

PRECISION MACHINING & FINISHING

*Micron+*

# NEXT GENERATION MICRON+

——— *Toolmakers can achieve highly consistent engineered abrasive tools using Micron+, which increases productivity and dramatically improves workpiece quality.*



**elementsix™**  
a De Beers Group Company

# PRECISE REQUIREMENT DELIVERS THE BEST SOLUTION

————— *Element Six works closely with customers to tailor products to meet their exact requirements.*

PRECISE REQUIREMENT is the Element Six approach to matching product offers to customer needs – exactly. From a core portfolio of products Element Six can work with customers to tailor a product to meet a specified end-use requirement. To support co-development, Element Six has a dedicated Global Innovation Centre where new ideas can be explored and specifications defined; and where prototype grit products can be developed and tested.

Element Six is the world leader in synthetic diamond supermaterials and provides extreme performance solutions for over 3,000 customers worldwide. Through our Customer Support Centre in Ireland and our extensive representative network across the world, the experience, skills, know-how and the best technical facilities in the industry are available to all our customers.



*The Micron Centre is another example of Element Six's dedication to meeting customers' exact specification requirements. Fitted with exacting segregation equipment and size measurement systems, the Centre can differentiate Micron+ by type and size.*

# ELEMENT SIX MICRON+

Element Six Micron+ powders are part of the Element Six synthetic diamond abrasives family that provides a range of benefits to customers. These include increased levels of productivity and world class workpiece qualities achieved from the use of highly consistently engineered abrasive tools. The ability to select particles of precisely controlled size, strength and shape enables the production of the highest quality tools for the most demanding industrial applications.

## MICRON+ SYNTHETIC DIAMOND AND CBN POWDERS

Element Six provides a complete range of micron powders in synthetic diamond and cubic boron nitride (CBN). As the leading producer of saw- and wheel-size synthetic diamond and CBN abrasives, Element Six exercises complete control over the source materials from which Micron+ products are manufactured.

With more than fifty years' experience in developing and producing precision graded micron powders, Element Six has developed proprietary manufacturing methods and uncompromising quality control procedures. This guarantees that all Micron+ products, including our customised products, exceed Micron industry standards.

The main applications for Element Six Micron+ products include finish grinding, lapping and precision polishing operations across the optics, electronics and automotive industries.

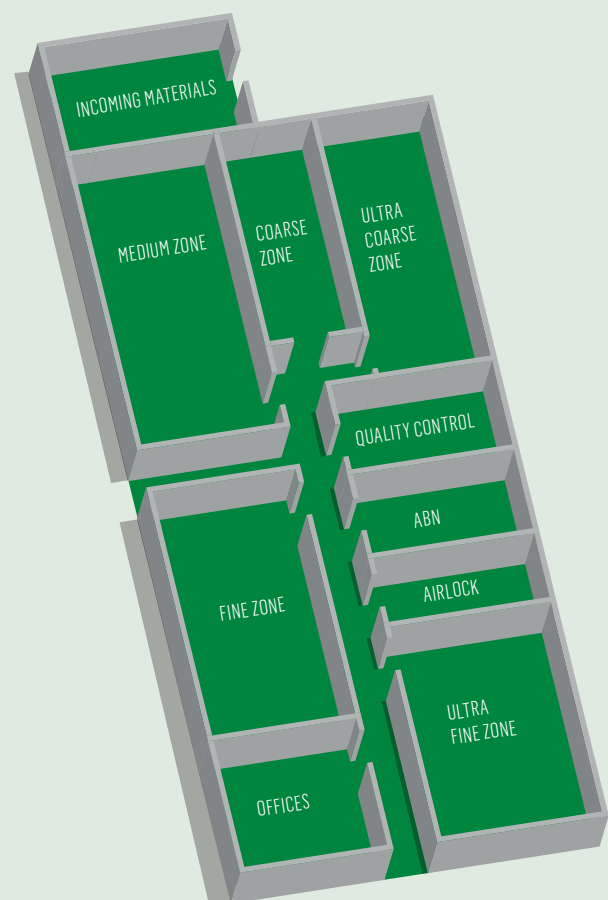
## THE ELEMENT SIX MICRON+ PRODUCTION CENTRE

The new Micron+ Production Centre in Shannon, Ireland, is one of the most advanced micron production facilities in the world. Using its state-of-the-art climate-controlled production lines, Element Six produces high-quality, high-performance micron to meet the needs of the tool manufacturers across the world.

A central characteristic of the Centre is the division of rooms into separate particle size zones. There is an air controlled, clean-room environment at every stage of the Micron+ production process, as well as a positive air pressure clean room for the preparation of ultra-fine grades of Micron+.

The Centre is fitted with exacting segregation equipment and size measurement systems which differentiate the Micron+ by type and size. In addition, these size measurement machines are used to develop customised size distribution to meet individual customers' exact specification requirements.

Stringent quality control measures are applied at every stage of the manufacturing process. It is this relentless commitment to industry-leading quality that allows Element Six to produce Micron+ with exceptional consistency in strength, size and purity.



# UNIQUE MICRON+ PRODUCTION PROCESS

Element Six is one of only a very few large-scale manufacturers of synthetic diamond. Since the fundamental characteristics of synthetic diamond are determined at the synthesising stage, complete control over this part of the process gives Element Six a significant advantage in producing extremely high quality micron.



Element Six creates the synthetic diamond that forms the basis for micron, which gives us a high degree of control over crystal size, strength, shape, purity and durability.



At the Element Six Micron+ Production Centre the incoming synthetic diamond is magnetically separated, milled to shape and size. The micron is then cleaned and rinsed before sedimentation.



In the final stage of production, Micron+ is oven dried, weighed, packed and labelled ready for dispatch - usually by express air freight from the nearby Shannon airport to customers all over the world.



Throughout the manufacturing process, the Micron+ is monitored by visual inspection and laser diffraction to make sure every batch matches each individual customer's exacting specification requirements.

# THE NEXT GENERATION MICRON+ PRODUCT RANGE

- Micron+ is available in two source materials: synthetic diamond and cubic boron nitride.
- Micron+ product range includes: MDA, CDA and ABN.
- Micron+ can be used in various bond systems including resin, metal, electroplated and vitrified bond applications.
- Coating is available for optimising tool fabrication and for increased tool performance.
- Cladding is an option for enhancing particle retention in bonded applications.
- All Micron+ products are manufactured to ISO9001:2008, the international standard for quality management.
- Micron+ is delivered in individual factory sealed containers in quantities of up to 25,000 carats.
- Every container is bar-coded for traceability throughout the manufacturing process, with samples of each batch held for reference.

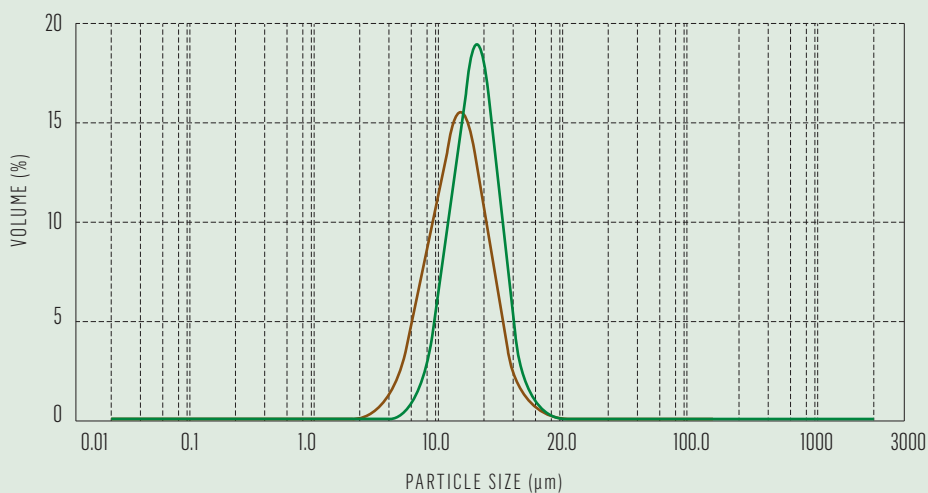
## MICRON+ STANDARD SIZES (µm)

### MDA, CDA, ABN

0-0.25	1-3	10-20	30-40
0-0.5	2-4	15-25	30-60
0-1	3-6	15-30	40-60
0.5-1	4-8	20-30	40-80
0.75-1.5	6-12	20-40	
1-2	8-16	25-35	

*Customised sizes are also available.*

## PARTICLE SIZE DISTRIBUTION



Element Six develops customised Micron+ to meet individual customers' specification requirements.

Element Six accurately controls the sizing distribution of its Micron+, using Laser Diffraction technology, which measures the angles and intensities of light diffracted from the micron particles.

# THE NEXT GENERATION MICRON+ PRODUCT RANGE

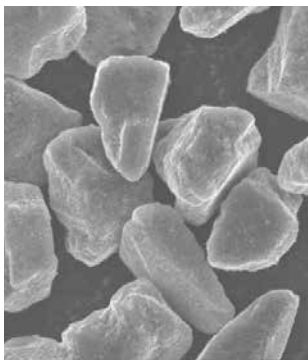
## THE IMPORTANCE OF COATINGS AND CLADDINGS

Protective coatings are a technology developed by Element Six to enhance synthetic diamond retention in the bonding matrix and to protect the surface of synthetic diamond crystals in the sintering process. Improving synthetic diamond retention keeps tools working at peak efficiency and extends tool life. Protective coatings also shield the synthetic diamond during the sintering process, allowing higher temperature sintering for either better bonding metallurgy or the use of different value bonding materials.

Claddings are primarily provided on synthetic diamond and cubic boron nitride abrasives to serve the resin bond tooling market. A copper or nickel cladding aids the dissipation of heat from active particles which prevents damage to the supporting resin matrix and the premature loss of the abrasive. Claddings also aid retention of the abrasive particles in the bond, providing for a rougher interface of greater area.

### COATINGS AND CLADDINGS

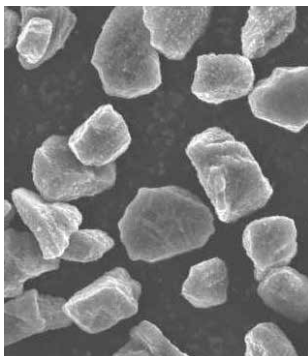
MICRON+ COATING AND CLADDING SIZES (µm)	MDA	CDA	ABN
6-12	Nickel cladding (55% by weight)	Nickel cladding (55% by weight)	Nickel cladding (60% by weight)
8-16			
10-20			
15-25			
15-30	Nickel cladding (30% by weight)	Copper cladding (50% by weight)	
20-30			
20-40			
25-35			
30-40	TF coating (titanium carbide)		
30-60			
40-60			
40-80			



Cladding improves particle retention.

### BENEFITS OF CLADDINGS

- Improved tool efficiency
- Improved heat dissipation
- Cladding shape can be customised to all customers' exacting requirements
- Differentiation of products to compete in the market with innovative solutions



Coating is available for optimising tool fabrication.

### BENEFITS OF COATINGS

- Improved diamond retention
- Improved tool efficiency
- Improved heat dissipation

# ADVANCED PERFORMANCE FOR DEMANDING APPLICATIONS

## A WIDE RANGE OF APPLICATIONS FOR TOOL MAKERS

Element Six Micron+ is used to cut, grind, lap or polish many different materials such as:

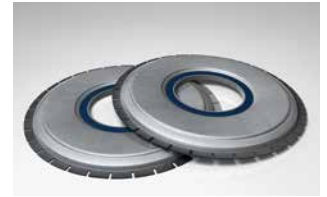
- silicon
- silicon carbide
- quartz
- sapphire
- metal carbides (WC)
- ceramics
- ferrous metal

## MICRON+ IS USED IN THE MANUFACTURE OF:

- metal, resin and vitrified bond wheels
- electroplated tools (EP)
- pellets and polishing pads



*Saw wire.*



*Dicing wheel.*



*Grinding wheel.*



*Stone polishing pad.*



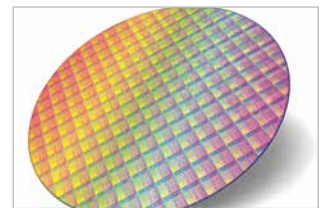
*Lapping tools.*

## TYPICAL END USER APPLICATIONS

- Super precision mould finishing for optical lenses
- Polishing optical lenses
- Cutting and grinding magnetic heads
- Slicing, dicing, back grinding and polishing silicon wafers
- Slicing and polishing sapphire wafers
- Cutting and lapping quartz oscillators
- Cutting and grinding glass for LCDs
- Honing of cylinder blocks for automotives



*Polishing lenses for optical instruments.*



*Slicing, dicing, back grinding and polishing silicon wafers.*



*Micron diamond is used in Metal Diamond Composite for heat sinks in PC chips.*

## **ELEMENT SIX**

Element Six is a synthetic diamond supermaterials company and a member of the De Beers Group of Companies.

Element Six designs, develops and produces synthetic diamond supermaterials, and operates worldwide with its head office registered in Luxembourg, and primary manufacturing facilities in China, Germany, Ireland, Sweden, South Africa, US and the UK.

Element Six supermaterial solutions are used in applications such as cutting, grinding, drilling, shearing and polishing, while the extreme properties of synthetic diamond beyond hardness are already opening up new applications in a wide array of industries such as optics, power transmission, water treatment, semiconductors and sensors.

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# FINELY TUNED FOR CONSISTENT PRECISION

——— *Element Six Micron+ is stringently processed to ever tighter specifications of size and shape to consistently meet the most exacting work-piece quality demands facing toolmakers today.*



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# MICRON+ MEETS PRECISE REQUIREMENTS

## NEWLY REFINED PROCESSES FOR ASSURED CONSISTENCY

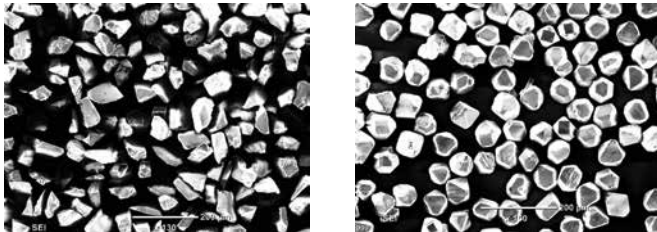
Element Six recognises that toolmakers need both optimised materials to fit precise tooling requirements, and materials that can be relied upon to deliver consistent performance from batch to batch.

Element Six's already stringent Micron processing and tight specification controls have now been further refined with;

- Further physical and systematic improvements in our processing facility, for reduced possibility of cross contamination
- Improved analysis techniques for tighter control over particle size and shape
- Certified Quality control processes
- Stringent control of purity and advanced cleaning to remove metals, silicates and other ceramics

## CUSTOMISED SHAPES FOR YOUR APPLICATION

New image analysis equipment enables Element Six to measure and specify the shape of Micron particles. Materials can be specified based on aspect ratio measurement.



Element Six can tailor particle shapes to a wide range of shape requirements.

Element Six can also specify the maximum percentage of needles down to 2% or potentially lower, providing a more precise material that delivers;

- Improved quality and performance
- Increased capability to customise for demanding applications

**ELEMENT SIX CAN HELP YOU DETERMINE THE CHARACTERISTICS YOU REQUIRE FOR YOUR APPLICATION, AND DELIVER TO YOUR EXACT SPECIFICATION**

## UP TO 25% TIGHTER SIZE PARTICLE DISTRIBUTION

With improved processing techniques, Element Six can now provide up to 25% tighter particle size distribution control.

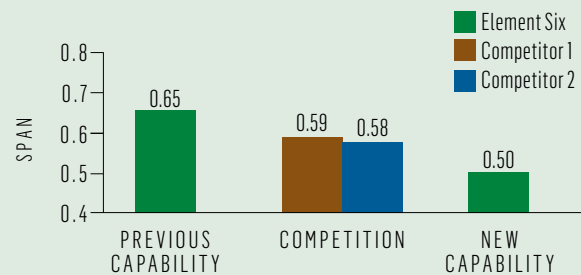
- All products 20 micron or less are subject to new large particle (LP) screening and quality inspection processes
- Removing up to an additional 3% of undesirable particles

This increased size control delivers;

- Consistent tool performance
- Improved efficiency due to reduced material waste
- Higher quality tools with fewer coarse scratches for ever finer grinding and polishing capability

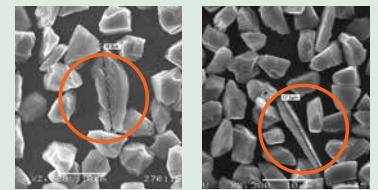
## TIGHT SIZING CAPABILITY VS COMPETITION

### RELATIVE SPAN



## LARGE PARTICLE SCREENING REDUCES NEEDLES

\*Needles are defined as particles with a length to breadth ratio of 2:1 or greater.



## CERTIFIED QUALITY ASSURANCE

Element Six Quality Assurance is ISO certified.

Our Advanced certificate can accompany each Micron delivery at your request - to certify conformance to product specifications.



## FIND OUT MORE ABOUT MICRON+

Call: +353 61 460 146, Email: support@e6.com  
www.e6.com/Micron