



# PETRA DRILLING SERVICES

*(Serving the Oil & Gas Industry)*

## PRODUCT CATALOG

**Hole Straighteners\***

**Shock Subs\***

**Mechanical Drilling Jar\***

**Eccentric Drill Collars\***

**Non Rotating Stabilizer\***

**(for open hole drilling)**

**Bumper Safety Joint\***

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## **Brief History - Petra Drilling Services**

In 1972, CMA Tool Company was founded and began manufacturing and marketing pressure control equipment to the global oil and gas industry. In 1980, the company entered the down-hole drilling equipment market with the introduction of a proprietary new tool - the Hole Straightener. The first customer for the Hole Straightener was Zakum Development in Abu Dhabi, who was having extreme drilling problems caused by sticking. The Hole Straightener helped to correct this problem and eliminated the loss of tools down-hole saving the customer considerable cost for lost tools as well as costly down rig time. This tool went on to become hugely successful for the company, ultimately entering into operations globally in nearly every major market.

As part of an overall global expansion, in 1980, CMA Tool took an investor and changed the name of the company to Double (S) Tool Company. With the expansion of the company, Double (S) Tool began manufacturing other down-hole drilling tools such as Drilling Jars, Shock Subs, and Bumper Safety Joints. The expansion of the company ultimately led to rental tool operations in the following countries:

<b>United States</b>	<b>North Sea – Scotland</b>
<b>Australia</b>	<b>Norway</b>
<b>New Zealand</b>	<b>Mexico</b>
<b>New Guinea</b>	<b>Venezuela</b>
<b>Indonesia</b>	<b>Egypt</b>
<b>UAE</b>	

With the expansion of the company and its products, Double S Tool developed a significant customer base of major national and international oil companies, including:

<b>Amoco</b>	<b>Chevron</b>	<b>Petrobel Oil Co.</b>	<b>ARCO</b>
<b>BP</b>	<b>North South Petr.</b>	<b>PDVSA – Venezuela</b>	<b>StatOil Norway</b>
<b>Shell</b>	<b>Zakum Development</b>	<b>PEMEX – Mexico</b>	<b>Crescent Petr.</b>
<b>Phillips</b>	<b>Hunt Oil Company</b>	<b>Murphy Oil Company</b>	<b>Amerada Hess</b>
<b>Conoco</b>	<b>Hunt Petroleum</b>	<b>Mobil Oil Company</b>	<b>Cal-Tex</b>
<b>Dubai Petr.</b>	<b>Placid Oil Company</b>	<b>Ultramar Oil Co.</b>	<b>NIOC-OSCO</b>
<b>ADMA-OPCO</b>	<b>Union Oil Company</b>	<b>Petrobras-Brazil</b>	

In the 90's, Double S Tool formed a joint venture with a venture capital group to further expand its operations. The company ultimately ceased rental tool operations late in the 90's to focus on the development of some new, advanced drilling equipment. The company ultimately became part of the Petra Group and has since been renamed Petra Drilling Services and is now focused on providing rental tool equipment to the oil and gas service industry.

# Hole Straightener

## Drilling Operating Procedure For Hole Straightener

The Hole Straightener is a tool designed to take advantage of the dynamics of the string such as axial load force, lateral movement, helical buckling, etc.

In vertical hole drilling, the tool can be run in tension or compression depending on hole conditions as to which location the tool will best be utilized. In softer type formations, as in areas like offshore California, this tool is placed in a tension position up hole as the formation will not support constant drill string friction from the tool joints. As the tool moves downward, it expands the hole to allow larger OD equipment freedom to move up and down with no restrictions.

The Hole Straightener must be free from support by stabilizer or larger OD tools as it is a wall contact tool which is designed to remove ledges, ridges, offsets and to eliminate keyseats before they occur.

The tool can be placed at the top of the drill collar string and be used as a cross-over sub from the drill collars back to the drill pipe and will eliminate any restriction as you come out of the hole by simply back reaming.

For placement in the collar string, it is very effective as the tool is  $\frac{1}{4}$ " -  $\frac{3}{8}$ " oversize to the drill collar string OD. As the bit moves laterally and starts building angle, the tool opens up the hole for easier movement of drill collar and stabilizers.

The tool has been run extensively in tapered drill collar string applications as the oversized OD assures the operator that the larger collars will not stick. Some of our customers have run 9" OD Hole Straighteners in their 8" drill collar strings to assure total free movement where they expect problems to occur.

Our tool pressure balances the string from differentially sticking as pressure is equalized due to our design.

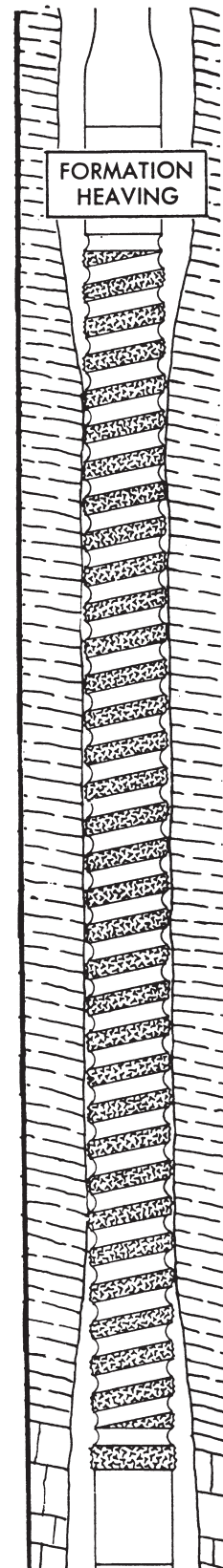
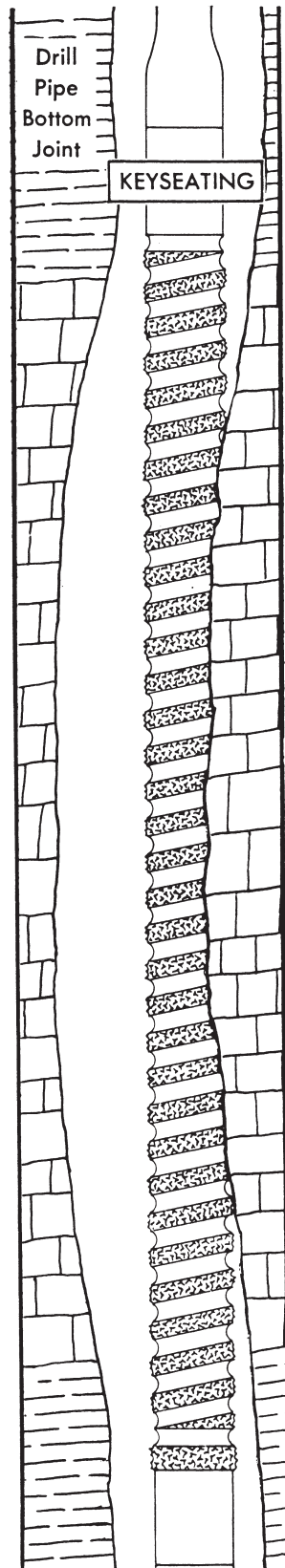
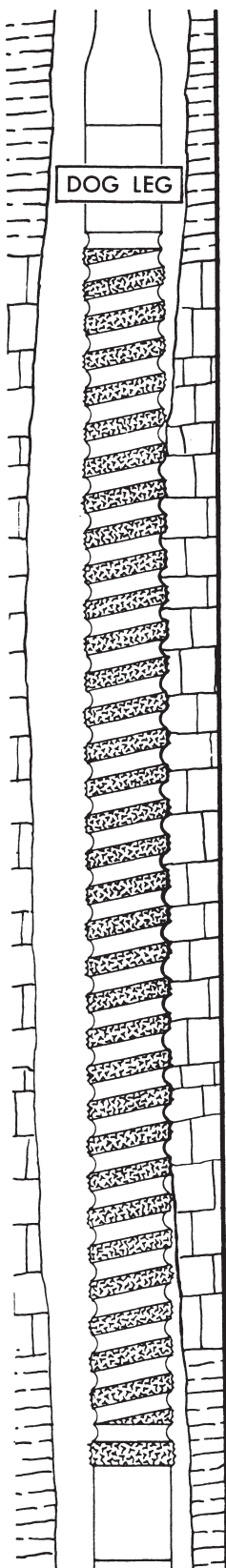
In directional holes, the tool helps to keep the mud heavies and cuttings in suspension and forces movement up the hole as the tool has a fanning effect while rotating. In addition, the Hole Straightener corrects troughing caused by wear pads on H.W. D.P. so the hole will be smooth while tripping out.

In areas where problems are encountered in running casing, this tool should be run as it straightens any well bore crooks and offsets so the casing can be shouldered up and set without problems.

As stated earlier, the tool can be run in tension or compression, however, the positioning of the tool can be determined by the operator as in most cases they already know the trouble areas. However, in our experience, we have found the tool most effective in the drill collar string away from stabilizers as the Hole Straightener must make wall contact to function as designed.



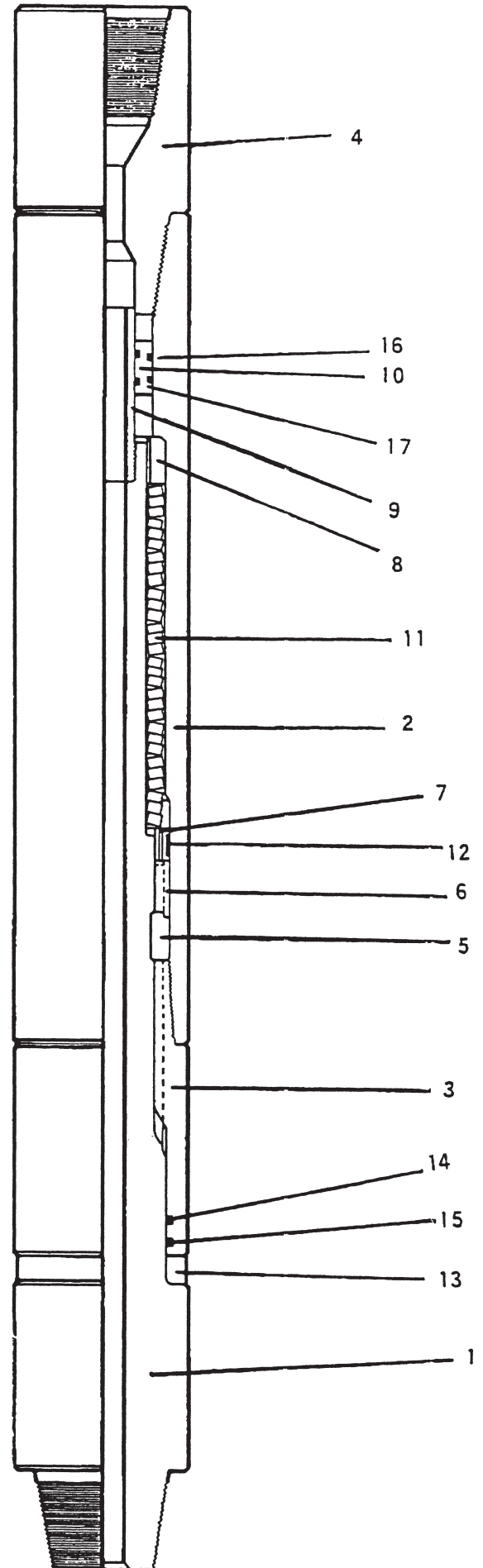
# Hole Straightener

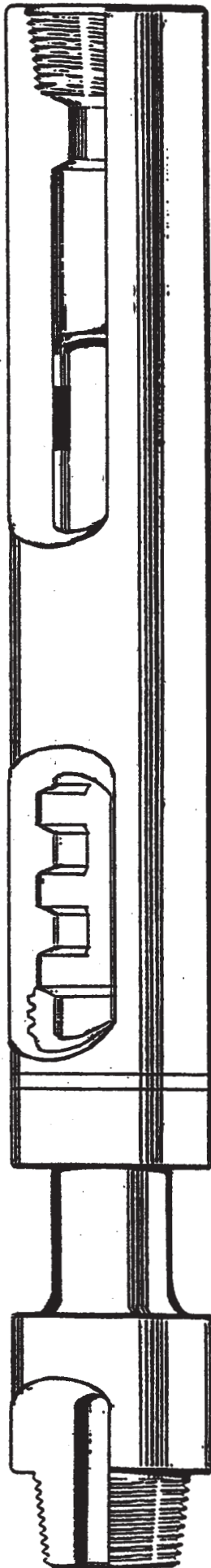


## MECHANICAL SHOCK SUB

The Shock Sub is engineered to increase bit penetration and to prolong bit life as well as reduce drill collar fatigue, vibration and impact loads. This tool can be run at the bit or in the drill collar string as required by the location personnel. The Shock Sub can be run box up or box down as this will not affect the performance of the tool. In areas where severe drilling causes the bit to vibrate and the string to jump, this tool will eliminate the problem by smoothing out these movements and forcing the bit to stay on the bottom thereby increasing the penetration rate and reducing trip time caused by bit wear and failure during rough drilling. All internal parts of the tool are lubricated and in the event of fluid loss, the tool still functions as the mechanical spring mechanism will function from lubrication by drilling fluid. Overall length of the tool is approximately six feet with 2 inch movement area for shock vibration. Very little maintenance is required as there are just a few moving parts. Assembly and disassembly of the tool can be completed in a short time.

Item	Description
1.	Mandrel
2.	Barrel
3.	Drive Sub
4.	Top Sub
5.	Split Ring
6.	Spacer Ring
7.	Upper Thrust Ring
8.	Lower Thrust Ring
9.	Washpipe
10.	Floater
11.	Spring
12.	Wear Ring
13.	Rubber Protector
14.	Drive Sub Seal
15.	Barrel Seal
16.	Wiper
17.	Washpipe Seal





## **BUMPER SUB/COMBINATION ROTARY/DRILLING JAR**

**This tool can be used in the drill string as a 10" free stroke up and down bumper sub or as a drilling jar using the following procedures.**

### **To jar up:**

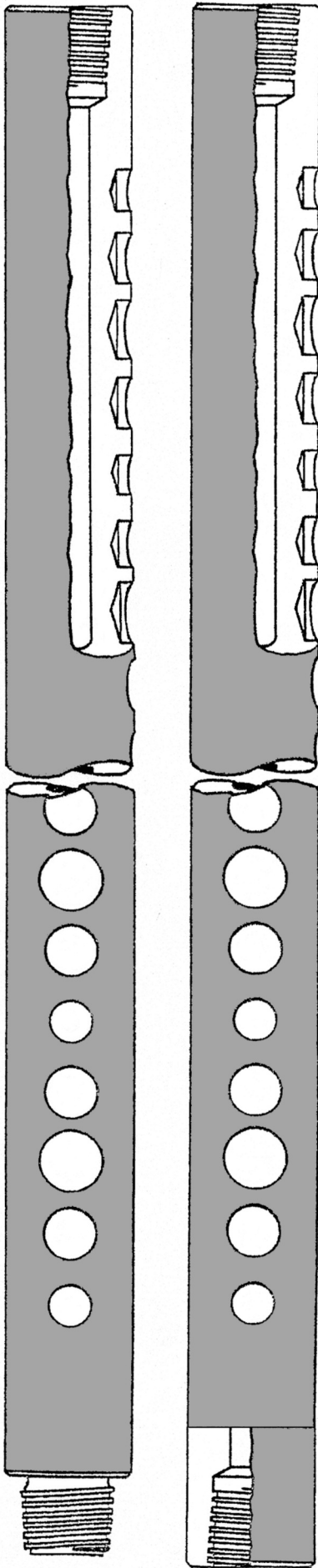
- **The tool should be in the compressed position.**
- **Set down on the string, determining if tool is open or closed;**
- **Rotate the drill string to the left to lock the tool (1/4 turn at tool to lock);**
- **Hold torque to the left;**
- **Pick up string to desired tension;**
- **Apply right hand torque to trip tool – maintaining desired tension on drill string.**

### **To jar down:**

- **Pull up on string until the jar is in an extended position;**
- **Rotate to left to lock tool (1/4 turn at the tool to lock);**
- **Hold torque to left;**
- **Apply desired weight;**
- **Rotate tool to right for downward jar.**

**The tool can be field serviced and broken down on location – the seals can be changed – ideal for remote drilling operations by following the simple redress procedures given in the operating instructions.**





*Eccentric Unbalanced Drill Collar* has machined indentations on one side of the OD which causes the drilling bit to bump the low side of the hole – causing a straightening effect of the hole. The driller can usually apply additional drilling weight even while dropping hole angle.

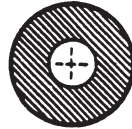
#### ADVANTAGES:

- positive active force to straighten the hole
- increased/faster drilling time
- longer bit life/usage
- reduced trip time
- slick bottom hole assemblies can be used – no extra tools to wash over
- does not create keyseats
- no special maintenance required – can be treated just as a drill collar

The *Eccentric Unbalanced Drill Collar* is not hazardous to run – has same OD as a normal drill collar and is 30 to 31 feet in length with box/box or box/ pin connections as required by customer. This tool can be utilized to straighten holes where keyseats have occurred or packed hole assemblies cannot be run in or out of the hole. The tool should be run before angle gets out of control and or seems difficult to control while drilling.

## Understanding dynamic side force

In a balanced shaft, the Center of Gravity (COG) and Center of Rotation (COR) are the same



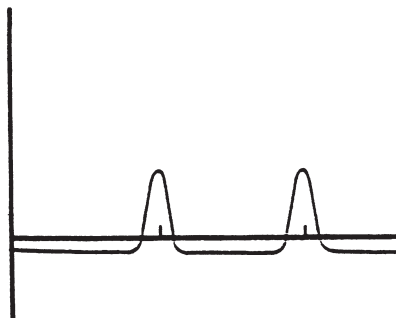
By removing weight from one side only, the COG and COR are separated.



Rotating this shaft at certain speeds creates a predictable, controlled shaft whirl.



When a shaft whirls, some of the Rotary Force is changed to a lateral force. Measured at one point alongside the shaft, a graph of this lateral force would look like this:



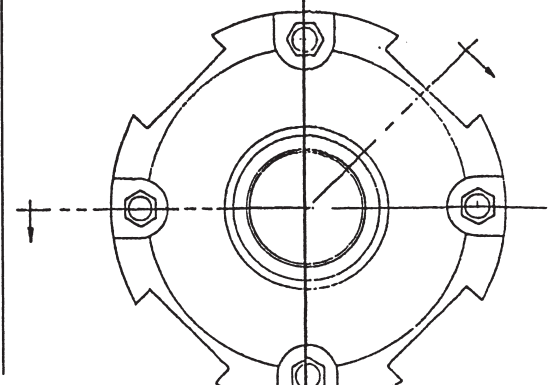
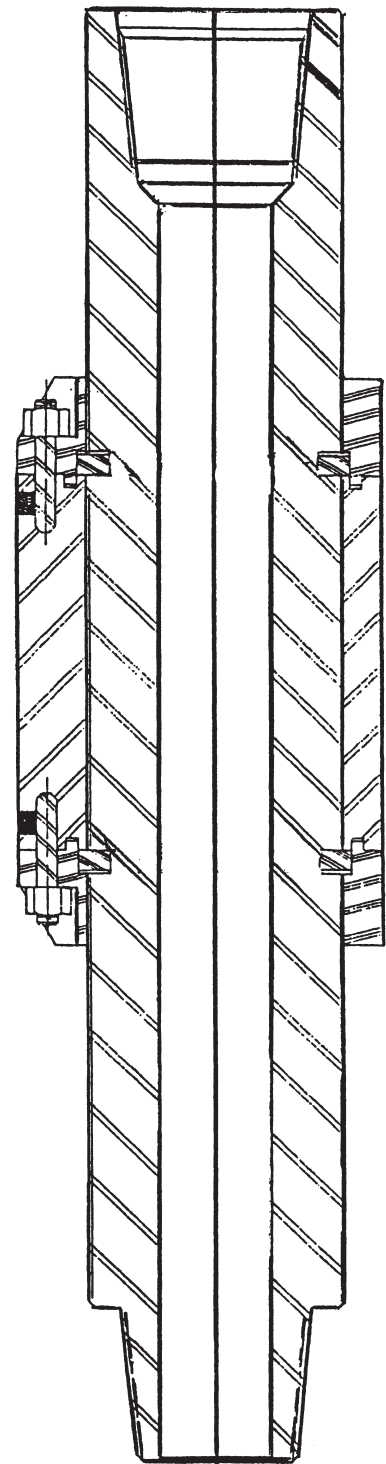


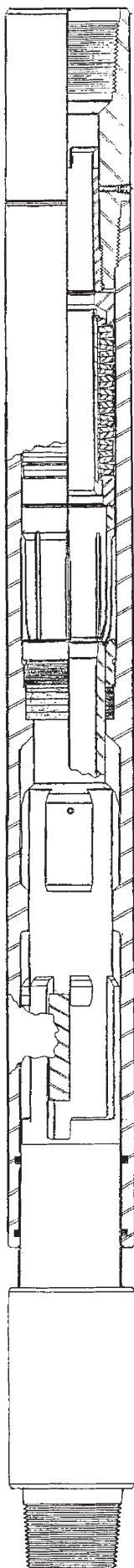
## NO TORQUE – NON ROTATING STABILIZER

The primary functions of the tool are as follows:

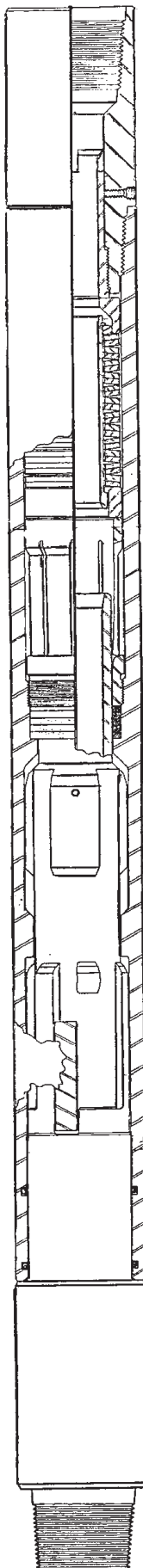
- Stabilizer section of the tool is stationary and does not rotate.
- Reduces extreme drilling torque – thereby increases drilling efficiency and relieves wear on the drill string.
- Centers the drill string in the hole which increases penetration rates and reduces torque.
- Increases drilling bit life, which reduces overall drill bit cost.
- Reduces trip time (in and out) hole for changing out worn bits, which reduces drilling cost.
- Relieves cyclic tool joint fatigue on drill pipe.
- Eliminates keyseats caused by drill pipe well bore contact.
- Tool can be run in casing which reduces thinning of the casing I.D. caused by friction from heavy weight and standard drill pipe.
- User can simply change out the stabilizer section of the tool for hole size change.
- Tool helps to relieve drill pipe and drill collar from being stuck due to well bore pressure.

This tool reduces drilling time by increasing drilling efficiency and helps the operator reduce costly thread recuts, replacement of damage tool joints and hardfacing. All sizes are made for both drill pipe and drill collars.





TENSION POSITION - OPEN



COMPRESSED POSITION - CLOSED

## Bumper Safety Joint Operation

The bumper safety joint is designed to give a positive fast way to get out of the hole when stuck.

- This tool also has a Jarring Down operation that frees stuck pipe and gets the operator through bridges, tight spots or key seats while going into the hole.
- The tool is run in the open position (Tension) and the driller simply sets down on the drill string using the weight of approximately 2.000 feet of drill pipe to trip and jar the tool downward - freeing the bit or pipe from being stuck.
- The jarring operation can be done fast and repeated continuously to free the string from being hung up in the hole.

## Safety Joint Operation

To operate the tool as a safety joint –

- The tool must be in the closed position (compressed)
- Hold torque to the left until the barrel slots slip through the mandrel drive keys to free the barrel from the mandrel in order to come out of the hole.
- Once the hole is cleaned up - the barrel can be run back into the hole - engaging the mandrel and drilling can resume.
- This procedure can be done as many times as needed without difficulty to the tool.
- This tool gives the operator a positive location in the string where he can disconnect and release the stuck portion of the string to come out of the hole quickly without delay.

**CONTACT INFORMATION:**

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