New PVD Coated Grades

**MP6100/MP7100/MP9100**

Specialised grades for specific materials.
New PVD Coated Grades

**MP6100/MP7100/MP9100**

Wide range of grades for specific materials

MIRACLE SIGMA accumulated Al-Ti-Cr-N based PVD coating

![Image of PVD coating and features]

- Excellent welding resistance due to low coefficient of friction
- PVD accumulated coating (Each damage measures)
- Special cemented carbide substrate

### Tool wear and Damage
- **P** Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy • Ti Alloy

<table>
<thead>
<tr>
<th>Features</th>
<th>MP6120/MP6130</th>
<th>MP7130/MP7140</th>
<th>MP9120/MP9130</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved thermal conductivity</td>
<td>Improved layer toughness</td>
<td>Low affinity at high temperature</td>
</tr>
</tbody>
</table>

### Shape

- **P** Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy • Ti Alloy

### ISO and Coated Carbide

#### MP6120/MP6130
- **P**
  - P10
  - P20
  - P30
  - P40

#### MP7130/MP7140
- **M**
  - M10
  - M20
  - M30
  - M40

#### MP9120/MP9130
- **S**
  - S10
  - S20
  - S30
  - S40

**ISO**

Coated Carbide

**PVD**
TOUGH-Σ Technology

A fusion of the separate coating technologies; PVD and multi-layering realises extra toughness.

**PVD accumulated coating**

**Base layer**
High Al-(Al, Ti)N

The new technology Al-(Al, Ti)N coating provides stabilisation of the high hardness phase and succeeds in dramatically improving wear, crater and welding resistance.

*Graphical representation.*

**Best layer of each workpiece**

<table>
<thead>
<tr>
<th>Work Material</th>
<th>Grade</th>
<th>Coefficient of friction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Steel, Alloy Steel</td>
<td><strong>MP6100</strong></td>
<td>0.4</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td><strong>MP7100</strong></td>
<td>0.5</td>
</tr>
<tr>
<td>Titanium Alloy, Heat Resistant Alloy</td>
<td><strong>MP9100</strong></td>
<td>0.3</td>
</tr>
</tbody>
</table>

Excellent welding resistance due to low coefficient friction!

**Heat resistance**

Conventional

**Wear resistance**

Multi-layering of the coating prevents any cracks penetrating through to the substrate.

*Graphical representation.*
Cutting Performance
General Steel and Alloy Steel machining

Wear Resistance

![Graph showing wear resistance comparison between MP6120 and Conventional]

- **MP6120** vs **Conventional**
- Cutting conditions:
  - Workpiece: JIS SCM440
  - Tool: ASX445R12508E
  - Insert: SEMT13T3AGSN-JM
  - Cutting speed: 270 m/min
  - Feed: 0.2 mm/tooth
  - Depth of cut: 2.0 mm
  - Coolant: Dry cutting

Crater Wear Resistance

![Graph showing crater wear resistance comparison between MP6120 and Conventional]

- **MP6120** vs **Conventional**
- Cutting conditions:
  - Workpiece: JIS SCM440
  - Tool: AJX14-063A04R
  - Insert: JDMT140520ZDSR-JM
  - Cutting speed: 200 m/min
  - Feed: 1.5 mm/tooth
  - Depth of cut: 1.0 mm, ae=50 mm
  - Coolant: Dry cutting

Helps to prevent occurrence and progression of thermal cracking

![Image showing improved wear resistance]

- **MP6120** vs **Conventional**
- Cutting conditions:
  - Workpiece: JIS SCM440
  - Tool: ASX445R12508E
  - Insert: SEMT13T3AGSN-JM
  - Cutting speed: 300 m/min
  - Feed per Tooth: 0.2 mm/tooth
  - Depth of Cut: ae 100 mm, ap 2.0 mm
  - Coolant: Dry cutting
Fracture Resistance

Stainless steel machining

Chipping Resistance

Wear Resistance

MP6120

MP7140 JM breaker

MP7130 JM breaker

MP6120
Cutting Performance
Titanium alloy and Heat treated steel machining

Wear Resistance

![Graph showing flank wear vs cutting length for MP9120 and conventional tools]

**<Cutting conditions>**
- Workpiece: Ti-6Al-4V
- Tool: ASX445R804S32
- Insert: SEMT13T3AGSN-JM
- Grade: MP9120
- Cutting speed: 50 m/min
- Feed: 0.15 mm/tooth
- Depth of cut: 1.5 mm
- Coolant: Wet cutting

Wear and Chipping Resistance

**MP9130**

![Comparative images of MP9130 and conventional tools]

**<Cutting conditions>**
- Workpiece: Ti-6Al-4V
- Tool: APX3000R323SA32SA
- Insert: AOMT123608PEER-M
- Grade: MP9120
- Cutting speed: 30 m/min
- Feed per tooth: 0.15 mm/tooth
- Width of cut: 8 mm
- Depth of cut: 8 mm
- Coolant: Wet cutting

**ASX400 + JM breaker**

![Bar chart showing cutting length for conventional and MP9120 tools]

**<Cutting conditions>**
- Workpiece: Ti-6Al-4V
- Tool: ASX400-063A04R
- Insert: SOMT12T308PEER-JM
- Grade: MP9120
- Cutting speed: 60 m/min
- Feed per tooth: 0.1 mm/tooth
- Axial depth of cut: 8 mm
- Radial depth of cut: 6 mm
- Coolant: Wet cutting

Wear and Chipping Resistance

**MP9130**

![Comparative images of MP9130 and conventional tools]

**<Cutting conditions>**
- Workpiece: Inconel®718
- Tool: APX3000R324SA32SA
- Insert: AOMT123608PEER-M
- Grade: MP9130
- Cutting speed: 30 m/min
- Feed per tooth: 0.15 mm/tooth
- Width of cut: 8 mm
- Depth of cut: 8 mm
- Coolant: Wet cutting
## APPLICATION EXAMPLES

The following application examples are customers' application examples, so it can be different from a maker's recommended conditions.

<table>
<thead>
<tr>
<th>Tool</th>
<th>ASX445R08004C</th>
<th>ASX445R12508E</th>
<th>ASX445R12508E</th>
<th>ASX445S-063A04R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert (Grade)</td>
<td>SEMT13T3AGSN-JM (MP9130)</td>
<td>SEMT13T3AGSN-JM (MP6120)</td>
<td>SEET13T3AGSN-JL (MP9120)</td>
<td>SEMT13T3AGSN-JM (MP9130)</td>
</tr>
<tr>
<td>Workpiece</td>
<td>15-5PH (Stainless steel)</td>
<td>SCM440H</td>
<td>Ti-6Al-4V</td>
<td>ASTM304</td>
</tr>
<tr>
<td>Component</td>
<td>Aerospace parts</td>
<td>Machine parts</td>
<td>Aerospace parts</td>
<td>Machine parts</td>
</tr>
</tbody>
</table>

| Cutting Speed (m/min) | 150 | 250 | 76 | 60 |
| Feed (mm/tooth) | 0.12 | 0.1-0.2 | 0.1 | 0.1 |
| Depth of Cut (mm) | ap:2, ae:76 | 2.0-5.0 | 0.25 | ap:2, ae:63 |
| Coolant | Dry cutting | Dry cutting | Wet cutting | Dry cutting |

**Results**
- MP9130 provides double tool life compared to conventional cutters and achieves high efficiency cutting by shortening the time required to replace a tool.
- MP6120 shows only a small amount of wear thereby achieving 1.5 times longer tool life compared to conventional cutters.
- Machining time can be extended 3 times longer without chipping.
- MP9130 achieves double tool life without burr formation compared to conventional cutters.

<table>
<thead>
<tr>
<th>Tool</th>
<th>ASX400-050A04R</th>
<th>ASX400-050A05R</th>
<th>ASX400-050A04R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert (Grade)</td>
<td>SOMT12T308PEER-JM (MP6120)</td>
<td>SOMT12T308PEER-JM (MP6130)</td>
<td>SOMT12T308PEER-JM (MP7130)</td>
</tr>
<tr>
<td>Workpiece</td>
<td>S45C</td>
<td>SCM440</td>
<td>SUS316</td>
</tr>
<tr>
<td>Component</td>
<td>Machine parts</td>
<td>Machine parts</td>
<td>Structural component</td>
</tr>
</tbody>
</table>

| Cutting Speed (m/min) | 152 | 180 | 88 |
| Feed (mm/tooth) | 0.15 | 0.2 | 0.1 |
| Axial depth of cut (mm) | 3.8 | 1.8 | ≤2 |
| Radial depth of cut (mm) | 6.2 | 31.75 | ≤2 |
| Coolant | Dry cutting | Wet cutting | Wet cutting |
| Results | MP6120 achieves 3 times longer tool life compared to conventional cutters. | MP6130 achieves 1.3 times longer tool life with suppressed chipping compared to conventional cutters. | MP7130 can continue machining without fracture. |

<table>
<thead>
<tr>
<th>Tool</th>
<th>AJX12R08006D</th>
<th>AJX12-080A06R</th>
<th>AJX12-080A06R</th>
<th>AJX14R10006D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert (Grade)</td>
<td>JL breaker (MP9130)</td>
<td>JL breaker (MP9120)</td>
<td>JL breaker (MP9130)</td>
<td>JM breaker (MP6120)</td>
</tr>
<tr>
<td>Workpiece</td>
<td>Co-Cr Alloy</td>
<td>INCONEL 625</td>
<td>Ti-6Al-4V</td>
<td>SKT4 (35HRC)</td>
</tr>
<tr>
<td>Component</td>
<td>Medical component</td>
<td>Aerospace component</td>
<td>Aerospace component</td>
<td>Press mold</td>
</tr>
<tr>
<td>Cutting Speed (mm⁻¹)</td>
<td>50mm/min(240min⁻¹)</td>
<td>35mm/min(140min⁻¹)</td>
<td>50mm/min(240min⁻¹)</td>
<td>100mm/min(318min⁻¹)</td>
</tr>
<tr>
<td>Feed (mm/tooth)</td>
<td>864mm/min(0.6mm/tooth)</td>
<td>501mm/min(0.6mm/tooth)</td>
<td>454mm/min(0.38mm/tooth)</td>
<td>760mm/min(0.4mm/tooth)</td>
</tr>
<tr>
<td>Depth of Cut (mm)</td>
<td>ap (Axial)</td>
<td>0.5</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>Overhang length (mm)</td>
<td>ae (Radial)</td>
<td>60</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>Coolant</td>
<td>Wet cutting</td>
<td>Wet cutting</td>
<td>Wet cutting</td>
<td>Air blow</td>
</tr>
</tbody>
</table>

**Results**
- The reduced wear displayed by MP9130 grade with JL breaker gave an increase in efficiency of 40%.
- The increased tool life and reduced wear displayed by MP9130 grade with JL breaker gave an increase in efficiency of 40%.
- Achieved twice the tool life compared to a conventional product.
### APPLICATION EXAMPLES

<table>
<thead>
<tr>
<th>Tool</th>
<th>APX3000-040A06RA</th>
<th>APX3000R203SA20SA</th>
<th>APX3000R254SA25SA</th>
<th>APX3000R254SA25SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert (Grade)</td>
<td>AMT123608PEER-M(MP9130)</td>
<td>AMT123608PEER-M(MP7130)</td>
<td>AMT123608PEER-M(MP7130)</td>
<td>AMT123616PEER-M(MP6130)</td>
</tr>
<tr>
<td>Workpiece</td>
<td>WASPALOY®</td>
<td>SUS420J</td>
<td>SUS304</td>
<td>SCM435H</td>
</tr>
<tr>
<td>Cutting Conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting Speed (m/min)</td>
<td>30</td>
<td>122</td>
<td>140</td>
<td>200</td>
</tr>
<tr>
<td>Feed per Tooth (mm/tooth)</td>
<td>0.033</td>
<td>0.1</td>
<td>0.1</td>
<td>0.12</td>
</tr>
<tr>
<td>Depth of Cut (mm)</td>
<td>1.4</td>
<td>2.54</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Width of Cut (mm)</td>
<td>16</td>
<td>5.08</td>
<td>25</td>
<td>—</td>
</tr>
<tr>
<td>Coolant</td>
<td>Wet</td>
<td>Dry</td>
<td>Dry</td>
<td></td>
</tr>
<tr>
<td>Result</td>
<td>Double tool life compared to conventional products which enabled to cut continuously without interruption.</td>
<td>Actual cutting time has been nearly doubled compared to conventional products.</td>
<td>Tool life has been improved by 25% compared to conventional products because of the superior fracture resistance.</td>
<td>1.5 times longer tool life provided 140% processing efficiency.</td>
</tr>
</tbody>
</table>

Please note that the machining performed in the application examples is dependent on the rigidity of the machine used and the rigidity of the workpiece and clamping.

### Products equipped with MP6100/MP7100/MP9100

**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 driver.
- When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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(Tools specifications subject to change without notice.)