



Your technology partner for cost-effective machining

MILLING

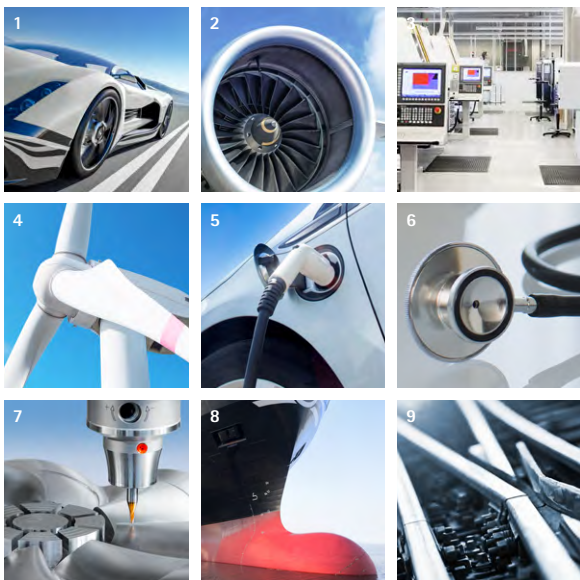




Tool and process solutions combined with comprehensive services

We see ourselves as a technology partner ready to support you in the development of efficient and resource-saving manufacturing processes with standard tools, individual tool concepts and tool detail optimisation. Our tools meet the requirements for process reliability, offer high levels of precision and are easy to handle. How do we achieve this? Through advanced development and construction methods and production at state-of-the-art manufacturing facilities.

You're looking for the perfect tool for your task but also want to find a partner who can take over and manage the entire planning stage of your process? If that sounds familiar, we're here for you. We support you during all phases of production and keep your manufacturing processes at the highest level – by being highly productive, economical and process-reliable. We also offer you complete networked solutions for all peripheral tasks related to the actual machining process.



Sectors

- 1 Automotive
- 2 Aerospace
- 3 Machine engineering
- 4 Power generation
- 5 Electric mobility
- 6 Medical technology
- 7 Die & Mould sector
- 8 Shipbuilding
- 9 Rail transport



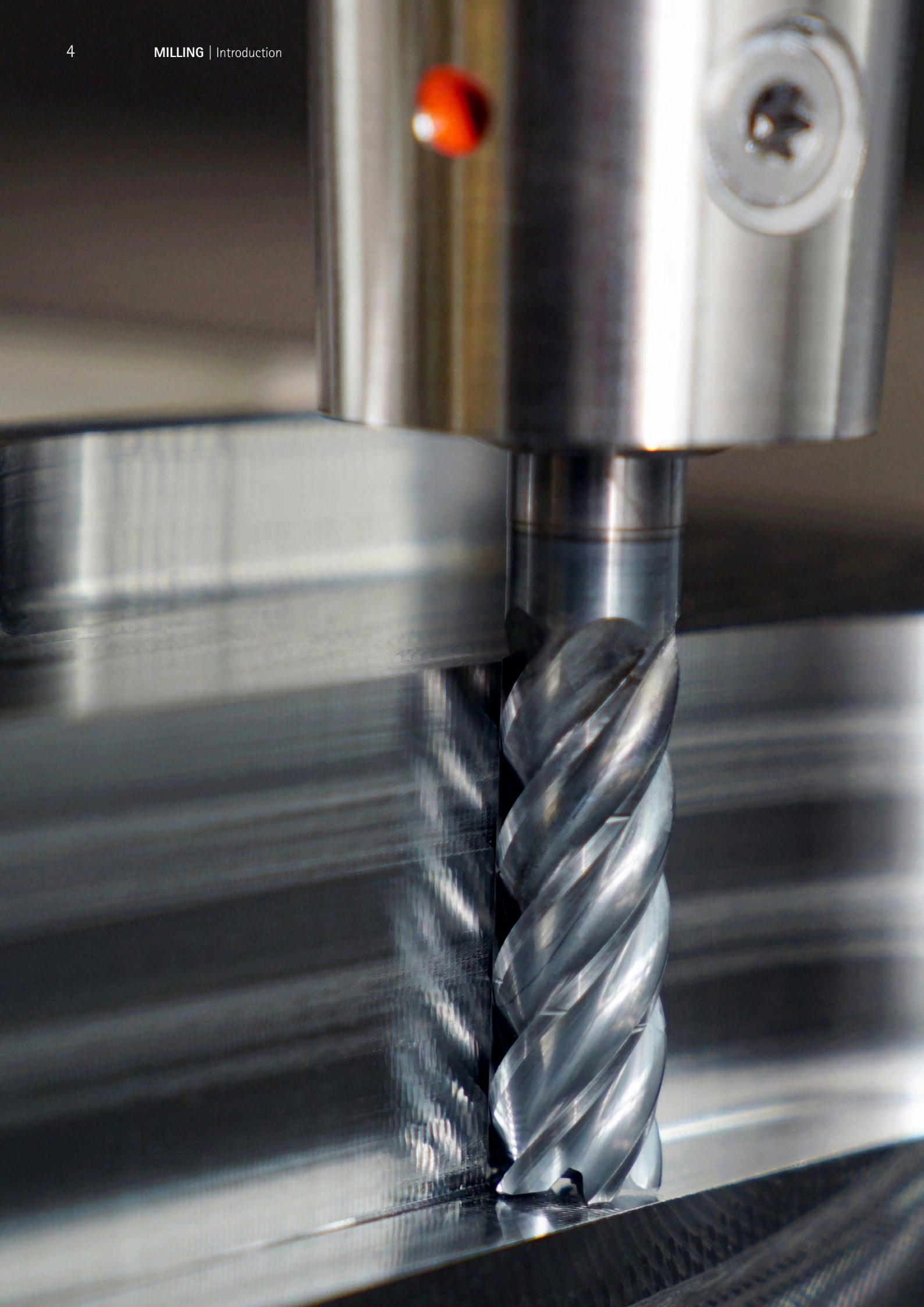
Over
5,000
 employees worldwide

No. 1
 technology leader
 for the machining
 of cubic parts



Product lines

- 1 Reaming and fine boring
- 2 Drilling from solid, boring and countersinking
- 3 Milling
- 4 Turning
- 5 Actuating
- 6 Clamping
- 7 Setting, measuring and dispensing
- 8 Services



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COMPETENCE MILLING

In the area of milling, the MAPAL tool experts have developed numerous machining solutions in recent years. The focus has been on tools adapted to the respective customer requirements. In addition to individual tool solutions, however, the use of high-performance standard tools plays a significant role in many applications. Therefore, an extensive standard range has been developed on the basis of custom tools.

MAPAL's many years of experience, accumulated know-how and high level of process understanding in the area of milling are reflected in the standard range. Process reliability, efficiency and the highest productivity for customers are therefore guaranteed.

Milling cutters from MAPAL only find their way to the customer after extensive research and development, design and simulation using the latest software, and production and inspection on the latest manufacturing equipment. In conjunction with the most efficient cutting materials, MAPAL therefore offers the optimal milling tool for almost all applications and workpiece materials.

For all applications

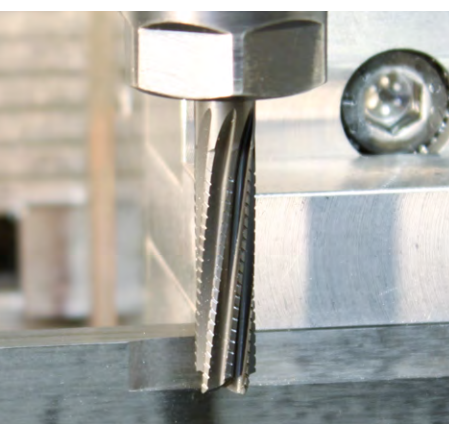
MAPAL offers the right tool for every milling operation: on the one hand, end milling cutters with fixed cutting edges, on the other hand, milling cutters with replaceable cutting edges. All types of machining – whether general such as groove milling, face milling, shoulder milling, for roughing and finishing or special such as trochoidal or helix milling – are covered with innovative tool solutions.

For all workpiece materials

Besides the type of machining, the workpiece material is the most important selection criterion for the right milling cutter. In addition to tools for machining steel, cast iron and aluminium, the MAPAL range also includes solutions for the economical and process-reliable milling of titanium, super alloys, plastics and composite materials.

Special solutions

Special machining tasks require special tools. MAPAL therefore offers milling tools in special designs, individually tailored to the customer's requirements. For example, specially designed milling cutters can be used to realise complex shapes and contours or combination tools can be used to reduce machining times and tool changes.





Competence milling in action – plunging at an angle of up to 45 degrees

Time-consuming ramping processes or pilot bores are often required when milling pockets.

The OptiMill-Uni-HPC-Pocket has a unique face geometry with an integrated drill tip.

This geometry enables the milling cutter to plunge at an angle of up to 45 degrees, helix milling and even grooving.

► [Further information on the product from page 47.](#)

High-performance coatings

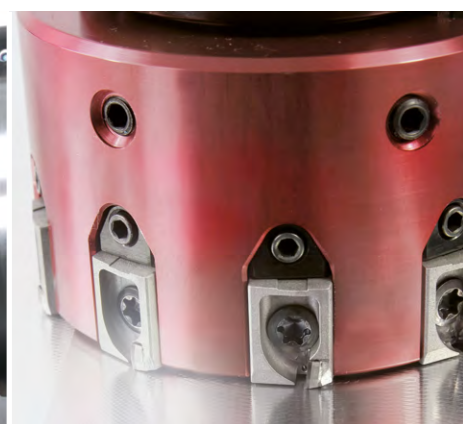
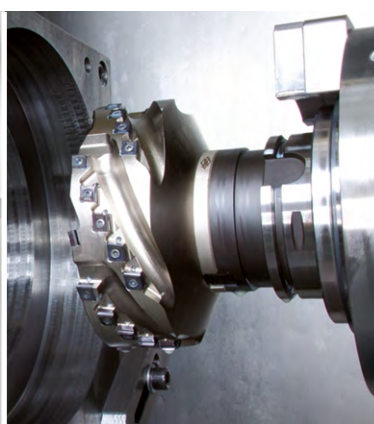
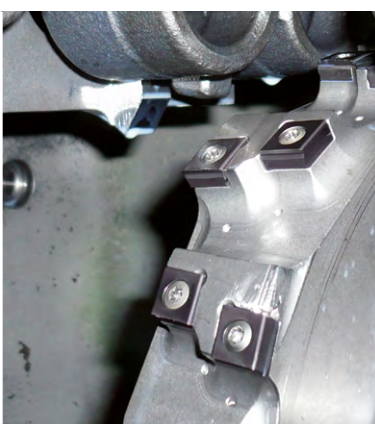
The coating of the cutting edges is a decisive criterion for the tool life and optimal machining results. MAPAL offers a wide range of substrates and coatings, each matched to the machining task at hand, including the in-house state-of-the-art coating system.

The most modern manufacturing facilities

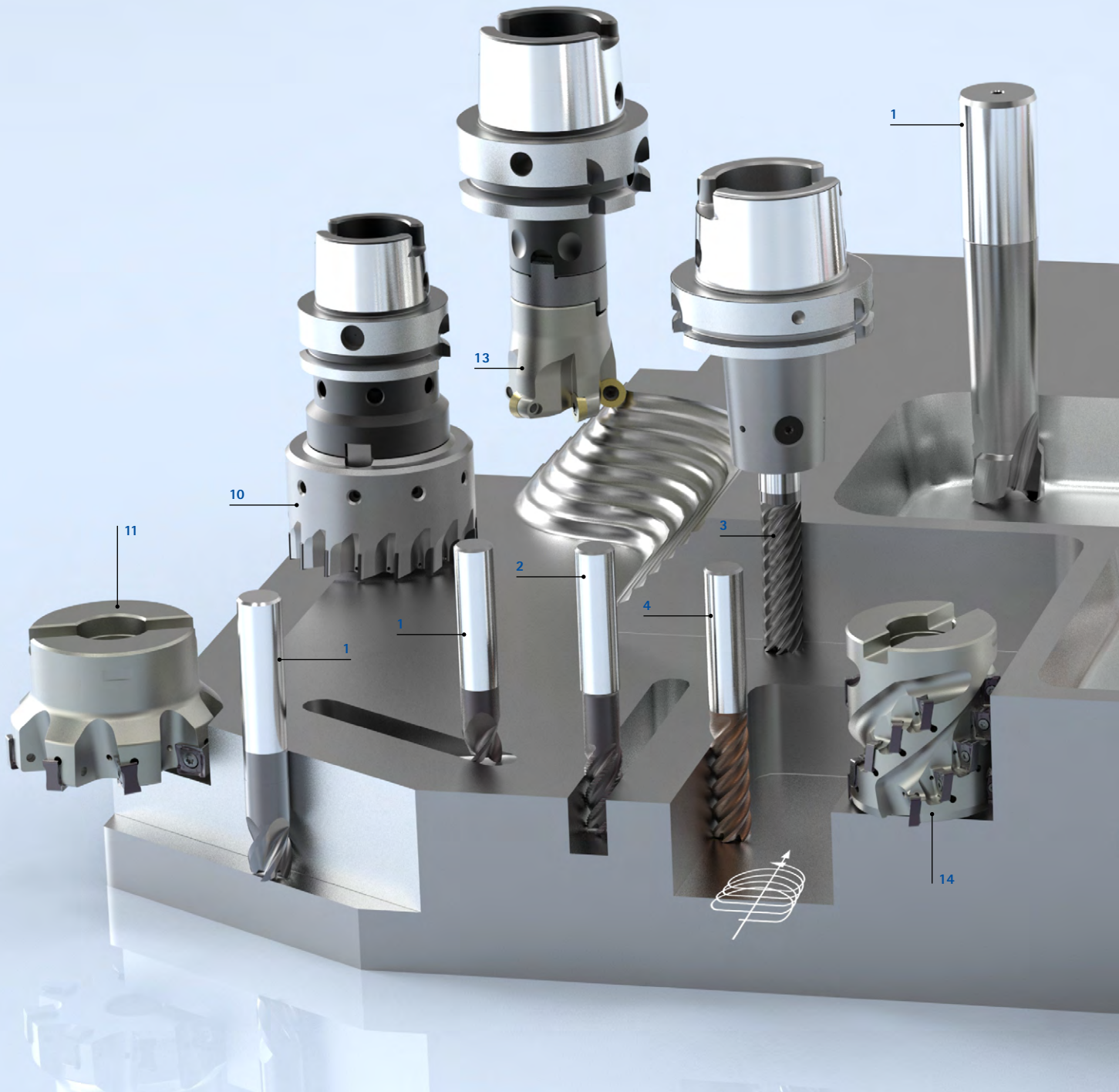
State-of-the-art 3D design and simulations form the basis for manufacturing MAPAL tools. The data is transferred via connections to the respective machining centre in the modern and extensive machine park. Monitored and controlled by experienced employees, MAPAL milling tools are created to meet the highest quality requirements.

Reconditioning to original manufacturer quality

By reconditioning solid carbide tools with original grinding and coating, almost 100% of new tool life can be achieved once again. For fast processing, MAPAL can collect and deliver tools upon request. The milling head management for PCD face milling cutters guarantees precise and reliable tools as well as 24-hour availability on site.



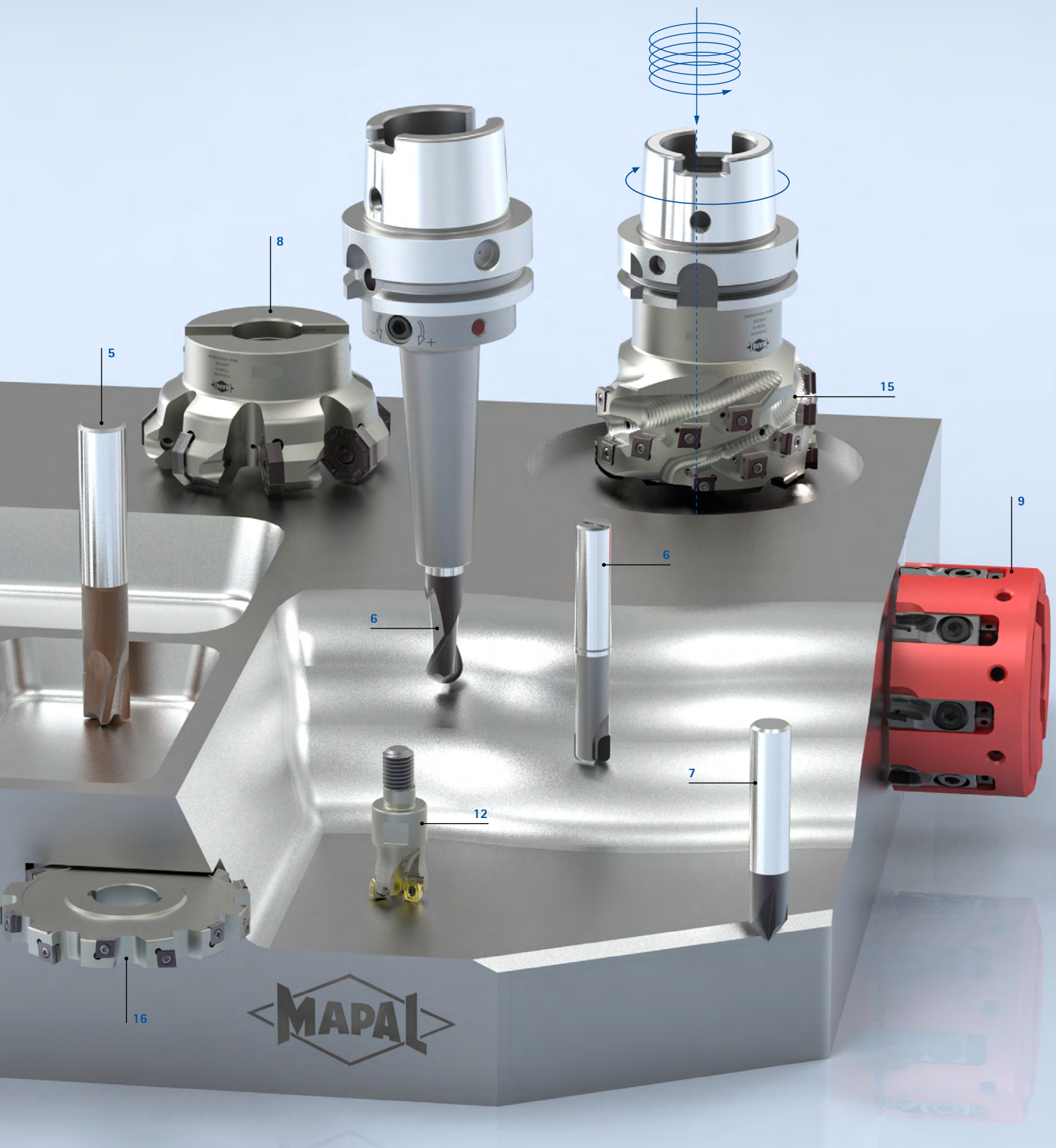
OVERVIEW OF THE RANGE



End milling cutter with fixed cutting edges

- 1 Shoulder milling cutter – universal application (from page 35)
- 2 Shoulder milling cutter – roughing (from page 107)
- 3 Shoulder milling cutter – finishing (from page 133)
- 4 Shoulder milling cutter – trochoidal milling (from page 151)

- 5 High-feed milling cutter (from page 169)
- 6 Profile milling cutter (from page 181)
- 7 Chamfering, deburring and drill milling cutter (from page 205)



Milling cutters with replaceable inserts

- 8 Face milling cutter with indexable inserts (from page 249)
- 9 Face milling cutter with PCD milling cartridges (from page 249)
- 10 Face milling cutter with brazed PCD cutting edges (from page 249)
- 11 Shoulder milling cutter (from page 291)
- 12 High-feed milling cutter (from page 309)

- 13 Copy milling cutter (from page 333)
- 14 Shell end face milling cutter (from page 343)
- 15 Helix milling cutter (from page 357)
- 16 Disc milling cutter (from page 367)

SPECIAL SOLUTIONS

End milling cutter with fixed cutting edges

In addition to an extensive standard range of end milling cutters with fixed cutting edges, MAPAL also offers special end milling cutters that are specially tailored to the machining tasks in question. Complex geometries and contours can be realised for high-precision and flexible manufacturing options. Even unusual tool concepts for combining machining steps or combination machining can be implemented at short notice – from complex form cutters to solid carbide disc milling cutters.





Application examples for special milling cutters

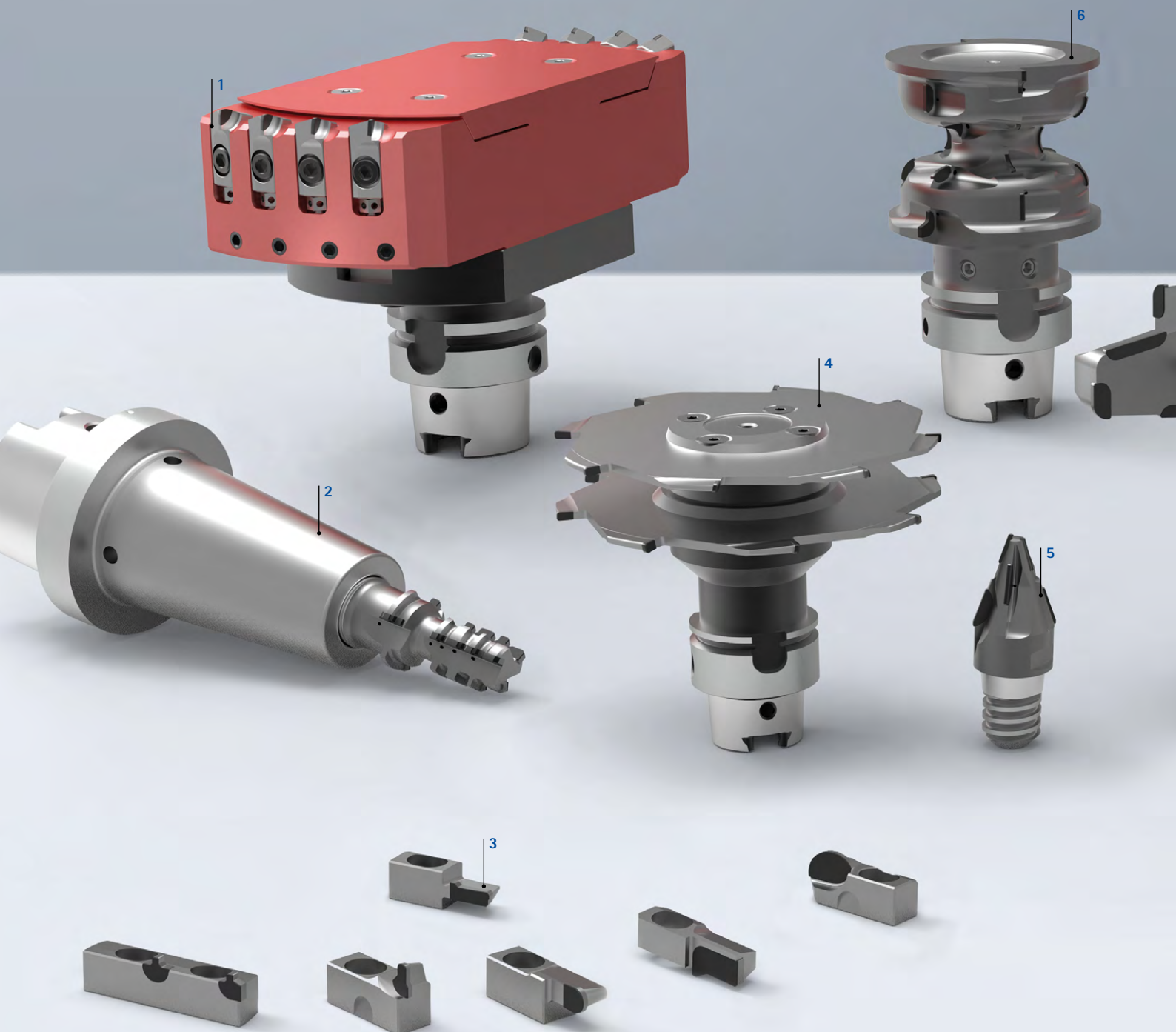
- 1 PCD circular milling cutter, two cutting edges, for recesses in aluminium parts.
- 2 Solid carbide special end milling cutter, five cutting edges, special coating and radial coolant outlets in the chip flute. Application in the machining of car steering housing made of AlSi9Cu3.
- 3 Solid carbide special end milling cutter, five cutting edges, left-hand helix with special roughing profile for machining car tailgates.
- 4 Solid carbide special form cutter, four cutting edges, special unequal spacing with eroded forming step. Optimisation of the machining of a bearing carrier made of AlSi1.
- 5 Solid carbide special disc milling cutters, 16 cutting edges, close tolerance contour of the form cutting edges. Application for machining automobile hinges made of S355J2.
- 6 Solid carbide special annular groove milling cutter, four cutting edges, straight fluted – form cutter with eroded peripheral flutes. Machining the fuel supply of common rail housing.
- 7 Solid carbide special ball nose milling cutter, four cutting edges for deburring wheel carriers made of AlMgSi1.
- 8 Solid carbide special form cutter, four cutting edges, prism and radius form. Machining the combustion chamber of an aluminium cylinder head.
- 9 Replaceable head ball nose milling cutter for soft and hard machining of homokinetic joints in a drive train. PcBN-tipped tools with hollow shank taper holder are used for hard milling.

SPECIAL SOLUTIONS

Special PCD tools for face milling and circular milling

In addition to the standard series, MAPAL often develops special solutions in the field of PCD milling tools, which are designed for a specific application. The latest manufacturing technologies, such as finishing lasers, make tools possible that solve highly demanding machining tasks. In this way, tool solutions with complex cutting geometries and extreme chip and helix angles can be produced that are individually adapted to the machining task in a process-reliable and reproducible manner.

The advantages of diamonds as a cutting material can be optimally utilised, especially in milling. The extreme hardness of the diamond cutting edge in combination with a highly polished rake face ensure low forces when shearing off the chip and reduce the heat introduced into the workpiece when sliding off. These are optimal conditions for the best machining qualities in terms of dimensions, surface and shape.





Application examples for special milling cutters

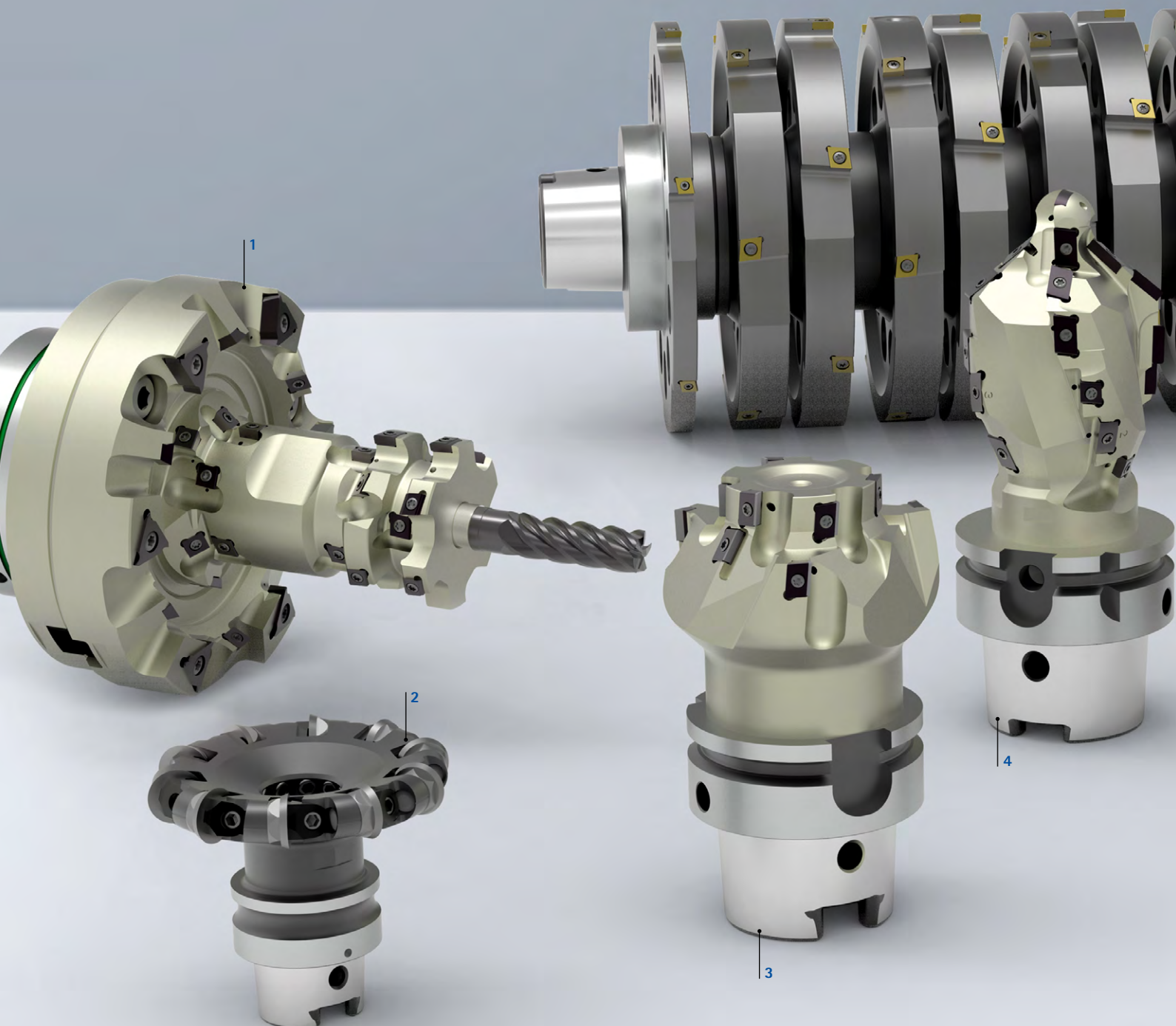
- | | |
|---|---|
| <p>1 Face milling cutter for cylinder head machining, combustion chamber side, different radial arrangement of PCD cutting edges for low-burr surface</p> <p>2 Circular milling cutter for machining on the connection side of a tank gun</p> <p>3 Milling inserts with special dimensions for customised machining solutions</p> <p>4 Disc milling cutter for face milling of camshaft bearing webs</p> <p>5 Chamfer milling cutter with CFS connection</p> <p>6 Circular milling cutter for machining on stabilising frame for an aircraft lifting system</p> | <p>7 Circular milling cutter for machining on stabilising frame for an aircraft lifting system</p> <p>8 Face milling cutter for brake caliper machining, back milling on the face surface of a main bore</p> <p>9 Combination milling cutter for gearbox housing machining</p> <p>10 Face milling cutter for double-sided machining on the bearing frame in a clamping setup</p> <p>11 Milling cutter for external machining on a turbocharger hose nozzle</p> <p>12 Circular milling cutter for machining on a throttle valve body</p> |
|---|---|

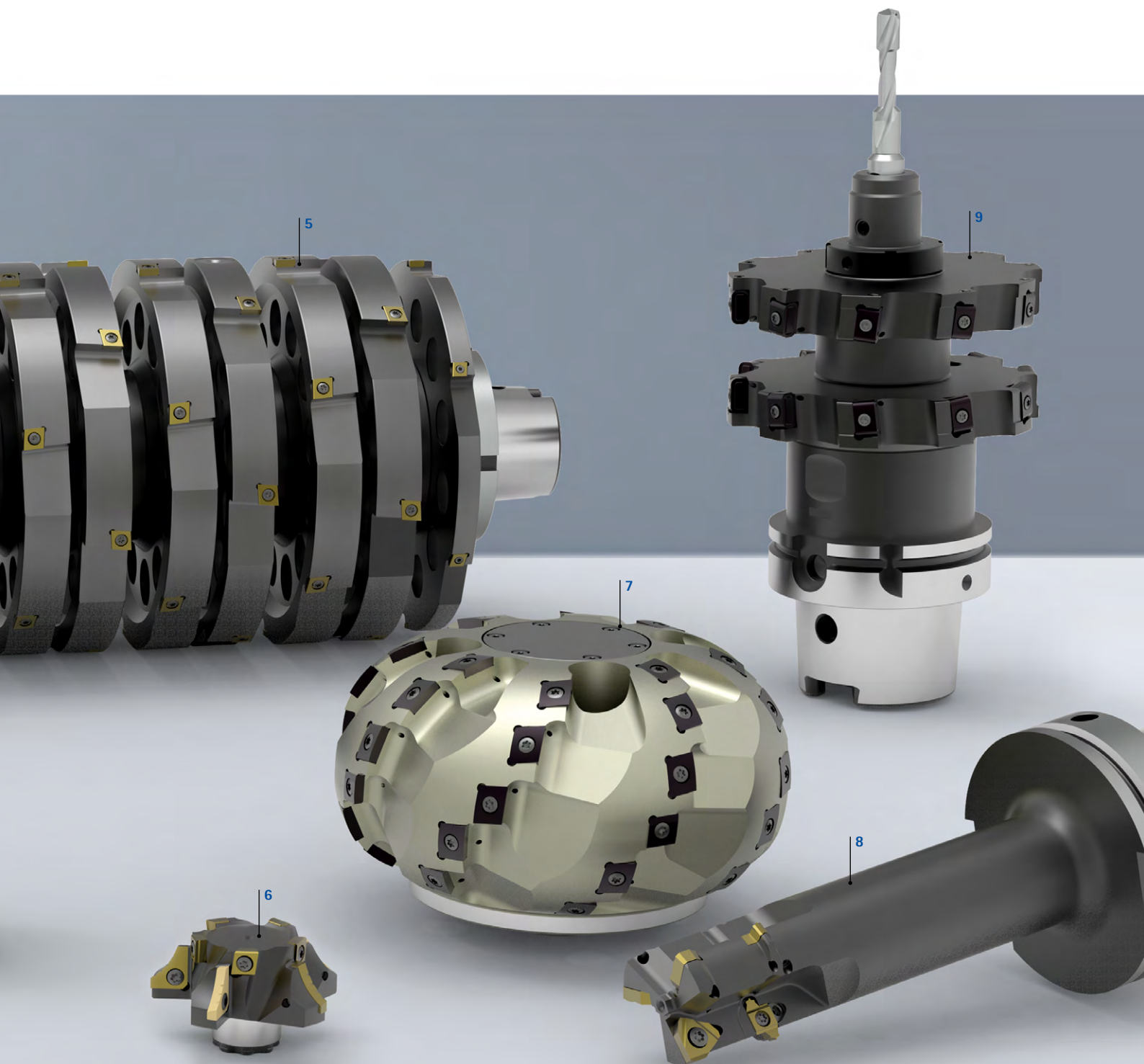
SPECIAL SOLUTIONS

Milling cutters with indexable inserts

In addition to the range of milling cutters with indexable inserts, MAPAL offers milling tools in special designs, which are individually developed for customer-specific applications. For example, complex shapes or contours are machined with innovative circular cutters that are particularly powerful due to the use of tangential technology.

Multi-stage milling tools or the combination of milling cutters with solid carbide drills can reduce tool changes. In unstable machining situations or large projection lengths, special milling cutters are designed with vibration dampers to increase machining quality and tool life.





Application examples for special milling cutters

- 1 Multi-stage tangential milling cutter which combines many steps for machining planetary carriers
- 2 Contour milling cutter with PCD cutting edges for machining optical components
- 3 Multi-stage profile milling cutter for machining contours on a main brake cylinder
- 4 Circular milling cutter with tangential inserts for machining contours on a cylinder crankcase
- 5 Double-bearing gang milling cutter for machining the crankshaft bearing aisle on special machines
- 6 Modular profile milling cutter for internal machining of an oil shaft bearing bore
- 7 Form cutter for radial contours on housings for large gearboxes
- 8 Circular milling cutter for recesses on a brake housing
- 9 Combination of disc milling cutter and insertion drill for machining steering knuckles

END MILLING CUTTERS WITH FIXED CUTTING EDGES

Milling cutter for almost all applications and workpiece materials.



PRODUCT OVERVIEW

End milling cutter with fixed cutting edges

The powerful OptiMill end milling cutter range from MAPAL ensures excellent and process-reliable results for all machining tasks. Cost-effectiveness and product quality are particularly important in meeting customer requirements.

Application-based

The end milling cutter range from MAPAL includes shoulder milling cutters for universal applications, for roughing, finishing and trochoidal milling as well as milling cutters for high-feed milling, profile milling and chamfering.

Leading through flexibility

The CPMill replaceable milling cutter range also saves set-up costs. Due to the easy, safe handling, the milling heads can be directly replaced in the machine tool.

Always the right choice

Regardless of whether an economical milling cutter is required for universal machining or an expert for a complex machining task – MAPAL offers the right tool.



Basic Line:

Universal tools, broad field of application, low procurement costs



Performance Line:

High-performance tools, broad field of application, high productivity in series production



Expert Line:

Specialist tools for selected applications, maximum precision and productivity

Shoulder milling cutter

| | | | |
|---|---|---|---|
| | | | |
| <p>Universal application</p> <p>Shoulder milling cutter for universal application. Cutting width a_e up to $1xD$.</p> <ul style="list-style-type: none"> - OptiMill-Uni-HPC-Plus for highly economical universal machining of steel, stainless steel and cast iron - OptiMill-HPC-Pocket: Face geometry with integrated drill tip. Perfect for inclined plunging up to 45°, in helix milling and grooving - OptiMill-SPM for machining structural parts made of aluminium - OptiMill-Diamond: PCD-tipped milling cutters for extremely long tool life in non-metallic workpiece materials <p>Ø area: 1.00 - 63.00 mm</p> <p>P M K N C H</p> | <p>Roughing</p> <p>For achieving maximum cutting volumes. Ideal for pre-machining with large stock removal. Large material removal rate ($a_e \sim 0.6xD$).</p> <ul style="list-style-type: none"> - OptiMill-Uni-HPC-Rough: Knurled profile for optimised force distribution on the cutting edges and therefore better chip formation - OptiMill-Uni-Wave: Ideal for roughing with high feed rates. Low radial forces due to newly developed roughing profile - OptiMill-SPM-Rough: High infeed depths and maximum feed rates for roughing in aluminium - ECU-Mill-Rough&Finish: Roughing-finishing milling in one machining step <p>Ø area: 4.00 - 25.00 mm</p> <p>P M K N</p> | <p>Finishing</p> <p>Ideal for producing the top-quality surface finishes. Fine machining with low stock removal. Low material removal rate ($a_e \leq 0.1xD$).</p> <ul style="list-style-type: none"> - OptiMill-Uni-HPC-Finish with seven cutting edges for the highest surface quality in the shortest possible time - OptiMill-Hardened-Finish for finishing components with a hardness of 45 HRC and above - OptiMill-SPM-Finish for finishing deep pockets and delicate component structures in aluminium even with large wrappings <p>Ø area: 4.00 - 25.00 mm</p> <p>P M K N H</p> | <p>Trochoidal milling</p> <p>Maximum material removal rate while providing an excellent surface finish at the same time. Cutting depth up to $5xD$.</p> <p>OptiMill-Tro:</p> <ul style="list-style-type: none"> - Pre-machining and fine machining with one tool - Extra long cutting area - Optimised unequal spacing and finely balanced cutting tool for protecting the machine spindle and a longer tool life - Chip breaker for optimum chip control <p>Ø area: 4.00 - 25.00 mm</p> <p>P M K S H</p> |
| <p>Page 35</p> | <p>Page 107</p> | <p>Page 133</p> | <p>Page 151</p> |



High-feed milling cutter



Milling at high feed rates

Perfect for high-feed machining with a high material removal rate, offering great process reliability. Low cutting depth ($a_p = 0.05 \times D$).

OptiMill-3D-HF:

- Extremely quiet running
- Hard and soft machining of steel
- High feed rates with up to 1.35 mm per tooth with diameter 20.00 mm
- Angled entry and pocket milling with long projection lengths

Ø area: 2.00 - 25.00 mm



Ball nose and corner radius milling cutter



High precision machining of 3D contours

Contour and copy milling with high shape accuracy.

- **OptiMill-3D-BN:** High-precision milling cutters with high radius accuracy for hard and soft machining of steel
- **OptiMill-Diamond-Radius and -Torus:** PCD cutting edges for long tool lives in aluminium
- **OptiMill-Composite-Speed-Radius** for repair work on CFRP structures

Ø area: 1.00 - 25.00 mm



Chamfering, deburring, drill milling cutters



Chamfering, deburring and drill milling

- **OptiMill-Chamfer:** Cost-effective chamfering and deburring of pre-machined parts
- **OptiMill-DrillMill:** Drill milling cutter for combination machining in one machining step, especially for sheet metal and thin-walled parts
- **CPD-Spot-Drill** for tapping and centring
- Designs with a replaceable head system for maximum flexibility and economic efficiency















Ø area: 3.00 - 20.00 mm

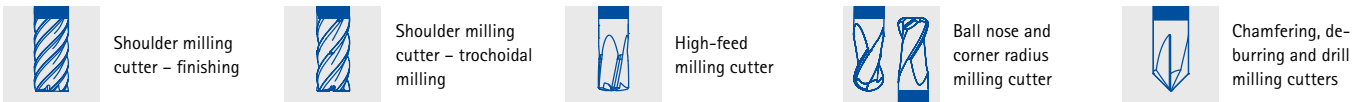


SELECTING A MILLING CUTTER

Step-by-step guide to selecting the right milling cutter

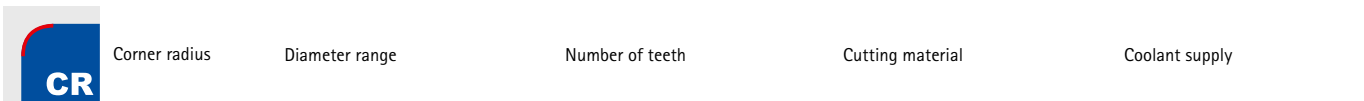
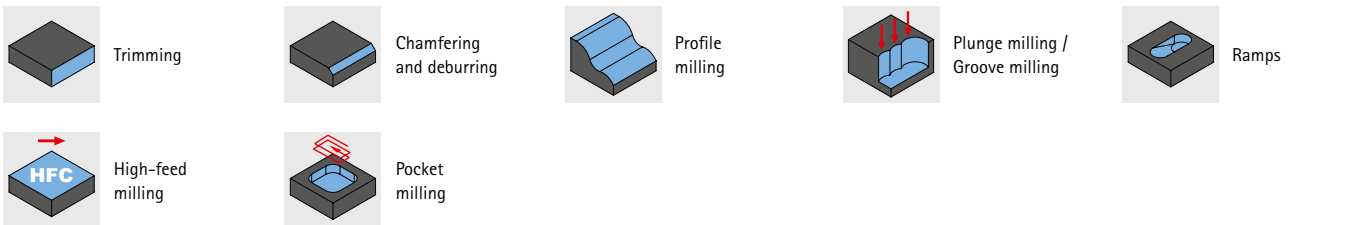
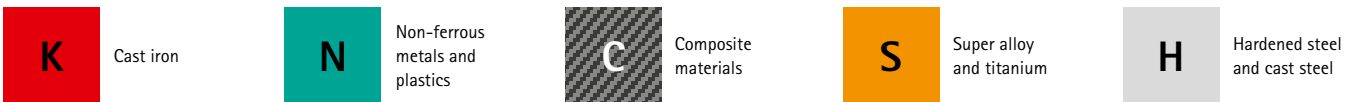
For example, are you looking for a shoulder milling cutter for universal use in steel with which you can also ramp?
This selection guide explains how to choose the right milling cutter step by step.

| | | | | | |
|---|-------------------------------|---|---|--|--|
| 1 | Type of milling cutter | Select the type of milling cutter you need. | ➤ |  Shoulder milling cutter – universal application |  Shoulder milling cutter – roughing |
| 2 | Design | Select your preferred design. | ➤ |  Monolithic |  Modular |
| 3 | Product category | Choose a product category. | ➤ |  Basic Line: Universal tools, broad field of application, low procurement costs | |
| 4 | Material suitability | Select your workpiece according to the MAPAL machining groups (MMG). You'll find the MMG chart on the fold-out page at the end of the catalogue. | ➤ |  P Steel |  M Stainless steel |
| 5 | Application | Select your preferred application. | ➤ |  Shoulder milling |  Groove milling |
| | | | |  Helix milling |  Trochoidal milling |
| 6 | Design | Check that the geometric features meet your requirements. | ➤ |  45° 45° chamfer |  90° Sharp-edged |
| 7 | Product | Select the milling cutter you need. Products of the preferred series are in stock and available at short notice, while products with configurable features can be freely configured within predefined limits. | ➤ |  Preferred series in stock | |



Performance Line:
High-performance tools, broad field of application, high productivity in series production

Expert Line:
Specialist tools for selected applications, maximum precision and productivity



CONFIG
Product with configurable features



| Edge design | | | Design | | | | Product | | | |
|-------------|-----|----|--------|-----|------|---|-------------------------------|--------------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| ✓ | | ✓ | 2,5-25 | 4 | HP | | OptiMill-Uni-HPC-Plus | SCM720,740,760,770 | | 36 |
| ✓ | | | 1-20 | 2 | HP | | OptiMill-Uni-HPC-Plus | SCM772 | | 43 |
| ✓ | ✓ | | 1-20 | 3 | HP | | OptiMill-Uni-HPC-Slot | SCM250 | | 45 |
| | | ✓ | 3,8-20 | 3 | HP | | OptiMill-Uni-HPC-Pocket | SCM800,810,840 | | 47 |
| ✓ | | | 6-25 | 5 | HP | | OptiMill-Uni-HPC-Silent | SCM570 | | 51 |
| | | ✓ | 4-20 | 4 | HP | | OptiMill-Hardened | SCM102,103 | | 54 |
| ✓ | | | 3-20 | 4 | HP | | OptiMill-Inox-HPC | SCM108 | | 56 |
| ✓ | | | 3-20 | 3 | HU | | OptiMill-Alu-HPC | SCM270 | | 57 |
| | | ✓ | 5-20 | 3 | HP | | OptiMill-Alu-HPC-Pocket | SCM850 | | 58 |
| | | ✓ | 5-20 | 4 | HP | | OptiMill-Alu-HPC-Pocket | SCM854 | | 59 |
| ✓ | | | 4-5 | 1 | PU | | OptiMill-Diamond-Typ 50 | SHM500 | | 63 |
| ✓ | | | 3-12 | 2 | PU | ✓ | OptiMill-Diamond-Typ 51 | SHM511,611,711 | | 64 |
| | | ✓ | 6-20 | 2-3 | PU | ✓ | OptiMill-Diamond-Typ 53 | SHM531 | | 65 |
| ✓ | | | 16-63 | 3-4 | PU | ✓ | OptiMill-Diamond-Typ 57 | SHM571 | | 66 |
| ✓ | | | 6-20 | 4 | HC | | OptiMill-Thermoplastic-FR | SCM610 | | 76 |
| ✓ | | | 4-20 | 8 | HU | | OptiMill-Composite-Speed-Plus | SCM982, 992 | | 70 |
| | ✓ | | 1-3 | MT | HC | | OptiMill-Composite-Micro | SCM560 | | 74 |
| | ✓ | | 4-20 | 2 | HU | | OptiMill-Composite-TwinCut | SCM490 | | 75 |
| | | ✓ | 12-32 | 3 | HU | ✓ | OptiMill-SPM | SCM681,691 | | 60 |
| | | ✓ | 6-50 | 3 | PU | ✓ | OptiMill-Diamond-SPM | SHM101,110,111,121 | | 61 |
| ✓ | | | 4-20 | 8 | HC | | OptiMill-Composite-Speed-Plus | SCM980, 990 | | 72 |
| ✓ | | | 3-20 | 4 | HP | | ECU-Mill-Uni-LV | SCM780,790 | | 52 |
| | ✓ | ✓ | 2-10 | 1 | HU | | OptiMill-Mono-Alu | SCM280 | | 68 |
| | ✓ | | 2-12 | 1 | HU | | OptiMill-Mono-Plastic | SCM330 | | 77 |

Additional shoulder milling cutters for universal application on the next page.

Step 1:
Type of milling cutter



Step 2:
Design



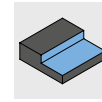
Step 3:
Product category



Step 4:
Material suitability



Step 5:
Application



Step 6:
Design



| Edge design | | Design | | | | Product | | | | |
|-------------|-----|--------|--------|---|------|---------|---------------------|---------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| ✓ | | | 8-20 | 4 | HP | | CPMill-Uni-HPC | CPM100 | | 44 |
| ✓ | | | 8-25 | 3 | HP | | CPMill-Uni-HPC-Slot | CPM110 | | 46 |

| Edge design | | Design | | | | Product | | | | |
|-------------|-----|--------|--------|-----|------|---------|---------------------------|-------------------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| ✓ | | | 4-25 | 3-5 | HP | | OptiMill-Uni-HPC-Rough | SCM700, 710 | | 108 |
| ✓ | | | 4-25 | 5 | HP | ✓ | OptiMill-Uni-Wave | SCM880,881, 890,900,910 | | 110 |
| | | ✓ | 12-25 | 3 | HU | ✓ | OptiMill-SPM-Rough | SCM951,961 | | 118 |
| ✓ | ✓ | | 6-20 | 3-4 | HP | | ECU-Mill-Uni-Rough&Finish | SCM220 | | 120 |
| ✓ | | | 8-25 | 4-6 | HP | | CPMill-Uni-Rough&Finish | CPM140 | | 121 |

Step 1:
Type of milling cutter



Step 2:
Design



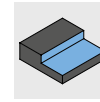
Step 3:
Product category



Step 4:
Material suitability



Step 5:
Application



Step 6:
Design



| Edge design | | | Design | | | | Product | | | |
|-------------|-----|----|--------|---|------|--|--------------------------|---------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| ✓ | ✓ | | 4-25 | 7 | HP | | OptiMill-Uni-HPC-Finish | SCM830 | | 134 |
| | ✓ | | 6-20 | 6 | HP | | OptiMill-Uni-HPC-Finish | SCM370 | | 138 |
| | ✓ | ✓ | 4-25 | 6 | HP | | OptiMill-Hardened-Finish | SCM104,124 | | 140 |
| | | ✓ | 12-25 | 4 | HU | | OptiMill-SPM-Finish | SCM970 | | 145 |
| | ✓ | | 8-25 | 6 | HP | | CPMill-Uni-HPC-Finish | CPM130 | | 139 |

| Edge design | | | Design | | | | Product | | | |
|-------------|-----|----|--------|---|------|--|--------------------|---------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| ✓ | | | 4-20 | 5 | HP | | OptiMill-Tro-Uni | SCM580, 940 | | 152 |
| ✓ | | | 4-25 | 5 | HP | | OptiMill-Tro-PM | SCM590 | | 155 |
| ✓ | | | 4-25 | 7 | HP | | OptiMill-Tro-PM | SCM820, 930 | | 156 |
| | | ✓ | 6-25 | 5 | HP | | OptiMill-Tro-Titan | SCM630 | | 162 |
| | | ✓ | 6-25 | 5 | HP | | OptiMill-Tro-S | SCM600 | | 161 |
| | | ✓ | 6-25 | 5 | HP | | OptiMill-Tro-H | SCM920 | | 160 |

| Edge design | | | Design | | | | Product | | | |
|-------------|-----|----|--------|---|------|---|-------------------------|---------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| | | | 3-16 | 4 | HP | | OptiMill-3D-HF | MHF101 | | 170 |
| | | | 2-16 | 4 | HP | | OptiMill-3D-HF-Hardened | MHF102 | | 171 |
| | | | 8-25 | 6 | | ✓ | CPMill-Uni-FeedPlus | CPM171 | | 172 |

Step 1:
Type of milling cutter



Step 2:
Design



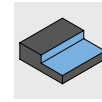
Step 3:
Product category



Step 4:
Material suitability



Step 5:
Application



Step 6:
Design

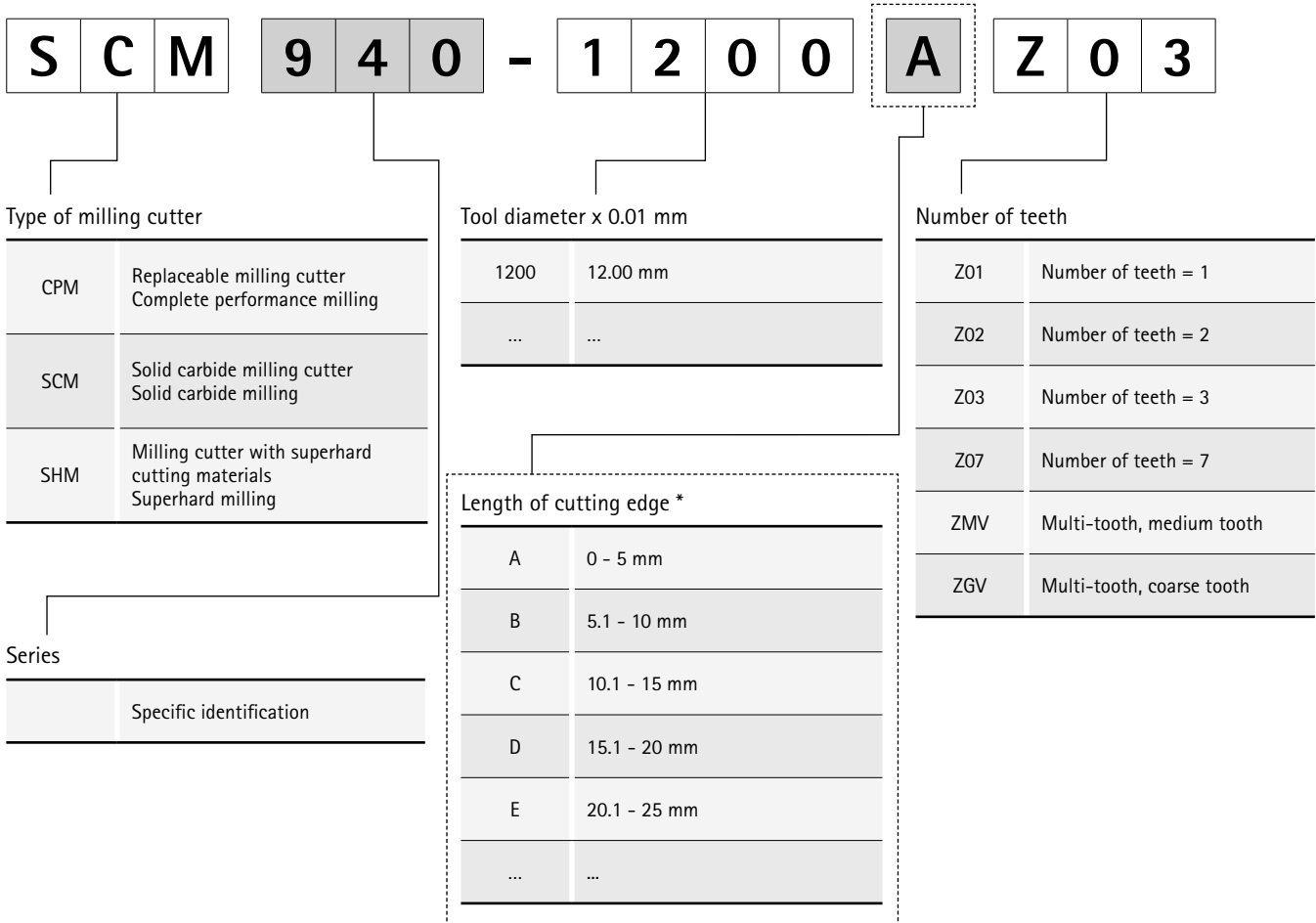


| Edge design | | | Design | | | | Product | | | |
|-------------|-----|----|--------|---|------|---|---------------------------------|---------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| | | | 1-12 | 2 | HP | | OptiMill-3D-BN | MBN101 | | 182 |
| | | | 3-12 | 2 | HP | | OptiMill-3D-BN-Hardened | MBN107 | | 183 |
| | | | 4-20 | 8 | HC | | OptiMill-Composite-Speed-Radius | SCM870 | | 188 |
| | | | 3-16 | 2 | PU | ✓ | OptiMill-Diamond-Radius | SHM521 | | 186 |
| | | ✓ | 3-12 | 2 | PU | ✓ | OptiMill-Diamond-Torus | SHM551 | | 187 |
| | | | 8-25 | 4 | HP | | CPMill-Uni-Radius | CPM150 | | 184 |
| | | ✓ | 8-25 | 4 | HP | | CPMill-Uni-Torus | CPM160 | | 185 |

| Edge design | | | Design | | | | Product | | | |
|-------------|-----|----|--------|-----|------|--|---------------------|---------------|--|------|
| 45° | 90° | CR | ø [mm] | z | Mat. | | Product name | Specification | | Page |
| | | | 4-20 | 4 | HP | | OptiMill-Chamfer | SCM340 | | 206 |
| | | | 3-16 | 2 | HU | | OptiMill-DrillMill | SCM350 | | 209 |
| | | | 8-20 | 4/6 | HP | | CPMill-Chamfer | CPM180 | | 207 |
| | ✓ | | 10-20 | 3+3 | HP | | CPMill-Chamfer-Twin | CPM190 | | 208 |

Product ID codes

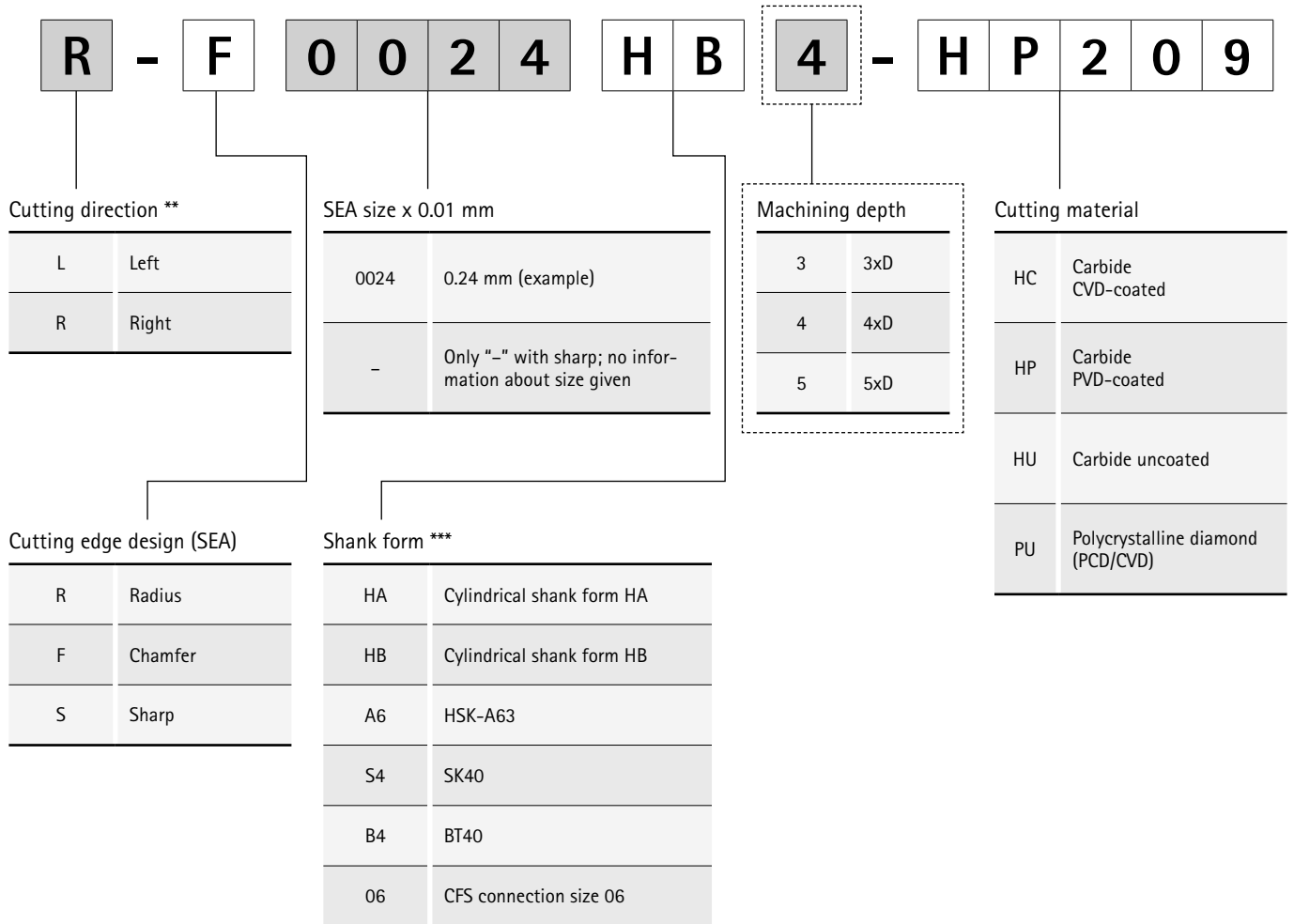
Solid carbide and PCD end milling cutter



* Only with milling cutter type SHM

** Not applicable for milling cutter type CPM

*** For milling cutter type CPM, the shank form corresponds to the CFS connection size



Product ID codes

End milling cutter with fixed cutting edges



Type of milling cutter

| | |
|-----|---|
| MBN | Ball nose cutter Die Et Mould – Ball Nose |
| MCR | Corner radius milling cutter Die Et Mould – corner radius |
| MCS | Shoulder radius milling cutter Die Et Mould – circle segment |
| MHF | High-feed milling cutter Die Et Mould – high feed |

Tool diameter x 0.1 mm

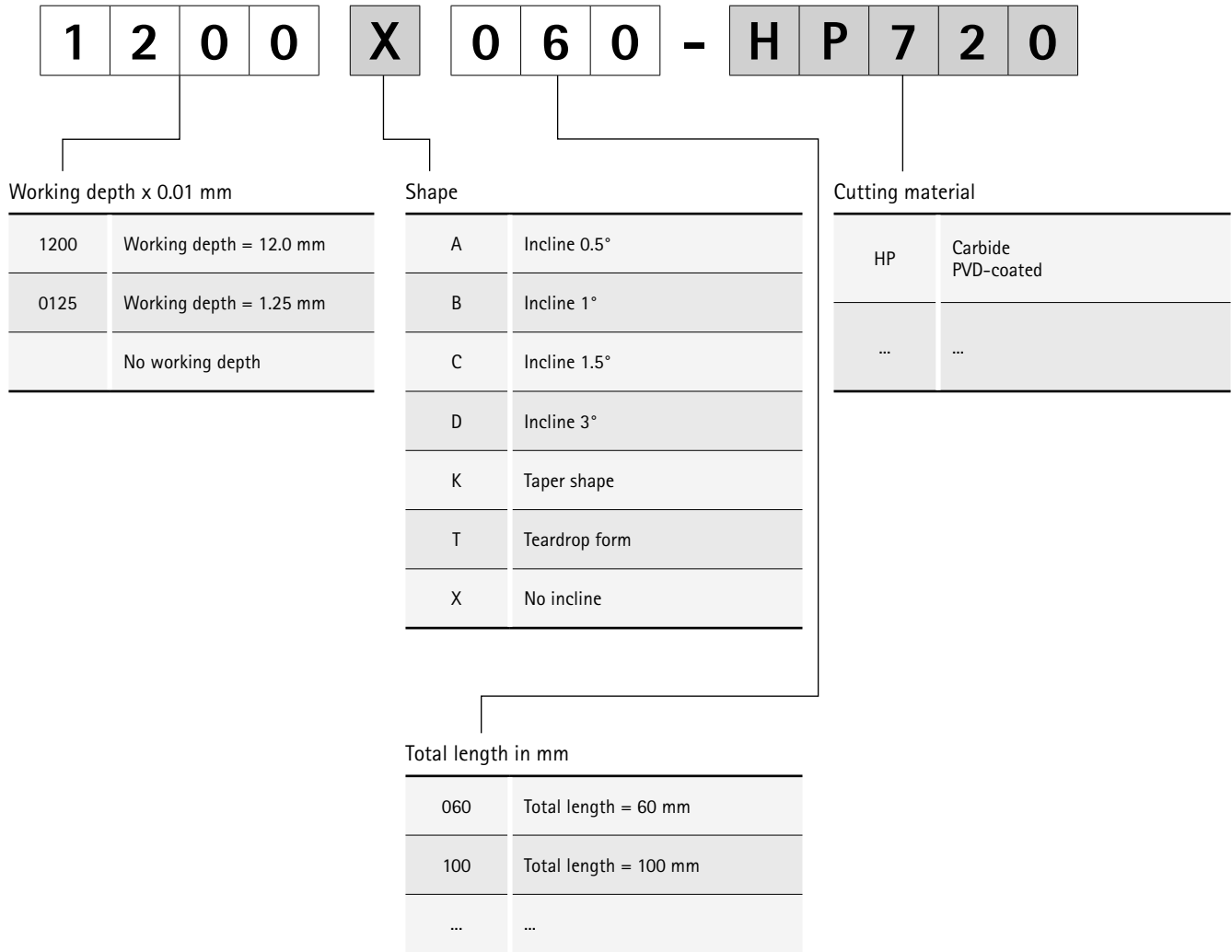
| | |
|-----|---------------------------------------|
| 040 | Milling cutter $\varnothing = 4.0$ mm |
| ... | ... |

Radius x 0.01 mm

| | |
|------|--|
| 0050 | Radius = 0.5 mm |
| | R ₁ for milling cutter type "MHF" |

Series

| | |
|-----|------------|
| 100 | Continuous |
| 101 | |
| ... | |
| 999 | |





SHOULDER MILLING CUTTERS – UNIVERSAL MACHINING



Universal application

| | |
|--|----|
| OptiMill-Uni-HPC-Plus | 36 |
| CPMill-Uni-HPC | 44 |
| OptiMill-Uni-HPC-Slot CPMill®-Uni-HPC-Slot | 45 |
| OptiMill-Uni-HPC-Pocket | 47 |
| OptiMill-Uni-HPC-Silent | 51 |
| ECU-Mill-Uni-LV | 52 |

Hardened steel

| | |
|-------------------------|----|
| OptiMill-Hardened | 54 |
|-------------------------|----|

Inox

| | |
|-------------------------|----|
| OptiMill-Inox-HPC | 56 |
|-------------------------|----|

Non-ferrous metals

| | |
|--------------------------------|----|
| OptiMill-Alu-HPC | 57 |
| OptiMill-Alu-HPC-Pocket | 58 |
| OptiMill-SPM | 60 |
| OptiMill-Diamond-SPM | 61 |
| OptiMill-Diamond type 50 | 63 |
| OptiMill-Diamond type 51 | 64 |
| OptiMill-Diamond type 53 | 65 |
| OptiMill-Diamond type 57 | 66 |
| OptiMill-Mono-Alu | 68 |

Plastics and composite materials

| | |
|-------------------------------------|----|
| OptiMill-Composite-Speed-Plus | 70 |
| OptiMill-Composite-Micro | 74 |
| OptiMill-Composite-TwinCut | 75 |
| OptiMill-Thermoplastic-FR | 76 |
| OptiMill-Mono-Plastic | 77 |

Technical appendix

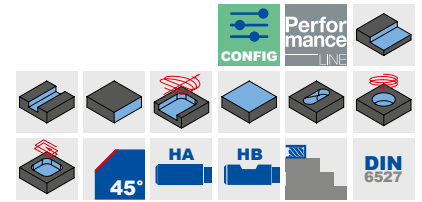
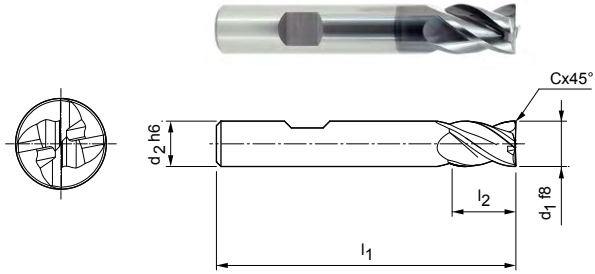
| | |
|------------------------------------|----|
| Cutting data recommendations | 78 |
|------------------------------------|----|

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, short design
SCM760

Design:


Diameter of milling cutter: 3.00 - 20.00 mm
Cutting material: HP920
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge




Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 3,00 | 6 | 50 | 6 | 0,06 | 4 | SCM760-0300Z04R-F0006HB-HP920 | 30787363 |
| 4,00 | 6 | 54 | 8 | 0,08 | 4 | SCM760-0400Z04R-F0008HB-HP920 | 30787364 |
| 5,00 | 6 | 54 | 9 | 0,10 | 4 | SCM760-0500Z04R-F0010HB-HP920 | 30787365 |
| 6,00 | 6 | 54 | 10 | 0,12 | 4 | SCM760-0600Z04R-F0012HB-HP920 | 30787366 |
| 8,00 | 8 | 58 | 12 | 0,16 | 4 | SCM760-0800Z04R-F0016HB-HP920 | 30787367 |
| 10,00 | 10 | 66 | 14 | 0,20 | 4 | SCM760-1000Z04R-F0020HB-HP920 | 30787368 |
| 12,00 | 12 | 73 | 16 | 0,24 | 4 | SCM760-1200Z04R-F0024HB-HP920 | 30787369 |
| 14,00 | 14 | 73 | 16 | 0,28 | 4 | SCM760-1400Z04R-F0028HB-HP920 | 30787370 |
| 16,00 | 16 | 82 | 22 | 0,32 | 4 | SCM760-1600Z04R-F0032HB-HP920 | 30787371 |
| 18,00 | 18 | 82 | 22 | 0,36 | 4 | SCM760-1800Z04R-F0036HB-HP920 | 30787372 |
| 20,00 | 20 | 92 | 26 | 0,40 | 4 | SCM760-2000Z04R-F0040HB-HP920 | 30787373 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM760-0300Z04R-F0006[shank form]-HP920

Example:

SCM760-0300Z04R-F0006HA-HP920

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

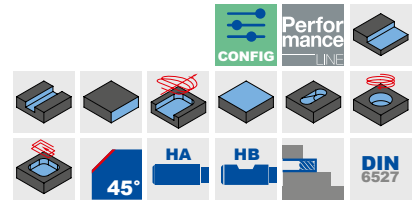
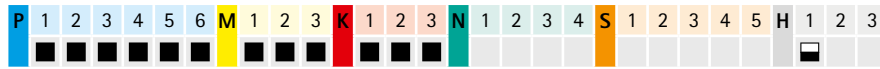
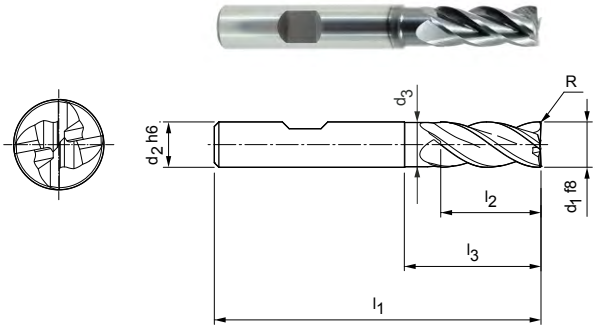
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, long design with neck, design with chamfer / small chamfer
SCM770

Design:

Diameter of milling cutter: 2.50 - 25.00 mm
Cutting material: HP920
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge




Design with chamfer | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-------|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 2,50* | 6 | - | 57 | 8 | - | 0,05 | 4 | SCM770-0250Z04R-F0005HB-HP920 | 30787374 |
| 3,00* | 6 | - | 57 | 8 | - | 0,06 | 4 | SCM770-0300Z04R-F0006HB-HP920 | 30787375 |
| 4,00* | 6 | - | 57 | 11 | - | 0,08 | 4 | SCM770-0400Z04R-F0008HB-HP920 | 30787376 |
| 5,00* | 6 | - | 57 | 13 | - | 0,10 | 4 | SCM770-0500Z04R-F0010HB-HP920 | 30787377 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 0,12 | 4 | SCM770-0600Z04R-F0012HB-HP920 | 30787378 |
| 7,00 | 8 | 6,8 | 63 | 16 | 25 | 0,14 | 4 | SCM770-0700Z04R-F0014HB-HP920 | 30787379 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 0,16 | 4 | SCM770-0800Z04R-F0016HB-HP920 | 30787380 |
| 9,00 | 10 | 8,8 | 72 | 22 | 30 | 0,18 | 4 | SCM770-0900Z04R-F0018HB-HP920 | 30787381 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,20 | 4 | SCM770-1000Z04R-F0020HB-HP920 | 30787382 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,24 | 4 | SCM770-1200Z04R-F0024HB-HP920 | 30787383 |
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,28 | 4 | SCM770-1400Z04R-F0028HB-HP920 | 30787390 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 0,32 | 4 | SCM770-1600Z04R-F0032HB-HP920 | 30787391 |
| 18,00 | 18 | 17,8 | 92 | 36 | 47 | 0,36 | 4 | SCM770-1800Z04R-F0036HB-HP920 | 30787392 |
| 20,00 | 20 | 19,8 | 104 | 41 | 55 | 0,40 | 4 | SCM770-2000Z04R-F0040HB-HP920 | 30787393 |
| 25,00 | 25 | 24,5 | 136 | 68 | 80 | 0,50 | 4 | SCM770-2500Z04R-F0050HB-HP920 | 30787394 |


Design with small chamfer | Preferred series in stock

| | | | | | | | | | |
|-------|----|------|-----|----|----|------|---|-------------------------------|----------|
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 0,10 | 4 | SCM770-0600Z04R-F0010HB-HP920 | 31243605 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 0,10 | 4 | SCM770-0800Z04R-F0010HB-HP920 | 31243606 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,10 | 4 | SCM770-1000Z04R-F0010HB-HP920 | 31243608 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,10 | 4 | SCM770-1200Z04R-F0010HB-HP920 | 31243609 |
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,10 | 4 | SCM770-1400Z04R-F0010HB-HP920 | 31243610 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 0,10 | 4 | SCM770-1600Z04R-F0010HB-HP920 | 31243611 |
| 20,00 | 20 | 19,8 | 104 | 41 | 55 | 0,10 | 4 | SCM770-2000Z04R-F0010HB-HP920 | 31243612 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM770-0250Z04R-F0005[shank form]-HP920

Example:

SCM770-0250Z04R-F0005HA-HP920

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

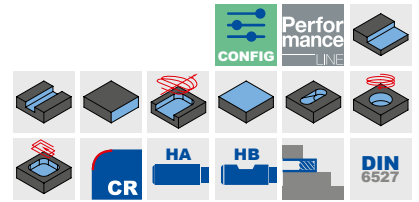
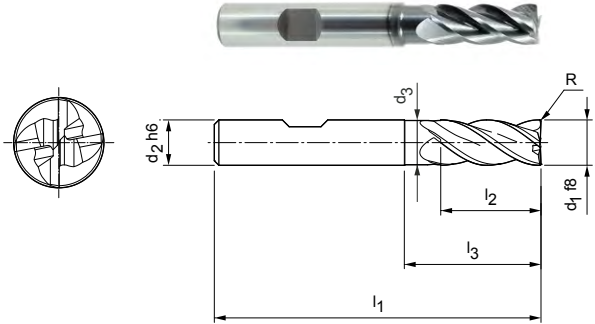
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, long design with neck, design with corner radius
SCM770

Design:

Diameter of milling cutter: 2.50 - 25.00 mm
Cutting material: HP920
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge




Design with radius | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-----|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 4,00* | 6 | - | 57 | 11 | - | 0,4 | 4 | SCM770-0400Z04R-R0040HB-HP920 | 30787434 |
| 4,00* | 6 | - | 57 | 11 | - | 0,5 | 4 | SCM770-0400Z04R-R0050HB-HP920 | 30787435 |
| 4,00* | 6 | - | 57 | 11 | - | 1 | 4 | SCM770-0400Z04R-R0100HB-HP920 | 30787436 |
| 5,00* | 6 | - | 57 | 13 | - | 0,5 | 4 | SCM770-0500Z04R-R0050HB-HP920 | 30787437 |
| 5,00* | 6 | - | 57 | 13 | - | 1 | 4 | SCM770-0500Z04R-R0100HB-HP920 | 30787438 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 0,5 | 4 | SCM770-0600Z04R-R0050HB-HP920 | 30787439 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 1 | 4 | SCM770-0600Z04R-R0100HB-HP920 | 30787440 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 1,5 | 4 | SCM770-0600Z04R-R0150HB-HP920 | 30787441 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 2 | 4 | SCM770-0600Z04R-R0200HB-HP920 | 30787442 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 0,5 | 4 | SCM770-0800Z04R-R0050HB-HP920 | 30787443 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 1 | 4 | SCM770-0800Z04R-R0100HB-HP920 | 30787444 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 1,5 | 4 | SCM770-0800Z04R-R0150HB-HP920 | 30787445 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 2 | 4 | SCM770-0800Z04R-R0200HB-HP920 | 30787446 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 2,5 | 4 | SCM770-0800Z04R-R0250HB-HP920 | 30787447 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 3 | 4 | SCM770-0800Z04R-R0300HB-HP920 | 30787448 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,5 | 4 | SCM770-1000Z04R-R0050HB-HP920 | 30787449 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 1 | 4 | SCM770-1000Z04R-R0100HB-HP920 | 30787450 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 1,5 | 4 | SCM770-1000Z04R-R0150HB-HP920 | 30787451 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 2 | 4 | SCM770-1000Z04R-R0200HB-HP920 | 30787452 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 2,5 | 4 | SCM770-1000Z04R-R0250HB-HP920 | 30787453 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 3 | 4 | SCM770-1000Z04R-R0300HB-HP920 | 30787454 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,5 | 4 | SCM770-1200Z04R-R0050HB-HP920 | 30787455 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 1 | 4 | SCM770-1200Z04R-R0100HB-HP920 | 30787456 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 1,5 | 4 | SCM770-1200Z04R-R0150HB-HP920 | 30787457 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 2 | 4 | SCM770-1200Z04R-R0200HB-HP920 | 30787458 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 2,5 | 4 | SCM770-1200Z04R-R0250HB-HP920 | 30787459 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 3 | 4 | SCM770-1200Z04R-R0300HB-HP920 | 30787460 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 4 | 4 | SCM770-1200Z04R-R0400HB-HP920 | 30787461 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 0,5 | 4 | SCM770-1600Z04R-R0050HB-HP920 | 30787462 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 1 | 4 | SCM770-1600Z04R-R0100HB-HP920 | 30787463 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 2 | 4 | SCM770-1600Z04R-R0200HB-HP920 | 30787464 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 2,5 | 4 | SCM770-1600Z04R-R0250HB-HP920 | 30787465 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 3 | 4 | SCM770-1600Z04R-R0300HB-HP920 | 30787466 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 4 | 4 | SCM770-1600Z04R-R0400HB-HP920 | 30787467 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 1 | 4 | SCM770-2000Z04R-R0100HB-HP920 | 30787468 |


Design with radius | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|---|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 2 | 4 | SCM770-2000Z04R-R0200HB-HP920 | 30787469 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 3 | 4 | SCM770-2000Z04R-R0300HB-HP920 | 30787470 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 4 | 4 | SCM770-2000Z04R-R0400HB-HP920 | 30787471 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM770-0400Z04R-R0040[shank form]-HP920

Example:
SCM770-0400Z04R-R0040HA-HP920

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

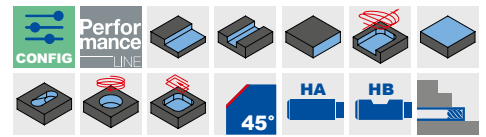
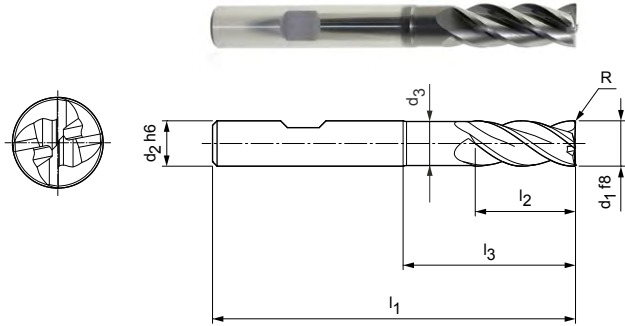
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, overlong design with neck, design with chamfer
SCM720

Design:

Diameter of milling cutter: 5.00 - 25.00 mm
Cutting material: HP920
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-------|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 0,12 | 4 | SCM720-0600Z04R-F0012HB-HP920 | 30652409 |
| 8,00 | 8 | 7,7 | 68 | 21 | 30 | 0,16 | 4 | SCM720-0800Z04R-F0016HB-HP920 | 30652410 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 0,20 | 4 | SCM720-1000Z04R-F0020HB-HP920 | 30652411 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 0,24 | 4 | SCM720-1200Z04R-F0024HB-HP920 | 30652412 |
| 14,00 | 14 | 13,6 | 99 | 26 | 52 | 0,28 | 4 | SCM720-1400Z04R-F0028HB-HP920 | 30652413 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 0,32 | 4 | SCM720-1600Z04R-F0032HB-HP920 | 30652414 |
| 18,00 | 18 | 17,5 | 117 | 36 | 67 | 0,36 | 4 | SCM720-1800Z04R-F0036HB-HP920 | 30652415 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 0,40 | 4 | SCM720-2000Z04R-F0040HB-HP920 | 30652416 |
| 25,00 | 25 | 24 | 150 | 50 | 92 | 0,50 | 4 | SCM720-2500Z04R-F0050HB-HP920 | 30652417 |

Available on request

| | | | | | | | | | |
|------|---|-----|----|----|----|------|---|-------------------------------|----------|
| 5,00 | 6 | 4,8 | 62 | 13 | 24 | 0,10 | 4 | SCM720-0500Z04R-F0010HB-HP920 | 30652408 |
|------|---|-----|----|----|----|------|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM720-0600Z04R-F0012[shank form]-HP920

Example:

SCM720-0600Z04R-F0012HA-HP920



Dimensions in mm.

For cutting data recommendations, see end of chapter.

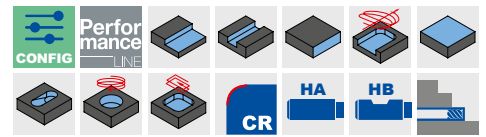
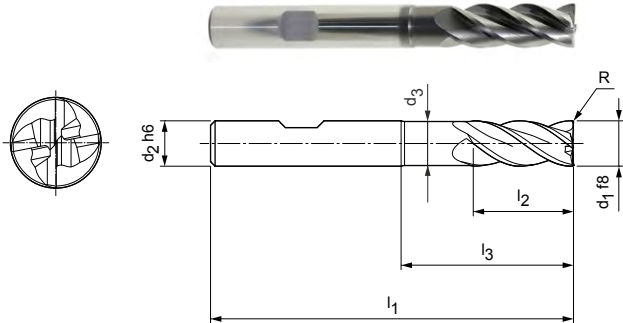
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, overlong design with neck, design with corner radius
SCM720

Design:

Diameter of milling cutter: 4.00 - 25.00 mm
Cutting material: HP920
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-----|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 4,00 | 6 | 3,8 | 62 | 11 | 22 | 0,5 | 4 | SCM720-0400Z04R-R0050HB-HP920 | 31046163 |
| 4,00 | 6 | 3,8 | 62 | 11 | 22 | 1 | 4 | SCM720-0400Z04R-R0100HB-HP920 | 31046164 |
| 5,00 | 6 | 4,8 | 62 | 13 | 24 | 0,5 | 4 | SCM720-0500Z04R-R0050HB-HP920 | 31046165 |
| 5,00 | 6 | 4,8 | 62 | 13 | 24 | 1 | 4 | SCM720-0500Z04R-R0100HB-HP920 | 31046166 |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 0,5 | 4 | SCM720-0600Z04R-R0050HB-HP920 | 31046167 |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 1 | 4 | SCM720-0600Z04R-R0100HB-HP920 | 31046168 |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 2 | 4 | SCM720-0600Z04R-R0200HB-HP920 | 31046169 |
| 8,00 | 8 | 7,7 | 68 | 21 | 30 | 1 | 4 | SCM720-0800Z04R-R0100HB-HP920 | 31046170 |
| 8,00 | 8 | 7,7 | 68 | 21 | 30 | 2 | 4 | SCM720-0800Z04R-R0200HB-HP920 | 31046171 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 0,5 | 4 | SCM720-1000Z04R-R0050HB-HP920 | 31046172 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 1 | 4 | SCM720-1000Z04R-R0100HB-HP920 | 31046173 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 1,5 | 4 | SCM720-1000Z04R-R0150HB-HP920 | 31046174 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 2 | 4 | SCM720-1000Z04R-R0200HB-HP920 | 31046175 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 3 | 4 | SCM720-1000Z04R-R0300HB-HP920 | 31046176 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 0,5 | 4 | SCM720-1200Z04R-R0050HB-HP920 | 31046177 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 1 | 4 | SCM720-1200Z04R-R0100HB-HP920 | 31046178 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 1,5 | 4 | SCM720-1200Z04R-R0150HB-HP920 | 31046179 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 2 | 4 | SCM720-1200Z04R-R0200HB-HP920 | 31046180 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 3 | 4 | SCM720-1200Z04R-R0300HB-HP920 | 31046181 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 0,5 | 4 | SCM720-1600Z04R-R0050HB-HP920 | 31046182 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 1 | 4 | SCM720-1600Z04R-R0100HB-HP920 | 31046183 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 2 | 4 | SCM720-1600Z04R-R0200HB-HP920 | 31046184 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 4 | 4 | SCM720-1600Z04R-R0400HB-HP920 | 31046185 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 1 | 4 | SCM720-2000Z04R-R0100HB-HP920 | 31046186 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 2 | 4 | SCM720-2000Z04R-R0200HB-HP920 | 31046187 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 4 | 4 | SCM720-2000Z04R-R0400HB-HP920 | 31046188 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM720-0400Z04R-R0050[shank form]-HP920

Example:

SCM720-0400Z04R-R0050**HA**-HP920

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

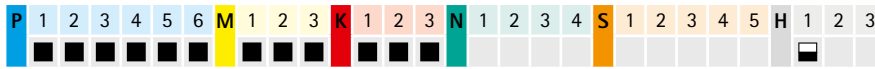
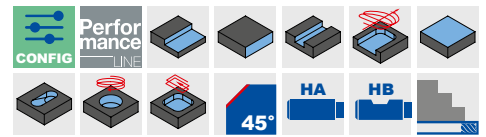
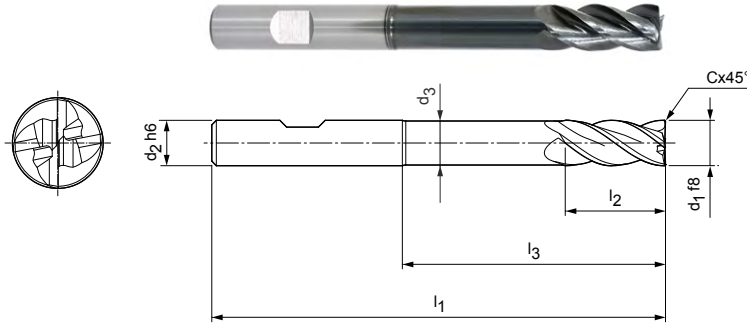
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, extra long design with neck
SCM740

Design:

Diameter of milling cutter: 5.00 - 25.00 mm
Cutting material: HP920
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|-----|-------|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 5,00 | 6 | 4,8 | 80 | 13 | 41 | 0,10 | 4 | SCM740-0500Z04R-F0010HB-HP920 | 30652418 |
| 6,00 | 6 | 5,8 | 80 | 13 | 42 | 0,12 | 4 | SCM740-0600Z04R-F0012HB-HP920 | 30652419 |
| 8,00 | 8 | 7,7 | 100 | 21 | 62 | 0,16 | 4 | SCM740-0800Z04R-F0016HB-HP920 | 30652420 |
| 10,00 | 10 | 9,7 | 100 | 22 | 58 | 0,20 | 4 | SCM740-1000Z04R-F0020HB-HP920 | 30652421 |
| 12,00 | 12 | 11,6 | 120 | 26 | 73 | 0,24 | 4 | SCM740-1200Z04R-F0024HB-HP920 | 30652422 |
| 14,00 | 14 | 13,6 | 120 | 26 | 73 | 0,28 | 4 | SCM740-1400Z04R-F0028HB-HP920 | 30652423 |
| 16,00 | 16 | 15,5 | 150 | 36 | 100 | 0,32 | 4 | SCM740-1600Z04R-F0032HB-HP920 | 30652424 |
| 20,00 | 20 | 19,5 | 150 | 41 | 98 | 0,40 | 4 | SCM740-2000Z04R-F0040HB-HP920 | 30652426 |

Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|-----|------|---|-------------------------------|----------|
| 18,00 | 18 | 17,5 | 150 | 36 | 100 | 0,36 | 4 | SCM740-1800Z04R-F0036HB-HP920 | 30652425 |
| 25,00 | 25 | 24 | 175 | 50 | 117 | 0,50 | 4 | SCM740-2500Z04R-F0050HB-HP920 | 30652427 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM740-0500Z04R-F0010[shank form]-HP920

Example:

SCM740-0500Z04R-F0010HA-HP920

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

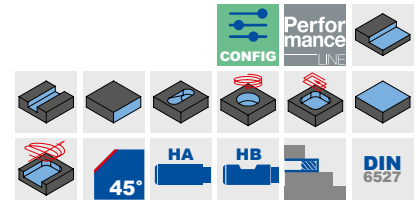
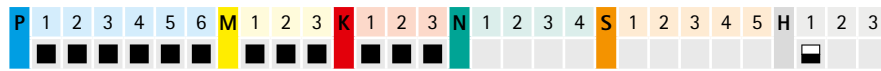
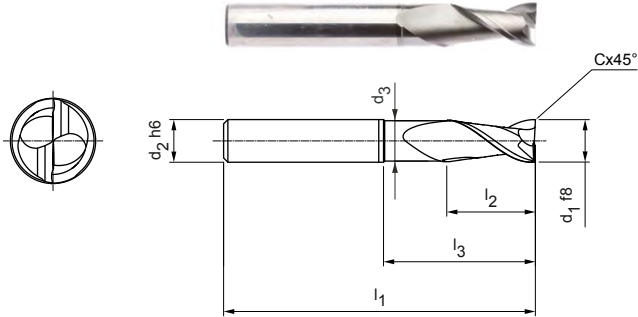
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Plus

Shoulder milling cutter, long design with neck
SCM772

Design:

Diameter of milling cutter: 1.00 - 20.00 mm
Cutting material: HP213/HP723
Number of cutting edges: 2
Helix angle: 36°/38°
Special features: Unequal spacing, rounding the cutting edge




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 1,00 | 3 | 0,97 | 38 | 3 | 5 | 0,025 | 2 | SCM772-0100Z02R-F0005HA-HP213 | 31205147 |
| 2,00 | 3 | 1,9 | 38 | 4 | 8 | 0,05 | 2 | SCM772-0200Z02R-F0005HA-HP213 | 31205148 |
| 3,00 | 6 | 2,8 | 57 | 7 | 13 | 0,10 | 2 | SCM772-0300Z02R-F0010HA-HP723 | 31205149 |
| 4,00 | 6 | 3,8 | 57 | 8 | 14 | 0,10 | 2 | SCM772-0400Z02R-F0010HA-HP723 | 31205180 |
| 5,00 | 6 | 4,8 | 57 | 10 | 15,5 | 0,10 | 2 | SCM772-0500Z02R-F0010HA-HP723 | 31205181 |
| 6,00 | 6 | 5,8 | 57 | 10 | 20 | 0,10 | 2 | SCM772-0600Z02R-F0010HA-HP723 | 31205182 |
| 8,00 | 8 | 7,8 | 63 | 16 | 25 | 0,10 | 2 | SCM772-0800Z02R-F0010HA-HP723 | 31205183 |
| 10,00 | 10 | 9,8 | 72 | 19 | 30 | 0,10 | 2 | SCM772-1000Z02R-F0010HA-HP723 | 31205184 |
| 12,00 | 12 | 11,8 | 83 | 22 | 36 | 0,10 | 2 | SCM772-1200Z02R-F0010HA-HP723 | 31205185 |
| 16,00 | 16 | 15,8 | 92 | 26 | 42 | 0,10 | 2 | SCM772-1600Z02R-F0010HA-HP723 | 31205186 |


Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|------|---|-------------------------------|----------|
| 20,00 | 20 | 19,8 | 104 | 32 | 52 | 0,10 | 2 | SCM772-2000Z02R-F0010HA-HP723 | 31205187 |
|-------|----|------|-----|----|----|------|---|-------------------------------|----------|

Configurable features*



Shank form:
Shank form: HB



Specification:
SCM772-0100Z02R-F0005[shank form]-HP213

Example:

SCM772-0100Z02R-F0005HB-HP213

Shank form HB

Dimensions in mm.

* Configurable features valid from d₁ = 3 mm.

For cutting data recommendations, see end of chapter.

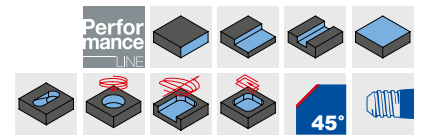
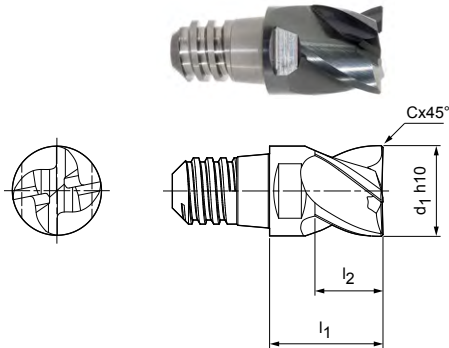
Special designs and other coatings available upon request.

CPMill®-Uni-HPC

Design with CFS connection
CPM100

Design:


Diameter of milling cutter: 8.00 – 20.00 mm
Cutting material: HP383
Number of cutting edges: 4
Helix angle: 37°
Special features: Unequal spacing



Preferred series in stock

| Dimensions | | | | | z | a _p max. | SW | Specification | Order no. |
|--------------------|----------|----------------|----------------|-------|---|---------------------|-------|-------------------------------|-----------|
| d ₁ h10 | CFS size | l ₁ | l ₂ | Cx45° | | | | | |
| 8,00 | 6 | 11 | 6 | 0,16 | 4 | 4,5 | SW 6 | CPM100-0800Z04-F0016-06-HP383 | 30371373 |
| 10,00 | 8 | 13 | 7,5 | 0,20 | 4 | 5,6 | SW 8 | CPM100-1000Z04-F0020-08-HP383 | 30371374 |
| 12,00 | 10 | 16 | 9 | 0,24 | 4 | 6,8 | SW 10 | CPM100-1200Z04-F0024-10-HP383 | 30371375 |
| 16,00 | 12 | 20 | 12 | 0,32 | 4 | 9 | SW 13 | CPM100-1600Z04-F0032-12-HP383 | 30371376 |
| 20,00 | 16 | 25 | 15 | 0,40 | 4 | 11,3 | SW 16 | CPM100-2000Z04-F0040-16-HP383 | 30371378 |

Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

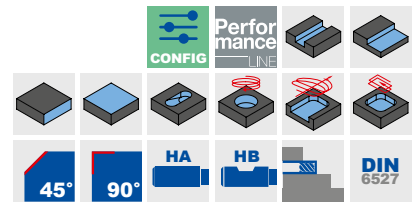
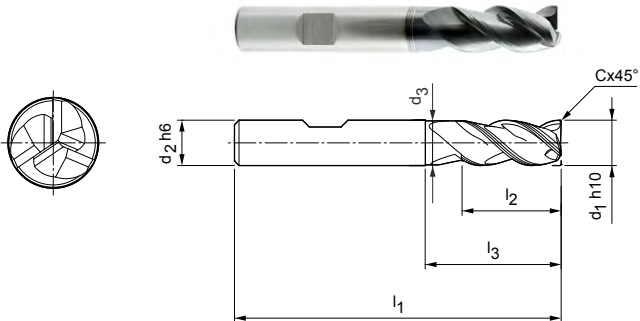
Dimensions in mm.
For cutting data recommendations, see end of chapter.
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Slot

Shoulder milling cutter, long design with neck
SCM250

Design:

Diameter of milling cutter: 1.00 - 20.00 mm
Cutting material: HP213/HP922
Number of cutting edges: 3
Helix angle: 42° - 43°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 1,00 | 6 | 0,9 | 54 | 2,5 | 4 | - | 3 | SCM250-0100Z03R-S-HB-HP922 | 30595972 |
| 1,50 | 6 | 1,4 | 54 | 4 | 6 | - | 3 | SCM250-0150Z03R-S-HB-HP922 | 30504879 |
| 2,00 | 6 | 1,9 | 54 | 5 | 8 | - | 3 | SCM250-0200Z03R-S-HB-HP922 | 30504885 |
| 2,50 | 6 | 2,4 | 54 | 6,5 | 10 | - | 3 | SCM250-0250Z03R-S-HB-HP922 | 30596272 |
| 3,00 | 6 | 2,8 | 57 | 8 | 12,5 | 0,06 | 3 | SCM250-0300Z03R-F0006HB-HP213 | 30393565 |
| 4,00 | 6 | 3,8 | 57 | 11 | 15 | 0,08 | 3 | SCM250-0400Z03R-F0008HB-HP213 | 30393566 |
| 5,00 | 6 | 4,8 | 57 | 13 | 16 | 0,10 | 3 | SCM250-0500Z03R-F0010HB-HP213 | 30393567 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 0,12 | 3 | SCM250-0600Z03R-F0012HB-HP213 | 30393568 |
| 8,00 | 8 | 7,8 | 63 | 21 | 27 | 0,16 | 3 | SCM250-0800Z03R-F0016HB-HP213 | 30393569 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,20 | 3 | SCM250-1000Z03R-F0020HB-HP213 | 30393570 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,24 | 3 | SCM250-1200Z03R-F0024HB-HP213 | 30393571 |
| 16,00 | 16 | 15,8 | 92 | 36 | 44 | 0,32 | 3 | SCM250-1600Z03R-F0032HB-HP213 | 30393573 |
| 18,00 | 18 | 17,8 | 92 | 36 | 44 | 0,36 | 3 | SCM250-1800Z03R-F0036HB-HP213 | 30393574 |
| 20,00 | 20 | 19,8 | 104 | 41 | 55 | 0,40 | 3 | SCM250-2000Z03R-F0040HB-HP213 | 30393575 |


Available on request

| | | | | | | | | | |
|-------|----|------|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,28 | 3 | SCM250-1400Z03R-F0028HB-HP213 | 30393572 |
|-------|----|------|----|----|----|------|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HA



Specification:
SCM250-0300Z03R-F0006[shank form]-HP213

Example:

SCM250-0300Z03R-F0006HA-HP213

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

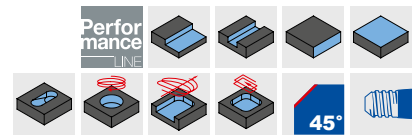
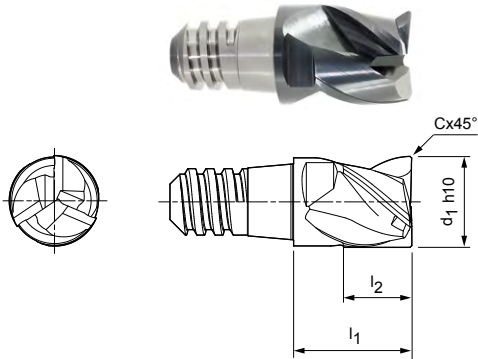
Special designs and other coatings available upon request.

CPMill®-Uni-HPC-Slot

Design with CFS connection
CPM110

Design:


Diameter of milling cutter: 8.00 – 25.00 mm
Cutting material: HP383
Number of cutting edges: 3
Helix angle: 41°
Special features: Unequal spacing



Preferred series in stock

| Dimensions | | | | | z | ap max. | SW | Specification | Order no. |
|------------|----------|----|-----|-------|---|---------|-------|-------------------------------|-----------|
| d1 h10 | CFS size | l1 | l2 | Cx45° | | | | | |
| 8,00 | 6 | 11 | 6 | 0,16 | 3 | 4,5 | SW 6 | CPM110-0800Z03-F0016-06-HP383 | 30371366 |
| 10,00 | 8 | 13 | 7,5 | 0,20 | 3 | 5,6 | SW 8 | CPM110-1000Z03-F0020-08-HP383 | 30371367 |
| 12,00 | 10 | 16 | 9 | 0,24 | 3 | 6,8 | SW 10 | CPM110-1200Z03-F0024-10-HP383 | 30371368 |
| 16,00 | 12 | 20 | 12 | 0,32 | 3 | 9 | SW 13 | CPM110-1600Z03-F0032-12-HP383 | 30371369 |
| 20,00 | 16 | 25 | 15 | 0,40 | 3 | 11,3 | SW 16 | CPM110-2000Z03-F0040-16-HP383 | 30371371 |
| 25,00 | 20 | 32 | 19 | 0,50 | 3 | 14 | SW 21 | CPM110-2500Z03-F0050-20-HP383 | 30371372 |

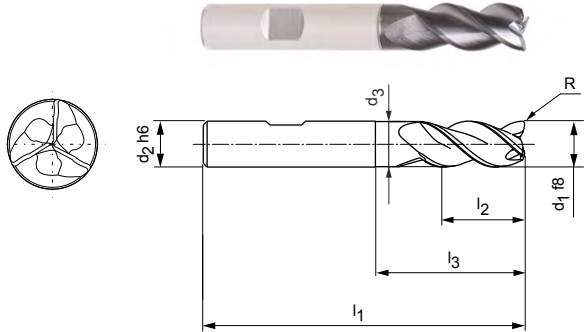
Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

Dimensions in mm.
For cutting data recommendations, see end of chapter.
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Pocket

Shoulder milling cutter, long design with neck
SCM810

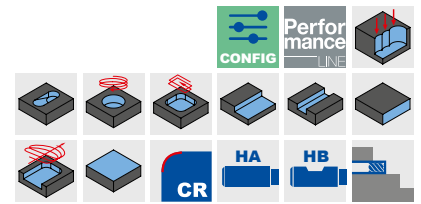


Design:

Diameter of milling cutter: 3.80 - 20.00 mm
Cutting material: HP920
Number of cutting edges: 3
Helix angle: ~ 42°
Special features: Face geometry with integrated drill tip

Application:


Perfect for inclined plunging up to 45°, in helix milling and grooving.




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|------|------|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 3,80 | 6 | 3,6 | 57 | 10 | 13 | 0,19 | 3 | SCM810-0380Z03R-R0019HB-HP920 | 31031147 |
| 4,00 | 6 | 3,8 | 57 | 11 | 13 | 0,2 | 3 | SCM810-0400Z03R-R0020HB-HP920 | 31031148 |
| 4,80 | 6 | 4,6 | 57 | 11 | 15,5 | 0,24 | 3 | SCM810-0480Z03R-R0024HB-HP920 | 31031149 |
| 5,00 | 6 | 4,8 | 57 | 13 | 15,5 | 0,25 | 3 | SCM810-0500Z03R-R0025HB-HP920 | 31031150 |
| 5,70 | 6 | 5,5 | 57 | 13 | 19 | 0,29 | 3 | SCM810-0570Z03R-R0029HB-HP920 | 30788023 |
| 6,00 | 6 | 5,8 | 57 | 13 | 19 | 0,3 | 3 | SCM810-0600Z03R-R0030HB-HP920 | 30788024 |
| 6,70 | 8 | 6,5 | 63 | 16 | 25 | 0,34 | 3 | SCM810-0670Z03R-R0034HB-HP920 | 30788025 |
| 7,00 | 8 | 6,8 | 63 | 16 | 25 | 0,35 | 3 | SCM810-0700Z03R-R0035HB-HP920 | 30788026 |
| 7,70 | 8 | 7,5 | 63 | 19 | 25 | 0,39 | 3 | SCM810-0770Z03R-R0039HB-HP920 | 30788027 |
| 8,00 | 8 | 7,8 | 63 | 19 | 25 | 0,4 | 3 | SCM810-0800Z03R-R0040HB-HP920 | 30788028 |
| 8,70 | 10 | 8,5 | 72 | 22 | 30 | 0,44 | 3 | SCM810-0870Z03R-R0044HB-HP920 | 30788029 |
| 9,00 | 10 | 8,8 | 72 | 22 | 30 | 0,45 | 3 | SCM810-0900Z03R-R0045HB-HP920 | 30788030 |
| 9,70 | 10 | 9,5 | 72 | 22 | 30 | 0,49 | 3 | SCM810-0970Z03R-R0049HB-HP920 | 30788031 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,5 | 3 | SCM810-1000Z03R-R0050HB-HP920 | 30788032 |
| 11,70 | 12 | 11,5 | 83 | 26 | 36 | 0,59 | 3 | SCM810-1170Z03R-R0059HB-HP920 | 30788033 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,6 | 3 | SCM810-1200Z03R-R0060HB-HP920 | 30788034 |
| 13,70 | 14 | 13,5 | 83 | 26 | 36 | 0,69 | 3 | SCM810-1370Z03R-R0069HB-HP920 | 30788035 |
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,7 | 3 | SCM810-1400Z03R-R0070HB-HP920 | 30788036 |
| 15,50 | 16 | 15,3 | 92 | 31 | 42 | 0,78 | 3 | SCM810-1550Z03R-R0078HB-HP920 | 30788037 |
| 16,00 | 16 | 15,8 | 92 | 31 | 42 | 0,8 | 3 | SCM810-1600Z03R-R0080HB-HP920 | 30788038 |
| 17,50 | 18 | 17,3 | 92 | 31 | 42 | 0,88 | 3 | SCM810-1750Z03R-R0088HB-HP920 | 30788039 |
| 18,00 | 18 | 17,8 | 92 | 31 | 42 | 0,9 | 3 | SCM810-1800Z03R-R0090HB-HP920 | 30788040 |
| 19,50 | 20 | 19,3 | 104 | 41 | 52 | 0,98 | 3 | SCM810-1950Z03R-R0098HB-HP920 | 30788041 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 1 | 3 | SCM810-2000Z03R-R0100HB-HP920 | 30788042 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM810-0380Z03R-R0019[shank form]-HP920

Example:

SCM810-0380Z03R-R0019HA-HP920

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Pocket

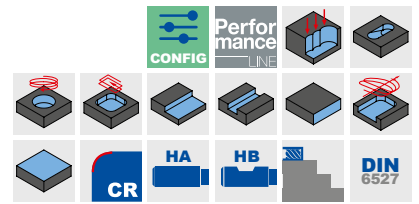
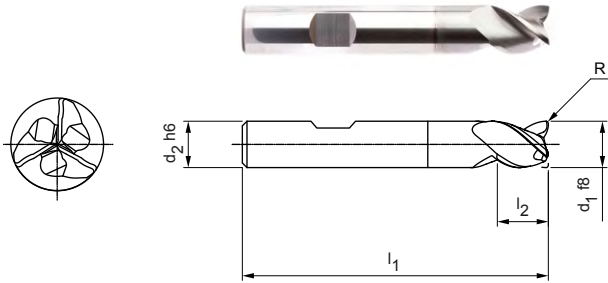
Shoulder milling cutter, short design
SCM840

Design:

Diameter of milling cutter: 3.80 – 20.00 mm
Cutting material: HP920
Number of cutting edges: 3
Helix angle: ~ 42°
Special features: Face geometry with integrated drill tip

Application:

Perfect for inclined plunging up to 45°, in helix milling and grooving.



Preferred series in stock

| Dimensions | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|------|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | l ₅ | R* | | | |
| 3,80 | 6 | 54 | 5 | 10,5 | 0,12 | 3 | SCM840-0380Z03R-R0012HB-HP920 | 31031129 |
| 4,00 | 6 | 54 | 5 | 10,5 | 0,12 | 3 | SCM840-0400Z03R-R0012HB-HP920 | 31031140 |
| 4,80 | 6 | 54 | 6 | 12,5 | 0,2 | 3 | SCM840-0480Z03R-R0020HB-HP920 | 31031141 |
| 5,00 | 6 | 54 | 6 | 12,5 | 0,2 | 3 | SCM840-0500Z03R-R0020HB-HP920 | 31031142 |
| 5,70 | 6 | 54 | 7 | 14,5 | 0,2 | 3 | SCM840-0570Z03R-R0020HB-HP920 | 30965832 |
| 6,00 | 6 | 54 | 7 | - | 0,2 | 3 | SCM840-0600Z03R-R0020HB-HP920 | 30965833 |
| 6,70 | 8 | 58 | 8 | 16,5 | 0,2 | 3 | SCM840-0670Z03R-R0020HB-HP920 | 30965834 |
| 7,00 | 8 | 58 | 8 | 17 | 0,2 | 3 | SCM840-0700Z03R-R0020HB-HP920 | 30965835 |
| 7,70 | 8 | 58 | 9 | 18,5 | 0,2 | 3 | SCM840-0770Z03R-R0020HB-HP920 | 30965836 |
| 8,00 | 8 | 58 | 9 | - | 0,2 | 3 | SCM840-0800Z03R-R0020HB-HP920 | 30965837 |
| 8,70 | 10 | 66 | 10 | 20,5 | 0,32 | 3 | SCM840-0870Z03R-R0032HB-HP920 | 30965838 |
| 9,00 | 10 | 66 | 10 | 21 | 0,32 | 3 | SCM840-0900Z03R-R0032HB-HP920 | 30965839 |
| 9,70 | 10 | 66 | 11 | 22,5 | 0,32 | 3 | SCM840-0970Z03R-R0032HB-HP920 | 30965840 |
| 10,00 | 10 | 66 | 11 | - | 0,32 | 3 | SCM840-1000Z03R-R0032HB-HP920 | 30953712 |
| 11,70 | 12 | 73 | 12 | 24,5 | 0,32 | 3 | SCM840-1170Z03R-R0032HB-HP920 | 30965841 |
| 12,00 | 12 | 73 | 12 | - | 0,32 | 3 | SCM840-1200Z03R-R0032HB-HP920 | 30948678 |
| 13,70 | 14 | 75 | 14 | 26,5 | 0,32 | 3 | SCM840-1370Z03R-R0032HB-HP920 | 30965842 |
| 14,00 | 14 | 75 | 14 | - | 0,32 | 3 | SCM840-1400Z03R-R0032HB-HP920 | 30965843 |
| 15,50 | 16 | 82 | 16 | 30 | 0,32 | 3 | SCM840-1550Z03R-R0032HB-HP920 | 30965844 |
| 16,00 | 16 | 82 | 16 | - | 0,32 | 3 | SCM840-1600Z03R-R0032HB-HP920 | 30965845 |
| 17,50 | 18 | 84 | 18 | 32 | 0,32 | 3 | SCM840-1750Z03R-R0032HB-HP920 | 30965846 |
| 19,50 | 20 | 92 | 20 | 38 | 0,5 | 3 | SCM840-1950Z03R-R0050HB-HP920 | 30965848 |
| 20,00 | 20 | 92 | 20 | - | 0,5 | 3 | SCM840-2000Z03R-R0050HB-HP920 | 30965849 |

* Corner radius especially for feather key milling according to DIN 6885.

Available on request

| | | | | | | | | |
|-------|----|----|----|---|------|---|-------------------------------|----------|
| 18,00 | 18 | 84 | 18 | - | 0,32 | 3 | SCM840-1800Z03R-R0032HB-HP920 | 30965847 |
|-------|----|----|----|---|------|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM840-0380Z03R-R0012[shank form]-HP920

Example:

SCM840-0380Z03R-R0012**HA**-HP920



Dimensions in mm.

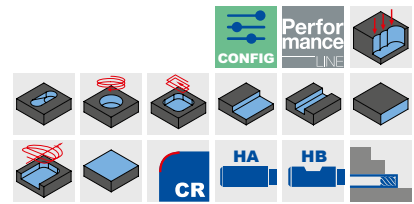
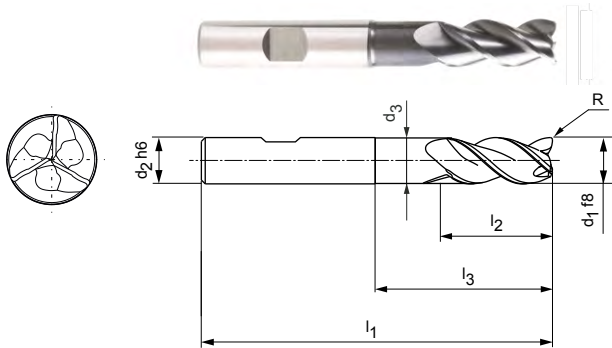
For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.



OptiMill®-Uni-HPC-Pocket

Shoulder milling cutter, overlong design with neck
SCM800



Design:
 Diameter of milling cutter: 5.00 - 20.00 mm
 Cutting material: HP920
 Number of cutting edges: 3
 Helix angle: ~ 42°
 Special features: Face geometry with integrated drill tip

Application:
 Perfect for inclined plunging up to 45°, in helix milling and grooving.

Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|------|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 5,00 | 6 | 4,8 | 62 | 13 | 24 | 0,25 | 3 | SCM800-0500Z03R-R0025HB-HP920 | 31031146 |
| 5,70 | 6 | 5,5 | 62 | 13 | 24 | 0,29 | 3 | SCM800-0570Z03R-R0029HB-HP920 | 30787957 |
| 6,00 | 6 | 5,8 | 62 | 13 | 24 | 0,3 | 3 | SCM800-0600Z03R-R0030HB-HP920 | 30787958 |
| 6,70 | 8 | 6,4 | 68 | 16 | 30 | 0,34 | 3 | SCM800-0670Z03R-R0034HB-HP920 | 30787959 |
| 7,00 | 8 | 6,7 | 68 | 16 | 30 | 0,35 | 3 | SCM800-0700Z03R-R0035HB-HP920 | 30787960 |
| 7,70 | 8 | 7,4 | 68 | 21 | 30 | 0,39 | 3 | SCM800-0770Z03R-R0039HB-HP920 | 30787961 |
| 8,00 | 8 | 7,7 | 68 | 21 | 30 | 0,4 | 3 | SCM800-0800Z03R-R0040HB-HP920 | 30787962 |
| 8,70 | 10 | 8,4 | 80 | 22 | 38 | 0,44 | 3 | SCM800-0870Z03R-R0044HB-HP920 | 30787963 |
| 9,00 | 10 | 8,7 | 80 | 22 | 38 | 0,45 | 3 | SCM800-0900Z03R-R0045HB-HP920 | 30787964 |
| 9,70 | 10 | 9,4 | 80 | 22 | 38 | 0,49 | 3 | SCM800-0970Z03R-R0049HB-HP920 | 30787965 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 0,5 | 3 | SCM800-1000Z03R-R0050HB-HP920 | 30787966 |
| 11,70 | 12 | 11,3 | 93 | 26 | 46 | 0,59 | 3 | SCM800-1170Z03R-R0059HB-HP920 | 30787967 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 0,6 | 3 | SCM800-1200Z03R-R0060HB-HP920 | 30787968 |
| 13,70 | 14 | 13,3 | 99 | 26 | 52 | 0,69 | 3 | SCM800-1370Z03R-R0069HB-HP920 | 30787969 |
| 14,00 | 14 | 13,6 | 99 | 26 | 52 | 0,7 | 3 | SCM800-1400Z03R-R0070HB-HP920 | 30787970 |
| 15,50 | 16 | 15 | 108 | 36 | 58 | 0,78 | 3 | SCM800-1550Z03R-R0078HB-HP920 | 30787971 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 0,8 | 3 | SCM800-1600Z03R-R0080HB-HP920 | 30787972 |
| 17,50 | 18 | 17 | 117 | 36 | 67 | 0,88 | 3 | SCM800-1750Z03R-R0088HB-HP920 | 30787973 |
| 18,00 | 18 | 17,5 | 117 | 36 | 67 | 0,9 | 3 | SCM800-1800Z03R-R0090HB-HP920 | 30787974 |
| 19,50 | 20 | 19 | 126 | 41 | 74 | 0,98 | 3 | SCM800-1950Z03R-R0098HB-HP920 | 30787975 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 1 | 3 | SCM800-2000Z03R-R0100HB-HP920 | 30787976 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM800-0500Z03R-R0025[shank form]-HP920

Example:
SCM800-0500Z03R-R0025HA-HP920

Shank form HA

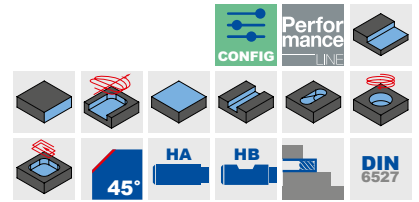
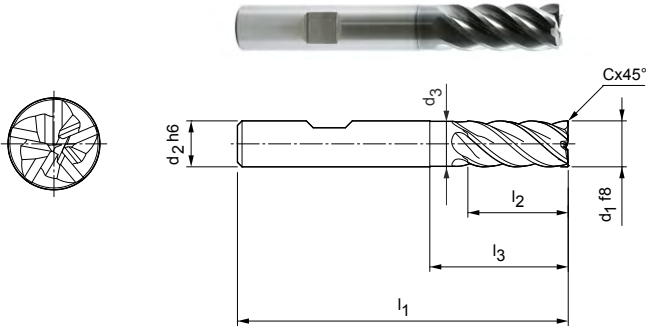
Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Silent

Shoulder milling cutter, long design with neck
SCM570

Design:

Diameter of milling cutter: 6.00 - 25.00 mm
Cutting material: HP723
Number of cutting edges: 5
Helix angle: 41° - 42°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 6,00 | 6 | 5,8 | 57 | 13 | 19 | 0,12 | 5 | SCM570-0600Z05R-F0012HB-HP723 | 30510329 |
| 8,00 | 8 | 7,8 | 63 | 19 | 25 | 0,16 | 5 | SCM570-0800Z05R-F0016HB-HP723 | 30510343 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,20 | 5 | SCM570-1000Z05R-F0020HB-HP723 | 30510345 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,24 | 5 | SCM570-1200Z05R-F0024HB-HP723 | 30510347 |
| 16,00 | 16 | 15,8 | 92 | 32 | 42 | 0,32 | 5 | SCM570-1600Z05R-F0032HB-HP723 | 30510348 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 0,40 | 5 | SCM570-2000Z05R-F0040HB-HP723 | 30510349 |
| 25,00 | 25 | 24,5 | 125 | 50 | 65 | 0,50 | 5 | SCM570-2500Z05R-F0050HB-HP723 | 30510350 |


Available on request

| | | | | | | | | | |
|-------|----|------|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,28 | 5 | SCM570-1400Z05R-F0028HB-HP723 | 30671900 |
| 18,00 | 18 | 17,8 | 92 | 32 | 42 | 0,36 | 5 | SCM570-1800Z05R-F0036HB-HP723 | 30583302 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM570-0600Z05R-F0012[shank form]-HP723

Example:

SCM570-0600Z05R-F0012HA-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

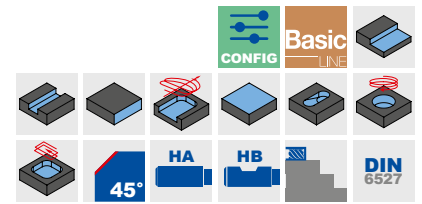
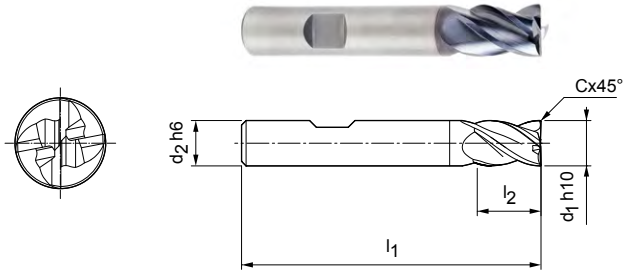
Special designs and other coatings available upon request.

ECU-Mill-Uni-LV

Shoulder milling cutter, short design
SCM780

Design:

Diameter of milling cutter: 3.00 - 20.00 mm
Cutting material: HP921
Number of cutting edges: 4
Helix angle: 36°/38.5°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 3,00 | 6 | 50 | 6 | 0,06 | 4 | SCM780-0300Z04R-F0006HB-HP921 | 30656944 |
| 4,00 | 6 | 54 | 8 | 0,08 | 4 | SCM780-0400Z04R-F0008HB-HP921 | 30656945 |
| 5,00 | 6 | 54 | 9 | 0,10 | 4 | SCM780-0500Z04R-F0010HB-HP921 | 30656946 |
| 6,00 | 6 | 54 | 10 | 0,12 | 4 | SCM780-0600Z04R-F0012HB-HP921 | 30656947 |
| 8,00 | 8 | 58 | 12 | 0,16 | 4 | SCM780-0800Z04R-F0016HB-HP921 | 30656949 |
| 10,00 | 10 | 66 | 14 | 0,20 | 4 | SCM780-1000Z04R-F0020HB-HP921 | 30656950 |
| 12,00 | 12 | 73 | 16 | 0,24 | 4 | SCM780-1200Z04R-F0024HB-HP921 | 30656951 |
| 16,00 | 16 | 82 | 22 | 0,32 | 4 | SCM780-1600Z04R-F0032HB-HP921 | 30656953 |
| 20,00 | 20 | 92 | 26 | 0,40 | 4 | SCM780-2000Z04R-F0040HB-HP921 | 30656955 |


Available on request

| | | | | | | | |
|-------|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 73 | 16 | 0,28 | 4 | SCM780-1400Z04R-F0028HB-HP921 | 30656952 |
| 18,00 | 18 | 82 | 22 | 0,36 | 4 | SCM780-1800Z04R-F0036HB-HP921 | 30656954 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM780-0300Z04R-F0006[shank form]-HP921

Example:

SCM780-0300Z04R-F0006HA-HP921

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

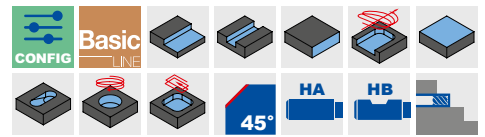
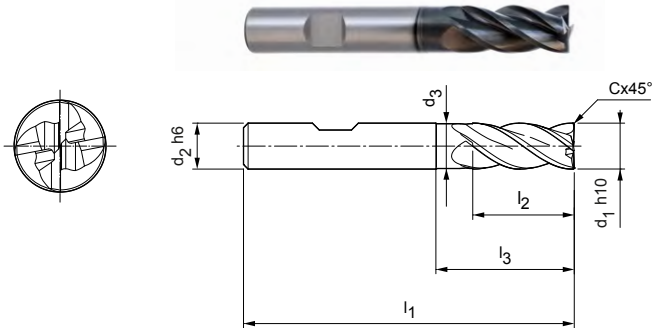
Special designs and other coatings available upon request.

ECU-Mill-Uni-LV

Shoulder milling cutter, long design with neck
SCM790, follow-up product to OptiMill-Uni (z4)

Design:

Diameter of milling cutter: 3.00 - 20.00 mm
Cutting material: HP921
Number of cutting edges: 4
Helix angle: 36°/38.5°
Special features: Unequal spacing



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 3,00* | 6 | - | 57 | 8 | - | 0,06 | 4 | SCM790-0300Z04R-F0006HB-HP921 | 30656932 |
| 4,00* | 6 | - | 57 | 11 | - | 0,08 | 4 | SCM790-0400Z04R-F0008HB-HP921 | 30656933 |
| 5,00* | 6 | - | 57 | 13 | - | 0,10 | 4 | SCM790-0500Z04R-F0010HB-HP921 | 30656934 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 0,12 | 4 | SCM790-0600Z04R-F0012HB-HP921 | 30656935 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 0,16 | 4 | SCM790-0800Z04R-F0016HB-HP921 | 30656936 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,20 | 4 | SCM790-1000Z04R-F0020HB-HP921 | 30656937 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,24 | 4 | SCM790-1200Z04R-F0024HB-HP921 | 30656938 |
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,28 | 4 | SCM790-1400Z04R-F0028HB-HP921 | 30656939 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 0,32 | 4 | SCM790-1600Z04R-F0032HB-HP921 | 30656940 |
| 20,00 | 20 | 19,8 | 104 | 41 | 53 | 0,40 | 4 | SCM790-2000Z04R-F0040HB-HP921 | 30656942 |

Available on request

| | | | | | | | | | |
|-------|----|------|----|----|----|------|---|-------------------------------|----------|
| 18,00 | 18 | 17,8 | 92 | 36 | 42 | 0,36 | 4 | SCM790-1800Z04R-F0036HB-HP921 | 30656941 |
|-------|----|------|----|----|----|------|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM790-0300Z04R-F006[shank form]-HP921

Example:

SCM790-0300Z04R-F006HA-HP921

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Hardened

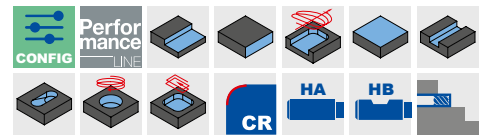
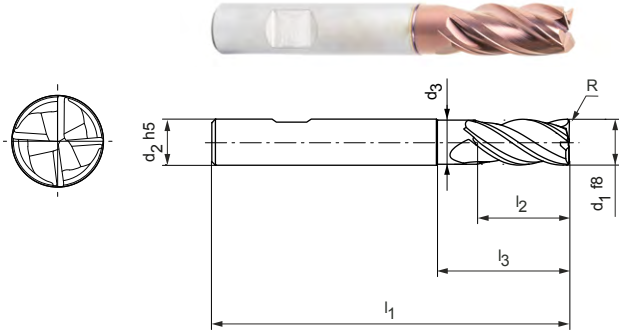
Shoulder milling cutter, long design with neck
SCM102

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP810
Number of cutting edges: 4
Helix angle: 42°

Application:

For roughing of parts with a hardness of 45 HRC.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-----|---|-------------------------------|-----------|
| d1 f8 | d2 h5 | d3 | l1 | l2 | l3 | R | | | |
| 4,00 | 6 | - | 57 | 11 | - | 0,5 | 4 | SCM102-0400Z04R-R0050HB-HP810 | 31152701 |
| 4,00 | 6 | - | 57 | 11 | - | 1 | 4 | SCM102-0400Z04R-R0100HB-HP810 | 31152702 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 0,5 | 4 | SCM102-0600Z04R-R0050HB-HP810 | 31152705 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 1 | 4 | SCM102-0600Z04R-R0100HB-HP810 | 31152706 |
| 6,00 | 6 | 5,8 | 57 | 13 | 20 | 2 | 4 | SCM102-0600Z04R-R0200HB-HP810 | 31152708 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 0,5 | 4 | SCM102-0800Z04R-R0050HB-HP810 | 31152709 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 1 | 4 | SCM102-0800Z04R-R0100HB-HP810 | 31152710 |
| 8,00 | 8 | 7,8 | 63 | 21 | 25 | 2 | 4 | SCM102-0800Z04R-R0200HB-HP810 | 31152712 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,5 | 4 | SCM102-1000Z04R-R0050HB-HP810 | 31152715 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 1 | 4 | SCM102-1000Z04R-R0100HB-HP810 | 31152716 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 2 | 4 | SCM102-1000Z04R-R0200HB-HP810 | 31152718 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,5 | 4 | SCM102-1200Z04R-R0050HB-HP810 | 31152721 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 1 | 4 | SCM102-1200Z04R-R0100HB-HP810 | 31152722 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 2 | 4 | SCM102-1200Z04R-R0200HB-HP810 | 31152724 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 0,5 | 4 | SCM102-1600Z04R-R0050HB-HP810 | 31152728 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 1 | 4 | SCM102-1600Z04R-R0100HB-HP810 | 31152729 |
| 16,00 | 16 | 15,8 | 92 | 36 | 42 | 2 | 4 | SCM102-1600Z04R-R0200HB-HP810 | 31152730 |
| 20,00 | 20 | 19,8 | 104 | 41 | 55 | 1 | 4 | SCM102-2000Z04R-R0100HB-HP810 | 31152734 |
| 20,00 | 20 | 19,8 | 104 | 41 | 55 | 2 | 4 | SCM102-2000Z04R-R0200HB-HP810 | 31152735 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM102-0400Z04R-R0050[shank form]-HP810

Example:

SCM102-0400Z04R-R0050HA-HP810

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Hardened

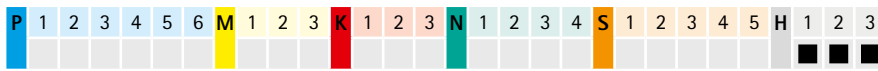
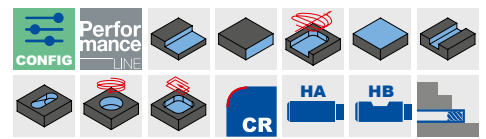
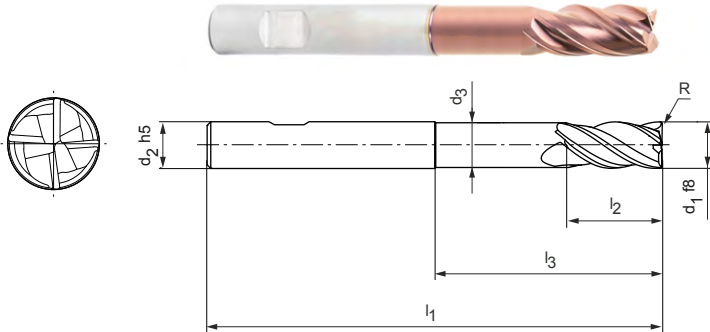
Shoulder milling cutter, overlong design with neck
SCM103

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP810
Number of cutting edges: 4
Helix angle: 42°

Application:

For roughing of parts with a hardness of 45 HRC.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-----|---|-------------------------------|-----------|
| d1 f8 | d2 h5 | d3 | l1 | l2 | l3 | R | | | |
| 4,00 | 6 | 3,8 | 62 | 11 | 22 | 0,5 | 4 | SCM103-0400Z04R-R0050HB-HP810 | 31152738 |
| 4,00 | 6 | 3,8 | 62 | 11 | 22 | 1 | 4 | SCM103-0400Z04R-R0100HB-HP810 | 31152739 |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 0,5 | 4 | SCM103-0600Z04R-R0050HB-HP810 | 31152742 |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 1 | 4 | SCM103-0600Z04R-R0100HB-HP810 | 31152743 |
| 6,00 | 6 | 5,8 | 62 | 13 | 25 | 2 | 4 | SCM103-0600Z04R-R0200HB-HP810 | 31152744 |
| 8,00 | 8 | 7,7 | 68 | 21 | 30 | 1 | 4 | SCM103-0800Z04R-R0100HB-HP810 | 31152745 |
| 8,00 | 8 | 7,7 | 68 | 21 | 30 | 2 | 4 | SCM103-0800Z04R-R0200HB-HP810 | 31152746 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 0,5 | 4 | SCM103-1000Z04R-R0050HB-HP810 | 31152747 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 1 | 4 | SCM103-1000Z04R-R0100HB-HP810 | 31152748 |
| 10,00 | 10 | 9,7 | 80 | 22 | 38 | 2 | 4 | SCM103-1000Z04R-R0200HB-HP810 | 31152750 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 0,5 | 4 | SCM103-1200Z04R-R0050HB-HP810 | 31152752 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 1 | 4 | SCM103-1200Z04R-R0100HB-HP810 | 31152753 |
| 12,00 | 12 | 11,6 | 93 | 26 | 46 | 2 | 4 | SCM103-1200Z04R-R0200HB-HP810 | 31152755 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 0,5 | 4 | SCM103-1600Z04R-R0050HB-HP810 | 31152757 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 1 | 4 | SCM103-1600Z04R-R0100HB-HP810 | 31152758 |
| 16,00 | 16 | 15,5 | 108 | 36 | 58 | 2 | 4 | SCM103-1600Z04R-R0200HB-HP810 | 31152759 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 1 | 4 | SCM103-2000Z04R-R0100HB-HP810 | 31152761 |
| 20,00 | 20 | 19,5 | 126 | 41 | 74 | 2 | 4 | SCM103-2000Z04R-R0200HB-HP810 | 31152762 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM103-0400Z04R-R0050[shank form]-HP810

Example:

SCM103-0400Z04R-R0050**HA**-HP810

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

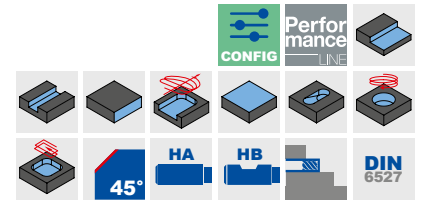
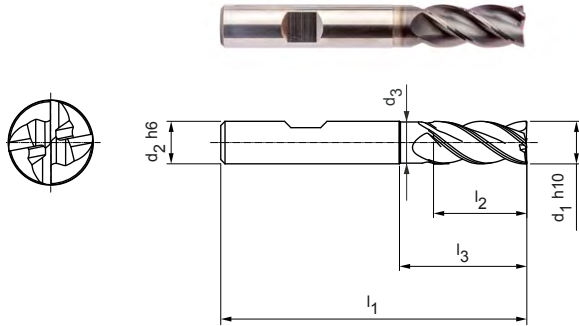
Special designs and other coatings available upon request.

OptiMill®-Inox-HPC

Shoulder milling cutter, long design with neck
SCM108

Design:

Diameter of milling cutter: 3.00 – 20.00 mm
Cutting material: HP921
Number of cutting edges: 4
Helix angle: 38°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 3,00 | 6 | - | 57 | 8 | - | 0,06 | 4 | SCM108-0300Z04R-F0006HB-HP921 | 31181468 |
| 4,00 | 6 | - | 57 | 11 | - | 0,08 | 4 | SCM108-0400Z04R-F0008HB-HP921 | 31181469 |
| 5,00 | 6 | - | 57 | 13 | - | 0,10 | 4 | SCM108-0500Z04R-F0010HB-HP921 | 31181480 |
| 6,00 | 6 | 5,8 | 57 | 13 | 19 | 0,12 | 4 | SCM108-0600Z04R-F0012HB-HP921 | 31181481 |
| 8,00 | 8 | 7,8 | 63 | 19 | 25 | 0,16 | 4 | SCM108-0800Z04R-F0016HB-HP921 | 31181482 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,20 | 4 | SCM108-1000Z04R-F0020HB-HP921 | 31181483 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,24 | 4 | SCM108-1200Z04R-F0024HB-HP921 | 31181484 |
| 16,00 | 16 | 15,8 | 92 | 32 | 42 | 0,32 | 4 | SCM108-1600Z04R-F0032HB-HP921 | 31181486 |
| 20,00 | 20 | 19,8 | 104 | 38 | 52 | 0,40 | 4 | SCM108-2000Z04R-F0040HB-HP921 | 31181488 |


Available on request

| | | | | | | | | | |
|-------|----|------|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,28 | 4 | SCM108-1400Z04R-F0028HB-HP921 | 31181485 |
| 18,00 | 18 | 17,8 | 92 | 32 | 42 | 0,36 | 4 | SCM108-1800Z04R-F0036HB-HP921 | 31181487 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM108-0300Z04R-F0006[shank form]-HP921

Example:

SCM108-0300Z04R-F0006HA-HP921

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

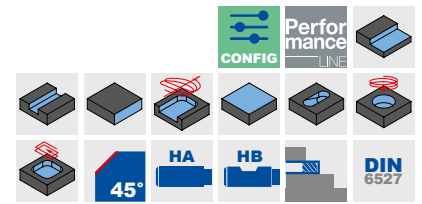
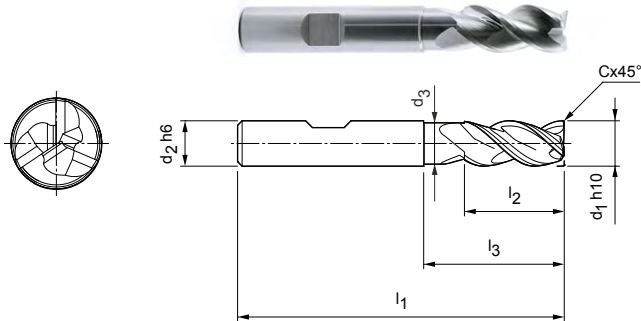
Special designs and other coatings available upon request.

OptiMill®-Alu-HPC

Shoulder milling cutter, long design with neck
SCM270

Design:

Diameter of milling cutter: 3.00 – 20.00 mm
Cutting material: HU210
Number of cutting edges: 3
Helix angle: 42°–43°
Special features: Unequal spacing, grooves polished




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h ₁₀ | d ₂ h ₆ | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 3,00* | 6 | – | 57 | 7 | – | 0,06 | 3 | SCM270-0300Z03R-F0006HB-HU210 | 30393590 |
| 4,00* | 6 | – | 57 | 8 | – | 0,08 | 3 | SCM270-0400Z03R-F0008HB-HU210 | 30393591 |
| 5,00* | 6 | – | 57 | 10 | – | 0,10 | 3 | SCM270-0500Z03R-F0010HB-HU210 | 30393592 |
| 6,00 | 6 | 5,5 | 57 | 10 | 18 | 0,12 | 3 | SCM270-0600Z03R-F0012HB-HU210 | 30393593 |
| 8,00 | 8 | 7,5 | 63 | 16 | 25 | 0,16 | 3 | SCM270-0800Z03R-F0016HB-HU210 | 30393594 |
| 10,00 | 10 | 9 | 72 | 19 | 30 | 0,20 | 3 | SCM270-1000Z03R-F0020HB-HU210 | 30393595 |
| 12,00 | 12 | 11 | 83 | 22 | 36 | 0,24 | 3 | SCM270-1200Z03R-F0024HB-HU210 | 30393596 |
| 16,00 | 16 | 15 | 92 | 26 | 42 | 0,32 | 3 | SCM270-1600Z03R-F0032HB-HU210 | 30393597 |
| 20,00 | 20 | 19 | 104 | 32 | 52 | 0,40 | 3 | SCM270-2000Z03R-F0040HB-HU210 | 30393598 |


Available on request

| | | | | | | | | | |
|-------|----|----|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 13 | 83 | 22 | 36 | 0,28 | 3 | SCM270-1400Z03R-F0028HB-HU210 | 30456715 |
|-------|----|----|----|----|----|------|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HA



Specification:
SCM270-0300Z03R-F0006[shank form]-HU210

Example:

SCM270-0300Z03R-F0006HA-HU210

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Alu-HPC-Pocket

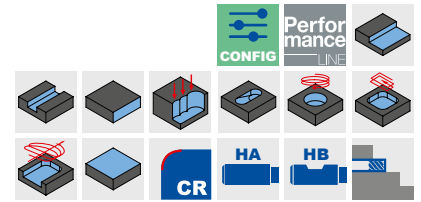
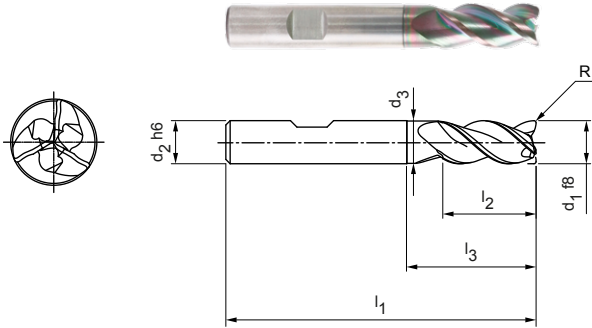
Shoulder milling cutter, long design with neck
SCM850

Design:

Diameter of milling cutter: 5.00 - 20.00 mm
Cutting material: HP913
Number of cutting edges: 3
Helix angle: 42°
Special features: Face geometry with integrated drill tip

Application:

Perfect for inclined plunging up to 45°, in helix milling and grooving.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|------|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 5,00 | 6 | 4,8 | 57 | 13 | - | 0,2 | 3 | SCM850-0500Z03R-R0020HB-HP913 | 31054950 |
| 6,00 | 6 | 5,8 | 57 | 13 | 19 | 0,2 | 3 | SCM850-0600Z03R-R0020HB-HP913 | 31054952 |
| 8,00 | 8 | 7,8 | 63 | 19 | 25 | 0,2 | 3 | SCM850-0800Z03R-R0020HB-HP913 | 31054956 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,32 | 3 | SCM850-1000Z03R-R0032HB-HP913 | 31054960 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,32 | 3 | SCM850-1200Z03R-R0032HB-HP913 | 31054962 |
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,32 | 3 | SCM850-1400Z03R-R0032HB-HP913 | 31054964 |
| 16,00 | 16 | 15,8 | 92 | 31 | 42 | 0,32 | 3 | SCM850-1600Z03R-R0032HB-HP913 | 31054966 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 0,5 | 3 | SCM850-2000Z03R-R0050HB-HP913 | 31054970 |

Undersize cutters available on request.

Configurable features

Shank form:
Shank form: HA

Specification:
SCM850-0500Z03R-R0020[shank form]-HP913

Example:

SCM850-0500Z03R-R0020**HA**-HP913

Shank form HA

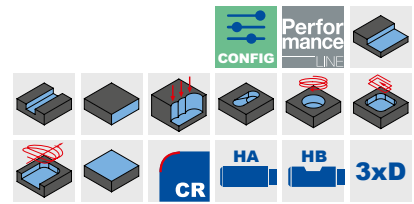
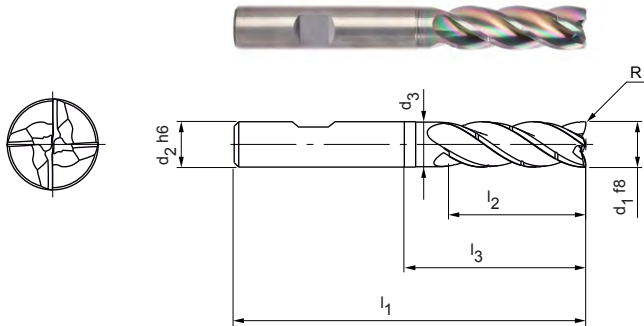
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Alu-HPC-Pocket

Shoulder milling cutter, 3xD design with neck, includes chip breaker
SCM854



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|------|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 5,00 | 6 | 4,8 | 62 | 17 | - | 0,20 | 4 | SCM854-0500Z04R-R0020HB-HP913 | 31302680 |
| 6,00 | 6 | 5,8 | 62 | 18 | 25 | 0,20 | 4 | SCM854-0600Z04R-R0020HB-HP913 | 31302681 |
| 8,00 | 8 | 7,7 | 68 | 24 | 30 | 0,20 | 4 | SCM854-0800Z04R-R0020HB-HP913 | 31302682 |
| 10,00 | 10 | 9,7 | 80 | 30 | 35 | 0,32 | 4 | SCM854-1000Z04R-R0032HB-HP913 | 31302683 |
| 12,00 | 12 | 11,6 | 93 | 36 | 45 | 0,32 | 4 | SCM854-1200Z04R-R0032HB-HP913 | 31302684 |
| 14,00 | 14 | 13,6 | 99 | 42 | 50 | 0,32 | 4 | SCM854-1400Z04R-R0032HB-HP913 | 31302685 |
| 16,00 | 16 | 15,5 | 108 | 48 | 56 | 0,32 | 4 | SCM854-1600Z04R-R0032HB-HP913 | 31302686 |
| 20,00 | 20 | 19,5 | 126 | 60 | 70 | 0,50 | 4 | SCM854-2000Z04R-R0050HB-HP913 | 31302688 |

Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|------|---|-------------------------------|----------|
| 18,00 | 18 | 17,5 | 117 | 54 | 67 | 0,32 | 4 | SCM854-1800Z04R-R0032HB-HP913 | 31302687 |
|-------|----|------|-----|----|----|------|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM854-0500Z04R-R0020[shank form]-HP913

Example:

SCM854-0500Z04R-R0020**HA**-HP913

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-SPM

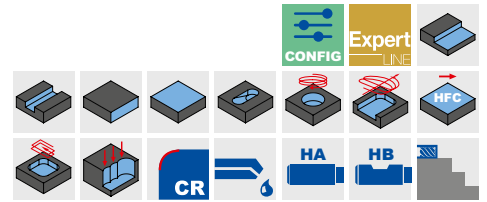
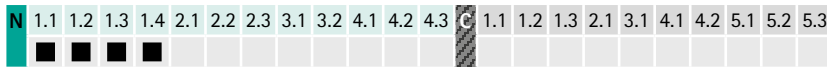
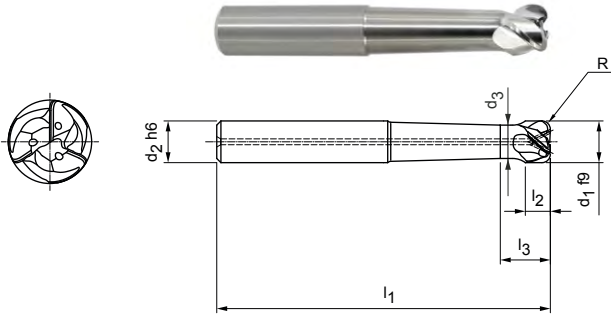
Shoulder milling cutter with internal cooling
SCM681/691

Design:

Diameter of milling cutter: 12.00 – 32.00 mm
Cutting material: HU610
Number of cutting edges: 3
Helix angle: 43°

Application:

For the machining of aluminium structural parts.



Short design, SCM681 | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|----|-----|------|------|---|---|-------------------------------|-----------|
| d1 f9 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 32,00 | 32 | 27 | 125 | 26,3 | 40,9 | 4 | 3 | SCM681-3200Z03R-R0400HA-HU610 | 30551346 |

Short design, SCM681 | Available upon request

| | | | | | | | | | |
|-------|----|------|----|------|----|---|---|-------------------------------|----------|
| 16,00 | 16 | 12,8 | 81 | 12,8 | 28 | 3 | 3 | SCM691-1600Z03R-R0300HA-HU610 | 30551341 |
| 20,00 | 20 | 16 | 90 | 16 | 35 | 3 | 3 | SCM691-2000Z03R-R0300HA-HU610 | 30551344 |


Long design, SCM691 | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|------|------|---|---|-------------------------------|-----------|
| d1 f9 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 12,00 | 12 | 9,6 | 90 | 10,3 | 19,4 | 2 | 3 | SCM691-1200Z03R-R0200HA-HU610 | 30551330 |
| 16,00 | 16 | 12,8 | 105 | 13,5 | 23,8 | 3 | 3 | SCM691-1600Z03R-R0300HA-HU610 | 30551350 |
| 20,00 | 20 | 16 | 120 | 16,7 | 28,2 | 3 | 3 | SCM691-2000Z03R-R0300HA-HU610 | 30551352 |
| 25,00 | 25 | 20 | 145 | 20,7 | 33,7 | 4 | 3 | SCM691-2500Z03R-R0400HA-HU610 | 30551353 |
| 32,00 | 32 | 27 | 173 | 26,3 | 40,2 | 4 | 3 | SCM691-3200Z03R-R0400HA-HU610 | 30551354 |


Long design, SCM691 | Available upon request

| | | | | | | | | | |
|-------|----|------|----|------|------|---|---|-------------------------------|----------|
| 14,00 | 16 | 11,2 | 99 | 11,2 | 45,5 | 3 | 3 | SCM691-1400Z03R-R0300HA-HU610 | 30551348 |
|-------|----|------|----|------|------|---|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HB



Specification:
SCM681-3200Z03R-R0400[shank form]-HU610

Example:

SCM681-3200Z03R-R0400HB-HU610

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Diamond-SPM

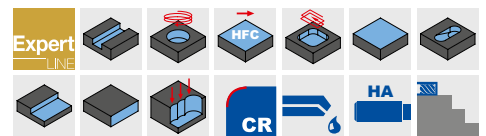
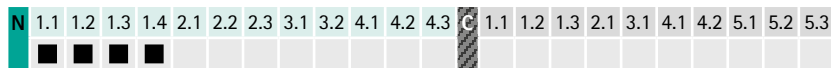
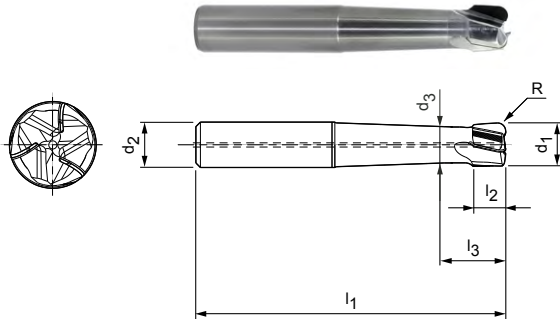
Shoulder milling cutter with internal cooling*
SHM101/110

Design:

Diameter of milling cutter: 6.00 – 32.00 mm
Cutting material: PU622
Number of cutting edges: 3
Axis angle: 9/12°
Special features: PCD cutting edges

Application:

For the machining of aluminium structural parts.



Short design, SHM101 | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|----------------|---|---|--------------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 20,00 | 20 | 17 | 90 | 14,2 | 22,6 | 3 | 3 | SHM101-2000CZ03R-R0300HA-PU622 | 30552846 |
| 25,00 | 25 | 20 | 107 | 17,8 | 28,2 | 4 | 3 | SHM101-2500DZ03R-R0400HA-PU622 | 30552849 |
| 32,00 | 32 | 27,2 | 125 | 20 | 27,9 | 4 | 3 | SHM101-3200DZ03R-R0400HA-PU622 | 30552851 |

Short design, SHM110, 111 | Available upon request

| | | | | | | | | | |
|-------|----|------|----|------|------|---|---|--------------------------------|----------|
| 14,00 | 16 | 11,8 | 77 | 10 | 16,6 | 3 | 3 | SHM101-1400BZ03R-R0300HA-PU622 | 30552836 |
| 15,00 | 16 | 12 | 78 | 10,6 | 18,5 | 3 | 3 | SHM101-1500CZ03R-R0300HA-PU622 | 30552839 |
| 16,00 | 16 | 12,8 | 81 | 11,4 | 19,5 | 3 | 3 | SHM101-1600CZ03R-R0300HA-PU622 | 30552842 |
| 18,00 | 20 | 14,4 | 87 | 12,8 | 20,4 | 3 | 3 | SHM101-1800CZ03R-R0300HA-PU622 | 30552844 |

Long design, SHM111 | Preferred series in stock

| | | | | | | | | | |
|-------|----|------|-----|------|------|---|---|--------------------------------|----------|
| 12,00 | 12 | 10,2 | 90 | 8,5 | 15,1 | 2 | 3 | SHM111-1200BZ03R-R0200HA-PU622 | 30552834 |
| 16,00 | 16 | 12,8 | 105 | 11,4 | 19,5 | 3 | 3 | SHM111-1600CZ03R-R0300HA-PU622 | 30552843 |
| 20,00 | 20 | 17 | 120 | 14,2 | 22,6 | 3 | 3 | SHM111-2000CZ03R-R0300HA-PU622 | 30552847 |
| 25,00 | 25 | 20 | 145 | 17,8 | 28,2 | 4 | 3 | SHM111-2500DZ03R-R0400HA-PU622 | 30552850 |
| 32,00 | 32 | 27,2 | 173 | 20 | 27,9 | 4 | 3 | SHM111-3200DZ03R-R0400HA-PU622 | 30552852 |

Long design, SHM111 | Available upon request

| | | | | | | | | | |
|-------|----|------|-----|------|------|---|---|--------------------------------|----------|
| 6,00 | 6 | 5,1 | 60 | 6 | 12,5 | 1 | 3 | SHM110-0600BZ03R-R0100HA-PU622 | 30552830 |
| 8,00 | 8 | 6,4 | 70 | 7 | 13,2 | 1 | 3 | SHM110-0800BZ03R-R0100HA-PU622 | 30552832 |
| 10,00 | 10 | 8,5 | 80 | 7,5 | 13,7 | 2 | 3 | SHM111-1000BZ03R-R0200HA-PU622 | 30552833 |
| 14,00 | 16 | 11,8 | 99 | 10 | 16,6 | 3 | 3 | SHM111-1400BZ03R-R0300HA-PU622 | 30552837 |
| 15,00 | 16 | 12 | 100 | 10,6 | 18,5 | 3 | 3 | SHM111-1500CZ03R-R0300HA-PU622 | 30552841 |
| 18,00 | 20 | 14,4 | 114 | 12,8 | 20,4 | 3 | 3 | SHM111-1800CZ03R-R0300HA-PU622 | 30552845 |

Dimensions in mm.

* Internal cooling from \varnothing 10 mm.

For cutting data recommendations, see end of chapter.

Special designs available upon request.

OptiMill®-Diamond-SPM

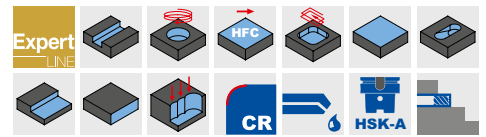
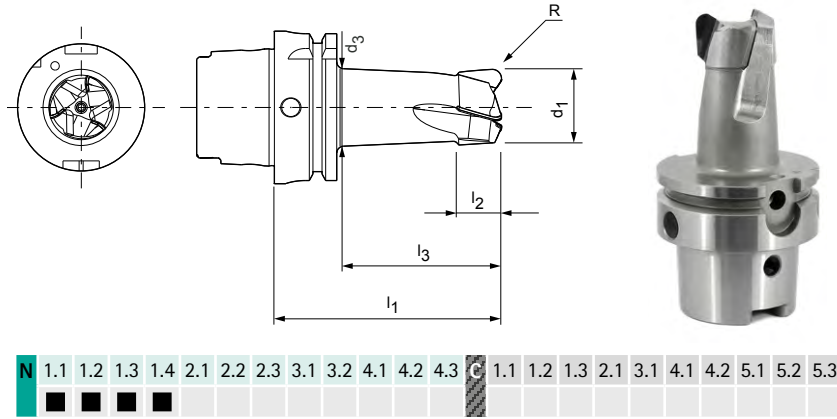
Shoulder milling cutter, with HSK-A (hollow shank taper form A) connection, with internal cooling
SHM121

Design:

Diameter of milling cutter: 32.00 – 50.00 mm
Cutting material: PU622
Number of cutting edges: 3/4
Helix angle: 12°
Special features: PCD cutting edges

Application:

For the machining of aluminium structural parts.



Preferred series in stock

| Dimensions | | | | | | z | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|---|---|-------------------------------|-----------|
| d ₁ | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 32,00 | 31,5 | 86 | 17 | 57 | 4 | 3 | SHM121-3200Z03R-R0400A6-PU622 | 30583603 |
| 40,00 | 39 | 98 | 17 | 70 | 4 | 4 | SHM121-4000Z04R-R0400A6-PU622 | 30597953 |
| 50,00 | 49 | 109 | 20 | 80 | 4 | 4 | SHM121-5000Z04R-R0400A6-PU622 | 30590483 |

Available on request | Design with increased hollow shank taper face connection ø 80 mm

| | | | | | | | | |
|-------|------|-----|----|----|---|---|-------------------------------|----------|
| 32,00 | 31,5 | 86 | 17 | 57 | 4 | 3 | SHM121-3200Z03R-R0400A6-PU622 | 30625821 |
| 50,00 | 49 | 109 | 20 | 80 | 4 | 4 | SHM121-5000Z04R-R0400A6-PU622 | 30625820 |

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs available upon request.

OptiMill®-Diamond type 50

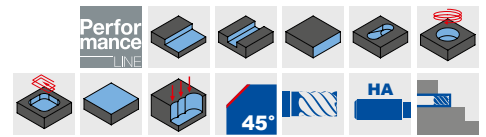
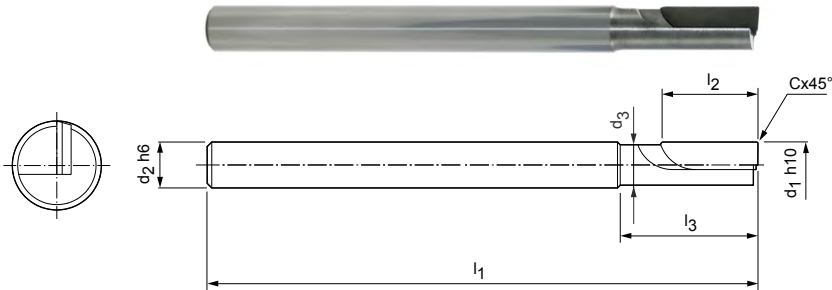
Shoulder milling cutter, overlong design with neck
SHM500

Design:

Diameter of milling cutter: 4.00 – 5.00 mm
Cutting material: PU611
Number of cutting edges: 1
Axis angle: 0°
Special features: PCD cutting edges

Application:

Designed for delicate milling tasks, e.g. in precision mechanics or for the production of printed circuit boards.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 4,00 | 4 | 3,6 | 60 | 10 | 15 | 0,10 | 1 | SHM500-0400BZ01R-F0010HA-PU611 | 30696677 |
| 5,00 | 5 | 4,4 | 60 | 10 | 15 | 0,10 | 1 | SHM500-0500BZ01R-F0010HA-PU611 | 30696678 |

Dimensions in mm.

For cutting data recommendations, see end of chapter.

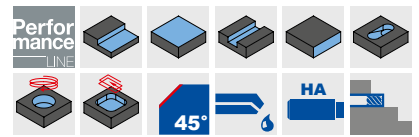
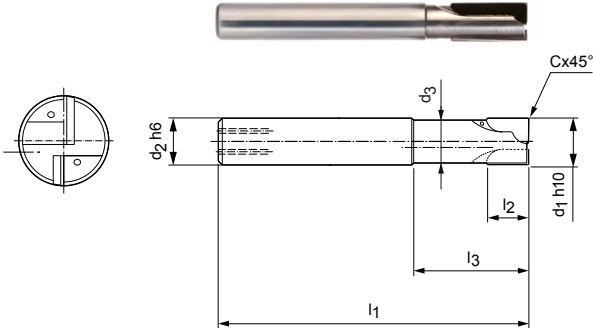
Special designs available upon request.

OptiMill®-Diamond type 51

Shoulder milling cutter, overlong design with neck, includes internal cooling
SHM511 | SHM611 | SHM711

Design:

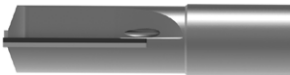
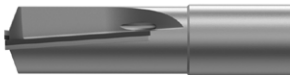
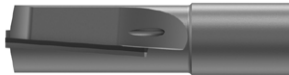
Diameter of milling cutter: 3.00 - 12.00 mm
Cutting material: PU611
Number of cutting edges: 2
Axis angle: neutral/positive/negative
Special features: PCD cutting edge



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. | | |
|--------------------------------|-------------------------------|----------------|----------------|----------------|----------------|-------|---|--------------------------------|-----------|----------|----------|
| d ₁ h ₁₀ | d ₂ h ₆ | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | SHM511 | SHM611 | SHM711 |
| 3,00 | 6 | 2,8 | 60 | 2,5 | 15 | 0,10 | 2 | SHM_*1-0300AZ02R-F0010HA-PU611 | 30334896 | 30334944 | 30334931 |
| 4,00 | 6 | 3,8 | 60 | 2,5 | 15 | 0,10 | 2 | SHM_*1-0400AZ02R-F0010HA-PU611 | 30334901 | 30334956 | 30334939 |
| 5,00 | 6 | 4,6 | 60 | 3 | 15 | 0,10 | 2 | SHM_*1-0500AZ02R-F0010HA-PU611 | 30334923 | 30334957 | 30334942 |
| 6,00 | 6 | 5,4 | 60 | 10 | 15 | 0,10 | 2 | SHM_*1-0600BZ02R-F0010HA-PU611 | 30696680 | 30696681 | 30696682 |
| 6,00 | 6 | 5,4 | 60 | 15 | 20 | 0,10 | 2 | SHM_*1-0600CZ02R-F0010HA-PU611 | 30696683 | 30696684 | 30696685 |
| 8,00 | 8 | 7,4 | 80 | 10 | 20 | 0,10 | 2 | SHM_*1-0800BZ02R-F0010HA-PU611 | 30696689 | 30696690 | 30696691 |
| 8,00 | 8 | 7,4 | 80 | 20 | 30 | 0,10 | 2 | SHM_*1-0800DZ02R-F0010HA-PU611 | 30696695 | 30696696 | 30696697 |
| 10,00 | 10 | 9,4 | 80 | 10 | 30 | 0,10 | 2 | SHM_*1-1000BZ02R-F0010HA-PU611 | 30696698 | 30696699 | 30696700 |
| 10,00 | 10 | 9,4 | 90 | 20 | 30 | 0,10 | 2 | SHM_*1-1000DZ02R-F0010HA-PU611 | 30290541 | 30290551 | 30290546 |
| 12,00 | 12 | 11 | 100 | 10 | 30 | 0,10 | 2 | SHM_*1-1200BZ02R-F0010HA-PU611 | 30696704 | 30696705 | 30696706 |
| 12,00 | 12 | 11 | 100 | 20 | 30 | 0,10 | 2 | SHM_*1-1200DZ02R-F0010HA-PU611 | 30696710 | 30696711 | 30696712 |

Cutting edge form

| SHM511 | SHM611 | SHM711 |
|---|---|---|
| Neutral axis angle | Negative axis angle | Positive axis angle |
| Straight cutting edge for neutral use. | Pushing cutting edge. The material is pressed onto the base. This is particularly well suited for thin materials. | Pulling cutting edge for normal use. |
|  |  |  |

Dimensions in mm.

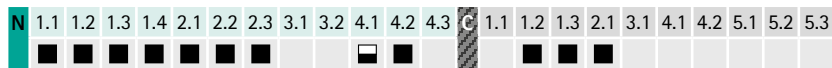
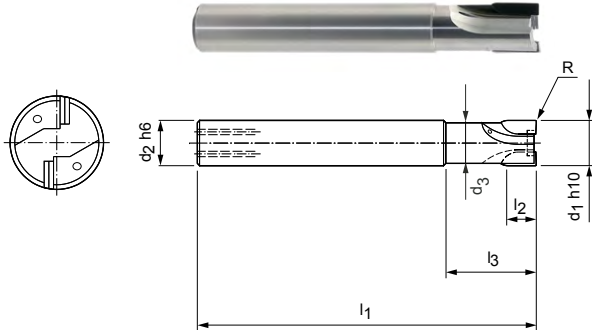
* Specification plus desired cutting edge form (see cutting edge form table).

For cutting data recommendations, see end of chapter.

Special designs and CVD-tipped tools available upon request.

OptiMill®-Diamond type 53

Shoulder milling cutter, long design with neck, includes internal cooling
SHM531

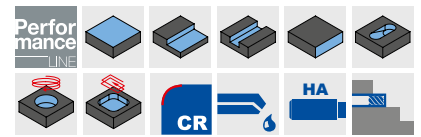


Design:

Diameter of milling cutter: 6.00 – 20.00 mm
Cutting material: PU611
Number of cutting edges: 2 to \varnothing 12 mm
3 from \varnothing 14 mm
Axis angle: $2^\circ/4^\circ/6^\circ$
Special features: No centre cutting edge
PCD cutting edge

Application:

Specially designed for high material removal rates and feeds per tooth. Closed pockets are machined by plunging into the workpiece.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-----|---|--------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 6,00 | 8 | 5 | 55 | 6 | 15 | 0,2 | 2 | SHM531-0600AZ02R-R0020HA-PU611 | 30696717 |
| 10,00 | 10 | 9 | 75 | 6 | 20 | 0,2 | 2 | SHM531-1000AZ02R-R0020HA-PU611 | 30696719 |
| 12,00 | 12 | 11 | 85 | 10 | 25 | 0,2 | 2 | SHM531-1200BZ02R-R0020HA-PU611 | 30696720 |
| 14,00 | 16 | 13 | 85 | 10 | 25 | 0,2 | 3 | SHM531-1400BZ03R-R0020HA-PU611 | 30696721 |
| 16,00 | 16 | 15 | 85 | 10 | 25 | 0,2 | 3 | SHM531-1600BZ03R-R0020HA-PU611 | 30696722 |
| 20,00 | 20 | 19 | 100 | 10 | 50 | 0,2 | 3 | SHM531-2000BZ03R-R0020HA-PU611 | 30696723 |

Available on request

| | | | | | | | | | |
|------|---|-----|----|---|----|-----|---|--------------------------------|----------|
| 8,00 | 8 | 7,2 | 60 | 6 | 20 | 0,2 | 2 | SHM531-0800AZ02R-R0020HA-PU611 | 30696718 |
|------|---|-----|----|---|----|-----|---|--------------------------------|----------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs available upon request.

OptiMill®-Diamond type 57

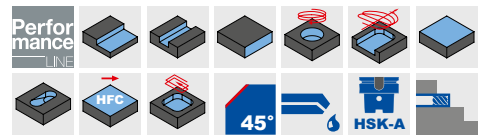
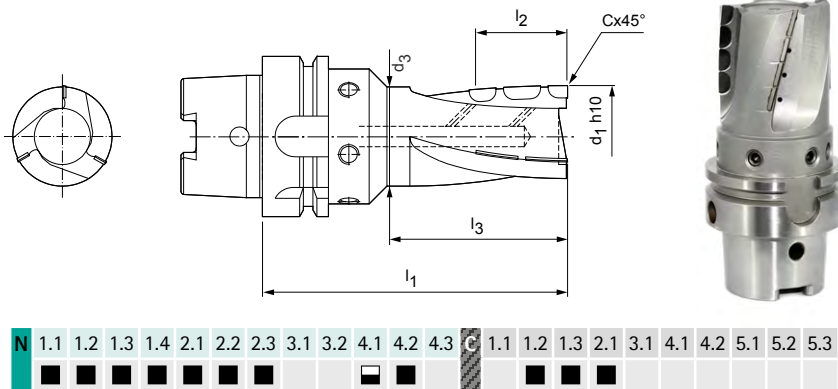
Shoulder milling cutter, with HSK-A (hollow shank taper form A) connection, with internal cooling
SHM571

Design:

Diameter of milling cutter: 32.00 – 63.00 mm
Cutting material: PU611
Number of cutting edges: 3 to \varnothing 40 mm
4 from \varnothing 50 mm
Helix angle: 15°
Special features: No centre cutting edge
PCD cutting edge

Application:

The spirally designed cutting rows are ideally suited for high volume machining.



Preferred series in stock

| Dimensions | | | | | | z | Specification | Order no. |
|--------------------|----------------|----------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ h10 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 32,00 | 31 | 100 | 30 | 50 | 0,10 | 3 | SHM571-3200FZ03R-F0010A6-PU611 | 30696736 |
| 40,00 | 39 | 100 | 40 | 53 | 0,10 | 3 | SHM571-4000HZ03R-F0010A6-PU611 | 30696739 |
| 50,00 | 49 | 100 | 40 | 56 | 0,10 | 4 | SHM571-5000HZ04R-F0010A6-PU611 | 30696742 |

Available on request

| | | | | | | | | |
|-------|----|-----|----|----|------|---|--------------------------------|----------|
| 63,00 | 62 | 100 | 40 | 73 | 0,10 | 4 | SHM571-6300HZ04R-F0010A6-PU611 | 30696745 |
|-------|----|-----|----|----|------|---|--------------------------------|----------|

Design with shank form SK40 or BT40 available upon request.

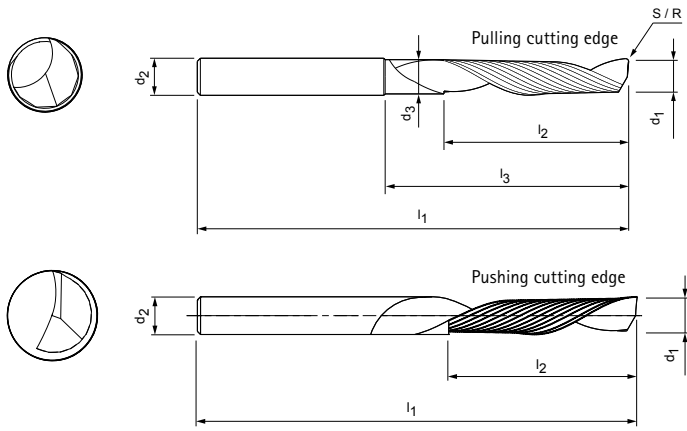
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs available upon request.

OptiMill®-Mono-Alu

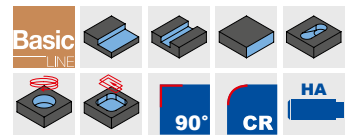
Shoulder milling cutter, design with pulling/pushing cutting edge
SCM280



Design:

- Diameter of milling cutter: 2.00 - 10.00 mm
- Cutting material: HU211
- Number of cutting edges: 1
- Helix angle: 30°
- Special features: Large chip space for unhindered chip discharge

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| N | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | C | 1.1 | 1.2 | 1.3 | 2.1 | 3.1 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 | |
| | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |



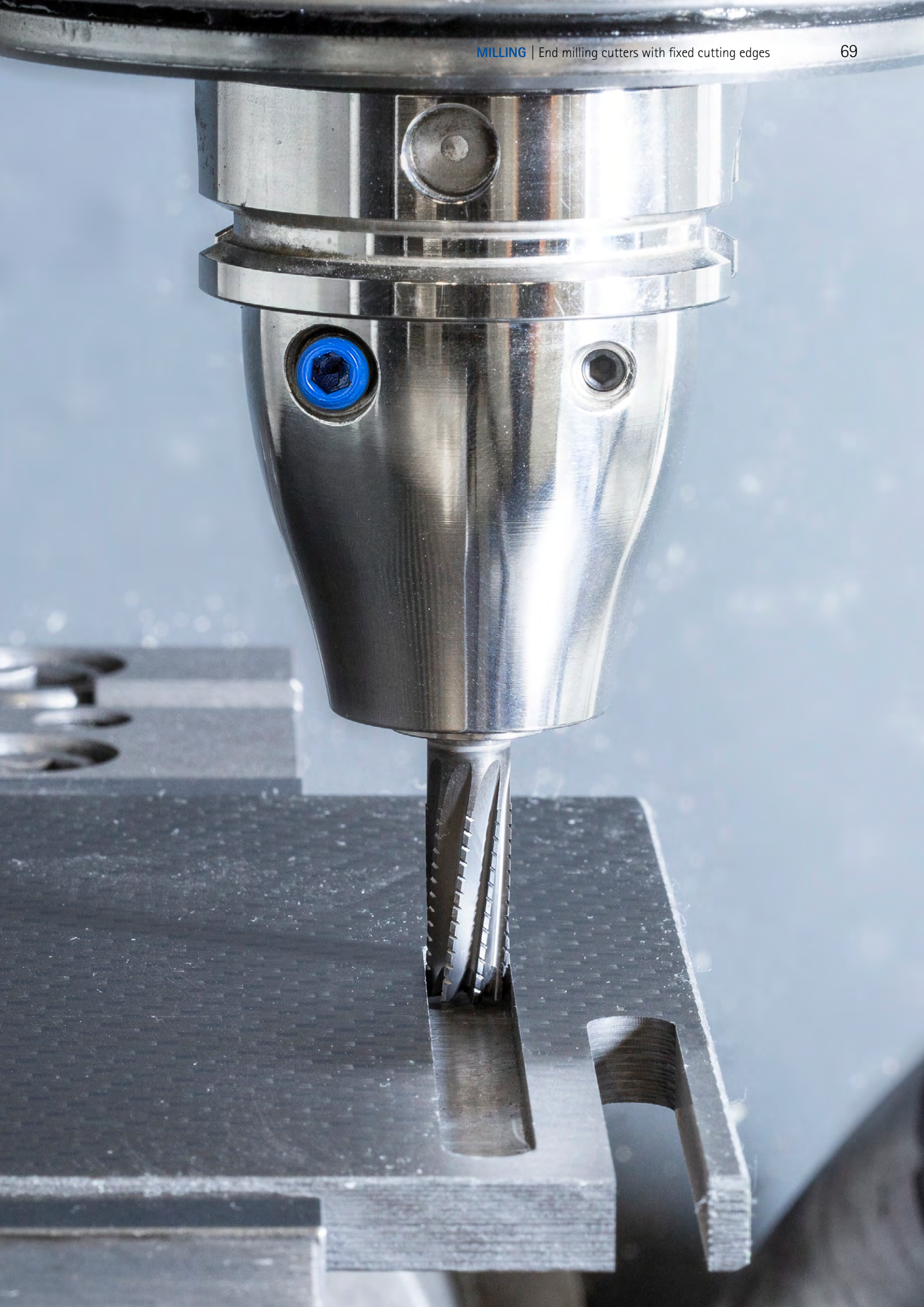
Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|----------------|------|---|-------------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 2,00 | 3 | - | 38 | 5 | - | - | 1 | SCM280-0200Z01R-S-HA-HU211 | 30393706 |
| 3,00 | 3 | - | 38 | 8 | - | - | 1 | SCM280-0300Z01R-S-HA-HU211 | 30393708 |
| 3,00 | 4 | - | 38 | 8 | - | - | 1 | SCM280-0300Z01R-S-HA-HU211 | 30393709 |
| 4,00 | 4 | - | 40 | 12 | - | - | 1 | SCM280-0400Z01R-S-HA-HU211 | 30393713 |
| 4,00 | 4 | - | 70 | 30 | - | - | 1 | SCM280-0400Z01R-S-HA-HU211 | 30393714 |
| 4,00 | 6 | - | 50 | 10 | - | - | 1 | SCM280-0400Z01R-S-HA-HU211 | 30393715 |
| 4,00 | 6 | - | 50 | 10 | - | - | 1 | SCM280-0400Z01L-S-HA-HU211 | 30393738 |
| 5,00 | 5 | - | 60 | 15 | - | - | 1 | SCM280-0500Z01R-S-HA-HU211 | 30393718 |
| 5,00 | 6 | - | 50 | 12 | - | - | 1 | SCM280-0500Z01R-S-HA-HU211 | 30393720 |
| 6,00 | 6 | - | 50 | 12 | - | - | 1 | SCM280-0600Z01R-S-HA-HU211 | 30393725 |
| 6,00 | 6 | - | 60 | 15 | - | - | 1 | SCM280-0600Z01L-S-HA-HU211 | 30393742 |
| 6,00 | 6 | - | 60 | 20 | - | - | 1 | SCM280-0600Z01R-S-HA-HU211 | 30393721 |
| 6,00 | 6 | - | 70 | 15 | - | - | 1 | SCM280-0600Z01R-S-HA-HU211 | 30393724 |
| 6,00 | 6 | - | 70 | 30 | - | - | 1 | SCM280-0600Z01R-S-HA-HU211 | 30393722 |
| 6,00 | 6 | - | 80 | 38 | - | - | 1 | SCM280-0600Z01R-S-HA-HU211 | 30393723 |
| 6,00 | 8 | 5,6 | 80 | 20 | 35 | 1,50 | 1 | SCM280-0600Z01R-R0150HA-HU211 | 30393756 |
| 8,00 | 8 | - | 60 | 22 | - | - | 1 | SCM280-0800Z01R-S-HA-HU211 | 30393727 |
| 8,00 | 8 | - | 80 | 38 | - | - | 1 | SCM280-0800Z01R-S-HA-HU211 | 30393728 |
| 10,00 | 10 | - | 60 | 25 | - | - | 1 | SCM280-1000Z01R-S-HA-HU211 | 30393730 |
| 10,00 | 10 | - | 75 | 30 | - | - | 1 | SCM280-1000Z01R-S-HA-HU211 | 30393729 |

Example:
SCM280-0400Z01R-S-HA-HU211

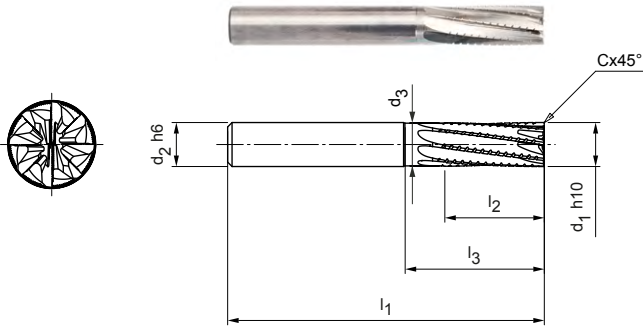


Dimensions in mm.
For cutting data recommendations, see end of chapter.
Special designs and other coatings available upon request.



OptiMill®-Composite-Speed-Plus

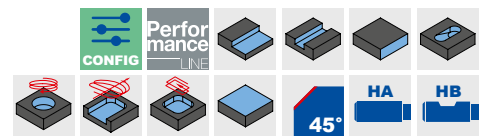
Shoulder milling cutter, design with pulling cutting edge
SCM982



| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| N | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | C | 1.1 | 1.2 | 1.3 | 2.1 | 3.1 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

Design:
 Diameter of milling cutter: 4.00 - 20.00 mm
 Cutting material: HU610
 Number of cutting edges: 8
 Helix angle: 8°
 Special features: Without coating, extremely sharp cutting edge

Application:
 Roughing and finishing of CFRP in one machining step. Pulling cutting edge for better removal of the chips/dust (e.g. on milling pockets and slots). Particularly suitable for difficult to machine surface layers (e.g. UD or copper mesh) to prevent delamination on the lower edge of the part.




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|-------|----|----|----|-------|---|-------------------------------|-----------|
| d1 h10 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 4,00 | 6 | 3,90 | 57 | 11 | - | 0,08 | 8 | SCM982-0400Z08R-F0008HA-HU610 | 31237353 |
| 5,00 | 6 | 4,90 | 57 | 13 | - | 0,10 | 8 | SCM982-0500Z08R-F0010HA-HU610 | 31237354 |
| 6,00 | 6 | 5,80 | 57 | 13 | 19 | 0,12 | 8 | SCM982-0600Z08R-F0012HA-HU610 | 31237355 |
| 6,00 | 6 | 5,80 | 65 | 21 | 27 | 0,12 | 8 | SCM982-0600Z08R-F0012HA-HU610 | 31237356 |
| 8,00 | 8 | 7,80 | 63 | 19 | 25 | 0,16 | 8 | SCM982-0800Z08R-F0016HA-HU610 | 31237357 |
| 8,00 | 8 | 7,80 | 70 | 22 | 32 | 0,16 | 8 | SCM982-0800Z08R-F0016HA-HU610 | 31237358 |
| 10,00 | 10 | 9,70 | 72 | 22 | 30 | 0,20 | 8 | SCM982-1000Z08R-F0020HA-HU610 | 31237359 |
| 12,00 | 12 | 11,60 | 83 | 26 | 36 | 0,24 | 8 | SCM982-1200Z08R-F0024HA-HU610 | 31237380 |
| 16,00 | 16 | 15,50 | 92 | 32 | 42 | 0,32 | 8 | SCM982-1600Z08R-F0032HA-HU610 | 31237381 |


Available on request

| | | | | | | | | | |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|
| 20,00 | 20 | 19,40 | 104 | 38 | 52 | 0,40 | 8 | SCM982-2000Z08R-F0040HA-HU610 | 31237382 |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HB



Specification:
SCM982-0400Z08R-F0008[shank form]-HU610

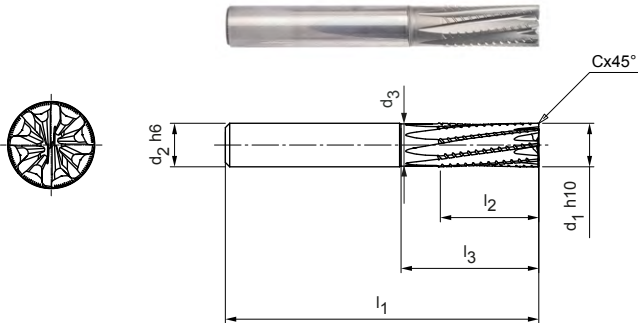
Example:
SCM982-0400Z08R-F0008HB-HU610

Shank form HB

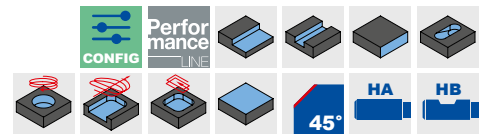
Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

OptiMill®-Composite-Speed-Plus

Shoulder milling cutter, design with pushing cutting edge
SCM992



| | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| N | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | C | 1.1 | 1.2 | 1.3 | 2.1 | 3.1 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|



Design:
 Diameter of milling cutter: 4.00 - 20.00 mm
 Cutting material: HU610
 Number of cutting edges: 8
 Helix angle: -8 °
 Special features: Without coating, extremely sharp cutting edge

Application:
 Roughing and finishing of CFRP in one machining step. Pushing cutting edge, where the material is pressed onto the base (e.g. very suitable for vacuum clamping). Particularly suitable for difficult to machine surface layers (e.g. UD or copper mesh) to prevent delamination on the upper edge of the part.


Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|-------|----|----|----|-------|---|-------------------------------|-----------|
| d1 h10 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 4,00 | 6 | 3,90 | 57 | 11 | - | 0,08 | 8 | SCM992-0400Z08R-F0008HA-HU610 | 31242585 |
| 5,00 | 6 | 4,90 | 57 | 13 | - | 0,10 | 8 | SCM992-0500Z08R-F0010HA-HU610 | 31242586 |
| 6,00 | 6 | 5,80 | 57 | 13 | 19 | 0,12 | 8 | SCM992-0600Z08R-F0012HA-HU610 | 31242587 |
| 6,00 | 6 | 5,80 | 65 | 21 | 27 | 0,12 | 8 | SCM992-0600Z08R-F0012HA-HU610 | 31242588 |
| 8,00 | 8 | 7,80 | 63 | 19 | 25 | 0,16 | 8 | SCM992-0800Z08R-F0016HA-HU610 | 31242589 |
| 8,00 | 8 | 7,80 | 70 | 22 | 32 | 0,16 | 8 | SCM992-0800Z08R-F0016HA-HU610 | 31242590 |
| 10,00 | 10 | 9,70 | 72 | 22 | 30 | 0,20 | 8 | SCM992-1000Z08R-F0020HA-HU610 | 31242591 |
| 12,00 | 12 | 11,60 | 83 | 26 | 36 | 0,24 | 8 | SCM992-1200Z08R-F0024HA-HU610 | 31242592 |
| 16,00 | 16 | 15,50 | 92 | 32 | 42 | 0,32 | 8 | SCM992-1600Z08R-F0032HA-HU610 | 31242593 |


Available on request

| | | | | | | | | | |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|
| 20,00 | 20 | 19,40 | 104 | 38 | 52 | 0,40 | 8 | SCM992-2000Z08R-F0040HA-HU610 | 31242594 |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HB



Specification:
SCM992-0400Z08R-F0008[shank form]-HU610

Example:
SCM992-0400Z08R-F0008HB-HU610

Shank form HB

Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

OptiMill®-Composite-Speed-Plus

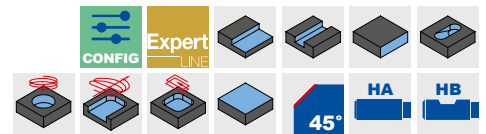
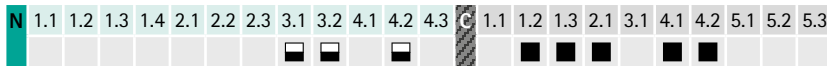
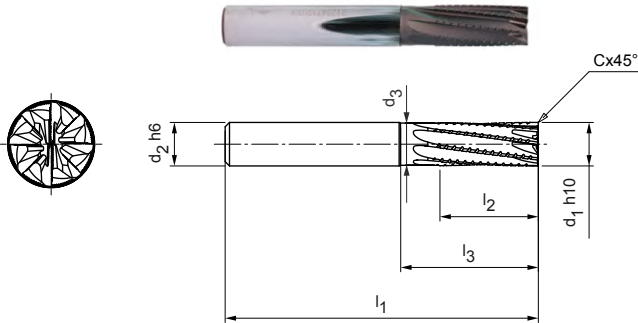
Shoulder milling cutter, design with pulling cutting edge
SCM980, follow-up product of SCM460

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HC633
Number of cutting edges: 8
Helix angle: 8°
Special features: Diamond coating

Application:

Roughing and finishing of CFRP in one machining step. Pulling cutting edge for better removal of the chips/dust (e.g. on milling pockets and slots). Particularly suitable for difficult to machine surface layers (e.g. UD or copper mesh) to prevent delamination on the lower edge of the part.




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|-------|----|----|----|-------|---|-------------------------------|-----------|
| d1 h10 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 4,00 | 6 | 3,90 | 57 | 11 | - | 0,08 | 8 | SCM980-0400Z08R-F0008HA-HC633 | 31223245 |
| 5,00 | 6 | 4,90 | 57 | 13 | - | 0,10 | 8 | SCM980-0500Z08R-F0010HA-HC633 | 31223246 |
| 6,00 | 6 | 5,80 | 57 | 13 | 19 | 0,12 | 8 | SCM980-0600Z08R-F0012HA-HC633 | 31223247 |
| 6,00 | 6 | 5,80 | 65 | 21 | 27 | 0,12 | 8 | SCM980-0600Z08R-F0012HA-HC633 | 31223248 |
| 8,00 | 8 | 7,80 | 63 | 19 | 25 | 0,16 | 8 | SCM980-0800Z08R-F0016HA-HC633 | 31223249 |
| 8,00 | 8 | 7,80 | 70 | 22 | 32 | 0,16 | 8 | SCM980-0800Z08R-F0016HA-HC633 | 31223260 |
| 10,00 | 10 | 9,70 | 72 | 22 | 30 | 0,20 | 8 | SCM980-1000Z08R-F0020HA-HC633 | 31223261 |
| 12,00 | 12 | 11,60 | 83 | 26 | 36 | 0,24 | 8 | SCM980-1200Z08R-F0024HA-HC633 | 31223262 |
| 16,00 | 16 | 15,50 | 92 | 32 | 42 | 0,32 | 8 | SCM980-1600Z08R-F0032HA-HC633 | 31223263 |


Available on request

| | | | | | | | | | |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|
| 20,00 | 20 | 19,40 | 104 | 38 | 52 | 0,40 | 8 | SCM980-2000Z08R-F0040HA-HC633 | 31223264 |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HB



Specification:
SCM980-0400Z08R-F0008[shank form]-HC633

Example:

SCM980-0400Z08R-F0008HB-HC633

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Composite-Speed-Plus

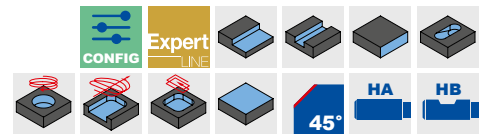
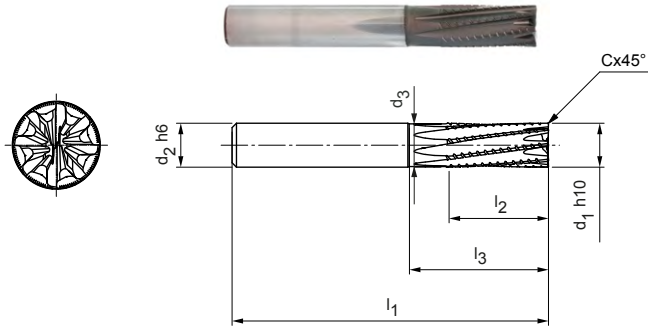
Shoulder milling cutter, design with pushing cutting edge
SCM990, follow-up product of SCM470

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HC633
Number of cutting edges: 8
Helix angle: -8 °
Special features: Diamond coating

Application:

Roughing and finishing of CFRP in one machining step. Pushing cutting edge, where the material is pressed onto the base (e.g. very suitable for vacuum clamping). Particularly suitable for difficult to machine surface layers (e.g. UD or copper mesh) to prevent delamination on the upper edge of the part.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 4,00 | 6 | 3,90 | 57 | 11 | - | 0,08 | 8 | SCM990-0400Z08R-F0008HA-HC633 | 31223265 |
| 5,00 | 6 | 4,90 | 57 | 13 | - | 0,10 | 8 | SCM990-0500Z08R-F0010HA-HC633 | 31223266 |
| 6,00 | 6 | 5,80 | 57 | 13 | 19 | 0,12 | 8 | SCM990-0600Z08R-F0012HA-HC633 | 31223267 |
| 6,00 | 6 | 5,80 | 65 | 21 | 27 | 0,12 | 8 | SCM990-0600Z08R-F0012HA-HC633 | 31223268 |
| 8,00 | 8 | 7,80 | 63 | 19 | 25 | 0,16 | 8 | SCM990-0800Z08R-F0016HA-HC633 | 31223269 |
| 8,00 | 8 | 7,80 | 70 | 22 | 32 | 0,16 | 8 | SCM990-0800Z08R-F0016HA-HC633 | 31223270 |
| 10,00 | 10 | 9,70 | 72 | 22 | 30 | 0,20 | 8 | SCM990-1000Z08R-F0020HA-HC633 | 31223271 |
| 12,00 | 12 | 11,60 | 83 | 26 | 36 | 0,24 | 8 | SCM990-1200Z08R-F0024HA-HC633 | 31223272 |
| 16,00 | 16 | 15,50 | 92 | 32 | 42 | 0,32 | 8 | SCM990-1600Z08R-F0032HA-HC633 | 31223273 |

Available on request

| | | | | | | | | | |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|
| 20,00 | 20 | 19,40 | 104 | 38 | 52 | 0,40 | 8 | SCM990-2000Z08R-F0040HA-HC633 | 31223274 |
|-------|----|-------|-----|----|----|------|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HB

Specification:
SCM990-0400Z08R-F0008[shank form]-HC633

Example:

SCM990-0400Z08R-F0008HB-HC633

Shank form HB

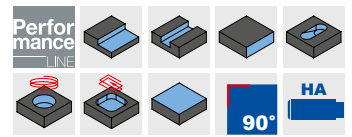
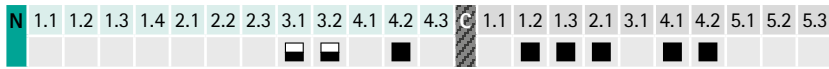
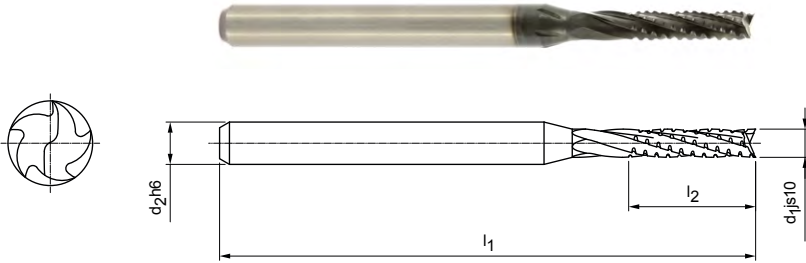
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Composite-Micro

Shoulder milling cutter, short design, pulling cutting edge
SCM560



Design:

Diameter of milling cutter: 1.00 – 3.00 mm
Cutting material: HC620
Number of cutting edges: Multi-tooth
Special features: Diamond coating

Application:

Pulling cutting edge for better removal of the chips/dust (e.g. on milling pockets and slots). Particularly suitable for difficult to machine surface layers (e.g. UD or copper mesh) to prevent delamination on the lower edge of the part.

Preferred series in stock

| Dimensions | | | | z | Specification | Order no. |
|---------------------|-------------------|----------------|----------------|-------------|----------------------------|-----------|
| d ₁ js10 | d ₂ h6 | l ₁ | l ₂ | | | |
| 1,00 | 3 | 38 | 5 | Multi-tooth | SCM560-0100ZMVR-S-HA-HC620 | 30504698 |
| 2,00 | 3 | 38 | 9 | Multi-tooth | SCM560-0200ZMVR-S-HA-HC620 | 30504700 |
| 3,00 | 3 | 38 | 9 | Multi-tooth | SCM560-0300ZMVR-S-HA-HC620 | 30504702 |

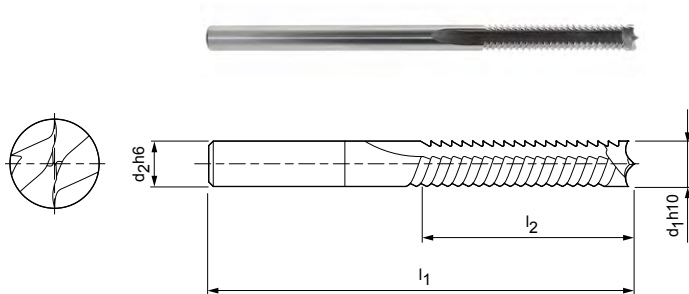
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Composite-TwinCut

Shoulder milling cutter, extra long design
SCM490

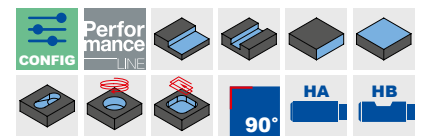


Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HU610
Number of cutting edges: 2
Helix angle: 0°
Special features: Alternating arrangement of the cutting edges

Application:

For roughing of aramid fibre-reinforced plastics.
Prevention of delamination in braided fibres and textile fibre structures.



| | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| N | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | C | 1.1 | 1.2 | 1.3 | 2.1 | 3.1 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Preferred series in stock

| Dimensions | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|---|----------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | | | |
| 4,00 | 4 | 75 | 20 | 2 | SCM490-0400Z02R-S-HA-HU610 | 30402708 |
| 6,00 | 6 | 100 | 35 | 2 | SCM490-0600Z02R-S-HA-HU610 | 30402710 |
| 8,00 | 8 | 100 | 40 | 2 | SCM490-0800Z02R-S-HA-HU610 | 30402711 |

Available on request

| | | | | | | |
|-------|----|-----|----|---|----------------------------|----------|
| 5,00 | 5 | 75 | 25 | 2 | SCM490-0500Z02R-S-HA-HU610 | 30402709 |
| 10,00 | 10 | 125 | 50 | 2 | SCM490-1000Z02R-S-HA-HU610 | 30402712 |
| 12,00 | 12 | 125 | 60 | 2 | SCM490-1200Z02R-S-HA-HU610 | 30402713 |
| 16,00 | 16 | 150 | 75 | 2 | SCM490-1600Z02R-S-HA-HU610 | 30402714 |
| 20,00 | 20 | 104 | 45 | 2 | SCM490-2000Z02R-S-HA-HU610 | 30402715 |

Configurable features

Shank form:
Shank form: HB

Specification:
SCM490-0400Z02R-S-[shank form]-HU610

Example:

SCM490-0400Z02R-S-**HB**-HU610

Shank form HB

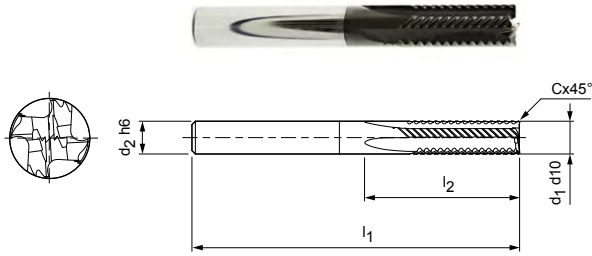
Dimensions in mm.

For cutting data recommendations, see end of chapter.

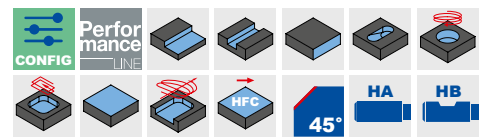
Special designs and other coatings available upon request.

OptiMill®-Thermoplastic-FR

Shoulder milling cutter, overlong design
SCM610



| | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| N | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | C | 1.1 | 1.2 | 1.3 | 2.1 | 3.1 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|



Design:
 Diameter of milling cutter: 6.00 - 20.00 mm
 Cutting material: HC614
 Number of cutting edges: 4
 Helix angle: 0°
 Special features: Diamond coating

Application:
 For machining thermoplastics with fibre reinforcement. Due to a special high-performance toothing, the fibres are cleanly cut off at the cutting edge without burr formation.


Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 6,00 | 6 | 62 | 13 | 0,12 | 4 | SCM610-0600Z04R-F0012HA-HC614 | 30602341 |
| 10,00 | 10 | 80 | 22 | 0,20 | 4 | SCM610-1000Z04R-F0020HA-HC614 | 30602345 |


Available on request

| | | | | | | | |
|-------|----|-----|----|------|---|-------------------------------|----------|
| 4,00 | 6 | 62 | 11 | 0,08 | 4 | SCM610-0400Z04R-F0008HA-HC614 | 30602339 |
| 5,00 | 6 | 62 | 13 | 0,10 | 4 | SCM610-0500Z04R-F0010HA-HC614 | 30602340 |
| 8,00 | 8 | 68 | 19 | 0,16 | 4 | SCM610-0800Z04R-F0016HA-HC614 | 30602343 |
| 12,00 | 12 | 93 | 26 | 0,24 | 4 | SCM610-1200Z04R-F0024HA-HC614 | 30602346 |
| 16,00 | 16 | 108 | 32 | 0,32 | 4 | SCM610-1600Z04R-F0032HA-HC614 | 30602347 |
| 20,00 | 20 | 126 | 38 | 0,40 | 4 | SCM610-2000Z04R-F0040HA-HC614 | 30602348 |

Configurable features



Shank form:
Shank form: HB



Specification:
SCM610-0600Z04R-F0012[shank form]-HC614

Example:
SCM610-0600Z04R-F0012**HB**-HC614

_____ Shank form HB

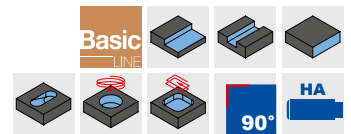
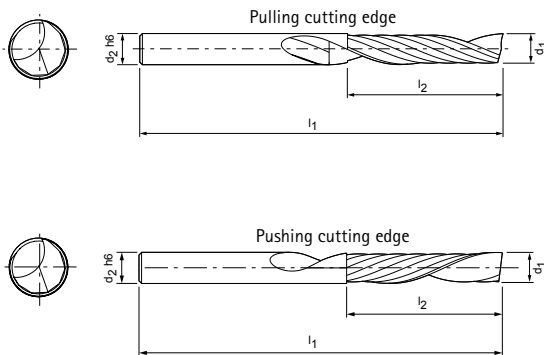
Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

OptiMill®-Mono-Plastic

Shoulder milling cutter, design with pulling/pushing cutting edge
SCM330

Design:

Diameter of milling cutter: 2.00 - 12.00 mm
Cutting material: HU211
Number of cutting edges: 1
Special features: Large chip space for unhindered chip discharge



Preferred series in stock

| Dimensions | | | | z | Specification* | Order no. | |
|----------------|-------------------|----------------|----------------|---|---|-----------|----------|
| d ₁ | d ₂ h6 | l ₁ | l ₂ | | | pulling | pushing |
| 2,00 | 3 | 38 | 8 | 1 | SCM330-0200Z01 [cutting behaviour]-S-HA-HU211 | 30393650 | 30393681 |
| 3,00 | 3 | 38 | 10 | 1 | SCM330-0300Z01 [cutting behaviour]-S-HA-HU211 | 30393652 | 30393683 |
| 3,00 | 4 | 38 | 10 | 1 | SCM330-0300Z01 [cutting behaviour]-S-HA-HU211 | 30393653 | - |
| 3,00 | 4 | 50 | 15 | 1 | SCM330-0300Z01 [cutting behaviour]-S-HA-HU211 | 30393654 | 30393685 |
| 3,00 | 6 | 50 | 10 | 1 | SCM330-0300Z01 [cutting behaviour]-S-HA-HU211 | 30393655 | 30393686 |
| 4,00 | 4 | 40 | 12 | 1 | SCM330-0400Z01 [cutting behaviour]-S-HA-HU211 | 30393659 | 30393688 |
| 4,00 | 4 | 60 | 20 | 1 | SCM330-0400Z01 [cutting behaviour]-S-HA-HU211 | 30393660 | - |
| 4,00 | 4 | 70 | 30 | 1 | SCM330-0400Z01 [cutting behaviour]-S-HA-HU211 | 30393661 | - |
| 4,00 | 6 | 50 | 15 | 1 | SCM330-0400Z01 [cutting behaviour]-S-HA-HU211 | 30393662 | 30393691 |
| 5,00 | 5 | 50 | 16 | 1 | SCM330-0500Z01 [cutting behaviour]-S-HA-HU211 | 30393665 | 30393695 |
| 5,00 | 5 | 70 | 30 | 1 | SCM330-0500Z01 [cutting behaviour]-S-HA-HU211 | 30393666 | - |
| 6,00 | 6 | 60 | 20 | 1 | SCM330-0600Z01 [cutting behaviour]-S-HA-HU211 | 30393669 | 30393698 |
| 6,00 | 6 | 70 | 30 | 1 | SCM330-0600Z01 [cutting behaviour]-S-HA-HU211 | 30393670 | 30393699 |
| 6,00 | 6 | 80 | 38 | 1 | SCM330-0600Z01 [cutting behaviour]-S-HA-HU211 | 30393671 | - |
| 8,00 | 8 | 60 | 25 | 1 | SCM330-0800Z01 [cutting behaviour]-S-HA-HU211 | 30393674 | 30393702 |
| 8,00 | 8 | 80 | 38 | 1 | SCM330-0800Z01 [cutting behaviour]-S-HA-HU211 | 30393675 | 30393703 |
| 10,00 | 10 | 75 | 30 | 1 | SCM330-1000Z01 [cutting behaviour]-S-HA-HU211 | 30393677 | - |
| 12,00 | 12 | 75 | 30 | 1 | SCM330-1200Z01 [cutting behaviour]-S-HA-HU211 | 30393679 | - |

Dimensions in mm.

For cutting data recommendations, see end of chapter.
Special designs and other coatings available upon request.

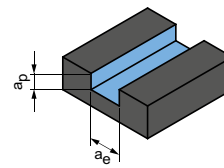
* Specification plus required soft cutting behaviour.
R = pulling | L = pushing

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| Long | 0,9 |
| Overlong | 0,8 |
| Extra long | 0,6 |

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

OptiMill-Uni-HPC-Plus | SCM720, 740, 760, 770

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------|--|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 175 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 145 | 0.012 | 0.023 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.080 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 160 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 110 | 0.011 | 0.020 | 0.029 | 0.037 | 0.044 | 0.051 | 0.062 | 0.071 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 105 | 0.012 | 0.023 | 0.034 | 0.043 | 0.051 | 0.059 | 0.072 | 0.082 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 95 | 0.012 | 0.022 | 0.032 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 85 | 0.011 | 0.021 | 0.030 | 0.038 | 0.046 | 0.053 | 0.065 | 0.074 |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | ✓ | 70 | 0.008 | 0.016 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 |
| | P5.1 | Cast steel | | ✓ | ✓ | ✓ | 105 | 0.012 | 0.023 | 0.034 | 0.043 | 0.051 | 0.059 | 0.072 | 0.082 |
| P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | ✓ | ✓ | 70 | 0.006 | 0.011 | 0.016 | 0.021 | 0.025 | 0.028 | 0.035 | 0.040 | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | ✓ | ✓ | 50 | 0.007 | 0.014 | 0.020 | 0.026 | 0.031 | 0.036 | 0.043 | 0.050 |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 45 | 0.006 | 0.012 | 0.017 | 0.021 | 0.026 | 0.029 | 0.036 | 0.041 |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | ✓ | ✓ | 50 | 0.008 | 0.015 | 0.022 | 0.028 | 0.034 | 0.039 | 0.047 | 0.054 |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 50 | 0.006 | 0.012 | 0.017 | 0.022 | 0.027 | 0.031 | 0.037 | 0.043 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 190 | 0.021 | 0.040 | 0.058 | 0.074 | 0.088 | 0.102 | 0.124 | 0.142 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 175 | 0.018 | 0.034 | 0.049 | 0.063 | 0.075 | 0.086 | 0.106 | 0.121 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 145 | 0.015 | 0.028 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 80 | 0.008 | 0.016 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 125 | 0.015 | 0.028 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 120 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 |

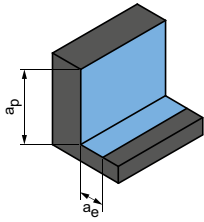
OptiMill-Uni-HPC-Plus | SCM772

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------|--|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 1.00 | 3.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 200 | 0.007 | 0.020 | 0.038 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 165 | 0.007 | 0.019 | 0.036 | 0.046 | 0.054 | 0.063 | 0.077 | 0.087 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 180 | 0.007 | 0.020 | 0.038 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 125 | 0.006 | 0.017 | 0.032 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 120 | 0.007 | 0.020 | 0.037 | 0.047 | 0.056 | 0.065 | 0.079 | 0.091 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 110 | 0.007 | 0.019 | 0.035 | 0.045 | 0.054 | 0.062 | 0.075 | 0.086 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 100 | 0.006 | 0.018 | 0.033 | 0.042 | 0.051 | 0.058 | 0.071 | 0.081 |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | ✓ | 80 | 0.005 | 0.014 | 0.025 | 0.033 | 0.039 | 0.045 | 0.055 | 0.062 |
| | P5.1 | Cast steel | | ✓ | ✓ | ✓ | 120 | 0.007 | 0.020 | 0.037 | 0.047 | 0.056 | 0.065 | 0.079 | 0.091 |
| P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | ✓ | ✓ | 80 | 0.003 | 0.010 | 0.018 | 0.023 | 0.027 | 0.031 | 0.038 | 0.044 | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | ✓ | ✓ | 55 | 0.004 | 0.012 | 0.022 | 0.028 | 0.034 | 0.039 | 0.048 | 0.055 |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 50 | 0.003 | 0.010 | 0.018 | 0.024 | 0.028 | 0.032 | 0.040 | 0.045 |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | ✓ | ✓ | 60 | 0.005 | 0.013 | 0.024 | 0.031 | 0.037 | 0.042 | 0.052 | 0.059 |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 55 | 0.004 | 0.010 | 0.019 | 0.024 | 0.029 | 0.034 | 0.041 | 0.047 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 215 | 0.012 | 0.034 | 0.064 | 0.081 | 0.097 | 0.112 | 0.137 | 0.156 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 200 | 0.010 | 0.029 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.133 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 160 | 0.008 | 0.024 | 0.045 | 0.057 | 0.068 | 0.078 | 0.096 | 0.109 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 90 | 0.005 | 0.014 | 0.025 | 0.033 | 0.039 | 0.045 | 0.055 | 0.062 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 145 | 0.008 | 0.024 | 0.045 | 0.057 | 0.068 | 0.078 | 0.096 | 0.109 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 135 | 0.007 | 0.020 | 0.038 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

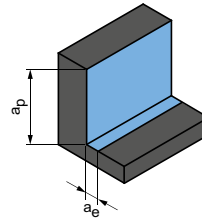
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| | v _c [m/min] | f _z [mm] | | | | | | | | v _c [m/min] | f _z [mm] | | | | | | | |
|--|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 355 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 525 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |
| | 290 | 0.020 | 0.038 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 | 430 | 0.032 | 0.060 | 0.087 | 0.111 | 0.133 | 0.153 | 0.187 | 0.213 |
| | 325 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 475 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |
| | 225 | 0.018 | 0.034 | 0.049 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 335 | 0.028 | 0.054 | 0.078 | 0.099 | 0.119 | 0.136 | 0.167 | 0.190 |
| | 210 | 0.021 | 0.040 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 310 | 0.033 | 0.063 | 0.090 | 0.115 | 0.138 | 0.158 | 0.193 | 0.221 |
| | 195 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.132 | 285 | 0.031 | 0.059 | 0.085 | 0.109 | 0.130 | 0.150 | 0.183 | 0.209 |
| | 180 | 0.019 | 0.035 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 | 260 | 0.029 | 0.056 | 0.081 | 0.103 | 0.123 | 0.142 | 0.173 | 0.198 |
| | 145 | 0.014 | 0.027 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 215 | 0.023 | 0.043 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 |
| | 215 | 0.021 | 0.040 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 320 | 0.033 | 0.063 | 0.090 | 0.115 | 0.138 | 0.158 | 0.193 | 0.221 |
| | 145 | 0.010 | 0.019 | 0.027 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 215 | 0.016 | 0.030 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 |
| | 95 | 0.012 | 0.024 | 0.034 | 0.044 | 0.053 | 0.060 | 0.074 | 0.084 | 145 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.117 | 0.133 |
| | 90 | 0.010 | 0.020 | 0.028 | 0.036 | 0.044 | 0.050 | 0.061 | 0.070 | 135 | 0.016 | 0.031 | 0.045 | 0.057 | 0.069 | 0.079 | 0.097 | 0.110 |
| | 105 | 0.014 | 0.026 | 0.037 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 155 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.104 | 0.127 | 0.145 |
| | 95 | 0.011 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 145 | 0.017 | 0.032 | 0.047 | 0.059 | 0.071 | 0.082 | 0.100 | 0.114 |
| | 390 | 0.036 | 0.068 | 0.098 | 0.125 | 0.150 | 0.172 | 0.211 | 0.241 | 570 | 0.056 | 0.108 | 0.155 | 0.198 | 0.237 | 0.273 | 0.333 | 0.381 |
| | 355 | 0.030 | 0.058 | 0.083 | 0.106 | 0.128 | 0.147 | 0.179 | 0.205 | 525 | 0.048 | 0.092 | 0.132 | 0.168 | 0.202 | 0.232 | 0.283 | 0.324 |
| | 290 | 0.025 | 0.048 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 430 | 0.040 | 0.076 | 0.109 | 0.139 | 0.166 | 0.191 | 0.233 | 0.267 |
| | 160 | 0.014 | 0.027 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 240 | 0.023 | 0.043 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 |
| | 260 | 0.025 | 0.048 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 380 | 0.040 | 0.076 | 0.109 | 0.139 | 0.166 | 0.191 | 0.233 | 0.267 |
| | 245 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 355 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |

| | v _c [m/min] | f _z [mm] | | | | | | | | v _c [m/min] | f _z [mm] | | | | | | | |
|--|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | 1.00 | 3.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 1.00 | 3.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 355 | 0.012 | 0.035 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | 480 | 0.019 | 0.055 | 0.102 | 0.131 | 0.157 | 0.180 | 0.220 | 0.251 |
| | 290 | 0.011 | 0.032 | 0.060 | 0.077 | 0.092 | 0.106 | 0.130 | 0.148 | 395 | 0.018 | 0.051 | 0.096 | 0.122 | 0.146 | 0.168 | 0.205 | 0.235 |
| | 325 | 0.012 | 0.035 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | 435 | 0.019 | 0.055 | 0.102 | 0.131 | 0.157 | 0.180 | 0.220 | 0.251 |
| | 225 | 0.010 | 0.029 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.132 | 305 | 0.016 | 0.045 | 0.085 | 0.109 | 0.130 | 0.150 | 0.183 | 0.209 |
| | 210 | 0.012 | 0.033 | 0.063 | 0.080 | 0.096 | 0.110 | 0.134 | 0.154 | 285 | 0.019 | 0.053 | 0.099 | 0.126 | 0.151 | 0.174 | 0.213 | 0.243 |
| | 195 | 0.011 | 0.032 | 0.059 | 0.076 | 0.091 | 0.104 | 0.127 | 0.146 | 260 | 0.018 | 0.050 | 0.094 | 0.120 | 0.144 | 0.165 | 0.202 | 0.230 |
| | 180 | 0.011 | 0.030 | 0.056 | 0.072 | 0.086 | 0.099 | 0.120 | 0.138 | 240 | 0.017 | 0.047 | 0.089 | 0.113 | 0.136 | 0.156 | 0.191 | 0.218 |
| | 145 | 0.008 | 0.023 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 195 | 0.013 | 0.036 | 0.068 | 0.087 | 0.104 | 0.120 | 0.147 | 0.168 |
| | 215 | 0.012 | 0.033 | 0.063 | 0.080 | 0.096 | 0.110 | 0.134 | 0.154 | 295 | 0.019 | 0.053 | 0.099 | 0.126 | 0.151 | 0.174 | 0.213 | 0.243 |
| | 145 | 0.006 | 0.016 | 0.030 | 0.039 | 0.046 | 0.053 | 0.065 | 0.074 | 195 | 0.009 | 0.025 | 0.048 | 0.061 | 0.073 | 0.084 | 0.103 | 0.117 |
| | 110 | 0.007 | 0.020 | 0.038 | 0.048 | 0.058 | 0.066 | 0.081 | 0.093 | 160 | 0.011 | 0.032 | 0.060 | 0.076 | 0.091 | 0.105 | 0.128 | 0.147 |
| | 105 | 0.006 | 0.017 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 150 | 0.009 | 0.026 | 0.049 | 0.063 | 0.076 | 0.087 | 0.106 | 0.121 |
| | 120 | 0.008 | 0.022 | 0.041 | 0.052 | 0.063 | 0.072 | 0.088 | 0.101 | 180 | 0.012 | 0.035 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 |
| | 110 | 0.006 | 0.017 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.079 | 160 | 0.010 | 0.027 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.126 |
| | 440 | 0.020 | 0.058 | 0.108 | 0.138 | 0.165 | 0.190 | 0.232 | 0.265 | 650 | 0.032 | 0.091 | 0.171 | 0.218 | 0.261 | 0.300 | 0.366 | 0.419 |
| | 405 | 0.017 | 0.049 | 0.092 | 0.117 | 0.140 | 0.161 | 0.197 | 0.225 | 595 | 0.027 | 0.077 | 0.145 | 0.185 | 0.222 | 0.255 | 0.311 | 0.356 |
| | 330 | 0.014 | 0.040 | 0.076 | 0.096 | 0.116 | 0.133 | 0.162 | 0.185 | 485 | 0.022 | 0.064 | 0.119 | 0.153 | 0.183 | 0.210 | 0.256 | 0.293 |
| | 185 | 0.008 | 0.023 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 270 | 0.013 | 0.036 | 0.068 | 0.087 | 0.104 | 0.120 | 0.147 | 0.168 |
| | 295 | 0.014 | 0.040 | 0.076 | 0.096 | 0.116 | 0.133 | 0.162 | 0.185 | 430 | 0.022 | 0.064 | 0.119 | 0.153 | 0.183 | 0.210 | 0.256 | 0.293 |
| | 275 | 0.012 | 0.035 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | 405 | 0.019 | 0.055 | 0.102 | 0.131 | 0.157 | 0.180 | 0.220 | 0.251 |

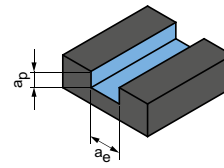
The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| A/B | 1.0 |
| C | 0.9 |
| D | 0.7 |
| E | 0.6 |

Groove milling



$$a_p = 0.6 \times D$$

$$a_e = 1 \times D$$

CPMill-Uni-HPC | CPM100

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | |
|------|--------------------|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | |
| | | | | | | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 160 | 0.021 | 0.025 | 0.028 | 0.034 | 0.039 | 0.044 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 130 | 0.019 | 0.023 | 0.026 | 0.032 | 0.037 | 0.041 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 145 | 0.021 | 0.025 | 0.028 | 0.034 | 0.039 | 0.044 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 100 | 0.017 | 0.020 | 0.024 | 0.029 | 0.033 | 0.037 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 95 | 0.020 | 0.024 | 0.027 | 0.033 | 0.038 | 0.043 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 85 | 0.019 | 0.023 | 0.026 | 0.032 | 0.036 | 0.040 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 80 | 0.018 | 0.021 | 0.024 | 0.030 | 0.034 | 0.038 |
| P5 | P5.1 | Stainless steels, ferritic and martensitic | | | | ✓ | 95 | 0.020 | 0.024 | 0.027 | 0.033 | 0.038 | 0.043 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 175 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 160 | 0.029 | 0.035 | 0.040 | 0.049 | 0.056 | 0.062 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 130 | 0.024 | 0.029 | 0.033 | 0.040 | 0.046 | 0.051 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 70 | 0.014 | 0.016 | 0.019 | 0.023 | 0.026 | 0.029 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 115 | 0.024 | 0.029 | 0.033 | 0.040 | 0.046 | 0.051 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 110 | 0.021 | 0.025 | 0.028 | 0.034 | 0.039 | 0.044 |

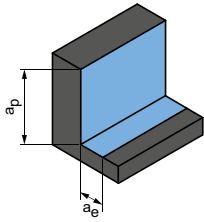
CPMill-Uni-HPC-Slot | CPM110

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | |
|------|--------------------|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | |
| | | | | | | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 160 | 0.021 | 0.025 | 0.028 | 0.034 | 0.039 | 0.044 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 130 | 0.019 | 0.023 | 0.026 | 0.032 | 0.037 | 0.041 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 145 | 0.021 | 0.025 | 0.028 | 0.034 | 0.039 | 0.044 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 100 | 0.017 | 0.020 | 0.024 | 0.029 | 0.033 | 0.037 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 95 | 0.020 | 0.024 | 0.027 | 0.033 | 0.038 | 0.043 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 85 | 0.019 | 0.023 | 0.026 | 0.032 | 0.036 | 0.040 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 80 | 0.018 | 0.021 | 0.024 | 0.030 | 0.034 | 0.038 |
| P5 | P5.1 | Stainless steels, ferritic and martensitic | | | | ✓ | 95 | 0.020 | 0.024 | 0.027 | 0.033 | 0.038 | 0.043 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 175 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 160 | 0.029 | 0.035 | 0.040 | 0.049 | 0.056 | 0.062 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 130 | 0.024 | 0.029 | 0.033 | 0.040 | 0.046 | 0.051 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 70 | 0.014 | 0.016 | 0.019 | 0.023 | 0.026 | 0.029 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 115 | 0.024 | 0.029 | 0.033 | 0.040 | 0.046 | 0.051 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 110 | 0.021 | 0.025 | 0.028 | 0.034 | 0.039 | 0.044 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

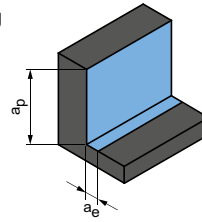
Roughing



$$a_p = 0.56 \times D$$

$$a_e = 0.5 \times D$$

Finishing



$$a_p = 0.56 \times D$$

$$a_e = 0.1 \times D$$

| | v_c [m/min] | f_z [mm] | | | | | | v_c [m/min] | f_z [mm] | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | Diameter of milling cutter [mm] | | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 285 | 0.041 | 0.049 | 0.056 | 0.069 | 0.079 | 0.088 | 385 | 0.065 | 0.078 | 0.089 | 0.109 | 0.125 | 0.139 |
| | 235 | 0.038 | 0.046 | 0.053 | 0.064 | 0.074 | 0.082 | 315 | 0.061 | 0.072 | 0.083 | 0.102 | 0.116 | 0.130 |
| | 260 | 0.041 | 0.049 | 0.056 | 0.069 | 0.079 | 0.088 | 350 | 0.065 | 0.078 | 0.089 | 0.109 | 0.125 | 0.139 |
| | 180 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 | 245 | 0.054 | 0.065 | 0.074 | 0.091 | 0.104 | 0.116 |
| | 170 | 0.040 | 0.047 | 0.055 | 0.067 | 0.076 | 0.085 | 225 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 0.134 |
| | 155 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 0.081 | 210 | 0.059 | 0.071 | 0.082 | 0.100 | 0.114 | 0.127 |
| | 145 | 0.036 | 0.043 | 0.049 | 0.060 | 0.068 | 0.076 | 190 | 0.056 | 0.067 | 0.077 | 0.094 | 0.108 | 0.121 |
| | 175 | 0.040 | 0.047 | 0.055 | 0.067 | 0.076 | 0.085 | 235 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 0.134 |
| | 355 | 0.068 | 0.082 | 0.094 | 0.115 | 0.131 | 0.147 | 520 | 0.108 | 0.129 | 0.149 | 0.182 | 0.208 | 0.232 |
| | 325 | 0.058 | 0.070 | 0.080 | 0.098 | 0.112 | 0.125 | 475 | 0.092 | 0.110 | 0.126 | 0.154 | 0.177 | 0.197 |
| | 265 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.103 | 390 | 0.076 | 0.091 | 0.104 | 0.127 | 0.145 | 0.162 |
| | 145 | 0.027 | 0.033 | 0.038 | 0.046 | 0.053 | 0.059 | 215 | 0.043 | 0.052 | 0.059 | 0.073 | 0.083 | 0.093 |
| | 235 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.103 | 345 | 0.076 | 0.091 | 0.104 | 0.127 | 0.145 | 0.162 |
| | 220 | 0.041 | 0.049 | 0.056 | 0.069 | 0.079 | 0.088 | 325 | 0.065 | 0.078 | 0.089 | 0.109 | 0.125 | 0.139 |

| | v_c [m/min] | f_z [mm] | | | | | | v_c [m/min] | f_z [mm] | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | Diameter of milling cutter [mm] | | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 285 | 0.041 | 0.049 | 0.056 | 0.069 | 0.079 | 0.088 | 385 | 0.065 | 0.078 | 0.089 | 0.109 | 0.125 | 0.139 |
| | 235 | 0.038 | 0.046 | 0.053 | 0.064 | 0.074 | 0.082 | 315 | 0.061 | 0.072 | 0.083 | 0.102 | 0.116 | 0.130 |
| | 260 | 0.041 | 0.049 | 0.056 | 0.069 | 0.079 | 0.088 | 350 | 0.065 | 0.078 | 0.089 | 0.109 | 0.125 | 0.139 |
| | 180 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 | 245 | 0.054 | 0.065 | 0.074 | 0.091 | 0.104 | 0.116 |
| | 170 | 0.040 | 0.047 | 0.055 | 0.067 | 0.076 | 0.085 | 225 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 0.134 |
| | 155 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 0.081 | 210 | 0.059 | 0.071 | 0.082 | 0.100 | 0.114 | 0.127 |
| | 145 | 0.036 | 0.043 | 0.049 | 0.060 | 0.068 | 0.076 | 190 | 0.056 | 0.067 | 0.077 | 0.094 | 0.108 | 0.121 |
| | 175 | 0.040 | 0.047 | 0.055 | 0.067 | 0.076 | 0.085 | 235 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 0.134 |
| | 355 | 0.068 | 0.082 | 0.094 | 0.115 | 0.131 | 0.147 | 520 | 0.108 | 0.129 | 0.149 | 0.182 | 0.208 | 0.232 |
| | 325 | 0.058 | 0.070 | 0.080 | 0.098 | 0.112 | 0.125 | 475 | 0.092 | 0.110 | 0.126 | 0.154 | 0.177 | 0.197 |
| | 265 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.103 | 390 | 0.076 | 0.091 | 0.104 | 0.127 | 0.145 | 0.162 |
| | 145 | 0.027 | 0.033 | 0.038 | 0.046 | 0.053 | 0.059 | 215 | 0.043 | 0.052 | 0.059 | 0.073 | 0.083 | 0.093 |
| | 235 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.103 | 345 | 0.076 | 0.091 | 0.104 | 0.127 | 0.145 | 0.162 |
| | 220 | 0.041 | 0.049 | 0.056 | 0.069 | 0.079 | 0.088 | 325 | 0.065 | 0.078 | 0.089 | 0.109 | 0.125 | 0.139 |

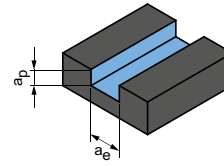
The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| Long | 0,9 |
| Overlong | 0,8 |
| Extra long | 0,6 |

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

OptiMill-Uni-HPC-Slot | SCM250

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | | |
|------|--------------------|--|---|--------|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 200 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 165 | 0.012 | 0.023 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.080 | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 180 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 125 | 0.011 | 0.020 | 0.029 | 0.037 | 0.044 | 0.051 | 0.062 | 0.071 | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 120 | 0.012 | 0.023 | 0.034 | 0.043 | 0.051 | 0.059 | 0.072 | 0.082 | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 110 | 0.012 | 0.022 | 0.032 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 100 | 0.011 | 0.021 | 0.030 | 0.038 | 0.046 | 0.053 | 0.065 | 0.074 | |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | 80 | 0.008 | 0.016 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 | |
| P5 | P5.1 | Cast steel | | | ✓ | 120 | 0.012 | 0.023 | 0.034 | 0.043 | 0.051 | 0.059 | 0.072 | 0.082 | | |
| P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | | ✓ | 80 | 0.006 | 0.011 | 0.016 | 0.021 | 0.025 | 0.028 | 0.035 | 0.040 | | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ | 55 | 0.007 | 0.014 | 0.020 | 0.026 | 0.031 | 0.036 | 0.043 | 0.050 | |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 50 | 0.006 | 0.012 | 0.017 | 0.021 | 0.026 | 0.029 | 0.036 | 0.041 | |
| | M2 | M2.1 | Stainless cast steel, austenitic | < 700 | ✓ | | ✓ | 60 | 0.008 | 0.015 | 0.022 | 0.028 | 0.034 | 0.039 | 0.047 | 0.054 |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (Duplex) | < 1000 | | | ✓ | 55 | 0.006 | 0.012 | 0.017 | 0.022 | 0.027 | 0.031 | 0.037 | 0.043 |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 215 | 0.021 | 0.040 | 0.058 | 0.074 | 0.088 | 0.102 | 0.124 | 0.142 |
| | K2 | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 200 | 0.018 | 0.034 | 0.049 | 0.063 | 0.075 | 0.086 | 0.106 | 0.121 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 160 | 0.015 | 0.028 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 |
| | K2 | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 90 | 0.008 | 0.016 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 |
| | K3 | K3.1 | Cast iron with vermicular graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 145 | 0.015 | 0.028 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 |
| | K3 | K3.2 | Cast iron with vermicular graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 135 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 |

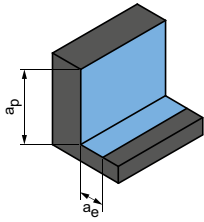
ECU-Mill-Uni-LV | SCM780.790

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------|--------------------|--|---|-------|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 170 | 0.022 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 140 | 0.020 | 0.029 | 0.037 | 0.045 | 0.051 | 0.063 | 0.072 | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 155 | 0.022 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 110 | 0.018 | 0.026 | 0.033 | 0.040 | 0.046 | 0.056 | 0.064 | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 100 | 0.021 | 0.030 | 0.039 | 0.046 | 0.053 | 0.065 | 0.074 | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 95 | 0.020 | 0.029 | 0.037 | 0.044 | 0.050 | 0.061 | 0.070 | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 85 | 0.019 | 0.027 | 0.035 | 0.041 | 0.048 | 0.058 | 0.066 | |
| | P5 | P5.1 | Cast steel | | | ✓ | 105 | 0.021 | 0.030 | 0.039 | 0.046 | 0.053 | 0.065 | 0.074 | |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 185 | 0.036 | 0.052 | 0.066 | 0.080 | 0.092 | 0.112 | 0.128 |
| | K2 | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 170 | 0.031 | 0.044 | 0.057 | 0.068 | 0.078 | 0.095 | 0.109 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 140 | 0.025 | 0.036 | 0.047 | 0.056 | 0.064 | 0.078 | 0.089 |
| | K2 | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 75 | 0.014 | 0.021 | 0.027 | 0.032 | 0.037 | 0.045 | 0.051 |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 120 | 0.025 | 0.036 | 0.047 | 0.056 | 0.064 | 0.078 | 0.089 |
| | K3 | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 115 | 0.022 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

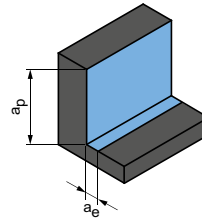
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| | v_c [m/min] | f_z [mm] | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 355 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 480 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |
| | 290 | 0.020 | 0.038 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 | 395 | 0.032 | 0.060 | 0.087 | 0.111 | 0.133 | 0.153 | 0.187 | 0.213 |
| | 325 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 435 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |
| | 225 | 0.018 | 0.034 | 0.049 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 305 | 0.028 | 0.054 | 0.078 | 0.099 | 0.119 | 0.136 | 0.167 | 0.190 |
| | 210 | 0.021 | 0.040 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 285 | 0.033 | 0.063 | 0.090 | 0.115 | 0.138 | 0.158 | 0.193 | 0.221 |
| | 195 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.132 | 260 | 0.031 | 0.059 | 0.085 | 0.109 | 0.130 | 0.150 | 0.183 | 0.209 |
| | 180 | 0.019 | 0.035 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 | 240 | 0.029 | 0.056 | 0.081 | 0.103 | 0.123 | 0.142 | 0.173 | 0.198 |
| | 145 | 0.014 | 0.027 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 195 | 0.023 | 0.043 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 |
| | 215 | 0.021 | 0.040 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 295 | 0.033 | 0.063 | 0.090 | 0.115 | 0.138 | 0.158 | 0.193 | 0.221 |
| | 145 | 0.010 | 0.019 | 0.027 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 195 | 0.016 | 0.030 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 |
| | 110 | 0.012 | 0.024 | 0.034 | 0.044 | 0.053 | 0.060 | 0.074 | 0.084 | 160 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.117 | 0.133 |
| | 105 | 0.010 | 0.020 | 0.028 | 0.036 | 0.044 | 0.050 | 0.061 | 0.070 | 150 | 0.016 | 0.031 | 0.045 | 0.057 | 0.069 | 0.079 | 0.097 | 0.110 |
| | 120 | 0.014 | 0.026 | 0.037 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 180 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.104 | 0.127 | 0.145 |
| | 110 | 0.011 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 160 | 0.017 | 0.032 | 0.047 | 0.059 | 0.071 | 0.082 | 0.100 | 0.114 |
| | 440 | 0.036 | 0.068 | 0.098 | 0.125 | 0.150 | 0.172 | 0.211 | 0.241 | 650 | 0.056 | 0.108 | 0.155 | 0.198 | 0.237 | 0.273 | 0.333 | 0.381 |
| | 405 | 0.030 | 0.058 | 0.083 | 0.106 | 0.128 | 0.147 | 0.179 | 0.205 | 595 | 0.048 | 0.092 | 0.132 | 0.168 | 0.202 | 0.232 | 0.283 | 0.324 |
| | 330 | 0.025 | 0.048 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 485 | 0.040 | 0.076 | 0.109 | 0.139 | 0.166 | 0.191 | 0.233 | 0.267 |
| | 185 | 0.014 | 0.027 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 270 | 0.023 | 0.043 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 |
| | 295 | 0.025 | 0.048 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 430 | 0.040 | 0.076 | 0.109 | 0.139 | 0.166 | 0.191 | 0.233 | 0.267 |
| | 275 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 405 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |

| | v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 305 | 0.043 | 0.062 | 0.080 | 0.096 | 0.110 | 0.134 | 0.153 | 410 | 0.069 | 0.099 | 0.126 | 0.151 | 0.174 | 0.212 | 0.242 |
| | 250 | 0.041 | 0.058 | 0.074 | 0.089 | 0.102 | 0.125 | 0.143 | 335 | 0.064 | 0.092 | 0.118 | 0.141 | 0.162 | 0.198 | 0.226 |
| | 275 | 0.043 | 0.062 | 0.080 | 0.096 | 0.110 | 0.134 | 0.153 | 370 | 0.069 | 0.099 | 0.126 | 0.151 | 0.174 | 0.212 | 0.242 |
| | 195 | 0.036 | 0.052 | 0.066 | 0.080 | 0.092 | 0.112 | 0.128 | 260 | 0.057 | 0.082 | 0.105 | 0.126 | 0.145 | 0.177 | 0.202 |
| | 180 | 0.042 | 0.060 | 0.077 | 0.092 | 0.106 | 0.130 | 0.148 | 240 | 0.066 | 0.095 | 0.122 | 0.146 | 0.168 | 0.205 | 0.234 |
| | 165 | 0.040 | 0.057 | 0.073 | 0.088 | 0.101 | 0.123 | 0.141 | 225 | 0.063 | 0.090 | 0.116 | 0.138 | 0.159 | 0.194 | 0.222 |
| | 150 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.133 | 205 | 0.060 | 0.086 | 0.109 | 0.131 | 0.150 | 0.184 | 0.210 |
| | 185 | 0.042 | 0.060 | 0.077 | 0.092 | 0.106 | 0.130 | 0.148 | 250 | 0.066 | 0.095 | 0.122 | 0.146 | 0.168 | 0.205 | 0.234 |
| | 375 | 0.072 | 0.104 | 0.133 | 0.159 | 0.183 | 0.224 | 0.256 | 550 | 0.114 | 0.165 | 0.210 | 0.252 | 0.289 | 0.353 | 0.404 |
| | 345 | 0.062 | 0.088 | 0.113 | 0.135 | 0.156 | 0.190 | 0.217 | 505 | 0.097 | 0.140 | 0.179 | 0.214 | 0.246 | 0.300 | 0.344 |
| | 280 | 0.051 | 0.073 | 0.093 | 0.111 | 0.128 | 0.156 | 0.179 | 415 | 0.080 | 0.115 | 0.147 | 0.176 | 0.203 | 0.247 | 0.283 |
| | 155 | 0.029 | 0.042 | 0.053 | 0.064 | 0.073 | 0.089 | 0.102 | 230 | 0.046 | 0.066 | 0.084 | 0.101 | 0.116 | 0.141 | 0.162 |
| | 250 | 0.051 | 0.073 | 0.093 | 0.111 | 0.128 | 0.156 | 0.179 | 365 | 0.080 | 0.115 | 0.147 | 0.176 | 0.203 | 0.247 | 0.283 |
| | 235 | 0.043 | 0.062 | 0.080 | 0.096 | 0.110 | 0.134 | 0.153 | 345 | 0.069 | 0.099 | 0.126 | 0.151 | 0.174 | 0.212 | 0.242 |

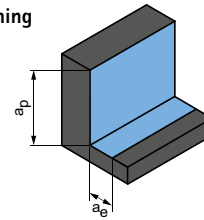
The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| short | 1 |
| Long | 1 |
| Overlong | 0.8 |
| Extra long | - |

Roughing



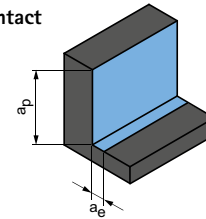
$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

OptiMill-Uni-HPC-Pocket | SCM800, 810, 840

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------|--|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | | | | 3.80 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 465 | 0.053 | 0.079 | 0.101 | 0.122 | 0.140 | 0.171 | 0.195 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 380 | 0.049 | 0.074 | 0.095 | 0.113 | 0.130 | 0.159 | 0.182 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 425 | 0.053 | 0.079 | 0.101 | 0.122 | 0.140 | 0.171 | 0.195 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 295 | 0.044 | 0.066 | 0.085 | 0.101 | 0.116 | 0.142 | 0.163 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 275 | 0.051 | 0.077 | 0.098 | 0.117 | 0.135 | 0.165 | 0.189 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 255 | 0.048 | 0.073 | 0.093 | 0.111 | 0.128 | 0.156 | 0.179 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 235 | 0.046 | 0.069 | 0.088 | 0.105 | 0.121 | 0.148 | 0.169 |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | ✓ | 190 | 0.035 | 0.053 | 0.068 | 0.081 | 0.093 | 0.114 | 0.130 |
| | P5.1 | Cast steel | | ✓ | ✓ | ✓ | 285 | 0.051 | 0.077 | 0.098 | 0.117 | 0.135 | 0.165 | 0.189 |
| P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | ✓ | ✓ | 190 | 0.025 | 0.037 | 0.047 | 0.057 | 0.065 | 0.080 | 0.091 | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | ✓ | ✓ | 125 | 0.031 | 0.046 | 0.059 | 0.071 | 0.081 | 0.100 | 0.114 |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 120 | 0.025 | 0.038 | 0.049 | 0.059 | 0.068 | 0.082 | 0.094 |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | ✓ | ✓ | 140 | 0.033 | 0.050 | 0.064 | 0.077 | 0.088 | 0.108 | 0.124 |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 125 | 0.026 | 0.040 | 0.051 | 0.061 | 0.070 | 0.085 | 0.098 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 510 | 0.088 | 0.132 | 0.169 | 0.203 | 0.233 | 0.284 | 0.325 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 465 | 0.075 | 0.113 | 0.144 | 0.172 | 0.198 | 0.242 | 0.276 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 380 | 0.062 | 0.093 | 0.118 | 0.142 | 0.163 | 0.199 | 0.228 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 210 | 0.035 | 0.053 | 0.068 | 0.081 | 0.093 | 0.114 | 0.130 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 340 | 0.062 | 0.093 | 0.118 | 0.142 | 0.163 | 0.199 | 0.228 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 315 | 0.053 | 0.079 | 0.101 | 0.122 | 0.140 | 0.171 | 0.195 |

Part-contact cutting



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

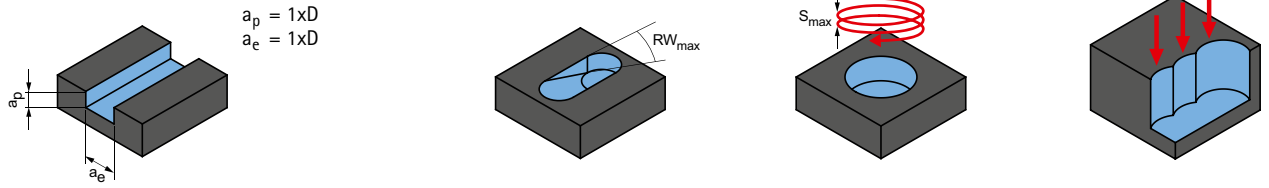
OptiMill-Alu-HPC-Pocket | SCM850

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------|--------------------|--|---|--------|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | | | | 5.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| N | N1 | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 945 | 0.080 | 0.120 | 0.145 | 0.169 | 0.210 | 0.243 | |
| | | N1.2 | Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | 625 | 0.084 | 0.126 | 0.152 | 0.177 | 0.221 | 0.256 | |
| | | N1.1 | Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | 500 | 0.088 | 0.132 | 0.160 | 0.186 | 0.231 | 0.268 | |
| | | N1.2 | Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | 360 | 0.096 | 0.144 | 0.174 | 0.202 | 0.252 | 0.292 | |
| | N2 | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 360 | 0.064 | 0.096 | 0.116 | 0.135 | 0.168 | 0.195 |
| | | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ | 270 | 0.064 | 0.096 | 0.116 | 0.135 | 0.168 | 0.195 |
| | | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 450 | 0.040 | 0.060 | 0.073 | 0.084 | 0.105 | 0.122 |
| | N4 | N4.1 | Plastic, thermoplastics | | ✓ | ✓ | ✓ | 125 | 0.040 | 0.060 | 0.073 | 0.084 | 0.105 | 0.122 |
| | | N4.2 | Plastic, thermosets | | ✓ | ✓ | ✓ | 185 | 0.040 | 0.060 | 0.073 | 0.084 | 0.105 | 0.122 |
| N4.3 | | Plastic, foams | | ✓ | ✓ | ✓ | 565 | 0.024 | 0.036 | 0.044 | 0.051 | 0.063 | 0.073 | |

* MAPAL machining groups

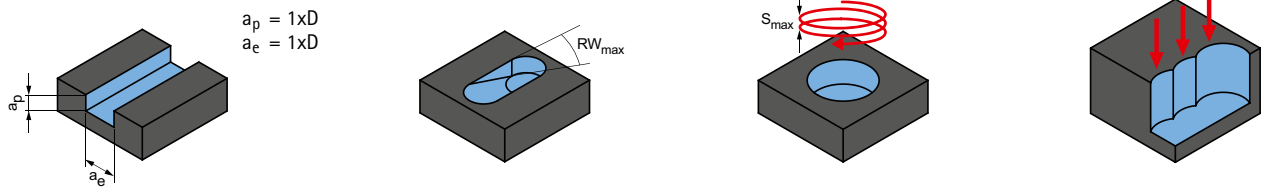
** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Groove milling



| v_c [m/min] | f_z [mm] | | | | | | | Ramps | Helix milling | | Drilling | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------------|---------------|------------|----------|--------------|
| | Diameter of milling cutter [mm] | | | | | | | RW_{max} | S_{max} | EW_{max} | | f_z factor |
| | 3.80 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | | G = 1.5 | G = 1.8 | |
| 230 | 0.031 | 0.047 | 0.060 | 0.072 | 0.082 | 0.101 | 0.115 | 45° | 0.75xD | 25° | 16° | 0.9 |
| 185 | 0.029 | 0.044 | 0.056 | 0.067 | 0.077 | 0.094 | 0.107 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 205 | 0.031 | 0.047 | 0.060 | 0.072 | 0.082 | 0.101 | 0.115 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 145 | 0.026 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 45° | 0.75xD | 25° | 16° | 0.7 |
| 135 | 0.030 | 0.045 | 0.058 | 0.069 | 0.080 | 0.097 | 0.111 | 30° | 0.5xD | 18° | 11° | 0.8 |
| 125 | 0.029 | 0.043 | 0.055 | 0.066 | 0.075 | 0.092 | 0.105 | 30° | 0.5xD | 18° | 11° | 0.7 |
| 115 | 0.027 | 0.041 | 0.052 | 0.062 | 0.071 | 0.087 | 0.100 | 30° | 0.5xD | 18° | 11° | 0.7 |
| 95 | 0.021 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 15° | 0.5xD | 18° | 11° | |
| 140 | 0.030 | 0.045 | 0.058 | 0.069 | 0.080 | 0.097 | 0.111 | 30° | 0.5xD | 18° | 11° | |
| 95 | 0.015 | 0.022 | 0.028 | 0.033 | 0.038 | 0.047 | 0.054 | 15° | 0.5xD | 18° | 11° | |
| 60 | 0.018 | 0.027 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 15° | 0.5xD | 18° | 11° | |
| 60 | 0.015 | 0.023 | 0.029 | 0.035 | 0.040 | 0.049 | 0.056 | 15° | 0.5xD | 18° | 11° | |
| 70 | 0.020 | 0.030 | 0.038 | 0.045 | 0.052 | 0.064 | 0.073 | 15° | 0.5xD | 18° | 11° | |
| 60 | 0.016 | 0.023 | 0.030 | 0.036 | 0.041 | 0.050 | 0.058 | 15° | 0.5xD | 18° | 11° | |
| 250 | 0.052 | 0.078 | 0.100 | 0.119 | 0.137 | 0.168 | 0.192 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 230 | 0.044 | 0.066 | 0.085 | 0.102 | 0.117 | 0.143 | 0.163 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 185 | 0.036 | 0.055 | 0.070 | 0.084 | 0.096 | 0.117 | 0.134 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 105 | 0.021 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 165 | 0.036 | 0.055 | 0.070 | 0.084 | 0.096 | 0.117 | 0.134 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 155 | 0.031 | 0.047 | 0.060 | 0.072 | 0.082 | 0.101 | 0.115 | 45° | 0.75xD | 25° | 16° | 0.8 |

Full cutting



| v_c [m/min] | f_z [mm] | | | | | | Ramps | Helix milling | | Drilling | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|------------|---------------|------------|----------|--------------|
| | Diameter of milling cutter [mm] | | | | | | RW_{max} | S_{max} | EW_{max} | | f_z factor |
| | 5.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | | G = 1.5 | G = 1.8 | |
| 610 | 0.047 | 0.071 | 0.086 | 0.099 | 0.124 | 0.144 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 405 | 0.049 | 0.074 | 0.090 | 0.104 | 0.130 | 0.151 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 325 | 0.052 | 0.078 | 0.094 | 0.109 | 0.136 | 0.158 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 235 | 0.057 | 0.085 | 0.103 | 0.119 | 0.149 | 0.172 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 235 | 0.038 | 0.057 | 0.068 | 0.080 | 0.099 | 0.115 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 175 | 0.038 | 0.057 | 0.068 | 0.080 | 0.099 | 0.115 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 295 | 0.024 | 0.035 | 0.043 | 0.050 | 0.062 | 0.072 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 80 | 0.024 | 0.035 | 0.043 | 0.050 | 0.062 | 0.072 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 120 | 0.024 | 0.035 | 0.043 | 0.050 | 0.062 | 0.072 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 365 | 0.014 | 0.021 | 0.026 | 0.030 | 0.037 | 0.043 | 45° | 0.75xD | 25° | 16° | 0.8 |

Explanation of terms:

RW_{max} = Maximum angle of the ramp

S_{max} = Maximum slope of the helix

G = Ratio of circular pocket \emptyset when plunging to the tool \emptyset

E.g.: Tool \emptyset 12 mm at G=1.5 results in a pocket \emptyset of 18 mm

EW_{max} = Slope angle of the helix (results from G and S_{max})

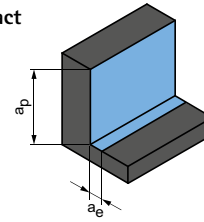
The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

Part-contact cutting



$$a_p = 3xD$$

$$a_e = 0.1xD$$

OptiMill-Alu-HPC-Pocket | SCM854

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] | | | | | | | | |
|------|--------------------|--|---------|-----|---------|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 5.00 | 8.00 | 10.00 | 12.00 | 14.00 | 16.00 | 18.00 | 20.00 | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 915 | 0.061 | 0.091 | 0.110 | 0.126 | 0.141 | 0.154 | 0.166 | 0.176 | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | 610 | 0.064 | 0.096 | 0.115 | 0.132 | 0.148 | 0.162 | 0.174 | 0.185 | |
| | | N1.1 Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | 485 | 0.067 | 0.101 | 0.121 | 0.139 | 0.155 | 0.169 | 0.182 | 0.193 | |
| | | N1.2 Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | 350 | 0.073 | 0.110 | 0.131 | 0.151 | 0.169 | 0.185 | 0.199 | 0.211 | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 350 | 0.049 | 0.073 | 0.088 | 0.101 | 0.113 | 0.123 | 0.132 | 0.141 |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ | 265 | 0.049 | 0.073 | 0.088 | 0.101 | 0.113 | 0.123 | 0.132 | 0.141 |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 440 | 0.030 | 0.046 | 0.055 | 0.063 | 0.070 | 0.077 | 0.083 | 0.088 |
| | N4 | N4.1 Plastic, thermoplastics | | ✓ | ✓ | ✓ | 120 | 0.030 | 0.046 | 0.055 | 0.063 | 0.070 | 0.077 | 0.083 | 0.088 |
| | | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ | 180 | 0.030 | 0.046 | 0.055 | 0.063 | 0.070 | 0.077 | 0.083 | 0.088 |
| | | N4.3 Plastic, foams | | ✓ | ✓ | | 315 | 0.018 | 0.027 | 0.033 | 0.038 | 0.042 | 0.046 | 0.050 | 0.053 |

OptiMill-Alu-HPC-Pocket | SCM854

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|--------------------|--|---------|-----|---------|---|
| | | | MQL/Air | Dry | Coolant | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | |
| | | N1.1 Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | |
| | | N1.2 Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |
| | N4 | N4.1 Plastic, thermoplastics | | ✓ | ✓ | ✓ |
| | | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ |
| | | N4.3 Plastic, foams | | ✓ | ✓ | |

Calculation example for 42CrMo4 ø 12 mm:

$$f_z | a_e | h_m \text{ max.} = \frac{D}{100} \cdot \text{See table for value}$$

| | | | | | | | | | | | | | |
|------|---|---|---|---|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| N1.1 | Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 915 | 0.061 | 0.091 | 0.110 | 0.126 | 0.141 | 0.154 | 0.166 | 0.176 |
|------|---|---|---|---|-----|-------|-------|-------|-------|-------|-------|-------|-------|

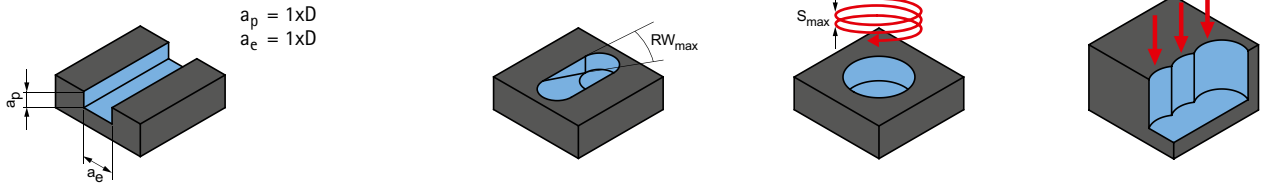
1 $f_z = \frac{12 \text{ mm}}{100} \cdot 1,2 = 0,144 \text{ mm}$

2 $h_m \text{ max.} = \frac{12 \text{ mm}}{100} \cdot 0,84 = 0,101 \text{ mm}$

* MAPAL machining groups

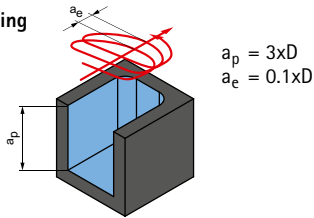
** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Full cutting

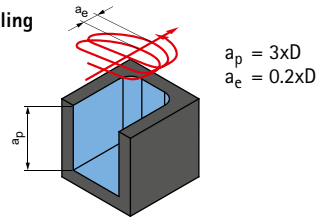


| v_c [m/min] | f_z [mm] | | | | | | | | Ramps | Helix milling | | Grooving | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------|---------------|------------|----------|--------------|
| | Diameter of milling cutter [mm] | | | | | | | | RW_{max} | S_{max} | EW_{max} | | f_z factor |
| | 5.00 | 8.00 | 10.00 | 12.00 | 14.00 | 16.00 | 18.00 | 20.00 | | $G = 1.5$ | $G = 1.8$ | | |
| 495 | 0.045 | 0.068 | 0.081 | 0.093 | 0.104 | 0.114 | 0.123 | 0.130 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 330 | 0.047 | 0.071 | 0.085 | 0.098 | 0.109 | 0.120 | 0.129 | 0.137 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 265 | 0.050 | 0.075 | 0.089 | 0.103 | 0.115 | 0.125 | 0.135 | 0.143 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 190 | 0.054 | 0.081 | 0.097 | 0.112 | 0.125 | 0.137 | 0.147 | 0.156 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 190 | 0.036 | 0.054 | 0.065 | 0.075 | 0.083 | 0.091 | 0.098 | 0.104 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 145 | 0.036 | 0.054 | 0.065 | 0.075 | 0.083 | 0.091 | 0.098 | 0.104 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 240 | 0.023 | 0.034 | 0.041 | 0.047 | 0.052 | 0.057 | 0.061 | 0.065 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 65 | 0.023 | 0.034 | 0.041 | 0.047 | 0.052 | 0.057 | 0.061 | 0.065 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 100 | 0.023 | 0.034 | 0.041 | 0.047 | 0.052 | 0.057 | 0.061 | 0.065 | 45° | 0.75xD | 25° | 16° | 0.8 |
| 170 | 0.014 | 0.020 | 0.024 | 0.028 | 0.031 | 0.034 | 0.037 | 0.039 | 45° | 0.75xD | 25° | 16° | 0.8 |

Trochoidal milling



Trochoidal milling



| v_c [m/min] | f_z [mm] in % of D | h_{max} [mm] in % of D | v_c [m/min] | f_z [mm] in % of D | h_{max} [mm] in % of D |
|------------------|----------------------|--------------------------|------------------|----------------------|--------------------------|
| 915 | 0.1 - 1.4 | 0.84 | 810 | 0.7 - 0.9 | 1.12 |
| 610 | 0.1 - 1.5 | 0.90 | 540 | 0.7 - 1.0 | 1.20 |
| 485 | 1.0 - 1.3 | 0.78 | 430 | 0.8 - 1.0 | 1.04 |
| 350 | 1.1 - 1.5 | 0.90 | 310 | 0.8 - 1.1 | 1.20 |
| 350 | 0.7 - 1.0 | 0.60 | 310 | 0.5 - 0.8 | 0.80 |
| 265 | 0.7 - 1.0 | 0.60 | 235 | 0.5 - 0.8 | 0.80 |
| 440 | 0.4 - 0.6 | 0.36 | 390 | 0.3 - 0.5 | 0.48 |
| 120 | 0.4 - 0.6 | 0.36 | 105 | 0.3 - 0.5 | 0.48 |
| 180 | 0.4 - 0.6 | 0.36 | 160 | 0.3 - 0.5 | 0.48 |
| 315 | 0.3 - 0.4 | 0.24 | 280 | 0.2 - 0.3 | 0.32 |

Explanation of terms:

RW_{max} = Maximum angle of the ramp

S_{max} = Maximum slope of the helix

G = Ratio of circular pocket \emptyset when plunging to the tool \emptyset

E.g.: Tool \emptyset 12 mm at $G=1.5$ results in a pocket \emptyset of 18 mm

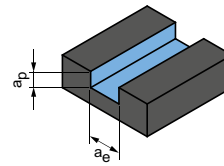
EW_{max} = Slope angle of the helix (results from G and S_{max})

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| Long | 0,9 |
| Overlong | 0,8 |
| Extra long | 0,6 |

Groove milling – partial slot



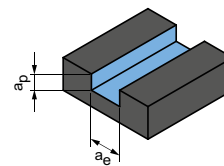
$$a_p = 1xD$$

$$a_e = 0.6xD$$

OptiMill-Uni-HPC-Silent | SCM570

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------|--------------------|--|---|--------|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 235 | 0.045 | 0.057 | 0.069 | 0.079 | 0.096 | 0.110 | 0.123 | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 190 | 0.042 | 0.053 | 0.064 | 0.074 | 0.090 | 0.103 | 0.115 | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 210 | 0.045 | 0.057 | 0.069 | 0.079 | 0.096 | 0.110 | 0.123 | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 150 | 0.037 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.102 | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 135 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 0.119 | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 125 | 0.041 | 0.052 | 0.063 | 0.072 | 0.088 | 0.101 | 0.113 | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 115 | 0.039 | 0.050 | 0.059 | 0.068 | 0.083 | 0.095 | 0.106 | |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | ✓ | 95 | 0.030 | 0.038 | 0.046 | 0.053 | 0.064 | 0.073 | 0.082 |
| P5 | P5.1 | Cast steel | | | ✓ | ✓ | 140 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 0.119 | |
| P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | | ✓ | ✓ | 95 | 0.021 | 0.027 | 0.032 | 0.037 | 0.045 | 0.051 | 0.057 | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ | 65 | 0.026 | 0.033 | 0.040 | 0.046 | 0.056 | 0.064 | 0.072 | |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 60 | 0.022 | 0.028 | 0.033 | 0.038 | 0.046 | 0.053 | 0.059 | |
| | M2 | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ | 70 | 0.028 | 0.036 | 0.043 | 0.050 | 0.061 | 0.070 | 0.078 |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 65 | 0.022 | 0.029 | 0.034 | 0.039 | 0.048 | 0.055 | 0.061 |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 250 | 0.075 | 0.095 | 0.114 | 0.131 | 0.160 | 0.183 | 0.205 |
| | K1 | K1.2 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 230 | 0.063 | 0.081 | 0.097 | 0.112 | 0.136 | 0.156 | 0.174 |
| | K2 | K2.1 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 190 | 0.052 | 0.067 | 0.080 | 0.092 | 0.112 | 0.128 | 0.143 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 105 | 0.030 | 0.038 | 0.046 | 0.053 | 0.064 | 0.073 | 0.082 |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 170 | 0.052 | 0.067 | 0.080 | 0.092 | 0.112 | 0.128 | 0.143 |
| | K3 | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 160 | 0.045 | 0.057 | 0.069 | 0.079 | 0.096 | 0.110 | 0.123 |

Groove milling



$$a_p = 1xD$$

$$a_e = 1xD$$

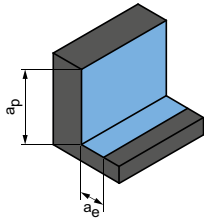
OptiMill-Inox-HPC | SCM108

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | | |
|------|--------------------|--|--|--------|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | | | | | 3.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ | 70 | 0.011 | 0.013 | 0.019 | 0.025 | 0.030 | 0.035 | 0.044 | 0.051 | |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 65 | 0.009 | 0.011 | 0.016 | 0.020 | 0.025 | 0.029 | 0.036 | 0.042 | |
| | M2 | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ | 75 | 0.011 | 0.015 | 0.021 | 0.027 | 0.032 | 0.038 | 0.047 | 0.055 |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 70 | 0.009 | 0.012 | 0.016 | 0.021 | 0.026 | 0.030 | 0.037 | 0.043 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

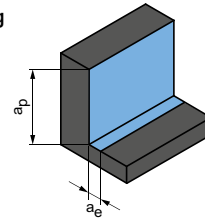
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing

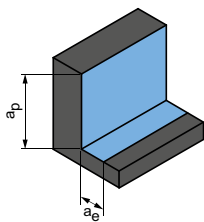


$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| v_c [m/min] | f_z [mm] | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------|------------------|---------------------------------|-------|-------|-------|-------|-------|--|--|
| | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | 6.00 | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | |
| 355 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 0.161 | 480 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 | 0.255 | | |
| 290 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 | 0.151 | 395 | 0.087 | 0.111 | 0.133 | 0.153 | 0.187 | 0.213 | 0.238 | | |
| 325 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 0.161 | 435 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 | 0.255 | | |
| 225 | 0.049 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 0.134 | 305 | 0.078 | 0.099 | 0.119 | 0.136 | 0.167 | 0.190 | 0.212 | | |
| 210 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 0.156 | 285 | 0.090 | 0.115 | 0.138 | 0.158 | 0.193 | 0.221 | 0.246 | | |
| 195 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.132 | 0.148 | 260 | 0.085 | 0.109 | 0.130 | 0.150 | 0.183 | 0.209 | 0.234 | | |
| 180 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 | 0.140 | 240 | 0.081 | 0.103 | 0.123 | 0.142 | 0.173 | 0.198 | 0.221 | | |
| 145 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 0.108 | 195 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 | 0.170 | | |
| 215 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 0.156 | 295 | 0.090 | 0.115 | 0.138 | 0.158 | 0.193 | 0.221 | 0.246 | | |
| 145 | 0.027 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 0.075 | 195 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 | 0.119 | | |
| 110 | 0.034 | 0.044 | 0.053 | 0.060 | 0.074 | 0.084 | 0.094 | 160 | 0.054 | 0.069 | 0.083 | 0.095 | 0.117 | 0.133 | 0.149 | | |
| 105 | 0.028 | 0.036 | 0.044 | 0.050 | 0.061 | 0.070 | 0.078 | 150 | 0.045 | 0.057 | 0.069 | 0.079 | 0.097 | 0.110 | 0.123 | | |
| 120 | 0.037 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.102 | 180 | 0.059 | 0.075 | 0.090 | 0.104 | 0.127 | 0.145 | 0.161 | | |
| 110 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 0.081 | 160 | 0.047 | 0.059 | 0.071 | 0.082 | 0.100 | 0.114 | 0.127 | | |
| 440 | 0.098 | 0.125 | 0.150 | 0.172 | 0.211 | 0.241 | 0.269 | 650 | 0.155 | 0.198 | 0.237 | 0.273 | 0.333 | 0.381 | 0.425 | | |
| 405 | 0.083 | 0.106 | 0.128 | 0.147 | 0.179 | 0.205 | 0.228 | 595 | 0.132 | 0.168 | 0.202 | 0.232 | 0.283 | 0.324 | 0.361 | | |
| 330 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 0.188 | 485 | 0.109 | 0.139 | 0.166 | 0.191 | 0.233 | 0.267 | 0.297 | | |
| 185 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 0.108 | 270 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 | 0.170 | | |
| 295 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 0.188 | 430 | 0.109 | 0.139 | 0.166 | 0.191 | 0.233 | 0.267 | 0.297 | | |
| 275 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 0.161 | 405 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 | 0.255 | | |

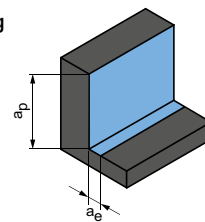
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| v_c [m/min] | f_z [mm] | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | 3.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 3.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| 110 | 0.018 | 0.023 | 0.033 | 0.042 | 0.051 | 0.059 | 0.074 | 0.086 | 160 | 0.028 | 0.036 | 0.051 | 0.066 | 0.080 | 0.093 | 0.117 | 0.135 |
| 105 | 0.015 | 0.019 | 0.027 | 0.035 | 0.042 | 0.049 | 0.061 | 0.071 | 150 | 0.023 | 0.030 | 0.043 | 0.055 | 0.066 | 0.077 | 0.097 | 0.112 |
| 120 | 0.019 | 0.025 | 0.035 | 0.045 | 0.055 | 0.064 | 0.080 | 0.093 | 180 | 0.031 | 0.039 | 0.056 | 0.072 | 0.087 | 0.101 | 0.127 | 0.147 |
| 110 | 0.015 | 0.020 | 0.028 | 0.036 | 0.043 | 0.051 | 0.063 | 0.073 | 160 | 0.024 | 0.031 | 0.044 | 0.057 | 0.069 | 0.080 | 0.100 | 0.116 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

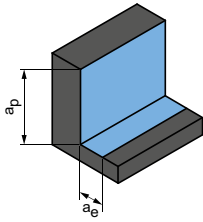
OptiMill-Hardened | SCM102, 103

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|----|--------------------|--|---------|-----|---------|---|
| | | | | MQL/Air | Dry | Coolant | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5 | P5.1 | Cast steel | | ✓ | | ✓ |
| | P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ |
| H | H1 | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | |
| | | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | |
| | H2 | H2.1 | Hardened steel / cast steel | < 60 | ✓ | | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Roughing



Next page:
Finishing

| a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | | |
|----------------------------|----------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|--|
| | | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | |
| 50 | 8 | 180 - 200 | 0.032 | 0.040 | 0.048 | 0.055 | 0.075 | 0.095 | 0.110 | 0.140 | |
| 50 | 8 | 160 - 180 | 0.030 | 0.038 | 0.046 | 0.052 | 0.071 | 0.090 | 0.105 | 0.133 | |
| 50 | 8 | 170 - 190 | 0.032 | 0.040 | 0.048 | 0.055 | 0.075 | 0.095 | 0.110 | 0.140 | |
| 50 | 8 | 150 - 170 | 0.030 | 0.038 | 0.046 | 0.052 | 0.071 | 0.090 | 0.105 | 0.133 | |
| 50 | 8 | 170 - 190 | 0.032 | 0.040 | 0.048 | 0.055 | 0.075 | 0.095 | 0.110 | 0.140 | |
| 50 | 7 | 150 - 170 | 0.030 | 0.038 | 0.046 | 0.052 | 0.071 | 0.090 | 0.105 | 0.133 | |
| 50 | 7 | 130 - 150 | 0.027 | 0.034 | 0.041 | 0.047 | 0.064 | 0.081 | 0.094 | 0.119 | |
| 50 | 7 | 130 - 150 | 0.027 | 0.034 | 0.041 | 0.047 | 0.064 | 0.081 | 0.094 | 0.119 | |
| 50 | 7 | 130 - 150 | 0.027 | 0.034 | 0.041 | 0.047 | 0.064 | 0.081 | 0.094 | 0.119 | |
| 50 | 8 | 140 - 160 | 0.029 | 0.036 | 0.043 | 0.050 | 0.068 | 0.086 | 0.099 | 0.126 | |
| 50 | 2 | 100 - 125 | 0.027 | 0.034 | 0.041 | 0.047 | 0.064 | 0.081 | 0.094 | 0.119 | |
| 50 | 1.5 | 80 - 100 | 0.022 | 0.028 | 0.034 | 0.039 | 0.053 | 0.067 | 0.077 | 0.098 | |
| 50 | 1.2 | 60 - 80 | 0.019 | 0.024 | 0.029 | 0.033 | 0.045 | 0.057 | 0.066 | 0.084 | |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

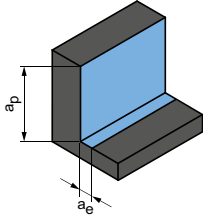
OptiMill-Hardened | SCM102, 103

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5 | P5.1 Cast steel | | ✓ | | ✓ |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | | | ✓ |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | | | ✓ |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | | K2.2 Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ |
| | K3 | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| H | H1 | H1.1 Hardened steel / cast steel | < 44 | ✓ | ✓ | |
| | | H1.2 Hardened steel / cast steel | < 55 | ✓ | ✓ | |
| | H2 | H2.1 Hardened steel / cast steel | < 60 | ✓ | | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Finishing



| | a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | |
|--|----------------------------|----------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 100 | 2 | 200 - 220 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 |
| | 100 | 2 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 |
| | 100 | 2 | 180 - 200 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 |
| | 100 | 2 | 160 - 180 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 |
| | 100 | 2 | 180 - 200 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 |
| | 100 | 2 | 160 - 180 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 |
| | 100 | 2 | 140 - 160 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 |
| | 100 | 2 | 140 - 160 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 |
| | 100 | 2 | 140 - 160 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 |
| | 100 | 1.5 | 110 - 130 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 |
| | 100 | 1.5 | 90 - 110 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 |
| | 100 | 1.5 | 110 - 130 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 |
| | 100 | 1.5 | 90 - 130 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 |
| | 100 | 2.5 | 200 - 220 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 |
| | 100 | 2.5 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 |
| | 100 | 2.5 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 |
| | 100 | 2.5 | 170 - 190 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 |
| | 100 | 2.5 | 200 - 220 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 |
| | 100 | 2.5 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 |
| | 100 | 1.5 | 110 - 130 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 |
| | 100 | 1.2 | 90 - 115 | 0.018 | 0.021 | 0.028 | 0.035 | 0.046 | 0.053 | 0.063 | 0.074 |
| | 100 | 0.8 | 70 - 90 | 0.015 | 0.018 | 0.024 | 0.030 | 0.039 | 0.045 | 0.054 | 0.063 |

The specified machining values are guide values.

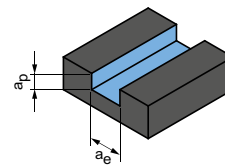
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| Long | 0,9 |
| Overlong | 0,8 |
| Extra long | 0,6 |

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

OptiMill-Alu-HPC | SCM270

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------|--------------------|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 765 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.104 | 0.127 | 0.145 | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | 510 | 0.023 | 0.043 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | 405 | 0.024 | 0.045 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | |
| | | N1.4 Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | 295 | 0.026 | 0.049 | 0.071 | 0.090 | 0.108 | 0.124 | 0.152 | 0.174 | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 295 | 0.017 | 0.033 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ | 220 | 0.017 | 0.033 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 365 | 0.011 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 |
| | N4 | N4.1 Plastic, thermoplastics | | ✓ | ✓ | ✓ | 100 | 0.011 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 |
| | | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ | 150 | 0.011 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 |
| | | N4.3 Plastic, foams | | ✓ | ✓ | | 265 | 0.006 | 0.012 | 0.018 | 0.023 | 0.027 | 0.031 | 0.038 | 0.043 |

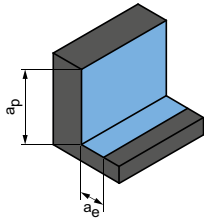
OptiMill-Mono-Alu | SCM281

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------|--------------------|--|---------|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | | | | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 12.00 | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 765 | 0.043 | 0.063 | 0.082 | 0.100 | 0.118 | 0.151 | 0.207 | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | 510 | 0.045 | 0.066 | 0.086 | 0.105 | 0.124 | 0.158 | 0.218 | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | 405 | 0.047 | 0.069 | 0.090 | 0.110 | 0.130 | 0.166 | 0.228 | |
| | | N1.4 Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | 295 | 0.051 | 0.075 | 0.098 | 0.120 | 0.141 | 0.181 | 0.249 | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 295 | 0.034 | 0.050 | 0.066 | 0.080 | 0.094 | 0.120 | 0.166 |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ | 220 | 0.034 | 0.050 | 0.066 | 0.080 | 0.094 | 0.120 | 0.166 |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 365 | 0.021 | 0.031 | 0.041 | 0.050 | 0.059 | 0.075 | 0.104 |
| | N4 | N4.1 Plastic, thermoplastics | | ✓ | ✓ | ✓ | 100 | 0.021 | 0.031 | 0.041 | 0.050 | 0.059 | 0.075 | 0.104 |
| | | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ | 150 | 0.021 | 0.031 | 0.041 | 0.050 | 0.059 | 0.075 | 0.104 |
| | | N4.3 Plastic, foams | | ✓ | ✓ | | 265 | 0.013 | 0.019 | 0.025 | 0.030 | 0.035 | 0.045 | 0.062 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

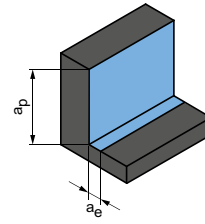
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| v_c [m/min] | f_z [mm] | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| 1,180 | 0.030 | 0.057 | 0.082 | 0.105 | 0.126 | 0.145 | 0.177 | 0.202 | 1,410 | 0.042 | 0.080 | 0.115 | 0.147 | 0.176 | 0.202 | 0.246 | 0.282 |
| 785 | 0.032 | 0.060 | 0.087 | 0.111 | 0.132 | 0.152 | 0.186 | 0.213 | 940 | 0.044 | 0.084 | 0.120 | 0.154 | 0.184 | 0.212 | 0.259 | 0.296 |
| 625 | 0.033 | 0.063 | 0.091 | 0.116 | 0.139 | 0.159 | 0.195 | 0.223 | 750 | 0.046 | 0.088 | 0.126 | 0.161 | 0.193 | 0.222 | 0.271 | 0.310 |
| 450 | 0.036 | 0.069 | 0.099 | 0.126 | 0.151 | 0.174 | 0.212 | 0.243 | 540 | 0.050 | 0.096 | 0.138 | 0.176 | 0.211 | 0.242 | 0.296 | 0.338 |
| 450 | 0.024 | 0.046 | 0.066 | 0.084 | 0.101 | 0.116 | 0.142 | 0.162 | 540 | 0.033 | 0.064 | 0.092 | 0.117 | 0.140 | 0.161 | 0.197 | 0.225 |
| 340 | 0.024 | 0.046 | 0.066 | 0.084 | 0.101 | 0.116 | 0.142 | 0.162 | 405 | 0.033 | 0.064 | 0.092 | 0.117 | 0.140 | 0.161 | 0.197 | 0.225 |
| 565 | 0.015 | 0.029 | 0.041 | 0.053 | 0.063 | 0.072 | 0.089 | 0.101 | 675 | 0.021 | 0.040 | 0.057 | 0.073 | 0.088 | 0.101 | 0.123 | 0.141 |
| 155 | 0.015 | 0.029 | 0.041 | 0.053 | 0.063 | 0.072 | 0.089 | 0.101 | 185 | 0.021 | 0.040 | 0.057 | 0.073 | 0.088 | 0.101 | 0.123 | 0.141 |
| 230 | 0.015 | 0.029 | 0.041 | 0.053 | 0.063 | 0.072 | 0.089 | 0.101 | 275 | 0.021 | 0.040 | 0.057 | 0.073 | 0.088 | 0.101 | 0.123 | 0.141 |
| 405 | 0.009 | 0.017 | 0.025 | 0.032 | 0.038 | 0.043 | 0.053 | 0.061 | 485 | 0.013 | 0.024 | 0.034 | 0.044 | 0.053 | 0.061 | 0.074 | 0.085 |

| v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 12.00 | | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 12.00 |
| 1,180 | 0.060 | 0.088 | 0.115 | 0.140 | 0.165 | 0.211 | 0.290 | 1,410 | 0.084 | 0.122 | 0.160 | 0.195 | 0.229 | 0.293 | 0.403 |
| 785 | 0.063 | 0.092 | 0.120 | 0.147 | 0.173 | 0.221 | 0.304 | 940 | 0.088 | 0.129 | 0.168 | 0.205 | 0.241 | 0.308 | 0.424 |
| 625 | 0.066 | 0.097 | 0.126 | 0.154 | 0.181 | 0.232 | 0.319 | 750 | 0.092 | 0.135 | 0.176 | 0.215 | 0.252 | 0.322 | 0.444 |
| 450 | 0.072 | 0.106 | 0.138 | 0.168 | 0.198 | 0.253 | 0.348 | 540 | 0.100 | 0.147 | 0.192 | 0.234 | 0.275 | 0.352 | 0.484 |
| 450 | 0.048 | 0.070 | 0.092 | 0.112 | 0.132 | 0.168 | 0.232 | 540 | 0.067 | 0.098 | 0.128 | 0.156 | 0.184 | 0.234 | 0.323 |
| 340 | 0.048 | 0.070 | 0.092 | 0.112 | 0.132 | 0.168 | 0.232 | 405 | 0.067 | 0.098 | 0.128 | 0.156 | 0.184 | 0.234 | 0.323 |
| 565 | 0.030 | 0.044 | 0.057 | 0.070 | 0.082 | 0.105 | 0.145 | 675 | 0.042 | 0.061 | 0.080 | 0.098 | 0.115 | 0.147 | 0.202 |
| 155 | 0.030 | 0.044 | 0.057 | 0.070 | 0.082 | 0.105 | 0.145 | 185 | 0.042 | 0.061 | 0.080 | 0.098 | 0.115 | 0.147 | 0.202 |
| 230 | 0.030 | 0.044 | 0.057 | 0.070 | 0.082 | 0.105 | 0.145 | 275 | 0.042 | 0.061 | 0.080 | 0.098 | 0.115 | 0.147 | 0.202 |
| 405 | 0.018 | 0.026 | 0.034 | 0.042 | 0.049 | 0.063 | 0.087 | 485 | 0.025 | 0.037 | 0.048 | 0.059 | 0.069 | 0.088 | 0.121 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| long | 0,9 |

OptiMill-SPM | SCM681, 691

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|--|--|---------|-----|---------|
| | | | MQL/Air | Dry | Coolant |
| N N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |

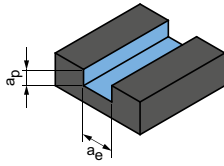
OptiMill-Diamond-SPM | SHM101, 110, 111

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|--|--|---------|-----|---------|
| | | | MQL/Air | Dry | Coolant |
| N N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |

OptiMill-Diamond-SPM, HSK (hollow shank taper) design | SHM121

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|--|--|---------|-----|---------|
| | | | MQL/Air | Dry | Coolant |
| N N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |

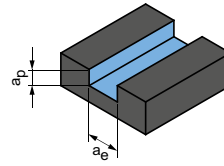
Groove milling



$$a_p = 0.5 \times D$$

$$a_e = 1 \times D$$

Groove milling



$$a_p = 0.3 \times D$$

$$a_e = 1 \times D$$

| v_c [m/min] | f_z [mm] | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | 32.00 | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | 32.00 |
| 1,990 | 0.111 | 0.142 | 0.170 | 0.196 | 0.239 | 0.273 | 0.305 | 0.332 | 1,990 | 0.128 | 0.164 | 0.196 | 0.225 | 0.275 | 0.315 | 0.351 | 0.383 |
| 1,320 | 0.117 | 0.149 | 0.179 | 0.206 | 0.251 | 0.287 | 0.320 | 0.349 | 1,320 | 0.135 | 0.172 | 0.206 | 0.237 | 0.289 | 0.331 | 0.369 | 0.402 |
| 1,055 | 0.122 | 0.156 | 0.187 | 0.215 | 0.263 | 0.301 | 0.336 | 0.366 | 1,055 | 0.141 | 0.180 | 0.216 | 0.248 | 0.303 | 0.346 | 0.387 | 0.421 |
| 760 | 0.134 | 0.171 | 0.204 | 0.235 | 0.287 | 0.328 | 0.366 | 0.399 | 760 | 0.154 | 0.197 | 0.235 | 0.271 | 0.331 | 0.378 | 0.422 | 0.459 |

| Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
|---------------------------------|------------|------------------|------------|------------------|------------|-------------------|------------|---------------------------------|------------|------------------|------------|------------------|------------|-------------------|------------|
| 6.00 - 8.00 | | 10.00 - 12.00 | | 16.00 - 20.00 | | 25.00 - 32.00 | | 6.00 - 8.00 | | 10.00 - 12.00 | | 16.00 - 20.00 | | 25.00 - 32.00 | |
| v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] |
| max. 300 | 0.10-0.12 | max. 600 | 0.12-0.20 | max. 900 | 0.20-0.30 | max. 1,500 | 0.20-0.30 | max. 300 | 0.12-0.15 | max. 600 | 0.15-0.25 | max. 900 | 0.25-0.33 | max. 1,500 | 0.25-0.33 |
| max. 300 | 0.10-0.12 | max. 600 | 0.12-0.20 | max. 900 | 0.20-0.30 | max. 1,500 | 0.20-0.30 | max. 300 | 0.12-0.15 | max. 600 | 0.15-0.25 | max. 900 | 0.25-0.33 | max. 1,500 | 0.25-0.33 |
| max. 300 | 0.10-0.12 | max. 600 | 0.12-0.20 | max. 900 | 0.20-0.30 | max. 1,500 | 0.20-0.30 | max. 300 | 0.12-0.15 | max. 600 | 0.15-0.25 | max. 900 | 0.25-0.33 | max. 1,500 | 0.25-0.33 |
| < 300 | 0.09-0.11 | < 600 | 0.10-0.18 | < 900 | 0.18-0.25 | < 1,200 | 0.18-0.25 | < 300 | 0.10-0.12 | < 600 | 0.12-0.20 | < 900 | 0.20-0.30 | < 1,200 | 0.20-0.30 |

| Diameter of milling cutter [mm] | | | | | | Diameter of milling cutter [mm] | | | | | |
|---------------------------------|------------|------------------|------------|------------------|------------|---------------------------------|------------|------------------|------------|------------------|------------|
| 32.00 | | 40.00 | | 50.00 | | 32.00 | | 40.00 | | 50.00 | |
| v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] |
| 1,500 | 0.15-0.25 | 1,800 | 0.20-0.30 | 1,800 | 0.20-0.30 | 1,500 | 0.20-0.33 | 1,800 | 0.25-0.33 | 1,800 | 0.25-0.33 |
| 1,500 | 0.15-0.25 | 1,800 | 0.20-0.30 | 1,800 | 0.20-0.30 | 1,500 | 0.20-0.33 | 1,800 | 0.25-0.33 | 1,800 | 0.25-0.33 |
| 1,500 | 0.15-0.25 | 1,800 | 0.20-0.30 | 1,800 | 0.20-0.30 | 1,500 | 0.20-0.33 | 1,800 | 0.25-0.33 | 1,800 | 0.25-0.33 |
| < 1,500 | 0.12-0.20 | < 1,800 | 0.18-0.25 | < 1,800 | 0.18-0.25 | < 1,500 | 0.15-0.25 | < 1,800 | 0.20-0.30 | < 1,800 | 0.22-0.30 |

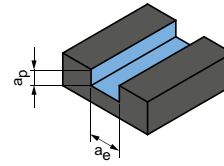
The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

OptiMill-Diamond type 51 | SHM511, 611, 711
 OptiMill-Diamond type 50 | SHM500
 OptiMill-Diamond type 53 | SHM531
 OptiMill-Diamond type 57 | SHM571

Groove milling



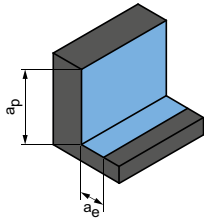
$$a_p = 0.5 \times D$$

$$a_e = 1 \times D$$

| MMG* | | Workpiece material | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | Diameter of milling cutter [mm] | | | | | | | |
|------|--|--|--|---------|-----|---------|---------------------------------|---------------------|---------------------------|---------------------|---------------------------|---------------------|---------------------------|---------------------|
| | | | | MQL/Air | Dry | Coolant | 3.00 - 6.00 | | 8.00 - 10.00 | | 12.00 - 16.00 | | 18.00 - 25.00 | |
| | | | | | | | v _c [m/min] | f _z [mm] | v _c [m/min] | f _z [mm] | v _c [m/min] | f _z [mm] | v _c [m/min] | f _z [mm] |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | N4 | N4.1 Plastic, thermoplastics | | | | | | | | | | | | |
| | | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 |
| | | N4.3 Plastic, foams | | | | | | | | | | | | |
| C | C1.1 Plastic matrix, aramide fibre-reinforced (AFRP) | | | | | | | | | | | | | |
| | C1.2 Plastic matrix (thermosetting), CFRP/GFRP | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 | |
| | C1.3 Plastic matrix (thermoplastic), CFRP/GFRP | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 | |
| | C2.1 Carbon matrix, carbon fibre-reinforced (CFC) | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.15 | 800 | 0.15-0.20 | 1,000 | 0.18-0.23 | |

* MAPAL machining groups

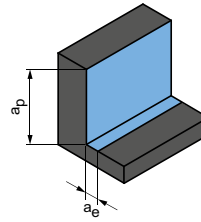
Roughing



$$a_p = 0.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 0.5xD$$

$$a_e = 0.1xD$$

| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
|------------------|------------|---------------------------------|------------|------------------|------------|------------------|------------|------------------|------------|---------------------------------|------------|------------------|------------|------------------|------------|------------------|------------|
| | | 3.00 - 6.00 | | 8.00 - 10.00 | | 12.00 - 16.00 | | 18.00 - 25.00 | | 3.00 - 6.00 | | 8.00 - 10.00 | | 12.00 - 16.00 | | 18.00 - 25.00 | |
| v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |
| 240 | 0.10-0.12 | 480 | 0.12-0.16 | 720 | 0.16-0.20 | 960 | 0.16-0.22 | 300 | 0.12-0.15 | 600 | 0.15-0.20 | 900 | 0.20-0.25 | 1,200 | 0.20-0.27 | | |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| Long | 0,9 |
| Overlong | 0,8 |
| Extra long | 0,6 |

OptiMill-Diamond type 57, with HSK-A
(hollow shank taper form A) connection | SHM571

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|---------|--|---|---------|-----|---------|
| | | | MQL/Air | Dry | Coolant |
| N N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |

Application examples

Full cutting



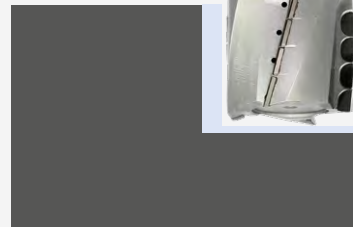
$a_p = 100\%$
 $a_e = 100\%$



Part-contact cutting



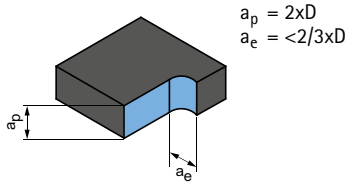
$a_p = 100\%$
 $a_e = 100\%$



Comment:

The OptiMill-Diamond type 57, design with HSK-A (hollow shank taper form A) connection, is a milling cutter for trimming. It is not suitable for full slot milling with max. a_p and a_e .

Trimming

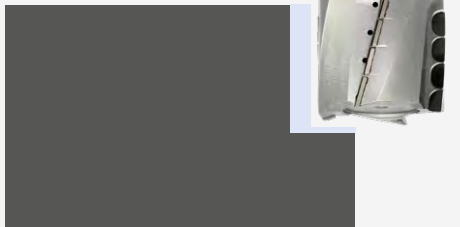


| | | Diameter of milling cutter [mm] | | | | | | | |
|-------------------|-------------|---------------------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | | 32.00 | | 40.00 | | 50.00 | | 63.00 | |
| v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] |
| 1,200 | 0.15 - 0.25 | 1,500 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 |
| 1,200 | 0.15 - 0.25 | 1,500 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 |
| 1,200 | 0.15 - 0.25 | 1,500 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 | 1,800 | 0.20 - 0.30 |
| < 1,200 | 0.12 - 0.20 | < 1,500 | 0.18 - 0.25 | < 1,800 | 0.18 - 0.25 | < 1,800 | 0.18 - 0.25 | < 1,800 | 0.18 - 0.25 |

Trimming



$a_p = < 100\%$
 $a_e = \text{max. } 2/3xD$



Groove milling



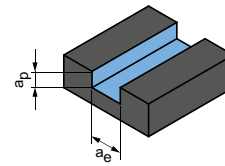
$a_p = 1/3 \text{ SKL}$
 $a_e = 100\%$



Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

OptiMill-Composite-Speed-Plus, uncoated | SCM982, 992

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] | | | | | | | | |
|------|--|--|---------|-----|---------|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|--|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| N N4 | N4.1 Plastic, thermoplastics | | ✓ | ✓ | ✓ | 125 | | | | | | | | | |
| | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ | | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | | |
| | N4.3 Plastic, foams | | ✓ | ✓ | | | | | | | | | | | |
| C C1 | C1.1 Plastic matrix, aramide fibre-reinforced (AFRP) | | ✓ | ✓ | ✓ | 120 | | | | | | | | | |
| | C1.2 Plastic matrix (thermosetting), CFRP/GFRP | | ✓ | ✓ | ✓ | | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | | |
| | C1.3 Plastic matrix (thermoplastic), CFRP/GFRP | | ✓ | ✓ | ✓ | | 80 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | |
| | C2 C2.1 Carbon matrix, carbon fibre-reinforced (CFC) | | ✓ | ✓ | ✓ | | 120 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 | |
| | C4 C4.1 Sandwich construction, honeycomb core | | ✓ | ✓ | | | 165 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | |
| | C4.2 Sandwich construction, foam core | | ✓ | ✓ | | | 125 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 | |

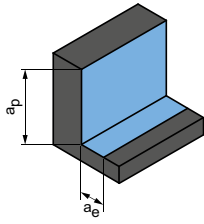
OptiMill-Composite-Speed-Plus, coated | SCM980, 990

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] | | | | | | | | |
|------|--|--|---------|-----|---------|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|--|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| C C1 | C1.1 Plastic matrix, aramide fibre-reinforced (AFRP) | | ✓ | ✓ | ✓ | 145 | | | | | | | | | |
| | C1.2 Plastic matrix (thermosetting), CFRP/GFRP | | ✓ | ✓ | ✓ | | 100 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | |
| | C1.3 Plastic matrix (thermoplastic), CFRP/GFRP | | ✓ | ✓ | ✓ | | 145 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 | |
| | C2 C2.1 Carbon matrix, carbon fibre-reinforced (CFC) | | ✓ | ✓ | ✓ | | 195 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | |
| | C4 C4.1 Sandwich construction, honeycomb core | | ✓ | ✓ | | | 150 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 | |
| | C4.2 Sandwich construction, foam core | | ✓ | ✓ | | | | | | | | | | | |

OptiMill-Composite-Micro | SCM560

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | v _c [m/min] | f _z [mm] | | | | | | | | | |
|------|--|--|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|--|--|
| | | | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| N N4 | N4.1 Plastic, thermoplastics | | 105 | | | | | | | | | | |
| | N4.2 Plastic, thermosets | | | 0.005 | 0.008 | 0.011 | | | | | | | |
| | N4.3 Plastic, foams | | | | | | | | | | | | |
| C C1 | C1.1 Plastic matrix, aramide fibre-reinforced (AFRP) | | 105 | | | | | | | | | | |
| | C1.2 Plastic matrix (thermosetting), CFRP/GFRP | | | 0.005 | 0.008 | 0.011 | | | | | | | |
| | C1.3 Plastic matrix (thermoplastic), CFRP/GFRP | | | 70 | 0.005 | 0.008 | 0.011 | | | | | | |
| | C2 C2.1 Carbon matrix, carbon fibre-reinforced (CFC) | | | 145 | 0.012 | 0.018 | 0.023 | | | | | | |
| | C4 C4.1 Sandwich construction, honeycomb core | | | 195 | 0.008 | 0.012 | 0.015 | | | | | | |
| | C4.2 Sandwich construction, foam core | | | 150 | 0.010 | 0.019 | 0.024 | | | | | | |

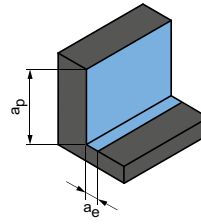
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| | v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| 190 | 0.029 | 0.041 | 0.053 | 0.063 | 0.072 | 0.089 | 0.101 | 230 | 0.040 | 0.057 | 0.073 | 0.088 | 0.101 | 0.123 | 0.141 | |
| 200 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | 295 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | |
| 135 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | 195 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | |
| 200 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 | 295 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 | |
| 270 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | 395 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | |
| 200 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 | 300 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 | |

| | v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| 240 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | 355 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | |
| 160 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | 235 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 | |
| 240 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 | 355 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 | |
| 325 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | 480 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 | |
| 245 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 | 360 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 | |

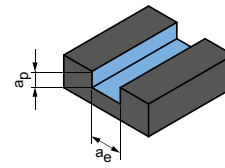
| | v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|------------|------------------|---------------------------------|-------|------|------|-------|-------|------------|------------------|---------------------------------|-------|------|------|------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | | 20.00 | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 |
| 210 | 0.008 | 0.013 | 0.018 | | | | | 310 | 0.012 | 0.02 | 0.028 | | | | | |
| 210 | 0.008 | 0.013 | 0.018 | | | | | 310 | 0.012 | 0.02 | 0.028 | | | | | |
| 140 | 0.008 | 0.013 | 0.018 | | | | | 210 | 0.012 | 0.02 | 0.028 | | | | | |
| 240 | 0.012 | 0.018 | 0.023 | | | | | 355 | 0.012 | 0.018 | 0.023 | | | | | |
| 325 | 0.008 | 0.012 | 0.015 | | | | | 480 | 0.008 | 0.012 | 0.015 | | | | | |
| 245 | 0.010 | 0.019 | 0.024 | | | | | 360 | 0.010 | 0.019 | 0.024 | | | | | |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

OptiMill-Composite-TwinCut | SCM490

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | v _c [m/min] | f _z [mm] | | | | | | | |
|------|--------------------|---|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| C C1 | C1.1 | Plastic matrix, aramide fibre-reinforced (AFRP) | 110 | 0.015 | 0.027 | 0.038 | 0.049 | 0.06 | 0.07 | 0.087 | 0.101 |
| | C1.2 | Plastic matrix (thermosetting), CFRP/GFRP | | | | | | | | | |
| | C1.3 | Plastic matrix (thermoplastic), CFRP/GFRP | | | | | | | | | |

OptiMill-Thermoplastic-FR | SCM610

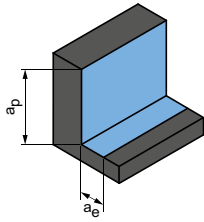
| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | v _c [m/min] | f _z [mm] | | | | | | | |
|------|--------------------|---|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| N N4 | N4.1 | Plastic, thermoplastics | 100 | 0.011 | 0.019 | 0.027 | 0.035 | 0.043 | 0.05 | 0.062 | 0.072 |
| | N4.2 | Plastic, thermosets | | | | | | | | | |
| | N4.3 | Plastic, foams | | | | | | | | | |
| C C1 | C1.1 | Plastic matrix, aramide fibre-reinforced (AFRP) | 100 | 0.011 | 0.019 | 0.027 | 0.035 | 0.043 | 0.05 | 0.062 | 0.072 |
| | C1.2 | Plastic matrix (thermosetting), CFRP/GFRP | | | | | | | | | |
| | C1.3 | Plastic matrix (thermoplastic), CFRP/GFRP | | | | | | | | | |

OptiMill-Mono-Plastic | SCM330

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | v _c [m/min] | f _z [mm] | | | | | | | |
|------|--------------------|--|------------------------|---------------------------------|------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| N N4 | N4.1 | Plastic, thermoplastics | 100 | 0.022 | 0.03 | 0.028 | 0.047 | 0.055 | 0.07 | 0.085 | 0.1 |
| | N4.2 | Plastic, thermosets | 150 | 0.022 | 0.03 | 0.028 | 0.047 | 0.055 | 0.07 | 0.085 | 0.1 |
| | N4.3 | Plastic, foams | | | | | | | | | |

* MAPAL machining groups

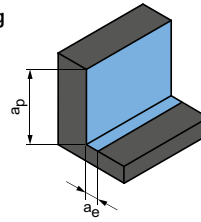
Roughing



$$a_p = 1.5 \times D$$

$$a_e = 0.25 \times D$$

Finishing



$$a_p = 1.5 \times D$$

$$a_e = 0.1 \times D$$

| v_c [m/min] | f_z [mm] | | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|--|--|
| | Diameter of milling cutter [mm] | | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | | |
| | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 2.00 | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| 220 | 0.026 | 0.046 | 0.065 | 0.084 | 0.101 | 0.118 | 0.148 | 0.171 | 325 | 0.041 | 0.072 | 0.103 | 0.132 | 0.16 | 0.187 | 0.234 | 0.271 | | |

| v_c [m/min] | f_z [mm] | | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------------------|---------------------------------|-------|-------|------|-------|-------|-------|-------|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|--|--|
| | Diameter of milling cutter [mm] | | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | | |
| | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 2.00 | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| 200 | 0.018 | 0.033 | 0.046 | 0.06 | 0.072 | 0.084 | 0.106 | 0.122 | 295 | 0.029 | 0.052 | 0.073 | 0.094 | 0.115 | 0.133 | 0.167 | 0.194 | | |

| v_c [m/min] | f_z [mm] | | | | | | | | | v_c [m/min] | f_z [mm] | | | | | | | | |
|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|--|--|
| | Diameter of milling cutter [mm] | | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | | |
| | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 2.00 | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | |
| 200 | 0.037 | 0.051 | 0.065 | 0.079 | 0.093 | 0.119 | 0.145 | 0.169 | 295 | 0.058 | 0.081 | 0.103 | 0.125 | 0.147 | 0.189 | 0.229 | 0.267 | | |
| 300 | 0.037 | 0.051 | 0.065 | 0.079 | 0.093 | 0.119 | 0.145 | 0.169 | 445 | 0.058 | 0.081 | 0.103 | 0.125 | 0.147 | 0.189 | 0.229 | 0.267 | | |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.





SHOULDER MILLING CUTTER – ROUGHING

Universal application

| | |
|---|-----|
| OptiMill-Uni-HPC-Rough | 108 |
| OptiMill-Uni-Wave | 110 |
| ECU-Mill-Uni-Rough&Finish CPMill-Uni-Rough&Finish | 120 |

Non-ferrous metals

| | |
|--------------------|-----|
| OptiMill-SPM-Rough | 118 |
|--------------------|-----|

Technical appendix

| | |
|------------------------------|-----|
| Cutting data recommendations | 122 |
|------------------------------|-----|

OptiMill®-Uni-HPC-Rough

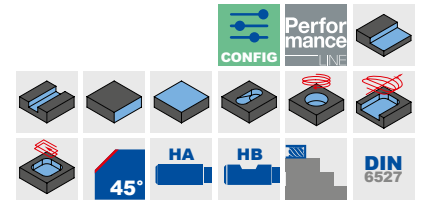
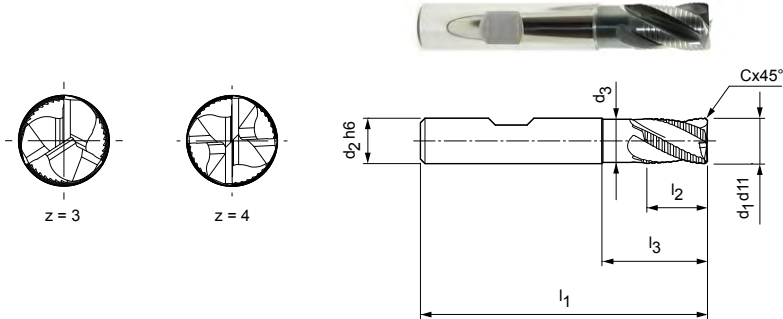
Shoulder milling cutter, short design with neck
SCM700

Design:

Diameter of milling cutter: 5.00 – 20.00 mm
Cutting material: HP213
Number of cutting edges: 3 to ø 8 mm
4 from ø 9 mm

Helix angle: 30°


Special features: Unequal spacing, profile undercut HPC roughing teeth




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h ₆ | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| *5,00 | 6 | – | 54 | 8 | – | 0,30 | 3 | SCM700-0500Z03R-F0030HB-HP213 | 30653380 |
| 6,00 | 6 | 5,5 | 54 | 8 | 18 | 0,30 | 3 | SCM700-0600Z03R-F0030HB-HP213 | 30653381 |
| *7,00 | 8 | – | 58 | 11 | – | 0,30 | 3 | SCM700-0700Z03R-F0030HB-HP213 | 30653382 |
| 8,00 | 8 | 7,5 | 58 | 11 | 22 | 0,30 | 3 | SCM700-0800Z03R-F0030HB-HP213 | 30653383 |
| *9,00 | 10 | – | 66 | 13 | – | 0,50 | 4 | SCM700-0900Z04R-F0050HB-HP213 | 30653384 |
| 10,00 | 10 | 9,5 | 66 | 13 | 26 | 0,50 | 4 | SCM700-1000Z04R-F0050HB-HP213 | 30653385 |
| 12,00 | 12 | 11 | 73 | 16 | 28 | 0,50 | 4 | SCM700-1200Z04R-F0050HB-HP213 | 30653386 |
| 14,00 | 14 | 13 | 76 | 16 | 31 | 0,50 | 4 | SCM700-1400Z04R-F0050HB-HP213 | 30653387 |
| 16,00 | 16 | 15 | 82 | 19 | 34 | 0,50 | 4 | SCM700-1600Z04R-F0050HB-HP213 | 30653388 |
| 18,00 | 18 | 17 | 84 | 19 | 36 | 0,50 | 4 | SCM700-1800Z04R-F0050HB-HP213 | 30653389 |
| 20,00 | 20 | 19 | 92 | 20 | 42 | 0,50 | 4 | SCM700-2000Z04R-F0050HB-HP213 | 30653390 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM700-0500Z03R-F0030[shank form]-HP213

Example:

SCM700-0500Z03R-F0030HA-HP213

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Rough

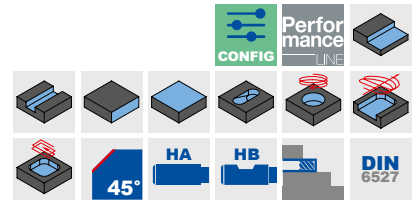
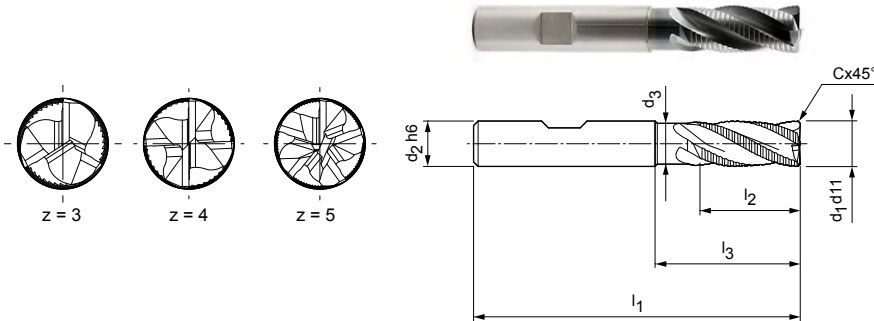
Shoulder milling cutter, long design with neck
SCM710

Design:

Diameter of milling cutter: 4.00 – 25.00 mm
Cutting material: HP213
Number of cutting edges: 3 to ø 8 mm
4 from ø 9 mm
5 from ø 25 mm

Helix angle: 30°


Special features: Unequal spacing, profile undercut HPC roughing teeth




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|-------------------------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h ₆ | d ₃ h ₉ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| *4,00 | 6 | - | 57 | 8 | - | 0,30 | 3 | SCM710-0400Z03R-F0030HB-HP213 | 30653391 |
| *5,00 | 6 | - | 57 | 13 | - | 0,30 | 3 | SCM710-0500Z03R-F0030HB-HP213 | 30653392 |
| 6,00 | 6 | 5,5 | 57 | 13 | 21 | 0,30 | 3 | SCM710-0600Z03R-F0030HB-HP213 | 30653393 |
| *7,00 | 8 | - | 63 | 16 | - | 0,30 | 3 | SCM710-0700Z03R-F0030HB-HP213 | 30653394 |
| 8,00 | 8 | 7,5 | 63 | 16 | 26 | 0,30 | 3 | SCM710-0800Z03R-F0030HB-HP213 | 30653395 |
| *9,00 | 10 | - | 72 | 19 | - | 0,50 | 4 | SCM710-0900Z04R-F0050HB-HP213 | 30653396 |
| 10,00 | 10 | 9,5 | 72 | 22 | 32 | 0,50 | 4 | SCM710-1000Z04R-F0050HB-HP213 | 30653397 |
| *11,00 | 12 | - | 83 | 26 | - | 0,50 | 4 | SCM710-1100Z04R-F0050HB-HP213 | 30653398 |
| 12,00 | 12 | 11 | 83 | 26 | 38 | 0,50 | 4 | SCM710-1200Z04R-F0050HB-HP213 | 30653399 |
| *13,00 | 14 | - | 83 | 26 | - | 0,50 | 4 | SCM710-1300Z04R-F0050HB-HP213 | 30653400 |
| 14,00 | 14 | 13 | 83 | 26 | 42 | 0,50 | 4 | SCM710-1400Z04R-F0050HB-HP213 | 30653401 |
| 16,00 | 16 | 15 | 92 | 32 | 44 | 0,50 | 4 | SCM710-1600Z04R-F0050HB-HP213 | 30653402 |
| 18,00 | 18 | 17 | 92 | 32 | 48 | 0,50 | 4 | SCM710-1800Z04R-F0050HB-HP213 | 30653403 |
| 20,00 | 20 | 19 | 104 | 38 | 54 | 0,50 | 4 | SCM710-2000Z04R-F0050HB-HP213 | 30653405 |
| 25,00 | 25 | 24 | 121 | 45 | 65 | 0,50 | 5 | SCM710-2500Z05R-F0050HB-HP213 | 30673093 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM710-0400Z03R-F0030[shank form]-HP213

Example:

SCM710-0400Z03R-F0030HA-HP213

Shank form HA

Dimensions in mm.

* Design without neck.

For cutting data recommendations, see end of chapter.

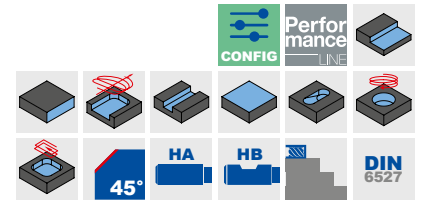
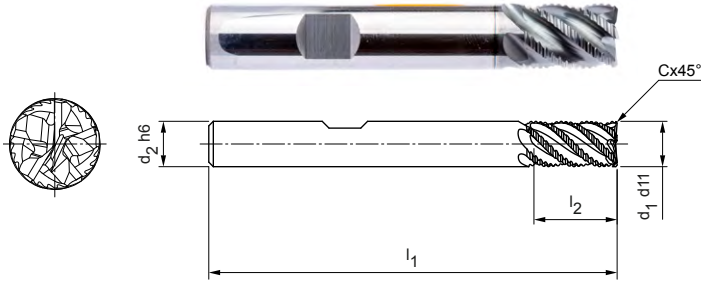
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, short design
SCM890

Design:

Diameter of milling cutter: 4.00 - 25.00 mm
Cutting material: HP723
Number of cutting edges: 5
Helix angle: ~ 41.5°
Special features: Unequal spacing, newly developed roughing profile



Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ d11 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 4,00 | 6 | 54 | 8 | 0,20 | 5 | SCM890-0400Z05R-F0020HB-HP723 | 30917921 |
| 5,00 | 6 | 54 | 9 | 0,25 | 5 | SCM890-0500Z05R-F0025HB-HP723 | 30917923 |
| 6,00 | 6 | 54 | 10 | 0,30 | 5 | SCM890-0600Z05R-F0030HB-HP723 | 30917924 |
| 7,00 | 8 | 58 | 11 | 0,35 | 5 | SCM890-0700Z05R-F0035HB-HP723 | 30917925 |
| 8,00 | 8 | 58 | 12 | 0,40 | 5 | SCM890-0800Z05R-F0040HB-HP723 | 30917926 |
| 9,00 | 10 | 66 | 13 | 0,45 | 5 | SCM890-0900Z05R-F0045HB-HP723 | 30917927 |
| 10,00 | 10 | 66 | 14 | 0,50 | 5 | SCM890-1000Z05R-F0050HB-HP723 | 30917928 |
| 12,00 | 12 | 73 | 16 | 0,60 | 5 | SCM890-1200Z05R-F0060HB-HP723 | 30917929 |
| 14,00 | 14 | 75 | 18 | 0,70 | 5 | SCM890-1400Z05R-F0070HB-HP723 | 30917930 |
| 16,00 | 16 | 82 | 22 | 0,80 | 5 | SCM890-1600Z05R-F0080HB-HP723 | 30917931 |
| 20,00 | 20 | 92 | 26 | 1,00 | 5 | SCM890-2000Z05R-F0100HB-HP723 | 30917933 |
| 25,00 | 25 | 105 | 32 | 1,25 | 5 | SCM890-2500Z05R-F0125HB-HP723 | 30917934 |

Available on request

| | | | | | | | |
|-------|----|----|----|-----|---|-------------------------------|----------|
| 18,00 | 18 | 84 | 24 | 0,9 | 5 | SCM890-1800Z05R-F0090HB-HP723 | 30917932 |
|-------|----|----|----|-----|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM890-0400Z05R-F0020[shank form]-HP723

Example:

SCM890-0400Z05R-F0020**HA**-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

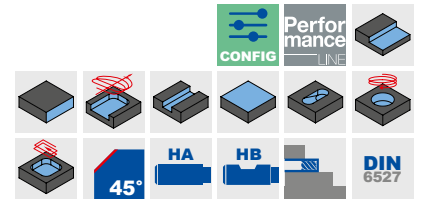
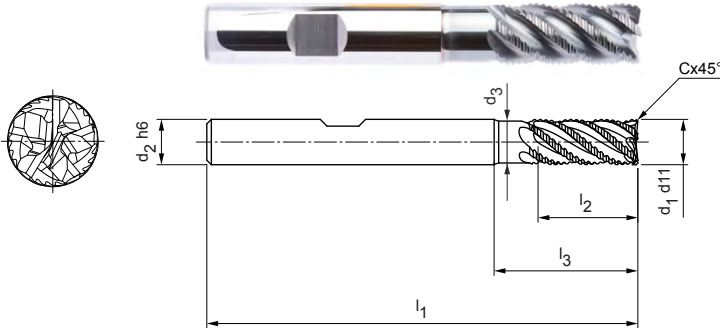
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, long design with neck
SCM880

Design:

Diameter of milling cutter: 4.00 - 25.00 mm
Cutting material: HP723
Number of cutting edges: 5
Helix angle: ~ 41.5°
Special features: Unequal spacing, newly developed roughing profile



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 4,00 | 6 | 3,7 | 57 | 11 | 19 | 0,20 | 5 | SCM880-0400Z05R-F0020HB-HP723 | 30917935 |
| 5,00 | 6 | 4,6 | 57 | 13 | 19 | 0,25 | 5 | SCM880-0500Z05R-F0025HB-HP723 | 30917936 |
| 6,00 | 6 | 5,6 | 57 | 13 | 19 | 0,30 | 5 | SCM880-0600Z05R-F0030HB-HP723 | 30917937 |
| 7,00 | 8 | 6,5 | 63 | 16 | 25 | 0,35 | 5 | SCM880-0700Z05R-F0035HB-HP723 | 30917938 |
| 8,00 | 8 | 7,4 | 63 | 19 | 25 | 0,40 | 5 | SCM880-0800Z05R-F0040HB-HP723 | 30917939 |
| 9,00 | 10 | 8,3 | 72 | 19 | 30 | 0,45 | 5 | SCM880-0900Z05R-F0045HB-HP723 | 30917940 |
| 10,00 | 10 | 9,3 | 72 | 22 | 30 | 0,50 | 5 | SCM880-1000Z05R-F0050HB-HP723 | 30917941 |
| 12,00 | 12 | 11,1 | 83 | 26 | 36 | 0,60 | 5 | SCM880-1200Z05R-F0060HB-HP723 | 30917942 |
| 14,00 | 14 | 13 | 83 | 26 | 36 | 0,70 | 5 | SCM880-1400Z05R-F0070HB-HP723 | 30917943 |
| 16,00 | 16 | 14,8 | 92 | 32 | 42 | 0,80 | 5 | SCM880-1600Z05R-F0080HB-HP723 | 30917944 |
| 20,00 | 20 | 18,5 | 104 | 38 | 52 | 1,00 | 5 | SCM880-2000Z05R-F0100HB-HP723 | 30917946 |
| 25,00 | 25 | 23,1 | 125 | 50 | 65 | 1,25 | 5 | SCM880-2500Z05R-F0125HB-HP723 | 30917947 |

Available on request

| | | | | | | | | | |
|-------|----|------|----|----|----|-----|---|-------------------------------|----------|
| 18,00 | 18 | 16,7 | 92 | 32 | 42 | 0,9 | 5 | SCM880-1800Z05R-F0090HB-HP723 | 30917945 |
|-------|----|------|----|----|----|-----|---|-------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM880-0400Z05R-F0020[shank form]-HP723

Example:

SCM880-0400Z05R-F0020HA-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

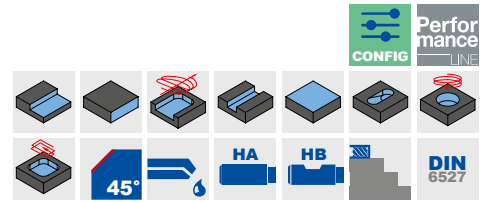
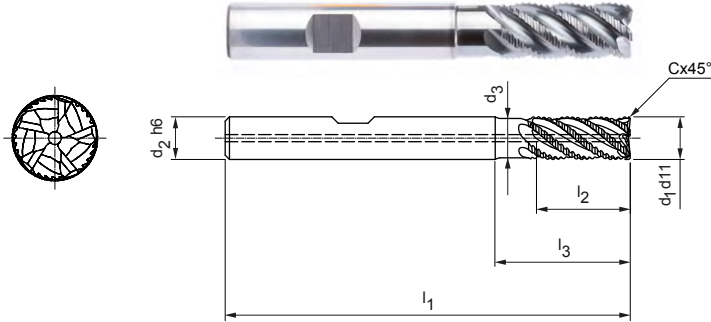
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, long design with neck, with internal coolant supply
SCM881

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP920
Number of cutting edges: 5
Helix angle: ~ 41°
Special features: Unequal spacing, newly developed roughing profile




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-------|---|-------------------------------|-----------|
| d1 d11 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 4,00 | 6 | 3,7 | 57 | 11 | 19 | 0,20 | 5 | SCM881-0400Z05R-F0020HB-HP920 | 31102736 |
| 5,00 | 6 | 4,6 | 57 | 13 | 19 | 0,25 | 5 | SCM881-0500Z05R-F0025HB-HP920 | 31102737 |
| 6,00 | 6 | 5,6 | 57 | 13 | 19 | 0,30 | 5 | SCM881-0600Z05R-F0030HB-HP920 | 31102738 |
| 8,00 | 8 | 7,4 | 63 | 19 | 25 | 0,40 | 5 | SCM881-0800Z05R-F0040HB-HP920 | 31102750 |
| 10,00 | 10 | 9,3 | 72 | 22 | 30 | 0,50 | 5 | SCM881-1000Z05R-F0050HB-HP920 | 31102752 |
| 12,00 | 12 | 11,1 | 83 | 26 | 36 | 0,60 | 5 | SCM881-1200Z05R-F0060HB-HP920 | 31102753 |
| 16,00 | 16 | 14,8 | 92 | 32 | 42 | 0,80 | 5 | SCM881-1600Z05R-F0080HB-HP920 | 31102755 |
| 20,00 | 20 | 18,5 | 104 | 38 | 52 | 1,00 | 5 | SCM881-2000Z05R-F0100HB-HP920 | 31102756 |


Available on request

| | | | | | | | | | |
|-------|----|----|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 13 | 83 | 26 | 36 | 0,70 | 5 | SCM881-1400Z05R-F0070HB-HP920 | 31102754 |
|-------|----|----|----|----|----|------|---|-------------------------------|----------|

Configurable features



Shank form:
Shank form: HA



Specification:
SCM881-0400Z05R-F0020[shank form]-HP920

Example:

SCM881-0400Z05R-F0020HA-HP920

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

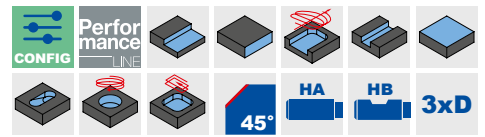
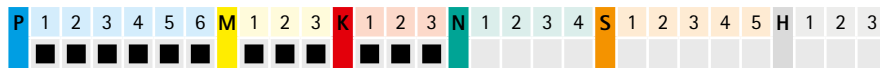
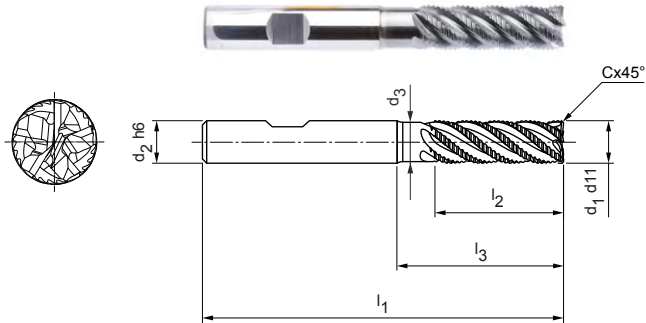
Shoulder milling cutter, design 3xD with neck
SCM900

Design:

Diameter of milling cutter: 5.00 - 25.00 mm
Cutting material: HP210
Number of cutting edges: 5
Helix angle: ~ 42°
Special features: Unequal spacing,
newly developed
roughing profile

Application:

Suitable for shoulder milling up to a maximum cutting width of 0.25xD. Also suitable for trochoidal milling.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|----------------|----------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h ₆ | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 5,00 | 6 | 4,6 | 62 | 17 | 24 | 0,25 | 5 | SCM900-0500Z05R-F0025HB3-HP210 | 31054554 |
| 6,00 | 6 | 5,6 | 62 | 18 | 25 | 0,30 | 5 | SCM900-0600Z05R-F0030HB3-HP210 | 31054555 |
| 8,00 | 8 | 7,7 | 68 | 24 | 30 | 0,40 | 5 | SCM900-0800Z05R-F0040HB3-HP210 | 31054556 |
| 10,00 | 10 | 9,3 | 80 | 30 | 35 | 0,50 | 5 | SCM900-1000Z05R-F0050HB3-HP210 | 31054557 |
| 12,00 | 12 | 11,1 | 93 | 36 | 45 | 0,60 | 5 | SCM900-1200Z05R-F0060HB3-HP210 | 31054558 |
| 14,00 | 14 | 13 | 99 | 42 | 50 | 0,70 | 5 | SCM900-1400Z05R-F0070HB3-HP210 | 31054559 |
| 16,00 | 16 | 14,8 | 108 | 48 | 55 | 0,80 | 5 | SCM900-1600Z05R-F0080HB3-HP210 | 31054570 |
| 20,00 | 20 | 18,5 | 126 | 60 | 70 | 1,00 | 5 | SCM900-2000Z05R-F0100HB3-HP210 | 31054572 |

Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|------|---|--------------------------------|----------|
| 18,00 | 18 | 16,7 | 117 | 54 | 67 | 0,90 | 5 | SCM900-1800Z05R-F0090HB3-HP210 | 31054571 |
| 25,00 | 25 | 21,1 | 150 | 75 | 92 | 1,25 | 5 | SCM900-2500Z05R-F0125HB3-HP210 | 31054573 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM900-0500Z05R-F0025[shank form]3-HP210

Example:

SCM900-0500Z05R-F0025HA3-HP210

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

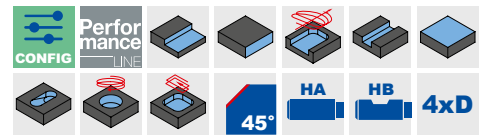
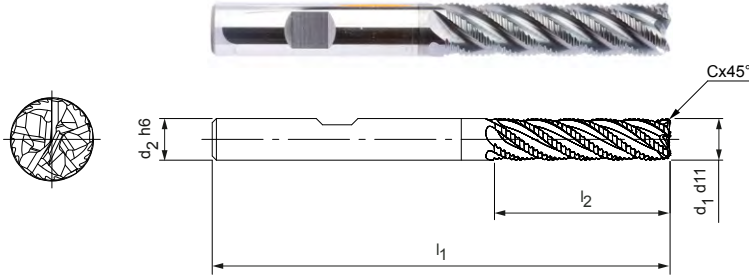
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, 4xD design
SCM900

Design:

Diameter of milling cutter: 6.00 - 20.00 mm
Cutting material: HP723
Number of cutting edges: 5
Helix angle: 38°
Special features: Unequal spacing, newly developed roughing profile



Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h ₆ | l ₁ | l ₂ | Cx45° | | | |
| 6,00 | 6 | 66 | 24 | 0,30 | 5 | SCM900-0600Z05R-F0030HB4-HP723 | 31200325 |
| 8,00 | 8 | 74 | 32 | 0,40 | 5 | SCM900-0800Z05R-F0040HB4-HP723 | 31200326 |
| 10,00 | 10 | 89 | 40 | 0,50 | 5 | SCM900-1000Z05R-F0050HB4-HP723 | 31200327 |
| 12,00 | 12 | 100 | 48 | 0,60 | 5 | SCM900-1200Z05R-F0060HB4-HP723 | 31200328 |
| 16,00 | 16 | 123 | 64 | 0,80 | 5 | SCM900-1600Z05R-F0080HB4-HP723 | 31200329 |
| 20,00 | 20 | 140 | 80 | 1,00 | 5 | SCM900-2000Z05R-F0100HB4-HP723 | 31200330 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM900-0600Z05R-F0030[shank form]4-HP723

Example:

SCM900-0600Z05R-F0030HA4-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

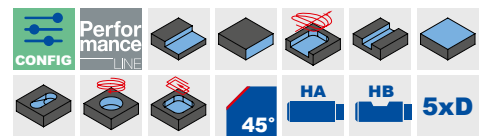
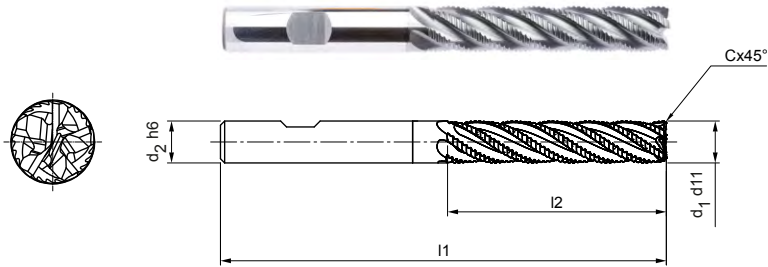
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, 5xD design
SCM900

Design:

Diameter of milling cutter: 6.00 - 20.00 mm
Cutting material: HP723
Number of cutting edges: 5
Helix angle: 35°
Special features: Unequal spacing, newly developed roughing profile



Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h ₆ | l ₁ | l ₂ | Cx45° | | | |
| 6,00 | 6 | 69 | 30 | 0,30 | 5 | SCM900-0600Z05R-F0030HB5-HP723 | 31240648 |
| 8,00 | 8 | 81 | 40 | 0,40 | 5 | SCM900-0800Z05R-F0040HB5-HP723 | 31240649 |
| 10,00 | 10 | 96 | 50 | 0,50 | 5 | SCM900-1000Z05R-F0050HB5-HP723 | 31240670 |
| 12,00 | 12 | 112 | 60 | 0,60 | 5 | SCM900-1200Z05R-F0060HB5-HP723 | 31240671 |
| 16,00 | 16 | 136 | 80 | 0,80 | 5 | SCM900-1600Z05R-F0080HB5-HP723 | 31240672 |
| 20,00 | 20 | 160 | 100 | 1,00 | 5 | SCM900-2000Z05R-F0100HB5-HP723 | 31240673 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM900-0600Z05R-F0030[shank form]5-HP723

Example:

SCM900-0600Z05R-F0030HA5-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

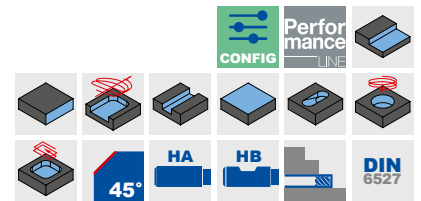
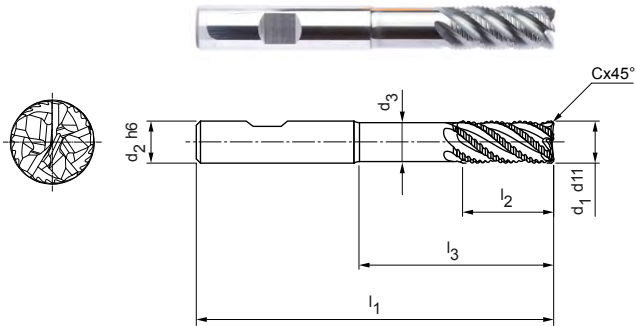
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, overlong design with neck
SCM900

Design:

Diameter of milling cutter: 5.00 - 25.00 mm
Cutting material: HP210
Number of cutting edges: 5
Helix angle: ~ 41.5°
Special features: Unequal spacing, newly developed roughing profile




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------------------|-------------------------------|----------------|----------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ d ₁₁ | d ₂ h ₆ | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | |
| 5,00 | 6 | 4,6 | 62 | 13 | 24 | 0,25 | 5 | SCM900-0500Z05R-F0025HB-HP210 | 31054574 |
| 6,00 | 6 | 5,6 | 62 | 13 | 25 | 0,30 | 5 | SCM900-0600Z05R-F0030HB-HP210 | 31054575 |
| 8,00 | 8 | 7,4 | 68 | 21 | 30 | 0,40 | 5 | SCM900-0800Z05R-F0040HB-HP210 | 31054576 |
| 10,00 | 10 | 9,3 | 80 | 22 | 38 | 0,50 | 5 | SCM900-1000Z05R-F0050HB-HP210 | 31054577 |
| 12,00 | 12 | 11,1 | 93 | 26 | 46 | 0,60 | 5 | SCM900-1200Z05R-F0060HB-HP210 | 31054578 |
| 14,00 | 14 | 13 | 99 | 26 | 52 | 0,70 | 5 | SCM900-1400Z05R-F0070HB-HP210 | 31054579 |
| 16,00 | 16 | 14,8 | 108 | 36 | 58 | 0,80 | 5 | SCM900-1600Z05R-F0080HB-HP210 | 31054580 |
| 20,00 | 20 | 18,5 | 126 | 41 | 74 | 1,00 | 5 | SCM900-2000Z05R-F0100HB-HP210 | 31054582 |


Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|------|---|-------------------------------|----------|
| 18,00 | 18 | 16,7 | 117 | 36 | 67 | 0,90 | 5 | SCM900-1800Z05R-F0090HB-HP210 | 31054581 |
| 25,00 | 25 | 23,1 | 150 | 50 | 92 | 1,25 | 5 | SCM900-2500Z05R-F0125HB-HP210 | 31054583 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM900-0500Z05R-F0025[shank form]-HP210

Example:

SCM900-0500Z05R-F0025HA-HP210

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

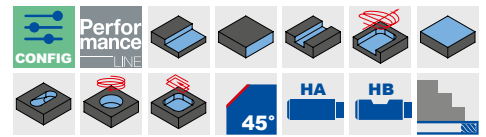
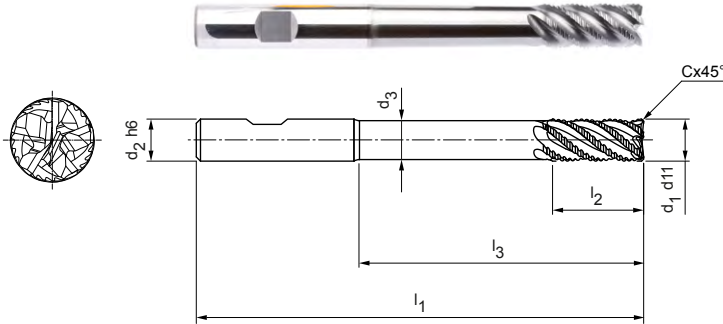
Special designs and other coatings available upon request.

OptiMill®-Uni-Wave

Shoulder milling cutter, extra long design with neck
SCM910

Design:


Diameter of milling cutter: 6.00 - 20.00 mm
Cutting material: HP723
Number of cutting edges: 5
Helix angle: ~ 42°
Special features: Unequal spacing, newly developed roughing profile




Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|-----|-------|---|-------------------------------|-----------|
| d1 d11 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 6,00 | 6 | 5,4 | 80 | 13 | 42 | 0,30 | 5 | SCM910-0600Z05R-F0030HB-HP723 | 31096360 |
| 8,00 | 8 | 7,2 | 100 | 21 | 62 | 0,40 | 5 | SCM910-0800Z05R-F0040HB-HP723 | 31096362 |
| 10,00 | 10 | 9 | 100 | 22 | 58 | 0,50 | 5 | SCM910-1000Z05R-F0050HB-HP723 | 31096363 |
| 12,00 | 12 | 10,8 | 120 | 26 | 73 | 0,60 | 5 | SCM910-1200Z05R-F0060HB-HP723 | 31096364 |
| 16,00 | 16 | 14,4 | 150 | 36 | 100 | 0,80 | 5 | SCM910-1600Z05R-F0080HB-HP723 | 31096365 |
| 20,00 | 20 | 18 | 150 | 41 | 98 | 1,00 | 5 | SCM910-2000Z05R-F0100HB-HP723 | 31096366 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM910-0600Z05R-F0030[shank form]-HP723

Example:

SCM910-0600Z05R-F0030HA-HP723

Shank form HA

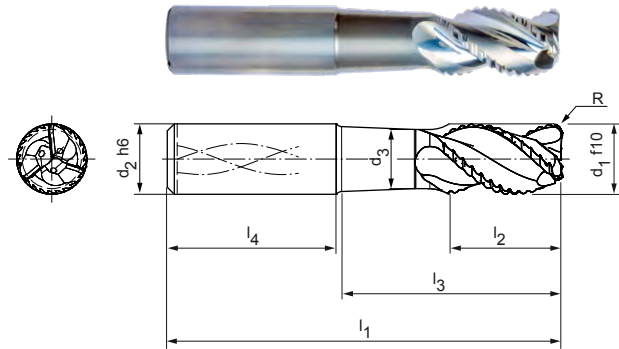
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-SPM-Rough

Shoulder milling cutter, design with internal coolant supply
SCM951/961

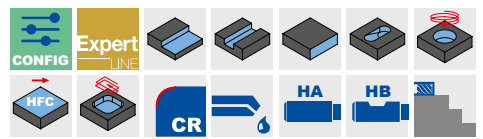


Design:

Diameter of milling cutter: 12.00 - 25.00 mm
Cutting material: HU318
Number of cutting edges: 3
Helix angle: 43°

Application:

High volume machining of structural parts made of aluminium. For full performance of the Opti-Mill-SPM-Rough, it is recommended to use it on high performance machines from 50 kW.



| | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| N | 1.1 | 1.2 | 1.3 | 1.4 | 2.1 | 2.2 | 2.3 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | C | 1.1 | 1.2 | 1.3 | 2.1 | 3.1 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Metric dimensions | Preferred series in stock

| Dimensions | | | | | | | | z | Specification | Order no. |
|------------|-------|-------|-----|----|----|----|------|---|-------------------------------|-----------|
| d1 f9 | d2 h6 | d3 | l1 | l2 | l3 | l4 | R | | | |
| 12,00 | 12 | 10 | 83 | 18 | 38 | 45 | 2,00 | 3 | SCM951-1200Z03R-R0200HA-HU318 | 31080117 |
| 16,00 | 16 | 13,40 | 92 | 24 | 47 | 45 | 2,00 | 3 | SCM951-1600Z03R-R0200HA-HU318 | 31080119 |
| 16,00 | 16 | 13,40 | 92 | 24 | 47 | 45 | 3,00 | 3 | SCM951-1600Z03R-R0300HA-HU318 | 31080140 |
| 20,00 | 20 | 16,80 | 104 | 35 | 56 | 48 | 2,00 | 3 | SCM951-2000Z03R-R0200HA-HU318 | 31080142 |
| 20,00 | 20 | 16,80 | 104 | 35 | 56 | 48 | 3,00 | 3 | SCM951-2000Z03R-R0300HA-HU318 | 31080143 |
| 20,00 | 20 | 16,80 | 104 | 35 | 56 | 48 | 4,00 | 3 | SCM951-2000Z03R-R0400HA-HU318 | 31080144 |
| 25,00 | 25 | 21 | 108 | 35 | 52 | 56 | 3,00 | 3 | SCM951-2500Z03R-R0300HA-HU318 | 31080145 |
| 25,00 | 25 | 21 | 108 | 35 | 52 | 56 | 4,00 | 3 | SCM951-2500Z03R-R0400HA-HU318 | 31080146 |
| 25,00 | 25 | 21 | 136 | 38 | 80 | 56 | 3,00 | 3 | SCM961-2500Z03R-R0300HA-HU318 | 31080147 |
| 25,00 | 25 | 21 | 136 | 38 | 80 | 56 | 4,00 | 3 | SCM961-2500Z03R-R0400HA-HU318 | 31080148 |

Inch dimensions | Available upon request

| | | | | | | | | | | |
|------|------|--------|--------|--------|--------|--------|-------|---|-------------------------------|----------|
| 1/2" | 1/2" | 0,417" | 3 1/2" | 3/4" | 1 5/8" | 1,772" | 0,09" | 3 | SCM951-1270Z03R-R0228HA-HU318 | 31080118 |
| 3/4" | 3/4" | 0,63" | 4 1/8" | 1 1/4" | 2 1/8" | 1,89" | 0,12" | 3 | SCM951-1905Z03R-R0305HA-HU318 | 31080141 |
| 1" | 1" | 0,839" | 5" | 1 1/2" | 2,783" | 2,205" | 0,12" | 3 | SCM951-2540Z03R-R0305HA-HU318 | 31080149 |

Configurable features

Shank form:
Shank form: HB

Specification:
SCM951-1200Z03R-R0200[shank form]-HU318

Example:

SCM951-1200Z03R-R0200**HB**-HU318

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

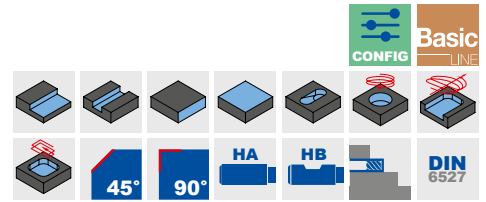
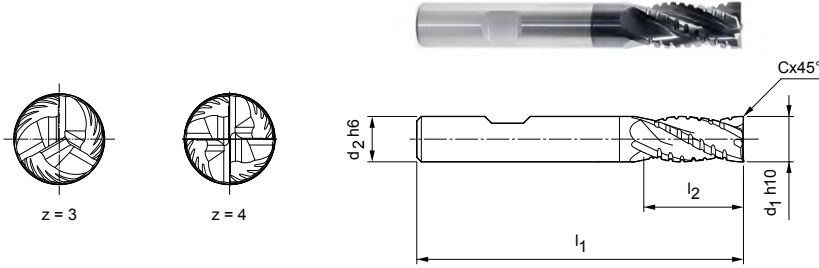
Special designs and other coatings available upon request.



ECU-Mill-Uni-Rough&Finish

Shoulder milling cutter, long design
SCM220

Design:
 Diameter of milling cutter: 6.00 – 20.00 mm
 Cutting material: HP213
 Number of cutting edges: 3 to ø 8 mm
 4 from ø 10 mm
 Helix angle: 30°




Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|-------|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 6,00 | 6 | 57 | 13 | – | 3 | SCM220-0600Z03R-S-HB-HP213 | 30393471 |
| 8,00 | 8 | 63 | 19 | 0,08 | 3 | SCM220-0800Z03R-F0008HB-HP213 | 30393472 |
| 10,00 | 10 | 72 | 22 | 0,10 | 4 | SCM220-1000Z04R-F0010HB-HP213 | 30393473 |
| 12,00 | 12 | 83 | 26 | 0,12 | 4 | SCM220-1200Z04R-F0012HB-HP213 | 30393474 |
| 16,00 | 16 | 92 | 32 | 0,16 | 4 | SCM220-1600Z04R-F0016HB-HP213 | 30393476 |
| 20,00 | 20 | 104 | 38 | 0,20 | 4 | SCM220-2000Z04R-F0020HB-HP213 | 30393478 |


Available on request

| | | | | | | | |
|-------|----|----|----|------|---|-------------------------------|----------|
| 14,00 | 14 | 83 | 26 | 0,14 | 4 | SCM220-1400Z04R-F0014HB-HP213 | 30393475 |
| 18,00 | 18 | 92 | 32 | 0,18 | 4 | SCM220-1800Z04R-F0018HB-HP213 | 30393477 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM220-0800Z03R-F0008[shank form]-HP213

Example:
SCM220-0800Z03R-F0008HA-HP213

Shank form HA

Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

CPMill®-Uni-Rough&Finish

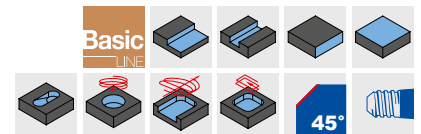
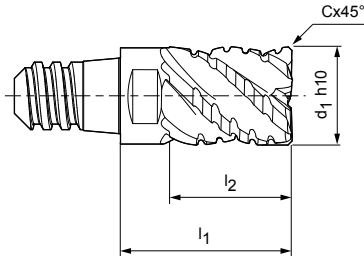
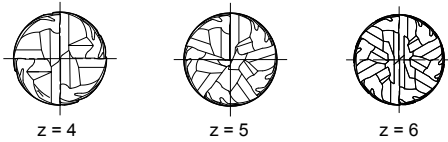
Design with CFS connection
CPM140

Design:

Diameter of milling cutter: 8.00 – 25.00 mm
Cutting material: HP383
Number of cutting edges: 4 to \varnothing 12.00 mm
5 at \varnothing 16.00 mm
6 from \varnothing 20.00 mm

Helix angle: 45°

Special features: Special roughing geometry, also suitable for unstable clamping.




Preferred series in stock

| Dimensions | | | | | z | a _p max. | SW | Specification | Order no. |
|--------------------|----------|----------------|----------------|-------|---|---------------------|-------|-------------------------------|-----------|
| d ₁ h10 | CFS size | l ₁ | l ₂ | Cx45° | | | | | |
| 8,00 | 6 | 15 | 10 | 0,16 | 4 | 7,5 | SW 6 | CPM140-0800Z04-F0016-06-HP383 | 30371395 |
| 10,00 | 8 | 18 | 12,5 | 0,20 | 4 | 9,4 | SW 8 | CPM140-1000Z04-F0020-08-HP383 | 30371396 |
| 12,00 | 10 | 22 | 15 | 0,24 | 4 | 11,3 | SW 10 | CPM140-1200Z04-F0024-10-HP383 | 30371397 |
| 16,00 | 12 | 28 | 20 | 0,32 | 5 | 15 | SW 13 | CPM140-1600Z05-F0032-12-HP383 | 30371398 |
| 20,00 | 16 | 35 | 25 | 0,40 | 6 | 18,8 | SW 16 | CPM140-2000Z06-F0040-16-HP383 | 30371400 |

Available on request

| | | | | | | | | | |
|-------|----|----|----|-----|---|------|-------|-------------------------------|----------|
| 25,00 | 20 | 45 | 32 | 0,5 | 6 | 23,4 | SW 21 | CPM140-2500Z06-F0050-20-HP383 | 30371401 |
|-------|----|----|----|-----|---|------|-------|-------------------------------|----------|

Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| short | 1 |
| long | 0.9 |

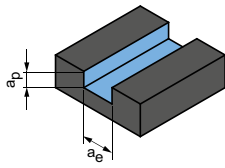
OptiMill-Uni-HPC-Rough | SCM700, 710

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|------|--|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5.1 | Cast steel | | | | ✓ |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | | | ✓ |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

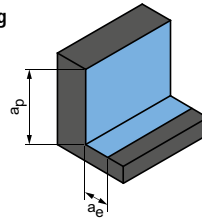
Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

Roughing



$$a_p = 1.5 \times D$$

$$a_e = 0.25 \times D$$

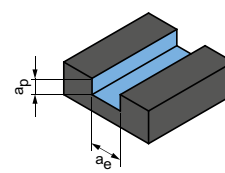
| | v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 200 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 | 0.095 | 355 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 0.161 |
| | 165 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.080 | 0.089 | 290 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 | 0.151 |
| | 180 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 | 0.095 | 325 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 0.161 |
| | 125 | 0.029 | 0.037 | 0.044 | 0.051 | 0.062 | 0.071 | 0.079 | 225 | 0.049 | 0.063 | 0.075 | 0.086 | 0.105 | 0.120 | 0.134 |
| | 120 | 0.034 | 0.043 | 0.051 | 0.059 | 0.072 | 0.082 | 0.092 | 210 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 0.156 |
| | 110 | 0.032 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 | 0.087 | 195 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.132 | 0.148 |
| | 100 | 0.030 | 0.038 | 0.046 | 0.053 | 0.065 | 0.074 | 0.082 | 180 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 | 0.140 |
| | 80 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 | 0.063 | 145 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 0.108 |
| | 120 | 0.034 | 0.043 | 0.051 | 0.059 | 0.072 | 0.082 | 0.092 | 215 | 0.057 | 0.073 | 0.087 | 0.100 | 0.122 | 0.140 | 0.156 |
| | 80 | 0.016 | 0.021 | 0.025 | 0.028 | 0.035 | 0.040 | 0.044 | 145 | 0.027 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 0.075 |
| | 55 | 0.020 | 0.026 | 0.031 | 0.036 | 0.043 | 0.050 | 0.055 | 110 | 0.034 | 0.044 | 0.053 | 0.060 | 0.074 | 0.084 | 0.094 |
| | 50 | 0.017 | 0.021 | 0.026 | 0.029 | 0.036 | 0.041 | 0.046 | 105 | 0.028 | 0.036 | 0.044 | 0.050 | 0.061 | 0.070 | 0.078 |
| | 60 | 0.022 | 0.028 | 0.034 | 0.039 | 0.047 | 0.054 | 0.060 | 120 | 0.037 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.102 |
| | 55 | 0.017 | 0.022 | 0.027 | 0.031 | 0.037 | 0.043 | 0.048 | 110 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 0.081 |
| | 215 | 0.058 | 0.074 | 0.088 | 0.102 | 0.124 | 0.142 | 0.158 | 440 | 0.098 | 0.125 | 0.150 | 0.172 | 0.211 | 0.241 | 0.269 |
| | 200 | 0.049 | 0.063 | 0.075 | 0.086 | 0.106 | 0.121 | 0.135 | 405 | 0.083 | 0.106 | 0.128 | 0.147 | 0.179 | 0.205 | 0.228 |
| | 160 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.111 | 330 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 0.188 |
| | 90 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 | 0.063 | 185 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 0.108 |
| | 145 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.111 | 295 | 0.069 | 0.088 | 0.105 | 0.121 | 0.147 | 0.169 | 0.188 |
| | 135 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 | 0.095 | 275 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 0.161 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

OptiMill-Uni-Wave | SCM800, 880, 881, 890, 900, 910

| MMG* | Workpiece material | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] | | | | | | | | | |
|------|--------------------|--|--|--------|---------|---------------------------|---------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | | | | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 200 | 0.027 | 0.038 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 | 0.105 |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 160 | 0.025 | 0.036 | 0.046 | 0.054 | 0.063 | 0.077 | 0.087 | 0.098 |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 180 | 0.027 | 0.038 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 | 0.105 |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 125 | 0.022 | 0.032 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 | 0.087 |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 115 | 0.026 | 0.037 | 0.047 | 0.056 | 0.065 | 0.079 | 0.091 | 0.101 |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 110 | 0.024 | 0.035 | 0.045 | 0.054 | 0.062 | 0.075 | 0.086 | 0.096 |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 100 | 0.023 | 0.033 | 0.042 | 0.051 | 0.058 | 0.071 | 0.081 | 0.091 |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | ✓ | 80 | 0.018 | 0.025 | 0.033 | 0.039 | 0.045 | 0.055 | 0.062 | 0.07 |
| | P5 | P5.1 | Cast steel | | ✓ | ✓ | ✓ | 120 | 0.026 | 0.037 | 0.047 | 0.056 | 0.065 | 0.079 | 0.091 | 0.101 |
| | P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | ✓ | ✓ | 80 | 0.012 | 0.018 | 0.023 | 0.027 | 0.031 | 0.038 | 0.044 | 0.049 |
| M | M1 | M1.1 | Stainless steels, austenitic | < 700 | ✓ | ✓ | ✓ | 55 | 0.015 | 0.022 | 0.028 | 0.034 | 0.039 | 0.048 | 0.055 | 0.061 |
| | | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 50 | 0.013 | 0.018 | 0.024 | 0.028 | 0.032 | 0.04 | 0.045 | 0.051 |
| | M2 | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | ✓ | ✓ | 60 | 0.017 | 0.024 | 0.031 | 0.037 | 0.042 | 0.052 | 0.059 | 0.066 |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | ✓ | ✓ | ✓ | 55 | 0.013 | 0.019 | 0.024 | 0.029 | 0.034 | 0.041 | 0.047 | 0.052 |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 215 | 0.044 | 0.064 | 0.081 | 0.097 | 0.112 | 0.137 | 0.156 | 0.174 |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 200 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.133 | 0.148 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 160 | 0.031 | 0.045 | 0.057 | 0.068 | 0.078 | 0.096 | 0.109 | 0.122 |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 90 | 0.018 | 0.025 | 0.033 | 0.039 | 0.045 | 0.055 | 0.062 | 0.07 |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 145 | 0.031 | 0.045 | 0.057 | 0.068 | 0.078 | 0.096 | 0.109 | 0.122 |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 135 | 0.027 | 0.038 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 | 0.105 |

Tool length/correction factor

| Length | v _c | f _z |
|--------------------|----------------|----------------|
| short / long / 3xD | 1 | 1 |
| overlong / 4xD | 0.8 | 0.9 |
| extra long / 5xD | 0.6 | 0.7 |

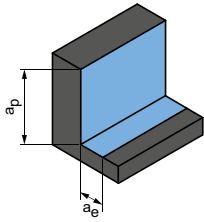
Please be aware:

Using the SCM900 in the 3xD design is only recommended up to a maximum cutting width of 0.25xD.

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

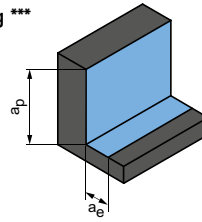
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Roughing ***



$$a_p = 3xD$$

$$a_e = 0.2xD$$

*** Valid for SCM900 - design 3xD

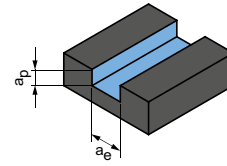
| | v _c [m/min] | f _z [mm] | | | | | | | | v _c [m/min] | f _z [mm] | | | | | | | |
|--|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 405 | 0.045 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | 0.177 | 355 | 0.054 | 0.064 | 0.082 | 0.098 | 0.112 | 0.137 | 0.157 | 0.175 |
| | 330 | 0.042 | 0.06 | 0.077 | 0.092 | 0.106 | 0.13 | 0.148 | 0.166 | 290 | 0.051 | 0.060 | 0.076 | 0.091 | 0.105 | 0.128 | 0.146 | 0.163 |
| | 370 | 0.045 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | 0.177 | 320 | 0.054 | 0.064 | 0.082 | 0.098 | 0.112 | 0.137 | 0.157 | 0.175 |
| | 260 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.132 | 0.148 | 225 | 0.045 | 0.053 | 0.068 | 0.081 | 0.094 | 0.114 | 0.131 | 0.146 |
| | 240 | 0.044 | 0.063 | 0.08 | 0.096 | 0.11 | 0.134 | 0.154 | 0.171 | 210 | 0.053 | 0.062 | 0.079 | 0.094 | 0.109 | 0.133 | 0.152 | 0.169 |
| | 220 | 0.041 | 0.059 | 0.076 | 0.091 | 0.104 | 0.127 | 0.146 | 0.163 | 190 | 0.050 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.144 | 0.161 |
| | 200 | 0.039 | 0.056 | 0.072 | 0.086 | 0.099 | 0.12 | 0.138 | 0.154 | 175 | 0.047 | 0.055 | 0.071 | 0.085 | 0.097 | 0.119 | 0.136 | 0.152 |
| | 165 | 0.03 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 0.118 | 145 | 0.036 | 0.043 | 0.054 | 0.065 | 0.075 | 0.091 | 0.105 | 0.117 |
| | 245 | 0.044 | 0.063 | 0.08 | 0.096 | 0.11 | 0.134 | 0.154 | 0.171 | 215 | 0.053 | 0.062 | 0.079 | 0.094 | 0.109 | 0.133 | 0.152 | 0.169 |
| | 165 | 0.021 | 0.03 | 0.039 | 0.046 | 0.053 | 0.065 | 0.074 | 0.083 | 145 | 0.025 | 0.030 | 0.038 | 0.046 | 0.052 | 0.064 | 0.073 | 0.082 |
| | 110 | 0.026 | 0.038 | 0.048 | 0.058 | 0.066 | 0.081 | 0.093 | 0.103 | 110 | 0.032 | 0.037 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.102 |
| | 105 | 0.022 | 0.031 | 0.04 | 0.048 | 0.055 | 0.067 | 0.077 | 0.086 | 105 | 0.026 | 0.031 | 0.039 | 0.047 | 0.054 | 0.066 | 0.076 | 0.085 |
| | 120 | 0.029 | 0.041 | 0.052 | 0.063 | 0.072 | 0.088 | 0.101 | 0.112 | 125 | 0.034 | 0.040 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.111 |
| | 110 | 0.023 | 0.032 | 0.041 | 0.05 | 0.057 | 0.07 | 0.079 | 0.089 | 110 | 0.027 | 0.032 | 0.041 | 0.049 | 0.056 | 0.069 | 0.078 | 0.088 |
| | 440 | 0.075 | 0.108 | 0.138 | 0.165 | 0.19 | 0.232 | 0.265 | 0.296 | 450 | 0.091 | 0.106 | 0.136 | 0.163 | 0.187 | 0.229 | 0.262 | 0.292 |
| | 405 | 0.064 | 0.092 | 0.117 | 0.14 | 0.161 | 0.197 | 0.225 | 0.251 | 410 | 0.077 | 0.090 | 0.116 | 0.138 | 0.159 | 0.194 | 0.222 | 0.248 |
| | 330 | 0.053 | 0.076 | 0.096 | 0.116 | 0.133 | 0.162 | 0.185 | 0.207 | 335 | 0.063 | 0.075 | 0.095 | 0.114 | 0.131 | 0.160 | 0.183 | 0.204 |
| | 185 | 0.03 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 0.118 | 185 | 0.036 | 0.043 | 0.054 | 0.065 | 0.075 | 0.091 | 0.105 | 0.117 |
| | 295 | 0.053 | 0.076 | 0.096 | 0.116 | 0.133 | 0.162 | 0.185 | 0.207 | 300 | 0.063 | 0.075 | 0.095 | 0.114 | 0.131 | 0.160 | 0.183 | 0.204 |
| | 275 | 0.045 | 0.065 | 0.083 | 0.099 | 0.114 | 0.139 | 0.159 | 0.177 | 280 | 0.054 | 0.064 | 0.082 | 0.098 | 0.112 | 0.137 | 0.157 | 0.175 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

Groove milling



$$a_p = 0.3 \times D$$

$$a_e = 1 \times D$$

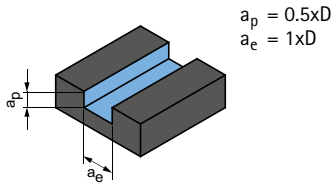
OptiMill-SPM-Rough | SCM951, 961

| MMG* | Workpiece material | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | |
|---------|--------------------|--|---------|-----|---------|------------------|---------------------------------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | |
| | | | | | | | 12.00 | 16.00 | 20.00 | 25.00 |
| N N1 | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 1,530 | 0.271 | 0.331 | 0.378 | 0.422 |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | 1,015 | 0.284 | 0.347 | 0.397 | 0.443 |
| | N1.3 | Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | 810 | 0.298 | 0.364 | 0.416 | 0.464 |
| | N1.4 | Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | 585 | 0.325 | 0.397 | 0.454 | 0.506 |

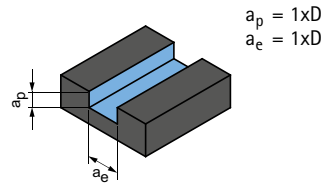
* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Groove milling



Groove milling



| | v_c [m/min] | f_z [mm] | | | | v_c [m/min] | f_z [mm] | | | |
|--|------------------|---------------------------------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | Diameter of milling cutter [mm] | | | |
| | | 12.00 | 16.00 | 20.00 | 25.00 | | 12.00 | 16.00 | 20.00 | 25.00 |
| | 1,530 | 0.235 | 0.287 | 0.328 | 0.366 | 1,530 | 0.186 | 0.228 | 0.260 | 0.291 |
| | 1,015 | 0.247 | 0.301 | 0.345 | 0.384 | 1,015 | 0.196 | 0.239 | 0.273 | 0.305 |
| | 810 | 0.258 | 0.316 | 0.361 | 0.403 | 810 | 0.205 | 0.251 | 0.286 | 0.320 |
| | 585 | 0.282 | 0.344 | 0.394 | 0.439 | 585 | 0.224 | 0.273 | 0.313 | 0.349 |

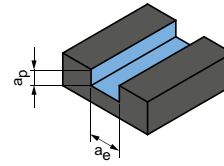
The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Tool length/correction factor: | |
|--------------------------------|---------------|
| Length | f_z & v_c |
| Short | 1 |
| Long | 0,9 |
| Overlong | 0,8 |
| Extra long | 0,6 |

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

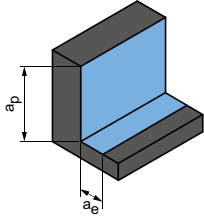
ECU-Mill-Uni-Rough&Finish | SCM220

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | | |
|------|--------------------|--|--|-----|---------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | | | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 140 | 0.028 | 0.035 | 0.042 | 0.049 | 0.060 | 0.068 | 0.076 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 115 | 0.026 | 0.033 | 0.040 | 0.046 | 0.056 | 0.064 | 0.071 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 125 | 0.028 | 0.035 | 0.042 | 0.049 | 0.060 | 0.068 | 0.076 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 90 | 0.023 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 | 0.063 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 85 | 0.027 | 0.034 | 0.041 | 0.047 | 0.058 | 0.066 | 0.074 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 75 | 0.025 | 0.033 | 0.039 | 0.045 | 0.055 | 0.062 | 0.070 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 70 | 0.024 | 0.031 | 0.037 | 0.042 | 0.052 | 0.059 | 0.066 |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | 55 | 0.018 | 0.024 | 0.028 | 0.033 | 0.040 | 0.045 | 0.051 |
| P5 | P5.1 | Cast steel | | | ✓ | 85 | 0.027 | 0.034 | 0.041 | 0.047 | 0.058 | 0.066 | 0.074 | |
| P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | | ✓ | 55 | 0.013 | 0.017 | 0.020 | 0.023 | 0.028 | 0.032 | 0.035 | |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ | 40 | 0.016 | 0.021 | 0.025 | 0.028 | 0.035 | 0.040 | 0.044 |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 35 | 0.013 | 0.017 | 0.021 | 0.024 | 0.029 | 0.033 | 0.037 |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ | 40 | 0.018 | 0.022 | 0.027 | 0.031 | 0.038 | 0.043 | 0.048 |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 40 | 0.014 | 0.018 | 0.021 | 0.024 | 0.030 | 0.034 | 0.038 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 150 | 0.046 | 0.059 | 0.071 | 0.081 | 0.099 | 0.114 | 0.127 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 140 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.097 | 0.108 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ | 115 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.080 | 0.089 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 65 | 0.018 | 0.024 | 0.028 | 0.033 | 0.040 | 0.045 | 0.051 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 100 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.080 | 0.089 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 95 | 0.028 | 0.035 | 0.042 | 0.049 | 0.060 | 0.068 | 0.076 |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ | 535 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 | 0.129 |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ | 355 | 0.049 | 0.063 | 0.076 | 0.087 | 0.106 | 0.122 | 0.136 |
| | N1.3 | Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ | 285 | 0.052 | 0.066 | 0.079 | 0.091 | 0.111 | 0.127 | 0.142 |
| | N1.4 | Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ | 205 | 0.057 | 0.072 | 0.087 | 0.099 | 0.121 | 0.139 | 0.155 |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 205 | 0.038 | 0.048 | 0.058 | 0.066 | 0.081 | 0.093 | 0.103 |
| | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ | 155 | 0.038 | 0.048 | 0.058 | 0.066 | 0.081 | 0.093 | 0.103 |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 255 | 0.024 | 0.030 | 0.036 | 0.041 | 0.051 | 0.058 | 0.065 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

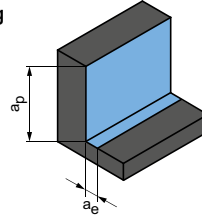
Roughing



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Finishing



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| | v_c [m/min] | f_z [mm] | | | | | | | v_c [m/min] | f_z [mm] | | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | Diameter of milling cutter [mm] | | | | | | |
| | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 250 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 | 0.129 | 335 | 0.074 | 0.095 | 0.114 | 0.131 | 0.160 | 0.183 | 0.204 |
| | 205 | 0.044 | 0.056 | 0.067 | 0.077 | 0.094 | 0.108 | 0.120 | 275 | 0.069 | 0.089 | 0.106 | 0.122 | 0.149 | 0.171 | 0.190 |
| | 225 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 | 0.129 | 305 | 0.074 | 0.095 | 0.114 | 0.131 | 0.160 | 0.183 | 0.204 |
| | 160 | 0.039 | 0.050 | 0.060 | 0.069 | 0.084 | 0.096 | 0.108 | 215 | 0.062 | 0.079 | 0.095 | 0.109 | 0.133 | 0.152 | 0.170 |
| | 145 | 0.045 | 0.058 | 0.070 | 0.080 | 0.098 | 0.112 | 0.125 | 200 | 0.072 | 0.092 | 0.110 | 0.127 | 0.155 | 0.177 | 0.197 |
| | 135 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 0.118 | 185 | 0.068 | 0.087 | 0.104 | 0.120 | 0.147 | 0.168 | 0.187 |
| | 125 | 0.041 | 0.052 | 0.062 | 0.072 | 0.088 | 0.100 | 0.112 | 170 | 0.064 | 0.082 | 0.099 | 0.113 | 0.139 | 0.158 | 0.177 |
| | 100 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 0.086 | 140 | 0.050 | 0.063 | 0.076 | 0.087 | 0.107 | 0.122 | 0.136 |
| | 150 | 0.045 | 0.058 | 0.070 | 0.080 | 0.098 | 0.112 | 0.125 | 205 | 0.072 | 0.092 | 0.110 | 0.127 | 0.155 | 0.177 | 0.197 |
| | 100 | 0.022 | 0.028 | 0.034 | 0.039 | 0.047 | 0.054 | 0.060 | 140 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 | 0.095 |
| | 75 | 0.027 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 0.075 | 115 | 0.043 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 | 0.119 |
| | 70 | 0.023 | 0.029 | 0.035 | 0.040 | 0.049 | 0.056 | 0.062 | 105 | 0.036 | 0.046 | 0.055 | 0.063 | 0.077 | 0.088 | 0.099 |
| | 85 | 0.030 | 0.038 | 0.046 | 0.052 | 0.064 | 0.073 | 0.082 | 125 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 | 0.129 |
| | 75 | 0.024 | 0.030 | 0.036 | 0.041 | 0.051 | 0.058 | 0.065 | 115 | 0.037 | 0.048 | 0.057 | 0.065 | 0.080 | 0.091 | 0.102 |
| | 310 | 0.078 | 0.100 | 0.120 | 0.138 | 0.169 | 0.193 | 0.215 | 455 | 0.124 | 0.158 | 0.190 | 0.218 | 0.266 | 0.305 | 0.340 |
| | 285 | 0.067 | 0.085 | 0.102 | 0.117 | 0.143 | 0.164 | 0.183 | 415 | 0.105 | 0.135 | 0.161 | 0.185 | 0.226 | 0.259 | 0.289 |
| | 230 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 | 0.151 | 340 | 0.087 | 0.111 | 0.133 | 0.153 | 0.187 | 0.213 | 0.238 |
| | 130 | 0.031 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 0.086 | 190 | 0.050 | 0.063 | 0.076 | 0.087 | 0.107 | 0.122 | 0.136 |
| | 205 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 | 0.151 | 300 | 0.087 | 0.111 | 0.133 | 0.153 | 0.187 | 0.213 | 0.238 |
| | 195 | 0.047 | 0.060 | 0.072 | 0.083 | 0.101 | 0.116 | 0.129 | 285 | 0.074 | 0.095 | 0.114 | 0.131 | 0.160 | 0.183 | 0.204 |
| | 825 | 0.066 | 0.084 | 0.101 | 0.116 | 0.142 | 0.162 | 0.181 | 985 | 0.092 | 0.117 | 0.140 | 0.161 | 0.197 | 0.225 | 0.252 |
| | 550 | 0.069 | 0.088 | 0.106 | 0.122 | 0.149 | 0.170 | 0.190 | 655 | 0.096 | 0.123 | 0.147 | 0.169 | 0.207 | 0.237 | 0.264 |
| | 440 | 0.073 | 0.093 | 0.111 | 0.128 | 0.156 | 0.178 | 0.199 | 525 | 0.101 | 0.129 | 0.154 | 0.178 | 0.217 | 0.248 | 0.277 |
| | 315 | 0.079 | 0.101 | 0.121 | 0.139 | 0.170 | 0.194 | 0.217 | 380 | 0.110 | 0.141 | 0.168 | 0.194 | 0.237 | 0.270 | 0.302 |
| | 315 | 0.053 | 0.067 | 0.081 | 0.093 | 0.113 | 0.130 | 0.145 | 380 | 0.073 | 0.094 | 0.112 | 0.129 | 0.158 | 0.180 | 0.201 |
| | 235 | 0.053 | 0.067 | 0.081 | 0.093 | 0.113 | 0.130 | 0.145 | 285 | 0.073 | 0.094 | 0.112 | 0.129 | 0.158 | 0.180 | 0.201 |
| | 395 | 0.033 | 0.042 | 0.050 | 0.058 | 0.071 | 0.081 | 0.090 | 470 | 0.046 | 0.059 | 0.070 | 0.081 | 0.099 | 0.113 | 0.126 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

| Correction factor: | |
|--------------------|---------------|
| Length | f_z & v_c |
| A/B | 1.0 |
| C | 0.9 |
| D | 0.7 |
| E | 0.6 |

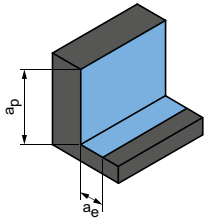
CPMill-Uni-Rough&Finish | CPM140

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| | P5 | P5.1 Cast steel | | | | ✓ |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2 | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ |
| | | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

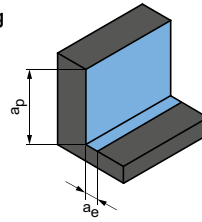
Roughing



$$a_p = 0.94 \times D$$

$$a_e = 0.25 \times D$$

Finishing



$$a_p = 0.94 \times D$$

$$a_e = 0.1 \times D$$

| | v_c [m/min] | f_z [mm] | | | | | | v_c [m/min] | f_z [mm] | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | Diameter of milling cutter [mm] | | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 250 | 0.036 | 0.043 | 0.050 | 0.061 | 0.070 | 0.078 | 335 | 0.057 | 0.069 | 0.079 | 0.096 | 0.110 | 0.123 |
| | 205 | 0.034 | 0.041 | 0.047 | 0.057 | 0.065 | 0.073 | 275 | 0.054 | 0.064 | 0.074 | 0.090 | 0.103 | 0.115 |
| | 225 | 0.036 | 0.043 | 0.050 | 0.061 | 0.070 | 0.078 | 305 | 0.057 | 0.069 | 0.079 | 0.096 | 0.110 | 0.123 |
| | 160 | 0.030 | 0.036 | 0.042 | 0.051 | 0.058 | 0.065 | 215 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.103 |
| | 145 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 0.075 | 200 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 | 0.119 |
| | 135 | 0.033 | 0.040 | 0.046 | 0.056 | 0.064 | 0.071 | 185 | 0.053 | 0.063 | 0.072 | 0.088 | 0.101 | 0.113 |
| | 125 | 0.031 | 0.038 | 0.043 | 0.053 | 0.060 | 0.067 | 170 | 0.050 | 0.060 | 0.068 | 0.084 | 0.096 | 0.107 |
| | 150 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 0.075 | 205 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 | 0.119 |
| | 310 | 0.060 | 0.072 | 0.083 | 0.102 | 0.116 | 0.130 | 455 | 0.096 | 0.114 | 0.132 | 0.161 | 0.184 | 0.205 |
| | 285 | 0.051 | 0.062 | 0.071 | 0.086 | 0.099 | 0.110 | 415 | 0.081 | 0.097 | 0.112 | 0.137 | 0.156 | 0.174 |
| | 230 | 0.042 | 0.051 | 0.058 | 0.071 | 0.081 | 0.091 | 340 | 0.067 | 0.080 | 0.092 | 0.113 | 0.129 | 0.144 |
| | 130 | 0.024 | 0.029 | 0.033 | 0.041 | 0.046 | 0.052 | 190 | 0.038 | 0.046 | 0.053 | 0.064 | 0.074 | 0.082 |
| | 205 | 0.042 | 0.051 | 0.058 | 0.071 | 0.081 | 0.091 | 300 | 0.067 | 0.080 | 0.092 | 0.113 | 0.129 | 0.144 |
| | 195 | 0.036 | 0.043 | 0.050 | 0.061 | 0.070 | 0.078 | 285 | 0.057 | 0.069 | 0.079 | 0.096 | 0.110 | 0.123 |
| | 825 | 0.051 | 0.061 | 0.070 | 0.085 | 0.098 | 0.109 | 985 | 0.071 | 0.085 | 0.097 | 0.119 | 0.136 | 0.152 |
| | 550 | 0.053 | 0.064 | 0.073 | 0.090 | 0.103 | 0.114 | 655 | 0.074 | 0.089 | 0.102 | 0.125 | 0.143 | 0.159 |
| | 440 | 0.056 | 0.067 | 0.077 | 0.094 | 0.107 | 0.120 | 525 | 0.078 | 0.093 | 0.107 | 0.131 | 0.150 | 0.167 |
| | 315 | 0.061 | 0.073 | 0.084 | 0.103 | 0.117 | 0.131 | 380 | 0.085 | 0.102 | 0.117 | 0.143 | 0.163 | 0.182 |
| | 315 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 | 0.087 | 380 | 0.057 | 0.068 | 0.078 | 0.095 | 0.109 | 0.121 |
| | 235 | 0.041 | 0.049 | 0.056 | 0.068 | 0.078 | 0.087 | 285 | 0.057 | 0.068 | 0.078 | 0.095 | 0.109 | 0.121 |
| | 395 | 0.025 | 0.030 | 0.035 | 0.043 | 0.049 | 0.055 | 470 | 0.035 | 0.042 | 0.049 | 0.059 | 0.068 | 0.076 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.





SHOULDER MILLING CUTTER – FINISHING

Universal application

OptiMill-Uni-HPC-Finish | CPMill-Uni-HPC-Finish _____ 134

Hardened steel

OptiMill-Hardened-Finish _____ 140

Non-ferrous metals

OptiMill-SPM-Finish _____ 145

Technical appendix

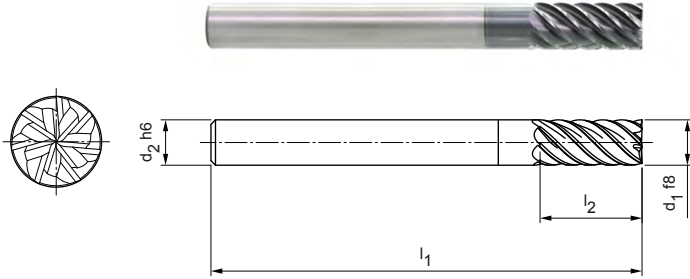
Cutting data recommendations _____ 146

OptiMill®-Uni-HPC-Finish

Shoulder milling cutter, 2xD design
SCM830

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP213
Number of cutting edges: 7
Helix angle: 45°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 4,00 | 6 | 57 | 11 | 0,04 | 7 | SCM830-0400Z07R-F0004HA2-HP213 | 30936070 |
| 5,00 | 6 | 57 | 13 | 0,05 | 7 | SCM830-0500Z07R-F0005HA2-HP213 | 30936071 |
| 6,00 | 6 | 57 | 13 | 0,06 | 7 | SCM830-0600Z07R-F0006HA2-HP213 | 30936072 |
| 8,00 | 8 | 63 | 19 | 0,08 | 7 | SCM830-0800Z07R-F0008HA2-HP213 | 30936073 |
| 10,00 | 10 | 72 | 22 | 0,10 | 7 | SCM830-1000Z07R-F0010HA2-HP213 | 30936074 |
| 12,00 | 12 | 83 | 26 | 0,12 | 7 | SCM830-1200Z07R-F0012HA2-HP213 | 30936076 |
| 14,00 | 14 | 83 | 26 | 0,14 | 7 | SCM830-1400Z07R-F0014HA2-HP213 | 30936077 |
| 16,00 | 16 | 92 | 32 | 0,16 | 7 | SCM830-1600Z07R-F0016HA2-HP213 | 30936078 |
| 20,00 | 20 | 104 | 41 | 0,20 | 7 | SCM830-2000Z07R-F0020HA2-HP213 | 30936090 |


Available on request

| | | | | | | | |
|-------|----|----|----|------|---|--------------------------------|----------|
| 18,00 | 18 | 92 | 32 | 0,18 | 7 | SCM830-1800Z07R-F0018HA2-HP213 | 30936079 |
|-------|----|----|----|------|---|--------------------------------|----------|

Configurable features



Shank form:
Shank form: HB



Specification:
SCM830-0400Z07R-F0004[shank form]2-HP213

Example:

SCM830-0400Z07R-F0004HB2-HP213

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

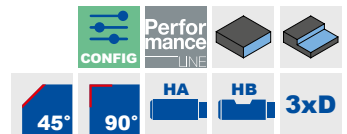
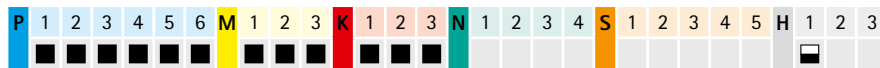
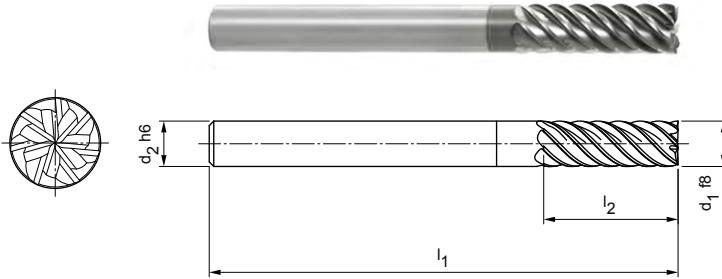
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Finish

Shoulder milling cutter, 3xD design
SCM830

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP213
Number of cutting edges: 7
Helix angle: ~ 45°
Special features: Unequal spacing


Design with chamfer | Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 4,00 | 6 | 62 | 16 | 0,04 | 7 | SCM830-0400Z07R-F0004HA3-HP213 | 30936093 |
| 5,00 | 6 | 62 | 17 | 0,05 | 7 | SCM830-0500Z07R-F0005HA3-HP213 | 30936094 |
| 6,00 | 6 | 62 | 18 | 0,06 | 7 | SCM830-0600Z07R-F0006HA3-HP213 | 30936095 |
| 8,00 | 8 | 68 | 24 | 0,08 | 7 | SCM830-0800Z07R-F0008HA3-HP213 | 30936096 |
| 10,00 | 10 | 80 | 30 | 0,10 | 7 | SCM830-1000Z07R-F0010HA3-HP213 | 30936098 |
| 12,00 | 12 | 93 | 36 | 0,12 | 7 | SCM830-1200Z07R-F0012HA3-HP213 | 30936099 |
| 14,00 | 14 | 99 | 42 | 0,14 | 7 | SCM830-1400Z07R-F0014HA3-HP213 | 30936110 |
| 16,00 | 16 | 108 | 48 | 0,16 | 7 | SCM830-1600Z07R-F0016HA3-HP213 | 30936111 |
| 20,00 | 20 | 126 | 60 | 0,20 | 7 | SCM830-2000Z07R-F0020HA3-HP213 | 30936114 |

Design with chamfer | Available on request

| | | | | | | | |
|-------|----|-----|----|------|---|--------------------------------|----------|
| 18,00 | 18 | 117 | 54 | 0,18 | 7 | SCM830-1800Z07R-F0018HA3-HP213 | 30936112 |
|-------|----|-----|----|------|---|--------------------------------|----------|

Design with sharp edge | Preferred series in stock

| | | | | | | | |
|-------|----|-----|----|---|---|-----------------------------|----------|
| 4,00 | 6 | 62 | 16 | - | 7 | SCM830-0400Z07R-S-HA3-HP213 | 31046210 |
| 5,00 | 6 | 62 | 17 | - | 7 | SCM830-0500Z07R-S-HA3-HP213 | 31046211 |
| 6,00 | 6 | 62 | 18 | - | 7 | SCM830-0600Z07R-S-HA3-HP213 | 31046212 |
| 8,00 | 8 | 68 | 24 | - | 7 | SCM830-0800Z07R-S-HA3-HP213 | 31046213 |
| 10,00 | 10 | 80 | 30 | - | 7 | SCM830-1000Z07R-S-HA3-HP213 | 31046214 |
| 12,00 | 12 | 93 | 36 | - | 7 | SCM830-1200Z07R-S-HA3-HP213 | 31046215 |
| 14,00 | 14 | 99 | 42 | - | 7 | SCM830-1400Z07R-S-HA3-HP213 | 31046216 |
| 16,00 | 16 | 108 | 48 | - | 7 | SCM830-1600Z07R-S-HA3-HP213 | 31046217 |
| 20,00 | 20 | 126 | 60 | - | 7 | SCM830-2000Z07R-S-HA3-HP213 | 31046219 |

Design with sharp edge | Available on request

| | | | | | | | |
|-------|----|-----|----|---|---|-----------------------------|----------|
| 18,00 | 18 | 117 | 54 | - | 7 | SCM830-1800Z07R-S-HA3-HP213 | 31046218 |
|-------|----|-----|----|---|---|-----------------------------|----------|

Configurable features


Shank form:
Shank form: HB


Specification:

SCM830-0400Z07R-F0004[shank form]3-HP213

Example:

SCM830-0400Z07R-F0004HB3-HP213

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

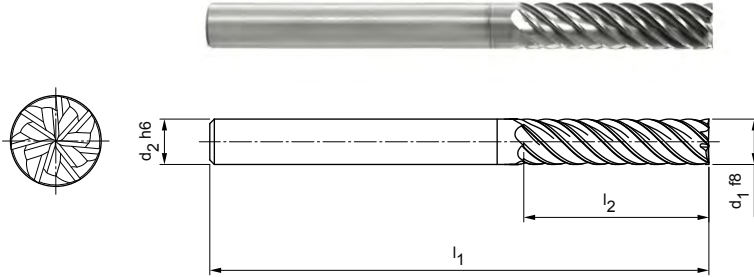
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Finish

Shoulder milling cutter, 4xD design
SCM830

Design:

Diameter of milling cutter: 6.00 - 25.00 mm
Cutting material: HP213
Number of cutting edges: 7
Helix angle: 45°
Special features: Unequal spacing



Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 6,00 | 6 | 66 | 24 | 0,06 | 7 | SCM830-0600Z07R-F0006HA4-HP209 | 30936116 |
| 8,00 | 8 | 74 | 32 | 0,08 | 7 | SCM830-0800Z07R-F0008HA4-HP209 | 30936117 |
| 10,00 | 10 | 89 | 40 | 0,10 | 7 | SCM830-1000Z07R-F0010HA4-HP209 | 30936118 |
| 12,00 | 12 | 100 | 48 | 0,12 | 7 | SCM830-1200Z07R-F0012HA4-HP209 | 30936119 |
| 14,00 | 14 | 122 | 70 | 0,14 | 7 | SCM830-1400Z07R-F0014HA4-HP209 | 30936131 |
| 16,00 | 16 | 123 | 64 | 0,16 | 7 | SCM830-1600Z07R-F0016HA4-HP209 | 30936132 |
| 20,00 | 20 | 140 | 80 | 0,20 | 7 | SCM830-2000Z07R-F0020HA4-HP209 | 30936134 |

Available on request

| | | | | | | | |
|-------|----|-----|-----|------|---|--------------------------------|----------|
| 18,00 | 18 | 130 | 72 | 0,18 | 7 | SCM830-1800Z07R-F0018HA4-HP209 | 30936133 |
| 25,00 | 25 | 170 | 100 | 0,25 | 7 | SCM830-2500Z07R-F0025HA4-HP209 | 30936136 |

Configurable features

Shank form:
Shank form: HB

Specification:
SCM830-0600Z07R-F0006[shank form]4-HP209

Example:

SCM830-0600Z07R-F0006HB4-HP209

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

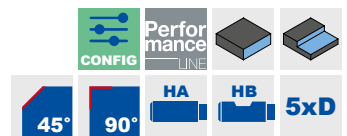
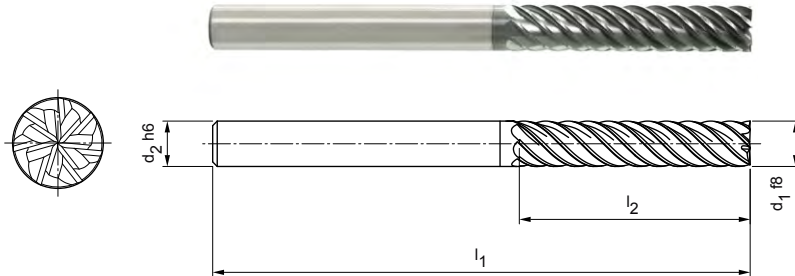
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Finish

Shoulder milling cutter, 5xD design
SCM830

Design:

Diameter of milling cutter: 8.00 - 25.00 mm
Cutting material: HP209
Number of cutting edges: 7
Helix angle: ~ 45°
Special features: Unequal spacing



Design with chamfer | Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | |
| 8,00 | 8 | 81 | 40 | 0,08 | 7 | SCM830-0800Z07R-F0008HA5-HP209 | 30936137 |
| 10,00 | 10 | 96 | 50 | 0,10 | 7 | SCM830-1000Z07R-F0010HA5-HP209 | 30936138 |
| 12,00 | 12 | 112 | 60 | 0,12 | 7 | SCM830-1200Z07R-F0012HA5-HP209 | 30936139 |
| 14,00 | 14 | 122 | 70 | 0,14 | 7 | SCM830-1400Z07R-F0014HA5-HP209 | 30936150 |
| 16,00 | 16 | 136 | 80 | 0,16 | 7 | SCM830-1600Z07R-F0016HA5-HP209 | 30936151 |
| 20,00 | 20 | 160 | 100 | 0,20 | 7 | SCM830-2000Z07R-F0020HA5-HP209 | 30936153 |

Design with chamfer | Available on request

| | | | | | | | |
|-------|----|-----|-----|------|---|--------------------------------|----------|
| 18,00 | 18 | 147 | 90 | 0,18 | 7 | SCM830-1800Z07R-F0018HA5-HP209 | 30936152 |
| 25,00 | 25 | 195 | 125 | 0,25 | 7 | SCM830-2500Z07R-F0025HA5-HP209 | 30936154 |

Edge design with sharp edge

| | | | | | | | |
|-------|----|-----|-----|---|---|-----------------------------|----------|
| 8,00 | 8 | 81 | 40 | - | 7 | SCM830-0800Z07R-S-HA5-HP209 | 31046449 |
| 10,00 | 10 | 96 | 50 | - | 7 | SCM830-1000Z07R-S-HA5-HP209 | 31046470 |
| 12,00 | 12 | 112 | 60 | - | 7 | SCM830-1200Z07R-S-HA5-HP209 | 31046471 |
| 14,00 | 14 | 122 | 70 | - | 7 | SCM830-1400Z07R-S-HA5-HP209 | 31046473 |
| 16,00 | 16 | 136 | 80 | - | 7 | SCM830-1600Z07R-S-HA5-HP209 | 31046474 |
| 20,00 | 20 | 160 | 100 | - | 7 | SCM830-2000Z07R-S-HA5-HP209 | 31046476 |

Design with sharp edge | Available on request

| | | | | | | | |
|-------|----|-----|-----|---|---|-----------------------------|----------|
| 18,00 | 18 | 147 | 90 | - | 7 | SCM830-1800Z07R-S-HA5-HP209 | 31046475 |
| 25,00 | 25 | 195 | 125 | - | 7 | SCM830-2500Z07R-S-HA5-HP209 | 31046477 |

Configurable features



Shank form:
Shank form: HB



Specification:

SCM830-0800Z07R-F0008[shank form]5-HP209

Example:

SCM830-0800Z07R-F0008HB5-HP209

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

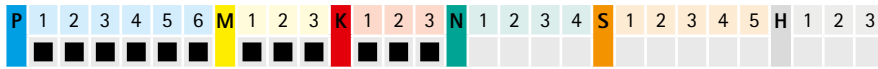
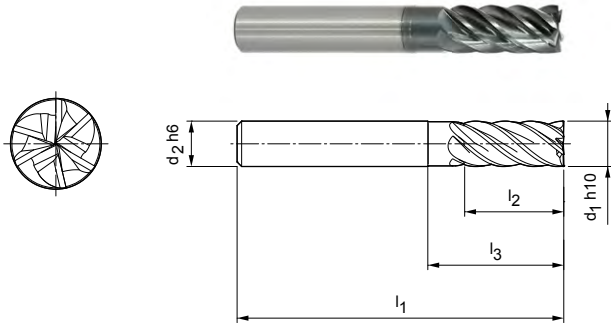
Special designs and other coatings available upon request.

OptiMill®-Uni-HPC-Finish

Shoulder milling cutter, long design with neck
SCM370

Design:


Diameter of milling cutter: 6.00 - 20.00 mm
Cutting material: HP213
Number of cutting edges: 6
Helix angle: 39°/41°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|---|----------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | l ₃ | | | |
| 6,00 | 6 | 57 | 15 | 20 | 6 | SCM370-0600Z06R-S-HA-HP213 | 30393541 |
| 8,00 | 8 | 63 | 21 | 25 | 6 | SCM370-0800Z06R-S-HA-HP213 | 30393542 |
| 10,00 | 10 | 72 | 22 | 30 | 6 | SCM370-1000Z06R-S-HA-HP213 | 30393543 |
| 12,00 | 12 | 83 | 26 | 36 | 6 | SCM370-1200Z06R-S-HA-HP213 | 30393544 |
| 16,00 | 16 | 92 | 36 | 42 | 6 | SCM370-1600Z06R-S-HA-HP213 | 30393545 |
| 20,00 | 20 | 104 | 41 | 55 | 6 | SCM370-2000Z06R-S-HA-HP213 | 30393546 |

Configurable features



Shank form:
Shank form: HB



Specification:
SCM370-0600Z06R-S-[shank form]-HP213

Example:

SCM370-0600Z06R-S-**HB**-HP213

_____ Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

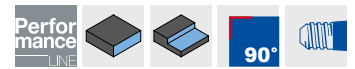
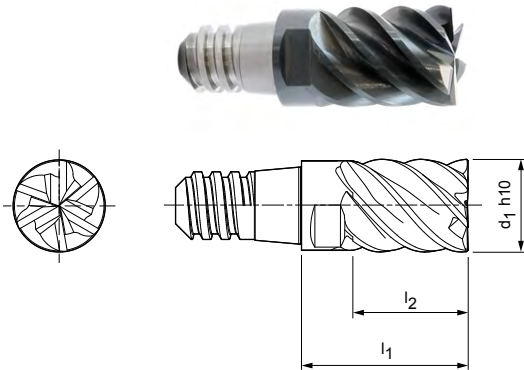
Special designs and other coatings available upon request.

CPMill®-Uni-HPC-Finish

Shoulder milling cutter, design with CFS connection
CPM130

Design:

Diameter of milling cutter: 8.00 – 25.00 mm
Cutting material: HP383
Number of cutting edges: 6
Helix angle: 45°
Special features: Unequal spacing




Preferred series in stock

| Dimensions | | | | z | a _p max. | SW | Specification | Order no. |
|--------------------|----------|----------------|----------------|---|---------------------|-------|---------------------------|-----------|
| d ₁ h10 | CFS size | l ₁ | l ₂ | | | | | |
| 8,00 | 6 | 15 | 10 | 6 | 7,5 | SW 6 | CPM130-0800Z06-S-06-HP383 | 30371380 |
| 10,00 | 8 | 18 | 12,5 | 6 | 9,4 | SW 8 | CPM130-1000Z06-S-08-HP383 | 30371381 |
| 12,00 | 10 | 22 | 15 | 6 | 11,3 | SW 10 | CPM130-1200Z06-S-10-HP383 | 30371382 |
| 16,00 | 12 | 28 | 20 | 6 | 15 | SW 13 | CPM130-1600Z06-S-12-HP383 | 30371383 |
| 20,00 | 16 | 35 | 25 | 6 | 18,8 | SW 16 | CPM130-2000Z06-S-16-HP383 | 30371386 |

Available on request

| | | | | | | | | |
|-------|----|----|----|---|------|-------|---------------------------|----------|
| 25,00 | 20 | 45 | 32 | 6 | 23,4 | SW 21 | CPM130-2500Z06-S-20-HP383 | 30371387 |
|-------|----|----|----|---|------|-------|---------------------------|----------|

Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Hardened-Finish

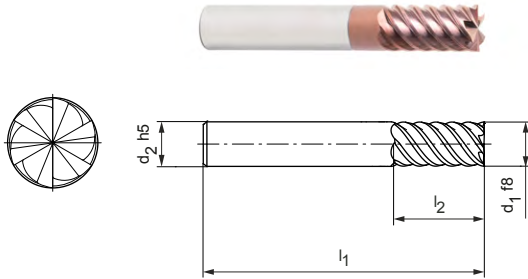
Shoulder milling cutter, 2xD design
SCM104

Design:

Diameter of milling cutter: 4.00 - 25.00 mm
Cutting material: HP808
Number of cutting edges: 6
Helix angle: 55°

Application:

For finishing of parts with a hardness of 45 HRC.



Design with sharp edge | Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|---|---|-----------------------------|-----------|
| d ₁ f8 | d ₂ h5 | l ₁ | l ₂ | R | | | |
| 4,00 | 6 | 57 | 11 | - | 6 | SCM104-0400Z06R-S-HA2-HP808 | 31152764 |
| 5,00 | 6 | 57 | 13 | - | 6 | SCM104-0500Z06R-S-HA2-HP808 | 31152765 |
| 6,00 | 6 | 57 | 13 | - | 6 | SCM104-0600Z06R-S-HA2-HP808 | 31152766 |
| 8,00 | 8 | 63 | 19 | - | 6 | SCM104-0800Z06R-S-HA2-HP808 | 31152767 |
| 10,00 | 10 | 72 | 22 | - | 6 | SCM104-1000Z06R-S-HA2-HP808 | 31152768 |
| 12,00 | 12 | 83 | 26 | - | 6 | SCM104-1200Z06R-S-HA2-HP808 | 31152769 |
| 16,00 | 16 | 92 | 32 | - | 6 | SCM104-1600Z06R-S-HA2-HP808 | 31152771 |

Design with sharp edge | Available on request

| | | | | | | | |
|-------|----|-----|----|---|---|-----------------------------|----------|
| 20,00 | 20 | 104 | 41 | - | 6 | SCM104-2000Z06R-S-HA2-HP808 | 31152773 |
| 25,00 | 25 | 125 | 50 | - | 6 | SCM104-2500Z06R-S-HA2-HP808 | 31152774 |

Design with corner radius | Preferred series in stock

| | | | | | | | |
|-------|----|----|----|-----|---|--------------------------------|----------|
| 4,00 | 6 | 57 | 11 | 0,5 | 6 | SCM104-0400Z06R-R0050HA2-HP808 | 31199098 |
| 5,00 | 6 | 57 | 13 | 0,5 | 6 | SCM104-0500Z06R-R0050HA2-HP808 | 31199099 |
| 5,00 | 6 | 57 | 13 | 1 | 6 | SCM104-0500Z06R-R0100HA2-HP808 | 31199100 |
| 6,00 | 6 | 57 | 13 | 0,5 | 6 | SCM104-0600Z06R-R0050HA2-HP808 | 31199101 |
| 6,00 | 6 | 57 | 13 | 1 | 6 | SCM104-0600Z06R-R0100HA2-HP808 | 31199102 |
| 8,00 | 8 | 63 | 19 | 0,5 | 6 | SCM104-0800Z06R-R0050HA2-HP808 | 31199103 |
| 8,00 | 8 | 63 | 19 | 1 | 6 | SCM104-0800Z06R-R0100HA2-HP808 | 31199104 |
| 10,00 | 10 | 72 | 22 | 0,5 | 6 | SCM104-1000Z06R-R0050HA2-HP808 | 31199105 |
| 10,00 | 10 | 72 | 22 | 1 | 6 | SCM104-1000Z06R-R0100HA2-HP808 | 31199106 |
| 12,00 | 12 | 83 | 26 | 0,5 | 6 | SCM104-1200Z06R-R0050HA2-HP808 | 31199107 |
| 12,00 | 12 | 83 | 26 | 1 | 6 | SCM104-1200Z06R-R0100HA2-HP808 | 31199108 |
| 16,00 | 16 | 92 | 32 | 0,5 | 6 | SCM104-1600Z06R-R0050HA2-HP808 | 31199109 |
| 16,00 | 16 | 92 | 32 | 1 | 6 | SCM104-1600Z06R-R0100HA2-HP808 | 31199110 |
| 16,00 | 16 | 92 | 32 | 2 | 6 | SCM104-1600Z06R-R0200HA2-HP808 | 31199111 |

Design with corner radius | Available on request

| | | | | | | | |
|-------|----|-----|----|---|---|--------------------------------|----------|
| 20,00 | 20 | 104 | 41 | 1 | 6 | SCM104-2000Z06R-R0100HA2-HP808 | 31199112 |
| 25,00 | 20 | 104 | 41 | 2 | 6 | SCM104-2500Z06R-R0200HA2-HP808 | 31199113 |

Configurable features



Shank form:
Shank form: HB

**Specification:**

SCM104-0400Z06R-S-[shank form]2-HP808

Example:

SCM104-0400Z06R-S-**HB**4-HP808

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Hardened-Finish

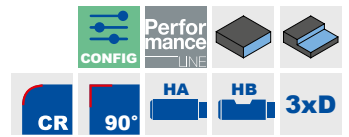
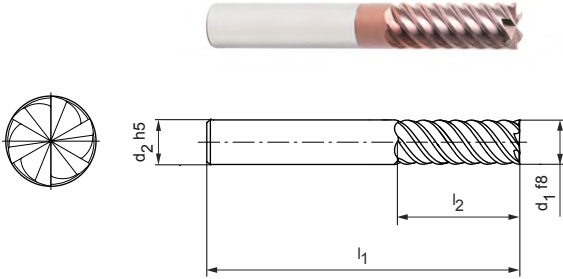
Shoulder milling cutter, 3xD design
SCM104

Design:

Diameter of milling cutter: 4.00 - 25.00 mm
Cutting material: HP808
Number of cutting edges: 6
Helix angle: 55°

Application:

For finishing of parts with a hardness of 45 HRC.



Design with sharp edge | Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|---|---|-----------------------------|-----------|
| d ₁ f8 | d ₂ h5 | l ₁ | l ₂ | R | | | |
| 4,00 | 6 | 62 | 16 | - | 6 | SCM104-0400Z06R-S-HA3-HP808 | 31152775 |
| 5,00 | 6 | 62 | 17 | - | 6 | SCM104-0500Z06R-S-HA3-HP808 | 31152776 |
| 6,00 | 6 | 62 | 18 | - | 6 | SCM104-0600Z06R-S-HA3-HP808 | 31152777 |
| 8,00 | 8 | 68 | 24 | - | 6 | SCM104-0800Z06R-S-HA3-HP808 | 31152778 |
| 10,00 | 10 | 80 | 30 | - | 6 | SCM104-1000Z06R-S-HA3-HP808 | 31152779 |
| 12,00 | 12 | 93 | 36 | - | 6 | SCM104-1200Z06R-S-HA3-HP808 | 31152780 |
| 16,00 | 16 | 108 | 48 | - | 6 | SCM104-1600Z06R-S-HA3-HP808 | 31152782 |

Design with sharp edge | Available on request

| | | | | | | | |
|-------|----|-----|----|---|---|-----------------------------|----------|
| 20,00 | 20 | 126 | 60 | - | 6 | SCM104-2000Z06R-S-HA3-HP808 | 31152785 |
| 25,00 | 25 | 150 | 75 | - | 6 | SCM104-2500Z06R-S-HA3-HP808 | 31152786 |


Design with corner radius | Preferred series in stock

| | | | | | | | |
|-------|----|-----|----|-----|---|--------------------------------|----------|
| 4,00 | 6 | 62 | 16 | 0,5 | 6 | SCM104-0400Z06R-R0050HA3-HP808 | 31199114 |
| 5,00 | 6 | 62 | 17 | 0,5 | 6 | SCM104-0500Z06R-R0050HA3-HP808 | 31199115 |
| 5,00 | 6 | 62 | 17 | 1 | 6 | SCM104-0500Z06R-R0100HA3-HP808 | 31199116 |
| 6,00 | 6 | 62 | 18 | 0,5 | 6 | SCM104-0600Z06R-R0050HA3-HP808 | 31199117 |
| 6,00 | 6 | 62 | 18 | 1 | 6 | SCM104-0600Z06R-R0100HA3-HP808 | 31199118 |
| 8,00 | 8 | 68 | 24 | 0,5 | 6 | SCM104-0800Z06R-R0050HA3-HP808 | 31199119 |
| 8,00 | 8 | 68 | 24 | 1 | 6 | SCM104-0800Z06R-R0100HA3-HP808 | 31199120 |
| 10,00 | 10 | 80 | 30 | 0,5 | 6 | SCM104-1000Z06R-R0050HA3-HP808 | 31199121 |
| 10,00 | 10 | 80 | 30 | 1 | 6 | SCM104-1000Z06R-R0100HA3-HP808 | 31199122 |
| 12,00 | 12 | 93 | 36 | 0,5 | 6 | SCM104-1200Z06R-R0050HA3-HP808 | 31199123 |
| 12,00 | 12 | 93 | 36 | 1 | 6 | SCM104-1200Z06R-R0100HA3-HP808 | 31199124 |
| 16,00 | 16 | 108 | 48 | 0,5 | 6 | SCM104-1600Z06R-R0050HA3-HP808 | 31199125 |
| 16,00 | 16 | 108 | 48 | 1 | 6 | SCM104-1600Z06R-R0100HA3-HP808 | 31199126 |
| 16,00 | 16 | 108 | 48 | 2 | 6 | SCM104-1600Z06R-R0200HA3-HP808 | 31199127 |


Design with corner radius | Available on request

| | | | | | | | |
|-------|----|-----|----|---|---|--------------------------------|----------|
| 20,00 | 20 | 126 | 60 | 1 | 6 | SCM104-2000Z06R-R0100HA2-HP808 | 31199128 |
| 20,00 | 20 | 126 | 60 | 2 | 6 | SCM104-2000Z06R-R0200HA2-HP808 | 31199129 |

Configurable features



Shank form:
Shank form: HB



Specification:
SCM104-0400Z06R-S-[shank form]3-HP808

Example:
SCM104-0400Z06R-S-**HB3**-HP808

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Hardened-Finish

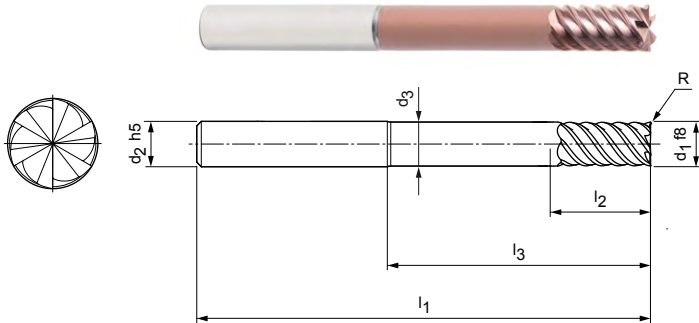
Shoulder milling cutter, extra long design with neck
SCM124

Design:

Diameter of milling cutter: 6.00 - 20.00 mm
Cutting material: HP808
Number of cutting edges: 6
Helix angle: 55°

Application:

For finishing of parts with a hardness of 45 HRC.



Design with sharp edge | Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|-----|---|---|----------------------------|-----------|
| d1 f8 | d2 h5 | d3 | l1 | l2 | l3 | R | | | |
| 6,00 | 6 | 5,8 | 80 | 13 | 42 | - | 6 | SCM124-0600Z06R-S-HA-HP808 | 31199092 |
| 8,00 | 8 | 7,8 | 100 | 21 | 62 | - | 6 | SCM124-0800Z06R-S-HA-HP808 | 31199093 |
| 10,00 | 10 | 9,7 | 100 | 22 | 58 | - | 6 | SCM124-1000Z06R-S-HA-HP808 | 31199094 |
| 12,00 | 12 | 11,7 | 120 | 26 | 73 | - | 6 | SCM124-1200Z06R-S-HA-HP808 | 31199095 |
| 16,00 | 16 | 15,6 | 150 | 36 | 100 | - | 6 | SCM124-1600Z06R-S-HA-HP808 | 31199096 |

Design with sharp edge | Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|---|---|----------------------------|----------|
| 20,00 | 20 | 19,5 | 150 | 41 | 98 | - | 6 | SCM124-2000Z06R-S-HA-HP808 | 31199097 |
|-------|----|------|-----|----|----|---|---|----------------------------|----------|


Design with corner radius | Preferred series in stock

| | | | | | | | | | |
|-------|----|------|-----|----|-----|-----|---|-------------------------------|----------|
| 6,00 | 6 | 5,8 | 80 | 13 | 42 | 0,5 | 6 | SCM124-0600Z06R-R0050HA-HP808 | 31199130 |
| 6,00 | 6 | 5,8 | 80 | 13 | 42 | 1 | 6 | SCM124-0600Z06R-R0100HA-HP808 | 31199131 |
| 8,00 | 8 | 7,8 | 100 | 21 | 62 | 0,5 | 6 | SCM124-0800Z06R-R0050HA-HP808 | 31199132 |
| 8,00 | 8 | 7,8 | 100 | 21 | 62 | 1 | 6 | SCM124-0800Z06R-R0100HA-HP808 | 31199133 |
| 10,00 | 10 | 9,7 | 100 | 22 | 58 | 0,5 | 6 | SCM124-1000Z06R-R0050HA-HP808 | 31199134 |
| 10,00 | 10 | 9,7 | 100 | 22 | 58 | 1 | 6 | SCM124-1000Z06R-R0100HA-HP808 | 31199135 |
| 12,00 | 12 | 11,7 | 120 | 26 | 73 | 0,5 | 6 | SCM124-1200Z06R-R0050HA-HP808 | 31199136 |
| 12,00 | 12 | 11,7 | 120 | 26 | 73 | 1 | 6 | SCM124-1200Z06R-R0100HA-HP808 | 31199137 |
| 16,00 | 16 | 15,6 | 150 | 36 | 100 | 0,5 | 6 | SCM124-1600Z06R-R0050HA-HP808 | 31199138 |
| 16,00 | 16 | 15,6 | 150 | 36 | 100 | 1 | 6 | SCM124-1600Z06R-R0100HA-HP808 | 31199139 |
| 16,00 | 16 | 15,6 | 150 | 36 | 100 | 2 | 6 | SCM124-1600Z06R-R0200HA-HP808 | 31199140 |


Design with corner radius | Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|---|---|-------------------------------|----------|
| 20,00 | 20 | 19,5 | 150 | 41 | 98 | 1 | 6 | SCM124-2000Z06R-R0100HA-HP808 | 31199141 |
| 20,00 | 20 | 19,5 | 150 | 41 | 98 | 2 | 6 | SCM124-2000Z06R-R0200HA-HP808 | 31199142 |

Configurable features



Shank form:
Shank form: HB



Specification:
SCM124-0600Z06R-S-[shank form]-HP808

Example:

SCM124-0600Z06R-S-HB-HP808

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.
Special designs and other coatings available upon request.

OptiMill®-SPM-Finish

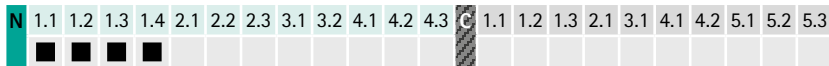
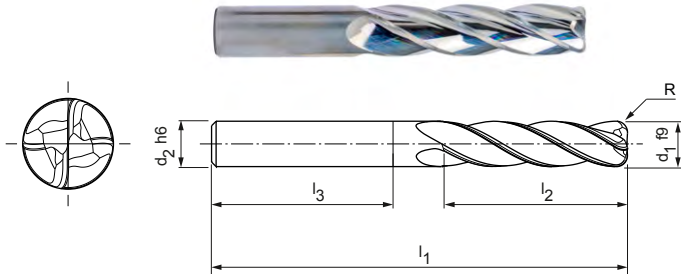
Shoulder milling cutter, 4xD design
SCM970

Design:

Diameter of milling cutter: 12.00 - 25.00 mm
Cutting material: HU019
Number of cutting edges: 4
Helix angle: 31°

Application:

Finishing of structural parts made of aluminium. Machining of deep pockets and delicate component structures even with large wrappings without "pull effect" (for example at the pocket corners).



Metric dimensions | Preferred series in stock

| Dimensions | | | | | | z | Specification | Order no. |
|-------------------------------|-------------------------------|----------------|----------------|----------------|---|---|-------------------------------|-----------|
| d ₁ f ₉ | d ₂ h ₆ | l ₁ | l ₂ | l ₄ | R | | | |
| 12,00 | 12 | 100 | 48 | 45 | 2 | 4 | SCM970-1200Z04R-R0200HA-HU019 | 31111852 |
| 12,00 | 12 | 100 | 48 | 45 | 3 | 4 | SCM970-1200Z04R-R0300HA-HU019 | 31082278 |
| 16,00 | 16 | 123 | 64 | 48 | 3 | 4 | SCM970-1600Z04R-R0300HA-HU019 | 31082280 |
| 16,00 | 16 | 123 | 64 | 48 | 4 | 4 | SCM970-1600Z04R-R0400HA-HU019 | 31082281 |
| 20,00 | 20 | 140 | 80 | 50 | 3 | 4 | SCM970-2000Z04R-R0300HA-HU019 | 31082283 |
| 20,00 | 20 | 140 | 80 | 50 | 4 | 4 | SCM970-2000Z04R-R0400HA-HU019 | 31082284 |

Metric dimensions | Available upon request

| | | | | | | | | |
|-------|----|-----|-----|----|---|---|-------------------------------|----------|
| 25,00 | 25 | 170 | 100 | 56 | 3 | 4 | SCM970-2500Z04R-R0300HA-HU019 | 31082285 |
| 25,00 | 25 | 170 | 100 | 56 | 3 | 4 | SCM970-2500Z04R-R0300HB-HU019 | 31190883 |

Inch dimensions | Available upon request

| | | | | | | | | |
|------|------|--------|----|--------|-------|---|-------------------------------|----------|
| 1/2" | 1/2" | 4" | 2" | 1,771" | 0,12" | 4 | SCM970-1270Z04R-R0300HA-HU019 | 31082279 |
| 3/4" | 3/4" | 5 1/2" | 3" | 1,968" | 0,12" | 4 | SCM970-1905Z04R-R0300HA-HU019 | 31082282 |

Configurable features



Shank form:
Shank form: HB



Specification:

SCM970-1200Z04R-R0200[shank form]-HU019

Example:

SCM970-1200Z04R-R0200HB-HU019

Shank form HB

Dimensions in mm.

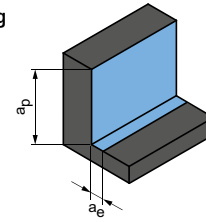
For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

Finishing



$$a_p = 1.5 \times D$$

$$a_e = 0.1 \times D$$

OptiMill-Uni-HPC-Finish | SCM370, 830

| MMG* | Workpiece material | | | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/ min] | f _z [mm] | | | | | | | |
|------|--------------------|------|--|--|---------|-----|---------|-------------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | |
| | | | | | | | | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 385 | 0.042 | 0.06 | 0.077 | 0.093 | 0.106 | 0.13 | 0.149 | 0.166 |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 315 | 0.039 | 0.056 | 0.072 | 0.086 | 0.099 | 0.121 | 0.139 | 0.155 |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 350 | 0.042 | 0.06 | 0.077 | 0.093 | 0.106 | 0.13 | 0.149 | 0.166 |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 245 | 0.035 | 0.05 | 0.064 | 0.077 | 0.089 | 0.108 | 0.124 | 0.138 |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 225 | 0.041 | 0.058 | 0.075 | 0.089 | 0.103 | 0.126 | 0.144 | 0.16 |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 210 | 0.039 | 0.055 | 0.071 | 0.085 | 0.097 | 0.119 | 0.136 | 0.152 |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 190 | 0.036 | 0.052 | 0.067 | 0.08 | 0.092 | 0.113 | 0.129 | 0.144 |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | ✓ | ✓ | 155 | 0.028 | 0.04 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.11 |
| | P5 | P5.1 | Cast steel | | | | ✓ | 235 | 0.041 | 0.058 | 0.075 | 0.089 | 0.103 | 0.126 | 0.144 | 0.16 |
| | P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | | | ✓ | 155 | 0.02 | 0.028 | 0.036 | 0.043 | 0.05 | 0.061 | 0.069 | 0.077 |
| M | M1 | M1.1 | Stainless steels, austenitic | < 700 | ✓ | ✓ | ✓ | 130 | 0.025 | 0.035 | 0.045 | 0.054 | 0.062 | 0.076 | 0.087 | 0.097 |
| | | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 120 | 0.02 | 0.029 | 0.037 | 0.045 | 0.051 | 0.063 | 0.072 | 0.08 |
| | M2 | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | ✓ | ✓ | 145 | 0.027 | 0.038 | 0.049 | 0.059 | 0.067 | 0.082 | 0.094 | 0.105 |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ | 130 | 0.021 | 0.03 | 0.039 | 0.046 | 0.053 | 0.065 | 0.074 | 0.083 |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 520 | 0.07 | 0.101 | 0.129 | 0.154 | 0.177 | 0.216 | 0.248 | 0.276 |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 475 | 0.06 | 0.086 | 0.109 | 0.131 | 0.151 | 0.184 | 0.21 | 0.235 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 390 | 0.049 | 0.071 | 0.09 | 0.108 | 0.124 | 0.152 | 0.173 | 0.193 |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 215 | 0.028 | 0.04 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.11 |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 345 | 0.049 | 0.071 | 0.09 | 0.108 | 0.124 | 0.152 | 0.173 | 0.193 |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 325 | 0.042 | 0.06 | 0.077 | 0.093 | 0.106 | 0.13 | 0.149 | 0.166 |

Factors for tool lengths 3xD/4xD/5xD ***

| Max. machining depth a _p | a _e max. | Correction factors | |
|--|---------------------|--------------------|----------------|
| | | v _c | f _z |
| 3xD | 0,1xD | 0,9 | 0,9 |
| 4xD | 0,05xD | 0,9 | 0,7 |
| 5xD | 0,05xD | 0,8 | 0,6 |

* MAPAL machining groups

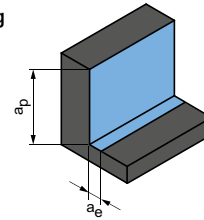
** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** In order to achieve very good surface results, the feed rate must be reduced further.

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Finishing



$$a_p = 0.94 \times D$$

$$a_e = 0.1 \times D$$

CPMill-Uni-HPC-Finish | CPM130

| MMG* | Workpiece material | | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | |
|------|--------------------|------------|--|---------|-----|---------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | |
| | | | | | | | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 385 | 0.057 | 0.069 | 0.079 | 0.096 | 0.11 | 0.123 |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 315 | 0.054 | 0.064 | 0.074 | 0.09 | 0.103 | 0.115 |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 350 | 0.057 | 0.069 | 0.079 | 0.096 | 0.11 | 0.123 |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 245 | 0.048 | 0.057 | 0.066 | 0.08 | 0.092 | 0.103 |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 225 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 | 0.119 |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 210 | 0.053 | 0.063 | 0.072 | 0.088 | 0.101 | 0.113 |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 190 | 0.05 | 0.06 | 0.068 | 0.084 | 0.096 | 0.107 |
| P5 | P5.1 | Cast steel | | | | ✓ | 235 | 0.055 | 0.066 | 0.076 | 0.093 | 0.107 | 0.119 | |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 520 | 0.096 | 0.114 | 0.132 | 0.161 | 0.184 | 0.205 |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 475 | 0.081 | 0.097 | 0.112 | 0.137 | 0.156 | 0.174 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | 390 | 0.067 | 0.08 | 0.092 | 0.113 | 0.129 | 0.144 |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 215 | 0.038 | 0.046 | 0.053 | 0.064 | 0.074 | 0.082 |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 345 | 0.067 | 0.08 | 0.092 | 0.113 | 0.129 | 0.144 |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 325 | 0.057 | 0.069 | 0.079 | 0.096 | 0.11 | 0.123 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group. The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for shoulder milling cutters

Feed and cutting speed

OptiMill-Hardened-Finish | SCM104

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|--------------------|--|---------|---------|---------|---|
| | | | Dry | Air/MQL | Coolant | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ |
| | P4.1 | Stainless steels, ferritic and martensitic | | | ✓ | ✓ |
| | P5.1 | Cast steel | | | ✓ | ✓ |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | | ✓ | ✓ |
| M | M1.1 | Stainless steels, austenitic | < 700 | | | ✓ |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | | | ✓ |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| H | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | |
| | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | |
| | H2.1 | Hardened steel / cast steel | < 60 | | ✓ | |
| | H2.2 | Hardened steel / cast steel | < 65 | | ✓ | |
| | H2.3 | Hardened steel / cast steel | < 68 | | ✓ | |
| | H3.1 | Wear-resistant cast/chill casting, GJN | | ✓ | ✓ | |

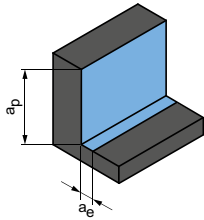
OptiMill-SPM-Finish | SCM970

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|--------------------|---|---------|-----|---------|
| | | | MQL/Air | Dry | Coolant |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ |
| | N1.3 | Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ |
| | N1.4 | Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ |

* MAPAL machining groups

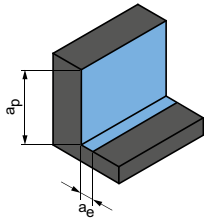
** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Finishing



| | a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | | | |
|--|----------------------------|----------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 14.00 | 16.00 | 18.00 | 20.00 |
| | 100 | 2 | 200 - 220 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 | 0.118 | 0.131 |
| | 100 | 2 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 | 0.112 | 0.124 |
| | 100 | 2 | 180 - 200 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 | 0.118 | 0.131 |
| | 100 | 2 | 160 - 180 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 | 0.112 | 0.124 |
| | 100 | 2 | 180 - 200 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 | 0.118 | 0.131 |
| | 100 | 2 | 160 - 180 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 | 0.112 | 0.124 |
| | 100 | 2 | 140 - 160 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 | 0.100 | 0.111 |
| | 100 | 2 | 140 - 160 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 | 0.100 | 0.111 |
| | 100 | 2 | 140 - 160 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 | 0.100 | 0.111 |
| | 100 | 2 | 150 - 170 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 | 0.106 | 0.118 |
| | 100 | 1.8 | 110 - 130 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 | 0.106 | 0.118 |
| | 100 | 1.5 | 90 - 110 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 | 0.100 | 0.111 |
| | 100 | 1.8 | 110 - 130 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 | 0.106 | 0.118 |
| | 100 | 1.5 | 90 - 130 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 | 0.100 | 0.111 |
| | 100 | 2 | 200 - 220 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 | 0.118 | 0.131 |
| | 100 | 2 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 | 0.112 | 0.124 |
| | 100 | 2 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 | 0.112 | 0.124 |
| | 100 | 2 | 170 - 190 | 0.023 | 0.027 | 0.036 | 0.045 | 0.059 | 0.068 | 0.081 | 0.095 | 0.106 | 0.118 |
| | 100 | 2 | 200 - 220 | 0.025 | 0.030 | 0.040 | 0.050 | 0.065 | 0.075 | 0.090 | 0.105 | 0.118 | 0.131 |
| | 100 | 2 | 180 - 200 | 0.024 | 0.029 | 0.038 | 0.048 | 0.062 | 0.071 | 0.086 | 0.100 | 0.112 | 0.124 |
| | 100 | 1.5 | 110 - 130 | 0.021 | 0.026 | 0.034 | 0.043 | 0.055 | 0.064 | 0.077 | 0.089 | 0.100 | 0.111 |
| | 100 | 1.2 | 90 - 115 | 0.018 | 0.021 | 0.028 | 0.035 | 0.046 | 0.053 | 0.063 | 0.074 | 0.082 | 0.092 |
| | 100 | 0.8 | 80 - 100 | 0.015 | 0.018 | 0.024 | 0.030 | 0.039 | 0.045 | 0.054 | 0.063 | 0.071 | 0.079 |
| | 100 | 0.6 | 70 - 90 | 0.013 | 0.015 | 0.020 | 0.025 | 0.033 | 0.038 | 0.045 | 0.053 | 0.059 | 0.066 |
| | 100 | 0.4 | 60 - 85 | 0.010 | 0.012 | 0.016 | 0.020 | 0.026 | 0.030 | 0.036 | 0.042 | 0.047 | 0.052 |
| | 100 | 0.8 | 80 - 100 | 0.015 | 0.018 | 0.024 | 0.030 | 0.039 | 0.045 | 0.054 | 0.063 | 0.071 | 0.079 |

Finishing



$a_p = 1xD$
 $a_e = 0.1xD$

$a_p = 1xD$
 $a_e = 0.1xD$

| | v_c [m/min] | f_z [mm] | | | |
|--|------------------|---------------------------------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | |
| | | 12.00 | 16.00 | 20.00 | 25.00 |
| | 985 | 0.107 | 0.131 | 0.150 | 0.167 |
| | 655 | 0.112 | 0.137 | 0.157 | 0.175 |
| | 525 | 0.118 | 0.144 | 0.164 | 0.184 |
| | 380 | 0.128 | 0.157 | 0.179 | 0.200 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.





SHOULDER MILLING CUTTER – TROCHOIDAL MILLING

Universal application

OptiMill-Tro-Uni 152

Steel and stainless steel

OptiMill-Tro-PM 155

Hardened steel

OptiMill-Tro-H 160

Titanium and nickel-based alloys

OptiMill-Tro-S 161

OptiMill-Tro-Titan 162

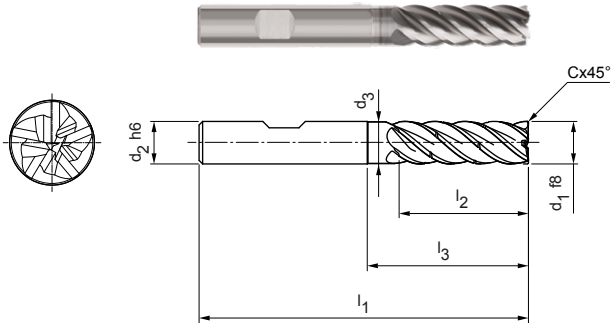
Technical appendix

Cutting data recommendations 164

Application notes Trochoidal milling 402

OptiMill®-Tro-Uni

Shoulder milling cutter, 3xD design with neck, includes chip breaker
SCM580 | SCM940

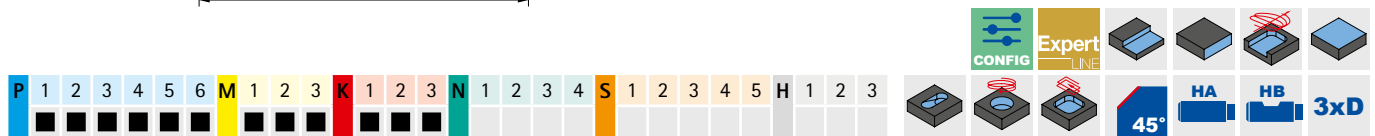


Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP213
Number of cutting edges: 5
Helix angle: ~ 41°
Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO1940-G2.5
Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.



Preferred series in stock

| Dimensions | | | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|--------------|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | | |
| 4,00 | 6 | 3,9 | 62 | 16 | 23 | 0,08 | 5 | 1 | SCM580-0400Z05R-F0008HB-HP213 | 30615710 |
| 5,00 | 6 | 4,8 | 62 | 17 | 24 | 0,10 | 5 | 1 | SCM580-0500Z05R-F0010HB-HP213 | 30564623 |
| 6,00 | 6 | 5,8 | 62 | 18 | 25 | 0,12 | 5 | 1 | SCM580-0600Z05R-F0012HB-HP213 | 30564624 |
| 8,00 | 8 | 7,8 | 68 | 24 | 30 | 0,16 | 5 | 1 | SCM580-0800Z05R-F0016HB-HP213 | 30564625 |
| 10,00 | 10 | 9,8 | 80 | 30 | 35 | 0,20 | 5 | 1 | SCM580-1000Z05R-F0020HB-HP213 | 30564626 |
| 12,00 | 12 | 11,8 | 93 | 36 | 45 | 0,24 | 5 | 2 | SCM940-1200Z05R-F0024HB3-HP213 | 31054530 |
| 14,00 | 14 | 13,8 | 99 | 42 | 50 | 0,28 | 5 | 2 | SCM940-1400Z05R-F0028HB3-HP213 | 31054531 |
| 16,00 | 16 | 15,8 | 108 | 48 | 55 | 0,32 | 5 | 2 | SCM940-1600Z05R-F0032HB3-HP213 | 31054532 |
| 20,00 | 20 | 19,8 | 126 | 60 | 70 | 0,40 | 5 | 2 | SCM940-2000Z05R-F0040HB3-HP213 | 31054533 |

Configurable features



Shank form:
Shank form: HA



Specification up to ø 10 mm:

SCM580-0400Z05R-F0008[shank form]-HP213

Specification from ø 12 mm:

SCM940-1200Z05R-F0024[shank form]3-HP213

Example:

SCM580-0400Z05R-F0008HA-HP213

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-Uni

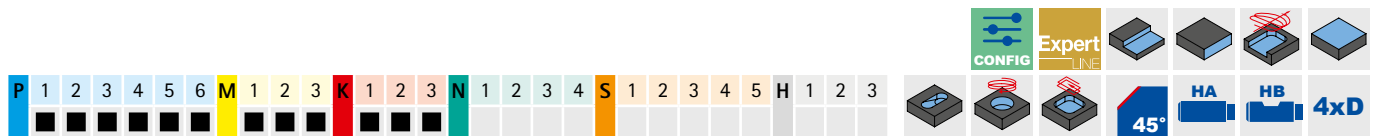
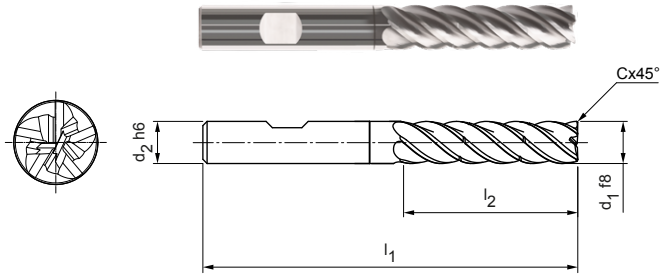
Shoulder milling cutter, 4xD design, with chip breaker
SCM940

Design:

Diameter of milling cutter: 5.00 - 20.00 mm
Cutting material: HP209
Number of cutting edges: 5
Helix angle: ~ 41°
Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.



Preferred series in stock

| Dimensions | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | | |
| 5,00 | 6 | 66 | 20 | 0,10 | 5 | 2 | SCM940-0500Z05R-F0010HB4-HP209 | 31054534 |
| 6,00 | 6 | 66 | 24 | 0,12 | 5 | 2 | SCM940-0600Z05R-F0012HB4-HP209 | 31054535 |
| 8,00 | 8 | 74 | 32 | 0,16 | 5 | 2 | SCM940-0800Z05R-F0016HB4-HP209 | 31054536 |
| 10,00 | 10 | 89 | 40 | 0,20 | 5 | 2 | SCM940-1000Z05R-F0020HB4-HP209 | 31054537 |
| 12,00 | 12 | 100 | 48 | 0,24 | 5 | 2 | SCM940-1200Z05R-F0024HB4-HP209 | 31054538 |
| 16,00 | 16 | 123 | 64 | 0,32 | 5 | 2 | SCM940-1600Z05R-F0032HB4-HP209 | 31054540 |
| 20,00 | 20 | 140 | 80 | 0,40 | 5 | 2 | SCM940-2000Z05R-F0040HB4-HP209 | 31054541 |

Available on request

| | | | | | | | | |
|-------|----|-----|----|------|---|---|--------------------------------|----------|
| 14,00 | 14 | 108 | 56 | 0,28 | 5 | 2 | SCM940-1400Z05R-F0028HB4-HP209 | 31054539 |
|-------|----|-----|----|------|---|---|--------------------------------|----------|

Configurable features



Shank form:
Shank form: HA



Specification:

SCM940-0500Z05R-F0010[shank form]4-HP209

Example:

SCM940-0500Z05R-F0010HA4-HP209

Shank form HA

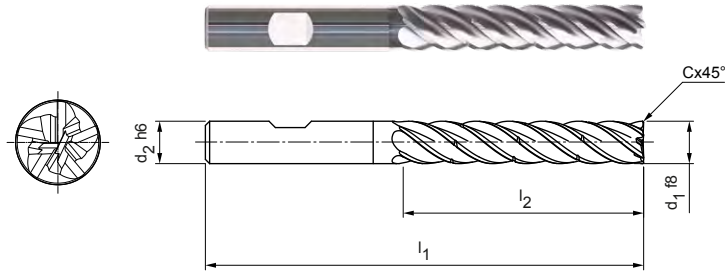
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-Uni

Shoulder milling cutter, 5xD design, with chip breaker
SCM940



Design:

- Diameter of milling cutter: 8.00 - 20.00 mm
- Cutting material: HP209
- Number of cutting edges: 5
- Helix angle: ~ 41°
- Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
- Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.

CONFIG Expert LINE

P 1 2 3 4 5 6 M 1 2 3 K 1 2 3 N 1 2 3 4 S 1 2 3 4 5 H 1 2 3

45° HA HB 5xD

Preferred series in stock

| Dimensions | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | | |
| 8,00 | 8 | 81 | 40 | 0,16 | 5 | 3 | SCM940-0800Z05R-F0016HB5-HP209 | 31054542 |
| 10,00 | 10 | 96 | 50 | 0,20 | 5 | 3 | SCM940-1000Z05R-F0020HB5-HP209 | 31054543 |
| 12,00 | 12 | 112 | 60 | 0,24 | 5 | 3 | SCM940-1200Z05R-F0024HB5-HP209 | 31054544 |
| 16,00 | 16 | 136 | 80 | 0,32 | 5 | 3 | SCM940-1600Z05R-F0032HB5-HP209 | 31054546 |
| 20,00 | 20 | 160 | 100 | 0,40 | 5 | 3 | SCM940-2000Z05R-F0040HB5-HP209 | 31054547 |

Available on request

| | | | | | | | | |
|-------|----|-----|----|------|---|---|--------------------------------|----------|
| 14,00 | 14 | 122 | 70 | 0,28 | 5 | 3 | SCM940-1400Z05R-F0028HB5-HP209 | 31054545 |
|-------|----|-----|----|------|---|---|--------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM940-0800Z05R-F0016[shank form]5-HP209

Example:

SCM940-0800Z05R-F0016HA5-HP209

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

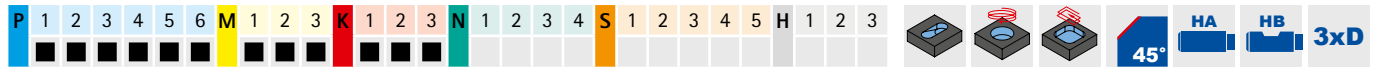
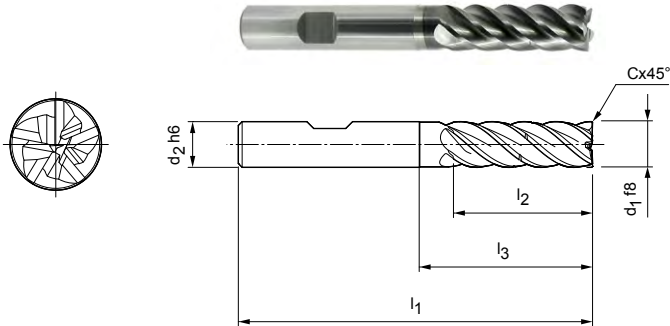
Special designs and other coatings available upon request.

OptiMill®-Tro-PM

Shoulder milling cutter, 3xD design with neck, includes chip breaker
SCM590

Design:
 Diameter of milling cutter: 4.00 - 25.00 mm
 Cutting material: HP723
 Number of cutting edges: 5
 Helix angle: 41° - 42°
 Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
 Special features: Unequal spacing, chip breaker


Application:
 Design with chip breaker for optimum chip control. Ensures chips are shortened.




Preferred series in stock

| Dimensions | | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|-------|---|--------------|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | l ₃ | Cx45° | | | | |
| 4,00 | 6 | 62 | 16 | 23 | 0,08 | 5 | 1 | SCM590-0400Z05R-F0008HB-HP723 | 30563364 |
| 5,00 | 6 | 62 | 17 | 24 | 0,10 | 5 | 1 | SCM590-0500Z05R-F0010HB-HP723 | 30563365 |
| 6,00 | 6 | 62 | 18 | 25 | 0,12 | 5 | 1 | SCM590-0600Z05R-F0012HB-HP723 | 30563366 |
| 8,00 | 8 | 68 | 24 | 30 | 0,16 | 5 | 1 | SCM590-0800Z05R-F0016HB-HP723 | 30563367 |
| 10,00 | 10 | 80 | 30 | 35 | 0,20 | 5 | 1 | SCM590-1000Z05R-F0020HB-HP723 | 30563368 |
| 12,00 | 12 | 93 | 36 | 45 | 0,24 | 5 | 1 | SCM590-1200Z05R-F0024HB-HP723 | 30563369 |
| 14,00 | 14 | 99 | 42 | 50 | 0,28 | 5 | 1 | SCM590-1400Z05R-F0028HB-HP723 | 30563370 |
| 16,00 | 16 | 108 | 48 | 55 | 0,32 | 5 | 1 | SCM590-1600Z05R-F0032HB-HP723 | 30563371 |
| 18,00 | 18 | 117 | 54 | 67 | 0,36 | 5 | 1 | SCM590-1800Z05R-F0036HB-HP723 | 30615879 |
| 20,00 | 20 | 126 | 60 | 70 | 0,40 | 5 | 1 | SCM590-2000Z05R-F0040HB-HP723 | 30563372 |
| 25,00 | 25 | 150 | 75 | 92 | 0,50 | 5 | 1 | SCM590-2500Z05R-F0050HB-HP723 | 30615113 |

Configurable features



Shank form:
Shank form: HA



Specification:
SCM590-0400Z05R-F0008[shank form]-HP723

Example:
SCM590-0400Z05R-F0008HA-HP723

Shank form HA

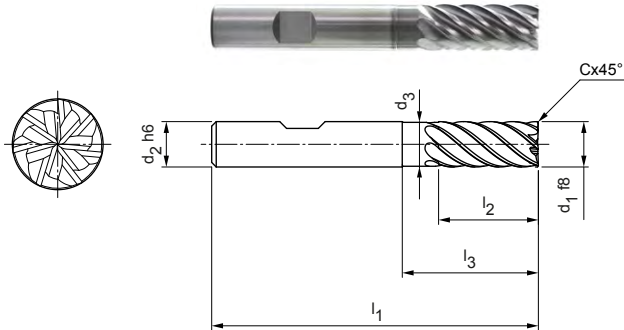
Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

OptiMill®-Tro-PM

Shoulder milling cutter, 2xD design with neck
SCM820

Design:

Diameter of milling cutter: 4.00 - 25.00 mm
 Cutting material: HP723
 Number of cutting edges: 7
 Helix angle: ~ 40°
 Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
 Special features: Unequal spacing



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-------|---|--------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | Cx45° | | | |
| 4,00 | 6 | - | 57 | 11 | - | 0,08 | 7 | SCM820-0400Z07R-F0008HB2-HP723 | 30855545 |
| 5,00 | 6 | - | 57 | 13 | - | 0,10 | 7 | SCM820-0500Z07R-F0010HB2-HP723 | 30855546 |
| 6,00 | 6 | 5,8 | 57 | 13 | 19 | 0,12 | 7 | SCM820-0600Z07R-F0012HB2-HP723 | 30855547 |
| 8,00 | 8 | 7,8 | 63 | 19 | 25 | 0,16 | 7 | SCM820-0800Z07R-F0016HB2-HP723 | 30855548 |
| 10,00 | 10 | 9,8 | 72 | 22 | 30 | 0,20 | 7 | SCM820-1000Z07R-F0020HB2-HP723 | 30855549 |
| 12,00 | 12 | 11,8 | 83 | 26 | 36 | 0,24 | 7 | SCM820-1200Z07R-F0024HB2-HP723 | 30855550 |
| 16,00 | 16 | 15,8 | 92 | 32 | 42 | 0,32 | 7 | SCM820-1600Z07R-F0032HB2-HP723 | 30855552 |
| 20,00 | 20 | 19,8 | 104 | 41 | 52 | 0,40 | 7 | SCM820-2000Z07R-F0040HB2-HP723 | 30855554 |

Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|------|---|--------------------------------|----------|
| 14,00 | 14 | 13,8 | 83 | 26 | 36 | 0,28 | 7 | SCM820-1400Z07R-F0028HB2-HP723 | 30855551 |
| 18,00 | 18 | 17,8 | 92 | 32 | 42 | 0,36 | 7 | SCM820-1800Z07R-F0036HB2-HP723 | 30855553 |
| 25,00 | 25 | 24,5 | 125 | 50 | 65 | 0,50 | 7 | SCM820-2500Z07R-F0050HB2-HP723 | 30855555 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM820-0400Z07R-F0008[shank form]2-HP723

Example:

SCM820-0400Z07R-F0008HA2-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-PM

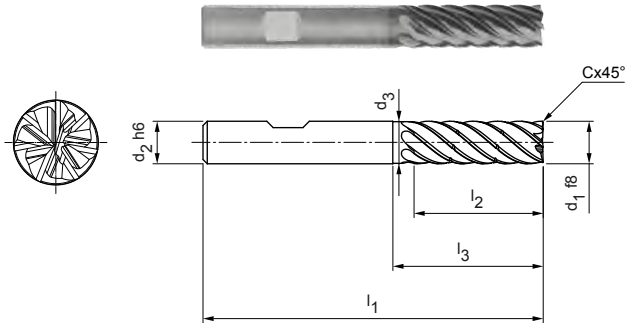
Shoulder milling cutter, 3xD design with neck, includes chip breaker
SCM820 | SCM930

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HP723
Number of cutting edges: 7
Helix angle: ~ 40°
Balancing quality: Cutting edge portion balanced to G2.5 according to DIN ISO 1940-G2.5
Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.



Preferred series in stock

| Dimensions | | | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------|---|--------------|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | Cx45° | | | | |
| 4,00 | 6 | 3,9 | 62 | 16 | 23 | 0,08 | 7 | 1 | SCM820-0400Z07R-F0008HB3-HP723 | 30855556 |
| 5,00 | 6 | 4,8 | 62 | 17 | 24 | 0,10 | 7 | 1 | SCM820-0500Z07R-F0010HB3-HP723 | 30855557 |
| 6,00 | 6 | 5,8 | 62 | 18 | 25 | 0,12 | 7 | 1 | SCM820-0600Z07R-F0012HB3-HP723 | 30855558 |
| 8,00 | 8 | 7,8 | 68 | 24 | 30 | 0,16 | 7 | 1 | SCM820-0800Z07R-F0016HB3-HP723 | 30855559 |
| 10,00 | 10 | 9,8 | 80 | 30 | 35 | 0,20 | 7 | 1 | SCM820-1000Z07R-F0020HB3-HP723 | 30855560 |
| 12,00 | 12 | 11,8 | 93 | 36 | 45 | 0,24 | 7 | 2 | SCM930-1200Z07R-F0024HB3-HP723 | 31054500 |
| 16,00 | 16 | 15,8 | 108 | 48 | 55 | 0,32 | 7 | 2 | SCM930-1600Z07R-F0032HB3-HP723 | 31054502 |
| 20,00 | 20 | 19,8 | 126 | 60 | 70 | 0,40 | 7 | 2 | SCM930-2000Z07R-F0040HB3-HP723 | 31054503 |

Available on request

| | | | | | | | | | | |
|-------|----|------|----|----|----|------|---|---|--------------------------------|----------|
| 14,00 | 14 | 13,8 | 99 | 42 | 50 | 0,28 | 7 | 2 | SCM930-1400Z07R-F0028HB3-HP723 | 31054501 |
|-------|----|------|----|----|----|------|---|---|--------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification up to ø 10 mm:
SCM820-0400Z07R-F0008[shank form]3-HP723

Specification from ø 12 mm:
SCM930-1200Z07R-F0024[shank form]3-HP723

Example:

SCM820-0400Z07R-F0008HA3-HP723

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-PM

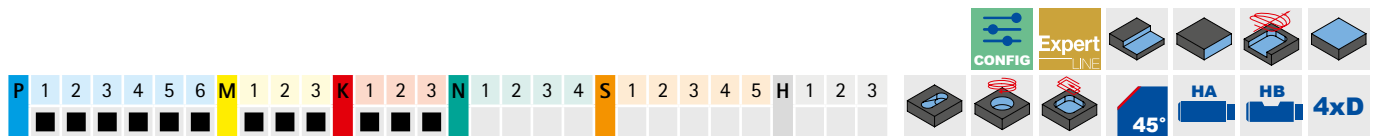
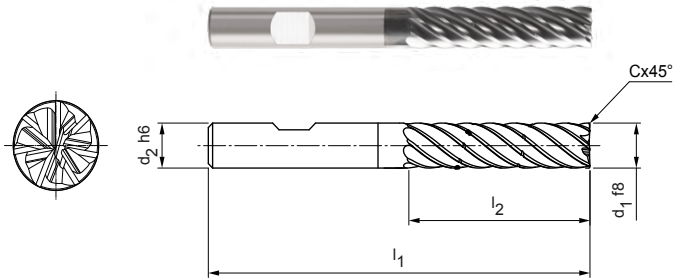
Shoulder milling cutter, 4xD design, with chip breaker
SCM930

Design:

Diameter of milling cutter: 6.00 - 20.00 mm
Cutting material: HP210
Number of cutting edges: 7
Helix angle: ~ 38°
Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.




Preferred series in stock

| Dimensions | | | | | z | Chip breaker | Specification | Order no. |
|------------|-------|-----|----|-------|---|--------------|--------------------------------|-----------|
| d1 f8 | d2 h6 | l1 | l2 | Cx45° | | | | |
| 6,00 | 6 | 66 | 24 | 0,12 | 7 | 2 | SCM930-0600Z07R-F0012HB4-HP210 | 31054505 |
| 8,00 | 8 | 74 | 32 | 0,16 | 7 | 2 | SCM930-0800Z07R-F0016HB4-HP210 | 31054506 |
| 10,00 | 10 | 89 | 40 | 0,20 | 7 | 2 | SCM930-1000Z07R-F0020HB4-HP210 | 31054507 |
| 12,00 | 12 | 100 | 48 | 0,24 | 7 | 2 | SCM930-1200Z07R-F0024HB4-HP210 | 31054508 |
| 16,00 | 16 | 123 | 64 | 0,32 | 7 | 2 | SCM930-1600Z07R-F0032HB4-HP210 | 31054510 |
| 20,00 | 20 | 140 | 80 | 0,40 | 7 | 2 | SCM930-2000Z07R-F0040HB4-HP210 | 31054511 |


Available on request

| | | | | | | | | |
|-------|----|-----|----|------|---|---|--------------------------------|----------|
| 14,00 | 14 | 108 | 56 | 0,28 | 7 | 2 | SCM930-1400Z07R-F0028HB4-HP210 | 31054509 |
|-------|----|-----|----|------|---|---|--------------------------------|----------|

Configurable features



Shank form:
Shank form: HA



Specification:
SCM930-0600Z07R-F0012[shank form]4-H210

Example:

SCM930-0600Z07R-F0012**HA**4-HP210

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-PM

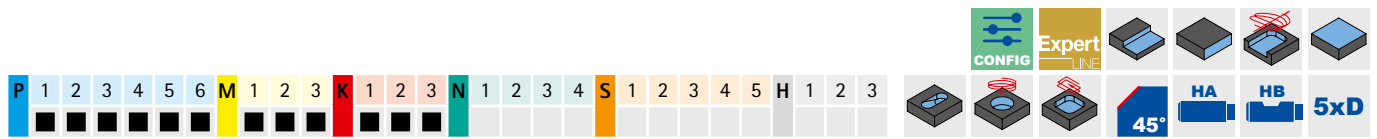
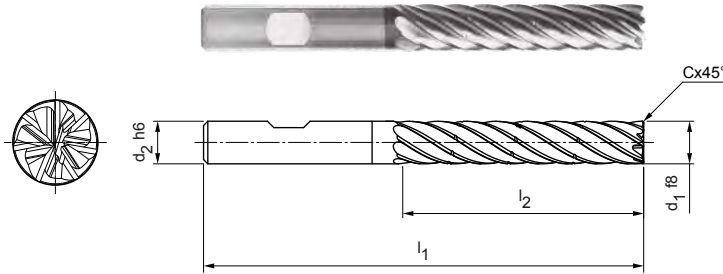
Shoulder milling cutter, 5xD design, with chip breaker
SCM930

Design:

Diameter of milling cutter: 8.00 - 20.00 mm
Cutting material: HP210
Number of cutting edges: 7
Helix angle: ~ 36°
Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.



Preferred series in stock

| Dimensions | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|-------|---|--------------|--------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | l ₁ | l ₂ | Cx45° | | | | |
| 8,00 | 8 | 81 | 40 | 0,16 | 7 | 3 | SCM930-0800Z07R-F0016HB5-HP210 | 31054512 |
| 10,00 | 10 | 96 | 50 | 0,20 | 7 | 3 | SCM930-1000Z07R-F0020HB5-HP210 | 31054513 |
| 12,00 | 12 | 112 | 60 | 0,24 | 7 | 3 | SCM930-1200Z07R-F0024HB5-HP210 | 31054514 |
| 16,00 | 16 | 136 | 80 | 0,32 | 7 | 3 | SCM930-1600Z07R-F0032HB5-HP210 | 31054516 |
| 20,00 | 20 | 160 | 100 | 0,40 | 7 | 3 | SCM930-2000Z07R-F0040HB5-HP210 | 31054517 |

Available on request

| | | | | | | | | |
|-------|----|-----|----|------|---|---|--------------------------------|----------|
| 14,00 | 14 | 122 | 70 | 0,28 | 7 | 3 | SCM930-1400Z07R-F0028HB5-HP210 | 31054515 |
|-------|----|-----|----|------|---|---|--------------------------------|----------|

Configurable features

Shank form:
Shank form: HA

Specification:
SCM590-0400Z05R-F0008[shank form]5-HP210

Example:

SCM590-0400Z05R-F0008HA5-HP210

Shank form HA

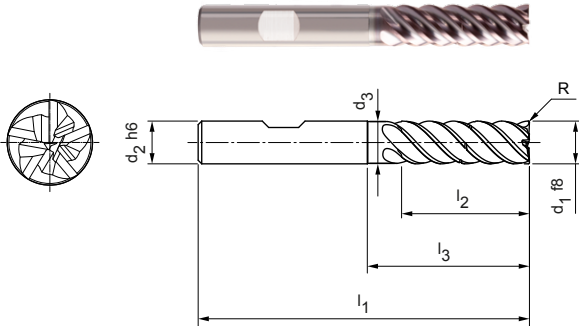
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-H

Shoulder milling cutter, 3xD design with neck, includes chip breaker
SCM920



Design:

- Diameter of milling cutter: 6.00 - 25.00 mm
- Cutting material: HP827
- Number of cutting edges: 5
- Helix angle: 41° - 42°
- Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
- Special features: Unequal spacing, chip breaker

Application:

Design with chip breaker for optimum chip control. Ensures chips are shortened.

CONFIG Expert LINE

P 1 2 3 4 5 6 M 1 2 3 K 1 2 3 N 1 2 3 4 S 1 2 3 4 5 H 1 2 3

CR HA HB 3xD

Preferred series in stock

| Dimensions | | | | | | | z | Chip breaker | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-----|---|--------------|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | | |
| 6,00 | 6 | 5,8 | 62 | 18 | 25 | 0,1 | 5 | 1 | SCM920-0600Z05R-R0010HB-HP827 | 31053921 |
| 8,00 | 8 | 7,8 | 68 | 24 | 30 | 0,2 | 5 | 1 | SCM920-0800Z05R-R0020HB-HP827 | 31053922 |
| 10,00 | 10 | 9,8 | 80 | 30 | 35 | 0,2 | 5 | 1 | SCM920-1000Z05R-R0020HB-HP827 | 31053923 |
| 12,00 | 12 | 11,8 | 93 | 36 | 45 | 0,3 | 5 | 1 | SCM920-1200Z05R-R0030HB-HP827 | 31053924 |
| 14,00 | 14 | 13,8 | 99 | 42 | 50 | 0,3 | 5 | 1 | SCM920-1400Z05R-R0030HB-HP827 | 31053925 |
| 16,00 | 16 | 15,8 | 108 | 48 | 55 | 0,3 | 5 | 1 | SCM920-1600Z05R-R0030HB-HP827 | 31053926 |
| 20,00 | 20 | 19,8 | 126 | 60 | 70 | 0,3 | 5 | 1 | SCM920-2000Z05R-R0030HB-HP827 | 31053928 |

Available on request

| | | | | | | | | | | |
|-------|----|------|-----|----|----|-----|---|---|-------------------------------|----------|
| 18,00 | 18 | 17,8 | 117 | 54 | 67 | 0,3 | 5 | 1 | SCM920-1800Z05R-R0030HB-HP827 | 31053927 |
| 25,00 | 25 | 24,5 | 150 | 75 | 92 | 0,4 | 5 | 1 | SCM920-2500Z05R-R0040HB-HP827 | 31053929 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM920-0600Z05R-R0010[shank form]-HP827

Example:

SCM920-0600Z05R-R0010HA-HP827

Shank form HA

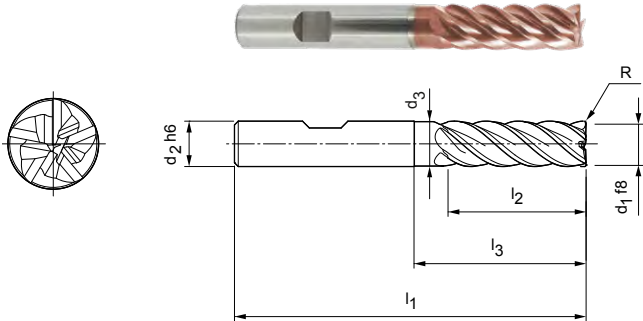
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-S

Shoulder milling cutter, design 3xD with neck
SCM600



Design:

Diameter of milling cutter: 6.00 - 25.00 mm
 Cutting material: HP828
 Number of cutting edges: 5
 Helix angle: 41° - 42°
 Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
 Special features: Unequal spacing

CONFIG Expert LINE

P 1 2 3 4 5 6 M 1 2 3 K 1 2 3 N 1 2 3 4 S 1 2 3 4 5 H 1 2 3

Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-----|---|-------------------------------|-----------|
| d ₁ f8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 6,00 | 6 | 5,8 | 62 | 18 | 25 | 0,1 | 5 | SCM600-0600Z05R-R0010HB-HP828 | 30564634 |
| 8,00 | 8 | 7,8 | 68 | 24 | 30 | 0,2 | 5 | SCM600-0800Z05R-R0020HB-HP828 | 30564635 |
| 10,00 | 10 | 9,8 | 80 | 30 | 35 | 0,2 | 5 | SCM600-1000Z05R-R0020HB-HP828 | 30564636 |
| 12,00 | 12 | 11,8 | 93 | 36 | 45 | 0,3 | 5 | SCM600-1200Z05R-R0030HB-HP828 | 30564637 |
| 16,00 | 16 | 15,8 | 108 | 48 | 55 | 0,3 | 5 | SCM600-1600Z05R-R0030HB-HP828 | 30564639 |
| 20,00 | 20 | 19,8 | 126 | 60 | 70 | 0,3 | 5 | SCM600-2000Z05R-R0030HB-HP828 | 30564640 |

Available on request

| | | | | | | | | | |
|-------|----|------|-----|----|----|-----|---|-------------------------------|----------|
| 14,00 | 14 | 13,8 | 99 | 42 | 50 | 0,3 | 5 | SCM600-1400Z05R-R0030HB-HP828 | 30564638 |
| 18,00 | 18 | 17,8 | 117 | 54 | 67 | 0,3 | 5 | SCM600-1800Z05R-R0030HB-HP828 | 30605011 |
| 25,00 | 25 | 24,5 | 150 | 75 | 92 | 0,4 | 5 | SCM600-2500Z05R-R0040HB-HP828 | 30605016 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM600-0600Z05R-R0010[shank form]-HP828

Example:

SCM600-0600Z05R-R0010HA-HP828

Shank form HA

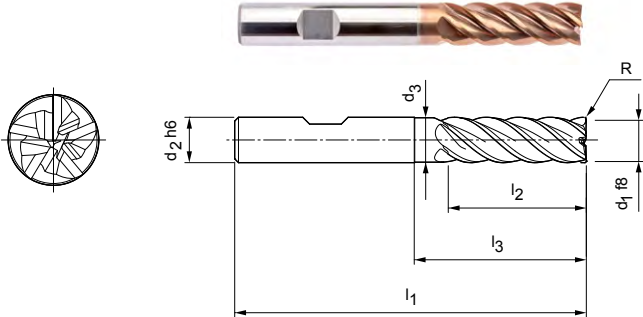
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Tro-Titan

Shoulder milling cutter, design 3xD with neck
SCM630



Design:

Diameter of milling cutter: 6.00 - 25.00 mm
 Cutting material: HP826
 Number of cutting edges: 5
 Helix angle: 41° - 42°
 Balancing quality: Cutting edge portion balanced on G2.5 according to DIN ISO 1940-G2.5
 Special features: Unequal spacing

Product configuration bar: P 1 2 3 4 5 6 M 1 2 3 K 1 2 3 N 1 2 3 4 S 1 2 3 4 5 H 1 2 3

Icons: CONFIG, Expert LINE, CR, HA, HB, 3xD

Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|------------|-------|------|-----|----|----|-----|---|-------------------------------|-----------|
| d1 f8 | d2 h6 | d3 | l1 | l2 | l3 | R | | | |
| 6,00 | 6 | 5,8 | 62 | 18 | 25 | 0,1 | 5 | SCM630-0600Z05R-R0010HB-HP826 | 30651032 |
| 8,00 | 8 | 7,8 | 68 | 24 | 30 | 0,2 | 5 | SCM630-0800Z05R-R0020HB-HP826 | 30651033 |
| 10,00 | 10 | 9,8 | 80 | 30 | 35 | 0,2 | 5 | SCM630-1000Z05R-R0020HB-HP826 | 30651034 |
| 12,00 | 12 | 11,8 | 93 | 36 | 45 | 0,3 | 5 | SCM630-1200Z05R-R0030HB-HP826 | 30651035 |
| 16,00 | 16 | 15,8 | 108 | 48 | 55 | 0,3 | 5 | SCM630-1600Z05R-R0030HB-HP826 | 30651037 |
| 20,00 | 20 | 19,8 | 126 | 60 | 70 | 0,3 | 5 | SCM630-2000Z05R-R0030HB-HP826 | 30651039 |

Available on request

| | | | | | | | | | |
|-------|----|---|-----|----|----|-----|---|-------------------------------|----------|
| 14,00 | 14 | - | 99 | 42 | 50 | 0,3 | 5 | SCM630-1400Z05R-R0030HB-HP826 | 30651036 |
| 18,00 | 18 | - | 117 | 54 | 67 | 0,3 | 5 | SCM630-1800Z05R-R0030HB-HP826 | 30651038 |
| 25,00 | 25 | - | 150 | 75 | 92 | 0,4 | 5 | SCM630-2500Z05R-R0040HB-HP826 | 30651040 |

Configurable features

Shank form:
Shank form: HA

Specification:
SCM630-0600Z05R-R0010[shank form]-HP826

Example:

SCM630-0600Z05R-R0010HA-HP826

Shank form HA

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.



Cutting data recommendations for trochoidal milling cutters

Feed and cutting speed

Correction factors

| Factor | v _c | | | a _e | h _m max. |
|--------|----------------|---|------|----------------|---------------------|
| | P | K | M | | |
| 2xD | 1,10 | | 1,05 | 1,05 | 1,05 |
| 3xD | 1,00 | | 1,00 | 1,00 | 1,00 |
| 4xD | 0,85 | | 0,92 | 0,90 | 0,94 |
| 5xD | 0,60 | | 0,80 | 0,80 | 0,87 |

OptiMill-Tro-Uni | SCM580, 940

OptiMill-Tro-PM | SCM590, 820, 930

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|------|--|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5.1 | Cast steel | | | | |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | | | ✓ |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |

Calculation example for 42CrMo4 ø 12 mm:

$$f_z | a_e | h_m \text{ max.} = \frac{D}{100} \cdot \text{See table for value}$$

| | | | | | | | | |
|------|--|--------|---|---|-----------|-----------|--------|-------------|
| P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | 280 - 380 | 1.0 - 1.6 | 8 - 12 | 0.56 - 0.68 |
|------|--|--------|---|---|-----------|-----------|--------|-------------|

$$1 \quad f_z = \frac{12 \text{ mm}}{100} \cdot 1,2 = 0,144 \text{ mm}$$

$$2 \quad a_e = \frac{12 \text{ mm}}{100} \cdot 10 = 1,2 \text{ mm}$$

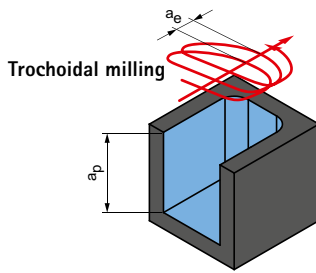
$$3 \quad h_m \text{ max.} = \frac{12 \text{ mm}}{100} \cdot 0,6 = 0,072 \text{ mm}$$

Note:

In the case of trochoidal milling, the specified cutting conditions change during the machining process. This also depends on the CAM software used and the machining position of the tool in the workpiece. The feed and cutting width or contact angle are constantly changing during machining in order to achieve, as far as is possible, the most constant average chip thickness depending on the contour.

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.



a_p = depending on max. machining depth of the tool
 a_e = depending on the workpiece material

| v_c [m/min] | f_z [mm] in % of D | a_e [mm] in % of D | h_m max. [mm] in % of D | Machining example | |
|------------------|-------------------------|-------------------------|------------------------------|--|--|
| 380 - 520 | 1.4 - 2.0 | 14 - 18 | 0.66 - 0.80 | 16MnCr5 $\varnothing = 12$ mm $v_c = 500$ m/min $f_z = 0.28$ mm $a_e = 1.8$ mm $a_p = 32$ mm | 42CrMo4 $\varnothing = 12$ mm $v_c = 375$ m/min $f_z = 0.17$ mm $a_e = 1.2$ mm $a_p = 32$ mm |
| 320 - 460 | 1.2 - 1.8 | 12 - 16 | 0.62 - 0.76 | | |
| 340 - 480 | 1.2 - 1.8 | 10 - 14 | 0.58 - 0.71 | | |
| 280 - 380 | 1.0 - 1.6 | 8 - 12 | 0.56 - 0.68 | | |
| 250 - 360 | 1.1 - 1.7 | 9 - 15 | 0.56 - 0.67 | | |
| 230 - 340 | 0.9 - 1.5 | 8 - 13 | 0.54 - 0.64 | | |
| 210 - 320 | 0.8 - 1.4 | 6 - 12 | 0.52 - 0.62 | | |
| 180 - 260 | 0.8 - 1.2 | 6 - 12 | 0.50 - 0.60 | | |
| 220 - 300 | 1.2 - 1.8 | 8 - 12 | 0.54 - 0.62 | | |
| 160 - 240 | 0.8 - 1.4 | 6 - 12 | 0.50 - 0.60 | X5CrNi18-8 $\varnothing = 12$ mm $v_c = 180$ m/min $f_z = 0.09$ mm | $a_e = 1.2$ mm $a_p = 32$ mm |
| 140 - 220 | 0.6 - 1.0 | 5 - 10 | 0.48 - 0.60 | | |
| 110 - 180 | 0.6 - 1.0 | 5 - 10 | 0.46 - 0.58 | | |
| 130 - 200 | 0.8 - 1.2 | 6 - 12 | 0.52 - 0.60 | | |
| 120 - 180 | 0.8 - 1.2 | 5 - 10 | 0.46 - 0.56 | | |
| 400 - 500 | 2.0 - 2.6 | 15 - 20 | 0.64 - 0.78 | | |
| 340 - 500 | 1.8 - 2.4 | 12 - 16 | 0.62 - 0.7 | | |
| 300 - 440 | 1.6 - 2.2 | 10 - 14 | 0.58 - 0.68 | | |
| 180 - 260 | 1.4 - 2.0 | 8 - 12 | 0.56 - 0.68 | | |
| 280 - 360 | 1.6 - 2.2 | 10 - 16 | 0.6 - 0.68 | | |
| 210 - 340 | 1.4 - 2.0 | 10 - 16 | 0.58 - 0.66 | | |

The specified machining values are guide values.

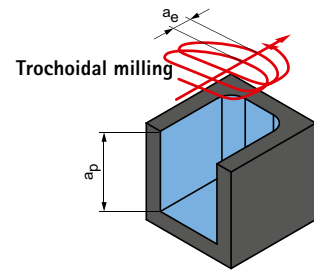
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for trochoidal milling cutters

Feed and cutting speed

OptiMill-Tro-H | SCM920

| MMG* | | Workpiece material | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] in % of D | a _e [mm] in % of D | h _m max. [mm] in % of D |
|------|------|--|--|---------|-----|-----------------|---------------------------|----------------------------------|----------------------------------|---------------------------------------|
| | | | | MQL/Air | Dry | Coolant | | | | |
| H | H1 | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | 100 - 160 | 0.48 - 0.67 | 6 - 10 | 0.38 - 0.50 |
| | | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | 80 - 140 | 0.45 - 0.65 | 4 - 8 | 0.28 - 0.36 |
| | H2 | H2.1 | Hardened steel / cast steel | < 60 | ✓ | ✓ | 60 - 120 | 0.4 - 0.52 | 3 - 6 | 0.27 - 0.34 |
| | | H2.2 | Hardened steel / cast steel | < 65 | ✓ | ✓ | 50 - 110 | 0.37 - 0.5 | 3 - 5 | 0.26 - 0.33 |
| | | H2.3 | Hardened steel / cast steel | < 68 | ✓ | ✓ | 50 - 100 | 0.3 - 0.48 | 2 - 5 | 0.25 - 0.32 |
| H3 | H3.1 | Wear-resistant cast/chill casting, GJN | | ✓ | | 60 - 120 | 0.35 - 0.55 | 3 - 6 | 0.28 - 0.34 | |



$a_p = \max. 3xD$
 $a_e =$ depending on the workpiece material

OptiMill-Tro-S | SCM600

OptiMill-Tro-Titan | SCM630

| MMG* | | Workpiece material | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] in % of D | a _e [mm] in % of D | h _m max. [mm] in % of D | |
|------|----|--------------------|--|-----------------------------|-------|---------|---------------------------|----------------------------------|----------------------------------|---------------------------------------|------------|
| | | | | MQL/Air | Dry | Coolant | | | | | |
| S | S1 | S1.1 | Titanium, titanium alloys | < 400 | | ✓ | 110 - 170 | 0.65 - 1.3 | 6 - 12 | 0.52 - 0.6 | |
| | | S2.1 | Titanium, titanium alloys | < 1200 | | ✓ | 90 - 150 | 0.6 - 1.2 | 5 - 10 | 0.46 - 0.56 | |
| | S2 | S2.2 | Titanium, titanium alloys | > 1200 | | ✓ | 70 - 130 | 0.4 - 1.0 | 5 - 10 | 0.42 - 0.54 | |
| | | S3 | S3.1 | Nickel, non-alloy and alloy | < 900 | | ✓ | 60 - 120 | 0.4 - 1.0 | 5 - 10 | 0.4 - 0.52 |
| | | | S3.2 | Nickel, non-alloy and alloy | > 900 | | ✓ | 50 - 100 | 0.3 - 0.9 | 5 - 10 | 0.4 - 0.52 |
| | S4 | S4.1 | High-temperature super alloy Ni, Co and Fe-based | | | ✓ | 35 - 90 | 0.3 - 0.8 | 4 - 8 | 0.38 - 0.46 | |
| | S5 | S5.1 | Tungsten and molybdenum alloys | | | ✓ | 35 - 90 | 0.3 - 0.8 | 4 - 8 | 0.38 - 0.46 | |

Note:

In the case of trochoidal milling, the specified cutting conditions change during the machining process. This also depends on the CAM software used and the machining position of the tool in the workpiece. The feed and cutting width or contact angle are constantly changing during machining in order to achieve, as far as is possible, the most constant average chip thickness depending on the contour.

| | Machining example | |
|--|---|--|
| | 90MnCrV8 $\varnothing = 12 \text{ mm}$ $v_c = 110 \text{ m/min}$ $f_z = 0.052 \text{ mm}$ $h_m = 0.04 \text{ mm}$ $a_e = 1 \text{ mm}$ | |

| | Machining example | |
|--|---|--|
| | TiAl6V4 $\varnothing = 12 \text{ mm}$ $v_c = 140 \text{ m/min}$ $f_z = 0.09 \text{ mm}$ $a_e = 1.2 \text{ mm}$ $a_p = 30 \text{ mm}$ | |

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.



HIGH-FEED MILLING

Universal application

OptiMill-3D-HF _____ 170

CPMill-Uni-FeedPlus _____ 172

Hardened steel

OptiMill-3D-HF-Hardened _____ 171

Technical appendix

Cutting data recommendations _____ 174



OptiMill®-3D-HF

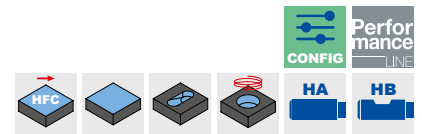
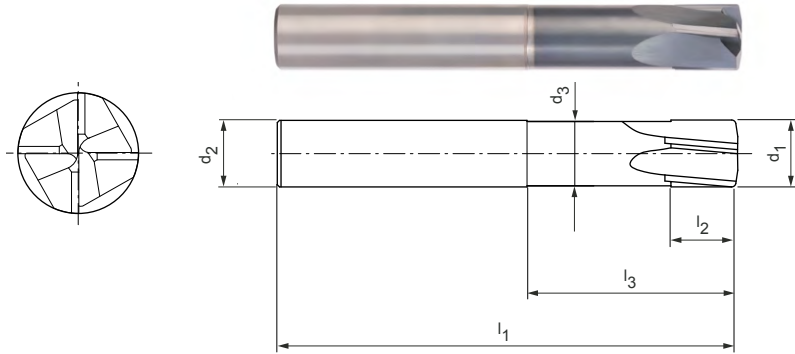
High-feed milling cutter, design with neck
MHF101

Design:

Diameter of milling cutter: 3.00 - 16.00 mm
Cutting material: HP806
Number of cutting edges: 4
Helix angle: 5°

Application:

Especially for roughing of parts with a hardness of up to 55 HRC.



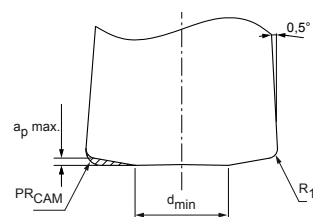
Preferred series in stock

| Dimensions | | | | | | | z | a _p max. | PRCAM | d _{min} | Shank form HA | |
|----------------|----------------|----------------|-------------------|----------------|----------------|----------------|---|---------------------|-------|------------------|--------------------------------|-----------|
| d ₁ | R ₁ | l ₃ | d ₂ h6 | l ₁ | l ₂ | d ₃ | | | | | Specification | Order no. |
| 3,00 | 0,15 | 9 | 4 | 50 | 3 | 2,85 | 4 | 0,13 | 0,2 | 1,5 | MHF101-030-0015-0900X050-HP806 | 31150920 |
| 3,00 | 0,15 | 15 | 4 | 50 | 3 | 2,85 | 4 | 0,13 | 0,2 | 1,5 | MHF101-030-0015-1500X050-HP806 | 31150921 |
| 3,00 | 0,15 | 9 | 6 | 60 | 3 | 2,85 | 4 | 0,13 | 0,2 | 1,5 | MHF101-030-0015-0900X060-HP806 | 31150922 |
| 3,00 | 0,15 | 15 | 6 | 60 | 3 | 2,85 | 4 | 0,13 | 0,2 | 1,5 | MHF101-030-0015-1500X060-HP806 | 31150923 |
| 4,00 | 0,2 | 12 | 6 | 60 | 4 | 3,8 | 4 | 0,17 | 0,3 | 2 | MHF101-040-0020-1200X060-HP806 | 31150924 |
| 4,00 | 0,2 | 20 | 6 | 60 | 4 | 3,8 | 4 | 0,17 | 0,3 | 2 | MHF101-040-0020-2000X060-HP806 | 31150925 |
| 5,00 | 0,25 | 15 | 6 | 60 | 5 | 4,75 | 4 | 0,2 | 0,4 | 2,3 | MHF101-050-0025-1500X060-HP806 | 31150926 |
| 5,00 | 0,25 | 20 | 6 | 60 | 5 | 4,75 | 4 | 0,2 | 0,4 | 2,3 | MHF101-050-0025-2000X060-HP806 | 31150927 |
| 6,00 | 0,3 | 18 | 6 | 60 | 6 | 5,7 | 4 | 0,24 | 0,5 | 3 | MHF101-060-0030-1800X060-HP806 | 31150928 |
| 6,00 | 0,3 | 24 | 6 | 60 | 6 | 5,7 | 4 | 0,24 | 0,5 | 3 | MHF101-060-0030-2400X060-HP806 | 31150929 |
| 8,00 | 0,4 | 24 | 8 | 64 | 8 | 7,7 | 4 | 0,31 | 0,7 | 3,8 | MHF101-080-0040-2400X064-HP806 | 31150930 |
| 8,00 | 0,4 | 32 | 8 | 64 | 8 | 7,7 | 4 | 0,31 | 0,7 | 3,8 | MHF101-080-0040-3200X064-HP806 | 31150931 |
| 8,00 | 0,4 | 40 | 8 | 75 | 8 | 7,7 | 4 | 0,31 | 0,7 | 3,8 | MHF101-080-0040-4000X075-HP806 | 31150932 |
| 10,00 | 0,5 | 30 | 10 | 75 | 10 | 9,65 | 4 | 0,39 | 0,85 | 5 | MHF101-100-0050-3000X075-HP806 | 31150933 |
| 10,00 | 0,5 | 40 | 10 | 75 | 10 | 9,65 | 4 | 0,39 | 0,85 | 5 | MHF101-100-0050-4000X075-HP806 | 31150934 |
| 10,00 | 0,5 | 50 | 10 | 100 | 10 | 9,65 | 4 | 0,39 | 0,85 | 5 | MHF101-100-0050-5000X100-HP806 | 31150935 |
| 12,00 | 0,6 | 36 | 12 | 75 | 12 | 11,6 | 4 | 0,46 | 1 | 5,8 | MHF101-120-0060-3600X075-HP806 | 31150936 |
| 12,00 | 0,6 | 48 | 12 | 100 | 12 | 11,6 | 4 | 0,46 | 1 | 5,8 | MHF101-120-0060-4800X100-HP806 | 31150937 |
| 12,00 | 0,6 | 60 | 12 | 100 | 12 | 11,6 | 4 | 0,46 | 1 | 5,8 | MHF101-120-0060-6000X100-HP806 | 31150938 |
| 16,00 | 0,8 | 48 | 16 | 100 | 16 | 15,5 | 4 | 0,61 | 1,4 | 8 | MHF101-160-0080-4800X100-HP806 | 31150939 |

Configurable features

Shank form:
Shank form: HB

Detailed view of face:



Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-3D-HF-Hardened

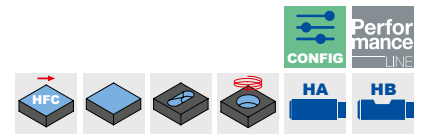
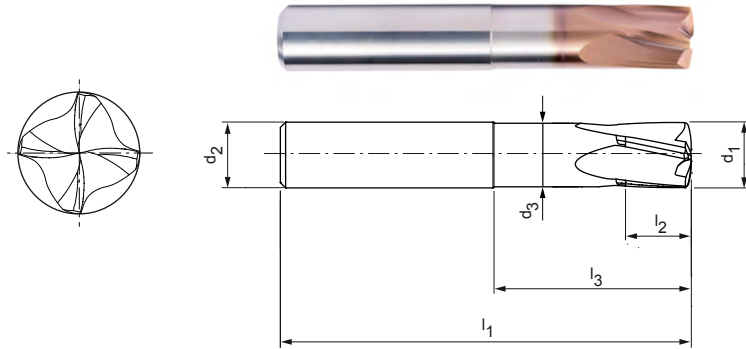
High-feed milling cutter with innovative face geometry, design with neck
MHF102

Design:

Diameter of milling cutter: 2.00 - 16.00 mm
Cutting material: HP810
Number of cutting edges: 4
Helix angle: 12°
Special feature: Innovative face geometry

Application:

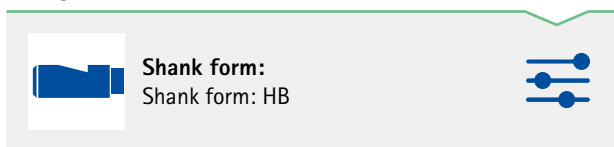
Especially for roughing and finishing of hardened parts with a hardness of 45 HRC or higher, as well as in interrupted cut. The innovative face geometry allows very good surface finishes to be achieved during finishing.



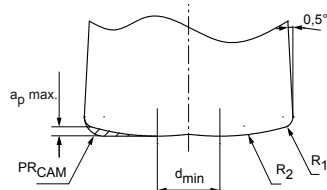
Preferred series in stock

| Dimensions | | | | | | | | z | ap max. | PRCAM | d _{min} | Shank form HA | |
|----------------|----------------|----------------|----------------|-------------------|----------------|----------------|----------------|---|---------|-------|------------------|--------------------------------|-----------|
| d ₁ | R ₁ | R ₂ | l ₃ | d ₂ h5 | l ₁ | l ₂ | d ₃ | | | | | Specification | Order no. |
| 2,00 | 0,1 | 2,3 | 6 | 4 | 50 | 2 | 1,9 | 4 | 0,09 | 0,18 | 0,6 | MHF102-020-0010-0600X050-HP810 | 31150940 |
| 2,00 | 0,1 | 2,3 | 10 | 4 | 50 | 2 | 1,9 | 4 | 0,09 | 0,18 | 0,6 | MHF102-020-0010-1000X050-HP810 | 31150941 |
| 2,00 | 0,1 | 2,3 | 6 | 6 | 60 | 2 | 1,9 | 4 | 0,09 | 0,18 | 0,6 | MHF102-020-0010-0600X060-HP810 | 31150942 |
| 2,00 | 0,1 | 2,3 | 10 | 6 | 60 | 2 | 1,9 | 4 | 0,09 | 0,18 | 0,6 | MHF102-020-0010-1000X060-HP810 | 31150943 |
| 3,00 | 0,15 | 3,45 | 9 | 4 | 50 | 3 | 2,85 | 4 | 0,13 | 0,275 | 0,9 | MHF102-030-0015-0900X050-HP810 | 31150944 |
| 3,00 | 0,15 | 3,45 | 15 | 4 | 50 | 3 | 2,85 | 4 | 0,13 | 0,275 | 0,9 | MHF102-030-0015-1500X050-HP810 | 31150945 |
| 3,00 | 0,15 | 3,45 | 9 | 6 | 60 | 3 | 2,85 | 4 | 0,13 | 0,275 | 0,9 | MHF102-030-0015-0900X060-HP810 | 31150946 |
| 3,00 | 0,15 | 3,45 | 15 | 6 | 60 | 3 | 2,85 | 4 | 0,13 | 0,275 | 0,9 | MHF102-030-0015-1500X060-HP810 | 31150947 |
| 4,00 | 0,2 | 4,6 | 12 | 6 | 60 | 4 | 3,8 | 4 | 0,17 | 0,368 | 1,2 | MHF102-040-0020-1200X060-HP810 | 31150948 |
| 4,00 | 0,2 | 4,6 | 20 | 6 | 60 | 4 | 3,8 | 4 | 0,17 | 0,368 | 1,2 | MHF102-040-0020-2000X060-HP810 | 31150949 |
| 5,00 | 0,25 | 5,75 | 15 | 6 | 60 | 5 | 4,75 | 4 | 0,22 | 0,46 | 1,5 | MHF102-050-0025-1500X060-HP810 | 31150950 |
| 5,00 | 0,25 | 5,75 | 20 | 6 | 60 | 5 | 4,75 | 4 | 0,22 | 0,46 | 1,5 | MHF102-050-0025-2000X060-HP810 | 31150951 |
| 6,00 | 0,3 | 6,9 | 18 | 6 | 60 | 6 | 5,7 | 4 | 0,26 | 0,55 | 1,8 | MHF102-060-0030-1800X060-HP810 | 31150952 |
| 6,00 | 0,3 | 6,9 | 24 | 6 | 60 | 6 | 5,7 | 4 | 0,26 | 0,55 | 1,8 | MHF102-060-0030-2400X060-HP810 | 31150953 |
| 8,00 | 0,4 | 9,2 | 24 | 8 | 64 | 8 | 7,7 | 4 | 0,35 | 0,74 | 2,4 | MHF102-080-0040-2400X064-HP810 | 31150954 |
| 8,00 | 0,4 | 9,2 | 32 | 8 | 64 | 8 | 7,7 | 4 | 0,35 | 0,74 | 2,4 | MHF102-080-0040-3200X064-HP810 | 31150955 |
| 8,00 | 0,4 | 9,2 | 40 | 8 | 75 | 8 | 7,7 | 4 | 0,35 | 0,74 | 2,4 | MHF102-080-0040-4000X075-HP810 | 31150956 |
| 10,00 | 0,5 | 11,5 | 30 | 10 | 75 | 10 | 9,65 | 4 | 0,44 | 0,92 | 3 | MHF102-100-0050-3000X075-HP810 | 31150957 |
| 10,00 | 0,5 | 11,5 | 40 | 10 | 75 | 10 | 9,65 | 4 | 0,44 | 0,92 | 3 | MHF102-100-0050-4000X075-HP810 | 31150958 |
| 10,00 | 0,5 | 11,5 | 50 | 10 | 100 | 10 | 9,65 | 4 | 0,44 | 0,92 | 3 | MHF102-100-0050-5000X100-HP810 | 31150959 |
| 12,00 | 0,6 | 13,8 | 36 | 12 | 75 | 12 | 11,6 | 4 | 0,52 | 1,11 | 3,6 | MHF102-120-0060-3600X075-HP810 | 31150960 |
| 12,00 | 0,6 | 13,8 | 48 | 12 | 100 | 12 | 11,6 | 4 | 0,52 | 1,11 | 3,6 | MHF102-120-0060-4800X100-HP810 | 31150961 |
| 12,00 | 0,6 | 13,8 | 60 | 12 | 100 | 12 | 11,6 | 4 | 0,52 | 1,11 | 3,6 | MHF102-120-0060-6000X100-HP810 | 31150962 |
| 16,00 | 0,8 | 18,4 | 48 | 16 | 100 | 16 | 15,5 | 4 | 0,7 | 1,47 | 4,8 | MHF102-160-0080-4800X100-HP810 | 31150963 |

Configurable features



Detailed view of face:



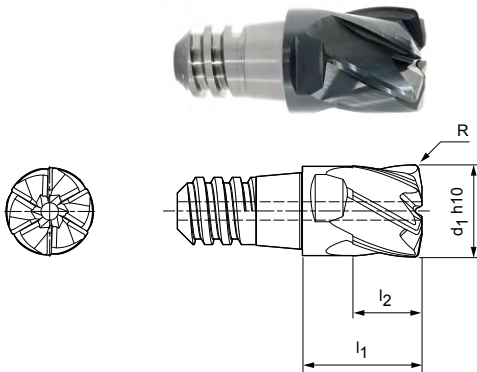
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

CPMill®-Uni-FeedPlus

Design with CFS connection, with internal cooling
CPM171

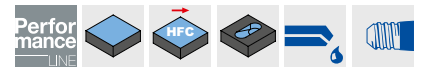


Design:

Diameter of milling cutter: 8.00 – 25.00 mm
Cutting material: HP383
Number of cutting edges: 6
Helix angle: 30°

Application:


High-feed milling with low a_p , angled entry and pocket milling with long projection lengths.



Preferred series in stock

| | | | | | z | a_p max. | SW | Specification | Order no. |
|-----------|----------|-------|-------|------|---|------------|-------|-------------------------------|-----------|
| d_1 h10 | CFS size | l_1 | l_2 | R | | | | | |
| 8,00 | 6 | 11 | 6 | 0,4 | 6 | 0,4 | SW 6 | CPM171-0800Z06-R0040-06-HP383 | 30371359 |
| 10,00 | 8 | 13 | 7,5 | 0,5 | 6 | 0,5 | SW 8 | CPM171-1000Z06-R0050-08-HP383 | 30371360 |
| 12,00 | 10 | 16 | 9 | 0,6 | 6 | 0,6 | SW 10 | CPM171-1200Z06-R0060-10-HP383 | 30371361 |
| 16,00 | 12 | 20 | 12 | 0,8 | 6 | 0,8 | SW 13 | CPM171-1600Z06-R0080-12-HP383 | 30371362 |
| 20,00 | 16 | 25 | 15 | 1 | 6 | 1 | SW 16 | CPM171-2000Z06-R0100-16-HP383 | 30371364 |
| 25,00 | 20 | 32 | 19 | 1,25 | 6 | 1,25 | SW 21 | CPM171-2500Z06-R0125-20-HP383 | 30371365 |

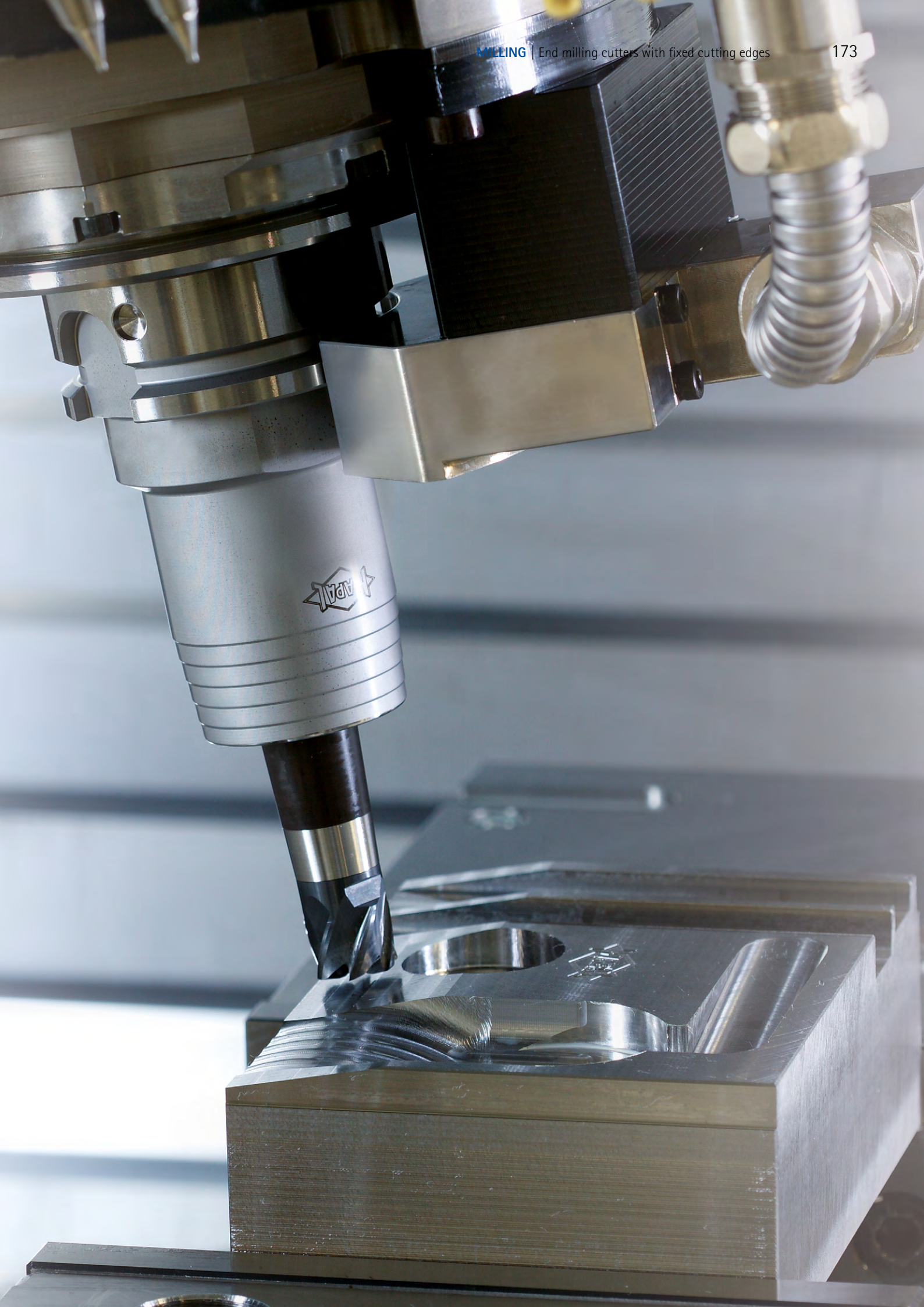
Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.



Cutting data recommendations for high-feed milling cutters

Feed and cutting speed

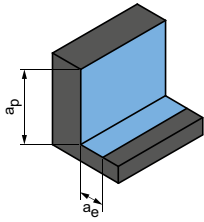
OptiMill-3D-HF | MHF101

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|----|--------------------|--|---------|-----|---------|---|
| | | | | MQL/Air | Dry | Coolant | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5 | P5.1 | Cast steel | | ✓ | | ✓ |
| | P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | |
| H | H1 | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | |
| | | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | |
| | H2 | H2.1 | Hardened steel / cast steel | < 60 | ✓ | ✓ | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Roughing



Plunge angle
1.0° - 1.5°

| | a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | | |
|--|----------------------------|----------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 |
| | 3.8 | 60 | 200 - 250 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.8 | 60 | 150 - 200 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.8 | 60 | 200 - 250 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.8 | 65 | 150 - 200 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.8 | 60 | 180 - 220 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 65 | 150 - 180 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 65 | 120 - 150 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 60 | 90 - 110 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 60 | 90 - 110 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 60 | 70 - 90 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 70 | 250 - 300 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.8 | 70 | 250 - 300 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.8 | 70 | 150 - 200 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 70 | 150 - 200 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 70 | 150 - 200 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.8 | 70 | 150 - 200 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 3.5 | 70 | 150 - 190 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.400 | 0.550 | 0.625 | 0.625 |
| | 3.2 | 65 | 120 - 150 | 0.100 | 0.150 | 0.200 | 0.225 | 0.287 | 0.325 | 0.325 | 0.475 | 0.475 |
| | 2.8 | 55 | 100 - 120 | 0.100 | 0.150 | 0.175 | 0.200 | 0.250 | 0.250 | 0.300 | 0.350 | 0.400 |

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for high-feed milling cutters

Feed and cutting speed

OptiMill-3D-HF-Hardened | MHF102, 103

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | | |
|------|--------------------|--|--|-------|---------|---|--|
| | | | MQL/Air | Dry | Coolant | | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | | |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ | |
| | P5.1 | Cast steel | | ✓ | | ✓ | |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ | |
| | K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | |
| K2.2 | | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | | |
| K2.3 | | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | | |
| K3.1 | | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | | |
| K3.2 | | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | | |
| H | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | | |
| | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | | |
| | H2.1 | Hardened steel / cast steel | < 60 | ✓ | | | |
| | H2.2 | Hardened steel / cast steel | < 65 | ✓ | | | |
| | H2.3 | Hardened steel / cast steel | < 68 | ✓ | | | |
| | H3.1 | Wear-resistant cast/chill casting, GJN | | ✓ | ✓ | | |

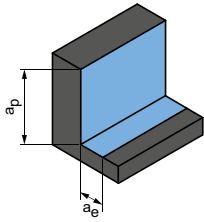
OptiMill-3D-HF-Hardened | MHF102, 103

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|--------------------|---|---------|-----|---------|
| | | | MQL/Air | Dry | Coolant |
| H2 | H2.1 | Hardened steel / cast steel | < 60 | ✓ | |
| | H2.2 | Hardened steel / cast steel | < 65 | ✓ | |
| | H2.3 | Hardened steel / cast steel | < 68 | ✓ | |
| H3 | H3.1 | Wear-resistant cast/chill casting, GJN | | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

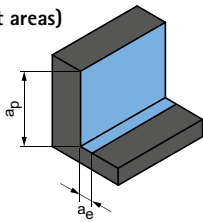
Roughing



Plunge angle
1.0° - 1.5°

| a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | | | |
|----------------------------|----------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| | | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | |
| 4.2 | 60 | 280 - 340 | 0.100 | 0.130 | 0.180 | 0.210 | 0.250 | 0.350 | 0.460 | 0.580 | 0.700 | |
| 4.2 | 60 | 240 - 300 | 0.080 | 0.110 | 0.160 | 0.190 | 0.230 | 0.310 | 0.430 | 0.520 | 0.620 | |
| 4.2 | 60 | 260 - 320 | 0.100 | 0.130 | 0.180 | 0.210 | 0.250 | 0.350 | 0.450 | 0.560 | 0.650 | |
| 4.2 | 65 | 240 - 300 | 0.080 | 0.100 | 0.150 | 0.180 | 0.220 | 0.310 | 0.410 | 0.500 | 0.580 | |
| 4.2 | 60 | 280 - 340 | 0.100 | 0.130 | 0.170 | 0.200 | 0.240 | 0.340 | 0.430 | 0.520 | 0.620 | |
| 4.2 | 65 | 260 - 300 | 0.090 | 0.100 | 0.150 | 0.180 | 0.220 | 0.300 | 0.390 | 0.460 | 0.580 | |
| 4.2 | 65 | 240 - 280 | 0.080 | 0.100 | 0.140 | 0.170 | 0.210 | 0.290 | 0.380 | 0.440 | 0.560 | |
| 4.2 | 60 | 160 - 200 | 0.100 | 0.130 | 0.180 | 0.210 | 0.250 | 0.350 | 0.400 | 0.500 | 0.620 | |
| 4.2 | 60 | 180 - 220 | 0.100 | 0.110 | 0.160 | 0.200 | 0.230 | 0.330 | 0.380 | 0.470 | 0.590 | |
| 4.2 | 60 | 160 - 200 | 0.100 | 0.110 | 0.160 | 0.200 | 0.230 | 0.320 | 0.370 | 0.450 | 0.570 | |
| 4.2 | 70 | 250 - 300 | 0.100 | 0.130 | 0.180 | 0.210 | 0.250 | 0.350 | 0.460 | 0.580 | 0.700 | |
| 4.2 | 70 | 250 - 300 | 0.080 | 0.110 | 0.160 | 0.190 | 0.230 | 0.310 | 0.430 | 0.520 | 0.620 | |
| 4.2 | 70 | 200 - 250 | 0.100 | 0.130 | 0.180 | 0.210 | 0.250 | 0.350 | 0.450 | 0.560 | 0.650 | |
| 4.2 | 70 | 200 - 250 | 0.080 | 0.100 | 0.150 | 0.180 | 0.220 | 0.310 | 0.410 | 0.500 | 0.580 | |
| 4.2 | 70 | 220 - 270 | 0.100 | 0.130 | 0.180 | 0.210 | 0.250 | 0.350 | 0.450 | 0.560 | 0.650 | |
| 4.2 | 70 | 200 - 250 | 0.080 | 0.100 | 0.150 | 0.180 | 0.220 | 0.310 | 0.410 | 0.500 | 0.580 | |
| 4.2 | 70 | 180 - 250 | 0.071 | 0.103 | 0.135 | 0.170 | 0.210 | 0.280 | 0.350 | 0.420 | 0.560 | |
| 4.2 | 65 | 150 - 200 | 0.066 | 0.096 | 0.127 | 0.158 | 0.190 | 0.256 | 0.320 | 0.385 | 0.510 | |
| 4 | 55 | 110 - 150 | 0.062 | 0.083 | 0.106 | 0.142 | 0.172 | 0.220 | 0.280 | 0.330 | 0.420 | |
| 3 | 40 | 80 - 120 | 0.044 | 0.065 | 0.086 | 0.109 | 0.131 | 0.170 | 0.210 | 0.245 | 0.305 | |
| 2.2 | 35 | 60 - 85 | 0.027 | 0.046 | 0.066 | 0.084 | 0.100 | 0.130 | 0.150 | 0.180 | 0.210 | |
| 3.5 | 45 | 90 - 120 | 0.055 | 0.070 | 0.090 | 0.120 | 0.140 | 0.180 | 0.220 | 0.250 | 0.320 | |

Finishing (flat areas)



Plunge angle
0.5° - 1.0°

| a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | | | |
|----------------------------|----------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| | | | Diameter of milling cutter [mm] | | | | | | | | | |
| | | | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | |
| 0.8 | 8 | 160 - 185 | 0.040 | 0.048 | 0.058 | 0.072 | 0.105 | 0.144 | 0.182 | 0.210 | 0.290 | |
| 0.4 | 7.2 | 130 - 170 | 0.028 | 0.037 | 0.046 | 0.063 | 0.084 | 0.110 | 0.148 | 0.174 | 0.221 | |
| 0.2 | 6 | 110 - 130 | 0.018 | 0.028 | 0.038 | 0.055 | 0.070 | 0.082 | 0.118 | 0.140 | 0.162 | |
| 0.6 | 8 | 160 - 180 | 0.038 | 0.042 | 0.055 | 0.070 | 0.092 | 0.128 | 0.160 | 0.190 | 0.270 | |

For finishing operations on planar surfaces, depending on the material removal rate (a_e) and the selected machining strategy, residual material may remain on the part. For this reason, $a_e < d_{\min}$ should be selected for planar surfaces.

The specified machining values are guide values.

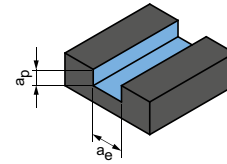
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendation for CPMill replaceable milling cutters

Feed and cutting speed

| Correction factor: | |
|--------------------|---------------|
| Length | f_z & v_c |
| A/B | 1,0 |
| C | 0,9 |
| D | 0,7 |
| E | 0,6 |

Groove milling



$$a_p = 0.05 \times D$$

$$a_e = 1 \times D$$

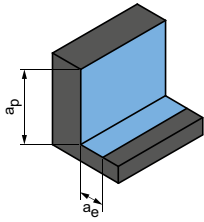
CPMill-Uni-FeedPlus | CPM171

| MMG* | | Workpiece material | Strength/ hardness [N/mm ²] [HRC] | Cooling | | | v_c [m/min] | f_z [mm] | | | | | | |
|------|------|--------------------|--|---------|-----|---------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | |
| | | | | | | | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 160 | 0.179 | 0.214 | 0.246 | 0.301 | 0.344 | 0.383 |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 130 | 0.167 | 0.200 | 0.230 | 0.281 | 0.321 | 0.358 |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 145 | 0.179 | 0.214 | 0.246 | 0.301 | 0.344 | 0.383 |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ | 100 | 0.149 | 0.178 | 0.205 | 0.250 | 0.286 | 0.320 |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 95 | 0.173 | 0.207 | 0.238 | 0.291 | 0.332 | 0.371 |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ | 85 | 0.164 | 0.196 | 0.226 | 0.276 | 0.315 | 0.352 |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ | 80 | 0.155 | 0.186 | 0.213 | 0.260 | 0.298 | 0.332 |
| P5 | P5.1 | Cast steel | | | | ✓ | 95 | 0.173 | 0.207 | 0.238 | 0.291 | 0.332 | 0.371 | |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 175 | 0.298 | 0.357 | 0.410 | 0.501 | 0.573 | 0.639 |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 160 | 0.253 | 0.303 | 0.349 | 0.426 | 0.487 | 0.543 |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ | 130 | 0.209 | 0.250 | 0.287 | 0.351 | 0.401 | 0.447 |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 70 | 0.119 | 0.143 | 0.164 | 0.200 | 0.229 | 0.256 |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 115 | 0.209 | 0.250 | 0.287 | 0.351 | 0.401 | 0.447 |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 110 | 0.179 | 0.214 | 0.246 | 0.301 | 0.344 | 0.383 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

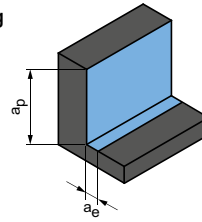
Roughing



$$a_p = 0.05 \times D$$

$$a_e = 0.25 \times D$$

Finishing



$$a_p = 0.05 \times D$$

$$a_e = 0.1 \times D$$

| | v_c [m/min] | f_z [mm] | | | | | | v_c [m/min] | f_z [mm] | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | Diameter of milling cutter [mm] | | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 285 | 0.357 | 0.428 | 0.492 | 0.601 | 0.687 | 0.767 | 385 | 0.565 | 0.677 | 0.778 | 0.950 | 1.087 | 1.213 |
| | 235 | 0.334 | 0.400 | 0.459 | 0.561 | 0.641 | 0.716 | 315 | 0.528 | 0.632 | 0.726 | 0.887 | 1.014 | 1.132 |
| | 260 | 0.357 | 0.428 | 0.492 | 0.601 | 0.687 | 0.767 | 350 | 0.565 | 0.677 | 0.778 | 0.950 | 1.087 | 1.213 |
| | 180 | 0.298 | 0.357 | 0.410 | 0.501 | 0.573 | 0.639 | 245 | 0.471 | 0.564 | 0.648 | 0.792 | 0.906 | 1.011 |
| | 170 | 0.346 | 0.414 | 0.476 | 0.581 | 0.664 | 0.741 | 225 | 0.546 | 0.654 | 0.752 | 0.919 | 1.050 | 1.172 |
| | 155 | 0.328 | 0.392 | 0.451 | 0.551 | 0.630 | 0.703 | 210 | 0.518 | 0.621 | 0.713 | 0.871 | 0.996 | 1.112 |
| | 145 | 0.310 | 0.371 | 0.426 | 0.521 | 0.596 | 0.665 | 190 | 0.490 | 0.587 | 0.674 | 0.824 | 0.942 | 1.051 |
| | 175 | 0.346 | 0.414 | 0.476 | 0.581 | 0.664 | 0.741 | 235 | 0.546 | 0.654 | 0.752 | 0.919 | 1.050 | 1.172 |
| | 355 | 0.596 | 0.714 | 0.820 | 1.002 | 1.145 | 1.278 | 520 | 0.942 | 1.128 | 1.297 | 1.584 | 1.811 | 2.021 |
| | 325 | 0.506 | 0.607 | 0.697 | 0.852 | 0.974 | 1.087 | 475 | 0.801 | 0.959 | 1.102 | 1.346 | 1.539 | 1.718 |
| | 265 | 0.417 | 0.499 | 0.574 | 0.701 | 0.802 | 0.895 | 390 | 0.659 | 0.790 | 0.908 | 1.109 | 1.268 | 1.415 |
| | 145 | 0.238 | 0.285 | 0.328 | 0.401 | 0.458 | 0.511 | 215 | 0.377 | 0.451 | 0.519 | 0.634 | 0.724 | 0.808 |
| | 235 | 0.417 | 0.499 | 0.574 | 0.701 | 0.802 | 0.895 | 345 | 0.659 | 0.790 | 0.908 | 1.109 | 1.268 | 1.415 |
| | 220 | 0.357 | 0.428 | 0.492 | 0.601 | 0.687 | 0.767 | 325 | 0.565 | 0.677 | 0.778 | 0.950 | 1.087 | 1.213 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.



PROFILE MILLING

Universal application

| | |
|-------------------------|-----|
| OptiMill-3D-BN | 182 |
| CPMill-Uni-Radius | 184 |
| CPMill-Uni-Torus | 185 |

Hardened steel

| | |
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| OptiMill-3D-BN-Hardened | 183 |
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Non-ferrous metals

| | |
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| OptiMill-Diamond-Radius | 186 |
| OptiMill-Diamond-Torus | 187 |

Plastics and composite materials

| | |
|---------------------------------------|-----|
| OptiMill-Composite-Speed-Radius | 188 |
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Technical appendix

| | |
|------------------------------------|-----|
| Cutting data recommendations | 190 |
|------------------------------------|-----|



OptiMill®-3D-BN

Ball nose milling cutter, cylindrical design with working depth
MBN101

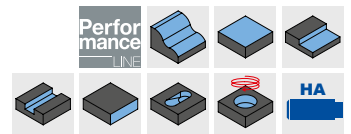
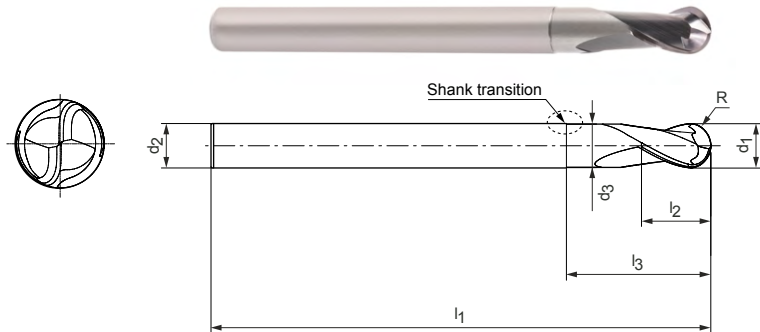
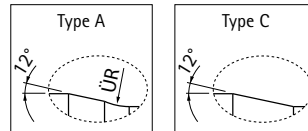
Design:

Diameter of milling cutter: 1.00 - 12.00 mm
Cutting material: HP801/HP820
Number of cutting edges: 2
Helix angle: 28°
Radial contour tolerance: ±0.005 if $d_1 \leq 6$ mm
±0.01 if $d_1 > 6$ mm

Application:

Suitable for machining workpiece materials up to 55 HRC.

Shank transition:



Preferred series in stock

| Dimensions | | | | | | Working depth at x° incline | | | | | Type | Specification | Order no. |
|----------------|------|----------------|-------------------|----------------|----------------|-----------------------------|-------|-------|-------|-------|------|--------------------------------|-----------|
| d ₁ | R | l ₃ | d ₂ h5 | l ₁ | l ₂ | d ₃ | 0.5 ° | 1° | 1.5 ° | 3° | | | |
| 1,00 | 0,5 | 3 | 4 | 50 | 1,2 | 0,94 | 3,47 | 3,57 | 3,66 | 4,01 | A | MBN101-010-0050-0300X050-HP820 | 31153292 |
| 1,00 | 0,5 | 5 | 4 | 50 | 1,2 | 0,94 | 5,54 | 5,68 | 5,8 | 6,66 | A | MBN101-010-0050-0500X050-HP820 | 31153294 |
| 2,00 | 1 | 8 | 4 | 50 | 2,3 | 1,94 | 9,09 | 9,45 | 9,74 | 10,49 | A | MBN101-020-0100-0800X050-HP801 | 31153313 |
| 2,50 | 1,25 | 25 | 6 | 75 | 2,9 | 2,44 | 26,72 | 27,37 | 28,5 | 32,97 | A | MBN101-025-0125-2500X075-HP801 | 31153328 |
| 3,00 | 1,5 | 10 | 6 | 60 | 3,5 | 2,94 | 11,17 | 11,56 | 11,88 | 12,98 | A | MBN101-030-0150-1000X060-HP801 | 31153329 |
| 3,00 | 1,5 | 15 | 6 | 60 | 3,5 | 2,94 | 16,38 | 16,87 | 17,26 | 19,62 | A | MBN101-030-0150-1500X060-HP801 | 31153330 |
| 3,00 | 1,5 | 20 | 6 | 60 | 3,5 | 2,94 | 21,56 | 22,13 | 22,76 | 26,25 | A | MBN101-030-0150-2000X060-HP801 | 31153331 |
| 3,00 | 1,5 | 25 | 6 | 75 | 3,5 | 2,94 | 26,71 | 27,36 | 28,47 | 32,2 | A | MBN101-030-0150-2500X075-HP801 | 31153332 |
| 4,00 | 2 | 10 | 6 | 60 | 4,6 | 3,94 | 11,14 | 11,52 | 11,84 | 12,82 | A | MBN101-040-0200-1000X060-HP801 | 31153333 |
| 4,00 | 2 | 15 | 6 | 60 | 4,6 | 3,94 | 16,36 | 16,84 | 17,23 | 19,46 | A | MBN101-040-0200-1500X060-HP801 | 31153334 |
| 4,00 | 2 | 20 | 6 | 60 | 4,6 | 3,94 | 21,54 | 22,1 | 22,69 | 24,85 | A | MBN101-040-0200-2000X060-HP801 | 31153335 |
| 4,00 | 2 | 25 | 6 | 75 | 4,6 | 3,94 | 26,7 | 27,33 | 28,4 | 29,85 | A | MBN101-040-0200-2500X075-HP801 | 31153336 |
| 4,00 | 2 | 30 | 6 | 75 | 4,6 | 3,94 | 31,84 | 32,66 | 34,1 | 34,85 | A | MBN101-040-0200-3000X075-HP801 | 31153337 |
| 4,00 | 2 | 35 | 6 | 75 | 4,6 | 3,94 | 36,98 | 38,11 | 39,8 | 39,85 | A | MBN101-040-0200-3500X075-HP801 | 31153338 |
| 5,00 | 2,5 | 15 | 6 | 60 | 5,8 | 4,9 | 15,78 | 16,38 | 17,03 | 17,59 | C | MBN101-050-0250-1500X060-HP801 | 31153339 |
| 5,00 | 2,5 | 20 | 6 | 60 | 5,8 | 4,9 | 21 | 21,82 | 22,59 | - | C | MBN101-050-0250-2000X060-HP801 | 31153340 |
| 5,00 | 2,5 | 25 | 6 | 60 | 5,8 | 4,9 | 26,21 | 27,27 | 27,59 | - | C | MBN101-050-0250-2500X060-HP801 | 31153341 |
| 5,00 | 2,5 | 30 | 6 | 75 | 5,8 | 4,9 | 31,42 | 32,59 | - | - | C | MBN101-050-0250-3000X075-HP801 | 31153342 |
| 6,00 | 3 | 15 | 6 | 60 | 6,9 | 5,9 | - | - | - | - | - | MBN101-060-0300-1500X060-HP801 | 31153343 |
| 6,00 | 3 | 20 | 6 | 60 | 6,9 | 5,9 | - | - | - | - | - | MBN101-060-0300-2000X060-HP801 | 31153344 |
| 6,00 | 3 | 25 | 6 | 60 | 6,9 | 5,9 | - | - | - | - | - | MBN101-060-0300-2500X060-HP801 | 31153345 |
| 6,00 | 3 | 30 | 6 | 75 | 6,9 | 5,9 | - | - | - | - | - | MBN101-060-0300-3000X075-HP801 | 31153346 |
| 6,00 | 3 | 35 | 6 | 75 | 6,9 | 5,9 | - | - | - | - | - | MBN101-060-0300-3500X075-HP801 | 31153347 |
| 8,00 | 4 | 25 | 8 | 64 | 9,2 | 7,8 | - | - | - | - | - | MBN101-080-0400-2500X064-HP801 | 31153348 |
| 8,00 | 4 | 50 | 8 | 100 | 9,2 | 7,8 | - | - | - | - | - | MBN101-080-0400-5000X100-HP801 | 31153349 |
| 10,00 | 5 | 30 | 10 | 75 | 11,5 | 9,8 | - | - | - | - | - | MBN101-100-0500-3000X075-HP801 | 31153350 |
| 10,00 | 5 | 50 | 10 | 100 | 11,5 | 9,8 | - | - | - | - | - | MBN101-100-0500-5000X100-HP801 | 31153351 |
| 12,00 | 6 | 35 | 12 | 75 | 13,8 | 11,8 | - | - | - | - | - | MBN101-120-0600-3500X075-HP801 | 31153352 |
| 12,00 | 6 | 60 | 12 | 100 | 13,8 | 11,8 | - | - | - | - | - | MBN101-120-0600-6000X100-HP801 | 31153353 |

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-3D-BN-Hardened

Ball nose milling cutter, design with working depth
MBN107

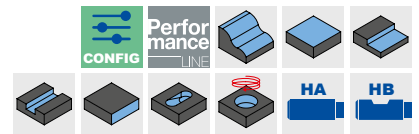
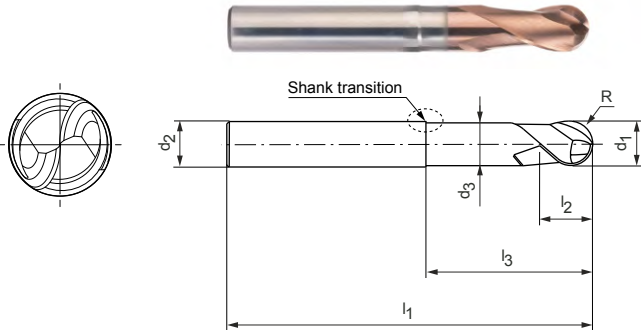
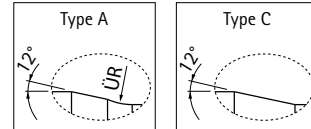
Design:

Diameter of milling cutter: 3.00 - 12.00 mm
Cutting material: HP808/HP818
Number of cutting edges: 2
Helix angle: 30°
Radial contour tolerance: ±0.005 if $d_1 \leq 6$ mm
±0.01 if $d_1 > 6$ mm

Application:

Suitable for machining workpiece materials up to 68 HRC.

Shank transition:



Preferred series in stock

| Dimensions | | | | | | | Working depth at x° incline | | | | Type | Shank form HA | Order no. |
|----------------|-----|----------------|-------------------|----------------|----------------|----------------|-----------------------------|-------|-------|-------|------|--------------------------------|-----------|
| d ₁ | R | l ₃ | d ₂ h5 | l ₁ | l ₂ | d ₃ | 0.5 ° | 1° | 1.5 ° | 3° | | Specification | |
| 3,00 | 1,5 | 10 | 6 | 60 | 3,5 | 2,94 | 11,17 | 11,56 | 11,88 | 12,98 | A | MBN107-030-0150-1000X060-HP808 | 31153744 |
| 3,00 | 1,5 | 15 | 6 | 60 | 3,5 | 2,94 | 16,38 | 16,87 | 17,26 | 19,62 | A | MBN107-030-0150-1500X060-HP808 | 31153745 |
| 3,00 | 1,5 | 20 | 6 | 60 | 3,5 | 2,94 | 21,56 | 22,13 | 22,76 | 26,25 | A | MBN107-030-0150-2000X060-HP808 | 31153746 |
| 3,00 | 1,5 | 25 | 6 | 75 | 3,5 | 2,94 | 26,71 | 27,36 | 28,47 | 32,2 | A | MBN107-030-0150-2500X075-HP808 | 31153748 |
| 4,00 | 2 | 10 | 6 | 60 | 4,6 | 3,94 | 11,14 | 11,52 | 11,84 | 12,82 | A | MBN107-040-0200-1000X060-HP808 | 31153749 |
| 4,00 | 2 | 15 | 6 | 60 | 4,6 | 3,94 | 16,36 | 16,84 | 17,23 | 19,46 | A | MBN107-040-0200-1500X060-HP808 | 31153750 |
| 4,00 | 2 | 20 | 6 | 60 | 4,6 | 3,94 | 21,54 | 22,1 | 22,69 | 24,85 | A | MBN107-040-0200-2000X060-HP808 | 31153751 |
| 4,00 | 2 | 25 | 6 | 75 | 4,6 | 3,94 | 26,7 | 27,33 | 28,4 | 29,85 | A | MBN107-040-0200-2500X075-HP808 | 31153752 |
| 4,00 | 2 | 30 | 6 | 75 | 4,6 | 3,94 | 31,84 | 32,66 | 34,1 | 34,85 | A | MBN107-040-0200-3000X075-HP808 | 31153753 |
| 4,00 | 2 | 35 | 6 | 75 | 4,6 | 3,94 | 36,98 | 38,11 | 39,8 | 39,85 | A | MBN107-040-0200-3500X075-HP808 | 31153754 |
| 5,00 | 2,5 | 15 | 6 | 60 | 5,8 | 4,9 | 15,78 | 16,38 | 17,03 | 17,59 | C | MBN107-050-0250-1500X060-HP808 | 31153755 |
| 5,00 | 2,5 | 20 | 6 | 60 | 5,8 | 4,9 | 21 | 21,82 | 22,59 | - | C | MBN107-050-0250-2000X060-HP808 | 31153756 |
| 5,00 | 2,5 | 25 | 6 | 60 | 5,8 | 4,9 | 26,21 | 27,27 | 27,59 | - | C | MBN107-050-0250-2500X060-HP808 | 31153757 |
| 5,00 | 2,5 | 30 | 6 | 75 | 5,8 | 4,9 | 31,42 | 32,59 | - | - | C | MBN107-050-0250-3000X075-HP808 | 31153758 |
| 6,00 | 3 | 15 | 6 | 60 | 6,9 | 5,9 | - | - | - | - | - | MBN107-060-0300-1500X060-HP808 | 31153759 |
| 6,00 | 3 | 20 | 6 | 60 | 6,9 | 5,9 | - | - | - | - | - | MBN107-060-0300-2000X060-HP808 | 31153760 |
| 6,00 | 3 | 25 | 6 | 60 | 6,9 | 5,9 | - | - | - | - | - | MBN107-060-0300-2500X060-HP808 | 31153761 |
| 6,00 | 3 | 30 | 6 | 75 | 6,9 | 5,9 | - | - | - | - | - | MBN107-060-0300-3000X075-HP808 | 31153762 |
| 6,00 | 3 | 35 | 6 | 75 | 6,9 | 5,9 | - | - | - | - | - | MBN107-060-0300-3500X075-HP808 | 31153763 |
| 8,00 | 4 | 25 | 8 | 64 | 9,2 | 7,8 | - | - | - | - | - | MBN107-080-0400-2500X064-HP808 | 31153764 |
| 8,00 | 4 | 50 | 8 | 100 | 9,2 | 7,8 | - | - | - | - | - | MBN107-080-0400-5000X100-HP808 | 31153765 |
| 10,00 | 5 | 30 | 10 | 75 | 11,5 | 9,8 | - | - | - | - | - | MBN107-100-0500-3000X075-HP808 | 31153766 |
| 10,00 | 5 | 50 | 10 | 100 | 11,5 | 9,8 | - | - | - | - | - | MBN107-100-0500-5000X100-HP808 | 31153767 |
| 12,00 | 6 | 35 | 12 | 75 | 13,8 | 11,8 | - | - | - | - | - | MBN107-120-0600-3500X075-HP808 | 31153768 |
| 12,00 | 6 | 60 | 12 | 100 | 13,8 | 11,8 | - | - | - | - | - | MBN107-120-0600-6000X100-HP808 | 31153769 |

Configurable features

Shank form:
Shank form: HB

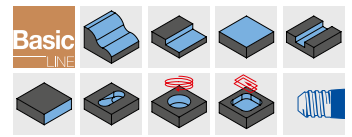
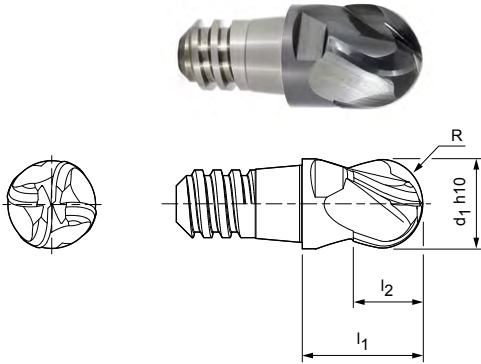
Dimensions in mm.
For cutting data recommendations, see end of chapter.
Special designs and other coatings available upon request.

CPMill®-Uni-Radius

Design with CFS connection
CPM150

Design:

Diameter of milling cutter: 8.00 – 25.00 mm
Cutting material: HP383
Number of cutting edges: 4
Helix angle: 30°




Preferred series in stock

| Dimensions | | | | | z | ap max. | SW | Specification | Order no. |
|------------|----------|----|-----|----|---|---------|-------|-------------------------------|-----------|
| d1 h10 | CFS size | l1 | l2 | R | | | | | |
| 10,00 | 8 | 13 | 7,5 | 5 | 4 | 5,6 | SW 8 | CPM150-1000Z04-R0500-08-HP383 | 30371416 |
| 12,00 | 10 | 16 | 9 | 6 | 4 | 6,8 | SW 10 | CPM150-1200Z04-R0600-10-HP383 | 30371417 |
| 16,00 | 12 | 20 | 12 | 8 | 4 | 9 | SW 13 | CPM150-1600Z04-R0800-12-HP383 | 30371418 |
| 20,00 | 16 | 25 | 15 | 10 | 4 | 11,3 | SW 16 | CPM150-2000Z04-R1000-16-HP383 | 30371420 |

Available on request

| | | | | | | | | | |
|-------|----|----|----|------|---|-----|-------|-------------------------------|----------|
| 8,00 | 6 | 11 | 6 | 4 | 4 | 4,5 | SW 6 | CPM150-0800Z04-R0400-06-HP383 | 30371595 |
| 25,00 | 20 | 32 | 19 | 12,5 | 4 | 14 | SW 21 | CPM150-2500Z04-R1250-20-HP383 | 30371421 |

Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

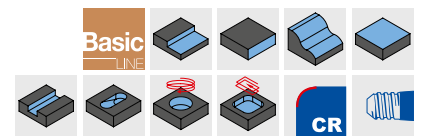
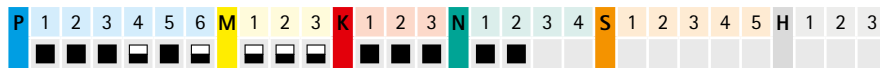
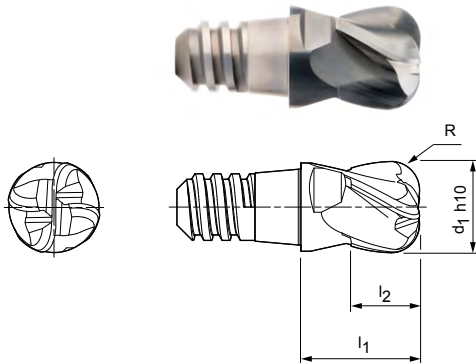
Special designs and other coatings available upon request.

CPMill®-Uni-Torus

Design with CFS connection
CPM160

Design:

Diameter of milling cutter: 8.00 – 25.00 mm
Cutting material: HP383
Number of cutting edges: 4
Helix angle: 30°




Preferred series in stock

| Dimensions | | | | | z | a _p max. | SW | Specification | Order no. |
|-------------------|----------|----------------|----------------|-----|---|---------------------|-------|-------------------------------|-----------|
| d ₁ 10 | CFS size | l ₁ | l ₂ | R | | | | | |
| 8,00 | 6 | 11 | 6 | 1 | 4 | 4,5 | SW 6 | CPM160-0800Z04-R0100-06-HP383 | 30371402 |
| 8,00 | 6 | 11 | 6 | 2 | 4 | 4,5 | SW 6 | CPM160-0800Z04-R0200-06-HP383 | 30371403 |
| 10,00 | 8 | 13 | 7,5 | 1,5 | 4 | 5,6 | SW 8 | CPM160-1000Z04-R0150-08-HP383 | 30371404 |
| 10,00 | 8 | 13 | 7,5 | 3 | 4 | 5,6 | SW 8 | CPM160-1000Z04-R0300-08-HP383 | 30371405 |
| 12,00 | 10 | 16 | 9 | 1,5 | 4 | 6,8 | SW 10 | CPM160-1200Z04-R0150-10-HP383 | 30371406 |
| 12,00 | 10 | 16 | 9 | 4 | 4 | 6,8 | SW 10 | CPM160-1200Z04-R0400-10-HP383 | 30371407 |
| 16,00 | 12 | 20 | 12 | 2 | 4 | 9 | SW 13 | CPM160-1600Z04-R0200-12-HP383 | 30371408 |
| 16,00 | 12 | 20 | 12 | 5 | 4 | 9 | SW 13 | CPM160-1600Z04-R0500-12-HP383 | 30371409 |
| 20,00 | 16 | 25 | 15 | 2 | 4 | 11,3 | SW 16 | CPM160-2000Z04-R0200-16-HP383 | 30371412 |
| 20,00 | 16 | 25 | 15 | 6 | 4 | 11,3 | SW 16 | CPM160-2000Z04-R0600-16-HP383 | 30371413 |
| 25,00 | 20 | 32 | 19 | 6 | 4 | 14 | SW 21 | CPM160-2500Z04-R0600-20-HP383 | 30371415 |

Available on request

| | | | | | | | | | |
|-------|----|----|----|---|---|----|------|-------------------------------|----------|
| 25,00 | 20 | 32 | 19 | 3 | 4 | 14 | SW21 | CPM160-2500Z04-R0300-20-HP383 | 30371414 |
|-------|----|----|----|---|---|----|------|-------------------------------|----------|

Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

OptiMill®-Diamond-Radius

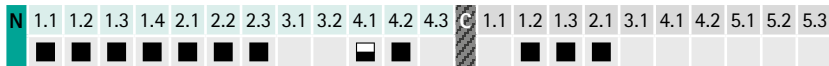
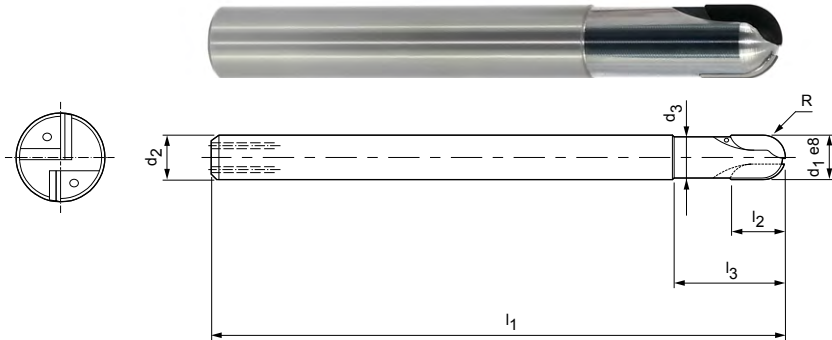
Ball nose milling cutter, overlong design with neck, includes internal cooling
SHM521

Design:

Diameter of milling cutter: 3.00 – 16.00 mm
Cutting material: PU611
Number of cutting edges: 2
Axis angle: 0°
Special features: PCD cutting edges for a long tool life

Application:

Ideal for contour and form milling aluminium parts.



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|----------------|----------------|-----|---|--------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 3,00 | 6 | 2,8 | 60 | 2,5 | 9 | 1,5 | 2 | SHM521-0300AZ02R-R0150HA-PU611 | 30340718 |
| 4,00 | 6 | 3,8 | 60 | 2,5 | 15 | 2 | 2 | SHM521-0400AZ02R-R0200HA-PU611 | 30334958 |
| 5,00 | 6 | 4,6 | 60 | 3 | 15 | 2,5 | 2 | SHM521-0500AZ02R-R0250HA-PU611 | 30340720 |
| 6,00 | 6 | 5,5 | 80 | 6 | 15 | 3 | 2 | SHM521-0600BZ02R-R0300HA-PU611 | 30334960 |
| 8,00 | 8 | 6,9 | 80 | 10 | 20 | 4 | 2 | SHM521-0800BZ02R-R0400HA-PU611 | 30696715 |
| 10,00 | 10 | 8,9 | 80 | 10 | 26 | 5 | 2 | SHM521-1000BZ02R-R0500HA-PU611 | 30696716 |
| 12,00 | 12 | 11,2 | 100 | 10 | 35 | 6 | 2 | SHM521-1200BZ02R-R0600HA-PU611 | 30324570 |
| 16,00 | 16 | 15 | 125 | 10 | 35 | 8 | 2 | SHM521-1600BZ02R-R0800HA-PU611 | 30324494 |

Dimensions in mm.

For cutting data recommendations, see end of chapter.

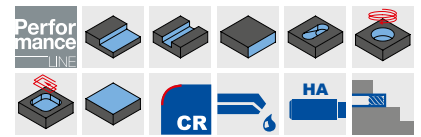
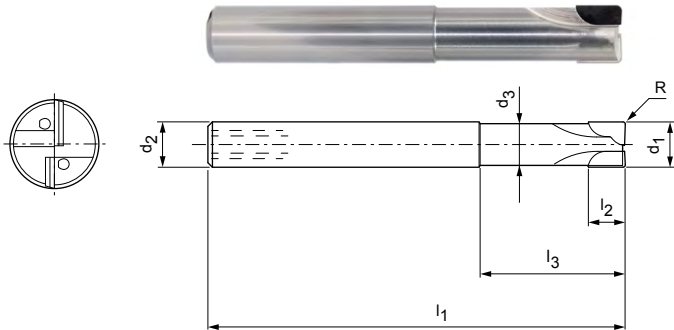
Special designs and CVD-tipped tools available upon request.

OptiMill®-Diamond-Torus

Corner radius milling cutter, long design with neck, includes internal cooling
SHM551

Design:

Diameter of milling cutter: 3.00 – 12.00 mm
Cutting material: PU611
Number of cutting edges: 2
Axis angle: 0°
Special features: PCD cutting edges for a long tool life



Preferred series in stock

| Dimensions | | | | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-----|---|--------------------------------|-----------|
| d ₁ e8 | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | R | | | |
| 3,00 | 6 | 2,8 | 50 | 2,5 | 14 | 0,3 | 2 | SHM551-0300AZ02R-R0030HA-PU611 | 30334961 |
| 4,00 | 6 | 3,8 | 50 | 2,5 | 14 | 0,5 | 2 | SHM551-0400AZ02R-R0050HA-PU611 | 30334966 |
| 5,00 | 6 | 4,6 | 54 | 3 | 18 | 0,5 | 2 | SHM551-0500AZ02R-R0050HA-PU611 | 30334969 |
| 6,00 | 6 | 5,5 | 57 | 6 | 21 | 0,5 | 2 | SHM551-0600BZ02R-R0050HA-PU611 | 30334973 |
| 6,00 | 6 | 5,5 | 57 | 6 | 21 | 1 | 2 | SHM551-0600BZ02R-R0100HA-PU611 | 30334974 |
| 8,00 | 8 | 7,4 | 63 | 7 | 27 | 0,5 | 2 | SHM551-0800BZ02R-R0050HA-PU611 | 30334976 |
| 10,00 | 10 | 9,2 | 72 | 8 | 32 | 0,5 | 2 | SHM551-1000BZ02R-R0050HA-PU611 | 30334980 |
| 10,00 | 10 | 9,2 | 72 | 8 | 32 | 1 | 2 | SHM551-1000BZ02R-R0100HA-PU611 | 30334981 |

Available on request

| | | | | | | | | | |
|-------|----|------|----|-----|----|-----|---|--------------------------------|----------|
| 3,00 | 6 | 2,8 | 50 | 2,5 | 14 | 0,5 | 2 | SHM551-0300AZ02R-R0050HA-PU611 | 30334962 |
| 3,00 | 6 | 2,8 | 50 | 2,5 | 14 | 1 | 2 | SHM551-0300AZ02R-R0100HA-PU611 | 30334963 |
| 4,00 | 6 | 3,8 | 50 | 2,5 | 14 | 0,3 | 2 | SHM551-0400AZ02R-R0030HA-PU611 | 30334964 |
| 4,00 | 6 | 3,8 | 50 | 2,5 | 14 | 1 | 2 | SHM551-0400AZ02R-R0100HA-PU611 | 30334967 |
| 5,00 | 6 | 4,6 | 54 | 3 | 18 | 1 | 2 | SHM551-0500AZ02R-R0100HA-PU611 | 30334971 |
| 6,00 | 6 | 5,5 | 57 | 6 | 21 | 1,5 | 2 | SHM551-0600BZ02R-R0150HA-PU611 | 30334975 |
| 8,00 | 8 | 7,4 | 63 | 7 | 27 | 1 | 2 | SHM551-0800BZ02R-R0100HA-PU611 | 30334977 |
| 8,00 | 8 | 7,4 | 63 | 7 | 27 | 1,5 | 2 | SHM551-0800BZ02R-R0150HA-PU611 | 30334978 |
| 8,00 | 8 | 7,4 | 63 | 7 | 27 | 2 | 2 | SHM551-0800BZ02R-R0200HA-PU611 | 30334979 |
| 10,00 | 10 | 9,2 | 72 | 8 | 32 | 1,5 | 2 | SHM551-1000BZ02R-R0150HA-PU611 | 30334982 |
| 10,00 | 10 | 9,2 | 72 | 8 | 32 | 2 | 2 | SHM551-1000BZ02R-R0200HA-PU611 | 30334983 |
| 12,00 | 12 | 11,2 | 83 | 9 | 38 | 0,5 | 2 | SHM551-1200BZ02R-R0050HA-PU611 | 30334984 |
| 12,00 | 12 | 11,2 | 83 | 9 | 38 | 1 | 2 | SHM551-1200BZ02R-R0100HA-PU611 | 30334985 |
| 12,00 | 12 | 11,2 | 83 | 9 | 38 | 1,5 | 2 | SHM551-1200BZ02R-R0150HA-PU611 | 30334986 |
| 12,00 | 12 | 11,2 | 83 | 9 | 38 | 2 | 2 | SHM551-1200BZ02R-R0200HA-PU611 | 30334987 |

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs available upon request.

OptiMill®-Composite-Speed-Radius

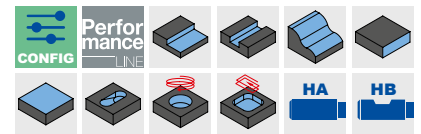
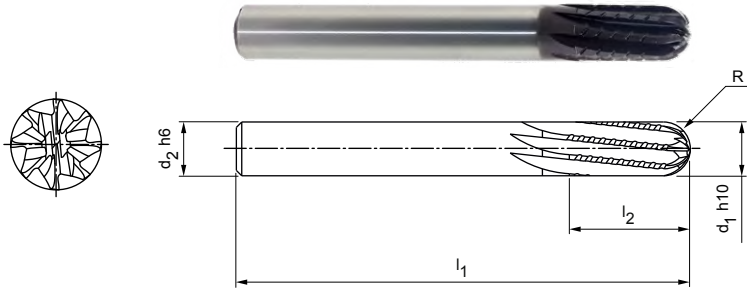
Ball nose milling cutter, design with pulling cut, with full radius
SCM870

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
Cutting material: HC611/HC619
Number of cutting edges: 8
Helix angle: 8°
Special features: Diamond coating for long tool life

Application:

Pulling cutting edge for better removal of the chips/dust (e.g. on milling pockets and slots). Particularly suitable for difficult to machine surface layers (e.g. UD or copper mesh) to prevent delamination on the lower edge of the part.




Preferred series in stock

| Dimensions | | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|---|---|-------------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | R | | | |
| 4,00 | 6 | 60 | 16 | 2 | 8 | SCM870-0400Z08R-R0200HA-HC619 | 30869182 |
| 6,00 | 6 | 75 | 28 | 3 | 8 | SCM870-0600Z08R-R0300HA-HC619 | 30869186 |
| 8,00 | 8 | 75 | 32 | 4 | 8 | SCM870-0800Z08R-R0400HA-HC619 | 30869188 |
| 10,00 | 10 | 72 | 32 | 5 | 8 | SCM870-1000Z08R-R0500HA-HC619 | 30869189 |


Available on request

| | | | | | | | |
|-------|----|-----|----|----|---|-------------------------------|----------|
| 12,00 | 12 | 83 | 32 | 6 | 8 | SCM870-1200Z08R-R0600HA-HC611 | 30869190 |
| 16,00 | 16 | 92 | 36 | 8 | 8 | SCM870-1600Z08R-R0800HA-HC611 | 30869191 |
| 20,00 | 20 | 104 | 45 | 10 | 8 | SCM870-2000Z08R-R1000HA-HC611 | 30869192 |

Configurable features



Shank form:
Shank form: HB



Specification up to ø 10 mm:
SCM870-0400Z08R-R0200[shank form]-HC619

Specification from ø 12 mm:
SCM870-1200Z08R-R0600[shank form]-HC611

Example:

SCM870-0400Z08R-R0200**HB**-HC619

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.



Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

OptiMill-3D-BN | MBN101

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|--------------------|--|---------|-----|---------|---|
| | | | MQL/Air | Dry | Coolant | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5.1 | Cast steel | | ✓ | | ✓ |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ |
| M | M1.1 | Stainless steels, austenitic | < 700 | | | ✓ |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | | | ✓ |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| H | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | |
| | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | |
| | H2.1 | Hardened steel / cast steel | < 60 | ✓ | | |

Working depth correction factor - k_{AT}

| AT | k_{AT} | | |
|--------|----------|------|-------|
| | a_p | n | v_f |
| ≤ 3xD | 1,00 | 1,00 | 1,00 |
| ≤ 5xD | 0,80 | 0,90 | 0,90 |
| ≤ 6xD | 0,70 | 0,85 | 0,85 |
| ≤ 8xD | 0,60 | 0,75 | 0,75 |
| ≤ 10xD | 0,50 | 0,70 | 0,70 |
| ≤ 12xD | 0,45*** | 0,65 | 0,65 |
| ≤ 15xD | 0,40*** | 0,60 | 0,60 |
| ≤ 20xD | 0,35*** | 0,60 | 0,60 |
| ≤ 25xD | 0,35*** | 0,50 | 0,50 |
| ≤ 30xD | 0,30*** | 0,50 | 0,50 |
| ≤ 35xD | 0,30*** | 0,50 | 0,50 |

Cone angle correction factor - k_{KW}

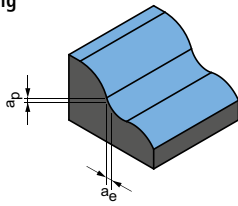
| φ [°] | k_{KW} | | |
|---------------|----------|------|-------|
| | a_p | n | v_f |
| 0 | 1,00 | 1,00 | 1,00 |
| 0,5 | 1,01 | 1,01 | 1,01 |
| 1 | 1,02 | 1,02 | 1,02 |
| 1,5 | 1,03 | 1,03 | 1,03 |
| 3 | 1,06 | 1,06 | 1,06 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** Consultation with a MAPAL application engineer.

Roughing



Plunge angle
1.0 ° - 3.0 °

Next page:
Finishing

| | a _p [mm] in % of D | a _e [mm] in % of D | V _c [m/min] | f _z [mm] | | | | | | | | | | | | | | | | | | | |
|--|--|--|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | | Diameter of milling cutter [mm] | | | | | | | | | | | | | | | | | | | |
| | | | | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.80 | 1.00 | 1.50 | 1.80 | 2.00 | 2.50 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 |
| | 5 | < 25 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| | 4.5 | < 25 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 5 | < 25 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| | 4.5 | < 25 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 5 | < 25 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| | 4.5 | < 20 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 4 | < 20 | 220-260 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| | 5 | < 25 | 240-280 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| | 5 | < 25 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 4.5 | < 25 | 200-250 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| | 5 | < 25 | 85-110 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 5 | < 25 | 60-85 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| | 5 | < 25 | 85-110 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 5 | < 25 | 60-85 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| | 6 | < 30 | 250-300 | 0.004 | 0.005 | 0.007 | 0.010 | 0.012 | 0.014 | 0.019 | 0.024 | 0.034 | 0.042 | 0.048 | 0.060 | 0.073 | 0.101 | 0.128 | 0.150 | 0.198 | 0.240 | 0.282 | 0.360 |
| | 6 | < 30 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| | 6 | < 30 | 240-280 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| | 6 | < 30 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| | 6 | < 30 | 250-300 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| | 6 | < 30 | 240-280 | 0.002 | 0.002 | 0.004 | 0.005 | 0.006 | 0.007 | 0.010 | 0.012 | 0.017 | 0.022 | 0.025 | 0.031 | 0.038 | 0.052 | 0.066 | 0.078 | 0.102 | 0.124 | 0.146 | 0.186 |
| | 4 | < 18 | 220-280 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| | 3 | < 12 | 160-220 | 0.002 | 0.002 | 0.004 | 0.005 | 0.006 | 0.007 | 0.010 | 0.012 | 0.017 | 0.021 | 0.024 | 0.030 | 0.037 | 0.050 | 0.064 | 0.075 | 0.099 | 0.120 | 0.141 | 0.180 |
| | 1.5 | < 3 | 100-160 | 0.001 | 0.002 | 0.002 | 0.003 | 0.004 | 0.005 | 0.006 | 0.008 | 0.011 | 0.014 | 0.016 | 0.020 | 0.024 | 0.034 | 0.043 | 0.050 | 0.066 | 0.080 | 0.094 | 0.120 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

OptiMill-3D-BN | MBN101

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|--------------------|--|---------|-----|---------|---|
| | | | MQL/Air | Dry | Coolant | |
| P | P1.1 | Structural, machining, case hardened and tempering steels, unalloyed | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Construction steels, machining steels, hardening and tempering steels, unalloyed | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitriding, hardening and tempering steels, alloyed | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitriding, hardening and tempering steels, alloyed | < 1400 | ✓ | ✓ | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool steels, roller bearing steels, spring steels and high-speed steels** | < 1000 | ✓ | ✓ | ✓ |
| | P3.3 | Tool steels, roller bearing steels, spring steels and high-speed steels** | < 1500 | ✓ | ✓ | ✓ |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5.1 | Cast steel | | ✓ | | ✓ |
| | P6.1 | Stainless cast steels, ferritic and martensitic | | ✓ | | ✓ |
| M | M1.1 | Stainless steels, austenitic | < 700 | | | ✓ |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2.1 | Stainless cast steel, austenitic | < 700 | | | ✓ |
| | M3.1 | Stainless cast steel, ferritic/austenitic (Duplex) | < 1000 | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with vermicular graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with vermicular graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| H | H1.1 | Hardened steel/cast steel | < 44 | ✓ | ✓ | |
| | H1.2 | Hardened steel/cast steel | < 55 | ✓ | ✓ | |
| | H2.1 | Hardened steel/cast steel | < 60 | ✓ | | |

Working depth correction factor – k_{AT}

| AT | k_{AT} | | |
|--------|----------|------|-------|
| | a_p | n | v_f |
| ≤ 3xD | 1,00 | 1,00 | 1,00 |
| ≤ 5xD | 0,80 | 0,90 | 0,90 |
| ≤ 6xD | 0,70 | 0,85 | 0,85 |
| ≤ 8xD | 0,60 | 0,75 | 0,75 |
| ≤ 10xD | 0,50 | 0,70 | 0,70 |
| ≤ 12xD | 0,45*** | 0,65 | 0,65 |
| ≤ 15xD | 0,40*** | 0,60 | 0,60 |
| ≤ 20xD | 0,35*** | 0,60 | 0,60 |
| ≤ 25xD | 0,35*** | 0,50 | 0,50 |
| ≤ 30xD | 0,30*** | 0,50 | 0,50 |
| ≤ 35xD | 0,30*** | 0,50 | 0,50 |

Cone angle correction factor – k_{KW}

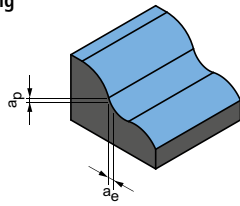
| φ [°] | k_{KW} | | |
|---------------|----------|------|-------|
| | a_p | n | v_f |
| 0 | 1,00 | 1,00 | 1,00 |
| 0,5 | 1,01 | 1,01 | 1,01 |
| 1 | 1,02 | 1,02 | 1,02 |
| 1,5 | 1,03 | 1,03 | 1,03 |
| 3 | 1,06 | 1,06 | 1,06 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** Consultation with a MAPAL application engineer.

Finishing



Plunge angle
0.5° - 1.0°

| ap [mm] in % of D | ae [mm] in % of D | Vc [m/min] | fz [mm] | | | | | | | | | | | | | | | | | | | |
|----------------------------|----------------------------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | Diameter of milling cutter [mm] | | | | | | | | | | | | | | | | | | | |
| | | | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.80 | 1.00 | 1.50 | 1.80 | 2.00 | 2.50 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 |
| 1.5 | 2.5 | 280-340 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.4 | 2.4 | 280-320 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.4 | 2.4 | 270-320 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.3 | 2.3 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.3 | 2.3 | 280-320 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.032 | 0.036 | 0.045 | 0.055 | 0.076 | 0.097 | 0.113 | 0.149 | 0.181 | 0.212 | 0.271 |
| 1.2 | 2.2 | 260-300 | 0.002 | 0.003 | 0.005 | 0.006 | 0.008 | 0.010 | 0.013 | 0.016 | 0.022 | 0.028 | 0.032 | 0.040 | 0.048 | 0.067 | 0.085 | 0.099 | 0.131 | 0.159 | 0.187 | 0.238 |
| 1 | 2 | 240-280 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.3 | 2.3 | 260-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.3 | 2.3 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.2 | 2.2 | 220-270 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.3 | 2.3 | 90-120 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.2 | 2.2 | 70-90 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.3 | 2.3 | 90-120 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.2 | 2.2 | 70-90 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.5 | 2.5 | 280-340 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.4 | 2.4 | 280-320 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.3 | 2.3 | 270-320 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.2 | 2.2 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.4 | 2.4 | 280-320 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.3 | 2.3 | 260-300 | 0.002 | 0.002 | 0.004 | 0.005 | 0.006 | 0.007 | 0.009 | 0.012 | 0.017 | 0.021 | 0.024 | 0.029 | 0.036 | 0.050 | 0.063 | 0.074 | 0.097 | 0.118 | 0.139 | 0.177 |
| 1.2 | 2.2 | 240-280 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.014 | 0.020 | 0.025 | 0.029 | 0.036 | 0.044 | 0.061 | 0.077 | 0.090 | 0.119 | 0.144 | 0.170 | 0.217 |
| 1 | 2 | 160-240 | 0.002 | 0.003 | 0.004 | 0.005 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.027 | 0.034 | 0.042 | 0.058 | 0.073 | 0.086 | 0.113 | 0.137 | 0.161 | 0.206 |
| 0.8 | 1.8 | 120-160 | 0.001 | 0.002 | 0.003 | 0.004 | 0.005 | 0.006 | 0.008 | 0.010 | 0.013 | 0.017 | 0.019 | 0.024 | 0.029 | 0.040 | 0.051 | 0.060 | 0.079 | 0.096 | 0.113 | 0.144 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

OptiMill-3D-BN-Hardened | MBN107

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | | |
|------|--------------------|--|--|-------|---------|---|---|
| | | | ML/Air | Dry | Coolant | | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ | |
| | P5.1 | Cast steel | | ✓ | | ✓ | |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ | |
| | K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| K2.2 | | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | |
| K2.3 | | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | |
| K3.1 | | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | |
| K3.2 | | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | |
| H | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | | |
| | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | | |
| | H2.1 | Hardened steel / cast steel | < 60 | ✓ | | | |
| | H2.2 | Hardened steel / cast steel | < 65 | ✓ | | | |
| | H2.3 | Hardened steel / cast steel | < 68 | ✓ | | | |
| | H3.1 | Wear-resistant cast/chill casting, GJN | | ✓ | ✓ | | |

Working depth correction factor – k_{AT}

| AT | k_{AT} | | |
|--------|----------|------|-------|
| | a_p | n | v_f |
| ≤ 3xD | 1,00 | 1,00 | 1,00 |
| ≤ 5xD | 0,80 | 0,90 | 0,90 |
| ≤ 6xD | 0,70 | 0,85 | 0,85 |
| ≤ 8xD | 0,60 | 0,75 | 0,75 |
| ≤ 10xD | 0,50 | 0,70 | 0,70 |
| ≤ 12xD | 0,45*** | 0,65 | 0,65 |
| ≤ 15xD | 0,40*** | 0,60 | 0,60 |
| ≤ 20xD | 0,35*** | 0,60 | 0,60 |
| ≤ 25xD | 0,35*** | 0,50 | 0,50 |
| ≤ 30xD | 0,30*** | 0,50 | 0,50 |
| ≤ 35xD | 0,30*** | 0,50 | 0,50 |

Cone angle correction factor – k_{KW}

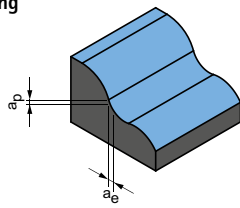
| φ [°] | k_{KW} | | |
|---------------|----------|------|-------|
| | a_p | n | v_f |
| 0 | 1,00 | 1,00 | 1,00 |
| 0,5 | 1,01 | 1,01 | 1,01 |
| 1 | 1,02 | 1,02 | 1,02 |
| 1,5 | 1,03 | 1,03 | 1,03 |
| 3 | 1,06 | 1,06 | 1,06 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** Consultation with a MAPAL application engineer.

Roughing



Plunge angle
1.0 ° - 3.0 °

Next page:
Finishing

| a_p [mm] in % of D | a_e [mm] in % of D | v_c [m/min] | f_z [mm] | | | | | | | | | | | | | | | | | | | |
|-------------------------------|-------------------------------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | Diameter of milling cutter [mm] | | | | | | | | | | | | | | | | | | | |
| | | | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.80 | 1.00 | 1.50 | 1.80 | 2.00 | 2.50 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 |
| 5 | < 25 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| 4.5 | < 25 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| 5 | < 25 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| 4.5 | < 25 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| 5 | < 25 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 4.5 | < 20 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| 4 | < 20 | 220-260 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| 5 | < 25 | 240-280 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| 5 | < 25 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| 4.5 | < 25 | 200-250 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| 6 | < 30 | 250-300 | 0.004 | 0.005 | 0.007 | 0.010 | 0.012 | 0.014 | 0.019 | 0.024 | 0.034 | 0.042 | 0.048 | 0.060 | 0.073 | 0.101 | 0.128 | 0.150 | 0.198 | 0.240 | 0.282 | 0.360 |
| 6 | < 30 | 250-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| 6 | < 30 | 240-280 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.012 | 0.016 | 0.020 | 0.028 | 0.035 | 0.040 | 0.050 | 0.061 | 0.084 | 0.107 | 0.125 | 0.165 | 0.200 | 0.235 | 0.300 |
| 6 | < 30 | 240-280 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.031 | 0.035 | 0.044 | 0.054 | 0.074 | 0.094 | 0.110 | 0.145 | 0.176 | 0.207 | 0.264 |
| 6 | < 30 | 250-300 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| 6 | < 30 | 240-280 | 0.002 | 0.002 | 0.004 | 0.005 | 0.006 | 0.007 | 0.010 | 0.012 | 0.017 | 0.022 | 0.025 | 0.031 | 0.038 | 0.052 | 0.066 | 0.078 | 0.102 | 0.124 | 0.146 | 0.186 |
| 4 | < 18 | 220-280 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.009 | 0.012 | 0.015 | 0.020 | 0.026 | 0.029 | 0.037 | 0.045 | 0.061 | 0.078 | 0.091 | 0.120 | 0.146 | 0.172 | 0.219 |
| 3 | < 12 | 160-220 | 0.002 | 0.002 | 0.004 | 0.005 | 0.006 | 0.007 | 0.010 | 0.012 | 0.017 | 0.021 | 0.024 | 0.030 | 0.037 | 0.050 | 0.064 | 0.075 | 0.099 | 0.120 | 0.141 | 0.180 |
| 1.5 | < 3 | 100-160 | 0.001 | 0.002 | 0.002 | 0.003 | 0.004 | 0.005 | 0.006 | 0.008 | 0.011 | 0.014 | 0.016 | 0.020 | 0.024 | 0.034 | 0.043 | 0.050 | 0.066 | 0.080 | 0.094 | 0.120 |
| 0.8 | < 1.8 | 60-100 | 0.001 | 0.001 | 0.002 | 0.002 | 0.003 | 0.004 | 0.005 | 0.006 | 0.008 | 0.011 | 0.012 | 0.015 | 0.018 | 0.025 | 0.032 | 0.038 | 0.050 | 0.060 | 0.071 | 0.090 |
| 0.5 | < 1.5 | 40-80 | 0.001 | 0.001 | 0.001 | 0.002 | 0.002 | 0.003 | 0.004 | 0.004 | 0.006 | 0.008 | 0.009 | 0.011 | 0.013 | 0.019 | 0.024 | 0.028 | 0.036 | 0.044 | 0.052 | 0.066 |
| 1.5 | < 3 | 100-160 | 0.001 | 0.002 | 0.002 | 0.003 | 0.004 | 0.005 | 0.006 | 0.008 | 0.011 | 0.014 | 0.016 | 0.020 | 0.024 | 0.034 | 0.043 | 0.050 | 0.066 | 0.080 | 0.094 | 0.120 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

OptiMill-3D-BN-Hardened | MBN107

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | | |
|------|--------------------|--|--|-------|---------|---|---|
| | | | ML/Air | Dry | Coolant | | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ | |
| | P5.1 | Cast steel | | ✓ | | ✓ | |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | ✓ | | ✓ | |
| | K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| K2.2 | | Cast iron with spheroidal graphite, GJS | ≤ 800 | ✓ | ✓ | ✓ | |
| K2.3 | | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | |
| K3.1 | | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | |
| K3.2 | | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | |
| H | H1.1 | Hardened steel / cast steel | < 44 | ✓ | ✓ | | |
| | H1.2 | Hardened steel / cast steel | < 55 | ✓ | ✓ | | |
| | H2.1 | Hardened steel / cast steel | < 60 | ✓ | | | |
| | H2.2 | Hardened steel / cast steel | < 65 | ✓ | | | |
| | H2.3 | Hardened steel / cast steel | < 68 | ✓ | | | |
| | H3.1 | Wear-resistant cast/chill casting, GJN | | ✓ | ✓ | | |

Working depth correction factor – k_{AT}

| AT | k_{AT} | | |
|--------|----------|------|-------|
| | a_p | n | v_f |
| ≤ 3xD | 1,00 | 1,00 | 1,00 |
| ≤ 5xD | 0,80 | 0,90 | 0,90 |
| ≤ 6xD | 0,70 | 0,85 | 0,85 |
| ≤ 8xD | 0,60 | 0,75 | 0,75 |
| ≤ 10xD | 0,50 | 0,70 | 0,70 |
| ≤ 12xD | 0,45*** | 0,65 | 0,65 |
| ≤ 15xD | 0,40*** | 0,60 | 0,60 |
| ≤ 20xD | 0,35*** | 0,60 | 0,60 |
| ≤ 25xD | 0,35*** | 0,50 | 0,50 |
| ≤ 30xD | 0,30*** | 0,50 | 0,50 |
| ≤ 35xD | 0,30*** | 0,50 | 0,50 |

Cone angle correction factor – k_{KW}

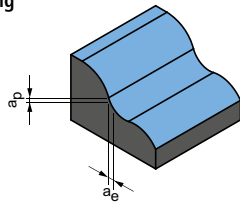
| φ [°] | k_{KW} | | |
|---------------|----------|------|-------|
| | a_p | n | v_f |
| 0 | 1,00 | 1,00 | 1,00 |
| 0,5 | 1,01 | 1,01 | 1,01 |
| 1 | 1,02 | 1,02 | 1,02 |
| 1,5 | 1,03 | 1,03 | 1,03 |
| 3 | 1,06 | 1,06 | 1,06 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** Consultation with a MAPAL application engineer.

Finishing



Plunge angle
0.5 ° - 1.0 °

| ap [mm] in % of D | ae [mm] in % of D | Vc [m/min] | fz [mm] | | | | | | | | | | | | | | | | | | | |
|----------------------------|----------------------------|---------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | Diameter of milling cutter [mm] | | | | | | | | | | | | | | | | | | | |
| | | | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.80 | 1.00 | 1.50 | 1.80 | 2.00 | 2.50 | 3.00 | 4.00 | 5.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 |
| 1.5 | 2.5 | 280-340 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.4 | 2.4 | 280-320 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.4 | 2.4 | 270-320 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.3 | 2.3 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.3 | 2.3 | 280-320 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.018 | 0.025 | 0.032 | 0.036 | 0.045 | 0.055 | 0.076 | 0.097 | 0.113 | 0.149 | 0.181 | 0.212 | 0.271 |
| 1.2 | 2.2 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1 | 2 | 240-280 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.3 | 2.3 | 260-300 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.3 | 2.3 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.2 | 2.2 | 220-270 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.5 | 2.5 | 280-340 | 0.003 | 0.004 | 0.006 | 0.008 | 0.010 | 0.011 | 0.015 | 0.019 | 0.027 | 0.033 | 0.038 | 0.048 | 0.058 | 0.080 | 0.102 | 0.119 | 0.157 | 0.190 | 0.223 | 0.285 |
| 1.4 | 2.4 | 280-320 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.3 | 2.3 | 270-320 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.2 | 2.2 | 260-300 | 0.003 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.042 | 0.051 | 0.070 | 0.089 | 0.105 | 0.138 | 0.167 | 0.196 | 0.251 |
| 1.4 | 2.4 | 280-320 | 0.002 | 0.003 | 0.004 | 0.006 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.028 | 0.035 | 0.042 | 0.058 | 0.074 | 0.087 | 0.114 | 0.139 | 0.163 | 0.208 |
| 1.3 | 2.3 | 260-300 | 0.002 | 0.002 | 0.004 | 0.005 | 0.006 | 0.007 | 0.009 | 0.012 | 0.017 | 0.021 | 0.024 | 0.029 | 0.036 | 0.050 | 0.063 | 0.074 | 0.097 | 0.118 | 0.139 | 0.177 |
| 1.2 | 2.2 | 250-300 | 0.003 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.015 | 0.018 | 0.026 | 0.032 | 0.037 | 0.046 | 0.056 | 0.077 | 0.098 | 0.114 | 0.151 | 0.183 | 0.215 | 0.274 |
| 1 | 2 | 200-250 | 0.002 | 0.003 | 0.005 | 0.007 | 0.008 | 0.010 | 0.013 | 0.017 | 0.023 | 0.029 | 0.033 | 0.041 | 0.051 | 0.070 | 0.089 | 0.104 | 0.137 | 0.166 | 0.195 | 0.249 |
| 0.8 | 1.8 | 130-200 | 0.002 | 0.003 | 0.005 | 0.006 | 0.008 | 0.009 | 0.012 | 0.015 | 0.021 | 0.026 | 0.030 | 0.038 | 0.046 | 0.063 | 0.081 | 0.094 | 0.124 | 0.151 | 0.177 | 0.226 |
| 0.6 | 1.6 | 100-150 | 0.002 | 0.003 | 0.004 | 0.005 | 0.007 | 0.008 | 0.011 | 0.014 | 0.019 | 0.024 | 0.027 | 0.034 | 0.042 | 0.058 | 0.073 | 0.086 | 0.113 | 0.137 | 0.161 | 0.206 |
| 0.5 | 1.5 | 70-120 | 0.001 | 0.002 | 0.003 | 0.004 | 0.005 | 0.006 | 0.008 | 0.010 | 0.013 | 0.017 | 0.019 | 0.024 | 0.029 | 0.040 | 0.051 | 0.060 | 0.079 | 0.096 | 0.113 | 0.144 |
| 0.8 | 1.8 | 130-200 | 0.002 | 0.003 | 0.005 | 0.006 | 0.008 | 0.009 | 0.012 | 0.015 | 0.021 | 0.026 | 0.030 | 0.038 | 0.046 | 0.063 | 0.081 | 0.094 | 0.124 | 0.151 | 0.177 | 0.226 |

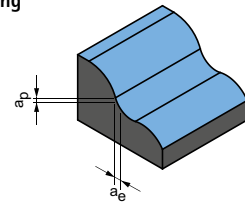
The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

| Correction factor: | |
|--------------------|---------------|
| Length | f_z & v_c |
| A/B | 1,0 |
| C | 0,9 |
| D | 0,7 |
| E | 0,6 |

Finishing



$$a_p = 0.1 \times D$$

$$a_e = 0.1 \times D$$

CPMill-Uni-Radius | CPM150

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|------|--|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| P5 | P5.1 | Cast steel | | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 | Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 | Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |

OptiMill-Diamond-Radius | SHM521

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|------|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 | Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 | Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |
| N4 | N4.1 | Plastic, thermoplastics | | | | |
| | N4.2 | Plastic, thermosets | | ✓ | | ✓ |
| | N4.3 | Plastic, foams | | | | |
| C | C1.1 | Plastic matrix, aramide fibre-reinforced (AFRP) | | ✓ | ✓ | ✓ |
| | C1.2 | Plastic matrix (thermosetting), CFRP/GFRP | | ✓ | ✓ | ✓ |
| | C1.3 | Plastic matrix (thermoplastic), CFRP/GFRP | | ✓ | ✓ | ✓ |
| | C2.1 | Carbon matrix, carbon fibre-reinforced (CFC) | | ✓ | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| | v_c [m/min] | f_z [mm] | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 240 | 0.052 | 0.063 | 0.072 | 0.088 | 0.100 | 0.112 |
| | 195 | 0.049 | 0.058 | 0.067 | 0.082 | 0.094 | 0.105 |
| | 220 | 0.052 | 0.063 | 0.072 | 0.088 | 0.100 | 0.112 |
| | 155 | 0.044 | 0.052 | 0.060 | 0.073 | 0.084 | 0.093 |
| | 140 | 0.050 | 0.060 | 0.069 | 0.085 | 0.097 | 0.108 |
| | 130 | 0.048 | 0.057 | 0.066 | 0.080 | 0.092 | 0.103 |
| | 120 | 0.045 | 0.054 | 0.062 | 0.076 | 0.087 | 0.097 |
| | 145 | 0.050 | 0.060 | 0.069 | 0.085 | 0.097 | 0.108 |
| | 325 | 0.087 | 0.104 | 0.120 | 0.146 | 0.167 | 0.187 |
| | 295 | 0.074 | 0.089 | 0.102 | 0.124 | 0.142 | 0.159 |
| | 245 | 0.061 | 0.073 | 0.084 | 0.102 | 0.117 | 0.131 |
| | 135 | 0.035 | 0.042 | 0.048 | 0.059 | 0.067 | 0.075 |
| | 215 | 0.061 | 0.073 | 0.084 | 0.102 | 0.117 | 0.131 |
| | 205 | 0.052 | 0.063 | 0.072 | 0.088 | 0.100 | 0.112 |
| | 705 | 0.064 | 0.077 | 0.089 | 0.108 | 0.124 | 0.138 |
| | 470 | 0.068 | 0.081 | 0.093 | 0.114 | 0.130 | 0.145 |
| | 375 | 0.071 | 0.085 | 0.097 | 0.119 | 0.136 | 0.152 |
| | 270 | 0.077 | 0.093 | 0.106 | 0.130 | 0.149 | 0.166 |
| | 270 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.111 |
| | 200 | 0.052 | 0.062 | 0.071 | 0.087 | 0.099 | 0.111 |
| | 335 | 0.032 | 0.039 | 0.044 | 0.054 | 0.062 | 0.069 |

| | Diameter of milling cutter [mm] | | | | | |
|--|---------------------------------|-------------|---------------|-------------|---------------|-------------|
| | 3.00 - 6.00 | | 8.00 - 10.00 | | 12.00 - 16.00 | |
| | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |
| | 300 | 0.12 - 0.15 | 600 | 0.15 - 0.20 | 900 | 0.20 - 0.25 |

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for corner radius milling cutters

Feed and cutting speed

| Korrekturfaktor: | |
|------------------|---------------|
| Länge | f_z & v_c |
| A/B | 1,0 |
| C | 0,9 |
| D | 0,7 |
| E | 0,6 |

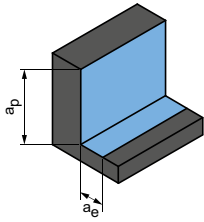
CPMill-Uni-Torus | CPM241

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|----|--------------------|--|---------|-----|---------|---|
| | | | | MQL/Air | Dry | Coolant | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| | P5 | P5.1 | Cast steel | | | | ✓ |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| N | N1 | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | | N1.2 | Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | | N1.3 | Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | | N1.4 | Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |
| | N2 | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

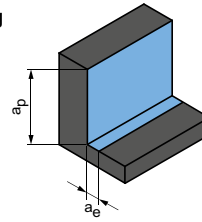
Roughing



$$a_p = 0.56 \times D$$

$$a_e = 0.5 \times D$$

Finishing



$$a_p = 0.56 \times D$$

$$a_e = 0.1 \times D$$

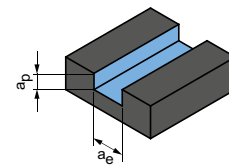
| | v_c [m/min] | f_z [mm] | | | | | | v_c [m/min] | f_z [mm] | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | Diameter of milling cutter [mm] | | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |
| | 125 | 0.015 | 0.018 | 0.021 | 0.026 | 0.029 | 0.033 | 240 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 |
| | 105 | 0.014 | 0.017 | 0.020 | 0.024 | 0.027 | 0.031 | 195 | 0.032 | 0.038 | 0.044 | 0.054 | 0.061 | 0.068 |
| | 115 | 0.015 | 0.018 | 0.021 | 0.026 | 0.029 | 0.033 | 220 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 |
| | 80 | 0.013 | 0.015 | 0.018 | 0.021 | 0.024 | 0.027 | 155 | 0.028 | 0.034 | 0.039 | 0.048 | 0.055 | 0.061 |
| | 75 | 0.015 | 0.018 | 0.020 | 0.025 | 0.028 | 0.032 | 140 | 0.033 | 0.040 | 0.045 | 0.055 | 0.063 | 0.071 |
| | 70 | 0.014 | 0.017 | 0.019 | 0.024 | 0.027 | 0.030 | 130 | 0.031 | 0.037 | 0.043 | 0.053 | 0.060 | 0.067 |
| | 65 | 0.013 | 0.016 | 0.018 | 0.022 | 0.025 | 0.028 | 120 | 0.030 | 0.035 | 0.041 | 0.050 | 0.057 | 0.063 |
| | 75 | 0.015 | 0.018 | 0.020 | 0.025 | 0.028 | 0.032 | 145 | 0.033 | 0.040 | 0.045 | 0.055 | 0.063 | 0.071 |
| | 140 | 0.025 | 0.030 | 0.035 | 0.043 | 0.049 | 0.055 | 325 | 0.057 | 0.068 | 0.078 | 0.096 | 0.109 | 0.122 |
| | 125 | 0.022 | 0.026 | 0.030 | 0.036 | 0.042 | 0.046 | 295 | 0.048 | 0.058 | 0.067 | 0.081 | 0.093 | 0.104 |
| | 105 | 0.018 | 0.021 | 0.025 | 0.030 | 0.034 | 0.038 | 245 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 0.085 |
| | 60 | 0.010 | 0.012 | 0.014 | 0.017 | 0.020 | 0.022 | 135 | 0.023 | 0.027 | 0.031 | 0.038 | 0.044 | 0.049 |
| | 90 | 0.018 | 0.021 | 0.025 | 0.030 | 0.034 | 0.038 | 215 | 0.040 | 0.048 | 0.055 | 0.067 | 0.077 | 0.085 |
| | 85 | 0.015 | 0.018 | 0.021 | 0.026 | 0.029 | 0.033 | 205 | 0.034 | 0.041 | 0.047 | 0.057 | 0.066 | 0.073 |
| | 470 | 0.024 | 0.028 | 0.032 | 0.040 | 0.045 | 0.050 | 705 | 0.042 | 0.050 | 0.058 | 0.071 | 0.081 | 0.090 |
| | 315 | 0.025 | 0.030 | 0.034 | 0.042 | 0.048 | 0.053 | 470 | 0.044 | 0.053 | 0.061 | 0.074 | 0.085 | 0.095 |
| | 250 | 0.026 | 0.031 | 0.036 | 0.044 | 0.050 | 0.056 | 375 | 0.046 | 0.055 | 0.064 | 0.078 | 0.089 | 0.099 |
| | 180 | 0.028 | 0.034 | 0.039 | 0.047 | 0.054 | 0.061 | 270 | 0.050 | 0.060 | 0.069 | 0.085 | 0.097 | 0.108 |
| | 180 | 0.019 | 0.023 | 0.026 | 0.032 | 0.036 | 0.040 | 270 | 0.034 | 0.040 | 0.046 | 0.057 | 0.065 | 0.072 |
| | 135 | 0.019 | 0.023 | 0.026 | 0.032 | 0.036 | 0.040 | 200 | 0.034 | 0.040 | 0.046 | 0.057 | 0.065 | 0.072 |
| | 225 | 0.012 | 0.014 | 0.016 | 0.020 | 0.023 | 0.025 | 335 | 0.021 | 0.025 | 0.029 | 0.035 | 0.040 | 0.045 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for corner radius milling cutters

Feed and cutting speed

Groove milling



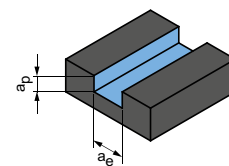
$$a_p = 0.5xD$$

$$a_e = 1xD$$

OptiMill-Diamond-Torus | SHM551

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | Diameter of milling cutter [mm] | | | | | | |
|------|--|--|---------|-----|---------|---------------------------------|---------------------|------------------------|---------------------|------------------------|---------------------|-----------|
| | | | MQL/Air | Dry | Coolant | 3.00 - 6.00 | | 8.00 - 10.00 | | 12.00 | | |
| | | | | | | v _c [m/min] | f _z [mm] | v _c [m/min] | f _z [mm] | v _c [m/min] | f _z [mm] | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |
| | | N1.4 Aluminium, alloy > 12 % Si | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 |
| | | N2.3 Brass, bronze, gunmetal | < 1.200 | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 |
| | N4 | N4.1 Plastic, thermoplastics | | | | | | | | | | |
| | | N4.2 Plastic, thermosets | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 |
| | | N4.3 Plastic, foams | | | | | | | | | | |
| C | C1.1 Plastic matrix, aramide fibre-reinforced (AFRP) | | | | | | | | | | | |
| | C1.2 Plastic matrix (thermosetting), CFRP/GFRP | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |
| | C1.3 Plastic matrix (thermoplastic), CFRP/GFRP | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |
| | C2.1 Carbon matrix, carbon fibre-reinforced (CFC) | | ✓ | ✓ | ✓ | 200 | 0.10-0.12 | 500 | 0.12-0.18 | 800 | 0.15-0.20 | |

Groove milling



$$a_p = 1xD$$

$$a_e = 1xD$$

OptiMill-Composite-Speed-Radius | SCM870

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] | | | | | | |
|------|--------------------|--|---------|-----|---------|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | |
| | | | | | | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| N | N4 | N4.1 Plastic, thermoplastics | | | | | | | | | | | |
| | | N4.2 Plastic, thermosets | ✓ | ✓ | ✓ | 150 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 |
| | | N4.3 Plastic, foams | | | | | | | | | | | |
| C | C1 | C1.1 Plastic matrix, aramide fibre-reinforced (AFRP) | | | | | | | | | | | |
| | | C1.2 Plastic matrix (thermosetting), CFRP/GFRP | ✓ | ✓ | ✓ | 145 | 0.021 | 0.026 | 0.031 | 0.035 | 0.038 | 0.042 | 0.043 |
| | | C1.3 Plastic matrix (thermoplastic), CFRP/GFRP | | | | | | | | | | | |
| | C2 | C2.1 Carbon matrix, carbon fibre-reinforced (CFC) | ✓ | ✓ | ✓ | 145 | 0.018 | 0.023 | 0.027 | 0.031 | 0.033 | 0.037 | 0.038 |
| | | C3.1 Metal matrix (MMC) | | | | | | | | | | | |
| | C4 | C4.1 Sandwich construction, honeycomb core | ✓ | ✓ | | 195 | 0.012 | 0.015 | 0.017 | 0.019 | 0.021 | 0.023 | 0.024 |
| | | C4.2 Sandwich construction, foam core | ✓ | ✓ | | 150 | 0.019 | 0.024 | 0.028 | 0.032 | 0.035 | 0.039 | 0.041 |

* MAPAL machining groups



CHAMFERING, DEBURRING AND DRILL MILLING

Universal application

| | |
|---------------------------|-----|
| OptiMill-Chamfer | 206 |
| CPMill-Chamfer | 207 |
| CPMill-Chamfer-Twin | 208 |
| OptiMill-DrillMill | 209 |

Technical appendix

| | |
|------------------------------------|-----|
| Cutting data recommendations | 210 |
|------------------------------------|-----|

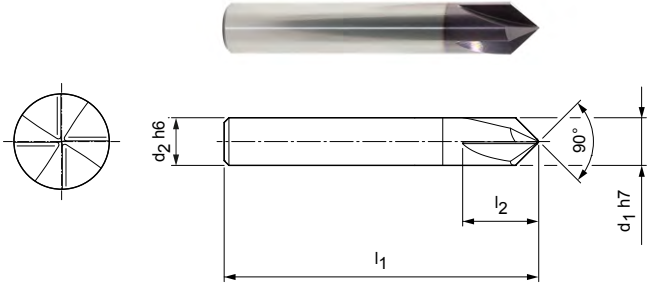


OptiMill®-Chamfer

Short design
SCM340

Design:

Diameter of milling cutter: 4.00 - 20.00 mm
 Cutting material: HP214
 Number of cutting edges: 4
 Tip angle: 90°
 Helix angle: 0°



Preferred series in stock

| Dimensions | | | | z | Specification | Order no. |
|-------------------|-------------------|----------------|----------------|---|--------------------------|-----------|
| d ₁ h7 | d ₂ h6 | l ₁ | l ₂ | | | |
| 4,00 | 4 | 54 | 9 | 4 | SCM340-0400Z04R-HA-HP214 | 30393635 |
| 6,00 | 6 | 54 | 12 | 4 | SCM340-0600Z04R-HA-HP214 | 30393636 |
| 8,00 | 8 | 58 | 15 | 4 | SCM340-0800Z04R-HA-HP214 | 30393637 |
| 10,00 | 10 | 66 | 16 | 4 | SCM340-1000Z04R-HA-HP214 | 30393638 |
| 12,00 | 12 | 73 | 18 | 4 | SCM340-1200Z04R-HA-HP214 | 30393639 |
| 16,00 | 16 | 82 | 25 | 4 | SCM340-1600Z04R-HA-HP214 | 30393640 |
| 20,00 | 20 | 92 | 30 | 4 | SCM340-2000Z04R-HA-HP214 | 30393641 |

Configurable features

Shank form:
Shank form: HB

Specification:
SCM340-0400Z04R-[shank form]-HP214

Example:

SCM340-0400Z04R-**HB**-HP214

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

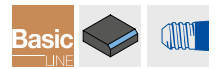
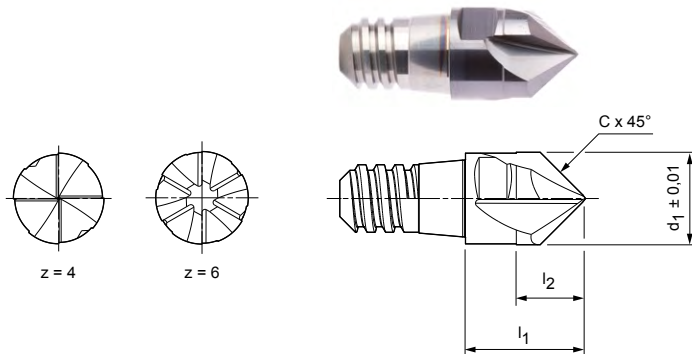
Special designs and other coatings available upon request.

CPMill®-Chamfer

Design with CFS connection
CPM180

Design:

Diameter of milling cutter: 8.00 – 20.00 mm
Cutting material: HP338
Number of cutting edges: 4 to ø 12.00 mm
6 from ø 16.00 mm
Helix angle: 0°




Preferred series in stock

| Dimensions | | | | | z | a _p max. | SW | Specification | Order no. |
|--------------------------|----------|----------------|----------------|-------|---|---------------------|-------|-------------------------------|-----------|
| d ₁ ± 0.01 mm | CFS size | l ₁ | l ₂ | Cx45° | | | | | |
| 10,00 | 8 | 13 | 7,5 | 5,00 | 4 | 5 | SW 8 | CPM180-1000Z04-F0500-08-HP338 | 30371353 |
| 12,00 | 10 | 16 | 9 | 6,00 | 4 | 6 | SW 10 | CPM180-1200Z04-F0600-10-HP338 | 30371354 |
| 16,00 | 12 | 20 | 12 | 4,80 | 6 | 4,8 | SW 13 | CPM180-1600Z06-F0480-12-HP338 | 30371355 |
| 20,00 | 16 | 25 | 15 | 6,00 | 6 | 6 | SW 16 | CPM180-2000Z06-F0600-16-HP338 | 30371357 |

Available on request

| | | | | | | | | | |
|------|---|----|---|------|---|---|------|-------------------------------|----------|
| 8,00 | 6 | 11 | 6 | 4,00 | 4 | 4 | SW 6 | CPM180-0800Z04-F0400-06-HP338 | 30371352 |
|------|---|----|---|------|---|---|------|-------------------------------|----------|

Accessories

| | | |
|---|--|----------|
|  | CFS replaceable head holders CFS201 | Page 218 |
|---|--|----------|

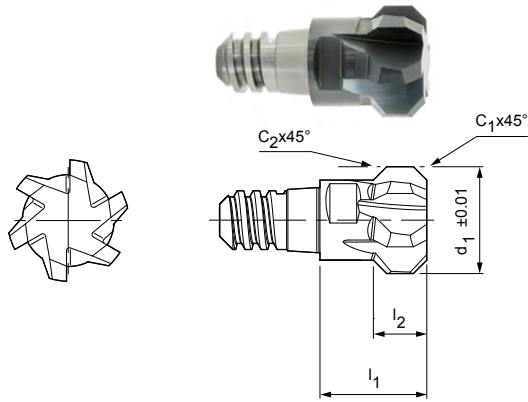
Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

CPMill®-Chamfer-Twin

Design with CFS connection
CPM190



Design:

Diameter of milling cutter: 10.00 – 20.00 mm
 Cutting material: HP383
 Number of cutting edges: 6
 Helix angle: 15°
 Special features: Reverse deburring and chamfering also possible – face side and 45°



Preferred series in stock

| Dimensions | | | | | | z | ap max. | SW | Specification | Order no. |
|--------------|----------|----|------|--------|--------|---|---------|-------|-------------------------------|-----------|
| d1 ± 0.01 mm | CFS size | l1 | l2 | C1x45° | C2x45° | | | | | |
| 10,00 | 6 | 11 | 4,75 | 1,25 | 1,00 | 6 | 1,25 | SW 8 | CPM190-1000Z06-F0125-06-HP383 | 30371346 |
| 12,00 | 8 | 13 | 5,5 | 1,50 | 1,00 | 6 | 1,5 | SW 10 | CPM190-1200Z06-F0150-08-HP383 | 30371348 |
| 16,00 | 10 | 16 | 8 | 2,00 | 2,00 | 6 | 2 | SW 13 | CPM190-1600Z06-F0200-10-HP383 | 30371349 |
| 20,00 | 12 | 20 | 9,5 | 2,50 | 2,00 | 6 | 2,5 | SW 16 | CPM190-2000Z06-F0250-12-HP383 | 30371350 |

Accessories

| | | |
|--|--|----------|
| | CFS replaceable head holders CFS201 | Page 218 |
|--|--|----------|

Dimensions in mm.
 For cutting data recommendations, see end of chapter.
 Special designs and other coatings available upon request.

OptiMill®-DrillMill

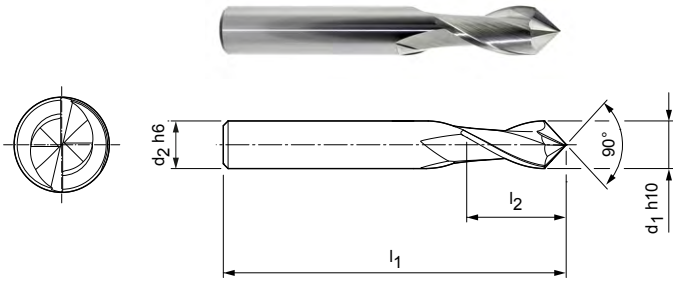
Long design with drill tip
SCM350

Design:

Diameter of milling cutter: 3.00 - 16.00 mm
Cutting material: HU211
Number of cutting edges: 2
Tip angle: 90°
Helix angle: 30°

Application:


Drill milling cutter for milling, chamfering, boring and drilling.




Preferred series in stock

| Dimensions | | | | z | Specification | Order no. |
|--------------------|-------------------|----------------|----------------|---|--------------------------|-----------|
| d ₁ h10 | d ₂ h6 | l ₁ | l ₂ | | | |
| 3,00 | 6 | 57 | 8 | 2 | SCM350-0300Z02R-HA-HU211 | 30393642 |
| 4,00 | 6 | 57 | 11 | 2 | SCM350-0400Z02R-HA-HU211 | 30393643 |
| 5,00 | 6 | 57 | 13 | 2 | SCM350-0500Z02R-HA-HU211 | 30393644 |
| 6,00 | 6 | 57 | 13 | 2 | SCM350-0600Z02R-HA-HU211 | 30393645 |
| 8,00 | 8 | 63 | 19 | 2 | SCM350-0800Z02R-HA-HU211 | 30393646 |
| 10,00 | 10 | 72 | 22 | 2 | SCM350-1000Z02R-HA-HU211 | 30393647 |
| 12,00 | 12 | 83 | 26 | 2 | SCM350-1200Z02R-HA-HU211 | 30393648 |
| 16,00 | 16 | 92 | 32 | 2 | SCM350-1600Z02R-HA-HU211 | 30393649 |

Configurable features



Shank form:
Shank form: HB



Specification:
SCM350-0300Z02R-[shank form]-HU211

Example:

SCM350-0300Z02R-**HB**-HU211

Shank form HB

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

Cutting data recommendation for radius and deburring milling cutter

Feed and cutting speed

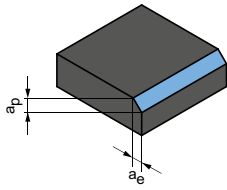
OptiMill-Chamfer | SCM340

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|--------------------|--|---------|-----|---------|---|
| | | | MQL/Air | Dry | Coolant | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| | P4.1 | Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5.1 | Cast steel | | | | ✓ |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | | | ✓ |
| M | M1.1 | Stainless steels, austenitic | < 700 | ✓ | | ✓ |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | N1.3 | Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | N1.4 | Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Finishing



$$a_p = 0.1 \times D$$

$$a_e = 0.1 \times D$$

| | v_c [m/min] | f_z [mm] | | | | | | |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | |
| | | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 215 | 0.043 | 0.061 | 0.078 | 0.094 | 0.108 | 0.132 | 0.151 |
| | 175 | 0.040 | 0.057 | 0.073 | 0.088 | 0.101 | 0.123 | 0.141 |
| | 195 | 0.043 | 0.061 | 0.078 | 0.094 | 0.108 | 0.132 | 0.151 |
| | 140 | 0.036 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 |
| | 130 | 0.041 | 0.059 | 0.076 | 0.091 | 0.104 | 0.127 | 0.146 |
| | 120 | 0.039 | 0.056 | 0.072 | 0.086 | 0.099 | 0.121 | 0.138 |
| | 110 | 0.037 | 0.053 | 0.068 | 0.081 | 0.093 | 0.114 | 0.131 |
| | 90 | 0.028 | 0.041 | 0.052 | 0.063 | 0.072 | 0.088 | 0.100 |
| | 130 | 0.041 | 0.059 | 0.076 | 0.091 | 0.104 | 0.127 | 0.146 |
| | 90 | 0.020 | 0.029 | 0.037 | 0.044 | 0.050 | 0.061 | 0.070 |
| | 75 | 0.025 | 0.036 | 0.046 | 0.055 | 0.063 | 0.077 | 0.088 |
| | 70 | 0.021 | 0.030 | 0.038 | 0.045 | 0.052 | 0.064 | 0.073 |
| | 80 | 0.027 | 0.039 | 0.050 | 0.059 | 0.068 | 0.083 | 0.095 |
| | 75 | 0.021 | 0.031 | 0.039 | 0.047 | 0.054 | 0.066 | 0.075 |
| | 290 | 0.071 | 0.102 | 0.131 | 0.156 | 0.180 | 0.220 | 0.251 |
| | 265 | 0.060 | 0.087 | 0.111 | 0.133 | 0.153 | 0.187 | 0.213 |
| | 220 | 0.050 | 0.072 | 0.091 | 0.109 | 0.126 | 0.154 | 0.176 |
| | 120 | 0.028 | 0.041 | 0.052 | 0.063 | 0.072 | 0.088 | 0.100 |
| | 195 | 0.050 | 0.072 | 0.091 | 0.109 | 0.126 | 0.154 | 0.176 |
| | 180 | 0.043 | 0.061 | 0.078 | 0.094 | 0.108 | 0.132 | 0.151 |
| | 635 | 0.053 | 0.076 | 0.097 | 0.116 | 0.133 | 0.162 | 0.186 |
| | 420 | 0.055 | 0.079 | 0.101 | 0.121 | 0.140 | 0.171 | 0.195 |
| | 335 | 0.058 | 0.083 | 0.106 | 0.127 | 0.146 | 0.179 | 0.204 |
| | 245 | 0.063 | 0.091 | 0.116 | 0.139 | 0.160 | 0.195 | 0.223 |
| | 245 | 0.042 | 0.060 | 0.077 | 0.093 | 0.106 | 0.130 | 0.149 |
| | 180 | 0.042 | 0.060 | 0.077 | 0.093 | 0.106 | 0.130 | 0.149 |
| | 305 | 0.026 | 0.038 | 0.048 | 0.058 | 0.066 | 0.081 | 0.093 |

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendation for CPMill replaceable milling cutters

Feed and cutting speed

Correction factor:

| Length | f_z & v_c |
|--------|---------------|
| A/B | 1,0 |
| C | 0,9 |
| D | 0,7 |
| E | 0,6 |

CPMill-Chamfer | CPM180

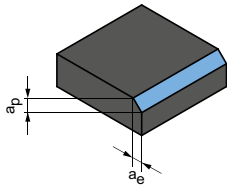
CPMill-Chamfer-Twin | CPM190

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | | ✓ |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | | ✓ |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | | ✓ |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | ✓ | | ✓ |
| | P5 | P5.1 Cast steel | | | | ✓ |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | | | ✓ |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | ✓ | | ✓ |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | ✓ | | ✓ |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | ✓ |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ |
| | | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ |
| | K3 | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ |
| | | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ |
| | | N1.4 Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ |
| | | N2.2 Copper, alloy | > 300 | ✓ | ✓ | ✓ |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

Deburring



$$a_p = 0.1 \times D$$

$$a_e = 0.1 \times D$$

| | v_c [m/min] | f_z [mm] | | | | |
|-----|------------------|---------------------------------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | |
| | | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 190 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 |
| | 155 | 0.061 | 0.073 | 0.084 | 0.102 | 0.117 |
| | 175 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 |
| | 120 | 0.054 | 0.065 | 0.075 | 0.091 | 0.105 |
| | 115 | 0.063 | 0.076 | 0.087 | 0.106 | 0.121 |
| | 105 | 0.060 | 0.072 | 0.082 | 0.101 | 0.115 |
| | 95 | 0.057 | 0.068 | 0.078 | 0.095 | 0.109 |
| | 80 | 0.044 | 0.052 | 0.060 | 0.073 | 0.084 |
| | 115 | 0.063 | 0.076 | 0.087 | 0.106 | 0.121 |
| | 80 | 0.030 | 0.036 | 0.042 | 0.051 | 0.059 |
| | 65 | 0.038 | 0.046 | 0.052 | 0.064 | 0.073 |
| | 60 | 0.032 | 0.038 | 0.043 | 0.053 | 0.061 |
| | 70 | 0.041 | 0.050 | 0.057 | 0.070 | 0.079 |
| | 65 | 0.033 | 0.039 | 0.045 | 0.055 | 0.063 |
| | 260 | 0.109 | 0.130 | 0.150 | 0.183 | 0.209 |
| | 240 | 0.092 | 0.111 | 0.127 | 0.155 | 0.178 |
| | 195 | 0.076 | 0.091 | 0.105 | 0.128 | 0.146 |
| | 110 | 0.044 | 0.052 | 0.060 | 0.073 | 0.084 |
| | 175 | 0.076 | 0.091 | 0.105 | 0.128 | 0.146 |
| | 160 | 0.065 | 0.078 | 0.090 | 0.110 | 0.125 |
| | 565 | 0.080 | 0.096 | 0.111 | 0.135 | 0.155 |
| | 375 | 0.085 | 0.101 | 0.116 | 0.142 | 0.162 |
| | 300 | 0.089 | 0.106 | 0.122 | 0.149 | 0.170 |
| | 215 | 0.097 | 0.116 | 0.133 | 0.162 | 0.186 |
| | 215 | 0.064 | 0.077 | 0.089 | 0.108 | 0.124 |
| | 160 | 0.064 | 0.077 | 0.089 | 0.108 | 0.124 |
| 270 | 0.040 | 0.048 | 0.055 | 0.068 | 0.077 | |

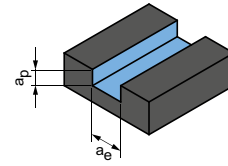
The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for drill milling cutters

Feed and cutting speed

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

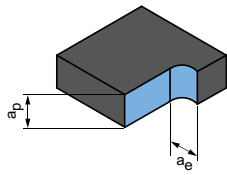
OptiMill-DrillMill | SCM350

| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | v _c [m/min] | f _z [mm] | | | | | | | | |
|------|--------------------|--|---------|-----|---------|------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | MQL/Air | Dry | Coolant | | Diameter of milling cutter [mm] | | | | | | | | |
| | | | | | | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | ✓ | ✓ | ✓ | 120 | 0.008 | 0.014 | 0.021 | 0.027 | 0.032 | 0.037 | 0.045 | 0.051 |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | ✓ | ✓ | ✓ | 100 | 0.007 | 0.014 | 0.019 | 0.025 | 0.030 | 0.034 | 0.042 | 0.048 |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | ✓ | ✓ | ✓ | 110 | 0.008 | 0.014 | 0.021 | 0.027 | 0.032 | 0.037 | 0.045 | 0.051 |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | ✓ | ✓ | ✓ | 75 | 0.006 | 0.012 | 0.017 | 0.022 | 0.027 | 0.031 | 0.037 | 0.043 |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | ✓ | ✓ | ✓ | 70 | 0.007 | 0.014 | 0.020 | 0.026 | 0.031 | 0.035 | 0.043 | 0.049 |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | ✓ | ✓ | ✓ | 65 | 0.007 | 0.013 | 0.019 | 0.024 | 0.029 | 0.034 | 0.041 | 0.047 |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | ✓ | ✓ | ✓ | 60 | 0.007 | 0.013 | 0.018 | 0.023 | 0.028 | 0.032 | 0.039 | 0.044 |
| P5 | P5.1 | Cast steel | | | | ✓ | 75 | 0.007 | 0.014 | 0.020 | 0.026 | 0.031 | 0.035 | 0.043 | 0.049 |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | ✓ | ✓ | ✓ | 130 | 0.013 | 0.024 | 0.035 | 0.044 | 0.053 | 0.061 | 0.075 | 0.085 |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | ✓ | ✓ | ✓ | 120 | 0.011 | 0.021 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 |
| | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | ✓ | ✓ | ✓ | 95 | 0.009 | 0.017 | 0.024 | 0.031 | 0.037 | 0.043 | 0.052 | 0.060 |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | ✓ | ✓ | ✓ | 55 | 0.005 | 0.010 | 0.014 | 0.018 | 0.021 | 0.024 | 0.030 | 0.034 |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | ✓ | ✓ | ✓ | 85 | 0.009 | 0.017 | 0.024 | 0.031 | 0.037 | 0.043 | 0.052 | 0.060 |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | ✓ | ✓ | ✓ | 80 | 0.008 | 0.014 | 0.021 | 0.027 | 0.032 | 0.037 | 0.045 | 0.051 |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | ✓ | ✓ | ✓ | 460 | 0.013 | 0.025 | 0.035 | 0.045 | 0.054 | 0.062 | 0.076 | 0.087 |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | | ✓ | ✓ | ✓ | 305 | 0.014 | 0.026 | 0.037 | 0.047 | 0.057 | 0.065 | 0.080 | 0.091 |
| | N1.3 | Aluminium, alloy > 7-12 % Si | | ✓ | ✓ | ✓ | 245 | 0.014 | 0.027 | 0.039 | 0.050 | 0.059 | 0.068 | 0.084 | 0.095 |
| | N1.4 | Aluminium, alloy > 12 % Si | | ✓ | ✓ | ✓ | 175 | 0.015 | 0.030 | 0.042 | 0.054 | 0.065 | 0.075 | 0.091 | 0.104 |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | ✓ | ✓ | ✓ | 175 | 0.010 | 0.020 | 0.028 | 0.036 | 0.043 | 0.050 | 0.061 | 0.069 |
| | N2.2 | Copper, alloy | > 300 | ✓ | ✓ | ✓ | 130 | 0.010 | 0.020 | 0.028 | 0.036 | 0.043 | 0.050 | 0.061 | 0.069 |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | ✓ | ✓ | ✓ | 220 | 0.006 | 0.012 | 0.018 | 0.023 | 0.027 | 0.031 | 0.038 | 0.043 |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

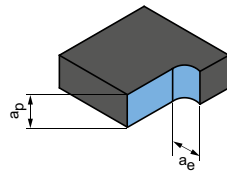
Trimming



$$a_p = 1.5xD$$

$$a_e = 0.25xD$$

Trimming



$$a_p = 1.5xD$$

$$a_e = 0.1xD$$

| | v _c [m/min] | f _z [mm] | | | | | | | | v _c [m/min] | f _z [mm] | | | | | | | |
|--|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | | Diameter of milling cutter [mm] | | | | | | | | | Diameter of milling cutter [mm] | | | | | | | |
| | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 | | 2.00 | 4.00 | 6.00 | 8.00 | 10.00 | 12.00 | 16.00 | 20.00 |
| | 215 | 0.013 | 0.025 | 0.035 | 0.045 | 0.054 | 0.062 | 0.076 | 0.087 | 290 | 0.020 | 0.039 | 0.056 | 0.071 | 0.085 | 0.098 | 0.120 | 0.137 |
| | 175 | 0.012 | 0.023 | 0.033 | 0.042 | 0.050 | 0.058 | 0.071 | 0.081 | 235 | 0.019 | 0.036 | 0.052 | 0.067 | 0.080 | 0.092 | 0.112 | 0.128 |
| | 195 | 0.013 | 0.025 | 0.035 | 0.045 | 0.054 | 0.062 | 0.076 | 0.087 | 260 | 0.020 | 0.039 | 0.056 | 0.071 | 0.085 | 0.098 | 0.120 | 0.137 |
| | 135 | 0.011 | 0.020 | 0.029 | 0.038 | 0.045 | 0.052 | 0.063 | 0.072 | 185 | 0.017 | 0.032 | 0.047 | 0.059 | 0.071 | 0.082 | 0.100 | 0.114 |
| | 125 | 0.012 | 0.024 | 0.034 | 0.044 | 0.052 | 0.060 | 0.073 | 0.084 | 170 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.133 |
| | 115 | 0.012 | 0.023 | 0.032 | 0.041 | 0.050 | 0.057 | 0.070 | 0.079 | 155 | 0.019 | 0.036 | 0.051 | 0.065 | 0.078 | 0.090 | 0.110 | 0.126 |
| | 105 | 0.011 | 0.021 | 0.031 | 0.039 | 0.047 | 0.054 | 0.066 | 0.075 | 145 | 0.018 | 0.034 | 0.048 | 0.062 | 0.074 | 0.085 | 0.104 | 0.119 |
| | 130 | 0.012 | 0.024 | 0.034 | 0.044 | 0.052 | 0.060 | 0.073 | 0.084 | 175 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.095 | 0.116 | 0.133 |
| | 265 | 0.021 | 0.041 | 0.059 | 0.075 | 0.090 | 0.103 | 0.126 | 0.145 | 390 | 0.034 | 0.065 | 0.093 | 0.119 | 0.142 | 0.164 | 0.200 | 0.228 |
| | 245 | 0.018 | 0.035 | 0.050 | 0.064 | 0.077 | 0.088 | 0.107 | 0.123 | 355 | 0.029 | 0.055 | 0.079 | 0.101 | 0.121 | 0.139 | 0.170 | 0.194 |
| | 200 | 0.015 | 0.029 | 0.041 | 0.053 | 0.063 | 0.072 | 0.088 | 0.101 | 290 | 0.024 | 0.045 | 0.065 | 0.083 | 0.100 | 0.115 | 0.140 | 0.160 |
| | 110 | 0.009 | 0.016 | 0.024 | 0.030 | 0.036 | 0.041 | 0.051 | 0.058 | 160 | 0.014 | 0.026 | 0.037 | 0.048 | 0.057 | 0.065 | 0.080 | 0.091 |
| | 175 | 0.015 | 0.029 | 0.041 | 0.053 | 0.063 | 0.072 | 0.088 | 0.101 | 260 | 0.024 | 0.045 | 0.065 | 0.083 | 0.100 | 0.115 | 0.140 | 0.160 |
| | 165 | 0.013 | 0.025 | 0.035 | 0.045 | 0.054 | 0.062 | 0.076 | 0.087 | 245 | 0.020 | 0.039 | 0.056 | 0.071 | 0.085 | 0.098 | 0.120 | 0.137 |
| | 705 | 0.018 | 0.034 | 0.049 | 0.063 | 0.076 | 0.087 | 0.106 | 0.121 | 845 | 0.025 | 0.048 | 0.069 | 0.088 | 0.105 | 0.121 | 0.148 | 0.169 |
| | 470 | 0.019 | 0.036 | 0.052 | 0.066 | 0.079 | 0.091 | 0.112 | 0.128 | 565 | 0.026 | 0.050 | 0.072 | 0.092 | 0.111 | 0.127 | 0.155 | 0.178 |
| | 375 | 0.020 | 0.038 | 0.054 | 0.069 | 0.083 | 0.096 | 0.117 | 0.134 | 450 | 0.028 | 0.053 | 0.076 | 0.097 | 0.116 | 0.133 | 0.163 | 0.186 |
| | 270 | 0.022 | 0.041 | 0.059 | 0.076 | 0.091 | 0.104 | 0.127 | 0.146 | 325 | 0.030 | 0.057 | 0.083 | 0.106 | 0.126 | 0.145 | 0.177 | 0.203 |
| | 270 | 0.014 | 0.028 | 0.040 | 0.051 | 0.061 | 0.070 | 0.085 | 0.097 | 325 | 0.020 | 0.038 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 |
| | 205 | 0.014 | 0.028 | 0.040 | 0.051 | 0.061 | 0.070 | 0.085 | 0.097 | 245 | 0.020 | 0.038 | 0.055 | 0.070 | 0.084 | 0.097 | 0.118 | 0.135 |
| | 340 | 0.009 | 0.017 | 0.025 | 0.032 | 0.038 | 0.043 | 0.053 | 0.061 | 405 | 0.013 | 0.024 | 0.034 | 0.044 | 0.053 | 0.061 | 0.074 | 0.085 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.



CFS REPLACEABLE HEAD HOLDERS

CFS replaceable head holders

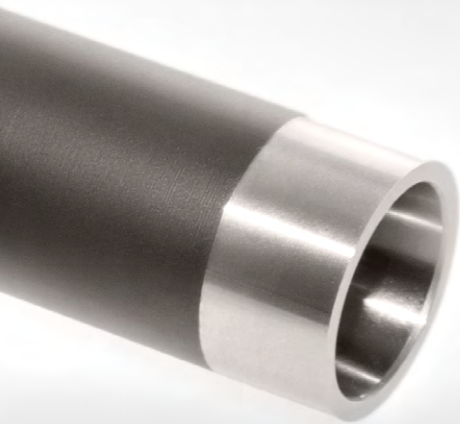
CFS201 replaceable head holder 218

Accessories

Mounting aids 219

Technical appendix

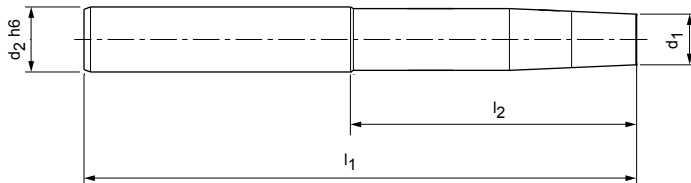
Handling notes CPMill replaceable milling cutters 404



CFS replaceable head holders

Conical design, with internal cooling
CFS201

Length category:



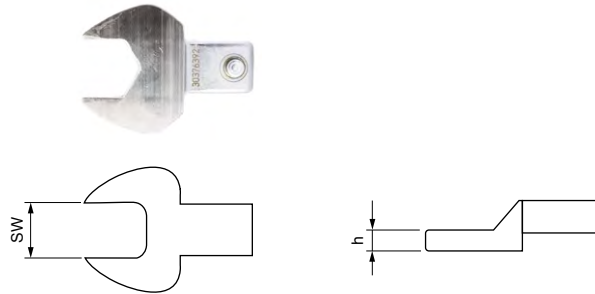
Design made of steel

| CFS size | Dimensions | | | | Length category | Specification | Order no. |
|----------|----------------|-------------------|----------------|----------------|-----------------|---------------------------|-----------|
| | d ₁ | d ₂ h6 | l ₁ | l ₂ | | | |
| 6 | 7,8 | 10 | 60 | 20 | A | CFS201N-06-020-ZYL-HA10-S | 30393776 |
| 8 | 9,8 | 16 | 70 | 30 | A | CFS201N-08-030-ZYL-HA16-S | 30393787 |
| 8 | 9,8 | 16 | 90 | 40 | B | CFS201N-08-040-ZYL-HA16-S | 30393788 |
| 10 | 11,8 | 16 | 70 | 30 | A | CFS201N-10-030-ZYL-HA16-S | 30393798 |
| 10 | 11,8 | 16 | 90 | 42 | B | CFS201N-10-042-ZYL-HA16-S | 30393799 |
| 12 | 15,8 | 20 | 80 | 30 | A | CFS201N-12-030-ZYL-HA20-S | 30393963 |
| 12 | 15,8 | 20 | 105 | 55 | B | CFS201N-12-055-ZYL-HA20-S | 30393964 |
| 16 | 19,8 | 25 | 90 | 40 | B | CFS201N-16-040-ZYL-HA25-S | 30393976 |

Design made of carbide

| | | | | | | | |
|----|------|----|-----|-----|---|---------------------------|----------|
| 6 | 7,8 | 10 | 110 | 70 | C | CFS201N-06-070-ZYL-HA10-H | 30393779 |
| 8 | 9,8 | 16 | 110 | 60 | C | CFS201N-08-060-ZYL-HA16-H | 30393790 |
| 10 | 11,8 | 20 | 110 | 60 | C | CFS201N-10-060-ZYL-HA20-H | 30393801 |
| 10 | 11,8 | 20 | 150 | 100 | D | CFS201N-10-100-ZYL-HA20-H | 30393802 |
| 12 | 15,8 | 20 | 130 | 80 | C | CFS201N-12-080-ZYL-HA20-H | 30393966 |
| 12 | 15,8 | 20 | 150 | 100 | D | CFS201N-12-100-ZYL-HA20-H | 30393967 |
| 16 | 19,8 | 25 | 150 | 94 | D | CFS201N-16-094-ZYL-HA25-H | 30393979 |

Accessories – mounting aids

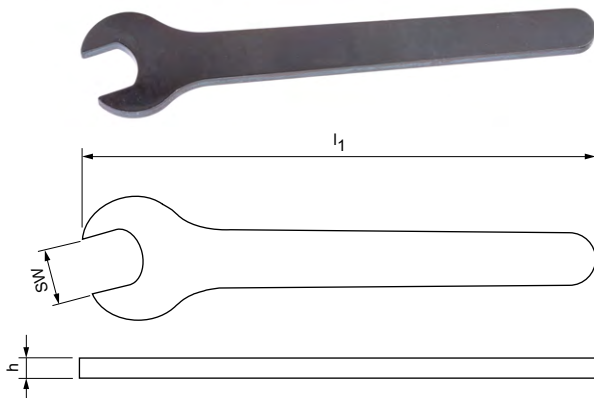


Torque wrench

| Attachment shank | Torque [Nm] | Total length l_1 | Order no. |
|------------------|-------------|--------------------|-----------|
| 9x12 | 2 - 25 | 274 | 30386735 |
| 14x18 | 20 - 200 | 470,5 | 30386736 |

Open-ended spanner attachments for torque wrenches

| SW | Dimensions | | Order no. |
|-------|------------|------------------|-----------|
| | h | Attachment shank | |
| SW 6 | 2,3 | 9 x 12 | 30376387 |
| SW 8 | 2,8 | 9 x 12 | 30376388 |
| SW 10 | 3,8 | 9 x 12 | 30376390 |
| SW 11 | 3,8 | 9 x 12 | 30672376 |
| SW 13 | 3,8 | 9 x 12 | 30376392 |
| SW 15 | 3,8 | 9 x 12 | 30376393 |
| SW 16 | 4,8 | 9 x 12 | 30376394 |
| SW 18 | 4,8 | 9 x 12 | 30673296 |
| SW 21 | 4,8 | 14 x 18 | 30376395 |



Assembly tool

| Connection size CFS | Dimensions | | | Order no. |
|---------------------|------------|-------|-----|-----------|
| | SW | l_1 | h | |
| 6 | SW 6 | 75 | 2,3 | 30352660 |
| 8 | SW 8 | 92 | 2,8 | 30352661 |
| 10 | SW 10 | 100 | 3,8 | 30352662 |
| 12 | SW 13 | 135 | 3,8 | 30352663 |
| 16 | SW 16 | 145 | 4,8 | 30352667 |
| 20 | SW 21 | 195 | 4,8 | 30352668 |

MILLING CUTTERS WITH REPLACEABLE INSERTS

Milling cutters with indexable inserts and PCD milling inserts.





PRODUCT OVERVIEW

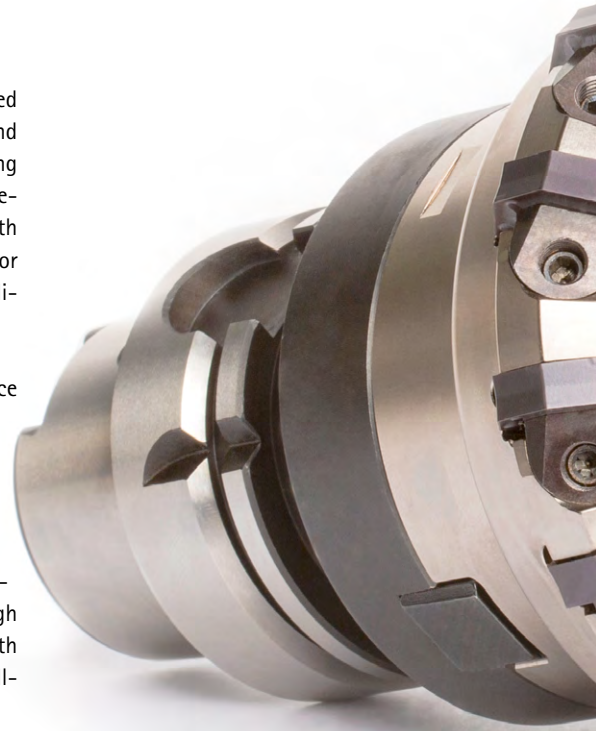
Milling cutters with replaceable inserts





MAPAL offers a standard range of milling cutters with radial (NeoMill) and tangential indexable inserts (TGMill) under the label milling cutters with replaceable inserts. For machining non-ferrous metals, the milling head systems are available with the Power and Eco PCD milling inserts as well as milling cutters with brazed PCD cutting edges (FaceMill-Diamond).

The NeoMill range with its face, corner, slot, shell end and high-feed milling cutters stands for maximum productivity and economic efficiency, especially in series production. The development was based on many years of experience with custom tools, which the industry uses to produce large quantities very efficiently with consistent quality.

The TGMill milling cutters are characterised by tangentially embedded cutting edges and achieve excellent machining results and long tool lives due to reduced cutting forces. Depending on requirements, milling cutters with narrow and wide spacing can be selected for face milling, corner milling, end milling, helical milling and disc milling cutters.

High stock removal rates, defined surface roughness or special requirements for the flatness of the part – the Power and Eco milling head systems are designed for high-performance machining of non-ferrous metals. A μm -accurate adjustment ensures perfect surface finishes for all series. Considerable cost savings can be achieved through reliable, fast and precise reconditioning with the MAPAL Maintenance Service for face milling heads.



| Face milling cutter | Shoulder milling cutter | High-feed milling cutter | |
|--|--|---|---|
|  |  |  |  |
| <p>Face milling with indexable inserts</p> <p>Roughing and semi-machining face surfaces.</p> <p>NeoMill-Face:</p> <ul style="list-style-type: none"> - Milling cutters available with 8- and 16-edge radial indexable inserts - Cutting depths from up to 5 mm <p>TGMill-Face45:</p> <ul style="list-style-type: none"> - 4+4-edge tangential indexable inserts available - Cutting depths from up to 8 mm <p>Ø area: 63.00 - 400.00 mm</p> <p>P M K</p> | <p>Face milling with PCD</p> <p>Ideal for producing the top-quality surface finishes on parts made of aluminium.</p> <p>Power milling head system:</p> <ul style="list-style-type: none"> - All-rounder for roughing and finishing - Robust adjusting screw - Cutting depths from up to 5 mm <p>Eco milling head system:</p> <ul style="list-style-type: none"> - Designed for finishing operations with high-quality surface finishes - Sensitive wedge adjustment - Cutting depths from up to 3 mm <p>FaceMill-Diamond:</p> <ul style="list-style-type: none"> - Milling cutter with brazed cutting edges for cutting depths of up to 8 mm <p>Ø area: 32.00 - 500.00 mm</p> <p>N C</p> | <p>Ideal for milling 90° shoulder surfaces</p> <p>NeoMill-Corner:</p> <ul style="list-style-type: none"> - Milling cutter available with double-, four- and eight-edge radial indexable inserts - Positive basic shape for parts susceptible to vibrations - Cutting depths from up to 17 mm <p>TGMill-Corner:</p> <ul style="list-style-type: none"> - Milling cutters available with double- and four-edge tangential indexable inserts - Cutting depths from up to 7 mm <p>Ø area: 10.00 - 200.00 mm</p> <p>P M K N</p> | <p>Milling at high feed rates</p> <p>NeoMill-HiFeed90:</p> <ul style="list-style-type: none"> - Universal tool system to ensure maximum productivity - Tool body with indexable inserts for high-feed and shoulder milling - Maximum rate of removal due to very high feed rates and large cutting depths - Tool and storage costs are reduced - Double- and four-edge radial indexable insert available - Available as arbor and end milling cutter <p>Ø area: 10.00 - 200.00 mm</p> <p>P M K H N</p> |
| <p>Page 249</p> | <p>Page 249</p> | <p>Page 291</p> | <p>Page 309</p> |

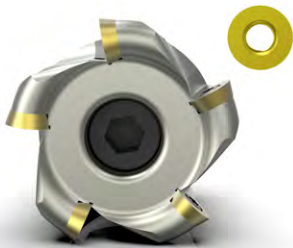


Copy milling cutter

Shell end face milling cutter

Helix milling cutters

Disc milling cutter



Roughing and pre-finishing of 3D contours

NeoMill-ISO-360:

- Perfect for roughing and pre-finishing
- Cutting materials and cutting edge designs are available for soft machining as well as hard/finish machining
- High-precision contours due to the indexable inserts being installed in a neutral position
- Soft cutting behaviour for low vibration machining
- Chip discharge protection
- Available as arbor and end milling cutter

Ø area: 15.00 - 160.00 mm

P M K H

Shell end face milling

Ideal for deep shoulder milling and trimming with high cutting depths of up to 75 mm.

NeoMill-Shell:

- Milling cutters with double- or four-edge radial indexable inserts
- Also suitable for heavy machining and full slot milling

TGMill-Shell:

- Milling cutters with double- or four-edge tangential indexable insert

Ø area: 25.00 - 105.00 mm

P M K N

Helix milling

For roughing, large bore diameter (> 150 mm).

TGMill-Helical:

- Cutting depths from up to 35 mm
- Helical plunging and ramping possible
- Optional with vibration damper
- Ideal for machining centres
- Available as double- and four-edge tangential indexable inserts
- Available as milling cutter and with HSK-A (hollow shank taper form A) connection

Ø area: 80.00 - 160.00 mm

P M K N

Milling of deep shoulder surfaces or slots

TGMill-Disc:

- Can be used as a gang milling cutter or milling shaft
- Cutting depths from up to 17 mm
- Ideal for machine tools with extending sleeve
- Can be adjusted axially for finishing
- Available as double- and four-edge tangential indexable inserts
- Contact angle of 90°








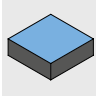
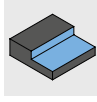
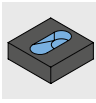
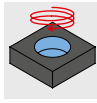


Ø area: 100.00 - 200.00 mm

P M K N

SELECTING A MILLING CUTTER

Step-by-step guide to selecting the right milling cutter

Say you're looking for a milling cutter with indexable inserts for shoulder milling stainless steel with a diameter of 125 mm in unfavourable machining conditions? This selection guide explains how to choose the right milling cutter step by step.

| | | | | | | | |
|---|--|---|---|---|---|---|-------------------------|
| 1 | Type of milling cutter | Select the type of milling cutter you need. | ➤ |  | Face milling cutter |  | Shoulder milling cutter |
| 2 | Material suitability | Select your workpiece according to the MAPAL machining groups (MMG). You'll find the MMG chart on the fold-out page at the end of the catalogue. | ➤ |  | Steel |  | Stainless steel |
| 3 | Manufacturing processes | Select your manufacturing process. | ➤ |  | Roughing |  | Medium machining |
| 4 | Process conditions | Assess your process conditions. | ➤ |  | Good: – Stable conditions – Low cutting width | | |
| 5 | Application | Select your preferred application. | ➤ |  | Face milling |  | Shoulder milling |
| | | | |  | Ramps |  | Helix milling |
| 6 | Technical design / Geometric features | Check that the geometric features meet your requirements. | ➤ | | Max. cutting depth | | Diameter range |
| 7 | Tool body | Select the milling cutter you need. If there are several possible selections, select the milling cutter that is marked as 1st choice (★) for material suitability. | ➤ |  | If designs with different spacing are available, please note the information on the relevant product pages. | | |
| 8 | Indexable insert / Milling cartridge | Select the indexable insert or milling cartridge you need. For the selection of the correct cutting material, pay attention to the cutting material overview on page 234. The name of the indexable insert is supplemented with the selected cutting edge design and the cutting material type. Example: RDKW1003M0N-PMU-HP635 | ➤ |  | Select the indexable insert or milling cartridge you need. | | |



High-feed milling cutter



Shell end face milling cutter



Copy milling cutter



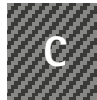
Helix milling cutters



Disc milling cutter



Cast iron



Composite materials



Non-ferrous metals and plastics



Super alloy and titanium

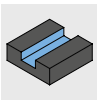


Finishing

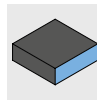


Unfavourable:

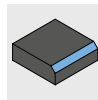
- Ratio $a_e / D > 0.6$
- High stock removal
- Part/clamping fixture/machine susceptible to vibration



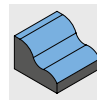
Groove milling



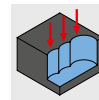
Trimming



Chamfering and deburring



Profile milling



Plunge milling / Groove milling



High-feed milling



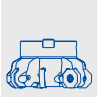
Pocket milling

Contact angle

Number of cutting edges

Coolant supply

Technology (radial/tangential)



Face milling cutter

Face milling cutter with indexable inserts

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | |
|----------------------|----|---|---|---|---|---|---|-------------------------|--|---|--------------------|---|-------------|--|--|--|--|--|--|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | |
| ★ | ☐ | | | | | | ■ | ■ | | ■ | ■ | ■ | | | | | | | | | | | |
| ■ | ★* | ★ | | | | | ■ | ■ | | ■ | ☐ | ■ | | | | | | | | | | | |
| ■ | | ■ | | | | | ■ | ☐ | | ■ | ☐ | ■ | | | | | | | | | | | |

Face milling cutter with PCD milling inserts

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|---|---|--------------------|---|-------------|--|--|--|--|--|--|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | |
| | | | ■ | ☐ | | | ☐ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| | | | ■ | ☐ | | | ★ | ★ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| | | | ■ | ☐ | | | | ☐ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| | | | ■ | ☐ | | | | | ★ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| | | | ■ | ☐ | | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| | | | ■ | ☐ | | | | ☐ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| | | | ■ | ☐ | | | ☐ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |

★ 1. choice ■ highly suitable ☐ suitable in some situations

Step 1:
Type of milling cutter



Step 2:
Material suitability



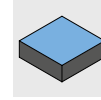
Step 3:
Manufacturing processes



Step 4:
Process conditions



Step 5:
Application



Step 6:
Design



| | Technical design | | | | | | Tool body | | | Indexable insert | | |
|--|--------------------|-----------------|---------------|---------------|------------|-----|-----------------|--------|------|------------------|--|------|
| | \varnothing [mm] | a_p max. [mm] | Cutting edges | Contact angle | Technology | | Product name | Design | Page | Product name | | Page |
| | 63 - 200 | 5 | 8 | 45° | Radial | ✓** | NeoMill-8-Face | | 250 | OFMT07 | | 251 |
| | 63 - 200 | 4 | 16 | 45° | Radial | ✓** | NeoMill-16-Face | | 252 | ONKU07 | | 253 |
| | 80 - 200 | 8 | 4 | 45° | Tangential | ✓ | TGMill-4-Face45 | | 254 | LTHU15 | | 255 |

| | Technical design | | | | | | Tool body | | | Milling cartridge | | |
|--|--------------------|-----------------|----------------------------|----------------|---------|-----------------|------------------|--------|------|------------------------------|--|------|
| | \varnothing [mm] | a_p max. [mm] | Chip removal | Coolant supply | | Can be reground | Product name | Design | Page | Product name | | Page |
| | | | | Cutting edge | Central | | | | | | | |
| | 50 - 250 | 5 | Replaceable chip deflector | | ✓ | ✓ | PowerMill | | 262 | PMC with face milling insert | | 265 |
| | 50 - 400 | 5 | Integrated chip deflector | ✓ | | ✓ | PowerMill-Blue | | 267 | PBC with face milling insert | | 269 |
| | 50 - 250 | 3 | Integrated chip deflector | | ✓ | | EcoMill | | 272 | EMC with face milling insert | | 275 |
| | 32 - 400 | 2 | Integrated chip deflector | ✓ | | | EcoMill-Blue | | 276 | EBC with face milling insert | | 279 |
| | 50 - 200 | 1 | Integrated chip deflector | ✓ | | | RapidMill-Blue | | 280 | RBC with face milling insert | | 281 |
| | 63 - 160 | 3 | | | ✓ | | FlyCutter | | 282 | FMC with face milling insert | | 283 |
| | 40 - 125 | 10 | | ✓ | | ✓ | FaceMill-Diamond | | 284 | brazed | | |

* in the case of heat-resistant cast steel

** up to dia. 125 mm



Shoulder milling cutter

Shoulder milling cutter with indexable inserts

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|--|---|--------------------|---|-------------|--|--|--|---|---|---|--|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | | |
| ■ | ■ | | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | | | | | |
| ■ | ■ | ■ | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | | | | | |
| ■ | ■ | ■ | ■ | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | | | | | |
| ■ | ★ | ■ | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| ★ | ■ | | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | ■ | | | | | | | |
| ■ | ■ | ★ | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| | | | ★ | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| ■ | ■ | ■ | | | | | ■ | ■ | | ■ | ■ | ■ | ■ | | | | | | | | | | | |

Shoulder milling cutter with PCD milling cartridges

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|---|---|--------------------|---|-------------|--|--|--|--|--|--|--|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | | |
| | | | ★ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |

★ 1. choice ■ highly suitable ■ suitable in some situations

Step 1:
Type of milling cutter



Step 2:
Material suitability



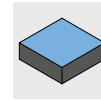
Step 3:
Manufacturing processes



Step 4:
Process conditions



Step 5:
Application



Step 6:
Design



| | Technical design | | | | | | Tool body | | | Indexable insert | | |
|--|--------------------|-----------------|---------------|---------------|------------|----|--------------------|--------|------|------------------|--|------|
| | \varnothing [mm] | a_p max. [mm] | Cutting edges | Contact angle | Technology | | Product name | Design | Page | Product name | | Page |
| | 10 - 50 | 5,2 | 2 | 90° | Radial | ✓ | NeoMill-2-HiFeed90 | | 310 | LPMX06 | | 318 |
| | 20 - 63 | 11 | 2 | 90° | Radial | ✓* | NeoMill-2-Corner | | 292 | AOKT12 | | 293 |
| | 25 - 160 | 17 | 2 | 90° | Radial | ✓ | NeoMill-2-HiFeed90 | | 314 | LD_X18 | | 318 |
| | 25 - 100 | 10 | 4 | 90° | Radial | ✓* | NeoMill-4-Corner | | 294 | ANMU12 | | 295 |
| | 40 - 160 | 7 | 4 | 90° | Radial | ✓* | NeoMill-4S-Corner | | 296 | SDKT10 | | 297 |
| | 50 - 160 | 8 | 8 | 90° | Radial | ✓* | NeoMill-8-Corner | | 298 | SNMU12 | | 299 |
| | 63 - 200 | 7 | 2 | 90° | Tangential | ✓ | TGMill-2-Corner | | 300 | CTHD09 | | 301 |
| | 63 - 200 | 7 | 4 | 90° | Tangential | ✓ | TGMill-4-Corner | | 302 | CT_Q09 | | 304 |

| | Technical design | | | | | | Tool body | | | Milling cartridge | | |
|--|--------------------|-----------------|--------------|----------------|---------|-----------------|--|--------|------|---|--|------|
| | \varnothing [mm] | a_p max. [mm] | Chip removal | Coolant supply | | Can be reground | Product name | Design | Page | Product name | | Page |
| | 32 - 400 | 1 - 10** | ** | Cutting edge | Central | | Milling cutter with PCD milling cartridges | | 226 | Milling cartridge with corner milling blade | | 226 |
| | | | | ✓** | ✓** | ✓** | | | | | | |

* in the case of heat-resistant cast steel
** up to dia. 125 mm



High-feed milling cutter

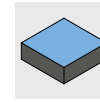
| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|--|---|--------------------|---|-------------|---|--|--|--|---|---|---|---|---|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | |
| ★ | ■ | | | | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | |
| ★ | ■ | ★ | ■ | | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | |
| ★ | ■ | | | | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | |
| ★ | ■ | ★ | ■ | | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | |
| ★ | ■ | ★ | ■ | | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | |
| ★ | ■ | ★ | | | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | |



Copy milling cutter

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|--|---|--------------------|---|-------------|--|---|---|---|---|---|---|---|---|---|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | |
| ■ | ■ | ■ | | | | ■ | ■ | ■ | | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| ■ | ■ | ■ | | | | ■ | ■ | ■ | | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| ★ | ★ | ★ | | | | ■ | ■ | ■ | | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| ■ | ■ | ■ | | | | ■ | ■ | ■ | | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

★ 1. choice ■ highly suitable ■ suitable in some situations

Step 1:
Type of milling cutterStep 2:
Material suitabilityStep 3:
Manufacturing processesStep 4:
Process conditionsStep 5:
ApplicationStep 6:
Design

| | Technical design | | | | | | Tool body | | | Indexable insert | | |
|--|---------------------|--------------------|------------------|------------------|-----------------|---|--------------------|--------|------|------------------|--|------|
| | \emptyset [mm] | a_p max. [mm] | Cutting edges | Contact angle | Techno- logy | | Product name | Design | Page | Product name | | Page |
| | 10 - 50 | 0,7 | 2 | High feed | Radial | ✓ | NeoMill-2-HiFeed90 | | 310 | LPMX06 | | 316 |
| | 16 - 80 | 1,4 | 2 | High feed | Radial | ✓ | NeoMill-2-HiFeed90 | | 312 | LD_X10 | | 316 |
| | 16 - 35 | 1 | 4 | High feed | Radial | ✓ | NeoMill-4-HiFeed90 | | 320 | SD__06 | | 326 |
| | 25 - 80 | 1,5 | 4 | High feed | Radial | ✓ | NeoMill-4-HiFeed90 | | 322 | SD__10 | | 326 |
| | 50 - 125 | 2,4 | 4 | High feed | Radial | ✓ | NeoMill-4-HiFeed90 | | 324 | SD__14 | | 326 |
| | 80 - 200 | 3,5 | 4 | High feed | Radial | ✓ | NeoMill-4-HiFeed90 | | 325 | SD__18 | | 326 |

| | Technical design | | | | | | Tool body | | | Indexable insert / Milling cartridge | | |
|--|---------------------|--------------------|------------------|------------------|-----------------|---|-----------------|--------|------|--------------------------------------|--|------|
| | \emptyset [mm] | a_p max. [mm] | Cutting edges | Contact angle | Techno- logy | | Product name | Design | Page | Product name | | Page |
| | 15 - 16 | 3,5 | * | 0° | Radial | ✓ | NeoMill-ISO-360 | | 334 | RD__07 | | 338 |
| | 20 - 52 | 5 | * | 0° | Radial | ✓ | NeoMill-ISO-360 | | 335 | RD__10 | | 338 |
| | 42 - 80 | 6 | * | 0° | Radial | ✓ | NeoMill-ISO-360 | | 336 | RD__12 | | 338 |
| | 50 - 160 | 8 | * | 0° | Radial | ✓ | NeoMill-ISO-360 | | 337 | RD__16 | | 338 |



Shell end face milling cutter

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|--|---|--------------------|--|-------------|---|---|--|--|--|--|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | |
| ■ | ■ | ★ | | | | | ■ | ■ | | ■ | ■ | | ■ | ■ | ■ | | | | | | | | |
| ■ | ■ | ■ | | | | | ■ | ■ | | ■ | ■ | | ■ | ■ | ■ | | | | | | | | |
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| | | | ■ | | | | ■ | ■ | | ■ | ■ | | ■ | ■ | ■ | | | | | | | | |



Helix milling cutters

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|--|---|--------------------|--|-------------|--|--|--|--|---|---|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | |
| ★ | ★ | ★ | | | | | ■ | ■ | | ■ | ■ | | ■ | | | | | ■ | ■ | | | | |
| | | | ★ | | | | ■ | ■ | | ■ | ■ | | ■ | | | | | ■ | ■ | | | | |



Disc milling cutter

| Material suitability | | | | | | | | Manufacturing processes | | | Process conditions | | Application | | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|-------------------------|---|---|--------------------|--|-------------|---|--|--|--|--|--|--|--|--|--|--|
| P | M | K | N | C | S | H | | | | | | | | | | | | | | | | | | |
| ★ | ★ | ★ | | | | | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | | | | | | | | | |
| | | | ★ | | | | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | | | | | | | | | |

★ 1. choice ■ highly suitable ■ suitable in some situations

Step 1:
Type of milling cutter



Step 2:
Material suitability



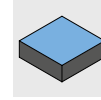
Step 3:
Manufacturing processes



Step 4:
Process conditions



Step 5:
Application



Step 6:
Design



| | Technical design | | | | | | Tool body | | | Indexable insert | | |
|--|------------------|-----------------|---------------|---------------|------------|---|-----------------|--------|------|------------------|--|------|
| | \emptyset [mm] | a_p max. [mm] | Cutting edges | Contact angle | Technology | | Product name | Design | Page | Product name | | Page |
| | 32 - 63 | 62 | 4 | 90° | Radial | ✓ | NeoMill-4-Shell | | 346 | ANMU12 | | 347 |
| | 25 - 40 | 62 | 2 | 90° | Radial | ✓ | NeoMill-2-Shell | | 344 | AOKT12 | | 345 |
| | 63 - 100 | 75 | 4 | 90° | Tangential | ✓ | TGMill-4-Shell | | 350 | CTHQ09 | | 352 |
| | 63 - 100 | 75 | 2 | 90° | Tangential | ✓ | TGMill-2-Shell | | 348 | CTHD09 | | 349 |

| | Technical design | | | | | | Tool body | | | Indexable insert | | |
|--|------------------|-----------------|---------------|---------------|------------|---|------------------|--------|------|------------------|--|------|
| | \emptyset [mm] | a_p max. [mm] | Cutting edges | Contact angle | Technology | | Product name | Design | Page | Product name | | Page |
| | 80 - 125 | 35 | 4 | 90° | Tangential | ✓ | TGMill-4-Helical | | 358 | CTHQ09 | | 359 |
| | 80 - 125 | 35 | 2 | 90° | Tangential | ✓ | TGMill-2-Helical | | 360 | CTHD09 | | 362 |

| | Technical design | | | | | | Tool body | | | Indexable insert | | |
|--|------------------|-----------------|---------------|---------------|------------|--|---------------|--------|------|------------------|--|------|
| | \emptyset [mm] | a_p max. [mm] | Cutting edges | Contact angle | Technology | | Product name | Design | Page | Product name | | Page |
| | 100 - 200 | 17 | 4 | 90° | Tangential | | TGMill-4-Disc | | 368 | CTHQ09 | | 369 |
| | 100 - 200 | 17 | 2 | 90° | Tangential | | TGMill-2-Disc | | 370 | CTHD09 | | 372 |

* depending on a_p max.

Cutting material overview: Selection of the correct cutting material

The cutting materials from MAPAL cover a wide spectrum of wear resistance and ductility. The designation of the cutting material indicates the level of ductility; the ductility increases as the number increases.

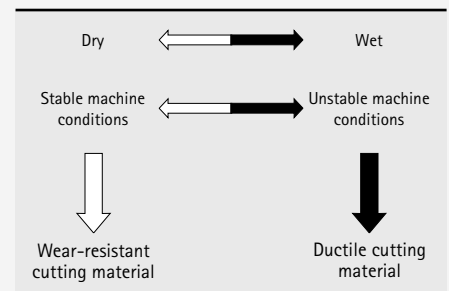
PVD-coated cutting materials (HP...) are the first choice for milling K, P and M workpiece materials. These cutting materials have the longest tool life. If high cutting speeds are to be realised, CVD-coated cutting materials (HC...) should be selected.

For non-ferrous workpiece materials, uncoated and coated carbide grades (HU.../HP...) are the first choice. From a silicon content of $\geq 12\%$, PCD (PU...) is recommended due to increasing abrasiveness. With PCD, maximum tool life is achievable, which is why this cutting material is particularly suitable for large series.

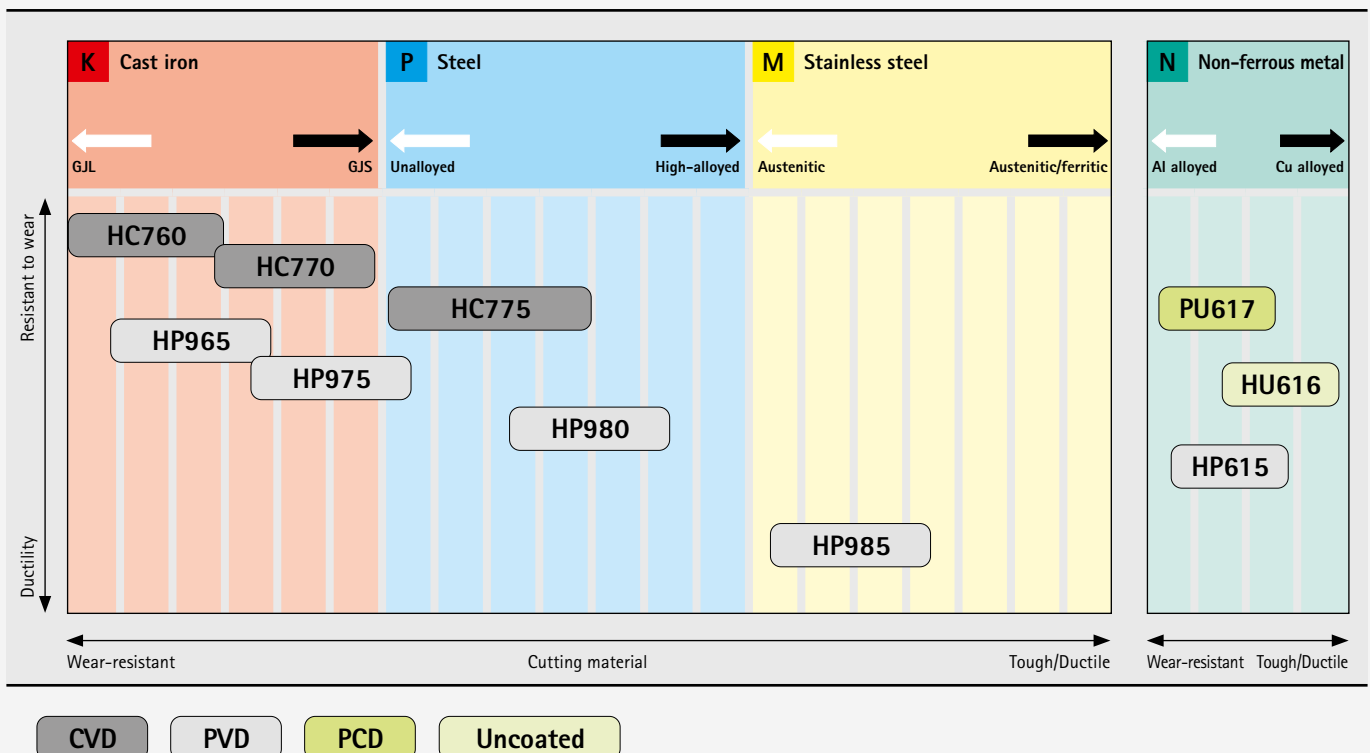
Example: HP980 is more ductile than HP965 (the more ductile the cutting material, the less resistant it is to wear).

1. Choose your workpiece material using the MMGs (MAPAL Machining Groups).
2. Depending on the tool type, select the material type below the desired workpiece material in the corresponding "Cutting material overview [...]" table.
3. Depending on the general conditions (see table "General conditions"), a wear-resistant or more ductile cutting material is to be selected.
4. If general conditions in the direction of the black arrow predominate and breakages cannot be prevented despite a ductile CVD grade, you should change to PVD-coated cutting materials.

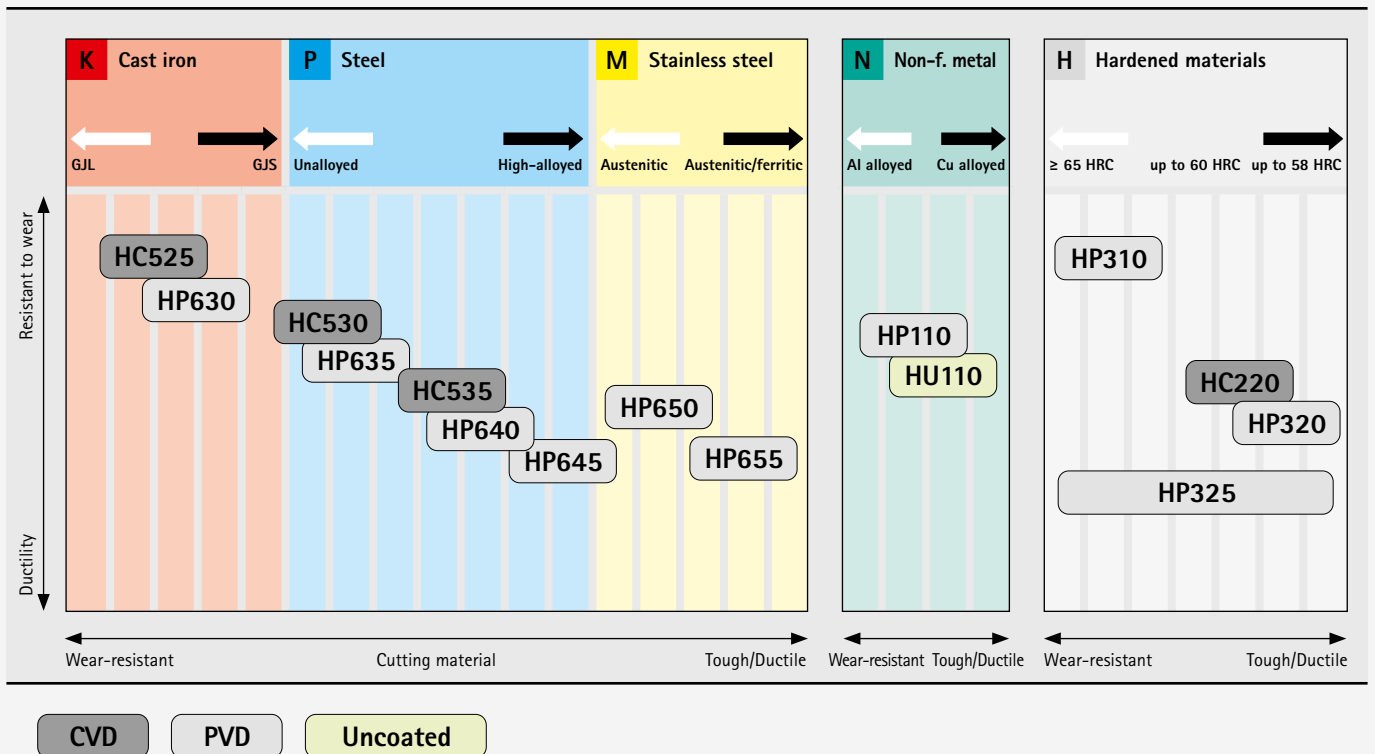
General conditions



Cutting material overview | Face, corner, end face, helix and disc milling cutters



Cutting material overview | High-feed and copy milling cutters from the Die & Mould sector



Cutting Material Overview: Types and type description

Milling cutters with indexable inserts

| Cutting material | Name of cutting material | Coating composition | Colour of coating | Field of application | Recommended application |
|-----------------------|--------------------------|---------------------|-------------------|----------------------|--|
| Carbide PVD-coated | HP110 | AlTiN | dark grey | ● | TiAlN-coated carbide for machining aluminium materials and other non-ferrous metals. Due to the very thin layer, the cutting material is also well suited for finishing stainless steels and grey cast iron. |
| | HP310 | TiSiN | reddish brown | ● | Finest grain-carbide grade with high wear resistance and temperature stable PVD coating. Suitable for the finishing of steel materials in the area of the highest cutting speeds. |
| | HP320 | AlTiN | light grey | ● | Universal ultra-fine grain-carbide grade, which is highly resistant to wear and has good breakage resistance and edge stability. Suitable for the machining of hard steel materials up to max. 60 HRC thanks to the temperature resistant PVD coating. |
| | HP325 | AlTiN | light grey | ⚡ | Finest grain-carbide grade with a balanced ratio between ductility and resistance to wear. Wide field of applications for steel materials due to the stress-optimised PVD coating. |
| | HP615 | TiB2 | silver-grey | ● | Fine grain carbide with a partially reduced PVD coating for machining adhesive materials. First choice for increasing tool life compared to uncoated cutting edges when machining aluminium alloys with 7-12% Si. |
| | HP630 | AlTiN | dark grey | ● | Ductile carbide grade with an AlTiN coating. Suitable for the machining of cast iron materials. Also suitable for finishing steel materials and cold work steels with a hardness of more than 54 HRC. |
| | HP635 | AlTiN-TiN | gold | ● | Carbide grade with PVD coating. Suitable for milling unalloyed, low-alloyed, high-alloyed and stainless steels. Particularly suitable for high cutting speeds in both dry and wet machining under stable conditions. |
| | HP640 | AlTiN-TiN | gold | ● | Universal carbide grade with high ductility and an AlTiN-TiN coating. Suitable for the machining of steel materials. Particularly suitable for dry milling at low to medium cutting speeds under difficult conditions. |
| | HP645 | AlTiN-TiN | gold | ⚡ | Ductile carbide grade with a PVD coating. Suitable in the event that the cutting of steel materials such as tool steels, heat-treated steel, case hardening steels and austenitic stainless materials is sharply interrupted. |
| | HP650 | AlTiN | dark grey | ● | Finest grain-carbide grade with a wear-resistant AlTiN coating. Suitable for the machining of stainless and austenitic stainless materials. Suitable for both the wet and dry machining. |
| | HP655 | AlTiN | dark grey | ● | Fine grain-carbide grade with extreme ductility. A thin, smooth PVD coating is ideal for the milling of austenitic stainless steels and duplex group workpiece materials at low to medium cutting speeds. |
| | HP965 | AlTiN | black anthracite | ● | PVD-coated fine grain carbide grade for medium machining and for roughing GJL, GJV and GJS. Suitable for the wet or dry machining at medium to high cutting speeds. |
| | HP975 | AlTiN | black anthracite | ⚡ | Ductile carbide grade with PVD thick layer for challenging milling in cast materials. Particularly suitable for GJS cast iron or ADI workpiece material and low-alloy steel in unstable conditions. |
| | HP980 | AlTiN | black anthracite | ⚡ | Ductile, PVD coated carbide grade for the general machining of steel and alloyed steel. Increased wear resistance with good impact resistance at the same time. |
| | HP985 | AlTiN | black anthracite | ⚡ | PVD-coated carbide grade for milling stainless and heat-resistant steels. Combination of good ductility and heat-resistant coating. |

Cutting Material Overview: Types and type description

Milling cutters with indexable inserts

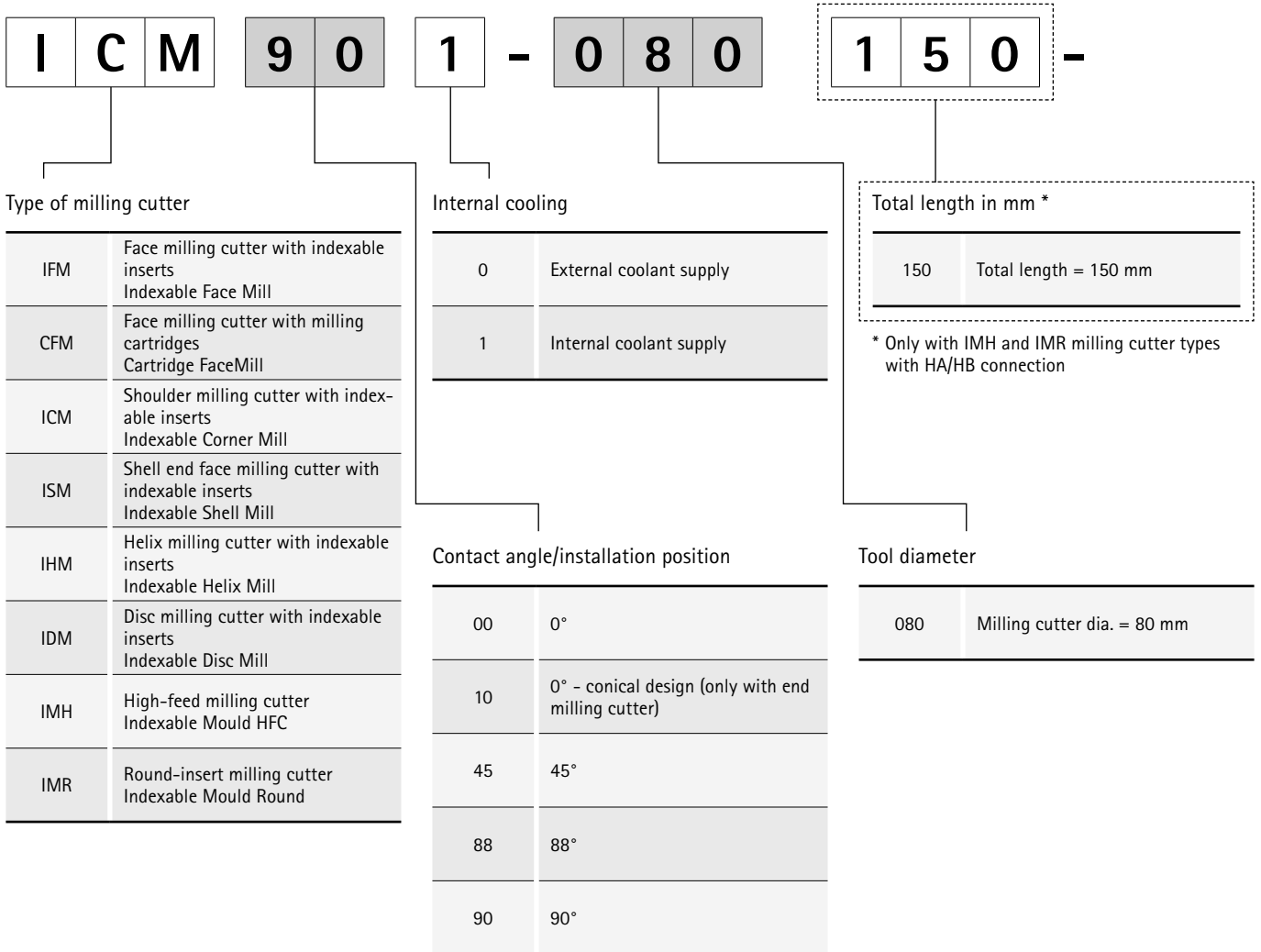
| Cutting material | Name of cutting material | Coating composition | Colour of coating | Field of application | Recommended application |
|--------------------|--------------------------|-------------------------------------|-------------------|----------------------|---|
| Carbide CVD-coated | HC220 | AlTiN | black anthracite | ● | Wear-resistant finest grain-carbide grade for a wide range of applications. Suitable for steel materials under stable conditions. New CVD coating with high temperature hardness, which is resistant to wear and tear. |
| | HC525 | AlTiN | black anthracite | ● | Optimised carbide substrate with an extremely hard and wear-resistant CVD multilayer coating. Ideally suited for dry machining of GJL, GJS, malleable cast iron and alloyed cast iron. |
| | HC530 | AlTiN | black anthracite | ● | Harder alternative to HP635 with a CVD coating that is highly resistant to abrasive wear and tear. Excellent for the face milling of steel materials with increased cutting speed under stable conditions. |
| | HC535 | AlTiN | black anthracite | ● | This ductile carbide grade with a CVD coating for dry machining at high cutting speeds. Particularly suitable for face milling for a wide range of steel materials. |
| | HC760 | TiCN+Al ₂ O ₃ | black | ● | Fine grain carbide with high resistance to wear and a multi-layer CVD coating with Al ₂ O ₃ top coating for medium machining to roughing of GJL at high cutting speeds. |
| | HC770 | TiCN+Al ₂ O ₃ | black | ● | Fine grain carbide with high wear resistance and a multi-layer CVD coating with Al ₂ O ₃ top coating. Wide field of applications for medium machining to roughing from GJS to unalloyed and low-alloy steels. |
| | HC775 | TiCN+Al ₂ O ₃ | black | ✚ | Fine grain carbide with a balanced relationship between wear resistance and ductility and a multi-layer CVD coating with Al ₂ O ₃ top coating for machining at higher cutting speeds. For unstable conditions and workpiece material with increased tensile strength. |
| Carbide Uncoated | HU110 | - | - | ● | Uncoated carbide grade for the machining of aluminium and other non-ferrous metals. |
| | HU616 | - | - | ● | Fine grain carbide with very smooth surface for the general machining of aluminium wrought alloys and aluminium cast alloys with Si contents < 3%. |
| PCD | PU617 | - | - | ● | PCD grade with medium particle size for roughing to semi-machining in non-ferrous metals and for machining very abrasive materials. |

Milling cutter with PCD milling cartridges and PCD end milling cutter

| Cutting material | Name of cutting material | Coating composition | Colour of coating | Field of application | Recommended application |
|------------------|--------------------------|---------------------|-------------------|----------------------|---|
| PCD | PU611 | - | - | ● | Universal PCD grade with medium particle size. First choice for milling non-ferrous metals with a low proportion of abrasive fillers (e.g. aluminium with Si <=12%) |
| | PU622 | - | - | ● | PCD grade with fine particle size. Optimal choice for machining non-ferrous metals with increased surface requirements and low-alloy AlSi compounds (e.g. aluminium with Si <5%). |

Product ID codes

Milling cutters with replaceable inserts



Type of milling cutter

| | |
|-----|--|
| IFM | Face milling cutter with indexable inserts Indexable Face Mill |
| CFM | Face milling cutter with milling cartridges Cartridge FaceMill |
| ICM | Shoulder milling cutter with indexable inserts Indexable Corner Mill |
| ISM | Shell end face milling cutter with indexable inserts Indexable Shell Mill |
| IHM | Helix milling cutter with indexable inserts Indexable Helix Mill |
| IDM | Disc milling cutter with indexable inserts Indexable Disc Mill |
| IMH | High-feed milling cutter Indexable Mould HFC |
| IMR | Round-insert milling cutter Indexable Mould Round |

Internal cooling

| | |
|---|-------------------------|
| 0 | External coolant supply |
| 1 | Internal coolant supply |

Contact angle/installation position

| | |
|----|--|
| 00 | 0° |
| 10 | 0° - conical design (only with end milling cutter) |
| 45 | 45° |
| 88 | 88° |
| 90 | 90° |

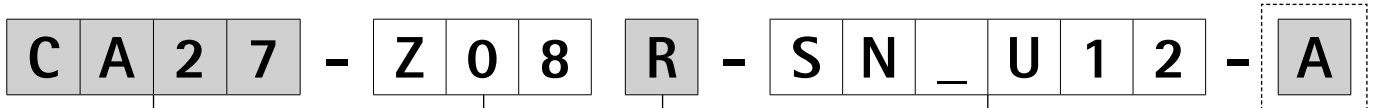
Total length in mm *

| | |
|-----|-----------------------|
| 150 | Total length = 150 mm |
|-----|-----------------------|

* Only with IMH and IMR milling cutter types with HA/HB connection

Tool diameter

| | |
|-----|-----------------------------|
| 080 | Milling cutter dia. = 80 mm |
|-----|-----------------------------|



Connection (examples)

| | |
|------|--|
| HA32 | Cylindrical shank dia. = 32 mm Shape HA |
| HB32 | Cylindrical shank dia. = 32 mm Shape HB |
| CA16 | Milling cutter arbor dia. = 16 mm |
| CA22 | Milling cutter arbor dia. = 22 mm |
| CA27 | Milling cutter arbor dia. = 27 mm |
| CA32 | Milling cutter arbor dia. = 32 mm |
| CA40 | Milling cutter arbor dia. = 40 mm |
| CA60 | Milling cutter arbor dia. = 60 mm |
| A063 | HSK-A63 |
| A080 | HSK-A80 |
| A100 | HSK-A100 |
| M045 | Thread M4.5 |
| M010 | Thread M10 |
| M012 | Thread M12 |
| M016 | Thread M16 |
| S050 | SK50 Form AD/AF ISO 7388-1 |

Rotational direction

| | |
|----|--|
| R | Right |
| L | Left |
| R1 | Right Disc milling cutter (left-side cutting) |
| R2 | Right Disc milling cutter (right-side cutting) |
| R3 | Right Disc milling cutter (both sides, 3-sided cutting) |

Effective (eff.) number of cutting edges
(example)

| | |
|-------|---|
| Z05 | Number of teeth eff. = 5 |
| Z10 | Number of teeth eff. = 10 |
| Z9+3 | Number of teeth eff. = 12 of which three are adjustable inserts |
| Z12+4 | Number of teeth eff. = 16 of which four are adjustable inserts |
| Z6+6 | Disc milling cutter Number of teeth eff. = 6 (both sides, 3-sided cutting) |
| Z7+7 | Face milling cutter LT_U Number of teeth eff. = 14 (alternating installation) |

Workpiece material tool body*

| | |
|---|-----------------------------|
| A | Tool body made of aluminium |
| S | Tool body made of steel |

* Only with CFM milling cutter type

Indexable insert/milling cartridge

| | |
|----------------------------|--|
| 2nd letter "T" | CT... Tangential LT... Tangential |
| 2nd letter "D, F, N, O, P" | AN... Radial AO... Radial OF... Radial ON... Radial SD... Radial SN... Radial LP... Radial LD... Radial RD... Radial |
| 3rd letter "C" | PMC... PowerMill EMC... EcoMill FMC... FlyCutter EBC... EcoMill-Blue RBC... RapidMill-Blue PBC... PowerMill-Blue |


Product ID codes

Radial indexable inserts


S
N
M
U
1
2
0
5
0
8

Insert form


S (90°)



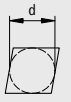
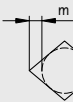
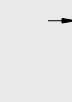
O (135°)



A (85°)

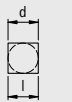
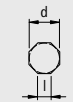
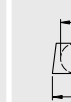


Tolerance

| |  |  |  |
|---|---|---|---|
| | d [mm] | m [mm] | s [mm] |
| M | from ±0.05 to ±0.15* | from ±0.08 to ±0.20 * | from ±0.05 to ±0.13* |
| K | from ±0.05 to ±0.15* | ±0.013 | ±0.013 |
| H | ±0.013 | ±0.013 | ±0.025 |

* Tolerance depends on the insert size

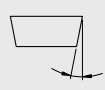
Insert size

| Insert size |  |  |  |
|-------------|--|---|---|
| d [mm] | S | O | A |
| 7.5 | - | - | 12 |
| 7.5 | - | - | 12 |
| 10 | 10 | - | - |
| 11.5 | 12 | - | - |
| 19 | - | 07 | - |
| 20 | - | 07 | - |

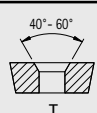
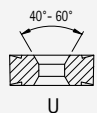
Insert thickness

| Identification number | s [mm] |
|-----------------------|--------|
| T3 | 3.97 |
| 04 | 4.76 |
| 05 | 5.56 |

Clearance angle

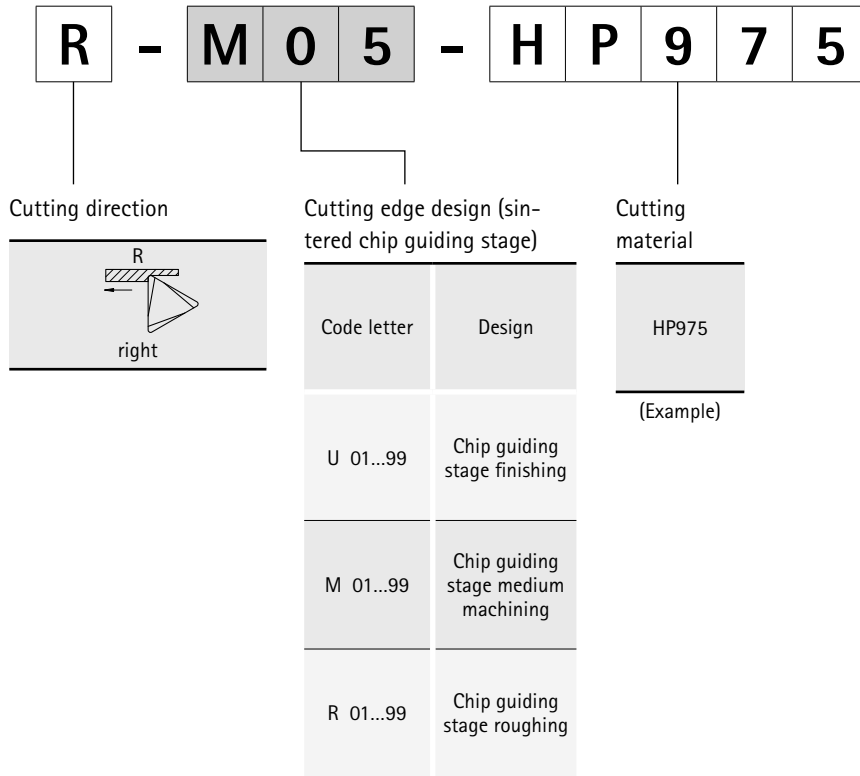
| |  |
|---|---|
| N | 0° |
| D | 15° |
| O | Custom |
| F | 25° |

Insert type

| | |
|---|---|
|  | T |
|  | U |
| Custom | X |

Corner radius

| Identification number | r [mm] |
|-----------------------|--------|
| 08 | 0.8 |
| 12 | 1.2 |




Product ID codes

Tangential indexable inserts


C
T
H
Q
09
05
08

Insert form



C (80°)




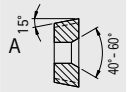

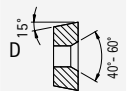

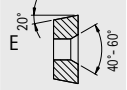

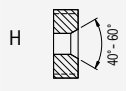

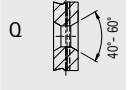

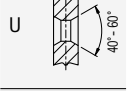

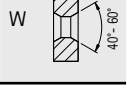
L (90°)





Tolerance

| |  |  |
|---|---|---|
| | d [mm] | s [mm] |
| H | ±0.013 | ±0.025 |
| G | ±0.025 | ±0.13 |
| N | ±0.05 - ±0.15 | ±0.025 |
| M | ±0.05 - ±0.15 | ±0.13 |


Insert type

| | |
|---|---|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |


Insert size

| Incircle |  |  |
|----------|---|---|
| d [mm] | C | L |
| 6.35 | 06 / 09 | - |
| 10.16 | - | - |
| 9.525 | 09 / 13 | 15 |
| 12.7 | 12 / 18 | - |
| 13.65 | - | - |

Insert thick-ness

|  | | |
|---|--------|--|
| Key figure | s [mm] | |
| 03 | 3.18 | |
| T3 | 3.97 | |
| 04 | 4.76 | |
| 05 | 5.56 | |
| 06 | 6.35 | |
| 07 | 7.94 | |


Indexable insert



T

Tangential

Corner radius

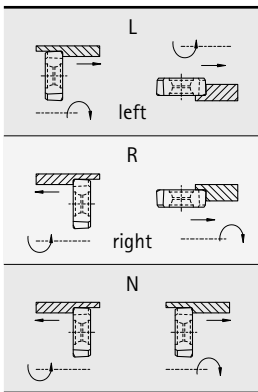
|  | | |
|---|--------|--|
| Identifica-tion number | r [mm] | |
| 00 | 0 | |
| 04 | 0.4 | |
| 08 | 0.8 | |
| 12 | 1.2 | |
| 20 | 2.0 | |
| 30 | 3.0 | |

H 1 2 R 9 0 M 0 1 8 - H P 9 6 5

Cutting edge design

| Code letter |
|-------------|
| A 01...99 |
| C 01...99 |
| D 01...99 |
| G 01...99 |
| H 01...99 |

Cutting direction



Contact angle

| Identification number | Angle |
|-----------------------|-------|
| 90 | 90° |
| 75 | 75° |

Finishing cutting edge

| Identification number | Length [mm] |
|-----------------------|-------------|
| M008 | 0.8 |
| M012 | 1.2 |
| M018 | 1.8 |

| Identification number | Radius |
|-----------------------|--------|
| M050 | R 050 |
| M100 | R 100 |

Cutting material

| |
|-----------|
| HP965 |
| (Example) |

Product ID codes

PCD milling cartridge

P B C - 6 1 1 - 1 - P U 6 1 1

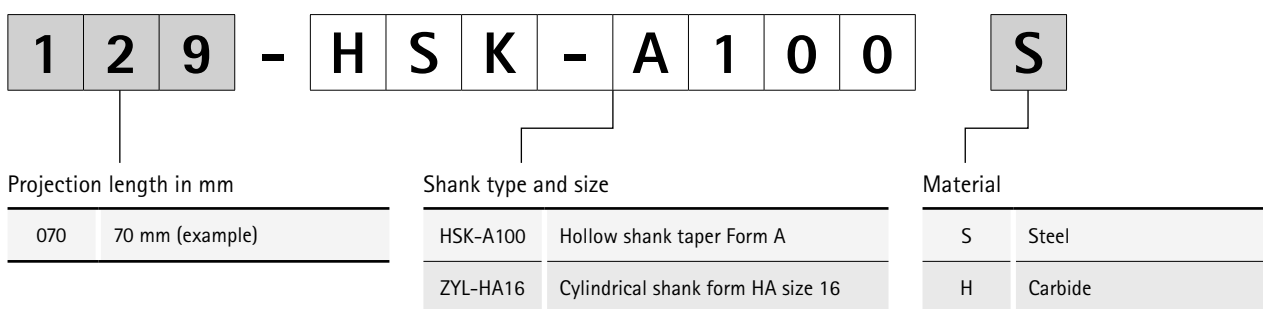
| Milling cartridge | | Type | | Rake angle | | Cutting edge form | | Running direction | | Cutting material | |
|-------------------|----------------|------|-------------------------|------------|--------|-------------------|---------------------------------------|-------------------|---------------|------------------|-----|
| PBC | PowerMill-Blue | 6 | Corner milling blade | 1 | 6° | 1 | R _z value ≤ 5 μm / radius* | 0 | Clockwise | PU | PCD |
| PMC | PowerMill | 7 | Face milling insert | 2 | 3° | 2 | R _z value ≤ 10 μm | 1 | Anticlockwise | | |
| EMC | EcoMill | 8 | Wide face milling blade | 3 | 0° | 3 | R _z value ≤ 20 μm | | | | |
| FMC | FlyCutter | 9 | PT milling insert | 4 | 10° | 4 | R _z value > 20 μm | | | | |
| EBC | EcoMill-Blue | | | 5 | 15° | | | | | | |
| RBC | RapidMill-Blue | | | X | Custom | | | | | | |

Specification, MFS milling head holder

M F S 2 0 1 N - M 0 8

| Holder type | | Series | | Coolant supply | | Design | | MFS connection size | |
|-------------|--|--------|--------------------|----------------|-------------------------|--------|-----------------|---------------------|-----------------------------------|
| MFS | Milling head holder Metric Fitting System | 10 | Cylindrical design | 0 | External coolant supply | N | Standard design | M08 | Metric ISO M8 thread (example) |
| | | 20 | Conical design | 1 | Internal coolant supply | | | | |

* Only with wide face milling blade type.





FACE MILLING CUTTER

Face milling cutter with indexable inserts

| | |
|--------------------------------------|-----|
| NeoMill – radial technology | |
| NeoMill-8-Face, OFMT07 | 250 |
| NeoMill-16-Face, ONKU07 | 252 |
| TGMill – tangential technology | |
| TGMill-4-Face45, LTHU15 | 254 |

Face milling cutter with PCD

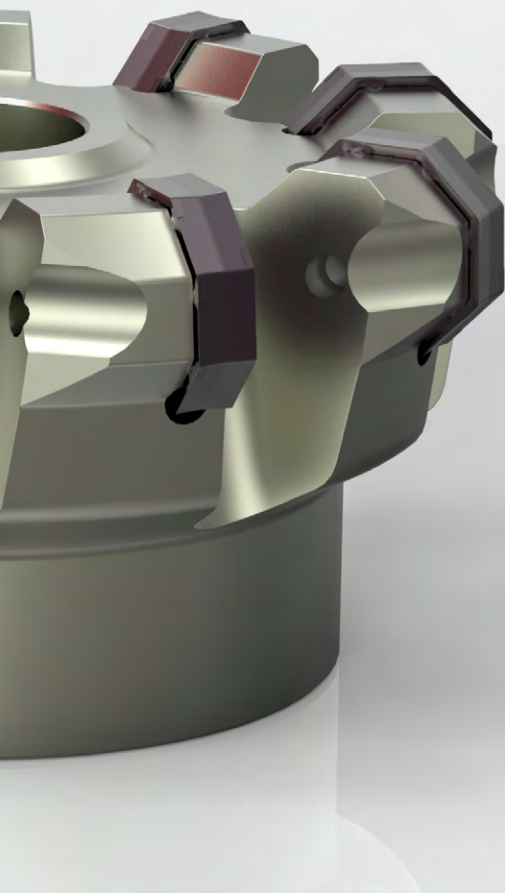
| | |
|--|-----|
| System delimitation: Power and Eco | 258 |
| Power milling head system..... | |
| Introduction to the technology | 260 |
| PowerMill and PMC milling cartridge | 262 |
| PowerMill-Blue and PBC milling cartridge | 266 |
| Eco milling head system | |
| Introduction to the technology | 270 |
| EcoMill and EMC milling cartridge | 272 |
| EcoMill-Blue and EBC milling cartridge | 276 |
| RapidMill-Blue and RBC milling cartridge | 280 |
| FlyCutter and FMC milling cartridge | 282 |
| FaceMill series | |
| Introduction to the technology | 284 |
| FaceMill-Diamond | 286 |

Accessories and spare parts

| | |
|--|-----|
| Face milling cutter with indexable inserts | |
| Accessories for indexable inserts | 384 |
| Allocating milling cutter clamping screws | 386 |
| Face milling cutter with PCD | |
| Milling cutters with PCD milling cartridges – Power system | 378 |
| Milling cutters with PCD milling cartridges – Eco system | 380 |

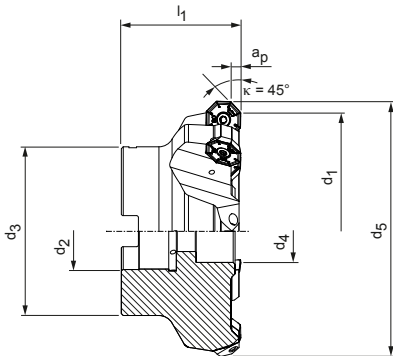
Technical appendix

| | |
|--|-----|
| Cutting data recommendations | 374 |
| Handling notes NeoMill-8/16-Face | 410 |
| Handling notes Power milling head system | 406 |
| Handling notes Eco milling head system | 408 |
| Handling notes Milling cutter clamping screw | 412 |
| Reconditioning for face milling heads with PCD | 414 |



NeoMill®-8-Face

45° face milling cutter, with radial technology
OFMT07



Milling cutter head, close spacing

| Dimensions | | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | d ₅ | l ₁ | | | | | | | |
| 63 | 22 | 48 | 18 | 75,5 | 40 | 5 | 3 | 0,6 | 15.800 | ✓ | IFM451-063-CA22-Z05R-OF_T07 | 31002131 |
| 80 | 27 | 60 | 20 | 92,4 | 50 | 6 | 3 | 1,2 | 14.300 | ✓ | IFM451-080-CA27-Z06R-OF_T07 | 31002132 |
| 100 | 32 | 78 | 27 | 111,3 | 55 | 8 | 3 | 2,1 | 12.900 | ✓ | IFM451-100-CA32-Z08R-OF_T07 | 31002133 |
| 125 | 40 | 89 | 33 | 137,3 | 63 | 10 | 3 | 3,6 | 11.700 | ✓ | IFM451-125-CA40-Z10R-OF_T07 | 31002134 |
| 160 | 40 | 89 | 65 | 172 | 63 | 13 | 3 | 5,4 | 10.400 | - | IFM450-160-CA40-Z13R-OF_T07 | 31002136 |
| 200 | 60 | 140 | - | 212,3 | 63 | 15 | 3 | 9,1 | 9.400 | - | IFM450-200-CA60-Z15R-OF_T07 | 31002137 |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

OFMT

Radial indexable insert, eight cutting edges






| Workpiece material | P | | | | M | |
|-----------------------|-----------------------------|--------------------------|-----------------------------|--------------------------|------------------------------|---------------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | Unalloyed Wear-resistant | Alloyed Tough/Ductile | Austenitic Wear-resistant | Ferritic Tough/Ductile |
| Substrate | Carbide | | | | Carbide | |
| Coating | PVD | | CVD | | PVD | |
| Cutting material type | HP980 | | HC775 | | HP980 | HP985 |
| Cutting edge design | M03 | | M03 | | M03 | M03 |
| OFMT07 | a_p max. [mm] | | | | | |
| OFMT070405R- | * | 31029307 | 31124599 | 31029307 | 31029341 | |

Feed per tooth


| Application | Medium machining | | |
|---------------------|------------------|------------|------------|
| Cutting edge design | M03 | | |
| Coating | PVD | CVD | |
| Edge rounding | ++ | ++ | |
| Feed/tooth [mm] | P | 0.1 - 0.3 | 0.1 - 0.23 |
| | M | 0.1 - 0.25 | 0.1 - 0.19 |
| | K | | |
| | N | | |

Legend: ++ = medium rounded

Accessories

| | | | |
|---|----------|---|----------|
|  | OFMT0704 | Indexable inserts | Page 251 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | | |
|---|----------|--|-----------------------|
|  | OFMT0704 | Clamping screw for indexable insert TORX PLUS® M5x13-TX20-IP | Order no. 10105084 |
|---|----------|--|-----------------------|

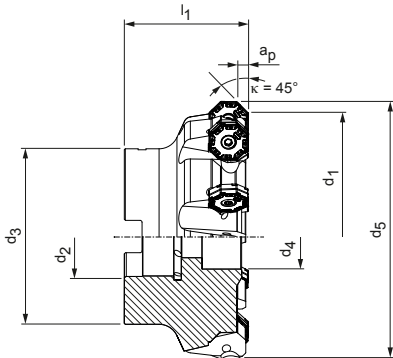
* a_p max. depends on the type of milling cutter and application.

** Included in scope of delivery.

For cutting data recommendations, see end of chapter.

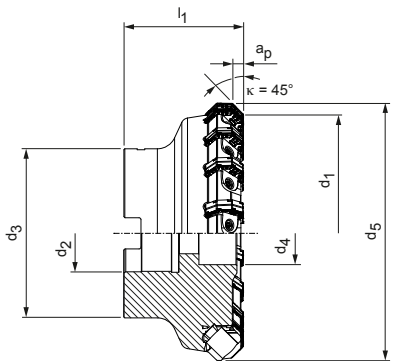
NeoMill®-16-Face

45° face milling cutter, with radial technology
ONKU07



Milling cutter head, medium spacing

| Dimensions | | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | d ₅ | l ₁ | | | | | | | |
| 63 | 22 | 48 | 18 | 75,1 | 50 | 6 | 4 | 0,8 | 6.800 | ✓ | IFM451-063-CA22-Z06R-ON_U07 | 31002143 |
| 80 | 27 | 60 | 20 | 92,1 | 50 | 7 | 4 | 1,2 | 6.100 | ✓ | IFM451-080-CA27-Z07R-ON_U07 | 31002144 |
| 100 | 32 | 78 | 27 | 112,1 | 55 | 9 | 4 | 2,2 | 5.500 | ✓ | IFM451-100-CA32-Z09R-ON_U07 | 31002145 |
| 125 | 40 | 89 | 33 | 137,1 | 63 | 10 | 4 | 3,7 | 5.000 | ✓ | IFM451-125-CA40-Z10R-ON_U07 | 31002146 |
| 160 | 40 | 89 | 65 | 172,1 | 63 | 12 | 4 | 5,4 | 4.400 | - | IFM450-160-CA40-Z12R-ON_U07 | 31002148 |
| 200 | 60 | 140 | - | 212,1 | 63 | 14 | 4 | 9,1 | 4.000 | - | IFM450-200-CA60-Z14R-ON_U07 | 31002149 |



Milling cutter head, close spacing

| Dimensions | | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | d ₅ | l ₁ | | | | | | | |
| 63 | 22 | 48 | 18 | 75,1 | 55 | 7 | 3 | 1,1 | 9.000 | - | IFM450-063-CA22-Z07R-ON_U07 | 31002155 |
| 80 | 27 | 60 | 20 | 92,1 | 50 | 11 | 3 | 1,5 | 7.800 | - | IFM450-080-CA27-Z11R-ON_U07 | 31002156 |
| 100 | 32 | 78 | 27 | 112,1 | 55 | 14 | 3 | 2,5 | 6.800 | - | IFM450-100-CA32-Z14R-ON_U07 | 31002157 |
| 125 | 40 | 89 | 33 | 137,1 | 63 | 18 | 3 | 4,1 | 5.900 | - | IFM450-125-CA40-Z18R-ON_U07 | 31002158 |
| 160 | 40 | 89 | 65 | 172,1 | 63 | 23 | 3 | 6,1 | 5.000 | - | IFM450-160-CA40-Z23R-ON_U07 | 31002160 |
| 200 | 60 | 140 | - | 212,1 | 63 | 30 | 3 | 10,1 | 4.200 | - | IFM450-200-CA60-Z30R-ON_U07 | 31002161 |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

ONKU

Radial indexable insert, 16 cutting edges






| Workpiece material | P | | | M ₂ | | K | | | |
|-----------------------|--------------------------------|----------------------------|----------|--------------------------------|-----------------------------|-------------------------|------------------------|-------------------------|------------------------|
| | ← Unalloyed Wear-resistant | Alloyed Tough/Ductile → | | ← Austenitic Wear-resistant | Ferritic Tough/Ductile → | ← GJL Wear-resistant | GJS Tough/Ductile → | ← GJL Wear-resistant | GJS Tough/Ductile → |
| Substrate | Carbide | | | Carbide | | Carbide | | | |
| Coating | PVD | | CVD | PVD | | PVD | | CVD | |
| Cutting material type | HP975 | HP980 | HC775 | HP980 | HP985 | HP965 | HP975 | HC760 | HC770 |
| Cutting edge design | | | | R03 | R03 | R05 | R05 | R05 | R05 |
| ONKU07 | a_p max. [mm] | | | | | | | | |
| ONKU070508R- | * | | | 31029361 | 31029362 | 31029363 | 31029360 | 31218299 | 31175603 |
| Cutting edge design | | M05 | M03 | M03 | M03 | M03 | M05 | M05 | M05 |
| ONKU07 | a_p max. [mm] | | | | | | | | |
| ONKU070508R- | * | 31029344 | 31029345 | 31271446 | 31029345 | 31029346 | 31029347 | 31029344 | 31122900 |

Feed per tooth




| Application | | Medium machining | | | | Roughing | | | |
|---------------------|---|------------------|------------|-------------|-------------|-------------|-------------|------------|-------------|
| | | M03 | | M05 | | R03 | | R05 | |
| Cutting edge design | | | | | | | | | |
| Coating | | PVD | CVD | PVD | CVD | PVD | CVD | PVD | CVD |
| Edge rounding | | ++ | ++ | +++ | +++ | ++ | ++ | +++ | +++ |
| Feed/tooth [mm] | P | 0.1 - 0.3 | 0.1 - 0.23 | 0.12 - 0.35 | 0.12 - 0.27 | | | | |
| | M | 0.1 - 0.25 | 0.1 - 0.19 | | | 0.12 - 0.25 | 0.12 - 0.19 | | |
| | K | | | 0.12 - 0.4 | 0.12 - 0.3 | | | 0.15 - 0.5 | 0.15 - 0.38 |
| | N | | | | | | | | |

Legend: ++ = medium rounded | +++ = sharp edged

Accessories

| | | | |
|---|----------|---|----------|
|  | ONKU0705 | Indexable inserts | Page 253 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | | |
|---|--------------------------|--|-----------------------|
|  | ONKU0705 (close spacing) | Indexable insert clamping wedge | Order no. 31071645 |
|  | ONKU0705 (close spacing) | Threaded spindle M6x0.75 LH/RHx23.4 TX15 - IP | Order no. 31041869 |
|  | ONKU0705 (wide spacing) | Clamping screw for indexable insert TORX PLUS® M5x13-TX20-IP | Order no. 10105084 |

* a_p max. depends on the type of milling cutter and application.

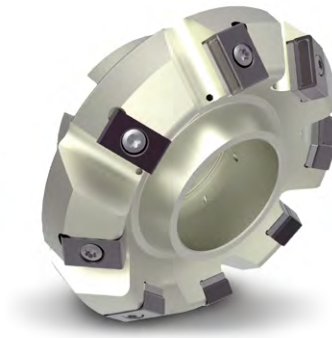
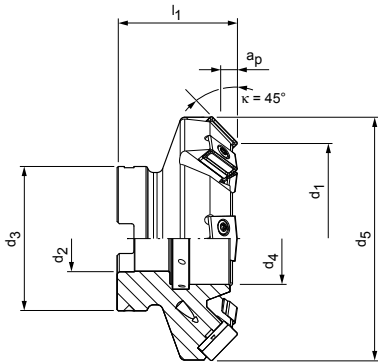
** Included in scope of delivery.

For cutting data recommendations, see end of chapter.

M₂ Heat-resistant cast steel (turbocharger materials)

TGMill-4-Face45

45° face milling cutter, with tangential technology
LTHU15



| Dimensions | | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | d ₅ | l ₁ | | | | | | | |
| 80 | 27 | 60 | 38 | 104 | 50 | 8 | 8 | 1,3 | 11.000 | ✓ | IFM451-080-CA27-Z8R-LT_U15 | 30635151 |
| 100 | 32 | 78 | 44 | 124 | 50 | 10 | 8 | 2,1 | 9.500 | ✓ | IFM451-100-CA32-Z10R-LT_U15 | 30635152 |
| 125 | 40 | 89 | 56 | 149 | 50 | 14 | 8 | 3,8 | 8.300 | ✓ | IFM451-125-CA40-Z14R-LT_U15 | 30635153 |
| 160 | 40 | 89 | 56 | 184 | 63 | 18 | 8 | 6,6 | 7.100 | ✓ | IFM451-160-CA40-Z18R-LT_U15 | 30538444 |
| 200 | 60 | 140 | - | 224 | 63 | 22 | 8 | 9,6 | 6.100 | ✓ | IFM451-200-CA60-Z22R-LT_U15 | 30635154 |

Accessories

| | | | |
|--|----------|---|----------|
| | LTHU1505 | Indexable inserts | Page 255 |
| | LTHU1507 | Indexable inserts | Page 255 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|--|----------------------|---------------------------------|-----------------------|
| | LTHU1505 LTHU1507 | TORX PLUS® M4x17-TX15-IP | Order no. 30414702 |
| | LTHU1505 | Backing plate 15.7x2.38x9.26 | Order no. 30413233 |
| | LTHU1505 LTHU1507 | Threaded bush M6x0.5x12-sw4 | Order no. 30413235 |

Selection notes

When using insert size LT_U1507, the backing plate must be removed

Fitting LT_U1505

Fitting LT_U1507

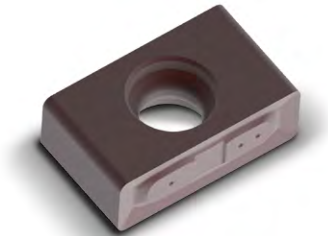
Dimensions in mm.

* Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

LTHU

Tangential indexable inserts, 4+4 cutting edge



| Workpiece material | P | | | K | | | |
|-----------------------|-----------------------------------|--------------------------|----------|-----------------------|----------------------|-----------------------|----------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | | GJL Wear-resistant | GJS Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile |
| Substrate | Carbide | | | Carbide | | | |
| Coating | PVD | | CVD | PVD | | CVD | |
| Cutting material type | HP975 | HP980 | HC775 | HP965 | HP975 | HC760 | HC770 |
| Cutting edge design | H82 | H82 | | H82 | H82 | H82 | H82 |
| LTHU15 | a_p max. [mm] | | | | | | |
| LTHU150508...N-... | * | 31177658 | 31177659 | | 31177657 | 31177658 | 31272657 |
| LTHU150512...N-... | * | 31177662 | 31177663 | | 31177661 | 31177662 | 31273026 |
| LTHU150520...N-... | * | 31177666 | 31177647 | | 31177665 | 31177666 | 31273028 |
| Cutting edge design | H92 | | H92 | H92 | H92 | H92 | H92 |
| LTHU15 | a_p max. [mm] | | | | | | |
| LTHU150508...N-... | * | 30840002 | | 30840014 | 31177639 | 30840002 | 31272670 |
| LTHU150512...N-... | * | 31177650 | | | 30259815 | 31177650 | 31272671 |
| LTHU150520...N-... | * | 31177654 | | | 31177653 | 31177654 | 31272674 |
| LTHU150720...N-... | * | | | | 31177655 | | |
| LTHU150730...N-... | * | | | | 31177656 | | |

Feed per tooth

| Application | | Roughing | | | |
|---------------------|---|------------|------------|-------------|-------------|
| | | H82 | | H92 | |
| Cutting edge design | | PVD | CVD | PVD | CVD |
| Coating | | | | | |
| Edge rounding | | +++ | +++ | +++ | +++ |
| Feed/tooth [mm] | P | 0.1 - 0.3 | 0.1 - 0.23 | 0.15 - 0.3 | 0.15 - 0.23 |
| | M | | | | |
| | K | 0.1 - 0.35 | 0.1 - 0.27 | 0.15 - 0.35 | 0.15 - 0.27 |
| | N | | | | |

Legend: +++ = Heavily rounded

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

Cutting Data recommendation for Face Milling Cutter with Indexable Inserts

Feed and cutting speed

Face milling cutter

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|----|--------------------|--|---------|-----|---------|--|
| | | | | MQL/Air | Dry | Coolant | |
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | | | |
| | P5 | P5.1 | Cast steel | | | | |
| | P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | | | |
| M | M1 | M1.1 | Stainless steels, austenitic | < 700 | | ✓ | |
| | | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2 | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2 | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3 | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |

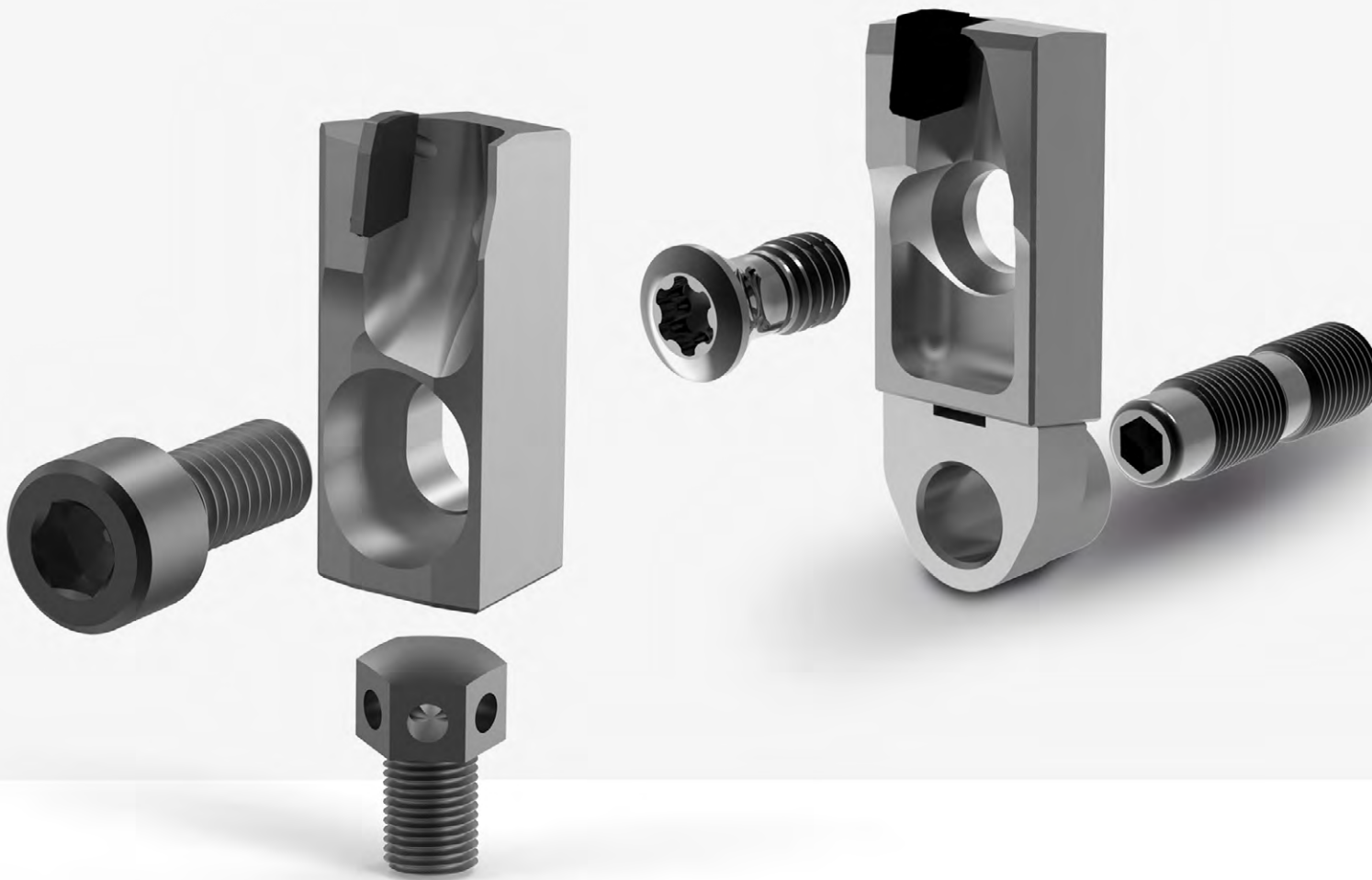
* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|-------|--|
| Carbide PVD-coated | | | | | | | | Carbide CVD-coated | | | | | | |
| HP965 | | HP975 | | HP980 | | HP985 | | HC760 | | HC770 | | HC775 | | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | |
| | | 180 | 220 | 180 | 220 | | | | | 260 | 280 | | | |
| | | 150 | 180 | 150 | 180 | | | | | 250 | 270 | 240 | 260 | |
| | | 160 | 200 | 160 | 200 | | | | | 240 | 260 | 230 | 250 | |
| | | | | 130 | 160 | | | | | | | 220 | 240 | |
| | | | | 130 | 160 | | | | | | | | | |
| | | | | 130 | 160 | | | | | | | | | |
| | | | | 120 | 150 | | | | | | | | | |
| | | | | 120 | 150 | | | | | | | | | |
| | | | | 130 | 160 | | | | | | | | | |
| | | | | 110 | 140 | | | | | | | | | |
| | | | | 160 | 180 | 140 | 170 | | | | | | | |
| | | | | 140 | 160 | 120 | 150 | | | | | | | |
| | | | | | | 100 | 120 | | | | | | | |
| | | | | | | 90 | 110 | | | | | | | |
| 220 | 270 | 200 | 240 | | | | | 330 | 350 | 320 | 330 | | | |
| 200 | 240 | 180 | 220 | | | | | 300 | 330 | 300 | 320 | | | |
| 180 | 220 | 160 | 200 | | | | | | | 260 | 300 | | | |
| 160 | 200 | 140 | 170 | | | | | | | 220 | 260 | | | |
| 170 | 210 | 150 | 180 | | | | | 210 | 240 | 200 | 220 | | | |
| 160 | 200 | 140 | 170 | | | | | 200 | 220 | 180 | 200 | | | |

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.



Eco and Power milling head system

Proven in aluminium machining

Machining to the highest perfection

High removal rates, defined roughness depths or special requirements for the flatness of the part during face milling – the Eco and Power milling head systems provide the solution. Different numbers of teeth allow the optimal selection of the tool, with the aim of always achieving the highest economic efficiency for the milling process.

There are two variants to choose from: milling cartridges for the Eco system or the cost-effective 24-hour regrinding service for the Power system.

As a special service, MAPAL offers milling head management and reconditioning to original quality (for further information, see page 414).

EcoMill and EcoMill-Blue

This milling head system, primarily designed for finishing, impresses with a multitude of innovations. Perfect surface finishes are achieved with this milling cutter thanks to the sensitive, effective wedge adjustment of the cutting edges in the z-direction. When it comes to handling, the simple positioning of the milling insert in the aluminium base body is impressive. Centrifugal forces that occur during machining are compensated for by a precisely fitting dovetail guide. The use of disposable milling cartridge reduces the logistics effort. Integrated chip deflectors and direct cutting edge cooling on the EcoMill-Blue series increase the tool life of the milling cutter base body.

PowerMill and PowerMill-Blue

The Power milling head system is the all-rounder for roughing and finishing. The simple, robust design guarantees uncomplicated and quick adjustment of the tool. The PowerMill series, the classic among the milling heads, has been continuously adapted to the growing requirements in machining. The main difference to the EcoMill series lies in the milling cartridge. In the PowerMill series, the milling cartridges are designed with larger PCD tipping. In addition to the higher cutting depth of up to max. 5 mm, this also enables regrinding. Thanks to the exact manufacturing, the high-precision milling cartridge guarantees a perfect diameter of the cutting edges in the aluminium base body. The PowerMill-Blue series features integrated chip deflectors and internal cooling directly onto the cutting edges.

1. Milling head system

System Power

All-rounder for roughing and finishing
 Robust adjusting screw
 Cutting depth up to 5 mm
 Can be reground

Robust adjusting screw



System Eco

1. Choice for finishing
 Sensitive wedge adjustment
 Cutting depth up to 3 mm
 Disposable milling cartridges

Sensitive wedge adjustment



2. Series

PowerMill



PowerMill-Blue



EcoMill



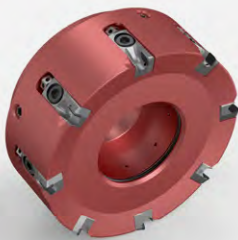
EcoMill-Blue



3. Design*

Example: PowerMill-Blue

Wide spacing "Speed"



Close spacing "Feed"



Monobloc design "Fix"



4. Cutting edge geometry of the milling inserts*

| Standard geometries | | Special geometries | |
|---------------------|----------------------|--|--|
| Face milling insert | Corner milling blade | Wide face milling blade | PT milling insert |
| | | | |
| Face milling | Shoulder milling | Face milling insert with wide finishing cutting edge | Generation of defined roughness depths |

"BLUE" SERIES FEATURES

- Less chips and dirt in the finished part
Innovative chip guiding geometry
- Direct coolant supply
Integrated coolant outlets
- Reduced noise level
Minimum cutting edge overhang
- Suitable for dry machining and MQL applications
Integrated coolant outlets

* Valid for all series.



Power milling head system

The robust all-rounder

The Power milling head system is characterised by its simple and robust design and is equally suitable for roughing and finishing operations in aluminium. The PCD milling cartridges can be adjusted quickly and easily by means of an adjusting screw. The adjusting screw ensures exact and safe adjustment of the axial run-out even under extreme operating conditions.

The main difference to the Eco milling head system is the milling cartridge. The milling cartridges of the Power system are designed with larger PCD tipping. In addition to the larger cutting depth of up to max. 5 mm, this also enables regrinding. Thanks to the exact manufacturing, the high-precision milling cartridge guarantees a perfect diameter of the cutting edges in the aluminium base body.

While the chip former is still integrated in the tool body of the classic PowerMill series, the new generation of PCD face milling cutters, the PowerMill Blue series, convinces with PCD milling cartridges with integrated chip guiding geometry. The chips are reliably removed and scratches on the surface as well as transport scoring are virtually impossible. The result is even better surface finishes.

Instead of a central coolant supply, the cutting edges are directly supplied with cooling lubricant at the point of action. The coolant outlet is integrated into the milling cartridge. This means the PowerMill Blue series is also suitable for MQL operations (recommended up to \varnothing 125 mm). Compared with the traditional PowerMill series, noise is minimised due to a low cutting edge overhang.

AT A GLANCE

- Tool of choice for aluminium machining
- Proven setting and clamping system
- Cutting depths up to $a_p = 5$ mm
- PowerMill-Blue with optimised chip guiding geometry and integrated coolant outlets

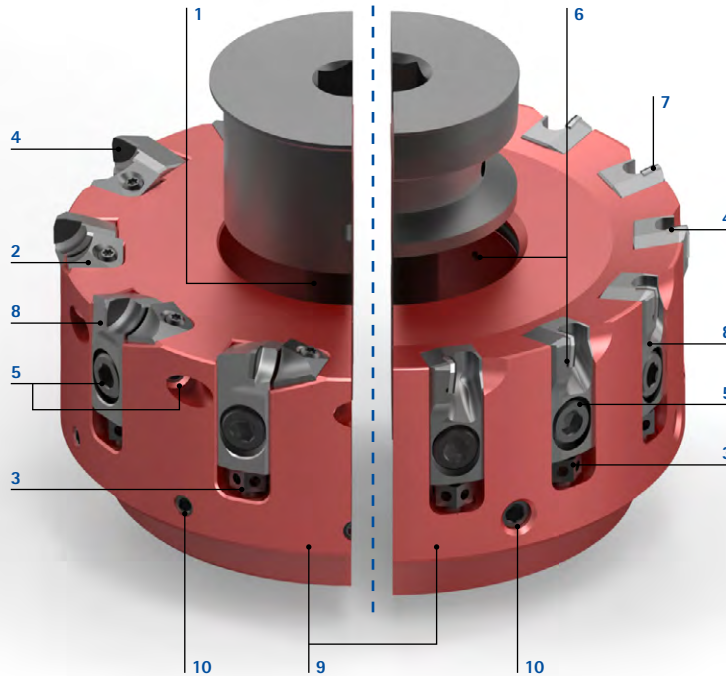
ADVANTAGES

- High process reliability even under extreme operating conditions
- Regrindable PCD milling cartridges for maximum cost effectiveness

Tool features in detail

PowerMill | PowerMill-Blue

- 1 Central coolant supply**
- Coolant supplied indirectly via central coolant screw or cap
- 2 Replaceable chip deflector**
- Significant increase in the tool life of the aluminium tool body
- 3 Adjusting screw**
- Exact, reliable adjustment of the axial run-out even in extreme conditions
 - Simple handling
- 4 Special cutting edge geometry**
- Face milling insert
 - Corner milling blade
 - Wide face milling blade
 - PT milling insert for defined roughness depths
- 5 Safety screw**
- Milling cartridge sits perfectly in the tool body
- PowerSpeed with additional safety screw for HSC applications.**



- 6 Integrated coolant outlets**
- Direct cooling and lubrication of the cutting edges
 - Suitable for dry machining and MQL applications
- 7 Minimised cutting edge overhang**
- Reduced noise level
- 8 Replaceable PCD milling cartridges**
- Long tool lives
 - Special chip guiding geometry for targeted chip removal
 - Robust and regrindable
- 9 Tool body made of steel or high-strength aluminium**
- Wear-resistant
 - Lightweight design allows use at very high spindle speeds
- 10 Balancing screws**
- Perfect radial run-out due to balanced milling body

PowerMill



- Simple, robust construction
- Proven setting system ensures exact, reliable adjustment of the axial run-out even in extreme application conditions
- Milling cartridges that can be reground for high cost-effectiveness
- Cutting depths up to $a_p = 5$ mm
- Simple handling

PowerMill-Blue



- Chip former directly integrated into milling cartridge
- Significantly better surface finish
- Reliable chip removal
- No transport scoring on the part surface as the chips are removed

Special solutions

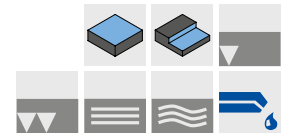
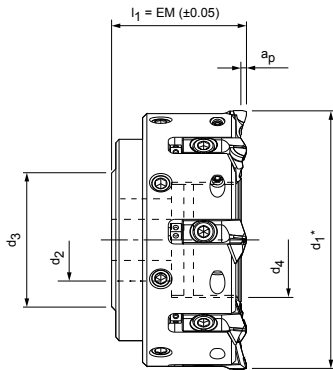


- PowerMill series acts as the basis for customised special solutions
- In addition to milling heads with special dimensions, milling cartridges can be individually adapted to the machining task

Robust basic set-up for more process reliability even under extreme operating conditions.

PowerSpeed

PCD face milling head, wide spacing
PowerMill



Tool body made of steel

| Dimensions | | | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|----------------|----------------|----------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | |
| 63 | 22 | 43 | 28 | 48 | 3 | 5 | 0,85 | 25.000 | CFM901-063-CA22-Z03R-PMC-S | 30696422 |
| 63 | 22 | 43 | 28 | 48 | 5 | 5 | 0,80 | 25.000 | CFM901-063-CA22-Z05R-PMC-S | 30696661 |

Tool body made of aluminium

| | | | | | | | | | | |
|-----|----|-----|----|----|----|---|------|--------|----------------------------|----------|
| 80 | 27 | 49 | 36 | 50 | 5 | 5 | 0,75 | 25.000 | CFM901-080-CA27-Z05R-PMC-A | 30696424 |
| 80 | 27 | 49 | 36 | 50 | 6 | 5 | 0,75 | 25.000 | CFM901-080-CA27-Z06R-PMC-A | 30696659 |
| 80 | 27 | 49 | 36 | 50 | 7 | 5 | 0,8 | 25.000 | CFM901-080-CA27-Z07R-PMC-A | 30696663 |
| 100 | 32 | 59 | 45 | 50 | 6 | 5 | 1,08 | 21.650 | CFM901-100-CA32-Z06R-PMC-A | 30696426 |
| 100 | 32 | 59 | 45 | 50 | 8 | 5 | 1,20 | 21.650 | CFM901-100-CA32-Z08R-PMC-A | 30696665 |
| 125 | 40 | 71 | 56 | 63 | 8 | 5 | 2,20 | 18.550 | CFM901-125-CA40-Z08R-PMC-A | 30696428 |
| 125 | 40 | 71 | 56 | 63 | 10 | 5 | 2,20 | 18.550 | CFM901-125-CA40-Z10R-PMC-A | 30696667 |
| 140 | 40 | 100 | 56 | 63 | 10 | 5 | 2,40 | 18.550 | CFM901-140-CA40-Z10R-PMC-A | 30696430 |
| 160 | 40 | 104 | - | 63 | 10 | 5 | 2,75 | 14.990 | CFM901-160-CA40-Z10R-PMC-A | 30696432 |
| 160 | 40 | 98 | - | 63 | 12 | 5 | 2,80 | 14.990 | CFM901-160-CA40-Z12R-PMC-A | 30696669 |
| 180 | 40 | 104 | - | 63 | 10 | 5 | 3,40 | 13.500 | CFM901-180-CA40-Z10R-PMC-A | 30696434 |
| 200 | 60 | 138 | - | 63 | 12 | 5 | 4,15 | 12.200 | CFM901-200-CA60-Z12R-PMC-A | 30696436 |
| 250 | 60 | 138 | - | 63 | 15 | 5 | 6,70 | 9.760 | CFM901-250-CA60-Z15R-PMC-A | 30696438 |

Accessories

| | | | |
|--|------------------------|---|----------------------|
| | PMC... | Milling cartridge | Page 265 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d ₁ | Fastening screw for milling cutter arbor | Order no. |
| | 160 - 180 200 - 250 | ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | 10006594 10007775 |

Spare parts**

| | | | |
|--|-----------------------------|--|-----------------------|
| | | Clamping screws for milling cartridge M6x13 | Order no. 30696520 |
| | | Adjusting screw M5x8 | Order no. 30696523 |
| | | Chip deflector | Order no. |
| | | Chip deflector for clockwise Chip deflector for anticlockwise | 30696535 30696536 |
| | | Clamping screw for chip deflector M3x7.3 | Order no. 30696537 |
| | | Locking screw M6x12 | Order no. 30696529 |
| | d ₁ 50 - 140 | Fastening screw with coolant delivery | Page 379 |
| | d ₁ 160 - 250 | Coolant cover and fastening screw M6x20 | Page 379 |

Dimensions in mm.

Anticlockwise design on request.

* d₁ Depending on the milling cartridge type, see page 265.

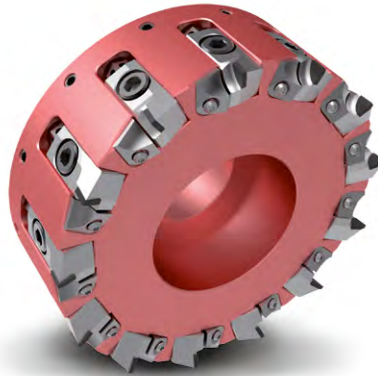
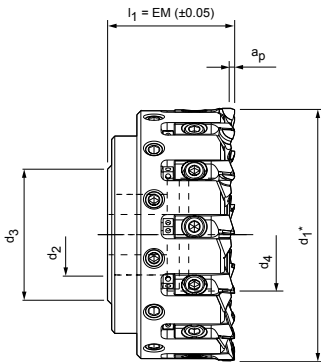
** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

PowerFeed

PCD face milling head, close spacing
PowerMill



Tool body made of steel

| Dimensions | | | | | Z_{eff} | a_p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min^{-1}] | Specification | Order no. |
|------------|-------|-------|-------|-------|------------------|------------|--------------------------------------|--|----------------------------|-----------|
| d_1^* | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 63 | 22 | 43 | 28 | 48 | 8 | 5 | 0,80 | 25.000 | CFM901-063-CA22-Z08R-PMC-S | 30696548 |

Tool body made of aluminium

| | | | | | | | | | | |
|-----|----|-----|----|----|----|---|------|--------|----------------------------|----------|
| 80 | 27 | 49 | 36 | 50 | 8 | 5 | 0,83 | 20.000 | CFM901-080-CA27-Z08R-PMC-A | 30696550 |
| 100 | 32 | 59 | 45 | 50 | 10 | 5 | 1,20 | 18.000 | CFM901-100-CA32-Z10R-PMC-A | 30696552 |
| 125 | 40 | 71 | 56 | 63 | 12 | 5 | 2,25 | 18.550 | CFM901-125-CA40-Z12R-PMC-A | 30696671 |
| 125 | 40 | 71 | 56 | 63 | 13 | 5 | 2,20 | 16.000 | CFM901-125-CA40-Z13R-PMC-A | 30696554 |
| 160 | 40 | 98 | - | 63 | 18 | 5 | 2,15 | 13.000 | CFM901-160-CA40-Z18R-PMC-A | 30696556 |
| 180 | 40 | 104 | - | 63 | 20 | 5 | 2,60 | 11.500 | CFM901-180-CA40-Z20R-PMC-A | 30696558 |
| 200 | 60 | 138 | - | 63 | 24 | 5 | 4,40 | 10.000 | CFM901-200-CA60-Z24R-PMC-A | 30696560 |
| 250 | 60 | 138 | - | 63 | 30 | 5 | 7,00 | 8.000 | CFM901-250-CA60-Z30R-PMC-A | 30696562 |

Accessories

| | | | |
|--|------------------------|---|----------------------|
| | PMC... | Milling cartridge | Page 265 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d_1 | Fastening screw for milling cutter arbor | Order no. |
| | 160 - 180 200 - 250 | ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | 10006594 10007775 |

Spare parts**

| | | | |
|--|--------------------|---|-----------------------------------|
| | | Clamping screws for milling cartridge M6x13 | Order no. 30696520 |
| | | Adjusting screw M5x8 | Order no. 30696523 |
| | | Chip deflector | Order no. 30696535 30696536 |
| | | Clamping screw for chip deflector M3x7.3 | Order no. 30696537 |
| | d_1 63 - 125 | Fastening screw with coolant delivery | Page 379 |
| | d_1 160 - 250 | Coolant cover and fastening screw M6x20 | Page 379 |

Dimensions in mm.

Anticlockwise design on request.

Special design with increased number of teeth on request.

* d_1 Depending on the milling cartridge type, see page 265.

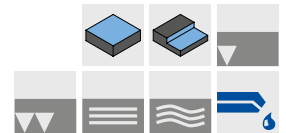
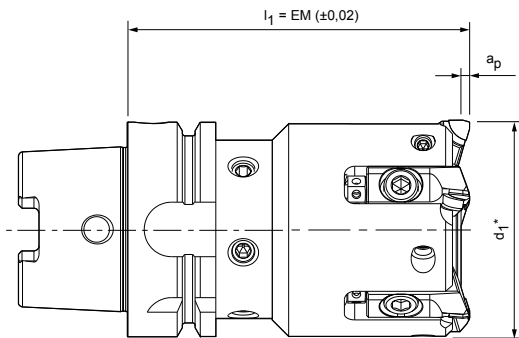
** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

PowerFix

PCD face milling cutter, monoblock design
PowerMill







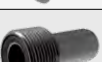
Tool body with HSK-A (hollow shank taper form A) connection

| Dimensions | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|--------------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | HSK-A nominal size | l ₁ | | | | | | |
| 50 | 63 | 100 | 4 | 5 | 1,62 | 25.000 | CFM901-050-A063-Z04R-PMC-S | 30696673 |
| 63 | 63 | 100 | 5 | 5 | 2,05 | 24.360 | CFM901-063-A063-Z05R-PMC-S | 30696724 |
| 80 | 63 | 100 | 5 | 5 | 2,75 | 22.000 | CFM901-080-A063-Z05R-PMC-S | 30696726 |
| 100 | 63 | 100 | 6 | 5 | 3,83 | 19.000 | CFM901-100-A063-Z06R-PMC-S | 30696931 |

Accessories

| | | | |
|---|--------|-------------------|----------|
|  | PMC... | Milling cartridge | Page 265 |
|---|--------|-------------------|----------|

Spare parts**

| | | | |
|---|----------------------------|---|-----------------------|
|  | d ₁ 50 - 100 | Clamping screws for milling cartridge M6x13 | Order no. 30696520 |
|  | | Adjusting screw M5x8 | Order no. 30696523 |
|  | | Locking screw M6x12 | Order no. 30696529 |
|  | | Fastening screw with coolant delivery | Page 379 |
|  | HSK connection | HSK-A63 coolant tube | Order no. 30326006 |

Dimensions in mm.

Anticlockwise design on request.

Special design with increased number of teeth on request.

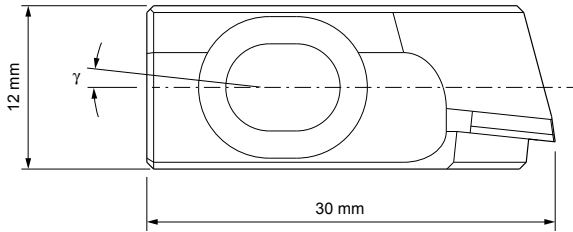
* d₁ Depending on the milling cartridge type, see page 265.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

PMC milling cartridge



Milling cartridge – face milling inserts

| | Rake angle γ [°] | R_z value [μm] | a_p max. | Cutting material | Cutting direction right | |
|--|-------------------------|-------------------------------|------------|------------------|-------------------------|-----------|
| | | | | | Specification | Order no. |
| | 6 | ≤ 5 | 5 | PU611 | PMC-711-0-PU611 | 30696478 |
| | 6 | ≤ 10 | 5 | PU611 | PMC-712-0-PU611 | 30696482 |
| | 6 | ≤ 20 | 5 | PU611 | PMC-713-0-PU611 | 30696485 |
| | 6 | > 20 | 5 | PU611 | PMC-714-0-PU611 | 30696488 |
| | 0 | ≤ 5 | 5 | PU611 | PMC-731-0-PU611 | 30696498 |
| | 0 | ≤ 10 | 5 | PU611 | PMC-732-0-PU611 | 30696504 |
| | 0 | ≤ 20 | 5 | PU611 | PMC-733-0-PU611 | 30696508 |
| | 0 | > 20 | 5 | PU611 | PMC-734-0-PU611 | 30696511 |

Milling cartridge – corner milling blade

| | | | | | | |
|--|---|-----------|---|-------|-----------------|----------|
| | 6 | ≤ 5 | 5 | PU611 | PMC-611-0-PU611 | 30696446 |
| | 6 | ≤ 10 | 5 | PU611 | PMC-612-0-PU611 | 30696450 |
| | 6 | ≤ 20 | 5 | PU611 | PMC-613-0-PU611 | 30696452 |
| | 6 | > 20 | 5 | PU611 | PMC-614-0-PU611 | 30696455 |
| | 0 | ≤ 5 | 5 | PU611 | PMC-631-0-PU611 | 30696466 |
| | 0 | ≤ 10 | 5 | PU611 | PMC-632-0-PU611 | 30696472 |
| | 0 | ≤ 20 | 5 | PU611 | PMC-633-0-PU611 | 30696474 |
| | 0 | > 20 | 5 | PU611 | PMC-634-0-PU611 | 30696476 |

Special geometries

Assembly note:

In order to achieve defined surfaces, it can make sense to supplement a face or corner milling blade tipping with a process-dependent number of special geometries (wide finishing/PT).

Milling cartridge – wide face milling blade

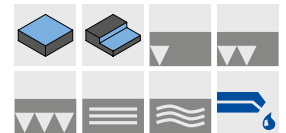
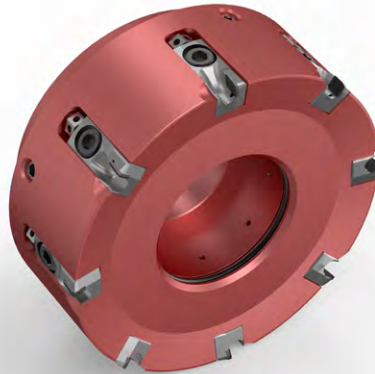
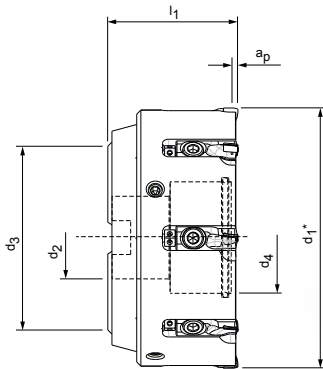
| | | | | | | |
|--|---|-------|---|-------|-----------------|----------|
| | 6 | < 5 | 5 | PU611 | PMC-811-0-PU611 | 30696513 |
| | 0 | < 3 | 5 | PU611 | PMC-831-0-PU611 | 30696516 |

Milling cartridge – PT milling insert

| | | | | | | |
|--|---|---|---|-------|-----------------|----------|
| | 0 | - | 5 | PU611 | PMC-931-0-PU611 | 30696518 |
|--|---|---|---|-------|-----------------|----------|

PowerSpeed-Blue

PCD face milling head, wide spacing
PowerMill-Blue



Tool body made of steel

| Dimensions | | | | | Z_{eff} | a_p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min^{-1}] | Specification | Order no. |
|------------|-------|-------|-------|-------|-----------|------------|--------------------------------------|-------------------------------------|----------------------------|-----------|
| d_1^* | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 63 | 22 | 48 | 26 | 48 | 5 | 5 | 1,0 | 25.000 | CFM901-063-CA22-Z05R-PBC-S | 30940667 |
| 80 | 27 | 60 | 34 | 50 | 6 | 5 | 1,5 | 22.000 | CFM901-080-CA27-Z06R-PBC-S | 30940669 |
| 100 | 32 | 78 | 43 | 50 | 6 | 5 | 2,5 | 18.000 | CFM901-100-CA32-Z06R-PBC-S | 30940703 |
| 125 | 40 | 89 | 54 | 63 | 8 | 5 | 4,7 | 18.000 | CFM901-125-CA40-Z08R-PBC-S | 30982043 |

Tool body made of aluminium

| | | | | | | | | | | |
|-----|----|-----|----|----|----|---|------|--------|----------------------------|----------|
| 100 | 32 | 78 | 43 | 50 | 6 | 5 | 1,1 | 20.000 | CFM901-100-CA32-Z06R-PBC-A | 30982041 |
| 125 | 40 | 89 | 54 | 63 | 8 | 5 | 2,1 | 18.000 | CFM901-125-CA40-Z08R-PBC-A | 30940705 |
| 160 | 40 | 130 | - | 63 | 10 | 5 | 2,6 | 14.000 | CFM901-160-CA40-Z10R-PBC-A | 30982047 |
| 200 | 60 | 134 | - | 63 | 12 | 5 | 3,8 | 11.000 | CFM901-200-CA60-Z12R-PBC-A | 30940720 |
| 250 | 60 | 134 | - | 63 | 15 | 5 | 6,1 | 8.500 | CFM901-250-CA60-Z15R-PBC-A | 30940724 |
| 315 | 60 | 232 | - | 80 | 18 | 5 | 12,0 | 7.250 | CFM901-315-CA60-Z18R-PBC-A | 30940726 |
| 400 | 60 | 232 | - | 80 | 24 | 5 | 19,0 | 6.100 | CFM901-400-CA60-Z24R-PBC-A | 30982048 |

Accessories

| | | | |
|--|---------------------------------|---|-----------------------------------|
| | PBC | Milling cartridge | Page 269 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d_1 160 - 180 200 - 400 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|--|--------------------|---|-----------------------|
| | | Clamping screws for milling cartridge M6x13 | Order no. 30696520 |
| | | Adjusting screw M5x8 | Order no. 30696523 |
| | d_1 63 - 125 | Fastening screw with coolant delivery | Page 379 |
| | d_1 160 - 400 | Coolant cover and fastening screw M6x20 | Page 379 |
| | | Balancing screw | Page 378 |

Dimensions in mm.

Anticlockwise design on request.

Special design with increased number of teeth on request.

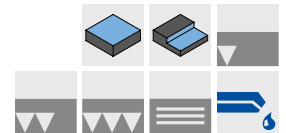
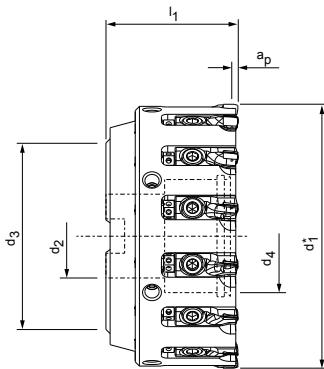
* d_1 Depending on the milling cartridge type, see page 269.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

PowerFeed-Blue

PCD face milling head, close spacing
PowerMill-Blue



Tool body made of steel

| Dimensions | | | | | Z_{eff} | a_p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min^{-1}] | Specification | Order no. |
|------------|-------|-------|-------|-------|-----------|------------|--------------------------------------|-------------------------------------|----------------------------|-----------|
| d_1^* | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 63 | 22 | 48 | 26 | 48 | 8 | 5 | 0,9 | 25.000 | CFM901-063-CA22-Z08R-PBC-S | 30940668 |
| 80 | 27 | 60 | 34 | 50 | 8 | 5 | 1,5 | 20.000 | CFM901-080-CA27-Z08R-PBC-S | 30940702 |
| 100 | 32 | 78 | 43 | 50 | 10 | 5 | 2,4 | 18.000 | CFM901-100-CA32-Z10R-PBC-S | 30940704 |
| 125 | 40 | 89 | 54 | 63 | 14 | 5 | 4,7 | 16.000 | CFM901-125-CA40-Z14R-PBC-S | 30982045 |

Tool body made of aluminium

| | | | | | | | | | | |
|-----|----|-----|----|----|----|---|------|--------|----------------------------|----------|
| 100 | 32 | 78 | 43 | 50 | 10 | 5 | 1,2 | 18.000 | CFM901-100-CA32-Z10R-PBC-A | 30982042 |
| 125 | 40 | 89 | 54 | 63 | 14 | 5 | 2,2 | 16.000 | CFM901-125-CA40-Z14R-PBC-A | 30940706 |
| 160 | 40 | 96 | - | 63 | 18 | 5 | 2,7 | 13.000 | CFM901-160-CA40-Z18R-PBC-A | 30940708 |
| 200 | 60 | 134 | - | 63 | 24 | 5 | 4,0 | 10.000 | CFM901-200-CA60-Z24R-PBC-A | 30940721 |
| 250 | 60 | 134 | - | 63 | 30 | 5 | 6,4 | 8.000 | CFM901-250-CA60-Z30R-PBC-A | 30940725 |
| 315 | 60 | 232 | - | 80 | 36 | 5 | 12,3 | 7.000 | CFM901-315-CA60-Z36R-PBC-A | 30940727 |
| 400 | 60 | 232 | - | 80 | 48 | 5 | 19,4 | 5.500 | CFM901-400-CA60-Z48R-PBC-A | 30982049 |

Accessories

| | | | |
|--|---------------------------------|---|-----------------------------------|
| | PBC | Milling cartridge | Page 269 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d_1 160 - 180 200 - 400 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|--|--------------------|---|-----------------------|
| | | Clamping screws for milling cartridge M6x13 | Order no. 30696520 |
| | | Adjusting screw M5x8 | Order no. 30696523 |
| | d_1 63 - 125 | Fastening screw with coolant delivery | Page 379 |
| | d_1 160 - 400 | Coolant cover and fastening screw M6x18 | Page 379 |
| | | Balancing screw | Page 378 |

Dimensions in mm.

Anticlockwise design on request.

Special design with increased number of teeth on request.

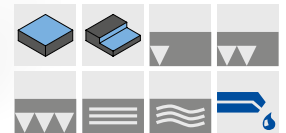
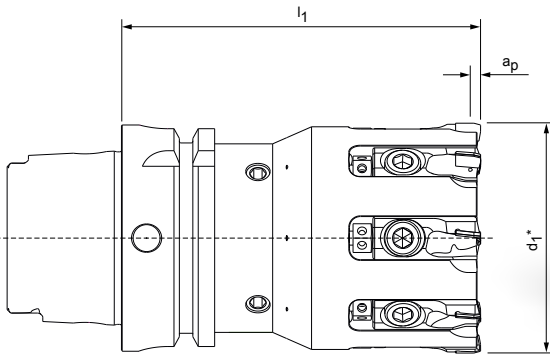
* d_1 Depending on the milling cartridge type, see page 269.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

PowerFix-Blue

PCD face milling cutter, monoblock design
PowerMill-Blue







Tool body with HSK-A (hollow shank taper form A) connection

| Dimensions | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|--------------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | HSK-A nominal size | l ₁ | | | | | | |
| 50 | 63 | 100 | 4 | 5 | 1,7 | 25.000 | CFM901-050-A063-Z04R-PBC-S | 30940663 |
| 63 | 63 | 100 | 8 | 5 | 2,1 | 25.000 | CFM901-063-A063-Z08R-PBC-S | 30940664 |
| 80 | 63 | 100 | 8 | 5 | 2,8 | 22.000 | CFM901-080-A063-Z08R-PBC-S | 30940665 |
| 100 | 63 | 100 | 10 | 5 | 3,8 | 18.000 | CFM901-100-A063-Z10R-PBC-S | 30940666 |

Accessories

| | | | |
|---|-----|-------------------|----------|
|  | PBC | Milling cartridge | Page 269 |
|---|-----|-------------------|----------|

Spare parts**

| | | | |
|---|----------------------------|---|-----------------------|
|  | d ₁ 50 - 100 | Clamping screws for milling cartridge M6x12 (flat head screw) M6x13 | Order no. 30696520 |
|  | | Adjusting screw M5x8 | Order no. 30696523 |
|  | HSK connection | HSK-A63 coolant tube | Order no. 30326006 |
|  | | Balancing screw M8x10 | Order no. 10012538 |

Dimensions in mm.

Anticlockwise design on request.

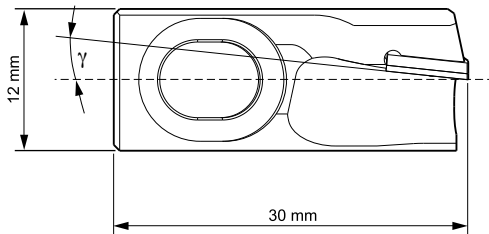
Special design with increased number of teeth on request.

* d₁ Depending on the milling cartridge type, see page 269.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

Milling cartridge – PowerMill-Blue Cartridge (PBC)



Milling cartridge – face milling inserts

| | Rake angle γ [°] | R_z value [μm] | a_p max. | Running direction | Cutting material | Specification | Order no. |
|--|----------------------------|----------------------------------|------------|----------------------|---------------------|-----------------|-----------|
| | 6 | ≤ 5 | 5 | Right | PU611 | PBC-711-0-PU611 | 30956576 |
| | 6 | ≤ 10 | 5 | Right | PU611 | PBC-712-0-PU611 | 30956577 |
| | 6 | ≤ 20 | 5 | Right | PU611 | PBC-713-0-PU611 | 30956578 |
| | 6 | > 20 | 5 | Right | PU611 | PBC-714-0-PU611 | 30956579 |
| | 0 | ≤ 5 | 5 | Right | PU611 | PBC-731-0-PU611 | 30956572 |
| | 0 | ≤ 10 | 5 | Right | PU611 | PBC-732-0-PU611 | 30956573 |
| | 0 | ≤ 20 | 5 | Right | PU611 | PBC-733-0-PU611 | 30956574 |
| | 0 | > 20 | 5 | Right | PU611 | PBC-734-0-PU611 | 30956575 |

Milling cartridge – corner milling blade

| | | | | | | | |
|--|---|-----------|---|-------|-------|-----------------|----------|
| | 6 | ≤ 5 | 5 | Right | PU611 | PBC-611-0-PU611 | 30956584 |
| | 6 | ≤ 10 | 5 | Right | PU611 | PBC-612-0-PU611 | 30956585 |
| | 6 | ≤ 20 | 5 | Right | PU611 | PBC-613-0-PU611 | 30956586 |
| | 6 | > 20 | 5 | Right | PU611 | PBC-614-0-PU611 | 30956587 |
| | 0 | ≤ 5 | 5 | Right | PU611 | PBC-631-0-PU611 | 30956580 |
| | 0 | ≤ 10 | 5 | Right | PU611 | PBC-632-0-PU611 | 30956581 |
| | 0 | ≤ 20 | 5 | Right | PU611 | PBC-633-0-PU611 | 30956582 |
| | 0 | > 20 | 5 | Right | PU611 | PBC-634-0-PU611 | 30956583 |

Special geometries

Assembly note:

In order to achieve defined surfaces, it can make sense to supplement a face or corner milling blade tipping with a process-dependent number of special geometries (wide finishing/PT).

Milling cartridge – wide face milling blade

| | | | | | | | |
|--|---|-------|---|-------|-------|-----------------|----------|
| | 0 | < 3 | 2 | Right | PU611 | PBC-831-0-PU611 | 30961943 |
|--|---|-------|---|-------|-------|-----------------|----------|

Milling cartridge – PT milling insert

| | | | | | | | |
|--|---|---|---|-------|-------|-----------------|----------|
| | 0 | - | 2 | Right | PU611 | PBC-931-0-PU611 | 30961944 |
|--|---|---|---|-------|-------|-----------------|----------|



Eco milling head system

First choice for finishing

The Eco milling head system is primarily designed for finishing operations in aluminium with high-quality surface finishes. As opposed to the Power system with regrindable milling cartridges, the Eco milling head system uses disposable milling cartridges that reduce logistical efforts. As there is less PCD tipping, the cutting depth is limited to max. 3 mm. The PCD cutting edges are fixed stably and securely by a highly precise dovetail guide. Changing the milling cartridges is quite straightforward. Adjustment is user-friendly with radially accessible, wedge-shaped adjusting elements. Integrated chip deflectors significantly increase the tool life of the cutter tool body.

While the classic EcoMill series already has an integrated chip guiding geometry, the innovative milling cartridges of the further developed EcoMill Blue series impress with a special chip

guiding geometry that specifically keeps chips away from the component surface. This means that parts cleaning can be reduced to a minimum in series production.

With tough and long-chipping material, a significantly better surface finish is optically achieved and the risk of the formation of scratches is significantly reduced. This has advantages particularly during dry machining and with minimum quantity lubrication. The integrated coolant outlets in the milling cartridges ensure optimal cooling and lubrication of the PCD cutting edge, particularly with minimum quantity lubrication.

With the same basic set-up and even more cutting edges ($z = 28$ for tool diameter 125 mm), the RapidMill Blue series achieves the highest possible productivity in face milling.

AT A GLANCE

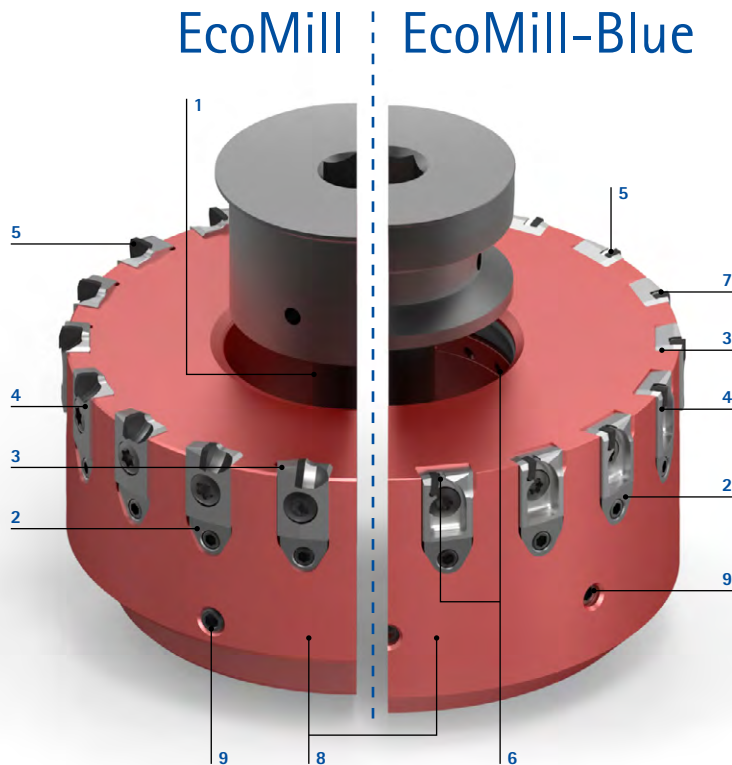
- 1. Choice for finishing aluminium
- Sensitive wedge adjustment
- Cutting depths up to $a_p = 3$ mm
- Disposable milling cartridges
- EcoMill-Blue with optimised chip guiding geometry and integrated coolant outlets

ADVANTAGES

- Superior surface finishes
- Setting of the axial run-out to the μm
- Easy handling

Tool features in detail

- 1 Central coolant supply**
- Coolant supplied indirectly via central coolant screw or cap
- 2 High-accuracy wedge adjustment**
- Simple handling
 - μm -precise setting of the axial run-out
- 3 Dovetail guide**
- Exact positioning of the blades over the whole tool life
- 4 Replaceable PCD milling cartridges**
- Long tool lifes
 - Special chip guiding geometry for targeted chip removal
- 5 Special cutting edge geometry**
- Face milling insert
 - Corner milling blade
 - Wide face milling blade
 - PT milling insert for defined roughness depths



- 6 Integrated coolant outlets**
- Direct cooling and lubrication of the cutting edges
 - Suitable for dry machining and MQL applications
- 7 Minimum cutting edge overhang**
- Low noise
 - Very quiet running
- 8 Tool body made of steel or high-strength aluminium**
- Wear-resistant
 - Lightweight design allows use at very high spindle speeds
- 9 Balancing screws**
- Perfect radial run-out due to balanced milling body

EcoMill



- Lightweight aluminium tool body
- Particularly sensitive adjustment for finishing operations
- Cost-effective disposable milling cartridge with smaller PCD cutting edges compared to the Power system

EcoMill-/RapidMill-Blue



- Innovative chip guiding geometry
- High process reliability as less chips and dirt in the finished part
- Direct cooling and lubrication of the cutting edges
- Significantly better surface finishes
- Suitable for dry machining and MQL applications

FlyCutter

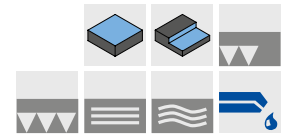
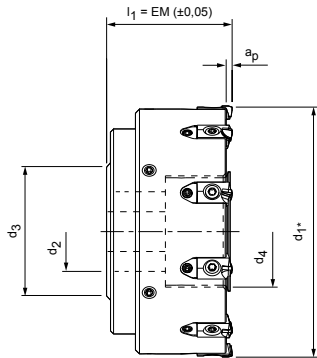


- Stress-free machining of the part due to highly positive cutting edge geometry
- Specially developed for very soft, long-chipping aluminium
- Suitable for machining vacuum-tensioned, thin-walled parts
- Weight reduction enables the use of larger diameters on small machines without exceeding the max. tool weight

Controlled chip removal for more quality, productivity, process reliability and longer tool life.

EcoSpeed

PCD face milling head, wide spacing
EcoMill



Tool body made of aluminium

| Dimensions | | | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|----------------|----------------|----------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | |
| 63 | 22 | 49 | 28 | 48 | 5 | 3 | 0,40 | 33.000 | CFM901-063-CA22-Z05R-EMC-A | 30696567 |
| 80 | 27 | 49 | 36 | 50 | 6 | 3 | 0,70 | 33.000 | CFM901-080-CA27-Z06R-EMC-A | 30696568 |
| 100 | 32 | 59 | 45 | 50 | 8 | 3 | 1,10 | 29.500 | CFM901-100-CA32-Z08R-EMC-A | 30696569 |
| 125 | 40 | 67 | 56 | 63 | 10 | 3 | 2,20 | 25.500 | CFM901-125-CA40-Z10R-EMC-A | 30696570 |
| 160 | 40 | 96 | - | 63 | 12 | 3 | 2,80 | 22.200 | CFM901-160-CA40-Z12R-EMC-A | 30696571 |
| 200 | 60 | 136 | - | 63 | 16 | 3 | 4,20 | 18.100 | CFM901-200-CA60-Z16R-EMC-A | 30696572 |
| 250 | 60 | 136 | - | 63 | 20 | 3 | 6,70 | 14.500 | CFM901-250-CA60-Z20R-EMC-A | 30696573 |

Accessories

| | | | |
|--|------------------------------------|---|-----------------------------------|
| | EMC | Milling cartridge | Page 275 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d ₁ 160 200 - 250 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|--|-----------------------------|---|-----------------------|
| | | Clamping screws for milling cartridge M5x11 | Order no. 30696524 |
| | | Threaded spindle M5x0.5LH/RHx17 | Order no. 30696525 |
| | | Adjusting wedge M5x0.5 | Order no. 30696526 |
| | d ₁ 63 - 125 | Fastening screw with coolant delivery | Page 381 |
| | d ₁ 160 - 250 | Coolant cover and fastening screw M6x20 | Page 381 |

Dimensions in mm.

* d₁ Depending on the milling cartridge type, see page 275.

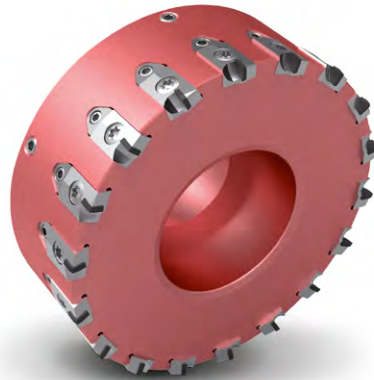
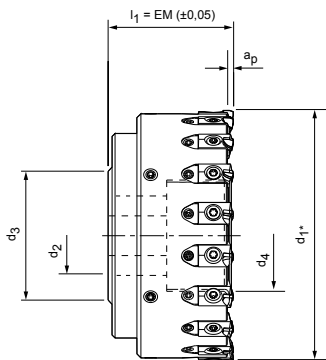
** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

EcoFeed

PCD face milling head, close spacing
EcoMill



Tool body made of aluminium

| Dimensions | | | | | Z_{eff} | a_p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min^{-1}] | Specification | Order no. |
|------------|-------|-------|-------|-------|-----------|------------|--------------------------------------|-------------------------------------|----------------------------|-----------|
| d_1^* | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 63 | 22 | 49 | 28 | 48 | 8 | 3 | 0,42 | 33.000 | CFM901-063-CA22-Z08R-EMC-A | 30696576 |
| 80 | 27 | 49 | 36 | 50 | 10 | 3 | 0,75 | 33.000 | CFM901-080-CA27-Z10R-EMC-A | 30696577 |
| 100 | 32 | 59 | 45 | 50 | 14 | 3 | 1,20 | 29.500 | CFM901-100-CA32-Z14R-EMC-A | 30696578 |
| 125 | 40 | 67 | 56 | 63 | 18 | 3 | 2,20 | 25.500 | CFM901-125-CA40-Z18R-EMC-A | 30696579 |
| 160 | 40 | 96 | - | 63 | 24 | 3 | 2,80 | 22.200 | CFM901-160-CA40-Z24R-EMC-A | 30696580 |
| 200 | 60 | 136 | - | 63 | 28 | 3 | 4,30 | 18.100 | CFM901-200-CA60-Z28R-EMC-A | 30696581 |
| 250 | 60 | 136 | - | 63 | 36 | 3 | 6,80 | 14.500 | CFM901-250-CA60-Z36R-EMC-A | 30696582 |

Accessories

| | | | |
|--|---------------------------|---|-----------------------------------|
| | EMC | Milling cartridge | Page 275 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d_1 160 200 - 250 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|--|--------------------|---|-----------------------|
| | | Clamping screws for milling cartridge M5x11 | Order no. 30696524 |
| | | Threaded spindle M5x0.5LH/RHx17 | Order no. 30696525 |
| | | Adjusting wedge M5x0.5 | Order no. 30696526 |
| | d_1 63 - 125 | Fastening screw with coolant delivery | Page 381 |
| | d_1 160 - 250 | Coolant cover and fastening screw M6x20 | Page 381 |

Dimensions in mm.

Special design with increased number of teeth on request.

* d_1 Depending on the milling cartridge type, see page 275.

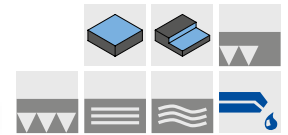
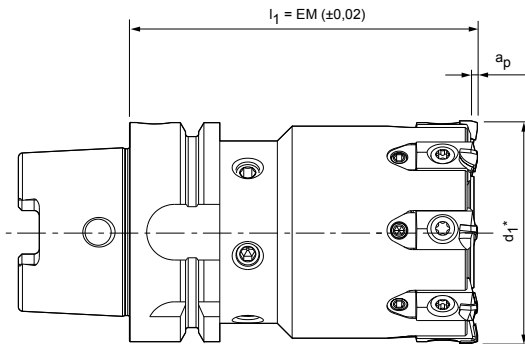
** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

EcoFix

PCD face milling cutter, monoblock design
EcoMill





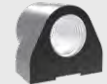


Tool body with HSK-A (hollow shank taper form A) connection

| Dimensions | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|--------------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | HSK-A nominal size | l ₁ | | | | | | |
| 50 | 63 | 100 | 6 | 3 | 1,7 | 27.000 | CFM901-050-A063-Z06R-EMC-S | 30696632 |
| 63 | 63 | 100 | 8 | 3 | 2,12 | 27.000 | CFM901-063-A063-Z08R-EMC-S | 30696634 |
| 80 | 63 | 100 | 10 | 3 | 2,68 | 25.000 | CFM901-080-A063-Z10R-EMC-S | 30696636 |
| 100 | 63 | 100 | 14 | 3 | 3,45 | 20.000 | CFM901-100-A063-Z14R-EMC-S | 30696637 |

Accessories

| | | | |
|---|--------|-------------------|----------|
|  | EMC... | Milling cartridge | Page 275 |
|---|--------|-------------------|----------|

Spare parts**

| | | | |
|---|----------------|---|-----------------------|
|  | | Clamping screws for milling cartridge M5x11 | Order no. 30696524 |
|  | | Threaded spindle M5x0.5LH/RHx17 | Order no. 30696525 |
|  | | Adjusting wedge M5x0.5 | Order no. 30696526 |
|  | | Fastening screw with coolant delivery | Page 381 |
|  | HSK connection | HSK-A63 coolant tube | Order no. 30326006 |

Dimensions in mm.

Special design with increased number of teeth on request.

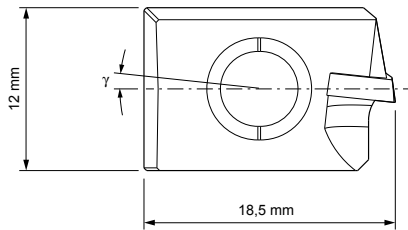
* d₁ Depending on the milling cartridge type, see page 275.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

Milling cartridge EMC



Milling cartridge – face milling inserts

| | Rake angle γ [°] | R _z value [μm] | a _p max. | Running direction | Cutting material | Specification | Order no. |
|--|-------------------------|---------------------------|---------------------|-------------------|------------------|-----------------|-----------|
| | 6 | ≤ 5 | 3 | Right | PU611 | EMC-711-0-PU611 | 30696600 |
| | 6 | ≤ 10 | 3 | Right | PU611 | EMC-712-0-PU611 | 30696603 |
| | 6 | ≤ 20 | 3 | Right | PU611 | EMC-713-0-PU611 | 30696606 |
| | 6 | > 20 | 3 | Right | PU611 | EMC-714-0-PU611 | 30696608 |
| | 0 | ≤ 5 | 3 | Right | PU611 | EMC-731-0-PU611 | 30696614 |
| | 0 | ≤ 10 | 3 | Right | PU611 | EMC-732-0-PU611 | 30696619 |
| | 0 | ≤ 20 | 3 | Right | PU611 | EMC-733-0-PU611 | 30696621 |
| | 0 | > 20 | 3 | Right | PU611 | EMC-734-0-PU611 | 30696623 |

Milling cartridge – corner milling blade

| | | | | | | | |
|--|---|------|---|-------|-------|-----------------|----------|
| | 6 | ≤ 5 | 3 | Right | PU611 | EMC-611-0-PU611 | 30696585 |
| | 6 | ≤ 10 | 3 | Right | PU611 | EMC-612-0-PU611 | 30696588 |
| | 6 | ≤ 20 | 3 | Right | PU611 | EMC-613-0-PU611 | 30696589 |
| | 6 | > 20 | 3 | Right | PU611 | EMC-614-0-PU611 | 30696590 |
| | 0 | ≤ 5 | 3 | Right | PU611 | EMC-631-0-PU611 | 30696595 |
| | 0 | ≤ 10 | 3 | Right | PU611 | EMC-632-0-PU611 | 30696597 |
| | 0 | ≤ 20 | 3 | Right | PU611 | EMC-633-0-PU611 | 30696598 |
| | 0 | > 20 | 3 | Right | PU611 | EMC-634-0-PU611 | 30696599 |

Special geometries

Assembly note:

In order to achieve defined surfaces, it can make sense to supplement a face or corner milling blade tipping with a process-dependent number of special geometries (wide finishing/PT).

Milling cartridge – wide face milling blade

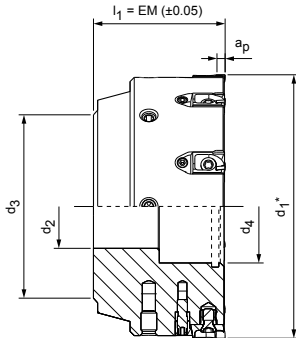
| | | | | | | | |
|--|---|-----|---|-------|-------|-----------------|----------|
| | 6 | < 5 | 3 | Right | PU611 | EMC-811-0-PU611 | 30696625 |
| | 0 | < 3 | 3 | Right | PU611 | EMC-831-0-PU611 | 30696627 |

Milling cartridge – PT milling insert

| | | | | | | | |
|--|---|---|---|-------|-------|-----------------|----------|
| | 0 | - | 3 | Right | PU611 | EMC-931-0-PU611 | 30696631 |
|--|---|---|---|-------|-------|-----------------|----------|

EcoSpeed-Blue

PCD face milling head, wide spacing
EcoMill-Blue



Tool body made of steel

| Dimensions | | | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|----------------|----------------|----------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | |
| 63 | 22 | 48 | 26 | 48 | 5 | 2 | 0,96 | 33.000 | CFM901-063-CA22-Z05R-EBC-S | 30569914 |
| 80 | 27 | 60 | 34 | 50 | 6 | 2 | 1,63 | 33.000 | CFM901-080-CA27-Z06R-EBC-S | 30569915 |
| 100 | 32 | 78 | 43 | 50 | 8 | 2 | 2,60 | 29.500 | CFM901-100-CA32-Z08R-EBC-S | 30569916 |
| 125 | 40 | 89 | 54 | 63 | 10 | 2 | 4,85 | 25.500 | CFM901-125-CA40-Z10R-EBC-S | 30569917 |
| 160 | 40 | 96 | 116,5 | 63 | 12 | 2 | 6,58 | 22.200 | CFM901-160-CA40-Z12R-EBC-S | 30569918 |

Tool body made of aluminium

| | | | | | | | | | | |
|-----|----|----|-------|----|----|---|-------|--------|----------------------------|----------|
| 63 | 22 | 48 | 26 | 48 | 5 | 2 | 0,43 | 33.000 | CFM901-063-CA22-Z05R-EBC-A | 30545037 |
| 80 | 27 | 60 | 34 | 50 | 6 | 2 | 0,71 | 33.000 | CFM901-080-CA27-Z06R-EBC-A | 30545038 |
| 100 | 32 | 78 | 43 | 50 | 8 | 2 | 1,13 | 29.500 | CFM901-100-CA32-Z08R-EBC-A | 30545039 |
| 125 | 40 | 89 | 54 | 63 | 10 | 2 | 2,08 | 25.500 | CFM901-125-CA40-Z10R-EBC-A | 30542646 |
| 160 | 40 | - | 116,5 | 63 | 12 | 2 | 2,52 | 22.200 | CFM901-160-CA40-Z12R-EBC-A | 30545040 |
| 200 | 60 | - | 156,5 | 63 | 16 | 2 | 3,80 | 18.100 | CFM901-200-CA60-Z16R-EBC-A | 30545041 |
| 250 | 60 | - | 206,5 | 63 | 20 | 2 | 6,11 | 14.500 | CFM901-250-CA60-Z20R-EBC-A | 30545042 |
| 315 | 60 | - | 271,5 | 80 | 24 | 2 | 12,15 | 11.500 | CFM901-315-CA60-Z24R-EBC-A | 30545052 |
| 400 | 60 | - | 356,5 | 80 | 28 | 2 | 19,00 | 9.000 | CFM901-400-CA60-Z28R-EBC-A | 30545044 |

Accessories

| | | | |
|--|------------------------------------|---|-----------------------------------|
| | EBC | Milling cartridge | Page 279 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d ₁ 160 200 - 400 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|--|-----------------------------|--|-----------------------|
| | | Clamping screws for milling cartridge TORX® M5x11 TX25 | Order no. 30696524 |
| | | Threaded spindle M5x0.5LH/RHx17 | Order no. 30696525 |
| | | Adjusting wedge M5x0.5 | Order no. 30696526 |
| | d ₁ 50 - 125 | Fastening screw with coolant delivery | Page 381 |
| | d ₁ 160 - 400 | Coolant cover and fastening screw M6x20 | Page 381 |

Dimensions in mm.

* d₁ Depending on the milling cartridge type, see page 279.

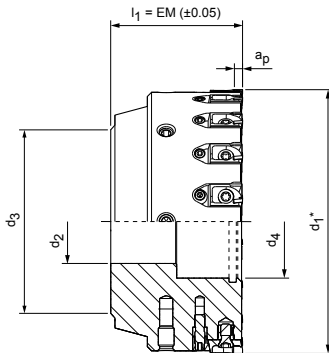
** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

EcoFeed-Blue

PCD face milling head, close spacing
EcoMill-Blue



Tool body made of steel

| Dimensions | | | | | Z_{eff} | a_p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min^{-1}] | Specification | Order no. |
|------------|-------|-------|-------|-------|-----------|------------|--------------------------------------|-------------------------------------|----------------------------|-----------|
| d_1^* | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 50 | 22 | 45 | 16 | 48 | 6 | 2 | 0,59 | 35.000 | CFM901-050-CA22-Z06R-EBC-S | 30569919 |
| 63 | 22 | 48 | 26 | 48 | 8 | 2 | 0,95 | 33.000 | CFM901-063-CA22-Z08R-EBC-S | 30569920 |
| 80 | 27 | 60 | 34 | 50 | 10 | 2 | 1,61 | 33.000 | CFM901-080-CA27-Z10R-EBC-S | 30569921 |
| 100 | 32 | 78 | 43 | 50 | 14 | 2 | 2,59 | 29.500 | CFM901-100-CA32-Z14R-EBC-S | 30569922 |
| 125 | 40 | 89 | 54 | 63 | 18 | 2 | 4,81 | 25.500 | CFM901-125-CA40-Z18R-EBC-S | 30569923 |
| 160 | 40 | 96 | 116,5 | 63 | 24 | 2 | 6,54 | 22.000 | CFM901-160-CA40-Z24R-EBC-S | 30569924 |

Tool body made of aluminium

| | | | | | | | | | | |
|-----|----|----|-------|----|----|---|-------|--------|----------------------------|----------|
| 50 | 22 | 45 | 16 | 48 | 6 | 2 | 0,28 | 35.000 | CFM901-050-CA22-Z06R-EBC-A | 30545045 |
| 63 | 22 | 48 | 26 | 48 | 8 | 2 | 0,45 | 33.000 | CFM901-063-CA22-Z08R-EBC-A | 30545046 |
| 80 | 27 | 60 | 34 | 50 | 10 | 2 | 0,73 | 33.000 | CFM901-080-CA27-Z10R-EBC-A | 30545047 |
| 100 | 32 | 78 | 43 | 50 | 14 | 2 | 1,17 | 29.500 | CFM901-100-CA32-Z14R-EBC-A | 30545048 |
| 125 | 40 | 89 | 54 | 63 | 18 | 2 | 2,14 | 25.500 | CFM901-125-CA40-Z18R-EBC-A | 30519037 |
| 160 | 40 | - | 116,5 | 63 | 24 | 2 | 2,60 | 22.200 | CFM901-160-CA40-Z24R-EBC-A | 30545049 |
| 200 | 60 | - | 156,5 | 63 | 28 | 2 | 3,88 | 14.500 | CFM901-200-CA60-Z28R-EBC-A | 30545050 |
| 250 | 60 | - | 206,5 | 63 | 36 | 2 | 6,22 | 14.500 | CFM901-250-CA60-Z36R-EBC-A | 30545051 |
| 315 | 60 | - | 271,5 | 80 | 46 | 2 | 12,29 | 11.500 | CFM901-315-CA60-Z46R-EBC-A | 30545043 |
| 400 | 60 | - | 356,5 | 80 | 58 | 2 | 19,21 | 9.000 | CFM901-400-CA60-Z58R-EBC-A | 30545053 |

Accessories

| | | | |
|--|---------------------------|---|-----------------------------------|
| | EBC | Milling cartridge | Page 279 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | d_1 160 200 - 400 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|--|--------------------|--|-----------------------|
| | | Clamping screws for milling cartridge TORX® M5x11 TX25 | Order no. 30696524 |
| | | Threaded spindle M5x0.5LH/RHx17 | Order no. 30696525 |
| | | Adjusting wedge M5x0.5 | Order no. 30696526 |
| | d_1 50 - 125 | Fastening screw with coolant delivery | Page 381 |
| | d_1 160 - 400 | Coolant cover and fastening screw M6x20 | Page 381 |

Dimensions in mm.

* d_1 Depending on the milling cartridge type, see page 279.

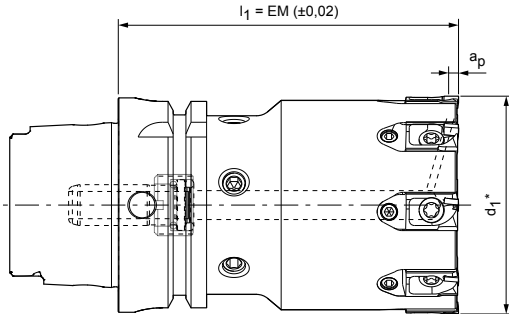
** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

EcoFix-Blue

PCD face milling cutter, monoblock variant
EcoMill-Blue





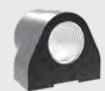

Tool body with HSK-A (hollow shank taper form A) connection

| Dimensions | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|--------------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|-----------|
| d ₁ * | HSK-A nominal size | l ₁ | | | | | | |
| 32 | 63 | 100 | 4 | 2 | 1,3 | 27.000 | CFM901-032-A063-Z04R-EBC-S | 30545054 |
| 40 | 63 | 100 | 6 | 2 | 1,45 | 27.000 | CFM901-040-A063-Z06R-EBC-S | 30545055 |
| 50 | 63 | 100 | 6 | 2 | 1,72 | 27.000 | CFM901-050-A063-Z06R-EBC-S | 30545056 |
| 63 | 63 | 100 | 8 | 2 | 2,18 | 27.000 | CFM901-063-A063-Z08R-EBC-S | 30545057 |
| 80 | 63 | 100 | 10 | 2 | 2,84 | 25.000 | CFM901-080-A063-Z10R-EBC-S | 30545058 |
| 100 | 63 | 100 | 14 | 2 | 3,58 | 20.000 | CFM901-100-A063-Z14R-EBC-S | 30545059 |

Accessories

| | | | |
|---|--------|-------------------|----------|
|  | EBC... | Milling cartridge | Page 279 |
|---|--------|-------------------|----------|

Spare parts**

| | | | |
|---|---------------------------------------|--|-----------------------------------|
|  | | Clamping screws for milling cartridge TORX® M5x11 TX25 | Order no. 30696524 |
|  | d ₁ 32 - 40 50 - 100 | Threaded spindle M5x0.5LH/RHx15 M5x0.5LH/RHx17 | Order no. 30696527 30696526 |
|  | d ₁ 32 - 40 50 - 100 | Adjusting wedge M5x0.5 M5x0.5 | Order no. 30696528 30696525 |
|  | HSK connection | HSK-63 coolant tube | Order no. 30326006 |

Dimensions in mm.

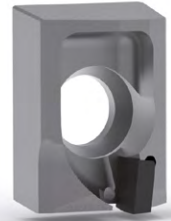
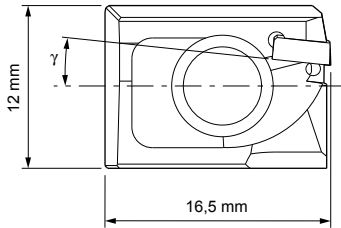
* d₁ Depending on the milling cartridge type, see page 279.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

EBC milling cartridge



Milling cartridge – face milling inserts

| | Rake angle γ [°] | R _z value [μm] | a _p max. | Running direction | Cutting material | Specification | Order no. |
|--|-------------------------|---------------------------|---------------------|-------------------|------------------|-----------------|-----------|
| | 0 | ≤ 5 | 2 | Right | PU611 | EBC-731-0-PU611 | 30559589 |
| | 0 | ≤ 10 | 2 | Right | PU611 | EBC-732-0-PU611 | 30559591 |
| | 0 | ≤ 20 | 2 | Right | PU611 | EBC-733-0-PU611 | 30559595 |
| | 0 | > 20 | 2 | Right | PU611 | EBC-734-0-PU611 | 30559599 |
| | 6 | ≤ 5 | 2 | Right | PU611 | EBC-711-0-PU611 | 30502818 |
| | 6 | ≤ 10 | 2 | Right | PU611 | EBC-712-0-PU611 | 30559592 |
| | 6 | ≤ 20 | 2 | Right | PU611 | EBC-713-0-PU611 | 30559596 |
| | 6 | > 20 | 2 | Right | PU611 | EBC-714-0-PU611 | 30559600 |
| | | | | | | | |

Milling cartridge – corner milling blade

| | | | | | | | |
|--|---|------|---|-------|-------|-----------------|----------|
| | 0 | ≤ 5 | 2 | Right | PU611 | EBC-631-0-PU611 | 30559590 |
| | 0 | ≤ 10 | 2 | Right | PU611 | EBC-632-0-PU611 | 30559593 |
| | 0 | ≤ 20 | 2 | Right | PU611 | EBC-633-0-PU611 | 30559597 |
| | 0 | > 20 | 2 | Right | PU611 | EBC-634-0-PU611 | 30559601 |
| | 6 | ≤ 5 | 2 | Right | PU611 | EBC-611-0-PU611 | 30518869 |
| | 6 | ≤ 10 | 2 | Right | PU611 | EBC-612-0-PU611 | 30559594 |
| | 6 | ≤ 20 | 2 | Right | PU611 | EBC-613-0-PU611 | 30559598 |
| | 6 | > 20 | 2 | Right | PU611 | EBC-614-0-PU611 | 30559602 |
| | | | | | | | |

Special geometries

Assembly note:

In order to achieve defined surfaces, it can make sense to supplement a face or corner milling blade tipping with a process-dependent number of special geometries (wide finishing/PT).

Milling cartridge – wide face milling blade

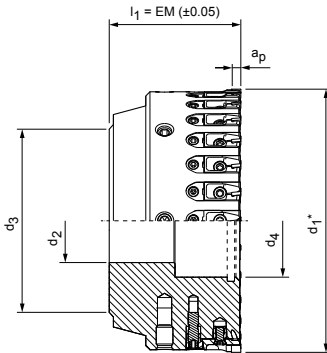
| | | | | | | | |
|--|---|-----|---|-------|-------|-----------------|----------|
| | 0 | < 3 | 2 | Right | PU611 | EBC-831-0-PU611 | 30542645 |
|--|---|-----|---|-------|-------|-----------------|----------|

Milling cartridge – PT milling insert

| | | | | | | | |
|--|---|-----|---|-------|-------|-----------------|----------|
| | 0 | ≤ 5 | 2 | Right | PU611 | EBC-931-0-PU611 | 30559603 |
|--|---|-----|---|-------|-------|-----------------|----------|

RapidFeed-Blue




PCD face milling head, close spacing
RapidMill-Blue








Tool body made of aluminium

| Dimensions | | | | | Z_{eff} | a_p max. | Weight incl. milling cartridges [kg] | Max. operating speed [min^{-1}] | Specification | Order no. |
|------------|-------|-------|-------|-------|-----------|------------|--------------------------------------|-------------------------------------|----------------------------|-----------|
| d_1^* | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 50 | 22 | 45 | 16 | 48 | 10 | 1 | 0,29 | 35.000 | CFM901-050-CA22-Z10R-RBC-A | 30547876 |
| 63 | 22 | 48 | 26 | 48 | 13 | 1 | 0,47 | 33.000 | CFM901-063-CA22-Z13R-RBC-A | 30547877 |
| 80 | 27 | 60 | 34 | 50 | 16 | 1 | 0,75 | 33.000 | CFM901-080-CA27-Z16R-RBC-A | 30547878 |
| 100 | 32 | 78 | 43 | 50 | 22 | 1 | 1,18 | 29.500 | CFM901-100-CA32-Z22R-RBC-A | 30547879 |
| 125 | 40 | 89 | 54 | 63 | 28 | 1 | 2,16 | 25.500 | CFM901-125-CA40-Z28R-RBC-A | 30547880 |
| 160 | 40 | - | 116,5 | 63 | 34 | 1 | 2,61 | 22.200 | CFM901-160-CA40-Z34R-RBC-A | 30547881 |
| 200 | 60 | - | 156,5 | 63 | 44 | 1 | 3,91 | 18.100 | CFM901-200-CA60-Z44R-RBC-A | 30547882 |

Accessories

| | | | |
|---|---------------------------|---|-----------------------------------|
|  | RBC | Milling cartridge | Page 281 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | d_1 160 200 - 400 | Fastening screws for milling cutter arbor ISO 4762 - M12x45-12.9 ISO 4762 - M16x50-12.9 | Order no. 10006594 10007775 |

Spare parts**

| | | | |
|---|-------------------------|--|-----------------------------------|
|  | | Clamping screws for milling cartridge TORX PLUS® M4X8.5-TX15-IP | Order no. 30412229 |
|  | d_1 50 63 - 200 | Threaded spindle M5x0.5LH/RHx15 M5x0.5LH/RHx17 | Order no. 30696528 30696525 |
|  | | Adjusting wedge M5x0.5 | Order no. 30557564 |
|  | d_1 50 - 125 | Fastening screw with coolant delivery | Page 381 |
|  | d_1 160 - 400 | Coolant cover and fastening screw M6x20 | Page 291 |

Dimensions in mm.

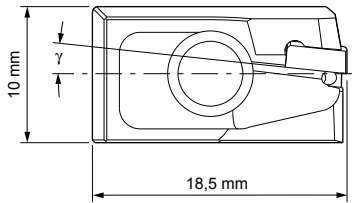
* d_1 Depending on the milling cartridge type, see page 281.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

RBC milling cartridge



Milling cartridge – face milling inserts

| | Rake angle γ [°] | R _z value [μm] | a _p max. | Running direction | Cutting material | Specification | Order no. |
|--|-------------------------|---------------------------|---------------------|-------------------|------------------|-----------------|-----------|
| | 0 | ≤ 5 | 1 | Right | PU611 | RBC-731-0-PU611 | 30560072 |
| | 0 | ≤ 10 | 1 | Right | PU611 | RBC-732-0-PU611 | 30560075 |
| | 0 | ≤ 20 | 1 | Right | PU611 | RBC-733-0-PU611 | 30560079 |
| | 0 | > 20 | 1 | Right | PU611 | RBC-734-0-PU611 | 30560083 |
| | 6 | ≤ 5 | 1 | Right | PU611 | RBC-711-0-PU611 | 30547873 |
| | 6 | ≤ 10 | 1 | Right | PU611 | RBC-712-0-PU611 | 30560076 |
| | 6 | ≤ 20 | 1 | Right | PU611 | RBC-713-0-PU611 | 30560080 |
| | 6 | > 20 | 1 | Right | PU611 | RBC-714-0-PU611 | 30560084 |
| | | | | | | | |

Milling cartridge – corner milling blade

| | | | | | | | |
|--|---|------|---|-------|-------|-----------------|----------|
| | 0 | ≤ 5 | 1 | Right | PU611 | RBC-631-0-PU611 | 30560073 |
| | 0 | ≤ 10 | 1 | Right | PU611 | RBC-632-0-PU611 | 30560077 |
| | 0 | ≤ 20 | 1 | Right | PU611 | RBC-633-0-PU611 | 30560081 |
| | 0 | > 20 | 1 | Right | PU611 | RBC-634-0-PU611 | 30560085 |
| | 6 | ≤ 5 | 1 | Right | PU611 | RBC-611-0-PU611 | 30547874 |
| | 6 | ≤ 10 | 1 | Right | PU611 | RBC-612-0-PU611 | 30560078 |
| | 6 | ≤ 20 | 1 | Right | PU611 | RBC-613-0-PU611 | 30560082 |
| | 6 | > 20 | 1 | Right | PU611 | RBC-614-0-PU611 | 30560086 |
| | | | | | | | |

Milling cartridge – wide face milling blade

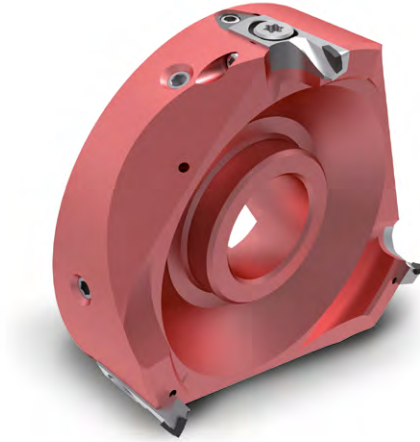
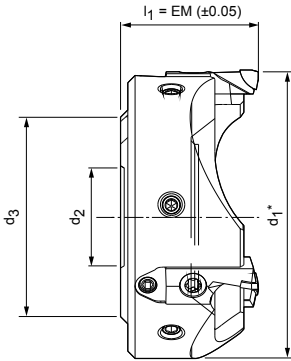
| | | | | | | | |
|--|---|-----|---|-------|-------|-----------------|----------|
| | 0 | < 3 | 1 | Right | PU611 | RBC-831-0-PU611 | 30560087 |
|--|---|-----|---|-------|-------|-----------------|----------|

Milling cartridge – PT milling insert

| | | | | | | | |
|--|---|---|---|-------|-------|-----------------|----------|
| | 0 | - | 1 | Right | PU611 | RBC-931-0-PU611 | 30560088 |
|--|---|---|---|-------|-------|-----------------|----------|

FlyCutter



PCD face milling head, weight-reduced design
EcoMill



Tool body made of aluminium

| Dimensions | | | | Z _{eff} | a _p max. | Weight incl. milling cartridges [kg] | max. operating speed [min ⁻¹] | Specification | Order no. |
|------------------|----------------|----------------|----------------|------------------|---------------------|--------------------------------------|---|----------------------------|--------------|
| d ₁ * | d ₂ | d ₃ | l ₁ | | | | | | |
| 63 | 27 | 55 | 42 | 3 | 3 | 0,22 | 33.000 | CFM901-063-CA27-Z03R-FMC-A | 30772751 |
| 80 | 27 | 59 | 38 | 3 | 3 | 0,299 | 33.000 | CFM901-080-CA27-Z03R-FMC-A | 30388951-200 |
| 100 | 27 | 59 | 38 | 3 | 3 | 0,418 | 30.000 | CFM901-100-CA27-Z03R-FMC-A | 30381973-200 |
| 125 | 27 | 59 | 38 | 3 | 3 | 0,627 | 25.000 | CFM901-125-CA27-Z03R-FMC-A | 30388952-200 |
| 140 | 27 | 59 | 38 | 4 | 3 | 0,800 | 23.000 | CFM901-140-CA27-Z04R-FMC-A | 30466716-200 |
| 160 | 27 | 59 | 50 | 4 | 3 | 1,469 | 21.000 | CFM901-160-CA27-Z04R-FMC-A | 30508209 |

Accessories

| | | | |
|---|--------|--------------------------------|----------|
|  | FMC... | Milling cartridge | Page 283 |
|  | | See MAPAL catalogue "CLAMPING" | |

Spare parts**

| | | | |
|---|----------------------------|---|-----------------------|
|  | | Clamping screws for milling cartridge ISO 14580 – M5x8-8.8-KL | Order no. 30499981 |
|  | | Threaded spindle M5x0.5LH/RHx17 | Order no. 30696525 |
|  | | Adjusting wedge M5x0.5 | Order no. 30696526 |
|  | | Locking screw ISO 4028 – M4x6-45H-KL | Order no. 30367364 |
|  | d ₁ 80 - 160 | Fastening screw with coolant delivery and washer | Page 381 |

Dimensions in mm.

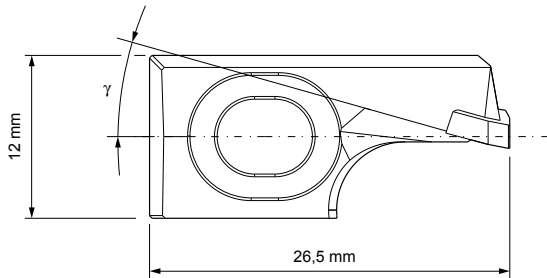
* d₁ Depending on the milling cartridge type, see page 283.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

For cutting data recommendations, see end of chapter.

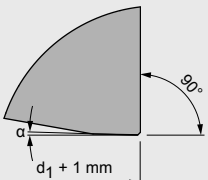
FMC milling cartridge



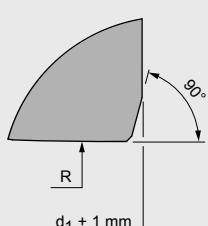
Milling cartridge – face milling inserts

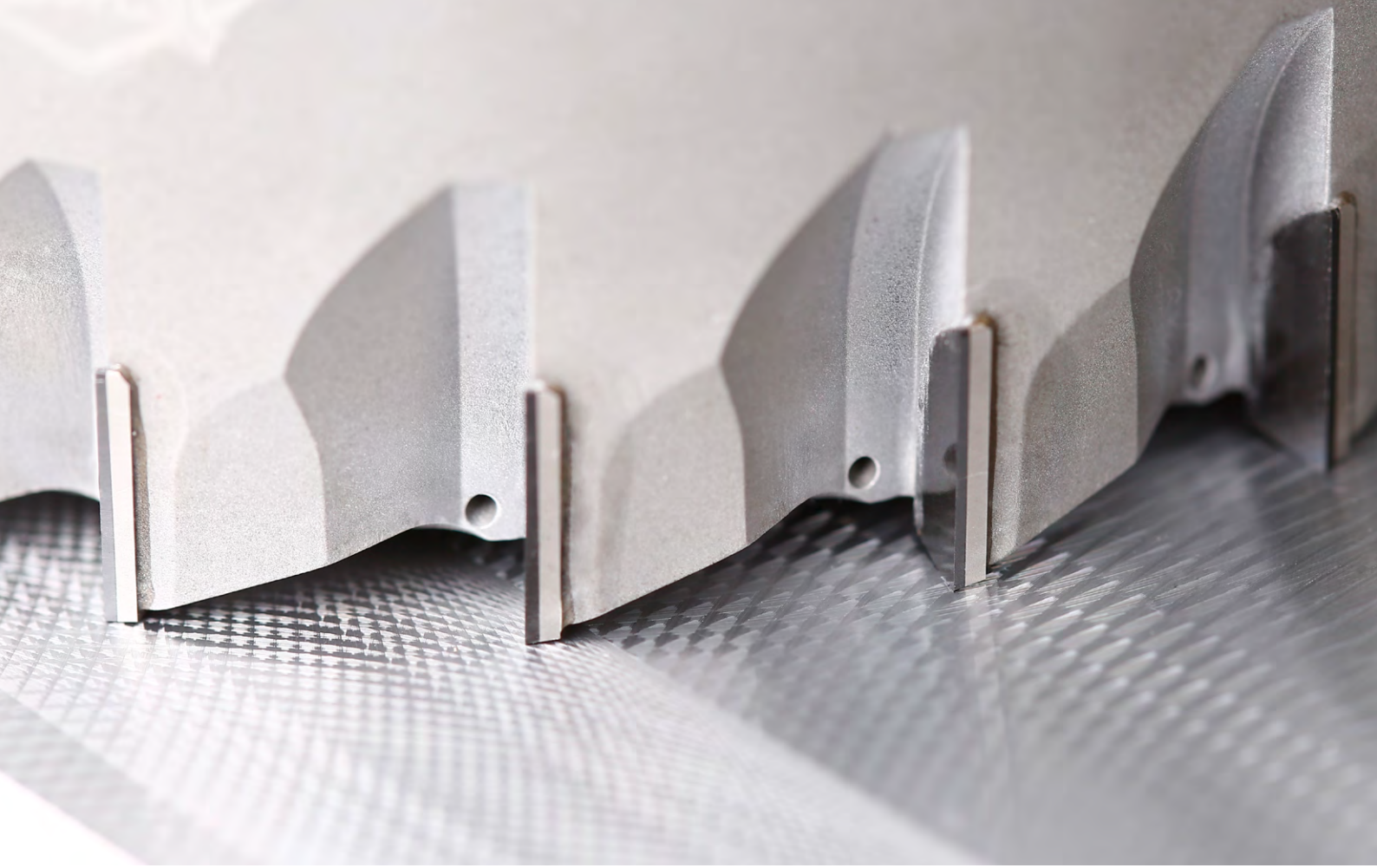
| | Rake angle γ [°] | R_z value [μm] | a_p max. | Running direction | Cutting material | Specification | Order no. |
|--|----------------------------|----------------------------------|------------|----------------------|---------------------|-----------------|--------------|
|  | 15 | ≤ 5 | 3 | Right | PU611 | FMC-751-0-PU611 | 30410278-300 |
| | 15 | > 20 | 3 | Right | PU611 | FMC-754-0-PU611 | 30410278-302 |

Milling cartridge – corner milling blade

| | | | | | | | |
|---|----|-----------|---|-------|-------|-----------------|--------------|
|  | 15 | ≤ 10 | 3 | Right | PU611 | FMC-652-0-PU611 | 30410278-303 |
|---|----|-----------|---|-------|-------|-----------------|--------------|

Milling cartridge – wide face milling blade

| | | | | | | | |
|---|----|----------|---|-------|-------|-----------------|--------------|
|  | 10 | ≤ 5 | 3 | Right | PU611 | FMC-841-0-PU611 | 30410278-301 |
|---|----|----------|---|-------|-------|-----------------|--------------|



FaceMill-Diamond

Maximum number of teeth for high productivity

For many years, the FaceMill-Diamond PCD face milling cutter has been used worldwide with great success. It is particularly strong in HPC applications or when machining unstable parts – and that with cutting depths up to 10 mm. The monolithic design with brazed PCD cutting edges allows large numbers of teeth, thus enabling high feed rates and increased material removal rates. Machining with the FaceMill-Diamond results in very good surface finishes and long tool life.

The FaceMill-Diamond has been overhauled with the goal of making the proven solution even better. For optimal cooling and lubrication of the PCD cutting edges, the coolant outlets are positioned directly at the cutting edges in the new model. This feature ensures

improved chip removal and offers significant benefits, particularly in applications with minimum quantity lubrication or air cooling.

Based on requirements pertaining to more flexibility and independence from the machine connection, the product range was expanded to include a modular milling head variant: The face milling cutter is now available as a milling cutter head variant. The milling cutter can thus be used flexibly, in particular for small series with machinery with different connections or even for large series that are produced on another machine and then relocated.

AT A GLANCE

- Large number of fixed brazed PCD cutting edges
- Proven geometry variants available for different surface finish requirements ($\leq 10 \mu\text{m}$ / $> 10 \mu\text{m}$)
- Cutting depths of up to $a_p = 10 \text{ mm}$ possible

ADVANTAGES

- Improved chip removal and longer tool lives thanks to cooling directly at the cutting edge
- Cutterhead variant for flexible use with different machine connections

Tool features in detail

1 Brazed PCD cutting edge

- Cutting edges made of PCD for long tool lives
- High cutting depth of up to 10 mm possible

2 Proven cutting edge geometry

- Available for different surface finish requirements ($R_z \leq 10 \mu\text{m}$ / $> 10 \mu\text{m}$)

3 Integrated coolant outlets

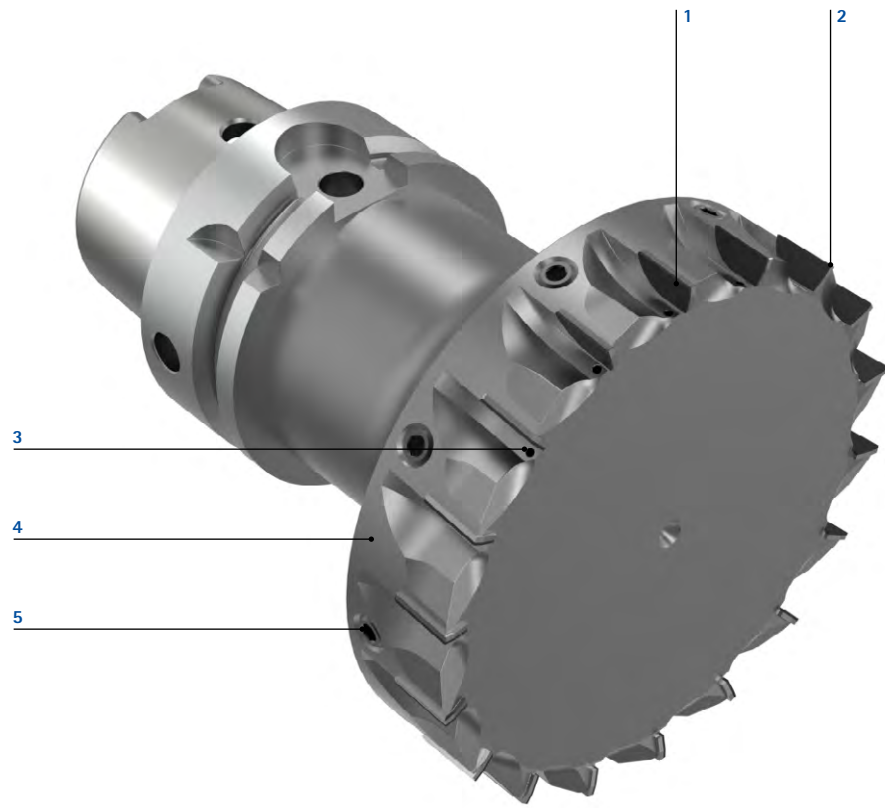
- Direct cooling and lubrication of the cutting edges
- Improved chip removal

4 Tool body made of steel

- Wear-resistant and ductile
- Multiple reconditioning possible

5 Balancing screws

- Perfect radial run-out due to balanced milling body

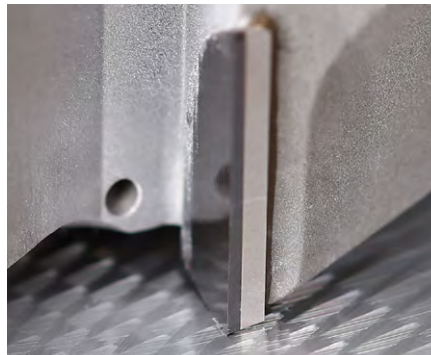


Largest number of cutting edges



- Highest symmetry and smooth running make extreme cutting speeds possible
- High feed rates possible and thus maximum productivity can be achieved

Direct coolant supply



- Cooling directly at the cutting edge ensures improved chip removal
- Significantly reduced risk of chips coming between workpiece and tool

Modular construction

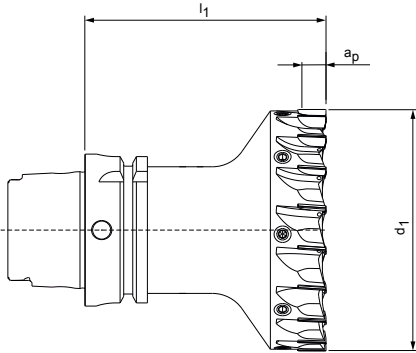


- Highest flexibility due to modularity and independence if there is machinery with different connections
- Especially for small series with different machinery
- Reduced noise level due to minimum cutting edge overhang and compact design

Highest number of teeth for more productivity in manufacturing.

FaceMill-Diamond

PCD face milling cutter with internal cooling
SHM581/591



Design:

Diameter of milling cutter: 40.00 – 125.00 mm
Cutting material: PU611
Number of cutting edges: 10-22
Helix angle: 4°
Special features: Coolant outlets directly at the cutting edge

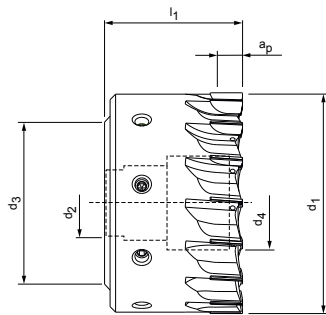
Application:

For face milling, especially with high stock removal. For cutting depths of up to 10 mm.



With tool body with HSK-A63 (hollow shank taper form A63) connection

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Specification* | Order number | | | |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|----------------------------------|----------------|----------|----------------|----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | SHM581 Rz ≤ 10 | | SHM591 Rz > 10 | |
| | | | | | | | | | 0.1x45° | R 0.4 | 0.1x45° | R 0.4 | |
| 40 | - | - | - | 100 | 10 | 10 | 1,42 | 33.000 | [Series]-040BZ10R-[Form]A6-PU611 | 30981554 | 30981557 | 30981655 | 30981657 |
| 50 | - | - | - | 100 | 12 | 10 | 1,69 | 33.000 | [Series]-050BZ12R-[Form]A6-PU611 | 30981568 | 30981570 | 30981667 | 30981669 |
| 63 | - | - | - | 100 | 14 | 10 | 1,97 | 33.000 | [Series]-063BZ14R-[Form]A6-PU611 | 30981580 | 30981582 | 30981680 | 30981682 |
| 80 | - | - | - | 100 | 16 | 10 | 2,4 | 31.000 | [Series]-080BZ16R-[Form]A6-PU611 | 30981602 | 30981605 | 30981692 | 30981694 |
| 100 | - | - | - | 100 | 18 | 10 | 3,01 | 28.000 | [Series]-100BZ18R-[Form]A6-PU611 | 30981623 | 30981625 | 30981708 | 30981710 |
| 125 | - | - | - | 100 | 22 | 10 | 4,23 | 25.000 | [Series]-125BZ22R-[Form]A6-PU611 | 30981639 | 30981641 | 30981724 | 30981726 |



Milling cutter head

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Specification* | Order number | | | |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|----------------------------------|----------------|----------|----------------|----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | SHM581 Rz ≤ 10 | | SHM591 Rz > 10 | |
| | | | | | | | | | 0.1x45° | R 0.4 | 0.1x45° | R 0.4 | |
| 50 | 22 | 45 | 16 | 48 | 12 | 10 | 0,55 | 30.000 | [Series]-050BZ12R-[Form]CA-PU611 | 30932481 | 30995680 | 30995698 | 30995700 |
| 63 | 22 | 48 | 26 | 48 | 14 | 10 | 0,91 | 30.000 | [Series]-063BZ14R-[Form]CA-PU611 | 30995682 | 30995685 | 30995702 | 30995703 |
| 80 | 27 | 60 | 34 | 50 | 16 | 10 | 1,55 | 29.000 | [Series]-080BZ16R-[Form]CA-PU611 | 30995687 | 30995688 | 30995705 | 30995707 |
| 100 | 32 | 78 | 43 | 50 | 18 | 10 | 2,49 | 27.000 | [Series]-100BZ18R-[Form]CA-PU611 | 30932465 | 30995692 | 30995709 | 30995710 |
| 125 | 40 | 89 | 54 | 63 | 22 | 10 | 4,62 | 22.000 | [Series]-125BZ22R-[Form]CA-PU611 | 30995694 | 30995696 | 30995712 | 30995714 |

Series

| | |
|--|--|
| SHM581 Surface quality Rz ≤ 10 | SHM591 Surface quality Rz > 10 |
|--|--|

Shape

| | |
|--------------------------------------|-------------------------------|
| F0010 Chamfer size 0.1x45° | R0040 Radius 0.4 mm |
|--------------------------------------|-------------------------------|

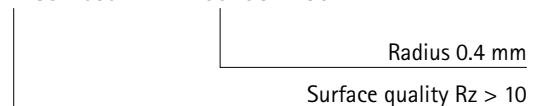
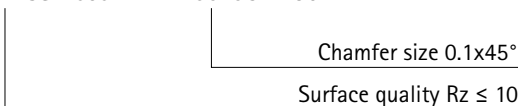
Example:

SHM581-050BZ12R-F0010CA-PU611

or

Example:

SHM591-050BZ12R-R0040CA-PU611



Tool body with other connection

Tool body with different connections in the dimensions of the connection HSK-A63 (hollow shank taper form A63) available at short notice.



HSK-100



SK40



BT40

Cutting edges with other geometries



Cutting edges with other geometries available at short notice:

- Radius: 0.1 - 1.5 mm
- Chamfer size: 0.1 - 0.9 mm

Custom tools made to order

Customised special designs are available on request.

- Individual dimensions
- Different numbers of teeth
- Insert position
- Different cutting materials
- Anticlockwise design

Accessories



Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING"

Spare parts**

| | d ₁ | Fastening screw with coolant delivery | Order no. |
|--|----------------|---------------------------------------|-----------|
| | 50 | SW8 - 20 Nm | 30984018 |
| | 63 | SW10 - 50 Nm | 30984019 |
| | 80 | SW12 - 80 Nm | 30984030 |
| | 100 | SW14 - 100 Nm | 30984031 |
| | 125 | SW14 - 200 Nm | 30984032 |

Dimensions in mm.

* Specification plus required cutting edge design.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

Cutting data recommendation for face milling cutters with PCD

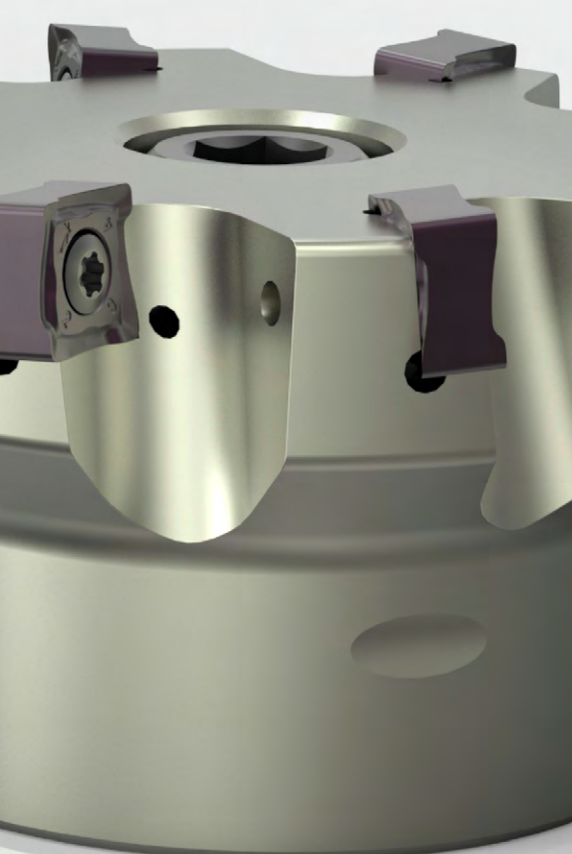
Feed and cutting speed



| MMG* | Workpiece material | Strength/hardness [N/mm ² - HRC] | PowerMill / PowerMill-Blue | | EcoMill | | | | | | |
|------|--------------------------------|--|---|---|---|------------------------|---------------------|---|-----|------------|--------|
| | | | v _c [m/min] | f _z [mm] | | v _c [m/min] | f _z [mm] | | | | |
| | | | | Cutting depth a _p max. 3 mm | Cutting depth a _p max. 5 mm | | | Cutting depth a _p max. 3 mm | | | |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | max. 6,000 | to 0.2 | 0.1 | max. 6,000 | to 0.2 | | | | |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | max. 6,000 | | | max. 6,000 | | | | | |
| | N1.3 | Aluminium, alloy > 7-12 % Si | max. 6,000 | | | max. 6,000 | | | | | |
| | N1.4 | Aluminium, alloy > 12 % Si | max. 2,000 | | | max. 2,000 | | | | | |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | | | max. 6,000 | | max. 6,000 | | | |
| | N2.2 | Copper, alloy | > 300 | | | max. 2,000 | | max. 2,000 | | | |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | | | max. 2,000 | | max. 2,000 | | | |
| | N3.1 | Graphite, > 8 μm | | | | max. 2,000 | | max. 2,000 | | | |
| | N4.1 | Plastic, thermoplastics | | | | max. 2,000 | | max. 2,000 | | | |
| | N4.2 | Plastic, thermosets | | | | max. 2,000 | | max. 2,000 | | | |
| | C | C1.1 | Plastic matrix, aramide fibre-reinforced (AFRP) | | | max. 2,000 | | to 0.2 | 0.1 | max. 2,000 | to 0.2 |
| | | C1.2 | Plastic matrix (thermosetting), CFRP/GFRP | | | max. 2,000 | | | | max. 2,000 | |
| | | C1.3 | Plastic matrix (thermoplastic), CFRP/GFRP | | | max. 2,000 | | | | max. 2,000 | |
| | | C2.1 | Carbon matrix, carbon fibre-reinforced (CFC) | | | max. 2,000 | | | | max. 2,000 | |
| S | S1.1 | Titanium, titanium alloys | < 400 | 150 - 500 | | 150 - 500 | | | | | |
| | S2.1 | Titanium, titanium alloys | < 1200 | 150 - 500 | | 150 - 500 | | | | | |
| | S2.2 | Titanium, titanium alloys | > 1200 | 150 - 500 | | 150 - 500 | | | | | |
| | S3.1 | Nickel, non-alloy and alloy | < 900 | 150 - 500 | | 150 - 500 | | | | | |
| | S3.2 | Nickel, non-alloy and alloy | > 900 | 150 - 500 | | 150 - 500 | | | | | |
| | S4.1 | High-temperature super alloy Ni, Co and Fe-based | | 150 - 500 | | 150 - 500 | | | | | |
| S5.1 | Tungsten and molybdenum alloys | | 150 - 500 | | 150 - 500 | | | | | | |

* MAPAL machining groups





SHOULDER MILLING CUTTER

Shoulder milling cutter with indexable inserts

| | |
|--------------------------------------|-----|
| NeoMill – radial technology | |
| NeoMill-2-Corner, AOKT12 | 292 |
| NeoMill-4-Corner, ANMU12 | 294 |
| NeoMill-4S-Corner, SDKT10 | 296 |
| NeoMill-8-Corner, SNMU12 | 298 |
| TGMill – tangential technology | |
| TGMill-2-Corner, CT_D09 | 300 |
| TGMill-4-Corner, CT_Q09 | 302 |

Shoulder milling cutter with PCD

| | |
|--|-----|
| Face milling cutter with PCD combined with corner milling blade cartridge .. | 258 |
|--|-----|

Accessories and spare parts

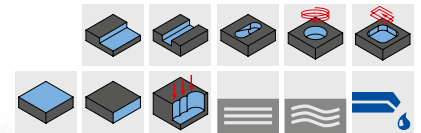
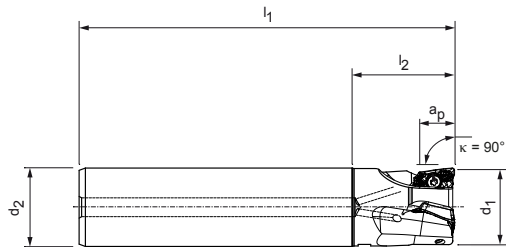
| | |
|--|-----|
| Shoulder milling cutter with indexable inserts | |
| Accessories for indexable inserts | 384 |
| Allocating milling cutter clamping screws | 386 |

Technical appendix

| | |
|---|-----|
| Cutting data recommendations | 306 |
| Application notes facing and shoulder milling | 398 |
| Handling notes Milling cutter clamping screw | 412 |

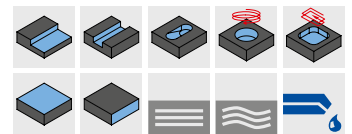
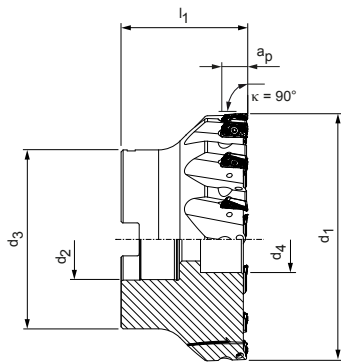
NeoMill®-2-Corner

Shoulder milling cutter, with radial technology
AOKT12



End milling cutter

| Dimensions | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Cylindrical shank form | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | l ₁ | l ₂ | | | | | | | | |
| 20 | 20 | 110 | 30 | 2 | 11 | 0,2 | 55.000 | HA | ✓ | ICM901-020-HA20-Z02R-AO_T12 | 31002166 |
| 20 | 20 | 81 | 30 | 2 | 11 | 0,2 | 55.000 | HB | ✓ | ICM901-020-HB20-Z02R-AO_T12 | 31002167 |
| 25 | 25 | 120 | 32 | 3 | 11 | 0,4 | 49.000 | HA | ✓ | ICM901-025-HA25-Z03R-AO_T12 | 31002168 |
| 25 | 25 | 88 | 32 | 3 | 11 | 0,3 | 49.000 | HB | ✓ | ICM901-025-HB25-Z03R-AO_T12 | 31002169 |
| 32 | 32 | 130 | 40 | 4 | 11 | 0,7 | 43.000 | HA | ✓ | ICM901-032-HA32-Z04R-AO_T12 | 31002170 |
| 32 | 32 | 100 | 40 | 4 | 11 | 0,5 | 43.000 | HB | ✓ | ICM901-032-HB32-Z04R-AO_T12 | 31002171 |
| 40 | 32 | 150 | 88 | 5 | 11 | 0,9 | 39.000 | HA | ✓ | ICM901-040-HA32-Z05R-AO_T12 | 31002174 |
| 40 | 32 | 110 | 48 | 5 | 11 | 0,7 | 39.000 | HB | ✓ | ICM901-040-HB32-Z05R-AO_T12 | 31002175 |



Milling cutter head

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 40 | 16 | 32 | 14 | 40 | 5 | 11 | 0,2 | 39.000 | ✓ | ICM901-040-CA16-Z05R-AO_T12 | 31002184 |
| 50 | 22 | 48 | 18,5 | 40 | 6 | 11 | 0,4 | 35.000 | ✓ | ICM901-050-CA22-Z06R-AO_T12 | 31002185 |
| 63 | 22 | 48 | 18,5 | 40 | 8 | 11 | 0,6 | 31.000 | ✓ | ICM901-063-CA22-Z08R-AO_T12 | 31002187 |

Dimensions in mm.
The maximum operating speeds refer only to the cutting edge system.

AOKT

Radial indexable insert, double edge



| Workpiece material | P | | | M | | K | |
|-----------------------|-----------------------------------|--------------------------|----------|------------------------------|---------------------------|----------|----------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | | Austenitic Wear-resistant | Ferritic Tough/Ductile | | |
| Substrate | Carbide | | | Carbide | | Carbide | |
| Coating | PVD | | CVD | PVD | | PVD | CVD |
| Cutting material type | HP975 | HP980 | HC775 | HP980 | HP985 | HP975 | HC770 |
| Cutting edge design | M05 | M03 | M03 | M03 | M03 | M05 | M05 |
| AOKT12 | a_p max. [mm] | | | | | | |
| AOKT12T304R- | * | 31029366 | | | 31029367 | 31029366 | 31218303 |
| AOKT12T308R- | * | 31029368 | 31200903 | 31124557 | 31200903 | 31029369 | 31029368 |

Feed per tooth

| Application | Medium machining | | | | |
|---------------------|------------------|-----------|-----------|----------|----------|
| | M03 | | M05 | | |
| Cutting edge design | PVD | CVD | PVD | CVD | |
| Coating | | | | | |
| Edge rounding | ++ | ++ | +++ | +++ | |
| Feed/tooth [mm] | P | 0.08-0.25 | 0.08-0.19 | 0.1-0.25 | 0.1-0.19 |
| | M | 0.08-0.2 | 0.08-0.15 | | |
| | K | | | 0.1-0.3 | 0.1-0.23 |
| | N | | | | |

Legend: ++ = medium rounded | +++ = sharp edged

Plunge angle

| Diameter [mm] | Plunge angle [°] |
|---------------|------------------|
| 20 | 6 |
| 25 | 4,2 |
| 32 | 3 |
| 40 | 2,2 |
| 50 | 1,7 |
| 63 | 1,3 |

Accessories

| | | | |
|--|----------|---|----------|
| | AOKT12T3 | Indexable inserts | Page 293 |
| | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | |
|--|---|-----------|
| | Clamping screw for indexable insert TORX® | Order no. |
| | End milling cutter | 10105074 |
| | Milling cutter head | 10105075 |
| | M3x6.5-TX8-IP | |
| | M3x7.5-TX8-IP | |

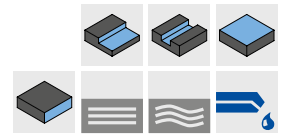
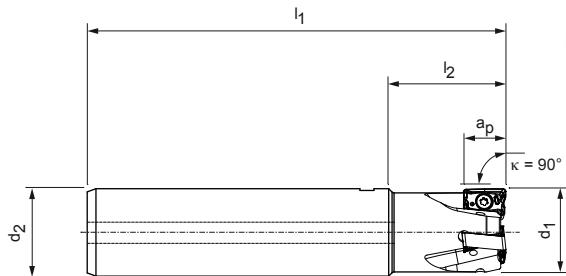
* a_p max. depends on the type of milling cutter and application.

** Included in scope of delivery.

For cutting data recommendations, see end of chapter.

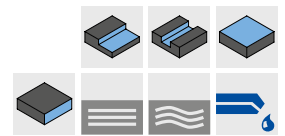
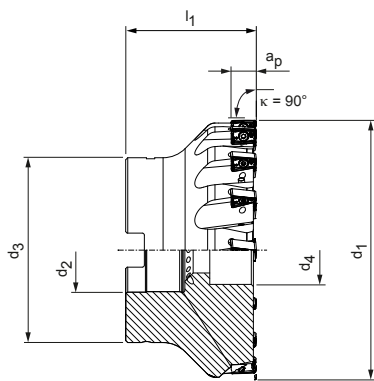
NeoMill®-4-Corner

Shoulder milling cutter, with radial technology
ANMU12



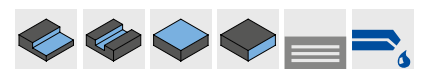
End milling cutter

| Dimensions | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Cylindrical shank form | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | l ₁ | l ₂ | | | | | | | | |
| 25 | 25 | 120 | 32 | 3 | 10 | 0,41 | 42.000 | HA | ✓ | ICM901-025-HA25-Z03R-AN_U12 | 31002200 |
| 25 | 25 | 88 | 32 | 3 | 10 | 0,29 | 42.000 | HB | ✓ | ICM901-025-HB25-Z03R-AN_U12 | 31002201 |
| 32 | 32 | 130 | 40 | 4 | 10 | 0,74 | 31.500 | HA | ✓ | ICM901-032-HA32-Z04R-AN_U12 | 31002202 |
| 32 | 32 | 100 | 40 | 4 | 10 | 0,55 | 31.500 | HB | ✓ | ICM901-032-HB32-Z04R-AN_U12 | 31002203 |
| 40 | 32 | 150 | 50 | 5 | 10 | 0,98 | 25.000 | HA | ✓ | ICM901-040-HA32-Z05R-AN_U12 | 31002206 |
| 40 | 32 | 110 | 50 | 5 | 10 | 0,73 | 25.000 | HB | ✓ | ICM901-040-HB32-Z05R-AN_U12 | 31002207 |



Milling cutter head, medium spacing

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 50 | 22 | 48 | 18,5 | 40 | 6 | 10 | 0,4 | 23.000 | ✓ | ICM901-050-CA22-Z06R-AN_U12 | 31018838 |
| 63 | 22 | 48 | 18,5 | 40 | 8 | 10 | 0,6 | 21.000 | ✓ | ICM901-063-CA22-Z08R-AN_U12 | 31018870 |
| 80 | 27 | 60 | 20,5 | 50 | 10 | 10 | 1,2 | 18.000 | ✓ | ICM901-080-CA27-Z10R-AN_U12 | 31018871 |
| 100 | 32 | 78 | 27,5 | 55 | 12 | 10 | 2,1 | 16.000 | ✓ | ICM901-100-CA32-Z12R-AN_U12 | 31018872 |



Milling cutter head, close spacing

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 40 | 16 | 32 | 14 | 40 | 6 | 6 | 0,2 | 26.000 | ✓ | ICM901-040-CA16-Z06R-AN_U12 | 31002214 |
| 50 | 22 | 48 | 18,5 | 40 | 8 | 6 | 0,5 | 23.000 | ✓ | ICM901-050-CA22-Z08R-AN_U12 | 31002215 |
| 63 | 22 | 48 | 18,5 | 40 | 10 | 6 | 0,6 | 21.000 | ✓ | ICM901-063-CA22-Z10R-AN_U12 | 31002217 |
| 80 | 27 | 60 | 20,5 | 50 | 12 | 6 | 1,2 | 18.000 | ✓ | ICM901-080-CA27-Z12R-AN_U12 | 31002218 |

ANMU

Radial indexable insert, four cutting edges



| Workpiece material | P | | | M | | K | | | |
|-----------------------|-----------------------------|--------------------------|----------|------------------------------|---------------------------|-----------------------|----------------------|-----------------------|----------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | | Austenitic Wear-resistant | Ferritic Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile |
| Substrate | Carbide | | | Carbide | | Carbide | | | |
| Coating | PVD | | CVD | PVD | | PVD | | CVD | |
| Cutting material type | HP975 | HP980 | HC775 | HP980 | HP985 | HP965 | HP975 | HC760 | HC770 |
| Cutting edge design | M05 | M03 | M03 | M03 | M03 | M05 | M05 | M05 | M05 |
| ANMU12 | a_p max. [mm] | | | | | | | | |
| ANMU120504R- | * | 31029427 | | | | | 31029427 | | 31218310 |
| ANMU120508R- | * | 30968178 | 31027000 | 31124584 | 31027000 | 31029429 | 31029430 | 30968178 | 31124582 31124583 |
| Cutting edge design | U05 | U03 | U03 | U03 | U03 | U05 | U05 | U05 | U05 |
| ANMU12 | a_p max. [mm] | | | | | | | | |
| ANMU120508R- | * | 31253944 | 31253948 | 31273152 | 31253948 | 31290794 | 31273129 | 31253944 | 31273153 31253947 |

Feed per tooth

| Application | Cutting edge design | Medium machining | | | | Difficult conditions | | | |
|-----------------|---------------------|------------------|-------------|------------|------------|----------------------|-------------|------------|------------|
| | | M03 | | M05 | | U03 | | U05 | |
| Coating | Edge rounding | PVD | CVD | PVD | CVD | PVD | CVD | PVD | CVD |
| | | ++ | ++ | +++ | +++ | ++ | ++ | +++ | +++ |
| Feed/tooth [mm] | P | 0.08 - 0.25 | 0.08 - 0.19 | 0.1 - 0.25 | 0.1 - 0.19 | 0.08 - 0.25 | 0.08 - 0.19 | 0.1 - 0.25 | 0.1 - 0.19 |
| | M | 0.08 - 0.2 | 0.08 - 0.15 | | | 0.08 - 0.2 | 0.08 - 0.15 | | |
| | K | | | 0.1 - 0.3 | 0.1 - 0.23 | | | 0.1 - 0.3 | 0.1 - 0.23 |
| | N | | | | | | | | |

Legend: ++ = medium rounded | +++ = sharp edged

Accessories

| | | | |
|--|----------|---|----------|
| | ANMU1205 | Indexable inserts | Page 295 |
| | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | | |
|--|----------|---|-----------------------|
| | ANMU1205 | Clamping screw for indexable insert TORX® M3x8.5-TX8-IP | Order no. 10105076 |
|--|----------|---|-----------------------|

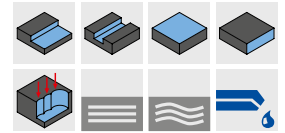
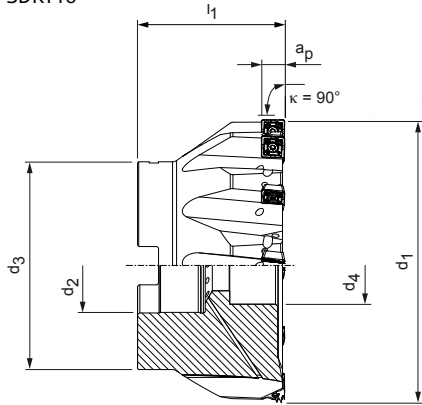
* a_p max. depends on the type of milling cutter and application.

** Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system. For cutting data recommendations, see end of chapter.

NeoMill®-4S-Corner




Shoulder milling cutter, with radial technology
SDKT10




Milling cutter head

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 40 | 16 | 32 | 13,8 | 40 | 5 | 5 | 0,2 | 37.000 | ✓ | ICM901-040-CA16-Z05R-SD_T10 | 31002262 |
| 50 | 22 | 48 | 18,5 | 40 | 6 | 5 | 0,4 | 33.000 | ✓ | ICM901-050-CA22-Z06R-SD_T10 | 31002263 |
| 63 | 22 | 48 | 18,5 | 40 | 7 | 5 | 0,6 | 30.000 | ✓ | ICM901-063-CA22-Z07R-SD_T10 | 31002264 |
| 80 | 27 | 60 | 20 | 50 | 9 | 5 | 1,1 | 26.000 | ✓ | ICM901-080-CA27-Z09R-SD_T10 | 31002265 |
| 100 | 32 | 78 | 27 | 55 | 10 | 5 | 2,1 | 23.000 | ✓ | ICM901-100-CA32-Z10R-SD_T10 | 31002266 |
| 125 | 40 | 89 | 33 | 63 | 12 | 5 | 3,5 | 21.000 | ✓ | ICM901-125-CA40-Z12R-SD_T10 | 31002267 |
| 160 | 40 | 89 | 65 | 63 | 15 | 5 | 5 | 18.000 | - | ICM900-160-CA40-Z15R-SD_T10 | 31002269 |

Accessories

| | | | |
|---|----------|---|----------|
|  | SDKT10T3 | Indexable inserts | Page 297 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|----------|---|-----------------------|
|  | SDKT10T3 | Clamping screw for indexable insert TORX® M3x7.5-TX8-IP | Order no. 10105075 |
|---|----------|---|-----------------------|

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

*Included in scope of delivery.

SDKT

Radial indexable insert, four cutting edges



| Workpiece material | P | | | | M | | | |
|-----------------------|-----------------------------------|--------------------------|-----------------------------|--------------------------|------------------------------|---------------------------|------------------------------|---------------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | Unalloyed Wear-resistant | Alloyed Tough/Ductile | Austenitic Wear-resistant | Ferritic Tough/Ductile | Austenitic Wear-resistant | Ferritic Tough/Ductile |
| Substrate | Carbide | | | | Carbide | | | |
| Coating | PVD | | CVD | | PVD | | | |
| Cutting material type | HP980 | | HC775 | | HP980 | | HP985 | |
| Cutting edge design | M03 | | M03 | | M03 | | M03 | |
| SDKT10 | a_p max. [mm] | | | | | | | |
| SDKT10T308R- | * | 31029463 | 31271444 | 31029463 | 31029463 | 31029463 | 31029465 | 31029465 |

Feed per tooth

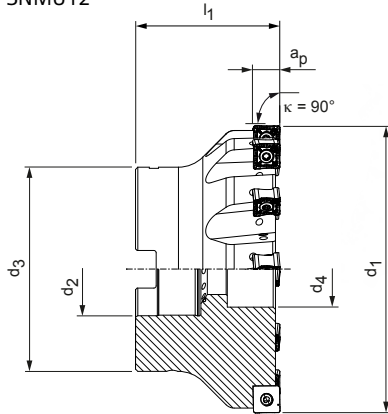
| Application | | Medium machining | |
|---------------------|---|------------------|-------------|
| Cutting edge design | | M03 | |
| Coating | | PVD | CVD |
| Edge rounding | | ++ | ++ |
| Feed/tooth [mm] | P | 0.08 - 0.25 | 0.08 - 0.19 |
| | M | 0.08 - 0.2 | 0.08 - 0.15 |
| | K | | |
| | N | | |

Legend: ++ = medium rounded

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 384.
 For cutting data recommendations, see end of chapter.

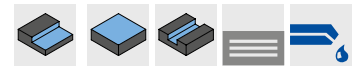
NeoMill®-8-Corner

Shoulder milling cutter, with radial technology
SNMU12



Milling cutter head, medium spacing




| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 50 | 22 | 48 | 18,5 | 40 | 4 | 8 | 0,4 | 17.000 | ✓ | ICM901-050-CA22-Z04R-SN_U12 | 31002271 |
| 63 | 22 | 48 | 18,5 | 40 | 6 | 8 | 0,5 | 15.000 | ✓ | ICM901-063-CA22-Z06R-SN_U12 | 31002272 |
| 80 | 27 | 60 | 20,5 | 50 | 8 | 8 | 1,2 | 13.000 | ✓ | ICM901-080-CA27-Z08R-SN_U12 | 31002273 |
| 100 | 32 | 78 | 27,5 | 55 | 10 | 8 | 2,2 | 12.000 | ✓ | ICM901-100-CA32-Z10R-SN_U12 | 31002274 |
| 125 | 40 | 89 | 33 | 63 | 12 | 8 | 3,7 | 11.000 | ✓ | ICM901-125-CA40-Z12R-SN_U12 | 31002275 |
| 160 | 40 | 89 | 65 | 63 | 16 | 8 | 4,9 | 9.000 | - | ICM900-160-CA40-Z16R-SN_U12 | 31002277 |
| 200 | 60 | 89 | - | 63 | 18 | 8 | 8,5 | 8.000 | - | ICM900-200-CA60-Z18R-SN_U12 | 31002278 |




Milling cutter head, close spacing

| | | | | | | | | | | | |
|-----|----|----|------|----|----|---|-----|--------|---|-----------------------------|----------|
| 50 | 22 | 48 | 18,5 | 40 | 6 | 6 | 0,4 | 17.000 | ✓ | ICM901-050-CA22-Z06R-SN_U12 | 31002279 |
| 63 | 22 | 48 | 18,5 | 40 | 8 | 6 | 0,6 | 15.000 | ✓ | ICM901-063-CA22-Z08R-SN_U12 | 31002280 |
| 80 | 27 | 60 | 20,5 | 50 | 10 | 6 | 1,1 | 13.000 | ✓ | ICM901-080-CA27-Z10R-SN_U12 | 31002281 |
| 100 | 32 | 78 | 27,5 | 55 | 12 | 6 | 2,2 | 12.000 | ✓ | ICM901-100-CA32-Z12R-SN_U12 | 31002282 |
| 125 | 40 | 89 | 33 | 63 | 14 | 6 | 3,6 | 11.000 | ✓ | ICM901-125-CA40-Z14R-SN_U12 | 31002283 |
| 160 | 40 | 89 | 65 | 63 | 18 | 6 | 4,8 | 9.000 | - | ICM900-160-CA40-Z18R-SN_U12 | 31002285 |

Accessories

| | | | |
|---|----------|---|----------|
|  | SNMU1205 | Indexable inserts | Page 299 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|----------|--|-----------------------|
|  | SNMU1205 | Clamping screw for indexable insert TORX PLUS® M4x11-TX15-IP | Order no. 10018468 |
|---|----------|--|-----------------------|

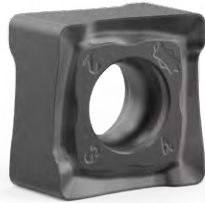
Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

* Included in scope of delivery.

SNMU

Radial indexable insert, eight cutting edges



| Workpiece material | P | | | M | | K | | | |
|-----------------------|-----------------------------------|--------------------------|----------|------------------------------|---------------------------|-----------------------|----------------------|-----------------------|----------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | | Austenitic Wear-resistant | Ferritic Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile |
| Substrate | Carbide | | | Carbide | | Carbide | | | |
| Coating | PVD | | CVD | PVD | | PVD | | CVD | |
| Cutting material type | HP975 | HP980 | HC775 | HP980 | HP985 | HP965 | HP975 | HC760 | HC770 |
| Cutting edge design | M05 | M03 | M03 | M03 | M03 | M05 | M05 | M05 | M05 |
| SNMU12 | a_p max. [mm] | | | | | | | | |
| SNMU120508R- | 30968200 | 31029466 | 31124590 | 31029466 | 31029469 | 31029480 | 30968200 | 31124588 | 31124589 |
| SNMU120512R- | 31029482 | | | | | 31029483 | 31029482 | 31170977 | 31170976 |
| SNMU120516R- | 31175561 | | | | | | 31175561 | | 31218330 |
| SNMU120520R- | 31175564 | | | | | | 31175564 | | 31218332 |

Feed per tooth

| Application | | Medium machining | | | |
|---------------------|---|------------------|-------------|------------|------------|
| Cutting edge design | | M03 | | M05 | |
| Coating | | PVD | CVD | PVD | CVD |
| Edge rounding | | ++ | ++ | +++ | +++ |
| Feed/tooth [mm] | P | 0.08 - 0.25 | 0.08 - 0.19 | 0.1 - 0.25 | 0.1 - 0.19 |
| | M | 0.08 - 0.2 | 0.08 - 0.15 | | |
| | K | | | 0.1 - 0.3 | 0.1 - 0.23 |
| | N | | | | |

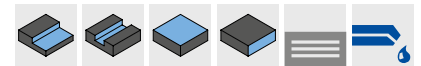
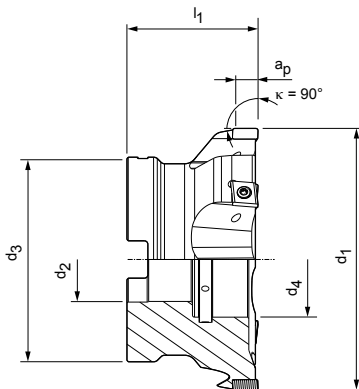
Legend: ++ = medium rounded | +++ = sharp edged

* a_p max. depends on the type of milling cutter and application.
For related clamping screw and screwdriver see page 384.
For cutting data recommendations, see end of chapter.

TGMill-2-Corner

Shoulder milling cutter with tangential technology




CT_D09




Milling cutter head, close spacing

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 63 | 22 | 48 | 28 | 50 | 8 | 7 | 0,5 | 34.000 | ✓ | ICM901-063-CA22-Z8R-CT_D09 | 30527703 |
| 80 | 27 | 60 | 38 | 50 | 12 | 7 | 1 | 30.200 | ✓ | ICM901-080-CA27-Z12R-CT_D09 | 30527705 |
| 100 | 32 | 78 | 44 | 50 | 14 | 7 | 1,4 | 27.000 | ✓ | ICM901-100-CA32-Z14R-CT_D09 | 30527706 |
| 125 | 40 | 89 | 56 | 63 | 18 | 7 | 2,6 | 24.100 | ✓ | ICM901-125-CA40-Z18R-CT_D09 | 30527707 |
| 160 | 40 | 89 | 56 | 63 | 20 | 7 | 4 | 21.300 | ✓ | ICM901-160-CA40-Z20R-CT_D09 | 30527708 |
| 200 | 60 | 140 | - | 63 | 25 | 7 | 8,1 | 19.100 | ✓ | ICM901-200-CA60-Z25R-CT_D09 | 30527711 |

Accessories

| | | | |
|---|----------|---|----------|
|  | CT_D09T3 | Indexable inserts | Page 301 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|-------------|---|-----------------------|
|  | CT_D09T3... | Clamping screw for indexable insert TORX PLUS® M3.5x9.4-TX10-IP | Order no. 10007315 |
|---|-------------|---|-----------------------|

Dimensions in mm.

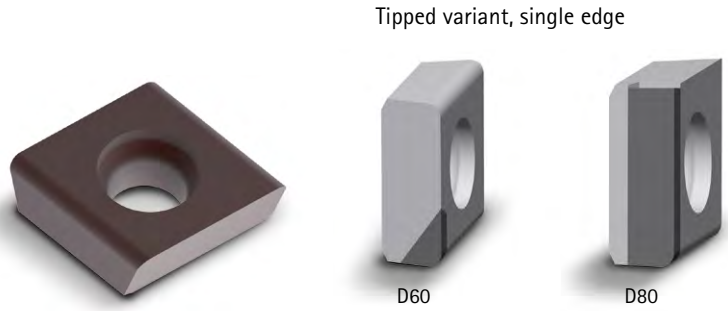
Further dimensions and designs in medium and wide spacing available upon request.

* Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

CTHD

Tangential indexable inserts, double edge



| | | |
|-----------------------|--------------------------------|-------------------------------|
| Workpiece material | N | |
| | Al alloyed ← Wear-resistant | Cu alloyed → Tough/Ductile |
| Substrate | Carbide | PCD |
| Coating | - | - |
| Cutting material type | HU616 | PU617 |

| | | | | |
|--------------------------|--------------------------------|----------|--|----------|
| Cutting edge design | | D00 | | D80 |
| CTHD09 | a_p max. [mm] | | | |
| CTHD09T304...R-... | * | 30029737 | | 30492519 |
| CTHD09T304...R90M018-... | * | 30567180 | | 31283626 |
| CTHD09T308...R-... | * | 30029738 | | 30374036 |
| CTHD09T312...R-... | * | 30029739 | | |

| | | | |
|--------------------------|--------------------------------|--|----------|
| Cutting edge design | | | D60 |
| CTHD09 | a_p max. [mm] | | |
| CTHD09T304...R-... | 2.5 | | 31283617 |
| CTHD09T304...R90M018-... | 2.5 | | 31283618 |
| CTHD09T308...R-... | 2.5 | | 31283621 |

Feed per tooth

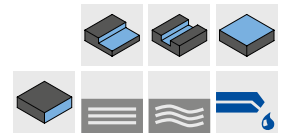
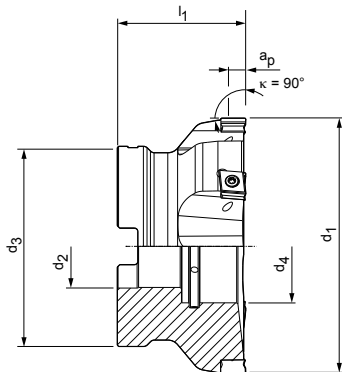
| | | | | |
|---------------------|----------|-----------------------|------------|------------|
| Application | | Universal application | | |
| Cutting edge design | | D00 | D60 | D80 |
| Edge rounding | | 0 | 0 | 0 |
| Feed/tooth [mm] | P | | | |
| | M | | | |
| | K | | | |
| | N | 0.05 - 0.5 | 0.05 - 0.5 | 0.05 - 0.5 |

Legend: 0 = Sharp edged

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

TGMill-4-Corner




Shoulder milling cutter with tangential technology
CT_Q09




Milling cutter head, close spacing

| Dimensions | | | | | Z _{eff} | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---------------------|-------------|---|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | | |
| 63 | 22 | 48 | 28 | 50 | 8 | 7 | 0,6 | 30.400 | ✓ | ICM901-063-CA22-Z8R-CT_Q09 | 30527712 |
| 80 | 27 | 60 | 38 | 50 | 12 | 7 | 0,8 | 27.000 | ✓ | ICM901-080-CA27-Z12R-CT_Q09 | 30527713 |
| 100 | 32 | 78 | 44 | 50 | 14 | 7 | 1,5 | 24.000 | ✓ | ICM901-100-CA32-Z14R-CT_Q09 | 30527714 |
| 125 | 40 | 89 | 56 | 63 | 18 | 7 | 2,7 | 21.600 | ✓ | ICM901-125-CA40-Z18R-CT_Q09 | 30527715 |
| 160 | 40 | 89 | 56 | 63 | 20 | 7 | 4,1 | 19.000 | ✓ | ICM901-160-CA40-Z20R-CT_Q09 | 30527716 |
| 200 | 60 | 140 | - | 63 | 25 | 7 | 8,1 | 17.000 | ✓ | ICM901-200-CA60-Z25R-CT_Q09 | 30527717 |

Accessories

| | | | |
|---|----------|---|----------|
|  | CT_Q0905 | Indexable inserts | Page 304 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|----------|--|-----------------------|
|  | CT_Q0905 | Clamping screw for indexable insert TORX PLUS® M3.5x11-TX10-IP | Order no. 10105079 |
|---|----------|--|-----------------------|

Dimensions in mm.

Further dimensions and designs in medium and wide spacing available upon request.

* Included in scope of delivery.

The maximum operating speeds refer only to the cutting edge system.

CUSTOM-MADE FACE AND SHOULDER MILLING CUTTERS



In unstable machining situations or with large projection lengths, special milling cutters are designed with vibration dampers or vibration-damped connections are used to increase machining quality and tool life.

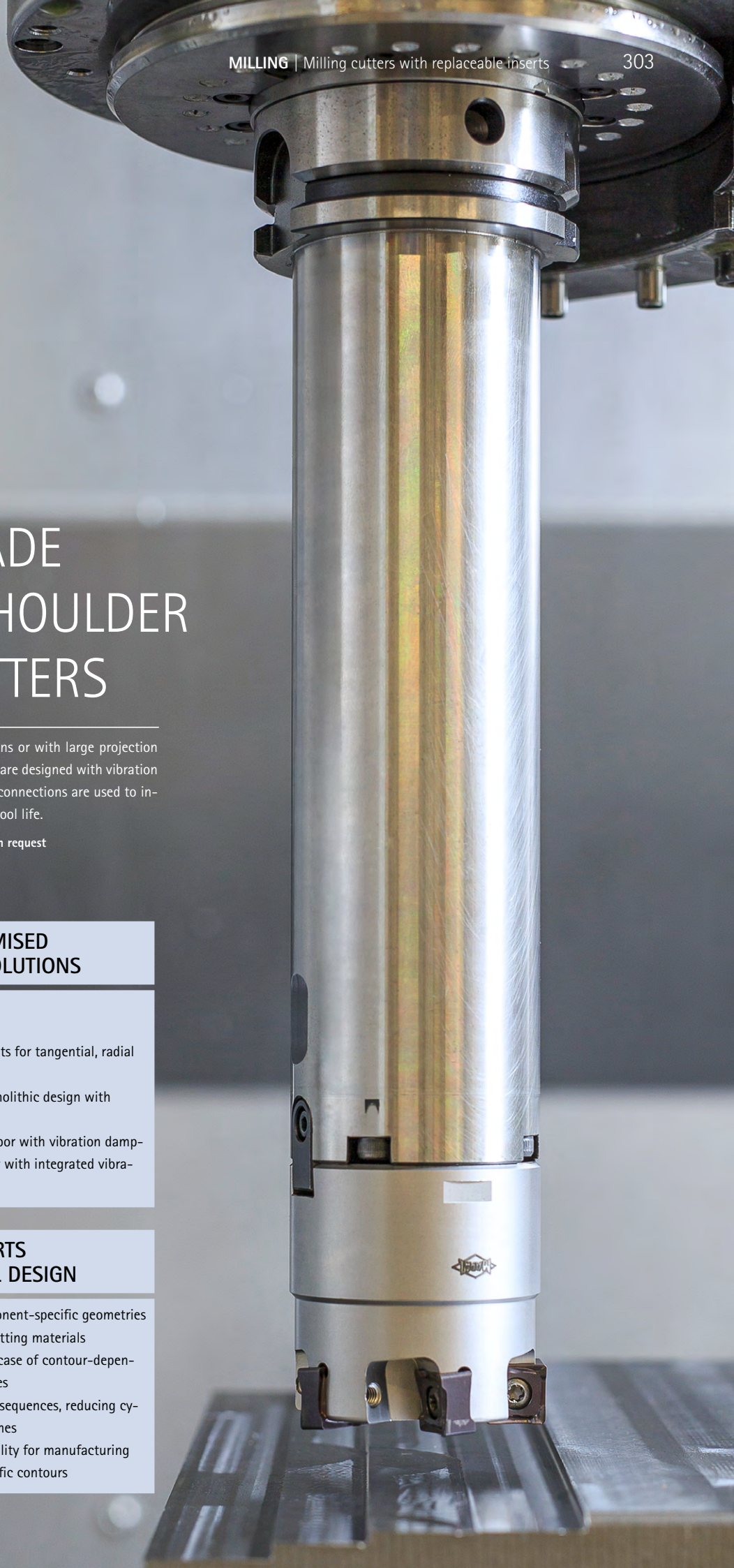
► Customised special solution upon request

CUSTOMISED SPECIAL SOLUTIONS

- Individual dimensions
- Different numbers of teeth
- Tool design with insert seats for tangential, radial and special cutting edges
- Milling cutter head or monolithic design with different connections
- Standard milling cutter arbor with vibration damper or customised tool body with integrated vibration damper

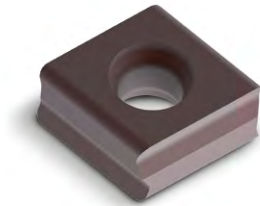
INSERTS IN SPECIAL DESIGN

- Special inserts with component-specific geometries and a large selection of cutting materials
- High process reliability in case of contour-dependent shapes and geometries
- Saves complex machining sequences, reducing cycle and non-productive times
- Multi-cutting-edge capability for manufacturing complex component-specific contours



CTHQ | CTNQ

Tangential indexable inserts, four cutting edges



| Workpiece material | P | | M | |
|-----------------------|-----------------------------|--------------------------|------------------------------|---------------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | Austenitic Wear-resistant | Ferritic Tough/Ductile |
| Substrate | Carbide | | Carbide | |
| Coating | PVD | | CVD | |
| Cutting material type | HP975 | | HP980 | |

| Cutting edge design | | H08 | | H06 | H06 | H06 |
|---------------------|-----------------|----------|--|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | | |
| CTNQ090508...R-... | * | 31048496 | | 31272737 | 31048497 | 31048498 |
| CTNQ090512...R-... | * | 31048510 | | 31272700 | 31048511 | 31048512 |
| CTHQ09 | | | | | | |
| CTHQ090508...R-... | * | 31048522 | | 31272841 | 31048523 | 31048524 |
| CTHQ090512...R-... | * | 31048526 | | 31272850 | 31048527 | 31048528 |

| Cutting edge design | | A38 | A36 | A36 | A36 | A36 |
|--------------------------|-----------------|----------|----------|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | | |
| CTNQ090508...R-... | * | 31048514 | | 31272812 | 31048515 | 31048516 |
| CTNQ090512...R-... | * | 31048518 | | 31272720 | 31048519 | 31048520 |
| CTHQ09 | | | | | | |
| CTHQ090508...R-... | * | 31048530 | | 31272837 | 31048531 | 31048532 |
| CTHQ090508...R90M008-... | * | | 31190731 | 31272835 | 31190733 | |
| CTHQ090512...R-... | * | 31048534 | | 31272845 | 31048535 | 31048536 |

Feed per tooth

| Application | | Roughing | | | | | Medium machining | | | | |
|---------------------|---|----------|-----------|-----------|-----------|-------------|------------------|-----------|-----------|-----------|-----------|
| | | H06 | | H08 | | H21 | A36 | | A38 | | H20 |
| Cutting edge design | | PVD | CVD | PVD | CVD | PVD | PVD | CVD | PVD | CVD | PVD |
| Coating | | | | | | | | | | | |
| Edge rounding | | ++ | | +++ | | + | ++ | | +++ | | 0 |
| Feed/tooth [mm] | P | 0.12-0.3 | 0.12-0.23 | 0.12-0.35 | 0.12-0.27 | | 0.1-0.25 | 0.1-0.19 | 0.12-0.25 | 0.12-0.19 | |
| | M | 0.1-0.3 | 0.1-0.23 | | | | 0.12-0.25 | 0.12-0.19 | | | |
| | K | | | 0.12-0.4 | 0.12-0.3 | | | | 0.1-0.3 | 0.1-0.23 | |
| | N | | | | | 0.15 - 0.35 | | | | | 0.1 - 0.3 |

Legend: 0 = sharp edged | + = slightly rounded | ++ = medium rounded | +++ = heavily rounded

* a_p max. depends on the type of milling cutter and application.

For related clamping screw and screwdriver see page 385.

For cutting data recommendations, see end of chapter.

| K | | | | | N | | |
|-------------------------|----------|------------------------|----------|-------------------------|----------|------------------------|----------|
| GJL ← Wear-resistant | | GJS → Tough/Ductile | | GJL ← Wear-resistant | | GJS → Tough/Ductile | |
| PVD | | | | Carbide | | Carbide | |
| HP965 | | HP975 | | HC760 | | HC770 | |
| H08 | | H08 | | H08 | | H21 | |
| 31048495 | 31048496 | 31272745 | | 31272748 | | | |
| 31048499 | 31048510 | 31272705 | | 31272707 | | | |
| 31048521 | 31048522 | 31272843 | | 31272844 | | | 31257300 |
| 31048525 | 31048526 | 31272851 | | 31272855 | | | 31316852 |
| A38 | | A38 | | A36 | | H20 | |
| 31048513 | 31048514 | 31272816 | | 31272817 | | | |
| 31048517 | 31048518 | 31272725 | | 31272726 | | | |
| 31048529 | 31048530 | 31272838 | | 31272840 | | 31316862 | |
| | | | 31272832 | | 31272834 | 31316865 | |
| 31048533 | 31048534 | 31272847 | | 31272848 | | 31316863 | |

Cutting data recommendations for shoulder milling cutters

Cutting speed

Shoulder milling cutter

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | | | |
| | P5 | P5.1 Cast steel | | | | |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | | | |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | | ✓ | |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2 | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | | ✓ | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | | | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | | | |
| | | N1.4 Aluminium, alloy > 12 % Si | | | | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | | ✓ | |
| | | N2.2 Copper, alloy | > 300 | | | |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | | | |
| | N3 | N3.1 Graphite, > 8 µm | | | | |
| | | N3.2 Graphite, ≤ 8 µm | | | | |
| | N4 | N4.1 Plastic, thermoplastics | | | | |
| | | N4.2 Plastic, thermosets | | | | |
| | | N4.3 Plastic, foams | | | | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|
| Carbide PVD-coated | | | | | | | | | | Carbide CVD-coated | | | | | | Carbide - uncoated | | PVD | |
| HP615 | | HP965 | | HP975 | | HP980 | | HP985 | | HC760 | | HC770 | | HC775 | | HU616 | | PU617 | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 |
| | | | | 180 | 220 | 180 | 220 | | | | | 260 | 280 | | | | | | |
| | | | | 150 | 180 | 150 | 180 | | | | | 250 | 270 | 240 | 260 | | | | |
| | | | | 160 | 200 | 160 | 200 | | | | | 240 | 260 | 230 | 250 | | | | |
| | | | | | | 130 | 160 | | | | | | | 220 | 240 | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 110 | 140 | | | | | | | | | | | | |
| | | | | | | 160 | 180 | 140 | 170 | | | | | | | | | | |
| | | | | | | 140 | 160 | 120 | 150 | | | | | | | | | | |
| | | | | | | | | 100 | 120 | | | | | | | | | | |
| | | | | | | | | 90 | 110 | | | | | | | | | | |
| | | 220 | 270 | 200 | 240 | | | | | 330 | 350 | 320 | 330 | | | | | | |
| | | 200 | 240 | 180 | 220 | | | | | 300 | 330 | 300 | 320 | | | | | | |
| | | 180 | 220 | 160 | 200 | | | | | | | 260 | 300 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | | | 220 | 260 | | | | | | |
| | | 170 | 210 | 150 | 180 | | | | | 210 | 240 | 200 | 220 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | 200 | 220 | 180 | 200 | | | | | | |
| 700 | 700 | | | | | | | | | | | | | | | 500 | 500 | 2000 | 2000 |
| 400 | 480 | | | | | | | | | | | | | | | 300 | 360 | 1500 | 1800 |
| 300 | 360 | | | | | | | | | | | | | | | 230 | 280 | 1200 | 1440 |
| 270 | 330 | | | | | | | | | | | | | | | | | 700 | 840 |
| 250 | 300 | | | | | | | | | | | | | | | 250 | 300 | 600 | 720 |
| 130 | 160 | | | | | | | | | | | | | | | 120 | 150 | 500 | 600 |
| 190 | 230 | | | | | | | | | | | | | | | 180 | 220 | 450 | 540 |
| 320 | 390 | | | | | | | | | | | | | | | 300 | 360 | | |
| 320 | 390 | | | | | | | | | | | | | | | | | | |
| 220 | 270 | | | | | | | | | | | | | | | 300 | 360 | 500 | 600 |
| 210 | 260 | | | | | | | | | | | | | | | 250 | 300 | 400 | 480 |

The specified machining values are guide values.
 The optimum data for the respective machining task should be determined during the test or machining.



HIGH-FEED MILLING CUTTER

NeoMill – radial technology

| | |
|----------------------------------|-----|
| NeoMill-2-HiFeed90, LP__06 _____ | 310 |
| NeoMill-2-HiFeed90, LD__10 _____ | 312 |
| NeoMill-2-HiFeed90, LD__18 _____ | 314 |
| NeoMill-4-HiFeed90, SD__06 _____ | 320 |
| NeoMill-4-HiFeed90, SD__10 _____ | 322 |
| NeoMill-4-HiFeed90, SD__14 _____ | 324 |
| NeoMill-4-HiFeed90, SD__18 _____ | 325 |

Accessories and spare parts

| | |
|---|-----|
| Accessories for indexable inserts _____ | 384 |
| Allocating milling cutter clamping screws _____ | 386 |

Technical appendix

| | |
|--|-----|
| Cutting data recommendations _____ | 330 |
| Handling notes Milling cutter clamping screw _____ | 412 |

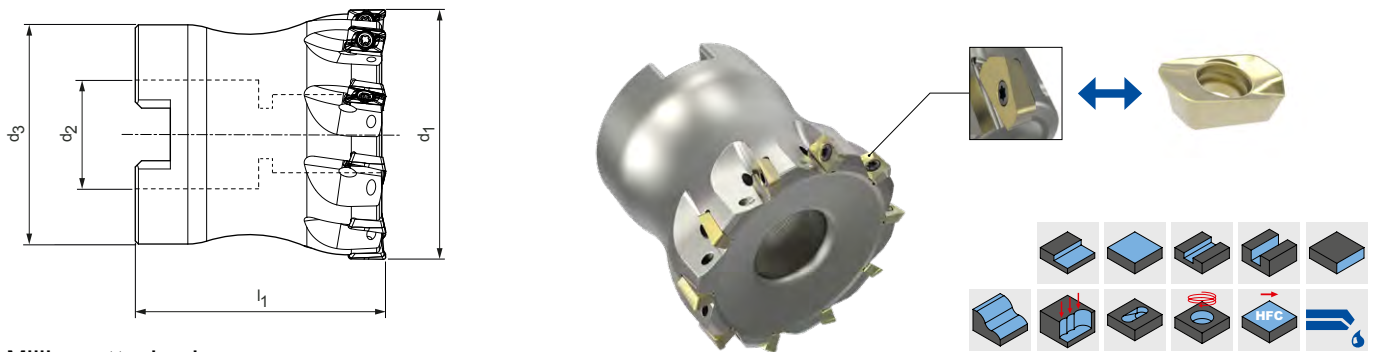
NeoMill®-2-HiFeed90

High-feed and 90° shoulder milling cutter
LP_06



End milling cutter






| Dimensions | | | | Z_{eff} | a_p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-----------|------------|-----|-------------|------------------|-------------------------------|-----------|
| d_1 | d_2 | l_1 | l_2 | | 90° | HFC | | | | |
| 10 | 10 | 80 | 28 | 2 | 5,2 | 0,7 | 0,04 | ✓ | IMH901-010-080-HA10-Z2R-LP_06 | 31146637 |
| 12 | 12 | 80 | 30 | 3 | 5,2 | 0,7 | 0,06 | ✓ | IMH901-012-080-HA12-Z3R-LP_06 | 31146638 |
| 16 | 16 | 85 | 35 | 4 | 5,2 | 0,7 | 0,11 | ✓ | IMH901-016-085-HB16-Z4R-LP_06 | 31146639 |
| 20 | 20 | 90 | 40 | 5 | 5,2 | 0,7 | 0,18 | ✓ | IMH901-020-090-HB20-Z5R-LP_06 | 31146640 |
| 25 | 25 | 106 | 50 | 7 | 5,2 | 0,7 | 0,34 | ✓ | IMH901-025-106-HB25-Z7R-LP_06 | 31146641 |




Milling cutter head

| Dimensions | | | | Z_{eff} | a_p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-----------|------------|-----|-------------|------------------|----------------------------|-----------|
| d_1 | d_2 | d_3 | l_1 | | 90° | HFC | | | | |
| 32 | 16 | 25 | 40 | 8 | 5,2 | 0,7 | 0,11 | ✓ | IMH901-032-CA16-Z08R-LP_06 | 31146643 |
| 40 | 16 | 35 | 40 | 10 | 5,2 | 0,7 | 0,23 | ✓ | IMH901-040-CA16-Z10R-LP_06 | 31146644 |
| 50 | 22 | 43 | 40 | 11 | 5,2 | 0,7 | 0,35 | ✓ | IMH901-050-CA22-Z11R-LP_06 | 31146645 |

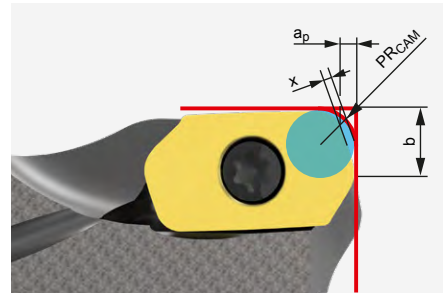
Accessories

| | | | |
|---|----------|---|----------|
|  | LP__0602 | Indexable insert 90° | Page 318 |
|  | LP__0602 | Indexable insert HFC | Page 316 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

| | | | |
|---|----------|--|-----------|
|  | LP__0602 | Clamping screw for indexable insert M1.8X4.09-TX6-IP | Order no. |
| | | | 31164571 |

CAM programming note



When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

LP__06

| Dimensions [mm] | | | |
|-----------------|-------|-----|-----|
| PR_{CAM} | a_p | x | b |
| 1,2 | 0,7 | 0,2 | 1,4 |

*Included in scope of delivery.

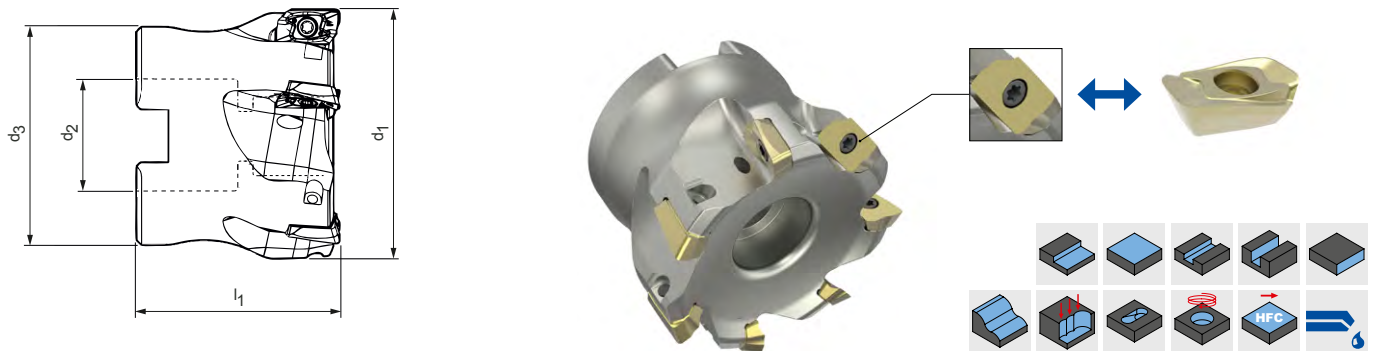
NeoMill®-2-HiFeed90

High-feed and 90° shoulder milling cutter
LD__10



End milling cutter

| Dimensions | | | | Z _{eff} | a _p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-----|-------------|------------------|--------------------------------|-----------|
| d ₁ | d ₂ | l ₁ | l ₂ | | 90° | HFC | | | | |
| 16 | 16 | 85 | 37 | 2 | 9 | 1,4 | 0,10 | ✓ | IMH901-016-085-HB16-Z2R-LD__10 | 31144149* |
| 20 | 20 | 90 | 40 | 2 | 9 | 1,4 | 0,17 | ✓ | IMH901-020-090-HB20-Z2R-LD__10 | 31144159* |
| 20 | 20 | 90 | 40 | 3 | 9 | 1,4 | 0,17 | ✓ | IMH901-020-090-HB20-Z3R-LD__10 | 31144151 |
| 25 | 25 | 106 | 50 | 3 | 9 | 1,4 | 0,32 | ✓ | IMH901-025-106-HB25-Z3R-LD__10 | 31144152 |
| 25 | 25 | 106 | 50 | 4 | 9 | 1,4 | 0,32 | ✓ | IMH901-025-106-HB25-Z4R-LD__10 | 31144153 |
| 32 | 32 | 124 | 64 | 3 | 9 | 1,4 | 0,65 | ✓ | IMH901-032-124-HB32-Z3R-LD__10 | 31144154 |
| 32 | 32 | 124 | 64 | 5 | 9 | 1,4 | 0,64 | ✓ | IMH901-032-124-HB32-Z5R-LD__10 | 31144155 |








Milling cutter head

| Dimensions | | | | Z _{eff} | a _p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-----|-------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | | 90° | HFC | | | | |
| 40 | 16 | 35 | 40 | 4 | 9 | 1,4 | 0,19 | ✓ | IMH901-040-CA16-Z04R-LD__10 | 31144049 |
| 40 | 16 | 35 | 40 | 6 | 9 | 1,4 | 0,19 | ✓ | IMH901-040-CA16-Z06R-LD__10 | 31144050 |
| 50 | 22 | 43 | 40 | 5 | 9 | 1,4 | 0,29 | ✓ | IMH901-050-CA22-Z05R-LD__10 | 31144051 |
| 50 | 22 | 43 | 40 | 7 | 9 | 1,4 | 0,29 | ✓ | IMH901-050-CA22-Z07R-LD__10 | 31144052 |
| 63 | 22 | 48 | 40 | 6 | 9 | 1,4 | 0,48 | ✓ | IMH901-063-CA22-Z06R-LD__10 | 31144053 |
| 63 | 22 | 48 | 40 | 8 | 9 | 1,4 | 0,46 | ✓ | IMH901-063-CA22-Z08R-LD__10 | 31144054 |
| 80 | 27 | 60 | 50 | 10 | 9 | 1,4 | 0,92 | ✓ | IMH901-080-CA27-Z10R-LD__10 | 31144055 |


Dimensions in mm.

* Use with clamping screw M2.5X5.9

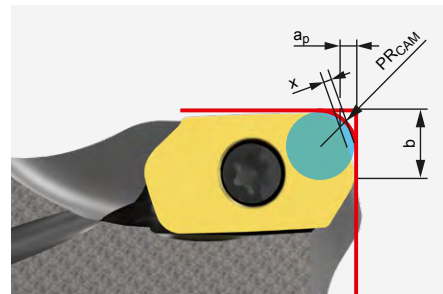
Accessories

| | | | |
|---|----------|---|----------|
|  | LD__1004 | Indexable insert 90° | Page 318 |
|  | LD__1004 | Indexable insert HFC | Page 316 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts**

| | | | |
|---|----------|-------------------------------------|-----------|
|  | | Clamping screw for indexable insert | Order no. |
| | *** | M2.5X5.9-TX8-IP | 31161842 |
| | LD__1004 | M2.5X6.8-TX8-IP | 31161843 |

CAM programming note



When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

LD__10

| Dimensions [mm] | | | |
|-----------------|-------|-----|------|
| PR_{CAM} | a_p | x | b |
| 2,2 | 1,4 | 0,4 | 3,52 |

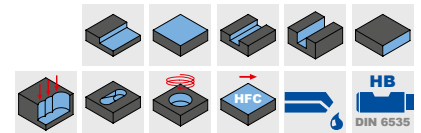
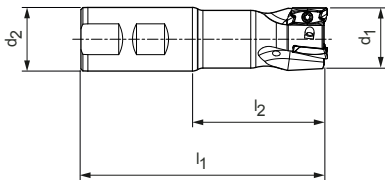
** Included in scope of delivery.

*** Use the order numbers marked with *.

NeoMill[®]-2-HiFeed90

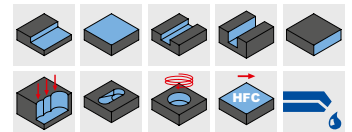
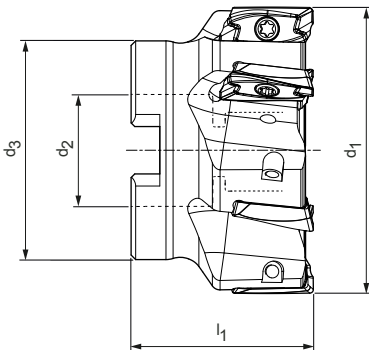
90° shoulder milling cutter

LD__18



End milling cutter





| Dimensions | | | | Z_{eff} | a_p max. | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|--------------------------------|-----------|
| d_1 | d_2 | l_1 | l_2 | | | | | | |
| 25 | 25 | 106 | 50 | 2 | 17 | 0,30 | ✓ | IMH901-025-106-HB25-Z2R-LD__18 | 31144161 |
| 32 | 32 | 124 | 64 | 3 | 17 | 0,61 | ✓ | IMH901-032-124-HB32-Z3R-LD__18 | 31144162 |
| 40 | 32 | 124 | 65 | 4 | 17 | 0,70 | ✓ | IMH901-040-130-HB32-Z4R-LD__18 | 31144163 |




Milling cutter head

| Dimensions | | | | Z_{eff} | a_p max. | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|-----------------------------|-----------|
| d_1 | d_2 | d_3 | l_1 | | | | | | |
| 40 | 16 | 35 | 40 | 4 | 17 | 0,16 | ✓ | IMH901-040-CA16-Z04R-LD__18 | 31144077 |
| 50 | 22 | 43 | 40 | 5 | 17 | 0,27 | ✓ | IMH901-050-CA22-Z05R-LD__18 | 31144074 |
| 52 | 22 | 43 | 40 | 5 | 17 | 0,28 | ✓ | IMH901-052-CA22-Z05R-LD__18 | 31144078 |
| 63 | 22 | 48 | 40 | 5 | 17 | 0,43 | ✓ | IMH901-063-CA22-Z05R-LD__18 | 31144079 |
| 66 | 22 | 48 | 40 | 6 | 17 | 0,51 | ✓ | IMH901-066-CA22-Z06R-LD__18 | 31144080 |
| 80 | 27 | 60 | 50 | 7 | 17 | 0,85 | ✓ | IMH901-080-CA27-Z07R-LD__18 | 31144081 |
| 100 | 32 | 78 | 50 | 8 | 17 | 1,49 | ✓ | IMH901-100-CA32-Z08R-LD__18 | 31144082 |
| 125 | 40 | 90 | 60 | 9 | 17 | 2,79 | ✓ | IMH901-125-CA40-Z09R-LD__18 | 31144083 |
| 160 | 40 | 115 | 60 | 10 | 17 | 3,65 | - | IMH900-160-CA40-Z10R-LD__18 | 31144084 |

Accessories

| | | | |
|---|----------|---|----------|
|  | LD__1805 | Indexable insert 90° | Page 318 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

| | | | |
|---|----------|---|-----------------------|
|  | LD__1805 | Clamping screw for indexable insert M3.5X10-TX15-IP | Order no. 30870699 |
|---|----------|---|-----------------------|

* Included in scope of delivery.

LPMX – LDMX

Radial indexable insert, double edge



For high-feed machining

| | Carbide | | | | | |
|-----------------------|-----------------------------------|-------------------------------|----------------------------------|-------------------------------|-----------------------------------|--------------------------------|
| Workpiece material | P | | | M | | |
| | Unalloyed ← Wear-resistant | Alloyed → Tough/Ductile | Unalloyed ← Wear-resistant | Alloyed → Tough/Ductile | Austenitic ← Wear-resistant | Ferritic → Tough/Ductile |
| Coating | PVD | | CVD | | PVD | |
| Cutting material type | HP635 | HP640 | HC530 | HC535 | HP650 | HP655 |
| Cutting edge design | PMS | PMS | PMS | | MQL | MQL |
| LPMX | a_p max. [mm] | | | | | |
| LPMX060210R- | 0.7 * | 31146693 | | 31146692 | | 31146694 |
| Cutting edge design | PMS | PMS | PMS | PMS | MQL | MQL |
| LDMX | a_p max. [mm] | | | | | |
| LDMX100415R- | 1.4 * | 31144267 | 31144268 | 31144265 | 31144266 | 31144263 31144264 |

Feed per tooth (selection according to cutting edge design)

| * MMG | Cutting edge design | LP_06 | | | | | | LD_10 | | | | | | | |
|----------|---------------------|-------|-----------------|------------|-----|------------|------------|-------|----|-----------------|------------|-----|------------|------------|-----|
| | | KV | a_p max. [mm] | | | f_z [mm] | | | KV | a_p max. [mm] | | | f_z [mm] | | |
| P | PMS | - | 0.2 | 0.4 | 0.7 | 0.2 | 0.5 | 0.8 | Δ+ | 0.4 | 0.9 | 1.4 | 0.6 | 1 | 1.5 |
| M | MQL | - | 0.2 | 0.4 | 0.7 | 0.2 | 0.4 | 0.7 | Δ+ | 0.4 | 0.9 | 1.4 | 0.5 | 0.9 | 1.3 |
| K | KMS | | | | | | | | Δ+ | 0.4 | 0.9 | 1.4 | 0.6 | 1.2 | 1.5 |
| H | HMS | - | 0.4 | 0.4 | 0.7 | 0.2 | 0.5 | 0.8 | Δ+ | 0.4 | 0.9 | 1.4 | 0.6 | 1.2 | 1.5 |

Legend: KV = edge rounding | - = not specified | Δ+ = bevelled and slightly rounded

* a_p max. depends on the type of milling cutter and application.

** MAPAL machining groups

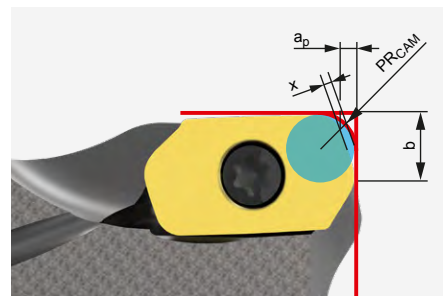
| Carbide | | | |
|----------|----------|----------|----------|
| K | | H | |
| PVD | CVD | PVD | CVD |
| HP630 | HC525 | HP320 | HC220 |
| | | HMS | HMS |
| | | 31146696 | 31146695 |
| KMS | KMS | HMS | HMS |
| 31144262 | 31144261 | 31146721 | 31146723 |

| Dimensions [mm] | | | | |
|-----------------|------|------|----------------|-----|
| | | | | |
| l | d | s | d ₁ | R |
| 0,7 | 3,64 | 2,15 | 2,05 | 1 |
| 1,5 | 6,6 | 4,76 | 2,8 | 1,5 |

Plunge angle | High-feed machining

| Diameter [mm] | Plunge angle [°] | |
|---------------|------------------|-------|
| | LP_06 | LD_10 |
| 10 | 6.3 | - |
| 12 | 4.5 | - |
| 16 | 3.5 | 8.8 |
| 18 | 3 | - |
| 20 | 1.8 | 6.1 |
| 25 | 1.5 | 4.4 |
| 32 | 1.1 | 3.2 |
| 40 | 0.8 | 2.4 |
| 50 | 0.6 | 1.9 |
| 63 | - | 1.4 |
| 80 | - | 1.1 |

CAM programming note



When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

| Dimensions [mm] | | | | |
|-----------------|------------|-------|-----|------|
| | PR_{CAM} | a_p | x | b |
| LP_06 | 1,2 | 0,7 | 0,2 | 1,4 |
| LD_10 | 2,2 | 1,4 | 0,4 | 3,52 |

LPMX – LDGX – LDMX – LDHX

Radial indexable insert, double edge



For 90° machining

| | | Carbide | | | | | |
|-----------------------|--------------------------------|-----------|-----|----------|---------|----------|-----|
| Workpiece material | P | Alloyed | | | | | |
| | | Unalloyed | | | Alloyed | | |
| Coating | | PVD | | | | | |
| Cutting material type | | HP635 | | HP640 | | HP645 | |
| Cutting edge design | | PMU | | PMU | | | |
| LPMX | a_p max. [mm] | | | | | | |
| LPMX060204R- | 5.2 * | 31146697 | | 31146698 | | | |
| Cutting edge design | | | | | | | |
| LDGX | a_p max. [mm] | | | | | | |
| LDGX180508R- | 17 * | | | | | | |
| Cutting edge design | | PMU | PRU | PMU | PRU | PMU | PRU |
| LDMX | a_p max. [mm] | | | | | | |
| LDMX100404R- | 9 * | 31146722 | | 31146724 | | | |
| LDMX100408R- | 9 * | 31144258 | | 31144259 | | 31144260 | |
| LDMX100420R- | 9 * | 31144269 | | 31144270 | | | |
| LDMX100430R- | 9 * | 31144271 | | 31144272 | | | |
| LDMX180508R- | 17 * | 31144276 | | 31144277 | | 31144278 | |
| LDMX180512R- | 17 * | | | 31144280 | | 31144281 | |
| LDMX180516R- | 17 * | | | 31146720 | | 31146719 | |
| Cutting edge design | | | | | | | |
| LDHX | a_p max. [mm] | | | | | | |
| LDHX100404R- | 9 * | | | | | | |
| LDHX100408R- | 9 * | | | | | | |

Feed per tooth (selection according to cutting edge design)

| * MMG | Cutting edge design | LP_06 | | | | | LD_10 | | | | | LD_18 | | | | | | | | | | |
|----------|---------------------|-------|--------------------------|---|---------------------|------|-------------|--------------------------|----|---------------------|----------|-------|--------------------------|-------------|---------------------|----|---|----------|----|------|-------------|------|
| | | KV | a _p max. [mm] | | f _z [mm] | | KV | a _p max. [mm] | | f _z [mm] | | KV | a _p max. [mm] | | f _z [mm] | | | | | | | |
| P | PMU | - | 0.5 | 2 | 5.2 | 0.1 | 0.13 | 0.17 | Δ+ | 1 | 3 | 9 | 0.1 | 0.18 | 0.25 | Δ+ | 1 | 6 | 17 | 0.1 | 0.19 | 0.25 |
| | PRU | | | | | | | | | | | | | | | Δ+ | 1 | 6 | 17 | 0.15 | 0.22 | 0.8 |
| M | MMU | - | 0.5 | 2 | 5.2 | 0.08 | 0.1 | 0.15 | Δ+ | 1 | 3 | 9 | 0.1 | 0.15 | 0.2 | Δ+ | 1 | 6 | 17 | 0.1 | 0.15 | 0.22 |
| K | KMU | | | | | | | | Δ+ | 1 | 3 | 9 | 0.15 | 0.2 | 0.27 | Δ+ | 1 | 6 | 17 | 0.15 | 0.21 | 0.26 |
| | KRU | | | | | | | | | | | | | | | Δ+ | 1 | 6 | 17 | 0.15 | 0.24 | 0.3 |
| N | NMU | | | | | | | | 0 | 1 | 3 | 9 | 0.1 | 0.14 | 0.26 | 0 | 1 | 6 | 17 | 0.1 | 0.14 | 0.26 |

Legend: KV = edge rounding | - = not specified | 0 = sharp edged | Δ+ = bevelled and slightly rounded

* a_p max. depends on the type of milling cutter and application.

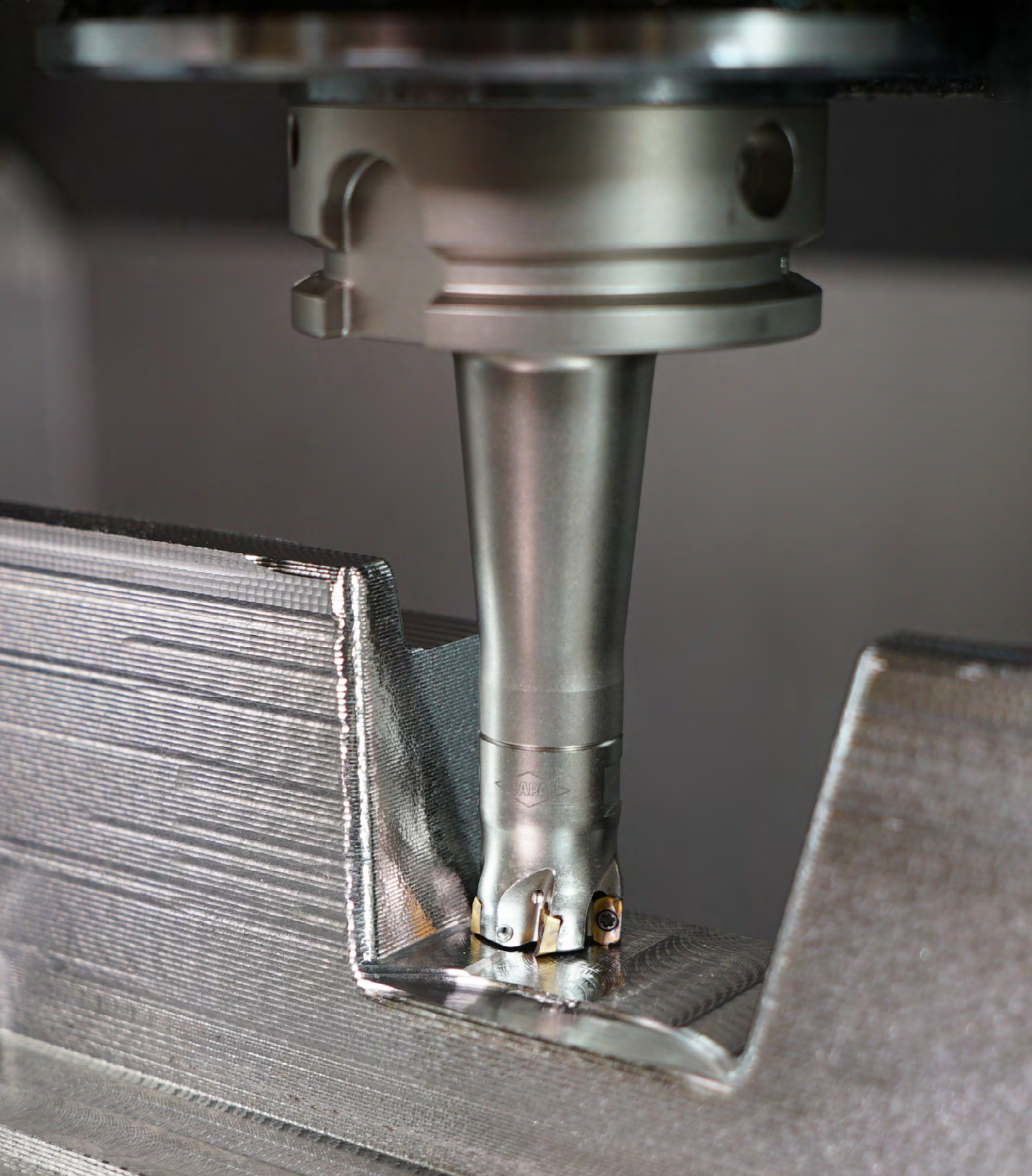
** MAPAL machining groups

| Carbide | | | | | |
|------------------|-----------------|------------------|-----------------|----------|----------|
| M | | K | | N | |
| Austenitic | Ferritic | GJL | GJS | | |
| ← Wear-resistant | → Tough/Ductile | ← Wear-resistant | → Tough/Ductile | | |
| PVD | | PVD | | Uncoated | PVD |
| HP650 | HP655 | HP630 | | HU110 | HP110 |
| MMU | | | | | |
| 31146699 | | | | | |
| | | | | NMU | NMU |
| | | | | 31144411 | 31144254 |
| MMU | MMU | KMU | KRU | | |
| 31146690 | 31146691 | | | | |
| 31144256 | 31144257 | 31144255 | | | |
| | | | | | |
| 31144274 | 31144275 | 31144273 | | | |
| 31146715 | 31146717 | | 31144279 | | |
| 31146716 | 31146718 | | | | |
| | | | | NMU | NMU |
| | | | | 31144409 | 31144252 |
| | | | | 31144410 | 31144253 |

| Dimensions [mm] | | | | |
|-----------------|------|------|----------------|-----|
| | | | | |
| l | d | s | d ₁ | R |
| 6 | 3,64 | 2,15 | 2,05 | 0,4 |
| 18 | 9,65 | 5 | 4,15 | 0,8 |
| 10 | 6,6 | 4,76 | 2,8 | 0,4 |
| 10 | 6,6 | 4,76 | 2,8 | 0,8 |
| 10 | 6,6 | 4,76 | 2,8 | 2 |
| 10 | 6,6 | 4,76 | 2,8 | 3 |
| 18 | 9,65 | 5 | 4,15 | 0,8 |
| 18 | 9,65 | 5 | 4,15 | 1,2 |
| 18 | 9,65 | 5 | 4,15 | 1,6 |
| 10 | 6,6 | 4,76 | 2,8 | 0,4 |
| 10 | 6,6 | 4,76 | 2,8 | 0,8 |

Plunge angle | 90° machining

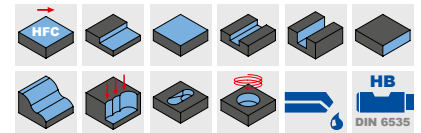
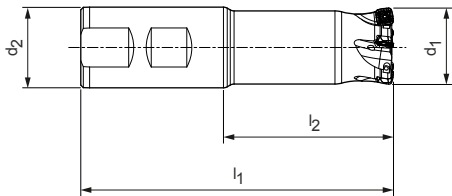
| Diameter [mm] | Plunge angle [°] | | |
|---------------|------------------|-------|-------|
| | LP_06 | LD_10 | LD_18 |
| 10 | 8.4 | - | - |
| 12 | 6.3 | - | - |
| 16 | 5 | 18 | - |
| 18 | 3.5 | - | - |
| 20 | 2.3 | 12.2 | - |
| 25 | 1.8 | 8.7 | - |
| 32 | 1.3 | 6.2 | - |
| 40 | 1 | 4.6 | 5 |
| 50 | 0.8 | 3.5 | 4 |
| 52 | - | - | 3.8 |
| 63 | - | 2.7 | 3.18 |
| 66 | - | - | 2.9 |
| 80 | - | 2.1 | 2.51 |
| 100 | - | - | 2 |
| 125 | - | - | 1.6 |
| 160 | - | - | 1.25 |



Screw-in milling cutters and other products for Die & Mould sector you will find under: die-mould.mapal.com

NeoMill®-4-HiFeed90



High-feed milling cutter
SD__06




End milling cutter

| Dimensions | | | | Z_{eff} | a_p max. | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|------------------|------------|-------------|------------------|--------------------------------|-----------|
| d_1 | d_2 | l_1 | l_2 | | | | | | |
| 16 | 16 | 85 | 37 | 2 | 1 | 0,10 | ✓ | IMH901-016-085-HB16-Z2R-SD__06 | 31146632 |
| 20 | 20 | 90 | 40 | 3 | 1 | 0,17 | ✓ | IMH901-020-090-HB20-Z3R-SD__06 | 31146633 |
| 25 | 25 | 106 | 50 | 4 | 1 | 0,33 | ✓ | IMH901-025-106-HB25-Z4R-SD__06 | 31146634 |
| 32 | 32 | 124 | 64 | 5 | 1 | 0,66 | ✓ | IMH901-032-124-HB32-Z5R-SD__06 | 31146635 |
| 35 | 32 | 124 | 64 | 5 | 1 | 0,67 | ✓ | IMH901-035-124-HB35-Z5R-SD__06 | 31146636 |

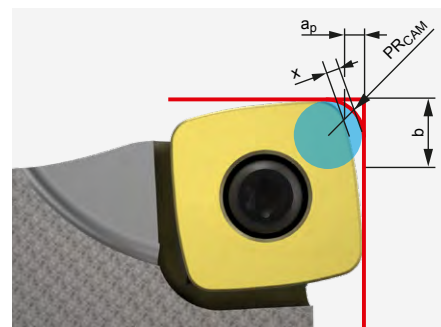
Accessories

| | | | |
|---|----------|---|----------|
|  | SD__0602 | Indexable insert HFC | Page 326 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

| | | | |
|---|----------|---|-----------------------|
|  | SD__0602 | Clamping screw for indexable insert M2.2X5.2-TX7-IP | Order no. 31161853 |
|---|----------|---|-----------------------|

CAM programming note



When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

SD__06

| Dimensions | | | |
|-------------------|-------|------|------|
| PR_{CAM} | a_p | x | b |
| 1,77 | 1,0 | 0,45 | 5,12 |

Dimensions in mm.

* Included in scope of delivery.

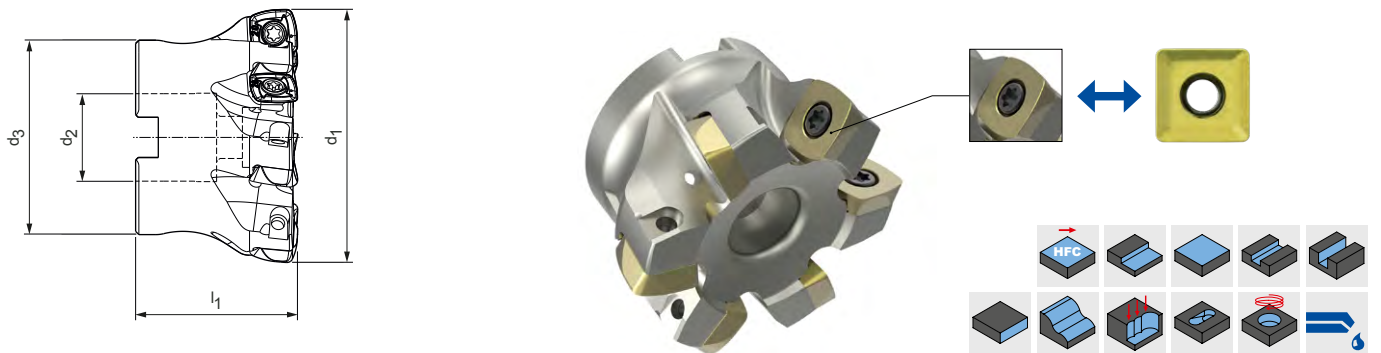
NeoMill®-4-HiFeed90

High-feed and 90° shoulder milling cutter
SD__10



End milling cutter






| Dimensions | | | | Z _{eff} | a _p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-----|-------------|------------------|--------------------------------|-----------|
| d ₁ | d ₂ | l ₁ | l ₂ | | 90° | HFC | | | | |
| 25 | 25 | 106 | 50 | 2 | 9 | 1,5 | 0,31 | ✓ | IMH901-025-106-HB25-Z2R-SD__10 | 31144156 |
| 25 | 25 | 106 | 50 | 3 | 9 | 1,5 | 0,30 | ✓ | IMH901-025-106-HB25-Z3R-SD__10 | 31144157 |
| 32 | 32 | 124 | 64 | 3 | 9 | 1,5 | 0,64 | ✓ | IMH901-032-124-HB32-Z3R-SD__10 | 31144158 |




Milling cutter head

| Dimensions | | | | Z _{eff} | a _p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-----|-------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | | 90° | HFC | | | | |
| 40 | 16 | 35 | 40 | 4 | 9 | 1,5 | 0,17 | ✓ | IMH901-040-CA16-Z04R-SD__10 | 31144056 |
| 40 | 16 | 35 | 40 | 6 | 9 | 1,5 | 0,17 | ✓ | IMH901-040-CA16-Z06R-SD__10 | 31144057 |
| 50 | 22 | 43 | 40 | 5 | 9 | 1,5 | 0,26 | ✓ | IMH901-050-CA22-Z05R-SD__10 | 31144059 |
| 50 | 22 | 43 | 40 | 7 | 9 | 1,5 | 0,25 | ✓ | IMH901-050-CA22-Z07R-SD__10 | 31144060 |
| 52 | 22 | 43 | 40 | 5 | 9 | 1,5 | 0,30 | ✓ | IMH901-052-CA22-Z05R-SD__10 | 31144061 |
| 63 | 22 | 48 | 40 | 6 | 9 | 1,5 | 0,42 | ✓ | IMH901-063-CA22-Z06R-SD__10 | 31144062 |
| 63 | 22 | 48 | 40 | 8 | 9 | 1,5 | 0,42 | ✓ | IMH901-063-CA22-Z08R-SD__10 | 31144063 |
| 66 | 22 | 48 | 40 | 5 | 9 | 1,5 | 0,46 | ✓ | IMH901-066-CA22-Z05R-SD__10 | 31144085 |
| 80 | 27 | 60 | 50 | 8 | 9 | 1,5 | 0,91 | ✓ | IMH901-080-CA27-Z08R-SD__10 | 31144064 |

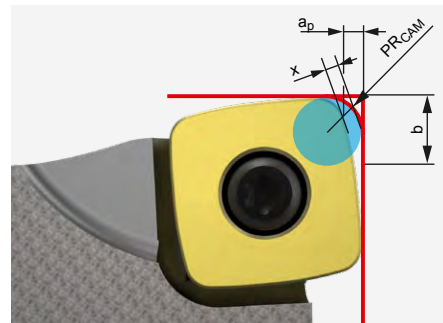
Accessories

| | | | |
|---|----------|---|----------|
|  | SD__1004 | Indexable insert 90° | Page 328 |
|  | SD__1004 | Indexable insert HFC | Page 326 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

| | | | |
|---|----------|---|-----------|
|  | SD__1004 | Clamping screw for indexable insert M3X8.3-TX9-IP | Order no. |
| | | | 31161852 |

CAM programming note



When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

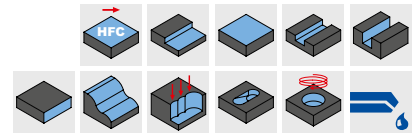
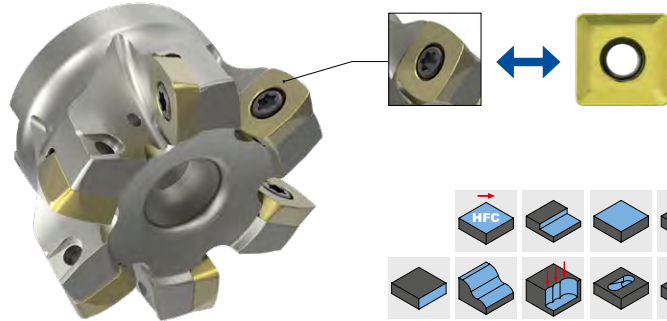
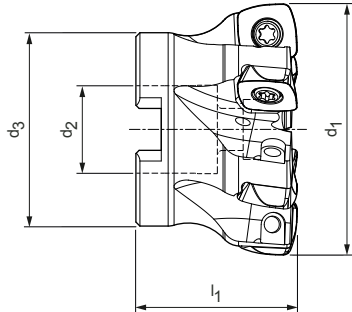
SD__10

| Dimensions [mm] | | | |
|-----------------|-------|------|-------|
| PR_{CAM} | a_p | x | b |
| 2,25 | 1,5 | 0,62 | 8,033 |

* Included in scope of delivery.

NeoMill®-4-HiFeed90

High-feed and 90° shoulder milling cutter
SD__14



Milling cutter head

| Dimensions | | | | Z _{eff} | a _p max. | | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|---------------------|-----|-------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | | 90° | HFC | | | | |
| 50 | 22 | 43 | 40 | 5 | 12,5 | 2,4 | 0,22 | ✓ | IMH901-050-CA22-Z05R-SD__14 | 31144065 |
| 52 | 22 | 43 | 40 | 5 | 12,5 | 2,4 | 0,28 | ✓ | IMH901-052-CA22-Z05R-SD__14 | 31144067 |
| 63 | 22 | 48 | 40 | 6 | 12,5 | 2,4 | 0,38 | ✓ | IMH901-063-CA22-Z06R-SD__14 | 31144068 |
| 66 | 22 | 48 | 40 | 6 | 12 | 2,5 | 0,43 | ✓ | IMH901-066-CA22-Z06R-SD__14 | 31144069 |
| 80 | 27 | 60 | 50 | 7 | 12,5 | 2,4 | 0,85 | ✓ | IMH901-080-CA27-Z07R-SD__14 | 31144070 |
| 100 | 32 | 78 | 50 | 7 | 12,5 | 2,4 | 1,49 | ✓ | IMH901-100-CA32-Z07R-SD__14 | 31144071 |
| 100 | 32 | 78 | 50 | 9 | 12,5 | 2,4 | 1,49 | ✓ | IMH901-100-CA32-Z09R-SD__14 | 31144072 |
| 125 | 40 | 90 | 60 | 11 | 12,5 | 2,4 | 2,79 | ✓ | IMH901-125-CA40-Z11R-SD__14 | 31144073 |

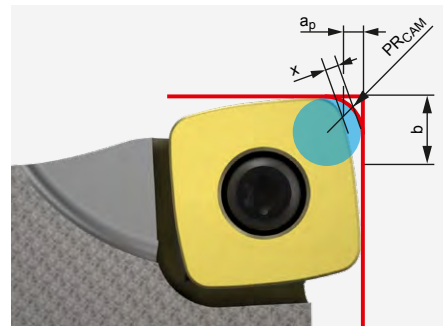
Accessories

| | | | |
|--|----------|---|----------|
| | SD__1405 | Indexable insert 90° | Page 328 |
| | SD__1405 | Indexable insert HFC | Page 326 |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|--|----------|---|-----------------------|
| | SD__1405 | Clamping screw for indexable insert M5X10.8-TX20-IP | Order no. 31161851 |
|--|----------|---|-----------------------|

CAM programming note



When using an HFC indexable insert, the programme radius P_{RCAM} must be observed.

SD__14

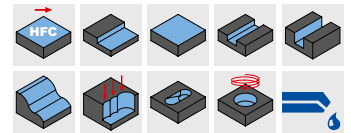
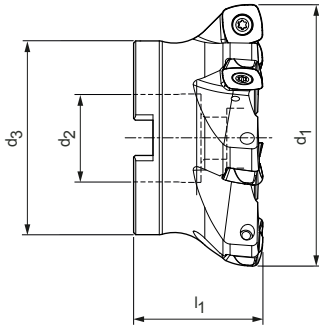
| Dimensions [mm] | | | |
|-------------------|----------------|------|--------|
| P _{RCAM} | a _p | x | b |
| 3,45 | 2,4 | 0,93 | 10,868 |

Dimensions in mm.

* Included in scope of delivery.

NeoMill®-4-HiFeed90




High-feed milling cutter
SD__18




Milling cutter head

| Dimensions | | | | Z_{eff} | a_p max. | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|-----------------------------|-----------|
| d_1 | d_2 | d_3 | l_1 | | | | | | |
| 80 | 27 | 60 | 50 | 5 | 3,5 | 0,79 | ✓ | IMH901-080-CA27-Z05R-SD__18 | 31144075 |
| 100 | 32 | 78 | 50 | 6 | 3,5 | 1,49 | ✓ | IMH901-100-CA32-Z06R-SD__18 | 31144087 |
| 125 | 40 | 90 | 60 | 7 | 3,5 | 2,43 | ✓ | IMH901-125-CA40-Z07R-SD__18 | 31144088 |
| 160 | 40 | 115 | 60 | 9 | 3,5 | 4,09 | - | IMH900-160-CA40-Z09R-SD__18 | 31144089 |
| 200 | 60 | 140 | 65 | 11 | 3,5 | 5,83 | - | IMH900-200-CA60-Z11R-SD__18 | 31144090 |

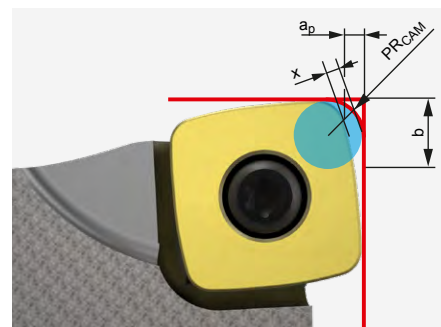
Accessories

| | | | |
|---|----------|---|----------|
|  | SD__1806 | Indexable insert HFC | Page 326 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|----------|---|-----------------------|
|  | SD__1806 | Clamping screw for indexable insert M6X15-T25 | Order no. 31161862 |
|---|----------|---|-----------------------|

CAM programming note



When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

SD__18

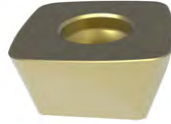
| Dimensions [mm] | | | |
|-----------------|-------|------|-------|
| PR_{CAM} | a_p | x | b |
| 4,82 | 3,5 | 1,24 | 13,77 |

Dimensions in mm.

* Included in scope of delivery.

SDMT – SDMW

Radial indexable insert, four cutting edges



For high-feed machining

| | Carbide | | | | |
|-----------------------|-------------------------------|-------|----------------------------|-------|-------------------------------|
| Workpiece material | P | | | | |
| | Unalloyed ← Wear-resistant | | Alloyed → Tough/Ductile | | Unalloyed ← Wear-resistant |
| Coating | PVD | | | CVD | |
| Cutting material type | HP635 | HP640 | HP645 | HC530 | HC535 |
| Cutting edge design | PMS | PMS | | PMS | PMS |

| SDMT | a _p max. [mm] | | | | | |
|--------------|--------------------------|----------|----------|--|----------|----------|
| SDMT060212R- | 1 * | 31144355 | | | | |
| SDMT100415R- | 1.5 * | 31144367 | 31144368 | | 31144365 | 31144366 |
| SDMT140520R- | 2.4 * | 31144380 | 31144381 | | 31144378 | 31144379 |
| SDMT180630R- | 3.5 * | 31144384 | 31144385 | | | |

| Cutting edge design | PRS | PRS | PRS | PRS | PRS | |
|---------------------|--------------------------|----------|----------|----------|----------|----------|
| SDMW | a _p max. [mm] | | | | | |
| SDMW100415R- | 1.5 * | 31144393 | 31144394 | | 31144391 | 31144392 |
| SDMW140520R- | 2.4 * | 31144402 | 31144403 | | 31144400 | 31144401 |
| SDMW180630R- | 3.5 * | | 31144407 | 31144408 | | |

Feed per tooth (selection according to cutting edge design) and plunge angle

| * MMG | Cutting edge design | SD_06 | | | SD_10 | | | SD_14 | | | SD_18 | | |
|-------|---------------------|-------|--------------------------|---------------------|-------|--------------------------|---------------------|-------|--------------------------|---------------------|-------|--------------------------|---------------------|
| | | KV | a _p max. [mm] | f _z [mm] | KV | a _p max. [mm] | f _z [mm] | KV | a _p max. [mm] | f _z [mm] | KV | a _p max. [mm] | f _z [mm] |
| P | PMS | - | 0.3 0.5 1 | 0.4 0.6 1.1 | Δ+ | 0.5 0.8 1.3 | 0.6 1 1.4 | Δ+ | 0.6 1.2 2.2 | 0.7 1.4 2.2 | Δ+ | 1 2.2 3.2 | 1.2 1.8 2.8 |
| | PRS | | | | Δ+ | 0.5 1 1.5 | 0.7 1.1 1.6 | Δ+ | 0.7 1.5 2.4 | 0.8 1.6 2.4 | Δ+ | 1 2.5 3.5 | 1.4 2.2 3 |
| M | MQL | - | 0.3 0.5 1 | 0.3 0.5 1 | + | 0.5 0.8 1.3 | 0.5 0.9 1.4 | + | 0.6 1.2 2.2 | 0.8 1.2 2.2 | Δ+ | 1 2 3 | 1 1.6 2.5 |
| K | KRS | | | | Δ+ | 0.5 1 1.5 | 0.7 1.2 1.6 | Δ+ | 0.7 1.6 2.4 | 0.8 1.7 2.4 | Δ+ | 1 2.8 3.5 | 1.4 2.5 3 |
| H | HMS | - | 0.3 0.5 1 | 0.4 0.6 1.1 | | | | | 0.4 1.2 2.2 | 0.4 1.2 2.2 | | | |
| | HRS | | | | Δ+ | 0.4 0.8 1.2 | 0.4 1.1 1.6 | Δ+ | 0.5 1.5 2.4 | 0.5 1.6 2.4 | Δ+ | 1 2.2 3.5 | 0.8 1.8 2.8 |

Legend: KV = edge rounding | - = not specified | + = slightly rounded | Δ+ = bevelled and slightly rounded

* a_p max. depends on the type of milling cutter and application.

** MAPAL machining groups

| Carbide | | | | | | |
|----------------|-------|---------------|-------|----------------|-------|-------|
| M | | K | | H | | |
| Austenitic | | Ferritic | | ≥ 65 HRC | | |
| Wear-resistant | | Tough/Ductile | | Wear-resistant | | |
| PVD | | PVD | CVD | PVD | | CVD |
| HP650 | HP655 | HP630 | HC525 | HP320 | HP325 | HC220 |
| MQL | MQL | | | HMS | HMS | |

| Dimensions [mm] | | | | |
|-----------------|---|---|----------------|---|
| | | | | |
| l | d | s | d ₁ | R |

| | | | | | |
|----------|----------|--|--|----------|----------|
| 31144354 | | | | 31144353 | |
| 31144363 | 31144364 | | | 31144362 | 31146714 |
| 31144376 | 31144377 | | | 31144375 | |
| 31144382 | 31144383 | | | | |

| | | | | |
|-----|------|------|-----|-----|
| 1 | 6,75 | 2,5 | 2,5 | 1,2 |
| 1,1 | 10,2 | 4,86 | 3,5 | 1,5 |
| 2,2 | 14,7 | 5 | 5,5 | 2 |
| 3 | 18,7 | 6 | 6,5 | 3 |

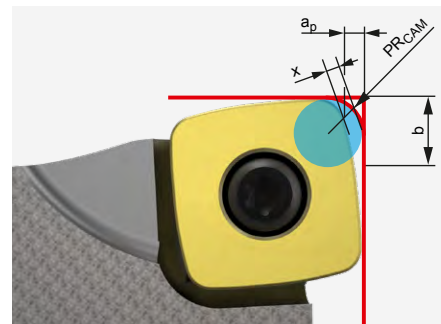
| | | | | | | |
|--|--|----------|----------|----------|----------|----------|
| | | KRS | KRS | HRS | HRS | HRS |
| | | 31144390 | 31144389 | 31144387 | 31144388 | 31144386 |
| | | 31144399 | 31144398 | 31144396 | 31144397 | 31144395 |
| | | 31144406 | 31144405 | | 31144404 | |

| | | | | |
|-----|------|------|-----|-----|
| 1,1 | 10,2 | 4,86 | 3,5 | 1,5 |
| 2,2 | 14,7 | 5 | 5,5 | 2 |
| 3 | 18,7 | 6 | 6,5 | 3 |

Plunge angle | High-feed machining

| Diameter [mm] | Plunge angle [°] | | | |
|---------------|------------------|--------|--------|--------|
| | SDM_06 | SDM_10 | SDM_14 | SDM_18 |
| 16 | 9 | - | - | - |
| 20 | 4.8 | - | - | - |
| 25 | 3 | 4.4 | - | - |
| 32 | 2 | 2.9 | - | - |
| 35 | 1.7 | - | - | - |
| 40 | - | 2 | - | - |
| 50 | - | 1.5 | 2.4 | - |
| 52 | - | 1.3 | 2.2 | - |
| 63 | - | 1.1 | 1.7 | - |
| 66 | - | 1 | 1.5 | - |
| 80 | - | 0.8 | 1.3 | 2.5 |
| 100 | - | 0.7 | 1 | 2 |
| 125 | - | 0.5 | 0.7 | 1.6 |
| 160 | - | - | - | 1.3 |
| 200 | - | - | - | 1 |

CAM programming note

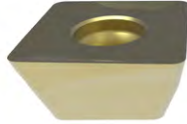


When using an HFC indexable insert, the programme radius PR_{CAM} must be observed.

| | Dimensions [mm] | | | |
|-------|-----------------|-------|------|--------|
| | PR_{CAM} | a_p | x | b |
| SD_06 | 1,77 | 1,0 | 0,45 | 5,12 |
| SD_10 | 2,25 | 1,5 | 0,62 | 8,033 |
| SD_14 | 3,45 | 2,4 | 0,93 | 10,868 |
| SD_18 | 4,82 | 3,5 | 1,24 | 13,77 |

SDHT – SDMT

Radial indexable insert, four cutting edges



For 90° machining

| | | | |
|-----------------------|-------------------------------|-------|----------------------------|
| | Carbide | | |
| Workpiece material | P | | |
| | Unalloyed ← Wear-resistant | | Alloyed → Tough/Ductile |
| Coating | PVD | | |
| Cutting material type | HP635 | HP640 | HP645 |
| Cutting edge design | | | |

| SDHT | a_p max. [mm] | | | |
|--------------|-----------------|--|--|--|
| SDHT100404R- | 9 * | | | |
| SDHT100408R- | 9 * | | | |
| SDHT140508R- | 12.5 * | | | |
| SDHT140512R- | 12.5 * | | | |

| Cutting edge design | | PMU | PMU | PMU |
|---------------------|-----------------|----------|----------|----------|
| SDMT | a_p max. [mm] | | | |
| SDMT100408R- | 9 * | 31144359 | 31144360 | 31144361 |
| SDMT140512R- | 12.5 * | 31144372 | 31144373 | 31144374 |

Feed per tooth (selection according to cutting edge design)

| * MMG | Cutting edge design | SD_10 | | | | | | SD_14 | | | | | | | |
|----------|---------------------|-------|-----------------|----------|---|------------|-------------|-------|-----------------|-----|----------|------------|------|-------------|------|
| | | KV | a_p max. [mm] | | | f_z [mm] | | KV | a_p max. [mm] | | | f_z [mm] | | | |
| P | PMU | Δ+ | 0.8 | 3 | 9 | 0.1 | 0.18 | 0.23 | Δ+ | 1.2 | 6 | 12.5 | 0.1 | 0.2 | 0.25 |
| M | MMU | + | 0.8 | 3 | 9 | 0.08 | 0.14 | 0.2 | + | 1.2 | 6 | 12.5 | 0.1 | 0.15 | 0.22 |
| K | KMU | Δ+ | 0.8 | 3 | 9 | 0.1 | 0.2 | 0.26 | Δ+ | 1.2 | 6 | 12.5 | 0.1 | 0.22 | 0.28 |
| N | NMU | 0 | 0.8 | 5 | 9 | 0.05 | 0.12 | 0.2 | 0 | 1.2 | 8 | 12.5 | 0.06 | 0.14 | 0.22 |

Legend: KV = edge rounding | 0 = sharp edged | + = slightly rounded | Δ+ = bevelled and slightly rounded

* a_p max. depends on the type of milling cutter and application.

** MAPAL machining groups

| Carbide | | | | |
|--------------------------------|-------|-----------------------------|----------|-------|
| M | | K | N | |
| Austenitic ← Wear-resistant | | Ferritic → Tough/Ductile | | |
| PVD | | PVD | Uncoated | PVD |
| HP650 | HP655 | HP630 | HU110 | HP110 |
| | | | NMU | NMU |

| Dimensions [mm] | | | | |
|-----------------|---|---|----------------|---|
| | | | | |
| l | d | s | d ₁ | R |

| | | | | |
|--|--|--|----------|----------|
| | | | 31144412 | 31144349 |
| | | | 31144413 | 31144350 |
| | | | 31144414 | 31144351 |
| | | | 31144415 | 31144352 |

| | | | | |
|------|------|------|-----|-----|
| 10,4 | 10,4 | 4,86 | 3,5 | 0,4 |
| 10,4 | 10,4 | 4,86 | 3,5 | 0,8 |
| 14,8 | 14,8 | 5,2 | 5,5 | 0,8 |
| 14,8 | 14,8 | 5,2 | 5,5 | 1,2 |

| MMU | MMU | KMU | | |
|----------|----------|----------|--|--|
| 31144357 | 31144358 | 31144356 | | |
| 31144370 | 31144371 | 31144369 | | |

| | | | | |
|------|------|------|-----|-----|
| 10,4 | 10,4 | 4,86 | 3,5 | 0,8 |
| 14,8 | 14,8 | 5,2 | 5,5 | 1,2 |

Plunge angle | 90° machining

| Diameter [mm] | Plunge angle [°] | |
|---------------|------------------|--------|
| | SD__10 | SD__14 |
| 25 | 7 | - |
| 32 | 4.6 | - |
| 40 | 3.3 | - |
| 50 | 2.4 | 5.5 |
| 52 | 2.2 | 5.3 |
| 63 | 1.8 | 3.7 |
| 66 | 1.6 | 3.4 |
| 80 | 1.3 | 2.6 |
| 100 | 1 | 1.9 |
| 125 | 0.8 | 1.5 |
| 160 | 0.5 | - |

Cutting data recommendations for high-feed milling cutters

Feed and cutting speed

High-feed milling cutter

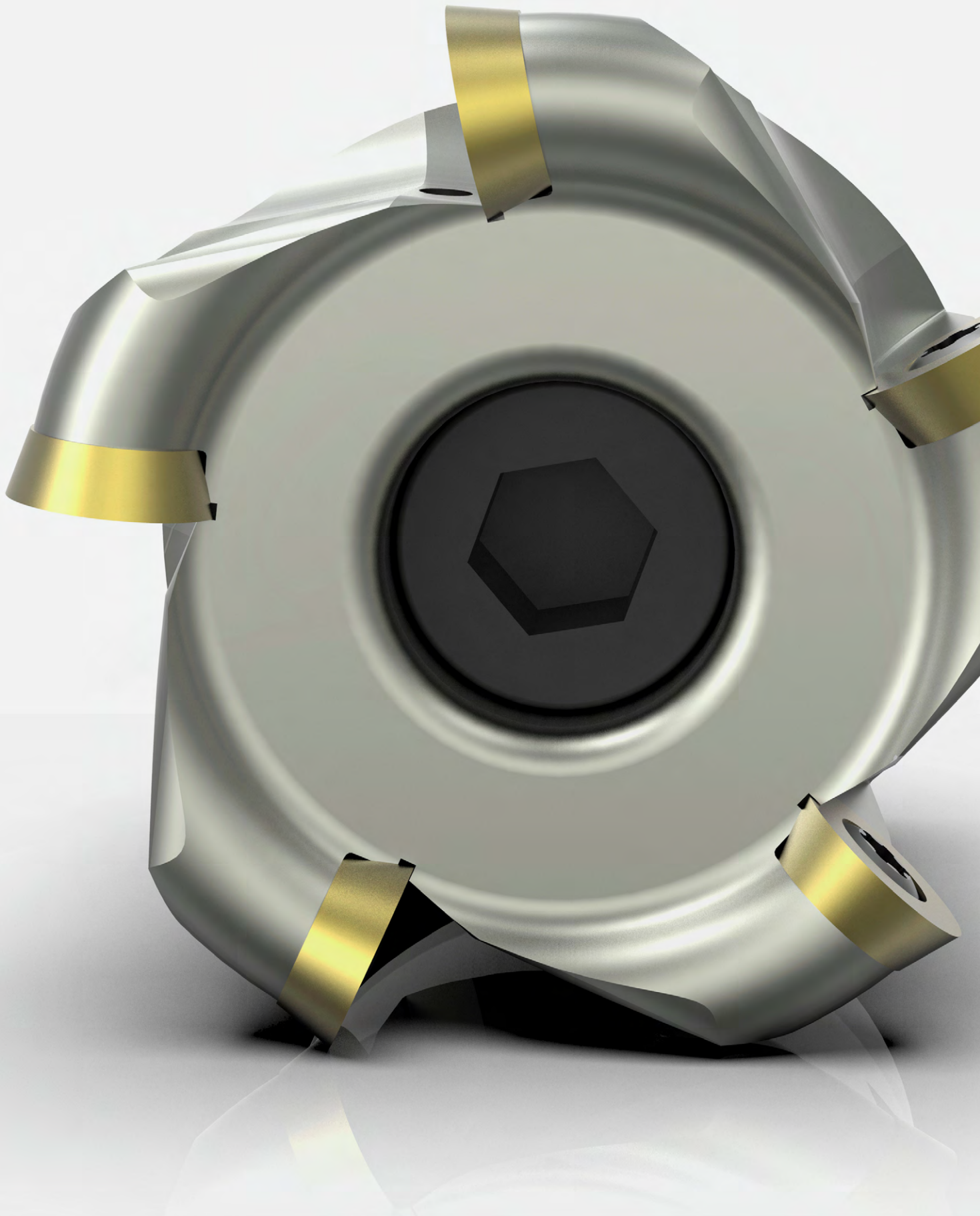
| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | | | |
| | P5 | P5.1 Cast steel | | | | |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | | | |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | | ✓ | |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2 | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | | ✓ | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | | | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | | | |
| | | N1.4 Aluminium, alloy > 12 % Si | | | | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | | ✓ | |
| | | N2.2 Copper, alloy | > 300 | | | |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | | | |
| H | H1 | H1.1 Hardened steel / cast steel | < 44 | | ✓ | |
| | | H1.2 Hardened steel / cast steel | < 55 | | ✓ | |
| | H2 | H2.1 Hardened steel / cast steel | < 60 | | ✓ | |
| | | H2.2 Hardened steel / cast steel | < 65 | | ✓ | |
| | | H2.3 Hardened steel / cast steel | < 68 | | ✓ | |
| | H3 | H3.1 Wear-resistant cast/chill casting, GJN | | | ✓ | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|-------|-------|-------|------------------|-------|-------|-------|-------|-------|-------|-------|
| Carbide PVD-coated | | | | | | | | | | | | Carbide CVD-coated | | | | | | | | Carbide uncoated | | | | | | | |
| HP110 | | HP320 | | HP325 | | HP630 | | HP635 | | HP640 | | HP645 | | HP650 | | HP655 | | HC220 | | HC525 | | HC530 | | HC535 | | HU110 | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 |
| | | | | | | | | 220 | 290 | 180 | 230 | 130 | 220 | | | | | | | | | 220 | 310 | 180 | 250 | | |
| | | | | | | | | 190 | 260 | 150 | 200 | 100 | 190 | | | | | | | | | 190 | 280 | 150 | 220 | | |
| | | | | | | | | 190 | 230 | 160 | 180 | 180 | 220 | | | | | | | | | 190 | 250 | 160 | 200 | | |
| | | | | | | | | 160 | 200 | 130 | 150 | 150 | 190 | | | | | | | | | 160 | 220 | 130 | 170 | | |
| | | | | | | | | 170 | 210 | 130 | 160 | 160 | 190 | | | | | | | | | 170 | 230 | 130 | 180 | | |
| | | | | | | | | 150 | 190 | 120 | 150 | 150 | 180 | | | | | | | | | 150 | 210 | 120 | 180 | | |
| | | | | | | | | 130 | 170 | 100 | 130 | 130 | 160 | | | | | | | | | 130 | 190 | 100 | 160 | | |
| | | | | | | | | 130 | 170 | | | | | | | | | | | | | 130 | 190 | 120 | 180 | | |
| | | | | | | | | 140 | 180 | | | | | | | | | | | | | 140 | 200 | 130 | 190 | | |
| | | | | | | | | 120 | 160 | | | | | | | | | | | | | 120 | 180 | 110 | 170 | | |
| | | | | | | | | | | | | | | 140 | 180 | 130 | 160 | | | | | | | | | | |
| | | | | | | | | | | | | | | 110 | 150 | 100 | 130 | | | | | | | | | | |
| | | | | | | | | | | | | | | 110 | 130 | 100 | 120 | | | | | | | | | | |
| | | | | | | | | | | | | | | 80 | 100 | 70 | 90 | | | | | | | | | | |
| | | | | | | | 180 | 320 | | | | | | | | | | | | | 210 | 360 | | | | | |
| | | | | | | | 150 | 200 | | | | | | | | | | | | | 180 | 250 | | | | | |
| | | | | | | | 140 | 180 | | | | | | | | | | | | | 170 | 230 | | | | | |
| | | | | | | | 130 | 160 | | | | | | | | | | | | | 160 | 210 | | | | | |
| | | | | | | | 140 | 180 | | | | | | | | | | | | | 170 | 230 | | | | | |
| | | | | | | | 130 | 160 | | | | | | | | | | | | | 160 | 210 | | | | | |
| 500 | 3000 | | | | | | | | | | | | | | | | | | | | | | | | | 400 | 2500 |
| 400 | 500 | | | | | | | | | | | | | | | | | | | | | | | | | 300 | 400 |
| 400 | 500 | | | | | | | | | | | | | | | | | | | | | | | | | 300 | 400 |
| 400 | 500 | | | | | | | | | | | | | | | | | | | | | | | | | 300 | 400 |
| 160 | 500 | | | | | | | | | | | | | | | | | | | | | | | | | 120 | 400 |
| 200 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | 160 | 250 |
| 200 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | 160 | 250 |
| | | 100 | 180 | 90 | 140 | | | | | | | | | | | | | | | 110 | 190 | | | | | | |
| | | 90 | 150 | 70 | 130 | | | | | | | | | | | | | | | 100 | 160 | | | | | | |
| | | 60 | 80 | | | | | | | | | | | | | | | | | 60 | 90 | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 65 | 95 | 60 | 90 | | | | | | | | | | | | | | | 70 | 100 | | | | | | |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.





COPY MILLING CUTTER

NeoMill – radial technology

| | | |
|-------------------------|-------|-----|
| NeoMill-ISO-360, RD__07 | _____ | 334 |
| NeoMill-ISO-360, RD__10 | _____ | 335 |
| NeoMill-ISO-360, RD__12 | _____ | 336 |
| NeoMill-ISO-360, RD__16 | _____ | 337 |

Accessories and spare parts

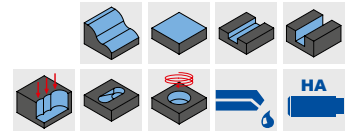
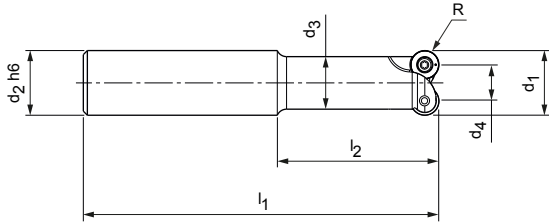
| | | |
|---|-------|-----|
| Accessories for indexable inserts | _____ | 384 |
| Allocating milling cutter clamping screws | _____ | 386 |

Technical appendix

| | | |
|--|-------|-----|
| Cutting data recommendations | _____ | 340 |
| Handling notes Milling cutter clamping screw | _____ | 412 |

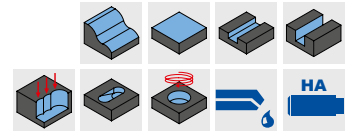
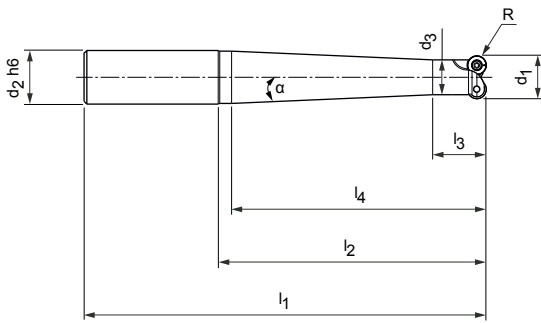
NeoMill-ISO-360

Round-insert milling cutter, radius 3.5 mm
RD__07



End milling cutter, cylindrical design



| Dimensions | | | | | | Z _{eff} | R | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|-------------------|----------------|----------------|----------------|----------------|------------------|-----|-------------|------------------|--------------------------------|-----------|
| d ₁ | d ₂ h6 | d ₃ | d ₄ | l ₁ | l ₂ | | | | | | |
| 15 | 16 | 13 | 8 | 88 | 40 | 2 | 3,5 | 0,11 | ✓ | IMR001-015-088-HA16-Z2R-RD__07 | 31144105 |
| 16 | 16 | 13 | 9 | 88 | 40 | 2 | 3,5 | 0,11 | ✓ | IMR001-016-088-HA16-Z2R-RD__07 | 31144106 |




End milling cutter, conical design

| Dimensions | | | | | | | | Z _{eff} | R | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|-------------------|----------------|----------------|----------------|----------------|----------------|------|------------------|-----|-------------|------------------|--------------------------------|-----------|
| d ₁ | d ₂ h6 | d ₃ | l ₁ | l ₂ | l ₃ | l ₄ | α | | | | | | |
| 15 | 16 | 13 | 108 | 60 | 20 | 55 | 2,0° | 2 | 3,5 | 0,14 | ✓ | IMR101-015-108-HA16-Z2R-RD__07 | 31144092 |
| 15 | 20 | 13 | 130 | 80 | 20 | 75 | 3,4° | 2 | 3,5 | 0,23 | ✓ | IMR101-015-130-HA20-Z2R-RD__07 | 31144093 |
| 15 | 20 | 13 | 150 | 100 | 20 | 95 | 2,5° | 2 | 3,5 | 0,26 | ✓ | IMR101-015-150-HA20-Z2R-RD__07 | 31144094 |
| 15 | 25 | 13 | 176 | 120 | 20 | 115 | 3,5° | 2 | 3,5 | 0,45 | ✓ | IMR101-015-176-HA25-Z2R-RD__07 | 31144095 |
| 16 | 16 | 13 | 108 | 60 | 20 | 55 | 2,0° | 2 | 3,5 | 0,14 | ✓ | IMR101-016-108-HA16-Z2R-RD__07 | 31144096 |
| 16 | 20 | 13 | 130 | 80 | 20 | 75 | 3,4° | 2 | 3,5 | 0,24 | ✓ | IMR101-016-130-HA20-Z2R-RD__07 | 31144097 |
| 16 | 20 | 13 | 150 | 100 | 20 | 95 | 2,5° | 2 | 3,5 | 0,27 | ✓ | IMR101-016-150-HA20-Z2R-RD__07 | 31144098 |
| 16 | 25 | 13 | 176 | 120 | 20 | 115 | 3,5° | 2 | 3,5 | 0,45 | ✓ | IMR101-016-176-HA25-Z2R-RD__07 | 31144099 |

Accessories

| | | | |
|---|----------|---|----------|
|  | RD__0702 | Indexable insert | Page 338 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

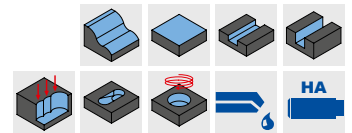
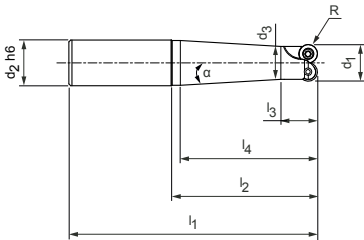
| | | | |
|---|----------|---|-----------------------|
|  | RD__0702 | Clamping screw for indexable insert M2.5X5.5-TX7-IP | Order no. 31161854 |
|---|----------|---|-----------------------|

Dimensions in mm.

* Included in scope of delivery.

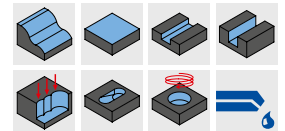
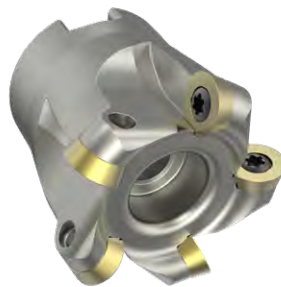
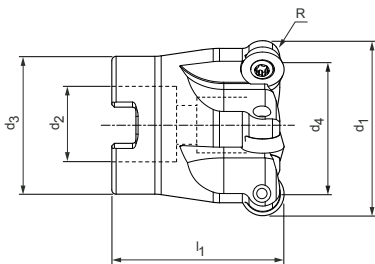
NeoMill-ISO-360

Round-insert milling cutter, radius 5 mm
RD__10



End milling cutter, conical design





| Dimensions | | | | | | | | Z_{eff} | R | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|----------|-------|-------|-------|-------|-------|----------|-----------|---|-------------|------------------|--------------------------------|-----------|
| d_1 | d_2 h6 | d_3 | l_1 | l_2 | l_3 | l_4 | α | | | | | | |
| 20 | 20 | 18 | 90 | 40 | 20 | 35 | 2,9° | 2 | 5 | 0,18 | ✓ | IMR101-020-090-HA20-Z2R-RD__10 | 31144100 |
| 20 | 20 | 18 | 110 | 60 | 20 | 55 | 1,3° | 2 | 5 | 0,22 | ✓ | IMR101-020-110-HA20-Z2R-RD__10 | 31144101 |
| 20 | 25 | 18 | 136 | 80 | 20 | 75 | 3,4° | 2 | 5 | 0,40 | ✓ | IMR101-020-136-HA25-Z2R-RD__10 | 31144102 |
| 20 | 25 | 18 | 156 | 100 | 20 | 95 | 2,5° | 2 | 5 | 0,45 | ✓ | IMR101-020-156-HA25-Z2R-RD__10 | 31144103 |
| 20 | 25 | 18 | 176 | 120 | 20 | 115 | 2,0° | 2 | 5 | 0,50 | ✓ | IMR101-020-176-HA25-Z2R-RD__10 | 31144104 |




Milling cutter head

| Dimensions | | | | | Z_{eff} | R | Weight [kg] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-------|-----------|---|-------------|------------------|-----------------------------|-----------|
| d_1 | d_2 | d_3 | d_4 | l_1 | | | | | | |
| 40 | 16 | 32 | 30 | 40 | 5 | 5 | 0,18 | ✓ | IMR001-040-CA16-Z05R-RD__10 | 31143968 |
| 42 | 16 | 32 | 32 | 40 | 5 | 5 | 0,20 | ✓ | IMR001-042-CA16-Z05R-RD__10 | 31143969 |
| 52 | 22 | 40 | 42 | 50 | 5 | 5 | 0,40 | ✓ | IMR001-052-CA22-Z05R-RD__10 | 31144030 |
| 52 | 22 | 40 | 42 | 50 | 7 | 5 | 0,30 | ✓ | IMR001-052-CA22-Z07R-RD__10 | 31144031 |

Accessories

| | | | |
|---|----------|---|----------|
|  | RD__1003 | Indexable insert | Page 338 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

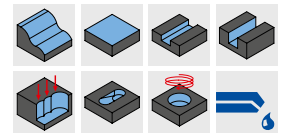
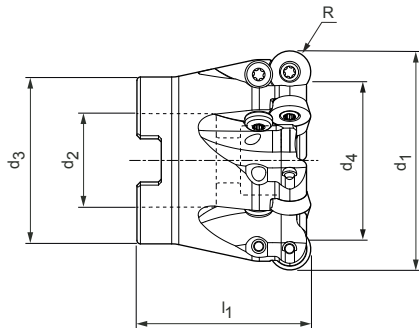
| | | | |
|---|----------|--|-----------------------|
|  | RD__1003 | Clamping screw for indexable insert M3.5X7.2-TX15-IP | Order no. 31161859 |
|---|----------|--|-----------------------|

Dimensions in mm.
* Included in scope of delivery.

NeoMill-ISO-360

Round-insert milling cutter, radius 6 mm




RD__12





Milling cutter head

| Dimensions | | | | | Z _{eff} | R | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---|-------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | |
| 42 | 16 | 32 | 30 | 40 | 4 | 6 | 0,14 | ✓ | IMR001-042-CA16-Z04R-RD__12 | 31144032 |
| 48 | 22 | 40 | 36 | 50 | 4 | 6 | 0,32 | ✓ | IMR001-048-CA22-Z04R-RD__12 | 31144033 |
| 50 | 22 | 40 | 38 | 50 | 5 | 6 | 0,36 | ✓ | IMR001-050-CA22-Z05R-RD__12 | 31144034 |
| 52 | 22 | 40 | 40 | 50 | 5 | 6 | 0,34 | ✓ | IMR001-052-CA22-Z05R-RD__12 | 31144035 |
| 63 | 27 | 48 | 51 | 50 | 6 | 6 | 0,52 | ✓ | IMR001-063-CA27-Z06R-RD__12 | 31144036 |
| 66 | 27 | 48 | 54 | 50 | 6 | 6 | 0,58 | ✓ | IMR001-066-CA27-Z06R-RD__12 | 31144037 |
| 80 | 27 | 60 | 68 | 52 | 7 | 6 | 0,99 | ✓ | IMR001-080-CA27-Z07R-RD__12 | 31144038 |

Accessories

| | | | |
|---|----------|---|----------|
|  | RD__12T3 | Indexable insert | Page 338 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|----------|--|-----------------------|
|  | RD__12T3 | Clamping screw for indexable insert M3.5X8.6-TX15-IP | Order no. 31161860 |
|  | RD__12T3 | Rotation lock M3.5X7.2-TX15-IP | Order no. 31161928 |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

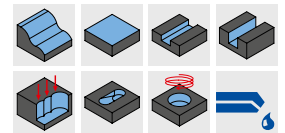
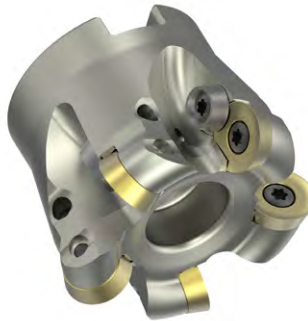
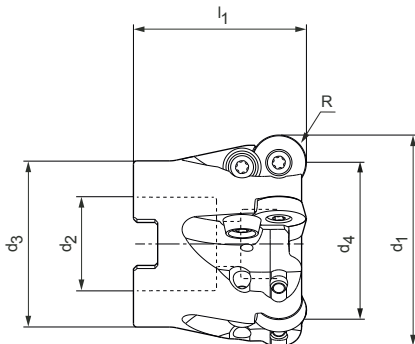
* Included in scope of delivery.

Depending on the clamping device used, different maximum operating speeds must be observed.

NeoMill-ISO-360

Round-insert milling cutter, radius 8 mm




RD__16






Milling cutter head

| Dimensions | | | | | Z _{eff} | R | Weight [kg] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|---|-------------|------------------|-----------------------------|-----------|
| d ₁ | d ₂ | d ₃ | d ₄ | l ₁ | | | | | | |
| 50 | 22 | 40 | 34 | 50 | 4 | 8 | 0,27 | ✓ | IMR001-050-CA22-Z04R-RD__16 | 31144039 |
| 52 | 22 | 40 | 36 | 50 | 4 | 8 | 0,30 | ✓ | IMR001-052-CA22-Z04R-RD__16 | 31144040 |
| 63 | 27 | 48 | 47 | 50 | 5 | 8 | 0,44 | ✓ | IMR001-063-CA27-Z05R-RD__16 | 31144041 |
| 66 | 27 | 48 | 50 | 50 | 5 | 8 | 0,67 | ✓ | IMR001-066-CA27-Z05R-RD__16 | 31144042 |
| 80 | 27 | 60 | 64 | 52 | 6 | 8 | 0,99 | ✓ | IMR001-080-CA27-Z06R-RD__16 | 31144044 |
| 80 | 27 | 60 | 64 | 52 | 7 | 8 | 0,97 | ✓ | IMR001-080-CA27-Z07R-RD__16 | 31144045 |
| 100 | 32 | 70 | 84 | 52 | 7 | 8 | 1,28 | ✓ | IMR001-100-CA32-Z07R-RD__16 | 31144046 |
| 125 | 40 | 90 | 109 | 63 | 8 | 8 | 2,66 | ✓ | IMR001-125-CA40-Z08R-RD__16 | 31144047 |
| 160 | 40 | 128 | 144 | 63 | 9 | 8 | 4,18 | ✓ | IMR001-160-CA40-Z09R-RD__16 | 31144048 |

Accessories

| | | | |
|---|----------|---|----------|
|  | RD__1604 | Indexable insert | Page 338 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts*

| | | | |
|---|----------|---|-----------------------|
|  | RD__1604 | Clamping screw for indexable insert M4.5X10.5-TX20-IP | Order no. 31161861 |
|  | RD__1604 | Clamping screw for clamping plate M4.5X10.5-TX20-IP | Order no. 31161861 |
|  | RD__1604 | Clamping plate | Order no. 31161929 |

Dimensions in mm.

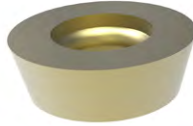
The maximum operating speeds refer only to the cutting edge system.

* Included in scope of delivery.

Depending on the clamping device used, different maximum operating speeds must be observed.

RDKW – RDKT – RDHW – RDHT

Radial indexable insert, round insert



| | Carbide | | | | |
|-----------------------|--------------------------------|----------------------------|--------------------------------|-----------------------------|----------|
| Workpiece material | P | | M | | |
| | Unalloyed ← Wear-resistant | Alloyed → Tough/Ductile | Austenitic ← Wear-resistant | Ferritic → Tough/Ductile | |
| Coating | PVD | | PVD | | |
| Cutting material type | HP635 | HP640 | HP650 | HP655 | |
| Cutting edge design | PMU | PMU | MMU | MMU | |
| RDKW | a_p max. [mm] | | | | |
| RDKW0501M0N- | 1.2 * | 31144308 | | 31144305 | 31144306 |
| RDKW0702M0N- | 1.7 * | 31144318 | 31144319 | 31144314 | 31144315 |
| RDKW1003M0N- | 2.5 * | 31144329 | 31144330 | 31144325 | 31144326 |
| RDKW12T3M0N- | 3 * | 31144338 | 31144339 | | |
| RDKW1604M0N- | 4 * | 31144347 | 31144348 | | |
| RDKT | | | | | |
| RDKT12T3M0N- | 3 * | 31144292 | 31144293 | 31144288 | 31144289 |
| RDKT1604M0N- | 4 * | 31144298 | 31144299 | 31144294 | 31144295 |
| RDHW | | | | | |
| RDHW0501M0N- | 0.45 * | | | | |
| RDHW0702M0N- | 0.85 * | | | | |
| RDHW1003M0N- | 1.2 * | | | | |
| RDHW12T3M0N- | 1.5 * | | | | |
| RDHW1604M0N- | 2 * | | | | |
| RDHT | | | | | |
| RDHT12T3M0N- | 3 * | | | 31144283 | 31144284 |

Feed per tooth (selection according to cutting edge design)

| * MMG | Cutting edge design | RD_0501 | | | | | | | RD_0702 | | | | | | |
|----------|---------------------|---------|--------------------------|-------------|------|---------------------|-------------|------|---------|--------------------------|-------------|------|---------------------|-------------|------|
| | | KV | a _p max. [mm] | | | f _z [mm] | | | KV | a _p max. [mm] | | | f _z [mm] | | |
| P | PMU | Δ+ | 0.25 | 0.7 | 1.2 | 0.14 | 0.26 | 0.5 | Δ+ | 0.25 | 1 | 1.7 | 0.14 | 0.27 | 0.6 |
| M | MMU | Δ+ | 0.25 | 0.7 | 1.2 | 0.13 | 0.23 | 0.45 | Δ+ | 0.25 | 1 | 1.7 | 0.13 | 0.24 | 0.52 |
| K | KMU | Δ+ | 0.25 | 0.7 | 1.2 | 0.15 | 0.27 | 0.53 | Δ+ | 0.25 | 1 | 1.7 | 0.15 | 0.28 | 0.63 |
| H | HFU | Δ+ | 0.1 | 0.18 | 0.45 | 0.1 | 0.2 | 0.36 | Δ+ | 0.1 | 0.2 | 0.65 | 0.11 | 0.22 | 0.42 |
| | HMU | Δ+ | 0.1 | 0.18 | 0.45 | 0.1 | 0.2 | 0.36 | Δ+ | 0.1 | 0.2 | 0.65 | 0.11 | 0.22 | 0.42 |
| | HRU | Δ+ | 0.12 | 0.24 | 0.6 | 0.1 | 0.22 | 0.4 | Δ+ | 0.12 | 0.25 | 0.85 | 0.11 | 0.25 | 0.46 |

Legend: KV = edge rounding | Δ+ = bevelled and slightly rounded

* a_p max. depends on the type of milling cutter and application.

** MAPAL machining groups

Cutting data recommendations for copy milling cutter

Feed and cutting speed

Copy milling cutter

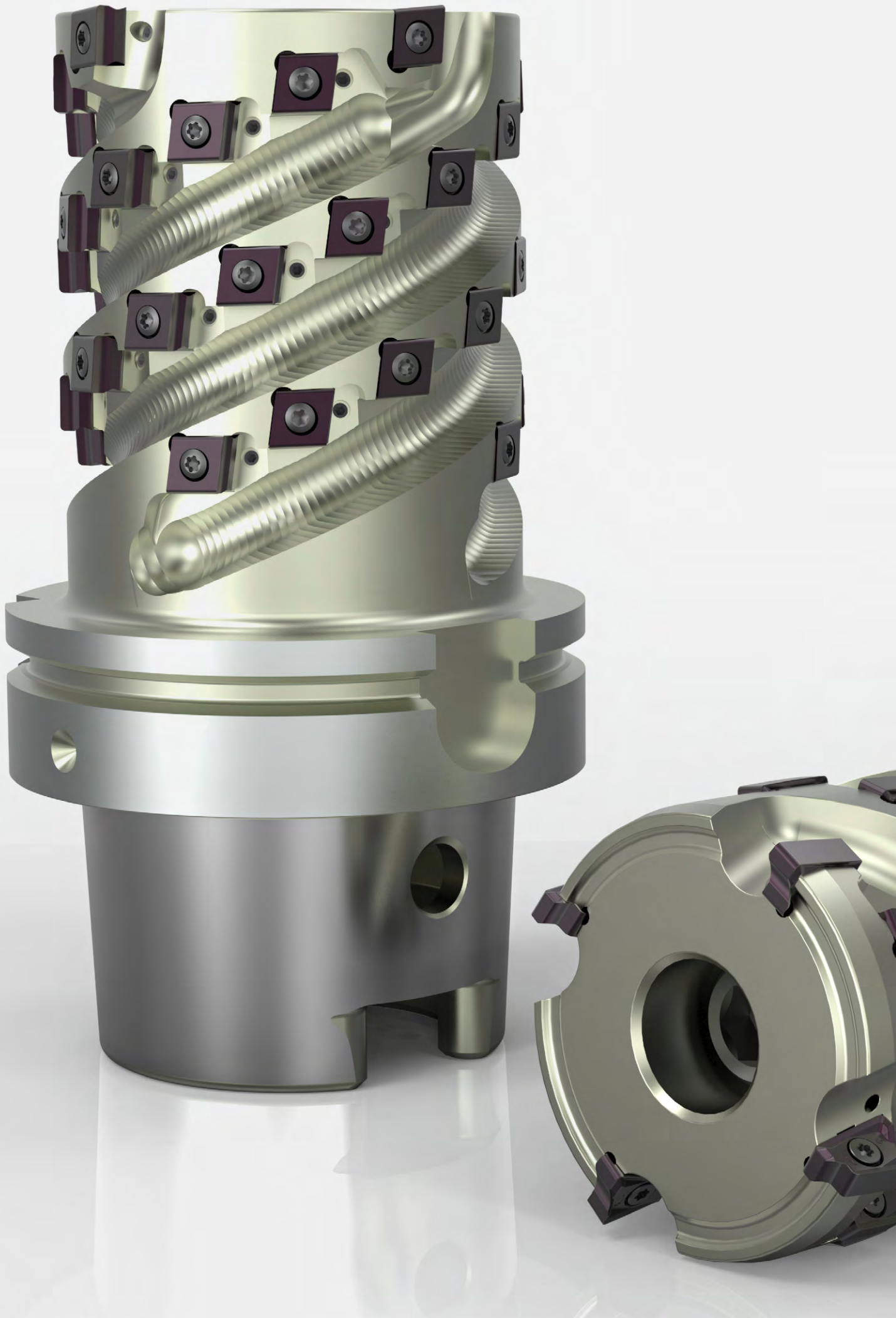
| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | | | |
| | P5 | P5.1 Cast steel | | | | |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | | | |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | | ✓ | |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2 | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |
| H | H1 | H1.1 Hardened steel / cast steel | < 44 | | ✓ | |
| | | H1.2 Hardened steel / cast steel | < 55 | | ✓ | |
| | H2 | H2.1 Hardened steel / cast steel | < 60 | | ✓ | |
| | | H2.2 Hardened steel / cast steel | < 65 | | ✓ | |
| | H3 | H2.3 Hardened steel / cast steel | < 68 | | ✓ | |
| | | H3.1 Wear-resistant cast/chill casting, GJN | | | ✓ | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|--|
| Carbide PVD-coated | | | | | | | | | | | | | | | | | CVD-coated | |
| HP310 | | HP320 | | HP325 | | HP630 | | HP635 | | HP640 | | HP650 | | HP655 | | HC220 | | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | |
| | | | | | | | | 230 | 300 | 200 | 260 | | | | | | | |
| | | | | | | | | 200 | 270 | 170 | 230 | | | | | | | |
| | | | | | | | | 210 | 280 | 180 | 240 | | | | | | | |
| | | | | | | | | 180 | 250 | 150 | 210 | | | | | | | |
| | | | | | | | | 190 | 250 | 170 | 220 | | | | | | | |
| | | | | | | | | 170 | 230 | 160 | 210 | | | | | | | |
| | | | | | | | | 150 | 210 | 140 | 190 | | | | | | | |
| | | | | | | | | 150 | 210 | | | | | | | | | |
| | | | | | | | | 160 | 220 | | | | | | | | | |
| | | | | | | | | 140 | 200 | | | | | | | | | |
| | | | | | | | | | | | | 140 | 180 | 130 | 160 | | | |
| | | | | | | | | | | | | 110 | 150 | 100 | 130 | | | |
| | | | | | | | | | | | | 110 | 130 | 100 | 120 | | | |
| | | | | | | | | | | | | 80 | 100 | 70 | 90 | | | |
| | | | | | | | 230 | 360 | | | | | | | | | | |
| | | | | | | | 200 | 250 | | | | | | | | | | |
| | | | | | | | 190 | 230 | | | | | | | | | | |
| | | | | | | | 180 | 210 | | | | | | | | | | |
| | | | | | | | 190 | 230 | | | | | | | | | | |
| | | | | | | | 180 | 210 | | | | | | | | | | |
| 90 | 290 | 80 | 270 | 90 | 180 | | | | | | | | | | | 80 | 270 | |
| 70 | 230 | 60 | 210 | 60 | 170 | | | | | | | | | | | 60 | 190 | |
| 60 | 190 | 50 | 170 | 50 | 130 | | | | | | | | | | | 50 | 150 | |
| 50 | 140 | 40 | 120 | | | | | | | | | | | | | 40 | 120 | |
| 60 | 140 | 50 | 120 | | | | | | | | | | | | | 50 | 120 | |

The specified machining values are guide values.
 The optimum data for the respective machining task should be determined during the test or machining.



SHELL END FACE MILLING CUTTER

NeoMill – radial technology

| | |
|-----------------------------|-----|
| NeoMill-2-Shell, AOKT | 344 |
| NeoMill-4-Shell, ANMU | 346 |

TGMill – tangential technology

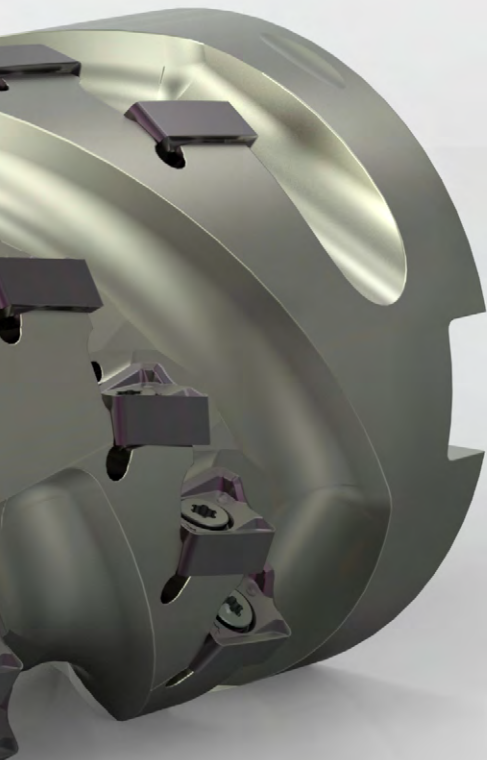
| | |
|------------------------------|-----|
| TGMill-2-Shell, CTHD | 348 |
| TGMill-4-Shell, CT_Q09 | 350 |

Accessories and spare parts

| | |
|---|-----|
| Accessories for indexable inserts | 384 |
| Allocating milling cutter clamping screws | 386 |

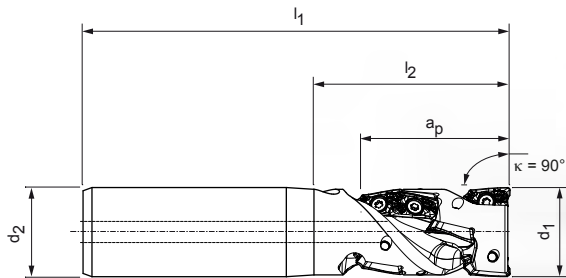
Technical appendix

| | |
|--|-----|
| Cutting data recommendations | 354 |
| Handling notes Milling cutter clamping screw | 412 |



NeoMill®-2-Shell



Shell end face milling cutter with radial technology
AOKT12




End milling cutter

| Dimensions | | | | Z_{eff} | Number of indexable inserts | a_p max. | Weight [kg] | Max. operating speed [min^{-1}] | Cylindrical shank form | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|------------------|-----------------------------|------------|-------------|--|------------------------|------------------|-----------------------------|-----------|
| d_1 | d_2 | l_1 | l_2 | | | | | | | | | |
| 25 | 25 | 120 | 55 | 2 | 8 | 41 | 0 | 49.000 | HA | ✓ | ISM901-025-HA25-Z02R-AO_T12 | 31002194 |
| 25 | 25 | 104 | 46 | 2 | 8 | 41 | 0 | 49.000 | HB | ✓ | ISM901-025-HB25-Z02R-AO_T12 | 31002195 |
| 32 | 32 | 140 | 75 | 3 | 15 | 51 | 1 | 43.000 | HA | ✓ | ISM901-032-HA32-Z03R-AO_T12 | 31002196 |
| 32 | 32 | 120 | 57 | 3 | 15 | 51 | 1 | 43.000 | HB | ✓ | ISM901-032-HB32-Z03R-AO_T12 | 31002197 |
| 40 | 32 | 150 | 80 | 4 | 20 | 51 | 1 | 39.000 | HA | ✓ | ISM901-040-HA32-Z04R-AO_T12 | 31002198 |
| 40 | 32 | 126 | 64 | 4 | 20 | 51 | 1 | 39.000 | HB | ✓ | ISM901-040-HB32-Z04R-AO_T12 | 31002199 |

Accessories

| | | | |
|---|----------|---|----------|
|  | AOKT12T3 | Indexable inserts | Page 345 |
|  | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |

Spare parts*

| | | | |
|---|----------|---|-----------------------|
|  | AOKT12T3 | Clamping screw for indexable insert TORX® M3x7.5-TX8-IP | Order no. 10105075 |
|---|----------|---|-----------------------|

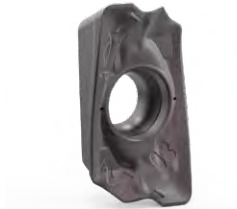
Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

* Included in scope of delivery.

AOKT

Radial indexable insert, double edge



| | | | | | | | |
|-----------------------|-----------------------------------|--------------------------|----------|------------------------------|---------------------------|----------|----------------------|
| Workpiece material | P | | | M | | K | |
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | | Austenitic Wear-resistant | Ferritic Tough/Ductile | | |
| Substrate | Carbide | | | Carbide | | Carbide | |
| Coating | PVD | | CVD | PVD | | PVD | CVD |
| Cutting material type | HP975 | HP980 | HC775 | HP980 | HP985 | HP975 | HC770 |
| Cutting edge design | M05 | M03 | M03 | M03 | M03 | M05 | M05 |
| AOKT12 | a_p max. [mm] | | | | | | |
| AOKT12T304R- | * | 31029366 | | | 31029367 | 31029366 | 31029368 |
| AOKT12T308R- | * | 31029368 | 31200903 | 31124557 | 31200903 | 31029369 | 31029368 31124556 |

Feed per tooth

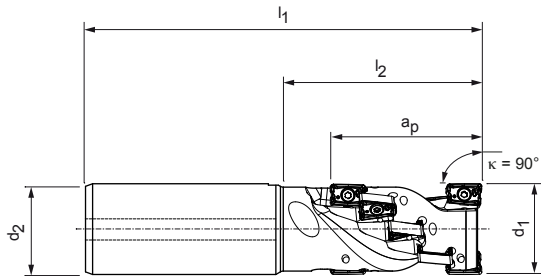
| Application | | Medium machining | | | |
|---------------------|---|------------------|-------------|------------|------------|
| | | M03 | | M05 | |
| Cutting edge design | | PVD | CVD | PVD | CVD |
| Coating | | PVD | CVD | PVD | CVD |
| Edge rounding | | ++ | ++ | +++ | +++ |
| Feed/tooth [mm] | P | 0.08 - 0.25 | 0.08 - 0.19 | 0.1 - 0.25 | 0.1 - 0.19 |
| | M | 0.08 - 0.2 | 0.08 - 0.15 | | |
| | K | | | 0.1 - 0.3 | 0.1 - 0.23 |
| | N | | | | |

Legend: ++ = medium rounded | +++ = sharp edged

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 384.
 For cutting data recommendations, see end of chapter.

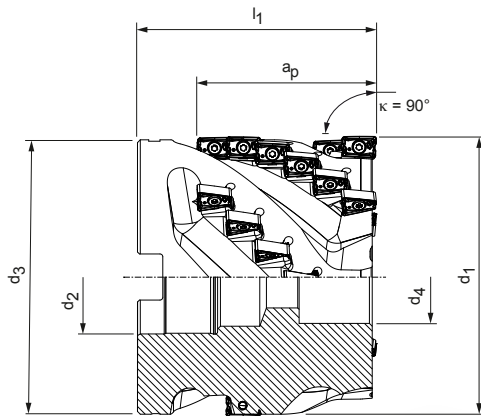
NeoMill®-4-Shell

Shell end face milling cutter with radial technology
ANMU12



End milling cutter

| Dimensions | | | | | Z_{eff} | Number of indexable inserts | a_p max. | Weight [kg] | Max. operating speed [min^{-1}] | Cylindrical shank form | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|---|------------------|-----------------------------|------------|-------------|--|------------------------|-----------------------------|---------------|-----------|
| d_1 | d_2 | l_1 | l_2 | | | | | | | | | | |
| 32 | 32 | 140 | 70 | 2 | 10 | 52 | 1 | 29.000 | HA | ✓ | ISM901-032-HA32-Z02R-AN_U12 | 31002236 | |
| 32 | 32 | 125 | 61 | 2 | 10 | 52 | 1 | 29.000 | HB | ✓ | ISM901-032-HB32-Z02R-AN_U12 | 31002237 | |
| 40 | 32 | 150 | 80 | 3 | 18 | 62 | 1 | 26.000 | HA | ✓ | ISM901-040-HA32-Z03R-AN_U12 | 31002238 | |
| 40 | 32 | 135 | 73 | 3 | 18 | 62 | 1 | 26.000 | HB | ✓ | ISM901-040-HB32-Z03R-AN_U12 | 31002239 | |



Milling cutter head

| Dimensions | | | | | Z_{eff} | Number of indexable inserts | a_p max. | Weight [kg] | Max. operating speed [min^{-1}] | Internal cooling | Specification | Order no. |
|------------|-------|-------|-------|-------|------------------|-----------------------------|------------|-------------|--|------------------|-----------------------------|-----------|
| d_1 | d_2 | d_3 | d_4 | l_1 | | | | | | | | |
| 40 | 16 | 38 | 14 | 60 | 3 | 12 | 42 | 0,4 | 26.000 | - | ISM900-040-CA16-Z03R-AN_U12 | 31002240 |
| 50 | 22 | 48 | 18,5 | 70 | 4 | 20 | 52 | 0,7 | 23.000 | - | ISM900-050-CA22-Z04R-AN_U12 | 31002241 |
| 63 | 27 | 60,6 | 20,5 | 75 | 4 | 20 | 52 | 1,2 | 21.000 | - | ISM900-063-CA27-Z04R-AN_U12 | 31002242 |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

ANMU

Radial indexable insert, four cutting edges



| Workpiece material | P | | | M | | K | | | |
|-----------------------|-----------------------------|--------------------------|----------|------------------------------|---------------------------|-----------------------|----------------------|-----------------------|----------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | | Austenitic Wear-resistant | Ferritic Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile | GJL Wear-resistant | GJS Tough/Ductile |
| Substrate | Carbide | | | Carbide | | Carbide | | | |
| Coating | PVD | | CVD | PVD | | PVD | | CVD | |
| Cutting material type | HP975 | HP980 | HC775 | HP980 | HP985 | HP965 | HP975 | HC760 | HC770 |
| Cutting edge design | M05 | M03 | M03 | M03 | M03 | M05 | M05 | M05 | M05 |
| ANMU12 | a_p max. [mm] | | | | | | | | |
| ANMU120504R- | * | 31029427 | | | | | 31029427 | | 31218310 |
| ANMU120508R- | * | 30968178 | 31027000 | 31124584 | 31027000 | 31029429 | 31029430 | 30968178 | 31124582 31124583 |
| Cutting edge design | U05 | U03 | U03 | U03 | U3 | U05 | U05 | U05 | U05 |
| ANMU12 | a_p max. [mm] | | | | | | | | |
| ANMU120508R- | * | 31253944 | 31253948 | 31273152 | 31253948 | 31290794 | 31273129 | 31253944 | 31273153 31253947 |

Feed per tooth

| Application | Cutting edge design | Medium machining | | | | Difficult conditions | | | |
|-----------------|---------------------|------------------|-------------|-----------|------------|----------------------|-------------|------------|------------|
| | | M03 | | M05 | | U03 | | U05 | |
| Coating | Edge rounding | PVD | CVD | PVD | CVD | PVD | CVD | PVD | CVD |
| | | ++ | ++ | +++ | +++ | ++ | ++ | +++ | +++ |
| Feed/tooth [mm] | P | 0.08 - 0.25 | 0.08 - 0.19 | 0.1 - 0.5 | 0.1 - 0.19 | 0.08 - 0.25 | 0.08 - 0.19 | 0.1 - 0.25 | 0.1 - 0.19 |
| | M | 0.08 - 0.2 | 0.08 - 0.15 | | | 0.08 - 0.2 | 0.08 - 0.15 | | |
| | K | | | 0.1 - 0.3 | 0.1 - 0.23 | | | 0.1 - 0.3 | 0.1 - 0.23 |
| | N | | | | | | | | |

Legend: ++ = medium rounded | +++ = sharp edged

Accessories

| | | | |
|--|----------|---|----------|
| | ANMU1205 | Indexable inserts | Page 347 |
| | | Chuck for end milling cutter see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
| | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | | |
|--|----------|---|-----------------------|
| | ANMU1205 | Clamping screw for indexable insert TORX® M3x8.5-TX8-IP | Order no. 10105076 |
|--|----------|---|-----------------------|

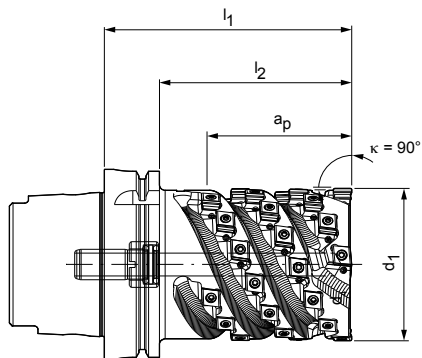
* a_p max. depends on the type of milling cutter and application.

** Included in scope of delivery.

For cutting data recommendations, see end of chapter.

TGMill-2-Shell


Shell end face milling cutter with tangential technology
CTHD09






With connection HSK-A (hollow shank taper form A)

| Dimensions | | | | Z_{eff} | Number of indexable inserts | a_p max. | Weight [kg] | Max. operating speed [min^{-1}] | Internal cooling | Specification | Order no. |
|------------|--------------------|-------|-------|-----------|-----------------------------|------------|-------------|-------------------------------------|------------------|----------------------------|-----------|
| d_1 | HSK-A nominal size | l_1 | l_2 | | | | | | | | |
| 63 | 100 | 130 | 100 | 3 | 30 | 75 | 4 | 20.000 | ✓ | ISM901-063-A100-Z3R-CT_D09 | 30425932 |
| 80 | 100 | 130 | 100 | 4 | 40 | 75 | 5 | 20.000 | ✓ | ISM901-080-A100-Z4R-CT_D09 | 30395633 |
| 100 | 100 | 130 | 100 | 4 | 40 | 75 | 7 | 20.000 | ✓ | ISM901-100-A100-Z4R-CT_D09 | 30395638 |

Accessories

| | | | |
|---|----------|-------------------|----------|
|  | CTHD09T3 | Indexable inserts | Page 349 |
|---|----------|-------------------|----------|

Spare parts*

| | | | |
|---|------------------|---|-----------------------|
|  | CTHD09T3 | Clamping screw for indexable insert TORX PLUS® M3.5x9.4-TX10-IP | Order no. 10007315 |
|  | | Threaded pin M3x8-sw1.5 IKØ1.2 | Order no. 30433620 |
|  | HSK-A connection | Coolant tube HSK100 | Order no. 30326008 |

Dimensions in mm.

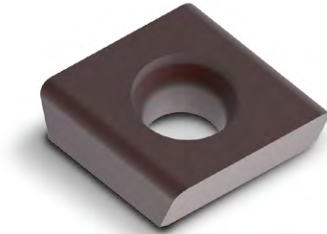
Other dimensions and mounting available upon request.

* Included in scope of delivery.

The maximum operating speeds refer to the cutting edge system.

CTHD

Tangential indexable inserts, double edge



| Workpiece material | N | | | |
|--------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| | Al alloyed ← Wear-resistant | Cu alloyed → Tough/Ductile | Al alloyed ← Wear-resistant | Cu alloyed → Tough/Ductile |
| Substrate | Carbide | | PCD | |
| Coating | - | | - | |
| Cutting material type | HU616 | | HU617 | |
| Cutting edge design | D00 | | D80 | |
| CTHD09 | a_p max. [mm] | | | |
| CTHD09T304...R-... | * | 30029737 | | 30492519 |
| CTHD09T304...R90M018-... | * | 30567180 | | 31283626 |
| CTHD09T308...R-... | * | 30029738 | | 30374036 |
| CTHD09T312...R-... | * | 30029739 | | |
| Cutting edge design | | | D60 | |
| CTHD09 | a_p max. [mm] | | | |
| CTHD09T304...R-... | 2.5 | | | 31283617 |
| CTHD09T304...R90M018-... | 2.5 | | | 31283618 |
| CTHD09T308...R-... | 2.5 | | | 31283621 |

Feed per tooth

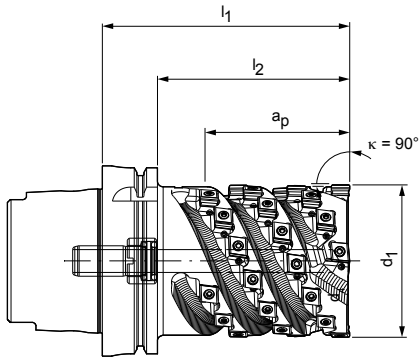
| Application | | Universal application | | |
|---------------------|---|-----------------------|------------|------------|
| | | D00 | D60 | D80 |
| Cutting edge design | | | | |
| Edge rounding | | 0 | 0 | 0 |
| Feed/tooth [mm] | P | | | |
| | M | | | |
| | K | | | |
| | N | 0.05 - 0.5 | 0.05 - 0.5 | 0.05 - 0.5 |

Legend: 0 = Sharp edged

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

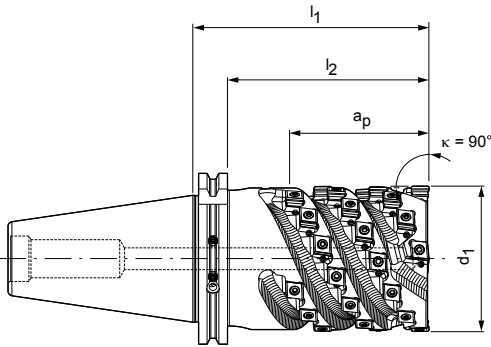
TGMill-4-Shell

Shell end face milling cutter with tangential technology
CT_Q09



With connection HSK-A (hollow shank taper form A)


| Dimensions | | | | Z _{eff} | Number of indexable inserts | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|--------------------|----------------|----------------|------------------|-----------------------------|---------------------|-------------|---|------------------|----------------------------|-----------|
| d ₁ | HSK-A nominal size | l ₁ | l ₂ | | | | | | | | |
| 63 | 100 | 130 | 100 | 4 | 40 | 75 | 4 | 20.000 | ✓ | ISM901-063-A100-Z4R-CT_Q09 | 30395627 |
| 80 | 100 | 130 | 100 | 4 | 40 | 75 | 5 | 20.000 | ✓ | ISM901-080-A100-Z4R-CT_Q09 | 30395634 |
| 100 | 100 | 130 | 100 | 5 | 50 | 75 | 5 | 20.000 | ✓ | ISM901-100-A100-Z5R-CT_Q09 | 30395640 |






With connection shank taper

| Dimensions | | | | Z _{eff} | Number of indexable inserts | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|-----------------|----------------|----------------|------------------|-----------------------------|---------------------|-------------|---|------------------|----------------------------|-----------|
| d ₁ | SK nominal size | l ₁ | l ₂ | | | | | | | | |
| 63 | 50 | 130 | 110 | 4 | 40 | 75 | 5 | 16.000 | ✓ | ISM901-063-S050-Z4R-CT_Q09 | 30395631 |
| 80 | 50 | 130 | 110 | 4 | 40 | 75 | 6 | 16.000 | ✓ | ISM901-080-S050-Z4R-CT_Q09 | 30395637 |
| 100 | 50 | 130 | 110 | 5 | 50 | 75 | 8 | 16.000 | ✓ | ISM901-100-S050-Z5R-CT_Q09 | 30395642 |

Accessories

| | | | |
|---|----------|-------------------|----------|
|  | CT_Q0905 | Indexable inserts | Page 352 |
|---|----------|-------------------|----------|

Spare parts*

| | | | |
|---|------------------|--|-----------------------|
|  | CT_Q0905 | Clamping screw for indexable insert TORX PLUS® M3.5x11-TX10-IP | Order no. 10105079 |
|  | | Threaded pin M3x8-sw1.5 1Kø1.2 | Order no. 30433620 |
|  | HSK-A connection | Coolant tube HSK100 | Order no. 30326008 |

Dimensions in mm.

Tool body for aluminium machining available upon request.

* Included in scope of delivery.

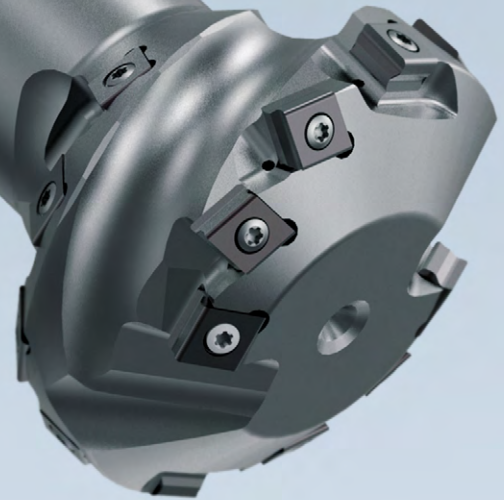
The maximum operating speeds refer to the cutting edge system.

CUSTOM- MADE SHELL END FACE AND FORM MILLING CUTTER



Form milling cutter with a special geometry for pre-milling the blade root groove profile on a gas turbine for energy production. The blade root groove profile is used to subsequently join the turbine blades.

► Customised special solution upon request



CUSTOMISED SPECIAL SOLUTIONS

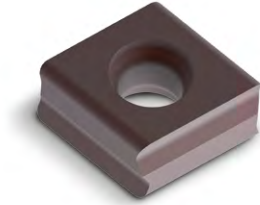
- Individual dimensions
- Different numbers of teeth
- Tool design with insert seats for tangential, radial and special inserts
- Milling cutter head or monolithic design with different connections
- Standard milling cutter arbor with vibration damper or customised tool body with integrated vibration damper

INSERTS IN SPECIAL DESIGN

- Special inserts with component-specific geometries and a large selection of cutting materials
- High process reliability in case of contour-dependent shapes and geometries
- Saves complex machining sequences, reducing cycle and non-productive times
- Multi-cutting-edge capability for manufacturing complex component-specific contours

CTHQ | CTNQ

Tangential indexable insert, four cutting edges



| | | | | |
|-----------------------|---------|-------|------------------------------|---------------------------|
| Workpiece material | P | | M | |
| | | | Austenitic Wear-resistant | Ferritic Tough/Ductile |
| Substrate | Carbide | | Carbide | |
| Coating | PVD | CVD | PVD | |
| Cutting material type | HP975 | HC775 | HP980 | HP985 |

| Cutting edge design | | H08 | H06 | H06 | H06 |
|---------------------|-----------------|----------|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | |
| CTNQ090508...R-... | * | 31048496 | 31272737 | 31048497 | 31048498 |
| CTNQ090512...R-... | * | 31048510 | 31272700 | 31048511 | 31048512 |
| CTHQ09 | | | | | |
| CTHQ090508...R-... | * | 31048522 | 31272841 | 31048523 | 31048524 |
| CTHQ090512...R-... | * | 31048526 | 31272850 | 31048527 | 31048528 |

| Cutting edge design | | A38 | A36 | A36 | A36 |
|--------------------------|-----------------|----------|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | |
| CTNQ090508...R-... | * | 31048514 | 31272812 | 31048515 | 31048516 |
| CTNQ090512...R-... | * | 31048518 | 31272720 | 31048519 | 31048520 |
| CTHQ09 | | | | | |
| CTHQ090508...R-... | * | 31048530 | 31272837 | 31048531 | 31048532 |
| CTHQ090508...R90M008-... | * | | 31272835 | 31190733 | |
| CTHQ090512...R-... | * | 31048534 | 31272845 | 31048535 | 31048536 |

Feed per tooth

| Application | | Roughing | | | | | Medium machining | | | | |
|---------------------|---|----------|-----------|-----------|-----------|-------------|------------------|-----------|-----------|-----------|-----------|
| | | H06 | | H08 | | H21 | A36 | | A38 | | H20 |
| Cutting edge design | | PVD | CVD | PVD | CVD | PVD | PVD | CVD | PVD | CVD | PVD |
| Coating | | | | | | | | | | | |
| Edge rounding | | ++ | | +++ | | + | ++ | | +++ | | 0 |
| Feed/tooth [mm] | P | 0.12-0.3 | 0.12-0.23 | 0.12-0.35 | 0.12-0.27 | | 0.1-0.25 | 0.1-0.19 | 0.12-0.25 | 0.12-0.19 | |
| | M | 0.1-0.3 | 0.1-0.23 | | | | 0.12-0.25 | 0.12-0.19 | | | |
| | K | | | 0.12-0.4 | 0.12-0.3 | | | | 0.1-0.3 | 0.1-0.23 | |
| | N | | | | | 0.15 - 0.35 | | | | | 0.1 - 0.3 |

Legend: 0 = sharp edged | + = slightly rounded | ++ = medium rounded | +++ = heavily rounded

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

| K | | | | N | |
|-------------------------|----------|---|----------|--------------------------------|----------|
| GJL ← Wear-resistant | | GJS → GJL Tough/Ductile ← Wear-resistant | | Al alloyed ← Wear-resistant | |
| | | GJS → GJL Tough/Ductile ← Wear-resistant | | Cu alloyed Tough/Ductile → | |
| Carbide | | | | Carbide | |
| PVD | | CVD | | - | PVD |
| HP965 | HP975 | HC760 | HC770 | HU616 | HP615 |
| H08 | H08 | H08 | H08 | | H21 |
| 31048495 | 31048496 | 31272745 | 31272748 | | |
| 31048499 | 31048510 | 31272705 | 31272707 | | |
| 31048521 | 31048522 | 31272843 | 31272844 | | 31257300 |
| 31048525 | 31048526 | 31272851 | 31272855 | | 31316852 |
| A38 | A38 | A38 | A38 | H20 | |
| 31048513 | 31048514 | 31272816 | 31272817 | | |
| 31048517 | 31048518 | 31272725 | 31272726 | | |
| 31048529 | 31048530 | 31272838 | 31272840 | 31316862 | |
| | | | | 31316865 | |
| 31048533 | 31048534 | 31272847 | 31272848 | 31316863 | |

Cutting Data Recommendation for Shell End Face Milling Cutter

Feed and cutting speed

Shell end face milling cutter

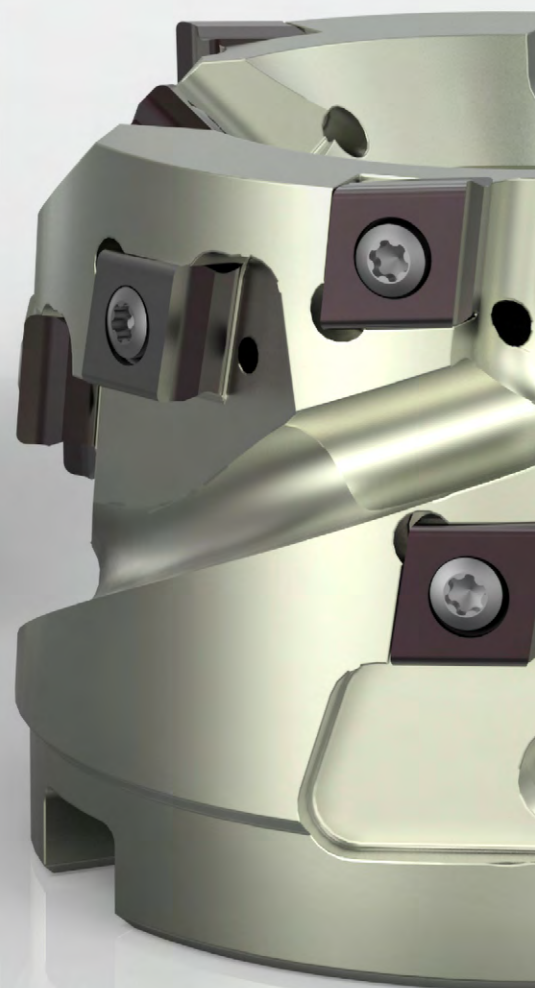
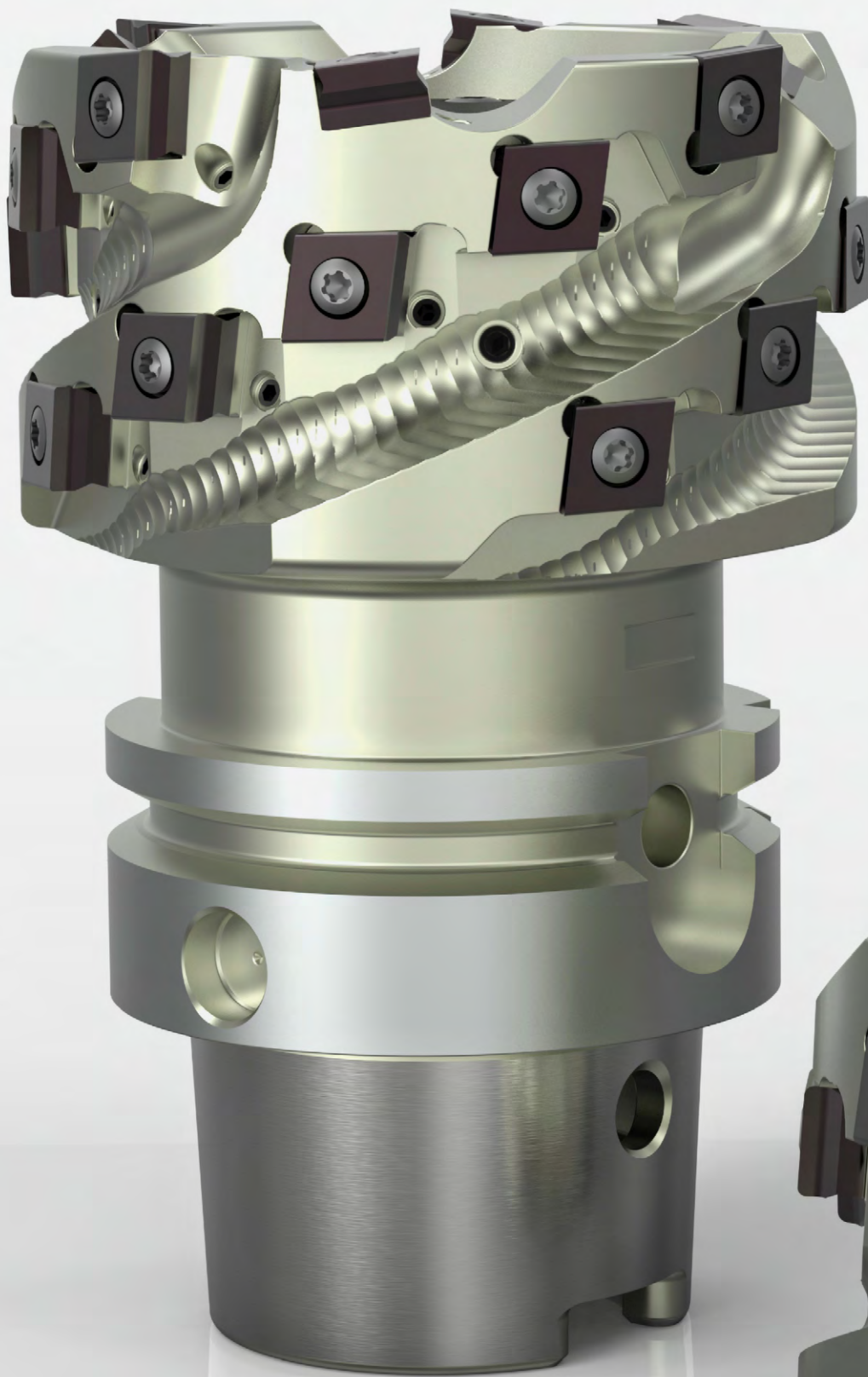
| MMG* | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | | |
|------|---------------------|--|---------|-----|---------|--|
| | | | MQL/Air | Dry | Coolant | |
| P | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3.1 | Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | P3.2 | Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | P3.3 | Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4.1 | Stainless steels, ferritic and martensitic | | | | |
| | P5.1 | Cast steel | | | | |
| | P6.1 | Stainless cast steel, ferritic and martensitic | | | | |
| M | M1.1 | Stainless steels, austenitic | < 700 | | ✓ | |
| | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2.2 | Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |
| N | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | | ✓ | |
| | N1.2 | Aluminium, alloy ≤ 7 % Si | | | | |
| | N1.3 | Aluminium, alloy > 7-12 % Si | | | | |
| | N1.4 | Aluminium, alloy > 12 % Si | | | | |
| | N2.1 | Copper, non-alloy and low-alloy | < 300 | | ✓ | |
| | N2.2 | Copper, alloy | > 300 | | | |
| | N2.3 | Brass, bronze, gunmetal | < 1200 | | | |
| | N3.1 | Graphite, > 8 µm | | | | |
| | N3.2 | Graphite, ≤ 8 µm | | | | |
| | N4.1 | Plastic, thermoplastics | | | | |
| N4.2 | Plastic, thermosets | | | | | |
| N4.3 | Plastic, foams | | | | | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|
| Carbide PVD-coated | | | | | | | | | | Carbide CVD-coated | | | | | | Carbide - uncoated | | PCD | |
| HP615 | | HP965 | | HP975 | | HP980 | | HP985 | | HC760 | | HC770 | | HC775 | | HU616 | | PU617 | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 |
| | | | | 180 | 220 | 180 | 220 | | | | | 260 | 280 | | | | | | |
| | | | | 150 | 180 | 150 | 180 | | | | | 250 | 270 | 240 | 260 | | | | |
| | | | | 160 | 200 | 160 | 200 | | | | | 240 | 260 | 230 | 250 | | | | |
| | | | | | | 130 | 160 | | | | | | | 220 | 240 | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 110 | 140 | | | | | | | | | | | | |
| | | | | | | 160 | 180 | 140 | 170 | | | | | | | | | | |
| | | | | | | 140 | 160 | 120 | 150 | | | | | | | | | | |
| | | | | | | | | 100 | 120 | | | | | | | | | | |
| | | | | | | | | 90 | 110 | | | | | | | | | | |
| | | 220 | 270 | 200 | 240 | | | | | 330 | 350 | 320 | 330 | | | | | | |
| | | 200 | 240 | 180 | 220 | | | | | 300 | 330 | 300 | 320 | | | | | | |
| | | 180 | 220 | 160 | 200 | | | | | | | 260 | 300 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | | | 220 | 260 | | | | | | |
| | | 170 | 210 | 150 | 180 | | | | | 210 | 240 | 200 | 220 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | 200 | 220 | 180 | 200 | | | | | | |
| 700 | 700 | | | | | | | | | | | | | | | 500 | 500 | 2,000 | 2,000 |
| 400 | 480 | | | | | | | | | | | | | | | 300 | 360 | 1,500 | 1,800 |
| 300 | 360 | | | | | | | | | | | | | | | 230 | 280 | 1,200 | 1,440 |
| 270 | 330 | | | | | | | | | | | | | | | | | 700 | 840 |
| 250 | 300 | | | | | | | | | | | | | | | 250 | 300 | 600 | 720 |
| 130 | 160 | | | | | | | | | | | | | | | 120 | 150 | 500 | 600 |
| 190 | 230 | | | | | | | | | | | | | | | 180 | 220 | 450 | 540 |
| 320 | 390 | | | | | | | | | | | | | | | 300 | 360 | | |
| 320 | 390 | | | | | | | | | | | | | | | | | | |
| 220 | 270 | | | | | | | | | | | | | | | 300 | 360 | 500 | 600 |
| 210 | 260 | | | | | | | | | | | | | | | 250 | 300 | 400 | 480 |

The specified machining values are guide values.
 The optimum data for the respective machining task should be determined during the test or machining.





HELIX MILLING CUTTERS

TGMill – tangential technology

| | |
|--------------------------------|-----|
| TGMill-2-Helical, CT_D09 | 358 |
| TGMill-4-Helical, CT_Q09 | 360 |

Accessories and spare parts

| | |
|---|-----|
| Accessories for indexable inserts | 385 |
| Allocating milling cutter clamping screws | 386 |

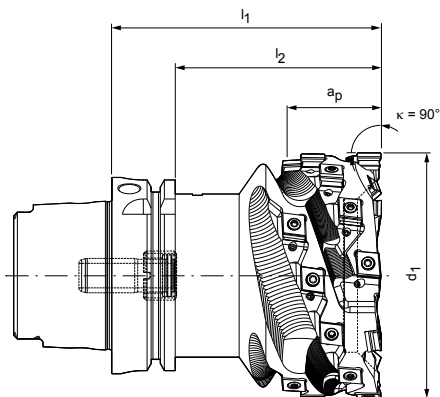
Technical appendix

| | |
|--|-----|
| Cutting data recommendations | 364 |
| Application notes Helix milling | 400 |
| Handling notes Milling cutter clamping screw | 412 |

TGMill-2-Helical

Helix milling cutter with tangential technology, with integrated vibration damper


CT_D09






With connection HSK-A (hollow shank taper form A)

| Dimensions | | | | Z _{eff} | Number of indexable inserts | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹]* | Internal cooling | Specification | Order no. |
|----------------|--------------------|----------------|----------------|------------------|-----------------------------|---------------------|-------------|--|------------------|----------------------------|-----------|
| d ₁ | HSK-A nominal size | l ₁ | l ₂ | | | | | | | | |
| 80 | 63 | 90 | 64 | 4 | 20+4 | 35 | 3 | 7.500 | ✓ | IHM901-080-A063-Z4R-CT_D09 | 30395675 |
| 100 | 80 | 110 | 84 | 4 | 20+4 | 35 | 5 | 7.000 | ✓ | IHM901-100-A080-Z4R-CT_D09 | 30395676 |
| 125 | 100 | 110 | 81 | 5 | 25+5 | 35 | 8 | 6.000 | ✓ | IHM901-125-A100-Z5R-CT_D09 | 30395677 |

Accessories

| | | | |
|---|----------|-------------------|----------|
|  | CT_D09T3 | Indexable inserts | Page 359 |
|---|----------|-------------------|----------|

Spare parts**

| | | | |
|---|------------------|---|---|
|  | CT_D09T3 | Clamping screw for indexable insert TORX PLUS® M3.5x9.4-TX10-IP | Order no. 10007315 |
|  | | Threaded pin M3x8-sw1.5 IKØ1.2 | Order no. 30433620 |
|  | HSK-A connection | Coolant tube HSK63 HSK80 HSK100 | Order no. 30326006 30326007 30326008 |

Dimensions in mm.

Other dimensions and mounting available upon request.

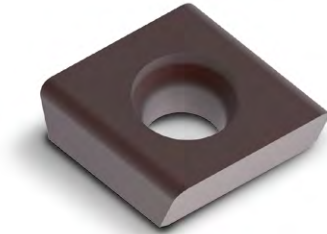
* For nominal length l₁.

** Included in scope of delivery.

The maximum operating speeds refer to the insert system.

CTHD

Tangential indexable insert, double edge



| Workpiece material | N | | | |
|-----------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| | Al alloyed ← Wear-resistant | Cu alloyed → Tough/Ductile | Al alloyed ← Wear-resistant | Cu alloyed → Tough/Ductile |
| Substrate | Carbide | | PCD | |
| Coating | - | | - | |
| Cutting material type | HU616 | | PU617 | |

| Cutting edge design | | D00 | D80 |
|--------------------------|-----------------------------------|----------|----------|
| CTHD09 | a_p max. [mm] | | |
| CTHD09T304...L-... | * | 30029697 | 30492516 |
| CTHD09T304...R-... | * | 30029737 | 30492519 |
| CTHD09T304...R90M018-... | * | 30567180 | 31283626 |
| CTHD09T308...L-... | * | 30029698 | 30383869 |
| CTHD09T308...R-... | * | 30029738 | 30374036 |
| CTHD09T312...L-... | * | 30029699 | |
| CTHD09T312...R-... | * | 30029739 | |

| Cutting edge design | | D60 |
|--------------------------|-----------------------------------|----------|
| CTHD09 | a_p max. [mm] | |
| CTHD09T304...L-... | 2.5 | 31283606 |
| CTHD09T304...R-... | 2.5 | 31283617 |
| CTHD09T304...R90M018-... | 2.5 | 31283618 |
| CTHD09T308...L-... | 2.5 | 31283620 |
| CTHD09T308...R-... | 2.5 | 31283621 |

Feed per tooth

| Application | | Universal application | | |
|---------------------|---|-----------------------|------------|------------|
| | | D00 | D60 | D80 |
| Cutting edge design | | | | |
| Edge rounding | | 0 | 0 | 0 |
| Feed/tooth [mm] | P | | | |
| | M | | | |
| | K | | | |
| | N | 0.05 - 0.5 | 0.05 - 0.5 | 0.05 - 0.5 |

Legend: 0 = Sharp edged

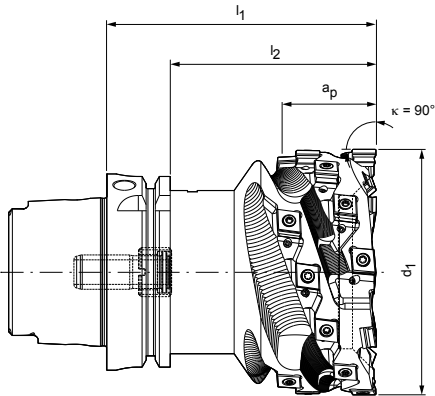
Assembly note

| d_1 | Number of indexable inserts | Right design | Left design |
|-------|-----------------------------|--------------|-------------|
| 80 | 20+4 | 20 | 4 |
| 100 | 20+4 | 20 | 4 |
| 125 | 25+5 | 25 | 5 |
| 140 | 25+5 | 25 | 5 |
| 160 | 30+6 | 30 | 6 |

* a_p max. depends on the type of milling cutter and application.
For related clamping screw and screwdriver see page 385.
For cutting data recommendations, see end of chapter.

TGMill-4-Helical


Helix milling cutter with tangential technology, with integrated vibration damper
CT_Q09






With connection HSK-A (hollow shank taper form A)

| Dimensions | | | | Z _{eff} | Number of indexable inserts | a _p max. | Weight [kg] | Max. operating speed [min ⁻¹]* | Internal cooling | Specification | Order no. |
|----------------|--------------------|----------------|----------------|------------------|-----------------------------|---------------------|-------------|--|------------------|----------------------------|-----------|
| d ₁ | HSK-A nominal size | l ₁ | l ₂ | | | | | | | | |
| 80 | 63 | 90 | 64 | 4 | 20+4 | 35 | 2,6 | 7.500 | ✓ | IHM901-080-A063-Z4R-CT_Q09 | 30346711 |
| 100 | 80 | 110 | 84 | 4 | 20+4 | 35 | 5 | 7.000 | ✓ | IHM901-100-A080-Z4R-CT_Q09 | 30346712 |
| 125 | 100 | 110 | 81 | 5 | 25+5 | 35 | 7,8 | 6.000 | ✓ | IHM901-125-A100-Z5R-CT_Q09 | 30340468 |

Accessories

| | | | |
|---|----------|-------------------|----------|
|  | CT_Q0905 | Indexable inserts | Page 362 |
|---|----------|-------------------|----------|

Spare parts**

| | | | |
|---|------------------|--|---|
|  | CT_Q0905 | Clamping screw for indexable insert TORX PLUS® M3.5x11-TX10-IP | Order no. 10105079 |
|  | | Threaded pin M3x8-sw1.5 IKØ1.2 | Order no. 30433620 |
|  | HSK-A connection | Coolant tube HSK63 HSK80 HSK100 | Order no. 30326006 30326007 30326008 |

Assembly note

| d ₁ | Number of indexable inserts | Right design | Left design |
|----------------|-----------------------------|--------------|-------------|
| 100 | 20+4 | 20 | 4 |
| 125 | 25+5 | 25 | 5 |

Dimensions in mm.
Additional dimensions and mounting versions available upon request.
Tool body for aluminium machining available upon request.
* For nominal length l₁.
** Included in scope of delivery.
The maximum operating speeds refer to the cutting edge system.

CUSTOM-MADE HELIX MILLING CUTTER



Helix milling cutter with integrated vibration damper, tangential technology and HSK extension for pre-milling the outer diameter at joints of the stator carrier of an electric motor. This allows standard extensions to be used without vibration dampers.

► Customised special solution upon request

CUSTOMISED SPECIAL SOLUTIONS

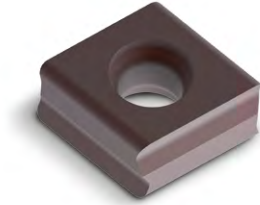
- Individual dimensions
- Different numbers of teeth
- Tool design with insert seats for tangential, radial and special inserts
- Monolithic design with integrated vibration damper for the use of standard extensions without integrated vibration dampening

INSERTS IN SPECIAL DESIGN

- Special inserts with component-specific geometries and a large selection of cutting materials
- High process reliability in case of contour-dependent shapes and geometries
- Saves complex machining sequences, reducing cycle and non-productive times
- Multi-cutting-edge capability for manufacturing complex component-specific contours

CTHQ | CTNQ

Tangential indexable insert, four cutting edges



| Workpiece material | P | | M | |
|-----------------------|---------|-------|------------------------------|---------------------------|
| | | | Austenitic Wear-resistant | Ferritic Tough/Ductile |
| Substrate | Carbide | | Carbide | |
| Coating | PVD | CVD | PVD | |
| Cutting material type | HP975 | HC775 | HP980 | HP985 |

| Cutting edge design | | H08 | H06 | H06 | H06 |
|---------------------|--------------------------------|----------|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | |
| CTNQ090508...L-... | * | 31190836 | 31272736 | 31190839 | 31190850 |
| CTNQ090508...R-... | * | 31048496 | 31272737 | 31048497 | 31048498 |
| CTNQ090512...L-... | * | 31190854 | 31272688 | 31190857 | 31190860 |
| CTNQ090512...R-... | * | 31048510 | 31272700 | 31048511 | 31048512 |
| CTHQ09 | | | | | |
| CTHQ090508...R-... | * | 31048522 | 31272841 | 31048523 | 31048524 |
| CTHQ090512...R-... | * | 31048526 | 31272850 | 31048527 | 31048528 |

| Cutting edge design | | A38 | A36 | A36 | A36 |
|--------------------------|--------------------------------|----------|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | |
| CTNQ090508...L-... | * | 31190866 | 31272811 | 31190868 | 31190870 |
| CTNQ090508...R-... | * | 31048514 | 31272812 | 31048515 | 31048516 |
| CTNQ090512...L-... | * | 31190872 | 31272709 | 31190874 | 31190875 |
| CTNQ090512...R-... | * | 31048518 | 31272720 | 31048519 | 31048520 |
| CTHQ09 | | | | | |
| CTHQ090508...R-... | * | 31048530 | 31272837 | 31048531 | 31048532 |
| CTHQ090508...R90M008-... | * | | 31272835 | 31190733 | |
| CTHQ090512...R-... | * | 31048534 | 31272845 | 31048535 | 31048536 |

Feed per tooth

| Application | | Roughing | | | | | Medium machining | | | | |
|---------------------|----------|----------|-----------|-----------|-----------|-------------|------------------|-----------|-----------|-----------|-----------|
| | | H06 | | H08 | | H21 | A36 | | A38 | | H20 |
| Cutting edge design | | PVD | CVD | PVD | CVD | PVD | PVD | CVD | PVD | CVD | PVD |
| Coating | | | | | | | | | | | |
| Edge rounding | | ++ | | +++ | | + | ++ | | +++ | | 0 |
| Feed/tooth [mm] | P | 0.12-0.3 | 0.12-0.23 | 0.12-0.35 | 0.12-0.27 | | 0.1-0.25 | 0.1-0.19 | 0.12-0.25 | 0.12-0.19 | |
| | M | 0.1-0.3 | 0.1-0.23 | | | | 0.12-0.25 | 0.12-0.19 | | | |
| | K | | | 0.12-0.4 | 0.12-0.3 | | | | 0.1-0.3 | 0.1-0.23 | |
| | N | | | | | 0.15 - 0.35 | | | | | 0.1 - 0.3 |

Legend: 0 = sharp edged | + = slightly rounded | ++ = medium rounded | +++ = heavily rounded

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

| K | | | | N | |
|-------------------------|----------|------------------------|----------|-------------------------|----------|
| GJL ← Wear-resistant | | GJS → Tough/Ductile | | GJL ← Wear-resistant | |
| GJS → Tough/Ductile | | GJS → Tough/Ductile | | | |
| Carbide | | | | Carbide | |
| PVD | | CVD | | - | PVD |
| HP965 | HP975 | HC760 | HC770 | HU616 | HP615 |
| H08 | H08 | H08 | H08 | | H21 |
| 31190831 | 31190836 | 31272741 | 31272744 | | |
| 31048495 | 31048496 | 31272745 | 31272748 | | |
| 31190852 | 31190854 | 31272702 | 31272703 | | |
| 31048499 | 31048510 | 31272705 | 31272707 | | |
| 31048521 | 31048522 | 31272843 | 31272844 | | 31257300 |
| 31048525 | 31048526 | 31272851 | 31272855 | | 31316852 |
| A38 | A38 | A38 | A38 | H20 | |
| 31190864 | 31190866 | 31272813 | 31272815 | | |
| 31048513 | 31048514 | 31272816 | 31272817 | | |
| 31190871 | 31190872 | 31272722 | 31272723 | | |
| 31048517 | 31048518 | 31272725 | 31272726 | | |
| 31048529 | 31048530 | 31272838 | 31272840 | 31316862 | |
| | | | | 31316865 | |
| 31048533 | 31048534 | 31272847 | 31272848 | 31316863 | |

Cutting data recommendations for helix milling cutter

Feed and cutting speed

Helix milling cutters

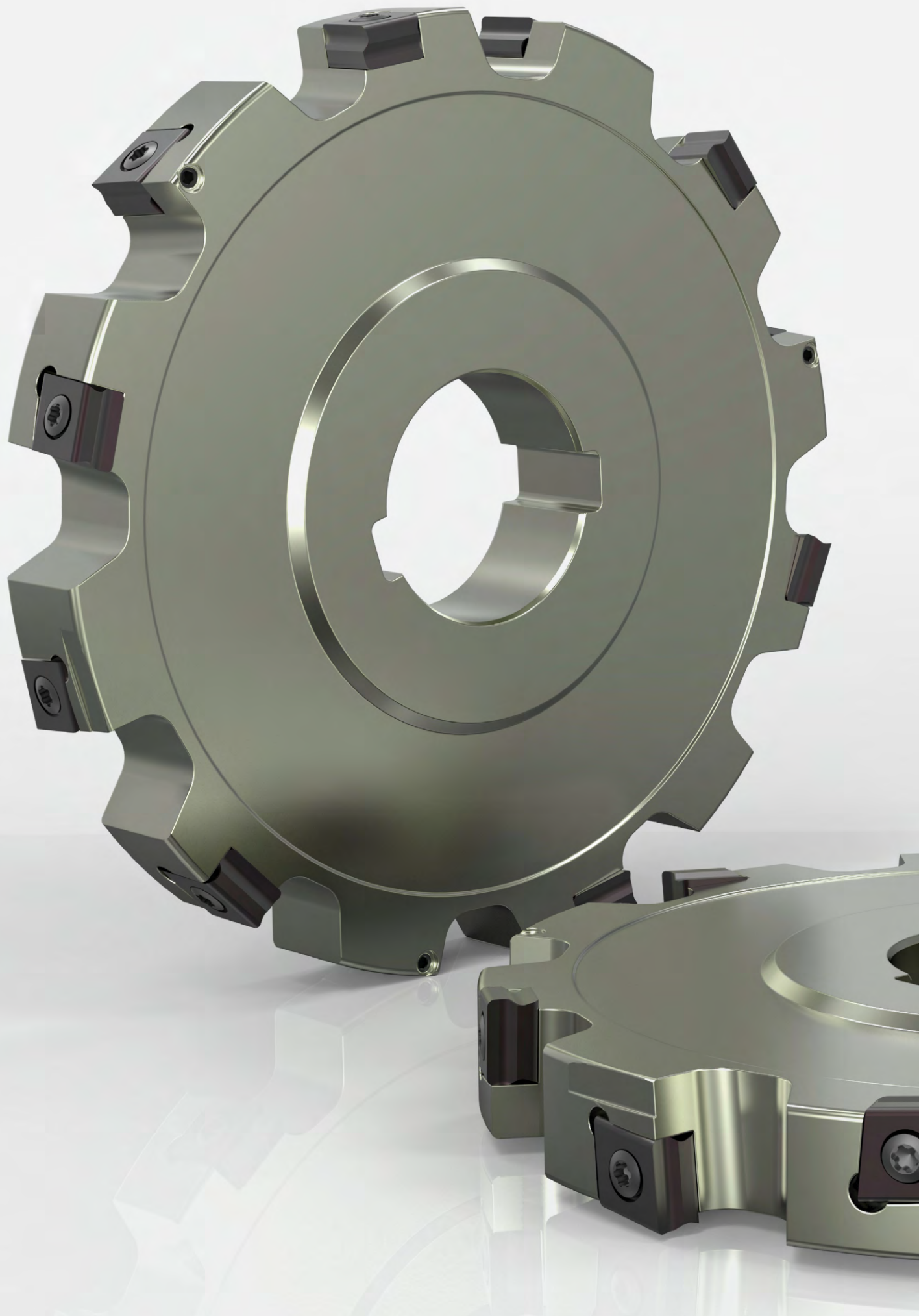
| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|--------------------------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | | | |
| | P5 | P5.1 Cast steel | | | | |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | | | |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | | ✓ | |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2 | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | | ✓ | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | | | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | | | |
| | | N1.4 Aluminium, alloy > 12 % Si | | | | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | | ✓ | |
| | | N2.2 Copper, alloy | > 300 | | | |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | | | |
| | N3 | N3.1 Graphite, > 8 µm | | | | |
| | | N3.2 Graphite, ≤ 8 µm | | | | |
| | N4 | N4.1 Plastic, thermoplastics | | | | |
| N4.2 Plastic, thermosets | | | | | | |
| N4.3 Plastic, foams | | | | | | |

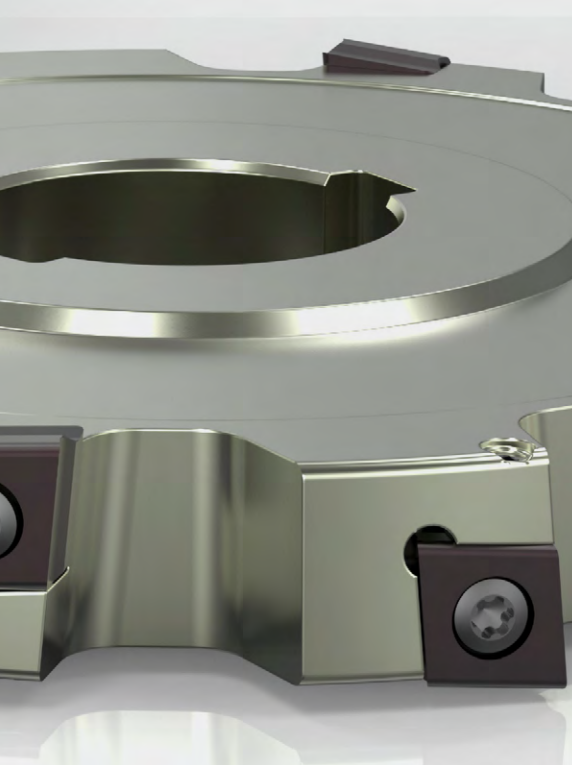
* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|
| Carbide PVD-coated | | | | | | | | | | Carbide CVD-coated | | | | | | Carbide - uncoated | | PCD | |
| HP615 | | HP965 | | HP975 | | HP980 | | HP985 | | HC760 | | HC770 | | HC775 | | HU616 | | PU617 | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 |
| | | | | 180 | 220 | 180 | 220 | | | | | 260 | 280 | | | | | | |
| | | | | 150 | 180 | 150 | 180 | | | | | 250 | 270 | 240 | 260 | | | | |
| | | | | 160 | 200 | 160 | 200 | | | | | 240 | 260 | 230 | 250 | | | | |
| | | | | | | 130 | 160 | | | | | | | 220 | 240 | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 110 | 140 | | | | | | | | | | | | |
| | | | | | | 160 | 180 | 140 | 170 | | | | | | | | | | |
| | | | | | | 140 | 160 | 120 | 150 | | | | | | | | | | |
| | | | | | | | | 100 | 120 | | | | | | | | | | |
| | | | | | | | | 90 | 110 | | | | | | | | | | |
| | | 220 | 270 | 200 | 240 | | | | | 330 | 350 | 320 | 330 | | | | | | |
| | | 200 | 240 | 180 | 220 | | | | | 300 | 330 | 300 | 320 | | | | | | |
| | | 180 | 220 | 160 | 200 | | | | | | | 260 | 300 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | | | 220 | 260 | | | | | | |
| | | 170 | 210 | 150 | 180 | | | | | 210 | 240 | 200 | 220 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | 200 | 220 | 180 | 200 | | | | | | |
| 700 | 700 | | | | | | | | | | | | | | | 500 | 500 | 2000 | 2000 |
| 400 | 480 | | | | | | | | | | | | | | | 300 | 360 | 1500 | 1800 |
| 300 | 360 | | | | | | | | | | | | | | | 230 | 280 | 1200 | 1440 |
| 270 | 330 | | | | | | | | | | | | | | | | | 700 | 840 |
| 250 | 300 | | | | | | | | | | | | | | | 250 | 300 | 600 | 720 |
| 130 | 160 | | | | | | | | | | | | | | | 120 | 150 | 500 | 600 |
| 190 | 230 | | | | | | | | | | | | | | | 180 | 220 | 450 | 540 |
| 320 | 390 | | | | | | | | | | | | | | | 300 | 360 | | |
| 320 | 390 | | | | | | | | | | | | | | | | | | |
| 220 | 270 | | | | | | | | | | | | | | | 300 | 360 | 500 | 600 |
| 210 | 260 | | | | | | | | | | | | | | | 250 | 300 | 400 | 480 |

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.





DISC MILLING CUTTER

TGMill – tangential technology

| | |
|-----------------------------|-----|
| TGMill-2-Disc, CT_D09 | 368 |
| TGMill-4-Disc, CT_Q09 | 370 |

Accessories and spare parts

| | |
|--|-----|
| Accessories for tangential indexable inserts | 385 |
| Allocating milling cutter clamping screws | 386 |

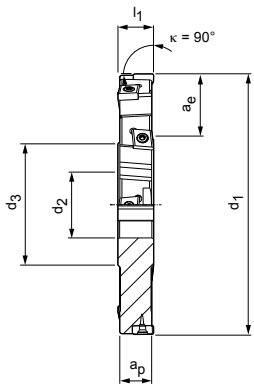
Technical appendix

| | |
|--|-----|
| Cutting data recommendations | 374 |
| Handling notes Milling cutter clamping screw | 412 |

TGMill-2-Disc

Disc milling cutter with tangential technology





CT_D09





Milling cutter head, both sides – triple edge

| Dimensions | | | | Z _{eff} | Z _{axial} * | Number of indexable inserts | a _p max. | a _e max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|----------------------|-----------------------------|---------------------|---------------------|-------------|---|------------------|-------------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | | | | | | | | | | |
| 100 | 32 | 58 | 17 | 5+5 | 2+2 | 10 | 17 | 18 | 0,7 | 27.000 | – | IDM900-100-CA32-Z5+5R3-CT_D09 | 30395685 |
| 125 | 32 | 58 | 17 | 6+6 | 3+3 | 12 | 17 | 30 | 1,2 | 24.100 | – | IDM900-125-CA32-Z6+6R3-CT_D09 | 30383557 |
| 160 | 40 | 70 | 17 | 7+7 | 3+3 | 14 | 17 | 40 | 2 | 21.300 | – | IDM900-160-CA40-Z7+7R3-CT_D09 | 30395701 |
| 200 | 40 | 70 | 17 | 8+8 | 4+4 | 16 | 17 | 60 | 3,3 | 19.100 | – | IDM900-200-CA40-Z8+8R3-CT_D09 | 30395712 |

Accessories

| | | | |
|---|----------|---|----------|
|  | CTHD09T3 | Indexable inserts | Page 369 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Spacer ring | Page 383 |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | | |
|---|----------|-------------------------------------|-----------------------|
|  | CT_D09T3 | TORX PLUS® M3.5x9.4-TX10-IP | Order no. 10007315 |
|  | CT_D09T3 | Threaded pin ISO 4026 – M3X5-45H | Order no. 10003421 |

Dimensions in mm.

Other dimensions for one-sided cutting (left or right side) available upon request.

* Number of axially adjustable indexable inserts.

** Included in scope of delivery.

The maximum operating speeds refer to the cutting edge system.

CTHD

Tangential indexable insert, double edge or single edge (tipped)



| | | |
|-----------------------|--------------------------------|-------------------------------|
| Workpiece material | N | |
| | Al alloyed ← Wear-resistant | Cu alloyed → Tough/Ductile |
| Substrate | Carbide | PCD |
| Coating | - | - |
| Cutting material type | HU616 | PU617 |

| Cutting edge design | | D00 | D80 |
|--------------------------|--------------------------------|----------|----------|
| CTHD09 | a_p max. [mm] | | |
| CTHD09T304...L-... | * | 30029697 | 30492516 |
| CTHD09T304...L90M018-... | * | 30493152 | 31283623 |
| CTHD09T304...R-... | * | 30029737 | 30492519 |
| CTHD09T304...R90M018-... | * | 30567180 | 31283626 |
| CTHD09T308...L-... | * | 30029698 | 30383869 |
| CTHD09T308...R-... | * | 30029738 | 30374036 |
| CTHD09T312...L-... | * | 30029699 | |
| CTHD09T312...R-... | * | 30029739 | |

| Cutting edge design | | D60 |
|--------------------------|--------------------------------|----------|
| CTHD09 | a_p max. [mm] | |
| CTHD09T304...L-... | 2.5 | 31283606 |
| CTHD09T304...L90M018-... | 2.5 | 31283614 |
| CTHD09T304...R-... | 2.5 | 31283617 |
| CTHD09T304...R90M018-... | 2.5 | 31283618 |
| CTHD09T308...L-... | 2.5 | 31283620 |
| CTHD09T308...R-... | 2.5 | 31283621 |

Feed per tooth

| Application | | Universal application | | |
|-----------------|----------|-----------------------|------------|------------|
| | | D00 | D60 | D80 |
| Edge rounding | | 0 | 0 | 0 |
| Feed/tooth [mm] | P | | | |
| | M | | | |
| | K | | | |
| | N | 0.05 - 0.5 | 0.05 - 0.5 | 0.05 - 0.5 |

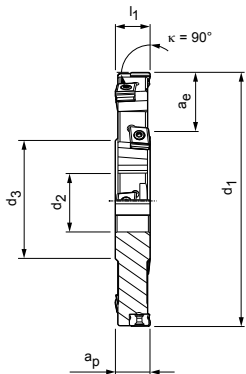
Legend: 0 = Sharp edged

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

TGMill-4-Disc

Disc milling cutter with tangential technology





CT_Q09





Milling cutter head, both sides – triple edge

| Dimensions | | | | Z _{eff} | Z _{axial} * | Number of indexable inserts | a _p max. | a _e max. | Weight [kg] | Max. operating speed [min ⁻¹] | Internal cooling | Specification | Order no. |
|----------------|----------------|----------------|----------------|------------------|----------------------|-----------------------------|---------------------|---------------------|-------------|---|------------------|-------------------------------|-----------|
| d ₁ | d ₂ | d ₃ | l ₁ | | | | | | | | | | |
| 100 | 32 | 58 | 17 | 5+5 | 2+2 | 10 | 17 | 18 | 0,7 | 24.000 | – | IDM900-100-CA32-Z5+5R3-CT_Q09 | 30395690 |
| 125 | 32 | 58 | 17 | 6+6 | 3+3 | 12 | 17 | 30 | 1,2 | 21.600 | – | IDM900-125-CA32-Z6+6R3-CT_Q09 | 30382216 |
| 160 | 40 | 70 | 17 | 7+7 | 3+3 | 14 | 17 | 40 | 2 | 19.000 | – | IDM900-160-CA40-Z7+7R3-CT_Q09 | 30395704 |
| 200 | 40 | 70 | 17 | 8+8 | 4+4 | 16 | 17 | 60 | 3,2 | 17.000 | – | IDM900-200-CA40-Z8+8R3-CT_Q09 | 30395717 |

Accessories

| | | | |
|---|----------|---|----------|
|  | CT_Q0905 | Indexable inserts | Page 372 |
|  | | Milling cutter arbor for milling cutter head see MAPAL catalogue "CLAMPING" | |
|  | | Spacer ring | Page 383 |
|  | | Milling cutter clamping screw for milling cutter head | Page 386 |

Spare parts**

| | | | |
|---|----------|-------------------------------------|-----------------------|
|  | CT_Q0905 | TORX PLUS® M3.5x11-TX10-IP | Order no. 10105079 |
|  | | Threaded pin ISO 4026 – M3X5-45H | Order no. 10003421 |

Dimensions in mm.

Other dimensions for one-sided cutting (left or right side) available upon request.

* Number of axially adjustable indexable inserts.

** Included in scope of delivery.

The maximum operating speeds refer to the cutting edge system.



CUSTOM-MADE DISC MILLING CUTTER



Combination disc milling cutter and insert drill for machining wheel carriers or swivel bearings with less tools.

► Customised special solution upon request

CUSTOMISED SPECIAL SOLUTIONS

- Individual dimensions
- Different numbers of teeth
- Tool design with insert seats for tangential, radial and special inserts
- Milling cutter head or monolithic design with different connections
- Standard milling cutter arbor with vibration damper or customised tool body with integrated vibration damper

INSERTS IN SPECIAL DESIGN

- Special inserts with component-specific geometries and a large selection of cutting materials
- High process reliability in case of contour-dependent shapes and geometries
- Saves complex machining sequences, reducing cycle and non-productive times
- Multi-cutting-edge capability for manufacturing complex component-specific contours



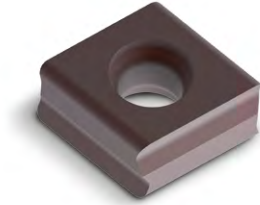
Disc milling cutters with PCD-tipped cutting edges for the economical machining of optical components.

► Customised special solution upon request



CTHQ | CTNQ

Tangential indexable insert, four cutting edges



| Workpiece material | P | | M | |
|-----------------------|-----------------------------|--------------------------|------------------------------|---------------------------|
| | Unalloyed Wear-resistant | Alloyed Tough/Ductile | Austenitic Wear-resistant | Ferritic Tough/Ductile |
| Substrate | Carbide | | Carbide | |
| Coating | PVD | | CVD | |
| Cutting material type | HP975 | | HP980 | HP985 |

| Cutting edge design | | H08 | | H06 | H06 | H06 |
|---------------------|-----------------|----------|--|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | | |
| CTNQ090508...L-... | * | 31190836 | | 31272736 | 31190839 | 31190850 |
| CTNQ090508...R-... | * | 31048496 | | 31272737 | 31048497 | 31048498 |
| CTNQ090512...L-... | * | 31190854 | | 31272688 | 31190857 | 31190860 |
| CTNQ090512...R-... | * | 31048510 | | 31272700 | 31048511 | 31048512 |
| CTHQ09 | | | | | | |
| CTHQ090508...R-... | * | 31048522 | | 31272841 | 31048523 | 31048524 |
| CTHQ090512...R-... | * | 31048526 | | 31272850 | 31048527 | 31048528 |

| Cutting edge design | | A38 | A36 | A36 | A36 | A36 |
|--------------------------|-----------------|----------|----------|----------|----------|----------|
| CTNQ09 | a_p max. [mm] | | | | | |
| CTNQ090508...L-... | * | 31190866 | | 31272811 | 31190868 | 31190870 |
| CTNQ090508...R-... | * | 31048514 | | 31272812 | 31048515 | 31048516 |
| CTNQ090512...L-... | * | 31190872 | | 31272709 | 31190874 | 31190875 |
| CTNQ090512...R-... | * | 31048518 | | 31272720 | 31048519 | 31048520 |
| CTHQ09 | | | | | | |
| CTHQ090508...L90M008-... | * | | 31190742 | 31272830 | 31190744 | |
| CTHQ090508...R-... | * | 31048530 | | 31272837 | 31048531 | 31048532 |
| CTHQ090508...R90M008-... | * | | 31190731 | 31272835 | 31190733 | |
| CTHQ090512...R-... | * | 31048534 | | 31272845 | 31048535 | 31048536 |

Feed per tooth

| Application | Cutting edge design | Roughing | | | | | Medium machining | | | | |
|-----------------|---------------------|----------|-----------|-----------|-----------|-------------|------------------|-----------|-----------|-----------|-----------|
| | | H06 | | H08 | | H21 | A36 | | A38 | | H20 |
| Coating | Edge rounding | PVD | CVD | PVD | CVD | PVD | PVD | CVD | PVD | CVD | PVD |
| | | ++ | | +++ | | + | ++ | | +++ | | 0 |
| Feed/tooth [mm] | P | 0.12-0.3 | 0.12-0.23 | 0.12-0.35 | 0.12-0.27 | | 0.1-0.25 | 0.1-0.19 | 0.12-0.25 | 0.12-0.19 | |
| | M | 0.1-0.3 | 0.1-0.23 | | | | 0.12-0.25 | 0.12-0.19 | | | |
| | K | | | 0.12-0.4 | 0.12-0.3 | | | | 0.1-0.3 | 0.1-0.23 | |
| | N | | | | | 0.15 - 0.35 | | | | | 0.1 - 0.3 |

Legend: 0 = sharp edged | + = slightly rounded | ++ = medium rounded | +++ = heavily rounded

* a_p max. depends on the type of milling cutter and application.
 For related clamping screw and screwdriver see page 385.
 For cutting data recommendations, see end of chapter.

| K | | | | | | | | N | |
|-------------------------|----------|------------------------|----------|-------------------------|----------|------------------------|----------|----------|----------|
| GJL ← Wear-resistant | | GJS → Tough/Ductile | | GJL ← Wear-resistant | | GJS → Tough/Ductile | | | |
| Carbide | | | | | | | | Carbide | |
| PVD | | | | CVD | | | | - | PVD |
| HP965 | | HP975 | | HC760 | | HC770 | | HU616 | HP615 |
| | H08 | | H08 | | H08 | | H08 | | H21 |
| | 31190831 | | 31190836 | | 31272741 | | 31272744 | | |
| | 31048495 | | 31048496 | | 31272745 | | 31272748 | | |
| | 31190852 | | 31190854 | | 31272702 | | 31272703 | | |
| | 31048499 | | 31048510 | | 31272705 | | 31272707 | | |
| | 31048521 | | 31048522 | | 31272843 | | 31272844 | | 31257300 |
| | 31048525 | | 31048526 | | 31272851 | | 31272855 | | 31316852 |
| | A38 | A36 | A38 | A36 | A38 | A36 | A38 | A36 | H20 |
| | 31190864 | | 31190866 | | 31272813 | | 31272815 | | |
| | 31048513 | | 31048514 | | 31272816 | | 31272817 | | |
| | 31190871 | | 31190872 | | 31272722 | | 31272723 | | |
| | 31048517 | | 31048518 | | 31272725 | | 31272726 | | |
| | | 31190740 | | 31190742 | | 31272818 | | 31272819 | |
| | 31048529 | | 31048530 | | 31272838 | | 31272840 | | 31316862 |
| | | 31190730 | | 31190731 | | 31272832 | | 31272834 | 31316865 |
| | 31048533 | | 31048534 | | 31272847 | | 31272848 | | 31316863 |

Cutting data recommendations for disc milling cutter

Feed and cutting speed

| MMG* | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Cooling | | |
|------|----|---|---|---------|-----|---------|
| | | | | MQL/Air | Dry | Coolant |
| P | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 | | ✓ | |
| | | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1200 | | ✓ | |
| | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy | < 900 | | ✓ | |
| | | P2.2 Nitrided, case hardened and heat-treated steels, alloy | < 1400 | | ✓ | |
| | P3 | P3.1 Tool, bearing, spring and high-speed steels** | < 800 | | ✓ | |
| | | P3.2 Tool, bearing, spring and high-speed steels** | < 1000 | | ✓ | |
| | | P3.3 Tool, bearing, spring and high-speed steels** | < 1500 | | ✓ | |
| | P4 | P4.1 Stainless steels, ferritic and martensitic | | | | |
| | P5 | P5.1 Cast steel | | | | |
| | P6 | P6.1 Stainless cast steel, ferritic and martensitic | | | | |
| M | M1 | M1.1 Stainless steels, austenitic | < 700 | | ✓ | |
| | | M1.2 Stainless steels, ferritic/austenitic (duplex) | < 1000 | | | |
| | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic | < 700 | | | |
| | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex) | < 1000 | | | |
| K | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL | < 300 | | ✓ | |
| | | K2.1 Cast iron with spheroidal graphite, GJS | < 500 | | ✓ | |
| | K2 | K2.2 Cast iron with spheroidal graphite, GJS | 500-800 | | | |
| | | K2.3 Cast iron with spheroidal graphite, GJS | > 800 | | | |
| | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 | | | |
| | | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 | | | |
| N | N1 | N1.1 Aluminium, non-alloy and alloy < 3 % Si | | | ✓ | |
| | | N1.2 Aluminium, alloy ≤ 7 % Si | | | | |
| | | N1.3 Aluminium, alloy > 7-12 % Si | | | | |
| | | N1.4 Aluminium, alloy > 12 % Si | | | | |
| | N2 | N2.1 Copper, non-alloy and low-alloy | < 300 | | ✓ | |
| | | N2.2 Copper, alloy | > 300 | | | |
| | | N2.3 Brass, bronze, gunmetal | < 1200 | | | |
| | N3 | N3.1 Graphite, > 8 µm | | | | |
| | | N3.2 Graphite, ≤ 8 µm | | | | |
| | N4 | N4.1 Plastic, thermoplastics | | | | |
| | | N4.2 Plastic, thermosets | | | | |
| | | N4.3 Plastic, foams | | | | |

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

| v _c [m/min] according to cutting material type and contact ratio a _e /D | | | | | | | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|-------|-------|-------|-------|-------|------------------|-------|-------|-------|
| Carbide PVD-coated | | | | | | | | | | Carbide CVD-coated | | | | | | Carbide uncoated | | PCD | |
| HP615 | | HP965 | | HP975 | | HP980 | | HP985 | | HC760 | | HC770 | | HC775 | | HU616 | | PU617 | |
| > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 | > 0.6 | < 0.6 |
| | | | | 180 | 220 | 180 | 220 | | | | | 260 | 280 | | | | | | |
| | | | | 150 | 180 | 150 | 180 | | | | | 250 | 270 | 240 | 260 | | | | |
| | | | | 160 | 200 | 160 | 200 | | | | | 240 | 260 | 230 | 250 | | | | |
| | | | | | | 130 | 160 | | | | | | | 220 | 240 | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 120 | 150 | | | | | | | | | | | | |
| | | | | | | 130 | 160 | | | | | | | | | | | | |
| | | | | | | 110 | 140 | | | | | | | | | | | | |
| | | | | | | 160 | 180 | 140 | 170 | | | | | | | | | | |
| | | | | | | 140 | 160 | 120 | 150 | | | | | | | | | | |
| | | | | | | | | 100 | 120 | | | | | | | | | | |
| | | | | | | | | 90 | 110 | | | | | | | | | | |
| | | 220 | 270 | 200 | 240 | | | | | 330 | 350 | 320 | 330 | | | | | | |
| | | 200 | 240 | 180 | 220 | | | | | 300 | 330 | 300 | 320 | | | | | | |
| | | 180 | 220 | 160 | 200 | | | | | | | 260 | 300 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | | | 220 | 260 | | | | | | |
| | | 170 | 210 | 150 | 180 | | | | | 210 | 240 | 200 | 220 | | | | | | |
| | | 160 | 200 | 140 | 170 | | | | | 200 | 220 | 180 | 200 | | | | | | |
| 700 | 700 | | | | | | | | | | | | | | | 500 | 500 | 2000 | 2000 |
| 400 | 480 | | | | | | | | | | | | | | | 300 | 360 | 1500 | 1800 |
| 300 | 360 | | | | | | | | | | | | | | | 230 | 280 | 1200 | 1440 |
| 270 | 330 | | | | | | | | | | | | | | | | | 700 | 840 |
| 250 | 300 | | | | | | | | | | | | | | | 250 | 300 | 600 | 720 |
| 130 | 160 | | | | | | | | | | | | | | | 120 | 150 | 500 | 600 |
| 190 | 230 | | | | | | | | | | | | | | | 180 | 220 | 450 | 540 |
| 320 | 390 | | | | | | | | | | | | | | | 300 | 360 | | |
| 320 | 390 | | | | | | | | | | | | | | | | | | |
| 220 | 270 | | | | | | | | | | | | | | | 300 | 360 | 500 | 600 |
| 210 | 260 | | | | | | | | | | | | | | | 250 | 300 | 400 | 480 |

The specified machining values are guide values.
 The optimum data for the respective machining task should be determined during the test or machining.





ACCESSORIES AND SPARE PARTS

Milling cutter with PCD milling cartridges

| | |
|---------------------------------|-----|
| Power milling head system | 378 |
| Eco milling head system | 380 |

Milling cutter with indexable inserts

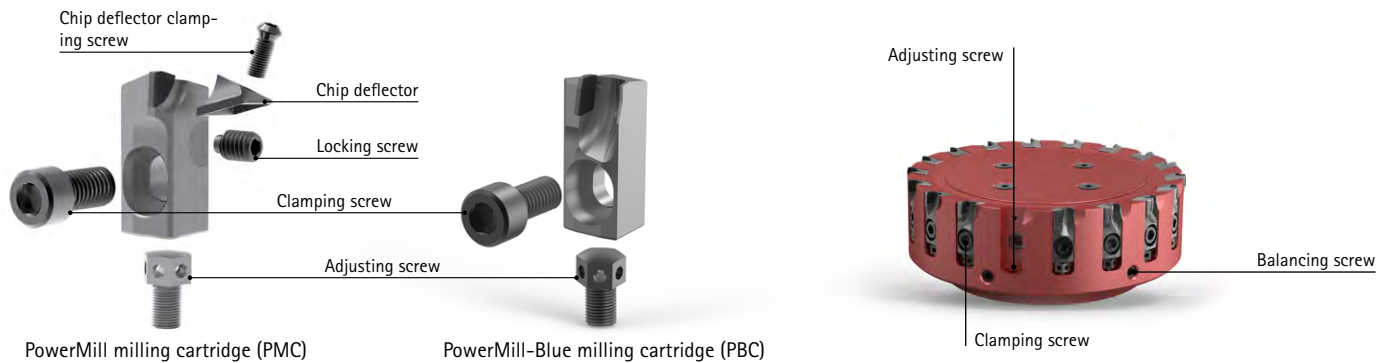
| | |
|---|-----|
| Accessories and spare parts | 382 |
| Allocating milling cutter clamping screws | 386 |




General accessories

| | |
|--|-----|
| Screwdriver | 388 |
| Torque wrench set, screwdriver set | 389 |



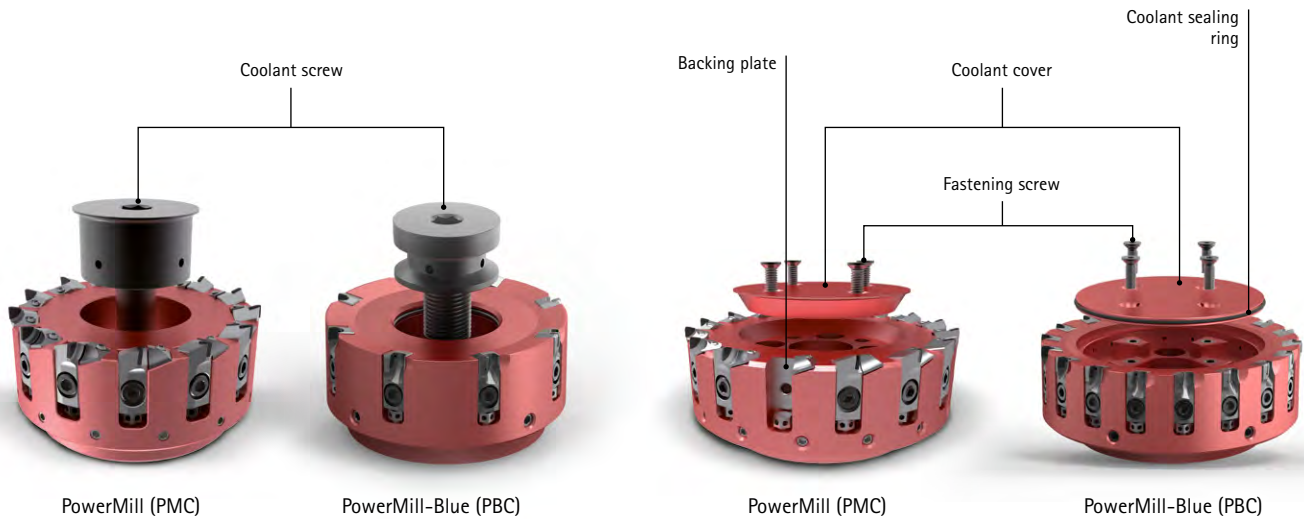
Accessories and spare parts for milling cutters with PCD milling cartridges – Power system









| | PMC | PBC | d* [mm] | Dimension | Description | Wrench size / Torx size | Tightening torque [Nm] | Weight [g] | Order no. |
|---|-----|-----|-----------|-----------|---------------------|-------------------------|------------------------|------------|------------|
| Clamping screws for milling cartridge | | | | | | | | | |
|  | • | • | 50 - 400 | M6x13 | Cylinder head screw | SW 5 | 14 | 5 | 30696520** |
| Adjusting screw for milling cartridge | | | | | | | | | |
|  | • | • | 50 - 400 | M5x8 | | | | 2,5 | 30696523 |
| Balancing screws | | | | | | | | | |
|  | • | • | 50 - 100 | M6x10 | Balancing screw | | | 1,4 | 10012533 |
| | • | • | 125 - 400 | M8x10 | Balancing screw | | | 2,7 | 10012538 |

* Face milling cutter diameter.

** Only suitable for single use.

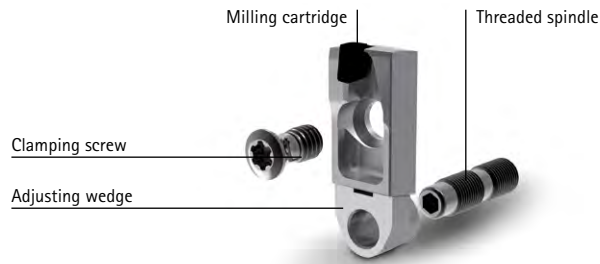


| | PMC | PBC | d* [mm] | Dimension | Description | Wrench size / Torx size | Tightening torque [Nm] | Weight [g] | Order no. |
|---|-----|-----|-----------|-----------|---|-------------------------|------------------------|------------|-----------|
| Fastening screw with coolant delivery | | | | | | | | | |
|  | • | | 50 | | Coolant screw | SW 8 | 20 | 33,6 | 30430829 |
| | • | | 63 | | Coolant screw | SW 10 | 50 | 82,3 | 30326178 |
| | • | | 80 | | Coolant screw | SW 12 | 80 | 176,2 | 30326179 |
| | • | | 100 | | Coolant screw | SW 14 | 100 | 263 | 30326180 |
| | • | | 125 - 140 | | Coolant screw | SW 14 | 200 | 595 | 30326181 |
|  | | • | 50 | | Coolant screw | SW 8 | 20 | 197 | 30543340 |
| | | • | 63 | | Coolant screw | SW 10 | 50 | 69,4 | 30543341 |
| | | • | 80 | | Coolant screw | SW 12 | 80 | 128,3 | 30543342 |
| | | • | 100 | | Coolant screw | SW 14 | 100 | 203,5 | 30543344 |
| | | • | 125 - 140 | | Coolant screw | SW 14 | 200 | 460 | 30543345 |
| Coolant cover | | | | | | | | | |
|  | • | | 160 - 180 | | Coolant cover | | | 200 | 30696538 |
| | • | | 200 | | Coolant cover | | | 500 | 30696539 |
| | • | | 250 | | Coolant cover | | | 700 | 30696540 |
| | • | | 315 | | Coolant cover | | | 1300 | 30696541 |
| | • | | 400 | | Coolant cover | | | 2300 | 30696542 |
| Coolant cover including coolant sealing ring | | | | | | | | | |
|  | | • | 160 | | Coolant cover | | | 140,4 | 30569889 |
| | | • | 200 | | Coolant cover | | | 256,2 | 30569890 |
| | | • | 250 | | Coolant cover | | | 540,2 | 30569891 |
| | | • | 315 | | Coolant cover | | | 940 | 30569892 |
| | | • | 400 | | Coolant cover | | | 1550 | 30569893 |
| Fastening screw for coolant cover | | | | | | | | | |
|  | • | • | 160 - 400 | M6x18 | Countersunk screw | SW 4 | | 4,3 | 30670137 |
| Accessories** | | | | | | | | | |
| Fastening screw for milling cutter arbors | | | | | | | | | |
|  | • | • | 160 | M12x45 | Cylinder head screw in acc. with ISO 4762 | SW 10 | 70 | 84 | 10006594 |
| | • | • | 200 - 400 | M16x50 | Cylinder head screw in acc. with ISO 4762 | SW 14 | 70 | 140 | 10007775 |

* Face milling cutter diameter.

** Not included in scope of delivery.






Accessories and spare parts for milling cutters with PCD milling cartridges – Eco system



Example: EcoMill-Blue milling cartridge (EBC)



FlyCutter (FMC)

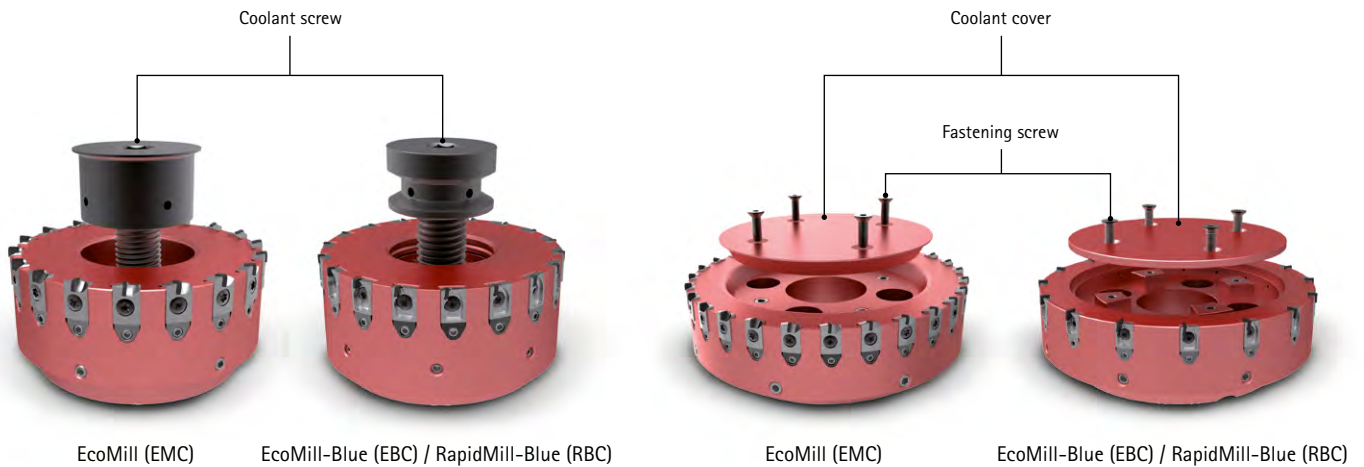
| | EMC | EBC | RBC | FMC | d* [mm] | Di mensions | Description | SW / Torx size | Tightening torque [Nm] | Weight [g] | Order no. |
|---|-----|-----|-----|-----|------------|---------------------|------------------|-------------------|---------------------------|---------------|------------|
| Clamping screws for milling cartridge | | | | | | | | | | | |
|  | • | • | | | all | M5x11 | Torx screw | TX25 | 8 | 1,5 | 30696524** |
| | | | • | | all | M4x8,5 | Torx screw | 15IP | 5 | 0,7 | 30412229** |
| | | | | • | all | M5x8 | Torx screw | TX25 | 8 | 2,3 | 30499981 |
| Adjusting wedge | | | | | | | | | | | |
|  | • | • | | | 32 - 40 | | Adjusting wedge | | | 1,7 | 30696527 |
| | • | • | | • | 50 - 400 | | Adjusting wedge | | | 1,6 | 30696526 |
| | | | • | | all | | Adjusting wedge | | | 1,6 | 30557564 |
| Threaded spindle | | | | | | | | | | | |
|  | | • | • | | 32 - 40*** | M5x0,5L/ REx11,5 | Threaded spindle | SW 2,5 | | 2,0 | 30696528 |
| | • | • | • | • | From 50 | M5x0,5LH/ RHx17 | Threaded spindle | SW 2,5 | | 1,2 | 30696525 |
| Locking screw | | | | | | | | | | | |
|  | | | | • | 80 - 160 | M4x6 | Locking screw | SW 2 | 2 | 0,3 | 30367364 |
| Balancing screws | | | | | | | | | | | |
|  | • | • | • | • | 80 - 160 | M6x10 | Threaded pin | | | 1,4 | 10040022 |
| | • | • | • | • | 200 - 400 | M10x10 | Threaded pin | | | 2,7 | 10012542 |
| | • | • | • | • | **** | M8x10 | Threaded pin | | | 2,2 | 10040023 |

* Face milling cutter diameter.

** Only suitable for single use.

*** RBC to 50.

**** Only suitable for custom milling cutters.

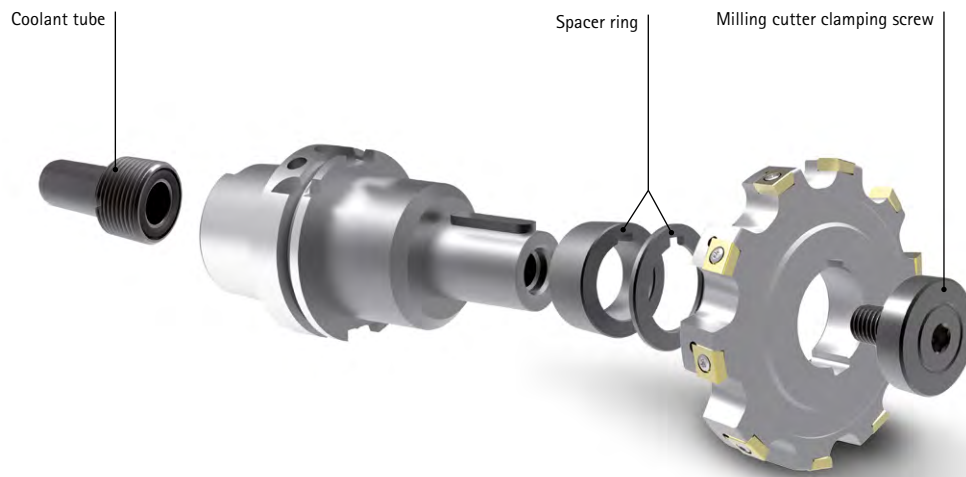








| | EMC | EBC | RBC | FMC | d* [mm] | Dimension | Description | Wrench size / Torx size | Tightening torque [Nm] | Weight [g] | Order no. |
|---|-----|-----|-----|----------|-----------|-----------|---|-------------------------|------------------------|------------|--------------|
| Fastening screw with coolant delivery | | | | | | | | | | | |
| | • | | | | 50 | | Coolant screw | SW 8 | 20 | 33,6 | 30430829 |
| | • | | | | 63 | | Coolant screw | SW 10 | 50 | 82,3 | 30326178 |
| | • | | | | 80 | | Coolant screw | SW 12 | 80 | 176,2 | 30326179 |
| | • | | | | 100 | | Coolant screw | SW 14 | 100 | 263 | 30326180 |
| | • | | | | 125 - 140 | | Coolant screw | SW 14 | 200 | 595 | 30326181 |
| | | • | • | | 50 | | Coolant screw | SW 8 | 20 | 197 | 30543340 |
| | | • | • | | 63 | | Coolant screw | SW 10 | 50 | 69,4 | 30543341 |
| | | • | • | | 80 | | Coolant screw | SW 12 | 80 | 128,3 | 30543342 |
| | | • | • | | 100 | | Coolant screw | SW 14 | 100 | 203,5 | 30543344 |
| | | | | • | 125 - 140 | | Coolant screw | SW 14 | 200 | 460 | 30543345 |
| | | | | • | 63 | | Coolant screw | SW 24 | 70 | 40 | 30772751-600 |
| | | | | • | 80 - 160 | M12x20 | Coolant screw | SW 24 | 80 | 47 | 30381973-601 |
| | | | • | 80 - 160 | ø 36 mm | Washer | | | | 21 | 30381973-600 |
| Coolant cover | | | | | | | | | | | |
| | • | | | | 160 - 180 | | Coolant cover | | | 200 | 30696538 |
| | • | | | | 200 | | Coolant cover | | | 500 | 30696539 |
| | • | | | | 250 | | Coolant cover | | | 700 | 30696540 |
| | • | | | | 315 | | Coolant cover | | | 1300 | 30696541 |
| | • | | | | 400 | | Coolant cover | | | 2300 | 30696542 |
| Coolant cover including coolant sealing ring | | | | | | | | | | | |
| | | • | • | | 160 | | Coolant cover | | | 140,4 | 30569889 |
| | | • | • | | 200 | | Coolant cover | | | 256,2 | 30569890 |
| | | • | • | | 250 | | Coolant cover | | | 540,2 | 30569891 |
| | | • | • | | 315 | | Coolant cover | | | 940 | 30569892 |
| | | • | • | | 400 | | Coolant cover | | | 1550 | 30569893 |
| Fastening screw for coolant cover | | | | | | | | | | | |
| | • | • | • | | 160 - 400 | M6x18 | Countersunk screw | SW 4 | | 4,3 | 30670137 |
| Accessories** | | | | | | | | | | | |
| Fastening screw for milling cutter arbors | | | | | | | | | | | |
| | • | • | • | | 160 | M12x45 | Cylinder head screw in acc. with ISO 4762 | SW 10 | 70 | 84 | 10006594 |
| | • | • | • | | 200 - 400 | M16x50 | Cylinder head screw in acc. with ISO 4762 | SW 14 | 70 | 140 | 10007775 |

* Face milling cutter diameter.
 ** Not included in scope of delivery.

Accessories and spare parts for milling cutter with indexable inserts (1/2)

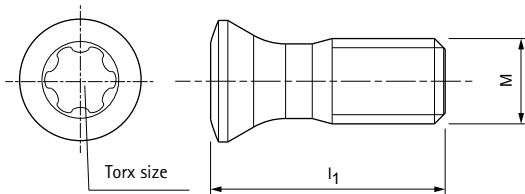
| | Dimension | Comments | Wrench size / Torx size | Order no. |
|---|------------|--|-------------------------|-----------|
| Threaded pin | | | | |
|  | M3X5-45H | Threaded pin ISO 4026 | SW 1,5 | 10003421 |
| | M3x8 | Reducer of the coolant bore with helix and shell end face milling cutter | SW 1,5 | 30433620 |
| Threaded spindle | | | | |
|  | M6x0.75 | M6x0.75 LH/RHx23.4 for ONKU0705 | 15IP | 31041869 |
| Clamping wedge | | | | |
|  | M6X0.75 LH | for ONKU0705 (close spacing) | | 31071645 |
| Clamping plate | | | | |
|  | | Screw lock for RD__1604 | | 31161929 |
| Threaded bush | | | | |
|  | M6x11 | for LTHU1505,1507 | SW 4 | 30413235 |
| Backing plate | | | | |
|  | 9,26x15,7 | Balancing plate for LTHU1505 | | 30413233 |
| Coolant tube | | | | |
|  | | DIN 69895-KSR-63 | | 30326006 |
| | | DIN 69895-KSR-80 | | 30326007 |
| | | DIN 69895-KSR-100 | | 30326008 |




| | d* [mm] | Dimension | Comments | Wrench size / Torx size | Tightening torque [Nm] | Order no. |
|---|---------|-----------|--|-------------------------|------------------------|-----------|
| Spacer ring DIN 2084-B | | | | | | |
|  | 32 | t=20 | for TGMill-2-Disc/-4-Disc with WSP CT__ | | | 10020571 |
| | 32 | t=3 | for TGMill-2-Disc/-4-Disc with WSP CT__ | | | 10020564 |
| | 40 | t=20 | for TGMill-2-Disc/-4-Disc with WSP CT__ | | | 10004780 |
| | 40 | t=6 | for TGMill-2-Disc/-4-Disc with WSP CT__ | | | 10004418 |
| Milling cutter clamping screw | | | | | | |
|  | 27 | M12x22 | DIN 6367 without internal cooling | SW 10 | 137 | 10005164 |
| | 32 | M16x26 | | SW 14 | 320 | 10004065 |
| | 40 | M20x30 | | SW 17 | 622 | 10004066 |
|  | 27 | M12x22 | DIN 6367 without internal cooling | SW 8 | 70 | 10006125 |
| | 32 | M16x26 | | SW 10 | 95 | 10009686 |
| | 40 | M20x30 | | SW 12 | 125 | 10006126 |
|  | 22 | M10x18 | With internal cooling | SW 10 | 50 | 10053822 |
| | 27 | M12x22 | | SW 12 | 70 | 10049206 |
| | 32 | M16x26 | | SW 14 | 100 | 10073932 |
|  | 40 | M20x30 | SW 14 | 125 | 10064487 | |
| | 16 | M8x30 | Cylinder head screw in acc. with ISO 4762 with internal cooling (according to MN692BL4) | SW 6 | 30 | 31006779 |
| | 22 | M10x30 | | SW 8 | 60 | 31006800 |
| | 27 | M12x35 | | SW 10 | 100 | 31008546 |
| 32 | M16x40 | SW 14 | | 250 | 31008547 | |
|  | 40 | M20x45 | SW 17 | 450 | 31009716 | |
| | 16 | M8X30 | Cylinder head screw in acc. with ISO 4762 | SW 6 | 35 | 10003638 |
| | 22 | M8X40 | | SW 6 | 35 | 10003640 |
| | 22 | M10X25 | | SW 8 | 70 | 10003659 |
| | 22 | M10x30 | | SW 8 | 70 | 10003660 |
| | 22 | M10X50 | | SW 8 | 70 | 10003663 |
| | 27 | M12X35 | | SW 10 | 120 | 10003677 |
| | 27 | M12X50 | | SW 10 | 120 | 10003679 |
| | 27 | M12X60 | | SW 10 | 120 | 10003680 |
| | 32 | M16X35 | | SW 14 | 300 | 10003690 |
| | 32 | M16X50 | | SW 14 | 300 | 10007775 |
| | 32 | M16X60 | | SW 14 | 300 | 10006564 |
| | 32 | M16X65 | | SW 14 | 300 | 10022995 |
| | 40 | M20X60 | | SW 17 | 550 | 10015925 |
| 40 | M20X45 | SW 17 | | 550 | 10111521 | |

* Face milling cutter diameter.


Accessories and spare parts for milling cutter with indexable inserts (2/2)




Clamping screw for radial indexable inserts

| | Indexable insert | Size of indexable insert | Clamping screw | | | | | Screwdriver | |
|---|------------------|--------------------------|----------------|---------------------|------------------------|-----------|-----------|-------------|----------|
| | | | Dimension | Description | Tightening torque [Nm] | Torx size | Order no. | Order no. | |
|  | OF... | 0704 | M5x13 | MN659 M5x13-TX20-IP | 7,5 | 20IP | 10105084 | 30414766 | |
| | ON... | 0705 | M5x13 | MN659 M5x13-TX20-IP | 7,5 | 20IP | 10105084 | 30414766 | |
| | AO... | 12T3 | M3x6.5 | MN659 M3x6.5-TX8-IP | 1,8 | 8IP | 10105074 | 30414760 | |
| | | | M3x7.5 | MN659 M3x7.5-TX8-IP | 1,8 | 8IP | 10105075 | 30414760 | |
| | AN... | 1205 | M3x8.5 | MN659 M3x8.5-TX8-IP | 1,8 | 8IP | 10105076 | 30414760 | |
| | SD... | 10T3 | M3x7.5 | MN659 M3x7.5-TX8-IP | 1,8 | 8IP | 10105075 | 30414760 | |
| | SN... | 1205 | M4x11 | MN659 M4x11-TX15-IP | 4 | 15IP | 10018468 | 30414764 | |
| | LP... | 0602 | M1.8X4.09 | M1.8X4.09-TX6-IP | 0,9 | 6IP | 31164571 | 30414758 | |
| | LD... | 1004 | M2.5X5.9 | M2.5X5.9-TX8-IP | 1,5 | 8IP | 31161842 | 30414760 | |
| | | | M2.5X6.8 | M2.5X6.8-TX8-IP | 2 | 8IP | 31161843 | 30414760 | |
| | | | 1804 | M3.5X10 | M3.5X10-TX15-IP | 3,5 | 15IP | 30870699 | 30414764 |
| | SD... | 0602 | M2.2X5.2 | M2.2X5.2-TX7-IP | 1,2 | 7IP | 31161853 | 30414759 | |
| | | | 1004 | M3X8.3 | M3X8.3-TX9-IP | 2 | 9IP | 31161852 | 30414761 |
| | | | 1405 | M5X10.8 | M5X10.8-TX20-IP | 5 | 20IP | 31161851 | 30414766 |
| | | | 0806 | M6X15 | M6X15-T25 | 6 | T25 | 31161862 | 10019476 |
| | RD... | 0501 | M1.8X3.7 | M1.8X3.7-TX6-IP | 0,6 | 6IP | 31161858 | 30414758 | |
| | | | 0702 | M2.5X5.5 | M2.5X5.5-TX7-IP | 1,4 | 7IP | 31161854 | 30414759 |
| | | | 1003 | M3.5X7.2 | M3.5X7.2-TX15-IP | 3,5 | 15IP | 31161859 | 30414764 |
| | | | 12T3 | M3.5X8.6 | M3.5X8.6-TX15-IP | 3,5 | 15IP | 31161860 | 30414764 |
| | | | | M3.5X7.2 | M3.5X7.2-TX15-IP | 5 | 15IP | 31161928 | 30414764 |
| 1604 | | | M4.5X10.5 | M4.5X10.5-TX20-IP | 5,5 | 20IP | 31161861 | 30414766 | |

Clamping screw for tangential indexable inserts

| | Indexable insert | Size of indexable insert | Clamping screw | | | | | Screwdriver |
|---|------------------|--------------------------|----------------|------------------------|------------------------|-----------|-----------|-------------|
| | | | Dimension | Description | Tightening torque [Nm] | Torx size | Order no. | Order no. |
|  | LT... | 1505, 1507 | M4x17 | MN659 M4x17-TX15-IP | 4,0 | 15IP | 30414702 | 30414764 |
| | CT... | 09T3 | M3.5x9.4 | MN659 M3.5x9.4-TX10-IP | 2,8 | 10IP | 10007315 | 30414763 |
| | | 0905 | M3.5x11 | MN659 M3.5x11-TX10-IP | 2,8 | 10IP | 10105079 | 30414763 |

High-temperature screw paste

| | Description | Order no. |
|---|--|-----------|
|  | Ceramic paste/re-sealable PE tube 30 g | 30861389 |

Allocating milling cutter clamping screws for milling cutters with indexable inserts

| Series | Diameter of milling cutter | Diameter of milling cutter arbor | Milling cutter clamping screw | | | | |
|--|----------------------------|----------------------------------|---|---|---|---|---|
| | | | Without internal cooling* | Without internal cooling | With internal cooling* | Without internal cooling* | With internal cooling |
| | | |  |  |  |  |  |
| NeoMill®-8-Face, OFMT07  | 63 | 22 | - | - | - | 10003660 | 31006800 |
| | 80 | 27 | - | - | - | 10003677 | 31008546 |
| | 100 | 32 | - | - | - | 10003690 | 31008547 |
| | 125 | 40 | - | - | - | 10111521 | 31009716 |
| | 160 | 40 | 10004066 | - | - | 10006594 (x4) | - |
| | 200 | 60 | - | - | - | 10022995 (x4) | - |
| NeoMill®-16-Face, ONKU07  | 63 | 22 | - | - | - | 10003660 | 31006800 |
| | 80 | 27 | - | - | - | 10003677 | 31008546 |
| | 100 | 32 | - | - | - | 10003690 | 31008547 |
| | 125 | 40 | - | - | - | 10111521 | 31009716 |
| | 160 | 40 | 10004066 | - | - | 10006594 (x4) | - |
| | 200 | 60 | - | - | - | 10022995 (x4) | - |
| TGMill-4-Face45, LTHU15  | 80 | 27 | 10005164 | 10006125 | 10049206 | - | - |
| | 100 | 32 | 10004065 | 10009686 | 10073932 | - | - |
| | 125 | 40 | 10004066 | 10006126 | 10064487 | - | - |
| | 160 | 40 | - | - | - | 10003680 (x4) | - |
| | 200 | 60 | - | - | - | 10006564 (x4) | - |
| NeoMill®-2-Corner, AOKT12 NeoMill®-4S-Corner, SDKT10 NeoMill®-8-Corner, SNMU12  | 40 | 16 | - | - | - | 10003638 | 31006779 |
| | 50 | 22 | - | - | - | 10003660 | 31006800 |
| | 63 | 22 | - | - | - | 10003660 | 31006800 |
| | 80 | 27 | - | - | - | 10003677 | 31008546 |
| | 100 | 32 | - | - | - | 10003690 | 31008547 |
| | 125 | 40 | - | - | - | 10111521 | 31009716 |
| | 160 | 40 | 10004066 | - | - | 10006594 (x4) | - |
| NeoMill®-4-Corner, ANMU12  | 40 | 16 | - | - | - | 10003640 | - |
| | 50 | 22 | - | - | - | 10003663 | - |
| | 63 | 27 | - | - | - | 10003679 | - |
| | 80 | 32 | - | - | - | 10007775 | - |
| | 100 | 40 | - | - | - | 10015925 | - |
| TGMill-2-Corner, CT_D09 TGMill-4-Corner, CT_Q09  | 63 | 22 | - | - | 10053822* | - | - |
| | 80 | 27 | 10005164 | 10006125 | 10049206 | - | - |
| | 100 | 32 | 10004065 | 10009686 | 10073932 | - | - |
| | 125 | 40 | 10004066 | 10006126 | 10064487 | - | - |
| | 160 | 40 | - | - | - | 10003680 (x4) | - |
| | 200 | 60 | - | - | - | 10006564 (x4) | - |
| NeoMill®-2-HiFeed90, LP_06  | 32 | 16 | - | - | - | 10003638 | - |
| | 40 | 16 | - | - | - | 10003638 | - |
| | 50 | 22 | - | - | - | 10003659 | - |

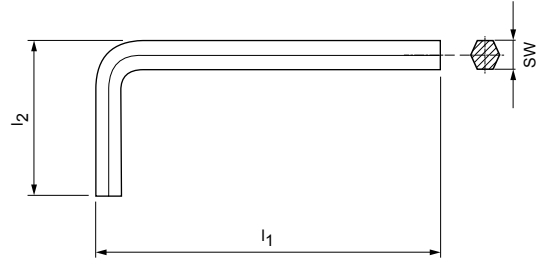
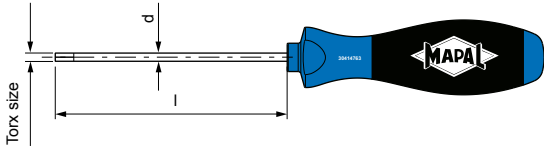
| Series | Diameter of milling cutter | Diameter of milling cutter arbor | Milling cutter clamping screw | | | | |
|---|----------------------------|----------------------------------|---|---|---|---|---|
| | | | Without internal cooling** | Without internal cooling | With internal cooling* | Without internal cooling* | With internal cooling |
| | | |  |  |  |  |  |
| NeoMill®-2-HiFeed90, LD_10  | 40 | 16 | - | - | - | 10003637 | - |
| | 50 - 63 | 22 | - | - | - | 10003659 | - |
| | 80 | 27 | - | - | - | 10003677 | - |
| NeoMill®-2-HiFeed90, LD_18  | 40 | 16 | - | - | - | 10003638 | - |
| | 50 - 66 | 22 | - | - | - | 10003659 | - |
| | 80 | 27 | - | - | - | 10003677 | - |
| | 100 | 32 | - | - | - | 10006565 | - |
| | 125 | 40 | - | - | - | 10009106 | - |
| | 160 | 40 | 10004066 | - | - | 10006594 (x4) | - |
| NeoMill®-4-HiFeed90, SD_10  | 40 | 16 | - | - | - | 31166231 | - |
| | 50 - 66 | 22 | - | - | - | 10003659 | - |
| | 80 | 27 | - | - | - | 10003677 | - |
| NeoMill®-4-HiFeed90, SD_14  | 50 - 52 | 22 | - | - | - | 31166232 | - |
| | 63 - 66 | 22 | - | - | - | 10003659 | - |
| | 80 | 27 | - | - | - | 10003677 | - |
| | 100 | 32 | - | - | - | 10003690 | - |
| | 125 | 40 | - | - | - | 10081881 | - |
| NeoMill®-4-HiFeed90, SD_18  | 80 | 27 | - | - | - | 10003677 | - |
| | 100 | 32 | - | - | - | 10003690 | - |
| | 125 | 40 | - | - | - | 10081881 | - |
| | 160 | 40 | 10004066 | - | - | 10006594 (x4) | - |
| | 200 | 60 | - | - | - | 10006594 (x4) | - |
| NeoMill®-ISO-360  | 40 - 42 | 16 | - | - | - | 10003639 | - |
| | 48 - 52 | 22 | - | - | - | 10003660 | - |
| | 63 - 80 | 27 | - | - | - | 10003677 | - |
| | 100 | 32 | - | - | - | 10003690 | - |
| | 125 | 40 | - | - | - | 10111521 | - |
| | 160 | 40 | 10004066 | - | - | 10006594 (x4) | - |
| NeoMill®-4-Shell, ANMU12  | 40 | 16 | - | - | - | 10003640 | - |
| | 50 | 22 | - | - | - | 10003663 | - |
| | 63 | 27 | - | - | - | 10003679 | - |
| TGMill-2-Disc, CT_D09 TGMill-4-Disc, CT_Q09  | 100 - 125 | 32 | 10004065 | 10009686 | - | - | - |
| | 160 - 200 | 40 | 10004066 | 10006126 | - | - | - |

Dimensions in mm.

* Included in scope of delivery for the tool body.

** Optional for clamping via central control.

General Accessories – Screwdriver

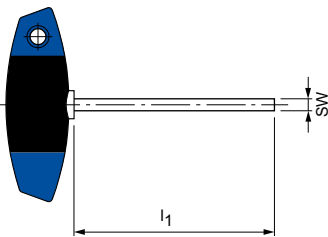


Screwdriver

| Dimensions | | | Description | Order no. | |
|------------|--------|-----------|-------------|-----------|----------|
| l [mm] | d [mm] | Torx size | | | |
| 60 | 3,5 | 6IP | TORX PLUS® | 30414758 | |
| 60 | 3,5 | 7IP | | 30414759 | |
| 60 | 3,5 | 8IP | | 30414760 | |
| 60 | 4 | 9IP | | 30414761 | |
| 80 | 4 | 10IP | | 30414763 | |
| 80 | 4 | 15IP | | 30414764 | |
| 100 | 4 | 20IP | | 30414766 | |
| 100 | 4,5 | 25IP | | 30414767 | |
| 60 | 3,5 | TX8 | | TORX® | 10019467 |
| 80 | 4 | TX15 | | | 10019469 |

Allen wrench

| Dimensions | | | Description | Order no. |
|---------------------|---------------------|--------|-------------|-----------|
| l ₁ [mm] | l ₂ [mm] | SW | | |
| 46,5 | 15,5 | SW 1,5 | ISO2936-X | 10004870 |
| 52 | 18 | SW 2 | | 10004356 |



Hexagonal T-key

| Wrench size SW | Short design | | | Long design | |
|----------------|---------------------|---------------|-----------|---------------------|-----------|
| | l ₁ [mm] | Specification | Order no. | l ₁ [mm] | Order no. |
| SW 2,5 | 100 | - | 10006233 | 200 | 10032722 |
| SW 3 | 100 | MN5221-31 | 10006234 | 200 | 10025313 |
| SW 4 | 100 | MN5221-32 | 10006235 | 200 | 10018010 |
| SW 5 | 100 | MN5221-33 | 10006236 | 200 | 10013350 |
| SW 6 | 100 | MN5221-34 | 10006237 | - | - |
| SW 8 | 100 | MN5221-35 | 10006238 | - | - |
| SW 10 | 100 | - | 30353270 | - | - |
| SW 12 | - | - | - | 200 | 30353272 |

General Accessories – Torque Wrench Set, Screwdriver Set



TorqueVario®-STplus T-key torque wrench 11 pcs. set

Model: 5–14 Nm

| Scope of delivery | Features | Order no. |
|--|--|-----------|
| <ul style="list-style-type: none"> • 1 T-handle torque wrench • 1 Torque-Tplus Setter • 1 Universal bit holder 1/4" • 3 TORX® standard bits T25x25 / T30x25 / T40x25 • 3 hex standard bits 4.0x25 / 5.0x25 / 6.0x25 • 2 adapter bits for the sockets <ul style="list-style-type: none"> 1 Torque-Tplus adapter bit 1/4" 1 Torque-Tplus adapter bit 3/8" • Stable metal box | <ul style="list-style-type: none"> • Accuracy $\pm 6\%$, can be traced to national standards • Numeric torque value indication on window scale • Torque continuously adjustable • Comfortable T-handle with soft zones • Click signal on reaching the set torque | 30415173 |



TorqueVario®-S torque screwdriver 13 pcs. set

Model: 1.0–5.0 Nm

| Scope of delivery | Features | Order no. |
|--|---|-----------|
| <ul style="list-style-type: none"> • 1 TorqueVario-S torque screwdriver • 1 torque setter • 1 Universal bit holder 1/4" • 5 TORX® standard bits T7x25 / T8x25 / T9x25 / T10x25 / T15x25 • 5 TORX PLUS® standard bits 7IPx25 / 8IPx25 / 9IPx25 / 10IPx25 / 15IPx25 • Stable metal box | <ul style="list-style-type: none"> • Accuracy $\pm 6\%$, can be traced to national standards • Numeric torque value indication on window scale • Torque continuously adjustable • Ergonomic multiple component handle • Click signal on reaching the set torque | 30415174 |

$$h_m = f_z \cdot \sqrt{\frac{ae}{D}} \text{ [mm]}$$

a_p

$\cos \varphi_s =$

d



TECHNICAL APPENDIX

Notes on application and handling

$$1 - \frac{2 \cdot a_e}{D}$$



59.5
Antriebsauslastung - Anzeige
Kanal 1
01/07
Service Info
DATE: 01.01.11
TIME: 18:28:05
24.7
MEL 4 Betriebsart aktiv
782012 4
NC/UKS/4_1471_SPM1_STANDARDPROG/SPM1_2_2
RESET
UKS
X
Y
Z
C
B
G55
Position [mm]
226.533
33.867
46.362
0.000°
0.000°
T.F.S
T SPM1_STANDARD D1
F SPM1_STANDARD 0.000 0.000 0.000
S1 Master 0
mm/min
0.0%
100%
Zoom Istwert
T.S.M NPV setzen Nullp. Werkst Werkz. messen Position Planfräsen Schwenken



TECHNICAL APPENDIX

General technical information

| | |
|--------------------------------|-----|
| Terminology and formulae | 394 |
| Technical information | 396 |

Application notes

| | |
|-----------------------------------|-----|
| Facing and shoulder milling | 398 |
| Helix milling | 400 |
| Trochoidal milling | 402 |

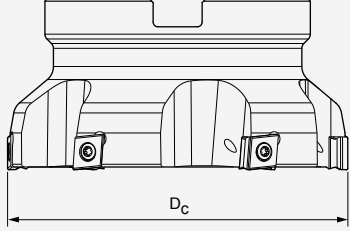
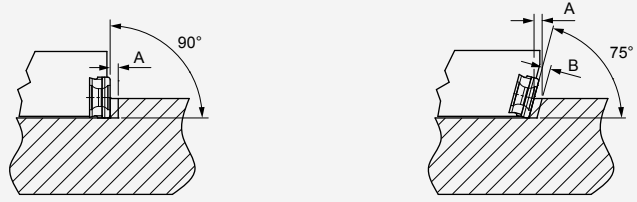
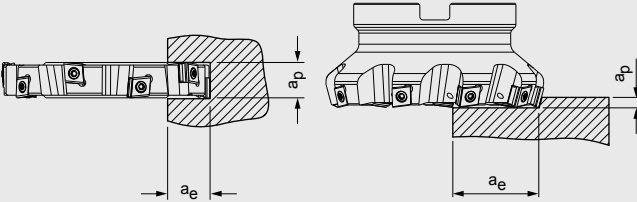
Handling notes

| | |
|---|-----|
| CPMill replaceable milling cutters | 404 |
| PCD face milling cutter – Power system | 406 |
| PCD face milling cutter – Eco system | 408 |
| Face milling cutter with radial indexable inserts | 410 |
| Milling cutter clamping screw | 412 |

MAPAL Maintenance Services

| | |
|---|-----|
| Reconditioning for face milling heads | 414 |
|---|-----|

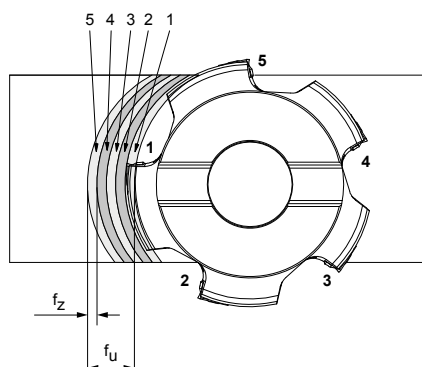
Terminology and Formulae

| | | | |
|---|-------------------------|--|------------|
| Diameter of milling cutter | D_c [mm] | Setting angle | K |
|  | |  | |
| Average roughness | R_a [μm] | Cutting depth | a_p [mm] |
| Average roughness depth | R_z [μm] | Cutting width | a_e [mm] |
| Number of inserts | z |  | |
| Spindle speed | n [U/min] | | |

Formulae

| | | |
|-----------------------|---|------------------------------|
| Feed per turn | $f_u = \left[\frac{\text{mm}}{U} \right]$ | $f_u = z \cdot f_z$ |
| Feed per tooth | $f_z = \left[\frac{\text{mm}}{\text{Tooth}} \right]$ | $f_z = \frac{vf}{n \cdot z}$ |

f_z during face milling:



| | | |
|-------------------------------|---|--|
| Spindle speed | $n = [\text{min}^{-1}]$ | $n = \frac{v_c \cdot 1.000}{\pi \cdot D}$ |
| Average chip thickness | $h_m = [\text{mm}]$ | $h_m = \sin \kappa \cdot f_z \cdot \sqrt{\frac{a_e}{D}}$ |
| Cutting speed | $v_c = \left[\frac{\text{m}}{\text{min}} \right]$ | $v_c = \frac{\pi \cdot D_c \cdot n}{1.000}$ |
| Feed rate | $v_f = \left[\frac{\text{mm}}{\text{min}} \right]$ | $v_f = f_z \cdot z \cdot n$ |
| Material removal rate | $Q = \left[\frac{\text{cm}^3}{\text{min}} \right]$ | $Q = \frac{a_e \cdot a_p \cdot v_f}{1.000}$ |

Disc, groove, shoulder milling

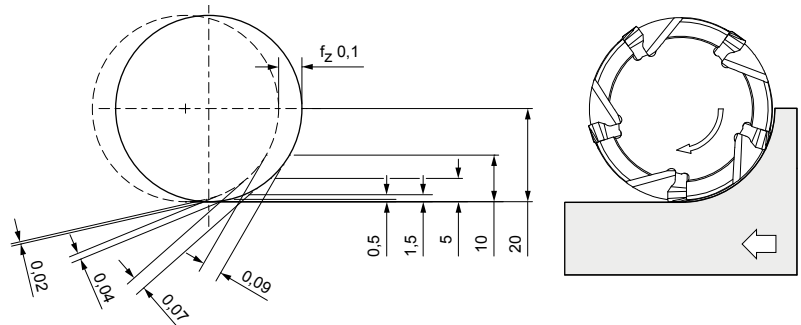
Feed value compensation

Machining steps with low radial cutting depth such as disc milling, groove milling or milling a shoulder require correction of the feed at the insert as it enters the work-piece.

The calculated and actual feed can vary depending on the cutting depth and the diameter of milling cutter used.

If a shoulder with a cutting depth of only 0.5 mm is machined using a milling cutter diameter of 40 mm, the feed must be multiplied by a factor of 5 to arrive at the actual feed or $f_z = 0.1$ mm (see example below).

A major advantage of the application of this formula is the increase in productivity with the effective use of the milling cutter.



Example:

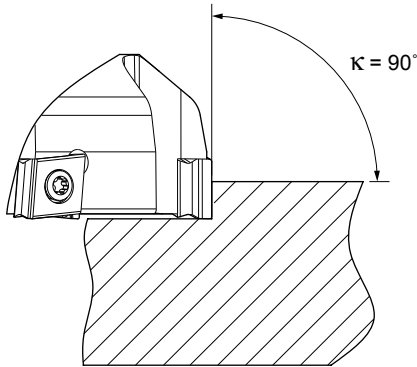
Tool: Diameter of milling cutter 40 mm
 z : 5
 f_z : 0.1 mm
 f : 0.5 mm/rev

| Radial cutting depth a_p [mm] | Feed per tooth f_z [mm] | Maximum chip thickness h_{max} [mm] | Required v_f to obtain $f_z = 0.1$ mm | Increase factor |
|---------------------------------|---------------------------|---------------------------------------|---|-----------------|
| 20 | 0,1 | 0,1 | 1.000 | 1,00 |
| 10 | 0,1 | 0,09 | 1.111 | 1,11 |
| 5 | 0,1 | 0,07 | 1.429 | 1,43 |
| 1,5 | 0,1 | 0,04 | 2.500 | 2,50 |
| 0,5 | 0,1 | 0,02 | 5.000 | 5,00 |

Note: Based on the above example, the feed per tooth can be increased with a low a_p/D ratio or a setting angle $< 90^\circ$.

Technical Information Milling

Selection of the setting angle

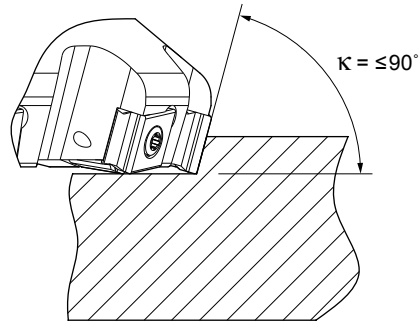


Advantages:

- For thin-walled workpieces
- For difficult clamping situations of the workpiece
- For 90° shoulder machining

Disadvantages:

- Highest radial forces
- High load on impact when penetrating the material
- Increased probability of the formation of burrs as the cutting edge exits



Advantages:

- For general milling applications
- Good ratio of cutting edge size to maximum cutting depth
- Reduced impact load on the insert on penetrating the material

Disadvantages:

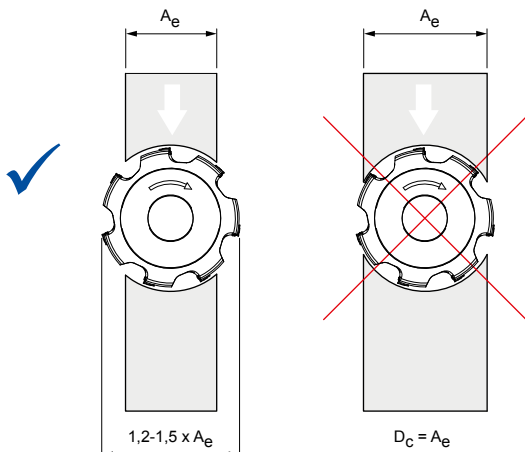
- Higher radial forces can cause problems in case of low-power machines or poorly clamped workpieces

Position of the milling cutter diameter and the milling cutter position

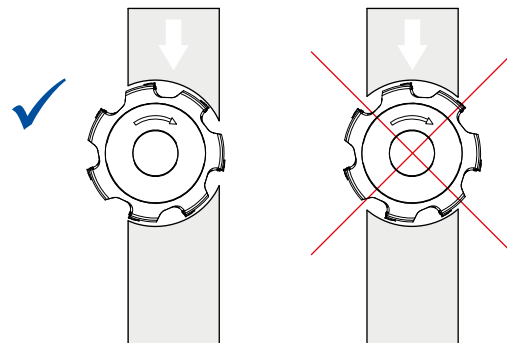
The milling cutter diameter is to be selected as a function of the size of the workpiece or the width of the workpiece as well as the power of the machine. During face milling, e.g., the milling cutter diameter should be 20-50% larger than the cutting width on the workpiece.

The position of the milling cutter and the insert contact on entering and exiting the workpiece affect the machining result.

Optimal milling cutter diameter

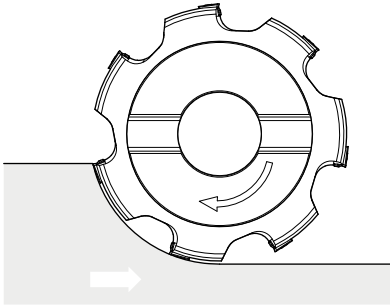


Optimal position



Differentiation based on running direction

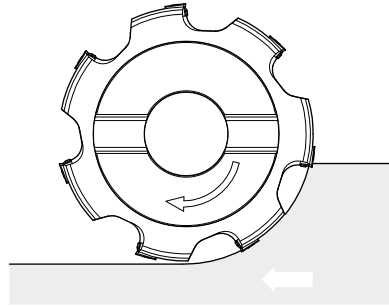
Counter feed milling



When the insert enters the chip-removing cut, the insert has the unfavourable chipping thickness zero in terms of machining technology and exits the workpiece material with the maximum chipping thickness h_{max} . Friction is produced during counter feed milling. This friction results in chip welding and the transfer of heat to the indexable insert and in the workpiece.

In the case of counter feed milling, the resulting forces are against the direction of feed. It is likely that material strain hardening will occur.

Synchronous milling (preferred)



Synchronous milling is generally recommended. When entering the material, the insert has a specific feed per tooth and with a maximum chipping thickness h_{max} generates a chip that becomes thinner on exiting the chip-removing cut. This aspect reduces the heat by transferring it to the chip. The material strain hardening is minimised.

Production of surfaces

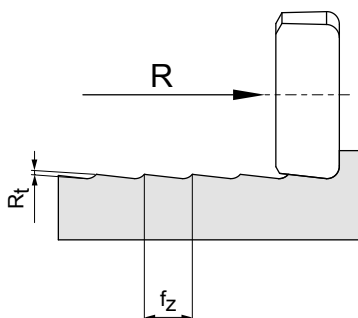
Axially produced surfaces:

During face milling, the surface quality is primarily generated by the cutting edge geometry and the feed.

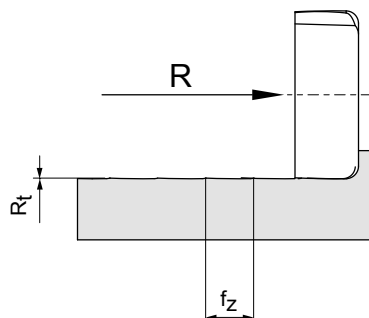
Improvement of surface quality:

Compared to a conventional cutting edge geometry, with a wide finishing indexable insert a R_a and R_z value several times better is achieved with the same feed.

Standard geometry

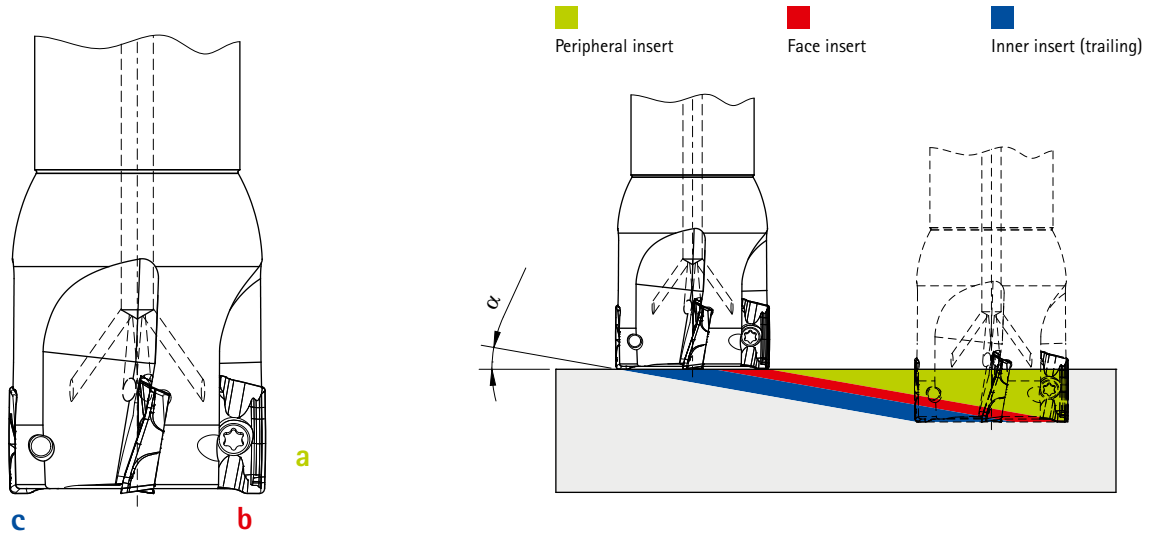


Wide finishing geometry



Face and Shoulder Milling

Two-axis angled entry – linear (flute)



Ramp angle α :

The maximum plunge angle α is dependent on the tool.

In case of two-axis angled entry, various machining processes take place at the same time:

- a) Machining at the entire periphery of the tool (peripheral machining) with leading insert.
- b) Machining at the face of the milling cutter with leading insert.
- c) Machining at the face of the milling cutter with trailing insert.

Application notes

For end milling cutter NeoMill-2-Corner

| Plunge milling | Diameter of milling cutter [mm] | Indexable insert that can be used | Maximum ramp angle α [°] |
|----------------|---------------------------------|-----------------------------------|---------------------------------|
| | \varnothing 20 | AOKT12T3 | 6,0 |
| | \varnothing 25 | | 4,2 |
| | \varnothing 32 | | 3,0 |
| | \varnothing 36 | | 2,6 |
| | \varnothing 40 | | 2,2 |

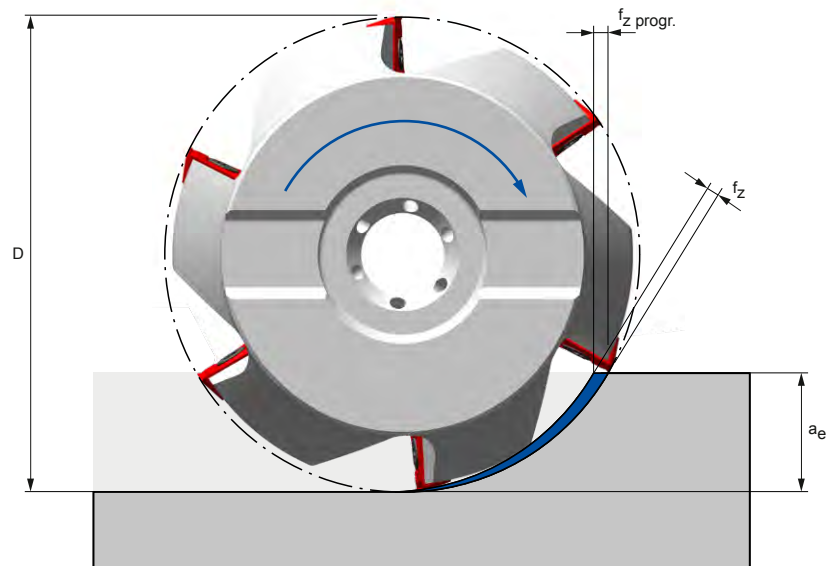
For milling cutter NeoMill-2-Corner

| Plunge milling | Diameter of milling cutter [mm] | Indexable insert that can be used | Maximum ramp angle α [°] |
|----------------|---------------------------------|-----------------------------------|---------------------------------|
| | \varnothing 40 | AOKT12T3 | 2,2 |
| | \varnothing 50 | | 1,7 |
| | \varnothing 55 | | 1,5 |
| | \varnothing 63 | | 1,3 |
| | \varnothing 80 | | 1,0 |
| | dia. 100 and more | | not recommended |

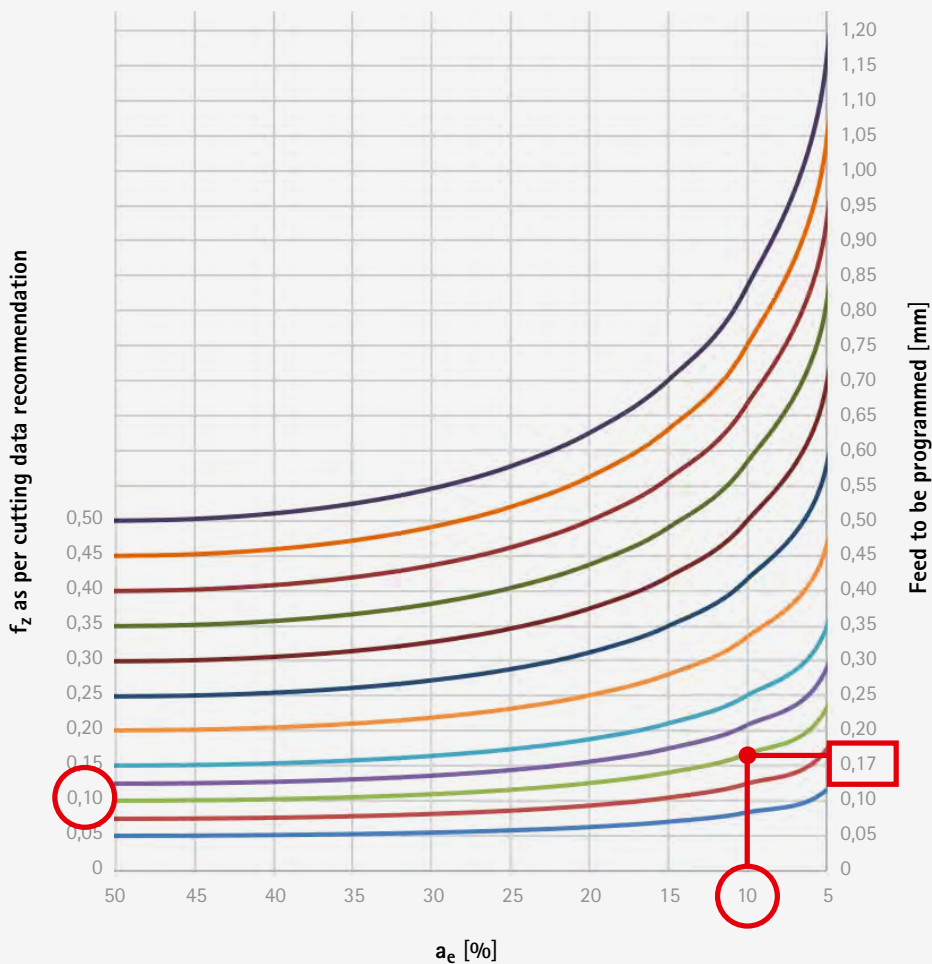
Feed value compensation

Machining steps with low radial cutting depth, such as milling a shoulder, require correction of the feed at the cutting edge as it enters the work-piece.

The recommended feed per tooth f_z varies depending on milling cutter diameter and operational time, that is the radial contact ratio of the milling cutter a_e/D . If this is less than 50 percent, the maximum chip thickness reduces relative to the feed f_z . The feed can be increased with the aid of the correction factor in the following diagram, depending on the a_e/D ratio.



Feed value compensation



Example:

$D = 20$ mm
 $a_e = 2$ mm
 $f_z = 0.1$ mm
 $a_e/D = 10\%$
 $f_{z \text{ progr.}} = 0.17$ mm

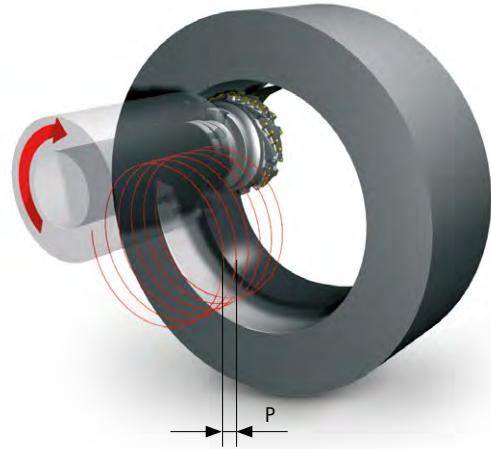
Helix milling

Helical angled entry

The helical angled entry is an alternative to boring. This involves a circular movement with simultaneous axial feed.

Pitch (P):

The pitch (P) corresponds to the axial infeed per revolution. This depends on the workpiece, tool length, workpiece material and machine.



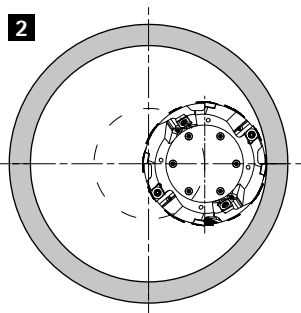
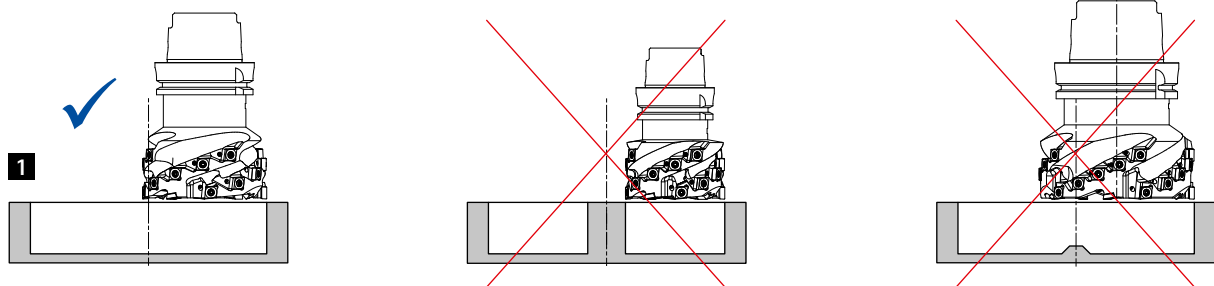
| Application note | Tool ϕ [mm] | Max. possible plunge angle α [°] |
|------------------|------------------|---|
| | 80 | 4,3 |
| | 100 | 3,4 |
| | 125 | 2,8 |
| | 140 | 2,4 |
| | 160 | 2,1 |

Selection of the milling cutter diameter as a function of the size of the bore

In the case of centre-cutting milling cutters it is important to select the correct ratio of diameter of milling cutter and bore diameter. The indexable insert must cut along the centre axis.

If the milling cutter diameter is too small, there is a core in the centre.

If the milling cutter diameter is too large, the centre is not machined. As a result a protrusion is left. This protrusion presses the milling cutter axially. This leads to a collision between the workpiece and tool.



1 Drilling into the solid (flat bottom of the bore)

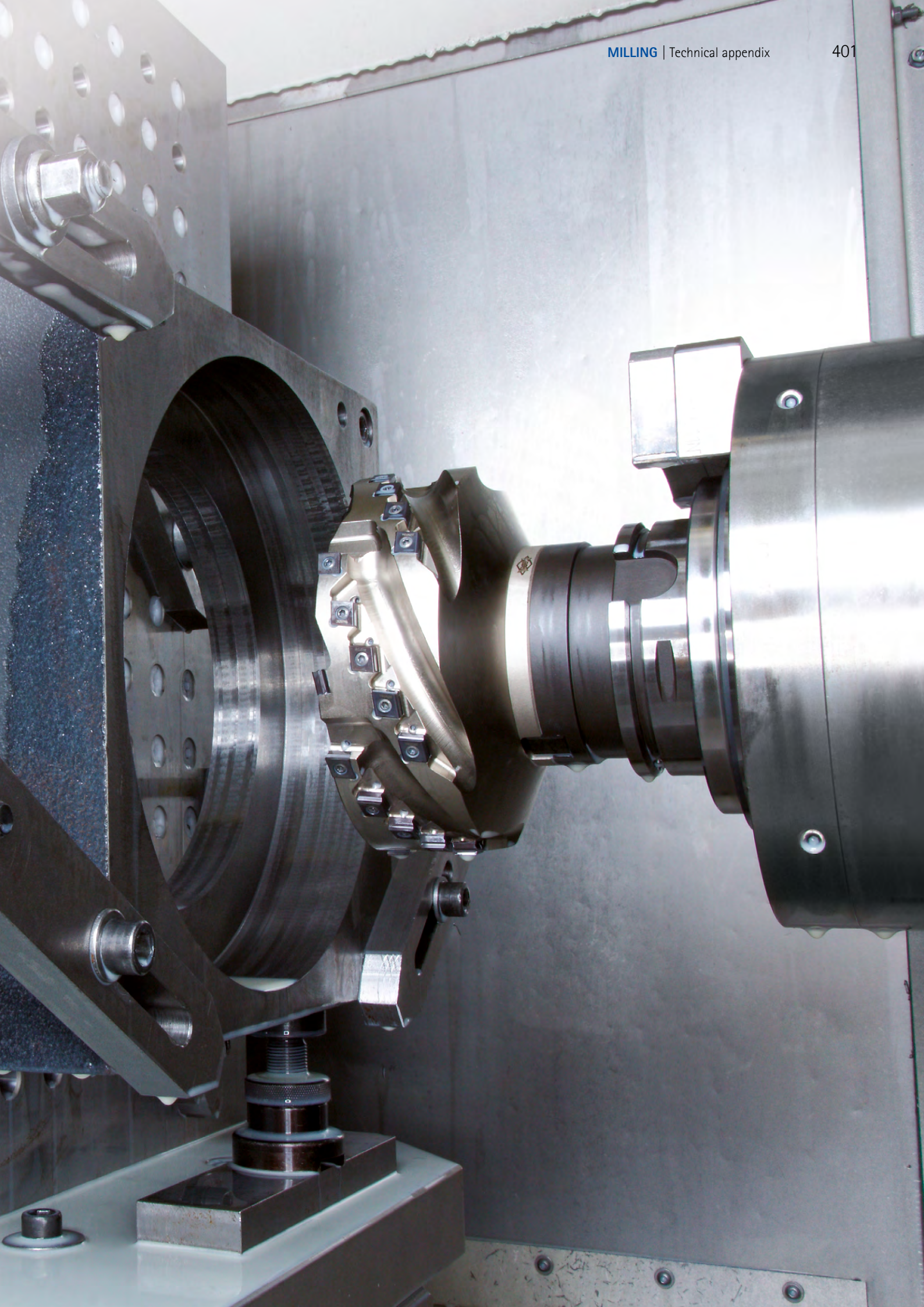
| Diameter of milling cutter [mm] | 80 | 100 | 125 | 140 | 160 |
|---------------------------------|---------|---------|---------|---------|---------|
| Bore diameter [mm] | 142-160 | 182-200 | 232-250 | 262-280 | 302-320 |

Note:

In the case of a bore diameter between the ranges stated, for example 170 mm, the smaller milling cutter with a diameter of 80 mm is selected. Two machining steps are then necessary to machine the bore.

2 Enlarging a bore (no face machining)

Milling cutter diameter = < 0.5 x bore diameter



Trochoidal milling – principles

Definition

Trochoidal milling is a milling strategy with the aim of reducing process forces and simultaneously increasing material removal rates. By superimposing a circular movement of the tool on the feed movement, the contact conditions can be positively influenced. This results in cyclic material removal with variable contact conditions that can be adjusted to the tool application, as well as variable cutting widths along the circular path of the tool.

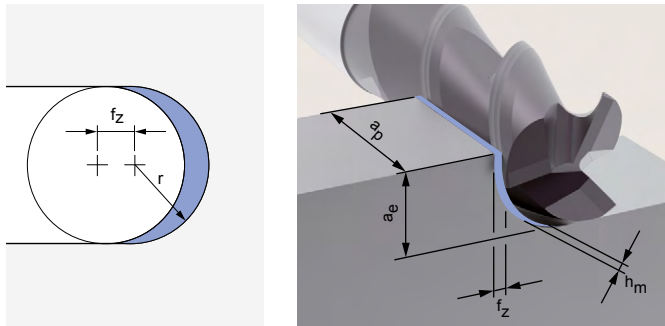


Example of full slot milling

Conventional milling

For roughing in a full cut, the contact conditions of the milling cutter are fixed at a wrapping angle of 180°.

In addition to the generation of long chips due to the long tooth contact, this leads to a comparatively high thermal load on the tool. The resulting large cutting cross section in turn results in high cutting forces, which limits process-stable infeed depths, feed rates and cutting speeds.

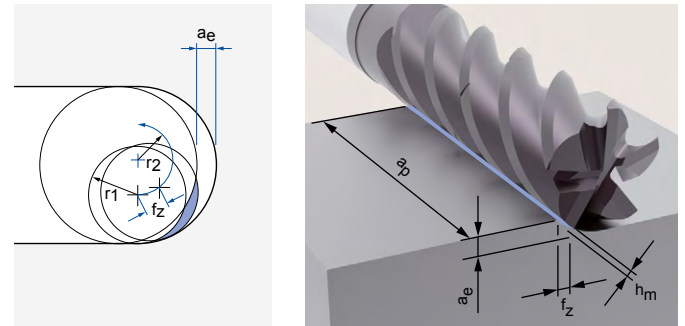


- a_p : small (cutting depth $\sim 1 \times D$)
- a_e : large ($1 \times D$)
- f_z : small
- v_c : low

Trochoidal milling

The specific kinematics of trochoidal milling makes it possible to positively influence the contact conditions as a circular movement of the tool is superimposed on the feed movement. The contact angle is correspondingly low.

The result of this technological approach is that a reduced cutting width and cutting length lead to significantly reduced process forces. This in turn makes it possible to achieve greater cutting depths.



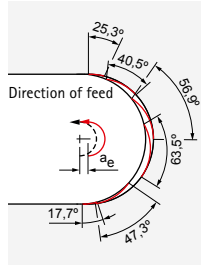
- a_p : large (full utilisation of the cutting edge length possible)
- a_e : small
- f_z : large
- v_c : high

Trochoidal milling – in detail

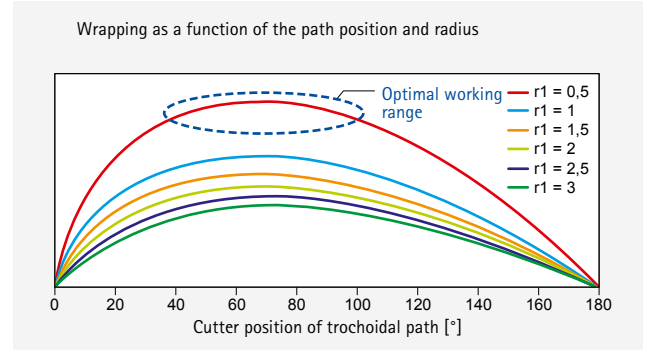
Trochoidal milling – circular path

For the case of a circular path with a constant radius, the wrapping angles on the contact tool cutting edge vary depending on the absolute radial material removal rate within one revolution.

- Contact conditions are constantly changing
- Optimal working range of the milling cutter
- Limited to a small area
- Low material removal rate
- Tends to vibrate more
- Increased tool wear



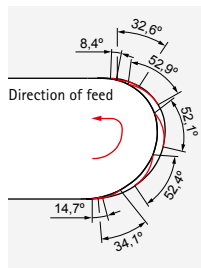
Wrapping as a function of the path position
- Circular path



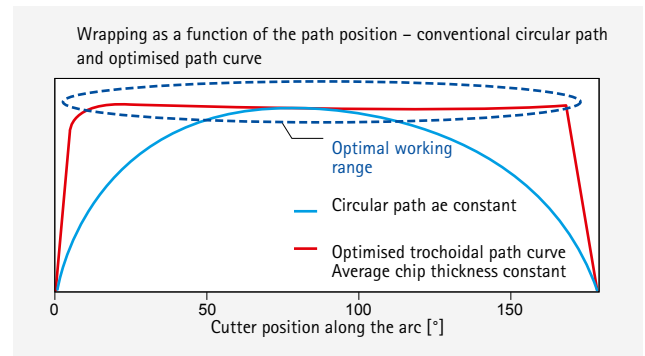
Trochoidal milling – optimised path curve

Through an adapted path movement of the tool, the contact ratios of the milling cutter can be kept constant at every point of the path over almost the entire machining operation. This means that the milling process can always be operated at its optimum. Within a path, the feed rate is adjusted so that the average chip thickness remains constant.

- Constant contact condition
- Constant strength level
- Less tool wear
- Maximum material removal rate

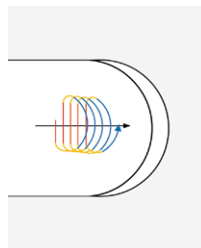


Wrapping as a function of the path position
- Optimised path curve



Feed movement – optimised air cut

For holistic process optimisation, the traversing motion in the air cut must be considered in addition to the tool path during engagement. The aim is to realise the fastest possible movement to the next entry point after the milling cutter has exited the material. Since the design of a circular path is not advantageous at this point, the most direct approach path possible is selected depending on the dynamics of the machine.



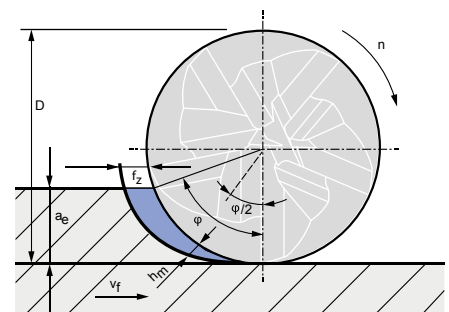
■ Feed
■ Ramp
■ Rapid traverse

NOTE

- In addition to a modern CAM system or a modern machine control system, trochoidal milling also requires a machining centre that is as dynamic as possible.
- Full performance is achieved by using OptiMill cutters from the Trochoid series.

Average chip thickness h_m and contact angle φ

| | | | |
|------------------------|-----------------------------------|--|--|
| Contact angle | $\varphi = [^\circ]$ | $\cos \varphi = 1 - \frac{2 \cdot a_e}{D}$ | Depends on the contact ratio a_e/D and is limited depending on the workpiece material. |
| Average chip thickness | $h_m = [mm]$ | $h_m = f_z \cdot \sqrt{\frac{a_e}{D}}$ | Is kept almost constant during trochoidal milling by dynamic feed rates. The average chip thickness is measured at $\varphi/2$. |
| Feed per tooth | $f_z = \frac{[mm]}{\text{Tooth}}$ | | Restricted variable, is adjusted during machining by CAM system. |
| Cutting width | $a_e = [mm]$ | | Constantly recalculated by the CAM software and limits the contact angle φ . |
| Tool diameter | $D = [mm]$ | | |



Handling notes for CPMill replaceable milling heads

The universally applicable replaceable milling heads from the CPMill series are characterised by a long tool life with consistently high machining quality. The CFS connection ensures simple and fast changing of the milling heads with high accuracy of repetition. At the same time, perfect retention with maximum stability and rigidity is achieved.

The replaceable milling head is tightened to the stipulated tightening torque and produces a joint with force and form fit. The key features of this system are high radial run-out accuracy in conjunction with very good rigidity.

Assembly of CPMill replaceable milling heads

Note:

To minimise the risk of injuries, it is recommended to wear gloves.

Comment:

For trained personnel only



1. Clean the taper, thread and face surface on the replaceable milling head using compressed air and a cloth.



2. Clean the taper, thread and face surface on the replaceable head holder using compressed air and a cloth.



3. Hand tighten the replaceable milling head clockwise into the replaceable head holder. Then clamp the replaceable head holder with the tool in the machine holder.



4. Place the torque wrench on the replaceable milling head so it is as horizontal as possible; do not tilt the faces on the wrench.



5. Note: Place your free hand on the replaceable milling head to be able to make delicate adjustments. This allows the tightening torque to be set more precisely.

Tighten the replaceable milling head using the torque wrench and the corresponding open-end spanner at the specified tightening torque (see table "Tightening torque of replaceable milling head").



Result:

The gap between the replaceable milling head and replaceable head holder is closed, producing a joint that is both force and form fit. The CPMill replaceable milling head is now ready for operation.

Tightening torques for replaceable milling heads

| Connection size CFS | Tightening torque [Nm] |
|---------------------|------------------------|
| 6 | 5 |
| 8 | 12,5 |
| 10 | 15 |
| 12 | 20 |
| 16 | 25 |
| 20 | 30 |



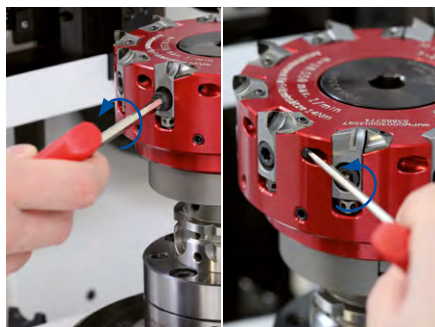
Handling notes for PCD face milling cutters – Power system

Applicable to milling cutters with PowerMill and PowerMill-Blue milling cartridges. The milling cartridges for the milling cutters PowerSpeed and PowerFix are additionally secured using a locking screw. Pay attention to the optional steps here.

Changing and setting PCD milling cartridges

Requirements:

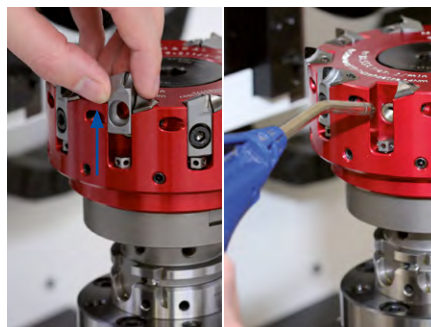
The hollow taper (HSK) face connection is checked for good condition and the milling cutter clamping screw / fastening screw with coolant delivery is tightened (for tightening torque, see page 409). The milling cutter is clamped on the setting fixture.



1. Undo and remove the milling cartridge clamping screw.

Optional:

Turn the locking screw a few turns in the anticlockwise direction.

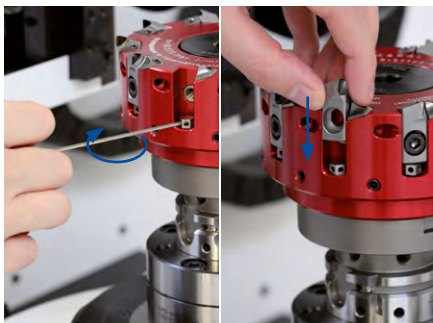


2. Remove the milling cartridge upward out of the seat for the milling cartridge. Then clean the seat for the milling cartridge using compressed air so the seat is free of residue.



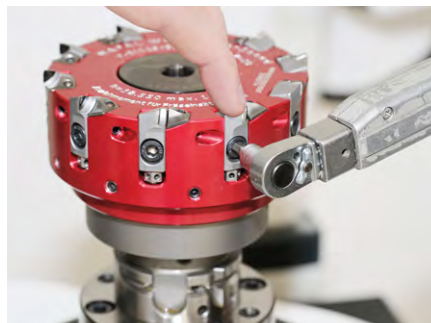
3. Optional:

If the locking screw is not yet screwed in, check whether the flat side of the locking screw (2) is pointing in the direction of the milling cartridge seat. If a spherical shape can be seen (1), use your finger or a magnet to turn this to the flat position.



4.1 If the adjusting screw is not yet fitted, fit it and screw in to the stop using a hex-wrench. Then turn back the adjusting screw two turns in the anticlockwise direction. Then fit the new milling cartridge in the seat from above.

4.2 If the adjusting screw is already fitted, screw in the adjusting screw one half of a turn in the clockwise direction. Then fit the new milling cartridge in the seat from above.



5. Fit the milling cartridge clamping screw and screw in lightly using a hex-wrench. Then carefully press down the milling cartridge with one finger and at the same time tighten the clamping screw to 4 Nm using a torque wrench.

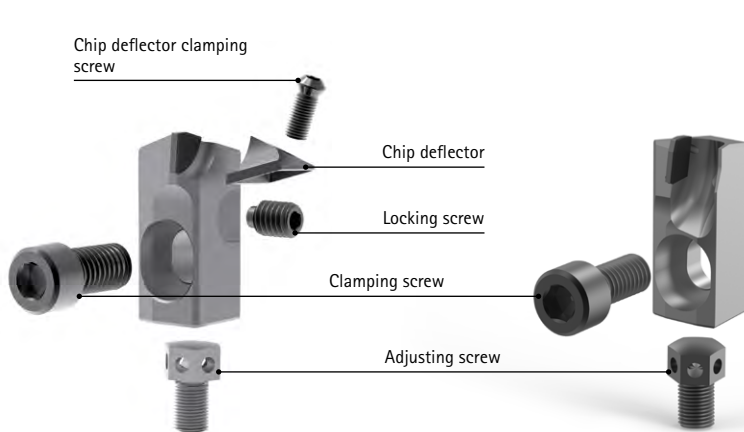


6. Optional:

Screw in the locking screw clockwise to the stop using a hex-wrench and then screw back half a turn.

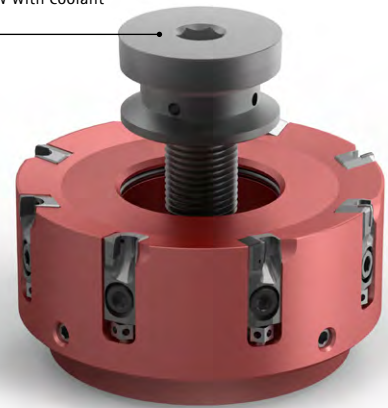
Comment:

- Only for trained personnel
- Clean the cutting edges on the milling cartridges using a cleaning compound to prevent measurement inaccuracies
- Clamping screws are only to be used once
- The fastening screw with coolant delivery is to be used with screw locking



PowerMill milling cartridge (PMC)

Fastening screw with coolant delivery



PowerMill-Blue milling cartridge (PBC)

PBC series

**7. Setting using setting fixture (optical)**

Acquire the cutting edge using the optical measuring device and using a hex-wrench turn the adjusting screw anticlockwise until the setting dimension (EM) = -0.015 mm is reached. For purely optical setting, repeat this process for the remaining milling cartridges (then continue with step 9).

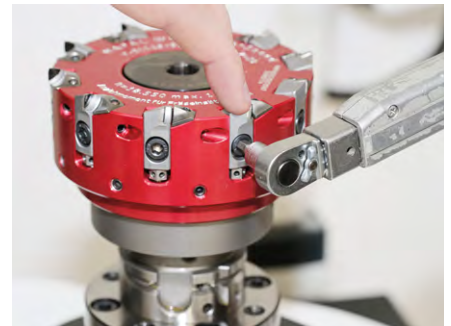
Note:

To ensure the correct preload, after reaching the setting dimension undo the adjusting screw again and then adjust to the target value (setting dimension -0.015 mm).

**8. Setting using a dial gauge (measuring plate)****Note:**

The measuring sensor should have a low measuring force, max. 0.3 N, with a flat probe made of aluminium, magnesium or carbide.

Position the measuring sensor against the milling cartridge at the highest point and set the dial gauge to zero. Turn the milling cartridge upward with the aid of the adjusting screw until the setting dimension = -0.015 mm is reached. Repeat this action for all milling cartridges.

**9. Note:**

The measuring sensor must not sit on the milling cartridge during this step. Tighten the clamping screw for the milling cartridges to 14 Nm using a torque wrench.

Optional:

Tighten the locking screws to approx. 2 Nm using a torque wrench.



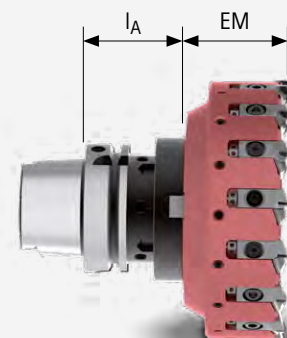
10. Using either optical or tactile measurement, identify the milling cartridge with the highest protruding cutting edge and set the dial gauge to zero. Set all milling cartridges in relation to the highest protruding cutting edge using dial gauge: For this purpose, the turn the adjusting screw clockwise using a hex-wrench until the zero dimension is reached (tolerance $\pm 2 \mu\text{m}$).

General information:

- Each time after changing the milling cartridges, the axial run-out and the permissible residual imbalance according to DIN ISO 1940-G2.5 should be checked.
- Ideally the cutting edge measurement should be checked again after balancing.
- The adjusting screw must touch the milling cartridge slightly with generally even clamping to avoid axial movement of the inserts in use.

Setting dimension EM:

Refer to the related product pages for the setting dimensions. The setting dimension EM relates only to the milling cutter's tool body incl. milling cartridges. If a milling cutter with connection is set, the height of the connection l_A must always be taken into account. In this situation the setting dimension is $l_A + EM$.



Handling notes for PCD face milling cutters – Eco system

In order to achieve optimal surface finishes in face milling, all cutting edges must run perfectly axially. MAPAL uses a special adjustment system for the face milling head system series (EcoMill, EcoMill-Blue, Rapid-Mill-Blue and FlyCutter). By means of a high-precision wedge adjustment, the axial run-out can be effortlessly set in the required μm range.

The achievable accuracy in combination with the simple handling set this system apart. A MAPAL setting fixture is recommended for straightforward, convenient, quick and precise setting. For example, the UNISET-P with measuring sensor* allows the axial run-out to be set easily and with μm precision in record time.

Changing and setting PCD milling cartridges

Requirements:

The milling cutter is clamped on the setting fixture and the milling cutter clamping screw/coolant screw is tightened (see table "Tightening torque for milling cutter clamping screw/coolant screw" on page 409).

Comment:

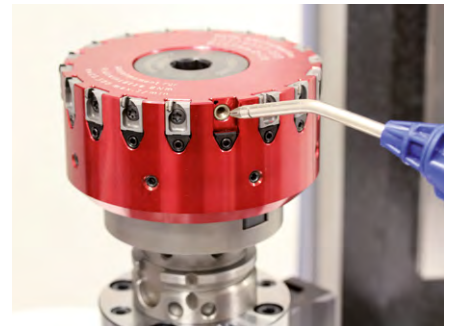
- Only for trained personnel
- Clean the cutting edges on the milling cartridges using a cleaning compound to prevent measurement inaccuracies



1. Turn the threaded spindle one turn anticlockwise with a hex-wrench, width across flats 2.5.



2. Loosen the clamping screw of the milling cartridge and remove it upwards from the dovetail guide.



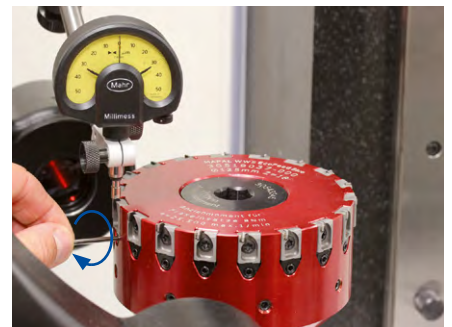
3. Clean the seat of the milling cartridge with compressed air and then insert the new milling cartridge from above into the dovetail guide.



4. Press the milling cartridge lightly while tightening so that the adjusting wedge is in contact. Insert the clamping screw** of the milling cartridge and tighten it clockwise with 1-2 Nm.



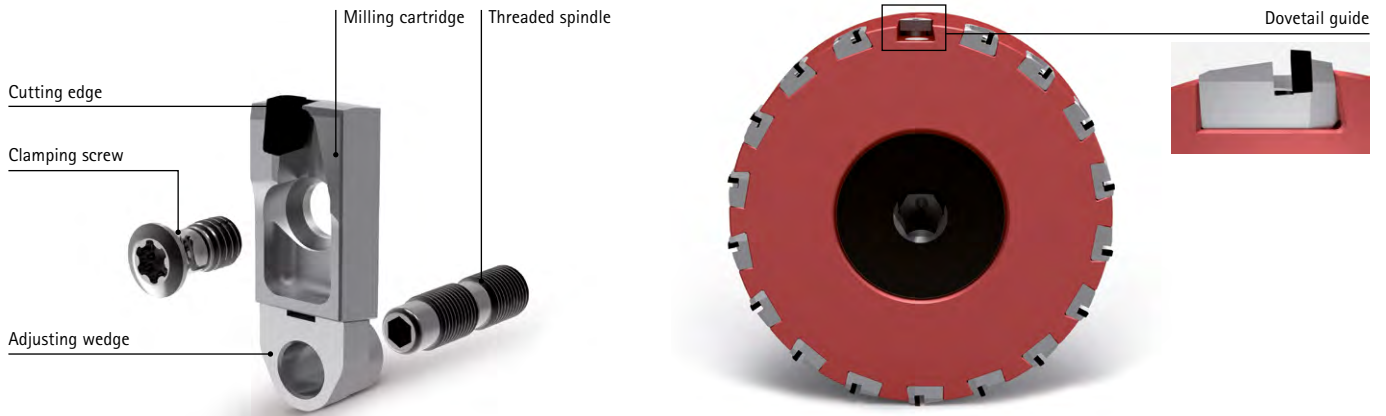
5. Use the setting fixture to optically set a milling cartridge -0.01 mm before the setting dimension (EM). To do this, measure the cutting edge with the optical measuring device and turn the threaded spindle clockwise with a hex-wrench until $\text{EM} = -0.01\text{ mm}$ is reached.
For purely optical setting, repeat this process for the remaining milling cartridges (then continue with step 7).



6. Position the dial gauge on the set milling cartridge and set it to zero. Set the milling cartridges with a dial gauge 0.01 mm before EM: To do this, turn the threaded spindle clockwise with a hex-wrench until zero dimension is reached.

* While optical systems reach their limits when it comes to μ -accurate adjustment, high-precision adjustments to the axial run-out can be easily realised with the help of the measuring sensor.

** For the use of the clamping screw, please note the information on page 380.



7. Note:

The measuring sensor must not sit on the milling cartridge during this step.

Tighten the clamping screw of the milling cartridge clockwise with a torque wrench (for tightening torques see table "Tightening torque for clamping screws").



8. Using the setting fixture, identify the milling cartridge with the highest protruding cutting edge and set the dial gauge to zero. Set all milling cartridges in relation to the highest protruding cutting edge using the dial gauge: For this purpose turn the threaded spindle clockwise using a hex-wrench until the zero dimension is reached (tolerance $\pm 2 \mu\text{m}$).

Setting dimension (EM):
 Refer to the related product pages for the setting dimensions. The setting dimension EM relates only to the milling cutter's tool body incl. milling cartridges. If a milling cutter with connection is set, the height of the connection l_A must always be taken into account. In this situation the setting dimension is $l_A + EM$.

Tightening torque for clamping screws

| Clamping screw Order no. | Dimensions | TORX®-/TORX PLUS® input size | Tightening torque [Nm] |
|--------------------------|------------|------------------------------|------------------------|
| 30696524 | M5x11 | TX25 | 8 |
| 30412229 | M4x8,5 | 15IP | 5 |
| 30499981 | M5x8 | TX25 | 8 |

Tightening torques for the milling cutter clamping screw / coolant screw

| Clamping screw Order no. | Milling head diameter [mm] | Dimensions | Wrench size | Tightening torque [Nm] |
|--------------------------|----------------------------|------------|-------------|------------------------|
| 30543340 | 50 | M10 | SW 8 | 20 |
| 30543341 | 63 | M10 | SW 10 | 50 |
| 30543342 | 80 | M12 | SW 12 | 80 |
| 30543344 | 100 | M16 | SW 14 | 100 |
| 30543345 | 125 | M20 | SW 14 | 200 |
| 10006594 | 160 | M12 | SW 10 | 70 |
| 10007775 | 200 - 400 | M16 | SW 14 | 70 |

Handling Instructions for Face Milling Cutters with Radial Indexable Inserts

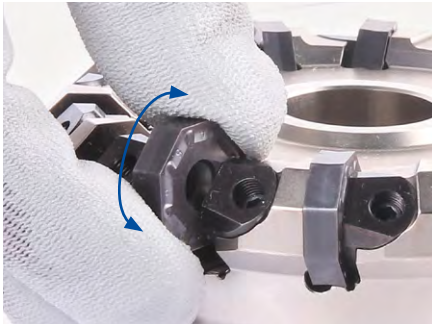
Applicable to milling cutters with ONKU and OFMT indexable inserts.

Replacing the indexable inserts

Requirements:

The face milling cutter and the indexable inserts have been checked for good condition and cleanliness.

ONKU indexable inserts



Note:

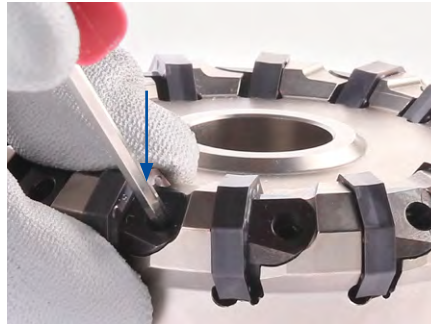
Before and during the replacement procedure, check the indexable inserts and insert seats for good condition and cleanliness.

1. Loosen the clamping wedge. To do this, use a TORX PLUS® wrench to turn the threaded spindle a few turns anticlockwise.

Note:

When inserting the indexable inserts, pay attention to the numbering of the chip breakers. The numbering should be identical in each insert seat.

2. Insert the indexable insert into the insert seat with repeated slight rocking movements.



3. Press the indexable insert downwards and make sure that the indexable insert is in contact with the circumference on both contact surfaces.
4. Hold the indexable insert and turn the threaded spindle clockwise with a TORX PLUS® wrench until the clamping wedge is slightly in contact with the indexable insert and fixes it.

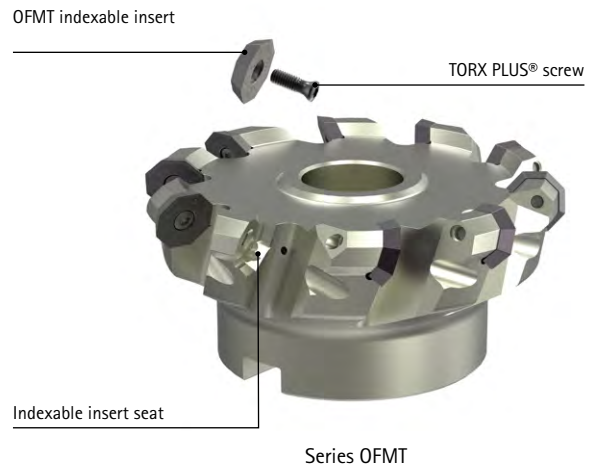
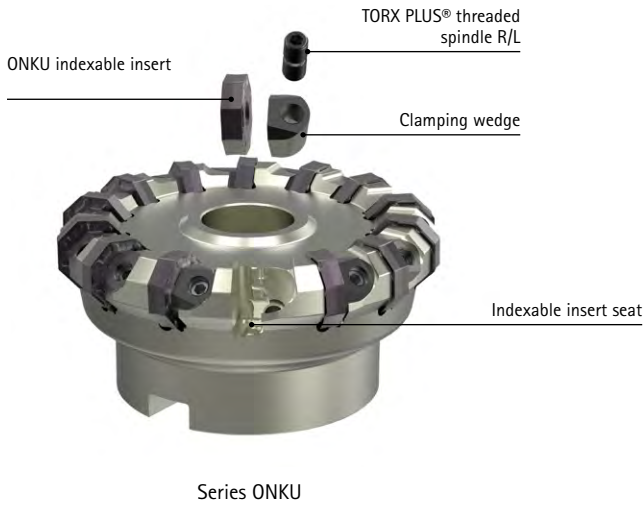
Comment:

- Only for trained personnel
- Clean the indexable inserts using cleaning compound

Note:

Before applying the tightening torque to the threaded spindle, all indexable inserts must first be mounted.

5. Tighten the threaded spindle at all clamping wedges to 7.5 Nm using a torque wrench.



OFMT indexable inserts



Note:

Before and during the replacement procedure, check the indexable inserts and insert seats for good condition and cleanliness.

1. Put the TORX PLUS® screw through the location bore of the indexable insert.

Note:

When inserting the indexable inserts, pay attention to the numbering of the chip breakers. The numbering should be identical in each insert seat.

2. Insert the TORX PLUS® screw together with the indexable insert into the location bore of the indexable insert seat. The indexable insert must not yet be in contact with the insert seat.



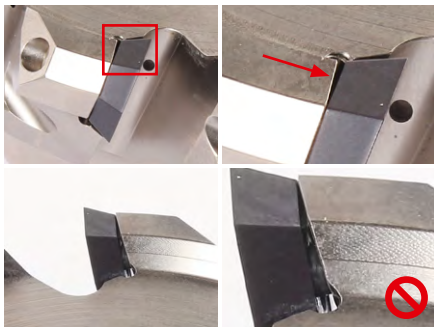
3. Using a TORX PLUS® wrench, screw in the TORX PLUS® screw clockwise and simultaneously insert the indexable insert into the insert seat with repeated slight rocking movements.



4. Pull the indexable insert outwards at a 45° angle and simultaneously screw in the TORX PLUS® screw as far as it will go.

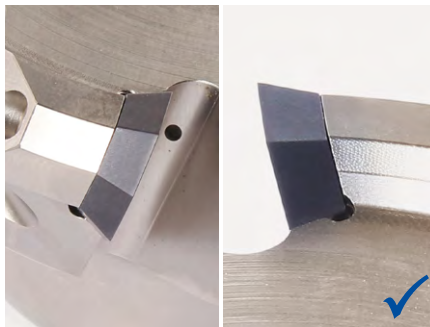
5. Make sure that the indexable insert is flat and free of gaps.

6. Tighten the TORX PLUS® screw to 7.5 Nm using a torque wrench.



Note:

If the indexable insert is not flat, it must be loosened and remounted.



Result:

The indexable insert is correctly mounted and flat.

Handling notes for milling cutter clamping screw

Clamp the tool



1. Remove the driving ring from the milling cutter arbor.



2. Insert the feather key on the milling cutter arbor.



3. Place the first spacer ring on the milling cutter arbor.



4. Place the second spacer ring on the first spacer ring and the milling cutter arbor.



5. Place the tool flat on the milling cutter arbor.

Comment:

For trained personnel only

Note:

The spacer rings are not included in the scope of delivery (see chapter "Accessories and spare parts" on page 383).

Mounting and setting milling cutter clamping screw



6. Turn threaded bolt until it protrudes 1-2 mm in relation to the threaded ring.



7. Slightly screw the milling cutter clamping screw onto the milling cutter arbor clockwise.



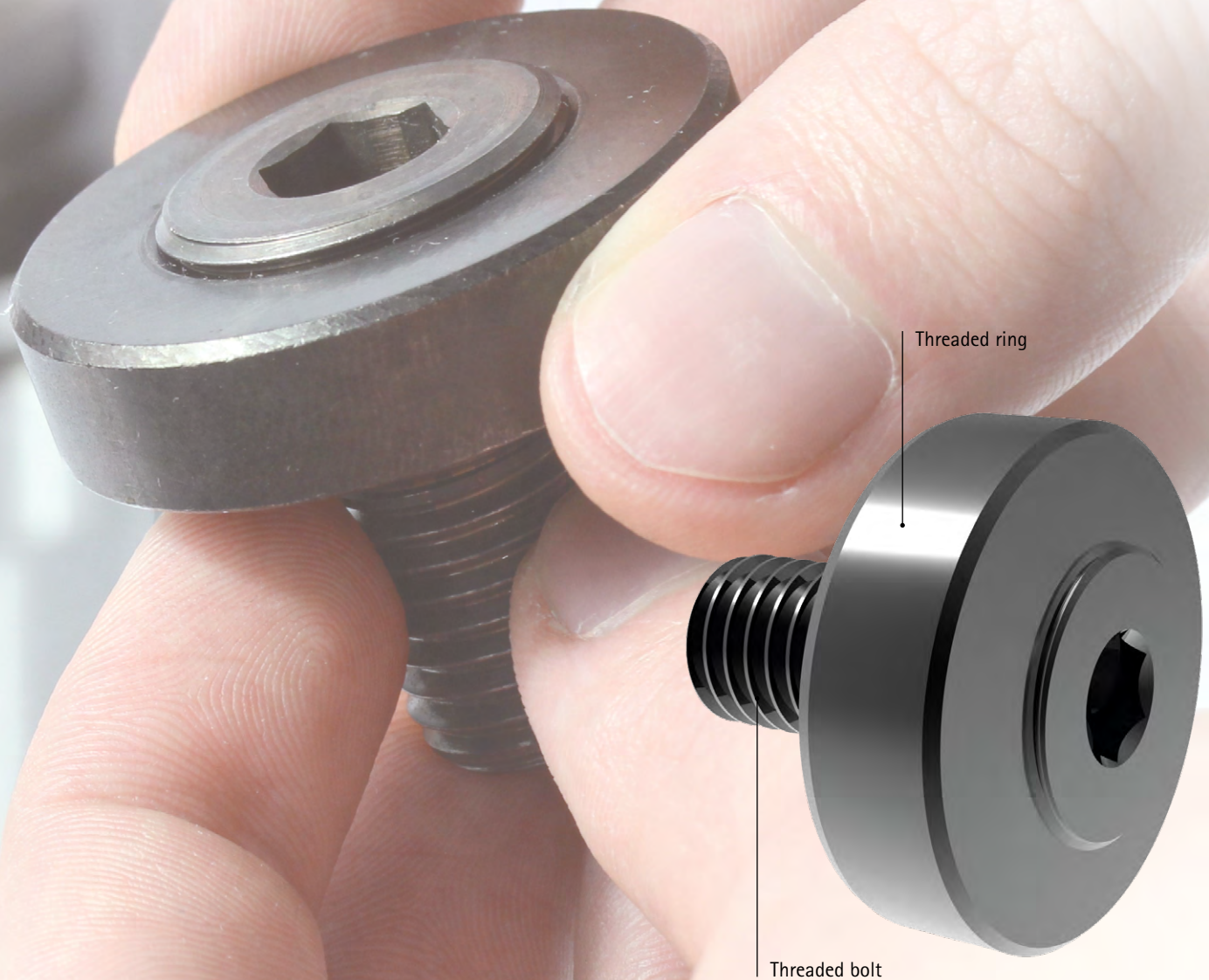
8. Screw in the milling cutter clamping screw further clockwise using a hex-wrench and then tighten it with a torque wrench (for tightening torque, see table "Tightening torque for milling cutter clamping screw").

Result:

The milling cutter clamping screw is tightened to the prescribed tightening torque and lies flat against the tool.

Tightening torque for milling cutter clamping screw

| Clamping screw Order no. | For milling cutter arbor – ø [mm] | Dimensions | Wrench size | Tightening torque [Nm] |
|--------------------------|-----------------------------------|------------|-------------|------------------------|
| 10041356 | 16 | M8 | SW 5 | 28 |
| 10009642 | 22 | M10 | SW 6 | 50 |
| 10006125 | 27 | M12 | SW 8 | 70 |
| 10009686 | 32 | M16 | SW 10 | 95 |
| 10006126 | 40 | M20 | SW 12 | 125 |



APPLICATION

- Disc milling cutter with milling cutter arbor
- Higher cutting force during machining
- High torques

ADVANTAGES

- Very high clamping force
- Greater safety due to the different pitch on the two threads on the threaded bolt
- Self-locking
- No risk of injury due to slipping wrench
- Higher cost-effectiveness thanks to greater radial and axial run-out accuracy of the milling cutter



MAPAL Maintenance Services

Reconditioning for face milling heads

Significant cost-savings thanks to reliable, quick and precise reconditioning

In machining, customers need to be able to rely on their tools throughout the process, especially after regeneration. Cleanliness, care and precision are the key factors for MAPAL when reconditioning milling heads. With reconditioning to original quality and milling head management, MAPAL offers two recon-

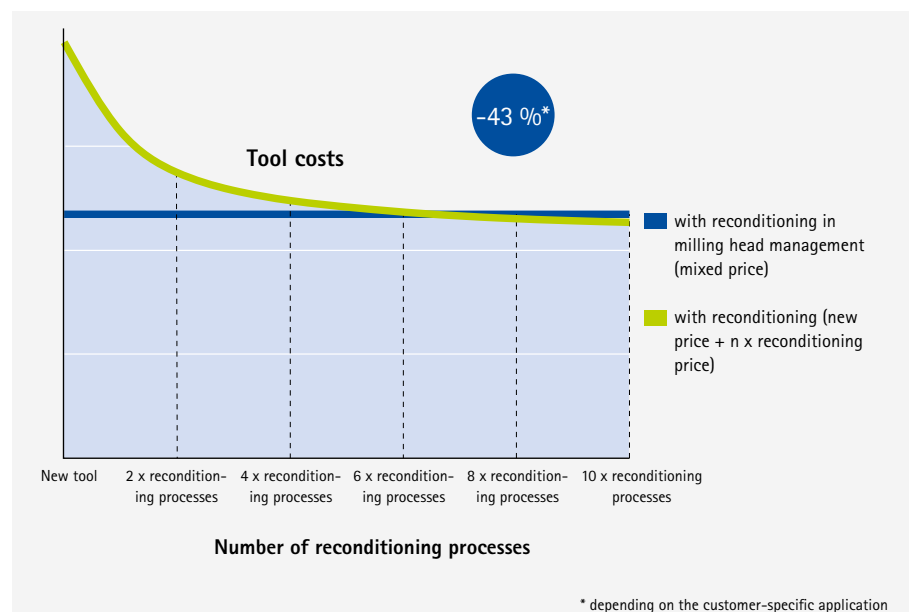
ditioning systems for face milling heads that guarantee precise and reliable tools with full performance. With each reconditioning, the tool life of the tools is significantly increased and costs for new tools saved. The customer receives tools ready for immediate use and can easily reach the familiar tool life. The

tools are collected from and delivered to the customer by courier. The standardised process ensures straightforward, fast processing within a few days.

ADVANTAGES

- Increased tool life
- Reduced tool costs
- Ready-to-use tools in original quality
- On-time collection and delivery
- Increased process reliability
- Reduced capital commitment*

* in conjunction with a milling head management system





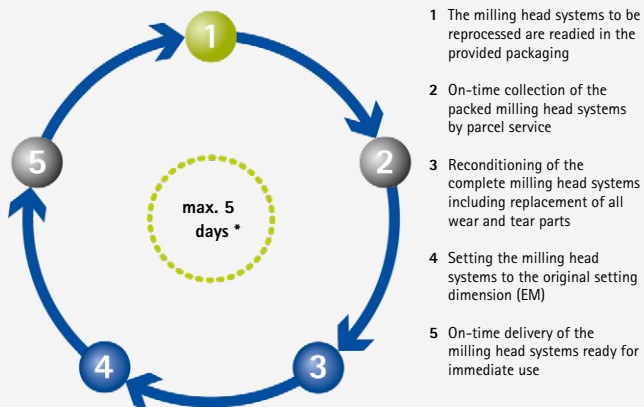
Reconditioning to original manufacturer quality

At MAPAL, the tools are thoroughly cleaned after dismantling, wear and tear parts are replaced, and the system is rebuilt from scratch. Worn milling cartridges go through a repair cycle. The tool is reloaded with stock regenerated cutting edges. After mounting with the corresponding cutter holder, the milling cartridges are set to the original setting dimension (EM). Within five days, the customer gets the tools back ready for use.

Milling head management

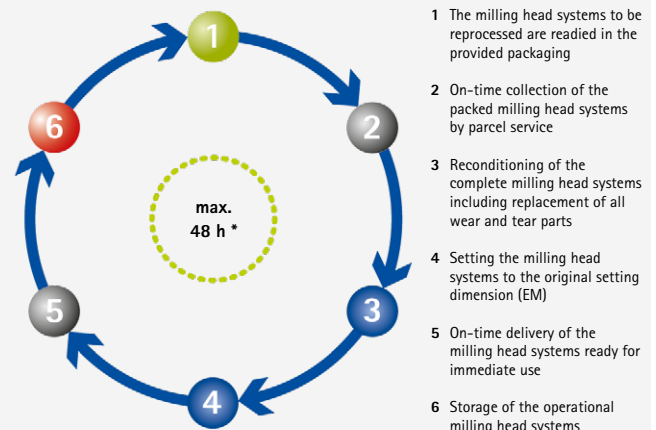
In addition to reconditioning to original quality, milling head management includes warehousing. Customers benefit from 24-hour tool availability on site as well as lower capital commitment. Billing takes place at a calculated mixed price upon removal. The customer retains full cost control. Expensive acquisition costs for new tools are eliminated. Bottlenecks due to tool availability are a thing of the past. A customer agreement defines a set process that allows delivery times of a maximum of 48 hours.

Reconditioning cycle



* Valid within Germany. Additional shipping days may have to be taken into account for international shipments

Reconditioning cycle – milling head management



* Valid within Germany. Additional shipping days may have to be taken into account for international shipments

Comment: As a technology partner, MAPAL can help with the selection of the optimal reconditioning process for the individual machining task.

MAPAL machining groups

| Machining group | | Workpiece material | Strength/hardness [N/mm ²] [HRC] | Frequently machined workpiece materials | |
|-----------------|------|--|--|---|---|
| P | P1 | P1.1 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 N/mm ² | 1.0122 (S235/St 37), 1.0401 (C15), 1.0503 (C45), 1.0570 (S355/St 52), 1.1213 (Cf63) |
| | | P1.2 | Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1.200 N/mm ² | 1.1249 (Cf70) |
| | P2 | P2.1 | Nitrided, case hardened and heat-treated steels, alloy | < 900 N/mm ² | 1.7131 (16MnCr5) |
| | | P2.2 | Nitrided, case hardened and heat-treated steels, alloy | < 1.400 N/mm ² | 1.7227 (42CrMo54) |
| | P3 | P3.1 | Tool, bearing, spring and high-speed steels* | < 800 N/mm ² | 1.2343 (X37CrMoV5-1), 1.2762 (75CrMoNiW6-7) |
| | | P3.2 | Tool, bearing, spring and high-speed steels* | < 1.000 N/mm ² | 1.2367 (X38CrMoV5-3), 1.2713 (55NiCrMoV6) |
| | | P3.3 | Tool, bearing, spring and high-speed steels* | < 1.500 N/mm ² | 1.2379 (X153CrMoV12) 1.2738 (40CrMnNiMo8-6-4) |
| | P4 | P4.1 | Stainless steels, ferritic and martensitic | | 1.4510 (X3CrTi17), 1.4589 (X5CrNiMoTi15-2) |
| P5 | P5.1 | Cast steel | | 1.7231 (G42CrMo4) | |
| P6 | P6.1 | Stainless cast steel, ferritic and martensitic | | | |
| M | M1 | M1.1 | Stainless steels, austenitic | < 700 N/mm ² | 1.4301 (V2A), 1.4571 (V4A) |
| | | M1.2 | Stainless steels, ferritic/austenitic (duplex) | < 1.000 N/mm ² | 1.4362 (Alloy 2304), 1.4501, 1.4662 (LDX 2404) |
| | M2 | M2.1 | Stainless/heat-resistant cast steel, austenitic | < 700 N/mm ² | |
| | M3 | M3.1 | Stainless cast steel, ferritic/austenitic (duplex) | < 1.000 N/mm ² | |
| K | K1 | K1.1 | Cast iron with lamellar graphite (grey cast iron), GJL | < 300 N/mm ² | GJL-250 (GG-25), GJL-260 (GG-26 Cr) |
| | | K2.1 | Cast iron with spheroidal graphite, GJS | < 500 N/mm ² | GJS-400 (GGG-40), GJS-450 (GGG-45) |
| | | K2.2 | Cast iron with spheroidal graphite, GJS | ≤ 800 N/mm ² | GJS-600 (GGG-60), GJS-800-2 (GGG-80), GJS-800-8 (ADI 800) |
| | K2 | K2.3 | Cast iron with spheroidal graphite, GJS | > 800 N/mm ² | GJS-900-2 (GGG-90), GJS-1000-5 (ADI 1000), GJS-1200-2 (ADI 1200), GJS-1400-1 (ADI 1400) |
| | | K3.1 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | < 500 N/mm ² | GJV-300, GJV-400, GJMW-400-5 (GTW-40) |
| | K3 | K3.2 | Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM | > 500 N/mm ² | GJV-500, GJV-700 |
| N | N1 | N1.1 | Aluminium, non-alloy and alloy < 3 % Si | | Alloy 2024, Alloy 7075, Al99 |
| | | N1.2 | Aluminium, alloy ≤ 7 % Si | | AlSi7 |
| | | N1.3 | Aluminium, alloy > 7-12 % Si | | AlSi9, AlSi9Cu |
| | | N1.4 | Aluminium, alloy > 12 % Si | | AlSi12, AlSi17 |
| | N2 | N2.1 | Copper, non-alloy and low-alloy | < 300 N/mm ² | SE-Cu |
| | | N2.2 | Copper, alloy | > 300 N/mm ² | CuSn6 |
| | N2 | N2.3 | Brass, bronze, gunmetal | < 1.200 N/mm ² | CuZn33, CuAl9Mn3 |
| | | N3 | N3.1 | Graphite, > 8 μm | |
| | N3.2 | | Graphite, ≤ 8 μm | | |
| | N4 | N4.1 | Plastic, thermoplastics | | PA, PE, PC, PS, PVC, PP, PTFE, POM, PMMA |
| | | N4.2 | Plastic, thermosets | | PU, PF, EP, UP, VE, CR |
| | | N4.3 | Plastic, foams | | EPS, PUR, PVC-E, PS-E, PP-E |
| | C | C1 | C1.1 | Plastic matrix, aramide fibre-reinforced (AFRP) | |
| C1.2 | | | Plastic matrix (thermosetting), CFRP/GFRP | | IMS, HTA |
| C1.3 | | | Plastic matrix (thermoplastic), CFRP/GFRP | | GMT-PP, PEEK |
| C2 | | C2.1 | Carbon matrix, carbon fibre-reinforced (CFC) | | CF222, CF225, CF226, CF227, CF260 |
| | | C3 | C3.1 | Metal matrix (MMC) | |
| C4 | | C4.1 | Sandwich construction, honeycomb core | | |
| | | C4.2 | Sandwich construction, foam core | | PLASCORE PAMG-XR1 5052, PCGA-XR1 3003, PAMG-XR1 5056, Micro-Cell (core made of alloy 5052/5056) |
| C5 | | C5.1 | Composite (stack), non-metal - non-ferrous metal composite | | CFK-aluminium, IMS/HTA + Alloy 2024/6061/7075 |
| | | C5.2 | Composite (stack), non-metal - metal composite | | CFK-titanium, IMS/HTA + TiAl6V4/AMS4905 |
| | | C5.3 | Composite (stack), non-metal - non-metallic composite | | CFK-CFK |
| | | C5.4 | Composite (stack), non-ferrous metal - non-ferrous metal composite | | Aluminium-aluminium |
| | | C5.5 | Composite (stack), non-ferrous metal - metal composite | | Aluminium-titanium |
| | C5.6 | Composite (stack), metal - metal composite | | Titanium Inox | |
| S | S1 | S1.1 | Titanium, titanium alloys | < 400 N/mm ² | |
| | | S2.1 | Titanium, titanium alloys | < 1.200 N/mm ² | TiAl6V4 |
| | S2 | S2.2 | Titanium, titanium alloys | > 1.200 N/mm ² | |
| | | S3 | S3.1 | Nickel, non-alloy and alloy | < 900 N/mm ² |
| | S3.2 | | Nickel, non-alloy and alloy | > 900 N/mm ² | |
| | S4 | S4.1 | High-temperature super alloy Ni, Co and Fe-based | | Hardox, Hastelloy, Incoloy, Inconel, NIMONIC, Stellite, Waspaloy |
| S5 | S5.1 | Tungsten and molybdenum alloys | | | |
| H | H1 | H1.1 | Hardened steel / cast steel | < 44 HRC | 1.2738 HH, 1.2085, Toolox 33, Toolox 44 |
| | | H1.2 | Hardened steel / cast steel | < 55 HRC | 1.2343, 1.2311, 1.2312, 1.2714, 1.2083, 1.2738 |
| | H2 | H2.1 | Hardened steel / cast steel | < 60 HRC | 1.1730, 1.2379, 1.2358, 1.2767, 1.4112, ASP 2012 |
| | | H2.2 | Hardened steel / cast steel | < 65 HRC | 1.2379, 1.2363, 1.2436, 1.2842, ASP 2005, Vanadis 23 |
| | H2 | H2.3 | Hardened steel / cast steel | < 68 HRC | ASP 2017, ASP 2023, Vanadis 30, Vanadis 60 |
| | | H3 | H3.1 | Wear-resistant cast/chill casting, GJN | |

* If the alloy parts Cr, Mo, Ni, V, W in total > 8 % then select the next highest MAPAL machining group.



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