SUPERABRASIVE
GRINDING WHEELS

Automotive
Bearing
Glass
Cutting tools
Medical
Turbine
Stationary dresser
1975. Founded in Seoul, Korea
1981. Established subsidiary in California, USA
1985. Headquarters moved to Osan, Korea
1993. ISO9001 certified (TÜV)
   Established plant in Fujian, China
1995. Opened sales office in Nagoya, Japan
1997. Established plant in Weihai, China
2002. Established plant in Shanghai, China
   Acquired revised ISO 9001 and ISO 14001
2003. oSa (Organization for the Safety of Abrasivos) certified
2004. Opened sales office in Frankfurt, Germany
2005. Selected as "Certified excellent company of quality
competitiveness" by the Korean government
2008. Awarded $100M export Presidential award
2011. Selected as "World class 300 company" by
   the Korean government (First round)
2012. Established plant in Jakarta, Indonesia
2013. Opened new facility in Dongtan (R&D center
   and new business development)
   Opened sales subsidiary in India
2015. Opened sales subsidiary in Mexico
2016. Certified KOSHA 18001
   (Safety and Health Management System)
2017. Designated as a Compliance Program Trader
   (Ministry of Trade, Industry and Energy)
Worldwide competence -

The most advanced technology for diamond tools and quality

EHWA has become an international benchmark for success because of our ability to adapt quickly to the changing markets and diverse needs of customers, and by leading the way in applying the most advanced technology for manufacturing industrial diamond tools.

Since 1975, EHWA has been able to greatly expand its market share throughout the world because we have established a world renowned reputation of high quality products, service and expertise in the industry. EHWA is deeply committed to keeping customers up-to-date and equipped with the most competitive products and technical information. Our success can only be measured by the success of our customers.

The key to our flexibility and strength in the global marketplace is our many alliances with reliable overseas partners and customers throughout the world. EHWA purchases only the highest quality raw materials, industrial diamonds and CBN from reputable sources. In addition to having strong supply lines with major suppliers, EHWA has successfully teamed up with high-tech manufacturers in Europe, Japan, and U.S. under several joint-ventures for the research and development of high precision diamond tools, rotary dressers, and precision electroplated diamond tools.

The success of a company depends on its ability to adapt and compete in the global marketplace. EHWA is able to survive in the age of globalization because we are already globalized.

EHWA diamond tools are your partner for success.
EHWA = Cooperation

"E(二)" means Two Parties: EHWA and People such as customers, employees, partners and our society. "HWA(和)" means Cooperation. Our philosophy is to nurture and grow long-term partnerships with our customers. Ever since 1975 when EHWA was established, EHWA has been striving to develop into the very best in our industry not only in size but more importantly in quality. We are convinced that we are the best partner for you.
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Superabrasive grinding wheels

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Diamon
tools
for
Applications

Automotive
- engine
- turbocharger
- gear
- steering
- brake

Bearing

Glass

Cutting tools

Medical

Turbine

Stationary dresser

Innovator in Technology
EHWA industrial diamond tools are widely used in this industry, and play a key role in machining main automotive components including the cylinder head and the cylinder block.

Diamond tools for Automotive

**engine · turbocharger**

- **Nozzle bore grinding wheel**
  For fuel injection

- **Metal honing stones**
  For cylinder block and connecting rod

- **Rotary dresser**
  For turbocharger
Camshaft grinding

- Benefits of EHWA vitrified CBN wheels for camshafts
  - High removal rate & low grinding force
  - Excellent surface finish and profile stability
  - Increased dressing intervals and longer wheel life

- Increased material removal rate

  EHWA vitrified wheels enable the removal rate to increase up to 18% when grinding camshafts, compared to the competitor’s.

- Work material – chrome molybdenum steel (Sintering)
- EHWA wheel specification – B126L200VEW
- $v_w$ (wheel speed) – 120m/s
- $v_f$ (feed rate) – 0.08mm/s
- $\delta_e$ (stock removal) – 0.8mm
- $d_w$ (work diameter) – 30-50mm camLobe
- $d_s$ (wheel diameter) – 450mm

Qw' (removal rate)

$$Qw' = \pi d_w \times v_f \times 2 \delta_e / b_2 \text{ (mm/m/min)}$$

- $d_w$ – work diameter
- $v_f$ – feed rate
- $\delta_e$ – lobe width
- $b_2$ – wheel width
Crankshaft grinding

- Benefits of EHWA vitrified CBN wheels for crankshafts
  - Longer dressing intervals and tool life
  - Consistent surface finish and high profile stability
  - Reduced thermal and mechanical damage to workpiece

- Wheel life increased by 20%
  - Work material – FCD (casting)
  - EHWA wheel specification – B151L200VEWN
  - \( v_s \) (wheel speed) – 80m/s
  - \( \nu_f \) (feed rate) – 0.05mm/s
  - \( \delta_e \) (stock removal) – 1.2mm
  - \( d_w \) (work diameter) – 60mm
  - \( d_s \) (wheel diameter) – 650mm

G-RATIO
\[
G \text{-ratio} = \frac{\text{workpiece’s removal volume}}{\text{CBN wheel wear volume}}
\]
Automotive | engine

Injectors bore grinding

Bore grinding wheel  Seat grinding wheel
For fuel injection

| Advantages |
- Free cutting abrasive
- Longer dressing interval & more efficient utilization
- Consistent grinding performance
- Highly precise wheel shape including coolant hole and slots

| Standard Specifications |

<table>
<thead>
<tr>
<th>Grinding</th>
<th>Bore, Seat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant hole size</td>
<td>H 0.5~1.0mm</td>
</tr>
<tr>
<td>Wheel size</td>
<td>D 1.5~20mm</td>
</tr>
<tr>
<td>CBN grit size</td>
<td>29μm~76μm</td>
</tr>
<tr>
<td>Slot</td>
<td>0.4~1.5mm</td>
</tr>
</tbody>
</table>

Slot shape
Metal honing stones
For cylinder block and connecting rod

For cylinder block

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Longer tool life &amp; cost saving</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Stone mesh</th>
<th>Bond modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough</td>
<td>D251–D91</td>
<td>MB, MS, MJ series</td>
</tr>
<tr>
<td>Semi-Finish</td>
<td>D76–D30</td>
<td></td>
</tr>
<tr>
<td>Finish</td>
<td>D25–D8</td>
<td>MJ, MH series</td>
</tr>
</tbody>
</table>

For connecting rod

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Longer tool life &amp; cost saving</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stone Mesh</th>
<th>Bond modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>D151–D25</td>
<td>MJ, MH, MS series</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool life (pcs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Tool life (pcs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular diamond</td>
<td>2800</td>
</tr>
<tr>
<td>Double-S</td>
<td>6000</td>
</tr>
</tbody>
</table>

Double -S
· Newly developed diamond with special coating
· Excellent roundness and surface finish
· Double the tool life
Automotive | engine valve

Rotary dresser

| Engine valve |
The valve consists of a head, face and stem. It is installed to control the mixed gas required for power stroke into the combustion chamber and to exhaust the gas generated after combustion.

| Advantages |
- Customized design
- Highly precise dressing with long life
- Able to be designed as either a single product or an assembly
A turbocharger, or colloquially turbo, is a turbine-driven-forced-induction device that increases the efficiency of an internal combustion of engine and output of power by forcing extra air into the combustion chamber.

| Advantages |
- Customized design
- Highly precise dressing with longer life
- Increased tool life with CVD reinforcement in key wear areas
Gear grinding dresser
For gear

Metal honing stone
For gear

Vitrified CBN wheel
For gear and shaft angular grinding

Vitrified CBN wheel
For gear internal grinding
Diamond tools for Automotive

gear · steering · brake

Vitrified CBN wheel
For CV joint

Rotary dresser
For CV joint

CBN segment
For brake disc

BSL & electroplated wheel
For brake pad
Automotive | gear

**Gear grinding dresser**

For dressing of worm wheel for gear grinding

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Highly precise gear dresser due to strict raw material management</td>
</tr>
<tr>
<td>• Achieve the optimal gear profile with EHWA’s precisely polished gear dresser</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of dresser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single taper disc type</td>
</tr>
<tr>
<td>Single cone type</td>
</tr>
<tr>
<td>Single and root type</td>
</tr>
<tr>
<td>Double type</td>
</tr>
</tbody>
</table>
Metal honing stone
For pinion gear, speed gear, sleeve gear, DCT gear, etc.

Pinion, speed, DCT gear

| Advantages |
- Longer tool life & cost saving
- Less grinding load
- Excellent roundness

| Performance |

| Tool life (pcs) | 8000
|----------------|---
| Competitor     | 4000
| EHWA           | 8000

| Bond modification |
- D181~D15
- MB, MH, MS, MJ series

Synchro sleeve gear

| Advantages |
- Effective inner diameter honing of a sleeve gear
- Longer tool life and better precision than a competitor’s product

| Performance |

<table>
<thead>
<tr>
<th>Roundness (μm)</th>
</tr>
</thead>
</table>
| 0.24
| 0.15

| Bond modification |
- D76~D20
- MB, MS series

Sleeve gear honing stone
Workpiece
Automotive | gear

Angular grinding

Vitrified CBN wheel
For angular grinding

| Advantages |
- Excellent grinding performance for gear component
- Longer dressing interval for cost saving and high production capacity
- High removal rate due to the free cutting capability
- Reduced cycle time
- Less mechanical & thermal damage to grinding surface

| Grinding condition |
- **Wheel speed**: 25 ~ 80 m/s
- **Removal amount**: 0.1 ~ 0.35mm D
- **Dressing amount**: 5μm ~ 30μm
- **Dresser**: diamond rotary dresser
- **Spindle axle degree**: 15 ~ 30 ~ 45
- **Shank material**: steel, aluminum alloy
| Advantages |

- Excellent surface quality
- Longer wheel life and cost saving
- Faster setup of production line
- High stock removal rate

**Wheel life**

<table>
<thead>
<tr>
<th>Conventional wheel</th>
<th>EHWA CBN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8-10X'S</td>
</tr>
</tbody>
</table>
Automotive | steering

CV Joint grinding

Vitrified CBN wheel
For CV joint

| Advantages |
- High stock removal for improved production capacity
- Outstanding surface quality with low heat and tight tolerance
- Longer dressing intervals & less wheel wear to reduce cost and improve consistency
- EHWA has specialized solution for cv joint part grinding

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**Cage window grinding**

**Standard specification**
B126M180VBTM

**Outer race grinding**

**Standard specification**
B181M160VBTM

---

CBN structure
Pores micro-structure of vitrified wheel
CV Joint grinding rotary dresser

CV joint

Components that transmit the power of the engine delivered to the transmission to the wheels at constant speed.

Advantages

- Customized design
- Highly precise tolerance
- Outstanding grinding performance due to high diamond exposure
Automotive | brake disc

CBN segments

For brake disc

| Advantages |
- Longer tool life & cost saving
- Shorter cycle time due to high grinding speed

| Bond modification |

- **Workpiece 4WD (FC)**
  - Stone mesh: D181~D54
  - Bond modification: MH series

- **Workpiece 2WD (SUS)**
  - Stone mesh: D181~D54
  - Bond modification: MP series
BSL & Electroplated wheels

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
</table>
| • Excellent free cutting performance & easy chip flow due to high diamond exposure
| • Longer wheel life than E/P wheels reduce cost

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
</table>
| • Synchronized for chamfer, slot, and face grinding
| • Available in various, complex designs
| • Proper for various materials such as composites, ceramic and rubber
| • Outstanding grinding performance
| • Can be refurbished multiple times
EHWA industrial diamond tools are indispensable in modern industries and are often applied to bearing and aerospace industries. In particular, EHWA has been providing the worldwide leading aerospace engine manufacturing and bearing companies as its main customers with the very best products.

Diamond tools for Bearing

- Double disc surface grinding wheel  
  For bearing
- Taper roller face grinding wheel  
  For bearing
- Rotary dresser  
  For LM guide
- Rotary dresser  
  For ball screw
Bearing
Vitrified CBN wheel

Grinding parts

- ID (Inner race internal diameter) / IR (Inner race) / OR (Outer race) / Lip / Ring face

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Higher removal rates and shorter cycle times</td>
</tr>
<tr>
<td>- Reduced grinding force</td>
</tr>
<tr>
<td>- Reduced mechanical &amp; thermal damage to bearing</td>
</tr>
<tr>
<td>- Stable and precise grinding performance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grinding Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Wheel speed : 30 – 80 m/s</td>
</tr>
<tr>
<td>- Removal amount : 0.1 ~ 0.35mm D</td>
</tr>
<tr>
<td>- Dressing amount : 5 ~ 30μm</td>
</tr>
<tr>
<td>- Dressing ratio : 0.3~0.6</td>
</tr>
<tr>
<td>- Dresser : Diamond rotary dresser</td>
</tr>
<tr>
<td>- Coolant : Oil, emulsion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic core</td>
</tr>
</tbody>
</table>

EHWA Innovator in Technology
Super finishing stone

| Advantages |

- Longer tool life and improved productivity
  - 5~10 times longer tool life than conventional stone
  - Shorter cycle time for honing
  - Higher stock removal rate
- Excellent performance
  - Improved surface finish
- ECO-friendly
  - No sulfur
  - More consistent performance with less scrap

Micro structure of CBN stone

small homogenous pores structure

coarse pores structure

| Taper roller bearing raceway super finishing |

Condition
- **Vw** : 100~200rpm
- Removal : 5μm
- Surface roughness : Ra 0.06 μm
- Stone specification : B2400K120VHWPN

| Stone life time (EA) |

| Stone life time (EA) |

| Conventional stone | EHWA CBN stone |

1500 | 15000 |

Bearing

CBN stone
Bearing

Rotary dresser

- Diamond rotary dresser for ball / roller / hub bearings & water pump bearing

| Advantages |
- Highly precise and complex grinding
- Less dressing load and excellent dressing performance
- Longer tool life and cycle time reduction
- Available for dressing of vitrified CBN wheel

<table>
<thead>
<tr>
<th>Water pump bearing</th>
<th>Ball bearing</th>
<th>Taper hub bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Water pump bearing" /></td>
<td><img src="image2" alt="Ball bearing" /></td>
<td><img src="image3" alt="Taper hub bearing" /></td>
</tr>
<tr>
<td><img src="image1" alt="Water pump bearing" /></td>
<td><img src="image2" alt="Ball bearing" /></td>
<td><img src="image3" alt="Taper hub bearing" /></td>
</tr>
<tr>
<td><img src="image1" alt="Water pump bearing" /></td>
<td><img src="image2" alt="Ball bearing" /></td>
<td><img src="image3" alt="Taper hub bearing" /></td>
</tr>
</tbody>
</table>
Metal cup dresser
For bearing ID grinding

| Advantages |
- Longer life
  - 20,000~30,000 times (depending on the wheel size)
- Precise dressing
  - Less grinding deviation after dressing
- Longer dressing interval and outstanding performance

| Reference |

Dressing performance depending on tip width on width of diamond layer

Workpiece dimensional stability depending on tip width on width of diamond layer
**Face grinding wheel**

EHWA diamond manufactures wheels for bearing face grinding. It improves productivity by reducing cycle time. It is suitable for cost saving and quality improvement with longer life and better surface finish.

**Advantages**
- Longer life
- Short cycle time
- Excellent surface finish

**For application**
- Roller of needle bearing
- Roller of roller bearing
- IR/OR ring of bearing

**Face grinding**
- for IR/OR ring of ball bearing
- for roller of roller bearing
Bearing

Taper roller face grinding wheel

| Advantages |
- Longer tool life & cost saving
- Higher stock removal rate and superior performance
- Excellent surface finish

| Performance |

Tool life (pcs)

<table>
<thead>
<tr>
<th></th>
<th>Previous</th>
<th>After improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>150%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Innovator in Technology
Rotary dresser
For LM guide

- LM guide is a linear motion product that is used to manufacture automotive equipment.
- LM guide consists of a block and rail, and balls between them rotating.
- Rotary dresser is used for dressing the CBN wheel that polishes the seat of the ball between a block and rail.
Rotary dresser - for ball screw

| Ball screw |
- An assembly that converts rotational motion into linear motion.
- Consists of ball screw and nut.

| Advantages |
- Highly precise dressing with longer life
- High diamond concentration
EHWA industrial diamond tools are widely used in the optical industry, owing to characteristics of glass and optic’s raw materials. For instance, the diamond tools are effectively used for grinding eye glass lens, automotive safety glass, crystal, and various other lenses.
Glass

Automotive / home appliance / optics

Automotive glass

<table>
<thead>
<tr>
<th>Grit size</th>
<th>Bond</th>
<th>Scanning electron micrograph</th>
<th>Bond features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB series</td>
<td></td>
<td><img src="image" alt="MB series micrograph" /></td>
<td>Softer</td>
</tr>
<tr>
<td>D107–D30</td>
<td>MC series</td>
<td><img src="image" alt="MC series micrograph" /></td>
<td>Standard</td>
</tr>
<tr>
<td></td>
<td>MG series</td>
<td><img src="image" alt="MG series micrograph" /></td>
<td>Harder</td>
</tr>
</tbody>
</table>

Home appliance glass

Newly developed wheels to improve edge quality and reduce chips. The deviation of chipping rate is less than 1% after refurbish.
<table>
<thead>
<tr>
<th>Specification</th>
<th></th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Type</td>
<td>Mesh</td>
</tr>
<tr>
<td>Roughing (GL)</td>
<td>MD-1A1</td>
<td>D251~D151</td>
</tr>
<tr>
<td>Roughing (PL)</td>
<td>MD-BSL</td>
<td>D301~D151</td>
</tr>
<tr>
<td>Finishing</td>
<td>MD-1EE6Y</td>
<td>D46~D30</td>
</tr>
<tr>
<td>Polishing</td>
<td>MD-1EE6Y</td>
<td>D2</td>
</tr>
</tbody>
</table>

Grinding performance (BSL)

EHWA #1: Slot type
EHWA #2: Continuous type
Periphery wheel
For inserts

Top & bottom wheel
For inserts

Top & bottom wheel
For inserts
EHWA industrial diamond wheels are widely used to grind various cutting tools. The cutting tools are classified by raw material type, such as high speed steel, carbon steel, ceramics, carbide, and PCD/PCBN tools, and EHWA products are often used to grind cemented carbide tools whose main raw material is tungsten.

Diamond grinding wheels for Cutting tools

Hybrid wheel pack
For rotating tool

Precision wheel pack
For micro rotating tool

Tool grinding wheel
For tip saw
Insert grinding wheel

EHWA manufactures a full line of insert grinding wheels for carbide, ceramic, cermet and PCD/PCBN materials. These wheels are designed with the optimal specifications considering the cycle time and dressing intervals for optimum productivity. Their grinding performance is excellent, therefore, they produce uniform inserts with a superior finish and chip-free edge.

<table>
<thead>
<tr>
<th>Periphery grinding</th>
<th>Top &amp; bottom grinding</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Shorter cycle time by high feed rate</td>
<td>· Shorter cycle times</td>
</tr>
<tr>
<td>· Small chip size</td>
<td>· Longer dressing intervals</td>
</tr>
<tr>
<td>· Longer dressing intervals</td>
<td>· Improved dimensional stability</td>
</tr>
<tr>
<td>· Machine: Agathon, Wendt, Waida, Ewamatic and Ewag</td>
<td>· Machine: Stahli, Peter Wolters, Wendt WBM, Agathon T&amp;B and Fujisanki</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bond table by application</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Low content</th>
<th>High content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periphery</td>
<td>Bond hardness weak</td>
<td>Bond hardness strong</td>
</tr>
<tr>
<td>PCD</td>
<td>VDGF</td>
<td>Hybrid</td>
</tr>
<tr>
<td>PCBN</td>
<td>VHGN</td>
<td></td>
</tr>
<tr>
<td>High performance resin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cermet</td>
<td>BXT</td>
<td>XA20</td>
</tr>
<tr>
<td>Ceramic</td>
<td>SA2</td>
<td>BMX series</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BXB</td>
<td>SA4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RM series</td>
</tr>
<tr>
<td></td>
<td>BXC</td>
<td></td>
</tr>
<tr>
<td>Top &amp; bottom</td>
<td>Standard resin</td>
<td>High performance resin</td>
</tr>
<tr>
<td>Carbide</td>
<td>B32</td>
<td>BXS4</td>
</tr>
<tr>
<td>Cermet</td>
<td>BQ / BG</td>
<td>SA5</td>
</tr>
<tr>
<td>Ceramic</td>
<td>BXC</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B26</td>
<td></td>
</tr>
</tbody>
</table>

EHWA Innovator in Technology
**Periphery grinding**

High temperature polyimide bond is commonly applied for periphery grinding. Recently, hybrid and soft-metal bonds are the new trend for reduced cycle time, smaller chip size, and better dimensional stability and productivity.

- **Machine**: Wendt 715 WAC Quattro
- **Workpiece**: Carbide insert
- **Wheel speed**: 20 m/s
- **Wheel spec**: RD-11A2, 400D-39T-10W-6X-355.06H
- **Bond**: D46 High temperature resin bond & D40 Hybrid bond

- **Machine**: Agathon
- **Workpiece**: PCBN Insert
- **Wheel speed**: 18 m/s
- **Wheel spec**: VD-11A2, 400D-39T-15W-6X-355.06H D6M120VHGN

<table>
<thead>
<tr>
<th>Tool life</th>
<th>Cycle time</th>
<th>Dressing interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% UP</td>
<td>30% DOWN</td>
<td>30% UP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size of chipping (μm)</th>
<th>Cycle time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

**Top & bottom grinding**

- **Machine**: Wendt WBM221-Duo Lift
- **Wheel**: RD-2A2T, 501D-5X-40W, D126BSX4
- **Workpiece**: Various carbide inserts
- **Oil coolant**

<table>
<thead>
<tr>
<th>Tool life</th>
<th>Dressing interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% UP</td>
<td>30% UP</td>
</tr>
</tbody>
</table>
Cutting tools

Rotating tool

- **Polyimide bond**
  
  Thermal stability of polyimide bonds is better than phenol or epoxy bonds, therefore, their grinding performance and wheel life are better than phenol and epoxy bonds.

- **Hybrid bond**
  
  Hybrid bond, a combination of polyimide and metal bond, are able to meet more challenging requirements as this bond has the best advantages of both polyimide and metal bond: Polyimide's good grinding performance and elasticity and metal bond high wear resistance and high thermal stability.

- **Porosity hybrid bond**
  
  This pore structure helps diamond protrusion and makes coolant flow easily. It also lowers the grinding load, and thereby increases the max allowable feed rate, which reduces cycle time.

---

- Phenolic bond
  
  - Free cutting ability
  - Good elasticity

- Standard polyimide bond
  
  - Good thermal and edge stability
  - # BX series

- High performance polyimide bond
  
  - Excellent thermal stability
  - Outstanding surface finish
  - # PA series

- Hybrid bond
  
  - Short cycle time due to high feed rate
  - Low grinding load
  - # BMX series
**Drill & endmill**
- **Machine**: ANCA FX7 (19kW)
- **Material**: Carbide Φ 12-50mm (LOF), 2 Flutes (K10)
- **Wheel speed**: 18 m/s
- **Feed rate**: 120 mm/min
- **Depth of cut**: 2.4 mm

**Precision cutting tool**
- High Productivity at the lowest tool cost
- Greatly improved surface and edge quality
- Accurate edge stability

**Tap**

**Rotary Burr**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VB-1A1 (grinding)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD-1V1</td>
<td>110D - 160D / 30V-60V</td>
<td>ME4 series</td>
</tr>
</tbody>
</table>
Cutting tools

Circular tip saw / hob cutter / broach

Tool grinding wheel
For circular tip saw

- Circular tip saw

| Advantages |
- Longer life time
- Shorter cycle time
- Fine surface finish
- High dimensional stability

Workpiece - carbide tipped saw

- Flank grinding
- Top grinding
- Face grinding

Workpiece high speed steel saw blade
Profile grinding
Profile grinding of high speed steel saw blade

**Wheel specification**: RB-14F1/S, CBN107

<table>
<thead>
<tr>
<th>Type</th>
<th>D</th>
<th>x1</th>
<th>x2</th>
<th>U</th>
<th>Bond type</th>
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<tbody>
<tr>
<td>RB-14F1/S</td>
<td>150</td>
<td>6</td>
<td>8</td>
<td>1,1,3</td>
<td>Hardened resin bond</td>
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<tr>
<td></td>
<td></td>
<td>6</td>
<td>10</td>
<td>1,3, 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>12.5</td>
<td>3.5</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>12.5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>15</td>
<td>5, 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>6</td>
<td>8</td>
<td>1, 1.3, 1.6, 2, 2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>12.5</td>
<td>3.5</td>
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<td></td>
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<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>15</td>
<td>5, 6</td>
<td></td>
</tr>
</tbody>
</table>

- **Hob cutter**

- **Broach**
Vitrified wheel (CFRP body)  
For artificial knee joint

Vitrified wheel (Al alloy body)  
For artificial knee joint

Vitrified wheel (Steel + Al body)  
For artificial knee joint

Electroplated wheel (Steel + Al body)  
For artificial knee joint
Superabrasive wheels are new trend for this rapidly developing industry.

Diamond wheels for Medical

- Rotary dresser
  For artificial knee joint

- Wire grinding wheel
  For medical wire

- Electro chemical grinding wheel
  For needles (SUS, SUS304)
Medical

Artificial knee joint

Vitrified wheel / CFRP body

Vitrified wheel / Al alloy body

Vitrified wheel / Steel + Al body

Electroplated wheel / Steel + Al body
| Features |

- Ideal for artificial knee joint grinding application
- High stock removal
- Well balanced for high speed operation
- Longer dressing interval & wheel life
- Excellent grinding performance and good surface quality

Standard dimensions for artificial knee joint grinding

<table>
<thead>
<tr>
<th>Item</th>
<th>Wheel size</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitrified CBN</td>
<td>VB-14F1, 250D-120T-20X-16U-8R-51H, VB-14F1, 240D-120T-20X-18U-10R-51H</td>
<td>B252L150VBW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B252L150VBW</td>
</tr>
<tr>
<td>Diamond rotary dresser</td>
<td>ROTARY-RP 98D-25T-10R-25H</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROTARY-IP1, 175D-2R-22T-52H</td>
<td></td>
</tr>
<tr>
<td>Electroplated CBN</td>
<td>EB-1FF1, 200D-120T-2U-12R-51H</td>
<td>B427</td>
</tr>
<tr>
<td></td>
<td>EB-1FF1, 200D-120T-12U-6R-51H</td>
<td>B252, B301</td>
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<tr>
<td></td>
<td>EB-1FF1, 160.45D-16T-8R-20H</td>
<td>B427</td>
</tr>
</tbody>
</table>
Medical wire

**Wire grinding wheel / For medical wire**

**Advantages**
- Low pressure & free cutting performance
- Excellent surface quality of wire
- Long wheel life & cost saving
- Well balanced wheel

**Wire grinding wheel / For medical wire**

**Advantages**
- Very straight face with a sharp edge
- Low cutting force & free cutting wheel
- Excellent surface quality of wire
Electrolytic polishing wheel for hypodermic needle.

| Standard dimensions |

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB-1A1</td>
<td>204D-3T ~ 15T</td>
<td>![Bond Image]</td>
</tr>
<tr>
<td>MB-3A1</td>
<td>204D-1U~2.9U</td>
<td>![Bond Image]</td>
</tr>
</tbody>
</table>

| Features |
- Low cost per part
- Increased stock removal
- Superior surface quality (burr free)
- Consistant grinding performance

Comparison of surface quality

- Conventional wheel (burr)
- EHWA ECG wheel (burr free)
Rotary dresser for
Turbine

Rotary dresser
For turbine blade

EHWA
Innovator in Technology
Rotary dresser

Turbine blade

Rotary dresser
For turbine blade

- **Turbine blade**: Aerospace turbine, power generator turbine & shipbuilding turbine

**Advantages**
- Custom roll design based on work piece
- Superior tool life and tool precision
- Stable dressing performance in creep feed grinding

Innovator in Technology
Material for dresser

Natural diamond
- Application: SDD, FDD, MDD, IDD

Mono diamond
- Application: SDD, FDD, MDD
  - Almost same properties as natural diamond

CVD (Chemical Vapor Deposition)
- Application: SDD, FDD, MDD
  - Almost same properties as natural diamond

* SDD (Single-point Diamond Dresser), FDD (Forming Diamond Dresser), MDD (Multi-point Diamond Dresser), IDD (Impregnated Diamond Dresser)
Stationary dresser

For conventional abrasive wheel

Type of dresser

SDD  Single-point Diamond Dresser

FDD  Forming Diamond Dresser

MDD  Multi-point Diamond Dresser

IDD  Impregnated Diamond Dresser
Conventional abrasive wheel

Stationary diamond dresser

Diamond Dresser
Natural, synthetic diamond

Dresser recommendations for abrasive wheel type

* SDD (Single-point Diamond Dresser), FDD (Forming Diamond Dresser), MDD (Multi-point Diamond Dresser), IDD (Impregnated Diamond Dresser)

- **Straight**
  - SDD, MDD, IDD

- **Tapered**
  - SDD, MDD, IDD

- **Convex**
  - SDD, FDD, MDD

- **Concave**
  - SDD, MDD, IDD

- **Angled**
  - FDD, MDD

- **Multi-angled**
  - FDD, MDD

EHWA Innovator in Technology
### Dresser recommendations for abrasive wheel

<table>
<thead>
<tr>
<th>Type</th>
<th>Applications</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SDD</strong></td>
<td>For conventional abrasive wheels with straight shape, simple profile, thread and gear grinding</td>
<td>Classified by carat (Size range: 1/30~1.5CT)</td>
</tr>
<tr>
<td><strong>FDD</strong></td>
<td>For conventional abrasive wheels with simple and complex profile, thread and gear grinding</td>
<td>Classified by shape of angle and radius (Roof, Chisel, Cone)</td>
</tr>
</tbody>
</table>
| **MDD** | For conventional abrasive wheels with straight shape and precise, complex profile grinding  
Ideal for precise angular profile | Classified by the number of diamond rods and types (available rods: 2~10) |
| **IDD** | Ideal for dressing large and wide conventional abrasive wheels.  
For dressing conventional surface and center-less abrasive wheels. | Classified by grit size (available mesh: #18~#140) |