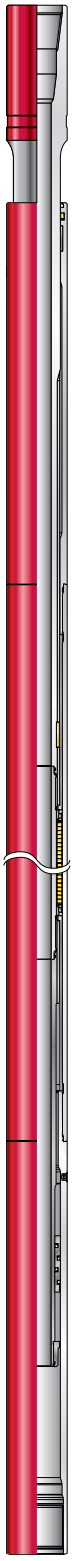
MA Drilling Impact Enhancer



Weatherford's patented MA drilling impact enhancer is designed for use in conjunction with a drilling jar to maximize the impact forces delivered to the stuck point during jarring operations.

The enhancer features mechanical action both upward and downward to maximize impact and jarring performance. Placed in the string above the jar, the enhancer adjusts automatically to the load applied up or down to provide maximum acceleration of the hammer mass and increased impact and impulse values.

Applications

The MA drilling impact enhancer is designed for use in all conventional, deviated, and extended-reach wells, including:

- demanding drilling conditions
- shallow jarring operations
- extended-reach-drilling jarring operations
- high-temperature applications

Features, Advantages and Benefits

- Unique steel-disk spring system enables upward/downward mechanical action, which increases acceleration of the hammer mass to improve impact and impulse for greater jarring efficiency.
- Bi-directional steel-disk spring system also absorbs and minimizes shock waves during jarring operations to reduce strain on surface equipment.
- Several features make the MA drilling impact enhancer a strong and durable tool:
  - Heat-treated, high-strength steel is tested to meet severe tensile, torsional, impact, and hardness requirements.
  - The combination of design and high-strength steels with stress-relieved threaded connections and load-bearing parts creates one of the most rugged and durable accelerators available today.
  - The accelerator is not affected by high temperatures.

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Specifications

Circulating pressure (psi/*bar*)	5,000 *345*			
Hydrostatic pressure (psi/*bar*)	None			
New[a] OD (in./*mm*)	4.844 *123.04*	6-21/32 *169.07*	8-5/32 *207.16*	9-11/16 *246.07*
Nominal OD (in./*mm*)	4-3/4 *120.65*	6-1/2 *165.10*	8 *203.20*	9-1/2 *241.30*
Nominal ID (in./*mm*)	2.250 *57.15*	2.520 *64.01*	2.813 *71.45*	3.000 *76.20*
Standard connections	3-1/2 IF NC38	4-1/2 IF NC50	6-5/8 Reg/FH	7-5/8 Reg
Tensile yield[b] (lbf/*kN*)	480,000 *2,135*	916,000 *4,075*	1,681,000 *7,477*	1,942,000 *8,638*
Torsional yield[c] (lbf-ft/*kN•m*)	12,518 *17.0*	45,980 *62.3*	77,831 *105.5*	140,415 *190.4*
Maximum pre-jarring pull (lbf/*kN*)	100,000 *445*	180,000 *801*	295,000 *1,312*	410,000 *1,824*
Tool length (ft/*m*)	23 *7.0*			
Tool length c/w top sub (ft/*m*)	31 *9.4*			
Weight (lb/*kg*)	1,000 *454*	2,250 *1,021*	3,400 *1,542*	4,750 *2,155*
Weight c/w top sub (lb/*kg*)	1,500 *680*	3,000 *1,361*	4,600 *2,087*	6,400 *2,903*
Overall jar stroke (in./*mm*)	14 *356*			
Maximum temperature, standard seals (°F/°*C*)	275° *135°*			
Maximum temperature, high-temperature seals[d] (°F/°*C*)	392° *200°*			
Pump-open area (in.^{2}/*cm*^{2})	11.0 *71.0*	16.8 *108.4*	28.3 *182.6*	35.8 *231.0*

[a] New OD is based on nominal OD plus wear allowance.
[b] Tensile yield is based on nominal OD and the published yield strength of material.
[c] Torsional yield is based on the weakest tool joint connection at nominal OD and calculated per API RP7G and the published yield strength of material.
[d] The maximum temperature is available upon request only.

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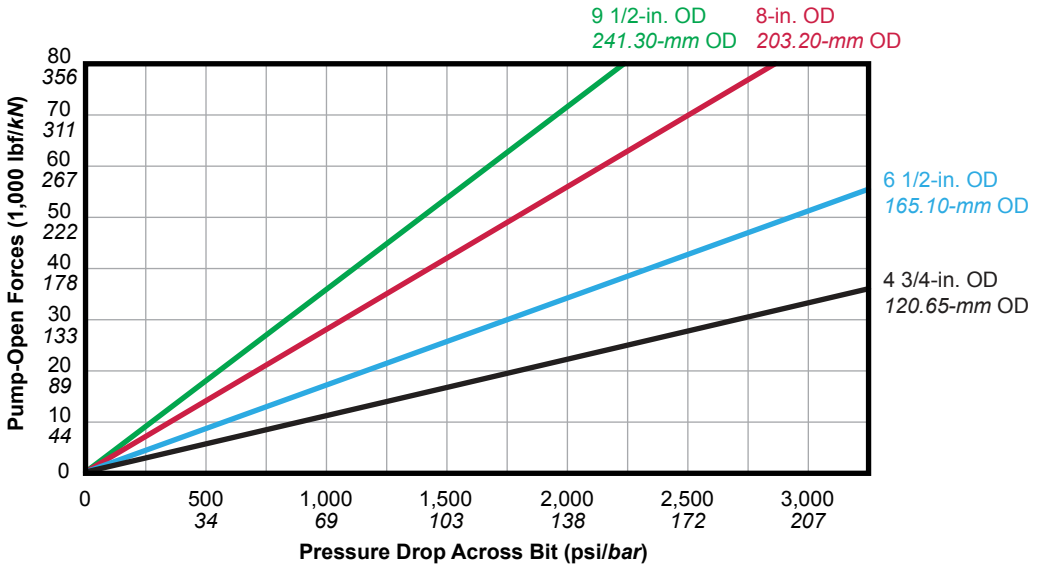
Pump-Open Force Chart



Pump-open force is created by pressure drop across the bit. The pump pressure creates a reaction force in the tool that tries to force it open. Reduce the pump to idle before attempting to jar.

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Operation

Run the enhancer above the jar with adequate joints of heavyweight pipe or drill collars between it and the jar. If down-jarring is anticipated, run several joints of heavyweight pipe or drill collars above the enhancer. The weight above the enhancer compresses the mechanical springs during down-jarring. After the jar releases,this compression accelerates the weight between the jar and enhancer downward. The load that the drawworks places on the drillpipe as the pipe is pulled to actuate the jar compresses the springs during up-jarring. After the jar releases, the spring force within the enhancer and the stretch of the pipe above it cause the weight between the jar and enhancer to accelerate upward to impact.

The enhancer is not affected by drilling torque. No pipe manipulation, other than axial motion, is required for operating this tool.

Caution: Avoid placement at the transition point between the bottomhole assembly and the string or near stabilizers to prevent excessive loading on the tool and possible premature failure.

Maintenance

Take the following steps each trip out of the hole:

1. Wash the mud from the polished mandrel and from inside the bottom connection.
2. Check the polished mandrel carefully for any signs of corrosion, pitting, or flaking of the coating.