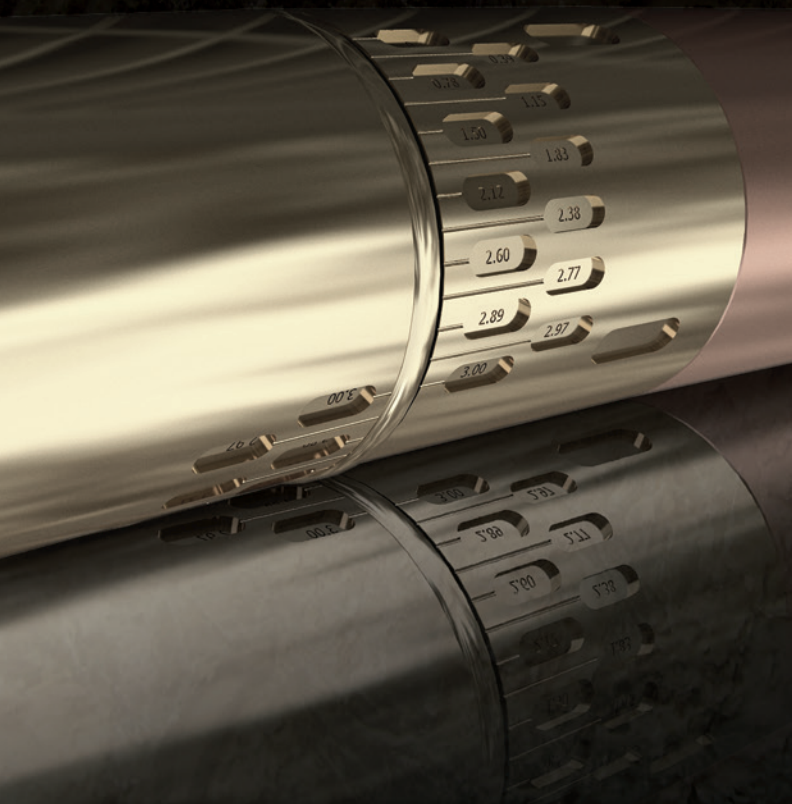
PHOENIX

TECHNOLOGY SERVICES



PERFORMANCE DRILLING
MOTOR HANDBOOK

PERFORMANCE DRILLING MOTOR HANDBOOK

SECOND EDITION
VERSION 4.0

The technical data and text in this handbook is subject to change without notice.

This handbook is intended to be an aid to the operator and is solely provided for information and illustration purposes only. The user assumes the responsibility and liability for the use of the information contained within.

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Introduction

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Introduction

Phoenix is committed to delivering unmatched drilling solutions for our clients. We have an extensive performance drilling motor fleet to ensure that we have the necessary configurations for each drilling application. Phoenix has fully equipped motor service, inspection and repair facilities where we build, test and repair all of our own motors ensuring the highest level of quality control.

Our fleet is always growing and we are always looking for new innovations; other configurations may be available that are not listed in this book. If you require additional information please contact your Phoenix representative.

The majority of Phoenix's motors utilize Hard Rubber. This stator rubber produces more torque and higher differential pressure. Hard Rubber is also less likely to swell downhole when running oil based mud.

General Guidelines

1. For maximum stator life and fewer failures, it is recommended running at no more than 80% of maximum differential pressure. Do not pump more than the recommended circulation rates, as premature stator failure and internal washing may occur.

2. When a motor stall occurs, shut down the rotary table and shut down the pumps completely (if possible) before slowly lifting the motor off bottom. If this procedure is not followed correctly, premature stator damage or backed off connections can occur. Refer to the recommended Hoisting Off Bottom Procedures on Page 12.

3. For winter conditions, ensure the motor is properly warmed up before running it downhole as the motor could be frozen internally (i.e. frost plug). See Mud Motor Cold Weather Handling Procedure on Page 11.

4. It is suggested to surface check the motor and check the dump sub to ensure it closes. Also check that there are no leaks once it is closed.

5. Always double check the adjustable connection. Do not touch any other connections as they may be left handed threads on some of the motors, these connections could possibly back off or loosen if improperly adjusted.

Torque Specifications

On-Site Connections for Atlas Motor (ft-lb)

Connection	5.76"	7.25"	9.00"
Thread Protector	9,000	13,000	40,000
Adjustable	-	-	65,000

On-Site Connections for Ultra Motor (ft-lb)

Connection	5"	6.5"
Thread Protector	6,000	10,000
Adjustable	16,000	28,000

On-Site Connections for NOV Motor (ft-lb)

Connection	3.75"	5"	6.5"	6.75"	7.75"	9.625"
Thread Protector	N/A	6,000	10,000	12,000	20,000	35,000
Adjustable	5,300	15,000	26,000	28,000	43,000	68,000

Note: 4.75" motors are torqued to the same specifications as a 5" motor.
A 6.25" motor is torqued to the same specifications as a 6.5" motor.

Motor Components

Top Assembly Options

Top Sub

At the top end of the motor you will find the top sub. The top sub is the crossover between the power section and the rest of the BHA. Most top subs are bored to accommodate a float.

Dump Sub

A dump sub can be used instead of a top sub, allowing fluid within the motor to drain out. When tripping into the hole, fluid may bypass the motor and can flow into the drill string. The use of a dump sub allows the drill string to drain out in hole, as opposed to on the rig floor.

Figure 1 illustrates the dump sub when activated by pump flow. When fluid is being pumped down the drill string, the flow pushes a spring loaded piston down, covering the port holes. This forces all fluid through the dump sub and into the power section.

Figure 2 illustrates how without flow, the spring pushes the piston up, allowing fluid to pour out through the portholes.

Figure 1

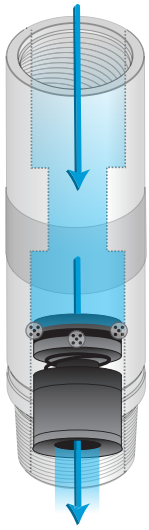
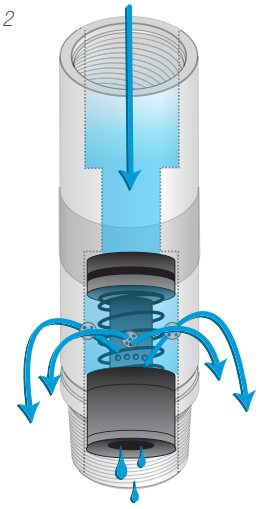


Figure 2



Like a top sub, a dump sub can also be bored for float. The addition of a float sub is available upon request.

Rotor Catch & Rotor Catch Sub

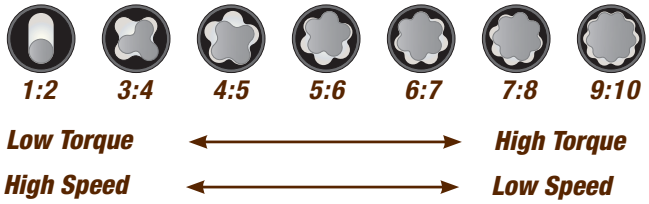
The rotor catch is designed to retrieve the motor should a motor housing failure occur. If a connection or housing failure occurs, the rotor catch mandrel will drop down and engage in the rotor catch sub. This will potentially make it possible to trip the tool out without losing anything downhole.

Note: if you continue to heavily pump after the rotor catch has been engaged you could potentially wear the catch mandrel off to the point that it will fall through the sub. Pumps need to be kept low, only to circulate to keep well control.

Power Section

A rotor and stator together make a power section. The stator has one more lobe than the rotor which creates a cavity for fluid to flow through. As fluid flows through the power section, the hydraulic energy is transformed creating the differential pressure that transmits torque to the rotor then through the transmission and bearing section.

A power section with a high rotation speed will produce lower torque, and a motor with a low rotation speed will generate higher torque.



Adjustable Assembly & Fixed Housing

Adjustable Assembly

The stator externally connects the power section to the bearing assembly.

Phoenix's most common adjustable can be set to a maximum of 3˚. The following are available adjustable settings: 0.39˚, 0.78˚, 1.15˚, 1.50˚, 1.83˚, 2.12˚, 2.38˚, 2.60˚, 2.77˚, 2.89˚, 2.97˚, 3.00˚.

The adjustable assembly is stenciled with "Tong Here" on the housing above, and below the adjusting ring. This indicates where it is safe to place tongs. If the area is not painted brown, and stenciled with "Tong Here", you risk the chance of crushing the housing with the tongs.

Fixed Housing

A fixed housing like the adjustable connects the bearing pack to the stator, but it is not adjustable.

Fixed housings are not adjustable, but are fixed at certain angle. Fixed housings are available in 0˚, 1.50˚, 1.75˚, 1.83˚, 2.00˚, 2.12˚, 2.25˚, and 2.38˚, and must be specially requested. Please contact your Phoenix representative for availability.

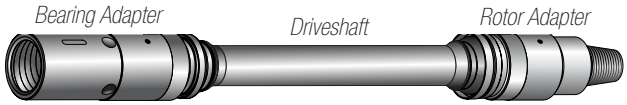
A fixed housing does not have "Tong Here" stenciled on the housing as it cannot be reset to a different setting. The fixed housing is a single housing not comprised of all of the working parts of an adjustable.

Driveline Assembly

The driveline assembly is comprised of a bearing adapter, driveshaft, and rotor adapter. It connects the rotor to the bearing assembly and is housed by the adjustable.

The rotor adapter connects the rotor to the driveshaft on the top end, and the bearing adapter connects the bearing assembly to the driveshaft on the lower end.

As fluid is pumped down the power section the rotor spins. As the rotor spins so does the driveshaft, which directly spins the bearing assembly.



Bearing Assembly

The bearing assembly is comprised of a bearing mandrel. The top end is connected to the driveline, and at the bottom end is the bit box.

Contained within three housings that cover the bearing mandrel are the on bottom and off bottom races and bearings, along with a piston pressured oil reserve.

Several different seals and wipers keep oil and mud apart while the bit box spins downhole.

ID Band on Bit Box

As illustrated in the example below, there is an ID band on the bit box of a motor which is stamped with important information.

There are two pieces of identification stamped into the ID band of the bit box. You'll find a stamp that describes the motor type, size, and motor number. The second stamp is a PTS number, this is a Phoenix part tracking number.

Motor type, size and motor number

PTS Number

The **first** digits are the motor type:

- 24XH = NOV 24XH Series
- G = Ultra Motor Series

The **second** digits are the motor size:

- 127mm = 5" Motor
- 165mm = 6.5" Motor
- 170mm = 6.75" Motor

The **third** digits are the motor number:

- 61 = Motor #61
- 07 = Motor #07

Stabilizer/Offset Kick Pad

All motors with a thread protector that are 4.75" or larger can have a stabilizer or a offset kick pad installed. Please contact your Phoenix representative for details of stabilizers and offset kick pad size availability.

A stabilizer can assist in maintaining a particular hole angle, and increase the yield of the motor with regards to angle change.

Build rates for stabilized motors are based on stabilizers that are 1/8" smaller than the hole size.

The offset kick pad and stabilizers are torqued to the same torque as the thread protector.

Offset kick pads require setting shims which come in a variety of thicknesses that allow the offset kick pad to be properly installed. When the offset kick pad is torqued the wear pad needs to align with the kick pad on the adjusting ring, as shown by the dotted line.

Setting Adjustable

1. Determine Motor Size

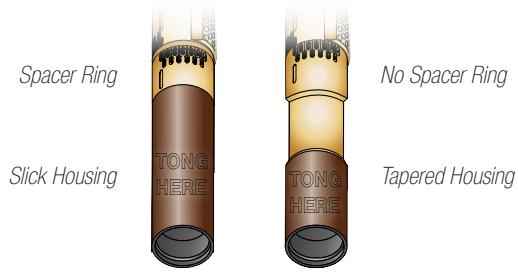
The top end of the adjustable is the lock housing, also known as the adapter housing. On the next page, there are illustrations showing where the lock housing is found on the adjustable.

See Torque Specifications table on Page 2.

2. Determine Motor Type

There are two different motor types available with similar adjustable's for the 5" and 6.5" sizes. These two types are the NOV motor and the Ultra motor. You can determine the type of motor by looking at the information on the ID band.

The two main visible differences are found at the adjustable settings and the offset/kick housing. The Ultra has a spacer ring that covers the teeth of the adjustable, where the NOV adjustable has no spacer and the housings face off. Secondly, the Ultra has a slick housing, where the NOV has a tapered housing.



3. Adjust Bend Setting

The middle of the adjustable is painted gold to highlight the adjustable settings, and to indicate that tongs are not to be placed here.

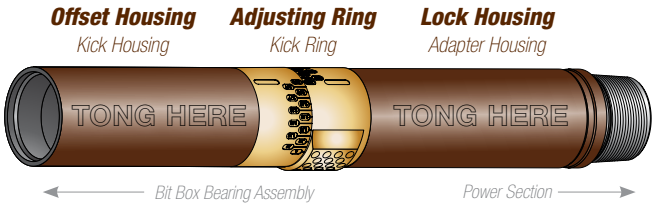
The top lock housing and bottom offset housing are painted brown and stenciled with "Tong Here". These are the only two areas where tongs can be placed to set the adjustable.

With tongs on the top and bottom housings break the joint. Next spin the lock housing two full turns using chain tongs. This will allow the adjusting ring to slide up, disengaging the teeth connecting the adjusting ring and offset housing.

With chain tongs you can now spin the adjusting ring between 0˚ and 3˚. Do not overspin past 3˚.

With the correct setting in place the adjusting ring will slide down, engaging the two sets of teeth. Notice that the degree setting will align on both housings.

Apply liberal amounts of dope to the teeth and the top and bottom faces of the adjusting ring. Make-up the lock housing to the adjusting ring with chain tongs, then torque to specified amount depending on motor size and type.



Performance Drilling Motors

Performance Drilling Motors are also called Mud Motors or Positive Displacement Drilling Motors.

The power section of a motor converts the hydraulic energy of drilling fluid flow to mechanical energy in the form of torque output for the drill bit.

A power section consists of a helical shaped rotor and stator. The rotor is typically made of steel and is either chrome plated or carbide plated depending on the drilling application. For brine applications Phoenix prefers to send a carbide rotor to withstand the higher chloride contents present in brine. The stator is a heat-treated steel tube lined with a helical shaped elastomeric insert.

During drilling operations, high pressure fluid is pumped into the top end of the power section, where it fills the first set of open cavities. The pressure differential across two adjacent cavities forces the rotor to turn. As this occurs, adjacent cavities are opened allowing the fluid to flow progressively down the length of the power section. Opening and closing of the cavities occur in a continuous, pulsationless manner causing the rotor to rotate at a speed that is proportional to drilling fluid flow rate.

The rotor has one less lobe than the stator, and when the two are assembled, a series of cavities are formed along the helical curve of the power section. Each of the cavities is sealed from adjacent cavities by seal lines. Phoenix's Fit Calculator aids in finding the adequate fit necessary for any given power section configuration and drilling parameters requested by the client.

Pressure Rating and Slip

The pressure rating of a motor is the differential pressure at which a power section should operate to achieve optimum stator life. The recommended differential pressure of a power section is the summation of the pressure ratings for each individual stage. A stage is typically defined as one pitch length of the stator.

The pressure differential rating for an individual stage generally ranges from 100–300 psi and depends on the number of lobe, pitch length, compression fit, and the elastomers physical properties. If all other conditions remain consistent, higher pressure per stage usually means a shorter stator life.

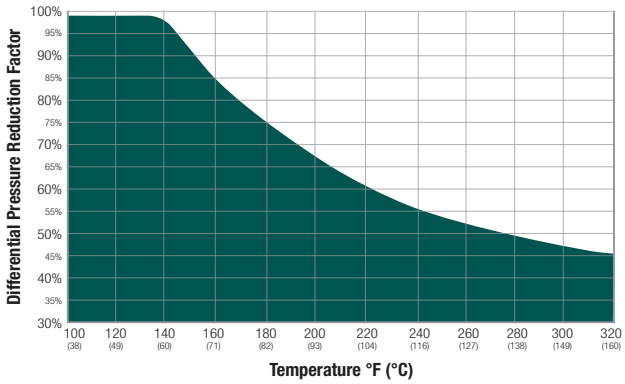
In many cases users will target to operate the motors at differential pressures just below stalling conditions. This practice results in a significant reduction of the stator's life.

Slip is caused when high pressure fluid blows past the rotor and stator seal lines. Slip results in a reduction of the power section's speed and is defined as the percent that the rotor speed was reduced below the theoretical maximum for a given flow rate.

The power sections maximum recommendations are in most cases set at the peak efficiency. Peak efficiency is the highest possible output of mechanical horse power as a result of the hydraulic horse power being put into the motor (flow and pressure). The misconception is that by increasing the hydraulic horse power that goes into the motor (flow and pressure) it will increase the output of mechanical horse power. In actuality by exceeding the maximum recommendations, the mechanical speed and torque decrease. The end result is stalling, decreased penetration rate, and/or failure. Simply stated, exceeding the maximum recommendations creates poor performance.

Temperature De-Rating of Power Sections

The mechanical properties of the elastomer in the power section are reduced at elevated temperatures. It is recommended to de-rate the maximum differential pressure that the power section is operated to avoid premature failure. Refer to the Differential Pressure De-Rating for Temperature chart for the recommended reduction factor to apply to the maximum recommended operating differential pressure of the power section.



Differential Pressure De-Rating for Temperature

Failure Mechanisms

One of the most challenging aspects of utilizing power sections for drilling operations is understanding and predicting a failure. Power section failures are primarily due to destruction of the stator elastomer. Rotor failures due to wear or chemical attack are rare compared to stator failures. Elastomer failures may be classified as those which result in a reduction in performance and those which are catastrophic.

Policies & Procedures

BHA Handling Procedures

Make-up is the most important single factor when handling/picking up the BHA. However, it is only one of many rig level practices necessary for downhole drilling components to perform at optimal levels. The following checklist can be used as a guide for making-up bottom hole assembly drill string components.

Unloading

The unloading of collars should be done by lifting them from the transportation vehicle onto the pipe rack. Collars should never be rolled off the vehicle or dropped onto the racks.

Thread Protectors

Cast steel thread protectors with a lifting bail provide a means of dragging the collar into the "V" door while protecting the shoulders and threads. The lifting bail makes the pick up safer and easier. The pin should also be protected. When picking up a collar with a lift sub, the lift sub pin should be cleaned, inspected and lubricated on each trip.

Cleaning and Lubrication

Thread protectors should be removed, all rust preventative coating washed off threads, and the threads dried. A good grade of drill collar lubricant containing 60% finely powdered metallic lead or 40–60% finely powdered metallic zinc should be applied to the threads and shoulders. Phoenix procedures require Jet Lube Kopre Kote be used as thread lubricant. Every thread and face must be lubricated in order to avoid galling on make-up. Do not rely on make-up to spread used lubricant, apply with a brush on entire seal face and threads, every time. Make a practice of lubricating a new thread; making it up hand tight with the chain tongs, breaking it out, and relubricating it. This procedure works the lubricant into the surfaces and avoids galling of threads and shoulders on the initial make-up.

Regulating Make-Up

Use the make-up torque recommended for the specific joint size, outside diameter, and bore of the collars. The make-up torque should be adjusted by multiplying the value from the table by the dope friction factor, which can be found on the label on the dope bucket. If in doubt, use a value of one. Make-up the collars with a slow and steady line pull. Continue torquing until reaching the required pull with the tongs at a right angle to the line pull. The torque is determined by the line pull itself multiplied by the effective tong length measured at a right angle to the line pull. A tong cocked at any other angle reduces the effective tong length, and reduces the make-up torque applied. Using a jerking action on the tong line momentarily increases the line pull but it may not move the collars because of their great weight. It is essential that line pull be measured when applied with a slow, steady pull.

Breaking Out

Drill collars properly made-up will break out at approximately the same line pull as used to make them up. If the shoulders are kept tight the joint cannot leak and the lubricant cannot be washed away. When joints are hard to break it usually means they have been operated loose so the lubricant has been washed away and replaced by drilling mud. To avoid hard to break joints, keep the lubricant in place by taking the joint to the recommended torque specifications.

Handling Subs

If subs are dirty or damaged, the handling subs transfer the dirt and damage to every thread and seal face in the drill collar string.

Stabbing

Avoid dropping the pin into the box threads with the weight of the collar not supported, or stabbing the pin into the box shoulder, this causes thread and seal face damage. Collars should be threaded to seal face with chain tongs to avoid damage.

Rotate the Break

On trips the breaks should be rotated so that each joint can be examined every second or third trip. The box shoulder should be wiped clean and examined for evidence of proper make-up. A shoulder that is bright and shiny all the way across with small circumferential scratches like a phonograph record, has been properly tightened. A shoulder face that is discolored around the outside of the edge, or that has patches or bright spots and discolored blue or gray areas, has been operated loose, and fluid has been getting between the shoulders. Fluid cutting and erosion indicate a damaged shoulder or extremely loose connection.

Draining the Motor

Generally the drill string will drain automatically if a dump sub has been installed on to the motor. However, the motor will still retain fluid until manually drained. Once the bit is recovered on surface rotate the bit and

bit box in a clockwise direction to drain the motor through the bottom. Additionally, it is recommended clean water be put through the top of the motor while the bit box is rotated clockwise with the rotary table. This cleans and flushes the power section and should minimize the effects of the drilling fluid on the motor while it is being shipped or stored.

Note: Rotating the bit box in a clockwise direction will drain the motor through the bottom, but one of the internal connections may back off and unscrew. For this reason this method of drainage should be performed carefully.

Laying Down

When laying down drill collars thread protectors should be installed on the rig floor. A tag line should be used to control the collars while laying down. The catwalk should be kept clear of other collars, pipes and subs to prevent damage from other tools being laid down.

Transportation

During transport the drill collar should be supported at each end and also at mid-length. Tie-down chains should be applied only at points of support. Thread protectors and installed lift subs should be put in the sub basket.

Storage

Before storing the drill collars they should be cleaned and if necessary reface the shoulders with a shoulder refacing tool. Fins on threads should be removed and a rust preventative applied to the connections The drill collar connection is a tapered threaded jack screw that forces the shoulders together to form a seal. This seal acts as a structural member to make the pin equally as strong in bending as the box when made up to the recommended torque. The threads do not form a seal. For good drill collar performance: properly lubricate shoulders and threads with drill collar compound, use proper torque (must be measured), and immediately repair any minor damage.

Mud Motor Cold Weather Handling

There are two main challenges with motors in cold weather. Firstly, thermal contraction effects the steel and elastometer of the stator resulting in stress on the bonding agent. Secondly, the stator rubber loses all elastic properties as stator rubber embrittlement occurs at temperatures below -20°C (-4°F).

- Handle motors and stators with care; especially at cold temperatures. Speak to the loader operator to ensure proper handling is completed.
- Warm motors at temperatures below 0°C (32°F) by indirect steam to the stator tube by tenting it under poly or using a steam blanket. Do not apply steam directly to the stator rubber by steaming inside of the motor.
- Alternatively, the motor can be warmed by immersing in drilling fluid for an hour prior to being pumped on, larger motors may require more time. Mud temperature and type will affect the warming process greatly. If the BHA pressures up solid then the surface equipment should be checked to confirm alignment. Rest the BHA for 20 minutes before pumping again at a very low rate. Pump every 20 minutes for one hour and call your Coordinator.
- If a motor incurs a shock (ie: dropped) below -20°C (-4°F) that motor should not be run.

Hoisting Off Bottom

Below are the procedures for pulling off bottom with a performance drilling motor that must be adhered to on any Phoenix job. These procedures must be followed by all Directional Drillers and Clients to ensure motor performance is not negatively impacting drilling operations.

Pulling Off Bottom While Drilling in Rotary Mode

A) Top Drive System

- Allow WOB to drill off
- Differential pressure should be as close to zero as practical
- Stop top drive rotary
- Allow residual torque in the drill pipe to relax
- Begin to lift drill string slowly while paying close attention to weight indicator
- At the first sign of excessive drag, stop hoisting and observe
- Reverse direction if necessary

B) Rotary Table Drive System

- Allow WOB to drill off
- Differential pressure should be as close to zero as practical
- At KD, stop rotary
- Allow residual string torque to relax to equilibrium
- Begin to lift drill string slowly while paying close attention to weight indicator
- At the first sign of excessive drag, stop hoisting and observe
- Reverse direction if necessary

Pulling Off Bottom While Drilling in Slide Mode

A) Top Drive System

- Allow differential pressure to drill off as far as practical
- Pick up the string while controlling the release of any trapped torque
- Ensure the bit has completely disengaged the rock face, and residual string torque has been released, continue hoisting an additional 6–10 ft (2–3 m)
- Ensure the hole drag is not excessive and residual string torque has been released

B) Rotary Table Drive System

- Allow differential to drill off as far as practical
- Hoist while monitoring hole drag and differential pressure

- Ensure the bit has completely disengaged the rock face, and residual string torque has been released, continue hoisting an additional 6–10 ft (2–3 m)

Stalling

If too much WOB is applied, the torque required to keep the bit turning creates a higher differential pressure than the seal between the rotor and stator elastomer can maintain. The drilling fluid breaks the seal and leaks through the power section without turning the rotor, so bit ceases rotation, or stalls. An increase in standpipe pressure will occur and penetration will cease. As the fluid leaks past, it erodes the elastomeric liner, which makes further stalling more likely and damages the liner, eventually leading to chunking.

Stalling generates large pressure pulses, creating torque spikes that can cause chunking, connection back off, or fracture of driveline components. Motor stall should be avoided, but when it occurs, it should be quickly remedied. If the bit is picked up off bottom while drilling, the 'trapped' torque within the drill string will be released uncontrollably, potentially causing damage to downhole components or causing connections to back off. This is especially true when a stall has occurred. If a stall condition occurs the following procedures should be followed as soon as possible. Refer to the applications for specific instructions.

Pulling Off Bottom for Motor Stall in Rotary or Slide Mode

At first sign of stalled motor:

- Stop string rotation or release rotation brake (if in slide mode)
- Immediately reduce pump rate completely
- Bleed SPP off at surface through standpipe if possible
- Allow residual string torque to release slowly
- Lift drill string to disengage bit completely from formation

Pulling Off Bottom for Stalled Drill String in Rotary Mode

Before pulling off bottom:

- Reduce pump rate completely, stop string rotation, and engage rotary brake
- Bleed SPP off at surface through standpipe if possible
- Carefully move weight back on to the traveling block hook, while controlling the release of trapped string torque
- Once all torque has been released lift off bottom, and work the hole, with all descending drill string movements done with rotary engaged

Additional Operational Requirements

- Never initiate circulation with WOB (on bottom)
- Never rotate the drill string while the mud pumps are off (during rig service or rig repair) unless absolutely necessary
- After connection lift up out of slips and continue coming up an additional 6–10 ft (2–3 m) prior to engaging pumps and rotary, ease back down to bottom until formation contact and adjust to recommend drilling parameters

Vibration Mitigation Axial Flow

Surface Measurement or Symptom

- Large WOB fluctuations
- Top-Drive stalling
- Erratic toolface control
- Reduced ROP

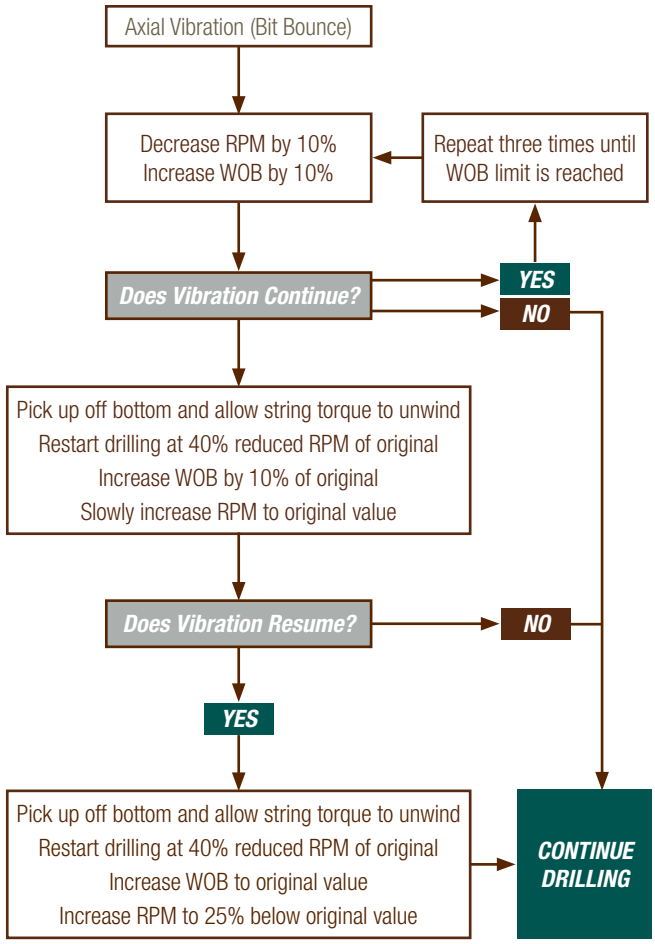
Downhole Measurement

- MWD tool erratic readings
- Missed decodes
- Increased Z-vibe counts

Post Run Evidence

- Premature failure of motor bearings
- Broken or chipped cutters
- Eccentric stabilizer wear
- BHA failure

Solutions While Drilling



Vibration Mitigation Lateral Flow

Surface Measurement or Symptom

- Increased surface torque
- Loss of toolface control
- Reduced ROP
- Erratic rotary torque

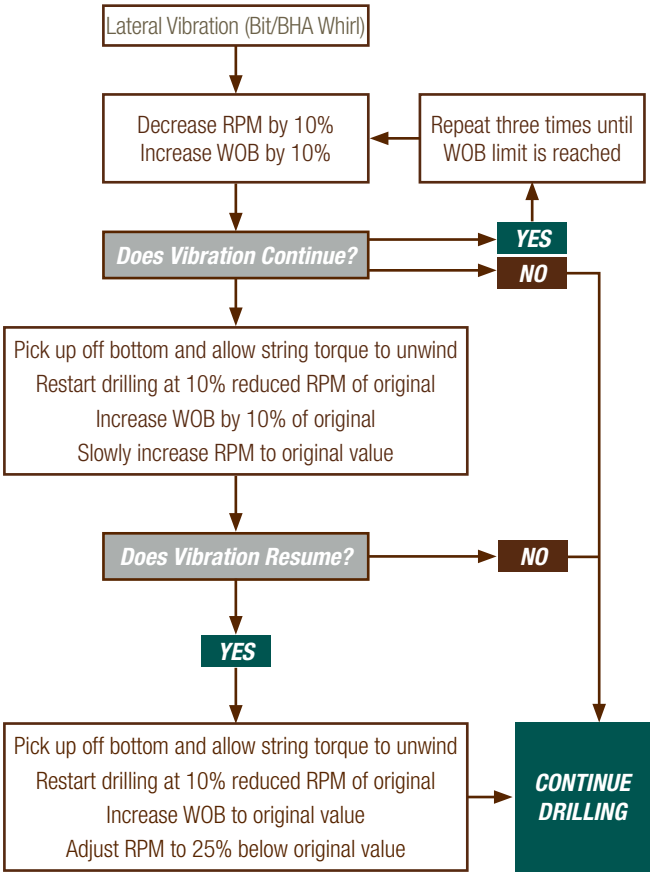
Downhole Measurement

- MWD tool erratic readings
- Missed decodes
- Increased XY vibe counts
- Increased downhole torque

Post Run Evidence

- Bit cutter/insert damages (typically on shoulder or gauge rows)
- Broken PDC blades
- Eccentric BHA wear
- Eccentric stabilizer wear
- BHA failure

Solutions While Drilling



Vibration Mitigation Torsional Flow - BHM

Surface Measurement or Symptom

- Topdrive stalling
- Increased delta surface torque
- RPM/torque cycling
- Loss of toolface
- Reduced ROP

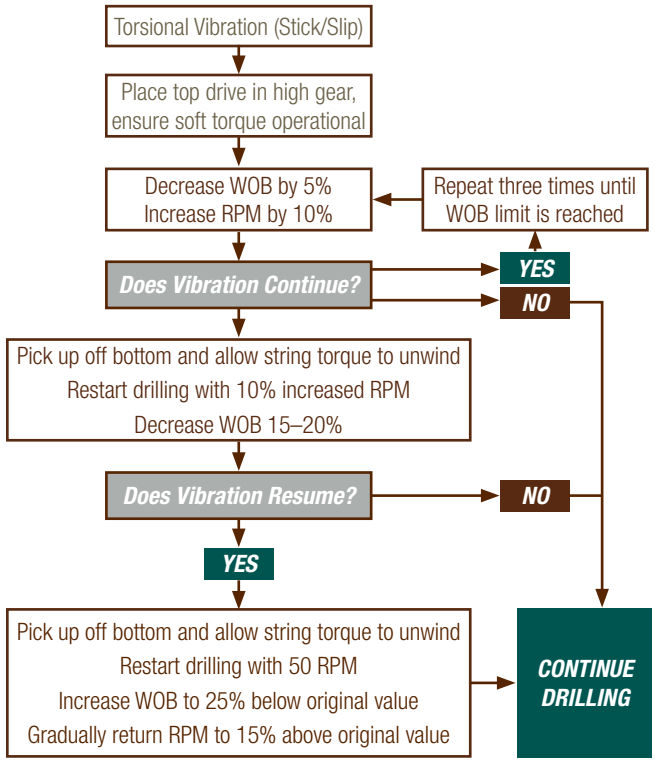
Downhole Measurement

- Increased delta downhole torque
- Increased torsional acceleration
- Increased stick/slip indicator
- Downhole collar RPM > surface RPM
- Loss of real-time data/measurement
- Increased lateral shocks
- Increased shock count

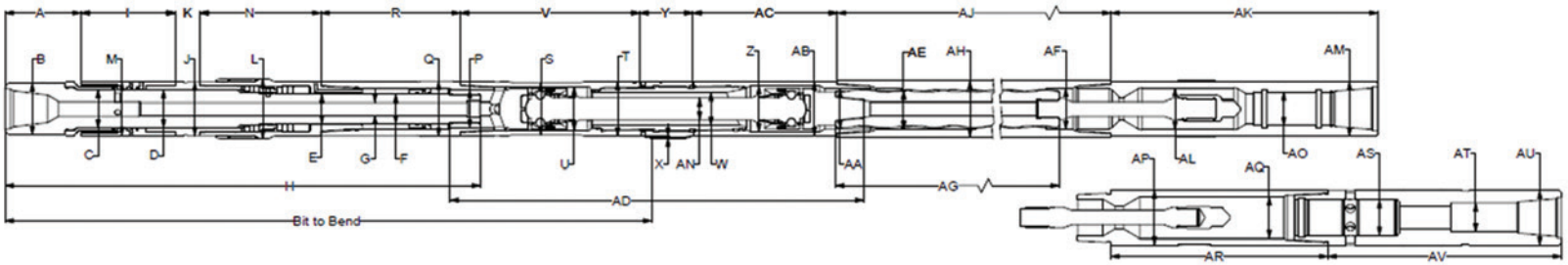
Post Run Evidence

- Cutters/inserts damaged, typically on nose and taper
- Overtorqued connections
- Twist-offs and washouts
- Eccentric stabilizer wear
- BHA failure

Solutions While Drilling

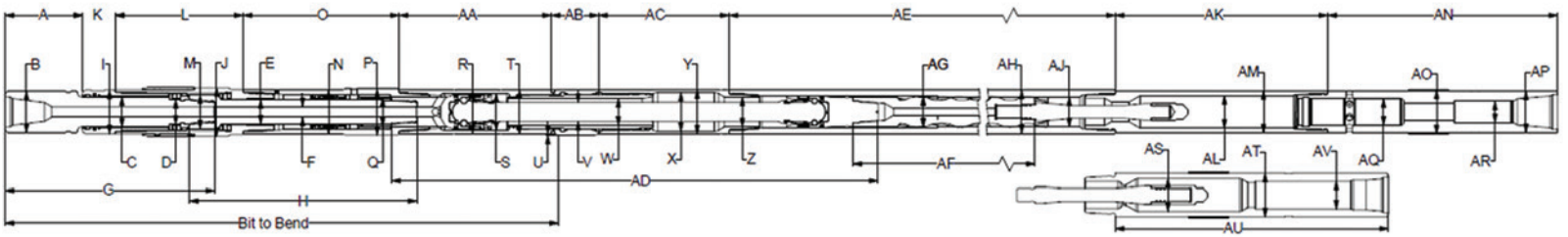


500-24XH

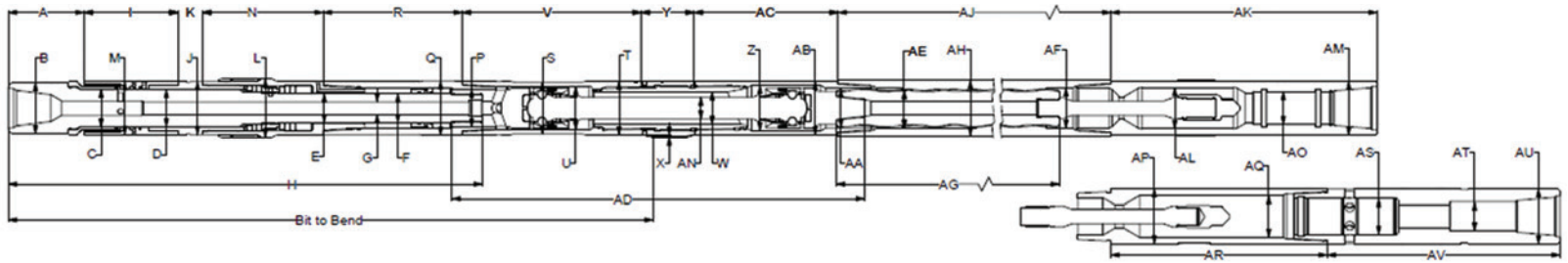


Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	7.22	183.39	**ID of Lock Housing**	Z	4.51	114.55
Bearing Mandrel Diameter	B	4.75	120.65	**Bore of Lock Housing**	AA	3.56	90.42
Bearing Mandrel Diameter	C	3.62	91.95	**OD of Lock Housing**	AB	5.13	130.30
Bearing Mandrel Diameter	D	3.50	88.90	**Length from Adjusting Ring to Stator**	AC	18.50	469.90
Bearing Mandrel Diameter	E	2.78	70.61	**Length of Drive Shaft**	AD	42.65	1083.31
Bearing Mandrel Diameter	F	2.50	63.50	**Length Stator to Top of US Fin-Catch Top Sub**	AK	31.50	800.10
Length of Bearing Mandrel	H	47.72	1212.09	**Bore of US Fin-Catch Top Sub**	AL	3.75	95.25
Length of Housing Flow Restrictor	I	8.44	214.38	**OD of US Fin-Catch Top Sub**	AM	5.00	127.00
OD of Bearing Housing	J	4.82	122.43	**OD of Driveshaft**	AN	2.19	55.63
Length of Bearing Housing	K	3.25	82.55	**Bore of Throat of US Fin-Catch Top Sub**	AO	2.85	72.39
Thrust Housing Diameter at Sleeve Connection	L	5.38	136.65	**OD of CAN Top Sub**	AP	4.88	123.95
OD of Housing Flow Restrictor	M	4.82	122.43	**ID of CAN Top Sub**	AQ	3.75	95.25
Length of Thrust Housing	N	12.31	312.67	**Length Stator to Top of CAN Top Sub**	AR	24.50	622.30
OD of Piston Housing	Q	5.00 5.13	127.00 130.30	**Bore of Dump Sub**	AS	3.01	76.45
Length of Piston Housing	R	14.14	359.16	**Bore of Dump Sub**	AT	2.44	61.98
OD of Offset Housing	S	4.98	126.49	**OD of Dump Sub**	AU	4.81	122.17
OD of Offset Housing	T	5.13	130.30	**Length Top Sub to Top of Dump Sub**	AV	26.50	673.10
Length End of Piston Housing to Adjusting Ring	V	17.45	443.23	**Bit to Adjustable Bend**		**62.81**	**1595.37**
Length of Adjusting Ring	Y	5.58	141.73	**Bit to Fixed Bend**		**56.61**	**1437.89**

500/514 Ultra X

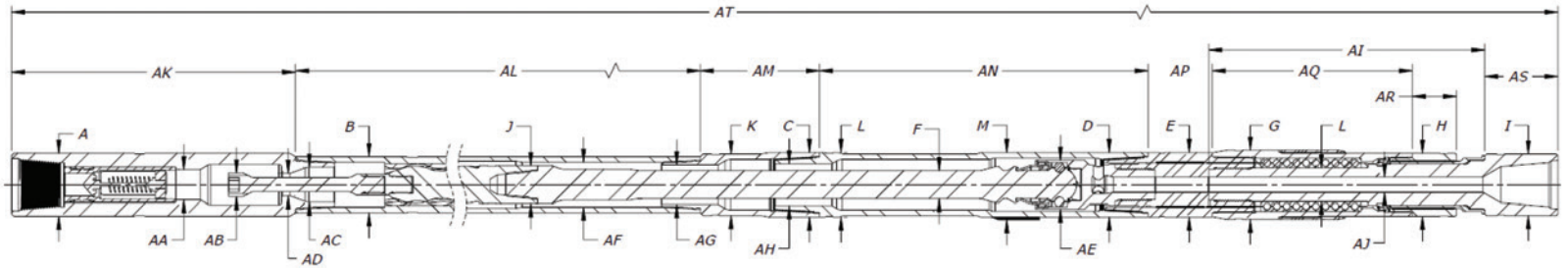


Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	8.86	225.04	**OD of Lock Housing**	Y	5.13	130.30
Bearing Mandrel Diameter	B	4.81	122.17	**Bore of Lock Housing**	Z	3.46	87.88
Bearing Mandrel Diameter	C	3.50	88.90	**Length End of Piston Housing to Adjusting Ring**	AA	17.53	445.26
Bearing Mandrel Diameter	D	2.88	73.15	**Length of Adjusting Ring**	AB	5.43	137.92
Washpipe Diameter	E	2.86	72.64	**Length from Adjusting Ring to Stator**	AC	15.06	382.52
Length of Bearing Mandrel	G	24.15	613.41	**Length of Drive Shaft**	AD	41.98	1066.29
Length of Washpipe	H	28.56	725.42	**Length Stator to Top of CAN Top Sub**	AK	24.50	622.30
OD of End Cap	I	5.00	127.00	**ID of CAN Top Sub**	AL	3.75	95.25
OD of Bearing Housing	J	5.56	141.22	**OD of CAN Top Sub**	AM	4.88	123.95
Length of End Cap Bottom to Bearing Housing Bottom	K	3.75	95.25	**Length Top Sub to Top of Dump Sub**	AN	26.50	673.10
Length of Bearing Housing	L	17.13	435.10	**OD of Cladding on Dump Sub**	AO	5.05	128.27
Washpipe Diameter	M	4.15	105.41	**OD of Dump Sub**	AP	4.81	122.17
OD of Piston Housing	N	5.13	130.30	**Bore of Dump Sub**	AQ	3.01	76.45
Length of Piston Housing	O	18.00	457.20	**Bore of Dump Sub**	AR	2.44	61.98
OD of Piston Housing	P	5.31	134.87	**Bore of US Top Sub**	AS	3.75	95.25
OD of Offset Housing	R	4.98	126.49	**OD of US Top Sub**	AT	5.00	127.00
OD of Offset Housing	T	5.13	130.30	**Length of US Top Sub**	AU	31.50	800.10
OD of Drive Shaft	V	2.19	55.63	**Bore of US Top Sub**	AV	3.16	80.26
				Bit to Adjustable Bend		**66.08**	**1678.43**
				Bit to Fixed Bend		**59.24**	**1504.70**



Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	7.25	184.15	Length of Adjusting Ring	Y	5.44	138.18
Bearing Mandrel Diameter	B	4.75	120.65	ID of Lock Housing	Z	3.46	87.88
Bearing Mandrel Diameter	C	3.62	91.95	Bore of Lock Housing	AA	3.56	90.42
Bearing Mandrel Diameter	D	3.50	88.90	OD of Lock Housing	AB	5.13	130.30
Bearing Mandrel Diameter	E	2.78	70.61	Length from Adjusting Ring to Stator	AC	15.00	381.00
Bearing Mandrel Diameter	F	2.50	63.50	Length of Drive Shaft	AD	41.02	1041.91
Length of Bearing Mandrel	H	49.22	1250.19	Length Stator to Top of US Fin-Catch Top Sub	AK	31.50	800.10
Length of Housing Flow Restrictor	I	8.44	214.38	Bore of US Fin-Catch Top Sub	AL	3.75	95.25
OD of Bearing Housing	J	4.82	122.43	OD of US Fin-Catch Top Sub	AM	5.00	127.00
Length of Bearing Housing	K	3.25	82.55	OD of Driveshaft	AN	2.19	55.63
Thrust Housing Diameter at Sleeve Connection	L	5.38	136.65	Bore of Throat of US Fin-Catch Top Sub	AO	2.85	72.39
OD of Housing Flow Restrictor	M	4.82	122.43	OD of CAN Top Sub	AP	4.88	123.95
Length of Thrust Housing	N	12.31	312.67	ID of CAN Top Sub	AQ	3.75	95.25
OD of Piston Housing	Q	4.95/5.13	125.73/130.30	Length Stator to Top of CAN Top Sub	AR	24.50	622.30
Length of Piston Housing	R	15.64	397.26	Bore of Dump Sub	AS	3.01	76.45
OD of Offset Housing	S	4.98	126.49	Bore of Dump Sub	AT	2.44	61.98
OD of Offset Housing	T	5.13	130.30	OD of Dump Sub	AU	4.81	122.17
ID of Offset Housing	U	4.30	109.22	Length Top Sub to Top of Dump Sub	AV	26.50	673.10
Length End of Piston Housing to Adjusting Ring	V	17.45	443.23	Bit to Adjustable Bend		**64.34**	**1634.24**
Offset of Pad	X	0.23	5.84	Bit to Fixed Bend		**58.14**	**1476.76**

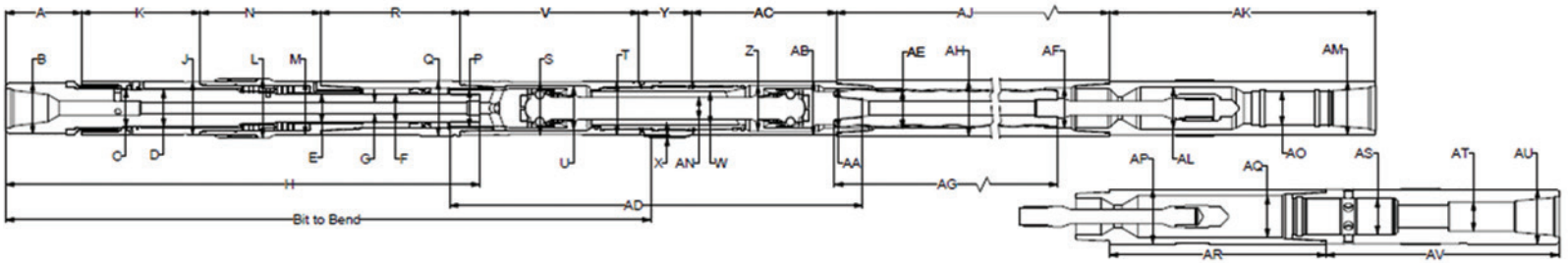
576 Atlas



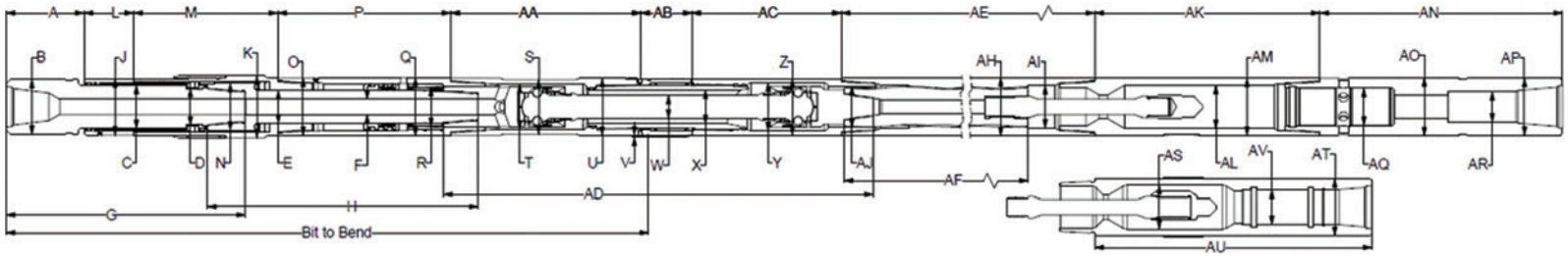
Dimension Description	Dimension	in	mm
Top Sub OD	A	5.50	139.70
Stator OD (550 Stator)	B	5.50	139.70
Spacer Sub Lower OD	C	5.76	146.30
Straight Housing Lower OD	D	5.76	146.30
Upper Bearing Housing OD	E	5.76	146.30
Flex Drive Shaft OD	F	2.50	63.50
Bearing Housing OD (Thread Upset)	G	6.18	156.97
Lower Nut OD	H	5.63	143.00
Bit Box OD	I	5.50	139.70
Rotor OD	J	3.40	86.36
Spacer Sub Upper OD	K	5.50	139.70
Fixed Bend Housing Upper OD	L	5.76	146.30
Bent Sub Pad OD	M	6.00	152.40

Dimension Description	Dimension	in	mm
Top Sub Upper ID	AA	2.69	68.33
Rotor Catch Mandrel Head OD	AB	2.20	55.88
Top Sub Lower ID	AC	3.11	78.99
Top Sub Choke ID	AD	2.00	50.80
Bearing Adapter OD	AE	4.38	111.25
Stator ID	AF	4.20	106.68
Spacer Sub ID	AG	3.55	90.17
Fixed Bend Housing ID	AH	3.75	95.25
Bearing Mandrel Neck Length	AI	23.00	584.20
Bearing Mandrel ID	AJ	1.38	35.05
Top Sub Length	AK	25.47	646.94
Stator Length	AL	275.00	6985.00
Spacer Sub Length	AM	10.70	271.78
Fixed Bend Sub Length	AN	29.50	749.30
Upper Bearing Housing Length	AP	5.77	146.56
Bearing Housing Length	AQ	17.96	456.18
Lower Nut Length	AR	3.97	100.84
Bit Box Length	AS	7.34	186.44
Overall Length		**376.49**	**9562.85**
Bit to Fixed Bend		**49.00**	**1244.60**

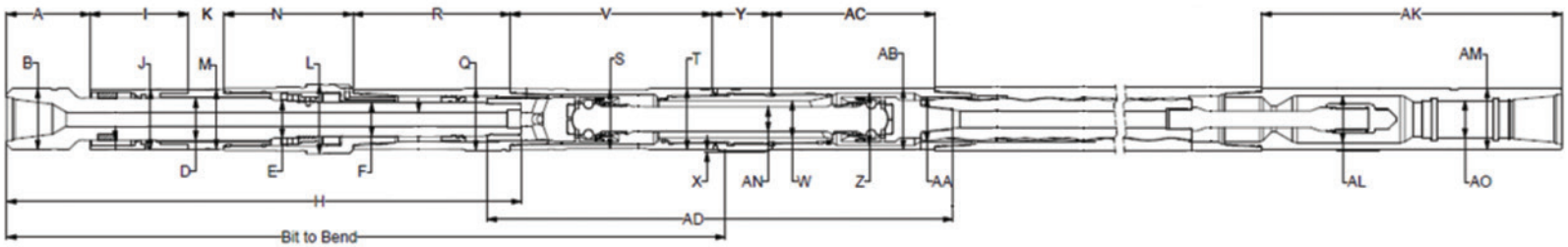
650-24XH



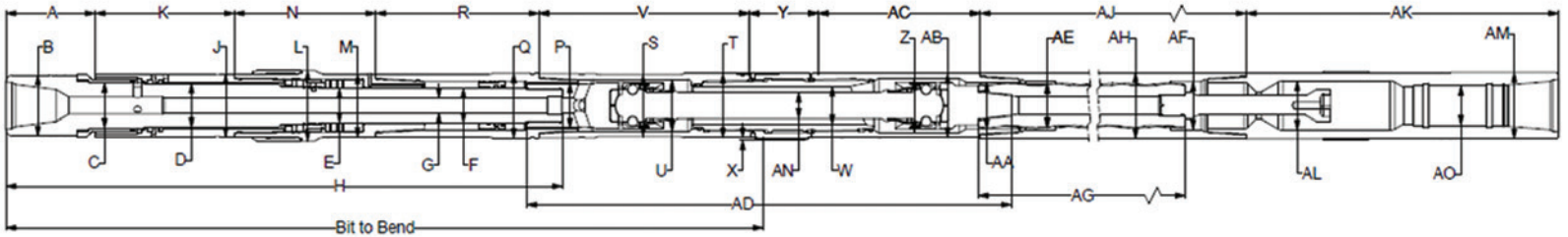
Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	9.15	232.41	ID of Lock Housing	Z	5.53	140.46
Bearing Mandrel Diameter	B	6.25	158.75	Bore of Lock Housing	AA	4.79	121.67
Bearing Mandrel Diameter	C	4.63	117.60	OD of Lock Housing	AB	6.50	165.10
Bearing Mandrel Diameter	D	4.50	114.30	Length from Adjusting Ring to Stator	AC	17.31	439.67
Bearing Mandrel Diameter	E	3.50	88.90	Length of Drive Shaft	AD	49.61	1260.09
Bearing Mandrel Diameter	F	3.50	88.90	Length Stator to Top of US Fin-Catch Top Sub	AK	32.00	812.80
Length of Bearing Mandrel	H	57.00	1447.80	Bore of US Fin-Catch Top Sub	AL	5.00	127.00
OD of Bearing Housing	J	6.38	162.05	OD of US Fin-Catch Top Sub	AM	6.50	165.10
Length of Bearing Housing	K	14.25	361.95	OD of Driveshaft	AN	2.65	67.31
Thrust Housing Diameter at Sleeve Connection	L	7.13	181.10	Bore of US Fin-Catch Top Sub	AO	4.00	101.60
OD of Thrust Housing	M	6.46	164.08	OD of CAN Top Sub	AP	6.56	166.62
Length of Thrust Housing	N	14.50	368.30	ID of CAN Top Sub	AQ	5.00	127.00
OD of Piston Housing	Q	6.60	167.64	Length Stator to Top of CAN Top Sub	AR	26.00	660.40
Length of Piston Housing	R	16.75	425.45	Bore of Dump Sub	AS	4.26	108.20
OD of Offset Housing	S	6.25	158.75	Bore of Dump Sub	AT	3.50	88.90
OD of Offset Housing	T	6.50	165.10	OD of Dump Sub	AU	6.56	166.62
Length End of Piston Housing to Adjusting Ring	V	21.50	546.10	Length Top Sub to Top of Dump Sub	AV	28.00	711.20
Length of Adjusting Ring	Y	6.26	159.00	**Bit to Adjustable Bend**		**76.15**	**1934.21**
				Bit to Fixed Bend		**60.15**	**1527.81**



Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	7.77	197.36	OD of Lock Housing	Z	6.50	165.10
Bearing Mandrel Diameter	B	6.38	162.05	Length End of Piston Housing to Adjusting Ring	AA	21.96	557.78
Bearing Mandrel Diameter	C	4.75	120.65	Length of Adjusting Ring	AB	5.86	148.84
Bearing Mandrel Diameter	D	4.33	109.98	Length from Adjusting Ring to Stator	AC	17.25	438.15
Bearing Mandrel Diameter	E	3.98	101.09	Length of Drive Shaft	AD	49.61	1260.09
Washpipe Diameter	F	3.75	95.25	Bore of Lock Housing	AJ	4.79	121.67
Length of Bearing Mandrel	H	23.38	593.85	Length Stator to Top of CAN Top Sub	AK	26.00	660.40
Length of Washpipe	I	34.31	871.47	ID of CAN Top Sub	AL	5.00	127.00
OD of End Cap	J	6.64	168.66	OD of CAN Top Sub	AM	6.56	166.62
OD of Bearing Housing	K	7.25	184.15	Length Top Sub to Top of Dump Sub	AN	28.00	711.20
Length of End Cap Bottom to Bearing Housing Bottom	L	4.63	117.60	OD of Cladding on Dump Sub	AO	6.73	170.94
Length of Bearing Housing	M	17.75	450.85	OD of Dump Sub	AP	6.56	166.62
Washpipe Diameter	N	5.60	142.24	Bore of Dump Sub	AQ	4.26	108.20
OD of Piston Housing	O	6.56	166.62	Bore of Dump Sub	AR	3.50	88.90
Length of Piston Housing	P	20.00	508.00	Bore of US Top Sub	AS	5.00	127.00
OD of Piston Housing	Q	6.75	171.45	OD of US Top Sub	AT	6.50	165.10
OD of Offset Housing	S	6.25	158.75	Length of US Top Sub	AU	32.00	812.80
OD of Offset Housing	U	6.56	166.62	Bore of US Top Sub	AV	4.00	101.60
OD of Drive Shaft	W	2.65	67.31	Bit to Adjustable Bend		**72.99**	**1853.95**
				Bit to Fixed Bend		**55.65**	**1413.51**

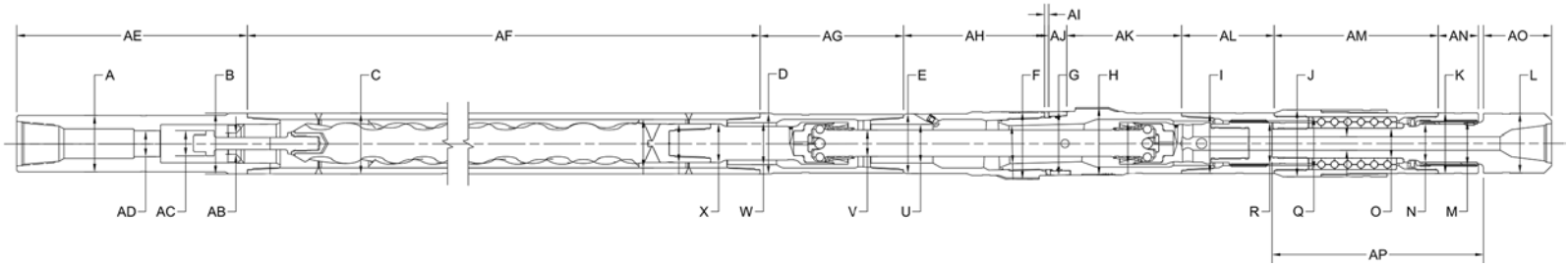


Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	8.90	226.06	**Length End of Piston Housing to Adjusting Ring**	V	22.00	558.80
Bearing Mandrel Diameter	B	6.50	165.10	**ID of Splined Mandrel**	W	3.91	99.31
Bearing Mandrel Diameter	D	4.50	114.30	**Offset of Pad**	X	0.25	6.35
Bearing Mandrel Diameter	E	4.00	101.60	**Length of Adjusting Ring**	Y	6.13	155.70
Bearing Mandrel Diameter	F	3.63	92.20	**ID of Lock Housing**	Z	5.48	139.19
Length of Bearing Mandrel	H	54.80	1391.92	**Bore of Lock Housing**	AA	4.54	115.32
Length of Bottom Piston Housing	I	10.16	258.06	**OD of Lock Housing**	AB	6.50	165.10
OD of Bottom Piston Housing	J	6.63	168.40	**Length from Adjusting Ring to Stator**	AC	17.25	438.15
Length of Bearing Housing	K	4.36	110.74	**Length of Drive Shaft**	AD	46.48	1180.59
Thrust Housing Diameter at Sleeve Connection	L	7.38	187.45	**Length Stator to Top of US Fin-Catch Top Sub**	AK	32.00	812.80
OD of Bearing Housing	M	6.63	168.40	**Bore of US Fin-Catch Top Sub**	AL	5.00	127.00
Length of Thust Housing	N	13.74	349.00	**OD of US Fin-Catch Top Sub**	AM	6.50	165.10
OD of Piston Housing	Q	6.63	168.40	**OD of Driveshaft**	AN	2.65	67.31
Length of Piston Housing	R	15.30	388.62	**Bore of US Fin-Catch Top Sub**	AO	4.00	101.60
OD of Offset Housing	S	6.25	158.75	**Bit to Adjustable Bend**		**74.46**	**1891.28**
OD of Offset Housing	T	6.50	165.10	**Bit to Fixed Bend**		**57.96**	**1472.18**

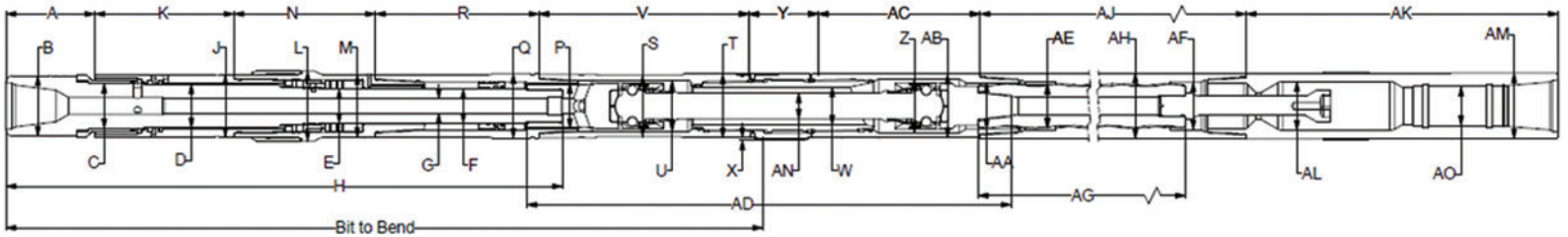


Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	11.70	297.18	Length End of Piston Housing to Adjusting Ring	V	21.38	543.05
Bearing Mandrel Diameter	B	6.75	171.45	ID of Splined Mandrel	W	4.20	106.68
Bearing Mandrel Diameter	C	5.00	127.00	Offset of Pad	X	0.19	4.83
Bearing Mandrel Diameter	D	4.75	120.65	Length of Adjusting Ring	Y	6.13	155.70
Bearing Mandrel Diameter	E	3.75	95.25	ID of Lock Housing	Z	5.91	150.11
Bearing Mandrel Diameter	F	3.75	95.25	Bore of Lock Housing	AA	4.83	122.68
Length of Bearing Mandrel	H	59.25	1504.95	OD of Lock Housing	AB	7.13	181.10
OD of Bearing Housing	J	6.87	174.50	Length from Adjusting Ring to Stator	AC	17.50	444.50
Length of Bearing Housing	K	10.35	262.89	Length of Drive Shaft	AD	51.22	1300.99
Length of Thrust Housing	N	19.85	504.19	Length Stator to Top of US Fin-Catch Top Sub	AK	32.00	812.80
OD of Piston Housing	Q	6.88	174.75	Bore of US Fin-Catch Top Sub	AL	5.00	127.00
Length of Piston Housing	R	15.50	393.70	OD of US Fin-Catch Top Sub	AM	6.75	171.45
OD of Offset Housing	S	6.90	175.26	OD of Driveshaft	AN	3.00	76.20
OD of Offset Housing	T	7.13	181.10	Bore of US Fin-Catch Top Sub	AO	4.00	101.60
				Bit to Adjustable Bend		**77.53**	**1969.26**

725 Atlas

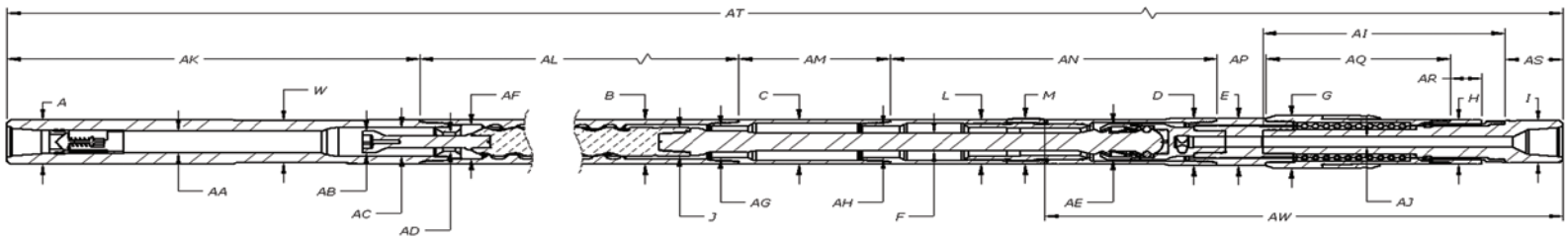


Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
OD Top Sub	A	6.75	171.45	Spacer Sub ID	W	5.00	127.00
OD Top Sub Pad	B	7.25	184.15	Rotor Adapter OD	X	4.60	116.84
Stator OD	C	7.25	184.15	Top Sub Choke ID	AB	2.50	63.50
Spacer Sub OD	D	7.25	184.15	Rotor Catch OD	AC	3.00	76.20
ABH Upper Housing OD	E	7.13	181.10	Top Sub Upper ID	AD	3.06	77.72
ABH Upper Housing Pad OD	F	8.06	204.72	Top Sub Length	AE	28.00	711.20
ABH Spacer OD	G	7.60	193.04	Stator Length	AF	275.00	6985.00
ABH Lower Housing Pad OD	H	8.06	204.72	Spacer Sub Length	AG	17.44	442.98
Upper Bearing Housing OD	I	7.25	184.15	ABH Upper Housing Length	AH	17.15	435.61
Lower Bearing Housing OD	J	8.00	203.20	Trim Ring Length	AI	0.50	12.70
Nut, Lower Replaceable OD	K	7.25	184.15	ABH Spacer Length	AJ	2.18	55.37
Bit Box OD	L	6.75	171.45	ABH Lower Housing Length	AK	13.99	355.35
Male Bearing Lower Replaceable OD	M	5.26	133.60	Upper Bearing Housing Length	AL	11.21	284.73
Bearing Mandrel Large Neck OD	N	4.56	115.82	Lower Bearing Housing Length	AM	20.00	508.00
Bearing Mandrel Small Neck OD	O	3.54	89.92	Nut, Lower Replaceable Length	AN	4.86	123.44
Lower Bearing Housing ID	Q	6.31	160.27	Bit Box Length	AO	8.25	209.55
Diverter Adapter OD	R	4.90	124.46	Drive Shaft Neck Length	AP	25.75	654.05
ABH Lower Housing Thread ID	U	4.60	116.84	Bit to Adjustable Bend		**59.00**	**1498.60**
CV Shaft OD	V	3.13	79.50	Bit to Fixed Bend		**49.00**	**1244.60**



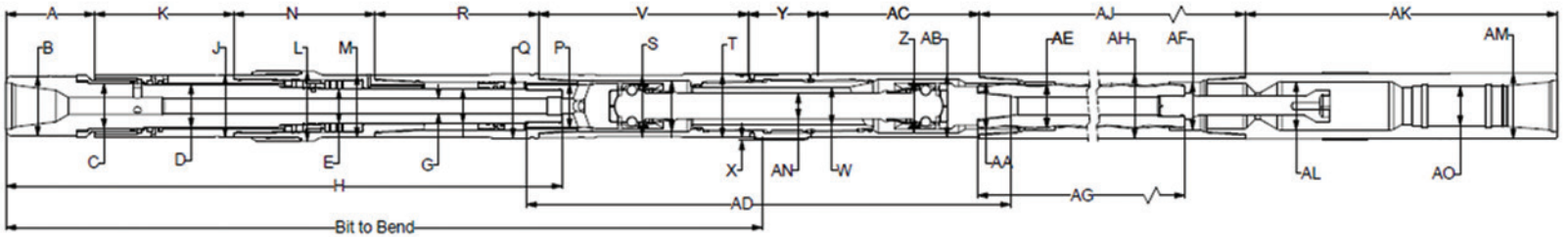
Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	10.00	254.00	**OD of Driveshaft**	S	5.56	141.22
Bearing Mandrel Diameter	B	7.63	193.80	**OD of Offset Housing**	T	7.75	196.85
Bearing Mandrel Diameter	C	5.66	143.76	**Length End of Piston Housing to Adjusting Ring**	V	21.67	550.42
Bearing Mandrel Diameter	D	5.63	143.00	**Length of Adjusting Ring**	Y	6.38	162.05
Bearing Mandrel Diameter	E	5.50	139.70	**Bore of Lock Housing**	AA	5.78	146.81
Bearing Mandrel Diameter	F	4.25	107.95	**OD of Lock Housing**	AB	7.75	196.85
Length of Bearing Mandrel	H	58.38	1482.85	**Length from Adjusting Ring to Stator**	AC	18.38	466.85
OD of Bearing Housing	J	8.10	205.74	**Length of Drive Shaft**	AD	51.72	1313.69
Length of Bearing Housing	K	11.80	299.72	**Length Stator to Top of US Top Sub**	AK	31.50	800.10
Thrust Housing Diameter at Sleeve Connection	L	9.25	234.95	**Bore of US Top Sub**	AL	5.20	132.08
OD of Thrust Housing	M	8.50	215.90	**OD of US Top Sub**	AM	7.75	196.85
Length of Thrust Housing	N	20.88	530.35	**OD of Driveshaft**	AN	2.88	73.15
OD of Piston Housing	Q	7.75	196.85	**Bore of US Top Sub**	AO	4.60	116.84
Length of Piston Housing	R	12.50	317.50	**Bit to Adjustable Bend**		**76.85**	**1951.99**

900 Atlas



Dimension Description	Dimension	in	mm
Top Sub OD	A	9.00	228.60
Stator OD	B	9.00	228.60
Spacer Sub OD	C	9.00	228.60
Offset Housing OD	D	9.50	241.30
Upper Bearing Housing OD	E	9.50	241.30
Flex Drive Shaft OD	F	3.50	88.90
Bearing Housing OD	G	10.50	266.70
Lower Nut OD	H	9.00	228.60
Bit Box OD	I	8.50	215.90
Rotor OD	J	5.75	146.05
Lock Housing OD	L	9.00	228.60
Adjusting Ring OD	M	9.25	234.95
Top Sub Slip Groove OD	W	8.50	215.90

Dimension Description	Dimension	in	mm
Top Sub Middle ID	AA	4.50	114.30
Rotor Catch Mandrel Head OD	AB	4.50	114.30
Top Sub Lower ID	AC	5.75	146.05
Top Sub Choke ID	AD	3.86	98.04
Bearing Adapter OD	AE	7.15	181.61
Stator ID	AF	7.00	177.80
Spacer Sub ID	AG	6.50	165.10
Straight Housing ID	AH	6.50	165.10
Bearing Mandrel Neck Length	AI	38.43	976.12
Bearing Mandrel ID	AJ	2.25	57.15
Top Sub Length	AK	65.50	1663.70
Stator Length	AL	275.00	6985.00
Spacer Sub Length	AM	24.00	609.60
Adjustable Assembly Length	AN	51.85	1316.99
Upper Bearing Housing Length	AP	7.76	197.10
Bearing Housing Length	AQ	29.20	741.68
Lower Nut Length	AR	5.00	127.00
Bit Box Length	AS	9.21	233.93
Overall Length		**471.23**	**11969.24**
Bit to Adjustable Bend		**82.21**	**2088.13**



Dimension Description	Dimension	in	mm	Dimension Description	Dimension	in	mm
Approx. Length Bottom Connection to Bearing Housing	A	16.31	414.27	**Length of Piston Housing**	R	17.50	444.50
Bearing Mandrel Diameter	B	9.63	244.60	**OD of Driveshaft**	S	9.12	231.65
Bearing Mandrel Diameter	C	6.75	171.45	**OD of Offset Housing**	T	9.63	244.60
Bearing Mandrel Diameter	D	6.50	165.10	**Length End of Piston Housing to Adjusting Ring**	V	25.30	642.62
Bearing Mandrel Diameter	E	5.00	127.00	**ID of Splined Mandrel**	W	5.00	127.00
Bearing Mandrel ID	G	2.25	57.15	**Length of Adjusting Ring**	Y	6.62	168.15
Length of Bearing Mandrel	H	73.77	1873.76	**ID of Lock Housing**	Z	7.88	200.15
OD of Bearing Housing	J	9.75	247.65	**Bore of Lock Housing**	AA	6.75	171.45
Length End of Bearing Housing to Thrust Housing	K	13.41	340.61	**OD of Lock Housing**	AB	9.63	244.60
Thrust Housing Diameter at Sleeve Connection	L	10.75	-	**Length from Adjusting Ring to Stator**	AC	23.58	598.93
OD of Thrust Housing	M	9.75	-	**Length of Drive Shaft**	AD	62.75	1593.85
Length of Thrust Housing	N	23.32	592.33	**Length Stator to Top of US Top Sub**	AK	18.50	469.90
OD of Piston Housing	Q	9.75	247.65	**OD of US Top Sub**	AM	9.63	244.60
				Bit to Adjustable Bend		**96.00**	**2438.40**

Atlas Configurations

Atlas Configurations

5.13"	5.76"
TOP SUB	
NC 38 (3½" IF)	NC 40 (4" FH)
DS 38	NC 44
POWER SECTION	
5.00" 6:7 6.4 EW	5.00" 6:7 6.4 EW
5.00" 6:7 8.8	5.00" 6:7 8.8
5.00" 7:8 5.7	5.00" 7:8 5.7
	5.50" 6:7 8.8
	5.50" 7:8 7.0
BEND OPTIONS	
FIXED	
1.50°	1.50°
1.75°	1.75°
1.83°	1.83°
2.00°	2.00°
2.12°	
2.25°	
2.38°	
ADJUSTABLE	
3.00°	-
STABILIZATION	
True Slick	True Slick
Slick Sleeve	Slick Sleeve
Screw-On Stabilizer	Screw-On Stabilizer
	Integral Blade Stabilizer
BOTTOM CONNECTION	
3½ REG Box	3½ REG Box
DS 38 Pin Down	NC 40 Box
NC 38 Box	NC 44 Pin Down
XT 39 Pin Down	
NC 35 Box	

** Configurations based on availability*
** 5.76" Atlas is only for 6¾ hole sizes*

7.25"	8.00"	9.00"
TOP SUB		
NC 50 (4½" IF)	6⅝" REG	6⅝" REG
POWER SECTION		
7.25" 4:5 8.4	8.00" 7:8 5.9	9.00" 7:8 7.0
7.25" 7:8 8.5		9.00" 8:9 4.0
7.25" 8:9 6.0		
BEND OPTIONS		
FIXED		
1.15°	-	-
1.50°		
1.75°		
1.83°		
2.00°		
ADJUSTABLE		
-	3.00°	3.00°
STABILIZATION		
True Slick	Slick Sleeve	Slick Sleeve
Slick Sleeve	Screw-On Stabilizer	Screw-On Stabilizer
Screw-On Stabilizer		
Integral Blade Stabilizer		
BOTTOM CONNECTION		
4½ REG Box	6⅝" REG Box	6⅝" REG Box
NC 50 Pin Down		

** When running 7.25" Atlas consult Phoenix guidelines for 8½" hole size*

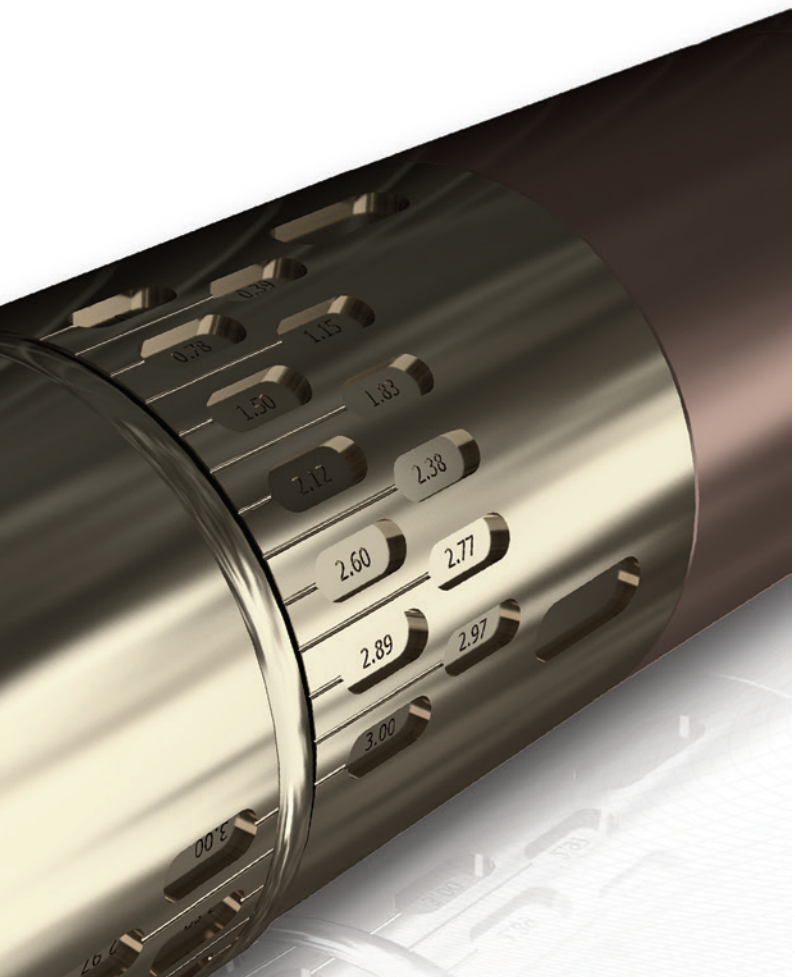
3.75"

COMMON CONNECTIONS

Bit Box	2 7/8 Reg
Dump Sub/Top Sub	2 7/8 Reg
	2 3/8 IF
	2 7/8 H-90

MOTOR SPECIFICATIONS

Average Length	244 in	6.2 m
Average Weight	533 lb	242 kg

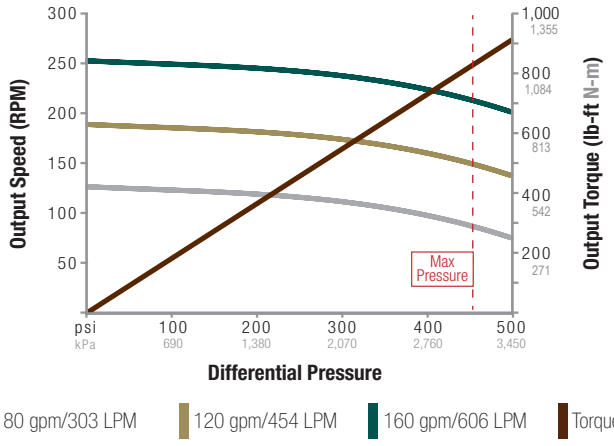


Performance Details

Max Diff Pressure	450	psi	3,100	kPa
Max Torque	820	lb-ft	1,100	N-m
Stall Torque	1,230	lb-ft	1,670	N-m
Flow Range	80–160	gpm	300–610	L/min
RPM	1.580	rev/gal	0.417	rev/L
Speed Range		126–260 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	4.75" 121mm	5.5" 140mm	5.875" 149mm	4.75" 121mm	5.5" 140mm	5.875" 149mm
0.39°	3.9	0.0	-	-	-	-
0.78°	7.8	3.9	1.9	-	-	-
1.15°	11.6	7.6	5.7	-	-	-
1.50°	15.1	11.1	9.2	-	-	-
1.83°	18.4	14.5	12.5	-	-	-
2.12°	21.3	17.4	15.4	-	-	-
2.38°	23.9	20.0	18.0	-	-	-
2.60°	26.1	22.2	20.2	-	-	-
2.77°	27.8	23.9	21.9	-	-	-
2.89°	29.0	25.1	23.1	-	-	-
2.97°	29.8	25.9	23.9	-	-	-
3.00°	30.1	26.2	24.2	-	-	-



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3.75" Motor 7:8 Lobe 2.3 Stage

Hard Rubber

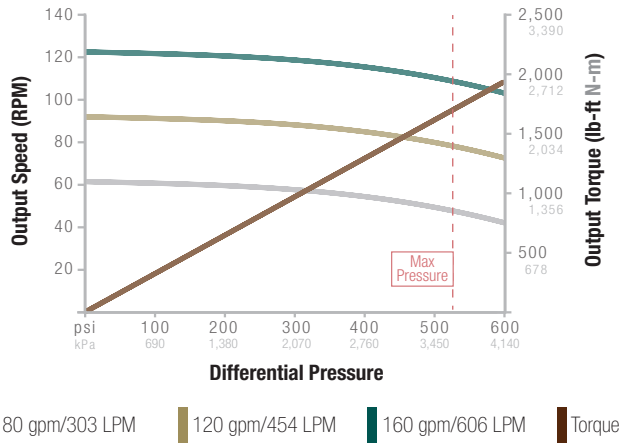
5.00/5.13/5.14"

Performance Details

Max Diff Pressure	520	psi	3,570	kPa
Max Torque	1,670	lb-ft	2,260	N-m
Stall Torque	2,500	lb-ft	3,390	N-m
Flow Range	80–160	gpm	300–610	L/min
RPM	0.768	rev/gal	0.203	rev/L
Speed Range		61–130 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	**4.75"** *121mm*	**5.5"** *140mm*	**5.875"** *149mm*	**4.75"** *121mm*	**5.5"** *140mm*	**5.875"** *149mm*
0.39°	3.7	0.0	-	-	-	-
0.78°	7.3	3.7	1.8	-	-	-
1.15°	10.8	7.1	5.3	-	-	-
1.50°	14.1	10.4	8.6	-	-	-
1.83°	17.2	13.5	11.7	-	-	-
2.12°	19.9	16.2	14.4	-	-	-
2.38°	22.3	18.7	16.8	-	-	-
2.60°	24.4	20.7	18.9	-	-	-
2.77°	26.0	22.3	20.5	-	-	-
2.89°	27.1	23.5	21.6	-	-	-
2.97°	27.9	24.2	22.4	-	-	-
3.00°	28.2	24.5	22.7	-	-	-



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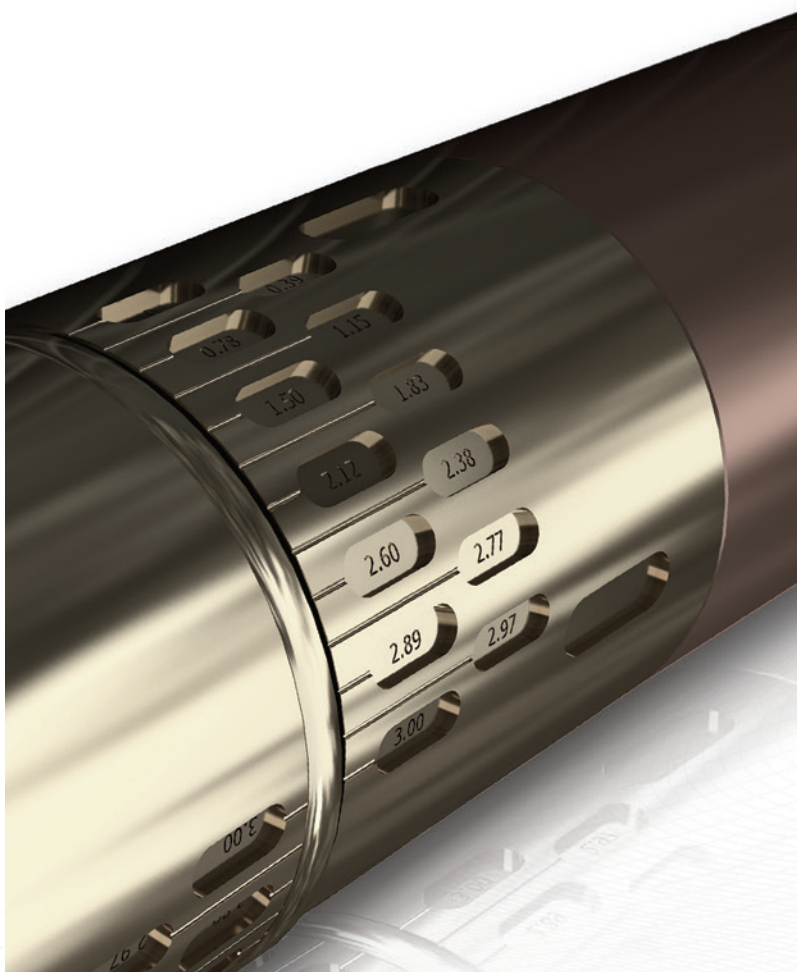
COMMON CONNECTIONS

Bit Box	3 1/2 Reg
Dump Sub/Top Sub	3 1/2 Reg
	3 1/2 IF

MOTOR SPECIFICATIONS

Average Length	315 in	7.99 m
Average Weight	1,100 lb	500 kg



5.00" Motor 4:5 Lobe 6.3 Stage

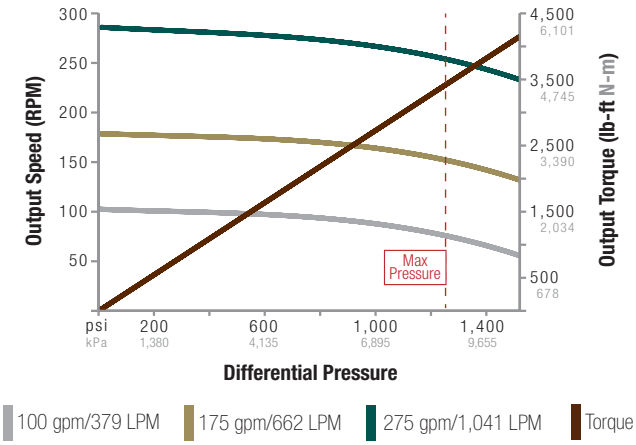
Hard Rubber

Performance Details

Max Diff Pressure	1,238	psi	8,532	kPa
Max Torque	3,373	lb-ft	4,573	N-m
Stall Torque	5,397	lb-ft	7,317	N-m
Flow Range	100–275	gpm	380–1,041	L/min
RPM	1.030	rev/gal	0.270	rev/L
Speed Range	103–284 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.5	1.9	0.7	1.9	2.1	2.4
0.78°	5.1	4.5	3.2	4.5	4.4	4.6
1.15°	7.5	6.9	5.6	7.3	7.1	6.8
1.50°	9.8	9.1	7.9	9.9	9.8	9.5
1.83°	11.9	11.3	10.0	12.4	12.2	11.9
2.12°	13.8	13.2	11.9	14.6	14.4	14.1
2.38°	15.5	14.9	13.6	16.5	16.3	16.0
2.60°	16.9	16.3	15.0	18.1	18.0	17.7
2.77°	18.0	17.4	16.1	19.4	19.3	19.0
2.89°	18.8	18.2	16.9	20.3	20.2	19.9
2.97°	19.3	18.7	17.4	20.9	20.8	20.5
3.00°	19.5	18.9	17.6	21.1	21.0	20.7



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5.00" Motor 5:6 Lobe 6.7 Stage

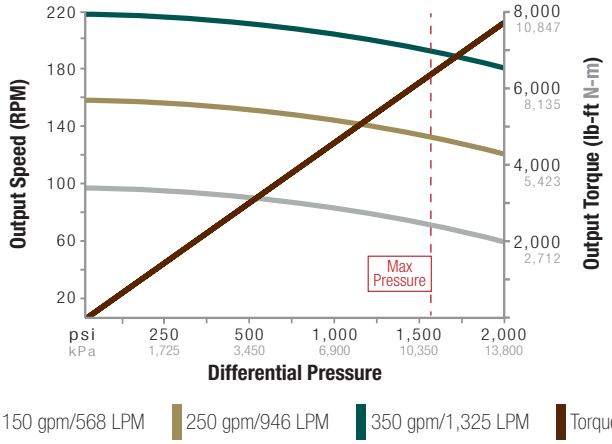
Hard Rubber

Performance Details

Max Diff Pressure	1,580	psi	10,900	kPa
Max Torque	6,330	lb-ft	8,600	N-m
Stall Torque	9,970	lb-ft	13,600	N-m
Flow Range	150–350	gpm	568–1,325	L/min
RPM	0.630	rev/gal	0.166	rev/L
Speed Range	90–220 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.3	1.7	0.6	1.7	1.8	2.1
0.78°	4.6	4.0	2.9	4.0	3.9	4.1
1.15°	6.7	6.2	5.1	6.5	6.4	6.1
1.50°	8.8	8.2	7.1	8.8	8.7	8.5
1.83°	10.7	10.2	9.0	11.0	10.9	10.7
2.12°	12.4	11.8	10.7	12.9	12.8	12.6
2.38°	13.9	13.4	12.2	14.7	14.6	14.3
2.60°	15.2	14.7	13.5	16.1	16.0	15.8
2.77°	16.2	15.6	14.5	17.3	17.1	16.9
2.89°	16.9	16.3	15.2	18.1	17.9	17.7
2.97°	17.4	16.8	15.7	18.6	18.5	18.2
3.00°	17.6	17.0	15.9	18.8	18.7	18.4



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5.00" Motor 5:6 Lobe 8.3 Stage

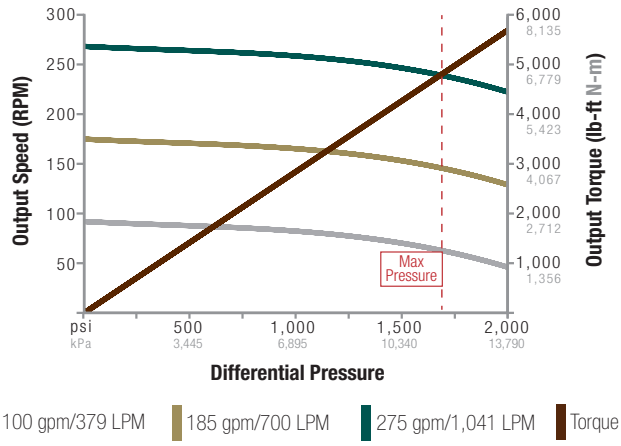
Hard Rubber

Performance Details

Max Diff Pressure	1,712	psi	11,801	kPa
Max Torque	4,942	lb-ft	6,701	N-m
Stall Torque	7,906	lb-ft	10,721	N-m
Flow Range	100–275	gpm	379–1,041	L/min
RPM	0.950	rev/gal	0.250	rev/L
Speed Range	95–262 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.4	1.8	0.6	1.8	1.9	2.2
0.78°	4.8	4.2	3.0	4.2	4.1	4.3
1.15°	7.0	6.4	5.3	6.8	6.7	6.4
1.50°	9.2	8.6	7.4	9.2	9.1	8.8
1.83°	11.2	10.6	9.4	11.5	11.4	11.1
2.12°	12.9	12.3	11.2	13.6	13.4	13.2
2.38°	14.5	13.9	12.8	15.4	15.2	15.0
2.60°	15.9	15.3	14.1	16.9	16.8	16.5
2.77°	16.9	16.3	15.1	18.1	17.9	17.7
2.89°	17.6	17.0	15.9	18.9	18.8	18.5
2.97°	18.1	17.5	16.4	19.5	19.3	19.1
3.00°	18.3	17.7	16.5	19.7	19.5	19.3



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5.00" Atlas 6:7 Lobe 6.4 Stage

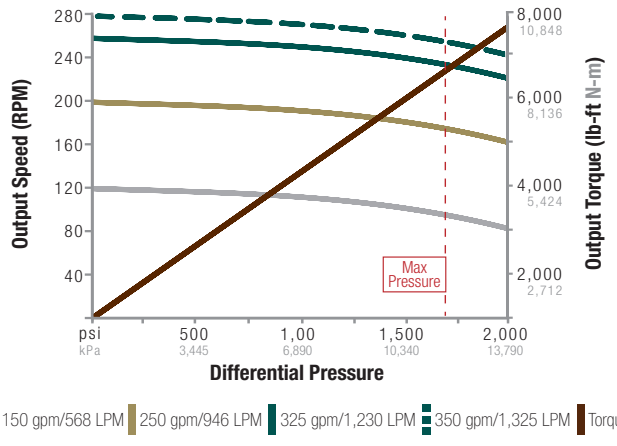
Evenwall

Performance Details

Max Diff Pressure	1,708 psi	11,776 kPa
Max Torque	6,714 lb-ft	9,103 N-m
Stall Torque	12,508 lb-ft	16,958 N-m
Flow Range	150–325 (350*) gpm	568–1,230 (1,325*) L/min
RPM	0.800 rev/gal	0.210 rev/L
Speed Range	120–260 rpm (280*)	

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	1.9	1.3	1.3	2.1	2.2	2.5
0.78°	4.6	3.9	2.6	4.6	4.5	4.8
1.15°	7.1	6.4	4.9	7.1	6.7	7.0
1.50°	9.5	8.7	7.3	9.5	8.8	9.0
1.83°	11.8	11.0	9.5	11.8	11.0	10.9
2.12°	13.8	12.9	11.4	13.7	12.9	12.7
2.38°	15.5	14.7	13.2	15.5	14.7	14.2
2.60°	17.0	16.2	14.6	17.0	16.2	15.5
2.77°	18.2	17.4	15.8	18.2	17.4	16.5
2.89°	19.0	18.2	16.6	19.0	18.2	17.2
2.97°	19.5	18.7	17.1	19.5	18.7	17.6
3.00°	19.7	18.9	17.3	19.7	18.9	17.8



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5.00" Motor 6:7 Lobe 8.0 Stage

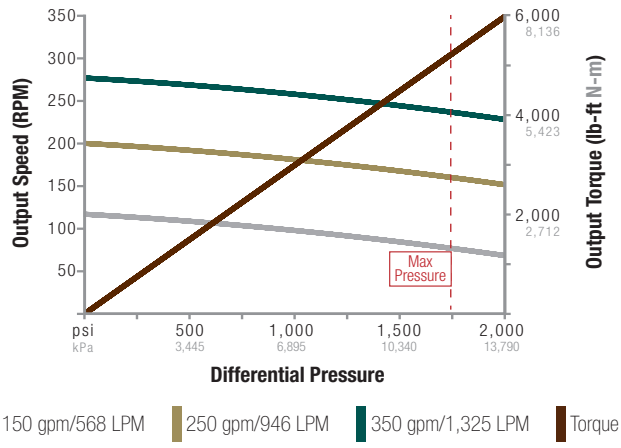
Hard Rubber

Performance Details

Max Diff Pressure	1,748	psi	12,048	kPa
Max Torque	5,840	lb-ft	7,917	N-m
Stall Torque	9,344	lb-ft	12,668	N-m
Flow Range	150–350	gpm	568–1,325	L/min
RPM	0.800	rev/gal	0.210	rev/L
Speed Range	120–282 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.3	1.7	0.6	1.7	1.8	2.1
0.78°	4.6	4.0	2.9	4.0	3.9	4.1
1.15°	6.7	6.2	5.1	6.5	6.4	6.1
1.50°	8.8	8.2	7.1	8.8	8.7	8.5
1.83°	10.7	10.2	9.0	11.0	10.9	10.7
2.12°	12.4	11.8	10.7	12.9	12.8	12.6
2.38°	13.9	13.4	12.2	14.7	14.6	14.3
2.60°	15.2	14.7	13.5	16.1	16.0	15.8
2.77°	16.2	15.6	14.5	17.3	17.1	16.9
2.89°	16.9	16.3	15.2	18.1	17.9	17.7
2.97°	17.4	16.8	15.7	18.6	18.5	18.2
3.00°	17.6	17.0	15.9	18.8	18.7	18.4



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5.00" Atlas Motor 6:7 Lobe 8.8 Stage

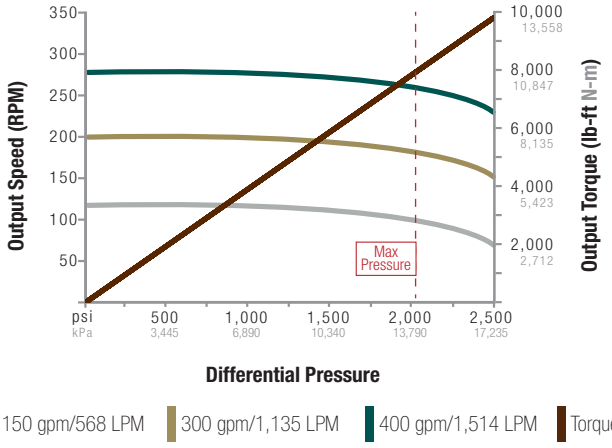
Hard Rubber

Performance Details

Max Diff Pressure	2,032	psi	14,010	kPa
Max Torque	8,014	lb-ft	10,684	N-m
Stall Torque	12,021	lb-ft	16,026	N-m
Flow Range	150–400	gpm	568–1,514	L/min
RPM	0.680	rev/gal	0.180	rev/L
Speed Range	102–272 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.2	1.3	0.6	1.6	1.7	2.0
0.78°	4.0	3.4	2.4	3.9	3.8	4.0
1.15°	6.2	5.8	4.7	6.4	6.3	6.0
1.50°	8.4	7.9	6.8	8.7	8.6	8.4
1.83°	10.4	9.9	8.7	11.0	10.8	10.6
2.12°	12.2	11.5	10.4	12.8	12.7	12.5
2.38°	13.6	13.1	11.9	14.6	14.5	14.2
2.60°	15.0	14.5	13.2	16.0	15.9	15.7
2.77°	16.0	15.4	14.2	17.2	17.0	16.7
2.89°	16.7	16.1	14.9	18.0	17.8	17.5
2.97°	17.2	16.6	15.4	18.5	18.4	18.0
3.00°	17.3	16.8	15.6	18.7	18.6	18.2



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5.00" Motor 7:8 Lobe 2.0 Stage

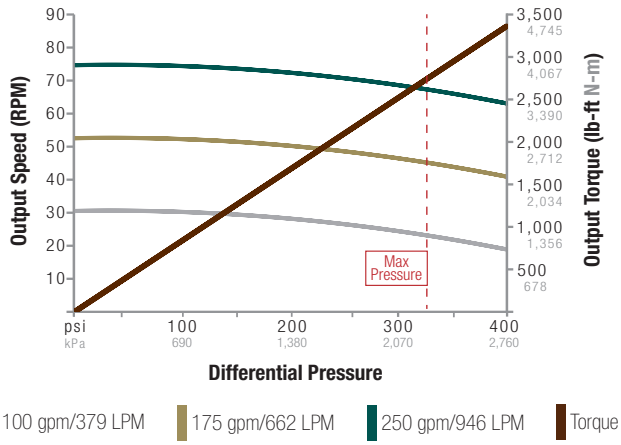
Hard Rubber

Performance Details

Max Diff Pressure	318	psi	2,193	kPa
Max Torque	2,799	lb-ft	3,795	N-m
Stall Torque	4,471	lb-ft	6,071	N-m
Flow Range	100–250	gpm	379–946	L/min
RPM	0.300	rev/gal	0.080	rev/L
Speed Range	29–74 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	3.5	2.6	0.9	2.7	3.1	3.7
0.78°	7.0	6.1	4.4	6.4	6.1	6.4
1.15°	10.3	9.4	7.7	10.4	10.1	9.5
1.50°	13.4	12.6	10.9	14.2	13.9	13.3
1.83°	16.4	15.5	13.8	17.8	17.5	16.9
2.12°	19.0	18.1	16.4	21.0	20.7	20.0
2.38°	21.3	20.5	18.8	23.8	23.5	22.9
2.60°	23.3	22.4	20.7	26.2	25.9	25.3
2.77°	24.8	24.0	22.2	28.0	27.7	27.1
2.89°	25.9	25.0	23.3	29.3	29.0	28.4
2.97°	26.6	25.7	24.0	30.2	29.9	29.3
3.00°	26.9	26.0	24.3	30.5	30.2	29.6



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

5.00" Motor 7:8 Lobe 2.6 Stage

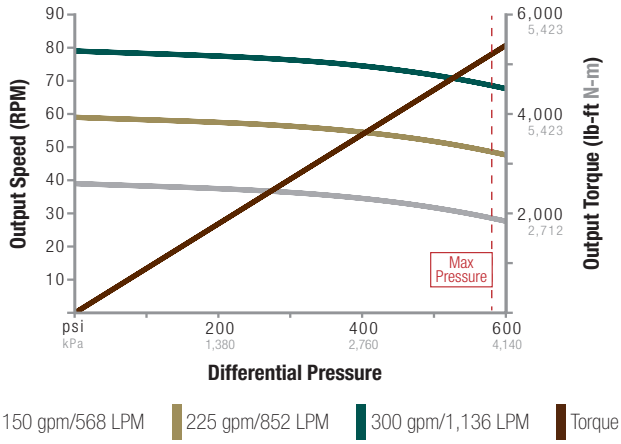
Hard Rubber

Performance Details

Max Diff Pressure	590	psi	4,030	kPa
Max Torque	5,250	lb-ft	7,120	N-m
Stall Torque	7,880	lb-ft	10,680	N-m
Flow Range	150–300	gpm	570–1,140	L/min
RPM	0.263	rev/gal	0.070	rev/L
Speed Range	39–79 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.4	1.8	0.6	1.8	1.9	2.2
0.78°	4.7	4.2	3.0	4.2	4.1	4.2
1.15°	7.0	6.4	5.3	6.8	6.6	6.4
1.50°	9.1	8.5	7.4	9.2	9.1	8.8
1.83°	11.1	10.6	9.4	11.5	11.4	11.1
2.12°	12.9	12.3	11.2	13.5	13.4	13.1
2.38°	14.5	13.9	12.7	15.3	15.2	14.9
2.60°	15.8	15.2	14.1	16.8	16.7	16.4
2.77°	16.8	16.3	15.1	18.0	17.9	17.6
2.89°	17.6	17.0	15.8	18.9	18.7	18.5
2.97°	18.1	17.5	16.3	19.4	19.3	19.0
3.00°	18.2	17.7	16.5	19.6	19.5	19.2



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

5.00" Motor 7:8 Lobe 3.7 Stage

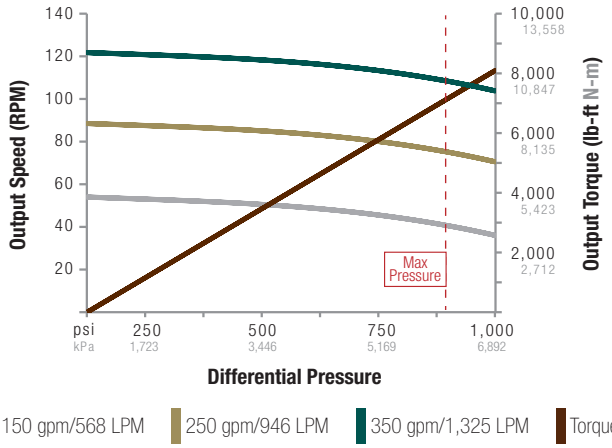
Hard Rubber

Performance Details

Max Diff Pressure	925	psi	6,378	kPa
Max Torque	6,894	lb-ft	9,347	N-m
Stall Torque	13,788	lb-ft	18,694	N-m
Flow Range	150–350	gpm	570–1,325	L/min
RPM	0.350	rev/gal	0.093	rev/L
Speed Range	53–123 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.4	1.8	0.6	1.8	1.9	2.2
0.78°	4.7	4.2	3.0	4.2	4.1	4.2
1.15°	7.0	6.4	5.3	6.8	6.6	6.4
1.50°	9.1	8.5	7.4	9.2	9.1	8.8
1.83°	11.1	10.6	9.4	11.5	11.4	11.1
2.12°	12.9	12.3	11.2	13.5	13.4	13.1
2.38°	14.5	13.9	12.7	15.3	15.2	14.9
2.60°	15.8	15.2	14.1	16.8	16.7	16.4
2.77°	16.8	16.3	15.1	18.0	17.9	17.6
2.89°	17.6	17.0	15.8	18.9	18.7	18.5
2.97°	18.1	17.5	16.3	19.4	19.3	19.0
3.00°	18.2	17.7	16.5	19.6	19.5	19.2



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5.00" Motor 7:8 Lobe 3.8 Stage

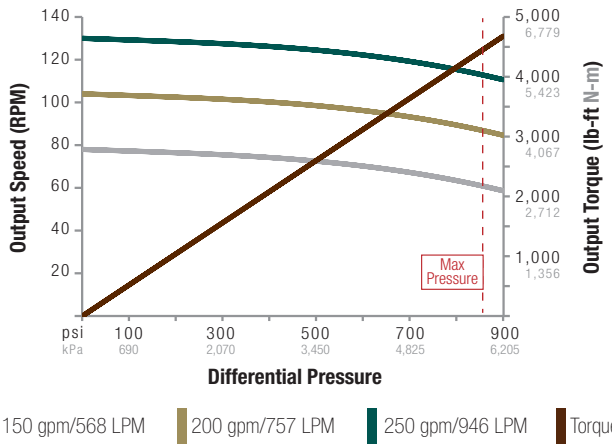
Hard Rubber

Performance Details

Max Diff Pressure	860	psi	5,900	kPa
Max Torque	4,450	lb-ft	6,030	N-m
Stall Torque	6,670	lb-ft	9,050	N-m
Flow Range	150–250	gpm	568–946	L/min
RPM	0.521	rev/gal	0.138	rev/L
Speed Range	78–140 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.7	2.0	0.7	2.1	2.2	2.6
0.78°	5.4	4.7	3.4	4.8	4.7	4.9
1.15°	8.0	7.3	6.0	7.8	7.6	7.3
1.50°	10.4	9.7	8.4	10.6	10.4	10.1
1.83°	12.7	12.0	10.7	13.3	13.1	12.7
2.12°	14.7	14.0	12.7	15.6	15.4	15.1
2.38°	16.5	15.8	14.5	17.7	17.5	17.2
2.60°	18.0	17.3	16.0	19.5	19.3	18.9
2.77°	19.2	18.5	17.2	20.8	20.7	20.3
2.89°	20.0	19.3	18.0	21.8	21.6	21.3
2.97°	20.6	19.9	18.6	22.4	22.3	21.9
3.00°	20.8	20.1	18.8	22.7	22.5	22.1



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5.00" Atlas 7:8 Lobe 5.7 Stage

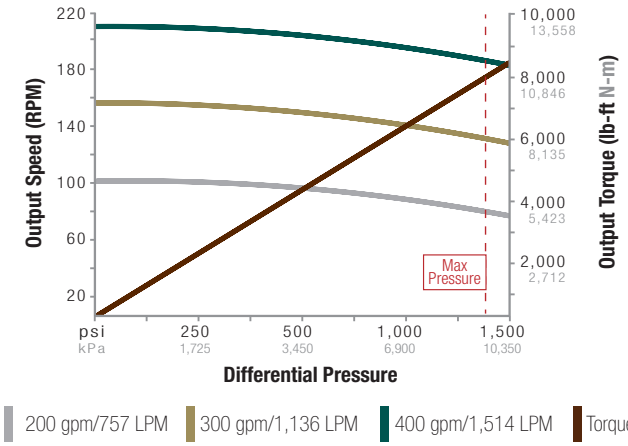
Hard Rubber

Performance Details

Max Diff Pressure	1,405	psi	9,687	kPa
Max Torque	7,749	lb-ft	10,506	N-m
Stall Torque	10,300	lb-ft	13,965	N-m
Flow Range	200–400	gpm	750–1,500	L/min
RPM	0.522	rev/gal	0.138	rev/L
Speed Range		105–210 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.3	1.7	0.6	1.7	1.8	2.1
0.78°	4.6	4.0	2.9	4.0	3.9	4.1
1.15°	6.7	6.2	5.1	6.5	6.4	6.1
1.50°	8.8	8.2	7.1	8.8	8.7	8.5
1.83°	10.7	10.2	9.0	11.0	10.9	10.7
2.12°	12.4	11.8	10.7	12.9	12.8	12.6
2.38°	13.9	13.4	12.2	14.7	14.6	14.3
2.60°	15.2	14.7	13.5	16.1	16.0	15.8
2.77°	16.2	15.6	14.5	17.3	17.1	16.9
2.89°	16.9	16.3	15.2	18.1	17.9	17.7
2.97°	17.4	16.8	15.7	18.6	18.5	18.2
3.00°	17.6	17.0	15.9	18.8	18.7	18.4



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5.00" Motor 9:10 Lobe 2.1 Stage

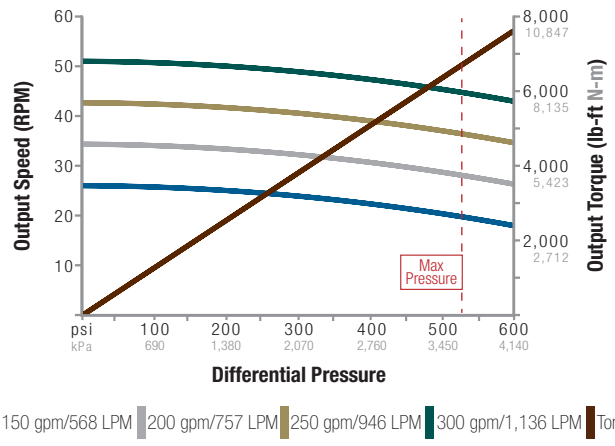
Hard Rubber

Performance Details

Max Diff Pressure	525	psi	3,620	kPa
Max Torque	7,610	lb-ft	10,318	N-m
Stall Torque	15,220	lb-ft	20,635	N-m
Flow Range	150–300	gpm	568–1,136	L/min
RPM	0.170	rev/gal	0.046	rev/L
Speed Range		26–51 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	6" 152mm	6.25" 159mm	6.75" 171mm	6" 152mm	6.25" 159mm	6.75" 171mm
0.39°	2.3	1.8	0.6	1.8	1.9	2.2
0.78°	4.7	4.1	3.0	4.2	4.0	4.2
1.15°	6.9	6.3	5.2	6.7	6.6	6.3
1.50°	9.0	8.4	7.3	9.1	8.9	8.7
1.83°	11.0	10.4	9.3	11.3	11.2	10.9
2.12°	12.7	12.1	11.0	13.3	13.2	12.9
2.38°	14.3	13.7	12.6	15.1	15.0	14.7
2.60°	15.6	15.0	13.9	16.6	16.5	16.2
2.77°	16.6	16.0	14.9	17.7	17.6	17.4
2.89°	17.3	16.8	15.6	18.6	18.4	18.2
2.97°	17.8	17.2	16.1	19.1	19.0	18.7
3.00°	18.0	17.4	16.3	19.3	19.2	18.9



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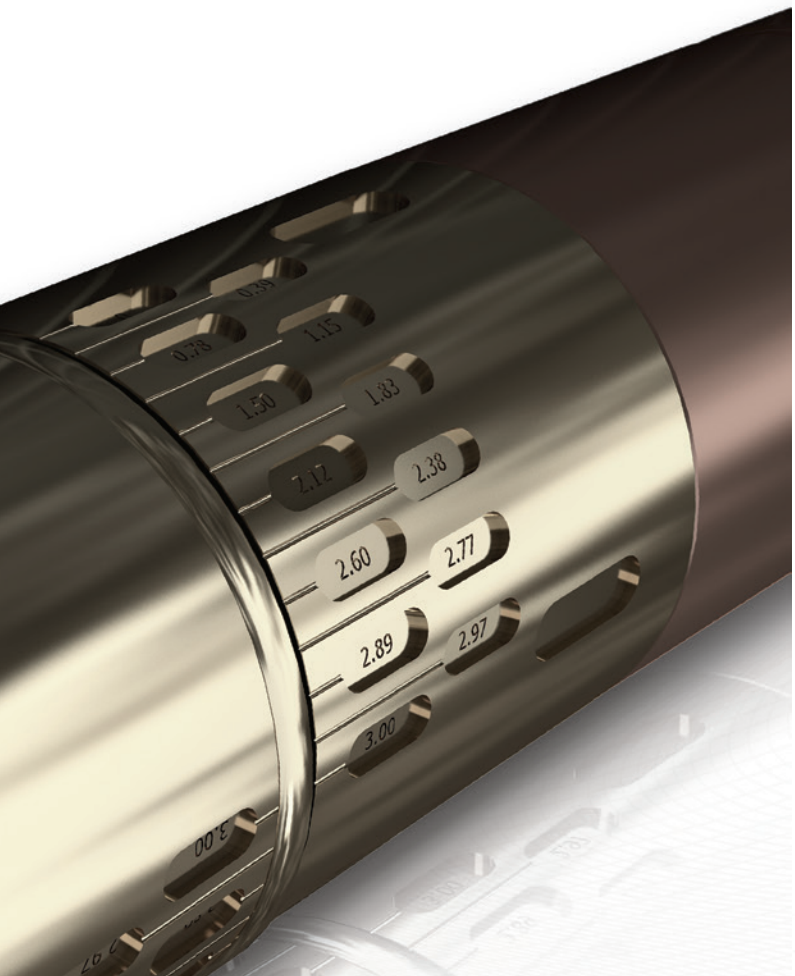
5.76"

COMMON CONNECTIONS

Bit Box	3 1/2 Reg
	NC 40
	NC 44
Dump Sub/Top Sub	NC 40
	NC 44

MOTOR SPECIFICATIONS

Average Length	376 in	9.5 m
Average Weight	2,050 lb	931 kg

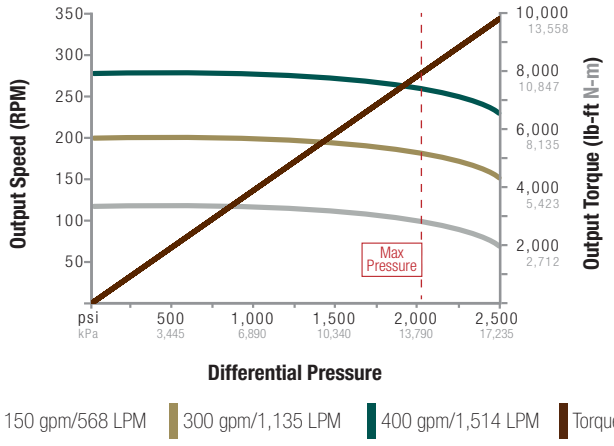


Performance Details

Max Diff Pressure	2,032	psi	14,010	kPa
Max Torque	8,014	lb-ft	10,684	N-m
Stall Torque	12,021	lb-ft	16,026	N-m
Flow Range	150–400	gpm	568–1,514	L/min
RPM	0.680	rev/gal	0.180	rev/L
Speed Range	102–272 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK	SINGLE STABILIZER	TWO STABILIZERS
	Hole Size	Hole Size	Hole Size
Bend Setting	**6.75"** *171mm*	**6.75"** *171mm*	**6.75"** *171mm*
1.50°	10.6	10.3	9.1
1.75°	12.5	12.1	10.8
1.83°	13.1	13.2	11.8
2.00°	14.4	14.4	13.0



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5.76" Atlas 7:8 Lobe 7.0 Stage

Hard Rubber

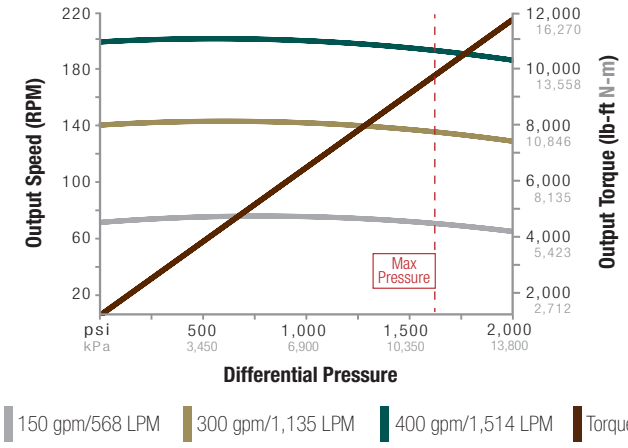
6.25"

Performance Details

Max Diff Pressure	1,619	psi	11,163	kPa
Max Torque	9,783	lb-ft	13,264	N-m
Stall Torque	14,674	lb-ft	19,895	N-m
Flow Range	150–400	gpm	568–1,514	L/min
RPM	0.48	rev/gal	0.127	rev/L
Speed Range		72–192 rpm		

Predicted Build Rates (Fixed) - Degrees/100ft (30m)

	SLICK	SINGLE STABILIZER	TWO STABILIZERS
	Hole Size	*Hole Size*	*Hole Size*
Bend Setting	**6.75"** *171mm*	**6.75"** *171mm*	**6.75"** *171mm*
1.50°	10.6	10.3	9.1
1.75°	12.5	12.1	10.8
1.83°	13.1	13.2	11.8
2.00°	14.4	14.4	13.0



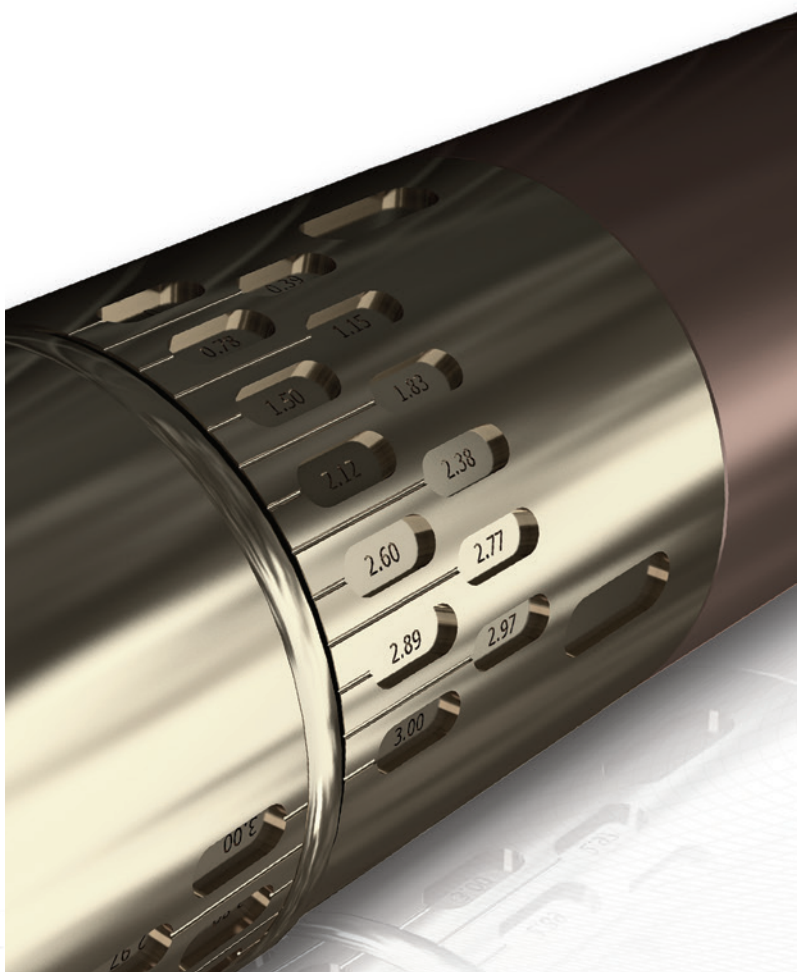
Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

COMMON CONNECTIONS

Bit Box	4 1/2 Reg
Dump Sub/Top Sub	4 1/2 Reg
	4 1/2 IF
	4 1/2 H-90
	4 1/2 XH
	5 H-90

MOTOR SPECIFICATIONS

Average Length	323 in	8.2 m
Average Weight	2,067 lb	938 kg



6.25" Motor 7:8 Lobe 4.8 Stage*

Standard Rubber

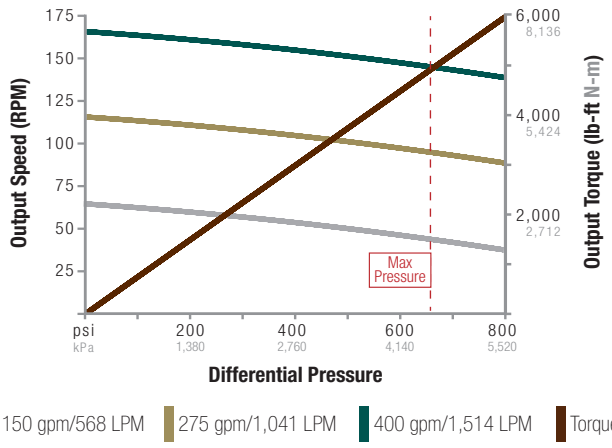
**Only available in Albania*

Performance Details

Max Diff Pressure	647	psi	4,461	kPa
Max Torque	5,061	lb-ft	6,863	N-m
Stall Torque	8,097	lb-ft	10,980	N-m
Flow Range	200–500	gpm	757–1,893	L/min
RPM	0.340	rev/gal	0.090	rev/L
Speed Range		67–168 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.2	-	-	2.2	2.6	2.8
0.78°	3.7	2.3	1.8	4.3	4.7	4.9
1.15°	6.1	4.8	4.2	7.2	6.8	6.8
1.50°	8.4	7.0	6.5	9.9	9.5	9.3
1.83°	10.6	9.2	8.6	12.4	12.0	11.9
2.12°	12.5	11.1	10.5	14.7	14.3	14.1
2.38°	14.2	12.8	12.2	16.7	16.3	16.1
2.60°	15.6	14.2	13.7	18.4	18.0	17.8
2.77°	16.7	15.3	14.8	19.7	19.3	19.2
2.89°	17.5	16.1	15.6	20.6	20.2	20.1
2.97°	18.0	16.6	16.1	21.2	20.9	20.7
3.00°	18.2	16.8	16.3	21.5	21.1	20.9



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6.25" Motor 7:8 Lobe 4.8 Stage*

Hard Rubber

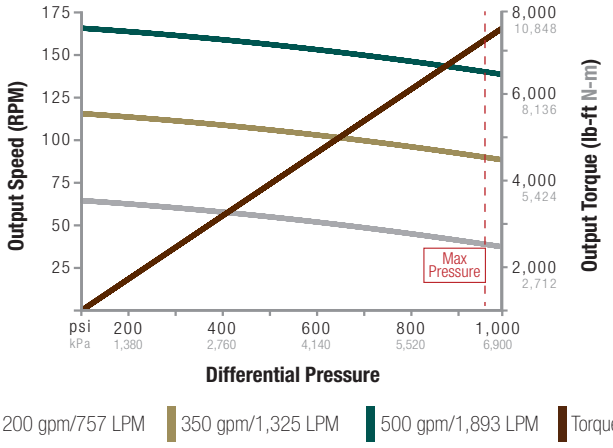
**Only available in Albania*

Performance Details

Max Diff Pressure	971	psi	6,692	kPa
Max Torque	7,592	lb-ft	10,294	N-m
Stall Torque	12,142	lb-ft	16,471	N-m
Flow Range	200–500	gpm	757–1,893	L/min
RPM	0.340	rev/gal	0.090	rev/L
Speed Range		67–168 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.2	-	-	2.2	2.6	2.8
0.78°	3.7	2.3	1.8	4.3	4.7	4.9
1.15°	6.1	4.8	4.2	7.2	6.8	6.8
1.50°	8.4	7.0	6.5	9.9	9.5	9.3
1.83°	10.6	9.2	8.6	12.4	12.0	11.9
2.12°	12.5	11.1	10.5	14.7	14.3	14.1
2.38°	14.2	12.8	12.2	16.7	16.3	16.1
2.60°	15.6	14.2	13.7	18.4	18.0	17.8
2.77°	16.7	15.3	14.8	19.7	19.3	19.2
2.89°	17.5	16.1	15.6	20.6	20.2	20.1
2.97°	18.0	16.6	16.1	21.2	20.9	20.7
3.00°	18.2	16.8	16.3	21.5	21.1	20.9



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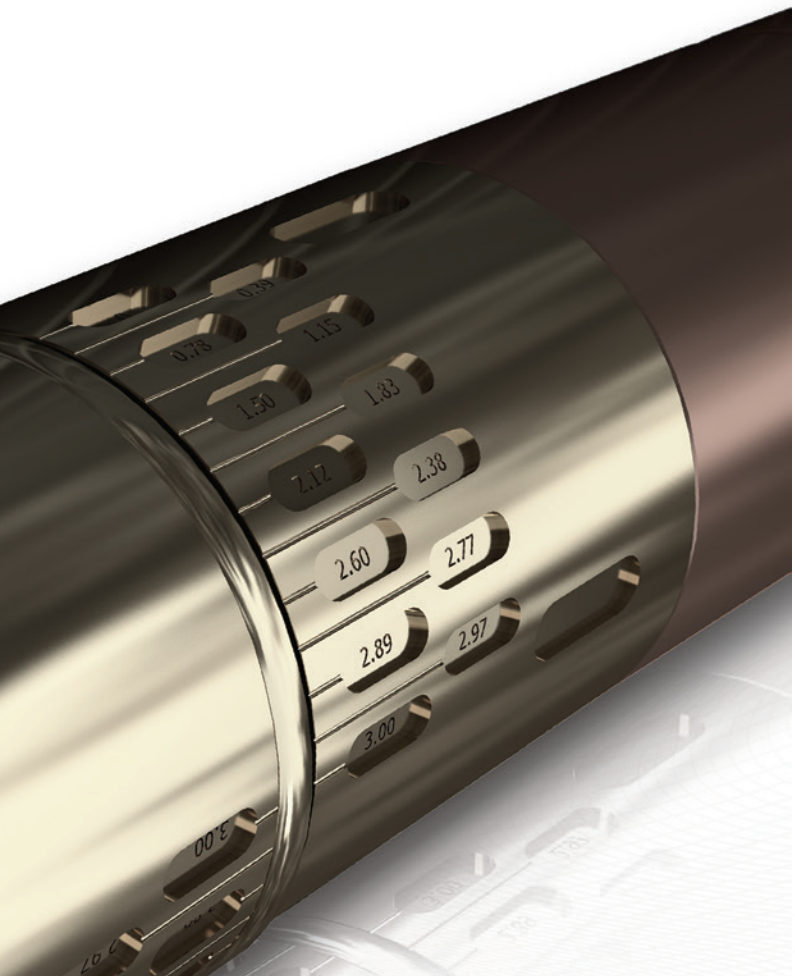
6.50"

COMMON CONNECTIONS

Bit Box	4 1/2 Reg
Dump Sub/Top Sub	4 1/2 Reg
	4 1/2 IF
	4 1/2 H-90
	4 1/2 XH
	5 H-90

MOTOR SPECIFICATIONS

Average Length	323 in	8.2 m
Average Weight	2,067 lb	938 kg

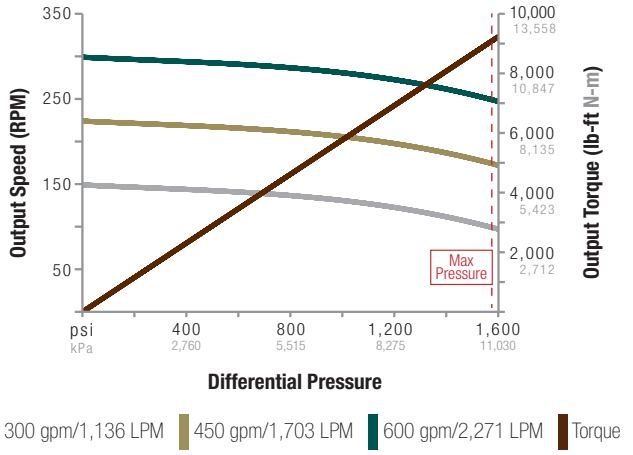


Performance Details

Max Diff Pressure	1,580	psi	10,860	kPa
Max Torque	9,090	lb-ft	12,330	N-m
Stall Torque	13,630	lb-ft	18,490	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.497	rev/gal	0.131	rev/L
Speed Range		149–300 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.7	0.3	-	2.0	2.4	2.5
0.78°	4.1	2.8	2.3	4.3	4.4	4.6
1.15°	6.5	5.1	4.6	7.1	6.7	6.6
1.50°	8.7	7.4	6.8	9.7	9.3	9.2
1.83°	10.8	9.5	8.9	12.2	11.8	11.7
2.12°	12.6	11.3	10.8	14.3	14.0	13.8
2.38°	14.3	12.9	12.4	16.3	15.9	15.8
2.60°	15.7	14.3	13.8	17.9	17.6	17.4
2.77°	16.7	15.4	14.9	19.2	18.8	18.7
2.89°	17.5	16.2	15.6	20.1	19.7	19.6
2.97°	18.0	16.7	16.1	20.7	20.3	20.2
3.00°	18.2	16.9	16.3	20.9	20.5	20.4



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6.50" Motor 6:7 Lobe 8.0 Stage

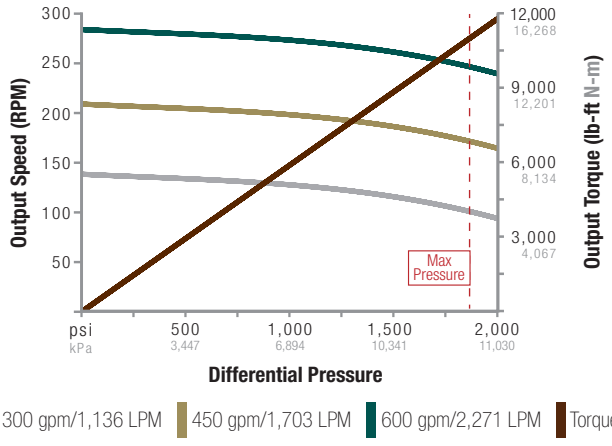
Hard Rubber

Performance Details

Max Diff Pressure	1,919	psi	13,231	kPa
Max Torque	10,928	lb-ft	14,816	N-m
Stall Torque	17,481	lb-ft	23,701	N-m
Flow Range	300–600	gpm	1,136–2,271	L/min
RPM	0.473	rev/gal	0.125	rev/L
Speed Range	141–283 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.6	0.3	-	1.9	2.2	2.3
0.78°	3.9	2.6	2.1	4.0	4.1	4.2
1.15°	6.0	4.8	4.3	6.6	6.3	6.1
1.50°	8.1	6.9	6.4	9.0	8.7	8.5
1.83°	10.1	8.8	8.3	11.3	10.9	10.8
2.12°	11.8	10.5	10.0	13.2	12.9	12.8
2.38°	13.3	12.1	11.6	15.0	14.7	14.6
2.60°	14.6	13.3	12.9	16.6	16.2	16.1
2.77°	15.6	14.4	13.9	17.7	17.4	17.3
2.89°	16.3	15.1	14.6	18.5	18.2	18.1
2.97°	16.8	15.5	15.0	19.1	18.8	18.7
3.00°	16.9	15.7	15.2	19.3	19.0	18.9



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6.50" Motor 7:8 Lobe 2.0 Stage

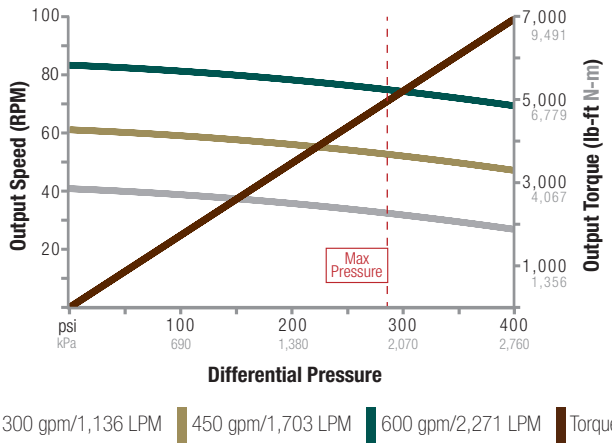
Hard Rubber

Performance Details

Max Diff Pressure	281	psi	1,934	kPa
Max Torque	5,215	lb-ft	7,070	N-m
Stall Torque	8,330	lb-ft	11,310	N-m
Flow Range	300–600	gpm	1,136–2,271	L/min
RPM	0.140	rev/gal	0.040	rev/L
Speed Range	42–85 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.7	0.3	-	2.1	2.5	2.6
0.78°	4.3	2.9	2.4	4.5	4.6	4.7
1.15°	6.7	5.3	4.8	7.4	7.0	6.8
1.50°	9.0	7.6	7.1	10.1	9.7	9.6
1.83°	11.2	9.8	9.2	12.7	12.3	12.1
2.12°	13.1	11.7	11.1	14.9	14.5	14.4
2.38°	14.8	13.4	12.9	17.0	16.6	16.4
2.60°	16.2	14.9	14.3	18.7	18.3	18.1
2.77°	17.3	16.0	15.4	20.0	19.6	19.4
2.89°	18.1	16.8	16.2	20.9	20.5	20.4
2.97°	18.7	17.3	16.7	21.5	21.2	21.0
3.00°	18.9	17.5	16.9	21.8	21.4	21.2



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6.50" Motor 7:8 Lobe 2.9 Stage

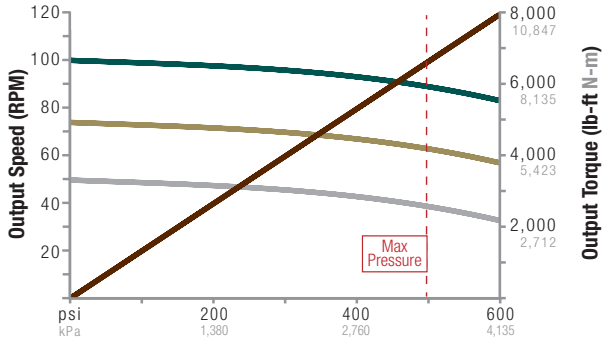
Hard Rubber

Performance Details

Max Diff Pressure	497	psi	3,423	kPa
Max Torque	7,846	lb-ft	10,637	N-m
Stall Torque	12,548	lb-ft	17,017	N-m
Flow Range	300–600	gpm	1,136–2,271	L/min
RPM	0.170	rev/gal	0.045	rev/L
Speed Range	50–100 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.6	0.3	-	1.9	2.2	2.3
0.78°	3.9	2.6	2.1	4.0	4.1	4.2
1.15°	6.0	4.8	4.3	6.6	6.3	6.1
1.50°	8.1	6.9	6.4	9.0	8.7	8.5
1.83°	10.1	8.8	8.3	11.3	10.9	10.8
2.12°	11.8	10.5	10.0	13.2	12.9	12.8
2.38°	13.3	12.1	11.6	15.0	14.7	14.6
2.60°	14.6	13.3	12.9	16.6	16.2	16.1
2.77°	15.6	14.4	13.9	17.7	17.4	17.3
2.89°	16.3	15.1	14.6	18.5	18.2	18.1
2.97°	16.8	15.5	15.0	19.1	18.8	18.7
3.00°	16.9	15.7	15.2	19.3	19.0	18.9



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6.50" Motor 7:8 Lobe 3.0 Stage Regular

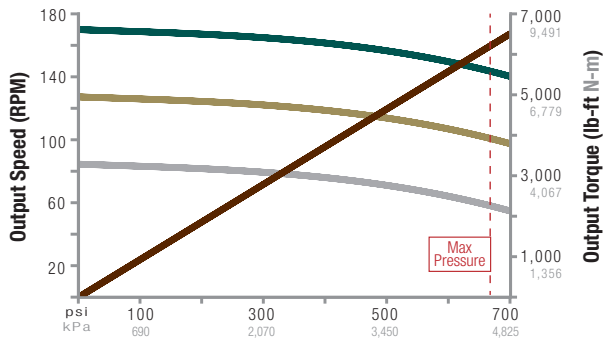
Hard Rubber

Performance Details

Max Diff Pressure	680	psi	4,650	kPa
Max Torque	6,280	lb-ft	8,510	N-m
Stall Torque	9,420	lb-ft	12,770	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.283	rev/gal	0.075	rev/L
Speed Range	84–170 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	2.2	0.4	-	2.7	3.4	3.6
0.78°	5.4	3.6	2.9	5.7	5.8	6.1
1.15°	8.4	6.7	6.0	9.4	8.8	8.6
1.50°	11.3	9.5	8.9	13.0	12.4	12.1
1.83°	14.0	12.3	11.6	16.4	15.7	15.5
2.12°	16.4	14.6	13.9	19.3	18.7	18.4
2.38°	18.5	16.8	16.1	22.0	21.3	21.1
2.60°	20.3	18.6	17.9	24.2	23.6	23.3
2.77°	21.7	20.0	19.3	25.9	25.3	25.0
2.89°	22.7	21.0	20.3	27.1	26.5	26.3
2.97°	23.3	21.6	20.9	28.0	27.3	27.1
3.00°	23.6	21.9	21.2	28.3	27.6	27.4



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6.50" Motor 7:8 Lobe 3.0 Stage Slow

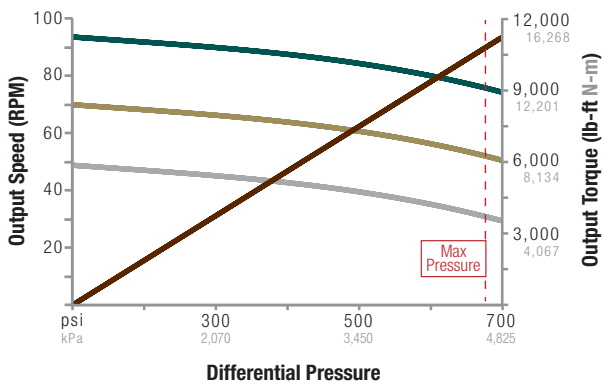
Hard Rubber

Performance Details

Max Diff Pressure	680	psi	4,650	kPa
Max Torque	10,800	lb-ft	14,640	N-m
Stall Torque	16,200	lb-ft	21,960	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.155	rev/gal	0.041	rev/L
Speed Range		46–93 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.7	0.3	-	2.0	2.4	2.5
0.78°	4.1	2.8	2.3	4.3	4.4	4.6
1.15°	6.5	5.1	4.6	7.1	6.7	6.6
1.50°	8.7	7.4	6.8	9.7	9.3	9.2
1.83°	10.8	9.5	8.9	12.2	11.8	11.7
2.12°	12.6	11.3	10.8	14.3	14.0	13.8
2.38°	14.3	12.9	12.4	16.3	15.9	15.8
2.60°	15.7	14.3	13.8	17.9	17.6	17.4
2.77°	16.7	15.4	14.9	19.2	18.8	18.7
2.89°	17.5	16.2	15.6	20.1	19.7	19.6
2.97°	18.0	16.7	16.1	20.7	20.3	20.2
3.00°	18.2	16.9	16.3	20.9	20.5	20.4



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6.50" Motor 7:8 Lobe 3.3 Stage

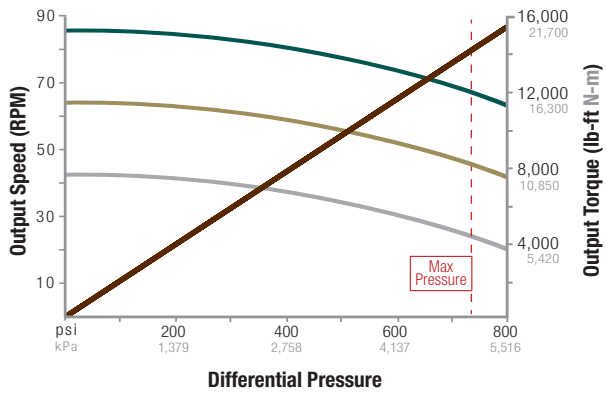
Hard Rubber

Performance Details

Max Diff Pressure	720	psi	4,965	kPa
Max Torque	13,867	lb-ft	18,801	N-m
Stall Torque	13,867	lb-ft	18,801	N-m
Flow Range	300–600	gpm	1,136–2,271	L/min
RPM	0.150	rev/gal	0.040	rev/L
Speed Range		43–85 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.5	0.3	-	1.8	2.0	2.2
0.78°	3.7	2.5	2.0	3.8	3.9	4.0
1.15°	5.8	4.6	4.1	6.3	6.0	5.9
1.50°	7.7	6.6	6.1	8.5	8.3	8.1
1.83°	9.6	8.4	7.9	10.7	10.4	10.3
2.12°	11.2	10.1	9.6	12.6	12.3	12.2
2.38°	12.7	11.5	11.0	14.3	14.0	13.9
2.60°	13.9	12.8	12.3	15.7	15.4	15.3
2.77°	14.9	13.7	13.2	16.8	16.6	16.4
2.89°	15.6	14.4	13.9	17.6	17.3	17.2
2.97°	16.0	14.8	14.4	18.1	17.9	17.7
3.00°	16.2	15.0	14.5	18.3	18.1	17.9



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6.50" Motor 7:8 Lobe 5.0 Stage

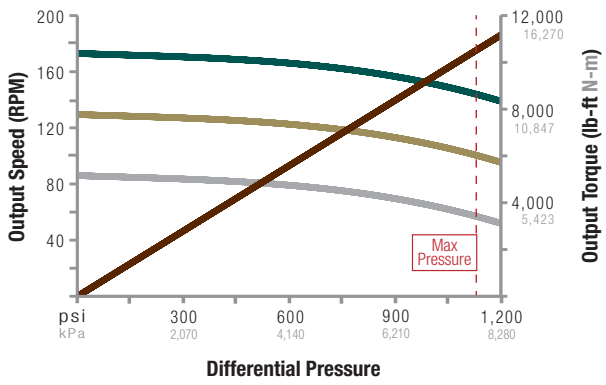
Hard Rubber

Performance Details

Max Diff Pressure	1,130	psi	7,760	kPa
Max Torque	10,460	lb-ft	14,190	N-m
Stall Torque	15,690	lb-ft	21,280	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.288	rev/gal	0.076	rev/L
Speed Range		86–173 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.7	0.3	-	2.0	2.4	2.5
0.78°	4.1	2.8	2.3	4.3	4.4	4.6
1.15°	6.5	5.1	4.6	7.1	6.7	6.6
1.50°	8.7	7.4	6.8	9.7	9.3	9.2
1.83°	10.8	9.5	8.9	12.2	11.8	11.7
2.12°	12.6	11.3	10.8	14.3	14.0	13.8
2.38°	14.3	12.9	12.4	16.3	15.9	15.8
2.60°	15.7	14.3	13.8	17.9	17.6	17.4
2.77°	16.7	15.4	14.9	19.2	18.8	18.7
2.89°	17.5	16.2	15.6	20.1	19.7	19.6
2.97°	18.0	16.7	16.1	20.7	20.3	20.2
3.00°	18.2	16.9	16.3	20.9	20.5	20.4



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6.50" Motor 7:8 Lobe 5.7 Stage

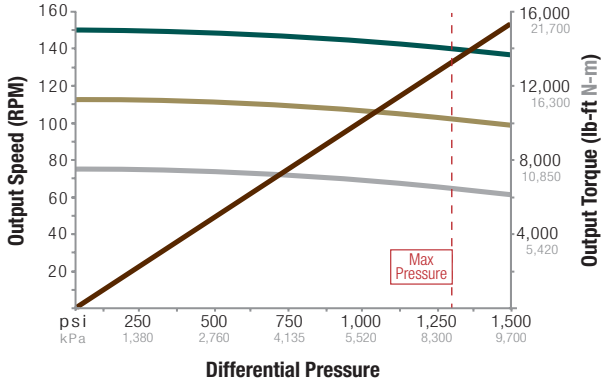
Hard Rubber

Performance Details

Max Diff Pressure	1,280	psi	8,840	kPa
Max Torque	13,720	lb-ft	18,600	N-m
Stall Torque	20,580	lb-ft	27,910	N-m
Flow Range	300–600	gpm	1,140–2,271	L/min
RPM	0.242	rev/gal	0.064	rev/L
Speed Range		75–150 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	7.875" 200mm	8.5" 216mm	8.75" 222mm	7.875" 200mm	8.5" 216mm	8.75" 222mm
0.39°	1.1	1.1	1.0	1.9	2.0	2.3
0.78°	2.7	2.3	2.1	3.7	3.8	4.2
1.15°	4.7	4.3	3.1	5.5	5.5	5.9
1.50°	6.6	6.1	4.1	7.1	7.2	7.5
1.83°	8.4	7.9	5.8	8.7	8.7	9.0
2.12°	10.0	9.5	7.4	10.0	10.1	10.4
2.38°	11.4	10.9	8.7	11.4	11.3	11.6
2.60°	12.6	12.1	9.9	12.6	12.4	12.6
2.77°	13.5	13.0	10.8	13.5	13.0	13.4
2.89°	14.1	13.6	11.4	14.1	13.6	13.9
2.97°	14.6	14.1	11.9	14.6	14.1	14.3
3.00°	14.7	14.2	12.0	14.7	14.2	14.5



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6.50" Motor 8:9 Lobe 4.0 Stage

Hard Rubber

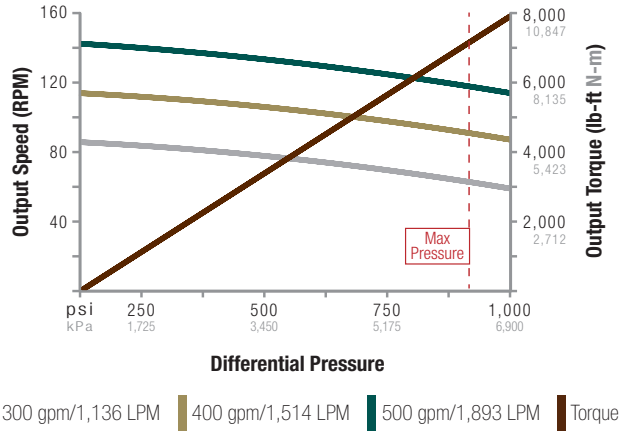
6.75"

Performance Details

Max Diff Pressure	900	psi	6,210	kPa
Max Torque	7,950	lb-ft	10,780	N-m
Stall Torque	11,920	lb-ft	16,170	N-m
Flow Range	300–500	gpm	1,140–1,890	L/min
RPM	0.288	rev/gal	0.076	rev/L
Speed Range		86–144 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	**7.875"** *200mm*	**8.5"** *216mm*	**8.75"** *222mm*	**7.875"** *200mm*	**8.5"** *216mm*	**8.75"** *222mm*
0.39°	1.3	1.3	1.3	2.4	2.7	2.9
0.78°	3.7	2.6	2.6	4.6	5.0	5.1
1.15°	6.2	4.8	4.2	6.8	7.1	7.2
1.50°	8.6	7.1	6.5	8.8	9.1	9.2
1.83°	10.9	9.4	8.8	10.9	11.0	11.1
2.12°	12.9	11.3	10.7	12.9	12.6	12.7
2.38°	14.7	13.1	12.5	14.7	14.1	14.2
2.60°	16.2	14.6	13.9	16.2	15.4	15.5
2.77°	17.3	15.7	15.1	17.3	16.4	16.4
2.89°	18.2	16.5	15.9	18.2	17.0	17.1
2.97°	18.7	17.1	16.4	18.7	17.5	17.6
3.00°	18.9	17.3	16.6	18.9	17.7	17.7



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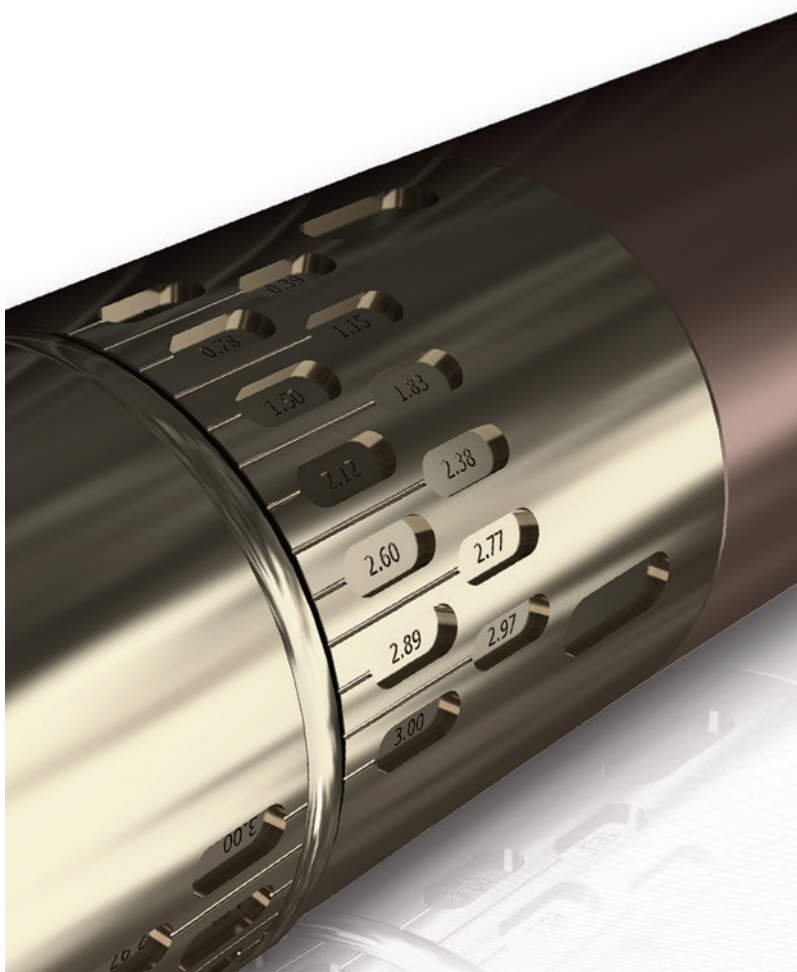
COMMON CONNECTIONS

Bit Box	4 1/2 Reg
Dump Sub/Top Sub	4 1/2 Reg
	4 1/2 IF
	4 1/2 H-90
	4 1/2 XH
	5 H-90

MOTOR SPECIFICATIONS

Average Length	325 in	8.3 m
Average Weight	2,304 lb	1,045 kg



6.75" Motor 4:5 Lobe 7.0 Stage

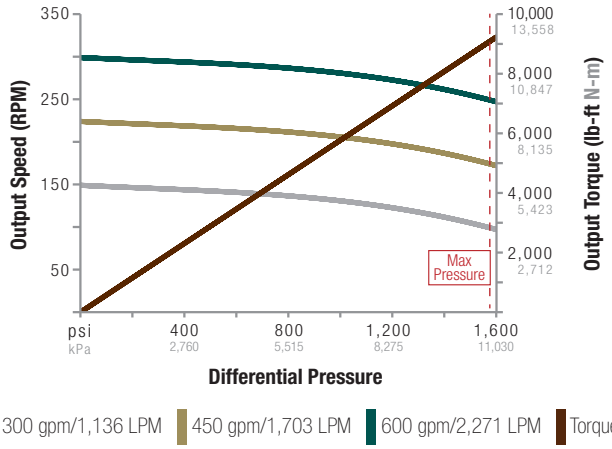
Hard Rubber

Performance Details

Max Diff Pressure	1,580	psi	10,860	kPa
Max Torque	9,090	lb-ft	12,330	N-m
Stall Torque	13,630	lb-ft	18,490	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.497	rev/gal	0.131	rev/L
Speed Range	149–300 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.9	0.4	-	2.1	2.3	2.9
0.78°	3.3	2.8	0.5	4.1	4.2	4.9
1.15°	5.6	5.1	2.8	6.7	6.6	6.7
1.50°	7.7	7.2	5.0	9.3	9.2	8.5
1.83°	9.8	9.3	7.0	11.7	11.6	10.9
2.12°	11.5	11.0	8.8	13.8	13.7	13.0
2.38°	13.1	12.6	10.4	15.7	15.6	14.9
2.60°	14.5	14.0	11.7	17.3	17.2	16.5
2.77°	15.5	15.0	12.8	18.5	18.4	17.8
2.89°	16.3	15.8	13.5	19.4	19.3	18.6
2.97°	16.8	16.3	14.0	20.0	19.8	19.2
3.00°	16.9	16.4	14.2	20.2	20.1	19.4



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

6.75" Motor 6:7 Lobe 8.0 Stage

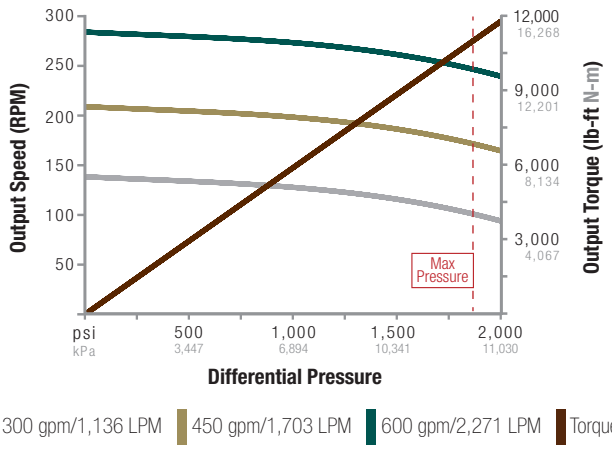
Hard Rubber

Performance Details

Max Diff Pressure	1,919	psi	13,231	kPa
Max Torque	10,928	lb-ft	14,816	N-m
Stall Torque	17,481	lb-ft	23,701	N-m
Flow Range	300–600	gpm	1,136–2,271	L/min
RPM	0.473	rev/gal	0.125	rev/L
Speed Range	141–283 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.9	0.4	-	1.8	1.9	2.3
0.78°	3.0	2.5	0.5	3.5	3.6	4.1
1.15°	5.0	4.6	2.5	5.8	5.7	5.8
1.50°	6.9	6.5	4.5	7.9	7.8	7.4
1.83°	8.8	8.3	6.3	10.0	9.9	9.4
2.12°	10.4	9.9	7.9	11.7	11.6	11.2
2.38°	11.8	11.3	9.3	13.3	13.2	12.8
2.60°	13.0	12.6	10.5	14.7	14.6	14.1
2.77°	13.9	13.5	11.5	15.7	15.6	15.2
2.89°	14.6	14.2	12.1	16.5	16.4	15.9
2.97°	15.1	14.6	12.6	17.0	16.9	16.4
3.00°	15.2	14.8	12.7	17.2	17.1	16.6



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

6.75" Motor 7:8 Lobe 2.9 Stage

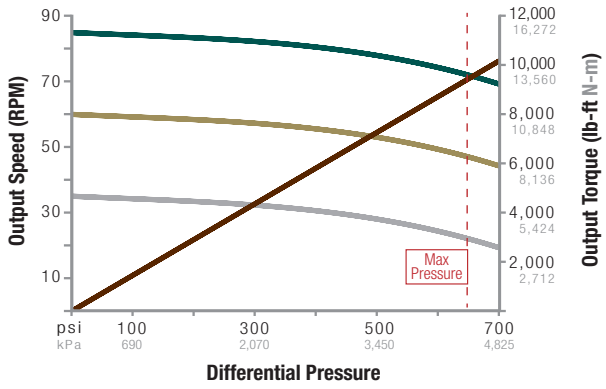
Hard Rubber

Performance Details

Max Diff Pressure	650	psi	4,500	kPa
Max Torque	9,600	lb-ft	13,020	N-m
Stall Torque	14,400	lb-ft	19,520	N-m
Flow Range	200–500	gpm	760–1,890	L/min
RPM	0.170	rev/gal	0.045	rev/L
Speed Range		34–85 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.9	0.4	-	2.0	2.1	2.7
0.78°	3.1	2.7	0.5	3.9	4.0	4.6
1.15°	5.3	4.8	2.7	6.4	6.3	6.4
1.50°	7.3	6.9	4.7	8.8	8.7	8.1
1.83°	9.3	8.8	6.7	11.1	10.9	10.4
2.12°	11.0	10.5	8.4	13.1	12.9	12.4
2.38°	12.5	12.0	9.9	14.8	14.7	14.2
2.60°	13.8	13.3	11.2	16.3	16.2	15.7
2.77°	14.8	14.3	12.2	17.5	17.4	16.8
2.89°	15.5	15.0	12.9	18.3	18.2	17.7
2.97°	15.9	15.5	13.3	18.9	18.8	18.2
3.00°	16.1	15.6	13.5	19.1	19.0	18.4



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6.75" Motor 7:8 Lobe 3.0 Stage Regular

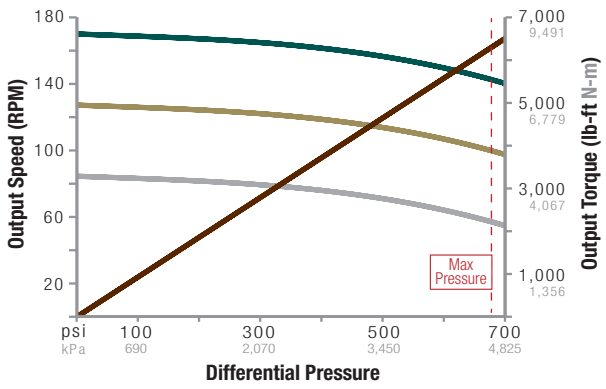
Hard Rubber

Performance Details

Max Diff Pressure	680	psi	4,650	kPa
Max Torque	6,280	lb-ft	8,510	N-m
Stall Torque	9,420	lb-ft	12,770	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.283	rev/gal	0.075	rev/L
Speed Range		84–170 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	1.2	0.5	-	3.0	3.3	4.4
0.78°	4.4	3.7	0.7	5.4	5.7	6.8
1.15°	7.4	6.7	3.7	9.1	8.8	9.0
1.50°	10.2	9.5	6.6	12.6	12.4	11.3
1.83°	12.9	12.2	9.2	16.0	15.7	14.6
2.12°	15.2	14.6	11.6	18.9	18.7	17.5
2.38°	17.3	16.7	13.7	21.5	21.3	20.2
2.60°	19.1	18.5	15.5	23.8	23.5	22.4
2.77°	20.5	19.8	16.9	25.5	25.2	24.1
2.89°	21.5	20.8	17.8	26.7	26.5	25.3
2.97°	22.1	21.5	18.5	27.5	27.3	26.2
3.00°	22.4	21.7	18.7	27.8	27.6	26.5



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6.75" Motor 7:8 Lobe 3.0 Stage Slow

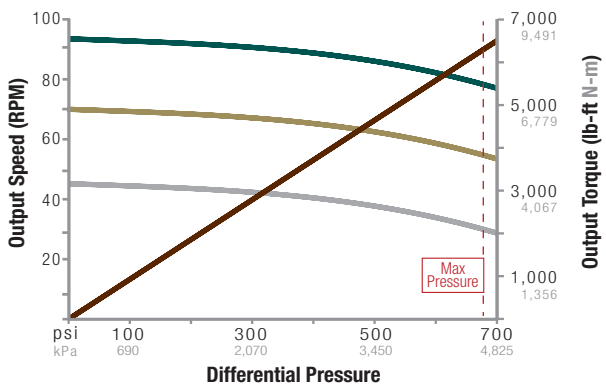
Hard Rubber

Performance Details

Max Diff Pressure	680	psi	4,650	kPa
Max Torque	10,800	lb-ft	14,640	N-m
Stall Torque	16,200	lb-ft	21,960	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.155	rev/gal	0.041	rev/L
Speed Range		46–93 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.9	0.4	-	2.2	2.3	3.0
0.78°	3.4	2.8	0.6	4.2	4.3	5.0
1.15°	5.7	5.2	2.9	6.9	6.7	6.8
1.50°	7.9	7.4	5.1	9.5	9.3	8.7
1.83°	9.9	9.4	7.1	11.9	11.8	11.1
2.12°	11.7	11.2	8.9	14.1	13.9	13.3
2.38°	13.4	12.9	10.6	16.0	15.9	15.2
2.60°	14.7	14.2	11.9	17.6	17.5	16.8
2.77°	15.8	15.3	13.0	18.9	18.8	18.1
2.89°	16.6	16.0	13.8	19.8	19.6	19.0
2.97°	17.1	16.5	14.3	20.4	20.2	19.6
3.00°	17.2	16.7	14.4	20.6	20.5	19.8



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6.75" Motor 7:8 Lobe 3.3 Stage

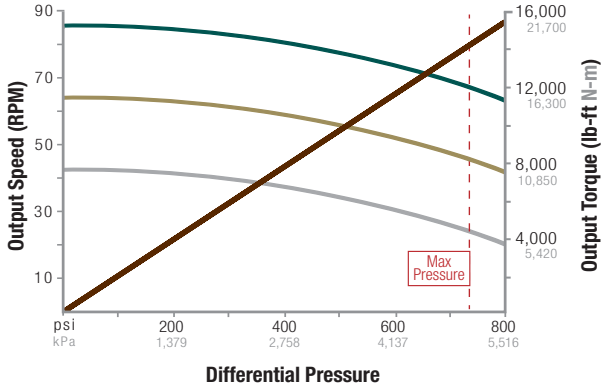
Hard Rubber

Performance Details

Max Diff Pressure	720	psi	4,965	kPa
Max Torque	13,867	lb-ft	18,801	N-m
Stall Torque	13,867	lb-ft	18,801	N-m
Flow Range	300–600	gpm	1,136–2,271	L/min
RPM	0.150	rev/gal	0.040	rev/L
Speed Range		43–85 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.9	0.4	-	2.0	2.1	2.7
0.78°	3.1	2.7	0.5	3.9	4.0	4.6
1.15°	5.3	4.8	2.7	6.4	6.3	6.4
1.50°	7.3	6.9	4.7	8.8	8.7	8.1
1.83°	9.3	8.8	6.7	11.1	10.9	10.4
2.12°	11.0	10.5	8.4	13.1	12.9	12.4
2.38°	12.5	12.0	9.9	14.8	14.7	14.2
2.60°	13.8	13.3	11.2	16.3	16.2	15.7
2.77°	14.8	14.3	12.2	17.5	17.4	16.8
2.89°	15.5	15.0	12.9	18.3	18.2	17.7
2.97°	15.9	15.5	13.3	18.9	18.8	18.2
3.00°	16.1	15.6	13.5	19.1	19.0	18.4



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6.75" Motor 7:8 Lobe 3.5 Stage

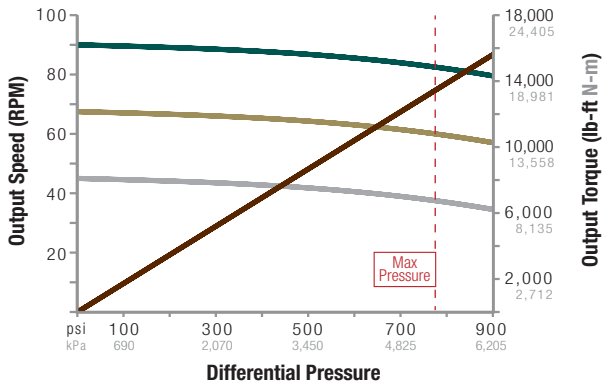
Hard Rubber

Performance Details

Max Diff Pressure	790	psi	5,430	kPa
Max Torque	13,500	lb-ft	18,300	N-m
Stall Torque	20,250	lb-ft	27,450	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.150	rev/gal	0.040	rev/L
Speed Range		45–90 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.8	0.4	-	1.9	2.0	2.5
0.78°	3.0	2.5	0.5	3.7	3.8	4.3
1.15°	5.1	4.6	2.6	6.1	6.0	6.1
1.50°	7.0	6.6	4.5	8.4	8.3	7.8
1.83°	8.9	8.4	6.4	10.5	10.4	9.9
2.12°	10.5	10.0	8.0	12.4	12.3	11.8
2.38°	11.9	11.5	9.4	14.1	14.0	13.5
2.60°	13.2	12.7	10.7	15.5	15.4	14.9
2.77°	14.1	13.7	11.6	16.7	16.5	16.0
2.89°	14.8	14.3	12.3	17.4	17.3	16.8
2.97°	15.2	14.8	12.7	18.0	17.8	17.3
3.00°	15.4	15.0	12.9	18.2	18.0	17.5



300 gpm/1,136 LPM | 450 gpm/1,703 LPM | 600 gpm/2,271 LPM | Torque

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6.75" Motor 7:8 Lobe 5.0 Stage

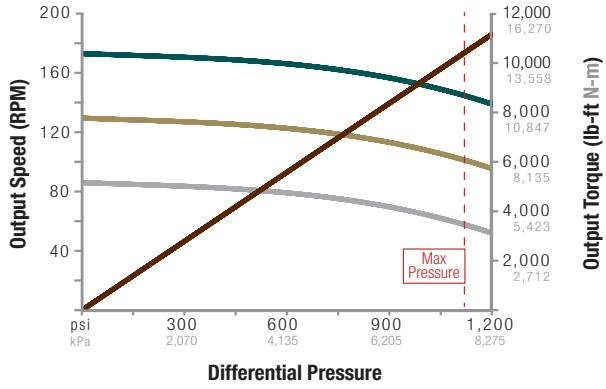
Hard Rubber

Performance Details

Max Diff Pressure	1,130	psi	7,760	kPa
Max Torque	10,460	lb-ft	14,190	N-m
Stall Torque	15,690	lb-ft	21,280	N-m
Flow Range	300–600	gpm	1,140–2,270	L/min
RPM	0.288	rev/gal	0.076	rev/L
Speed Range		86–180 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.39°	0.9	0.4	-	2.2	2.3	3.0
0.78°	3.4	2.9	0.6	4.2	4.3	5.0
1.15°	5.7	5.2	2.9	6.9	6.7	6.9
1.50°	7.9	7.4	5.1	9.5	9.4	8.7
1.83°	10.0	9.4	7.1	12.0	11.8	11.2
2.12°	11.8	11.3	9.0	14.1	14.0	13.3
2.38°	13.4	12.9	10.6	16.1	15.9	15.3
2.60°	14.8	14.3	12.0	17.7	17.5	16.9
2.77°	15.9	15.3	13.0	19.0	18.8	18.2
2.89°	16.6	16.1	13.8	19.8	19.7	19.1
2.97°	17.1	16.6	14.3	20.4	20.3	19.7
3.00°	17.3	16.8	14.5	20.7	20.5	19.9



300 gpm/1,136 LPM | 450 gpm/1,703 LPM | 600 gpm/2,271 LPM | Torque

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6.75" Motor 7:8 Lobe 5.7 Stage

Hard Rubber

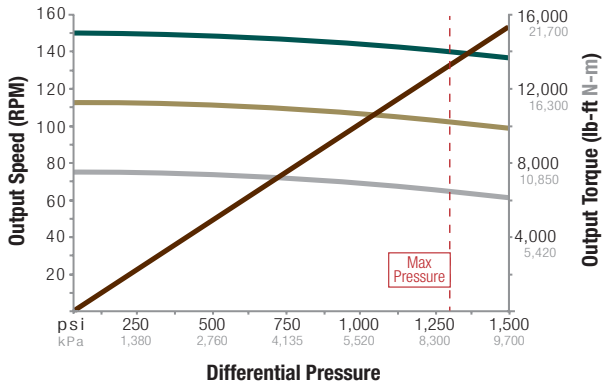
7.25"

Performance Details

Max Diff Pressure	1,280	psi	8,840	kPa
Max Torque	13,720	lb-ft	18,600	N-m
Stall Torque	20,580	lb-ft	27,910	N-m
Flow Range	300–600	gpm	1,140–2,271	L/min
RPM	0.242	rev/gal	0.064	rev/L
Speed Range		75–150 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	**8.5"** *216mm*	**8.75"** *222mm*	**9.875"** *251mm*	**8.5"** *216mm*	**8.75"** *222mm*	**9.875"** *251mm*
0.39°	1.1	1.1	1.0	1.9	2.0	2.3
0.78°	2.7	2.3	2.1	3.7	3.8	4.2
1.15°	4.7	4.3	3.1	5.5	5.5	5.9
1.50°	6.6	6.1	4.1	7.1	7.2	7.5
1.83°	8.4	7.9	5.8	8.7	8.7	9.0
2.12°	10.0	9.5	7.4	10.0	10.1	10.4
2.38°	11.4	10.9	8.7	11.4	11.3	11.6
2.60°	12.6	12.1	9.9	12.6	12.4	12.6
2.77°	13.5	13.0	10.8	13.5	13.0	13.4
2.89°	14.1	13.6	11.4	14.1	13.6	13.9
2.97°	14.6	14.1	11.9	14.6	14.1	14.3
3.00°	14.7	14.2	12.0	14.7	14.2	14.5



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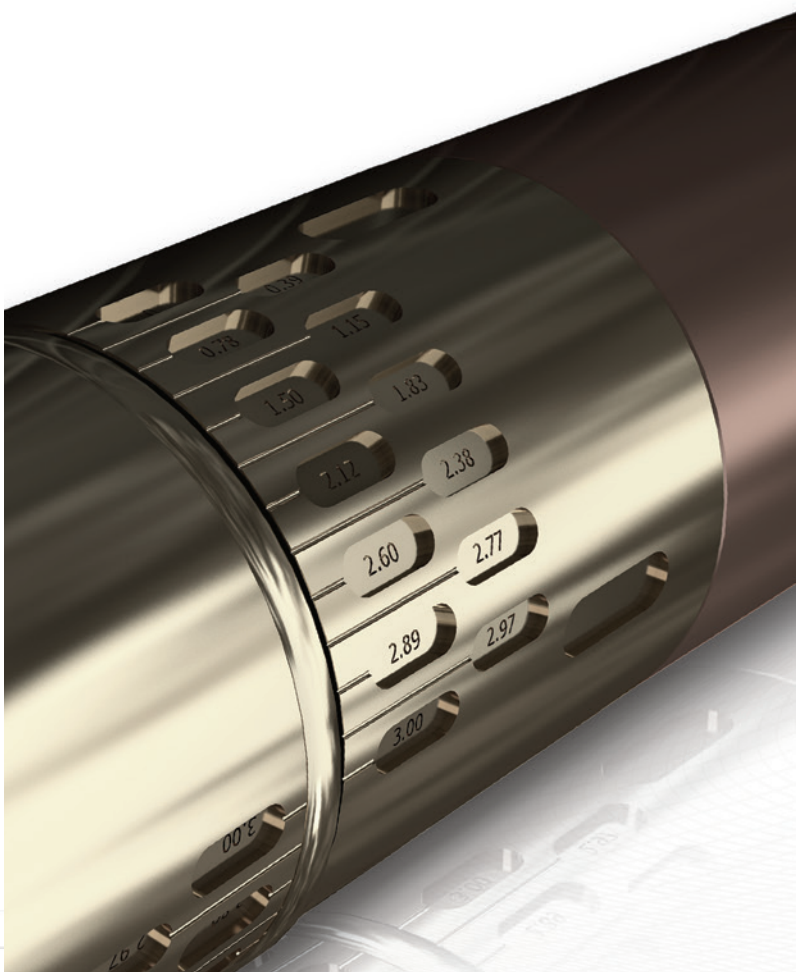
COMMON CONNECTIONS

Bit Box	4 1/2 Reg
	6 5/8 Reg
Dump Sub/Top Sub	4 1/2 IF

MOTOR SPECIFICATIONS

Average Length	399 in	10.1 m
Average Weight	3,200 lb	1,450 kg



7.25" Atlas 4:5 Lobe 8.4 Stage

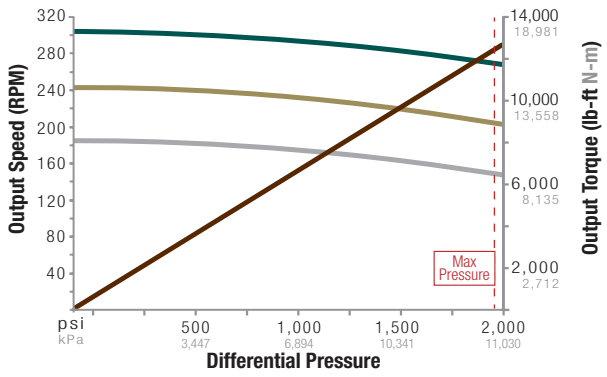
Hard Rubber

Performance Details

Max Diff Pressure	1,980	psi	13,652	kPa
Max Torque	12,420	lb-ft	16,839	N-m
Stall Torque	19,560	lb-ft	26,519	N-m
Flow Range	450–750	gpm	1,703–2,840	L/min
RPM	0.405	rev/gal	0.107	rev/L
Speed Range	182–304 rpm			

Predicted Build Rates (Fixed) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.78°	5.3	4.5	0.9	5.3	5.0	5.7
1.15°	7.9	7.1	3.4	7.9	7.3	8.0
1.50°	10.4	9.5	5.9	10.4	9.5	10.2
1.75°	12.1	11.3	7.6	12.1	11.3	11.8
1.83°	12.6	11.8	8.2	12.6	11.8	12.3
2.00°	13.8	13.0	9.3	13.8	13.0	13.3
2.12°	14.6	13.8	10.2	14.6	13.8	14.1
2.25°	15.5	14.7	11.1	15.5	14.7	14.9
2.38°	16.4	15.6	12.0	16.4	15.6	15.7
2.50°	17.3	16.5	12.8	17.3	16.5	16.5



450 gpm/1,703 LPM | 600 gpm/2,271 LPM | 750 gpm/2,840 LPM | Torque

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7.25" Atlas 7:8 Lobe 8.5 Stage

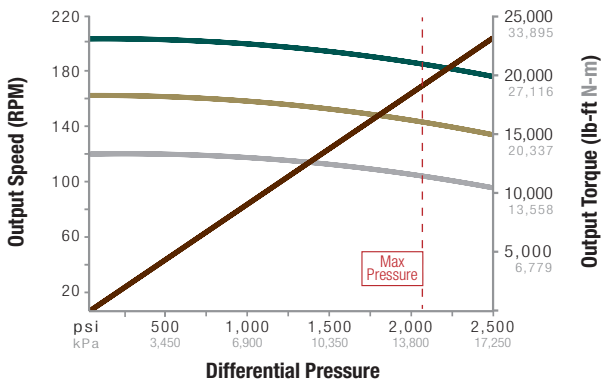
Hard Rubber

Performance Details

Max Diff Pressure	2,129	psi	14,679	kPa
Max Torque	19,050	lb-ft	25,828	N-m
Stall Torque	33,338	lb-ft	45,199	N-m
Flow Range	450–750	gpm	1,703–2,840	L/min
RPM	0.270	rev/gal	0.071	rev/L
Speed Range	121–203 rpm			

Predicted Build Rates (Fixed) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	8.5" 216mm	8.75" 222mm	9.875" 251mm	8.5" 216mm	8.75" 222mm	9.875" 251mm
0.78°	5.3	4.5	0.9	5.3	5.0	5.7
1.15°	7.9	7.1	3.4	7.9	7.3	8.0
1.50°	10.4	9.5	5.9	10.4	9.5	10.2
1.75°	12.1	11.3	7.6	12.1	11.3	11.8
1.83°	12.6	11.8	8.2	12.6	11.8	12.3
2.00°	13.8	13.0	9.3	13.8	13.0	13.3
2.12°	14.6	13.8	10.2	14.6	13.8	14.1
2.25°	15.5	14.7	11.1	15.5	14.7	14.9
2.38°	16.4	15.6	12.0	16.4	15.6	15.7
2.50°	17.3	16.5	12.8	17.3	16.5	16.5



450 gpm/1,703 LPM | 600 gpm/2,271 LPM | 750 gpm/2,840 LPM | Torque

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7.25" Atlas 8:9 Lobe 6.0 Stage

Hard Rubber

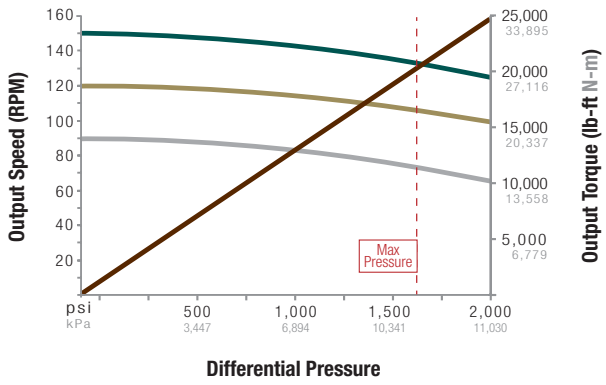
7.75/8.00"

Performance Details

Max Diff Pressure	1,618	psi	11,156	kPa
Max Torque	20,237	lb-ft	27,434	N-m
Stall Torque	35,415	lb-ft	48,010	N-m
Flow Range	450–750	gpm	1,730–2,840	L/min
RPM	0.200	rev/gal	0.053	rev/L
Speed Range		90–150 rpm		

Predicted Build Rates (Fixed) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	**8.5"** *216mm*	**8.75"** *222mm*	**9.875"** *251mm*	**8.5"** *216mm*	**8.75"** *222mm*	**9.875"** *251mm*
0.78°	5.3	4.5	0.9	5.3	5.0	5.7
1.15°	7.9	7.1	3.4	7.9	7.3	8.0
1.50°	10.4	9.5	5.9	10.4	9.5	10.2
1.75°	12.1	11.3	7.6	12.1	11.3	11.8
1.83°	12.6	11.8	8.2	12.6	11.8	12.3
2.00°	13.8	13.0	9.3	13.8	13.0	13.3
2.12°	14.6	13.8	10.2	14.6	13.8	14.1
2.25°	15.5	14.7	11.1	15.5	14.7	14.9
2.38°	16.4	15.6	12.0	16.4	15.6	15.7
2.50°	17.3	16.5	12.8	17.3	16.5	16.5



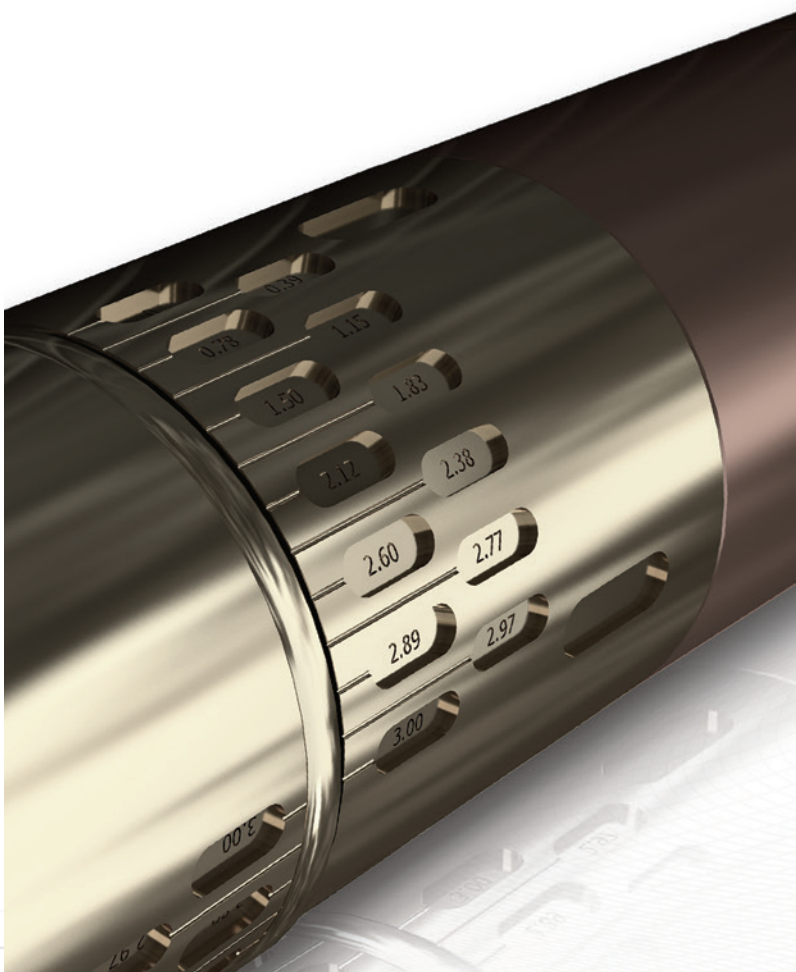
Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

COMMON CONNECTIONS

Bit Box	6 5/8 Reg
Dump Sub/Top Sub	6 5/8 Reg
	7 H-90

MOTOR SPECIFICATIONS

Average Length	330 in	8.4 m
Average Weight	3,083 lb	1,398 kg



7.75" Motor 4:5 Lobe 5.3 Stage

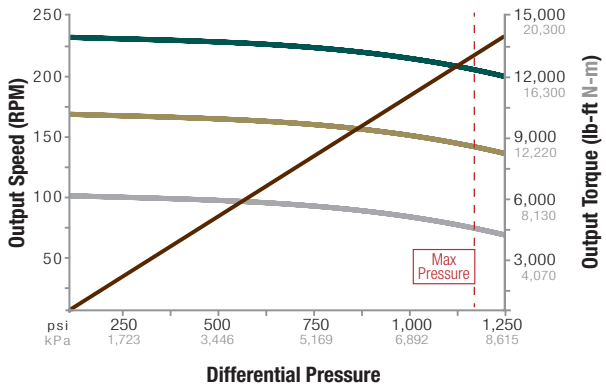
Hard Rubber

Performance Details

Max Diff Pressure	1,190	psi	8,220	kPa
Max Torque	13,310	lb-ft	18,050	N-m
Stall Torque	19,970	lb-ft	27,070	N-m
Flow Range	400–900	gpm	1,514–3,407	L/min
RPM	0.253	rev/gal	0.067	rev/L
Speed Range	101–230 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	9.875" 251mm	10.625" 270mm	12.25" 311mm	9.875" 251mm	10.625" 270mm	12.25" 311mm
0.39°	1.1	1.1	1.0	2.3	2.5	3.1
0.78°	2.2	2.1	2.1	4.1	4.4	4.9
1.15°	4.2	3.1	3.1	5.9	6.1	6.6
1.50°	6.1	4.9	4.0	7.6	7.8	8.2
1.83°	7.9	6.6	4.9	9.1	9.3	9.7
2.12°	9.5	8.2	5.6	10.5	10.7	11.1
2.38°	10.9	9.6	7.0	11.8	11.9	12.3
2.60°	12.1	10.8	8.1	12.8	13.0	13.3
2.77°	13.1	11.7	9.0	13.6	13.8	14.1
2.89°	13.7	12.4	9.6	14.2	14.4	14.6
2.97°	14.2	12.8	10.1	14.6	14.7	15.0
3.00°	14.3	13.0	10.2	14.7	14.9	15.2



400 gpm/1,514 LPM | 650 gpm/2,460 LPM | 900 gpm/3,406 LPM | Torque

Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

7.75" Motor 7:8 Lobe 2.0 Stage

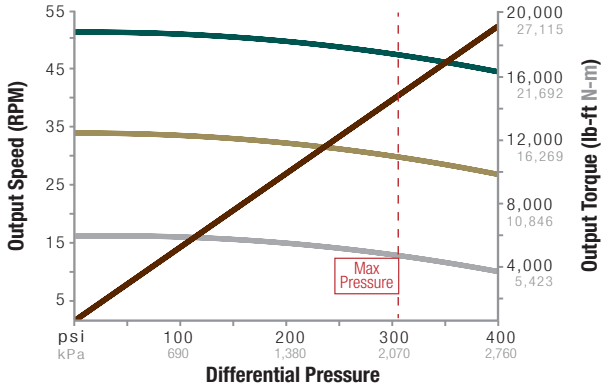
Hard Rubber

Performance Details

Max Diff Pressure	306	psi	2,111	kPa
Max Torque	14,274	lb-ft	19,360	N-m
Stall Torque	22,811	lb-ft	30,969	N-m
Flow Range	300–900	gpm	1,136–3,407	L/min
RPM	0.060	rev/gal	0.015	rev/L
Speed Range	16–50 rpm			

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	9.875" 251mm	10.625" 270mm	12.25" 311mm	9.875" 251mm	10.625" 270mm	12.25" 311mm
0.39°	0.7	-	-	2.3	2.7	3.6
0.78°	3.1	1.6	-	4.2	4.7	5.6
1.15°	5.5	3.9	0.7	6.9	6.6	7.5
1.50°	7.7	6.2	2.9	9.5	9.1	9.3
1.83°	9.7	8.2	4.9	12.0	11.5	11.0
2.12°	11.6	10.1	6.8	14.1	13.7	12.8
2.38°	13.2	11.7	8.4	16.1	15.6	14.7
2.60°	14.6	13.1	9.8	17.7	17.3	16.4
2.77°	15.7	14.1	10.8	19.0	18.6	17.6
2.89°	16.4	14.9	11.6	19.9	19.5	18.5
2.97°	16.9	15.4	12.1	20.5	20.1	19.1
3.00°	17.1	15.6	12.3	20.7	20.3	19.4



300 gpm/1,136 LPM | 600 gpm/2,271 LPM | 900 gpm/3,406 LPM | Torque

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7.75" Motor 7:8 Lobe 3.0 Stage

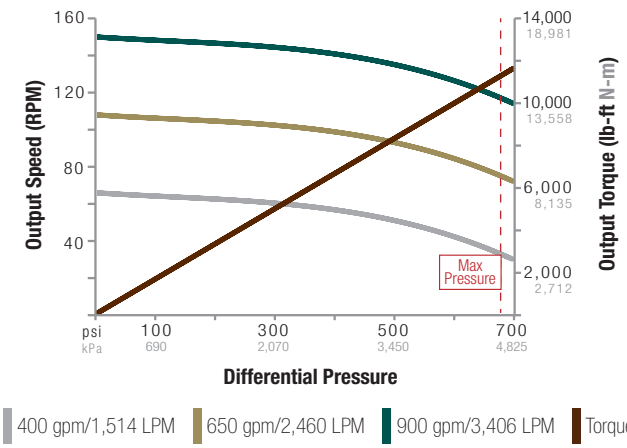
Hard Rubber

Performance Details

Max Diff Pressure	680	psi	4,650	kPa
Max Torque	11,200	lb-ft	15,180	N-m
Stall Torque	16,800	lb-ft	22,770	N-m
Flow Range	400–900	gpm	1,514–3,406	L/min
RPM	0.166	rev/gal	0.044	rev/L
Speed Range		66–150 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	9.875" 251mm	10.625" 270mm	12.25" 311mm	9.875" 251mm	10.625" 270mm	12.25" 311mm
0.39°	0.8	-	-	2.7	3.2	4.4
0.78°	3.6	1.8	-	4.8	5.4	6.6
1.15°	6.2	4.5	0.7	7.9	7.5	8.7
1.50°	8.7	7.0	3.2	10.9	10.3	10.7
1.83°	11.1	9.3	5.6	13.8	13.2	12.5
2.12°	13.1	11.4	7.7	16.3	15.7	14.5
2.38°	15.0	13.3	9.5	18.6	18.0	16.8
2.60°	16.6	14.8	11.1	20.5	19.9	18.7
2.77°	17.8	16.1	12.3	22.0	21.4	20.2
2.89°	18.6	16.9	13.2	23.0	22.5	21.2
2.97°	19.2	17.5	13.7	23.7	23.1	21.9
3.00°	19.4	17.7	14.0	24.0	23.4	22.2



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

7.75" Motor 7:8 Lobe 4.0 Stage

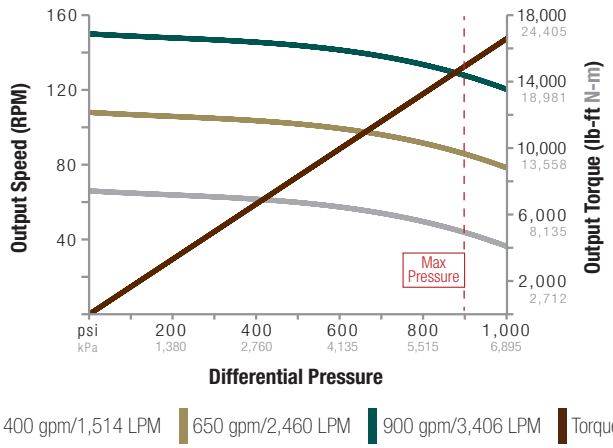
Hard Rubber

Performance Details

Max Diff Pressure	900	psi	6,210	kPa
Max Torque	14,930	lb-ft	20,240	N-m
Stall Torque	22,400	lb-ft	30,360	N-m
Flow Range	400–900	gpm	1,514–3,406	L/min
RPM	0.166	rev/gal	0.044	rev/L
Speed Range		66–150 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	9.875" 251mm	10.625" 270mm	12.25" 311mm	9.875" 251mm	10.625" 270mm	12.25" 311mm
0.39°	0.7	-	-	2.3	2.8	3.8
0.78°	3.2	1.7	-	4.4	4.8	5.8
1.15°	5.6	4.0	0.7	7.0	6.7	7.7
1.50°	7.9	6.3	2.9	9.7	9.3	9.5
1.83°	10.0	8.4	5.1	12.3	11.8	11.3
2.12°	11.8	10.3	6.9	14.5	14.1	13.1
2.38°	13.5	12.0	8.6	16.5	16.1	15.1
2.60°	14.9	13.4	10.0	18.2	17.8	16.8
2.77°	16.0	14.5	11.1	19.5	19.1	18.1
2.89°	16.8	15.3	11.9	20.4	20.0	19.0
2.97°	17.3	15.8	12.4	21.1	20.6	19.6
3.00°	17.5	16.0	12.6	21.3	20.8	19.8



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8.00" Atlas 7:8 Lobe 5.9 Stage

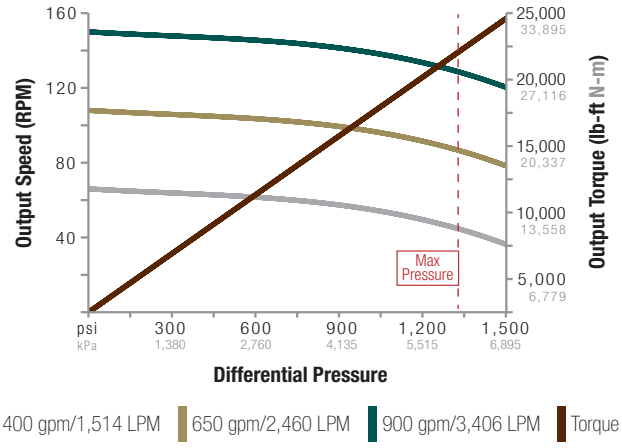
Hard Rubber

Performance Details

Max Diff Pressure	1,330	psi	9,150	kPa
Max Torque	22,020	lb-ft	29,860	N-m
Stall Torque	33,030	lb-ft	44,780	N-m
Flow Range	400–900	gpm	1,514–3,406	L/min
RPM	0.166	rev/gal	0.044	rev/L
Speed Range		66–150 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	**9.875"** *251mm*	**10.625"** *270mm*	**12.25"** *311mm*	**9.875"** *251mm*	**10.625"** *270mm*	**12.25"** *311mm*
0.39°	-	-	-	1.7	1.9	2.5
0.78°	1.7	0.6	-	3.4	3.6	4.1
1.15°	3.6	2.4	-	5.3	5.2	5.7
1.50°	5.3	4.1	1.7	7.3	8.0	7.9
1.83°	6.9	5.7	3.3	9.1	8.9	8.6
2.12°	8.3	7.2	4.7	10.7	10.5	10.0
2.38°	9.6	8.4	6.0	12.2	11.9	11.4
2.60°	10.6	9.5	7.1	13.4	13.2	12.6
2.77°	11.5	10.3	7.9	14.3	14.1	13.6
2.89°	12.1	10.9	8.5	15.0	14.8	14.2
2.97°	12.5	11.3	8.9	15.5	15.2	14.7
3.00°	12.6	11.5	9.0	14.2	15.4	15.3



400 gpm/1,514 LPM | 650 gpm/2,460 LPM | 900 gpm/3,406 LPM | Torque

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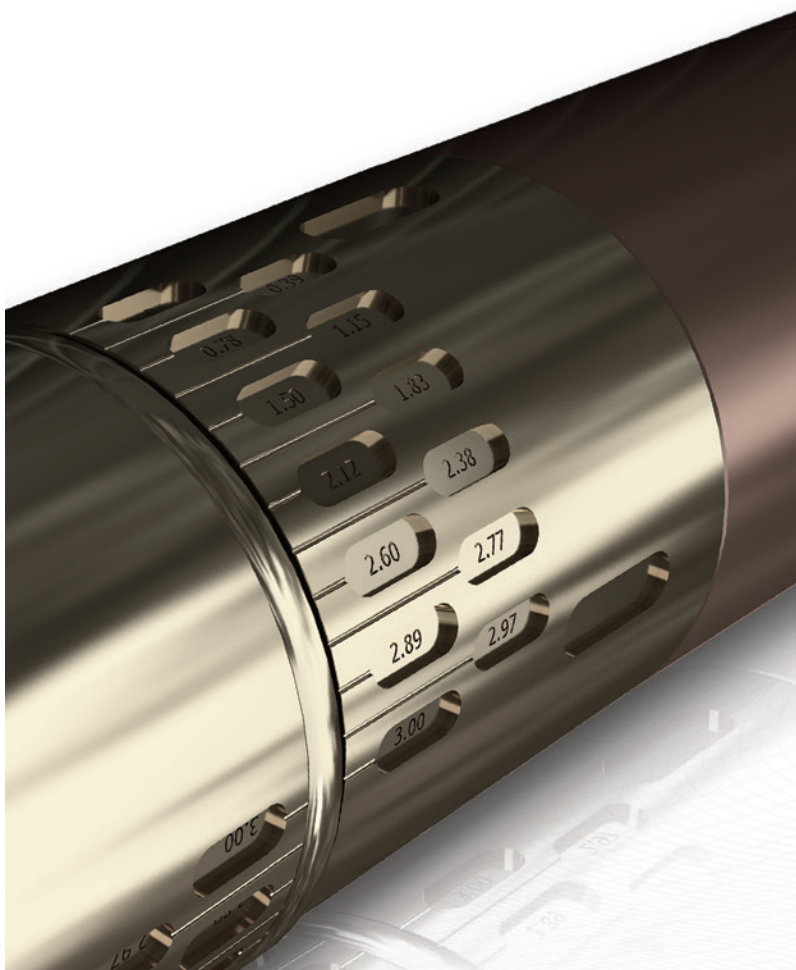
9.00"

COMMON CONNECTIONS

Bit Box	6 5/8 Reg
Top Sub	6 5/8 Reg

MOTOR SPECIFICATIONS

Length	471 in	11.96 m
Weight	6,600 lb	3,000 kg
Adjustable Make-Up Torque	65,000 ft-lb	



9.00" Atlas 7:8 Lobe 7.0 Stage

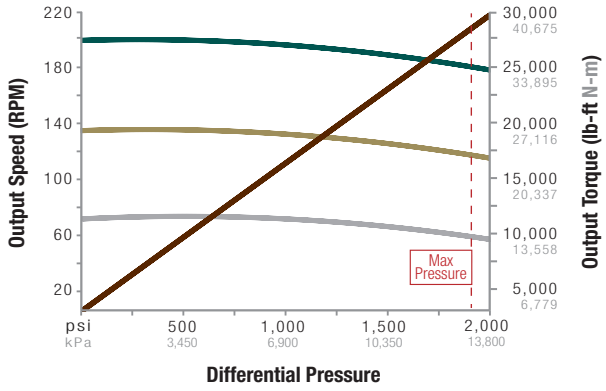
Hard Rubber

Performance Details

Max Diff Pressure	1,902	psi	13,114	kPa
Max Torque	28,409	lb-ft	38,517	N-m
Stall Torque	42,614	lb-ft	57,777	N-m
Flow Range	400–1,100	gpm	1,514–4,164	L/min
RPM	0.18	rev/gal	0.047	rev/L
Speed Range		72–198 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	12.25" 311mm	14.75" 375mm	17.5" 445mm	12.25" 311mm	14.75" 375mm	17.5" 445mm
0.39°	-	-	-	1.9	2.6	3.5
0.78°	-	-	-	3.5	4.3	5.1
1.15°	1.7	-	-	5.0	5.8	6.6
1.50°	3.4	-	-	6.5	7.2	8.1
1.83°	4.9	1.7	-	8.0	8.6	9.4
2.12°	6.2	3.0	-	9.5	9.8	10.6
2.38°	7.5	4.2	0.8	10.8	10.9	11.7
2.60°	8.5	5.2	1.8	12.0	11.8	12.6
2.77°	9.3	6.0	2.6	12.8	12.5	13.3
2.89°	9.8	6.6	3.2	13.5	13.0	13.8
2.97°	10.2	7.0	3.5	13.9	13.3	14.1
3.00°	10.3	7.1	3.7	14.0	13.4	14.2



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

9.00" Motor 8:9 Lobe 4.0 Stage

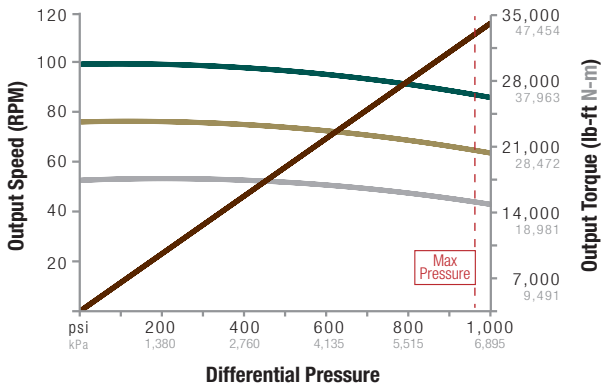
Hard Rubber

Performance Details

Max Diff Pressure	978	psi	6,743	kPa
Max Torque	32,935	lb-ft	44,654	N-m
Stall Torque	49,402	lb-ft	66,981	N-m
Flow Range	600–1,100	gpm	2,271–4,164	L/min
RPM	0.09	rev/gal	0.024	rev/L
Speed Range		54–99 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	12.25" 311mm	14.75" 375mm	17.5" 445mm	12.25" 311mm	14.75" 375mm	17.5" 445mm
0.39°	-	-	-	1.9	2.6	3.5
0.78°	-	-	-	3.5	4.3	5.1
1.15°	1.7	-	-	5.0	5.8	6.6
1.50°	3.4	-	-	6.5	7.2	8.1
1.83°	4.9	1.7	-	8.0	8.6	9.4
2.12°	6.2	3.0	-	9.5	9.8	10.6
2.38°	7.5	4.2	0.8	10.8	10.9	11.7
2.60°	8.5	5.2	1.8	12.0	11.8	12.6
2.77°	9.3	6.0	2.6	12.8	12.5	13.3
2.89°	9.8	6.6	3.2	13.5	13.0	13.8
2.97°	10.2	7.0	3.5	13.9	13.3	14.1
3.00°	10.3	7.1	3.7	14.0	13.4	14.2



Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

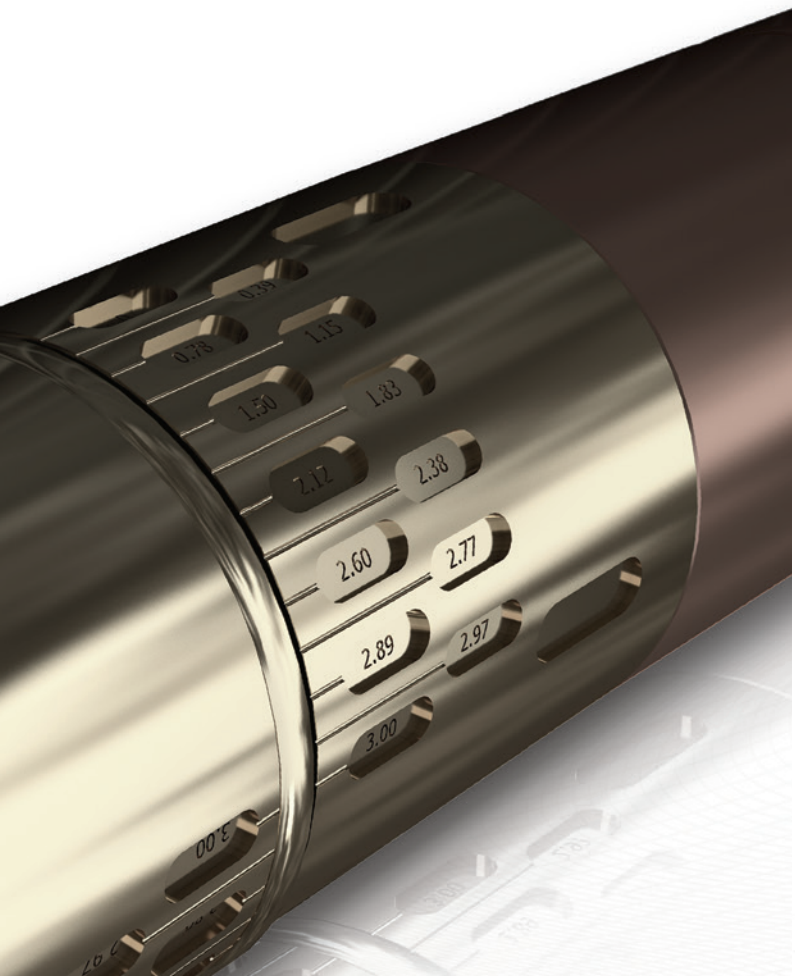
9.625"

COMMON CONNECTIONS

Bit Box	6 5/8 Reg
	7 5/8 Reg
Dump Sub/Top Sub	6 5/8 Reg
	7 5/8 Reg
	7 H-90

MOTOR SPECIFICATIONS

Average Length	361 in	9.2 m
Average Weight	5,203 lb	2,360 kg

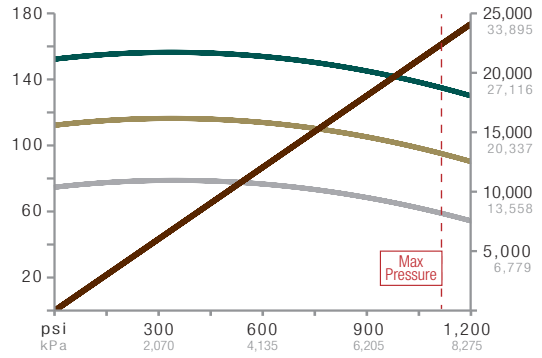


Performance Details

Max Diff Pressure	1,130	psi	7,760	kPa
Max Torque	22,840	lb-ft	30,970	N-m
Stall Torque	34,260	lb-ft	46,460	N-m
Flow Range	600–1,200	gpm	2,271–4,542	L/min
RPM	0.127	rev/gal	0.034	rev/L
Speed Range		78–156 rpm		

Predicted Build Rates (Adj.) - Degrees/100ft (30m)

	SLICK			SINGLE STABILIZER		
	Hole Size			Hole Size		
Bend Setting	**12.25"** *311mm*	**14.75"** *375mm*	**17.5"** *445mm*	**12.25"** *311mm*	**14.75"** *375mm*	**17.5"** *445mm*
0.39°	1.0	1.0	1.0	2.4	3.2	4.0
0.78°	2.1	2.0	1.9	4.2	4.9	5.6
1.15°	3.2	3.0	2.8	5.9	6.6	7.2
1.50°	5.0	3.9	3.7	7.5	8.1	8.7
1.83°	6.8	4.7	4.5	9.0	9.6	10.1
2.12°	8.3	5.4	5.2	10.3	10.9	11.4
2.38°	9.7	6.2	5.9	11.5	12.0	12.5
2.60°	10.9	7.3	6.4	12.5	13.0	13.4
2.77°	11.8	8.2	6.8	13.3	13.8	14.2
2.89°	12.4	8.8	7.1	13.9	14.3	14.7
2.97°	12.9	9.2	7.3	14.2	14.7	15.0
3.00°	13.0	9.3	7.4	14.4	14.8	15.1



600 gpm/2,271 LPM | 900 gpm/3,406 LPM | 1,200 gpm/4,542 LPM | Torque

Performance curves are for reference only. Actual field performance may vary with field conditions. For optimal performance, Phoenix recommends that motors are not run at or near the engineered maximums noted. Performance data and dimensions are subject to change without notice.

Reference Information

Common OD Conversions

Inch	Millimeter
2	50.80
2 1/8	53.98
2 1/4	57.15
2 3/8	60.33
2 1/2	63.50
2 5/8	66.68
2 3/4	69.85
2 7/8	73.03
3	76.20
3 1/8	79.38
3 1/4	82.55
3 3/8	85.73
3 1/2	88.90
3 5/8	92.08
3 3/4	95.25
3 7/8	98.43
4	101.60
4 1/8	104.78
4 1/4	107.95
4 3/8	111.13
4 1/2	114.30
4 5/8	117.48
4 3/4	120.65
4 7/8	123.83
5	127.00
5 1/8	130.18
5 1/4	133.35
5 3/8	136.53
5 1/2	139.70
5 5/8	142.88
5 3/4	146.05
5 7/8	149.23
6	152.40
6 1/8	155.58
6 1/4	158.75
6 3/8	161.93

Inch	Millimeter
6 1/2	165.10
6 5/8	168.28
6 3/4	171.45
6 7/8	174.63
7	177.80
7 1/8	180.98
7 1/4	184.15
7 3/8	187.33
7 1/2	190.50
7 5/8	193.68
7 3/4	196.85
7 7/8	200.02
8	203.20
8 1/8	206.38
8 1/4	209.55
8 3/8	212.73
8 1/2	215.90
8 5/8	219.08
8 3/4	222.25
8 7/8	225.43
9	228.60
9 1/8	231.78
9 1/4	234.95
9 3/8	238.13
9 1/2	241.30
9 5/8	244.48
9 3/4	247.65
9 7/8	250.83
10	254.00
10 1/8	257.18
10 1/4	260.35
10 3/8	263.53
10 1/2	266.70
10 5/8	269.88
10 3/4	273.05
10 7/8	276.23

Inch	Millimeter
11	279.40
11 1/8	282.58
11 1/4	285.75
11 3/8	288.93
11 1/2	292.10
11 5/8	295.28
11 3/4	298.45
11 7/8	301.63
12	304.80
12 1/8	307.98
12 1/4	311.15
12 3/8	314.33
12 1/2	317.50
12 5/8	320.68
12 3/4	323.85
12 7/8	327.03
13	330.20
13 1/8	333.38
13 1/4	336.55
13 3/8	339.73
13 1/2	342.90
13 5/8	346.08
13 3/4	349.25
13 7/8	352.43
14	355.60
14 1/8	358.78
14 1/4	361.95
14 3/8	365.13
14 1/2	368.30
14 5/8	371.48
14 3/4	374.65
14 7/8	377.83

Metric Conversions

Convert From	To	Multiply By
Length		
millimeter (mm)	inch (in)	**0.03936996**
centimeter (cm)	inch (in)	**0.3937008**
meter (m)	feet (ft)	**3.28083**
Drilling Rate		
meter/hour (m/hr)	feet/hour (ft/hr)	**3.28083**
Mass		
kilogram (kg)	pound (lb)	**2.20462**
metric ton (t)	pound (lb)	**2,204.623**
metric ton (t)	ton (T)	**1.102311**
Volume		
milliliter (ml)	ounce (oz)	**0.03381**
cubic centimeter (cm^3)	cubic inch (in^3)	**0.061024**
liter (L)	cubic feet (ft^3)	**.035315**
cubic meter (m^3)	cubic feet (ft^3)	**35.31466**
liter (L)	quart (qt)	**1.056688**
liter (L)	gallon (gal)	**0.008386**
liter (L)	gallon (gal)	**0.2641721**
liter (L)	barrel (bbl)	**0.006289**
cubic meter (m^3)	barrel (bbl) (US oil)	**264.172**
cubic meter (m^3)	barrel (bbl)	**8.38641**
cubic meter (m^3)	barrel (bbl) (US oil)	**6.28981**
Flow Rate		
liter/minute (L/min)	gallon/minute (gpm)	**0.2641721**
liter/minute (L/min)	barrel/minute (bbl/min)	**0.008386**
cubic meter/minute (m^3/min)	gallon/minute (gpm)	**264.1721**
cubic meter/minute (m^3/min)	barrel/minute (bbl/min)	**8.38641**
Force		
decanewton (daN)	pound (lb)	**2.24808943**
kilogram/meter (kg/m)	pound/foot (lb-ft)	**0.671968975**
Torque		
newton meter (N-m)	pound foot (lb-ft)	**0.737561**
Pressure		
megapascal (mPa)	pound per square inch	**145.0377**
kilopascals (kPa)	pound per square inch	**0.1450377**
pascals (Pa)	pound per square inch	**0.000145038**

** US Barrels (Liquid): US measurement of volume for non-petroleum liquids*
** US Barrels (Oil): US measurement of volume for petroleum*

Metric Conversions

Convert From	To	Multiply By
Pressure Gradient		
killogram/centimeter sq (kg/cm^2)	pound per square inch (psi)	**14.22334**
kilopascal/meter (kPa/m)	psi/ft	**0.0442121**
Mud Weight		
kilogram/liter (kg/L)	pound/gallon (ppg)	**8.347254**
kilogram/cubic meter (kg/m^3)	pound/gallon (ppg)	**0.0083472**
specific gravity	pound/gallon (ppg)	**8.345406**
kilogram/cubic meter (kg/m^3)	pound/cubic foot (lb/ft^3)	**0.062428**
Funnel Viscosity		
second/liter (s/L)	second/quart (s/qt)	**0.94635**
Power		
kilowatt (kW)	horsepower (hp)	**1.34102**
Well Control		
liter/metre (L/m)	bbl/ft capacity	**0.0019186**
cubic meter/meter (m^3/m)	bbl/ft capacity	**1.9160043**
liter/meter (L/m)	bbl/ft displacement	**0.0019186**
cubic meter/meter (m^3/m)	bbl/ft displacement	**1.9160043**
kg/cm^2/m	gradient psi/ft	**4.335705**
kilopascal/meter (kpa/m)	gradient psi/ft	**0.0442121**
Temperature		
°celsius (°C)	°fahrenheit (°F)	**(°C x 1.8) + 32**

Imperial Conversions

Convert From	To	Multiply By
Length		
inch (in)	millimeter (mm)	**25.4**
inch (in)	centimeter (cm)	**2.54**
feet (ft)	meter (m)	**0.3048**
Drilling Rate		
feet/hour (ft/hr)	meter/hour (m/hr)	**0.3048**
Mass		
pound (lb)	kilogram (kg)	**0.4536**
pound (lb)	metric ton (t)	**0.0004535**
ton (T)	metric ton (t)	**0.9071847**
Volume		
ounce (oz)	milliliter (ml)	**29.5735**
cubic inch (in^3)	cubic centimeter (cm^3)	**16.38706**
cubic feet (ft^3)	liter (L)	**28.3169**
cubic feet (ft^3)	cubic meter (m^3)	**0.028317**
quart (qt)	liter (L)	**0.9464**
gallon (gal)	cubic meter (m^3)	**0.0037852**
gallon (gal)	liter (L)	**3.785412**
barrel (bbl)	cubic meter (m^3)	**0.119240**
barrel (bbl) (US oil)	cubic meter (m^3)	**0.158987**
barrel (bbl)	liter (L)	**119.2401**
barrel (bbl) (US oil)	liter (L)	**158.9871**
Flow Rate		
gallon/minute (gpm)	cubic meter/minute (m^3/min)	**0.00378541**
gallon/minute (gpm)	liter/minute (L/min)	**3.785412**
barrel/minute (bbl/min)	cubic meter/minute (m^3/min)	**0.119240**
barrel/minute (bbl/min)	liter/minute (L/min)	**119.2401**
Force		
pound (lb)	decanewton (daN)	**0.4448**
pound/foot (lb/ft)	kilogram/meter (kg/m)	**1.4882**
Torque		
pound foot (lb-ft)	newton meter (N-m)	**1.35582**
Pressure		
pound per square inch	megapascal (mPa)	**0.00689476**
pound per square inch	kilopascal (kPa)	**6.894757**
pound per square inch	pascal (Pa)	**6,894.757**

** US Barrels (Liquid): US measurement of volume for non-petroleum liquids*

** US Barrels (Oil): US measurement of volume for petroleum*

Imperial Conversions

Convert From	To	Multiply By
Pressure Gradient		
pound per square inch	killogram/centimeter sq (kg/cm^2)	**0.07030696**
psi/ft	kilopascal/meter (kPa/m)	**22.61822**
Mud Weight		
pound/gallon (ppg)	kilogram/liter (kg/L)	**0.1198**
pound/gallon (ppg)	kilogram/cubic meter (kg/m^3)	**119.8264**
pound/gallon (ppg)	specific gravity	**0.1198264**
pound/cubic foot (lb/ft^3)	kilogram/cubic meter (kg/m^3)	**16.01846**
Funnel Viscosity		
second/quart (s/qt)	second/liter (s/L)	**1.056688**
Power		
horsepower (hp)	kilowatt (kW)	**0.745699**
Well Control		
bbl/ft capacity	liter/meter (L/m)	**521.19195**
bbl/ft capacity	cubic metre/meter (m^3/m)	**0.52119195**
bbl/ft displacement	liter/meter (L/m)	**521.19195**
bbl/ft displacement	cubic metre/meter (m^3/m)	**52119195**
gradient psi/ft	kg/cm^2/m	**0.230643**
gradient psi/ft	kilopascal/meter (kpa/m)	**22.61822**
Temperature		
°fahrenheit (°F)	°celsius (°C)	**(°F - 32)/1.8**

Tensile Strength API Class 2 Drill Pipe

OD (in)	Weight (lb-ft)	ID (in)	E	X-95	G-105	S-135
2 3/8	4.85	1.995	66,686	84,469	93,360	120,035
	6.65	1.815	92,871	117,636	130,019	167,167
2 7/8	6.85	2.441	93,801	117,549	129,922	167,043
	10.40	2.151	143,557	181,839	200,980	258,403
3 1/2	9.50	2.992	132,793	168,204	185,910	239,027
	13.30	2.764	183,398	232,304	256,757	330,116
	15.50	2.602	215,967	273,558	302,354	338,741
4	11.85	3.476	158,132	200,301	221,385	284,638
	14.00	3.340	194,363	246,193	272,108	349,852
	15.70	3.240	219,738	278,335	307,633	395,528
4 1/2	13.75	3.958	185,389	234,827	259,545	333,701
	16.60	3.826	225,771	285,977	316,080	406,388
	20.00	3.640	279,502	354,035	391,302	503,103
	22.82	3.500	317,497	402,163	444,496	571,495
5	16.25	4.408	225,316	285,400	315,442	405,568
	19.50	4.276	270,432	342,548	378,605	486,778
	25.60	4.000	358,731	454,392	502,223	645,715
5 1/2	19.20	4.892	255,954	324,208	358,335	460,717
	21.90	4.778	299,533	379,409	419,346	539,160
	24.70	4.670	339,533	430,076	475,347	611,160
6 5/8	25.20	5.965	337,236	427,166	472,131	607,026

Torsional Strength API Class 2 Drill Pipe

OD (in)	Weight (lb-ft)	ID (in)	E	X-95	G-105	S-135
2 3/8	4.85	1.995	3,224	4,083	4,513	5,802
	6.65	1.815	4,130	5,232	5,782	7,434
2 7/8	6.85	2.441	5,484	6,946	7,677	9,871
	10.40	2.151	7,591	9,615	10,627	13,663
3 1/2	9.50	2.992	9,612	12,176	13,457	17,302
	13.30	2.764	12,365	15,663	17,312	22,258
	15.50	2.602	13,828	17,515	19,359	24,890
4	11.85	3.476	13,281	16,823	18,594	23,907
	14.00	3.340	15,738	19,935	22,034	28,329
	15.70	3.240	17,315	21,932	24,241	31,166
4 1/2	13.75	3.958	17,715	22,439	24,801	31,887
	16.60	3.826	20,908	26,483	29,271	37,634
	20.00	3.640	24,747	31,346	34,645	44,544
	22.82	3.500	27,161	34,404	38,026	48,890
5	16.25	4.408	23,974	30,368	33,564	43,154
	19.50	4.276	27,976	35,436	39,166	50,356
	25.60	4.000	34,947	44,267	48,926	62,905
5 1/2	19.20	4.892	30,208	38,263	42,291	54,374
	21.90	4.778	34,582	43,804	48,414	62,247
	24.70	4.670	38,383	48,619	53,737	69,090
6 5/8	25.20	5.965	48,497	61,430	67,896	87,295

Tensile Strength API Premium Class Drill Pipe

OD (in)	Weight (lb-ft)	ID (in)	E	X-95	G-105	S-135
2 3/8	4.85	1.995	76,893	97,398	107,650	138,407
	6.65	1.815	107,616	136,313	150,662	193,709
2 7/8	6.85	2.441	106,946	135,465	149,752	192,503
	10.40	2.151	166,535	210,945	233,149	299,764
3 1/2	9.50	2.992	152,979	193,774	214,171	275,363
	13.30	2.764	212,150	268,723	297,010	381,870
	15.50	2.602	250,620	317,452	350,868	451,115
4	11.85	3.476	182,016	230,554	254,823	327,630
	14.00	3.340	224,182	283,963	313,854	403,627
	15.70	3.240	253,851	321,544	355,391	456,931
4 1/2	13.75	3.958	213,258	270,127	298,561	383,864
	16.60	3.826	260,165	329,542	364,231	468,297
	20.00	3.640	322,916	409,026	452,082	581,248
	22.82	3.500	367,566	465,584	514,593	661,620
5	16.25	4.408	259,155	328,263	362,817	466,479
	19.50	4.276	311,535	394,612	436,150	560,764
	25.60	4.000	414,690	525,274	580,566	746,443
5 1/2	19.20	4.892	294,260	372,730	411,965	529,669
	21.90	4.778	344,780	436,721	482,692	620,604
	24.70	4.670	391,285	495,627	547,799	704,313
6 5/8	25.20	5.965	387,466	490,790	542,452	697,438

Torsional Strength API Premium Class Drill Pipe

OD (in)	Weight (lb-ft)	ID (in)	E	X-95	G-105	S-135
2 3/8	4.85	1.995	3,725	4,719	5,215	6,705
	6.65	1.815	4,811	6,093	6,735	8,659
2 7/8	6.85	2.441	6,332	8,020	8,865	11,397
	10.40	2.151	8,858	11,220	12,401	15,945
3 1/2	9.50	2.992	11,094	14,052	15,531	19,968
	13.30	2.764	14,361	18,191	20,106	25,850
	15.50	2.602	16,146	20,452	22,605	29,063
4	11.85	3.476	15,310	19,392	21,433	27,557
	14.00	3.340	18,196	23,048	25,474	32,752
	15.70	3.240	20,067	25,418	28,094	36,120
4 1/2	13.75	3.958	20,403	25,844	28,564	36,725
	16.60	3.826	24,139	30,576	33,795	43,450
	20.00	3.640	28,683	36,332	40,157	51,630
	22.82	3.500	31,587	40,010	44,222	56,856
5	16.25	4.408	27,607	34,969	38,650	49,693
	19.50	4.276	32,285	40,895	45,199	58,113
	25.60	4.000	40,544	51,356	56,762	72,979
5 1/2	19.20	4.892	34,764	44,035	48,670	62,575
	21.90	4.778	39,863	50,494	55,809	71,754
	24.70	4.670	44,320	56,139	62,048	79,776
6 5/8	25.20	5.965	55,766	71,522	79,050	101,635

Nozzle Comparison/Total Flow Area (TFA)

Size (32's)	Size (mm)	TFA (mm^2)	TFA (in^2)
7	5.5	24.0	0.0376
8	6.4	32.2	0.0491
9	7.1	39.6	0.0621
10	7.9	48.9	0.0767
11	8.7	59.2	0.0928
12	9.5	70.5	0.1104
13	10.3	82.7	0.1296
14	11.1	96.8	0.1503
15	11.9	111.2	0.1726
16	12.7	126.7	0.1964
17	13.4	141.4	0.2217
18	14.3	160.6	0.2485
19	15.0	176.6	0.2769
20	15.9	198.6	0.3068
21	16.6	215.8	0.3382
22	17.5	240.5	0.3712
23	18.2	258.8	0.4057
24	19.0	283.5	0.4418
25	19.7	305.8	0.4794
26	20.5	330.8	0.5185
27	21.3	356.7	0.5591
28	22.1	383.6	0.6013

Imperial Displacement of Triplex Pumps (100% Efficiency)

Liner Diameter (in)	Stroke Length 7"	Stroke Length 7 ½"	Stroke Length 8"	Stroke Length 8 ½"	Stroke Length 9"	Stroke Length 9 ½"	Stroke Length 10"	Stroke Length 11"	Stroke Length 12"
3	0.015	0.016	0.017	0.019	0.020	0.021	0.022	0.024	0.026
3¼	0.018	0.019	0.021	0.022	0.023	0.024	0.026	0.028	0.031
3½	0.021	0.022	0.024	0.025	0.027	0.028	0.030	0.033	0.036
3¾	0.024	0.026	0.027	0.029	0.031	0.032	0.034	0.038	0.041
4	0.027	0.029	0.031	0.033	0.035	0.036	0.039	0.043	0.047
4¼	0.031	0.033	0.035	0.037	0.039	0.041	0.044	0.048	0.053
4½	0.034	0.037	0.039	0.042	0.044	0.045	0.049	0.054	0.059
4¾	0.038	0.041	0.044	0.047	0.049	0.051	0.055	0.060	0.066
5	0.043	0.045	0.049	0.052	0.055	0.056	0.061	0.067	0.073
5¼	0.047	0.050	0.054	0.057	0.060	0.062	0.067	0.074	0.080
5½	0.051	0.055	0.059	0.062	0.066	0.068	0.073	0.081	0.088
5¾	0.056	0.060	0.064	0.068	0.072	0.074	0.080	0.088	0.096
6	0.061	0.065	0.070	0.074	0.079	0.081	0.087	0.096	0.105
6¼	0.066	0.071	0.076	0.081	0.085	0.088	0.095	0.104	0.114
6½	0.072	0.077	0.082	0.087	0.092	0.095	0.103	0.113	0.123
6¾	0.077	0.083	0.088	0.094	0.100	0.102	0.111	0.122	0.133
7	0.083	0.089	0.095	0.101	0.107	0.110	0.119	0.131	0.143

Displacement expressed in barrels per stroke (bps) (US oil)

Metric Displacement of Triplex Pumps (100% Efficiency)

Liner Diameter (in)	Stroke Length 7"	Stroke Length 7 ½"	Stroke Length 8"	Stroke Length 8 ½"	Stroke Length 9"	Stroke Length 9 ½"	Stroke Length 10"	Stroke Length 11"	Stroke Length 12"
3	2.38	2.54	2.70	3.02	3.18	3.34	3.50	3.82	3.82
3¼	2.86	3.02	3.34	3.50	3.66	3.82	4.13	4.45	4.45
3½	3.34	3.50	3.82	3.98	4.29	4.45	4.77	5.25	5.25
3¾	3.82	4.13	4.29	4.61	4.93	5.09	5.41	6.04	6.04
4	4.29	4.61	4.93	5.25	5.56	5.72	6.20	6.84	6.84
4¼	4.93	5.25	5.57	5.88	6.20	6.52	7.00	7.63	7.63
4½	5.41	5.88	6.20	6.68	7.00	7.15	7.79	8.59	8.59
4¾	6.04	6.52	7.00	7.47	7.79	8.11	8.74	9.54	9.54
5	6.84	7.15	7.79	8.27	8.74	8.90	9.70	10.65	10.65
5¼	7.47	7.95	8.59	9.06	9.54	9.86	10.65	11.77	11.77
5½	8.11	8.74	9.38	9.86	10.49	10.81	11.61	12.88	12.88
5¾	8.90	9.54	10.18	10.81	11.45	11.77	12.72	13.99	13.99
6	9.70	10.33	11.13	11.77	12.56	12.88	13.83	15.26	15.26
6¼	10.49	11.29	12.08	12.88	13.51	13.99	15.10	16.54	16.54
6½	11.45	12.24	13.04	13.83	14.63	15.10	16.38	17.97	17.97
6¾	12.24	13.20	14.00	14.95	15.90	16.22	17.65	19.40	19.40
7	13.20	14.15	15.10	16.06	17.01	17.49	18.92	20.83	20.83

Displacement expressed in liters per stroke (lps)

Formulas

Mechanical Power

$$HP = \frac{TS}{5{,}250}$$

HP = Horsepower
S = Speed (rpm)
T = Torque (lb–ft)

$$kW = \frac{TS}{9{,}548.8}$$

kW = Kilowatt
S = Speed (rpm)
T = Torque (N-m)

Hydraulic Power

$$HP = \frac{PQ}{1{,}714}$$

HP = Horsepower
P = Pressure Drop (psi)
Q = Flow Rate (US gpm)

$$kW = \frac{PQ}{60{,}000}$$

kW = Kilowatt
S = Speed (rpm)
T = Torque (N-m)

Pressure Across Bit

$$P = \frac{Q^2W}{10{,}858A^2}$$

P = Pressure Drop (psi)
Q = Flow Rate (US gpm)
W = Fluid Weight (lb/gal)
A = Nozzle Area (in^2)

$$P = \frac{Q^2W}{6.49643A^2}$$

P = Pressure Drop (kPa)
Q = Flow Rate (lpm)
W = Fluid Weight (kg/m^3)
A = Nozzle Area (mm^2)

Hydrostatic Pressure

$$P = 0.52\,(TVD)\,W$$

P = Pressure Drop (psi)
TVD = True Vertical Depth (ft)
W = Fluid Weight (lb/gal)

$$P = 0.0981(TVD)\,W$$

P = Pressure Drop (kPa)
TVD = True Vertical Depth (m)
W = Fluid Weight (kg/m^3)

Annular Velocity

$$V = \frac{0.4085Q}{(D_h^2 - D_s^2)}$$

V = Velocity (ft/sec)
Q = Flow Rate (US gpm)
D_h = Hole Diameter (in)
D_s = String Diametrer (in)

$$V = \frac{1{,}273Q}{(D_h^2 - D_s^2)}$$

V = Velocity (m/min)
Q = Flow Rate (lpm)
D_h = Hole Diameter (mm)
D_s = String Diameter (mm)

$$\% = \frac{32.64TS}{QP}$$

% = Percent Motor Efficiency
T = Torque (lb–ft)
S = Speed (rpm)
P = Pressure Drop (psi)
Q = Flow Rate (US gpm)