Three times the selection, more than a triple advantage
ACCELERATED MACHINING
DoTriple-Mill features an improved dovetail clamping structure and offers *triple advantage of using square, octagonal, and round inserts* in the same pocket.
Brings a top performance in every operation: from high feed milling, scale removing, finish milling ... to stainless steel milling

Versatility
3 types of double sided inserts fit in the same pocket

- Three different pitches are available: standard, close, and extra-close pitches

Rigid clamping
Dovetail structure provides high clamping rigidity with only one screw
- Improved performance especially in machining high-temperature materials
- Extended tool life
Rich grade lineup for every kind of material
- A total of four grades, including two new CVD grades

<table>
<thead>
<tr>
<th>AH3135</th>
<th>P</th>
<th>M</th>
<th>Steel Stainless</th>
</tr>
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<tbody>
<tr>
<td>PVD grade for high fracture resistance</td>
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<td></td>
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<tr>
<td>Most suitable for steel and stainless steel in general cutting parameters</td>
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<table>
<thead>
<tr>
<th>AH120</th>
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<th>K</th>
<th>Steel Cast Iron</th>
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<tbody>
<tr>
<td>PVD grade with a well-balanced wear and fracture resistance</td>
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<tr>
<td>Ideal for general machining of steel and stainless steel</td>
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<table>
<thead>
<tr>
<th>T1215</th>
<th>K</th>
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<tbody>
<tr>
<td>CVD grade with outstanding wear and chipping resistance</td>
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<tr>
<td>Best for cast iron at high-speed machining</td>
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<table>
<thead>
<tr>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3225</td>
</tr>
<tr>
<td>CVD grade with excellent chipping and fracture resistance</td>
</tr>
<tr>
<td>Most suited for steel and stainless steel at high-speed machining</td>
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</tbody>
</table>

Special Surface Technology

Enhanced coating resistance to chipping and peeling
- Special surface post-treatment technology improves surface smoothness

Superior wear resistance in high speed cutting
- A thick alumina (Al2O3) layer improves insert life in a high cutting temperature generated during high speed machining

Enhanced coating resistance to peeling
- Strong adhesion between the carbide substrate and the coating layer improves coating resistance to peeling

Application Area

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<tr>
<td>T3225</td>
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<tr>
<td>Cutting speed Vc (m/min) High Low</td>
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<tr>
<td>Stable Unstable</td>
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</tbody>
</table>

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</table>

w w w. t u n g a l o y. c o m
Features of SNMU and SNGU inserts

Double-sided, square inserts with eight cutting edges
- most suitable for a large depth of cut
- Free cutting inserts with excellent chip control

The optimized cutting edge height allows smooth chips flow in cutting smearing materials like stainless steel. Due to a large rake angle, less cutting force is produced, making the insert optimal for use even on a less rigid spindle like BT40.

Chip formation in stainless steel milling

Chips are formed in optimal large curls for smooth evacuation.

Small curls are formed, causing heavy load on the insert

Cutting force

Cutting force (N)

- Superior surface finish quality

The insert incorporates built-in wipers of for improved surface quality.

Surface roughness

- 

Surface roughness: Ra (μm)

Competitor A

Competitor B

Competitor

Steel

Stainless

Competitor

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**- Stable tool life**

The MJ chipbreaker is most suitable for steel and stainless steel milling. The MH chipbreaker with an enhanced cutting edge delivers long, predictable insert life in removing scales from cast stainless steel.

#### Tool life comparison in alloy steel milling

<table>
<thead>
<tr>
<th>Cutting length (m)</th>
<th>Competitor A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.5 1 1.5 2 2.5 3</td>
</tr>
</tbody>
</table>

**New**

- **Cutter**: TASN13J125B38.1R07 (øDc = 125mm, z=1)
- **Insert**: SNMU1307ANEN-MJ T3225
- **Workpiece material**: SCM440 (290HB)
- **Cutting speed**: Vc = 300 m/min
- **Feed per tooth**: fz = 0.2 mm/t
- **Depth of cut**: ap = 3 mm
- **Width of cut**: ae = 75 mm
- **Coolant**: Dry

#### Tool life comparison in stainless steel milling

<table>
<thead>
<tr>
<th>Cutting length (m)</th>
<th>Competitor A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2 4 6 8</td>
</tr>
</tbody>
</table>

**New**

- **Cutter**: TASN13M100B32.0R08 (øDc = 100 mm, z = 1)
- **Insert**: SNMU1307ANEN-MJ
- **Workpiece material**: SUS304 / X5CrNi18-9
- **Cutting speed**: Vc = 150 m/min
- **Feed per tooth**: fz = 0.15 mm/t
- **Depth of cut**: ap = 3.0 mm
- **Width of cut**: ae = 75 mm
- **Coolant**: Dry

#### Tool life comparison in stainless steel milling

<table>
<thead>
<tr>
<th>Cutting length (m)</th>
<th>Competitor A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.5 1 1.5 2 2.5 3.5 4</td>
</tr>
</tbody>
</table>

**New**

- **Cutter**: TASN13M063B22.0R08 (øDc = 63mm, z=1)
- **Insert**: SNGU1307ANEN-MH T3225
- **Workpiece material**: 1.4848
- **Cutting speed**: Vc = 90 m/min
- **Feed per tooth**: fz = 0.28 mm/t
- **Depth of cut**: ap = 2.5 mm
- **Width of cut**: ae = 25 mm
- **Coolant**: Dry

#### Tool life comparison in ductile cast iron milling

<table>
<thead>
<tr>
<th>Cutting length (m)</th>
<th>Competitor A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

**New**

- **Cutter**: TASN13J125B38.1R07 (øDc = 125mm,z=1)
- **Insert**: SNMU1307ANEN-MJ T1215
- **Workpiece material**: FCD600 (160HB)
- **Cutting speed**: Vc = 200 m/min
- **Feed per tooth**: fz = 0.35 mm/t
- **Depth of cut**: ap = 3.0 mm
- **Width of cut**: ae = 75 mm
- **Coolant**: Wet
**Features of ONMU and ONGU inserts**

Double-sided, octagonal insert with 16 cutting edges - high economy inserts

- Light cutting force due to excellent chip control

The optimized cutting edge creates barrel-formed chips for easy removal, allowing an operation at higher feed rate.

**- Superior surface finish**

The wiper insert with eight cutting edges assures a superior finish on the machined surface

**- Stability in insert life**

Ensures tool life stability in milling stainless steel
Features of RNMU and RNGU inserts

Double-sided, round inserts with eight cutting edges - an ideal insert for a roughing operation

- Can be used either in a high feed milling or in an operation with a large depth of cut

The robust cutting edge design of the RNMU and RNGU inserts facilitates a reliable rough milling even on an unstable surface. The chipbreaker is optimized for a high feed rate assists to form large-curl chips for easy chip evacuation.

- Lower cutting force

The helical cutting edge on the insert lowers the cutting load. Thermal damage to the cutting edge is thus reduced, leading to longer insert life.

Tool life comparison in steel milling

Steel

Competitor A

Depth of cut: $a_p$ (mm)

Feed: $f_z$ (mm/tooth)

Economical type

High feed & rough machining

Cutting force

<table>
<thead>
<tr>
<th>Cutting force (N)</th>
<th>Competitor A</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<td>1500</td>
</tr>
<tr>
<td>1500</td>
<td>1000</td>
</tr>
<tr>
<td>2000</td>
<td>500</td>
</tr>
</tbody>
</table>

Cutting length (m)

Competitor A

Cutting force (N)

Cutter: TASN13M100B32.0R08 ($D_c = 100$ mm, $z = 1$)
Insert: RNMU1307ANEN-MJ
Workpiece material: S55C / C55
Cutting speed: $V_c = 200$ m/min
Feed per tooth: $f_z = 0.2$ mm/t
Depth of cut: $a_p = 2.0$ mm
Width of cut: $a = 75$ mm
Coolant: Dry

Cutting force (N)

Cutter: TASN13M100B32.0R08 ($D_c = 100$ mm, $z = 1$)
Insert: RNMU1307ANEN-MJ
Workpiece material: SCM440 / 42CrMo4
Cutting speed: $V_c = 160$ m/min
Feed per tooth: $f_z = 0.2$ mm/t
Depth of cut: $a_p = 2.0$ mm
Width of cut: $a = 105$ mm
Coolant: Dry

www.tungaloy.com
**TASN13**

45° face milling cutter to seat double sided square, octagonal, round insert

<table>
<thead>
<tr>
<th>Designation</th>
<th>aDc1</th>
<th>aDc2</th>
<th>aDc3</th>
<th>z</th>
<th>øDb</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>ød</th>
<th>ℓ</th>
<th>a</th>
<th>b</th>
<th>Kg</th>
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<td>41</td>
<td>40</td>
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<td>20</td>
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**SPARE PARTS**

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<th>Clamping screw</th>
<th>Grip</th>
<th>Lubricant</th>
<th>Shell locking bolt</th>
<th>Shell locking bolt 1</th>
<th>Torx bit</th>
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<td>CM12X30H</td>
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<td>H-TB2W</td>
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<td>TMBA-M16H</td>
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ACCELERATED MACHINING

INSERT

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<th>rε</th>
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<th>Coated</th>
<th>A</th>
<th>ød</th>
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<td>-</td>
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*: First choice  **: Second choice

: New product  : Line up


Steel  Stainless  Cast iron  Non-ferrous  Superalloys  Hard materials

First choice  Second choice

Website: www.tungaloy.com


: New product  : Line up
## STANDARD CUTTING CONDITIONS

### SNM / SNGU / ONMU / ONGU

<table>
<thead>
<tr>
<th>ISO</th>
<th>Workpiece materials</th>
<th>Hardness</th>
<th>Priority</th>
<th>Grades</th>
<th>Chip-breaker</th>
<th>Cutting speed Vc (m/min)</th>
<th>Feed per tooth fz (mm/t)</th>
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</thead>
<tbody>
<tr>
<td>P</td>
<td>Low carbon steel (C15, etc.)</td>
<td>200 - 300HB</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.1 - 0.3</td>
</tr>
<tr>
<td>M</td>
<td>High carbon and alloy steel (55S5 / C55, SCM440 / 42CrMo4, etc.)</td>
<td>150 - 300HB</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.1 - 0.4</td>
</tr>
<tr>
<td></td>
<td>Prehardened steel (NAK80, PX5, etc.)</td>
<td>30 - 40HRC</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 200</td>
<td>0.1 - 0.4</td>
</tr>
<tr>
<td></td>
<td>Stainless steel (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.)</td>
<td>- 200HB</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 200</td>
<td>0.1 - 0.35</td>
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<tr>
<td></td>
<td>Stainless cast steel (SCH20XNb / 1.4849, etc.)</td>
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<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>60 - 120</td>
<td>0.1 - 0.3</td>
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<tr>
<td>K</td>
<td>Gray cast iron (FC250 / 250, etc.)</td>
<td>150 - 250 HB</td>
<td>First choice</td>
<td>AH120</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.1 - 0.3</td>
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<tr>
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<td>Ductile cast iron (FCD400 / 400-15, FCD600 / 600-3, etc.)</td>
<td>150 - 250 HB</td>
<td>First choice</td>
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<td>MJ</td>
<td>80 - 200</td>
<td>0.1 - 0.3</td>
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<td>S</td>
<td>Titanium alloys (Ti-6Al-4V, etc.)</td>
<td>- 40HRC</td>
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<td>MJ</td>
<td>30 - 60</td>
<td>0.1 - 0.3</td>
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<td>Heat-resistant alloys (Inconel718, etc.)</td>
<td>- 40HRC</td>
<td>First choice</td>
<td>AH120</td>
<td>MJ</td>
<td>10 - 40</td>
<td>0.05 - 0.15</td>
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<tr>
<td>H</td>
<td>Hardened steel (SKD61 / X40CrMoV5-1, etc.)</td>
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<td>(SKD11 / X153CrMoV12, etc.)</td>
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<td>AH120</td>
<td>MJ</td>
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### RNM / RNGU

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<th>ISO</th>
<th>Workpiece materials</th>
<th>Hardness</th>
<th>Priority</th>
<th>Grades</th>
<th>Chip-breaker</th>
<th>Cutting speed Vc (m/min)</th>
<th>Feed per tooth fz (mm/t)</th>
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<tbody>
<tr>
<td>P</td>
<td>Low carbon steel (C15, etc.)</td>
<td>200 - 300 HB</td>
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<td>AH3135</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.1 - 0.3</td>
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<tr>
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<td>High carbon and alloy steel (55S5 / C55, SCM440 / 42CrMo4, etc.)</td>
<td>150 - 300 HB</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 250</td>
<td>0.1 - 0.4</td>
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<td>Prehardened steel (NAK80, PX5, etc.)</td>
<td>30 - 40HRC</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 200</td>
<td>0.1 - 0.4</td>
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<td></td>
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<td>- 200HB</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
<td>100 - 200</td>
<td>0.1 - 0.35</td>
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<td>MJ</td>
<td>60 - 120</td>
<td>0.1 - 0.3</td>
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<tr>
<td>K</td>
<td>Gray cast iron (FC250 / 250, etc.)</td>
<td>150 - 250 HB</td>
<td>First choice</td>
<td>AH120</td>
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<td>Ductile cast iron (FCD400 / 400-15, FCD600 / 600-3, etc.)</td>
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<td>AH120</td>
<td>MJ</td>
<td>80 - 200</td>
<td>0.1 - 0.3</td>
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<td>S</td>
<td>Titanium alloys (Ti-6Al-4V, etc.)</td>
<td>- 40HRC</td>
<td>First choice</td>
<td>AH3135</td>
<td>MJ</td>
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<td>0.1 - 0.3</td>
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<td>- 40HRC</td>
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<td>MJ</td>
<td>10 - 40</td>
<td>0.05 - 0.15</td>
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<td>H</td>
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<td>MJ</td>
<td>80 - 130</td>
<td>0.1 - 0.35</td>
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<td>(SKD11 / X153CrMoV12, etc.)</td>
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<td>MJ</td>
<td>50 - 70</td>
<td>0.5 - 0.6</td>
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*When using T3225 or T1215, decrease the feed per tooth (fz) to 80% of the above-mentioned value.*
Selection guide for face milling cutters

For workpiece configuration and spindle power

<table>
<thead>
<tr>
<th>Spindle power</th>
<th>light interrupted cuts</th>
<th>Edging of thin sections</th>
<th>Thin plates / hollow structure</th>
<th>Heavy interrupted cuts / scale or unstable surface</th>
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<tr>
<td>BT40 (≥15kW)</td>
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<td>BT50 (≥22kW)</td>
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<td>BT50/BT60 (≥30kW)</td>
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![Images of milling cutters](image_url)
**PRACTICAL EXAMPLES**

<table>
<thead>
<tr>
<th>Workpiece type</th>
<th>Turbine blade</th>
<th>Turbine housing</th>
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</thead>
<tbody>
<tr>
<td>Cutter</td>
<td>TASN13J100B31.7R08 (ø100, z = 8)</td>
<td>TASN13J100B32.0R08 (ø100, z = 8)</td>
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<td>Insert</td>
<td>ONGU0507ANEN-MJ</td>
<td>SNGU1307ANEN-MJ</td>
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<tr>
<td>Grade</td>
<td>AH3135</td>
<td>AH3135</td>
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<tr>
<td>Workpiece material</td>
<td>10705BU (Stainless steel)</td>
<td>GX40CNISINb22-10</td>
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<table>
<thead>
<tr>
<th>Cutting conditions</th>
<th>Workpiece material</th>
<th>DoTripleMill</th>
<th>Competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed: ( V_c ) (m/min)</td>
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<td>Tool life 34% up!</td>
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<tr>
<td>Feed per tooth: ( f_z ) (mm/t)</td>
<td>0.10</td>
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<tr>
<td>Feed speed: ( V_f ) (m/min)</td>
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<tr>
<td>Depth of cut: ( a_p ) (mm)</td>
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<tr>
<td>Width of cut: ( a_e ) (mm)</td>
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</tr>
<tr>
<td>Machining</td>
<td>Face milling (Roughing)</td>
<td>Face milling</td>
<td>Face milling</td>
</tr>
<tr>
<td>Coolant</td>
<td>External</td>
<td>External</td>
<td>External</td>
</tr>
<tr>
<td>Machine</td>
<td>Horizontal M/C, BT50</td>
<td>Horizontal M/C, BT50</td>
<td>Horizontal M/C, BT50</td>
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</tbody>
</table>

- **Results**

  - **Tool life**
    - With DoTripleMill, the tool life is increased by 34% compared to the competitor.
  - **Tool life**
    - DoTripleMill extends tool life by 1.3 times compared with the competitor.

<table>
<thead>
<tr>
<th>Workpiece type</th>
<th>Turbine housing</th>
<th>Pallete</th>
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<tbody>
<tr>
<td>Cutter</td>
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<td>TASN13J160B50.8R08 (ø160, z = 8)</td>
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<tr>
<td>Insert</td>
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<td>RNGU1307ZNER-MJ</td>
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<tr>
<td>Grade</td>
<td>AH3135</td>
<td>AH120</td>
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<tr>
<td>Workpiece material</td>
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<td>FC300</td>
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<table>
<thead>
<tr>
<th>Cutting conditions</th>
<th>Workpiece material</th>
<th>DoTripleMill</th>
<th>Competitor</th>
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</thead>
<tbody>
<tr>
<td>Cutting speed: ( V_c ) (m/min)</td>
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<td>Tool life 1.3 time!</td>
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<tr>
<td>Feed per tooth: ( f_z ) (mm/t)</td>
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</tr>
<tr>
<td>Feed speed: ( V_f ) (m/min)</td>
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<tr>
<td>Depth of cut: ( a_p ) (mm)</td>
<td>1.3</td>
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<tr>
<td>Width of cut: ( a_e ) (mm)</td>
<td>100</td>
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</tr>
<tr>
<td>Machining</td>
<td>Face milling (Roughing)</td>
<td>Face milling (Roughing)</td>
<td>Face milling (Roughing)</td>
</tr>
<tr>
<td>Coolant</td>
<td>External</td>
<td>External</td>
<td>Dry</td>
</tr>
<tr>
<td>Machine</td>
<td>Vertical M/C, BT50</td>
<td>Horizontal M/C, BT50</td>
<td>Horizontal M/C, BT50</td>
</tr>
</tbody>
</table>

- **Results**

  - **Tool life**
    - DoTripleMill extends tool life by 1.3 times compared with the competitor.
  - **Productivity**
    - Practical examples

  - **Tool life**
    - DoTripleMill extends tool life by 1.3 times compared with the competitor.
  - **Productivity**
    - Practical examples

**Due to DoTripleMill’s low cutting force, the feed rate is maximized despite the weak fixture setting of the component.**

**Tough RNGU insert offers stable and highly efficient machining even on the cast surface.**
### PRACTICAL EXAMPLES

#### Workpiece type | Flange yoke | Bogie truck
---|---|---
**Cutter** | TASN13J080B25.4R08 (ø80, z = 8) | TASN13J160B50.8R08 (ø160, z = 8)
**Insert** | SMU1307ANEN-MJ | SMU1307ANEN-MJ
**Grade** | T3225 | T3225

#### Workpiece material
- S45C (DIN C45 / AISI 1045 / GB 45)
- SM 490 A (DIN St52-3 / A573-81)

#### Cutting conditions
- **Cutting speed:** $V_c$ (m/min)
- **Feed per tooth:** $f_z$ (mm/t)
- **Feed speed:** $V_f$ (m/min)
- **Depth of cut:** $a_p$ (mm)
- **Width of cut:** $a_e$ (mm)

#### Machining
- **Face milling (Roughing)**

#### Coolant
- **External coolant**

#### Machine
- **Horizontal M/C, BT40**

#### Results
- **Num of pieces (pcs)**

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#### Workpiece type | Bulb body | Pump housing
---|---|---
**Cutter** | TASN13J125B38.1R10 (ø125, z = 10) | TASN13J125B38.1R07 (ø125, z = 7)
**Insert** | SMU1307ANEN-MJ | SMU1307ANEN-MJ
**Grade** | T1215 | T1215

#### Workpiece material
- FCV410 (DIN GJV450)
- FCD600 (DIN GJV450)

#### Cutting conditions
- **Cutting speed:** $V_c$ (m/min)
- **Feed per tooth:** $f_z$ (mm/t)
- **Feed speed:** $V_f$ (m/min)
- **Depth of cut:** $a_p$ (mm)
- **Width of cut:** $a_e$ (mm)

#### Machining
- **Face milling (Roughing)**

#### Coolant
- **Air**

#### Machine
- **Horizontal M/C, BT50**

#### Results
- **Num of pieces (pcs)**

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#### Workpiece type | Cutters | Inserts | Grades
---|---|---|---

#### Cutting conditions
- **Cutting speed:** $V_c$ (m/min)
- **Feed per tooth:** $f_z$ (mm/t)
- **Feed speed:** $V_f$ (m/min)
- **Depth of cut:** $a_p$ (mm)
- **Width of cut:** $a_e$ (mm)

#### Machining
- **Face milling (Roughing)**

#### Coolant
- **Air**

#### Machine
- **Horizontal M/C, BT50**

#### Results
- **Num of pieces (pcs)**

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#### Tool life
- **1.25 time**
- **1.5 time**
- **1.8 time**
- **1.3 time**

**Criteria of tool life was burr.** T3225 was long tool life due to less chipping and fracture on the cutting edge.

**Criteria of tool life was burr.** T1215 showed stable tool life in machining vermicular cast iron because T1215 had good chipping resistance.

T1215 showed longer tool life in spite of bigger depth of cut than competitor. T1215 has both good wear resistance and toughness.