Incredible reliability in profile milling!
MillLine

Ideal solution for three dimensional machining of profile surfaces!

www.tungaloy.com
Innovative and safe anti-rotation system, featuring FIX insert location and higher clamping rigidity

Special inserts with anti-rotation system
- The protrusion on the body and the cavity on the insert bottom fit each other to guarantee exact indexing and prevent insert rotation.
- The unique insert fixation in the pocket allows up to 6 indexes.
- Two types of chipbreakers are available:
  - MJ: General purpose machining
  - ML: Low cutting force machining

Rigid insert clamping system
- The location of the FIX point on the protrusion and the cavity ensures that the insert is pushed inside into the pocket due to the cutting forces, offering rigid clamping.

The cutting force pushes the insert into the insert seat, providing high clamping forces.

Screw-on clamping + problem with insert with flat contact face
Cutting force rotates the insert and reduces the contact area, making insert unstable.
Grades

AH725

For general purpose milling
- Provides high reliability in steel and cast iron machining
- Highly versatile grade with excellent wear and chipping resistance

AH130

For general stainless steel milling
- Reduces crater and notch wear
- Provides exceptionally reliable milling

AH4035

Ideal grade for high chromium content stainless steels
- Newly developed grade with exceptional balance of wear and chipping resistance
- Drastically reduces flank wear and chipping when machining stainless steels

Comparison of tool life

Longer tool life than competitors' products

Further utilizable

<table>
<thead>
<tr>
<th>Cutter</th>
<th>TRP12R050M22.0E05 (z = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert</td>
<td>RPM1204EN-ML</td>
</tr>
<tr>
<td>Grade</td>
<td>AH4035</td>
</tr>
<tr>
<td>Workpiece</td>
<td>SUS420J1 / X20Cr13</td>
</tr>
<tr>
<td>Cutting speed</td>
<td>Vc = 300 m/min</td>
</tr>
<tr>
<td>Feed per tooth</td>
<td>fz = 0.5 mm/t</td>
</tr>
<tr>
<td>Depth of cut</td>
<td>ap = 2.0 mm</td>
</tr>
<tr>
<td>Width of cut</td>
<td>ae = 32.5 mm</td>
</tr>
<tr>
<td>Machine</td>
<td>Horizontal M/C, BT40</td>
</tr>
</tbody>
</table>
**Cutter**

**Bore type**

![Diagram of Bore Type Cutter](image)

- TRP10: Max. ap = 5 mm
- TRP12: Max. ap = 6 mm
- TRP16: Max. ap = 8 mm

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Stock No. of inserts</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
<th>Air hole</th>
<th>Center bolt</th>
<th>Inserts</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRP10R040M16.0E05</td>
<td>● 5 40 30 35 16 18 40 5.6 8.4 0.2</td>
<td>with FSHM8-30H RPMT10T3EN-M*</td>
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<tr>
<td>TRP12R050M22.0E05</td>
<td>● 5 50 38 47 22 20 40 6.3 10.4 0.3</td>
<td>with CM10X30H RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRP12R032M22.0E05</td>
<td>● 5 52 40 49 22 20 40 6.3 10.4 0.3</td>
<td>with CM10X30H RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRP12R063M22.0E06</td>
<td>● 6 63 51 59 22 20 40 6.3 10.4 0.6</td>
<td>with CM10X30H RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRP12R066M27.0E06</td>
<td>● 6 66 54 62 27 22 40 7 12.4 0.6</td>
<td>with CM12X30H RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRP16R063M22.0E05</td>
<td>● 5 63 47 59 22 20 40 6.3 10.4 0.6</td>
<td>with CM10X30H RPMT1606EN-M*</td>
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<tr>
<td>TRP16R066M27.0E05</td>
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<td>with CM12X30H RPMT1606EN-M*</td>
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</tbody>
</table>

**Shank type**

![Diagram of Shank Type Cutter](image)

- ERP10: Max. ap = 5 mm
- ERP12: Max. ap = 6 mm
- ERP16: Max. ap = 8 mm

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Stock No. of inserts</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
<th>Air hole</th>
<th>Inserts</th>
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</thead>
<tbody>
<tr>
<td>ERP10R020M20.0-02</td>
<td>● 2 20 10 25 100 50 150 0.3</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP10R025M25.0-02</td>
<td>● 2 25 15 32 100 60 150 0.5</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP10R032M30.0-04</td>
<td>● 4 32 22 32 100 70 150 0.8</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP10R035M30.0-04</td>
<td>● 4 35 25 32 100 50 150 0.9</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP12R025M25.0-02</td>
<td>⋆ 2 25 13 25 100 50 150 0.6</td>
<td>with RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP12R032M30.0-03</td>
<td>● 3 32 20 32 100 50 150 0.8</td>
<td>with RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP12R040M30.0-04</td>
<td>● 4 40 28 32 100 50 150 0.9</td>
<td>with RPMT1204EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERP16R040M30.0-02</td>
<td>● 2 40 24 32 100 50 150 0.9</td>
<td>with RPMT1606EN-M*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Modular type

![Modular type](image)

**HRP10: Max. ap = 5 mm**  
**HRP12: Max. ap = 6 mm**

### Cat. No. Dimensions (mm) Weight (kg) Applicable Insert

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Stock No. of Inserts</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
<th>Applicable Insert</th>
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</thead>
<tbody>
<tr>
<td>HRP10R020MM10-02</td>
<td>★</td>
<td>øD1 10 49 30 10 15 17.8 M10 0.1</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
</tr>
<tr>
<td>HRP10R025MM12-02</td>
<td>★</td>
<td>øD1 15 57 35 10 17 20.8 M12 0.1</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
</tr>
<tr>
<td>HRP10R032MM16-04</td>
<td>★</td>
<td>øD1 22 63 40 12 22 28.8 M16 0.2</td>
<td>with RPMT10T3EN-M*</td>
<td></td>
</tr>
<tr>
<td>HRP12R025MM12-02</td>
<td>★</td>
<td>øD1 13 57 35 10 17 20.8 M12 0.2</td>
<td>with RPMT1204EN-M*</td>
<td></td>
</tr>
<tr>
<td>HRP12R032MM16-03</td>
<td>★</td>
<td>øD1 20 63 40 12 22 28.8 M16 0.2</td>
<td>with RPMT1204EN-M*</td>
<td></td>
</tr>
</tbody>
</table>

### Insert

![Insert](image)

### Chipbreaker

- **MJ** chipbreaker  
- **ML** chipbreaker

![Chipbreaker](image)
### Standard cutting condition

<table>
<thead>
<tr>
<th>ISO</th>
<th>Workpiece material</th>
<th>Hardness</th>
<th>Priority</th>
<th>Grade</th>
<th>Chip-breaker</th>
<th>Cutting speed Vc (m/min)</th>
<th>Feed per tooth fz (mm/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Carbon steels (S45C / C45, S55C / C55 etc.)</td>
<td>&lt; 300 HB</td>
<td>First choice</td>
<td>AH725</td>
<td>MJ</td>
<td>120 - 250</td>
<td>0.3 - 0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 300 HB</td>
<td>for impact resistance</td>
<td>AH130</td>
<td>MJ</td>
<td>120 - 250</td>
<td>0.3 - 0.7</td>
</tr>
<tr>
<td></td>
<td>Alloy steels (SCM440 / 42CrMo4, SCr415 / 17Cr3 etc.)</td>
<td>150 - 300 HB</td>
<td>First choice</td>
<td>AH725</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.2 - 0.6</td>
</tr>
<tr>
<td></td>
<td>Tool steels (SKD11 / X15CrMoV12 etc.)</td>
<td>&lt; 300 HB</td>
<td>-</td>
<td>AH725</td>
<td>ML</td>
<td>80 - 180</td>
<td>0.2 - 0.4</td>
</tr>
<tr>
<td>M</td>
<td>Stainless steels (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3 etc.)</td>
<td>&lt; 200 HB</td>
<td>First choice</td>
<td>AH130</td>
<td>ML</td>
<td>100 - 250</td>
<td>0.2 - 0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 200 HB</td>
<td>for impact resistance</td>
<td>AH130</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.2 - 0.6</td>
</tr>
<tr>
<td></td>
<td>Stainless steels (SUS430 / X6Cr17 etc.)</td>
<td>&lt; 200 HB</td>
<td>First choice</td>
<td>AH4035</td>
<td>ML</td>
<td>100 - 300</td>
<td>0.2 - 0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 200 HB</td>
<td>for impact resistance</td>
<td>AH4035</td>
<td>MJ</td>
<td>100 - 300</td>
<td>0.2 - 0.6</td>
</tr>
<tr>
<td>K</td>
<td>Grey cast irons (FC250 / GG25 / 250 etc.)</td>
<td>150 - 250 HB</td>
<td>-</td>
<td>AH725</td>
<td>ML</td>
<td>120 - 250</td>
<td>0.3 - 0.7</td>
</tr>
<tr>
<td></td>
<td>Ductile cast irons (FCD400 / GGG40 etc.)</td>
<td>150 - 250 HB</td>
<td>-</td>
<td>AH725</td>
<td>ML</td>
<td>100 - 200</td>
<td>0.3 - 0.7</td>
</tr>
<tr>
<td>H</td>
<td>Hardened steels (SKD61 / X40CrMoV5-1 etc.)</td>
<td>40 - 50 HRC</td>
<td>-</td>
<td>AH725</td>
<td>MJ</td>
<td>60 - 140</td>
<td>0.1 - 0.3</td>
</tr>
<tr>
<td></td>
<td>Hardened steels (SKD11 / X15CrMoV12 etc.)</td>
<td>50 - 60 HRC</td>
<td>-</td>
<td>AH725</td>
<td>MJ</td>
<td>20 - 60</td>
<td>0.05 - 0.2</td>
</tr>
</tbody>
</table>

- Use air blast to remove chips from the work area in slot milling or pocketing operation.
- When machining at high cutting speeds of more than Vc = 1000 m/min, the dynamic balance of the tools must be adjusted.
- Cutting conditions are limited by machine power, workpiece rigidity and spindle output. When the cutting width or depth is large, set Vc and fz to the lower recommended values and check the machine power and vibration.
| Tool dia.: ØDc (mm), Number of revolutions: n (min⁻¹), Feed speed: Vf (mm/min), Depth of cut: ap = 2.0 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ø20 | Ø25 | Ø32 | Ø35 | Ø40 | Ø50 | Ø63 |
| n | Vf | n | Vf | n | Vf | n | Vf | n | Vf | n | Vf | n | Vf |
| 2390 | 2390 | 1910 | 1910 | 1490 | 2980 | 2240 | 1360 | 2720 | 1190 | 2980 | 2380 | 1190 | 950 | 2380 | 760 | 2280 | 1900 |
| 1590 | 630 | 1270 | 510 | 990 | 790 | 590 | 910 | 730 | 800 | 800 | 640 | 320 | 640 | 640 | 510 | 610 | 510 |
| 640 | 150 | 510 | 120 | 400 | 190 | 140 | 360 | 170 | 320 | 190 | 150 | 75 | 250 | 150 | 200 | 140 | 120 |

**Notification for clamping**

- When installing the insert, please carefully locate the insert in the seat and fasten the screw.

Make sure the insert cavity fits the protrusion on the body
### Machining applications

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Tool-Ø d (mm)</th>
<th>Max. depth of cut ap (mm)</th>
<th>Max. ramping angle θ</th>
<th>Max. plunging A (mm)</th>
<th>Machining length for removing uncut portion L (mm)</th>
<th>Min. machining ØD1 (mm)</th>
<th>*Max. machining ØD2 (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP10R020M20.0-02</td>
<td>20</td>
<td>5</td>
<td>2.2°</td>
<td>0.3</td>
<td>12</td>
<td>27</td>
<td>39</td>
</tr>
<tr>
<td>HRP10R020MM10-02</td>
<td>20</td>
<td>5</td>
<td>2.2°</td>
<td>0.3</td>
<td>12</td>
<td>27</td>
<td>39</td>
</tr>
<tr>
<td>ERP10R025M25.0-02</td>
<td>25</td>
<td>5</td>
<td>3.4°</td>
<td>0.7</td>
<td>16</td>
<td>35</td>
<td>49</td>
</tr>
<tr>
<td>HRP10R025MM12-02</td>
<td>25</td>
<td>5</td>
<td>3.4°</td>
<td>0.7</td>
<td>16</td>
<td>35</td>
<td>49</td>
</tr>
<tr>
<td>ERP12R025M25.0-02</td>
<td>25</td>
<td>6</td>
<td>4.4°</td>
<td>0.7</td>
<td>14</td>
<td>33</td>
<td>49</td>
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<tr>
<td>HRP12R025MM12-02</td>
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<td>6</td>
<td>4.4°</td>
<td>0.7</td>
<td>14</td>
<td>33</td>
<td>49</td>
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<tr>
<td>ERP10R032M32.0-04</td>
<td>32</td>
<td>5</td>
<td>8.0°</td>
<td>2.5</td>
<td>23</td>
<td>46</td>
<td>63</td>
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<tr>
<td>HRP10R032MM16-04</td>
<td>32</td>
<td>5</td>
<td>8.0°</td>
<td>2.5</td>
<td>23</td>
<td>46</td>
<td>63</td>
</tr>
<tr>
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<td>5</td>
<td>8.2°</td>
<td>3.0</td>
<td>26</td>
<td>51</td>
<td>69</td>
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<tr>
<td>ERP12R032M32.0-03</td>
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<td>6</td>
<td>10°</td>
<td>2.7</td>
<td>21</td>
<td>53</td>
<td>63</td>
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<tr>
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<td>6</td>
<td>10°</td>
<td>2.7</td>
<td>21</td>
<td>53</td>
<td>63</td>
</tr>
<tr>
<td>ERP12R040M32.0-04</td>
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<td>6.6°</td>
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<td>29</td>
<td>59</td>
<td>79</td>
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<tr>
<td>ERP16R040M32.0-02</td>
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<td>8</td>
<td>8.4°</td>
<td>2.7</td>
<td>25</td>
<td>53</td>
<td>79</td>
</tr>
<tr>
<td>TRP10R040M16.0E05</td>
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<td>5</td>
<td>6.5°</td>
<td>3.0</td>
<td>31</td>
<td>61</td>
<td>79</td>
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<tr>
<td>TRP12R050M22.0E05</td>
<td>50</td>
<td>6</td>
<td>4.5°</td>
<td>2.7</td>
<td>39</td>
<td>79</td>
<td>99</td>
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<tr>
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<td>41</td>
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<td>125</td>
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<td>3.6°</td>
<td>2.7</td>
<td>48</td>
<td>99</td>
<td>125</td>
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<tr>
<td>TRP16R066M27.0E05</td>
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<td>8</td>
<td>3.4°</td>
<td>2.7</td>
<td>51</td>
<td>105</td>
<td>131</td>
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</table>

*For flat bottom hole
### Practical examples

<table>
<thead>
<tr>
<th>Workpiece type</th>
<th>Die</th>
<th>Machine part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutter</td>
<td>ERP12R032M32.0-03</td>
<td>TRP12R050M22.0E05</td>
</tr>
<tr>
<td>Insert</td>
<td>RPMT1204EN-ML</td>
<td>RPMT1204EN-ML</td>
</tr>
<tr>
<td>Grade</td>
<td>AH725</td>
<td>AH130</td>
</tr>
</tbody>
</table>

- **Workpiece material**: SKD61 / X40CrMoV5-1 Corrosion-resistant stainless steel

<table>
<thead>
<tr>
<th>Cutting conditions</th>
<th>Die</th>
<th>Machine part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed: $V_c$ (m/min)</td>
<td>130</td>
<td>200</td>
</tr>
<tr>
<td>Feed per tooth: $f_z$ (mm/t)</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Depth of cut: $a_p$ (mm)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Width of cut: $a_e$ (mm)</td>
<td>26.0</td>
<td>&lt; 50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method of machining</th>
<th>Die</th>
<th>Machine part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile milling</td>
<td></td>
<td>Profile milling on curved surface</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coolant</th>
<th>Die</th>
<th>Machine part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical M/C, BT40</td>
<td></td>
<td>5 axis M/C, BT50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machine</th>
<th>Die</th>
<th>Machine part</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

#### Results

- **Tool life**: 15% up!
- **Productivity**: 1.25 times!

Due to the high toughness and rigidity, higher cutting speed and feed is possible without any chipping or vibration. This improves productivity by 25%.

<table>
<thead>
<tr>
<th>Workpiece type</th>
<th>Machine part</th>
<th>Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutter</td>
<td>TRP12R050M22.0E05</td>
<td>ERP10R032M32.0-04</td>
</tr>
<tr>
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<td>RPMT1204EN-MJ</td>
<td>RPMT10T3EN-ML</td>
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<tr>
<td>Grade</td>
<td>AH4035</td>
<td>AH4035</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Workpiece material</th>
<th>Machine part</th>
<th>Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUS420J1 / X20Cr13</td>
<td>Martensitic stainless steel</td>
<td></td>
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<table>
<thead>
<tr>
<th>Cutting conditions</th>
<th>Machine part</th>
<th>Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed: $V_c$ (m/min)</td>
<td>300</td>
<td>275</td>
</tr>
<tr>
<td>Feed per tooth: $f_z$ (mm/t)</td>
<td>0.5</td>
<td>0.11</td>
</tr>
<tr>
<td>Depth of cut: $a_p$ (mm)</td>
<td>2.0</td>
<td>0.5 - 1.0</td>
</tr>
<tr>
<td>Width of cut: $a_e$ (mm)</td>
<td>&lt; 50</td>
<td>&lt; 32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method of machining</th>
<th>Machine part</th>
<th>Blade</th>
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</thead>
<tbody>
<tr>
<td>Profile milling on curved surface</td>
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<td>Profile milling on curved surface</td>
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<table>
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<tr>
<th>Coolant</th>
<th>Machine part</th>
<th>Blade</th>
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<tbody>
<tr>
<td>Air blast</td>
<td></td>
<td>Wet</td>
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<thead>
<tr>
<th>Machine</th>
<th>Machine part</th>
<th>Blade</th>
</tr>
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<tbody>
<tr>
<td>5 axis M/C, BT50</td>
<td></td>
<td>5 axis M/C, BT50</td>
</tr>
</tbody>
</table>

#### Results

- **Machining length (m)**: Tool life 15% up!
- **Chip removal rate Q**: Productivity 1.3 times!

Due to the high rigidity, higher cutting speed and feed is possible without any chipping or vibration. This improves productivity by 30%.