

RENTAL TOOL SERVICES

Megaton™ Impact Tools



KNIGHT
oil tools

Megaton Impact Tools optimize your drilling operations.



New-Generation Drilling Tools

Knight Oil Tools is the exclusive manufacturer and provider of Megaton drilling jars, energizers and shock tools in the U.S. The Megaton tools are manufactured in Broussard, Louisiana by Knight Manufacturing LLC, a service line of Knight Oil Tools. Knight Manufacturing unit has maintained API Spec. Q1-7-1/5CT and Grant Prideco certification for more than five years. The Megaton tools are manufactured to API Q1 Standards, using high-strength 4330 V-modified steel developed to Knight Oil Tools' specifications. Since these tools are manufactured in-house, Knight Oil Tools is able to provide superior quality control and on-time delivery.

A Proven Performer

The Megaton product line has a proven track record in the N. Sea and various other oil and gas producing areas worldwide that dates back to 2004. The Megaton tools have been used in U.S. markets, such as, Gulf of Mexico deep-water, Eagle Ford Shale, Haynesville Shale, Permian Basin, S. Louisiana land and inland water, Oklahoma and E. Texas land locations. The Megaton product line has provided exceptional results in both drilling and fishing operations throughout these areas. The wells ranged from ultra-deepwater to multi-lateral, extended-reach horizontal wells.

With a strong track record and Knight Oil Tools' manufacturing capabilities, the Megaton product line is a field-proven extension to the Rental Tool Services line of existing products.



Megaton Drilling Jar Frees the Toughest Stuck Pipe

The Megaton (HP) drilling jar, with Ulti-Torq connections, is a new generation of drilling tool designed and manufactured for the severe drilling conditions of today. The Megaton jars ensure secure and durable operation while providing high impact as and when required. They also provide several distinct advantages over conventional hydraulic or mechanical drilling jars, including industry leading torsional yield, involute spline design, and a superior metering system.



Megaton™ Impact Tools Advantages and Benefits

- Ulti-Torq™ high-torque, double shoulder connections
- Involute spline design
- High-strength steel developed to Knight Oil Tools' specifications
- High-temperature seal kits available
- Manufactured to API Q1 Standards



Simple Tool Operation

The Megaton drilling jar is operated by the simple up and down motion of the drill string. The intensity of the up-jarring force is directly proportional to applied tension, while the down-jarring force is directly proportional to the slack-off weight applied.



Megaton™ Drilling Jar Advantages and Benefits

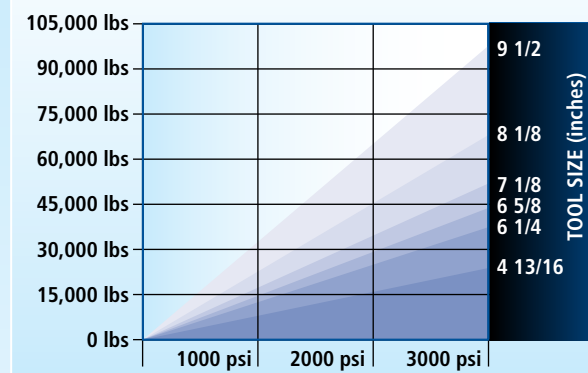
- Can be run in compression or tension
- Fully-interchangeable upper and lower connectors to accommodate various connection sizes
- High-stress areas optimized to ensure balance with regard to bend stiffness ratio

Megaton Drilling Jar Features

- Involute spline drive section provides the option for torque transmission while jarring
- Tool BSR designed to ensure even stress distribution across length of tool
- Low-friction seals
- Valve design includes unique jet to provide improved filtering of hydraulic fluid and ensure consistent delay times
- Can accommodate any BHA based on flexibility of tool
- Large pump open area

PUMP OPEN FORCE

Force created by pressure drop across the bit



SPECIFICATIONS

Jar and Energizer Series	Units	47	62	66	71	81	96
Tool Size OD (New)	in. (mm)	4.89 (124)	6.36 (162)	6.73 (171)	7.125 (180.98)	8.28 (210)	9.69 (246)
Bore ID	in. (mm)	2.25 (57)	2.44 (62)	2.56 (65)	2.750 (69.85)	3.00 (76)	3.25 (83)
Overpull Max (pre-jarring at jar)	lbs. (kg)	95,000 (43,091)	165,000 (74,842)	190,000 (86,182)	225,000 (104,326)	300,000 (136,077)	425,000 (192,776)
Tensile Yield	lbf (N)	402,740 (1,791,477)	766,150 (3,408,004)	921,000 (4,096,812)	1,055,000 (4,692,874)	1,564,000 (6,957,018)	2,014,000 (8,958,718)
Torsional Yield	lbf*ft (Nm)	32,200 (43,657)	77,510 (105,089)	86,400 (117,143)	94,930 (128,708)	162,200 (219,914)	227,300 (308,177)
Pump Open Area	sq. in (sq mm)	7.43 (4,794)	12.6 (8,129)	14.48 (9,342)	17.30 (11,161)	22.40 (14,452)	32.99 (21,284)
Total Stroke	in. (mm)	22 (558)	22 (558)	22 (558)	22 (558)	22 (558)	22 (558)
Max Temp (standard)	°F (°C)	350 (176)	350 (176)	350 (176)	350 (176)	350 (176)	350 (176)
Max Temp (high)	°F (°C)	450 (232)	450 (232)	450 (232)	450 (232)	450 (232)	450 (232)
Max Drilling Hrs Up to 350° F	hrs.	350	350	350	350	350	350
Max Drilling Hrs Up to 450° F	hrs.	200	200	200	200	200	200
Length Approx.	ft. (m)	32 (9.8)	32 (9.8)	32 (9.8)	32 (9.8)	32 (9.8)	32 (9.8)
Weight Approx.	lbs. (kg)	1,320 (600)	2,420 (1,100)	2,860 (1,300)	3,350 (1,520)	4,600 (2,090)	6,400 (2,910)

Megaton™ Energizer Advantages and Benefits

- All energizers are two-way (double-acting)
- All energizers are two-stage
- Protects top-side equipment in shallow sections
- Concentrates impact to stuck point
- Simple push/pull operation



Megaton Energizer—Maximizing the Megaton Drilling Jar

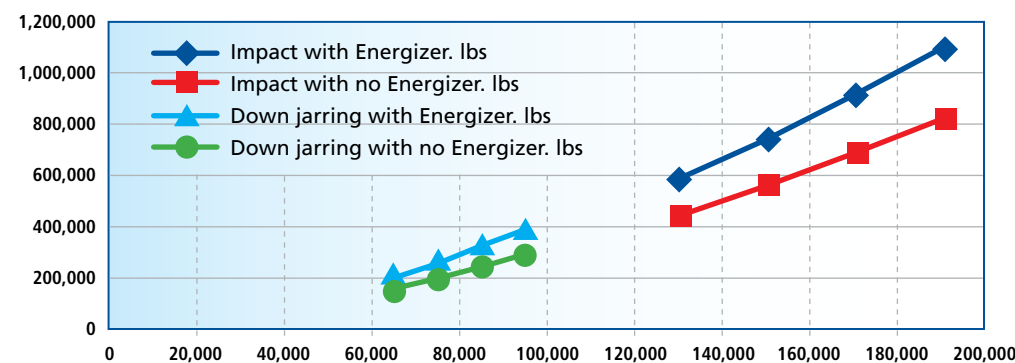
The Megaton Energizer is a two-way tool that stores pipe stretch for use when jarring up and down. The energy is stored in a number of steel disc springs that are compressed when the tool is activated. It operates automatically with the jar while protecting the drill string and surface equipment from damaging shock waves.

In a drill string without a Megaton Energizer, the impact of a jar is dependent on pipe stretch (overpull) and the ability of the drill pipe to contract when the jar is released. When used as a supplement to the Megaton drilling jar, Belleville disc springs compressing inside the Megaton Energizer compensate for limited pipe stretch in shallow or deviated holes. These compressed springs provide stored energy so that high impact is achieved regardless of depth (or amount of overpull achieved). The Megaton Energizer also optimizes jar performance in high-angle, extended-reach and horizontal wells, where the stored energy in the drill pipe is lost due to friction.

JAR PLACEMENT IMPACT ANALYSIS

Overpull, lbs	190,000	170,000	150,000	130,000	
Impact with Energizer, lbs	1,095,473	914,596	744,941	587,306	Pipe stretch, in:46 Press. drop bit, psi:199.2 Pump open force lbs:3,913 Pipe stretch is ok
Impact no Energizer, lbs	823,045	687,149	559,685	441,252	
Down jarring with Energizer, lbs	387,308	323,358	263,376	207,644	
Down jarring with no Energizer, lbs	290,990	242,944	197,878	156,006	

The use of jar placement modeling software shows increased impact when the Megaton Energizer is used in conjunction with the Megaton drilling jar. Using information from the operator's well plan, including BHA and wellbore parameters, the software recommends the optimal placement to achieve the highest impact.



Megaton Shock Tool Impact and Vibration Reduction Sub

The Megaton shock tool is the new-generation impact tool that incorporates both proven and new technology for superior performance. Using Belleville-style disc springs, a unique dampening system and pump-open force enable the Megaton shock tool to produce maximum bit performance. During drilling or milling, the tools will normally be run partially compressed, enabling compensation in both up and down directions to ensure that the bit/mill remains on bottom.

Megaton Shock Tool Operation

The Megaton shock tool incorporates a pressure-balancing piston that equalizes pressure inside the tool with the pressure inside the drill string. Because of this, the pressure drop across the bit will tend to extend the tool. The amount will depend on a balance between Weight On Bit (WOB) and pump-open force. If the hydraulic force extending the impact tool is greater than WOB, the tool will open, compressing the spring assembly from the lower end until the tool reaches a balance. If the pump-open force is less than WOB, the tool will close, compressing the spring assembly from the upper end until the tool reaches a balance.

Jarring with the Megaton Shock Tool

The Megaton shock tool is sprung in both directions but when jarring is necessary, overpulling the tool will bring the split bushing in contact with the pin on the splined housing. This causes the tool to act as an integral part of the drill string, eliminating any adverse reaction from the spring system while jarring.

Megaton Shock Tool Features

- Tool sprung in both directions
- Metal-to-metal contact when jarring up
- Hydrostatically balanced
- Involute spline design is stabilized and will not build angle
- Internal mechanical safety bearing
- Tool is fully stress relieved both internally and externally

Megaton Shock Tool Benefits

- Reduced bit/mill bounce
- Extended bit/mill life and performance
- Reduced shock loads transferred through drill string, protecting LWD equipment
- Increased ROP
- Extended connection life
- Lower drilling cost per foot



SPECIFICATIONS

Shock Tool Series	Units	47	62	66	80	96
Tool Size OD (New)	in. (mm)	4.89 (124)	6.36 (162)	6.73 (171)	8.26 (210)	9.67 (246)
Bore ID	in. (mm)	2.25 (57)	2.56 (65)	2.75 (70)	3.25 (83)	3.75 (95)
Tensile Yield	lbf (N)	508,080 (2,260,052)	792,150 (359,313)	894,560 (4,096,812)	1,399,820 (6,226,710)	2,168,640 (9,646,591)
Torsional Yield	lbf*ft (Nm)	32,200 (43,657)	77,510 (105,089)	86,400 (117,143)	162,200 (219,914)	227,300 (308,177)
Pump Open Area	sq. in (sq mm)	7.43 (4,794)	13.51 (8,716)	14.96 (9,651)	23.6 (15,226)	33.16 (21,394)
Max Temp (standard)	°F (°C)	350 (176)	350 (176)	350 (176)	350 (176)	350 (176)
Max Temp (high)	°F (°C)	450 (232)	450 (232)	450 (232)	450 (232)	450 (232)
Max Drilling Hrs Up to 350° F	hrs.	350	350	350	350	350
Max Drilling Hrs Up to 450° F	hrs.	200	200	200	200	200
Length Approx.	ft. (m)	16 (4.9)	17 (5.2)	16 (4.9)	16 (4.9)	16 (4.9)
Weight Approx.	lbs. (kg)	660 (300)	1,100 (500)	1,320 (600)	2,200 (1000)	3,080 (1400)



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