Excellent for highly accurate machining of heat-resistant and titanium alloy.

- **CVD coated US905**
  a new CVD coated grade, for efficient high-speed turning of heat-resistant alloys.

- An economical W type insert and a notch resistant, large corner radius type available.

- **RCMX** round insert available as standard.

- **CVD coated US905**
  available for M class MS / GJ breaker.
Special Breakers for Difficult-to-cut Materials

**FJ/MJ/GJ/MS breaker**

RCMX type insert

### Features of FJ/MJ/MS/GJ breaker

#### FJ breaker

**Finish cutting**

G Class

- Optimum chip breaker for high accuracy finishing
- Changeable rake angle
- 9°-14°

- Reduced heat generation with the use of a sharp cutting edge.
- Superior chip control at very small depths of cut with a special dot type chip breaker.

#### MJ breaker

**Medium—Finish cutting**

M Class

- First recommended chip breaker
- Changeable rake angle
- 9°-13°

- M-class type with a smooth micro honing for highest sharpness.
- A curved edge design suitable for copy turning.
- A wide variety of corner radii, 0.4-1.6 available as standard.

#### MS breaker

**Medium cutting**

M Class

- The sharp edges reduces cutting temperatures.
- Reduced contact area on the rake face.
- Suppresses heat generation.

#### GJ breaker

**Semi-heavy cutting**

M Class

- Ideal for rough turning and machining of surface scale.
- 18°
- Flat land

- Sharpness and high cutting edge strength with an optimum rake angle and flat land.
- Cutting edge geometry optimized for resistance to face wear when cutting titanium alloy.

#### RCMX breaker

**Medium cutting**

NEW

- Standard breaker
- 18°
- 2.1

- A smaller lead angle prevents notching.

### For effective use of large corner radius and round inserts

By setting the depth of cut smaller than the corner radius value, notching during cutting of heat-resistant alloys can be greatly reduced.

**Corner radius > 1.5 x Depth of cut**

- Depth of cut: 1 mm
- Corner radius over 1.5 is recommended.

**Cutting conditions**

- Workpiece : Inconel718
- Insert : CNMG1204-MJ (US905)
- Holder : PCLNL2525M12
- Cutting speed : 70m/min
- Feed : 0.2mm/rev
- Depth of cut : 1.0mm
- Coolant : Wet (water soluble)

- Cutting time : 1min.
- Lead angle (Large)

**Large notch wear**

- Cutting time : 10min.

**Lead angle (Small)**

- R0.8

- A smaller lead angle is the key to reduced notching.
Grade Features

Application range for heat resistant alloy machining

<table>
<thead>
<tr>
<th>Properties</th>
<th>Heat-resistant alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CVD coated <strong>US905</strong> Unequalled wear resistance enables machining at high speeds when compared to conventional products.</td>
</tr>
<tr>
<td></td>
<td><strong>Miracle Coated grade VP05RT</strong> The combination of MIRACLE coating and a high-strength micro-grain cemented carbide substrate increases wear resistance and exhibits high continuous cut performance.</td>
</tr>
<tr>
<td></td>
<td><strong>Miracle Coated grade VP10RT</strong> A good balance of wear and fracture resistance. First recommendation for turning heat-resistant alloys. Also suitable for stainless steels.</td>
</tr>
<tr>
<td></td>
<td><strong>Miracle Coated grade VP15TF</strong> High-strength micro-grain cemented carbide substrate. Ideal for interrupted cutting that requires high fracture resistance.</td>
</tr>
</tbody>
</table>

Features of **US905**

- **CVD Coated US905**
  - A CVD coating layer with a close micro structure to prevent flank and face wear of edges that are subject to very high temperatures.

- **Substrate**
  - The highest hardness cemented carbide substrate suitable for CVD coating. For reduced plastic deformation and improved dimensional accuracy of components.

Features of MIRACLE coating

- **Micro-structure of VP10RT**
  - Micro-grain cemented carbide

- **MIRACLE coating features**
  - Increased adhesion strength
  - Increased heat resistance

- **Micro-structure of Oxidation temperature/°C**
  - Unequalled wear resistance enables machining at high speeds when compared to conventional products.
  - Unmatched resistance to heat and plastic deformation.
  - Ideal for wear resistant high-speed machining.
  - Good balance of wear and fracture resistance. First choice for turning of titanium alloys.
  - High-strength micro-grain cemented carbide grade. Ideal for interrupted cutting that requires high fracture resistance.

Titanium alloys

<table>
<thead>
<tr>
<th>Properties</th>
<th>Titanium Alloys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Cemented carbide grade RT9005</strong> Unmatched resistance to heat and plastic deformation. Ideal for wear resistant high-speed machining.</td>
</tr>
<tr>
<td></td>
<td><strong>Cemented carbide grade RT9010</strong> Good balance of wear and fracture resistance. First choice for turning of titanium alloys.</td>
</tr>
<tr>
<td></td>
<td><strong>Cemented carbide grade TF15</strong> High-strength micro-grain cemented carbide grade. Ideal for interrupted cutting that requires high fracture resistance.</td>
</tr>
</tbody>
</table>
Special Breakers for Difficult-to-cut Materials

**Cutting performance of FJ breaker**

- Finished surface comparison on Inconel 718
  - Feed 0.15mm/rev
    - **FJ breaker VP10RT**
      - Rz=6.0  Rz JIS=5.6
    - **Competitor’s breakers for difficult-to-cutting materials**
      - Rz=7.5  Rz JIS=6.4
  - Feed 0.15mm/rev
    - **FJ breaker VP10RT**
      - Rz=2.4  Rz JIS=2.1
    - **Competitor’s breakers for difficult-to-cutting materials**
      - Rz=4.7  Rz JIS=4.4

  
  <Cutting conditions>
  - Insert : DNGG150408-FJ/VP10RT
  - Holder : PDJNL2525M15
  - Cutting speed : 40m/min
  - Depth of cut : 0.7mm
  - Coolant : Wet (water soluble)

  - The sharp cutting edges of the FJ breaker for fine feed turning to ensure high quality surface finishes.

**Cutting performance of MJ breaker**

- High speed turning of Inconel 718 **US905** with unmatched wear resistance.

  
  <Cutting conditions>
  - Insert : CNMG120408-MJ
  - Holder : PCLNL2525M12
  - Cutting speed : 90m/min
  - Feed : 0.15mm/rev
  - Depth of cut : 0.5mm
  - Coolant : Wet (water soluble)

  - Unparalleled “sharp” moulded chip breaker cutting edges of class M inserts.
  - For excellent wear resistance due to a combination of M class accuracy and the coated carbide grade US905.
  - Excellent for lowly rigidity workpieces and machines.
  - Ideal for stainless steel turning with a combination of M class accuracy and the coated carbide grade VP10RT.

**Cutting performance of GJ breaker**

- Titanium alloy (Ti-6Al-4V)
  - GJ breaker for excellent wear & fracture resistance.

  
  <Cutting conditions>
  - Insert : CNMG120408-GJ
  - Holder : PCLNL2525M12
  - Cutting speed : 50m/min
  - Feed : 0.25mm/rev
  - Depth of cut : 2mm
  - Coolant : Wet (water soluble)
**Recommended cutting conditions**

- **Cutting conditions**
  - **Stable cutting**
  - **General cutting**
  - **Unstable cutting**

- **Cutting area**
  - **F** Finish cutting
  - **M** Medium cutting
  - **S** Light cutting
  - **G** Semi-heavy cutting

---

**Negative Inserts for Heat-resistant Alloy**

<table>
<thead>
<tr>
<th>Cutting area</th>
<th>Breaker</th>
<th>1st Recommendation</th>
<th>Cutting speed (m/min)</th>
<th>Feed (mm/rev)</th>
<th>Depth of cut (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish cutting</td>
<td>FJ</td>
<td>VP10RT</td>
<td>20–60</td>
<td>−0.20</td>
<td>−0.8</td>
</tr>
<tr>
<td>Medium cutting</td>
<td>MJ</td>
<td>VP10RT</td>
<td>20–50</td>
<td>−0.20</td>
<td>0.5–1.5</td>
</tr>
<tr>
<td>Medium cutting</td>
<td>MS</td>
<td>VP10RT</td>
<td>20–50</td>
<td>0.10–0.25</td>
<td>0.5–2.0</td>
</tr>
<tr>
<td>Semi-heavy cutting</td>
<td>GJ</td>
<td>VP10RT</td>
<td>20–40</td>
<td>0.15–0.30</td>
<td>1.0–3.0</td>
</tr>
</tbody>
</table>

---

**Negative Inserts for Titanium Alloy**

<table>
<thead>
<tr>
<th>Cutting area</th>
<th>Breaker</th>
<th>1st Recommendation</th>
<th>Cutting speed (m/min)</th>
<th>Feed (mm/rev)</th>
<th>Depth of cut (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish cutting</td>
<td>FJ</td>
<td>RT9010</td>
<td>50–100</td>
<td>−0.20</td>
<td>−0.8</td>
</tr>
<tr>
<td>Medium cutting</td>
<td>MJ</td>
<td>RT9010</td>
<td>40–90</td>
<td>−0.20</td>
<td>0.5–1.5</td>
</tr>
<tr>
<td>Medium cutting</td>
<td>MS</td>
<td>RT9010</td>
<td>40–80</td>
<td>0.10–0.25</td>
<td>0.5–2.0</td>
</tr>
<tr>
<td>Semi-heavy cutting</td>
<td>GJ</td>
<td>RT9010</td>
<td>40–70</td>
<td>0.15–0.30</td>
<td>1.0–3.0</td>
</tr>
</tbody>
</table>
# Special Breakers for Difficult-to-cut Materials

## Inserts

<table>
<thead>
<tr>
<th>Type</th>
<th>Shape</th>
<th>Order Number</th>
<th>Coating</th>
<th>Carbide Dimensions (mm)</th>
<th>Geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNGG1204V5-FJ</td>
<td>G</td>
<td>120401-FJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>DNGM150404-FJ</td>
<td>G</td>
<td>150408-FJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>VNGG1604V5-FJ</td>
<td>G</td>
<td>160401-FJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 9.525, S1: 4.76, Re: 3.81</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>MNG160404-MJ</td>
<td>M</td>
<td>160408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>DNMG150404-MJ</td>
<td>M</td>
<td>150408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>TNMG160404-MJ</td>
<td>M</td>
<td>160408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 9.525, S1: 4.76, Re: 3.81</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>VNMG160404-MJ</td>
<td>M</td>
<td>160408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 9.525, S1: 4.76, Re: 3.81</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>WMG080408-MJ</td>
<td>M</td>
<td>080408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>CNGG120404-MJ</td>
<td>G</td>
<td>120408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>DNGM150404-MJ</td>
<td>G</td>
<td>150408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 12.7, S1: 4.76, Re: 5.16</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
<tr>
<td>VNMG160404-MJ</td>
<td>G</td>
<td>160408-MJ</td>
<td>[Coating] [Carbide]</td>
<td>D1: 9.525, S1: 4.76, Re: 3.81</td>
<td><img src="image" alt="Geometry" /></td>
</tr>
</tbody>
</table>

- **G Class**: General-purpose cutting
- **M Class**: Medium cutting
- **G** and **M**: Inventory maintained
- **FJ** and **MJ**: Non stock, produced to order only

---

**Notes**:

- **Coating**: [Coating] [Carbide]
- **Dimensions (mm)**: [D1] [S1] [Re] [D2]
- **Geometry**: [Geometry](image)
<table>
<thead>
<tr>
<th>Type</th>
<th>Shape</th>
<th>Order Number</th>
<th>Coating</th>
<th>Carbide</th>
<th>Dimensions (mm)</th>
<th>Geometry</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Medium cutting - M Class)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Medium cutting - M Class)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Semihard cutting - M Class)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Coating**
- VP05RT
- VP10RT
- VP15RT

**Carbide**
- US905
- VP1055
- RT1505
- RF1505

**Dimensions (mm)**
- D1  
- S1  
- Re  
- D2  

**Geometry**
- 80°  
- 55°  

**Images**
- 3D illustrations of each insert type.
### Application Examples

<table>
<thead>
<tr>
<th>Insert (Grade)</th>
<th>CNGG120408-MJ(VP15TF)</th>
<th>CNMG120408-MJ(US905)</th>
<th>DNMG150404-MJ(RT9010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>Ring (Inconel 718)</td>
<td>Inconel 718 (AM5663)</td>
<td>Titanium alloy (Ti-6Al-4V)</td>
</tr>
<tr>
<td>Cutting speed (m/min)</td>
<td>50(Continuous) 30(Interrupted)</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>Feed (mm/rev)</td>
<td>0.1</td>
<td>0.25</td>
<td>0.2</td>
</tr>
<tr>
<td>Depth of cut (mm)</td>
<td>0.3</td>
<td>0.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Coolant</td>
<td>Wet</td>
<td>Wet</td>
<td>Wet</td>
</tr>
<tr>
<td>Result</td>
<td>0.25 pieces/corner</td>
<td>0.35 pieces/corner</td>
<td>0.75 pieces/corner</td>
</tr>
<tr>
<td>Class M MJ breaker (VP05RT)</td>
<td>Fracture</td>
<td>Class M MJ breaker (US905)</td>
<td>Cutting length: 1000m</td>
</tr>
<tr>
<td>Competitor's coated carbide</td>
<td>Fracture</td>
<td>Competitor's coated carbide</td>
<td>Cutting length: 680m</td>
</tr>
<tr>
<td>Stable machining without fracturing was possible with the MJ breaker.</td>
<td>Doubled tool life with the MJ breaker.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insert (Grade)</th>
<th>CNMG120408-GJ(VP10RT)</th>
<th>TNMG160408-MJ(VP05RT)</th>
<th>RCMX120400-MJ(VP05RT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>Pin (Inconel 718)</td>
<td>Sintered iron components (FH655)</td>
<td>Case (Inconel 718)</td>
</tr>
<tr>
<td>Cutting speed (m/min)</td>
<td>31</td>
<td>120</td>
<td>45</td>
</tr>
<tr>
<td>Feed (mm/rev)</td>
<td>0.2</td>
<td>0.05</td>
<td>0.2</td>
</tr>
<tr>
<td>Depth of cut (mm)</td>
<td>2.3</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Coolant</td>
<td>W.S.O.</td>
<td>Wet</td>
<td>Wet</td>
</tr>
<tr>
<td>Result</td>
<td>0.25 pieces/corner</td>
<td>0.75 pieces/corner</td>
<td>0.75 pieces/corner</td>
</tr>
<tr>
<td>Class M MJ breaker (VP10RT)</td>
<td>Fracture</td>
<td>Class M MJ breaker (VP05RT)</td>
<td>Cutting time: 11min</td>
</tr>
<tr>
<td>Competitor's coated carbide</td>
<td>Fracture</td>
<td>Competitor's coated carbide</td>
<td>Cutting time: 9min</td>
</tr>
<tr>
<td>GJ breaker for excellent chip disposal and vastly increased tool life.</td>
<td>50% longer tool life.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**For Your Safety**
- Don’t handle inserts and chips without gloves.
- Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage.
- Please use safety covers and wear safety glasses.
- When using compounded cutting oils, please take fire precautions.
- When attaching inserts or spare parts, please use only the correct wrench or spanner.