

Your technology partner for cost-effective machining

INNOVATIONS 2023

You

don't want to do everything differently. But many things better.

Opening up opportunities

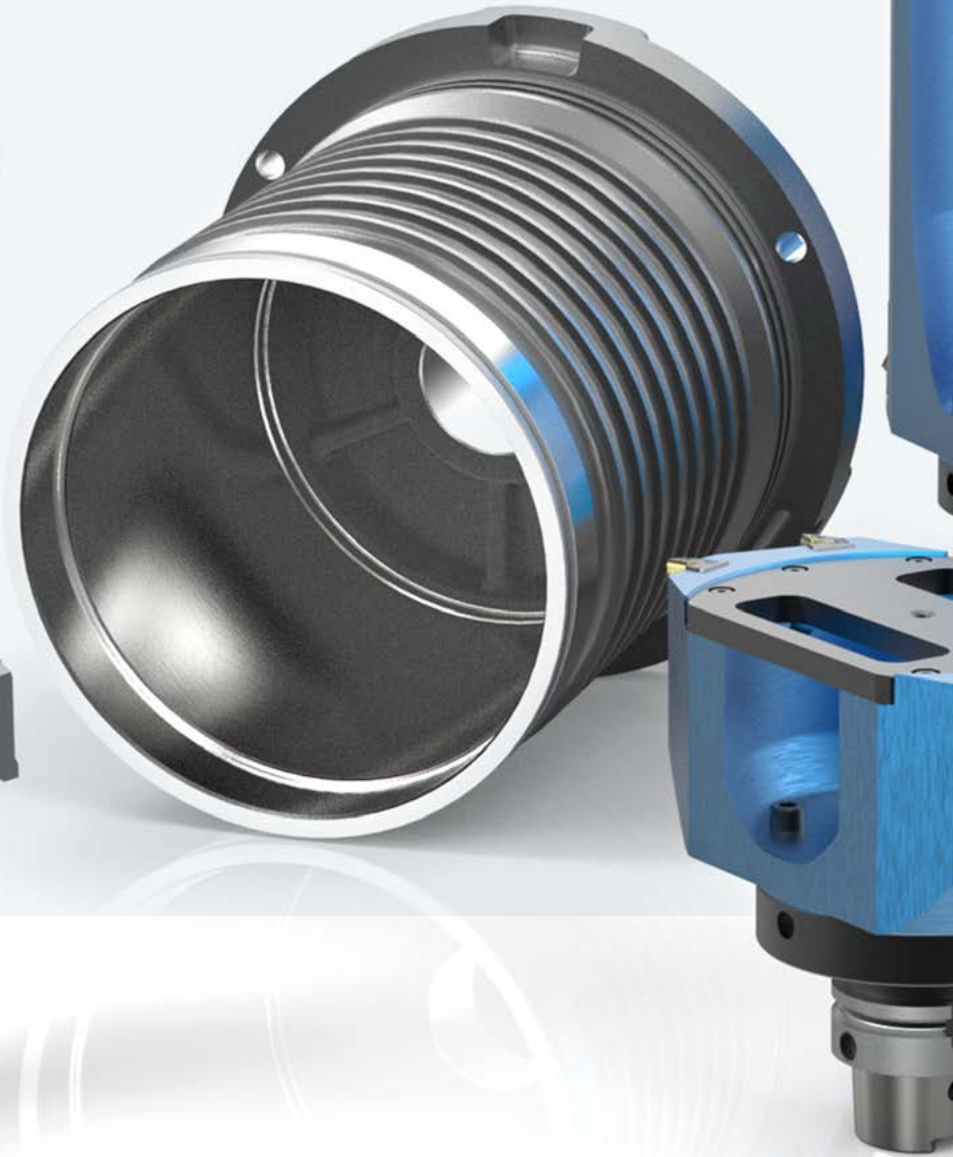
We

always find new ways to get more for you out of your processes.



Contents

The E-mobility solution portfolio – Basic - Performance - Expert _____	04
Hydraulics, pneumatics and controller technology – complete supplier in fluid technology _____	06
Complete supplier for titanium machining – whether in medical technology, aerospace or automotive industries _____	08
Aluminium machining – optimum surface finish for every quantity _____	12
Perfect interplay – reamers with new cutting materials, available for rapid delivery _____	16
Social responsibility – Sustainability in machining _____	18



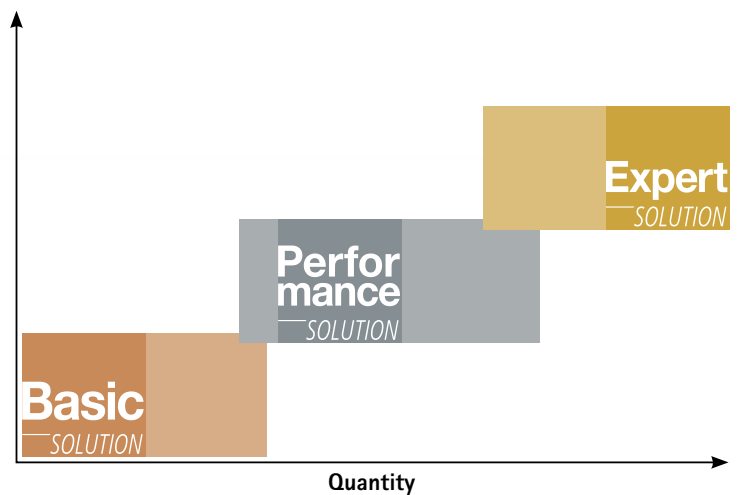
The E-mobility solution portfolio – Basic – Performance – Expert

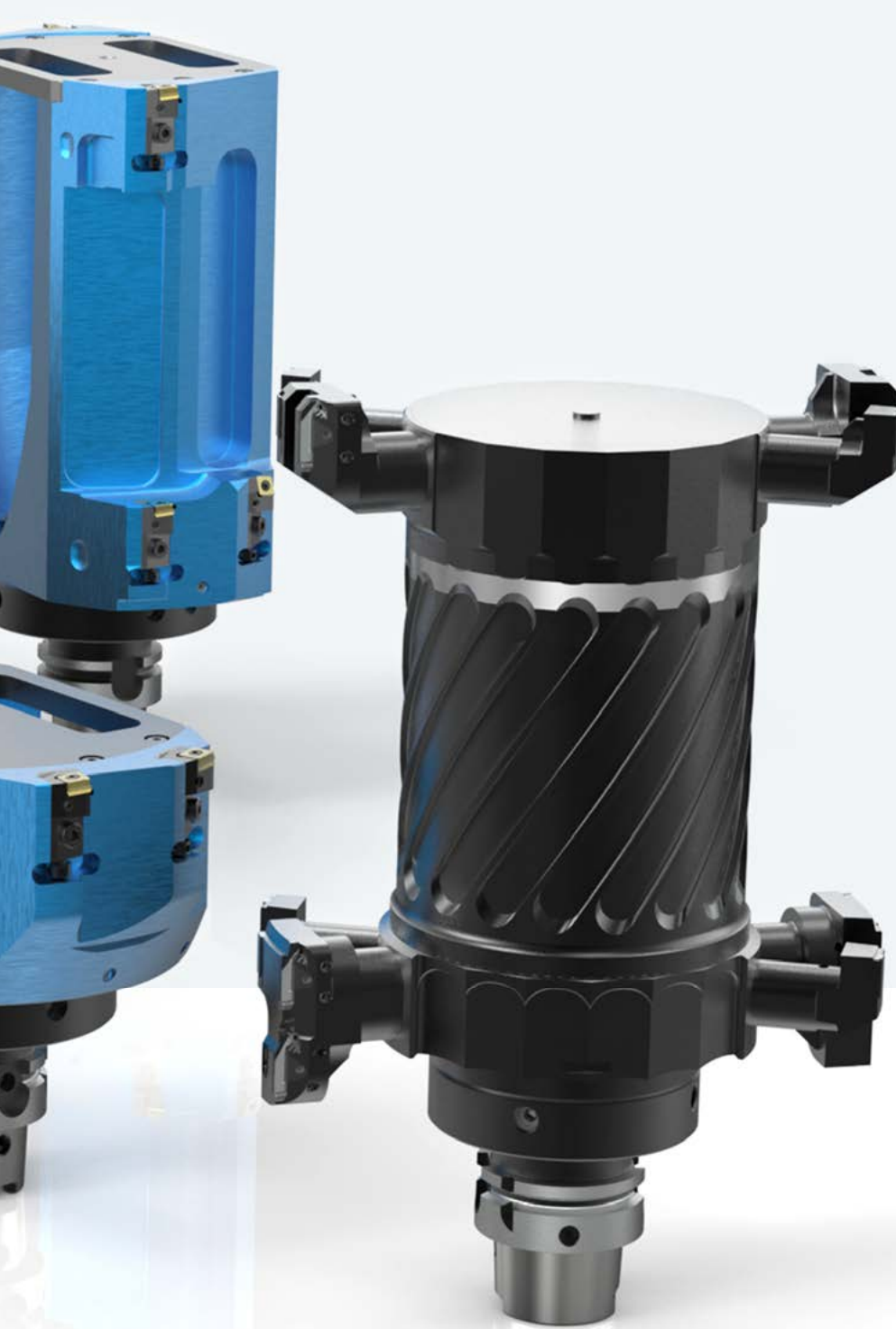
MAPAL has focused on sophisticated parts in the field of electric mobility and developed complete packages that can be individually adapted to customer needs. The new classification of these complete packages into Basic, Performance and Expert solutions describes the different approaches in terms of process requirements, quantity and investment.

The Performance solution is designed for series production and focuses on machining specific parts using custom tools.

Process requirement

- Quality
- Process capability
- Output
- Low unit costs





The stator housing solution portfolio

As part of the Performance solution, MAPAL has designed a test case for medium-sized manufacturing quantities of stator housings on HSK-63 machinery for all standards. The tools are geometrically adapted to the available space in the corresponding machines. They also remain under the permitted tool weight of 8 kg for example and the maximum moment of tilt of 10 Nm.

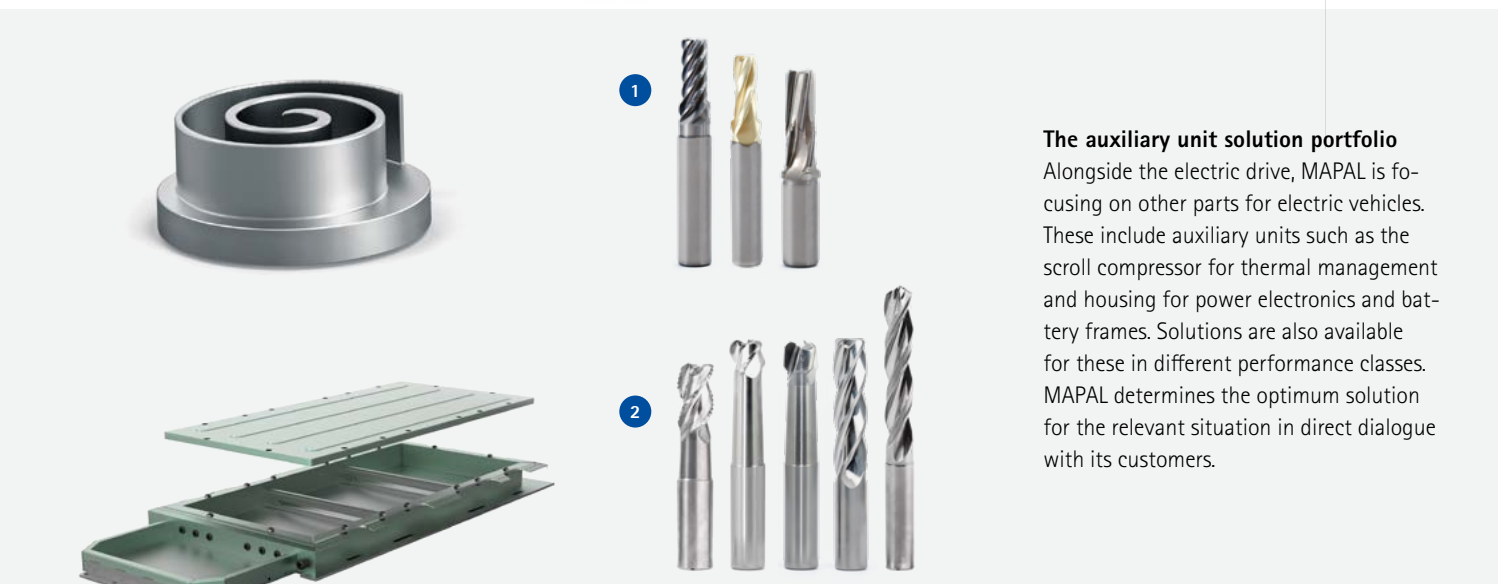
The change to E-mobility has been actively analysed at MAPAL for years and, based on the experience gained, MAPAL not only offers customers the process designed to suit their requirements, with its re-tooling service, it can also handle re-tooling of machinery where desired.



Find out more about E-Mobility solutions at: www.mapal.com

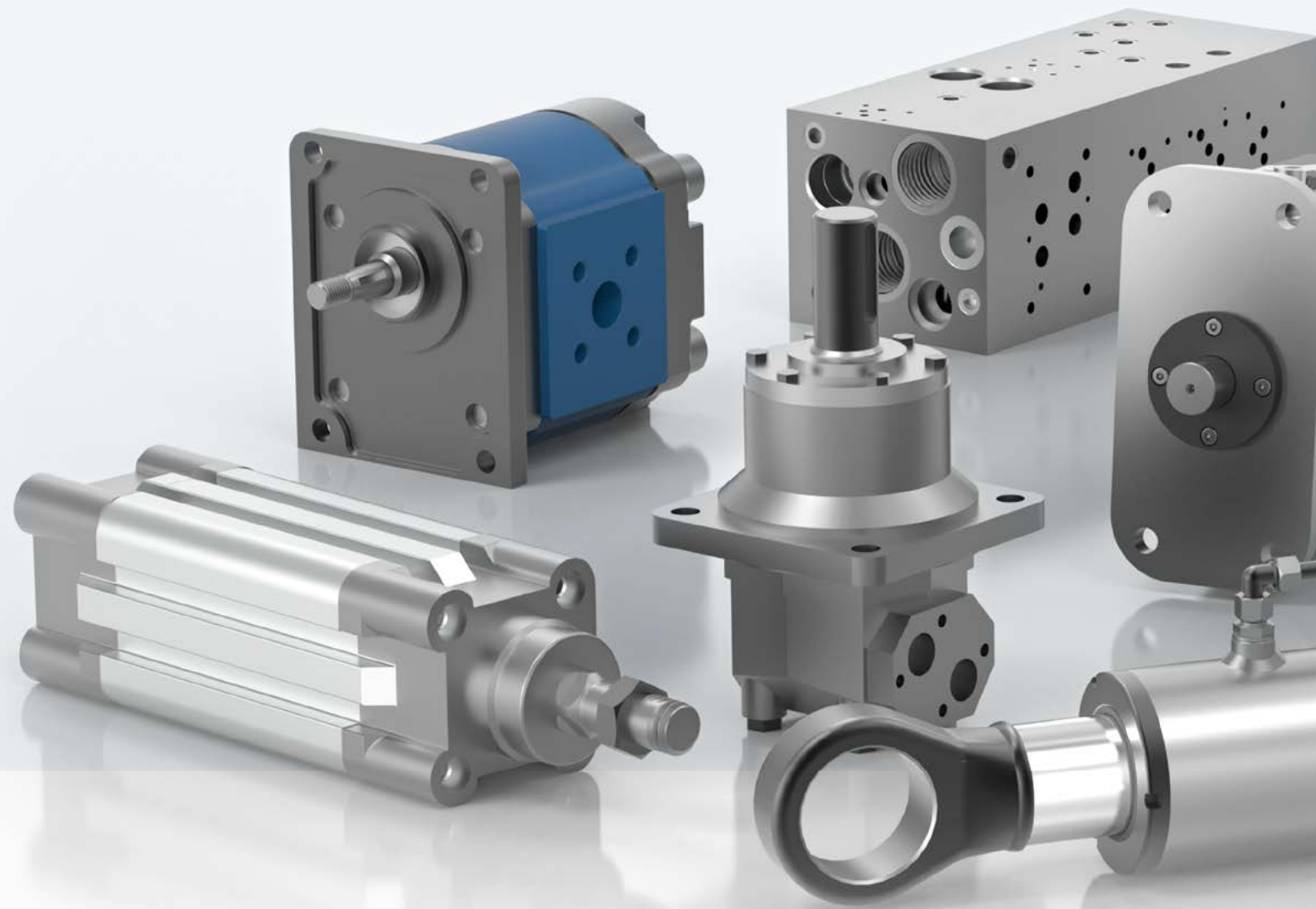
Extract from the solution portfolio

- 1 Uncoated and coated solid carbide cutters as well as PCD cutters are available for finishing the spiral shapes.
- 2 OptiMill-SPM and Tritan-Drill-Alu: Standard programme for the machining of aluminium structural parts.



The auxiliary unit solution portfolio

Alongside the electric drive, MAPAL is focusing on other parts for electric vehicles. These include auxiliary units such as the scroll compressor for thermal management and housing for power electronics and battery frames. Solutions are also available for these in different performance classes. MAPAL determines the optimum solution for the relevant situation in direct dialogue with its customers.



Hydraulics, pneumatics and controller technology – complete supplier in fluid technology

MAPAL has become a one-stop supplier for fluid technology, offering effective and cost-efficient complete solutions for all areas: hydraulics, pneumatics and controller technology.

Based on the applications already implemented for customers, MAPAL has developed specific machining solutions. They reflect many customer and component requirements. With the individual machining design, MAPAL takes into account different production volumes, parts complexity and precision specifications, specifically addressing global corporations as well as medium-sized enterprises.

For the processes, MAPAL draws on its entire product portfolio – from the solid carbide drill and the insert boring tool, fine boring tools and multi-bladed reamer, all the way through to the flexible actuating tool. The tool management service with its individually adaptable services enables an especially close technology partnership and caps off the complete package.





Additional solutions in hydraulics and pneumatics can be found in our "FLUID POWER" sector catalogue



Example vacuum pump
Cast iron housing



Find out more about fluid technology solutions at: www.mapal.com



Controller technology – MAPAL expands its range

Typical components in controller technology include valves, pumps, compressors and actuators. The focus is on all aspects concerning the movement, control and regulation of fluids. Components in this division typically feature functional properties which are associated with high requirements for the manufacturing process. In addition to machining these specific components, MAPAL also offers complete solutions for the entire part.

This includes the machining of vacuum pumps made of cast iron. Here, the focus is on machining the housing. In order to maintain the vacuum in the pump at a constant level, high de-

mands are placed on the bore quality and perpendicularity. The requirements are in the range of a few μm . Changing stock removal and heavily interrupted cuts also constitute a challenge for machining.

For reliable machining, MAPAL recommends tools with guide pads according to the MAPAL principle with opposite guide pads and EA system for ultra-precise blade clamping. A combination of fixed brazed and spring-loaded guide pads made from PCD and cermet ensures stable and secure machining even with a significantly interrupted cut. The tools are adjustable with μm accuracy.

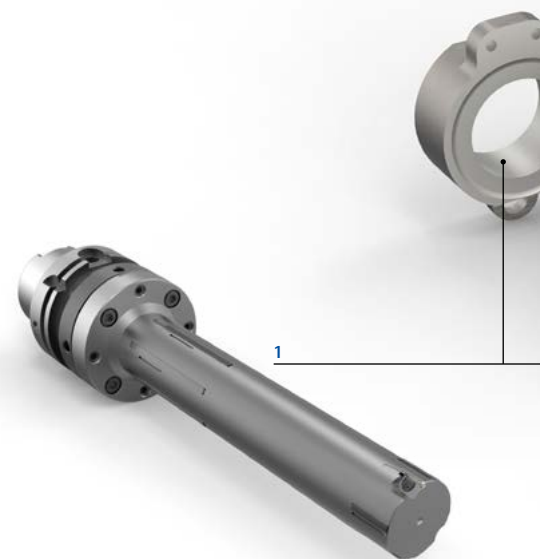


Complete supplier for titanium machining – whether in medical technology, aerospace or automotive industries

Titanium is a workpiece material which comes into play in key areas of the aerospace and automotive industries and in medical technology. After all, high-strength titanium alloys meet the highest standards. In the past, MAPAL has made a name for itself with customer-specific custom tools in titanium machining in particular. Based on the expertise acquired in this way and its specific high-performance tools, MAPAL has created an entire product range specifically for machining titanium alloys.

As well as chucks, milling cutters and drills, it includes reaming and fine boring tools especially designed for the tough, high-strength workpiece material. The effective product range thus ensures outstanding, reliable results for all machining tasks, such as torsion links in aeroplanes, control arms in cars, and bone plates and artificial hip joints in the field of medical technology.

Skilled solutions are what set MAPAL as a tool manufacturer and its tools apart in the field of titanium machining, too. As a technology partner, MAPAL doesn't just supply tools – it provides complete processes to ensure efficacy, economic efficiency and optimum product quality in manufacturing.

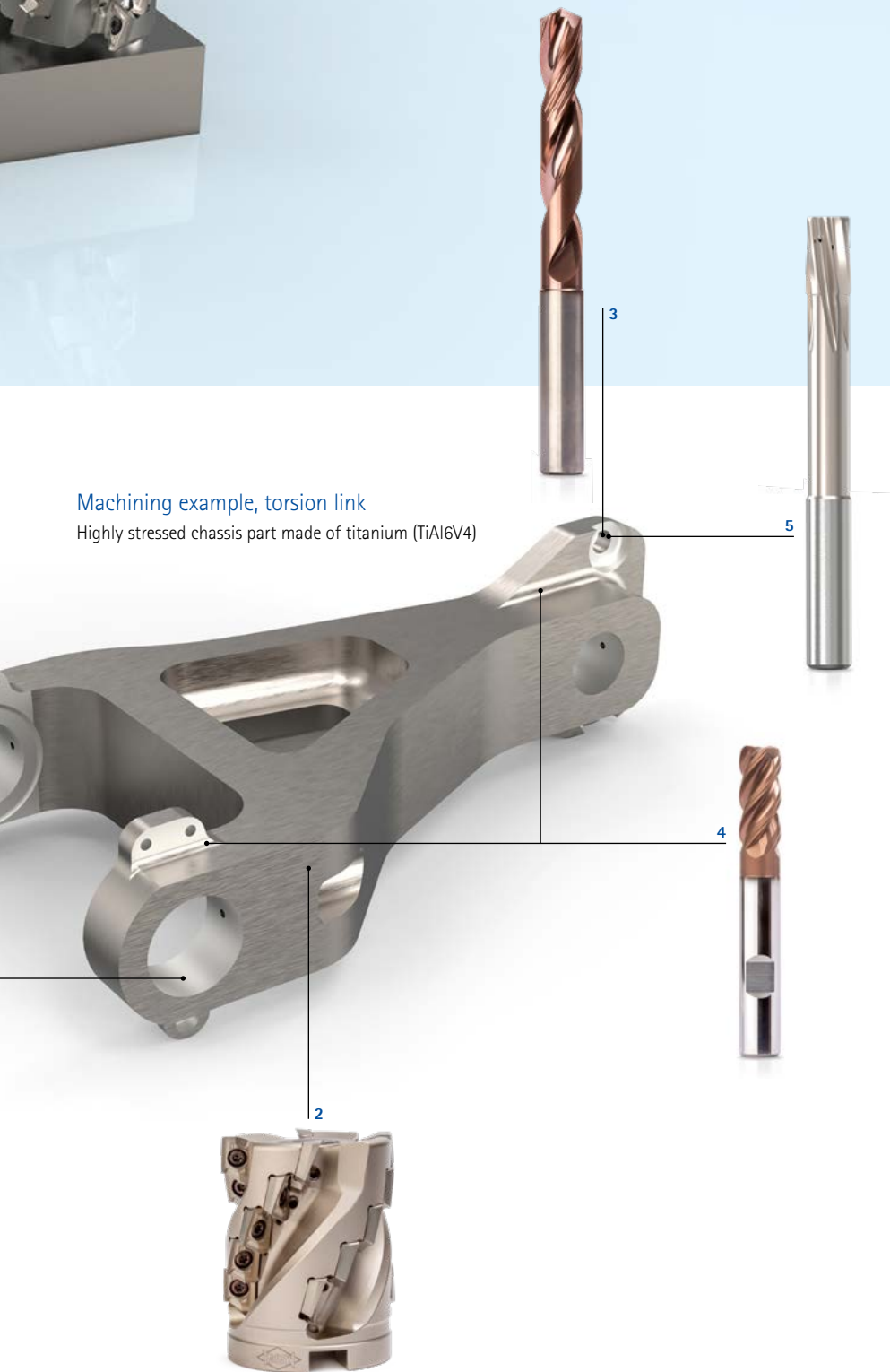




Find out more about machining solutions in titanium machining at: www.mapal.com

Machining example, torsion link

Highly stressed chassis part made of titanium (TiAl6V4)



1 Fine boring tool

- Ultra-precise cutting edge adjustment
- Perfect concentricity and geometry of the bores
- Optimal surface roughness
- 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
- Variety of cutting materials available

3 MEGA-Speed-Drill-Titan

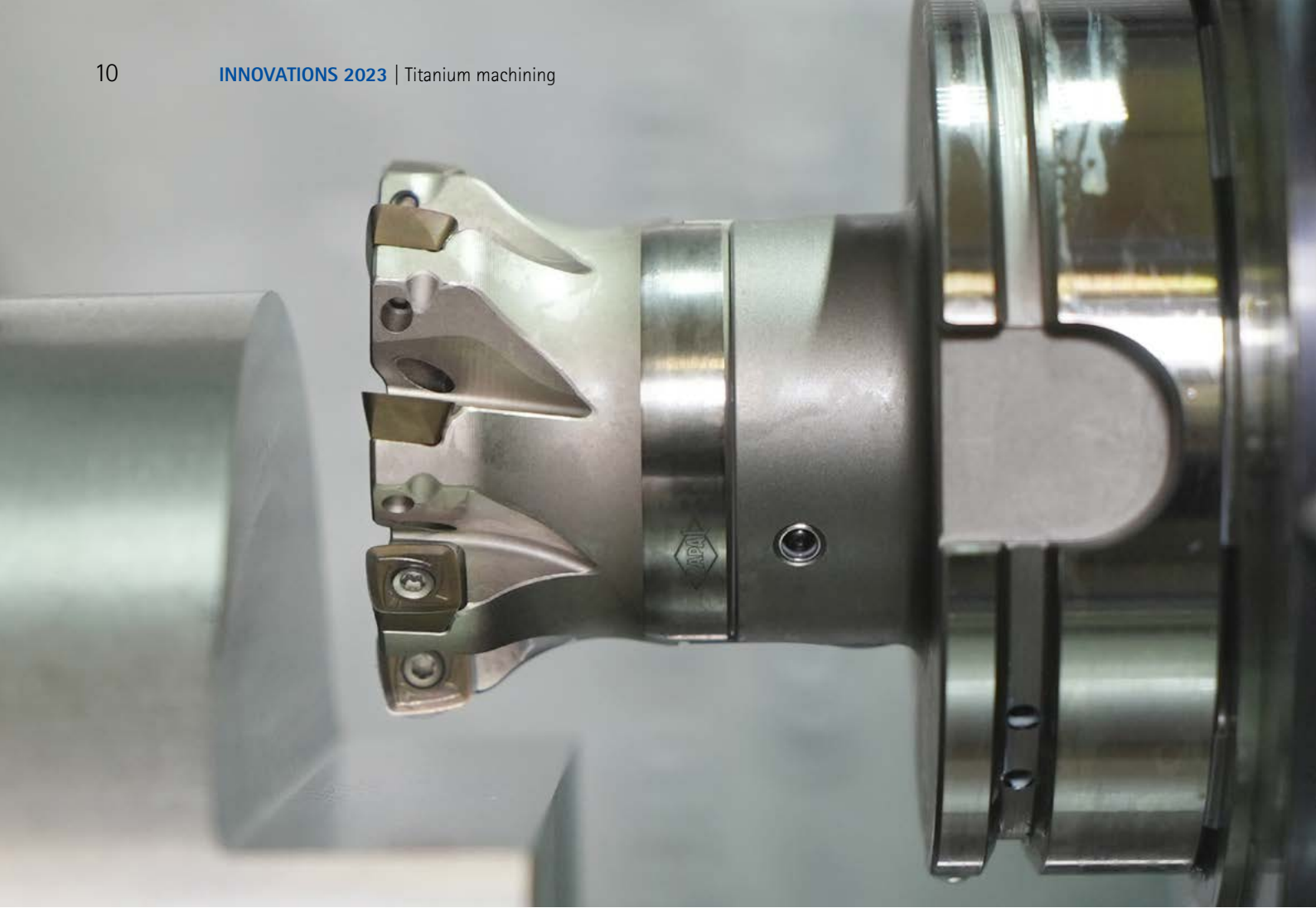
- 140° point angle
- Little development of built-up edge due to extremely smooth coating
- Best roundness values due to four guide pads
- Convex cutting edge
- Internal coolant supply
- Redesigned chip flute for optimum chip removal
- Efficient coolant flow avoids friction and heat at the cutting edge

4 OptiMill-Titan-HPC

- Stable cutting edge due to special edge preparation
- Stable cut and smooth running due to optimal pitch
- 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)



NeoMill®-4-HiFeed90

Very high machining rates with good process reliability

The new high-feed milling cutter NeoMill-4-Hi-Feed90 is a universally applicable tool system for maximum productivity. It is characterised by

top removal rates and extreme feed rates. The milling cutter is available 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

2 Blades

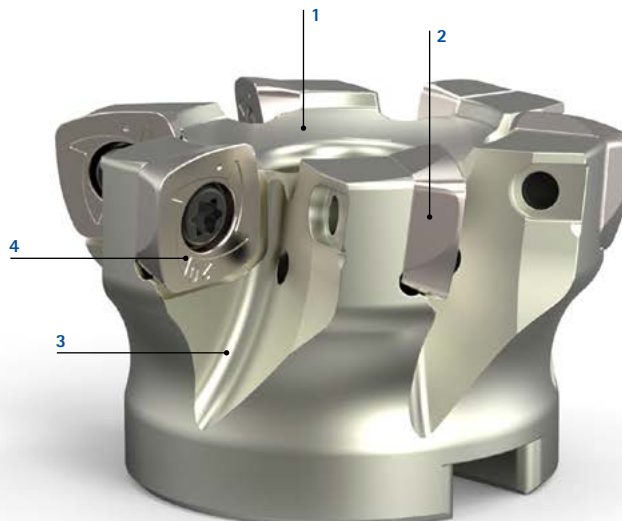
- Four blade sizes
- Four-edge indexable insert

3 Slot geometry

- Effective chip transport out of the shear zone

4 Cutting material

- Two different cutting material types with PVD coating





OptiMill®-Tro-Titan

Five-edge trochoidal milling cutter for milling titanium

MAPAL presents the five-edge trochoidal milling cutter OptiMill-Tro-Titan, which offers maximum material removal rate while providing an excellent surface finish at the same time. Unequal spacing and gradient prevent vibration, which result in quiet cutting behaviour. The modern multilayer coating counteracts adhesive wear and takes the cutter to a new level of performance. It is designed for trochoidal milling in part-contact cutting, trimming and for cutting depth up to 3xD.



1 Modern cutting material

- Tough carbide for highly dynamic loads
- Multilayer coating for ideal thermal stability

2 Special geometry

- Micro-prepared cutting edge stabilises the process
- Optimum relationship between chip and relief angle to minimise heat

3 Unequal spacing and gradient

- Smooth running
- Top surface qualities thanks to fewer vibrations

4 Polished chip flute

- Effective chip transport
- Reduced friction





Aluminium machining – optimum surface finish for every quantity

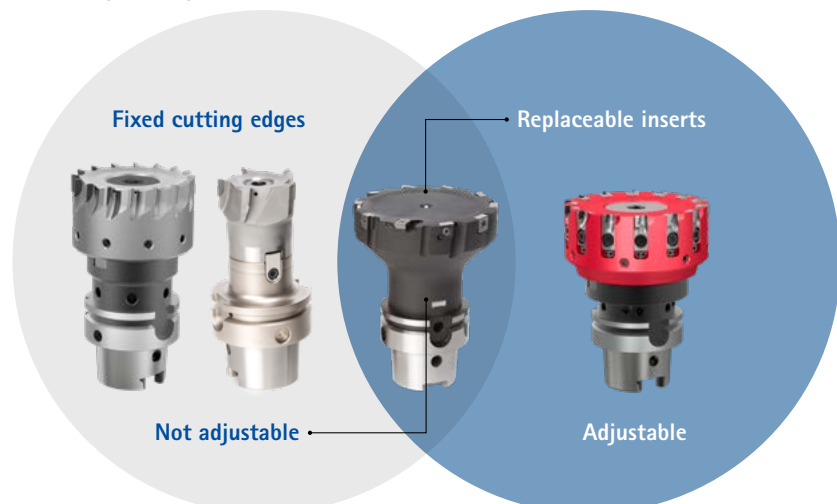
MAPAL is adding two new products to its wide range of aluminium machining tools.

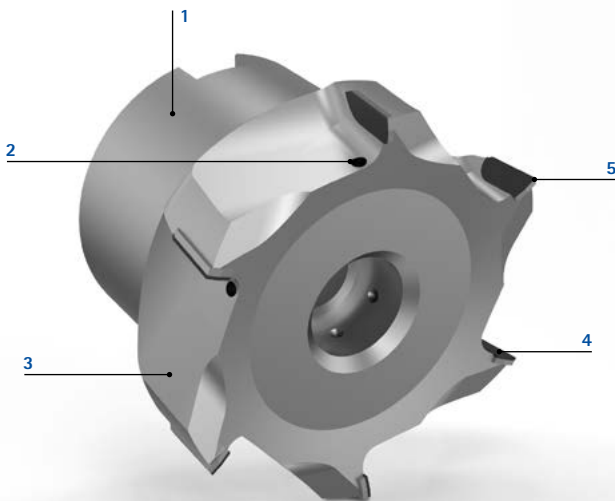
The FaceMill-Diamond-ES is a versatile all-rounder that ensures high economic efficiency and lasting process reliability in demanding production conditions with smaller quantities and changing part types.

The indexable insert milling cutters from the new NeoMill-T-Finish series ensure a dramatic increase in economic efficiency as well as efficiency in finishing in series production.

Each tool is adapted specifically to the customer's requirements. Maximum economic efficiency and productivity are the top priority.

Overview product portfolio





FaceMill-Diamond-ES

The versatile PCD face milling cutter for small quantities

The new FaceMill-Diamond-ES is a versatile entry-level addition to the PCD face milling cutters in MAPAL's FaceMill-Diamond family. The milling cutters have fewer blades than the established FaceMill-Diamond tools, making them a more cost-effective and economical solution. With a diameter of 50 mm, for instance, the FaceMill-Diamond-ES has five blades, while the classic FaceMill-Diamond has twelve.

Another difference is the area of application: The FaceMill-Diamond-ES is suitable for shoulder milling, trimming and machining thin-walled parts, as well as face milling. The milling cutters in the FaceMill-Diamond-ES series can be reground and re-equipped. They are exclusively available as milling cutters for arbor mounting.

1 Standard milling cutter arbor

- Highest flexibility due to modularity

2 Cooling directly at the cutting edge

- Avoids overheating and abrasion on the tool body

3 Generous chip space

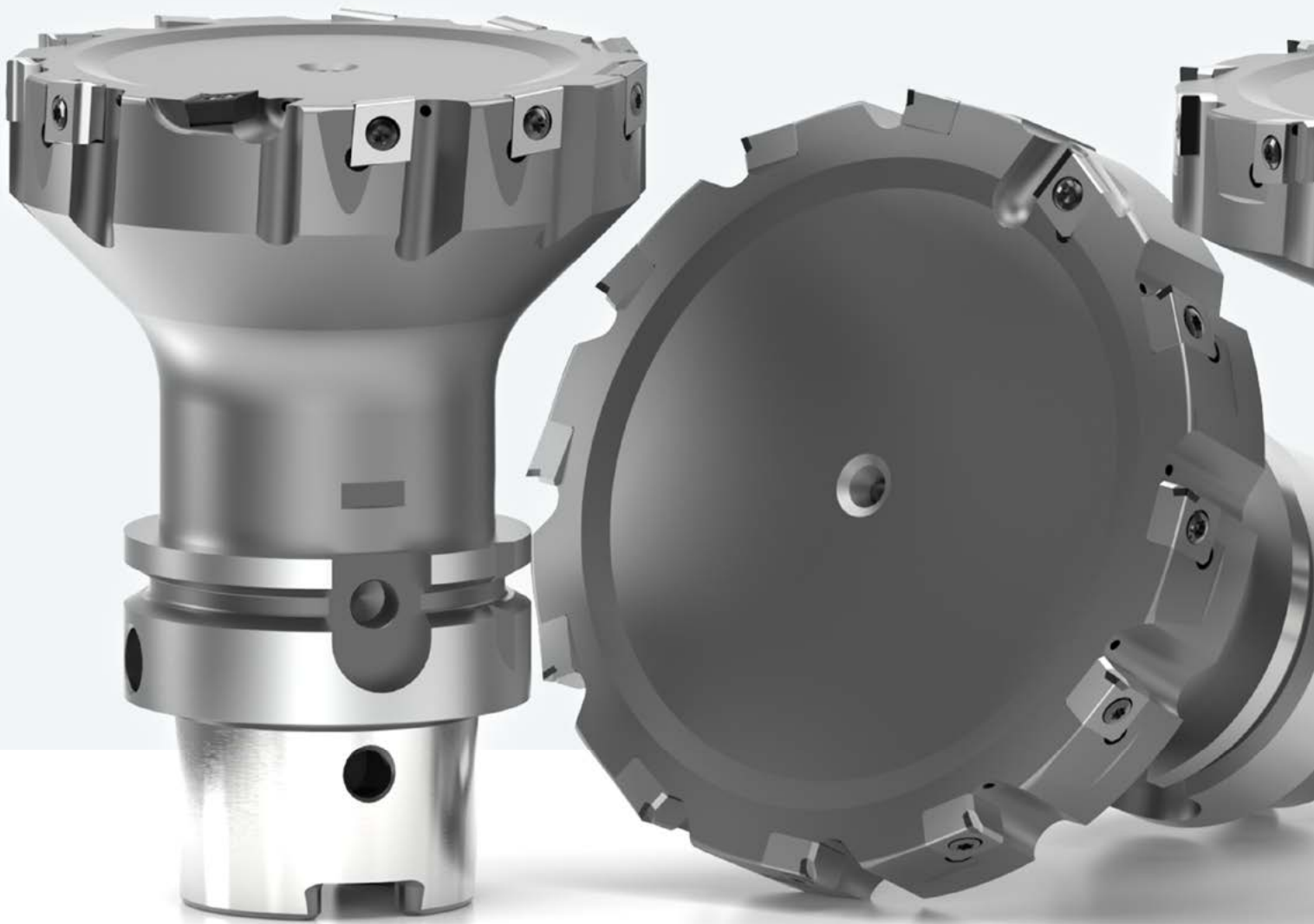
- Safe removal of chips even under peak loads

4 Brazed PCD cutting edges

- Cutting edges made of PCD for long tool lives
- High cutting depth of up to 10 mm

5 Universal lead 0.1x45°

- Suitable for many different machining operations with very good surface finishes



NeoMill-T-Finish

Finishing aluminium with indexable inserts

With the NeoMill-T-Finish, MAPAL presents a milling cutter with indexable inserts for face milling aluminium at high quantities for the very first time. The finishing milling cutter with replaceable blades functions according to the "plug and play" principle: Customers change the blades on site without having to adjust them afterwards. Fewer tool bodies need to be kept to hand as a result.

With the new system, customers can also use other cutting materials, as well as PCD-tipped blades, depending on application and workpiece material, such as uncoated carbide or carbide with CVD diamond or PVD coating – the right cutting material for each of the different aluminium workpiece materials.

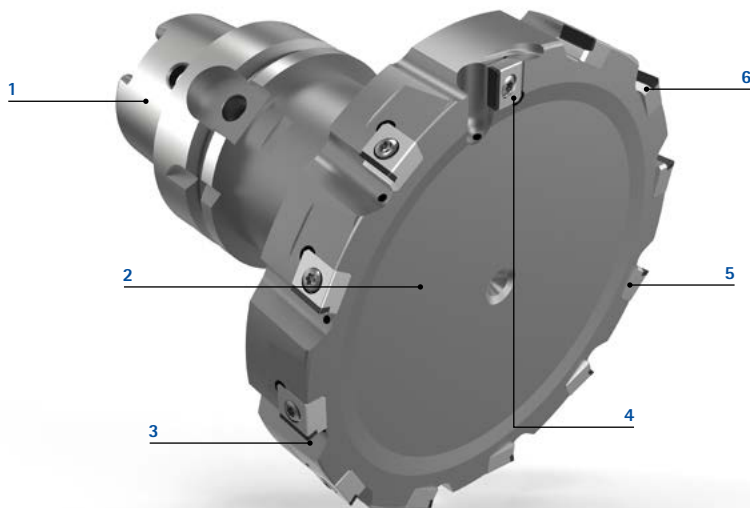
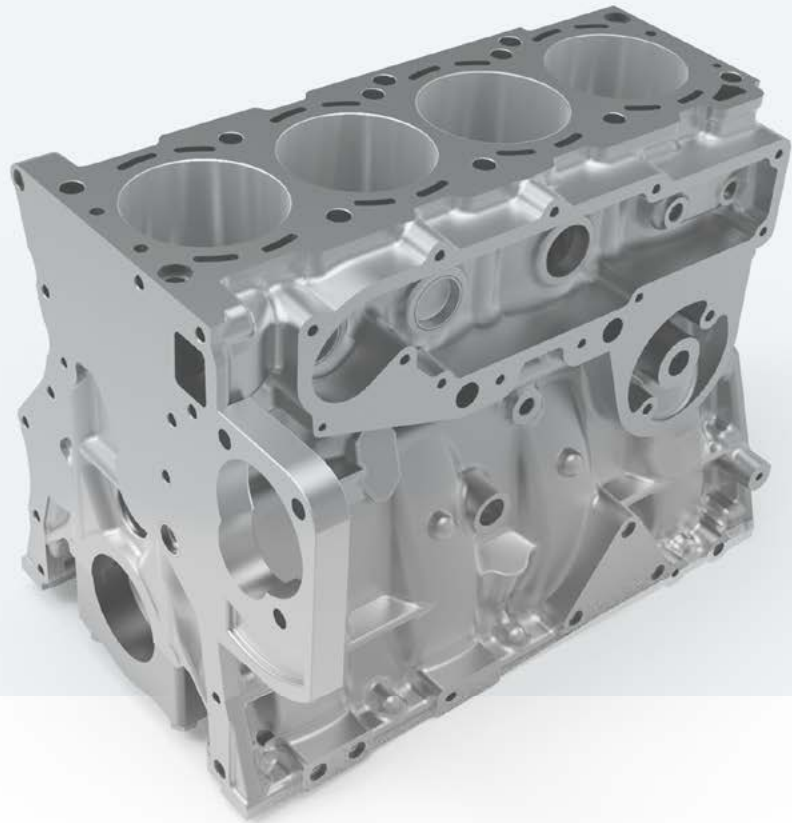
A (patent pending) blade arrangement system is what makes the new milling cutter unique. The main cutters, which perform stock removal of up to 2.5 mm, are attached to the circumference. A wide finishing cutting edge arranged axially is responsible for the ability to reach surface roughness levels of $R_z = 1.5 \mu\text{m}$. The innovative system enables homogeneous wear and tear on the blades.



Wiper(geometry)

With a large operating radius for an excellent surface finish





1 Tool adapter

- Monolithic or adaptive

2 Tool body

- Individual designs → maximum efficacy and economic efficiency

3 Cooling

- Emulsion, MQL, dry or air cooling

4 Finish cutting edge

- No tool setting → Plug & Play

5 Peripheral cutting edge

- Leading stages for low burr formation

6 Cutting materials

- Cutting material variants for all applications in aluminium



Perfect interplay – reamers with new cutting materials, available for rapid delivery

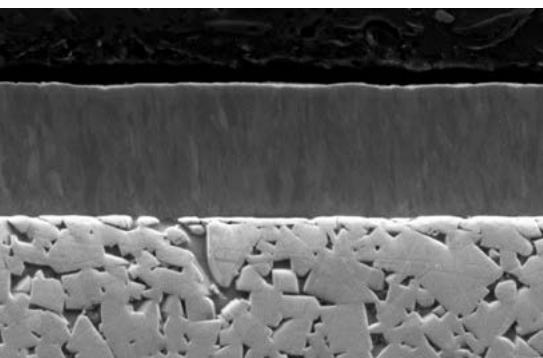
MAPAL presents the two new HP016 and HP018 cutting materials for reaming and fine boring high-alloyed and stainless steels, cast steel and hardened steel. Cutting material HP016 is suitable for all machining operations involving a slightly interrupted cut, while cutting material HP018 is used for a continuous cut. Both are based on a silicon-doped PVD coating on two different varieties of carbides with low cobalt content, making them extremely resistant to wear and offering great dimensional accuracy.

The PVD coating has a fine crystalline microstructure, combining high levels of hardness and ductility. The cutting material is thermally very stable and offers impressive high-temperature stability and coating adhesion. To create an optimum surface in through bores and blind bores, the PVD coating is deposited in the μm range. This ensures the cutting edges retain their sharpness.

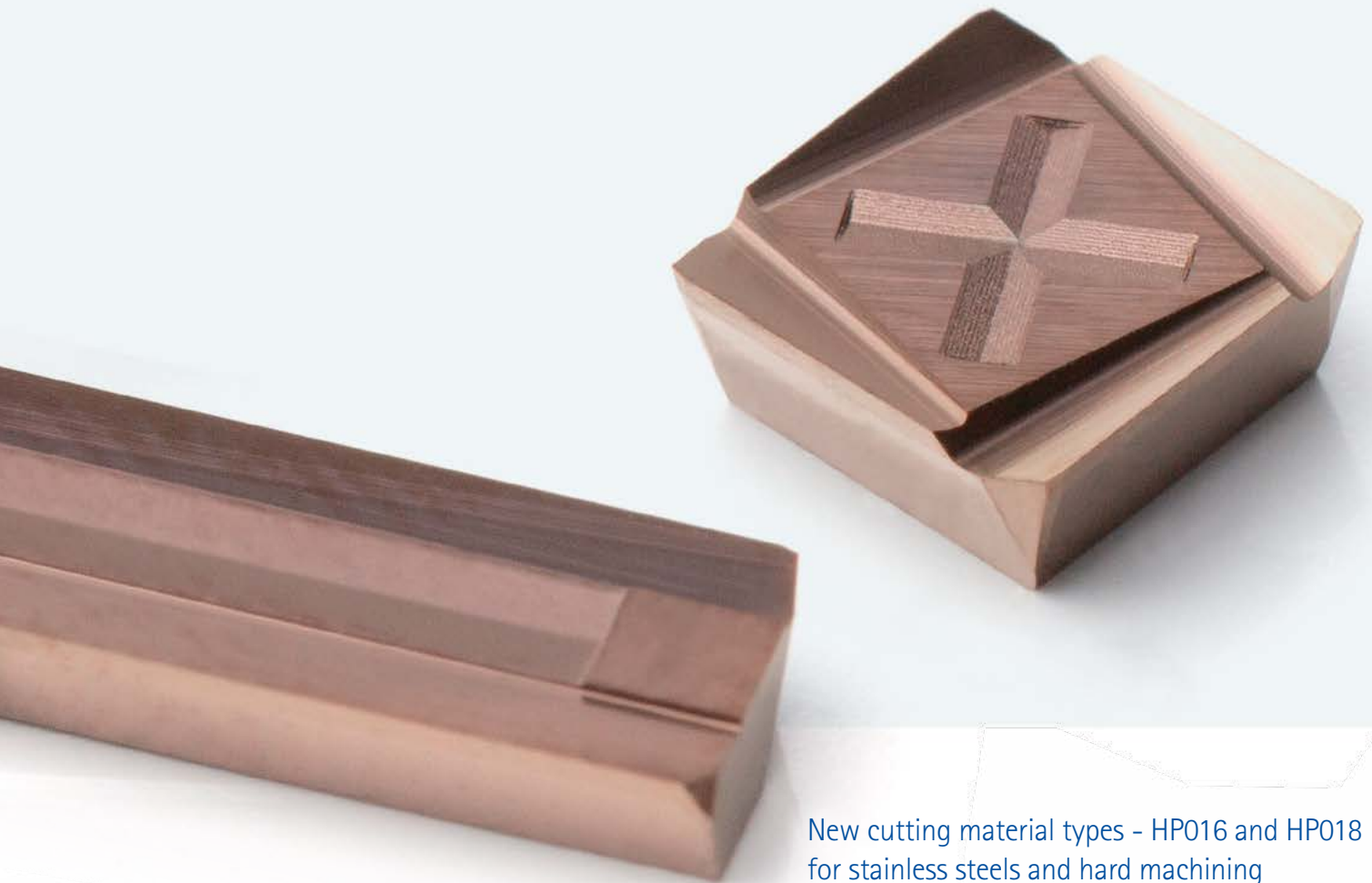
The new cutting materials are used for market launch in the reamers in the MN series by MAPAL, among others. These tools represent the utmost accuracy and are now ideally suitable for use in hard reaming as well as reaming stainless steel thanks to the new cutting materials. They operate according to the MAPAL principle – with a cutting edge and a guide pad opposite. Depending on the application, they are made from carbide, cermet or PCD.

New cutting material grades

- HP016 and HP018 for stainless steels and hard machining
- Silicon-doped TiAlN coating
- Very high thermal stability / high temperature stability
- Fine crystalline coating microstructure (combines high hardness with high toughness)
- Excellent coating adhesion



Silicon-doped TiAlN coating is convincing when machining **M** and **H**



New cutting material types - HP016 and HP018 for stainless steels and hard machining

MN-reamers – deliverable in 10 working days

Thanks to optimisations in design, manufacturing and logistics, MAPAL supplies custom-made carbide and cermet reamers within 10 working days.



10



UNIQ HYDRAULIC CHUCK MQL TECHNOLOGY COMBINATION TO REPLACABLE HEAD SYSTEM AND INDELEIBLE INSERT RECONDICION

Social responsibility – Sustainability in machining

Responsible use of resources, protecting the environment and keeping CO₂ emissions to a minimum wherever we can – these have been MAPAL's commitments since day one. Accordingly, the principle of sustainability plays a key role in every product and business division.



The UNIQ hydraulic chuck

Longer clamping, reduced energy use

With the UNIQ hydraulic chuck, MAPAL is offering a much more sustainable alternative to the classic shrink chuck. The UNIQ has exactly the same tool restriction stipulated by the DIN. But it has a tool life that is ten times as high, as the material is not worn out by shrinking processes. Overall, the hydraulic chuck requires much less energy, doing away with energy-intensive shrinking processes.



MQL technology

Save energy and protect the environment

Minimum quantity lubrication (MQL) is a particularly important feature for the energy efficiency of a machine tool. After all, the high-pressure pumps required for cooling lubricant use a lot of energy. Cooling lubricant disposal – or rather, recycling – is also no longer required. MQL technology therefore helps protect the environment and ensures a much safer workplace. MAPAL offers an extensive portfolio of tools for use with MQL technology.

UCK
OLS
TEMS



Combination tools

Reducing manufacturing and non-productive times

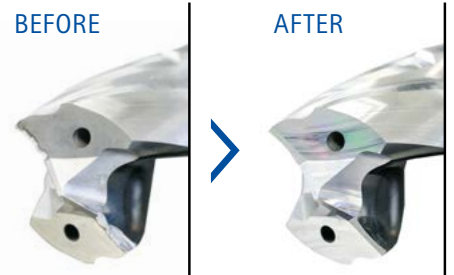
Combination tools are particularly effective in reducing energy requirements, making them particularly sustainable. In process design, MAPAL combines as many machining operations as possible in one single tool. This saves on tool changes and travels, and non-productive times and energy as a result. The total manufacturing time is reduced by the simultaneous machining of various bores, chamfers and face surfaces. In addition, this approach uses much less material than separate individual tools.



Replaceable head systems and indexable inserts

Optimum use of resources

Replaceable head systems are a prime example of efficient use of resources. With these tools, such as the TTD-Tritan-Drill, the cost-intensive carbide – the primary resource – is limited to the tool head. When this reaches the end of its tool life, the entire tool doesn't need to be replaced – only the head needs to be changed. Indexable inserts also offer optimum use of resources. If a cutting edge has become worn, users can turn or rotate the insert and use it again.



Reconditioning

100% performance with a longer tool life

PCD tools, solid carbide tools and tools with indexable inserts or ISO elements all have one thing in common: they can be reconditioned. Processes such as regrinding, cutting edge replacement and a new coating can give the tool back 100% of its performance. This significantly increases the tool life of the tools – and drastically reduces the use of key resources.



Discover tool and service solutions now that give you a lead:

BORE MACHINING

REAMING | FINE BORING

DRILLING FROM SOLID | BORING | COUNTERSINKING

MILLING

CLAMPING

TURNING

ACTUATING

SETTING | MEASURING | DISPENSING

SERVICES

www.mapal.com