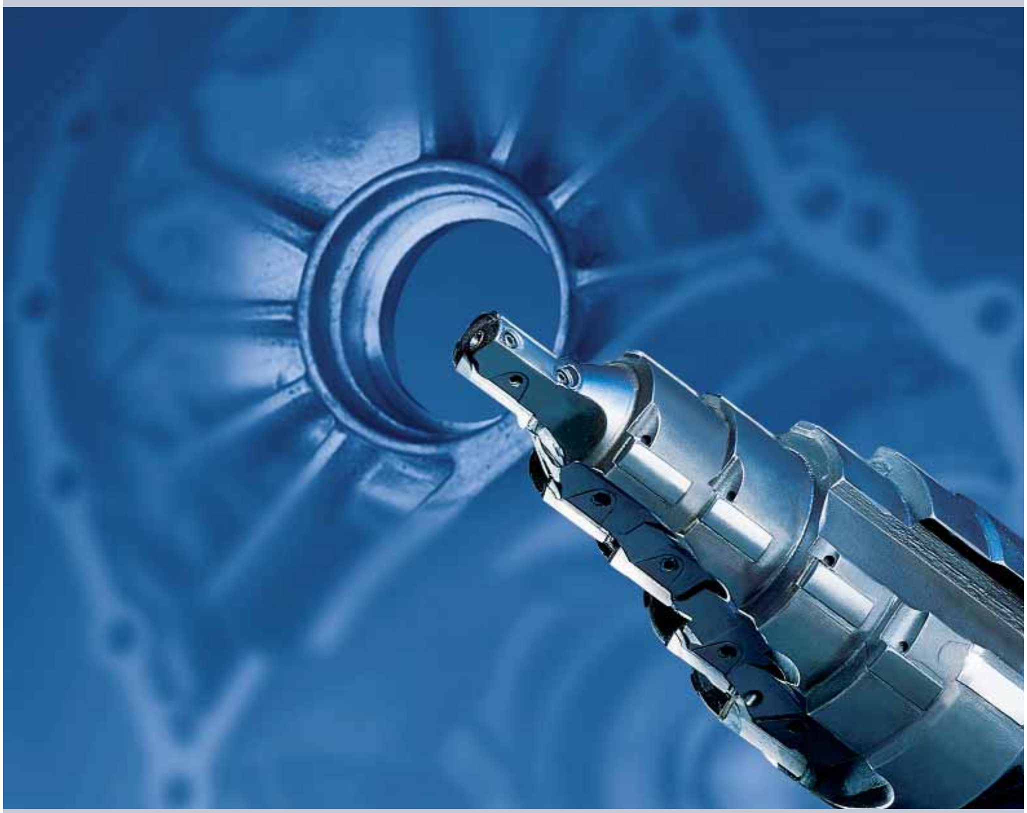
MAPAL Competence in Practice

As a specialist in the precision machining of bores with decades of experience, MAPAL offers an unrivalled range of tool solutions. Based on tried and tested standard and special solutions, tool designs are optimised and innovations incorporated, with a constant focus on how the customer will use them. The result is the best possible machining concepts for the widest variety of cutting tasks.



Transmission Housings

Aluminium and magnesium pressure castings are increasingly used as a structural material in modern vehicles to achieve reductions in weight. Today's casting processes are very accurate and efficient, which also allows extremely complex workpiece geometry to be produced. One example of this is with transmission housings. The finish machining operation is carried out with combination tools with which several bores can be machined. The individual steps are designed with adjustable systems for the precision machining operation.

Performance details:
Transmission housing in AlSi9Cu3
Machining diameter 65 R7
Cutting speed v_c = 2500 m/min
Feed f = 0,1 mm

Connecting Rods

When machining the small and large end of a steel connecting rod, the best possible, evenly formed surface finishes are required with high dimensional constancy within tight tolerances.
The MAPAL fine boring tool with 2 HX blades in Cermet deals with this difficult task extremely reliably and economically. There is no need for an additional measurement control on the machine and a final finishing operation by honing.

Performance details:
Cutting speed v_c = 400 m/min
Feed f = 0,16 mm
Surface finish max. R_a = 0,5 µm
Tool life 800 – 1000 parts

Wheel Brake Cylinder

The surface finishes required for machining wheel brake cylinders are extremely high, which makes finish machining by honing essential. An economic alternative here is to use a MAPAL twin-bladed tool with HX blades in PCD. The required surface quality of max. R_a = 0,3 µm is achieved with a tool life of more than 1000 parts. The microstructure of the surface is even improved as this does not produce a superficial effect but a surface with a high percentage contact area and deposits of lubricant.

Performance details:
Wheel brake cylinder in GG25
Spindle speed n = 2050 min^{-1}
Cutting speed v_c = 120 m/min
Feed f = 0,3 mm
Surface finish max. R_a = 0,3 µm
Tool life > 1000 parts

Engine Block

The requirements of new engine designs place demands on design engineers. Toxic and noise emissions need to be reduced, weight and also fuel need to be saved and at the same time performance and drive features have to be improved. Cast iron with vermicular graphite (CGI) is being increasingly used as a structural material. Compared with laminate and globular graphite materials, CGI has greater mechanical properties which as a consequence also have an effect on cutting results. MAPAL has developed a tool concept here which has also met the increased demands. A fine boring tool with 6 HX blades in coated carbide is being used in a 4 + 2 configuration (i.e. with 4 pre-machining blades and 2 finishing blades). This allows the cutting speed to be adjusted to prevent an excessive thermal effect on the blades. At the same time the feed rate can be increased because of the number of blades.

Performance details:
Cylinder bore in CGI
Cutting speed v_c = 120 m/min
Feed f = 1,5 mm
Allowance a_p = 0,2 mm

Universal Joint Yoke

One example for the application of HPR Replaceable Reamers is the machining of universal joint yokes in forged steel. These components provide the power transmission on the drive train in vehicles. The requirements for fine machining the bores on the yokes are extremely high, especially as machining is carried out with interrupted cut because of the shape of the component. Using the MAPAL HPR Replaceable Reamer in this example on a universal joint yoke in CK35 and C45, surface finish results of R_z 5 µm are reliably obtained over a tool life of 6000 parts.

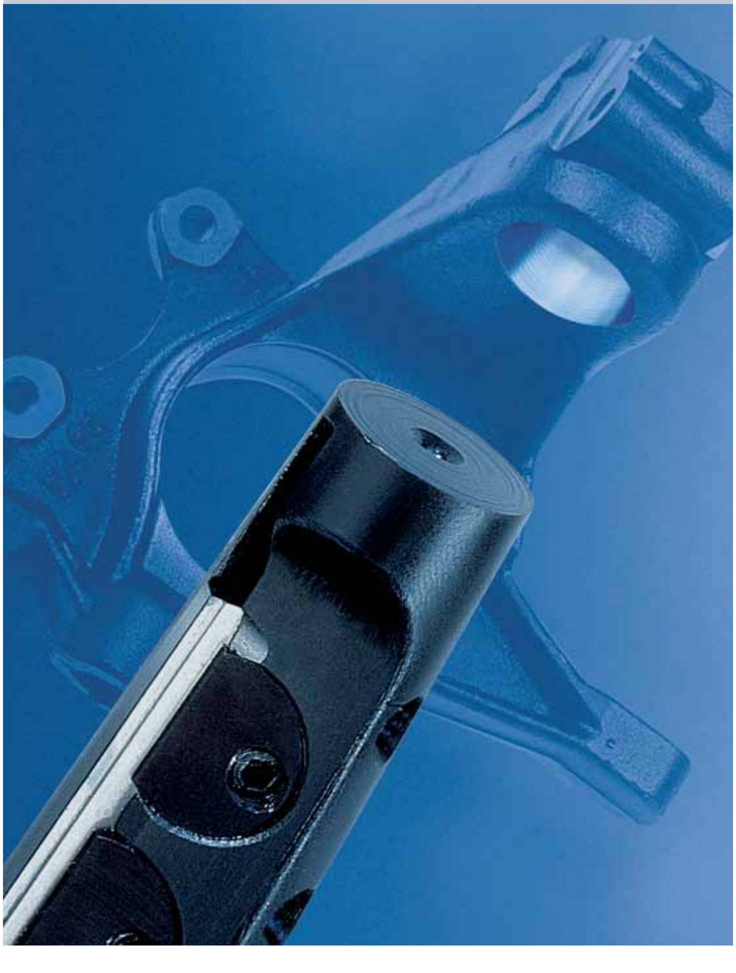
By changing over production from a conventional multi-bladed system to the MAPAL HPR system, it was possible to increase the tool life from 2000 to 6000 parts and, at the same time, the feed rates were increased from 1000 to 1500 mm/min and the spindle speed from 1300 to 1500 rpm.

Together with the fact that the HFS® system is extremely simple to handle, this means a significant improvement in economy and quality.

Suspension Arm

Taper connections in machine manufacturing place the highest demands on surface finish, accuracy of pitch and concentricity deviations in order to ensure the decisive percentage contact area is achieved in the connection. In vehicle manufacture in particular, where safety-related components in steering or drive systems are mass produced, the necessary tolerances must be reliably met: a task which is predestined for the MAPAL taper reamers, as a result of the MAPAL principle of blade and guide pads which has also been applied in this context. Steering arms in vehicle manufacturing are an example of this.

Performance details:
Spindle speed n = 150 min^{-1}
Feed speed v_f = 67,5 mm/min
Feed f = 0,45 mm
Cutting speed v_c = 8 m/min



Slide Valves

for automatic transmission systems

One machining example of the extraordinary precision which can be achieved with MAPAL adjustable precision machining tools with guide pads are control bores in slide valve housings and the actuating pistons for automatic transmission which run inside these. Roundness and concentricity of ≤ 2 µm are achieved, with tool life of 200 000 parts per blade and more. The control bores are machined with multi-step, single-bladed precision machining tools so that the coaxial result is also in the high precision range.

For machining actuating pistons, MAPAL single-bladed external reamers are used. With these tools the MAPAL principle of blade and guide pads is practically reversed from external to internal, which also ensures optimum support during external machining operations.