

BOART LONGYEAR®
DRILLING PRODUCTS

EXPLORATION TOOLING

DIAMOND PRODUCTS

2026.R5 EN EDITION

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PRODUCT OVERVIEW



HISTORY

Boart Products

The first Boart bits off the line were put to use exploring for copper in Zambia and gold in the Orange Free State, South Africa. The early success of these bits paved the way for widespread adoption of the technology within the industry.

Early Success in the Copper Belt

Our diamond products were originally developed by Anglo American Corporation in the 1930s as a way to commercialize industrial-grade diamonds for the world's leading diamond producer. Boart Products led the research and development program, enabling practical, reliable manufacturing of diamond coring bits.

Revolutionary Engineering

1974 was an important year for Boart Longyear. Boart International became the sole owner of Longyear. With the new found technical talent and capital investment from Boart International, Longyear became the leading manufacturer of diamond bits.

Longyear

In 1938, the Longyear contract drilling department started using castset diamond bits. Almost immediately after Longyear had the bits in the field, the sales department started receiving inquiries from around the world regarding the availability of the diamond bit.

As our surface-set diamond bit technology developed, Longyear brand bits were put to use around the world. In the 1960s, the Longyear™ Q™ wireline took the industry by storm and opened the door for widespread adoption of Longyear drilling tools and consumables.

Continued Advances

As we entered our ninth decade, our engineers in North Bay, Ontario, secured a reliable source of high-performance synthetic diamonds, which triggered the development of a completely revolutionary bit design – the impregnated-diamond bit. With decades of powder metallurgy experience behind them, Longyear engineers set out to develop a new crown comprising synthetic diamonds evenly distributed throughout a composite matrix. This new design could drill further and faster than surface-set bits, and it cut through much harder material. By 1980, 75% of our Canadian-produced bits were of the new impregnated type, and Longyear was manufacturing diamond bits in more than eight countries.

Today

Today, there are many marketers of diamond bits and very few of those companies have invested in bit development. Boart Longyear is dedicated to the development of diamond bit technology. You can see it in our designs, such as the patented Stage®, Razorcut® and Longyear® innovations. You can trust us to deliver continued innovation.



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SPECIALTY BITS



Polycrystalline Diamond CUTTER (PDC) Bits

PDC bits are made for cutting softer formations at high penetration rates. They typically have round PDC cutters that can be replaced, extending the life of the bit.



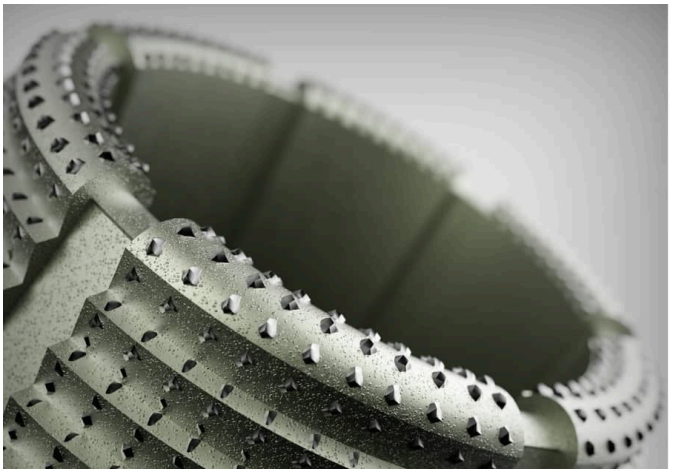
Tuyere bits

Tuyere bits are used for drilling holes through refractory bricks in smelters, named for the nozzles that inject air into smelting furnaces.



Surface Set Coring Bits

Surface set bits are bits with a single layer of diamonds inset in the face of the crown design. These bits are used for higher penetration rates is soft formations. Longyear diamond bonding technology has been incorporated into the new HI-EX line, diamonds remain in the matrix for up 2x longer than standard mechanically bonded surface set bits.

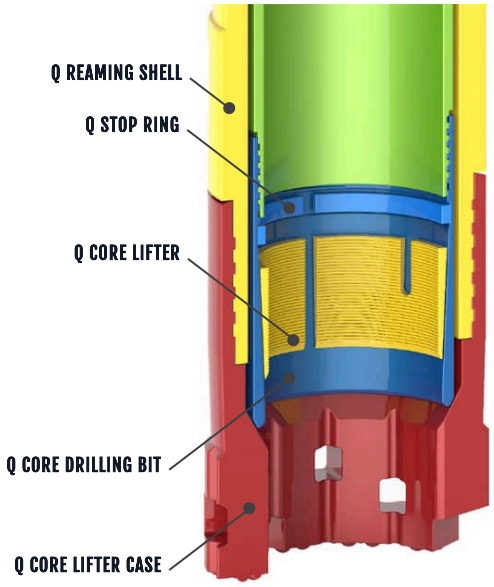


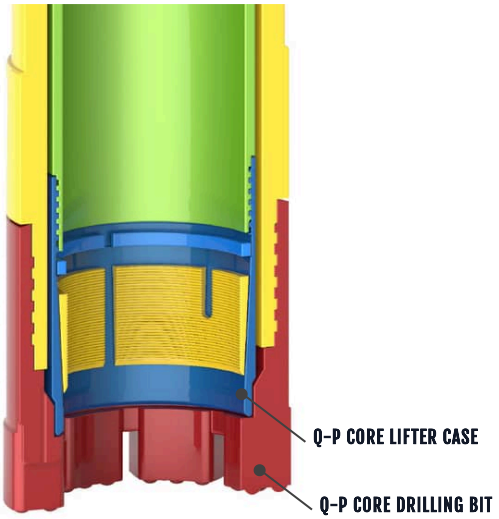
High Exposure (HI-EX) surface set bits

Utilizing patented Longyear diamond bonding, the new Hi-Ex surface set line retain diamonds on bit longer improving life and overall performance.

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SYSTEM OVERVIEW





Q™ & Q™ TK SYSTEM

Genuine Q™ double-tube wireline systems are ideal for most drilling conditions and are available for use in standard DCDMA hole sizes (B, N, H, P).

QTK systems are optimized to allow for a larger core sample while retaining the same hole size. QTK systems can penetrate faster due to their smaller kerfs, but are less robust than standard kerf systems. QTK systems are offered in the B and N* sizes.

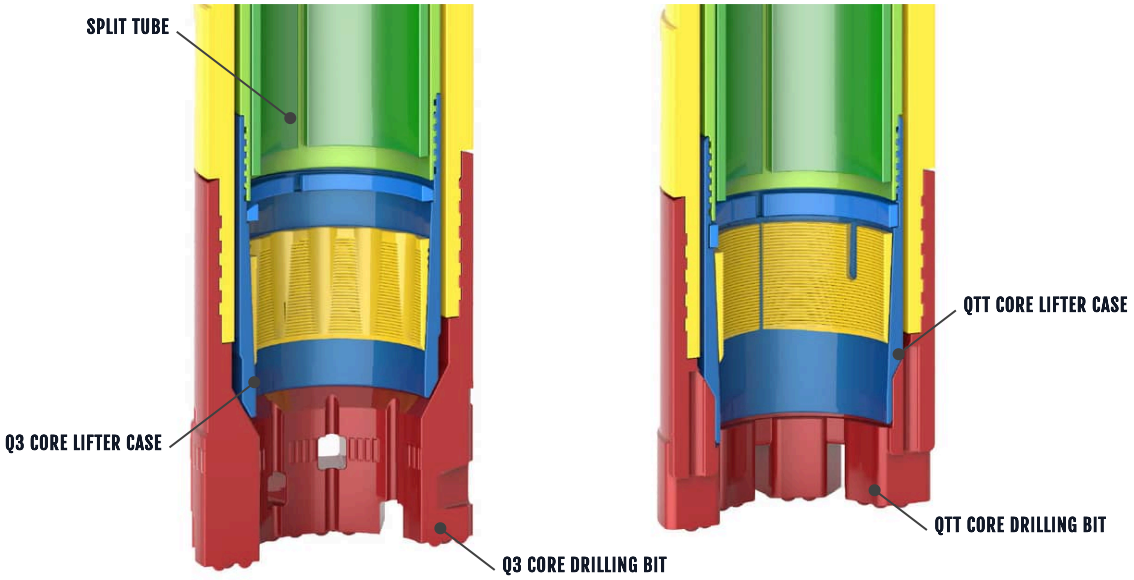
*NQTK also known as NQ2

Q™-P SYSTEM

The Q-P system is a double tube configuration like Q and QTK double tube systems but includes a specialized core lifter case and bit. These components redirect the water flow away from the core by creating a seal on the ID, improving core recovery. Available in N and H sizes.

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SYSTEM OVERVIEW (CONT.)



Q™ 3 SYSTEM

Q™ 3 wireline systems consist of the same components as the Q and QTK but utilize a third tube called an inner-tube liner or split tube. The liner is placed inside the inner tube. Q3 systems enable integral core recovery when drilling coal, clay-bearing, or highly fractured formations.

The liner, or split tube, retains the core sample in its received state for easier loading into sample trays, storage, and subsequent presentation to the geologist. The Q3 system is available in N, H and P sizes.

Q™ TT SYSTEM

The Q-TT system is a triple tube configuration like Q3 but includes a specialized core lifter case and bit. These components redirect the water flow away from the core by creating a seal on the ID, improving core recovery. Available in N, H, and P sizes.

Q is a trademark of Boart Longyear.

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DIAMOND CORING DRILL BIT GAUGES

The Boart Longyear nomenclature and hole sizes are based on the globally accepted Diamond Core Drilling Manufacturers Association (DCDMA) “W" series. Also note that the DCDMA specifications were adopted into ISO3551 (1992) and British Standard BS4019 (1993) Rotary Drilling Equipment.

SIZE	CORE DIAMETER	OUTER DIAMETER	REAMING SHELL OD	OVERSIZED OD
Q™ Wireline	in / mm	in / mm	in / mm	in / mm
BQ	1.433 / 36.4	2.355 / 59.8	2.365 / 60.0	--
NQ, NQ-P	1.875 / 47.6	2.975 / 75.6	2.985 / 75.8	3.032 / 77.0
HQ	2.500 / 63.5	3.775 / 95.9	3.789 / 96.2	3.830 / 97.3
HQ-P	2.500 / 63.5	3.775 / 95.9	3.789 / 96.2	3.895 / 98.9
PQ	3.345 / 85.0	4.817 / 122.4	4.834 / 122.8	4.950 / 125.73

SIZE	CORE DIAMETER	OUTER DIAMETER	REAMING SHELL OD	OVERSIZED OD
Q™ Thin Kerf	in / mm	in / mm	in / mm	in / mm
AQTK	1.202 / 30.5	1.885 / 47.9	1.895 / 48.1	--
BQTK	1.601 / 40.7	2.355 / 59.8	2.365 / 60.0	--
NQTK (NQ2)	1.995 / 50.7	2.975 / 75.6	2.985 / 75.8	3.032 / 77.0

SIZE	CORE DIAMETER	OUTER DIAMETER	REAMING SHELL OD	OVERSIZED OD
Q™ Triple Tube	in / mm	in / mm	in / mm	in / mm
NQ3, NQTT	1.775 / 45.1	2.975 / 75.6	2.985 / 75.8	3.032 / 77.0
HQ3	2.406 / 61.1	3.775 / 95.9	3.789 / 96.2	3.830 / 97.3
HQTT	2.406 / 61.1	3.775 / 95.9	3.789 / 96.2	3.895 / 98.9
PQ3, PQTT	3.270 / 83.1	4.817 / 122.4	4.834 / 122.8	4.950 / 125.7

All dimensions, weights, and volumes shown are nominal
*NQTK also known as NQ2

Installation

All recommended torque values below are for use with full-grip outer tube wrenches. Pipe wrenches/Stilsons can crush, ovalize, or leave deep gripper marks that lead to fatigue failures due to the steel hardness of most diamond products. Steel-brush thread cleaning and generous application of anti-galling thread compound prior to make up is also recommended to prevent galling.

Bit, Shell, Coupling and O/Tube Joint Torque Values:

AQ/BQ/BQTK: Minimum full-grip wrench torque =100 ft-lbs or 67 lbf using an 18" full-grip wrench

NQ/NQTK: Minimum full-grip wrench torque =125 ft-lbs or 83 lbf using an 18" full-grip wrench

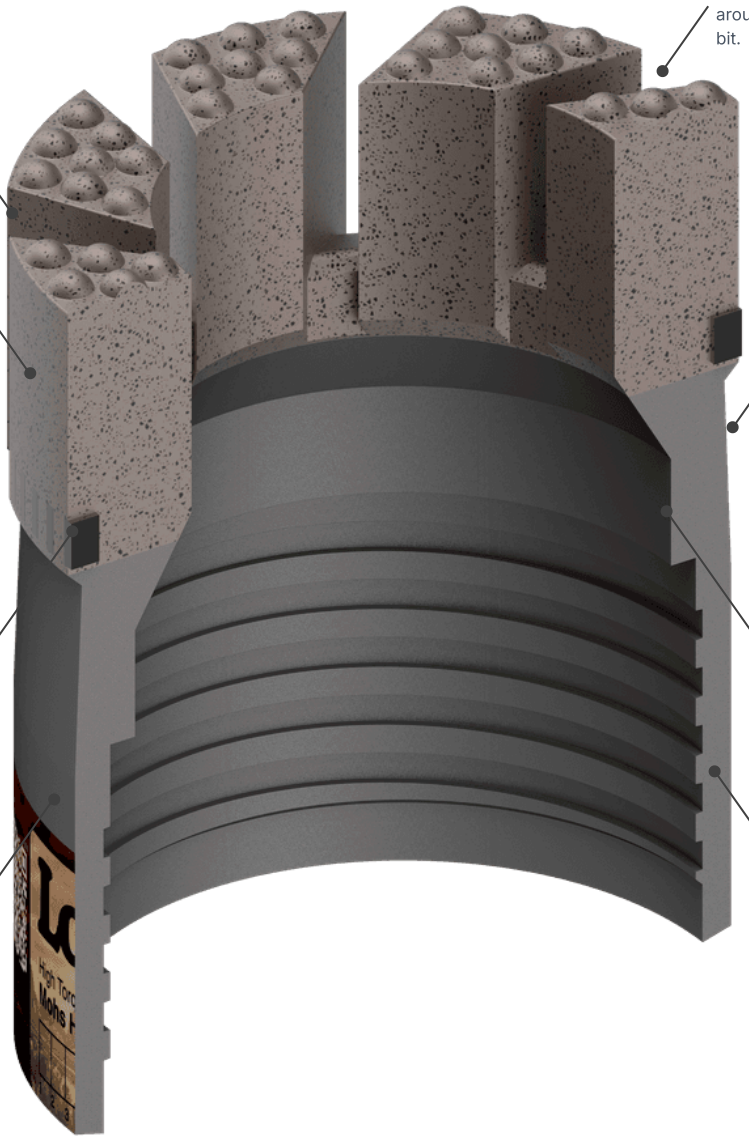
HQ: Minimum full-grip wrench torque =150 ft-lbs or 100 lbf using an 18" full-grip wrench

PQ: Minimum full-grip wrench torque =200 ft-lbs or 133 lbf using an 18" full-grip wrench

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IMPREGNATED BIT FEATURES



WATERWAYS
Waterways control the fluid around the cutting edge of the bit.

BIT FACE
Patented Razorcut™ design is ready to cut right out of the box and improves tracking and balance in the hole.

CROWN
Tungsten matrix impregnated with diamonds that expose as drilling progresses.

TAPER
Our designs of bits have a taper on the outer diameter (OD) to smooth the transition of cuttings from the waterways up the hole, improving flushing.

TUNGSTEN CARBIDE AND TSD* PINS
The pins protect the integrity of the crown.

CORE LIFTER CASE SEAT
The core lifter case seat supports the core lifter case when breaking core.

BIT SHANK
The bit shank is made of high-quality steel and machined in small batches to maintain manufacturing standards.

THREADS
The threads are precision-cut industry standard bit threads.

AU 2015203268; CA 2,784,465; AU Design Nos. 332257; 332260; 332261; CA Design Nos. 135751; CL Design 6479; CN Design No. ZL201030188519.X; EP Design No. 1216527-001; PE Design Nos. 2662; 2663; US Design Nos. D622,745; D647,114; ZA Design Nos. F2010/00750; CA Design No. 135753; CL Patent No. 52.578; PE Patent No. 9185; US Patent Nos. 9,903,165; 9,500,036; ZA Patent Nos. 2012/05225; 2013/07869; ES, FI, NO, SE, TR Patent No. 2513405.

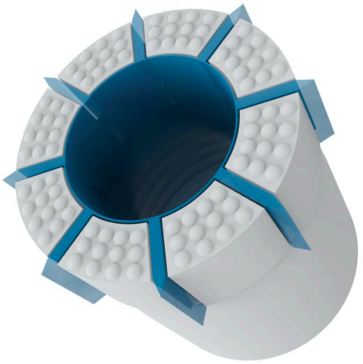
AU 201082270; 2015202683; AU Design No. 332218; CA 2,762,861; CN201080035195.3; US 9,051,786; 9,637,980; CA Design No. 136438; CL Design 6561; CN Design No. ZL201030248719.X; EP Design 001225676-001; PE Design No. 2690; US Patent No. D630,656; ZA Design No. F2010/1030; ZA Patent No. 2012/01878; CL Patent No. 54.449; PE Patent No. 7799; ES, FR, TR Patent No. 2464809.

AU Patent Nos. 2007333850; 2011201711; 2011201710; 2011201709; CA Patent No. 2,671,061; CA Patent 2,826,590; CN Patent No. ZL200780051070.8; US Patent Nos. 7,628,228; 7,828,090; 7,874,384; 8,051,929; ZA Patent No. 2009/03801; ES, FI, SE, TR Patent No. 2122111.

Patents Pending

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WATERWAYS



STANDARD (STD)
Recommended for general purpose use in competent, fine-grained formations.



TAPERED (TW)
Recommended for general purpose in areas that can encounter broken ground. Pushes cuttings to the OD and reduces pressure across bit face.



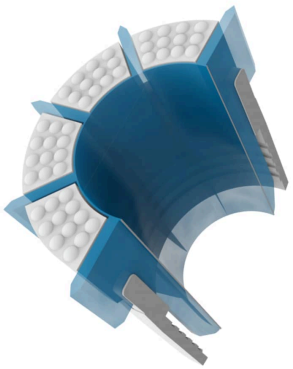
TAPERED SWIRL (TSW)
Recommended for fast penetration in competent ground with the ability to push cuttings from broken ground easily to OD.



EXPRESS (EX)
Recommended for fast penetration in competent formations.



STAGE and GT (STG, GT)
Recommended for maximum life. Wide waterways improve flushing of cuttings from bit face.



DEEP ID (DD)
Recommended for lost circulation by preventing lifter case from pulling into the bit and shutting off water.



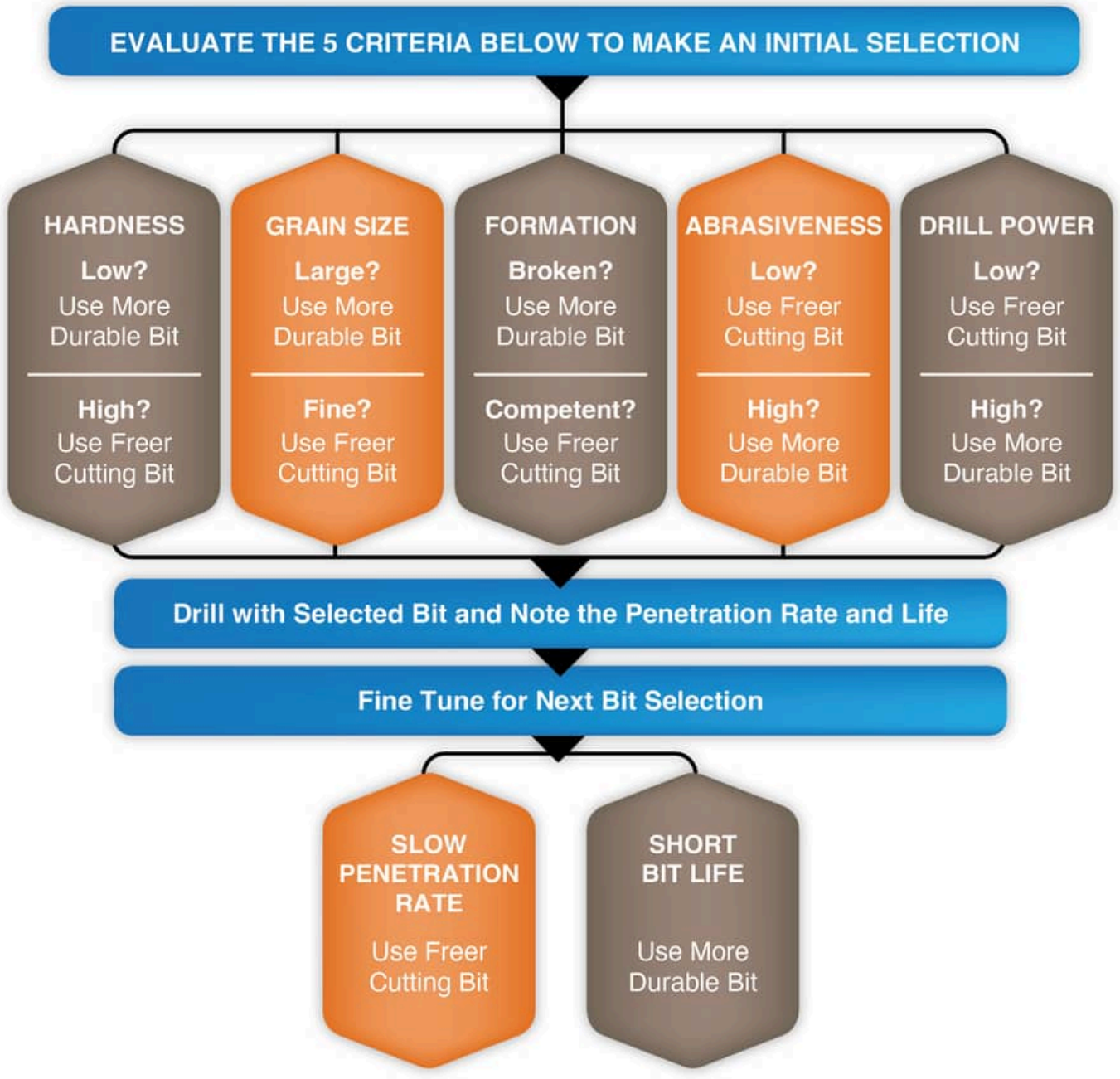
FACE DISCHARGE (FD)
Recommended for broken and soft formations. Reduces water pressure on core and redirects fluid to the bit face.

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PRODUCT SELECTION

Selecting the right bit for the job is not as difficult as it may seem. Just assess the speed and power capability of your drill for the size and depths of the holes to be drilled and gain as much knowledge as you can about the expected rock types and down-hole conditions; then follow the guidelines below.
Boart Longyear recognizes that drilling conditions are often encountered where formations change repeatedly within a very short interval of drilling. Under such circumstances, the most durable bit which will cut the hardest of the expected formations is recommended, and some discretion should be exercised to restrict penetration rates in any abrasive rocks encountered to protect the bit from excessive wear rates. However, if hole deviation becomes a problem, a freer cutting bit, combined with reduced penetration rates, may help bring it under control.

In certain instances, particularly in broken ground conditions, a mud program should be developed to maintain hole stability.



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LONGYEAR™ BIT SELECTION CHART

WATERWAY CONFIGURATIONS



STANDARD
Recommended for general purpose use in competent, fine-grained formations. Longest life of non-stage bits.



TAPERED
Recommended for general purpose in areas that can encounter broken ground. Pushes cuttings to the OD and reduces pressure across bit face.



TAPERED SWIRL
Recommended for fast penetration in competent ground with the ability to push cuttings from broken ground easily to OD.



EXPRESS
Recommended for fast cutting in competent formations. Offers faster penetration and lower weight.



STAGE
Recommended for the longest maximum life circumstances. Wide waterways offering better flushing and penetration.

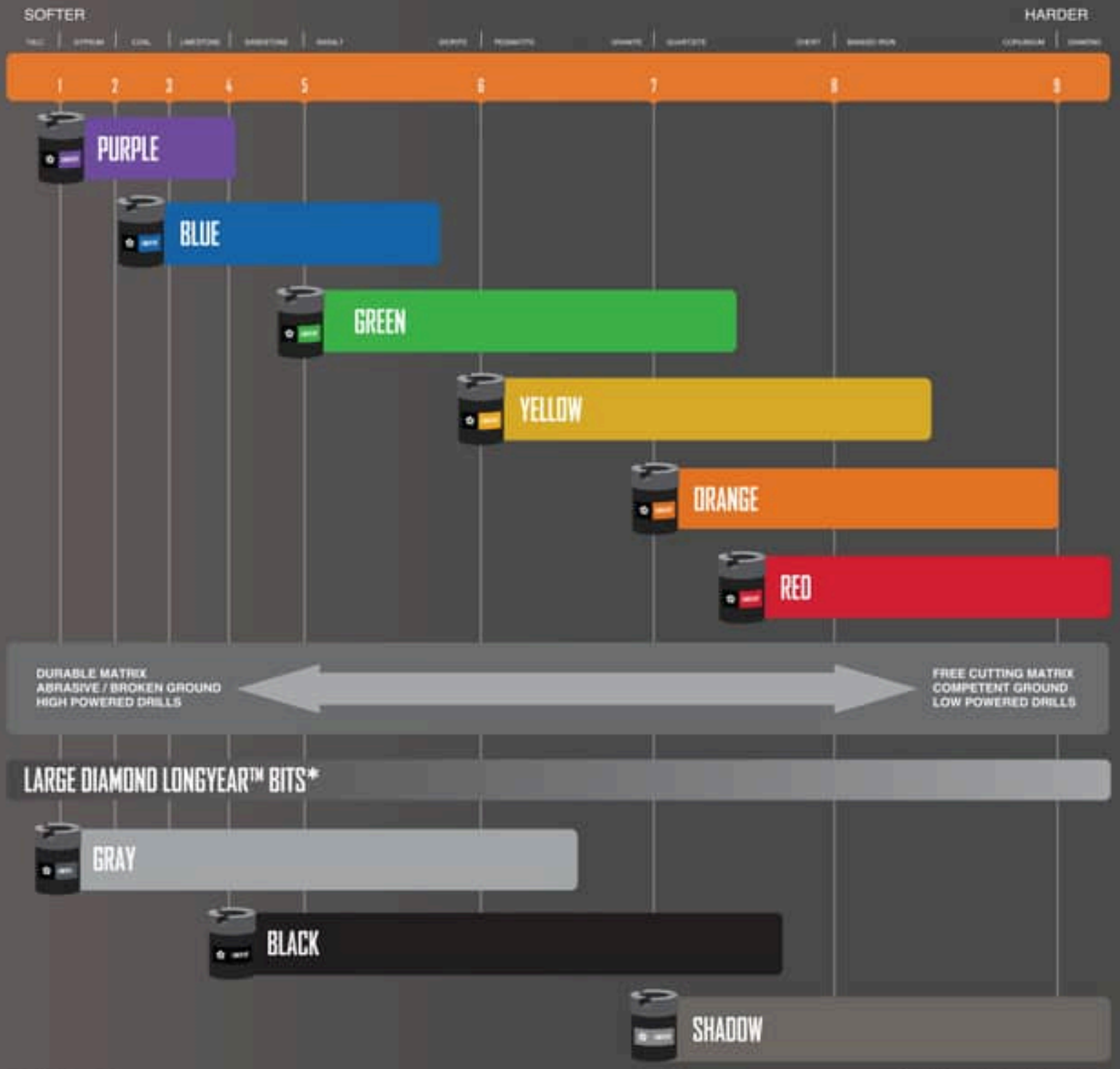
WATER CONTROL FEATURES
(available in all waterway configurations)



FACE DISCHARGE
Recommended for broken and soft formations. Reduces water pressure on core and redirects fluid to the bit face.



DEEP ID
Recommended for lost circulation by preventing lifter case from pulling into the bit and shutting off water.



*Driller adaptation is required for High Torque Longyear™ Bits, ask your regional Boart Longyear representative for more information.

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DIRECTIONAL DRILLING BITS

Downhole Motor Bits

Downhole motor (DHM) bits are threaded onto downhole motors and used in directional drilling applications. They have reinforced center ports and an impregnated full-face crown.

Eliminating the center diamonds, introducing variable wear resistance, and scalable wear life on the new full-face bit enable increased ROP with less WOB and limit early end of life due to concave wear. Boart Longyear full-face bits can also be used for hole opening, continuous boring, ventilation, drainage, utility & infrastructure.



Wedge Coring Bits (WD)

Boart Longyear™ wedging bits are diamond products designed to follow wedges set in the borehole to alter the hole direction.

These special profiles are required to avoid drilling straight through the wedge. The tapered crown profile is available with a taper ranging from 1/4" to 7/16" chamfer or 7-step (shown).



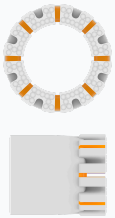
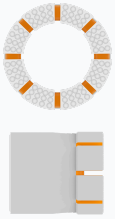
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DIAMOND BITS

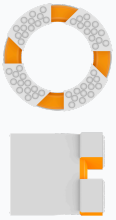


AQTK DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
EX							
	4056064	Red	12	R	—	—	—
STG3							
	4056687	Green	25	R	—	—	—
	4056489	Orange	25	R	—	—	—
STANDARD							
	4051749	08	—	S	—	—	—

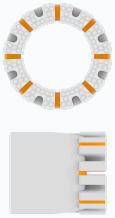
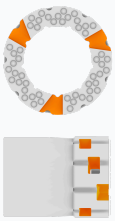
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BQ DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056170	Blue	12	R	—	—	—
	4056171	Green	12	R	—	—	—
	4056402	Purple	12	R	—	—	—
	4056694	Red	12	R	—	—	—
	4056650	Yellow	12	R	—	—	—
TW							
	4057149	Blue	12	R	—	—	—
	4057217	Red	12	R	—	—	—
	4056274	Black	16	R	—	—	—
	4056278	Blue	16	R	—	—	—
	4056273	Green	16	R	—	—	—
	4056276	Grey	16	R	—	—	—
	4056514	Orange	16	R	—	—	—
	4056762	Purple	16	R	—	—	—
	4056277	Yellow	16	R	—	—	—
TSW							
	4056881	Black	20	R	—	—	—
	4057153	Blue	20	R	—	—	—
	4056996	Green	20	R	—	—	—
	4056880	Orange	20	R	—	—	—
	4056928	Red	20	R	—	—	—

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BQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW (CONT.)							
	4057036	Shadow	20	R	—	—	—
	4056997	Yellow	20	R	—	—	—
EX							
	4056213	Black	16	R	—	—	—
	4056217	Blue	16	R	—	—	—
	4056212	Green	16	R	—	—	—
	4056215	Grey	16	R	—	—	—
	4056515	Orange	16	R	—	—	—
	4056214	Red	16	R	—	—	—
	4056216	Yellow	16	R	—	—	—
STG3							
	4056187	Black	25	R	—	—	—
	4056405	Green	25	R	—	—	—
	4056518	Orange	25	R	—	—	—
	4056407	Red	25	R	—	—	—
	4057154	Shadow	25	R	—	—	—
	4056310	Yellow	25	R	—	—	—
STANDARD							
	4057163	Orange	16	R	—	—	—

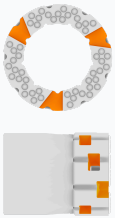
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BQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STANDARD (CONT.)							
	4057164	Red	16	R	—	—	—
	4057162	Yellow	16	R	—	—	—

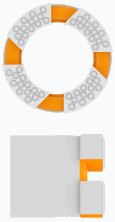
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BQTK DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW							
	4057040	Red	16	R	—	—	—
	4057133	Yellow	16	R	—	—	—
EX							
	4056141	Green	16	R	—	—	—
	4056292	Orange	16	R	—	—	—
	4056144	Red	16	R	—	—	—
	4056143	Yellow	16	R	—	—	—
STG3							
	4055953	Green	25	R	—	—	—
	4056312	Orange	25	R	—	—	—
	4056024	Yellow	25	R	—	—	—
STANDARD							
	4057135	Orange	12	S	—	—	—
	4057039	Orange	16	R	—	—	—

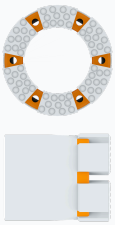
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NQ DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056437	Blue	12	R	—	—	—
	4056440	Green	12	R	—	—	—
	4056159	Grey	12	R	—	—	—
	4056980	Grey	12	R	—	—	—
	4056435	Purple	12	R	—	—	—
	4056627	Red	12	R	—	—	—
	4056443	Yellow	12	R	—	—	—
TW							
	4057136	Blue	12	R	—	—	—
	4057070	Green	12	R	—	—	—
	4057142	Grey	12	OS	3.032	—	—
	4057068	Orange	12	R	—	—	—
	4057069	Yellow	12	R	—	—	—
	4056485	Black	16	R	—	—	—
	4057118	Black	16	OS	3.032	DD	—
	4056378	Blue	16	R	—	—	—
	4056754	Blue	16	OS	3.032	—	—
	4057112	Green	16	R	—	FD	—

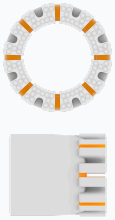
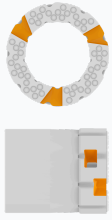
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NQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056360	Green	16	R	—	—	—
	4056744	Green	16	OS	3.032	—	—
	4056583	Grey	16	R	—	—	—
	4056356	Orange	16	R	—	—	—
	4057210	Orange	16	OS	3.032	—	—
	4056711	Purple	16	R	—	—	—
	4056357	Red	16	R	—	—	—
	4057043	Shadow	16	R	—	—	—
	4057111	Yellow	16	R	—	FD	—
	4056355	Yellow	16	R	—	—	—
	4056787	Yellow	16	OS	3.032	—	—
	4057119	Yellow	16	OS	3.032	DD	—
TSW							
	4057232	Black	16	R	—	—	—
	4057235	Blue	16	R	—	—	—
	4057234	Green	16	R	—	—	—
	4057233	Yellow	16	R	—	—	—
	4056876	Black	20	R	—	—	—
	4056968	Blue	20	R	—	—	—

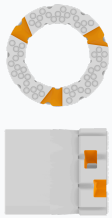
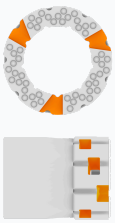
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NQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW (CONT.)							
	4056875	Green	20	R	—	—	—
	4056895	Grey	20	R	—	—	—
	4056894	Orange	20	R	—	—	—
	4056910	Red	20	R	—	—	—
	4057037	Shadow	20	R	—	—	—
	4057102	Shadow	20	R	—	—	PINS
	4056896	Yellow	20	R	—	—	—
EX							
	4056180	Black	16	R	—	—	—
	4056183	Blue	16	R	—	—	—
	4057268	Blue	16	R	—	—	—
	4056181	Green	16	R	—	—	—
	4057267	Green	16	R	—	—	—
	4056182	Grey	16	R	—	—	—
	4056379	Orange	16	R	—	—	—
	4056639	Purple	16	R	—	—	—
	4056178	Red	16	R	—	—	—
	4057266	Red	16	R	—	—	—
	4056179	Yellow	16	R	—	—	—
STG2							
	4056096	Black	16	R	—	—	—

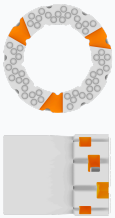
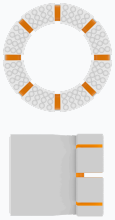
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NQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STG2 (CONT.)							
	4055909	Green	16	R	—	—	—
	4057139	Orange	16	R	—	—	—
	4056025	Red	16	R	—	—	—
	4056028	Yellow	16	R	—	—	—
	4056868	Red	20	OS	3.830	—	—
STG3							
	4056127	Black	25	R	—	—	—
	4057006	Black	25	OS	3.032	—	—
	4056126	Blue	25	R	—	—	—
	4055897	Green	25	R	—	—	—
	4056572	Green	25	OS	3.032	—	—
	4056618	Green	25	OS	3.032	FD	—
	4056011	Grey	25	R	—	—	—
	4056289	Grey	25	OS	3.032	—	—
	4056619	Grey	25	OS	3.032	FD	—
	4056521	Orange	25	R	—	—	—
	4056867	Orange	25	OS	3.032	—	—
	4055991	Red	25	R	—	—	—
	4056633	Red	25	OS	3.032	—	—
	4057044	Shadow	25	R	—	—	—
	4056029	Yellow	25	R	—	—	—

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NQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STG3 (CONT.)							
	4057301	Yellow	25	OS	3.032	—	—
STANDARD							
	4057000	Green	16	R	—	DD	—

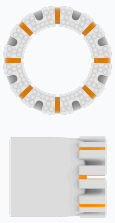
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NQTK DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056686	Black	12	R	—	—	—
	4056453	Purple	12	R	—	—	—
TW							
 	4056685	Black	16	R	—	—	—
	4056384	Blue	16	R	—	—	—
	4056063	Green	16	R	—	—	—
	4056385	Grey	16	R	—	—	—
	4056130	Orange	16	R	—	—	—
	4056131	Red	16	R	—	—	—
	4056062	Yellow	16	R	—	—	—
	4056856	Yellow	16	R	—	—	PINS
TSW							
 	4057322	Black	16	R	—	—	—
	4057236	Green	16	R	—	—	—
	4057244	Orange	16	R	—	—	—
	4057243	Red	16	R	—	—	—
	4057141	Shadow	16	R	—	—	PINS
	4057246	Shadow	16	R	—	—	—
	4057245	Yellow	16	R	—	—	—
	4056829	Black	20	R	—	—	—

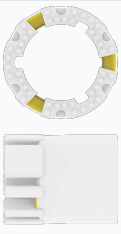
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NQTK DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW (CONT.)							
	4056809	Blue	20	R	—	—	—
	4056807	Green	20	R	—	—	—
	4056808	Grey	20	R	—	—	—
	4056831	Grey	20	OS	3.032	—	—
	4056799	Orange	20	R	—	—	—
	4056803	Orange	20	OS	3.032	—	—
	4057204	Orange	20	OS	3.032	—	PINS
	4056774	Red	20	R	—	—	—
	4056801	Red	20	OS	3.032	—	—
	4057167	Red	20	R	—	—	—
	4057200	Red	20	R	—	—	PINS
	4056907	Shadow	20	R	—	—	—
	4057201	Shadow	20	R	—	—	PINS
	4056798	Yellow	20	R	—	—	—
	4056802	Yellow	20	OS	3.032	—	—
EX							
	4056161	Black	16	R	—	—	—
	4057150	Black	16	OS	3.032	—	—
	4056164	Blue	16	R	—	—	—
	4056160	Green	16	R	—	—	—
	4056279	Green	16	R	—	—	PINS

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NQTK DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
EX (CONT.)							
	4056338	Green	16	OS	3.032	—	—
	4056162	Grey	16	R	—	—	—
	4056364	Orange	16	R	—	—	—
	4056147	Red	16	R	—	—	—
	4057157	Shadow	16	R	—	—	—
	4056163	Yellow	16	R	—	—	—
STG3							
	4056076	Black	25	R	—	—	—
	4056188	Grey	25	R	—	—	—
	4057110	Grey	25	OS	3.032	—	—
	4056998	Orange	25	R	—	—	—
	4055977	Red	25	R	—	—	—
	4056006	Yellow	25	R	—	—	—
STANDARD							
	4056830	Red	12	S	—	DD	—
	4056091	Grey	16	R	—	—	—
	4056368	Orange	16	S	—	—	—
	4056014	Red	16	R	—	—	—
	4057152	Shadow	16	R	—	—	—
SNAKE							
	4057303	Black	25	R	—	—	—

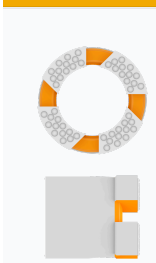
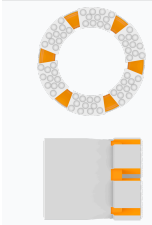
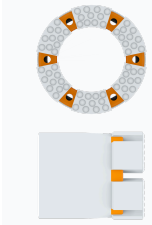
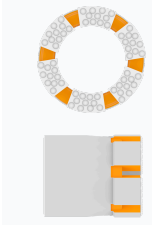
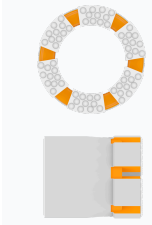
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NQTK DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
SNAKE (CONT.)							
	4057339	Black	25	OS	3.032	—	—
	4057305	Blue	25	R	—	—	—
	4057304	Green	25	R	—	—	—
	4057326	Grey	25	R	—	—	—

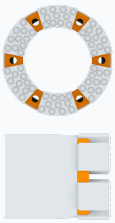
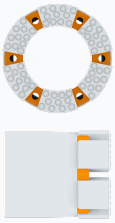
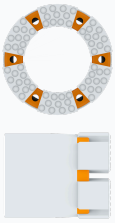
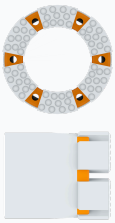
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NQ3 DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056695	Green	12	R	—	FD	—
	4056641	Purple	12	R	—	FD	—
	4056950	Red	12	R	—	FD	—
	4056949	Yellow	12	R	—	FD	—
TW							
	4056261	Black	12	R	—	—	—
	4056271	Blue	12	R	—	FD	—
	4056265	Blue	12	R	—	—	—
	4056266	Green	12	R	—	FD	—
	4056260	Green	12	R	—	—	—

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NQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056269	Grey	12	R	—	FD	—
	4056263	Grey	12	R	—	—	—
	4056588	Orange	12	R	—	FD	—
	4056629	Orange	12	R	—	—	—
	4056268	Red	12	R	—	FD	—
	4056262	Red	12	R	—	—	—
	4056270	Yellow	12	R	—	FD	—

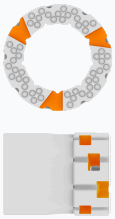
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NQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056264	Yellow	12	R	—	—	—
	4057084	Black	16	OS	3.032	—	—
	4056254	Green	16	R	—	—	—
	4056847	Green	16	OS	3.032	—	—
	4057034	Grey	16	R	—	—	—
	4057049	Grey	16	OS	3.032	—	—
	4056256	Red	16	R	—	—	—
	4056987	Red	16	OS	3.032	—	—
	4056258	Yellow	16	R	—	—	—
	4056857	Yellow	16	OS	3.032	—	—
TSW							
	4057194	Orange	16	R	—	DD	—
	4057195	Shadow	16	R	—	DD	—
	4057060	Black	20	R	—	—	—
	4057313	Blue	20	R	—	—	—
	4057182	Green	20	R	—	—	—
	4057061	Grey	20	R	—	—	—
	4057173	Orange	20	R	—	FD	—
	4057186	Orange	20	R	—	—	—
	4057180	Red	20	R	—	—	—
	4057086	Shadow	20	R	—	—	—

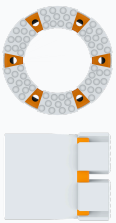
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NQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW (CONT.)							
	4057181	Yellow	20	R	—	—	—
STG3							
	4057314	Blue	25	R	—	—	—
	4057219	Green	25	R	—	—	—
	4057179	Grey	25	OS	3.032	—	—
	4056309	Yellow	25	R	—	—	—
	4057085	Yellow	25	OS	3.032	—	—

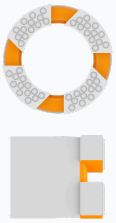
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NQTT DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW							
	4056576	Green	16	R	—	FD	—
	4057030	Green	16	OS	3.032	FD	—
	4057031	Grey	16	OS	3.032	FD	—
	4056578	Yellow	16	R	—	FD	—
	4057014	Shadow	20	R	—	FD	—
STANDARD							
	4057309	Yellow	12	R	—	FD	PINS

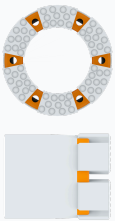
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HQ DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056957	Black	12	OS	3.895	—	—
	4057192	Black	12	OS	3.830	—	—
	4056410	Blue	12	R	—	—	—
	4057238	Blue	12	R	—	FD	PINS
	4056239	Green	12	R	—	FD	—
	4056413	Green	12	R	—	—	—
	4056850	Green	12	OS	3.895	—	—
	4057237	Green	12	R	—	FD	PINS
	4056852	Grey	12	OS	3.895	—	—
	4057191	Grey	12	OS	3.830	—	—
	4056408	Purple	12	R	—	FD	—
	4056409	Purple	12	R	—	—	—
	4056414	Red	12	R	—	—	—
	4056243	Yellow	12	R	—	FD	—
	4056417	Yellow	12	R	—	—	—
	4057113	Yellow	12	OS	3.895	—	—
TW							
	4057137	Blue	12	R	—	—	—
	4057075	Green	12	R	—	—	—
	4057143	Grey	12	OS	3.895	—	—
	4057073	Orange	12	R	—	—	—

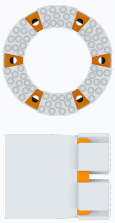
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HQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4057072	Red	12	R	—	—	—
	4057074	Yellow	12	R	—	—	—
	4056760	Black	16	OS	3.895	—	—
	4056789	Black	16	R	—	—	—
	4057117	Black	16	OS	3.895	DD	—
	4057209	Black	16	OS	3.895	—	PINS
	4056386	Blue	16	R	—	—	—
	4056648	Blue	16	OS	3.830	—	—
	4056761	Blue	16	OS	3.895	—	—
	4057292	Green	16	R	—	FD	—
	4056247	Green	16	R	—	—	—
	4056679	Green	16	OS	3.895	DD	—
	4056917	Green	16	OS	3.830	—	—
	4057175	Green	16	R	—	—	PINS
	4056319	Grey	16	OS	3.830	—	—
	4056569	Grey	16	R	—	—	—
	4056324	Orange	16	R	—	—	—
	4056935	Orange	16	OS	3.830	—	—
	4056712	Purple	16	R	—	—	—

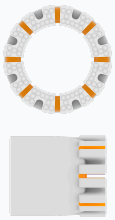
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HQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4057291	Red	16	R	—	FD	—
	4056325	Red	16	R	—	—	—
	4056759	Red	16	OS	3.895	—	—
	4056918	Red	16	OS	3.830	—	—
	4056246	Yellow	16	R	—	—	—
	4056757	Yellow	16	OS	3.895	—	—
	4056936	Yellow	16	OS	3.830	—	—
	4057116	Yellow	16	OS	3.895	DD	—
	4057174	Yellow	16	R	—	—	PINS
	4057208	Yellow	16	OS	3.895	—	PINS
TSW							
	4057178	Black	20	R	—	—	—
	4057052	Blue	20	R	—	—	—
	4057240	Blue	20	R	—	—	PINS
	4056911	Green	20	R	—	—	—
	4057239	Green	20	R	—	—	PINS
	4057294	Green	20	R	—	FD	—
	4057177	Grey	20	R	—	—	—
	4056964	Orange	20	R	—	—	—

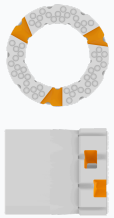
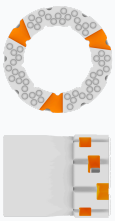
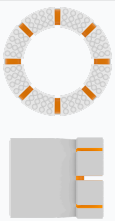
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HQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW (CONT.)							
	4057032	Red	20	R	—	—	—
	4057199	Red	20	R	—	—	PINS
	4057293	Red	20	R	—	FD	—
	4057064	Shadow	20	R	—	—	—
	4057103	Shadow	20	R	—	—	PINS
	4057121	Shadow	20	OS	3.895	—	—
	4056912	Yellow	20	R	—	—	—
EX							
	4056149	Black	16	R	—	—	—
	4057115	Black	16	OS	3.895	—	—
	4056153	Blue	16	R	—	—	—
	4056148	Green	16	R	—	—	—
	4056317	Green	16	OS	3.830	—	—
	4056151	Grey	16	R	—	—	—
	4056490	Grey	16	OS	3.895	—	—
	4056323	Orange	16	R	—	—	—
	4056150	Red	16	R	—	—	—
	4057185	Shadow	16	R	—	—	—
	4056152	Yellow	16	R	—	—	—
	4057114	Yellow	16	OS	3.895	—	—

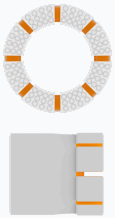
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HQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STG2							
	4055880	Green	16	R	—	—	—
	4057138	Orange	16	R	—	—	—
	4056415	Red	16	R	—	—	—
	4056418	Yellow	16	R	—	—	—
STG3							
	4056843	Black	25	R	—	—	—
	4056958	Black	25	OS	3.895	—	—
	4057190	Black	25	OS	3.830	—	—
	4056844	Blue	25	R	—	—	—
	4056038	Green	25	R	—	—	—
	4057302	Green	25	OS	3.895	—	—
	4055992	Grey	25	R	—	—	—
	4056487	Grey	25	OS	3.895	—	—
	4056704	Orange	25	R	—	—	—
	4056845	Purple	25	R	—	—	—
	4056375	Red	25	R	—	—	—
	4057325	Shadow	25	OS	3.895	—	—
	4056052	Yellow	25	R	—	—	—
	4056883	Yellow	25	OS	3.895	—	—
STANDARD							
	4056832	Red	12	S	—	DD	—

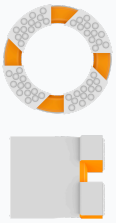
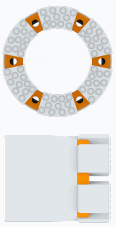
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HQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STANDARD (CONT.)							
	4056168	Grey	16	R	—	—	—
	4056166	Red	16	R	—	—	—
	4057183	Red	16	R	—	—	—
	4057003	Shadow	16	R	—	—	—
	4056752	Grey	50	R	—	—	—
	4056750	Yellow	50	R	—	—	—
TTW							
	4056155	Grey	12	R	—	—	—

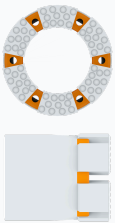
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HQ3 DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056200	Black	12	OS	3.895	—	—
	4057160	Black	12	OS	3.895	—	PINS
	4056423	Blue	12	R	—	FD	—
	4056424	Blue	12	R	—	—	—
	4056177	Green	12	OS	3.895	—	—
	4056426	Green	12	R	—	FD	—
	4056427	Green	12	R	—	—	—
	4056157	Grey	12	OS	3.895	—	—
	4056299	Grey	12	R	—	FD	—
	4056735	Orange	12	R	—	—	—
	4056419	Purple	12	R	—	—	—
	4056420	Purple	12	R	—	FD	—
	4056430	Red	12	R	—	FD	—
	4056637	Yellow	12	R	—	—	—
	4056951	Yellow	12	R	—	FD	—
TW							
	4056232	Blue	12	R	—	FD	—
	4056233	Green	12	R	—	FD	—
	4056231	Grey	12	R	—	FD	—
	4056371	Orange	12	R	—	FD	—

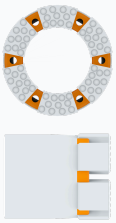
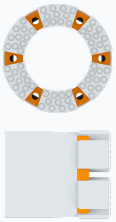
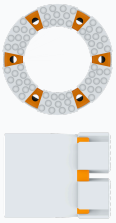
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HQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056916	Orange	12	OS	3.895	—	—
	4056236	Red	12	R	—	FD	—
	4056230	Red	12	R	—	—	—
	4056582	Red	12	OS	3.895	—	—
	4056235	Yellow	12	R	—	FD	—
	4056644	Yellow	12	OS	3.895	—	—
	4056222	Black	16	R	—	—	—
	4057027	Black	16	OS	3.830	—	—
	4057328	Black	16	OS	3.895	—	—
	4056070	Blue	16	R	—	DD	—
	4056220	Blue	16	R	—	—	—
	4056343	Blue	16	OS	3.830	—	—

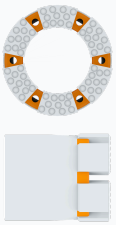
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HQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056553	Green	16	R	—	FD	—
	4056046	Green	16	R	—	DD	—
	4056221	Green	16	R	—	—	—
	4056706	Green	16	OS	3.830	—	—
	4056710	Green	16	OS	3.895	—	—
	4056165	Grey	16	R	—	DD	—
	4056219	Grey	16	R	—	—	—
	4056342	Grey	16	OS	3.830	—	—
	4057272	Grey	16	OS	3.830	DD	—
	4056556	Orange	16	R	—	FD	—
	4056366	Orange	16	R	—	—	—
	4057033	Orange	16	OS	3.830	—	—
	4056558	Red	16	R	—	FD	—

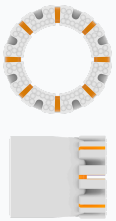
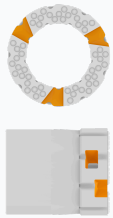
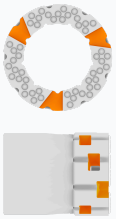
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HQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056109	Red	16	R	—	DD	—
	4056224	Red	16	R	—	—	—
	4056984	Red	16	OS	3.830	—	—
	4057025	Shadow	16	R	—	FD	—
	4057028	Shadow	16	OS	3.830	—	—
	4056555	Yellow	16	R	—	FD	—
	4056071	Yellow	16	R	—	DD	—
	4056223	Yellow	16	R	—	—	—
	4056927	Yellow	16	OS	3.895	—	—
	4056985	Yellow	16	OS	3.830	—	—
TSW							
	4057080	Green	20	R	—	—	—
	4057042	Grey	20	R	—	—	—
	4057106	Grey	20	R	—	FD	—
	4057082	Orange	20	R	—	—	—

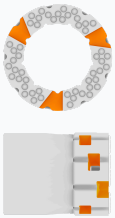
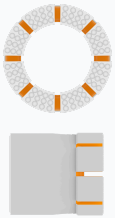
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HQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TSW (CONT.)							
	4057083	Shadow	20	R	—	—	—
	4057287	Shadow	20	OS	3.830	—	—
	4057081	Yellow	20	R	—	—	—
	4057315	Yellow	20	OS	3.895	DD	—
EX							
	4056905	Black	16	OS	3.895	—	—
	4057104	Black	16	R	—	—	—
	4057159	Black	16	OS	3.895	—	PINS
	4056826	Grey	16	OS	3.895	—	—
	4057120	Grey	16	R	—	—	—
	4057012	Orange	16	R	—	—	—
	4057047	Shadow	16	OS	3.830	DD	—
	4056906	Yellow	16	OS	3.895	—	—
STG2							
	4056298	Grey	16	R	—	FD	—
	4057046	Orange	16	R	—	—	—
	4057045	Red	16	R	—	—	—
STG3							
	4056192	Black	25	OS	3.895	—	—
	4057169	Black	25	R	—	—	—
	4056190	Grey	25	OS	3.895	—	—

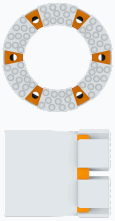
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HQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STG3 (CONT.)							
	4056878	Orange	25	R	—	—	—
	4056111	Red	25	R	—	—	—
	4057312	Shadow	25	OS	3.895	—	—
	4056193	Yellow	25	OS	3.895	—	—
STANDARD							
	4056307	Green	12	S	—	DD	PINS
	4056322	Grey	12	OS	3.895	FD	—
	4057288	Grey	12	R	—	—	—
	4057289	Grey	12	R	—	—	—
	4056534	Blue	16	R	—	DD	—
	4056902	Green	16	R	—	DD	—
	4057165	Green	16	OS	3.830	—	—
	4056124	Grey	16	R	—	FD	—
	4056533	Grey	16	R	—	DD	—
	4056539	Red	16	R	—	DD	—
	4056536	Yellow	16	R	—	DD	—
	4057002	Shadow	—	—	—	DD	—

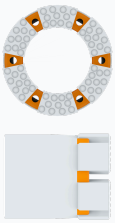
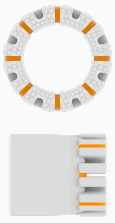
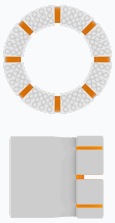
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HQTT DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW							
	4057188	Black	12	OS	3.895	FD	PINS
	4057308	Green	12	R	—	FD	PINS
	4057220	Orange	12	R	—	FD	PINS
	4057307	Red	12	R	—	FD	PINS
	4057222	Shadow	12	R	—	FD	PINS
	4057221	Yellow	12	R	—	FD	PINS
	4057187	Black	16	OS	3.895	FD	PINS
	4057231	Black	16	OS	3.830	FD	—
	4057261	Black	16	OS	3.895	FD	PINS
	4056921	Blue	16	OS	3.830	FD	—
	4056601	Green	16	R	—	FD	—
	4056920	Green	16	OS	3.830	FD	—
	4057227	Green	16	OS	3.830	FD	PINS
	4057005	Grey	16	OS	3.830	FD	—
	4056607	Orange	16	R	—	FD	—
	4056941	Orange	16	OS	3.830	FD	—
	4056919	Red	16	OS	3.830	FD	—
	4057013	Shadow	16	R	—	FD	—
	4057275	Shadow	16	OS	3.830	FD	—
	4056608	Yellow	16	R	—	FD	—
	4056940	Yellow	16	OS	3.830	FD	—

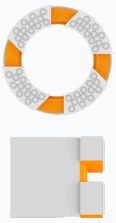
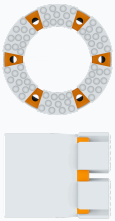
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HQTT DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4057228	Yellow	16	OS	3.830	FD	PINS
TSW							
	4057262	Grey	20	OS	3.830	DD	—
EX							
	4057096	Purple	16	OS	3.830	FD	—
STANDARD							
	4056779	Black	12	OS	3.895	FD	—
	4056671	Green	12	OS	3.830	FD	—
	4056672	Purple	12	OS	3.830	FD	—
	4056791	Yellow	16	OS	3.830	FD	—
SNAKE							
	4057343	Black	25	OS	3.830	FD	—
	4057344	Blue	25	OS	3.830	FD	—
	4057345	Green	25	OS	3.830	FD	—

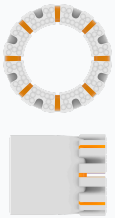
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PQ DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056889	Black	12	OS	4.950	—	—
	4056961	Black	12	OS	4.950	—	—
	4056460	Blue	12	R	—	—	—
	4056463	Green	12	R	—	—	—
	4056674	Green	12	OS	4.950	—	—
	4056888	Grey	12	OS	4.950	—	—
	4056459	Purple	12	R	—	—	—
	4056479	Red	12	R	—	—	—
	4056477	Yellow	12	R	—	—	—
	4056890	Yellow	12	OS	4.950	—	—
TW							
	4056669	Black	12	R	—	—	—
	4056328	Blue	12	R	—	FD	—
	4056329	Grey	12	R	—	FD	—
	4056327	Yellow	12	R	—	FD	—
	4056560	Blue	16	R	—	—	—
	4056561	Green	16	R	—	—	—
	4056559	Grey	16	R	—	—	—
	4056389	Orange	16	R	—	—	—

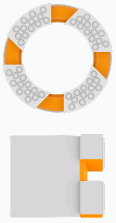
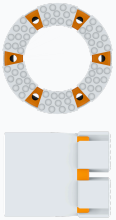
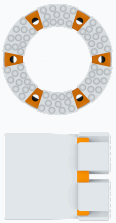
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PQ DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4057151	Orange	16	OS	4.950	—	—
	4056387	Red	16	R	—	—	—
	4056793	Red	16	OS	4.950	—	—
	4057029	Red	16	OS	—	—	—
	4056390	Yellow	16	R	—	—	—
EX							
	4056504	Green	16	R	—	—	—
	4056505	Yellow	16	R	—	—	—
STG3							
	4056962	Black	25	OS	4.950	—	—
	4056963	Grey	25	OS	4.950	—	—

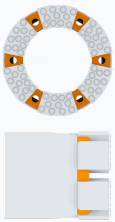
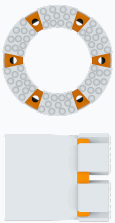
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PQ3 DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4056675	Green	12	OS	4.950	—	—
	4056701	Green	12	R	—	FD	—
	4056678	Grey	12	OS	4.950	—	—
	4056464	Purple	12	R	—	FD	—
	4057122	Shadow	12	R	—	FD	—
	4057216	Black	16	OS	4.950	—	—
	4057215	Orange	16	OS	4.950	—	—
TW							
	4056281	Black	12	R	—	FD	—
	4056285	Blue	12	R	—	FD	—
	4056280	Green	12	R	—	FD	—
	4056283	Grey	12	R	—	FD	—
	4057300	Grey	12	R	—	—	—
	4056589	Orange	12	R	—	FD	—
	4056282	Red	12	R	—	FD	—
	4056284	Yellow	12	R	—	FD	—
	4057078	Black	16	OS	4.950	FD	—

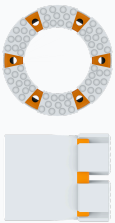
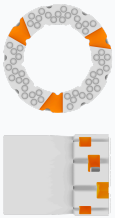
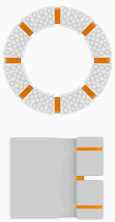
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PQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4056986	Black	16	OS	4.950	—	—
	4057035	Black	16	R	—	—	—
	4057144	Black	16	OS	4.950	—	PINS
	4057205	Black	16	R	—	—	PINS
	4057278	Black	16	OS	4.900	DD	—
	4056396	Blue	16	R	—	—	—
	4056057	Green	16	R	—	FD	—
	4056395	Green	16	R	—	—	—
	4056676	Green	16	OS	4.950	—	—
	4056540	Grey	16	R	—	FD	—
	4056397	Grey	16	R	—	—	—
	4056677	Grey	16	OS	4.950	—	—
	4057276	Grey	16	OS	4.900	DD	—
	4056394	Orange	16	R	—	—	—
	4057214	Orange	16	OS	4.950	—	—
	4056586	Red	16	R	—	—	—

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PQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4057279	Shadow	16	OS	4.900	DD	—
	4056058	Yellow	16	R	—	FD	—
	4056393	Yellow	16	R	—	—	—
	4056683	Yellow	16	OS	4.950	—	—
EX							
	4057125	Black	16	OS	4.950	—	—
	4057145	Black	16	OS	4.950	—	PINS
STG3							
	4057094	Blue	25	OS	4.950	—	PINS
STANDARD							
	4056465	Blue	12	S	—	DD	—
	4055999	Green	12	S	—	DD	—
	4056595	Green	12	S	—	DD	PINS

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PQ3 DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
STANDARD (CONT.)							
	4057299	Grey	12	R	—	—	—
	4056303	Red	16	R	—	DD	PINS

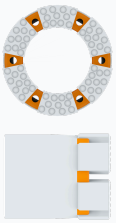
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PQTT DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
GT							
	4057098	Grey	12	R	—	DD	—
TW							
	4057206	Black	12	R	—	FD	PINS
	4056848	Blue	12	OS	4.950	FD	—
	4055940	Green	12	S	—	FD	—
	4056849	Green	12	OS	4.950	FD	—
	4056775	Grey	12	OS	4.950	FD	—
	4057311	Orange	12	R	—	FD	PINS
	4057310	Red	12	R	—	FD	PINS
	4056331	Yellow	12	S	—	FD	—
	4057077	Black	16	OS	4.950	FD	—
	4057146	Black	16	OS	4.950	FD	PINS
	4057260	Black	16	OS	4.950	FD	PINS
	4057282	Black	16	OS	4.900	FD	—
	4056055	Green	16	R	—	FD	—
	4057230	Grey	16	OS	4.950	FD	PINS
	4057280	Grey	16	OS	4.900	FD	—
	4056529	Orange	16	R	—	FD	—
	4056531	Red	16	R	—	FD	—

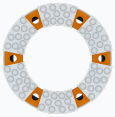
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PQTT DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
TW (CONT.)							
	4057283	Shadow	16	OS	4.900	FD	—
	4056056	Yellow	16	R	—	FD	—
	4057229	Yellow	16	OS	4.950	FD	PINS
STANDARD							
	4057318	Black	12	OS	4.950	FD	—
	4056108	Red	12	S	—	DD	PINS
	4056838	Black	16	R	—	DD	—
	4056501	Blue	16	R	—	DD	—
	4056512	Green	16	R	—	DD	—
	4056570	Grey	16	R	—	DD	—
	4056326	Red	16	R	—	DD	PINS
	4057066	Shadow	16	R	—	DD	—
	4056532	Yellow	16	R	—	DD	—

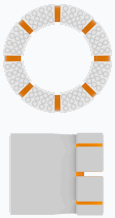
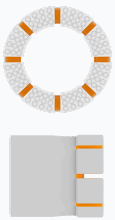
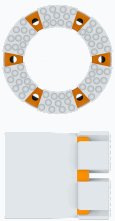
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SPECIAL SIZES DIAMOND CORING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
BX							
	4056573	Red	9	R	—	—	—
	4057105	Yellow	9	R	—	—	—
H47							
 	4056500	Yellow	12	R	—	—	—
H76							
	4057317	Black	16	S	—	—	PINS
	4057207	Red	16	S	—	—	PINS
HMLC							
	4057091	Green	6	S	—	FD	—
	4057092	Orange	6	S	—	FD	—
	4057093	Red	6	S	—	FD	—
HQ-P							
	4056546	Green	16	S	—	DD	—
	4056820	Yellow	16	S	—	DD	—
HTW							
 	4057011	Blue	16	R	—	—	—

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SPECIAL SIZES DIAMOND CORING BITS (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
HTW (CONT.)							
	4057009	Green	16	R	—	—	—
	4057010	Yellow	16	R	—	—	—
LTK48							
	4056042	Green	12	R	—	—	—
	4056587	Orange	12	R	—	—	—
	4056473	Red	12	R	—	—	—
	4056585	Yellow	12	R	—	—	—
LTK60							
	4056049	Red	12	R	—	—	—
NMLC							
	4057088	Green	6	S	—	FD	—
	4057089	Orange	6	S	—	FD	—
	4057090	Red	6	S	—	FD	—

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OPERATING PARAMETERS

OPERATING PARAMETERS

DRILLING GUIDELINES

This section of the field book is intended to provide our customers with some guidelines that may help to make Longyear bits work better.

A condensed, convenient reference for the selection of suitable drilling guidelines for impregnated bits is provided in the chart on Page 56.

ROTATIONAL SPEEDS

Rotational speed is typically set at a fixed value based on the size of the tools being used. If the rig has sufficient torque, the speed can be increased to get higher penetration rates.

The RPI index (bit revolutions per inch of penetration) or r/cm (bit revolutions per cm of penetration) is a tool in achieving maximum bit life, lowest bit cost, and good productivity.

To calculate the RPI (r/cm) index, divide the rotational speed (rpm) of the bit by the rate of penetration:
- 800 rpm divided by 4 in/min = 200 rpi, or
- 800 rpm divided by 10 cm/min = 80 r/cm

IDEAL MINIMUM RPI OR R/CM:

- 200 rpi or 80 r/cm for surface projects
- 100 rpi or 40 r/cm for underground projects

DRILLING GUIDELINES

Providing you work within these guidelines and the selected bit matches the formation, drilling should progress smoothly, and the bit will wear at a constant rate throughout its life.

If rpi (r/cm) is below the recommended minimum of 100 (40) for underground or 200 (80) for surface, excessive wear may occur. If it does, you should either increase rpm or decrease penetration rate by reducing bit weight. If ground conditions or drill limitations prevent you from making these adjustments, change to a more durable bit.

If the rpi (r/cm) index becomes too high, the bit may polish. If it does, you should reduce rpm or increase penetration rate by increasing bit weight. If rpm or weight cannot be altered, change to a more free-cutting bit.

Polishing and glazing are two terms for the same condition, in which no diamond points protrude from the matrix. Penetration will stop, and it will become necessary to strip the bit face and re-expose diamonds.

BIT WEIGHT

The bit weights shown on the gauge/guidance chart indicate the range of weights considered normal for a given size of core barrel. If the weight on the bit is too low, both penetration rate and torque drop due to polishing, resulting in shorter life and lower productivity. If the weight on the bit is too high, characterized by very little or no increase in penetration rate for additional weight, the bit will constantly sharpen and wear rapidly.

DETERMINING BIT WEIGHT FROM HYDRAULIC PRESSURE

The weight of the rods and the down force developed by the hydraulic cylinders provide the force exerted on the diamond bit. Unfortunately, drill rig controls typically display feed cylinder pressure rather than weight on bit. The weight on the bit or force can easily be found by the following off-bottom method:

- Suspend the rods with the hydraulic system in the lowering position.
- With the drilling motor running at a drill rotation, note the reading on the cylinder feed pressure gauge. This is approximately equal to the hydraulic pump pressure plus the weight of the rods in terms of hydraulic pressure. This is called the off bottom pressure.
- Rotate the rods and feed them down by opening the restrictor valve. As the bit touches bottom, part of the weight of the rods is supported on the bit. This action is indicated by a decrease in the gauge reading. The difference in the gauge readings is the pressure applied to the bit.
- The pressure applied to the bit multiplied by the area of the hydraulic cylinders gives the force or weight on bit.
- The bit torque can be measured in a similar fashion by comparing the off bottom hydraulic pressure of the rotation unit to the hydraulic pressure while drilling:

  Area of both cylinders = 25.1in2 or 162cm2 (4in diameter)
  Drop Pressure = 100psi or 7kg/cm2
  25.1in2 X 100psi = 2510 lbs
  162cm2 X 7 kg/cm2 = 1136 kg

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OPERATING PARAMETERS (CONT.)



FLUID FLOW

The flow of drilling fluid in the drill hole serves many purposes, including cooling the drill bit and removing cuttings. High penetration rates require additional flow to keep cuttings off the bit face. There is no maximum water flow rate, though at high-flow rates, the bit can be lifted off the rock face, causing it to polish. Free-cutting bits obtain maximum life and penetration using plenty of water. If pumping at the highest flow rates, there is a frequent need to sharpen the bit; reduce the pump output. This will create a minor buildup of cuttings and sharpen the bit.

Water pressure is not an indication of water flow in positive displacement pumps. To calculate water flow, measure pump rpm with a tachometer. Pump output is proportional to output at max speed, as follows:

Model:	FMC LO918
Max Speed:	625 rpm
Output Flow:	20.2 GPM

Measured rpm of 240 rpm

$$\left(\frac{625\ \text{rpm}}{240\ \text{rpm}}\right) \text{X } 20.2\ \text{GPM} = 7.5\ \text{GPM}$$

SHARPENING

Simultaneous decreases in torque and penetration rate indicate that the bit is polishing and needs to be sharpened. Torque increases due to sharpening should only be a concern in lost circulation or when sharpening requires water restriction.

If a more durable bit has been selected for the rock type or if an impregnated bit has been allowed to slow down and polish, it is necessary to "open" or "strip" the matrix surface to expose new diamonds. This can usually be accomplished by reducing the spindle rpm by about 1/3 - 1/2 (select a lower gear if you have a transmission) and maintaining a constant penetration rate. Bit pressure will build up for approximately 1/2 - 1 in (1 - 2 cm) of drilling, and then the bit pressure will drop quickly, signaling that stripping has occurred and the bit is cutting freely again. Immediately reduce bit pressure and increase spindle rpms to return to the target rpi (r/cm). If it becomes necessary to frequently repeat this process, it is recommended that you change to a more free cutting bit.

TORQUE

Torque generated by the bit is a function of the sharpness of the bit and the weight on the bit, and results from the diamonds cutting the formation. As such, torque should be viewed as beneficial and an indication of drilling effectiveness. Minimum torque occurs just after bit sharpening is complete, as the bit weight is reduced. Maximum bit torque occurs during bit sharpening as the bit matrix contacts the rock. A simultaneous decrease in torque and penetration rate indicates that the bit is polishing and needs sharpening. Torque increases due to sharpening should only be a concern in lost circulation or when sharpening requires water restriction. Bits with large diamonds can drop or stall RPM when sharpening. If RPM drops during sharpening, use a lower gear or speed to increase available torque. If WOB is reduced when stalling, the bit will polish.

PENETRATION RATE

The cutting rate varies with weight on bit, sharpness, bit formula, and ground conditions. Typical penetration rates range from 2 to 12 ipm (5 to 30 cpm), depending on bit formula and formation. As formations become harder, the penetration rate should be reduced to achieve good bit life. In extremely broken ground, drill at half RPM and weight-on-bit sufficient to reach 1 to 2 ipm (3 to 5 cpm).

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SURFACE DRILLING

BIT WEIGHT	FORCE ON BIT	WOB	LF90D			
Off Pressure	LBF / kN	kg	BQ	NQ	HQ	PQ
100	1257 / 5.59	570				
150	1885 / 8.38	855				
200	2513 / 11.18	1140				
250	3142 / 13.97	1425				
300	3770 / 16.77	1710				
350	4398 / 19.56	1995				
400	5027 / 22.35	2280				
450	5655 / 25.15	2565				
500	6283 / 27.94	2850				
550	6912 / 30.73	3135				
600	7540 / 33.53	3420				
650	8168 / 36.32	3705				
700	8796 / 39.11	3990				
750	9425 / 41.91	4275				
800	10053 / 44.70	4560				
850	10681 / 47.49	4845				
900	11310 / 50.29	5130				
950	11938 / 53.08	5415				
1000	12566 / 55.87	5700				
1050	13195 / 58.67	5985				
1100	13823 / 61.46	6270				
1150	14451 / 64.25	6555				
1200	15080 / 67.05	6840				

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UNDERGROUND DRILLING

BIT WEIGHT	FORCE ON BIT	1300FF UPHOLE			
Holdback Pressure (Mpa)	LBF / kN	BQ	NQ	HQ	PQ
1	515 / 2.29				
2	1025 / 4.55				
3	1539 / 6.84				
4	2050 / 9.11				
5	2565 / 11.40				
6	3080 / 13.70				
7	3590 / 15.96				
8	4100 / 18.23				
9	4615 / 20.52				
10	5130 / 22.81				
11	5645 / 25.11				
12	6155 / 27.37				
13	6670 / 29.66				
14	7180 / 31.93				
15	7695 / 34.22				
16	8210 / 36.51				
17	8721 / 38.79				
18	9234 / 41.07				
19	9750 / 43.37				
20	10260 / 45.63				

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IMPREGNATED BIT DRILLING GUIDELINES

SIZE	FLUID VOLUME RANGE		ROTATION SPEED**	PENETRATION RATE				INDICATIVE BIT WEIGHT RANGE			
	GPM	LPM	RPM	100 in/min	200 in/min	40 cm/min	80 cm/min	lb Low	lb High	kN Low	Kn High
AQTK	3-5	11-19	2000	20.0	10.0	50.0	25.0	1200	3200	5	14
AQTK	3-5	11-19	1500	15.0	7.5	37.5	18.8	1200	3200	5	14
AQTK	3-5	11-19	750	7.5	3.8	18.8	9.4	1200	3200	5	14
BQ/ BQTK	6-8	22-30	1500	15.0	7.5	37.5	18.8	2000	5500	9	24
BQ/ BQTK	6-8	22-30	1200	12.0	6.0	30.0	15.0	2000	5500	9	24
BQ/ BQTK	6-8	22-30	600	6.0	3.0	15.0	7.5	2000	5500	9	24
NQ/ NQ3	10-13	38-49	1200	12.0	6.0	30.0	15	3000	8000	13	36
NQ/ NQ3	10-13	38-49	1000	10.0	5.0	25.0	12.5	3000	8000	13	36
NQ/ NQ3	10-13	38-49	500	5.0	2.5	12.5	6.3	3000	8000	13	36
HQ/ HQ3	14-20	53-75	900	9.0	4.5	22.5	11.3	5000	12000	22	53
HQ/ HQ3	14-20	53-75	750	7.5	3.8	18.8	9.4	5000	12000	22	53
HQ/ HQ3	14-20	53-75	400	4.0	2.0	10.0	5.0	5000	12000	22	53
PQ/ PQ3	20-28	75-105	700	7.0	3.5	17.5	8.8	7000	18000	31	80
PQ/ PQ3	20-28	75-105	600	6.0	3.0	15.0	7.5	7000	18000	31	80
PQ/ PQ3	20-28	75-105	300	3.0	1.5	7.5	3.8	7000	18000	31	80

* Scaled matching OD surface velocity, chip volume, and contact pressure

** Rotation speeds are Max, Typical, and Broken Ground

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DRILLING TIPS

Geology:

- In broken ground, rock is removed by grinding instead of cutting, run at half RPM, and apply sufficient weight on the bit to reach 1 to 2 ipm (3 to 5 cpm).
- Fluctuation in torque, particularly during sharpening, is caused by unstable rock fragmentation and/or insufficient rock penetration. Weight on bit needs to be maintained to establish secondary fracturing and stable cutting.

Weight on Bit (WOB)

- WOB is too low if the bit polishes and torque drops. Results in low life and penetration rate.
- WOB is too high if the added weight does not increase the penetration rate. Results in constant sharpening and rapid wear.

Fluid Flow

- High penetration rates require additional flow.
- The maximum flow rate will be reached when the bit is lifted off the rock face, causing it to polish.
- Free-cutting bits obtain maximum life and penetration using plenty of water.

Torque:

- If the head stalls under normal operating conditions, reduce speed to increase torque and maintain steady rotation.
- Maximum bit torque occurs during bit sharpening. Only be concerned with torque rise when restricting water or in lost circulation.

Penetration:

- The penetration rate to prevent polishing may be higher in large diamond bits.
- If reducing rotation by 1/3 and maintaining penetration does not sharpen the bit (up-holes, underpowered rigs, or too low a series bit), reduce RPM by 1/2 and reduce water flow. Wait until torque and penetration rate rises. Return speed and water flow to normal operation.

Sharpening:

- Sandblasting bit with a hard abrasive will restore exposure.
- Large diamond bits exhibit a greater increase in torque during initial sharpening. WOB needs to be held until the penetration rate increases. Reduce WOB to maintain the desired RPI once sharp.
- If frequent sharpening is required, a higher series bit formula should be selected.

Sharpening DO-NOTs

- Under no circumstances should any acid be used for sharpening a Longyear™ bit.
- Shutting off the water flow while drilling and waiting for the bit to "bite", is not recommended due to the likelihood of burning in the bit.
- It is not recommended to drop nuts or bolts down hole to sharpen bits as these can melt and block waterways.

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TROUBLESHOOTING

TROUBLESHOOTING

Much can be learned from examining impregnated bits when they are pulled from the hole. The illustrations and observations in this section can help identify and remedy many common field problems.

Normal retirement or discarding of an impregnated bit should take place only after it has been totally consumed. Most Boart Longyear™ impregnated bits have full-depth waterways to allow the bit to be fully consumed. The first indicator that a bit is nearing normal retirement is a rise or kick in pump pressure due to the diminishing depth of waterways. In Stage™ bits, this rise is observed at the transition of each stage.Ideally, an impregnated bit drills steadily with the matrix and diamond wearing away at the same rate.

NORMAL WEAR PATTERNS



New Condition



Ideal Wear Pattern

The face wear pattern of an impregnated bit should be relatively flat with slightly chamfered sides. Bit feels sharp, comet tails have formed to support diamonds. Diamonds release from matrix as they are worn. Gauge stays within tolerance.



Normal Retirement

Full depth of impregnation evenly consumed. Gauge stays within tolerance.

The causes and solutions described in this section are not exclusive lists, but represent common causes and generally effective solutions based on the experience of Boart Longyear and its customers.

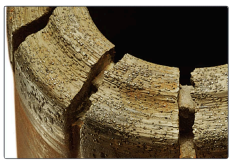
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TROUBLESHOOTING (CONT.)

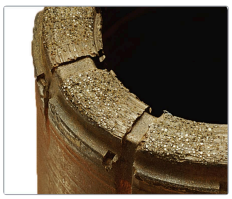
IRREGULAR WEAR PATTERNS



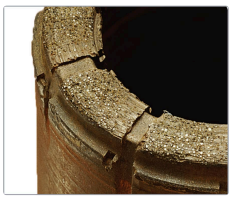
Concave Face Wear (Rounded to Inner Diameter)
Cause: Often caused by excessive penetration rate for the RPM used (rpi/rcm is too low). This can also be caused by core grinding or overdrilling.
Solution: Reduce penetration rate or increase RPM.



Convex Face Wear (Rounded to Outer Diameter)
Cause: Insufficient water flow.
Solution: Check pump and rod string for leaks; increase pump output.



Gauge Loss ID
Cause: (A) Overfeeding (B) Broken formations (C) Drilling over lost core (D) Insufficient drilling fluid
Solution: (A) Reduce penetration rate (B) Cement or change to a lower series bit (C) Check core barrel/core lifter/core lifter case (D) Check inner tube length adjustment; check pump and rod string for leaks – increase pump output



Gauge Loss Outer Diameter
Cause: (A) Lack of circulation (B) Bit being reamed down under-size hole
(C) Vibration
Solution: (A) Increase coolant flow rate (B) Check reamer shell gauge and replace if under-sized (C) Alter RPM



Excessive Diamond Exposure
Matrix abrades away before diamonds have worn sufficiently, resulting in high diamond exposure and low bit life.
Cause: Caused by overfeeding/over drilling
Solution: Increase RPM, change to a lower series bit, or reduce bit weight



Face Glazed (Diamond Polished)
Cause: Bit does not feel sharp; diamonds flush w matrix; no significant “comet tails” behind each diamond.
Solution: Sandblast the face or use other recommended methods to re-expose the diamond. If the face glazes repeatedly, increase the bit size.



Cracked Waterways
Cause: (A) Excessive bit load; dropped rods; free fall of (wireline) inner tube in dry hole; (B) bit crushed by rod holder, foot clamp, or pipe wrench; (C) Pushed down an undersized hole (i.e., reaming shell worn out).
Solution: Review proper operating procedures.



Burnt
Cause: (A) Lack of fluid. (B) Too high of weight on bit being used
Solution: Check pump and rod string for leaks, check inner tube adjustment, maintain coolant flow rates

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SPECIALIZED BITS

WEDGE BITS

IMAGE	PART #	WATERWAY	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
BQ								
	4056914	Standard	Green	12	S	—	—	—
HQ								
	4056764	Standard	Blue	12	R	—	—	—
	4056748	Standard	Green	12	R	—	—	—
	4056708	Standard	Yellow	12	R	—	—	—
	4056728	TW	Yellow	16	OS	3.895	—	—
HQ3								
	4056301	Standard	Yellow	12	R	—	—	—
NQ								
	4056645	GT	Blue	12	R	—	—	—
	4056646	GT	Green	12	R	—	—	—
	4056773	GT	Yellow	12	R	—	—	—
	4051875	Standard	07	—	S	—	—	—
	4056746	Standard	Blue	16	R	—	—	—

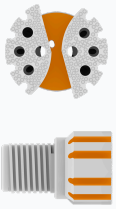
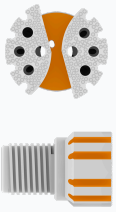
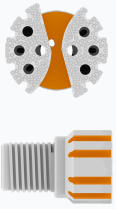
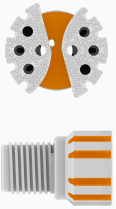
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WEDGE BITS (CONT.)

IMAGE	PART #	WATERWAY	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
NQ3								
	4056294	Standard	Yellow	12	S	—	—	—
NQTK								
	4057016	Standard	Green	12	S	—	—	—
	4056994	Standard	Orange	12	S	—	—	—
	4056993	Standard	Red	12	S	—	—	—

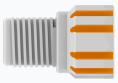
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DOWN HOLE MOTOR (DHM)

IMAGE	PART #	WATERWAY	FORMULA	CROWN (MM)	GAUGE	OS OD
(NO SIZE)						
	4057057	SRAY	Red / Green	16	—	—
BW						
	4057223	SRAY	—	16	R	—
	4056967	SRAY	Red	16	R	—
	4064919	PORT	Red	16	R	—
	4057051	SRAY	Red / Green	16	R	—
	4057189	SRAY	Red / Green	31	S	—
	4057058	PORT	Shadow	16	R	—
	4104650	TP	—	—	R	—
	4065006	TP	Red	9	S	—
	4065007	TP	Yellow	9	S	—
HW						
	4065439	SRAY	Red / Green	31	S	—
NW						
	4065425	SRAY	Red	31	S	—
	4057055	SRAY	Red / Green	16	R	—
	4057124	SRAY	Red / Green	31	S	—

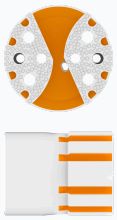
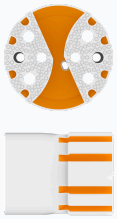
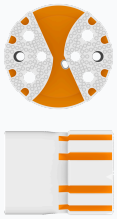
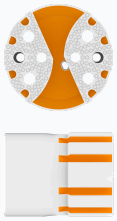
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DOWN HOLE MOTOR (DHM) (CONT.)

IMAGE	PART #	WATERWAY	FORMULA	CROWN (MM)	GAUGE	OS OD
NW (CONT.)						
 	4057286	SRAY	Red / Green	31	OS	3.830
	4057059	SRAY	Shadow	31	S	—
 	4065012	TP	Red	9	S	—

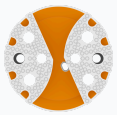
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FULL FACE BIT (FF)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD
HQ					
	4056806	—	16	OS	3.895
	4056835	—	31	S	—
	4056839	—	31	S	—
	4056840	—	31	S	—
	4057248	—	31	S	—
	4057249	Black	31	S	—
	4057099	Grey	31	S	—
	4057197	Red	31	S	—
	4057198	Red / Green	31	S	—
HRQ					
	4056805	—	31	R	—
NQ					
	4057184	—	16	R	—
	4057247	—	31	R	—
	4057050	Red	16	R	—
	4056946	Red / Green	16	R	—
P					
	4057107	Red / Green	31	OS	4.950

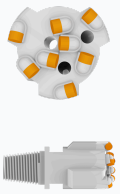
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FULL FACE BIT (FF) (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD
PQ					
	4056777	—	31	S	—
	4056836	Red / Green	31	S	—

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POLYCRYSTALLINE DIAMOND CUTTER BIT (PDC)

IMAGE	PART #	DIAMETER	PDC GAUGE	PDC FACE	CONNECTION
(NO SIZE)					
	4067265	99mm	3×13mm	5×13mm	2-3/8" API R/P

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SURFACE SET

IMAGE	PART #	STEPS	DIAMOND SIZE	GAUGE	WATER CONTROL	SPECIAL
HQ						
	4066856	7	15/25 SEL 26CT	S	—	—
HQ3						
	4056913	—	—	S	FD	—
	4106105	7	5/25 SEL 26CT	S	—	—
	4066892	7	15/25 SEL 26CT	S	DD	HI-EX
	4066895	7	15/25 SEL 26CT	S	—	HI-EX
	4066890	7	15/25 SEL 26CT	S	DD	—
NQ3						
	4066874	7	25/35 SEL 24CT	S	—	HI-EX

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SURFACE SET (CONT.)

IMAGE	PART #	STEPS	DIAMOND SIZE	GAUGE	WATER CONTROL	SPECIAL
NQ3 (CONT.)						
	4101745	7	25/35 SEL 24CT	S	—	—
NQTK						
	4056207	7	—	S	—	—
PQ3						
	4056313	7	—	S	FD	—
	4066900	7	15/25 SEL 37CT	S	DD	HI-EX
	4066898	7	15/25 SEL 37CT	S	DD	—

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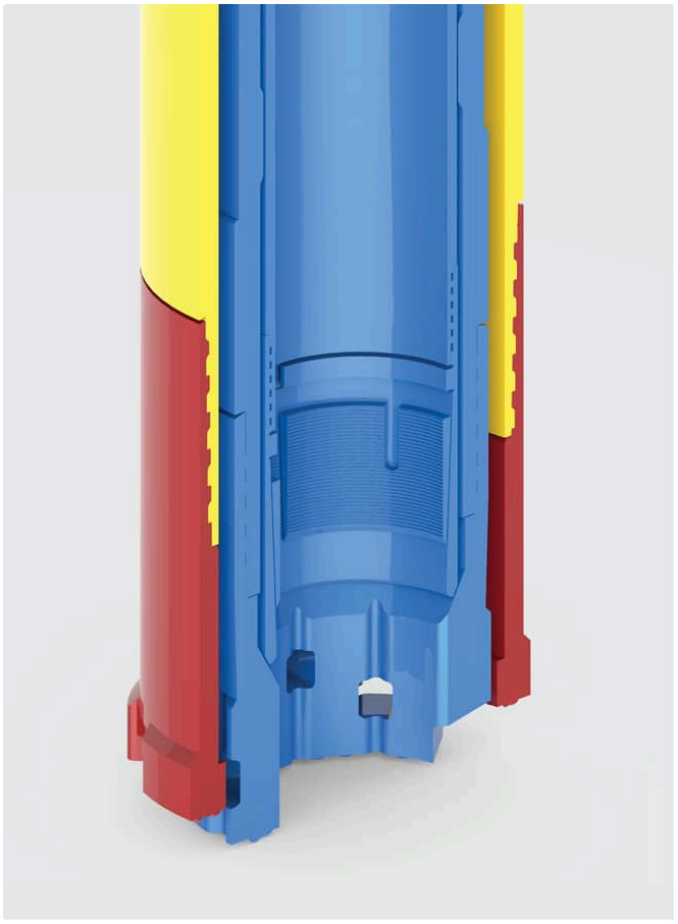
TUYERE BITS

IMAGE	PART #	SIZE	DIAMOND SIZE
(NO SIZE)			
	4011608	—	11.50CT
	4018168	—	11.50CT
	4064646	—	16CT
	4064647	—	8CT
	4065479	—	14CT
	4057053	—	Black Matrix

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CASING AND ROD SHOES

SYSTEM OVERVIEW





Casing & Rod Shoes

Casing and rod shoes are threaded to the end of the outer drill string to penetrate the overburden. It assists in seating the outer drill string into the bedrock, providing a tight seal for the drilling fluids to return to the surface. A casing shoe can be used to ream the casing downward as the casing string advances in an existing hole, with the rod string still in place.

The casing shoe ID is flush with the casing, which allows free passage of the core barrel through the shoe.

Casing Bits

These are less commonly used and differ from casing shoes in that the casing bit's ID is smaller. It does not permit the passage of the core barrel due to dimensional overlap.

Casing bits are used when deep or difficult overburden is encountered or to ream over rod strings when stuck in the hole.

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CASING SHOES

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
BW							
	4056915	Purple	3	R	—	—	—
HW							
	4056659	Purple	3	R	—	—	—
	4057127	Purple	6	R	—	—	—
HWT							
	4057320	Green	6	R	—	—	—
	4056197	Purple	3	R	—	—	—
	4056198	Purple	6	OS	4.765	—	—
	4057131	Purple	6	R	—	—	—
	4057263	Purple	6	R	—	—	—
NW							
	4056293	Purple	3	R	—	—	—
	4057126	Purple	6	R	—	—	—
	4056623	Purple	6	OS	3.755	—	—

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CASING SHOES (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
NWT							
	4057130	Purple	6	R	—	—	—
	4056621	Purple	3	R	—	—	—
	4056622	Purple	6	OS	3.755	—	—
PW							
	4057128	Purple	6	R	—	—	—
	4056624	Purple	3	R	—	—	—
	4056625	Purple	6	OS	5.790	—	—
PWT							
	4056658	Purple	3	R	—	—	—
	4057132	Purple	6	R	—	—	—
	4056626	Purple	6	OS	5.790	—	—

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ROD SHOES

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
HQ							
	4057140	Purple	6	R	—	—	—
	4056703	Purple	3	R	—	—	—
	4056886	Purple	6	OS	3.775	—	—
HRQ							
	4056662	Purple	3	R	—	—	—
HXQ							
	4056663	Purple	3	R	—	—	—
NQ							
	4056885	Purple	3	R	—	—	—
NRQ							
	4056664	Purple	3	R	—	—	—

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ROD SHOES (CONT.)

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
NXQ							
	4056665	Purple	3	R	—	—	—

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CASING BITS

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
(NO SIZE)							
	4057166	Yellow	6	S	—	—	—
HQ							
	4057156	Yellow	6	S	—	—	—
HWT							
	4056661	Purple	6	OS	4.765	—	—
	4057004	Purple	5	—	—	—	—
	4056642	Yellow	6	OS	4.765	—	—
PWT							
	4056893	Blue	6	S	—	—	—

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DEVIL'S NIGHTMARE

IMAGE	PART #	FORMULA	CROWN (MM)	GAUGE	OS OD	WATER CONTROL	SPECIAL
HQ							
	DHREVP/1	Devil's Nightmare	—	OS	3.875	—	—
HW							
	DHWEVP/1	Devil's Nightmare	—	OS	4.875	—	—
HWT							
	DHJEVP/1	Devil's Nightmare	—	OS	4.875	—	—
NW							
	DNWEVP/6	Devil's Nightmare	—	OS	3.875	—	HEAVY DUTY

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REAMING SHELLS

OVERVIEW

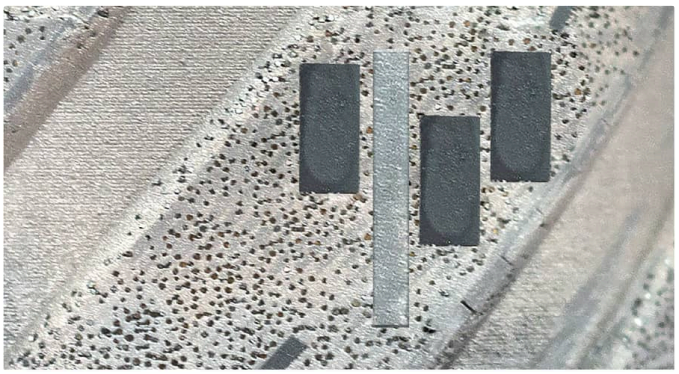
Reaming Shells Pad Designs



TOUGH™
Patented technology enables the use of large synthetic diamonds greatly enhancing wear life and eliminating the need for specialty shells in diamond core drilling exploration. TSD and carbide pins on the leading edge provide protection for the exposed diamonds in the pad.



ABR
Using rows of synthetic diamond and TSD pins, abrasive pads generate less torque in the hole than the equivalent reaming shell, while still producing long life.

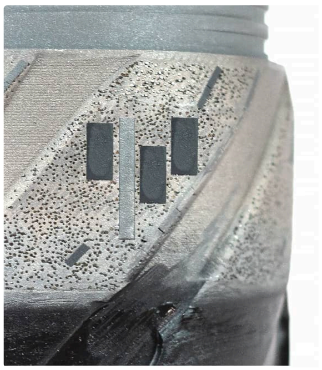


RSUMX™ Diamond Impregnated Pad
Patented technology enables the use of large synthetic diamonds greatly enhancing wear life and eliminating the need for specialty shells in diamond exploration. In addition to improve life of the RSUMX reaming shell, large oversized pins have been added.

Reaming Shell Options



Dual Pad
A 10" pad designed to aid in straighter holes when deviation is a concern.



Heavy Duty
Shell design that add steel fins to the blank for improved life in abrasive and broken ground conditions.

All pad designs are available with the above configuration options.

Adapter Coupling
All reaming shell pad designs are available in adapter coupling versions that replace the adapter coupling in a the Link Latch wireline system for improved tracking and balance in hole.

Rod Shell
All reaming shell pad designs are available in a rod-shell version to improve hole and drill-string stability.

US Patent Nos. AU 2011379964; CA 2,784,916; CL 54.546; CN ZL201180074402.0; PE 7805; US 9,446,503; ZA 2014/03786.

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STANDARD SHELLS

PART #	PAD FORMULA	PAD CONFIG	GAUGE	OS OD	OPTION
AQTK					
4064363	ABR	Dual Pad	R	—	—
BQ					
4064555	ABR	Single Pad	R	—	—
4066606	RSUMX	Single Pad	R+	—	—
4066079	TOUGH	Single Pad	R	—	—
4066386	TOUGH	Dual Pad	R	—	—
BQTK					
4064170	ABR	Dual Pad	R	—	—
4066434	TOUGH	Single Pad	R	—	—
4066435	TOUGH	Dual Pad	R	—	—
HQ					
4064492	ABR	Dual Pad	R	—	—
4064556	ABR	Single Pad	R	—	—
4065929	RSUMX	Single Pad	R+	—	—
4066607	RSUMX	Single Pad	R+	—	—
4066611	RSUMX	Single Pad	OS	3.830	—
4066612	RSUMX	Single Pad	OS	3.895	—
4066702	RSUMX	Single Pad	OS	3.830	—
4065995	TOUGH	Single Pad	R	—	—
4066000	TOUGH	Single Pad	OS	3.895	—
4066218	TOUGH	Single Pad	OS	3.895	—
4066300	TOUGH	Dual Pad	R	—	—
4066465	TOUGH	Single Pad	OS	3.830	—
4066962	TOUGH	Dual Pad	OS	3.830	—
4066963	TOUGH	Single Pad	OS	3.830	—
LTK48					
4062275	RSUMX	Single Pad	R	—	—
LTK60					
4065005	ABR	Single Pad	R	—	—
NQ					
4064364	ABR	Dual Pad	R	—	—
4064554	ABR	Single Pad	R	—	—
4065051	ABR	Single Pad	OS	3.032	—
4066605	RSUMX	Single Pad	R+	—	—
4066608	RSUMX	Single Pad	R+	—	—
4066613	RSUMX	Single Pad	OS	3.032	—
4066720	RSUMX	Single Pad	OS	3.032	—
4065986	TOUGH	Single Pad	R	—	—
4066139	TOUGH	Single Pad	OS	3.032	—
4066208	TOUGH	Dual Pad	R	—	—
4067440	TOUGH	Dual Pad	OS	3.032	—
PQ					
4064557	ABR	Single Pad	R	—	—
4066604	RSUMX	Single Pad	R+	—	—
4066609	RSUMX	Single Pad	R+	—	—
4066610	RSUMX	Single Pad	OS	4.950	—
4066080	TOUGH	Single Pad	R	—	—

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STANDARD SHELLS (CONT.)

PART #	PAD FORMULA	PAD CONFIG	GAUGE	OS OD	OPTION
PQ (CONT.)					
4066437	TOUGH	Single Pad	OS	4.950	—

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ADAPTER COUPLINGS

PART #	PAD FORMULA	PAD CONFIG	GAUGE	OS OD	OPTION
BQ					
4067439	TOUGH	Single Pad	R	—	—
4101173	IMP	Single Pad	R	—	—
BQTK					
4066698	TOUGH	Single Pad	R	—	—
HQ					
4062288	RSUMX	Single Pad	OS	3.830	—
4063207	RSUMX	Single Pad	R	—	—
4063453	RSUMX	Single Pad	OS	3.895	—
4064591	ABR	Single Pad	R	—	—
4066260	TOUGH	Single Pad	OS	3.895	—
4066378	TOUGH	Single Pad	R	—	—
NQ					
4062284	RSUMX	Single Pad	R	—	—
4064590	ABR	Single Pad	R	—	—
4065050	ABR	Single Pad	OS	3.032	—
4066259	TOUGH	Single Pad	OS	3.032	—
4066374	TOUGH	Single Pad	R	—	—
4101174	IMP	Single Pad	R	—	—
NQU					
4065001	ABR	Dual Pad	R	—	—
4067063	ABR	Dual Pad	OS	3.032	—
PHD					
4066007	ABR	Single Pad	R	—	—
4066382	TOUGH	Single Pad	R	—	—
4066697	TOUGH	Single Pad	OS	4.950	—

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ROD SHELLS

PART #	PAD FORMULA	PAD CONFIG	GAUGE	OS OD	OPTION
BRQTK					
4064174	ABR	Single Pad	R	—	—
HQ					
4067181	TOUGH	Single Pad	R	—	—
4067390	TOUGH	Single Pad	OS	3.830	—
HRQ					
4064708	ABR	Single Pad	R	—	—
4067177	TOUGH	Single Pad	R	—	—
4067178	TOUGH	Single Pad	OS	3.895	—
HXQ					
4065671	ABR	Single Pad	R	—	—
NQ					
4064881	ABR	Single Pad	R	—	—
4067000	ABR	Single Pad	OS	3.032	—
4067180	TOUGH	Single Pad	R	—	—
NRQ					
4064272	ABR	Single Pad	R	—	—
4065717	ABR	Single Pad	OS	3.032	—
4064635	RSUMX	Dual Pad	R	—	—
4067175	TOUGH	Single Pad	R	—	—
4067176	TOUGH	Single Pad	OS	3.032	—
NXQ					
4065668	ABR	Single Pad	R	—	—
4066253	ABR	Single Pad	OS	3.032	—
4067010	RSUMX	Dual Pad	R	—	—

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ACCESSORIES

ACCESSORY OVERVIEW

Core Lifter Cases



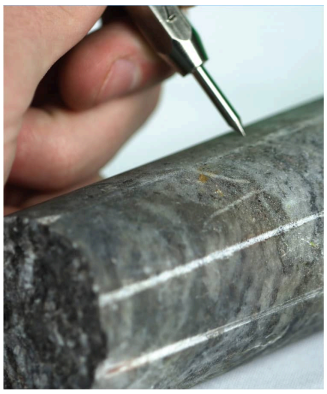
Boart Longyear™ core lifter cases are made of a high-quality alloy steel that is specially heat treated to increase strength, toughness, and wear life. Available in Q™, QTK, Q-P, Q3, and QTT models. The specialized Q-P/QTT core lifer case works with Q-P/QTT bits to route fluid flow to the cutting face – further improving core recovery.

Guide Plugs



Guide Plugs, also known as mud plugs, aid in transitioning bits across the wedge when directional drilling. Plugs can also be used to prevent filling inner tube with mud or debris during descent.

Scratch Test Kits



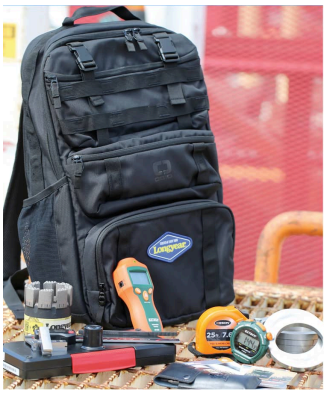
Scratch Test Kits, also known as hardness testers, are used both to help identify minerals and select bits for drilling applications. The picks are made of metals and alloys of hardness values equal to 2 through 9 on Mohs' hardness scale. Because they are made of metal, they are easily ground to sharp points which will not break off and which can be easily sharpened, unlike traditional mineral picks.

Gauges



Steel Ring Gauges are used for verifying the size of new bits and/or shells. All gauges are stamped with measurement size for reference.

Exploration Kit



Used by drilling personnel to improve performance during exploration by measuring parameters and examining tooling wear.

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ACCESSORIES | LIFTER CASES

IMAGE	PART #	SIZE	DESCRIPTION
AQTK			
	5001021	AQTK	CASE, C/LIFTER AQTK FLUTED
	52877	AQTK	C/LIFTER, AQTK SPIRAL
BQ			
	24830	BQ	CASE, BQ C/LIFTER
	5009470	BQ	C/LIFTER, BQ FLUTED
	5010025	BQ	C/LIFTER, BQ SLOTTED
	5010175	BQ	C/LIFTER, BQ SMOOTH
BQTK			
	5010026	BQTK	C/LIFTER, BQTK SLOTTED
	53199	BQTK	CASE, BQTK C/LIFTER
HQ			
	25237	HQ	CASE, HQ C/LIFTER
	5007937	HQ	CASE, HQ PILOTED C/LIFTER
	5009475	HQ	C/LIFTER, HQ FLUTED
	5010029	HQ	C/LIFTER, HQ SLOTTED
	5010174	HQ	C/LIFTER, HQ SMOOTH
HQ3			
	26514	HQ3	CASE, HQ3 C/LIFTER

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ACCESSORIES | LIFTER CASES (CONT.)

IMAGE	PART #	SIZE	DESCRIPTION
HQ3 (CONT.)			
	5009476	HQ3	C/LIFTER, HQ3 FLUTED
HQTT			
	65607	HQTT	CASE, HQTT C/LIFTER
LTK48			
	63925	LTK48	CASE, LTK48 C/LIFTER
	67709	LTK48	C/LIFTER, LTK48
NQ			
	24892	NQ	CASE, NQ C/LIFTER
	5008320	NQ	CASE, NQ PILOTED C/LIFTER
	5009472	NQ	C/LIFTER, NQ FLUTED
	5010027	NQ	C/LIFTER, NQ SLOTTED
	5010032	NQ	C/LIFTER, NQ SMOOTH
NQ3			
	26529	NQ3	CASE, NQ3 C/LIFTER
	5009474	NQ3	C/LIFTER, NQ3 FLUTED

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ACCESSORIES | LIFTER CASES (CONT.)

IMAGE	PART #	SIZE	DESCRIPTION
NQTK			
	29209	NQTK	CASE, NQTK C/LIFTER
	5009298	NQTK	C/LIFTER, NQTK APAC FLUTED
	5009312	NQTK	CASE, NQTK APAC C/LIFTER
	5009473	NQTK	C/LIFTER, NQTK FLUTED
	5010028	NQTK	C/LIFTER, NQTK SLOTTED
	5010131	NQTK	C/LIFTER, NQTK SMOOTH
NQTT			
	65600	NQTT	CASE, C/LIFTER NQTT
PQ			
	5009477	PQ	C/LIFTER, PQ FLUTED
	5010894	PQ	C/LIFTER, PQ SMOOTH
	52172	PQ	CASE, PQ C/LIFTER
PQ3			
	5009478	PQ3	C/LIFTER, PQ3 FLUTED
	5011030	PQ3	C/LIFTER, PQ3 SMOOTH
PQ3/PQTT			
	26160	PQ3/PQTT	CASE, PQ3/PQTT C/LIFTER

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ACCESSORIES | PLUGS

PART #	SIZE	DESCRIPTION
(NO SIZE)		
4067054	—	PLUG, NQ/BTK CARBON TAPERED
BQ		
4101948	BQ	PLUG BQ CARBON TAPERED
HQ		
4011438	HQ	PLUG HQ CARBON TAPERED
HQ3		
4101954	HQ3	PLUG HQ3 S CARBON TAPERED
NQ		
4101949	NQ	PLUG NQ CARBON TAPERED
NQ3		
4101952	NQ3	PLUG NQ3 CARBON TAPERED
NQTK		
4101845	NQTK	PLUG NQTK CARBON TAPERED
PQ		
4067141	PQ	PLUG, PQ CARBON TAPERED
PQ3		
4063855	PQ3	PLUG PQ3 OS 4.950 CARBON TAPERED

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ACCESSORIES | GAUGES

PART #	SIZE	DESCRIPTION
(NO SIZE)		
4065882	—	GAUGE ASM, BQ/LTK60 BIT -R & SHELL R WEAR
HQ		
4065869	HQ	GAUGE ASM, HQ BIT -R & SHELL R WEAR
4066537	HQ	GAUGE ASM, HQ 3.830 OS BIT & SHELL WEAR
4066542	HQ	GAUGE ASM, HQ 3.895 OS BIT & SHELL WEAR
NQ		
4065874	NQ	GAUGE ASM, NQ BIT -R & SHELL R WEAR
4066272	NQ	GAUGE ASM, NQ BIT OS & SHELL OS WEAR
PQ		
4065919	PQ	GAUGE ASM, PQ BIT -R & SHELL R WEAR
4066547	PQ	GAUGE ASM, PQ OS BIT & SHELL WEAR

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ACCESSORIES | EXPLORATION KIT



Used by drilling personnel to improve performance during exploration by measuring parameters and examining tooling wear.

PART #	DESCRIPTION
5010602	KIT, EXPLORATION INSPECTION
Included	OGIO BACKPACK
Included	CONTACTLESS TACHOMETER
Included	STOPWATCH
Included	MEASURING TAPE
Included	DIGITAL CALIPER
Included	10X EYE LOUPE
Included	SCRATCH TEST KIT
Included	BIT/SHELL GUAGES
Included	ROD WEAR GUAGES - Q, RQ, XQ



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PART #	DESCRIPTION
4065217	SCRATCH TEST KIT

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REFERENCE



Warranty

Please refer to our warranty on our website, https://www.boartlongyear.com/warranty



Intellectual Property

Please refer to our patent and trademark listing available on our website, https://www.boartlongyear.com/ip

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