CORE CUT®

CORE BORE®

Diamond Tools and Equipment
Basic Training Booklet

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DIAMOND PRODUCTS®

Part # LIT0009

DIAMOND TOOL BASICS

3 RULES:

1. Use something hard to cut something soft / use something soft to cut something hard.
When cutting concrete (hard material) - use a softer bond.
When cutting asphalt (soft material) - use a hard bond.
Many factors change the bonds, but this is the basic building blocks for using diamond tools.

2. Start in the middle; then adjust.
Starting with a mid-range, general purpose bond makes it easier to dial-in the correct adjustments needed for which bond specification to be used for the most effective cutting.

3. Never say no!
This is the DIAMOND PRODUCTS advantage.
We can make a custom bond to match the exact application.

In soft material, diamonds hold their shape for a long time and do not fracture as quickly.

You want to hold on to those diamonds longer – a hard bond will do that in that soft material.

In hard material, diamonds fracture more quickly.

You want to release these and expose new diamonds faster – a soft bond will do that in hard material.

WHEN SEARCHING FOR THE RIGHT DIAMOND TOOL, ASK THE RIGHT QUESTIONS:

What Are You Cutting? (concrete, asphalt, green concrete, block, etc)

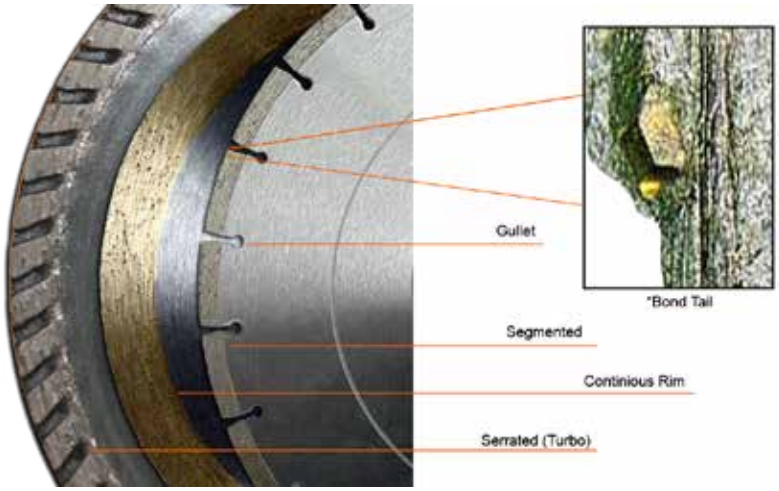
What Type of Saw Are You Using? (walk behind, high speed, masonry, etc)

What Size Blade Do You Need? (12”, 14”, 16”, etc)

Wet or Dry Cutting? (water or air cooling)

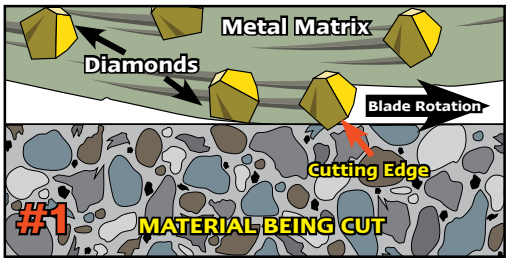
What Price Range?

TYPES OF DIAMOND BLADES



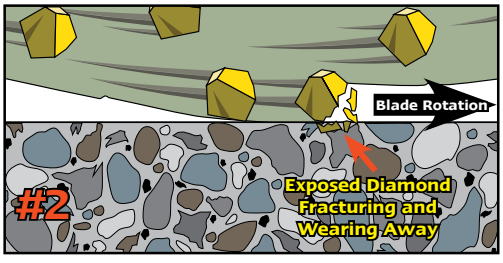
A diamond blade is circular steel disc with a diamond bearing edge. The edge or rim can have either a segmented, continuous or serrated rim configuration. The blade core is a precision- made steel disc which may have slots called 'gullets'. These provide faster cooling by allowing water or air to flow between the segments. These slots also allow the blade to flex. Blade cores are tensioned so that the blade will run straight at the proper cutting speed. Proper tension also allows the blade to remain flexible enough to bend slightly under cutting pressure and then go back to it's original position. Diamond segments or rims are made up of a mixture of diamonds and metal powders. The diamonds used in bits and blades are man made (synthetic) and are carefully selected diamonds are then mixed with powder consisting of metals such as cobalt, iron, tungsten, carbide, copper, and other materials. This mixture is then molded into shape and then heated at temperatures from 1700 to 2300 under pressure to form a solid metal part called the 'bond' or 'matrix'. The segment or rim is slightly wider than the blade core. This side clearance allows the cutting edge to penetrate the material being cut without the steel dragging against the sides of the cut. There are several methods of attaching the segments to the steel core. Brazing - Silver solder is placed between the segment and the core is then heated until the solder melts and bonds the two together. This method is used for wet cutting blades only. Laser welding- The diamond segment and steel core are welded together by a laser beam. Mechanical bond - A notched, serrated or texture blade core may be used to "lock" the diamond rim or segments onto the edge of the blade. Mechanical bonds usually also include brazing or other metallurgical bonding processes to hold the rim or segments in place. After the blade is assembled it is 'opened', 'broken in' or 'dressed' by grinding the edge concentric to the center. This exposes the diamonds that will be doing the work and establishes the cutting direction as noted by the direction arrow stamped into the blade.

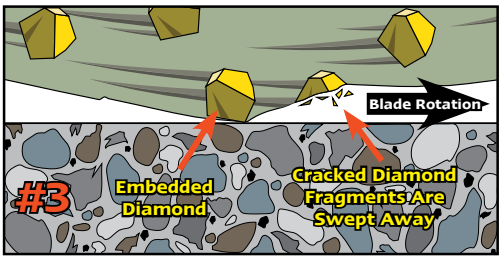
HOW DO DIAMOND CUTTING TOOLS WORK?



Diamond blades don't cut, they grind! The exposed diamond crystals do the grinding work. The metal matrix or bond holds the diamonds in place. Trailing behind each exposed diamond is a 'bond tail' which helps to support the diamond. As the blade rotates through the material the exposed surface diamonds grind the material being cut into fine powder

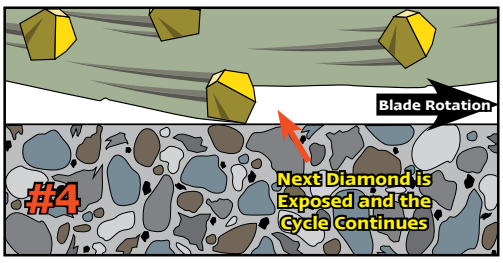
After several thousand passes through the material being cut the exposed diamonds begin to crack and fracture. The matrix holding the diamond also begins to wear away.





Eventually the diamond completely breaks up and it's fragments are swept away with the material that it is grinding.

As the old diamonds are worn down they are replaced by the new ones and the process continues until the blade is worn out.



FACTORS THAT AFFECT PERFORMANCE

AGGREGATES - TYPES AND HARDNESS

Factors Involving Concrete

When cutting concrete, several factors influence your choice of diamond blades. These include compressive strength. Concrete slabs may vary greatly in compressive strength, measured in pounds per square inch (PSI). Compressive strength in concrete is a measurement of the load carrying capability of concrete:

Concrete Hardness	**PSI**
Critically Hard	8,000 or more
Hard	6 8,000
Medium	4 6,000
Soft	3,000 or less

Most concrete roads are 4,000 - 6,000 PSI, while typical patios or sidewalks are about 3,000 PSI.

Hardness of the Aggregate

There are many different types of rock used as aggregate. Hardness often
varies even within the same classification of rock. For example, granite varies in hardness and friability (a measure of how easily a material crumbles) over a wide range of medium-soft to hard.

The Mohs scale is frequently used to measure aggregate hardness. Values of hardness are assigned from one to 10. A substance with a higher Mohs number scratches a substance with a lower number higher Mohs scale numbers indicate harder materials. The following table shows where some common minerals fall on the Mohs scale.

Mohs Scale

1 Talc	5 Apatite	9 Corundum
2 Gypsum	6 Feldspar	10 Diamond
3 Calcite	7 Quartz	
4 Flourite	3 Topaz	

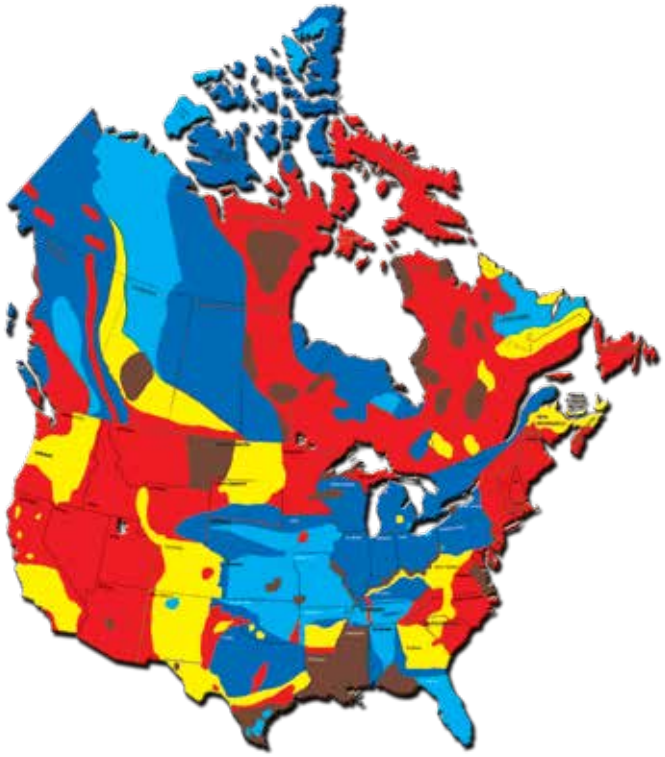
Most aggregates fall into the 2 to 9 range on the Mohs scale.

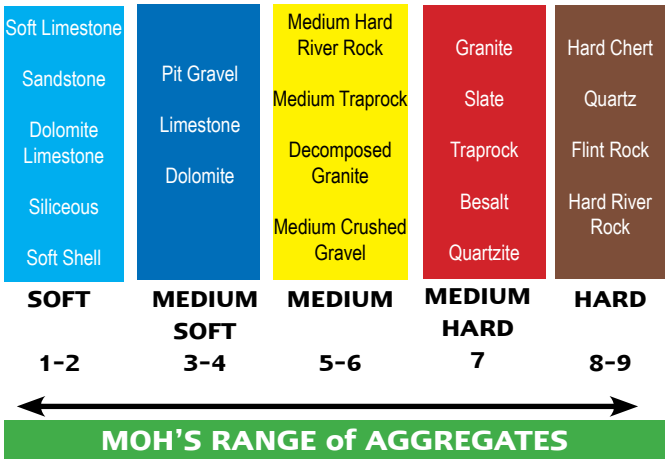
Aggregate hardness is one important factor when cutting concrete. Because hard aggregate dulls diamond more quickly, segment bonds generally need to be softer when cutting hard aggregate. This allows the segment to wear normally and bring new, sharp diamond grit to the surface. Softer aggregate will not dull diamond grit as quickly, so harder segment bonds are needed to hold the diamonds in place long enough to use their full potential.

Size of the Aggregate

The size of aggregate affects diamond blade performance. Large aggregates tend to make a blade cut slower. Smaller aggregates tend to make a blade cut faster. The most common standard sizes of aggregate are:

- Pea Gravel - variable in size, usually 3/8” or less in diameter
- ¾ inch - sieved size of ¾” or less
- 1-l/2 inch - sieved size of 1-1/2” or less





FACTORS THAT AFFECT PERFORMANCE

Compressive Strength

Concrete may vary greatly in compressive strength which is measured in POUNDS per SQUARE INCH (PSI). Most concrete roads are approximately 4-6,000 PSI, while typical patios and sidewalks are about 3,000 PSI.

Concrete Hardness	PSI	Application
Critically Hard	8,000 +	Nuclear plants
Hard	6-8,000	Bridge piers
Medium	4-6,000	HIghways
Soft	3,000 or less	Sidewalks/Patios

Types of Sand

Sand is the component of the mix which determines the abrasiveness of the concrete. Sand can either be 'sharp' (abrasive) or 'round' (non-abrasive). Crushed sand or bank sand are usually sharp; river sand is usually round.

Reinforcing Steel

Steel reinforcing tends to make a blade cut slower. Less reinforcing allows a blade to cut faster. Heavy rebar can also result from different grades of steel. Typical rebar is grade 40 but grade 60 is also common. Rebar gauges are in eighths of an inch. #4 is 1/2" diameter, #5 is 5/8" diameter, etc.

Size	Examples
Light	Wire mesh, single mat
Medium	#4 rebar, every 12" on center each way (OCEW) single mat, wire mesh, multi-mat
Heavy	#5 rebar, 12" OCEW, single mat #4 rebar, 12" OCEW, double mat

Green or Cured Concrete

The drying or curing of concrete greatly affects how the concrete will interact with a diamond blade. Green concrete is freshly poured concrete that has not yet cured. It is softer and more abrasive than cured concrete. Harder bond with undercut protection should be used in this application until it is cured at which point a softer bond would be appropriate. The definition of green concrete can vary widely. Water, temperature, moisture in the aggregate, time of the year and the amount of water in the mix all influence the curing time. It is generally considered "green" for 8 to 48 hours after it has set.

Horsepower and Variables

If a blade is used with a machine that does not have sufficient horsepower for the diamond / bond system, the blade will not perform well. Diamond particles will polish forming flat spots and the blade will become glazed. Typically flat saws range in power from 8 to 75 horsepower. In selecting a blade, manufacturers or distributors should be told what the horsepower of the saw is. Using a blade designed for low horsepower saws on a high horsepower saw will result in fast cutting rate and short blade life. Using a blade designed for high horsepower saws on a low horsepower saw will result in slow cutting rates, long blade life.

To summarize all of these factors that impact blade performance the following chart is presented.

Variables		Change	RESULTS	
			Cutting Speed	Blade Life
The Blade	Segment Bond Hardness	Harder Softer	Slower Faster	Longer Shorter
	Diamond Quality	Lower Higher	Slower Faster	Longer Shorter
	Diamond Concentration	Lower Higher	Slower Faster	Longer Shorter
	Segment Width	Thicker Thinner	Slower Faster	Longer Shorter
The Saw	Horse Power	Lower Higher	Slower Faster	Longer Shorter
	Blade Speed	Higher Lower	Slower Faster	Longer Shorter
The Job	Water Volume	Higher Lower	Slower Faster	Longer Shorter
	Cutting Depth	Deep Shallow	Slower Faster	Longer Shorter
	Cutting Pressure	Lower Higher	Slower Faster	Longer Shorter
The Material	Material Hardness	Harder Softer	Slower Faster	Longer Shorter
	Material Abrasiveness	Less More	Slower Faster	Longer Shorter
	Aggregate Size	Larger Smaller	Slower Faster	Longer Shorter
	Steel Reinforcing	More Less	Slower Faster	Longer Shorter

High Speed Hand Saw
Masonry Saw
Small Electric Hand Tools
Low HP Push Walk Behind

INTERMITTENT CUTTING

Walk Behind Saws
Wall Saws
Tile Saws
Block Saws

CONTINUOUS CUTTING

QUESTIONS OF DIAMOND QUALITY

LOW QUALITY SYNTHETIC DIAMONDS
- Weaker crystals with irregular shape
- Shorter life & lower cutting rates
- Lower thermal stability
- Does not handle steel & hard aggregates well
- Jagged points that break causing faster wear & lower cutting & drilling performance
- Widely used in lower priced dry products

MEDIUM QUALITY SYNTHETIC DIAMONDS
- Good crystal strength & shape
- Good for sawing & drilling applications
- Good cutting speed
- Handles moderate steel & hard aggregate applications

HIGH QUALITY SYNTHETIC DIAMONDS
- Strongest crystals
- Lasts longer
- Withstands high temperatures
- Octahedral shape for increased tool life & faster cutting
- High impact strength against steel & hard aggregate

SEGMENT HEIGHT VS. DIAMOND DEPTH

Diamond Segment

Segment Height: The overall measurement of the total height - diamond depth + backer pad
Diamond Depth: Diamond-bearing portion of a segment made up of the metal bond/matrix
Backer Pad: Bottom portion of the segment that has no diamonds which is the weld point of the segment.

DIAMOND PRODUCTS DRY HIGH SPEED QUALITY GRADES

High Speed Quality Grade	Quality Description	Segment Height	Diamond Depth
Delux-Cut	Basic Quality	.512”	.377”
Star Blue	Good Quality & Good Cutting Value	.472”	.394”
Standard Gold	Better Quality & Better Cutting Value	.472”	.394”
Imperial Purple	Better Quality & Very Good Cutting Life	.433”	.354”
X-tra Plus Red	Higher Quality & Long Cutting Life	.350”	.255”
Heavy Duty Orange	Very High Quality & Longer Cutting Life	.394”	.295”
Premium Black	Highest Quality & Longest Cutting Life	.350”	.255”

A QUESTION OF QUALITY

Do you want to know the PRICE or how much it will COST?

WHICH BLADE DO I SELL ?

Higher Quality Blades Offer Better Savings Down the Road

14" X .125 x 1"
Delux-Cut
$114
(list price)

APPROXIMATE
LIFE IN INCH FEET
(example)
1,000

COST PER INCH FOOT

$114
1,000

= .11 ¢ Per In. Ft.

INCH FEET TO BE CUT
25,000

= Cost per In Ft. x 25,000

= .11 ¢ x 25,000

= $2,750 Cost of Blades

14" X .125 x 1"
Imperial Purple
$392
(list price)

APPROXIMATE
LIFE IN INCH FEET
(example)
5,000

COST PER INCH FOOT

$$= \frac{\$392}{5{,}000}$$

= .08 ¢ Per In. Ft.

INCH FEET TO BE CUT
25,000

= Cost per In Ft. x 25,000

= .08/c x 25,000

= $2,000 Cost of Blades

14" X .125 x 1"
Heavy Duty Orange
$600
(list price)

APPROXIMATE
LIFE IN INCH FEET
(example)
10,000

COST PER INCH FOOT

$600
10,000

= .06 ¢ Per In. Ft.

INCH FEET TO BE CUT
25,000

= Cost per In Ft. x 25,000

= .06 ¢ x 25,000

= $1,500 Cost of Blades

Prices and inch footage shown are for example only and should not be used as a definitive amount.
Footage rates vary depending on quality grade, bond spec and multiple other variables.

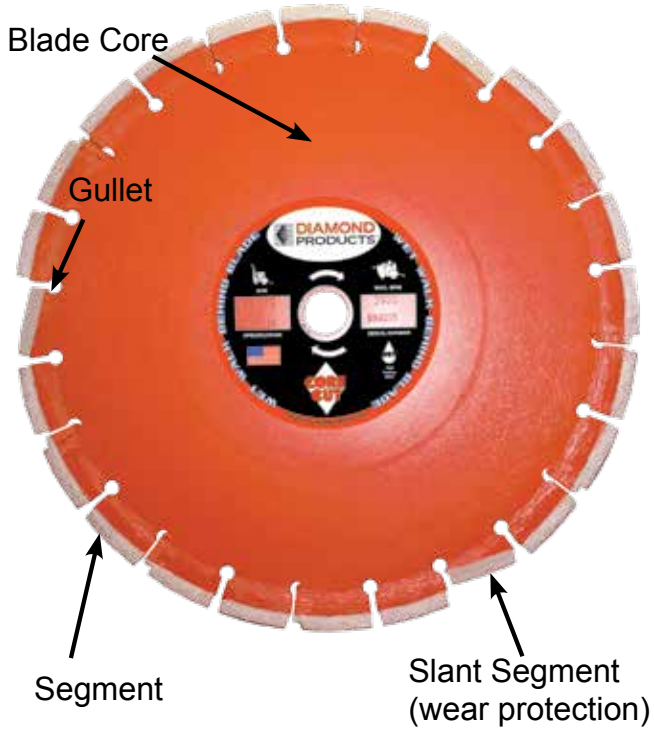
DIAMOND CUTTING FACTS

Walk Behind Wet Blades

Blade Diameter	Maximum Cutting Depth	Recommended Operating Speed RPM	Maximum Safe Speed RPM
12”	3-3/4”	2900	4500
14”	4-3/4”	2900	3900
16”	5-3/4”	2600	3400
18”	6-3/4”	2600	3000
20”	7-3/4”	2450	2700
24”	9-3/4”	1950	2250
26”	10-3/4”	1950	2100
30”	11-3/4”	1650	1800
36”	14-3/4”	1300	1500
42”	17”	1050	1300
48”	20”	900	1000

Segment- Metal matrix containing diamonds which are brazed or welded to the tube.
Slant Segment- helps prevent undercutting of the blade core. Other types of wear protection are: Full Radius and Inserts.
Gullet - laser-cut ‘keyway’ in the blade core that allows air cooling and gives space between segments.
Blade Core - The steel disc that makes up the main body of the blade which has an arbor hole in the center along with a drive pin hole.

Diamond Blade Components (Wet Blade Shown)



Dry Blades

Blade Diameter	Maximum Cutting Depth	Recommended Operating Speed RPM	Maximum Safe Speed RPM
4”	1”	9075	15000
4-1/2”	1-1/4”	8065	13300
5”	1-1/2”	7250	12000
7”	2-1/2”	5175	8725
8”	2-5/8”	4500	7650
10”	2-3/4”	3600	7500
12”	3-3/4”	3400	6300
14”	4-3/4”	3200	5400

Wall Saw Blades

Blade Diameter	Maximum Cutting Depth	Recommended Operating Speed RPM	Maximum Safe Speed RPM
18”	6-1/4”	2600	3000
20”	7-1/4”	2450	2700
24”	9-1/4”	1950	2250
30”	12-1/4”	1650	1800
36”	15-1/4”	1300	1500
42”	18-1/4”	1050	1300
48”	21-1/4”	900	1000
54”	24-1/4”	600	700

Masonry Blades

Blade Diameter	Maximum Cutting Depth	Recommended Operating Speed RPM	Maximum Safe Speed RPM
14”	5”	2550	3900
18”	7”	2300	3000
20”	8”	2300	2700
24”	10”	2300	2800

DIAMOND CORING FACTS

Segmented Core Bit Recommended R.P.M. Reference Chart

Bit Diameter	Minimum RPM	Maximum RPM	Ideal RPM
5/16"	7639	12736	10182
1/2"	4775	7960	6364
5/8"	3820	6368	5091
3/4"	3183	5307	4242
7/8"	2728	4549	3636
1"	2387	3980	3182
1-1/5"	1989	3317	2652
1-1/8"	2122	3538	2828
1-1/4"	1910	3184	2545
1-3/8"	1736	2895	2314
1-1/2"	1592	2653	2121
1-5/8"	1469	2449	1958
1-3/4"	1364	2274	1818
1-7/8"	1273	2123	1697
2"	1194	1990	1591
2-1/4"	1061	1769	1414
2-3/8"	1005	1676	1340
2-1/2"	955	1592	1273
2-3/4"	868	1447	1157
3"	796	1327	1061
3-1/4"	735	1225	979
3-1/2"	682	1137	909
4"	597	995	795
4-1/4"	562	937	749
4-1/2"	531	884	707
5"	477	796	636
5-1/2"	434	724	579
6"	398	663	530
6-1/4"	382	637	509
6-1/2"	367	612	490
7"	341	569	455
8"	298	498	398
9"	265	442	354
10"	239	398	318
12"	199	332	265
14"	171	284	227
16"	149	249	199
18"	133	221	177
20"	119	199	159
22"	109	181	145
24"	99	166	133
26"	92	153	122
28"	85	142	114
30"	80	133	106
32"	75	124	99
34"	70	117	94
36"	66	111	88

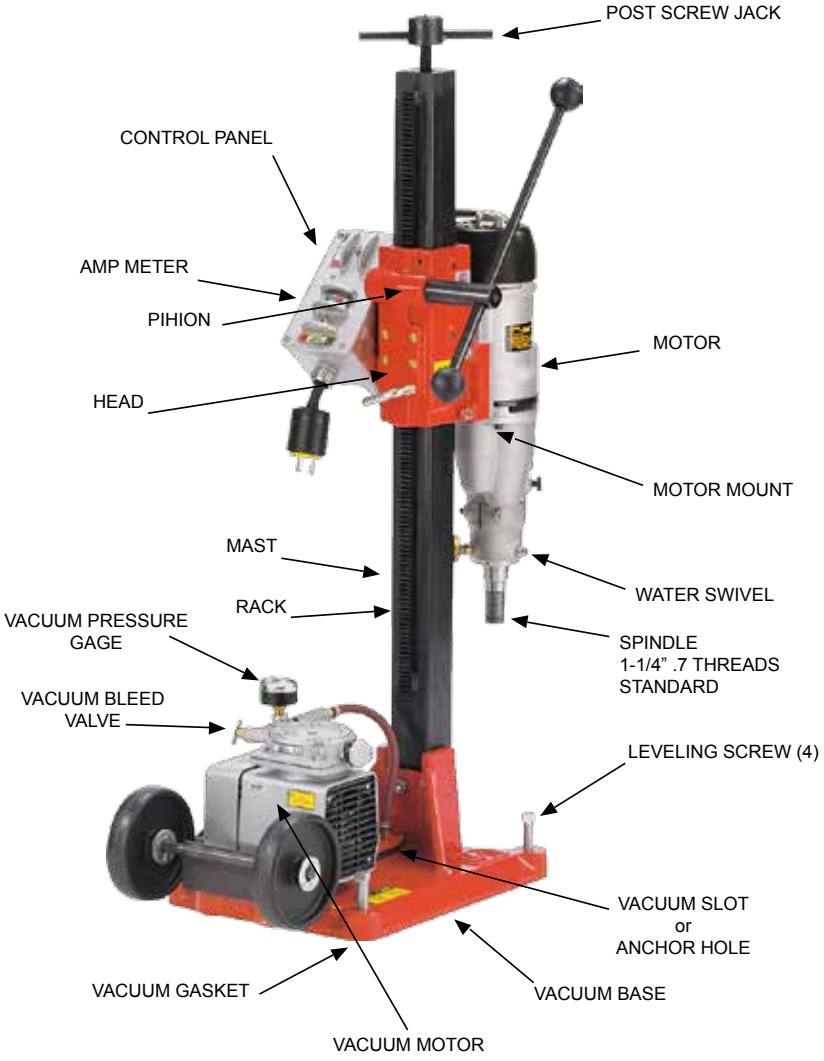
SEGMENT- Metal matrix containing diamonds which are brazed or welded to the tube.

WATERWAY- Allows cooling water to reach the cutting surface.

TUBE OR BARREL- Normally 14” in length with 13” core depth.

HUB- 1/2” to 1-1/2” threads 5/8-11 1-5/8 and up threads 1-1/4-7

KERF- Width of segment. Normally .145”



YOU AND YOUR HAND SAW

Inspection - Before Running Your Hand Saw

Attachments
Never modify a saw. Use only attachments expressly approved by the saw manufacturer.

Drive Stafts and Flanges
Check driveshaft threads for damage. Check that contact surfaces on diamond blade and flanges are flat, run true on the arbor and are free of foreign materials. Do not use flanges that are different sizes, warped, nicked or dirty.

Diamond Blade
Type - Check that blade is approved for hand-held, portable, high speed, cut-off saws. Do not exceed the maximum operating speed of the blade.
Damage - Inspect the blade for cracks or other damage. Do not use a wheel that has been dropped. This throws it out of tension and can cause damage to you and your saw.
Mounting - Do not use a blade that is too loose or too tight on the saw. Follow all blade mounting specifications in the operator's manual.

Blade Guard
Check blade guard for cracks or other damage. Clean inside of guard before installing new blade. Check that guard can be adjusted and locked.

V-Belt and Covers
Check that the belt has the right tension. Check that covers are in place, tight, undamaged and that belt does not rub on them.

Vibration Isolation Elements
Check that the vibration elements are in place and undamaged.

Air Filter
Clean all air filters and pre-filters ever time you refuel.

Cooling Vents
Check all cooling passages and cylinder fins are clean.

Saw Body
Inspect power head and cutting arm for wear or damage. Check all components to be sure fasteners are tight.

Blade Sharpening
Diamond blades can be dulled by using wrong feed pressure or by cutting certain materials such as heavily reinforced concrete. Forcing a dull blade will cause overheating and eventually loss of segments.
Blade Vibration - The blade may become out of round and vibrate if too high a feed pressure is used or if blade is jammed into the cut. Lower feed pressure should stop the vibration. If it does not, discontinue use and replace the blade.
Drive Shaft RPM - At regular intervals, use a tachometer to check drive shaft RPM with saw at operating temperature, at full throttle and under no load. Maximum RPM is marked on the blade and the saw.

CARE AND STORAGE

High speed hand saws are rugged and dependable. However, since they are used in high-speed cutting operations, all service must be done when and how it is supposed to be done so the saw will operate effectively and safely.
Always handle saws carefully and store them with the blade removed. Protect them from temperature and moisture extremes. All diamond blades should be removed from the saw after use and carefully stored. Special care should be taken with abrasive wheels. Abrasive wheels should be stored on a firm, level surface. Avoid moisture and temperature extremes. Remove wheels before moving or transporting saw. Inspect new blades and wheels for handling or storing damage before use.

Operation - Hand Held Saws

General
A cut-off saw must be used by a trained, alert operator wearing protective clothing and equipment. A cut-off saw must be used only after the most careful inspection and must be used and maintained with extreme care.

The Operator
Never use a cut-off saw unless you are fully instructed in its use.

Physical Condition
Do not work when tired, under stress or under the influence of any medicine, drug or alcoholic beverage. If you tire while operating the saw, take a break.

Operation
· Check operator's manual for proper fuel mixture. Running the saw on straight gas will cause a major breakdown.
· Fill tank outdoors at least 10-feet away from cutting area.
· Wipe up any spilled fuel and check for leakage.
· Place saw in an open area, cleared of all objects, on a firm, level surface at least 10 feet away from where it was fueled.
· Your cut-off saw is strictly a one-person saw. Make sure no one else is near the saw, but make sure there is someone near the area in case of accident.
· Set blade-guard so the rear section is close to work, directing particles away from the operator.
WARNING! Never use a saw without the blade guard. Always make sure the guard is undamaged, unmodified and adjusted for the work piece.

Starting
WARNING! Never drop start; you may lose control of saw
WARNING! Never start saw with wheel in cut. This could cause kickback and serious injury.
WARNING! On cold starts, wheel will turn as soon as engine is started.
· Hold saw so that wheel does not touch anything, including the ground.
· Make sure you have a good balanced stance with good footing.
· Use starter grip and after pulling, let starter rewind fully. Don't warp starter rope around your hand or let starter rope snap back. Injury to yourself of damage to starter could result.
· Check when you release the throttle control, engine RPM drops and returns to idle by itself. Check that wheel does not move when the engine is idling.
· Check that stop control stops engine.
· Before cutting, run saw at no load under full throttle for 30 seconds to check that blade runs evenly. **WARNING! Do not use a blade that wobbles or pounds.**

Cutting
· Support work piece so that you know what to expect while cutting and so it will not bind.
· Always cut at wide open throttle.
· Start cut gently, do not bump or jam wheel.
· Use high speed blades at the correct RPM.
· Move blade slowly back and forth as you cut.
· Use small portion of blade's cutting edge.
· Only use cutting edge (segments) of blade for cutting.
WARNING! Absolutely never cut with the side of the wheel. It will damage the blade core and will cause sever injury to the operator. Do not use the side of an abrasive wheel, it will break and cause severe injury to the operator.
· Cut with blade straight up and down - at right angle to the work piece.

YOU AND YOUR WALK BEHIND SAW

Walk Behind Saws

Preventative Maintenance

1. Lubricate the blade shaft bearings daily using high quality grease.
2. Check engine oil level daily. Keep oil clean and at "FULL" level. DO NOT overfill.
3. Grease the depth screw feed assembly weekly (screw feed models)
4. Air filters must be checked frequently and cleaned every day when dry cutting.
5. The high quality V-belts used on the Diamond Products walk behind saws are properly tensioned at the factory. DO NOT overtighten as this could damage blade shaft bearings and engine crankshaft bearings. To adjust belt tension, loosen engine mounting bolts and move engine with belt adjustment screw. When installing new belts, DO NOT attempt to stretch over pulleys.
6. Keep saw clean and free of cutting slurry for ease of maintenance.
7. DO NOT transport saw the blade mounted on the blade shaft. DO transport saw resting on shaft guard and NOT on front wheels.

Walk Behind Saw Start-Up

For instructions on starting, warm up and engine break in, refer to the operator's manual.

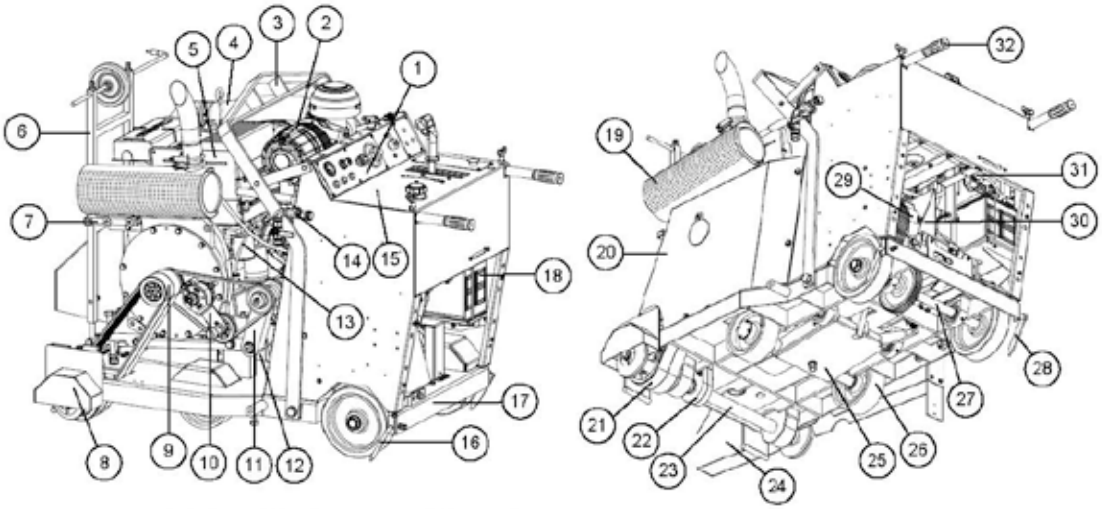
1. Always let engine to warm up at fast idle briefly before going to full power.
2. After engine warm up, always cut with engine at full power.
3. Always operate engine briefly at idle speed before stopping it.

Mounting the Blade

1. Raise machine to assure that the blade will clear pavement when installed.
2. Remove spindle nut and blade collar (flange).
3. Mount blade on shaft and replace flange and nut. The drive pin in the outer blade flange must go completely through the blade into matching hole on the inside blade flange.
4. Tighten nut with wrench provided with saw.
5. DO NOT operate saw without blade guard in place.
6. Whenever possible, cut from the right side of saw.

Operating Instructions

1. Be sure to use the correct Diamond Products blade for the material being cut. The correct blade will make a marked difference in the blade life and saw performance.
2. Cut only as deep as the specifications require. This will save blade life and reduce sawing costs.
3. Cut in a straight line. Mark the cutting line clearly so that the saw operator can follow without difficulty. DO NOT attempt to make curved cuts.
4. Connect saw to water supply.
5. Start engine and allow to idle briefly before going to full power.
6. With saw running and water supply on, position saw over line to be cut. Lower blade into the cut by slowly turning the depth feed handle to the LEFT. When blade reaches the desired depth of cut, lock handle with latch. When using a power raise/lower model, push button until blade hits the surface and lower to the desired depth.
7. With blade at desired depth of cut, allow engine to regain full power before moving ahead. Push forward steadily at a rate of speed that allows engine to run at or near maximum RPMs.
8. To maneuver saw from one cut to another, always raise blade as high as required to clear pavement.
9. If saw should stall for any reason, raise the blade completely out of cut before starting engine again.
10. When lowering blade into a partially made cut, use extreme care to be certain the blade is perfectly aligned within the existing cut.
11. At end of cut, bring, blade out of cut by turning screw feed handle to RIGHT. (screw feed models)
12. If you are cutting more that 2" deep, you can finish the job in less time and effort by step cutting in 2" increments. Cut a 2" depth on the first pass, 4" depth on the second and so on. On repeated passes, the blade will tend to follow the previous path.
13. DO NOT cut all the way through the material (concrete or asphalt) as it will cause rapid blade wear. While this does not damage the machine, gravel and sand that underlies most pavement will eat away at the blade. Lower the blade until you notice mud and sand in the water, then raise the blade one full turn of the crank.



1. Instrument Panel
2. Air Intake
3. Frame Lift
4. Air Intake
5. Engine
6. Front Pointer
7. Pointer Stop
8. Flange Guard
9. Power Take-Off (PTO)
10. Rotary Tensioner
11. Transmission Jackshaft
12. Hydraulic Cylinder
13. Throttle Cable
14. Water Valve
15. Fame Upright
16. Rear Pointer Rod
17. Frame Base
18. Battery
19. Muffler
20. Belt Guard
21. Belt Drive
22. Shaft Tachometer Gear
23. Blade Shaft
24. Blade Guard
25. Front Axle
26. Front Wheels
27. Rear Axle
28. Rear Pointer
29. Transmission
30. Rear Drive
31. Hydraulic Pump
32. Handlebars

Example Components of a Walk Behind Saw

SAFETY SYMBOLS

Always look for symbols when on a job site. Adhere to the rules and warnings of all symbols and instructions. Always wear Personal Protective Equipment (PPE) when working with diamond tools and equipment.

Please read the instructions for use prior to operating the machine for the first time.
Antes de la puesta en marcha, lea detenidamente las instrucciones y familiarcese con la maquina.

Prohibited
Prohibicion

Warning
Triangulo de advertencia

Wear Eye Protection
Usar gafas de proteccion

Wear Head Protection
Usar casco de proteccion

Wear Breathing Protection
Usar mascara de proteccion

Ear Protection Use is Mandatory
Es obligatorio el uso de proteccion auditiva

Hard Hat is Mandatory
Es obligatorio el uso de casco duro

Safety shoes are mandatory
Es obligatorio el uso de zapatos de seguridad

Fall protection is mandatory
Es obligatorio el uso de ropa adecuada

Use in Well Ventilated Area
Utilizzare in presenza di un'adeguata ventilazione

Danger, Poison Exhaust Gas
Peligro, gases de escape toxicos

Do Not Use in Flammable Areas
No usar en areas inflamables

No Non-Working Personnel in Area
Prohibido para personas ajenas a la obra

Motor Off
Parar el motor

Keep All Guards in Place
Mantenga siempre las protecciones de la hoja en su sitio

Danger ! Keep Hands Away From Machinery
Máquina peligrosa- Matenga manos y pies alejados de la maqunia

No Smoking
No fumar

SAFETY AND YOUR EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT

Operations such as wall sawing, core drilling, slab sawing, chain sawing, hand sawing and wire sawing may present noise exposures that exceed an eight-hour, time weighted average of 85 dBA. Operators should not be subject to noise levels in excess of the following noise level limits without proper hearing protection.

Duration (in hours)	dBA Decibel
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

Hand Saw Kickback

Saw kickback can occur extremely fast and with great force. Failure to comply with the following rules can result in severe or fatal injury to the operator. The diamond blade may climb in the cut and result in kickback. Applying too much feed pressure can contribute to this. If too much feed pressure is being used, it can be more difficult to control the kickback.

To Avoid a Kickback

1. Always cut in a 90 degree, perpendicular to the ground.
2. Keep good balance and footing.
3. Use both hands and keep firm grip with thumb and fingers encircled.
4. Keep work piece at a comfortable distance when cutting.
5. Run saw at full throttle.
6. Be careful when re-entering the cut.
7. Never cut above shoulder height.
8. Be alert to shifting of work piece or anything that could cause cut to close and pinch the blade.

Ladders

The American National Standards Institute (ANSI) adopted and issued a code of safety requirements for portable ladders. The code, last revised in 1982, sets out the properties and design specifications for wood (A14.1), metal (A14.2), and reinforced plastic (A14.5) ladders. Completed ladders must also be capable of pass a variety of test requirements as set out in the code.

ANSI TYPE *	DUTY RATING **	DESCRIPTION
TYPE 1A	300 lbs.	Extra heavy duty industrial
TYPE I	250 lbs.	Heavy duty industrial
TYPE II	250 lbs.	Medium duty commercial
TYPE III	200 lbs.	Light duty household

* OSHA essentially follows the guidelines set by ANSI. Therefore, industrial users should purchase and properly use TYPE 1A and TYPE I ladders to be in compliance with OSHA regulations. TYPE II and TYPE III are NOT permitted on the job site.

**The Duty Rating means that the ladder is designed to meet these loads with a safety factor of four (4) when set and used properly at 75-1/2" to the horizontal.

SAFETY RULES

These rules apply to the operations related to concrete sawing and drilling. These are brief summaries of safety issues and are not all-inclusive for safety and procedures for these operations. Read and understand your operator's manual for each piece of equipment that you will be operating.

Flat Sawing

1. Check with the owner or hiring contractor to identify any electrical lines, gas lines or other hazards that may be located under or in the slab that will be cut.
2. Shut off any utilities that may be damaged by the slab sawing.
3. Ensure the machine is working properly and the blade is appropriate for the material and the RPM requirements.

Core Drilling

1. Check with the owner or hiring contractor to identify any electrical lines, gas lines or other hazards that may be located in or under the slab or in or behind the wall that will be cored.
2. Secure base of the rig stand to prevent movement during coring operations.
3. Provide for proper protection below the coring area to prevent any persons from being struck by the falling core. A spotter is recommended.
4. If you are using a vacuum to secure a rig to a wall, you must have another way to secure the rig in case power were to be cut off or shut down during drilling.

Wall Sawing

1. Check with the owner or hiring contractor to identify any electrical lines, gas line or other hazards that may be located in or under the slab or in or behind the wall that will be cut.
2. Check both sides of the wall prior to setting up.
3. Provide necessary barricades and warning lines on the opposite side of wall.
4. Determine wall thickness; strap and wedge the wall to prevent premature tip-out.
5. Check both sides of the wall prior to tipping out the section. Use a spotter on the backside to prevent anyone from being struck by the wall section.

Safe Blade Installation Procedures

· Raise the saw high enough to allow clearance for mounting the blade.

· Before starting the mounting procedure, make sure the ignition switch is OFF or the engine kill switch is in the stop position.

· With electric or hydraulic powered saws, make sure the saw is disconnected from the power source.

· Remove the blade shaft nut or bolt and the outer collar or flange.

· Inspect both flanges and the arbor shaft for damage, nicks and burrs. The inner flange should be tight on the shaft.

· Slide the blade onto the arbor shaft. it should fit snugly. DO NOT force it, alter the arbor hole or file the blade shaft to force it to fit.

· If it does not fit, either there is damage or you have the wrong blade. Inspect the shaft for grooves caused by saw blades.

· Check to make sure the inside and outside flanges are of the same diameter, not excessively worn and free form concrete buildup.

· Align the blade so the pin on the flange is placed through the drive pin hole on the blade and into the inner flange. hand-tighten the mounting nut or bolt with the pin in the hole.

· Prior to wrench-tightening the blade shaft nut, grasp the outer edge of the blade and rotate it up toward the back of the saw to remove any clearance between the drive pin and the drive pin hole.

· Tighten the blade nut securely, according to the operator's manual, using the proper wrench. Before starting the saw, make sure the blade guard is installed properly and will not interfere with the blade. Again, NEVER attempt to operate a saw without a blade guard.

· Before sawing, check for missing or loose nuts and bolts, and check any drive belts. Tighten or replace them if necessary.

HYDRAULIC INFO AND TROUBLE SHOOTING

HYDRAULIC MOTOR RPM CHART – MAXIMUM RPM WITH CUBIC INCH DISPLACEMENT & GPM COMBINATIONS

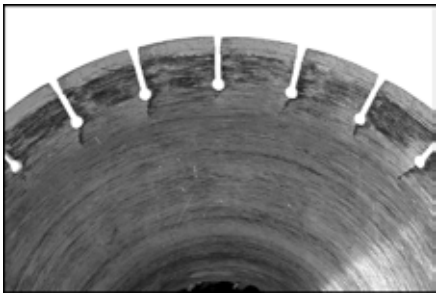
	Danfoss Motor				Char-Lynn Motor								White Motor	
Cubic Inch	.77	1.16	1.55	1.94	4.9	6.2	8.0	9.6	11.9	14.9	18.7	24.0	32.0	45.6
Part #	4250012	4250013	4250014	4250015	4250008	4250007	4250006	4250005	4250004	4250002	4250000	4250003	4250010	4250011
Cat #	01836	01837	01838	01839	01833	47655	01832	01831	01830	01828	01826	01829	01834	01835
8 GPM	2640	1680	1232	973	377	298	231	193	155	124	99	77	58	41
12 GPM	N/A	2520	1848	1459	566	447	347	289	233	186	148	116	87	61
20 GPM	N/A	N/A	N/A	2553	990	782	606	505	408	326	259	202	152	106
25 GPM	N/A	N/A	N/A	N/A	1226	969	751	626	505	403	321	250	188	132

To choose the right hydraulic motor for your application, follow this formula: Closest G.P.M. of your power unit + closest RPM of core bit on the Bit RPM chart above and match these values on the chart above to get the Cubic Inch of the motor you need.

HYDRAULIC TROUBLE SHOOTING

Problem	Symptom	Pressure Reading Power Unit	Flow & Pressure on Test Kit	Cause	Solution
No blade rotation		0 or maximum Maximum psi		Hydraulic quick coupler not connected: wall saw internal damage 'locked up'	Inspect, connect as necessary, test disconnect from hydraulic system, test by hand to locate problem
	Pump noise	0 psi	Pump shaft failed - pump not rotating		Remove pump to inspect - repair as needed
Blade rotates but with major power loss	Excessive system temp. - pump or meter may be noisy	Maximum psi, but slow gauge response under blade stall	Partial to full flow, but psi slow response maximum flow, maximum psi	Excessive aeration in hydraulic oil or pump cavitation	Refer to pump service manual
	Excessive hose vibration	Maximum psi, but slow gauge response under blade stall	Partial to full flow, but psi slow response	Hydraulic meter fail, excess internal slippage - noisy Pump failure - excess internal slippage shaft failure	Repair or replace as necessary
Blade rotates but with major power loss	minor heat buildup, no blade	Difficult to maintain 1250 psi and over stalling blade	Maximum flow Maximum psi	Blade polished can not utilize horsepower output from saw	Replace blade or attempt to 'open up' segments but running in abrasive material
Blade rotates but with major power loss	No heat buildup, no noise, oil to compensator when hose fitting checked	300 psi or less	12 gpm or less 300 psi or less	Stuck flow compensator spool	Remove and clean as necessary - inspect on removal to prove cause
		Maximum psi	Flow less than max psi	Worn flow compensator spool or weak spring on flow compensator spool	Adjust to correct reading or replace
		Maximum psi or less than max	Less than max flow or pressure or less than max on both	Misadjusted compensator spools	Adjust to correct specifications
	No oil to compensator when hose fitting checked	300 psi or less	12 gpm or less 300 psi or less	Sensing hose obstructed or sensing hose not connected	Repair or replace Inspect and correct
	Aerated oil to compensator when hose fitting checked	300 psi or less, but erratic	12 gpm or less 300 psi or less but erratic	Aeration in hydraulic oil or air inclusion in sensing line	Refer to pump aeration cause and solution or bleed sense line
	No heat buildup, no noise oil to compensator when hose fitting checked	300 psi or less	12 gpm or less 300 psi or less	Stuck pressure compensator spool	Remove and clean as necessary - inspect on removal to prove cause
		Less than maximum, slow response on stall	Full flow, but less than maximum psi, slow response	Weak spring on pressure compensation spool - worn pressure compensator spool	Adjust to correct reading or replace compensator assembly

TROUBLE SHOOTING DIAMOND BLADES



BURNING

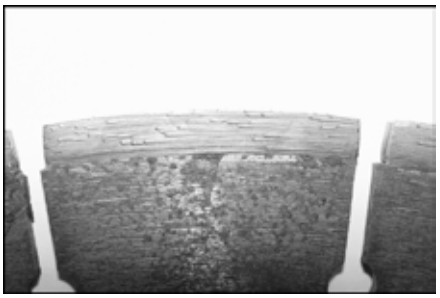
CAUSE: Insufficient coolant (water) at the cutting surface of a wet cut core bit or blade

REMEDY: Increase the flow of water and check for proper direction of the water to the cutting surface.

Insufficient cooling (air)
Allow the blade to cool every few feet of cut by running it at full speed outside of the cut.

CAUSE: Blade is too hard for material being cut (Wrong Spec.) Bond will not wear away to expose new diamonds.

REMEDY: Choose a softer bond.



BLADE WILL NOT CUT (GLAZING)

CAUSE: Material being cut is too hard.

REMEDY: Dress or sharpen the blade with a soft concrete block or old abrasive wheel to expose new diamonds. If continual dressing is needed change to a softer bond.

CAUSE: Insufficient power to permit blade to cut properly.

REMEDY: Check and tighten belts and make sure adequate horsepower is available for application

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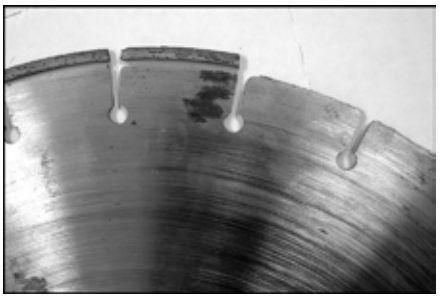
CAUSE: On stone or masonry blades the material may not have been held firmly which allowed the blade to twist or jam.

REMEDY: Material must be held firmly.

CAUSE: Overheating due to an inadequate supply of water. Look for burning or discoloration near missing segments.

REMEDY: Provide adequate supply of water.



SEGMENT LOSS

CAUSE: Undercutting which wears away blade core and weakens the weld between segment and core.

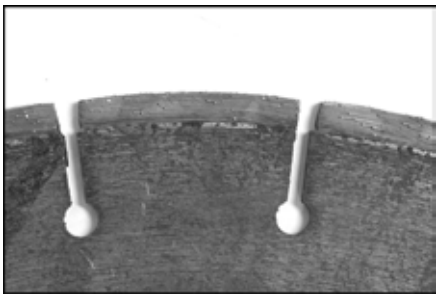
REMEDY: Increase water supply and if material being cut is very abrasive switch to water-resistant cores.

CAUSE: Blade is too hard for material being cut causing excessive dull-ness and the segment separates because of impact, fatigue or frictional heat.

REMEDY: Use the proper blade specification for material being cut.

CAUSE: Worn shaft bearings on saw which allows blade to run eccentric.

REMEDY: Install new bearings



WORN OUT OF ROUND

CAUSE: Engine not properly tuned which causes “hunting”.

REMEDY: Tune the engine

CAUSE: Blade arbor hole is damaged.

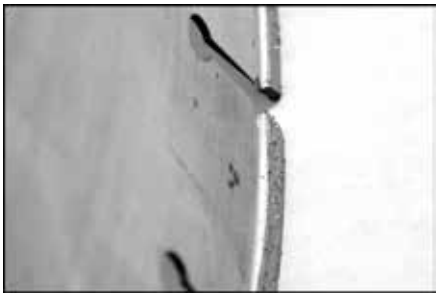
REMEDY: If blase is in good condition the core may be re-bored.

CAUSE: Blade mounting arbor busing or is the wrong size.

REMEDY: Replace worn arbor busing or arbor shaft.

Bond is too hard for material causing machine to “pound” at regular intervals, thereby wearing one half of the blade more than the other half

TROUBLE SHOOTING DIAMOND BLADES



UNDERCUTTING

CAUSE: A condition in which the steel core wears at a faster rate than the diamond segments. It is cause by highly abrasive material grinding against the core.
REMEDY: The blade core should be equipped with undercut protectors or segments.

CAUSE: Blade is used on a misaligned saw.
REMEDY: Check for proper saw alignment.

LOSS OF TENSION

CAUSE: Blade is excessively hard for the material being cut.
REMEDY: Correct bond spec.

CAUSE: Material slippage causing blade twist.
REMEDY: Maintain a firm grip on material while cutting.

CAUSE: Undersized or mismatched blade collars.
REMEDY: Minimum 3-7/8” - 4-1/2” on concrete saws, 6” Minimum on blades over 30”.

CAUSE: Blade used at improper RPM.
REMEDY: Check shaft RPM.

CAUSE: Improper mounting on arbor shaft allows collars to bend blade when tightened.
REMEDY: Make sure blade is securely on arbor shoulder until outside flange and nuts are firm.

ARBOR OUT OF ROUND

CAUSE: Blade collar is not properly tightened allowing it to turn or rotate on the shaft.
REMEDY: Tighten collars.

CAUSE: Worn or dirty collars which do not allow proper blade clamping.
REMEDY: Clean and replace if necessary.

CAUSE: Blade not properly mounted.
REMEDY: Rebore arbor hole if within tolerances.

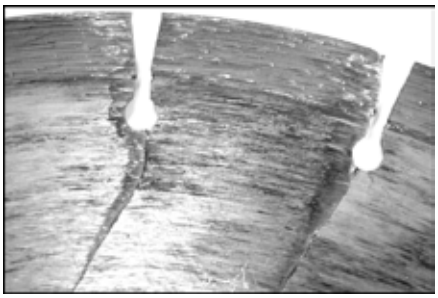
EXCESSIVE WEAR
UNDERCUTTING

CAUSE: Using the wrong blade to spec. on highly abrasive materials.
REMEDY: Change to a more abrasive resistant bond.

CAUSE: Lack of sufficient coolant to the blade often detected by excessive wear in the center of the segment.
REMEDY: Make sure water supply system is functioning properly.

Wearing out-of-round accelerates wear. Usually caused by bad bearings, loose or worn “V” belts.

TROUBLE SHOOTING DIAMOND BLADES

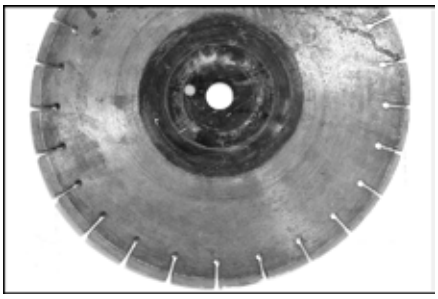


CORE CRACKS

CAUSE: Blade is too hard for material being cut.
REMEDY: Change to softer bond.

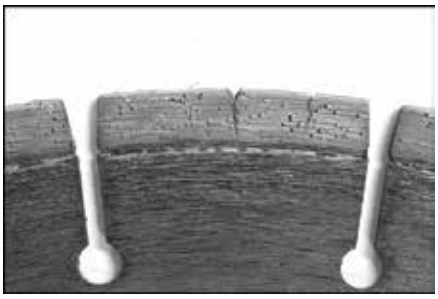
CAUSE: Excessive cutting pressure, jamming or twisting of the blade.
REMEDY: The saw operator should use a steady even pressure without twisting the blade in the cut.

CAUSE: Overheating through inadequate water supply or not allowing a dry blade to intermittently cool down.
REMEDY: Use adequate water on wet cutting blades and allow adequate air flow on dry blades.



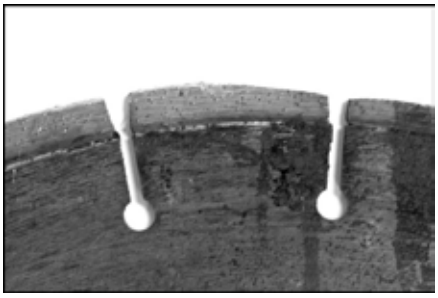
MISMOUNTING

CAUSE: Blade collars are not properly tightened or are worn out.
REMEDY: Check tightness and replace collars if necessary.



SEGMENT CRACKS

CAUSE: Blade is too hard for the material being cut.
REMEDY: Use correct blade with a softer bond.



UNEVEN SIDE WEAR

CAUSE: Insufficient water, generally on one side of the blade.
REMEDY: Make sure water is being distributed evenly on both sides of blade.

CAUSE: Equipment problem which causes blade to wear out-of-round.
REMEDY: Replace bearings, worn arbor shaft or misaligned spindle.

CAUSE: Saw head is misaligned.
REMEDY: Check saw head alignment for trueness both vertically and horizontally.

TROUBLE SHOOTING CORE BITS

GLAZING
(Bit stops drilling or is very slow)

CAUSE: Too much feed pressure.
REMEDY: Open bit with abrasive material (Sand pot, concrete block, chop saw blade). Reduce feed pressure. Using an ammeter will help control speed and pressure.

CAUSE: Aggregate is too hard.
REMEDY: Change to a softer bond.

BENT SEGMENTS

CAUSE: Too much feed pressure and not enough water.
REMEDY: Repair the bit if possible. Ease up on feed pressure and increase water flow.

CAUSE: Aggregate is too hard.
REMEDY: Change to a softer bond.

LOST SEGMENTS
(Particularly on bits up to 1 -3/4")

CAUSE: Steel reinforcing rod
REMEDY: Ease up on feed pressure (water ammeter). Use a higher quality bit and increase the water flow.

CAUSE: Not enough water to properly cool bit.
REMEDY: Increase water flow.

CAUSE: Drill rig is not properly anchored
REMEDY: There are three ways of anchoring a core rig. **STANDING ON IT IS NOT ONE OF THEM!** This quick dirty method damages the bit and the rig and dramatically slows the drilling process.

CORE STUCK

CAUSE: Not enough water to remove slurry.
REMEDY: Remove bit and drive core out with a spike through the hub. Increase water flow.

CAUSE: Core barrel is dented because of hammering on it to remove previous hung up cores.
REMEDY: Repair the barrel. Increase water flow.

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Part # LIT0009