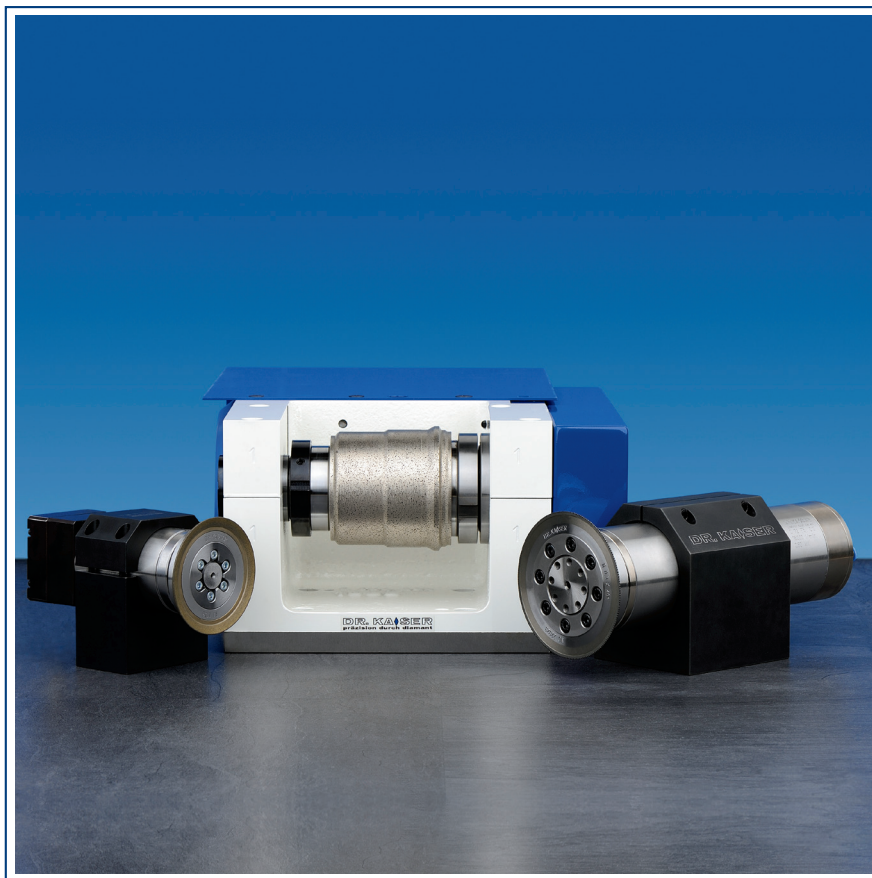




DRESSING SPINDLE SYSTEMS

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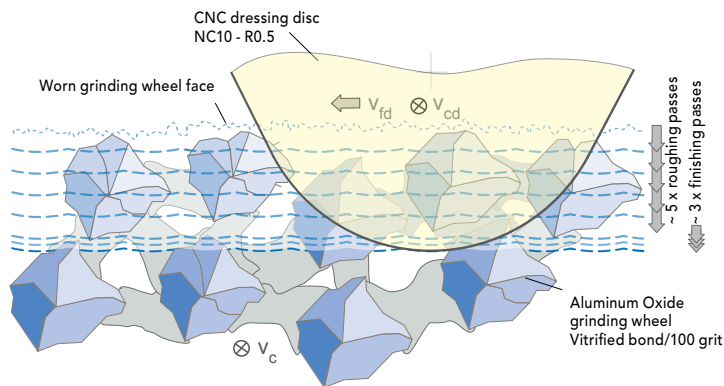
14

OUR FURTHER BUSINESS FIELDS

MULTI-FUNCTIONAL AND APPLICATION-SPECIFIC

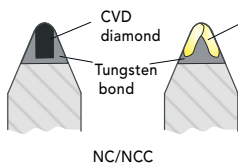
CNC-DRESSING WITH CNC-DRESSING DISCS

4

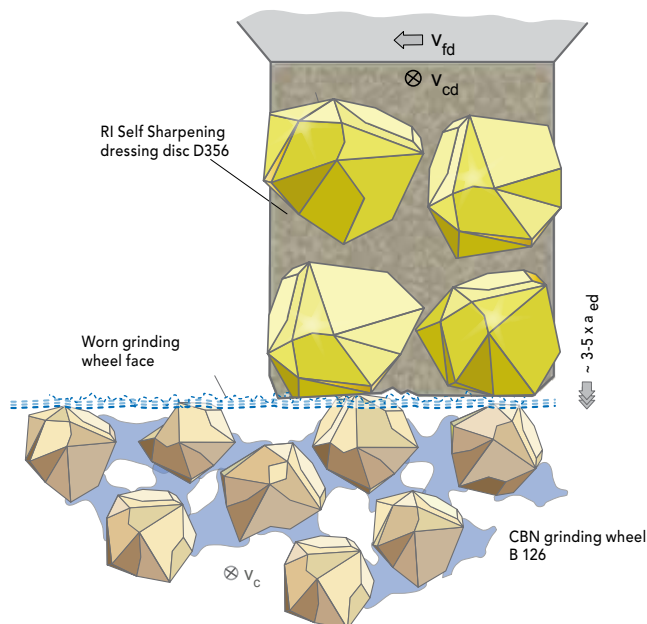
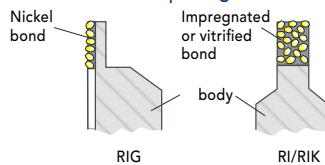


VARIATIONS

Stable Form

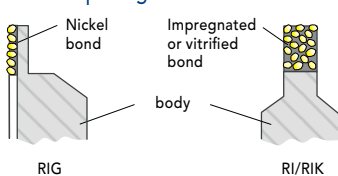


Self-Sharpening

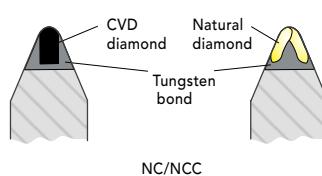


VARIATIONS

Self-Sharpening



Stable Form



CONVENTIONAL GRINDING WHEELS

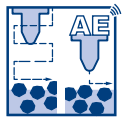
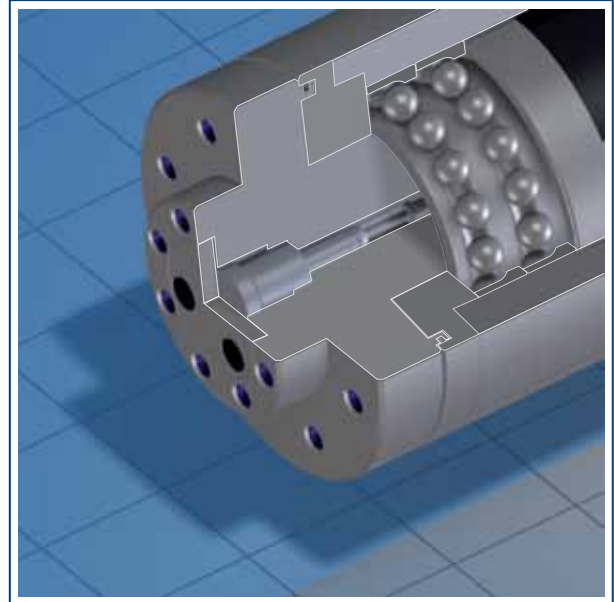
Aluminum oxide, which can have a wide variety of modifications, is the most widely used conventional abrasive. While dressing with a rotary diamond dresser, approximately one layer of abrasive grain (depending upon the grain size) is removed. During this process, embedded material is removed from the wheel face and at the same time the correct profile geometry is imparted. Roughing passes are generally from 20 up to 40 microns on in-feed. Subsequent finishing passes are normally around 10 microns on in-feed. These finishing passes condition the wheel face so that it is able to provide the desired material removal as well as part finish requirements. Rotary dressers with hand set CVD and natural diamond are normally used for this type of dressing application. Impregnated diamond dressing tools can also be used depending upon the application. It is extremely important that the rotary diamond dresser be used with a highly accurate dressing spindle for optimal dressing results.

CBN AND DIAMOND GRINDING WHEELS

Superabrasive grinding wheels (Diamond and CBN) are generally dressed using an in-feed amount of 3-5 microns. Due to the extreme hardness of these abrasives, self-sharpening (impregnated type) rotary dressers should be utilized. It is very important to know when the rotary dresser has come in contact with the superabrasive wheel. Special AE (acoustic emission) sensors can be integrated into the dressing system. These sensors send a signal to the machine control telling it that the dresser has come in contact with the superabrasive wheel and when the signal is consistent across the wheel face, that the wheel is dressed properly. Rotary dressing spindles for superabrasive applications should be designed for high speeds and have high static and dynamic rigidity. This is accomplished thru the use of special bearing arrangements. Optional sensors can be supplied to monitor a variety of functions.

EVERYTHING FROM ONE SOURCE

CNC controlled dressing provides great flexibility and can be found in small "job shop" applications as well as high production manufacturing. A wide variety of grinding operations and processes calls for a dressing spindle offering that is just as diverse. DR. KAISER can provide the correct dressing spindle whether your application is CNC profiling of small or large conventional or Superabrasive grinding wheels or single axis plunge dressing of grinding wheels that might be used for gear grinding or the manufacture of turbine blades. DR. KAISER can provide a system that can be retrofitted to existing grinding machines or provided to OEM's for new grinding machines. As a supplier of grinding wheels, dressers, PCD wear parts and spindle systems, DR. KAISER can provide the complete solution for your grinding and dressing application.



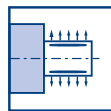
Elimination of non-contact dress passes (AE)



Air purge technology



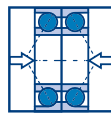
Envelope deviation (AE)



Hydraulic expanding clamping technique



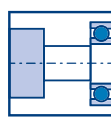
Collision control



Preloaded bearing system



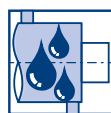
Temperature control



High stiffness



Rotation control



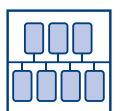
Water cooling



Speed control



Fine balancing



CNC embedding



Energy recuperation

ADVANTAGES OF DRESSING SPINDLES

Dressing spindles from DR. KAISER are available in a variety of configurations and can be easily adapted to produce optimal process conditions. Whether small or large, DR. KAISER rotary dressing spindles all have unique control and sensing features that set them apart from the competition. Our spindles offer easy installation on new or existing machines.

- Sensors adaptable to your application
- Compact size
- Rigid spindle mounting/clamping system
- High speed range for synchronous and counter-rotation dressing
- Air purge system/Air filter system
- Maintenance-free bearings
- Excellent spindle shaft run-out characteristics
- High rigidity for high-precision dressing
- System solutions for your dressing requirements with our extensive range of dressing products

MODULAR SYSTEM OPTIONS

Experience leads to optimized solutions: Your process defines the configuration of the spindle system – we take care of the integration:

- Touch sensor (AE sensor)
- Temperature sensor
- Actual speed measurement and control
- Energy recovery
- Hydraulic clamping of the rotary dresser
- Micro-balancing of the spindle and rotary dresser.

SPINDLES FOR SMALL GRINDING WHEELS

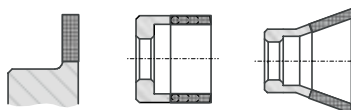
6



STANDARD DRESSER DESIGNS: THE FAST WAY TO A SYSTEM

DR. KAISER has a wide variety of dresser configurations and specifications available for any grinding wheel application. Self sharpening dressers with an impregnated or positive plated bond system are perfect for Superabrasive grinding wheel applications. CNC dressing discs utilizing handset natural and CVD diamond (form stable) are primarily used to dress conventional grinding wheels. Our product application experts can specify the correct dresser to meet your requirements.

Impregnated (Self-Sharpening)

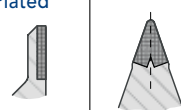


RI 40

RI 50

RI 60

Positive Plated



RIG 40

Stable Form



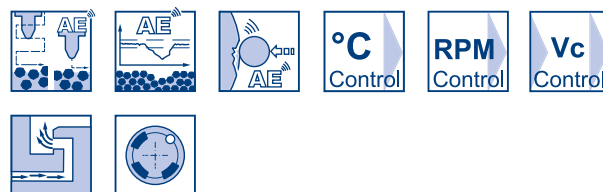
NC/NCC

HIGH SPEEDS

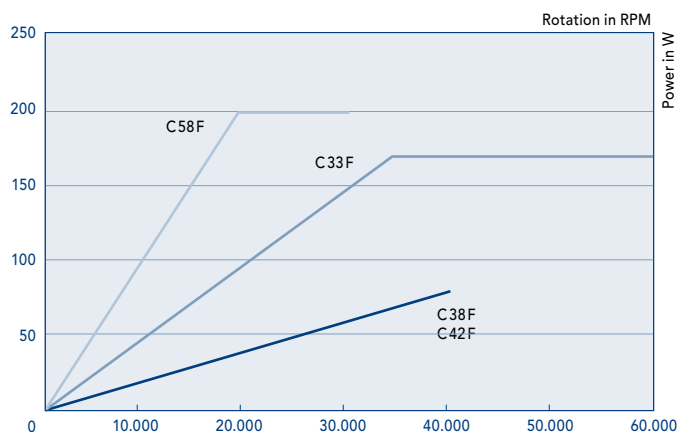
Internal grinding wheels work at high speeds. High-speed dressing spindles are therefore required to permit the necessary speed ratios between the rotary dresser and grinding wheel during dressing. A number of dressing spindles with different speed and performance ranges are available for a wide variety of applications. The majority of DR. KAISER spindles can be designed with adaptive sensor technology to optimize the dressing process and make it more cost effective.

OPTIONAL EXTRAS

Thanks to the modular design of our dressing spindles we can integrate the sensors and other system options needed for your specific dressing requirements. Details can be found on pages 10 - 12.



SPEED-POWER-CHARACTERISTIC



LIST OF DRESSING SPINDLES FOR DRESSING OF ID GRINDING WHEELS

Description*	Dimension	Spindle Arbor**	Max. Dresser Diameter	Rotational Speed Range	Current	Stiffness Classification
C33F	Ø 33 h5 x 162 mm	Ø 7 x 3 mm	40 mm	5.000 - 60.000 RPM	30 V	Stiffness Class I
C38F	Ø 38 h6 x 68 mm	Ø 6 x 4 mm	40 mm	5.000 - 40.000 RPM	30 V	Stiffness Class I
C42F	Ø 42 h6 x 96 mm	Ø 6 x 6 mm	40 mm	5.000 - 40.000 RPM	30 V	Stiffness Class I
C58Fx	Ø 58 h6 x 121 mm	Ø 20 x 4 mm	100 mm	5.000 - 30.000 RPM	230 V	Stiffness Class II

*x different motor-elements are available (with different speed, torque and power) ** customer specific modification possible

SPINDLES FOR LARGE GRINDING WHEELS

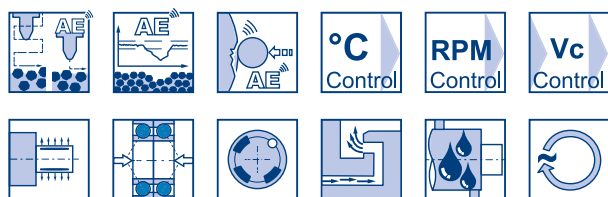
7

THE HIGHEST PRECISION

Dressing spindles with excellent run-out characteristics and high rigidity are required for external cylindrical grinding applications. From fuel injection needle manufacturing to gear grinding applications, DR. KAISER has a reputation for providing high quality dressing spindle/rotary diamond dresser systems. The spindle systems can also be fitted with a variety of sensing and control options to cover the entire range of abrasives with their specific application requirements. All dressing spindles are application-specific according to the criteria of concentricity, dynamic rigidity, speed control and power requirement. Through the use of the latest technologies and intensive product developments, we are continuously improving our dressing spindles and adapting them to changing grinding process requirements. Call us to learn more.

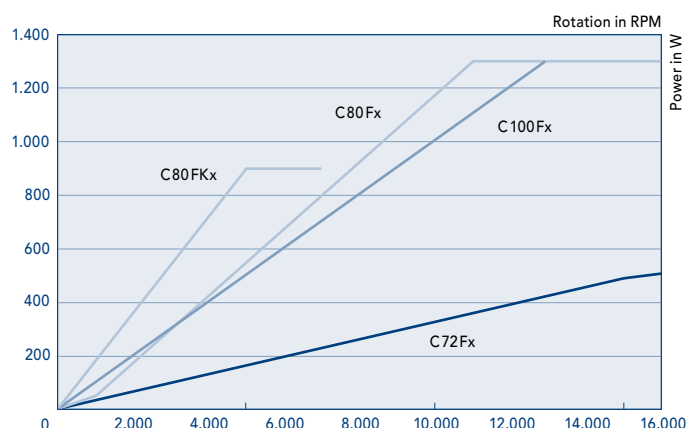
OPTIONAL EXTRAS

Details can be found on pages 10 - 12.



SPEED-POWER-CHARACTERISTIC

The spindle power, torque and speed range can be individually adapted to process requirements through the use of various spindle motor elements. This means that one type of spindle can be adapted for various dressing tasks: thanks to the logical continuation of the modular system.



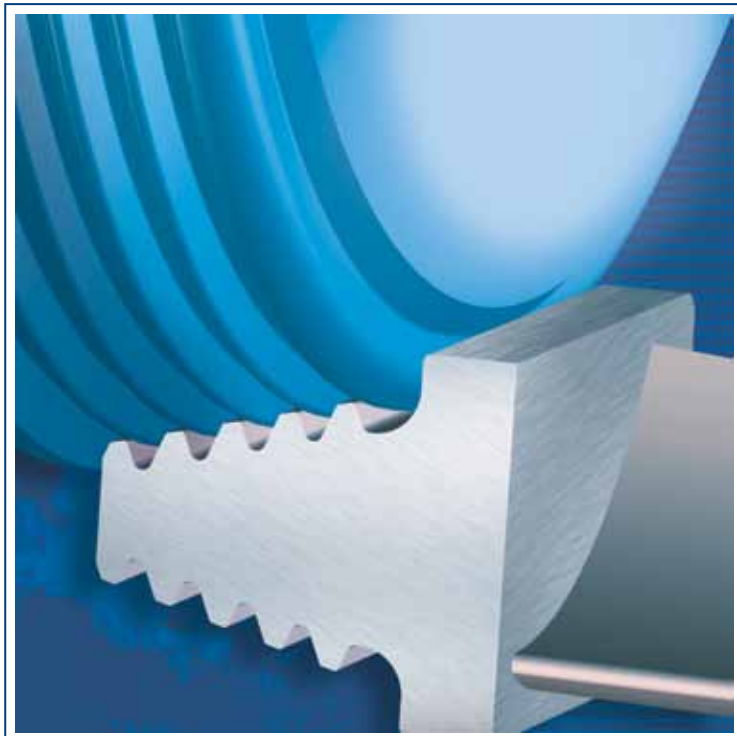
LIST OF DRESSING SPINDLES FOR OD GRINDING WHEELS

Description*	Dimension	Spindle Arbor**	Max. Dresser Diameter	Rotational Speed Range	Current	Stiffness Classification
C 72 Fx	Ø 72 h6 x 250 mm	Ø 40 x 10 mm	150 mm	1.500 - 16.000 RPM	230 V	Stiffness Class III
C 80 Fx	Ø 80 h6 x 250 mm	Ø 40 x 10 mm	150 mm	1.500 - 16.000 RPM	230 V	Stiffness Class IV
C 100 Fx	Ø 100 h6 x 313 mm	Ø 40 x 13 mm	200 mm	1.500 - 13.000 RPM	230 V	Stiffness Class V

*x different motor-elements are available (with different speed, torque and power) ** customer specific modification possible

SPINDLES

8



HIGH TORQUE

During plunge-cut dressing the entire work piece profile is transferred from the profile roll to the grinding wheel in a single axis in-feed motion. The large contact lengths between the grinding wheel and dressing tool call for rigid and powerful spindles. Profile rolls up to a width of 50 mm can be used with frequency-controlled motor spindles. The cantilevered bearing design permits a rapid change of the dressing tool. Profile geometries wider than 50 mm can be dressed with a spindle using an outboard-supported cartridge type bearing system with a driving power of 3.5 kW.

RIGIDITY THROUGH SPINDLE BEARING

Dressing spindles need high static and dynamic rigidity. Thermal changes in the rotary dresser position under load are kept as low as possible by preloaded roller bearings. The use of ceramic ball bearings in high-speed spindles permit even smoother running. High dressing forces require the use of multiple preloaded bearings. The best possible dressing results and highest surface qualities on the work-piece are achieved by the fine balancing of the spindle and the rotary diamond dresser.

Maximum Rotational Speed (RPM)	Bearings	Overall Length (mm)	Stiffness Classification
60.000	2-3	100	Class I
30.000	2-3	200	Class II
16.000	4-5	300	Class III
10.000	4-5	300	Class IV
6.000	5-6	350	Class V
6.000	Counter Bearing	350	Class VI

LIST OF DRESSING SPINDLES FOR SINGLE AXIS INFEED DRESSING

Description*	Dimension	Spindle Arbor**	Max. Dresser Diameter	Rotational Speed Range	Current	Stiffness Classification
C80Fx	Ø 80 h6 x 329 mm	Ø 52 x 40 mm	250 mm	1.500 - 6.000 RPM	350 V	Stiffness Class IV
C100Fx	Ø 100 h6 x 313 mm	Ø 40 x 13 mm	200 mm	1.500 - 7.000 RPM	230 V	Stiffness Class V
CPRS	283 x 162 x 370 mm	Ø 52 x 100 mm	150 mm	500 - 6.000 RPM	230 V	Stiffness Class VI

*x different motor-elements are available (with different speed, torque and power) ** customer specific modification possible

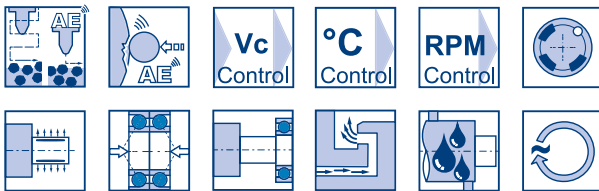
DRESSING SPINDLES FOR FAST ROTARY DRESSER CHANGES

These dressing spindles have been designed for the high-precision use of profile rotary dressers and rotary dresser sets up to 50 mm in width. A spindle with high power and torque and the ability for fast dresser change is required here. The spindles have multiple bearings and can be supplied with thrust bearings if necessary to provide additional support for the cantilevered spindle nose.



OPTIONAL EXTRAS

Details can be found on pages 10 - 12.



PROFILE ROLL SYSTEM FOR HIGH DRESSING FORCES

CPRS rotary dresser spindle systems with high precision and stiffness are available for rotary diamond dressers wider than 50 mm. The drive consists of a frequency-controlled induction motor that transfers torque to the dresser spindle shaft either by belt or directly via a coupling. Alternatively, the spindles can be equipped with 3-phase current servomotors or hydraulic motors. This provides for good damping characteristics and a quiet-running spindle that will produce the best possible dressing results.



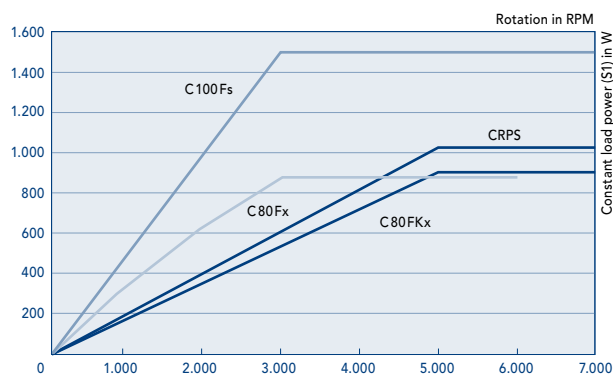
OPTIONAL EXTRAS

Details can be found on pages 10 - 12.

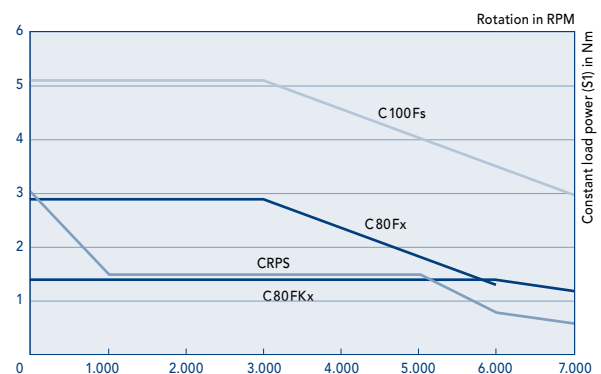


SPEED-POWER-CHARACTERISTIC

Our dressing spindles have motors and frequency converters that are specifically adapted to your process requirements. By matching a motor to a specific frequency converter we can keep the rise in temperature that can cause a loss in performance to a minimum. Dressing spindles are normally used intermittently between grinding cycles.

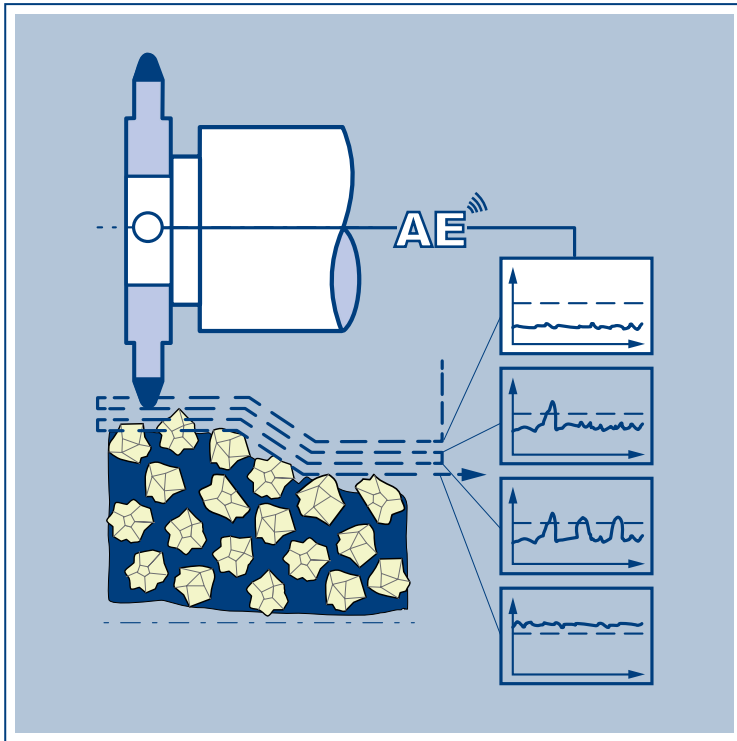


When operated for these short periods of time, the spindle can provide performance that is 50% higher (S6) than when used constantly and with constant load (S1).



PROCESS MONITORING SENSORS KEEP TRACK OF EVERYTHING

10



MODULAR SYSTEM SENSORS

Today's demand for high-performance dressing systems is higher than ever before. High-precision sensors can be used to monitor and control the process. Whether for temperature, speed or touch sensing, our modular system lets you react to any requirement.

TOUCH SENSOR



The detection of the initial contact between the grinding wheel and rotary dresser is very important during CBN and diamond grinding wheel dressing operations. This detection prevents overfeeding of the rotary dresser into the grinding wheel and also avoids dressing passes in which the dresser is not actually in contact with the grinding wheel. Since all moving components of the drive unit cause structure-borne noise signals and thus a baseline signal noise, the AE sensor is positioned directly in the spindle nose. The AE signals are also amplified in the rotor to allow a separation of contact noises between the grinding wheel and dresser from the background noise level signal at the best possible resolution. Through an electronic analysis of the structure-borne noise signals the contact point between the grinding wheel and dresser can be identified and sent to the machine control system. What's more, the system can also be used to check the envelopes and automatically analyzes the dressing result. The signal feedback to the machine control system takes place in a matter of milliseconds and can therefore be used for collision control as well.

TEMPERATURE MONITORING



Temperature sensors monitor the motor and bearing temperatures and report any spindle overload to the control system. Easy and effective.

SPEED MONITORING



Speed sensors monitor the condition of the spindle and transmit signals such as „Speed reached“ or „Standstill“ to the machine control system.

SPEED CONTROL



Accurate control of the rotary dresser speed is necessary for high-precision dressing applications such as truing Diamond and CBN grinding wheels. Sine-cosine encoders with a matching measuring gearwheel are integrated into the dressing spindles for this purpose so that deviations can be compensated for as quickly as possible. Alternatively, the use of inductive motor speed sensors allows the adjustment of the spindle speed (which is affected by process parameters) with a speed accuracy of 10 rpm. Simple standstill monitoring is also possible with this system.

PRIMARY POWER SUPPLY



The frequency converter can be connected to single-phase (230 or 110 VAC) or three-phase (400 VAC) incoming power supply. The use of a three-phase device is recommended for larger drives.

INTEGRATION IN THE CNC



Our spindle control system can be integrated into just about any grinding machine control. We can also supply our control as a stand alone unit.

REMOTE CONTROL



In some applications it is required that the machine operator be able to start/stop the dressing spindle or change the direction of the dressing spindle manually. For this we recommend the use of a remote control system.

INTERFACES



The machine control system and frequency converter can communicate without a direct signal wire between the relevant inputs and outputs via interfaces such as PROFIBUS, CANBUS, SERCOS or INDUSTRIAL ETHERNET to monitor the process parameters.

CONTROL PRINCIPLE

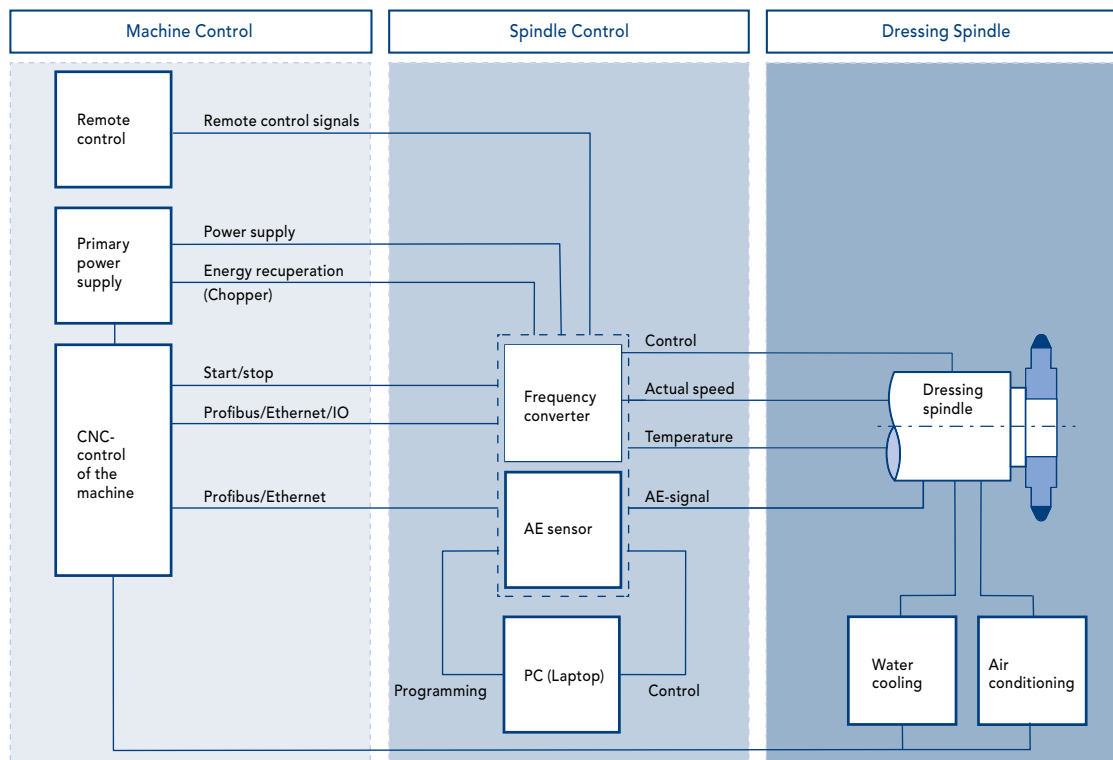


Depending on the spindle drive system chosen, various characteristic curves can be used for the dressing spindle. We recommend the use of sensor-less or sensor-guided vector controls in place of the U/F characteristic curve for synchronous dressing spindles in particular. This permits a very precise control of the speed and thus a constant cutting rate during dressing, particularly when profiling CBN and diamond grinding wheels.

ENERGY RECOVERY



Energy costs money. This is why our dressing spindle systems in the upper power range have a generator function. During generator-based acceleration in the synchronous process any excess energy is fed back into the main power supply. An additional brake fuse (chopper) prevents any overload on the system in the event of a main failure so that in this case the spindle is slowed to speed of zero under control. An economic and safe solution.



ACCESSORIES AND OPTIONS

ALL COMPONENTS FOR ONE SYSTEM

12

HYDRO-EXPANSION CHUCK



Hydro-expansion chucks permit precise and fast clamping of rotary dressers. This clamping system reduces downtime and improves dress/part quality.

CLAMPING TYPE



High-precision spindle mounting brackets are available for all of our rotary dressing spindles.

IMPROVED STIFFNESS



Plunge dressing with profile rollers creates high forces. DR. KAISER uses multiple bearing technology to achieve the best quality results.

WATER COOLING



An optional water cooling system is available for several of our rotary dressing spindles. This additional cooling system allows the spindle to run cooler and therefore more precisely.

FINE BALANCING



The best quality results can be achieved by fine balancing of the entire dressing system. We can also install your dressing roller onto your spindle at our factory for the best run-out and balance possible.

CABLE



Cables of various lengths are available from our stock. The cables can also be made up per your requirements upon request. We can supply cables with straight or angled connector plugs. The plug connectors always comply with protection category IP 67.

AIR PURGE FOR SEALING AND COOLING



Our dressing spindles are protected and sealed against the penetration of coolants and contaminants by the use of special ring seals and precisely controlled purging air pressure/flow. The uniform flow of air keeps the spindle at a constant temperature level and prevents changes in rotary dresser position due to thermal expansion. A fine filter water trap supplies the spindle with dry and clean air, thus greatly prolonging the service life of the bearings. Through optimal adjustment of the air flow, use of short hose connections and correct sizing of hose diameter, the spindles can be operated in an energy-efficient and effective manner.

DOCUMENTATION



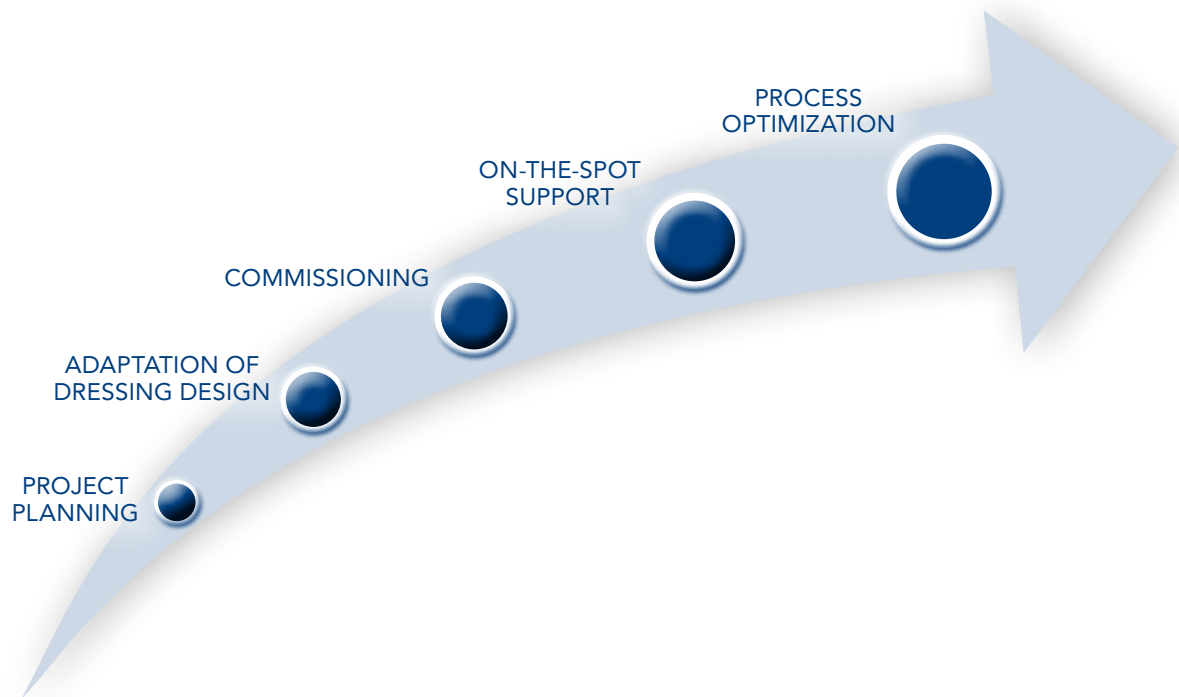
Each dressing spindle is supplied with a comprehensive installation and operating manual. This manual is available in many languages.

CE-CONFORMITY



All spindles are subject to stringent quality testing and comply with CE requirements.





PROJECT PLANNING

Careful understanding of the dressing strategy and necessary system components is a prerequisite for a good grinding process result. Our dressing experts are involved in projects from their inception to ensure an optimum design of the dressing spindle and rotary diamond dresser. The exact coordination of dresser, spindle, drive unit, sensors and control unit are key to a well-functioning system. We offer a one-source solution for grinding and dressing to ensure the best outcome.

ADAPTATION OF DRESSING DESIGN

Grinding machines and grinding and dressing processes are becoming more complex and need a dressing system solution. Adapting our dressing spindle system to your specific application helps save money and achieve better results.

COMMISSIONING

All dressing systems are delivered with comprehensive manuals, instructions and documentation. We will be pleased to contribute our many years of experience by assisting in the commissioning of your spindle system on-site and helping to train your personnel in the use of our products.

ON-THE-SPOT SUPPORT

We take service very seriously! Our service technicians will help you install the systems in your machine. Final customers and machine manufacturers from across the globe have been trusting our experience as a system supplier in the field of grinding technologies and our on-site support for many years.

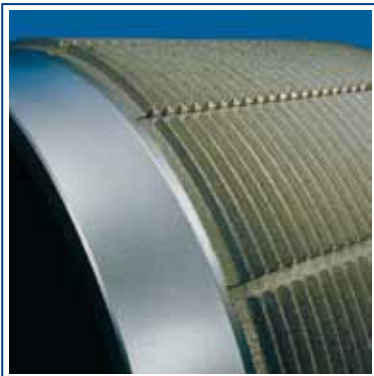
PROCESS OPTIMIZATION

Existing dressing systems can often be improved. Whether changing dressing tools, process control, the use of a new sensing technology, updated drive concepts or the adjustment of controllers and sensors in an existing dressing spindle system, we would be pleased to offer our assistance.



DRESSING TOOLS FOR EVERY TASK

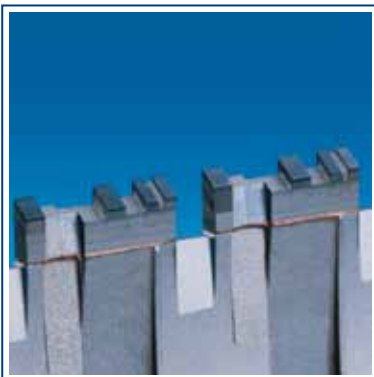
Whether diamond form dressers for CNC-controlled dressing or profile rolls for plunge-cut dressing, DR. KAISER can manufacture and supply dressing tools for almost every grinding application. Through the use of various diamond coatings (natural or synthetic diamonds in a scattered or hand-placed arrangement) 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.



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.



WEAR RESISTANT PARTS PCD LASTS LONGER

Guideways, shoes-bearings, drivers-bearings, prisms, male and female centers, steady rests or abrasive belt shoes are used to position work-pieces in grinding applications. These components are loaded by process forces resulting in extreme rotational and sliding friction. Special PCD coatings increase tool life and increase the accuracy of the process and improve the surface quality and form accuracy of the workpiece. Do not hesitate to ask a DR. KAISER application specialist to discuss the many possibilities for this modern technique.



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

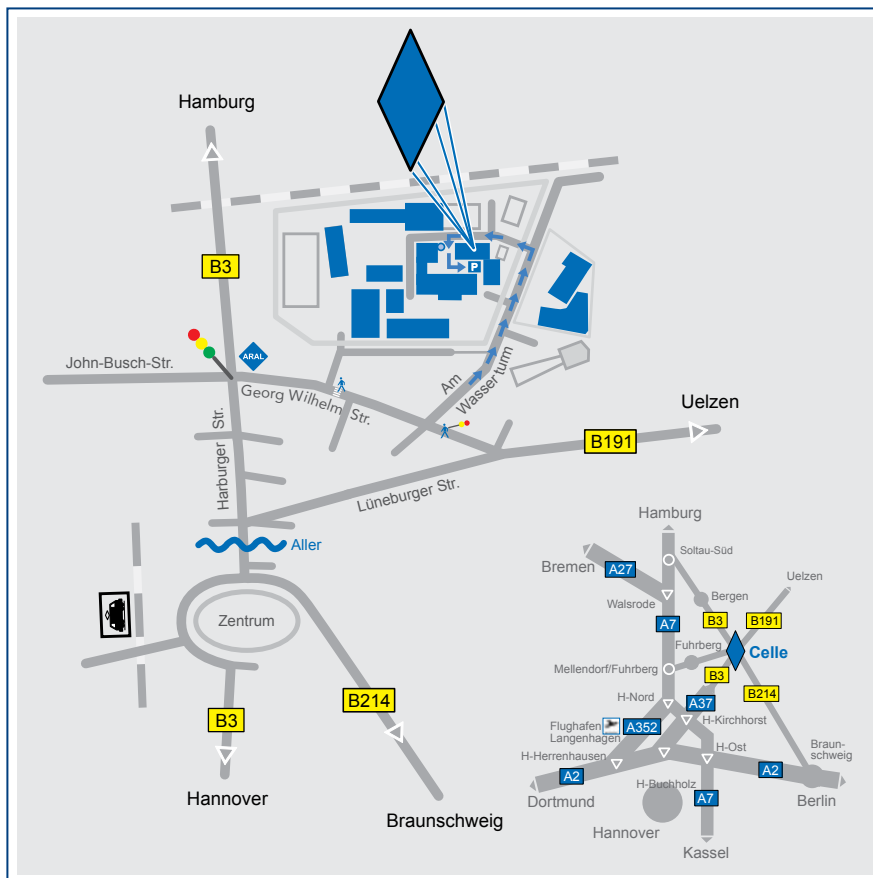
ELECTROPLATED CBN- AND
DIAMOND GRINDING WHEELS

VITRIFIED BONDED CBN-
AND DIAMOND GRINDING WHEELS

PCD- AND CBN CUTTING TOOLS

PCD WEAR PROTECTION
COMPONENTS

STATIONARY DRESSING TOOLS



DR. KAISER präzision durch diamant

DR. KAISER DIAMANTWERKZEUGE
GmbH & Co. KG

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