



ARRIVAL
ENERGY SOLUTIONS



Anvil

Hydromechanical Drilling Jar

The ULTIMATE in Downhole Jarring & Impacting

The Anvil Drilling Jar is installed in any drill-string to provide means to unstick a drill string should it become mechanically or differentially wedged in to the formation. The increased stroke length of the Anvil provides operators with larger impact than other available jars. The bi-directional jar action gives the operator the ability to fire the jar in the uphole or downhole directions. Accidental firing of the jar is prevented by a mechanical latch that holds the internal mandrel in place during tripping and drilling operations.

Benefits & Features

- Simple operation with hydraulic delay upstroke and mechanical downstroke.
- Internal Lee Visco Jet metering valve provides reliable and repeatable hydraulic delay that is temperature independent providing constant timing even during repeated firing.
- Large through bore for high flow rates and MWD sonde retrieval can be used in directional, horizontal and extended reach wells.
- Robust internal mechanical latch prevents accidental firing.
- One of the longest strokes available in the industry allows the operator to deliver massive jar impacts to unstick the pipe preventing costly loss of time or equipment.

Arrival Canada
(780) 983-8300

Arrival USA
(833) 645-8665

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Operation Sequence

Pump-Open Force Graph

Jarring Up

- 1 Apply enough drill string over pull at the jar to overcome the mechanical latch setting.
- 2 Continue to apply upward loading through hydraulic delay and free stroke.
- 3 Close the jar by lowering the drill string and resetting the mechanical latch.
- 4 Repeat as necessary.

Example: Weight Indicator reading to jar up

Total drill string weight	300,000	(lb)	1334	(kN)
Drill string weight below jar	-65,000		-289	
Drill string weight above jar	235,000		1045	
Hole drag upward	+20,000		+89	
Pump open force	-29,000		-131	
Jar up latch setting	+50,000		+222	
Min. weight indicator to jar up	275,500		1225	
Max. tensile load during hydraulic delay	+80,000		+356	
Jar-up latch settings	-50,000		-222	
Max. weight indicator to jar-up	305,500		1359	

Jarring Down

- 1 Apply enough drill string weight at the jar to overcome the mechanical latch setting and continue to apply load until downward impact.
- 2 Open the jar by raising the drill string and resetting the mechanical latch.
- 3 Repeat as necessary.

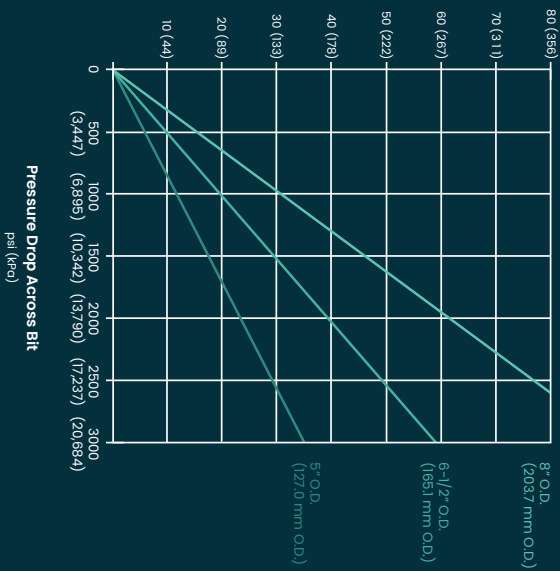
Example: Weight Indicator reading to jar down

Total drill string weight	300,000	(lb)	1334	(kN)
Drill string weight below jar	-65,000		-289	
Drill string weight above jar	235,000		1045	
Hole drag upward	+20,000		+89	
Pump open force	-29,400		-131	
Jar-down latch setting	-25,000		-111	
Min. weight indicator to jar-down	200,500		892	
Max. weight indicator to jar-down	300,000		1334	

(available drill string weight)

Pump Open Force

x 1000 lbf (kN)



Note: Pump open force is the force generated by the surface mud pump system which acts to open the jar. Higher pump rates will make unlatching to jar upwards easier and will increase the upward impact. Lower or no pump rate will make unlatching to jar downward easier and will increase the downward impact. The jar-up and jar-down settings are marked on the Delivery Ticket.

Technical Specifications

Outside Diameter	in (mm)	5.250 (134.0)	6.500 (165.0)	6.750 (171.5)	8.000 (203.2)
Inner Diameter	in (mm)	2.375 (60.3)	2.625 (66.7)	2.750 (69.9)	3.00 (76.2)
Standard Tool Joint Connection		3-1/2" IF (NC 38) or 4" FH (NC 40)	4" IF (NC 46)	4-1/2" IF (NC 50)	6-5/8" REG
Open Length (In Latched Position)	ft (m)	23.8 (7.25)	23.5 (7.16)	23.5 (7.16)	23.5 (7.16)
Up Latch Release Force	lb (daN)	90,000 (40,035)	120,000 (54,000)	142,000 (63,390)	150,000 (66,725)
	Typical	60,000 (26,690)	80,000 (36,000)	95,000 (42,260)	10,000 (44,484)
Down Latch Release Force	lb (daN)	30,000 (13,345)	40,000 (18,000)	47,500 (21,130)	50,000 (22,242)
Tensile Load During Hydraulic Delay	lb (daN)	118,000 (52,491)	135,000 (60,000)	143,400 (63,790)	290,000 (129,003)
Tensile Load After Jarring	Maximum	383,000 (170,373)	650,000 (290,000)	674,110 (299,870)	1,000,000 (444,840)
Maximum Torsional Load (Yield)	ft-lb (Nm)	16,750 (22,710)	36,500 (49,500)	38,600 (52,335)	64,700 (87,721)
Mandrel Area (to calculate pump-open force)	in ² (cm ²)	13.4 (86.45)	19.6 (126.5)	20.6 (132.9)	30.7 (198.1)
Total Stroke	in (mm)	24 (609.2)	24 (609.2)	24 (609.2)	24 (609.2)
Maximum Temperature (HNBR Seals)	°F (°C)	250 (121)	250 (121)	250 (121)	250 (121)
Minimum Temperature (Fluorocarbon Seals)	°F (°C)	400 (204)	400 (204)	400 (204)	400 (204)