

Nomenclature

Application-based product groups

The alpha prefix of fixed cutter bits is being changed to more clearly define the target application. This will allow products to be easily identified as a specific member of an application-based product group.

Product Groups

- RS - Designed for Rotary Steerable applications
- SB - Stabil BiCentrix reaming while drilling technology
- DS - Standard, includes SteeringWheel, Anti-Whirl, Side-Track, Hole Openers, Fishtail

Reed-Hycalog Fixed Cutter Drill Bit Nomenclature

Alpha Numeric Code

The fixed cutter bit nomenclature is as follows:-

Alpha prefix:

DS - Standard PDC bit

RS - Rotary Steerable bit

SB - Stabil BiCentrix

An X in alpha prefix. DSX, RSX, SBX denotes that the bit has highly abrasion resistant TReX cutters

XXX - two or three digits representing a sequential design number

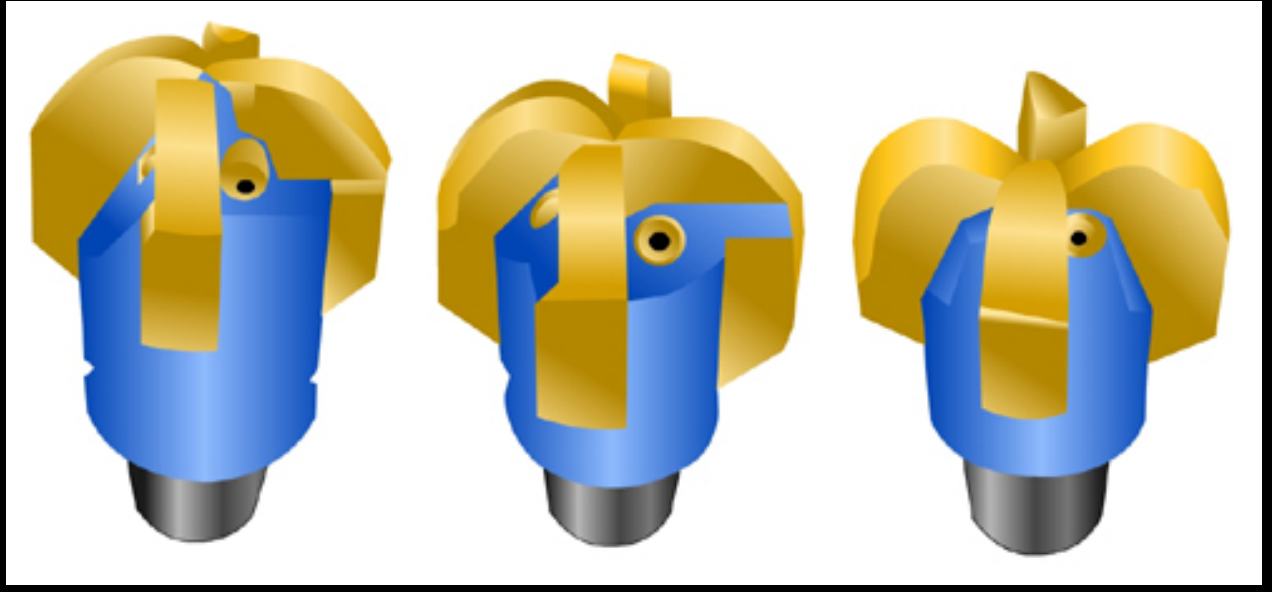
A1 - Alpha numeric code for a design revision or version

HFG - Alpha code for the design features included in the bit. The alpha suffix codes will be discussed on the following pages.

Diamond impregnated matrix bits (DuraDiamond TM) consist of of a three digit code.

A, B, C - Versions

Versions - from left to right - A, B, C



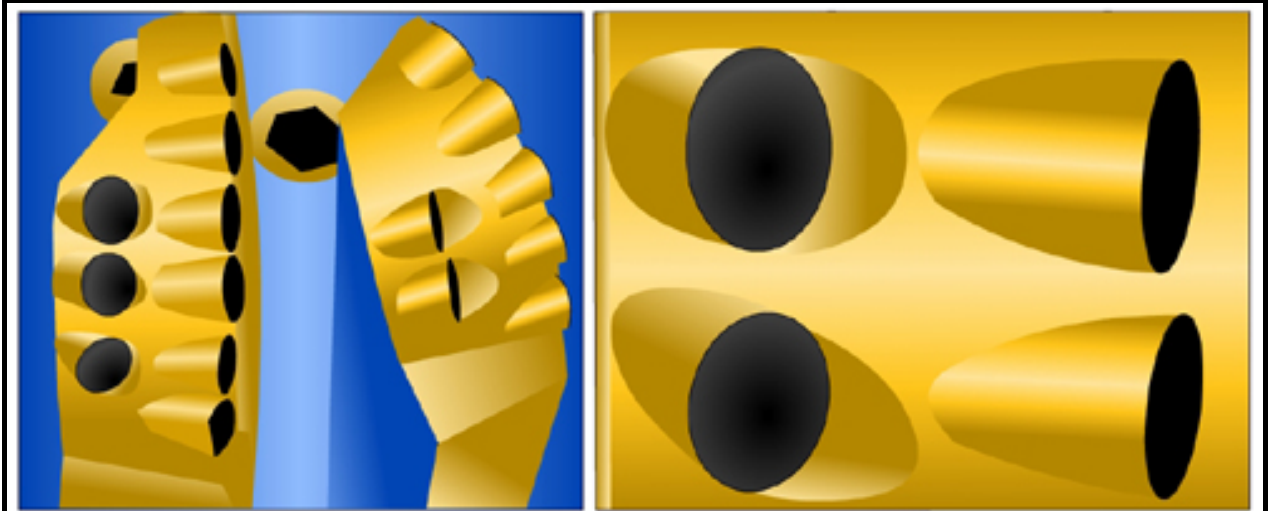
Version A was the first major design. Following analysis of run and wear data there was a major design modification to version B. Run and wear data was evaluated for this version which resulted in major design revision C.

The design version letter is generally associated with a number such as A8, B3 etc. and denotes a design modification. The version letter and number directly follow the design number e.g. DS173A1

D - DiamondBack

DiamondBack has a higher back rake than the primary cutter. DiamondBack cutters are set behind and below the primary cutting structure tip profile. DiamondBacks provide higher localized cutter density and increased durability without compromising the bit's profile or hydraulic design.

Circumferentially Paired Cutters

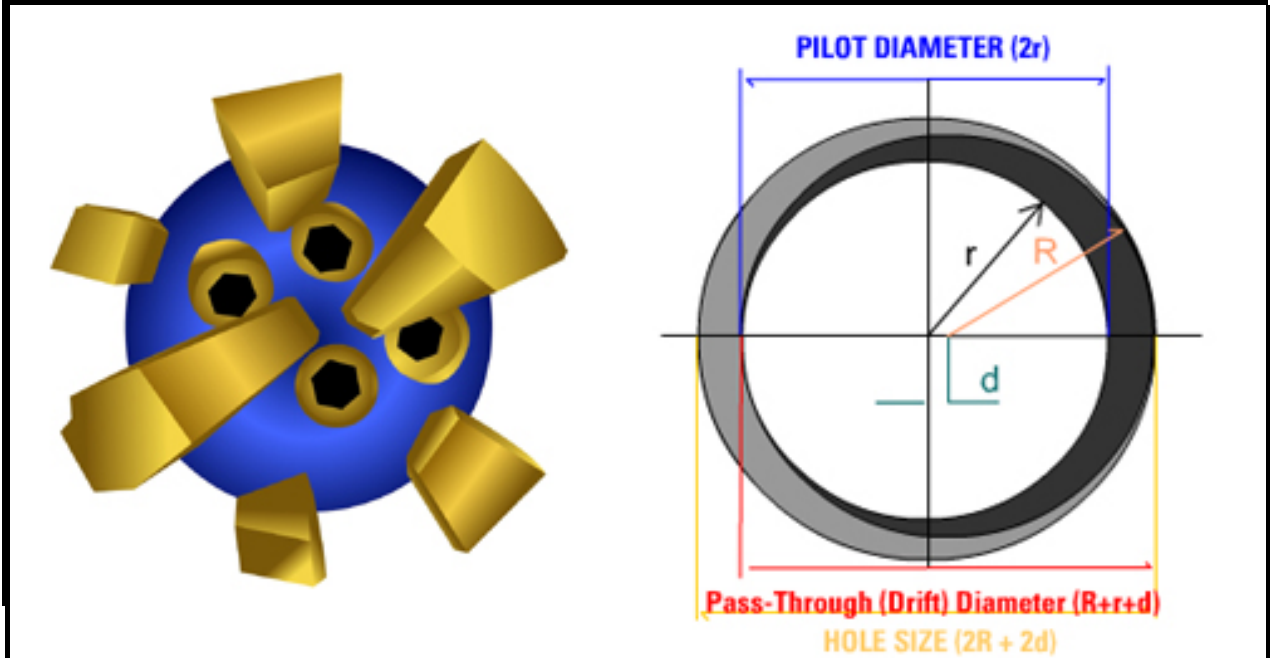


E - Eccentric

Eccentric products have been replaced by BiCentrix bits such as the one pictured below.

A BiCentrix bit has the ability to pass through a smaller diameter casing, and then drill a larger diameter borehole. Bicentrix bits are used in a range of applications.

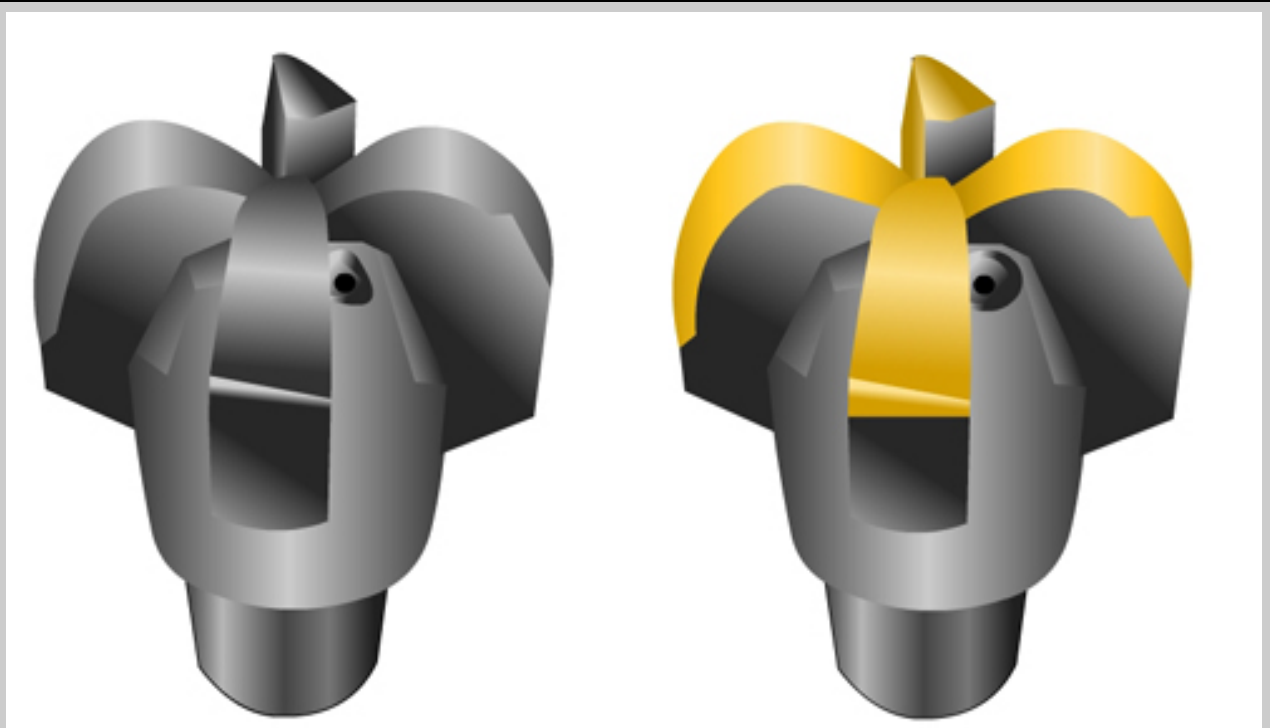
BiCentrix - Reaming while drilling technology



F - Hard Facing

Optional DiamondBack* cutters provide a secondary cutting structure that improves the ability of the PDC bit to drill faster and further into harder, more abrasive formations. These durable cutters provide higher localized cutter density on the critical shoulder area to extend bit life. As a result, torque response is smoother, which improves stability and control when drilling long-reach or tortuous well paths.

Hard Facing is applied to the front and top of blades to prevent erosion.(shown in gold)



G - Additional Diamond Gauge Protection

Standard gauge protection for steel bodied bits is tungsten carbide inserts and tungsten carbide pads for the matrix bits. Where additional gauge protection is required diamond is added to the pads on the matrix bits while cubic diamonds are added to the tungsten carbide inserts for steel bodied bits.

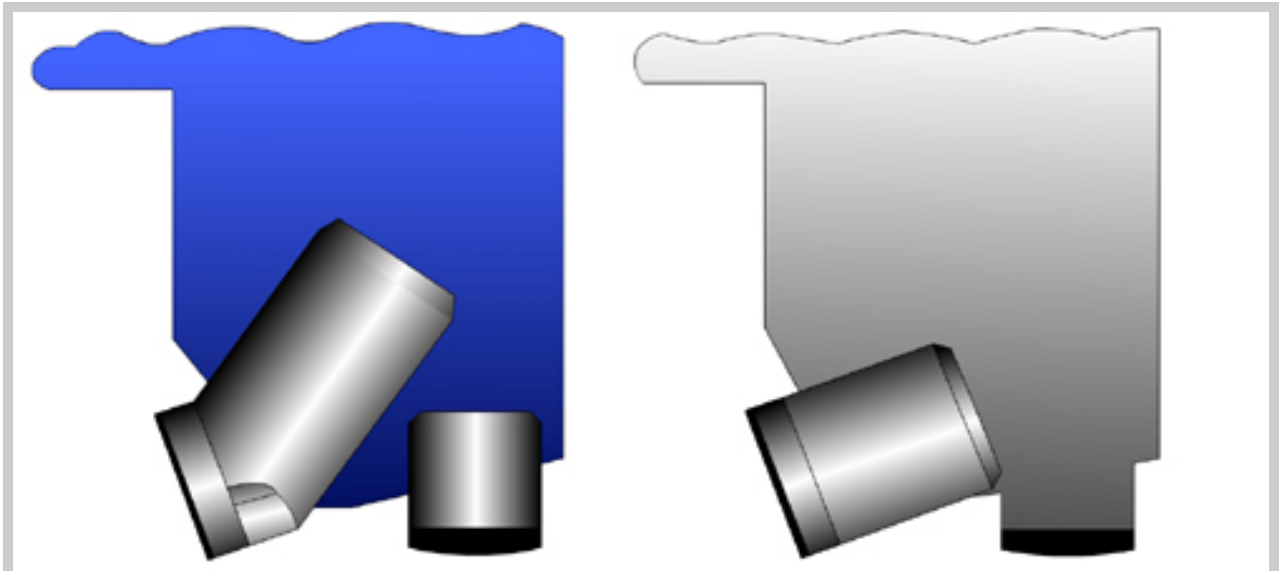
Additional diamond gauge protection in a steel bodied bit (left) Standard tungsten carbide inserts (right)



H - Hybrid

A Hybrid bit is one which has a combination of PDC cutter and natural diamond impregnated stud. Hybrid PDC bits are more durable than conventional PDC bits of similar design. The Hybrid component is one of many that the design engineer uses to determine the optimum mix of aggressiveness, durability, steerability, and stability in a bit design.

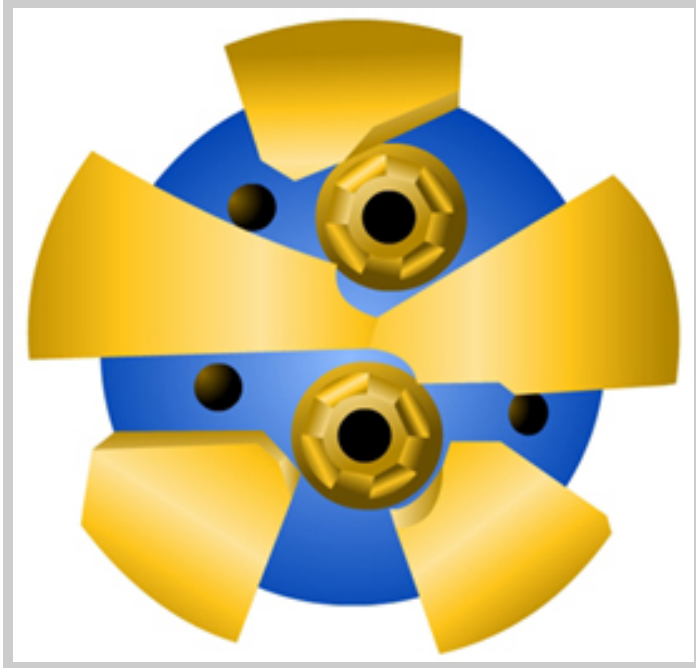
Steel bodied hybrid bit (left) and tungsten carbide matrix bodied bit (right)



J - Ports

The drill bit is fitted with ports or a combination of ports and nozzles.

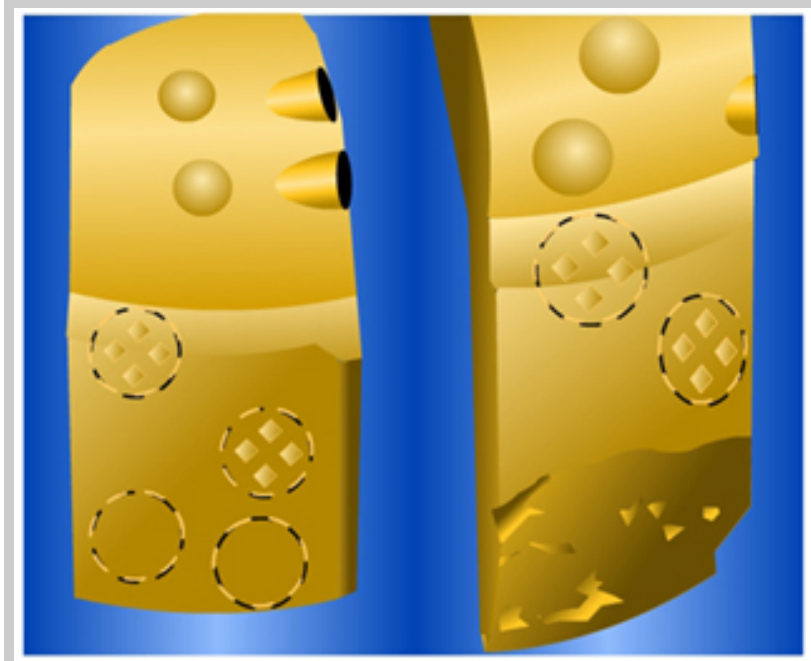
A bit designed with 2 nozzles and 3 ports



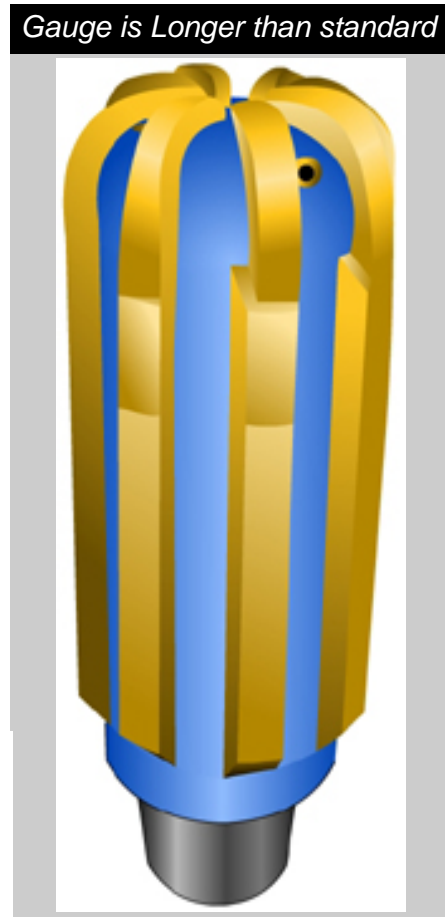
K - WC Upreaming material

Hard Facing material applied to the back of the blade for added protection during upreaming. Small size bits only.

Standard blade (left) and with hard facing material (right)



L - Gauge is Longer than standard



N+ - Non Planar Interface (TReX)

The TReX Cutter is a highly advanced version of the Iris Cutter. It is differentiated in that the top 1/4mm of the diamond table consists of a super abrasion resistant diamond layer. This thin diamond layer is four times more abrasion resistant than the underlying high abrasion resistant, multi-modal diamond material.

Due to the super abrasion resistant front layer, the TReX Cutter wears more slowly than the normal Iris Cutter and consequently bit life/footage increases. Additionally, since the cutter stays sharper longer, penetration rates are also increased. Despite the use of extremely hard diamond materials the TReX cutter's impact resistance equals that of the normal Iris Cutter.

N - Non Planar Interface (Standard)

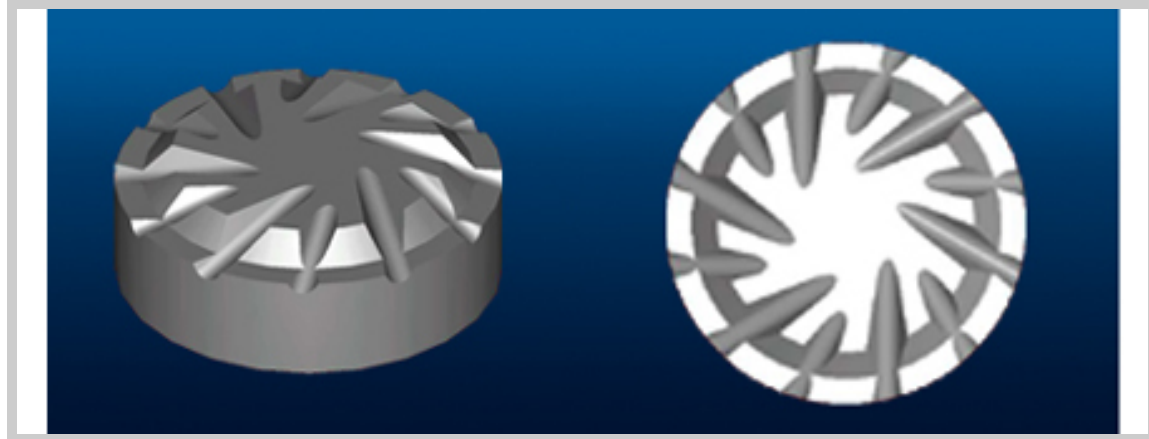
Several geometries are available including the Star and the Iris. The non planar interface of the Iris Cutter consists of inclined non radial protrusions of diamond into the carbide substrate. The protrusions are equally spaced around the cutter centre but alternate in length. The Iris Cutter features the stepped rim geometry.

The Star Cutter is characterised in having inclined radial protrusions of the diamond into the carbide substrate. The protrusions are evenly spaced around the cutter but alternate in length. The Star design features the angled rim geometry for additional

diamond table thickness.

The Star Cutter incorporates a mono-modal diamond layer for good abrasion resistance and impact resistance. The angled rim provides thick diamond right at the cutting edge.

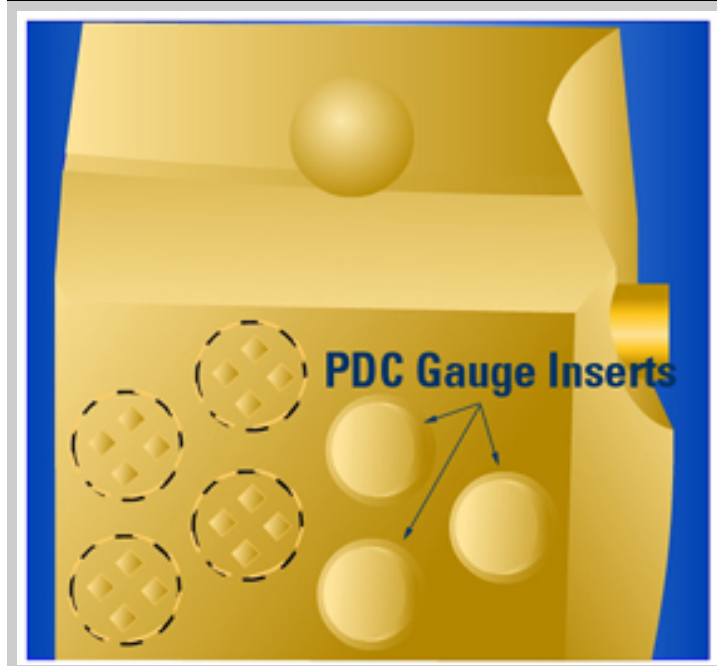
The non planar interface of the Iris Cutter



P - PDC Gauge Insert

The highly radiused leading edge and lesser radiused trailing edge of the PDC insert cannot 'bite' into the side wall, while the smooth radius of the insert help maintain low torque while providing excellent stability and gauge integrity.

PDC Gauge Inserts

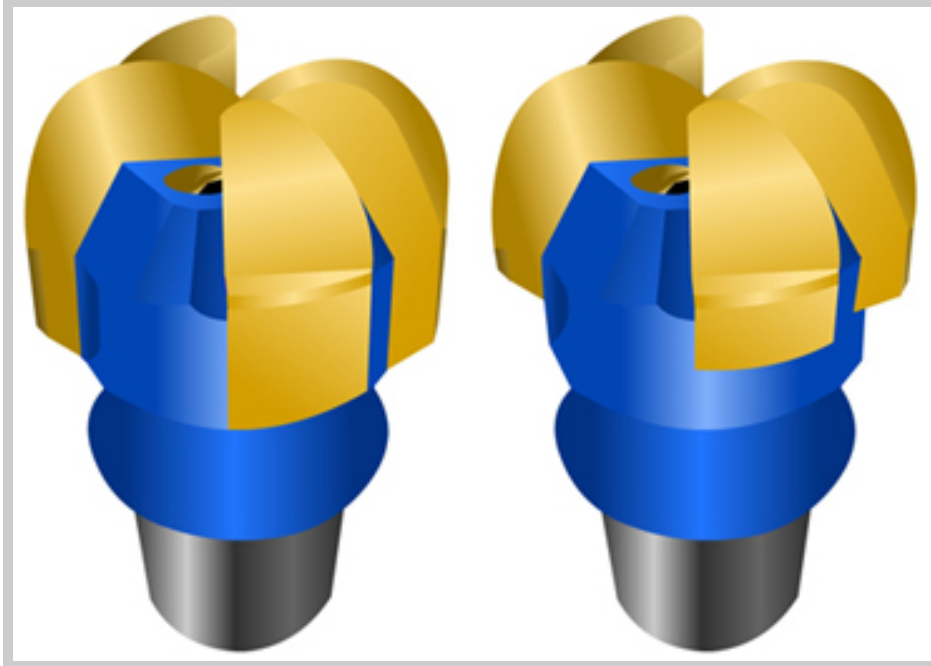


S - Gauge is Shorter than standard

Reed-Hycalog produces bits in a variety of gauge lengths, depending on the proposed application and customer preference. In general, PDC bits with a diameter between 5" and 14" have a standard gauge length between 2 inches and 3 inches

Short gauge bits for the same size range generally have a gauge length between 1 inch and 2 inches.

Standard gauge (left) and Short Gauge Length (right)



ST - SideTrack

Ultra-short gauge lengths with a sharp break-over are available for sidetracking.

Ultra-short gauge length



T - Turbine Sleeve

Sleeve for turbine drilling

Turbine Sleeve

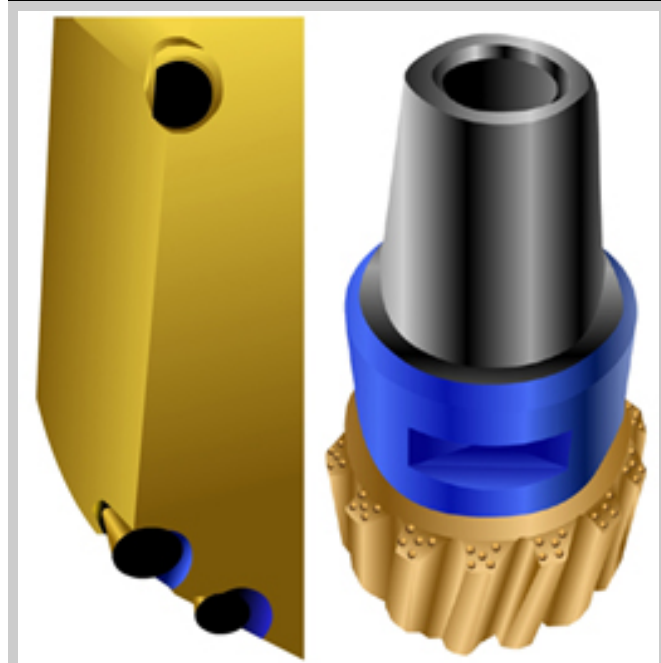


U - Back Reamers

PDC cutters positioned on the back of gauge for use during back reaming operations.

Diamond positioned on the back angle of DuraDiamond bits for use during back reaming operations

PDC (left) Diamond (right)



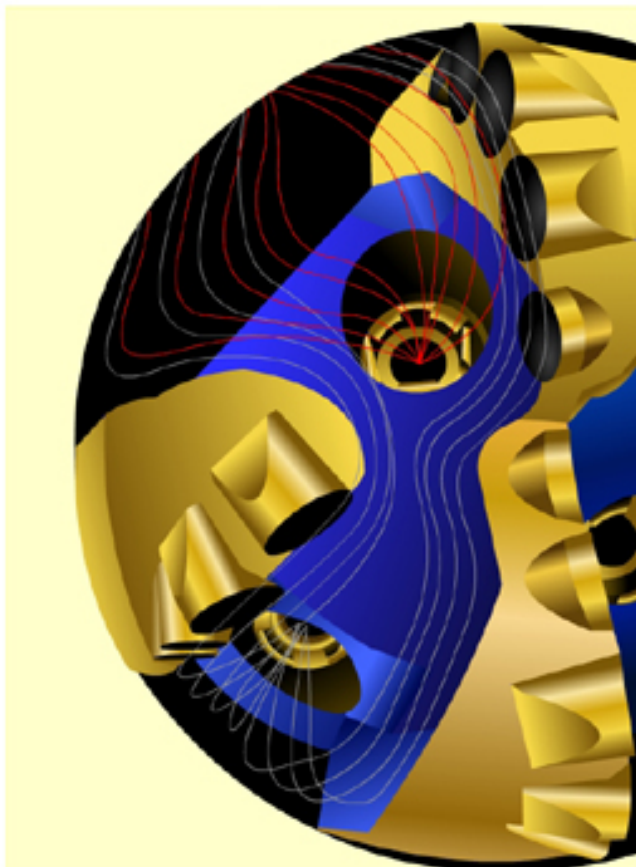
V - SwitchBlade Hydraulics

SwitchBlade Hydraulics employ a patented cross-flow design to improve the drilling efficiency of PDC drill bits.

Conventional PDC bit hydraulics channels all flow from the central region of the bit outwards. Much of the flow is used inefficiently and contributes little to cleaning and cooling the PDC cutters.

By using a new cross-flow approach, the SwitchBlade design makes more efficient use of the total fluid volume. SwitchBlade hydraulics position nozzles in both the central and outer regions of the bit, radial distribution of hydraulic energy is greatly improved. A greater portion of the hydraulic energy is directed to the outside diameter region where it is needed most.

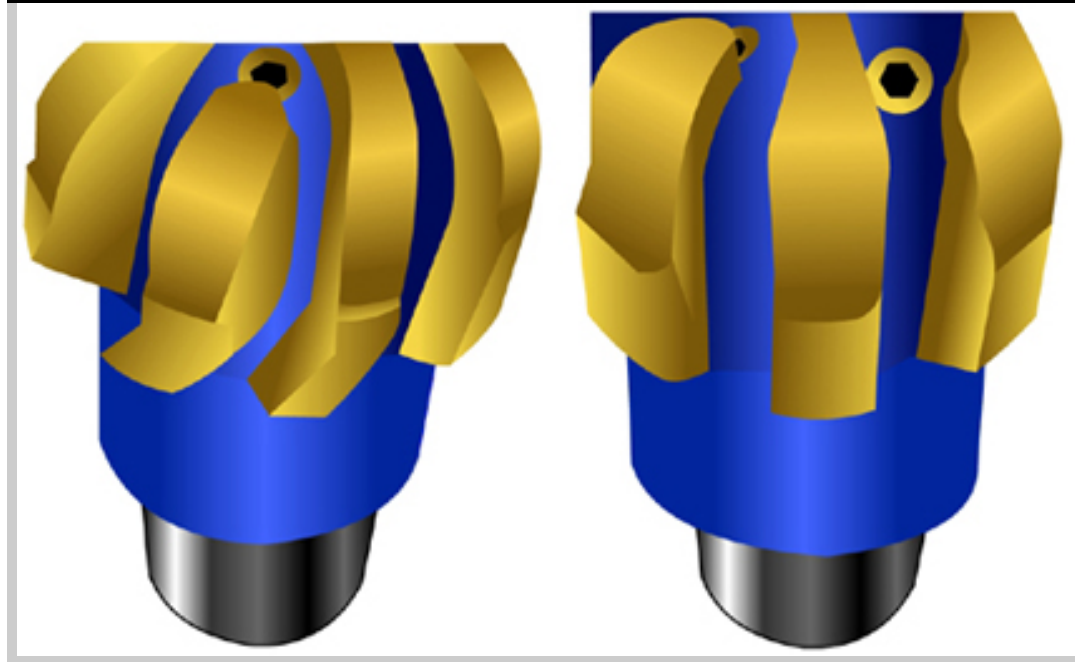
SwitchBlade Hydraulics employ a patented cross-flow design to improve the drilling efficiency of PDC drill bits.



W - Spiral Gauge

Stability can be improved by increasing the circumferential contact of bit designs without compromising steerability. This has been achieved by the introduction of spiral gauge pads. In order to achieve full circumferential gauge pad contact, the spiral angle required is high.

Spiral gauge can improve stability



X - None Standard Specification

Includes bit with box connection etc.

Z - Low Torque Gauge

PDC bits produce torque when drilling properly. However, excessive torque is bad because it can limit the operating parameters to below optimum for the bit. Reed-Hycalog employs numerous strategies for reducing the torque generated by a PDC bit.

The Low Torque gauge configuration is one such strategy. The stepped design of Low Torque provides optimum contact for stability with minimum torque while additional gauge contact is available when extra stability is required.



Reed-Hycalog enhances bit performance with leading-edge technology

Reed-Hycalog, a Schlumberger company, is a global provider of drilling solutions. Featuring Reed roller cone and Hycalog diamond bit technologies, Reed-Hycalog offers a wide range of bits to meet the requirements of your drilling application. To learn more about the advantages Reed-Hycalog drilling bits can provide in your drilling program, please contact your Reed-Hycalog representative.

Eastern Hemisphere Headquarters

Stonehouse, England

Phone: 44-1-453-826061

Fax: 44-1-453-825833

Western Hemisphere Headquarters

Houston, Texas USA

Phone: 713-934-6600

Fax: 713-934-6609