

PRECISION MACHINING & FINISHING

*Precision Machining*

# GIVING TOOLMAKERS A COMPETITIVE EDGE

— *With PCD, PCBN, CVD Diamond & Single Crystal Diamond*





# A PARTNER FOR SUCCESS

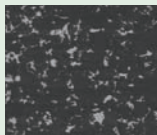
Element Six works in partnership with customers to develop cutting-edge products and materials that offer considerable advantages over their competitors. Element Six has a proven commitment and capacity to innovate and continues to deliver ground breaking commercial opportunities.

The unique Element Six state-of-the-art Global Innovation Centre (GIC) near Oxford (UK), further enhances our position as the world leader in synthetic diamond and supermaterials research to find new ways to turn the extreme properties of supermaterials into products with revolutionary performance.

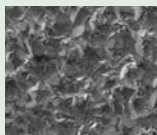
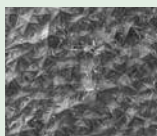
Element Six welcomes customers to collaborate with us to develop their next generation products at the GIC. Not only can we deliver unprecedented levels of product performance for customers, but we can bring these proven innovations to market within a short timescale.

# PCD AND CVD GRADES AND CHARACTERISTICS

## PCD GRADES AND CHARACTERISTICS

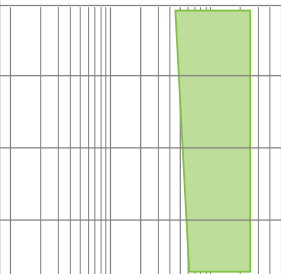
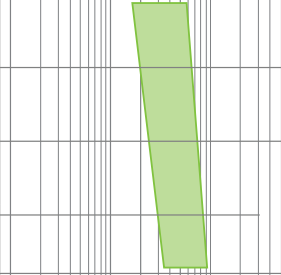
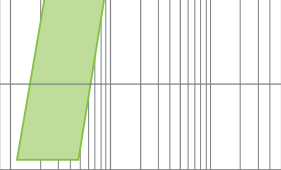
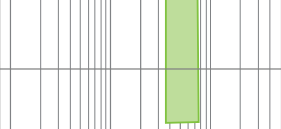
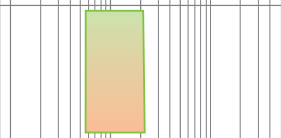
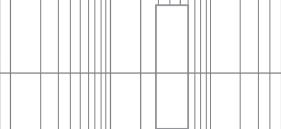
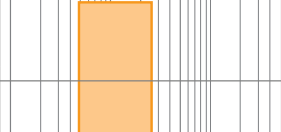
| GRADE  | APPLICATIONS                                                                                                                                                                | CHARACTERISTICS                                                                                                                                                                | MICROSTRUCTURE                                                                        |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| CMX850 | Ideal for milling and rough cutting of aluminium alloys where extreme chip resistance is required, also for machining titanium and composites.                              | Sub-micron grain size.<br><br>CMX850's ultra-fine grain structure is suitable for applications where mirror finishes are required due to its extreme edge sharpness/retention. |    |
| CTX002 | Ideal for profile routers and thread cutting tools, can also be used in wear part applications.                                                                             | 2µm average grain size with increased cobalt for ease of processing.<br><br>CTX002 is ideal for complex tools where excessive processing is required.                          |    |
| CTB010 | The ideal grade where roughing and finishing are performed with a single tool. Highly recommended for low to medium content aluminium alloys.                               | 10µm average grain size.<br><br>CTB010 is the workhorse PCD grade ideal for many applications where a good balance of toughness and wear resistance is required.               |   |
| CTH025 | Successful in machining of high silicon aluminium alloys, metal matrix composites (MMC), tungsten carbides and ceramics.                                                    | Average grain size of 25µm.<br><br>CTH025 offers the optimum wear resistance for abrasive machining conditions.                                                                |  |
| CTM302 | Application areas include MMC, high silicon aluminium alloys, high strength cast irons and bi-metal applications. Excellent abrasion resistance and good thermal stability. | A multi-modal PCD with grain sizes of 2µm to 30µm which gives CTM302 excellent wear resistance, edge strength and edge quality.                                                |  |

## CVD DIAMOND GRADES AND CHARACTERISTICS

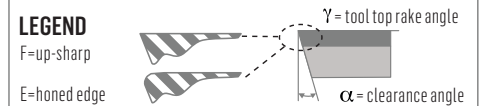
| GRADE  | APPLICATIONS                                                                                                                          | CHARACTERISTICS                                                                                                                                                   | MICROSTRUCTURE                                                                        |
|--------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| CDE PL | Application areas are the machining of laminated flooring, fibre and cement boards.                                                   | An electrically conducting grade of CVD for cutting tool applications that allows customers to use EDM machining or EDG grinding within their tooling processing. |  |
| CDM PL | Successful in the machining of metal matrix composites, aluminium alloys, glass reinforced plastics and carbon fibre based materials. | A general purpose mechanical grade for cutting tools.                                                                                                             |  |

# PCD AND CVD APPLICATION GUIDE

## SELECTING PRODUCTS & GRADES FOR YOUR APPLICATIONS

| PCD / CVD GRADE SELECTION                                                                          |                                                                                                                                                                            |            |        |        |        |        |        |     |     | CUTTING CONDITIONS AND EDGE DESIGN                                                   |                                |                                  |                                                                     |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------|--------|--------|--------|--------|-----|-----|--------------------------------------------------------------------------------------|--------------------------------|----------------------------------|---------------------------------------------------------------------|
|                                                                                                    |                                                                                                                                                                            |            | CMX850 | CTX002 | CTB010 | CTH025 | CTM302 | CDM | CDE | CUTTING SPEED (M/MIN)                                                                | FEED, F (MM)<br>FZ (MM/INSERT) | DEPTH OF CUT A <sub>P</sub> (MM) | TYPICAL EDGE GEOMETRIES                                             |
| NON FERROUS METALS<br><br>HYPOEUTECTIC (SI< 12%) AND<br><br>EUTECTIC (SI =12%)<br>SILICON ALLOYS   |                                                                                           | N01        |        |        |        |        |        |     |     |    | 0.1 - 0.4                      | 0.1 - 4.0                        | F<br><br>$\alpha = 7-20^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$   |
|                                                                                                    |                                                                                                                                                                            | N10        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
|                                                                                                    |                                                                                           | N20        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
|                                                                                                    |                                                                                                                                                                            | N30        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
| HYPEREUTECTIC (SI > 12%)<br>ALUMINIUM<br>CASTING<br>ALLOYS<br><br>METAL MATRIX<br>COMPOSITES (MMC) |                                                                                           | N01        |        |        |        |        |        |     |     |   | 0.1 - 0.5                      | 0.1 - 4.0                        | F/E<br><br>$\alpha = 7-11^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$ |
|                                                                                                    |                                                                                                                                                                            | N10        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
|                                                                                                    |                                                                                          | N20        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
|                                                                                                    |                                                                                                                                                                            | N30        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
| CERAMIC<br>MACHINING (GREEN)                                                                       |                                                                                         | UNSINTERED |        |        |        |        |        |     |     |  | 0.1 - 0.4                      | 0.2 - 1.0                        | F/E<br><br>$\alpha = 0-7^\circ$<br><br>$\gamma = 0^\circ/-6^\circ$  |
|                                                                                                    |                                                                                                                                                                            | SINTERED   |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
| COPPER AND ITS<br>ALLOYS<br><br>MAGNESIUM<br>AND ITS ALLOYS                                        | <br> | N01        |        |        |        |        |        |     |     |  | 0.03 - 0.3                     | 0.05 - 2.0                       | F<br><br>$\alpha = 7-11^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$   |
|                                                                                                    |                                                                                                                                                                            | N30        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
| BI METALS                                                                                          |                                                                                         | N20        |        |        |        |        |        |     |     |  | 0.08 - 0.2                     | 0.25 - 1.0                       | F/E<br><br>$\alpha = 7-11^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$ |
| GREY & HIGH<br>STRENGTH<br>IRONS                                                                   | <br> | K01        |        |        |        |        |        |     |     |  | 0.08 - 0.2                     | 0.25 - 1.0                       | F<br><br>$\alpha = 7-11^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$   |
|                                                                                                    |                                                                                                                                                                            | K40        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
| COMPOSITE<br>PLASTICS                                                                              | <br> | 01         |        |        |        |        |        |     |     |  | 0.1 - 0.2                      | 0.2 - 3.0                        | F/E<br><br>$\alpha = 7-11^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$ |
|                                                                                                    |                                                                                                                                                                            | 20         |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |
| TITANIUM                                                                                           | <br> | S01        |        |        |        |        |        |     |     |  | 0.1 - 0.2                      | 0.2 - 0.5                        | F/E<br><br>$\alpha = 7-11^\circ$<br><br>$\gamma = 0^\circ/+6^\circ$ |
|                                                                                                    |                                                                                                                                                                            | S30        |        |        |        |        |        |     |     |                                                                                      |                                |                                  |                                                                     |

Work material characteristics and to a lesser extent, cutting parameters, determine the demands placed on the cutting tool and hence, the optimum balance of tool material properties. Knowledge of the application, including workpiece composition, facilitates selection of the optimum grade and selection of the correct tool geometry. Often, work material composition and machining parameters (vc, f, ap) go hand in hand. It is possible, therefore, only to provide a typical range of values for each parameter.



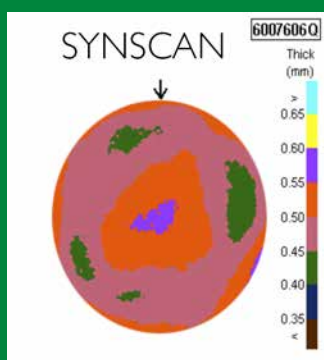
# PCD PRODUCT RANGE

## SPECIFICATIONS FOR PCD DISC

| GRADE  | OUTSIDE DIAMETER (MM) | PCD USABLE AREA (MM) | PCD LAYER (MM) | OVERALL THICKNESS (+/- 0.05MM) |   |     |     |     |     |      |      | PCD LAYER THICKNESS (MM) |
|--------|-----------------------|----------------------|----------------|--------------------------------|---|-----|-----|-----|-----|------|------|--------------------------|
|        |                       |                      |                | 0.8                            | 1 | 1.2 | 1.4 | 1.6 | 2.0 | 3.18 | 8.00 |                          |
| CMX850 | 76                    | 70                   | 0.3            | ✓                              | ✓ | ✓   | ✓   | ✓   |     |      |      | 0.20 to 0.45             |
| CMX850 | 76                    | 70                   | 0.5            |                                | ✓ |     |     | ✓   | ✓   |      |      | 0.40 to 0.60             |
| CMX850 | 76                    | 70                   | 1.0            |                                |   |     |     |     |     | ✓    |      | 0.88 to 1.13             |
| CTX002 | 76                    | 70                   | 0.5            |                                | ✓ |     |     | ✓   |     | ✓    |      | 0.40 to 0.60             |
| CTB010 | 76                    | 70                   | 0.3            | ✓                              | ✓ | ✓   | ✓   | ✓   |     | ✓    |      | 0.20 to 0.45             |
| CTB010 | 76                    | 70                   | 0.5            |                                | ✓ | ✓   |     | ✓   | ✓   | ✓    |      | 0.40 to 0.60             |
| CTB010 | 76                    | 70                   | 0.7            |                                |   |     |     | ✓   |     | ✓    | ✓    | 0.53 to 0.88             |
| CTB010 | 76                    | 70                   | 1.0            |                                |   |     |     |     |     | ✓    |      | 0.88 to 1.13             |
| CTH025 | 76                    | 70                   | 0.5            |                                |   |     |     | ✓   | ✓   | ✓    |      | 0.40 to 0.60             |
| CTM302 | 76                    | 70                   | 0.5            |                                |   |     |     | ✓   | ✓   |      |      | 0.40 to 0.60             |
| CTM302 | 76                    | 70                   | 0.7            |                                |   |     |     |     |     | ✓    |      | 0.53 to 0.88             |
| CTM302 | 76                    | 70                   | 1.0            |                                |   |     |     |     |     | ✓    |      | 0.88 to 1.13             |
| CTM302 | 76                    | 70                   | 1.5            |                                |   |     |     |     |     | ✓    | ✓    | 1.35 to 1.88             |

## PCD LAYER PROFILE

Element Six supplies a unique ultrasonic scan depicting the PCD layer profile. The PCD scan indicates a 'North Point', which matches a 'North Point' laser marked on the disc, allowing users to optimise the cutting areas.



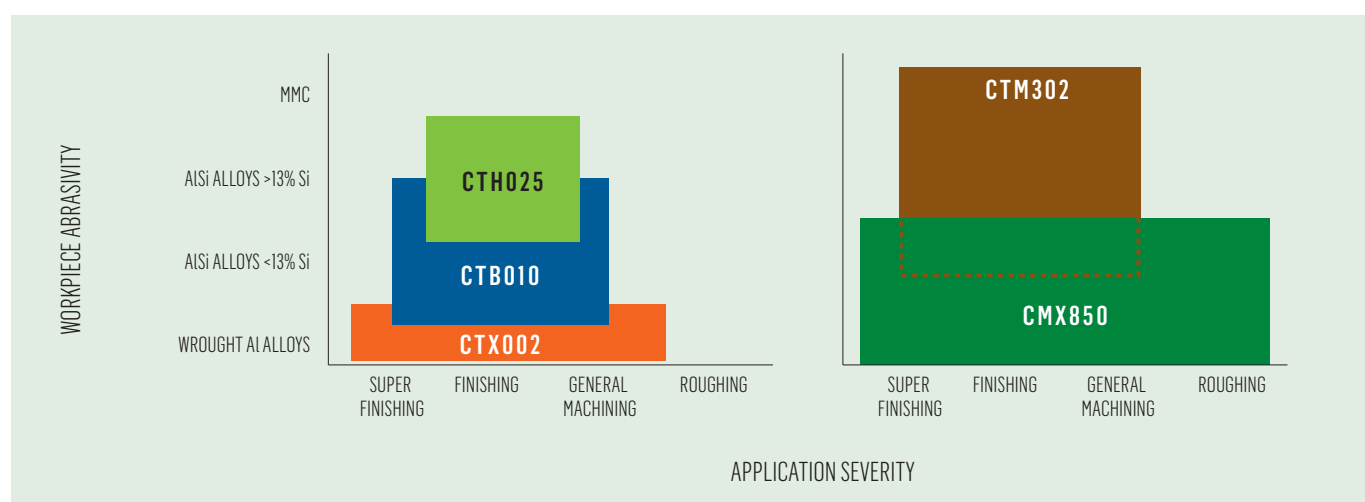
## CHOOSING THE RIGHT PCD GRADES

## PCD GRADES FOR WIDER USAGE

Improvements in synthesis techniques coupled with new product development capability has resulted in CMX850 and CTM302 having the properties to meet all of the challenges in tool performance. CTM302 provides the ultimate abrasion resistance while CMX850 provides the optimum balance of processability and performance.

## THE 4 MAIN FACTORS FOR CONSIDERATION WHEN SELECTING PCD GRADES:

- Chip resistance
  - Abrasion resistance
- } Behaviour in Application
- 
- Electro-discharge characteristics
  - Grindability characteristics
- } Processing Characteristics



## MATERIALS AND MACHINING

Element Six PCD grades provide the ideal balance between behaviour in application and processing characteristics to meet the requirements of the cutting or grinding operation.

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# AERO-DYNAMICS - PCD ROUND TOOLS BLANKS

## GRADES AND CHARACTERISTICS

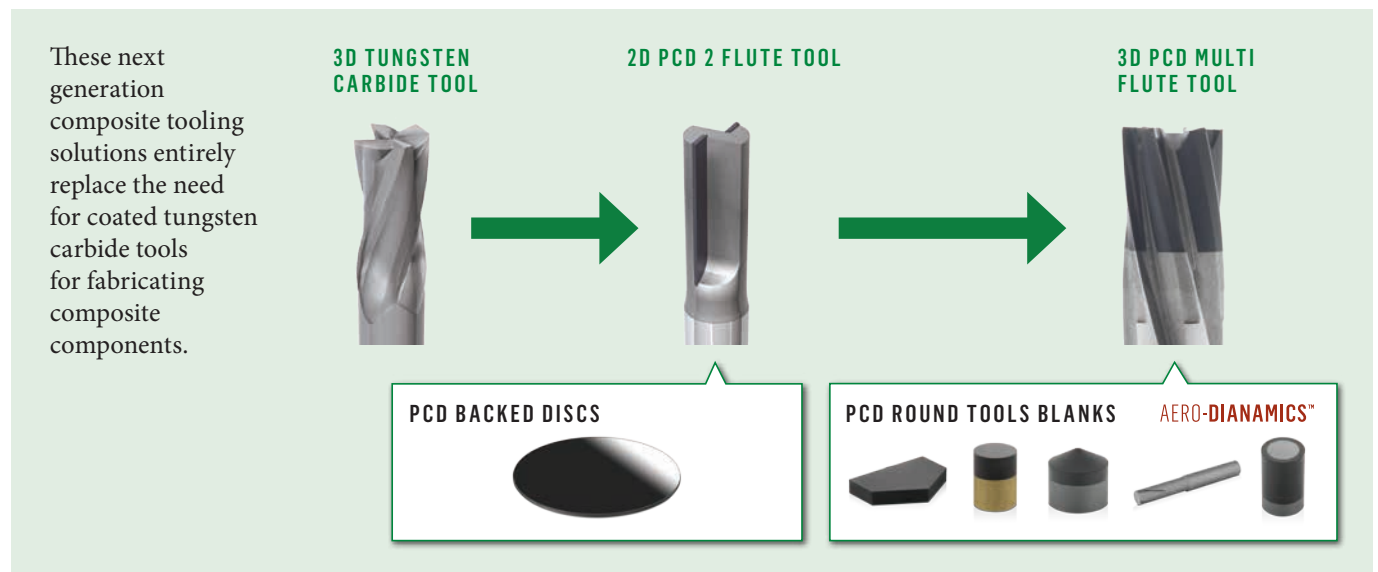
| GRADE                   | APPLICATIONS | GRAIN SIZES | CHARACTERISTICS                                                                                                                                                                                                                                                                                        |                                                                                       |                                                                                       |
|-------------------------|--------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>A3MT<br/>TUBE</b>    | Milling      | Medium      | <ul style="list-style-type: none"> <li>– Up to 250 times wear resistance compared with traditional tungsten carbide end mills</li> <li>– Up to 12 times faster machining speeds</li> <li>– Tubular configuration gives virtually infinite possibilities for flute angles &amp; orientations</li> </ul> |    |    |
| <b>A3MH<br/>HELIX</b>   | Milling      | Fine        | <ul style="list-style-type: none"> <li>– Helical geometry results in lower tool forces and better chip evacuation</li> <li>– High thermal conductivity and low coefficient of friction results in less heat build-up and adhesion</li> <li>– Sharp PCD edges cut fibres cleanly</li> </ul>             |   |   |
| <b>A2DS<br/>CHEVRON</b> | Drilling     | Coarse      | <ul style="list-style-type: none"> <li>– Tool life extended 10 times longer than Carbide drills</li> <li>– Half round disc formats available</li> <li>– EDM segments available and cut to order</li> </ul>                                                                                             |  |  |
| <b>A3DP<br/>PLANAR</b>  | Drilling     | Fine        | <ul style="list-style-type: none"> <li>– Almost infinite flexibility in drill point geometry</li> <li>– Tool life more than 10 times longer than Tungsten Carbide drills</li> <li>– Large rake angles possible for lower tool forces</li> </ul>                                                        |  |  |
| <b>A3DC<br/>CONE</b>    | Drilling     | Medium      | <ul style="list-style-type: none"> <li>– Significantly increased wear resistance over traditional coated carbide drills</li> <li>– Consistent performance over the tool life</li> <li>– Suitable for drilling CFRP stacked with aluminium and/or titanium</li> </ul>                                   |  |  |

# SETTING TOOL DESIGN FREE

Our Aero-Dianamics range of round tool blanks provides tool designers the ability to create entirely new PCD tool geometries which break through existing barriers in PCD tool design with:

- Freedom of design in flute profiles
- Multiple flutes
- Limitless flute angles and orientations

## AERO-DIANAMICS - TRANSFORMING COMPOSITE TOOLING



### REVOLUTIONARY AD-M3 BLANKS FOR MILLING TOOLS

Our Aero-Dianamics milling range enables significant improvements in productivity over coated tungsten carbide tools:

- 3-12 x faster machining speeds\*
- Lower cutting forces\*
- Improved tool evacuation\*

### UNIQUE AD-D3 BLANKS FOR COMPLEX DRILL GEOMETRIES

Our Aero-Dianamics drilling range enables significant improvements in productivity over coated tungsten carbide tools:

- Significantly increased wear resistance over coated carbide drills\*
- 10 x longer tool life in drilling CFRP\*
- 2 x speed of drilling CFRP/ Al\*
- Consistence performance over tools life\*
- Superior work piece finish\*

### ACHIEVING A SUPERIOR SURFACE FINISH



**UNCOATED TUNGSTEN CARBIDE:**

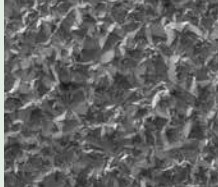
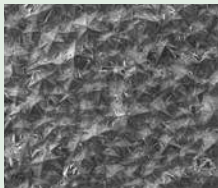
Surface quality finish on 5mm test piece of CFRP.



**AD-M3 TUBE:**

Surface quality finish on 5mm test piece of CFRP.

# CVD DIAMOND GRADES AND CHARACTERISTICS

| GRADE         | APPLICATIONS                                                                                          | CHARACTERISTIC                                                                                                                                                     | MICROSTRUCTURE                                                                      |
|---------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>CDE PL</b> | Wide-ranging laser cut shape and size for Precision machining of MMC, CFRP and woodworking materials. | An electrically conducting grade of CVD for cutting tool applications, that allows customers to use EDM machining or EDG grinding within their tooling processing. |  |
| <b>CDM PL</b> | Wide-ranging laser cut shape and size for Precision machining of MMC and CFRP materials.              | A general purpose mechanical grade for cutting tools.                                                                                                              |  |

## BENEFITS OF ELEMENT SIX CVD DIAMOND: CVDITE

- Higher wear resistance than medium PCD grades
- Excellent thermal stability and thermal conductivity
- Binder-free so is extremely chemically inert
- Extreme abrasion resistance
- Ideal for applications where higher temperature operating conditions are seen
- High purity

| BEHAVIOUR IN APPLICATION |            |                                                                                                                           |                                                                                                                           | PROCESSING CHARACTERISTICS                                                                                                |                                                                                                                           |
|--------------------------|------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Grade                    | Grain Size | Chip Resistance                                                                                                           | Abrasion Resistance                                                                                                       | Electro-discharge Machinability                                                                                           | Grindability                                                                                                              |
| CDE                      | 60-80µm    | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> |
| CDM                      | 60-80µm    | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | N/A                                                                                                                       | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> |
| CTB010                   | 10µm       | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> |

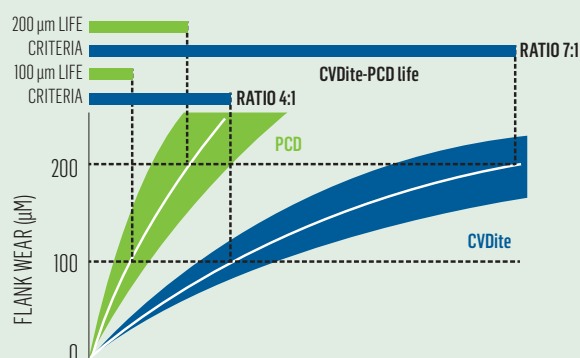
## CHOOSING THE RIGHT CVDITE GRADE

Element Six's CVDITE is generally recommended for the machining of non-ferrous materials where high abrasion resistance is required. CVDITE has high thermal stability and more wear resistance than PCD.

Due to its high abrasion resistance and low coefficient of sliding friction, the CVDITE range is also ideal for uses in lubricated and dry wear part applications.

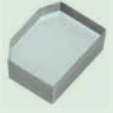
## CVDITE-PCD LIFE

### ABRASION RESISTANCE DEPENDING ON APPLICATION

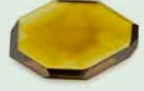
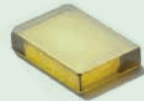


# SINGLE CRYSTAL DIAMOND GRADES AND CHARACTERISTICS

## SINGLE CRYSTAL MCC

| APPLICATIONS                                                                                                                               | CHARACTERISTICS                                                                                                                                                                                                                         |                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| MCC is available in 2pt and 4pt orientations. Ultra precision machining acrylics, copper, germanium. Generates very high surface finishes. | Produced under ultra-high purity conditions, which gives it its colourless appearance. It offers a combination of extreme wear resistance, excellent chip resistance and high thermal conductivity combined with low thermal expansion. |  |

## MONODITE

| APPLICATIONS                                                                                                                                              |                                                                     | CHARACTERISTICS                                                                                                                                                                                                                                                                                                                     |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Primary applications for Monodite are engineered cutting tools and wear parts for super finishing, burnishing, wire guides and ultra-precision machining. |                                                                     | Manufactured using a proprietary high pressure, high temperature synthesis process and is pale yellow in colour. The result is a single crystal synthetic diamond that is highly consistent and has predictable properties / behaviours, offering an unrivalled choice of synthetic diamond required for cutting tool applications. |                                                                                       |
| PRODUCT RANGE                                                                                                                                             | KEY PRODUCT FEATURES                                                | PRIMARY APPLICATION                                                                                                                                                                                                                                                                                                                 |                                                                                       |
| MSP                                                                                                                                                       | Individually prices large edge length plates                        | Long edge length requirements<br>(e.g. profile tools)                                                                                                                                                                                                                                                                               |  |
| MLP                                                                                                                                                       | Long edge length polished near rectangular logs                     | Long edge length requirements<br>(e.g. controlled waviness tools)                                                                                                                                                                                                                                                                   |  |
| MT L (RECTANGULAR)<br>MT T (TRIANGLE)<br>MT R (ROUND)                                                                                                     | Highly engineered polished plates, laser cut to specific dimensions | Engineered cutting tools and wear parts for superfinishing, burnishing and wire guides. Convenient cut shapes                                                                                                                                                                                                                       |  |
| MXP                                                                                                                                                       | Near square plates having guaranteed inscribed square               | Superfinishing and precision machining (e.g. precious metals and MMC materials)                                                                                                                                                                                                                                                     |  |
| MWS PT4                                                                                                                                                   | Near round plates having guaranteed inscribed circle                |                                                                                                                                                                                                                                                                                                                                     |  |
| MWS PT2                                                                                                                                                   | Engineered polished plates benefitting from 2 point orientation     |                                                                                                                                                                                                                                                                                                                                     |  |

### BENEFITS OF ELEMENT SIX SINGLE CRYSTAL

- Highly consistent, predictable properties and behaviour
- Unrivalled surface finish and component accuracy performance unattainable with conventional polycrystalline tool materials
- Surface roughness values are of the order of nanometres and form accuracies are commonly sub-micron
- Facilitates the manufacture of cutting tools with edge roughness and sharpness values in the order of 10 nm and form accuracies in the micrometre range

# PCBN STANDARD PRODUCT RANGE AVAILABLE

OTHER SIZES AND FORMATS AVAILABLE ON REQUEST

## PCBN WC BACKED DISC PRODUCT RANGE

| GRADE  | OUTSIDE DISC DIAMETER (MM) | PCBN USABLE AREA (MM) | PCBN LAYER (MM) | OVERALL THICKNESS (+/- 0.05MM) |      |      |      |
|--------|----------------------------|-----------------------|-----------------|--------------------------------|------|------|------|
|        |                            |                       |                 | 1.6                            | 2.38 | 3.18 | 4.76 |
| DCN450 | 76                         | 70                    | 0.7-1.0         | ✓                              | ✓    | ✓    | ✓    |
| DCC500 | 76                         | 70                    | 0.7-1.0         | ✓                              | ✓    | ✓    | ✓    |
| DCX650 | 76                         | 70                    | 0.7-1.0         | ✓                              | ✓    | ✓    | ✓    |
| DBW85  | 76                         | 70                    | 0.7-1.0         | ✓                              | ✓    | ✓    | ✓    |
| DBS900 | 76                         | 70                    | 0.7-1.0         | ✓                              | ✓    | ✓    | ✓    |

## PCBN SOLID LOW CONTENT PRODUCT RANGE

| GRADE  | CONDUCTIVE / NON-CONDUCTIVE | OVERALL THICKNESS (+/- 0.05MM) |     |      |      |      |      |      | OUTSIDE DISC DIAMETER (MM) | PCBN USABLE AREA (MM) |
|--------|-----------------------------|--------------------------------|-----|------|------|------|------|------|----------------------------|-----------------------|
|        |                             | 1.0                            | 1.6 | 2.38 | 3.18 | 4.76 | 6.35 | 7.94 |                            |                       |
| DSN450 | CONDUCTIVE                  | ✓                              | ✓   | ✓    | ✓    | ✓    | ✓    | ✓    | 94                         | 90                    |
| DSC500 | CONDUCTIVE                  | ✓                              | ✓   | ✓    | ✓    | ✓    | ✓    | ✓    | 94                         | 90                    |

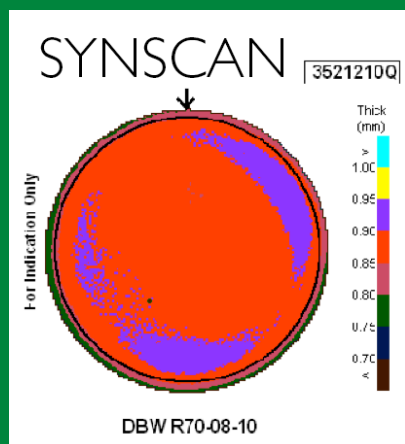
## PCBN SOLID HIGH CONTENT PRODUCT RANGE

| GRADE | CONDUCTIVE / NON-CONDUCTIVE | OVERALL THICKNESS (+ / - 0.13MM) |      |      | OUTSIDE DISC DIAMETER (MM) | PCBN USABLE AREA (MM) |
|-------|-----------------------------|----------------------------------|------|------|----------------------------|-----------------------|
|       |                             | 3.18                             | 4.76 | 6.35 |                            |                       |
| AMB90 | NON-CONDUCTIVE              | ✓                                | ✓    | ✓    | 97                         | 97                    |
| AMK90 | NON-CONDUCTIVE              | ✓                                | ✓    |      | 97                         | 97                    |

## PCBN SYNSCAN

Element Six supplies a unique ultrasonic scan depicting the PCBN layer profile.

The PCBN scan indicates a 'North Point', which matches a 'North Point' laser marked on the disc, allowing users to optimise the cutting areas.



## OUR UNIQUE SCALABLE SEGMENTATION SERVICE

Our fast, high quality and cost effective segmentation service is supported by the largest Laser Cutting and Electrical Discharge Machinery (EDM) capacity of all abrasive manufacturers. We provide both standard and complex bespoke geometries at any volume required.



*Our unique segmentation expertise.*

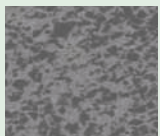
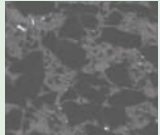
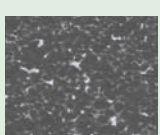
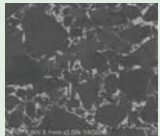


*Our large scale EDM and laser cutting technology.*

*Precision Machining*

# PCBN GRADES AND CHARACTERISTICS

## GRADES AND CHARACTERISTICS

| GRADE                                        | APPLICATIONS                                                                                                                                                                                                                                                                                                       | CHARACTERISTICS                                                                                                                         | MICROSTRUCTURE                                                                        |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| DCN450<br>(WC-BACKED)<br>&<br>DSN450 (SOLID) | For moderately interrupted hard turning and finish hard milling as well as high speed continuous turning. Its resistance to crater wear is among the highest in the market. With one of the finest structures of all commercial grades, DCN450 provides for sub- $\mu\text{m}$ surface roughness.                  | Approximately 45% CBN<br>Sub- $\mu\text{m}$ CBN grain size<br>TiCN binder                                                               |    |
| DCC500<br>(WC-BACKED)<br>DSC500 (SOLID)      | For continuous and lightly interrupted cutting of the majority of automotive steels. Excellent abrasion resistance makes it the ideal choice for cold work tool steels and certain valve seat alloys. Also recommended for finishing abrasive high strength cast irons.                                            | Approximately 50% CBN<br>1.5 $\mu\text{m}$ average grain size<br>Principally TiC binder                                                 |    |
| DCX650                                       | For moderate to heavy interrupted turning of all common hardened steels. Provides an excellent balance of toughness, and crater and flank wear resistance. Also used for plunge machining of valve seat rings.                                                                                                     | Approximately 65% CBN<br>Average 3 $\mu\text{m}$ proprietary multi-modal grain size<br>TiN binder                                       |   |
| DBW85                                        | For applications such as grey iron fine boring and valve seat machining, due to excellent strength and abrasion resistance. Ideal for heavily interrupted cutting of all hard and abrasive work piece materials including powder metallurgy components. Proven performance also in hard fine milling applications. | Approximately 85% CBN<br>2 $\mu\text{m}$ average grain size<br>AlWCoB binder for extreme chip resistance                                |  |
| DBS900                                       | Ideal for applications where longer tool life is required. Excels in interrupted machining of grey and hard cast irons, hardened steel milling and in the machining of the majority of valve seat ring alloys. Excellent first choice grade for majority of ferrous powder metals.                                 | Approximately 90% CBN<br>4 $\mu\text{m}$ average grain size<br>Novel binder system to provide the ultimate abrasion and chip resistance |  |
| AMB90                                        | For turning and milling of grey and hard cast iron and heavy turning of hardened steels; including components such as brake discs, pump bodies and impellers and large rolls.                                                                                                                                      | Approximately 90% CBN<br>Binder phase includes aluminium nitrides and borides                                                           |  |
| AMK90                                        | For similar application areas as AMB90, but providing higher wear resistance. Exhibits particularly high performance in abrasive work materials such as high chrome cast irons. Usable edges on both faces of insert.                                                                                              | Approximately 90% CBN<br>Binder phase includes aluminium nitrides and borides                                                           |  |

PCBN APPLICATION GUIDE

SELECTING PRODUCTS AND GRADES FOR YOUR APPLICATIONS

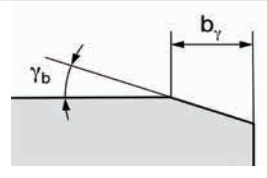
| GRADED RECOMMENDATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |                                                                                   |  |  |  |  |  |  | CUTTING CONDITIONS                             |      |                                     |      |                                                  |     | EDGE GEOMETRY GUIDE                                                                                                                                                |           |         |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------|--|--|--|--|--|--|------------------------------------------------|------|-------------------------------------|------|--------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------|-----------|
| Due to the very large number of unique applications, it is possible only to make general recommendations.<br><br>Significant improvements in tool performance should be possible through further optimisation.<br><br>ISO513's colour-coded classification of cutting tool applications has been used here to indicate the intended application area for cutting tool materials.<br><br>Deeper colour bars indicate preferred grades.<br><br>Lighter colour bars indicate other grades which may be preferable in specific circumstances. |                                          | DCN450 / DSN450<br>DCC500 / DSC500<br>DCX650<br>DBS900<br>DBW85<br>AMB90<br>AMK90 |  |  |  |  |  |  | CUTTING SPEED, $v_c$<br>(m/min) <sup>(8)</sup> |      | FEED, $f$ (mm) <sup>(3, 5, 7)</sup> |      | DEPTH OF CUT, $a_p$<br>(mm) <sup>(4, 5, 7)</sup> |     | CHAMFER ANGLE, $\gamma_b$<br><br>CHAMFER WIDTH, $b\gamma$<br>(mm)<br><br>EDGE RADIUS, $r_\beta$ ( $\mu$ m)<br><br>NOSE RADIUS, $r_\epsilon$<br>(mm) <sup>(6)</sup> |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  | MIN                                            | MAX  | MIN                                 | MAX  | MIN                                              | MAX | Recommended Ranges                                                                                                                                                 |           |         |           |
| HARDENED STEELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | H01                                      |                                                                                   |  |  |  |  |  |  | 130                                            | 210  | -                                   | 0.5  | -                                                | 0.5 | 15                                                                                                                                                                 | 0.1       | 5       | 0.4       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | H10                                      |                                                                                   |  |  |  |  |  |  | 100                                            | 170  | -                                   | 0.5  | -                                                | 0.5 | 25                                                                                                                                                                 | 0.2       | 10      | 1.6       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | H20                                      |                                                                                   |  |  |  |  |  |  | 100                                            | 160  | -                                   | 0.5  | -                                                | 0.3 | 20                                                                                                                                                                 | 0.1       | 5       | 0.4       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | H30                                      |                                                                                   |  |  |  |  |  |  | 100                                            | 190  | -                                   | 0.5  | -                                                | 0.3 | -                                                                                                                                                                  | -         | -       | -         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | HARD MILLING                             |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     | 35                                                                                                                                                                 | 0.2       | 15      | 1.6       |
| CAST IRONS <sup>(1, 2)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | GREY IRON - K01                          |                                                                                   |  |  |  |  |  |  | 600                                            | 2500 | 0.1                                 | 1    | 0.1                                              | 2   | 15 - 25                                                                                                                                                            | 0.2 - 1.0 | - 20    | - 3.2     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | GREY IRON - K10 <sup>(12)</sup>          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | GREY IRON - K20 <sup>(12)</sup>          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | GREY IRON - K30                          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ADI <sup>(9)</sup> - K01                 |                                                                                   |  |  |  |  |  |  | 150                                            | 500  | 150                                 | 500  | 150                                              | 500 | 15 -                                                                                                                                                               | 0.1 -     | 10 -    | 0.8 -     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ADI - K10                                |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ADI - K20 - K30                          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | NODULAR IRON AND CGI <sup>(10, 11)</sup> |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | WHITE AND CHROME IRONS - K10             |                                                                                   |  |  |  |  |  |  | 200                                            | 400  | 200                                 | 400  | 200                                              | 400 | 25                                                                                                                                                                 | 0.3       | 20      | 1.6       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | WHITE AND CHROME IRONS - K20-K30         |                                                                                   |  |  |  |  |  |  | 150                                            | 350  | 0.1                                 | 1    | 0.2                                              | 2   | As for ADI                                                                                                                                                         |           |         |           |
| FERROUS POWDER METALS (EXCL. VSR <sup>13</sup> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | < 300 HV                                 |                                                                                   |  |  |  |  |  |  | 50                                             | 80   | 0.1                                 | 0.5  | 0.2                                              | 2   | 20 -                                                                                                                                                               | 0.2 -     | 20 -    | 1.6 -     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | < 750 HV                                 |                                                                                   |  |  |  |  |  |  | 50                                             | 100  | 0.2                                 | 2    | 1                                                | 3   | 30                                                                                                                                                                 | 1.0       | 30      | > 9.0     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  | -                                              | 350  | 0.1                                 | 0.5  | -                                                | 1.0 | 0 - 20                                                                                                                                                             | -0.2      | -15     | -1.6      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  | -                                              | 250  | 0.1                                 | 0.3  | -                                                | 1.0 | 15 - 35                                                                                                                                                            | -0.2      | -30     | -1.6      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  | 50                                             | 150  | 0.02                                | 0.05 | NA                                               | NA  | 10 -                                                                                                                                                               | 0.1 -     | 0 -     | NA        |
| VALVE SEAT RINGS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | < 350 HV: PLUNGING                       |                                                                                   |  |  |  |  |  |  | 50                                             | 180  | 0.05                                | 0.2  | 0.1                                              | 0.5 | 30                                                                                                                                                                 | 0.2       | 20      | - 1.6     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | < 350 HV: TURNING                        |                                                                                   |  |  |  |  |  |  | 50                                             | 150  | 0.02                                | 0.05 | NA                                               | NA  | 15 -                                                                                                                                                               | 0.1 -     | 10 -    | NA        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | > 350 HV: PLUNGING                       |                                                                                   |  |  |  |  |  |  | 50                                             | 180  | 0.05                                | 0.2  | 0.1                                              | 0.5 | 25                                                                                                                                                                 | 0.2       | 30      | - 1.6     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | > 350 HV: TURNING                        |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
| SUPER-ALLOYS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NI-BASE: S10 <sup>(14, 15)</sup>         |                                                                                   |  |  |  |  |  |  | 150                                            | 400  | -                                   | 0.3  | -                                                | 0.5 | 0 - 20                                                                                                                                                             | 0 - 0.3   | 20 - 40 | 1.6 - 3.2 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | NI-BASE: S20 - S30                       |                                                                                   |  |  |  |  |  |  | 100                                            | 150  |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CO-BASE: S10                             |                                                                                   |  |  |  |  |  |  | 50                                             | 200  |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CO-BASE: S20 - S30                       |                                                                                   |  |  |  |  |  |  | 50                                             | 100  |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                                                                                   |  |  |  |  |  |  |                                                |      |                                     |      |                                                  |     |                                                                                                                                                                    |           |         |           |

ISO1832 prescribes several edge conditions, three of which are most commonly applied to PCBN indexable inserts.

Indexable inserts made in accordance with ISO16462 are obliged to indicate the edge condition, expressed as a letter symbol (e.g. S, T, E). Five digits indicate the T-land dimensions. Hone dimensions are not indicated in ISO designations.

Example: CNGA120408 S 015 30

- Edge shape (S, T, E, etc)
- Chamfer width,  $b_\gamma$ , in 1/100<sup>th</sup> mm
- Chamfer angle,  $\gamma_b$ , in degrees



CHAMFER AND HONE:

Stronger than T-land - First choice for HPT  
Feed must be greater than hone size

HONED EDGE:

Hone size is more difficult to control than chamfers, but popular for HRSA's

CHAMFER / T-LAND:

The larger the T-land width and angle, the higher the forces

- For cast iron and roll machining, solid grades AMB90 and AMK90 are more economical, while DBW85 and DBS900 provide for a superior finish and greater edge strength; e.g. for positive inserts or a heavy interrupted cut.
- Performance for grey irons can vary depending on casting quality and degree of ageing.
- The feed is selected with nose radius according to surface roughness requirements.
- The depth of cut is typically determined by stock removal allowance (oversize) prior to hardening of the component.
- While there is no strict minimum feed or depth of cut, excessively low values (e.g., < 0.02 mm) may result in adverse machining vibrations.
- While a larger nose radius provides a stronger edge, excessively large values may result in adverse machining vibrations.
- For braze-tipped tools, the segment area (in mm<sup>2</sup>) should be > 100\*f\*a<sub>p</sub>, so as to securely bear the cutting load.
- Indicated cutting speeds for hard steels are primarily for case hardened steels. For higher alloy steels, it may be necessary to reduce the cutting speed to achieve the required tool life.
- ADI: Austempered Ductile Iron.
- CGI: Compacted Graphite Iron (also known as vermicular iron).
- Compacted graphite cast irons are also successfully machined with PCD - we recommend CTM302. The cutting speed for PCD should be 200 +/- 50 m/min.
- Milling of grey cast irons is typically done within the upper portion of the speed range indicated.
- VSR: Valve Seat Rings.
- Super-alloys - also known as heat resistant superalloys (HRSA) - consist of a very large range of compositions and properties, resulting in very different machining characteristics.
- For HRSA's it is preferable to use round inserts. It is also advisable to assess the use of un-chamfered, but honed, cutting edge geometries.

# SUPPORTING THE SWITCH TO HIGHER PERFORMING SOLID PCBN

Element Six's low content solid PCBN grades DSN450 and DSC500 offer significant advantages over their WC-backed (tungsten carbide backed) PCBN equivalents. Their uniform and self-supporting structures significantly increase tool life and provide unique opportunities for innovation in tool design giving tool makers a technical and commercial edge.

**SOLID DSN450** ← **WC BACKED DCN450**

**SOLID DSC500** ← **WC BACKED DCC500**

## DISCOVERING COMPETITIVE ADVANTAGE WITH SOLID PCBN

With an identical structure, it has never been easier to make the switch from WC-backed PCBN.

The benefits of our low content solid PCBN Grades DSN450 and DSC500 include;

- Highly adaptable and fully conductive
- Discs can be cut using EDM wire machines and configured into many shapes and geometries, offering greater flexibility in design to differentiate product lines
- Can be brazed directly onto tool substrates through advances in active brazing capabilities, reducing production costs
- Free of bimetal stress, reducing instances of chipping and cracking during brazing
- Can be supplied at any thicknesses between 1.0mm - 10.0mm

## PROVEN PERFORMANCE

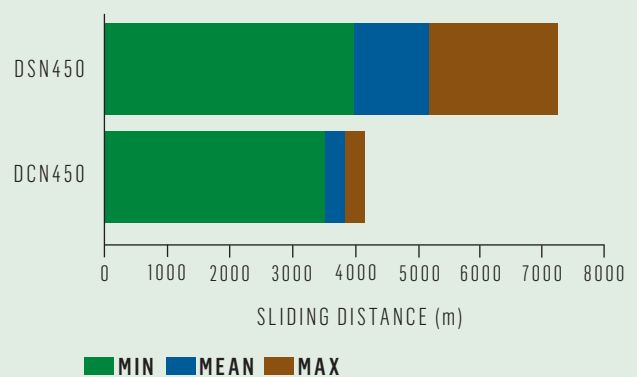
In our application tests under laboratory conditions in continuous turning of hardened steel 60 HR, our solid PCBN significantly extended mean tool life by:

- Up to 40% with DSN450
- Up to 35% with DSC500

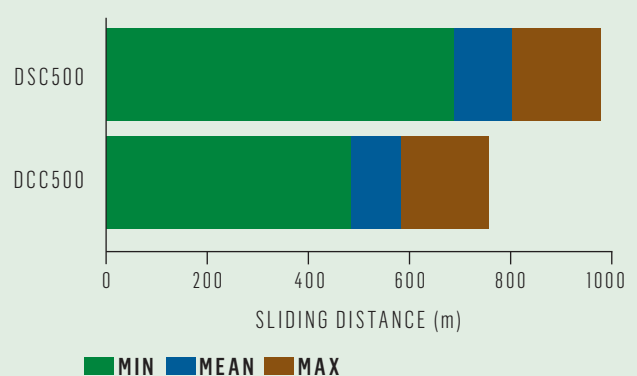
Extended tool life means better performance and reduced costs for end users.

## SLIDING DISTANCE RESULTS IN CONTINUOUS MACHINING OF HARDENED STEEL 60 HRC (SAE8620)

### SOLID PCBN (DSN450) VS. WC-BACKED PCBN (DCN450)



### SOLID PCBN (DSC500) VS. WC-BACKED PCBN (DCC500)



## TEST CONDITIONS



**CUTTING SPEED:** 200m/min  
**FEED RATE:** 0.1mm/rev  
**DEPTH OF CUT:** 0.15mm  
**FAILURE MODE:** Edge Chipping

# REDUCE DOWNTIME & IMPROVE PRODUCTIVITY BY CONVERTING TO INTEGRAL INSERTS

With increasing pressure from competitors and end users, tool manufacturers are always looking for ways to simplify the manufacturing process, raise productivity and reduce costs. By switching from brazed inserts to centre-lock full face inserts, these aspirations become reality.

## HIGH PERFORMANCE COMPONENTS

Centre-lock full face PCBN inserts provide for easily manufactured multi-cornered tools with a number of benefits:

- A more robust cutting component than a conventional brazed tool
- Greater reliability in interrupted cutting applications
- Elimination of the braze joint allowing higher temperature coatings to be applied
- Reduced insert failure risks and improved production continuity
- Longer cutting edges which enable productivity improvements in application; either through the use of larger depths of cut or plunge-type machining operations
- High and low CBN content configurations

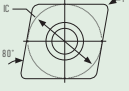
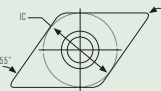
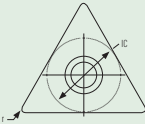
## THE BENEFITS OF USING CENTRE-LOCK FULL-FACE INSERTS

- Eliminate pocketing and brazing procedures
- Improved precision by eliminating brazing inaccuracies
- Reduce the amount of handling
- Cut the overall production cost per usable corner
- Apply higher temperature coatings
- Shorten the production pipeline by eliminating the need for:
  - Carbide preparation
  - Segment cleaning
  - Brazing
  - After-brazing cleaning



# STANDARD PCBN RANGE AVAILABLE

## (OTHER SIZES AND FORMATS AVAILABLE ON REQUEST)

| INSERT SHAPE                                                                        | INSERT STYLE | CLEARANCE | TOLERANCE CLASS <sup>(1)</sup> | HOLE STYLE | FINISHED IC <sup>(2)</sup> | INSERT THICKNESS | CORNER RADIUS |
|-------------------------------------------------------------------------------------|--------------|-----------|--------------------------------|------------|----------------------------|------------------|---------------|
|    | C            | N         | M                              | W          | 06 - 6.35                  | 02 - 2.38        | 02            |
|                                                                                     | 80°          |           |                                |            | 09 - 9.52                  | T3 - 3.97        | 02            |
|    | D            | N         | M                              | W          | 07 - 6.35                  | 02 - 2.38        | 02            |
|                                                                                     | 55°          |           |                                |            | 11 - 9.52                  | T3 - 3.97        | 02            |
|    | S            | N         | M                              | W          | 06 - 6.35                  | 02 - 2.38        | 02            |
|                                                                                     | 90°          |           |                                |            | 09 - 9.52                  | T3 - 3.97        | 02            |
|   | T            | N         | M                              | W          | 09 - 5.56                  | 02 - 2.38        | 02            |
|                                                                                     | 60°          |           |                                |            | 11 - 6.35                  | 02 - 2.38        | 02            |
|  | R            | N         | M                              | W          | 06 - 6.35                  | 03 - 3.18        | 00            |
|                                                                                     | 360°         |           |                                |            | 07 - 7.94                  | 03 - 3.18        | 00            |
|  | W            | N         | M                              | W          | 06 - 9.52                  | 03 - 3.18        | 02            |
|                                                                                     | 80°          |           |                                |            |                            |                  |               |

IC - Inscribed Circle

1) Tolerance on overall thickness  $\pm 0.05$  and IC tolerance  $\pm 0.10$ mm.

2) Grinding allowances apply, IC diameters shown will be produced with a 0.3mm grinding allowance.

3) All measurements are mm.

### PCBN GRADE AVAILABILITY

Centre-lock full face PCBN inserts are available in all WC backed PCBN grades.

### END USER BENEFITS

Machine operators and engineering managers also value the benefits of integral inserts over brazed inserts; the ability to switch from corner to corner means that maintaining production continuity is simply a matter of adjusting the insert. The longer cutting edges of an integral insert also enable plunge machining which can achieve valuable gains in productivity, reductions in both downtime and costs.



## 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, 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.

## FIND OUT MORE

Please contact one of our regional teams using the details below or visit [www.e6.com](http://www.e6.com).

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