.D. or sits below the surface.

Note: If the ABH Set Screw extends above the O.D. of the Outer Spline Ring. Re-adjust the Outer Spline Ring to allow for proper seating of the ABH Set Screw inside the pocket in the I.D...

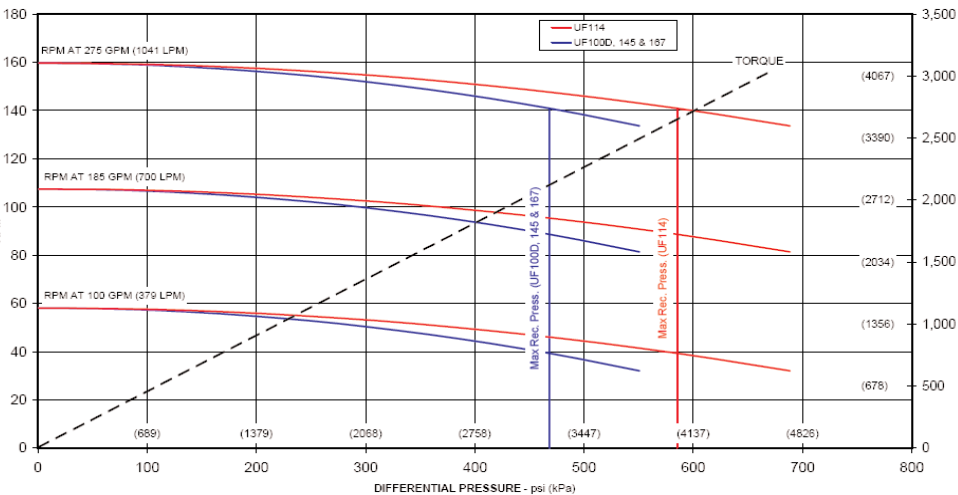
4.3/4" - 4/5 6.3 Stage



| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 820psi | hp |
|--------------|-------------|-------------------------|------|
| 100 | 60-105 | 2,200 | 25.1 |
| 185 | 145-190 | 2,200 | 60.7 |
| 275 | 235-285 | 2,200 | 98.4 |

| | |
|-------------------------------------|-----------------|
| Tool O.D. (Inches) | 4 3/4" |
| Lobe configuration | 4:5 |
| Number of Stages | 6.3 |
| Length (Inches) | 275 |
| Weight (Pounds) | 1200 |
| Bit Size Range (Inches) | 5 3/4" - 6 3/4" |
| Top Connection | 3 1/2 IF |
| Bit Connection | 3 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 100 -275 |
| Bit Speed Range (RPM) | 100 - 270 |
| Torque Output (Foot Pounds) | 2,200 |
| Horsepower (HP) | 100 |
| Maximum Bit Weight (Pounds) | 40,000 |
| Maximum Sand Content (%) | 2 |

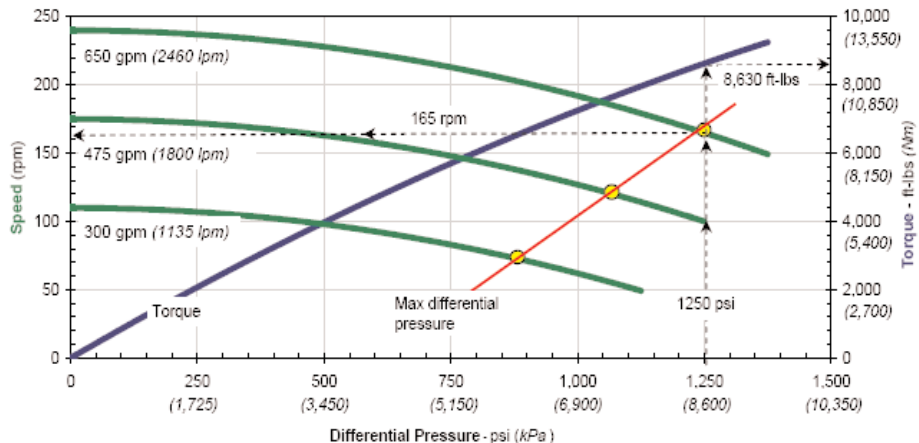
4.3/4" - 7/8 3.8 Stage



| | |
|-------------------------------------|------------------------|
| Tool O.D. (Inches) | 4 3/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 3.8 |
| Length (Inches) | 265.5 |
| Weight (Pounds) | 1100 |
| Bit Size Range (Inches) | 5 3/4" - 6 3/4" |
| Top Connection | 3 1/2 IF |
| Bit Connection | 3 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 100-275 |
| Bit Speed Range (RPM) | 59-160 |
| Torque Output (Foot Pounds) | 2,200 |
| Horsepower (HP) | 55 |
| Maximum Bit Weight (Pounds) | 40,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 475psi | hp |
|--------------|-------------|-------------------------|------|
| 100 | 32-58 | 2,200 | 13.4 |
| 185 | 81-108 | 2,200 | 33.9 |
| 275 | 132-160 | 2,200 | 55.3 |

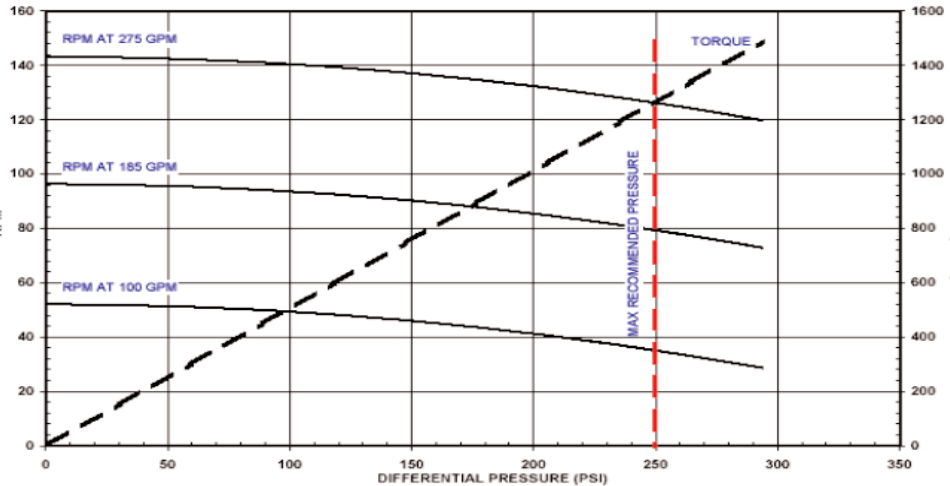
4.3/4" ERT - 4/5 3.6 stage



| | |
|-------------------------------------|-------------------|
| Tool O.D. (Inches) | 4 3/4" ERT |
| Lobe configuration | 4:5 |
| Number of Stages | 3.6 |
| Length (Inches) | 205 |
| Weight (Pounds) | 900 |
| Bit Size Range (Inches) | 5 3/4" - 6 3/4" |
| Top Connection | 3 1/2 IF |
| Bit Connection | 3 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 150-300 |
| Bit Speed Range (RPM) | 150-300 |
| Torque Output (Foot Pounds) | 3,150 |
| Horsepower (HP) | 72 |
| Maximum Bit Weight (Pounds) | 40,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 1300psi | hp |
|--------------|-------------|--------------------------|------|
| 150 | 75-150 | 3,150 | 18.0 |
| 225 | 135-225 | 3,150 | 43.2 |
| 300 | 200-300 | 3,150 | 72.0 |

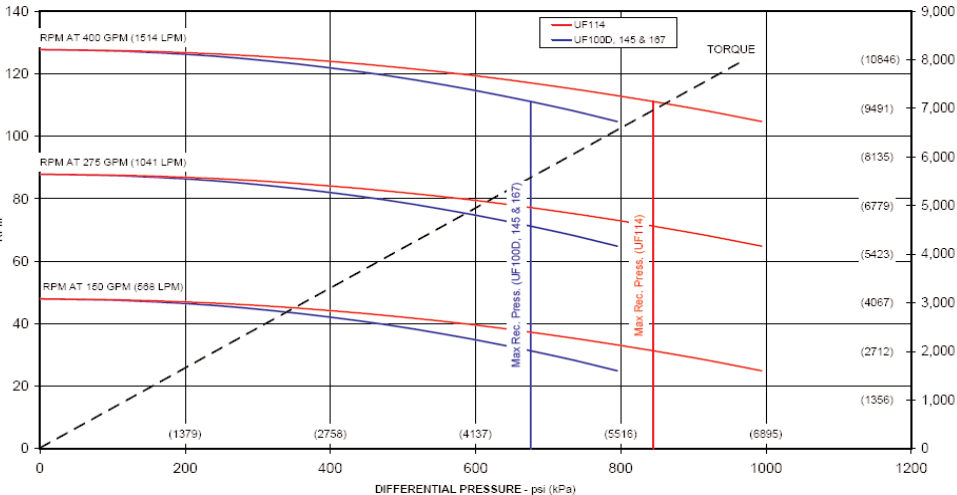
4.3/4" - 7/8 2.2 Stage



| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 250psi | hp |
|--------------|-------------|-------------------------|------|
| 100 | 30-52 | 1,300 | 7.4 |
| 185 | 72-95 | 1,300 | 17.8 |
| 275 | 120-142 | 1,300 | 29.7 |

| | |
|------------------------------|-----------------|
| Tool O.D. (Inches) | 4 3/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 2.2 |
| Length (Inches) | 193 |
| Weight (Pounds) | 900 |
| Bit Size Range (Inches) | 5 3/4" - 6 3/4" |
| Top Connection | 3 1/2 IF |
| Bit Connection | 3 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 100-275 |
| Bit Speed Range (RPM) | 50-140 |
| Torque Output (Foot Pounds) | 1,300 |
| Horsepower (HP) | 30 |
| Maximum Bit Weight (Pounds) | 40,000 |
| Maximum Sand Content (%) | 2 |

6 1/2" -7/8
4.8 stage

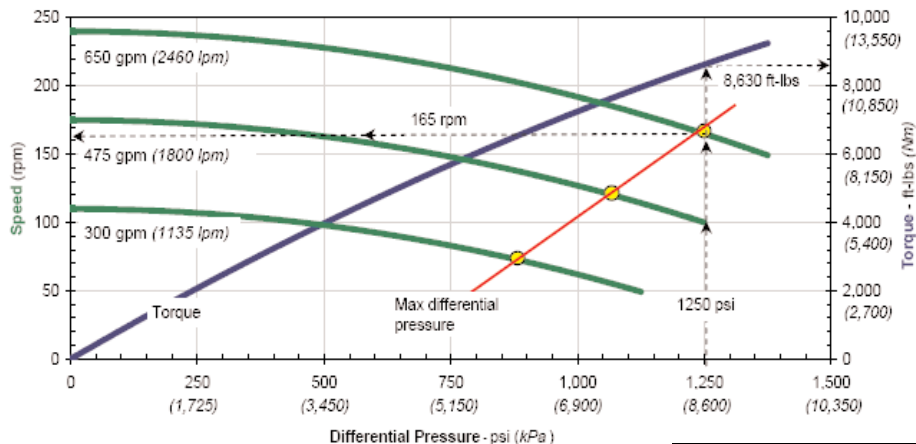


| | |
|-------------------------------------|-----------------|
| Tool O.D. (Inches) | 6 1/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 4.8 |
| Length (Inches) | 313 |
| Weight (Pounds) | 2000 |
| Bit Size Range (Inches) | 7 7/8" - 8 3/4" |
| Top Connection | 4 1/2 XH |
| Bit Connection | 4 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 150 - 400 |
| Bit Speed Range (RPM) | 50 - 130 |
| Torque Output (Foot Pounds) | 5,500 |
| Horsepower (HP) | 110 |
| Maximum Bit Weight (Pounds) | 75,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 680psi | hp |
|--------------|-------------|-------------------------|-------|
| 150 | 25-48 | 5,500 | 26.2 |
| 275 | 65-88 | 5,500 | 68.1 |
| 400 | 105-128 | 5,500 | 110.0 |

For more information on our products see our Web site <http://www.nql.com>

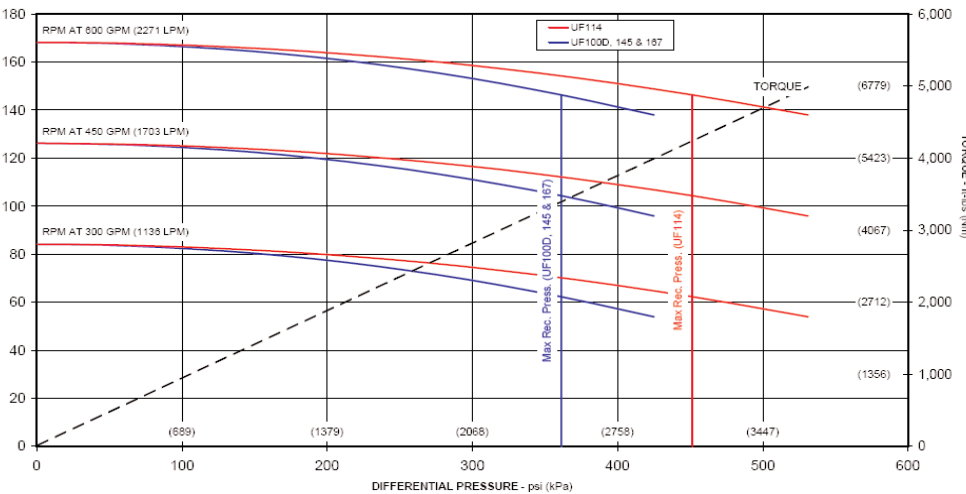
6.3/4" - 6/7
3.1 Stage



| | |
|-------------------------------------|-------------------|
| Tool O.D. (Inches) | 6 3/4" ERT |
| Lobe configuration | 6:7 |
| Number of Stages | 3.1 |
| Length (Inches) | 241 |
| Weight (Pounds) | 2700 |
| Bit Size Range (Inches) | 8 1/2" - 9 7/8" |
| Top Connection | 4 1/2 IF |
| Bit Connection | 4 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 300 - 650 |
| Bit Speed Range (RPM) | 110 - 240 |
| Torque Output (Foot Pounds) | 8,630 |
| Horsepower (HP) | 197 |
| Maximum Bit Weight (Pounds) | 80,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 1250psi | hp |
|--------------|-------------|--------------------------|-------|
| 300 | 50-110 | 8,630 | 49.3 |
| 475 | 100-175 | 8,630 | 118.3 |
| 650 | 150-240 | 8,630 | 197.2 |

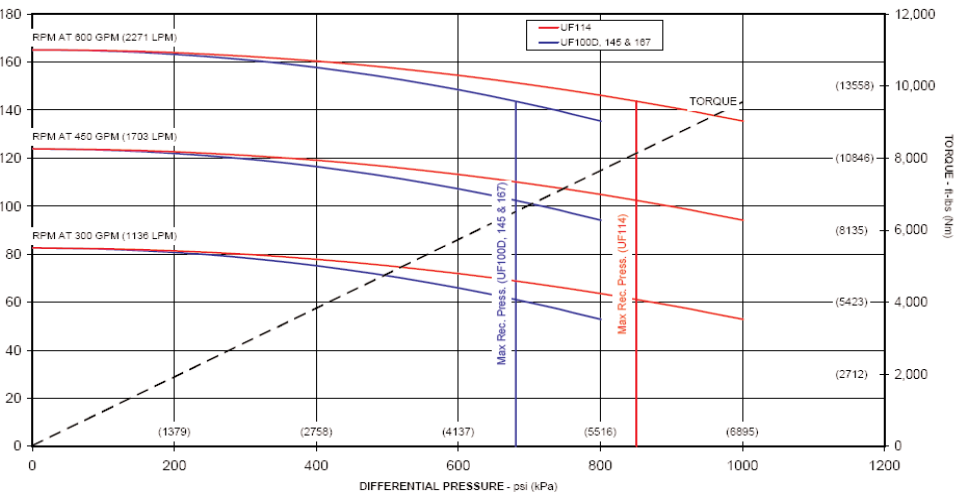
6 3/4" -7/8
3 stage



| | |
|-------------------------------------|------------------------|
| Tool O.D. (Inches) | 6 3/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 3 |
| Length (Inches) | 227 |
| Weight (Pounds) | 2000 |
| Bit Size Range (Inches) | 8 1/2" - 9 7/8" |
| Top Connection | 4 1/2 IF |
| Bit Connection | 4 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 300 - 600 |
| Bit Speed Range (RPM) | 80 - 170 |
| Torque Output (Foot Pounds) | 3,400 |
| Horsepower (HP) | 90 |
| Maximum Bit Weight (Pounds) | 80,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 360psi | hp |
|--------------|-------------|-------------------------|------|
| 300 | 52-85 | 3,400 | 33.7 |
| 450 | 95-125 | 3,400 | 61.5 |
| 600 | 138-168 | 3,400 | 89.3 |

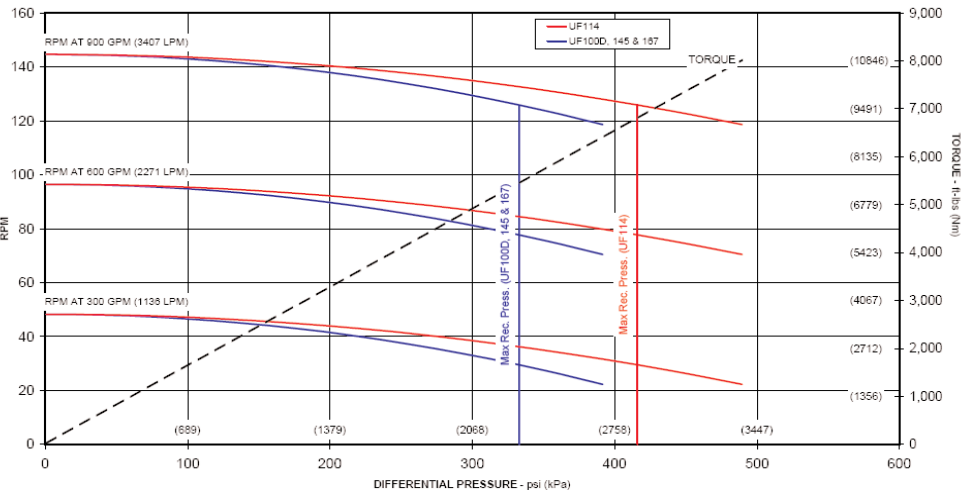
6 3/4" -7/8 5 stage



| | |
|-------------------------------------|------------------------|
| Tool O.D. (Inches) | 6 3/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 5 |
| Length (Inches) | 301 |
| Weight (Pounds) | 2200 |
| Bit Size Range (Inches) | 8 1/2" - 9 7/8" |
| Top Connection | 4 1/2 IF |
| Bit Connection | 4 1/2 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 300 - 600 |
| Bit Speed Range (RPM) | 80 - 165 |
| Torque Output (Foot Pounds) | 6,250 |
| Horsepower (HP) | 160 |
| Maximum Bit Weight (Pounds) | 80,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 675psi | hp |
|--------------|-------------|-------------------------|-------|
| 300 | 54-82 | 6,250 | 64.3 |
| 450 | 95-125 | 6,250 | 113.1 |
| 600 | 135-165 | 6,250 | 160.7 |

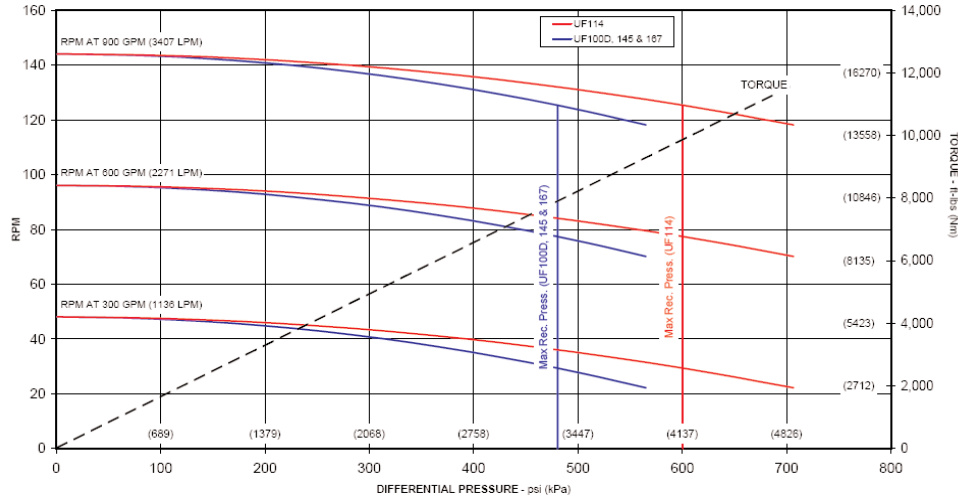
7 3/4" - 7/8 3 stage



| | |
|-------------------------------------|-------------------------|
| Tool O.D. (Inches) | 7 3/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 3 |
| Length (Inches) | 280 |
| Weight (Pounds) | 2800 |
| Bit Size Range (Inches) | 9 7/8" - 12 1/4" |
| Top Connection | 6 5/8 Reg. |
| Bit Connection | 6 5/8 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 300 - 900 |
| Bit Speed Range (RPM) | 50 - 150 |
| Torque Output (Foot Pounds) | 5,500 |
| Horsepower (HP) | 125 |
| Maximum Bit Weight (Pounds) | 100,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 330psi | hp |
|--------------|-------------|-------------------------|-------|
| 300 | 22-48 | 5,500 | 23.0 |
| 600 | 70-95 | 5,500 | 73.3 |
| 900 | 118-145 | 5,500 | 123.6 |

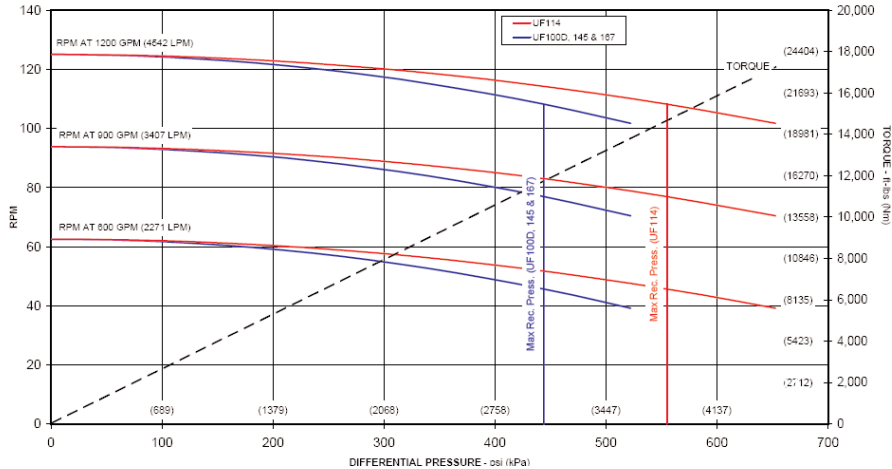
7 3/4" - 7/8
4 stage



| | |
|-------------------------------------|---------------------|
| Tool O.D. (Inches) | 8" OR 7 3/4" |
| Lobe configuration | 7:8 |
| Number of Stages | 4 |
| Length (Inches) | 320 |
| Weight (Pounds) | 3500 |
| Bit Size Range (Inches) | 10 5/8 - 12 1/4" |
| Top Connection | 6 5/8 Reg. |
| Bit Connection | 6 5/8 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 300 - 900 |
| Bit Speed Range (RPM) | 50 -145 |
| Torque Output (Foot Pounds) | 8,000 |
| Horsepower (HP) | 180 |
| Maximum Bit Weight (Pounds) | 100,000 |
| Maximum Sand Content (%) | 2 |

| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 475psi | hp |
|--------------|-------------|-------------------------|-------|
| 300 | 22-49 | 8,000 | 33.5 |
| 600 | 70-95 | 8,000 | 106.6 |
| 900 | 118-144 | 8,000 | 179.7 |

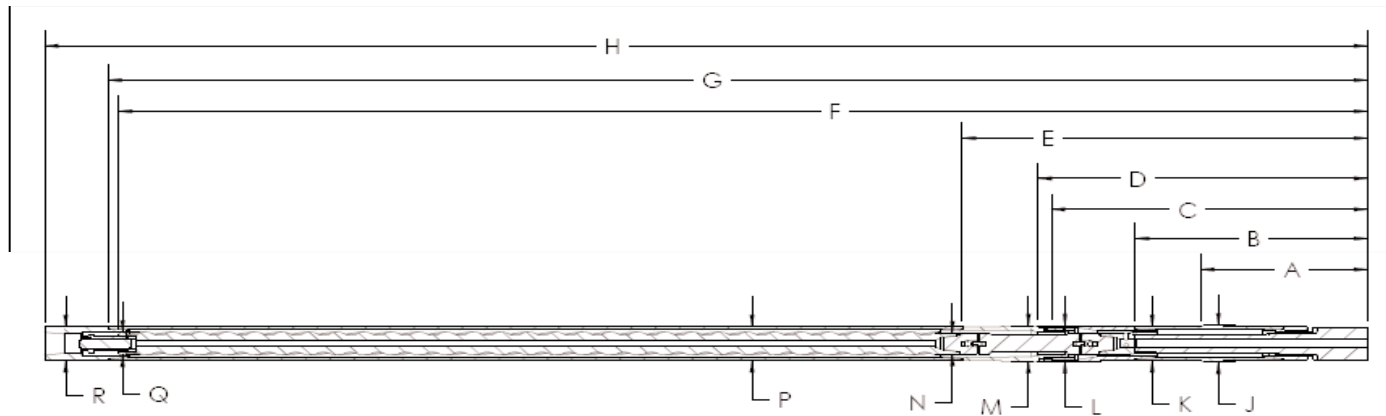
9 5/8" 5/6 4 stage



| Volume (gpm) | Speed (rpm) | Torque (ft lb) @ 445psi | hp |
|--------------|-------------|-------------------------|-------|
| 600 | 39-63 | 12,000 | 89.1 |
| 900 | 70-95 | 12,000 | 159.9 |
| 1200 | 105-125 | 12,000 | 239.9 |

| | |
|-------------------------------------|--------------------------|
| Tool O.D. (Inches) | 9 5/8" |
| Lobe configuration | 5:6 |
| Number of Stages | 4 |
| Length (Inches) | 368.5 |
| Weight (Pounds) | 6000 |
| Bit Size Range (Inches) | 12 1/4" - 17 1/2" |
| Top Connection | 6 5/8 Reg. |
| Bit Connection | 6 5/8 Reg. |
| Bent Housing Range (Degrees) | 0 - 3 |
| Flow Rate Range (GPM) | 600 - 1200 |
| Bit Speed Range (RPM) | 62-130 |
| Torque Output (Foot Pounds) | 12,000 |
| Horsepower (HP) | 240 |
| Maximum Bit Weight (Pounds) | 120,000 |
| Maximum Sand Content (%) | 2 |

Fishing Dimensions



Fishing Dimensions Continued..

| Motor | Lobes | Stages | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R |
|-------|-------|--------|------|------|------|------|------|-----|-----|-----|------|------|------|------|------|------|------|------|
| 4 3/4 | 4/5 | 6.3 | 20 | 44 | 58 | 59.6 | 69 | 274 | 277 | 286 | 5.56 | 4.75 | 5 | 5 | 2.75 | 4.75 | 2.75 | 4.75 |
| 4 3/4 | 7/8 | 3.8 | 20 | 44 | 58 | 59.6 | 69 | 253 | 256 | 265 | 5.56 | 4.75 | 5 | 5 | 2.75 | 4.75 | 2.75 | 4.75 |
| | | | | | | | | | | | | | | | | | | |
| 6 1/4 | 7/8 | 4.8 | 32.8 | 54.5 | 72.8 | 75.3 | 91 | 291 | 294 | 308 | 6.63 | 6.25 | 6.55 | 6.55 | 3.68 | 6.25 | 3.68 | 6.25 |
| | | | | | | | | | | | | | | | | | | |
| 6 1/2 | 7/8 | 2.9 | 31 | 57 | 75.3 | 78.3 | 93.7 | 308 | 311 | 327 | 7.25 | 6.5 | 6.75 | 6.75 | 4 | 6.5 | 4 | 6.5 |
| | | | | | | | | | | | | | | | | | | |
| 6 3/4 | 7/8 | 2.9 | 31 | 57 | 75.3 | 78.3 | 93.7 | 308 | 311 | 327 | 7.5 | 6.75 | 7.06 | 7.06 | 4 | 6.75 | 4 | 6.75 |
| 6 3/4 | 7/8 | 3 | 31 | 57 | 75.3 | 78.3 | 93.7 | 213 | 216 | 232 | 7.5 | 6.75 | 7.06 | 7.06 | 4 | 6.75 | 4 | 6.75 |
| 6 3/4 | 7/8 | 5 | 31 | 57 | 75.3 | 78.3 | 93.7 | 285 | 288 | 304 | 7.5 | 6.75 | 7.06 | 7.06 | 4 | 6.75 | 4 | 6.75 |
| | | | | | | | | | | | | | | | | | | |
| 7 3/4 | 7/8 | 3 | 40 | 70 | 91 | 94 | 116 | 270 | 273 | 293 | 8.63 | 7.75 | 8.06 | 8.06 | 4.7 | 7.75 | 4.7 | 7.75 |
| 7 3/4 | 7/8 | 4 | 40 | 70 | 91 | 94 | 116 | 313 | 316 | 335 | 8.63 | 7.75 | 8.06 | 8.06 | 4.7 | 7.75 | 4.7 | 7.75 |
| | | | | | | | | | | | | | | | | | | |
| 9 5/8 | 5/6 | 4 | 50 | 68 | 93.5 | 96.9 | 121 | 343 | 346 | 366 | 10.6 | 9.63 | 10.3 | 10.3 | 5.5 | 9.63 | 5.5 | 9.63 |

| lb/gal | lb/ft3 | kg/m3 | Specific Gravity | Gradient Depth (psi/ft) | Gradient Depth (kPa/m) |
|--------|--------|--------|------------------|-------------------------|------------------------|
| 16.4 | 122.66 | 1965.1 | 1.97 | 0.853 | 19.3 |
| 16.5 | 123.41 | 1977 | 1.98 | 0.858 | 19.4 |
| 16.6 | 124.16 | 1989 | 2 | 0.863 | 19.5 |
| 16.7 | 124.91 | 2001 | 2.01 | 0.868 | 19.6 |
| 16.8 | 125.65 | 2013 | 2.02 | 0.874 | 19.8 |
| 16.9 | 126.4 | 2025 | 2.03 | 0.879 | 19.9 |
| 17 | 127.15 | 2036.9 | 2.04 | 0.884 | 20 |
| 17.1 | 127.9 | 2048.9 | 2.05 | 0.889 | 20.1 |
| 17.2 | 128.65 | 2060.9 | 2.06 | 0.894 | 20.2 |
| 17.3 | 129.39 | 2072.9 | 2.08 | 0.9 | 20.3 |
| 17.4 | 130.14 | 2084.9 | 2.09 | 0.905 | 20.5 |
| 17.5 | 130.89 | 2096.9 | 2.1 | 0.91 | 20.6 |
| 17.6 | 131.64 | 2108.8 | 2.11 | 0.915 | 20.7 |
| 17.7 | 132.39 | 2120.8 | 2.12 | 0.92 | 20.8 |
| 17.8 | 133.13 | 2132.8 | 2.14 | 0.926 | 20.9 |
| 17.9 | 133.88 | 2144.8 | 2.15 | 0.931 | 21.1 |
| 18 | 134.63 | 2156.8 | 2.16 | 0.936 | 21.2 |
| 18.1 | 135.38 | 2168.8 | 2.17 | 0.941 | 21.3 |
| 18.2 | 136.13 | 2180.7 | 2.18 | 0.946 | 21.4 |

| lb/gal | lb/ft3 | kg/m3 | Specific Gravity | Gradient Depth (psi/ft) | Gradient Depth (kPa/m) |
|--------|--------|--------|------------------|-------------------------|------------------------|
| 18.3 | 136.87 | 2192.7 | 2.2 | 0.952 | 21.5 |
| 18.4 | 137.62 | 2204.7 | 2.21 | 0.957 | 21.6 |
| 18.5 | 138.37 | 2216.7 | 2.22 | 0.962 | 21.8 |
| 18.6 | 139.12 | 2228.7 | 2.23 | 0.967 | 21.9 |
| 18.7 | 139.87 | 2240.6 | 2.24 | 0.972 | 22 |
| 18.8 | 140.61 | 2252.6 | 2.26 | 0.978 | 22.1 |
| 18.9 | 141.36 | 2264.6 | 2.27 | 0.983 | 22.2 |
| 19 | 142.11 | 2276.6 | 2.28 | 0.988 | 22.3 |
| 19.1 | 142.86 | 2288.6 | 2.29 | 0.993 | 22.5 |
| 19.2 | 143.61 | 2300.6 | 2.3 | 0.998 | 22.6 |
| 19.3 | 144.35 | 2312.5 | 2.32 | 1.004 | 22.7 |
| 19.4 | 145.1 | 2324.5 | 2.33 | 1.009 | 22.8 |
| 19.5 | 145.85 | 2336.5 | 2.34 | 1.014 | 22.9 |
| 19.6 | 146.6 | 2348.5 | 2.35 | 1.019 | 23.1 |
| 19.7 | 147.34 | 2360.5 | 2.36 | 1.024 | 23.2 |
| 19.8 | 148.09 | 2372.4 | 2.38 | 1.03 | 23.3 |
| 19.9 | 148.84 | 2384.4 | 2.39 | 1.035 | 23.4 |
| 20 | 149.59 | 2396.4 | 2.4 | 1.04 | 23.5 |

| Multiplying Factor | Prefix | Symbol |
|-----------------------|--------|--------|
| 1 000 000 = 10^6 | mega | M |
| 1 000 = 10^3 | kilo | k |
| 100 = 10^2 | hecto | h |
| 10 = 10^1 | deca | da |
| 0.1 = 10^{-1} | deci | d |
| 0.01 = 10^{-2} | centi | c |
| 0.001 = 10^{-3} | milli | m |
| 0.000 001 = 10^{-6} | micro | μ |

OILFIELD QUICK REFERENCE

| | |
|---------------|----------------------|
| 1 Cubic Meter | 1000 Liters |
| 1 Cubic Meter | 264.2 US Gallons |
| 1 Cubic Meter | 220 Imperial Gallons |
| 1 Cubic Meter | 6.28 US Barrels |
| 1 Cubic Meter | 5.0 Imperial Barrels |
| PSI x 6.89 | = KPA |
| 100 PSI X6.89 | =6890 KPA |

| UNITS | MULTIPLY BY | TO OBTAIN |
|--------------------|--------------------------|--------------------|
| ac | 43560 | ft ² |
| ac | 4047 | m ² |
| ac | 0.001562 | mi ² |
| atm | 33.94 | ft of water |
| atm | 14.7 | lb/in ² |
| atm | 1.013 x 10 ⁵ | pascals |
| atm | 1.033 | kg/cm ² |
| bbl (British, dry) | 5.78 | ft ³ |
| bbl (British, dry) | 0.1637 | m ³ |
| bbl (British, dry) | 36 | gal (British) |
| bbl, cement | 170.6 | kg |
| bbl, cement | 376 | lb (cement) |
| bbl, oil | 42 | gal (U.S.) |
| bbl (U.S., liquid) | 4.211 | ft ³ |
| bbl (U.S., liquid) | 0.1192 | m ³ |
| bbl (U.S., liquid) | 31.5 | gal (U.S.) |
| bbl/min | 42 | gal/min |
| bbl/day | 0.02917 | gal/min |
| cm ³ | 3.531 x 10 ⁻⁵ | ft ³ |
| daN | 2.2467 | lbs |

| UNITS | MULTIPLY BY | TO OBTAIN |
|--------------------------------------|--------------------------|-------------------|
| deg (angle) | 60 | min |
| deg (angle) | 0.01745 | rad |
| deg (angle) | 3600 | s |
| deg/s | 0.1667 | rpm |
| deg/s | 2.778×10^{-3} | rev/s |
| ft | 12 | in |
| ft | 0.3048 | m |
| ft | 1.89394×10^{-4} | mi |
| ft ² | 0.0929 | m ² |
| ft ³ | 1728 | in ³ |
| ft ³ | 0.02832 | m ³ |
| ft ³ | 7.481 | gal (U.S.) |
| ft ³ | 28.32 | liters |
| ft ³ of water (60 deg. F) | 62.37 | lb |
| ft ³ /min | 4.72×10^{-4} | m ³ /s |
| ft ³ /min | 0.1247 | gal/s |
| ft ³ /min | 0.472 | liters/s |
| ft ³ /s | 448.83 | gal/min |
| ft ³ - atm | 2116.3 | ft-lb |
| ft-lb | 1.286×10^{-3} | Btu |
| ft-lb | 0.1383 | Kg-m |
| ft-lb | 1.355818 | N-m |

| UNITS | MULTIPLY BY | TO OBTAIN |
|-------------------|-------------------------|--------------------|
| ft/min | 0.508 | cm/s |
| ft/min | 0.01667 | ft/s |
| ft/min | 0.01829 | km/hr |
| ft/min | 0.3048 | m/min |
| ft/min | 0.01136 | mi/hr |
| ft-lb/min | 0.01667 | ft-lb/s |
| ft-lb/min | 2.26×10^{-5} | KW |
| ft-lb/s | 1.356×10^{-3} | KW |
| ft-lb/s | 1.818×10^{-3} | hp |
| g | 0.001 | kg |
| gal (British) | 1.20094 | gal (U.S.) |
| gal | 3785 | cm ³ |
| gal | 0.1337 | ft ³ |
| gal | 231 | in ³ |
| gal | 3.785 | liters |
| gal/min | 2.228×10^{-3} | ft ³ /s |
| gal/min | 3.785 | liters/min |
| g-cm ² | 3.4172×10^{-4} | lb-in ² |
| hp | 0.7457 | kW |
| in | 25.4 | mm |
| in ² | 645.2 | mm ² |
| in ² | 6.452 | cm ² |

| UNITS | MULTIPLY BY | TO OBTAIN |
|--------------------|------------------------|--------------------|
| in ² | 6.944×10^{-3} | ft ² |
| in ³ | 1.639×10^{-5} | m ³ |
| in ³ | 5.787×10^{-4} | ft ³ |
| in ³ | 4.329×10^{-3} | gal |
| in ³ | 0.01639 | liters |
| kg | 2.2046 | lb |
| kg-m | 7.233 | ft-lb |
| kg/m ³ | 0.06243 | lb/ft ³ |
| kg/m | 0.672 | lb/ft |
| kW | 44250 | ft-lb/min |
| kW-hr | 2.655×10^6 | ft-lb |
| lb | 4.45×10^5 | dynes |
| lb | 4.448 | newtons |
| lb | 4.535×10^{-4} | tons (metric) |
| lb/ft ³ | 16.02 | kg/m ³ |
| lb/ft ³ | 5.787×10^{-4} | lb/in ³ |
| lb/ft ² | 4.882 | kg/m ² |
| lb/ft ² | 6.945×10^{-3} | lb/in ² |
| lb/gal | 7.48 | lb/ft ³ |
| lb/gal | .12 | specific grav. |
| lb/gal | .1198 | g/cm ³ |

| UNITS | MULTIPLY BY | TO OBTAIN |
|--------------------|------------------------|-----------------|
| lb/in ² | 6.894757 | kPa |
| liter | 0.03531 | ft ³ |
| liter | 0.001 | m ³ |
| liter | 0.2642 | gal |
| liter | 0.001 | m ³ |
| liter | 0.2642 | gal |
| m | 3.2808 | ft |
| m ² | 10.764 | ft ² |
| m ³ | 264.2 | gal |
| m ³ /s | 15850 | gal/min |
| m ³ /s | 60000 | liters/min |
| mi ² | 2.788×10^7 | ft ² |
| mi ² | 2.59 | km ² |
| rad | 57.3 | deg |
| rad/s | 0.1592 | rev/s |
| rad/s | 9.549 | rpm |
| temp. (°C) | $1.8 (°C) + 32$ | temp. °F |
| temp. (°F) | $(°F - 32) 5/9$ | temp. °C |
| tons (metric) | 1000 | kg |
| watts | 0.7376 | ft-lb/s |
| watts | 1.341×10^{-3} | hp |
| yds | 3 | ft |
| yds | 0.9144 | m |

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