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"Built to last, built to cut fast"

PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

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MATRIX SELECTION & TROUBLESHOOTING

Call the factory or your representative for additional help.

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ULTRATERRA BY DIASET

Free cutting SOFT matrix for production in hard rock

The Drilling Industry has asked for a free cutting, abrasion resistant, straight-hole, long life core bit. They want to cut the hardest rock, faster.

The goal is to maximize productivity, while minimizing the cost to do so.

The UltraTerra Precision Series is designed to deliver exactly that:

- The matrix metallurgy makes use of the latest technology to maximize penetration rates.
- These bits are 30% softer – cutting hard rock faster and straighter.
- Less push means straighter holes.

Check the chart on the next page for complete details or ask your representative today about how you can run the **NEW UltraTerra Precision Series** (patent pending) bit.

- **NEW TECHNOLOGY** - WORLDWIDE PATENT PENDING MATRIX PROCESS!
- FASTER PENETRATION RATES
- LONGER LIFE (Ultra-abrasion resistant gauges)
- PRECISION, VIBRATION FREE DRILLING
- STRAIGHTER HOLES
- HEAVY DUTY HARDMETAL RIBS AVAILABLE

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Precision Matrix & Crown Design Chart

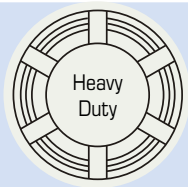
SOFT ROCK		HARD ROCK DESCRIPTION				
Any Abrasion	< ABRASION >	Extreme	Abrasive	Some	Nil	Nil
Any Fracturing	< FRACTURING >	Extreme	Fractured	Minor	Solid	Solid Core
Hardness <MOHS 3	< HARDNESS >	Soft to Medium	Medium	Medium with hard bands	Hard to Very Hard	Extremely Hard

Surface Set or Polycrystalline Set
VERY FAST CUTTING

1X to 3X

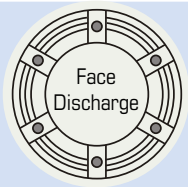
For longest bit life, start with the lowest number in each application zone

Long-life and abrasion resistant crown design. Good results with any matrix.



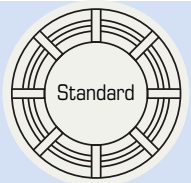
4X to 5X

Best core recovery on "Triple-Tube" designs, abrasion resistant. Can be used with any matrix



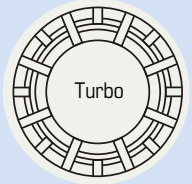
6X to 9X

Standard design. Works with any matrix, best results with #6X and higher numbers.



10X to 15X

Faster penetrating design in solid, hard rock. Works best with #8X and higher numbers



Wireline bits
All popular corebarrel designs and Sizes: A, B, N, H, P

Conventional bits
All CDA/DCDMA standard items IEW/IEW-S,IAW/IAW-S, AW34, LTK 46, JKT 48, LTK 56, BW44, A,B,N,H

International metric T-series:
T(2), T-36 ,46 ,56 ,66 ,76 ,86 ,101

International metric B-series:
B-36, 46,56,66,76,86,101

Please ask about any size or style not listed.

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Cross reference chart of UltraTerra PrecisionX Matrix types to others:

ROCK TYPE	ROCK FEATURES	UltraTerra PrecisionX (Diaset)	BOART	HOBIC	FORDIA	HAYDEN	DRILLER'S EDGE	DIMATEC
Chert Jasperite Quartzite Rhyolite	Extremely Hard Non-Abrasive Very Fine Grained SOLID	**#13X* #12X* #11X* #10X* #9X**	9, 9COM 10, 10COM	13AC-15AC	Shark 12 Shark Adv 13 Shark 15		T04, T19, T25, T26, T46	HR12, HR13, HR14
Diorite Granite Gneiss	Very Hard Non-Abrasive Fine Grained SOLID	**#8X #7X**	8 8ABR 8COM	8A.4 11AC	Shark 10 Shark Adv 8	8, 9, 10	T07, T25, T40, T42, T43, T46	HR10, HR11
Granite Quartz Skarns Silicified Volcanics	Hard Abrasive Medium Grained Competent to Fractured	**#7X #6X**	7 7ABR	7AC, 7AA 8AC, 8AA	Shark10 Shark Adv 7/7+ T Xtreme 6-9 Hero 7	7, 8	T25, T27	D8, D9, D10 HR9, HR10
Basalt Dolorite/Diabase Gabbro	Medium Hard Abrasive Medium Grained Competent to Fractured	**#5X #4X**	6 6ABR	5AC 7AC 7AA	Shark 6, 8A,10 T Xtreme 4-6 Hero 7	5, 6	T20	D7, D8 HR9, HR10
Dolomite Weathered Granites Peridotite	Medium Soft Abrasive Medium to Coarse Grained Competent to Fractured	**#4X #3X**	4	5AC	Shark 4 T Xtreme 4-6	3, 4	T23	D4, D5, D6, D7 HR7, HR8
Shale Limestone Sandstone	Very Abrasive Coarse Grained Soft Very Fractured	**#2X #1X**	2 1	3AC	Shark 1 T Xtreme 4-6 Hero 3	2, 1	T23	D2, D3

*>>>Use #10X or higher in solid formations only<<<

Please ask about any size or style not listed.

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

Long Life Reaming Shells

Our most popular product.

STANDARD FEATURES:

1. **LONG PAD** heavily set with diamonds. The matrix pad butts securely against the bit blank, preventing shoulder wear and "walkover" into the bit blank.
2. **CONCENTRIC CAST PAD** runs true and will not break off. Less vibration.
3. **SPIRAL CARBIDE REINFORCED WATERWAYS**
4. **AAA DIAMONDS** on the leading edge. This is a DIASET EXCLUSIVE, increases penetration rates and enables the shell to cut more freely.

UPGRADE OPTIONS:

5. **PREMIUM GOLD:** larger, premium diamonds, 4140 heat treated alloy full hole "polk" or "hexagonal" blank design. LARGE premium diamonds are well anchored, resisting pull out. Heavy-duty "polk" blank.

PLATINUM: All the features of our PREMIUM GOLD plus carbide wear pads welded to the blank and ground to size. (Platinum does not use a full hole "polk" blank design)

GRADES AVAILABLE:

STANDARD (Copper)

PREMIUM (Gold)

PLATINUM

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

Long Life Reaming Shells

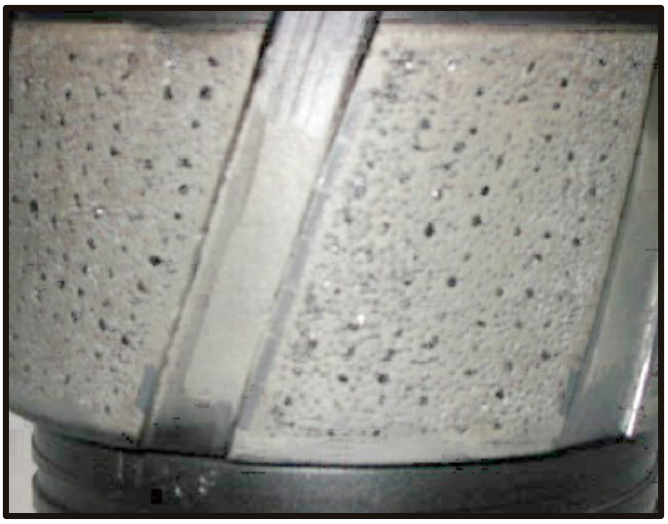
THE DIASET DIFFERENCE

HEAVY-DUTY "POLK" STYLE BLANK the thickest blank available in the industry. Milled flutes allow flushing, blank lasts longer. (Gold/Premium grade only)

LONG MATRIX PAD heavily set with diamonds.The matrix pad butts securely against the bit blank, preventing shoulder wear and "walkover" into the bit blank.

SPIRAL TUNGSTEN CARBIDE reinforced waterways.

AAA DIAMONDS on the leading edge. This is a DIASET EXCLUSIVE, increases penetration rates and enables the shell to cut more freely.



Wireline bits
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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

Stabilized 10" Reaming Shells

DIASET EXCLUSIVE FEATURES:

1. **PREMIUM AAA DIAMONDS** on the leading edge. This shell reams and cuts freely, increasing penetration rates.
2. **TWO DIAMOND RING PADS** heavily set with diamonds. We use LARGE premium diamonds to improve the "diamond anchor" in abrasive conditions, the diamonds will not pull out. The "pin" matrix pad butts securely against the bit blank, preventing shoulder wear and bit blank damage due to "walkover".
3. **CONCENTRIC** cast diamond pad, runs true, reduces vibration, increases core recovery. Diamond pad is NOT brazed on, pad will not break off.
4. **SPIRAL, CARBIDE REINFORCED WATERWAYS** 100% hole coverage, smooth, vibration free operation.
5. **4140 HEAT TREATED STEEL** Toughest in the industry.

We are happy to quote on your specific requirements

Proven to drill the straightest holes in the industry

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

Diamond & Carbide Stabilized Locking Couplings

STYLE #1: the matrix pad butts securely against the adaptor body, preventing shoulder wear and "walkover".

STYLE #2: The matrix pad is mid-body. This design is useful for wedging.

DIASET EXCLUSIVE FEATURES:

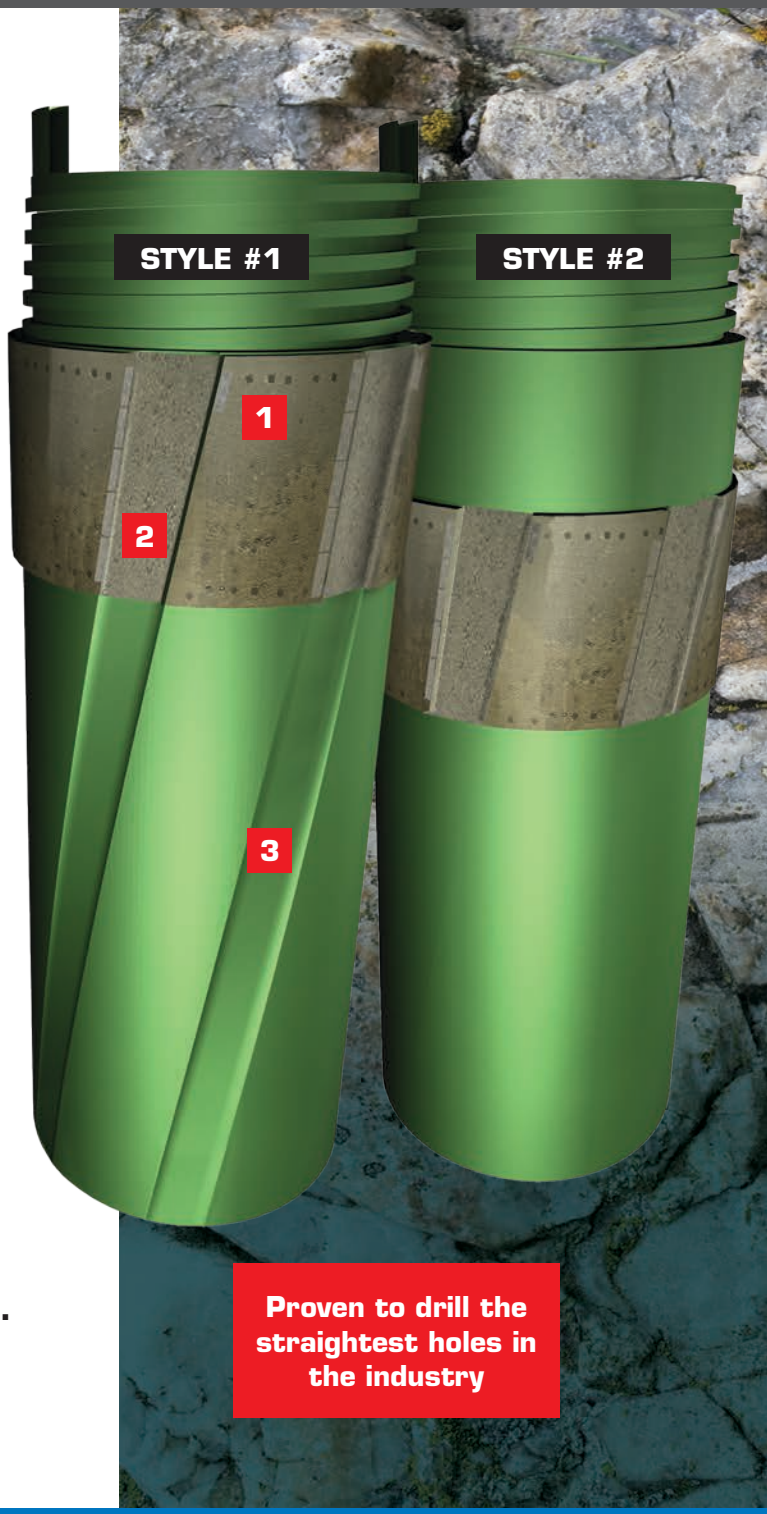
1. **LONG CARBIDE** stabilizer pad, set with diamonds.
   CONCENTRIC cast diamond pad, runs true, reduces vibration. Not brazed on, pad will not break off.
2. **SPIRAL,** full contact, carbide reinforced waterways
3. "**POLK" / "HEXAGONAL"** body design. Stabilizes best, and removes cuttings faster.
   "Non-polk" recommended for faulted, sandy conditions

HEAT TREATED 4140 alloy steel.
Strongest in the industry.

WIRELINE sizes available: A, B, N, H, P

N.B. - due to design constraints, not all back-ends can have "POLK" style bodies

UNDERGROUND VERSION:
no tab on locking coupling



Proven to drill the straightest holes in the industry

Use with our stabilized adaptor couplings. This system helps reduce vibration & increases bit penetration and life

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

Stabilized Adaptor Coupling

THE DIASET DIFFERENCE:

1. **SPIRAL,** full contact, body
2. "**POLK" / "HEXAGONAL"** waterway flute design. Stabilizes best, and removes cuttings faster.

"Non-polk" recommended for faulted, sandy conditions

HEAT TREATED 4140 alloy steel. Strongest in the industry.

WIRELINE sizes available: A, B, N, H, P

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

ALL-TERRAIN Impregnated Casing Shoes

STANDARD FEATURES:

- **#6 Matrix is standard** Proven to penetrate overburden FAST
- **Heavy waterway reinforcement** Ensures flushing, keeps tool cool and cutting fast.
- **Excellent gauge reinforcement** Improves life
- **Premium tubing** Strong crown bond. Wrench and abrasion resistant.
- **Computer threaded** Precision cut. Won't gall or damage your casing.
- **Variety of impregnated depths** to suit your job 1.6, 3.2, 6.5 mm

THE DIASET DIFFERENCE

High Diamond Concentration
Helps Diaset shoes last longer

GRADE & APPLICATION GUIDE:			
UTILITY SHOE - No boulders - Soft sand and soils	**STANDARD** (copper) - Little overburden - No boulders - Light duty or leave casing	**PREMIUM** (gold) - All around application - Some boulders - Recovery and reuse of shoe	**SUPER V-RING** - High production - V-ring crown, like a bit - Re use of shoe many times - Very abrasive, boulder strewn overburden

CUSTOM DESIGNS AVAILABLE:

- Heavy-duty style: core bit crown with casing threads.
- Wireline rod threads (rod shoe)
- Non-standard I.D. (Turns a shoe into a bit. Coresprings or soil baskets available)
- Custom O.D. And I.D. Can be built to your specifications.

Please ask about any size or style not listed.

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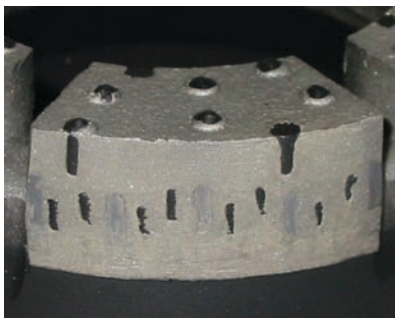
Polycrystalline Diamond Core Bits

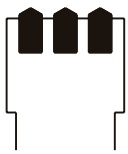
Exceptional features found in Diaset polycrystalline core bits:

- large 3 mm x 5 mm polycrystalline pins
- heavy duty outside and inside gauge (wear) protection. Tungsten carbide wear pads, plus large, strong gauge polycrystalline pins.
- for soft rock only

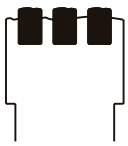


Polycrystalline bits are very tough, ideal for geotechnical crews with limited coring experience.

Large 3mm x 5mm polycrystalline diamond pins, won't dull or polish (in the correct application). This used bit shows the exposure that the polypins generate.



Profile of new bit. A portion of the polycrystalline pin protrudes from the free cutting matrix, the rest of the pin is embedded into the matrix.



As the bit wears, the pins wear while retaining exposure. The cylindrical shape of the pin results in even drilling characteristics throughout the life of the bit.

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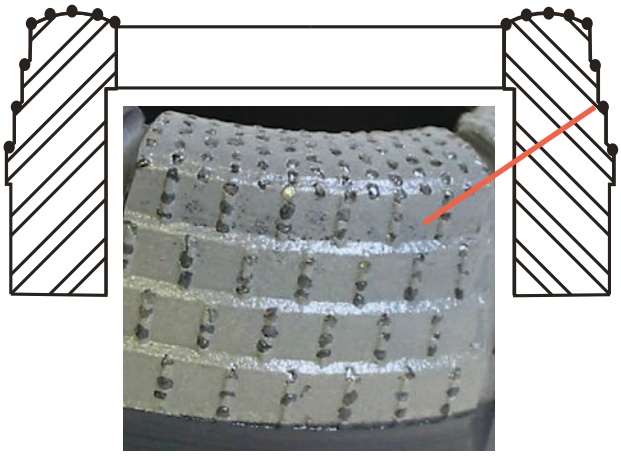
Fast Cutting Surface Set Core Bits

Surface set bits are characterized by:
- very fast cutting in SOFT rock
- low unit price - less than comparable impregnated tools.

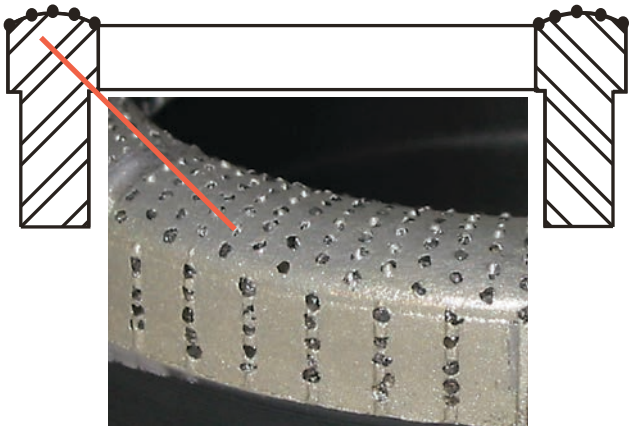
The price of premium natural diamond has become very reasonable, making surface set bits an excellent option for all soft formations, such as sandstones, shales, limestone, salt (potash) and similar formations.

CARBONADO type of unique polycrystalline natural diamonds can be used in diamond exploration work. They are exceptionally tough, and provide tremendous penetration rates and tool life in soft kimberlite type formations.



Multi-Step Profile
Recommended for "thick kerf" wireline drilling.
Customer may specify:
- diamond size and grade,
- # steps,
- # waterways (standard or face discharge)
- junk slots
- heavy duty gauge protection

Rounded Profile
Recommended for "thin kerf" wireline, conventional core bits or casing shoes.
Customer may specify:
- diamond size and grade,
- # waterways
- heavy duty gauge protection



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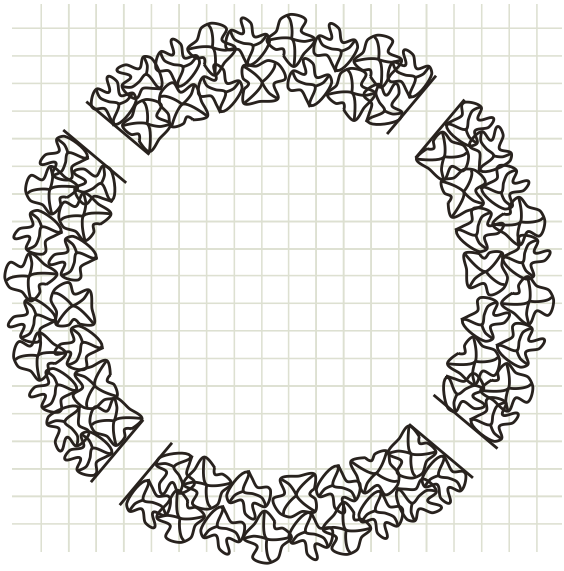
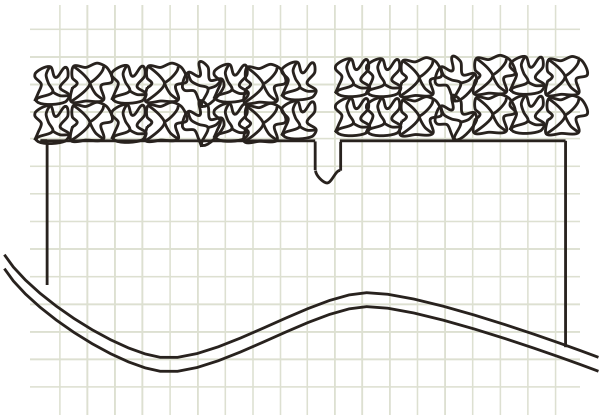
"Devil's Dread" Crushed Carbide Tools

"Devil's Dread" is the name we've given these tools; they are tough, cut fast, last long, and are priced much lower than diamond tools. Crushed agglomerated carbide tools (core bits and casing shoes) provide excellent service in clays, soft shales, sandstones and similar formations. The individual carbide pieces average 1/4" (6,5 mm) in diameter. They are highly irregular in shape, providing self cleaning, large cutting surfaces. The carbide pieces are brazed to the tool blank and to each other, resulting in an "impregnated" cutting action--as one carbide piece wears off, another sharp one below it is exposed and continues cutting. *These tools will mill stuck steel also!*

Sizes: "N" core and larger.



Typical crown pattern.
Aggressive carbide pieces agglomerated together with wide waterways to flush cuttings



Typical Devil's Dread profile.
The carbide is stacked 10 mm high providing "impregnated" style cutting.

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Innertube Parts Availablity

Innertube parts for 3 wireline systems and many types of conventional systems are available from DIASET.

The **"MW"** corelifter, a DIASET exclusive, is a well proven and recommended long-life alternative for thinwall wireline systems. **DIAMOND IMPREGNATED** corelifters are the longest lasting, toughest lifters available. Several wireline sizes are commonly used, minimum orders will apply.

Conventional Parts	WIRELINE INNERTUBE PARTS			
Hole Sizes: E to H **Systems:** most standard Metric TT & T2	**Hole Sizes:** A, B, N, H, P **Systems:** W/L Wireline	**Hole Sizes:** A, B, N **Systems:** TW, DBGM	**Hole Sizes:** N, H **Systems:** XB, CD3, CD4	**PRODUCT**
✗	✓	✓	✗	Landing Ring
✗	✓	✓	✗	Stabilizer
✗	✓	✗	✗	Stop Ring
✓	✓	✓	✓	Core Lifter Case
✗	✓	✓	✗	MW & Broached Lifter
✗	✓	✓	✗	Diamond Core Lifter
✓	✓	✓	✓	Slotted Lifter

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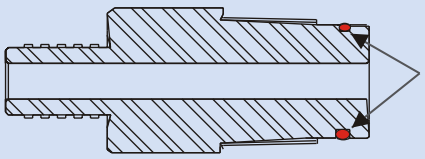
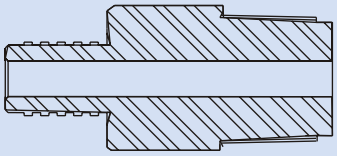
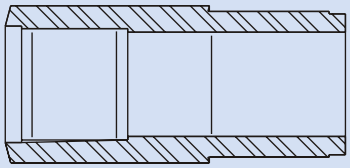
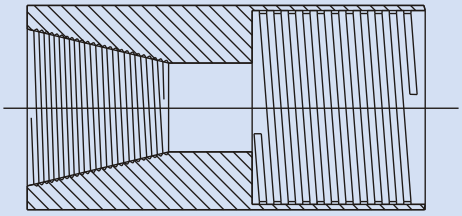
Subs & Adaptors

Diaset subs and adaptors are manufactured from premium 4130 steel alloy - outlasts mild steel by a factor of 2:1. Many standard drilling threadforms are available, as are combinations: pin to pin, pin to box, box to box. Illustrated below are some standard and exclusive designs.









DIASET (exclusive) "No-Leak"Pin Design.

O-ring on pin reduces spray - keeps drill crew dry and happy. Available on wireline and flush joint casing designs. ***Ask us about it!***

MANY THREAD FORMS AVAILABLE:

- HOLE & CASING SIZES: E, A, B, N, H, P, S
- MOST COMMON WIRELINE ROD THREADS
- ALL CONVENTIONAL ROD THREADS
- CASING THREADS: *W, *WT, *X
- API (REG.): 2 3/8 , 2 7/8 , 3 1/2 , 4 1/2

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

How to Select the Correct Diaset Core Bit

If drilling conditions are unknown, start with a Matrix #7X, Heavy Duty (HD) crown design

Selection Guide & Troubleshooting Tips

A Define rock hardness

1. **For softer rock:** (MOH's hardness to 5). Use lower matrix numbers #2X - #7X
2. **For very soft rock** (MOH's hardness to 3, use a PCD, Polycrystalline or Surface Set
3. **Harder rock:** Use higher matrix number #8X - 13X

B Define the degree of abrasiveness, fractures or breaks within a particular rock formation

1. Coarse grained and fractured: use a lower matrix number
2. Fine grained and solid: use a higher matrix number

C Define type of diamond drill used:

1. **High powered drills** (>100 h.p.), choose lower matrix numbers to maximize bit life.
2. **Low powered drills** choose a higher matrix number to get better penetration.
3. If ground or rig conditions force you to turn at lower RPM, then choose a lower matrix number. (Low RPM makes a matrix act differently)
4. Always use the highest RPM that suits the conditions.

D Tips for selecting the correct matrix type

If you started with a Diaset matrix #7X HD, and if productivity is too slow, try a #8X or higher matrix number. A Turbo crown design will cut the fastest in hard, solid rock. If bit life is too low, try a lower matrix number, such as matrix #6X. Review the troubleshooting guide to pinpoint specific formation problems, to help you fine tune for the selection of the next bit.

Call the factory or your representative for additional help.

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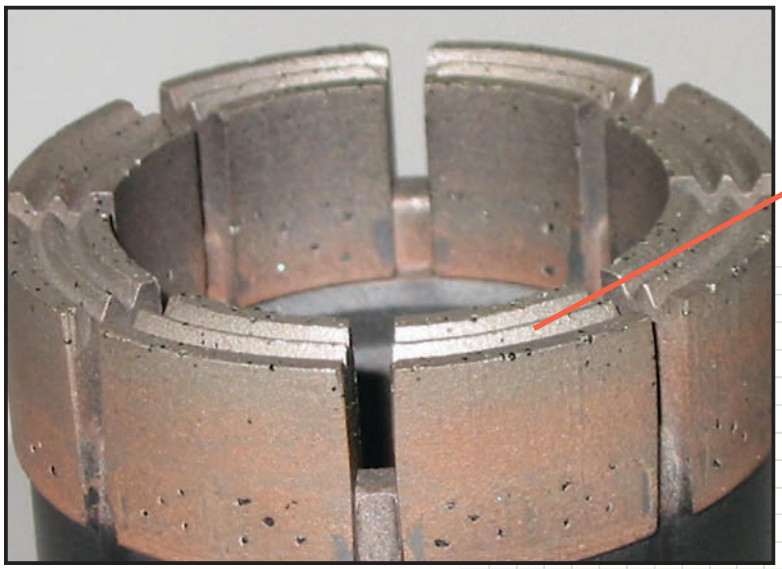
PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

New Bit & Normal Wear Pattern



New Bit Observation

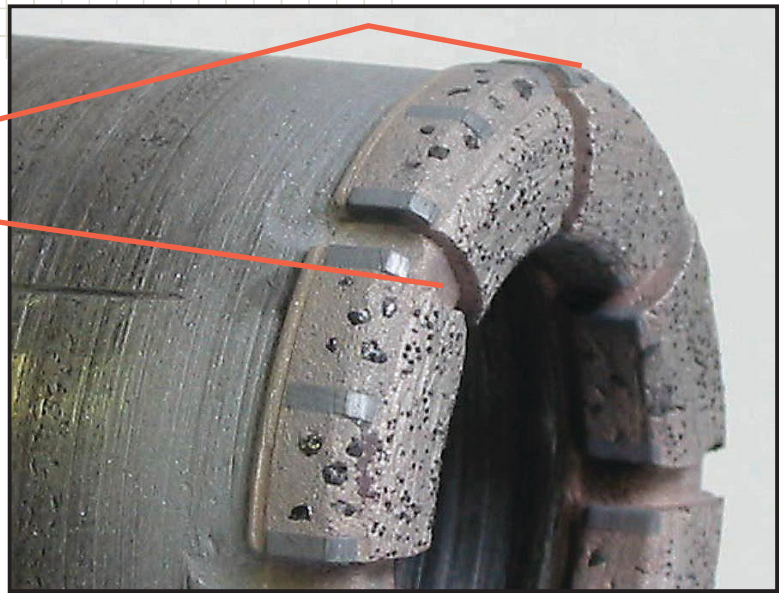
- v-ring pattern allows bit to start drilling quickly, stabilizes bit to bottom of hole.

Normal Wear

- O.D. and I.D. gauge intact
- flat to slight rounded profile
- "teardrop" matrix wear pattern behind diamond

Comments

- correct drilling procedure
- correct matrix selection



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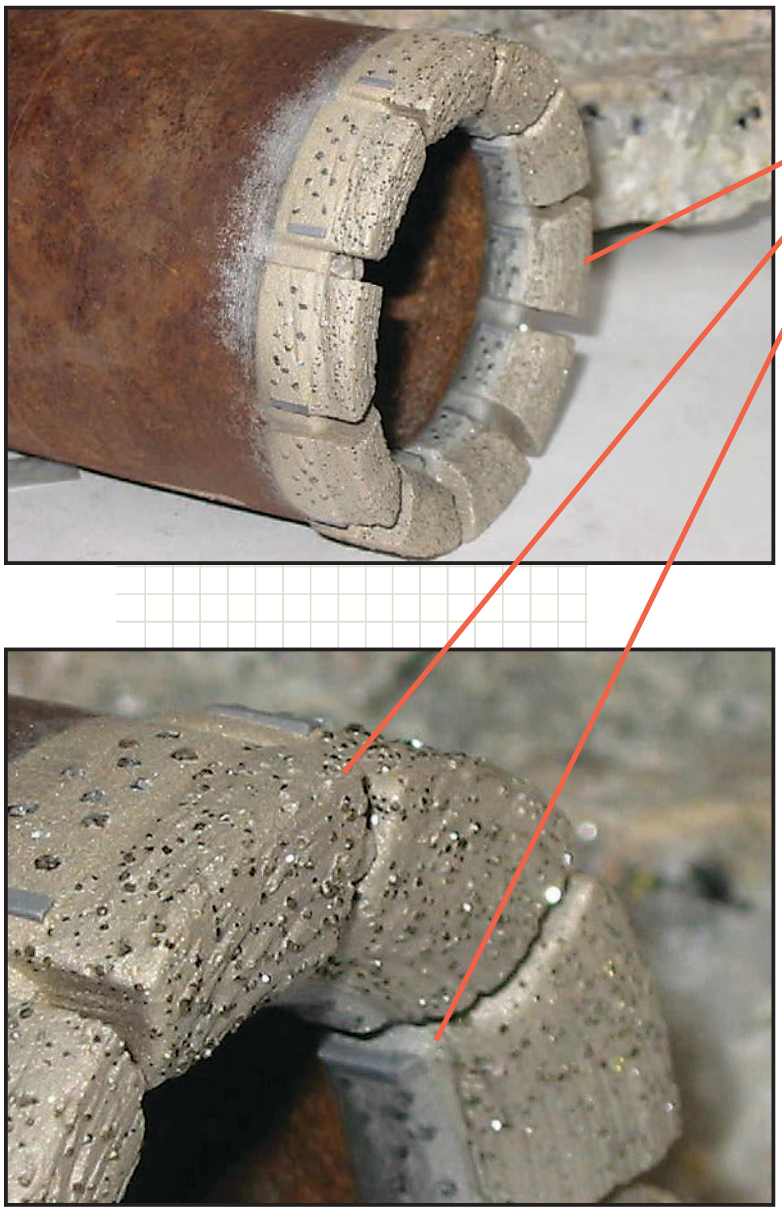
PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

I.D. Gauge Problems



Observations:

- rounded wear to I.D.
- excessive diamond exposure
- complete loss of I.D. gauge

Probable causes:

- Hard, broken or fractured formation
- excessive penetration rate for the RPM used
- insufficient fluid flow
- mis-latched innertube
- high bit load
- improper innertube adjustment

Possible solutions:

- retrieve innertube immediately upon core block
- clean hole properly before each core run
- use a harder (lower number) matrix
- increase pump output.
- check rod string for leaks, split rods
- adjust innertube to allow more fluid flow
- increase RPM

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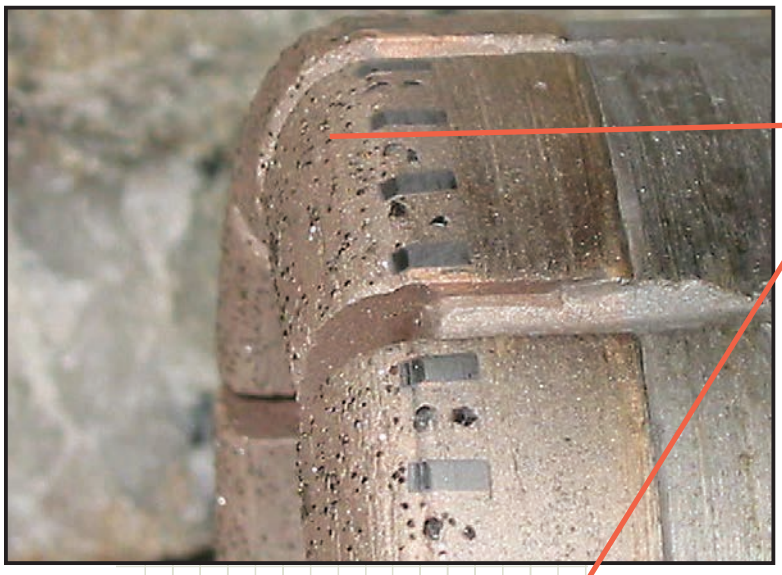
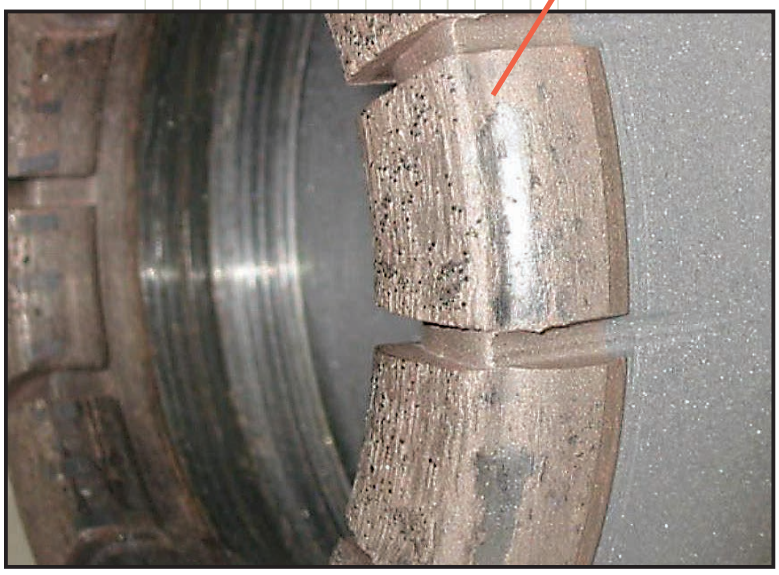
PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

O.D. Gauge Problems





Observations:

- rounded wear to O.D.
- complete loss of O.D. gauge

Probable causes:

- vibration
- excessive RPM
- bit reaming down an undersize hole
- bit following a worn bit
- insufficient fluid flow (attempting to make bit cut faster)

Possible solutions:

- alter RPM to reduce vibration. May have to change matrix to suit new RPM
- stabilize drill string
- adjust bit weight to reduce vibration
- check reaming shell, replace if undersized
- start drilling with new bit well before bottom of hole to ensure hole size matches new bit.
- increase fluid flow
- softer (higher number) matrix

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PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

Burnt & Polished Bits

Burnt Bit Observations:

- melted crown.
- diamonds and waterways fused

Probable causes:

- insufficient fluid flow
- split drill rod(s)

Possible solutions:

- check pump
- check innertube adjustment
- check rods for leaks or cracks
- increase fluid flow

Polished Bit Observations:

- no or poor diamond exposure
- smooth surface

Probable causes:

- wrong matrix selection, diamond concentration too high
- drill too small to push this bit

Possible solutions:

- use a softer (higher number) matrix
- try decreasing fluid flow rate slightly
- sandblast face of bit to expose diamonds
- maintain torque, keep the bit cutting