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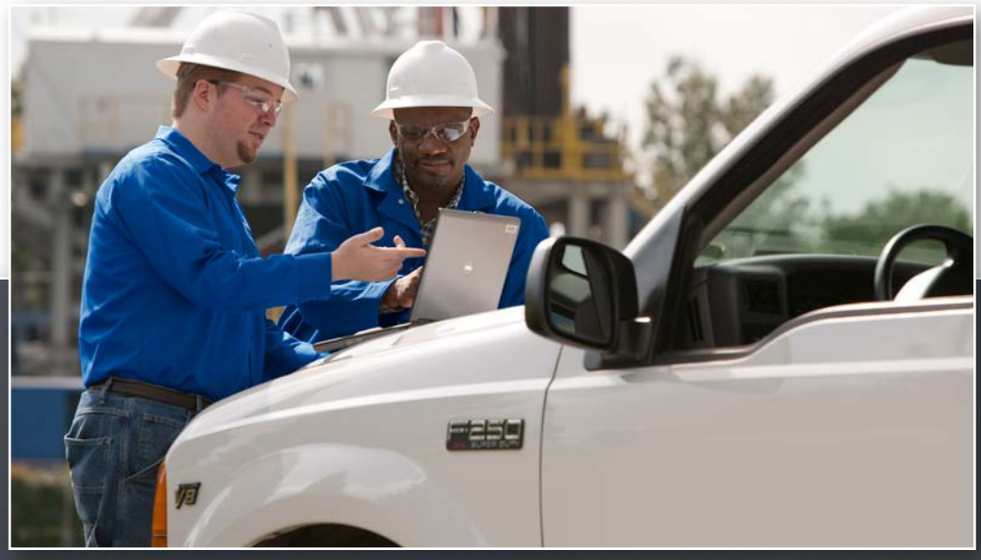


Shock Sub tool

Impact and vibration reduction tool

Shock Sub tool with Belleville spring assembly in compression.

During drilling and milling operations, the drill bit imparts various dynamic impact loads to the drillstring. These loads, which are cyclical in nature, can lead to premature failure of the drillstring and rig equipment, low ROP, and hole problems—all translating to a higher cost of drilling per foot.

The Shock Sub* tool impact and vibration reduction sub is a drillstring component that is designed to absorb and dampen the variable axial dynamic loads produced by the drill bit during "normal" drilling operations, by interrupting the harmonic cycle created by the bit. The tool uses a bidirectional spring action that allows it to automatically adjust for a wide range of values for weight on bit (WOB). As axial loads are produced, energy is absorbed through the use of the Belleville spring assembly, while force dampening is accomplished by mechanical friction.

Innovative technologies for modern drilling

Advances in drilling technology have necessitated the redesign of shock tools to account for new parameters.

- Increased hole deviation means that the weight required to activate the previous generation of shock tools is simply not available at the bit.
- Drilling motors and MWD tools require drillstring components with a larger ID.
- As well profiles and BHAs have grown more complex, downhole tools need to be more reliable in order to minimize increasingly expensive NPT.

With enhanced reliability, better fatigue and corrosion resistance, large ID, significant reduction of vibrations, and the ability to operate with low WOB, the Shock Sub tool meets these challenges.

Durable construction you can rely on

The Shock Sub tool is made of high-quality, hardened steel, and the OD and designed service connections are for longer fatigue life. Rotary shoulder connections incorporate the API stress-relief groove and bore-back box. The seals can withstand temperatures up to 450 degF.

Continuous shock absorption

As a roller cone bit rotates, it produces a pattern of "peaks and valleys" on the bottom of the borehole. With each revolution of the bit, the cones will tend to follow this sinusoidal contour, producing a cyclical oscillation of the drillstring.

The springs in the Shock Sub tool—normally used to keep the tool extended—are compressed and absorb the shock load produced by the bit cones as they progress through one of the "peaks". Additionally, the load is dissipated by the mechanical friction resulting from the movement of the spring stack. When the bit cones move into a "valley", the Shock Sub tool's springs will extend the tool to its normal position. A similar compression and extension of the springs is produced in response to the axial movement of a hammer bit. These two combined actions isolate the axial loads present during the drilling operation and maintain a near constant WOB when the tool is run within its operational load limits.

The Belleville spring stack has been engineered for optimal WOB range and performance. The spring rate can be adjusted in the workshop to meet application-specific requirements. The Shock Sub tool works equally well with low or high WOB. Seals isolate internal components from the drilling fluid.

The tool does not need to be activated to operate. During the drilling or milling operation, it is constantly working, regardless of the hole depth, bit weight, mud weight, or torque.

Applications

- Drilling competent sediments in straight holes with roller cone or hammer bits
- Some directional applications: hard formations, horizontal sections, directionally drilled crossings
- Milling operations: sections, windows, casing
- Under-reaming and hole opening
- Coiled tubing drilling operations

Benefits

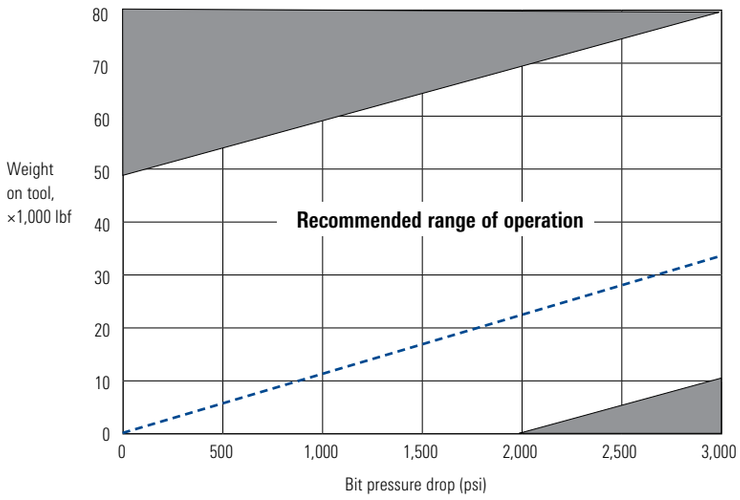
- Increased ROP
- Longer life for the cutting structure and bearings because of reduced impact loads
- Extended connection life
- Reduced shock loads on surface equipment
- Lower drilling cost per foot

Operating parameters

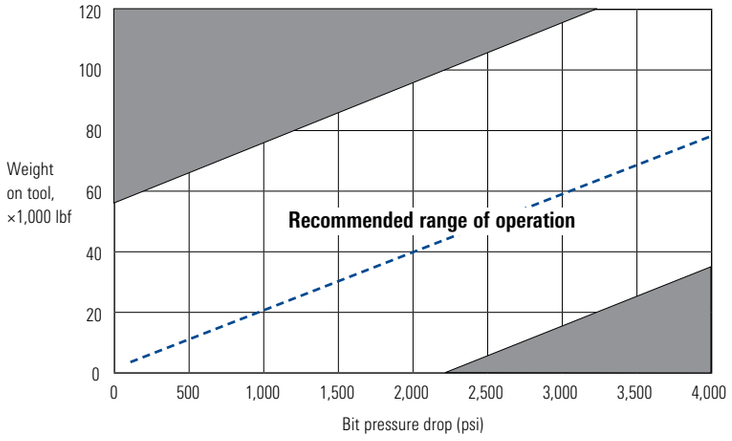
Maximum shock absorption is achieved by placing the Shock Sub tool as close to the bit or drilling motor as possible. The use of the Shock Sub tool is most beneficial when drilling in hard rock, broken formations, and intermittent hard and soft streaks. At shallow depths, rough running in these formations transmits vibrations to the surface. At greater depths these vibrations may not be transmitted to the surface because of stretch in the drillpipe, but the damaging effects to the bit, drill collars, and lower end of the drillpipe may still exist.

The Shock Sub tool size must be matched to the drill collar OD and it should be run within generally accepted oilfield WOB and rotary parameters. It can be placed between two points of stabilization, preferably separated from each stabilizer by at least a pony collar. Shock Sub tools are built to standard ID specifications, and under average operating conditions they can provide up to 300 hours of service. The tool is not recommended to be run in the neutral zone, in tension, or in hole sizes greater than 1.65–1.85 times the OD of the tool unless approved by Schlumberger. Normal oilfield recommended makeup and breakout procedures are applicable.

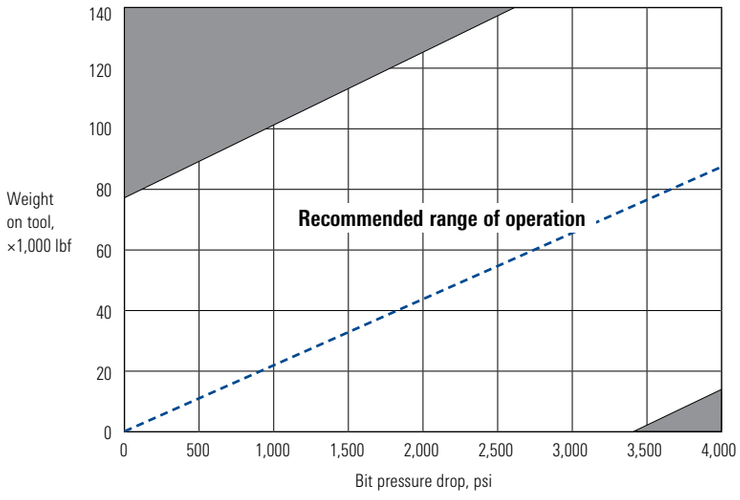
Range of operation for 4.75–5.0-in tool size



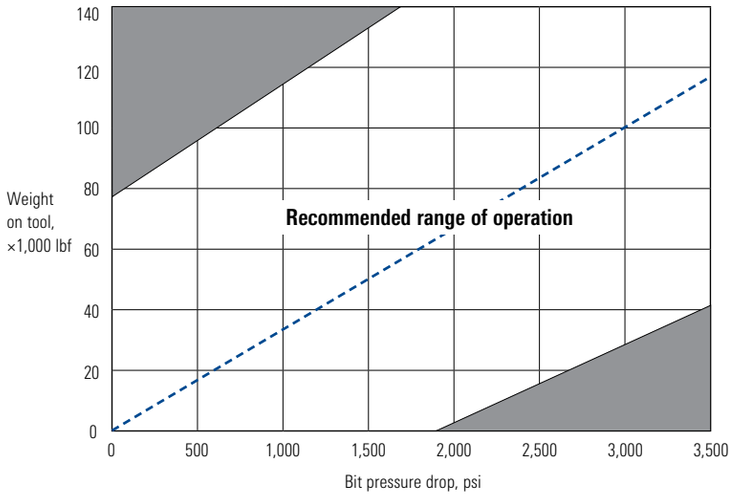
Range of operation for 6.5-in tool size



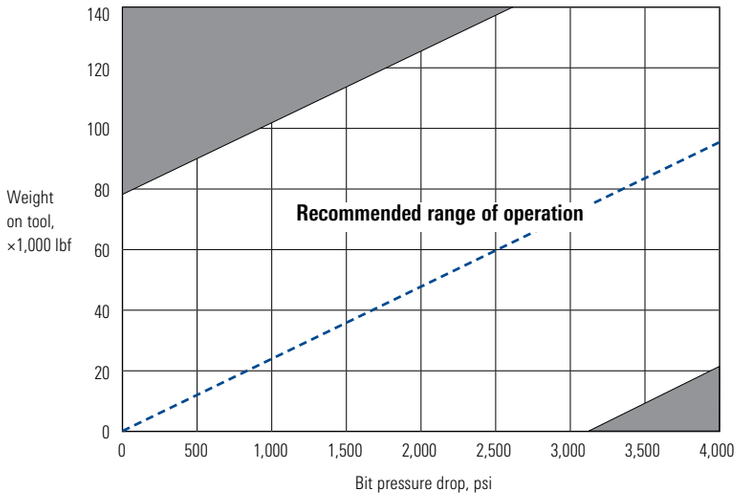
Range of operation for 8-in tool size



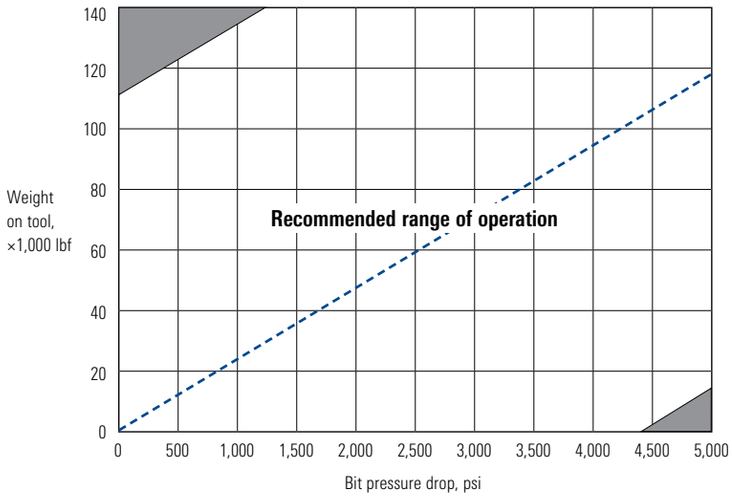
Range of operation for 9.5-in tool size



Range of operation for 12-in tool size



Range of operation for 14-in tool size



Shock Sub tool

With enhanced reliability, better fatigue and corrosion resistance, large ID, significant reduction of vibrations, and the ability to operate with low WOB, the Shock Sub tool meets the challenges of modern drilling.

Shock Sub Tool Specifications

Overall Diameter, in [mm]	Internal Diameter, in [mm]	Tool Joint Connection, in	Tensile Yield, lbf [N]	Torsional Yield, lbf.ft [N.m]	Approx. Weight, lbm [kg]	Length, ft [m]
4.75 [121]	1.75 [44]	3½ IF	415,000 [1,846,000]	17,500 [23,700]	600 [270]	11.5 [3.50]
5.0 [127]	1.75 [44]	XT39	589,000 [2,620,000]	31,000 [42,000]	800 [360]	11.5 [3.50]
6.5 [165]	2.25 [57]	4½ IF 4½ XH	800,000 [3,559,000]	57,000 [77,200]	1,300 [590]	12.0 [3.68]
8.0 [203]	3.00 [76]	6⅝ Reg	1,100,000 [4,893,000]	84,000 [113,900]	1,800 [817]	13.5 [4.12]
9.5 [241]	3.00 [76]	7⅝ Reg	1,800,000 [8,006,000]	150,000 [203,300]	2,700 [1,225]	13.5 [4.12]
12.0 [305]	3.25 [83]	7⅝ H90	2,300,000 [10,230,000]	250,000 [339,000]	4,500 [2,041]	13.8 [4.21]

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