

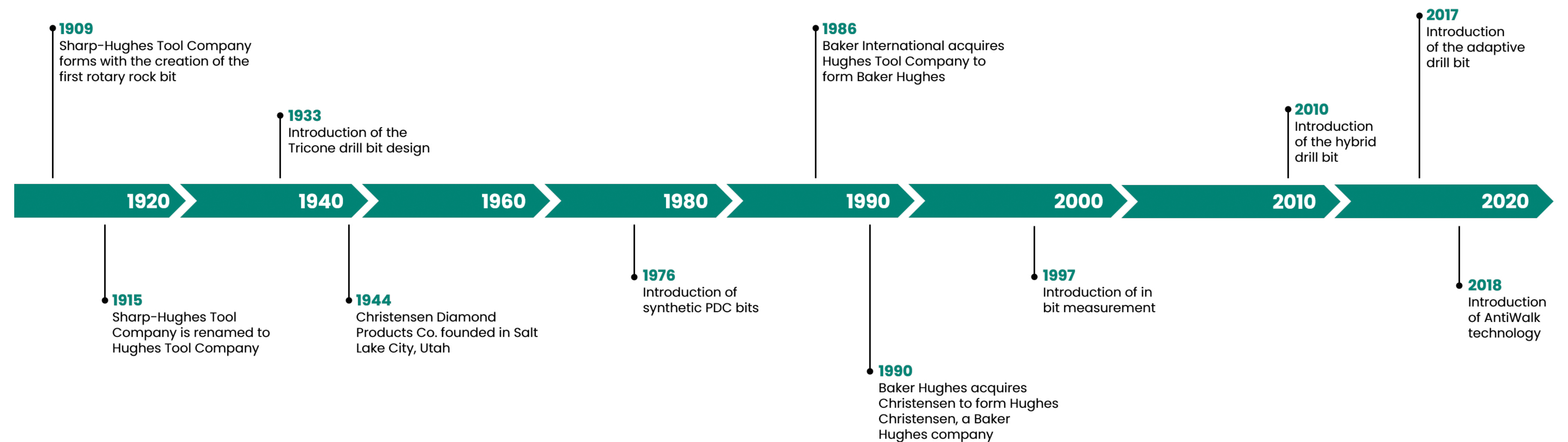
Baker Hughes 

Drill Bits Catalog

bakerhughes.com

Drill Bits

History of innovation



Drill Bits

Manufacturing and R&D facilities

MANUFACTURING FACILITIES

- The Woodlands, Texas, USA
- Dhahran, Saudi Arabia

R&D FACILITIES

- The Woodlands, Texas, USA
- Dhahran, Saudi Arabia

Drill Bits

Assembly, Maintenance, and Operations (AMO) facilities

WESTERN HEMISPHERE

- The Woodlands, Texas, USA
- Oklahoma City, Oklahoma, USA
- Vernal, Utah, USA
- Leduc, Alberta, Canada
- Mendoza, Argentina
- Bogota, Colombia

EASTERN HEMISPHERE

- Dammam, Saudi Arabia
- Celle, Germany
- Nizhnevartovsk, Russia
- Nizwa, Oman

Drilling Technology Laboratory

Shorten the lead time between concept and product introduction

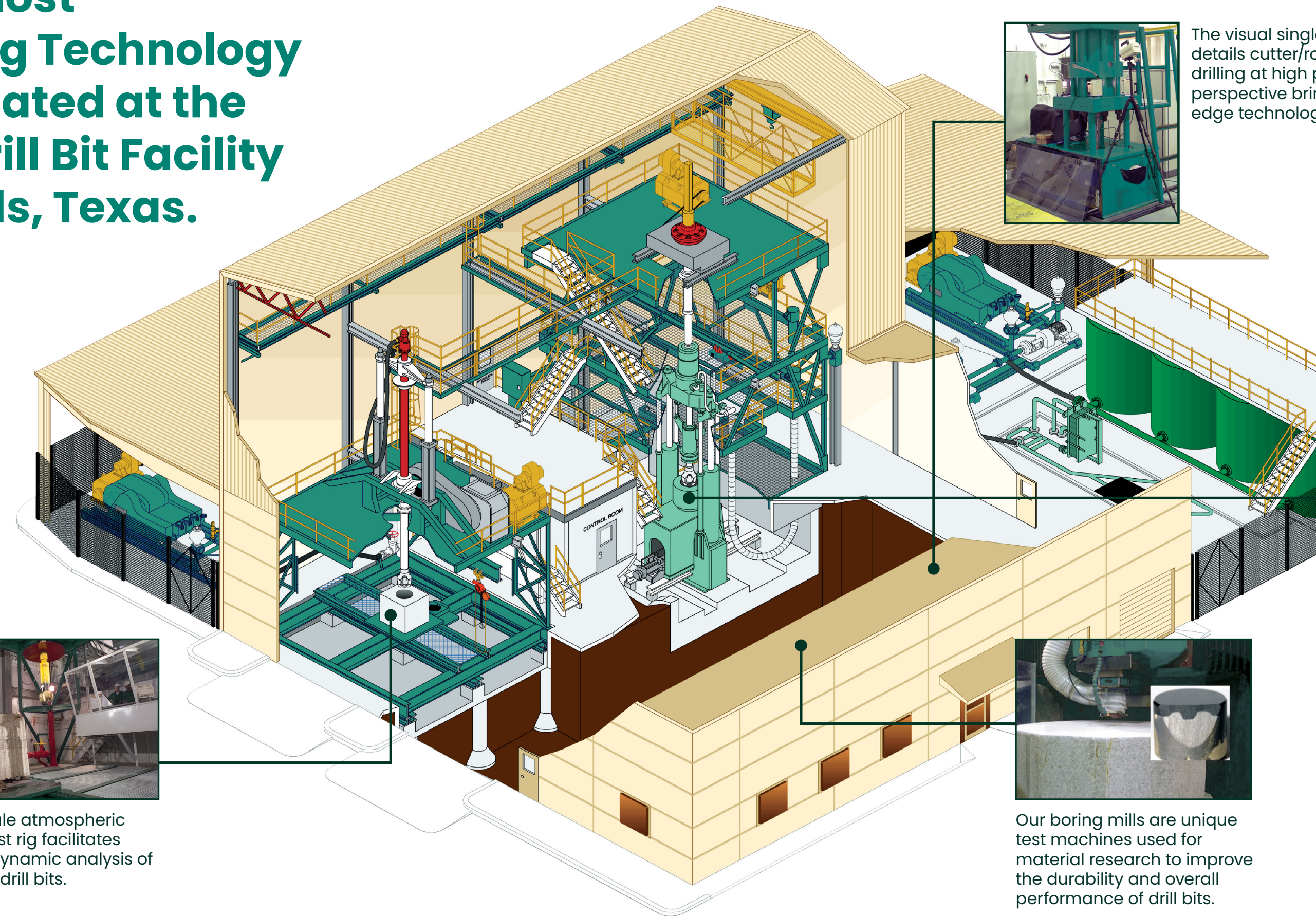
This state-of-the-art laboratory, employing the drilling industry's most sophisticated high-pressure downhole simulator, reflects Baker Hughes commitment to lead the way in developing innovative, cost-saving technologies. The Drilling Technology Laboratory gives the Baker Hughes researchers an accurate understanding of the drilling environment, opening the door for technology development aimed at redefining performance standards.

The Drilling Technology Laboratory allows Baker Hughes' engineers to capture bit behavior under strict laboratory controls and rapidly optimize penetration rates and hydraulics. These capabilities dramatically shorten the lead-time between concept and product introduction. Downhole conditions equivalent to drilling at depths of up to 30,000 feet with 9.5 ppg mud can be simulated for accurately determining performance envelopes of full-sized drill bits in various rock formations, in-situ conditions, and operating parameters.

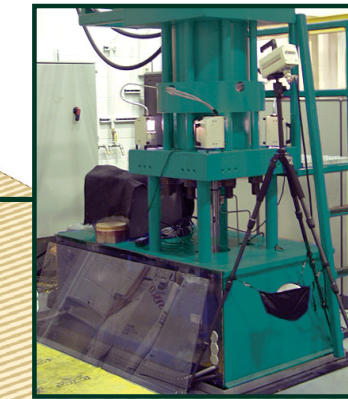
DRILLING TECHNOLOGY
LABORATORY

Surface rig and
downhole simulator

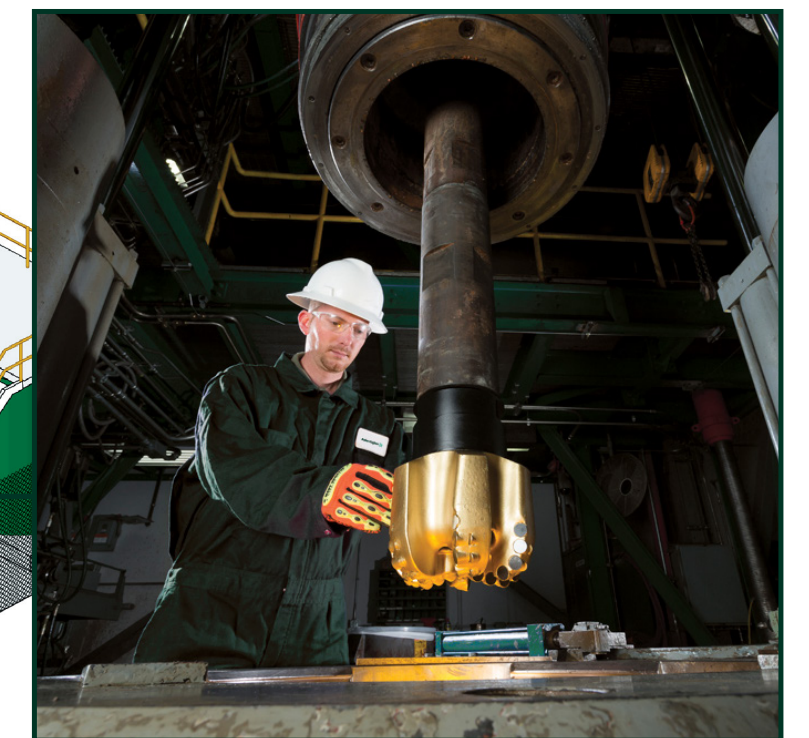
The industry's most
advanced Drilling Technology
Laboratory is located at the
Baker Hughes Drill Bit Facility
in The Woodlands, Texas.



Our full-scale atmospheric pressure test rig facilitates wear and dynamic analysis of all types of drill bits.



The visual single-point cutter machine details cutter/rock interaction during drilling at high pressures. Its unique perspective brings fresh ideas to cutting-edge technology and drilling efficiency.



Our full-scale, high-pressure bottomhole drilling simulator brings the field into the laboratory, significantly reducing new bit development from months to days.



Our boring mills are unique test machines used for material research to improve the durability and overall performance of drill bits.

Diamond Press

In-house cutter R&D

Baker Hughes provides our own custom PDC cutter research and collaborates with PDC manufactures to bring you premium cutter and compact technology. Our diamond laboratory houses a 4,100 ton multi-axis anvil press that can achieve pressures and temperatures greater than 1 million psi and 2700°F (1482°C), respectively. Baker Hughes can synthesis, process, and finish small-scale PDC cutter and compacts fit for drilling and cutting tests. These capabilities, with our drilling laboratory, help our Baker Hughes researchers and collaborators rapidly develop novel cutting technology.

Diamond press

Experimental Test Facility

Redefine drilling performance with an advanced knowledge of drilling environments

The Baker Hughes BETA experimental test facility enables drilling, completion, and production solutions to be tested on a full-scale rig while simulating a range of geological formations. This unique resource brings field-proven technology to the field faster while reducing the risk of using unproven tools. All real-time data and information, including a rig-floor video, are available for immediate analysis.

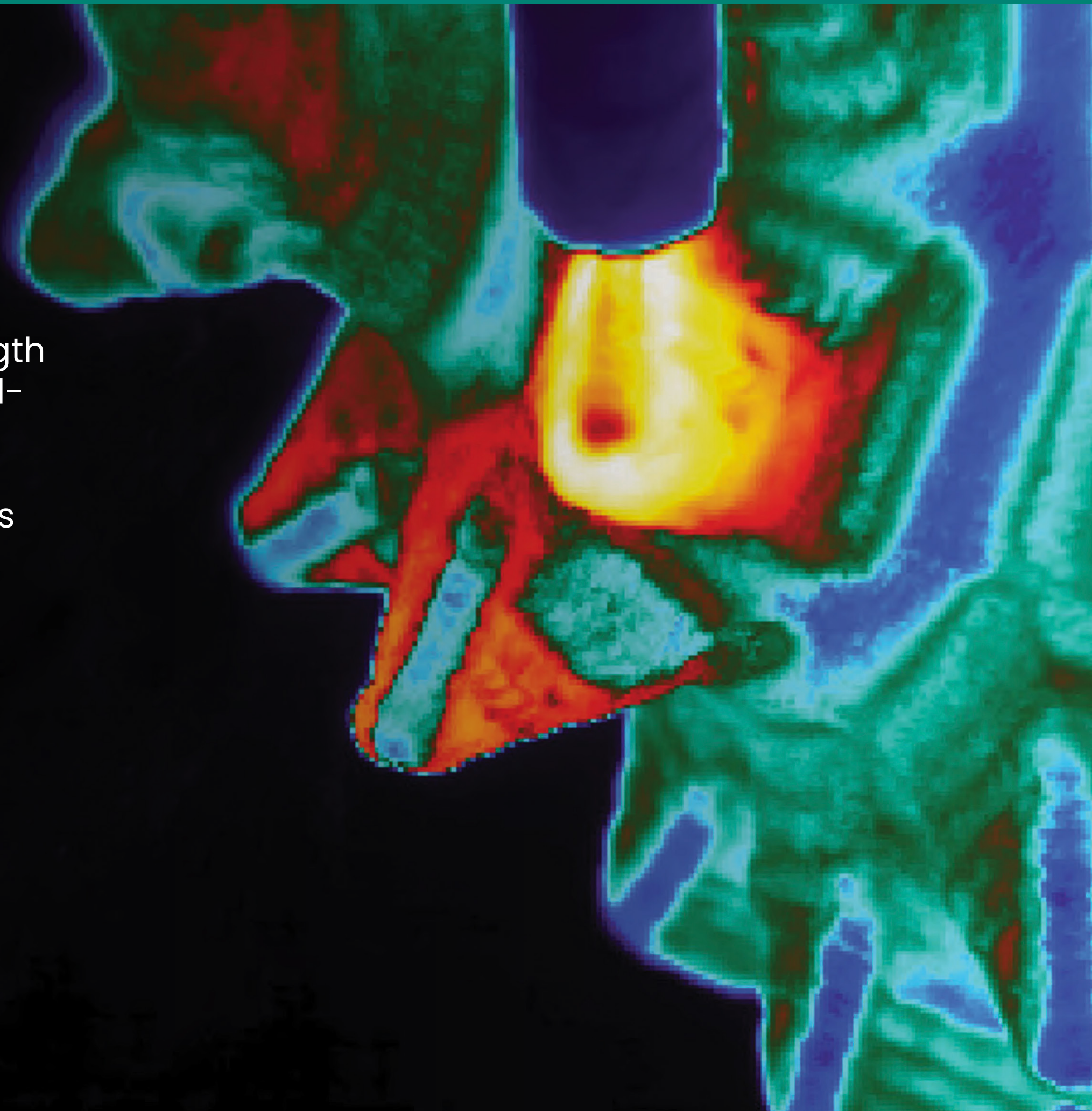
Experimental test
facility (BETA)

Materials Research

Improve drill bit durability and longevity

To lower the cost-per-foot-drilled while improving durability and product effectiveness, Baker Hughes continuously monitors the strength and fracture durability of Hybrid and PDC drill bit materials. The world-class materials laboratories house material synthesis, mechanical & wear testing, characterization, and prototype machining capabilities. Baker Hughes scientists and engineers routinely use these capabilities to unite the **molecular structure** with **drilling performance**. This attention to detail improves the effectiveness of bearing and seals, compact and PDC cutters, and hardfacing and bit body materials to realize performance enhancements.

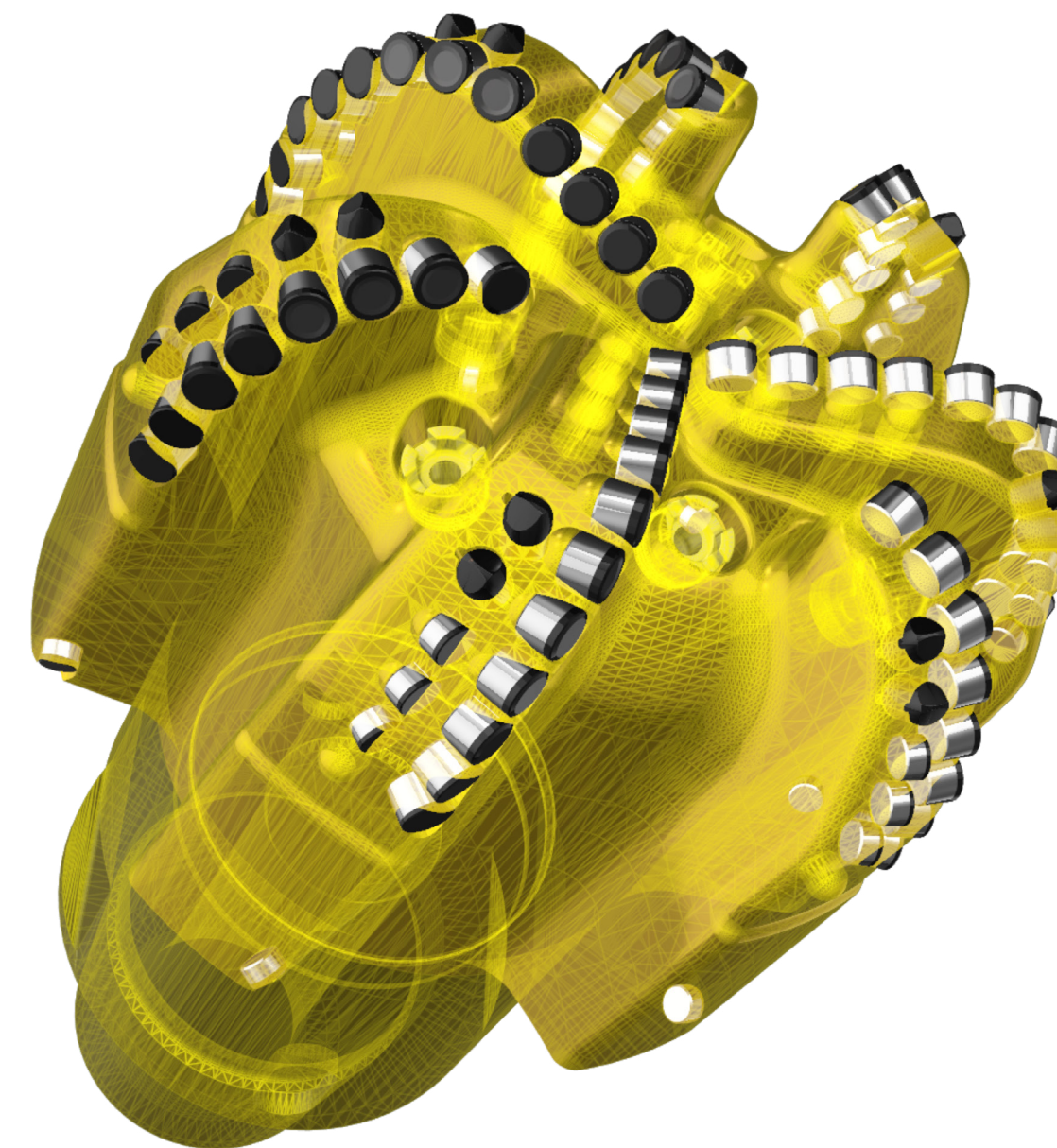
Materials research



Dynamus Extended-life Drill Bit

Fast. Rugged. Reliable.

The **Dynamus™ extended-life drill bit** platform is now faster, more rugged, and more reliable. New features reduce slide and steering time for increased rate of penetration (ROP), improve cutter durability to maximize drilling efficiency, and open the smooth drilling window to expand performance limits under extreme parameters and harsh conditions.



APPLICATIONS

- Hard, interbedded formations
- Tough-to-drill carbonates
- High-energy drilling environments
- Directional drilling w/motors or RSS
- Complex vertical and tangent sections

BENEFITS

- Full customization to maximize performance in any application
- Higher ROP and longer bit life
- Advanced vibration mitigation
- Enhanced directional control
- Reduce drilling cost

Dynamus AntiWalk Drill Bit Technology

Drill on time. Drill on target.

Dynamus™ AntiWalk drill bit technology reduces slide time to increase rate of penetration (ROP), lower overall drilling time, and improve wellbore placement. It also optimizes wellbore quality and enables greater flexibility in BHA design.

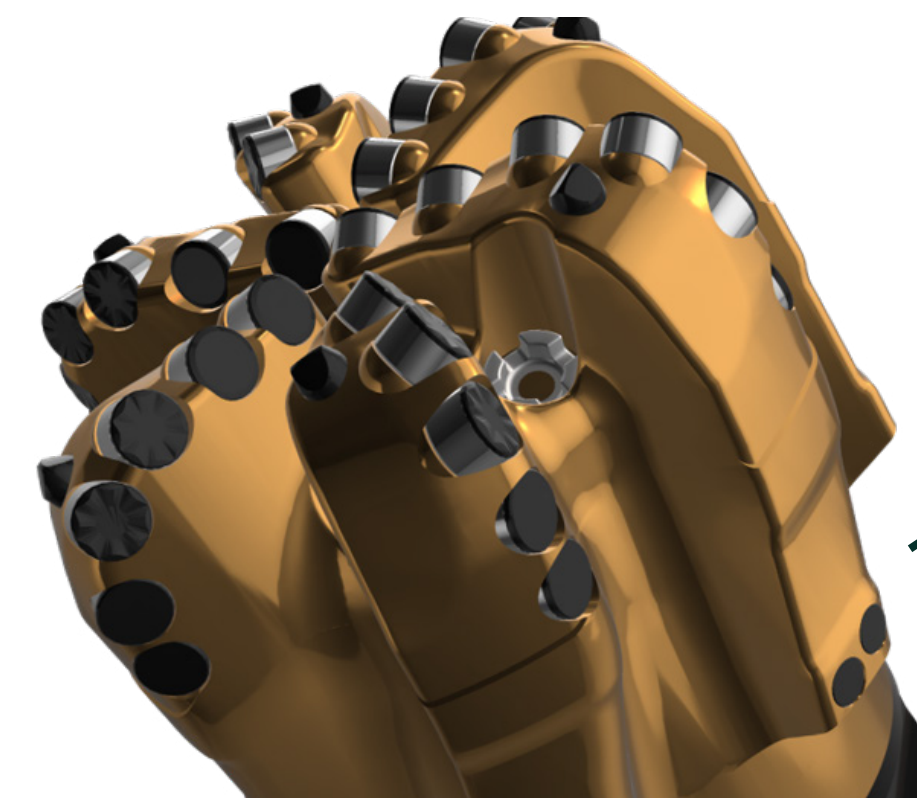
Slides on conventional motor assemblies often account for up to 50% of drilling time, yet only 10 –15% of the distance drilled. AntiWalk technology tracks better to stay on target in all hole sections and reduce the time spent sliding for corrections. This enables you to spend your time optimizing ROP rather than correcting the wellbore trajectory. A unique stripe on the gauge pad limits depth of side cutting against the borehole wall while drilling ahead for reliable tracking, resulting in increased overall ROP and reduced dogleg severity.

APPLICATIONS

- Unconventional oil and gas wells
- Motor directional assemblies
- Wells prone to unplanned deviations
- Vertical, curve, and lateral sections

BENEFITS

- Optimizes section ROP for reduced drilling time and costs
- Tracks to stay on target in rotate mode
- Reduces number and severity of slides for trajectory corrections
- Improves wellbore quality with reduced dogleg severity



RELIEF

Allows for planned BUR

STRIPE

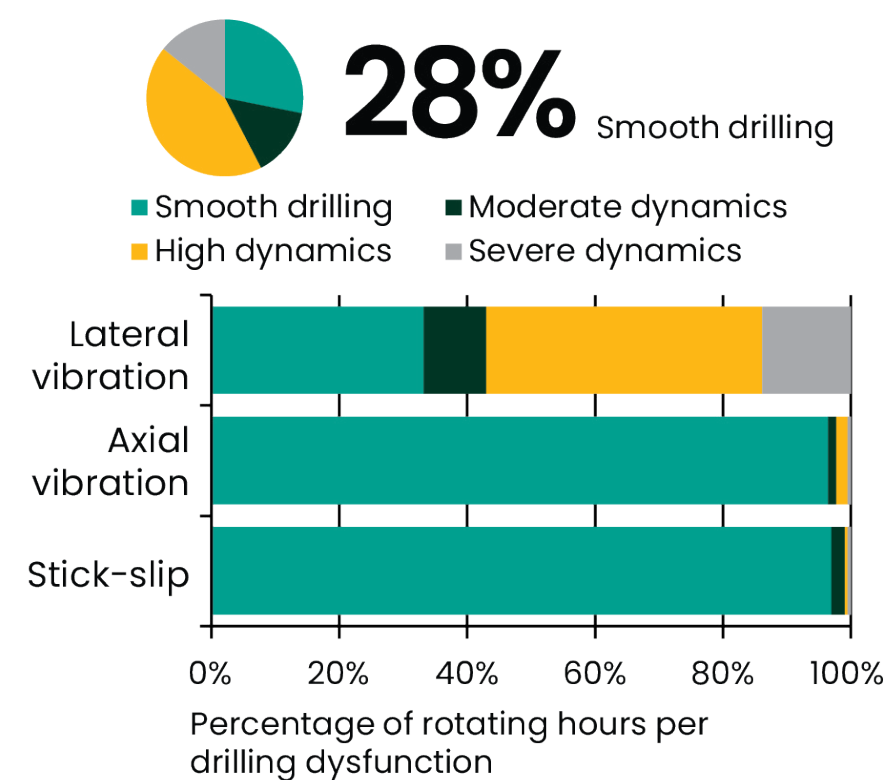
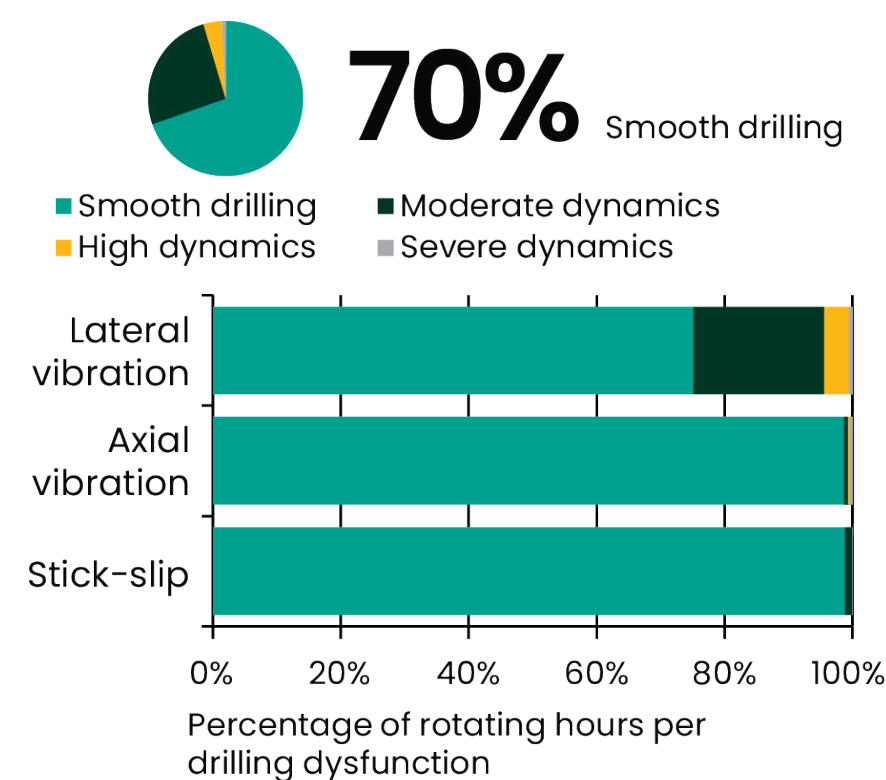
Limits DOC against borehole wall at low side loads

StayTrue Shaped Diamond Elements

Get longer, faster runs consistently and without compromise

StayTrue™ shaped diamond element technology delivers improved speed and durability—without compromise—in hard and interbedded formations by enabling more efficient bit designs that expand the smooth drilling window.

The StayTrue shaped technology leverages a unique chisel shape and engineered placement so you don't have to choose between bit life and speed. Instead, it minimizes downhole dysfunctions and delivers longer, faster runs—and reduced cost per foot—consistently and without compromise.



APPLICATIONS

- Hard and interbedded formations
- Where downhole vibrations/bit whirl are causing tool damage/poor bit performance

BENEFITS

- Creates a stabilizing effect to reduce lateral vibrations
- Mitigates bit whirl
- Optimizes bit response
- Provides increased durability over standard PDC cutters
- Improves energy efficiency
- Minimizes damage to primary cutting structure
- Increases durability and longevity
- Prevents chipping
- Reduces drag
- Improves cutting performance
- Improves ROP

Talon Strike PDC Drill Bit

Performance delivered

The **Talon™ Strike PDC drill bit** from Baker Hughes delivers consistent performance, competitive pricing, and fast response times in soft to medium-hard formation toughness and moderate application complexity.

Talon Strike drill bits build upon the strength of the Baker Hughes Talon high-performance PDC bit family. Talon Strike combines application engineering expertise, proven bit technology and a comprehensive feature set to deliver the right bit at the right price, when and where it's needed.



APPLICATIONS

- Soft to medium-hard rock
- Fast-drilling applications
- Top hole applications
- Directional applications (RSS and conventional)
- Development drilling campaigns

BENEFITS

- Comprehensive application engineering expertise
- Superior directional control and bit stability
- Reliable, consistent performance
- Bit design and supply chain streamlined for responsiveness

TerrAdapt Adaptive Drill Bit

Work Smarter. Not Harder

With yesterday's PDC technology, once you trip in hole, that bit's behavior is what you have for your entire well. If rock strength changes, or stringers are encountered, that bit is no longer optimized to drill efficiently. The **TerrAdapt™ adaptive drill bit** solves that issue—it is the first and only smart bit that can adjust depth of cut control downhole, in real-time to optimize efficiency for those loading conditions.

The TerrAdapt bit's autonomous depth of cut control adjustment:

- Mitigates stick-slip, an often silent torsional dysfunction that can lead to erratic bit performance and inconsistent bit/BHA life.
- Absorbs impact loads – prolong cutting structure life and ensuring your goals will be met.

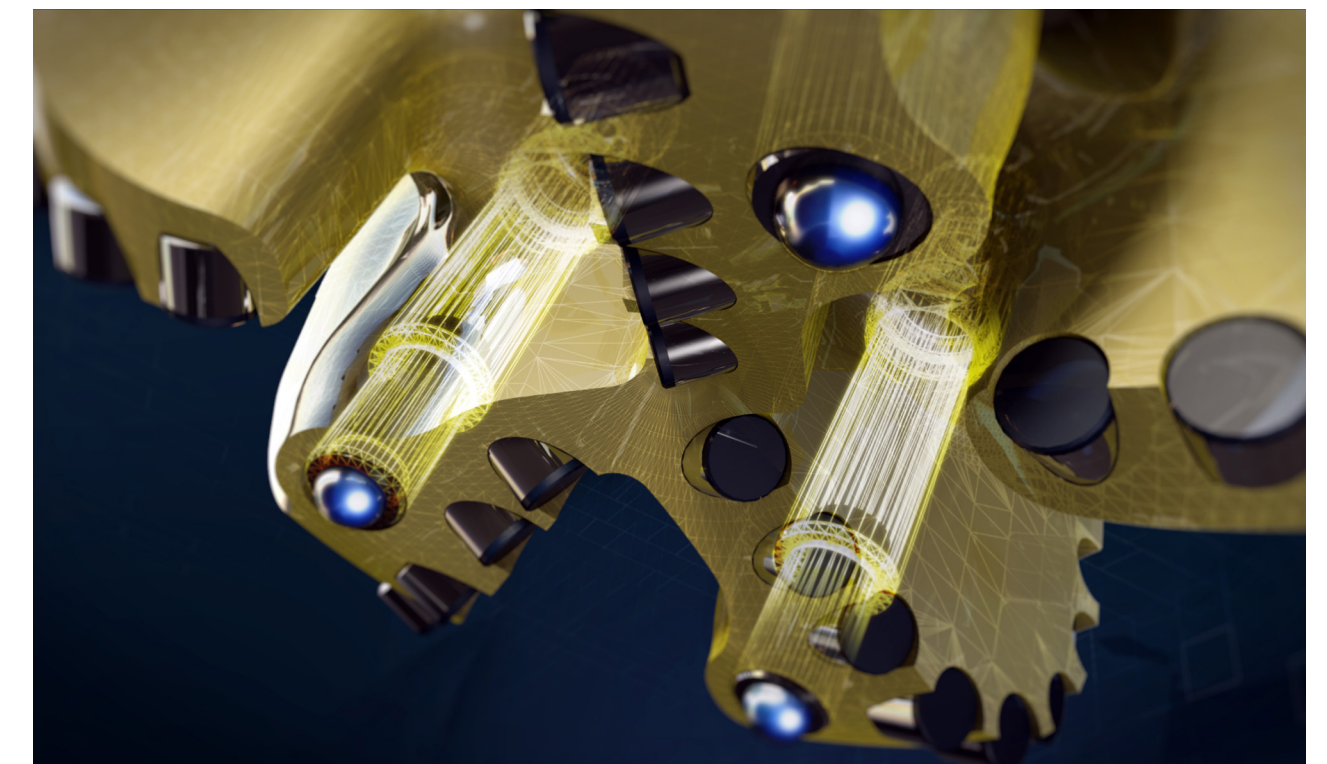
The TerrAdapt technology optimizes bit response to deliver the best performance real-time, increasing efficiency and reducing NPT.

APPLICATIONS

- Rotary steerable and bent motor applications
- Performance limited by stick-slip and torsional vibrations
- Reamer applications

BENEFITS

- Mitigate stick-slip
- Real-time depth of cut control
- Eliminate surface intervention
- Optimize bit response
- Reduce bit-reamer matching issues

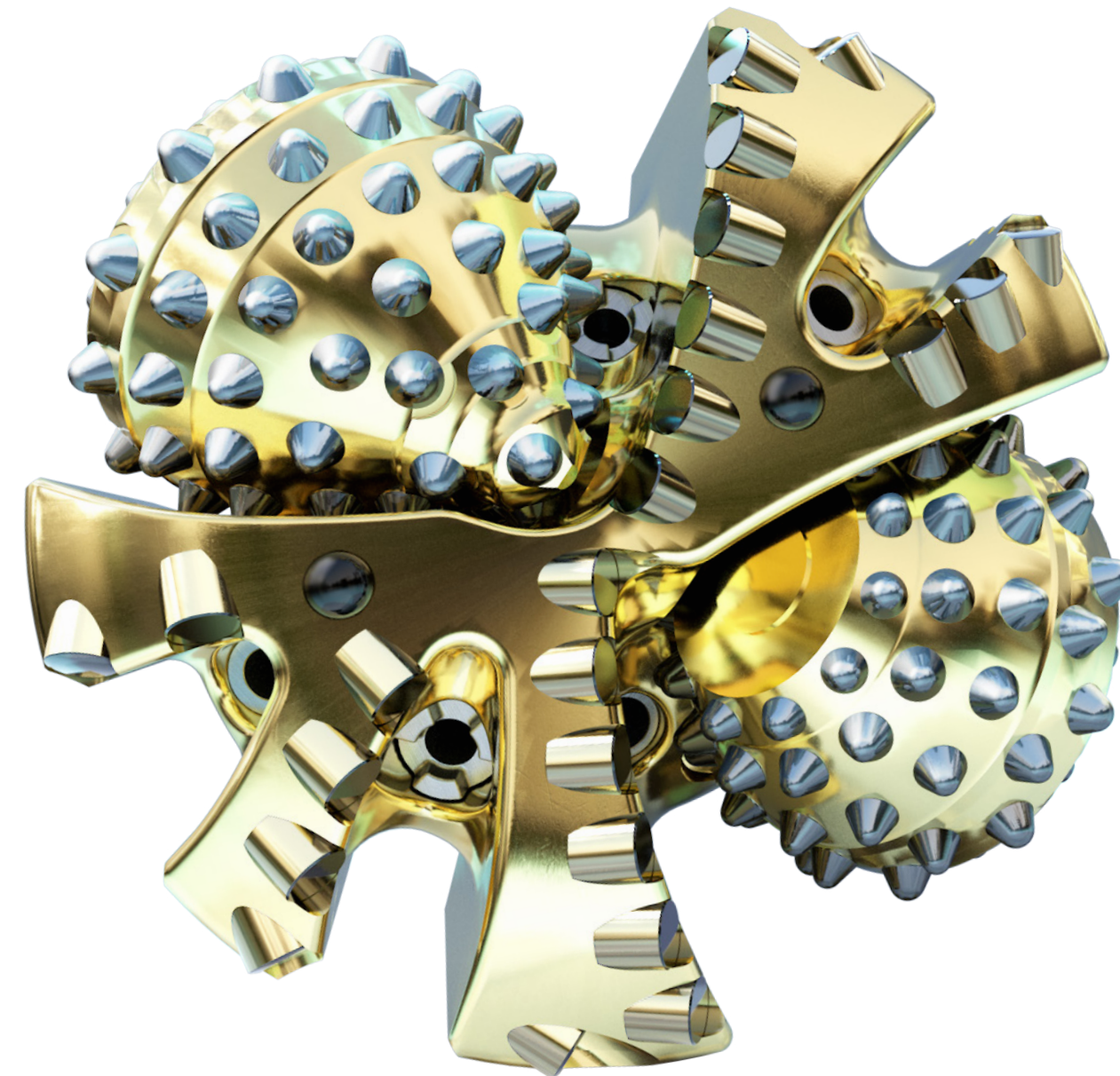


Kymera Mach 5 Hybrid Drill Bit

Unleash the power. Extend the limit.

The drive to improve penetration rates has seen the introduction of high torque motors and higher weight on bit, making it increasingly challenging to find the right bit for this tougher operating environment. Steering issues make it difficult to land in the desired target and compromise overall penetration rates. Bit durability has been limited in harder formations and intervals with interbedded hard streaks.

The **Kymera™ Mach 5 hybrid drill bit** from Baker Hughes extends the hybrid bit application range, increases rate of penetration (ROP), improves steerability, and provides longer bit life in high energy drilling environments.



APPLICATIONS

- Challenging carbonates
- Hard interbedded formations
- Vertical and/or curve sections
- Directional drilling with motors or rotary steerable systems (RSS)
- High-energy drilling environments

BENEFITS

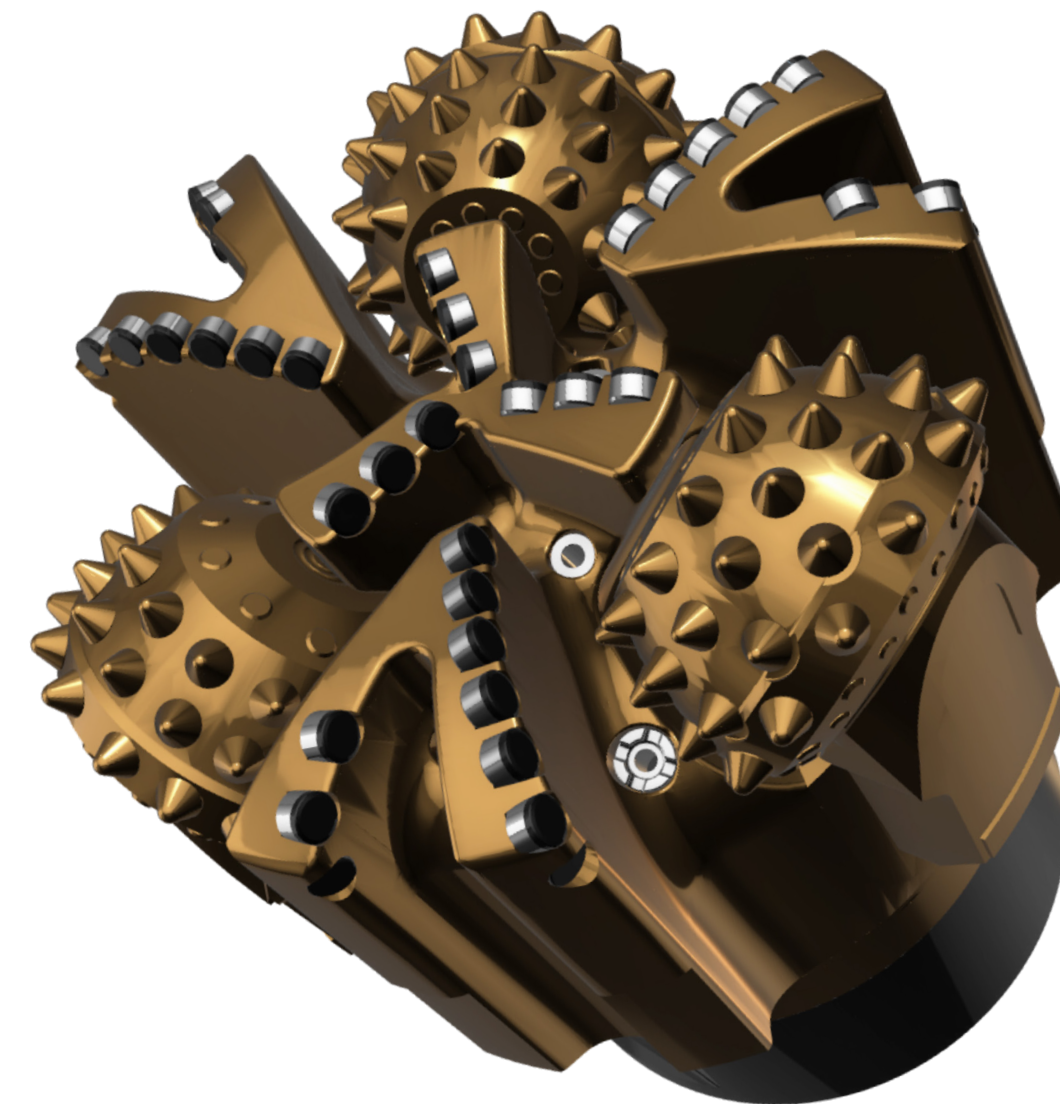
- Increased application range
- Higher penetration rates
- Improved steerability
- Longer bit life
- Reduced drilling cost

Kymera Mach 4 Hybrid Drill Bit

Dig beyond the curve

The drilling industry has enjoyed the benefits of hybrid drill bits for 10+ years. Pairing the fixed blades of a polycrystalline diamond compact (PDC) bit with the roller cones of a tricone bit, hybrid bits crush the rock and then shear it away, minimizing downhole vibrations. Operators require faster drilling speeds and better performance, demanding a new offering of hybrid bit technology.

The **Kymera™ Mach 4 hybrid drill bit** extends drilling lengths from typical curve sections to handle combination sections of the well—saving trips and replacing both roller cone and PDC bit runs. Baker Hughes is the expert in hybrid drill bit technology. The Kymera Mach 4 drill bit extends performance, digging beyond the curve.



APPLICATIONS

- Challenging carbonates
- Hard interbedded formations
- Vertical and/or curve sections
- Directional drilling with motors or rotary steerable systems (RSS)
- High-energy drilling environments

BENEFITS

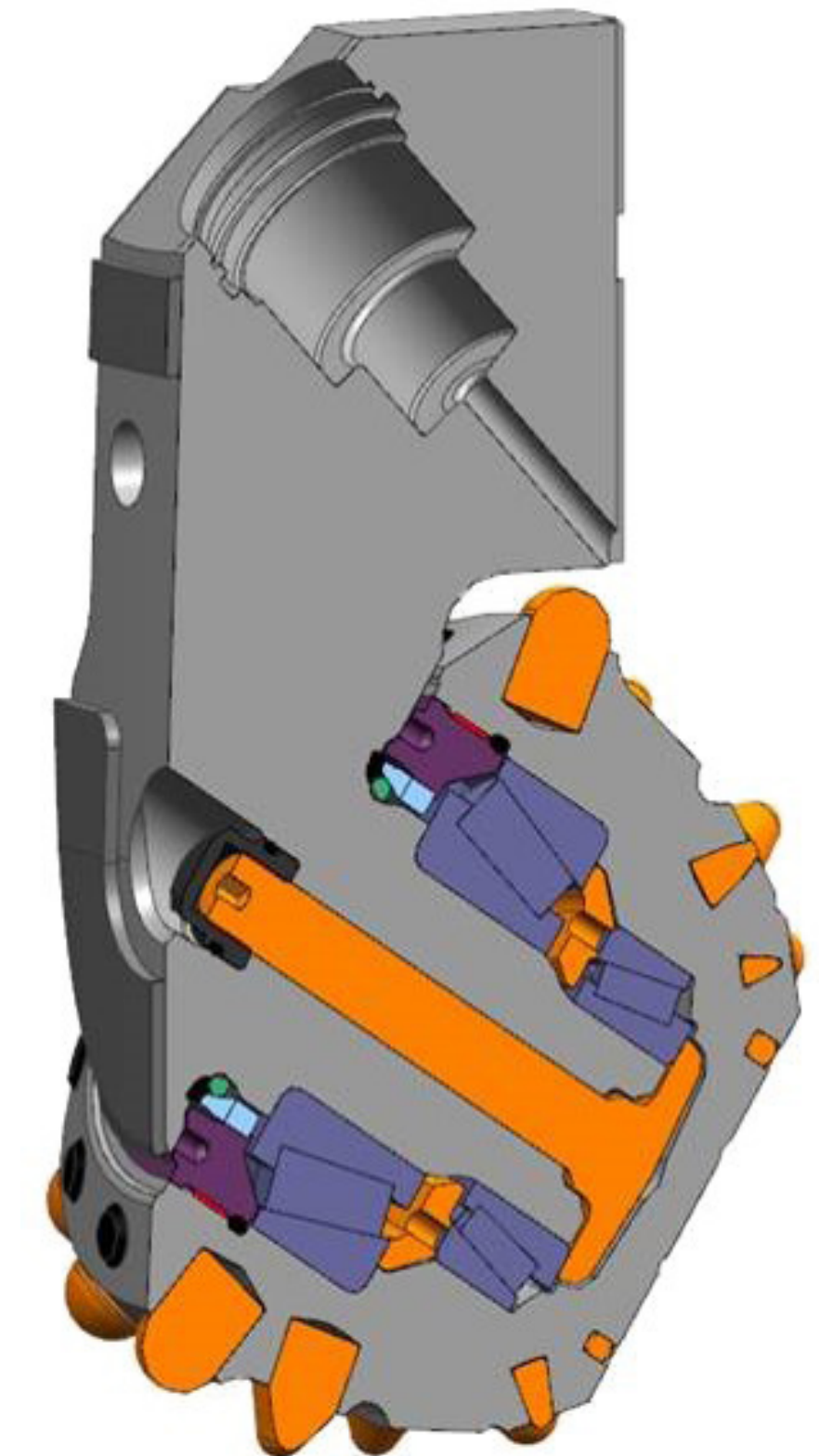
- Make fewer trips with the most durable hybrid bit on the market
- Minimize lateral, axial, and torsional vibrations
- Improve speed and durability without sacrifice to stability
- Enhance ROP by up to 25% over previous hybrid bit designs
- Maximize performance by drilling multiple sections in one hybrid bit run

Kymera Extended Life Bearing Package

Extended bit life

Kymera Extended Life has a patented tapered roller bearing arrangement that targets the bearing misalignment present in rock bit bearings today providing:

- Improved bearing alignment which stabilizes seal interface, leading to longer seal life replacing both PDCs and roller cones in challenging applications
- Bearing races are profiled specifically to rock bit application loads, providing lower overall peak stresses in the system
- Assembled tapered roller bearings are pre-loaded for improved distribution and constant seal face load(s)
- Reduced heat generation with no journal or thrust faces
- Extended bit life defining new world records



StayCool 2.0 Cutter Technology

Beat the drilling day curve with cooler, sharper, more efficient cutter technology

StayCool™ 2.0 multidimensional cutter technology from Baker Hughes helps beat the drilling day curve and reduce drilling costs by minimizing friction on the cutter face, improving rates of penetration (ROP), and drilling more efficiently. Run on the Baker Hughes **Dynamus™ platform** of extended-life PDC drill bits, StayCool 2.0 cutters use unique nonplanar diamond table geometry and polished cutter base technology to enhance performance in key applications.

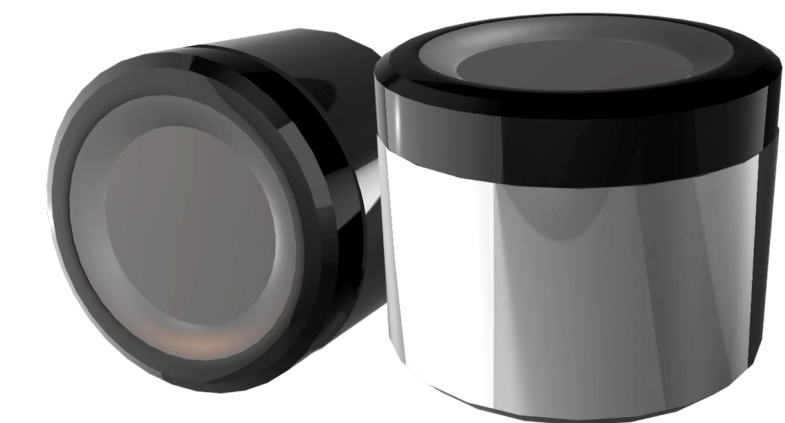
In more challenging environments, like interbedded sandstones and carbonates, bit performance is directly related to cutters and their ability to withstand heat. StayCool 2.0 technology reduces heat generation at the cutter/rock interface. This lengthens the life of the cutter, which leads to extended runs, fewer bit trips, and reduced overall time to reach total depth (TD).

APPLICATIONS

- Conventional or unconventional oil and gas wells
- Abrasive formations
- High-speed motor applications

BENEFITS

- Reduces friction on diamond table
- Lowers heat generation at cutter/rock interface
- Maintains sharper edge for more efficient drilling over the life of the run
- Increased durability and consistency
- Reduced cracking
- Enables faster and longer drilling
- Maximizes thermal stability



Stabilis X Reinforced Cutter Technology

Drill farther in challenging applications

The **Stabilis™ X reinforced cutter technology** from Baker Hughes amplifies cutter durability and delivers longer runs in challenging formations. Where traditional PDC cutters fail, the Stabilis cutter's novel geometrical design protects the cutters while improving performance.

Stabilis cutters introduce a secondary chamfer on the diamond face of the cutter that enables a higher loading to be applied without breakage. Compared to traditional cutter geometry, Stabilis cutters have nearly triple the impact strength.

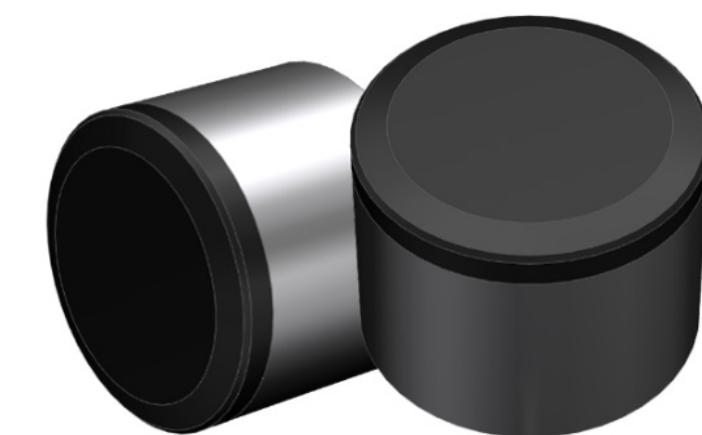
Stabilis cutters also generate less torque fluctuations compared to the standard geometry. For changing cut depths, Stabilis cutters have a consistent coefficient of friction, whereas standard cutters have a fluctuating torque response. Controlling these oscillations leads to smoother, more stable drilling resulting in higher rates of penetration (ROP) and improved overall run performance.

APPLICATIONS

- Wide range of challenging formations where PDC cutter breakage is a concern
- Interbedded or directional intervals where improved torsional stability is required

BENEFITS

- Protect the cutter for increased durability and longer run life
- Reduce spalling and chipping of the diamond face
- Generate less torque fluctuations with a consistent response across changing cut depths
- Decrease friction on the cutter face to reduce heat buildup
- Reduce cuttings size for easier transport to surface and improved borehole quality



ShockWave Shaped Cutter

Drill faster. Drill farther.

The **ShockWave™ shaped cutter** from Baker Hughes saves time and money by extending cutter life to enable your drill bit to drill faster and farther. Designed for the **Dynamus™ extended-life drill bit** platform, novel ShockWave geometry improves cutter-rock interaction for efficient drilling and increased durability in all applications.

DRILL FASTER

The ShockWave cutter geometry increases stress on the rock, enabling the rock to fracture with less energy. The result is a cutter that drills like a single chamfer cutter with the impact resistance of a dual chamfer cutter, resulting in increased ROP for a given weight on bit (WOB).

DRILL FARTHER

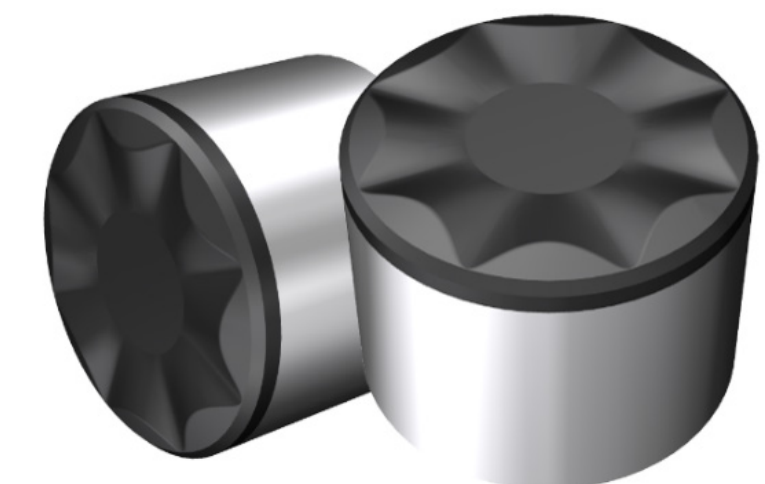
Heat on the face of a cutter causes it to wear and chip faster. The unique shape moves the rock up the trough and breaks it as it hits the ShockWave feature. Cuttings are projected away from the face of the cutter resulting in lower heat on the diamond table. Less heat on the diamond table results in longer cutter life.

APPLICATIONS

- Conventional and unconventional oil and gas wells
- Abrasive and interbedded formations

BENEFITS

- Lowers WOB requirement for a given ROP
- Reduces friction on diamond table
- Lowers heat generation at cutter/rock interface
- Breaks up rock cuttings to improve efficiency
- Enables faster drilling and longer runs



Application Specific Cutter Technologies

Cutter characteristics and application targeting

Baker Hughes’ application specific cutter technologies are designed to address specific applications challenges to maintain a sharp cutting structure and improve overall drilling performance.

APPLICATIONS

- Impact
- General purpose
- Abrasive

BENEFITS

- Reduces breakage to maintain ROP
- Prevents wear and chipping/spalling to facilitate higher ROP and longer runs
- Improves abrasion resistance and thermal stability to prevent the cutters from wearing prematurely

APPLICATION	IMPACT	GENERAL PURPOSE		ABRASIVE
				
Damage type	Breakage	Wear + chipping/spalling		Wear
Dynamus, TerrAdapt, and Kymera	DYNAMUS IMPACT		DYNAMUS GENERAL PURPOSE	DYNAMUS ABRASION
			DYNAMUS THERMALLY TOUGH	
Talon Strike	STRIKE IMPACT		STRIKE GENERAL PURPOSE	

Vanguard Air Tricone Drill Bits

Drill faster with increased reliability

The **Vanguard™ air performance tricone drill bit**, from Baker Hughes combines extra-hard tungsten carbide alloys with a customized insert layout to maximize penetration rates and downhole rock destruction in air-drilling applications.

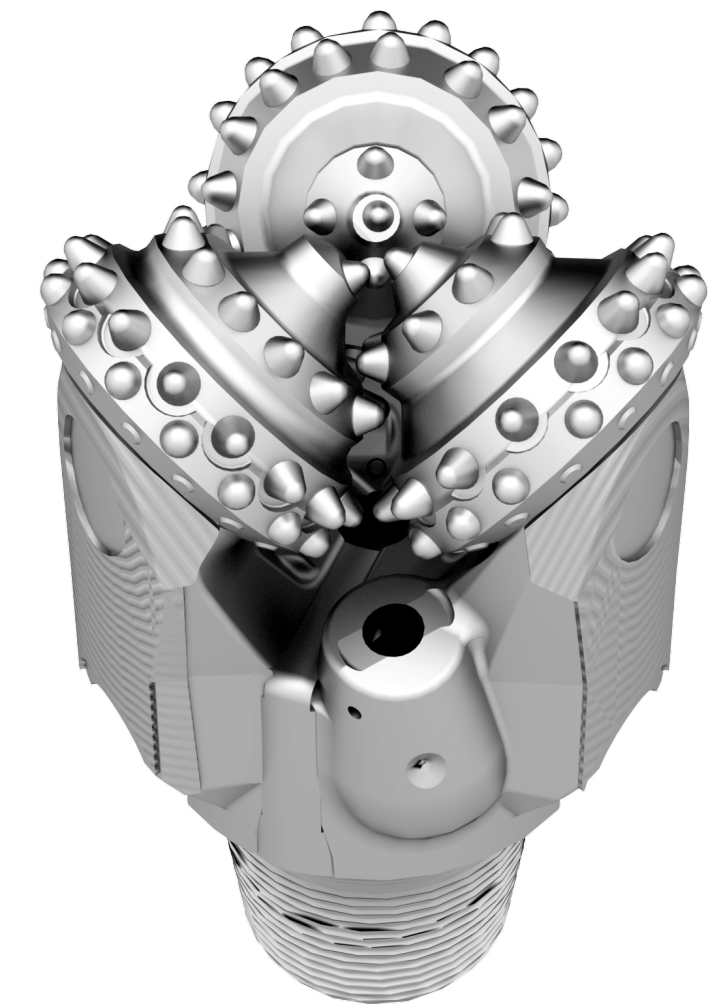
The tricone bit's uniformly applied tungsten carbide hardfacing protects the body from damaging rock formations and debris, enhancing wear resistance while extending the life of bearing and grease compensator seals. Further optimizing performance, the bit features a unique seal and bearing package engineered to improve bit life and reliability.

APPLICATIONS

- Air-drilling operations

BENEFITS

- Provides exceptional ROP
- Increases bit life in abrasive drilling environments
- Better hole cleaning for greater ROP and reduced risk of bit erosion
- Improves reliability



Vanguard Arabia Tricone Drill Bits

Optimize drilling efficiency in carbonate formations

The Baker Hughes **Vanguard™ Arabia tricone drill bits** reliably drill hard-carbonate formations, offering unprecedented cutting aggressiveness. The bit's next-generation family of carbide grades and geometry deliver unsurpassed penetration rates and ROI in these drilling applications.

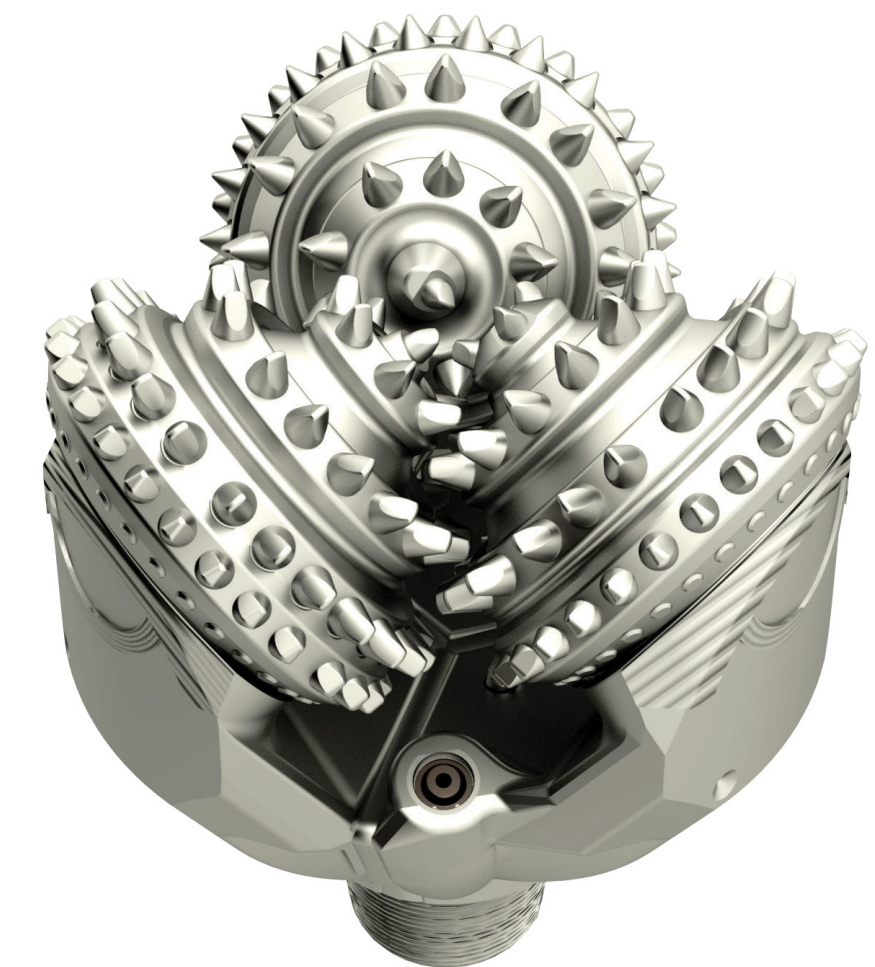
Vanguard Arabia bits are designed using enhanced engineering methods, which calculate the optimum tungsten carbide insert spacing on each row to further improve drilling efficiency and minimize the risk of tracking, allowing higher rates of penetration (ROP) over longer distances in carbonate sections.

APPLICATIONS

- Performance drilling in carbonate formations
- Rotary, RSS, and motor applications

BENEFITS

- Provides exceptional ROP
- Improves reliability for longer drilling hours downhole
- Increases bit life in carbonate drilling environments



Vanguard Directional Tricone Drill Bits

The new benchmark for drilling directional intervals

Increasing dependence on directional drilling has resulted in a higher demand for quality drill bits that provide high levels of reliability, steerability, and performance. Baker Hughes has addressed these needs with our **Vanguard Directional™ roller-cone drill bits**.

Because traditional roller cones were originally designed to drill vertically, the bits did not perform at the same levels in diverse drilling environments. For example, cyclical sideloading intrinsic to directional drilling often led to leg damages and early seal failures, premature heel-rounding also gave way to early seal failures and reduced penetration rates, and back reaming damaged bit compensator systems and increased torque and drag.

Baker Hughes has invested more than a decade of continuous improvement efforts in directional drilling technology, including analyzing the root cause of failures and drilling inefficiencies.

APPLICATIONS

- Non-vertical drilling
- Rotary, motor, and other directional system applications

BENEFITS

- Achieving longer curve drilling hours
- Maximizing average ROP with specific cutting structures
- Improves seal reliability and bit dull conditions
- Decreasing directional drilling cost-per-foot



Vanguard geothermal
tricone drill bit

Vanguard Geothermal Tricone Drill Bit

High-temperature performance

The **Vanguard™ Geothermal tricone bit** from Baker Hughes offers application-specific bearing packages that deliver unsurpassed reliability across a wide high-temperature range. Vanguard Geothermal Bits equipped with a standard metal-face seal, drill 18% longer hours than bits with conventional elastomer components. A proprietary metal-to-metal sealing system provides unmatched reliability in circulating temperatures up to 350°F (177°C). For temperatures up to 550° (288°C), the Vanguard Geothermal tricone bit can incorporate specially formulated, high-temperature compounds that are more resistant to thermal degradation and compression set. Vanguard Geothermal tricone bits designed for temperatures beyond 550° feature an unsealed bearing package to allow the bit to drill further in ultra-high temperatures.

Circulating temperature range	Recommendation
≤275°F (135°C)	Elastomer (VG)
275°F (135C) to 350°F (177°C)	Metal-face seals on (VM)
350°F (177°C) to 550°F (288°C)	Vanguard Geothermal bit MFS only (VMG)
>550°F (288°C)	Vanguard bit ultrahigh-temperature nonsealed (VXG)

APPLICATIONS

- Geothermal drilling
- High-temperature environments
- Rotary and motor applications
- Air drilling applications

BENEFITS

- Longer continuous operation in HT environments
- Lower NPT
- Greater reliability in high RPM and HT conditions
- Improved efficiencies for faster ROP and reduced vibrations
- Enhanced outer diameter protection for consistently drilling in-gauge holes and improved seal reliability
- Increased bit stability for superior borehole quality
- Extended cutting structure life in abrasive environments

Vanguard Plug Drillout Bit

Smooth, fast drillout for expedited operations

Designed to do more than simply drill through composite bridge plugs (CBPs), the **Vanguard™ plug drillout roller cone bit**, from Baker Hughes consistently delivers a cleaner, more reliable drillout operation.

The unique cutting structure of the Vanguard plug drillout bit uses a higher tooth count and self-sharpening teeth to tackle the specific challenges of plug drillouts. This cutting structure directs the limited available weight on bit (WOB) to destroy cast iron and tungsten carbide CBPs, crushing them into smaller cuttings. Production is then allowed to flow more smoothly and cleanly with less debris.

Vanguard plug drillout
tricone drill bit



APPLICATIONS

- Bridge plug drillouts
- Fracturing ball and sleeve system drillouts
- Coiled tubing
- Motor, rotary, and directional drilling
- Low weight on bit; low available torque

BENEFITS

- Improves drilling efficiency in low WOB applications
- Reduces wear in the bearing
- Extends bearing life
- Protects the bearing and seal for increased durability and performance
- Protects the compensator
- Assists the drilling operation when backreaming is required
- Provides longer bit life in rotary, motor, and directional applications

Vanguard Steel Tooth Drill Bit

Unsurpassed performance, reliability, and economics in a range of soft formations

Vanguard™ steel-tooth tricone bits from Baker Hughes address the primary issues associated with steel-tooth applications and the need for enhanced durability and speed. The VGM-1 bit design gives operators the fastest drilling achievable in a range of soft formations, while the VGM-3 bit design offers unprecedented durability against more demanding and extremely abrasive high-wear applications.

An optimized high-count row minimizes bit tracking and improves drilling efficiency, allowing higher rates of penetration (ROP) over longer distances. Superior reliability in a wide range of applications is achieved with patented high-aspect-ratio and metal-face seal technologies, while shirrtail and leg hardfacing (STL) protects the bit body, increases wear resistance, and extends bearing and grease-compensator seal life.

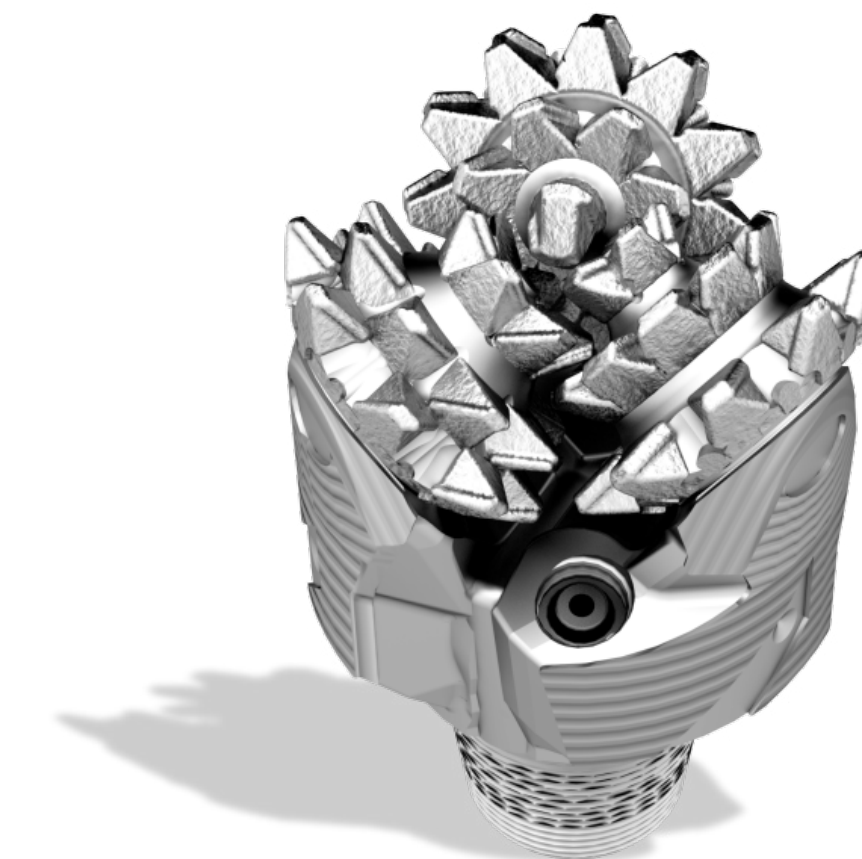
Vanguard steel tooth
tricone drill bit

APPLICATIONS

- Performance drilling operations in soft formations
- Rotary and motor applications

BENEFITS

- Deliver maximum rock destruction and improved ROP in a full range of formations and applications
- Improve reliability for longer drilling hours downhole
- Increases bit life in abrasive drilling environments



GTX, GX, MX,
AND STX

GTX, GX, MX, and STX Tricone Drill Bits

Achieve consistent, reliable drilling performance
in a broad range of applications

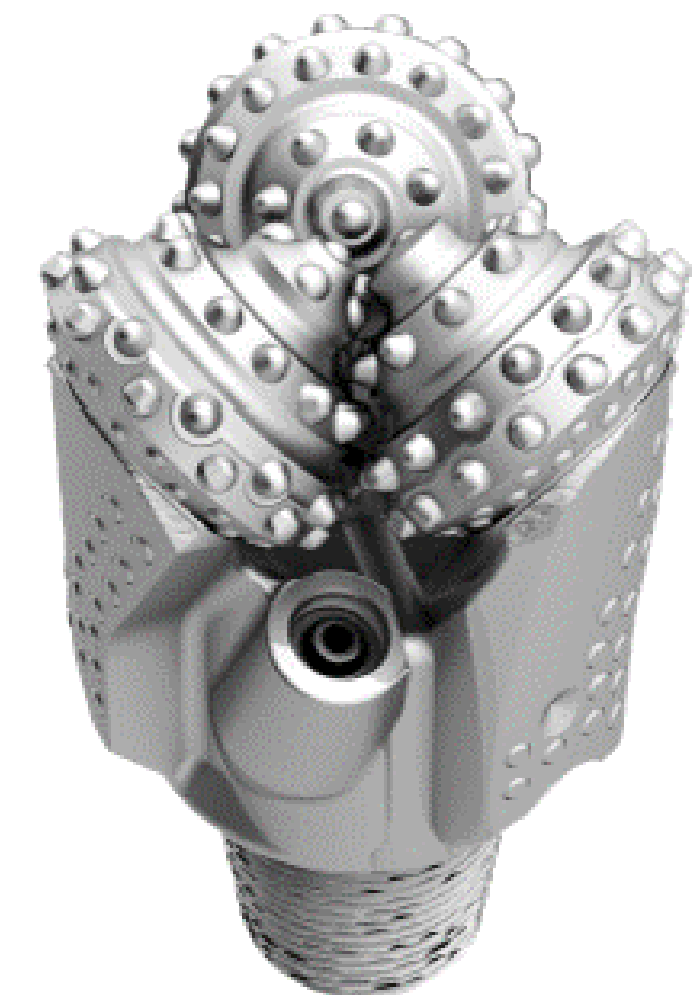
The family of **GTX™, GX™, MX™, and STX™ tungsten carbide tricone drill bits** from Baker Hughes has accumulated significant field experience over the last decade, becoming the drill bits of choice for many operators and contractors in a variety of applications. The GTX, GX, and STX tricone drill bits are elastomer-sealed and are available in diameters from 3.875 to 30 in. For highspeed and/or high-temperature drilling, the MX bit is a versatile, reliable solution that uses Baker Hughes patented second-generation metal seals.

APPLICATIONS

- Conventional drilling applications
- Rotary and motor applications

BENEFITS

- Efficient operational costs
- Provide reliable and consistent drilling performance
- Offers flexibility when choosing the right bit for a wide range of applications



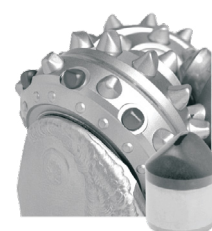
Tricone Drill Bit Optional Features

Tricone drill bits



Diamond inserts (DX)

For directional and highly abrasive applications, diamond inserts deliver unmatched gauge-holding ability. Every third insert has a thicker diamond table and generous chamfer for remarkable resistance to breakage.



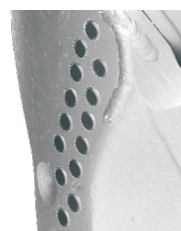
Diamond gauge trimmers (DT)

For abrasive applications where rounded gauge is a problem, every gauge trimmer is diamond.



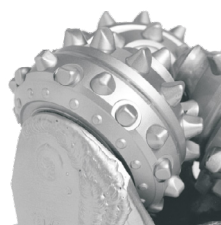
Shirttail and leg hardfacing

STL™ hardfacing is the industry's leading technology to strengthen legs and shirttails.



Diamond shirttail compacts (DS)

For additional leg protection in abrasive applications, flat diamond compacts can be inserted on the leg of the bit.



Spray-coated cones (R)

For additional wear resistance when drilling directional or abrasive applications, a tungsten carbide spray coating can be applied to cones.



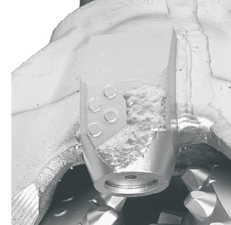
Diamond heel compacts (DH)

Every heel compact is diamond enhanced.



Diamond-enhanced wear pad (DP)

For additional leg protection in abrasive applications, flat diamond compacts can be added to the leading edge of the leg pad.



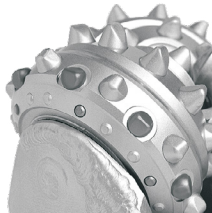
High-flow extended nozzles (T)

High-flow extended nozzles are added to maximize penetration rates in hard and soft formations. These nozzles are much sturdier and provide greater flow capacity than conventional extended nozzles.



Gauge enhancement package (G)

For directional and highly abrasive applications, tough ovoid-shaped inserts are added on the heel row and a generous amount of carbide inserts are added on the gauge.



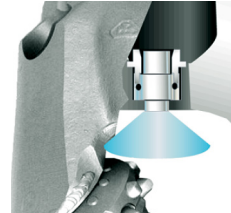
Diamond gauge/diamond trimmers (DDT)

For maximum gauge and heel-area protection, every third gauge compact and every gauge trimmer is diamond.



Motor hardfacing (M)

For additional protection in high-speed, directional, or abrasive applications, motor hardfacing can be applied. Tungsten carbide particle hardfacing is applied liberally along the shirttail and extended up the leading edge of the bit leg.



Center jet (C)

A fourth jet may be positioned in the center of the bit. Center jets are primarily used to prevent bit balling and the associated reduction in penetration rate. Center jets are available in bit sizes 7 7/8-in. and larger.



Breakage-resistant heels (H)

A breakage-resistance package for tough drilling applications where friction tends to heat-check the heel compacts.



Wear/stabilization pad (P)

Wear/stabilization pads are a steel block containing flush-mounted carbide inserts added to the outer diameter of a bit to minimize wear on the bit leg or body.



Shirttail compacts (S)

Tungsten carbide compacts are added to the shirttail to reduce leg wear in abrasive formations and deviated or horizontal wellbores.



Three-port center jet (C3)

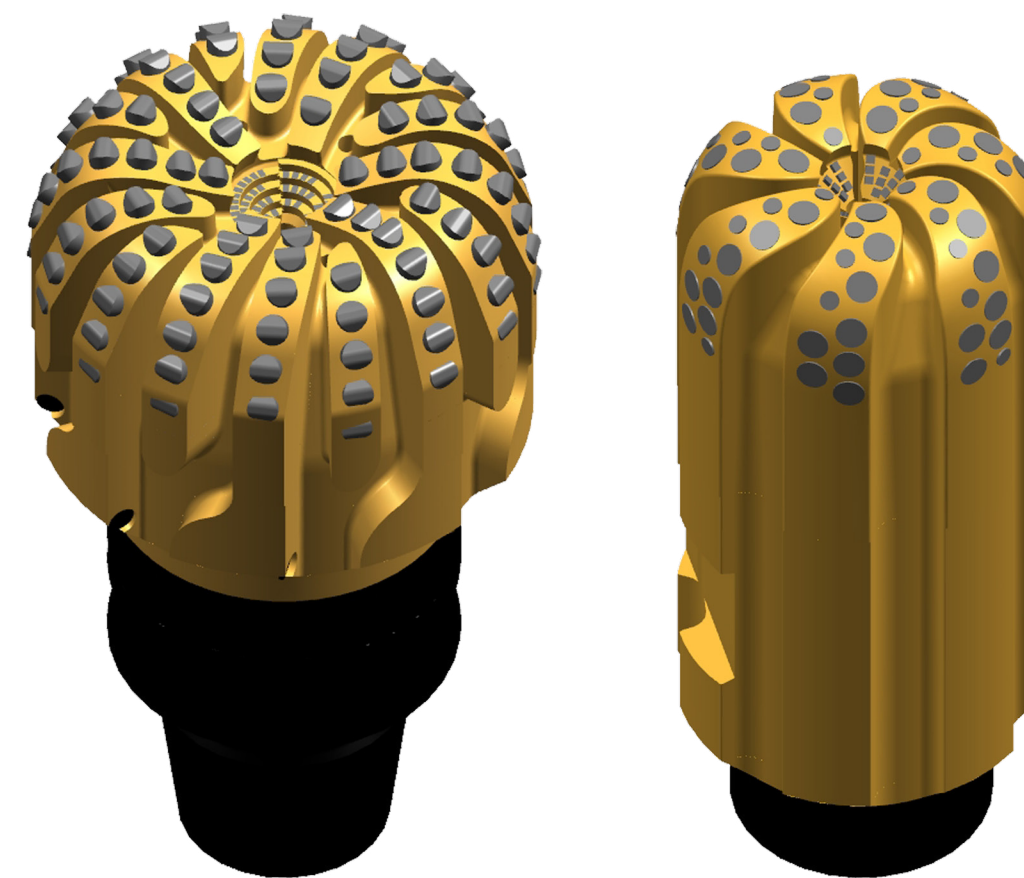
For bit sizes 16-in. and larger where severe balling conditions may occur, three fixed ports can be positioned in the bit center.

IRev Impregnated Drill Bit

Maximize drilling performance in even the most difficult and abrasive environments

The **IRev™ infinite revolution impreg bit** from Baker Hughes improves run life, while minimizing trips and the number of bits required when drilling in hard and abrasive intervals, including sandstones, or complex sections interbedded with softer shales.

IRev technology features a completely new cutting structure including diamond impregnated posts that allow a more aggressive rate of rock removal, enabling the bit to drill in places where PDC bits typically cannot perform. As diamonds wear away, new diamonds are exposed to enhance performance and further extend bit life.



APPLICATIONS

- Extremely hard and abrasive intervals
- Hard sections interbedded with soft shales and siltstones
- Enhanced coring operations

BENEFITS

- Diamond impregnated posts increase durability, performance, and footage drilled
- More aggressive design enables higher torque output to deliver greater ROP
- Application-specific diamond grits and body matrix provides optimal performance by matching technology to application for best performance
- Optimized profile better balances workloads and extends bit life

EZCase Casing Bit System

Optimize casing and liner operations

The Baker Hughes **EZCase™ casing bit system** enables casing or liner systems to be successfully drilled down to total depth. By combining drilling and casing in one run, the system reduces flat time and provides additional options for problematic wells that cannot be completed through traditional drilling techniques. This nonretrievable casing bit system incorporates numerous exclusive features to enable drilling and reaming over longer intervals, in the most demanding applications, and in a full range of formations.



APPLICATIONS

- Casing and liner drilling or reaming operations
- Drilling and completing problematic wells, including rubble zones, lost-circulation zones, depleted reservoirs, and underground blowouts

BENEFITS

- Steel allow construction maximizes integrity, durability, and efficiency
- Robust crown cutting structure enables casing bit to match performance of standard PDC bits
- Drillable body with patented internal profile reduces drillout time and costs
- Optimized hydraulic efficiency and easy change nozzles to adjust TFA's in the field
- Patented secondary bypass port to mitigate plugged nozzles

EZReam Casing and Liner Reaming Shoe

Reduce drilling cost with fewer trips

The Baker Hughes **EZReam™ casing and liner reaming shoe** reduces drilling costs by reaming faster through long, challenging intervals while ensuring casing and liner systems successfully reach total depth on the first attempt. This robust steel-body reaming shoe incorporates a unique design for efficient reaming and faster drillout. It is the industry's only steel reaming shoe that is drillable with a standard PDC bit.



APPLICATIONS

- Casing reaming operations
- Liner reaming operations

BENEFITS

- Steel allow construction increases ROP and maximizes durability
- Optimized profile and heavy-duty cutting structure to eliminate obstructions, improve borehole quality, and allow completion equipment to pass through
- Combined tungsten carbide hardfacing and PDC cutting structure to open up tight spots and wipe away low-side cutting beds
- Patented concave profile reduces total drillout time and costs
- 360° spiral gauge increases stability when rotating and improves reaming efficiency
- Patented secondary bypass port to mitigate plugged nozzles

LedgeX Reaming Tools

Eliminate dedicated wiper trips, save time and money by wiping out ledges while drilling

The Baker Hughes **LedgeX™ eccentric reaming tools** eliminate the need for dedicated wiper trips and enable completion systems to be run to total depth on the first attempt, saving rig time and lowering cost per foot.

By incorporating LedgeX in the drill string, wellbores can be conditioned during normal drilling operations without sacrificing directional control or bottomhole assembly (BHA) integrity. This fixed-blade PDC reamer improves overall borehole quality by clearing ledges and micro-doglegs created by steerable motor assemblies, and it agitates low-side cuttings beds while drilling high-angle and extended lateral sections. The ability of LedgeX reamers to enhance hole cleaning and conditioning can help reduce torque and drag, improving weight transfer to the bit for increased rate of penetration performance.



APPLICATIONS

- Steerable motor and rotary steerable applications
- Curve, lateral, and other directional drilling applications
- Swelling formations

BENEFITS

- Eccentric blade configuration maintains a smaller pass-through diameter and ensures full hole cleaning / ledge removal
- Reduce torque and drag and risk of hanging up while sliding
- Parabolic blade profile improves reaming efficiency and allows for drilling and back-reaming
- PDC cutters actively engage ledges and provide full-gauge hole conditions while BHA rotates
- Leading and trailing hardfacing pads manage torque and extend PDC cutter life

RWD2 Ream While Drilling Tools

Enlarge and ream boreholes in one run with eccentric, concentric, and bicenter tools

The Baker Hughes **RWD2™ fixed-blade eccentric ream while drilling tools** are capable of drilling out cement and float equipment, as well as drilling and reaming the remaining interval in one continuous operation. The tool blade design and depth-adjusted cutters increase efficiency and reduce cost per foot. RWD2 tools also provide bottomhole assembly (BHA) flexibility for any motor, rotary, or rotary steerable application.



APPLICATIONS

- Rotary and rotary steerable applications

BENEFITS

- Active stabilization pad decreases vibrations for increased drilling efficiency and improved borehole quality
- Depth-adjusted cutters eliminate premature wear and improve balance and durability
- Casing drillout protection with one-run capability
- Optimized nozzle positioning to maximize cuttings removal and cutting structure cooling
- Meets profile needs of a given well with pendulum, packed, or directional assemblies

RWD2 REAM WHILE DRILLING TOOLS

RWD2S™ MOTOR STEERABLE
FIXED-BLADE ECCENTRIC
REAM WHILE DRILLING TOOLS

APPLICATIONS

- Directional motor applications
- Hard rock drilling applications

BENEFITS

- Interchangeable pilot bit allows the selection for an application specific pilot bit and the ability to change bits at the rigsite
- Short tool body provides greater directional performance and control with additional features for BHA flexibility, durability, and stability without the length of traditional eccentric tools



RWD2C™ ROTARY FIXED-
BLADE CONCENTRIC REAM
WHILE DRILLING TOOLS

APPLICATIONS

- Rotary and rotary steerable applications
- Pilot hole enlargement operations
- Predrilled wellbore enlargement operations

BENEFITS

- Variable profile features increase stability and improve hydraulic efficiency



RWD2ST™ SLIMHOLE
BICENTER REAM WHILE
DRILLING TOOLS

APPLICATIONS

- Coiled tubing operations
- Re-entry and sidetrack operations

BENEFITS

- Customized pilot bit design increases performance and durability in specific applications
- One-piece construction with shorter tool body enhances potential buildup rates



RWD2X™ DIRECTIONAL
BICENTER REAM WHILE
DRILLING TOOLS

APPLICATIONS

- Directional motor applications
- Balling-prone operations

BENEFITS

- Directional technology manages pilot bit aggressiveness to allow for better tool face control in directional applications
- Pilot and reamer blade alignment optimizes fluid paths for improved cutter removal, increased cutter durability, and better rates of penetration



MultiSense HD Service

In-bit measurement

The **MultiSense™ HD service** provides a digital drilling record combined with our tailored services allows a detailed post-well analysis to deliver lower cost-per-foot with minimized non-productive time (NPT) for multiple well applications.

The module is pressure activated, designed for drill bit applications and multiple placements along the drill string. Sizes incorporate 4 1/2-in., 6 5/8-in., and 7 5/8-in. API Regular, API IF, and Baker Hughes modular pin connections.



The acceleration measurements are processed using proprietary and field proven algorithms to provide recognition of:

- Lateral Acceleration
- Axial Acceleration
- Stick/Slip
- Revolutions per Minute (rpm)
- Temperature

FEATURES

- Self-contained and self-activated module
- Non-invasive installation in pin
- Multi-axis opposing accelerometers
- High Density background capture
- Field proven algorithms

BENEFITS

- Drill bits and drill string tools with modified pin handled the same as standard tools, reducing BHA handling time and errors
- At the bit dynamic measurements with no additional BHA length above bit
- Higher accuracy and the ability to separate operational parameters from drilling vibrations
- High data density for improved vibration visibility, in-depth analysis and capturing on-bottom practices
- Field tests proving MultiSense measurements correlate with industry accepted measurements

Sabio Drilling Insights

Your roadmap to performance

The **Sabio™ Drilling Insights service** from Baker Hughes allows you to plan, and execute a single well, multiple wells, or an entire field campaign using actionable insights based on structured data. The Sabio Drilling Insights single well service utilizes our cloud based digital ecosystem combined with relevant surface drilling parameters and high frequency in-bit dynamics data from our **MultiSense™ HD modules** to enable engineers to generate actionable insights that improve drilling performance.

The Sabio Drilling Insights multi-well service organizes data for multiple wells to deliver a high-resolution best benchmark well. The system visualizes performance and economics for each bit run and deliver enhanced formation level statistics and limiters. The output becomes a driller's roadmap to guide the rig staff to drill optimized wells.



CLEAN, MATCHED
DATA



DETAILED IN-BIT
MEASUREMENTS



HIGH RESOLUTION
BENCHMARK WELL



AUTOMATED DRILLERS
ROADMAP



CONTINUOUS
IMPROVEMENT

APPLICATIONS

- MultiSense HD in-bit vibration measurement module
- Single run deep-dive service powered by drilling insights platform
- Multi-well drilling optimization projects for defining best practices of parameters, connections, directional control, and reaming

BENEFITS

- Reduced Invisible Lost Time (ILT)
- Reduced Non Productive Time (NPT)
- Faster penetration rates and lower drilling costs
- Delivers high-resolution composite benchmarks for speed and efficiency
- Captures in-bit vibrations and performance by formation
- MSE, Horsepower analysis
- Provides parameter recommendations
- Produces reports with actionable insights

Diamond Drill Bits

API bit tolerances		
Nominal bit size OD		OD tolerance
In.	In.	mm
Up-6 ³ / ₄ incl.	+0.-0.015	+0.-0.38
6 ²⁵ / ₃₂ -9 incl.	+0.-0.020	+0.-0.51
9 ¹ / ₃₂ -13 ³ / ₄ incl.	+0.-0.030	+0.-0.76
13 ²⁵ / ₃₂ -17½ incl.	+0.-0.045	+0.-1.14
17 ¹⁷ / ₃₂ and larger	+0.-0.063	+0.-1.60

TFA values

Diamond Drill Bits

TFA values of common nozzle sizes										
Nozzle size*	Number of nozzles									
	1	2	3	4	5	6	7	8	9	10
7	.0376	.0752	.1127	.1503	.1877	.2255	.2631	.3007	.3382	.375
8	.0491	.0982	.1473	.1963	.2454	.2945	.3435	.3927	.4418	.4909
9	.0621	.1242	.1864	.2485	.3106	.3728	.4249	.4970	.5591	.6213
10	.0767	.1534	.2301	.3060	.3835	.4602	.5369	.6136	.6903	.7670
11	.0928	.1856	.2784	.3712	.4640	.5568	.6496	.7424	.8353	.9281
12	.1104	.2209	.3313	.4418	.5522	.6627	.7731	.8836	.9940	1.045
13	.1296	.2592	.3889	.5185	.6481	.7777	.9073	1.0370	1.1666	1.2962
14	.1503	.3007	.4510	.6013	.7517	.9020	1.0523	1.2026	1.3530	1.5033
15	.1726	.3451	.5177	.6903	.8629	1.0354	1.2080	1.3806	1.5532	1.7258
16	.1963	.3927	.5890	.7854	.9817	1.1781	1.3744	1.5708	1.7671	1.9634
18	.2485	.4970	.7455	.9940	1.2425	1.4910	1.7395	1.9880	2.2365	2.4850
20	.3068	.6136	.9204	1.2272	1.5340	1.8408	2.1476	2.4544	2.7612	3.0680
22	.3712	.7424	1.1137	1.4849	1.8561	2.2273	2.5986	2.9698	3.3410	3.7122

*Nozzle size in 32nds of an in.

Diamond Drill Bits

API connection /
recommended makeup

API connection chart/recommended makeup torque				
Bit OD (in.)	Connection	Bit sub OD (in.)	Recommended makeup torque	
			(kNm)	(kft/lb)
3½–4½	2¾ REG	3, 3⅛, 3¼	2.4–2.7, 3.3–3.6, 4.2–4.6	1.8–2.0, 2.4–2.7, 3.1–3.4
4⅞–5	2⅞ REG	3½, 3¾, and larger	4.2–4.6, 6.3–6.9	3.1–3.4, 4.6–5.1
5⅞–7⅜	3½ REG	4⅛, 4¼, 4½	7.0–7.7, 8.6–9.4, 10.3–11.4	5.2–5.7, 6.3–6.9, 7.6–8.4
7⅞–9⅜	4½ REG	5½, 5¾, 6, and larger	16.9–18.6, 22.4–24.6, 27.6–30.3	12.5–13.7, 16.5–18.1, 20.3–22.4
9⅞–14½	6⅝ REG	7½, 7¾, and larger	50.3–55.4, 57.9–63.6	37.1–40.8, 42.7–46.9
14⅞ and larger	7⅝ REG	8½, 8¾, 9, 9¼, and larger	65.5–72.1, 78.3–86.1, 91.6–100.8, 96.1–105.7	48.3–53.2, 57.7–63.5, 67.6–74.3, 70.9–78.0

Tricone Drill Bits

API bit tolerances		
Nominal bit size OD	OD tolerance	
In.	In.	mm
1 ³ / ₄ –13 ³ / ₄ incl.	–0.–0.0313 (¹ / ₃₂)	–0.–0.8
14–17 ¹ / ₂ incl.	–0.–0.0625 (¹ / ₁₆)	–0.–1.6
17 ⁵ / ₈ and larger	–0.–0.0938 (³ / ₃₂)	–0.–2.4

TFA values

Tricone Drill Bits

TFA common values				
Nozzle size	Number of nozzles			
in.	1	2	3	4
$\frac{6}{32}$	0.028	0.055	0.083	0.110
$\frac{8}{32}$	0.049	0.098	0.147	0.196
$\frac{9}{32}$	0.062	0.124	0.186	0.248
$\frac{10}{32}$	0.077	0.153	0.230	0.307
$\frac{11}{32}$	0.093	0.186	0.278	0.371
$\frac{12}{32}$	0.110	0.221	0.331	0.442
$\frac{13}{32}$	0.130	0.259	0.389	0.518
$\frac{14}{32}$	0.150	0.301	0.451	0.601
$\frac{15}{32}$	0.173	0.345	0.518	0.690
$\frac{16}{32}$	0.196	0.393	0.589	0.785
$\frac{18}{32}$	0.248	0.497	0.745	0.994
$\frac{20}{32}$	0.307	0.614	0.920	1.227
$\frac{22}{32}$	0.371	0.742	1.114	1.485
$\frac{24}{32}$	0.442	0.884	1.325	1.767
$\frac{26}{32}$	0.518	1.037	1.555	2.074
$\frac{28}{32}$	0.601	1.203	1.804	2.405

Tricone Drill Bits

Makeup torque
recommendations

Makeup torque recommended for roller cone bit shanks		
Shank size	Recommended torque	
in.	ft-lb	Nm
2 ³ / ₈	3,000–3,500	4,100–4,700
2 ⁷ / ₈	4,500–5,500	6,100–7,500
3½	7,000–9,000	9,500–12,200
4½	12,000–16,000	16,300–21,700
6 ⁵ / ₈	28,000–32,000	38,000–43,400
7 ⁵ / ₈	34,000–40,000	46,100–54,200
8 ⁵ / ₈	40,000–60,000	54,200–81,300

Tricone Drill Bits

Nozzles				
Bit size (in.)	Standard nozzle	Mini-extended nozzle	High-flow extended nozzle	Center jet nozzle
3½–3¾	AA			
3 ⁷ / ₈ –4 ¹ / ₈	FA			
4½–4¾	FB			
5 ⁵ / ₈ –6¾	FF	LF		
7 ⁵ / ₈ –7 ⁷ / ₈	FH	LH		FF / VF
8 ³ / ₈ –9 ⁷ / ₈	FK	LK		FF / VF
9 ⁷ / ₈ –13½	FK	LK		
10 ⁵ / ₈ –14	FK	LK	FK / LK	FK / VK
14–22	FL	LL	FL / LL	FK / VK
19–30	FL	LL		FK / VK

Nozzles

Tricone Drill Bits

Bearing and performance packages								
	VXG	Vanguard VM	VG	MX	GX	STX	GTX	Triton
Journal bearing		●	●	●	●	●		●
Ball and roller bearing	●	●	●	●			●	●
Metal seal		●		●				
Elastomer seal			●		●	●	●	●
GT performance package				●	●	●	●	
High-temperature package	●	●						
Directional package	●	●	●					
Unsealed	●							●

Bearing performance
packages

Tricone Drill Bits

Product features and enhancements

Code	Description	Example
A	Air journal bearing, air nozzles	VG-40A
C (prefix)	Center jet	GX-C18
C (suffix)	Conical-shape insert	GX-18C
C3	Three-directed center jets	MX-C31
DDX	DSE diamond gauge (33%) / diamond trimmers (50%)	MX-09DDX
DDT	DSE diamond gauge (33%) / diamond trimmers (100%)	MX-09DDT
DH	Diamond heel compacts (100%)	STX-50DH
DH1	Diamond heel compacts (50%)	STX-50DH1
DP	Diamond-enhanced stabilization pad	GX-DP66
DS	Diamond-enhanced shirttail compacts	GX-DS20
DT	Diamond gauge trimmers (100%)	MX-09DT
DT1	Diamond gauge trimmers (50%)	MX-1DT1
DX	DSE diamond gauge compacts (33%)	MX-09DX
DX0	DSE diamond gauge compacts (20%)	MX-09DX0
DX1	DSE diamond gauge compacts (50%)	MX-09DX1
DX2	DSE diamond gauge compacts (100%)	MX-09DX2

Code	Description	Example
DX3	DSE diamond gauge compacts / 1st row (33%), 2nd row (100%)	MX-09DX3
DVH	Diamond Vanguard bit heel	VGD-20DVH
DVHX0	Diamond Vanguard bit heel +20% gauge	VGD-20DVHX0
DVHX	Diamond Vanguard bit heel +33% gauge	VGD-20DVHX
DVHX1	Diamond Vanguard bit heel +50% gauge	VGD-20DVHX1
DVHX2	Diamond Vanguard bit heel +100% gauge	VGD-20DVHX2
G	Enhanced gauge wear resistant	MX-20G
H	Enhanced gauge breakage resistant	GTX-11H
M (prefix)	Motor hardfacing	GTX-M1
M (suffix)	M technology	GX-20M
P (prefix)	Leg stabilization wear pad	GX-P35
R	Spray-coat cones	MX-R09
S	Shirttail compacts	MX-S20
T	High-flow nozzles (two)	MX-T03
T1	High-flow nozzle (one)	MX-T103
T3	High-flow nozzles (three)	MX-T303

Product features
and enhancements

Effective ID
and nozzle type

Ream While Drilling Tools

Effective ID and nozzle type		
Tool size (in.)	Nozzle type	Inlet ID (in.)
7	A	.300
7½	A	.300
8	A	.300
9⅞	B	.850
12¼	B	.850
13¾	B	.850
14	B	.850
15	B	.850
17	C	1.850
18	C	1.850
20	C	1.850

Ream While Drilling Tools

Tool nozzle parts			
Tool size (in.)	RWD2 a	RWD2 b	RWD2 c
9	123-204-434	-	-
10	015-226-932	015-226-942	015-226-952
11	015-226-933	015-226-943	015-226-953
12	015-226-934	015-226-944	015-226-954
13	015-226-935	015-226-945	015-226-955
14	015-226-936	015-226-946	015-226-956
15	015-226-937	015-226-947	015-226-957
16	015-226-938	015-226-948	015-226-958
18	015-226-939	015-226-949	015-226-959
20	015-226-940	015-226-950	015-226-960
22	015-226-941	015-226-951	015-226-961

Ream While Drilling Tools

Makeup torque

Makeup Torque											
Size (in.)	Connection		Minimum makeup torque (ft/lb)‡								
	Type	OD (in.)	Bore of drill collar (in.)								
			1¼	2	2¼	2½	2 ¹³ / ₁₆	3	3¼	3½	3¾
3½	API IF	4¾	*9,986	*9,986	*9,986	*9,986	8,315				
API	NC38	5	*13,949	*13,949	12,907	10,977	8,315				
3½	H-90†	4¾	*8,786	*8,786	*8,786	*8,786	*8,786				
		5	*12,794	*12,794	*12,794	*12,794	10,408				
		5¼	*17,094	16,929	15,137	13,151	10,408				
		5½	18,522	16,929	15,137	13,151	10,408				
4½	H-90†	5¼	*12,590	*12,590	*12,590	*12,590	*12,590				
		5½	*17,401	*17,401	*17,401	*17,401	16,536				
		5¾	*22,531	*22,531	21,714	19,543	16,536				
		6	25,408	23,671	21,714	19,543	16,536				
		6¼	25,408	23,671	21,714	19,543	16,536				
4½	API Reg	5½	*15,576	*15,576	*15,576	*15,576	*15,576				
		5¾	*20,609	*20,609	*20,609	19,601	16,629				
		6	25,407	23,686	21,749	19,601	16,629				
		6¼	25,407	23,686	21,749	19,601	16,629				
API	NC44	5¾	*20,895	*20,895	*20,895	*20,895	18,161				
		6	*26,453	25,510	23,493	21,257	18,161				
		6¼	27,300	25,510	23,493	21,257	18,161				
		6½	27,300	25,510	23,493	21,257	18,161				
4½	API full hole	5½		*12,973	*12,973	*12,973	*12,973	*12,973			
		5¾		*18,119	*18,119	*18,119	*18,119	17,900			
		6		*23,605	*23,605	*23,028	19,921	17,900			
		6¼		27,294	25,272	22,028	19,921	17,900			
		6½		27,294	25,272	22,028	19,921	17,900			

Makeup Torque (continued)											
Size (in.)	Connection		Minimum makeup torque (ft/lb)‡								
	Type	OD (in.)	Bore of drill collar (in.)								
			1¼	2	2¼	2½	2 ¹³ / ₁₆	3	3¼	3½	3¾
4½	API IF	6¼			*23,004	*23,004	*23,004	*23,004	*23,004		
API	NC50	6½			*29,679	*29,679	*29,679	*29,679	26,675		
6 ⁵ / ₈	API REG	7½			*46,399	*46,399	*46,399	*46,399	*46,399		
		7¾			*55,627	53,346	50,704	46,936			
		8			57,393	53,346	50,704	46,936			
		8¼			57,393	53,346	50,704	46,936			
		8½			*60,402	*60,402	*60,402	*60,402	*60,402	*60,402	*60,402
		8¾			*72,169	*72,169	*72,169	*72,169	*72,169	*72,169	*72,169
		9			*84,442	*84,442	*84,442	84,221	79,536	74,529	
		9¼			96,301	91,633	88,580	84,221	79,536	74,529	
		9½			96,301	91,633	88,580	84,221	79,536	74,529	

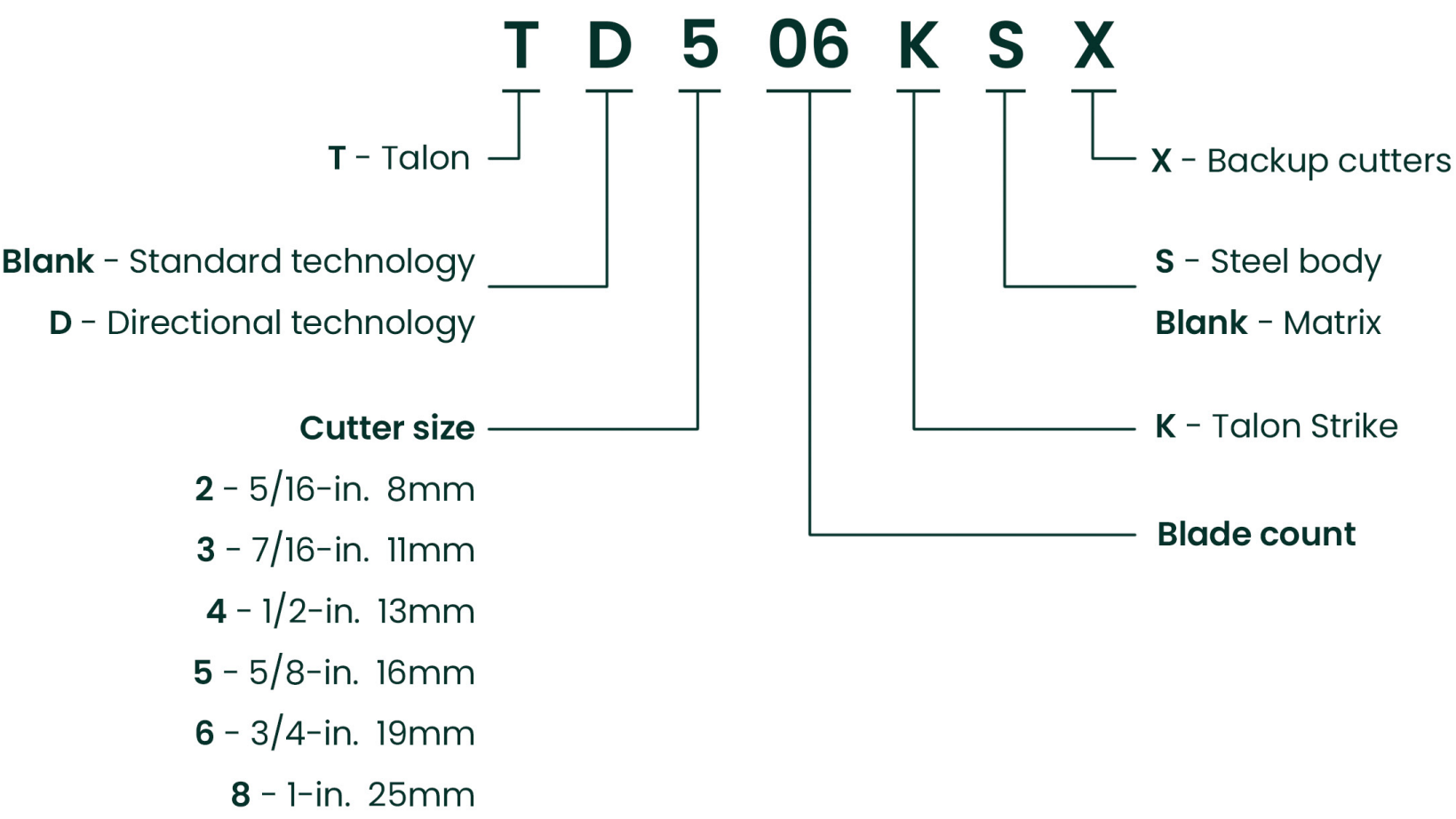
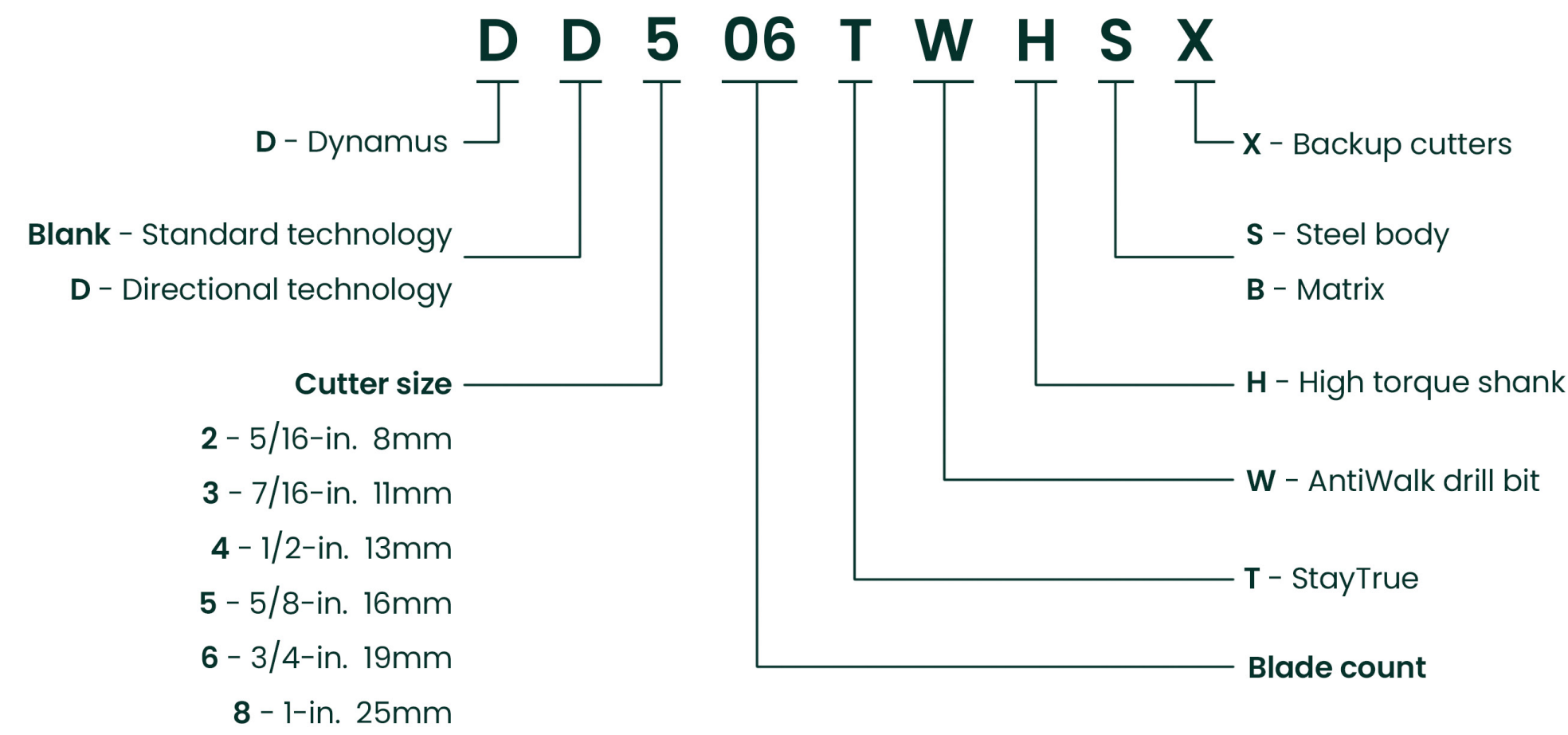
*Notes

1. Torque figures preceded by an asterisk indicate the weaker member for the corresponding outside diameter (OD) and bore is the BOX. For all other torque values, the weaker member is the PIN.
2. In each connection size and type group, torque values apply to all connection types in the group, when used with the same drill collar outside diameter and bore, i.e., 2³/₈-in. API IF, API NC 26, and 2⁷/₈-in. slimhole connections used with 3½ in. x 1¼ in. drill collars all have the same minimum makeup torque of 4,600 ft/lb, and the BOX is the weaker number.
3. Stress-relief features are disregarded for makeup torque.

‡ Basis of recommended maximum torque values are from API Specification 7.

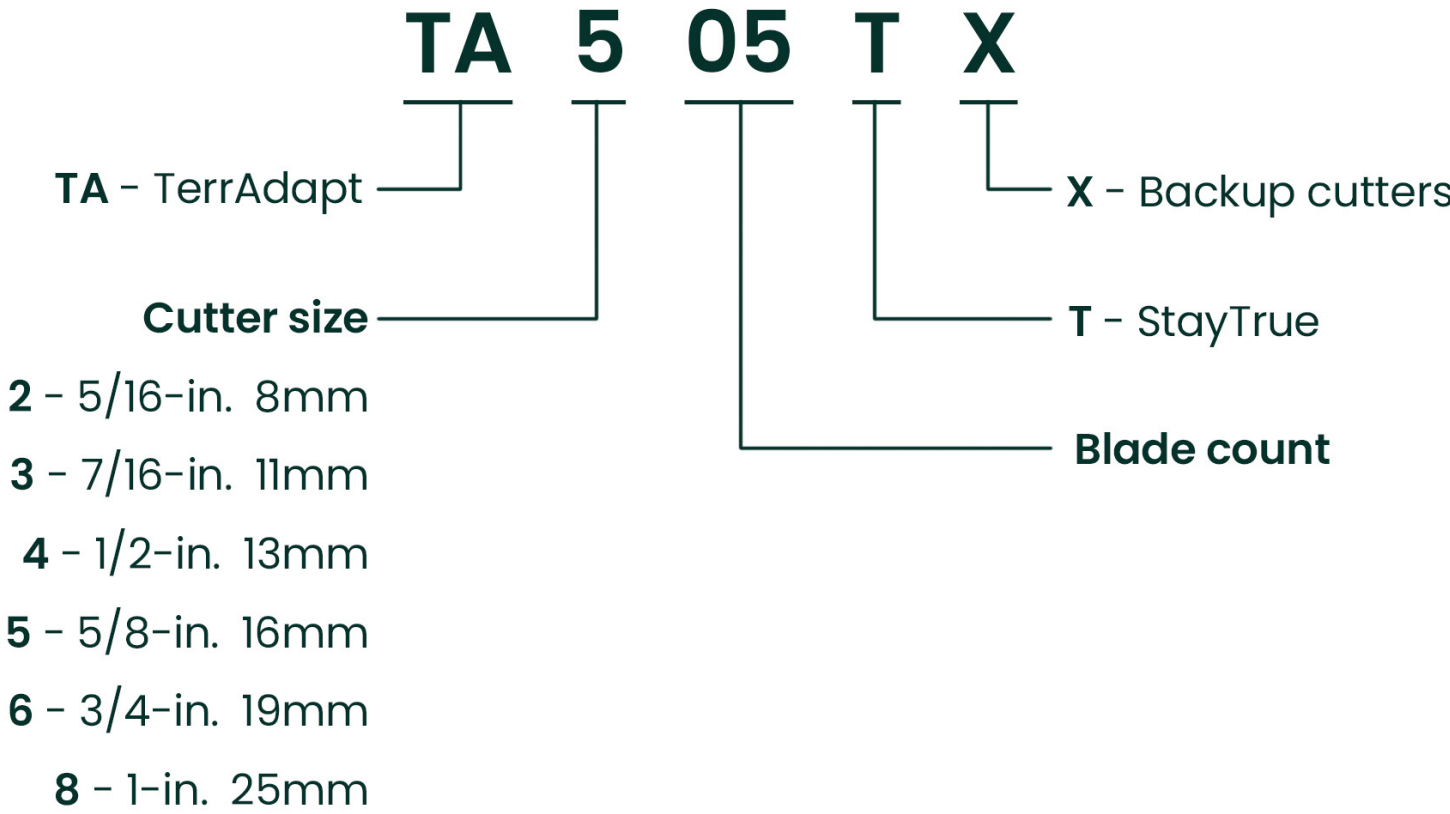
† Basis of calculation for recommended makeup torque assumed the use of a thread compound containing 40-60 by weight of finely powdered metallic zinc or 60 by weight of finely powdered lead, with not more than 0.3 total active sulfur (reference the caution regarding the use of hazardous materials in Appendix F of Specification 7) applied thoroughly to all threads and shoulders and using the modified Screw Jack formula in Appendix A, paragraph A.8, and a unit stress of 62,500 psi in the BOX or PIN, whichever is weaker.

PDC Drill Bit Nomenclature

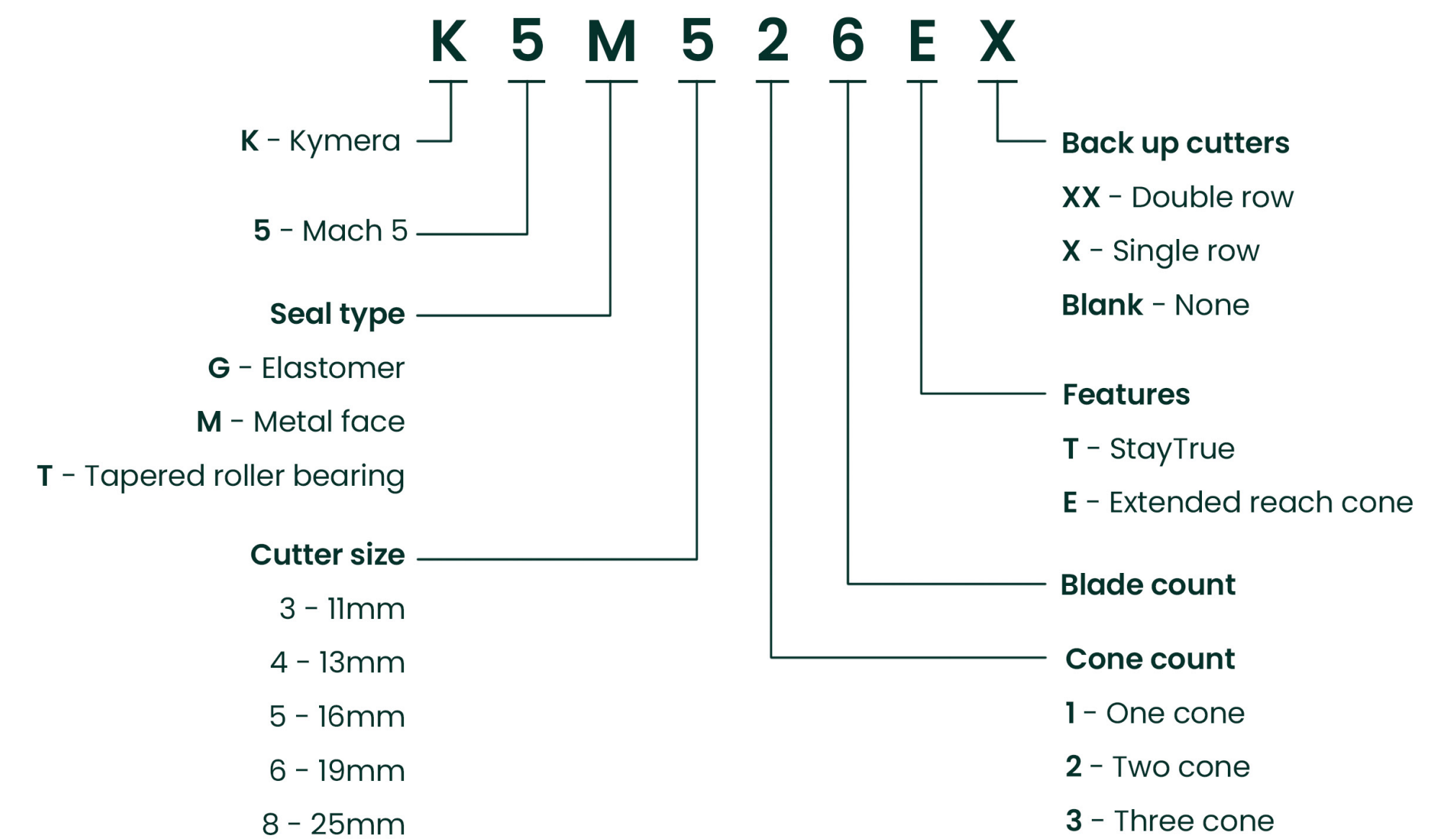
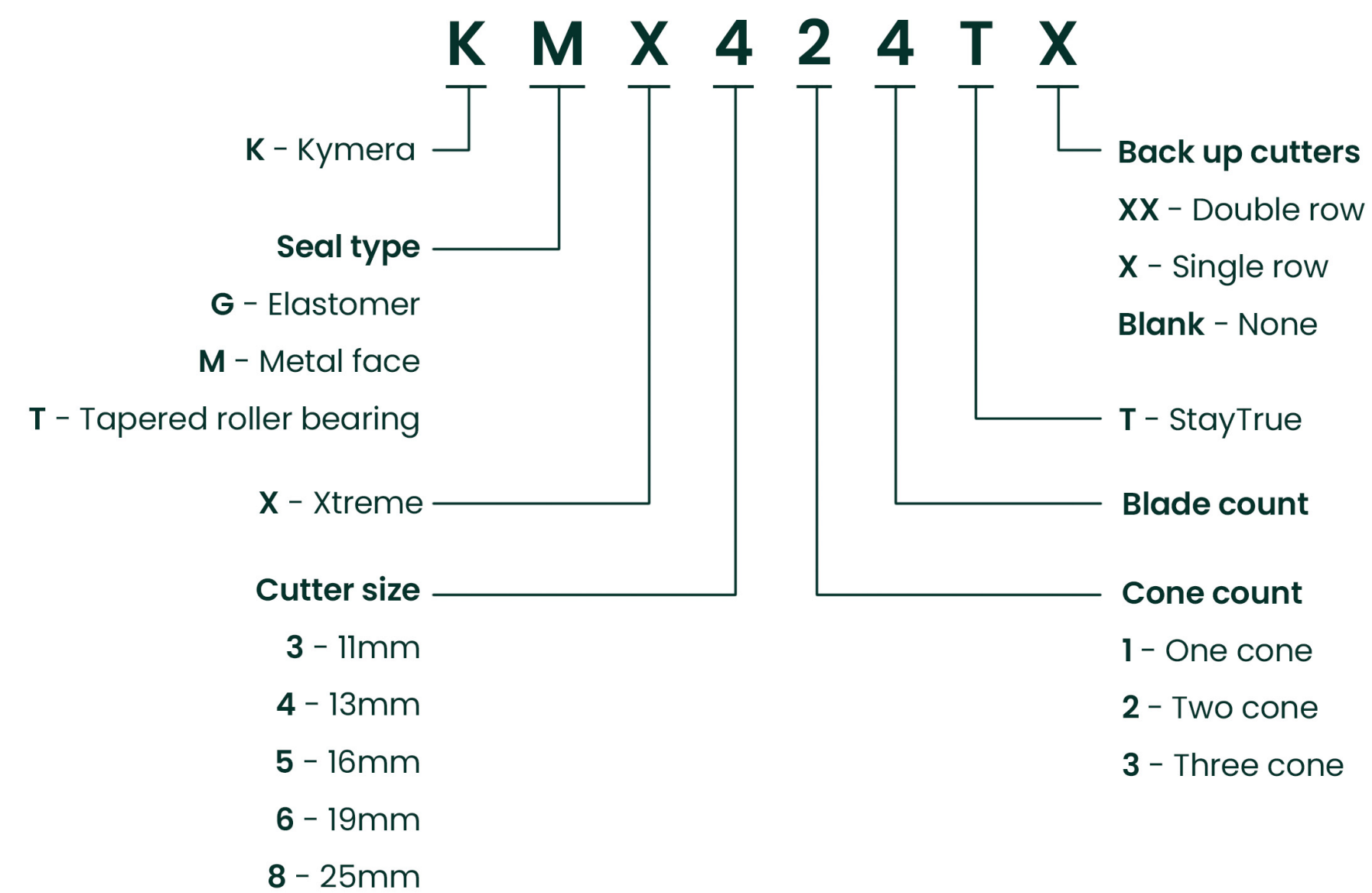


Adaptive
drill bits

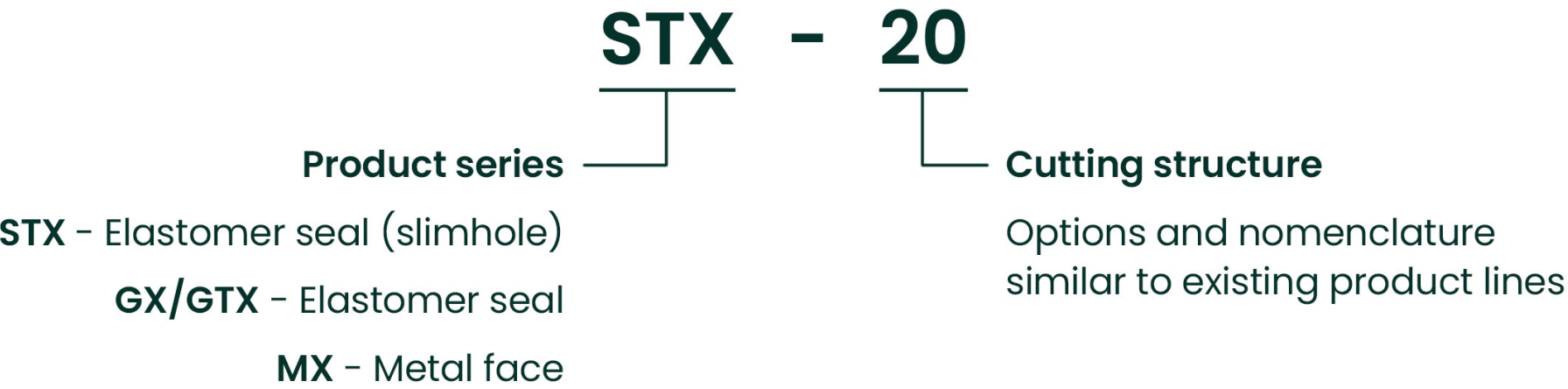
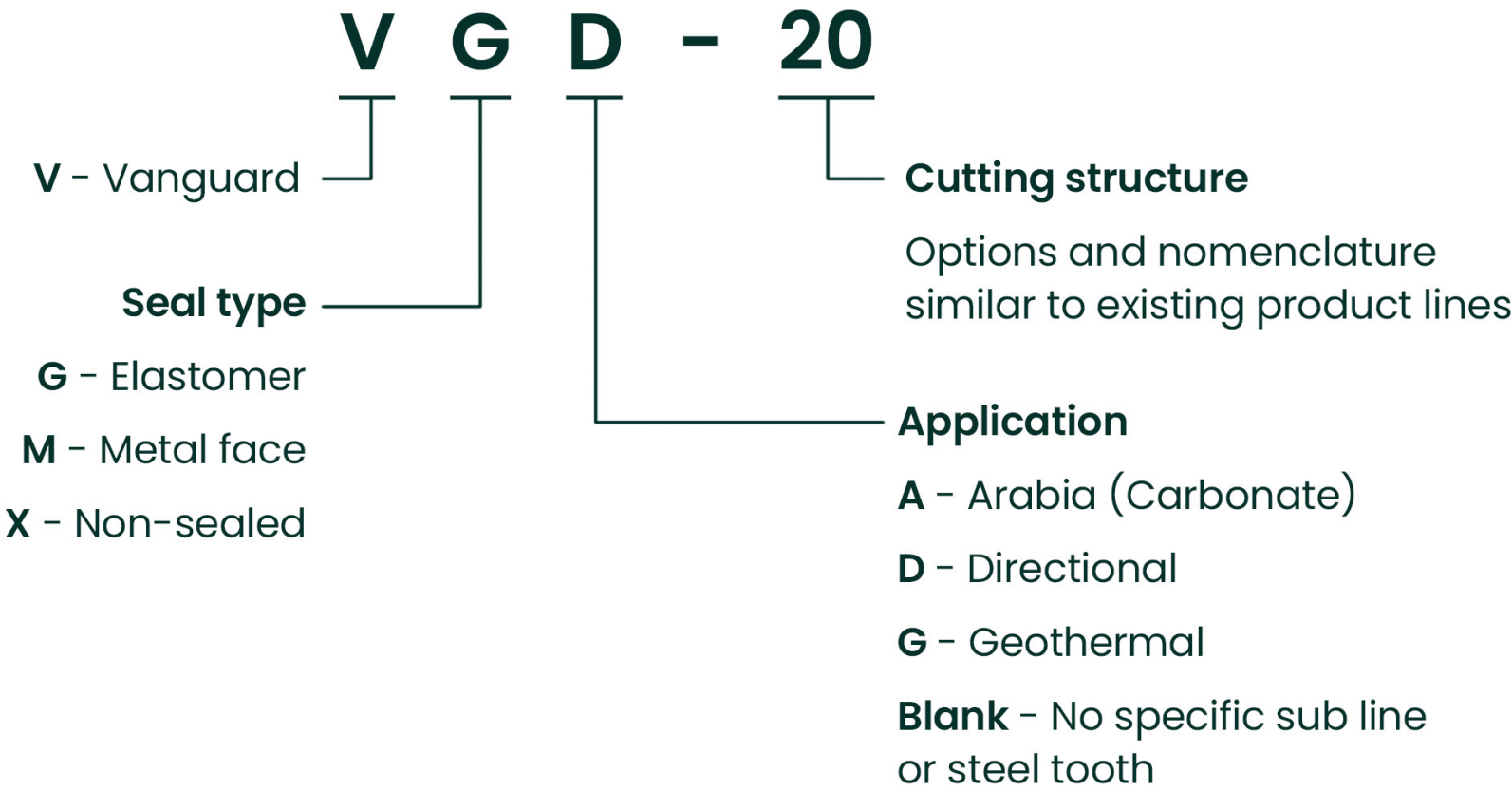
Adaptive Drill Bit Nomenclature



Hybrid Drill Bit Nomenclature

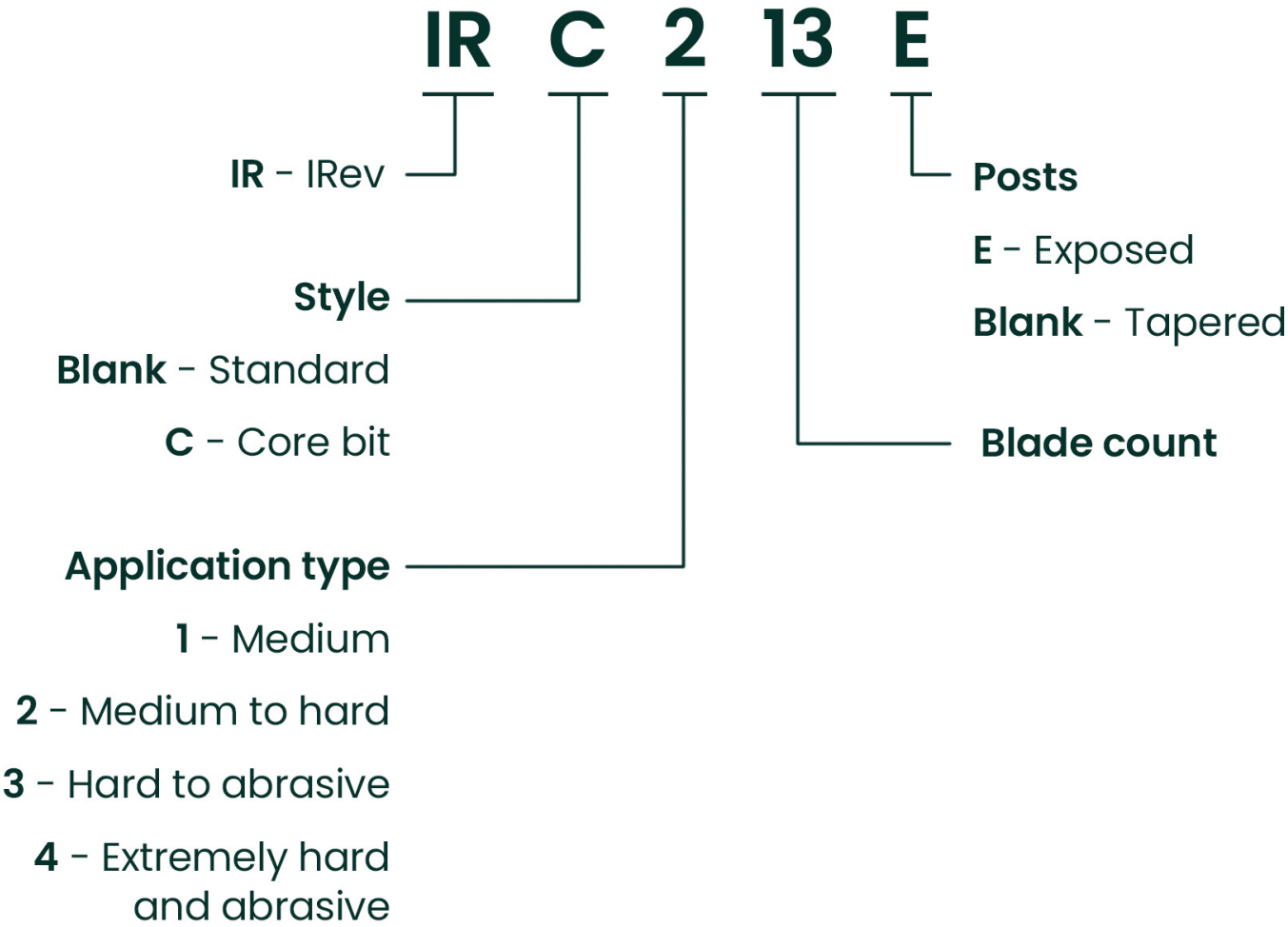


Tricone Drill Bit Nomenclature



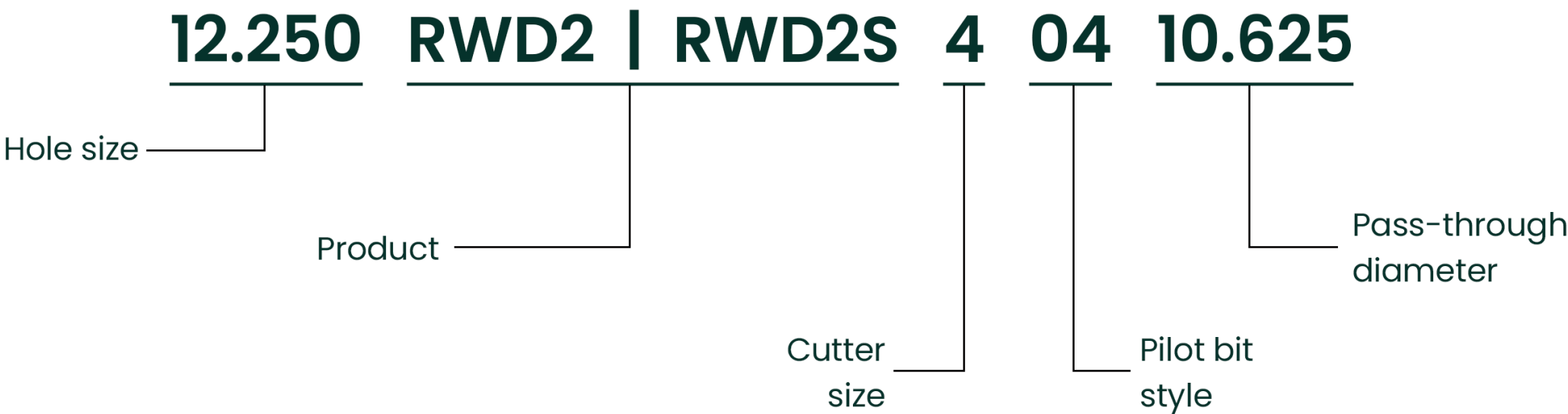
Tricone
drill bits

Impregnated Drill Bit Nomenclature



Impregnated
drill bits

Specialty Products Nomenclature



Specialty
products

