



terelion™

HIGH PERFORMANCE ROTARY DRILLING TOOLS
PRODUCT CATALOG

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GET READY FOR YOUR BREAK- THROUGH.

Wherever you may look, the world is full of challenging tasks for mankind to solve. At Terelion we specialize in those challenges posed by blasthole drilling in surface mining.

We've always been devoted to be the best in our business. We constantly explore new innovative designs, new materials, new manufacturing methods and new engineering tools. All with the aim to making the most hard-wearing, efficient and cost-effective roller cone drill bits available.

Some of our innovations are minor. Others lead to breakthroughs affecting the entire industry. Stay tuned, and you'll be among the first to know when the next rock-drilling innovation is to be launched by Terelion.



MILESTONES.

1950

Varel begins volume production of rotary three cone drill bits and fixed cutter drag bits to the Mining, Construction & Seismic industries.

1998

Family ownership changed and Varel was sold to a UK/USA Venture capital company. The well-respected Varel name was retained.

2000

Launch of the innovative drill bit series Ridgeback™. It introduces the first generation of advanced features to improve hole cleaning and extend bit life: Longer life bearings, improved cutting structures and patented shirttail concept.

2008

Formation of a new holding company, Varel International Energy Services (VIES), to become parent company of Varel Oil & Gas, Downhole Products, and Varel Mining & Industrial.

2012

Launch of Avenger™, the sealed bearing drill bit series. Combining the best of our patented features, knowledge, and experience. Delivering extended bit life and lower Total Drilling Cost.

2016

Launch of the Advanced Modeling Package (AMP) software, enabling a unique drill bit design that's just right for any specific rock conditions.



1947

The family business of Varel Manufacturing Company was founded by Daniel W Varel and Headquartered in Texas, USA.



1971

Inauguration of Varel de Mexico S.A. In the late 80's the entire manufacturing facility moved from Dallas to Mexico, where the majority of products continue to be produced for Terelion.

1999

Acquisition of Walker Mc Donald, a well-known manufacturer of mining three cone bits, from Greenville, Texas.



2005

Launch of the D-Force™ drill bit series. Designed for highly abrasive conditions. Combines field-proven and new features, like the high load SP1 bearing package, reinforced gage and shirttail protection.

2011

Varel acquires the RPS Rotary Percussion product line from Renegade Tool, USA.

2014

Sandvik acquires the holding company, Varel International Energy Services (VIES).

2019

Divestment of Varel International Energy Services (VIES). Retaining Varel Mining & Industrial to focus on the core business.

terelion™

2020

Varel Mining & Industrial is renamed to Terelion.

FREE OF CHARGE WITH EVERY BIT.

01. BIT SCHOOLS AND SEMINARS

Getting the most out of our highly engineered drill bits also requires operator skills. We carry out customized schools/seminars for all levels of drilling personnel dealing with the impact of rotary speeds, air flow and pulldown on bit to optimize drilling performance.

02. DRILL BIT PERFORMANCE ANALYSIS

Our highly qualified field engineering team will assist customers to gather performance data, produce detailed reports, and offer suggestions to improve performance based on data analysis.

03. DULL BIT ANALYSIS

Very often much can be learned from analyzing dull drilling bits in an effort to determine end of life causes. These drill bit examinations can be made on site or in our continuous improvement lab, in order to study wear patterns with the potential of improving bit life.

04. CONTINUOUS SITE VISITS

Our team of highly qualified design engineers are frequently visiting mine sites around the globe in order to carry out drill bit inspections, performance studies, and data analysis. This is just a part of the Engineers role, and the outcomes of such visits will often lead to customized designs and features specifically geared towards individual mine conditions and circumstances.



OPTIMIZE YOUR DRILLING PERFORMANCE.

The drill bit's purchase price is only a small part of your operational Total Drilling Cost (TDC). A lower cost, lower performance product ties up drill resources and results in costly productivity losses. By Contrast, a high performance product increases holes per shift, productivity, and overall profitability. Dial up your profitability with Terelion.

$$TDC = \frac{B}{F} + \frac{R}{P}$$

B = total bit price

R = operating cost per hour for the drill rig expressed in dollars per hour

F = total life of the rock bit expressed in either feet or meters

P = penetration rate of the rock bit expressed as feet or meters per hour

01. GET THE MOST OUT OF EACH DRILL BIT

To maximize your bit life and rate of penetration:

- Choose the Terelion drill bit best suited for your specific formation. For guidance, see the Comparison and hardness table on page 40.
- Apply our tips for optimizing drill bit performance, listed on page 38.
- If you have any questions, your Terelion representative will be happy to answer them.

02. REDUCE YOUR CARBON FOOTPRINT

Improving your performance will also allow you to reduce your carbon footprint. More efficient drilling and maximized bit life mean less fuel consumption for your drill rigs and less resources consumed for supplying drill bits. All in all, this enables your operations to cut down on emissions and improve your sustainability report.

03. CUSTOMIZE YOUR TOOL DESIGN

To improve your drilling performance even further, we can create a drill bit design uniquely matched to your rock conditions. By importing your geological data into our digital tool AMP (Advanced Modeling Package), we can virtually design a drill bit that's ideal for your specific conditions. The design file is then used to manufacture your customized drill bits.

04. LEVERAGE OUR SERVICES AND SUPPORT

Terelion and our distribution/servicing partners provide a range of services for our customers to help you get the full value out of your Terelion drill bits. See the full package on pages 8–9.

**SOME
ADVANTAGES
ARE
VISIBLE.**

MAXIMUM GAGE PROTECTION

OPIMIZED SHIRTTAILS DESIGNS

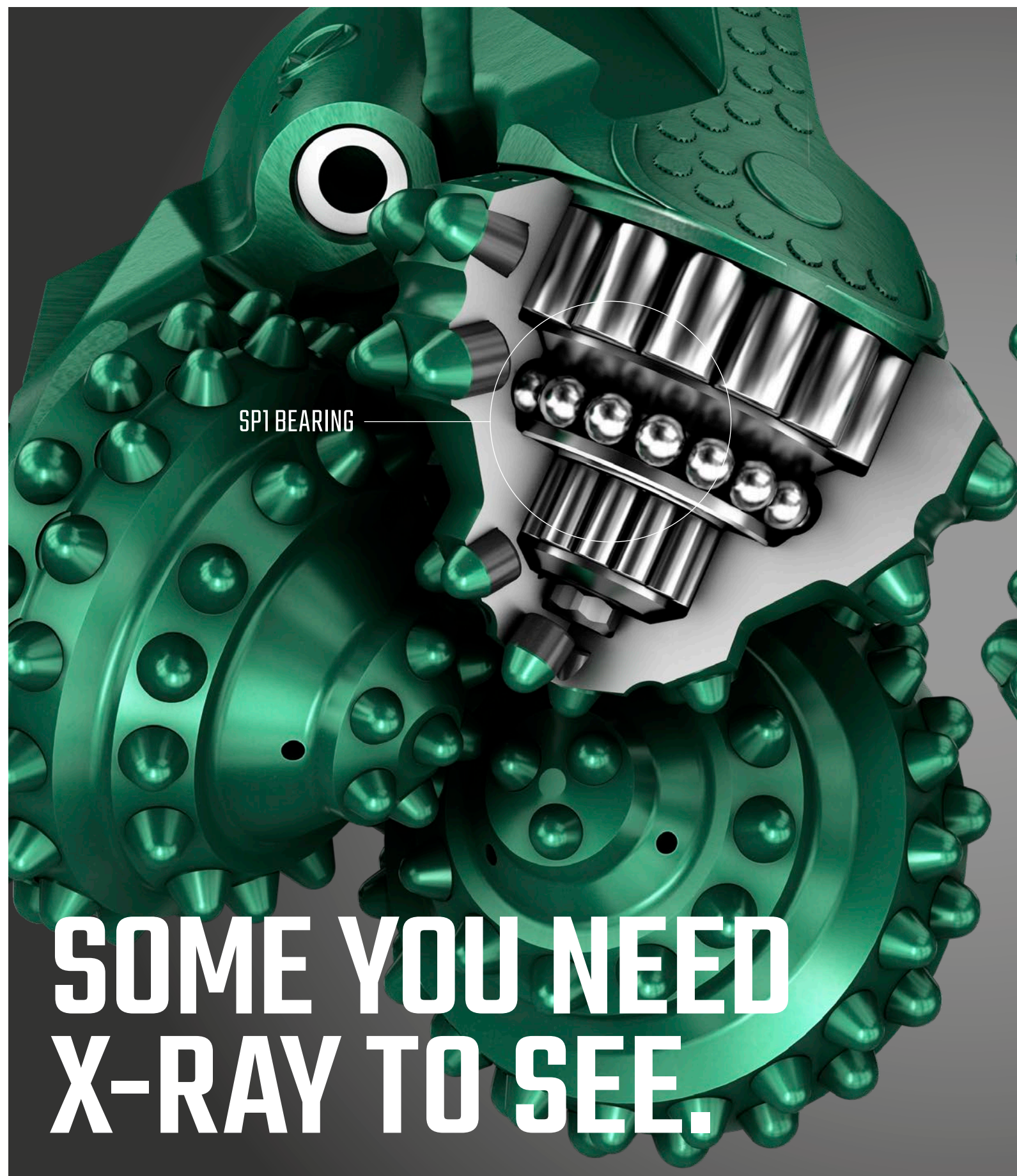
ENHANCED CUTTING STRUCTURE

VENTED CONES

HARD SHELL CONES

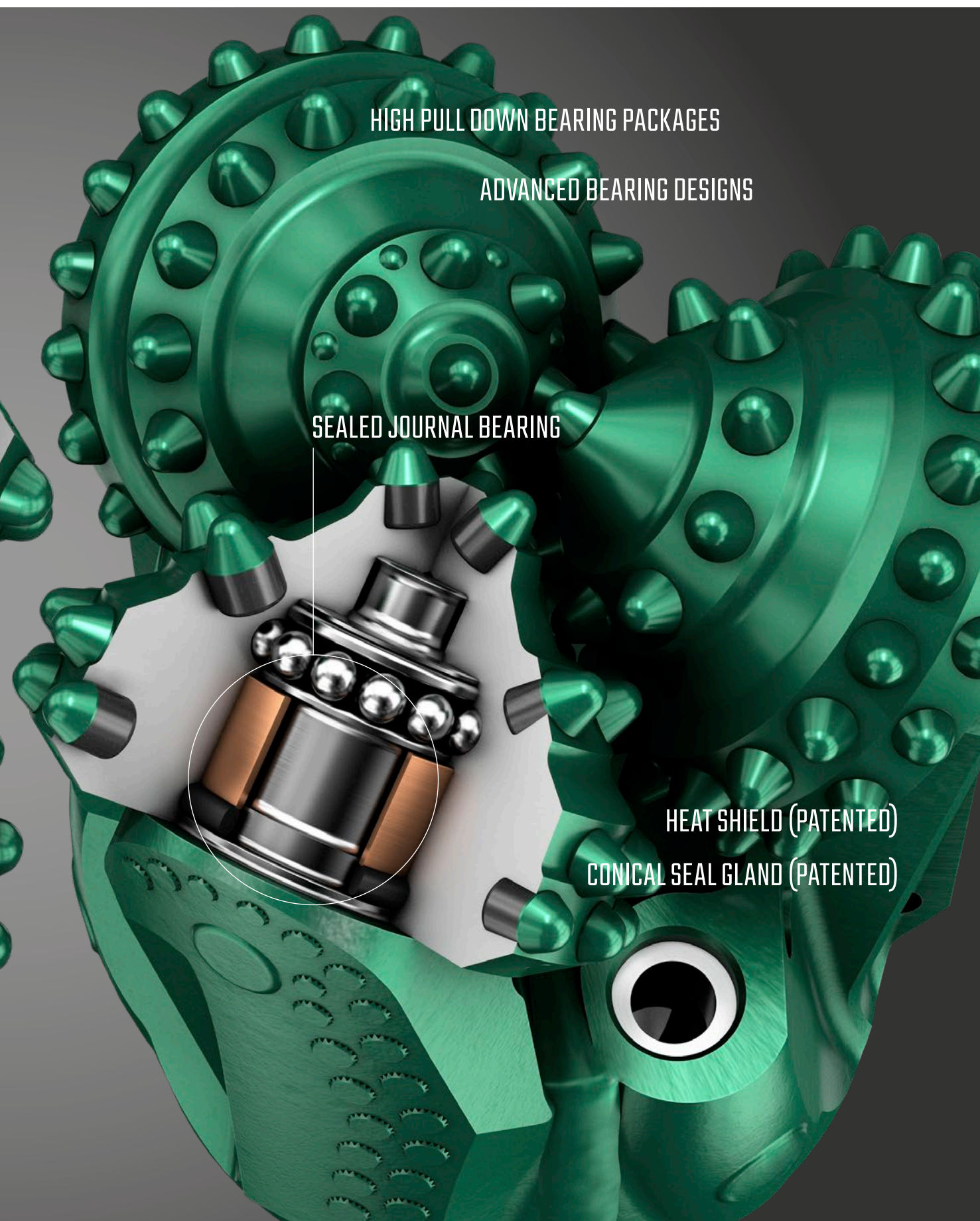
HET CARBIDE TREATMENT

INTERSTITIAL INSERTS



SPI BEARING

**SOME YOU NEED
X-RAY TO SEE.**



HIGH PULL DOWN BEARING PACKAGES

ADVANCED BEARING DESIGNS

SEALED JOURNAL BEARING

HEAT SHIELD (PATENTED)

CONICAL SEAL GLAND (PATENTED)

RIDGEBACK™

HARD ROCK DRILLING.

Rotary bits for blasthole drilling in hard rock. Specially designed shirrtail to assist in rapid cuttings evacuation. High load open bearings, robust cutting structure and HET carbide treatment provide high penetration rates and long life. Vented cones (9" diameter and up) provide for additional bearing cleaning and heat reduction.

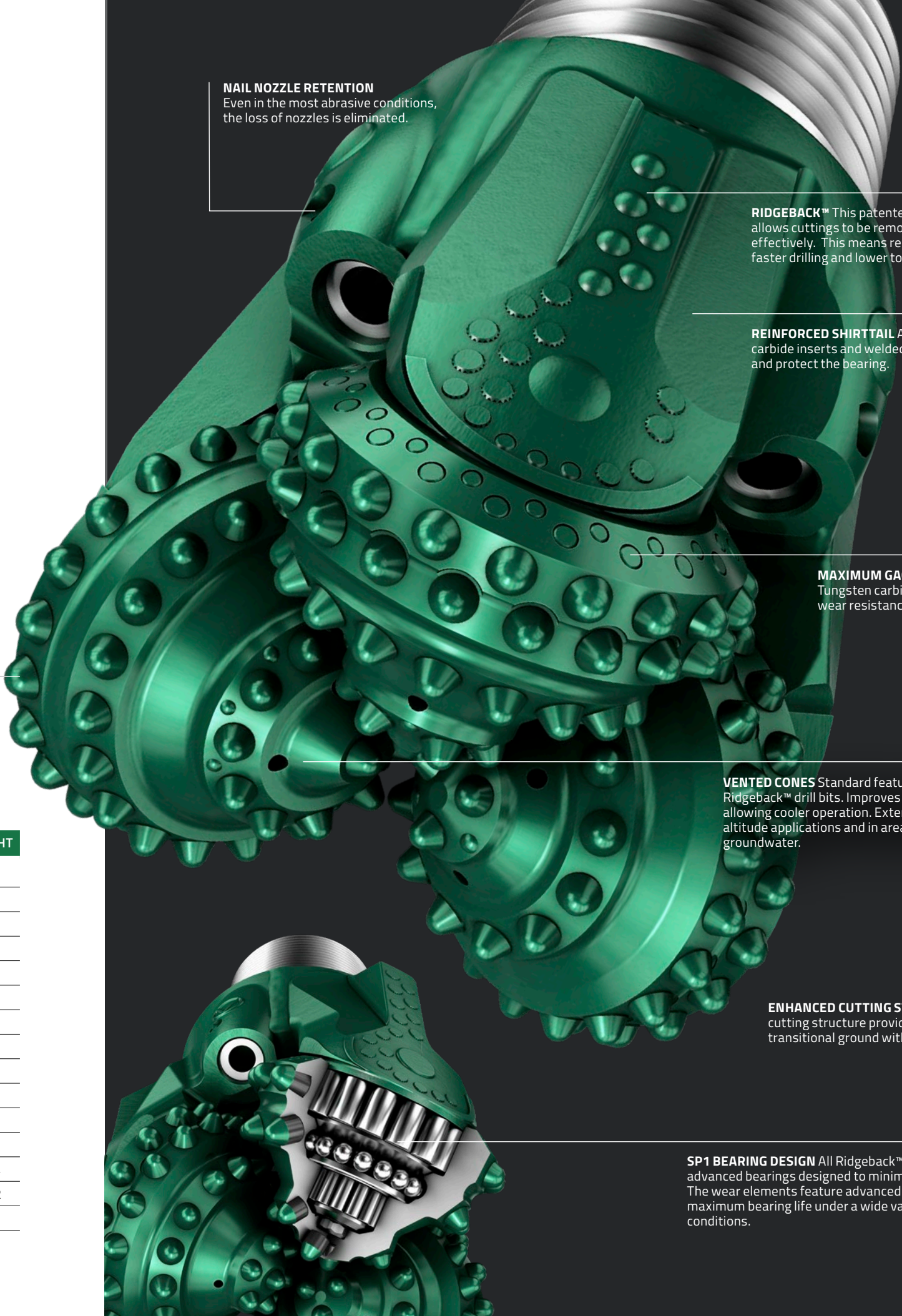


HET CARBIDE TREATMENT The patented High Energy Tumbling™ (HET) method produces a unique cutting structure surface toughness that extends bit life and increases drilling rate.

Product Range

DIAMETER		SOFT TO MEDIUM				MEDIUM TO HARD			HARD TO VERY HARD			PIN SIZE	APPROX. WEIGHT	
in	mm											Inches	lbs	kg
6.25	159					RB53						3 1/2	42	19.1
6.75	171			RB40	RB50			RB60			RB70	3 1/2	46	20.9
7.375	187			RB40	RB50							3 1/2	58	26.3
7.875	200		RB30	RB40	RB50	RB53	RB60	RB63				4 1/2	76	34.5
8.5	216			RB40					RB67			4 1/2	83	37.6
8.75	222							RB63				4 1/2	83	37.6
9	229	RB20	RB30	RB40	RB43	RB53	RB60		RB67			4 1/2	96	43.5
9.875	251		RB35	RB40		RB53	RB60	RB63	RB67	RB70		6 5/8	145	65.8
10.625	270	RB25	RB30	RB40	RB43	RB47	RB53	RB60	RB63	RB67		6 5/8	157	71.2
11	279						RB53	RB60	RB63	RB67		6 5/8	193	87.5
12.25	311			RB40	RB43	RB47	RB53	RB60	RB63	RB67	RB70	6 5/8	225	102.1
13.75	349				RB43		RB53	RB57		RB67		6 5/8	292	132.4
15	381						RB53	RB60				7 5/8	362	164.2
16	406							RB60*				7 BECO	580	263.1

Your Terelion representative can assist you in selecting the proper bits to suit your application and maximize your productivity. The availability of specific products may change from time to time. All models are available with BECO threads on request. *With 7" BECO pin.



NAIL NOZZLE RETENTION
Even in the most abrasive conditions, the loss of nozzles is eliminated.

RIDGEBACK™ This patented shirrtail feature allows cuttings to be removed from the hole effectively. This means reduced regrinding, faster drilling and lower total drilling costs.

REINFORCED SHIRTTAIL A pattern of tungsten carbide inserts and welded hardmetal resist wear and protect the bearing.

MAXIMUM GAGE PROTECTION
Tungsten carbide inserts for superior wear resistance and bit life.

VENTED CONES Standard feature on all 9" and above Ridgeback™ drill bits. Improves bearing airflow allowing cooler operation. Extends service life in high altitude applications and in areas of excessive groundwater.

ENHANCED CUTTING STRUCTURE Robust cutting structure providing toughness in transitional ground with high ROP.

SP1 BEARING DESIGN All Ridgeback™ drill bits incorporate advanced bearings designed to minimize over heating. The wear elements feature advanced materials to give the maximum bearing life under a wide variety of operating conditions.

SOFT FORMATION

All soft formation bits are designed with aggressive cutter profiles to provide extremely high penetration rates.



RB20

2,000 to 10,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 4,000 lbs/inch DRILLING WEIGHTS



RB30

2,000 to 10,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 4,000 lbs/inch DRILLING WEIGHTS



RB40

5,000 to 15,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 4,500 lbs/inch DRILLING WEIGHTS



RB43

5,000 to 15,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 5,000 lbs/inch DRILLING WEIGHTS

MEDIUM FORMATION

Medium formation bits are most commonly used in the mining industry, and provide long bearing life with additional insert strength for consolidated formations.



RB47

10,000 to 30,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,500 to 5,000 lbs/inch DRILLING WEIGHTS



RB50

10,000 to 30,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,500 to 5,000 lbs/inch DRILLING WEIGHTS



RB53

12,000 to 30,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,500 to 5,000 lbs/inch DRILLING WEIGHTS



RB60

25,000 to 45,000 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 6,000 lbs/inch DRILLING WEIGHTS

MEDIUM HARD FORMATION

All medium hard formation bits are designed with robust cutting structure providing high Rate of Penetration, especially in transitional formations.



RB63	
27,500 to 47,500 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 6,000 lbs/inch DRILLING WEIGHTS



RB67	
30,000 to 50,000 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 6,500 lbs/inch DRILLING WEIGHTS

HARD/VERY HARD FORMATION

All hard formation bits are designed with tough, reduced extension cutter profiles to provide maximum durability in hard formations.



RB70	
35,000 to 60,000 psi COMPRESSIVE STRENGTHS	50 to 90 rpm ROTATION SPEED
All sizes JET CIRCULATION	5,000 to 8,000 lbs/inch DRILLING WEIGHTS



D-FORCE™

DRILLING IN ABRASIVE FORMATIONS.

Rotary bits for blasthole drilling in abrasive formations. Equipped with Sidewinder shirttail and abrasion resistant carbide inserts to increase wear resistance. High load open bearings, robust cutting structure and HET carbide treatment provide high penetration rates and long life. Vented cones (9" diameter and up) provide for additional bearing cleaning and heat reduction.



HET CARBIDE TREATMENT The patented High Energy Tumbling™ (HET) method produces a unique cutting structure surface toughness that extends bit life and increases drilling rate.

Product Range

DIAMETER		SOFT TO MEDIUM		MEDIUM TO HARD		HARD TO VERY HARD		PIN SIZE	APPROX. WEIGHT	
in	mm							Inches	lbs	kg
6.75	171		DF43		DF60	DF67		3 1/2	42	19.1
7.875	200		DF43		DF60 DF63	DF70		4 1/2	76	34.5
9	229				DF60			4 1/2	96	43.5
9.875	251	DF30			DF60	DF67		6 5/8	145	65.8
10.625	270	DF30	DF53		DF63	DF67		6 5/8	157	71.2
11	279				DF63			6 5/8	193	87.5
12.25	311		DF53	DF60				6 5/8	225	102.1

Your Terelion representative can assist you in selecting the proper bits to suit your application and maximize your productivity. The availability of specific products may change from time to time. All models are available with BECO threads on request.



ABRASION RESISTANT CARBIDE Upgrades developed for improved fracture toughness and abrasion resistance.

ENHANCED CUTTING STRUCTURE Designed to provide the highest penetration rates and the longest life available.

VENTED CONES Standard feature on all 9" and above D-Force™ drill bits. Improves bearing airflow allowing cooler operation. Extends service life in high altitude applications and in areas of excessive groundwater.

INTERSTITIAL INSERTS Interstitial Inserts provide additional cone protection in abrasive formations. These small tungsten carbide inserts protect the TCI cutting structure to eliminate cone wear.

REINFORCED SHIRTTAIL A pattern of tungsten carbide inserts resist wear and protect the bearing.

SP1 BEARING DESIGN All D-Force™ drill bits incorporate advanced bearings designed to minimize over heating. The wear elements feature advanced materials to give the maximum bearing life under a wide variety of operating conditions.

SIDEWINDER SHIRTTAIL Provides a return path for cuttings to flow up the side of the head and into the annulus. Reduces recirculation of cuttings on bottom. Improves ROP through enhanced chip removal.



SOFT FORMATION

All soft formation bits are designed with aggressive cutter profiles to provide extremely high penetration rates.



DF30

2,000 to 10,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 4,000 lbs/inch DRILLING WEIGHTS



DF43

5,000 to 23,500 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 5,000 lbs/inch DRILLING WEIGHTS

MEDIUM FORMATION

Medium formation bits are most commonly used in the mining industry, and provide long bearing life with additional insert strength for consolidated formations.



DF53

12,000 to 30,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,500 to 5,000 lbs/inch DRILLING WEIGHTS



DF60

25,000 to 45,000 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 6,000 lbs/inch DRILLING WEIGHTS

MEDIUM HARD FORMATION

All medium hard formation bits are designed with robust cutting structure providing high Rate of Penetration, especially in transitional formations.



DF63

27,500 to 47,500 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 6,000 lbs/inch DRILLING WEIGHTS



DF67

30,000 to 50,000 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 6,500 lbs/inch DRILLING WEIGHTS

HARD/VERY HARD FORMATION

All hard formation bits are designed with tough low extension cutter profiles to provide maximum durability in hard formations.

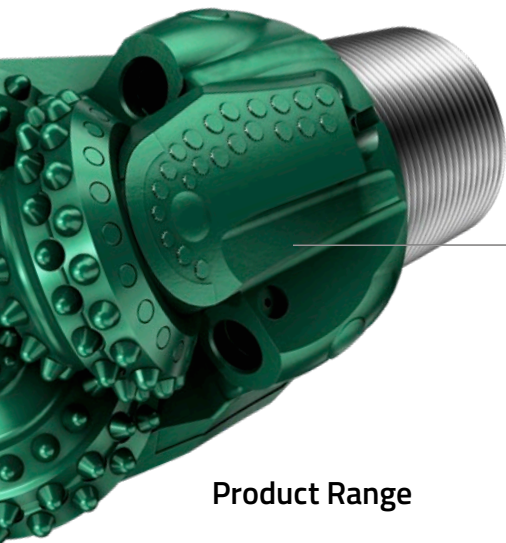


DF70

35,000 to 60,000 psi COMPRESSIVE STRENGTHS	50 to 90 rpm ROTATION SPEED
All sizes JET CIRCULATION	5,000 to 8,000 lbs/inch DRILLING WEIGHTS

AVENGER™ HIGH-PERFORMANCE DRILLING.

Sealed bearing rotary bits for high-performance blasthole drilling. Available in versions with roller (AVL) or journal (AV) bearings to provide longer bearing life. The external features of Avenger™ drill bits are carried over from both Ridgeback™ and D-Force™ drill bit series. Thereby, each Avenger™ drill bit is optimized for drilling in hard rock or abrasive formations, providing maximum Rate of Penetration and wear resistance.

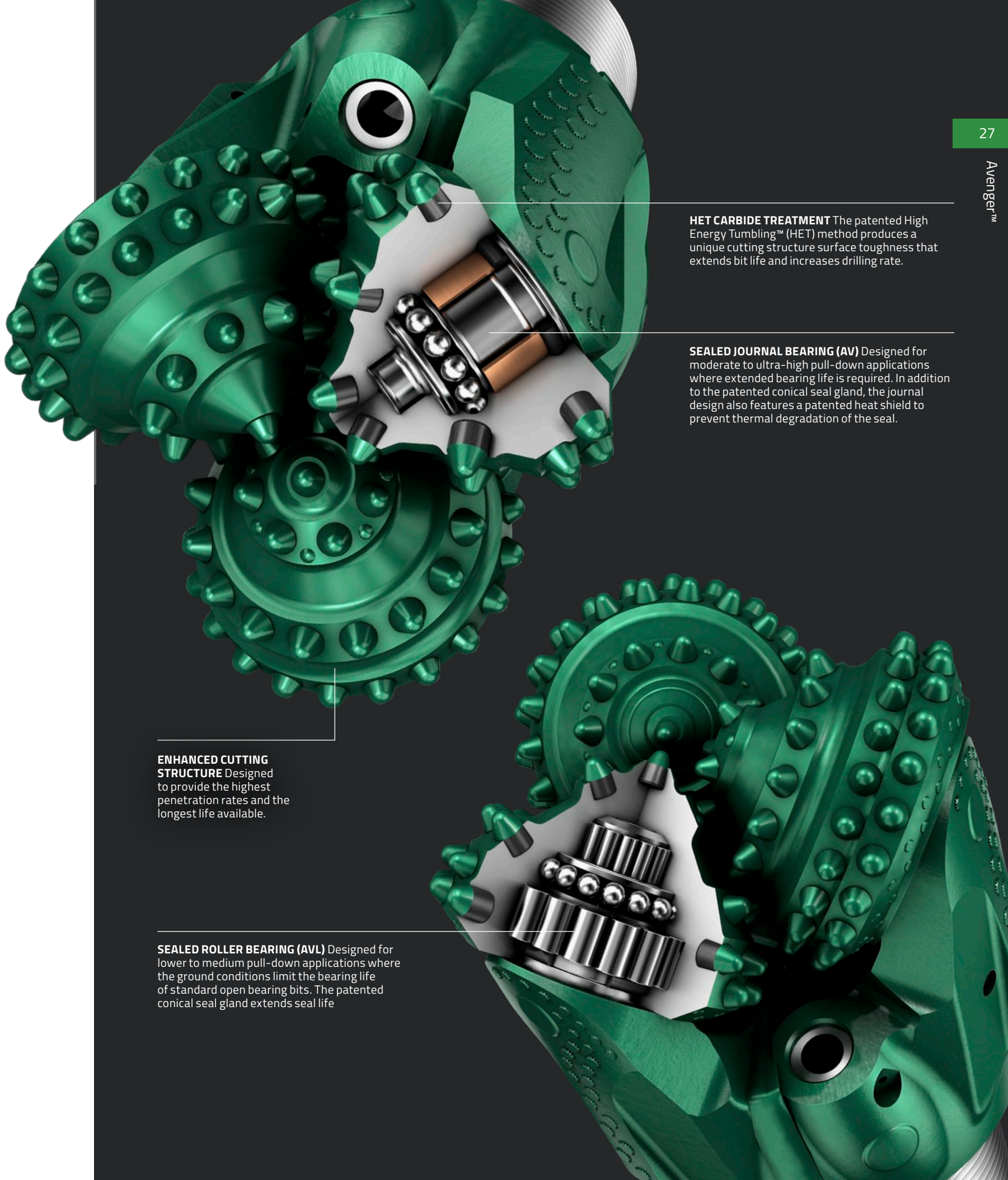


SIDEWINDER™ CUTTINGS EVACUATION The Sidewinder shirttail design eliminates most of the re-cutting of cuttings as they are efficiently lifted up and out of the hole.

Product Range

DIAMETER		SOFT TO MEDIUM			MEDIUM TO HARD			PIN SIZE	APPROX. WEIGHT	
in	mm							Inches	lbs	kg
7.875	200	AVL30			AVL53			4 1/2	76	34.5
9	229	AVL30	AV40/AVL40		AVL53			4 1/2	96	43
9.875	251	AVL30			AV53/AVL53	AV60/AVL60		6 5/8	145	66
10.625	270	AV30/AVL30	AVL40	AV43	AV53/AVL53	AV60	AV67	6 5/8	157	72
12.25	311			AV43	AV53/AVL53	AV60/AVL60	AV63	6 5/8	225	102
13.75	349				AV53	AV60		6 5/8	292	134

Your Terelion representative can assist you in selecting the proper bits to suit your application and maximize your productivity. The availability of specific products may change from time to time. All models are available with BECO threads on request.



HET CARBIDE TREATMENT The patented High Energy Tumbling™ (HET) method produces a unique cutting structure surface toughness that extends bit life and increases drilling rate.

SEALED JOURNAL BEARING (AV) Designed for moderate to ultra-high pull-down applications where extended bearing life is required. In addition to the patented conical seal gland, the journal design also features a patented heat shield to prevent thermal degradation of the seal.

ENHANCED CUTTING STRUCTURE Designed to provide the highest penetration rates and the longest life available.

SEALED ROLLER BEARING (AVL) Designed for lower to medium pull-down applications where the ground conditions limit the bearing life of standard open bearing bits. The patented conical seal gland extends seal life

SOFT FORMATION

All soft formation bits are designed with aggressive cutter profiles to provide extremely high penetration rates.



AV30

2,000 to 10,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 5,000 lbs/inch DRILLING WEIGHTS



AV40

5,000 to 15,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 5,000 lbs/inch DRILLING WEIGHTS



AV43

8,500 to 23,500 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 5,500 lbs/inch DRILLING WEIGHTS

MEDIUM FORMATION

Medium formation bits are the most commonly used in the mining industry, and provide long bearing life with additional insert strength for consolidated formations.



AV53

15,000 to 35,000 psi COMPRESSIVE STRENGTHS	70 to 120 rpm ROTATION SPEED
All sizes JET CIRCULATION	2,000 to 6,000 lbs/inch DRILLING WEIGHTS

MEDIUM HARD FORMATION

All medium hard formation bits are designed with robust cutting structure providing high Rate of Penetration, especially in transitional formations.



AV60

25,000 to 45,000 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 7,000 lbs/inch DRILLING WEIGHTS



AV63

27,500 to 47,500 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 7,000 lbs/inch DRILLING WEIGHTS



AV67

30,000 to 50,000 psi COMPRESSIVE STRENGTHS	60 to 100 rpm ROTATION SPEED
All sizes JET CIRCULATION	3,000 to 7,000 lbs/inch DRILLING WEIGHTS

ROTARY PERCUSSION SYSTEM™

ADD SOME RPS TO YOUR ROP.

The patented RPS Rotary Percussion System combines the best advantages of rotary drilling and percussive drilling. The rotary cutting action combined with a percussive element allows for formations to fracture more easily. Thereby, RPS can drill efficiently in most formations whether hard or soft which leads to improved penetration rates and reduced drilling costs. The Plug and play design makes it easy to fit the RPS system on your existing rotary drills.



Product Range

DIAMETER		SOFT TO MEDIUM				MEDIUM TO HARD		HARD TO VERY HARD		PIN SIZE	APPROX. WEIGHT	
in	mm									Inches	lbs	kg
6.75	171		RP43	RP50		RP60				3 1/2	46	21
7.875	200		RP43					RP70		4 1/2	76	35
9	229	RP35	RP40	RP43	RP53					4 1/2	96	43
9.875	251	RP35		RP53	RP60			RP67		6 5/8	145	66
10.625	270		RP40	RP53		RP63				6 5/8	157	72
12.25	311			RP53	RP60	RP63		RP67		6 5/8	225	102

AV/AVL products can be modified to run under RPS by special request. Your Terelion representative can assist you in selecting the proper bits to suit your application and maximize your productivity. The availability of specific products may change from time to time.

PLUG AND PLAY The Plug and play design to fit on your existing rotary drills effectively makes the RPS a broad application tool for the blast hole market. RPS will operate efficiently on any air rotary drill rig with 80-105 psi available.

UTILIZE PERCUSSION ENERGY Combining percussive energy with a rotary action allows formations to fracture more easily which in turn leads to increased drilling penetration rates.

VERSATILE IN ALL FORMATIONS The combined RPS action also drills without problem in consolidated or broken formations and transitional hard or soft formation changes. The system works as a rotary drill bit when a percussive action is not possible, such as when encountering groundwater.

OPTIMIZED RP DRILL BITS A high quality, energy focused bit is necessary to ensure the best drilling results possible. The RP bit series is designed specifically for use with the RPS tool to maximize ROP and minimize TDC. Switching out bits is easy – all RPS tools are built with API bit connections.



A WIDER RANGE OF ROLLER CONE DRILL BITS FOR INDUSTRIAL APPLICATIONS.

Terelion offers more than 100 variants of roller cone drill bits designed for special use in industrial applications. Here you can find the perfect match for your operations, no matter if you're into construction, water well drilling, mineral exploration or any other industrial drilling business. Our industrial product line includes both tungsten carbide insert (TCI) bits and steel tooth bits for the toughest drilling applications.

01. HORIZONTAL DIRECTIONAL DRILLING
02. PILOT HOLE DRILLING
03. MINERAL EXPLORATION
04. WATER WELL DRILLING
05. PRE-PILEDIVING
06. TOWER ANCHORING ... AND MORE.

GET YOUR DETAILED SPECS UPON REQUEST.

Contact us with your query and we'll provide you with a drill bit specification that's just right for the drilling job you're up to.



TARGET™ HDD SERIES

Designed specifically for horizontal directional drilling (HDD) and trenchless technology applications. Available in both open bearing and sealed bearing configurations.

KEY FEATURES

Available in both open bearing and sealed bearing configurations. Patented EdgeGuard™ shirttail protection. HET treated carbide inserts.

FORMATIONS

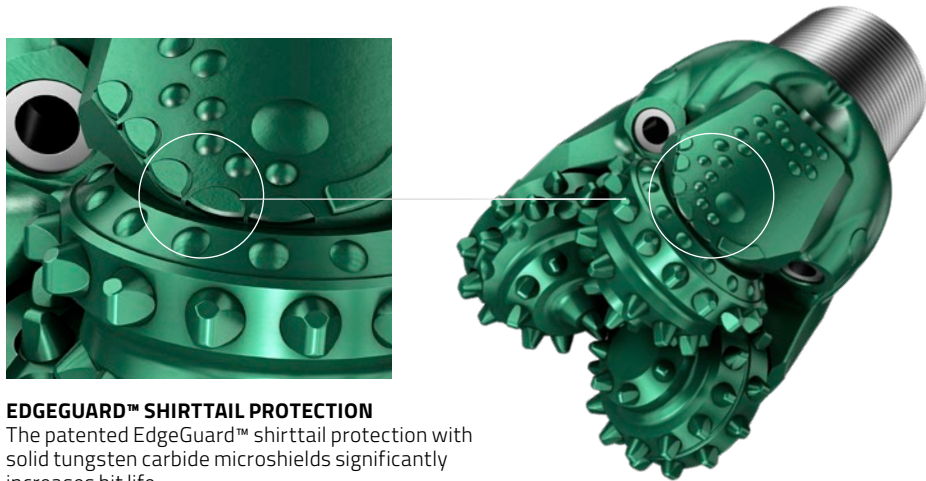
Available for soft, medium and hard.

BIT SIZES

3 7/8" through 6 1/2".

PRODUCT RANGE

UT



EDGEGUARD™ SHIRTTAIL PROTECTION
The patented EdgeGuard™ shirttail protection with solid tungsten carbide microshields significantly increases bit life.

PILOT HOLE BITS

A range of sealed journal and roller bearing bits designed for drilling the most demanding raise bore pilot holes and blind bore pilot holes.

KEY FEATURES

Cooler running bearings. Engineered bearing seals. Custom cutting structures. Shirttail protection.

FORMATIONS

Available for medium and hard.

BIT SIZES

9" through 15".

PRODUCT RANGE

PH Sealed journal bearing, PHR Sealed roller bearing



REVERSE CIRCULATION BITS

Deliver exceptional drilling performance in soft to medium formations typically found in mineral exploration. Available with both sealed and open bearings.

KEY FEATURES

Engineered bearing seals. Custom cutting structures. Shirttail protection. Full hole/skirts and reverse circulation fluid flow.

FORMATIONS

Available for soft, medium and hard.

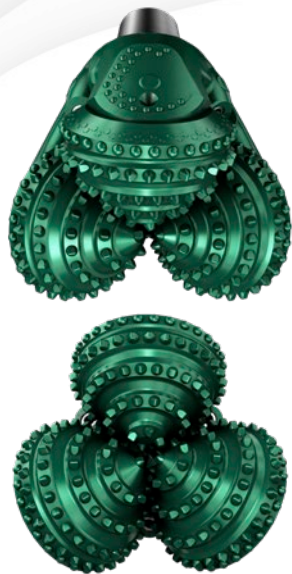
BIT SIZES

4 3/4" through 5 3/4".

PRODUCT RANGE

DW, RX, RC, QMC

GENERAL PURPOSE BITS



TCI BITS

Water well drilling or geothermal/hot spring drilling.

KEY FEATURES
Sealed bearing insert bits.
FORMATIONS
Available for soft, medium and hard.
BIT SIZES
4 3/4" through 26".
PRODUCT RANGE
IADC 415 through 625.

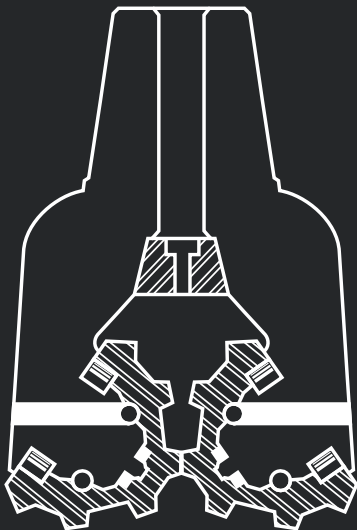


STEEL TOOTH BITS

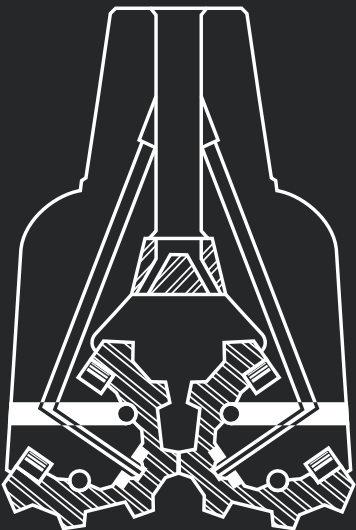
Construction and water well drilling.

KEY FEATURES
Open and sealed bearing.
FORMATIONS
Available for soft, medium and hard.
BIT SIZES
Open bearing – 2 7/8" through 6" for soft, medium and hard formations. Sealed bearing – 9 7/8" through 26" for soft and medium formations.
PRODUCT RANGE
Open bearing – IADC 111 through 321. Sealed bearing – IADC 115 through 216.

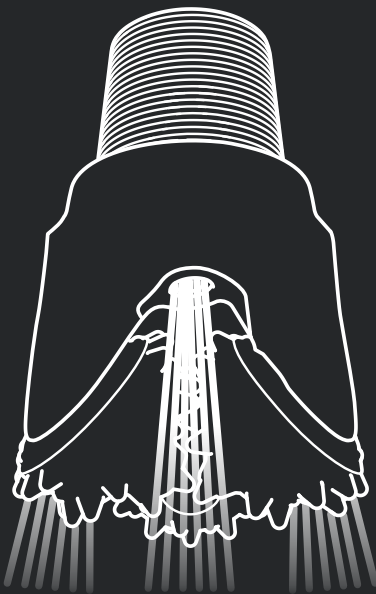
Please ask your Terelion representative for the full and detailed product offering for these bits.



REGULAR CENTER FLUID CIRCULATION
The regular circulation bits provide efficient circulation of fluid through the center of the bit to clean the teeth and the bottom of the hole. Available in full opening or three drilled hole courses.



REGULAR AIR CIRCULATION The air blast circulation bits provide a balanced supply of air to the bearings for cooling. A balanced supply of air also is directed to clean the cutters and the bottom of the hole. Back flow valve is available with this design.



JET CIRCULATION MUD/WATER OR AIR
The jet circulation bits are engineered for use with high pressure fluid or air. The precision nozzles direct the velocity of the fluid or air at the bottom of the hole for efficient cleaning.

TIPS FOR OPTIMIZING DRILL BIT PERFORMANCE.

01.

Keep rotating the bit, and turn on the air before the bit touches the ground, and keep the air on until the bit is out of the hole. If the bit is to stay in the hole while adding drill steel, blow the hole clean for 60 seconds prior to turning off the air.
02.

When purchasing a new drill specify compressors with adequate capacity. Don't forget the altitude factor when sizing the compressor. Often 7,000 to 10,000 linear feet per minute in return air velocity is required to properly clean the hole, particularly with heavier or larger cuttings.
03.

Inspect the rock bit after each hole and record the condition of the rock bit at regular intervals.
04.

Hot cones may indicate obstruction of the air passage to the bearings.
05.

Pressure gage increases may indicate air passages are plugging.
06.

An increase in air pressure may indicate unwanted restrictions in the air system. A decrease in air pressure may indicate leakage in the air system.
07.

Accidental dropping of the bit and drill string can damage bearings and/or cones.
08.

The I.D. (inside diameter) of the pin and box connections of the drill string should be the same as or larger than the I.D. of the pin on the rock bit. This will reduce the pressure drop loss across the drill string to the lowest possible psi.
09.

Avoid early bit failures by refraining from using bent drill steel and excessively worn drill steel, stabilizers, deck bushings or shock subs.
10.

When making up the rock bit use slow rotation and ensure that the drill string and rock bit mate properly shoulder to shoulder. Monitor the process carefully in order to avoid cross threading.
11.

Use proper tool joint thread compound to maintain connections.
12.

Use only the minimum amount of water required to suppress the dust.
13.

Use the factory recommended weight and rotation speeds to accommodate the formations being drilled.
14.

Rotary speed should be decreased as down pressure is increased and down pressure decreased as rotary speed is increased.
15.

Accurate information is valuable knowledge. Always record footage drilled, time in the hole, rpm, weight on bit, psi, formation drilled and any unusual drilling conditions. (Water in the hole, broken formations, etc.)
16.

Form drilling process improvement teams with your key suppliers. Establish improvement goals and measure progress.

Conversion chart.

	TO CONVERT	INTO	MULTIPLY BY
DISTANCE	feet	meters	0.3048
	metres	feet	3.2808
	inches	millimeters	25.4
	millimeters	inches	0.0394
PULLDOWN	pounds	decanewtons	0.4448
	decanewtons	tonne (metric)	2.2481
	tonne	pounds	0.0004536
	pounds	kilograms	0.4536
	kilograms	pounds	2.205
NOZZLE SIZE	32nds	millimeters	0.7938
	millimeters	32nds	1.2598
VOLUME	barrels	cubic meters	0.1590
	cubic meters	barrels	6.290
	U.S. gallons	cubic meters	0.003785
	cubic meters	U.S. gallons	264.2
	U.S. gallons	liters	3.7854
	liters	U.S. gallons	0.2642
CIRCULATION RATE	barrels/min	gallons/min	42
	gallons/min	barrels/min	0.02381
	gallons/min	liters/min	3.7854
	liters/min	gallons/min	0.2642
ANNULAR VELOCITY	feet/min	meters/min	0.3048
	meters/min	feet/min	3.2808
	psi	kilopascals	6.8947
PRESSURE	kilopascals	psi	0.14504
	psi	megapscals	0.006895
	megapascals	psi	145.038
	psi	atm	0.06804
	atm	psi	14.696
	psi	bars	0.06895
	bars	psi	14.5038
	psi	kilogram/sq cm	0.07031
MUD WEIGHT (DENSITY)	kilogram/sq cm	psi	14.2233
	pound/gallon	kilogram/cubic meter	119.829
	kilogram/cubic meter	pound/gallon	0.008345
	pound/gallon	specific gravity	0.119829
	specific gravity	pound gallon	8.3452
	pound/gallon	psi/1000 ft	51.948
TORQUE	psi/100 ft	pound gallon	0.01923
	foot pound	newton meters	1.3558
	newton meters	foot pound	0.7376
AREA	square inches	square millimeters	645.16
	square millimeters	square inches	0.00155

Insert bit comparison and hardness chart.

PSI		2,500	5,000	7,500	10,000	12,500	15,000	17,500	20,000	22,500	25,000	27,500	30,000	32,500	35,000	37,500	40,000	42,500	45,000	47,500	50,000	52,500	55,000	57,500
MPA		17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9	155.1	172.4	189.6	206.8	224.1	241.3	258.6	275.8	293.0	310.3	327.5	344.7	362.0	379.2	396.5
PTO		2.5	4	6	7	8	10	11	12	13	14	15	16	17	18	18	19	20	21	22	23	23	24	
FORMATION	SOFT	Schist (soft)	Sandstone (soft)	Limestone (soft)	Limestone (hard)	Conglomerate	Sandstone (hard)	Diorite		Quartzite (soft)	Slate	Gabbro	Gneiss (average)	Granite			Amphibolite			Diabase (Dolerite)				
		20																						
		30																						
		40																						
		43																						
FORMATION	MEDIUM																							
FORMATION	HARD																							

Steel tooth bit comparison and hardness chart.

	PSI	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	19,000
MPA		6.9	13.8	20.7	27.6	34.5	41.4	48.3	55.2	62.1	69.0	75.8	82.7	89.6	96.5	103.4	110.3	117.2	124.1	131.0
PTO		1	2	3		4		6	6	7			8	9	9	10	10	11	11	12
FORMATION	SOFT		Schist (soft)	Tuff		Sandstone (soft)		Limestone (soft)	Basalt (soft)	Limestone (hard)			Conglomerate	Dolomite	Shale (soft)	Andesite	Sandstone (hard)	Marble	Diorite	Schist (hard)
		IADC 111																		
		IADC 131																		
	MEDIUM																			
	HARD																			

Nozzle hole area.

HOLE SIZE		AREA 1 HOLE		AREA 3 HOLES	
in	mm	Square in	mm ²	Square in	mm ²
1/4	6.35	.049	31.62	.147	94.84
9/32	7.14	.062	40.00	.186	120.01
5/16	7.93	.076	49.04	.228	147.11
11/32	8.73	.093	60.00	.279	180.01
3/8	9.52	.110	70.97	.330	219.92
13/32	10.31	.130	83.88	.390	251.63
7/16	11.11	.150	96.78	.450	290.34
15/32	11.90	.172	110.97	.516	332.92
1/2	12.70	.196	126.46	.588	379.38
17/32	13.49	.222	143.23	.666	429.70
9/16	14.28	.248	160.01	.745	480.67
5/8	15.87	.306	197.43	.918	592.29
11/16	17.46	.372	240.01	1.116	720.04
3/4	19.05	.442	285.18	1.326	855.54
7/8	22.22	.601	387.77	1.803	1,163.30
1	25.40	.785	506.48	2.355	1,519.45
1 1/8	28.57	.993	640.68	2.985	1,925.92
1 1/4	31.75	1.228	792.31	3.684	2,376.92

Bit air pressure drop chart.

BIT SIZE RANGE	JET NOZZLE DIAMETER 3 EACH	AIR VOLUME DELIVERED IN CUBIC FEET PER MINUTE																										
		in	mm	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,600	2,800	3,000	
5 3/8 – 6 3/4" 137–171 mm	5/16	7.93	45	55	65	75	84																					
	3/8	9.52	36	46	54	64	72	81																				
	7/16	11.11	30	37	44	51	60	68	76	82																		
	1/2	12.70	26	32	36	44	51	57	64	70	76	82																
	9/16	14.28	21	26	32	37	44	50	54	59	65	70	76	82														
7 3/8 – 7 7/8" 187–200 mm	7/16	11.11	24	31	38	45	52	58	66	72	78	84																
	1/2	12.70		24	30	36	42	48	54	62	70	79	87															
	9/16	14.28			23	29	35	40	46	52	58	64	70	76	83													
	5/8	15.87				24	29	34	39	44	50	55	60	65	71	76	82											
9 – 9 7/8" 229–251 mm	3/8	9.52	29	39	49	57	65	73	80																			
	7/16	11.11	22	30	38	45	53	61	68	75	82																	
	1/2	12.70		24	30	36	42	48	56	63	69	74	80															
	9/16	14.28			23	29	35	41	46	52	57	62	67	71	76	81												
	5/8	15.87				22	28	35	39	44	49	52	56	61	65	69	73	81										
	3/4	19.05					22	25	29	34	39	43	46	50	53	57	64	67	71	74	78	82						
10 5/8 – 17 1/2" 270–245 mm	7/16	11.11			22	28	33	38	44	49	55	61	66	72	78													
	1/2	12.70				21	26	30	36	41	46	50	55	59	63	68	73	78										
	9/16	14.28					22	26	30	34	37	41	45	49	53	58	62	66	70	75								
	5/8	15.87					22	25	28	30	34	37	41	45	49	52	56	60	64	67	71	75						
	3/4	19.05						22	25	28	31	34	37	40	43	45	48	51	54	57	60	64	68					
	7/8	22.22							20	22	24	26	28	30	31	33	36	38	40	43	45	47	50					
	1 1/8	28.57																20	22	28	30	30	32	34				

In addition to adequate return air velocities, the pressure drop across the bit must be controlled to obtain the optimum bearing life. Pressure drop across the bit should be maintained in excess of 30 psi. Two (2) to ten (10) psi should be added for losses in the system ahead of the bit. For optimum bit life nozzles should be selected to hold pressure near the maximum allowable on the compressor.

This table assumes a new compressor operating at sea level. ACFM should be adjusted for maintenance condition and derated for altitude.

Helpful hole cleaning information.

For the most effective hole cleaning a minimum bailing velocity of 6000 feet per minute is considered desirable. This volume is calculated for the most common bit and pipe sizes. For dense materials, this volume should be increased in order to yield optimum cleaning efficiency.

The simple formula Q=AV can be applied to determine the volume flow of air (Q) necessary to give the desired velocity (V). (A) is the area of the hole through which the cuttings-laden air flows. This area is the area of the hole less the area filled by the drill pipe.

Bailing velocity.

BV =

183.3 × ACFM

D² – d²

- BV = Bailing velocity(feet per minute)
- ACFM = Actual cubic feet of free air per minute delivered
- 183.3 = Factor for conversion
- D = Diameter of the hole being drilled (inches)
- d = Outside diameter of the drill pipe being utilized (inches)

