BINDERLESS NPD10 / DA90

PCD tool for Carbide & hard brittle material turning

BINDERLESS NPD10
Ultimate High Precision Machining

For Carbide & Hard brittle material Roughing
BINDERLESS
NPD10/DA90

Application Range (Carbide)

NPD10
Adopts Nano-polycrystalline Diamond for the cutting edge, which is binder-less, isotropic and harder than single crystal diamond.
Achieves long tool life and improved machining accuracy for carbide and hard brittle material machining compared to conventional diamond tools.

Best suited for finish machining of carbide and hard brittle material
Achieves high precision machining of carbide with nano-polycrystalline diamond, which has excellent wear resistance.

Maintains excellent dimensional accuracy over long periods
Greatly reduces the number of times that the tool must be indexed compared to previous diamond tools, improving work efficiency and reducing total cost.

Nano-polycrystalline Diamond
Nano-polycrystalline Diamond is a polycrystalline diamond that directly binds nanometer-level diamond particles at high strength without using binders. It is harder than single-crystal diamond and has no cleavability. Therefore, it enables machining of hard brittle materials such as carbides and enables new machining methods.

Hardness
No Anisotropy and Ultra Hard
Nano-polycrystalline Diamond
Single Crystal Diamond
Conventional PCD
Knoop Hardness HK(GPa)
0 50 100 150
Load 4.9N
Grade line up

<table>
<thead>
<tr>
<th>Grade</th>
<th>BINDERLESS</th>
<th>DA1000</th>
<th>DA2200</th>
<th>DA150</th>
<th>DA90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microstructure</td>
<td>Diamond grain</td>
<td>Cavity made by some melted combination materials with acid treatment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonding Material</td>
<td>–</td>
<td>Co</td>
<td>Co</td>
<td>Co</td>
<td>Co</td>
</tr>
<tr>
<td>Grain Size (µm)</td>
<td>less than 0.05</td>
<td>less than 0.5</td>
<td>0.5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>CBN Content (%)</td>
<td>100</td>
<td>90 to 95</td>
<td>85 to 90</td>
<td>85 to 90</td>
<td>90 to 95</td>
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</tbody>
</table>

DA90

A grade made by sintering rough-grained diamond which contains the highest amount of diamond, has excellent wear resistance for rough machining of carbide and hard brittle material. Achieves high cost performance as same performance as before through optimal design and development of mass production technology.

Best suited for rough machining of carbide and hard brittle material

Achieves stable tool life for rough machining of carbide and hard brittle material by the excellent wear resistance of rough-grained polycrystalline diamond.

Adopting NF Inserts

Achieves high cost performance as same performance as before through optimal design and development of mass production technology.

Expand stock items for carbide and hard brittle materials machining
**Wear Resistance of NPD10**

NPD10 shows excellent wear resistance.

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**Wear Resistance of DA90**

DA90 shows excellent wear resistance under rough machining conditions.

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**Application Examples**

<table>
<thead>
<tr>
<th>Carbide Machining VC40 (89HRA) Die Metal Mold</th>
<th>Carbide Machining VM30 (91HRA) Die Metal Mold</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NPD10</strong> achieved more 5 times longer tool life than conventional PCD.</td>
<td><strong>Reduced processing costs 33% by applying DA90 for roughing and NPD10 for finishing.</strong></td>
</tr>
</tbody>
</table>

- **Insert**: CCMA2X104RH (NPD10) Internal turning
- **Cutting Conditions**: \( v_c = 50 \text{ SFM} \), \( f = 0.0006 \text{ IPR} \), \( a_p = 0.003 \text{ in} \) in Dry

<table>
<thead>
<tr>
<th>Processing costs (%)</th>
<th>33% Reduction</th>
</tr>
</thead>
</table>

- **Insert**: Rough NF-CCMA21.5.5 (DA90) Internal turning
- **Finish**: CCMA21.5.5RH (NPD10) Internal turning
- **Cutting Conditions**: Rough \( v_c = 66 \text{ SFM} \), \( f = 0.004 \text{ IPR} \), \( a_p = 0.004 \text{ in} \) in Dry
- **Finish**: \( v_c = 66 \text{ SFM} \), \( f = 0.004 \text{ IPR} \), \( a_p = 0.008 \text{ in} \) in Dry
### Stock Items of NPD10

<table>
<thead>
<tr>
<th>Shape</th>
<th>Cat. No.</th>
<th>Stock</th>
<th>Cutting Edge Length</th>
<th>Dimensions (mm)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inscribed Circle</td>
<td>Thickness</td>
<td>Hole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NPD10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DNMA 432RH</td>
<td>433RH</td>
<td>1.8</td>
<td>12.7</td>
<td>4.76</td>
<td>5.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SNMA 432RH</td>
<td>433RH</td>
<td>1.7</td>
<td>12.7</td>
<td>4.76</td>
<td>5.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>VNMA 432RH</td>
<td>433RH</td>
<td>1.8</td>
<td>9.525</td>
<td>4.76</td>
<td>3.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.8</td>
<td></td>
<td></td>
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</tbody>
</table>

* : Standard Stocked Item

### Stock Items of DA90

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<tr>
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<th>Dimensions (mm)</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NF-DNMA 432</td>
<td>433</td>
<td>2.0</td>
<td>12.7</td>
<td>4.76</td>
<td>5.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>NF-SNMA 432</td>
<td>433</td>
<td>2.4</td>
<td>12.7</td>
<td>4.76</td>
<td>5.16</td>
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<tr>
<td></td>
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<td>2.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NF-VNMA 432</td>
<td>433</td>
<td>1.9</td>
<td>9.525</td>
<td>4.76</td>
<td>3.81</td>
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<td>1.9</td>
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</tbody>
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* : Standard Stocked Item

### Wear Resistance of Rough Machining Conditions

DA90 shows excellent wear resistance under (0.006 - 0.008 - 0.012).

Frank Wear Width (in)

VC40 (89HRA) Die Metal Mold Carbide Machining

- Conv. PCD: Part Material: Carbide (87HRA), Insert: NF-DCMA 1.5
- Conv. PCD: Part Material: Carbide (87HRA), Insert: NF-DCMA 1.5
- Conv. PCD: Part Material: Carbide (87HRA), Insert: NF-DCMA 1.5

NPD10 achieved more 5 times longer tool life than PCD.

- VC = 66 SFM, ft = 0.004 IPR, Finishing Cutting Conditions: Rough vc = 66 SFM, f = 0.004 IPR, ap = 0.004 in, Dry for roughing and NPD10 for finishing.

Reduced processing costs 33% by applying DA90.

### Shape of a rounded corner is cylindrical.

![Image of Shape of a rounded corner is cylindrical]
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