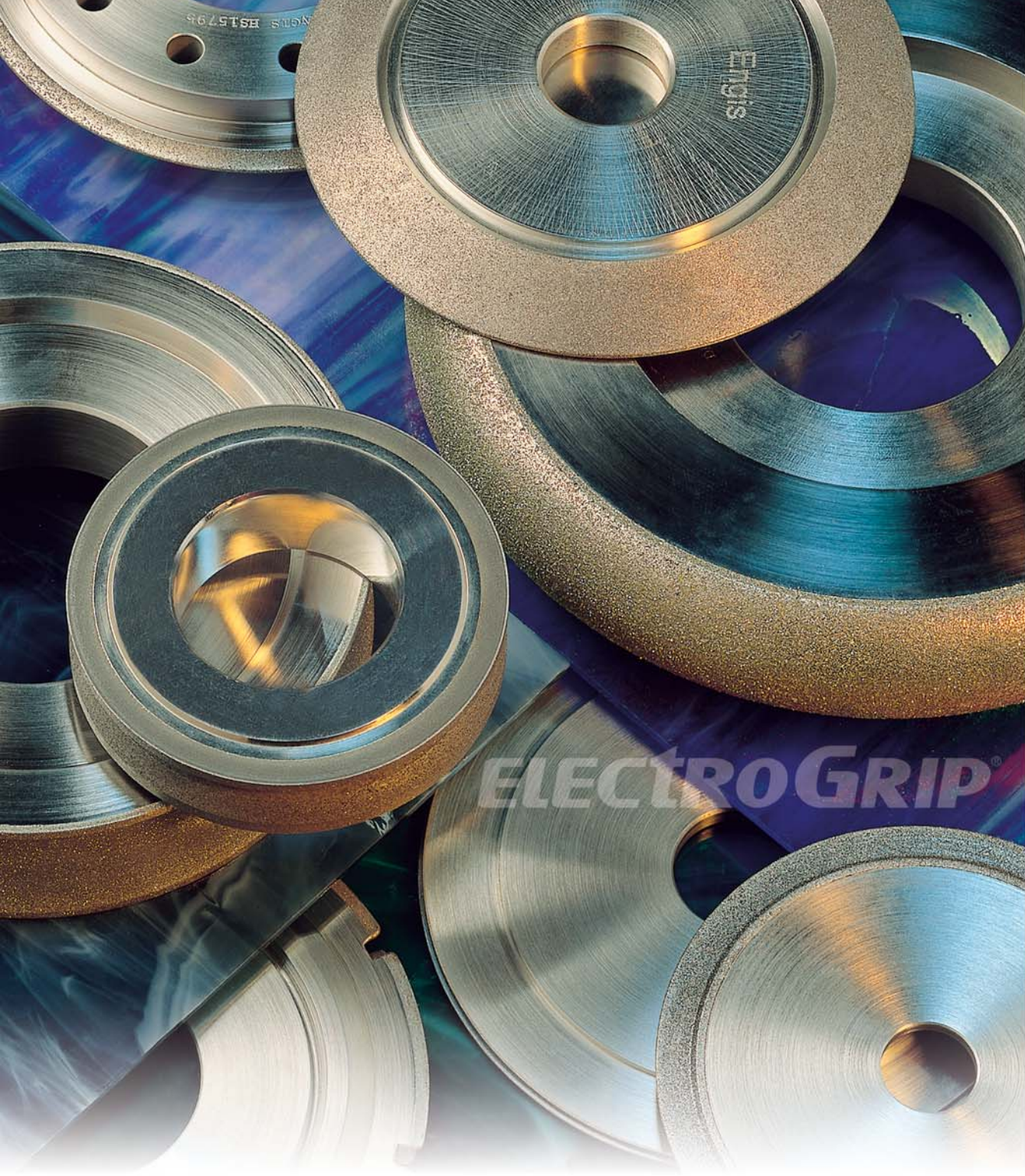




GRINDING PRODUCTS



Electrogrip® Grinding Wheels and Cutting Tools





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*Source: Machinery's Handbook, 21st Edition.

THE ENGIS STORY

Engis Electrogrip[®] diamond and CBN (cubic boron nitride) electroplated grinding wheels and cutting tools are engineered to your exact requirements and designed to deliver unsurpassed productivity with consistent quality that you can rely on.

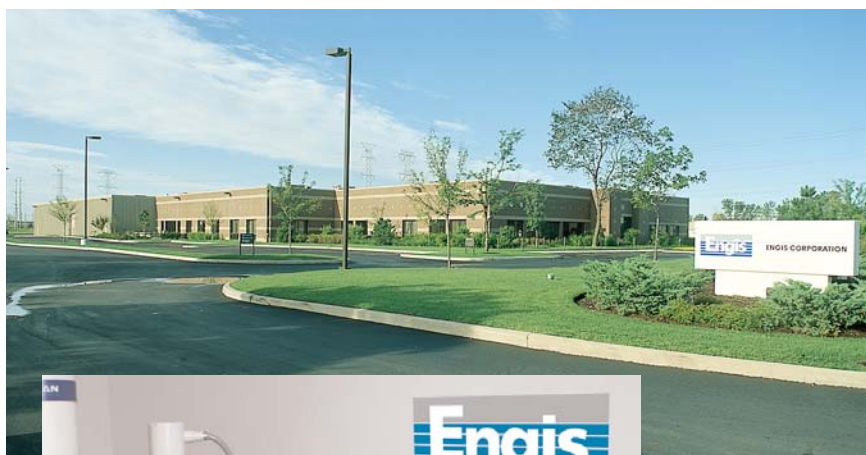
Tailor-made form grinding wheels, pins, dressing blocks and saw blades are only a few of our specialty items engineered and manufactured in our Wheeling, Illinois plant.

Customers are offered technical assistance by our trained and experienced regional sales managers who are supported by the product manager and a staff of sales and application engineers.

With more than 40 years of electroplating experience, Engis builds on this wealth of experience with continuous research and development on diamond and CBN electroplated applications. We constantly develop new processes to keep us on the cutting edge of technology so that we can offer our customers the best possible solutions to their superabrasive needs.

Whether you are in the market for a new electroplated wheel or are in need of strip and replate services for an existing core, please contact Engis.

Call Toll Free 1-800-99-ENGIS.



Engis designs, engineers, machines, plates, inspects and ships all of its Electrogrip diamond and CBN plated tools at the company's corporate headquarters in Wheeling, IL.



THE ELECTROGRIP® ELECTROPLATED BOND SYSTEM



THE ELECTROGRIP PROCESS GIVES ENGIS DIAMOND AND CBN TOOLS THE CUTTING EDGE

Electroplated tools are made up of a basic single layer of either diamond or CBN particles that are bonded to the tool surface by a nickel matrix. This bonding process allows the manufacture of tools with various forms and contours.

These tools are used in applications requiring the grinding of deep forms such as splines, slots, gear teeth and other deep grooves.

In general, Engis electroplated diamond and CBN tools exhibit:

- **Free cutting action**
- **Good form-holding characteristics**
- **Maximum abrasive particle exposure**
- **High stock removal**
- **Strict quality control**

Call Engis Corporation for more information on electroplated tool applications.



STRIP AND REPLATE SERVICE

In addition to our special and standard electroplated tool design and manufacturing, we offer our customers strip and replate service. Your worn diamond or CBN electroplated tool can be brought back to new condition by stripping the old abrasive and reapplying new abrasive to the tool. When the tool form or surface that is plated is damaged, it can be repaired by remachining and then replating. This is called strip, rework and replate.

In many cases, electroplated tools can be stripped and replated several times before the form needs to be remachined.

SPECIALS: Let Engis design a diamond grinding wheel to your specifications. For more details on our standard and special electroplated diamond wheels, contact Engis Corporation.

DIAMOND GRINDING WHEELS

Electrogrip[®] diamond peripheral wheels are available in both formed and type 1A1, and are designed primarily for grinding hard or abrasive materials such as ferrites, tungsten carbide, ceramics, aluminum oxide, gray and ductile iron, abrasives and carbon.

Major advantages of Electrogrip wheels are their ability to cut freely and provide a cool cutting action. This feature makes them ideally suited for use on materials where coolants would cause damage. However, using coolants whenever possible will increase the life and performance of Electrogrip wheels. They have proven themselves on thousands of jobs by accurately performing timesaving grinding operations without breakdowns. No truing or dressing is necessary to maintain Electrogrip wheels. Just mount on your machine spindle and grind. When the diamond mono-layer is worn out, return the wheel to Engis for replating.

CBN GRINDING WHEELS

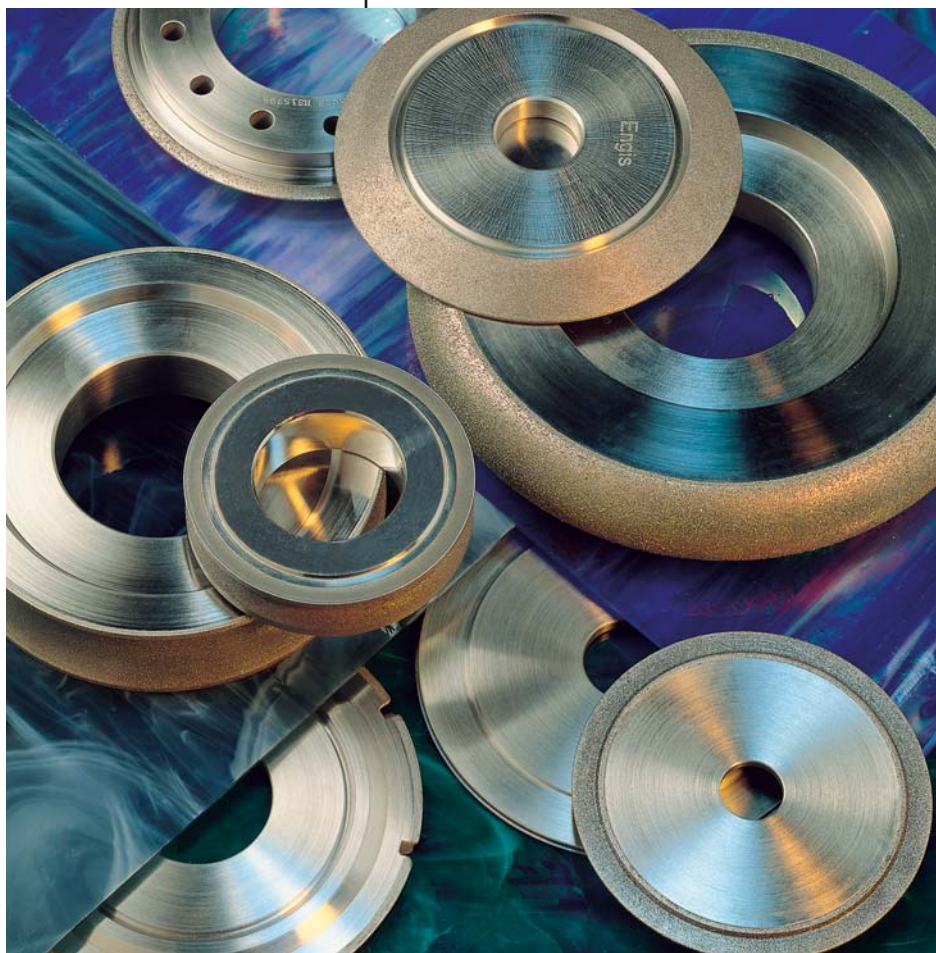
Engis CBN peripheral grinding wheels are available in a variety of sizes and styles, both plain and formed to specific contours. These wheels are designed primarily for grinding such materials as: high carbon; high chrome; high speed steels, such as M2, M3, M7 and T15; die steels, such as: D2, D3, HB, A & O; alloy steels (harder than 50 Rc); nickel and cobalt base super alloys; titanium; stainless steels, etc.

Electroplated CBN grinding wheels offer substantial benefits in grinding exotic alloy steels. Since the CBN crystal resists dulling much better than conventional abrasives, it provides stress-free, cool cutting action throughout its long life. The crystal tends to be self-sharpening as cutting stress increases.

The mono-layer wheel structure requires no truing or dressing throughout its life, thereby eliminating truing tool cost as well as non-productive wheel truing time.

ADVANTAGES:

- *Tough crystals - stay sharp longer*
- *Cuts cooler - no metallurgical part damage*
- *Low abrasive cost per part ground*
- *Needs no truing or dressing*
- *High precision*
- *Consistent parts batch-to-batch*



ISO 9001:2008
CERTIFIED

Our ISO 9001-2008 certification ensures you receive grinding products that provide consistent and guaranteed performance.

CBN ELECTROPLATED BROACH GRINDING WHEELS



CBN plated grinding wheels...a highly productive alternative to aluminum oxide wheels, for the sharpening of broach gullets. These wheels can be used on your conventional broach grinder without modification. However, for best results, equipment of rigid construction with a good spindle should be used. While wheel life is best when coolant is used, the operation can be done dry. The aggressive, free-cutting CBN superabrasive generates little heat. This is especially important in dry grinding.

You will find these CBN wheels to be a very efficient and cost-effective way to grind broaches.

GUIDELINES FOR USING SUPERABRASIVE GRINDING WHEELS

HELPFUL HINTS

Listed below are some major factors that need to be considered when designing a metal removal process which will incorporate the use of diamond or CBN wheels.

- *Machine tool quality*
- *Machine feed parameters*
- *Grinding wheel speeds*
- *Grinding fluids*

Optimization of the grinding process with respect to these factors will increase the performance of the CBN wheel and lower the overall grinding costs.

MACHINE TOOL QUALITY

- *Rigidity*
- *Accuracy of feed systems*
- *Adequate power*
- *Fluid delivery and filtration*

Good spindle bearings, as well as tight and accurate ways and feed screws, are a must for effective performance. Varying the downfeed, infeed, crossfeed and workspeed with respect to each other will affect a wheel's life, workpiece surface finish and integrity, geometric accuracy of the part and cost effectiveness of the operation.

Electroplated wheels can be run safely at peripheral speeds up to 25,000 SFPM. Running at these higher speeds will increase the overall efficiency of the grinding operation and could even double the wheel life.

Diamond and CBN wheels provide the most outstanding performance when used with lubricating type fluids without water. However, the method by which it is applied can have a dramatic effect on the performance. A high pressure fluid delivery system pumped under pressures of 300-1,000 PSI to nozzles located near the grinding wheel should be considered for severe grinding conditions.

ADVANTAGES:

- *Aggressive grinding with less burnishing*
- *Broach remains cooler*
- *No dressing required*
- *Big savings — wheel is recycled, not thrown away*
- *Available in any form, and in a variety of grit sizes*

CBN BROACH WHEELS

Diameter: 5" and 6"

Width: .25" to .75"

CBN Grit Size:

80/100

100/120

120/140

STRIP AND REPLATE SERVICE

Engis offers strip and replating service on all electroplated grinding wheels. Call 1-800-993-6447 for information.

CBN FORM GRINDING WHEELS

A variety of CBN form grinding wheels are available from Engis Corporation.

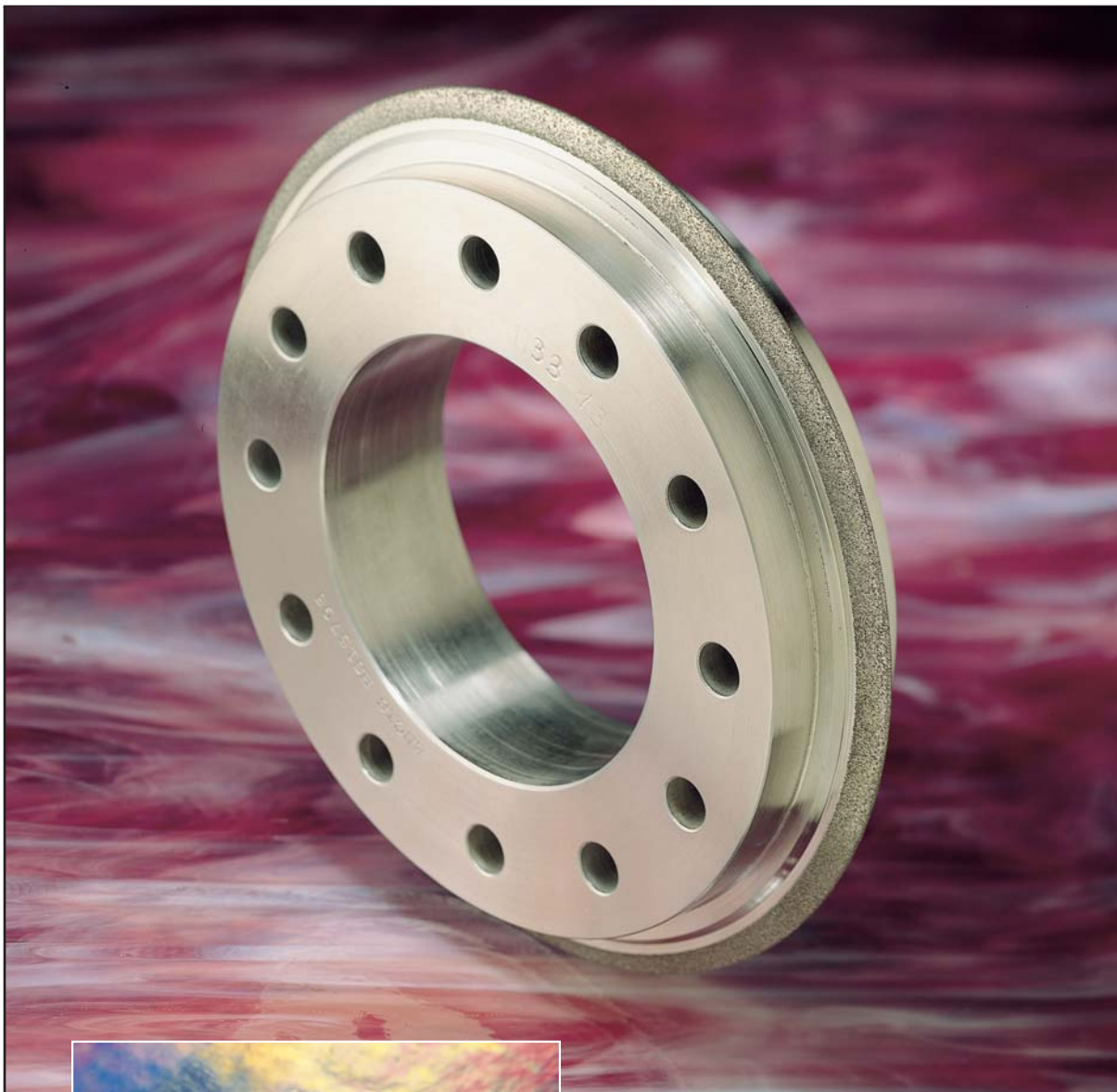
Our engineers, using sophisticated software and a wealth of application expertise, will custom design each wheel to your specifications and tolerances. High-precision CNC turning and grinding operations prepare the blanks for our Electrogrip[®] electroplating process. Each wheel goes through a multi-step inspection process prior to release for shipment.

STRIP AND REPLATE PROCESS

Engis also provides complete and comprehensive strip and replate and reconditioning services that return existing wheels to original print tolerances.

Unlike typical strip and replate services, Engis utilizes the same multiple inspection process applied to new wheel orders. Prior to stripping, each wheel is checked for damage. After stripping, the blank is reinspected for shape and other attributes and repaired before replating. The Electrogrip electroplating process is then applied, and the finished wheels are inspected once again prior to shipment.

Wheels that have gone through the Engis strip and replate process are capable of achieving the same tolerances and precision as when they were originally designed and manufactured.



Engis Wheel Compatibility

Engis grinding wheels are compatible with most major machine manufacturers, including, but not limited to:

- Blohm
- Mägerle
- Campbell
- Mazak
- Edgetek
- Mitsui Seiki
- Mori Seiki
- Excello

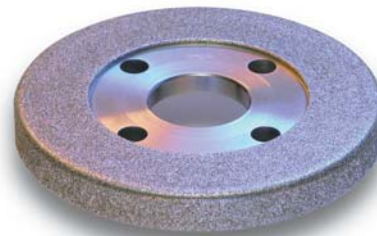
ELECTROMILL™ DIAMOND & CBN GRINDING WHEELS

ElectroMill™ diamond and CBN electroplated wheels replace expensive, complex indexable tungsten carbide or PCD milling cutters in high volume production finishing applications by consistently providing accurate flatness and part tolerances. With the right machine tool conditions and speed/feed parameters, throughput is significantly increased and tool costs, tool changeover and down-time cycles are dramatically reduced. ElectroMill can be successfully applied in marine, small-engine, automotive, off-road, agriculture, aerospace, defense and other industries - across a wide variety of components as well as ferrous, non-ferrous and exotic materials.



- *Tool life of the ElectroMill has proven to be 50,000 pieces, consistently.*
- *The mills are then sent back to Engis for strip and replate.*
- *Tool quality, dimensional accuracy and life repeatability are the same as the original mill.*

CUSTOM WHEELS FOR FACE GRINDING AND OTHER SPECIAL APPLICATIONS



Engis constantly develops new designs and products, while continuously improving existing wheel designs for higher levels of precision and performance.

In particular, we create custom superabrasive diamond and CBN wheels for medical, automotive and aerospace applications that utilize advanced ceramics, superalloys, composites and other hard-to-machine materials – especially where tolerance requirements are beyond what is achievable by standard or conventional grinding and milling.

In fact, in some applications, Engis grinding wheels have replaced conventional face milling, producing superior Ra & Ry values for surface finishes and flatness.

MEDICAL APPLICATIONS

Engis diamond & CBN wheels maintain surface integrity with controlled grinding and polishing of both ceramic and metallic medical and dental products, including prosthetics, sharps, surgical tools and dental implants. We also design specially processed grinding wheels for dental burr manufacturing.

AEROSPACE APPLICATIONS

Custom diamond wheels from Engis are used to grind aerospace and flight control components within super critical tolerances – including ceramic pump seals custom-made for the Space Shuttle.

AUTOMOTIVE APPLICATIONS

Innovative Engis diamond wheels also finish asymmetrical shapes and surfaces for ceramic automotive components. Engis face grinding wheels are used for aluminum manifolds and blocks, cast iron or bi-metal engine blocks, and cast iron connecting rods.

STRIP AND REPLATE SERVICE

Engis offers strip and replate service on all electroplated grinding wheels. Call 1-800-993-6447 for information.

ENGIS DIA-FORZ™ DIAMOND WHEELS FOR FOUNDRY APPLICATIONS



GRINDING WHEELS FOR ROBOTIC CELLS

ENGIS DIA-FORZ DIAMOND PLATED GRINDING WHEELS FOR ROBOTIC CELLS PROVIDE SEVERAL SIGNIFICANT ADVANTAGES WHEN COMPARED TO OTHER PLATED WHEELS.

Engis is a leader in the manufacture of plated wheels for use in robotic grinding cells, including Barinder and Maus systems.

As a pioneer in the design of wheels for robotic cells, our knowledgeable sales engineers can visit your plant to provide on-the-spot application assistance.

With our extensive experience in the plated tool business, Engis is capable of manufacturing electroplated wheels to almost any shape and design to meet the most demanding applications.



DIAMOND BURRS

ADVANTAGES:

- *Dia-ForZ diamond plated burrs provide up to five times longer life than carbide burrs*
- *Diamond cuts faster than carbide*
- *Excellent for use on burnt-on sand*
- *Better ergonomics result in less fatigue for your operator*
- *Customized shapes are available*
- *Our coarse, medium and fine grit diamond sizes allow you to customize the stock removal rate/finish required for your application*



Part Number	Size (Inches)	Grit
HS35509-1	.390 x 0.800 x .250	Fine
HS35509-2	.390 x 0.800 x .250	Medium
HS35509-3	.390 x 0.800 x .250	Coarse
HS35471-1	.715 x 1.125 x .250	Fine
HS35471-2	.715 x 1.125 x .250	Medium
HS35471-3	.715 x 1.125 x .250	Coarse
HS35367-1	.670 x 1.400 x .375	Fine
HS35367-2	.670 x 1.400 x .375	Medium
HS35367-3	.670 x 1.400 x .375	Coarse
HS35366-1	.730 x 1.500 x .375	Fine
HS35366-2	.730 x 1.500 x .375	Medium
HS35366-3	.730 x 1.500 x .375	Coarse
HS35470-1	1.100 x 2.000 x .3 x 5/8	Fine
HS35470-2	1.100 x 2.000 x .3 x 5/8	Medium
HS35470-3	1.100 x 2.000 x .3 x 5/8	Coarse

GRINDING WHEELS FOR OFFHAND OPERATIONS

As opposed to conventional resin bonded grinding wheels, the Engis Dia-ForZ™ (Diamond Force) range offers significantly greater safety to your operator. Since the diamond grits are electroplated to a metal body, the wheel cannot fail, break or come apart due to abuse. This is particularly important in offhand operations where the grinder can be dropped or the governor fails and the machine over-speeds.

- **Safe**
- **Long Lasting**
- **Ergonomic**
- **Environmentally Friendly**
- **Fast Cutting**
- **High Performance**
- **Lower Overall Costs**

Dia-ForZ diamond plated wheels significantly outlast and cut faster than aluminum oxide and zirconia alumina products. This means a lower overall cost to your foundry.

As an added benefit, since diamond stays sharper longer and cuts faster, less force is required to remove imperfections on a casting, leading to enhanced operator ergonomics.

There is no dressing of the wheel required, as the grits are more fully exposed than in conventional wheels. And, because the wheel does not wear like a conventional wheel would, there is no loss of form or peripheral speed, and less dust is generated.

Dia-ForZ wheels can be replated with new, fresh diamond abrasive, making it an environmentally friendly "green" product, as there is less, if any, waste to dispose of.

DIA-FORZ DIAMOND PLATED GRINDING PRODUCTS OFFER YOUR CLEANING ROOM SEVERAL SIGNIFICANT ADVANTAGES OVER CONVENTIONAL BONDED ABRASIVE WHEELS.

- **Increased Safety – the wheel body will not fail, break or come apart due to abuse or over-speeding**
- **Better cutting action with diamond abrasive - giving you reduced cost per piece**
- **Cleaner operator environment – virtually no grinding dust from wheel wear**
- **Reduced material disposal cost – eliminates your used wheel hubs**
- **No loss of wheel speed – wheel diameter is maintained**
- **No dressing required**
- **No loss of form due to wear**
- **Improved balance over conventional wheels**
- **Enhanced comfort for your operators**

The Dia-ForZ range is available in:

- **Portable Ty 1, Ty 6 and Ty 27 versions**
- **Cutoff wheels**
- **Burrs**
- **Wheels for Robotic Cells**



ELECTROGRIP[®] DIAMOND CIRCULAR SAW BLADES



For use with:

- *Table Saws*
- *Hand Saws*
- *Horizontal Milling Machines*
- *Special Machines*

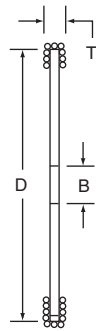
The major advantage of Electrogrip circular saw blades is their ability to cut freely, quickly and efficiently (either dry or wet) such materials as fiberglass, aluminum oxide, bakelite with abrasive filler, carbon, ceramics (both fired and unfired), melamine plastics and many other abrasive filled materials. They are available in a variety of diamond grits, thicknesses, saw blade edge styles and diameters ranging from 1" to 30".



Typical cutting applications for Engis Electrogrip saw blades include:

- | | | |
|--|--|-------------------|
| • <i>Fired and unfired ceramic automotive components</i> | • <i>Cast iron gates and risers in foundries</i> | • <i>Ferrites</i> |
| • <i>Fiberglass oilfield pipe</i> | • <i>Reinforced plastics</i> | • <i>Micarta</i> |
| • <i>Fiberglass pools</i> | • <i>Cement board</i> | • <i>Graphite</i> |
| • <i>Composite aerospace materials</i> | • <i>Friction materials</i> | • <i>Cermets</i> |
| | • <i>Refractory materials</i> | |



ELECTROGRIP® DIAMOND SAW BLADES**HOW TO ORDER**

When ordering, please specify the following:

- Diameter (D)
 - Width of diamond section (T)
 - Bore size (B)
 - Diamond grit required
 - Blade type — gulleted or continuous rim
 - Type of material to be cut and thickness
 - Physical properties of material
 - Type of machine and RPM available
-

DIAMOND AND CBN GRINDING PINS & MANDRELS

**FOR FAST, LOW-COST
GRINDING/FINISHING**

Engis diamond and CBN grinding pins offer a new dimension in precision grinding. They're today's answer for fast, efficient and reliable grinding of various, even difficult materials...at low cost.

These high-quality abrasive tools feature slow-wearing properties to provide long life and superior surface finishes, while increasing your productivity and reducing your inventory costs. Fast stock removal is assured even on the hardest materials.

Tools are available in a wide variety of popular styles and sizes, stocked for immediate delivery.

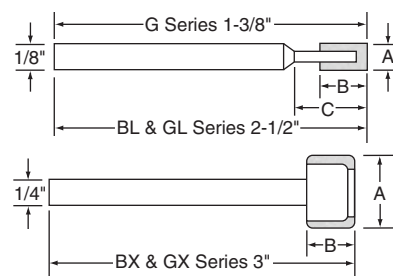
- **Electroplated Diamond & CBN Grinding Pins that consistently outperform conventional pins**
- **Diamond-Plated Taper Pins for grinding/ripping tungsten carbide drawing dies and cold heading dies**



ELECTROPLATED DIAMOND & CBN GRINDING PINS & MANDRELS

Featuring hardened steel shanks and bonded diamond or CBN particles, these precision grinding pins are ideal for use on jig and internal grinding machines and/or hand tools. Through our Electrogrip® process, particle exposure is maximized, assuring a free cutting action that greatly reduces heat and wear.

When ordering: Specify catalog number and grit size.
 Special pins quoted upon request (please furnish print or sketch).



BL (CBN) & GL (DIAMOND) SERIES PINS - SPECIFICATIONS

CBN Grit Size	Catalog Number	Diamond Grit Size	Catalog Number	A	B	C
140/170	BL-20	Coarse	GL-20	.020"	1/16"	1/8"
	BL-25	140/170	GL-25	.025"	3/32"	1/4"
	BL-30	Fine	GL-30	.030"	3/32"	1/4"
	BL-35	200/230	GL-35	.035"	3/32"	1/4"
80/100	BL-40	Coarse	GL-40	.040"	1/8"	3/8"
	BL-45	80/100	GL-45	.045"	1/8"	3/8"
	BL-50	Fine	GL-50	.050"	1/8"	3/8"
	BL-50-1	200/230	GL-50-1	.050"	1/8"	1"
80/100	BL-55		GL-55	.055"	1/8"	3/8"
	BL-60		GL-60	.060"	1/8"	3/8"
	BL-60-1	Coarse	GL-60-1	.060"	1/8"	1"
	BL-70	100/120	GL-70	.070"	5/32"	1/2"
80/100	BL-70-1	Fine	GL-70-1	.070"	5/32"	1"
	BL-80	200/230	GL-80	.080"	5/32"	1/2"
	BL-80-1		GL-80-1	.080"	5/32"	1"

CBN Grit Size	Catalog Number	Diamond Grit Size	Catalog Number	A	B	C
80/100	BL-90		GL-90	.090"	5/32"	1/2"
	BL-90-1		GL-90-1	.090"	5/32"	1"
	BL-100	Coarse	GL-100	.100"	5/32"	1/2"
	BL-100-1	100/120	GL-100-1	.100"	5/32"	1"
80/100	BL-110	Fine	GL-110	.110"	5/32"	1/2"
	BL-110-1	200/230	GL-110-1	.110"	5/32"	1"
	BL-125		GL-125	.125"	5/32"	1/2"
	BL-125-1		GL-125-1	.125"	5/32"	1"
80/100	BL-141		GL-141	.141"	1/4"	—
	BL-156	Coarse	GL-156	.156"	1/4"	—
	BL-188	100/120	GL-188	.188"	1/4"	—
	BL-218	Fine	GL-218	.218"	1/4"	—
80/100	BL-250/2	200/230	GL-250/2	.250"	5/8"	—
	BL-250/4		GL-250/4	.250"	1/4"	—

DIAMOND-PLATED TAPER PINS & MANDRELS



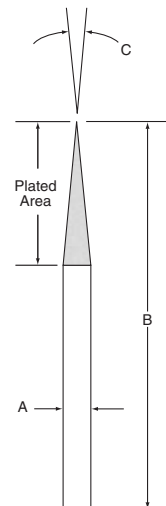
These diamond plated taper pins are ideal for grinding or ripping tungsten carbide drawing dies for the wire and tube industries, and for cold heading dies. You get fast, efficient and precise grinding, with long wear.

SPECIFICATIONS

Part Number	A	B	C
GLT-125-10	1/8"	2-1/2"	10°
GLT-125-12	1/8"	2-1/2"	12°
GLT-125-16	1/8"	2-1/2"	16°
GLT-125-26	1/8"	2-1/2"	26°
GLT-250-10	1/4"	3"	10°
GLT-250-12	1/4"	3"	12°
GLT-250-16	1/4"	3"	16°
GLT-250-26	1/4"	3"	26°

When Ordering: Specify grit desired;
80/100 Coarse or 200/230 Fine.

Price sheet available on request.



G (DIAMOND) SERIES PINS — SPECIFICATIONS

Diamond Grit Size	Catalog Number	A	B	C
Coarse	G-20	.020"	1/16"	1/8"
140/170	G-25	.025"	3/32"	1/4"
Fine	G-30	.030"	3/32"	1/4"
200/230	G-35	.035"	3/32"	1/4"
Coarse	G-40	.040"	1/8"	3/8"
100/120	G-45	.045"	1/8"	3/8"
Fine	G-50	.050"	1/8"	3/8"
200/230	G-55	.055"	1/8"	3/8"
	G-60	.060"	1/8"	3/8"
	G-70	.070"	5/32"	1/2"
Coarse	G-80	.080"	5/32"	1/2"
100/120	G-90	.090"	5/32"	1/2"
Fine	G-100	.100"	5/32"	1/2"
200/230	G-110	.110"	5/32"	1/2"
	G-125	.125"	5/32"	1/2"

BX (CBN) & GX (DIAMOND) SERIES PINS - SPECIFICATIONS

CBN Grit Size	Catalog Number	Diamond Grit Size	Catalog Number	A	B
	BX-141		GX-141	9/64"	1/4"
	BX-156		GX-156	5/32"	1/4"
	BX-188		GX-188	3/16"	1/4"
	BX-218	Coarse	GX-218	7/32"	1/4"
80-100	BX-250/2	100/120	GX 250/2	1/4"	1/8"
	BX-250/4	Fine	GX-250/4	1/4"	1/4"
	BX-312/2	140/170	GX-312/2	5/16"	1/8"
	BX-312/4		GX-312/4	5/16"	1/4"
	BX-312/6		GX-312/6	5/16"	3/8"
	BX-375/2		GX-375/2	3/8"	1/8"
	BX-375/4		GX-375/4	3/8"	1/4"
	BX-375/6	Coarse	GX-375/6	3/8"	3/8"
80/100	BX-500/4	100/120	GX-500/4	1/2"	1/4"
	BX-500/6	Fine	GX-500/6	1/2"	3/8"
	BX-500/8	140/170	GX-500/8	1/2"	1/2"
	BX-750/4		GX-740/4	3/4"	1/4"
	BX-750/8		GX-750/8	3/4"	1/2"

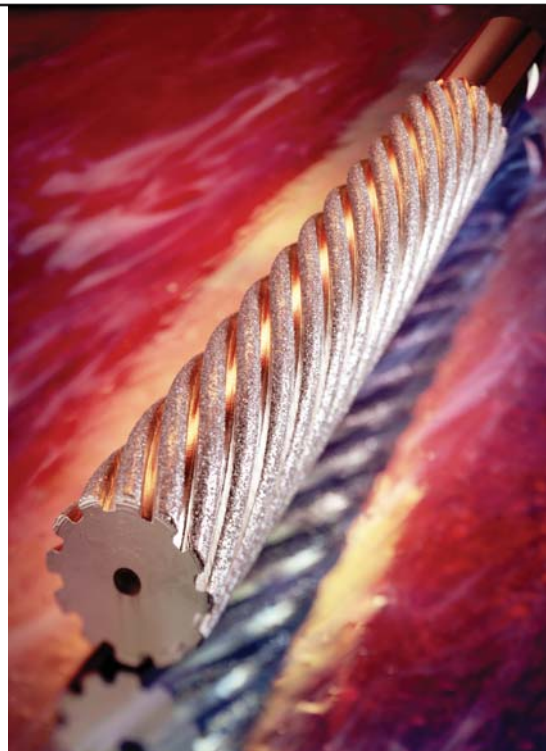
Toll-Free 1-800-99-ENGIS

ELECTROGRIP[®] DIAMOND ROUTERS

For use with:

- **Power Hand Tools**
- **Routing Machines**
- **Milling Machines, horizontal and vertical**

Electrogrip diamond routers are manufactured in a wide variety of sizes and styles designed specifically to machine, trim, groove and grind forms in composites or abrasive materials. They produce finishes which are free from chipping or crazing. These tools cut by an abrasive action which differs from the shearing action of cutters generally used in the metalworking industry. Because of their free cutting action there is no excessive heat and little wear. For best performance, these tools should be run at speeds of 5,000 to 6,000 surface feet per minute. Short shaft lengths eliminate whipping and deflection when operated at high speeds.

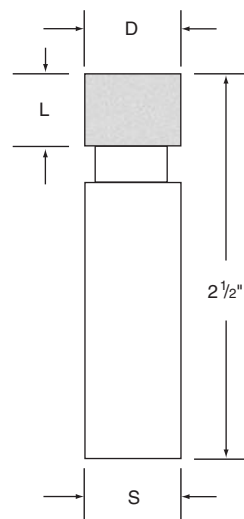


Electrogrip diamond routers work effectively on materials such as composites, fiberglass, aluminum oxide, wood, particle board (MDF), bakelite with abrasive filler, carbon (unfired), melamine plastic and many other abrasive-filled materials.

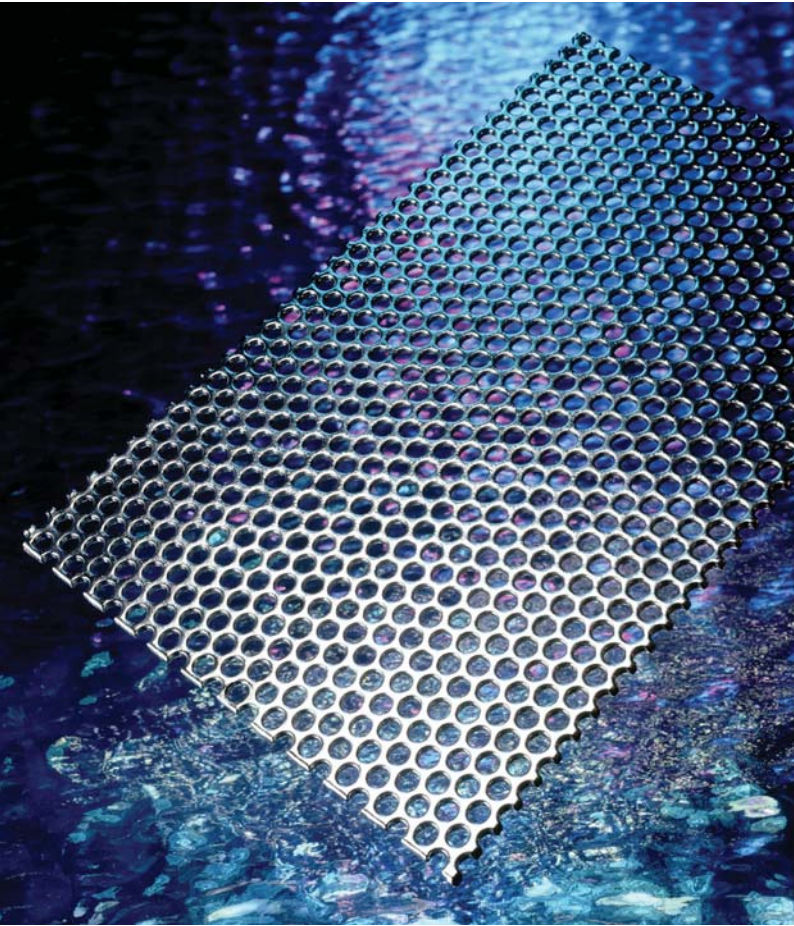
HOW TO ORDER:

When ordering other than catalog items, the following information is necessary — tool diameter (D), shank diameter (M), diamond length (L), overall length (if longer than 2-1/2"), grit size, type and hardness of material to be used on.

COARSE 30/40 Part #	FINE 40/60 Part #	S	D	L
R14C	R14F	1/4"	1/8"	1/2"
R18C	R18F	1/4"	1/8"	1"
R24C	R24F	1/4"	1/4"	1/2"
R28C	R28F	1/4"	1/4"	1"
R34C	R34F	1/2"	3/8"	1/2"
R38C	R38F	1/2"	3/8"	1"
R44C	R44F	1/2"	1/2"	1/2"
R48C	R48F	1/2"	1/2"	1"
R54C	R54F	1/2"	5/8"	1/2"
R58C	R58F	1/2"	5/8"	1"
R64C	R64F	1/2"	3/4"	1/2"
R68C	R68F	1/2"	3/4"	1"
R84C	R84F	1/2"	1"	1/2"
R88C	R88F	1/2"	1"	1"



When ordering standard routers, please specify grit size, "D" dimension and "L" dimension. Note: other shank lengths and diameters can be made to order.



ELECTROGRIP ABRA-SCREEN

Diamond plated screen for use in operations usually performed with coated abrasive papers.

ADVANTAGES

- *Long lasting diamond abrasive*
- *Free cutting, well exposed abrasive*
- *Minimal loading with abraded material*
- *Ideal for hard and highly abrasive materials*

Electrogrip diamond plated screen is manufactured in a variety of sizes and grit choices. It is used as a general purpose abrasive for operations such as deburring, edge breaking and removing high spots from flat surfaces. In fact, it can be used as a substitute for coated abrasives in all applications, except where flexibility is required. Because the tough diamond abrasive is electrochemically bonded and well exposed, these tools exhibit a free cutting action with no excessive heat and little wear. The perforations provide ample clearance for abraded material, keeping the abrasive free from loading. This feature is also well suited for use with a dust collection system.

COARSE 100/120 Part #	FINE 325/400 Part #	WIDTH	LENGTH
AS-24C	AS-24F	2"	4"
AS-26C	AS-26F	2"	6"
AS-46C	AS-46F	4"	6"
AS-1212C	AS-1212F	12"	12"

Other sizes and shapes available upon request.



DI-FLEX SUPERABRASIVE SHEETS AND DISCS

Di-Flex superabrasive sheets and discs feature diamond particles electroplated to a thin sheet of material. This material, when plated with diamond, is semi-flexible and can be used for a variety of applications.

Di-Flex can be used as a general purpose abrasive for operations such as deburring, edge breaking and removing high spots from flat surfaces. Because this material is semi-flexible, it can also be used on areas of parts where some flexibility is required. Di-Flex can be adhered by a pressure sensitive adhesive backing to tables, tools, wheels and other areas where an abrasive can be used. Di-Flex is available with or without a pressure sensitive adhesive backing, in discs from 1" - 30" in diameter or can be supplied in squares and rectangles.

We can also supply Di-Flex to your specified shapes.

DIAMOND HAND FILES

EXTRA LONG

For use on carbide, stainless steel, hardened steel, glass, ceramics and other similar materials

The Engis "extra long" hand files illustrated are made from carefully selected quality diamonds, precisely bonded to obtain the best physical properties for added strength and resistance to wear. The high stock removal rate and constant cutting action make Engis diamond files an economical choice. These files can be used in applications where other files may be limited. They can also be used with the world famous Di-Profiler reciprocating hand machines (air or electric) to speed filing operations and eliminate tedious hand labor.

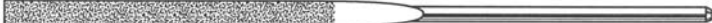
LONG DIAMOND FILE SETS

Engis diamond file sets are attractively packaged in a plastic pouch and include the following diamond files: Nos. 1, 2, 3, 4, 5, 6 and 7.

NOTE: For information on other diamond, CBN or steel files, contact your local Engis representative or call us direct.



DESCRIPTION — LONG DIAMOND HAND FILES 100 MICRON SIZE

Part No.		Description
DLH-1		 Flat (coated 1 side)
DLH-2		 Round (completely coated)
DLH-3		 Half-round (1 safe side)
DLH-4		 Crossing (completely coated)
DLH-5		 Triangle (coated 3 sides)
DLH-6		 Square (coated 4 sides)
DLH-7		 Barrette (coated 1 side)
DLH-11		 Flat (coated 4 sides)
DLH-30		 Half-round (completely coated)

FULLY-IMPREGNATED DIAMOND & CBN GRINDING TOOLS

**FOR FAST, LOW-COST
CLOSE TOLERANCE
GRINDING/FINISHING**



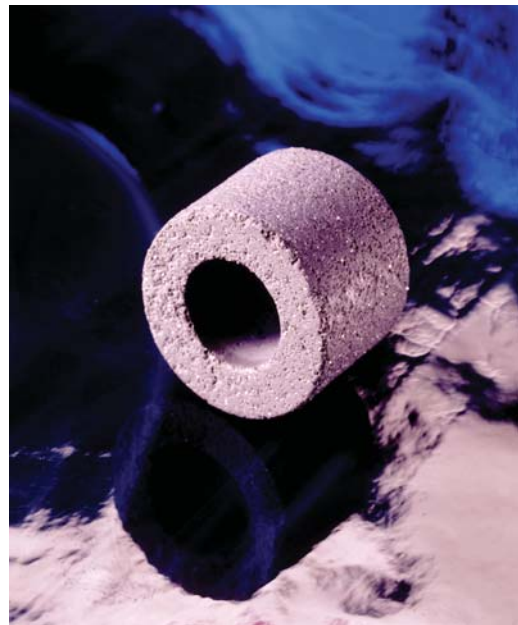
GRINDING PINS & MANDRELS

Fully-impregnated diamond or CBN abrasive particles, precision bonded to carbide shanks. They provide you with fast, free-cutting action and maximum stock removal. Precision grind to close tolerances. Long life provides maximum return on investment and lower inventory costs.



CONE GRINDING WHEELS

Featuring fully-impregnated diamond or CBN abrasive particles metal bonded to carbide shanks. These cone grinding wheels allow you to quickly grind to extremely close tolerances at low cost. Free-cutting, they combine maximum stock removal with precision.



GRINDING WHEELS

Providing fast, free-cutting means of yielding maximum stock removal with precision. These fully-impregnated diamond or CBN grinding wheels are your best choice for grinding to close tolerances at the lowest possible cost.

TOOLS ARE AVAILABLE IN A VARIETY OF STYLES AND SIZES, STOCKED FOR QUICK DELIVERY

Toll-Free 1-800-99-ENGIS

DIAMOND DRESSING BLOCKS

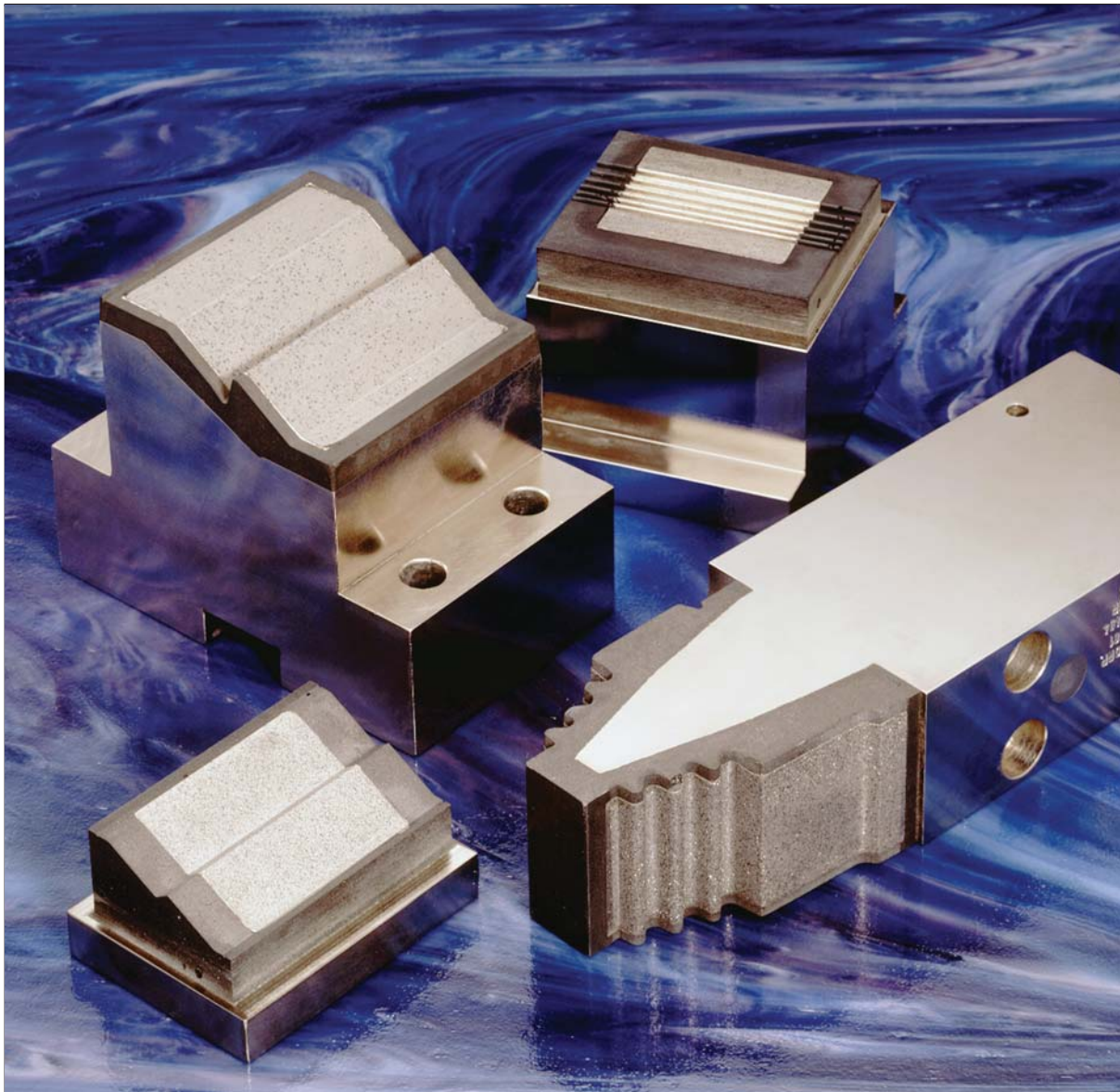
For use on grinders with
 reciprocating tables such as:

- *Surface Grinders*
- *Tool & Cutter Grinders*
- *Optical Form Grinders*

Electrogrip® diamond dressing blocks are used to dress specific forms into aluminum oxide and silicon carbide grinding wheels, quickly and accurately. These simple-to-use dressing blocks can be held magnetically or mechanically on a machine table, or mounted within a part holding fixture.

By setting the dressing block at the finished ground height and adjusting the reciprocating stroke length, it will continually dress the wheel as the part approaches its finished form and height. At the same time as the wheel is being freshly dressed, the workpiece is being ground to precise form and size. It's your assurance that all parts are accurately ground, piece-after-piece.

By using these tools, your standard surface grinders can become automatic form grinders when combined with power downfeed.



ADVANTAGES:

- *Speed and accuracy*
- *Simplifies set-up*
- *Minimum work space*
- *Long tool life*
- *Less spindle wear than with crush dressing*
- *Increases machine versatility*
- *Eliminates costly wheel truing attachments*
- *Assures freshly dressed wheel throughout cycle*

STANDARD RADIUS DIAMOND DRESSING BLOCKS

These standard dressing blocks are set up and used in the same manner as the special form dressing blocks and are available from stock in the three configurations and radius sizes listed.

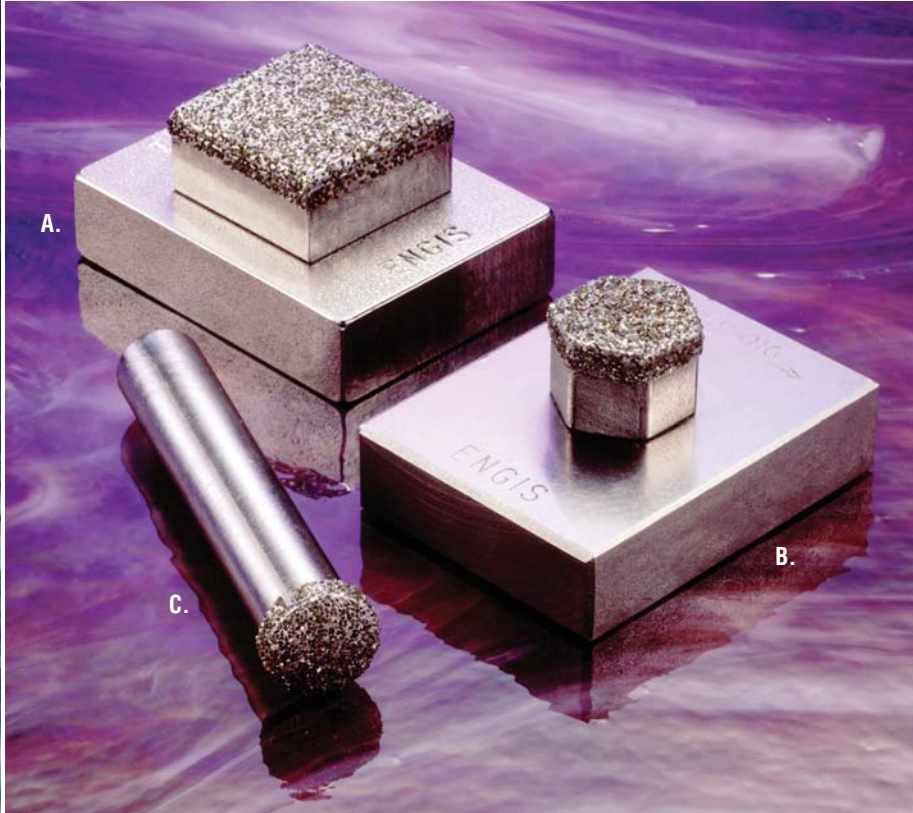
DRESSING BLOCK TOLERANCES

The following applies to the diamond coated portion of the dressing blocks.

Dimensional accuracy	± .0002"
Radii tolerance	± .0002"
Minimum inside and outside radii	0.003"

Note: These tolerances are generalized. Specific forms can be held to closer limits. Let our applications engineers review your needs.

STANDARD DIAMOND PLATED STRAIGHT PERIPHERAL DRESSING TOOLS



A. ENGIS LP-1 Diamond Straight Dressing Block
B. ENGIS MINI-DRESS* Diamond Straight Dressing Block
C. ENGIS MINI-MATE I* - 3/8", MINI-MATE II* - 7/16" Diamond Straight Dressing Tool

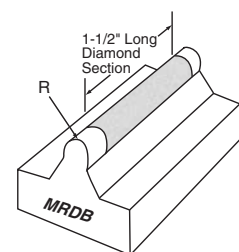
For use on:

- **Surface Grinders**
- **Cylindrical Grinders**
- **Tool Grinders**
- **Optical Projector Grinders**
- **Other grinders with traversing capabilities**

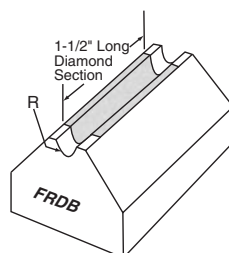
Engis Electrogrip® diamond straight dressing tools are designed to dress aluminum oxide and silicon carbide grinding wheels straight and true, removing previous forms or shapes, quickly and efficiently.

ADVANTAGES:

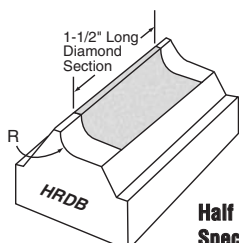
- **Can dress thin wheels without vibration or chipping**
- **Dressing load is distributed over a period of time and distance**
- **Does not require re-orientation to keep diamond sharp**
- **Easily dresses aluminum oxide and silicon carbide**
- **Improves surface finish because phonographing and/or grooving of the wheel being dressed is eliminated**



Male Radius Dressing Block MRDB
Specify MRDB and Radius



Female Radius Dressing Block FRDB
Specify FRDB and Radius



Half Radius Dressing Block HRDB
Specify HRDB and Radius

STYLE	STD. RADII	STYLE	STD. RADII	STYLE	STD. RADII
MRDB FRDB HRDB	.010"	MRDB FRDB HRDB	.281"	MRDB FRDB HRDB	.781"
	.015"		.312"		.812"
	.020"		.375"		.843"
	.025"		.406"		.875"
	.030"		.437"		.906"
	.031"		.468"		.937"
	.040"		.500"		.968"
	.046"		.531"		1.000"
	.050"				
MRDB FRDB HRDB	.062"	MRDB FRDB HRDB	.562"		
	.078"		.593"		
	.094"		.625"		
	.125"		.656"		
	.156"		.687"		
	.188"		.718"		
	.250"		.750"		

Toll-Free 1-800-99-ENGIS

*Trademark of Engis Corporation

WFM ROTARY DRESSING DISCS

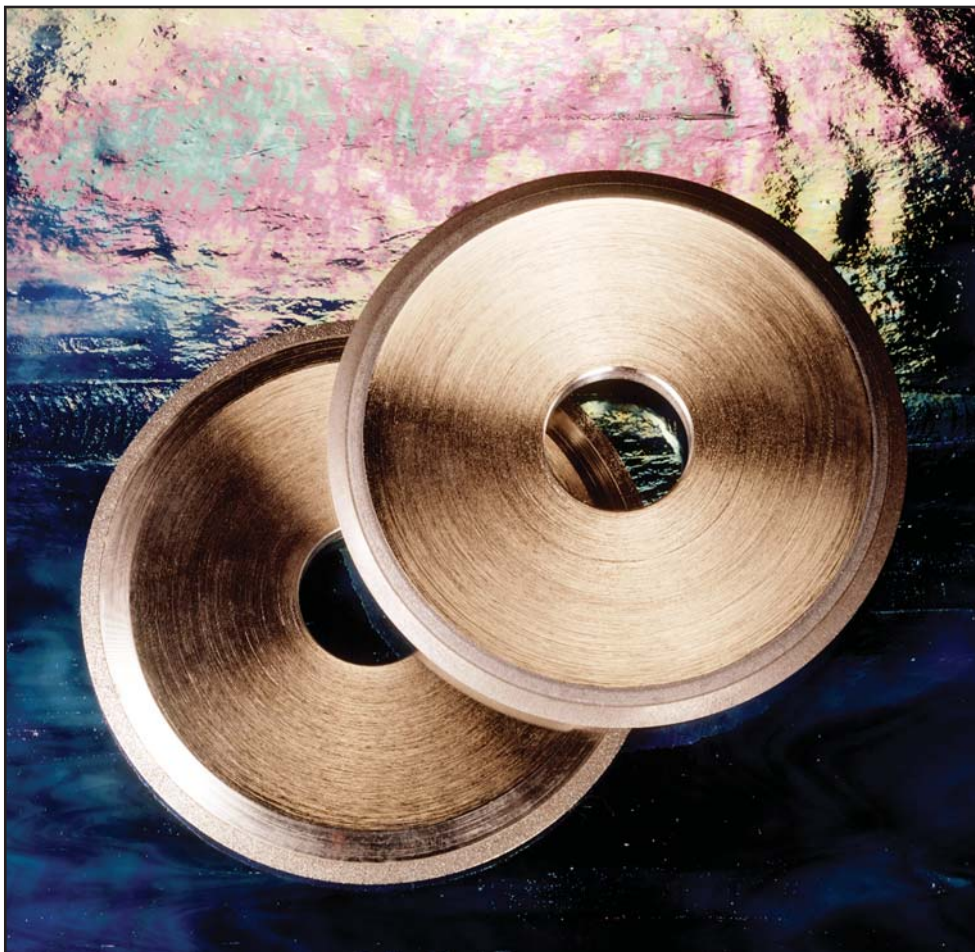
ENGIS WFM GRINDING WHEEL DRESSING DISCS

Engis manufactures both direct and reverse plated grinding wheel dressing discs. These discs were developed for use on grinding wheel dressing and profiling systems and can be used for any type of dressing system that requires a 4" diameter power-driven dressing disc.

WFM discs are used to dress conventional, as well as vitrified and resin bonded, diamond and CBN grinding wheels.

Similar to the chisel-type dressing tools, these discs are available with a selection of angles and edge radius in both the reverse and direct plated types.

**FOR FAST DELIVERY ENGIS
 CAN SUPPLY 1" AND 10MM
 BORE SIZES FROM STOCK.**



ELECTROGRIP WHEEL FOR WHEEL FORMING MACHINE: WFM-1A – DIRECT PLATED

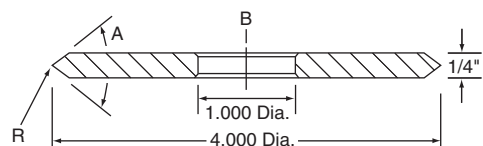
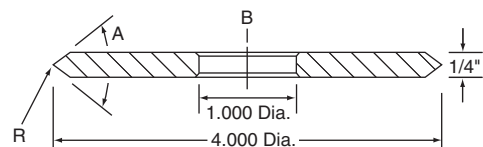
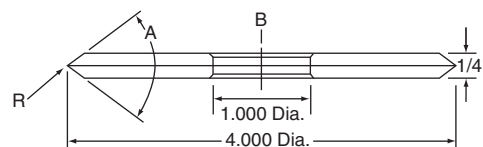
Part No.	A Angle	R Radius
WFM-1A-104	40°	.010"
WFM-1A-204	40°	.020"
WFM-1A-254	40°	.025"
WFM-1A-106	60°	.010"
WFM-1A-206	60°	.020"
WFM-1A-054	40°	.005"
WFM-1A-306	60°	.030"

REFORM[®] DRESSING WHEEL: WFM-2A-TYPE 1 – REVERSE PLATED

Part No.	A Angle	R Radius
WFM-2A-206	60°	.020"
WFM-2A-026	60°	.002"
WFM-2A-056	60°	.005"
WFM-2A-106	60°	.010"
WFM-2A-054	40°	.005"
WFM-2A-104	40°	.010"
WFM-2A-204	40°	.020"
WFM-2A-209	90°	.020"
WFM-2A-154	60°	.015"

REFORM[®] DRESSING WHEEL: WFM-2A-TYPE 2 – REVERSE PLATED

Part No.	A Angle	R Radius
WFM-2A-634	40°	.0625"
WFM-2A-306	60°	.0300"
WFM-2A-626	60°	.0625"



FOR ORDERING SPECIAL WFM DISCS

When ordering specials, please specify each dimension required:

B (Bore Size)
 T (Thickness)
 D (Diameter)
 A (Angle)
 R (Radius)

BONDED DIAMOND CORE DRILLS

For use with:

- **Drilling Machines**
- **Milling Machines**
- **Special Machinery**

When properly used, Engis bonded diamond core drills provide maximum efficiency and trouble-free core drilling of holes or plugs in glass, quartz, silica, ceramics, refractories, abrasive blocks and similar materials.

All Engis bonded core drills have a maximum concentration of diamonds evenly dispersed through a one-piece tube of extreme strength. Manufacturing tolerances are held to $\pm .001''$ on the O.D. Closer tolerances can be maintained on the I.D. or O.D. if required. These must be specified and are subject to quotation.

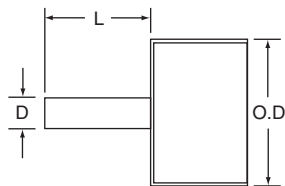
Electroplated core drills are also available.

CORE DRILLS ARE AVAILABLE IN DIAMETERS .030" AND LARGER.
ELECTROPLATED CORE DRILLS ARE ALSO AVAILABLE.

HOW TO ORDER

When ordering bonded diamond core drills, please specify the following:

- **Diameter required**
- **I.D. or O.D.**
- **Shank diameter and length**
- **Type of material to be drilled**
- **Thickness of material to be drilled**



NOTE:

All bonded core drills have a 1/4" length of bonded diamond mounted on a straight tube shank.

Steel shanks and threaded adapter nuts are available on request.

For additional information, please contact Engis.

SUPERABRASIVE BORE FINISHING TOOLS



Engis superabrasive diamond and CBN plated bore finishing tools provide fast and precise stock removal, and superior finishes. They outlast conventional honing tools by margins up to 100 to 1.

Extremely accurate and consistent, and capable of finishing thousands of parts with a single sleeve, these tools greatly increase your productivity and improve your dimensional control. You can achieve near zero rejections at tolerances better than .0001", with roundness and straightness to better than .000020", saving you the cost of inspecting each part processed. Coolant life is also greatly increased because there's no loose abrasive to contaminate the fluid.

Superabrasive bore finishing tools are designed for use on standard drilling, milling and honing machines. They're ideal for use on any machine with rotating spindles.

AVAILABILITY FROM STOCK

A limited range of superabrasive bore finishing tools is available from inventory. Call for fast delivery. Also, inquire about our Just-In-Time delivery programs tailored to your exact needs.



ADVANTAGES:

- ***Speeds finishing operations on a wide variety of materials***
- ***Provides predictable and consistent hole size and geometry...for near zero rejection rates***
- ***Helical design reduces tool loading, overheating and torque requirements for extended life***
- ***Just-In-Time delivery programs***
- ***Engis superabrasive bore finishing tools increase productivity on a wide range of materials and parts.***

MULTIPLE-SPINDLE BORE FINISHING SYSTEMS

In addition to tools, Engis also manufactures complete systems, featuring multiple-spindle, single-pass bore finishing systems that make conventional honing obsolete. Ask your Engis representative for a copy of our free catalog or download a catalog at www.engis.com.

SURFACE SPEED/FEET PER MINUTE CHART

REVOLUTION PER MINUTE FOR VARIOUS GRINDING SPEEDS AND WHEEL DIAMETERS

Wheel Diameter Inches	Wheel Peripheral (Surface) Speed, Feet per Minute																Wheel Diameter Inches
	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000	8,500	9,000	9,500	10,000	12,000	14,000	16,000	
	Revolutions per Minute																
1	15,279	17,189	19,098	21,008	22,918	24,828	26,737	28,647	30,558	30,467	34,377	36,287	38,196	45,836	53,474	61,116	1
2	7,639	8,594	9,549	10,504	11,459	12,414	13,368	14,328	15,278	16,238	17,188	18,143	19,098	22,918	26,737	30,558	2
3	5,093	5,729	6,366	7,003	7,639	8,276	8,913	9,459	10,186	10,822	11,459	12,115	12,732	15,278	17,826	20,472	3
4	3,820	4,297	4,775	5,252	5,729	6,207	6,685	7,162	7,640	8,116	8,595	9,072	9,549	11,459	13,368	15,278	4
5	3,056	3,438	3,820	4,302	4,584	4,966	5,348	5,730	6,112	6,494	6,876	7,258	7,640	9,168	10,696	12,224	5
6	2,546	2,865	3,183	3,501	3,820	4,138	4,456	4,775	5,092	5,411	5,729	6,048	6,366	7,639	8,913	10,186	6
7	2,183	2,455	2,728	3,001	3,274	3,547	3,820	4,092	4,366	4,638	4,911	5,183	5,456	6,548	7,640	8,732	7
8	1,910	2,148	2,387	2,626	2,865	3,103	3,342	3,580	3,820	4,058	4,297	4,535	4,775	5,729	6,685	7,640	8
9	1,698	1,910	2,122	2,334	2,546	2,758	2,970	3,182	3,396	3,606	3,820	4,032	4,244	5,092	5,940	6,792	9
10	1,528	1,719	1,910	2,101	2,292	2,483	2,674	2,865	3,056	3,247	3,438	3,629	3,820	4,584	5,348	6,112	10
12	1,273	1,432	1,591	1,751	1,910	2,069	2,228	2,386	2,546	2,705	2,864	3,023	3,183	3,820	4,456	5,092	12
14	1,091	1,228	1,364	1,500	1,637	1,773	1,910	2,046	2,182	2,319	2,455	2,592	2,728	3,274	3,820	4,366	14
16	955	1,074	1,194	1,313	1,432	1,552	1,672	1,791	1,910	2,029	2,149	2,268	2,387	2,865	3,342	3,820	16
18	849	955	1,061	1,167	1,273	1,379	1,485	1,591	1,698	1,803	1,910	2,016	2,122	2,546	2,970	3,396	18
20	764	859	955	1,050	1,146	1,241	1,337	1,432	1,528	1,623	1,719	1,814	1,910	2,292	2,674	3,056	20
22	694	781	868	955	1,042	1,128	1,215	1,302	1,388	1,476	1,562	1,649	1,736	2,084	2,430	2,776	22
24	637	716	796	875	955	1,034	1,115	1,194	1,274	1,353	1,433	1,512	1,591	1,910	2,238	2,546	24
26	588	661	734	808	881	955	1,028	1,101	1,176	1,248	1,322	1,395	1,468	1,762	2,056	2,352	26
28	546	614	682	750	818	887	955	1,023	1,092	1,159	1,228	1,296	1,364	1,637	1,910	2,182	28
30	509	573	637	700	764	828	891	955	1,018	1,082	1,146	1,210	1,274	1,528	1,782	2,036	30
32	477	537	597	656	716	776	836	895	954	1,014	1,074	1,134	1,194	1,432	1,672	1,910	32
34	449	505	562	618	674	730	786	843	898	955	1,011	1,067	1,124	1,348	1,572	1,796	34
36	424	477	530	583	637	690	742	795	848	902	954	1,007	1,061	1,273	1,484	1,698	36



Toll-Free 1-800-99-ENGIS

Leaders in Superabrasive Finishing Systems



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Hyprez® Lapping/Polishing Systems

Beginning-to-end flat finishing systems – machines, plates, pads, diamond powders, slurries, lubricants and other accessories – plus customized equipment, specialized formulas, testing labs and technical support for process and technology development.

DiaMold® Toolroom Products

Comprehensive line of diamond polishing compounds, abrasive stones, sticks, bobs, brushes and files – plus powered hand finishing systems for every toolroom application.

Engis Single-Pass Bore Finishing Systems

Single-pass bore finishing systems – standard models and custom machines – plus diamond and CBN plated finishing tools, parts holders/fixtures and integrated automation system.

Electrogrip® Grinding Systems

Advanced superabrasive grinding, cutting and dressing systems utilizing diamond and CBN materials. Specializing in the aerospace, medical, ceramic, automotive and composite industries.



® **Leaders in Superabrasive Finishing Systems**

ENGIS CORPORATION

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