Gear Milling
Productivity and innovation — powerful gear cutting tools with modern design

In the production stage of large gears, requirements for cutter machines have changed drastically. The ever-increasing cost pressure on production processes and increasing quality requirements on the components provide customers and tool suppliers with new challenges. This is in accordance with the powerful and innovative tool concepts necessary for a cost-effective production. To meet these demands, we provide powerful solutions with optimized cutting division and positive cutting geometry, as well as custom solutions. Our goal is to increase productivity and optimisation in new and existing product lines.

Features and Benefits

Recommended cutting and power requirements and CPP calculation are also important parts of tool care and productivity. Our technical assistance and tool selection help to round out this complete package.

- Optimised cutting division along with the use of positive cutting geometries ensure low power requirements at higher feed rates.
- Tool wear is minimised by optimising the indexable insert number to achieve smoother cuts and increased productivity.
- High cutting speeds achievable through innovative and material-specific tailored cutting materials and geometries.
- Low tooling costs are achieved by using inserts with up to eight usable cutting edges.
- Optimised accessibility for easy insert changes.

GOAL:
- Optimised number of effective cutting edges per insert
- Insert positioning
- Cutter design
- Positive geometry
- Standardised inserts

CONCEPT:
- Higher speed and feed (cycle time saved)
- Tool cost reduction
- Smoother cutting
- Less power consumption
- Chip forming
- Longer tool life/cutting edge optimisation
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### Roughing Module (9) 12–27

CPP reduction due to the 8-edged Gear-FIX insert.

<table>
<thead>
<tr>
<th>Type</th>
<th>Roughing (stock 1mm)</th>
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</thead>
<tbody>
<tr>
<td>Cutting diameter</td>
<td>D1 [mm]</td>
</tr>
<tr>
<td>Number of eff. inserts</td>
<td>Zeff</td>
</tr>
<tr>
<td>Module</td>
<td>m</td>
</tr>
<tr>
<td>Number of teeth</td>
<td>Z</td>
</tr>
<tr>
<td>Pressure angle</td>
<td>PA [°]</td>
</tr>
<tr>
<td>Speed</td>
<td>vc [m/min]</td>
</tr>
<tr>
<td>Feed</td>
<td>vf [mm/min]</td>
</tr>
<tr>
<td>Depth of cut</td>
<td>DOC [mm]</td>
</tr>
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</table>

### Roughing Module 17–38 (50)

Roughing up to 60mm with 1 cut • Up to 25% less power consumption.

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
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<td>No. of eff. inserts</td>
<td>Zeff</td>
</tr>
<tr>
<td>Module</td>
<td>m</td>
</tr>
<tr>
<td>No. of teeth</td>
<td>Z</td>
</tr>
<tr>
<td>Pressure angle</td>
<td>PA [°]</td>
</tr>
<tr>
<td>Speed</td>
<td>vc [m/min]</td>
</tr>
<tr>
<td>Feed</td>
<td>vf [mm/min]</td>
</tr>
<tr>
<td>Depth of cut</td>
<td>DOC [mm]</td>
</tr>
</tbody>
</table>
Pre-Finishing Internal Module 9–25

Flexible use of inserts for different modules.

<table>
<thead>
<tr>
<th>type</th>
<th>pre-finishing internal (stock 0.3mm)</th>
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</thead>
<tbody>
<tr>
<td>cutting diameter</td>
<td>D1 [mm]</td>
</tr>
<tr>
<td>number of eff. inserts</td>
<td>Zeff</td>
</tr>
<tr>
<td>module</td>
<td>m</td>
</tr>
<tr>
<td>number of teeth</td>
<td>Z</td>
</tr>
<tr>
<td>pressure angle</td>
<td>PA [°]</td>
</tr>
<tr>
<td>speed</td>
<td>vc [m/min]</td>
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<tr>
<td>feed</td>
<td>vf [mm/min]</td>
</tr>
<tr>
<td>depth of cut</td>
<td>DOC [mm]</td>
</tr>
</tbody>
</table>

Pre-Finishing External Module 9–25

Patented technology: Profiled inserts, 4 cutting edges, and positive geometry.

<table>
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<tbody>
<tr>
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<td>D1 [mm]</td>
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<tr>
<td>number of eff. inserts</td>
<td>Zeff</td>
</tr>
<tr>
<td>module</td>
<td>m</td>
</tr>
<tr>
<td>number of teeth</td>
<td>Z</td>
</tr>
<tr>
<td>pressure angle</td>
<td>PA [°]</td>
</tr>
<tr>
<td>speed</td>
<td>vc [m/min]</td>
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<tr>
<td>feed</td>
<td>vf [mm/min]</td>
</tr>
<tr>
<td>depth of cut</td>
<td>DOC [mm]</td>
</tr>
</tbody>
</table>
Gear Milling
Gasher Roughing

- Up to 8 true cutting edges.
- Less power consumption due to positive geometry.
- Smooth cutting performance due to modern design.
- Machining up to module 30 with one cut.
- Modifications and further dimensions (D1, D, W...) upon request.

### Roughing Gasher Module 12–27/PA20

<table>
<thead>
<tr>
<th>Cutting View</th>
<th>Profile — PA20°</th>
<th>Module Max*</th>
<th>D1</th>
<th>Catalogue Number</th>
<th>Zeff</th>
<th>D</th>
<th>W</th>
<th>Ztot</th>
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<td>80 100</td>
<td>30 12 18</td>
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<td>49.50 18.75 23.58 6.08</td>
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<tr>
<td>60.75 23.75 29.85 6.08</td>
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<td>27</td>
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<td>60 80</td>
<td>80 100</td>
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### Roughing Gasher Module 17–38/PA25

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<tr>
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<td>38</td>
<td>300 GGR172525300</td>
<td>6 3</td>
<td>60 80</td>
<td>80 100</td>
<td>48 12 36</td>
<td></td>
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</tr>
</tbody>
</table>

*Basic profile: 1.25/0.38/1.0 ISO 53.2
Alternative roughing solutions for your applications.

- Customised cutting profiles.
  - On request with topping or semi-topping.
- Profile optimised. For example: pinion.*
  - Less stock for finishing operation.
- Big module >35.
  - FR18 inserts.
- Small module 5–12.
  - FR12 inserts.
- Duplex gasher for double feed.*
  - On request: triple gasher.
- Small module (up to 4).*
  - Full profiled inserts.
  - Positive cutting.

* See also: Custom Solutions and Alternatives.
Gear Milling
Gasher Pre-Finishing

- 4 true cutting edges (patented technology).
- Less power consumption due to positive geometry.
- Pre-Finishing for grinding with equal stock after milling.
- Smooth cutting performance due to modern design.
- Standardised inserts with customised toolholder.
- Modifications and further dimensions (D1, D, W...) upon request.

### Pre-Finishing Gasher Module 9–25/PA20°

<table>
<thead>
<tr>
<th>module min*</th>
<th>module max*</th>
<th>D1 min</th>
<th>D1 max</th>
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<th>ID* no. int. ext.</th>
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<td>320</td>
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<td>4</td>
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<td>360</td>
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<td>4</td>
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<td>320</td>
<td>380</td>
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<td>4</td>
<td>24</td>
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<td>340</td>
<td>400</td>
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<td>4</td>
<td>32</td>
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*Recommendation for basic profile: 1.25/0.38/1.0 ISO 53.2; PA20.

### Pre-Finishing Gasher Module 12–26/PA25

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<th>D1 max</th>
<th>Zeff</th>
<th>Ztot no.</th>
<th>ID* no.</th>
<th>ID* no. int. ext.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>14</td>
<td>280</td>
<td>340</td>
<td>8</td>
<td>4</td>
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<td>16</td>
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<tr>
<td>15</td>
<td>17</td>
<td>300</td>
<td>360</td>
<td>8</td>
<td>4</td>
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<td>16</td>
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<tr>
<td>18</td>
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<td>8</td>
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<td>21</td>
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<td>340</td>
<td>400</td>
<td>8</td>
<td>4</td>
<td>32</td>
<td>16</td>
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<td>24</td>
<td>26</td>
<td>360</td>
<td>420</td>
<td>8</td>
<td>4</td>
<td>24</td>
<td>16</td>
</tr>
</tbody>
</table>

*Recommendation for basic profile: 1.25/0.38/1.0 ISO 53.2; PA25.
Two examples for the flexible use of the patented Kennametal flank inserts. 4 true cutting edges and positive geometry for an optimised pre-finishing process. Through building up your own insert-standard programme in combination with customised toolholders, you will be able to save time and control the variety of inserts.

Basic profile: ISO 53.2: Profile A; 1,25/0,38/1,0 PA20
Module 12 to 16: stock after milling +/- 0,05mm
Module 17 to 25 stock after milling +/- 0,08mm

Basic profile: ISO 53.2: Profile A; 1,25/0,38/1,0 PA20
Module 12 to 19: stock after milling +/- 0,12mm
Module 20 to 25 stock after milling +/- 0,15mm
Gear Milling
Finishing Application Examples

**Finishing Module 6–22**

- Cost-saving design for big lot sizes.
- 4 true cutting edges.

![Flexible use of the cutter body for different modules.](image)

<table>
<thead>
<tr>
<th>Type</th>
<th>Cutting Diameter D1 [mm]</th>
<th>Number of Eff. Inserts Zeff</th>
<th>Module m</th>
<th>Number of Teeth Z</th>
<th>Pressure Angle PA [°]</th>
<th>Feed vf [mm/min]</th>
<th>Depth of Cut DOC [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>400</td>
<td>10</td>
<td>12</td>
<td>153</td>
<td>20</td>
<td>420</td>
<td>27</td>
</tr>
</tbody>
</table>

**Finishing Module 12–20**

- Cost-saving design for big lot sizes.
- 4 true cutting edges.

![Patented technology: Profilled inserts 4 cutting edges.](image)

<table>
<thead>
<tr>
<th>Type</th>
<th>Cutting Diameter D1 [mm]</th>
<th>Number of Eff. Inserts Zeff</th>
<th>Module m</th>
<th>Number of Teeth Z</th>
<th>Pressure Angle PA [°]</th>
<th>Feed vf [mm/min]</th>
<th>Depth of Cut DOC [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>420</td>
<td>16</td>
<td>16</td>
<td>180</td>
<td>20</td>
<td>800</td>
<td>1</td>
</tr>
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</table>

Flexible use of the cutter body for different modules.

Patented technology:
Profi led inserts 4 cutting edges.
Gear Milling

Finishing Application Examples

- Flexible design for different profiles and modules.
- 2 true cutting edges.

**Finishing Module 23–45**

- Cost-saving design for profiles with protuberance.
- 4 true cutting edges.

<table>
<thead>
<tr>
<th>type</th>
<th>finishing module</th>
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</thead>
<tbody>
<tr>
<td>cutting diameter</td>
<td>D1 [mm]</td>
</tr>
<tr>
<td>module</td>
<td>m</td>
</tr>
<tr>
<td>number of teeth</td>
<td>Z</td>
</tr>
<tr>
<td>pressure angle</td>
<td>PA [°]</td>
</tr>
<tr>
<td>speed</td>
<td>v [m/min]</td>
</tr>
<tr>
<td>feed</td>
<td>vf [mm/min]</td>
</tr>
<tr>
<td>depth of cut</td>
<td>DOC [mm]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Optimised chip forming due to positive geometry.

<table>
<thead>
<tr>
<th>type</th>
<th>finishing with protuberance</th>
</tr>
</thead>
<tbody>
<tr>
<td>cutting diameter</td>
<td>D1 [mm]</td>
</tr>
<tr>
<td>module</td>
<td>m</td>
</tr>
<tr>
<td>number of teeth</td>
<td>Z</td>
</tr>
<tr>
<td>pressure angle</td>
<td>PA [°]</td>
</tr>
<tr>
<td>speed</td>
<td>v [m/min]</td>
</tr>
<tr>
<td>feed</td>
<td>vf [mm/min]</td>
</tr>
<tr>
<td>depth of cut</td>
<td>DOC [mm]</td>
</tr>
</tbody>
</table>

kennametal.com
Gear Milling Hobs

Hobbing is a useful technology and there are a lot of different kinds available on the market, but ours are simply great.

The goal should not be to provide you with another hob for your production, but a solution to improve and optimise your process. The challenge is to find the best combination of cutting diameter, length, and number of inserts, as well as design and edge preparation. On the following pages, you will find multiple finishing solutions. All hobs and inserts are designed for the basic rack profile II (acc. DIN3972).

Upon request, you could use up to 3 different profiles with the same toolholder.

All hobs are also available with your basic rack profiles, your specifications, and your suggestions.

Features and Benefits

Monoblock design
• Designed for the module range 3–10
• Small cutting diameters possible (up to D1 = 80)
• Inserts with 4 true cutting edges
• Great quality due to monoblock design

Disc solution
• Stable design for best performance
• Extension and reduction of hob possible
• Available up to quality A/AA upon request

Basic Profile
- \( hP0 = 2,0-2,6 \times \text{module} \)
- \( haP0 = 1,0-1,4 \times \text{module} \)
- \( hprP0 = 0-0,6 \times \text{module} \)
- \( R = 0,2-0,4 \times \text{module} \)
- \( PA = 15-27^\circ \)
- \( PApr = 0-12^\circ \)
- \( SP0 = \left( \frac{x}{2} \times \text{module} \right) / 2 \)
Disc Solution Module 11–20

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Cutting Diameter D1 [mm]</td>
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<tr>
<td>Number of Effective Inserts Zeff</td>
<td>7</td>
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<tr>
<td>Quality Class DIN 3968</td>
<td>A</td>
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<tr>
<td>Module m</td>
<td>18</td>
</tr>
<tr>
<td>Number of Teeth Z</td>
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<tr>
<td>Pressure Angle PA [°]</td>
<td>20</td>
</tr>
<tr>
<td>Speed vc [m/min]</td>
<td>250</td>
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<tr>
<td>Feed fa [mm/min]</td>
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Monoblock Design Module 3–10

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</tr>
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<td>Quality Class DIN 3968</td>
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<td>Module m</td>
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<td>Number of Teeth Z</td>
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<tr>
<td>Pressure Angle PA [°]</td>
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<td>Speed vc [m/min]</td>
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<td>Feed fa [mm/min]</td>
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**High precision and top quality due to Monoblock design.**

**Modern design and optimised cutting performance.**
Gear Milling
Monoblock Hob Module 3–10/PA 20 • Class B

- High precision (no cutting surfaces, monoblock design).
- High productivity and performance (4 true cutting edges).
- Smooth cutting performance due to modern design.
- Zeff +/-1 upon request.
- Modifications and further dimensions (D1, D, W, PA...) upon request.

### Monoblock Hob Module 3–10/PA 20 • Class B

<table>
<thead>
<tr>
<th>Module</th>
<th>Catalogue Number</th>
<th>D1</th>
<th>D</th>
<th>L eff</th>
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<td>56</td>
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- Stabile design for best performance.
- High productivity and performance (4 true cutting edges).
- Smooth cutting performance due to modern design.
- Modifications and further dimensions (D1, D, W, PA...) upon request.
Gear Milling
Disc Solution Module 16–25/PA25 • Class A/AB

- High precision (up to class A) due to optimised design.
- High productivity and performance (4 true cutting edges).
- Smooth cutting performance due to modern design.
- Zeff (+/-2) upon request.
- Modifications and further dimensions (D1, D, W, PA…) upon request.

■ Disc Solution Module 16–25/PA25 • Class A/AB

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High precision (up to class A) due to optimised design.
High productivity and performance (4 true cutting edges).
Smooth cutting performance due to modern design.
Zeff (+/-2) upon request.
Modifications and further dimensions (D1, D, W, PA...) upon request.

## Disc Solution Module 26–45/PA25 • Class AA

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kennametal.com
Gear Milling
Gasher Inserts

- Type N
- Type P
- Type I
- Type E
- Type F15
- Type U2
- Type B2
- Type U4
Gear Milling
Hobbing Inserts

- Type H
- Type HP
- Type U
- Type UP
- Type F
- Type UH
Gear Milling
Custom Solutions and Alternatives

- Pinion Roughing Gasher
- Pinion Pre-Finishing Gasher
- Duplex Roughing Gasher
- Duplex Pre-Finishing Gasher
Gear Milling
Custom Solutions and Alternatives

- End Mill Hob
- Shaping Cutter
- Roughing End Mill
- Solid Profile Gasher (Module <4)
Carbide Recycling
Help preserve and protect our planet!

It’s easy for your company to be environmentally conscious with the Kennametal Carbide Recycling Programme.

By sending us your used carbide tools, you help preserve and protect the environment and ensure that these products are recycled responsibly. Kennametal accepts any coated or non-coated carbide items, including inserts, drills, reamers, and taps.

By using the Kennametal Carbide Recycling Programme, you will receive:

• A partner who cares about a sustainable environment.
• Easy-to-use web portal to value your used carbide.
• Access to our popular Green Box™ options for carbide collection.
• Systematic and efficient disposal of carbide materials.
• Improved profitability.

Programme is not currently available in all geographical areas. For more information, please visit kennametal.com/carbiderecycling.

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