MEAS
High Efficiency Milling Cutters for Aluminum Machining

High Consistency, High Speed and High Efficiency Machining for Aluminum

Grooved Insert Pockets Provide Secure Clamping to Ensure Stable, High Speed Machining
Sharp Cutting Edge with Low Cutting Force Design
Simultaneous 3-axis with a Max. Ramping Angle of 20° (Ø1.000" / Ø25mm)
Kyocera’s Proprietary Hydrogen-free DLC Coated PDL025 Inserts
MEAS
High Efficiency Milling Cutters for Aluminum Machining

Excellent Scatter Prevention to Ensure Stable, High Speed Aluminum Machining
Simultaneous 3-axis with Large Ramping Angle for a Wide Range of Machining Applications

1 Reliable High Efficiency Machining

Grooved Connection Between the Insert and Holder for High Speed Aluminum Machining
(Ø1.250” / Ø32mm: Recommended Max. Cutting Speed Vc = 9,842 sfm)

Balance Grade G6.3
Prevents Vibration during high speed machining (ISO1940/1)

Unique Grooved Contact Surface
Prevents insert screw breakage to ensure greater safety

M4 Insert Screw

Grooved Insert Pocket
Centrifugal force is applied across the grooved surface to reduce pressure on the insert screw and to prevent insert screw breakage and safely secure the insert during high-speed revolutions

Centrifugal Force Direction

Grooved Contact Surface
2 Low Cutting Force with Sharp Cutting Edge

True Rake Angle Max. 20°
Low Cutting Force and Excellent Chattering Resistance

![Image of tool with text: True Rake Angle: Max. 20°]

Cutting Force Comparison (Internal Evaluation)

Cutting Conditions: Vc = 1280 sfm, D.O.C × ae = 0.315” × 0.197”, Dry
Cutter Diameter: Ø25mm (2 Inserts) Workpiece: 7075

Max. Ramping Angle 20° (Ø1.000" / Ø25mm)
The MEAS can be used for shouldering, slotting, ramping, and helical milling applications

3 Machining for a Wide Variety of Applications

![Images of different machining operations: Face Milling & Shouldering, Slotting, Contouring, Pocketing, Ramping, Helical Milling, Plunging]
### MEAS | End Mill

#### Toolholder Dimensions (Inch / Metric)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Stock</th>
<th>Unit</th>
<th>No. of Inserts</th>
<th>Dimensions (mm)</th>
<th>Rake Angle</th>
<th>Coolant Hole</th>
<th>Spare Parts</th>
<th>Weight (kg)</th>
<th>Max RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DC</td>
<td>DCON</td>
<td>LF</td>
<td>LH</td>
<td>APMX</td>
<td>R.R.</td>
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<tr>
<td>MEAS 1000-S1000-13-2T</td>
<td></td>
<td></td>
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<td>2.00</td>
<td>1.000</td>
<td>1.000</td>
<td>5.000</td>
<td>2.00</td>
<td>0.472</td>
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<td>MEAS 1250-S1250-13-2T</td>
<td></td>
<td></td>
<td></td>
<td>2.00</td>
<td>1.250</td>
<td>1.250</td>
<td>6.000</td>
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<td>MEAS 1500-S1250-13-3T</td>
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<td>2.00</td>
<td>3.000</td>
<td>1.250</td>
<td>6.000</td>
<td>2.00</td>
<td>0.472</td>
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</tbody>
</table>

### MEAS | Face Mill

#### Toolholder Dimensions (Inch / Metric)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Stock</th>
<th>Unit</th>
<th>No. of Inserts</th>
<th>Dimensions (mm)</th>
<th>Rake Angle</th>
<th>Gold Hole</th>
<th>Spare Parts</th>
<th>Weight (kg)</th>
<th>Max RPM</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>DC</td>
<td>DCON</td>
<td>LF</td>
<td>CBP</td>
<td>CBPP</td>
<td>APMX</td>
</tr>
<tr>
<td>MEAS 2000R-13-4T</td>
<td></td>
<td></td>
<td></td>
<td>2.00</td>
<td>2.00</td>
<td>1.750</td>
<td>0.750</td>
<td>0.433</td>
<td>1.969</td>
</tr>
<tr>
<td>MEAS 050R-13-4T-M</td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td>22</td>
<td>18</td>
<td>11</td>
<td>50</td>
<td>21</td>
</tr>
</tbody>
</table>

When using inserts with a corner-R (RE) of 1/8” (3.2mm) or larger, additional modifications (R0.138” (3.5mm) or larger) on the corner of cutter body is necessary: Standard Item

(If corner-radius is 0.118” (3.0mm) or smaller, additional modifications are not needed)

Coat Anti-seize Compound (P-37) thinly on portion of taper and thread when insert is mounted.
### Applicable Inserts

<table>
<thead>
<tr>
<th>Shape</th>
<th>Part Number</th>
<th>Dimensions (in)</th>
<th>DLC Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KCGT 130504FR-AL</td>
<td>W1 0.390 S 0.201 D1 0.173 L 0.524 RE PDL025</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130508FR-AL</td>
<td>0.555 1/64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130512FR-AL</td>
<td>0.547 1/32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130516FR-AL</td>
<td>0.543 3/64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130520FR-AL</td>
<td>1/16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130524FR-AL</td>
<td>5/64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130530FR-AL</td>
<td>3/32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130532FR-AL</td>
<td>0.118</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130540FR-AL</td>
<td>0.504</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130550FR-AL</td>
<td>1/8</td>
<td></td>
</tr>
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</table>

### Recommended Cutting Conditions

#### Recommended Cutting Conditions

<table>
<thead>
<tr>
<th>Workpiece</th>
<th>Property</th>
<th>Cutting Speed Vc (sfm)</th>
<th>Feed fz (ipt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum Alloy</td>
<td>Si Ratio ≤ 12.5%</td>
<td>660 ~ 3,280 ~ 9,840</td>
<td>0.002&quot; ~ 0.006&quot; ~ 0.010&quot;</td>
</tr>
<tr>
<td>Aluminum Alloy</td>
<td>Si Ratio ≥ 12.5%</td>
<td>660 ~ 980 ~ 1,310</td>
<td>0.002&quot; ~ 0.004&quot; ~ 0.008&quot;</td>
</tr>
</tbody>
</table>

- Recommended cutting conditions are reference values. Please adjust cutting speed and feed rate according to actual machining conditions taking into account machine and workpiece rigidity.
- Do not exceed the maximum cutting speed limit (see page 6).
- Regularly changing the insert screw is recommended. Use appropriate safety covers to protect from tool breakage and chip scattering.
- When using at a higher revolution (10,000 RPM or over), refer to the table below to adjust the balance of the MEAS and arbor.

#### Spindle Revolution (RPM)

- ~ 20,000: G16
- ~ 30,000: G6.3
- 30,000 ~: G2.5

### Max. Revolution for Each Cutting Diameter

<table>
<thead>
<tr>
<th>Cutting Diameter ØDC (mm)</th>
<th>Cutter Max. Revolutions (RPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø1.000&quot; Ø25mm</td>
<td>59,000 (Long Shank: 49,000)</td>
</tr>
<tr>
<td>Ø28mm</td>
<td>54,000</td>
</tr>
<tr>
<td>Ø1.250&quot; Ø32mm</td>
<td>49,000</td>
</tr>
<tr>
<td>Ø35mm</td>
<td>46,000 (Long Shank: 39,000)</td>
</tr>
<tr>
<td>Ø1.500&quot; Ø40mm</td>
<td>42,000</td>
</tr>
<tr>
<td>Ø2.000&quot; Ø50mm</td>
<td>36,000</td>
</tr>
</tbody>
</table>

#### Industrial Machine Parts 5052

- Vc = 4,920 sfm (n = 9,550 rpm)
  1. D.O.C. x ae = 0.118" x 1.575"  
     fz = 0.008 ipt (Vf = 300 ipm)
  2. D.O.C. x ae = 0.315" x 0.197"  
     fz = 0.008 ipt (Vf = 200 ipm)
  3. D.O.C. x ae = 0.079" ~ 1.97"  
     fz = 0.006 ipt (Vf = 225 ipm)

- Wet

**MEAS050R-13-4T-M KCGT130504FR-AL PDL025**

#### Case Study

**MEAS ø50-4T** | **190 Sec**

- Cutting Time
- MEAS showed 50% faster cycle time or more compared to Competitor C
  (User Evaluation)

**Competitor C ø50-3T** | **430 Sec**

- Cutting Time
Ramping Reference Data

<table>
<thead>
<tr>
<th>Cutting Dia. DC</th>
<th>1.000&quot;</th>
<th>1.250&quot;</th>
<th>1.500&quot;</th>
<th>2.000&quot;</th>
<th>25mm</th>
<th>28mm</th>
<th>32mm</th>
<th>35mm</th>
<th>40mm</th>
<th>50mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Ramping Angle RMPX</td>
<td>20°</td>
<td>12.5°</td>
<td>8.5°</td>
<td>6°</td>
<td>20°</td>
<td>16°</td>
<td>12.5°</td>
<td>11°</td>
<td>8.5°</td>
<td>6°</td>
</tr>
<tr>
<td>tan RMPX</td>
<td>0.363</td>
<td>0.221</td>
<td>0.149</td>
<td>0.105</td>
<td>0.363</td>
<td>0.287</td>
<td>0.221</td>
<td>0.194</td>
<td>0.149</td>
<td>0.105</td>
</tr>
</tbody>
</table>

Ramping Tips

Recommended ramping angle is ≤ RMPX (see chart above for recommended ramp angle)
Reduce recommended feed rate by 50%

Formula for Max. Cutting max Length (L) at Max. Ramping Angle

\[ L = \frac{\text{D.O.C.}}{\tan \text{RMPX}} \]

Plunging Tips

* Reduce feed rate to \( f_z \leq 0.004 \) ipt when plunging

<table>
<thead>
<tr>
<th>Insert</th>
<th>Maximum Width of Cut (ae)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KCGT13...</td>
<td>0.315&quot;</td>
</tr>
</tbody>
</table>

Helical Milling Tips

For Helical milling, use between Min. Drilling Dia. and Max. Drilling Dia.

**Exceeding Max. Machining Dia.**
- Center Core Remains After Machining

**Under Min. Machining Dia.**
- Center Core Hits Holder Body

<table>
<thead>
<tr>
<th>Cutter</th>
<th>Min. Drilling Dia.</th>
<th>Max. Drilling Dia.</th>
<th>Maximum Ramping Depth per Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAS...13...</td>
<td>( 2 \times \text{DC} - 0.630&quot; )</td>
<td>( 2 \times \text{DC} - 0.118&quot; )</td>
<td>0.138&quot;</td>
</tr>
</tbody>
</table>

- Use climb milling. (Refer to detail on right above)
- Feed rates should be reduced to 50% of recommended cutting conditions
- Use caution to eliminate incidences caused by producing long chips
**Drilling Tips**

**Drilling Depth**
Please refer to the figure on the left (Pd: Max. Drilling depth)

**Traversing after Drilling**
1. It is recommended to reduce feed by \( fz = 0.006 \) ipt or less until the center core is removed
2. Axial feed rate recommendation per revolution is \( f = 0.004 \) ipr or less

<table>
<thead>
<tr>
<th>Cutter</th>
<th>Max. Drilling Depth (Pd)</th>
<th>Min. Cutting Length (X) for Flat Bottom Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAS-13-15-1</td>
<td>0.138”</td>
<td>DC - 0.630”</td>
</tr>
</tbody>
</table>

**Unit: inch**

**How to Mount Inserts**

1. Completely eliminate chips and dust from the insert mounting side
2. Insert Screw
   - Coat anti-seize compound (P-37) thinly on portion of taper and thread
   - Attach screw to the magnetized wrench tip and tighten while gently pressing the outside edge of the insert toward the insert pocket surface (grooved surface) (see picture on the right)
   (Recommended Torque 3.5Nm)

**Cautions**

**While in Use**

*Caution*

Please use within recommended cutting conditions

Do not run the cutter at revolutions exceeding the printed maximum revolution limit of the cutter body
- Inserts may be damaged due to the centrifugal force and cutting load

Please do not use under the following conditions:
- When cutter is not fully loaded with inserts
- If the body is damaged

Please wear protective equipment such as gloves when changing inserts
- Injury can occur when touching the cutting edge

**Dynamic Balance**

Balance adjustment on the cutter is completed before shipping
Balance adjustment has been made with special high precision inserts to be ISO balance grade (ISO1940/1) G6.3

When using at a higher revolution (10,000 RPM or above), refer to the table below to adjust the balance of MEAS and arbor

Do not operate the balance adjustment screw on the outer periphery of the cutter. This could lead to improper dynamic balance.

<table>
<thead>
<tr>
<th>Spindle Revolution (RPM)</th>
<th>ISO Balance Grade ISO 1940-1/8821 (B0905)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ 20,000</td>
<td>G16</td>
</tr>
<tr>
<td>~ 30,000</td>
<td>G6.3</td>
</tr>
<tr>
<td>30,000 ~</td>
<td>G2.5</td>
</tr>
</tbody>
</table>
DLC Coating

**PDL025**

Kyocera’s Proprietary Hydrogen-free DLC Coating Achieves Long Tool Life with Hardness Close to that of Diamond

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**1 Long and Stable Tool Life**

Coating Properties (Internal Evaluation)

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**2 Excellent Surface Finish**

Excellent Surface Finish with Aluminum Welding Resistance

Welding Resistance Comparison (Internal Evaluation)

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**3 Stable Machining**

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

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**KYOCERA Precision Tools**

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06/20