



## Underreamers - Section 9

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Please call for custom options and other accessories.

## Overview

Roller Cone and Drag Type Underreamers are just two more examples of our goal to bring expensive Oil Field technology to other drilling markets at an economical cost. We have been manufacturing both types of Underreamer designs for over 20 years and based on the feedback from our customers out in the field, we have been able to offer continual improvements.

**The primary use for both of these tools is to open up the bore hole below the casing.** Most drillers are trying to straighten up a dog leg down in a hole, which may be preventing advancement of the casing.

Other uses include opening up zones down in a hole to increase the yield of a well or seal off salt water intrusion from the bottom of the hole.

The construction industry has used Underreamers for tie-back or anchor holes in any type of dirt, rock, or concrete formations.

Our Underreamers can be opened up anywhere down in a hole and as many times as needed, but **you must have adequate annular space for the blades or rollers to open up.** Most drillers pull the casing up 3 or 4 feet and lower the underreamer below the casing and then open the tool and start drilling. The tools operate with either **air or fluid pressure** and require as little as 60 - 100 lbs. of pressure to force the cutter arms out.

The bodies and cutter arms are manufactured from heat-treated steel.

The piston is carbonized steel to reduce abrasion and features a replaceable tungsten carbide jet nozzle to adjust to your individual compressor or mud pump output.

**Additional circulation holes have been added into the side of the piston body to keep the cuttings out of the cutter slots.**

The simple, rugged design features easily replaceable components for long-term, trouble free operation. The operation of our Underreamers is very simple. The tool is hydraulically operated by pump pressure which forces a spring loaded actuating piston downward. A cam attached to the lower end of the actuating piston forces the cutter arms out to the desired cutting diameter. When the pump pressure is shut off, a coil spring forces the piston upward causing the cutter arms to retract back into the body.

We can custom manufacture any underreamer to meet your individual requirements.

Please call for custom options and other accessories.

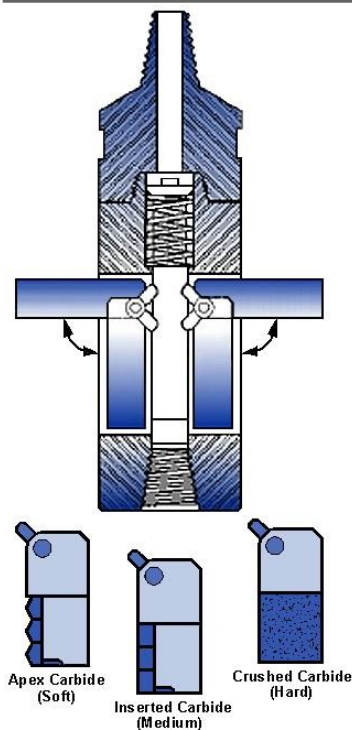
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## Drag Type Underreamers



Mills Machine Company has been manufacturing and continually improving the design of its Drag Type (Blade) Underreamer for over twenty years. The design is simple, yet rugged enough to provide the most efficient operation for opening up a soft to medium formation hole. Through the use of highly efficient tungsten carbide tipped alloy steel blades, the tool is exceptionally fast in opening up a hole below the casing. The primary uses for this type of tool is to provide clearance for running casing, to obtain adequate annular space for cementing, to enlarge zones for gravel pack completion or tie back anchor holes. Recommended for use in sand, dirt, clay, sand rock, sandstone, and hard shale formations.

The Mills Machine Drag Type (Blade) Underreamer:

- Enlarges the borehole below the casing.
- Produces positive cutter blade opening by direct pump pressure.
- Several blade designs are available for soft to hard formations.
- Rubber piston cup is designed for fluid or air drilling.
- Features simple, rugged construction with a minimum of parts to ensure trouble-free operation.
- Has adjustable carbide jet orifices to match output from your pump or compressor.
- Features additional circulation holes drilled into the piston body to keep cuttings out of the cutter slots.
- Sizes for 4" casing and larger with tungsten carbide inserts or crushed carbide chips.
- Any thread type, breakout flats, or float valve bore available.

The Mills Machine Underreamer is hydraulically operated by pump pressure which forces a spring loaded actuating piston downward. A milled opening in the side of the piston forces the cutter blades out to the desired cutting diameter. Adequate annular space is required to open the blades. When the pump pressure is shut off, a coil spring forces the piston upward causing the cutter blades to retract back into the body. The tool can be opened up anywhere down enabling you to open up as many zones as you like.

To maintain your Mills underreamer simply clean and lubricate after each use and store in a dry area. Spare parts kits are available with the original purchase of your underreamer and for field repair of tool.

Please call for custom options and other accessories.

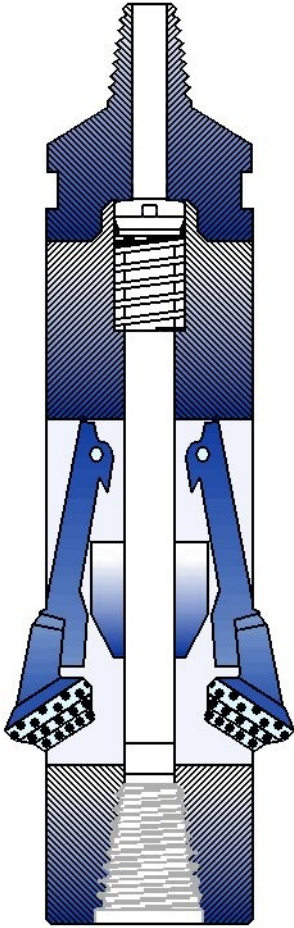
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## Roller Cone Underreamers



Mills Machine Company has been manufacturing and continually improving the design of its Roller Cone Underreamer for over twenty years. The design is simple, yet rugged enough to provide the most efficient operation for opening up a hole. Through the use of highly efficient rock bit cones on the cutting arms, the tool is exceptionally fast in opening up a hole. The primary uses for this type of tool is to provide clearance for running casing, to obtain adequate annular space for cementing, or to enlarge zones for gravel pack completion. Recommended for soft to hard rock formations.

The Mills Machine Roller Cone Underreamer:

- Enlarges the borehole below the casing.
- Produces positive cutter arm opening by direct pump pressure.
- Rubber piston cup is designed for fluid or air drilling.
- Features simple, rugged construction with a minimum of parts to ensure trouble-free operation.
- Has adjustable carbide jet orifices to match output from your pump or compressor.
- Features additional circulation holes drilled into the piston body to keep cuttings out of the cutter slots.
- Sizes for 6" casing and larger with Steel Tooth or TCI Button Cutters.
- Any thread type, breakout flats, or float valve bore available.
- The Mills Machine Underreamer is hydraulically operated by pump pressure which forces a spring loaded actuating piston downward. A cam attached to the lower end of the actuating piston forces the cutter arms out to the desired cutting diameter.

Adequate annular space is required to open the blades. When the pump pressure is shut off, a coil spring forces the piston upward causing the cutter arms to retract back into the body. The tool can be opened up anywhere down enabling you to open up as many zones as you like.

To maintain your Mills underreamer simply clean and lubricate after each use and store in a dry area. Spare parts kits are available with the original purchase of your underreamer and for field repair of tool.

Please call for custom options and other accessories.

## Underreamer Maintenance

Drag or Roller Cone Underreamers: Clean and lubricate your underreamer after each use and store in a dry area. Periodically disassemble the underreamer and lubricate the piston and check on the condition of the cup seal and compression spring. Insure that there is no dirt in the system that hinders flow of air or fluid. Check the replaceable carbide jet plug (if you have one installed) for abrasive wear. Note you can adjust the fluid flow by changing the jet plug diameter and for your convenience we use a standard tricone rock bit jet. Check the rubber cup seal for edge wear and the actuator spring for strength.

Replacement of the underreamer arm is a simple operation. First remove the pin retaining bolt, and then remove the pin using a punch or round bar. The blade or roller cone arm is then easily removed. To check the piston assembly, remove the top sub and pull the piston assembly out of the body to check the jet plug, cup seal and actuator spring.

Drag Underreamers need the blades replaced, when the Tungsten Carbide coating becomes worn. Roller Cone Underreamers, need the roller cone assembly replaced when the teeth, buttons or bearings become worn. If the underreamer is a custom size we may require the complete assembly to be returned for reworking the roller arms. If you have any technical questions please contact us.

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