DLC Coating

**PDL010/PDL025**

High Quality and Long Tool Life for Machining Aluminum

- Achieves Long Tool Life with Hardness Close to that of Diamond
- Excellent Surface Finish with Aluminum Welding Resistance
- Large Lineup for Turning, Cut-Off, and Milling Operations

**NEW** New High Wear Resistant Coating PDL010
DLC Coating

**PDL010/PDL025**

Achieves Long Tool Life with Hardness Close to that of Diamond

Large Lineup for Turning, Cut-Off, and Milling Operations

### 1. Long and Stable Tool Life

**High Hardness with Kyocera’s Proprietary Hydrogen-free DLC Coating**

**Coating Properties** *(In-house Evaluation)*

<table>
<thead>
<tr>
<th>Young’s Modulus (GPa)</th>
<th>120</th>
<th>100</th>
<th>80</th>
<th>60</th>
<th>40</th>
<th>20</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDL010/PDL025</td>
<td></td>
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<tr>
<td>Hydrogen-free DLC Coating</td>
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<tr>
<td>Competitor B</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Competitor A</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>DLC Coating with Hydrogen</td>
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</tr>
</tbody>
</table>

**Tool Life** *(In-house Evaluation)*

- **Further Machining is Possible**
- **Tool Life**
- **Fracture Due to Welding**

**Cutting Conditions:**
- **Vc = 500 m/min, fz = 0.2 mm/t, ap x ae = 3 x 5 mm, Dry**
- **Cutter Dia. ø25 mm**
- **Workpiece: A7075**

### 2. Excellent Surface Finish

**Excellent Surface Finish with Aluminum Welding Resistance**

**Welding Resistance Comparison** *(In-house Evaluation)*

**PDL025**

- Minor Welding

**Competitor D**

- Welding

**Cutting Conditions:**
- **Vc = 800 m/min, fz = 0.1 mm/t, ap x ae = 3 x 5 mm, Dry**
- **Cutter Dia. ø25 mm**
- **Workpiece: A6061**
- **Cutting Length: 57 m**

**Machined Surface Comparison** *(In-house Evaluation)*

**PDL025**

- Machined Surface is Clouded

**Competitor E**

**Cutting Conditions:**
- **Vc = 800 m/min, fz = 0.1 mm/t, ap x ae = 3 x 5 mm, Dry**
- **Cutter Dia. ø25 mm**
- **Workpiece: A6061**
- **Cutting Length: PDL025 (48 m), Competitor E (14 m)**
3 Stable Machining

Stable Machining Due to DLC Coating Layer with Excellent Peeling Resistance
Improved Chip Evacuation Due to High Lubrication

Scratch Test: Coating Conditions Comparison with Load 80 N (In-house Evaluation)

PDL025

Competitor F (DLC Coating)

Even Chips with Small Curl Diameter
Carbide (non-coated)

Film Peeling

Cutting Conditions: Vc = 800 m/min, fz = 0.1 mm/t, ap × ae = 3 × 5 mm, Dry. Cutting Dia. ø25 mm
Insert BDGT11T304FR-JA. Workpiece A5052

4 Large Tooling Lineup

Wide Range of Applications Including Turning, Cut-off, and Milling Operations

Turning
(PDL010/PDL025)

Cut-off
(PDL025)

Milling
(PDL025)

Case Study

Block A5052
Vc = 450 m/min
fz = 0.15 mm/t,
ap × ae = 2 × 80 mm
Wet
MEC080R-11-T7 (7-Flute)
BDGT11T304FR-JA. PDL025

Number of Workpieces
PDL025 7 pcs/edge
Competitor G 5 pcs/edge

PDL025 has less welding compared to Competitor G and tool life is improved by 1.4 times.
A good wall and surface finish is achieved.
(User Evaluation)
## Standard Stock Items Description

### Turning Inserts (Positive)

<table>
<thead>
<tr>
<th>Shape</th>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>Relief Angle</th>
<th>DLC Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L.C.</td>
<td>Width:</td>
<td>Thickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>mm</td>
<td>mm</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **Turning Inserts**: Positive
- **Standard Stock**: R-hand Only in Stock
- **L-hand Only in Stock**: L

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**Image shows right handed inserts**

**Image shows left handed inserts**

**Mirror Surface Finish**

**Sharp Edge**

**Dimensions (mm)**

- **Diameter**
- **DLC Coating**
- **PDL**
- **R (rε)**

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**Shape Description**

- **Sharp Edge**
- **Mirror Surface Finish**
- **Turning-Medium**
- **Finishing-Medium**
- **Minute Depth of Cut**
- **Sharp Edge**

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**R (rε)**

- Standard Stock: R-hand Only in Stock,
- L-hand Only in Stock.
### Standard Stock Items Description

#### Turning Inserts (Negative)

<table>
<thead>
<tr>
<th>Shape</th>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>DLC Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNGG 120404°/-A3</td>
<td>12.70 4.76 5.16</td>
<td>PDL 010</td>
<td>PDL 025</td>
</tr>
<tr>
<td>CNGG 12040AH</td>
<td>12.70 4.76 5.16</td>
<td>PDL 010</td>
<td>PDL 025</td>
</tr>
<tr>
<td>CNMG 12040AH</td>
<td>12.70 4.76 5.16</td>
<td>PDL 010</td>
<td>PDL 025</td>
</tr>
<tr>
<td>DNGG 150404°/-A3</td>
<td>12.70 4.76 5.16</td>
<td>PDL 010</td>
<td>PDL 025</td>
</tr>
<tr>
<td>DNGG 15040AH</td>
<td>12.70 4.76 5.16</td>
<td>PDL 010</td>
<td>PDL 025</td>
</tr>
</tbody>
</table>

#### Cut-off TKF

<table>
<thead>
<tr>
<th>Shape</th>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>Angle</th>
<th>DLC Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>TKF12°/1 100-S-16DR</td>
<td>1.0</td>
<td>12</td>
<td>0.03</td>
<td>3</td>
</tr>
<tr>
<td>TKF12°/1 150-S-16DR</td>
<td>1.5</td>
<td>2.0</td>
<td>12</td>
<td>0.03</td>
</tr>
<tr>
<td>TKF16°/1 150-S-16DR</td>
<td>1.5</td>
<td>2.0</td>
<td>16</td>
<td>0.05</td>
</tr>
</tbody>
</table>

#### Cut-off GDG

<table>
<thead>
<tr>
<th>Shape</th>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>Angle</th>
<th>DLC Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDG 2020N-005PG</td>
<td>2.0</td>
<td>≤0.02</td>
<td>0.05</td>
<td>1.7</td>
</tr>
<tr>
<td>GDG 2020R-005PG-15D</td>
<td>2.0</td>
<td>≤0.02</td>
<td>0.05</td>
<td>1.7</td>
</tr>
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</table>

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<table>
<thead>
<tr>
<th>Standard Stock</th>
<th>R: R-hand Only in stock</th>
</tr>
</thead>
</table>

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[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

[Standard Stock]: Standard Stock

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[M]: Medium

[W]: Wide

[T]: Taper

[L]: Long

[H]: High

[θ]: Angle

[PDL]: PDL Coating

---

[DLC]: DLC Coating

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[ε]: Tolerance

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[Cut-off TKF]: Cut-off TKF

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[Cut-off GDG]: Cut-off GDG

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[Turning Inserts (Negative)]: Turning Inserts (Negative)
### Recommended Cutting Conditions

<table>
<thead>
<tr>
<th>Turning</th>
<th>Chipbreaker</th>
<th>Aluminum Alloy</th>
<th>Cutting Speed Vc (m/min)</th>
<th>Feed Rate f (mm/rev)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>A3 Si 10% or Less</td>
<td>400 – 500 – 800</td>
<td>0.1 – 0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AH Si 10% or Less</td>
<td>200 – 300 – 600</td>
<td>0.1 – 0.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SK Si 10% or Less</td>
<td>100 – 150 – 300</td>
<td>0.03 – 0.12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CK Si 10% or Less</td>
<td>100 – 150 – 300</td>
<td>0.03 – 0.12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CF Si 10% or Less</td>
<td>100 – 150 – 300</td>
<td>0.02 – 0.15</td>
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</tr>
<tr>
<td></td>
<td>AH Si 10% or Less</td>
<td>100 – 200 – 300</td>
<td>0.05 – 0.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A3 Si 10% or Less</td>
<td>100 – 200 – 300</td>
<td>0.05 – 0.2</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>F Si 10% or Less Cutting Dia. ø10 or More</td>
<td>100 – 250 – 500</td>
<td>0.03 – 0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Si 10% or Less Cutting Dia. ø10 or Less</td>
<td>100 – 200 – 300</td>
<td>0.03 – 0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>U Si 10% or Less Cutting Dia. ø10 or More</td>
<td>100 – 250 – 500</td>
<td>0.03 – 0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Si 10% or Less Cutting Dia. ø10 or Less</td>
<td>100 – 200 – 300</td>
<td>0.03 – 0.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cut-off</th>
<th>Aluminum Alloy</th>
<th>Cutting Speed Vc (m/min)</th>
<th>Feed Rate f (mm/rev)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TKF Si 10% or Less</td>
<td>200 – 500</td>
<td>0.01 – 0.03</td>
<td></td>
</tr>
<tr>
<td>GDG Si 10% or Less</td>
<td>200 – 500</td>
<td>0.01 – 0.05</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Milling Inserts</th>
<th>Aluminum Alloy</th>
<th>Cutting Speed Vc (m/min)</th>
<th>Feed Rate f (mm/rev)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGT 13% or Less</td>
<td>200 – 900</td>
<td>0.05 – 0.3</td>
<td></td>
</tr>
<tr>
<td>BDGT 13% or Greater</td>
<td>200 – 900</td>
<td>0.05 – 0.3</td>
<td></td>
</tr>
<tr>
<td>WNGT 13% or Greater</td>
<td>200 – 900</td>
<td>0.1 – 0.3</td>
<td></td>
</tr>
<tr>
<td>TKF Si 10% or Less</td>
<td>200 – 500</td>
<td>0.01 – 0.03</td>
<td></td>
</tr>
<tr>
<td>GDG Si 10% or Less</td>
<td>200 – 500</td>
<td>0.01 – 0.05</td>
<td></td>
</tr>
</tbody>
</table>

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