



Your technology partner for machining
INNOVATIONS 2022





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Opening up opportunities

We

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

Innovations

and industry highlights 2022



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Example of a torsion joint

Highly stressed chassis part made of titanium (TiAl6V4)

New Products for Titanium Machining

The low thermal conductivity of titanium, together with its high tensile strength, means that the tools are subjected to high thermal and mechanical stresses. The new MAPAL titanium range features sophisticated heat dissipation and heat-resistant coatings. As a result, comparatively high cutting values can be achieved with high process reliability at the same time. Compared to conventional solutions on the market, 25 to 35 percent longer tool lives are achieved.

1 NeoMill-Titan

Indexable insert milling cutters with a bite
NeoMill-Titan is the name for a whole family of milling cutters with indexable inserts for titanium machining: Shell end face milling cutters in slip-on and shank versions, as well as shoulder milling cutters are part of the standard portfolio. The topography of the indexable insert has been redesigned from scratch for optimum chip formation and removal. The indexable inserts

each have two cutting edges and are available with corner radii from 0.8 mm to 4 mm.

An equally new cutting material concept minimises wear and the formation of built-up on the cutting edges. There are two different substrates to choose from. In addition to a wear-resistant universal grade, a temperature-resistant high-performance grade has been developed with which cutting speeds of up to 70 m/min can be achieved.

The tool body has also been newly developed for the high-tech inserts. With ideally adapted shapes, the chip flutes transport the chips out of the shear zone. The unequal spacing of the inserts provides additional stability and smooth running.

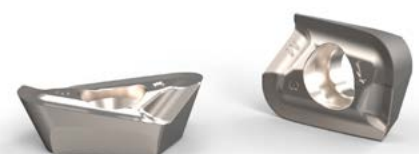
Variably designed coolant outlets make the regulation of the flow rate of each individual insert possible.

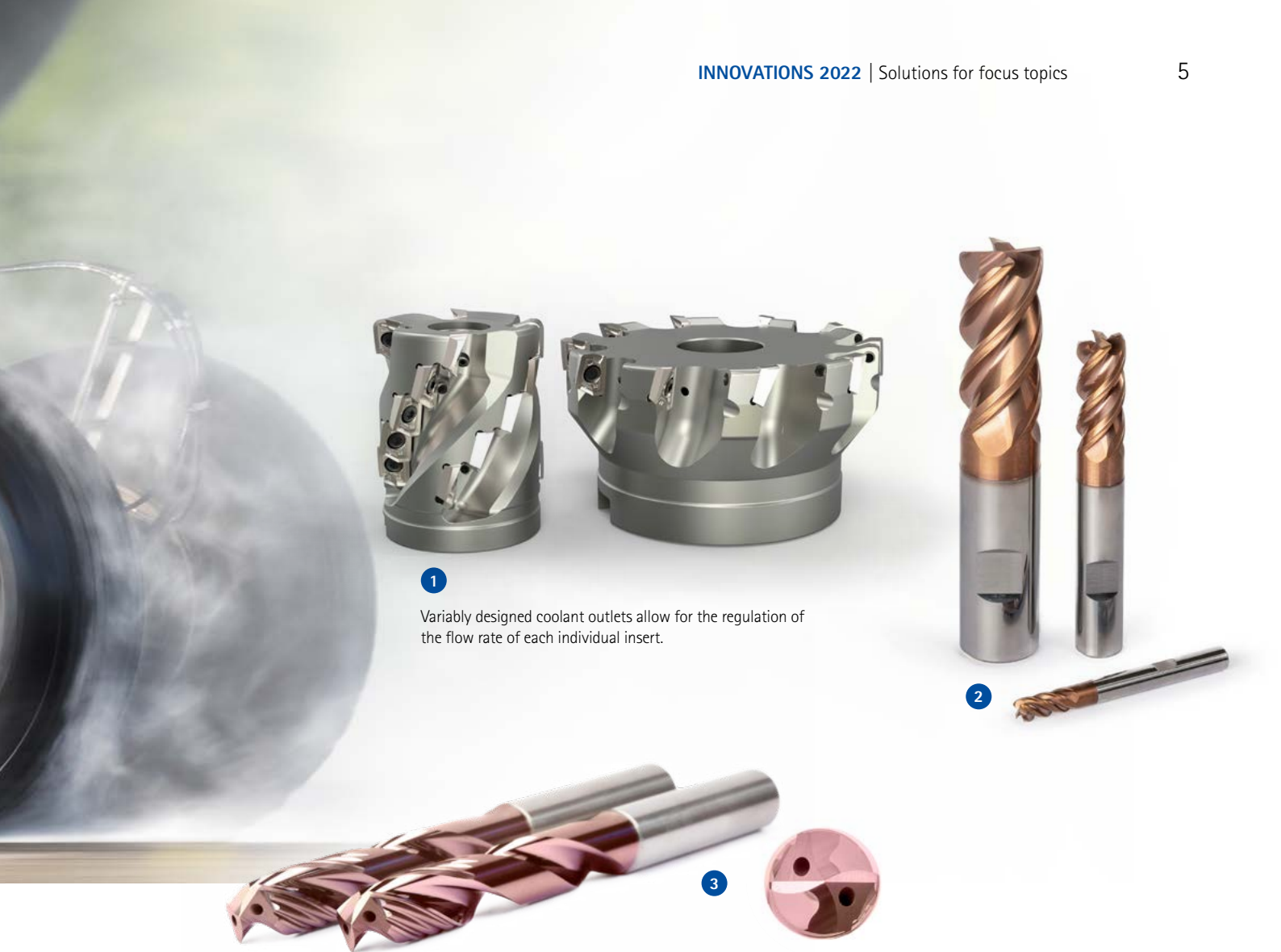
FEATURES

- Diameter: 32 – 125 mm
- Available as shoulder & shell end face milling cutters
- Available radii: 0.8 mm / 2 mm / 3 mm / 4 mm

ADVANTAGES

- New insert topography for optimal cutting behaviour
- Efficient and variable cooling concept increases tool life
- Perfect solution for roughing and medium machining
- 25 to 35 percent longer tool lives are achievable





1

Variably designed coolant outlets allow for the regulation of the flow rate of each individual insert.

2

3

2 OptiMill-Titan-HPC

Versatile roughing and finishing

The OptiMill-Titan-HPC four-edged shoulder milling cutter is a versatile tool. The solid carbide end milling cutter can perform roughing operations and can also be used for a finish cut.

The special cutting edge preparation produces clean surfaces and allows finishing up to a working depth of 2xD. The core diameter of this milling cutter rises from the cutting edge to the shank, giving it greater stability. The spacing of the cutting edges as well as the helix of the spirals are unequal to achieve smooth running. The coating, which contains silicon, proves to be highly heat-resistant, counteracts the tendency to adhesion and, together with the polished chip spaces, ensures optimum chip removal. The OptiMill-Titan-HPC is available from diameter 4 to 25 mm. Special dimensions are possible.

3 MEGA-Speed-Drill-Titan

Cost-efficient and productive

The high-speed drill MEGA-Speed-Drill-Titan is characterized by cost efficiency with maximum productivity. The double edge solid carbide drill is equipped with four guiding chamfers for optimum roundness. To bring the maximum coolant flow to the main cutting edge, the coolant is directed backwards along the shell surface. In this way, the guiding chamfers experience maximum cooling, dissipating the generated heat effectively. A new design of the chip flute produces small chips. The convex main cutting edge ensures high stability and long tool life. The drill is available from diameter 3 to 20 mm in length 5xD.

Typical parts that can be created with the drill, which achieves a cutting speed of up to 40 m/min, are structural parts in the aerospace industry, for example, brackets for the wing box or the landing gear with its numerous bores.

FEATURES

- High thermal stability due to heat-resistant coating
- Sophisticated heat removal
- High stability
- Cost efficiency with the highest possible productivity

ADVANTAGES

- High process reliability and up to 35 percent higher tool life
- Low cycle times due to high cutting data
- Efficient coolant flow to avoid friction and heat at the cutting edge
- Avoidance of chipping and built-up edges



Solutions for Fluid Technology

For the materials often used in fluid technology, cast iron, steel, stainless steels and non-ferrous metals, MAPAL offers economical process solutions through a high level of expertise in both bore machining and milling applications. Customers have relied on MAPAL's expertise for many years, particularly for demanding machining operations for hydraulic parts in a wide range of dimensions.



The required tolerances of the spool bore in terms of roundness (2.5 μm) and straightness (1 μm) are achieved in series production.

Everything depends on the main bore

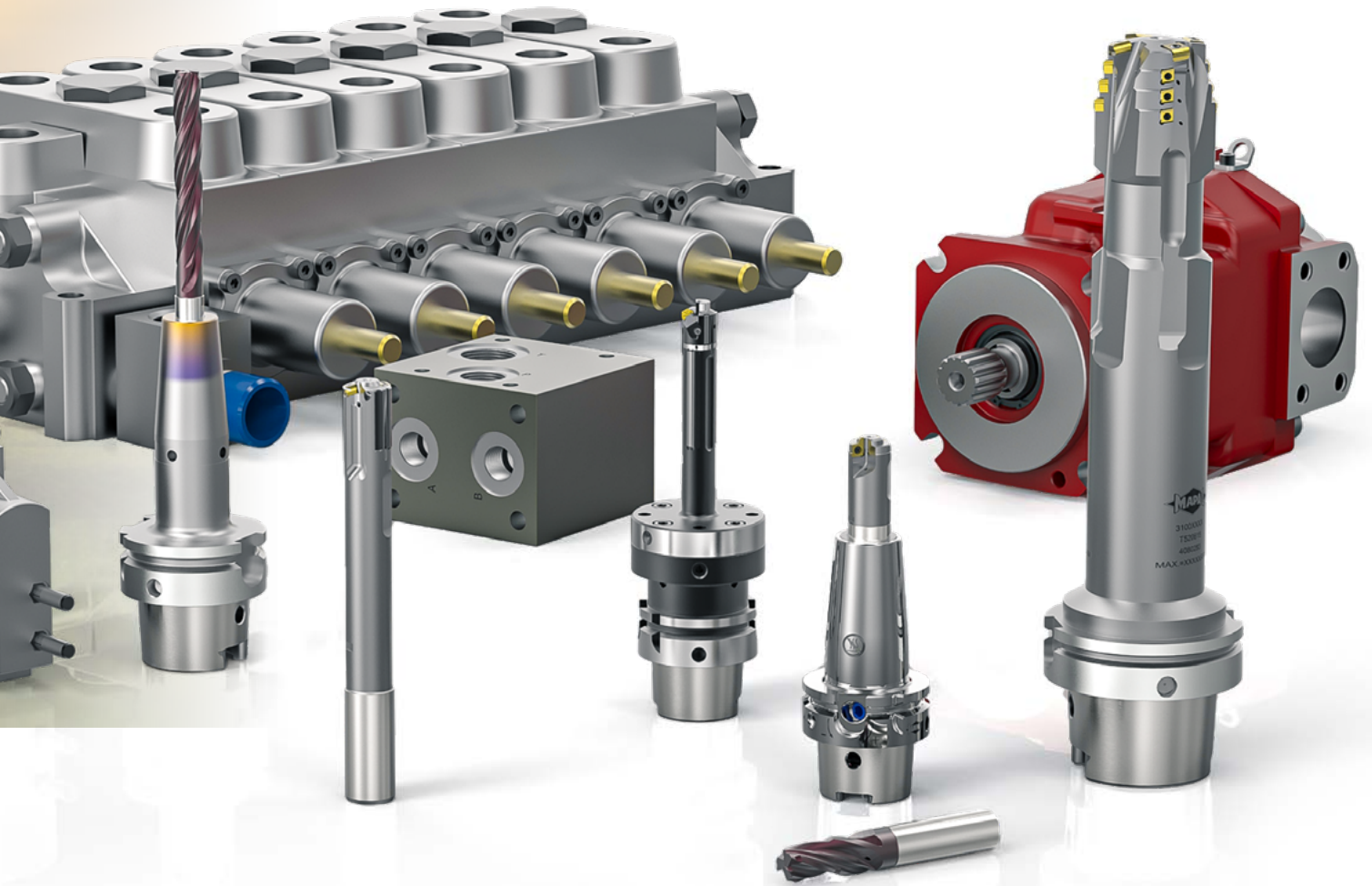
Manufacturing valve housings is the supreme discipline in the hydraulics world. For many years, MAPAL's expertise has been in demand for the spool bore. The gap dimension with the slide depends on the accuracy of this bore, which is very narrowly defined in modern hydraulic valves, so that the hydraulic oil can only flow in the required direction. The roundness, straightness and surface finish of this bore are also crucial.

The first machining step takes the varying quality of the blank parts into account. Since the pre-cast bores are relatively imprecise, a precise pilot bore must first be created in the first ridge. This lays the foundation for creating a good cylindrical form in the subsequent machining

steps. Next, a solid carbide tool or, in the case of larger parts, a tool with indexable inserts passes through the entire bore. What the pilot drill has created for the first ridge is now produced along its entire length. To prevent ring formation in the hollow chambers due to chips, MAPAL ensures a soft cut during machining by using tangential technology. This can eliminate the need for a separate washing cycle in the process.

After this pre-machining, the classic fine boring tool is used, finishing the bore extremely precisely. It has an adjustable cutting edge and guide pads, which prevent the tool from being displaced from ridge to ridge. This produces a high degree of straightness and an exact cylindrical form.

The bore quality can usually be improved to such an extent that the sometimes still necessary three-stage honing process can be reduced to a one- or two-stage honing pro-



cess, or honing can even be eliminated altogether. However in cases where three stages are still needed, this process is considerably faster thanks to the good pre-machining.

High cost-effectiveness with standard tools

In the machining of hydraulic parts, the focus is also on enabling economical machining with the available standard portfolio. Examples of this include the NeoMill programme for face milling or the Tritan-Drill-Reamer that combines drilling and reaming in one operation and guarantees best drilling results with the new UNIQ DReaM Chuck 4.5°.

Efficient machining with tangential boring tool

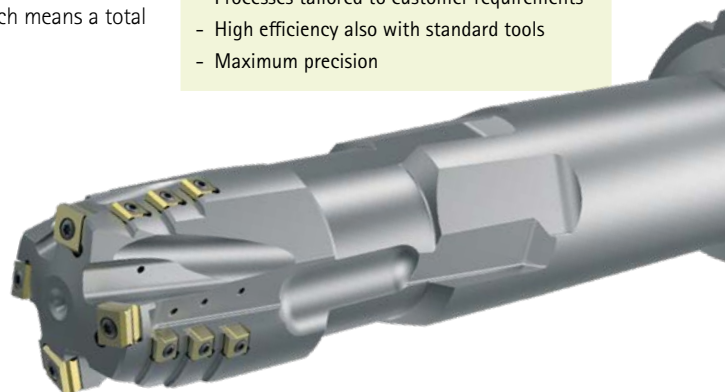
The parts are 500x500 mm valve blocks made of spheroidal graphite cast iron 50, with three piston bores to be machined from both sides. Stock removal can amount to 16 mm in diameter. The tangential boring tools with indexable inserts produce short rip chips, preventing rings from being pressed into the gaps which then have to be removed at great expense. The operation time has been reduced by 15.33 minutes per part. The housings of the corresponding model were produced in a quantity of 500, which means a total time saving of 128 hours.

FEATURES

- High solution competence in fluid technology
- Economical machining solutions
- Process-reliable machining

ADVANTAGES

- Complete process design and implementation from a single source
- Processes tailored to customer requirements
- High efficiency also with standard tools
- Maximum precision





Internal and External Machining of the Stator Housing

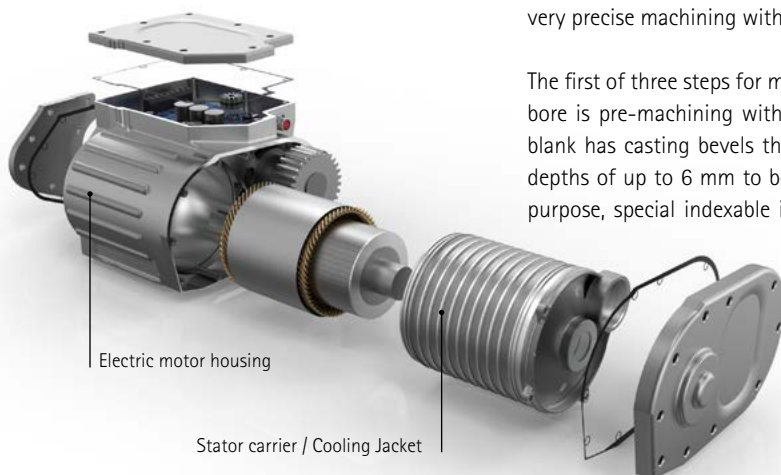
With increasing numbers of electric vehicles, not only very precisely manufactured parts are required, but also the most efficient production possible. One part that is particularly demanding in terms of machining is the motor housing for the electric motor. MAPAL has already established a three-stage solution for machining the stator bore. The precision tool manufacturer now presents a large tool for external machining.

Three-stage solution for the stator bore

In the pot-shaped version of the motor housing, the stator carrier housing is inserted into the main housing as an intermediate housing. Typical diameters for the thin-walled aluminium part are between 200 and 240 mm on the inside and between 240 and 260 mm externally. Concentricity of the various bearing and mounting diameters is critical to the performance of the electric motor, which requires very precise machining within tight tolerances.

The first of three steps for machining the stator bore is pre-machining with a boring tool. The blank has casting bevels that result in cutting depths of up to 6 mm to be removed. For this purpose, special indexable inserts with a sup-

porting arc shaped land are used to avoid vibrations. This also ensures that small chips are produced, which can be easily removed. In the subsequent semi-finish machining, the complex contour path of the electric motor housing is pre-machined in such a way that the complete fine machining with chamfers and radial transitions can be produced to μm accuracy with the finishing fine boring tool. The tools are individually designed for the respective customer depending on the stock situation, machinery and clamping setup. Different steps in the housing are



Electric motor housing

Stator carrier / Cooling Jacket



Find out more about solutions for e-mobility at: mapal.com

WORLD FIRST
Lightweight tool for external machining

World first for external machining

On the outside, the part features a helical circumferential groove. Because the coolant later flows through this groove after it's been inserted into the outer housing, the stator carrier is also known as the "cooling jacket".

MAPAL is presenting new external machining tools at the EMO in Milan. They are among the more unusual tools. After pre-machining, a bell-shaped tool takes over the complete finishing of the outside. The specifically designed lightweight tool is equipped with indexable inserts and guide pads and was provided with bars in the right places to save as much weight as possible and to get rid of chips through large openings. The fine machining tool promises high roundness and accuracy.

Complete machining on machining centre

Internal machining is possible very quickly and accurately with the boring tools. In addition, the outside can also be machined in the same clamping setup without moving. The machining centre solution caters to customers who are embracing the transformation to e-mobility with existing machinery geared to machining large cubic aluminium housings.

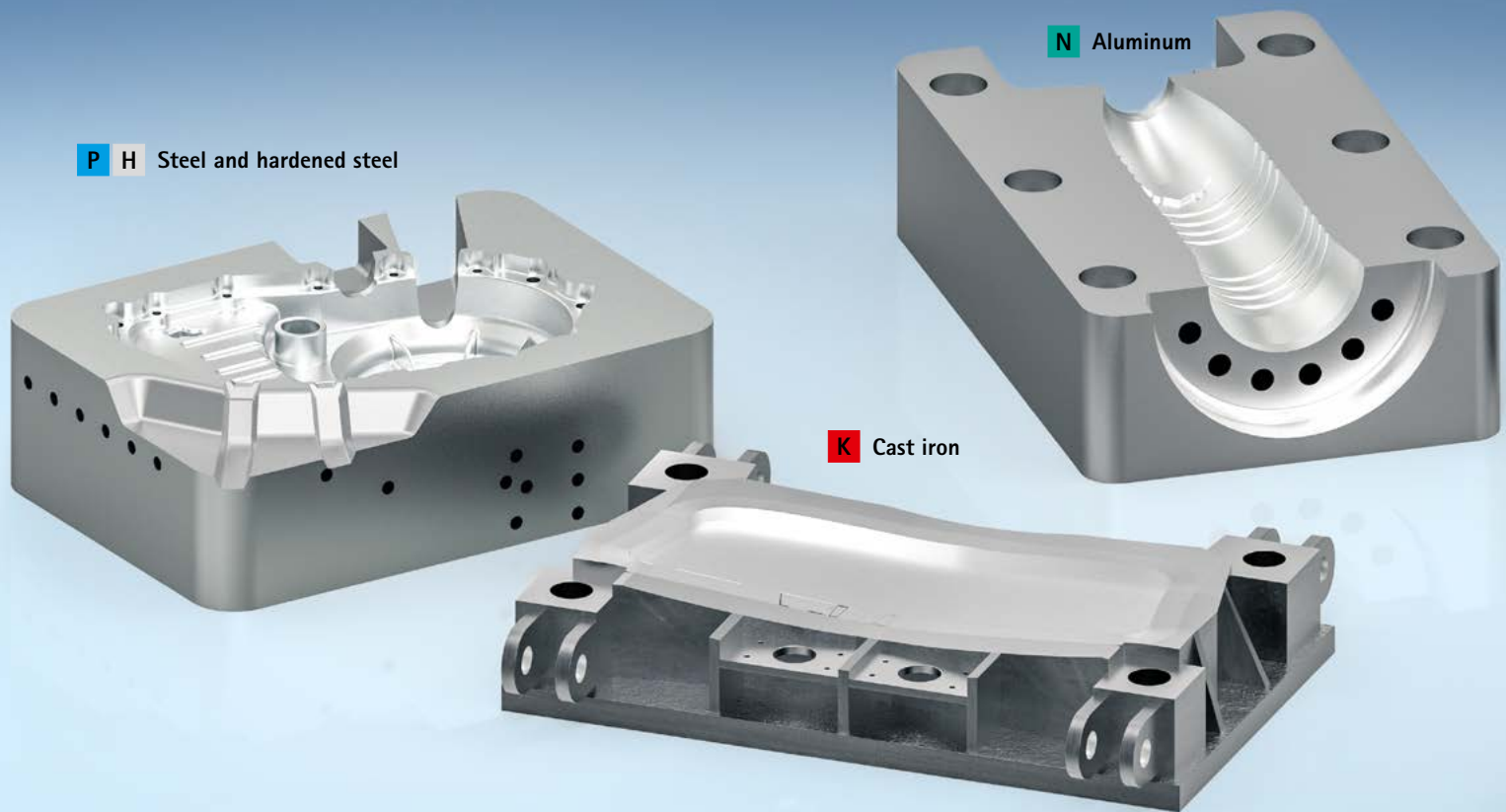
Those who start their production on a green-field site can, of course, choose which machining strategy is best for them. MAPAL has developed an alternative machining solution in a joint project with a machine manufacturer. In this case, the process was rotated 90 degrees for use on vertical lathes.

FEATURES

- Process-reliable complete machining of stator housings
- Internal and external machining of the stator housing on a machining centre
- New extraordinary external machining tool in lightweight design

ADVANTAGES

- Complete process design and implementation from a single source
- High-precision manufacturing for optimum power development of the electric motor
- Efficient and cost-optimised tool technology
- Highest product quality, process reliability and cost-effectiveness



Technology Partner and Complete Supplier in the Die & Mould Sector

Apart from tools and chucks, MAPAL supplies complete processes and the path to digital manufacturing.

Companies that make dies and moulds expect high process and product expertise from their tool partner. This is because the tool life of the moulds to be produced and the precision of the moulded parts are enormously important for competitiveness in the manufacture of the end products. Therefore, they require their tools to offer the highest levels of precision, a long tool life, and – above all – process reliability.

It is precisely these aspects that make MAPAL successful in sectors such as the automotive industry, machine engineering and the aerospace industry. It's therefore only logical to also offer efficient and economical solutions for the complete machining process in the die & mould sector.

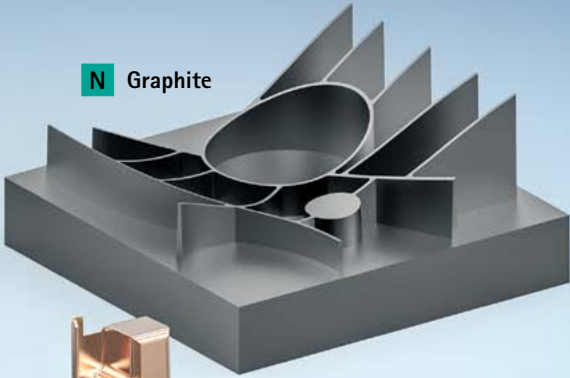
The programme for the die & mould sector forms a cross-section through MAPAL's tool portfolio, from milling with fixed and replaceable inserts and drilling to countersinking and reaming. The portfolio comprises around 6,500 articles matched to the workpiece materials used, such as steel, hardened steel, cast iron, aluminium and copper, as well as graphite.

Numerous highlights, such as the milling cutters with high-feed geometry, are part of this. Both the solid carbide design of the OptiMill series and the variants with exchangeable inserts enable machining with high stock removal rates and can be used flexibly. In addition, the highlights also include the shoulder radius milling cutter OptiMill-3D-CS with its large operating radius or the drill reamer MEGA-Drill-Reamer, which combines two work steps into one and is mainly used for creating dowel pin and ejector bores.

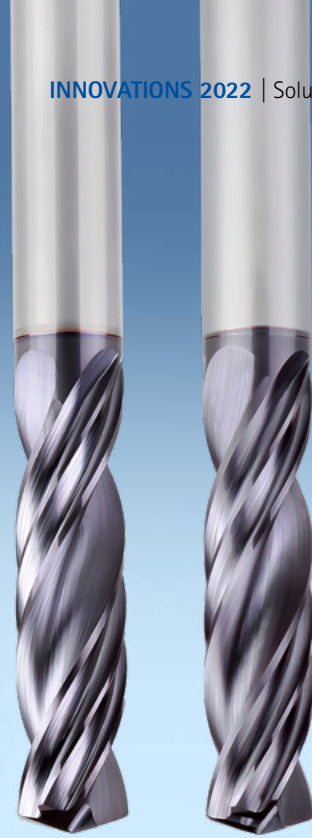
Due to the high specialisation in the market segment of the die & mould sector and the significantly increasing demand for technology and management solutions, the focus is no longer on tool solutions only when selecting the right machining partner. Machining strategies, machine tools, workpiece clamping systems, CAD-CAM systems and solutions for tool management are part of the machining process and are decisive for efficient and economical manufacturing.

As a technology partner, MAPAL offers everything from a single source and covers all facets of the overall process.

N Graphite



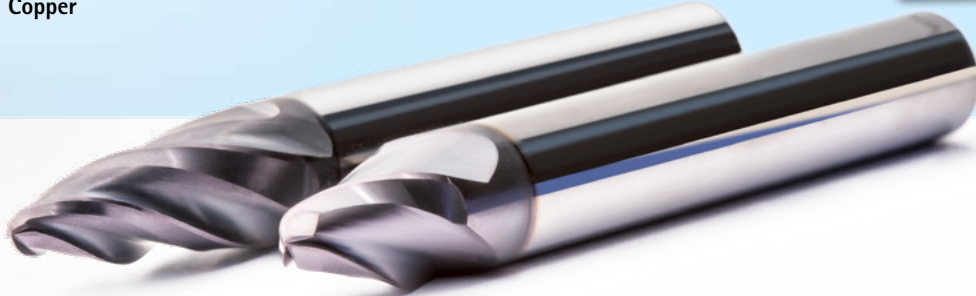
N Copper



MEGA-Drill-Reamer

Two working steps –
drilling and reaming –
combined in a single tool.

Shoulder radius milling cutters OptiMill-3D-CS
Efficient semi-finishing and finishing on 5-axis machines



Find out more at:
die-mould.mapal.com

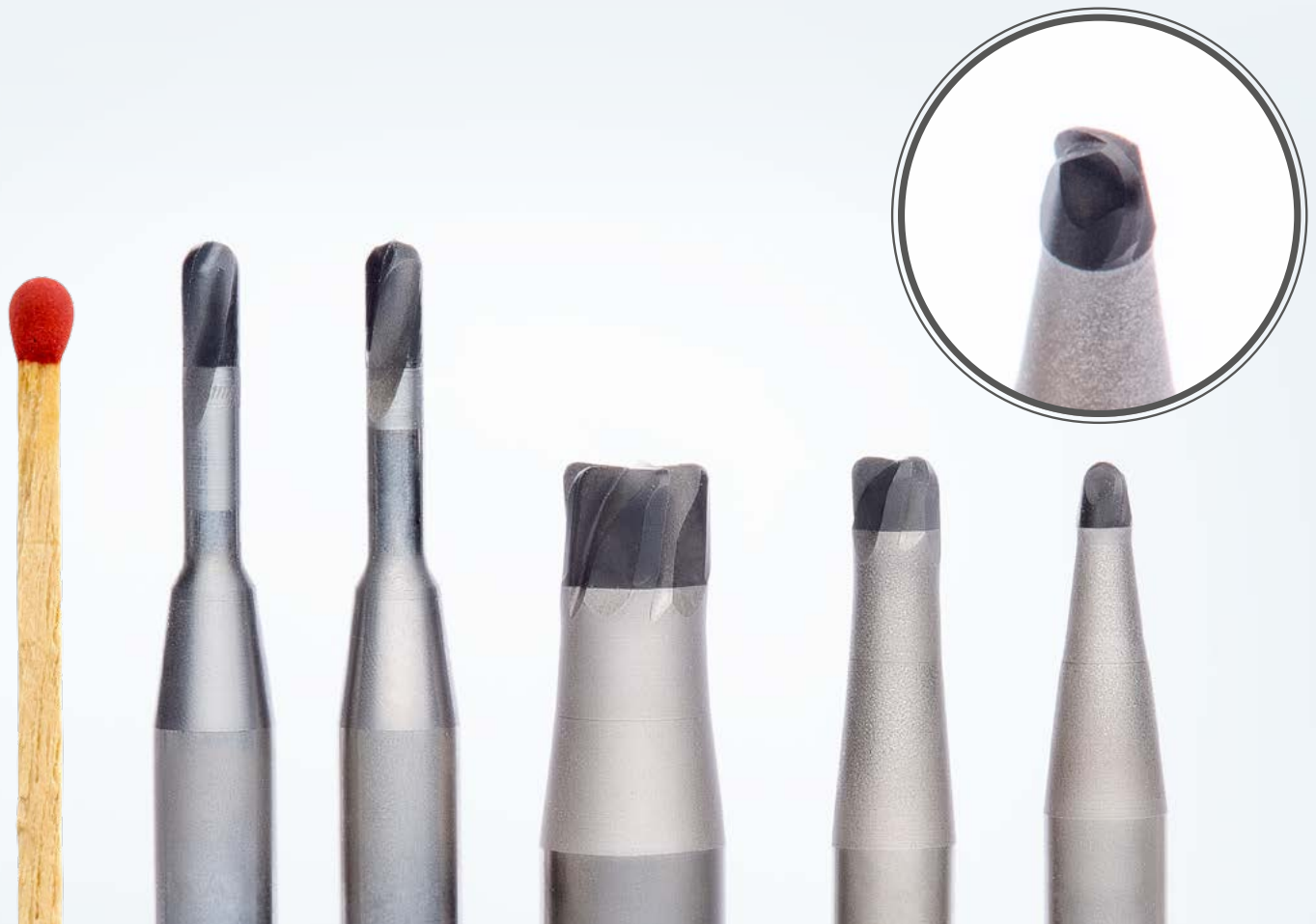
FEATURES

- Complete range of tools, clamping technology, peripherals and services
- Technology partner with extensive machining and process know-how
- Customer-specific solutions

ADVANTAGES

- All from a single source
- Tools for the highest precision, long tool life and process reliability
- Short delivery times





Machining carbide with PCD solid head milling cutters

With new PCD solid head milling cutters, MAPAL is extending the possibility of machining carbide and other hard-brittle materials to smaller diameters.

Deep-drawing dies in the die & mould sector are often made of durable carbide. Machining them by die-sinking or grinding is tedious. Machining with coated solid carbide tools often suffers from high wear and low tool life. PCD tools are a cost-efficient alternative here.

The punches and die moulds usually require tools with diameters less than 6 mm. To execute these tool dimensions in PCD, full-head PCD must be used, since smaller milling cutters have no room for brazed-on cutting edges and their substructure. With new geometry, number of cutting edges and arrangement, MAPAL now makes it

possible to machine hard-brittle workpiece materials with diameters from 2 to 6 mm.

To produce the perfect PCD tool according to customer requirements, blanks are kept in stock in the appropriate sizes. PCD is more expensive than solid carbide, but thanks to the longer tool life and shorter process times, break-even is quickly reached. In tests, the new milling cutters managed significantly higher feeds per tooth compared to solid carbide and therefore a much higher machining volume.

In addition to carbide, hard-brittle materials also include zirconia, a ceramic material used in dental technology. The new PCD solid head milling cutters from MAPAL are also an alternative to solid carbide in this area.

FEATURES

- Machining of carbide and other hard-brittle materials
- PCD solid head milling cutters available in diameter range from 2 to 6 mm

ADVANTAGES

- Long tool lifes
- Short processing times
- High feeds per tooth and therefore higher machining volumes



OptiMill®-Tro-Inox: Highly Productive Milling in Stainless Steel

To ensure highly productive machining of stainless steel (Inox), MAPAL is launching the OptiMill-Tro-Inox – a new, six-fluted solid carbide trochoidal milling cutter.

In particular, high-temperature-resistant and tough workpiece materials of the ISO material group M have a tendency to block the chip flutes at high machining volumes, making reliable machining difficult. The OptiMill-Tro-Inox solves this challenge through an optimal ratio between the number of cutting edges, chip breakers and a new type of flute shape. The modern multilayer coating is another key advantage of the six-flute solid carbide trochoidal milling cutter. This counteracts adhesive wear and, combined with the carbide matched to the application, ensures optimum results.

Initial applications underline the performance potential of the OptiMill-Tro-Inox: compared to well-known market solutions with four or five cutting edges, the new six-flute trochoidal milling cutter from MAPAL stands out with a 20 percent increase in material removal rate and has a 30 percent longer tool life. The tool achieves cutting depths of up to 5xD reliably in one pass. The optimised helix angle also reduces the extraction forces which increases process reliability.

The OptiMill-Tro-Inox is available in the diameter range from 4 to 20 mm in the designs 2xD to 5xD and will be available from stock from June 2022.

FEATURES

- Six-flute trochoidal milling cutter for highly productive milling in stainless steel
- Diameter: 4 – 20 mm
- Designs: 2xD and 5xD

ADVANTAGES

- Multilayer coating counteracts adhesive wear and prevents adhesions
- The tool reliably achieves cutting depths of up to 5xD in one pass
- 20 percent higher material removal rate and 30 percent longer tool life compared to four or five cutting edges
- Very high ductility for maximum safety against chipping
- High thermal stability and oxidation resistance



Exciting and Unique Gems

On the basis of a design study, MAPAL launched products with unique appearance and properties in November last year. Now, the high-gloss hydraulic chucks have also been given their own product name: under the name UNIQ, they represent the premium segment of MAPAL clamping technology.

Part of the concept is that the new products not only look good, but that each design element also offers added technical value. A lower tightening torque when tightening the actuator screw, clearly recognisable controls and reduced risk of accidents when handling the hydraulic chucks benefit the worker first and foremost. How the operator deals with the tool on the machine is also reflected in technical factors such as higher productivity, more process reliability and lower production costs.

Added to this are improved product properties, which MAPAL has achieved with UNIQ. The contours bring more stability and higher accuracy to the overall system. Micro-vibrations are minimised and the temperature in the tool stays lower. In addition to the visually recognisable features, the UNIQ tool adapters also incorporate a completely revised and patented chamber system. This has made it possible to redirect the tensile forces so that they act as an additional clamping force on the tool. Tests show that this achieves extreme stability, a higher machining volume, better surface finishes and high long-term strength.





The two hydraulic chucks UNIQ Mill Chuck and UNIQ DRaM Chuck 4.5° with diameters of 12 mm and 20 mm respectively have already been launched because customer demand for these sizes is highest. Announced product extensions are also based on customer requirements and will extend the portfolio in terms of continuity.

The first of these will be the additional diameters of 6, 8, 10 and 16 mm for hollow shank taper A63 at the EMO. From January 2022, both chucks will also be available from stock in the same sizes with BT30 tool adapters.

FEATURES

- New product name UNIQ
- Tool clamping diameter from 6 to 20 mm
- Machine connection HSK-A63 and BT30
- High availability of stock

ADVANTAGES

- Maximum stability at optimal use of resources
- Low actuation torque
- High long-term temperature resistance
- Optimum surface finish
- Dirt and corrosion-resistant
- Self-explanatory, simple handling



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