BOART LONGYEAR®

DIAMOND PRODUCTS

Global Catalog

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PRODUCT OVERVIEW

HISTORY

BOART PRODUCTS
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 which enabled practical and reliable manufacturing of diamond coring bits.

EARLY SUCCESS IN THE COPPER BELT
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.

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.

BIT HISTORY

1930

1930S: Diamond bit technology developed by Boart Products

1938

1938: Longyear™ Cast Set diamond drill bits launched

1949

1949: Key manufacturing partnership formed to produce Longyear™ bits

1955

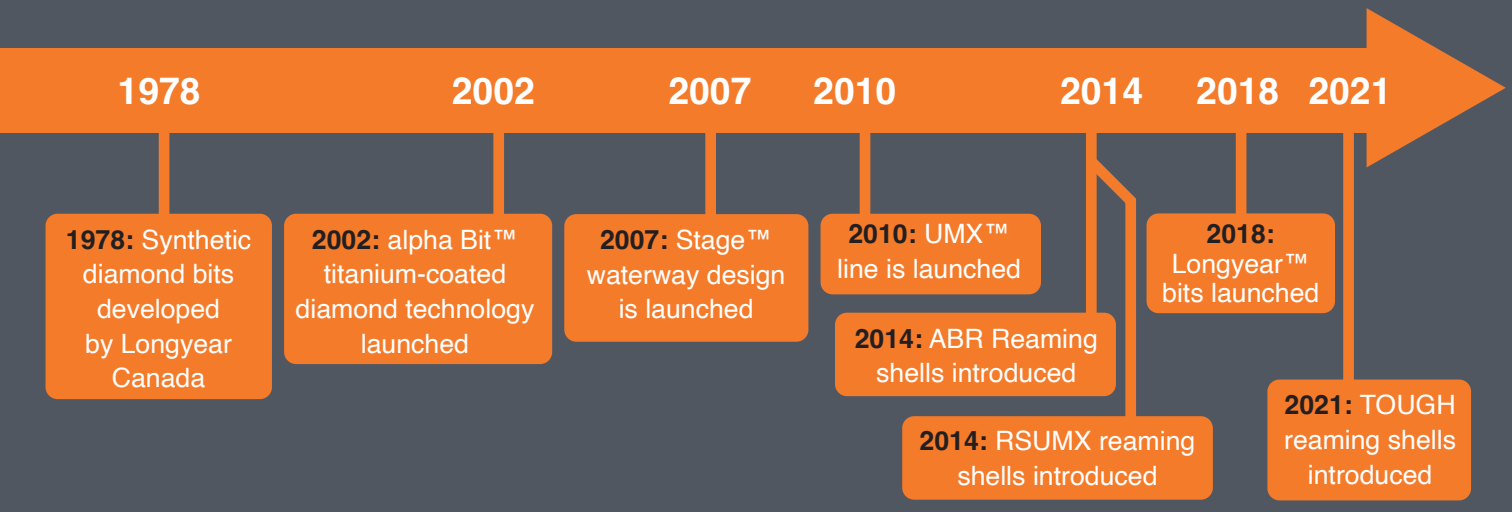
1955: Longyear develops drilling system for NASA

1950S: Powder metallurgy first applied to surface-set diamond bits

HISTORY

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 which consisted of 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, 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.



DIAMOND IMPREGNATED BITS

AU Patent Nos. 2007333850; 2011201711; 2011201710; 2011201709; CA Patent Nos. 2,671,061; 2,826,570; US Patent Nos. 7,628,228; 7,874,384; 7,828,090; 8,051,929; CN Patent No. ZL200780051070.8; ZA Patent No. 2009/05801; ES, FI, SE, TR Patent No. 2122111; Patents Pending.

IMPREGNATED DIAMOND BITS

Impregnated diamond bits are used for cutting holes in medium to ultra-hard formations. A variety of types are available to maximize drill life and penetration.

The crown is made up of metal powder and diamond matrix that wears away during the drilling process and exposes new layers of diamonds, renewing the cutting points for more meters per bit.

LONGYEAR™ BITS

Longyear Bits are designed to have smooth drilling characteristics that drillers prefer. This means increased productivity throughout the entire operation, and ultimately more core.

STAGE™ WATERWAYS

The innovative Stage™ waterway design pushes the envelope by allowing the tallest crown height in the industry. The Stage waterway design lets you spend more time drilling and less time tripping rods.

The design features an expansion of our patented window design to improve productivity, a revised window layout to increase strength, and our patented Razorcut™ face design which provides the driller with a ready-to-cut bit right out of the box and provides excellent tracking to maintain straightness while drilling.

The Stage waterway option is available in both 16mm and 25mm crown heights. Stage is also available in face discharge for very soft or broken ground conditions.

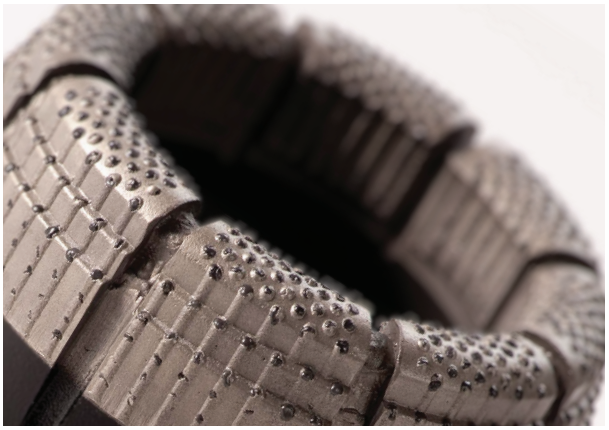
SPECIALTY BITS

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.

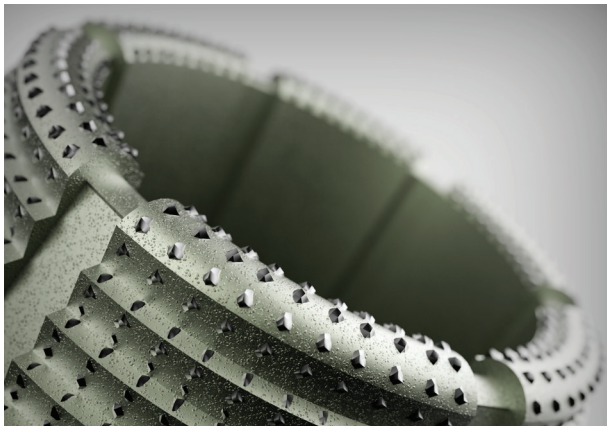
TUYERE BITS

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 coring bits are typically used for higher penetration rates than impregnated bits in softer formations. They utilize a single layer of synthetic diamonds set in a hard matrix.

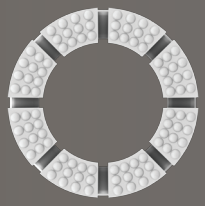


HIGH EXPOSURE (HI-EX) SURFACE SET BITS

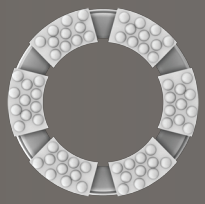
Utilizing patented Longyear diamond bonding, the new Hi-Ex surface set line retain diamonds on bit longer improving life and overall performance.

LONGYEAR™ BIT SELECTION CHART

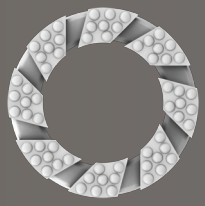
WATERWAY CONFIGURATIONS



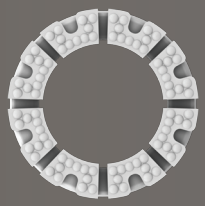
STANDARD
Recommended for general purpose use in competent, fine-grained formations. Longest life of non-stage bits.



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



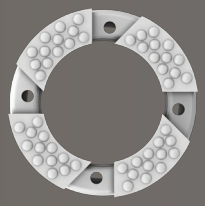
TAPERED SWIRL
Recommended for fast penetration in competent ground with the ability to push cuttings from broken ground easily to OD.



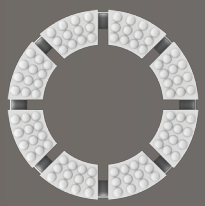
EXPRESS
Recommended for fast cutting in competent formations. Offers faster penetration and lower weight.

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

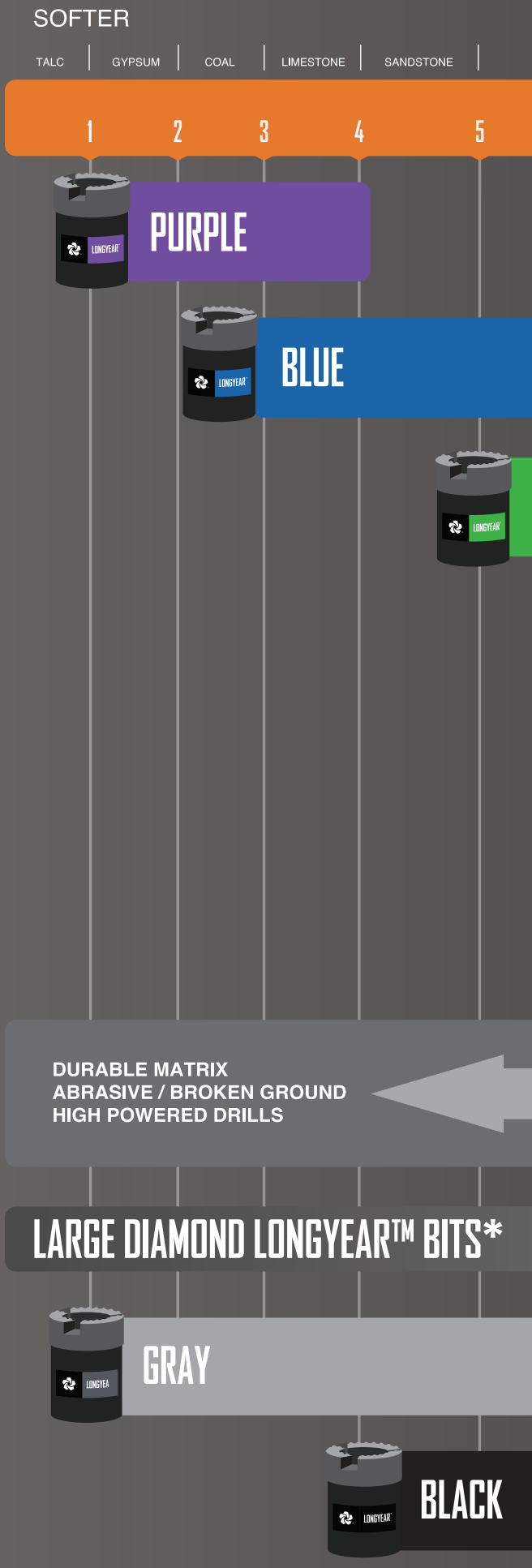
WATER CONTROL FEATURES
(available in all waterway configurations)



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.

HARDER

DIORITE | PEGMATITE | GRANITE | QUARTZITE | CHERT | BANDED IRON | CORUNDUM | DIAMOND

6 7 8 9

GREEN

YELLOW

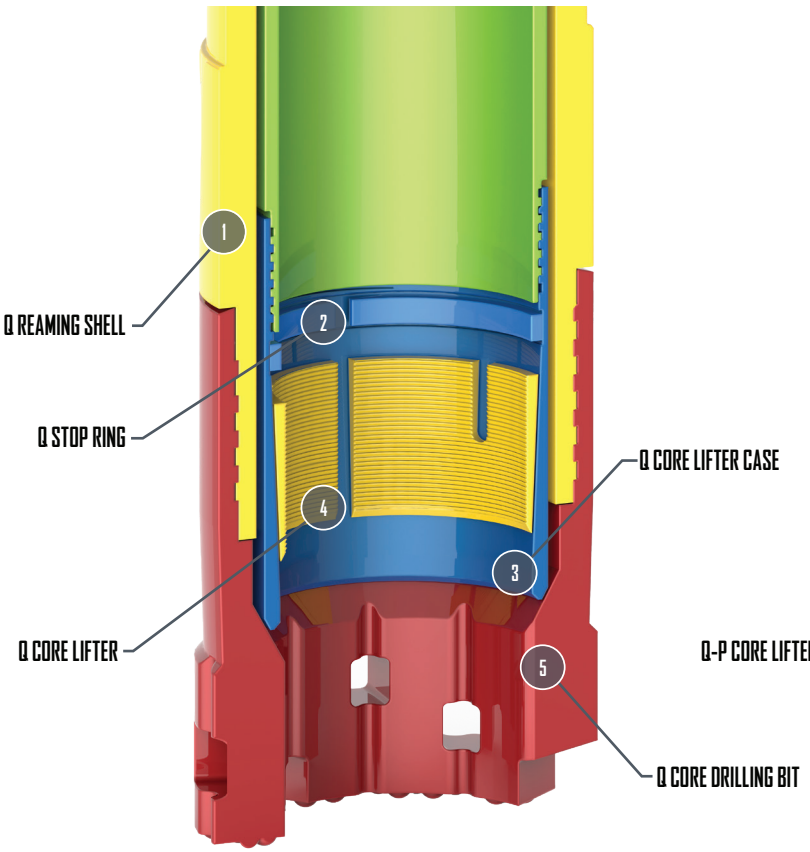
ORANGE

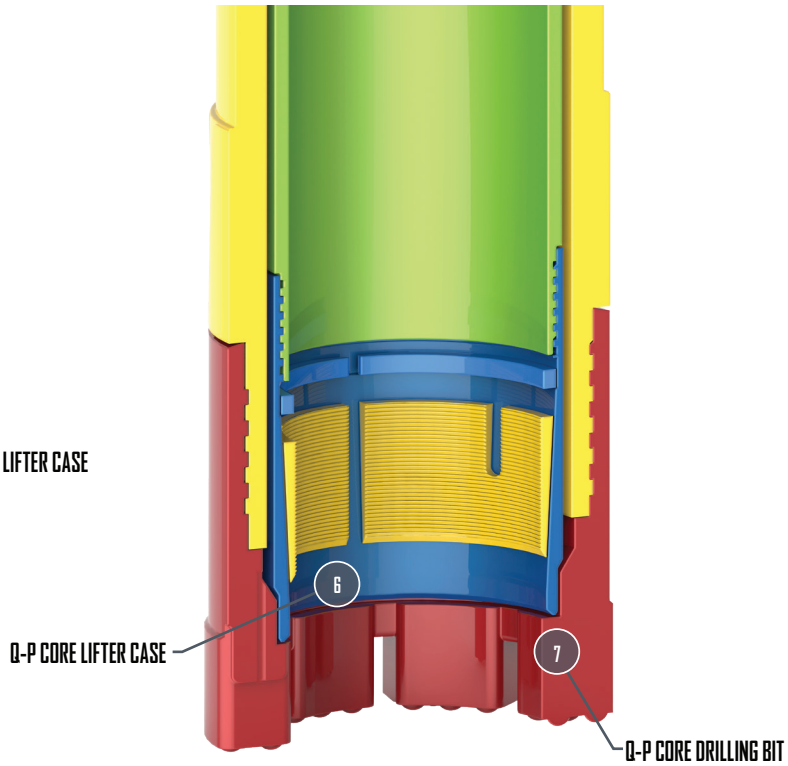
RED

FREE CUTTING MATRIX
COMPETENT GROUND
LOW POWERED DRILLS

SHADOW

SYSTEM OVERVIEW





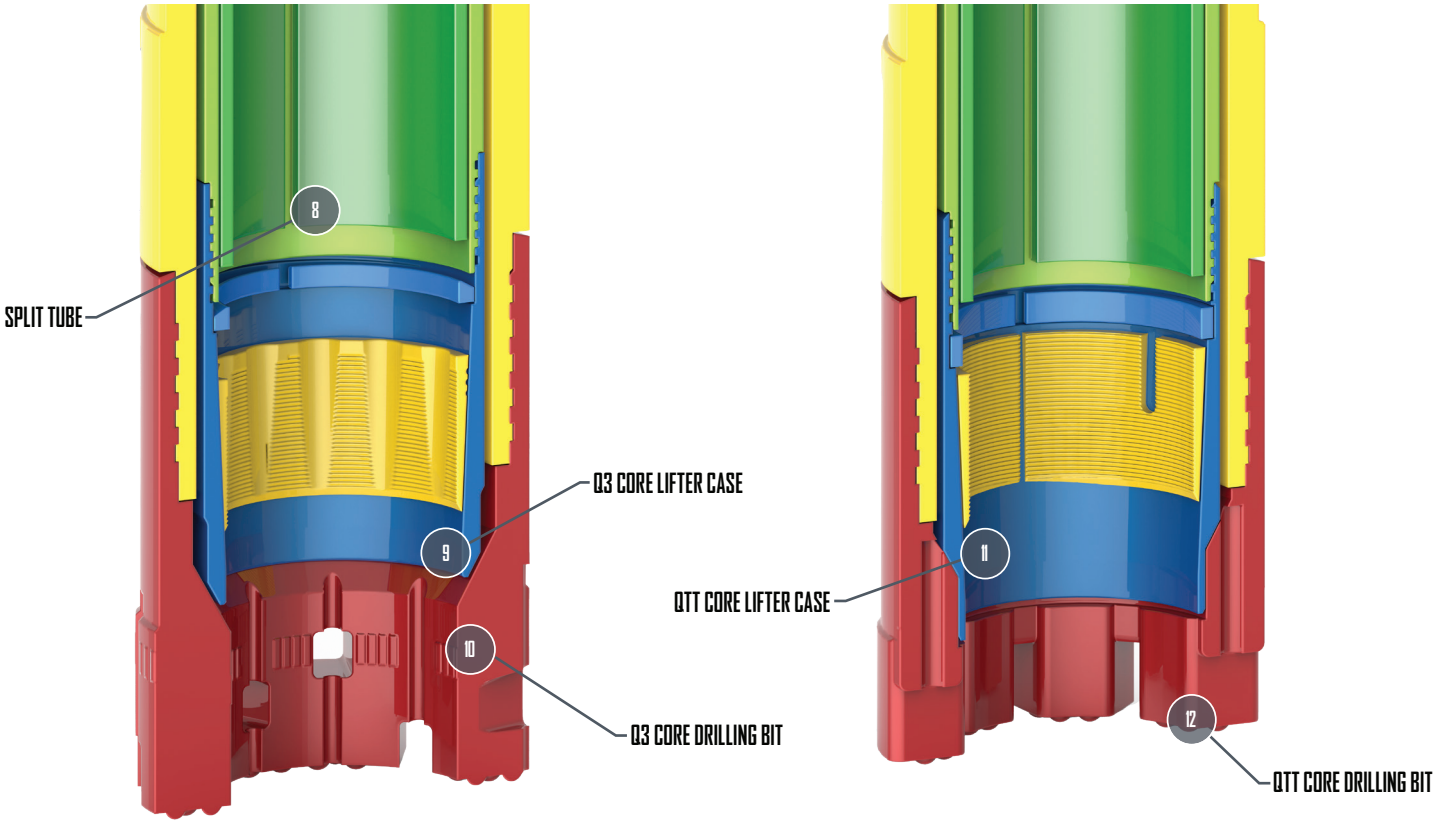
Q™ & Q™ TK SYSTEM
Genuine Q™ double tube wireline systems are ideal for use in most drilling conditions and are available for application in standard DCDMA hole sizes (B, N, H, P).

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 not as robust as 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.

SYSTEM OVERVIEW



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 or for 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.

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	
	in	mm	in	mm	in	mm	in	mm
Q™ WIRELINE								
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, HQ-P	2.500	63.5	3.775	95.9	3.789	96.2	3.830, 3.895	97.3, 98.9
PQ	3.345	85.0	4.817	122.4	4.834	122.8	4.950	97.3, 98.9
Q™ THIN KERF								
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
Q™ TRIPLE TUBE								
NQ3, NQTT	1.775	45.1	2.975	75.6	2.985	75.8	3.032	77.0
HQ3, HQTT	2.406	61.1	3.775	95.9	3.789	96.2	3.830, 3.895	97.3, 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

IMPREGNATED DIAMOND BITS

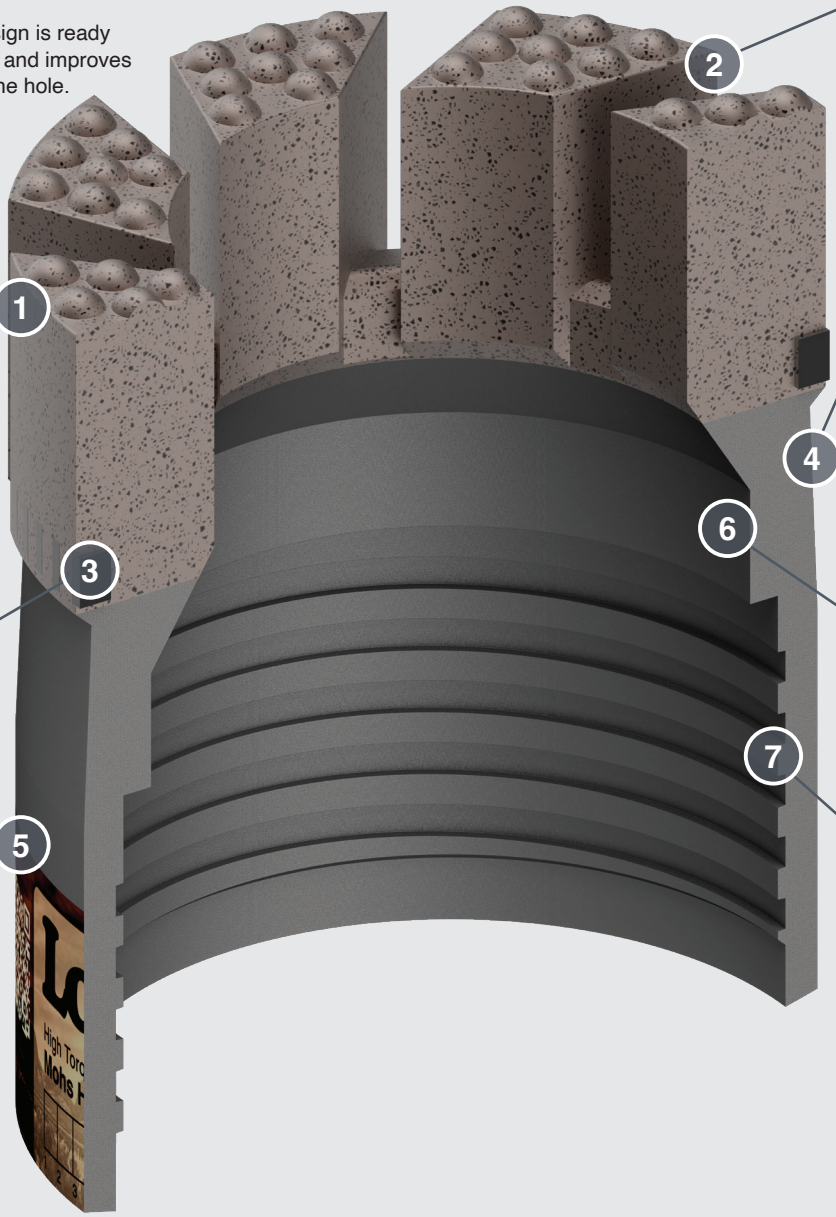
IMPREGNATED BIT FEATURES

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.

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

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



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

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.

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

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.

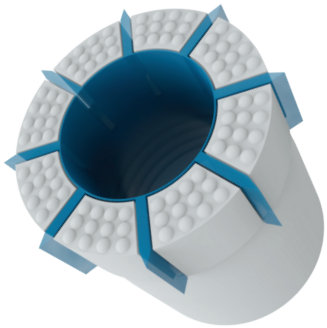
Patents Pending

*Thermally Stable Diamond

WATERWAYS

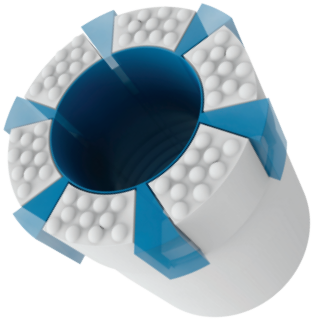
STANDARD (STD)

Recommended for general purpose use in competent, fine-grained formations.



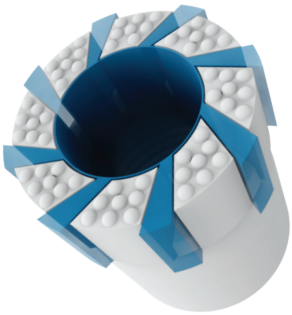
TAPERED (TW)

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.

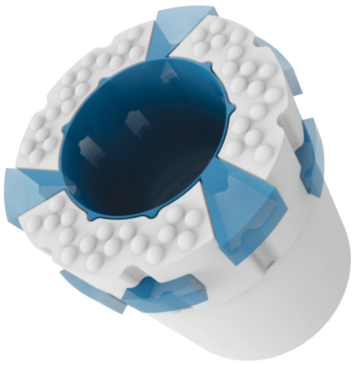


EXPRESS (EX)

Recommended for fast penetration in competent formations.

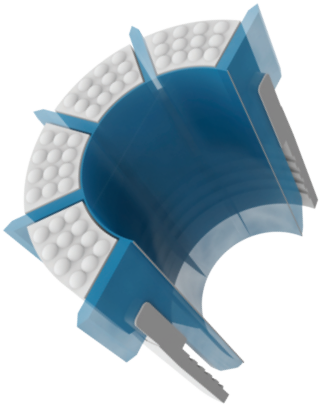
STAGE and GT (STG, GT)

Recommended for maximum life. Wide waterways improve flushing of cuttings from bit face.



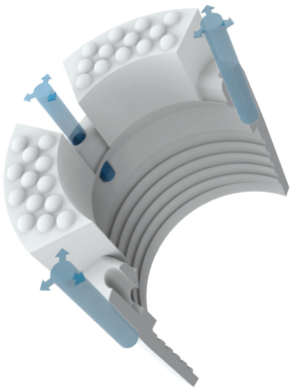
DEEP ID (DD)

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.

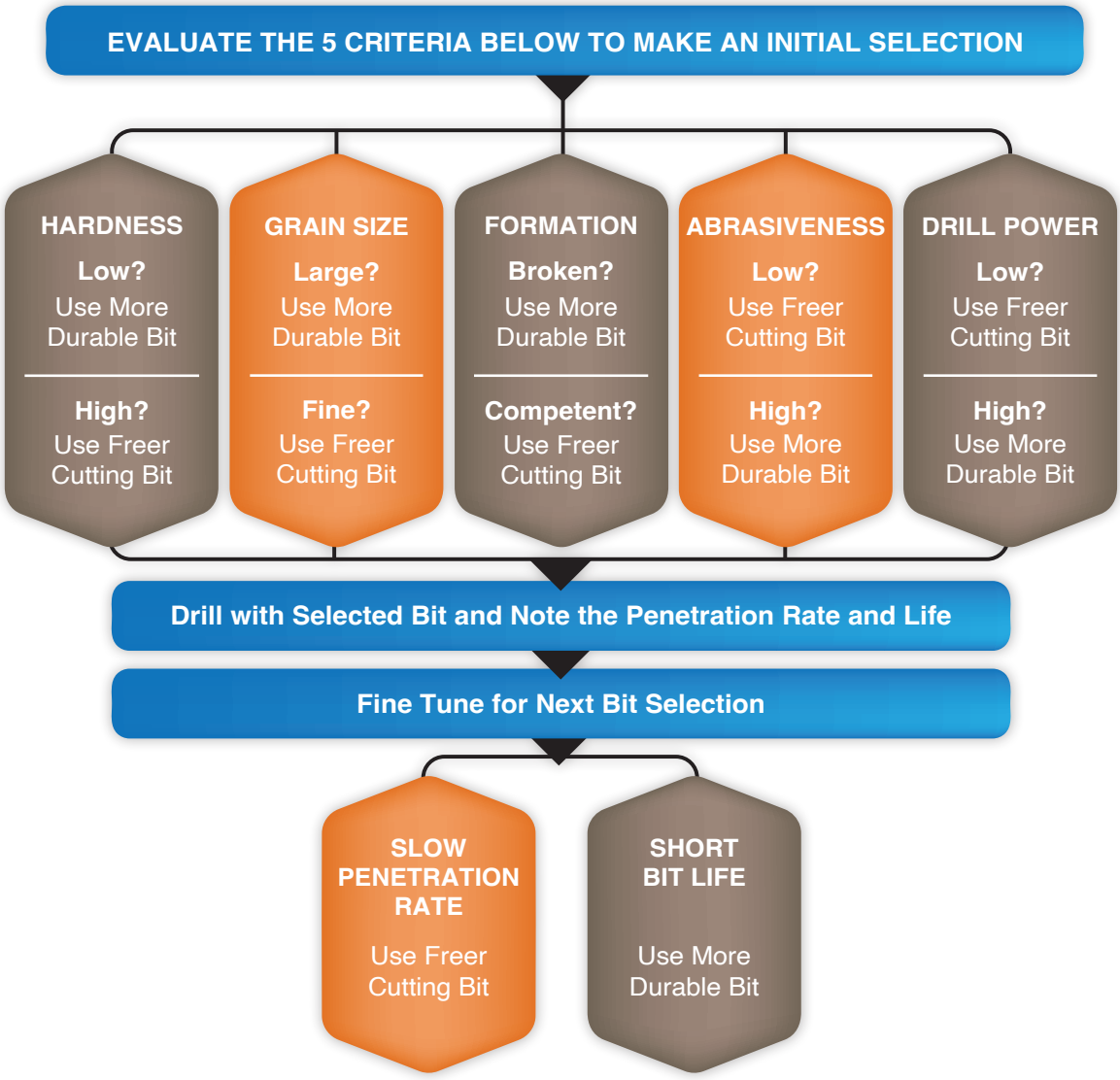


PRODUCT SELECTION

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 contribute to bringing it under control.

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



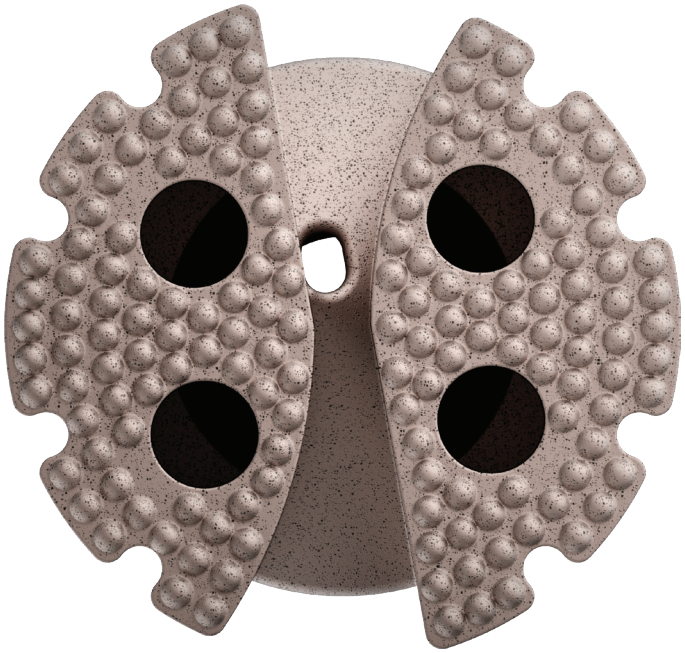
DIRECTIONAL DRILLING BITS

DOWNHOLE MOTOR BITS

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

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

PATENTED 10,077,609

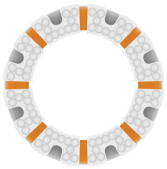
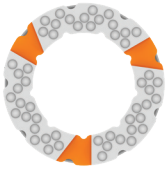


WEDGE CORING BITS (WD)

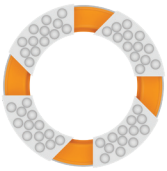
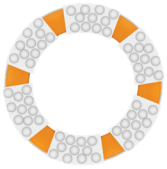
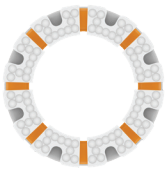
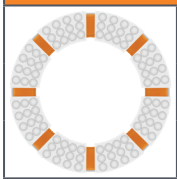
Boart Longyear™ wedging bits are diamond products that are made to follow wedges set in the bore hole with the intention of altering the hole direction.

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

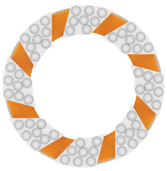
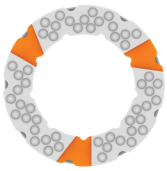
AQTK

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
EXPRESS (EX)								
		4056064	Red	12	-R	-	-	-
STAGE 3 (STG3)								
		4056687	Green	25	-R	-	-	-
		4056489	Orange	25	-R	-	-	-

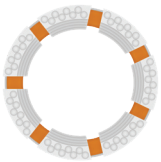
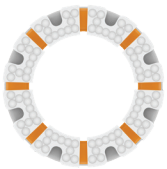
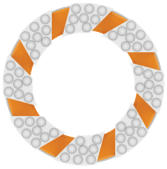
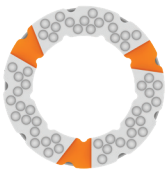
BQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056402	Purple	12	-R	-	-	-
		4056170	Blue	12	-R	-	-	-
		4056171	Green	12	-R	-	-	-
		4056650	Yellow	12	-R	-	-	-
		4056694	Red	12	-R	-	-	-
		4056169	Grey	12	-R	-	-	-
TAPERED WATERWAY (TW)								
		4057149	Blue	12	-R	-	-	-
		4056762	Purple	16	-R	-	-	-
		4056278	Blue	16	-R	-	-	-
		4056273	Green	16	-R	-	-	-
		4056277	Yellow	16	-R	-	-	-
		4056514	Orange	16	-R	-	-	-
		4056275	Red	16	-R	-	-	-
		4056274	Black	16	-R	-	-	-
EXPRESS (EX)								
		4056217	Blue	16	-R	-	-	-
		4056212	Green	16	-R	-	-	-
		4056216	Yellow	16	-R	-	-	-
		4056515	Orange	16	-R	-	-	-
		4056214	Red	16	-R	-	-	-
		4056970	Red	16	-R	-	-	PINS
		4056215	Grey	16	-R	-	-	-
		4056213	Black	16	-R	-	-	-
STANDARD								
		4057162	Yellow	16	-R	-	-	-
		4057163	Orange	16	-R	-	-	-
		4057164	Red	16	-R	-	-	-

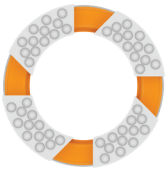
BQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED SWIRL (TSW)								
		4057153	Blue	20	-R	-	-	-
		4056996	Green	20	-R	-	-	-
		4056997	Yellow	20	-R	-	-	-
		4056880	Orange	20	-R	-	-	-
		4056928	Red	20	-R	-	-	-
		4056881	Black	20	-R	-	-	-
		4057036	Shadow	20	-R	-	-	-
STAGE 3 (STG3)								
		4056405	Green	25	-R	-	-	-
		4056310	Yellow	25	-R	-	-	-
		4056518	Orange	25	-R	-	-	-
		4056407	Red	25	-R	-	-	-
		4055994	Grey	25	-R	-	-	-
		4056187	Black	25	-R	-	-	-
		4057154	Shadow	25	-R	-	-	-

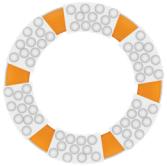
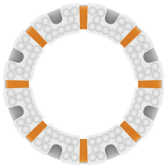
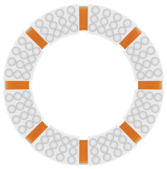
BQTK

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STANDARD								
		4057135	Orange	12	-R	-	-	ID4STP
EXPRESS (EX)								
		4056142	Blue	16	-R	-	-	-
		4056141	Green	16	-R	-	-	-
		4056143	Yellow	16	-R	-	-	-
		4056292	Orange	16	-R	-	-	-
		4056144	Red	16	-R	-	-	-
TAPERED SWIRL (TSW)								
		4057133	Yellow	16	-R	-	-	-
		4057039	Orange	16	-R	-	-	-
		4057040	Red	16	-R	-	-	-
STAGE 3 (STG3)								
		4055953	Green	25	-R	-	-	-
		4056024	Yellow	25	-R	-	-	-
		4056312	Orange	25	-R	-	-	-
		4056022	Red	25	-R	-	-	-
		4056185	Grey	25	-R	-	-	-

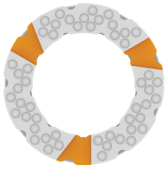
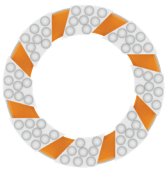
NQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056435	Purple	12	-R	-	-	-
		4056437	Blue	12	-R	-	-	-
		4056440	Green	12	-R	-	-	-
		4056443	Yellow	12	-R	-	-	-
		4056627	Red	12	-R	-	-	-
		4056159	Grey	12	-R	-	-	-
		4056250	Red	12	-R	-	FD	-
		4056249	Black	12	-R	-	FD	-
TAPERED WATERWAY (TW)								
		4057071	Purple	12	-R	-	-	-
		4057136	Blue	12	-R	-	-	-
		4057070	Green	12	-R	-	-	-
		4057069	Yellow	12	-R	-	-	-
		4057068	Orange	12	-R	-	-	-
		4057067	Red	12	-R	-	-	-
		4057142	Grey	12	OS	3.032	-	-
		4056711	Purple	16	-R	-	-	-
		4056378	Blue	16	-R	-	-	-
		4056360	Green	16	-R	-	-	-
		4056355	Yellow	16	-R	-	-	-
		4056356	Orange	16	-R	-	-	-
		4056357	Red	16	-R	-	-	-
		4056583	Grey	16	-R	-	-	-
		4056485	Black	16	-R	-	-	-
		4057043	Shadow	16	-R	-	-	-
		4057112	Green	16	-R	-	FD	-
		4057111	Yellow	16	-R	-	FD	-
		4056872	Green	16	-R	-	-	PINS

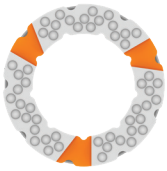
NQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED WATERWAY (TW)								
		4056873	Yellow	16	-R	-	-	PINS
		4056865	Orange	16	-R	-	-	PINS
		4056744	Green	16	OS	3.032	-	-
		4056787	Yellow	16	OS	3.032	-	-
		4057210	Orange	16	OS	3.032	-	-
		4057119	Yellow	16	OS	3.032	DD	-
		4057118	Black	16	OS	3.032	DD	-
EXPRESS/TURBO (EX)								
		4056639	Purple	16	-R	-	-	-
		4056183	Blue	16	-R	-	-	-
		4056181	Green	16	-R	-	-	-
		4056179	Yellow	16	-R	-	-	-
		4056379	Orange	16	-R	-	-	-
		4056178	Red	16	-R	-	-	-
		4056182	Grey	16	-R	-	-	-
		4056180	Black	16	-R	-	-	-
STANDARD								
		4056702	Yellow	16	-R	-	-	-
		4057000	Green	16	-R	-	DD	-
		4056859	Orange	16	-R	-	DD	-
		4056860	Red	16	-R	-	DD	-

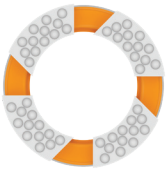
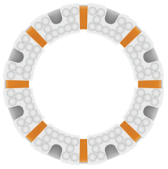
NQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STAGE 2 (STG2)								
		4055909	Green	16	-R	-	-	-
		4056028	Yellow	16	-R	-	-	-
		4057139	Orange	16	-R	-	-	-
		4056025	Red	16	-R	-	-	-
		4056096	Black	16	-R	-	-	-
TAPERED SWIRL (TSW)								
		4056968	Blue	20	-R	-	-	-
		4056875	Green	20	-R	-	-	-
		4056896	Yellow	20	-R	-	-	-
		4056894	Orange	20	-R	-	-	-
		4056910	Red	20	-R	-	-	-
		4056895	Grey	20	-R	-	-	-
		4056876	Black	20	-R	-	-	-
		4057037	Shadow	20	-R	-	-	-
		4057102	Shadow	20	-R	-	-	PINS

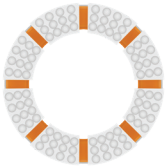
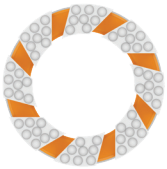
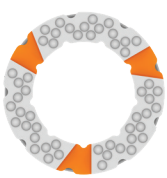
NQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STAGE 3 (STG3)								
		4056126	Blue	25	-R	-	-	-
		4055897	Green	25	-R	-	-	-
		4056029	Yellow	25	-R	-	-	-
		4056521	Orange	25	-R	-	-	-
		4055991	Red	25	-R	-	-	-
		4056011	Grey	25	-R	-	-	-
		4056127	Black	25	-R	-	-	-
		4057044	Shadow	25	-R	-	-	-
		4056572	Green	25	OS	3.032	-	-
		4056867	Orange	25	OS	3.032	-	-
		4056633	Red	25	OS	3.032	-	-
		4056289	Grey	25	OS	3.032	-	-
		4057006	Black	25	OS	3.032	-	-
		4056618	Green	25	OS	3.032	FD	-
		4056619	Grey	25	OS	3.032	FD	-

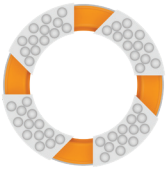
NQTK

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056453	Purple	12	-R	-	-	-
		4056456	Green	12	-R	-	-	-
		4056457	Yellow	12	-R	-	-	-
		4056686	Black	12	-R	-	-	-
EXPRESS/TURBO (EX)								
		4056164	Blue	16	-R	-	-	-
		4056160	Green	16	-R	-	-	-
		4056163	Yellow	16	-R	-	-	-
		4056364	Orange	16	-R	-	-	-
		4056147	Red	16	-R	-	-	-
		4056162	Grey	16	-R	-	-	-
		4056161	Black	16	-R	-	-	-
		4057157	Shadow	16	-R	-	-	-
		4056279	Green	16	-R	-	-	PINS
		4056969	Red	16	-R	-	-	PINS
		4056338	Green	16	OS	3.032	-	-
		4057150	Black	16	OS	3.032	-	-
TAPERED WATERWAY (TW)								
		4056977	Purple	16	-R	-	-	-
		4056384	Blue	16	-R	-	-	-
		4056063	Green	16	-R	-	-	-
		4056062	Yellow	16	-R	-	-	-
		4056130	Orange	16	-R	-	-	-
		4056131	Red	16	-R	-	-	-
		4056385	Grey	16	-R	-	-	-
		4056685	Black	16	-R	-	-	-
		4056856	Yellow	16	-R	-	-	PINS

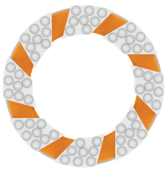
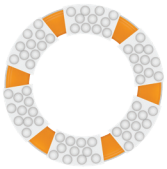
NQTK

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STANDARD								
		4057161	Yellow	16	-R	-	-	-
		4055896	Green	16	-R	-	-	-
TAPERED SWIRL (TSW)								
		4057141	Shadow	16	-R	-	-	PINS
		4056809	Blue	20	-R	-	-	-
		4056807	Green	20	-R	-	-	-
		4056798	Yellow	20	-R	-	-	-
		4056799	Orange	20	-R	-	-	-
		4056774	Red	20	-R	-	-	-
		4056808	Grey	20	-R	-	-	-
		4056829	Black	20	-R	-	-	-
		4056907	Shadow	20	-R	-	-	-
		4057200	Red	20	-R	-	-	PINS
		4057201	Shadow	20	-R	-	-	PINS
		4056802	Yellow	20	OS	3.032	-	-
		4056803	Orange	20	OS	3.032	-	-
		4056801	Red	20	OS	3.032	-	-
		4056831	Grey	20	OS	3.032	-	-
		4057015	Shadow	20	OS	3.032	-	-
		4057204	Orange	20	OS	3.032	-	PINS
STAGE 3 (STG3)								
		4055912	Green	25	-R	-	-	-
		4056006	Yellow	25	-R	-	-	-
		4056998	Orange	25	-R	-	-	-
		4055977	Red	25	-R	-	-	-
		4056188	Grey	25	-R	-	-	-
		4056076	Black	25	-R	-	-	-
		4057110	Grey	25	OS	3.032	-	-

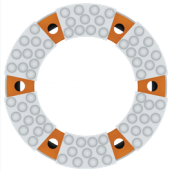
NQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056641	Purple	12	-R	-	FD	-
		4056948	Blue	12	-R	-	FD	-
		4056695	Green	12	-R	-	FD	-
		4056949	Yellow	12	-R	-	FD	-
		4056950	Red	12	-R	-	FD	-
TAPERED WATEWAY (TW)								
		4056265	Blue	12	-R	-	-	-
		4056260	Green	12	-R	-	-	-
		4056264	Yellow	12	-R	-	-	-
		4056629	Orange	12	-R	-	-	-
		4056262	Red	12	-R	-	-	-
		4056263	Grey	12	-R	-	-	-
		4056261	Black	12	-R	-	-	-
		4056271	Blue	12	-R	-	FD	-
		4056266	Green	12	-R	-	FD	-
		4056270	Yellow	12	-R	-	FD	-
		4056588	Orange	12	-R	-	FD	-
		4056268	Red	12	-R	-	FD	-
		4056269	Grey	12	-R	-	FD	-
		4056254	Green	16	-R	-	-	-
		4056258	Yellow	16	-R	-	-	-
		4056256	Red	16	-R	-	-	-
		4057034	Grey	16	-R	-	-	-
		4056847	Green	16	OS	3.032	-	-
		4056857	Yellow	16	OS	3.032	-	-
		4056987	Red	16	OS	3.032	-	-
		4057049	Grey	16	OS	3.032	-	-
		4057084	Black	16	OS	3.032	-	-

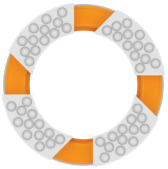
NQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED SWIRL (TSW)								
		4057194	Orange	16	-R	-	DD	-
		4057195	Shadow	16	-R	-	DD	-
		4057182	Green	20	-R	-	-	-
		4057181	Yellow	20	-R	-	-	-
		4057186	Orange	20	-R	-	-	-
		4057180	Red	20	-R	-	-	-
		4057061	Grey	20	-R	-	-	-
		4057060	Black	20	-R	-	-	-
		4057086	Shadow	20	-R	-	-	-
		4057173	Orange	20	-R	-	FD	-
STAGE 3 (STG3)								
		4056309	Yellow	25	-R	-	-	-
		4057085	Yellow	25	OS	-	3.032	-
		4057179	Grey	25	OS	-	3.032	-

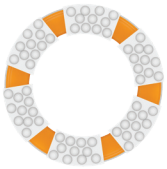
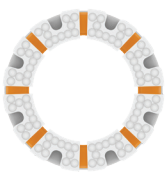
NQTT

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED WATERWAY								
		4056576	Green	16	-R	-	FD	-
		4056578	Yellow	16	-R	-	FD	-
		4057030	Green	16	OS	3.032	FD	-
		4057031	Grey	16	OS	3.032	FD	-
		4057014	Shadow	20	-R	-	FD	-

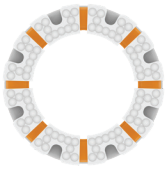
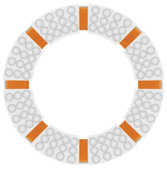
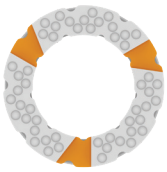
HQ

		Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056409	Purple	12	-R	-	-	-
		4056410	Blue	12	-R	-	-	-
		4056413	Green	12	-R	-	-	-
		4056417	Yellow	12	-R	-	-	-
		4056414	Red	12	-R	-	-	-
		4056926	Black	12	-R	-	-	-
		4056408	Purple	12	-R	-	FD	-
		4056244	Blue	12	-R	-	FD	-
		4056239	Green	12	-R	-	FD	-
		4056243	Yellow	12	-R	-	FD	-
		4056240	Black	12	-R	-	FD	-
		4057191	Grey	12	OS	3.830	-	-
		4057192	Black	12	OS	3.830	-	-
		4056850	Green	12	OS	3.895	-	-
		4057113	Yellow	12	OS	3.895	-	-
		4056852	Grey	12	OS	3.895	-	-
		4056957	Black	12	OS	3.895	-	-
TAPERED WATERWAY (TW)								
		4057137	Blue	12	-R	-	-	-
		4057075	Green	12	-R	-	-	-
		4057074	Yellow	12	-R	-	-	-
		4057073	Orange	12	-R	-	-	-
		4057072	Red	12	-R	-	-	-
		4057143	Grey	12	OS	3.895	-	-
		4056712	Purple	16	-R	-	-	-
		4056386	Blue	16	-R	-	-	-
		4056247	Green	16	-R	-	-	-
		4056246	Yellow	16	-R	-	-	-
		4056324	Orange	16	-R	-	-	-

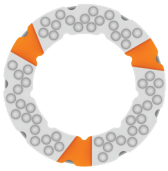
HQ

		Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TW								
		4056325	Red	16	-R	-	-	-
		4056569	Grey	16	-R	-	-	-
		4056789	Black	16	-R	-	-	-
		4057175	Green	16	-R	-	-	PINS
		4057174	Yellow	16	-R	-	-	PINS
		4056648	Blue	16	OS	3.830	-	-
		4056917	Green	16	OS	3.830	-	-
		4056936	Yellow	16	OS	3.830	-	-
		4056935	Orange	16	OS	3.830	-	-
		4056918	Red	16	OS	3.830	-	-
		4056319	Grey	16	OS	3.830	-	-
		4056761	Blue	16	OS	3.895	-	-
		4056757	Yellow	16	OS	3.895	-	-
		4056759	Red	16	OS	3.895	-	-
		4056760	Black	16	OS	3.895	-	-
		4056679	Green	16	OS	3.895	DD	-
		4057116	Yellow	16	OS	3.895	DD	-
		4057117	Black	16	OS	3.895	DD	-
		4057208	Yellow	16	OS	3.895	-	PINS
		4057209	Black	16	OS	3.895	-	PINS
EXPRESS/TURBO (EX)								
		4056153	Blue	16	-R	-	-	-
		4056148	Green	16	-R	-	-	-
		4056152	Yellow	16	-R	-	-	-
		4056323	Orange	16	-R	-	-	-
		4056150	Red	16	-R	-	-	-
		4056151	Grey	16	-R	-	-	-
		4056149	Black	16	-R	-	-	-
		4057185	Shadow	16	-R	-	-	-

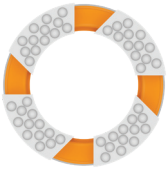
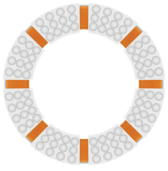
HQ

		Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
EXPRESS/TURBO (EX)								
		4056317	Green	16	OS	3.830	-	-
		4056316	Grey	16	OS	3.830	-	-
		4057114	Yellow	16	OS	3.895	-	-
		4056490	Grey	16	OS	3.895	-	-
		4057115	Black	16	OS	3.895	-	-
STANDARD								
		4057183	Red	16	-R	-	-	-
		4057003	Shadow	16	-R	-	-	-
STAGE 2 (STG2)								
		4055880	Green	16	-R	-	-	-
		4056418	Yellow	16	-R	-	-	-
		4057138	Orange	16	-R	-	-	-
		4056415	Red	16	-R	-	-	-
TAPERED SWIRL (TSW)								
		4057052	Blue	20	-R	-	-	-
		4056911	Green	20	-R	-	-	-
		4056912	Yellow	20	-R	-	-	-
		4056964	Orange	20	-R	-	-	-
		4057032	Red	20	-R	-	-	-
		4057177	Grey	20	-R	-	-	-
		4057178	Black	20	-R	-	-	-
		4057064	Shadow	20	-R	-	-	-
		4057199	Red	20	-R	-	-	PINS
		4057103	Shadow	20	-R	-	-	PINS
		4057121	Shadow	20	OS	3.895	-	-

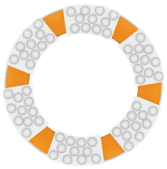
HQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STAGE 3 (STG3)								
		4056845	Purple	25	-R	-	-	-
		4056844	Blue	25	-R	-	-	-
		4056038	Green	25	-R	-	-	-
		4056052	Yellow	25	-R	-	-	-
		4056704	Orange	25	-R	-	-	-
		4056375	Red	25	-R	-	-	-
		4055992	Grey	25	-R	-	-	-
		4056843		25	-R	-	-	-
		4057190	Black	25	OS	3.830	-	-
		4056883	Yellow	25	OS	3.895	-	-
		4056487	Grey	25	OS	3.895	-	-
		4056958	Black	25	OS	3.895	-	-

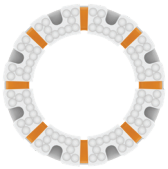
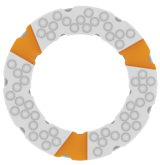
HQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056419	Purple	12	-R	-	-	-
		4056424	Blue	12	-R	-	-	-
		4056427	Green	12	-R	-	-	-
		4056637	Yellow	12	-R	-	-	-
		4056735	Orange	12	-R	-	-	-
		4056420	Purple	12	-R	-	FD	-
		4056423	Blue	12	-R	-	FD	-
		4056426	Green	12	-R	-	FD	-
		4056951	Yellow	12	-R	-	FD	-
		4056430	Red	12	-R	-	FD	-
		4056299	Grey	12	-R	-	FD	-
		4056177	Green	12	OS	3.895	-	-
		4056157	Grey	12	OS	3.895	-	-
		4056200	Black	12	OS	3.895	-	-
		4057160	Black	12	OS	3.895	-	PINS
STANDARD								
		4056307	Green	12	S	-	DD	PINS
		4056322	Grey	12	OS	3.895	FD	-
		4056534	Blue	16	-R	-	DD	-
		4056902	Green	16	-R	-	DD	-
		4056536	Yellow	16	-R	-	DD	-
		4056537	Orange	16	-R	-	DD	-
		4056539	Red	16	-R	-	DD	-
		4056533	Grey	16	-R	-	DD	-
		4056837	Black	16	-R	-	DD	-
		4057002	Shadow	16	-R	-	DD	-

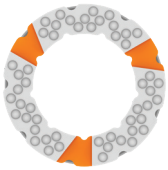
HQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED WATERWAY (TW)								
		4056230	Red	12	-R	-	-	-
		4056232	Blue	12	-R	-	FD	-
		4056233	Green	12	-R	-	FD	-
		4056235	Yellow	12	-R	-	FD	-
		4056371	Orange	12	-R	-	FD	-
		4056236	Red	12	-R	-	FD	-
		4056231	Grey	12	-R	-	FD	-
		4056644	Yellow	12	OS	3.895	-	-
		4056916	Orange	12	OS	3.895	-	-
		4056582	Red	12	OS	3.895	-	-
		4056220	Blue	16	-R	-	-	-
		4056221	Green	16	-R	-	-	-
		4056223	Yellow	16	-R	-	-	-
		4056366	Orange	16	-R	-	-	-
		4056224	Red	16	-R	-	-	-
		4056219	Grey	16	-R	-	-	-
		4056222	Black	16	-R	-	-	-
		4056070	Blue	16	-R	-	DD	-
		4056046	Green	16	-R	-	DD	-
		4056071	Yellow	16	-R	-	DD	-
		4056109	Red	16	-R	-	DD	-
		4056165	Grey	16	-R	-	DD	-
		4056553	Green	16	-R	-	FD	-
		4056555	Yellow	16	-R	-	FD	-
		4056556	Orange	16	-R	-	FD	-
		4056558	Red	16	-R	-	FD	-
		4056551	Grey	16	-R	-	FD	-
		4057025	Shadow	16	-R	-	FD	-
		4056343	Blue	16	OS	3.830	-	-

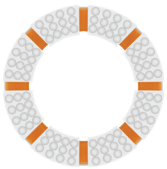
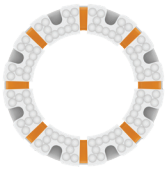
HQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED WATERWAY (TW)								
		4056706	Green	16	OS	3.830	-	-
		4056985	Yellow	16	OS	3.830	-	-
		4057033	Orange	16	OS	3.830	-	-
		4056984	Red	16	OS	3.830	-	-
		4056342	Grey	16	OS	3.830	-	-
		4057027	Black	16	OS	3.830	-	-
		4057028	Shadow	16	OS	3.830	-	-
		4057041	Black	16	OS	3.830	DD	-
		4056710	Green	16	OS	3.895	-	-
		4056927	Yellow	16	OS	3.895	-	-
EXPRESS/TURBO (EX)								
		4057012	Orange	16	-R	-	-	-
		4057120	Grey	16	-R	-	-	-
		4057104	Black	16	-R	-	-	-
		4057047	Shadow	16	OS	3.830	DD	-
		4056906	Yellow	16	OS	3.895	-	-
		4056826	Grey	16	OS	3.895	-	-
		4056905	Black	16	OS	3.895	-	-
		4057159	Black	16	OS	3.895	-	PINS
STAGE 2 (STG2)								
		4057046	Orange	16	-R	-	-	-
		4057045	Red	16	-R	-	-	-
		4056298	Grey	16	-R	-	FD	-

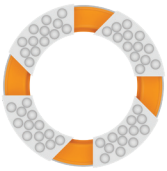
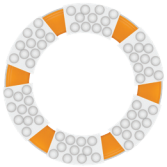
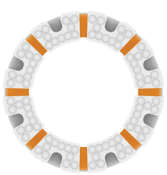
HQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED SWIRL (TSW)								
		4057080	Green	20	-R	-	-	-
		4057081	Yellow	20	-R	-	-	-
		4057082	Orange	20	-R	-	-	-
		4057042	Grey	20	-R	-	-	-
		4057056	Black	20	-R	-	-	-
		4057083	Shadow	20	-R	-	-	-
		4057106	Grey	20	-R	-	FD	-
STAGE 3 (STG3)								
		4056039	Green	25	-R	-	-	-
		4056878	Orange	25	-R	-	-	-
		4056111	Red	25	-R	-	-	-
		4055993	Grey	25	-R	-	-	-
		4057169	Black	25	-R	-	-	-
		4057079	Yellow	25	OS	3.830	-	-
		4056193	Yellow	25	OS	3.895	-	-
		4056190	Grey	25	OS	3.895	-	-

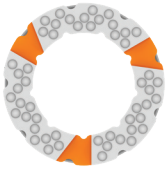
HQTT

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STANDARD								
		4056672	Purple	12	OS	3.830	FD	-
		4056671	Green	12	OS	3.830	FD	-
		4056779	Black	12	OS	3.895	FD	-
		4056791	Yellow	16	OS	3.830	FD	-
		4056790	Red	16	OS	3.830	FD	-
EXPRESS/TURBO (EX)								
		4057096	Purple	16	OS	3.830	FD	-
TAPERED WATERWAY (TW)								
		4056601	Green	16	-R	-	FD	-
		4056608	Yellow	16	-R	-	FD	-
		4056607	Orange	16	-R	-	FD	-
		4056602	Red	16	-R	-	FD	-
		4056603	Grey	16	-R	-	FD	-
		4057013	Shadow	16	-R	-	FD	-
		4056922	Purple	16	OS	3.830	FD	-
		4056921	Blue	16	OS	3.830	FD	-
		4056920	Green	16	OS	3.830	FD	-
		4056940	Yellow	16	OS	3.830	FD	-
		4056941	Orange	16	OS	3.830	FD	-
		4056919	Red	16	OS	3.830	FD	-
		4057005	Grey	16	OS	3.830	FD	-
		4057187	Black	16	OS	3.895	FD	-

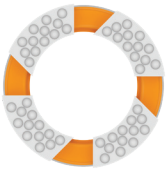
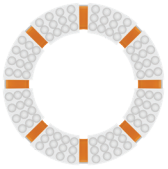
PQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056459	Purple	12	-R	-	-	-
		4056460	Blue	12	-R	-	-	-
		4056463	Green	12	-R	-	-	-
		4056477	Yellow	12	-R	-	-	-
		4056479	Red	12	-R	-	-	-
		4056674	Green	12	OS	4.950	-	-
		4056890	Yellow	12	OS	4.950	-	-
		4056888	Grey	12	OS	4.950	-	-
		4056889	Black	12	OS	4.950	-	-
TAPERED WATERWAY (TW)								
		4056669	Black	12	-R	-	-	-
		4056328	Blue	12	-R	-	FD	-
		4056327	Yellow	12	-R	-	FD	-
		4056329	Grey	12	-R	-	FD	-
		4056560	Blue	16	-R	-	-	-
		4056561	Green	16	-R	-	-	-
		4056390	Yellow	16	-R	-	-	-
		4056389	Orange	16	-R	-	-	-
		4056387	Red	16	-R	-	-	-
		4056559	Grey	16	-R	-	-	-
		4057151	Orange	16	OS	4.950	-	-
		4056793	Red	16	OS	4.950	-	-
EXPRESS/TURBO (EX)								
		4056504	Green	16	-R	-	-	-
		4056505	Yellow	16	-R	-	-	-

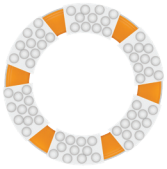
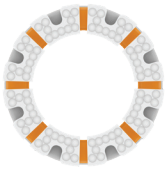
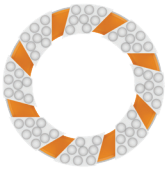
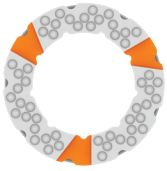
PQ

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
STAGE 3 (STG3)								
		4056963	Grey	25	OS	4.950	-	-
		4056962	Black	25	OS	4.950	-	-

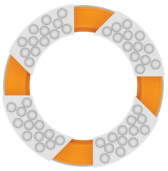
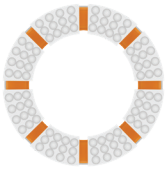
PQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4056464	Purple	12	-R	-	FD	-
		4056701	Green	12	-R	-	FD	-
		4056953	Yellow	12	-R	-	FD	-
		4056954	Red	12	-R	-	FD	-
		4056925	Grey	12	-R	-	FD	-
		4057122	Shadow	12	-R	-	FD	-
		4056675	Green	12	OS	4.950	-	-
		4056678	Grey	12	OS	4.950	-	-
STANDARD								
		4056465	Blue	12	S	-	DD	-
		4055999	Green	12	S	-	DD	-
		4056595	Green	12	S	-	DD	PINS
		4056566	Yellow	16	-R	-	DD	-
		4056303	Red	16	-R	-	DD	PINS
TAPERED WATERWAY (TW)								
		4056285	Blue	12	-R	-	FD	-
		4056280	Green	12	-R	-	FD	-
		4056284	Yellow	12	-R	-	FD	-
		4056589	Orange	12	-R	-	FD	-
		4056282	Red	12	-R	-	FD	-
		4056283	Grey	12	-R	-	FD	-
		4056281	Black	12	-R	-	FD	-
		4056396	Blue	16	-R	-	-	-
		4056395	Green	16	-R	-	-	-
		4056393	Yellow	16	-R	-	-	-
		4056394	Orange	16	-R	-	-	-
		4056586	Red	16	-R	-	-	-
		4056397	Grey	16	-R	-	-	-
		4057035	Black	16	-R	-	-	-
		4056057	Green	16	-R	-	FD	-

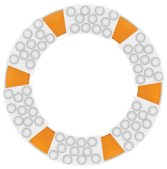
PQ3

Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED WATERWAY (TW)								
		4056058	Yellow	16	-R	-	FD	-
		4056545	Red	16	-R	-	FD	-
		4056540	Grey	16	-R	-	FD	-
		4057205	Black	16	-R	-	-	PINS
		4056676	Green	16	OS	4.950	-	-
		4056683	Yellow	16	OS	4.950	-	-
		4056677	Grey	16	OS	4.950	-	-
		4056986	Black	16	OS	4.950	-	-
		4057078	Black	16	OS	4.950	FD	-
		4057144	Black	16	OS	4.950	-	PINS
EXPRESS/TURBO (EX)								
		4057125	Black	16	OS	4.950	-	-
		4057145	Black	16	OS	4.950	-	PINS
TAPERED SWIRL (TSW)								
		4057063	Grey	20	-R	-	-	-
		4057062	Black	20	-R	-	-	-
STAGE 3 (STG3)								
		4057094	Blue	25	OS	4.950	-	-

PQTT

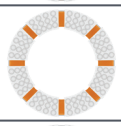
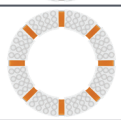
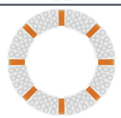
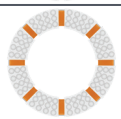
Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
GT								
		4057098	Grey	12	-R	-	DD	-
STANDARD								
		4056108	Red	12	S	-	DD	PINS
		4056501	Blue	16	-R	-	DD	-
		4056512	Green	16	-R	-	DD	-
		4056532	Yellow	16	-R	-	DD	-
		4056511	Orange	16	-R	-	DD	-
		4056570	Grey	16	-R	-	DD	-
		4056838	Black	16	-R	-	DD	-
		4057066	Shadow	16	-R	-	DD	-
		4056326	Red	16	-R	-	DD	PINS

PQTT

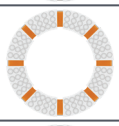
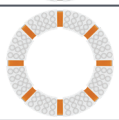
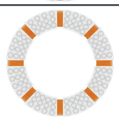
Face	Side	Part #	Formula	Crown Height (mm)	Gauge	Oversized Diameter	Water Control Features	Special Features
TAPERED WATERWAY (TW)								
		4055940	Green	12	S	-	FD	-
		4056331	Yellow	12	S	-	FD	-
		4056848	Blue	12	q	4.950	FD	-
		4056849	Green	12	OS	4.950	FD	-
		4056776	Yellow	12	OS	4.950	FD	-
		4056775	Grey	12	OS	4.950	FD	-
		4056055	Green	16	-R	-	FD	-
		4056056	Yellow	16	-R	-	FD	-
		4056529	Orange	16	-R	-	FD	-
		4056531	Red	16	-R	-	FD	-
		4057065	Shadow	16	-R	-	FD	-
		4056924	Purple	16	OS	4.950	FD	-
		4056923	Blue	16	OS	4.950	FD	-
		4056942	Green	16	OS	4.950	FD	-
		4056943	Yellow	16	OS	4.950	FD	-
		4056944	Orange	16	OS	4.950	FD	-
		4056945	Red	16	OS	4.950	FD	-
		4057077	Black	16	OS	4.950	FD	-
		4057146	Black	16	OS	4.950	FD	PINS

SPECIALTY CORING BITS

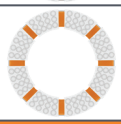
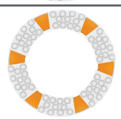
SPECIALTY SIZES

Face	Side	Part Number	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Options	Special
LTK48									
		4056042	Standard	12	Green	-R	-	-	-
		4056585	Standard	12	Yellow	-R	-	-	-
		4056473	Standard	12	Red	-R	-	-	-
LTK60									
		4056049	Standard	12	Red	-R	-	-	-
		4056122	Standard	16	Green	-R	-	-	-
		4056361	Standard	16	Orange	-R	-	-	-
H47									
		4056500	Express/Turbo (EX)	12	Yellow	-R	-	-	-
H56/39									
		4056486	Express/Turbo (EX)	12	Red	-R	-	-	-
		4057202	Tapered Swirl (TSW)	16	Red	S	-	-	PINS
H76									
		4057207	Tapered Swirl (TSW)	16	Red	S	-	-	PINS
BX									
		4057105	GT	6	Yellow	-R	-	-	-
		4056573	GT	6	Red	-R	-	-	-

SPECIALTY SIZES

Face	Side	Part Number	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Options	Special
NMLC									
		4057088	Standard	6	Green	S	-	FD	-
		4057089	Standard	6	Orange	S	-	FD	-
		4057090	Standard	6	Red	S	-	FD	-
NQ-B									
		4056870	Express/Turbo (EX)	16	Orange	-R	-	-	-
		4056869	Express/Turbo (EX)	16	Red	-R	-	-	-
NQ-BTK									
		4056901	Express/Turbo (EX)	16	Orange	-R	-	-	-
		4056900	Express/Turbo (EX)	16	Red	-R	-	-	-
NQ-P									
		4056667	Standard	12	Green	S	-	FD	-
HMLC									
		4057091	Standard	6	Green	S	-	FD	-
		4057092	Standard	6	Orange	S	-	FD	-
		4057093	Standard	6	Red	S	-	FD	-

SPECIALTY SIZES

Face	Side	Part Number	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Options	Special
HQ-P									
		4056546	Standard	16	Green	S	-	DD	-
		4056820	Standard	16	Yellow	S	-	DD	-
HTW									
		4057011	Tapered Waterway (TW)	16	Blue	-R	-	-	-
		4057009	Tapered Waterway (TW)	16	Green	-R	-	-	-
		4057010	Tapered Waterway (TW)	16	Yellow	-R	-	-	-
GEOBOR									
		4056594	GT	12	Green	S	-	FD	-
		4056813	GT	12	Red	S	-	FD	-

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 this guideline and the bit selected matches the formation, drilling should

progress smoothly and the bit will wear at a constant rate over its entire 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 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 or glazing are two terms for the same condition, where 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 weight on bit is too low, both the penetration rate and torque drop, due to polishing, which results in shorter life and lower productivity. If weight on 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 do not typically display weight on bit but instead display feed cylinder pressure. The weight on 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 = (4in diameter)	25.1in2 or 162cm2
Drop Pressure	= 100psi or 7kg/cm2
25.1in2 X 100psi	= 2510 lbs
162cm2 X 7 kg/cm2	= 1136 kg

OPERATING PARAMETERS

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				

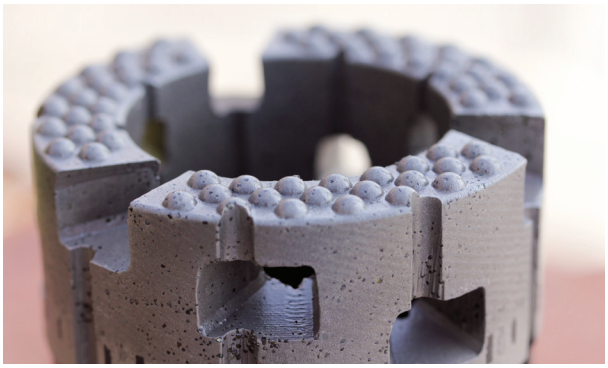
BIT WEIGHT	FORCE ON BIT		1300FF UPHOLE			
HOLDBACK PRESSURE (MPA)	LBF	kN	BQ	NQ	HQ	PQ
1	515	2.28				
2	1025	2.28				
3	1539	2.28				
4	2050	2.28				
5	2565	2.28				
6	3080	2.28				
7	3590	2.28				
8	4100	2.28				
9	4615	2.28				
10	5130	2.28				
11	5645	2.28				
12	6155	2.28				
13	6670	2.28				
14	7180	2.28				
15	7695	2.28				
16	8210	2.28				
17	8721	2.28				
18	9234	2.28				
19	9750	2.28				
20	10260	2.28				

TORQUE

Torque generated by the bit is a function of sharpness of the bit and weight on 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 has completed and as bit weight is reduced. Maximum bit torque occurs during bit sharpening due to the bit matrix coming into contact with the rock. A simultaneous decrease of torque and penetration rate indicates 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. Bits with large diamonds can drop or stall RPM when sharpening. If RPM drops during sharpening then a lower gear or speed should be used to increase available torque. If WOB is reduced when stalling, the bit will polish.

PENETRATION RATE

The cutting rate varies as a result of weight on bit, sharpness, bit formula, and ground conditions. Typical penetration rates vary anywhere 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).



FLUID FLOW

The flow of drilling fluid in the drill hole serves many purposes including the essential cooling of the diamonds and removal of 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 pump output should be reduced. 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 decrease of torque and penetration rate indicates 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.

DRILL TIPS

Geology:

- In broken ground, rock is removed by grinding instead of cutting, run at half RPM and apply sufficient weight on 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 added weight does not increase 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.

IMPREGNATED BIT DRILLING GUIDELINES

Torque:

- If the head stalls under normal operation, reduce the speed to produce more 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 have a greater rise in torque on initial sharpening. WOB needs to be held until penetration rate increases. Reduce WOB to maintain 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.

	Fluid Volume Range		Rotation Speed**	Penetration Rate				Indicative Bit Weight Range			
				in/min		cm/min		lb		kN	
	GPM	LPM	RPM	100 rpi	200 rpi	40 r/cm	80 r/cm	Low	High	Low	High
AQTK	3-5	11-19	2000	20.0	10.0	50.0	25.0	1200	3200	5	14
			1500	15.0	7.5	37.5	18.8				
			750	7.5	3.8	18.8	9.4				
BQ/ BQTK	6-8	22-30	1500	15.0	7.5	37.5	18.8	2000	5500	9	24
			1200	12.0	6.0	30.0	15.0				
			600	6.0	3.0	15.0	7.5				
NQ/ NQ3	10-13	38-49	1200	12.0	6.0	30.0	15.0	3000	8000	13	36
			1000	10.0	5.0	25.0	12.5				
			500	5.0	2.5	12.5	6.3				
HQ/ HQ3	14-20	53-75	900	9.0	4.5	22.5	11.3	5000	12000	22	53
			750	7.5	3.8	18.8	9.4				
			400	4.0	2.0	10.0	5.0				
PQ/ PQ3	20-28	75-105	700	7.0	3.5	17.5	8.8	7000	18000	31	80
			600	6.0	3.0	15.0	7.5				
			300	3.0	1.5	7.5	3.8				

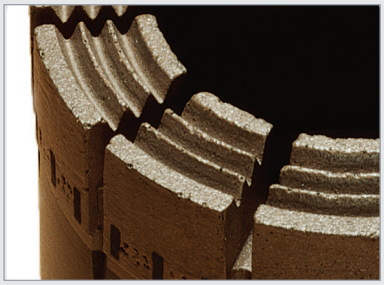
* Scaled matching OD surface velocity, chip volume, and contact pressure
** Rotation speeds are Max, Typical, and Broken Ground

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.

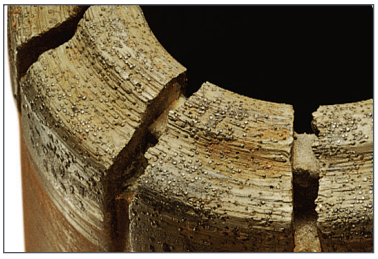
The causes and solutions described in this section are not exclusive lists, but represent common causes and generally effective solutions based on the experience of Boart Longyear and its customers.

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, overdrilling.

Solution: Reduce penetration rate or increase RPM.



CONVEX FACE WEAR (ROUNDED TO OUTER DIAMETER)

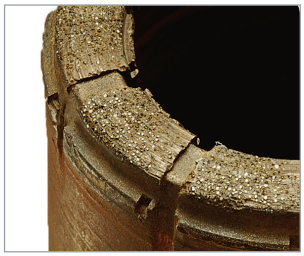
Cause: Insufficient water flow.

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 and Metal Bound)

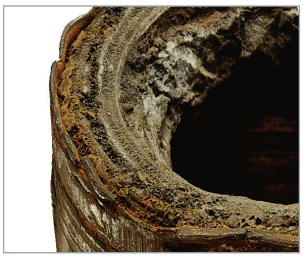
Cause: Bit does not feel sharp; diamonds flush w matrix; no significant “comet tails” behind each diamond.

Solution: Sand blast face or use other recommended methods to re-expose diamond. If the face glazes repeatedly, change to a higher bit.

CRACKED WATERWAYS (Diamonds Polished)

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

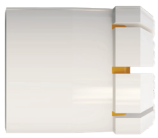
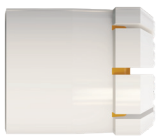
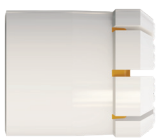
Cause: (A) Lack of fluid. (B) Too high of weight on bit being used

Solution: Check pump and rod string for leaks, check inner tube adjustment, maintain coolant flow rates

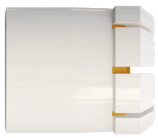
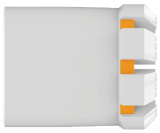
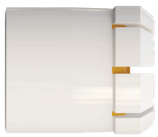
WEDGE BITS

Boart Longyear™ wedging bits are diamond products that are made to follow wedges set in the bore hole with the intention of altering the hole direction. These special profiles are required to avoid drilling straight through the wedge. The tapered crown profile is available in a taper varying from 1/4" to 7/16" chamfer, or 7-step.

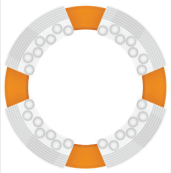
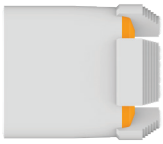
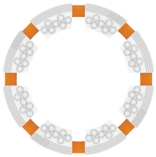
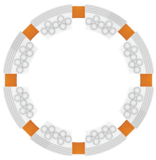
WEDGE

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Options	Special
BQ									
		4056914	Standard	12	Green	S	-	-	-
NQ									
		4056646	GT	12	Green	-R	-	-	-
		4056773	GT	12	Yellow	-R	-	-	-
		4057021	Standard	12	Green	S	-	-	-
		4057019	Standard	12	Red	S	-	-	-
		4056731	Standard	12	Green	OS	3.032	-	-
		4056746	Standard	16	Blue	-R	-	-	-
NQTK									
		4057016	Standard	12	Green	S	-	-	-
		4056994	Standard	12	Orange	S	-	-	-
		4056993	Standard	12	Red	S	-	-	-
		4056830	Standard	12	Red	S	-	DD	-

WEDGE

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Options	Special
NQ3									
		4057023	Standard	12	Green	S	-	-	-
HQ									
		4056764	Standard	12	Blue	-R	-	-	-
		4056748	Standard	12	Green	-R	-	-	-
		4056708	Standard	12	Yellow	-R	-	-	-
		4056728	Tapered Waterway (TW)	16	Yellow	OS	3.895	-	-
HQ3									
		4056301	Standard	12	Yellow	-R	-	-	-

STEP

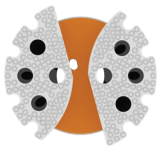
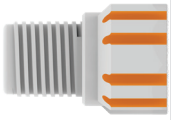
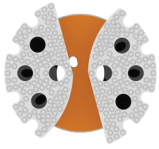
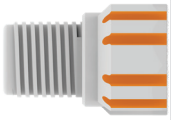
Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Options	Special
NQ									
		4056979	GT	12	Orange	-R	-	-	7STP
		4056980	GT	12	Grey	-R	-	-	7STP
NQTK									
		4056207	Standard	12	Green	S	-	-	7STP
HQ									
		4056832	Standard	12	Red	S	-	DD	4STP
HQ3									
		4056913	Tapered Wateway (TW)	12	Grey	S	-	FD	7STP

DHM / FULL-FACE BITS

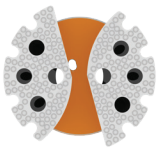
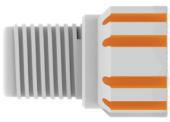
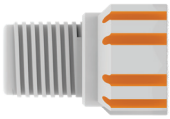
Downhole motors (DHM) bits are threaded onto downhole motors and used in directional drilling applications. They have reinforced center ports and have an impregnated full face crown.

Boart Longyear™ directional drilling bits can also be used as an impregnated plug bit.

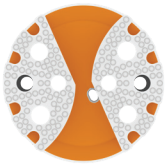
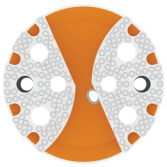
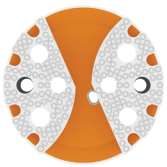
DOWN HOLE MOTOR (DHM)

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Connection
N								
		4065007	TP	9	Yellow	S	-	BW R/P
		4065006	TP	9	Red	S	-	
		4056967	Butterfly	16	Red	R	-	BW R/P
		4057051	Butterfly	16	Red/Green	R	-	
		4057058	Butterfly	16	Shadow	R	-	
H								
		4065012	TP	9	Red	S	-	NW R/P
		4057055	Butterfly	16	Red/Green	R	-	
		4057124	Butterfly	31	Red/Green	S	-	
		4057059	Butterfly	31	Shadow	S	-	

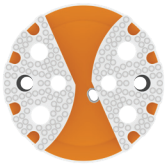
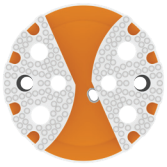
DOWN HOLE MOTOR (DHM)

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Connection
P								
		4065439	Butterfly	31	Red/Green	S	-	HW R/P
2-3/8API								
		4057057	Butterfly	16	Red/Green	OS	4.250	2-3/8 API R/P

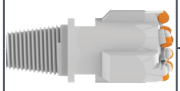
FULL FACE BIT (FF)

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Connection
NQ								
		4057050	Butterfly	16	Red	R	-	NQ OT R/B
		4057184	Butterfly	16	Yellow/Blue	R	-	
		4056946	Butterfly	16	Red/Green	R	-	
HQ								
		4056840	Butterfly	31	Yellow/Purple	S	-	
		4056866	Butterfly	31	Yellow/Purple	S	-	
		4056835	Butterfly	31	Yellow/Blue	S	-	
		4056839	Butterfly	31	Yellow/Blue	S	-	
		4057198	Butterfly	31	Red/Green	S	-	
		4056806	Butterfly	16	Yellow/Blue	OS	3.895	
HRQ								
		4056805	Butterfly	31	Yellow/Blue	R	-	HRQ R/B

FULL FACE BIT (FF)

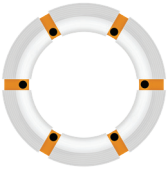
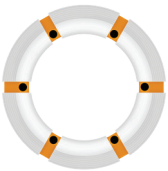
Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversize OD	Connection
PQ								
		4056836	Butterfly	31	Red/Green	S	-	PQ OT R/B
		4056777	Butterfly	31	Yellow/Blue	S	-	PQ OT R/B
PHD								
		4057107	Butterfly	31	Red/Green	OS	4.950	PHD R/B

POLYCRYSTALLINE DIAMOND CUTTER BIT (PDC)

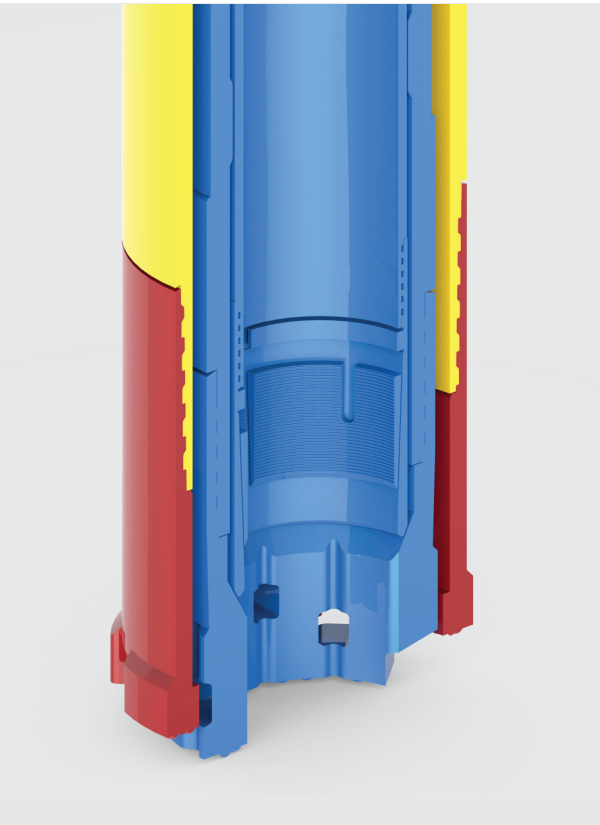
Face	Side	Part #	Diameter	PDC Qty x Diameter		Connection
				Gauge	Face	
PDC						
		4067271	96mm	4x13mm	3x13mm	NW R/P
		4067265	99mm	3x13mm	5x13mm	2-3/8" API R/P

SURFACE SET BITS

SURFACE SET

Face	Side	Part #	Step Count	Diamond Size	Gauge	Options	Special
NQ3							
		4101745	7	25/35 SEL 24CT	S	-	-
		4066874	7	25/35 SEL 24CT	S	-	HI-EX
HQ							
		4066856	7	15/25 SEL 26CT	S	-	-
HQ3							
		4106105	7	15/25 SEL 26CT	S	-	-
		4066895	7	15/25 SEL 26CT	S	-	HI-EX
		4066890	7	15/25 SEL 26CT	S	DD	-
		4066892	7	15/25 SEL 26CT	S	DD	HI-EX
PQ3							
		4066898	7	15/25 SEL 37CT	S	DD	-
		4066900	7	15/25 SEL 37CT	S	DD	HI-EX
TUYERE							
		4065479	1	14/16 14CT	2.5	-	-
		4011608	1	14/16 14CT	2.5	-	-
		4064647	1	14/16 14CT	2.938	-	-

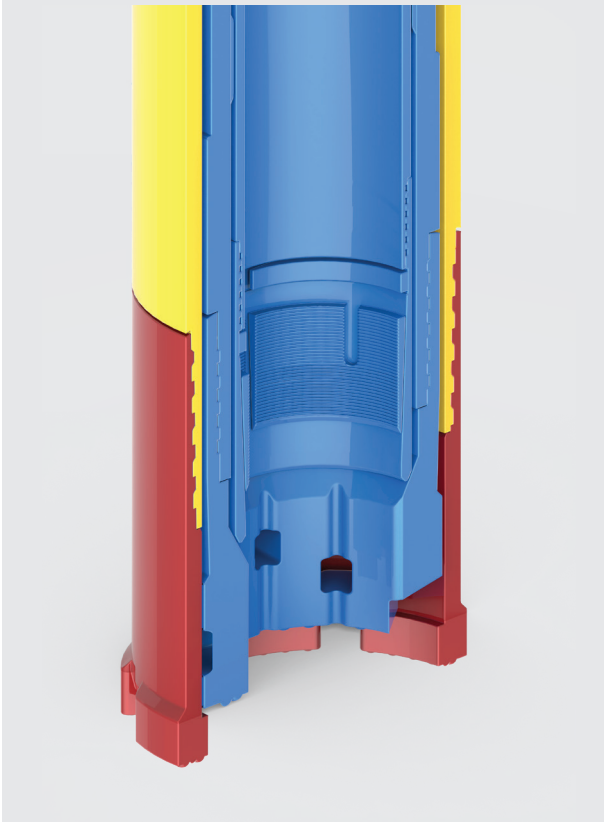
CASING SHOES



1. CASING & ROD SHOES

Casing and rod shoes are threaded to the end of the outer drill string for penetration through 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 when advancing a casing string in an existing hole with the rod string still in place.

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

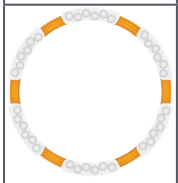
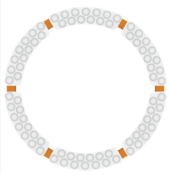


2. CASING BITS

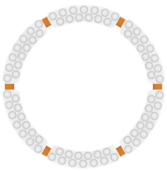
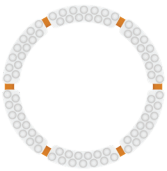
These are less commonly used and differ from casing shoes in that the ID of the casing bit is smaller. It does not permit the passage of the core barrel due to the overlap of dimensions.

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

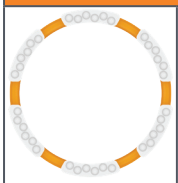
CASING SHOES

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversized Diameter	Special Features
BW								
		4056915	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
NW								
		4056293	Standard	3	Purple	R	-	-
		4057126	Standard	6	Purple	R	-	-
		4056623	Twin Tapered Waterway (TTW)	6	Purple	OS	3.755	-
NWT								
		4056621	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
		4056622	Twin Tapered Waterway (TTW)	6	Purple	OS	3.755	-
		4057130	Standard	6	Purple	R	-	-
HW								
		4056659	Standard	3	Purple	R	-	-
		4057127	Standard	6	Purple	R	-	-

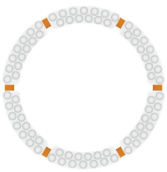
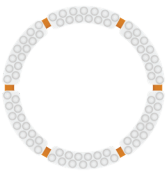
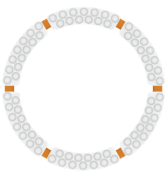
CASING SHOES

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversized Diameter	Special Features
HWT								
		4056197	Standard	3	Purple	R	-	-
		4057131	Standard	6	Purple	R	-	-
		4056198	Standard	6	Purple	OS	4.765	-
PW								
		4056624	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
		4056625	Twin Tapered Waterway (TTW)	6	Purple	OS	5.790	-
		4057128	Standard	6	Purple	R	-	-
PWT								
		4056658	Standard	3	Purple	R	-	-
		4057132	Standard	6	Purple	R	-	-
		4056626	Twin Tapered Waterway (TTW)	6	Purple	OS	5.790	-

ROD SHOES

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversized Diameter	Special Features
NQ								
		4056885	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
NRQ								
		4056664	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
NXQ								
		4056665	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
HQ								
		4056703	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
		4056886	Twin Tapered Waterway (TTW)	6	Purple	OS	3.775	-
		4057140	Standard	6	Purple	R	-	-
HRQ								
		4056662	Twin Tapered Waterway (TTW)	3	Purple	R	-	-
HXQ								
		4056663	Twin Tapered Waterway (TTW)	3	Purple	R	-	-

CASING BITS

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversized Diameter	Special Features
NWT								
		4056871	Standard	6	Purple	S	-	-
HW								
		4056792	Standard	6	Purple	OS	4.765	-
HQ								
		4057004	Twin Tapered Waterway (TTW)	5	Purple	OS	4.810	-
		4057166	Standard	6	Yellow	S	-	-
		4056661	Standard	6	Purple	OS	4.765	-
		4056909	Standard	6	Purple	OS	4.625	-
		4056642	Tapered Waterway (TW)	6	Yellow	OS	4.765	-
PWT								
		4056893	Standard	6	Blue	S	-	-

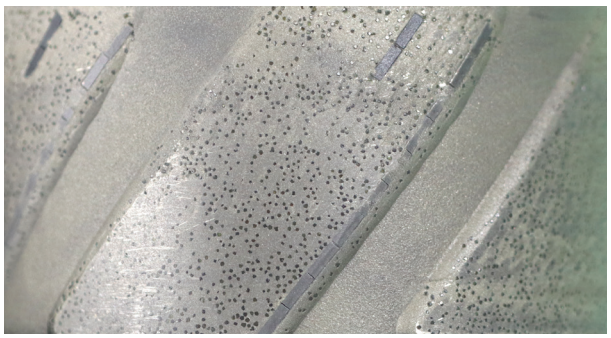
DEVIL'S NIGHTMARE

Face	Side	Part #	Waterway	Crown Height (mm)	Formula	Gauge	Oversized Diameter	Special Features
BW CASING SHOE								
		DBWEVP/1	Standard	-	Devil's Nightmare	OS	3.105	-
NQ CASING BIT								
		1NQEVP/1	Standard	-	Devil's Nightmare	R	-	-
NW CASING SHOE								
		DNWEVP/6	Standard	-	Devil's Nightmare	OS	3.875	HD
HQ CASING BIT								
		1HQEVP/1	Standard	-	Devil's Nightmare	R	-	-
HWT CASING SHOE								
		DHJEVP/1	Standard	-	Devil's Nightmare	OS	4.875	-


OGIO
TRUSTED AT EVERY TURN
Longyear
EXTECH
KESON
25ft.
EXTECH
STOPWATCH
WATER RESISTANT

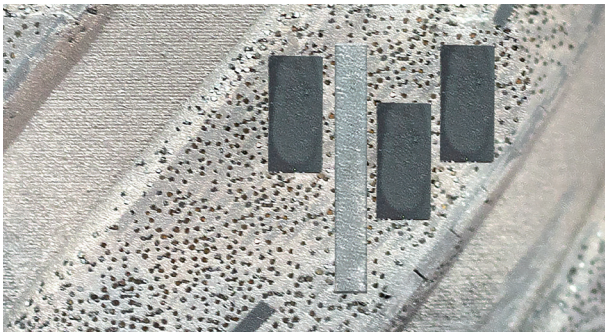
REAMING SHELLS

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.

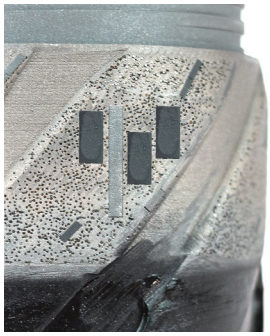


RSUMX™ DIAMOND IMPREGNATED PAD
Patented technology enables the use of large synthetic diamonds greatly enhancing wear life and eliminating the need for specialty shells in diamond exploration. In addition to improve life of the RSUMX reaming shell, large oversized pins have been added.

REAMING SHELL OPTIONS

All pad designs are available with the following configuration 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.

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 stability of hole and drill string.

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

STANDARD SHELLS

Part #	Pad Formula	Pad Configuration	Gauge	Oversized OD	Option
AQTK					
4064363	ABR	Dual Pad	R	-	-
BQ					
4066079	Tough	Single Pad	R	-	-
4066386	Tough	Dual Pad	R	-	-
4064555	ABR	Single Pad	R	-	-
4066606	RSUMX	Single Pad	R+	-	-
BQTK					
4066434	Tough	Single Pad	R	-	-
4066435	Tough	Dual Pad	R	-	-
4064170	ABR	Dual Pad	R	-	-
NQ					
4065986	Tough	Single Pad	R	-	-
4066139	Tough	Single Pad	OS	3.032	-
4066208	Tough	Dual Pad	R	-	-
4064554	ABR	Single Pad	R	-	-
4065051	ABR	Single Pad	OS	3.032	-
4064364	ABR	Dual Pad	R	-	-
4066608	RSUMX	Single Pad	R+	-	-
4066720	RSUMX	Single Pad	OS	3.032	-
4066605	RSUMX	Single Pad	R	-	Heavy Duty
4066613	RSUMX	Single Pad	OS	3.032	Heavy Duty
24901	No Pads	Single Pad	R	-	-

STANDARD SHELLS

Part #	Pad Formula	Pad Configuration	Gauge	Oversized OD	Option
HQ					
4065995	Tough	Single Pad	R	-	-
4066465	Tough	Single Pad	OS	3.830	-
4066218	Tough	Single Pad	OS	3.895	-
4066000	Tough	Single Pad	OS	3.895	Heavy Duty
4066300	Tough	Dual Pad	R	-	-
4066963	Tough	Single Pad	OS	3.830	Heavy Duty
4066962	Tough	Dual Pad	OS	3.895	Heavy Duty
4064556	ABR	Single Pad	R	-	
4064492	ABR	Dual Pad	R	-	-
4066607	RSUMX	Single Pad	R+	-	-
4066702	RSUMX	Single Pad	OS	3.830	-
4065929	RSUMX	Single Pad	R+	-	Heavy Duty
4066611	RSUMX	Single Pad	OS	3.830	Heavy Duty
4066612	RSUMX	Single Pad	OS	3.895	Heavy Duty
25248	No Pads	Single Pad	R	-	-
PQ					
4066080	Tough	Single Pad	R	-	-
4066437	Tough	Single Pad	OS	4.950	-
4064557	ABR	Single Pad	R	-	-
4066609	RSUMX	Single Pad	R+	-	-
4066604	RSUMX	Single Pad	R+	-	Heavy Duty
4066610	RSUMX	Single Pad	OS	4.950	-
H47					
4066173	Tough	Single Pad	R	-	-
LTK48					
4062275	RSUMX	Single Pad	R	-	-
LTK60					
4065005	ABR	Single Pad	R	-	-

ADAPTER COUPLING (AC)

Part #	Pad Formula	Pad Configuration	Gauge	Oversized OD	Option
BQ					
4062283	RSUMX	Single Pad	R	-	-
BQTK					
4066698	Tough	Single Pad	R	-	-
NQ					
4066374	Tough	Single Pad	R	-	-
4066259	Tough	Single Pad	OS	3.032	-
4064590	ABR	Single Pad	R	-	-
4065050	ABR	Single Pad	OS	3.032	-
4062284	RSUMX	Single Pad	R	-	-
NQU					
4065001	ABR	Dual Pad	R	-	-
4067063	ABR	Dual Pad	OS	3.032	-
HQ					
4066378	Tough	Single Pad	R	-	-
4066260	Tough	Single Pad	OS	3.895	-
4064591	ABR	Single Pad	R	-	-
4063207	RSUMX	Single Pad	R	-	-
4062288	RSUMX	Single Pad	OS	3.830	-
4063453	RSUMX	Single Pad	OS	3.895	-
PHD					
4066382	Tough	Single Pad	R	-	-
4066697	Tough	Single Pad	OS	4.950	-
4066007	ABR	Single Pad	R	-	-

ROD SHELL

Part #	Pad Formula	Pad Configuration	Gauge	Oversized OD	Option
BRQTK					
4064174	ABR	Single Pad	R	-	-
NQ					
4064881	ABR	Single Pad	R	-	-
4067000	ABR	Single Pad	OS	3.032	-
NRQ					
4064272	ABR	Single Pad	R	-	-
4065717	ABR	Single Pad	OS	3.032	-
4063792	RSUMX	Single Pad	OS	3.343	-
4064635	RSUMX	Dual Pad	R	-	-
NXQ					
4065668	ABR	Single Pad	R	-	-
4066253	ABR	Single Pad	OS	3.032	-
4067010	RSUMX	Dual Pad	R	-	-
HQ					
4067181	TOUGH	Single Pad	R	-	-
HRQ					
4064708	ABR	Single Pad	R	-	-
HXQ					
4065671	ABR	Single Pad	R	-	-
PHD					
4063861	RSUMX	Single Pad	OS	4.950	-

ACCESSORIES

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.

PART #	DESCRIPTION
4101948	PLUG **BQ** CARBON TAPERED
4101949	PLUG **NQ** CARBON TAPERED
4067054	PLUG, **NQ/BTK** CARBON TAPERED
4101845	PLUG **NQTK** CARBON TAPERED
4101952	PLUG **NQ3** CARBON TAPERED
4011438	PLUG **HQ** CARBON TAPERED
4101954	PLUG **HQ3** S CARBON TAPERED
4067141	PLUG, **PQ** CARBON TAPERED

*NQTK also known as NQ2

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.

PART #	DESCRIPTION
4065217	Scratch Test Kit

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.

PART #	DESCRIPTION
4065882	BQ/LTK60 BIT -R & SHELL
4065874	NQ BIT -R & SHELL
4066272	NQ BIT OS & SHELL
4065869	HQ BIT -R & SHELL
4066537	HQ 3.830 OS BIT & SHELL
4066542	HQ 3.895 OS BIT & SHELL
4065919	PQ BIT -R & SHELL R
4066547	PQ OS BIT & SHELL

EXPLORATION KIT

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

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

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.

Q Lifter Case

Q3 Lifter Case

QP Lifter Case

QTT Lifter Case

BQ

PART #	DESCRIPTION
24830	BQ CORE LIFTER CASE
53199	BQTK CORE LIFTER CASE

NQ

PART #	DESCRIPTION
24892	NQ CORE LIFTER CASE
29209	NQTK* CORE LIFTER CASE
5008320	NQ-P CORE LIFTER CASE
26529	NQ3 CORE LIFTER CASE
65600	NQTT CORE LIFTER CASE

*NQTK also known as NQ2

HQ

PART #	DESCRIPTION
25237	HQ CORE LIFTER CASE
5007937	HQ-P CORE LIFTER CASE
26514	HQ3 CORE LIFTER CASE
65607	HQTT CORE LIFTER CASE

PQ

PART #	DESCRIPTION
52172	PQ CORE LIFTER CASE
26160	PQ3/PQTT CORE LIFTER CASE

Q is a trademark of Boart Longyear.

WARRANTY

PLEASE REFER TO OUR UP-TO-DATE WARRANTY AVAILABLE 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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BOART LONGYEAR

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