



Your technology partner for economic machining

# TITANIUM MACHINING



# Markets and sectors

After many years of close cooperation with customers, MAPAL has acquired a profound understanding of almost all processes and applications in machining production. The fields of application in which machining solutions from MAPAL are used are found in a wide variety of industries.







**Germany**  
Headquarters of the group of companies

### Close to the customer – globally

The close dialogue with customers and thus the early recognition of technological requirements and approaches for innovations are essential pillars of the MAPAL company policy. As a result, MAPAL is directly represented with production and sales branches in 25 countries. This ensures close proximity, personal contacts and long-term partnerships.

In addition to the main production facilities in Germany, local production facilities in strategically important markets worldwide guarantee short delivery times. They are responsible for the manufacture of selected products as well as for reconditioning, repairs and repeat orders for the local market.

In addition to its own branch offices, MAPAL products are available through sales agencies in a further 19 countries.



# No. 1

Technology leader for the machining of cubic parts.

Subsidiaries with production, sales and service in

# 25

countries.

Annual investment in research and development of

# 6%

of turnover.

Over

# 450

technical consultants on the road.

More than

# 300

trainees worldwide.

**Our most important asset: More than**

# 5,000

employees worldwide.



MAPAL  
Sectors

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

# Titanium machining with new tool technology

In medical technology, this workpiece material is used for implants because of its strength and compatibility with human tissue. High demands are placed on dimensional accuracy and high-quality surface finishes to ensure a long service life of hip prostheses and titanium implants.

Automotive manufacturers use it to create powerful sports cars. Application involves semi-machining and finishing of chassis components. The blades of large gas turbines, made of titanium, absorb enormous forces.

The aircraft industry is producing more and more highly stressed parts made of titanium. MAPAL is making drilling and milling of the ductile, high-strength workpiece material more productive, thereby reducing costs.







# CONTENTS

## Introduction

---

|                                        |    |
|----------------------------------------|----|
| Competence in titanium machining ..... | 6  |
| Application areas .....                |    |
| Aerospace .....                        | 8  |
| Automotive .....                       | 14 |
| Medical technology .....               | 15 |
| Special solutions .....                | 16 |
| Engineering .....                      | 18 |

## Titanium machining

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|                               |    |
|-------------------------------|----|
| Product overview .....        | 22 |
| Milling .....                 | 25 |
| Drilling from solid .....     | 55 |
| Boring .....                  | 61 |
| Reaming and fine boring ..... | 65 |
| Clamping .....                | 79 |

## Technical appendix

---

|                            |     |
|----------------------------|-----|
| Product ID code .....      | 118 |
| Application notes .....    | 132 |
| Instructions for use ..... | 136 |

# Competence in titanium machining



1

## Aerospace

Titanium and titanium alloys are predestined for use in aerospace. High demands are placed on workpiece material strength and corrosion resistance in relation to their specific weight. This results in a wide range of applications extending from small mechanically processed structural parts to load-bearing parts in the fuselage or blades in the engine.

**>> More from page 8**

2

## Automotive

Lower weight means lower fuel consumption resulting in fewer emissions. Therefore, many different applications for titanium materials can be found in automotive engineering. Starting with engine components, through to transmission parts and suspension elements as well as exhausts. The automotive manufacturers' objective is to make vehicles lighter and therefore more environmentally friendly.

**>> More from page 14**

3

## Medical technology

Titanium is practically the perfect workpiece material for medical technology as it can be implemented extensively due to its bio-compatibility (i.e., its stability in biological surrounding – anti-allergenic), low thermal conductivity and anti-magnetic behaviour.

**>> More from page 15**





**TITANIUM IS PARTICULARLY SUITABLE FOR APPLICATIONS IN WHICH HIGH CORROSION RESISTANCE, STRENGTH AND LOW WEIGHT ARE REQUIRED.**



#### PROPERTIES

- Low density ( $4.5 \text{ kg/dm}^3$ )
- High specific strength
- High temperature resistance
- Short thermal conductivity
- High ductility

#### MACHINABILITY

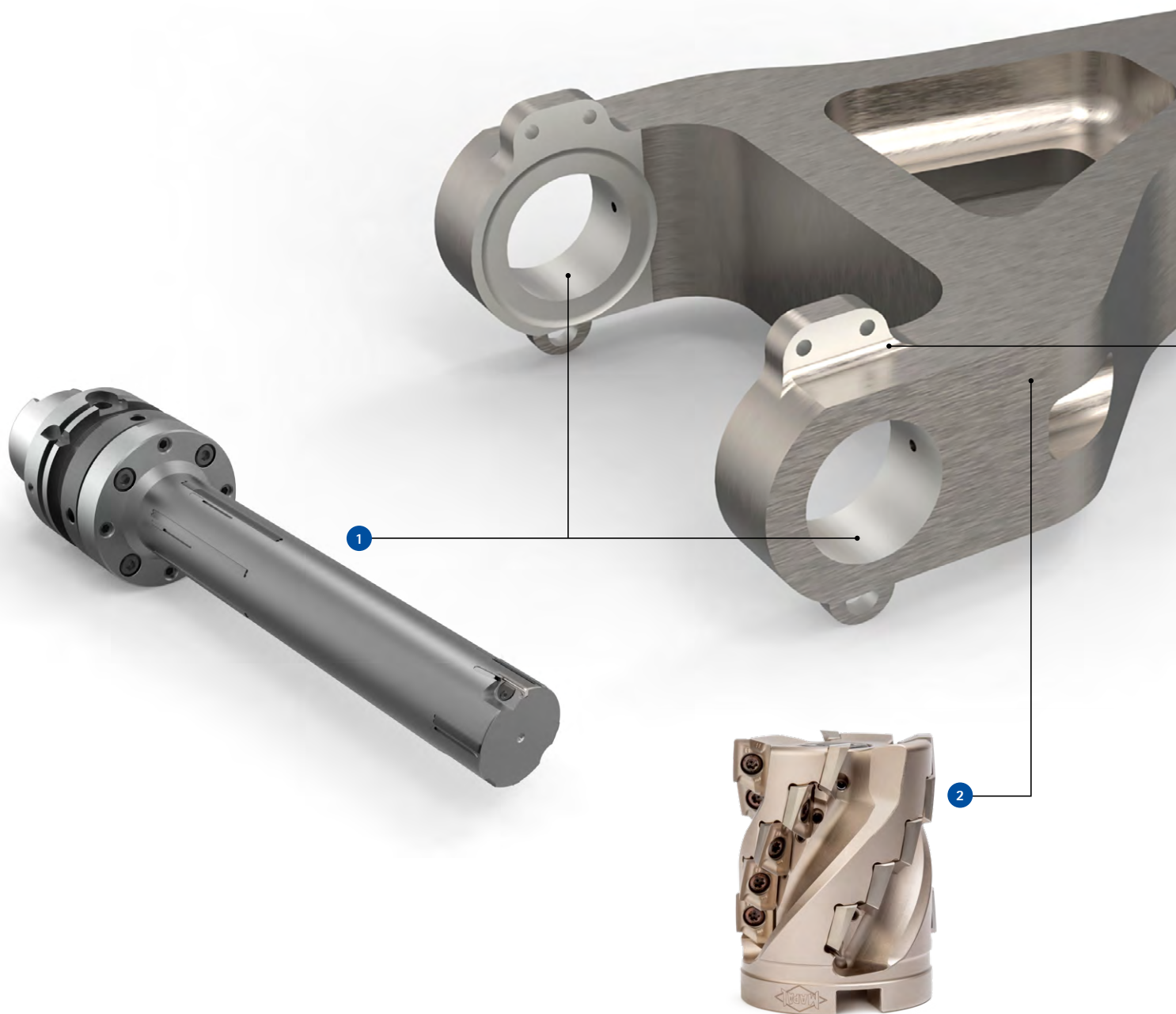
The low thermal conductivity of titanium and titanium alloys in conjunction with the high tensile strength of the workpiece material means that the tools are subjected to high thermal and mechanical stresses during machining and are therefore subject to high wear and tear. Adhesive effects between workpiece material and tool also lead to the formation of built-up edges. Therefore, tools with a high degree of hardness and thermal stability are particularly suitable for machining here.

# Aerospace

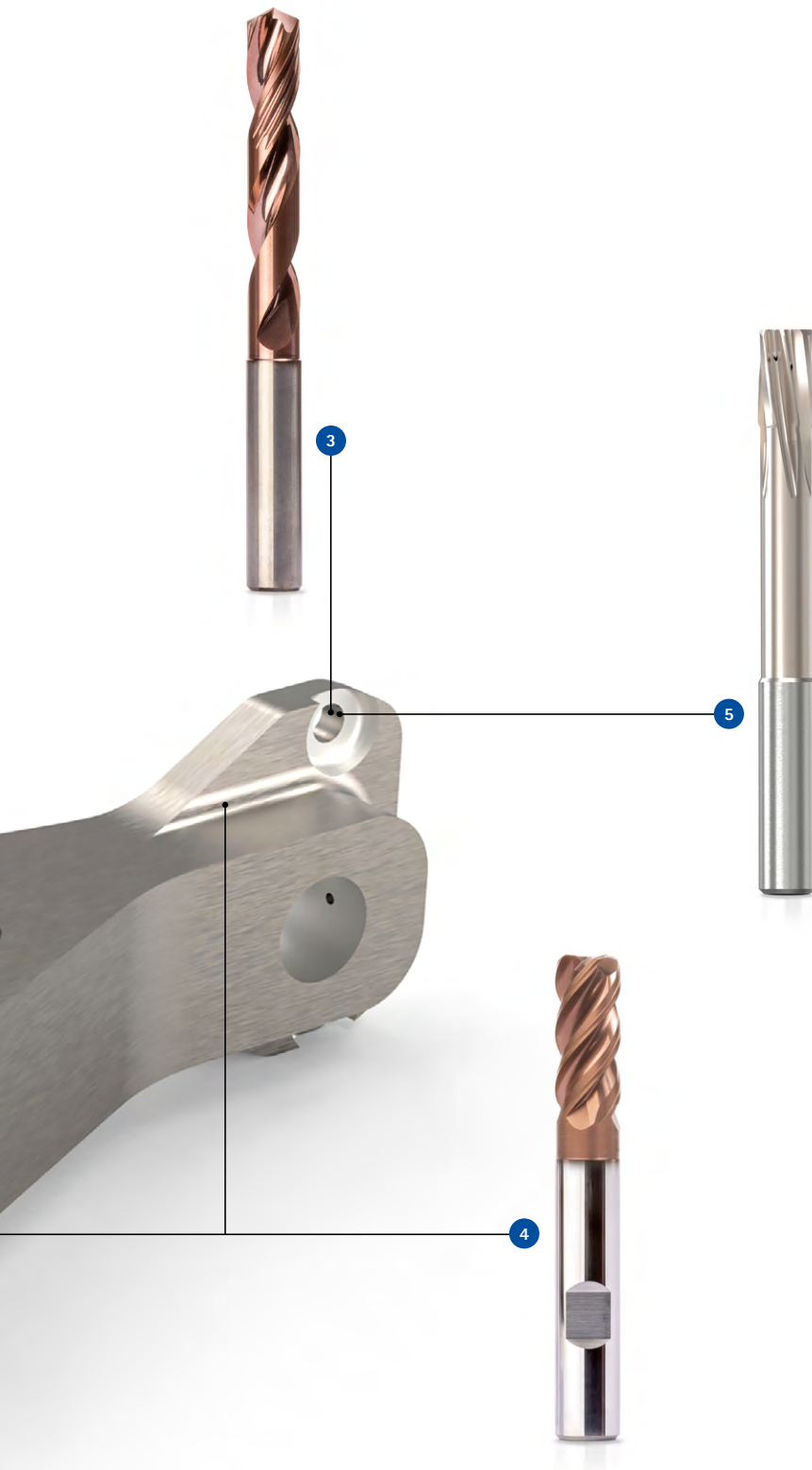
## Torsion link

### Highly stressed landing gear parts made of titanium

The torsion link is a component part of the main landing gear of aeroplanes. The top and bottom torsion links are attached to one another by a hinge. This design allows the damper cylinders to retract and extend without twisting. The torsion link thus maintains correct positioning of the wheels and in this way ensures the directional stability of the aeroplane when the landing gear is extended. As this is a highly stressed part, both the upper and lower torsion links are made of titanium.







### 1 Fine boring tool

- High-precision adjustment of the inserts
- Perfect concentricity of the bores
- Optimal surface roughness
- Perfect bore geometry
- Stable machining thanks to guide pads
- High accuracy of repetition and easy tool setting

### 2 NeoMill-Titan-2-Shell

- Maximum machining rates
- Optimum chip removal
- Very quiet running
- Variable cooling concept
- Cutting edges with various corner radii can be deployed
- Variety of cutting materials available

### 3 MEGA-Speed-Drill-Titan

- 140° point angle
- Little formation of built-up edge due to extremely smooth coating
- Four margin lands (best roundness values)
- Convex cutting edge
- Internal coolant supply
- Newly designed chip flute (optimal chip removal)
- Efficient coolant flow (avoids friction and heat at the cutting edge)

### 4 OptiMill-Titan-HPC

- Special edge preparation (stable cutting edge)
- Optimal pitch (stable cut, smooth running)
- Core rise for more stability

### 5 FixReam

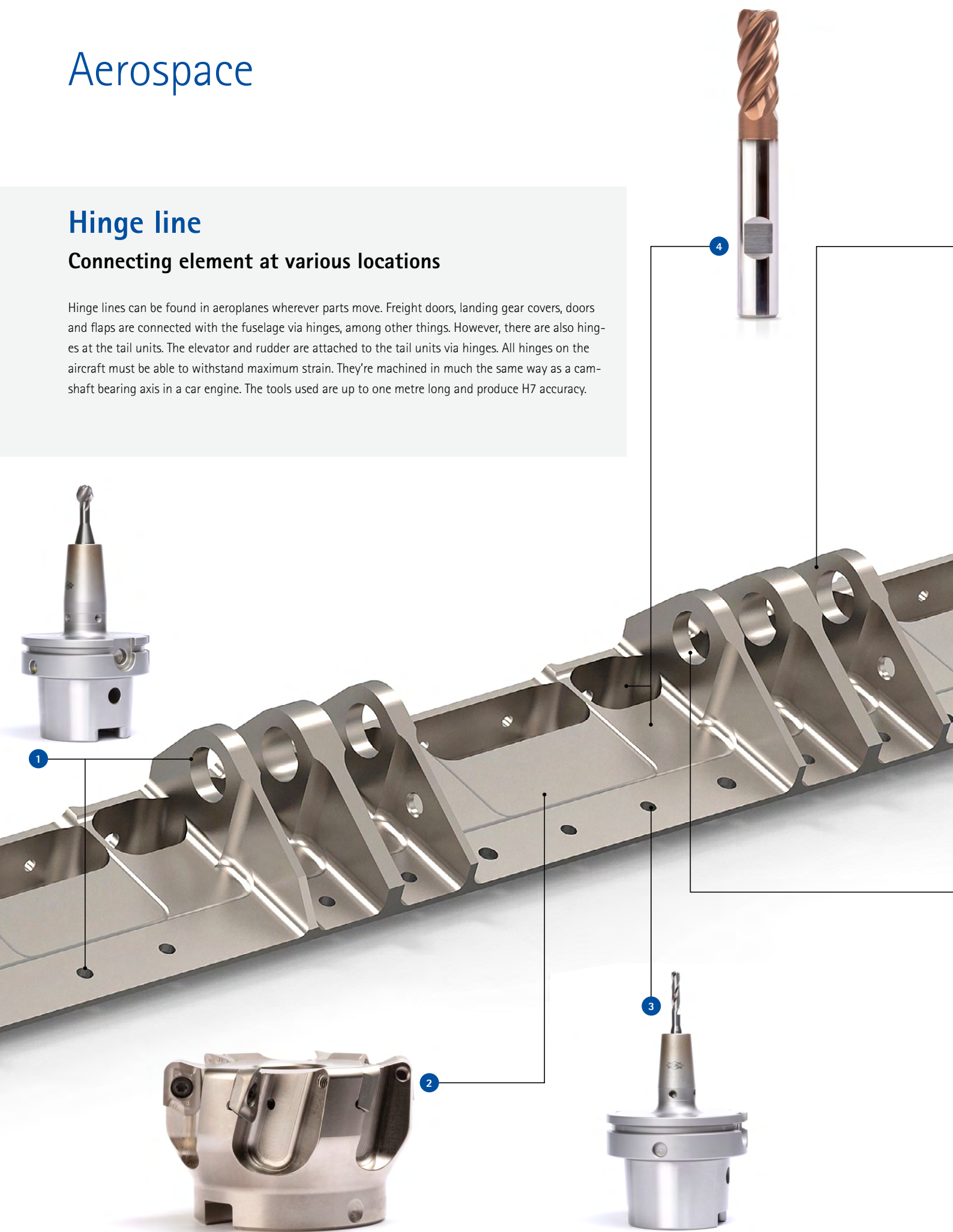
- Solid carbide or brazed design
- Bore quality: H7
- DLC coating for optimal performance
- Configurable diameter
- Design for through or blind bores
- Suitable for minimum quantity lubrication (MQL)

# Aerospace

## Hinge line

### Connecting element at various locations

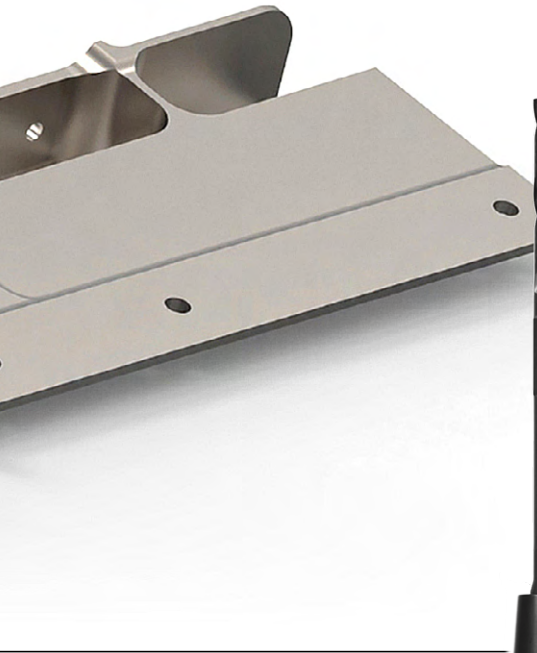
Hinge lines can be found in aeroplanes wherever parts move. Freight doors, landing gear covers, doors and flaps are connected with the fuselage via hinges, among other things. However, there are also hinges at the tail units. The elevator and rudder are attached to the tail units via hinges. All hinges on the aircraft must be able to withstand maximum strain. They're machined in much the same way as a cam-shaft bearing axis in a car engine. The tools used are up to one metre long and produce H7 accuracy.







5



6



6



6



### 1 Deburring tools made from solid carbide

With these custom tools in a special spherical shape, the bore entrance and exit of the main bore as well as the fixing bore are deburred through circular milling.

### 2 NeoMill-Titan-2-Corner

- High machining rates
- Very quiet running
- Cutting edges with various corner radii can be deployed
- Variety of cutting materials available

### 3 MEGA-Speed-Drill-Titan

- Extends tool life by 30% compared to previous solutions
- Drilling specialist for high cutting speeds and feed rates
- Short cycle times

### 4 OptiMill-Titan-HPC

- Increases tool life by 35%
- Perfect solution for roughing, medium machining and finishing
- Excellent price-performance ratio
- Fits Mill Chuck, System HB
- Optimal pitch (stable cut, smooth running)
- Core rise for more stability

### 5 OptiMill-Tro-Titan

- Extends tool life by 10% compared to previous solutions
- High removal rates possible
- Unequal spacing of the cutting edges
- Special coating to avoid deposits
- Specially designed chip flute for optimum chip removal

### 6 TTD replaceable head drill, custom drill, boring bar

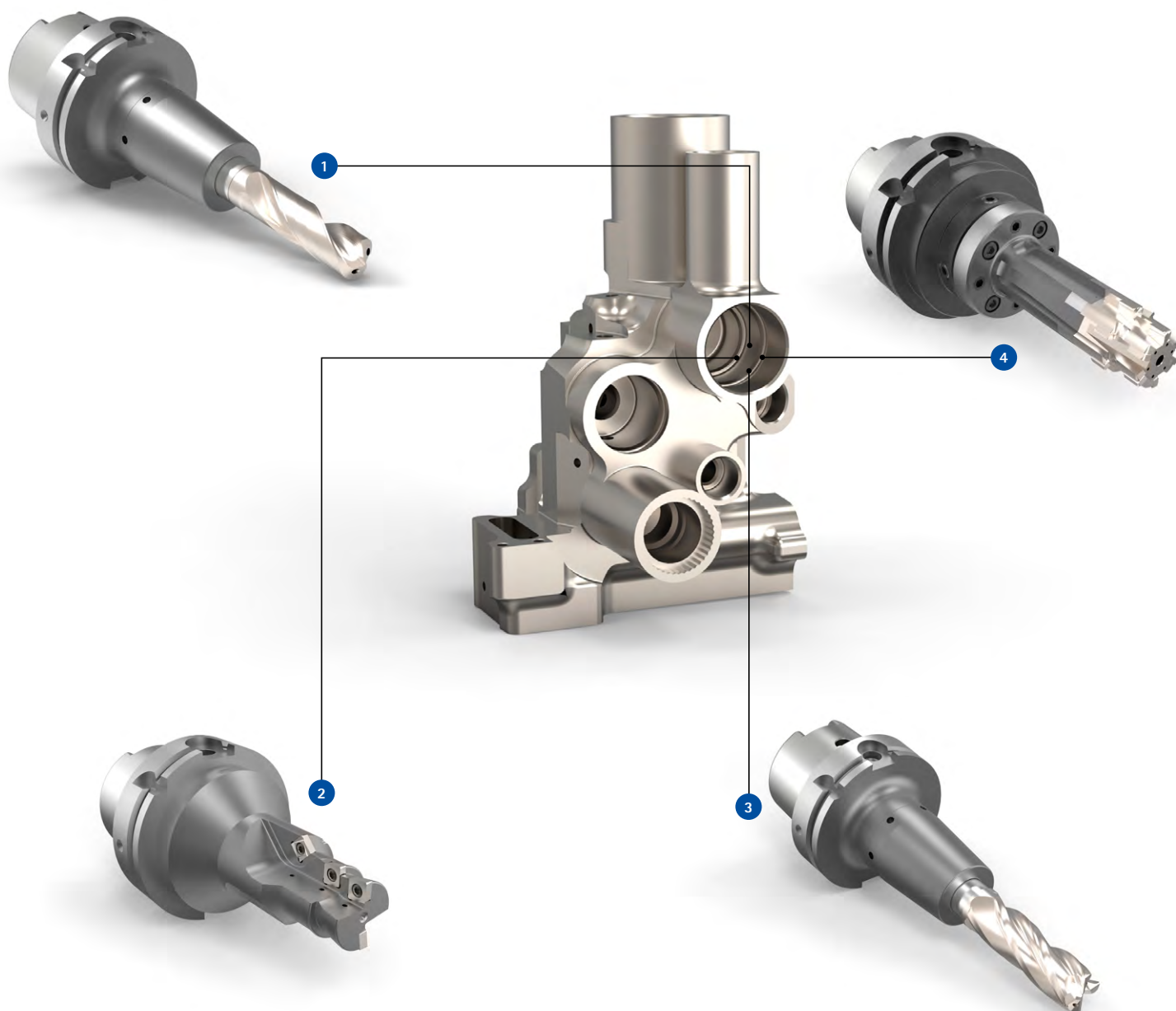
- TTD replaceable head drill for piloting the first lug
- Custom drill with additional guide element at the neck for medium machining of lugs from both sides
- Bearing-guided boring bar for precise finishing of the main bore from one side

# Aerospace

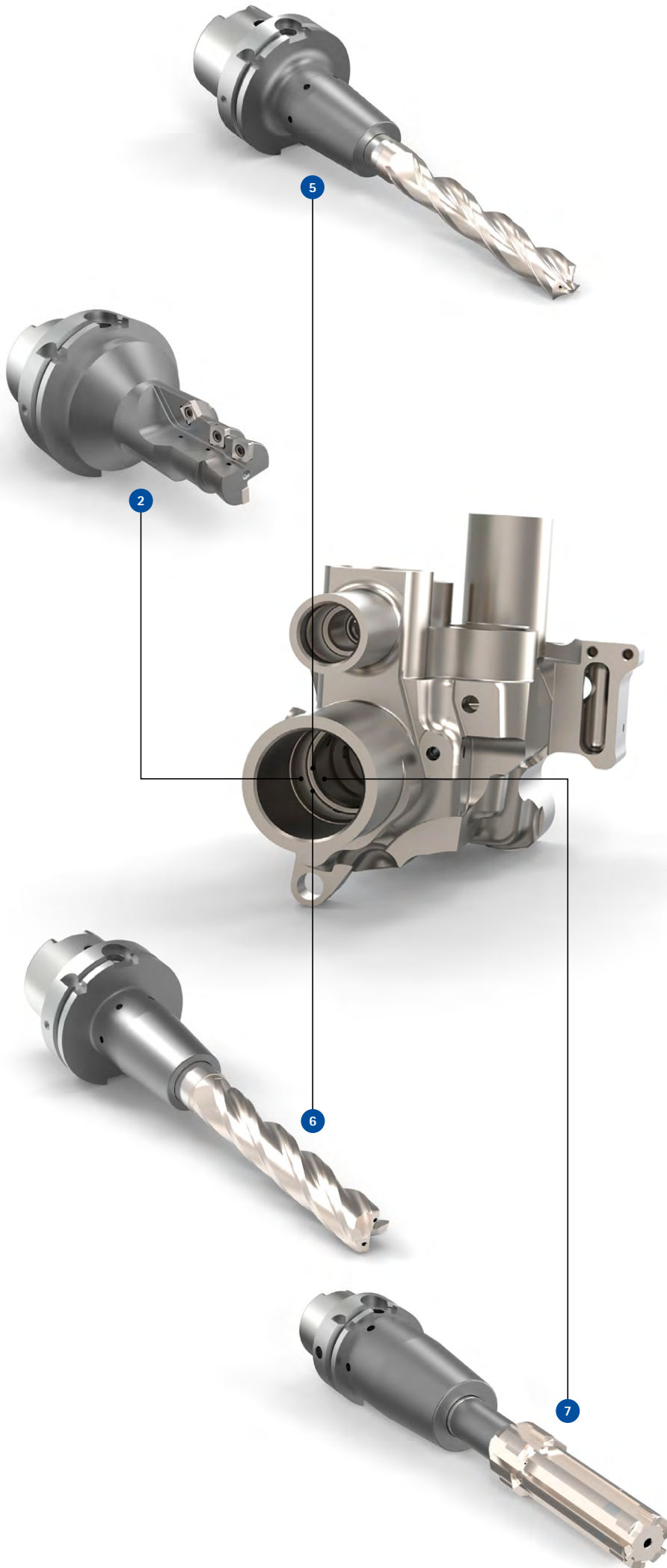
## Valve housing

### Best surface finishes for optimal flow rate

Valve housings in aeroplanes are often made of titanium alloy due to its operational characteristics and low weight. The requirements related to quality and technology imposed on these parts are very high and call for a special approach that ensures high reproducibility in production and reliable processes. Complex and multi-stepped bores with slots or bores that cross each other can be efficiently machined with special or standard tools and in this way meet high quality demands.





**1 Solid carbide drill**

- For difficult drilling applications
- Innovative lead geometry for good chip removal and low cutting pressure
- Significantly more performance, up to twice the feed rate compared to previous solutions

**2 Boring tool with changeable inserts**

- Three-stepped boring tool for medium machining
- No setting of cutting edges necessary
- Economical tool concept for roughing bores
- High machining rates possible
- Indexable inserts with excellent thermal stability

**3 Boring tool made of solid carbide with four edges**

- Long tool life thanks to special coating
- Coating protects the cutting edges against high temperatures and excessive wear and tear
- The internal coolant supply and chip channel geometries ensure efficient chip removal

**4 HPR replaceable head reamer with six edges**

- Perfect concentricity of the bores
- High feed rate possible and therefore less machining time
- Adjustable adapter enables precise tool settings and eliminates spindle errors
- Complete finishing in a single step

**5 Solid carbide drill with three edges**

- Special triple-edge geometry
- Perfect positioning of the drill
- Highly suitable for inclined bore entrances or cross bores

**6 Boring tool made of solid carbide with four edges**

- Special geometry
- Stable machining
- Optimal guide into the bore
- Four cutting edges ensure the right geometry of the bore prior to finishing

**7 HPR reamer with six edges**

- Can be repaired by desoldering/soldering the blades
- Perfect roundness of the bore due to the matching multi-cutting-edge geometry
- Internal cooling ensures effective chip transport

# Automotive

## Control arm

### A lot of horsepower placed securely on the road

What works well in aircraft construction also applies in the production of sports cars, and even more so of supercars: titanium where it matters. The industry uses high-strength titanium alloys for control arms, brake calipers or chassis parts that are exposed to high loads. This often involves precision fit bores that connect parts, such as the control arm to the body.



#### 4 NeoMill-Titan-2-Shell

- Maximum machining rates
- Optimum chip removal
- Very quiet running
- Variable cooling concept
- Cutting edges with various corner radii can be deployed
- Variety of cutting materials available



#### 1 MEGA-Speed-Drill-Titan

- Extends tool life by 30% compared to previous solutions
- Drilling specialist for high cutting speeds and feed rates
- Short cycle times

#### 2 OptiMill-Titan-HPC

- Four-edge roughing milling cutter
- Polished chip flute
- Heat-resistant high-performance coating
- Unequal cutting edge (smooth cut)

#### 3 HPR replaceable head reamer

- Radial run-out and change-over accuracy less than 3 µm
- Easy to handle
- Maximum precision and productivity
- Internal coolant supply for direct cooling of the cutting edges
- Particularly economical (replaceable head)

# Medical technology

## Hip joint

### A second hip that lasts a lifetime

Dimensional accuracy is of elementary importance in medical technology. In addition, the surface finish of parts is decisive. For instance, hip prostheses require a defined surface roughness on one side to favour ingrowth into the bone. An absolutely smooth surface on the other socket side is also required to achieve a long service life with as little friction as possible.



#### 1 OptiMill-Tro-Titan

- Heat-resistant high-performance coating
- Specially designed chip flute for optimum chip removal
- Heat reduction in the cutting zone



#### 2 MEGA-Speed-Drill-Titan

- Extends tool life by 30% compared to previous solutions
- Drilling specialist for high cutting speeds and feed rates
- Short cycle times

## Bone plates

### Connection element in the prosthesis

Titanium is also employed for external prostheses, mainly where the workpiece material is used for moving parts of artificial limbs.





# SPECIAL SOLUTIONS

Features for tools for machining large parts



## Application examples for special solutions

- 1 Shell end face milling cutter in a monolithic design for milling very high shoulder dimensions.
- 2 Combination tool with tangential technology for boring as well as circular milling of chamfers on both sides on the large bore of a connecting rod.
- 3 Fine boring tool with minimum quantity lubrication (MQL) with PCD guide pads and module flange for setting radial run-out precisely. The adjustable cutting edge ensures a  $\mu\text{m}$ -accurate diameter on the bearing rib.
- 4 Six-edge special HNC reamer made of solid carbide for MQL machining with a back-flushing function for machining engine holders.
- 5 Solid carbide form-cutter head ( $z=2+2$ ) with CFS connection for deburring, chamfering and circular milling of inner contours or relief grooves.
- 6 Four-edge solid carbide end milling cutter with a neck for machining parts with deep pockets.



- 7 Fine boring tool with MQL, with insert and PCD guide pads for  $\mu\text{m}$ -accurate machining of valve bores.
- 8 Multi-stepped boring tool with ISO indexable inserts for machining bearing bores on housing parts.
- 9 HPR replaceable head reamer with brazed cutting edges for economical contour machining of diameter, chamfer and radii on hydraulic housings.

- 10 Circular milling tool with tangential technology for countersinking and circular milling of chamfers on bores.
- 11 Coated solid-carbide drill with internal cooling and three margin lands for precise milling of bores on pylons.
- 12 Boring bar with ISO indexable insert for machining the bearing ribs of hinge lines. These are used as fuselage connection elements for doors, landing gear covers and flaps on aeroplanes.



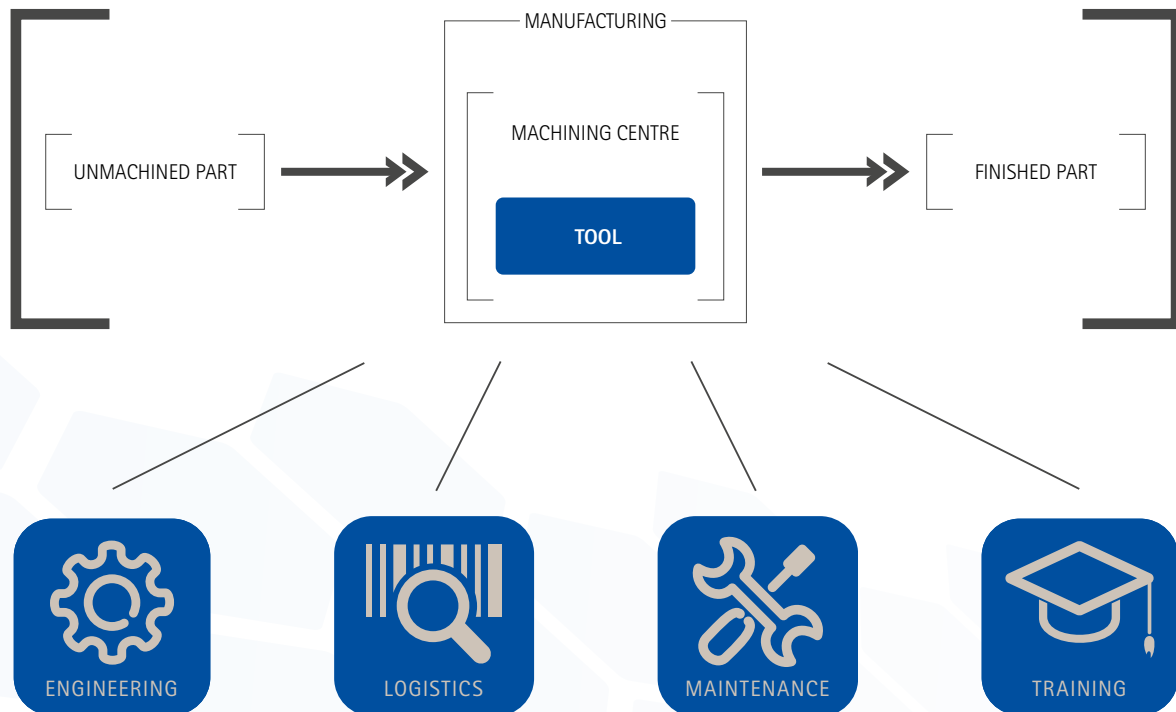
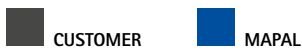
# Individual, needs-based service

MAPAL's roots lie in the manufacture of custom tools. The focus is therefore always on holistic advice and support for machining tasks and processes.

MAPAL provides support in all phases and areas of production with an extensive range of services. Regardless of whether a new production facility is to be set up, processes need to be optimised, new technologies need to be introduced, machines need to be converted to new parts, the tool inventory needs to be optimised or the know-how of employees needs to be expanded.





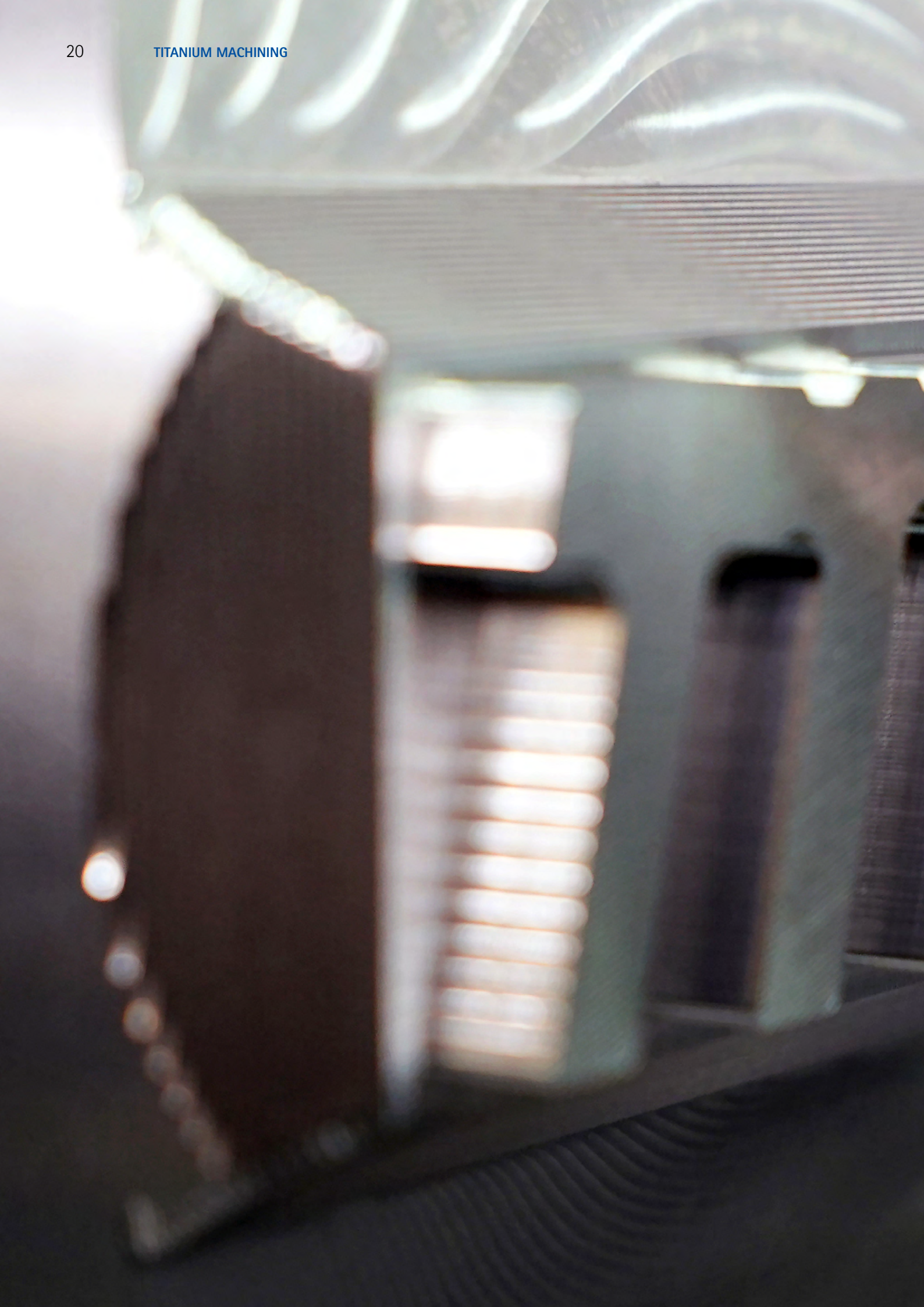


With the engineering service module, MAPAL guarantees fast, precise and safe manufacturing. Further savings potential can be tapped in the area of logistics and maintenance. And in the area of training, MAPAL ensures that the specialist know-how it has gathered is transparently and completely available to the customer – this gives customers a decisive lead over their competitors.

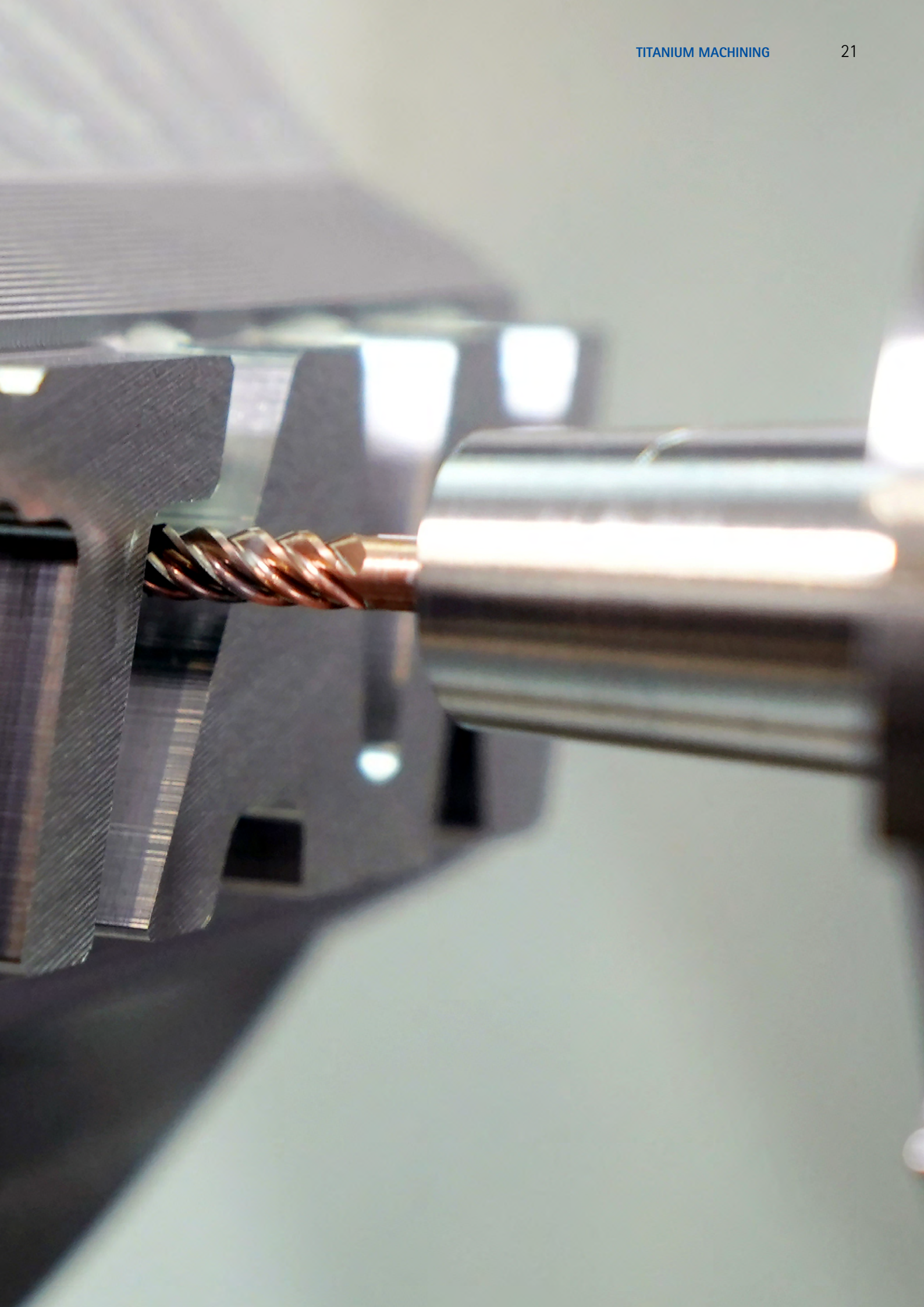
All of the services offered by MAPAL focus on optimal processes and comprehensive support on the way to Industry 4.0. The goal is to always significantly assist the customer in achieving smooth, productive and economical manufacturing.

## ADVANTAGES

- Solutions for complete workpieces including tools, fixtures, NC programs and commissioning
- Complete process design and implementation from a single source
- Fast and flexible on-site support worldwide
- Efficient and cost-optimised tool technology
- Optimal coordination of tool, workpiece, equipment and machine
- Highest product quality, process reliability and economic efficiency right from the start
- Fast throughput from planning to implementation with maximum planning security









# PRODUCT OVERVIEW

## Tools for titanium machining

MAPAL's highly capable product range ensures excellent and reliable results for all machining tasks in titanium. Cost-effectiveness and product quality are particularly important in meeting customer requirements.

### Processing titanium efficiently

The centrepiece of tool design is well thought-out heat removal and heat-resistant cutting material. In this way, relatively high cutting values can be achieved with high process reliability. Machining ductile, high-strength workpiece material becomes more productive and costs are reduced.

### Application-oriented

The portfolio includes drills and milling cutters made of solid carbide, milling cutters with indexable inserts, reamers for fine bore machining and indexable inserts for boring. In connection with application-oriented clamping technology, MAPAL offers everything from the spindle to the cutting edge from a single source, thus ensuring the maximum performance of the entire system.

### Wide range of available diameters

The range of available diameters is correspondingly broad. Starting with small sizes from 3 mm, as often required in medical technology, through to the large tools for aircraft construction and energy technology.

| Milling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Drilling from solid                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <p><b>Milling cutters with replaceable inserts</b></p> <p><b>NeoMill-Titan-2-Corner</b></p> <ul style="list-style-type: none"> <li>Shoulder milling cutter with double-edge radial indexable inserts</li> <li>Positive basic shape for parts susceptible to vibrations</li> <li>Cutting depths from up to 10 mm</li> </ul> <p><b>NeoMill-Titan-2-Shell</b></p> <ul style="list-style-type: none"> <li>Shell end face milling cutter with double-edge radial indexable inserts</li> <li>Ideal for deep shoulder milling and trimming with high cutting depths of up to 75 mm</li> </ul> <p><b>NeoMill-4-HiFeed90</b></p> <ul style="list-style-type: none"> <li>High-feed milling cutter with four-edge radial indexable inserts</li> <li>Universal tool system to ensure maximum productivity</li> </ul> <p>Ø area: 16.00 - 200.00 mm</p> | <p><b>Milling with Fixed Cutting Edges</b></p> <p><b>OptiMill-Titan-HPC</b></p> <ul style="list-style-type: none"> <li>Four-edge shoulder milling cutter for roughing and finishing titanium</li> <li>Special cutting edge finish for the highest degree of resistant to wear</li> <li>Highest degree of tool stability through maximum core dimension and core rise at the shank</li> <li>Different corner radii available</li> </ul> <p><b>OptiMill-Tro-Titan</b></p> <ul style="list-style-type: none"> <li>Five-edge trochoidal milling cutter</li> <li>Maximum material removal rate while providing an excellent surface finish at the same time</li> <li>Unequal spacing for quiet running during machining</li> <li>Finely balanced cutting tool for protecting the machine spindle and a longer tool life</li> <li>Cutting depth up to 3xD</li> </ul> <p>Ø area: 6.00 - 25.00 mm</p> | <p><b>Drilling from solid with solid carbide</b></p> <p><b>MEGA-Speed-Drill-Titan</b></p> <ul style="list-style-type: none"> <li>Double-edge high-speed drill</li> <li>Four margin lands for precise surface accuracy and cylindricity</li> <li>Convex cutting edge with corner chamfer for high stability</li> <li>Novel cord profile to protect the margin lands</li> <li>Maximum heat and wear resistance</li> </ul> <p>Ø area: 3.00 - 20.00 mm</p> |
| Page 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Page 55                                                                                                                                                                                                                                                                                                                                                                                                                                                |



| Boring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reaming and fine boring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Clamping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p><b>Boring with tangential technology</b></p> <p><b>Part-specific custom tools</b></p> <ul style="list-style-type: none"> <li>– Single- or multi-stepped tool with indexable inserts</li> <li>– Tangential technology for top performance</li> <li>– Defined chip formers</li> <li>– Highest productivity</li> <li>– Stable machining</li> </ul> <p><b>Tangential indexable inserts</b></p> <ul style="list-style-type: none"> <li>– Ground CTHQ and FTHQ inserts</li> <li>– Four usable cutting edges</li> <li>– Wide range of applications due to the three different sizes</li> <li>– High-performance PVD coating for maximum heat and wear resistance</li> <li>– Special arc shaped land for optimal machining results at a length-to-diameter ratio &gt;3.5xD</li> </ul> | <p><b>Fine bore machining</b></p> <p><b>FixReam FXR</b></p> <ul style="list-style-type: none"> <li>– High-performance reamer made from solid carbide</li> <li>– Ideal for implementing short cycle times</li> <li>– Variety of cutting materials and coatings available</li> </ul> <p><b>HPR replaceable head reamer</b></p> <ul style="list-style-type: none"> <li>– High-precision replaceable head system in a fixed design with brazed cutting edges</li> <li>– Precise radial run-out and changeover accuracy of &lt; 3 µm</li> <li>– Highest degree of economic efficiency due to modular system</li> <li>– Suitable for minimum quantity lubrication (MQL)</li> </ul> <p>Ø area: 2.80 - 65.00 mm</p> | <p><b>Hydraulic clamping technology and mechanical tool clamping technology</b></p> <p><b>Hydraulic clamping technology</b></p> <ul style="list-style-type: none"> <li>– UNIQ Mill Chuck, HA for highly dynamic milling applications</li> <li>– UNIQ DReAM Chuck for reaming and drilling applications as well as for finishing during milling operations</li> <li>– HydroChuck with an extensive standard range</li> </ul> <p><b>Mechanical tool clamping technology</b></p> <ul style="list-style-type: none"> <li>– Side lock chuck Mill Chuck, HB</li> <li>– MFS milling head holder for screw-in milling cutter</li> <li>– HFS replaceable head holders for HPR replaceable head reamer</li> </ul> <p><b>Milling cutter arbor</b></p> <ul style="list-style-type: none"> <li>– With enlarged face connection diameter</li> </ul> <p><b>Adapter</b></p> <ul style="list-style-type: none"> <li>– Alignment adapter for high-precision alignment of all flange modules</li> </ul> |
| Page 61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Page 65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Page 79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |







# MILLING

## Milling cutters with replaceable inserts

|                                                |    |
|------------------------------------------------|----|
| NeoMill-Titan-2-Corner                         | 26 |
| NeoMill-Titan-2-Shell                          | 28 |
| XPKT radial indexable insert, double edge      | 31 |
| NeoMill-4-HiFeed90                             | 32 |
| SDGT   SDMT radial indexable insert, four edge | 38 |
| Cutting data recommendations                   | 39 |
| Cutting material overview                      | 39 |
| Spare parts and accessories                    | 48 |

## Milling cutter with fixed cutting edges

|                              |    |
|------------------------------|----|
| OptiMill-HPC-Titan           | 40 |
| OptiMill-Tro-Titan           | 44 |
| Cutting data recommendations | 46 |

## Technical appendix

|                   |     |
|-------------------|-----|
| Product ID code   | 118 |
| Application notes | 132 |



# NeoMill®-Titan-2-Corner

## indexable insert milling cutters with a bite

NeoMill-Titan is the umbrella term for a whole family of tools with indexable inserts for titanium machining: Arbor, shank and shoulder milling cutters belong to the standard range. Chips are effectively ejected from the shear zone through optimally adapted indexable insert geometries and chip flutes. The unequal spacing of the inserts on the tool periphery ensures very quiet running.

### 1 Indexable inserts

- XPKT indexable insert with four different corner radii and three cutting material types

### 2 Coolant outlets

- Variably designed coolant outlets allow the flow rate to be regulated for each individual cutting edge (shell end face milling cutter)

### 3 Positive blade geometry

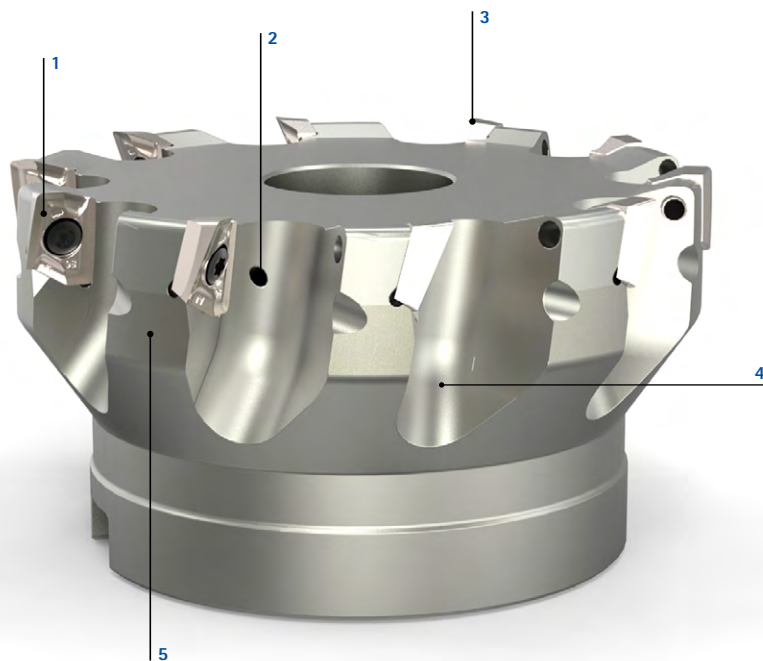
- The positive cutting edge geometry ensures soft cutting behaviour, which minimises thermal load on the cutting edges

### 4 Chip flute

- Chips are effectively ejected from the shear zone through optimally adapted chip flutes

### 5 Unequal spacing

- The unequal spacing of the inserts ensures very quiet running

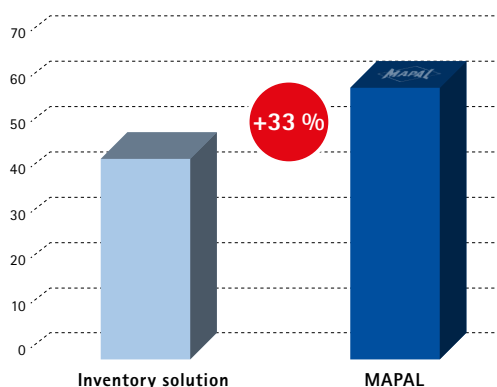


## Features

### Dimensions:

- Shoulder milling cutter as milling cutter head
- $\varnothing$  area: 40 mm up to 100 mm
- Standard corner radii of the indexable inserts: 0.8 / 2 / 3 and 4 mm
- Double-edge indexable insert
- $a_p$  max 10 mm
- Longer tool life
- Perfect solution for roughing and medium machining

## Tool life (min) \*



### TC6/TA15

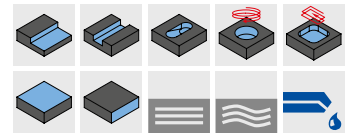
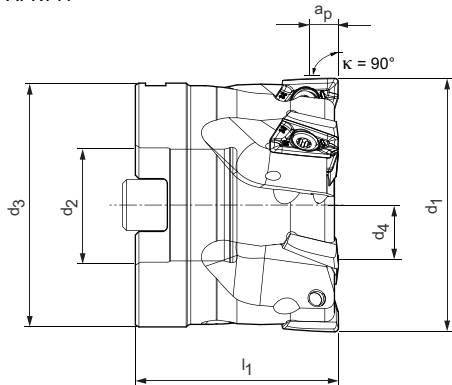
#### Tool with six cutting edges

Nominal  $\varnothing$ : 50 mm  
 $v_c$ : 47 m/min  
 $f_z$ : 0.14 mm  
 $a_p$ : 3 mm  
 $a_e$ : 30 mm

\* Tool life per milling unit (without changing the indexable inserts or use of additional cutting edges).

# NeoMill®-Titan-2-Corner

Shoulder milling cutter with radial technology  
XPKT11



## Milling cutter, medium spacing

| Dimensions     |                |                |                |                | Z <sub>eff</sub> | a <sub>p</sub><br>max. * | Weight<br>[kg] | Max. opera-<br>ting speed<br>[rpm] | Internal<br>cooling | Specification               | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|--------------------------|----------------|------------------------------------|---------------------|-----------------------------|-----------|
| d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> |                  |                          |                |                                    |                     |                             |           |
| 40             | 16             | 38             | 13,8           | 40             | 4                | 10                       | 0,2            | 21.000                             | ✓                   | ICM901-040-CA16-Z04R-XP_T11 | 31281086  |
| 50             | 22             | 48             | 18,5           | 40             | 4                | 10                       | 0,3            | 20.000                             | ✓                   | ICM901-050-CA22-Z04R-XP_T11 | 31281088  |
| 63             | 27             | 58             | 20,5           | 50             | 5                | 10                       | 0,7            | 18.000                             | ✓                   | ICM901-063-CA27-Z05R-XP_T11 | 31281110  |
| 80             | 32             | 78             | 27             | 55             | 7                | 10                       | 1,5            | 16.000                             | ✓                   | ICM901-080-CA32-Z07R-XP_T11 | 31281112  |
| 100            | 32             | 78             | 27             | 55             | 9                | 10                       | 2,0            | 14.000                             | ✓                   | ICM901-100-CA32-Z09R-XP_T11 | 31281114  |

## Milling cutter, close spacing

| Dimensions     |                |                |                |                | Z <sub>eff</sub> | a <sub>p</sub><br>max. * | Weight<br>[kg] | Max. opera-<br>ting speed<br>[rpm] | Internal<br>cooling | Specification               | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|--------------------------|----------------|------------------------------------|---------------------|-----------------------------|-----------|
| d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> |                  |                          |                |                                    |                     |                             |           |
| 40             | 16             | 38             | 13,8           | 40             | 5                | 10                       | 0,2            | 21.000                             | ✓                   | ICM901-040-CA16-Z05R-XP_T11 | 31281087  |
| 50             | 22             | 48             | 18,5           | 40             | 6                | 10                       | 0,3            | 20.000                             | ✓                   | ICM901-050-CA22-Z06R-XP_T11 | 31281089  |
| 63             | 27             | 58             | 20,5           | 50             | 7                | 10                       | 0,7            | 18.000                             | ✓                   | ICM901-063-CA27-Z07R-XP_T11 | 31281111  |
| 80             | 32             | 78             | 27             | 55             | 9                | 10                       | 1,5            | 16.000                             | ✓                   | ICM901-080-CA32-Z09R-XP_T11 | 31281113  |
| 100            | 32             | 78             | 27             | 55             | 11               | 10                       | 2,0            | 14.000                             | ✓                   | ICM901-100-CA32-Z11R-XP_T11 | 31281115  |

## Accessories

|  |          |                      |         |
|--|----------|----------------------|---------|
|  | XPKT1104 | Indexable insert     | Page 31 |
|  | MCA-...  | Milling cutter arbor | Page 96 |

## Spare parts\*\*

|  |                                                                      |                       |
|--|----------------------------------------------------------------------|-----------------------|
|  | Clamping screw for indexable insert<br>TORX PLUS<br>M3.5X8.1-TX10-IP | Order no.<br>30979520 |
|  | Milling cutter clamping screws<br>for milling cutter                 | Page 48               |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

\* A cutting depth that is bigger or smaller than the corner radius of the indexable insert should be chosen for shoulder milling.

\*\* Included in scope of delivery.

Depending on the clamping device used, different maximum operating speeds must be observed.



# NeoMill®-Titan-2-Shell

## Shell end face milling cutter with individual coolant supply

The NeoMill shell end face milling cutters are available as arbor and shank versions. Due to the topography of the indexable insert, the chips are optimally formed and ejected from the shear zone via the ideally customised chip flutes. Variably designed coolant outlets allow the flow rate to be regulated for each individual cutting edge.

### 1 Clamping screw for indexable insert (TORX PLUS)

### 2 Indexable inserts

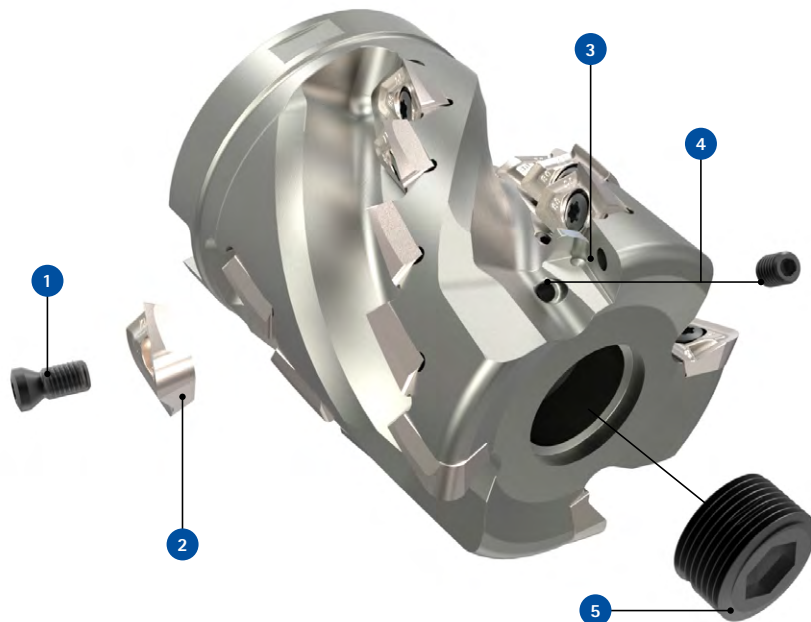
- XPKT indexable insert with four different corner radii and three cutting material types

### 3 Indexable insert seat

### 4 Threaded pin with coolant outlet

- Efficient and variable cooling concept increases tool life
- Outlet diameters can be individually set and sealed
- Easy regulation of the coolant supply at each cutting edge, whereby optimal heat removal is ensured at the cutting edge

### 5 Coolant sealing screw

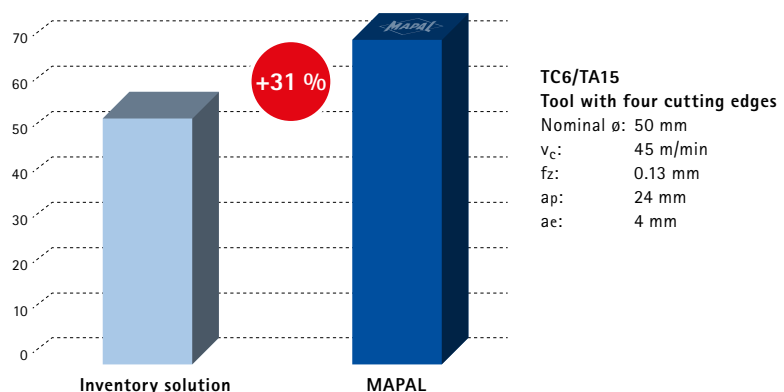


## Features

### Dimensions:

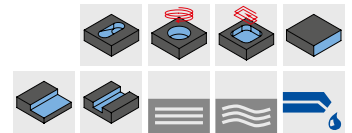
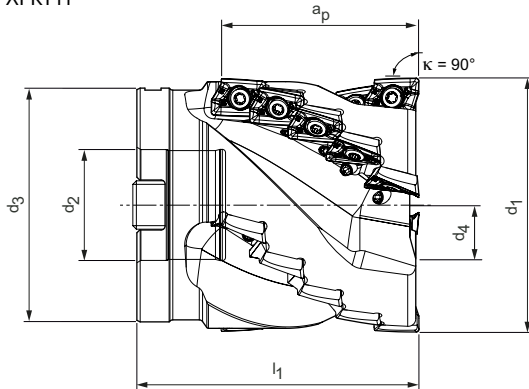
- $\varnothing$  area: 32 mm up to 80 mm
- Standard corner radii of the indexable inserts: 0.8 mm / 2 mm / 3 mm and 4 mm
- Improved chip removal
- Optimal heat removal in the cutting zone
- Longer tool life
- Perfect solution for roughing and medium machining

## Tool life [min]



# NeoMill®-Titan-2-Shell

Shell end face milling cutter with radial technology  
XPKT11



## Milling cutter, medium spacing

| Dimensions     |                |                |                |                | Z <sub>eff</sub> | No. of indexable inserts | a <sub>p</sub> max. * | Weight [kg] | Max. operating speed [rpm] | Internal cooling | Specification               | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|--------------------------|-----------------------|-------------|----------------------------|------------------|-----------------------------|-----------|
| d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> |                  |                          |                       |             |                            |                  |                             |           |
| 50             | 22             | 48             | 16,5           | 65             | 4                | 20                       | 47,5                  | 0,6         | 20.000                     | ✓                | ISM901-050-CA22-Z04R-XP_T11 | 31281119  |
| 63             | 27             | 58             | 20,5           | 70             | 4                | 20                       | 47,5                  | 1,0         | 18.000                     | ✓                | ISM901-063-CA27-Z04R-XP_T11 | 31281121  |
| 80             | 32             | 78             | 25             | 85             | 5                | 30                       | 57                    | 2,2         | 16.000                     | ✓                | ISM901-080-CA32-Z05R-XP_T11 | 31281123  |

## Milling cutter, close spacing

| Dimensions     |                |                |                |                | Z <sub>eff</sub> | No. of indexable inserts | a <sub>p</sub> max. * | Weight [kg] | Max. operating speed [rpm] | Internal cooling | Specification               | Order no. |
|----------------|----------------|----------------|----------------|----------------|------------------|--------------------------|-----------------------|-------------|----------------------------|------------------|-----------------------------|-----------|
| d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> |                  |                          |                       |             |                            |                  |                             |           |
| 40             | 16             | 38             | 14,5           | 60             | 3                | 12                       | 38                    | 0,3         | 21.000                     | ✓                | ISM901-040-CA16-Z03R-XP_T11 | 31281118  |
| 50             | 22             | 48             | 16,5           | 65             | 5                | 25                       | 47,5                  | 0,5         | 20.000                     | ✓                | ISM901-050-CA22-Z05R-XP_T11 | 31281120  |
| 63             | 27             | 58             | 20,5           | 70             | 5                | 25                       | 47,5                  | 1,1         | 18.000                     | ✓                | ISM901-063-CA27-Z05R-XP_T11 | 31281122  |
| 80             | 32             | 78             | 25             | 85             | 6                | 36                       | 57                    | 2,3         | 16.000                     | ✓                | ISM901-080-CA32-Z06R-XP_T11 | 31281124  |

## Accessories

|  |          |                                                               |                      |
|--|----------|---------------------------------------------------------------|----------------------|
|  | XPKT1104 | Indexable insert                                              | Page 31              |
|  | MCA-...  | Milling cutter arbor                                          | Page 96              |
|  |          | Threaded pin                                                  | Order no.            |
|  |          | With coolant bore<br>Internal ø = 1 mm<br>Internal ø = 0.5 mm | 31291814<br>31291816 |
|  |          | Without coolant bore                                          | 10003420             |

## Spare parts\*\*

|  |  |                                                                      |                       |
|--|--|----------------------------------------------------------------------|-----------------------|
|  |  | Clamping screw for indexable insert<br>TORX PLUS<br>M3.5X8.1-TX10-IP | Order no.<br>30979520 |
|  |  | Threaded pin<br>with coolant bore<br>Internal ø = 1.5 mm             | Order no.<br>31291811 |
|  |  | Milling cutter clamping screws<br>for milling cutter                 | Page 48               |
|  |  | Coolant sealing screw                                                | Page 48               |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

\* A cutting depth that is bigger or smaller than the corner radius of the indexable insert should be chosen for shoulder milling.

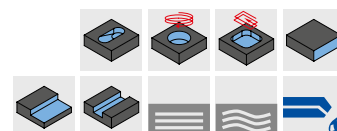
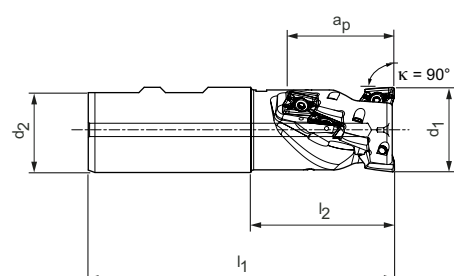
\*\* Included in scope of delivery.

\*\*\* Additional coolant nozzle to reduce the cross section of the coolant outlet, which results in increased coolant pressure (if there is not enough coolant pressure on the machine tool).

Depending on the clamping device used, different maximum operating speeds must be observed.

# NeoMill®-Titan-2-Shell

Shell end face milling cutter with radial technology  
XPKT11



## End milling cutter

| Dimensions     |                |                |                | Z <sub>eff</sub> | No. of indexable inserts | a <sub>p</sub> max. * | Weight [kg] | Max. operating speed [rpm] | Shank form | Internal cooling | Specification                  | Order no. |
|----------------|----------------|----------------|----------------|------------------|--------------------------|-----------------------|-------------|----------------------------|------------|------------------|--------------------------------|-----------|
| d <sub>1</sub> | d <sub>2</sub> | l <sub>1</sub> | l <sub>2</sub> |                  |                          |                       |             |                            |            |                  |                                |           |
| 32             | 32             | 115            | 53             | 2                | 8                        | 38                    | 0,6         | 23.000                     | HB         | ✓                | ISM901-032-115-HB32-Z2R-XP_T11 | 31281125  |
| 40             | 32             | 120            | 58             | 3                | 15                       | 47,5                  | 0,7         | 21.000                     | HB         | ✓                | ISM901-040-120-HB32-Z3R-XP_T11 | 31281126  |

## Accessories

|                                                                                     |          |                  |         |
|-------------------------------------------------------------------------------------|----------|------------------|---------|
|  | XPKT1104 | Indexable insert | Page 31 |
|  | MWC-...  | MillChuck, HB    | Page 94 |

## Spare parts\*\*

|                                                                                     |                                                                      |                       |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|
|  | Clamping screw for indexable insert<br>TORX PLUS<br>M3.5X8.1-TX10-IP | Order no.<br>30979520 |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

\* A cutting depth that is bigger or smaller than the corner radius of the indexable insert should be chosen for shoulder milling.

\*\* Included in scope of delivery.

Depending on the clamping device used, different maximum operating speeds must be observed.



# XPKT

Radial indexable insert, double edge



|                       |                                                                                                     |       |       |
|-----------------------|-----------------------------------------------------------------------------------------------------|-------|-------|
| Workpiece material    | <b>S</b>                                                                                            |       |       |
|                       | <div> <div>Ni alloy</div> <div>Wear-resistant</div> <div>Ti alloy</div> <div>Toughened</div> </div> |       |       |
| Substrate             | Carbide                                                                                             |       |       |
| Coating               | PVD                                                                                                 |       |       |
| Cutting material type | HP990                                                                                               | HP993 | HP995 |

| Dimensions [mm] |   |   |                |   |
|-----------------|---|---|----------------|---|
|                 |   |   |                |   |
| l               | d | s | d <sub>1</sub> | R |

| Cutting edge design |                                | M33      | M33      | M33      |
|---------------------|--------------------------------|----------|----------|----------|
| <b>XPKT11</b>       | <b>a<sub>p</sub> max. [mm]</b> |          |          |          |
| XPKT110408R-...-    | *                              | 31103767 | 31329348 | 31103766 |
| XPKT110420R-...-    | *                              | 31160787 | 31343443 | 31160786 |
| XPKT110430R-...-    | *                              | 31160789 | 31343444 | 31160788 |
| XPKT110440R-...-    | *                              | 31160801 | 31343445 | 31160800 |

|       |      |     |     |     |
|-------|------|-----|-----|-----|
| 13,98 | 9,35 | 4,7 | 4,1 | 0,8 |
| 13,98 | 9,35 | 4,7 | 4,1 | 2,0 |
| 13,98 | 9,35 | 4,7 | 4,1 | 3,0 |
| 13,98 | 9,35 | 4,7 | 4,1 | 4,0 |

## Feed per tooth

| MMG**    | Cutting edges design | XPKT                      |
|----------|----------------------|---------------------------|
|          |                      | f <sub>z</sub> [mm/tooth] |
| <b>S</b> | <b>M33</b>           | <b>0.1 - 0.25</b>         |

Legend: M33 = Medium machining

## Assembly note

### Tipping shell end face milling cutter NeoMill-Titan-2-Shell with XPKT indexable insert



Different indexable insert corner radii can be used in the foremost cutting edge row.  
**0.8 mm / 2.0 mm / 3.0 mm / 4.0 mm**

In the back cutting edge rows (from the 2nd row onwards) **only** indexable inserts with a corner radius smaller than or equal to **0.8 mm** may be used

\*\* a<sub>p</sub> max. depends on the type of milling cutter and application.

\*\* MAPAL machining groups

See Pages 52/53 for associated clamping screws and screwdrivers.  
For cutting data recommendations, see end of chapter.

# NeoMill®-4-HiFeed90

## Very high machining rates with good process reliability

The NeoMill-4-HiFeed90 high-feed milling cutter is a universal tool system that ensures maximum productivity and is characterised by top removal rates, extreme feed rates and big cutting depths. Offered as arbor, shank and screw-in milling cutters.

### 1 Universal tool system

- Unequal spacing ensures high stability and quiet running
- Highest productivity
- Maximum rate of removal due to very high feed rates and large cutting depths

### 2 Inserts

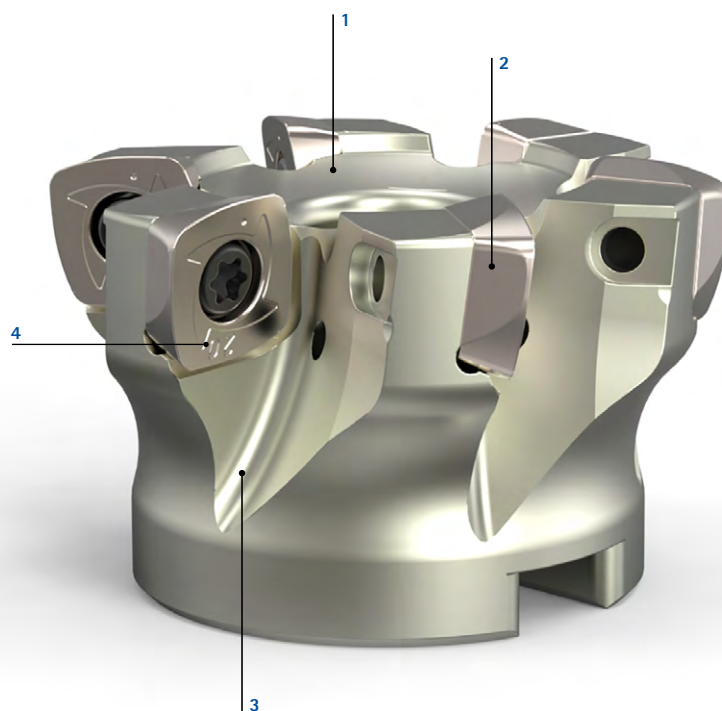
- Four blade sizes
- Four-edge indexable insert

### 3 Slot geometry

- Effective chip transport out of the shear zone

### 4 Cutting material

- Two different cutting material types with PVD coating

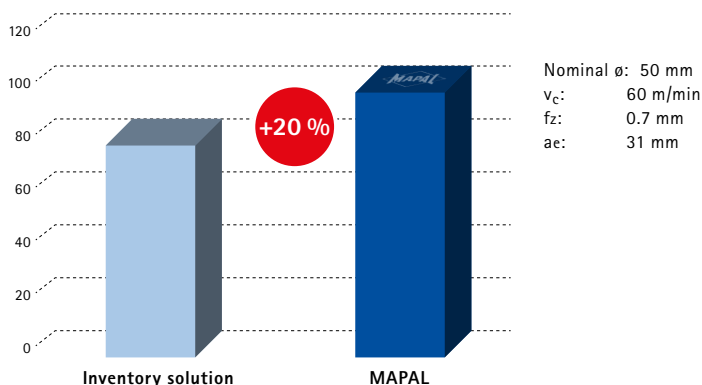


## Features

### Dimensions:

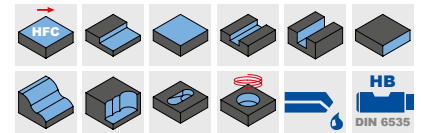
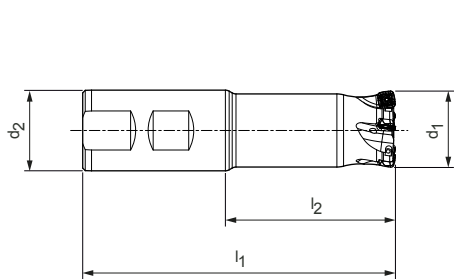
- End milling cutter, screw-in milling cutter, arbor milling cutter
- $\varnothing$  area: 16 mm up to 200 mm
- Four-edge indexable insert
- $a_p$  max 1 mm to 3.5 mm
- $z_{eff}$  two to eleven cutting edges
- SD insert size of 06, 10, 14 and 18
- Easy cutting even in full slot milling

## Tool life [min]



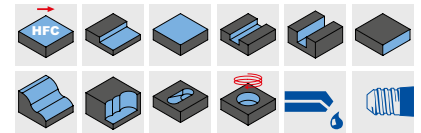
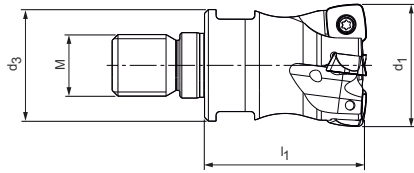
# NeoMill®-4-HiFeed90

High-feed milling cutter  
SDMT06



## End milling cutter

| Dimensions |       |       |       | $Z_{eff}$ | $a_p$ max. | Weight [kg] | Internal cooling | Specification                 | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|-------------------------------|-----------|
| $d_1$      | $d_2$ | $l_1$ | $l_2$ |           | HFC        |             |                  |                               |           |
| 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-HB32-Z5R-SD_06 | 31146636  |



## Screw-in milling cutter

| Dimensions |    |       |       | $Z_{eff}$ | $a_p$ max. | SW | Weight [kg] | Internal cooling | Specification              | Order no. |
|------------|----|-------|-------|-----------|------------|----|-------------|------------------|----------------------------|-----------|
| $d_1$      | M  | $d_3$ | $l_1$ |           | HFC        |    |             |                  |                            |           |
| 16         | 8  | 13,8  | 31    | 2         | 1          | 12 | 0,03        | ✓                | IMH901-016-M008-Z02R-SD_06 | 31146646  |
| 20         | 10 | 18    | 29,8  | 3         | 1          | 16 | 0,05        | ✓                | IMH901-020-M010-Z03R-SD_06 | 31146647  |
| 25         | 12 | 21    | 32    | 4         | 1          | 18 | 0,09        | ✓                | IMH901-025-M012-Z04R-SD_06 | 31146648  |
| 32         | 16 | 29    | 43    | 5         | 1          | 24 | 0,21        | ✓                | IMH901-032-M016-Z05R-SD_06 | 31146649  |
| 35         | 16 | 29    | 43    | 5         | 1          | 24 | 0,23        | ✓                | IMH901-035-M016-Z05R-SD_06 | 31146650  |

## Accessories

|  |          |                                                     |         |
|--|----------|-----------------------------------------------------|---------|
|  | SDMT0602 | Indexable insert HFC                                | Page 38 |
|  | MWC-...  | MillChuck, HB                                       | Page 94 |
|  | MFS-101  | MFS milling head holder for screw-in milling cutter | Page 99 |

## Spare parts\*

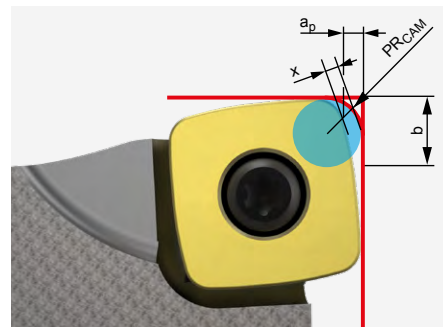
|  |          |                                                     |           |
|--|----------|-----------------------------------------------------|-----------|
|  | SDMT0602 | Clamping screw for indexable insert M2.2X5.2-TX7-IP | Order no. |
|  |          |                                                     | 31161853  |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

\*Included in scope of delivery.

## CAM programming note



When using an HFC indexable insert, the programme radius  $PR_{CAM}$  must be observed.

## SDMT06

| Dimensions [mm] |       |      |      |
|-----------------|-------|------|------|
| $PR_{CAM}$      | $a_p$ | x    | b    |
| 1,77            | 1,0   | 0,45 | 5,12 |

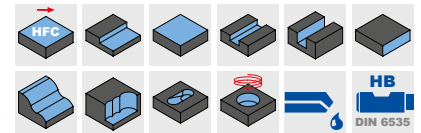
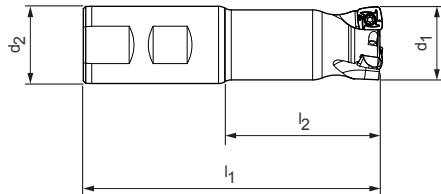
Depending on the clamping device used, different maximum operating speeds must be observed.



# NeoMill®-4-HiFeed90

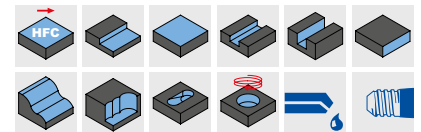
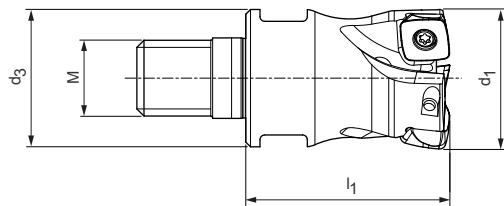
High-feed milling cutter

SD\_\_10



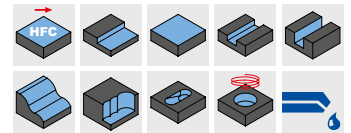
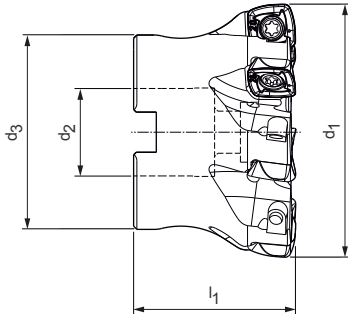
## End milling cutter

| Dimensions |       |       |       | $Z_{eff}$ | $a_p$ max. | Weight [kg] | Internal cooling | Specification                  | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|--------------------------------|-----------|
| $d_1$      | $d_2$ | $l_1$ | $l_2$ |           | HFC        |             |                  |                                |           |
| 25         | 25    | 106   | 50    | 2         | 1,5        | 0,31        | ✓                | IMH901-025-106-HB25-Z2R-SD__10 | 31144156  |
| 25         | 25    | 106   | 50    | 3         | 1,5        | 0,30        | ✓                | IMH901-025-106-HB25-Z3R-SD__10 | 31144157  |
| 32         | 32    | 124   | 64    | 3         | 1,5        | 0,64        | ✓                | IMH901-032-124-HB32-Z3R-SD__10 | 31144158  |



## Screw-in milling cutter

| Dimensions |    |       |       | $Z_{eff}$ | $a_p$ max. | SW | Weight [kg] | Internal cooling | Specification               | Order no. |
|------------|----|-------|-------|-----------|------------|----|-------------|------------------|-----------------------------|-----------|
| $d_1$      | M  | $d_3$ | $l_1$ |           | HFC        |    |             |                  |                             |           |
| 25         | 12 | 21    | 32    | 2         | 1,5        | 18 | 0,08        | ✓                | IMH901-025-M012-Z02R-SD__10 | 31144200  |
| 25         | 12 | 21    | 32    | 3         | 1,5        | 18 | 0,07        | ✓                | IMH901-025-M012-Z03R-SD__10 | 31144201  |
| 32         | 16 | 29    | 42    | 3         | 1,5        | 24 | 0,20        | ✓                | IMH901-032-M016-Z03R-SD__10 | 31144206  |
| 32         | 16 | 29    | 43    | 4         | 1,5        | 24 | 0,17        | ✓                | IMH901-032-M016-Z04R-SD__10 | 31144202  |
| 40         | 16 | 29    | 43    | 4         | 1,5        | 24 | 0,21        | ✓                | IMH901-040-M016-Z04R-SD__10 | 31144203  |



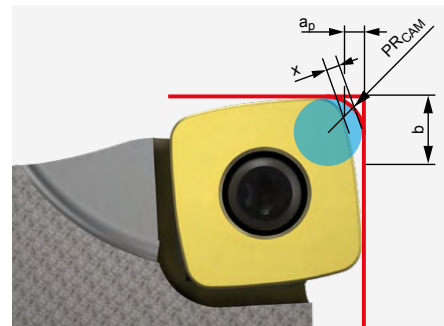
### Milling cutter

| Dimensions |       |       |       | $Z_{eff}$ | $a_p$ max. | Weight [kg] | Internal cooling | Specification               | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|-----------------------------|-----------|
| $d_1$      | $d_2$ | $d_3$ | $l_1$ |           | HFC        |             |                  |                             |           |
| 40         | 16    | 35    | 40    | 4         | 1,5        | 0,17        | ✓                | IMH901-040-CA16-Z04R-SD__10 | 31144056  |
| 40         | 16    | 35    | 40    | 6         | 1,5        | 0,17        | ✓                | IMH901-040-CA16-Z06R-SD__10 | 31144057  |
| 50         | 22    | 43    | 40    | 5         | 1,5        | 0,26        | ✓                | IMH901-050-CA22-Z05R-SD__10 | 31144059  |
| 50         | 22    | 43    | 40    | 7         | 1,5        | 0,25        | ✓                | IMH901-050-CA22-Z07R-SD__10 | 31144060  |
| 52         | 22    | 43    | 40    | 5         | 1,5        | 0,30        | ✓                | IMH901-052-CA22-Z05R-SD__10 | 31144061  |
| 63         | 22    | 48    | 40    | 6         | 1,5        | 0,42        | ✓                | IMH901-063-CA22-Z06R-SD__10 | 31144062  |
| 63         | 22    | 48    | 40    | 8         | 1,5        | 0,42        | ✓                | IMH901-063-CA22-Z08R-SD__10 | 31144063  |
| 66         | 22    | 48    | 40    | 5         | 1,5        | 0,46        | ✓                | IMH901-066-CA22-Z05R-SD__10 | 31144085  |
| 80         | 27    | 60    | 50    | 8         | 1,5        | 0,91        | ✓                | IMH901-080-CA27-Z08R-SD__10 | 31144064  |

### Accessories

|  |          |                                                     |         |
|--|----------|-----------------------------------------------------|---------|
|  | SD__1004 | Indexable insert HFC                                | Page 38 |
|  |          | Milling cutter clamping screws for milling cutter   | Page 48 |
|  | MCA-...  | Milling cutter arbor                                | Page 96 |
|  | MWC-...  | MillChuck, HB                                       | Page 94 |
|  | MFS-101  | MFS milling head holder for screw-in milling cutter | Page 99 |

### 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 |

### Spare parts\*

|  |          |                                                   |           |
|--|----------|---------------------------------------------------|-----------|
|  | SD__1004 | Clamping screw for indexable insert M3X8.3-TX9-IP | Order no. |
|  |          |                                                   | 31161852  |

Dimensions in mm.

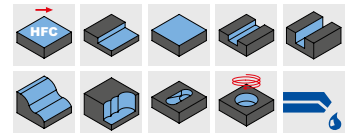
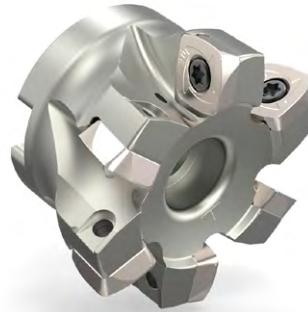
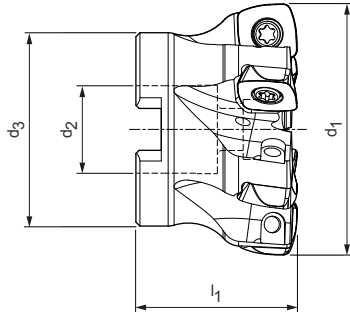
The maximum operating speeds refer only to the cutting edge system.

\*Included in scope of delivery.

Depending on the clamping device used, different maximum operating speeds must be observed.

# NeoMill®-4-HiFeed90

High-feed milling cutter  
SDMT14



## Milling cutter

| Dimensions |       |       |       | $Z_{eff}$ | $a_p$ max. | Weight [kg] | Internal cooling | Specification               | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|-----------------------------|-----------|
| $d_1$      | $d_2$ | $d_3$ | $l_1$ |           | HFC        |             |                  |                             |           |
| 50         | 22    | 43    | 40    | 5         | 2,4        | 0,22        | ✓                | IMH901-050-CA22-Z05R-SD__14 | 31144065  |
| 52         | 22    | 43    | 40    | 5         | 2,4        | 0,28        | ✓                | IMH901-052-CA22-Z05R-SD__14 | 31144067  |
| 63         | 22    | 48    | 40    | 6         | 2,4        | 0,38        | ✓                | IMH901-063-CA22-Z06R-SD__14 | 31144068  |
| 66         | 22    | 48    | 40    | 6         | 2,5        | 0,43        | ✓                | IMH901-066-CA22-Z06R-SD__14 | 31144069  |
| 80         | 27    | 60    | 50    | 7         | 2,4        | 0,85        | ✓                | IMH901-080-CA27-Z07R-SD__14 | 31144070  |
| 100        | 32    | 78    | 50    | 7         | 2,4        | 1,49        | ✓                | IMH901-100-CA32-Z07R-SD__14 | 31144071  |
| 100        | 32    | 78    | 50    | 9         | 2,4        | 1,49        | ✓                | IMH901-100-CA32-Z09R-SD__14 | 31144072  |
| 125        | 40    | 90    | 60    | 11        | 2,4        | 2,79        | ✓                | IMH901-125-CA40-Z11R-SD__14 | 31144073  |

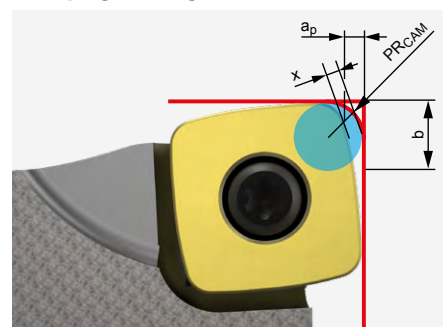
## Accessories

|  |          |                                                   |         |
|--|----------|---------------------------------------------------|---------|
|  | SDMT1405 | Indexable insert HFC                              | Page 38 |
|  | MCA-...  | Milling cutter arbor                              | Page 96 |
|  |          | Milling cutter clamping screws for milling cutter | Page 48 |

## Spare parts\*

|  |          |                                                     |           |
|--|----------|-----------------------------------------------------|-----------|
|  | SDMT1405 | Clamping screw for indexable insert M5X10.8-TX20-IP | Order no. |
|  |          |                                                     | 31161851  |

## CAM programming note



When using an HFC indexable insert, the programme radius  $PR_{CAM}$  must be observed.

## SDMT14

| Dimensions [mm] |       |      |        |
|-----------------|-------|------|--------|
| $PR_{CAM}$      | $a_p$ | $x$  | $b$    |
| 3,45            | 2,4   | 0,93 | 10,868 |

Dimensions in mm.

The maximum operating speeds refer only to the cutting edge system.

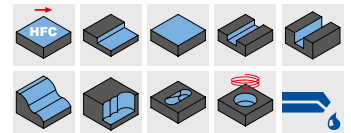
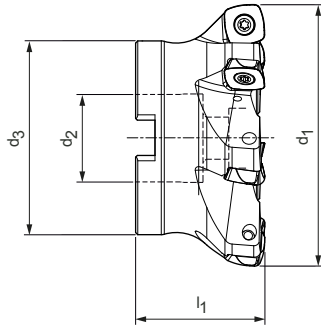
\*Included in scope of delivery.

Depending on the clamping device used, different maximum operating speeds must be observed.



# NeoMill®-4-HiFeed90

High-feed milling cutter  
SDMT18



## Milling cutter

| Dimensions |       |       |       | $Z_{eff}$ | $a_p$ max. | Weight [kg] | Internal cooling | Specification               | Order no. |
|------------|-------|-------|-------|-----------|------------|-------------|------------------|-----------------------------|-----------|
| $d_1$      | $d_2$ | $d_3$ | $l_1$ |           | HFC        |             |                  |                             |           |
| 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  |

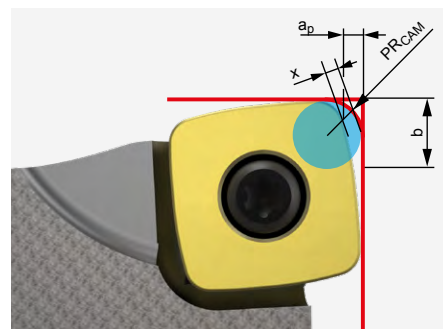
## Accessories

|  |          |                                                   |         |
|--|----------|---------------------------------------------------|---------|
|  | SDMT1806 | Indexable insert HFC                              | Page 38 |
|  | MCA-...  | Milling cutter arbor                              | Page 96 |
|  |          | Milling cutter clamping screws for milling cutter | Page 48 |

## Spare parts\*

|  |          |                                               |           |
|--|----------|-----------------------------------------------|-----------|
|  | SDMT1806 | 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.

## SDMT18

| Dimensions [mm] |       |      |       |
|-----------------|-------|------|-------|
| $PR_{CAM}$      | $a_p$ | $x$  | $b$   |
| 4,82            | 3,5   | 1,24 | 13,77 |

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.

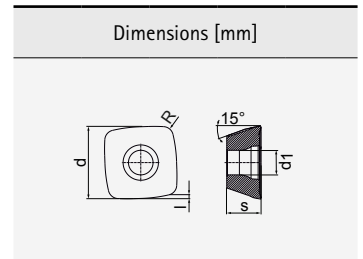
# SDGT | SDMT

Radial indexable insert, four cutting edges



|                       |                              |                         |
|-----------------------|------------------------------|-------------------------|
| Workpiece material    | <b>S</b>                     |                         |
|                       | Ni alloy<br>← Wear-resistant | Ti alloy<br>→ Toughened |
| Substrate             | Carbide                      |                         |
| Coating               | PVD                          |                         |
| Cutting material type | HP990                        | HP995                   |

| Cutting edge design |                 | SMH      | MQL      | SMH      | MQL      | SMS      |
|---------------------|-----------------|----------|----------|----------|----------|----------|
| SD__                | $a_p$ max. [mm] |          |          |          |          |          |
| SDMT060212R-...-    | *               | 31311724 | 31311727 | 31311725 | 31311729 |          |
| SDMT100415R-...-    | *               | 31311731 | 31311733 | 31311732 | 31311734 |          |
| SDGT100415R-...-    | *               |          |          |          |          | 31311736 |
| SDMT140520R-...-    | *               | 31311737 | 31311741 | 31311739 | 31311742 |          |
| SDMT180630R-...-    | *               | 31311745 | 31311748 | 31311746 | 31311749 |          |



| l   | d    | s    | d <sub>1</sub> | R   |
|-----|------|------|----------------|-----|
| 1   | 6,75 | 2,5  | 2,5            | 1,2 |
| 1,1 | 10,2 | 4,86 | 3,5            | 1,5 |
| 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   |

## Feed per tooth (selection according to cutting edge design) and plunge angle

| MMG** | Cutting edge design | SD__06          |     |   | SD__10           |     |     | SD__14          |     |     | SD__18          |     |     |
|-------|---------------------|-----------------|-----|---|------------------|-----|-----|-----------------|-----|-----|-----------------|-----|-----|
|       |                     | $a_p$ max. [mm] |     |   | $f_z$ [mm/tooth] |     |     | $a_p$ max. [mm] |     |     | $a_p$ max. [mm] |     |     |
| S     | MQL                 | 0.3             | 0.5 | 1 | 0.3              | 0.5 | 1   | 0.5             | 0.8 | 1.3 | 0.5             | 0.9 | 1.4 |
|       | SMH                 | 0.3             | 0.5 | 1 | 0.3              | 0.5 | 0.9 | 0.5             | 0.7 | 1.2 | 0.6             | 1.2 | 2   |
|       | SMS                 | –               | –   | – | –                | –   | –   | 0.5             | 0.7 | 1.2 | –               | –   | –   |

Legend: MQL = General machining | SMH = Unstable machining | SMS = Precise machining

\*\*  $a_p$  max. depends on the type of milling cutter and application.

\*\* MAPAL machining groups

See Pages 52/53 for associated clamping screws and screwdrivers.

For cutting data recommendations, see end of chapter.

# Cutting data recommendations for milling cutter with indexable inserts

Feed and cutting speed

## Cutting speed for milling cutter with indexable inserts

| MMG* |    |      | Workpiece material                                   | Strength/<br>hardness<br>[N/mm <sup>2</sup> ]<br>[HRC] | Carbide PVD-coated |      |       |      |       |      |
|------|----|------|------------------------------------------------------|--------------------------------------------------------|--------------------|------|-------|------|-------|------|
|      |    |      |                                                      |                                                        | HP990              |      | HP993 |      | HP995 |      |
|      |    |      |                                                      |                                                        | >0.6               | <0.6 | >0.6  | <0.6 | >0.6  | <0.6 |
| S    | S1 | S1.1 | Titanium, titanium alloys                            | < 400                                                  | 50                 | 55   | 60    | 70   | 60    | 70   |
|      | S2 | S2.1 | Titanium, titanium alloys                            | < 1,200                                                | 35                 | 45   | 45    | 55   | 45    | 55   |
|      |    | S2.2 | Titanium, titanium alloys                            | > 1,200                                                | 30                 | 35   | 40    | 50   | 40    | 50   |
|      | S3 | S3.1 | Nickel, unalloyed and alloyed                        | < 900                                                  | 40                 | 45   | 50    | 60   | 50    | 60   |
|      |    | S3.2 | Nickel, unalloyed and alloyed                        | > 900                                                  | 35                 | 40   | 45    | 55   | 45    | 55   |
|      | S4 | S4.1 | High-temperature super alloy, Ni-, Co-, and Fe-based |                                                        | 30                 | 35   | 40    | 50   | 40    | 50   |
|      | S5 | S5.1 | Molybdenum and tungsten alloys                       |                                                        | 60                 | 65   | 70    | 80   | 70    | 80   |
|      |    |      |                                                      |                                                        |                    |      |       |      |       |      |

## Cutting material overview: Types and type description

| Cutting material   | Name of cutting material | Coating composition | Colour of coating | Field of application | Recommended application                                                                                                                                                                                                                                                                                                                                                                                                                  | S High temperature alloys and titanium alloys |    |    |           |    |  |
|--------------------|--------------------------|---------------------|-------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----|----|-----------|----|--|
|                    |                          |                     |                   |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                          | Wear-resistant                                |    |    | Toughened |    |  |
|                    |                          |                     |                   |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                          | 05                                            | 15 | 25 | 35        | 45 |  |
| Carbide PVD-coated | HP990                    | TiB2                | Silver            | ●                    | PVD-coated universal carbide type for titanium machining <b>at low and medium cutting speeds</b> (30 – 50 m/min). The TiB2 coating is characterised by a high level of resistance to wear and excellent coating adhesion. In addition, the extremely smooth coating surface reduces the formation of built-up edges.                                                                                                                     |                                               |    |    |           |    |  |
|                    | HP993                    |                     |                   |                      | PVD-coated carbide types that are considered the <b>first choice in relation to price and performance</b> for titanium machining <b>at high cutting speeds</b> (40 – 70 m/min). The TiB2 coating is characterised by a high level of resistance to wear and excellent coating adhesion. In addition, the extremely smooth coating surface reduces the formation of built-up edges.                                                       |                                               |    |    |           |    |  |
|                    | HP995                    |                     |                   |                      | PVD-coated carbide types with high thermal stability that are considered the first choice in relation to price and performance for titanium machining <b>at high cutting speeds (40 – 70 m/min) together with maximum tool life</b> . The TiB2 coating is characterised by a high level of resistance to wear and excellent coating adhesion. In addition, the extremely smooth coating surface reduces the formation of built-up edges. |                                               |    |    |           |    |  |

Field of application: ✖ Unstable machining ● General machining ● Stable machining

\* MAPAL machining groups  
The specified machining values are guide values.

### Note:

A cutting depth that is bigger or smaller than the corner radius of the insert chose be chosen for shoulder milling.



# OptiMill®-Titan-HPC

## Versatile roughing and finishing

The OptiMill-Titan-HPC four-edge shoulder milling cutter is a versatile tool. The end milling cutter made of solid carbide can be used for roughing as well as finishing. The special cutting edge preparation creates optimal surfaces.

### 1 Novel slot profile

- Very high stability and very good chip removal
- Optimal chip spaces for optimal chip transport

### 2 Unequal spacing and gradient

- Runs as quietly as possible due to varying helix angle design and cutting edge spacing
- Full slot milling up to a depth of 1.5xD possible

### 3 New coating technology

- AlTiN-based multi-layer coating for high thermal loads

### 4 Different corner radii variants available

- For machining of part as close to the contour as possible

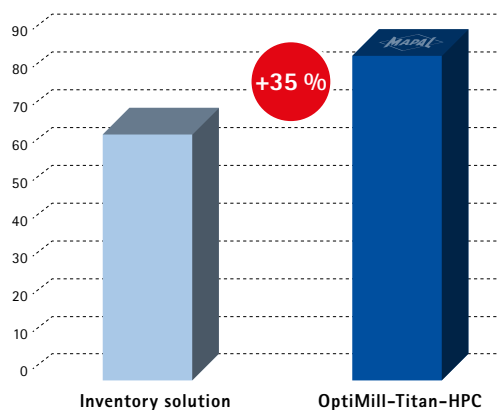


## Features

### Dimensions:

- Shoulder milling cutter shank form
- $\varnothing$  area: 6 mm up to 25 mm
- Number of cutting edges: 4
- Unequal spacing
- Shank connection 6, 8, 10, 12, 16, 20 and 25 mm
- Cutting edge preparation creates optimal surfaces

## Tool life [m]



### Ti6Al4V-1.1800

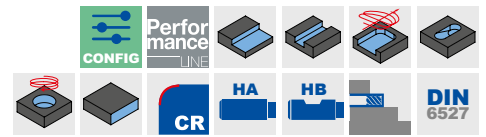
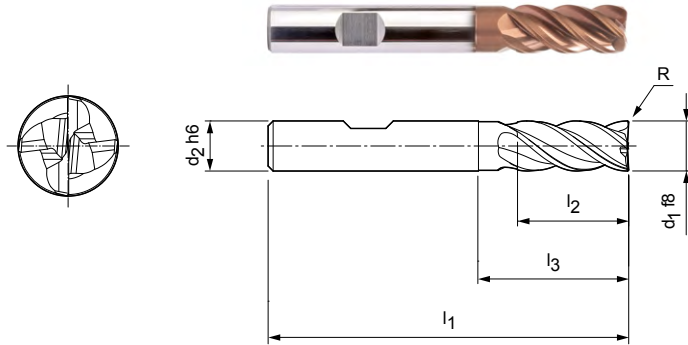
Tool  $\varnothing$ : 12 mm  
 $v_c$ : 80 m/min  
 $f_z$ : 0.06 mm  
 $a_p$ : 12 mm  
 $a_e$ : 4.8 mm

# OptiMill®-Titan-HPC

Shoulder milling cutter, long design with neck  
SCM394

## Design:

Diameter of milling cutter: 6.00 - 25.00 mm  
Cutting material: HP826  
Number of cutting edges: 4  
Helix angle: 43°  
Special feature: Unequal spacing



## Preferred series in stock

| Dimensions        |                   |                |                |                |                |      | Specification                 | Order no. |
|-------------------|-------------------|----------------|----------------|----------------|----------------|------|-------------------------------|-----------|
| d <sub>1</sub> f8 | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | d <sub>3</sub> | l <sub>3</sub> | R    |                               |           |
| 6,00              | 6                 | 57             | 13             | 5,8            | 20             | 0,50 | SCM394-0600Z04R-R0050HB-HP826 | 31304509  |
| 6,00              | 6                 | 57             | 13             | 5,8            | 20             | 1,00 | SCM394-0600Z04R-R0100HB-HP826 | 31304544  |
| 8,00              | 8                 | 63             | 21             | 7,8            | 25             | 0,50 | SCM394-0800Z04R-R0050HB-HP826 | 31304547  |
| 8,00              | 8                 | 63             | 21             | 7,8            | 25             | 1,00 | SCM394-0800Z04R-R0100HB-HP826 | 31304549  |
| 10,00             | 10                | 72             | 22             | 9,8            | 30             | 0,50 | SCM394-1000Z04R-R0050HB-HP826 | 31304552  |
| 10,00             | 10                | 72             | 22             | 9,8            | 30             | 1,00 | SCM394-1000Z04R-R0100HB-HP826 | 31304554  |
| 12,00             | 12                | 83             | 26             | 11,8           | 36             | 0,50 | SCM394-1200Z04R-R0050HB-HP826 | 31304557  |
| 12,00             | 12                | 83             | 26             | 11,8           | 36             | 1,00 | SCM394-1200Z04R-R0100HB-HP826 | 31304558  |
| 16,00             | 16                | 92             | 36             | 15,8           | 42             | 1,00 | SCM394-1600Z04R-R0100HB-HP826 | 31304573  |
| 16,00             | 16                | 92             | 36             | 15,8           | 42             | 2,00 | SCM394-1600Z04R-R0200HB-HP826 | 31304575  |
| 20,00             | 20                | 104            | 41             | 19,7           | 55             | 1,00 | SCM394-2000Z04R-R0100HB-HP826 | 31304580  |
| 20,00             | 20                | 104            | 41             | 19,7           | 55             | 2,00 | SCM394-2000Z04R-R0200HB-HP826 | 31304582  |
| 25,00             | 25                | 136            | 50             | 24,7           | 65             | 2,00 | SCM394-2500Z04R-R0200HB-HP826 | 31304586  |

## Available on request

|       |    |     |    |      |    |      |                               |          |
|-------|----|-----|----|------|----|------|-------------------------------|----------|
| 8,00  | 8  | 63  | 21 | 7,8  | 25 | 2,00 | SCM394-0800Z04R-R0200HB-HP826 | 31304551 |
| 10,00 | 10 | 72  | 22 | 9,8  | 30 | 2,00 | SCM394-1000Z04R-R0200HB-HP826 | 31304555 |
| 12,00 | 12 | 83  | 26 | 11,8 | 36 | 2,00 | SCM394-1200Z04R-R0200HB-HP826 | 31304570 |
| 12,00 | 12 | 83  | 26 | 11,8 | 36 | 3,00 | SCM394-1200Z04R-R0300HB-HP826 | 31304571 |
| 16,00 | 16 | 92  | 36 | 15,8 | 42 | 3,00 | SCM394-1600Z04R-R0300HB-HP826 | 31304576 |
| 16,00 | 16 | 92  | 36 | 15,8 | 42 | 4,00 | SCM394-1600Z04R-R0400HB-HP826 | 31304578 |
| 20,00 | 20 | 104 | 41 | 19,7 | 55 | 3,00 | SCM394-2000Z04R-R0300HB-HP826 | 31304583 |
| 20,00 | 20 | 104 | 41 | 19,7 | 55 | 4,00 | SCM394-2000Z04R-R0400HB-HP826 | 31304585 |
| 25,00 | 25 | 136 | 50 | 24,7 | 65 | 3,00 | SCM394-2500Z04R-R0300HB-HP826 | 31304588 |
| 25,00 | 25 | 136 | 50 | 24,7 | 65 | 4,00 | SCM394-2500Z04R-R0400HB-HP826 | 31304589 |

Continued on next page.

OptiMill-Titan-HPC | Solid-carbide shoulder milling cutter SCM394, external coolant supply

Configurable features



**Shank form:**  
Shank form: HA



**Specification:**  
SCM394-1200Z04R-R0300[shank form]-HP826

**Example:**  
SCM394-1200Z04R-R0300**HA**-HP826

Shank form HA

Accessories

|                                                                                   |         |                     |         |
|-----------------------------------------------------------------------------------|---------|---------------------|---------|
|  | MHC-... | UNIQ Mill Chuck, HA | Page 83 |
|-----------------------------------------------------------------------------------|---------|---------------------|---------|





# OptiMill®-Tro-Titan

## Five-edge trochoidal milling cutter for milling titanium workpiece material

The five-edge shoulder milling cutter OptiMill-Tro-Titan offers maximum material removal while providing an excellent surface finish at the same time. The unequal spacing and gradient prevents vibration, which results in quiet cutting behaviour. It is designed for trochoidal milling in part-contact cutting, trimming and for cutting depth up to 3xD.

### 1 Face geometry

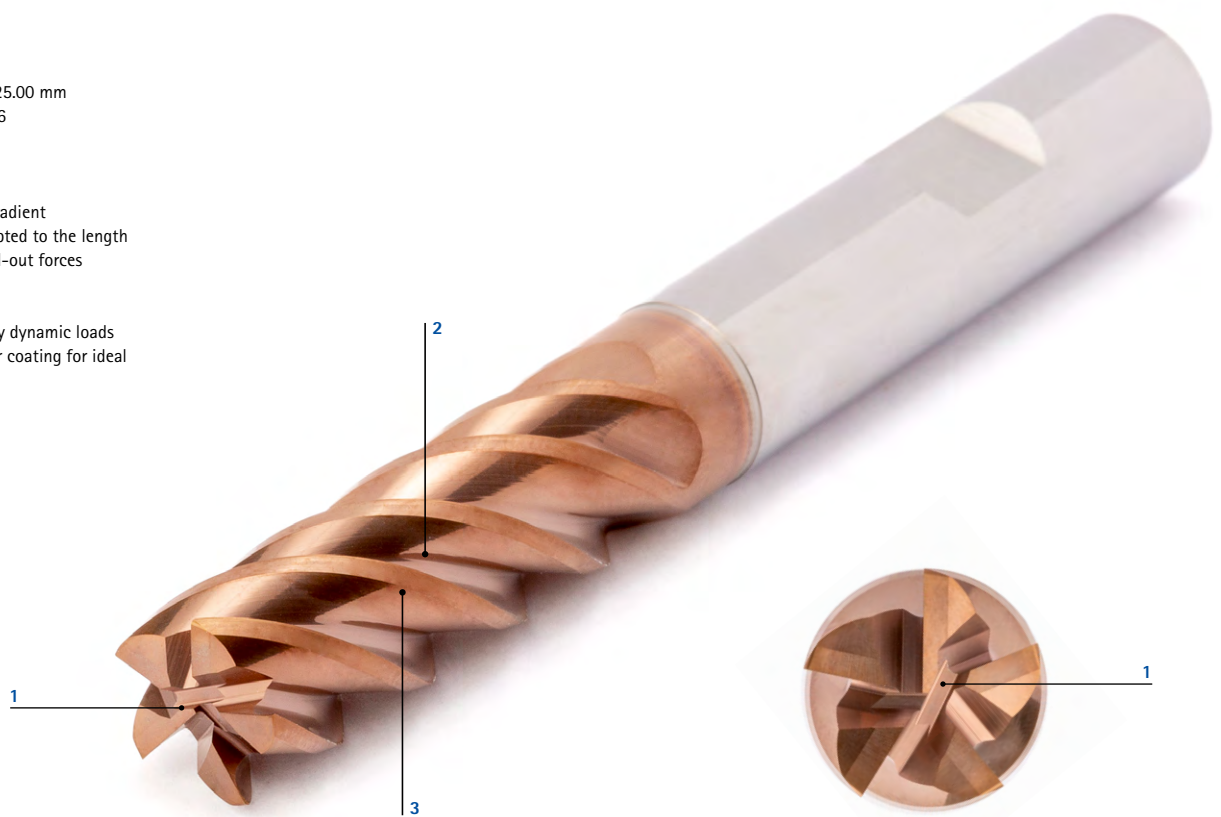
- 5 blades
- Diameter: 6.00 mm to 25.00 mm
- Cutting material: HP826

### 2 Helix angle

- Helix angle: 41° – 42°
- Unequal spacing and gradient
- Special helix angle adapted to the length ratio 3xD to reduce pull-out forces

### 3 Carbide & coating

- Tough carbide for highly dynamic loads
- AlTiN-based multi-layer coating for ideal thermal stability

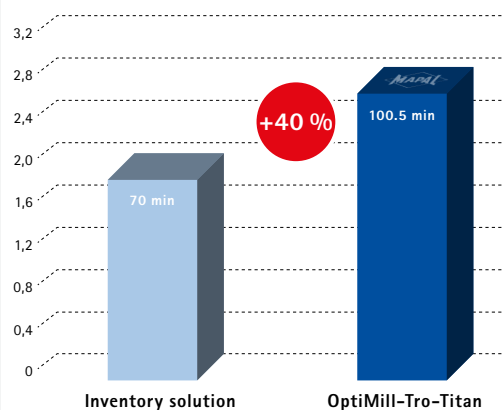


## Features

### Dimensions:

- Preferred series in stock:  
Ø area: 6 mm up to 20 mm
- Available on request:  
Diameter: 14 mm, 18 mm and 25 mm
- Number of cutting edges: 5
- Unequal spacing
- Especially for trochoidal milling
- For cutting depths up to 3xD
- Usage of the complete cutting length

## Cutting volumes [dm<sup>3</sup>]\*



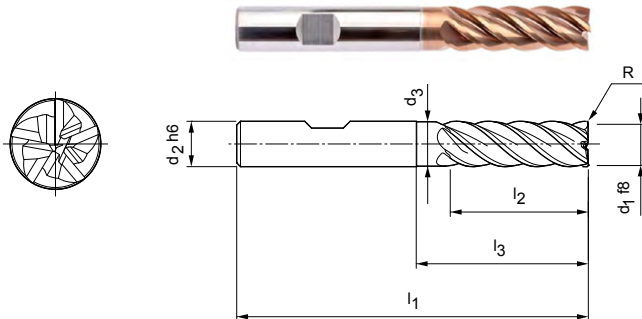
### Ti6Al4V

Nominal ø: 12 mm  
fz: 0.09 mm  
ap: 25 mm  
ae: 1.2 mm  
hmax: 0.08 mm

\* Until end of tool life

# OptiMill®-Tro-Titan

Shoulder milling cutter, design 3xD with neck  
SCM630

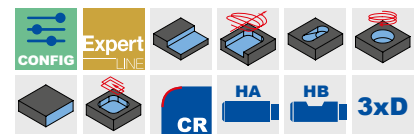


## Design:

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 ISO1940-G2.5  
Special features: Unequal spacing

## Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 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

## Accessories

|  |         |               |         |
|--|---------|---------------|---------|
|  | MWC-... | MillChuck, HB | Page 94 |
|--|---------|---------------|---------|

Dimensions in mm.

For cutting data recommendations, see end of chapter.

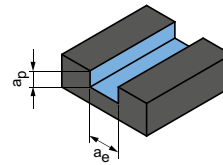
Special designs and other coatings available upon request.



# Cutting data recommendations for OptiMill®-Titan-HPC and OptiMill®-Tro-Titan

Feed and cutting speed

## Groove milling



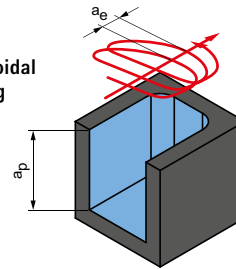
$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

### OptiMill-Titan-HPC | SCM394

| MMG* |    |      | Workpiece material        | Strength/<br>hardness<br>[N/mm <sup>2</sup> ]<br>[HRC] | Cooling |     |     | v <sub>c</sub><br>[m/min] | f <sub>z</sub> [mm/tooth]       |       |       |       |       |       |       |  |
|------|----|------|---------------------------|--------------------------------------------------------|---------|-----|-----|---------------------------|---------------------------------|-------|-------|-------|-------|-------|-------|--|
|      |    |      |                           |                                                        | MQL/Air | Dry | KSS |                           | Diameter of milling cutter [mm] |       |       |       |       |       |       |  |
|      |    |      |                           |                                                        |         |     |     |                           | 6.00                            | 8.00  | 10.00 | 12.00 | 16.00 | 20.00 | 25.00 |  |
| S    | S1 | S1.1 | Titanium, titanium alloys | < 400                                                  |         |     | ✓   | 85                        | 0.035                           | 0.045 | 0.054 | 0.062 | 0.075 | 0.086 | 0.096 |  |
|      | S2 | S2.1 | Titanium, titanium alloys | < 1,200                                                |         |     | ✓   | 80                        | 0.029                           | 0.037 | 0.044 | 0.050 | 0.061 | 0.070 | 0.078 |  |
|      |    | S2.2 | Titanium, titanium alloys | > 1,200                                                |         |     | ✓   | 50                        | 0.025                           | 0.033 | 0.039 | 0.045 | 0.055 | 0.062 | 0.070 |  |

## Trochoidal milling



$$a_p = \max. 3 \times D$$

$$a_e = \text{depending on the workpiece material}$$

### OptiMill-Tro-Titan | SCM630

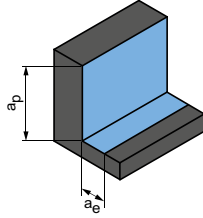
| MMG* |    |      | Workpiece material        | Strength/<br>hardness<br>[N/mm <sup>2</sup> ]<br>[HRC] | Cooling |     |     | v <sub>c</sub><br>[m/min] | f <sub>z</sub> [mm]<br>in % of D | a <sub>e</sub> [mm]<br>in % of D | h <sub>m</sub> max. [mm]<br>in % of D |  |
|------|----|------|---------------------------|--------------------------------------------------------|---------|-----|-----|---------------------------|----------------------------------|----------------------------------|---------------------------------------|--|
|      |    |      |                           |                                                        | MQL/Air | Dry | KSS |                           |                                  |                                  |                                       |  |
| S    | S1 | S1.1 | Titanium, titanium alloys | < 400                                                  |         |     | ✓   | 110 – 170                 | 0.65 - 1.3                       | 6 - 12                           | 0.52 - 0.6                            |  |
|      | S2 | S2.1 | Titanium, titanium alloys | < 1,200                                                |         |     | ✓   | 90 – 150                  | 0.6 - 1.2                        | 5 - 10                           | 0.46 - 0.56                           |  |
|      |    | S2.2 | Titanium, titanium alloys | > 1,200                                                |         |     | ✓   | 70 – 130                  | 0.4 - 1.0                        | 5 - 10                           | 0.42 - 0.54                           |  |

#### 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.



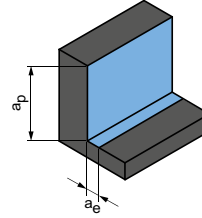
## Roughing



$$a_p = 1,5 \times D$$

$$a_e = 0,25 \times D$$

## Finishing



$$a_p = 1,5 \times D$$

$$a_e = 0,1 \times D$$

|  | $v_c$<br>[m/min] | $f_z$ [mm/tooth]                |       |       |       |       |       |       | $v_c$<br>[m/min] | $f_z$ [mm/tooth]                |       |       |       |       |       |       |
|--|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|------------------|---------------------------------|-------|-------|-------|-------|-------|-------|
|  |                  | 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 |
|  | <b>135</b>       | 0.059                           | 0.076 | 0.091 | 0.104 | 0.127 | 0.146 | 0.163 | <b>160</b>       | 0.094                           | 0.120 | 0.144 | 0.165 | 0.202 | 0.230 | 0.257 |
|  | <b>120</b>       | 0.049                           | 0.062 | 0.074 | 0.085 | 0.104 | 0.119 | 0.133 | <b>145</b>       | 0.077                           | 0.098 | 0.117 | 0.135 | 0.165 | 0.189 | 0.210 |
|  | <b>80</b>        | 0.043                           | 0.055 | 0.066 | 0.076 | 0.093 | 0.106 | 0.118 | <b>95</b>        | 0.068                           | 0.087 | 0.104 | 0.120 | 0.147 | 0.168 | 0.187 |

## Machining example

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

The specified machining values are guide values.

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

# Accessories

## NeoMill®-Titan



### Milling cutter clamping screws and coolant sealing screw

| Series                                                                                                               |        | Diameter of milling cutter | Diameter of milling cutter arbor                                                  | Milling cutter clamping screw                                                      |                                                                                     | Coolant sealing screw                                                               |
|----------------------------------------------------------------------------------------------------------------------|--------|----------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                                                      |        |                            |                                                                                   | Without internal cooling*                                                          | With internal cooling                                                               |                                                                                     |
|                                                                                                                      |        |                            |  |  |  |  |
| <b>NeoMill-Titan-2-Corner</b><br> | XPKT11 | 40                         | 16                                                                                | 10003638                                                                           | 31006779                                                                            | –                                                                                   |
|                                                                                                                      |        | 50                         | 22                                                                                | 10003660                                                                           | 31006800                                                                            | –                                                                                   |
|                                                                                                                      |        | 63                         | 27                                                                                | 10003677                                                                           | 31008546                                                                            | –                                                                                   |
|                                                                                                                      |        | 80                         | 32                                                                                | 10003691                                                                           | 31008547                                                                            | –                                                                                   |
|                                                                                                                      |        | 100                        | 32                                                                                | 10003691                                                                           | 31008547                                                                            | –                                                                                   |
| <b>NeoMill-Titan-2-Shell</b><br>  | XPKT11 | 40                         | 16                                                                                | 10003638                                                                           | 31006779                                                                            | 31143577                                                                            |
|                                                                                                                      |        | 50                         | 22                                                                                | 10003660                                                                           | 31006800                                                                            | 10033245                                                                            |
|                                                                                                                      |        | 63                         | 27                                                                                | 10003677                                                                           | 31008546                                                                            | 31248082                                                                            |
|                                                                                                                      |        | 80                         | 32                                                                                | 10003691                                                                           | 31008547                                                                            | 31248083                                                                            |
| <b>NeoMill-4-Hi-Feed90</b><br>    | SD__10 | 40                         | 16                                                                                | 31166231                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 50 – 66                    | 22                                                                                | 10003659                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 80                         | 27                                                                                | 10003677                                                                           | 31008546                                                                            | –                                                                                   |
|                                                                                                                      | SD__14 | 50 – 52                    | 22                                                                                | 31166232                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 63 – 66                    | 22                                                                                | 10003659                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 80                         | 27                                                                                | 10003677                                                                           | 31008546                                                                            | –                                                                                   |
|                                                                                                                      |        | 100                        | 32                                                                                | 10003690                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 125                        | 40                                                                                | 10081881                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      | SD__18 | 80                         | 27                                                                                | 10003677                                                                           | 31008546                                                                            | –                                                                                   |
|                                                                                                                      |        | 100                        | 32                                                                                | 10003690                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 125                        | 40                                                                                | 10081881                                                                           | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 160                        | 40                                                                                | 10006594 (x4)                                                                      | –                                                                                   | –                                                                                   |
|                                                                                                                      |        | 200                        | 60                                                                                | 10006594 (x4)                                                                      | –                                                                                   | –                                                                                   |

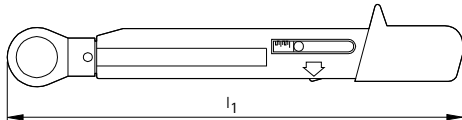
Dimensions in mm.

\* Included in scope of delivery for the tool body.

Note: Milling cutter clamping screw without internal cooling is the first choice when using milling cutter arbors with decentralised coolant delivery (see Page 96) as a higher coolant flow can be achieved. Milling cutter clamping screws with internal cooling may only be used if the coolant flow between the milling cutter arbor and milling cutter can only take place over a screw.

# Accessories

## Torque wrench and hexagonal inserts

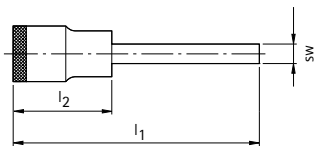


### Torque wrench

| HSK-C   | $l_1$ | Torque range [Nm] | Order no.    | Design reversible ratchet |
|---------|-------|-------------------|--------------|---------------------------|
| 32 - 40 | 210   | 4 - 20            | 30149002*    | 1/4"                      |
| 32 - 40 | 210   | 4 - 20            | 10040125**   | 1/4"                      |
| 50 - 80 | 240   | 8 - 40            | 30148986***  | 3/8"                      |
| 50 - 80 | 240   | 8 - 40            | 10040126**   | 3/8"                      |
| 100     | 333   | 10 - 60           | 30149001**** | 3/8"                      |
| -       | 333   | 10 - 60           | 10074788**   | 3/8"                      |
| -       | 435   | 25 - 130          | 30353267**   | 1/2"                      |

#### Scope of delivery:

- \* As set with replaceable hexagonal insert (wrench size SW3).
- \*\* Torque wrench without hexagonal insert.
- \*\*\* As set with replaceable hexagonal inserts (wrench size SW4, 5, 6).
- \*\*\*\* As set with replaceable hexagonal insert (wrench size SW8).

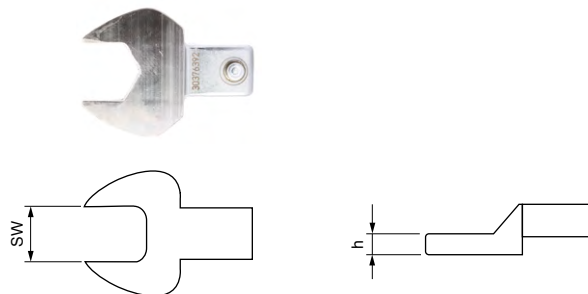


### Hexagonal inserts

| Nominal size | Dimensions |       |    | Order no. | Input variant |
|--------------|------------|-------|----|-----------|---------------|
|              | $l_1$      | $l_2$ | SW |           |               |
| HSK-C        | $l_1$      | $l_2$ | SW |           |               |
| 32 - 40      | 55         | 25    | 3  | 10040122  | 1/4"          |
| 50           | 63         | 28    | 4  | 10040123  | 3/8"          |
| 63           | 73         | 28    | 5  | 10040124  | 3/8"          |
| 80           | 78         | 28    | 6  | 10074792  | 3/8"          |
| 100          | 95         | 32    | 8  | 10074793  | 3/8"          |
| -            | 140        | 38    | 10 | 30353265  | 1/2"          |
| -            | 140        | 38    | 12 | 30353266  | 1/2"          |
| -            | 140        | 38    | 14 | 30707823  | 1/2"          |



## Accessories – mounting aids torque wrench, spanners and assembly tools

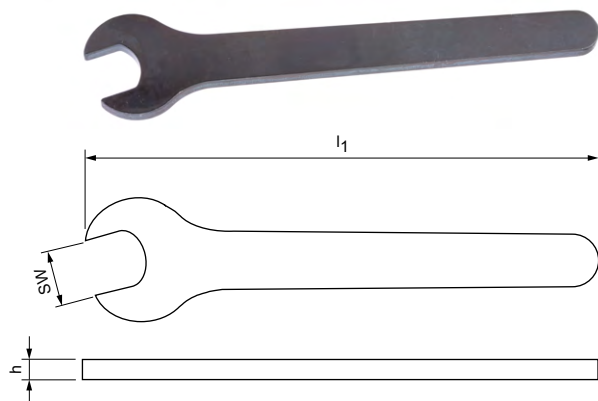


### Torque wrench

| Attachment shank | Torque range [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

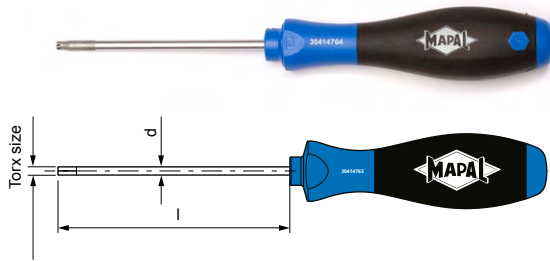
| Dimensions |     |                  | Order no. |
|------------|-----|------------------|-----------|
| SW         | h   | Attachment shank |           |
| 6          | 2,3 | 9 x 12           | 30376387  |
| 8          | 2,8 | 9 x 12           | 30376388  |
| 10         | 3,8 | 9 x 12           | 30376390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



### Assembly tool

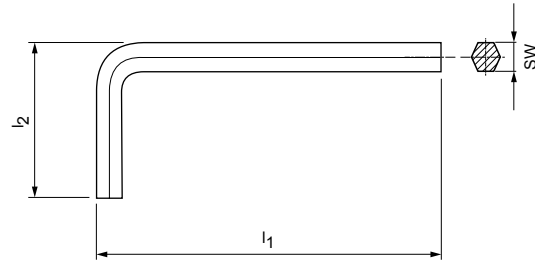
| Connection size CFS | Dimensions |       |     | Order no. |
|---------------------|------------|-------|-----|-----------|
|                     | SW         | $l_1$ | h   |           |
| 6                   | 6          | 75    | 2,3 | 30352660  |
| 8                   | 8          | 92    | 2,8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

## General accessories: Screwdriver



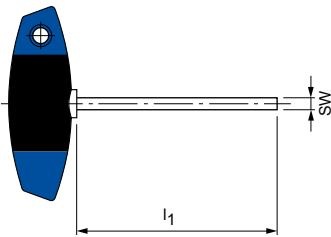
### Screwdriver

| Dimensions |     |     | Name       | Order no. |
|------------|-----|-----|------------|-----------|
| Torx size  | l   | d   |            |           |
| 6IP        | 60  | 3,5 | TORX PLUS® | 30414758  |
| 7IP        | 60  | 3,5 |            | 30414759  |
| 8IP        | 60  | 3,5 |            | 30414760  |
| 9IP        | 60  | 4   |            | 30414761  |
| 10IP       | 80  | 4   |            | 30414763  |
| 15IP       | 80  | 4   |            | 30414764  |
| 20IP       | 100 | 4   |            | 30414766  |
| 25IP       | 100 | 4,5 |            | 30414767  |
| TX8        | 60  | 3,5 | TORX®      | 10019467  |
| TX15       | 80  | 4   |            | 10019469  |



### Allen wrench

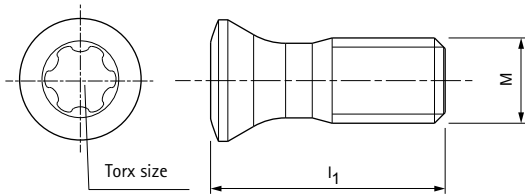
| Dimensions |                |                | Name      | Order no. |
|------------|----------------|----------------|-----------|-----------|
| SW         | l <sub>1</sub> | l <sub>2</sub> |           |           |
| 1,5        | 46,5           | 15,5           | ISO2936-X | 10004870  |
| 2          | 52             | 18             |           | 10004356  |



### Hexagonal T-key

| HFS Size | Wrench size SW | Short design   |               |           | Long design    |           |
|----------|----------------|----------------|---------------|-----------|----------------|-----------|
|          |                | l <sub>1</sub> | Specification | Order no. | l <sub>1</sub> | Order no. |
| 10       | 2,5            | 100            | –             | 10006233  | 200            | 10032722  |
| 12, 14   | 3              | 100            | MN5221-31     | 10006234  | 200            | 10025313  |
| 16, 20   | 4              | 100            | MN5221-32     | 10006235  | 200            | 10018010  |
| 24       | 5              | 100            | MN5221-33     | 10006236  | 200            | 10013349  |
| –        | 6              | 100            | MN5221-34     | 10006237  | –              | –         |
| –        | 8              | 100            | MN5221-35     | 10006238  | –              | –         |
| –        | 10             | 100            | –             | 30353270  | –              | –         |
| –        | 12             | –              | –             | –         | 200            | 30353272  |

## List of spare parts for NeoMill milling tools, tightening torque and Torx extension



### Clamping screw for milling cutter NeoMill-Titan

| Indexable insert | Size of indexable insert | Clamping screw |                               |                        |           |           |
|------------------|--------------------------|----------------|-------------------------------|------------------------|-----------|-----------|
|                  |                          | Dimension      | Name                          | Tightening torque [Nm] | Torx size | Order no. |
| XPKT             | 1104                     | M3,5X8,1       | TORX PLUS® - M3,5X8,1-TX10-IP | 2,8                    | 10IP      | 30979520  |

### Clamping screw for milling cutter NeoMill-4-HiFeed

| Indexable insert | Size of indexable insert | Clamping screw |                              |                        |           |          |
|------------------|--------------------------|----------------|------------------------------|------------------------|-----------|----------|
|                  |                          | Dimension      | Name                         | Tightening torque [Nm] | Torx size |          |
| SD               | 06                       | M2,2X5,2       | TORX PLUS® - M2,2X5,2-TX7-IP | 1,2                    | 7IP       | 31161853 |
|                  | 10                       | M3X8,3         | TORX PLUS® - M3X8,3-TX9-IP   | 2                      | 9IP       | 31161852 |
|                  | 14                       | M5X10,8        | TORX PLUS® - M5X10,8-TX20-IP | 5                      | 20IP      | 31161851 |
|                  | 18                       | M6X15          | TORX PLUS® - M6X15-T25       | 6                      | T25       | 31161862 |

### Tightening torque at threaded pins for coolant outlet

| Threaded pin for coolant outlet | Order no. | Screw dimensions | Size               | Tightening torque [Nm] |
|---------------------------------|-----------|------------------|--------------------|------------------------|
| Closed variant                  | 10003420  | M3 x 4           | ISO 4026-M3X4-45H  | 1.0                    |
| With inner diameter             | 31291811  | M3 x 4           | MN620-AD M3X4-Ø1.5 | 1.0                    |
| With inner diameter             | 31291814  | M3 x 4           | MN620-AD M3X4-Ø1.0 | 1.0                    |
| With inner diameter             | 31291816  | M3 x 4           | MN620-AD M3X4-Ø0.5 | 1.0                    |

### Torx extension to mount the clamping screw with the torque wrench

|  | Indexable insert | Torx size | Order no. |
|-------------------------------------------------------------------------------------|------------------|-----------|-----------|
|                                                                                     | XPKT11           | 10IP      | 10102291  |
|                                                                                     | SD__T06          | 7IP       | 30237488  |
|                                                                                     | SD__T10          | 9IP       | 10102290  |
|                                                                                     | SD__T14          | 20IP      | 30237490  |
|                                                                                     | SD__T18          | T25       | 30237491  |

# General accessories: Torque tool set



TorqueVario®-S torque screwdriver set

| Area         | Scope of delivery                                                                                              | Features                                                                                                                                                                                                                                                                                                | Order no. |
|--------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1.0 – 5.0 Nm | <ul style="list-style-type: none"><li>• 1 TorqueVario-S torque screwdriver</li><li>• 1 torque setter</li></ul> | <ul style="list-style-type: none"><li>• Accuracy ± 6%, can be traced to national standards</li><li>• Numeric torque value indication on window scale</li><li>• Torque continuously adjustable</li><li>• Ergonomic multiple component handle</li><li>• Click signal on reaching the set torque</li></ul> | 10103019  |
| 2.0 – 8.0 Nm |                                                                                                                |                                                                                                                                                                                                                                                                                                         | 31363399  |



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"><li>• 1 T-handle torque wrench</li><li>• 1 Torque-Tplus Setter</li><li>• 1 Universal bit holder 1/4"</li><li>• 3 TORX® standard bits T25x25 / T30x25 / T40x25</li><li>• 3 hex standard bits 4.0x25 / 5.0x25 / 6.0x25</li><li>• 2 adapter bits for the sockets</li><li>    1 Torque-Tplus adapter bit 1/4"</li><li>    1 Torque-Tplus adapter bit 3/8"</li><li>• Stable metal box</li></ul> | <ul style="list-style-type: none"><li>• Accuracy ± 6%, can be traced to national standards</li><li>• Numeric torque value indication on window scale</li><li>• Torque continuously adjustable</li><li>• Comfortable T-handle with soft zones</li><li>• Click signal on reaching the set torque</li></ul> | 30415173  |





# DRILLING FROM SOLID

## Drilling from solid

---

MEGA-Speed-Drill-Titan \_\_\_\_\_ 56

Cutting data recommendations \_\_\_\_\_ 59

## Technical appendix

---

Product ID codes \_\_\_\_\_ 122



# MEGA-Speed-Drill-Titan

## Cost-efficient and productive

This double-edge high-speed drill is equipped with four margin lands for optimum bore roundness. The coolant is guided along the outside surface to the rear. In this way, optimal cooling is achieved for the margin lands, dissipating the heat generated.

### 1 Face geometry

- Convex cutting edge with corner chamfer for high stability

### 2 Innovative cooling ribs

- Protects the margin land
- Maximum coolant supply at the bore wall
- Maximum heat and wear resistance

### 3 Four margin lands

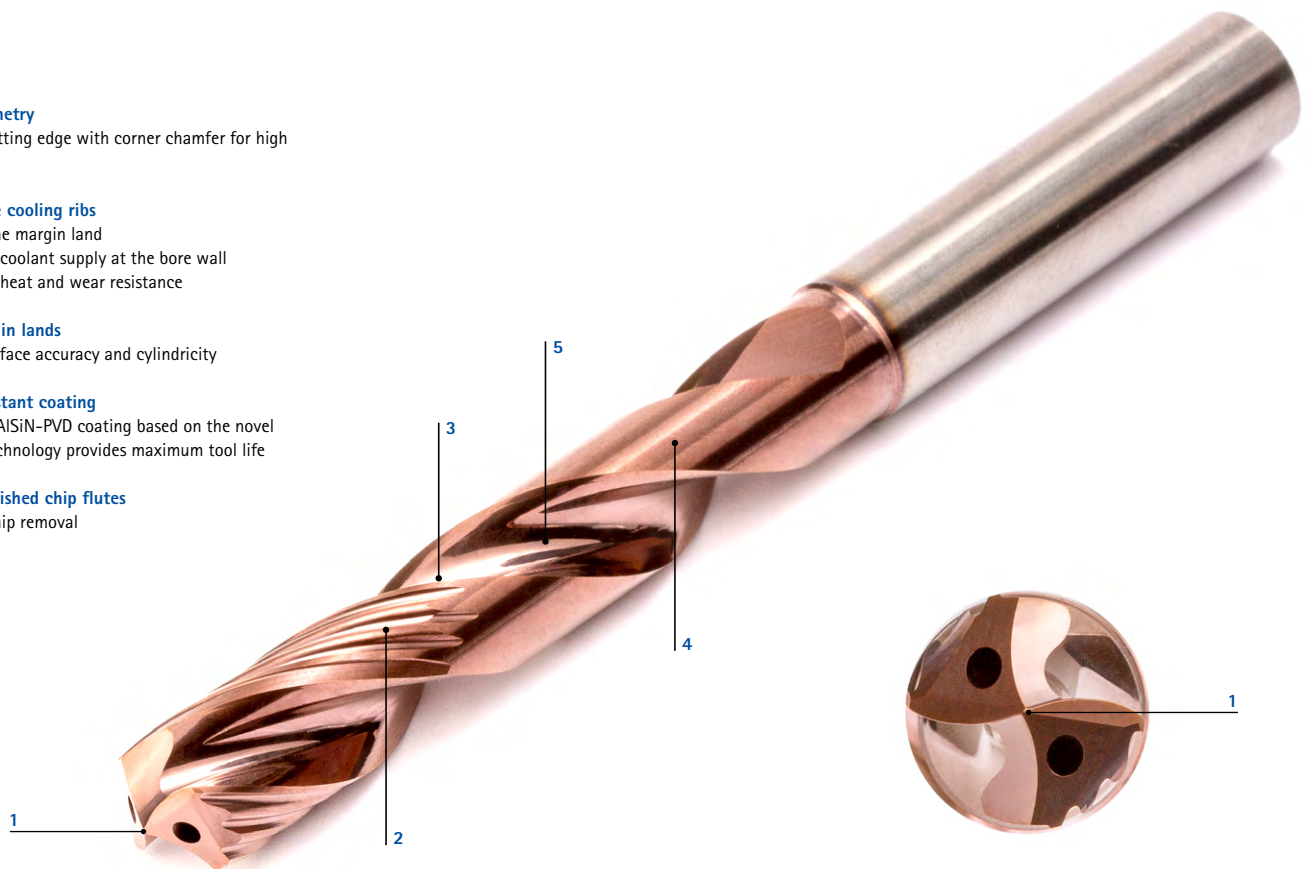
- Precise surface accuracy and cylindricity

### 4 Heat-resistant coating

- Smooth TiAlSiN-PVD coating based on the novel HiPIMS technology provides maximum tool life

### 5 Highly polished chip flutes

- Reliable chip removal

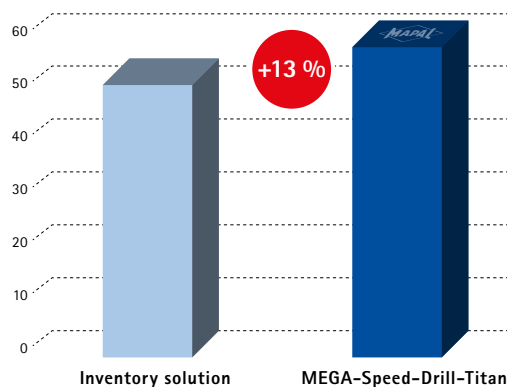


## Features

### Dimensions:

- Preferred series in stock:  
ø area: 3.00 to 16.00 mm  
Shank form HA
- Configurable diameter  
ø area: 3.00 to 20.00 mm  
Shank form HB, HE
- 5xD with internal coolant supply
- Short cycle times

## Tool life [m]



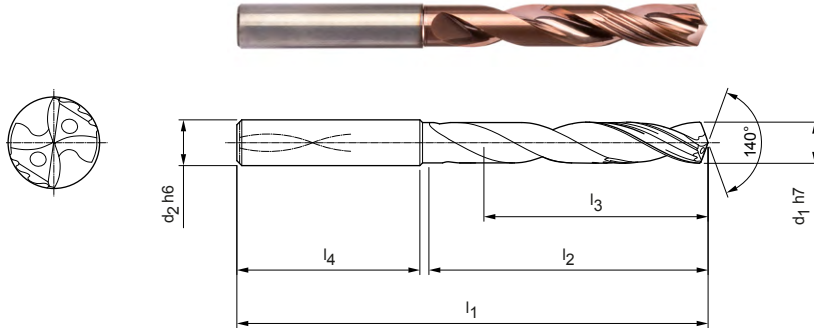
TiAl6V4-1.1800  
Nominal ø: 8.50 mm  
v<sub>c</sub>: 40 m/min  
f<sub>u</sub>: 0.2 mm/rev

# MEGA-Speed-Drill-Titan

Solid carbide twist drill  
SCD961 (5xD), internal coolant supply

## Design:

Drill diameter: 3.00 – 20.00 mm  
Bore tolerance: IT 9  
Cutting material: HP184  
Number of cutting edges: 2  
Number of guiding chamfers: 4  
Tip angle: 140°  
Helix angle: 30°



## Preferred series in stock

| Dimensions        |                   |                |                |                |                | Shank form HA                 |           |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------------------------------|-----------|
| d <sub>1</sub> h7 | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | Specification                 | Order no. |
| 3,00              | 6                 | 66             | 28             | 23             | 36             | SCD961-0300-2-4-140HA05-HP184 | 31315779  |
| 3,10              | 6                 | 66             | 28             | 23             | 36             | SCD961-0310-2-4-140HA05-HP184 | 31315820  |
| 3,20              | 6                 | 66             | 28             | 23             | 36             | SCD961-0320-2-4-140HA05-HP184 | 31315821  |
| 3,30              | 6                 | 66             | 28             | 23             | 36             | SCD961-0330-2-4-140HA05-HP184 | 31315822  |
| 3,40              | 6                 | 66             | 28             | 23             | 36             | SCD961-0340-2-4-140HA05-HP184 | 31315823  |
| 3,50              | 6                 | 66             | 28             | 23             | 36             | SCD961-0350-2-4-140HA05-HP184 | 31315824  |
| 3,60              | 6                 | 66             | 28             | 23             | 36             | SCD961-0360-2-4-140HA05-HP184 | 31315825  |
| 3,70              | 6                 | 66             | 28             | 23             | 36             | SCD961-0370-2-4-140HA05-HP184 | 31315826  |
| 3,80              | 6                 | 74             | 36             | 29             | 36             | SCD961-0380-2-4-140HA05-HP184 | 31315827  |
| 4,00              | 6                 | 74             | 36             | 29             | 36             | SCD961-0400-2-4-140HA05-HP184 | 31315828  |
| 4,10              | 6                 | 74             | 36             | 29             | 36             | SCD961-0410-2-4-140HA05-HP184 | 31315829  |
| 4,20              | 6                 | 74             | 36             | 29             | 36             | SCD961-0420-2-4-140HA05-HP184 | 31315830  |
| 4,30              | 6                 | 74             | 36             | 29             | 36             | SCD961-0430-2-4-140HA05-HP184 | 31315831  |
| 4,40              | 6                 | 74             | 36             | 29             | 36             | SCD961-0440-2-4-140HA05-HP184 | 31315832  |
| 4,50              | 6                 | 74             | 36             | 29             | 36             | SCD961-0450-2-4-140HA05-HP184 | 31315833  |
| 4,60              | 6                 | 74             | 36             | 29             | 36             | SCD961-0460-2-4-140HA05-HP184 | 31315834  |
| 4,70              | 6                 | 74             | 36             | 29             | 36             | SCD961-0470-2-4-140HA05-HP184 | 31315835  |
| 4,80              | 6                 | 82             | 44             | 35             | 36             | SCD961-0480-2-4-140HA05-HP184 | 31315836  |
| 5,00              | 6                 | 82             | 44             | 35             | 36             | SCD961-0500-2-4-140HA05-HP184 | 31315837  |
| 5,10              | 6                 | 82             | 44             | 35             | 36             | SCD961-0510-2-4-140HA05-HP184 | 31315838  |
| 5,20              | 6                 | 82             | 44             | 35             | 36             | SCD961-0520-2-4-140HA05-HP184 | 31315839  |
| 5,30              | 6                 | 82             | 44             | 35             | 36             | SCD961-0530-2-4-140HA05-HP184 | 31315840  |
| 5,40              | 6                 | 82             | 44             | 35             | 36             | SCD961-0540-2-4-140HA05-HP184 | 31315841  |
| 5,50              | 6                 | 82             | 44             | 35             | 36             | SCD961-0550-2-4-140HA05-HP184 | 31315842  |
| 5,80              | 6                 | 82             | 44             | 35             | 36             | SCD961-0580-2-4-140HA05-HP184 | 31315843  |
| 5,90              | 6                 | 82             | 44             | 35             | 36             | SCD961-0590-2-4-140HA05-HP184 | 31315844  |
| 6,00              | 6                 | 82             | 44             | 35             | 36             | SCD961-0600-2-4-140HA05-HP184 | 31315845  |
| 6,20              | 8                 | 91             | 53             | 43             | 36             | SCD961-0620-2-4-140HA05-HP184 | 31315846  |
| 6,50              | 8                 | 91             | 53             | 43             | 36             | SCD961-0650-2-4-140HA05-HP184 | 31315847  |
| 6,60              | 8                 | 91             | 53             | 43             | 36             | SCD961-0660-2-4-140HA05-HP184 | 31315848  |
| 6,80              | 8                 | 91             | 53             | 43             | 36             | SCD961-0680-2-4-140HA05-HP184 | 31315849  |
| 7,00              | 8                 | 91             | 53             | 43             | 36             | SCD961-0700-2-4-140HA05-HP184 | 31315850  |
| 7,10              | 8                 | 91             | 53             | 43             | 36             | SCD961-0710-2-4-140HA05-HP184 | 31315851  |
| 7,30              | 8                 | 91             | 53             | 43             | 36             | SCD961-0730-2-4-140HA05-HP184 | 31315852  |
| 7,40              | 8                 | 91             | 53             | 43             | 36             | SCD961-0740-2-4-140HA05-HP184 | 31315853  |

Continued on next page.



## MEGA-Speed-Drill-Titan | Solid carbide twist drill SCD961 (5xD), internal coolant supply

| Dimensions        |                   |                |                |                |                | Shank form HA                 |           |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------------------------------|-----------|
| d <sub>1</sub> h7 | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | Specification                 | Order no. |
| 7,50              | 8                 | 91             | 53             | 43             | 36             | SCD961-0750-2-4-140HA05-HP184 | 31315854  |
| 7,80              | 8                 | 91             | 53             | 43             | 36             | SCD961-0780-2-4-140HA05-HP184 | 31315855  |
| 8,00              | 8                 | 91             | 53             | 43             | 36             | SCD961-0800-2-4-140HA05-HP184 | 31315856  |
| 8,10              | 10                | 103            | 61             | 49             | 40             | SCD961-0810-2-4-140HA05-HP184 | 31315857  |
| 8,20              | 10                | 103            | 61             | 49             | 40             | SCD961-0820-2-4-140HA05-HP184 | 31315858  |
| 8,30              | 10                | 103            | 61             | 49             | 40             | SCD961-0830-2-4-140HA05-HP184 | 31315859  |
| 8,40              | 10                | 103            | 61             | 49             | 40             | SCD961-0840-2-4-140HA05-HP184 | 31315860  |
| 8,50              | 10                | 103            | 61             | 49             | 40             | SCD961-0850-2-4-140HA05-HP184 | 31315861  |
| 8,80              | 10                | 103            | 61             | 49             | 40             | SCD961-0880-2-4-140HA05-HP184 | 31315862  |
| 9,00              | 10                | 103            | 61             | 49             | 40             | SCD961-0900-2-4-140HA05-HP184 | 31315863  |
| 9,80              | 10                | 103            | 61             | 49             | 40             | SCD961-0980-2-4-140HA05-HP184 | 31315864  |
| 10,00             | 10                | 103            | 61             | 49             | 40             | SCD961-1000-2-4-140HA05-HP184 | 31315865  |
| 10,20             | 12                | 118            | 71             | 56             | 45             | SCD961-1020-2-4-140HA05-HP184 | 31315866  |
| 10,50             | 12                | 118            | 71             | 56             | 45             | SCD961-1050-2-4-140HA05-HP184 | 31315867  |
| 11,00             | 12                | 118            | 71             | 56             | 45             | SCD961-1100-2-4-140HA05-HP184 | 31315868  |
| 11,80             | 12                | 118            | 71             | 56             | 45             | SCD961-1180-2-4-140HA05-HP184 | 31315869  |
| 12,00             | 12                | 118            | 71             | 56             | 45             | SCD961-1200-2-4-140HA05-HP184 | 31315870  |
| 12,50             | 14                | 124            | 77             | 60             | 45             | SCD961-1250-2-4-140HA05-HP184 | 31315871  |
| 13,00             | 14                | 124            | 77             | 60             | 45             | SCD961-1300-2-4-140HA05-HP184 | 31315872  |
| 13,50             | 14                | 124            | 77             | 60             | 45             | SCD961-1350-2-4-140HA05-HP184 | 31315873  |
| 14,00             | 14                | 124            | 77             | 60             | 45             | SCD961-1400-2-4-140HA05-HP184 | 31315874  |
| 15,80             | 16                | 133            | 83             | 63             | 48             | SCD961-1580-2-4-140HA05-HP184 | 31315875  |
| 16,00             | 16                | 133            | 83             | 63             | 48             | SCD961-1600-2-4-140HA05-HP184 | 31315876  |

## Configurable features



**Diameter:**  
Diameter in increments of  
0.01 mm freely selectable



**Shank form:**  
Shank form: HB | HE

## Specification:

SCD961-[diameter]-2-4-140[shank form]05-HP184

## Example:

SCD961-0470-2-4-140HE05-HP184

Shank form HE

Tool diameter d<sub>1</sub> = 4.70 mm

## Dimensions of configurable series

| d <sub>1</sub> min. | d <sub>1</sub> max. | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> |
|---------------------|---------------------|-------------------|----------------|----------------|----------------|----------------|
| 3,00                | 3,70                | 6                 | 66             | 28             | 23             | 36             |
| 3,71                | 4,70                | 6                 | 74             | 36             | 29             | 36             |
| 4,71                | 6,00                | 6                 | 82             | 44             | 35             | 36             |
| 6,01                | 6,80                | 8                 | 91             | 53             | 43             | 36             |
| 6,81                | 8,00                | 8                 | 91             | 53             | 43             | 36             |
| 8,01                | 9,00                | 10                | 103            | 61             | 49             | 40             |
| 9,01                | 10,00               | 10                | 103            | 61             | 49             | 40             |
| 10,01               | 11,00               | 12                | 118            | 71             | 56             | 45             |
| 11,01               | 12,00               | 12                | 118            | 71             | 56             | 45             |
| 12,01               | 14,00               | 14                | 124            | 77             | 60             | 45             |
| 14,01               | 16,00               | 16                | 133            | 83             | 63             | 48             |
| 16,01               | 18,00               | 18                | 143            | 93             | 71             | 48             |
| 18,01               | 20,00               | 20                | 153            | 101            | 77             | 50             |

## Accessories



MHC-...

UNIQ-Dream Chuck

Page 86

Dimensions in mm.

For cutting data recommendations, see end of chapter.

Special designs and other coatings available upon request.

# Cutting data recommendations for solid carbide drills

Feed and cutting speed

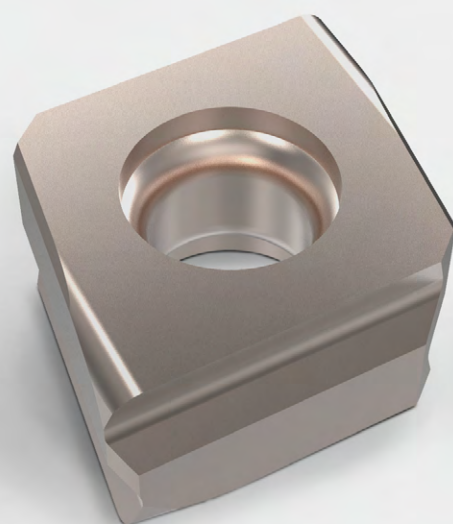
## MEGA-Speed-Drill-Titan | SCD961

| MMG* |    |      | Workpiece material        | Strength/hardness<br>[N/mm²] [HRC] | Cutting speed $v_c$ [m/min] |    |     |     | Feed $f$ [mm] for drill diameter |       |       |       |       |       |
|------|----|------|---------------------------|------------------------------------|-----------------------------|----|-----|-----|----------------------------------|-------|-------|-------|-------|-------|
|      |    |      |                           |                                    | IC                          | EC | MQL | Air | 3.00                             | 4.50  | 6.50  | 9.50  | 14.00 | 20.00 |
| S    | S1 | S1.1 | Titanium, titanium alloys | < 400                              | 40                          | 25 |     |     | 0.077                            | 0.103 | 0.134 | 0.173 | 0.219 | 0.259 |
|      | S2 | S2.1 | Titanium, titanium alloys | < 1,200                            | 30                          | 20 |     |     | 0.066                            | 0.088 | 0.115 | 0.149 | 0.188 | 0.222 |
|      |    | S2.2 | Titanium, titanium alloys | > 1,200                            | 25                          | 15 |     |     | 0.055                            | 0.073 | 0.095 | 0.124 | 0.157 | 0.185 |

\* MAPAL machining groups

The specified cutting values are guide values.

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

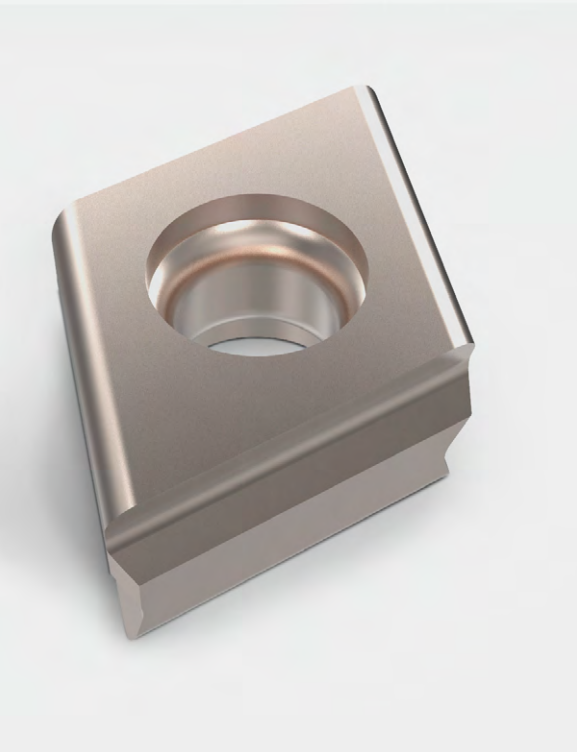


# BORING

## Boring

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Boring with tangential technology \_\_\_\_\_ 62





# Boring in titanium

## Tools with tangential technology

Part-specific custom tools are equipped with MAPAL's indexable inserts for machining titanium – for highest productivity, economic processes and stable machining concepts. Chips are ejected from the shear zone via the customised chip flutes, preventing wear and tear on the tool.

### 1 Part-specific custom tool body design

- Stable, vibration-free machining

### 2 Targeted coolant supply

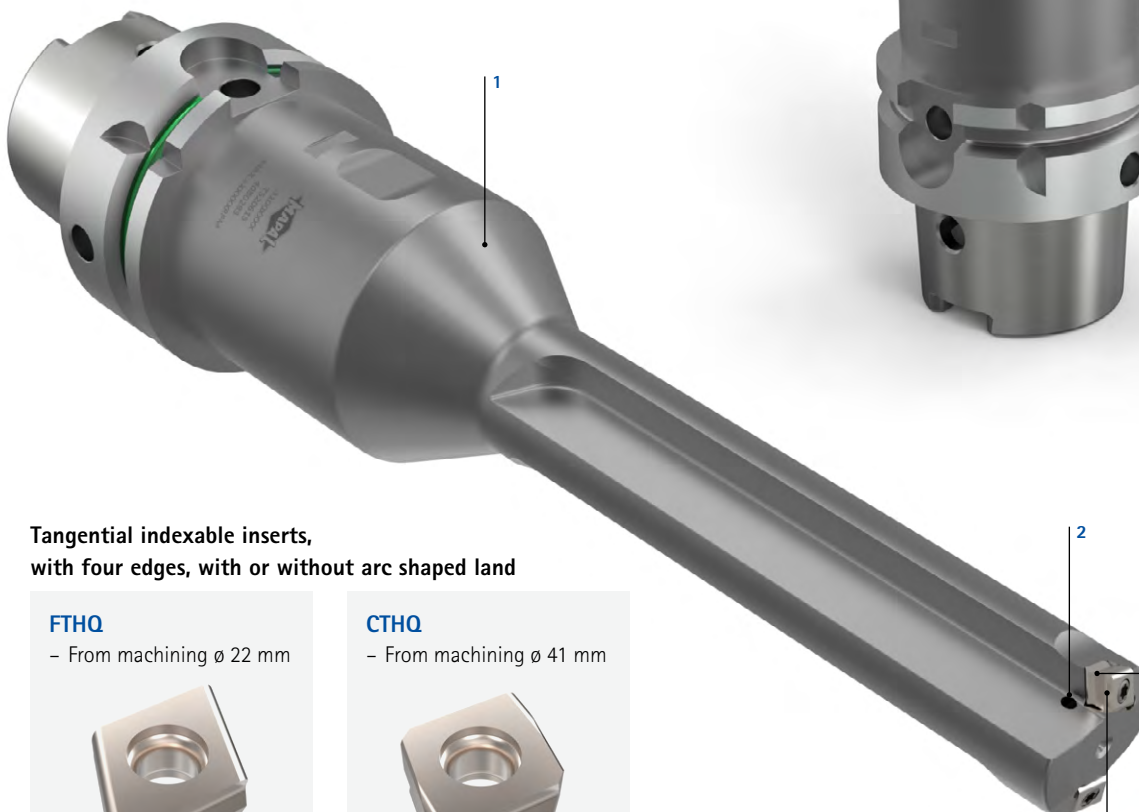
- Reduces high cutting temperatures

### 3 Defined chip formers

- For controlled chip formation

### 4 Tangential indexable inserts

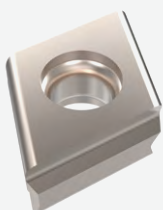
- Four-edge insert, with or without arc shaped land
- For through bores and blind bores
- FTHQ and CTHQ



**Tangential indexable inserts,  
with four edges, with or without arc shaped land**

#### FTHQ

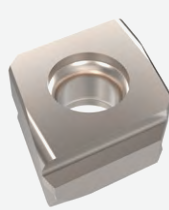
- From machining  $\varnothing$  22 mm



Through hole

#### CTHQ

- From machining  $\varnothing$  41 mm



Blind bore

## Boring – cost-efficient and productive

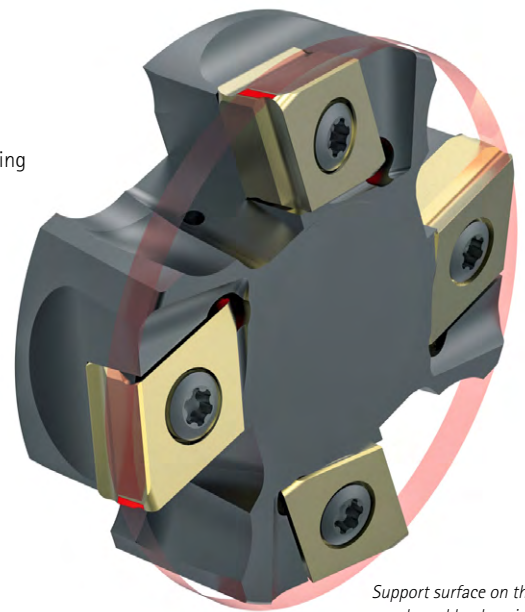
The indexable inserts for boring titanium impress due to their three usable cutting edges and a high-performance PVD coating. The cutting edges are available in three sizes. This allows their use in a very wide range of applications. The single- or multi-stepped custom tools are characterised by extremely high economic efficiency and simple handling.

## Tangential technology

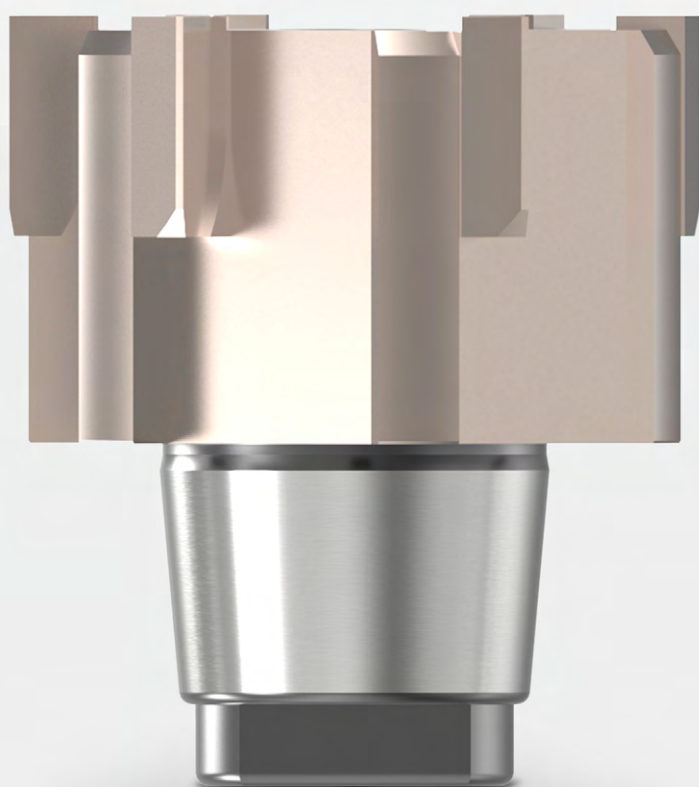
Tangential technology is the key to the excellent performance of MAPAL boring tools. Due to the stable indexable insert geometry, this technology makes higher machining values possible compared to radial indexable insert and, as a result, larger material removal rates. Tangential tools also run very quietly. As a result, excellent tool lives and very good part qualities are achieved.

## Optimal machining results at a length-to-diameter ratio $>3.5 \times D$ due to arc shaped lands

Due to the normal relief angle on ISO indexable inserts, there is only limited support for the tool during bore machining. Tools then tend to vibrate; this vibration degrades the surface finish and tool life achieved. To counteract this problem, MAPAL developed the arc shaped land. This special geometry is a support surface on the cutting edge that holds the tool in the bore and is comparable to an arc land chamfer on fixed reamers.



*Support surface on the arc shaped land against the bore wall.*





# REAMING | FINE BORING

## Reaming | Fine Boring

|                                |    |
|--------------------------------|----|
| Product overview               | 66 |
| FixReam FXR                    |    |
| Introduction to the technology | 68 |
| FXR510 for through bores       | 69 |
| FXR505 for blind bores         | 70 |
| HPR replaceable head reamer    |    |
| Introduction to the technology | 71 |
| HPR131 for through bores       | 72 |
| HPR110 for through bores       | 73 |
| HPR180 for blind bores         | 74 |
| HPR150 for blind bores         | 75 |
| Cutting data recommendations   | 76 |

## Technical appendix

|                  |     |
|------------------|-----|
| Product ID codes | 124 |
|------------------|-----|



# PRODUCT OVERVIEW

## Reaming and fine boring

Tools for the fine machining of bores represent the core competence of MAPAL. The "original reamer" produced in 1954 marked the beginning of the success story that MAPAL continues to write today in this area. Decades of experience and continuous further development and optimisation of the tool solutions ensure that MAPAL offers the right solution according to the complexity of the machining and the precision requirements.

In addition to customised special solutions, a diverse standard range of tools for reaming and fine boring is available. Reaming and fine boring are the most common methods for the fine machining of bores, yielding impressive, precise results. Whatever the complexity of the machining and the requirements placed on precision and surface finish, MAPAL has the appropriate solution: Single-bladed reamers, fine boring tools with guide pads and WP cutting inserts all deliver the highest levels of precision.

On top of that, the range also includes fixed multi-bladed reamers, HPR replaceable head reamers with high-precision clamping system, high-performance reamers made of carbide or cermet as well as systems for machining large diameters.

## Reaming

### First choice for ...

- ... machining at high feed rates
- ... high performance in series production
- ... machining without additional setting effort
- ... Machining operations with diameter >3 mm

### Bore tolerance

**IT6** up to **IT9**

| Fixed multi-bladed reamers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Replaceable head reamers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Solutions for large diameters                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p><b>High-performance reamers FixReam – FXR</b></p> <p>The high-performance reamers of the FXR series are available with different cutting materials and coatings. This means that almost all workpiece materials can be machined economically and reliably with them. They are the tool of choice when short cycle time are called for. Without any setting effort, the tools, which are available in the diameter range 3.701 to 20.200 mm, achieve IT6 tolerances.</p> <p>Ø area: 3.701 – 20.200 mm*</p> |  <p><b>HPR replaceable head reamers with HFS connection</b></p> <p>If maximum economic efficiency is required, the use of HPR replaceable head reamers is recommended in the small diameter range. The high-precision connection HFS guarantees (despite the replaceable head system) an exact radial run-out as well as a high changeover accuracy. Handling is very simple. The HPR reamers are available with fixed brazed cutting edges as well as with adjustable cutting edges.</p> <p>Ø area: 7.000 – 65.000 mm*</p> |  <p><b>Solutions for large diameters</b></p> <p>Multi-bladed high-performance reamers for large diameter ranges. HPR400: Quick change of cutting edges on site without long reconditioning. HPR400 plus: four instead of the previous single cutting edge. Indexable inserts are simple to rotate and change.</p> <p>Ø area: 63.000 – 319.999 mm*</p> |
| Page 68                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Page 71                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | See the "BORE MACHINING" catalogue                                                                                                                                                                                                                                                                                                                                                                                                         |

\* The diameter range can vary, depending on the series.



Scan the QR code to download the new "BORE MACHINING" catalogue.

Further information is available at [www.mapal.com](http://www.mapal.com)

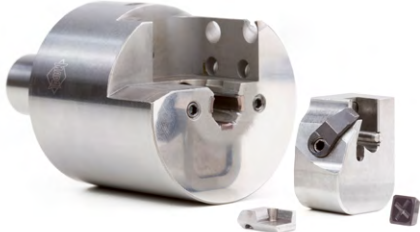
## Fine boring

### First choice for ...

- ... unstable machining conditions
- ... machining with a floating holder on a lathe
- ... interrupted machining and thin-walled parts
- ... unfavourable length-diameter ratios
- ... extremely high workpiece material requirements and position tolerances
- ... Machining operations with diameter >5 mm

### Bore tolerance

**IT4** up to **IT8**

| Single-bladed reamers                                                                                                                                                                                                                                                                                                                                                                                                                                                             | EasyAdjust system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | External machining tools                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Single bladed reamer</b></p> <p>When it comes to achieving the greatest possible precision, single bladed reamers with guide pads based on the MAPAL principle are virtually unrivalled. Their cutting inserts are available with two and six cutting edges. The indexable inserts with two cutting edges offer special leads. Maximum economic efficiency is guaranteed with the HX indexable inserts with six usable cutting edges.</p> <p>Ø area: 5.000 – 30.290 mm*</p> | <p><b>EasyAdjust system</b></p> <p>When developing the EasyAdjust system, the goal was to drastically reduce the setting effort for tools with guide pad technology. The heart of the system is an innovative cassette that holds the six- or four-edge indexable inserts securely without any play. The back taper of the minor cutting edge is already integrated into this cassette, thus eliminated the need for this adjustment. Due to the exact guidance of the cassette on a precision guide pin, the back taper remains unchanged even during diameter settings.</p> | <p><b>External machining tools</b></p> <p>The EasyAdjust system is integrated to make setting external reamers with small diameters as easy as possible. Thanks to greater changeover accuracy as well as the fact that the inserts can be set very easily, reliable compliance with the required tolerances for highly accurate fits is significantly easier using the new system, even in the small diameter range.</p> |
| See the "BORE MACHINING" catalogue                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                           |

# FixReam

## High-performance reamer made of solid carbide

With the new high-performance reamer FixReam, both through and blind bores can be machined in titanium workpiece material. The patented arc land chamfer ensures that the roundness and cylindrical form of the bore are improved by up to 30 per cent. Individually adapted chucks are made possible by innovative geometry. It is therefore suitable also for use with short and medium production runs.

### 1 Prime number spacing

- Less vibrations, better surfaces, smoother running and longer tool life

### 2 Innovative coolant outlets

- Optimal cooling lubricant supply at the blind and through bores

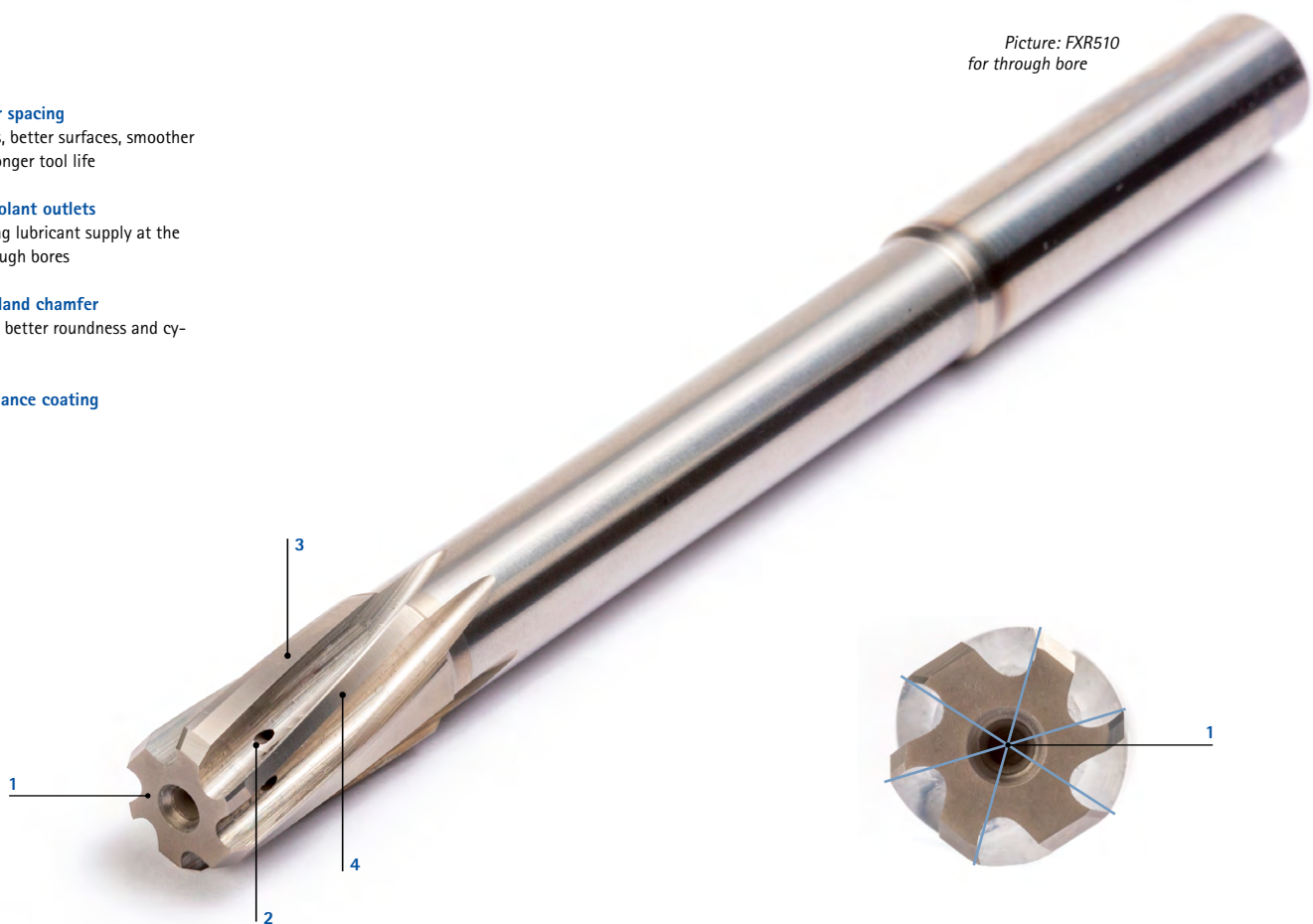
### 3 Patented arc land chamfer

- For up to 30% better roundness and cylindrical form

### 4 High-performance coating

- PVD coating

Picture: FXR510  
for through bore



## Features

### Dimensions:

- For through bore, left-hand fluted
- Straight-fluted blind bore
- Configurable diameter:  $\varnothing$  area: 3.701 to 20.200 mm
- Z4, Z6 and Z8
- Short design for more stability and higher feed rates
- Internal coolant supply
- High-performance tools for a wide range of applications
- High productivity in series production

## Available designs



FXR 510, left-hand fluted



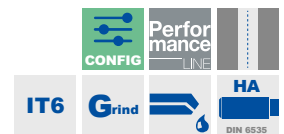
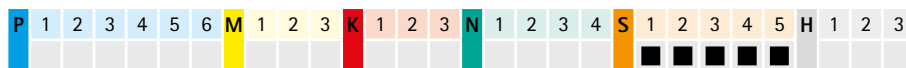
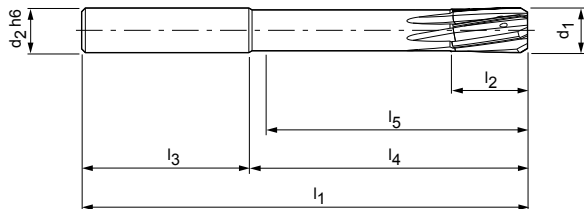
FXR 505, straight fluted

# FixReam

Fixed design, left-hand fluted, for through hole  
FXR510

**Design:**  
Reamer diameter:  
Lead:  
Cutting material:

**Solid carbide**  
3.701 - 20.200 mm  
MF1M  
HP625 (carbide PVD coated)



## Configurable features



**Bore diameter tolerance  $\geq$  IT6:**  
- Diameter freely selectable  
in increments of 0.001 mm  
- Can be ordered in tolerance  $\geq$  IT6

**Specification:**  
FXR510Ø[diameter][tolerance]MF1M-HP625

**G variants:**  
- Diameter freely selectable  
in increments of 0.001 mm  
- From tolerance  $\geq 4 \mu\text{m}$  orderable  
(G variant)

**G variant specification:**  
FXR510GØ[diameter][tolerance]MF1M-HP625

## Dimensions of configurable series IT6

| $d_1$           | $d_2$ | $l_1$ | $l_2$ | $l_3$ | $l_4$ | $l_5$ | $z$ |
|-----------------|-------|-------|-------|-------|-------|-------|-----|
| 3,701 - 4,700   | 6     | 75    | 12    | 36    | 39    | 34    | 4   |
| 4,701 - 6,200   | 6     | 75    | 12    | 36    | 39    | 35    | 4   |
| 6,201 - 7,200   | 8     | 100   | 16    | 36    | 64    | 59    | 6   |
| 7,201 - 8,200   | 8     | 100   | 16    | 36    | 64    | 60    | 6   |
| 8,201 - 9,200   | 10    | 100   | 20    | 40    | 60    | 55    | 6   |
| 9,201 - 10,200  | 10    | 120   | 20    | 40    | 80    | 76    | 6   |
| 10,201 - 11,200 | 12    | 120   | 20    | 45    | 75    | 70    | 6   |
| 11,201 - 12,200 | 12    | 120   | 20    | 45    | 75    | 71    | 6   |
| 12,201 - 14,200 | 14    | 130   | 22    | 45    | 85    | 80    | 6   |
| 14,201 - 15,200 | 16    | 130   | 22    | 48    | 82    | 77    | 6   |
| 15,201 - 16,200 | 16    | 150   | 25    | 48    | 102   | 97    | 6   |
| 16,201 - 18,200 | 18    | 150   | 25    | 48    | 102   | 97    | 8   |
| 18,201 - 20,200 | 20    | 150   | 25    | 50    | 100   | 95    | 8   |

**IT6 tolerance example:**  
FXR510Ø16.350H6MF1M-HP625

Bore diameter  $d_1 = 16.350 \text{ H6}$

**G variant example:**  
FXR510GØ16.350-4MF1M-HP625

Special tool diameter  $d_1 = 16.350 -4 \mu\text{m}$

## Accessories

|  |         |                  |         |
|--|---------|------------------|---------|
|  | MHC-... | UNIQ DReaM Chuck | Page 86 |
|--|---------|------------------|---------|

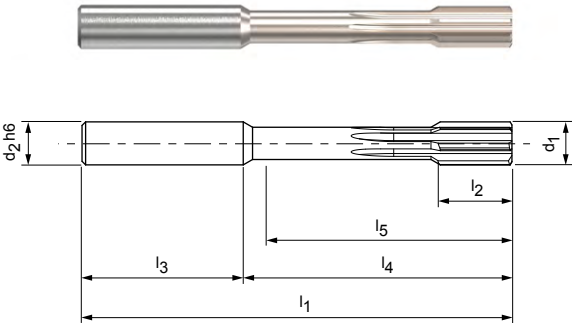


# FixReam

Fixed design, straight fluted, for blind bore  
FXR505

**Design:**  
Reamer diameter:  
Lead:  
Cutting material:

**Solid carbide**  
3.701 - 20.200 mm  
MT0A  
HP625 (carbide PVD coated)



### Configurable features

**Bore diameter tolerance  $\geq$  IT6:**  
- Diameter freely selectable in increments of 0.001 mm  
- Can be ordered in tolerance  $\geq$  IT6

**Specification:**  
FXR505Ø[diameter][tolerance]MT0A-HP625

**G variants:**  
- Diameter freely selectable in increments of 0.001 mm  
- From tolerance  $\geq 4 \mu\text{m}$  orderable (G variant)

**G variant specification:**  
FXR505GØ[diameter][tolerance]MT0A-HP625

### Dimensions of configurable series IT6

| d <sub>1</sub>  | d <sub>2</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | l <sub>5</sub> | z |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
| 3,701 - 6,200   | 6              | 75             | 12             | 36             | 39             | 34             | 4 |
| 6,201 - 8,200   | 8              | 100            | 16             | 36             | 64             | 58             | 6 |
| 8,201 - 9,200   | 10             | 100            | 20             | 40             | 60             | 54             | 6 |
| 9,201 - 10,200  | 10             | 120            | 20             | 40             | 80             | 74             | 6 |
| 10,201 - 12,200 | 12             | 120            | 20             | 45             | 75             | 68             | 6 |
| 12,201 - 14,200 | 14             | 130            | 22             | 45             | 85             | 78             | 6 |
| 14,201 - 15,200 | 16             | 130            | 22             | 48             | 82             | 75             | 6 |
| 15,201 - 16,200 | 16             | 150            | 25             | 48             | 102            | 95             | 6 |
| 16,201 - 18,200 | 18             | 150            | 25             | 48             | 102            | 95             | 6 |
| 18,201 - 20,200 | 20             | 150            | 25             | 50             | 100            | 92             | 6 |

**IT6 tolerance example:**  
FXR505Ø16.350H6MT0A-HP625

Bore diameter d<sub>1</sub> = 16.350 H6

**G variant example:**  
FXR505GØ16.350-4MT0A-HP625

Special tool diameter d<sub>1</sub> = 16.350 -4  $\mu\text{m}$

### Accessories

|  |         |                  |         |
|--|---------|------------------|---------|
|  | MHC-... | UNIQ DReaM Chuck | Page 86 |
|--|---------|------------------|---------|

# HPR replaceable head reamer

**Taper and face connection provide the greatest possible stability and rigidity**

The HFS (Head Fitting System) forms the heart of the HPR reamer. It combines very easy and quick handling with absolute precision and a changeover accuracy of  $< 3 \mu\text{m}$ .

## 1 High-precision short tapered connection

- Changeover accuracy and concentricity  $< 3 \mu\text{m}$
- Face connection for high rigidity and accuracy

## 2 HPR replaceable head

- Replaceable head with brazed cutting edge
- Solid carbide heads

## 3 Cutting edge made of carbide

- Coated

## 4 Coolant outlets

- Direct on the cutting edge
- Optimal amount and direction of the coolant jet

## 5 Differential screw

- Clamping and releasing the replaceable head

## 6 Wrench surfaces

- Alignment of head and tool holder with each other



## Features

### Dimensions:

- For through bore, left-hand fluted
- Straight-fluted blind bore
- Configurable diameter
  - HPR 131:  $\varnothing$  area: 7.00 to 18.59 mm
  - HPR 150:  $\varnothing$  area: 16.60 to 65.00 mm
- Z4 and Z6
- Short design for more stability and higher feed rates
- Internal coolant supply

## Available designs



- 1 HPR replaceable head reamer, HPR131
- 2 HPR replaceable head reamer, HPR180
- 3 HPR replaceable head reamer, HPR110
- 4 HPR replaceable head reamer, HPR150



# HPR replaceable head reamer

Fixed design, left-hand grooved, for through hole  
HPR131

## Design:

Reamer diameter:

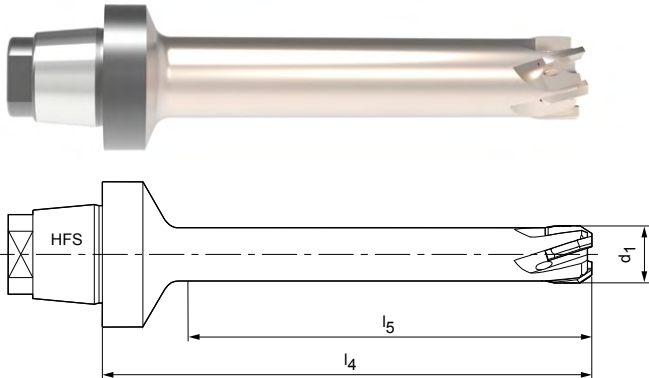
7.000 - 18.590 mm

Lead:

MF1G

Cutting material:

HP625 (carbide PVD coated)



## Configurable features



### Bore diameter tolerance IT7:

- Diameter freely selectable in increments of 0.001 mm
- Can be ordered in tolerance IT7

### Specification:

HPR131Ø[diameter][tolerance]MF1G-HP625

### Bore diameter tolerance < IT7:

- Tolerances smaller than IT7 can be ordered as a special tool diameter (G variant)

### G variant specification:

HPR131GØ[diameter][tolerance]MF1G-HP625

## Dimensions of configurable series IT7

| d <sub>1</sub> | l <sub>4</sub> | l <sub>5</sub> | HFS-Größe | z |
|----------------|----------------|----------------|-----------|---|
| 7,000 - 9,590  | 60             | 45             | 12        | 4 |
| 9,600 - 18,590 | 60             | 45             | 12        | 6 |

### IT7 tolerance example:

HPR131Ø16.350H7MF1G-HP625

Bore diameter d<sub>1</sub> = 16.350 H7

### G variant example:

HPR131GØ16.350-5MF1G-HP625

Special tool diameter d<sub>1</sub> = 16.350 -5 µm

## Tolerances for the G variant

| Cutting material                  | Diameter range |            |
|-----------------------------------|----------------|------------|
|                                   | Ø7 - <Ø60      | ≥Ø60 - Ø65 |
| Coated (Coating thickness 2-3 µm) |                |            |
| HP625                             | -0,005         | -0,008     |

## Accessories

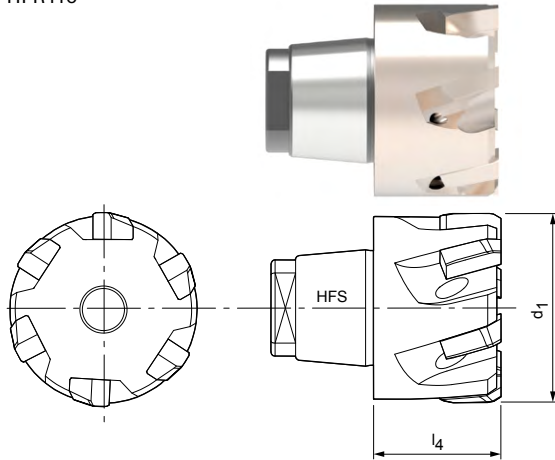
|                                                                                     |           |                              |          |
|-------------------------------------------------------------------------------------|-----------|------------------------------|----------|
|  | HFS101SN- | HFS replaceable head holders | Page 103 |
|  | MHC-...   | HydroChuck                   | Page 88  |

# HPR replaceable head reamer

Fixed design, left-hand fluted, for through hole  
HPR110

## Design:

Reamer diameter: 15.600 - 65.000 mm  
Lead: MF1G  
Cutting material: HP625 (carbide PVD coated)



## Configurable features



### Bore diameter tolerance IT6/IT7:

- Diameter freely selectable in increments of 0.001 mm
- Can be ordered from tolerance IT6/IT7 depending on the diameter range
- $\geq \varnothing 30,000$  IT6 |  $\leq \varnothing 30,000$  IT7

### Specification:

HPR110Ø[diameter][tolerance]MF1G-HP625

### Bore diameter tolerance < IT6/IT7:

- Tolerances smaller than IT6/IT7 can be ordered as a special tool diameter (G variant)

### G variant specification:

HPR110GØ[diameter][tolerance]MF1G-HP625

## Dimensions of configurable series

| d1              | l <sub>4</sub> | l <sub>5</sub> | HFS size | z | Tolerance |
|-----------------|----------------|----------------|----------|---|-----------|
| 15.600 - 18.590 | 14             | –              | 10       | 6 | IT7       |
| 18.600 - 21.290 | 14.5           | –              | 12       | 6 | IT7       |
| 21.300 - 23.990 | 15.5           | –              | 14       | 6 | IT7       |
| 24.000 - 29.990 | 16             | –              | 16       | 6 | IT7       |
| 30.000 - 39.990 | 17             | –              | 20       | 8 | IT6       |
| 40.000 - 50.700 | 19             | –              | 24       | 8 | IT6       |
| 50.710 - 65.000 | 25             | –              | 24       | 8 | IT6       |

### IT6/IT7 tolerance example:

HPR110Ø16.350H7MF1G-HP625

Bore diameter d<sub>1</sub> = 16.350 H7

## Tolerances for the G variant

| Cutting material                  | Diameter range |            |
|-----------------------------------|----------------|------------|
|                                   | Ø7 - <Ø60      | ≥Ø60 - Ø65 |
| Coated (Coating thickness 2-3 µm) |                |            |
| HP625                             | -0,005         | -0,008     |

### G variant example:

HPR110GØ16.350-5MF1G-HP625

Special tool diameter d<sub>1</sub> = 16.350 -5 µm

## Accessories

|                                                                                     |           |                              |          |
|-------------------------------------------------------------------------------------|-----------|------------------------------|----------|
|  | HFS101SN- | HFS replaceable head holders | Page 103 |
|  | MHC-...   | HydroChuck                   | Page 88  |



# HPR replaceable head reamer

Fixed design, straight fluted, for blind bore  
HPR180

## Design:

Reamer diameter:

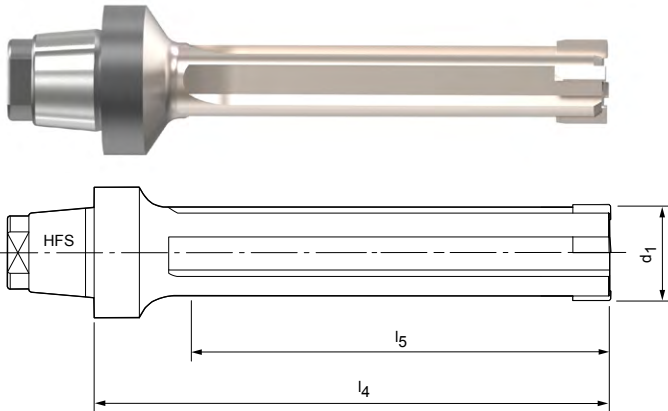
7.000 - 21.290 mm

Lead:

M02G

Cutting material:

HP625 (carbide PVD coated)



## Configurable features



### Bore diameter tolerance IT7:

- Diameter freely selectable in increments of 0.001 mm
- Can be ordered from tolerance IT7

### Specification:

HPR180Ø[diameter][tolerance]M02G-HP625

### Bore diameter tolerance < IT7:

- Tolerances smaller than IT7 can be ordered as a special tool diameter (G variant)

### G variant specification:

HPR180GØ[diameter][tolerance]M02G-HP625

## Dimensions of configurable series IT7

| d1              | l <sub>4</sub> | l <sub>5</sub> | HFS size | z |
|-----------------|----------------|----------------|----------|---|
| 7.000 - 14.590  | 60             | 40             | 12       | 4 |
| 14.600 - 21.290 | 60             | 40             | 12       | 6 |

### IT7 tolerance example:

HPR180Ø16.350H7M02G-HP625

Bore diameter d<sub>1</sub> = 16.350 H7

### G variant example:

HPR180GØ16.350-5M02G-HP625

Special tool diameter d<sub>1</sub> = 16.350 -5 µm

## Tolerances for the G variant

| Cutting material                  | Diameter range |            |
|-----------------------------------|----------------|------------|
|                                   | Ø7 - <Ø60      | ≥Ø60 - Ø65 |
| Coated (Coating thickness 2-3 µm) |                |            |
| HP625                             | -0,005         | -0,008     |

## Accessories

|  |           |                              |          |
|--|-----------|------------------------------|----------|
|  | HFS101SN- | HFS replaceable head holders | Page 103 |
|  | MHC-...   | HydroChuck                   | Page 88  |

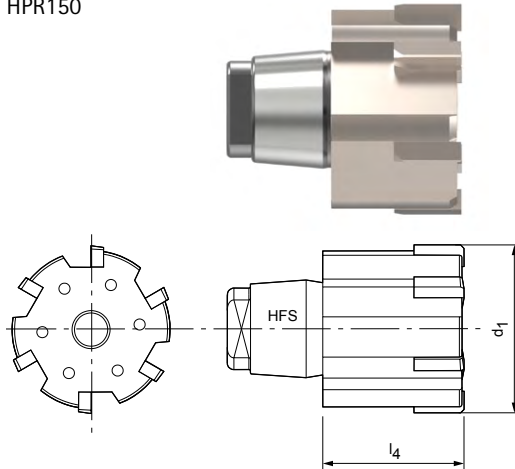
Dimensions in mm.

# HPR replaceable head reamer

Fixed design, straight fluted, for blind bore  
HPR150

## Design:

Reamer diameter: 16.600 - 65.000 mm  
Lead: M02G  
Cutting material: HP625 (carbide PVD coated)



## Configurable features



### Bore diameter tolerance IT6/IT7:

- Diameter freely selectable in increments of 0.001 mm
- Can be ordered from tolerance IT6/IT7 depending on the diameter range
- $\geq \varnothing 30,000$  IT6 |  $\leq \varnothing 30,000$  IT7

### Specification:

HPR150Ø[diameter][tolerance]M02G-HP625

### Bore diameter tolerance < IT6/IT7:

- Tolerances smaller than IT6/IT7 can be ordered as a special tool diameter (G variant)

### G variant specification:

HPR150GØ[diameter][tolerance]M02G-HP625

## Dimensions of configurable series IT6/IT7

| d1              | l <sub>4</sub> | l <sub>5</sub> | HFS size | z | Tolerance |
|-----------------|----------------|----------------|----------|---|-----------|
| 16.600 - 21.290 | 14             | -              | 10       | 6 | IT7       |
| 21.300 - 24.990 | 15.5           | -              | 12       | 6 | IT7       |
| 25.000 - 28.990 | 15.5           | -              | 14       | 6 | IT7       |
| 29.000 - 29.990 | 17             | -              | 16       | 6 | IT7       |
| 30.000 - 36.990 | 17             | -              | 16       | 6 | IT6       |
| 37.000 - 44.990 | 17             | -              | 20       | 8 | IT6       |
| 45.000 - 50.700 | 19             | -              | 24       | 8 | IT6       |
| 50.710 - 65.000 | 25             | -              | 24       | 8 | IT6       |

### IT6/IT7 tolerance example:

HPR150Ø37.350H7M02G-HP625

Bore diameter d<sub>1</sub> = 37.350 H7

## Tolerances for the G variant

| Cutting material                  | Diameter range |            |
|-----------------------------------|----------------|------------|
|                                   | Ø7 - <Ø60      | ≥Ø60 - Ø65 |
| Coated (Coating thickness 2-3 µm) |                |            |
| HP625                             | -0,005         | -0,008     |

### G variant example:

HPR150GØ37.350-5M02G-HP625

Special tool diameter d<sub>1</sub> = 37.350 -5 µm

## Accessories

|  |           |                              |          |
|--|-----------|------------------------------|----------|
|  | HFS111SN- | HFS replaceable head holders | Page 103 |
|  | MHC-...   | HydroChuck                   | Page 88  |

# Cutting data recommendations for FXR and HPR

Feed and cutting speed

## FXR510 | FXR505

Cutting material: HP625 | Lead: MF1M | MTOA

| MMG* |    |      | Workpiece material                                   | Strength/hardness<br>[N/mm <sup>2</sup> ] [HRC] | Cutting speed $v_c$ (m/min) |                  |     |  |
|------|----|------|------------------------------------------------------|-------------------------------------------------|-----------------------------|------------------|-----|--|
|      |    |      |                                                      |                                                 | Internal cooling            | External cooling | MQL |  |
| S    | S1 | S1.1 | Titanium, titanium alloys                            | < 400                                           | 25                          | 10               | 15  |  |
|      | S2 | S2.1 | Titanium, titanium alloys                            | < 1,200                                         | 25                          | 10               | 15  |  |
|      |    | S2.2 | Titanium, titanium alloys                            | > 1,200                                         | 25                          | 10               | 15  |  |
|      | S3 | S3.1 | Nickel, unalloyed and alloyed                        | < 900                                           | 25                          | 10               | 15  |  |
|      |    | S3.2 | Nickel, unalloyed and alloyed                        | > 900                                           | 25                          | 10               | 15  |  |
|      | S4 | S4.1 | High-temperature super alloy, Ni-, Co-, and Fe-based |                                                 | 25                          | 10               | 15  |  |
|      |    |      |                                                      |                                                 |                             |                  |     |  |
|      | S5 | S5.1 | Molybdenum and tungsten alloys                       |                                                 | 25                          | 10               | 15  |  |

## HPR180 | HPR131

Cutting material: HP625 | Lead: MO2G | MF1G

| MMG* |    |      | Workpiece material                                   | Strength/hardness<br>[N/mm <sup>2</sup> ] [HRC] | Cutting speed $v_c$ (m/min) |                  |     |  |
|------|----|------|------------------------------------------------------|-------------------------------------------------|-----------------------------|------------------|-----|--|
|      |    |      |                                                      |                                                 | Internal cooling            | External cooling | MQL |  |
| S    | S1 | S1.1 | Titanium, titanium alloys                            | < 400                                           | 35                          | 20               | 25  |  |
|      | S2 | S2.1 | Titanium, titanium alloys                            | < 1,200                                         | 35                          | 20               | 25  |  |
|      |    | S2.2 | Titanium, titanium alloys                            | > 1,200                                         | 35                          | 20               | 25  |  |
|      | S3 | S3.1 | Nickel, unalloyed and alloyed                        | < 900                                           | 30                          | 15               | 25  |  |
|      |    | S3.2 | Nickel, unalloyed and alloyed                        | > 900                                           | 30                          | 15               | 25  |  |
|      | S4 | S4.1 | High-temperature super alloy, Ni-, Co-, and Fe-based |                                                 | 25                          | 15               | 20  |  |
|      |    |      |                                                      |                                                 |                             |                  |     |  |
|      | S5 | S5.1 | Molybdenum and tungsten alloys                       |                                                 | 25                          | 15               | 20  |  |

## HPR110 | HPR150

Cutting material: HP625 | Lead: MO2G | MF1G

| MMG* |    |      | Workpiece material                                   | Strength/hardness<br>[N/mm <sup>2</sup> ] [HRC] | Cutting speed $v_c$ (m/min) |                  |     |  |
|------|----|------|------------------------------------------------------|-------------------------------------------------|-----------------------------|------------------|-----|--|
|      |    |      |                                                      |                                                 | Internal cooling            | External cooling | MQL |  |
| S    | S1 | S1.1 | Titanium, titanium alloys                            | < 400                                           | 35                          | 20               | 25  |  |
|      | S2 | S2.1 | Titanium, titanium alloys                            | < 1,200                                         | 35                          | 20               | 25  |  |
|      |    | S2.2 | Titanium, titanium alloys                            | > 1,200                                         | 35                          | 20               | 25  |  |
|      | S3 | S3.1 | Nickel, unalloyed and alloyed                        | < 900                                           | 30                          | 15               | 25  |  |
|      |    | S3.2 | Nickel, unalloyed and alloyed                        | > 900                                           | 30                          | 15               | 25  |  |
|      | S4 | S4.1 | High-temperature super alloy, Ni-, Co-, and Fe-based |                                                 | 25                          | 15               | 20  |  |
|      |    |      |                                                      |                                                 |                             |                  |     |  |
|      | S5 | S5.1 | Molybdenum and tungsten alloys                       |                                                 | 25                          | 15               | 20  |  |

\* MAPAL machining groups

[illegible][illegible][illegible]







# CLAMPING

## Clamping

---

|                                                      |     |
|------------------------------------------------------|-----|
| Hydraulic clamping technology .....                  |     |
| UNIQ Chuck: Industrial design with added value ..... | 80  |
| UNIQ Mill Chuck, HA .....                            | 82  |
| UNIQ DReaM Chuck .....                               | 85  |
| HydroChuck .....                                     | 88  |
| Mechanical tool clamping technology .....            |     |
| Mill Chuck, HB .....                                 | 92  |
| Milling cutter arbors .....                          | 96  |
| MFS milling head holder .....                        | 99  |
| HFS replaceable head holders .....                   | 103 |
| Adapters .....                                       | 109 |
| Spare parts and accessories .....                    | 114 |

## Technical appendix

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|                         |     |
|-------------------------|-----|
| Product ID codes .....  | 126 |
| Application notes ..... | 136 |

# INDUSTRIAL DESIGN WITH ADDED VALUE – UNIQ<sup>®</sup> CHUCK

The newly-developed hydraulic expansion clamping system enables high machining parameters through excellent stability and accuracy. It minimises self-excited vibration so that clamped tools are not exposed to micro-vibration. This in turn leads to a reduced spindle load of up to 5 per cent, enables significantly longer tool life and guarantees optimal surface quality.

In addition, the brilliant surface which MAPAL creates using a specially developed polishing process ensures that the chucks are more resistant to dirt and corrosion than previous chucks. Users can safely clamp the tool in the holder with little force. This is ensured by "foolproof handling", i.e. simple and self-explanatory handling of the chucks. A lot of time is saved compared to other clamping mechanisms, especially with the UNIQ Hydro DReaM Chuck 4.5°.





## Design features in detail

### Use of form

FEM-supported contours for maximum stiffness with minimum use of resources

### Polished surface

Maximum corrosion and dirt resistance

### Blue actuator screw

- Optical control element – foolproof
- Reduced risk of errors and accidents

### Reduced tightening torque

- Less non-productive time
- Ergonomic handling

### Signature elements

Information regarding function and product



### Use of form | Bionic contours

- Higher stability and accuracy of the overall system
- Less displacement of the tool
- Less weight through minimal use of resources
- Good handling when setting up the tool magazine
- Self-excited vibrations are minimised



### Polished surfaces

- Dirt resistance (corrosion resistance) increased
- Highest balancing qualities due to compacted surfaces



### Blue actuator screw | Signature elements

- Actuator screw clearly identifiable and easier actuation of the tightening torque, which is reduced by up to 70%
- Clear arrangement on the product, important functional and product information immediately visible

## UNIQ® Mill Chuck, HA

### Dependable. Dynamic. Agile.

The UNIQ Mill Chuck is specially designed for clamping milling tools with an HA shank. Due to the high temperature resistance of 80 °C even during very long milling cycles, it impresses with highly dynamic milling applications such as SPM (Structural Part Machining), HSC (High Speed Cutting) or HPC (High Performance Cutting) of high-quality components with excellent process reliability and a high material removal rate. Universal application for roughing, semi-finished and finishing operations.

#### Hydraulic chuck

- For highly dynamic milling applications

#### Excellent results

- When using tools with HA shanks

#### High thermal stability

- 80 °C even with very long milling cycles (over 240 minutes)

#### For high-performance milling operations

- Up to 33,000 revolutions per minute

#### Highest process reliability

- Even on high-quality parts



### Features

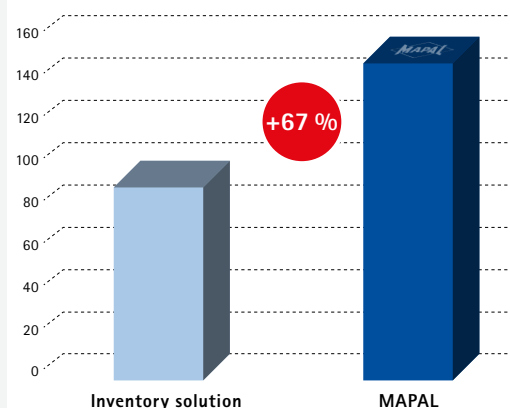
#### Connections:

- HSK-A063
- HSK-A100
- BT30

#### Mounting diameter:

- 6.0 mm up to 20.00 mm

### Tool life [m]



**MAPAL:**  
Higher tool lifes

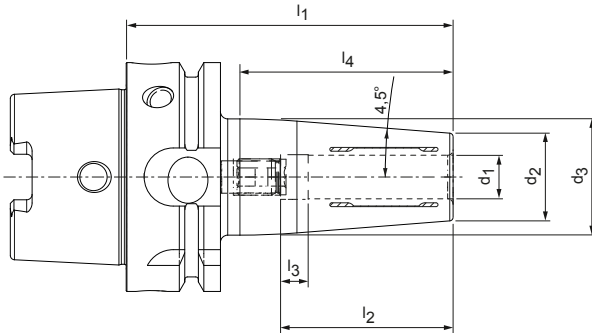
**Inventory solution:**  
Hydro bushing burst before end of tool life



# UNIQ® Mill Chuck, HA

With axial tool length adjustment

HSK-A (hollow shank taper form A) shank according to DIN 69893-1



| HSK-A | Dimensions |       |       |       |       |       |       | G    | Torque*<br>[Nm] | Specification             | Order no. |
|-------|------------|-------|-------|-------|-------|-------|-------|------|-----------------|---------------------------|-----------|
|       | $d_1$      | $d_2$ | $d_3$ | $l_1$ | $l_2$ | $l_3$ | $l_4$ |      |                 |                           |           |
| 63    | 6,0        | 26,0  | 50,0  | 65,0  | 37,0  | 10,0  | 35,2  | M5   | 22              | MHC-HSK-A063-06-065-1-0-A | 31270591  |
| 63    | 8,0        | 28,0  | 50,0  | 65,0  | 37,0  | 10,0  | 35,2  | M6   | 47              | MHC-HSK-A063-08-065-1-0-A | 31270593  |
| 63    | 10,0       | 30,0  | 50,0  | 75,0  | 41,0  | 10,0  | 45,2  | M8x1 | 85              | MHC-HSK-A063-10-075-1-0-A | 31270595  |
| 63    | 12,0       | 32,0  | 52,5  | 75,0  | 46,0  | 10,0  | 45,2  | M8x1 | 130             | MHC-HSK-A063-12-075-1-0-A | 31229418  |
| 63    | 16,0       | 38,0  | 52,5  | 79,0  | 49,0  | 10,0  | 49,2  | M8x1 | 350             | MHC-HSK-A063-16-079-1-0-A | 31270598  |
| 63    | 20,0       | 38,0  | 52,5  | 79,0  | 51,0  | 10,0  | 49,2  | M8x1 | 520             | MHC-HSK-A063-20-079-1-0-A | 31229438  |
| 100   | 6,0        | 26,0  | 50,0  | 73,0  | 37,0  | 10,0  | 40,3  | M5   | 22              | MHC-HSK-A100-06-073-1-0-A | 31345192  |
| 100   | 8,0        | 28,0  | 50,0  | 73,0  | 37,0  | 10,0  | 40,3  | M6   | 47              | MHC-HSK-A100-08-073-1-0-A | 31345193  |
| 100   | 10,0       | 30,0  | 50,0  | 83,0  | 41,0  | 10,0  | 50,3  | M8x1 | 85              | MHC-HSK-A100-10-083-1-0-A | 31345194  |
| 100   | 12,0       | 32,0  | 52,5  | 83,0  | 46,0  | 10,0  | 50,3  | M8x1 | 130             | MHC-HSK-A100-12-083-1-0-A | 31345195  |
| 100   | 16,0       | 38,0  | 52,5  | 87,0  | 49,0  | 10,0  | 54,3  | M8x1 | 350             | MHC-HSK-A100-16-087-1-0-A | 31345197  |
| 100   | 20,0       | 38,0  | 52,5  | 87,0  | 51,0  | 10,0  | 54,3  | M8x1 | 520             | MHC-HSK-A100-20-087-1-0-A | 31345199  |

\* Permissible transferable torque.

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without coolant tube.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD (max. 50 mm), radial run-out accuracy 3  $\mu$ m. When using cylindrical shanks with an in-

clined clamping surface (form E and form HE), the accuracy may be impaired. Torque transmission perfectly tailored to the respective application.

Note: Coolant supply via central through hole. Coolant tubes, code carriers, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

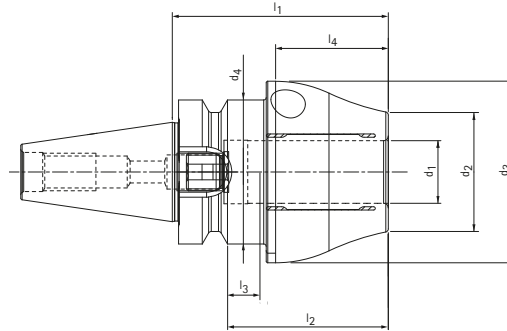
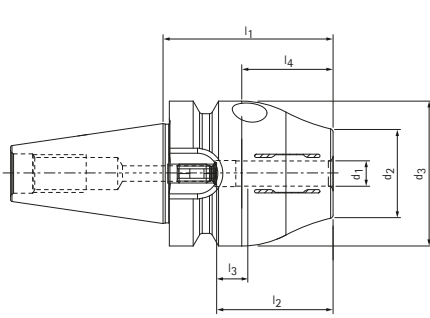
Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# UNIQ® Mill Chuck, HA

With axial tool length adjustment

Shank BT according to ISO 7388-2 Form JD/JF (JIS B 6339)



| BT   | Dimensions     |                |                |                |                |                |                |                | G     | Torque*<br>[Nm] | Specification          | Order no. |
|------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|-----------------|------------------------|-----------|
|      | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> |       |                 |                        |           |
| 30** | 6,0            | 26,0           | 46,0           | –              | 54,0           | 37,0           | 10,0           | 29,0           | M5    | 22              | MHC-BT030-06-054-1-0-A | 31280342  |
| 30** | 8,0            | 28,0           | 46,0           | –              | 54,0           | 37,0           | 10,0           | 29,0           | M6    | 47              | MHC-BT030-08-054-1-0-A | 31280343  |
| 30** | 10,0           | 30,0           | 50,0           | 46,0           | 54,0           | 41,0           | 10,0           | 23,5           | M8x1  | 85              | MHC-BT030-10-054-1-0-A | 31280344  |
| 30** | 12,0           | 32,0           | 50,0           | 46,0           | 54,0           | 46,0           | 10,0           | 23,5           | M10x1 | 130             | MHC-BT030-12-054-1-0-A | 31280345  |
| 30** | 16,0           | 38,0           | 55,0           | 46,0           | 69,0           | 49,0           | 10,0           | 38,5           | M12x1 | 350             | MHC-BT030-16-069-1-0-A | 31280346  |
| 30** | 20,0           | 38,0           | 58,0           | 46,0           | 69,0           | 51,0           | 10,0           | 38,5           | M12x1 | 520             | MHC-BT030-20-069-1-0-A | 31280347  |

\* Permissible transferable torque.

\*\* Design: Taper shank size is not available in the JD/JF combination design.

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without pull stud.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD (max. 50 mm) radial run-out accuracy 3 µm. When using cylindrical shanks with an in-

clined clamping surface (form E and form HE), the accuracy may be impaired. Torque transmission perfectly tailored to the respective application.

Note: Coolant supply via central through hole. Pull stud, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# UNIQ® DReaM Chuck

## High machining parameters through stability and accuracy

The UNIQ DReaM Chuck 4.5° is ideally suited for reaming and drilling applications as well as for use with finishing milling cutters. Thanks to the clamping initiation in the hollow shank taper collar, it enables maximum rigidity with minimal use of material at minimal tool restriction. The outer contour of the UNIQ DReaM Chuck is based one to one on DIN 69882-8 for heat shrink chucks. This means that the advantages of hydraulic clamping technology can be harnessed for these applications.

### Hydraulic chuck

- For reaming and drilling applications as well as for finishing during milling operations

### Application-oriented system design

- With the original dimensions of a shrink chuck (DIN contour with 4.5°)

### Excellent surfaces

- As well as improved handling

### Maximum flexibility and productivity

- During the machining of contour-critical parts



## Features

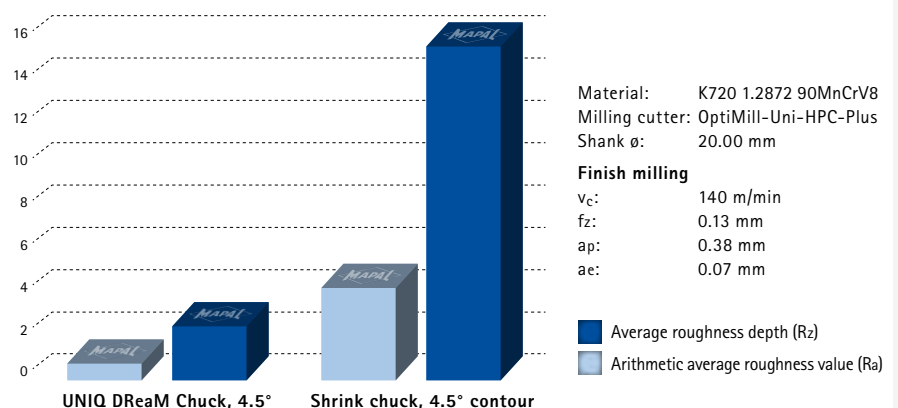
### Connections:

- HSK-A063
- HSK-A100
- BT30

### Mounting diameter:

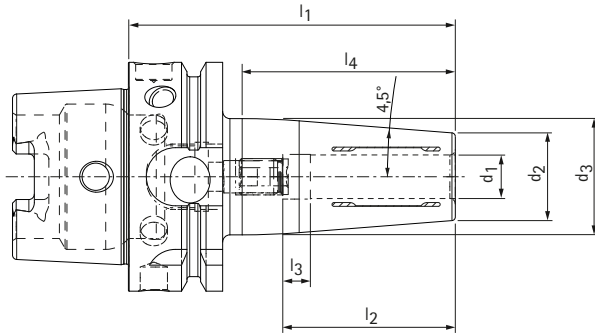
- 6.0 mm up to 20.00 mm

## Surface finish [ $\mu\text{m}$ ]



## UNIQ® DReaM Chuck, 4.5°

With axial tool length adjustment, clamping initiation in collar  
HSK-A (hollow shank taper form A) shank according to DIN 69893-1



| HSK-A | Dimensions     |                |                |                |                |                |                | G     | Torque*<br>[Nm] | Specification             | Order no. |
|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|-----------------|---------------------------|-----------|
|       | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> |       |                 |                           |           |
| 63    | 6,0            | 21,0           | 27,0           | 80,0           | 37,0           | 10,0           | 48,9           | M5    | 18              | MHC-HSK-A063-06-080-1-0-A | 31270515  |
| 63    | 8,0            | 21,0           | 27,0           | 80,0           | 37,0           | 10,0           | 48,9           | M6    | 35              | MHC-HSK-A063-08-080-1-0-A | 31270525  |
| 63    | 10,0           | 24,0           | 32,0           | 85,0           | 41,0           | 10,0           | 53,7           | M8x1  | 60              | MHC-HSK-A063-10-085-1-0-A | 31270550  |
| 63    | 12,0           | 24,0           | 32,0           | 90,0           | 46,0           | 10,0           | 58,6           | M10x1 | 90              | MHC-HSK-A063-12-090-1-0-A | 31229439  |
| 63    | 16,0           | 27,0           | 34,0           | 95,0           | 49,0           | 10,0           | 63,1           | M12x1 | 200             | MHC-HSK-A063-16-095-1-0-A | 31270555  |
| 63    | 20,0           | 33,0           | 42,0           | 100,0          | 51,0           | 10,0           | 68,9           | M16x1 | 330             | MHC-HSK-A063-20-100-1-0-A | 31229440  |
| 100   | 6,0            | 21,0           | 27,0           | 85,0           | 37,0           | 10,0           | 38,7           | M5    | 18              | MHC-HSK-A100-06-085-1-0-A | 31344789  |
| 100   | 8,0            | 21,0           | 27,0           | 85,0           | 37,0           | 10,0           | 38,7           | M6    | 35              | MHC-HSK-A100-08-085-1-0-A | 31344860  |
| 100   | 10,0           | 24,0           | 32,0           | 90,0           | 41,0           | 10,0           | 53,8           | M8x1  | 60              | MHC-HSK-A100-10-090-1-0-A | 31344862  |
| 100   | 12,0           | 24,0           | 32,0           | 95,0           | 46,0           | 10,0           | 58,7           | M10x1 | 90              | MHC-HSK-A100-12-095-1-0-A | 31344863  |
| 100   | 16,0           | 27,0           | 34,0           | 100,0          | 49,0           | 10,0           | 63,1           | M12x1 | 200             | MHC-HSK-A100-16-100-1-0-A | 31344865  |
| 100   | 20,0           | 33,0           | 42,0           | 105,0          | 51,0           | 10,0           | 69,0           | M16x1 | 330             | MHC-HSK-A100-20-105-1-0-A | 31344867  |

\* Permissible transferable torque.

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without coolant tube.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD (max. 50 mm) radial run-out accuracy 3 µm. When using cylindrical shanks with an in-

clined clamping surface (form E and form HE), the accuracy may be impaired. Torque transmission perfectly tailored to the respective application.

Note: Coolant supply via central through hole. Coolant tubes, code carriers, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

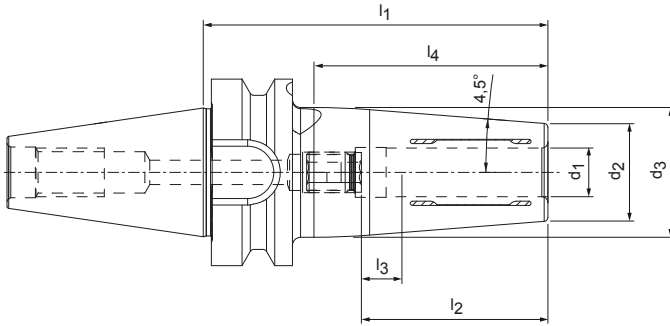
Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.



## UNIQ® DReaM Chuck, 4.5°

With axial tool length adjustment, clamping initiation in collar  
Shank BT according to ISO 7388-2 Form JD/JF (JIS B 6339)



| BT   | Dimensions     |                |                |                |                |                |                | G     | Torque*<br>[Nm] | Specification          | Order no. |
|------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|-----------------|------------------------|-----------|
|      | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> |       |                 |                        |           |
| 30** | 6,0            | 21,0           | 27,0           | 85,0           | 37,0           | 10,0           | 57,7           | M5    | 18              | MHC-BT030-06-085-1-0-A | 31280360  |
| 30** | 8,0            | 21,0           | 27,0           | 85,0           | 37,0           | 10,0           | 57,7           | M6    | 35              | MHC-BT030-08-085-1-0-A | 31280361  |
| 30** | 10,0           | 24,0           | 32,0           | 85,0           | 41,0           | 10,0           | 57,7           | M8x1  | 60              | MHC-BT030-10-085-1-0-A | 31280362  |
| 30** | 12,0           | 24,0           | 32,0           | 85,0           | 46,0           | 10,0           | 57,7           | M10x1 | 90              | MHC-BT030-12-085-1-0-A | 31280365  |
| 30** | 16,0           | 27,0           | 34,0           | 85,0           | 49,0           | 10,0           | 57,2           | M10x1 | 200             | MHC-BT030-16-085-1-0-A | 31280366  |
| 30** | 20,0           | 33,0           | 42,0           | 85,0           | 51,0           | 10,0           | 57,5           | M10x1 | 330             | MHC-BT030-20-085-1-0-A | 31280367  |

\* Permissible transferable torque.

\*\* Design: Taper shank size is not available in the JD/JF combination design

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without pull stud.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD (max. 50 mm), radial run-out accuracy 3 µm. When using cylindrical shanks with an in-

clined clamping surface (form E and form HE), the accuracy may be impaired. Torque transmission perfectly tailored to the respective application.

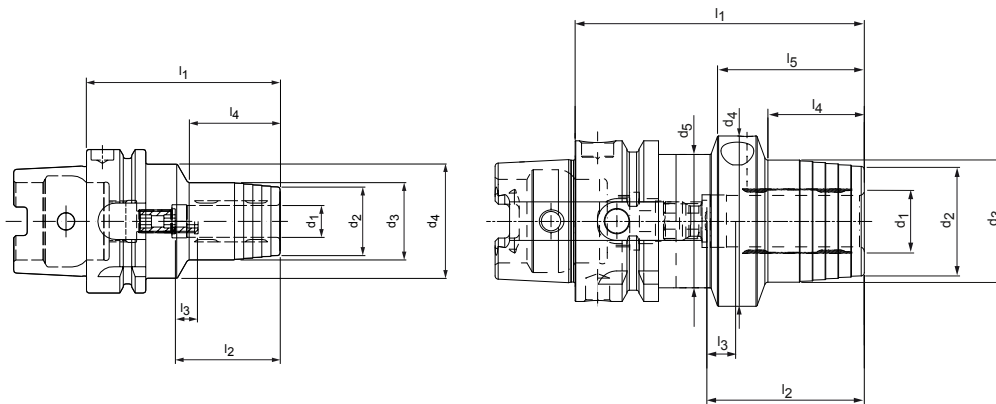
Note: Coolant supply via central through hole. Pull stud, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# HydroChuck

In accordance with DIN 69882-7 with axial tool length adjustment  
HSK-A (hollow shank taper form A) shank according to DIN 69893-1



| HSK-A | Dimensions     |                |                |                |                |                |                |                |                |                | G     | Specification             | Order no. |
|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|---------------------------|-----------|
|       | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | l <sub>5</sub> |       |                           |           |
| 32    | 6,0            | 22,0           | 26,0           | 40,0           | -              | 80,0           | 37,0           | 10,0           | 29,0           | -              | M5    | MHC-HSK-A032-06-080-1-0-A | 30250998  |
| 32    | 8,0            | 24,0           | 28,0           | 40,0           | -              | 80,0           | 37,0           | 10,0           | 29,0           | -              | M6    | MHC-HSK-A032-08-080-1-0-A | 30250999  |
| 32    | 10,0           | 26,0           | 30,0           | 40,0           | -              | 85,0           | 41,0           | 10,0           | 35,0           | -              | M6    | MHC-HSK-A032-10-085-1-0-A | 30251000  |
| 32    | 12,0           | 28,0           | 32,0           | 40,0           | -              | 90,0           | 46,0           | 10,0           | 40,0           | -              | M6    | MHC-HSK-A032-12-090-1-0-A | 30251001  |
| 40    | 6,0            | 22,0           | 26,0           | 33,5           | -              | 70,0           | 37,0           | 10,0           | 36,0           | -              | M5    | MHC-HSK-A040-06-070-1-0-A | 30251002  |
| 40    | 8,0            | 24,0           | 28,0           | 33,5           | -              | 70,0           | 37,0           | 10,0           | 36,0           | -              | M6    | MHC-HSK-A040-08-070-1-0-A | 30251003  |
| 40    | 10,0           | 26,0           | 30,0           | 33,5           | -              | 75,0           | 41,0           | 10,0           | 42,0           | -              | M6    | MHC-HSK-A040-10-075-1-0-A | 30251004  |
| 40    | 12,0           | 28,0           | 32,0           | 33,5           | -              | 80,0           | 46,0           | 10,0           | 48,0           | -              | M6    | MHC-HSK-A040-12-080-1-0-A | 30251005  |
| 50    | 6,0            | 22,0           | 26,0           | 40,0           | -              | 70,0           | 37,0           | 10,0           | 28,0           | -              | M5    | MHC-HSK-A050-06-070-1-0-A | 30251006  |
| 50    | 8,0            | 24,0           | 28,0           | 40,0           | -              | 70,0           | 37,0           | 10,0           | 28,0           | -              | M6    | MHC-HSK-A050-08-070-1-0-A | 30251007  |
| 50    | 10,0           | 26,0           | 30,0           | 40,0           | -              | 75,0           | 41,0           | 10,0           | 34,0           | -              | M8x1  | MHC-HSK-A050-10-075-1-0-A | 30251008  |
| 50    | 12,0           | 28,0           | 32,0           | 40,0           | -              | 85,0           | 46,0           | 10,0           | 44,0           | -              | M10x1 | MHC-HSK-A050-12-085-1-0-A | 30251009  |
| 50    | 14,0           | 30,0           | 34,0           | 40,0           | -              | 85,0           | 46,0           | 10,0           | 44,0           | -              | M10x1 | MHC-HSK-A050-14-085-1-0-A | 30251010  |
| 50    | 16,0           | 34,0           | 38,0           | 53,0           | 41,5           | 90,0           | 49,0           | 10,0           | 30,0           | 45,5           | M12x1 | MHC-HSK-A050-16-090-1-0-A | 30251011  |
| 50    | 18,0           | 36,0           | 40,0           | 53,0           | 41,5           | 90,0           | 49,0           | 10,0           | 30,0           | 45,5           | M12x1 | MHC-HSK-A050-18-090-1-0-A | 30251012  |
| 50    | 20,0           | 38,0           | 42,0           | 57,0           | 41,5           | 90,0           | 51,0           | 10,0           | 29,0           | 45,5           | M16x1 | MHC-HSK-A050-20-090-1-0-A | 30251013  |
| 63    | 6,0            | 22,0           | 26,0           | 50,0           | -              | 70,0           | 37,0           | 10,0           | 24,0           | -              | M5    | MHC-HSK-A063-06-070-1-0-A | 30251014  |
| 63    | 6,0            | 22,0           | 26,0           | 50,0           | -              | 120,0          | 37,0           | 10,0           | 73,0           | -              | M5    | MHC-HSK-A063-06-120-1-0-A | 30273801  |
| 63    | 6,0            | 22,0           | 26,0           | 50,0           | -              | 150,0          | 37,0           | 10,0           | 103,0          | -              | M5    | MHC-HSK-A063-06-150-1-0-A | 30251144  |
| 63    | 6,0            | 22,0           | 26,0           | 50,0           | -              | 200,0          | 37,0           | 10,0           | 153,0          | -              | M5    | MHC-HSK-A063-06-200-1-0-A | 30251152  |
| 63    | 8,0            | 24,0           | 28,0           | 50,0           | -              | 70,0           | 37,0           | 10,0           | 25,0           | -              | M6    | MHC-HSK-A063-08-070-1-0-A | 30251015  |
| 63    | 8,0            | 24,0           | 28,0           | 50,0           | -              | 120,0          | 37,0           | 10,0           | 74,0           | -              | M6    | MHC-HSK-A063-08-120-1-0-A | 30273802  |
| 63    | 8,0            | 24,0           | 28,0           | 50,0           | -              | 150,0          | 37,0           | 10,0           | 104,0          | -              | M6    | MHC-HSK-A063-08-150-1-0-A | 30251145  |
| 63    | 8,0            | 24,0           | 28,0           | 50,0           | -              | 200,0          | 37,0           | 10,0           | 154,0          | -              | M6    | MHC-HSK-A063-08-200-1-0-A | 30251153  |
| 63    | 10,0           | 26,0           | 30,0           | 50,0           | -              | 80,0           | 41,0           | 10,0           | 35,0           | -              | M8x1  | MHC-HSK-A063-10-080-1-0-A | 30251016  |
| 63    | 10,0           | 26,0           | 30,0           | 50,0           | -              | 120,0          | 41,0           | 10,0           | 74,0           | -              | M8x1  | MHC-HSK-A063-10-120-1-0-A | 30273803  |
| 63    | 10,0           | 26,0           | 30,0           | 50,0           | -              | 150,0          | 41,0           | 10,0           | 104,0          | -              | M8x1  | MHC-HSK-A063-10-150-1-0-A | 30251146  |
| 63    | 10,0           | 26,0           | 30,0           | 50,0           | -              | 200,0          | 41,0           | 10,0           | 154,0          | -              | M8x1  | MHC-HSK-A063-10-200-1-0-A | 30251154  |
| 63    | 12,0           | 28,0           | 32,0           | 50,0           | -              | 85,0           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-HSK-A063-12-085-1-0-A | 30251017  |
| 63    | 12,0           | 28,0           | 32,0           | 50,0           | -              | 120,0          | 46,0           | 10,0           | 75,0           | -              | M10x1 | MHC-HSK-A063-12-120-1-0-A | 30273804  |
| 63    | 12,0           | 28,0           | 32,0           | 50,0           | -              | 150,0          | 46,0           | 10,0           | 105,0          | -              | M10x1 | MHC-HSK-A063-12-150-1-0-A | 30251147  |
| 63    | 12,0           | 28,0           | 32,0           | 50,0           | -              | 200,0          | 46,0           | 10,0           | 155,0          | -              | M10x1 | MHC-HSK-A063-12-200-1-0-A | 30251155  |
| 63    | 14,0           | 30,0           | 34,0           | 50,0           | -              | 85,0           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-HSK-A063-14-085-1-0-A | 30251018  |
| 63    | 14,0           | 30,0           | 34,0           | 50,0           | -              | 120,0          | 46,0           | 10,0           | 75,0           | -              | M10x1 | MHC-HSK-A063-14-120-1-0-A | 30273805  |
| 63    | 14,0           | 30,0           | 34,0           | 50,0           | -              | 150,0          | 46,0           | 10,0           | 105,0          | -              | M10x1 | MHC-HSK-A063-14-150-1-0-A | 30251148  |
| 63    | 14,0           | 30,0           | 34,0           | 50,0           | -              | 200,0          | 46,0           | 10,0           | 155,0          | -              | M10x1 | MHC-HSK-A063-14-200-1-0-A | 30251156  |
| 63    | 16,0           | 34,0           | 38,0           | 50,0           | -              | 90,0           | 49,0           | 10,0           | 46,0           | -              | M12x1 | MHC-HSK-A063-16-090-1-0-A | 30251019  |
| 63    | 16,0           | 34,0           | 38,0           | 50,0           | -              | 120,0          | 49,0           | 10,0           | 76,0           | -              | M12x1 | MHC-HSK-A063-16-120-1-0-A | 30273806  |
| 63    | 16,0           | 34,0           | 38,0           | 50,0           | -              | 150,0          | 49,0           | 10,0           | 106,0          | -              | M12x1 | MHC-HSK-A063-16-150-1-0-A | 30251149  |

## HydroChuck | as per DIN 69882-7 with axial tool length adjustment | HSK-A shank as per DIN 69893-1

| HSK-A | Dimensions     |                |                |                |                |                |                |                |                |                | G     | Specification             | Order no. |
|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|---------------------------|-----------|
|       | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | l <sub>5</sub> |       |                           |           |
| 63    | 16,0           | 34,0           | 38,0           | 50,0           | -              | 200,0          | 49,0           | 10,0           | 156,0          | -              | M12x1 | MHC-HSK-A063-16-200-1-0-A | 30251157  |
| 63    | 18,0           | 36,0           | 40,0           | 50,0           | -              | 90,0           | 49,0           | 10,0           | 47,0           | -              | M12x1 | MHC-HSK-A063-18-090-1-0-A | 30251020  |
| 63    | 18,0           | 36,0           | 40,0           | 50,0           | -              | 120,0          | 49,0           | 10,0           | 77,0           | -              | M12x1 | MHC-HSK-A063-18-120-1-0-A | 30273807  |
| 63    | 18,0           | 36,0           | 40,0           | 50,0           | -              | 150,0          | 49,0           | 10,0           | 107,0          | -              | M12x1 | MHC-HSK-A063-18-150-1-0-A | 30251150  |
| 63    | 18,0           | 36,0           | 40,0           | 50,0           | -              | 200,0          | 49,0           | 10,0           | 157,0          | -              | M12x1 | MHC-HSK-A063-18-200-1-0-A | 30251158  |
| 63    | 20,0           | 38,0           | 42,0           | 50,0           | -              | 90,0           | 51,0           | 10,0           | 48,0           | -              | M16x1 | MHC-HSK-A063-20-090-1-0-A | 30251021  |
| 63    | 20,0           | 38,0           | 42,0           | 50,0           | -              | 120,0          | 51,0           | 10,0           | 78,0           | -              | M16x1 | MHC-HSK-A063-20-120-1-0-A | 30273808  |
| 63    | 20,0           | 38,0           | 42,0           | 50,0           | -              | 150,0          | 51,0           | 10,0           | 108,0          | -              | M16x1 | MHC-HSK-A063-20-150-1-0-A | 30251151  |
| 63    | 20,0           | 38,0           | 42,0           | 50,0           | -              | 200,0          | 51,0           | 10,0           | 158,0          | -              | M16x1 | MHC-HSK-A063-20-200-1-0-A | 30251159  |
| 63    | 25,0           | 53,0           | 57,0           | 52,5           | -              | 120,0          | 57,0           | 10,0           | 63,0           | -              | M16x1 | MHC-HSK-A063-25-120-1-0-A | 30251022  |
| 63    | 25,0           | 53,0           | 57,0           | 52,5           | -              | 150,0          | 57,0           | 10,0           | 63,0           | -              | M16x1 | MHC-HSK-A063-25-150-1-0-A | 30785029  |
| 63    | 25,0           | 53,0           | 57,0           | 52,5           | -              | 200,0          | 57,0           | 10,0           | 63,0           | -              | M16x1 | MHC-HSK-A063-25-200-1-0-A | 30882168  |
| 63    | 32,0           | 59,0           | 63,0           | 59,0           | 52,5           | 125,0          | 61,0           | 10,0           | 61,0           | 77,0           | M16x1 | MHC-HSK-A063-32-125-1-0-A | 30251023  |
| 63    | 32,0           | 59,0           | 63,0           | 59,0           | 52,5           | 150,0          | 61,0           | 10,0           | 65,0           | 77,0           | M16x1 | MHC-HSK-A063-32-150-1-0-A | 30882169  |
| 63    | 32,0           | 59,0           | 63,0           | 59,0           | 52,2           | 200,0          | 61,0           | 10,0           | 65,0           | 77,0           | M16x1 | MHC-HSK-A063-32-200-1-0-A | 30882171  |
| 80    | 6,0            | 22,0           | 26,0           | 50,0           | -              | 70,0           | 37,0           | 10,0           | 24,0           | -              | M5    | MHC-HSK-A080-06-070-1-0-A | 30355067  |
| 80    | 8,0            | 24,0           | 28,0           | 50,0           | -              | 70,0           | 37,0           | 10,0           | 24,0           | -              | M6    | MHC-HSK-A080-08-070-1-0-A | 30355068  |
| 80    | 10,0           | 26,0           | 30,0           | 50,0           | -              | 80,0           | 41,0           | 10,0           | 35,0           | -              | M8x1  | MHC-HSK-A080-10-080-1-0-A | 30355069  |
| 80    | 12,0           | 28,0           | 32,0           | 50,0           | -              | 85,0           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-HSK-A080-12-085-1-0-A | 30355071  |
| 80    | 14,0           | 30,0           | 34,0           | 50,0           | -              | 85,0           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-HSK-A080-14-085-1-0-A | 30355072  |
| 80    | 16,0           | 34,0           | 38,0           | 50,0           | -              | 95,0           | 49,0           | 10,0           | 51,0           | -              | M12x1 | MHC-HSK-A080-16-095-1-0-A | 30355074  |
| 80    | 18,0           | 36,0           | 40,0           | 50,0           | -              | 95,0           | 49,0           | 10,0           | 51,0           | -              | M12x1 | MHC-HSK-A080-18-095-1-0-A | 30355075  |
| 80    | 20,0           | 38,0           | 42,0           | 50,0           | -              | 95,0           | 51,0           | 10,0           | 51,0           | -              | M16x1 | MHC-HSK-A080-20-095-1-0-A | 30355077  |
| 80    | 25,0           | 53,0           | 57,0           | 63,0           | -              | 110,0          | 57,0           | 10,0           | 65,0           | -              | M16x1 | MHC-HSK-A080-25-110-1-0-A | 30355078  |
| 80    | 32,0           | 59,0           | 63,0           | 66,5           | -              | 125,0          | 61,0           | 10,0           | 63,0           | -              | M16x1 | MHC-HSK-A080-32-125-1-0-A | 30355080  |
| 100   | 6,0            | 22,0           | 26,0           | 50,0           | -              | 75,0           | 37,0           | 10,0           | 26,0           | -              | M5    | MHC-HSK-A100-06-075-1-0-A | 30251024  |
| 100   | 6,0            | 22,0           | 26,0           | 50,0           | -              | 120,0          | 37,0           | 10,0           | 71,0           | -              | M5    | MHC-HSK-A100-06-120-1-0-A | 30273809  |
| 100   | 6,0            | 22,0           | 26,0           | 50,0           | -              | 165,0          | 37,0           | 10,0           | 116,0          | -              | M5    | MHC-HSK-A100-06-165-1-0-A | 30273810  |
| 100   | 8,0            | 24,0           | 28,0           | 50,0           | -              | 75,0           | 37,0           | 10,0           | 26,0           | -              | M6    | MHC-HSK-A100-08-075-1-0-A | 30251025  |
| 100   | 8,0            | 24,0           | 28,0           | 50,0           | -              | 120,0          | 37,0           | 10,0           | 71,0           | -              | M6    | MHC-HSK-A100-08-120-1-0-A | 30273811  |
| 100   | 8,0            | 24,0           | 28,0           | 50,0           | -              | 165,0          | 37,0           | 10,0           | 116,0          | -              | M6    | MHC-HSK-A100-08-165-1-0-A | 30273812  |
| 100   | 10,0           | 26,0           | 30,0           | 50,0           | -              | 90,0           | 41,0           | 10,0           | 42,0           | -              | M8x1  | MHC-HSK-A100-10-090-1-0-A | 30251026  |
| 100   | 10,0           | 26,0           | 30,0           | 50,0           | -              | 120,0          | 41,0           | 10,0           | 72,0           | -              | M8x1  | MHC-HSK-A100-10-120-1-0-A | 30273813  |
| 100   | 10,0           | 26,0           | 30,0           | 50,0           | -              | 165,0          | 41,0           | 10,0           | 117,0          | -              | M8x1  | MHC-HSK-A100-10-165-1-0-A | 30273814  |
| 100   | 12,0           | 28,0           | 32,0           | 50,0           | -              | 95,0           | 46,0           | 10,0           | 47,0           | -              | M10x1 | MHC-HSK-A100-12-095-1-0-A | 30251027  |
| 100   | 12,0           | 28,0           | 32,0           | 50,0           | -              | 120,0          | 46,0           | 10,0           | 72,0           | -              | M10x1 | MHC-HSK-A100-12-120-1-0-A | 30273816  |
| 100   | 12,0           | 28,0           | 32,0           | 50,0           | -              | 165,0          | 46,0           | 10,0           | 117,0          | -              | M10x1 | MHC-HSK-A100-12-165-1-0-A | 30273817  |
| 100   | 14,0           | 30,0           | 34,0           | 50,0           | -              | 95,0           | 46,0           | 10,0           | 47,0           | -              | M10x1 | MHC-HSK-A100-14-095-1-0-A | 30251028  |
| 100   | 16,0           | 34,0           | 38,0           | 50,0           | -              | 100,0          | 49,0           | 10,0           | 53,0           | -              | M12x1 | MHC-HSK-A100-16-100-1-0-A | 30251029  |
| 100   | 16,0           | 34,0           | 38,0           | 50,0           | -              | 135,0          | 49,0           | 10,0           | 88,0           | -              | M12x1 | MHC-HSK-A100-16-135-1-0-A | 30273818  |
| 100   | 16,0           | 34,0           | 38,0           | 50,0           | -              | 165,0          | 49,0           | 10,0           | 118,0          | -              | M12x1 | MHC-HSK-A100-16-165-1-0-A | 30273819  |
| 100   | 18,0           | 36,0           | 40,0           | 50,0           | -              | 100,0          | 49,0           | 10,0           | 53,0           | -              | M12x1 | MHC-HSK-A100-18-100-1-0-A | 30251030  |
| 100   | 20,0           | 38,0           | 42,0           | 50,0           | -              | 105,0          | 51,0           | 10,0           | 59,0           | -              | M16x1 | MHC-HSK-A100-20-105-1-0-A | 30251031  |
| 100   | 20,0           | 38,0           | 42,0           | 50,0           | -              | 135,0          | 51,0           | 10,0           | 89,0           | -              | M16x1 | MHC-HSK-A100-20-135-1-0-A | 30273820  |
| 100   | 20,0           | 38,0           | 42,0           | 50,0           | -              | 165,0          | 51,0           | 10,0           | 119,0          | -              | M16x1 | MHC-HSK-A100-20-165-1-0-A | 30273821  |
| 100   | 25,0           | 53,0           | 57,0           | 63,0           | -              | 110,0          | 57,0           | 10,0           | 62,0           | -              | M16x1 | MHC-HSK-A100-25-110-1-0-A | 30251032  |
| 100   | 25,0           | 53,0           | 57,0           | 63,0           | -              | 165,0          | 57,0           | 10,0           | 117,0          | -              | M16x1 | MHC-HSK-A100-25-165-1-0-A | 30882185  |
| 100   | 32,0           | 59,0           | 63,0           | 67,0           | -              | 110,0          | 61,0           | 10,0           | 62,0           | -              | M16x1 | MHC-HSK-A100-32-110-1-0-A | 30251033  |
| 100   | 32,0           | 59,0           | 63,0           | 67,0           | -              | 165,0          | 61,0           | 10,0           | 117,0          | -              | M16x1 | MHC-HSK-A100-32-165-1-0-A | 30882187  |

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without coolant tube.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD

(max. 50 mm) radial run-out accuracy 3 µm. When using cylindrical shanks with an inclined clamping surface (form E and form HE), the accuracy may be impaired.

Note: Coolant supply via central through hole. Coolant tubes, code carriers, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

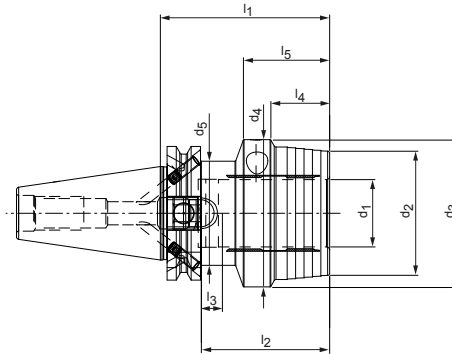
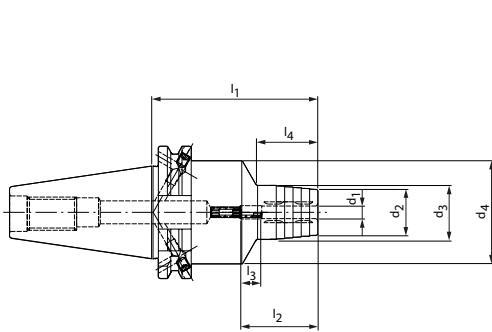
Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# HydroChuck

With axial tool length adjustment

SK shank according to ISO 7388-1 Form AD/AF



| Steep taper | Dimensions     |                |                |                |                |                |                |                |                |                | G     | Specification          | Order no. |
|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|------------------------|-----------|
|             | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> | l <sub>5</sub> |       |                        |           |
| 30*         | 6,0            | 23,0           | 26,0           | 44,5           | -              | 55,0           | 37,0           | 10,0           | 20,0           | -              | M5    | MHC-SK030-06-055-1-0-A | 30559118  |
| 30*         | 8,0            | 24,0           | 28,0           | 44,5           | -              | 55,0           | 37,0           | 10,0           | 20,0           | -              | M6    | MHC-SK030-08-055-1-0-A | 30559119  |
| 30*         | 10,0           | 27,0           | 30,0           | 44,5           | -              | 55,0           | 41,0           | 10,0           | 21,0           | -              | M8x1  | MHC-SK030-10-055-1-0-A | 30559120  |
| 30*         | 12,0           | 28,0           | 32,0           | 44,5           | -              | 55,0           | 46,0           | 10,0           | 22,0           | -              | M8x1  | MHC-SK030-12-055-1-0-A | 30559121  |
| 30*         | 14,0           | 30,0           | 34,0           | 44,5           | -              | 90,0           | 46,0           | 10,0           | 42,0           | -              | M8x1  | MHC-SK030-14-090-1-0-A | 30559122  |
| 30*         | 16,0           | 34,0           | 38,0           | 44,5           | -              | 90,0           | 49,0           | 10,0           | 50,0           | -              | M8x1  | MHC-SK030-16-090-1-0-A | 30559123  |
| 30*         | 18,0           | 36,0           | 40,0           | 44,5           | -              | 90,0           | 49,0           | 10,0           | 50,0           | -              | M8x1  | MHC-SK030-18-090-1-0-A | 30559124  |
| 30*         | 20,0           | 38,0           | 42,0           | 44,5           | -              | 90,0           | 51,0           | 10,0           | 50,0           | -              | M8x1  | MHC-SK030-20-090-1-0-A | 30559125  |
| 40          | 6,0            | 22,0           | 26,0           | 49,5           | -              | 80,5           | 37,0           | 10,0           | 29,5           | -              | M5    | MHC-SK040-06-081-3-0-A | 30250958  |
| 40          | 8,0            | 24,0           | 28,0           | 49,5           | -              | 80,5           | 37,0           | 10,0           | 30,0           | -              | M6    | MHC-SK040-08-081-3-0-A | 30250959  |
| 40          | 10,0           | 26,0           | 30,0           | 49,5           | -              | 80,5           | 41,0           | 10,0           | 35,0           | -              | M8x1  | MHC-SK040-10-081-3-0-A | 30250960  |
| 40          | 12,0           | 28,0           | 32,0           | 49,5           | -              | 80,5           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-SK040-12-081-3-0-A | 30250961  |
| 40          | 14,0           | 30,0           | 34,0           | 49,5           | -              | 80,5           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-SK040-14-081-3-0-A | 30250962  |
| 40          | 16,0           | 34,0           | 38,0           | 49,5           | -              | 80,5           | 49,0           | 10,0           | 45,0           | -              | M12x1 | MHC-SK040-16-081-3-0-A | 30250963  |
| 40          | 18,0           | 36,0           | 40,0           | 49,5           | -              | 80,5           | 49,0           | 10,0           | 46,0           | -              | M12x1 | MHC-SK040-18-081-3-0-A | 30250964  |
| 40          | 20,0           | 38,0           | 42,0           | 49,5           | -              | 80,5           | 51,0           | 10,0           | 47,0           | -              | M16x1 | MHC-SK040-20-081-3-0-A | 30250965  |
| 40          | 25,0           | 51,0           | 55,0           | 63,0           | 49,5           | 80,5           | 57,0           | 10,0           | 28,0           | 42,0           | M16x1 | MHC-SK040-25-081-3-0-A | 30250966  |
| 40          | 32,0           | 59,0           | 63,0           | 70,0           | 49,5           | 80,5           | 61,0           | 10,0           | 20,0           | 41,0           | M16x1 | MHC-SK040-32-081-3-0-A | 30250967  |
| 50          | 6,0            | 22,0           | 26,0           | 49,5           | -              | 80,5           | 37,0           | 10,0           | 29,5           | -              | M5    | MHC-SK050-06-081-3-0-A | 30250968  |
| 50          | 8,0            | 24,0           | 28,0           | 49,5           | -              | 80,5           | 37,0           | 10,0           | 30,0           | -              | M6    | MHC-SK050-08-081-3-0-A | 30250969  |
| 50          | 10,0           | 26,0           | 30,0           | 49,5           | -              | 80,5           | 41,0           | 10,0           | 35,0           | -              | M8x1  | MHC-SK050-10-081-3-0-A | 30250970  |
| 50          | 12,0           | 28,0           | 32,0           | 49,5           | -              | 80,5           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-SK050-12-081-3-0-A | 30250971  |
| 50          | 14,0           | 30,0           | 34,0           | 49,5           | -              | 80,5           | 46,0           | 10,0           | 40,0           | -              | M10x1 | MHC-SK050-14-081-3-0-A | 30250972  |
| 50          | 16,0           | 34,0           | 38,0           | 49,5           | -              | 80,5           | 49,0           | 10,0           | 45,0           | -              | M12x1 | MHC-SK050-16-081-3-0-A | 30250973  |
| 50          | 18,0           | 36,0           | 40,0           | 49,5           | -              | 80,5           | 49,0           | 10,0           | 46,0           | -              | M12x1 | MHC-SK050-18-081-3-0-A | 30250974  |
| 50          | 20,0           | 38,0           | 42,0           | 49,5           | -              | 80,5           | 51,0           | 10,0           | 42,0           | -              | M16x1 | MHC-SK050-20-081-3-0-A | 30250975  |
| 50          | 25,0           | 51,0           | 55,0           | 63,0           | -              | 100,0          | 57,0           | 10,0           | 48,0           | -              | M16x1 | MHC-SK050-25-100-3-0-A | 30250976  |
| 50          | 32,0           | 59,0           | 63,0           | 70,0           | -              | 100,0          | 61,0           | 10,0           | 61,0           | -              | M16x1 | MHC-SK050-32-100-3-0-A | 30250977  |

\* Design: Taper shank size is not available in the AD/AF combination design

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without pull stud.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD (max. 50 mm) radial run-out accuracy 3 µm. When using cylindrical shanks with an in-

clined clamping surface (form E and form HE), the accuracy may be impaired. Basic setting Form AD, if Form AF is required, please specify this when placing your order.

Note: Coolant supply via central through hole. Pull stud, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

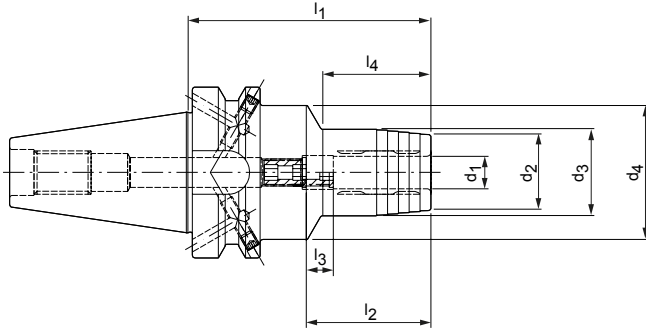
Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# HydroChuck

With axial tool length adjustment

Shank BT according to ISO 7388-2 Form JD/JF (JIS B 6339)



| BT  | Dimensions     |                |                |                |                |                |                |                | G     | Specification          | Order no. |
|-----|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|------------------------|-----------|
|     | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>4</sub> |       |                        |           |
| 30* | 6,0            | 23,0           | 26,0           | 45,0           | 50,8           | 37,0           | 10,0           | 12,3           | M5    | MHC-BT030-06-051-1-0-A | 30270438  |
| 30* | 8,0            | 25,0           | 28,0           | 45,0           | 50,8           | 37,0           | 10,0           | 12,5           | M6    | MHC-BT030-08-051-1-0-A | 30270439  |
| 30* | 10,0           | 27,0           | 30,0           | 45,0           | 50,8           | 41,0           | 10,0           | 13,0           | M8x1  | MHC-BT030-10-051-1-0-A | 30270440  |
| 30* | 12,0           | 29,0           | 32,0           | 45,0           | 50,8           | 46,0           | 10,0           | 14,0           | M8x1  | MHC-BT030-12-051-1-0-A | 30270441  |
| 30* | 14,0           | 30,0           | 34,0           | 45,0           | 90,0           | 46,0           | 10,0           | 45,0           | M8x1  | MHC-BT030-14-090-1-0-A | 30270442  |
| 30* | 16,0           | 34,0           | 38,0           | 45,0           | 90,0           | 49,0           | 10,0           | 50,0           | M8x1  | MHC-BT030-16-090-1-0-A | 30270443  |
| 30* | 18,0           | 36,0           | 40,0           | 45,0           | 90,0           | 49,0           | 10,0           | 50,0           | M8x1  | MHC-BT030-18-090-1-0-A | 30270444  |
| 30* | 20,0           | 38,0           | 42,0           | 45,0           | 90,0           | 51,0           | 10,0           | 50,0           | M8x1  | MHC-BT030-20-090-1-0-A | 30270445  |
| 40  | 6,0            | 22,0           | 26,0           | 49,5           | 90,0           | 37,0           | 10,0           | 29,0           | M5    | MHC-BT040-06-090-3-0-A | 30251037  |
| 40  | 8,0            | 24,0           | 28,0           | 49,5           | 90,0           | 37,0           | 10,0           | 30,0           | M6    | MHC-BT040-08-090-3-0-A | 30251038  |
| 40  | 10,0           | 26,0           | 30,0           | 49,5           | 90,0           | 41,0           | 10,0           | 35,0           | M8x1  | MHC-BT040-10-090-3-0-A | 30251039  |
| 40  | 12,0           | 28,0           | 32,0           | 49,5           | 90,0           | 46,0           | 10,0           | 40,0           | M10x1 | MHC-BT040-12-090-3-0-A | 30251040  |
| 40  | 14,0           | 30,0           | 34,0           | 49,5           | 90,0           | 46,0           | 10,0           | 40,0           | M10x1 | MHC-BT040-14-090-3-0-A | 30251041  |
| 40  | 16,0           | 34,0           | 38,0           | 49,5           | 90,0           | 49,0           | 10,0           | 45,0           | M12x1 | MHC-BT040-16-090-3-0-A | 30251042  |
| 40  | 18,0           | 36,0           | 40,0           | 49,5           | 90,0           | 49,0           | 10,0           | 46,0           | M12x1 | MHC-BT040-18-090-3-0-A | 30251043  |
| 40  | 20,0           | 38,0           | 42,0           | 49,5           | 90,0           | 51,0           | 10,0           | 47,0           | M16x1 | MHC-BT040-20-090-3-0-A | 30251044  |
| 40  | 25,0           | 51,0           | 55,0           | 52,0           | 90,0           | 57,0           | 10,0           | 50,0           | M16x1 | MHC-BT040-25-090-3-0-A | 30251045  |
| 40  | 32,0           | 59,0           | 63,0           | 62,0           | 90,0           | 61,0           | 10,0           | 48,0           | M16x1 | MHC-BT040-32-090-3-0-A | 30251046  |
| 50  | 6,0            | 22,0           | 26,0           | 49,5           | 90,0           | 37,0           | 10,0           | 29,0           | M5    | MHC-BT050-06-090-3-0-A | 30251047  |
| 50  | 8,0            | 24,0           | 28,0           | 49,5           | 90,0           | 37,0           | 10,0           | 30,0           | M6    | MHC-BT050-08-090-3-0-A | 30251048  |
| 50  | 10,0           | 26,0           | 30,0           | 49,5           | 90,0           | 41,0           | 10,0           | 34,0           | M8x1  | MHC-BT050-10-090-3-0-A | 30251049  |
| 50  | 12,0           | 28,0           | 32,0           | 49,5           | 90,0           | 46,0           | 10,0           | 34,0           | M10x1 | MHC-BT050-12-090-3-0-A | 30251050  |
| 50  | 14,0           | 30,0           | 34,0           | 49,5           | 90,0           | 46,0           | 10,0           | 35,0           | M10x1 | MHC-BT050-14-090-3-0-A | 30251051  |
| 50  | 16,0           | 34,0           | 38,0           | 49,5           | 90,0           | 49,0           | 10,0           | 35,0           | M12x1 | MHC-BT050-16-090-3-0-A | 30251052  |
| 50  | 18,0           | 36,0           | 40,0           | 49,5           | 90,0           | 49,0           | 10,0           | 35,0           | M12x1 | MHC-BT050-18-090-3-0-A | 30251053  |
| 50  | 20,0           | 38,0           | 42,0           | 49,5           | 90,0           | 51,0           | 10,0           | 35,0           | M16x1 | MHC-BT050-20-090-3-0-A | 30251054  |
| 50  | 25,0           | 51,0           | 55,0           | 63,0           | 110,0          | 57,0           | 10,0           | 48,0           | M16x1 | MHC-BT050-25-110-3-0-A | 30251055  |
| 50  | 32,0           | 59,0           | 63,0           | 70,0           | 110,0          | 61,0           | 10,0           | 50,0           | M16x1 | MHC-BT050-32-110-3-0-A | 30251056  |

\* Design: Taper shank size is not available in the JD/JF combination design

Dimensions in mm.

Additional dimensions available upon request.

Use: For clamping tools with smooth cylindrical shanks according to DIN 1835 form A, DIN 6535 form HA as well as with recesses according to DIN 1835 form B, E and DIN 6535 form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Scope of delivery: With length adjustment screw, without pull stud.

Design: Highest tool life and production quality when using smooth cylindrical shanks according to DIN 1835 form A and DIN 6535 form HA. With a projection length of 2.5xD (max. 50 mm) radial run-out accuracy 3 µm. When using cylindrical shanks with an in-

clined clamping surface (form E and form HE), the accuracy may be impaired. Basic setting Form JD; if Form JF is required, please state with the order.

Note: Coolant supply via central through hole. Pull stud, reducing sleeves for reducing the clamping diameter (if the reducing sleeve is used, the accuracy may be impaired), see "CLAMPING" catalogue.

Length adjustment screws available on request.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.



# Mill Chuck, HB

## Side lock chuck for high-performance milling operations

The new side lock chuck from MAPAL impresses with its strong clamping ability, easy handling and significantly improved radial run-out. The location bore is created with significantly more precision than before. This reduces the radial play of the clamped tool and considerably improves the radial run-out. The large tolerance on the lateral clamping surface is also compensated for.

To achieve this, MAPAL uses a spring element in the connection that enables a defined form fit between the tool and connection. Coolant channels parallel to the axis in the clamping range also ensure an improved coolant supply.

A two-part clamping element is used to considerably simplify handling. This reduces the tightening torque while maintaining the same clamping force, allowing the tool to be clamped in the connection with manual force in a process-reliable manner.

### AT A GLANCE

- Significantly fewer location bores
- Available with clamping diameters from 6 to 32 mm for hollow shank taper form A (HSK-A) and steep taper (SK)
- Balancing quality of G 2.5 at 25,000 rpm
- Can be easily combined with MAPAL high performance milling cutters

### ADVANTAGES

- Easy to handle thanks to use of a differential screw
- Maximum cost-effectiveness and precision
- Axial tool positioning can be defined using a spring system
- Decentralised coolant outlets for maximum process reliability



# MillChuck, HB

## Mill chuck for high-performance milling operations

The Mill Chuck, HB impresses with its strong clamping ability, easy handling and significantly improved radial run-out. It is the perfect solution for machining with high pull-out forces and applications with material that is difficult to machine.

### 1 Decentralised coolant delivery

- Optimal coolant supply

### 2 Differential screw

- Simple handling with reduced force requirements

### 3 Spring system

- Defined axial tool positioning (no tool pull-out)

### 4 Contour

- Application-optimised contour for maximum rigidity

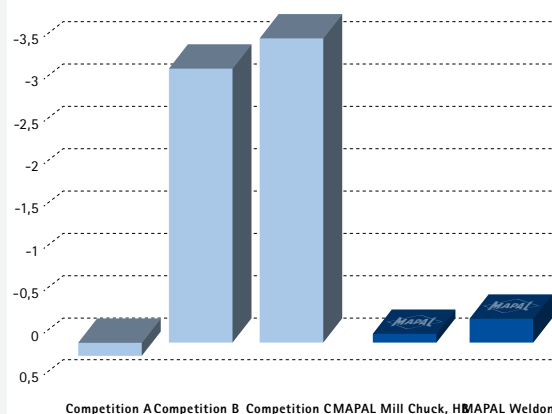


## Features

### Dimensions:

- Significantly more accurate location bore
- Easy to handle with reduced force requirements thanks to differential screw
- Axial tool positioning can be defined using a spring system (no tool pull-out)
- The best solution for machining with high pull-out forces (trochoidal milling)
- Currently available for HSK-A063/100 and SK040/050

## Milling cutter pull-out [mm]



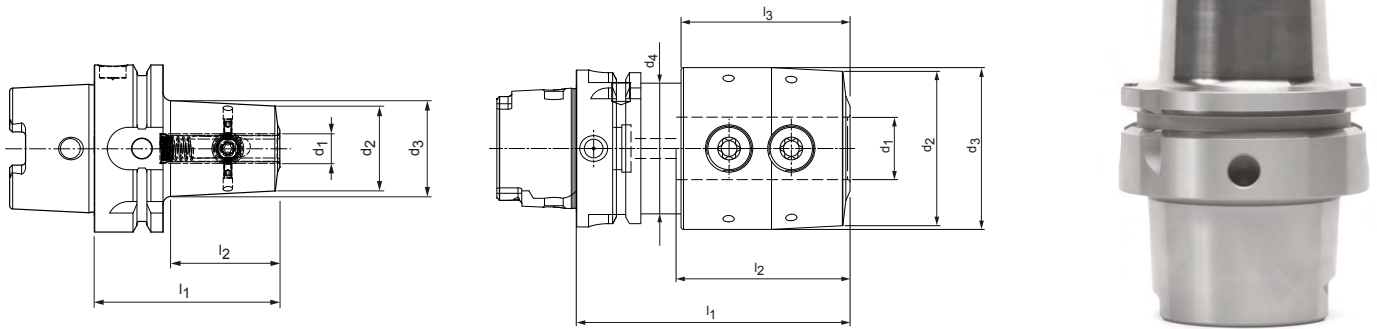
Material: K720 1.2872 90MnCrV8  
Milling cutter: OptiMill-Uni-HPC-Plus  
Shank ø: 20.00 mm

### Dry machining: Groove milling

$v_c$ : 120 m/min  
 $f_z$ : 0.1 mm  
 $a_p$ : 30 mm  
 $a_e$ : 20 mm

# MillChuck, HB

HSK-A (hollow shank taper form A) shank according to DIN 69893-1



| HSK-A | Dimensions     |                |                |                |                |                |                | Specification             | Order no. |
|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------------------|-----------|
|       | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                           |           |
| 63    | 6,0            | 22,5           | 26,2           | -              | 65,0           | 36,2           | -              | MWC-HSK-A063-06-065-1-0-W | 30941344  |
| 63    | 8,0            | 25,0           | 28,7           | -              | 65,0           | 36,2           | -              | MWC-HSK-A063-08-065-1-0-W | 30941345  |
| 63    | 10,0           | 32,0           | 36,2           | -              | 70,0           | 41,2           | -              | MWC-HSK-A063-10-070-1-0-W | 30941346  |
| 63    | 12,0           | 37,5           | 42,7           | -              | 80,0           | 51,2           | -              | MWC-HSK-A063-12-080-1-0-W | 30941347  |
| 63    | 16,0           | 43,0           | 48,3           | -              | 80,0           | 52,2           | -              | MWC-HSK-A063-16-080-1-0-W | 30941349  |
| 63    | 20,0           | 46,5           | 52,0           | -              | 80,0           | 54,0           | -              | MWC-HSK-A063-20-080-1-0-W | 30941371  |
| 63    | 25,0           | 62,0           | 65,0           | 52,5           | 110,0          | 69,9           | 68,0           | MWC-HSK-A063-25-110-1-0-W | 30941372  |
| 63    | 32,0           | 69,0           | 72,0           | 52,5           | 110,0          | 69,9           | 68,0           | MWC-HSK-A063-32-110-1-0-W | 30941373  |
| 100   | 6,0            | 22,5           | 27,5           | -              | 80,0           | 48,2           | -              | MWC-HSK-A100-06-080-1-0-W | 30941374  |
| 100   | 8,0            | 25,0           | 30,0           | -              | 80,0           | 48,2           | -              | MWC-HSK-A100-08-080-1-0-W | 30941375  |
| 100   | 10,0           | 32,0           | 36,9           | -              | 80,0           | 48,2           | -              | MWC-HSK-A100-10-080-1-0-W | 30941376  |
| 100   | 12,0           | 37,5           | 42,9           | -              | 85,0           | 53,2           | -              | MWC-HSK-A100-12-085-1-0-W | 30941377  |
| 100   | 16,0           | 43,0           | 50,0           | -              | 100,0          | 68,2           | -              | MWC-HSK-A100-16-100-1-0-W | 30941379  |
| 100   | 20,0           | 46,5           | 53,5           | -              | 100,0          | 68,2           | -              | MWC-HSK-A100-20-100-1-0-W | 30941381  |
| 100   | 25,0           | 62,0           | 65,0           | -              | 100,0          | 68,1           | -              | MWC-HSK-A100-25-100-1-0-W | 30941382  |
| 100   | 32,0           | 69,0           | 72,0           | -              | 110,0          | 78,1           | -              | MWC-HSK-A100-32-110-1-0-W | 30925430  |

Dimensions in mm.

Additional dimensions available upon request.

Use: For connecting milling cutters with cylindrical shank and lateral drive area according to DIN 1835 Form B and DIN 6535 Form HB.

Scope of delivery: With built-in clamping screw, without coolant tube.

Design: Permissible run-out variation of the taper to the location bore d<sub>1</sub> = 3 µm.

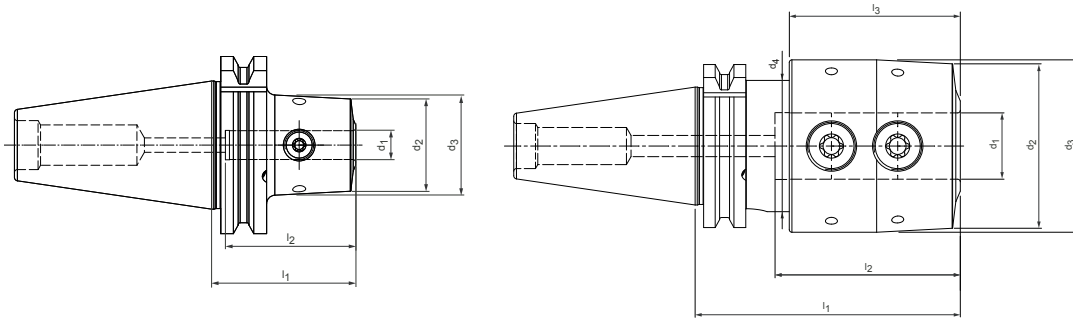
The bore tolerance is much more restricted than DIN 1835 in order to achieve machining accuracies of the highest quality.

Note: There are two clamping screws from clamping diameter d<sub>1</sub> = 25 mm.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# MillChuck, HB

SK shank according to ISO 7388-1 Form AD/AF



| Steep taper | Dimensions     |                |                |                |                |                |                | Specification          | Order no. |
|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------|-----------|
|             | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                        |           |
| 40          | 6,0            | 22,5           | 25,4           | -              | 50,0           | 28,1           | -              | MWC-SK040-06-050-3-0-W | 31059420  |
| 40          | 8,0            | 25,0           | 27,9           | -              | 50,0           | 28,1           | -              | MWC-SK040-08-050-3-0-W | 31059421  |
| 40          | 10,0           | 32,0           | 34,8           | -              | 50,0           | 28,1           | -              | MWC-SK040-10-050-3-0-W | 31059422  |
| 40          | 12,0           | 37,5           | 40,3           | -              | 50,0           | 28,1           | -              | MWC-SK040-12-050-3-0-W | 31059423  |
| 40          | 16,0           | 43,0           | 47,3           | -              | 63,0           | 43,0           | -              | MWC-SK040-16-063-3-0-W | 31059425  |
| 40          | 20,0           | 46,5           | 49,5           | -              | 63,0           | 43,0           | -              | MWC-SK040-20-063-3-0-W | 31059427  |
| 40          | 25,0           | 62,0           | 65,0           | 49,5           | 100,0          | 69,9           | 64,5           | MWC-SK040-25-100-3-0-W | 31059428  |
| 40          | 32,0           | 69,0           | 72,0           | 49,5           | 100,0          | 69,9           | 64,5           | MWC-SK040-32-100-3-0-W | 31059429  |
| 50          | 6,0            | 22,5           | 26,7           | -              | 63,0           | 41,1           | -              | MWC-SK050-06-063-3-0-W | 31059430  |
| 50          | 8,0            | 25,0           | 29,2           | -              | 63,0           | 41,1           | -              | MWC-SK050-08-063-3-0-W | 31059431  |
| 50          | 10,0           | 32,0           | 36,2           | -              | 63,0           | 41,1           | -              | MWC-SK050-10-063-3-0-W | 31059432  |
| 50          | 12,0           | 37,5           | 41,7           | -              | 63,0           | 41,1           | -              | MWC-SK050-12-063-3-0-W | 31059433  |
| 50          | 16,0           | 43,0           | 47,1           | -              | 63,0           | 41,1           | -              | MWC-SK050-16-063-3-0-W | 31059435  |
| 50          | 20,0           | 46,5           | 50,6           | -              | 63,0           | 41,1           | -              | MWC-SK050-20-063-3-0-W | 31059437  |
| 50          | 25,0           | 62,0           | 67,8           | -              | 80,0           | 58,1           | -              | MWC-SK050-25-080-3-0-W | 31059438  |
| 50          | 32,0           | 69,0           | 76,9           | -              | 100,0          | 78,1           | -              | MWC-SK050-32-100-3-0-W | 31059439  |

Dimensions in mm.

Additional dimensions available upon request.

Use: For connecting milling cutters with cylindrical shank and lateral drive area according to DIN 1835 Form B and DIN 6535 Form HB.

Scope of delivery: Built-in clamping screw, does not include pull stud.

Design: Permissible run-out variation of the taper to the location bore d<sub>1</sub> = 3 µm. The bore

tolerance is much more restricted than DIN 1835 in order to achieve machining accuracies of the highest quality.

Note: There are two clamping screws from clamping diameter d<sub>1</sub> = 25 mm.

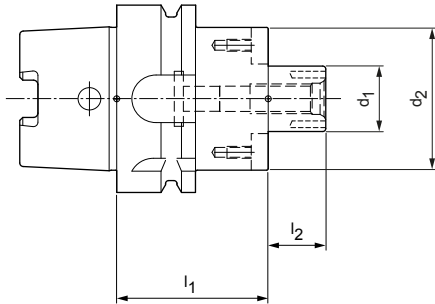
Balancing quality: G 2.5 with 25,000 rpm in delivery status.

# Milling cutter arbor

Mechanical tool clamping

With enlarged face connection diameter according to DIN 69882-3

HSK-A (hollow shank taper form A) shank according to DIN 69893-1



HSK-A (hollow shank taper form A) shank with decentralised coolant delivery

| HSK-A | Dimensions |       |       |       | G   | Specification             | Order no. |
|-------|------------|-------|-------|-------|-----|---------------------------|-----------|
|       | $d_1$      | $d_2$ | $l_1$ | $l_2$ |     |                           |           |
| 63    | 16         | 38    | 50    | 17    | M8  | MCA-HSK-A063-16-050-1-0-W | 31312171  |
| 63    | 16         | 38    | 100   | 17    | M8  | MCA-HSK-A063-16-100-1-0-W | 31312176  |
| 63    | 16         | 38    | 160   | 17    | M8  | MCA-HSK-A063-16-160-1-0-W | 31312191  |
| 63    | 22         | 48    | 50    | 19    | M10 | MCA-HSK-A063-22-050-1-0-W | 31312172  |
| 63    | 22         | 48    | 100   | 19    | M10 | MCA-HSK-A063-22-100-1-0-W | 31312177  |
| 63    | 22         | 48    | 160   | 19    | M10 | MCA-HSK-A063-22-160-1-0-W | 31312192  |
| 63    | 27         | 60    | 60    | 21    | M12 | MCA-HSK-A063-27-060-1-0-W | 31312173  |
| 63    | 27         | 60    | 100   | 21    | M12 | MCA-HSK-A063-27-100-1-0-W | 31312178  |
| 63    | 27         | 60    | 160   | 21    | M12 | MCA-HSK-A063-27-160-1-0-W | 31312193  |
| 63    | 32         | 78    | 60    | 24    | M16 | MCA-HSK-A063-32-060-1-0-W | 31312174  |
| 63    | 32         | 78    | 100   | 24    | M16 | MCA-HSK-A063-32-100-1-0-W | 31312179  |
| 63    | 32         | 78    | 160   | 24    | M16 | MCA-HSK-A063-32-160-1-0-W | 31312194  |
| 63    | 40         | 89    | 60    | 27    | M20 | MCA-HSK-A063-40-060-1-0-W | 31312175  |
| 63    | 40         | 89    | 100   | 27    | M20 | MCA-HSK-A063-40-100-1-0-W | 31312190  |
| 100   | 16         | 38    | 50    | 17    | M8  | MCA-HSK-A100-16-050-1-0-W | 31312195  |
| 100   | 16         | 38    | 100   | 17    | M8  | MCA-HSK-A100-16-100-1-0-W | 31312200  |
| 100   | 16         | 38    | 160   | 17    | M8  | MCA-HSK-A100-16-160-1-0-W | 31312205  |
| 100   | 22         | 48    | 50    | 19    | M10 | MCA-HSK-A100-22-050-1-0-W | 31312196  |
| 100   | 22         | 48    | 100   | 19    | M10 | MCA-HSK-A100-22-100-1-0-W | 31312201  |
| 100   | 22         | 48    | 160   | 19    | M10 | MCA-HSK-A100-22-160-1-0-W | 31312206  |
| 100   | 27         | 60    | 50    | 21    | M12 | MCA-HSK-A100-27-050-1-0-W | 31312197  |
| 100   | 27         | 60    | 100   | 21    | M12 | MCA-HSK-A100-27-100-1-0-W | 31312202  |
| 100   | 27         | 60    | 160   | 21    | M12 | MCA-HSK-A100-27-160-1-0-W | 31312207  |
| 100   | 32         | 78    | 50    | 24    | M16 | MCA-HSK-A100-32-050-1-0-W | 31312198  |
| 100   | 32         | 78    | 100   | 24    | M16 | MCA-HSK-A100-32-100-1-0-W | 31312203  |
| 100   | 32         | 78    | 160   | 24    | M16 | MCA-HSK-A100-32-160-1-0-W | 31312208  |
| 100   | 40         | 89    | 60    | 27    | M20 | MCA-HSK-A100-40-060-1-0-W | 31312199  |
| 100   | 40         | 89    | 100   | 27    | M20 | MCA-HSK-A100-40-100-1-0-W | 31312204  |
| 100   | 40         | 89    | 160   | 27    | M20 | MCA-HSK-A100-40-160-1-0-W | 31312209  |
| 100   | 60         | 140   | 70    | 40    | M30 | MCA-HSK-A100-60-070-1-0-W | 31354755  |

Dimensions in mm.

Additional dimensions available upon request.

Scope of delivery: With screwed-on key blocks and milling cutter clamping screw according to DIN 6367. Without coolant tube.

Design: Permissible run-out variation on the taper in relation to the arbor diameter  $d_1 = 6 \mu\text{m}$ .

Note: Milling cutter clamping screw supplied without internal cooling. Coolant tubes and assembly tool, see "CLAMPING" catalogue.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

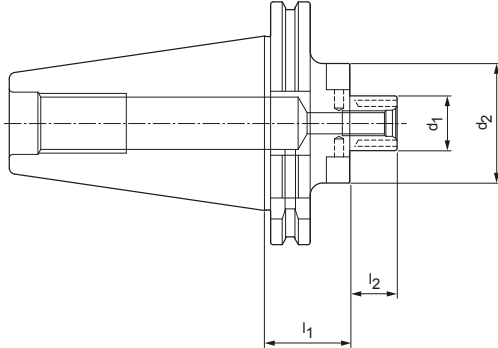


# Milling cutter arbor

Mechanical tool clamping

With enlarged face connection diameter according to DIN 69882-3

SK shank according to ISO 7388-1 Form AD/AF



SK shank with decentralised coolant delivery

| Steep taper | Dimensions |       |       |       | G   | Specification          | Order no. |
|-------------|------------|-------|-------|-------|-----|------------------------|-----------|
|             | $d_1$      | $d_2$ | $l_1$ | $l_2$ |     |                        |           |
| 40          | 16         | 38    | 35    | 17    | M8  | MCA-SK040-16-035-3-0-W | 31369046  |
| 40          | 22         | 48    | 35    | 19    | M10 | MCA-SK040-22-035-3-0-W | 31369047  |
| 40          | 27         | 50    | 35    | 21    | M12 | MCA-SK040-27-035-3-0-W | 31369048  |
| 50          | 22         | 48    | 35    | 19    | M10 | MCA-SK050-22-035-3-0-W | 31312229  |
| 50          | 22         | 48    | 100   | 19    | M10 | MCA-SK050-22-100-3-0-W | 31312233  |
| 50          | 22         | 48    | 160   | 19    | M10 | MCA-SK050-22-160-3-0-W | 31312237  |
| 50          | 27         | 60    | 35    | 21    | M12 | MCA-SK050-27-035-3-0-W | 31312230  |
| 50          | 27         | 60    | 100   | 21    | M12 | MCA-SK050-27-100-3-0-W | 31312234  |
| 50          | 27         | 60    | 160   | 21    | M12 | MCA-SK050-27-160-3-0-W | 31312238  |
| 50          | 32         | 78    | 35    | 24    | M16 | MCA-SK050-32-035-3-0-W | 31312231  |
| 50          | 32         | 78    | 100   | 24    | M16 | MCA-SK050-32-100-3-0-W | 31312235  |
| 50          | 32         | 78    | 160   | 24    | M16 | MCA-SK050-32-160-3-0-W | 31312239  |
| 50          | 40         | 89    | 50    | 27    | M20 | MCA-SK050-40-050-3-0-W | 31312232  |
| 50          | 40         | 89    | 100   | 27    | M20 | MCA-SK050-40-100-3-0-W | 31312236  |
| 50          | 40         | 89    | 160   | 27    | M20 | MCA-SK050-40-160-3-0-W | 31312240  |

Dimensions in mm.

Additional dimensions available upon request.

Scope of delivery: With screwed-on key blocks and milling cutter clamping screw according to DIN 6367. Without pull stud.

Design: Permissible run-out variation on the taper in relation to the arbor diameter  $d_1 = 6$

$\mu\text{m}$ . Basic setting Form AD, if Form AF is required, please specify this when placing your order.

Note: Milling cutter clamping screw supplied without internal cooling. Coolant tubes and assembly tool, see "CLAMPING" catalogue.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

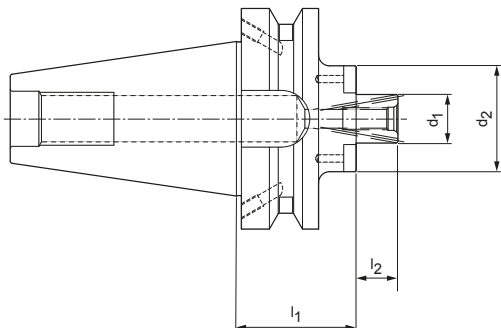


## Milling cutter arbor

Mechanical tool clamping

With enlarged face connection diameter according to DIN 69882-3

Shank BT according to ISO 7388-2 Form JD/JF (JIS B 6339)



**BT (steep taper) shank with decentralised coolant delivery**

| BT | Dimensions |       |       |       | G   | Specification          | Order no. |
|----|------------|-------|-------|-------|-----|------------------------|-----------|
|    | $d_1$      | $d_2$ | $l_1$ | $l_2$ |     |                        |           |
| 50 | 22         | 48    | 55    | 19    | M8  | MCA-BT050-22-055-3-0-W | 31312241  |
| 50 | 22         | 48    | 100   | 19    | M8  | MCA-BT050-22-100-3-0-W | 31312245  |
| 50 | 27         | 60    | 55    | 21    | M10 | MCA-BT050-27-055-3-0-W | 31312242  |
| 50 | 27         | 60    | 100   | 21    | M10 | MCA-BT050-27-100-3-0-W | 31312246  |
| 50 | 32         | 78    | 55    | 24    | M12 | MCA-BT050-32-055-3-0-W | 31312243  |
| 50 | 32         | 78    | 100   | 24    | M12 | MCA-BT050-32-100-3-0-W | 31312247  |
| 50 | 40         | 89    | 55    | 27    | M16 | MCA-BT050-40-055-3-0-W | 31312244  |

Dimensions in mm.

Additional dimensions available upon request.

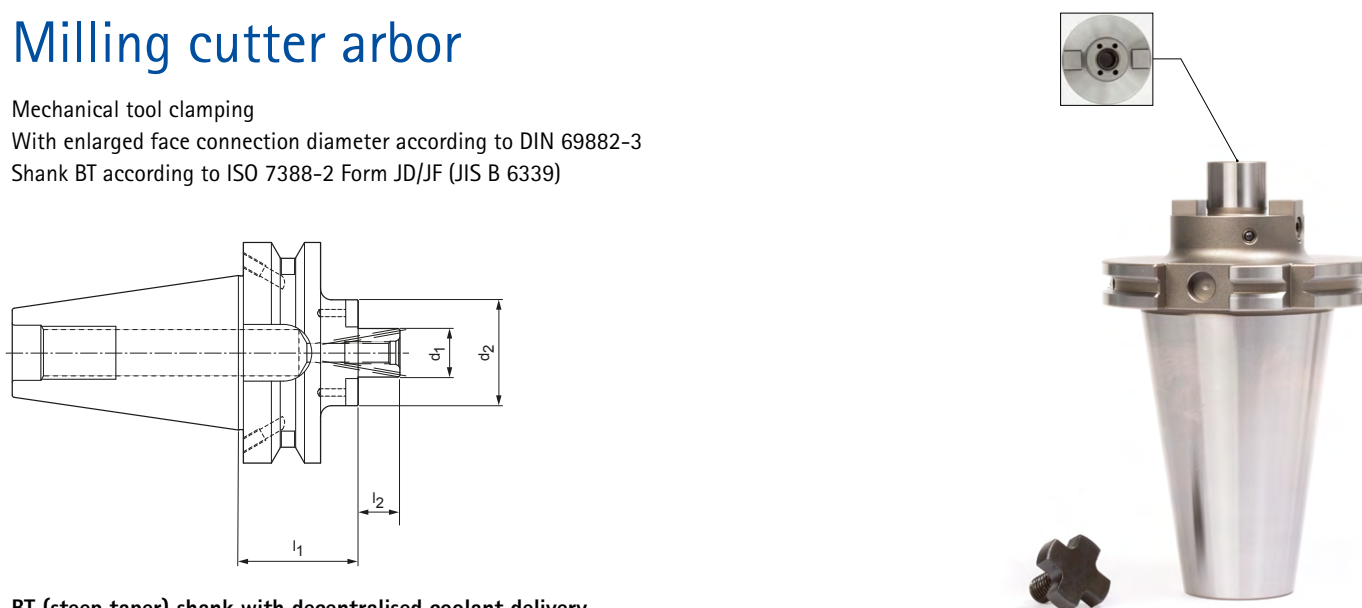
Scope of delivery: With screwed-on key blocks and milling cutter clamping screw according to DIN 6367. Without pull stud.

Design: Permissible run-out variation on the taper in relation to the arbor diameter  $d_1 = 6$

$\mu\text{m}$ . Basic setting Form JD; if Form JF is required, please state with the order.

Note: Milling cutter clamping screw supplied without internal cooling. Coolant tubes and assembly tool, see "CLAMPING" catalogue.

Balancing quality: G 2.5 with 25,000 rpm in delivery status.

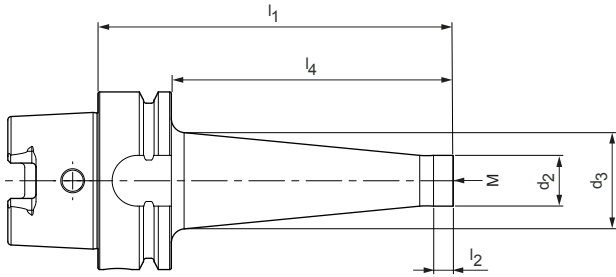


# MFS milling head holder

Mechanical tool clamping

For screw-in milling cutter, made from steel

HSK-A (hollow shank taper form A) shank according to DIN 69893-1



| HSK-A | Dimensions |                |                |                |                |                | Weight [kg] | Specification              | Order no. |
|-------|------------|----------------|----------------|----------------|----------------|----------------|-------------|----------------------------|-----------|
|       | M          | d <sub>2</sub> | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>4</sub> |             |                            |           |
| 63    | 8          | 14             | 23             | 76             | 12             | 50             | 0,8         | MFS201N-M08-076-HSK-A063-S | 31184124  |
| 63    | 8          | 14             | 25             | 101            | 12             | 75             | 0,9         | MFS201N-M08-101-HSK-A063-S | 31227420  |
| 63    | 8          | 14             | 30             | 126            | 12             | 100            | 1,0         | MFS201N-M08-126-HSK-A063-S | 31184059  |
| 63    | 10         | 18             | 25             | 76             | 12             | 50             | 0,8         | MFS201N-M10-076-HSK-A063-S | 31184130  |
| 63    | 10         | 18             | 30             | 101            | 12             | 75             | 0,9         | MFS201N-M10-101-HSK-A063-S | 31227421  |
| 63    | 10         | 18             | 35             | 126            | 12             | 100            | 1,1         | MFS201N-M10-126-HSK-A063-S | 31184066  |
| 63    | 10         | 18             | 45             | 176            | 12             | 150            | 1,6         | MFS201N-M10-176-HSK-A063-S | 31227410  |
| 63    | 12         | 21             | 30             | 76             | 12             | 50             | 0,9         | MFS201N-M12-076-HSK-A063-S | 31184140  |
| 63    | 12         | 21             | 43             | 151            | 12             | 125            | 1,4         | MFS201N-M12-151-HSK-A063-S | 31184097  |
| 63    | 12         | 21             | 35             | 101            | 12             | 75             | 1,0         | MFS201N-M12-101-HSK-A063-S | 31227422  |
| 63    | 12         | 21             | 38             | 126            | 12             | 100            | 1,2         | MFS201N-M12-126-HSK-A063-S | 31184076  |
| 63    | 12         | 21             | 45             | 176            | 12             | 150            | 1,6         | MFS201N-M12-176-HSK-A063-S | 31227411  |
| 63    | 16         | 29             | 34             | 76             | 12             | 50             | 1,0         | MFS201N-M16-076-HSK-A063-S | 31184152  |
| 63    | 16         | 29             | 35             | 101            | 12             | 75             | 1,1         | MFS201N-M16-101-HSK-A063-S | 31227423  |
| 63    | 16         | 29             | 40             | 126            | 12             | 100            | 1,3         | MFS201N-M16-126-HSK-A063-S | 31184087  |
| 63    | 16         | 29             | 44             | 151            | 12             | 125            | 1,7         | MFS201N-M16-151-HSK-A063-S | 31184098  |
| 63    | 16         | 29             | 48             | 176            | 12             | 150            | 2,0         | MFS201N-M16-176-HSK-A063-S | 31227412  |
| 63    | 16         | 29             | 50             | 226            | 12             | 200            | 2,5         | MFS201N-M16-226-HSK-A063-S | 31227414  |
| 63    | 16         | 29             | 50             | 276            | 12             | 250            | 3,0         | MFS201N-M16-276-HSK-A063-S | 31227418  |
| 100   | 8          | 14             | 23             | 79             | 12             | 50             | 2,3         | MFS201N-M08-079-HSK-A100-S | 31227405  |
| 100   | 8          | 14             | 30             | 129            | 12             | 100            | 2,4         | MFS201N-M08-129-HSK-A100-S | 31227398  |
| 100   | 10         | 18             | 25             | 79             | 12             | 50             | 2,3         | MFS201N-M10-079-HSK-A100-S | 31227406  |
| 100   | 10         | 18             | 35             | 129            | 12             | 100            | 2,5         | MFS201N-M10-129-HSK-A100-S | 31227399  |
| 100   | 10         | 18             | 45             | 179            | 12             | 150            | 3,0         | MFS201N-M10-179-HSK-A100-S | 31227400  |
| 100   | 12         | 21             | 30             | 79             | 12             | 50             | 2,2         | MFS201N-M12-079-HSK-A100-S | 31184139  |
| 100   | 12         | 21             | 38             | 129            | 12             | 100            | 2,6         | MFS201N-M12-129-HSK-A100-S | 31184074  |
| 100   | 12         | 21             | 52             | 179            | 12             | 150            | 3,4         | MFS201N-M12-179-HSK-A100-S | 31184100  |
| 100   | 12         | 21             | 58             | 229            | 12             | 200            | 4,0         | MFS201N-M12-229-HSK-A100-S | 31227401  |
| 100   | 12         | 21             | 62             | 279            | 12             | 250            | 4,7         | MFS201N-M12-279-HSK-A100-S | 31227403  |
| 100   | 16         | 29             | 34             | 79             | 12             | 50             | 2,4         | MFS201N-M16-079-HSK-A100-S | 31184151  |
| 100   | 16         | 29             | 40             | 129            | 12             | 100            | 2,7         | MFS201N-M16-129-HSK-A100-S | 31184085  |
| 100   | 16         | 29             | 58             | 179            | 12             | 150            | 3,8         | MFS201N-M16-179-HSK-A100-S | 31184103  |
| 100   | 16         | 29             | 58             | 229            | 12             | 200            | 4,3         | MFS201N-M16-229-HSK-A100-S | 31227402  |
| 100   | 16         | 29             | 66             | 279            | 12             | 250            | 5,5         | MFS201N-M16-279-HSK-A100-S | 31227556  |

Dimensions in mm.

Additional dimensions available upon request.

Scope of delivery: Without coolant tube.

Design: Permissible run-out variation of the hollow taper shank to the clamping diameter

d<sub>1</sub> = 3 µm.

Note: Coolant tube, see "CLAMPING" catalogue.

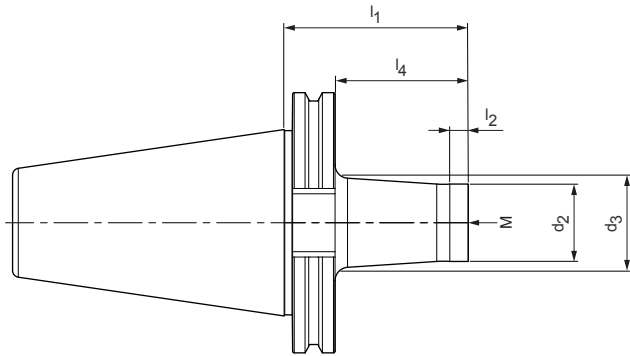
Balancing quality: G 6.3 with 25,000 rpm in delivery status.

# MFS milling head holder

Mechanical tool clamping

For screw-in milling cutter, made from steel

Shank SK according to ISO 7388-1 Form AD



| Steep taper | Dimensions |       |       |       |       |       | Weight [kg] | Specification           | Order no. |
|-------------|------------|-------|-------|-------|-------|-------|-------------|-------------------------|-----------|
|             | M          | $d_2$ | $d_3$ | $l_1$ | $l_2$ | $l_4$ |             |                         |           |
| 40          | 8          | 14    | 23    | 69,1  | 12    | 50    | 0,9         | MFS201N-M08-069-SK040-S | 31227376  |
| 40          | 8          | 14    | 25    | 94,1  | 12    | 75    | 1,1         | MFS201N-M08-094-SK040-S | 31227377  |
| 40          | 8          | 14    | 30    | 119,1 | 12    | 100   | 1,2         | MFS201N-M08-119-SK040-S | 31227363  |
| 40          | 10         | 18    | 25    | 69,1  | 12    | 50    | 1,0         | MFS201N-M10-069-SK040-S | 31184128  |
| 40          | 10         | 18    | 30    | 94,1  | 12    | 75    | 1,2         | MFS201N-M10-094-SK040-S | 31227378  |
| 40          | 10         | 18    | 35    | 119,1 | 12    | 100   | 1,3         | MFS201N-M10-119-SK040-S | 31184063  |
| 40          | 10         | 18    | 45    | 169,1 | 12    | 150   | 1,8         | MFS201N-M10-169-SK040-S | 31227367  |
| 40          | 12         | 21    | 30    | 69,1  | 12    | 50    | 1,0         | MFS201N-M12-069-SK040-S | 31184136  |
| 40          | 12         | 21    | 35    | 94,1  | 12    | 75    | 1,2         | MFS201N-M12-094-SK040-S | 31227379  |
| 40          | 12         | 21    | 38    | 119,1 | 12    | 100   | 1,3         | MFS201N-M12-119-SK040-S | 31184071  |
| 40          | 12         | 21    | 48    | 169,1 | 12    | 150   | 2,0         | MFS201N-M12-169-SK040-S | 31227368  |
| 40          | 16         | 29    | 34    | 69,1  | 12    | 50    | 1,2         | MFS201N-M16-069-SK040-S | 31184147  |
| 40          | 16         | 29    | 35    | 94,1  | 12    | 75    | 1,3         | MFS201N-M16-094-SK040-S | 31227380  |
| 40          | 16         | 29    | 40    | 119,1 | 12    | 100   | 1,5         | MFS201N-M16-119-SK040-S | 31184081  |
| 40          | 16         | 29    | 48    | 169,1 | 12    | 150   | 2,2         | MFS201N-M16-169-SK040-S | 31227369  |
| 50          | 10         | 18    | 25    | 69,1  | 12    | 50    | 2,8         | MFS201N-M10-069-SK050-S | 31227558  |
| 50          | 10         | 18    | 30    | 94,1  | 12    | 75    | 3,0         | MFS201N-M10-094-SK050-S | 31227559  |
| 50          | 10         | 18    | 35    | 119,1 | 12    | 100   | 3,1         | MFS201N-M10-119-SK050-S | 31227554  |
| 50          | 10         | 18    | 45    | 169,1 | 12    | 150   | 3,4         | MFS201N-M10-169-SK050-S | 31227555  |
| 50          | 12         | 21    | 30    | 69,1  | 12    | 50    | 3,0         | MFS201N-M12-069-SK050-S | 31184134  |
| 50          | 12         | 21    | 38    | 119,1 | 12    | 100   | 3,1         | MFS201N-M12-119-SK050-S | 31184069  |
| 50          | 12         | 21    | 52    | 169,1 | 12    | 150   | 4,0         | MFS201N-M12-169-SK050-S | 31184099  |
| 50          | 16         | 29    | 34    | 69,1  | 12    | 50    | 2,9         | MFS201N-M16-069-SK050-S | 31184145  |
| 50          | 16         | 29    | 40    | 119,1 | 12    | 100   | 3,3         | MFS201N-M16-119-SK050-S | 31184079  |
| 50          | 16         | 29    | 48    | 169,1 | 12    | 150   | 3,9         | MFS201N-M16-169-SK050-S | 31184101  |

Dimensions in mm.

Additional dimensions available upon request.

Scope of delivery: Without pull stud.

Design: Permissible run-out variation of the hollow taper shank to the clamping diameter

$d_1 = 3 \mu\text{m}$ .

Note: Pull stud, see "CLAMPING" catalogue.

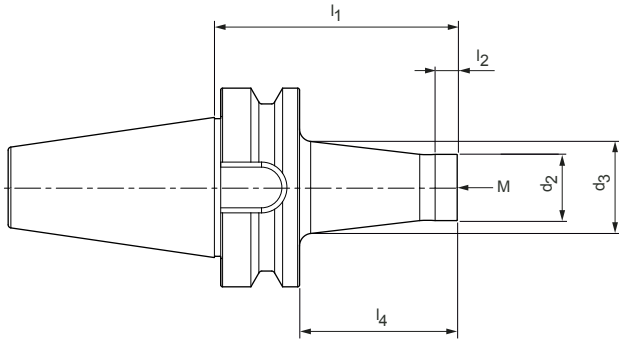
Balancing quality: G 16 with 8,000 rpm in delivery status.

# MFS milling head holder

Mechanical tool clamping

For screw-in milling cutter, made from steel

Shank BT according to ISO 7388-2 Form JD/JF (JIS B 6339)



| BT | Dimensions |       |       |       |       |       | Weight [kg] | Specification           | Order no. |
|----|------------|-------|-------|-------|-------|-------|-------------|-------------------------|-----------|
|    | M          | $d_2$ | $d_3$ | $l_1$ | $l_2$ | $l_4$ |             |                         |           |
| 40 | 8          | 14    | 23    | 77    | 12    | 50    | 1,2         | MFS201N-M08-077-BT040-S | 31227390  |
| 40 | 8          | 14    | 30    | 127   | 12    | 100   | 1,4         | MFS201N-M08-127-BT040-S | 31227381  |
| 40 | 10         | 18    | 25    | 77    | 12    | 50    | 1,2         | MFS201N-M10-077-BT040-S | 31227391  |
| 40 | 10         | 18    | 35    | 127   | 12    | 100   | 1,5         | MFS201N-M10-127-BT040-S | 31227382  |
| 40 | 12         | 21    | 30    | 77    | 12    | 50    | 1,2         | MFS201N-M12-077-BT040-S | 31227392  |
| 40 | 12         | 21    | 38    | 127   | 12    | 100   | 1,6         | MFS201N-M12-127-BT040-S | 31227383  |
| 40 | 16         | 29    | 34    | 77    | 12    | 50    | 1,3         | MFS201N-M16-077-BT040-S | 31227393  |
| 40 | 16         | 29    | 40    | 127   | 12    | 100   | 1,7         | MFS201N-M16-127-BT040-S | 31227384  |
| 50 | 12         | 21    | 30    | 88    | 12    | 50    | 4,0         | MFS201N-M12-088-BT050-S | 31227440  |
| 50 | 12         | 21    | 38    | 138   | 12    | 100   | 4,1         | MFS201N-M12-138-BT050-S | 31227430  |
| 50 | 16         | 29    | 34    | 88    | 12    | 50    | 3,9         | MFS201N-M16-088-BT050-S | 31227441  |
| 50 | 16         | 29    | 40    | 138   | 12    | 100   | 4,3         | MFS201N-M16-138-BT050-S | 31227431  |

Dimensions in mm.

Additional dimensions available upon request.

Scope of delivery: Without pull stud.

Design: Permissible run-out variation of the hollow taper shank to the clamping diameter

$d_1 = 3 \mu\text{m}$ .

Note: Pull stud, see "CLAMPING" catalogue.

Balancing quality: G 16 with 8,000 rpm in delivery status.

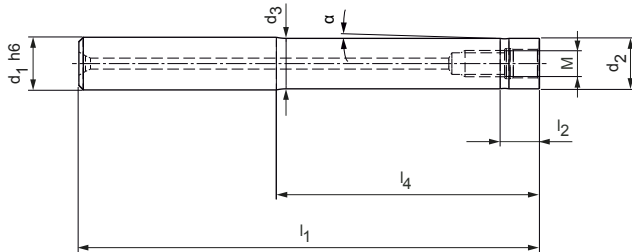


# MFS milling head holder

Mechanical tool clamping

For screw-in milling cutter made from solid carbide

Cylindrical shank according to DIN 1835-A



## Solid carbide extension for screw-in milling cutter

| Dimensions |                   |                |                |                |                |                |        | Internal cooling | Specification            | Order no. |
|------------|-------------------|----------------|----------------|----------------|----------------|----------------|--------|------------------|--------------------------|-----------|
| M          | d <sub>1</sub> h6 | d <sub>2</sub> | d <sub>3</sub> | l <sub>1</sub> | l <sub>4</sub> | l <sub>2</sub> | α      |                  |                          |           |
| 4,5        | 10                | 7,7            | 10             | 65             | 20             | –              | –      | ✓                | MFS101-45-020-ZYL-HA10-H | 31217761  |
| 4,5        | 10                | 7,7            | 10             | 85             | 40             | –              | 1,65°  | ✓                | MFS101-45-040-ZYL-HA10-H | 31217755  |
| 4,5        | 10                | 7,7            | 10             | 105            | 60             | –              | 1,1°   | ✓                | MFS101-45-060-ZYL-HA10-H | 31217757  |
| 4,5        | 10                | 7,7            | 10             | 130            | 80             | –              | 0,82°  | ✓                | MFS101-45-080-ZYL-HA10-H | 31217758  |
| 4,5        | 10                | 7,7            | 10             | 150            | 100            | –              | 0,66°  | ✓                | MFS101-45-100-ZYL-HA10-H | 31217760  |
| 6          | 10                | 9,5            | 10             | 60             | 20             | 9              | 0,72°  | ✓                | MFS101-06-020-ZYL-HA10-H | 31166769  |
| 6          | 10                | 9,5            | 10             | 80             | 40             | 9              | 0,36°  | ✓                | MFS101-06-040-ZYL-HA10-H | 31166770  |
| 6          | 10                | 9,5            | 10             | 100            | 60             | 9              | 0,24°  | ✓                | MFS101-06-060-ZYL-HA10-H | 31166771  |
| 6          | 10                | 9,5            | 10             | 120            | 80             | 9              | 0,18°  | ✓                | MFS101-06-080-ZYL-HA10-H | 31166772  |
| 8          | 16                | 12,8           | 16             | 95             | 40             | –              | 2,29°  | ✓                | MFS101-08-040-ZYL-HA16-H | 31166749  |
| 8          | 16                | 12,8           | 16             | 115            | 60             | –              | 1,53°  | ✓                | MFS101-08-060-ZYL-HA16-H | 31166750  |
| 8          | 16                | 12,8           | 16             | 135            | 80             | –              | 1,15°  | ✓                | MFS101-08-080-ZYL-HA16-H | 31166751  |
| 8          | 16                | 12,8           | 16             | 155            | 100            | –              | 0,92°  | ✓                | MFS101-08-100-ZYL-HA16-H | 31166752  |
| 8          | 16                | 12,8           | 16             | 175            | 120            | –              | 0,76°  | ✓                | MFS101-08-120-ZYL-HA16-H | 31166753  |
| 10         | 20                | 17,8           | 20             | 100            | 40             | –              | 1,58°  | ✓                | MFS101-10-040-ZYL-HA20-H | 31166754  |
| 10         | 20                | 17,8           | 20             | 120            | 60             | –              | 1,05°  | ✓                | MFS101-10-060-ZYL-HA20-H | 31166755  |
| 10         | 20                | 17,8           | 20             | 140            | 80             | –              | 0,79°  | ✓                | MFS101-10-080-ZYL-HA20-H | 31166756  |
| 10         | 20                | 17,8           | 20             | 160            | 100            | –              | 0,63°  | ✓                | MFS101-10-100-ZYL-HA20-H | 31166757  |
| 10         | 20                | 17,8           | 20             | 180            | 120            | –              | 0,53°  | ✓                | MFS101-10-120-ZYL-HA20-H | 31166758  |
| 12         | 25                | 23             | 24,3           | 136            | 80             | 9              | 0,591° | ✓                | MFS101-12-080-ZYL-HA25-H | 31166759  |
| 12         | 25                | 23             | 24,3           | 156            | 100            | 9              | 0,449° | ✓                | MFS101-12-100-ZYL-HA25-H | 31166760  |
| 12         | 25                | 23             | 24,3           | 176            | 120            | 9              | 0,362° | ✓                | MFS101-12-120-ZYL-HA25-H | 31166761  |
| 12         | 25                | 23             | 24,3           | 196            | 140            | 9              | 0,303° | ✓                | MFS101-12-140-ZYL-HA25-H | 31166762  |
| 12         | 25                | 23             | 24,3           | 216            | 160            | 9              | 0,260° | ✓                | MFS101-12-160-ZYL-HA25-H | 31166763  |
| 16         | 32                | 29             | 31,5           | 160            | 100            | 9              | 0,828° | ✓                | MFS101-16-100-ZYL-HA32-H | 31166764  |
| 16         | 32                | 29             | 31,5           | 210            | 150            | 9              | 0,517° | ✓                | MFS101-16-150-ZYL-HA32-H | 31166765  |
| 16         | 32                | 29             | 31,5           | 260            | 200            | 9              | 0,376° | ✓                | MFS101-16-200-ZYL-HA32-H | 31166766  |
| 16         | 32                | 29             | 31,5           | 310            | 250            | 9              | 0,295° | ✓                | MFS101-16-250-ZYL-HA32-H | 31166767  |
| 16         | 32                | 29             | 31,5           | 360            | 300            | 9              | 0,243° | ✓                | MFS101-16-300-ZYL-HA32-H | 31166768  |

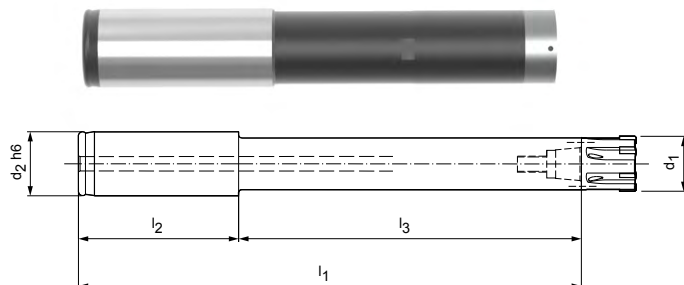
## Accessories

|                                                                                     |                                 |         |                    |         |
|-------------------------------------------------------------------------------------|---------------------------------|---------|--------------------|---------|
|  | d <sub>1</sub><br>10, 16, 20 mm | MHC-... | UNIQ MillChuck, HA | Page 83 |
|  | d <sub>1</sub><br>25, 32 mm     | MHC-... | HydroChuck         | Page 88 |

# HFS replaceable head holders

With axial clamping system

Shank to MN 623, similar to DIN 1835-A



## Long design with cylindrical shank

| Dimensions     |          |                   |                |                |                | Specification              | Order no. |
|----------------|----------|-------------------|----------------|----------------|----------------|----------------------------|-----------|
| d <sub>1</sub> | HFS size | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                            |           |
| 15,60 - 18,59  | 10       | 20                | 160            | 50             | 110            | HFS101SN-10-110-ZYL-HA20-S | 30010248  |
| 18,60 - 21,29  | 12       | 20                | 179,5          | 50             | 129,5          | HFS101SN-12-130-ZYL-HA20-S | 30010249  |
| 21,30 - 23,99  | 14       | 20                | 180,5          | 50             | 130,5          | HFS101SN-14-131-ZYL-HA20-S | 30010250  |
| 24,00 - 29,99  | 16       | 25                | 211            | 60             | 151            | HFS101SN-16-151-ZYL-HA25-S | 30010251  |
| 30,00 - 39,99  | 20       | 25                | 210            | 60             | 150            | HFS101SN-20-150-ZYL-HA25-S | 30010252  |
| 40,00 - 65,00  | 24       | 32                | 266            | 60             | 206            | HFS101SN-24-206-ZYL-HA32-S | 30010253  |

## Short design with cylindrical shank

| Dimensions     |          |                   |                |                |                | Specification              | Order no. |
|----------------|----------|-------------------|----------------|----------------|----------------|----------------------------|-----------|
| d <sub>1</sub> | HFS size | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                            |           |
| 15,60 - 18,59  | 10       | 20                | 99             | 50             | 49             | HFS101SN-10-049-ZYL-HA20-S | 30010256  |
| 18,60 - 21,29  | 12       | 20                | 118,5          | 50             | 68,5           | HFS101SN-12-069-ZYL-HA20-S | 30010257  |
| 21,30 - 23,99  | 14       | 20                | 119,5          | 50             | 69,5           | HFS101SN-14-070-ZYL-HA20-S | 30010258  |
| 24,00 - 29,99  | 16       | 25                | 150            | 60             | 90             | HFS101SN-16-090-ZYL-HA25-S | 30010259  |
| 30,00 - 39,99  | 20       | 25                | 149            | 60             | 89             | HFS101SN-20-089-ZYL-HA25-S | 30010260  |
| 40,00 - 65,00  | 24       | 32                | 167            | 60             | 107            | HFS101SN-24-107-ZYL-HA32-S | 30010261  |

## Extra short design with cylindrical shank

| Dimensions     |          |                   |                |                |                | Specification              | Order no. |
|----------------|----------|-------------------|----------------|----------------|----------------|----------------------------|-----------|
| d <sub>1</sub> | HFS size | d <sub>2</sub> h6 | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                            |           |
| 18,60 - 21,29  | 12       | 20                | 82             | 50             | 32             | HFS101SN-12-032-ZYL-HA20-S | 30078683  |

## Accessories

|                                                                                     |         |            |         |
|-------------------------------------------------------------------------------------|---------|------------|---------|
|  | MHC-... | HydroChuck | Page 88 |
|-------------------------------------------------------------------------------------|---------|------------|---------|

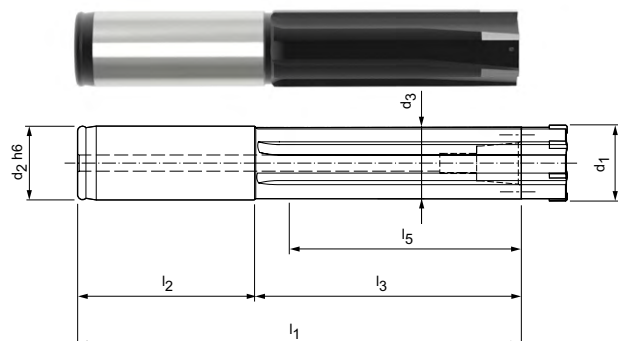
Dimensions in mm.

Scope of delivery: Tool holder with threaded spindle and hexagonal T-handle.

# HFS replaceable head holders

With axial clamping system

Shank to MN 623, similar to DIN 1835-A



## Long design with cylindrical shank

| Dimensions     |          |                   |                |                |                |                |                | Specification               | Order no. |
|----------------|----------|-------------------|----------------|----------------|----------------|----------------|----------------|-----------------------------|-----------|
| d <sub>1</sub> | HFS size | d <sub>2</sub> h6 | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>5</sub> |                             |           |
| 16,60 - 19,39  | 10       | 20                | 16             | 160            | 50             | 110            | 94             | HFS111SN-10A-110-ZYL-HA20-S | 30026380  |
| 19,40 - 21,29  | 10       | 20                | 18,6           | 160            | 50             | 110            | 94             | HFS111SN-10B-110-ZYL-HA20-S | 30026488  |
| 21,30 - 24,99  | 12       | 20                | 20,5           | 180,5          | 50             | 130,5          | 114,5          | HFS111SN-12-131-ZYL-HA20-S  | 30026489  |
| 25,00 - 28,99  | 14       | 25                | 24,2           | 211,5          | 60             | 151,5          | 132,5          | HFS111SN-14-152-ZYL-HA25-S  | 30026510  |
| 29,00 - 32,29  | 16       | 25                | 28,2           | 210            | 60             | 150            | 131            | HFS111SN-16A-150-ZYL-HA25-S | 30026511  |
| 32,30 - 36,99  | 16       | 25                | 31,5           | 210            | 60             | 150            | 140            | HFS111SN-16B-150-ZYL-HA25-S | 30026512  |
| 37,00 - 41,19  | 20       | 25                | 36,2           | 210            | 60             | 150            | 140            | HFS111SN-20A-150-ZYL-HA25-S | 30026513  |
| 41,20 - 44,99  | 20       | 25                | 40,2           | 210            | 60             | 150            | 140            | HFS111SN-20B-150-ZYL-HA25-S | 30026514  |
| 45,00 - 65,00  | 24       | 32                | 44             | 266            | 60             | 206            | 195            | HFS111SN-24-206-ZYL-HA32-S  | 30026515  |

## Short design with cylindrical shank

| Dimensions     |          |                   |                |                |                |                |                | Specification               | Order no. |
|----------------|----------|-------------------|----------------|----------------|----------------|----------------|----------------|-----------------------------|-----------|
| d <sub>1</sub> | HFS size | d <sub>2</sub> h6 | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>5</sub> |                             |           |
| 16,60 - 19,39  | 10       | 20                | 16             | 99             | 50             | 49             | 33             | HFS111SN-10A-049-ZYL-HA20-S | 30026516  |
| 19,40 - 21,29  | 10       | 20                | 18,6           | 99             | 50             | 49             | 33             | HFS111SN-10B-049-ZYL-HA20-S | 30026521  |
| 21,30 - 24,99  | 12       | 20                | 20,5           | 117,5          | 50             | 67,5           | 51,5           | HFS111SN-12-068-ZYL-HA20-S  | 30026522  |
| 25,00 - 28,99  | 14       | 25                | 24,2           | 150,5          | 60             | 90,5           | 71,5           | HFS111SN-14-091-ZYL-HA25-S  | 30026523  |
| 29,00 - 32,29  | 16       | 25                | 28,2           | 149            | 60             | 89             | 70             | HFS111SN-16A-089-ZYL-HA25-S | 30026525  |
| 32,30 - 36,99  | 16       | 25                | 31,5           | 149            | 60             | 89             | 79             | HFS111SN-16B-089-ZYL-HA25-S | 30026526  |
| 37,00 - 41,19  | 20       | 25                | 36,2           | 149            | 60             | 89             | 79             | HFS111SN-20A-089-ZYL-HA25-S | 30026527  |
| 41,20 - 44,99  | 20       | 25                | 40,2           | 149            | 60             | 89             | 79             | HFS111SN-20B-089-ZYL-HA25-S | 30026528  |
| 45,00 - 65,00  | 24       | 32                | 44             | 167            | 60             | 107            | 96             | HFS111SN-24-107-ZYL-HA32-S  | 30026529  |

## Accessories

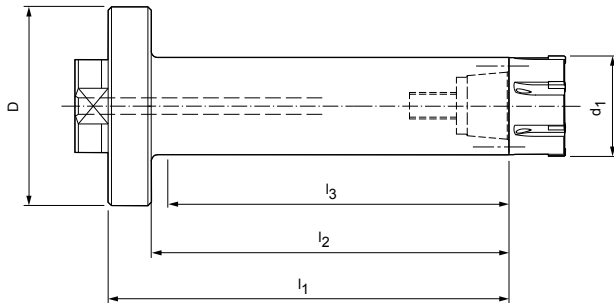
|  |         |            |         |
|--|---------|------------|---------|
|  | MHC-... | HydroChuck | Page 88 |
|--|---------|------------|---------|

Dimensions in mm.

Scope of delivery: Tool holder with threaded spindle and hexagonal T-handle.

# HFS replaceable head holders

With axial clamping system with radial and angular alignment  
Module connection sizes to MN 5000-14



## Long design with module adaptor (radial and angular alignment)

| Dimensions     |          |    |                |                |                | Specification             | Order no. |
|----------------|----------|----|----------------|----------------|----------------|---------------------------|-----------|
| d <sub>1</sub> | HFS size | D  | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                           |           |
| 15,60 - 18,59  | 10       | 60 | 81             | 68             | 61             | HFS101SN-10-081-MOD-060-S | 30010264  |
| 18,60 - 21,29  | 12       | 60 | 100,5          | 87,5           | 80,5           | HFS101SN-12-101-MOD-060-S | 30010265  |
| 21,30 - 23,99  | 14       | 60 | 101,5          | 88,5           | 79,5           | HFS101SN-14-102-MOD-060-S | 30010266  |
| 24,00 - 29,99  | 16       | 60 | 122            | 109            | 104            | HFS101SN-16-122-MOD-060-S | 30010267  |
| 30,00 - 39,99  | 20       | 60 | 121            | 108            | 103            | HFS101SN-20-121-MOD-060-S | 30010268  |
| 40,00 - 50,70  | 24       | 60 | 133            | 120            | 116            | HFS101SN-24-133-MOD-060-S | 30010269  |
| 50,71 - 65,00  | 24       | 80 | 133            | 116            | 112            | HFS101SN-24-133-MOD-080-S | 30190195  |

## List of spare parts for module adaptors

| Module size<br>D | Cylinder screw ISO 4762 (DIN 912) |            |          | Thrust pad |          | Threaded pin |          |
|------------------|-----------------------------------|------------|----------|------------|----------|--------------|----------|
|                  | Quantity required                 | Order no.  | Size     | Order no.  | Size     | Order no.    | Size     |
| 60               | 4                                 | M5x16-12,9 | 10003601 | 10,6x5     | 10040108 | M8x1x8       | 10040109 |
| 80               | 4                                 | M6x20-12,9 | 10003619 | 10,6x5     | 10040108 | M8x1x11,5    | 10075074 |

## Accessories

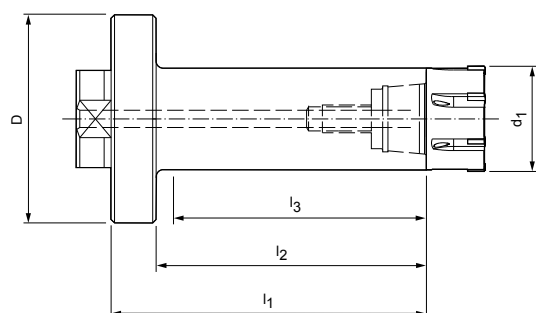
|                                                                                     |           |                |          |
|-------------------------------------------------------------------------------------|-----------|----------------|----------|
|  | OS-AD-... | Module adaptor | Page 109 |
|-------------------------------------------------------------------------------------|-----------|----------------|----------|

Dimensions in mm.

Scope of delivery: Tool holder with threaded spindle, screwdriver with T-handle, fastening screws for the module adaptor, and parts for the angular alignment of the module adaptor.

# HFS replaceable head holders

With axial clamping system with radial and angular alignment  
Module connection sizes to MN 5000-14



## Short design with module adaptor (radial and angular alignment)

| Dimensions     |          |    |                |                |                | Specification             | Order no. |
|----------------|----------|----|----------------|----------------|----------------|---------------------------|-----------|
| d <sub>1</sub> | HFS size | D  | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                           |           |
| 15,60 - 18,59  | 10       | 60 | 49             | 36             | 31             | HFS101SN-10-049-MOD-060-S | 30027896  |
| 18,60 - 21,29  | 12       | 60 | 58,5           | 45,5           | 40,5           | HFS101SN-12-059-MOD-060-S | 30027897  |
| 21,30 - 23,99  | 14       | 60 | 62,5           | 49,5           | 44,5           | HFS101SN-14-063-MOD-060-S | 30027898  |
| 24,00 - 29,99  | 16       | 60 | 72             | 59             | 54             | HFS101SN-16-072-MOD-060-S | 30027899  |
| 30,00 - 39,99  | 20       | 60 | 71             | 58             | 53             | HFS101SN-20-071-MOD-060-S | 30027900  |
| 40,00 - 50,70  | 24       | 60 | 84             | 71             | 66             | HFS101SN-24-084-MOD-060-S | 30027901  |
| 50,71 - 65,00  | 24       | 80 | 84             | 67             | 62             | HFS101SN-24-084-MOD-080-S | 30152510  |

## List of spare parts for module adaptors

| Module size<br>D | Cylinder screw ISO 4762 (DIN 912) |            |          | Thrust pad |          | Threaded pin |          |
|------------------|-----------------------------------|------------|----------|------------|----------|--------------|----------|
|                  | Quantity required                 | Order no.  | Size     | Order no.  | Size     | Order no.    | Size     |
| 60               | 4                                 | M5x16-12,9 | 10003601 | 10,6x5     | 10040108 | M8x1x8       | 10040109 |
| 80               | 4                                 | M6x20-12,9 | 10003619 | 10,6x5     | 10040108 | M8x1x11,5    | 10075074 |

## Accessories

|  |           |                |          |
|--|-----------|----------------|----------|
|  | OS-AD-... | Module adapter | Page 109 |
|--|-----------|----------------|----------|

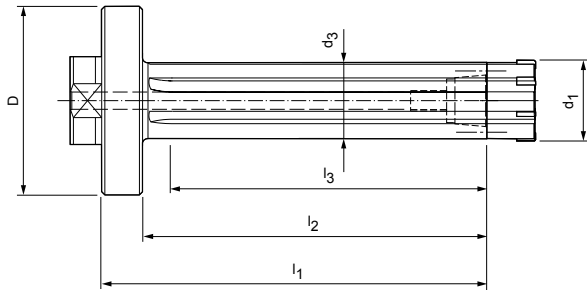
Dimensions in mm.

Scope of delivery: Tool holder with threaded spindle, screwdriver with T-handle, fastening screws for the module adaptor, and parts for the angular alignment of the module adaptor.



# HFS replaceable head holders

With axial clamping system with radial and angular alignment  
Module connection sizes to MN 5000-14



## Long design with module adaptor (radial and angular alignment)

| Dimensions     |          |    |                |                |                |                | Specification              | Order no. |
|----------------|----------|----|----------------|----------------|----------------|----------------|----------------------------|-----------|
| d <sub>1</sub> | HFS size | D  | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                            |           |
| 16,60 - 19,39  | 10       | 60 | 16             | 81             | 68             | 48             | HFS111SN-10A-081-MOD-060-S | 30026562  |
| 19,40 - 21,29  | 10       | 60 | 18,6           | 81             | 68             | 48             | HFS111SN-10B-081-MOD-060-S | 30026563  |
| 21,30 - 24,99  | 12       | 60 | 20,5           | 101,5          | 88,5           | 69,5           | HFS111SN-12-102-MOD-060-S  | 30026564  |
| 25,00 - 28,99  | 14       | 60 | 24,2           | 122,5          | 109,5          | 90,5           | HFS111SN-14-123-MOD-060-S  | 30026565  |
| 29,00 - 32,29  | 16       | 60 | 28,2           | 121            | 108            | 89             | HFS111SN-16A-121-MOD-060-S | 30026566  |
| 32,30 - 36,99  | 16       | 60 | 31,5           | 121            | 108            | 89             | HFS111SN-16B-121-MOD-060-S | 30026567  |
| 37,00 - 41,19  | 20       | 60 | 36,2           | 121            | 108            | 89             | HFS111SN-20A-121-MOD-060-S | 30026568  |
| 41,20 - 44,99  | 20       | 60 | 40,2           | 121            | 108            | 89             | HFS111SN-20B-121-MOD-060-S | 30026569  |
| 45,00 - 50,70  | 24       | 60 | 44             | 123            | 110            | 95             | HFS111SN-24-123-MOD-060-S  | 30026570  |
| 50,71 - 65,00  | 24       | 80 | 44             | 133            | 116            | 110            | HFS111SN-24-133-MOD-080-S  | 30193167  |

## List of spare parts for module adaptors

| Module size<br>D | Cylinder screw ISO 4762 (DIN 912) |            |          | Thrust pad |          | Threaded pin |          |
|------------------|-----------------------------------|------------|----------|------------|----------|--------------|----------|
|                  | Quantity required                 | Order no.  | Size     | Order no.  | Size     | Order no.    | Size     |
| 60               | 4                                 | M5x16-12,9 | 10003601 | 10,6x5     | 10040108 | M8x1x8       | 10040109 |
| 80               | 4                                 | M6x20-12,9 | 10003619 | 10,6x5     | 10040108 | M8x1x11,5    | 10075074 |

## Accessories

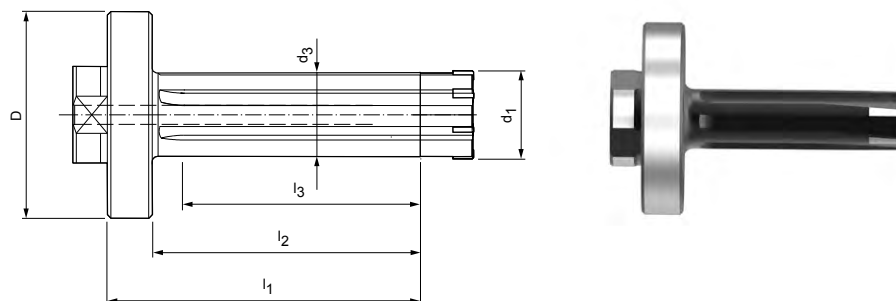
|                                                                                     |           |                |          |
|-------------------------------------------------------------------------------------|-----------|----------------|----------|
|  | OS-AD-... | Module adaptor | Page 109 |
|-------------------------------------------------------------------------------------|-----------|----------------|----------|

Dimensions in mm.

Scope of delivery: Tool holder with threaded spindle, screwdriver with T-handle, fastening screws for the module adaptor, and parts for the angular alignment of the module adaptor.

# HFS replaceable head holders

With axial clamping system with radial and angular alignment  
Module connection sizes to MN 5000-14



## Short design with module adaptor (radial and angular alignment)

| Dimensions     |          |    |                |                |                |                | Specification              | Order no. |
|----------------|----------|----|----------------|----------------|----------------|----------------|----------------------------|-----------|
| d <sub>1</sub> | HFS size | D  | d <sub>3</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>3</sub> |                            |           |
| 16,60 - 19,39  | 10       | 60 | 16             | 49             | 36             | 31             | HFS111SN-10A-049-MOD-060-S | 30027885  |
| 19,40 - 21,29  | 10       | 60 | 18,6           | 59             | 46             | 41             | HFS111SN-10B-059-MOD-060-S | 30027886  |
| 21,30 - 24,99  | 12       | 60 | 20,5           | 62,5           | 49,5           | 44,5           | HFS111SN-12-063-MOD-060-S  | 30027887  |
| 25,00 - 28,99  | 14       | 60 | 24,2           | 72,5           | 59,5           | 54,5           | HFS111SN-14-073-MOD-060-S  | 30027888  |
| 29,00 - 32,29  | 16       | 60 | 28,2           | 71             | 58             | 53             | HFS111SN-16A-071-MOD-060-S | 30027889  |
| 32,30 - 36,99  | 16       | 60 | 31,5           | 71             | 58             | 53             | HFS111SN-16B-071-MOD-060-S | 30027890  |
| 37,00 - 41,19  | 20       | 60 | 36,2           | 71             | 58             | 53             | HFS111SN-20A-071-MOD-060-S | 30027891  |
| 41,20 - 44,99  | 20       | 60 | 40,2           | 81             | 68             | 63             | HFS111SN-20B-081-MOD-060-S | 30027892  |
| 45,00 - 50,70  | 24       | 60 | 44             | 84             | 71             | 66             | HFS111SN-24-084-MOD-060-S  | 30027893  |
| 50,71 - 65,00  | 24       | 80 | 44             | 84             | 67             | 64             | HFS111SN-24-084-MOD-080-S  | 30193168  |

## List of spare parts for module adaptors

| Module size<br>D | Cylinder screw ISO 4762 (DIN 912) |            |          | Thrust pad |          | Threaded pin |          |
|------------------|-----------------------------------|------------|----------|------------|----------|--------------|----------|
|                  | Quantity required                 | Order no.  | Size     | Order no.  | Size     | Order no.    | Size     |
| 60               | 4                                 | M5x16-12,9 | 10003601 | 10,6x5     | 10040108 | M8x1x8       | 10040109 |
| 80               | 4                                 | M6x20-12,9 | 10003619 | 10,6x5     | 10040108 | M8x1x11,5    | 10075074 |

## Accessories

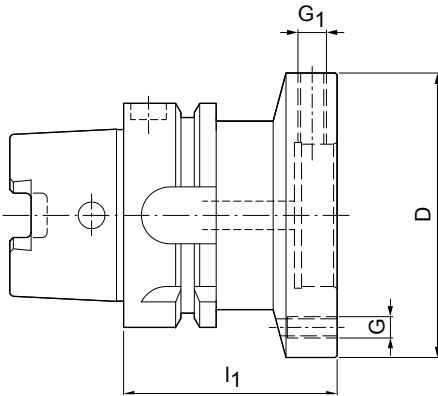
|                                                                                     |           |                |          |
|-------------------------------------------------------------------------------------|-----------|----------------|----------|
|  | OS-AD-... | Module adaptor | Page 109 |
|-------------------------------------------------------------------------------------|-----------|----------------|----------|

Dimensions in mm.

Scope of delivery: Tool holder with threaded spindle, screwdriver with T-handle, fastening screws for the module adaptor, and parts for the angular alignment of the module adaptor.

# HSK (hollow shank taper) adapters

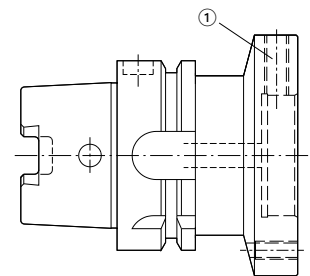
HSK-A (hollow shank taper form A) shank according to DIN 69893-1



| HSK-A | Module size D | Dimensions     |     |                | Specification                | Order no. |
|-------|---------------|----------------|-----|----------------|------------------------------|-----------|
|       |               | l <sub>1</sub> | G   | G <sub>1</sub> |                              |           |
| 40    | 60            | 60             | M5  | M8x1           | OS-AD-HSK-A050-MOD060-060-11 | 30344525  |
| 50    | 60            | 60             | M5  | M8x1           | OS-AD-HSK-A050-MOD060-060-11 | 30319384  |
| 50    | 70            | 60             | M6  | M8x1           | OS-AD-HSK-A050-MOD070-060-11 | 30319385  |
| 50    | 80            | 60             | M6  | M8x1           | OS-AD-HSK-A050-MOD080-060-11 | 30319386  |
| 63    | 60            | 60             | M5  | M8x1           | OS-AD-HSK-A063-MOD060-060-11 | 30319387  |
| 63    | 70            | 60             | M6  | M8x1           | OS-AD-HSK-A063-MOD070-060-11 | 30319388  |
| 63    | 80            | 60             | M6  | M8x1           | OS-AD-HSK-A063-MOD080-060-11 | 30319389  |
| 63    | 100           | 65             | M8  | M10x1          | OS-AD-HSK-A063-MOD100-065-11 | 30319390  |
| 63    | 117           | 65             | M8  | M10x1          | OS-AD-HSK-A063-MOD117-065-11 | 30319391  |
| 80    | 60            | 50             | M5  | M8x1           | OS-AD-HSK-A080-MOD060-050-11 | 30319392  |
| 80    | 70            | 60             | M6  | M8x1           | OS-AD-HSK-A080-MOD070-060-11 | 30319393  |
| 80    | 80            | 60             | M6  | M8x1           | OS-AD-HSK-A080-MOD080-060-11 | 30319394  |
| 80    | 100           | 65             | M8  | M10x1          | OS-AD-HSK-A080-MOD100-065-11 | 30319395  |
| 80    | 117           | 65             | M8  | M10x1          | OS-AD-HSK-A080-MOD117-065-11 | 30319396  |
| 80    | 140           | 75             | M10 | M10x1          | OS-AD-HSK-A080-MOD140-075-11 | 30319397  |
| 100   | 60            | 55             | M5  | M8x1           | OS-AD-HSK-A100-MOD060-055-11 | 30319398  |
| 100   | 70            | 55             | M6  | M8x1           | OS-AD-HSK-A100-MOD070-055-11 | 30319399  |
| 100   | 80            | 55             | M6  | M8x1           | OS-AD-HSK-A100-MOD080-055-11 | 30319400  |
| 100   | 100           | 65             | M8  | M10x1          | OS-AD-HSK-A100-MOD100-065-11 | 30319401  |
| 100   | 117           | 65             | M8  | M10x1          | OS-AD-HSK-A100-MOD117-065-11 | 30319402  |
| 100   | 140           | 75             | M10 | M10x1          | OS-AD-HSK-A100-MOD140-075-11 | 30319403  |

## Spare parts

| Module size D | Quantity re-quired | ① Threaded pin |          |           |
|---------------|--------------------|----------------|----------|-----------|
|               |                    | Size           |          | Order no. |
| 60 - 80       | 4                  | M8x1x16        |          | 10075355  |
| 100 - 140     | 4                  | M10x1x20       | K2865-34 | 10075099  |



Dimensions in mm.

Use: For use in the machine spindle for mounting KS flange adapters, shrink chucks, hydraulic chucks, chucks for cylindrical shanks or tools with a module shank in accordance with MAPAL factory standard.

Design: The radial run-out of a fitted connection or a tool can be adjusted in relation to the hollow taper shank due over threaded pins.

Scope of delivery: With threaded pins for aligning the radial run-out, does not include

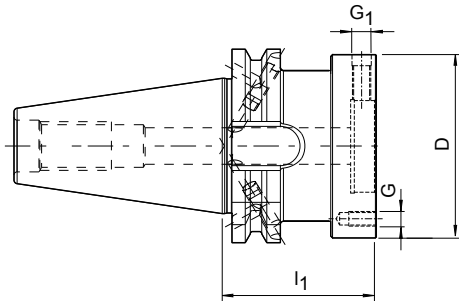
coolant tube.

Note: For coolant tube, code carrier and notes regarding coding system, see "CLAMPING" catalogue.

Balancing quality: G 2.5 with 16,000 rpm in delivery status.

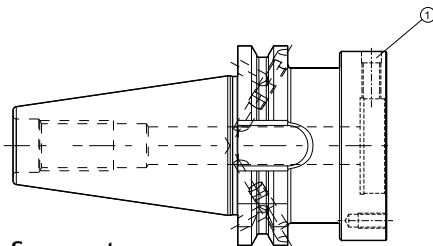
# Steep taper adapters

SK shank according to ISO 7388-1 Form AD/AF



| Steep taper | Module size D | l <sub>1</sub> | G   | G <sub>1</sub> | Shape | Specification             | Order no. |
|-------------|---------------|----------------|-----|----------------|-------|---------------------------|-----------|
| 30*         | 60            | 50             | M5  | M8x1           | AD    | OS-AD-SK030-MOD060-050-11 | 30319771  |
| 30*         | 60            | 50             | M5  | M8x1           | AF    | OS-AD-SK030-MOD060-050-12 | 30319772  |
| 30*         | 70            | 50             | M6  | M8x1           | AD    | OS-AD-SK030-MOD070-050-11 | 30319773  |
| 30*         | 70            | 50             | M6  | M8x1           | AF    | OS-AD-SK030-MOD070-050-12 | 30319774  |
| 40          | 60            | 50             | M5  | M8x1           | AD/AF | OS-AD-SK040-MOD060-050-13 | 10058658  |
| 40          | 70            | 50             | M6  | M8x1           | AD/AF | OS-AD-SK040-MOD070-050-13 | 10058660  |
| 40          | 80            | 55             | M6  | M8x1           | AD/AF | OS-AD-SK040-MOD080-055-13 | 10058661  |
| 40          | 100           | 60             | M8  | M10x1          | AD/AF | OS-AD-SK040-MOD100-060-13 | 10058662  |
| 50          | 60            | 50             | M5  | M8x1           | AD/AF | OS-AD-SK050-MOD060-050-13 | 10058669  |
| 50          | 70            | 50             | M6  | M8x1           | AD/AF | OS-AD-SK050-MOD070-050-13 | 10058670  |
| 50          | 80            | 50             | M6  | M8x1           | AD/AF | OS-AD-SK050-MOD080-050-13 | 10058671  |
| 50          | 100           | 60             | M8  | M10x1          | AD/AF | OS-AD-SK050-MOD100-060-13 | 10058672  |
| 50          | 117           | 60             | M8  | M10x1          | AD/AF | OS-AD-SK050-MOD117-060-13 | 10058673  |
| 50          | 140           | 60             | M10 | M10x1          | AD/AF | OS-AD-SK050-MOD140-060-13 | 10058675  |

\* Taper shank size SK30 is not available in combined design AD/AF.



## Spare parts

| Module size D | Quantity required | Size     | ① Threaded pin<br>Order no. |
|---------------|-------------------|----------|-----------------------------|
| 60 - 80       | 4                 | M8 x1x16 | 10075355                    |
| 100 - 140     | 4                 | M10x1x20 | 10075099                    |

Dimensions in mm.

Use: For use in the machine spindle for mounting KS flange adapters, shrink chucks, hydraulic chucks, chucks for cylindrical shanks or tools with a module shank in accordance with MAPAL factory standard.

Design: The radial run-out of a fitted connection or a tool can be adjusted in relation to the taper shank over threaded pins. Basic setting Form AD, if Form AF is required, please specify this when placing your order.

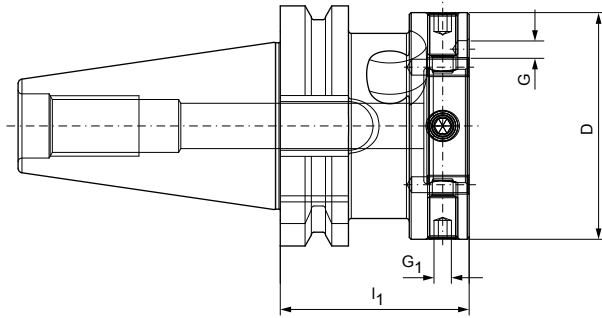
Scope of delivery: With threaded pins for aligning the radial run-out, without pull stud.

Note: For coolant tube and coding system, see "CLAMPING" catalogue.

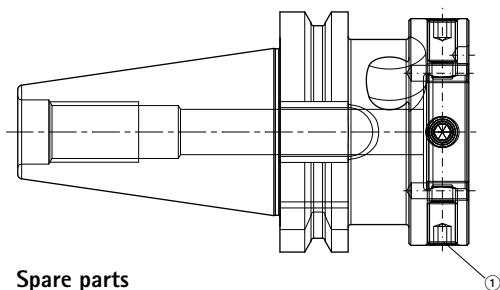
Balancing quality: G 6.3 with 3,000 rpm in delivery status.

# Steep taper adapters

Form AD similar to ISO 7388-1, with face connection



| SK-FC | Module size D | l <sub>1</sub> | G   | G <sub>1</sub> | Specification                | Order no. |
|-------|---------------|----------------|-----|----------------|------------------------------|-----------|
| 30    | 60            | 50             | M5  | M8x1           | OS-AD-AD-FC030-MOD060-050-11 | 30630793  |
| 30    | 70            | 50             | M6  | M8x1           | OS-AD-AD-FC030-MOD070-050-11 | 30630794  |
| 40    | 60            | 50             | M5  | M8x1           | OS-AD-AD-FC040-MOD060-050-11 | 30630796  |
| 40    | 70            | 50             | M6  | M8x1           | OS-AD-AD-FC040-MOD070-050-11 | 30630797  |
| 40    | 80            | 55             | M6  | M8x1           | OS-AD-AD-FC040-MOD080-055-11 | 30630798  |
| 40    | 100           | 60             | M8  | M10x1          | OS-AD-AD-FC040-MOD100-060-11 | 30630799  |
| 50    | 60            | 50             | M5  | M8x1           | OS-AD-AD-FC050-MOD060-050-11 | 30630800  |
| 50    | 70            | 50             | M6  | M8x1           | OS-AD-AD-FC050-MOD070-050-11 | 30630801  |
| 50    | 80            | 50             | M6  | M8x1           | OS-AD-AD-FC050-MOD080-050-11 | 30630802  |
| 50    | 100           | 60             | M8  | M10x1          | OS-AD-AD-FC050-MOD100-060-11 | 30630803  |
| 50    | 117           | 60             | M8  | M10x1          | OS-AD-AD-FC050-MOD117-060-11 | 30630804  |
| 50    | 140           | 60             | M10 | M10x1          | OS-AD-AD-FC050-MOD140-060-11 | 30630805  |



## Spare parts

| Module size D | Quantity required | Size     | ① Threaded pin<br>Order no. |
|---------------|-------------------|----------|-----------------------------|
| 60 - 80       | 4                 | M8x1x16  | 10075355                    |
| 100 - 140     | 4                 | M10x1x20 | 10075099                    |

Dimensions in mm.

Use: For use in the machine spindle for mounting KS flange adapters, shrink chucks, hydraulic chucks, chucks for cylindrical shanks or tools with a module shank in accordance with MAPAL factory standard.

Design: The radial run-out of a fitted connection or a tool can be adjusted in relation to the taper shank over threaded pins. Basic setting Form AD, if Form AF is required, please specify this when placing your order.

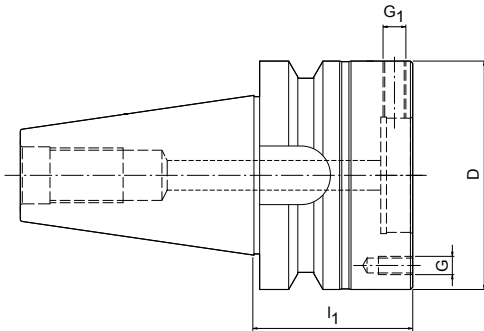
Scope of delivery: With threaded pins for aligning the radial run-out, without pull stud. Note: For coolant tube, code carrier and notes regarding coding system, see "CLAMPING" catalogue.

Balancing quality: G 6.3 with 3,000 rpm in delivery status.

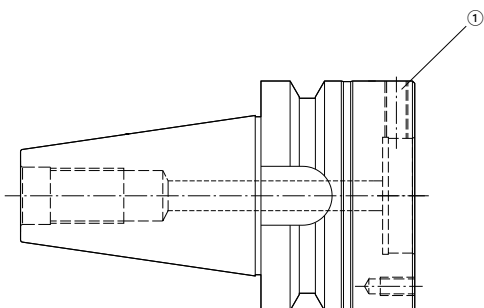


# Steep taper adapters

Shank BT according to ISO 7388-2 Form JD (JIS B 6339)



| BT | Module size D | Dimensions     |     |                | Specification             | Order no. |
|----|---------------|----------------|-----|----------------|---------------------------|-----------|
|    |               | l <sub>1</sub> | G   | G <sub>1</sub> |                           |           |
| 30 | 60            | 40             | M5  | M8x1           | OS-AD-BT030-MOD060-040-11 | 30320084  |
| 30 | 70            | 40             | M6  | M8x1           | OS-AD-BT030-MOD070-040-11 | 30320085  |
| 40 | 60            | 55             | M5  | M8x1           | OS-AD-BT040-MOD060-055-11 | 30320086  |
| 40 | 70            | 55             | M6  | M8x1           | OS-AD-BT040-MOD070-055-11 | 30320087  |
| 40 | 80            | 65             | M6  | M8x1           | OS-AD-BT040-MOD080-065-11 | 30320088  |
| 40 | 100           | 70             | M8  | M10x1          | OS-AD-BT040-MOD100-070-11 | 30320089  |
| 50 | 60            | 70             | M5  | M8x1           | OS-AD-BT050-MOD060-070-11 | 30320095  |
| 50 | 70            | 70             | M6  | M8x1           | OS-AD-BT050-MOD070-070-11 | 30320096  |
| 50 | 80            | 70             | M6  | M8x1           | OS-AD-BT050-MOD080-070-11 | 30320097  |
| 50 | 100           | 70             | M8  | M10x1          | OS-AD-BT050-MOD100-070-11 | 30320098  |
| 50 | 117           | 80             | M8  | M10x1          | OS-AD-BT050-MOD117-080-11 | 30320099  |
| 50 | 140           | 80             | M10 | M10x1          | OS-AD-BT050-MOD140-080-11 | 30320100  |



## Spare parts

| Module size D | Quantity required | Size     | ① Threaded pin<br>Order no. |
|---------------|-------------------|----------|-----------------------------|
| 60 - 80       | 4                 | M8x1x16  | 10075355                    |
| 100           | 4                 | M10x1x20 | 10075099                    |
| 117           | 4                 | M10x1x20 | 10075099                    |
| 140           | 4                 | M10x1x20 | 10075099                    |

Dimensions in mm.

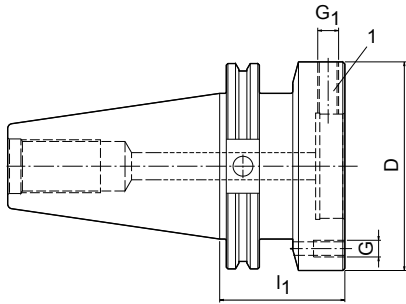
Use: For use in the machine spindle for connecting to hollow shank taper tools.  
Scope of delivery: With standard KS clamping cartridge and stop ring. Without pull stud.  
Design: Permissible run-out variation on the taper shank in relation to the hollow shank

taper inner taper = 3 µm.

Note: For clamping cartridge, stop ring and pull stud, see "CLAMPING" catalogue.  
Balancing quality: G 6.3 with 3,000 rpm in delivery status.

# Steep taper adapters

"CAT" shank in accordance with ASME B5.50-1994



| CAT | Module size<br>D | Dimensions     |     |                | Specification              | Order no. |
|-----|------------------|----------------|-----|----------------|----------------------------|-----------|
|     |                  | l <sub>1</sub> | G   | G <sub>1</sub> |                            |           |
| 30  | 60               | 50             | M5  | M8x1           | OS-AD-CAT030-MOD060-050-11 | 30320124  |
| 30  | 70               | 50             | M6  | M8x1           | OS-AD-CAT030-MOD070-050-11 | 30320125  |
| 40  | 60               | 50             | M5  | M8x1           | OS-AD-CAT040-MOD060-050-11 | 30320126  |
| 40  | 70               | 50             | M6  | M8x1           | OS-AD-CAT040-MOD070-050-11 | 30320127  |
| 40  | 80               | 55             | M6  | M8x1           | OS-AD-CAT040-MOD080-055-11 | 30320128  |
| 40  | 100              | 60             | M8  | M10x1          | OS-AD-CAT040-MOD100-060-11 | 30320129  |
| 50  | 60               | 50             | M5  | M8x1           | OS-AD-CAT050-MOD060-050-11 | 30320135  |
| 50  | 70               | 50             | M6  | M8x1           | OS-AD-CAT050-MOD070-050-11 | 30320136  |
| 50  | 80               | 50             | M6  | M8x1           | OS-AD-CAT050-MOD080-050-11 | 30320137  |
| 50  | 100              | 60             | M8  | M10x1          | OS-AD-CAT050-MOD100-060-11 | 30320138  |
| 50  | 117              | 60             | M8  | M10x1          | OS-AD-CAT050-MOD117-060-11 | 30320139  |
| 50  | 140              | 60             | M10 | M10x1          | OS-AD-CAT050-MOD140-060-11 | 30320140  |

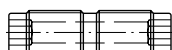
Dimensions in mm.

Use: For use in the machine spindle for connecting to hollow shank taper tools.  
 Scope of delivery: With standard KS clamping cartridge and stop ring. Without pull stud.  
 Design: Permissible run-out variation on the taper shank in relation to the hollow shank

taper inner taper = 3 µm.

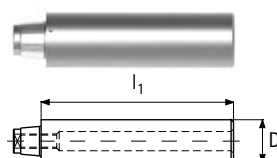
Note: For clamping cartridge, stop ring and pull stud, see "CLAMPING" catalogue.  
 Balancing quality: G 6.3 with 3,000 rpm in delivery status.

# Spare parts and accessories HFS system



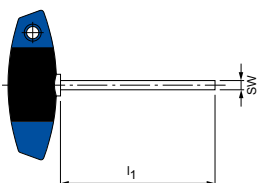
**Threaded spindle for axial clamping system**

| HFS size | Without coolant through-bore<br>Threaded spindle MN 618<br>Order no. | With coolant through-bore<br>Threaded spindle MN 618<br>Order no. |
|----------|----------------------------------------------------------------------|-------------------------------------------------------------------|
| 10       | 10024720                                                             | 10025194                                                          |
| 12       | 10024721                                                             | 10025195                                                          |
| 14       | 10024721                                                             | 10025195                                                          |
| 16       | 10024722                                                             | 10025196                                                          |
| 20       | 10024722                                                             | 10025196                                                          |
| 24       | 10024723                                                             | 10025198                                                          |



**Test arbor (alignment aid)**

| HFS size | $l_1$ | D    | Order no. |
|----------|-------|------|-----------|
| 10       | 70    | 15   | 30036468  |
| 12       | 80    | 20   | 30036469  |
| 14       | 80    | 20,5 | 30036470  |
| 16       | 80    | 23,2 | 30036471  |
| 20       | 80    | 29,3 | 30036472  |
| 24       | 80    | 39   | 30036473  |



**Hexagonal wrench with T-handle**

| HFS size | Short design |           | Long design |           |
|----------|--------------|-----------|-------------|-----------|
|          | Size         | Order no. | Size        | Order no. |
| 10       | SW2,5 x 100  | 10006233  | SW2,5 x 200 | 10032722  |
| 12       | SW3 x 100    | 10006234  | SW3 x 200   | 10025313  |
| 14       | SW3 x 100    | 10006234  | SW3 x 200   | 10025313  |
| 16       | SW4 x 100    | 10006235  | SW4 x 200   | 10018010  |
| 20       | SW4 x 100    | 10006235  | SW4 x 200   | 10018010  |
| 24       | SW5 x 100    | 10006236  | SW5 x 200   | 10013350  |



**Taper wipers for HFS internal tapers**

| HFS size | Order no. |
|----------|-----------|
| 10       | 10029989  |
| 12       | 10029990  |
| 14       | 10030002  |
| 16       | 10030003  |
| 20       | 10030004  |
| 24       | 10030005  |

**Torque wrench, blades and hexagonal inserts**

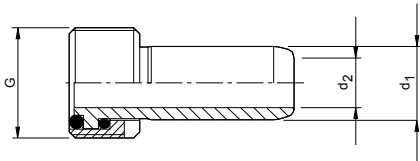
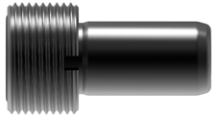
| HFS size | SW  | Torque wrench |                              |       |           | Blades and hexagonal inserts for torque wrenches |            |              |           |
|----------|-----|---------------|------------------------------|-------|-----------|--------------------------------------------------|------------|--------------|-----------|
|          |     | Torque        | Design                       | Input | Order no. | l [mm]                                           | $l_1$ [mm] | Input        | Order no. |
| 10       | 2.5 | 4 Nm          | fixed – with blade           | –     | 10044842  | 175                                              | 70         | Blade        | 10044839  |
| 12       | 3   | 6 Nm          | adjustable – without element | 1/4"  | 10040125  | 55                                               | 30         | 1/4" element | 10040122  |
| 14       | 3   | 6 Nm          | adjustable – without element | 1/4"  | 10040125  | 55                                               | 30         | 1/4" element | 10040122  |
| 16       | 4   | 15 Nm         | adjustable – without element | 3/8"  | 10040126  | 60                                               | 35         | 3/8" element | 10040123  |
| 20       | 4   | 15 Nm         | adjustable – without element | 3/8"  | 10040126  | 60                                               | 35         | 3/8" element | 10040123  |
| 24       | 5   | 20 Nm         | adjustable – without element | 3/8"  | 10040126  | 70                                               | 45         | 3/8" element | 10040124  |

Torque wrench and hexagon inserts only from HFS size 12 or SW 3.

Dimensions in mm.

Design: Permissible run-out variation of the cylindrical part in relation to the HFS connection of max. 0.002 mm.

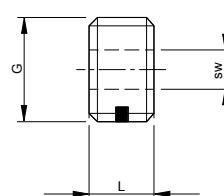
# Spare parts and accessories HSK-A 63



**Coolant tubes according to DIN 69895**

| HSK | Dimensions |                |                | Order no. |
|-----|------------|----------------|----------------|-----------|
|     | G          | d <sub>1</sub> | d <sub>2</sub> |           |
| 63  | M18x1      | 12             | 8              | 30326006  |
| 100 | M24x1,5    | 16             | 12             | 30326008  |

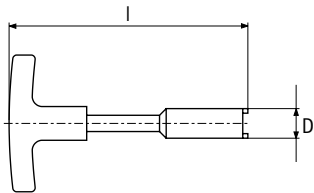
Scope of delivery: Coolant tube with two O-rings and clamping nut.  
Design: Smooth angular movement 1° self-centering, axially sealed.  
Note: Designed according to DIN 69895. Tightness tested to 80 bar.



**Blind screws**

| HSK | Dimensions |      |    | Order no. |
|-----|------------|------|----|-----------|
|     | G          | L    | SW |           |
| 63  | M18x1      | 11,5 | 8  | 30326078  |
| 100 | M24x1,5    | 15,5 | 12 | 30326074  |

Use: For closing the thread bore in hollow shank taper tool shanks if no coolant tube is used.  
Design: With Nylok insert for screw retention.  
Workpiece material: Corrosion-resistant steel.



**Assembly tool**

| HSK | d <sub>1</sub> | For blanking plugs/adaptor tube on the KS clamping cartridges for MQL applications |           |
|-----|----------------|------------------------------------------------------------------------------------|-----------|
|     |                | Specification                                                                      | Order no. |
| 63  | 17             | MAT-HSK-A063-1                                                                     | 10040110  |
| 100 | 22             | MAT-HSK-A100-1                                                                     | 10074775  |

Use: For installation and removal of coolant tubes.









# TECHNICAL APPENDIX

## Product ID codes

---

|                                                    |     |
|----------------------------------------------------|-----|
| Milling _____                                      |     |
| Milling with indexable inserts _____               | 118 |
| Radial indexable inserts _____                     | 120 |
| Solid carbide and replaceable milling cutter _____ | 122 |
| Drilling _____                                     |     |
| Solid carbide drill _____                          | 122 |
| Reaming and fine boring _____                      |     |
| FixReam reamer _____                               | 124 |
| HPR replaceable head reamer _____                  | 124 |
| Clamping _____                                     |     |
| Chucks _____                                       | 126 |
| MFS milling head holder _____                      | 128 |
| HFS replaceable head holders _____                 | 130 |

## Application notes

---

|                             |     |
|-----------------------------|-----|
| Milling _____               |     |
| Two-axis angled entry _____ | 132 |
| Trochoidal milling _____    | 134 |

## Handling notes

---

|                                      |     |
|--------------------------------------|-----|
| Clamping _____                       |     |
| Hydraulic chuck _____                | 136 |
| KS flange adapter _____              | 137 |
| Side lock chuck Mill Chuck, HB _____ | 138 |

## Pictograms

---

|                  |     |
|------------------|-----|
| Pictograms _____ | 140 |
|------------------|-----|

# Product ID codes

## Milling cutter with indexable inserts

I

S

M

9

0

1

-

0

6

3

-

1

1

5

-

Type of milling cutter

|     |                                                                              |
|-----|------------------------------------------------------------------------------|
| ISM | Shell end face milling cutter with indexable inserts<br>Indexable Shell Mill |
| IMH | High-feed milling cutter<br>Indexable Mould HFC                              |
| ICM | Shoulder milling cutter with indexable inserts<br>Indexable Corner Mill      |

Internal cooling

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

Tool diameter in mm

|     |                          |
|-----|--------------------------|
| 032 | Milling cutter Ø = 63 mm |
|-----|--------------------------|

Contact angle / installation position

|    |                                                                                  |
|----|----------------------------------------------------------------------------------|
| 00 | 0°                                                                               |
| 10 | 0° - conical design<br>(only for end milling cutter)                             |
| 20 | 0° - cylindrical design made from solid carbide<br>(only for end milling cutter) |
| 90 | 90°                                                                              |
| 95 | 95°                                                                              |

Total length in mm \*

|     |                       |
|-----|-----------------------|
| 115 | Total length = 115 mm |
|-----|-----------------------|

\* Only for milling cutters with HA/HB connection

**H B 3 2 - Z 2 R - X P \_ T 1 1**

Connection (example)

|      |                                         |
|------|-----------------------------------------|
| CA16 | Milling cutter arbor Ø = 16 mm          |
| CA22 | Milling cutter arbor Ø = 22 mm          |
| CA27 | Milling cutter arbor Ø = 27 mm          |
| CA32 | Milling cutter arbor Ø = 32 mm          |
| HB16 | Cylindrical shank Ø = 16 mm<br>Shape HB |
| HB20 | Cylindrical shank Ø = 20 mm<br>Shape HB |
| HB25 | Cylindrical shank Ø = 25 mm<br>Shape HB |
| HB32 | Cylindrical shank Ø = 32 mm<br>Shape HB |
| HB35 | Cylindrical shank Ø = 35 mm<br>Shape HB |

Effective number of teeth (eff.) (example)

|     |                                                              |
|-----|--------------------------------------------------------------|
| Z2  | Number of teeth eff. = 2<br>two-digit, with HA/HB connection |
| Z02 | Number of teeth eff. = 2<br>three-digit                      |

Rotational direction

|   |       |
|---|-------|
| R | Right |
| L | Left  |

Indexable insert

|                 |                 |
|-----------------|-----------------|
| 1st letter      | Blade form      |
| 2nd letter      | Clearance angle |
| 3rd letter      | Tolerance       |
| 4th letter      | Insert type     |
| 5th & 6th digit | Insert size     |

# Product ID codes

## Radial indexable inserts

**X P K T 1 1 0 4 0 8**

**Blade form**

C (80°)

L (90°)

R

S (90°)

X (90°)

**Tolerance**

|   | d [mm]                  | m [mm]                  | s [mm] |
|---|-------------------------|-------------------------|--------|
| G | ±0,025                  | ±0,025                  | ±0,13  |
| H | ±0,013                  | ±0,013                  | ±0,025 |
| K | from ±0.05<br>to ±0.15* | ±0,013                  | ±0,025 |
| M | from ±0.05<br>to ±0.15* | from ±0.08<br>to ±0.20* | ±0,13  |

\* Tolerance depends on the insert size

**Insert type**

40° - 60°

T

40° - 60°

W

**Insert size**

| Incircle |    |    |
|----------|----|----|
| d [mm]   | X  | S  |
| 6,75     | -  | 06 |
| 9,35     | 11 | -  |
| 10,2     | -  | 10 |
| 14,7     | -  | 14 |
| 18,7     | -  | 18 |

**Clearance angle**

| D | 15° |
|---|-----|
| P | 11° |

**Insert thickness**

| Identi-<br>fication<br>number | s [mm] |        |
|-------------------------------|--------|--------|
|                               | X      | S      |
| 02                            | 4,7    | 2,5*   |
| 04                            | 4,7    | 4,86   |
| 05                            | 4,7    | 5*/5,2 |
| 06                            | 4,7    | 6*     |

\* High-feed machining

**Corner radius**

| Identi-<br>fication<br>number | r [mm] |
|-------------------------------|--------|
| 04                            | 0,4    |
| 08                            | 0,8    |
| 10                            | 1,0    |
| 12                            | 1,2    |
| 15                            | 1,5    |
| 16                            | 1,6    |
| 20                            | 2,0    |
| 30                            | 3,0    |
| 40                            | 4,0    |

R

-

M

3

3

-

H

P

9

9

0

Cutting direction

R

right

N

neutral

Cutting edge design

| Technology         | Cutting edge design | Application         |
|--------------------|---------------------|---------------------|
| NeoMill-4-HiFeed90 | MLQ                 | General machining   |
|                    | SMH                 | Unstable conditions |
|                    | SMS                 | Precise machining   |

| Technology    | Cutting edge design | Application      |
|---------------|---------------------|------------------|
| NeoMill-Titan | M33                 | Medium machining |

Cutting material

HP990

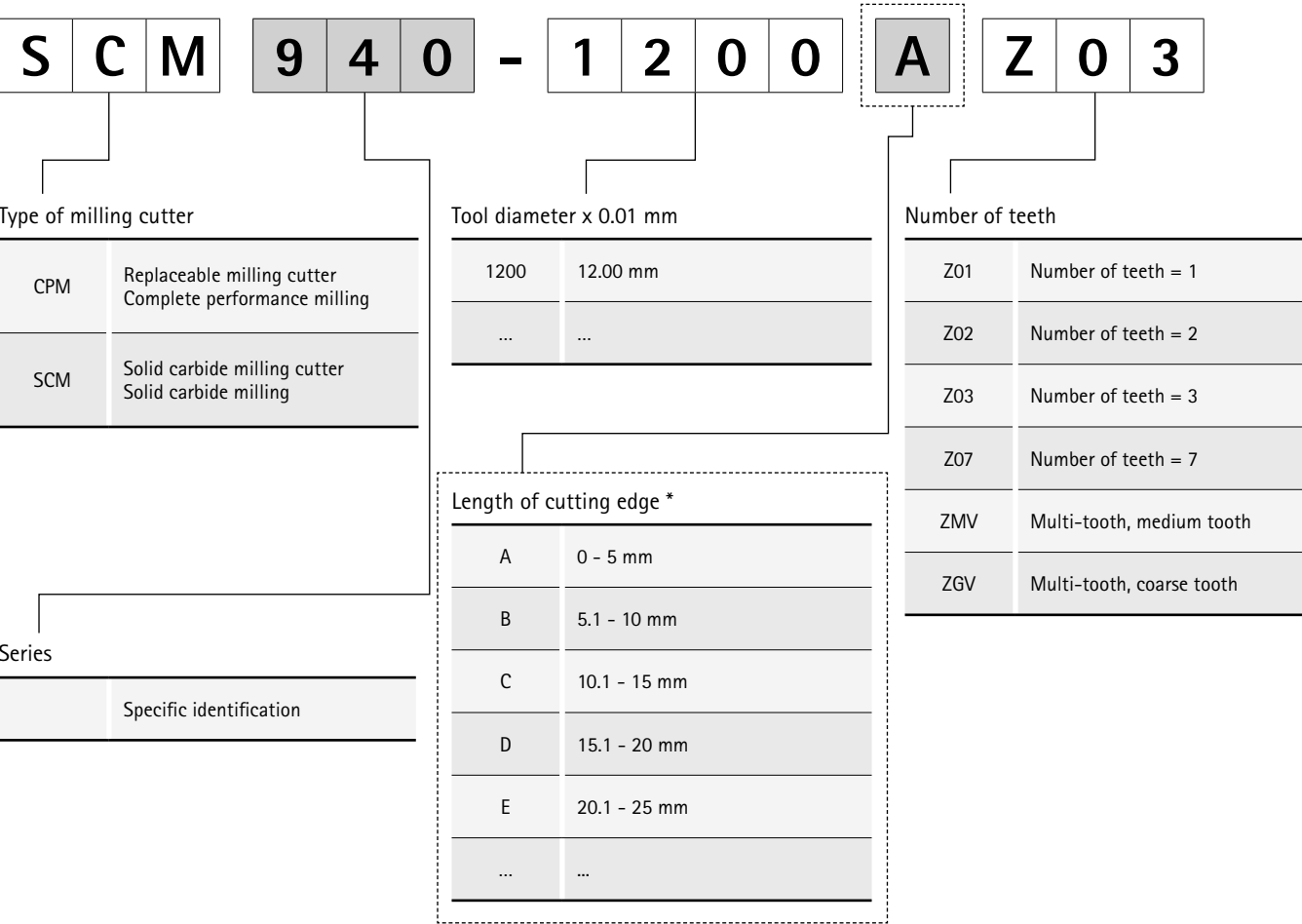
HP993

HP995

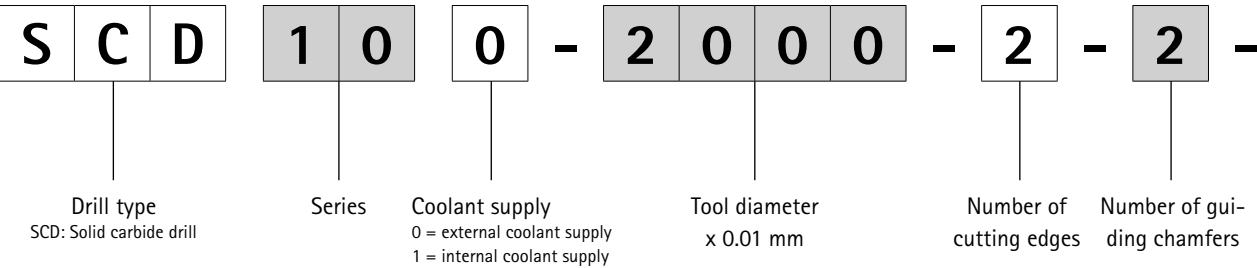


# Product ID codes

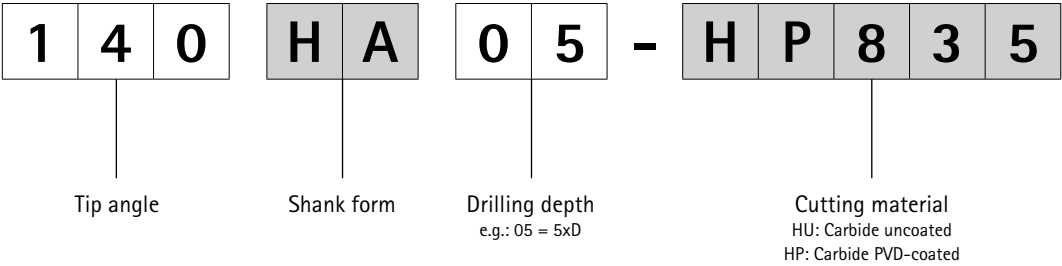
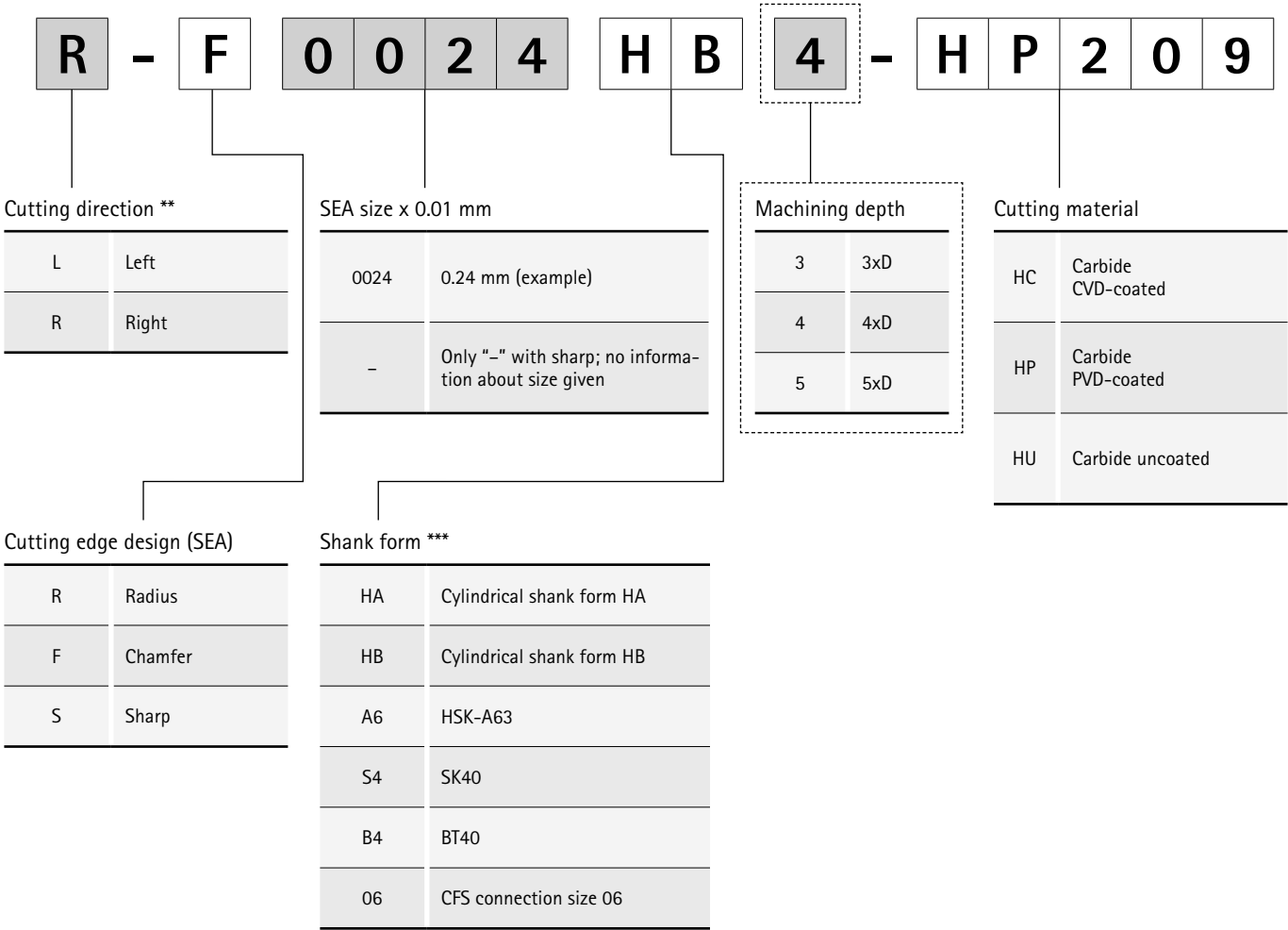
## Solid carbide and replaceable milling cutter



## Solid carbide drill product ID code



\* 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



# FixReam reamer product ID code

Series

F

X

R

FixReam

Diameter

5

1

0

Type of bore:  
0 | 2 = Through hole  
3 | 5 = Blind bore

G

Detail  
Tool grinding diameter  
(Digit is only occupied for G-variant)

ø

2

0

Bore diameter

.

0

0

0

Tolerance

-

3

IT or tolerances in µm  
(Example: +30+10)  
or for G variant specifica-  
tion of the manufacturing  
tolerance of the tool grind-  
ing diameter  
for example -3 µm

Designs:

Solid carbide

Flute helix angle for cutting edges:

0 = Straight fluted  
1 = Left-hand fluted

# HPR replaceable head reamer product ID code

Series

H

P

R

HPR replaceable head reamer

Diameter

1

5

0

Flute helix angle of the cutting edges:  
0 = Straight fluted up to ø 65.000 mm  
1 = Left-hand fluted up to ø 65.000 mm  
3 = Left-hand up to ø 18.590 mm  
5 = Blind bore up to ø 65.000 mm  
8 = Blind bore up to ø 21.290 mm

G

G = Tool diameter information  
Digit is only used for C and G variants

ø

2

0

Bore or tool diameter

.

0

0

0

Tolerance

H

7

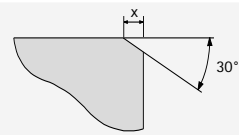
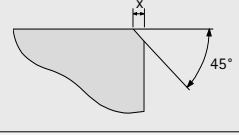
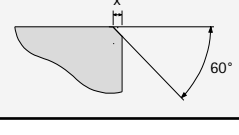
IT or tolerances in µm  
(Example: +30+10)

Designs:

1 = Fixed reamer  
2 = Finely adjustable reamer

# Lead geometries and rake angles multi-bladed reamer

Series FXR, HPR

| Geometry                                                                            | Lead geometry |          |
|-------------------------------------------------------------------------------------|---------------|----------|
|                                                                                     | Name          | Geometry |
|  | MF            | 30°      |
|  | MO            | 45°      |
|  | MT            | 60°      |

| Rake angle |                     |
|------------|---------------------|
| Name       | Angle               |
| 0A         | 0°                  |
| 1G         | 6°                  |
| 1M         | 13°                 |
| 2G         | 6° (for blind bore) |

x = lead length

Lead

M

F

1

M

Lead geometry and rake angle:

MF1M

MT0A

For an explanation of the lead geometry, see below.

Cutting material

H

P

6

2

5

Cutting material:

HP625

Lead

M

O

2

G

Lead geometry and rake angle:

MO2G

MF1G

For an explanation of the lead geometry, see below.

Cutting material

H

P

6

2

5

Cutting material:

HP625

Series overview | diameter range | lead designation | lead length

| Series | Lead designation | Diameter range  | Lead length x |
|--------|------------------|-----------------|---------------|
| FXR    | MF               | 3,701 - 6,200   | 0,90          |
|        |                  | 6,210 - 12,200  | 1,20          |
|        |                  | 12,210 - 20,200 | 1,50          |
|        | MT               | 3,701 - 6,200   | 0,30          |
|        |                  | 6,210 - 10,700  | 0,40          |
|        |                  | 10,710 - 16,200 | 0,50          |
|        |                  | 16,210 - 20,200 | 0,60          |

| Series | Lead designation | Diameter range | Lead length x |
|--------|------------------|----------------|---------------|
| HPR    | MF               | 7,00 - 65,00   | 1,40          |
|        | MO               | 7,00 - 65,00   | 0,60          |

# Product ID codes

## Chucks

M

H

C

-

H

S

K

-

A

0

6

3

-

0

8

-

1

0

0

-

Type

Locating shank

Clamping diameter  
(max. clamping ø)

Projection length

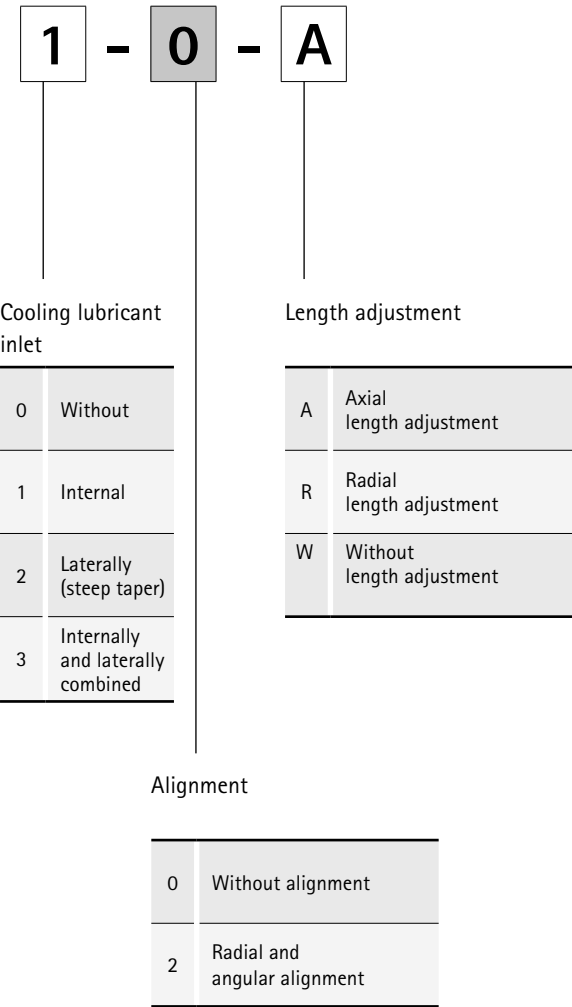
|     |                                              |
|-----|----------------------------------------------|
| HTC | HighTorque Chuck                             |
| MHC | Hydraulic chuck (HydroChuck)                 |
| MTC | Shrink chuck (ThermoChuck)                   |
| MWC | Weldon/Mill Chuck chuck                      |
| MNC | Whistle Notch chuck                          |
| MCC | Chucks for collets                           |
| MPC | Precision drill chuck (Precision-DrillChuck) |
| MSC | Synchro tapping chuck                        |
| MDA | Milling cutter arbor vibration dampened      |
| MCA | Milling cutter arbor                         |

|             |                                                           |
|-------------|-----------------------------------------------------------|
| HSK-A       | Hollow shank taper Form A                                 |
| MOD         | Module connection                                         |
| ZYL         | Cylindrical shank                                         |
| Steep taper | Taper shank in form A According to ISO                    |
| AD-FC       | Taper shank in form A According to ISO                    |
| BT          | Taper shank in form J According to ISO                    |
| JD-FC       | Taper shank in form J similar to ISO with face connection |

The following configurations are possible:

- VS: Coding system
- FB: Finely balanced
- FAS: Milling cutter clamping screw
- BC: Chip version
- CT: Coolant tube



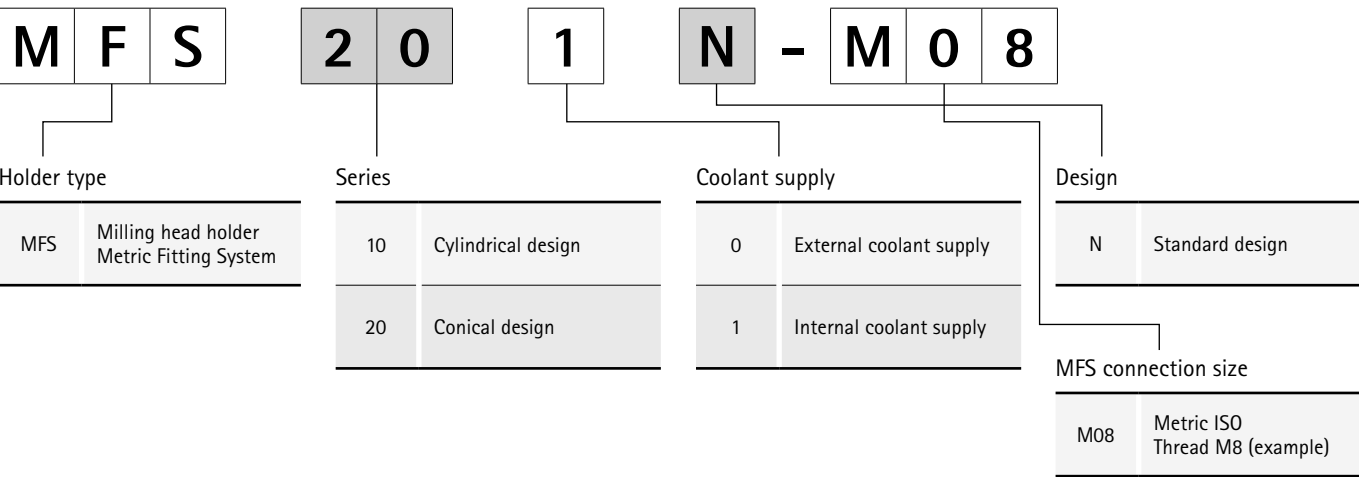


Designs with code carrier



# Product ID codes

## MFS milling head holder



1

2

9

-

H

S

K

-

A

1

0

0

S

Projection length in mm

|     |                 |
|-----|-----------------|
| 070 | 70 mm (example) |
|-----|-----------------|

Shank type and size

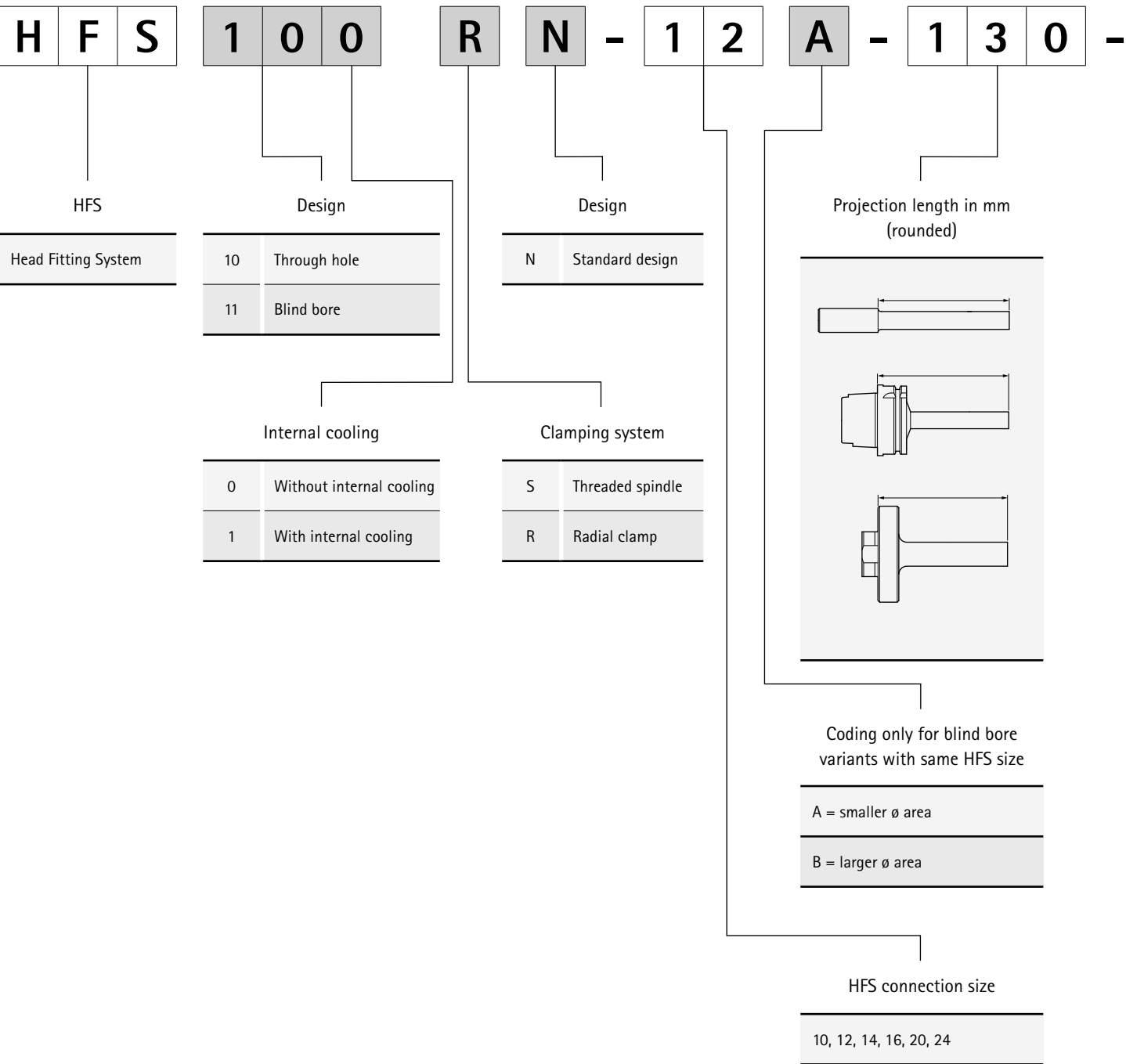
|          |                                   |
|----------|-----------------------------------|
| HSK-A100 | Hollow shank taper Form A         |
| ZYL-HA16 | Cylindrical shank form HA size 16 |

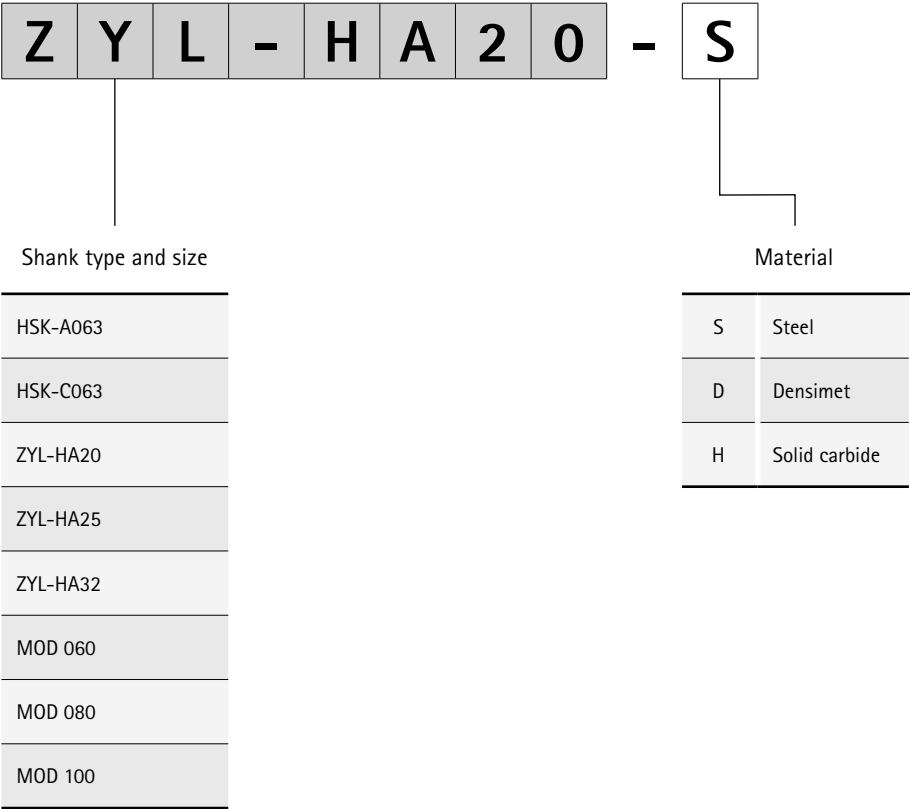
Material

|   |         |
|---|---------|
| S | Steel   |
| H | Carbide |

# Product ID codes

## HFS replaceable head holders

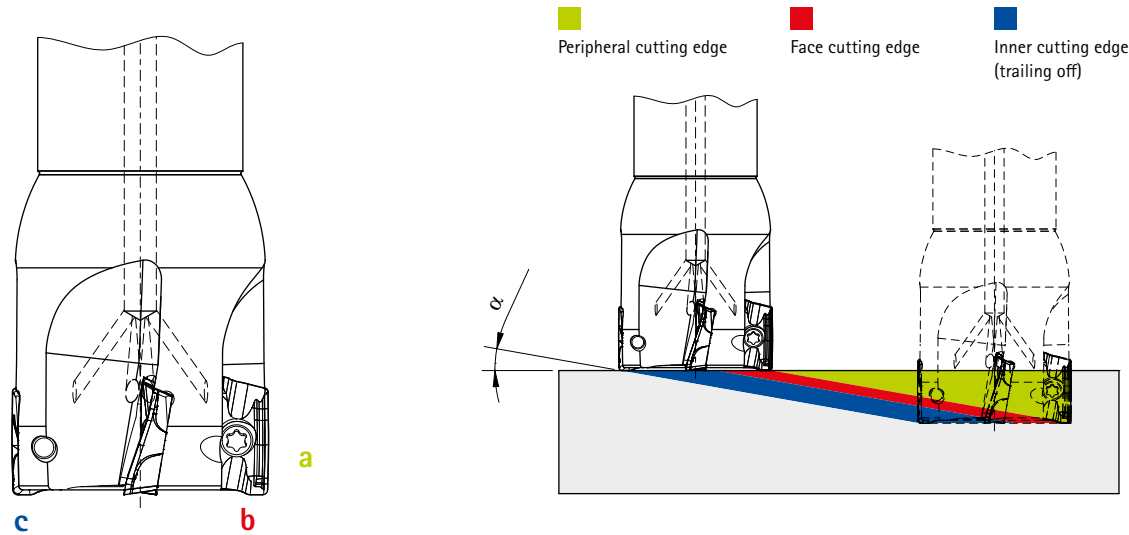






# Milling application notes – Two-axis angled entry

## Two-axis angled entry – linear (flute)



**Ramp angle  $\alpha$ :**  
 The maximum plunge angle  $\alpha$  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.

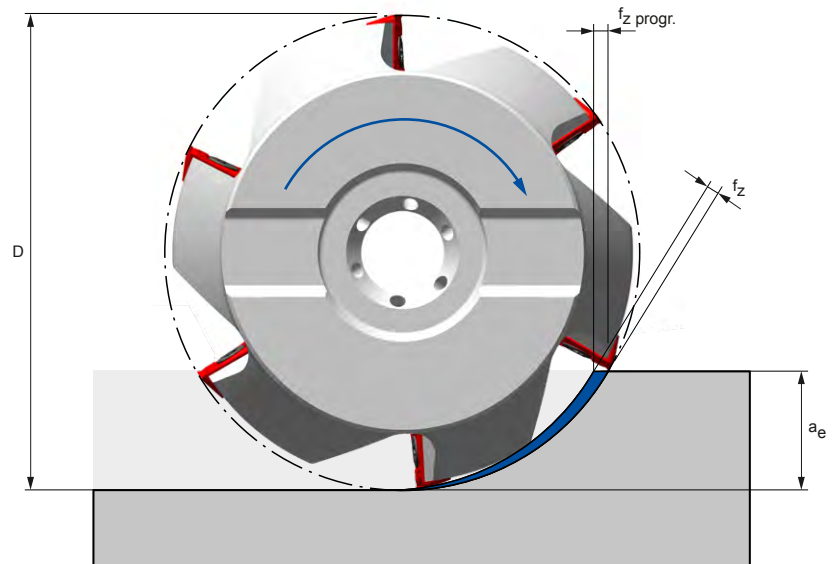
### Maximum plunge angle for NeoMill milling cutter

| Plunge milling | Diameter of milling cutter [mm] | Maximum plunge angle [°] |        |        |        |        |
|----------------|---------------------------------|--------------------------|--------|--------|--------|--------|
|                |                                 | XPKT11                   | SDMT06 | SDMT10 | SDMT14 | SDMT18 |
|                | 16                              | –                        | 9      | –      | –      | –      |
|                | 20                              | –                        | 4,8    | –      | –      | –      |
|                | 25                              | –                        | 3      | 4,4    | –      | –      |
|                | 32                              | 4                        | 2      | 2,9    | –      | –      |
|                | 35                              | –                        | 1,7    | –      | –      | –      |
|                | 40                              | 3                        | –      | 2      | –      | –      |
|                | 50                              | 2,2                      | –      | 1,5    | 2,4    | –      |
|                | 52                              | –                        | –      | 1,1    | 1,7    | –      |
|                | 63                              | 1,7                      | –      | 1,1    | 1,7    | –      |
|                | 66                              | –                        | –      | 0,8    | 1,3    | –      |
|                | 80                              | 1,3                      | –      | 0,8    | 1,3    | 2,5    |
|                | 100                             | 1                        | –      | –      | 1      | 2      |
|                | 125                             | –                        | –      | –      | 0,7    | 1,6    |
|                | 160                             | –                        | –      | –      | –      | 1,3    |
|                | 200                             | –                        | –      | –      | –      | 1      |

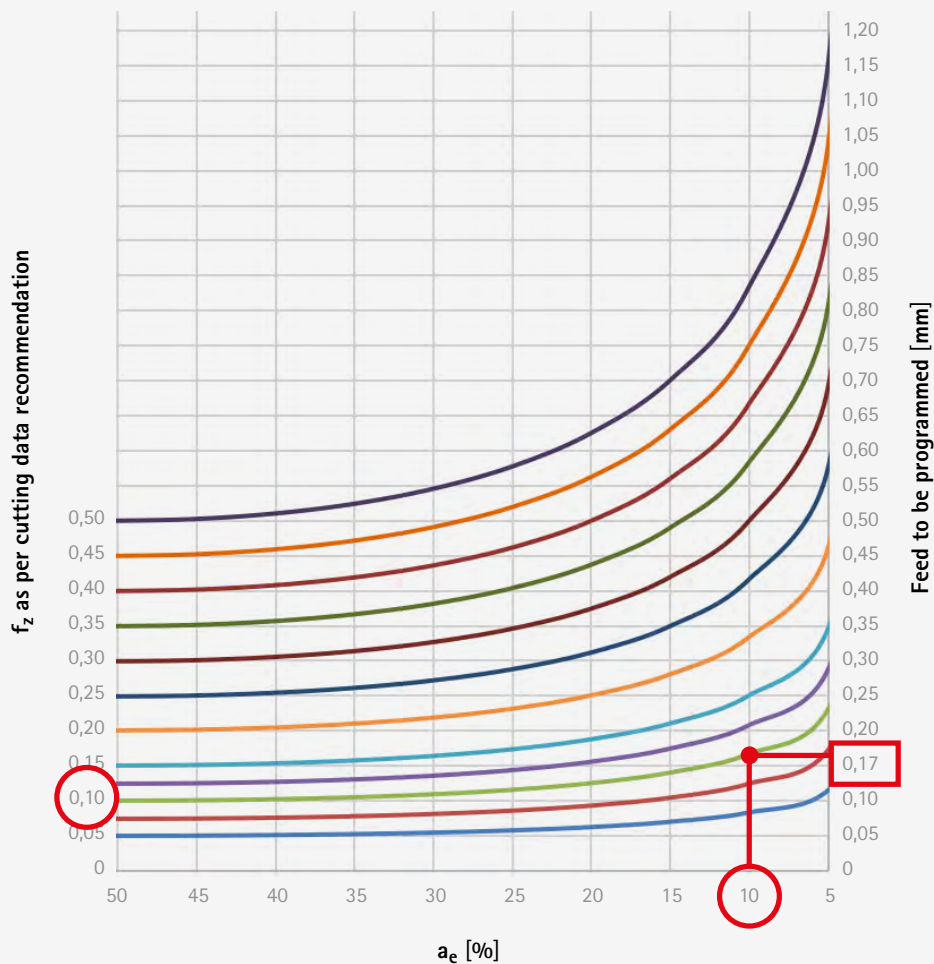
## Feed value compensation

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 workpiece.

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 per cent, 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:

$D = 20 \text{ mm}$   
 $a_e = 2 \text{ mm}$   
 $f_z = 0.1 \text{ mm/tooth}$   
 $a_e/D = 10\%$   
 $f_{z \text{ progr.}} = 0.17 \text{ mm/tooth}$

# Milling application notes – 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.

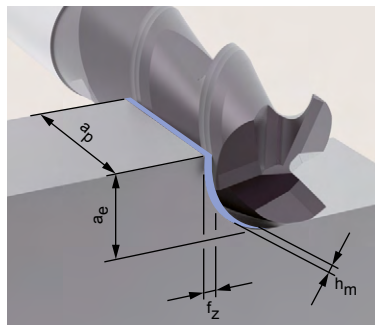
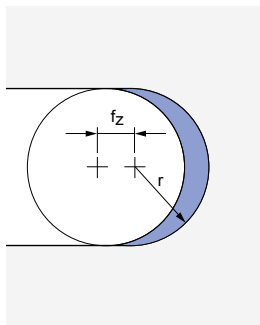


## Example of full slot milling

### Conventional milling

For roughing in a full cut, the contact conditions of the milling cutter are fixed at a wrapping angle of  $180^\circ$ .

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.

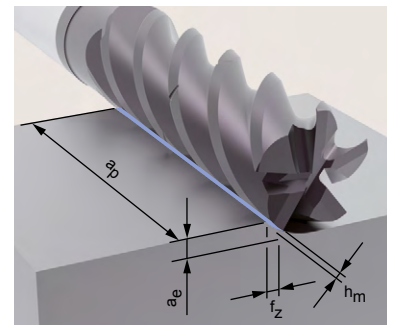
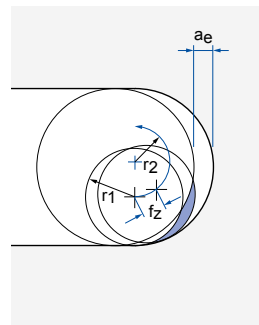


$a_p$ : small (cutting depth  $\sim 1 \times D$ )  
 $a_e$ : large ( $1 \times D$ )  
 $f_z$ : small  
 $v_c$ : low

### 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.



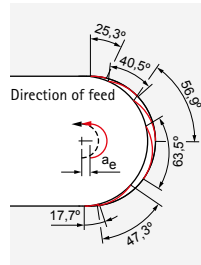
$a_p$ : large (full utilisation of the cutting edge length possible)  
 $a_e$ : small  
 $f_z$ : large  
 $v_c$ : high

# Trochoidal milling – in detail

## Trochoidal milling – circular path

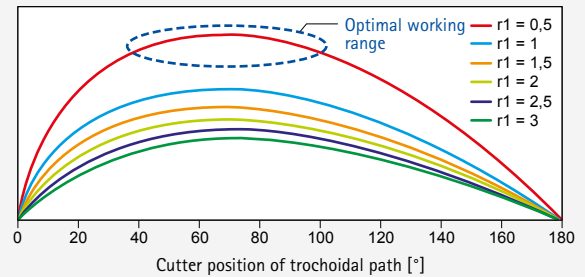
For the case of a circular path with a constant radius, the wrapping angles on the contact tool cutting edge vary depending on the absolute radial material removal rate within one revolution.

- 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

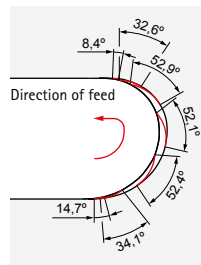
Wrapping as a function of the path position and radius



## Trochoidal milling – optimised path curve

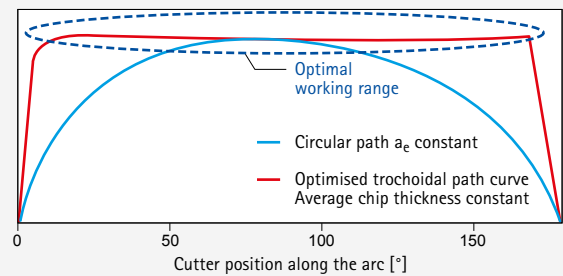
Through an adapted path movement of the tool, the contact ratios of the milling cutter can be kept constant at every point of the path over almost the entire machining operation. This means that the milling process can always be operated at its optimum. Within a path, the feed rate is adjusted so that the average chip thickness remains constant.

- Constant contact condition
- Constant strength level
- Less tool wear
- Maximum material removal rate



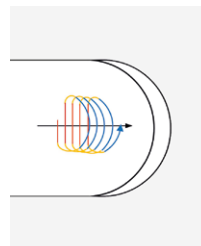
Wrapping as a function of the path position  
- optimised path curve

Wrapping as a function of the path position – conventional circular path and 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.



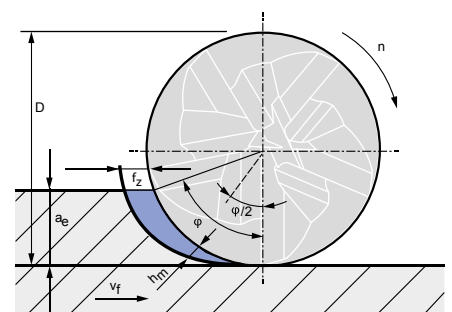
Feed  
Ramp  
Rapid traverse

## NOTES

- 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 $\varphi$

|                        |                                          |                                            |                                                                                                                                     |
|------------------------|------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 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 | $h_m = [\text{mm}]$                      | $h_m = f_z \cdot \sqrt{\frac{a_e}{D}}$     | Is kept almost constant during trochoidal milling by dynamic feed rates.<br>The average chip thickness is measured at $\varphi/2$ . |
| Feed per tooth         | $f_z = \frac{[\text{mm}]}{\text{Tooth}}$ |                                            | Restricted variable, is adjusted during machining by CAM system.                                                                    |
| Cutting width          | $a_e = [\text{mm}]$                      |                                            | Constantly recalculated by the CAM software and limits the contact angle $\varphi$ .                                                |
| Tool diameter          | $D = [\text{mm}]$                        |                                            |                                                                                                                                     |



# Clamping instructions – Hydraulic chuck

## Checking the minimum number of rotations



Figure 1:  
Turn the clamping screw and the tool test piece.



Figure 2:  
Tighten the clamping screw and observe the minimum revolutions.

1. Clean and degrease the tool test piece and the location bore (for more information see the brief instructions for the corresponding hydraulic chuck).
2. Insert the tool test piece into the chuck to be tested.
3. Turn the clamping screw with a hex-wrench until the tool test piece in the chuck can no longer be turned by hand (see figure 1).
4. Tighten the clamping screw as far as it will go with a hex-wrench. Refer to the corresponding table for the minimum revolutions.

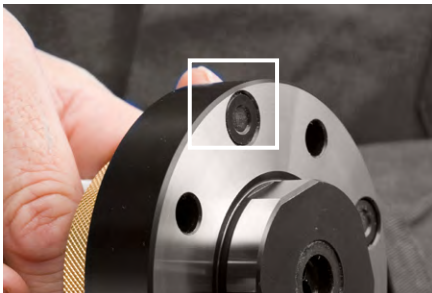
### Tool test piece

| Order no. | Specification                                    |
|-----------|--------------------------------------------------|
| 31212898  | Test arbor ø3x70 mm min. rotation TU cylindrical |
| 31212910  | Test arbor ø4x70 mm min. rotation TU cylindrical |
| 31212911  | Test arbor ø5x70 mm min. rotation TU cylindrical |
| 30844163  | Test arbor ø6x70 mm Drehmoment TU                |
| 30844164  | Test arbor ø8x70 mm min. torque TU               |
| 30844166  | Test arbor ø10x70 mm min. torque TU              |
| 30844167  | Test arbor ø12x70 mm min. torque TU              |
| 30844168  | Test arbor ø14x70 mm min. torque TU              |
| 30844170  | Test arbor ø16x70 mm min. torque TU              |
| 30844171  | Test arbor ø18x70 mm min. torque TU              |
| 30844173  | Test arbor ø20x70 mm min. torque TU              |
| 30844174  | Test arbor ø25x100 mm min. torque TU             |
| 30844175  | Test arbor ø32x100 mm min. torque TU             |



# Clamping instructions – KS flange adapter

## Assembling and aligning KS flange adapters and MAPAL module adaptors with radial and angular alignment



1. Clean face surfaces on flange adapter and adapter. Ensure that the face surface on the alignment screw does not protrude beyond the face surface in the flange adapter.



2. Insert flange adapter. Place fastening screws in contact.



3. Clean taper and face surface on the test arbor or tool carefully. Insert test arbor or tool.



4. Position the dial gauge at radial run-out checkpoint. On MAPAL tools, it is also possible to use the HSK collar for alignment. Take lowest measuring point and set dial gauge to "zero". Align radially.



5. For the angular alignment, the dial gauge is positioned at the upper point to be checked or approx. 100 mm from the connection. Align angularly using alignment screws. Do not loosen the alignment screws after actuation.

6. Once the angular alignment is set to  $< 3 \mu\text{m}$ , check the radial alignment again at the radial run-out checkpoint on the collar and correct if necessary. Should it be necessary to correct the radial alignment, check the angular alignment again afterwards.

### Tightening torques

| Nominal size | Module diameter [mm] | Fastening screw          | Tightening torque [Nm] |
|--------------|----------------------|--------------------------|------------------------|
| HSK32        | 60                   | ISO 4762 – M5x16 – 12.9  | 8,7                    |
| HSK40        | 70                   | ISO 4762 – M6x20 – 12.9  | 15                     |
| HSK50        | 80                   | ISO 4762 – M6x20 – 12.9  | 15                     |
| HSK63        | 100                  | ISO 4762 – M8x25 – 12.9  | 36                     |
| HSK80        | 117                  | ISO 4762 – M8x25 – 12.9  | 36                     |
| HSK100       | 140                  | ISO 4762 – M10x30 – 12.9 | 72                     |

The basis for the maximum tightening torque of the cylinder head screws in accordance with DIN 912 is the general DIN standard for property class 10.9.

MAPAL only uses cylinder head screws in accordance with ISO 4762 with the property class 12.9.

# Clamping instructions – Side lock chuck Mill Chuck, HB

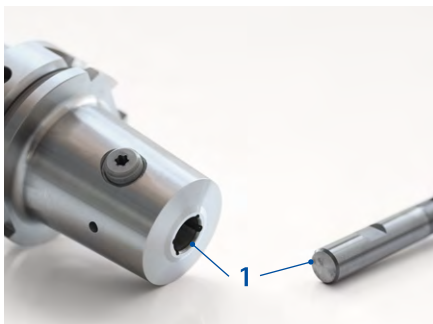
## Clamping a tool

### Note:

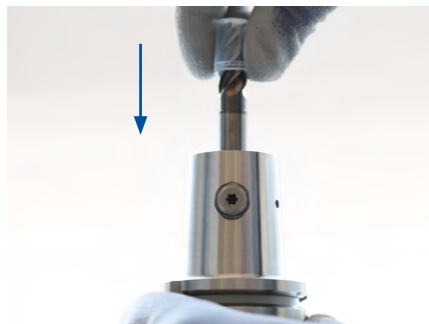
Only clamp undamaged tools and tools that are free from burrs.

### Comment:

- Only for trained personnel.
- Wear protective gloves.
- It is recommended that you handle the tool with a protective cap.



1. Clean the location bore and the tool shank (position 1).



### Note:

To ensure correct tool clamping, the HB surface of the tool must face the clamping screw.

2. Push the tool, starting with the shank, into the location bore of the side lock chuck. The recess on the tool must be directed towards the clamping screw.



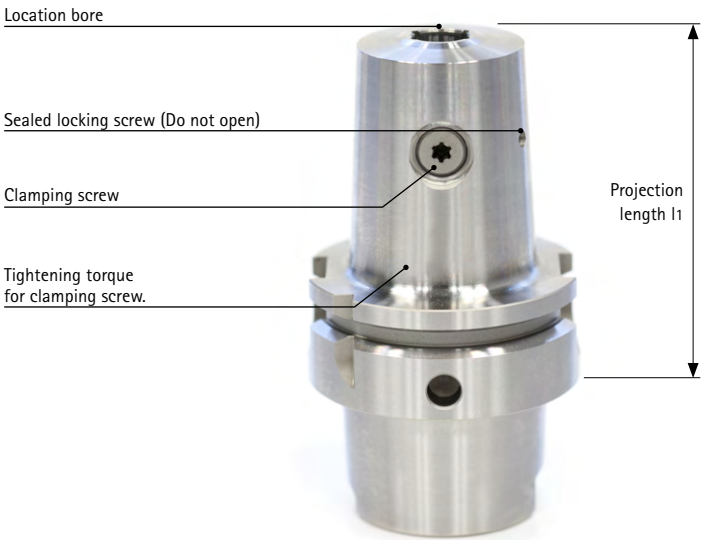
3. Press on the tool from above. At the same time, turn the clamping screw clockwise until it stops.  
 → The clamping screw is abut with the HB surface of the tool.  
 4. Turn the clamping screw back half a turn.



5. Set a torque wrench to the specified tightening torque (see Table "Tightening torques for the clamping screw").  
 6. Tighten the clamping screw until it stops using the torque wrench.

### Result:

The tool is completely clamped in the mill chuck and can be used.

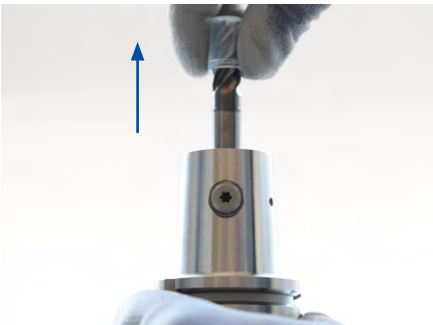


Unclamping a tool

**Note:**  
The clamping screw is not secured from accidentally falling out.



1. Loosen the clamping screw by turning it anticlockwise.



2. Remove the tool from the side lock chuck's location bore.

**Result:**  
The tool has been removed.

Tightening torques for clamping screw

| Diameter tool shank [mm] | Tightening torque [Nm] | Torx size |
|--------------------------|------------------------|-----------|
| 6                        | 10                     | T15       |
| 8                        | 10                     | T25       |
| 10                       | 7                      | T25       |
| 12                       | 13                     | T30       |
| 14                       | 13                     | T30       |
| 16                       | 23                     | T40       |
| 18                       | 23                     | T40       |
| 20                       | 25                     | T40       |
| 25                       | 47                     | T50       |
| 32                       | 50                     | T50       |



# MAPAL machining groups

| Machining group |    | Workpiece material                                                              | Strength/hardness<br>[N/mm <sup>2</sup> ] [HRC] | Frequently machined workpiece materials                                                         |
|-----------------|----|---------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------|
| P               | P1 | P1.1 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 700 N/mm <sup>2</sup>                         | 1.0122 (S235/St 37), 1.0401 (C15), 1.0503 (C45), 1.0570 (S355/St 52), 1.1213 (Cf53)             |
|                 |    | P1.2 Structural, free-cutting, case hardened and heat-treated steels, non-alloy | < 1.200 N/mm <sup>2</sup>                       | 1.1249 (Cf70)                                                                                   |
|                 | P2 | P2.1 Nitrided, case hardened and heat-treated steels, alloy                     | < 900 N/mm <sup>2</sup>                         | 1.7131 (16MnCr5)                                                                                |
|                 |    | P2.2 Nitrided, case hardened and heat-treated steels, alloy                     | < 1.400 N/mm <sup>2</sup>                       | 1.7227 (42CrMo54)                                                                               |
|                 | P3 | P3.1 Tool, bearing, spring and high-speed steels*                               | < 800 N/mm <sup>2</sup>                         | 1.2343 (X37CrMoV5-1), 1.2762 (75CrMoNiW6-7)                                                     |
|                 |    | P3.2 Tool, bearing, spring and high-speed steels*                               | < 1.000 N/mm <sup>2</sup>                       | 1.2367 (X38CrMoV5-3), 1.2713 (55NiCrMoV6)                                                       |
|                 |    | P3.3 Tool, bearing, spring and high-speed steels*                               | < 1.500 N/mm <sup>2</sup>                       | 1.2379 (X153CrMoV12), 1.2738 (40CrMnNiMo8-6-4)                                                  |
|                 | P4 | P4.1 Stainless steels, ferritic and martensitic                                 |                                                 | 1.4510 (X3CrTi17), 1.4589 (X5CrNiMoTi15-2)                                                      |
| M               | M1 | M1.1 Stainless steels, austenitic                                               | < 700 N/mm <sup>2</sup>                         | 1.4301 (V2A), 1.4571 (V4A)                                                                      |
|                 |    | M1.2 Stainless steels, ferritic/austenitic (duplex)                             | < 1.000 N/mm <sup>2</sup>                       | 1.4362 (Alloy 2304), 1.4501, 1.4662 (LDX 2404)                                                  |
|                 | M2 | M2.1 Stainless/heat-resistant cast steel, austenitic                            | < 700 N/mm <sup>2</sup>                         |                                                                                                 |
|                 | M3 | M3.1 Stainless cast steel, ferritic/austenitic (duplex)                         | < 1.000 N/mm <sup>2</sup>                       |                                                                                                 |
| K               | K1 | K1.1 Cast iron with lamellar graphite (grey cast iron), GJL                     | < 300 N/mm <sup>2</sup>                         | GJL-250 (GG-25), GJL-260 (GG-26 Cr)                                                             |
|                 |    | K2.1 Cast iron with spheroidal graphite, GJS                                    | < 500 N/mm <sup>2</sup>                         | GJS-400 (GGG-40), GJS-450 (GGG-45)                                                              |
|                 | K2 | K2.2 Cast iron with spheroidal graphite, GJS                                    | ≤ 800 N/mm <sup>2</sup>                         | GJS-600 (GGG-60), GJS-800-2 (GGG-80), GJS-800-8 (ADI 800)                                       |
|                 |    | K2.3 Cast iron with spheroidal graphite, GJS                                    | > 800 N/mm <sup>2</sup>                         | GJS-900-2 (GGG-90), GJS-1000-5 (ADI 1000), GJS-1200-2 (ADI 1200), GJS-1400-1 (ADI 1400)         |
|                 | K3 | K3.1 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM          | < 500 N/mm <sup>2</sup>                         | GJV-300, GJV-400, GJMW-400-5 (GTW-40)                                                           |
|                 |    | K3.2 Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM          | > 500 N/mm <sup>2</sup>                         | 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 <sup>2</sup>                         | SE-Cu                                                                                           |
|                 |    | N2.2 Copper, alloy                                                              | > 300 N/mm <sup>2</sup>                         | CuSn6                                                                                           |
|                 |    | N2.3 Brass, bronze, gunmetal                                                    | < 1.200 N/mm <sup>2</sup>                       | 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)                            |                                                 | Nomex, Kevlar, Twaron, KOREX                                                                    |
|                 |    | 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)                                                         |                                                 | CeramTec AO-403 (AlSi9MgMn-Al2O3), Al/Cu/Mg-SiO2/Al2O3/AlN/TiC/SiC/BN/TiB2                      |
|                 | 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 <sup>2</sup>                         |                                                                                                 |
|                 | S2 | S2.1 Titanium, titanium alloys                                                  | < 1.200 N/mm <sup>2</sup>                       | TiAl6V4                                                                                         |
|                 |    | S2.2 Titanium, titanium alloys                                                  | > 1.200 N/mm <sup>2</sup>                       |                                                                                                 |
|                 | S3 | S3.1 Nickel, non-alloy and alloy                                                | < 900 N/mm <sup>2</sup>                         | 1.3912 (Invar, Ni36)                                                                            |
|                 |    | S3.2 Nickel, non-alloy and alloy                                                | > 900 N/mm <sup>2</sup>                         |                                                                                                 |
|                 | S4 | S4.1 High-temperature super alloy Ni, Co and Fe-based                           |                                                 | Hardox, Hastelloy, Incoloy, Inconel, NIMONIC, Stellite, Waspaloy                                |
| 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                                                  |
|                 |    | H2.1 Hardened steel / cast steel                                                | < 60 HRC                                        | 1.1730, 1.2379, 1.2358, 1.2767, 1.4112, ASP 2012                                                |
|                 | H2 | H2.2 Hardened steel / cast steel                                                | < 65 HRC                                        | 1.2379, 1.2363, 1.2436, 1.2842, ASP 2005, Vanadis 23                                            |
|                 |    | 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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