

Your technology partner for cost-effective machining

CHASSIS & BRAKES

Markets and sectors

MAPAL has developed an in-depth understanding of processes and applications in machining manufacturing through many years of close cooperation with customers. The areas of application for MAPAL machining solutions extend across various sectors.

MAPAL has been developing innovations to meet the challenges of the automotive industry and large-scale production for a long time. These innovations are successfully used by reputable manufacturers and their suppliers in the Chassis and brakes sector as well as in the powertrain sector and in electric mobility.

MAPAL is an accredited partner to the aerospace industry and sets trends and standards in manufacturing and machining technology with reliable solutions. When it comes to demanding machining for hydraulic and pneumatic parts in different dimensions, customers have relied on MAPAL's expertise for many years. On top of this, an extensive range of products for die & mould rounds off the offering.





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 offering production, sales and service in

25 countries.

Yearly investment in research and development amounting to

6% of turnover.

Over

450

technical consultants in the field.

More than

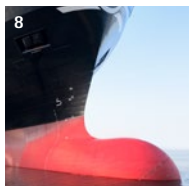
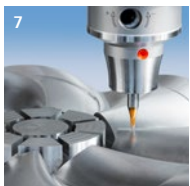
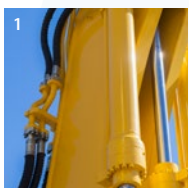
300

apprentices worldwide.

Our biggest asset: More than

5,000

staff worldwide.



- 1 Fluid power
- 2 Automotive
- 3 Aerospace
- 4 Energy production
- 5 Electric mobility
- 6 Medical technology
- 7 Die & mould
- 8 Shipbuilding
- 9 Rail transport



BUS



BICYCLE

Chassis & Brakes

Tool solutions for every vehicle concept

The automotive industry is undergoing a major shift with an irrevocable trajectory towards electrified mobility. In the long term, the aim is to achieve a carbon neutral future with all-electric vehicles. But how does this transformation impact Chassis and brake components?

Due to the battery systems, which result in increased vehicle weight, the aluminium content in Chassis and brake components is rising. This is because aluminium ensures high stability and reduced weight. At the same time, components are constantly being developed on account of innovative technologies, such as steer-by-wire, brake-by-wire and self-driving.

New production methods such as giga- and megacasting open up new opportunities such as bigger component dimensions, meaning parts of a bodywork can be produced in a single piece.

As a manufacturer of machining tools and solutions, MAPAL conducts intensive market research and maintains close relationships with universities, institutions and key players along the value chain. This way, changes and trends can be detected early and implemented in innovative machining processes accordingly. MAPAL determines the optimum solution for the relevant situation in direct dialogue with its customers.



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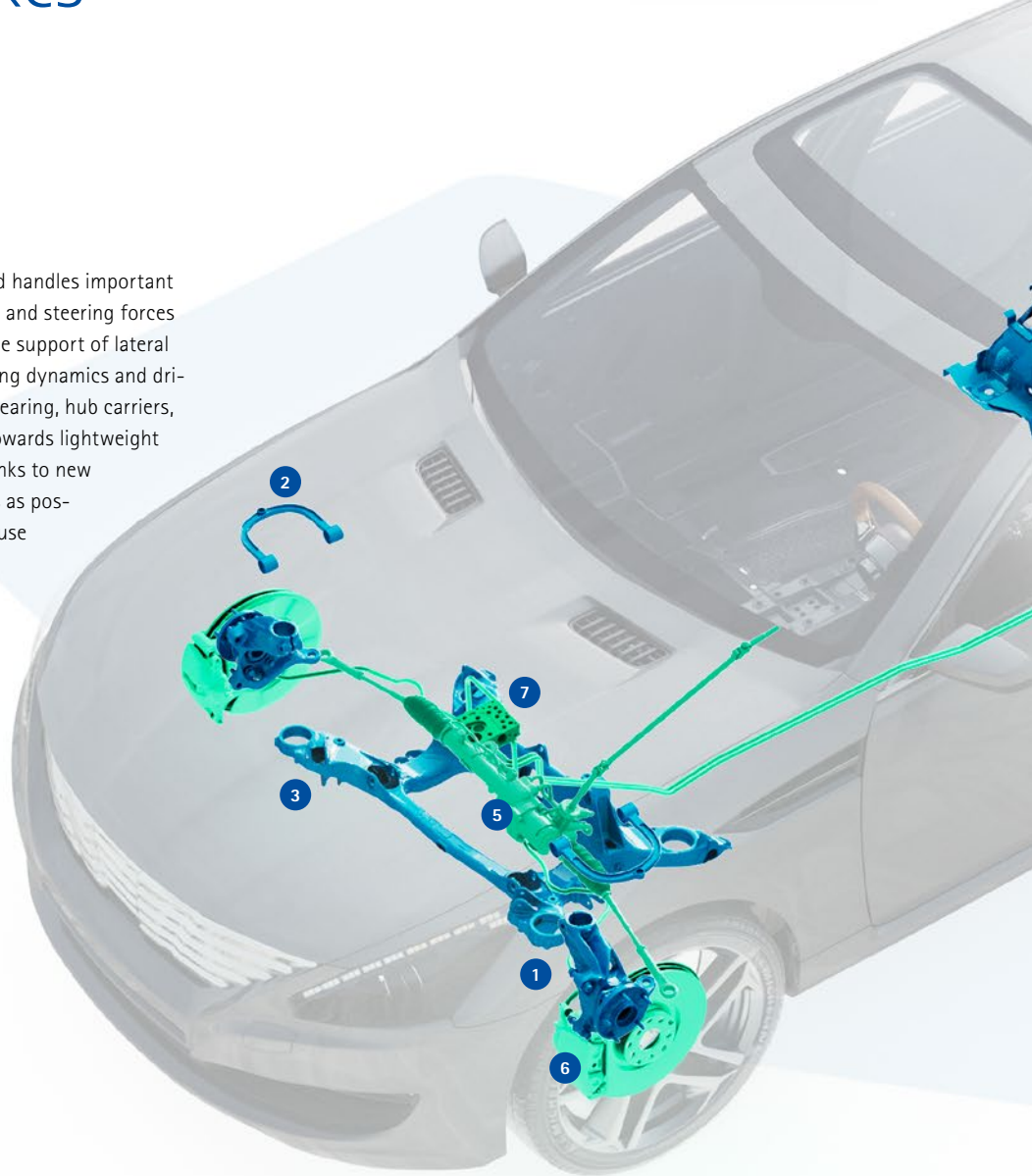


Learn more about solutions for
CHASSIS & BRAKES

Expertise Chassis & Brakes

Chassis & bodywork

The chassis combines wheels and bodywork and handles important tasks such as the transmission of drive, braking and steering forces as well as the damping of vertical forces and the support of lateral forces. It is essential for a vehicle's safety, driving dynamics and driving comfort. Key components include swivel bearing, hub carriers, suspension arms and subframes. The trend is towards lightweight construction, improved material properties thanks to new alloys and the integration of as many functions as possible in one component, including through the use of innovative manufacturing technologies such as giga- and megacasting.



SOLUTIONS FOR CHASSIS & BODYWORK:

1 Swivel bearing / steering knuckle **K N**

Precise machining of many different variants
A diversity of vehicle concepts results in a multitude of variants. Individual machining concepts ensure a high level of dimensional accuracy and process reliability, even in instances of difficult accessibility and complex geometry.

» More from page 8

2 Suspension arm **N**

High flexibility and process reliability
Suspension arms require a high-quality surface finish and dimensional accuracy. Milling instead of drilling offers improved chip control and higher process reliability, particularly for complex chipping devices and long-chipping workpiece materials.

» More from page 14

3 Subframe **N**

Low-vibration machining of complex structures
Due to delicate structures and complex design, subframes require low-vibration machining. Optimised cutting edge arrangements and combination tools reduce vibrations and ensure high quality.

» More from page 16

4 Gigacasting / megacasting **N**

Stable machining of large, thin-walled components
Thin-walled components with deep machining contours require solutions with vibration damping. These ensure quiet running and improved surface quality and are gentle on the machines, even when long projection lengths are involved.

» More from page 20



Brakes & steering

The brake and steering system takes care of key tasks in vehicle manoeuvrability and safety by enabling vehicles to be slowed, stopped and steered precisely. The steering housing, brake caliper and combined brake housing are key components. These components require precise machining and high process reliability, particularly in instances of tight tolerances and complex geometry. Trends such as brake-by-wire and steer-by-wire increase the complexity of the components, while the use of new alloys primarily affects chip formation and represents additional challenges for machining.

SOLUTIONS FOR BRAKES & STEERING:

5 Steering housing N

Reliable handling of thin-walled bores with close tolerances

Steering housings made from aluminium or magnesium require precise machining due to tight form and position tolerances and high positional accuracy. The thin-walled construction poses additional challenges due to vibrations. Adapted tool solutions and process reliability in chip removal are crucial.

» More from page 22

6 Brake caliper K N

High precision and safety in series production

As safety-relevant components, brake calipers must be produced in high quantities and with tight tolerances. Individual solution packages guarantee high process reliability, dimensional accuracy and efficient machining, even in instances of difficult accessibility and high machining forces.

» More from page 26

7 Combined brake housing N

Process reliability with exact chip control

Combined brake housings made from extruded aluminium with low silicon content require short chips and reliable chip breaking. A new chip breaker creates a defined chip form and maximum process reliability, even for low feed rates and stock removals.

» More from page 32

Component expertise

Swivel bearing / steering knuckle

Functional description:

Hub carriers on the rear axle and swivel bearing on the front axle are responsible for carrying the wheels and crucial to driving comfort and safety. They act as mounting points for the wheel hub, brake disc, brake caliper and suspension arm. Their design differs depending on the axle concept so as to meet specific vehicle requirements. The components must be capable of bearing high wheel loads and are therefore made from strong, corrosion resistant materials such as forged aluminium or spheroidal cast iron. Their robust design ensures the vehicle's effectiveness and safety.

FEATURES

- Forged aluminium or spheroidal cast iron
- High demand on quality as component is safety-relevant
- High quantities
- Close position tolerances
- High process reliability and dimensional accuracy

Aluminium or cast iron

The choice between these materials depends on specific requirements for use, such as weight, strength, rigidity, costs and environmental conditions.


N

Aluminium

Aluminium, with its combination of high strength and very high flexibility, is the ideal workpiece material for safety-critical components that also need to be light-weight. These properties make it the perfect choice for unsprung masses.


K

Cast iron

In comparison to aluminium, these materials are more cost-effective but have a higher specific weight. Cast iron is resistant to wear and tear and can withstand high loads.

MACHINING REQUIREMENTS

- Long chipping due to wrought alloy and forged/heat treated
- More difficult tool accessibility depending on clamping fixture and number of process steps
- Machining in a clamping system
- Multi-spindle machining or custom machines

MACHINING REQUIREMENTS

- High abrasiveness
- More difficult tool accessibility depending on clamping fixture and number of process steps
- Reduction of cutting forces due to positive cutting edge geometry
- Adapted cutting data
- Controlled chip breaking



MAPAL solutions expertise

PRECISION EVEN WITH MANY DIFFERENT VARIANTS

- Production in one clamping position for high component quality and low cycle times
- Process reliability in machinery even in the case of restricted accessibility due to tailored machining concepts adapted to the component version and machine concept
- Defined and controlled chip breaking for forged or heat-treated aluminium





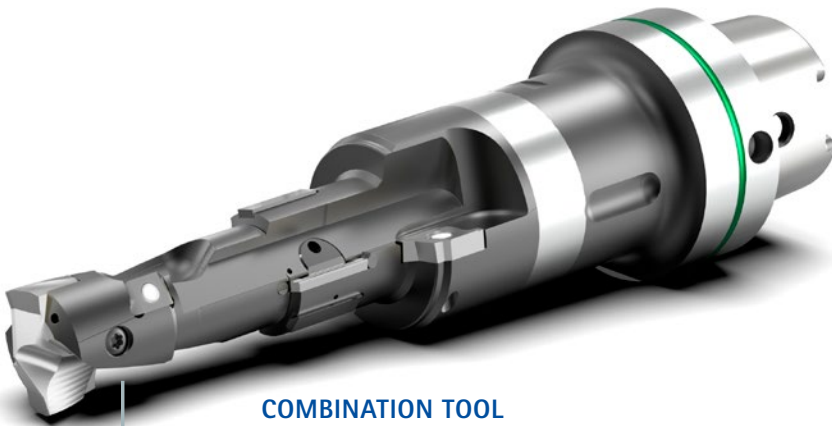
Discover how innovative tools from MAPAL can make your production more sustainable.

Machining highlights

Swivel bearing

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THRUST STRUT, CAMBER STRUT AND TENSION STRUT

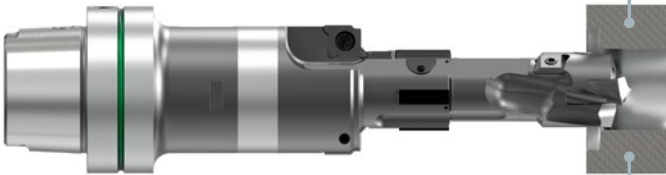


COMBINATION TOOL

- Fine machining of close diameter tolerances with long projection length
- High shape accuracy due to precisely ground blades

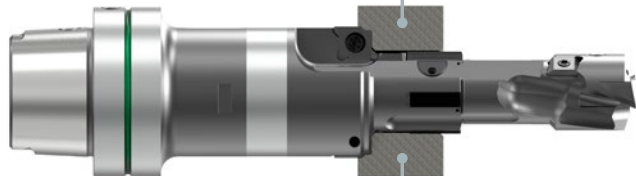
1. Drilling from solid

Cost-effective drilling from solid using QTD indexable cutting edge



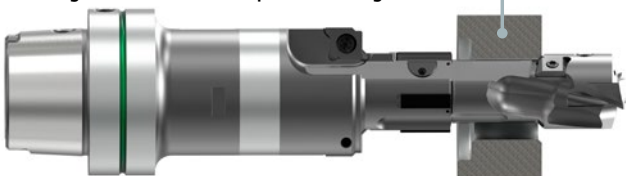
2. Fine boring + bearing seat machining

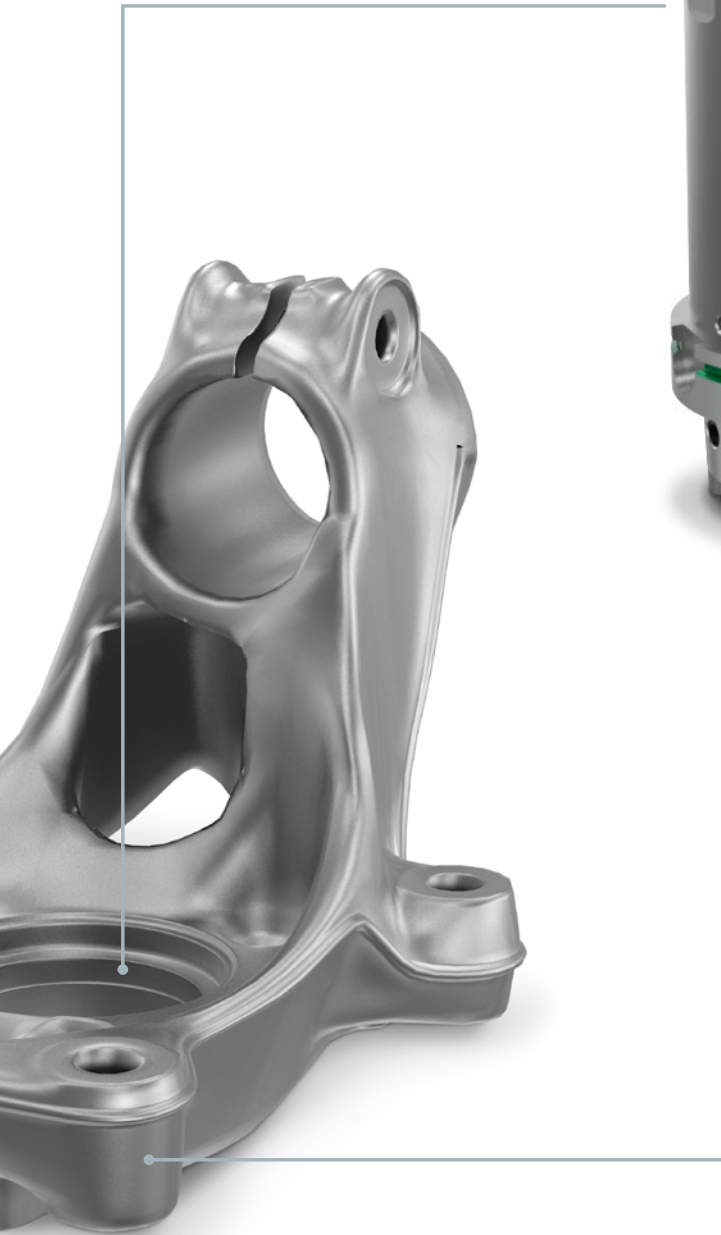
Fine machining of bores using pad-guided fine-bore cutting edges for tight tolerance requirements



3. Reverse machining

Reverse circular milling of chamfers with replaceable tangential inserts





MAIN BEARING BORE

PCD MILLING TOOL

- Short cycle times due to finish milling of all diameters and contours with one tool
- Reliable machining with short chips



PRE-MACHINING OF MAIN BEARING BORES

OPTIMILL-DIAMOND-SPM

- Ideal for making openings or pockets
- Solid carbide design or with brazed PCD blades

Machining highlights

Swivel bearing

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MAIN BEARING BORE

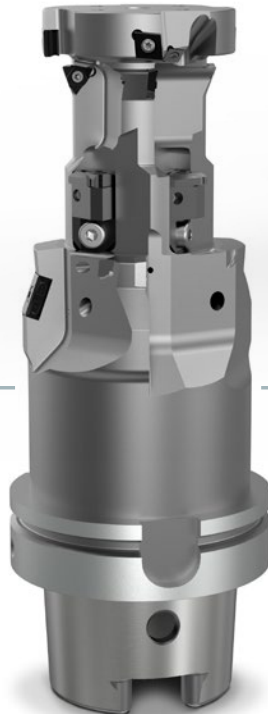
1. Pre-machining



BORING TOOL WITH INDEXABLE INSERTS

- Precision boring tool with cartridges
- High flexibility due to quick, straightforward interchangeability
- Adjusting feature for long adjustment range

2. Semi-finish machining



BORE MILLING COMBINATION WITH INDEXABLE INSERTS

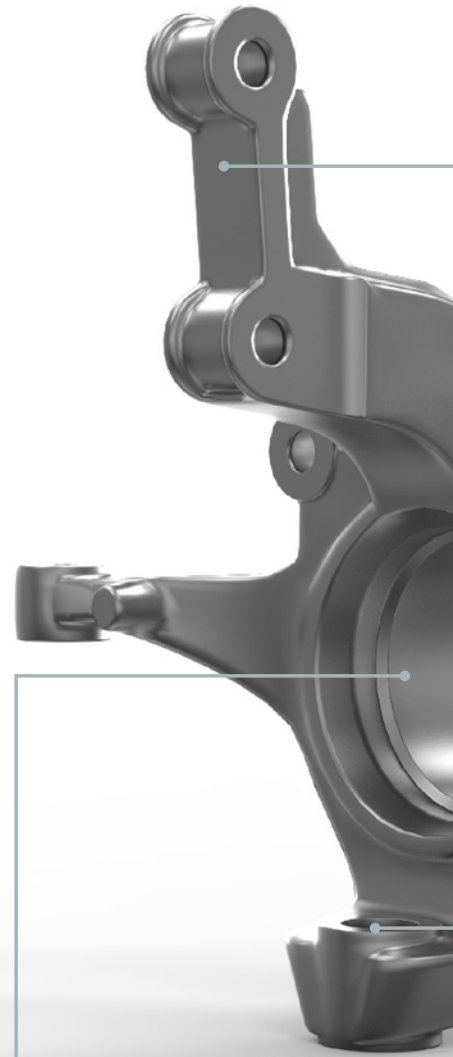
- High effectiveness due to the usage of tangential technology
- Cartridge for high flexibility due to quick, straightforward interchangeability

3. Fine machining



HIGH-PERFORMANCE REAMER HPR400

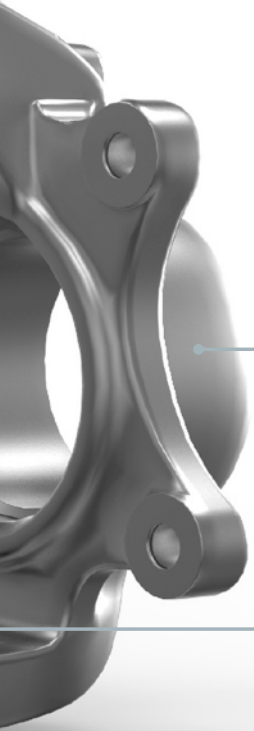
- Reliable machining of the large diameter
- Easy to handle without setting effort
- High accuracy: Precision of a brazed reamer





CONNECTION STEERING ARM DISC MILLING CUTTER

- Reliable milling due to tangential technology
- Eight cutting edges per indexable insert for cost-effective machining
- Vibration damper to reduce vibration



MILLING MACHINING NEOMILL-8-CORNER

- Maximum economic efficiency for corner milling
- Eight cutting edges per indexable insert for cost-effective machining
- Large cutting depths up to 8 mm



CONNECTION SWING ARM/SUSPENSION ARM TAPER REAMER

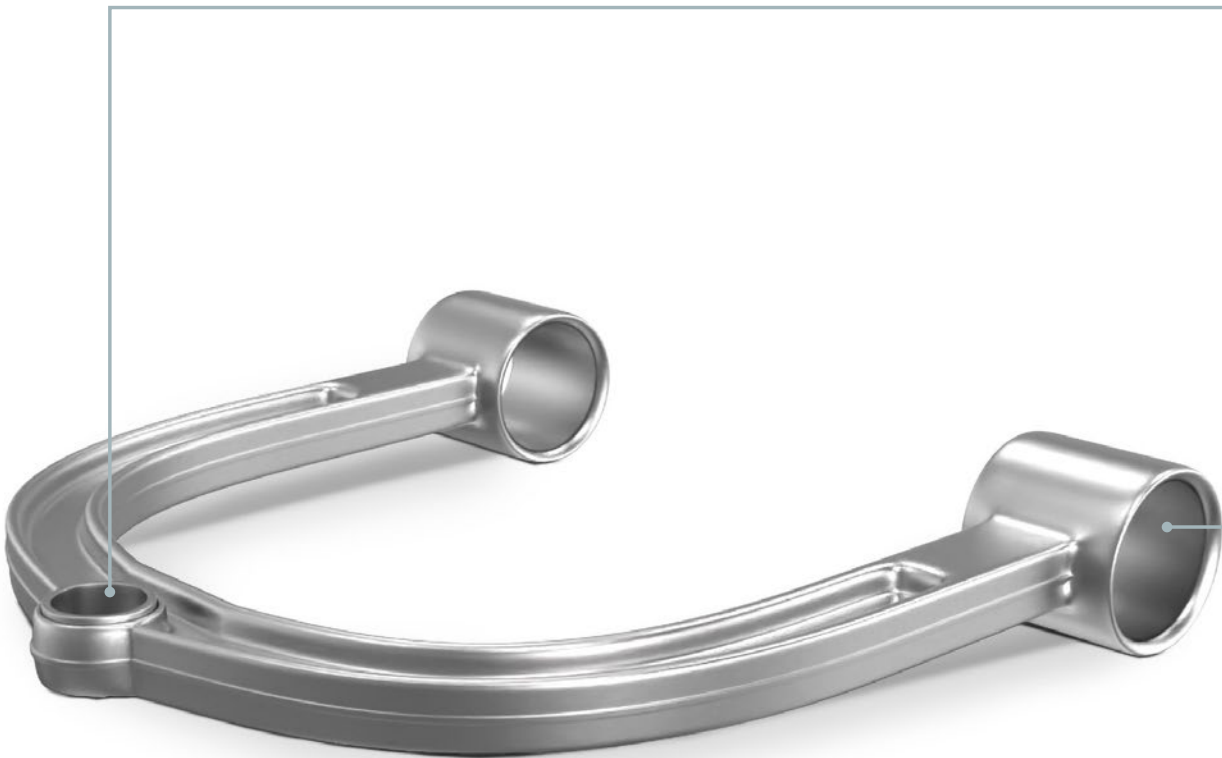
- Maximum accuracy thanks to guide pads and μ -precise adjustment of indexable inserts
- Insert technology for maximum flexibility in the choice of cutting material for optimisation of tool life and surface quality

Component expertise

Suspension arm

Functional description:

Suspension arms are an essential component of individual wheel suspensions in cars and are responsible for wheel guidance. They absorb the lateral forces between the wheel and the vehicle body. Depending on the axle concept, there are many geometric solutions. Suspension arms must withstand high wheel loads and should be resistant to corrosion and very strong. They play a key role in driving mechanics and make a major contribution to safety and comfort.



FEATURES

- Cast iron, aluminium or steel
- High demand on quality
- High quantities
- Defined surfaces for bores ($R_z > 30 \mu\text{m}$) where rubber bearings are pressed into
- High process reliability, dimensional accuracy and contour accuracy

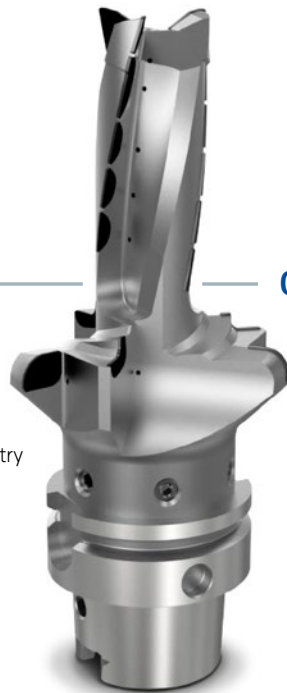
MACHINING REQUIREMENTS

- Long chipping due to wrought alloy and forged/heat treated
- Multi-spindle machining



**FINE MACHINING
OF THE SPHERICAL BORE
PCD BORING TOOL**

- Tight tolerance and contour accuracy
- High demands on surface finish



OR



**BEARING BORE
PCD MILLING TOOL**

- Pre-machining and fine machining with one tool
- Special face-side cutting edge geometry for helical pre-machining of the bore
- Peripheral cutting edge with special cutting edge geometry for fine machining of a defined surface

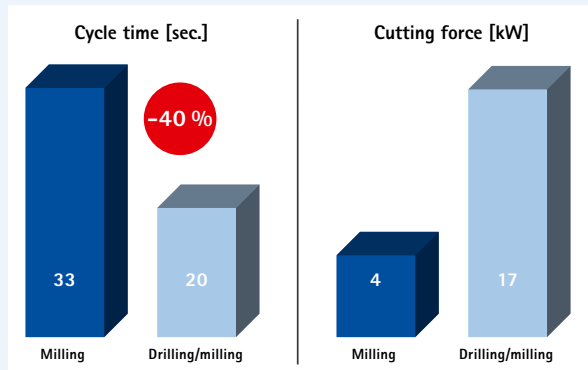
**BEARING BORE
PCD BORE MILLING TOOL**

- Cost-effective pre-drilling using indexable insert technology
- Special cutting edge geometry on peripheral cutting edge for fine machining of a defined surface



**MAPAL solutions expertise
MILLING INSTEAD OF DRILLING**

Drilling offers efficient cycle times but requires high machine capacity and, for long-chipping aluminium workpiece materials, may cause accumulations of chips to form and block tools and machinery. Milling offers increased process reliability through improved chip control, which is particularly important in the case of tool restrictions due to clamping fixtures that hinder chip flow. Milling is also considered the preferred method in instances of insufficient machine capacity. In summary, milling offers greater flexibility and process reliability, while drilling can be more efficient if there is sufficient machine capacity.



Component expertise

Subframe

Functional description:

The subframe is a load-bearing element of the vehicle bodywork and serves as a pivot point for the wheel suspension. The motor and gears are also mounted on the front axle. The subframe's construction makes assembly easier during vehicle production. It also contributes to increased driving comfort as it minimises vibration and noise while driving.

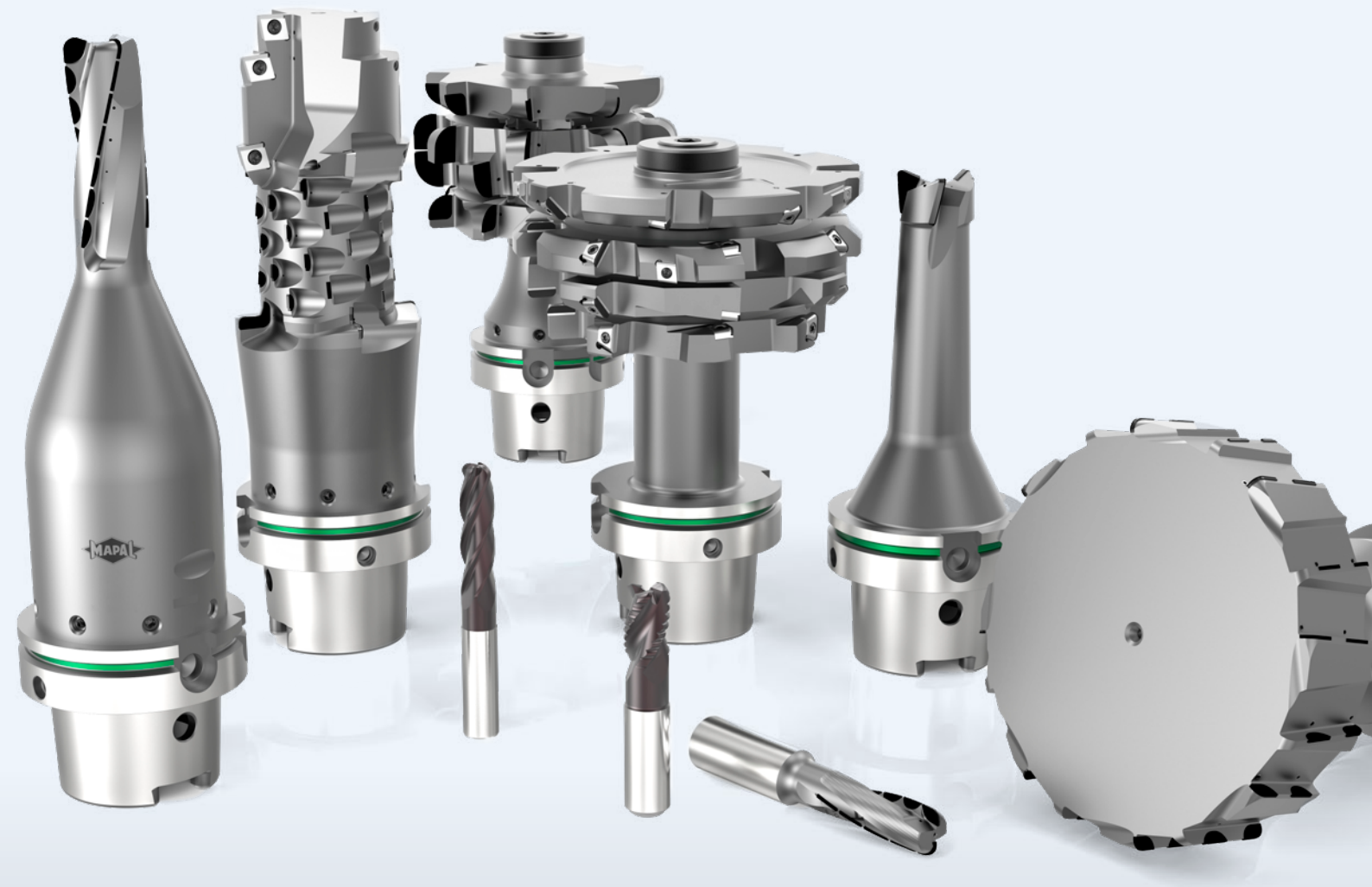


FEATURES

- Aluminium pressure die casting / sand casting / welded designs
- Thin-walled part
- Defined surfaces for bores (rubber bearing)

MACHINING REQUIREMENTS

- High cutting pressure through component contour and large radius transitions (>R5)
- Difficult clamping setup
- Tools with long projection length for hard-to-access machining features
- Vibration caused by tools and the machine process
- Minimum quantity lubrication (MQL) for efficient coolant use
- Springback of freestanding connections



MAPAL solutions expertise

LOW-VIBRATION MACHINING OF STRUCTURAL PARTS

Machining vibration-prone structural parts represents a particular challenge due to vibrations and delicate structures. MAPAL has a comprehensive understanding of the processes involved and is thus in a position to machine these parts with low vibration using combination tools and optimised cutting edge arrangements. These reduce non-productive time and ensure reliable results, even in instances of complex geometry and high quality requirements.

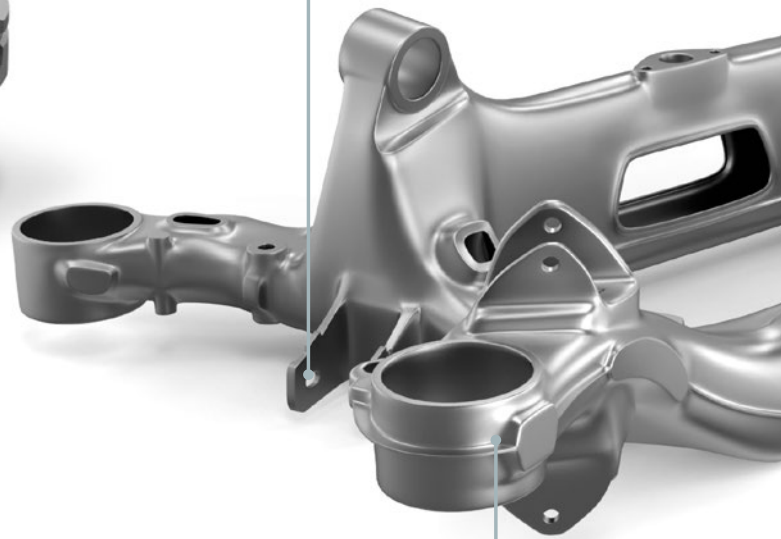
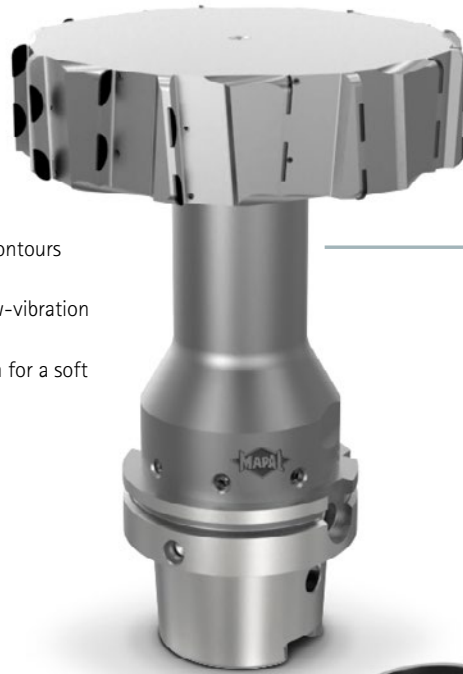
Machining highlights

Subframe

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CROSS BRIDGE PCD MILLING TOOL

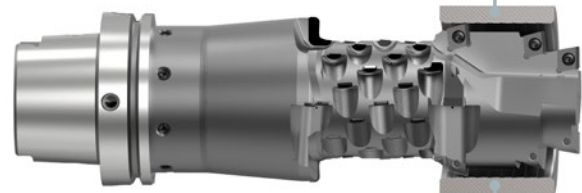
- Machining precise component contours in a single cut
- Specially arranged blades for low-vibration milling
- Special cutting-edge preparation for a soft cut



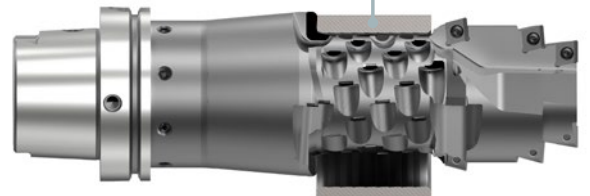
BEARING BORE PCD BORING TOOL

- Hybrid design combines two technologies for cost-effective machining
- Cost-effective pre-machining of the bore with indexable inserts
- Fine machining of bearing bore with a PCD circular stage for a defined surface $R_z 60$

1. Boring

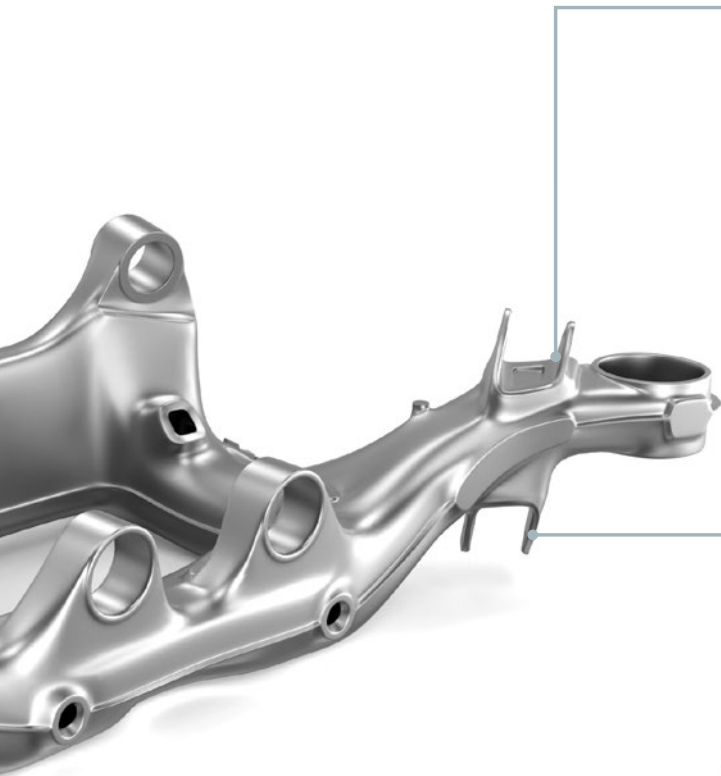


2. Circular milling + chamfering



THRUST STRUT
PCD DISC MILLING CUTTER

- Machining thin-walled ribs in one pass
- Counter-rotating arrangement of cutting edges for mutual support during machining. The result: quiet running



CAMBER STRUT
PCD MILLING TOOL

- Pre-machining and fine machining with one tool
- Special cutting-edge finishing for quiet running with maximum material removal
- Special arrangement of coolant outlets for optimal wetting for MQL

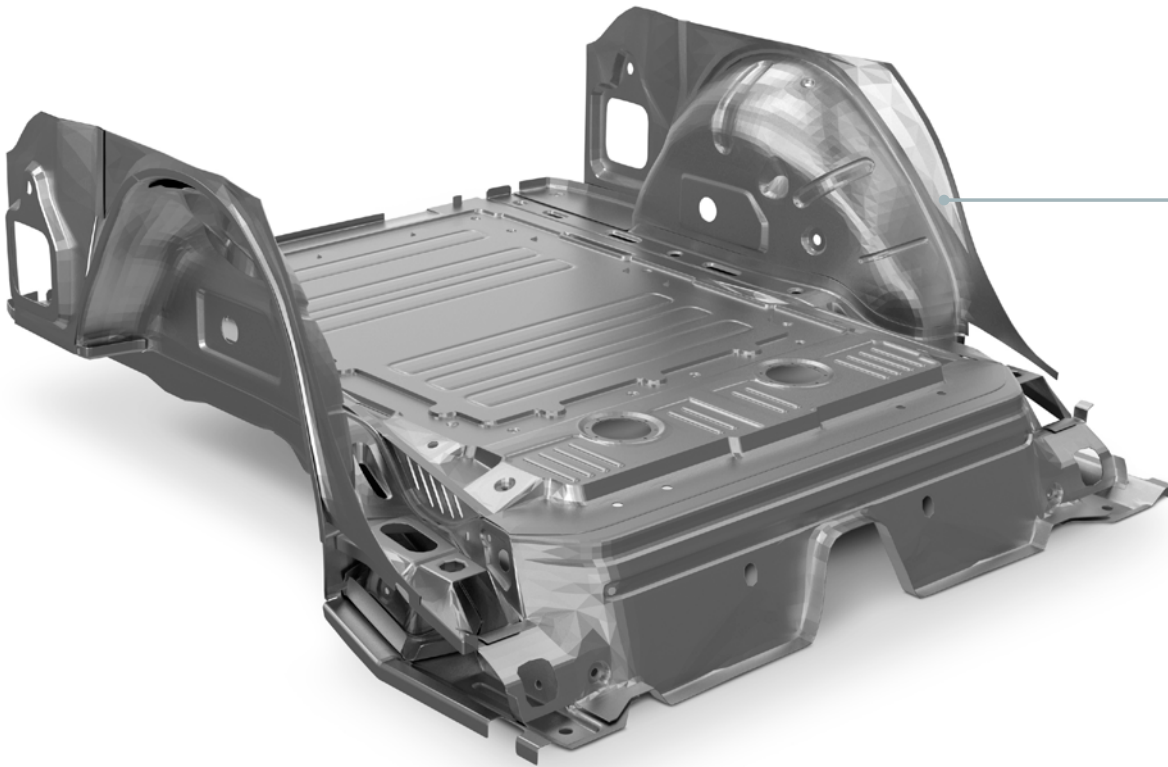


Component expertise

Gigacasting / megacasting

Functional description:

New manufacturing technologies such as giga- and megacasting are revolutionising the automotive industry. Instead of multiple individual parts, complex structural components are now produced in a single casting. Aluminium alloys are used to manufacture components that are bigger, more lightweight, yet resilient. These processes promise to reduce weight, boost performance and help ensure safety in future vehicles.

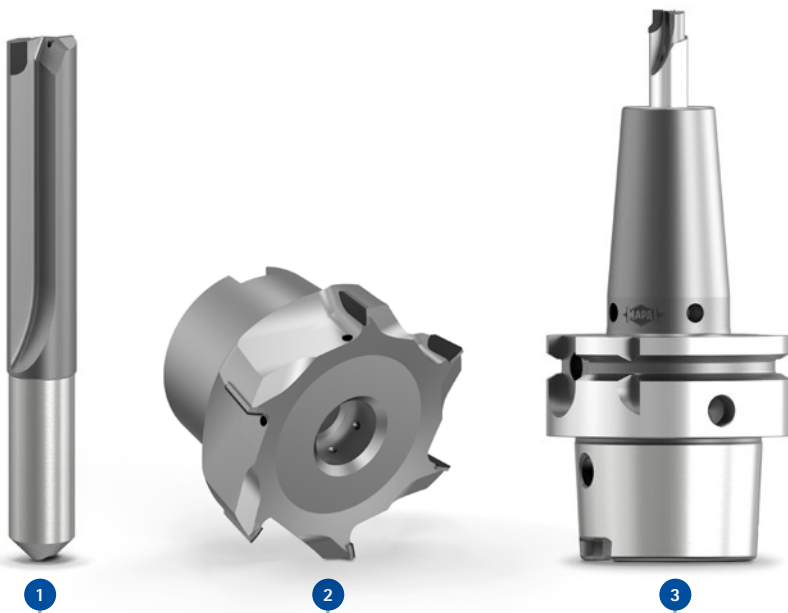


FEATURES

- Wall thickness between 2 and 5 mm
- Newly developed aluminium alloy for improved flow characteristics
- Large component dimensions (L=160 cm x B=160 cm x H=130 cm)
- Defined surfaces for adhesive surfaces
- Diameter tolerance ± 0.05 mm or 5 ± 50 μ m

MACHINING REQUIREMENTS

- Deep machining contours
- Low-burr drilling without cover formation at the bore outlet
- Low-burr milling
- Production of various bore diameters
- Increased non-productive time and longer travel distances between different machining steps
- Low cutting pressure leads to deformation of component
- Vibration-prone due to long projection lengths
- Lubrication through MQL and aluminium alloy



1 PCD BORING TOOL

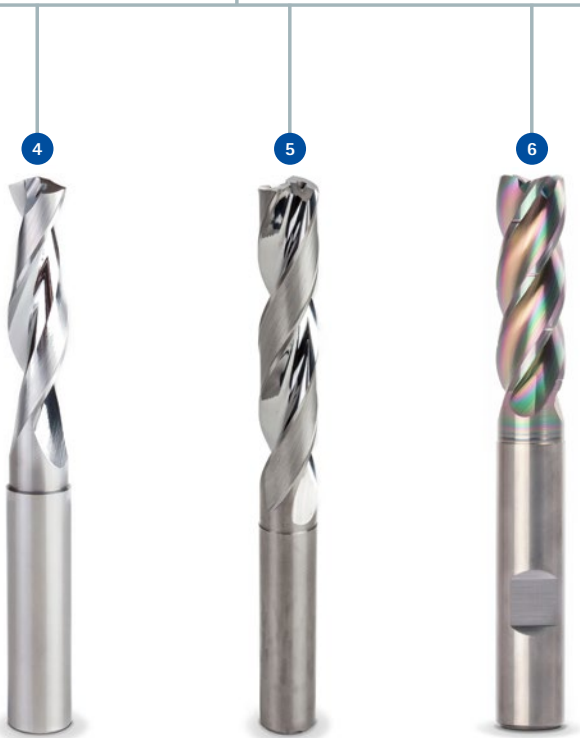
- Form E cut for burr reduction

2 FACEMILL-DIAMOND-ES

- Highest flexibility due to modularity
- Brazed PCD blades for long tool lives
- Short machining time

3 PCD BORE MILLING TOOL

- Drilling and milling in one tool



4 MEGA-DRILL-ALU

- Uncoated or coated
- Pre-cutting stage for reduction of burr formation

5 MEGA-180°-DRILL-ALU

- Uncoated or coated
- Spot drilling on inclined surfaces

6 OPTIMILL-ALU-HPC-POCKET

- Drilling and milling with one tool



MAPAL solutions expertise VIBRATION DAMPENING

- Smooth, stable running despite long projections
- Protection of spindle and machine
- Noise is minimised in the machining process
- Improvement of surface quality
- Adapted to the rigidity of all common machine types
- Standard products available from stock with connection HSK 63 and 100 and SK 40 and 50

» For more information, see MAPAL "CLAMPING" catalogue page 114-115

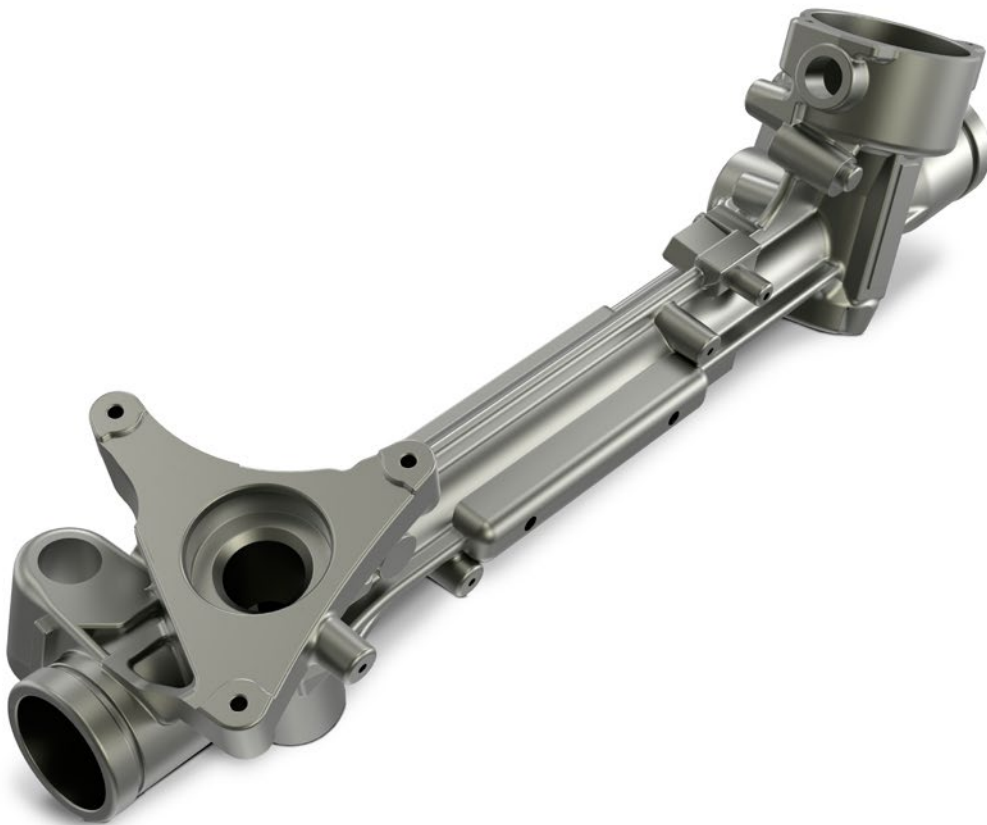


Component expertise

Steering housing

Functional description:

The steering gear transmits the rotational movement of the steering wheel via the tie rod to the front axle of the vehicle. The steering torque is transmitted via a rack and pinion in the steering housing. The trend towards steer-by-wire systems enables improved driving and steering characteristics. This technology also lays the foundation for self-driving cars by enabling more direct and precise steering. Overall, the steering gear plays a central role in the vehicle's steering ability and safety.



FEATURES

- Workpiece material: Aluminium or magnesium
- Defined roughness $R_z > 40 \mu\text{m}$
- Thin-walled component tends to vibrate
- Interrupted cut
- Thruster pad bore with high tolerance requirement

MACHINING REQUIREMENTS

- High tool weight (depending on design)
- Tight form and position tolerances
- High degree of positional accuracy
- Complex design of tool solutions
- High cutting data requirement in series production
- Reliable chip removal due to casting situation (hybrid tools)
- Delicate clamping system
- Machining in one pass depending on design and clamping



MAPAL solutions expertise **RE.TOOLING**

MAPAL re.tooling efficiently utilizes the existing machinery for new projects, manufacturing economically without the need for additional investments in new machines. It offers comprehensive solutions for complete workpieces, including all necessary components such as tools, fixtures, NC programs, and commissioning. Process planning and implementation are carried out by experienced specialists who employ the latest machining technologies and cost-effective tools. Fast and flexible on-site support ensures high-quality execution, even within tight deadlines.

Machining highlights

Steering housing

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GEAR RACK BORE PCD BORING TOOL

- Thin-walled bore
- Unequal number of cutting edges for higher proportion of guidance in the bore
- Special axial cutting edge arrangement for a soft cut



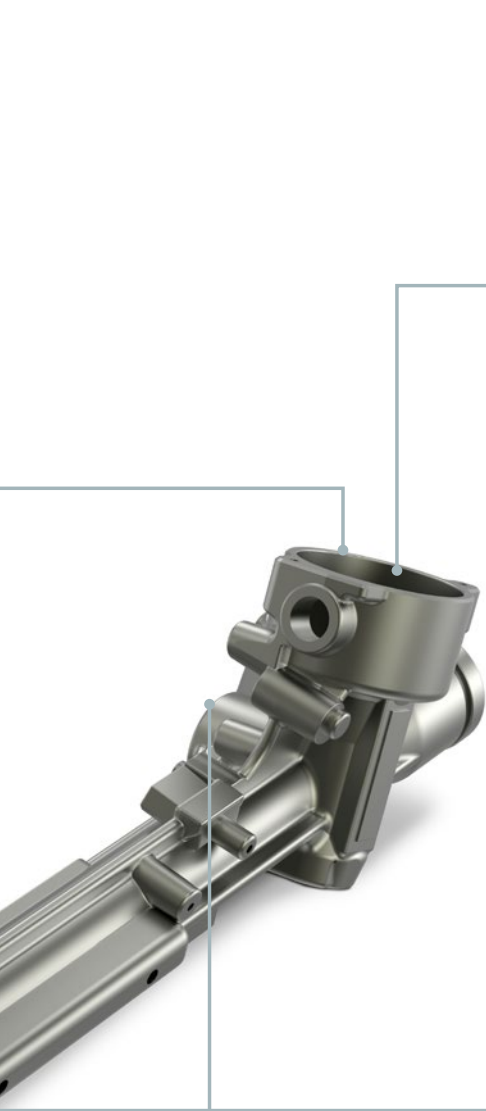
RACK BORE PCD BORING TOOL

- Guide pads for maximum precision for deep bores with interrupted cut



RETAINING GROOVE PCD CIRCULAR MILLING TOOL

- Cost-effective circular milling of delicate component contours
- Smart cutting edge arrangement for high surface quality



**THRUSTER BORE
PCD BORING TOOL**

- Cost-effective machining of the thruster bore in a clamping system
- First stage with fine boring tool for tight tolerances and precise cutting edge adjustment



**THRUSTER BORE
PCD BORE MILLING
COMBINATION TOOL**

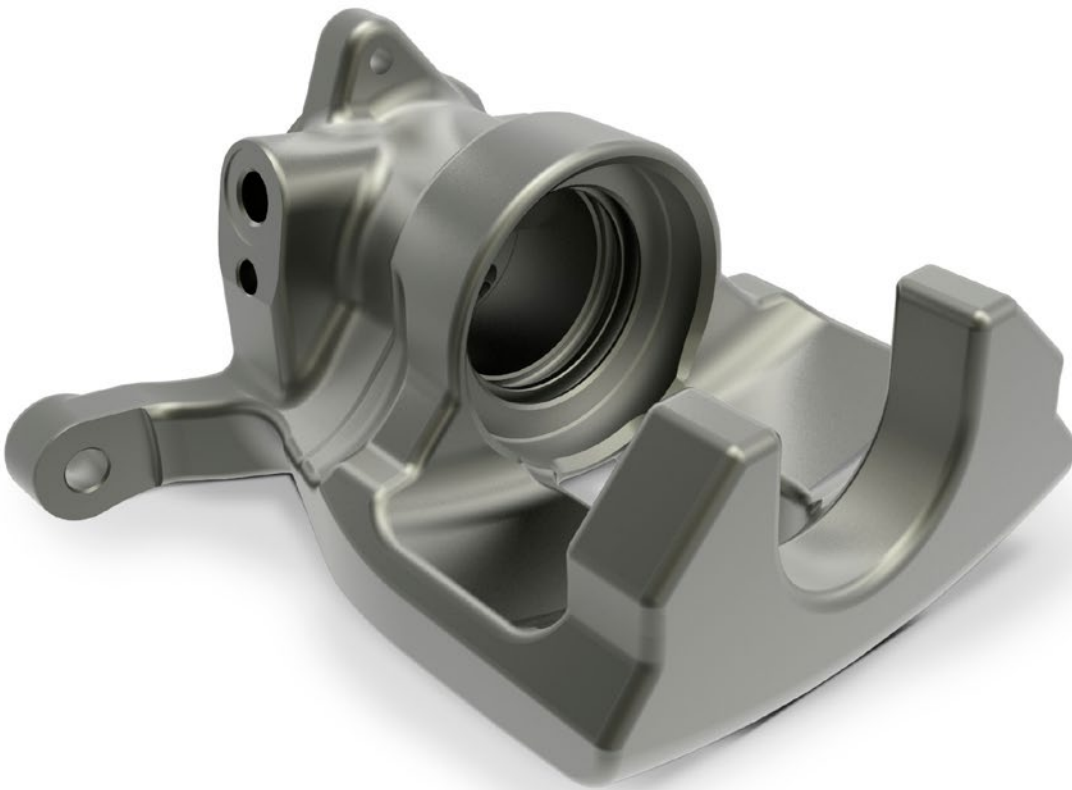
- Machining bores with tight tolerances
- Circular milling of thread in the same bore
- Cost-effective machining of two features with one tool

Component expertise

Brake caliper

Functional description:

The brake caliper is a safety-relevant component in the vehicle that is exposed to high thermal and mechanical loads. When the brake pedal is operated, brake fluid is sent to the piston of the brake caliper, which presses the brake pads onto the disc. Designs and the number of pistons vary depending on the vehicle type and motorisation.



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Aluminium

Solid aluminium brake calipers are used for weight reduction. They are ideal for high performance vehicles and heavy models that require a rapid brake response.

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Cast iron

Cast iron is frequently used in mass production as it is inexpensive and can be used irrespective of the machine concept.

FEATURES

- Safety-relevant component
- High demand on quality
- High quantities

MACHINING REQUIREMENTS

- High chip volume depending on casting situation
- Tight tolerance fields due to process and machine capability in series production
- High process reliability and dimensional accuracy
- Multi-spindle machining or custom machine
- Cast iron: Higher machining forces



MAPAL solutions expertise

COMPLETE PROJECT PLANNING FOR COMPONENTS

MAPAL supplies bespoke solution packages for every manufacturing situation: From prototypes and small series with extensive component variation through to series production. With the solution levels Basic, Performance and Expert, MAPAL guarantees quality without compromise. Through close collaboration with the customer, MAPAL precisely identifies the requirements and implements these efficiently. This approach ensures high productivity and quality irrespective of the scope of production.

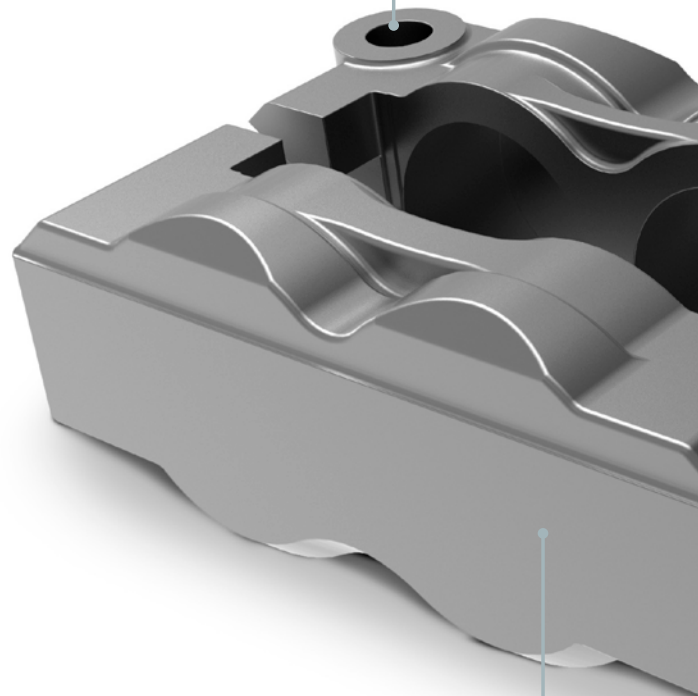
Machining highlights

Brake caliper

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BRAKE CALIPER CONNECTION PCD BORE MILLING TOOL

- Pre-machining and fine machining on one tool
- Reverse circular milling of chamfer

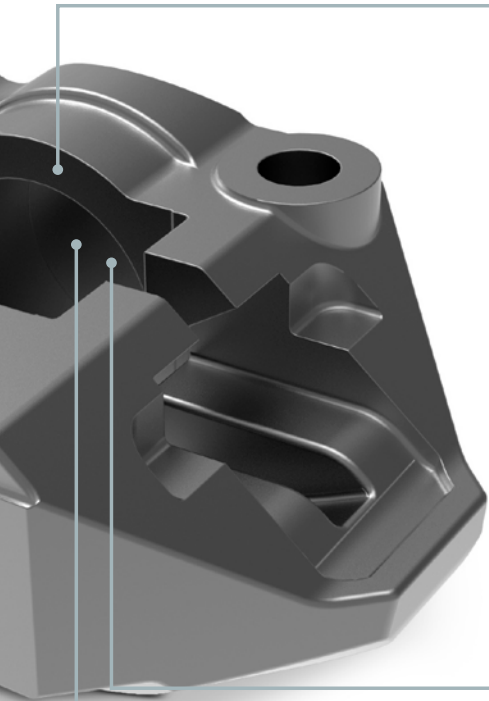


OIL BORES SOLID CARBIDE DEEP DRILL

- Process-reliable chip removal for bore depths 20xD
- High cutting data due to optimal choice of coating

Right-angle drill head

The use of right-angle drill heads offers significant benefits in the machining of complex workpieces, including a significant reduction in machining time and production costs thanks to the potential for full machining on a single machine. This means the tool does not need to be reclamped multiple times. This doesn't just boost efficiency and accuracy. It also enables machining of previously hard-to-reach or inaccessible places.

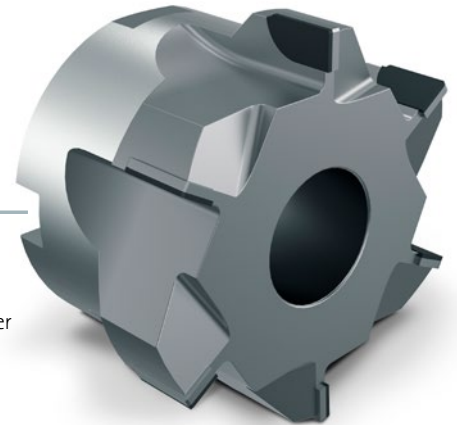


**BRAKE PAD SURFACE
PCD CIRCULAR MILLING TOOL**

- High number of teeth for low cutting force
- Burr-free milling due to perfect cutting-edge preparation

**PISTON BORE
PCD BORING TOOL**

- Fine machining of close diameter tolerances



**SEAL AND PROTECTION CAP GROOVE
PCD CIRCULAR MILLING TOOL**

- High form and dimensional accuracy due to laser-machined cutting edge

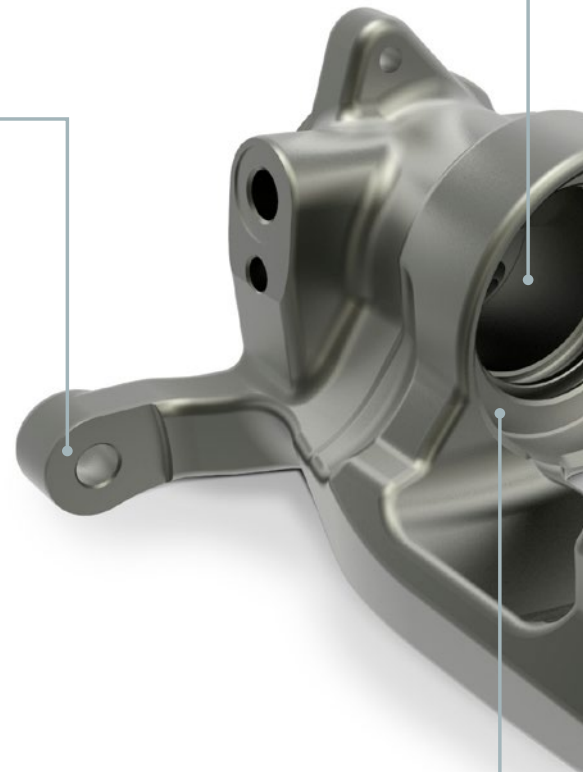
Machining highlights

Brake caliper

K


FLANGE SURFACE (CONTACT SURFACE) ISO BORE MILLING COMBINATION

- Reduced cycle times due to machining of two features with one tool
- Cost-effective circular milling of the flange surface in one cut with SPGN indexable inserts
- Drilling of the connection bore with coated solid carbide drill or high cutting data with high tool life

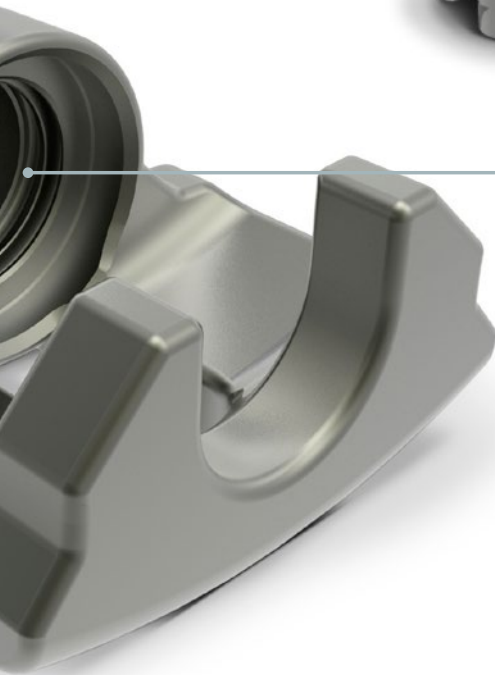


U-FACE DRILLING TOOL WITH INDEXABLE INSERT

- Face-side pre-machining of the main bore
- Control cut of U-surface
- Cost-effective machining of two features with one tool

**MAIN BORE****HPR400 HIGH-PERFORMANCE REAMER**

- Replaceable blades for fine machining the main bore
- Face-side HPR replaceable head for easy tool change in case of wear and tear
- Maximum productivity with low tool costs
- No setting of cutting edges necessary

**SEAL AND PROTECTION CAP GROOVE
ISO CIRCULAR MILLING TOOL**

- Tangential technology
- Machining delicate radial grooves with tight tolerance requirements
- Maximum radial run-out accuracy of the cutting edges for optimal milling output
- Process reliability in machining thanks to indexable inserts with tangential technology

Component expertise

Combined brake housing

Functional description:

The combination of ABS/ESP housing and main brake cylinder enables brake operation and monitoring in the smallest spaces. This unit is an indispensable element for level-five self-driving vehicles and brake-by-wire systems. It reduces the braking distances in comparison to older systems and enables higher recuperation for electric vehicles. The integration of these functions in a single component boosts efficiency and safety in modern vehicle construction considerably.

One housing combines functions of several components



ABS/ESP housing



Main brake cylinder

Combined brake housing

One housing combines functions of the ABS/ESP housing and main brake cylinder



FEATURES

- Extruded aluminium with low silicon content (<Si1)
- High quantities
- Surface finish $R_a < 3 \mu\text{m}$
- High process reliability with regard to tolerance requirement and surface finish

MACHINING REQUIREMENTS

- Short chips
- Reliable chip breaking
- Multi-spindle machining

SEAL AND OIL GROOVE PCD CIRCULAR MILLING TOOL

- Machining delicate radial grooves with tight tolerance requirements
- Laser-machined blades for highest radial run-out accuracy
- Positive insert position of blades for soft, low-vibration cut





GENERAL MILLING FACEMILL-DIAMOND

- Maximum cutting data and tool life for cost-effective machining
- High-quality surface finish, low burr formation
- Cutting depth up to 10 mm



VALVE AND CONNECTION BORE PCD MILLING TOOL

- Complex bore contour on a PCD cutting edge
- Ground/laser-machined PCD cutting edge for the required quality surface finishes and contour accuracy



MAIN BORE PCD BORING TOOL

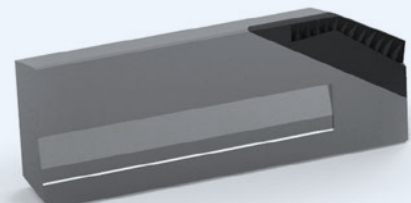
- Cost-effective machining of deep bores with high surface requirements
- Spirals design for optimum chip removal and proportion of guidance for interrupted cut
- Laser-machined cutting edge for high surface requirements



MAPAL solutions expertise

PROCESS RELIABILITY THANKS TO CHIP CONTROL

MAPAL has developed a new chip breaker to ensure defined chip breaking when boring and reaming with PCD aluminium with a low content of silicon. Its special topology, which was developed with the help of 3D simulations, ensures defined chip breaking and thus short chips. Defined chip breaking and defined chip shape are guaranteed even with low feed rates and low allowances. This ensures the highest performance and process reliability.

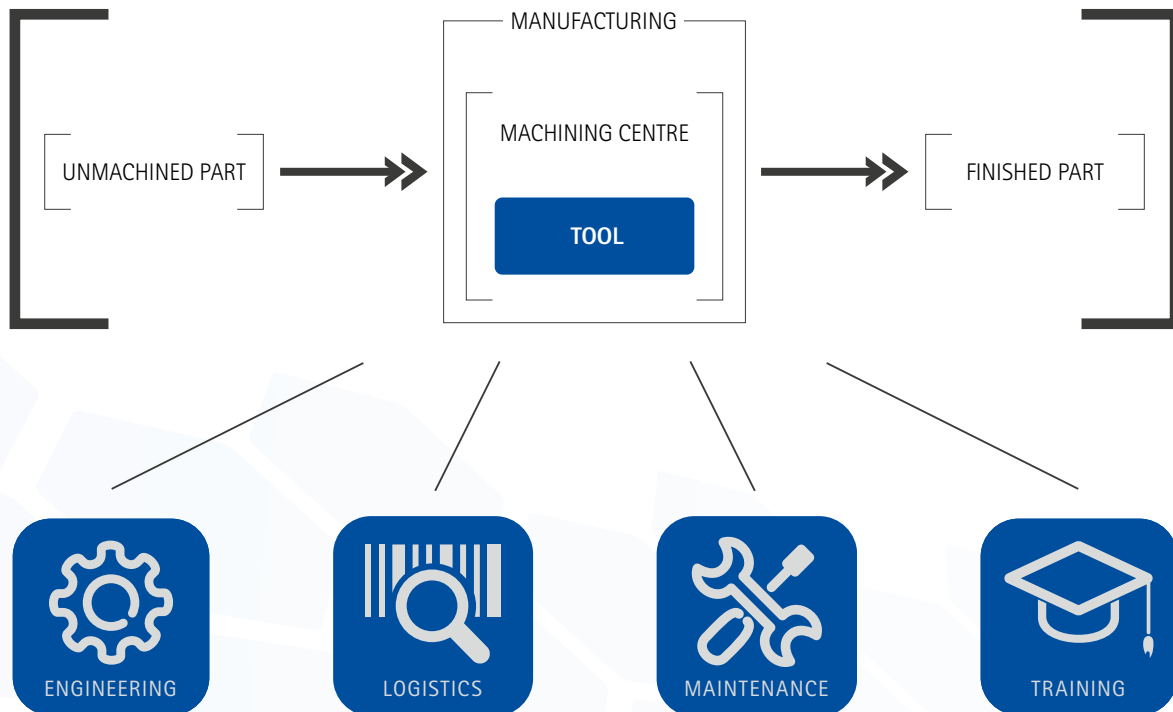


Individual, needs-based service

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 advantage 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

- Various solution packages depending on production phase (prototype, pre-series, series)
- Solutions for complete parts 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
- Optimum coordination of tool, part, fixture and machine
- Highest product quality, process reliability and economic efficiency right from the start
- Fast throughput from planning to implementation with maximum planning security

Process design and implementation from a single source

For initial equipping or re-tooling existing machinery, MAPAL offers the re.tooling service package.

For a time-critical project related to the manufacture of steering housings, a customer transferred the complete process responsibility to MAPAL. On the one hand, the customer did not have the resources to tackle such a project on schedule. On the other hand, the customer also wanted to profit specifically from the experience of the tool and process specialists at MAPAL.



A SUCCESS STORY

The MAPAL team undertook a cycle time study and drafted a clamping concept with which the complete part could be manufactured in one clamping system on a five-axis machining centre. After the definition of the most cost-effective tools and a detailed collision assessment, MAPAL manufactured the tools and the clamping fixture. In parallel, MAPAL staff prepared the NC program for the machine controller.

MAPAL also undertook the complete installation of the process and the adaptation of the NC program. For this purpose, MAPAL staff worked on the machine at the customer's site. After successful installation, MAPAL transferred the process on schedule. And despite the tight schedule, the customer profited from a process implemented with extremely high quality that, from then on, made particularly cost-effective manufacture possible.



1 PCD CIRCULAR MILLING TOOL

- Full external contour on one tool
- Dimensionally accurate machining

2 PCD BORING TOOL

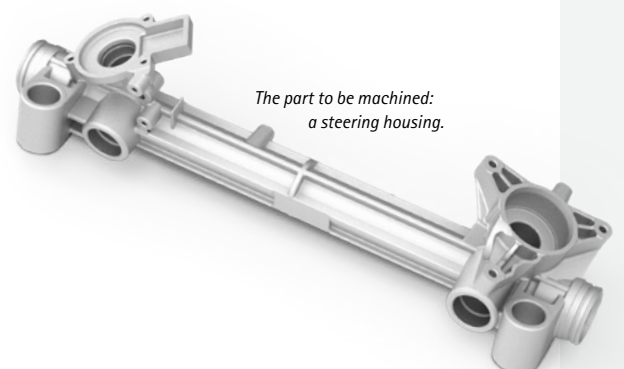
- Back-cutting spindle cutting edge
- High-accuracy machining without changeover error

3 PCD BORING TOOL

- Heavy metal core for vibration-free machining
- Highest quality of surface finish

ADVANTAGES

- Cost-effective manufacturing without investing in new machines
- Solutions for complete workpieces including tools, devices, NC programs and commissioning
- Process planning and implementation from a single source by experienced specialists
- Usage of the latest machining technology and efficient, cost-optimised tools
- Quick and flexible support on-site
- High-quality implementation also with tight schedules



*The part to be machined:
a steering housing.*

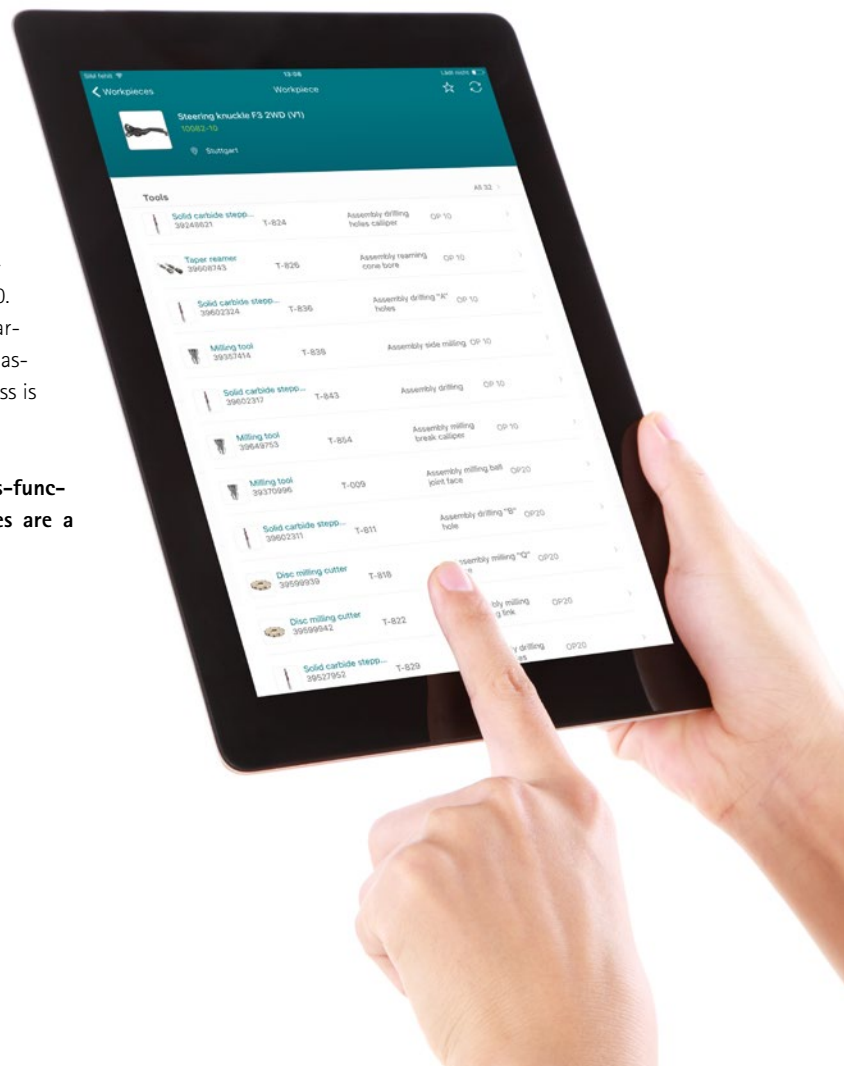
Investment in tool control

MAPAL's offering of logistics services ranges from the analysis of the tool inventory with suggestions for optimisation and the provision of tools to complete tool management with personnel on site.

Irrespective of the scope: Customers benefit from high tool competence, more free capacities in production and the ability to focus on their core business. As a long-term technology partner, MAPAL continuously optimises all processes related to the tool and in this way increases your productivity sustainably.

Depending on the size of production and the way it is organised, the parts produced and the tool consumption, an individual, cost-optimised logistics concept is created. For maximum customer benefit and the biggest savings potential, MAPAL focuses on digital Tool Management 4.0. This means data and information can be provided in a much more transparent and consistent manner for all parties involved – manufacturing, purchasing, planning, tool managers and suppliers. In this way, the overall process is efficiently structured.

The use of Tool Management 4.0 provides companies with a cross-functional and group-wide technology database. Redundant structures are a thing of the past.



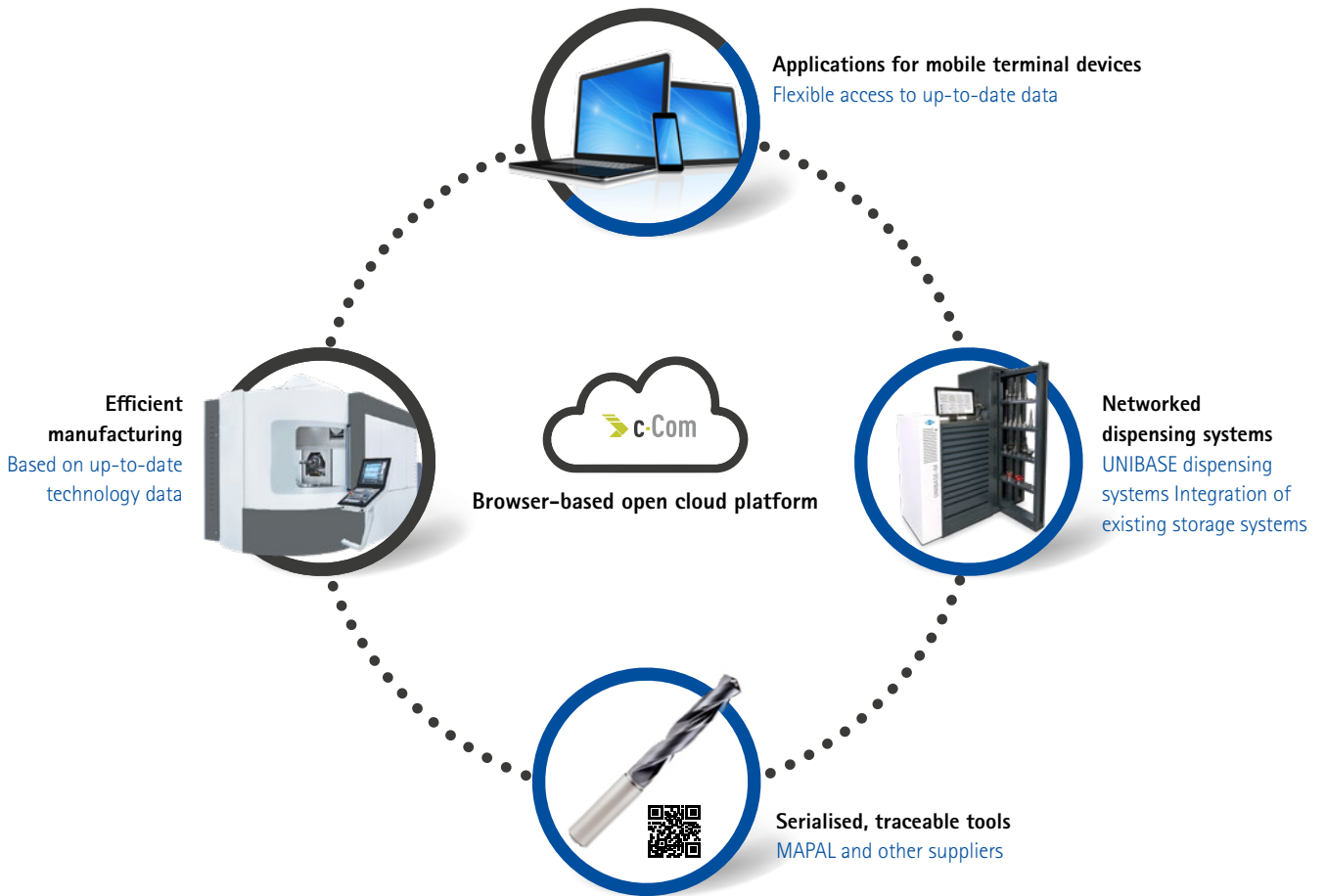
STARTING POINT

Clear organisation of your tool inventory
MAPAL ensures clear organisation and optimisation of the tool inventory based on transparent data. This way, unnecessary machine downtimes and unnecessary capital commitment are avoided.

Continuous optimisation of inventory
Upon request, a MAPAL specialist is also available on-site who provides long-term support for customers and implements continuous measures for the optimisation of tool costs.

Outsourcing of tool management
In this case, MAPAL staff take over the complete procurement and management of the tools, including all tasks in the tool-setting area.

CUSTOMER **TOOL MANAGER**



With Tool Management 4.0, customers benefit from our comprehensive know-how as a complete supplier for machining. Along with leading tool solutions and services related to the machining process, MAPAL offers highly accurate setting fixtures as well as intelligent dispensing systems developed in-house. The browser-based open cloud platform c-Com networks tool, warehouse and production and ensures you can access your data in real

time from anywhere. Technology data are entered and managed centrally. In this way, it is ensured that all employees at all sites have access to the same up-to-date data at all times. This way, all those involved benefit from the accumulated knowledge and know-how. As a consequence, manufacturing is more efficient and the costs can be monitored and reduced.

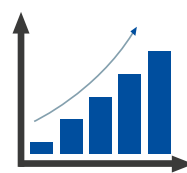
ADVANTAGES



MORE networking



MORE transparency



MORE efficiency



MORE cost control



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

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