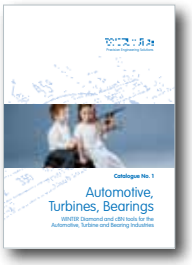
WINTER

Precision Grinding Solutions

Catalogue No. 5

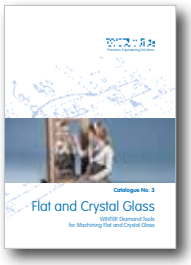
Dressing tools

WINTER diamond tools for dressing grinding wheels



Catalogue No. 1: Automotive, Turbines, Bearings
WINTER Diamond and cBN Tools for the Automotive, Turbine and Bearing Industries

Catalogue No. 2: Tools
WINTER Diamond and cBN Tools for the Tools Industry



Catalogue No. 3: Flat and Crystal Glass
WINTER Diamond Tools for Machining Flat and Crystal Glass

Catalogue No. 4: Electronics, Photovoltaics , Optics, Ceramics and Composites
WINTER Diamond and cBN Tools for the Electronic and Photovoltaic Industries, for Machining Optical Glass, Ceramics & Composites

Catalogue No. 5: Dressing Tools
WINTER Diamond Tools for Dressing of Grinding Wheels

Catalogue No. 6: WINTER Standard Catalogue
Stock Programme for Diamond and cBN Tools

WINTER

Precision Grinding Solutions

Dressing Tools

WINTER diamond tools for dressing grinding wheels

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Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.

A good Connection

Always close to the customer and customer-focused, our diverse market presence worldwide reflects the strength of a global player. Saint-Gobain's businesses are spread over 64 countries and new locations are being added frequently. Activities are clearly structured to ensure operational leadership. In Abrasives alone, over 16,000 people are employed. The company is the only manufacturer to offer a comprehensive product range of abrasives and dressing tools for almost all fields of industry. WINTER, as the premium brand for diamond and cBN grinding products, is one of the most well established and respected names in the market. Our combination of quality products, expertise and service, together with the international network of the parent company Saint-Gobain, is the key to success; WINTER grinding tools go with you worldwide, and lead you to your goals.

Saint-Gobain…

…was established in 1665 to supply glass for the Hall of Mirrors in the Palace of Versailles.
…kits out every second car in Europe with window glass
…presently has more than 190,000 employees
…generates € 37.8 billion annual turnover

High Performance Materials
Grinding Tools
No. 1 Worldwide

Flat Glass
No. 1 in Europe, No. 3 Worldwide

WINTER NORTON Industrial Super Abrasives

Glass Packaging
No. 1 in Europe, No. 3 Worldwide

Bonded Abrasives

Coated Abrasives

Thin Wheels

SAINT-GOBAIN

Construction Products
Insulating Materials
No. 1 Worldwide

Construction Products

Plaster/Plaster Boards
No. 1 Worldwide

Ceramics and Plastics
No. 1 Worldwide for Thermal and Mechanical Applications

Pipes
No. 1 Worldwide in Cast Iron Pipes

Reinforcement Materials
No. 1 Worldwide

Industrial Mortar
No. 1 Worldwide in Tile Adhesives

Building Distribution
No. 1 Worldwide in Tiles, No. 1 in Europe in Construction Materials and Industrial Woodworking

Exterior Siding
No. 1 in USA for Exterior Siding
No. 3 in USA for Roofing

Worldwide Expertise

Saint-Gobain is in the top one hundred largest industrial groups in the world and is leading in the production of glass, high performance materials and construction products. Two major milestones stand out in the Saint-Gobain Group's long history; it was established in 1665 by Colbert under Louis XIV, then, over 300 years later, Saint-Gobain and Pont-à-Mousson merged in 1970. WINTER joined the group in 1996. Today, the group invests € 390 million per year in research and development and files around 300 patents per year, to support its reputation for innovation and discovery.

The WINTER Brand:

For over 160 years WINTER has been a worldwide synonym for high-quality diamond and cBN grinding tools for industrial production. As pioneer and trend-setter, WINTER has been actively involved in the development of the success story of grinding, as well as in the production of synthetic diamonds.

Custom-made Solutions - the key to success

Over 75% of all WINTER products are developed in close cooperation with our customers. The results are tailored grinding solutions that perfectly fit your special requirements. Our expert teams would also like to help you. Together we will meet your technical challenges.

Market Leader - in front through quality

In Superabrasives, WINTER is No. 1 in Europe with quality products and services. In Europe, over 500 employees in three production sites take care of our customers' needs. Worldwide, over 2,000 people are employed in our global business.

INNOVATIONS

To this day, the WINTER philosophy is closely connected to innovation and technical progress. We thank our customers for over 160 years of momentum, challenges and confidence. **And in the future our next generation of innovations will ensure your success.**

PRECISION

From ACCURACY to Z-AXIS - the WINTER precision alphabet spells the suitable solution for your needs. Profile accuracies below 1 µm and a surface finish in the nanometer range are achieved regularly. **You can trust WINTER.**

WINTER

PERFORMANCE

The WINTER performance package contains top quality precision grinding tools, comprehensive service and individual customer care - which ranges from best grinding tool selection through to process optimisation. **Benefit from our full service, and make use of our leading technical expertise to increase your profitability.**

QUALITY

Since the foundation of the company, WINTER has stood for quality at the highest level. It begins with the first customer contact, and covers the identification of appropriate tool specifications, manufacturing, customer support and the final optimisation of your production process. **WINTER quality: Satisfaction guaranteed!**

Quality, Environmental Protection and Safety

As a responsible manufacturer of quality grinding tools, WINTER production is eco-friendly and avoids waste of precious resources according to the latest international standards and certification requirements. WINTER is certified to ISA 9001 (Quality Management), ISO 14001 (environmental management) and OHSAS 18001 (health and safety management). All rotating WINTER tools bear the OSA safety seal (OSA: Organization for the Safety of Abrasives), granting WINTER the customers' highest safety tool in application.

GLC Certified ISO 9001 ISO 14001 OHSAS 18001

OSA®

Snapshots of a long history

WINTER was established in 1847 by Ernst Winter as a family-owned company. We still adhere to the original goal of developing ultra-hard crystal tools of the highest quality. Our claim is to be the best. In numerous fields of application for diamond and cBN grinding tools we have been pioneers, and today we still follow this way as trend-setters and the technology leader.

Ernst Winter
Goldsmith and diamantaire, started his diamond tool workshop in 1847.

WINTER in Hamburg
1872: WINTER's first company building in Hamburg.

With WINTER to Outer Space
Laser reflectors ground with WINTER diamond tools enable the most accurate astronomic and geographic measurements.

Success from the beginning

Former letterhead and contemporary advertisement of WINTER with images showing medals received at important exhibitions.

Ernst Winter & Sohn
Hamburg-Eimsbüttel
Diamant-Werkzeug-Fabrik
Gegründet 1847

Wir empfehlen
Steinschreib-Diamanten,
hergestellt aus ausgesucht guten, rissfreien Diamanten und leisten für
dauernd feste Passung
schriftlich Garantie

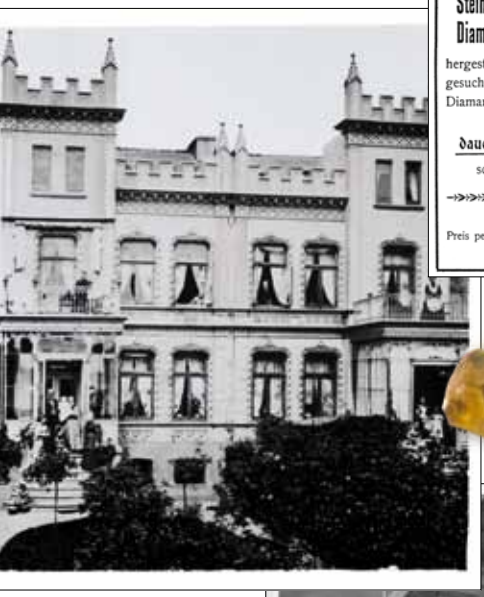
Prämiiert mit 3 goldenen Medaillen:
Hamburg 1889
Lübeck 1895 — Paris 1895

Weltausstellung Paris 1900
„Silberne Medaille".
Höchste Auszeichnung
für
Diamant-Werkzeuge
Gruppe III,
Klasse 15.

Garantie

No.	1	2	3	4	5
Preis per Stück Mk.	4	6	8	10	12

(Umtausch gestattet.)



Celebrities

Even Helmut Schmidt (Federal Republic of Germany's former Chancellor) acted as a WINTER "diamond maker" in 1983.

Posters and Brochures in the course of time

Innovations: Yesterday's vision of the

WINTER bridges the combination of inventive skills, creativity, identification of challenges and the ambition to meet our customers' expectations: WINTER developments of the past are found in industrial museums. Yesterday's vision of the future is today's standard. We are committed to over 160 years of company history: Today and in the future, we work hand in hand with our customers on innovations and their ecomomical implementation.

1847
WINTER produced lithography diamonds, replacing the conventional steel tips.

1969
As the first grinding tool manufacturer worldwide, WINTER presented cBN grinding tools with a special resin bond (KSS) for HSS tool grinding.

1962
WINTER UZ rotary dressers hit the market. Produced in a reverse plating process, they allow tightest tolerances.

2008
WINTER offered metal bonded tools with internal cooling for creep-feed glass edging.

1935
WINTER produced the first phenolic bond grinding wheel to replace previously used grinding wheels with loose, hammered or rolled-in grain.

2006
With Q-Flute⁺Dress, WINTER offered the first resin bonded grinding wheel dressable with a diamond rotary dresser.

In|no|

1548. from L. innovatus, pp. of innovare "to renew or change", from in- "into" + novus "new".

1975
WINTER DMC diamond grinding wheels and BMC cBN grinding wheels came into the market: WINTER MC grinding wheels allow cost-effective profile grinding for difficult to machine work pieces. They also reduce thermal effects of the near-surface microstructure and assure extremely long profile lifetime. WINTER DMC and BMC grinding wheels can be profiled by crushing directly on the grinding machine.

2001
WINTER introduced special cutting wheel products for slicing advanced ceramics like SiC.

1988
New super-light cutting wheels with carbon fibre bodies were patented.

1993
WINTER SG-CNC rotary dressers conquered the market. They have made dressing of vitrified cBN grinding wheels possible.

1958
WINTER was the first in Europe producing grinding tools with synthetic diamonds. In combination with WINTER special resin bonds, full performance benefits were achieved.

e Future

1971
At the European Machine Tool Exhibition WINTER showed for the first time a novel grinding wheel type that met the demand for short grinding cycle times. The structure of metallic and non-metallic bond components allows the efficient grinding of tungsten carbide and steel combinations. (M+789).

2003
WINTER developed the DDS (Diamond Dressing System), permitting the dressing of vitrified and resin bonded grinding wheels directly on the production machine. Until then, it was performed on external machines. Due to its free standing layer, outstanding profile grinding capability is achieved.

1992
New standards are set with the "34SG" series in the field of laminated safety glass and fire-resistant glass machining.

1875
Delivery of WINTER diamond particles to Zeiss Jena, enabling the engraving of 150 lines per millimeter.

1929
WINTER started producing diamond micro-grain by the sedimentation process.

va|ti|on

In general linguistic usage as a nonspecific term in the sense of new ideas and inventions and their conversion to economic use.

2006
N7 as a glass-ceramic bond system was introduced to the market. This bond can be precisely engineered to meet individual customer application requirements: Very high bond-hardness, optimised wetting of the grains and perfect development of bond bridges enable the creation of very high porosity for cool grinding and extremely long tool life.

1950-1954
WINTER developed a large variety of electroplated tools: Files, grinding pins, cutting wheels, drills…

2008
WINTER tools "Ti-Tan" and "Furioso" are a new generation of extremely wear-resistant stationary dressers.

1982
The patented dressing process "TDC" (Touch Dressing cBN) was developed by WINTER.

1977 / 78
WINTER presented the special bond "VF/VFF" for grinding and finishing polycristalline diamond and cBN materials.

1996
For four generations the company, founded by Ernst WINTER in 1847, was familiy-owned. In 1996 it was taken over by the French Saint-Gobain group.

2001
"Tiger" caused a stir with a new revolutionary grinding wheel geometry for narrow tooth gaps in saw manufacturing.

Your best solution

WINTER diamond tools gain great recognition in the fields of quality, performance and cost effectiveness. This is no coincidence, as WINTER is not limited to manufacturing excellent grinding tools: more than 75% of the cases are tailor-made solutions, developed in close cooperation with the customer. This successful engineering is based on a modular performance package, specifically equipped according to individual needs.

Tailor-made products

Optimised grinding solutions for your specific application provide the greatest benefit: In the end, you generate cost savings through more productivity, less down time, and better quality.

Each one of your technological challenges is an incentive for our product managers and our application engineers to achieve the best grinding results. Please contact us.

Besides the high percentage of custom-made solutions, WINTER offers a comprehensive range of stock products - and can supply these short term straight to your production line.

Focused on the goal ahead
Comprehensive technical advice in all questions about WINTER products and grinding processes. Our field sales force and our customer service are at your disposal.

Advice

Expertise
Advantage in accumulated knowledge: Seminars about current grinding issues as well as training programs matching our customers requirements.

Product Development

Solution

Trainings

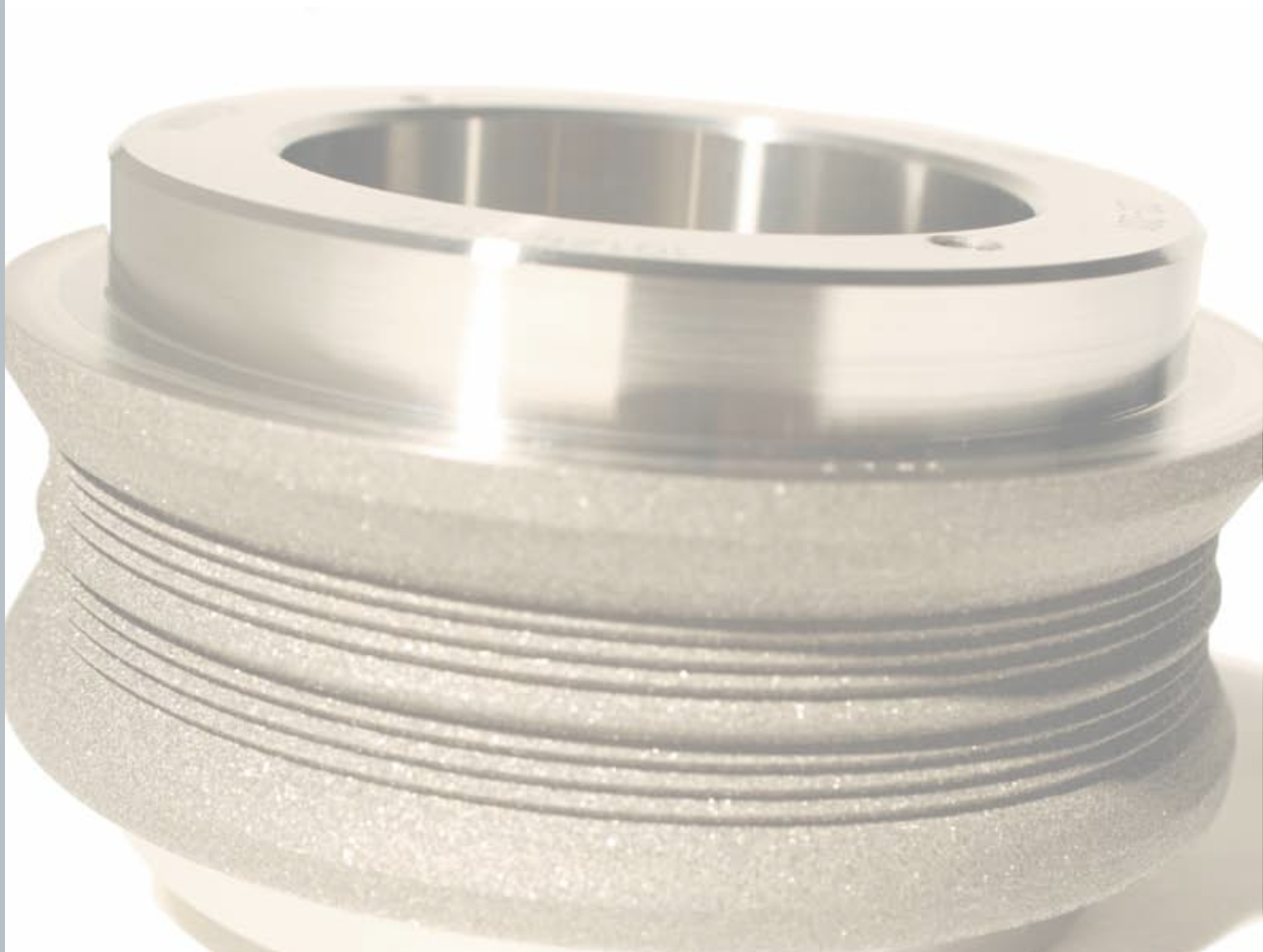
Process Optimisation

The cream of the crop
In order to meet your production-oriented challenges, take advantage of our dedicated specialists: In the R&D department and the European Grinding Technology Centre about 50 scientists are at your disposal for developing grinding tools and processes.

Fine Tuning
Our application engineers and our product developers will help you. Either at your premises, or in our EGTC (European Grinding Technology Centre), where we can optimise your production process, without interfering with your workflow.

Please ask your sales advisor - contact details on the last page.

Diamond profile roller dressers for high precision dressing of grinding wheels



Rotating profile roller dressers, also known as rotary truers, have the same profile as the workpiece.
These dressing tools are particularly suitable for complex profiles in mass production.

The advantages of profile roller dressers are

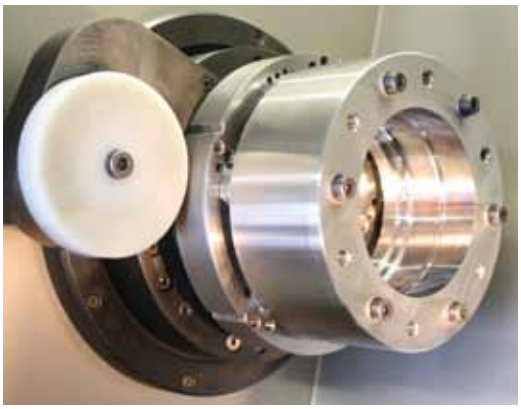
- Reduction of dressing costs per workpiece
- Optimized utilization of machine capacity
- Automation of the dressing process
- Repeatable high precision with low workpiece rejects
- Rapid incorporation of complex profiles in the grinding wheel

Production of UZ profile roller dressers

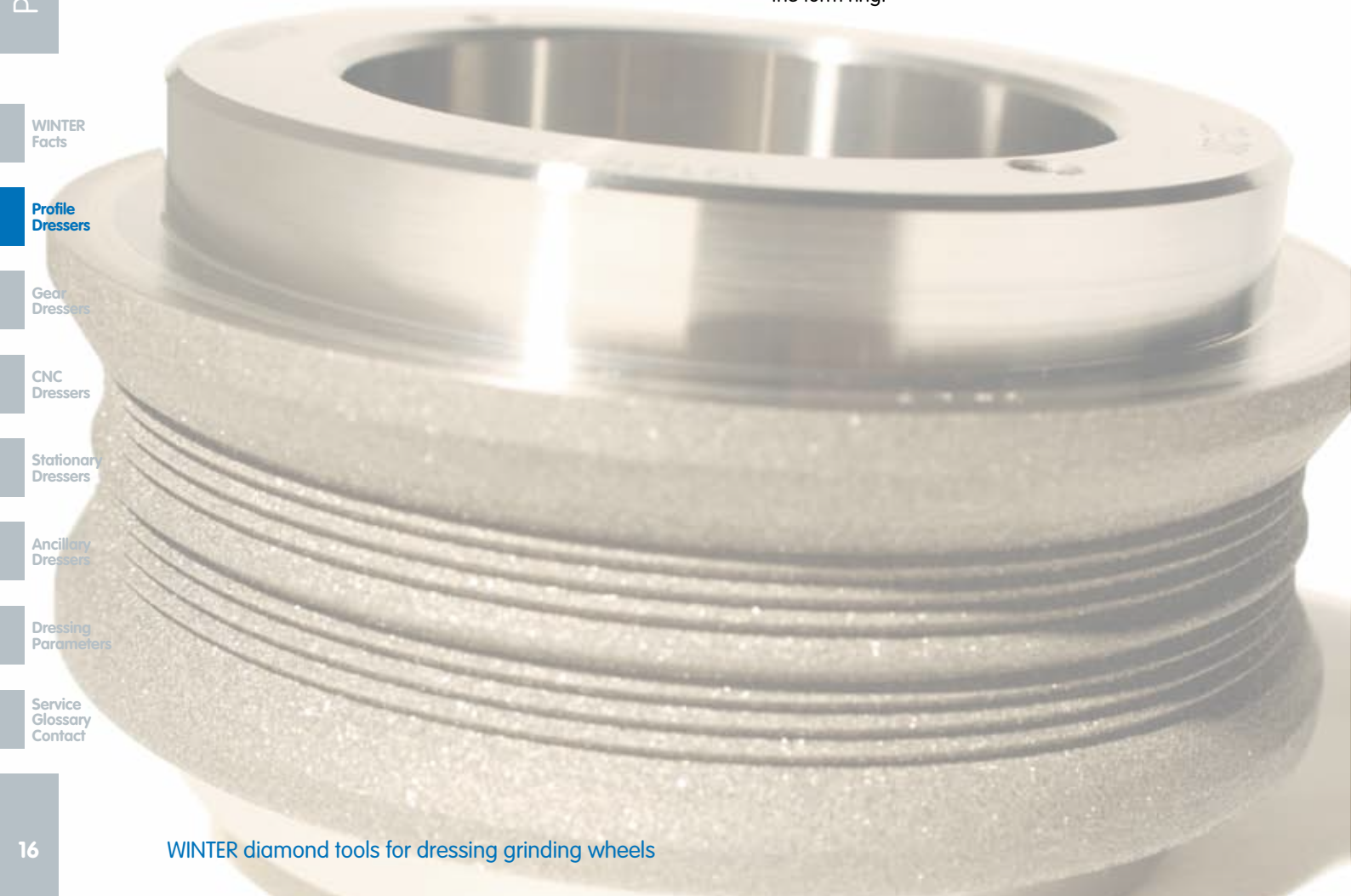
Most WINTER profile roller dressers are produced by electroplating using the reverse plating process (these are UZ rollers). The production process is illustrated on these pages.
Profile roller dressers with broader tolerances, namely those with infiltrated bonds (TS rollers) and those made by positive electroplating (SG rollers) are more robust tools.

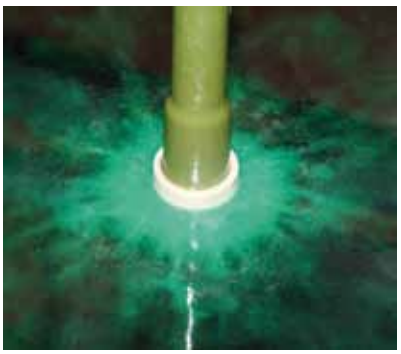
In order to be sure that the designs will work, collision scenarios are run using 3D models.

Design: Precision from the very start!
CAD drawings created in SOLID EDGE® are linked to the programs of the production and measuring machines.



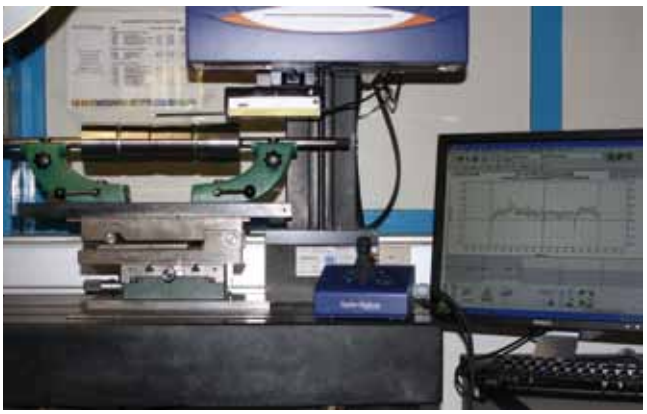
Manufacturing the form ring
Depending on the profile shape, the ring is either CNC turned, or manually plunge turned with a profile tool: the high precision profile is created on the inside diameter of the form ring.





The diamonds are secured to the ring in a galvanic bath.

This key step in the production process requires patience and technical know-how.
The correct core for the profile is then inserted and fixed to the diamond/nickel layer using a casting technique. The form ring is turned off and the bore and contact surfaces are ground.



Creating the test piece

After a grinding wheel has been profiled with the roller dresser, a test piece is ground and inspected: Does the ground test piece meet the requirements? This is where the new roller dresser proves itself for the first time.

Measuring the profile accuracy of the test pieces

Adherence to workpiece or tool drawing profile is verified on state of the art measuring machines. We work in close cooperation with our discerning customers, agreeing measuring instructions and test protocols with them and discussing their wishes concerning the measuring procedure.

Mounting the profile roller dresser

Sensitivity and a respect for detail: profile roller dressers are manually fitted onto the customer's arbor when requested – a job that we are very happy to do, since keeping to the tightest running tolerance has a crucial effect on the working life of the tool.

Using profile roller dressers

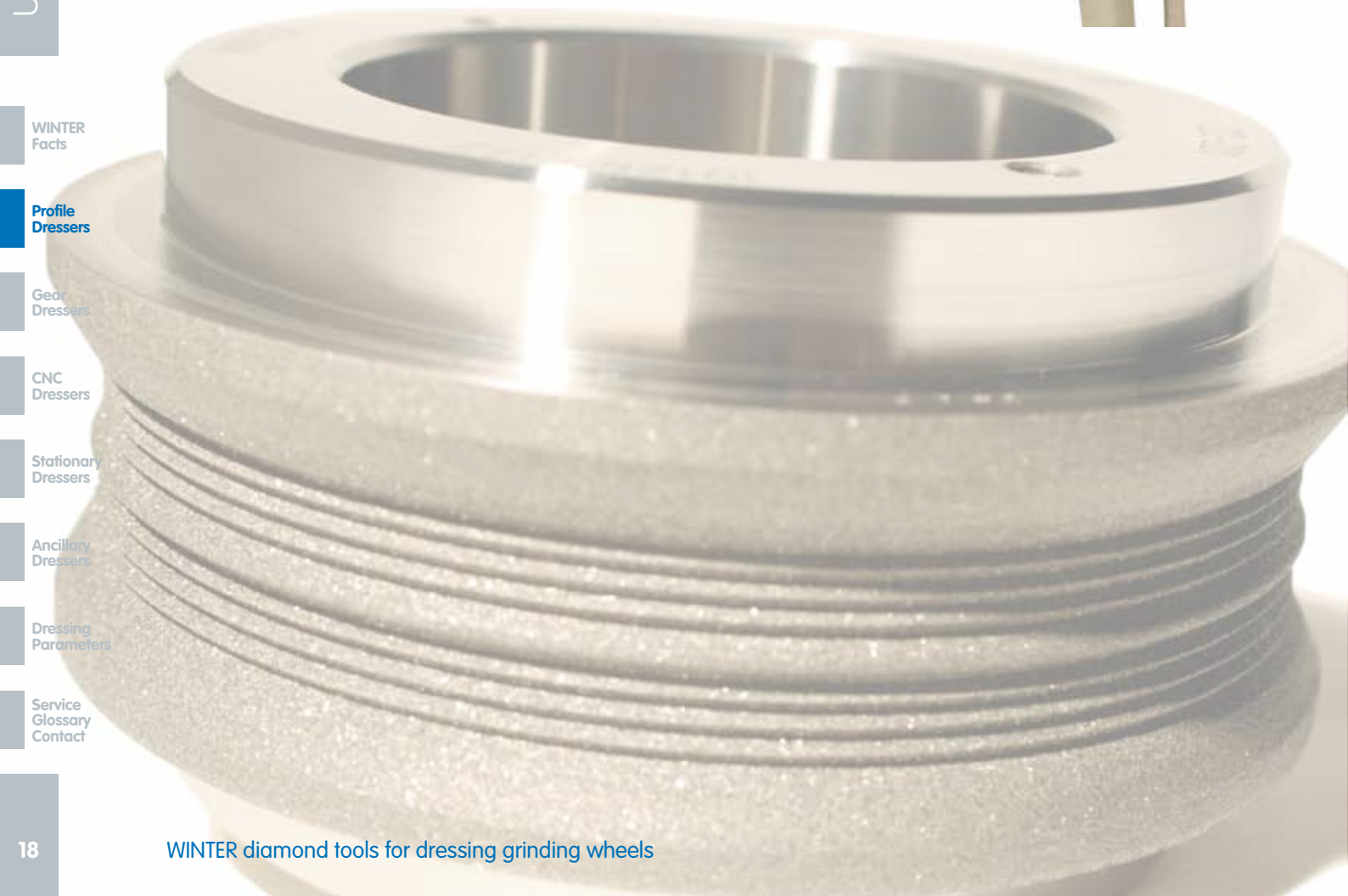
Our greatest claim is that we offer innovative solutions for our customers in the form of optimized high-performance diamond dressing tools – precisely matched to their particular needs and requirements.
Therefore in this chapter you will not find any standard articles available ex stock, but a survey of typical applications and information on feasibility and tolerances.

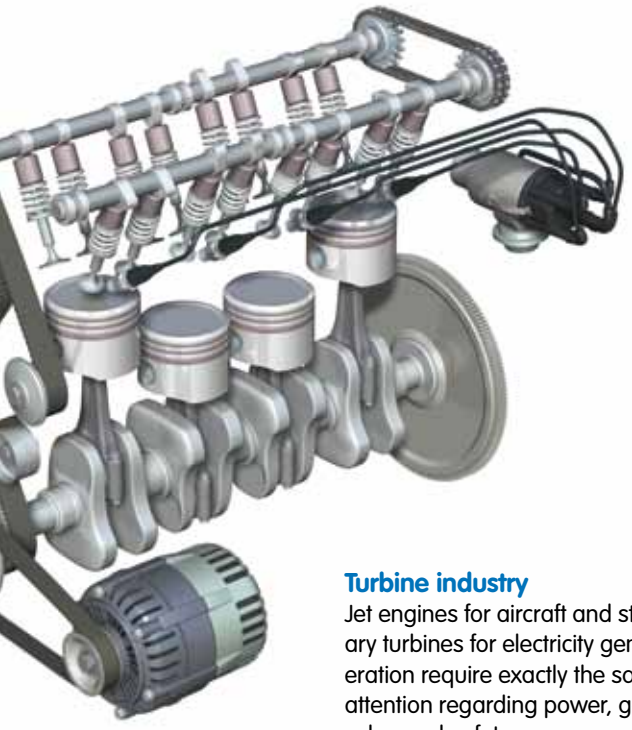
Cutting tool industry

Shorter process times are a key requirement in the cutting tool industry. WINTER profile roller dressers are the means to high precision and rapid cycle times.

Medical technology

High precision grinding and dressing are taken as a matter of course in this industry. It is therefore obvious that WINTER profile roller dressers are used here.





Automotive industry

Very many engine and drive components require the tightest tolerances – here high quality is combined with large quantities. WINTER profile roller dressers help to meet these demands.

Turbine industry

Jet engines for aircraft and stationary turbines for electricity generation require exactly the same attention regarding power, good value and safety.
You can meet the challenges of your market by using WINTER tools.

The roller bearing industry

Since a roller bearing has a large number of different components, a wide variety of demands are made on the dressing tools that are used.
WINTER profile roller dressers offer economical, highly precise dressing with excellent results.

Wind farms

Renewable energy is the challenge of the times and will characterize future markets. Continuing demands for higher efficiency require high-quality tools and partners who go all the way into the future with you.

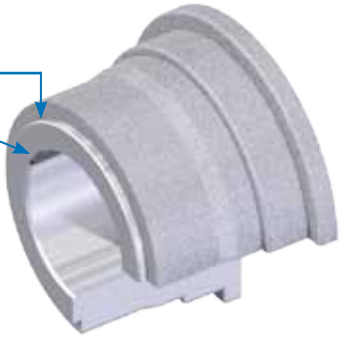
Dimensions that can be produced

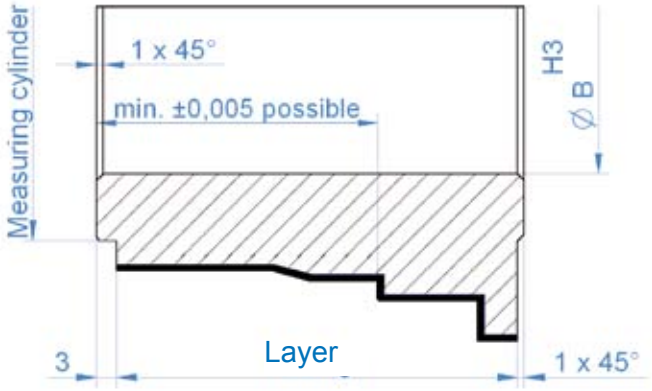
The dimensions and tolerances that can be obtained for different profiles are summarized on the next two pages. As a general rule, WINTER diamond roller dressers have a 3 mm clocking ring on one face and a 1 mm integral spacer on the other face. The measuring cylinder allows the concentricity of the mounted diamond roller dresser to be checked, as it runs to within 0.002 mm concentric to the bore and diamond coating of the roller dresser. The working strip prevents a spacer ring or flange from coming into direct contact with the diamond coating. These features add 4 mm to the width of the diamond roller dresser.

Minimum deviations

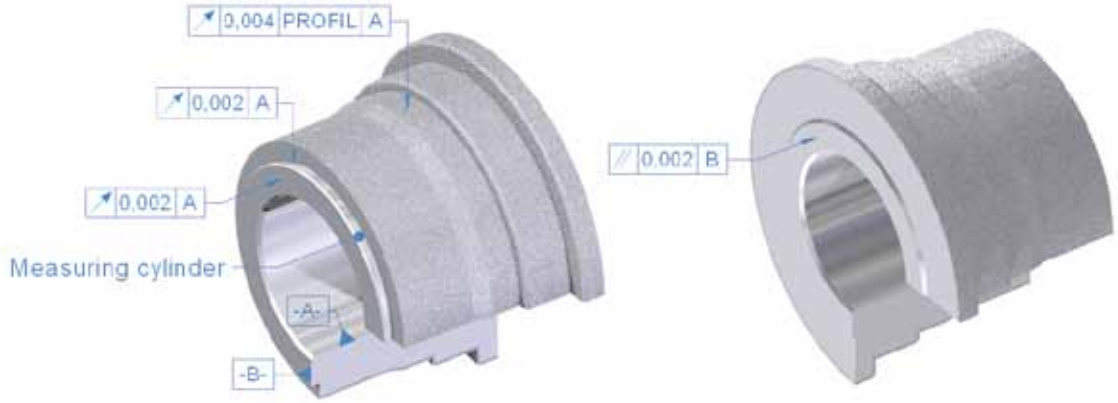
Standard tolerances

Measuring surfaces





Running tolerances



Info

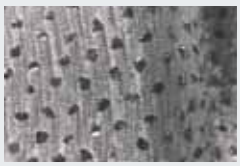
As a basic rule, the diameter of a diamond roller dresser is not dependent on the diameter of the workpiece. What matters is that the profile of the roller matches that of the workpiece.

Installation dimensions of a roller dresser:
width over diamond coating = grinding wheel width +3–4 mm
overall width of the roller dresser = diamond coating width +4 mm

Please note:
To achieve profile stability, a cylindric extension should be given to the profile edge, if the geometry is concave or tapered.

Free size tolerances to DIN ISO 7861 m

Types UZ, TS, SG

	Type	Manufacture	Bond	Grit distribution	Grit density
	UZ	Reverse process	Electroplated	Statistical	Maximum
	TS	Reverse process	Infiltrated	Statistical/ controlled	Maximum/ controlled
	SG	Positive process	Electroplated	Statistical	Maximum

UZ version

The diamond grit is statistically distributed over the surface of the profile roller dresser. The distance between the grits is determined by the grit size used. The dense coating of diamonds means that the diamond content is greater than in comparable profile roller dressers with manually applied diamonds. The manufacturing process is largely independent of the shape of the profile. Concave radii ≥ 0.03 mm and convex radii ≥ 0.08 mm are possible.

→ For use in applications with the most stringent surface and geometry requirements since this type can achieve profile accuracy of ≥ 0.8 µm.

TS version

In contrast with the UZ version, the diamonds here can also be set according to a defined pattern. This requires certain minimum diamond sizes so not all profile shapes are available in this version.
The concentration of the diamond coating can be influenced by changing the distance between the diamonds. Profile accuracy is achieved by grinding the diamond coating.
Convex and concave radii ≥ 0.3 mm are possible.
The diamond coating can be re-machined, depending on its condition.

→ For use in applications with very stringent surface and geometry requirements; profile accuracy of ≥ 2 µm can be achieved.

SG version

The diamond grit is statistically distributed. Convex and concave radii ≥ 0.5 mm are possible.

→ For use on prototypes (short delivery time but limited service life) where the surface and geometry requirements are lower; dimensional accuracy is achieved by grinding the diamond coating.

Factors that affect the service life of diamond roller dressers

The main influencing factors include:

- The rigidity of the machine and dressing device
- The runout of the roller dresser and holding fixture
- Suitable cooling during dressing
- Specification of the grinding wheel
- Dressing parameters
- Diamond pattern and grit size
- Type of roller dresser
- Dimensional and form tolerances

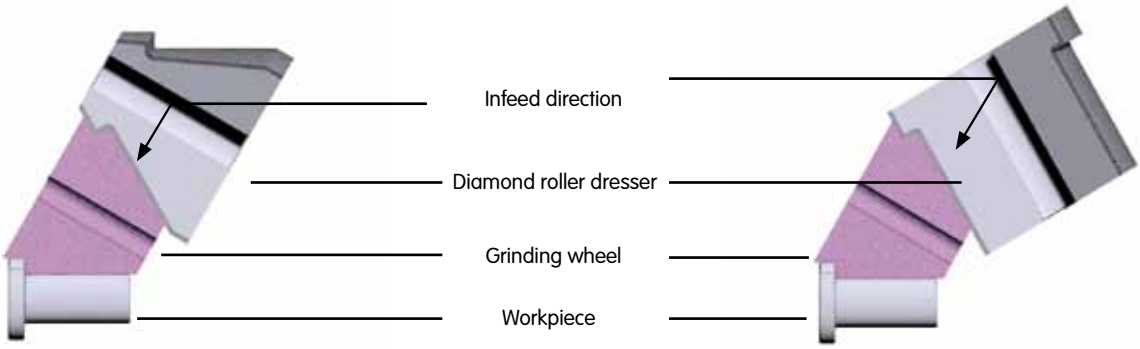
The effect on the grinding behaviour

The roller dresser – grinding wheel – workpiece arrangement

The behaviour of a grinding wheel depends on the structure and sharpness of the grit on the cutting surface and the kinematic cutting parameters as well as length and depth; it is also affected by

- The dressing parameters
- The diamond roller dresser – grinding wheel – workpiece arrangement
- The grit size used.

The effective peak-to-valley height is an important feature of grinding wheel topography. As this increases, the cutting performance of the grinding wheel and the surface roughness of the workpiece also increase.
The axial arrangements shown below for angle approach grinding are the most practical. They create a greater effective peak-to-valley height at the flat shoulders. In consequence there is less chance of burning.



The axes of the roll and the grinding wheel are parallel to each other but at an angle to the axis of the workpiece. The dressing infeed is at right angles to the grinding wheel axis.

The axes of the roll and the grinding wheel are not parallel to each other. The dressing infeed is at right angles to the grinding wheel axis. The profile of the diamond roller dresser is the same as that of the workpiece.

The roller dresser/grinding wheel speed ratio q_d, the dressing infeed per grinding wheel revolution f_{rd} and the number of spark-out revolutions n_a (i.e. the number of revolutions of the grinding wheel with no further dressing infeed) have been found to be suitable control parameters for the conditions during dressing that affect the peak-to-valley height. Further information can be found in the chapter entitled 'Dressing parameters'.

Machining conditions

Drive capacity of the dressing spindle

For dressing with diamond roller dressers, provision has to be made for relative motion between the roller dresser and the grinding wheel. This relative motion is defined as the difference between the circumferential speeds of the diamond roller dresser and the grinding wheel.

Diamond roller dressers must be mounted on a separate drive in order to generate the relative speed in the circumferential direction. The design of the drive depends on the following variables:

- The specification of the grinding wheel to be dressed
- The specification of the diamond roller dresser
- The dressing infeed
- The speeds that are required
- The type of dressing (uni-directional, counter-directional)

The required spindle drive power is typically 20 W/mm of developed roller dresser contact width. This value applies for dressing a medium-hard grinding wheel with special fused alumina in a vitrified bond.

To obtain a reproducible dressing result, the roller dresser drive must be designed in such a way that the speed ratio between the diamond roller dresser and grinding wheel is constant. If the drives are separate the grinding wheel motor output must be aligned with that of the roller dresser motor. In order to guarantee a constant speed ratio in practice, it may be necessary to install greater drive capacities in the dressing unit than those obtained using the basis of calculation referred to above.

Machine mounting

The static and dynamic rigidity of the dressing system has a crucial influence on the dressing performance. The greatest system rigidity is achieved by installing bearings on both sides of the roller dresser. The high normal forces that occur with profile roller dressers require the roller dresser to have bearings on both sides.
In order to counteract the build-up of circumferential waviness on the grinding wheel during dressing, the dressing unit must possess radial rigidity. When dressing with continuous-path controlled diamond dressing wheels, the normal forces are considerably lower. In this case bearings on one side only (flying bearings) can be considered.

Running truth and vibration

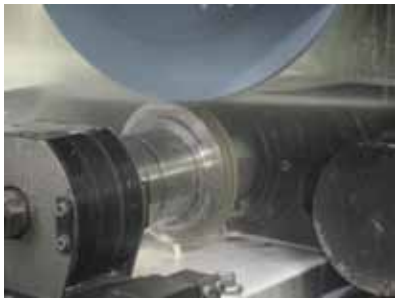
Special attention must be given to the geometric runout of the roller dresser and its balance quality. The tolerances for high precision profiles of 0.002 mm must be observed; so the radial and axial run-out of the diamond roller dresser spindle must not exceed 0.002 mm. Because of the rigidity requirements, the largest possible arbor diameter should be selected provided that it is still in proportion to the outer diameter. Bore diameters of Ø 40 to 80 mm are usual in the case of diamond roller dressers.
The required combination of tolerances between the roller dresser bore and the arbor is H3/h2. A fitting allowance of 0.003 to 0.005 mm enables the diamond roller dressers to be mounted and prevents running deviations in the diamond coating.
The most frequent sources of vibration during dressing are rotating imbalances. An important requirement, therefore, is precise balancing of the roller dresser and arbor. The natural frequencies of the dressing system should also be known. Knowing these, it is possible to select the dressing parameters so that the rotation frequencies of the dressing spindle and grinding wheel do not coincide with resonance points in the dressing unit or the overall system.

Cooling

An adequate cooling system is essential, and coolant must be applied before dressing starts. The coolant flow rate and the pressure should be exactly the same as for grinding. In the case of complex profiles, particularly those with high shoulders, the coolant nozzle must be of a suitable design.

The speed at which the coolant leaves the nozzle should be as close as possible to the circumferential speed of the grinding wheel and the jet of coolant should be directed accurately onto the point of contact.

The coolant nozzle for dressing must be mounted such that fluid is directed at the point of contact between dresser and wheel, in the direction of wheel rotation.



Optimally designed coolant nozzle grants controlled coolant jet

Contact detection

A high-precision dressing spindle is required when diamond profile roller dressers and path controlled form rolls are used to dress vitrified bonded cBN or diamond grinding wheels. A contact detection device monitors the point at which the roller dresser touches the grinding wheel and supervises the complete dressing cycle.

Contactless measurement using structure-borne noise signals which are displayed on the monitor enable dressing to be as economical as possible: this guarantees minimum loss of the grinding wheel layer together with maintenance of the maximum possible chip space.

Minimum material removal during dressing leads to a marked reduction in tooling costs. Continuous control of the dressing and grinding processes is an essential requirement for high process reliability.

For more information about contact detection please refer to chapter „Dressing parameters, contact detection".

Assembly and removal of roller dressers

1. WINTER diamond roller dressers are manufactured with bore tolerance H3 to ISO Standard.

2. The required tolerance of the holding fixture for the roller dresser is 0 to –0.002 mm.
   The maximum permissible radial and axial running error for the holding fixture is 0.002 mm.

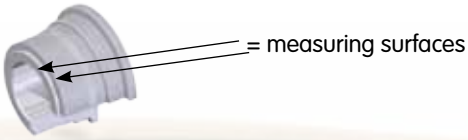
3. Absolute cleanliness is essential when mounting the roller dresser on the holding fixture.
   Do not use any lubricants. In order to facilitate assembly it is permissible to heat the roller dressers to no more than 50 °C in a water bath.
   Please note: The arbor may also be cooled. The roller dressers must not be pressed or forced onto the holding fixture.
   Obviously impact tools must not be used under any circumstances.

4. The spacer rings and bushes to be used for assembly must be < 0.002 mm plane parallel.

5. After assembly the radial and axial running of the roller dressers is determined using the measuring cylinder provided for the purpose or on the plane surfaces. Maximum permissible running deviations:

   Radial 0.002 mm

   Axial 0.002 mm



6. When removing diamond roller dressers the roller dresser/arbor unit must be cooled down. Subsequently the roller dresser exclusively may be heated in warm water to 50 °C maximum.

7. Before the first dressing operation the position of the dressing coolant nozzle must be checked and adjusted if necessary.
   Please note: The coolant nozzle for dressing must be mounted in the direction in which the grinding wheel rotates. Dressing without coolant leads to premature destruction of the roller dressers. The design of the coolant nozzle for deep profiles should be adapted to the profile of the roller dresser.

8. **Please note:** The static roller dresser must not come into contact with the rotating grinding wheel as this will destroy its profile.

Troubleshooting

Symptom:	Cause and corrective action:
1. Machine generates increased noise when dressing	Imbalance or radial runout of the diamond roller dresser or grinding wheel, or excessive dressing forces.
1.1. Constant dressing noise	a) Correct imbalances and/or runout b) Change direction of rotation from uni-directional to counter-directional c) Reduce dressing feed
1.2. Louder at the start, then gradually fading	Arrangement is not rigid enough Reduce dressing forces (see 1.1)
2. Workpiece profile deviates from target	a) Grinding wheel too soft: Grinding wheel profile collapses b) Grinding wheel too hard: excessive grinding pressure
3. Workpiece shows chatter marks	Machine vibrations caused by: a) Inadequate bearing arrangement for the grinding spindle or holding fixture b) Inadequate rigidity of the machine or dressing unit c) Insufficient dressing spindle driving power d) Radial runout of the diamond roller dresser is too high
4. Deviating width dimension at slots or ribs	a) Axial play in the grinding spindle or holding fixture bearings b) Diamond roller dresser has axial run out
5. Burn marks on workpiece	a) Insufficient coolant supply (pressure, flow rate or nozzle position) b) Unsuitable grinding wheel structure and hardness c) Unsuitable workpiece – grinding wheel – diamond roller dresser arrangement d) Spark-out time too long, dressing feed too short e) Unsuitable speed ratio q_d selected
6. Increased surface waviness and peak-to-valley height	a) Worn diamond coating on roller dresser b) Contaminated coolant c) Insufficient sparking out time when grinding

Checklist

Customer: _____

Customer no.: _____

Machine:

Machine type: _____

Current dressing tool: _____

Dressing unit:

Arbor diameter (mm): _____

Arbor length (mm): _____

Workpiece:

Workpiece drawing:
(If available, file in .dxf, .dwg, .pdf or .tif format)

Surface finish desired: _____

Grinding allowance (mm / Ø): _____

Grinding wheel:

Specification: _____

Dimensions: _____

Diamond roller dresser:

Greatest diameter allowed by the machine: _____

Greatest roller dresser width allowed by the machine: _____

Parameters:

Grinding wheel circumferential speed (m/s)
or speed (rpm): _____
Circumferential speed of roller (m/s)
or speed (rpm): _____

Counter-directional or Uni-directional at point of contact: _____

Radial infeed per dressing pass (a_{ed}): _____

Angular/straight plunge grinding: _____

Spark-out time/revolutions: _____

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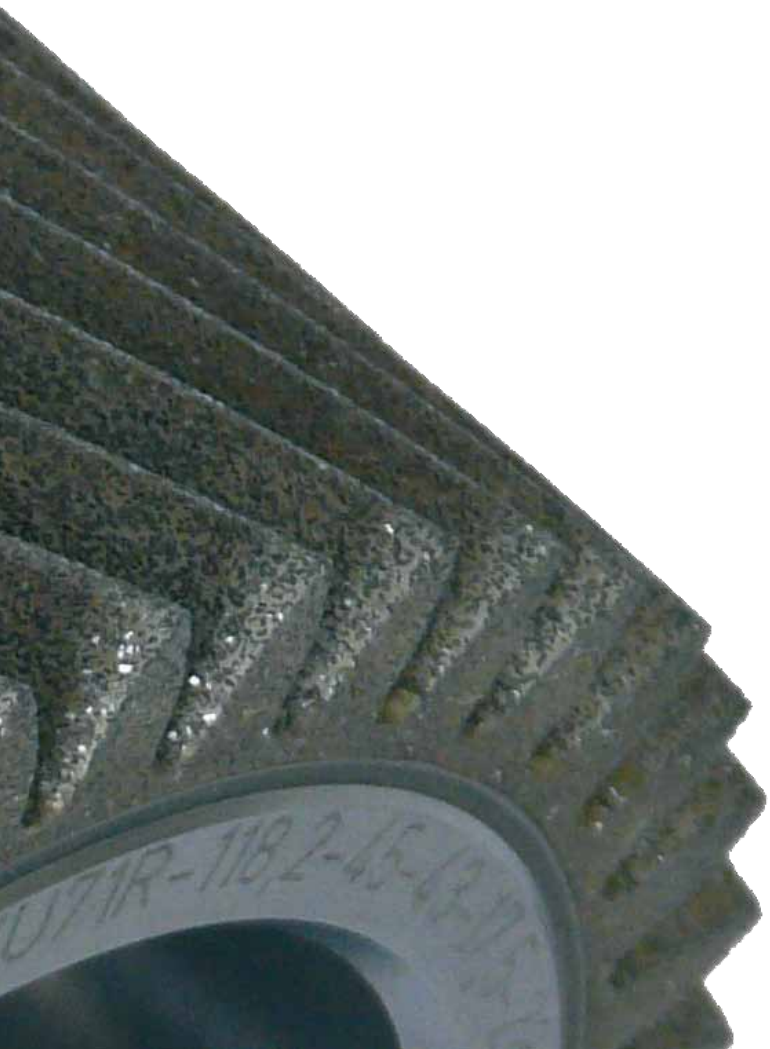
Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Dressing tools for the machining of gear teeth

High precision dressing tools are essential for accurate profiling and sharpening of grinding worms and honing rings. They determine the quality of the finished gears.

WINTER rotary diamond dressing tools for gear generation and honing are matched to individual needs and specifications. Therefore in this chapter you will not find any standard articles available ex stock, but a survey of

- Rotary single- and twin-taper dressers with plain roller dressers
- Full-profile roller dressers for small modules
- Roller dresser sets
- Plated gear tools (positive electroplated or produced with the double reverse plating process).



Manufacturing process

Dressing tools for continuous generating grinding

	Type	Manufacture	Bond	Grit distribution	Grit density
	HP	Positive process	Electroplated	Statistical	Maximum
	VU	Reverse process	Electroplated	Statistical	Maximum

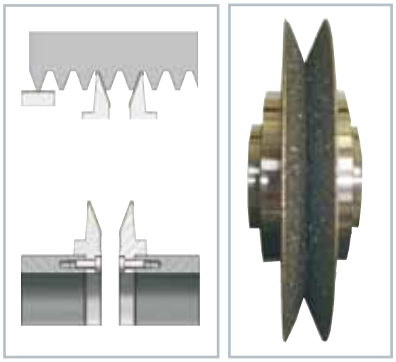
Plated gear tools for honing and continuous generating and profile grinding

	Type	Manufacture	Bond	Grit distribution	Grit density
	SG	Positive process	Electroplated	Statistical	Maximum
	VU	Double reverse process	Electroplated	Statistical	Maximum

Dressing tools

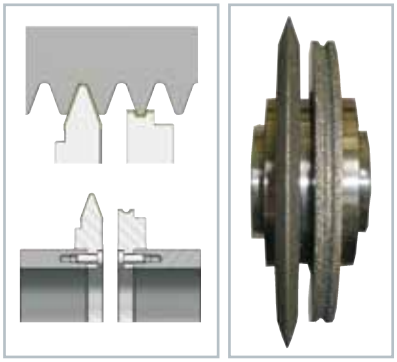
Continuous generating grinding

Single-taper dressing wheels (HP)



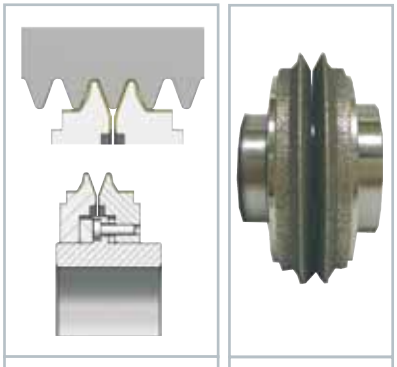
- Excellent, highly versatile tool design
- Dressing wheels are used in pairs, each with its own powered dressing spindle
- Dressing wheels can be independently angled and the optimum positioning of the dressing tools guarantees the highest gear quality
- The pitch of the grinding worm can be adjusted by changing the distance between the dressing wheels
- The profile depth of the grinding worm can be individually selected
- Can be used across different modules, if required
- Tooth root grinding can be integrated using additional design features
- Tools can be regenerated by regrinding or replating the body

Twin-taper dressing wheels and chamfering rolls (HP or VU)



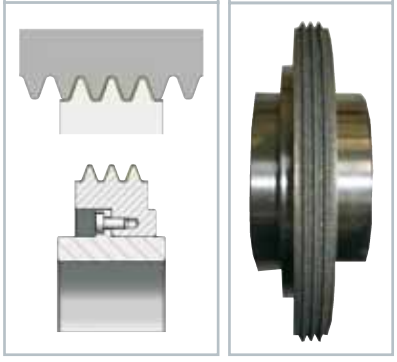
- A very good tool design where tooth root machining is required
- For small modules (< 1.5) we recommend the use of reverse electroplated profile roller dressers
- For larger modules (> 1.5) we recommend the use of positive electroplated profile roller dressers
- Both these dressing tools can be used with separately powered working spindles
- The positioning of the individual tools can be individually adjusted, but their design is dependent on the workpiece
- Positive electroplated (HP) tools can be regenerated by regrinding or replating the body

Roller dresser sets for single-pass dressing (HP)



- A very good tool design where tooth root machining is required
- Various roller dresser set configurations are available to optimize dressing paths and therefore allow shorter dressing times
- Dressing set designs are specific to each workpiece and are used on individually powered working spindles
- Proven rapid setup and tool change times
- Small module roller dresser sets can be reinforced at the tip diameter
- Tools can be regenerated by regrinding or replating the body

Full profile roller dressers (VU)



- An excellent tool design with low setup requirements
- Particularly suitable for module ranges < 1.5
- The full profile roller dresser is basically used as an individual tool on a powered dressing spindle
- For single-pass and multi-pass dressing
- The design of each tool is specific to that of the workpiece
- Tooth root grinding is normally used
- Tools cannot be regenerated by regrinding or replating the body

Honing processes, continuous gear grinding and profile grinding

Tooth flank honing

Honing hardened gear teeth is a powerful fine machining process with low cutting speeds.
The cross-axis angle between the gear and the honing ring causes relative motion at an angle from the tooth tip and root towards the pitch circle.
Because of the curved machining marks and surface structure produced, noise production in use is reduced.
There is no possibility of thermal degradation of the tooth flanks because of the low cutting speeds, which also induce a residual compressive surface stress.

In tooth flank honing there is a distinction between structural honing and power honing:
Structural honing, with low material removal, follows gear grinding and generally only changes the surface structure.
Power honing does away with the need for preliminary grinding because of its high metal removal rate.

Source: Gleason-Hurth

Continuous profile grinding

In continuous profile grinding on Reishauer RZF and RZP gear grinding machines the profile of the globoid grinding worm is created with a diamond dressing wheel. Line contact in this process enables a high rate of material removal.

Continuous hob grinding

In continuous hob grinding the shape of the involute is generated by rolling the rack-shaped profile of the cylindrical grinding worm over the workpiece. The profile of the grinding worm can be generated with a variety of dressing tools. The gear is used to make a rack-like profile for the dressing tools. The profile is created in the grinding worm by diamond dressing wheels, single-taper and twin-taper dressing wheels and single-pass dressing sets.

Machining bevel gears

With the WINTER and NORTON brands, Saint-Gobain has an optimally matched product range for grinding spiral and hypoid bevel gears.

For grinding bevel gears, Klingelnberg and Gleason-Pfauter machines are typically used.
With grinding cups and the corresponding rotary dressing tools, Saint-Gobain offers a comprehensive grinding process solution:

- Vitrified bonded WINTER cBN grinding cup wheels
- NORTON grinding cup wheels made from special fused alumina or sintered corundum
- Rotary WINTER dressing tools matched to the grinding cups

Source: Klingelnberg

Complete solutions

External cylindrical grinding, bore grinding and top-and-bottom grinding operations

The best solutions for these applications are
- NORTON conventional grinding tools and wheels
- WINTER electroplated or vitrified bonded diamond/cBN grinding wheels
- WINTER diamond dressing tools.

Gear grinding

Gear grinding tasks are best done with
- NORTON conventional grinding wheels, grinding worms and grinding cup wheels
- WINTER electroplated or vitrified bonded diamond/cBN grinding wheels and cup wheels
- WINTER diamond dressing tools.

Checklist

for the manufacture of a new dressing tool for grinding worms

Customer / customer no.: _____

Machine / dresser: _____

Design data:

☐ Workpiece drawing/diagrams with tolerances and flank assignment shown – by post or email (.dxf, .dwg, .pdf or .tif format)

☐ Diagram of flank lines and profile modifications with all data and tolerances for traction flank and thrust flank

☐ Traction flank and thrust flank assignment on the tool specified where profile modification differs on each flank

Profile crowning	C_h = _____
Profile angle deviation	fH_α = _____
Tip relief	C_a = _____
Tip relief start diameter	d_{ca} = _____
Crowning	C_b = _____
Tooth trace angle deviation	fH_β = _____

☐ Tooth root is ground

Tool tip radius roh_{fp} = _____

and/or

Fillet radius r_f = _____

☐ Tool tip height h_{ap} = _____

☐ Drawing requested for approval

Gear data:

Normal module	m_n = _____
Number of teeth	z = _____
Pressure angle	α_n = _____
Helix angle and direction	β = _____
Tip diameter	d_a = _____
Root diameter	d_f = _____
Usable tip circle diameter	d_{Na} = _____
Usable root circle diameter	d_{Nf} = _____
Surface quality required	R_a/R_z = _____
Diametric two-ball/two-roller measurement	M_{dk}/M_{dr} = _____
Measuring ball Ø and/or measuring roller Ø	D_M = _____
or	
Base tangent length	W_k = _____
Number of measuring teeth	k = _____
or	
Normal tooth thickness	S_n = _____

Correction undertaken on the machine:

Pressure angle		α_n = _____
Module		m = _____
Grinding worm: Dimensions	☐ Right-hand	= _____
Number of threads	☐ Left-hand	= _____

Specification used at the time _____

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Checklist

for the manufacture of a new dressing tool for honing rings

Customer / customer no.: _____

Machine / dresser: _____

Honing process:

☐ Structural/surface honing (approx. 10 µm removal/flank) Preprocessing: hard shaving/grinding

☐ Power honing (> 30 µm removal/flank) Preprocessing: milling

Loading:

☐ Automatic ☐ Manual loading

Design data:

☐ Workpiece drawing/diagrams with tolerances and flank assignment shown – by post or email (.dxf, .dwg, .pdf or .tif format)

☐ Diagram of flank lines and profile modifications with all data and tolerances for traction flank and thrust flank (also showing the traction flank and thrust flank assignment on the tool)

Profile crowning	Ch = _____
Profile angle deviation	fH_{α} = _____
Tip relief	C_a = _____
Tip relief start diameter	d_{ca} = _____
Crowning	C_b = _____
Tooth trace angle deviation	fH_{β} = _____

☐ Workpiece position definition (machine/measurement/flank assignment)

☐ Drawing requested for approval

Gear data:

Normal module	m_n = _____
Number of teeth	z = _____
Pressure angle	α_n = _____
Helix angle and direction	β = _____
Tip diameter	d_a = _____
Root diameter	d_f = _____
Usable tip circle diameter	d_{Na} = _____
Usable root circle diameter	d_{Nf} = _____
Surface quality required	R_a/R_z = _____
Diametric two-ball/two-roller measurement	M_{dk}/M_{dr} = _____
Measuring ball Ø and/or measuring roller Ø	D_M = _____
or	
Base tangent length	W_k = _____
Number of measuring teeth	k = _____
or	
Normal tooth thickness	S_n = _____

Honing ring:
(only in addition for repeat orders)

Coating/grit size
☐ D91 ☐ D126 ☐ D151 ☐ D181 ☐ _____
Cutting material _____
Dimensions _____

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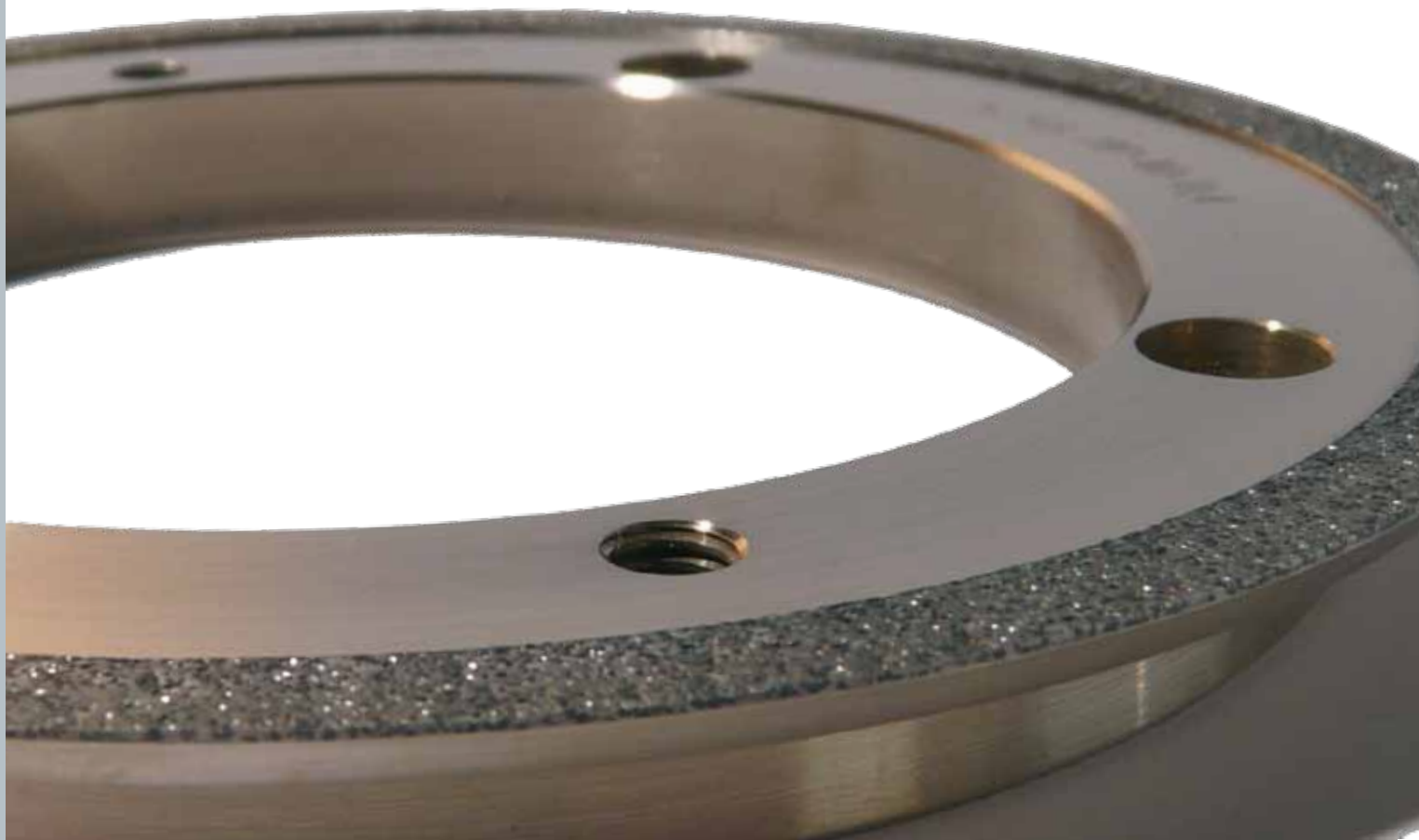
CNC Dressing Discs



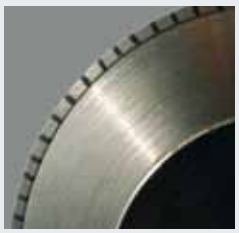
Contour controlled dressing tools enable complex grinding wheel profiles to be dressed as well as simple cylindrical grinding wheels of differing widths. In addition it is possible, by specifying the dressing tool and selecting the individual dressing parameters, to influence the dressing result and thereby the quality of the workpiece.

The advantages of contour controlled dressing discs are

- A versatile dressing tool
- Design is not specific to individual workpieces
- Constant effective dressing width
- Automation of the dressing process
- Reproducable high precision with low workpiece rejects

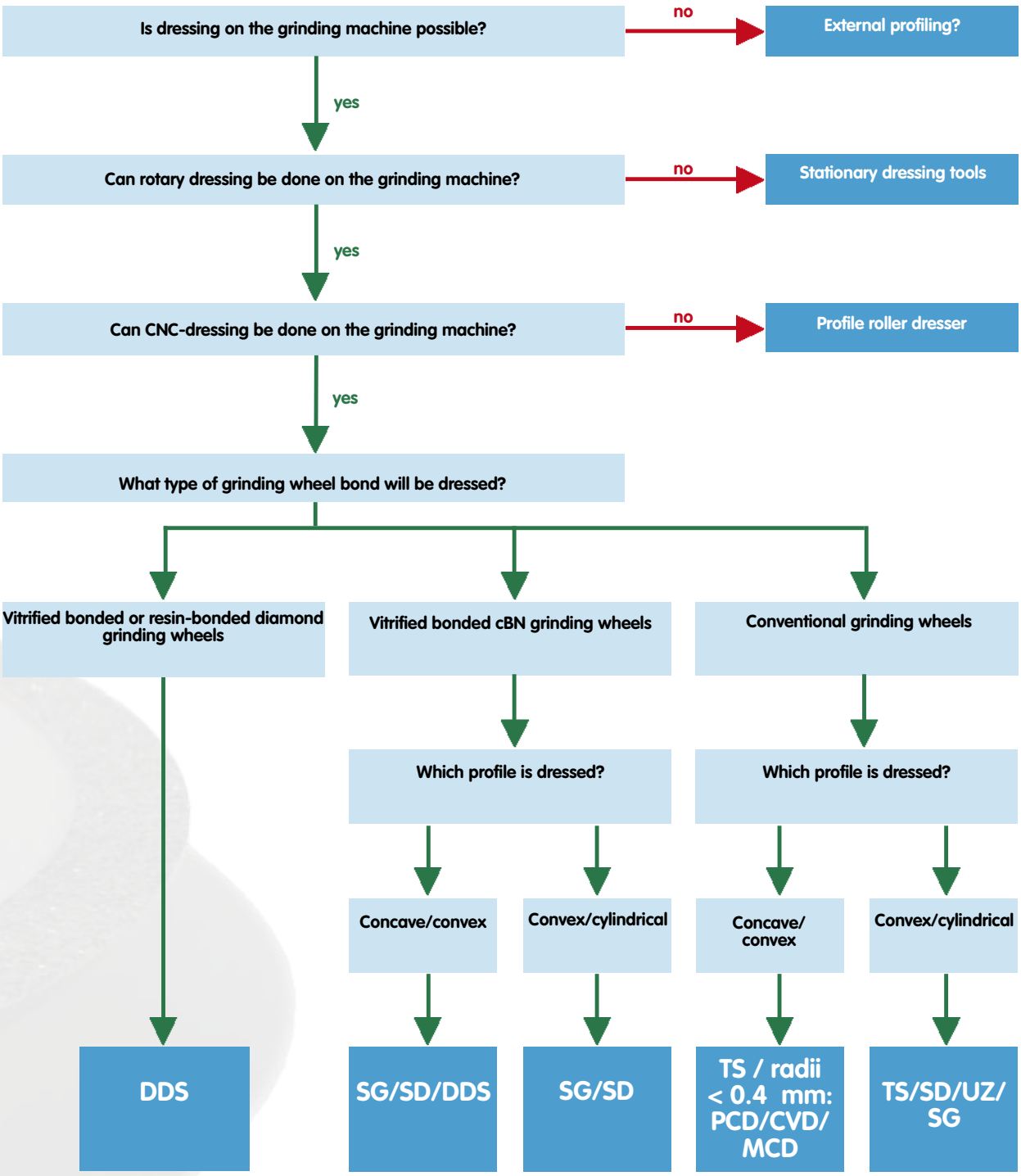
Manufacturing process

Types of rotary CNC dressing discs

	Type	Manufacture	Bond	Grit distribution	Grit density
	SG	Positive process	Electroplated	Statistical	Maximum
	TS	Reverse process	Infiltrated	Controlled or statistical	Controlled or maximum
	PCD/CVD/ MCD	Reverse process	Infiltrated	Controlled	Controlled
	SD	Positive process	Sintered	Statistical	Controlled
	UZ	Reverse process	Electroplated	Statistical	Maximum
	DDS	Positive process	Sintered	Controlled	Controlled

Which one to choose?

This diagram is intended to assist technical users in the selection of the correct dressing tool. The selection does not depend just on the machine settings and grinding wheel specification, but also on the geometry to be dressed and the surface finish to be achieved on the workpiece. This aid is no more than a rough guideline and recommendation.
A selection for a particular application may be arrived at by discussing it with our product managers and sales personnel.



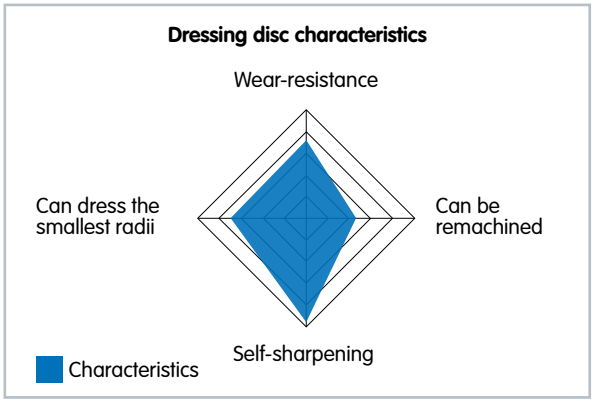
Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

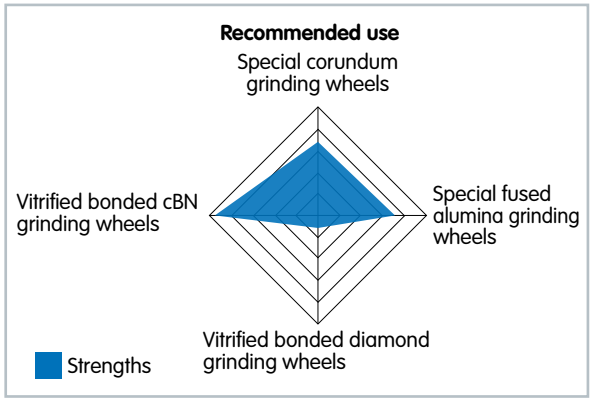
SG dressing discs

General

Positive electroplated SG dressing discs have been established in the market for many years. They are characterized by a single layer of diamonds arranged radially and therefore have a constant effective dressing width b_d.
Versions are available in either steel or bronze bodies.

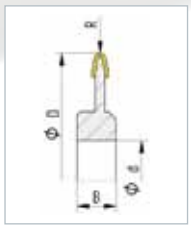
Applications:
- → Dressing vitrified bonded cBN grinding wheels
- → Dressing all conventional grinding wheels

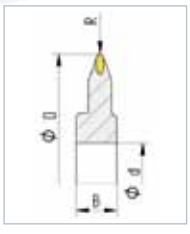


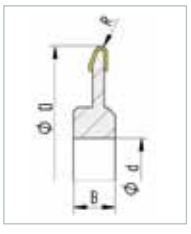


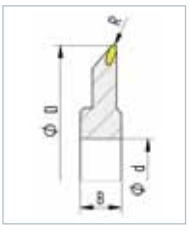
Advantages:
- Statistical diamond distribution gives maximum diamond concentration
- Exceptional running truth accuracy achieved through the finish of the diamond coating
- Constant diamond layer widths due to single-layer of diamond particles
- Minimum radius R = 0.10 mm depending on diamond grit
- Wide variety of versions can be supplied for all dressing applications and machines
- Standard dressing discs can be supplied from stock
- Max. outer diameter 340 mm, H3 bore

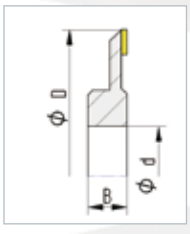
Some of our designs:

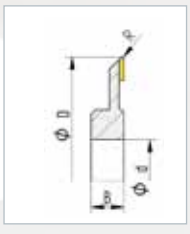

SG 10

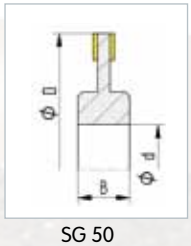

SG 10 N

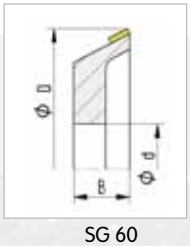

SG 20

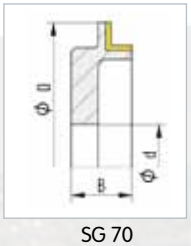

SG 20 N

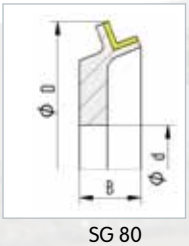

SG 40


SG 40 R


SG 50


SG 60

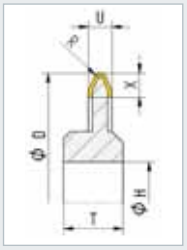

SG 70

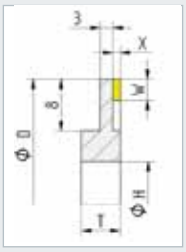

SG 80

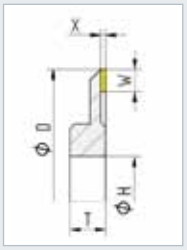

SG 90

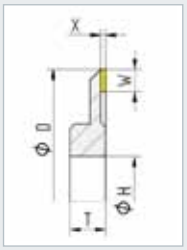

SG99

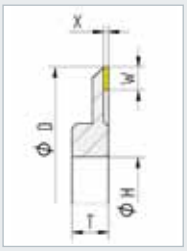
Range of SG dressing discs in stock

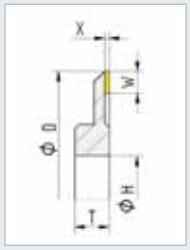
SG 10	Design code	D	U	X	T	H	Bore tol-erance	Grit size	Body	Order number	Comment
	300SG71P	100	2.4	2.5	15	40	H3	D426	Steel	60157698782	R = 1.2
	Machine: e.g. Studer Applications: Dressing conventional grinding wheels Delivery: Ex stock										

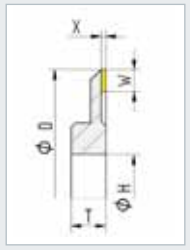
SG 40	Design code	D	X	W	T	H	Bore tol-erance	Grit size	Body	Order number	Comment
	302SG71P	100	0,6	5	20	25	H6	D602	Bronze	00310337534	Semi-manu-factured part
	310SG71P	120	0,6	5	20	25	H6	D602	Bronze	00310337535	Semi-manu-factured part
	305SG71P	150	0,6	5	20	25	H6	D602	Bronze	00310337536	Semi-manu-factured part
	Machine: Universal application —> after suitable adaptation of the body can be used on all machines (e.g. bores 40, 52, 56 mm etc.) Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock, 2 weeks for adapting the bore, body width and fastening holes if necessary										

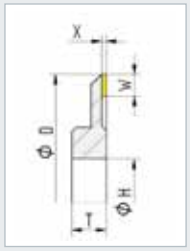
SG 40	Design code	D	X	W	T	H	Bore tol-erance	Grit size	Body	Order number	Comment
	5SG71P	110	0.4	5	10.5	75	H3	D426	Steel	66260136400	
	Machine: e.g. Junker Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

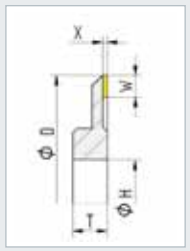
SG 40	Design code	D	X	W	T	H	Bore tol-erance	Grit size	Body	Order number	Comment
	2SG71P	110	0.4	5	10	75	H3	D426	Bronze	66260372485	
	Machine: e.g. Junker Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

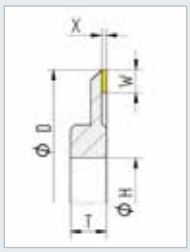
SG 40	Design code	D	X	W	T	H	Bore tol-erance	Grit size	Body	Order number	Comment
	SG71P	110	0. 8	5	10.85	75	H3	D852	Bronze	66260129200	
	Machine: e.g. Junker Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

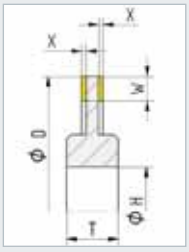
SG 40	Design code	D	X	W	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	306SG71P	120	0.4	5	19	52	H3	D426	Steel	66260347760	Case-hardened bore
	Machine: e.g. Landis Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

SG 40	Design code	D	X	W	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	1SG71P	130	0.6	10	12	50	H3	D602	Steel	66260116525	
	Machine: e.g. Schaudt Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

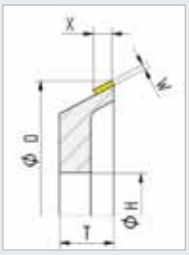
SG 40	Design code	D	X	W	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	1SG71P	140	0.6	5	12	50	H3	D602	Bronze	66260334649	
	Machine: e.g. Schaudt Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

SG 40	Design code	D	X	W	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	302SG71P	140	0.6	5	12	50	H3	D602	Steel	69014159716	Hardened body
	Machine: e.g. Schaudt Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

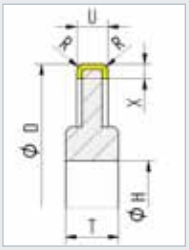
SG 40	Design code	D	X	W	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	303SG71P	150	0.4	5	19	52	H3	D426	Steel	66260355740	Case-hardened bore
	Machine: e.g. Landis Application: Dressing of conventional and vitrified bonded cBN grinding wheels Delivery: Ex stock										

SG 50	Design code	D	X	W	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	SG71P	150	1.2	10	50	56	H3	D602	Steel	66260132775	Case-hardened bore

Machine: e.g. Naxos
Application: Dressing of conventional and vitrified bonded cBN grinding wheels
Delivery: Ex stock

SG 60	Design code	D	W	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	SG71P	110.8	0.8	8	18	75	H3	D852	Steel	66260127188	

Machine: e.g. Junker
Application: Dressing of conventional and vitrified bonded cBN grinding wheels
Delivery: Ex stock

SG 99	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	SG71P	173	3	3	16	50	H3	D602	Steel	66260131884	R = 0.3 / ∢ 3°*

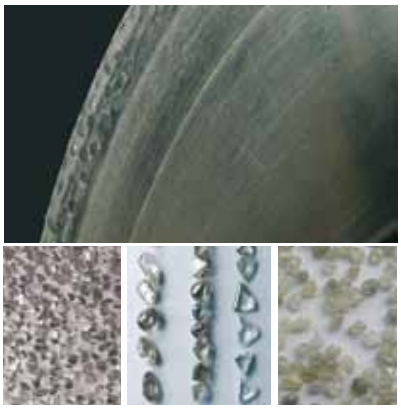
Machine: e.g. Schaudt
Applications: Dressing conventional grinding wheels
Delivery: Ex stock

* This refers to the conicity of the outer diameter

TS dressing discs

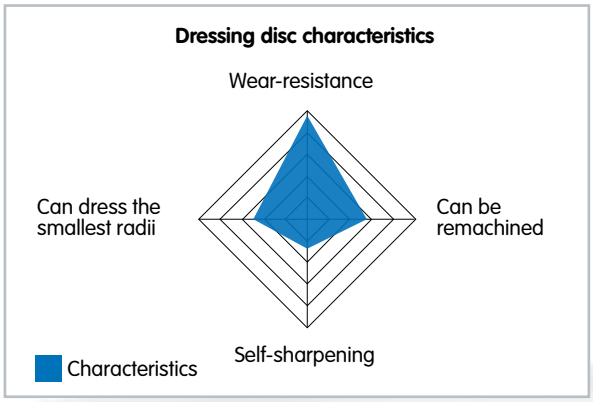
General

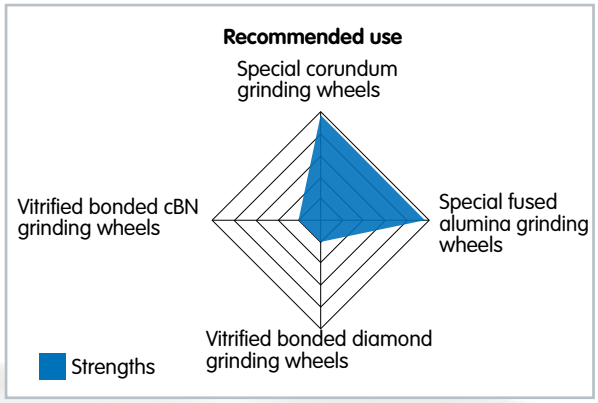
Infiltrated dressing discs are characterized by high wear resistance and consist of a single-layer diamond coating.
Edge reinforcements can be used to increase the wear resistance.



Applications:

→ Dressing all conventional grinding wheels

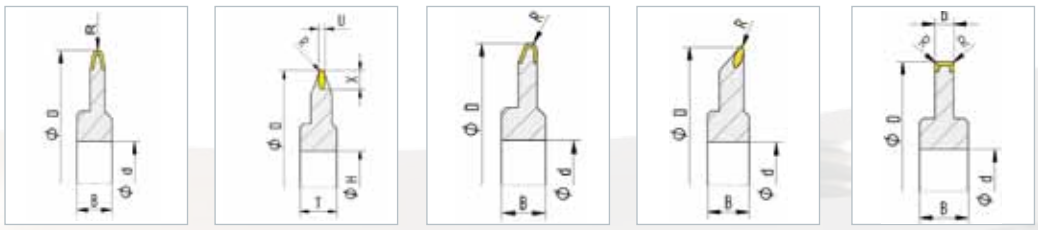




Advantages:

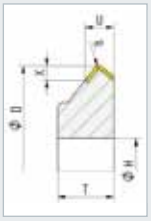
- Both random and controlled diamond concentration
- Extremely high accuracy as the diamond coating is ground
- Individually selected diamonds reinforce small radii
- Radii of less than R = 0.4 mm have needle diamonds
- Minimum radius R = 0.1 mm for an internal angle of 30°
- Minimum coating thickness B = 2 mm with minimum edge radius R = 0.2 mm
- Max. outer diameter 340 mm, H3 bore

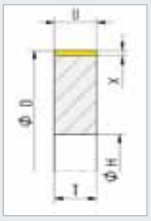
Some of our designs:

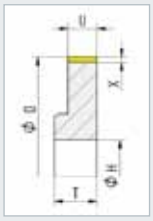


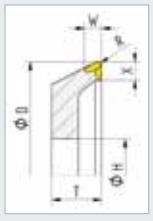
TS 10 | TS 10 N | TS 20 | TS 20 N | TS 30

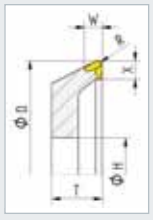
TS dressing discs held in stock

TS 20	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	TS71P	140	3.4	2.6	20	60	H3	D602	Steel	66260387514	R = 0.3
	Machine: e.g. Buderus Applications: Dressing conventional grinding wheels Delivery: Ex stock										

TS 30	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	TS71Z	65	8	0.8	8	43	H3	D852	Steel	66260382820	Cylindrical
	Machine: e.g. Giustina Applications: Dressing conventional grinding wheels Delivery: Ex stock										

TS 30	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	2TS71P	85	10	0.8	13	43	H3	D852	Steel	66260381629	Cylindrical
	Machine: Universal Applications: Dressing conventional grinding wheels Delivery: Ex stock										

TS 60 N	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	UTS71P	50	3	3	25	20	H3	Needles	Steel	66260388125	R = 0.4
	Machine: e.g. Buderus Applications: Dressing conventional grinding wheels Delivery: Ex stock										

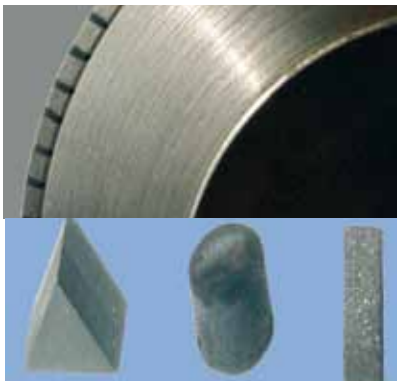
TS 60 N	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	TS71P	100	3	3	21	40	H3	Needles	Steel	69014181275	R = 0.5
	Machine: e.g. Klingelnberg Applications: Dressing conventional grinding wheels Delivery: Ex stock										

PCD/CVD/MCD dressing discs

General

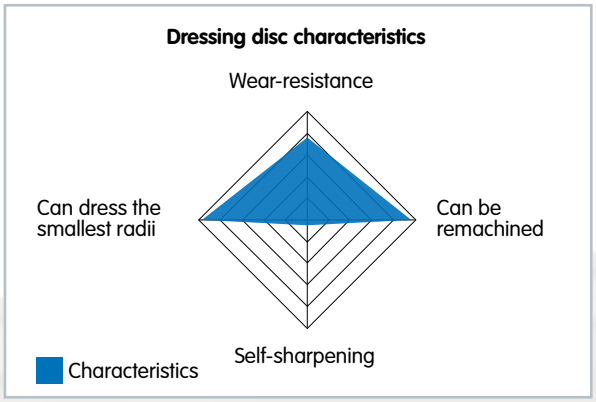
Infiltrated versions of CNC dressing discs, with PCD, CVD or MCD rods are particularly suitable for dressing very small radii.

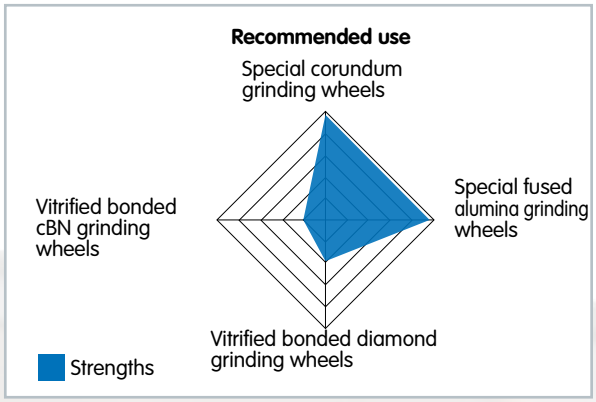
The design enables the dressing discs to be reworked a number of times.



Applications:

→ PCD for dressing grinding wheels with special fused alumina
→ CVD or MCD for dressing grinding wheels with sintered corundum (TG/SG/XG etc.)

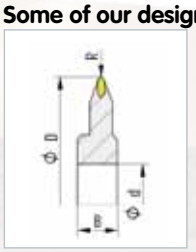


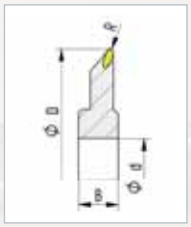


Advantages:

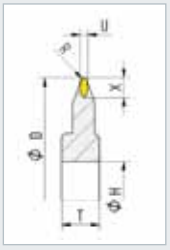
- Controlled concentration
- Extremely high accuracy as the diamond coating is ground
- Can be reprofiled many times
- Minimum radius with an internal angle:
  R = 0.05 mm for a minimum angle of 35°
  R = 0.10 mm for a minimum angle of 25°
- Minimum layer thickness and corner radius for cylindrical version:
  B = 0.5 mm
  R = 0.05 mm
- Max. outer diameter 340 mm, H3 bore

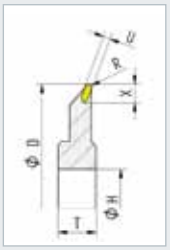
Some of our designs:


TS 10 N


TS 20 N

Designs with CVD held in stock

TS 10 N	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	YTS71P	100	0.71	1.5	12	40	H3	CVD	Steel	60157698362	R = 0.10 ⊀ 40°
	Machine: Applications: Delivery:	e.g. Studer Dressing conventional grinding wheels Ex stock									

TS 20 N	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	YTS71P	100	0.67	1.5	12	40	H3	CVD	Steel	60157698367	R = 0.25 ⊀ 40°
	YTS71P	100	1.07	1.5	12	40	H3	CVD	Steel	60157698368	R = 0.50 ⊀ 40°
	YTS71P	120	0.67	1.5	12	40	H3	CVD	Steel	60157698370	R = 0.25 ⊀ 40°
	YTS71P	120	1.07	1.5	12	40	H3	CVD	Steel	60157698369	R = 0.50 ⊀ 40°
	Machine: Applications: Delivery:	e.g. Studer Dressing conventional grinding wheels Ex stock									

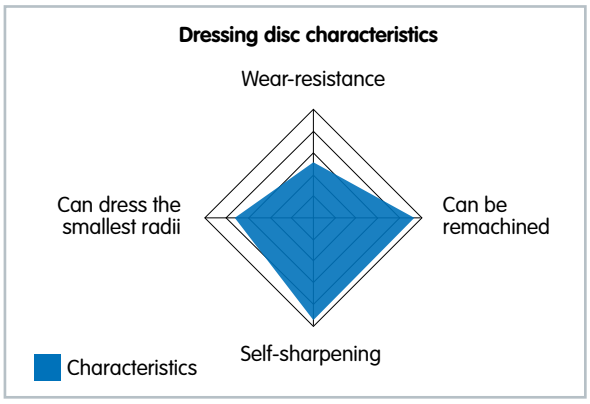
SD dressing discs

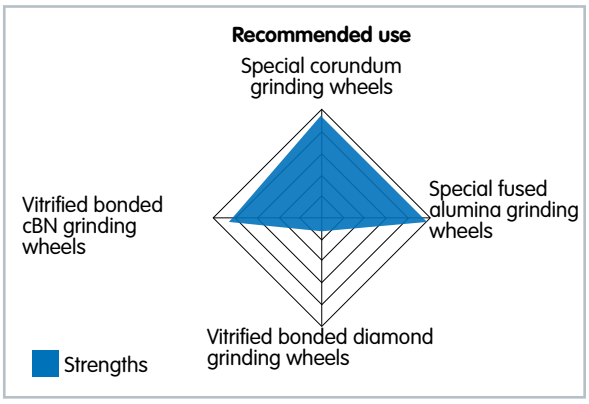
The metal-bonded SD dressing disc consists of a multi-layer coating that can be reground and sharpened many times.

These dressing discs are highly suitable for centreless cylindrical process applications with very fine surface requirements.

Applications:

→ Dressing vitrified bonded cBN grinding wheels
→ Dressing all conventional grinding wheels

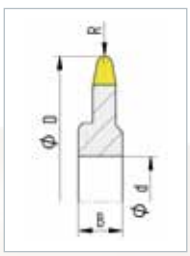


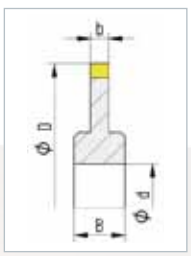


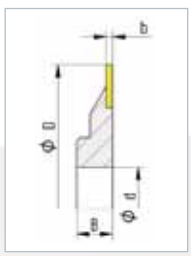
Advantages:

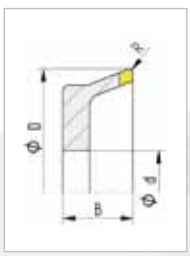
- Statistical diamond distribution
- Controlled diamond concentration
- Extremely high accuracy as the diamond layer is ground
- Wide variety of versions for all dressing applications and machines
- Constant effective dressing width b_d depending on the design
- Can be reprofiled and sharpened many times
- Multi-layer coating
  - Minimum layer width 0.8 mm (cylindrical only)
  - Max. outer diameter 150 mm
  - Max. usable coating thickness 10 mm

Some of our designs:


SD 10


SD 30

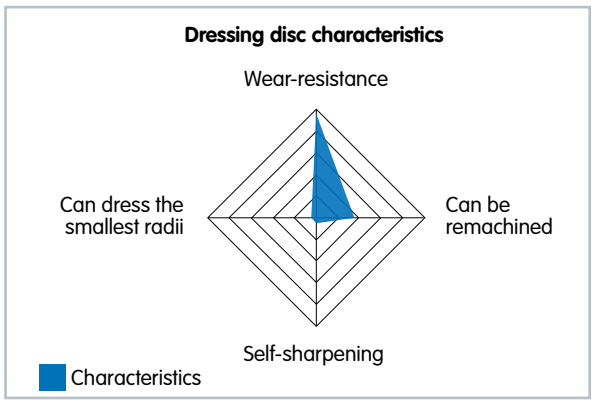

SD 40

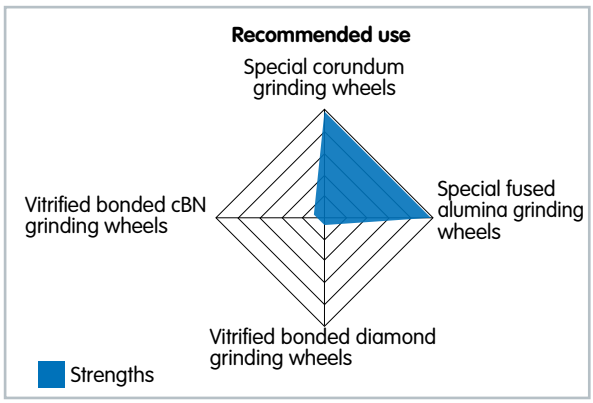

SD 60

UZ dressing discs

UZ dressing discs are manufactured using the reverse process and have a single-layer diamond coating with high wear resistance.
Edge reinforcements can be used to increase the wear resistance.

Applications:
→ Dressing all conventional grinding wheels

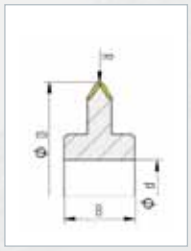




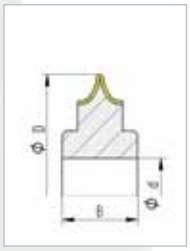
Advantages:

- Highest possible diamond concentration
- Statistical diamond distribution
- High precision manufacturing process gives extremely high accuracy of the diamond layer
- In profile roller dressers, concave radius of 0.03 mm (minimum) and convex radius of 0.1 mm (minimum) can be produced
- Minimum layer width 10 mm
- Current design limits are:
  – Maximum outer diameter 320 mm, H3 bore
  – Minimum radius 3 mm for an internal angle of 180°

Some of our designs:



UZ 10



Special designs

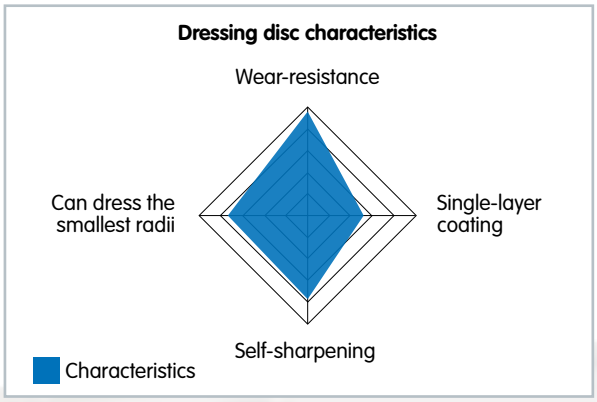
DDS dressing discs

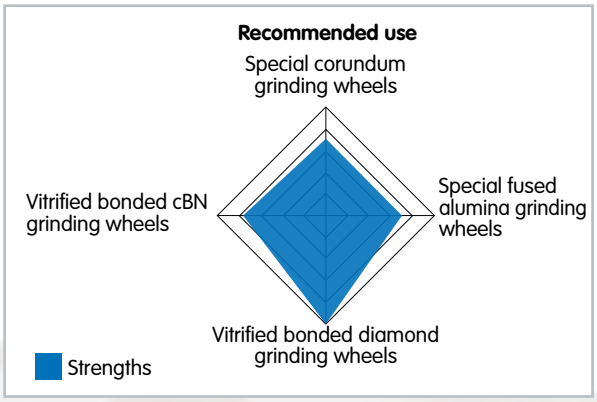
General

The WINTER DDS (Diamond Dressing System) dressing disc enables high-precision CNC dressing of vitrified bonded diamond and cBN grinding wheels. It has a constant profile bearing ratio thanks to patented diamond distribution and concentration and consists of a patterned single layer of sintered diamonds that is clamped into a twopiece body. This type of construction gives it extreme flexibility during the dressing of a variety of different profiles in a single working pass. This requires a grinding machine with a CNC dressing spindle and a contact detection system (e.g. Dittel).

Applications:

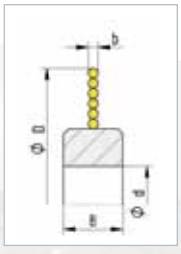
→ Dressing vitrified bonded diamond grinding wheels and cBN grinding wheels directly on the production machine





Advantages:

- Controlled concentration of diamonds
- Extremely high accuracy as the diamond layer is ground
- Free standing diamond layer, so dressing of concave and convex profiles is possible
- Constant layer width
- Dressing of vitrified bonded diamond grinding wheels
- Diameters from 90 mm – 210 mm
- Layer widths from 0.6 mm – 1.2 mm
- Radii depending on layer width 0.3 mm – 0.6 mm

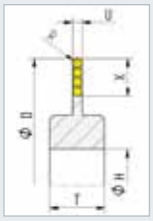


DS 10

The DDS dressing disc has a patterned single-layer sintered diamond coating that is clamped into a two-part steel body.

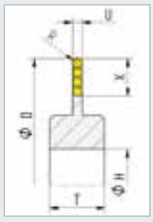
DDS dressing discs held in stock

Range of DDS dressing discs in stock

DS 10	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	300DS71P	120	1	2	15	40	H5	D1181	Steel	69014194133	R = 0.5

Machine: e.g. Studer
Application: Dressing conventional grinding wheels and vitrified bonded diamond and cBN grinding wheels
Delivery: Ex stock

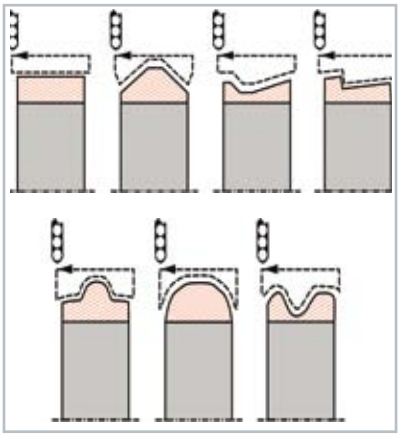
DDS dressing discs – Semi-manufactured parts

DS 10	Design code	D	U	X	T	H	Bore tolerance	Grit size	Body	Order number	Comment
	3DS71P	150	1	2	15	25		D1181	Steel	60157684272	R = 0.5
	DS71P	120	1	2	15	25		D1181	Steel	00310395606	Semi-manufactured part

Machine: Universal, after suitable adaptation of the body can be used on all machines
Application: Dressing conventional grinding wheels and vitrified bonded diamond and cBN grinding wheels
Delivery: Ex stock, 2 weeks for adapting the bore, body width and fastening holes if necessary

Profile examples

With this new dressing system a broad range of different profiles can be created in a single working step



Advantages of CNC dressing of diamond grinding wheels with DDS dressing discs

- Precision dressing on the production machine
  - Improved profile accuracy
  - Very simple to automate
  - Dressing at grinding speeds
- No need to remove the grinding wheel
  - Reduced down times
  - High-precision axial and radial running truth of the grinding wheel
  - Improved workpiece quality
- Reproducible grinding wheel topography, improved process control

Sample applications

Peel grinding

Machine parameters

Machine:	STUDER S32 cylindrical grinding machine
Coolant:	Emulsion
Workpiece:	Carbide K10

Grinding parameters

Grinding wheel:	1VG 3A1-500-5-4.5 D126 V+ 2046 J1SC C150 E
Cutting speed:	v_c = 75 m/s
Axial feed:	v_{fa} = 40 mm/min
Infeed:	a_e = 0.2 mm

Dressing parameters

Dressing tool:	WINTER DDS dressing disc
Dressing cut:	a_{ed} = 4 × 2 µm
Speed ratio:	q_d = 0.7 Counter-directional
Overlap ratio:	U_d = 4

Results

Surface finish:	R_a = 0.17 µm at v_{fa} = 5 mm/min R_a = 0.74 µm at v_{fa} = 40 mm/min

Form grinding

Machine parameters

Machine:	SCHÜTTE WU 305 tool grinding machine
Coolant:	Sintogrind fluid (Oelheld)
Workpiece:	Bio-ceramics

Grinding parameters

Grinding wheel:	99VG 700-15 / D64 D64 V+ 2046 J1SC C150
Cutting speed:	v_c = 60 m/s
Transverse infeed:	a_e = 0.2 mm
Allowance:	$a_{e\,tot}$ = 1 mm

Dressing parameters

Dressing tool:	WINTER DDS dressing disc
Dressing cut:	a_{ed} = 2 µm
Speed ratio:	q_d = 0.3
Overlap ratio:	U_d = 3–9

Results

Surface finish:	$R_z \leq 3$ µm

Centreless grinding

Machine parameters

Machine:	SCHAUDT MIKROSA KRONOS S cylindrical grinding machine
Coolant:	Emulsion
Workpiece:	Si_3N_4

Grinding parameters

Grinding wheel:	1VG 3A1-400-15 D46 V+ 2046 J1SC C100
Cutting speed:	v_c = 120 m/s
Allowance:	$a_{e\,tot}$ = 0.7 mm

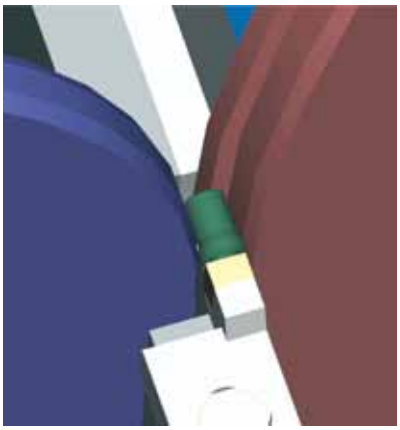
Dressing parameters

Dressing tool:	WINTER DDS dressing disc
Dressing cut:	a_{ed} = 3 µm
Cutting speed:	v_{cd} = 40 m/s
Speed ratio:	q_d = 0.4

Results

Surface roughness:	R_z = 2.02 µm
Diameter tolerance:	D ± 2 µm

No measurable wear after 400 workpieces.



Drill flute grinding

Machine parameters

Machine:	WALTER Helitronic Power
Coolant:	Sintogrind fluid (Oelheld)
Workpiece:	Carbide K10

Grinding parameters

Grinding wheel:	99VG 700-125-10 D76 V+ 3438 J1SC C100
Cutting speed:	v_c = 18–44 m/s
Feed:	v_f = up to 200 mm/min
Allowance:	a_e = 3.5 mm
Material removal rate:	Q'_{wmax} = 8.75 $mm^3/(mm \cdot s)$

Dressing parameters

Dressing tool:	WINTER DDS dressing disc
Dressing cut:	a_{ed} = 3 µm
Cutting speed:	v_{cd} = 18 m/s
Speed ratio:	q_d = 0.7
Overlap ratio:	U_d = 3

Result

Markedly improved surface roughness and chipping compared with resin-bonded diamond grinding wheels

External cylindrical plunge grinding

Machine parameters

Machine: STUDER S32 CNC cylindrical grinding machine
Coolant: Emulsion
Workpiece: Carbide K10

Grinding parameters

Grinding wheel: 99VG 700-400-5
D91 V+ 2046 J1SC C125 E
Cutting speed: v_c = 40 m/s
Feed: v_{fr} = 4 mm/min
Allowance: a_e = 3.5 mm, radial

Dressing parameters

Dressing tool: WINTER DDS dressing disc
Dressing cut: a_{ed} = 3 µm
Speed ratio: q_d = 0.7
Overlap ratio: U_d = 7

Result

Good profile accuracy, very good dimensional accuracy and low roughness values

Surface profile grinding

Machine parameters

Machine: BLOHM MT 408 surface grinding machine
Coolant: Rotorol (Oelheld)
Workpiece: SiC

Grinding parameters

Grinding wheel: 99VG 700-400-15
D46 V+ 2046 J1SC C100
Cutting speed: v_c = 45 m/s
Allowance: $a_{e\,tot}$ = 0.3 mm

Dressing parameters

Dressing tool: WINTER DDS dressing disc
Cutting speed: v_{cd} = 35 m/s
Dressing cut: a_{ed} = 2 µm
Speed ratio: q_d = 0.4
Overlap ratio: U_d = 2

Results

Good profile accuracy, very good dimensional accuracy and low roughness values

WINTER

Checklist

for CNC dressing discs

Customer: _____

Customer no.: _____

Machine:

Machine type: _____

Maximum acceptable dressing disc diameter (mm): _____

Current dressing tool: _____

Dressing unit:

Arbor diameter (mm): _____

Arbor length (mm): _____

Workpiece:

Workpiece drawing: _____

Surface finish desired: _____

Grinding allowance (mm / Ø): _____

Grinding wheel:

Specification: _____

Dimensions: _____

Parameters:

Profile or straight dressing: _____

Grinding wheel circumferential speed (m/s)
or speed (rpm): _____

Circumferential speed of dressing disc (m/s)
or speed (rpm): _____

Counter-directional (GGL) / uni-directional
dressing (GL): _____

Radial infeed per dressing pass (a_{ed}): _____

Axial dressing feed (f_{ad}): _____

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www.winter-superabrasives.com

Stationary dressing tools

Dressing grinding wheels is an essential step without which high quality results cannot be achieved. There are as many different dressing tools as there are grinding tasks. Stationary dressing tools with single-grit and cluster diamonds, Fliesen® dressers with natural or synthetic diamond needles, or grits are suitable for every grinding application.

Information on choosing your tool

	Application	Centreless / through-feed grinding					Angular plunge / profile grinding			Straight plunge grinding		
	Designation of abrasives / Dressing tool Recommended	All standard alumina (Al_2O_3)	Silicon carbide (SiC)	Quantum, SG, TG, XG, ES, Vortex, sintered alumina	Altos, Altos IPX, extruded alumina	Regulating wheel, rubber or vitrified bond	All standard aluminas (Al_2O_3)	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)	All standard aluminas (Al_2O_3)	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)
Diamond Fliesen®	Ti-Tan™			o	●			o		o	o	
	Furioso™			●	o			o		o	●	
	D25 – MCD needle blade dressers		o	o	o				●			o
	D30 – CVD needle blade dressers	●		o						●	o	
	D35 – CVD needle blade dressers						●	●		o	o	
	Needle blade with natural diamond						o	o	o			
	Standard blade with diamond grit	o	●	o	o					o	o	●
Single point dressers	Profile dressing diamond / Diaform chisel											
	D12 – single point dresser with MCD needle											
	D30 – single point dresser with CVD needle											
	D53 – single point dresser with PCD plate					●						
	single point dresser with natural diamond					o						
	PCD / CVD insert dressers	o		o	o							
	Rotatable tool with natural diamond or CVD											
Multipoint dressers	D21 – multi-point dressers with natural diamonds in 2 or 3 rows	o	o									
	Igel® and pro-dress multi-point dressers											

● First choice
o Second choice

	Internal grinding / grinding wheels ≥ 500 mm			Internal grinding / grinding wheels < 500 mm			Flat / creep feed grinding			Profile grinding DIA-FORM equip-ment	Grinding wheels with very coarse or very fine grit, straight dressing	
	All standard aluminas (Al_2O_3)	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)	All standard aluminas (Al_2O_3)	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)	Vortex, all standard aluminas (Al_2O_3)	Altos, Altos IPX, sintered aluminas	Silicon carbide (SiC)	All con-ventional grinding wheels	All standard aluminas (Al_2O_3), sintered aluminas	Silicon carbide (SiC)
		o					o	●				
		o					●	o				
		o	●				o	o	●			
	●	●					o	o		o		
	o	o	o				o	o	o		o	o
										●		
				o	o	●						
				●	●							
				o	o	o						
				o	o		o	o				
				o	o	o	o	o				
											●	●

Diamond Fliesen® tools

Diamond Fliesen® tools tools are universal tools for profile dressing and straight dressing operations. Whether they have natural or synthetic diamonds, or whether they are produced as a needle blade or grit blade tool, their consistent performance over the whole of their working life is simply amazing.
Information on toolholders for diamond Fliesen® tools tools is given in the section on "Toolholders and shanks for diamond Fliesen® tools". A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MK1).

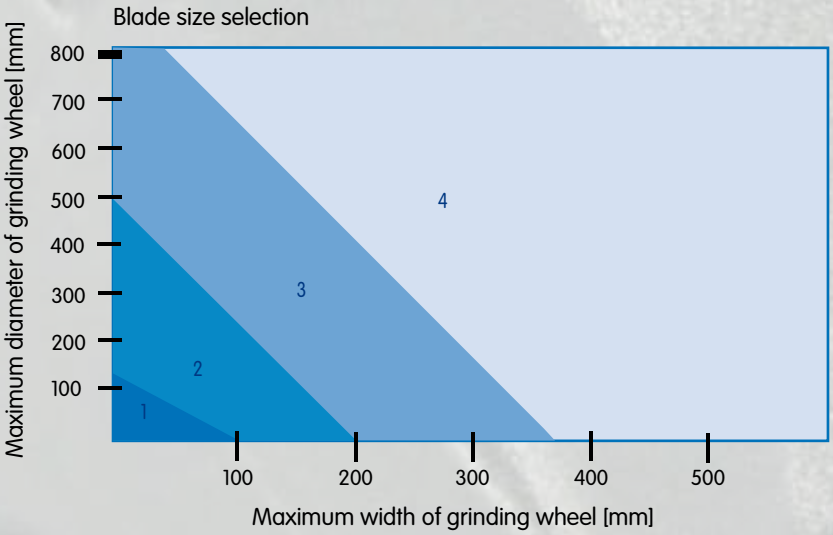
Ti-Tan & Furioso: The new generation of particularly wear-resistant diamond Fliesen® tools

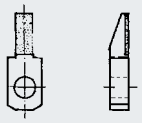
Ti-Tan has been developed for Altos, Altos IPX, sintered and extruded aluminas etc.
Furioso has been developed for Quantum, SG, TG, XG, ES and special aluminas.

Selecting the right blade tool

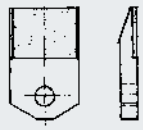
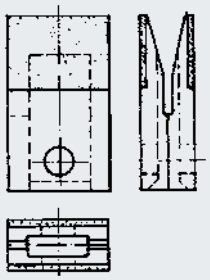
We have made it easy for you to select the most suitable blade dresser:

- Simply choose the appropriate blade size from the diagram according to the width and diameter of your grinding wheel,
- Then choose the best blade tool from the table below.



	Blade size	Grinding wheel grit size [mesh]	For Altos, Altos IPX, sintered and extruded aluminas		For Quantum, Vortex, SG, TG, XG, ES, sintered aluminas	
			Specification	Order number	Specification	Order number
	1	120-180	FRS 75 Ti-Tan	69014122959	FRS 75 Furioso	69014122937
		80-120	FRS 90 Ti-Tan	69014122960	FRS 90 Furioso	69014122939
		54-80	FRS 115 Ti-Tan	69014122965	FRS 115 Furioso	69014122940
		36-54	FRS 140 Ti-Tan	69014122970	FRS 140 Furioso	69014122941

All dimensions in mm
[1] Available ex stock
Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks

	Blade size	Grinding wheel grit size [mesh]	For Altos, Altos IPX, sintered and extruded aluminas		For Quantum, Vortex, SG, TG, XG, ES, sintered aluminas	
			Specification	Order number	Specification	Order number
 FAS/FBS	2	120-180	FBS 75 Ti-Tan	69014122972	FBS 75 Furioso	69014122944
		80-120	FBS 90 Ti-Tan	69014122974 [1]	FBS 90 Furioso	69014122946 [1]
		54-80	FBS 115 Ti-Tan	69014122975 [1]	FBS 115 Furioso	69014122947 [1]
		36-54	FBS 140 Ti-Tan	69014122979	FBS 140 Furioso	69014122948
	3	120-180	FAS 75 Ti-Tan	69014122981	FAS 75 Furioso	69014122950
		80-120	FAS 90 Ti-Tan	69014122983 [1]	FAS 90 Furioso	60157693885 [1]
		54-80	FAS 115 Ti-Tan	69014122987 [1]	FAS 115 Furioso	60157690579 [1]
		36-54	FAS 140 Ti-Tan	69014122989	FAS 140 Furioso	69014122952
	4	120-180	1TFAS 75 Ti-Tan	69014122991	1TFAS 75 Furioso	69014122953
		80-120	1TFAS 90 Ti-Tan	69014122993	1TFAS 90 Furioso	69014122954
		54-80	1TFAS 115 Ti-Tan	69014122994 [1]	1TFAS 115 Furioso	69014122955
		36-54	1TFAS 140 Ti-Tan	69014122995	1TFAS 140 Furioso	69014122956

Explanation of the specification

Designation		Width	Effective length	Total length
1	FRS	5	12	28
2	FBS	10	15	33
3	FAS	20	15	33
	Twin blade with cooling channel			
4	1TFAS	20	15	35

Designation	FEPA
75	D501
90	D711
115	D1001
140	D1181

All dimensions in mm

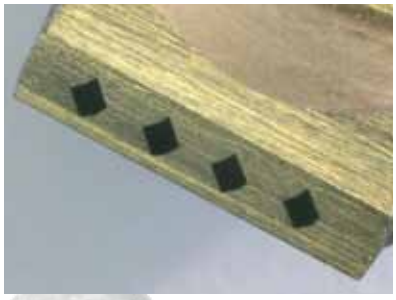
[1] Available ex stock

Minimum order quantity for articles not in stock: 6 pieces/for twin blade: 3 pieces, delivery: 6 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

D25 MCD needle blade dressers

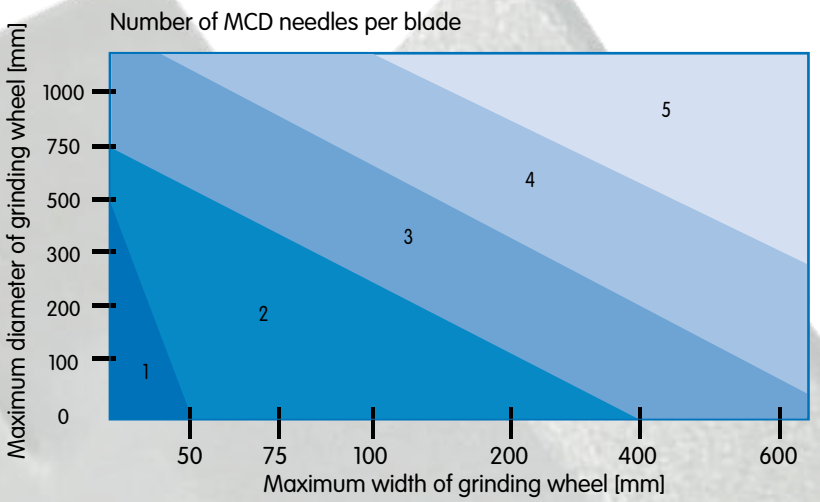
Preferably for profiling, but also for the straight dressing of hard grinding wheels, sintered alumina and silicon carbide grinding wheels. For straight plunge dressing we recommend the version with the hard material in the centre; for angular plunge dressing the off centred (OC) arrangement is suitable.



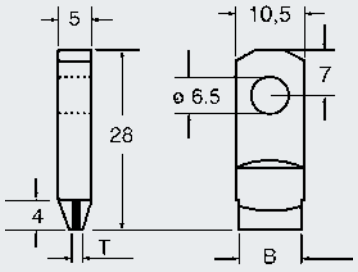
Selecting the right blade tool

We have made it easy for you to select the most suitable blade dresser:

- Simply choose the appropriate blade size from the diagram according to the width and diameter of your grinding wheel,
- Then choose the best blade tool from the table below.



D25 standard range (centred version)



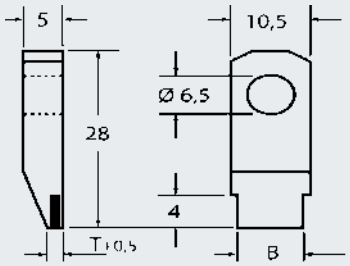
Number of needles	Grit size Grinding wheel [Mesh]	Designation	Effective cutting width T	Width at tip B	Order number
1	80-120 60 46	2565 / 1 2585 / 1 25115 / 1	0.8 1.1 1.5	4.0 4.0 4.0	66260348671 66260348174 66260346380
2	80-120 60 46	2565 / 2 2585 / 2 25115 / 2	0.8 1.1 1.5	6.0 6.0 6.0	66260139870 [1] 66260134397 [1] 66260339334
3	80-120 60 46	2565 / 3 2585 / 3 25115 / 3	0.8 1.1 1.5	8.0 8.0 8.0	66260138695 [1] 66260139398 [1] 66260139601
4	80-120 60 46	2565 / 4 2585 / 4 25115 / 4	0.8 1.1 1.5	10.0 10.0 10.0	66260137996 [1] 66260392047 [1] 66260138202 [1]
5	80-120 60 46	2565 / 5 2585 / 5 25115 / 5	0.8 1.1 1.5	10.0 10.0 10.0	66260378376 66260372054 69014128154

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 4 item, delivery: 4 weeks

D25 standard range (off-centred version, OC)



Number of needles	Grit size Grinding wheel [mesh]	Designation	Effective cutting width T	Width at tip B	Order number
1	80-120 60 46	2565 - OC / 1 2585 - OC / 1 25115 - OC / 1	0.8 1.1 1.5	4.0 4.0 4.0	66260349073 66260345676 66260344382
2	80-120 60 46	2565 - OC / 2 2585 - OC / 2 25115 - OC / 2	0.8 1.1 1.5	6.0 6.0 6.0	66260344134 [1] 66260138314 [1] 66260139317
3	80-120 60 46	2565 - OC / 3 2585 - OC / 3 25115 - OC / 3	0.8 1.1 1.5	8.0 8.0 8.0	66260135912 [1] 66260342479 66260137318
4	80-120 60 46	2565 - OC / 4 2585 - OC / 4 25115 - OC / 4	0.8 1.1 1.5	10.0 10.0 10.0	66260392033 [1] 66260137616 [1] 66260137319 [1]
5	80-120 60 46	2565 - OC / 5 2585 - OC / 5 25115 - OC / 5	0.8 1.1 1.5	10.0 10.0 10.0	69014128155 69014128156 69014128157

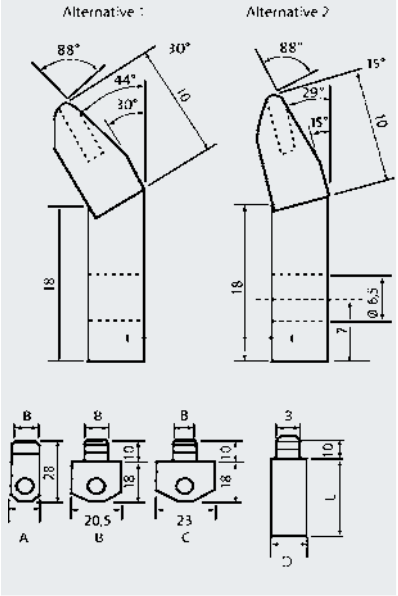
D25 radius and angle pregrinding

D25, D30 and D35 diamond Fliesen® tools are available with the diamond radius and angle preground.

The advantages of pre-polishing are

- Reduction of the work needed to change the tool as it takes less time to match the dresser to the profile of the grinding wheel,
- Adherence to profile directly after tooling change, even for high precision profiles with a radius of only 0.125 mm.

Example of special blade tools with pre-prolished profile



Information on toolholders for diamond Fliesen® tools is given in the section on 'Toolholders and shanks for diamond tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MK1).

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 4 item, delivery: 4 weeks

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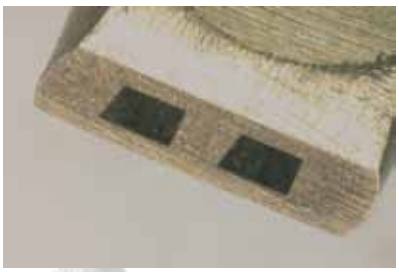
D30 CVD needle blade

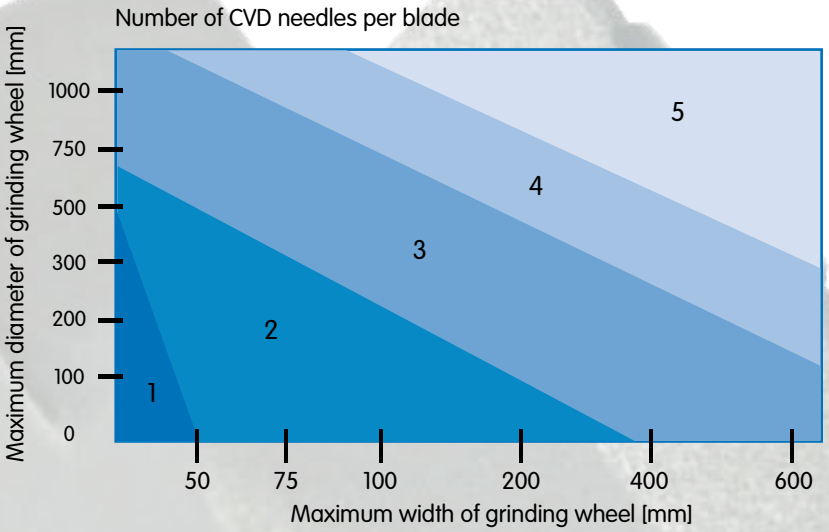
Because the CVD diamond material is centred, this blade is the first choice for high precision straight dressing of alumina, special fused alumina and sintered alumina grinding wheels.
A highly durable tool with straight CVD needle inserts.



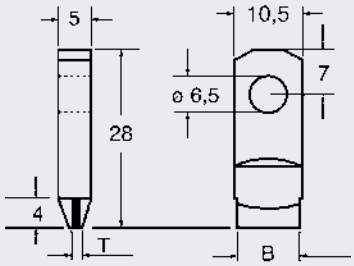
Selecting the right blade tool

We have made it easy for you to select the most suitable blade dresser:

- Simply choose the appropriate blade size from the diagram according to the width and diameter of your grinding wheel,
- Then choose the best blade tool from the table below.



D30 standard range



Number of needles	Grit size Grinding wheel [Mesh]	Designation	Effective cutting width T	Width at tip B	Order number
1	150-240 80-120 60 46	3044 / 1 3064 / 1 3084 / 1 30124 /1	0.4 0.6 0.8 1.2	3.0 3.0 3.0 4.0	66260350081 66260350933 69014128213 69014128215
2	150-240 80-120 60 46	3044 / 2 3064 / 2 3084 / 2 30124 / 2	0.4 0.6 0.8 1.2	4.0 4.0 5.0 6.0	66260137455 [1] 66260139158 [1] 66260136762 [1] 66260196365 [1]
3	150-240 80-120 60 46	3044 / 3 3064 / 3 3084 / 3 30124 / 3	0.4 0.6 0.8 1.2	5.0 6.0 7.0 8.0	66260139756 [1] 66260391992 [1] 66260139163 [1] 66260139466
4	150-240 80-120 60 46	3044 / 4 3064 / 4 3084 / 4 30124 / 4	0.4 0.6 0.8 1.2	6.0 8.0 9.0 10.0	66260195857 [1] 66260138561 [1] 66260139464 [1] 66260137467 [1]
5	150-240 80-120 60 46	3044 / 5 3064 / 5 3084 / 5 30124 / 5	0.4 0.6 0.8 1.2	7.0 10.0 10.0 10.0	69014128217 66260345996 69014128219 69014128221

Information on toolholders for diamond Fliesen® tools tools is given in the section on 'Toolholders and shanks for diamond Fliesen® tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MK1).

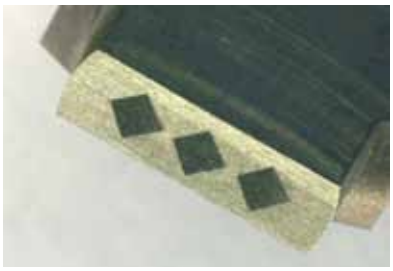
All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 4 item, delivery: 4 weeks

D35 CVD needle blade

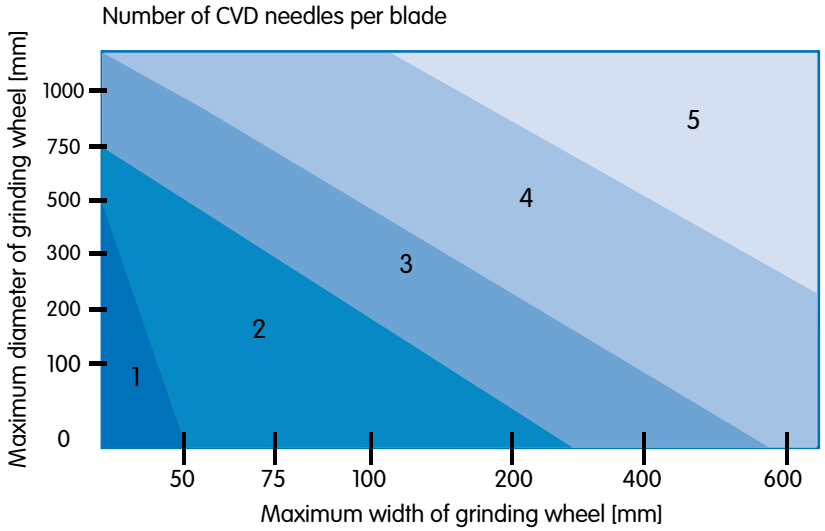
This blade with its off-centred CVD material is a first choice for angular plunge dressing of all alumina, special fused alumina and sintered alumina grinding wheels.
A highly durable tool with CVD needles inserted diagonally.



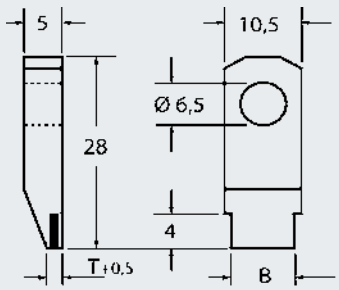
Selecting the right blade tool

We have made it easy for you to select the most suitable blade dresser:

- Simply choose the appropriate blade size from the diagram according to the width and diameter of your grinding wheel,
- Then choose the best blade tool from the table below.



D35 standard range



Number of needles	Grit size Grinding wheel [Mesh]	Designation	Effective cutting width T	Width at tip B	Order number
1	150-240 80-120 60 46	3544 - OC / 1 3564 - OC / 1 3584 - OC / 1 35124 - OC / 1	0.6 0.8 1.1 1.5	3.0 3.0 3.0 4.0	66260346491 66260346692 66260345994 66260346395
2	150-240 80-120 60 46	3544 - OC / 2 3564 - OC / 2 3584 - OC / 2 35124 - OC / 2	0.6 0.8 1.1 1.5	4.0 4.0 5.0 6.0	66260336089 66260337490 66260337491 [1] 66260336994
3	150-240 80-120 60 46	3544 - OC / 3 3564 - OC / 3 3584 - OC / 3 35124 - OC / 3	0.6 0.8 1.1 1.5	5.0 6.0 7.0 8.0	66260336752 66260337624 [1] 66260337292 [1] 66260337195 [1]
4	150-240 80-120 60 46	3544 - OC / 4 3564 - OC / 4 3584 - OC / 4 35124 - OC / 4	0.6 0.8 1.1 1.5	6.0 8.0 9.0 10.0	66260333197 66260195223 [1] 66260336093 [1] 66260336196 [1]
5	150-240 80-120 60 46	3544 - OC / 5 3564 - OC / 5 3584 - OC / 5 35124 - OC / 5	0.6 0.8 1.1 1.5	7.0 10.0 10.0 10.0	69014128150 69014128151 69014128152 69014128153

Information on toolholders for diamond Fliesen® tools is given in the section on 'Toolholders and shanks for diamond Fliesen® tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MK1).

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 4 item, delivery: 4 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

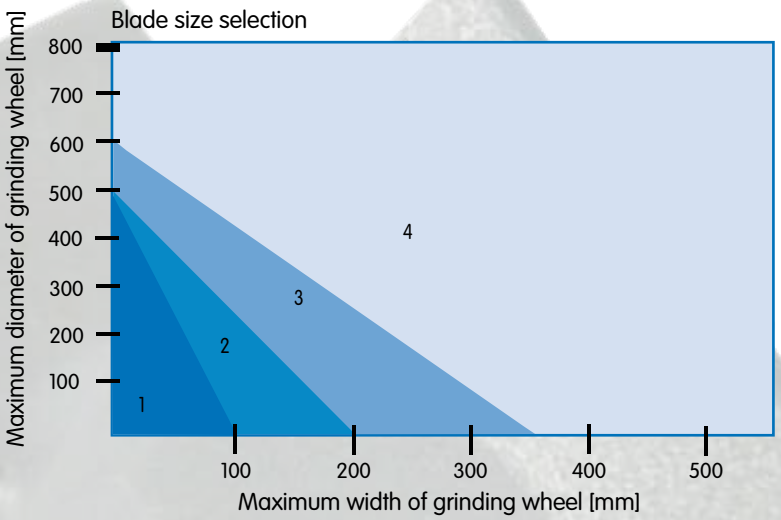
Needle blade with natural diamond

Suitable for angular plunge / straight and profile dressing of all alumina, special fused alumina, and sintered alumina grinding wheels in grit sizes 46–80. Exceptional natural diamond needles, set by hand in a special design, guarantee the long service life of these tools.

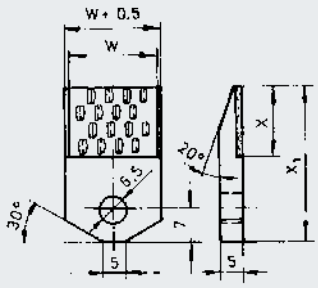
Selecting the right blade tool

We have made it easy for you to select the most suitable blade dresser:

- Simply choose the appropriate blade size from the diagram according to the width and diameter of your grinding wheel,
- Then choose the best blade tool from the table below.



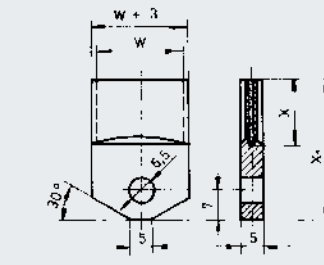
Standard range of needle blade tools



Blade size	Specification	W	X	X_1	Bond	Size of needles	Order number
1	FD180	10	12	28	T645 E	N1000	69014185757 [1]
2	FB180	10	15	33	T645 E	N1100	69014185754 [1]
3	FC180	20	10	28	T645 E	N1100	69014185756 [1]
4	FA180	20	15	33	T645 E	N1100	69014185755 [1]

Special designs of needle blade tools

Needle blade tools in centered version with highly effective cutting width specifications b_d and consistent wear characteristics.



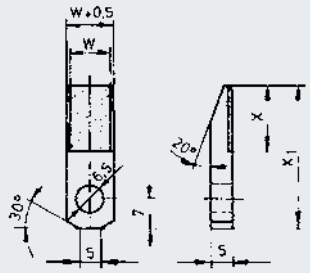
Blade size	Specification	W	X	X_1	Bond	Size of needles	Order number
2	9TFB180	10	15	33	T645J	N800	69014185798 [1]
2	1TFB180	10	15	33	T645J	N1000	66260388626
4	8TFA180	20	15	33	T645J	N900	66260387342 [1]

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks

Needle blade tools in an off-centred versions with highly effective cutting width specifications b_d and consistent wear characteristics.

	Blade size	Specification	W	X	X_1	Bond	Size of needles	Order number
	2	11TFB180	10	15	33	T645E	N1000	66260100089
	2	13TFB180	10	15	33	T645E	N800	66260113218
	4	14TFA180	20	15	33	T645E	N900	69014159391

Information on toolholders for diamond Fliesen® tools is given in the section on 'Toolholders and shanks for diamond Fliesen® tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MK1).

All dimensions in mm

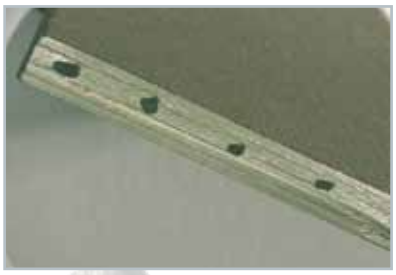
[1] Available ex stock

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Standard blade with diamond grit

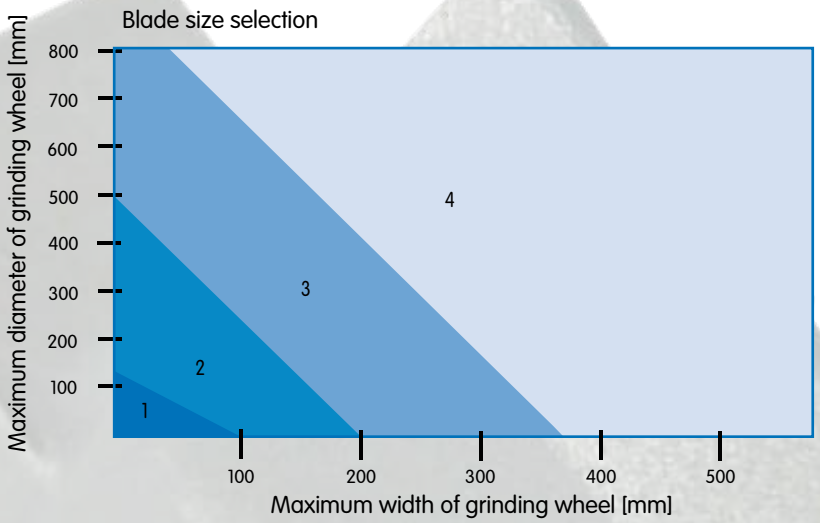
A universal dressing tool for straight and profiled dressing of alumina and sintered alumina grinding wheels with consistent surface finish over the whole of its working life.
For large grinding wheels and sets of grinding wheels we recommend mounting of two blade tools or use of a twin blade such as 1T FAS 115-20-15-35.



Selecting the right blade tool

We have made it easy for you to select the most suitable blade dresser:

- Simply choose the appropriate blade size from the diagram according to the width and diameter of your grinding wheel,
- Then choose the best blade tool from the table below.



Explanation of the specification

Designation		Width	Effective length	Total length
1	FRS	5	12	28
2	FBS	10	15	33
2	FDS	10	12	28
3	FAS	20	15	33
3	FCS	20	10	28
	Twin blade with cooling channel			
4	1TFAS	20	15	35

Designation	FEPA
75	D501
90	D711
115	D1001
140	D1181

Order sample

Dressing tool	Width of diamond section W	Effective length of diamond section X	Total length of tool X_1	Diamond grit size	Bond
FAS 115 -	20 -	15 -	33	D1001	H770J

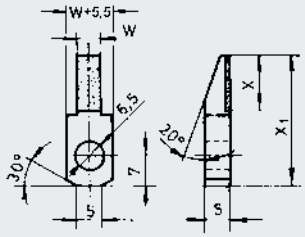
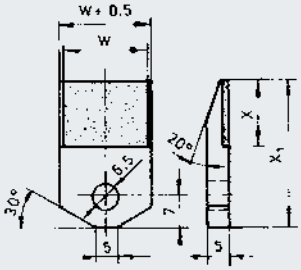
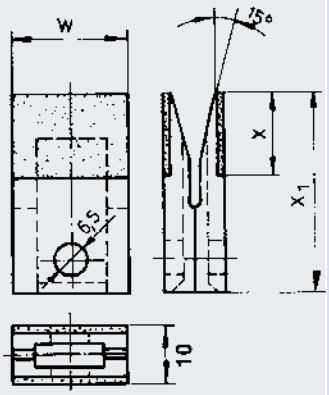
All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks

Range of standard blade tool with diamond grit

T645E bond for alumina grinding wheels, including sintered aluminas (AL_2O_3)

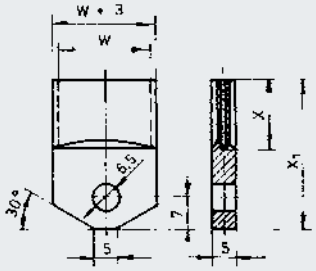
	Blade size	Grit size Grinding wheel [Mesh]	Shape	W	X	X_1	Grit size of blade	Order number
	1	120-180	FRS 75	5	12	28	D501	66260382020
		80-120	FRS 90	5	12	28	D711	66260114636 [1]
		54-80	FRS 115	5	12	28	D1001	66260388134
	2	120-180	FBS 75	10	15	33	D501	66260387135 [1]
		80-120	FBS 90	10	15	33	D711	69014185726 [1]
		54-80	FBS 115	10	15	33	D1001	69014185727 [1]
		36-54	FBS 140	10	15	33	D1181	69014185728 [1]
		120-180	FDS 75	10	12	28	D501	69014185747 [1]
		80-120	FDS 90	10	12	28	D711	69014185735 [1]
		54-80	FDS 115	10	12	28	D1001	69014185736 [1]
		36-54	FDS 140	10	12	28	D1181	69014185737 [1]
	3	120-180	FAS 75	20	15	33	D501	66260384327 [1]
		80-120	FAS 90	20	15	33	D711	69014185720 [1]
		54-80	FAS 115	20	15	33	D1001	69014185721 [1]
		36-54	FAS 140	20	15	33	D1181	69014185722 [1]
		120-180	FCS 75	20	10	28	D501	69014185746 [1]
		80-120	FCS 90	20	10	28	D711	69014185732 [1]
		54-80	FCS 115	20	10	28	D1001	69014185718 [1]
		36-54	FCS 140	20	10	28	D1181	69014185716 [1]
	4	80-120	1T FAS 90	20	15	35	D711	66260389354
		54-80	1T FAS 115	20	15	35	D1001	66260388162 [1]
		36-54	1T FAS 140	20	15	35	D1181	66260386770

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 6 pieces/for twin blade: 3 pieces, delivery: 6 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

H770J bond for silicon carbide (SiC) grinding wheels								
	Blade size	**Grit size Grinding wheel [Mesh]**	**Shape**	**W**	**X**	**X_1**	**Grit size of blade**	**Order number**
	2	120-180	FBS 75	10	15	33	D501	69014185749 [1]
		80-120	FBS 90	10	15	33	D711	69014185729 [1]
		54-80	FBS 115	10	15	33	D1001	69014185730 [1]
		36-54	FBS 140	10	15	33	D1181	66260384396 [1]
		120-180	FDS 75	10	12	28	D501	66260378692 [1]
		80-120	FDS 90	10	12	28	D711	69014185738 [1]
		54-80	FDS 115	10	12	28	D1001	66260387592 [1]
		36-54	FDS 140	10	12	28	D1181	66260387481 [1]
	3	120-180	FAS 75	20	15	33	D501	69014185748 [1]
		80-120	FAS 90	20	15	33	D711	69014185723 [1]
		54-80	FAS 115	20	15	33	D1001	69014185724 [1]
		36-54	FAS 140	20	15	33	D1181	69014185725 [1]
		120-180	FCS 75	20	10	28	D501	66260385384 [1]
		80-120	FCS 90	20	10	28	D711	66260384227 [1]
		54-80	FCS 115	20	10	28	D1001	69014185734 [1]
		36-54	FCS 140	20	10	28	D1181	66260387133 [1]

Information on toolholders for diamond Fliesen® tools is given in the section on 'Toolholders and shanks for diamond Fliesen® tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MK1).

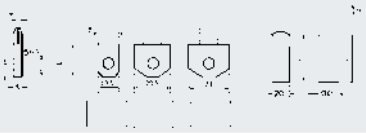
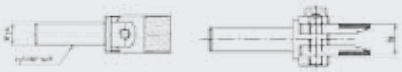
All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks

Toolholders and shanks for diamond Fliesen® tools

Two types of shank for diamond Fliesen® tools are available for your machine toolholders:
– rigid brazed blade tool
– flexible swivel holder.
The variable adjustable angle of the flexible swivel holder allows the dresser to be placed in the best possible position with respect to the grinding wheel and simply clamped.

Tool holder	Shank	Order number	Clamping length	
Rigid brazed tool holder	MK0 MK1 Cylindrical			See section entitled 'Toolholders and shanks'
Rigid brazed tool holder	to customer specification			
Swivel holder for single blade	MK0	66260386838	25.5	
	MK1	66260196356	40	
	Cylindrical, diameter 10	66260389757	50	
Swivel holder for dual blade tools	MK1	66260389454	40	
	Cylindrical diameter 12.7	66260390721	50	

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

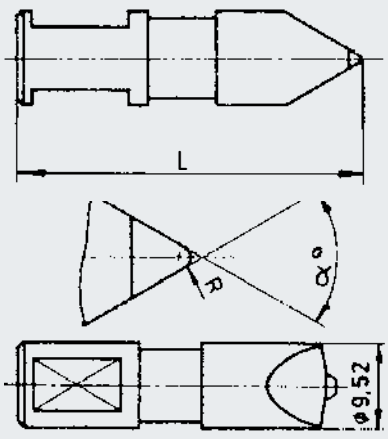
Single point dressers

The single point dresser is made of synthetic diamond (CVD or MCD) or a natural diamond, preferably an octahedron. The hard material is gripped in a mount that is suitable for the machine toolholder and direction of use. Diamonds of many different grades and dimensions are used depending on the customer's requests and the application. The main applications for these dressers are small single-profile grinding wheels and internal cylindrical grinding. An exception to this is the profile diamond with a pre-ground radius and angle, which is also used for larger grinding wheels and wheels with complex profiles. Care is required when using these individual dressing tools, as the exposed hard diamond tips are susceptible to vibration and impacts as well as large variations in temperature, which can cause damage to the tool.

Profile diamond, ground

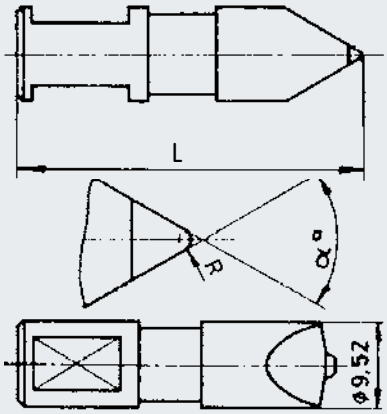
Profile diamonds fit all Diaform, Schaudt and Fortuna dressing units.
They are dressing tools with the highest quality diamonds. These tools are exceptionally economical as their angles and radii can be reground. Please note that the number of possible regrinding operations depends on the shape and size of the diamond.
In addition to the durable and extremely high-specification natural diamond tools, we also offer these tools with CVD inserts. They are an economical alternative giving reproducible quality.

Profile diamond types



Type	Tool length L	Angle α	Radius R	Designation
S	36	40	0.125	40/125 S
			0.250	40/250 S
			0.500	40/500 S
		60	0.125	60/125 S
			0.250	60/250 S
			0.500	60/500 S
L	45.5	30	0.125	30/125 L
			0.250	30/250 L
		40	0.125	40/125 L
			0.250	40/250 L
			0.500	40/500 L
		60	0.125	60/125 L
			0.250	60/250 L
			0.500	60/500 L

All dimensions in mm

	Type	Tool length L	Angle α	Radius R	Designation
	X	58	30	0.125	30/125 X
				0.250	30/250 X
			40	0.125	40/125 X
				0.250	40/250 X
				0.500	40/500 X
			60	0.125	60/125 X
				0.250	60/250 X
				0.500	60/500 X

Order sample

Designation	Diamond [ct]	
40/125 L	0.5	All profile diamonds are available in the following sizes: 0.25, 0.33, 0.50, 0.75 and 1.00 ct.

Standard range of profile diamonds

Designation α / R	Dimensions Ø × L	ct	Order number
30/250L	9.52 × 45.5	0.25	66260343187
40/125L		0.25	66260340672 [1]
40/250L		0.25	66260351876 [1]
40/125L		0.33	66260389254 [1]
40/250L		0.33	66260339381 [1]
60/250L		0.33	66260340002 [1]
60/500L		0.33	66260351876
30/125L		0.50	66260339047 [1]
30/250L		0.50	66260339689
40/125L		0.50	66260199494
40/250L		0.50	66260368449
40/500L		0.50	66260339689 [1]
60/500L		0.50	66260336405 [1]

Info

Contact for orders and reworking of profile diamonds:
Saint-Gobain Diamantwerkzeuge GmbH & Co KG
Unstrutweg 1 Tel. +49 3641 4531-0
07743 Jena, Germany Fax +49 3641 4531-25

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

D12 single point dressers with MCD needles

This single point dresser consists of a synthetic MCD needle gripped in a holder. The advantage of the synthetic diamond over the natural one is that its precise geometry remains constant over the whole of its working life. This guarantees a uniformly high surface finish that can be reproduced every time without the need to change any set variables such as feed. It is therefore highly suitable for CNC dressing processes and the machining of small grinding wheels, including profiled ones, and internal cylindrical grinding. There is a cutout in the head of the dresser to make it easier to position the needle correctly with respect to the grinding wheel when setting up. The MCD needle is sintered in diagonally with respect to the cutout as this guarantees the longest possible tool life. The cutout must therefore be at right angles to the grinding wheel to obtain the maximum benefit.

Standard range of D12 single point dressers with MCD needles

Type	Needle dimensions			Shank		Order number
D12	D	T	L	Type	Clamping length	
1265	0.6	0.8	4	MK1	40	66260334408
1265	0.6	0.8	4	MK0	25	66260136620
1265	0.6	0.8	4	Cylindrical Ø 10	40	69014164301
1285	0.8	1.1	4	MK1	40	66260340532
1285	0.8	1.1	4	MK0	25	66260369142
1285	0.8	1.1	4	Cylindrical Ø 10	40	66260138887
12115	1.15	1.5	4	MK1	40	66260334220
12115	1.15	1.5	4	MK0	25	69014146751
12115	1.15	1.5	4	Cylindrical Ø 10	40	66260345558

Order sample

Type	Shank	Clamping length
1285	Cylindrical Ø 10	40

Other shank dimensions available on request.

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

D30 single point dressers with CVD needles

This single point dresser consists of a synthetic CVD needle gripped in a holder. The advantage of the synthetic diamond over the natural one is that its precise geometry is retained over the whole of its working life. This guarantees a uniformly high surface finish that can be reproduced every time without the need to change any process variables such as feed. It is therefore highly suitable for CNC dressing processes and the machining of small grinding wheels, including profiled ones, and internal cylindrical grinding. There is a cutout in the head of the dresser to make it easier to position the needle correctly with respect to the grinding wheel when setting up. Since this is a CVD needle, its orientation to the grinding wheel has no significant effect on the tool life of the dresser. Nevertheless it should be noted that the diagonal mounting leads to a greater overlap (T dimension). The CVD is sintered into the shank horizontally with respect to the cutout and in this position the T dimension is the smallest.

Standard range of D30 single point dressers with CVD needles

Type	Needle dimensions			Shank		Order number
D30	D	T	L	Type	Clamping length	
3023	0.2	0.2	3	MK1	40	66260364163
3023	0.2	0.2	3	MK0	25	66260338571
3023	0.2	0.2	3	Cylindrical Ø 10	40	66260336272
3033	0.3	0.3	3	MK1	40	66260339183
3033	0.3	0.3	3	MK0	25	66260356104
3033	0.3	0.3	3	Cylindrical Ø 10	40	66260336101
3044	0.4	0.4	4	MK1	40	69014146755
3044	0.4	0.4	4	MK0	25	66260138967
3044	0.4	0.4	4	Cylindrical Ø 10	40	66260338797
3064	0.6	0.6	4	MK1	40	66260335519
3064	0.6	0.6	4	MK0	25	66260334913
3064	0.6	0.6	4	Cylindrical Ø 10	40	66260155917
3084	0.8	0.8	4	MK1	40	66260155970
3084	0.8	0.8	4	MK0	25	66260139868
3084	0.8	0.8	4	Cylindrical Ø 10	40	66260137229
30124	1.2	1.2	4	MK1	40	66260136169
30124	1.2	1.2	4	MK0	25	66260138367
30124	1.2	1.2	4	Cylindrical Ø 10	40	66260195542

Order sample

Type	Shank	Clamping length
3084	Cylindrical Ø 10	40

Other shank dimensions available on request.

All dimensions in mm

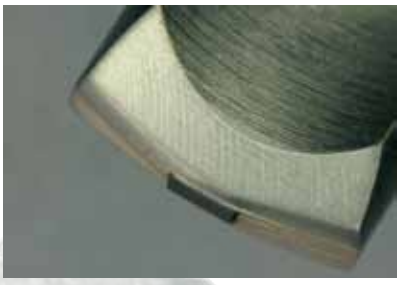
[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

D53 single point diamond dressers with PCD plates

This dresser has been specially designed for conditioning centreless regulating wheels. It consists of a PCD plate gripped in a holder. The advantage of PCD over natural diamond is that its precise geometry remains constant over the whole of its working life. This guarantees a uniformly reproducible high surface finish without the need to change any set variables such as feed. It is therefore most suitable for CNC dressing processes.



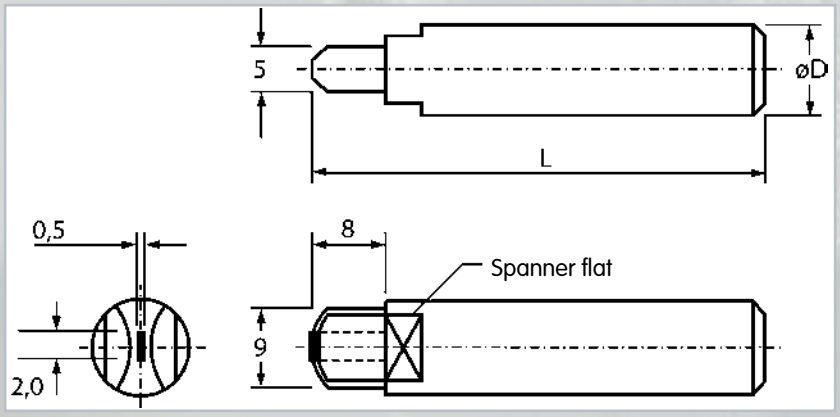
Standard range of D53 single point diamond dressers with PCD plates

Type	PCD dimensions			Shank		Order number
D53	B	H	L	Type	Clamping length	
5320	0.5	2	8	MK1	40	69014164952
5320	0.5	2	8	MK0	25	66260333171
5320	0.5	2	8	Diameter 10	40	66260199498

Order sample

Type	Shank	Clamping length
5320	Diameter 10	40

Type D53 single point dressers



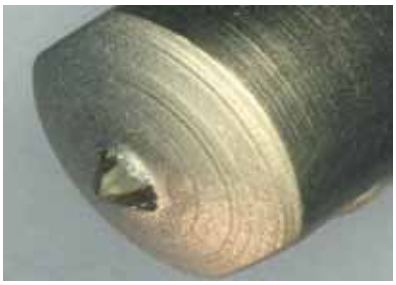
All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Single point dressers with natural diamonds

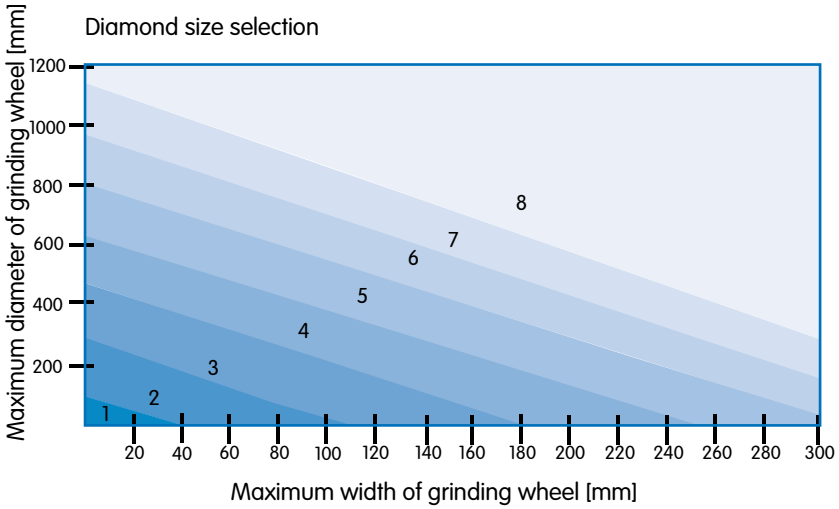
Single point dressers are used for straight dressing and for dressing grinding wheels with simple profiles.
Diamonds have a number of working points, depending on the grade. Repositioning the diamonds enables these to be activated in turn. Please send your dresser back to us in good time. Re-brazing the diamond at the factory increases the service life of the tool and makes it even better value for money.



Selecting the right dresser

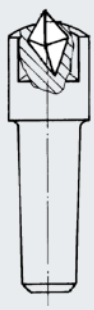
We have made it easy for you to select the most suitable dresser:

- Choose the size of diamond from the diagram according to the width and diameter of your grinding wheel,
- then choose the best tool from the table below.



Recommended diamond size [ct]	
1	0.15…0.35
2	0.25…0.50
3	0.35…0.75
4	0.50…1.00
5	0.60…1.25
6	0.70…1.50
7	0.85…1.75
8*	1.00…2.00

* Diamonds > 2 ct available on request

Type of dressing tool		Grade of diamond	Description
	LEA (single point dressers)	Basram	Top grade, at least 4–6 working points, regular octahedron, no inclusions, no cracks
		Diacar	Good industrial grade, at least 3–4 working points, regular octahedron, virtually no inclusions, no cracks
		Vatom	Standard grade, at least 3 working points, limited irregular shape, few inclusions, no cracks
		ZA	Normal grade, at least 2 working points, few inclusions and may have cracks
		Industry	Simple industrial grade, at least 2 working points
	LEW ('basic' single point dressers)	Basic	Basic grade with one working point

All dimensions in mm

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Order sample

Type of dresser	Diamond [ct]	Grade of diamond	Holder	The holder of a single point dresser can also be made with a head, depending on the size of the diamond.
LEA -	0.5 -	Vatom -	MK1-40	

Range of single point dressers in stock

Specification	Grade of diamond	Shape – Overall length	Diamond [ct]	Working points	Order number
LEA-1-Diacar-MK1-40	Diacar	MK1 × 40	1.00	4	66260195848 [1]
LEA-1-Vatom-MK1-40	Vatom	MK1 × 40	1.00	3	66260382005 [1]
LEA-1-Standard-MK0-25.5	Industry	MK0 × 25.5	1.00	2	66260385415 [1]
LEA-1-Standard-MK1-40	Industry	MK1 × 40	1.00	2	66260389207 [1]
LEA-0.5-Standard-Z8-30	Industry	Ø 8 × 30	0.50	2	66260386391 [1]
LEA-0.5-Standard-MK0-25.5	Industry	MK0 × 25.5	0.50	2	66260384683 [1]
LEA-0.5-Standard-MK1-40	Industry	MK1 × 40	0.50	2	66260386875 [1]
LEA-0.33-Standard-MK1-40	Industry	MK1 × 40	0.33	2	66260387542 [1]

Range of 'basic' single point dressers in stock

Specification	Grade of diamond	Shape – Overall length	Diamond [ct]	Working points	Order number
LEW-0,25-MK0-25.5	Basic	MK0 × 25.5	0.25	1	66260342633 [1]
LEW-0.1-MK1-40	Basic	MK1 × 40	0.10	1	66260386731 [1]
LEW-0.1-Z8-90	Basic	Ø 8 × 90	0.10	1	66260386964 [1]
LEW-0.1-MK0-25.5	Basic	MK0 × 25.5	0.10	1	66260387348 [1]
LEW-0.1-Z8-30	Basic	Ø 8 × 30	0.10	1	66260389256 [1]

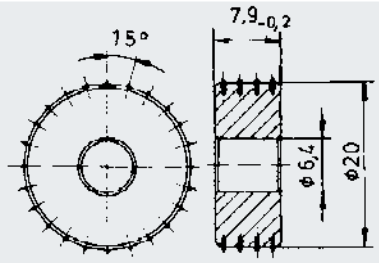
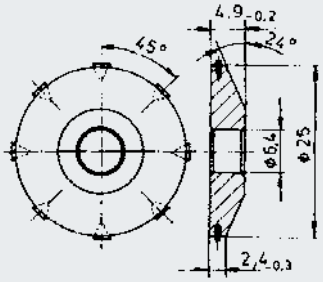
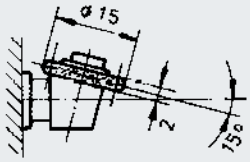
All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Rondist rotatable tools with diamond or CVD

An economical multi-point dressing tool with the functional characteristics of a single-point dresser.
A number of individual diamonds can be used in sequence. Turning the wheel replaces the used diamond grit with a new one. These tools can be supplied with natural diamonds and CVD, for both profiling and straight dressing. The table below shows the commonest types. They can also be made on request with e.g. differing densities of diamond needles on the circumference.

	Type	Grinding wheels		Diamond specification	Quantity of hard material per rotatable tool		Order number
		Grit size [mesh]	Diameter [mm]		Size Weight	Number	
	RO2096	46 - 80	< 600	Diamond needles	2 ct	96	69014185803 [1]
	RO5096	36 - 60	> 600	Diamond needles	5 ct	96	66260390774 [1]
	RO1008	46 - 100	≤ 1000	Triangular diamonds	1.30 ct	8	69014185801 [1]
	RO1008	46 - 100	≤ 1000	Triangular CVD	Length of sides = 3.5 Depth = 1.0 [mm]	8	66260354350 [1]
	RO15/5	60 - 120	5 - 40	Diamond grit D501	0.65 ct	Multi-layer	66260389341 [1]

Holders for rotatable tools

Specification	Shape of holder	Order number
2096/5096	MK1	66260385746
2096/5096	MK0	66260386916
2096/5096	Z12-35	66260381329
1008	MK1	66260386640
1008	MK0	7958703355
1008	Z10-39.5	66260391408

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Specification	Shape of holder	Order number
W15/5	MK1	69014125429
W15/5	MK0	66260385884
W15/5	W15/5	66260370419

Order sample

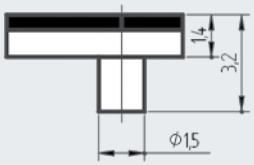
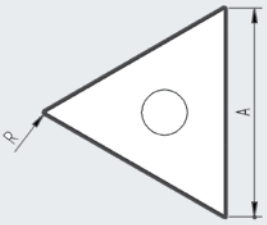
Specification	Diamond [ct] / [mm]	Holder
RO2096	2	MK1

All dimensions in mm

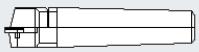
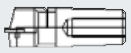
Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

PCD and CVD insert dressers

This economical tool has three working points on a defined radius that can be brought into play by rotating the insert.
A certain amount of regrinding is possible to create the next largest radius.

Tool	Type	Shank length A	Radius R
 	PCD	6.0	0.125
		6.0	0.200
		6.0	0.250
		6.0	0.500
		6.0	0.800
		6.5	0.125
		6.5	0.200
		6.5	0.250
		6.5	0.500
		6.5	0.800
		7.0	0.125
		7.0	0.200
		7.0	0.250
		7.0	0.500
		7.0	0.800
	CVD	6.0	0.125
		6.0	0.200
		6.0	0.250
		6.0	0.500
		6.0	0.800
		6.5	0.125
		6.5	0.200
		6.5	0.250
		6.5	0.500
		6.5	0.800
		7.0	0.125
		7.0	0.200
		7.0	0.250
		7.0	0.500
		7.0	0.800

All dimensions in mm

Dresser holder	Designation	Size
	PKD81A-966/1	MK1
	PKD81A-966/2	MK1
	PK81A-966/3	Cylindrical 12/10/8

More holder shapes on request

Order sample

Type	Diamond	Dimensions	Radius
Insert dresser	PCD	6.0 mm	0.125 mm

Info

Contact for orders and reworking of PCD and CVD insert dressers:
Saint-Gobain Diamantwerkzeuge GmbH & Co KG
Unstrutweg 1 Tel. +49 3641 4531-0
07743 Jena, Germany Fax +49 3641 4531-25

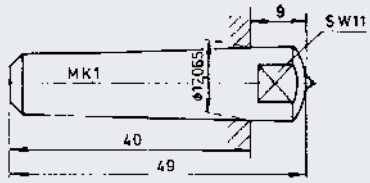
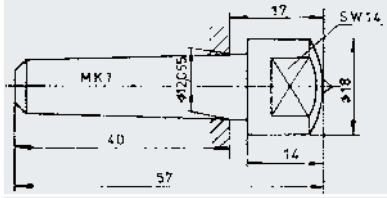
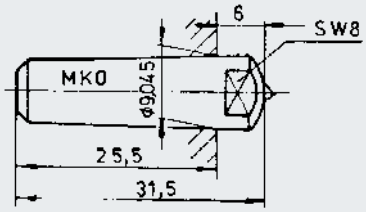
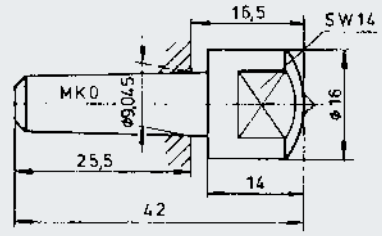
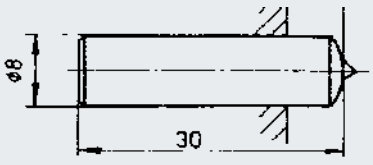
All dimensions in mm

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Toolholders and shanks for common machine types

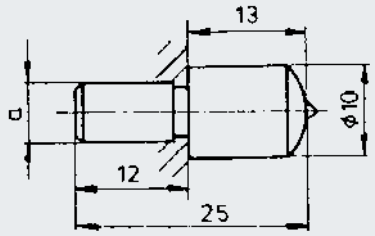
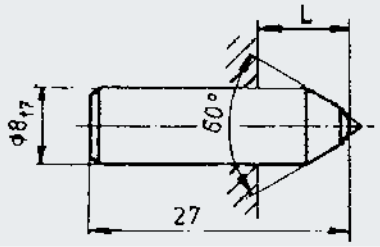
Most of our stationary dressers are manufactured in standard sizes and kept in stock. The tools can be fastened to a suitable holder or shank to match any machine toolholder. We give here a summary of the most common holders and shanks. Please also consult our section entitled 'Toolholders and shanks for diamond Fliesen® tools'.

Diamond holder to DIN 228

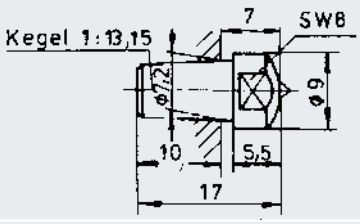
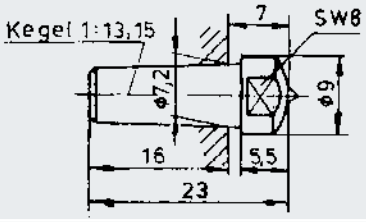
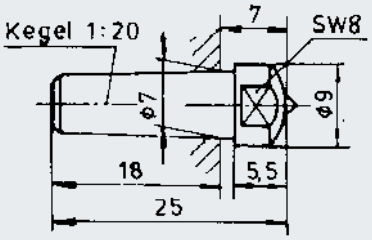
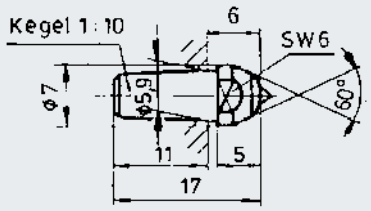
	Type	Machine mounting
	400	MK1
	400K	MK1
	402	MK0
	402K	MK0
	403	Cylindrical

Other shank dimensions on request.

All dimensions in mm

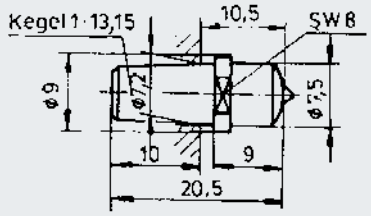
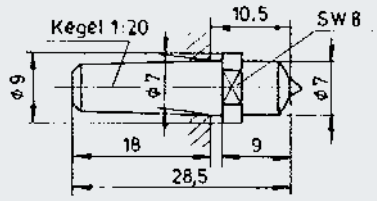
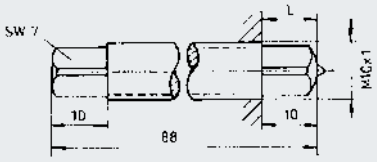
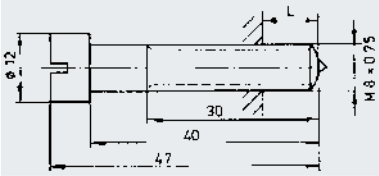
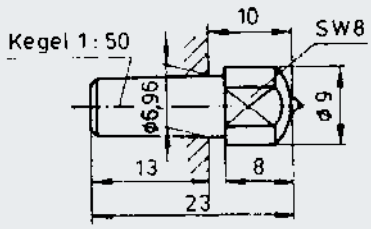
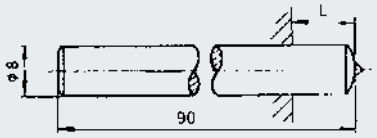
	Type	Machine mounting
	405	Landis a Ø 6; Ø 6.5; Ø 8
	406	D (diamond tip) centred

Other diamond holders

	Type	Machine mounting
	407	Jung NT 65 taper 1:13.15
	409	Jung JgN 1751 taper 1:13.15
	411	Jung JgN 1751 taper 1:20
	412	Jung FA 42-12 taper 1:10

Other shank dimensions on request.

All dimensions in mm

	Type	Machine mounting
	413	Jung C 8 taper 1:13.15
	417	Jung C 8 taper 1:20
	420	Niles
	421	Niles
	422	Kolb KZ 1 + 2 taper 1:50
	424	Cover

Other shank dimensions on request.

All dimensions in mm

Multi-point dressers

Multi-point dressers consist of a holder and a diamond section. The dimensions of the diamond section, the grit size and the ratio of the bond to the diamond grit are determined by the grinding wheel to be dressed. If you supply us with your individual grinding wheel parameters we shall be pleased to recommend a suitable multi-point dresser. Please specify the holder and the mounting angle according to your machine mounting system (cylindrical or tapered e.g. MK1, MK0). In addition to their short delivery times multi-point dressers have more to offer:

Lower costs

Although the actual diamond content of multi-point dressers is usually much higher than that of single-point dressers, the price is lower because the diamonds used are so very much smaller.

Faster stock removal

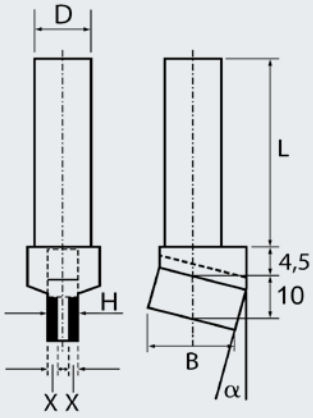
As far more diamonds are in contact with the grinding wheel, the working load is distributed between several diamond tips and this enables the feed to be greater. Result: faster removal of material from the grinding wheel. The diamonds can be arranged in various different ways, depending on the application.

Long service life

Multi-point dressers wear far more slowly than single-point dressers. There is no need to rotate or regrind the points. Multi-point dressers are robust tools and considerably less sensitive than single-point dressers.

D21 multi-point dressers with natural diamond

A robust tool for the straight dressing of grinding wheels for peripheral and surface grinding.
The uniform setting pattern and the special arrangement of the diamonds guarantee a relatively uniform degree of coverage (the number of diamonds making contact).

	Type	Segment dimensions		Diamond		Shank		Order number
	D21	Width B	Height H	Number / rows	Grit size	Shape / D	Clamping length	
	2101	12	10	3	711	14.8	22	66260196334
	2102	12	6	2	711	11	40	66260373763
	2103	12	10	3	1001	10	60	66260383028
	2104	12	6	2	1001	16	50	66260387928
	2105	18	10	3	711	10	40	66260322879
	2106	18	6	2	711	12	50	66260336054
	2107	18	10	3	1001	8	10	66260391179
	2108	18	6	2	1001	10	40	66260337072
	2109	18	10	3	1500	10.9	30	66260320914

Order sample

Type	Shank / D	Clamping length	Mounting angle / °
2104	16	50	0

All dimensions in mm

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks

Igel® multi-point dressers

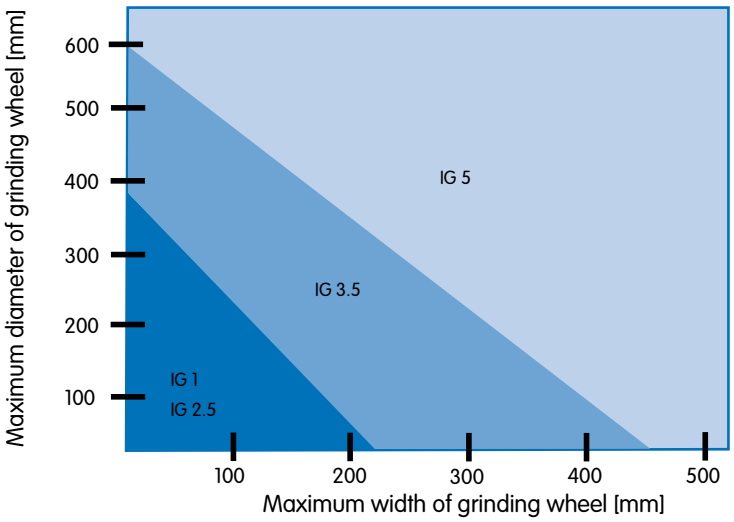
A robust tool for the straight dressing of circumferential grinding wheels and wheels for surface grinding.
Igel® dressers are easy to handle and very economical in use. A great advantage of the Igel® is that it can be used at high dressing feed rates.

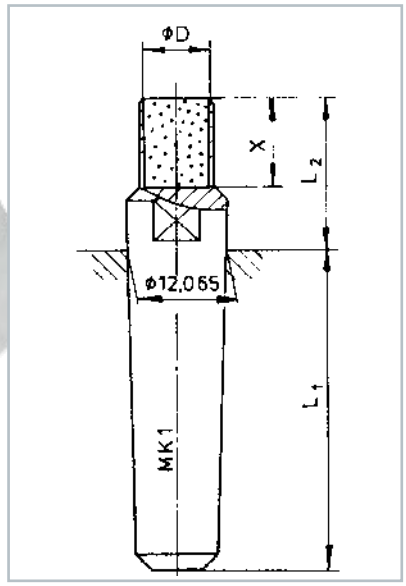
Selecting the best Igel® tool

We have made it easy for you to select a suitable Igel®:

- From the diagram, choose the diamond size and content of the Igel®,
- then choose the best tool from the table below.

Igel® size and diamond [ct] selection





Igel®	Dimensions of diamond section (diameter Ø and length X)	Diamond [ct]
IG 1	8 × 4	1
IG 2.5	8 × 11	2.5
IG 3.5	8 × 11	3.5
IG 5	11 × 11	5

Order sample

Bond (first letter of the bonding material)	Size of Igel®	Diamond [ct]	Dimensions	Holder	Grit size	Bond
H	IG -	2.5 -	8 - 11 -	MK1-40 *	D 1001	H710

All dimensions in mm

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Bond for all alumina grinding wheels, including sintered alumina

Igel®	Grinding wheel grit size	Grit size of Igel®	Bond
IG 1, IG 2.5, IG 3.5, IG 5	60 - 80	D711	H710
	46 - 60	D1001	H710
	36 - 46	D2240	H710

Bond for SiC grinding wheels

Igel®	Grit size Grinding wheel	Grit size of Igel®	Bond
IG 1, IG 2.5, IG 3.5, IG 5	60 - 80	D711	H770
	46 - 60	D1001	H770
	36 - 46	D2240	H770

Igel® range in stock

Specification	Dimensions Diameter D × Length X	Diamond		Order number
		Grit size	ct	
HIG1-8-4-MK1-40*D1001 H710	8 × 4	D1001	1.0	66260195955 [1]
HIG2.5-8-11-MK1-40*D711 H710	8 × 11	D711	2.5	66260387566 [1]
HIG2.5-8-11-MK0-25.5*D1001 H710	8 × 11	D1001	2.5	66260383700 [1]
HIG2.5-8-11-MK1-40*D1001 H710	8 × 11	D1001	2.5	66260195957 [1]
HIG2.5-8-11-MK1-40*D2240 H710	8 × 11	D2240	2.5	66260385203 [1]
HIG3.5-8-11-MK0-25.5*D711 H710	8 × 11	D711	3.5	66260389441 [1]
HIG3.5-8-11-MK1-40*D711 H710	8 × 11	D711	3.5	66260195960 [1]
HIG5-11-11-MK1-40*D711 H710	11 × 11	D711	5.0	66260195972 [1]
HIG5-11-11-MK1-40*D1001 H710	11 × 11	D1001	5.0	66260195959 [1]
HIG5-11-11-MK1-40*D2240 H710	11 × 11	D2240	5.0	66260195953 [1]

All dimensions in mm

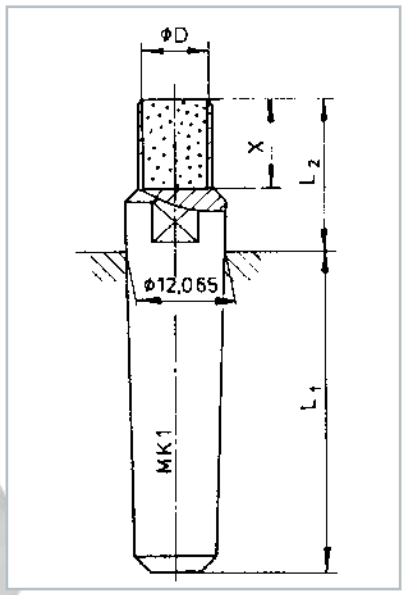
[1] Available ex stock

pro-dress® multi-point dressers

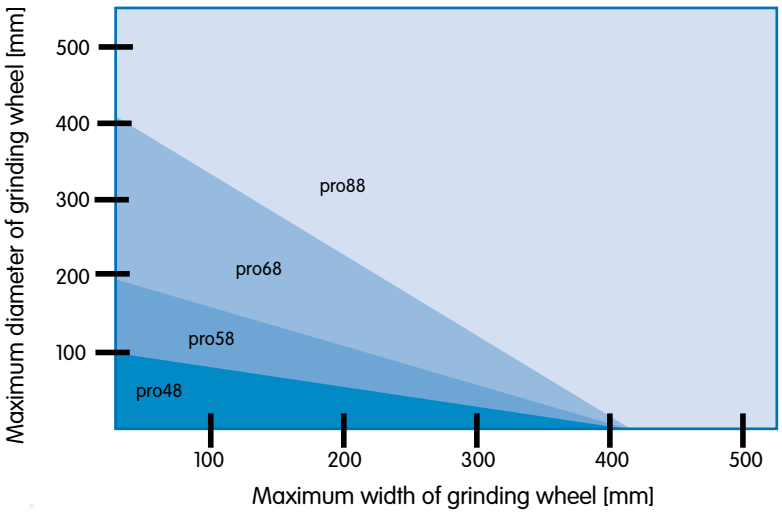
The design of the pro-dress® is similar to that of the Igel®. The pro-dress® is used for the straight dressing of wheels with fine and very fine grit sizes for flat grinding and peripheral grinding.
Its low dressing forces make it especially useful for external cylindrical grinding and fine surfaces.

Selecting the right tool

We have made it easy for you to select the most suitable pro-dress® tool:
- From the diagram, choose the diamond size and content of the pro-dress®,
- then choose the best tool from the table below.



pro-dress® type selection



pro-dress®	Dimensions of diamond tip (diameter D and length X)	Diamond [ct]
pro48	4 × 8	0.6
pro58	5 × 8	1
pro68	6 × 8	1.3
pro88	8 × 8	2.4

Order sample

Bond (first letter)	Design	Dimensions	Holder	Grit size	Bond
H	pro58 -	5 - 8 -	MK1-40	D151	H760

pro-dress® for alumina grinding wheels

pro-dress®	Grinding wheel grit size	Grit size pro-dress®	Bond
pro48, pro58, pro68, pro88	320 - 600	D76	H760
	220 - 320	D107	H760
	180 - 220	D151	H760
	120 - 180	D213	H760
	100 - 120	D301	H760

All dimensions in mm

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

pro-dress®	Grinding wheel grit size	Grit size pro-dress®	Bond
pro48, pro58, pro68, pro88	80 - 100	D426	H710
	60 - 80	D601	H710
	54 - 60	D711	H710

pro-dress® for dressing alumina grinding wheels (low hardness grades, e.g. A and B)

pro-dress®	Grit size Grinding wheel	Grit size pro-dress®	Bond
pro48, pro58, pro68, pro88	320 - 600	D76	ST469
	220 - 320	D107	ST469
	180 - 220	D151	ST469
	120 - 180	D213	ST469
	100 - 120	D301	ST469
	80 - 100	D426	ST469
	60 - 80	D601	ST469
	54 - 60	D711	ST469

pro-dress® for silicon carbide (SiC) grinding wheels

pro-dress®	Grit size Grinding wheel	Grit size pro-dress®	Bonds
pro48, pro58, pro68, pro88	320 - 600	D76	H770
	220 - 320	D107	H770
	180 - 220	D151	H770
	120 - 180	D213	H770
	100 - 120	D301	H770
	80 - 100	D426	H770
	60 - 80	D601	H770
	54 - 60	D711	H770

pro-dress® range in stock

Specification	Dimensions Diameter D × Length X	Diamond		Order number
		Grit size	ct	
HPRO48-4-8-Z6-24*D301 H760	4 × 8	D301	0.6	66260384896 [1]
HPRO58-5-8-Z6-25*D426 H710	5 × 8	D426	1	66260196226 [1]
HPRO68-6-8-MK0-25.5*D213 H760	6 × 8	D213	1.3	66260196258 [1]

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks

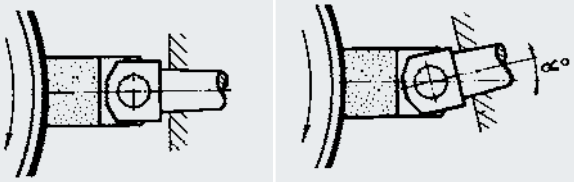
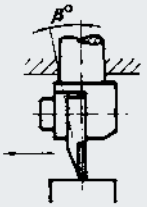
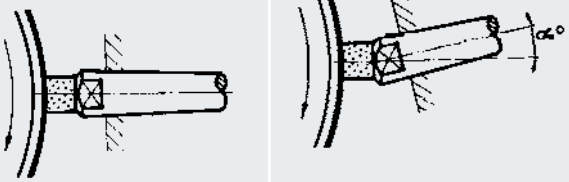
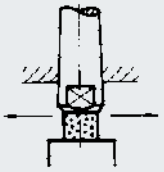
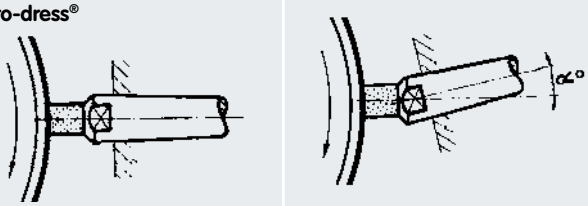
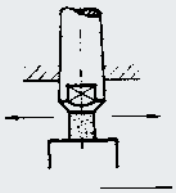
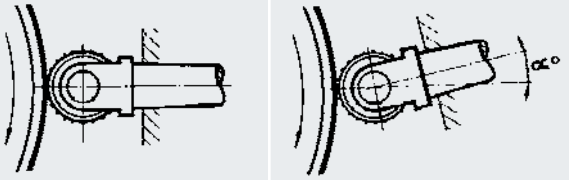
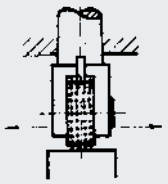
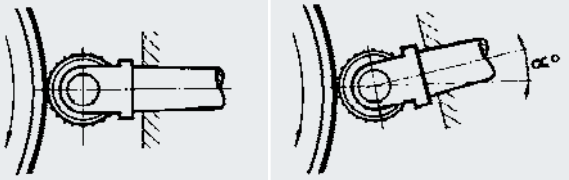
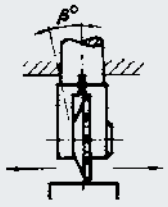
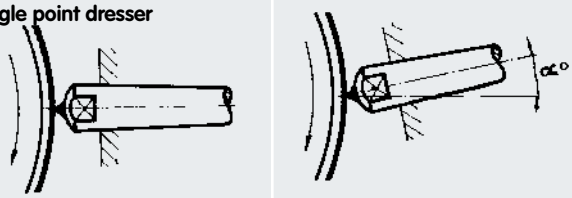
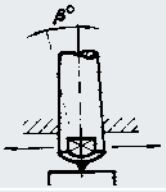
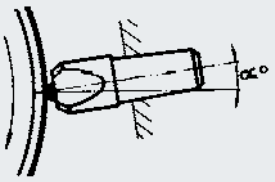
Technical notes

Dressing side feed and positions in relation to the grinding wheel for stationary dressing tools

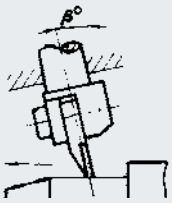
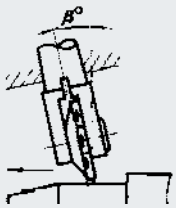
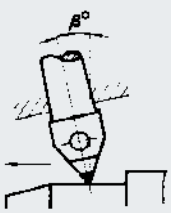
Grinding wheel grit size	Recommended dressing feed (mm/rev)	Grinding wheel speed [rpm]									
		500	1000	1500	2000	2500	3000	3500	4000	4500	5000
150	0.05	25	50	75	100	125	150	175	200	225	250
100	0.15	75	150	225	300	375	420	525	600	675	750
60	0.25	125	250	375	500	625	750 *	875	1000	1125	1250
46	0.35	175	350	525	700	875	1050	1225	1400	1575	1750
< 46	0.45	225	450	675	900	1125	1350	1575	1800	2025	2250
		Dressing feed [mm/min]									

* Example for grinding wheel with 60 mesh grit and speed n = 3000 rpm, dressing feed 750 mm/min

Grinding wheel grit size	Recommended dressing feed (mm/rev)	Grinding wheel speed [rpm]									
		5500	6000	6500	7000	7500	8000	8500	9000	9500	10000
150	0.05	275	300	325	350	375	400	425	450	475	500
100	0.15	825	900	975	1050	1125	1200	1275	1350	1425	1500
60	0.25	1375	1500	1625	1750	1875	2000	2125	2250	2375	2500
46	0.35	1925	2100	2275	2450	2625	2800	2975	3150	3325	3500
< 46	0.45	2475	2700	2925	3150	3375	3600	3825	4050	4275	4500
		Dressing feed [mm/min]									

Work settings for stationary dressing tools					
with straight holding fixture	**with tilted holding fixture**		**when straight dressing**		
Diamantfliesen®		Inclination is compensated by swivelling the blade in the holding fixture **α** = 0...30° or rigidly brazed		Vertical till ß = 30°	
Igel®		If the holding fixture is tilted, please state the angle of inclination **α**°		Vertical	
pro-dress®		If the holding fixture is tilted, please state the angle of inclination **α**°		Vertical	
Rotatables 2096/5096				Vertical	
Rotatables 1008				Vertical or **α** = 30°	
Single point dresser		**α** = 5...45°		Vertical or **α** = 15° to main dressing direction	
Profile diamond		**α** = 5...10°			

All dimensions in mm

	Work setting for profile dressing	Effective cutting width b_D [mm]	Contact ratio U_d	Dressing infeed amount a_{ed} [mm]	Dressing side feed f_{ad} [mm/U]	Other notes
	 ß = 30°...45°	~ 0.8 · d_K d_K = theoretical diameter of diamond grit	2 - 8	0.01 - 0.03	0.05 - 0.5	Slightly diagonal setting possible when dressing straight =Recutting effect =feiner surface quality
				0.01 - 0.05	0.3 - 1.0	Because of the large number of active diamonds during dressing the dressing feed f_{ad} and/or the feed rate v_{fad} must be increased accordingly
				0.005 - 0.3	0.005 - 0.5	Because of the large number of active diamonds during dressing the dressing feed f_{ad} and/or the feed rate v_{fad} must be increased accordingly
		~ 0.8 · d_K per active grit		0.01 - 0.05	0.3 - 1.0	Because of the four active diamonds the dressing feed f_{ad} and/or the feed rate v_{fad} must be increased accordingly
	 ß = 30...45°	~ 0.8 · d_K	2 - 8	0.01 - 0.03	0.05 - 0.5	
		According to the degree of wear	2 - 8	0.01 - 0.03	0.05 - 0.15	When sharpness deteriorates, rotate diamond insert approx. 60° about its own axis, remount in good time. Do not allow wear flats to become larger than approx. 1 mm² Stop! Too late! 
	 ß = 30...45°	According to the profile of the diamond (angle/radius)	2 - 8	0.01 - 0.02	0.03 - 0.10	Please observe the manufacturer's instructions for equipment and machines

All dimensions in mm

Checklist

Company _____

Technical advice to improve results ☐
Offer ☐
Order ☐

1. Workpiece

1.1 Drawing of workpiece _____

1.2. Workpiece material _____

1.3. Surface finish required _____ R_a, R_t, R_z

2. Machine

2.1 Manufacturer _____

2.2 Model/type _____

2.3 Grinding process Angular plunge grinding ☐ Straight plunge grinding: ☐

2.4 Cooling lubricant _____

3. Grinding wheel

3.1 Dimensions _____ mm

3.2. Specification _____

3.3 Manufacturer _____

4. Diamond dresser in use

4.1 Designation _____

4.2 Dimensions _____ mm

4.3. Specification _____

5. Dressing process

5.1 Straight dressing Circumferential ☐ On the face ☐

5.2 Copy dressing / profile dressing _____

6. Current dressing insert data

6.1 Grinding wheel cutting speed during dressing v_{sd}= _____ m/s

6.2. Dressing infeed/ stroke a_{ed}= _____ mm

6.2. Dressing infeed/ stroke f_{ad}= _____ mm

7. Requirement or problem

vf_{ad}= _____ mm/min

Please send the completed form to your expert advisor or directly to our product management: tel +49 40 5258-220, fax +49 40 5258-215

Ancillary dressers

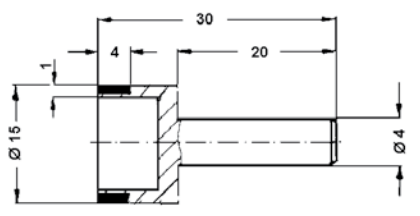
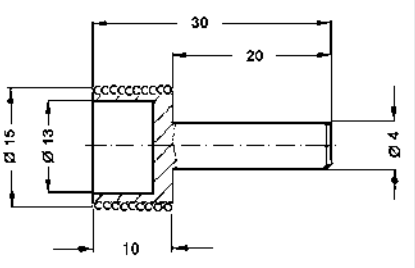
Standard dressing tools keep grinding wheels in shape and in the best possible condition to do their jobs. The choice of process to be used depends on the grinding machine, the type of dressing unit, the shape and type of the grinding wheel, as well as the workpiece to be machined.

We offer an appropriate dressing solution for every application – from the dressing tool to the dressing unit. Most standard dressing tools are kept in stock and are available immediately. This chapter includes details of rotary dressing cups for internal grinding, sharpening stones for subsequent sharpening of grinding wheels and manual dressers for hand dressing of alumina and silicon carbide wheels.

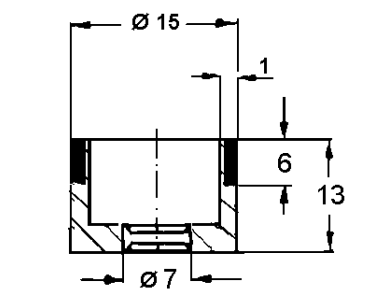
Dressing tools for vitrified bonded grinding tools

Dressing pins and cups are particularly suitable for dressing small grinding wheels for internal cylindrical grinding.

Diamond dressing pins for dressing vitrified bonded cBN grinding wheels

	Shape	D	T	X	S	L	Grit size	Bond	Concentration	Order number
	4BZ 07B	15	4	1	4	30	D301	BZ 387.1	C135	66260100343 [1]
	50S 07B	15	10		4	30	D426	G825	S33	60157644198 [1]

Diamond dressing cups for dressing vitrified bonded cBN grinding wheels

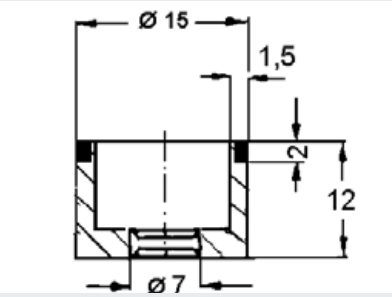
	Shape	D	T	X	H	Grit size	Bond	Concentration	Order number
	2BZ6A9	15	6	1	7	D301	BZ 387	C135	66260379145

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 6 weeks

Diamond dressing cups for dressing vitrified bonded cBN grinding wheels

	Shape	D	T	X	H	Grit size	Bond	Concen-tration	Order number
	1BZ6A9	15	2	1.5	7	D213	BZ 387.1	C135	66260112087

All dimensions in mm

[1] Available ex stock

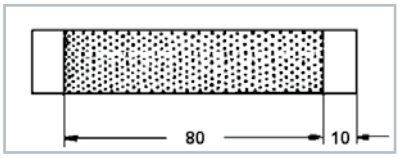
Minimum order quantity for articles not in stock: 1 item, delivery: 6 weeks

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

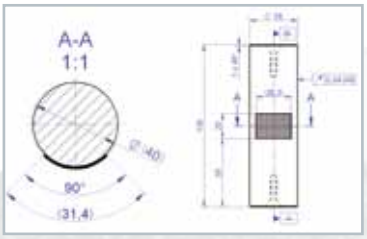
Dressing tools for resin-bonded grinding wheels

Electroplated and sintered metal bond dressing tools

WINTER also offers suitable tools for dressing resin-bonded diamond and cBN grinding wheels. Electroplated and sintered metal-bonded dressing tools are available from stock.



WINTER dressing block			
Application	**Shape**	**Specification**	**Order number**
For truing resin bond diamond and cBN grinding wheels on surface grinders. If used with coolant, subsequent sharpening with WA150GV sharpening stone or WINTER stone No. 2 is required.	1S09H-80-20-8	D301 / S11	66260134287 [1]



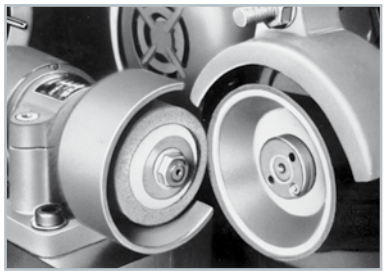
WINTER dressing cylinder			
Application	**Shape**	**Specification**	**Order number**
For dressing resin bond diamond and cBN grinding wheels on cylindrical grinders. If used with coolant, subsequent sharpening with WA150GV sharpening stone or WINTER stone No. 2 is required.	1S44B-40-20	D301 / S11	60157642712

All dimensions in mm

[1] Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 5 weeks

Dressing tools for diamond and cBN grinding wheels



WINTER dressing unit

This brake-controlled dressing unit, for dressing diamond and cBN grinding wheels, comes complete with two SiC wheels,
one 37 C60-MV and one 39 C802-15V **Order no. 66260195821**

Replacement grinding wheels	For grit sizes	Order number
37C46-N5VS	D91 - D181	69936679412 [1]
39C60-MV	D64 - D126	66253051624 [1]
39C802-IV	≤ D64	66253052726 [1]
Accessories	1 set consisting of: 3 brake segments, 3 springs and 3 screws	66260274670 [1]

Only use dry; subsequent sharpening with a WINTER stone previously soaked in water should be used as necessary

Cleaning and sharpening stones

Cleaning and sharpening stones	WINTER	Order number
WINTER stone No. 1AW (100×20×20)	Special white fused alumina, vitrified bonded, 360 mesh, for sharpening resin bond grinding wheels with grit size < D46	66260395639 [1]
WINTER stone No. 2 (100×24×13)	Special white fused alumina, vitrified bonded, 180 mesh, for sharpening resin and metal-bonded grinding and cut-off wheels with grit size ≥ D46	66260195816 [1]
WINTER stone No. 3 (100×40×15)	Silicon carbide, rubber-bonded, 80 mesh, for cleaning and sharpening electroplated and vitrified bonded grinding wheels and pins	66260195817 [1]
WINTER stone No. 3A (80×15×10)	See WINTER stone No. 3	66260389357 [1]
WINTER stone No. 3B (100×50×25)	See WINTER stone No. 3	66260386167 [1]
WINTER stone No. 4 (90×70×20)	Special pink fused alumina, vitrified bonded, 60 mesh, for sharpening metal bond grinding wheels with grit size ≥ D251	60157642665 [1]
WINTER stone No. 5 (100×50×25)	See WINTER stone No. 2	66260389054 [1]

Cleaning and sharpening stones	flexovit	Order number
Stone WA150GV (25×25×150)	Cleaning and sharpening vitrified and resin bond grinding wheels ≥ D54, recommended for sharpening Q-Flute[2]	69936621643 [1]
Stone WA220GV (25×25×150)	Cleaning and sharpening vitrified and resin bond grinding wheels	69014165446 [1]
Stone WA320GV (25×25×150)	Cleaning and sharpening vitrified and resin bond grinding wheels ≤ D46	69936651380 [1]

All dimensions in mm

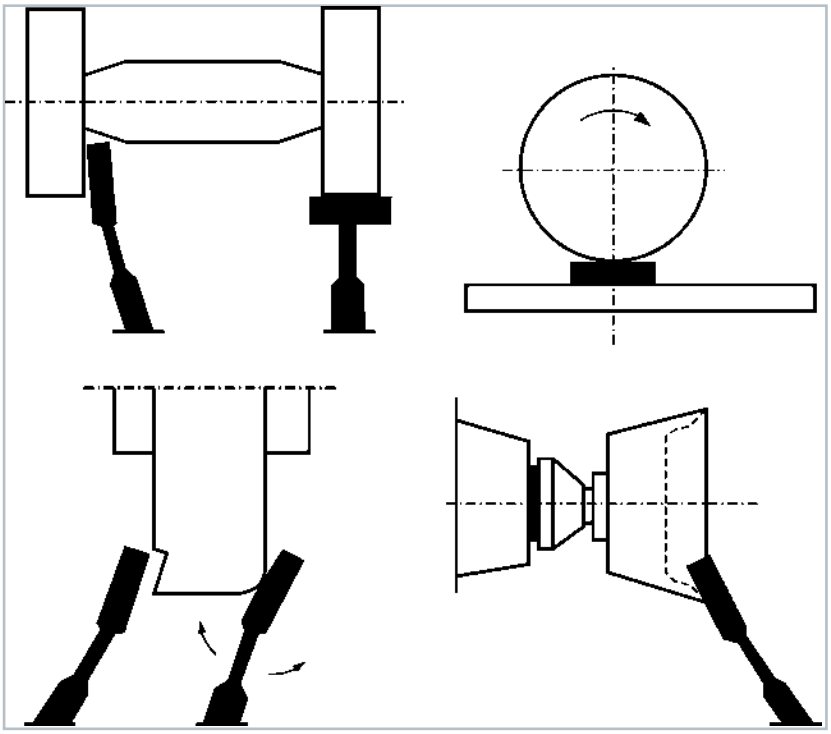
[1] Available ex stock

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Manual dressing tools

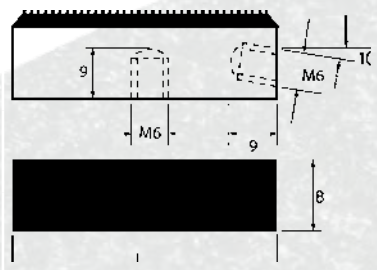
You can use these robust tools to dress glazed and loaded conventional vitrified grinding wheels. This will give you a better grinding tool topography and improve the radial running truth of the grinding wheel. The high concentration of diamonds in these dressers ensures a long service life with good wear resistance and enables sharpening the wheels without damaging the tool. They are designed for the rapid dressing of grinding wheels up to 1000 mm in diameter with grain sizes of 36–120 mesh.

Examples showing the use of the straight and side versions of our manual dressing tools



D20 manual dressing tool with natural diamond in an electroplated bond

The 2001 and 2002 versions are principally for particularly hard grinding wheels such as SiC, supplied also with an M6 thread handle to be screwed in at the side or the end.



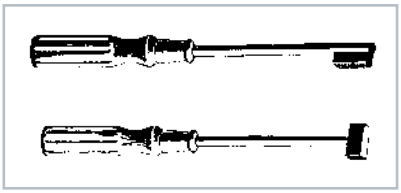
Type	Segment dimensions		Design		Diamond content [ct]	Order number
D 20	L	B	lateral	straight		
2001	45	12	x	x	5	66260139141 [1]
2002	20	12	x	x	2.2	66260195353 [1]

All dimensions in mm

[1] Available ex stock

Multigrit manual dressing tool with natural diamond in a sintered metal bond

Models Igel-P (side-mounted) and Igel-T (end-mounted) have a fixed handle. They are suitable for all alumina grinding wheels.



Type	Segment dimensions		Design	Diamond content [ct]	Order number
Igel	L	B			
Igel-P	25	7	lateral	1.3	66260134089 [1]
Igel-T	25	7	straight	1.3	66260133388 [1]

All dimensions in mm

[1] Available ex stock

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page

Dressing parameters

The correct choice of dressing parameters is essential to optimize the grinding process. Dressing is a method of rapidly and flexibly influencing the active surface roughness and geometry of a grinding wheel, thereby changing its surface topography, profile accuracy, and the grinding forces during use.

Conditioning

Dressing		Cleaning
Profiling	**Sharpening**	
Macrostructure	**Microstructure**	**Microstructure**
Imparting running truth and correct wheel shape	Producing the wheel topography	Elimination of chips from the chip spaces
Intentional modification of grit and bond	Intentional setting back of the bond	No intention to modify the grinding wheel

Dressing parameters have a very great influence on the behaviour of a grinding wheel. The use of CNC dressing tools enables quick and easy changes to the active surface roughness and geometry of a grinding wheel, thereby influencing its surface finish, profile accuracy and grinding forces.

The grinding results are influenced by the radial dressing infeed, a_{ed}, and the axial dressing feed, f_{ad}. Together with the dressing feed, the diamond grit size is another important factor that affects the grinding result. The effective dressing width, b_d, and the associated overlap, U_d, affect the active surface roughness, R_{ts}, of the grinding wheel.

In the case of CNC dressing discs the dressing results are also affected by the speed factor, q_d, and the direction of rotation, whether dressing is uni-directional (GL) or counter-directional (GGL). It is important to use a suitable coolant with adequate filtration during the dressing process.

When dressing with profile roller dressers, the roll is plunged into the grinding wheel surface. Its effect is achieved through the speed factor and direction of dressing as mentioned above. There is no lateral motion.

Characteristics of conditioning processes

System component	Process variables	Targets
Grinding wheel	Dressing forces	Grinding wheel profile
Dressing tool	Structure-borne noise signal	Grinding wheel running truth
Coolant conditions	Power from grinding and dressing spindles	Active surface roughness of the grinding wheel
Dressing parameters: – Overlap ratio (CNC) – Speed ratio – Grinding wheel speed – Infeed		Dressing wear ratio Workpiece quality

Process parameters

Infeed a_{ed} when dressing with stationary dressers and CNC dressing discs

With radial infeed, a_{ed}, the dressing tool advances towards and into the grinding wheel with each dressing pass. The total dressing infeed, $a_{ed\,tot}$, can be divided into roughing and finishing infeeds.

Dressing infeeds for alumina grinding wheels:

Total infeed $a_{ed\,tot}$ for special fused alumina grinding wheels:	20 µm – 40 µm, depending on the grit size of the grinding wheel
Total infeed $a_{ed\,tot}$ for sintered alumina grinding wheels:	10 µm – 20 µm, depending on the grit size of the grinding wheel

Dressing infeed for cBN grinding wheels with vitrified bonds:

Infeed a_{ed} per dressing pass:	1 µm – 3 µm
Maximum dressing amount $a_{ed\,tot}$:	No more than 10% of the average grit diameter of the grinding wheel

In general, cBN grinding wheels with vitrified bonds have a much longer interval between dressing events and therefore the number of dressing operations needed is far lower for a given output than when conventional grinding wheels are used.

Example using vitrified cBN grinding wheels

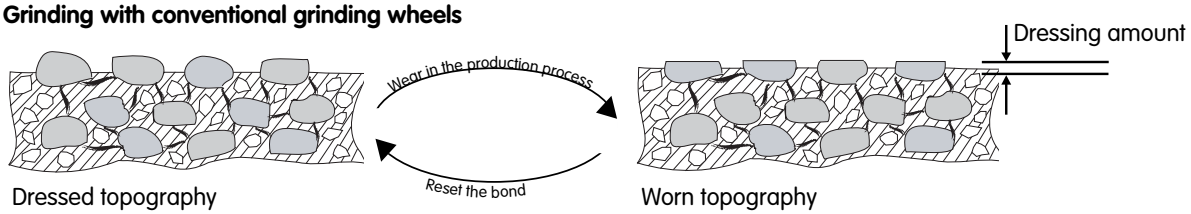
B126 indicates an average grit diameter of the grinding wheel of 118 µm, so infeed $a_{ed\,tot}$ will be 10 µm – 12 µm

General notes:

- Avoid dressing passes without infeed a_{ed}
- Contact sensors are needed for accurate control and economics
- Ensure that suitable coolant is used

There is a fundamental difference between dressing requirements needed for conventional grinding wheels and cBN grinding wheels with a vitrified bond:

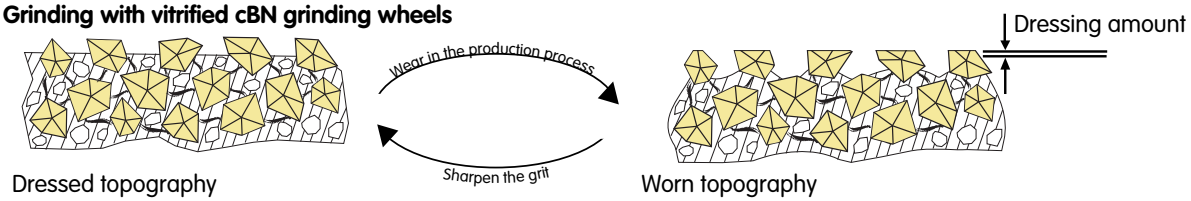
Grinding with conventional grinding wheels



Dressed topography
Grit protrusion high
Active surface roughness high
Grinding forces low

Worn topography
Grit protrusion low
Active surface roughness low
Grinding forces high

Grinding with vitrified cBN grinding wheels



Dressed topography
Grit protrusion low
Active surface roughness low
Grinding forces high

Worn topography
Grit protrusion high
Active surface roughness high
Grinding forces low

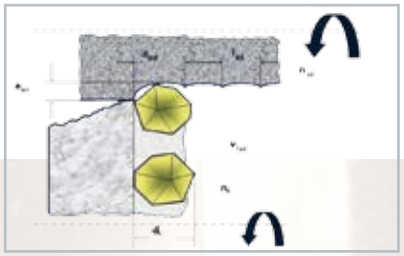
Overlap ratio, U_d, for stationary and CNC dressing tools

In addition to the geometric and dimensional accuracy of a grinding wheel, the required active surface roughness, R_{ts}, plays an important role. It defines the surface finish of the ground workpiece.
Both CNC dressing tools and stationary dressing tools are driven over the grinding wheel profile to be dressed with an axial feed, f_{ad}. One of the advantages of CNC dressing is that different feed rates can be used on different sections of profile. Flat surfaces can be dressed with a smaller overlap ratio, U_d, in order to prevent burning in these areas.

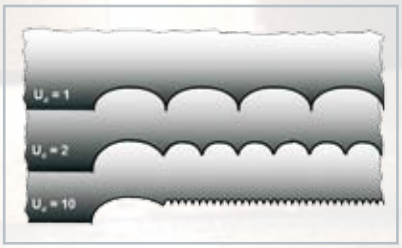
The overlap ratio, U_d, is defined as the number of revolutions executed by a grinding wheel, during which the dressing tool has traversed by its exact contact width, a_{pd}.

$U_d = a_{pd} / f_{ad}$
$\approx d_k / [v_{fad} / n_{sd}]$
$\approx d_k / [v_{fad} * ds * \pi / (v_{cd} \times 60{,}000)]$

U_d	[-]	:	Overlap ratio
a_{pd}	[mm]	:	Contact width of dressing tool
d_k	[mm]	:	Grit size of dressing tool
d_s	[mm]	:	Diameter of grinding wheel
f_{ad}	[mm]	:	Axial feed for each grinding wheel revolution
n_{sd}	[rpm]	:	Grinding wheel speed
v_{cd}	[m/s]	:	Cutting speed while dressing
v_{fad}	[mm/min]	:	Axial infeed speed while dressing



Lower U_d -
High active surface roughness of the grinding wheel
Higher U_d -
Lower active surface roughness of the grinding wheel



Suggested values:

Overlap ratio U_d	$= a_{pd} / f_{ad}$
Rough grinding	= 2 - 4
Finish grinding	= 4 - 8
Super finish grinding	= 8 - 20

Infeed, a_{ed}, when dressing with profile rollers

With radial infeed, a_{ed}, the dressing tool advances towards the grinding wheel with each dressing pass. The radial infeed depends on the grit size, hardness and dimensions of the grinding wheel, rigidity of the machine and dressing unit and the specification and developed length of the profile roller.

Dressing infeeds for alumina grinding wheels:
Total infeed, $a_{ed\,tot}$, for special fused alumina grinding wheels: 20 µm – 40 µm, depending on the grit size of the wheel

Total infeed, $a_{ed\,tot}$, for sintered alumina grinding wheels: 10 µm – 20 µm, depending on the grit size of the wheel

Dressing infeed for cBN grinding wheels with vitrified bonds:
Maximum dressing amount, $a_{ed\,tot}$: No more than 10% of the average grit diameter of the grinding wheel

Continuous dressing (CD)

In the continuous dressing (CD) process, the dresser is in continuous contact with the grinding wheel. The progressive reduction of the grinding wheel diameter must be compensated for during the grinding process by the CNC machine control. Through the continuous sharpening and profiling, a constant roughness and profile holding of the grinding wheel is obtained.
The dressing process is especially suitable for roughing and creep feed grinding processes.

Speed ratio, q_d, of rotary dressing tools

The speed ratio, q_d, between the rotary dressing tool and the grinding wheel has a considerable influence on the grinding wheel topography and consequently on the dressing and grinding result.

Recommended values for the speed ratio, q_d:

CNC dressing discs:

Uni-directional:	+0.5 …+0.85
Counter-directional:	- 0.5 …- 0.85

Profile roller dresser

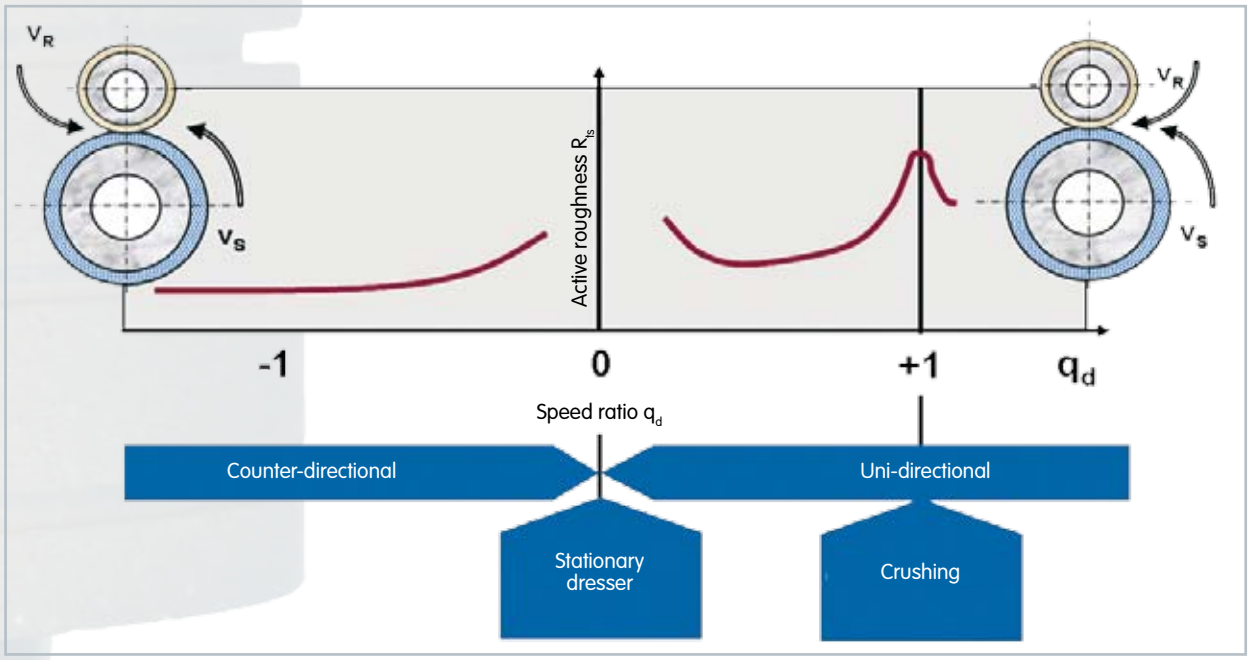
Uni-directional:	+0.3 …+0.8
Counter-directional:	- 0.3 …- 0.5

Vitrified cBN grinding wheels should usually be dressed in the same direction in order to achieve the greatest active surface roughness on the grinding wheel.

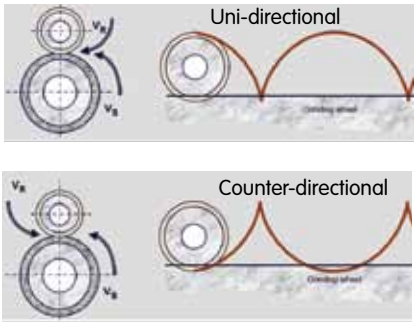
Uni-directional:	+0.6 …+0.9

Attention

A speed ratio of +1 leads to increased dressing forces and can damage the tools.



The different dressing forces are explained by the different paths (cycloids) of the grinding wheel and roller dresser.



Dressing speed ratio $q_d = \frac{v_r}{v_{sd}}$

Circumferential speed of the roller dresser	v_r
Circumferential speed of the grinding wheel when dressing	v_{sd}
Dressing speed ratio	q_d

> 0:	Uni-directional
= 1:	Crushing
= 0:	Stationary dresser
< 0:	Counter-directional

Uni-directional dressing:

During uni-directional dressing the diamond moves along a shorter path (epicycloid), causing it to penetrate the grinding wheel surface at a more acute angle and producing a highly aggressive active surface roughness, R_{ts}, on the grinding wheel.

- Greater influence on the grinding wheel topography
- Higher dressing forces
- Higher stresses on the roller dresser

Counter-directional dressing:

During counter-directional dressing the path is much longer (hypocycloid) and the diamond penetrates the grinding wheel at a much flatter angle, producing a much lower active surface roughness, R_{ts}, on the grinding wheel.

- Lesser influence on the grinding wheel topography
- Lower dressing forces
- Lower stresses on the roller dresser

Notes

Wherever possible, dress at grinding speed

Radial run-out | Axial run-out | Imbalance

Prevent dynamic imbalance

$v_c = v_{cd}$

Avoid ratios that are whole numbers $n_s : n_D$

· Figure shows the dresser on the grinding wheel
· Patterns form on the workpiece

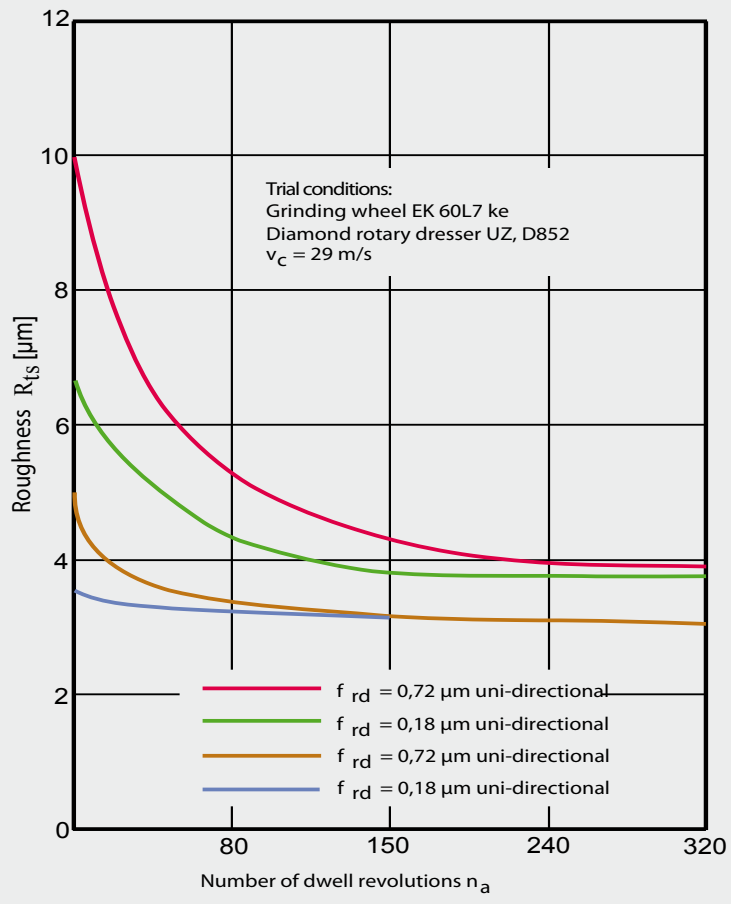
General

Other influences on active surface roughness and workpiece surface finish when using profile roller dressers

Dwell revolution

The figure shows the effect of the number of dwell revolutions on active surface roughness. In practical terms this means that after 80 counter-directional dwell revolutions or 160 uni-directional dwell revolutions the minimum active surface roughness is reached on the grinding wheel, and that if the diamond roller dresser remains in contact for any longer this roughness will remain unchanged. These absolute values apply to one particular dressing device. Designs that have different rigidities will have different absolute values, but the principle remains the same.

R_{ts} Active surface roughness
v_c Peripheral speed of the grinding wheel
f_{rd} Dressing infeed per grinding wheel revolution



Effect of the number of dwell revolutions on active surface roughness according to G. Pahlitzsch and R. Schmidt [1]

Diamond grit size

In addition to the dressing conditions, the diamond grit size also affects the achievable grinding wheel surface roughness and consequently the surface finish of the workpiece. In the case of diamond roller dressers with hand-set diamonds, the required workpiece finish is obtained by adjusting the concentration and pattern of diamonds.
The roughness and waviness of the workpiece can be reduced by dressing with a correspondingly longer dwell time.

For diamond roller dressers with statistically distributed diamonds (type UZ), it is preferable to select a greater diamond density in the interest of greater active surface roughness whenever the workpiece profile allows this.

[1] G. Pahlitzsch and R. Schmidt „ Wirkung von Korngröße und Konzentration beim Abrichten von Schleifscheiben mit diamantbestückten Rollen"

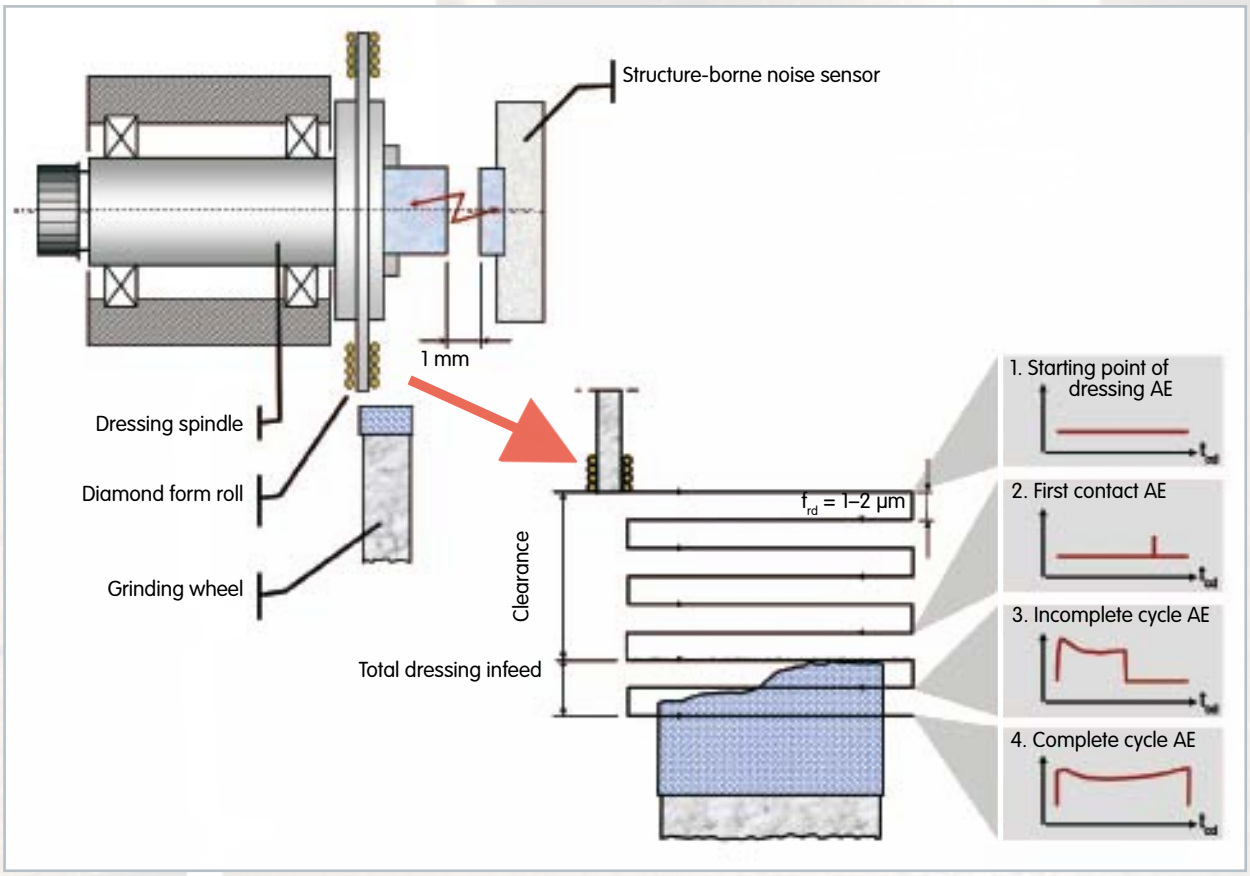
Contact detection

A high-precision dressing spindle is required when a form roll is used to dress vitrified cBN or diamond grinding wheels. A contact detection device monitors the point at which the dressing disc touches the grinding wheel and supervises the complete dressing cycle.
Contactless measurement using noise signals transmitted through the machine structure and subsequently displayed on the monitor guarantees minimum loss of the grinding wheel coating and retention of the chip space.
Minimizing the amount of dressing means that tool costs are markedly reduced and guarantees a high degree of process reliability together with a continuously controlled dressing and grinding process.

Source: Dittel

Advantages of contact detection:

- Grinding processes are displayed
- Grinding processes are optimized
- 'Dead times' are identified
- Cycle times are reduced
- Tool life is prolonged
- Weak points are analyzed

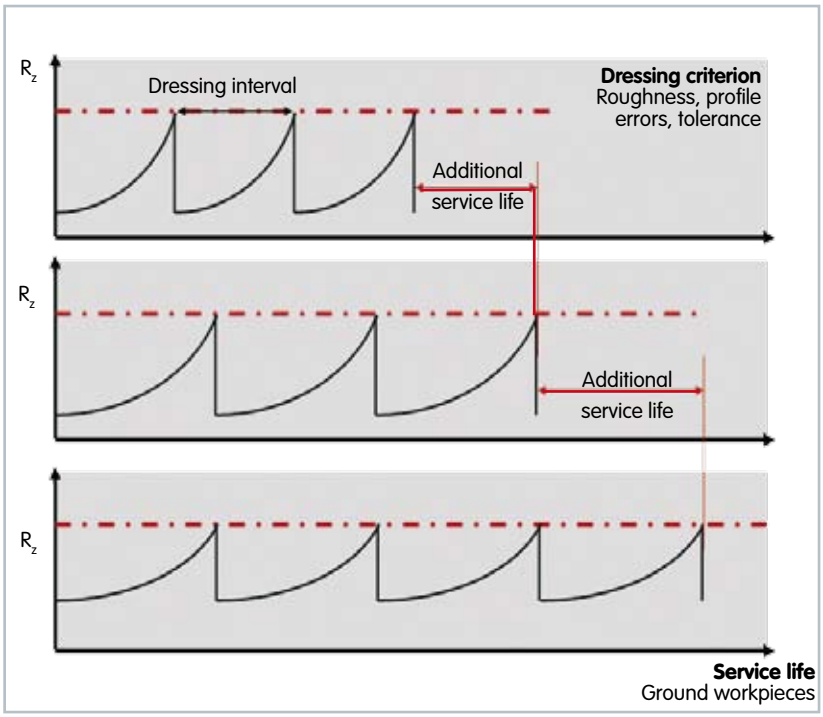


Optimized dressing process

Initial process

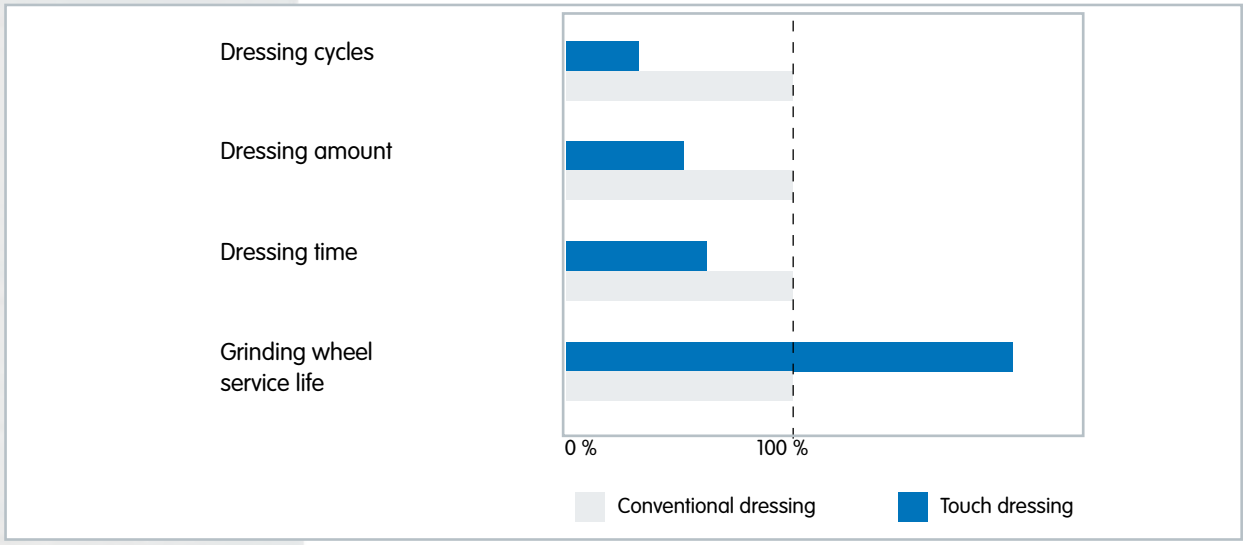
Optimized grinding wheel
Extended dressing cycles

By using contact detection optimized dressing results in a reduced dressing infeed and prolongs the working life of the grinding wheel



Comparison of time savings and working life

In order to minimize the amount of dressing when using vitrified cBN grinding wheels and exploit the potential tool life to the maximum, 'Touch dressing' is used for dressing and conditioning. Contact detection systems with rapid, reliable monitoring of the initial contact between grinding wheel and dresser permit dressing amounts in the range of a few microns and thus enable increased economy and productivity.



Compendium

The WINTER brand represents over 160 years of heritage and grinding experience. Many companies worldwide involved in industrial production benefit from this expertise.

We know our customers' requirements and help you with our technological expertise and competence. This way, your grinding process becomes more effective and profitable.

Service

Competition is keen, and cost pressures are acute. To improve productivity and technical capability, you need a supplier who co-operates efficiently. WINTER not only provides high performance grinding tools but can also assist in analysing your processes, to identify the best solution, and then to implement it together with you.

Advice

Our field service engineers and customer service team are here to help, and can offer advice on all WINTER products and grinding processes. Together with product management and our application engineering team, customised solutions will be found which meet your needs.

Product Development

WINTER, as the grinding industry's technology leader, invests heavily in Research and Development. Basic research supports new customer-specific product and application developments at our global Technology Centres. Our EGTC (European Grinding Technology Centre) with the R&D Department in Norderstedt, closely co-operate with our Research and Technology Centres in the USA, France and China.

Process Optimisation

At our EGTC (European Grinding Technology Centre), we can evaluate your grinding processes using sophisticated sensing and measurement systems which you may not have access to. So we can demonstrate improvements to your process without interrupting your production. On your factory floor, our application and development engineers continue to support you. Our dedicated specialists are expert in the field of complex grinding systems, and can advise on new production strategies with the help of innovative process diagnostic technology. The result for customers is a fine-tuned production process, and optimised day-to-day operations.

Training and Continuing Education

We offer regular seminars on current issues and developments at our European Grinding Technology Centre (EGTC) in Norderstedt. Economic and advanced production processes are reviewed with top-class experts from different parts of the industry. We invite internal and external consultants on specific subjects to comment on the technological state-of-the-art and development trends.

Ask your field salesman for the latest calendar of scheduled seminars and get yourself registered.
Specific training programmes can also be arranged according to your individual requirements.
Just contact us - we will gladly make an offer that meets your needs.

WINTER offers seminars on topics such as:

- Tool Grinding Technology Forum (expert panel discussion)
- Grinding (basic training)
- Grinding fluids (focused technology review)
- Dressing technology (focused review)

Field Instrumentation System (FIS)

Optimise your production process

Have us make a FIS process analysis and optimise your production process: field instrumentation system is a portable system to monitor and measure your grinding process. Exact and comparable data is obtained and can contribute to increase your performance:

– Process optimisation, reduction of cycle time
– Prolongation of tool life time
– Machine and process studies
– Analytical determination and benchmarking

Give it a try!

MDress - Mobile Dressing Unit

For better grinding results

Almost every CNC grinding machine can be upgraded by MDress, the mobile rotary diamond dressing unit. Using MDress ensures highly precise reconditioning of grinding wheel profiles. The grinding wheel achieves its ultimate axial and radial running truth directly on the main spindle. Our customers are enabled to test, for example, vitrified bonded grinding wheels, on the CNC grinding machine and obtain a more economic grinding result.

Our application engineers will give you support, to demonstrate an optimised dressing process with the MDress dressing system on your machine at your premises.

Just contact us.

RFID – Radio Frequency Identification

This technology makes it possible to transfer stored data from the grinding wheel to the grinding machine. The advantages are

The increased level of transparency

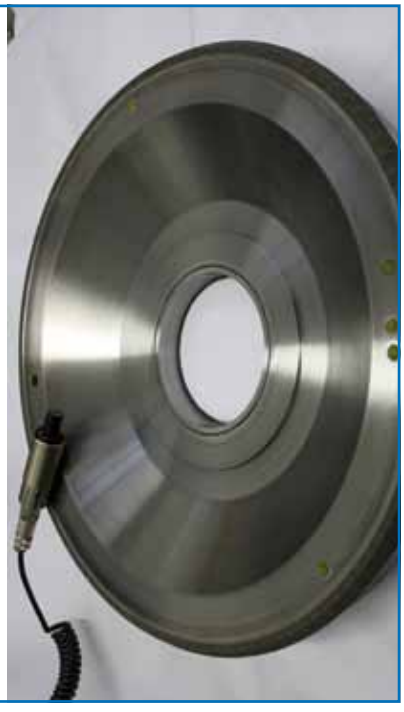
- Integrated tool-life monitoring
- Automated scanning and storage of tool use

Shorter set-up times

- Direct access to grinding wheel data by the machine control system
- Elimination of operator error in manual recording and entry of data

Improved profitability

- Reduced machine downtime by automatic data transfer between machine and grinding wheel



Glossary

For your reference: a short explanation of grinding terms

Bonds

To meet the challenges of the wide diversity of grinding applications, it is inevitable that a wide range of bond systems is required. Bonds are categorised according to the fundamental material type used, and many variations exist within each type.

Resin Bond Systems

These are based on either phenolic or polyimide resins, usually together with added fillers, as well as the abrasive grains. Resin bonds are at the lower end of the hardness scale, and are used in a wide range of applications due to their fast and cool grinding behaviour.

Sintered Metal Bonds

Most metal bonds are based on bronze, although harder systems may be based on steel or even hardmetal. Sintered bronze bonds are relatively soft and at their softest can overlap the hardest resin bonds. Steel and hardmetal bonds are more wear resistant, so therefore act harder and grip the abrasive grains more strongly, leading to longer tool life, although the abrasive can sometimes appear blunt.

Metal bonded grinding wheels generally grind more slowly, in most applications acting harder, and more grinding heat is developed than in resin bonded wheels. However, metal bonds can also readily dissipate heat, which also impacts the grinding process. Metal bonds are ideal for grinding wheels with sharp edge profiles, and for machining abrasive materials that would otherwise wear the bond. Furthermore, metal bonds are shock-resistant, and are suitable for very aggressive operating conditions. Metal bonds are mostly used in wet grinding. Special variants are crushable, brittle metal bonds that can be dressed on the machine in a special crushing process. These bonds are especially useful in creep feed grinding.

Electroplated Bonds

In this bond system, the metal bond is deposited electrolytically onto a bronze or steel body. The grit is tenaciously achored by the bond, and grain tips can protrude from the bond layer by 30 - 50 % of the grain diameter. This leads to a grinding layer with a very high material-removal-rate capability. However, only the outermost grain layer acts in this way, which is why these tools are mainly designed in single-layer versions. Such single layer bond systems are suitable for profiled wheel bodies of all kinds; profile accuracy is dependent on the grit size specified.

Vitrified Bonds

Vitrified bonds are based on fusible glasses combined with fillers and the abrasive grains. While resin and metal bonds are generally fully dense, vitrified bonds are usually produced with a defined porosity, and are available in different hardness levels. This variation in porosity and hardness is analogous to the vitrified bonds of conventional grinding wheels. The main features of vitrified bonds are:

- Good dressability and profileability
- Free-cutting due to the porosity and self sharpening behaviour
- Fluid availability, due to porosity, in the grinding zone allows cool grinding at low grinding forces
- High cutting speeds and material removal rates are possible.

Concentration

According to the WINTER system, the concentration value defines the volume fraction of diamond or cBN in the abrasive layer as follows:

Diamond		
Concentration	**Carat / cm³**	**Volume %**
C50	2,2	12,5
C75	3,3	18,75
C100	4,4	25
C125	5,5	31,25

cBN		
Concentration	**Carat / cm³**	**Volume %**
V120	2,09	12
V180	3,13	18
V240	4,18	24
V300	5,22	30

These definitions are not applicable for single layer electroplated tools.

Conditioning

Conditioning of a grinding wheel consists of dressing and cleaning:

Dressing		**Cleaning**
Profiling	**Sharpening**	
Influences macrostructure	Influences microstructure	Influences microstructure
Produces concentricity and grinding wheel profile	Generates topography and grain exposure by eroding the bond	Removes chips from chip space
Need: Shape or re-shape the wheel surface	Need: Create grit protrusion	Need: No change in the surface

Cubic Boron Nitride (cBN)

Boron nitride is found in two structural modifications: Cubic boron nitride (cBN) has the zinc-blende crystal structure equivalent to diamond, and has a hardness just a little below that of diamond. The graphite-like hexagonal modification of boron nitride (hBN) is soft and is used as a lubricant.

Compared to diamond, cBN has technological and economic advantages when grinding materials having a chemical affinity to carbon, such as steels and ferrous alloys. Applications for cBN are becoming increasingly economic, and cBN grinding of workpieces with hardness as low as 50 HRC have been demonstrated.

Diamond

Diamond is one of the three carbon modifications (the others are graphite and the fullerenes) and, with a Moh's hardness of 10, diamond is the hardest material known. The grinding (Rosiwal) hardness is 140 times higher than that of alumina. Because of its hardness and wear resistance, diamond is used for grinding hard, brittle and short-chipping materials. Examples are tungsten carbide, glass, ceramics, quarz, semiconductor materials, graphite and wear-resistant thermal spray alloys as well as hard-facing alloys, plastics with glass fiber reinforcement, and other difficult to machine materials. Both natural and synthetic diamonds are used in industrial applications.

- **Natural diamond:** these diamonds were created in the earth's mantle under high pressure and temperature (1200 - 1400°C). Both single crystals (octahedrons, triangles…) and crushed grit (boart) are used in industrial diamond tools
- **Synthetic diamond:** synthetic diamond grits are formed in presses in a very high pressure/high temperature (HP/HT) process, at up to 60000 bar and 1500°C, using a variety of solvent/catalyst materials which help to convert graphite into diamond.
- **MCD:** large synthetic diamonds that are produced in a HP/HT process similar to synthetic diamond grit.
- **PCD:** polycrystalline diamond pieces formed by sintering micronized diamond particles together with a binder under HP/HT conditions.
- **CVD:** these diamonds are manufactured by gas phase deposition (methane, hydrogen) at low pressure using a vacuum system.

Direction of Rotation Indicator

Resin and metal bond diamond and cBN grinding wheels always show an indicator for the direction of rotation. At the end of the production chain of a multilayer grinding wheel is the profiling and sharpening process. In the sharpening process, a bond tail is formed behind each of the active abrasive grains. This bond tail supports the grain and prevents the grain from untimely fracture. If the wheel is mounted the wrong way round, this bond tail would precede the grains during cutting, which would lead to lower chip-space, increased grinding pressure, and early grain fracture. Therefore, it is important to adhere to the rotational direction shown by the indication arrow or to re-sharpen the grinding wheel before use, if you chose to change the direction of rotation.

Dressing = Truing + Sharpening

It is necessary to distuinguish between the key wheel preparation steps of truing, sharpening and cleaning of the grinding wheel surface.

Dressing describes the processes of truing and sharpening a grinding wheel. When grinding with conventional alumina or silicon carbide wheels, "dressing" is the combined process of truing and sharpening. However, for superabrasive grinding wheels containing either diamond or cBN abrasives in a resin or metal bond, after truing, a separate sharpening step is usually required to remove some of the bond material and expose the grains. In addition, the grinding wheel surface must be cleaned (Dressing + Cleaning = Reconditioning) periodically. The dressing interval depends upon the grinding process parameters being used, and the type of workpiece material being ground.

Grinding wheel truing generates the correct geometric shape, develops the necessary concentricity, and also removes any surface contamination. In so doing, worn blunted grains are either removed or resharpened, and fresh grains are exposed. To achieve optimum results, dressing tools, dressing parameters and dressing strategy must be finely tuned to the grinding wheel and grinding process. Therefore, different tools and methods are used, such as either alumina-based or SiC sharpening stones, SiC grinding wheels, the WINTER brake-dressing device, CNC rotary dressers, diamond dressing sticks, rotary profile dressers, etc.

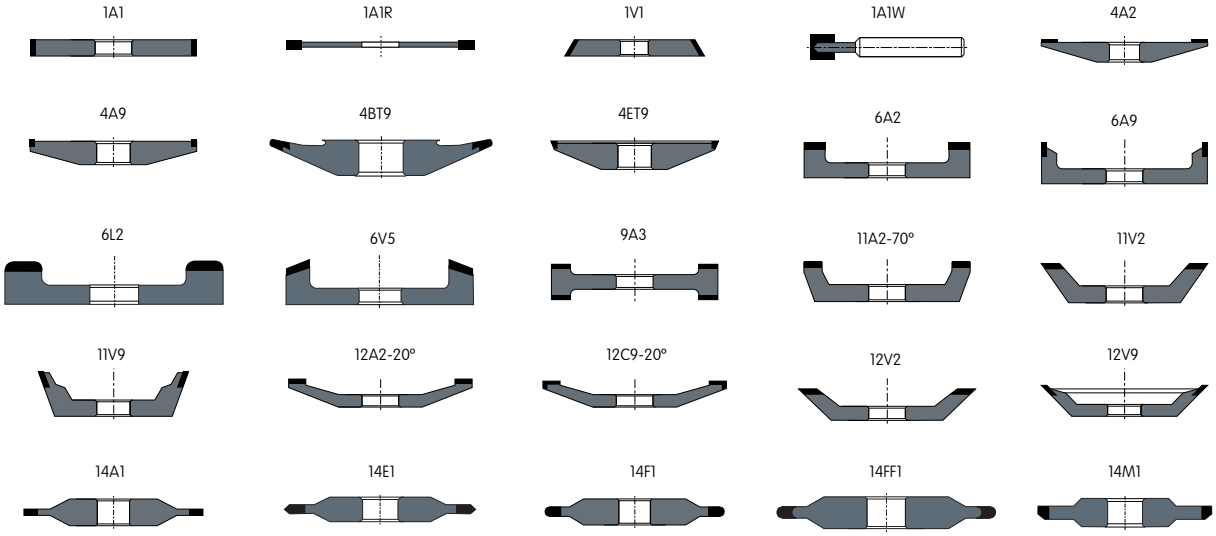
Our engineers can offer advice to help you chose the best method for your application.

FEPA

The Federation of European Producers of Abrasives (FEPA) is a non-profit European organisation which publishes safety guidelines and standards for conventional and superabrasive (diamond and cBN) grinding tools as well as loose abrasive grain (see grit sizes). It also provides standards for the most common grinding wheel shapes and dimensions.

FEPA-Shapes

These drawings show the most important grinding wheel geometries:



Grinding

According to DIN 8589, grinding is defined as material removal using geometrically undefined cutting edges. All grinding wheels with either diamond or cubic boron nitride (cBN) are grinding tools according DIN 8589. The "cutting edges" are composed of the diamond or cBN grit.

Grinding Ratio (G-Ratio)

The grinding-ratio is calculated as a ratio of the ground workpiece volume V_w to the wheel wear volume V_s.

Grinding Wheel Bodies

The body of a grinding wheel provides the static and dynamic stiffness to the tool. Dependent on the kind of grinding layer, it may consist of aluminium, filled resin, brass, steel or ceramics. The body significantly influences the vibration behaviour and the thermal conductivity of the grinding wheel; the following table shows examples for superabrasive grinding wheel bodies.

Body material type	Label	Vibration Absorbtion	Heat Transmission	Mechanical Stiffness
Resin with metal fillers	H	medium	sufficient	good
Resin with non-metallic fillers	B or D	good	bad	satisfactory (not sufficient with thin-walled bodies)
Aluminium	A	bad	good	very good
Steel	E	bad	satisfactory	very good
Copper	C	bad	very good	very good
Composite material	CFK	good	bad	good

Grit Sizes

The seive-sizes for diamond and cBN range according to FEPA standards (also ISO 6106) and are shown in the following table. As abrasives always contain a range of grit sizes, the values given for average grit sizes and particles per carat are approximations. D-prefix indicates diamond, while B-prefix refers to cBN.

FEPA grit size D or B	Standard [Mesh]	Average Grit Size [µm]	Particles per ct
1181	16/18	1100	60
1001	18/20	930	100
851	20/25	780	160
711	25/30	660	270
601	30/35	555	450
501	35/40	465	760
426	40/45	395	1200
356	45/50	330	2100
301	50/60	280	3500
251	60/70	233	6000
213	70/80	197	10000
181	80/100	167	16000
151	100/120	140	28000
126	120/140	118	46000
107	140/170	99	80000
91	170/200	83	135000
76	200/230	72	200000
64	230/270	63	300000
54	270/325	55	460000
46	325/400	47	750000
39	400/500	38	1400000
33	500/600	33	2100000

WINTER has its own classification for fine and microgrit sizes. FEPA standards are similar (M 63…M1.0).

WINTER diamond classification	Grit size [µm]
D 25	40 - 60
D 20 C	34 - 45
D 20 B	25 - 37
D 20 A	20 - 30
D 15	8 - 25
D 15 C	15 - 25

WINTER diamond classification	Grit size [µm]
D 15 B	10 - 20
D 15 A	8 - 15
D 10	6 - 10
D 7	5 - 10
D 5	3 - 7
D 3	2 - 5
D 1	0,5 - 2
D 0,7	0 - 1
D 0,25	0 - 0,5

Hardness of Abrasives

The hardness value of a material is generally influenced by the method of measurement. Different measuring methods and equipment result in different scales and units which cannot easily be compared. Thus several scales exist, for example:

Moh's hardness: abrasion behaviour (measure of scratch resistance)
Rosiwal hardness: stock removal behaviour (measure of resistance to stock removal)
Vicker's Microhardness: indentation behaviour (resistance to penetration)

In the following table, different hardness values for abrasives are given and compared to some reference materials:

Material	Moh's Hardness	Rosiwal Hardness	Vickers Microhardness (HV)
Diamond	10	140,000	10,000
cBN	9,9		9,000
Silicon carbide	9,6		2,600
Corundum	9	1.000	2,060
Quarz	7	120	1,120
Manganese	5	6.5	540
Gypsum	2	1.25	36
Talc	1	0.03	2.6

Diamond's stock removal resistance (Rosiwal hardness) is 140 times higher than corundum (alumina), even though its penetration hardness (Vickers) is only 5 times higher.

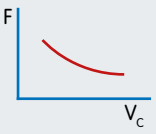
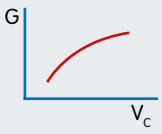
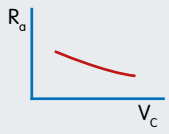
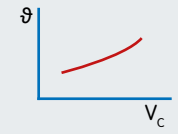
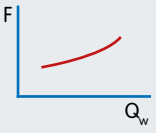
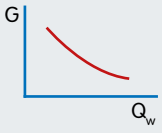
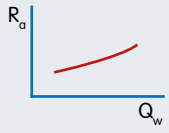
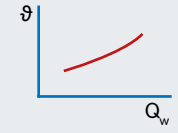
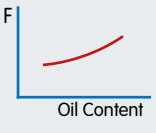
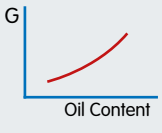
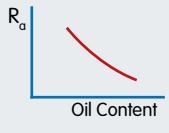
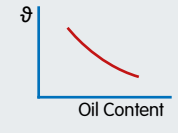
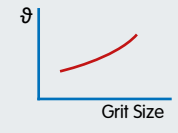
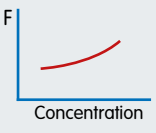
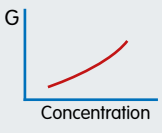
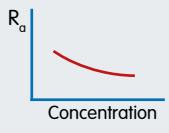
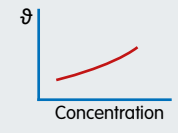
Material Removal Rate

The material removal rate, MRR or Q_w, is expressed in mm^3/s and defines the volume of workpiece material ground per unit time (second).

The specific material removal rate, MRR' or Q'_w, refers to the removal rate per millimetre of wheel contact width and is expressed in units of $[mm^3/(s \cdot mm)]$.

Parameters influencing Grinding Results

The table shows some correlations between process variables and the grinding results.

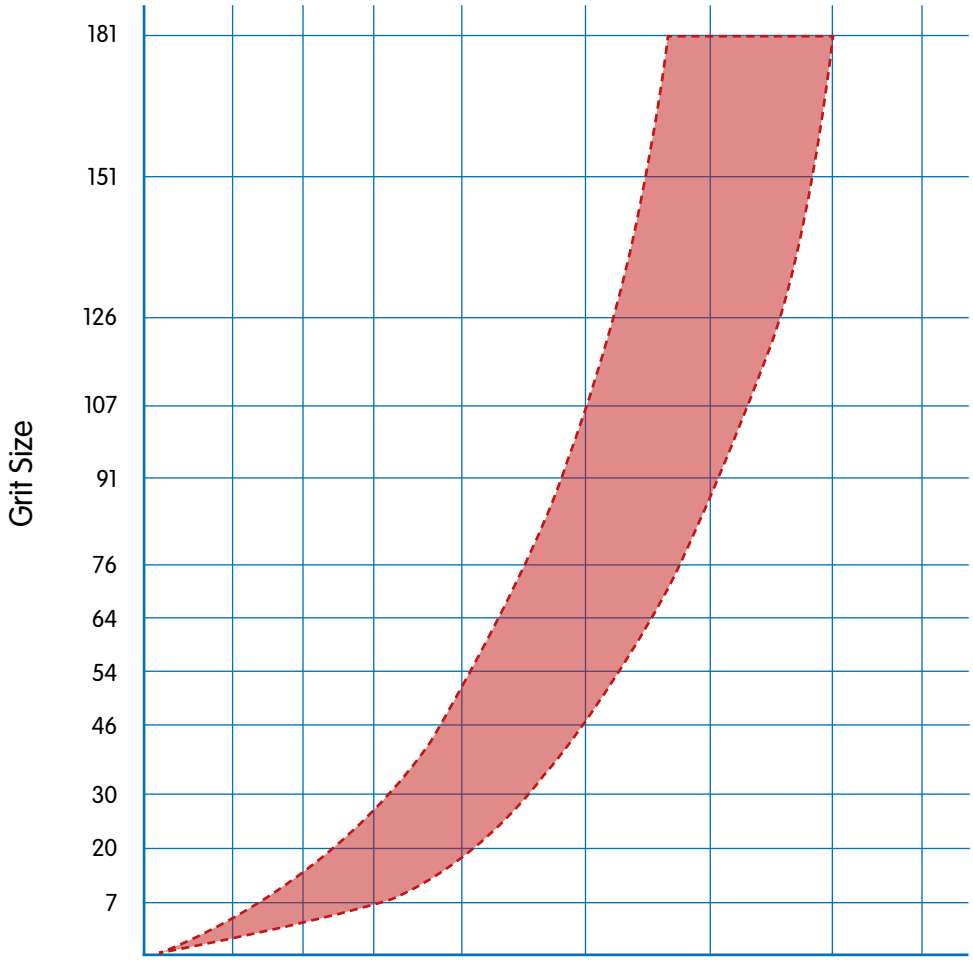
Influencing Paramters / Appraisal criterion		Cutting Force F F= f(...)	Grinding Ratio G G= f(...)	Roughness R_a R_a= f(...)	Temperature ϑ ϑ = f(...)
Machine- and Operation Paramters	Cutting Speed v_c (m/s)				
	Material Removal Rate Q_w (mm^3/s)				
	Coolant (Oil Content)				
Grinding Wheel	Grit Size (µm)				
	Concentration ($Carat/cm^3$)				

Roughness

The surface roughness of a ground workpiece is influenced by many diverse parameters:

- Grit size of abrasive grain
- Concentration of abrasive grain
- Specification of bond system
- Type and hardness of work piece
- Grinding process
- Grinding parameters
- Dressing parameters

A general and qualitative correlation between grit size and surface roughness is shown below:



R_a [µm]	0.012	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2
R_t [µm]	0.100	0.200	0.40	1.0	1.6	2.5	6.3	10	20
R_z [µm]	0.050	0.100	0.20	0.6	1.0	1.6	3.8	6	15

Specification

The specification is the general description of the grinding tool and contains all relevant information concerning the product's features. In general, the specification always contains the following details:

Example:

11V9	100-2-10-20	D126	K+888R	C75	A
Shape	Dimension	Grit Size	Bond	Concentration	Body Material

Furthermore, the specification can contain additional information regarding drawing index, production method, structure, and other details.

Superabrasives

Diamond and cubic boron nitride are the hardest materials existing in industry today, according to the current state of knowledge. The levels of hardness of diamond and cBN are significantly higher than those of conventional abrasives like alumina (corundum) and silicon carbide (see hardness).

Wear effects on diamond and cBN

The hardness of an abrasive grit type alone is not sufficient to determine the grinding tool's grinding behaviour. Diamond and cBN grains can wear in many ways, causing different effects.

Primarily, there are two main types of wear.

Mechanical wear:
Abrasion, micro-chipping of cutting edges, grit macrofracture, and breakout of grain from the bond.

Chemical and thermal wear
Carbon diffusion, graphitization, oxidation, and reaction with grinding fluids.

Diamond not only reacts with iron (above a certain threshold temperature), but also with chromium, vanadium and tungsten. cBN does not show chemical reaction with iron or other metals.
Therefore, cBN has proven to give better tool performance when machining, for example, high speed steel, although it is not as hard as diamond.
An outward sign of the occurance of thermo-chemical wear is the rapid appearance of wear flats on the grains, when no grain chipping from mechanical wear is present.

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C6 – see catalogue No. 6 **"WINTER Standard Catalogue"**

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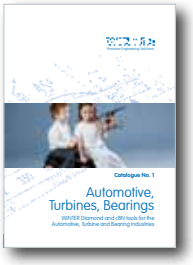
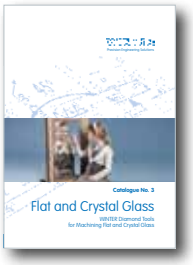
Catalogue No. 1: Automotive, Turbines, Bearings
WINTER Diamond and cBN Tools for the Automotive, Turbine and Bearing Industries



Catalogue No. 2: Tools
WINTER Diamond and cBN Tools for the Tools Industry

Catalogue No. 3: Flat and Crystal Glass
WINTER Diamond Tools for Machining Flat and Crystal Glass



Catalogue No. 4: Electronics, Photovoltaics , Optics, Ceramics and Composites
WINTER Diamond and cBN Tools for the Electronic and Photovoltaic Industries, for Machining Optical Glass, Ceramics & Composites

Catalogue No. 5: Dressing Tools
WINTER Diamond Tools for Dressing of Grinding Tools

Catalogue No. 6: WINTER Standard Catalogue
Stock Programme for Diamond and cBN Tools

Thank you to Ella, who had her photo taken for our front cover.
Ella's father works in our sales department.

Contact

Whom to ask first? Who is my nearest contact person? Where can I get quick and easy help on grinding tools and grinding processes?

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