DR. KAISER
precision through diamond

DRESSING SPINDLE SYSTEMS

CONTENTS

4 CNC-DRESSING
WITH CNC-DRESSING DISCS

5 SPINDLE TECHNOLOGY
FROM DR. KAISER

6 SPINDLES
FOR LARGE AND SMALL GRINDING WHEELS

8 SPINDLES
SINGLE AXIS PLUNGE DRESSING

10 PROCESS MONITORING
SENSORS KEEP TRACK OF EVERYTHING

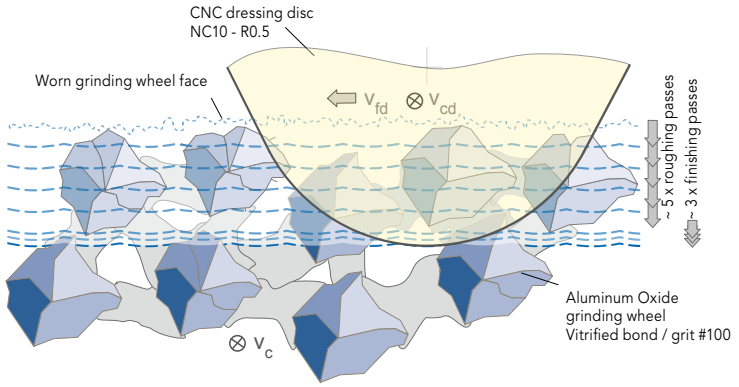
11 CONTROL TECHNOLOGY
EASY INTEGRATION

12 ACCESSORIES AND OPTIONS
ALL COMPONENTS FOR ONE SYSTEM

13 SERVICE
FROM ONE SOURCE

14 TECHNICAL INSTRUCTIONS
PROFESSIONAL HANDLING OF SPINDLES

CNC-DRESSING
WITH CNC-DRESSING DISCS

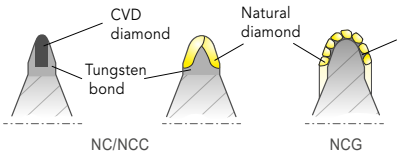


CONVENTIONAL GRINDING WHEELS

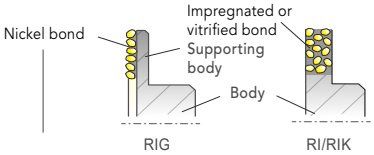
Aluminum oxide, which can have a wide variety of modifications, is the most widely used conventional abrasive. While dressing with a rotary diamond dresser, approximately one layer of abrasive grain (depending upon the grain size) is removed. During this process, embedded material is removed from the 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. Dressing discs 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 diamond dressing disc be used with a highly accurate dressing spindle for optimal dressing results.

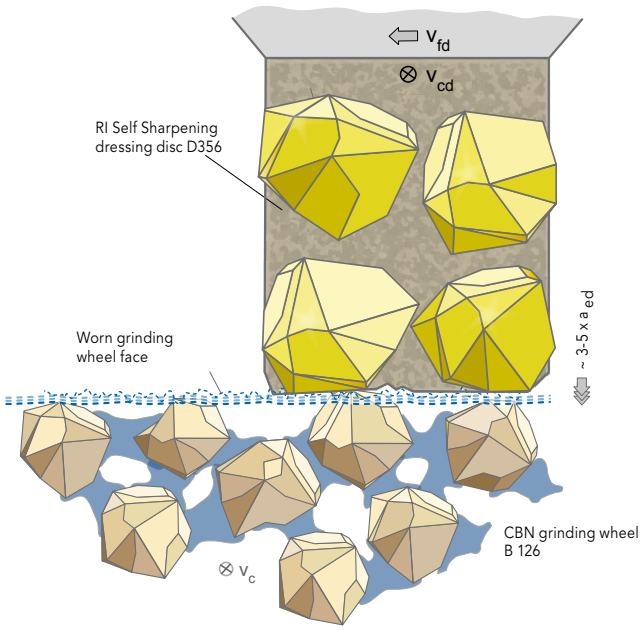
VARIATIONS

Stable Form



Self-Sharpening



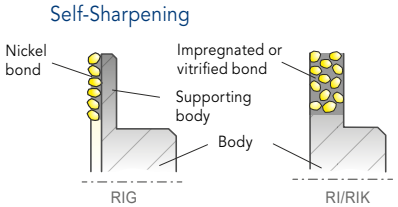


CBN AND DIAMOND GRINDING WHEELS

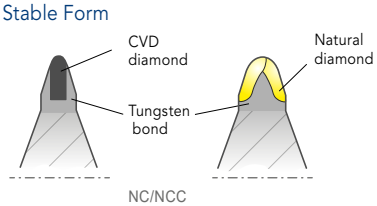
Superabrasive grinding wheels (Diamond and CBN) are generally dressed using an in-feed amount of 3-5 microns. Due to the extreme hardness of these abrasives, self-sharpening (impregnated type) dressing discs should be utilized. It is very important to know when the dressing disc has come in contact with 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. Dressing spindles for superabrasive applications should be designed for high speeds and have high static and dynamic stiffness. This is accomplished thru the use of special bearing arrangements. Optional sensors can be supplied to monitor a variety of functions.

VARIATIONS

Self-Sharpening

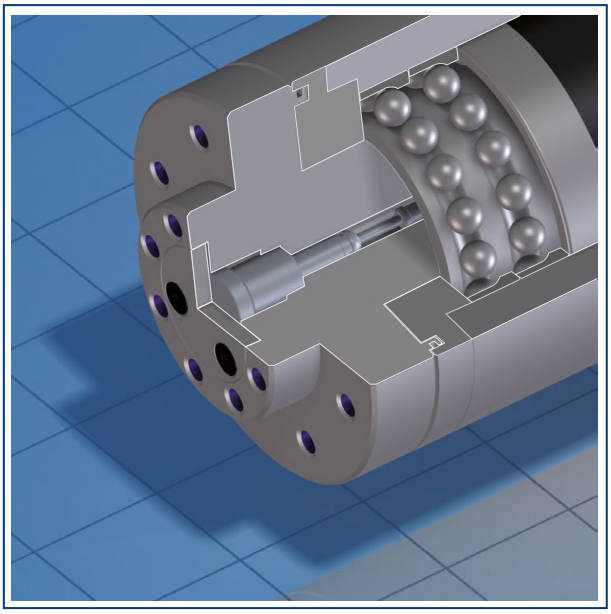


Stable Form



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)

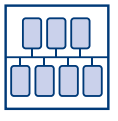
Envelope deviation (AE)

Collision control (AE)

Temperature control

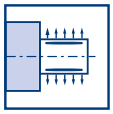
Rotation control

Speed control

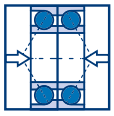


CNC embedding

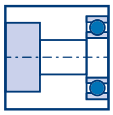
Air purge technology



Hydraulic expanding clamping technique



High stiffness



Preloaded bearing system

Water cooling

Fine balancing

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 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 stiffness 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 diamond dresser
- Micro-balancing of the spindle and the diamond dressing roller.

SPINDLES
FOR SMALL GRINDING WHEELS




OPTIONAL EXTRAS

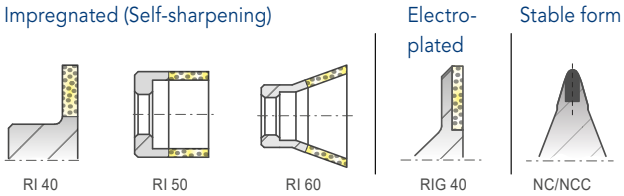
Thanks to the modular design of our dressing spindles we can integrate the sensors and other system options needed for your specific dressing requirements. Details can be found on pages 10 - 12.

HIGH SPEEDS

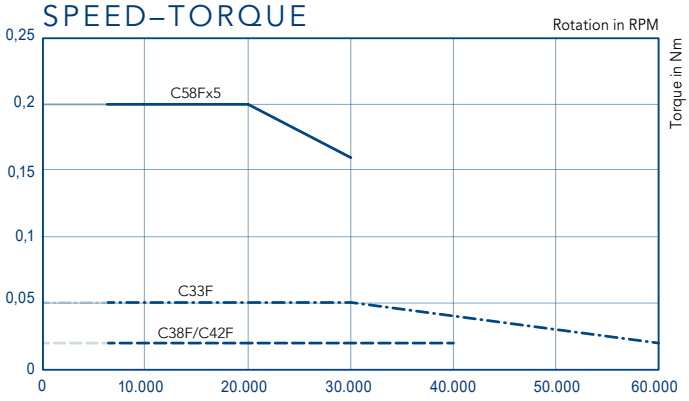
Internal grinding wheels work at high speeds. High-speed dressing spindles are therefore required to permit the necessary speed ratios between the dressing disc and grinding wheel during dressing. A number of dressing spindles with different speed and performance ranges are available for a wide variety 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.

STANDARD DRESSER DESIGNS: THE FAST WAY TO A SYSTEM

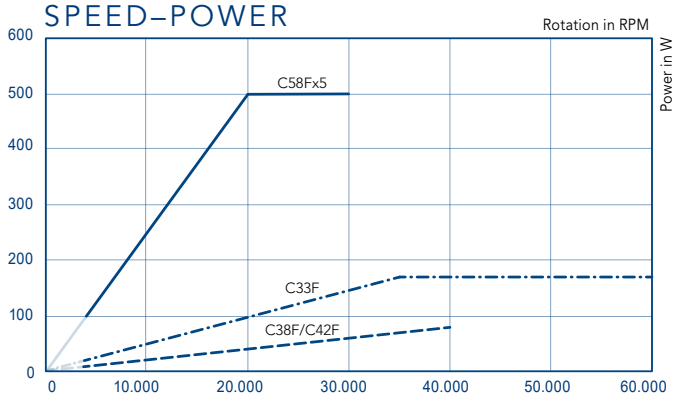
DR. KAISER has a wide variety of dresser configurations and specifications available for any grinding wheel application. Self sharpening dressers with an impregnated or electroplated bond system are perfect for superabrasive grinding wheel applications. CNC dressing discs utilizing handset natural and 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.



SPEED–TORQUE



SPEED–POWER



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

THE HIGHEST PRECISION

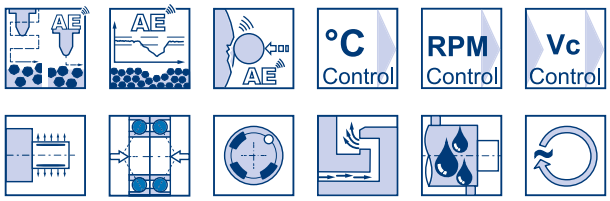
Dressing spindles with excellent run-out characteristics and high stiffness are required for external cylindrical grinding applications. From fuel injection needle manufacturing to gear grinding applications, DR. KAISER has a reputation for providing high quality dressing spindle/diamond dressing roller 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.

SPEED–POWER CHARACTERISTICS

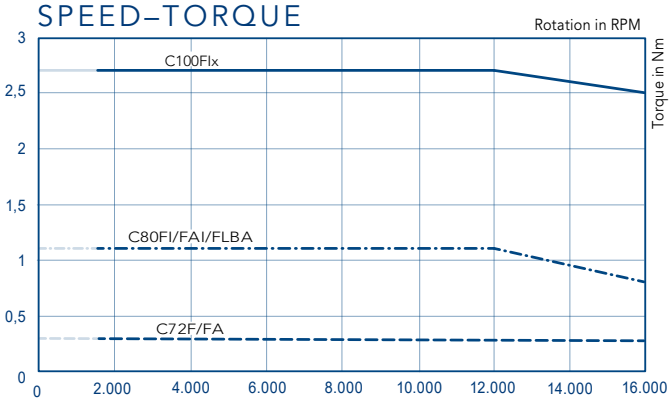
The spindle power, torque and speed range can be individually adapted to process requirements through the use of various spindle motor elements. This means that one type of spindle can be adapted for various dressing tasks: thanks to the logical continuation of the modular system.

OPTIONAL EXTRAS

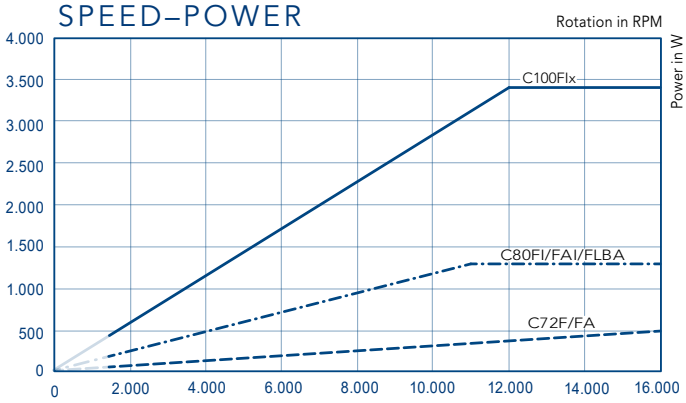
Details can be found on pages 10 - 12.



SPEED–TORQUE



SPEED–POWER

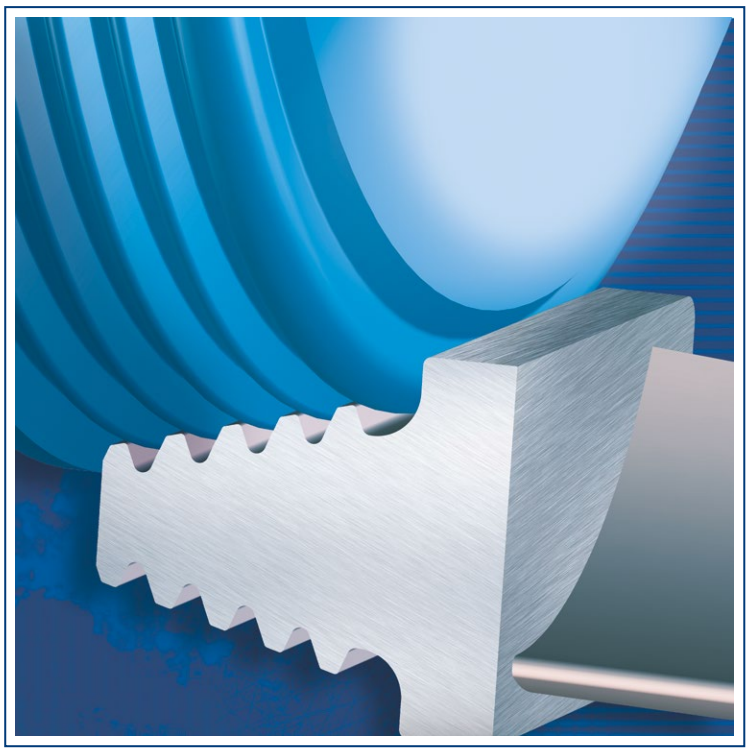


LIST OF DRESSING SPINDLES FOR OD GRINDING WHEELS

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



HIGH TORQUE

During plunge-cut dressing the entire work piece profile is transferred from the profile roller 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 rollers 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.

STIFFNESS THROUGH SPINDLE BEARING

Dressing spindles need high static and dynamic rigidity. Thermal changes in the dressing roller 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 diamond dressing roller.

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

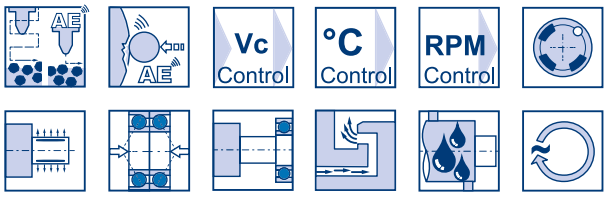
*x different motor-elements are available (with different speed, torque and power) ** customer specific modification possible

DRESSING SPINDLES FOR FAST DRESSING ROLLER CHANGES

These dressing spindles have been designed for the high-precision use of profile dressing rollers and dressing roller 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 ROLLER SYSTEM FOR HIGH DRESSING FORCES

CPRS profile dressing 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 dressing 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

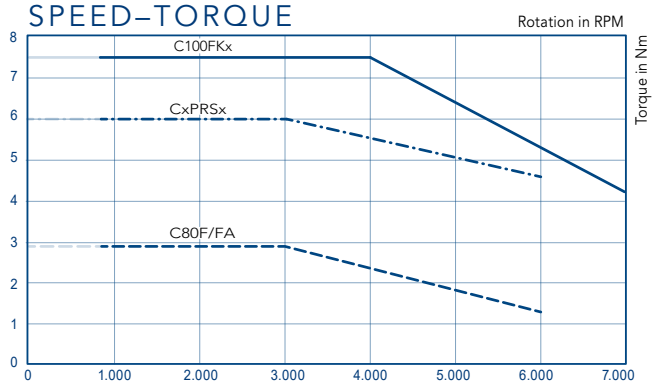
Details can be found on pages 10 - 12.

SPEED–POWER CHARACTERISTICS

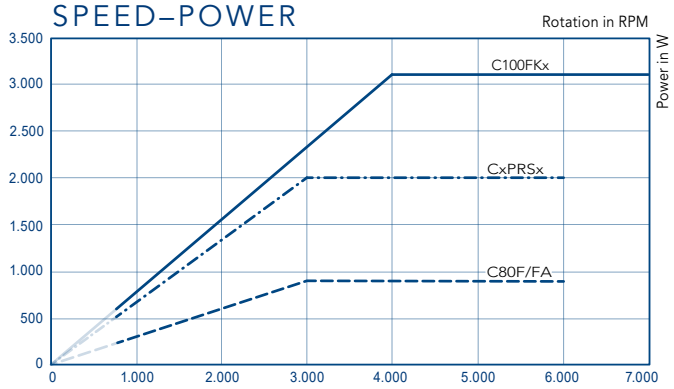
Our dressing spindles have motors and frequency converters that are specifically adapted to your process requirements. By matching a motor to a specific frequency converter we can keep the rise in temperature that can cause a loss in performance to a minimum. Dressing spindles are normally used intermittently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

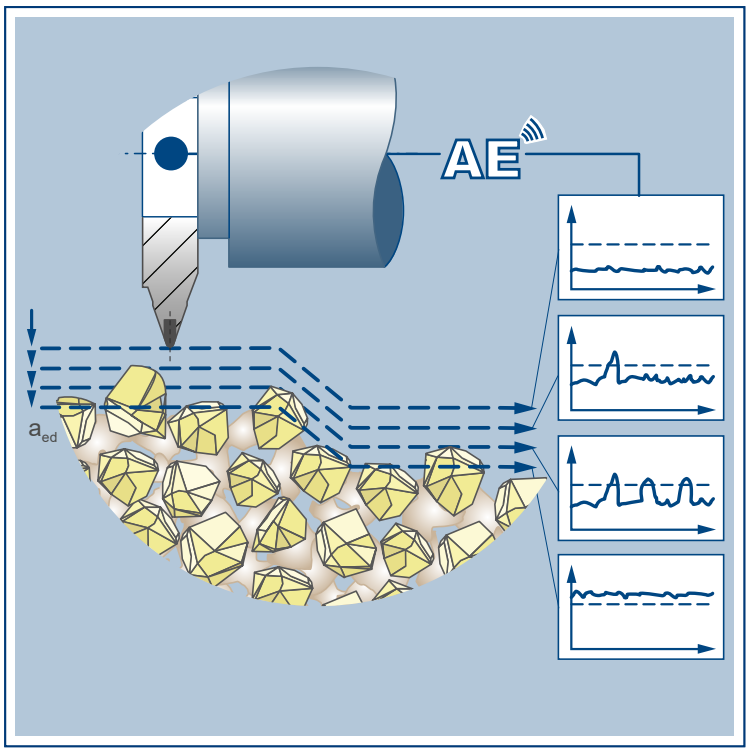
SPEED–TORQUE



SPEED–POWER



PROCESS MONITORING
SENSORS KEEP TRACK OF EVERYTHING



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 diamond dresser is very important during CBN and diamond grinding wheel dressing operations. This detection prevents overfeeding of the diamond 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

°C Control

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

SPEED MONITORING

RPM Control

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

SPEED CONTROL

Vc Control

Accurate control of the diamond 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.

CONTROL TECHNOLOGY
EASY INTEGRATION

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

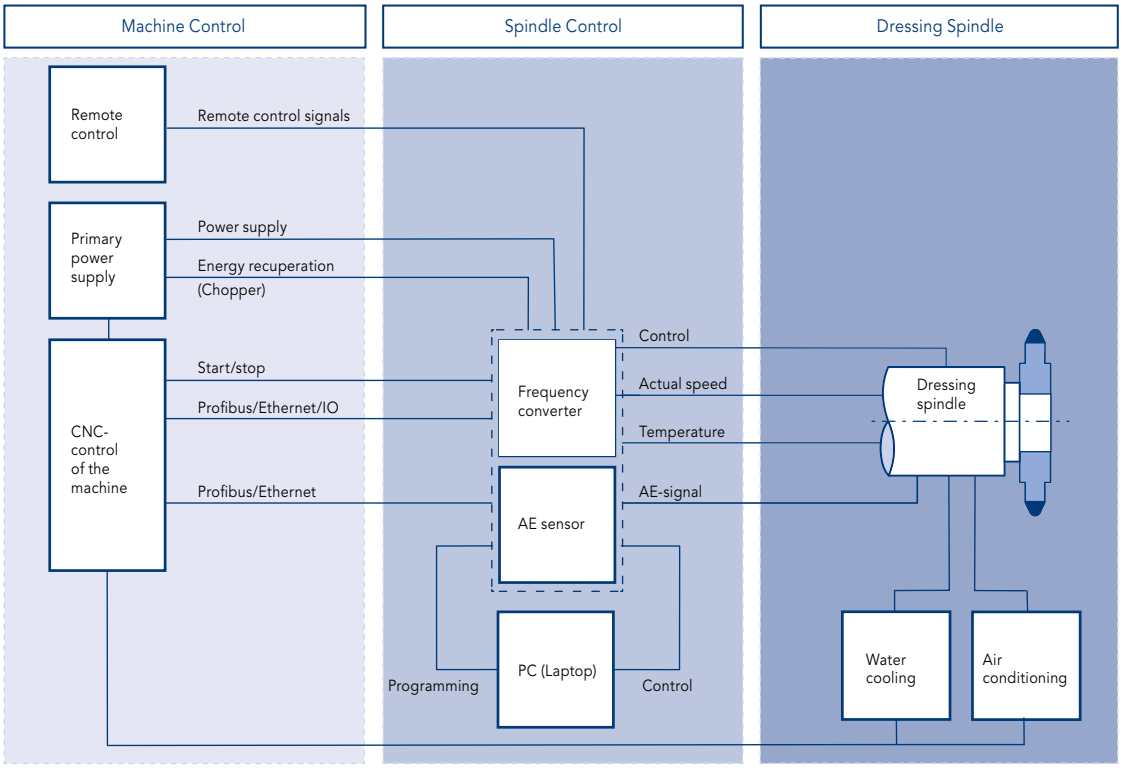
The machine control system and frequency converter can communicate without a direct signal wire between the relevant inputs and outputs via interfaces such as PROFIBUS, CANBUS, SERCOS or INDUSTRIAL ETHERNET to monitor the process parameters.

CONTROL PRINCIPLE

Depending on the spindle drive system chosen, various characteristic curves can be used for the dressing spindles. 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

HYDRO-EXPANSION CHUCK

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

CLAMPING TYPE

High-precision spindle mounting brackets are available for all of our 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 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 diamond 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.

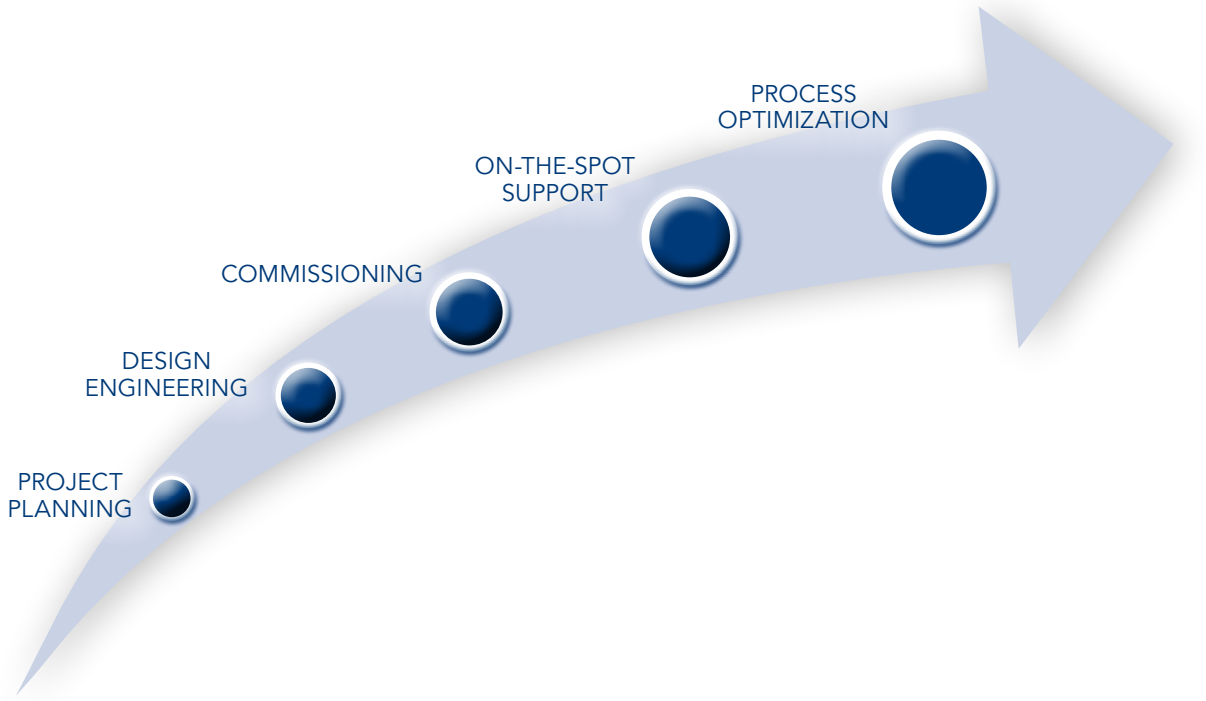
DOCUMENTATION

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.

SERVICE
FROM ONE SOURCE



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 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

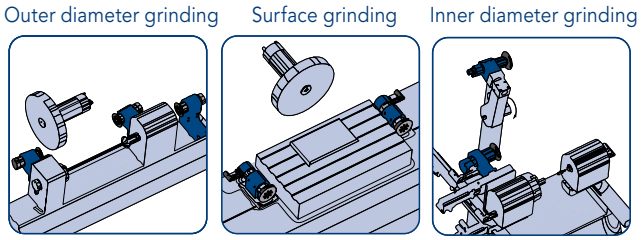
We take service very seriously! Our service technicians will help you install the systems in your machine. Final customers and machine manufacturers from across the globe have been trusting our experience as a system supplier in the field of grinding technologies and our on-site support for many years.

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.

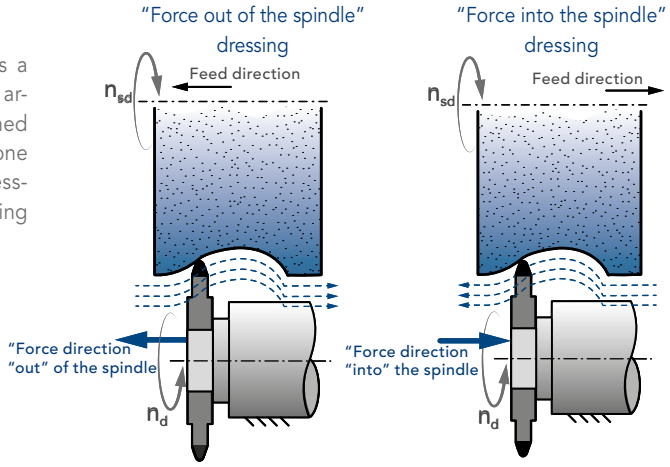
TECHNICAL NOTES

A perfect dressing process requires a favourable positioning of the dressing spindle system. Due to the given machine concept, a subsequent modification is in many cases not possible. In principle, a rigid design is important in order to avoid positional shifts caused by the dressing forces and vibration excitation. For certain profiles, an inclination of a few degrees between the dressing and grinding wheel axes may also be favourable.



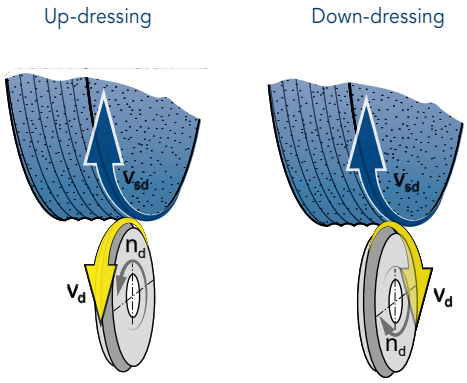
AXIAL DRESSING DIRECTION

High-precision profile dressing with CNC-dressing discs requires a high axial rigidity of the dressing spindle. As a rule, the bearing arrangements of the DR. KAISER dressing spindles are usually designed for both load directions. Nevertheless, it is recommended to use one dressing direction for profile dressing and not to use oscillating dressing. In order to additionally achieve higher axial rigidity, the bearing preload can be adjusted.



SAME AND COUNTER DIRECTION DRESSING

When dressing with CNC-dressing discs or profile rollers, the dressing result can be influenced within wide limits by the direction of rotation and the speed ratio between dressing tool and grinding wheel. For up-dressing, the spindle must be continuously braked by the frequency converter. The dressing spindle system should therefore be designed for such „generator operation" to avoid mechanical or electrical damage. For high-precision control processes of the dressing spindle speed, the integration of a Sin-Cos encoder is recommended.



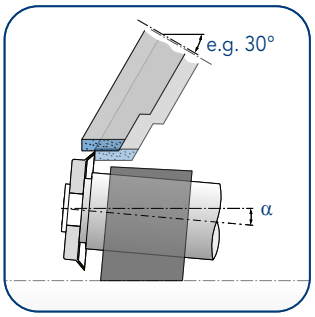
BALANCING

CNC-dressing discs and profile rollers are fast rotating bodies with a mass. The balance quality describes the permissible residual unbalance in gmm for a rotating mass at a specific speed. All dressing tools from DR. KAISER are therefore balanced at one working speed. In addition to the balance quality of the tool, the concentricity error of the spindle as well as of the dressing tool are decisive for the work result and the balance quality of the entire dressing spindle system in the mounted condition.

To keep oscillations and vibrations caused by the dressing spindle system as low as possible, DR. KAISER therefore offers fine balancing of the entire spindle system including the dressing tool. To achieve even better process results: ask our specialists.

INCLINATION OF THE DRESSING SPINDLE

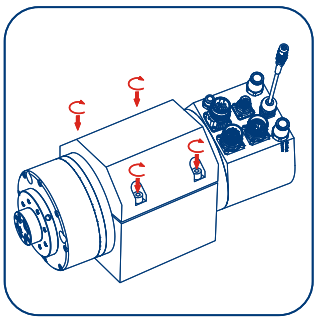
For face dressing of peripheral grinding wheels, it is recommended to adjust the dressing spindle by a few degrees. We offer suitable tool holders with individual adjustment angles α for this purpose.



CLAMPING OF DRESSING SPINDLES

The dressing spindle must not be installed in the grinding machine until the spindle has reached ambient temperature. Depending on the design of the clamping device, the dressing spindle is fixed with a torque specified by the manufacturer of the clamping device. Too high a tightening torque can deform the spindle sleeve and thus lead to premature bearing damage.

By checking the no-load current on the frequency converter, excessive clamping of the spindle can be ruled out. The reference value of the no-load current can be taken from the enclosed motor data sheet.



THERMAL LINEAR EXPANSION

To prevent thermal linear expansion, the dressing spindle should be started several workpieces before the actual dressing cycle. Alternatively, the spindle can be "parked" permanently at a low standby speed and only accelerated to the set speed during the dressing process.

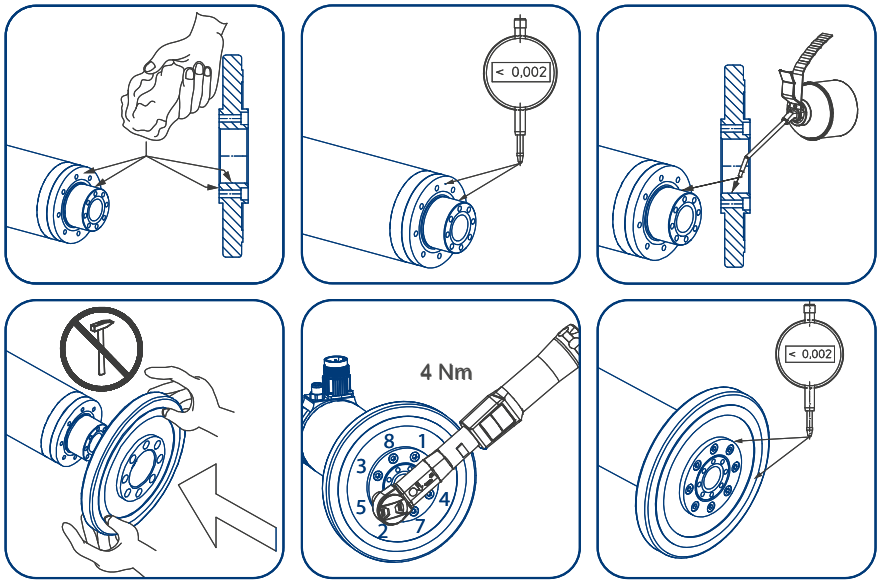
For high-precision dressing processes, displacement measuring systems can be installed in the front bearing area of the spindle to measure the expansion of the shaft and the associated axial displacement of the dressing roll. By transmitting the temperature and position information to the machine control, the machine can compensate the deviation by means of the traversing axes and thus achieve an optimum dressing result.

TOOL ASSEMBLY

Diamond dressing rollers are high-precision tools with axial and radial run-out tolerances of a few micrometers. The tools must therefore be mounted with the utmost care. Since the diameters of the spindle nose and the tool bore are very closely toleranced, the surfaces must be thoroughly cleaned and oiled before assembly. Frequently a slight heating of the tool in an oil bath facilitates assembly, which should never be done with the help of a hammer. Ensure that the screws are tightened crosswise to ensure that the tool is exactly flat.

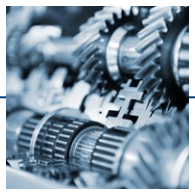
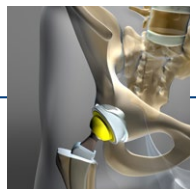
A final check of the running accuracy can be carried out on the measuring surfaces for axial and radial runout usually provided on the tool.

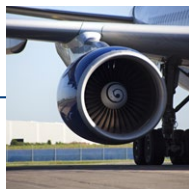
For disassembly only roll extractors individually manufactured by DR. KAISER may be used. They can be requested from us.



OUR FIELDS OF ACTIVITY



EVERYTHING FROM
A SINGLE SOURCE:

- DRESSING DISCS
- DRESSING ROLLERS
- STATIONARY DRESSING TOOLS
- CVD DIAMOND DRESSING TECHNOLOGY
- DRESSING SYSTEMS FOR VITRIFIED CBN GRINDING WHEELS
- DRESSING TOOLS FOR GEAR GRINDING
- DRESSING SPINDLE SYSTEMS
- CBN AND DIAMOND GRINDING WHEELS
- PCD AND PCBN CUTTING TOOLS
- PCD AND CVD DIAMOND WEAR
- PROTECTION COMPONENTS
- APPLICATION ENGINEERING
- SEMINARS AND TRAINING

DR. KAISER
präzision durch diamant

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