DR. KAISER
precision through diamond

WEAR RESISTANCE PARTS

CONTENT OF WEAR RESISTANCE PARTS

WEAR PROTECTION

PCD workrest blade for double side face grinding

WEAR PROTECTION: NOT JUST A QUESTION OF HARDNESS

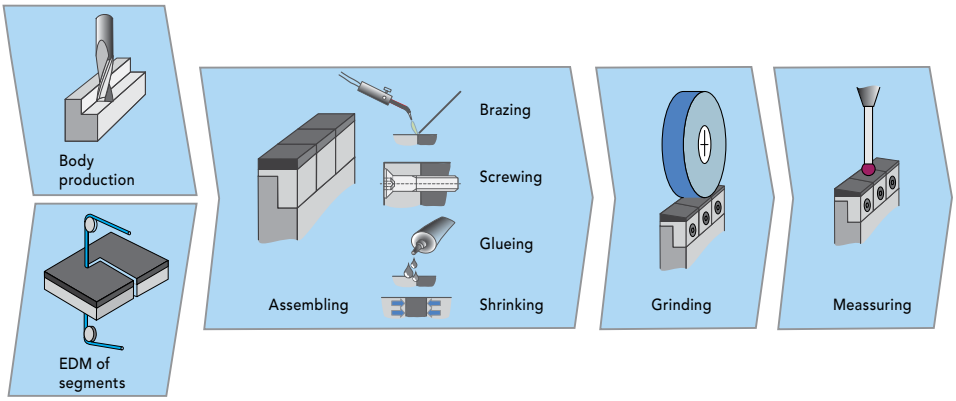
Wear refers to continuous material loss from the surface of a solid body, caused by the mechanical, thermal or chemical impact of a solid, liquid or gaseous contacting body. It therefore makes sense to use the hardest material possible for components prone to wear: diamond.

But it is not hardness alone that is the key factor: diamond also features good frictional and gliding properties and can be produced with very high surface qualities. This opens up the opportunity for new applications and process optimizations, because in a diamond version your component will feel virtually no contact.

Processing diamond as a construction material for high-precision wear protection components calls for state-of-the-art production technologies and many years of experience: DR. KAISER has both.

MANUFACTURING PROCESS

Essentially, manufacturing involves shaping diamond segments by eroding or laser ablation. These are soldered, pressed, glued or shrunk onto precisely manufactured base bodies made of carbide or steel. It is therefore possible to perform repairs or geometrical adjustments on individual segments by simply replacing them in most cases. The greatest expertise lies in finishing the diamond segments joined to the base body, in order to achieve the required dimensional and shape accuracy on the wear protection components. Together with suitable measurement techniques, high-precision components can therefore be manufactured from the very hardest material and wear in the application process can be reduced to a minimum.



THE CLASSIC: POLYCRYSTALLINE DIAMOND (PCD)

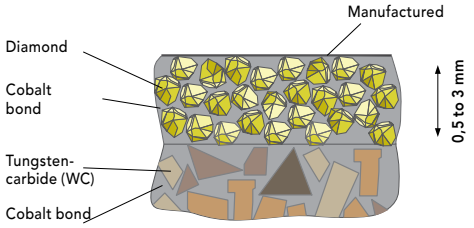
Polycrystalline diamond (PCD) is a synthetically manufactured, extremely hard conjoined mass of diamond particles in a metal matrix. During manufacturing using a high-pressure liquid-phase sintering process, a diamond layer is attached directly to a carbide base body containing cobalt. As a starting material, defined diamond grains with a diameter between 0.5 µm and 50 µm are used. The liquid cobalt from the carbide base body penetrates the remaining hollow spaces between the diamond grains, dissolves the graphite located there and joins the diamond together. The diamond coatings have a thickness of 0.5 to 3 mm with an overall thickness with the carbide base body of up to 10 mm.

PCD-carbide-compound

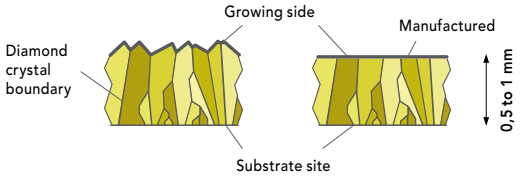
PCD-/CVD diamond semifinished parts

THE NEW: CVD DIAMOND

CVD diamond is manufactured from gaseous starting materials using chemical vapor deposition. In a vacuum chamber at temperatures of 2000°C to 2800 °C, the diamond is deposited from a hydrogen-methane mix onto a base (e.g. Silicon wafer).
The individual diamond crystals created grow like columns up to the required layer thickness of some tenths of a millimeter at coating rates from 0.1 to 3 µm/h. The diamond crystals are separated by crystal boundaries, which is why CVD diamond appears dark.
The diamond segments created with a thickness from 0.5 to 1 mm are then processed and separated into the required shaped elements using laser cutting.



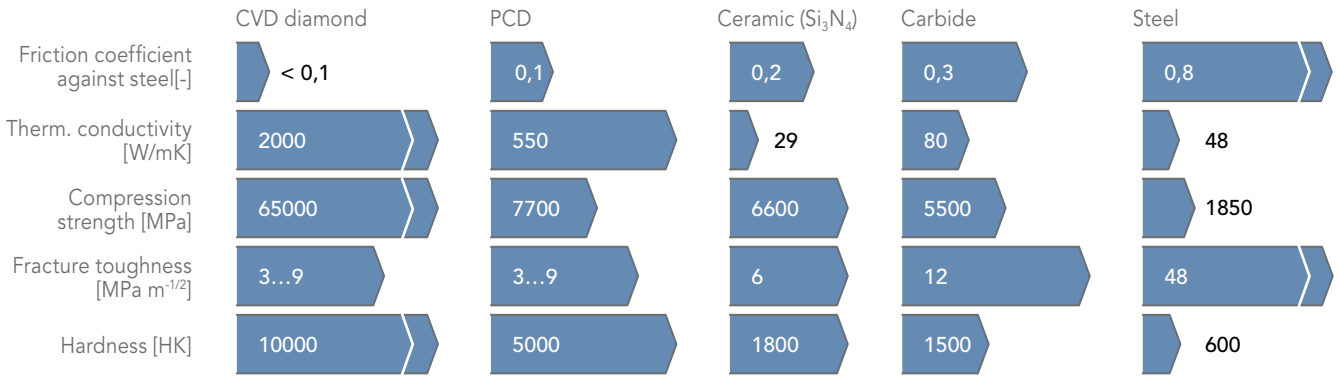
Composition PCD



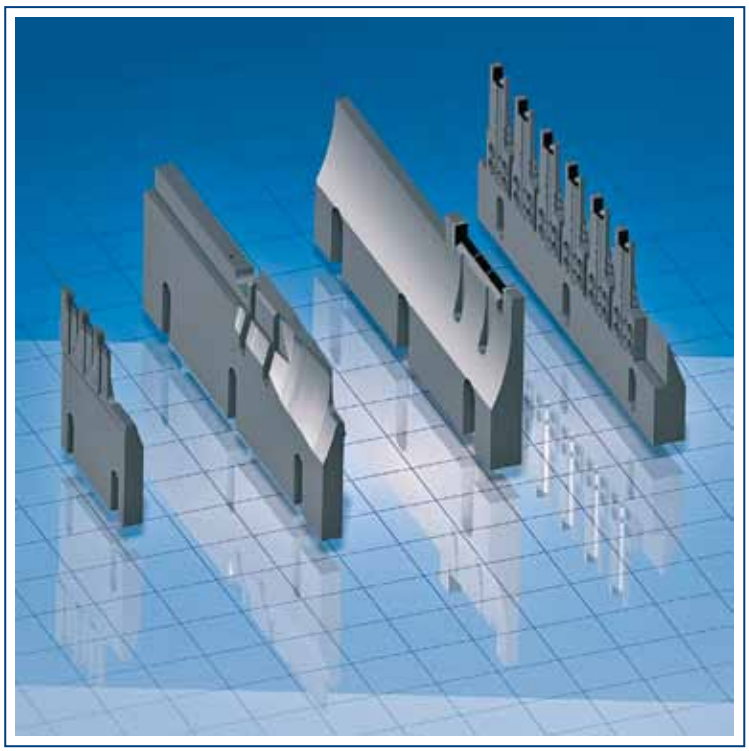
Composition CVD diamond

LIFE CYCLE

Hardness and compressive strength are the key properties of a material. These influence wear behaviour and therefore determine the life cycle of components.
Because of its hardness and ductility properties and its comparatively good machining possibilities, carbide is often used for wearing components. However, PCD and CVD diamond offer unbeatable advantages. Wear protection components made of these extra-hard materials are characterized by lifetimes that are often more than 100 times those of carbide. Another advantage is the strong frictional behaviour compared to steel. Less friction improves component quality and the process behaviour in operation.



WORKREST BLADES



MAXIMUM ACCURACY FOR A LONG PERIOD OF TIME

Centerless grinding processes are often highly developed series processes for the economically efficient machining of rotationally symmetrical components, such as piston rods, jet needles, gas pressurised springs, needle rollers, crankshafts, camshafts and valves.

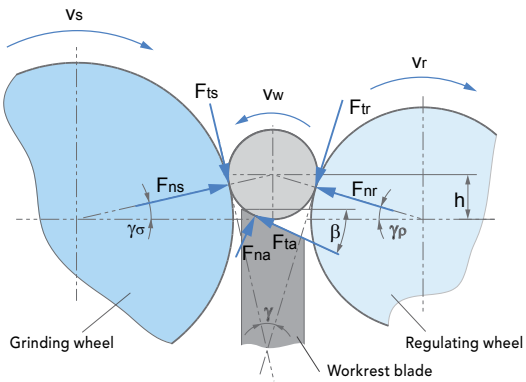
The workrest blade for supporting components during the grinding process is one of the most important wearing components on the machine, and this plays a large role in determining the dimensional and shape accuracy as well as the surface quality of the component. The low friction of diamond compared to steel reduces the machining forces and therefore improves the quality of the work pieces. Often, PCD can do even more than this: the polished PCD surface smoothes down the work piece surface and reduces roughness.

To achieve optimum results over a long period, there is no real alternative to PCD coatings.

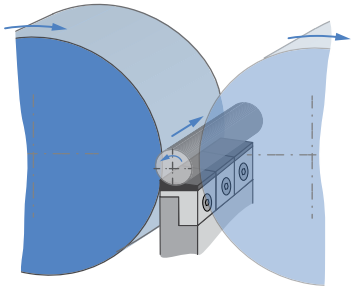
CENTRELESS GRINDING

Centreless grinding is a special form of external cylindrical grinding. Instead of being clamped between the headstock and tailstock, the work piece is fed between the grinding wheel and regulating wheel. The work pieces are supported by a workrest blade.

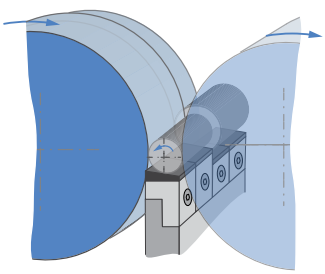
Centreless through-feed grinding is particularly efficient for machining cylindrical work pieces without recesses, such as bolts, shafts, pistons or spindles. With centerless plunge grinding, complex recessed work pieces can be machined using straight plunging or, for machining an additional collar, in an angular plunge process.



Through-feed grinding

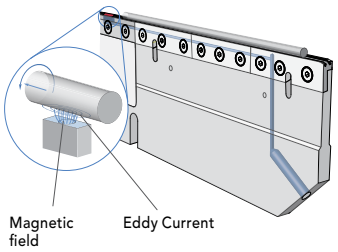


Plunge grinding



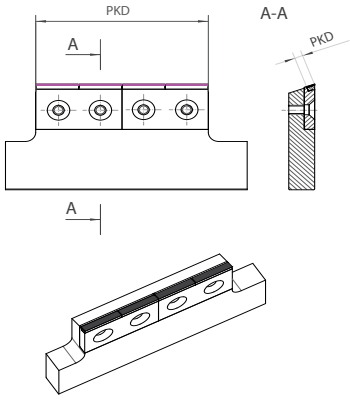
PCD ALLOWS 100% CONTROL

Economic efficiency and quality must form a single entity when it comes to mechanical machining processes. 100% in-process control offers a clever solution for process monitoring in the series production of work pieces machined using centerless grinding. An eddy-current sensor integrated into the workrest blade measures the component hardness during machining and at the same time checks the surface for micro-cracks. This technique requires precisely defined measuring distances between the sensor and component surface. This can only be achieved with PCD workrest blades; a key advantage for series production, made possible by DR. KAISER's many years of expertise.



SEGMENTING

Easy-to-maintain machines and components make it possible to design process sequences in a simplified and cost-effective way. In many cases, workrest blades from DR. KAISER are structured in segments. Individual diamond inserts are joined to the geometrically complex base body using pressing, gluing or soldering. This technique allows for repair work to be carried out easily and efficiently.



ACCURACIES

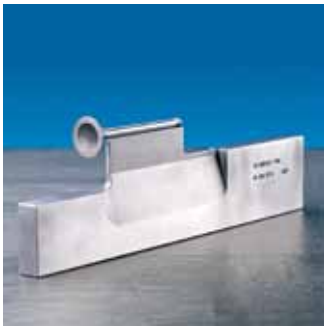
Machining diamond within a few microns requires continuous in-process controls during manufacturing. DR. KAISER utilizes state-of-the-art measuring equipment and, upon demand, can also supply the inspection certificate for your workrest blade.

DELIVERY OPTIONS

All PCD diamond support bars from DR. KAISER are packaged in secure wooden crates. The high-quality components therefore reach our customers securely without any damage – wherever they are in the world.

ALSO IN CARBIDE

We can of course also supply workrest blades and bars for the highest demands and levels of accuracy in a carbide version for your applications.



WORKPIECE GUIDES

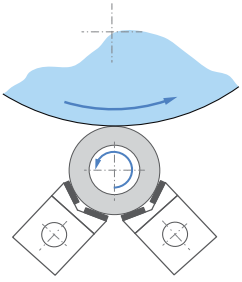
LONG LIFETIME AND COMPONENT QUALITY THANKS TO DIAMOND

During precision machining, such as grinding, honing or polishing, rotationally symmetrical components must be supported, held or guided to absorb process forces and prevent a deflection due to the component's own weight. In ultra precision machining, this can only take place by means of fixed guiding elements such as prisms, sliding blocks, tips, hollow tips or steady rest blocks.

During machining, the guiding elements rub and slide on the work piece surface and thus influence the quality of the components. Low friction values and high wear resistance are called for: an ideal task for diamond!

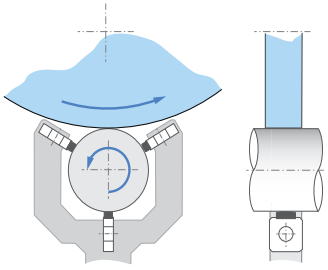
PRISMS AND SLIDING BLOCKS

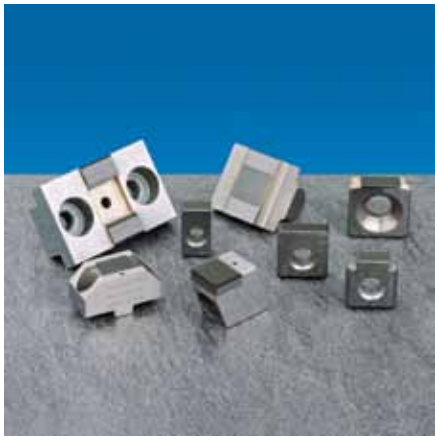
To fix the position when machining long rotationally symmetrical components, such as jet needles, valves and rods, a wide variety of prisms are used. In the antifriction bearing industry, these guiding elements are called sliding blocks. Short work pieces (bearing shells) are driven by magnetic chucks or driving pins.



STEADY REST BLOCKS

Self-centring steady rests for the precision machining of long and slim components use fixed inserts: steady rest blocks. The large number of applications (crankshafts, camshafts, valves, piston rods, etc.) and styles of steady rests result in a broad spectrum of steady rest blocks.





MEASURING AND TESTING: A SPECIALTY OF DIAMOND

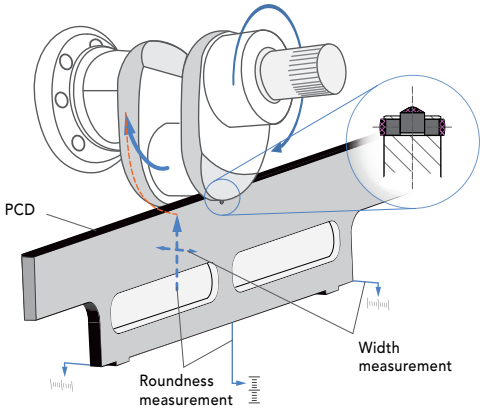
Whether in an industrial production environment or in clean rooms: measuring systems have to work accurately and reliably over a long period of time and therefore require robust and wear-resistant sensing devices. Diamond is the ideal material here as well.
Whether it's a PCD or CVD diamond version: the manufacturing expertise of DR. KAISER enables a wide variety of applications in the field of measurement and testing technology.

A WIDE VARIETY OF POSSIBILITIES

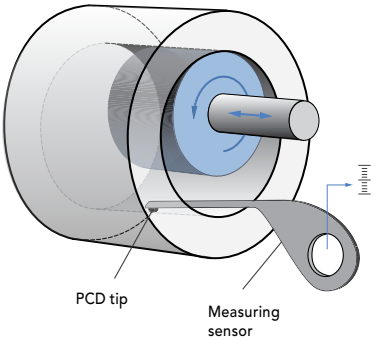
In the automobile and aircraft industries, for chemical production processes in medical and power engineering, and of course in machine tools: for the combination of a rough environment and the very highest precision requirements, diamond is the optimum solution.

EXAMPLES OF INDIVIDUAL MEASURING TASKS

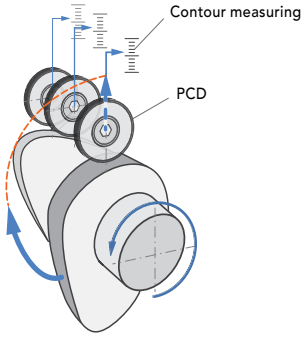
Crankshaft stroke measurement



In-process bore measurement



Camshaft contour measurement



CENTERS

MAXIMUM PRECISION: THANKS TO DIAMOND

High-precision machining of complex, rotationally symmetrical components is often carried out by clamping between centers. Revolving conical tips are not suitable for maximum precision of less than 1µm due to the bearing dynamics. In high-precision machining applications, therefore, only fixed tips are used. Here, the process forces are transferred directly to the tips – generally made of carbide – via the work piece. In many applications, the contact chamfers are only a few tenths of a millimeter, meaning that large surface pressures lead to high friction and a fast wear rate.

High accuracies, especially in continuous operation, can only be achieved economically with PCD centers: their low friction compared to steel benefits the process behaviour and improves the shape, position and roundness of the work pieces.

CENTRING TIPS

For work pieces with large diameters – flexible and precise:

The center hole in the component enables accurate re-chucking and machining beyond the end areas. The low friction value between diamond and steel means that very high levels of accuracy can be achieved on the component.

HOLLOW TIPS

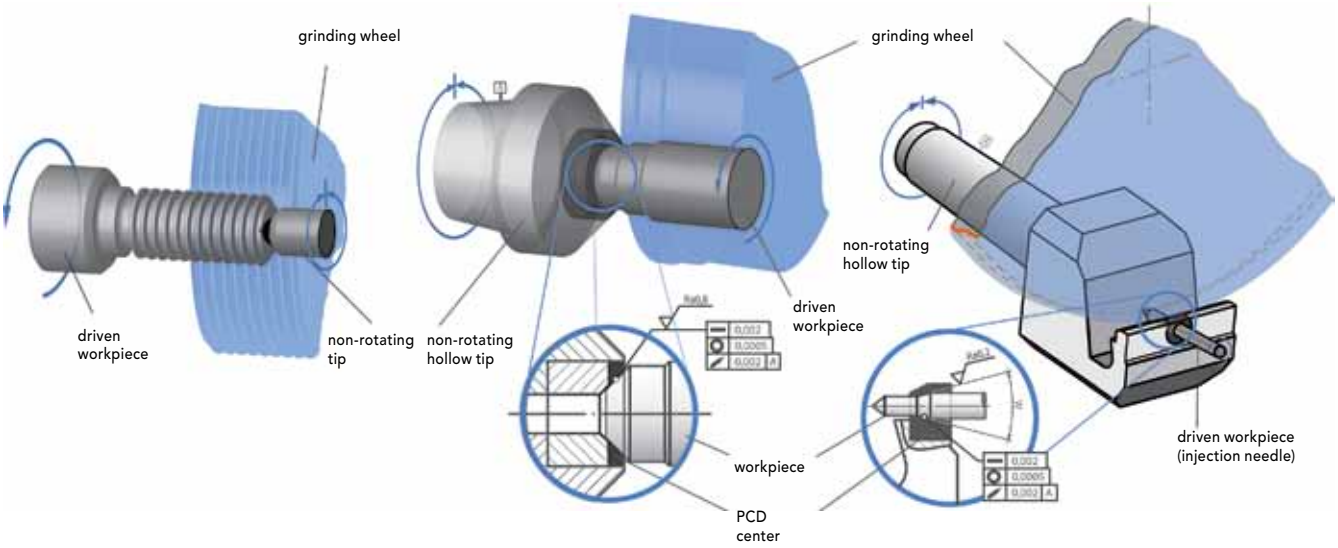
Indispensible for long components, such as jet needles:

The high-precision hollow conical tip possesses roundnesses of < 0.5µm on the PCD internal tapered surface. Components with bevelled ends can therefore be machined around the perimeter with high precision.

SPECIAL TIPS

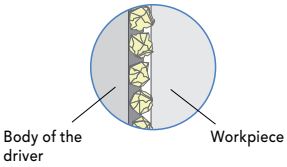
Long, slim, multi-recessed components or the machining of end contours (e.g. jet needle):

Special solutions for the highest demands are DR. KAISER's specialty, in a PCD or carbide version.

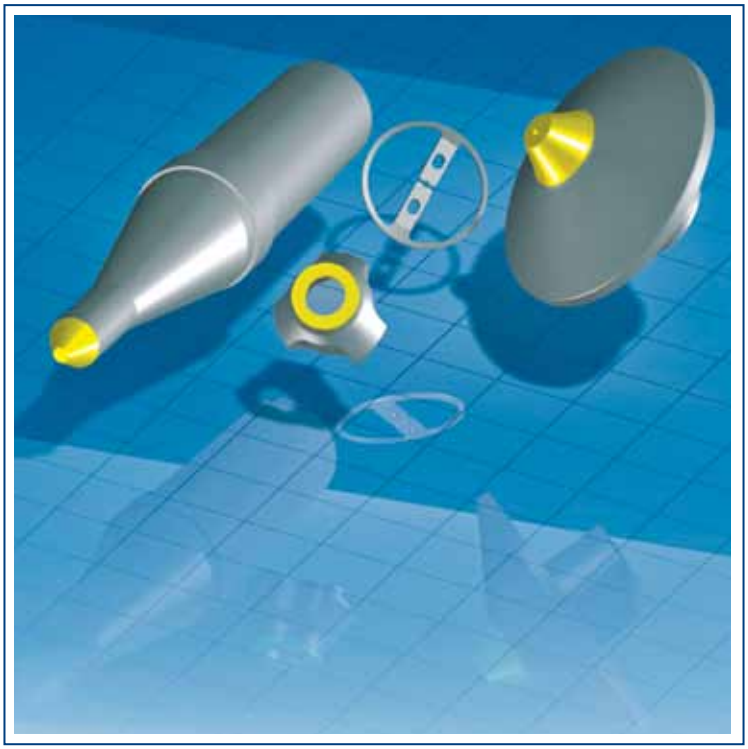


NON-SLIP: THANKS TO DIAMOND

Non-slip functional surfaces mean that components do not slip during machining or handling. Centers, driving pins and gripping elements: DR. KAISER tailors electroplated coatings with synthetic or natural diamond towards the application at hand, leading to a long life cycle for these clamping devices coupled with reproducible accuracy. DR. KAISER ensures the very highest standard of quality when it comes to both manufacturing and repairs as well as re-coating, even for products from other manufacturers.

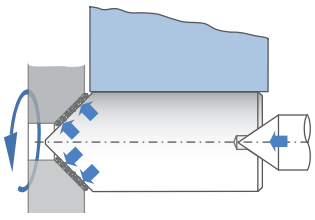


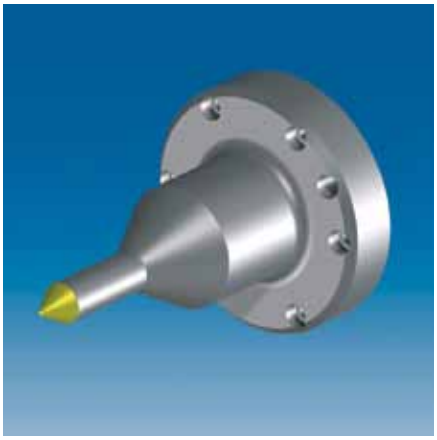
Pressure-resistant diamonds latch on to the work piece surface thanks to micro-indentations and ensure a reliable component entrainment.



CENTERING TIPS

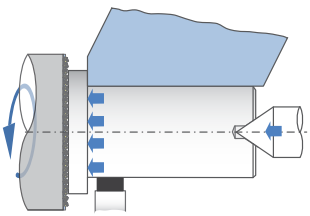
Entrainment and centring for internal or external tapers: the electroplated diamond coating enables both and is characterized by a long life cycle.

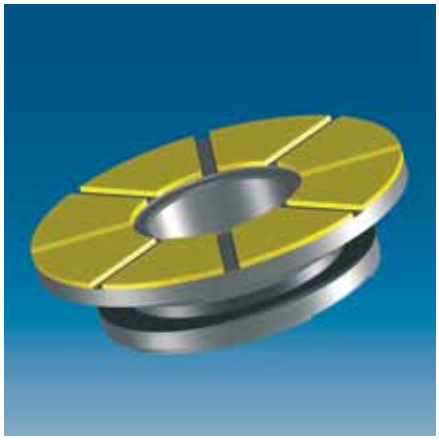




DRIVING PINS

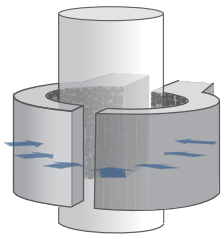
Electroplated diamond-coated driving pins drive the work pieces effectively in the machining process. The component is centered using sliding blocks or prisms.

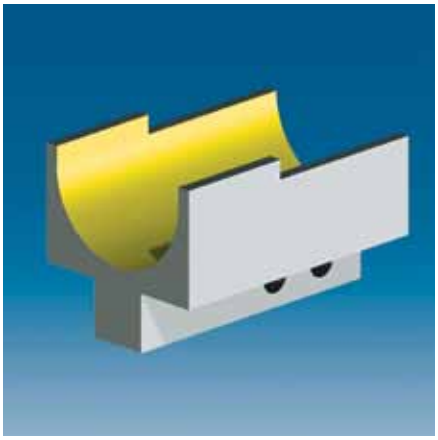




GRIPPING ELEMENTS

Improved grip on internal and external grippers, chuck jaws or measuring and counting rollers reduces slipping and sliding of the work piece.

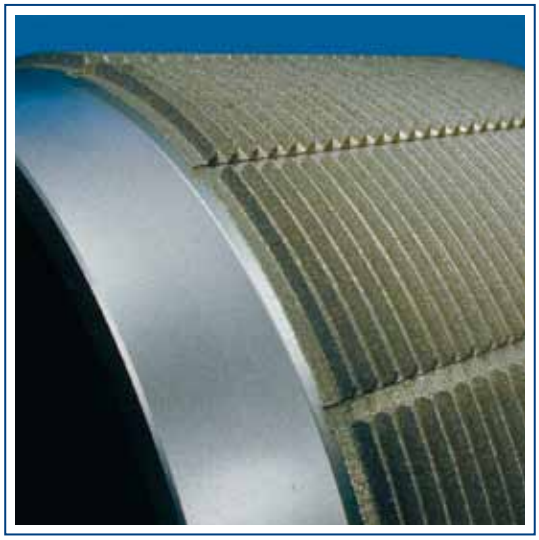




OUR FURTHER BUSINESS FIELDS

DRESSING SPINDLE SYSTEMS
IMPORTANT DRIVE

Application specific dressing systems are necessary to achieve both best surface qualities of the workpiece and high production reliability with excellent spindle run-out. Dressing systems are designed either for CNC dressing or single-axis plunge dressing operations. These systems can be designed for aligned electrical and mechanical power and best dynamic stiffness with different types of acoustic sensor systems. Spindle attributes such as stable drive speed, constant torque, temperature control and acoustic emission sensors are important to the performance of the dressing spindle. Our experts will help find the best solution for your dressing spindle requirements.

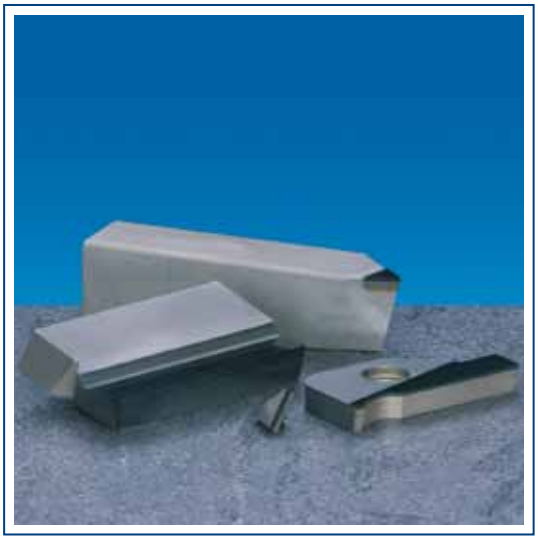


GRINDING WHEELS
FOR THE CORRECT CUT

Electroplated CBN and diamond grinding wheel do not have to be dressed. The galvanic Nickel bond leads to very high grain protrusion with high cohesion to the grit. High wear-resistance of the bond and excellent formholding result in long tool life. Another advantage of grinding with CBN is its high temperature resistance and cool grinding.
Vitrified CBN and diamond wheels are mainly used for straight ID and OD, as well as the grinding of complex and fine profiles. DR. KAISER vitrified CBN and diamond grinding wheels can be produced with bond porosity up to 60%. They are easily dressed and have high stock removal capability. Hardened and high-alloyed steel as well as carbide, ceramic and polycrystalline CBN and diamond are main applications for these grinding wheels.

DRESSING TOOLS
FOR EVERY TASK

Whether diamond form dressers for CNC-controlled dressing or profile rolls for plunge-cut dressing, DR. KAISER can manufacture and supply dressing tools for almost every grinding application. Through the use of various diamond coatings (natural or synthetic diamonds in a scattered or hand-placed arrangement) combined with a non-wearing sintered bond or a galvanic positive or negative bond system, the dressers can be specifically designed for the processing requirement. Dressing applications cover Aluminum Oxide, SiC as well as bonded CBN and Diamond grinding wheels. Whether it be a job lot, small run or serial production quantities, DR. KAISER DIAMOND DRESSERS are in use around the world.



CUTTING TOOLS
SPECIAL SOLUTIONS

Efficient milling and turning of composite materials and non-ferrous alloys can be done with application-designed superabrasive cutting tools. PCD and CVD diamond are used to optimize the process behavior and guarantee highest tool life and best surface finishes. Our knowledgeable specialists can discuss your specific requirements in detail.

PRECISION THROUGH DIAMOND

From a small enterprise, run from home, to a modern company with a worldwide reputation.

Dr. Michael Kaiser started his "shop for diamond tools" over thirty years ago as a small enterprise run from home. The company has grown to a modern company with a world-wide reputation, constantly expanding product lines through the creation of flexible and powerful production units. The company's goal has always been to be a problem-solver for all customers' questions, "regarding the grinding zone". The company's success comes from providing highest precision products by consulting with individual customers to produce the best possible performance for its tools. The company, founded in 1977, had its first office in a cellar while the production of its first product, stationary diamond dressing tools, was performed on simple, small machines in a garden shed with an area of 7,55 m². In 1979 the company relocated to its first manufacturing facility and started production of rotary diamond dressing tools. In 1986, the product line was expanded with the introduction of a production department to manufacture diamond wear protection components and point crush dressing tools for the profiling of vitrified bond diamond grinding wheels.
Over the years, the number of production departments has grown in order to focus our manufacturing capabilities on customer's production requirements. In order to maximize performance of our rotary diamond dressers, a production department for dressing spindles using speed control and acoustic sensing technology was established.

In 1989, the precision electroplating department started production of electroplated dressing wheels with special focus on the dressing of gear grinding wheels. Production departments for manufacture of special application tools, such as stationary dressing tools using manmade diamonds and rotary dressers for ceramic bond CBN grinding wheels were established as new products based on existing DR. KAISER product and manufacturing technology. This was done in order to build a focused customer oriented manufacturing organization. In 2004 the production department for hard machining applications using electroplated CBN and diamond grinding products was established.
The high precision reverse plated profile roller department, which provides high precision and geometrically complex dressing tools, was established as an independent department in 2007.
In 2009, DR. KAISER established manufacturing and technical support capability for the production and application of Vitrified CBN and Diamond grinding wheels. DR. KAISER now has the ability to offer our customers a complete system solution for high performance super abrasive grinding wheels and rotary diamond dressing tools.
DR. KAISER is represented by a worldwide team of technical organizations providing product and process solutions to grinding and dressing operations.





EVERYTHING FROM
A SINGLE SOURCE:

DRESSING DISCS

SINGLE AXIS PLUNGE DRESSING ROLLERS

POINT CRUSH DRESSING DISCS

DRESSING SYSTEMS FOR VITRIFIED
CBN GRINDING WHEELS

ROTARY DRESSERS FOR
GEAR GRINDING

DRESSING SPINDLE SYSTEMS

ELECTROPLATED CBN- AND
DIAMOND GRINDING WHEELS

VITRIFIED BONDED CBN-
AND DIAMOND GRINDING WHEELS

PCD- AND CBN CUTTING TOOLS

PCD WEAR PROTECTION
COMPONENTS

STATIONARY DRESSING TOOLS

HOW TO FIND US

DR. KAISER
präzision durch diamant

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