Diamond·cBN Tools

A.L.M.T. Corp.
# Diamond•cBN Tools

Nano technology and Eco-friendly tools from A.L.M.T. bring next generation of cutting, grinding, and polishing.

## Grinding Tools

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<td>P37 - 38</td>
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<tr>
<td>PCD Small saw</td>
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## Diamond Wire Saw

<table>
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<th>P47 ~ P48</th>
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<td>PWS</td>
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<table>
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<tr>
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<td>CPG Series</td>
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## Information

<table>
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<th>Types</th>
<th>P51 ~ P56</th>
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<td>P51 - 52</td>
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<td>P55 - 56</td>
</tr>
</tbody>
</table>
A.L.M.T.Corp. offers a wide range of products to meet all of your cutting, grinding, and polishing needs.

Thank you for using A.L.M.T.
**Grinding Tools**

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**Superabrasive Wheel**

Grinding Wheels with diamond and cBN are called “Superabrasive Wheels”, to distinguish from conventional wheels such as aluminum oxide and silicon carbide.

*cBN (or CBN) = Cubic Boron Nitride*

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**Comparison of Superabrasive and Conventional wheel (based on characteristics)**

1. **Thermal Conductivity**

   ![Thermal Conductivity Graph]

   Superabrasives have better thermal conductivity. (Inhibit temperature rise of workpiece)

   Deterioration risk of work hardness under proper condition is low. High quality process such as high compressive stress and low damaged layers are obtained.

2. **Hardness**

   ![Hardness Graph]

   Superabrasives have higher hardness.

   High efficiency and accuracy as well as low cost process are obtained under proper condition. Also, continuous processing is available due to low frequency of tool change.
**Abrasives**

<table>
<thead>
<tr>
<th>Type</th>
<th>JIS Display</th>
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<tbody>
<tr>
<td>Natural Diamond</td>
<td>D</td>
</tr>
<tr>
<td>Synthetic Diamond</td>
<td>SD</td>
</tr>
<tr>
<td>Coated Synthetic Diamond</td>
<td>SDC</td>
</tr>
<tr>
<td>Cubic Boron Nitride</td>
<td>cBN</td>
</tr>
<tr>
<td>Coated Cubic Boron Nitride</td>
<td>cBNC</td>
</tr>
</tbody>
</table>

**Type of Bond**

- Resin: B
- Metal: M
- Vitrified: V
- Electro-plated: P

**Grit Size**

<table>
<thead>
<tr>
<th>Display Size</th>
<th>JIS</th>
<th>Average (μm)</th>
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<tbody>
<tr>
<td>16</td>
<td>16/20</td>
<td>1190</td>
</tr>
<tr>
<td>20</td>
<td>20/30</td>
<td>840</td>
</tr>
<tr>
<td>30</td>
<td>30/40</td>
<td>590</td>
</tr>
<tr>
<td>40</td>
<td>40/50</td>
<td>420</td>
</tr>
<tr>
<td>50</td>
<td>50/60</td>
<td>300</td>
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<td>60</td>
<td>60/80</td>
<td>250</td>
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<td>80</td>
<td>80/100</td>
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<td>100</td>
<td>100/120</td>
<td>149</td>
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<td>120</td>
<td>120/140</td>
<td>125</td>
</tr>
<tr>
<td>140</td>
<td>140/170</td>
<td>105</td>
</tr>
<tr>
<td>170</td>
<td>170/200</td>
<td>88</td>
</tr>
<tr>
<td>200</td>
<td>200/230</td>
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<tr>
<td>230</td>
<td>230/270</td>
<td>63</td>
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<tr>
<td>270</td>
<td>270/325</td>
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<tr>
<td>325</td>
<td>325/400</td>
<td>44</td>
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<tr>
<td>400</td>
<td></td>
<td>37</td>
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<tr>
<td>2000</td>
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<td>8</td>
</tr>
<tr>
<td>3000</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

**Identification System of Diamond & cBN Wheel**

- SDC 200 N 100 BS40 3.0
- Abrasive Type
- Bonding Degree
- Bond Name
- Grit Size
- Concentration
- Thickness of Abrasive Layer

**Concentration**

<table>
<thead>
<tr>
<th>Degree of Concentration</th>
<th>Grain Content ct/cm³ (mg/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>6.6 (1320)</td>
</tr>
<tr>
<td>125</td>
<td>5.5 (1100)</td>
</tr>
<tr>
<td>100</td>
<td>4.4 (880)</td>
</tr>
<tr>
<td>75</td>
<td>3.3 (660)</td>
</tr>
<tr>
<td>50</td>
<td>2.2 (440)</td>
</tr>
</tbody>
</table>

**Bond Strength**

- "N" is standard and indicates the bonding strength of abrasive and bond

- Soft: J, L
- Hard: N, P, R

**Material Processed by Diamond or cBN Wheel**

- **Diamond**
  - Cutting Tool: SK, SKH, SK
  - Electric Part: Ceramic (Alumina, etc.), Ceramic (Aluminum nitride, etc.), Compound semiconductor
  - Magnetic Material: Ferrite, Rare earth Magnet
  - Crystaline Material: Glass, Crystal, Quartz, Sapphire
  - Ceramic Products: Stone, Refractory Material, Tile, Asbestos, Concrete
  - Wear Resistant Metal: Sprayed Metal, Cobalt base Alloy, Titanium Carbide
  - Plastic: F.R.P.
  - Graphite

- **CBN**
  - Cutting Tool: SKD, Sprayed Metal, Cobalt base Alloy
  - Structural Component: SCM, SMC, SCr, SUS
  - Heat Resistant Metal: SUH, Nickel base Alloy, Titanium base Alloy
  - Magnetic Material: Dust Core, Alnico

**Notes:** 1ct=200mg
Resin Bond Wheel

The main component of resin bond is thermo-hardening resin. Phenol resin is mainly used but polyimide resin, which has better heat resistance, is becoming more common.

Our products are widely used in many kinds of material.

**Features**

1. Elastic property of (resin) bond leads to excellent surface roughness.
2. Excellent durability of grinding ability for various kind of materials hard to be ground.

**Applications**

Metal material such as cemented carbide, cermet, and high speed steel
From rough to finish grinding for certain materials such as fine ceramics, ferrite, and glass

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Metal Bond Wheel

Metal Bond consists of various types of alloys: copper, tin, steel, cobalt, and tungsten.

MT Bond Wheel applying (our) special metal bond has excellent grinding ability as well as long tool life and is highly recommended for ceramics, carbide, and cermet.

**Features**

1. Higher wear resistance and abrasive retention lead to long tool life.
2. Good grinding ability on glass and ferrite by brittle (fracturing) mode.

**Applications**

Rough grinding for certain material such as glass, ceramics, ferrite, semiconductor material, and stone

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Bond features and applications
Vitrified Bond Wheel

Vitrified Bond is glass-based ceramic and has been used for conventional grinding wheels through the ages.

We have abundant lineup: “VITMATE” applying cBN, “EG WHEEL” for cemented carbide and ceramic, and “NANOMATE” which is applicable to super finish grinding of semiconductor materials.

Features
1. Good grinding ability due to pores
2. Trueing and dressing of VITMATE can be operated with a Rotary Dresser on the machine
3. Special adhesion technology can be applied for high speed grinding.

Applications
Steel, cemented carbide, semiconductor material, and ceramics, etc.
Suitable for high efficiency processes of high speed grinding

Electroplated Wheel

Abrasives are fixed by Ni plating on the surface of steel bodies which have various kinds of precise forms.

Our products are widely used in many kinds of material.

Features
1. Excellent durability of grinding ability due to large protrusion (following good chip discharging property).
2. Excellent profile maintaining property due to large number of active grains.
3. Easy to be formed and body is reusable

Applications
Form grinding of cemented carbide, ceramics, magnetic material and steel, etc.
Dry grinding of rubber and FRP, etc.
**About Truing and Dressing**

Truing and Dressing are important in allowing full grinding ability and effective wheel use.

**Truing** is wheel forming process including run-out elimination.

**Dressing** is abrasive projecting process by removing bond and chips on wheel surface.

### Table 1. Method of Truing for Each Type of Diamond and cBN Wheel

<table>
<thead>
<tr>
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<th>Applicable Bond</th>
<th>Forming</th>
<th>Remarks</th>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Rotating Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotary Dresser</td>
<td>Dia</td>
<td>V</td>
<td>Possible</td>
</tr>
<tr>
<td></td>
<td>Metal Wheel</td>
<td>Dia</td>
<td>cBN</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Electrodeposition Arbor</td>
<td>cBN</td>
<td>V</td>
<td>B.V.M</td>
</tr>
<tr>
<td>Static Type</td>
<td>Single Point, Multi-point Dresser</td>
<td>cBN</td>
<td>V</td>
<td>Not Possible</td>
</tr>
<tr>
<td></td>
<td>Impregnated Dresser</td>
<td>cBN</td>
<td>V</td>
<td>Not Possible</td>
</tr>
<tr>
<td></td>
<td>Block Dresser</td>
<td>cBN</td>
<td>V</td>
<td>Not Possible</td>
</tr>
<tr>
<td></td>
<td>Electrodeposition Block Dresser</td>
<td>cBN</td>
<td>V</td>
<td>B.V.(M)</td>
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<tr>
<td>Conventional Wheel Method</td>
<td>Rotating Type</td>
<td>Grinding Wheel</td>
<td>Dia</td>
<td>V.B.M</td>
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<tr>
<td></td>
<td>Static Type</td>
<td>Stick</td>
<td>Dia</td>
<td>B.V.(M)</td>
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<td>cBN</td>
<td>B.V(M)</td>
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<td>Rotating Type</td>
<td>Soft Steel Roll</td>
<td>Dia</td>
<td>B</td>
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<td></td>
<td>Static Type</td>
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<td>Dia</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cBN</td>
<td>B</td>
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<td>Dia</td>
<td>B.V.M</td>
<td>Not Possible</td>
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<td></td>
<td></td>
<td>cBN</td>
<td>B.V.M</td>
<td>Not Possible</td>
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<td>Crash Method</td>
<td>Steel Roll</td>
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<td>V</td>
<td>Possible</td>
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<td></td>
<td></td>
<td>cBN</td>
<td>V</td>
<td>Not Possible</td>
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<td>Electrode</td>
<td>Dia</td>
<td>M</td>
<td>Possible</td>
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<tr>
<td></td>
<td></td>
<td>cBN</td>
<td>M</td>
<td>Possible</td>
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</table>

*1 : B: Resin Bond , M: Metal Bond, V: Vitrified Bond  
*2 : Order of easiness for truing; ( ) is not general

### Table 2. Method of Dressing for Each Type of Diamond and cBN Wheel

<table>
<thead>
<tr>
<th>Dressing Method and Tool</th>
<th>Applicable Abrasive</th>
<th>Applicable Bond</th>
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<tbody>
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<td>Diamond Tool Method</td>
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<tr>
<td>Rotating Type</td>
<td>Rotary Dresser</td>
<td>Dia</td>
</tr>
<tr>
<td>Metal Wheel</td>
<td>Dia</td>
<td>cBN</td>
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<tr>
<td>Static Type</td>
<td>Single Point, Multi-point Dresser</td>
<td>cBN</td>
</tr>
<tr>
<td>Impregnated Dresser</td>
<td>cBN</td>
<td>V</td>
</tr>
<tr>
<td>Block Dresser</td>
<td>cBN</td>
<td>V</td>
</tr>
<tr>
<td>Conventional Wheel Method</td>
<td>Rotating Type</td>
<td>Grinding Wheel</td>
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<td>Static Type</td>
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<td>Dia</td>
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<tr>
<td></td>
<td>cBN</td>
<td>B.V.M</td>
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<td>Soft Steel Method</td>
<td>Rotating Type</td>
<td>Soft Steel Roll</td>
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<td>Static Type</td>
<td>Soft Steel Block</td>
<td>Dia</td>
</tr>
<tr>
<td></td>
<td>cBN</td>
<td>B</td>
</tr>
<tr>
<td>Free Abrasive Method</td>
<td>Lapping</td>
<td>Dia, cBN</td>
</tr>
<tr>
<td>Crash Method</td>
<td>Blasting</td>
<td>Dia, cBN</td>
</tr>
<tr>
<td>Electro-discharge Machining</td>
<td>Electrode</td>
<td>Dia</td>
</tr>
<tr>
<td></td>
<td>Steel Roll</td>
<td>Dia, cBN</td>
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</tbody>
</table>

*1 : B: Resin Bond , M: Metal Bond, V: Vitrified Bond  
Order of easiness for dressing
Identification Method of Wheel Shape

1 Standard Body Shape

2 Cross Sectional Shape of Abrasive Layer

3 Abrasive Layer Position & Symbol Reference to B

4 Modification & Symbol

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Position</th>
<th>Diagram</th>
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<tr>
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<td>Periphery</td>
<td><img src="periphery.png" alt="Diagram" /></td>
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<tr>
<td>2</td>
<td>Side</td>
<td><img src="side.png" alt="Diagram" /></td>
</tr>
<tr>
<td>3</td>
<td>Both Sides</td>
<td><img src="both_sides.png" alt="Diagram" /></td>
</tr>
<tr>
<td>4</td>
<td>Incline or Roundness, Inside</td>
<td><img src="incline_roundness_inside.png" alt="Diagram" /></td>
</tr>
<tr>
<td>5</td>
<td>Incline or Roundness, Outside</td>
<td><img src="incline_roundness_outside.png" alt="Diagram" /></td>
</tr>
<tr>
<td>6</td>
<td>Part of Periphery</td>
<td><img src="part_of_periphery.png" alt="Diagram" /></td>
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<tr>
<td>7</td>
<td>Part of Side</td>
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</tr>
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<td>8</td>
<td>Whole</td>
<td><img src="whole.png" alt="Diagram" /></td>
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<td>9</td>
<td>Edge</td>
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<tr>
<td>10</td>
<td>Internal</td>
<td><img src="internal.png" alt="Diagram" /></td>
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<table>
<thead>
<tr>
<th>Symbol</th>
<th>Modification</th>
<th>Diagram</th>
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<tr>
<td>B</td>
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<td><img src="spot_facing_hole.png" alt="Diagram" /></td>
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<tr>
<td>C</td>
<td>Countersinking Hole</td>
<td><img src="countersinking_hole.png" alt="Diagram" /></td>
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<tr>
<td>H</td>
<td>Straight Hole</td>
<td><img src="straight_hole.png" alt="Diagram" /></td>
</tr>
<tr>
<td>M</td>
<td>Straight &amp; Threading Hole</td>
<td><img src="straight_threading_hole.png" alt="Diagram" /></td>
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<tr>
<td>P</td>
<td>Relief at One Side</td>
<td><img src="relief_one_side.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Q</td>
<td>Insert of Abrasive Layer</td>
<td><img src="insert_abrasive_layer.png" alt="Diagram" /></td>
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<tr>
<td>R</td>
<td>Relief at Both Sides</td>
<td><img src="relief_both_sides.png" alt="Diagram" /></td>
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<td>S</td>
<td>Segmented Abrasive Layer</td>
<td><img src="segmented_abrasive_layer.png" alt="Diagram" /></td>
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<tr>
<td>SS</td>
<td>Slot Segmented Abrasive Layer</td>
<td><img src="slot_segmented_abrasive_layer.png" alt="Diagram" /></td>
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<td>T</td>
<td>Threading Hole</td>
<td><img src="threading_hole.png" alt="Diagram" /></td>
</tr>
<tr>
<td>V</td>
<td>Reverse Attachment of Abrasive Layer</td>
<td><img src="reverse_attachment_abrasive_layer.png" alt="Diagram" /></td>
</tr>
<tr>
<td>W</td>
<td>With Shaft</td>
<td><img src="with_shaft.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Y</td>
<td>Reverse Insert of Abrasive layer</td>
<td><img src="reverse_insert_abrasive_layer.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>
Standard Wheel Shape 1

- **1A1** Straight
- **3A1/4A1** Straight with Boss
- **1F1/1FF1** Straight with R
- **1EE1/1E6Q** V Face
- **1Q1/1L1** Chipbreaker
- **1DD6Y** Centering

- **1A1R** Cutting
- **1A1RSS** Cutting Saw
- **1V1** Straight with Angle
- **4B2** One Side V Face
- **9U1** U-shaped Straight
- **1FF6Y/1EE6Y/1LL6Y/1DD6Y** Pencil Edge
Standard Wheel Shape 2

- **6A2** Plain Cup
- **6A2S** Segment Cup
- **11A2/11B2** Flair Cup
- **11C9/11Y9** L-shaped Flair Cup
- **6A9/11V9** Corner Cup
- **12A2** Dish
- **11V2S** Wedge-shaped Segment Cup
- **9A3** Both Side Cup
- **3A2** Core Drill
- **3V2T** Chamfering
- **3F2** Curve Generator
- **W** Internal with Shank
Flute MAX

Suitable for grooving with water-soluble coolant

Flute MAX applies super heat resistant resin with a special filler to achieve both superior cutting ability and long tool life.

Suitable for grooving applications such as endmills, drills, reamers, and creep feed grinding for various other tools.

Features

- Super heat resistant resin helps to reduce deterioration under high temperature.
- Excellent cutting ability and shape retention even for heavy load grinding such as creep feed grinding.
- High feed rate and long dressing interval compared to conventional wheels which lead to high efficiency and cost reduction.

Applications

- Grooving of endmills, drills and reamers
- Chipbreaker grinding of inserts
- Heavy grinding of various tools including special steel tools

3 different bond types

<table>
<thead>
<tr>
<th>Bond grade</th>
<th>Special feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Superior cutting ability</td>
</tr>
<tr>
<td>N</td>
<td>Standard</td>
</tr>
<tr>
<td>P</td>
<td>Superior shape retention</td>
</tr>
</tbody>
</table>

Creep feed grinding of cemented carbide

**Conditions**

- Workpiece: Cemented carbide
- Wheel specification: SDC140-100B
- Wheel speed: V=1600m/min
- Work speed: F=80mm/min
- Depth of cut: a=0.5mm/pass
- Coolant: water-soluble

**Result**

Compared to conventional resin bond wheel Flute MAX can maintain low grinding force and cutting ability.

Flute Grinding of Cemented Carbide Endmill

**Conditions**

- Workpiece: 8D 2-flute endmill
- Wheel specification: SDC270-100B
- Wheel speed: V=1,600m/min
- Depth of cut: a=1.5mm (1st time), 0.5mm (2nd time)
- Coolant: water-soluble

**Result**

Flute MAX can achieve grinding by 4 times faster feed ratio than conventional resin bond wheel in same tool life.
Flute Master®

Suitable for grooving with oil-based coolant

Flute Master was created to exhibit excellent heat resistance of metal bond and surpasses the grinding ability of the resin bond wheel.

Features

Newly developed metal bond has both excellent grinding ability and provides long tool life. It also increases grinding efficiency, especially when used with oil-based coolant.

Applications

- Flute grinding of endmills, drills and reamers
- Chipbreaker grinding of inserts
- Heavy duty grinding of various tools, including special steel tools

Bond Line Up

- CBM-P: Long tool life, high grinding efficiency
- CBM-N: Medium tool life, medium grinding efficiency
- CBM-L: Short tool life, low grinding efficiency

Flute Grinding

Relation between grinding force and feed rate

1) Wheel Specification
   1. Resin: SDC325N100B
   2. CBM-L: SD325L100CBM
2) Work Material: Cemented Carbide
3) Conditions: Wheel Peripheral Speed: 1500m/min
   D.O.C.: 3mm
   Coolant: Oil-based
   Machine: Horizontal spindle surface grinder

Grinding performance

1) Wheel Specification
   1. Resin: BN140-100B
   2. CBM-L: BN140L-100CBM
   3. CBM-P: BN140P-100CBM
2) Work Material: SKH51 (HRC60)
3) Conditions: Wheel Peripheral Speed: 1500m/min
   D.O.C.: 1mm
   Feed rate: 40mm/min
   Coolant: Oil-based
   Machine: Horizontal spindle surface grinder

Comparison of grinding quantities

Comparison of surface roughness

Comparison of grinding force
Hybrid Wheel

Suitable for cermet grinding

Features
- The Hybrid Wheel was developed for high-efficiency grinding of cermet, a material that is hard-to-cut.
- Excellent grinding ability and long tool life due to effect by micro-segment of special metal bond
- Good surface roughness and minimal chipping due to resin bond matrix

Micro-segment structure

Applications
- Peripheral grinding of cermet, surface honing, grooving and chipbreaker grinding, etc.
- Various grinding including cemented carbide and ceramics

Type and standard size

Straight Type

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Cup Type

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</table>

Performance of Hybrid Wheel

- Excellent grinding ability and long tool life due to effect by micro-segment of special metal bond
- Good surface roughness and minimal chipping due to resin bond matrix

Applications
- Peripheral grinding of cermet, surface honing, grooving and chipbreaker grinding, etc.
- Various grinding including cemented carbide and ceramics

Performance of Hybrid Wheel

<table>
<thead>
<tr>
<th></th>
<th>Hybrid</th>
<th>Conventional resin bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel</td>
<td>Size</td>
<td>Ø350×12W×6X, 6A2</td>
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<tr>
<td></td>
<td>Specification</td>
<td>SD325-HB, SDC325R75B</td>
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<tr>
<td>Work Material</td>
<td>Size</td>
<td>12.73θ×3,175</td>
</tr>
<tr>
<td></td>
<td>Specification</td>
<td>TIC-TIN Cermet</td>
</tr>
<tr>
<td>Grinding Condition</td>
<td>Peripheral Speed</td>
<td>1600m/min</td>
</tr>
<tr>
<td></td>
<td>Cutting Speed</td>
<td>3mm/min</td>
</tr>
<tr>
<td></td>
<td>R part</td>
<td>40mm/min</td>
</tr>
<tr>
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<td>Coolant</td>
<td>Water soluble</td>
</tr>
<tr>
<td>Result</td>
<td>Current Value</td>
<td>9A</td>
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<tr>
<td></td>
<td>Dress Interval</td>
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<td>Processing Quantity</td>
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<tr>
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<td>Surface Roughness</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Chipping</td>
<td>Good</td>
</tr>
</tbody>
</table>

*All cup wheel types are available
**Flank Master®** (Peripheral grinding and finish grinding of cutting edge)

### For carbide / cermet cutting tools Type-R

![Image of Flank Master Type-R](image1)

**Features**
Applies special metal filler to improve heat radiation drastically. Realize good cutting ability and long tool life by reducing heat deterioration of grit and bond from cutting heat.

**Peripheral grinding of cemented carbide insert**

1. **Conditions**
   1) Machine : NC peripheral grinder
   2) Workpiece : carbide
   3) Coolant : water-soluble
   4) Wheel
   - SD400N100BFX (Flank Master Type-R)
   - SD400-100B (made by another company)

2. **Results**

![Bar chart of Machining efficiency](chart1)

*Another company’s product shown with index of 100

![Bar chart of Tool life](chart2)

*Another company’s product shown with index of 100

### For PCD / PcBN cutting tools Type-V

![Image of Flank Master Type-V](image2)

**Features**
Combination of bond which has superior grit retention and pore structure realize good grinding ability and wear resistance that lead to high-efficiency and high-accuracy grinding.

**Peripheral grinding of PCD insert**

1. **Conditions**
   1) Machine : NC outer grinder
   2) Workpiece : PCD (Polycrystalline Diamond)
   3) Coolant : water-soluble
   4) Wheel
   - SD2000N2-VPD (Flank Master Type-V)

2. **Results**

![Bar chart of Chipping rejection rate](chart3)

*Another company’s product shown with index of 100

![Bar chart of Cutting speed](chart4)

*Another company’s product shown with index of 100

![Bar chart of Cleaning time](chart5)

*Another company’s product shown with index of 100

---

**Cutting surface comparison**

![Image of Flank Master Type-V](image3)

![Image of Another company’s product](image4)

Chipping
**Features**
- Achieves high efficiency and low cost grinding thanks to high grit retention
- Easy to use with improved dressing performance.

**Applications**
**Industries**: Automotive, bearing, household appliances, tools machinery, gear, mold&die
**Work piece**: Cam, crank shaft, injection needle, rocker arm, compressor, bearing, ball screw, motor, etc.

## Angular grinding

1. **Conditions**
   1) Machine: Angular grinder
   2) Wheel: Size: Ø350×22U
      Specification: BN120N175VX5
   3) Dresser: SD40-75M
   4) Workpiece: SCM425 (HRC60)
   5) Conditions
      Peripheral speed: 80m/s
      Stock allowance: O.D. Ø0.28mm
      End Face 0.15mm
      Coolant: Water-soluble

2. **Results**

   ![Surface Roughness](chart1.png)
   - **Surface Roughness**
     - VITMATE: 6 μm
     - Conventional wheel: 4 μm
   - **Machining Time**
     - VITMATE: 60 sec
     - Conventional wheel: 40 sec

## High-speed contouring grinding

1. **Conditions**
   1) Machine: High-speed cylindrical grinder
   2) Wheel: Size: Ø400×10U
      Specification: BN120M200VE2
   3) Workpiece: SCM435 (HRC60)
   4) Conditions
      Peripheral speed: 160m/s
      D.O.C.: Ø0.2mm
      Feed rate: 300mm/min
      Coolant: Water-soluble

2. **Results**

   ![Surface Roughness](chart2.png)
   - **Surface Roughness**
     - VITMATE: 1.5 μm
     - Conventional wheel: 1.0 μm
   ![Tool Cost](chart3.png)
   - **Tool Cost**
     - VITMATE: 100
     - Conventional wheel: 150
   *Another company’s product shown with index of 100
EG Wheel

Features
- Easy dressing and truing on a grinder with special diamond rotary dresser
- Excellent run-out and form accuracy in short time on a grinder
- Accurate arrangement of cutting edges for surface roughness, productivity and wheel life

Applications
Industries: Machine tool, household appliances, automotive, bearing
Workpiece: Ceramics and carbide

Surface grinding
• Conditions
Workpiece: Ceramics post
Alumina □60 × 360L
• Application Example
1. Machine: Surface grinder PSG-63DXNC
2. Wheel: Ø300-15U
   1) #270 resin bond wheel
   2) SD230G100C3
3. Rotary Dresser: Ø150-10U
   SD40-M
4. Dresser Drive Unit: SGS-50 (ALMT)
• Result
1. 6 times productivity than conventional diamond resin bond wheel
2. Decreases dressing and truing time from 60min. to 5min.

Production ranges
| Outer diameter | Ø3~750mm |
| T size         | 3~300mm  |
| X size         | 2~15mm   |
| Grit size      | SD (#80~#3000) |

Accuracy

Surface Roughness (μm) and Straightness (μm)

EG Wheel Conventional resin wheel

Result
- 6 times productivity than conventional diamond resin bond wheel
- Decreases dressing and truing time from 60min. to 5min.
Nanomate V-Heart

Suitable for rough grinding of deposited or sliced wafer

Strong diamond grit retention and high porosity vitrified bond, combined with a specially-shaped diamond layer, offers lower grinding force and improves grinding operations.

Achieves a flatness of less than 1μm on Ø300 Si wafer and makes possible to grind hard-to-cut materials, including semi-conductor, electrics, and other materials.

Grinding Force
Low grinding forces result in reduction of each load applied on workpiece and grinding machine.

Grinding Force is 1/10 of resin bonding wheel

Nanomate Premium

Suitable for mirror finish grinding of wafer and back side grinding of device wafer

Super-fine diamond grit and super-fine ceramics revolutionized the conventional wisdom with regard to grinding wheels. Application of both acquired material technology and production technology has allowed super-fine grinding.

Its effectiveness to reduce a grinding damaged layer of brittle material such as polish-reduction of Ø300mm silicon wafer and prevent cracks on a thin layer device wafer.

Relation between grit size and surface roughness

Grinding result by SD8000 Nanomate
**Nanomate Premium**

**For SiC finish process**

Suitable for wafer grinding of semiconductor power device

Combining diamond grit and vitrified bond with suitable ratio to obtain best grit clearance for efficient grinding. Continuous grinding of monocrystal SiC is now available.

Especially, superabrasive wheel can process with same feed rate as the one for silicon wafer grinding to obtain extremely smooth surface.

□ Grit size and work surface (SiC wafer)
- SD3000 (feed 40μm/min)
- SD8000 (feed 20μm/min)

□ Grinding result of 4 inch sapphire wafer

Normal force and surface roughness (Spec : SD400)

□ High efficient grinding results of 3 inch SiC wafer

Current value and surface roughness (Spec : SD2000)

**For SiC and Sapphire rough process**

Suitable for rough and semi-finish grinding of semiconductor power device

Newly developed vitrified bond for rough process has high grit retention and pore which realize high efficient continuous process.

Suitable for hard-to-cut material such as sapphire and SiC and can feed 2 to 3 times compared to conventional wheel.

□ Grinding result of 3 inch SiC wafer

Possible to increase feed rate for high efficient process

Current value and surface roughness (Spec : SD2000)
MT Bond Wheel - pursuing the ideal grinding wheel

MT Bond is a new metal bond which is manufactured to reach optimum grinding ability, fusing the advantages of both resin bond and metal bond.

The Diamond Wheel efficiently grinds ceramic, carbide, cermet, and quartz, on the other hand, cBN wheel is for non-ferrous materials.

MT Bond Wheel is recommended for the surface grinding and creep feed grinding by profiled wheel, which sustains its grinding ability.

Suitable for various workpieces

MT10 and 20 are recommended for the grinding operation of various tools such as cemented carbide, cermet, and high speed steel. MT30, 40, and 50 are recommended for the surface grinding of glass, various ceramics, and steels.

Surface grinding

- Grinding conditions
  - Workpiece: Silicon Nitride
  - Wheel Speed: V=1760m/min
  - Work Speed: F=10m/min
  - D.O.C.: a=20μm

- Result
  - The grinding force (normal force) is 40% lower than the resin bond wheel

Creep feed grinding

- Grinding conditions
  - Workpiece: Silicon Nitride
  - Wheel Speed: V=1600m/min
  - Work Speed: F=60m/min
  - D.O.C.: a=1mm

- Result
  - MT Bond Wheel shows 20% lower grinding force than resin bond wheel with the same grit size. The finer grit produces a lower grinding force (comparison is between grit sizes #230, #400, and #800).

Grinding ability of each grades MT Bond

- Grinding conditions
  - Workpiece: Silicon Nitride
  - Wheel Speed: V=1,650m/min
  - Work Speed: F=10m/min
  - D.O.C.: a=20μm

- Result
  - MT Bond Wheel shows 20% lower grinding force than resin bond wheel with the same grit size. The finer grit produces a lower grinding force (comparison is between grit sizes #230, #400, and #800).
MB SPARK

The next generation of double disc grinding systems

Suitable for surface quality improvement of elements used in automotive and household appliance in the progress of energy saving and miniaturization.

Extends the truing interval in combination with electro-discharge truing compared with conventional resin bond wheel.

Features
1. Metal bond wheel with excellent electro-discharge truing capability. Easy high-accuracy truing on a grinder.
2. Long lasting cutting performance and high-wear resistance.
3. Less industrial waste-stops sludge produced from wheel during truing.

Grinding Conditions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
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<tbody>
<tr>
<td>Grinder</td>
<td>Koyo KVD-300</td>
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<tr>
<td>Grinding Wheel</td>
<td>Ø305-7SW-3X-Ø80H</td>
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<td>MB SPARK #230-MED</td>
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<tr>
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<td>Resin Bond Wheel #140-B</td>
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<tr>
<td>Workpiece</td>
<td>Oil pump component</td>
</tr>
<tr>
<td></td>
<td>Powdermetal SMF4040</td>
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<tr>
<td>Wheel Rotation</td>
<td>Upper : 1500min⁻¹ (C.C.W)</td>
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<td>Lower : 1500min⁻¹ (C.C.W)</td>
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High Truing Performance
- MB SPARK allows for shorter work time on grinder quick truing with high accuracy using special low-melting metal bond suitable for electro-discharge truing.
- Further benefits are attained with fine grit of superabrasive applied. Excellent flatness acquired in a short time frame.

Extended truing interval compared with conventional resin bond wheel.

Long Lasting Quality
MB SPARK has higher wear resistance than conventional resin bond wheel and keeps flatness of super abrasive layer longer. Truing interval is extended and suitable for automated production line.

Grindability
MB SPARK applies special metal bond suitable for double disc grinding. Its characteristic of high grit retention and surface retention of abrasive layer show excellent cutting ability to achieve improvement of process.

High Grindability
- MB SPARK allows for shorter work time on grinder quick truing with high accuracy using special low-melting metal bond suitable for electro-discharge truing.
- Further benefits are attained with fine grit of superabrasive applied. Excellent flatness acquired in a short time frame.

Comparison of Truing Performance

Comparison of Grinding Capability

Comparison of Grinding Amount

Comparison of Load Current Value of Grinding Spindle

Grinding Tools

Electro-discharge Truing
Machine : Koyo Machinery

Discharge Electrode
Features

1. Environment
DPG (Diamond Pellet Grinding) Wheel is an environmentally friendly fixed abrasive tool, enable replacing loose abrasive processing,
   1) Reduce industrial waste dramatically
   2) No clean-up with chloric organic solvent
   3) Clean operating environment

2. High Efficiency
5 to 100 times faster grinding speed compared to loose abrasive lapping.

3. Cost Reduction
Reduce maintenance costs with long lasting plate and gear.

4. Process Reduction
Integrate pre-grinding and lapping into one process.

Grinding Performance of DPG wheel (MDP bond)

Cassette Plate (design registration)

1. Reduction of replacing process for cassette plate
   • No detaching base plate
   • Divisible cassette fixed on base plate
   • Short dressing time (20 minutes: 9B, 1-2 hours: 16B)

2. Pellet pattern keeps high accuracy grinding
   • Divisible cassette designed for pellet layout
   • Seams never interfere with the density of pellet distribution

3. Free layout of coolant hole for top plate
   • Coolant pool on clamp face

<table>
<thead>
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<th>Min. Dia.</th>
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<tr>
<td>28B</td>
<td>1864</td>
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</tbody>
</table>

* Special sizes also available
Super Sizing

Highly efficient superabrasive reamer for high precision one-pass hole machining

Features
1. Capable of one-pass hole machining
2. High accuracy (roughness • roundness • cylindricity)
3. Reduction of rolled edge around lubricant hole or keyway
4. Skill is not required

Applications
- Hole finish machining of cast iron hydraulic component and automotive parts.

Possible Manufacturing Range

<table>
<thead>
<tr>
<th>Abrasive</th>
<th>Diamond or cBN</th>
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<tr>
<td>Grit size</td>
<td>#60/80~#100/120</td>
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<td>Tool dia.</td>
<td>Ø5~40 ±0.002mm</td>
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<tr>
<td>Run-out</td>
<td>0.005mm or less</td>
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</tbody>
</table>

* Some items even in its range cannot be produced depending on specifications.

Machining Application

Workpiece : Hole finish machining of hydraulic components
- Dia. Ø18.5 H6 (+0.13,0)
- FC250 or equivalent

Tool specification : cBN80-P
Tool size : Ø18.5 0,+0.005

Conditions : Tool peripheral speed 7.6m/min
- Feed rate 26mm/min
- Removal stock Ø0.01mm
- Coolant Straight oil

Results : Hole roundness 0.002mm or less
- Hole cylindricity 0.004mm
- Roughness Ry2.6μm

CMP Conditioner

1. High quality diamond
   - Scratches caused by diamond crash can be minimized
   - Uniformly-shaped diamond leads stable performance

2. High precision body
   - Uniform contact with polishing pad

3. High precision electro-plating
   - Complete single diamond layer
   - Uniform distribution of the diamond grit creates the best surface condition of the pad and stable polishing performance

4. Dedicated production line
   - CMP Conditioner is produced on a line isolated from other tools

* Some items even in its range cannot be produced depending on specifications.
**Diamond/cBN mounted points for internal grinding**

<table>
<thead>
<tr>
<th>CD code</th>
<th>D</th>
<th>T</th>
<th>ɛ</th>
<th>L</th>
<th>Grit #</th>
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<td>0.3</td>
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<tr>
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<tr>
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<td>5</td>
<td>20</td>
<td>45</td>
<td>#120</td>
</tr>
<tr>
<td>W11030</td>
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<td>15</td>
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<td>#120</td>
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<td>5</td>
<td>22</td>
<td>50</td>
<td>#120</td>
</tr>
<tr>
<td>W11060</td>
<td>6.0</td>
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<td>20</td>
<td>65</td>
<td>#120</td>
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<tr>
<td>LD</td>
<td>6.0</td>
<td>5</td>
<td>27</td>
<td>65</td>
<td>#120</td>
</tr>
</tbody>
</table>

(Y=Ø3, But *Y=Ø6)

---

**When ordering**

- Please instruct CD code
- All items are in stock
- Special specifications available upon request. Please instruct required sizes (ex) W12050 SD L=100, Y=10, ....

**Code of mounted point**

W12050 SD  
D=Diamond  
B=cBN

---

A.L.M.T.
Dresser

Rotary Dresser is a Diamond tool to form a conventional or cBN grinding wheels. Complex and Precise profile accuracy.

**RZ Type**

Our advanced and unique technology in high precision electro-deposition make it possible to accommodate complex and fine profiles. Diamond grits which fixed by reverse plating method are arranged randomly and its concentration is very high, so it is also suitable for longer life applications. Various optional specifications are also available.

**SZ Type**

A rotary dresser with diamond grits arranged regularly made by the reverse plating method. Concentration of the diamond can be controlled according to requirements. The SZ Type provides efficient plunge dressing of large size rotary dressers.

**Z Type**

The diamond grits of Z type rotary dresser are fixed on the precise body by use of electro-plating process. This type can be made relatively easily and is suitable for small lot production and trial production.

**SX Type**

SX type rotary dresser is produced by integration of our prominent technologies the original arrangement design of diamonds, the precise sintering technology and the excellent truing technology. Therefore SX type has a high valuation in grinding applications that require sharpness. It can also be effective in traverse dressing and contour dressing.

**X Type**

X type rotary dresser is a metal bond type impregnated with diamond grits. High performance is made possible by free selection of concentration and uniform distribution of diamond grits. This type is suitable for traverse dressing of our VITMATE and EG Wheel.
## Rotary Dressers

### Process grouping & possible production ranges

#### Process grouping

<table>
<thead>
<tr>
<th>Item</th>
<th>RZ Type</th>
<th>SZ Type</th>
<th>Z Type</th>
<th>SX Type</th>
<th>X Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Method</td>
<td>Electro-deposition</td>
<td>Electro-deposition</td>
<td>Electro-plating</td>
<td>Sintering</td>
<td>Sintering</td>
</tr>
<tr>
<td>Diamond Grit Distribution</td>
<td>Random</td>
<td>Regular</td>
<td>Random</td>
<td>Regular</td>
<td>Random</td>
</tr>
<tr>
<td>Applicable Grit Size</td>
<td>#20~#140</td>
<td>#16~#20</td>
<td>#30~#140</td>
<td>#16~#20</td>
<td>#30~#80</td>
</tr>
<tr>
<td>Profile</td>
<td>Complex</td>
<td>Fine</td>
<td>Form</td>
<td>Form</td>
<td>Cup</td>
</tr>
<tr>
<td>Dress Method</td>
<td>Plunge</td>
<td>Plunge</td>
<td>Plunge</td>
<td>Plunge</td>
<td>Traverse</td>
</tr>
<tr>
<td>Principal use</td>
<td>Bearing, Injection Needles</td>
<td>Shafts</td>
<td>Gear Grinding</td>
<td>Turbine Blades, Camshafts</td>
<td>Internal Grinding, Centerless Grinding</td>
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<tr>
<td>Profile accuracy</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>—</td>
</tr>
<tr>
<td>Surface Roughness</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>△</td>
</tr>
<tr>
<td>Dressing Force</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Major Features</td>
<td>Highest precision, Fine profile/Complex profile</td>
<td>Large diameter, High dressing ability</td>
<td>Gear Grinding</td>
<td>Any concentration settable, High dressing ability</td>
<td>Consistant dressing ability</td>
</tr>
</tbody>
</table>

#### Possible production ranges

- Ranges vary depending on profile or specification etc

<table>
<thead>
<tr>
<th>RZ Type</th>
<th>O.D.</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>(mm)</th>
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<tbody>
<tr>
<td>Width</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SZ Type</td>
<td>O.D.</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z Type</td>
<td>O.D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SX Type</td>
<td>O.D.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
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<tr>
<td>X Type</td>
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<td></td>
</tr>
<tr>
<td>Width</td>
<td>Ø20~Ø300</td>
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</tr>
</tbody>
</table>

### Outline of Production Processes for Rotary Dressers

#### Electro-deposition Method / RZ • SZ Type

As the product is processed under room temperature, the accuracy is not changed by thermal expansion.

1. **Diamond Setting**
2. **Plating**
3. **Setting Body**
4. **Machining Body**

#### Electro-plating Method / Z Type

Diamond is fixed directly on the body and finished by on the surface of diamond layer.

1. **Diamond Setting**
2. **Machining base**
3. **Lapping**

#### Sintering Method / SX Type

Surface of the diamond layer is lapped in the final process to achieve specified accuracy.

1. **Diamond Setting**
2. **Sintering**
3. **Machining Body**
4. **Lapping**
Tolerances of Rotary Dresser Designs

<table>
<thead>
<tr>
<th>U Value</th>
<th>W Value</th>
<th>Y Value</th>
<th>M Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ Type ≥ 10</td>
<td>RZ Type ≥ 0.5Z</td>
<td>RZ Type ≥ 10</td>
<td>RZ Type ≥ 0.5Z</td>
</tr>
<tr>
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<td>SZ Type ≥ 0.5Z</td>
<td>SZ Type ≥ 10</td>
<td>SZ Type ≥ 0.5Z</td>
</tr>
<tr>
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<td>SX Type ≥ 0.5Z</td>
<td>SX Type ≥ 4</td>
<td>SX Type ≥ 0.5L</td>
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<tr>
<td>Z Type ≥ 3</td>
<td>Z Type ≥ 4</td>
<td>Z Type ≥ 4</td>
<td>Z Type ≥ 0.5L</td>
</tr>
<tr>
<td>X Type ≥ 3</td>
<td>X Type ≥ 4</td>
<td>X Type ≥ 4</td>
<td>X Type ≥ 0.5L</td>
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</table>

*Value depending on diamond grain sizes

Accuracy of Rotary Dressers

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<thead>
<tr>
<th>Item</th>
<th>Factor</th>
<th>Symbol</th>
<th>Accuracy (mm)</th>
<th>Illustration</th>
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<tbody>
<tr>
<td>Profile</td>
<td>Runout</td>
<td>↗</td>
<td>0.005</td>
<td><img src="mm" alt="Profile" /></td>
</tr>
<tr>
<td></td>
<td>Width</td>
<td>L</td>
<td>± 0.005</td>
<td><img src="mm" alt="Width" /></td>
</tr>
<tr>
<td></td>
<td>Radius</td>
<td>R</td>
<td>± 0.002</td>
<td><img src="mm" alt="Radius" /></td>
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<tr>
<td></td>
<td>Step</td>
<td>S</td>
<td>± 0.001</td>
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<td>± 2°</td>
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<td>Straightness</td>
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<tr>
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<td>Pitch</td>
<td>P</td>
<td>± 0.002</td>
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<td>Bore</td>
<td>ØH</td>
<td>+ 0.005</td>
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<tr>
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<td>Runout</td>
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<td>0.002</td>
<td><img src="mm" alt="Runout" /></td>
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</tbody>
</table>
Optional Specifications of Rotary Dressers

Various options available upon request
*Availability depending on profile or specification

Optional Specifications for RZ Type
1. Improved Dressing Ability (for fast dressing)
   - **GB (controlled diamond concentration)**
     High dressing rate with lower concentration by setting the glass balls for hard-to-concentration control electro-deposition type.
   - **Sharp type (controlled diamond projection)**
     Our unique process not by etching the bond layer realizes the diamond projection control without pulling-off the diamond grit.
   - **RZ-ACROSS® (controlled diamond concentration)**
     Improves the discharge of chips and coolant

**RZ-ACROSS® Surface and Profile**

2. Improving Wear Resistance (for longer life)
   - **Strong**
     Reinforcing the peak of convex portion by pre-shaped diamond stones leads stable accuracy and high wear resistance.

Optional Specifications for SX Type
For Improving Wear Resistance

- **Super High Concentration**
  By the unique pattern of diamond setting, maximum 100 pcs/cm² diamond stones provides longer life.
- **Strong**
  Reinforcing the peak of convex portion by pre-shaped diamond stones leads stable accuracy and high wear resistance as same as RZ type.

Optional Specifications for Vitrified cBN Wheels (SP Type)
Stable performance and longer life

- **SP**
  Special development for high-wear-proof vitrified and cBN forming wheels performing stable dressing as well as long life. Available both for RZ and SX.

- **Polycrystalline Prism Diamond**
  Arranging isotropic polycrystalline prism diamond provides stable tool life and performance solving the problem of short life and instability caused by anisotropy and cleavage characteristic of mono-crystal diamond.

Dressing Example
- **Dresser** : Monocrystalline, Polycrystalline
- **Dressing Conditions**
  - Wheel specs : cBN230G125V3 Ø30×20×5 1200min⁻¹
  - RD specification : 0.4 Ø2L 25pcs Ø25×18 250min⁻¹
  - Dressing unit : Toolpet
  - Feed rate : 240mm/min
  - D.O.C. : 0.002mm/pass (Total 1.0mm in 500 dressing cycles)

Results
- **Wear Volume**
  - Index
  - Polycrystalline: 100
  - Monocrystalline: 50

*Mono crystalline shown with index of 100.
Inspection of Rotary Dressers

For higher accuracy.

Required accuracy of rotary dressers is becoming more strict, ranging from microns to submicrons. To ensure required accuracy, we have established an excellent inspection system with the most up-to-date equipment.

Description of Inspection

Inspection with transfer test pieces
1. Measuring dimensional accuracy and profile (tool microscope, profile measuring equipment, projector)
2. Surface roughness (surface roughness tester)

Body accuracy
1. Bore (Air micrometer)
2. Parallelism, squareness (Roundness measuring equipment)
3. Reference surface (Roundness measuring equipment)
4. Profile runout (Roundness measuring equipment)

Slip Test Results
An inspection sheet showing measurements taken by the transfer test is attached.

Recommended Dressing Conditions

Plunge Dress

<table>
<thead>
<tr>
<th>Rotary Dresser</th>
<th>Coupon (Plate)</th>
<th>Coupon (Cylindrical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner diameter</td>
<td>Profile</td>
<td>Profile</td>
</tr>
<tr>
<td>Air micrometer</td>
<td>Tool microscope</td>
<td>Tool microscope</td>
</tr>
<tr>
<td>Runout-reference surface</td>
<td>Profile measuring equipment</td>
<td>Profile measuring equipment</td>
</tr>
<tr>
<td>Runout-profile</td>
<td>Profile Projector</td>
<td>Profile Projector</td>
</tr>
<tr>
<td>Roundness measuring equipment</td>
<td>Surface roughness tester</td>
<td>Surface roughness tester</td>
</tr>
</tbody>
</table>

Conventional Grinding Wheel | Hard Conventional Grinding Wheel | cBN Wheel |
-----------------------------|---------------------------------|-----------|
Dress Direction | Down | Down | Down |
Peripheral Speed Ratio | 0.25~0.5 | 0.3~0.9 | 0.3~0.9 |
Dress Amount | 0.02~0.03mm | 0.02~0.03mm | 0.01~0.015mm |
Infeed Rate | 0.5~1μm/rev.of wheel | 0.1~0.5μm/rev.of wheel | 0.01~0.5μm/rev.of wheel |
Dress Out | 0~3 sec. | 0~3 sec. | 0~3 sec. |

Traverse Dress

Conventional Grinding Wheel | Hard Conventional Grinding Wheel | cBN Wheel |
-----------------------------|---------------------------------|-----------|
Dress Direction | Down | Down | Down |
Peripheral Speed Ratio | 0.25~0.5 | 0.3~0.9 | 0.3~0.9 |
Dress Amount | 0.02mm | 0.02mm | 0.01mm |
Infeed Rate | 0.005~0.03mm/pass | 0.003~0.005mm/pass | 0.002~0.003mm/pass |
Dress Out (Traversal cycles) | 0~4times | 0~4times | 0~4times |
Feed Rate | 80~140mm/min | See below | See below |

Feed Rate

Down Dressing | Up Dressing
Feed rate = C × RD width × grinding wheel revolution

Peripheral speed ratio = \( \frac{V_r}{V_s} \)

\( V_r \) (RD peripheral speed) = RD revolution (min\(^{-1}\)) × RD O.D. × π
\( V_s \) (grinding wheel peripheral speed) = grinding wheel revolution (min\(^{-1}\)) × O.D. × π

<table>
<thead>
<tr>
<th>Operation</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
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<tr>
<td>Efficient grinding High speed grinding</td>
<td>0.125~0.2</td>
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<tr>
<td>Centerless grinding</td>
<td>0.005~0.01</td>
</tr>
</tbody>
</table>
Technical Data

In dressing, the surface roughness of grinding wheels is influenced by elements such as:
1. Peripheral speed ratio (Vr/Vs), 2. Infeed per revolution of wheel (Ar), and 3. dress out (Na).

1. Peripheral Speed Ratio

- Influence of Peripheral Speed Ratio on grinding Wheel Surface Roughness
  - Control of the grinding surface accuracy by up-dressing is easier than by down-dressing
  - Higher feed rate creates more open grinding surface (grinding ability increases)

- Influence of Peripheral Speed Ratio on Dressing Force
  - Larger peripheral speed ratio allows higher normal force (increasing in grinding ability)
  - Tangential force shows the same tendency as normal force, but the value is much smaller

2. Infeed Rate

- Influence of Infeed Rate of Grinding Wheel Surface Roughness
  - Higher feed rates create a more open grinding surface (grinding ability increases)
  - Longer dress-out time diminishes sharpness of the grinding surface

- Influence of Infeed Rate on Dressing Force
  - Larger feed rate increases normal force (grinding ability increases).
  - Tangential force shows the same tendency as normal force, but the value is much smaller

3. Dress Out

- Influence of Dress out on Grinding Wheel Surface Roughness
  - Longer dress out time increases roundness of the grinding surface, but reduces sharpness.
## Rotary Dresser for internal grinding machine

### Straight Type

<table>
<thead>
<tr>
<th>Model Number</th>
<th>S40-N</th>
<th>S40-C</th>
<th>S40-D</th>
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</thead>
<tbody>
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<td>Profile</td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td>Diamond layer Disposition</td>
<td><img src="image4" alt="Image" /></td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
</tr>
<tr>
<td>CVD Prism</td>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
<td><img src="image9" alt="Image" /></td>
</tr>
<tr>
<td>Impregnated</td>
<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
</tr>
</tbody>
</table>

- Diamond size: 100SPC
- Diamond size: 0.4×0.4
- Concentration: SD#40

### Cup Type

<table>
<thead>
<tr>
<th>Model Number</th>
<th>C40-N</th>
<th>C40-C</th>
<th>C40-D</th>
</tr>
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<tbody>
<tr>
<td>Profile</td>
<td><img src="image13" alt="Image" /></td>
<td><img src="image14" alt="Image" /></td>
<td><img src="image15" alt="Image" /></td>
</tr>
<tr>
<td>Diamond layer Disposition</td>
<td><img src="image16" alt="Image" /></td>
<td><img src="image17" alt="Image" /></td>
<td><img src="image18" alt="Image" /></td>
</tr>
<tr>
<td>CVD Prism</td>
<td><img src="image19" alt="Image" /></td>
<td><img src="image20" alt="Image" /></td>
<td><img src="image21" alt="Image" /></td>
</tr>
<tr>
<td>Impregnated</td>
<td><img src="image22" alt="Image" /></td>
<td><img src="image23" alt="Image" /></td>
<td><img src="image24" alt="Image" /></td>
</tr>
</tbody>
</table>

- Diamond size: 100SPC
- Diamond size: 0.4×0.4
- Concentration: SD#40

*Other sizes and specifications available upon request*

## Crown Dresser

### Features
1. CVD diamond provide high-wear-proof performance like monocrystal diamond.
2. Constant and stable active area with prism diamond.
3. Cost effective with no reworking.
4. Adjusting the diamond size and distribution enable to optimize the dressing performance.

### Straight Type

<table>
<thead>
<tr>
<th>Size</th>
<th>CVD Size</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Ø35~180</td>
<td>0.2[♂], 0.4[♀]</td>
<td>0.8~2mm</td>
</tr>
<tr>
<td>H Ø 8~30</td>
<td>0.6[♂], 0.8[♀]</td>
<td></td>
</tr>
<tr>
<td>T 6~20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Cup Type

<table>
<thead>
<tr>
<th>Size</th>
<th>CVD Size</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Ø40~80</td>
<td>0.2[♂], 0.4[♀]</td>
<td>0.8~2mm</td>
</tr>
<tr>
<td>H Ø10~20</td>
<td>0.6[♂], 0.8[♀]</td>
<td></td>
</tr>
<tr>
<td>T 15~20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Other sizes and specifications available upon request*
Diamond Disc Dresser

Features
Adopted precise electro-deposition and surface forming technique to obtain high accurate tooth profile forming

Application
• Tooth profile forming of gear grinding

CVD Ace Dresser

Features
1. Adopted CVD diamond for high-wear-proof like single crystal diamond
2. Prism diamond has fixed active area to maintain stable performance

<table>
<thead>
<tr>
<th>L</th>
<th>L1</th>
<th>D</th>
<th>W</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>38</td>
<td>11</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

* Please contact us for special sizes

Dressing for worm gear grinding wheel

Gear Grinding
Diamond is superior to "hardness" and "thermally extensibility" as well as "sharp edge" created by polishing and that is the reason to be used as cutting tool material. Diamond cutting tools show ultra-precision, long tool life, high-efficiency and high precision cutting process through its features.
A.L.M.T. Corp., as a leading manufacturer of ultra-precision diamond cutting tools, offers a broad range of nano- and micro-forming cutting tools to meet market needs.

Our many years of experience and extensive knowledge give us a comprehensive understanding of the optimal physical properties of single crystal diamond.

Our state-of-the-art development process yields the highest precision in tool edge measurement. As a result, our diamond cutting tools achieve high-precision microscopic cutting of workpieces in the order of nanometers.

**Identification and Measurement Technology**

Identify the anisotropy of atoms in single crystal diamond and pursue the best crystal orientation

Creation of tools pursuing cutting edge sharpness in the order of nanometers starts with the screening and selection of single crystal diamond.

The lattice constant of diamond is always 3.5667 Å, but the distance between crystal faces varies, causing differences in the ease of cleavage and intrusion of impurities. Therefore, sorting of rough diamonds is important in addition to the identification of crystal orientation according to the machining conditions.

**Polishing and Measurement Technologies**

Cutting edge polishing technology that produces nanometer-controlled movement

In order to accurately produce nanometer-controlled movement on a workpiece, a cutting tool requires a sharp cutting edge capable of producing nanometer-sized chips and high profile precision.

We have achieved this using our unique polishing and measurement technologies.

**Nano/Micro Processing Technology**

Straightness and surface roughness unattainable with photolithography or ion-beam method

With its cutting edge sharpness in the order of nanometers, A.L.M.T.’s UPC-Nano series achieves a surface roughness and straightness that cannot be obtained by the photolithography or ion-beam method.

This technology is also effective for micrometer-order processing of high aspect ratio.
SUMIDIA Binderless (Nano-Polycrystalline Diamond)

Ultra-Precision Cutting Tool / BL-UPC

Employs SUMIDIA® Binderless on the edge of UPC®

Achieves long tool life in mirror finish and fine machining of carbides

Features of SUMIDIA® Binderless
- Fine grains of several tens of nanometers are firmly and directly bonded together without binder.
- Harder than mono crystalline diamond.
- No anisotropy and specific cleavage.

Features of BL-UPC
- Superior chipping and wear resistance compared to single-/poly- crystal diamond.
- Sharp and precise cutting edge equivalent to UPC® (Single crystal diamond).
- Free from uneven wear caused by crystal orientation due to no anisotropy.

Applications
- Molds for carbide glass lenses
- Large molds for prism sheets and light guide plates
- Glass lenses
- Machining of other high-hardness and brittle materials

☐ Sharp Cutting Edge Equivalent to Single Crystal Diamond

☐ Flank Wear Comparison of Machined Carbide

☐ Comparison of Required Characteristics for Cutting Tool Materials

<table>
<thead>
<tr>
<th>Required Characteristics</th>
<th>Diamond</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Crystal</td>
</tr>
<tr>
<td>High Hardness</td>
<td>☐</td>
</tr>
<tr>
<td>High Temperature Hardness</td>
<td>☐</td>
</tr>
<tr>
<td>Suitable Toughness</td>
<td>X</td>
</tr>
<tr>
<td>High Thermal Diffusibility</td>
<td>☐</td>
</tr>
<tr>
<td>Sharpness of Cutting Edge</td>
<td>☐</td>
</tr>
</tbody>
</table>

*SUMIDIA® is a registered trademark of Sumitomo Electric Industries, Ltd.
For ultra fine grooving

**UPC®-Nano groove**

**Features**
1. The world’s smallest grooving tool with a cutting edge width of 0.9μm
2. Provides the world’s highest dimensional accuracy of ±0.5 μm
3. High-precision-polished durable cutting edge
4. Enables high-precision fine grooving that cannot be achieved using the photolithography or ion-beam method

**Applications**
1. Hologram diffraction grating molds
2. Fine linear grooving
3. Molds with fine grooves
4. Optical sheet molds

![Cutting edge of 900nm width](image1)

---

Endmill (Square type)

**UPC®-Nano endmill**

**Features**
1. Enables the world’s thinnest-in-its-class 30-μm wide flexible grooving
2. Enables machining with a high aspect ratio of 2.5 times the rotation diameter
3. High-precision-polished durable cutting edge
4. Enables high-precision fine grooving that cannot be achieved using the photolithography or ion-beam method

**Applications**
1. Hologram grating
2. Fine free curve grooving
3. LCD light guide plate molds
4. Micro machine parts grooving

![Process example of Nano endmill](image2)
Endmill (Ball type)

**UPC®-Nano ballendmill**

**Features**
1. The world’s smallest-in-its-class ballendmill with R=30μm
2. Provides the world’s highest profile of 50nm
3. Enables high-precision 3-D machining with its extremely sharp cutting edge

**Applications**
1. Micro lens array
2. Free-form submillimeter lens
3. LCD light guide plate molds
4. Micro machine parts grooving

Form type

**UPC®-Nano Profile**

**Features**
1. Enables flexible one-pass machining of free-form surfaces including elliptical and paraboloidal surfaces with a form accuracy of 1μm or less
2. Ensures high form accuracy in machining of paraboloidal and other free-form surfaces

**Applications**
1. Optical sheet molds for LCD panels
2. Micro lens array molds
3. Various optical element molds

**Process example of Nano ballendmill**

**Standard sizes**
- L: 50  W: Ø6
- L: 30  W: Ø4

**Elliptical cutting edge**  **Parabolic cutting edge**
UPC-R shows extraordinary success in ultra precision spherical and aspherical cutting applications.

**Features**
1. Achieves an edge arc profile of 50nm (0.05μm) over a wide working angle range of 90°.
2. The cutting edge is uniformly finished in high quality, achieving a surface roughness in the order of nanometers.
3. A record of the edge arc profile measured with our originally-developed measuring instrument (with a resolution of 5nm) is attached to the product for thorough quality control.

**Applications**
1. Camera lens molds for CD, DVD, and BD players
2. Lens molds for digital cameras
3. Camera lens molds for smartphones, PCs, and tablets
4. Infrared lens
5. Spherical and aspherical mirrors for lasers and X-rays
6. Various spherical and aspherical lenses
7. Profile processing using a ultra-precision processing machine

**Tool Nose Shape**

**Dimensions & Limit Precision**

<table>
<thead>
<tr>
<th>Type</th>
<th>Contour R</th>
<th>Corner Radius R</th>
<th>Tool Edge Angle</th>
<th>Tool Width (RR)</th>
<th>Clearance Angle</th>
<th>Rake Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPC-R</td>
<td>≤90°</td>
<td>≤120°</td>
<td>≤150°</td>
<td>0.002</td>
<td>0.5</td>
<td>0° ~ 20°</td>
</tr>
<tr>
<td>Ultra precision SS</td>
<td>0.05μm</td>
<td>0.1μm</td>
<td>0.20μm</td>
<td>min 15°</td>
<td>0.5</td>
<td>0° ~ 20°</td>
</tr>
<tr>
<td>Precision S</td>
<td>0.25μm</td>
<td>0.5μm</td>
<td>1μm</td>
<td>200°</td>
<td>5</td>
<td>0° ~ 20°</td>
</tr>
</tbody>
</table>
**UPC®-F**

Exhibits its potential in high-efficiency ultra-precision cutting into plane and cylindrical shapes

**Features**
1. Drastically reduces or dispenses with running-in processing time.
2. You can obtain uniform, high-quality worked surfaces by setting the roundness (sharpness) of the cutting edge according to the work material and processing conditions.

**Applications**
1. Laser reflective mirrors
2. Polygon mirrors
3. Photosensitive drums of copying machines
4. Plane and cylindrical mirror finishing

**Cutting Edge**

Exclusive Edge for Polygon Mirrors

**Dimension and Highest Accuracy**

<table>
<thead>
<tr>
<th>Type</th>
<th>Tool Edge Angle α</th>
<th>Tool Width</th>
<th>Clearance Angle γ</th>
<th>Rake Angle β</th>
<th>Side Rake Angle γ</th>
<th>Rake Face R</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPC-FC</td>
<td>45°~80°</td>
<td>1.0~4.0</td>
<td>0°~5°</td>
<td>-5°~0°</td>
<td>0°~15°</td>
<td>---</td>
</tr>
<tr>
<td>UPC-FR</td>
<td>10°~45°</td>
<td>2.0~4.0</td>
<td>2°~5°</td>
<td>0°</td>
<td>0°</td>
<td>30~40mm</td>
</tr>
</tbody>
</table>

**UPC®-T**

Ideal for fine grooving such as that for Fresnel lenses

**Features**
1. The cutting edge is uniform and extremely sharp, free from chipping and undulation.
2. Guarantees the cutting edge shape in the order of submicrons.

**Applications**
1. LCD light guide plate molds
2. Fresnel lens molds
3. Optical sheet molds
4. Various diffraction grating molds
5. Other fine grooving

**Cutting Edge**

**Dimension and Highest Accuracy**

<table>
<thead>
<tr>
<th>Type</th>
<th>Tool Edge Angle α</th>
<th>Angle Tolerance</th>
<th>Leading Edge Width</th>
<th>Clearance Angle γ</th>
<th>Rake Angle β</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPC-T</td>
<td>Ultprecision SS</td>
<td>less 45°</td>
<td>min 0.2μm</td>
<td>0°~15°</td>
<td>-5~10°</td>
</tr>
<tr>
<td></td>
<td>Precision S</td>
<td>min 45°</td>
<td>Sharp Corner</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Molding of LCD display optical waveguide
New D Tools

Achieves stable and long tool life by measuring and optimizing the crystal orientation.

Features
1. Less dispersion in tool life, which is a weakness of single crystal diamond tools, and 1.5 to 2 times longer tool life than conventional tools on average.
2. The combination of our originally-designed inserts and holders enables easy and precise tool setting like indexable inserts.
3. There are inserts for straight cutting and those for curved-surface copying. The form accuracy of the latter is 5μm.
4. The rake face is free from adhesions and accumulation of chips and maintains the high quality of worked surfaces even during continuous use.
5. The diamond is firmly attached by a unique brazing method.
6. Exhibits high durability even during interrupted cutting.
7. Unlike the conventional type with a retaining cap, there is no retaining cap to hold the diamond, enabling chips to move smoothly on the rake face, improving the machining accuracy.

Applications
• Automotive components (pistons, aluminum wheels, compressors, commutators, etc.)
• Plastic lenses, resin parts
• HDD parts
• Aluminum die cast alloys, other non-ferrous metals

Performance of New D Tools

Data 1 Tool Life and Stability Comparisons (Interrupted Cutting) (Cutting Distance When the Flank Wear Width is 30μm)

Data 2 Tool Life Comparison for Interrupted Cutting

Data 3 Recommended Range of Cutting Condition for New D Tools

• Example of Cutting

1) Curved-Surface Copying
2) Straight Cutting
### Insert Types (inventory items)

<table>
<thead>
<tr>
<th>Insert Specifications</th>
<th>Types</th>
<th>Corner Radius</th>
<th>Clearance Angle</th>
<th>I.C. ØA (mm)</th>
<th>I.H. ØB (mm)</th>
<th>Thickness h (mm)</th>
<th>Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Life Type</td>
<td>* Precision Type</td>
<td>R0.2</td>
<td>7°</td>
<td>Ø9.525</td>
<td>0.4</td>
<td>+0.2 4~0</td>
<td>NDH-R1</td>
</tr>
<tr>
<td></td>
<td>NWD-CL302</td>
<td>R0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-L1</td>
</tr>
<tr>
<td></td>
<td>NWD-CL305</td>
<td>R0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-N1</td>
</tr>
<tr>
<td></td>
<td>NWD-CL310</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NDH-QR1</td>
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<tr>
<td></td>
<td>NWD-CL316</td>
<td>R1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-QL1</td>
</tr>
<tr>
<td></td>
<td>NWD-CL320</td>
<td>R2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NWD-PL302</td>
<td>R0.2</td>
<td>11°</td>
<td>Ø6.35</td>
<td>Ø2.8</td>
<td>+0.2 3~0</td>
<td>NDH-R0</td>
</tr>
<tr>
<td></td>
<td>NWD-PL305</td>
<td>R0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-L0</td>
</tr>
<tr>
<td></td>
<td>NWD-PL308</td>
<td>R0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-N0</td>
</tr>
<tr>
<td></td>
<td>NWD-PL202</td>
<td>R0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NDH-R20V</td>
</tr>
<tr>
<td></td>
<td>NWD-PL205</td>
<td>R0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-L20V</td>
</tr>
<tr>
<td></td>
<td>NWD-PL208</td>
<td>R0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-R25V</td>
</tr>
<tr>
<td></td>
<td>NWD-CL416</td>
<td>R1.6</td>
<td>7°</td>
<td>Ø9.525</td>
<td>Ø4.4</td>
<td>+0.2 5.5~0</td>
<td>NDH-R20V</td>
</tr>
<tr>
<td></td>
<td>NWD-CL420</td>
<td>R2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-L25V</td>
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<td></td>
<td>NWD-CL425</td>
<td>R2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 : Precision type/cutting edge contour precision 5um or less
*2 : Special process to cutting edge

### Holder Types (inventory items)

<table>
<thead>
<tr>
<th>Holder Specifications</th>
<th>Types</th>
<th>Size (mm)</th>
<th>Insert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Hand Left Hand</td>
<td>W L S h</td>
<td>Insert</td>
<td></td>
</tr>
<tr>
<td>NDH-R06</td>
<td>6 50 6.5 6</td>
<td>NWD-PP2□□</td>
<td></td>
</tr>
<tr>
<td>NDH-R08</td>
<td>8 60 8.5 8</td>
<td>-PL2□□</td>
<td></td>
</tr>
<tr>
<td>NDH-R10</td>
<td>10 80 10 10</td>
<td>-CP3□□</td>
<td></td>
</tr>
<tr>
<td>NDH-R12</td>
<td>12 100 12 12</td>
<td>-CP3□□</td>
<td></td>
</tr>
<tr>
<td>NDH-R20V</td>
<td>20 150 25 20</td>
<td>NWD-CL416</td>
<td></td>
</tr>
<tr>
<td>NDH-R25V</td>
<td>25 150 32 25</td>
<td>-CL420</td>
<td></td>
</tr>
<tr>
<td>NDH-N06</td>
<td>6 50 - 6</td>
<td>NWD-PP2□□</td>
<td></td>
</tr>
<tr>
<td>NDH-N08</td>
<td>8 60 - 8</td>
<td>-PL2□□</td>
<td></td>
</tr>
<tr>
<td>NDH-N10</td>
<td>10 80 - 10</td>
<td>-CP3□□</td>
<td></td>
</tr>
<tr>
<td>NDH-N12</td>
<td>12 100 - 12</td>
<td>-CP3□□</td>
<td></td>
</tr>
<tr>
<td>NDH-N16</td>
<td>16 125 - 16</td>
<td>-CP3□□</td>
<td></td>
</tr>
</tbody>
</table>

Please inquire for specifications except the above in the case of an order

---

**NewD e-EDGE**

Patent granted

To meet customer’s demands for low cost and green operation, we introduce the NewD e-EDGE for multi-purpose single crystal cutting tool for aluminum.

### Features

1. Low cost / high performance
2. Special holder for HDD aluminum die cast part and internal cutting in stock
3. Special inserts for existing holders
4. Sharp cutting and very good cutting heat diffusibility (compared to poly crystalline diamond)
Ultrasonic vibration cutting system

Ultrasonic vibration cutting system

Ultrasonic vibration cutting device

EL-50Σ
Product of Taga Electric Co., Ltd.

Features of elliptical vibration cutting
1. Mirror finish cutting of harden steel and stainless
2. Stable mirror finish cutting of cemented carbide and glass
3. High accurate corner cutting

Features of EL-50Σ
1. High frequency around 41kHz makes 1μm or more elliptical vibration
2. Ultra precise technique of automatic tracking for elliptical vibration route with lower than 1nm precision
3. Small vibrator can be attached to ultra precision machine or machining center
4. Work with AC 100V and no need for special installation work

Specifications outline

<table>
<thead>
<tr>
<th>Main specifications of EL-50Σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Oscillation of elliptical vibration</td>
</tr>
<tr>
<td>Max. ultrasonic power</td>
</tr>
<tr>
<td>Main controller sizes</td>
</tr>
<tr>
<td>Sizes of ultra precision bipolar amplifier</td>
</tr>
<tr>
<td>Oscillation sizes</td>
</tr>
<tr>
<td>Applicable tools</td>
</tr>
</tbody>
</table>

Outer drawing of vibrator

Mirror finish of cemented carbide

Ultra precision cutting of optical glass

Ultrasonic vibration cutting device is jointly developed by Nagoya Univ. and Taga Electric Co., Ltd.
PCD Rotating Tool

**Features**
1. Multiple parts can be machined in a single pass by using an integrated formed step tool.
2. Adoption of diamond offers significantly-improved tool life (10 times or longer than that of carbide ones).
3. Excellent machining surface can be obtained even with cutting speeds at over 300m/min.
4. Stable cutting is possible even when using emulsion-type water-soluble coolant. (Semi-dry cutting is also possible according to your environment.)

**Application of PCD reaming (Reaming of automotive hydraulic regulator valves)**

<table>
<thead>
<tr>
<th>Item</th>
<th>PCD Reamer</th>
<th>Carbide Reamer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting Speed (m/min)</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Feed Speed (mm/Rev)</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Machining Allowance (mm/dia.)</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Coolant</td>
<td>water-soluble</td>
<td>oil-based</td>
</tr>
<tr>
<td>Surface Roughness (μmRz)</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Cirularity</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Running Cost Ratio</td>
<td>0.5</td>
<td>1</td>
</tr>
</tbody>
</table>

**Data 1 Improvement of Productivity by Breaking Chips**

The breaker function is enhanced to prevent a reduction in productivity due to problems caused by chips. Solutions are proposed according to the type of chip problem.

**Data 2 Capable of both high-efficiency and high-precision machining**

The coaxiality and cylindricity of the cutting edge have greatly improved due to high shank rigidity (carbide) and grinding technology on cutting edge. The high run-out precision leads to stable machining, and consequently, reduction of the cycle time.

**Machining Results**

<table>
<thead>
<tr>
<th>Machining Results</th>
<th>1 tooth</th>
<th>4 teeth (steel)</th>
<th>4 teeth (carbide)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining time (s)</td>
<td>52</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>Circularity (mm)</td>
<td>0.01</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Coaxiality (mm)</td>
<td>0.01</td>
<td>0.07</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**Machining conditions**

- **Workpiece**: Cylinder head, valve seat, guide hole
- **Material**: Aluminum alloy casting AC4B
- **Machines**: Horizontal machining center
- **Tool Size**: Ø11-Ø36-L150
- **# of Rotations (min⁻¹)**: 3500
- **Cutting Speed (m/min)**: 395
- **Feed Rate (mm/rev)**: 0.3
- **Machining Allowance (mm/dia)**: 0.5
- **Coolant**: Emulsion type water-soluble
### Process 1  Finishing of Valve-and-Sheet Fitting Holes

The high rigidity of the shank and accuracy of the cutting edge achieves coaxiality and cylindricity.

<table>
<thead>
<tr>
<th>Specifications for Finishing of Valve-and-Sheet Fitting Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine : Horizontal machining center</td>
</tr>
<tr>
<td>Cutting Conditions</td>
</tr>
<tr>
<td>Spindle Speed (min⁻¹)</td>
</tr>
<tr>
<td>Feed Rate (mm/rev)</td>
</tr>
<tr>
<td>Feed Rate (mm/min)</td>
</tr>
<tr>
<td>Stock Removal (mm/dia.)</td>
</tr>
<tr>
<td>Coolant</td>
</tr>
</tbody>
</table>

### Process 2  Finishing of Hydraulic Lash Adjuster (HLA) Holes

Optimized design for machining of thin-wall parts and stop holes improves chip removal and achieves a high cylindricity.

<table>
<thead>
<tr>
<th>Specifications for Finishing of Hydraulic Lash Adjuster (HLA) Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine : Horizontal machining center</td>
</tr>
<tr>
<td>Cutting Conditions</td>
</tr>
<tr>
<td>Spindle Speed (min⁻¹)</td>
</tr>
<tr>
<td>Feed Rate (mm/rev)</td>
</tr>
<tr>
<td>Feed Rate (mm/min)</td>
</tr>
<tr>
<td>Stock Removal (mm/dia.)</td>
</tr>
<tr>
<td>Coolant</td>
</tr>
</tbody>
</table>

### Process 3  Finishing of Intake and Exhaust Valve Guide Holes

Since the overhang (L) is long and the diameter (D) is small, consequently L/D is large, the coaxiality and cylindricity of tools are controlled with high accuracy to improve the self-guide effect during reaming. Additionally, chip evacuation is improved by the guide shape and coolant design. As a result, the tool life is increased to 10 times as long as that of carbide.

<table>
<thead>
<tr>
<th>Specifications for Finishing of Intake and Exhaust Valve Guide Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine : Horizontal machining center</td>
</tr>
<tr>
<td>Cutting Conditions</td>
</tr>
<tr>
<td>Spindle Speed (min⁻¹)</td>
</tr>
<tr>
<td>Feed Rate (mm/rev)</td>
</tr>
<tr>
<td>Feed Rate (mm/min)</td>
</tr>
<tr>
<td>Stock Removal (mm/dia.)</td>
</tr>
<tr>
<td>Coolant</td>
</tr>
</tbody>
</table>

### Results

<table>
<thead>
<tr>
<th>Material</th>
<th>Tool Life (No. of Holes)</th>
<th>Price Ratio</th>
<th>Cost Ratio</th>
<th>Coaxiality</th>
<th>Inner Diameter Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbide</td>
<td>1,200</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>A.L.M.T. PCD Tool</td>
<td>12,000</td>
<td>3</td>
<td>0.8</td>
<td>10μm</td>
<td>3μm/10,000hole</td>
</tr>
</tbody>
</table>
Tools for cylinder head machining

- Features
  - Optimised tool balance for high-feed machining.
  - Effective direction of internal coolant supply.

- Advantages
  - Improvement of the feed rate and machining quality.
  - Reduction of tool costs per machining.

PCD Reamers with multi-edge shapes.

For Solenoid Hole Machining

For Spark Plug Hole Machining

For Guide-and-Sheet Hole Machining

For Spring Sheet Hole Machining

PCD Reamers with high precision cutting edge and high rigidity of the shank.

For Valve Guide Hole Machining

For Lash Adjuster Hole Machining

PCD endmills that enables high-feed rate machining using the high rigidity of the shank

For Camshaft Bearing (Half R) Machining

PCD endmills that enables high-feed rate machining using the multi-edge structure

For Cam Oil Hole Grooving
Special Tools for Automotive aluminum parts Machining

Features
• Tool designed dynamic balance for higher cutting speed
• Reduce the machining time and the tool cost by our special tool adapted for high feed, integrate machining processes.

Advantages
• Integration of processes, Shorter cycle time
• Elimination of variance in quality due to tool sets
• To minimize quality variation due to tool setting

With a run-out adjustment function

Mechanical Clamp Monoblock

Enables high-efficiency high-precision machining using the rigidity of the shank

Monoblock

Enables higher feed machining using multi teeth set on the small body

Face Milling Cutter

Achieves high-efficiency machining by a structure that integrates several processes

Special Process Integrating Tools

Reamer + Cutter

Reamer + Tap
PCD Small Saw

High accurate and efficient cutting or grooving process for resin and non-ferrous materials are required recently. PCD Small Saw was developed to meet with this requirement.

Features
- Longer tool life compared to conventional tools due to superior wear resistance of cutting edge
- Better cutting edge and higher feed rate compared to thin blade
  Due to the reason above, followings are expected
  - Improve surface quality (burr less and burning is not much)
  - Improve productivity
  - Reduce tool cost

Possible production range
- Outer dia. : Ø20~76.2mm
- Blade thickness : 0.2~1.0mm
  (Some exception depending on tool specification.)

Process example
- Work material : Compound material of copper and resin (Ø40-24mm width)
  Outer grooving process
- Machine : Designated slicer
- Specification : Ø20mm-0.4mm (blade thickness)-6 (number of blade)
- Conditions : Cutting speed : 377mm/min
  D.O.C : 1.5mm
  Feed rate : 3m/min (0.083mm/blade)
- Result : Achieved 50 times tool life compared to conventional cutting tool

Enlarged picture of edge
Diamond Wire Saw

Fixed Abrasive Diamond Wire

PWS® Precision Wire Saw

PWS Features (PWS-R • E)

- High-precision, high-efficiency (cutting speed: 2 to 10 times the loose abrasive wire)
- Improved working environment (a water-soluble machining fluid can be used)
- Significantly improved material (separation and collection of the chips)
- Specifications can be selected according to needs and applications

Applications

- Brittle materials such as sapphire, glass, ceramics and quartz
- Magnetic material such as neodymium and ferrite magnets
- Silicon for semiconductors and solar cells
- More difficult to cut materials, SiC and various substrates

Outline of Multi-wire Saw

≦Standard specification for Fixed Abrasive Diamond Wire Saw formula

<table>
<thead>
<tr>
<th>Type</th>
<th>Diameter</th>
<th>Average Diamond Size</th>
<th>Production Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWS-R</td>
<td>Ø0.255 ± 0.01</td>
<td>40–60µm</td>
<td>~100km</td>
</tr>
<tr>
<td>PWS-E</td>
<td>Ø0.250 ± 0.01</td>
<td>30–40µm</td>
<td>~ 50km</td>
</tr>
<tr>
<td></td>
<td>Ø0.190 ± 0.01</td>
<td>30–40µm</td>
<td>~ 50km</td>
</tr>
</tbody>
</table>

*For longer products, and other specifications, please contact us
## PWS-R (Resin Bonded Type)

**PWS-R Type Surface**

### PWS-R Features
- High finishing quality of cut surface
- Ideal for slicing a variety of materials

### PWS-R Features
- High cutting efficiency due to high diamond retention

### Case Processing

<table>
<thead>
<tr>
<th>Specifications : PWS</th>
<th>PWS-R</th>
<th>PWS-R</th>
<th>PWS-E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation System</td>
<td>Multi-wire saw</td>
<td>Multi-wire saw</td>
<td>Multi-wire saw</td>
</tr>
<tr>
<td></td>
<td>Dimension: W(50×4columns)×H(25×4high)×L(50×2columns)mm</td>
<td>Dimension: Ø50mm×L200mm</td>
<td>Dimension: Ø50mm×L200mm</td>
</tr>
<tr>
<td>Cutting Condition</td>
<td>Wire Speed: max 800m/min</td>
<td>Wire Speed: Ave 0.1mm/min</td>
<td>Wire Speed: Ave 0.3mm/min</td>
</tr>
<tr>
<td></td>
<td>Work Feed Speed: 0.6mm/min</td>
<td>Wire Running Direction: Reciprocate running</td>
<td>Wire Running Direction: Reciprocate running</td>
</tr>
<tr>
<td></td>
<td>Wire Tension: 35N</td>
<td>Wire Tension: 35N</td>
<td>Wire Tension: 35N</td>
</tr>
<tr>
<td></td>
<td>Coolant: Water-soluble</td>
<td>Coolant: Water-soluble</td>
<td>Coolant: Water-soluble</td>
</tr>
<tr>
<td>Cutting Results</td>
<td>Surface Roughness (Ra)*: on and less than 1.5μm</td>
<td>Surface Roughness (Ra)*: on and less than 0.4μm</td>
<td>Surface Roughness (Ra)*: on and less than 0.5μm</td>
</tr>
<tr>
<td></td>
<td>Waviness (WCM)*: on and less than 10μm</td>
<td>Waviness (WCM)*: on and less than 30μm</td>
<td>Waviness (WCM)*: on and less than 30μm</td>
</tr>
<tr>
<td></td>
<td>Total Thickness Variation (TTV): on and less than 30μm</td>
<td>Total Thickness Variation (TTV): on and less than 30μm</td>
<td>Total Thickness Variation (TTV): on and less than 30μm</td>
</tr>
<tr>
<td></td>
<td>Average Wafer Thickness: 0.6mm</td>
<td>Average Wafer Thickness: 0.6mm</td>
<td>Average Wafer Thickness: 0.6mm</td>
</tr>
<tr>
<td></td>
<td>Kerf-loss: 0.26mm</td>
<td>Kerf-loss: 0.26mm</td>
<td>Kerf-loss: 0.26mm</td>
</tr>
<tr>
<td></td>
<td>Outer Diameter: Ave. 0.250mm</td>
<td>Outer Diameter: Ave. 0.250mm</td>
<td>Outer Diameter: Ave. 0.250mm</td>
</tr>
</tbody>
</table>

- **Workpiece** : Sapphire
- **Workpiece** : Monocrystalline silicon

*Total length of cutting direction was measured.*

**Cutting resistance varies depending on the coolant. Please contact us for assistance in selecting the optimal coolant.**
**CPG Series**

**For PCD Tool Grinding**

**CPG Series** Compact Tool Grinders

**Suitable for super hard tool Grinding**

**Features**

1. **Incomparable rigidity**
   Diamond and cBN grinding require 10 times grinding pressure compared to cemented carbide grinding. CPG series employ precise angler bearing for grinding spindle and pivot and frame itself is originally designed rigidly.

2. **Excellent grinding accuracy**
   Super rigid and accurate grinding spindle realize sharp cutting edge.

3. **High efficient operation**
   Quick setting for cutting edge angle and relief angle with oscillating location adjustment of wheel with workpiece sight. Leaning mechanics with centering grinding point and highly precise projector for high efficiency operation environment.

---

**Options**

Special power-up units for CPG Series

- **D.O.C. digital unit**
  - CPG-310
    Digital Display of D.O.C. by linear scale (min. 1μm)
  - CPG-200
    Digital Display by combination of ball screw mechanism length measuring encoder (min. 5μm)

- **Turning angle digital Display**
  Turning angle measuring encoder (min. 1min.)

- **Coolant Tank (120ℓ)**
  Improved filtering system with paper filter

---

**Accessories**

Special jigs to guarantee grinding accuracy for CPG Series (genuine parts)

- **CPG-310**
  - Brake truing unit BT-2
  - Ø250mm projector
  - Angle measurement projector
  - D.O.C. digital meter
  - Turning angle digital meter

- **Main specifications**
  - Ø150mm projector
  - Constant pressure (grinding) unit
  - Coolant unit
  - Holder (QC-21) and Table
  - Rapid forward/backward unit

- **CPG-200**

  **Basic grinding machine for low volume production**

  - Adequate precision and rigidity as compact tool grinder
  - X20 projector for centering and profiling

---

**Other**

**Machinery / Coolant**

- Painted color of grinder is image and standard color is green

- **Options**
  - Ø250mm projector
  - Angle measurement projector
  - D.O.C. digital meter
  - Turning angle digital meter

- **Main specifications**
  - Ø150mm projector
  - Constant pressure (grinding) unit
  - Coolant unit
  - Holder (QC-21) and Table
  - Rapid forward/backward unit

- **Calibration and Precision**
  - Brake truing unit BT-2
  - X20 projector for centering and profiling

- **Dimensions**
  - Length: 2000mm
  - Width: 1000mm
  - Height: 1200mm

- **Weight**
  - 2500kg

- **Coolant**
  - Type: Water-based
  - Flow rate: 150ℓ/minute

**D.O.C. digital unit**

- **CPG-310**
  - Digital Display of D.O.C. by linear scale (min. 1μm)
  - **CPG-200**
    - Digital Display by combination of ball screw mechanism length measuring encoder (min. 5μm)

**Turning angle digital Display**

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  - Angle measurement projector
  - D.O.C. digital meter
  - Turning angle digital meter

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- **Weight**
  - 2500kg

- **Coolant**
  - Type: Water-based
  - Flow rate: 150ℓ/minute
Grinding wheel profile forming unit

**Rotary Dresser drive unit**

### Features
1. **High precision**
   Employed high precision pivot adjusted run-out of outer and edge to less than 2μm
2. **High rigidity**
   Make spindle dia. as big as possible and employ angular bearing
3. **Easy to use**
   - Fix with T-slot to surface grinding machines
   - No need to take out joint for removing

### Specifications of drive unit

<table>
<thead>
<tr>
<th>Spec</th>
<th>SGS-30</th>
<th>SGS-50</th>
<th>SGS-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation speed (60Hz)</td>
<td>300rpm</td>
<td>2,500rpm</td>
<td>2,500rpm</td>
</tr>
<tr>
<td>Electric motor</td>
<td>90W/200V</td>
<td>400W/200V</td>
<td>750W/200V</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>22</td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td>Spindle</td>
<td>SU-30</td>
<td>SU-50</td>
<td>SU-100</td>
</tr>
<tr>
<td>Dresser dia.and width (mm)</td>
<td>Ø90×30</td>
<td>Ø150×50</td>
<td>Ø150×100</td>
</tr>
</tbody>
</table>

---

**Coolant ODIUP**

### Features
Water soluble grinding coolant specialized to replace from loose abrasive to fixed abrasive

### Applications
- PWS (Fixed) Diamond Wire
- DPG (Diamond Pellet Grinding) wheel

---

**Ultra precision dressing system TACUMINO Dress**

### Features
- World’s smallest class
- High-speed rotation up to 20,000
- Detect contact of wheel and dresser with submicron range

1. **Decrease product defects drastically with high precision dressing**
   AE censor system benefits accurate dressing
2. **Reduce dressing time drastically**
   AE censor system removes useless dressing
3. **Increase tool life drastically**
   Increase number of dressing by reducing useless dressing

[Selling agency] Sumitomo Electric Tool Net

---

**Truing Unit Brake Dresser**

### Features
The brake dresser removes run-out with pressing force between dresser and diamond wheel as well as peripheral speed difference

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**Other**

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**Specifications of drive unit Spindle unit (SU type) is separately sold**

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**Machinery / Coolant**

---

**A.L.M.T.**

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50
Introduction of Customer Solution Center (CSC)

Propose most suitable condition of cutting / grinding process

Customer Solution Center (CSC) proposes best solution for your problem by gathering know-how of analysis, evaluation and experience that have cultivated over the years as a manufacturer.

- **Grinding to Cutting**
  Propose high precision and high efficiency cutting process that realizes space saving and clean environment.

- **Free abrasive to Grinding**
  Propose high precision and high efficiency grinding process lead to low damage to work material under clean environment that realize improvement of working condition and washability of work material as well as reducing industrial waste.

- **Measurement to analysis and evaluation**
  Propose evaluation method after process.

Work flow from request to report

- Propose most suitable machining process, analysis and evaluation method by considering customer’s request.
- Select machining process through meeting 1) Machine tool 2) Work holder 3) Process condition 4) Tool specification
- Experience action of work material, equipment and tool during process evaluation. Analyze work material and tool by measurement and analytical instrument after process.
- Propose most suitable process and tool for next step by summarizing analysis, evaluation and measurement result.
Cutting process evaluation system

Record chip status during cutting process by high speed camera. Observe and analyze cutting status by tool dynamometer.

Grinding process evaluation system

Load truing and dressing system on machine. Observe and analyze grinding status under various grinding condition.

- **Photo by high speed camera**

Analysis and evaluation

- **Analysis of flatness and waviness**: 3-D flat face analysis unit: TROPEL
  - Measure and analyze wafer surface up to 200mm².
  - Measurement accuracy: 0.1µm
  - Measurement range: 100µm

- **Surface analysis**: 3-D surface analysis unit: Zygo
  - 2-D and 3-D surface status are obtained by nondestructive inspection.
  - Analysis ability of height direction: 0.1nm
  - Vertical scanning speed: 4µm/sec

- **Observation by high magnification and component analysis**: EDX-SEM
  - Observe and analyze up to 200mm for diameter, 10mm (straight type) and 40mm (cup type) for height.

- **Cutting/Grinding resistance**: Tool dynamometer (by Kistler)
  - Process characteristic are grasped by comparing 3 force components.
Safety Precautions of Diamond and cBN wheels in use

1. Work environment / Work clothes / Protective equipment

**Warning**
- Wheel guard must be properly attached
- Only authorized people attend around machine and do not stand at rotation direction
- Must wear dust-proof glasses, safety shoes, safety hat and appropriate clothes

**Caution**
- Ventilate to remove mist coolant and dust
- Must wear dust-proof mask and ear plug
- Clean floor around grinding machine
- Instruct moving range of table of grinding machine etc. on the floor
- Do not put anything or stand within its moving area
- Do not operate in the area of inflammable object because wheel sparks in use

2. Before use

**Caution**
- Check wheel sizes to match with requirement of grinding machine
- Check appearance (crack, fracture, breakage etc.) after cleaning wheel
- Wash corrosion inhibitor in case wheel body is ferrous material
- Clean wheel mouting portion of spindle
- Clean flange and chuck to confirm no damage, warp and bend etc.
- Check warp and bend on wheel
- Read user manual and confirm wheel is for appropriate usage

3. Attachment

**Warning**
- Turn off a switch when wheel is attached to spindle
- Attach wheel guard appropriately

**Caution**
- Check scratch and dust etc. around or inside of mounting portion of wheel, flange and chuck
- Remove small scratch etc. by sandpaper
- Hold wheel with enclosed cushion material to prevent crack etc. in case of vitrified bond wheel
- Wheel and flange need to be smoothly attached

4. Trial run

**Warning**
- Check work material is firmly attached and operation of feed mechanism work correctly
- Check wheel is firmly attached and operation of feed mechanism work correctly
- Check rotation direction of wheel
- Check irregular sound or vibration by no-load operation around 1-3 mins

**Caution**
- Check coolant is correctly supplied

5. Grinding operation

**Warning**
- Do not touch wheel when rotating
- Make completed stop when irregular sound or vibration occurred
- Turn off a switch only after stopping coolant supply
- Do not touch or put object to stop rotating wheel
- Turn off a switch when wheel is taken out from spindle

**Caution**
- Be careful of excess cutting especially dry tool cutting
- Confirm feed, D.O.C. and cycle time by trial run
- Check burning or chatter mark on work material
- Be careful of overload

6. Storage and handling

**Caution**
- Check crack, scratch, breakage, burning etc. on working face
- Store dry area and prevent drop-off and crash etc.
- Apply corrosion inhibitor to ferrous wheel body to store
- Do not operate to change wheel shape. Please instruct us if necessary
Safety precautions of Circular Saw in use

1. Work environment / Work clothes / Protective equipment

Warning
- Designated wheel guard must be properly attached
- Only authorized people attend around machine
- Must wear dust-proof glasses, safety shoes, safety hat and appropriate clothes
- Must wear dust-proof mask and ear plug
- Do not operate in the area of inflammable object because tool sparks in use

Caution
- Ventilate to remove mist coolant and dust
- Clean floor around machine
- Check tool sizes to match with requirement of the machine
- Remove edge protection and store it in the case
- Check crack and breakage etc. after washing corrosion inhibitor
- In case no irregular is confirmed, please attach edge protection
- Check warp and bend
- Clean mounting portion of main spindle
- Clean flange and check scratch, warp, bend, irregular balance etc.

2. Before use

Warning
- Please use within peripheral speed stated

Caution
- Check tool is firmly attached and operation of feed mechanism work correctly
- Check rotation direction of tool
- Check irregular sound or vibration by no-load operation around 1-3 mins

3. Tool attachment

Warning
- Turn off a switch when tool is attached to main spindle
- Check scratch and dust etc. around mounting portion of tool and apply sandpaper if necessary to remove
- Apply edge protection when tools is attached
- Do not attach with force by hammering etc.
- Screw flange by equable torque at the position of diagonal line
- Remove edge protection after attaching

4. Trial run

Warning
- Check tool is firmly attached and operation of feed mechanism work correctly
- Check work material is firmly attached and operation of feed mechanism work correctly
- Tool or work material breakage may occur injury
- Check rotation direction of tool
- It may occur injury if it is not correct
- Check irregular sound or vibration by no-load operation around 1-3 mins

5. Cutting operation

Warning
- Do not touch tool when rotating to remove risk of serious injury
- Make completed stop when irregular sound or vibration occurred to remove risk of injury
- Cutting operation needs to be processed after reaching allowable rotation
- Turn off a switch of main spindle after completion of cutting process
- Do not touch or put object to stop rotating tool
- Turn off a switch when tool is taken out from main spindle

Caution
- Confirm feed, D.O.C. and cycle time by trial run
- Be careful of overload
- Check burning or chatter mark on work material

Important notice
- Please consult us in case cutting condition or tool specification is not correctly chosen

6. Storage and handling

Warning
- Attach edge protection
- Touching directly to cutting edge may occur injury
- Impact to tool may occur crack or breakage etc.

Caution
- Check irregular wear, breakage, crack, peeling etc. on working face
- Store dry area and prevent drop-off and crash after anti-corrosion treatment and edge protection etc.

Important notice
- Do not operate to change tool shape
- Please instruct us if necessary

Safety precautions of PCD reamer and endmill

Warning
- Put safety cover and protection glasses etc.
- Do not touch sharp cutting edge by hand
- Check tool hand and rotation direction of machine
Network

Technical & Reliable Network for A.L.M.T.Corp.

Based on the domestic production subsidiaries with high technologies, the sales network close to the local and overseas markets and the manufacturing affiliates overseas, A.L.M.T.Corp. serve society both at home and abroad with reliable products.

Domestic production network (Diamond Tool)

- A.L.M.T. DIAMOND Corp. (Harima)
  - Diamond • cBN wheel, cutting tool / Rotary Dresser / Wear-resistance products
- A.L.M.T. DIAMOND Corp. (Shizuoka)
  - Diamond Tools
- Awaji Diamond Industrial Co.,Ltd. (Sumoto)
  - Diamond drawing dies / Wear-resistance products

Domestic production network (Functional Material)

- A.L.M.T. TECH Inc. (Sakata)
  - Heatspreader products / Tungsten • Molybdenum products
- A.L.M.T. TECH Inc. (Toyama)
  - Tungsten • Molybdenum powder, stick, plate
- A.L.M.T. TECH Inc. (Itami)
  - Electric Contacts, Heavy metal, Heatspreader products, Ceramic products
- A.L.M.T. TUNGSTEN Corp. (Toyama)
  - Powderly products / Cemented carbide

Domestic Sales Network

- Head Office
  - 1-11-11, Shiba, Minato-ku, Tokyo, 105-0014
  - TEL : +81-3-5418-1809
  - FAX : +81-3-5418-1811
- Tohoku Office
- Kita-kanto Office
- Atsugi Office
- Nagoya Office
- Mikawa-anjo Office
- Hamamatsu Office
- Hokuriku Office
- Osaka Office
- Hiroshima Office
- Kyushu Office

Other catalogues

Diamond tool catalogues are available for various markets

Tyrolit ULTRA series (conventional wheel)

- Automotive • bearing CSS ULTRA
- Gear (general), MIRA ULTRA
- Gear (honing), MIRA
- Turbine (general), STRATO ULTRA
- Turbine (viper grinding), VIPER ULTRA

For semiconductor

For drawing wire