SUPER•CUT

Diamond tools for processing automotive glass

SPECIFICATIONS

A diamond tool has four parts to its diamond-bond specifications. They are Mesh, Diamond Type, Concentration and Bond. Each of these have a definite effect on the performance of the diamond tool for a specific application.

MESH: the size of diamond

The size of the diamonds is classified according to the size of the screen through which it is sieved. The screen size is termed as the number of holes per square inch of the screen. The mesh size is always a range between two screen sizes.
The various screen sizes and their common applications in glass grinding are:

Screen size	Supercut terminology	Application
80/100	80	Drilling
100/120	100	Drilling
120/140	120	Drilling, Chamfering
140/170	150	Pencil Edging
170/200	180	Pencil Edging, Seaming
200/230	220	Pencil Edging, Seaming
230/270	240	Seaming
270/325	280	Seaming

As the mesh of diamond decreases, i.e. from 150 to 180, the number of diamond particles per carat increases.

Mesh	150	220	400
Average particle diameter in microns	102	74	46
Number of particles per carat	49,400	140,000	1,250,000

DIAMOND TYPE: the quality of diamond

There are various qualities of diamonds used for glass grinding. The diamond can be synthetic or natural depending on their application. The diamond type for a Supercut diamond tool is designated in alphanumeric codes. Some of these diamond codes are 27D, 72D, 50D, 60D, etc. The quality of diamond is determined by the toughness, the friability index and the shape.

CONCENTRATION: the quantity of diamond

The concentration of diamond is measured in carats per cubic inch. 100 concentration = 25% by volume diamond = 72 carats per cubic inch (4.4 carats per cubic centimeter).

BOND:

The bond material is a key ingredient to the performance of the diamond tool. It is a matrix of various metals in which the diamonds are dispersed. The diamond-bond matrix offers a specific wear resistant property, which makes it suitable for a specific glass grinding application.

Bonds	*Application*
1-21-2A	*Seaming*
X10, 1374, 1371, 13433, 13614, 1101, X100	*Pencil Edging*
F, 1474	*Drilling*
140-7	*Chamfering*

CUTTING PARAMETERS

The performance of a diamond tool depends on the diamond-bond matrix, as well as the cutting parameters of the glass grinding operation. In certain cases the cutting parameters are by themselves a criteria for evaluating the performance, for example: grinding speed.

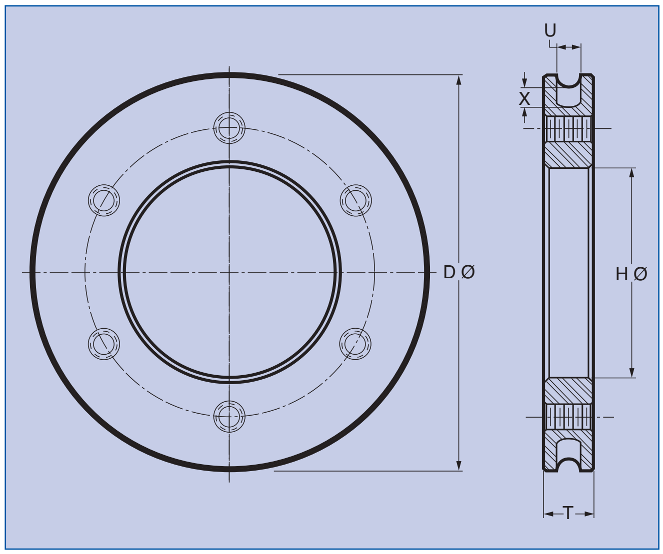
The cutting parameters have a direct relationship to the material removal rate, which in turn affects the performance of the diamond tool and the efficiency of the operation. The three major cutting parameters that affect material removal rate are:
rpm, grinding speed, and depth of cut.

The various principles of these cutting parameters for grinding and drilling glass are explained below.

RPM (N)

DIAMOND WHEELS

The rpm of a grinding wheel is calculated from the peripheral speed (v) of the wheel. For glass grinding application with a diamond grinding wheel, the ideal peripheral speed is recommended to be between 40 to 60 m/s (meters per second). Larger the wheel diameter, higher the recommended peripheral speed.



The peripheral speed and rpm are related by the formula:

$$v = \frac{\pi D N}{60 \times 1000}$$

$\pi = 3.142$

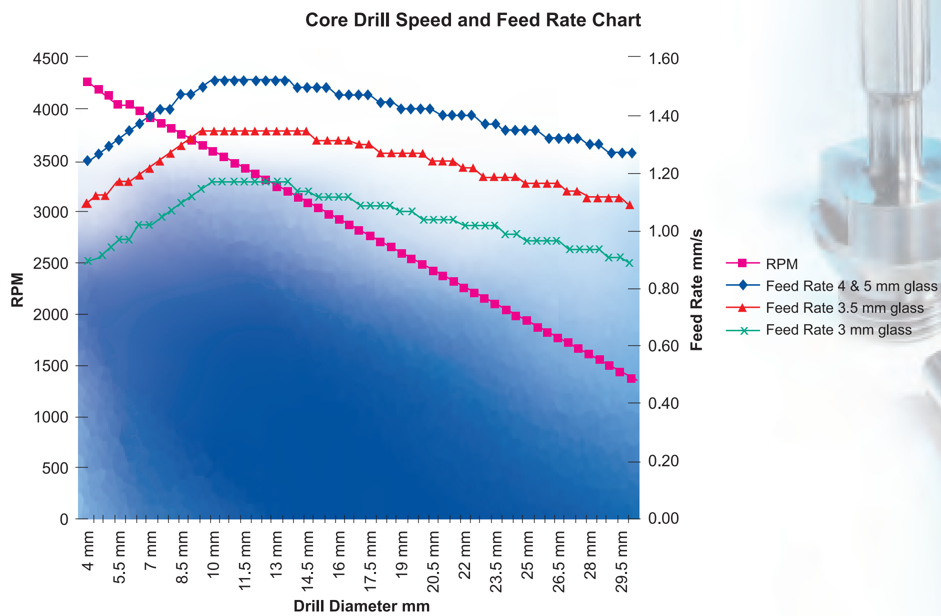
D = diameter of the wheel in mm

N = RPM

For example, for a 250 mm or 9-$^3/_4$" wheel, considering the recommended peripheral speed of 50 m/s, the rpm is calculated to be approximately 3800 rpm.

DIAMOND DRILLS

The rpm of a drill also depends on the diameter of the drills. The drill feed - rpm chart is shown below.



RPM AND SURFACE FINISH

There is a direct relationship between the rpm of a wheel or a drill, and the surface finish achieved from the tool. The principle is centered over the size of the chip generated from the cutting tool.

Consider a diamond wheel rotating at 3000 rpm and grinding glass at a constant grinding speed (u) of 10 m/min. The size of the chip generated has, for example a hypothetical size B. This is Condition 1. In Condition 2 we increase the rpm to 3500, and keep (u) the same at 10 m/min. The diamond particle that generates the chip will grind through the glass faster than at Condition 1, as the rpm at Condition 2 is faster than at Condition 1. Hence the chip size, C at Condition 2 will be smaller than chip size (B) at Condition 1. Smaller the chip size, superior the surface finish. Hence the higher the rpm, better the surface finish. On the other hand, lower the rpm (2500), slower the motion of the diamond particle grinding through the glass, bigger the chip size (A), and therefore inferior the surface finish.

Therefore, one should maintain the rpm at the recommended level. Further, if there is a requirement to improve the surface finish, the rpm can be increased to achieve the desired results. The extent to which the rpm needs to be increased is subjective and depends on local conditions. However, there is a limit based on the diamond-bond specification, to which the rpm can be increased.

Presently, Supercut has been experimenting with grinding glass with high peripheral speed in order to achieve better edge finish. Laboratory tests with speeds of up to 70 m/sec have been tested with encouraging results. Tests are ongoing at higher speeds in the range of 100 m/sec, and the overall effect on diamond wheel life and edge finish have yet to be evaluated.

GRINDING SPEED (U)

The grinding speed is a very important operating parameter. In certain cases where cycle time is considered as a productivity factor on an automatic line, grinding speed can be considered as the most important performance criteria.

DIAMOND WHEELS

The grinding (traverse) speed of a diamond wheel depends on the amount of material removal, and hence the application. If the application is windshield seaming, the material removal is less as compared to sidelite pencil edging. Lower the material removal, faster the traverse speed at which the wheel can operate to achieve a predetermined surface finish and wheel life. Hence the traverse speed for seaming a windshield can be higher than for pencil edging a sidelite. Similarly, the traverse speed for pencil edging a 3.5 mm sidelite can be higher than for a 5 mm sidelite.

The traverse speed has a direct relationship to the surface finish and tool life requirements. Higher the traverse speed, lower the quality of surface finish, and lower the tool life achieved.

The traverse speed is also affected by the coolant used at the grinding station. One of the properties of the coolant is to carry away the heat from the grinding zone. If no coolant, i.e. only water is used, and the traverse speed is maintained at a high level, there may be a situation of glass burns/chips on the glass edge, and a loss of wheel life. Hence, it may be necessary to reduce the traverse speed in order to achieve the desired edge quality and tool life.

The traverse speed of a diamond wheel depends on a multitude of factors. However, the standard speeds achievable with a Supercut wheel are:

Pencil edging:	8 to 15 m/min
Seaming:	14 to 20 m/min

CORE DRILL SEAMER

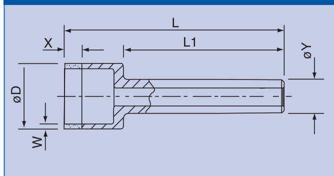
The grinding speed (feed rate) of a core drill seamer is different for the drill depth and for the seamers, the drill depth being more than the seamer. This is mainly due to the fact that since the surface finish requirements on the seamed section of the hole is high, the feed speed on the chamfer needs to be reduced.

A standard feed speed for a Supercut Core Drill Seamer is:

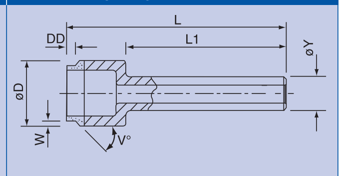
Drill depth:	1.5 mm/s
Chamfer:	0.5 mm/s

Some machines do not have the ability to change the feed rate on the chamfer. Hence, they may use a feed rate of 1.5 mm/s for the drill depth and the chamfer, and sacrifice on quality, or reduce the feed rate to approximately 1 mm/s.

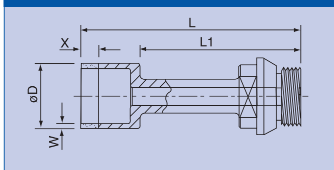
CORE DRILL WITH STRAIGHT MANDREL



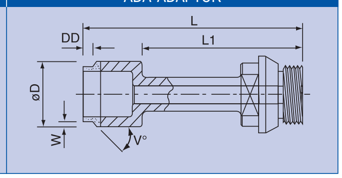
CORE DRILL / SEAMER COMBINATION WITH STRAIGHT MANDREL

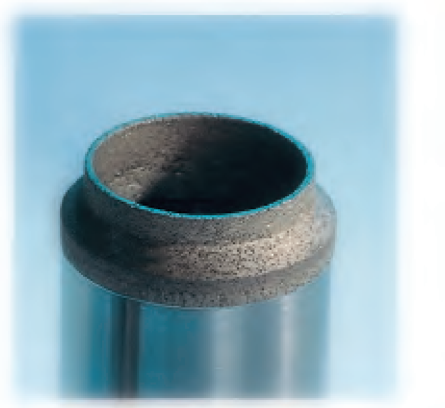


CORE DRILL WITH ADA ADAPTOR



CORE DRILL/SEAMER COMBINATION WITH ADA ADAPTOR





DEPTH OF CUT

DIAMOND WHEELS

The depth of cut for grinding with a diamond wheel depends on the application and user requirements.
Pencil Edging (sidelite and backlite): 0.3 to 0.5 mm.
Seaming (windshield and backlite): 20% to 30% of glass thickness per side of the chamfer. The chamfering operation involves the removal of the scouring chip from the cut side and is a safety issue on the non-cut side. Presently the industry trend on windshields is moving towards a full pencil edge rather than a seamed edge.

CORE DRILLS/SEAMERS

The core drill/seamer drills a hole using a set of top and bottom drills. It is recommended that first the bottom drill grind approximately 60% of the glass thickness, 50% for 3 to 3.5 mm glass, and then the top drill more than the remaining 40%. If the bottom drill grinds more than the 60%, there is a possibility of breaking the glass at the top. The top drill needs to overlap the path of the bottom drill so as to remove any parting line created by the bottom drill. Hence, usually the top drill is provided with a longer drill depth than the bottom drill.

The standard drill depths of a core drill seamer are:

Glass thickness (mm)	Drill depth (mm)	
	BOTTOM DRILL	TOP DRILL
3	1.25	1.5
3.5	1.5	1.75
4	2	2.5
5	2.5	3

COOLANT

A glass grinding fluid is recommended for all optimal pencil edging operation. Windshield seaming and core drilling may not require the use of a coolant concentrate.

The grinding fluids are synthetic and contain no mineral oils. They are specifically formulated for closed system glass grinding operation. The coolant concentrate is mixed with plain water in a dilution of 50:1 to 75:1.

In a closed system for glass grinding, the coolant performs the following functions:

COOLING

The most important function of a coolant is to remove the heat generated during grinding thereby improving diamond wheel life and glass edge finish.

LUBRICATION

The coolant also reduces the friction between the diamond wheel and the glass thereby improving wheel life and glass edge finish.

CORROSION PROTECTION

The coolant components have a rust inhibitor offering corrosion protection of the machine components thereby reducing wear and tear on the machine.

REMOVAL OF CHIPS

The coolant assists in the removal of chips or swarf (an accumulation of fine glass and abrasive particles) from the grinding zone.

ANTI-FOAMING

The coolant-water mix has a tendency to foam due to chemical components and the agitation in the system. Foam or air bubbles if carried back to the grinding zone reduce the cooling and the lubrication functions of the coolant. The anti-foam component in the coolant tends to break down the foam.

SETTLING OF GLASS FINES

The swarf in the system is negatively charged which tends to remain afloat in the system tank and re-circulate back to the grinding zone. The coolant is positively charged which attracts the negative charge swarf to form larger and heavier groups of particles which fall out of the suspension. Additives such as 'Flocculent' can be added to reduce the settling time of the swarf in the system.

NON-HARDENING OF GLASS FINES

The coolant also prevents the hardening of the swarf as it settles in the system tank. Removal of hardened swarf from the bottom of a settling tank is usually very difficult.

ANTI-BACTERIAL

Moisture, warm temperature (90º-119º F), no light, and no air, besides shop floor contamination such as tobacco, human saliva, cigarette butts, sandwich pieces, and any other foods, are the all possible causes of bacterial growth in a coolant system. As bacteria grows in the system, they produce odors, induce rust, remove needed components of the coolant, and lead to product instability. Growth of fungus also clog up pipes and grinding head nozzles. The coolant has anti-bacterial components that tends to prevent the growth of bacteria. Additives can be added to remove fungi colonies in the coolant system.

PERFORMANCE

The performance of a diamond tool for glass application can be evaluated under various criteria. The importance of any criteria depends on user requirements.

DIAMOND WHEELS

The various criteria for evaluating diamond wheel performance are:

LIFE BETWEEN RETRUE

The amount of material removed by the sides of the groove profile is more than that removed by the center. Hence, the sides of the groove wear off faster than the center, thereby losing its profile. For a pencil edging wheel, the radius of the groove becomes flatter as the wheel is used. After the groove has lost its profile, it affects the edge finish to such an extent that it starts chipping. The wheel is then sent for retrueing.

In certain cases, there may be a flare out on the bottom edge of the glass at the cutting station. This edge flare leads to additional material removal from one side of the diamond groove. This results in the loss of the groove profile with a wear more on one side of the center of the profile, or with the formation of a deep groove at the section where the edge flare is ground by the diamond. This again leads to glass chipping and wheel removal.

The life of the wheel between retrue is calculated by the number of linear meters of glass ground.

NUMBER OF RETRUES

The usable depth of diamond impregnation of a Supercut wheel is usually 6.4 mm. Hence, the wheel can be reused a number of times after retrueing.

TOTAL LIFE

The total life of the wheel is the total number of linear meters ground by the wheel. This is calculated by the life between retrue multiplied by the number of retrues plus one.

WEAR RATE ('G' RATIO)

The wear rate is the number of linear meters ground by the wheel per 0.025 mm radial wear of the diamond impregnation. This is a key criteria in evaluating the life of a diamond wheel.

QUALITY

Quality can be categorized under:

A. Edge finish

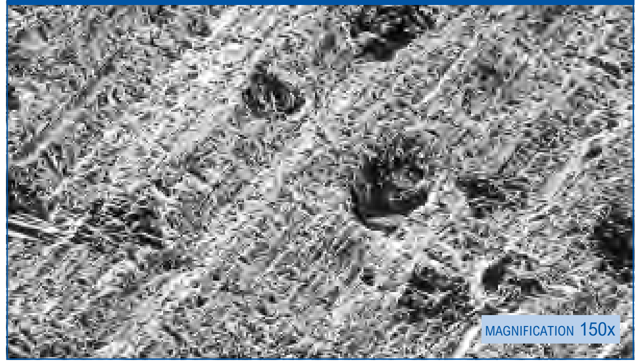
B. Surface finish

Edge finish depends on a multitude of factors, machine, operating conditions, and the diamond wheel. The only method of evaluating quality of edge finish is by a visual check.

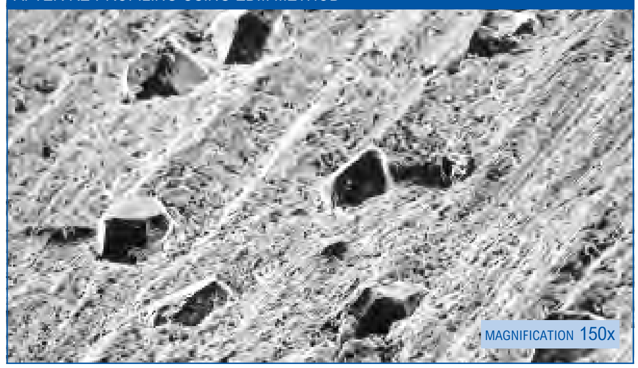
Surface finish is dependent to a major extent on the mesh size of the diamond. Finer the diamond particle, superior the surface finish.

Diamond wheel performance based on life and quality is a spectrum, with high life and low quality at one end, and lower life and high quality at the other end. Therefore, there is an inverse relationship between life and quality. One has to sacrifice on quality in order to achieve a higher life, and vice versa.

AFTER RE-PROFILING WITH CONVENTIONAL ABRASIVE WHEEL



AFTER RE-PROFILING USING EDM METHOD



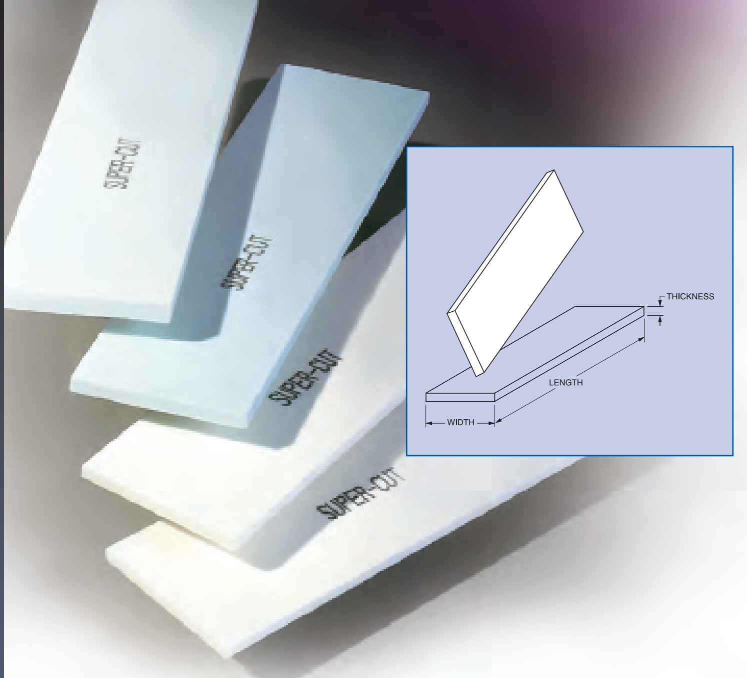
BREAK IN TIME

This is the number of pieces of glass required to break in the wheel, i.e. produce a relatively chip free edge. The break in time depends on how well the diamonds are exposed during manufacturing or retrueing of the groove profile. The profile is generated by using a Silicon Carbide wheel. The grit size, grade, and structure of the SiC wheel should be appropriate for the specific diamond-bond matrix of the diamond wheel. The theory being that the SiC carbide abrasive wheel should fracture as less diamond as possible while retrueing. For a standard Supercut diamond wheel with a D mesh - X10 bond, a C80 - K7 wheel is recommended.

Break in time can be greatly improved by EDM (Electro Discharge Machining). In this process the groove is initially profiled with the recommended SiC wheel. Using an EDM machine, the outer layer of the bond is melted away with the help of an arc generated between a groove shaped electrode and the diamond groove. The gradual removal of the bond layer further exposes the diamond without fracturing them, and greatly reduces break in time.

Supercut manufactures and retrues diamond wheels using only the EDM process, without the initial rough grinding with the SiC conventional wheel. This greatly improves the break in time of the wheel with well exposed and non fractured diamonds on the surface of the wheel.

EDM MACHINES AT BENSENVILLE USA



FREQUENCY OF DRESSING

A diamond tool ideally should not need any resharpening. The diamond-bond matrix consists of randomly dispersed diamond particles in a metal bond. As the diamond particles are worked on during the grinding operation, they wear off and lose their cutting faces by flattening off at the top exposed face, a phenomenon termed as glazing. However, the bond wear may not be at the same rate as the diamond wear. If the bond wear is faster than the diamond wear, the matrix is soft for the application, and the diamond tool is not suitable as it will give a low life. If the bond wear is slower than the diamond wear, the matrix is hard. This is most likely the case for glass grinding application. In this case the diamonds are not exposed enough to grind the glass at the required cutting parameters. Hence, a relatively soft abrasive such as aluminum oxide (Al_2O_3) is required to grind off the bond, and expose some new diamonds particles and re-expose the old ones. Some diamonds are also gorged out of the bond during this exposure. This is called dressing, sticking, or stoning.

Besides the differential wear rate between the diamond and the bond, there is always the possibility of glass fines suspended in the coolant system to cling on between the diamond particles. This also creates a situation of diamond under-exposure, which requires the use of an Al_2O_3 abrasive to remove the glass fines.

In both the above two cases, the Al_2O_3 abrasive, usually in the form of a stick, should not affect the diamond. A softer abrasive, such as Al_2O_3 is used so that the diamonds do not get fractured. Further the grit size of the abrasive is one or two sizes finer than the mesh size of the diamond. This reduces the possibility of diamonds being gorged out of the bond during dressing.

The amount of Al_2O_3 stick used in dressing directly effects the grinding speed or the tool life of the wheel. Under utilization of the stick will not re-expose the diamond properly, which will result in a loss of grinding speed. An over utilization of the stick will result in the loss of diamond due to gorging, and hence a loss of life.

Lower the frequency of dressing, better the diamond tool for the specific application.

SUPERCUT WHEEL PERFORMANCE

An average Supercut wheel performance for certain machine types, wheel dimensions, and cutting parameters is charted opposite in Table 1: These are the results of case studies conducted by Supercut. However, actual performances at user's end may be different as it depends on local conditions which may differ from those existing during the case studies.

Table 1

	Pencil Edging 4 mm sidelite			Seaming 2.1 mm windshield
Machine Type CNC	Bystronic	Bando	Glassline	Bando
Wheel Dimensions				
Diameter mm	250	200	175	150
Impregnation mm	6.4	6.4	6.4	6.4
Cutting Parameters				
rpm	3000	3200	3600	3600
Grinding speed m/min	12-14	8-10	10-12	18-20
Depth of cut mm	0.35-0.4	0.35-0.4	0.35-0.4	0.125-0.15
Performance				
Life B/R lin.mts	6-7000	8-10000	6-6500	10-15000
No. of RT	8-10	4-6	6-8	5-6
Total life lin.mts	60-70000	50-60000	50-60000	80-90000

Table 2 – Format for evaluating wheel performance.

Account:	**Contact:**
Location:	**Title:**
	Telephone: **Fax:**

Machine/Line:
Glass thickness:

SUPER-CUT Wheel Details

Diameter:	**Thickness:**
Hole:	**Serial Number:**
Specification:	

	Date	Reference Number	Root diameter into m/c (mm)	Root diameter off m/c	No. of meters achieved	Comments
New						
Reprofile						
1						
2						

SEE FULL TEST CHART ON PAGE 10

CORE DRILLS/SEAMER

LIFE

The life of a core drill is termed by the number of holes drilled. A simple core drill can be retrued several times. The wear on the drill depth of the core drill takes place on the drill face as well as the wall thickness. The core drill can be retrued by facing off the drill depth with a SiC wheel to the point where the wall thickness is standard. During retrueing there is a tendency to pull out or fracture the diamond particles on the drill face. Care should be taken to reduce this, and re-expose the drill face with on Al_2O_3 stick after retrueing. Hence the total life of the core drill is the life between retrue times the number of retrues plus one.

On the other hand a core drill seamer cannot be retrued. The wear on the core drill seamer takes place on the drill depth as well as the chamfer. Although the drill depth can be retrued as a simple core drill, it is not possible to retrue the chamfer. Hence the core drill seamer can be used only for one run.

The drill depth of a top core drill seamer is longer than that of the bottom core drill seamer. Therefore the top drill has a comparatively longer life than the bottom drill of the set.

QUALITY

The quality of the core drill/seamer is evaluated by the amount of chips generated on the face of the glass. Visual check is the only way of ascertaining quality.

BREAK IN TIME

Similar to a diamond wheel, core drill/seamer like any diamond tool requires some time to break in, i.e., produce relatively chip free glass.

FREQUENCY OF DRESSING

Lower the frequency of dressing to re-expose the diamond, better the core drill seamer.

APPLICATION

APPARENT HARDNESS

The apparent hardness is an abstract measure of hardness of a diamond tool. It has no relation to the HRA, HRB, etc. numbers. It is the way the diamond feels when grinding a work material. The apparent hardness depends on three components of the specification, i.e. the mesh size, concentration, and the bond. Changing any of these components has a direct effect on the diamond tool performance. Given below are cause - effect relationships between each component of the specification and the diamond tool performance. In order to explain this relationship, only one component is changed and the remaining kept the same.

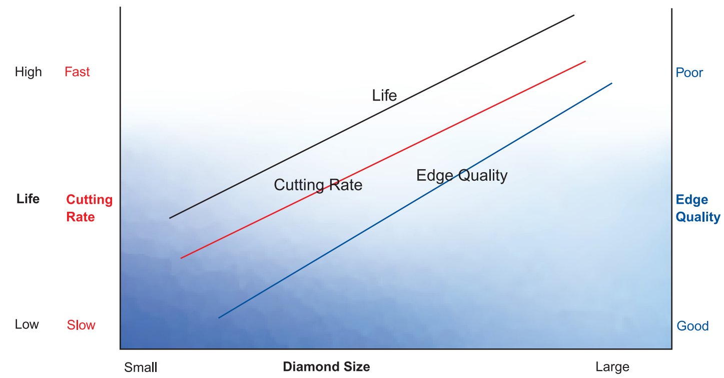


Figure 1

MESH – FIGURE 1

Medium to Coarse:

Coarser mesh results in a softer matrix, and therefore the tool can grind faster. Coarser diamond means larger size diamonds which increases the cutting surface on each diamond particle, and therefore leads to higher cutting speed and longer tool life. However, coarser mesh results in more space between the diamond particles, and therefore deeper grinding lines and inferior surface finish. The opposite results will be achieved with finer mesh.

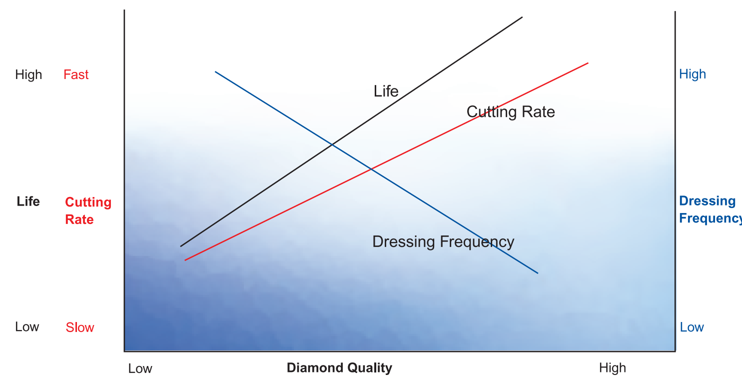


Figure 2

TYPE – FIGURE 2

Moderate to Superior quality:

A superior diamond results in higher grinding speed, longer life, and lesser frequency of dressing. However, this increases the cost of the wheel.

CONCENTRATION – FIGURE 3

Medium to Higher:

Higher concentration results in longer life as there are more diamonds cutting points in the matrix. However, this results in a harder matrix which leads to slower grinding speed. Higher concentration means the diamond particles are closer to each other, and therefore results in a superior surface finish.

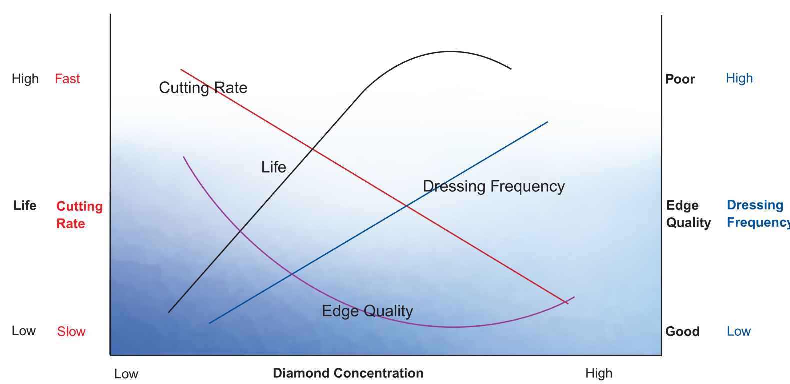


Figure 3

BOND – FIGURE 4

Medium to Hard:

A harder bond results in slower speed and longer life, and vice versa.

DIAMETER

Large to Small:

If the diameter is decreased, the wheel tends to act softer. It can therefore grind at a faster speed. However, a smaller diameter results in less overall diamond in the wheel, and therefore lower life.

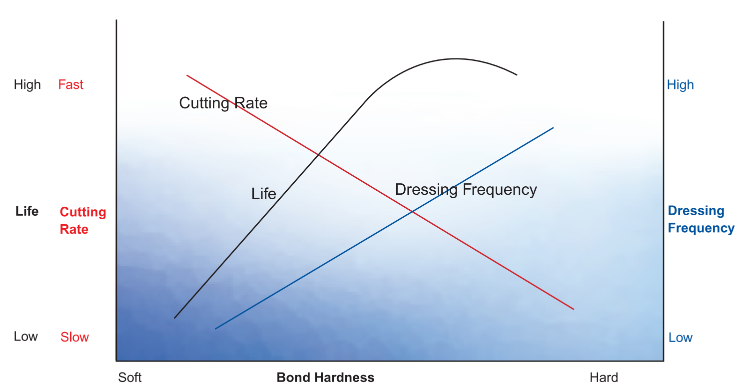


Figure 4

GROOVE PROFILE

The groove profile greatly determines the quality of the edge finish. There are three basic types of profiles: Standard, Full Hemisphere, and Basket.

STANDARD

This is the most widely used profile, and results in satisfactory edge finish and long life, refer figure 5.

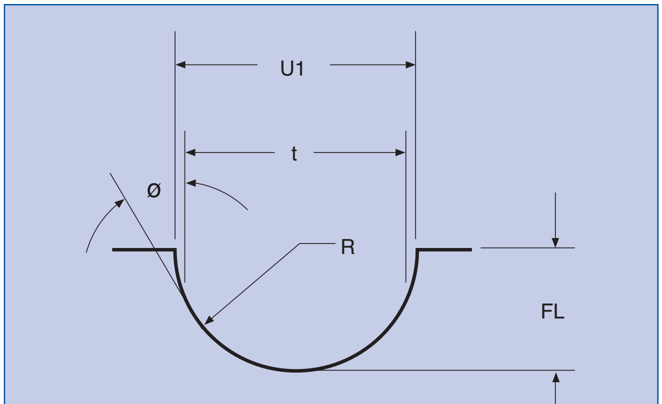


Figure 5

The standard and the full hemispherical profile use the following formula:

U1 = 2 x SQRT (FL x (2 x R - FL))

where U1 = width of opening

FL = depth of the groove

R = radius of the groove

The width of opening depends on the machine condition and wheel to glass alignment.

U1 = t + 0.5 mm, for a well maintained machine.

U1 = t + 0.8 to 1 mm, for an old machine.

The transition angle Ø, is the angle between the vertical line of the glass as it fits into the groove, and the line tangent to the groove at point of intersection of the vertical glass line and the groove. Smaller the transition angle, better the edge finish. An ideal transition angle is 30º. The depth of the groove is related to the transition angle.

For the standard profile, a depth of 1.65 to 1.9 mm for 3.5 to 5 mm glass respectively gives a transition angle of approximately 30º, and is recommended. The radius of the groove is evolved from the formula mentioned above. For the standard groove profile, R > FL. In many cases, the radius R is specified as greater than or equal to half the glass thickness.

FULL HEMISPHERE

For the full hemispherical profile, R = FL. The transition angle is close to 30º. This profile gives a superior surface finish than the standard profile. However, older machines should not use this profile as there may be insufficient coolant flow into the groove.

BASKET

The profile, as shown in figure 6, has an included angle into which the groove fits. Since the side of the groove is a straight line instead of a curve as in a standard profile, the transition

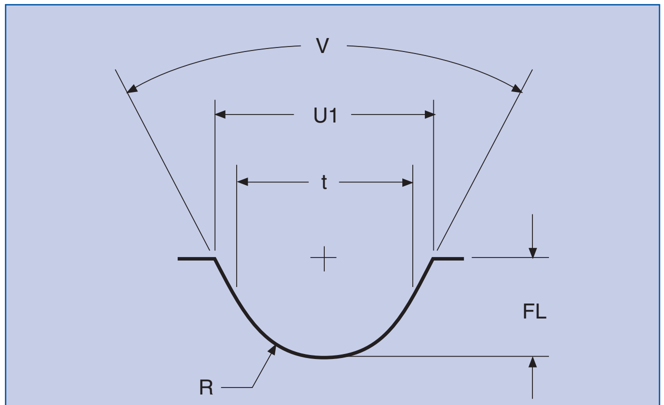


Figure 6

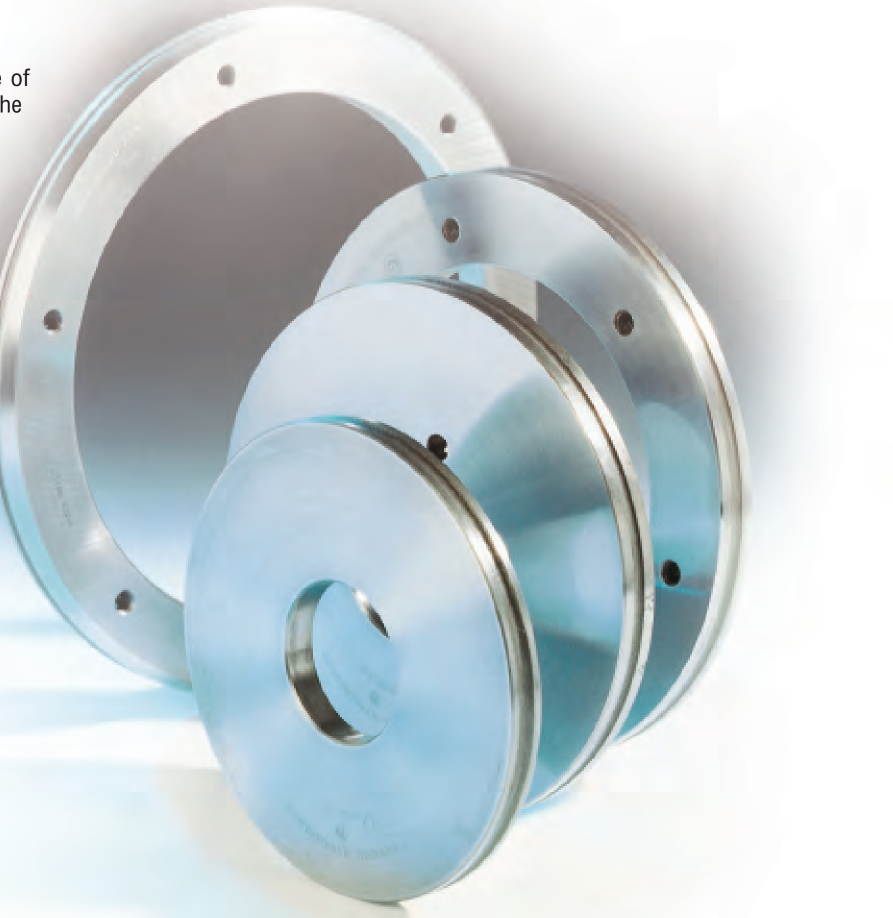
angle remains the same irrespective of where the glass touches the groove, due to any variance in its thickness or its alignment.

The formula for the basket profile is:

U1/2 = R/Cos(v/2) - (R - FL) x Tan(v/2)

where v = included angle, usually 50º or 60º

The width, depth, and radius is calculated using the same principle as the standard profile.



OPERATING PROCEDURES (DIAMOND WHEELS)

WHEEL MOUNTING PROCEDURE

1. Use a wire brush or Scotch Brite type pad to clean the adapter plate. Wipe the adapter plate with a clean rag. Inspect the adapter plate to be free of ground glass or dirt.
2. Mount the new wheel on to the adapter with 3 mounting bolts in every alternate hole, (2 bolts for a 3 hole mounting pattern) and tighten lightly.
3. Mount a lever arm indicator on the center of the groove of the diamond impregnation. Do not indicate the steel on the sides of the diamond impregnation.
4. Rotate the wheel and read the indicator. If the T.I.R. (radial runout) is more than 0.002" (0.05 mm), tap the wheels high spots with a rubber, brass, lead, or plastic mallet until an indicator reading of 0.002" or less is obtained. Do not use a steel hammer.
5. If the T.I.R. is 0.002" or less, tighten the 3 mounting bolts, and install and tighten the others.
6. Recheck the T.I.R. to be in the tolerance range of 0.002". If not in tolerance, repeat step 4 & 5.
7. If the T.I.R of 0.002" cannot be obtained, remove the wheel and check the adapter plate for runout. The adapter plate runout must be 0.001" (0.025 mm) or less. If the runout is out of tolerance, repair or replace the adapter. If it is within tolerance, send the wheel to manufacture or retruer for rework.

WHEEL START UP PROCEDURE

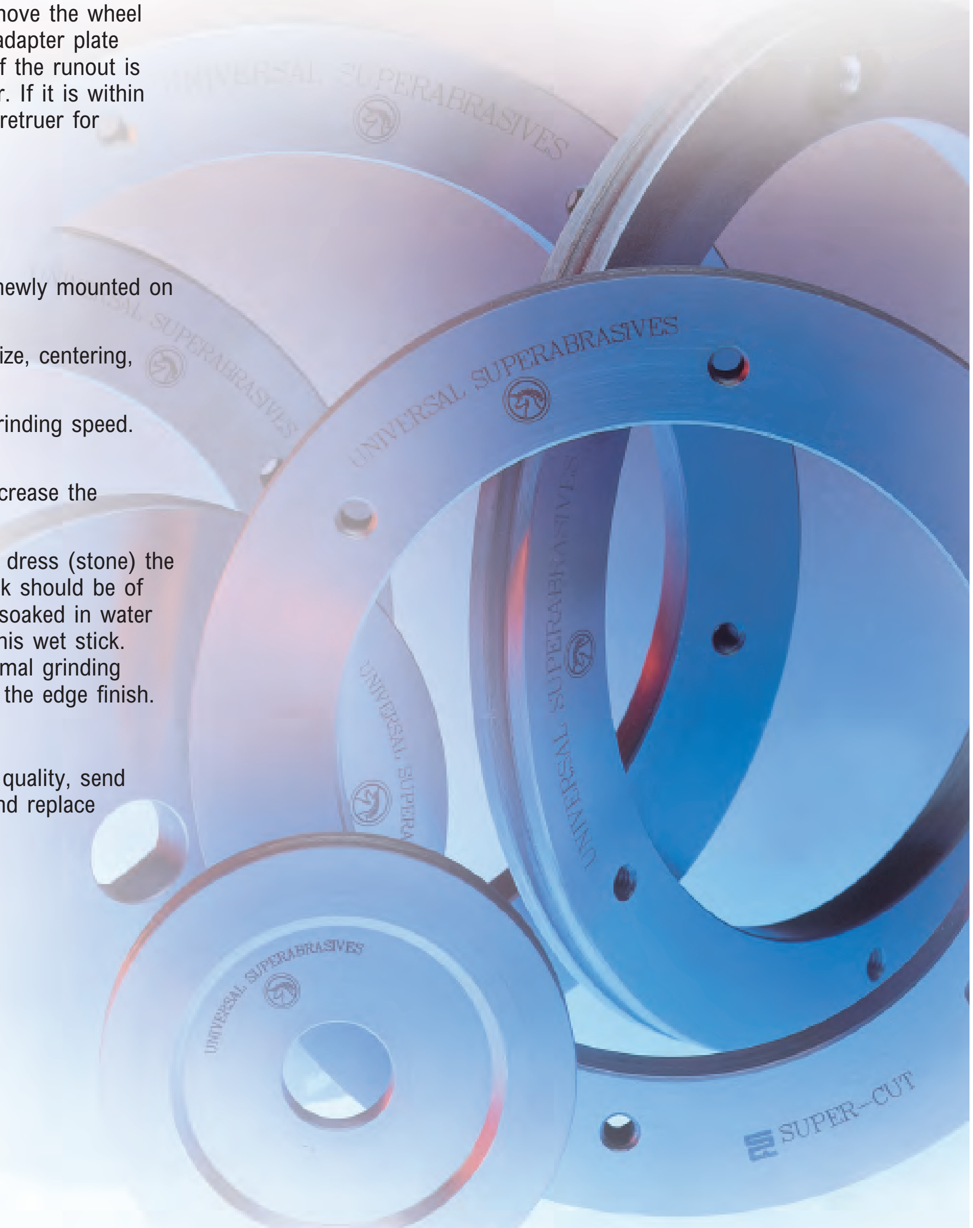
Do not stone the wheel, wet or dry, when it is newly mounted on the grinder.

1. Grind a piece of glass and check/adjust for size, centering, and edge finish.
2. Run 2-3 pieces of glass at half the normal grinding speed. Check the edge for chips/burns.
3. If edge finish is satisfactory, progressively increase the grinding speed to the required maximum.
4. If chips/burns exist, turn off the coolant, and dress (stone) the wheel with an aluminum oxide stick. The stick should be of the same thickness of the glass ground and soaked in water before being used. Use approximately 3" of this wet stick. Run 2-3 more pieces of glass at half the normal grinding speed with the coolant turned on, and check the edge finish.
5. If chips/burns still exist, repeat step 4.
6. If step 5 does not produce satisfactory edge quality, send the wheel back to manufacturer or retruer, and replace with a new wheel.

WHEEL DRESSING PROCEDURE

Dress the wheel only when the amperage on the grinding station rises, or the edge quality shows chips/burns, or the ground glass is oversized.

1. Turn off the coolant.
2. Use an aluminum oxide abrasive stick with the same thickness as that of the glass ground. The grit size should be the same or one level finer than that of the diamond wheel. Soak the aluminum oxide stick in water .
3. Feed this wet stick in the same horizontal plane as the glass, and directly into the center of the groove. Use approximately 2" of the stick .
4. Turn the coolant on. Run a piece of glass and check edge finish and amperage reading.
5. If edge finish not satisfactory, repeat the above steps until edge finish improves.



TROUBLE SHOOTING (DIAMOND WHEELS)

Certain common problems encountered during grinding auto glass and their solution checklist are enumerated below:

Chips: small chips on the edge of the glass

1. If the number of lin.mts of glass ground is close to the average life of the wheel between retrue, replace with a new wheel.
2. If not, dress with an Al_2O_3 stick.
3. Ascertain that the wheel T.I.R. is within 0.002". If it is within the tolerance range, check for the adapter plate runout to be within 0.001".
4. Check coolant system to ascertain the following:
   - the coolant holes are not clogged,
   - the coolant spouts are directed towards the center of the diamond groove,
   - the coolant concentration is within the specified limits,
   - the coolant is free from bubbles, and
   - the coolant does not have a high dispersion of glass fines.
5. Check if the grinding speed is not higher than recommended.
6. If no effect, consult with the wheel manufacturer for correct diamond-matrix for the specific application, i.e. mesh size is not too coarse, and matrix hardness is not too high.

Burns: on the surface of the ground glass

1. Check the coolant system.
2. Check for excessive material removal rate by:
   - controlling the cut size to a maximum of 0.5 mm per side, and
   - maintaining the grinding speed at its recommended limit.
3. If burns still exist, consider modifying the shape of the diamond groove to a more shallow profile.
4. If no effect, consult with the wheel manufacturer for diamond-bond matrix hardness for the specific application.

Shiners: unground sections at irregular intervals on the surface of the ground glass

1. Check the glass positioning on the table with respect to the wheel path.
2. Check for undersized cut at the cutting station.
3. Maintain the specified grinding speed.
4. If condition still exist, dress with Al_2O_3 stick.
5. If no effect, consult with the wheel manufacturer for correct diamond-bond matrix for the specific application.

Oversize: the ground glass is oversized

1. Check the cut size at the cutting station to a maximum of 0.5 mm per side.
2. Maintain the specified grinding speed.
3. Check the coolant system.
4. Dress with an Al_2O_3 stick.
5. If no effect, consult with the wheel manufacturer for correct diamond-bond matrix for the specific application.

Rollover: lopsided radius over the glass edge

1. Check the alignment of the glass horizontal plane to the center of the groove profile.
2. Maintain the horizontal motion of the Al_2O_3 stick while dressing.
3. Check the profile of the wheel.
4. Check the horizontal alignment of the grinding table and/or grinding arm.

Low grinding speed

1. Check the cut size at the cutting station to a maximum of 0.5 mm per side.
2. Check the coolant system.
3. Dress with an Al_2O_3 stick.
4. Check the rpm of the wheel so as the maintain a peripheral speed of 45-50 m/s.
5. In some cases, the motor hp may be insufficient for the required material removal rate.
6. If no effect, consult with the wheel manufacturer for correct diamond-bond matrix for the specific application.

Low life between retrue

1. Check for excessive material removal rate by controlling the cut size and the grinding speed.
2. Check the coolant system.
3. Make sure that the frequency of dressing has not increased, and the grit size of the Al_2O_3 stick is of the same size or one size finer than the diamond mesh size.
4. If life is still low, consider modifying the groove to a more shallow profile.
5. If no effect, consult with the wheel manufacturer for correct diamond-bond matrix for the specific application.

Longer break in time

1. Check if the wheel mounting procedure and the start-up procedure are followed.
2. Compare the break in time of a new wheel against that of a retrued wheel. If the retrued wheel has a longer break in time, check the type of the silicon carbide wheel used by the retruer.
3. If the new wheel takes a longer time to break in, check with the wheel manufacturer for the appropriateness of the profiling process.

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SUPER•CUT

Wheel Performance Record

Account:	**Contact:**
Location:	**Title:**
	Telephone: **Fax:**

Machine/Line:
Glass thickness:

SUPER-CUT Wheel Details

Diameter:	**Thickness:**
Hole:	**Serial Number:**
Specification:	

	Date	Reference Number	Root diameter into m/c (mm)	Root diameter off m/c	No. of meters achieved	Comments
New						
Reprofile						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
TOTAL						

Rep. Name:	
Telephone:	**Fax:**

SUPER•CUT

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