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: Standard Catalogue
WINTER Stock Programme for Diamond and cBN Tools
Dressing Tools

WINTER diamond tools for dressing grinding wheels
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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

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.

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.
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.

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

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 economical 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.

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

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

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.

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.

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.

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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).

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

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

1929
New standards are set with the “345G” series in the field of laminated safety glass and fire-resistant glass machining.

1992
New standards are set with the “345G” series in the field of laminated safety glass and fire-resistant glass machining.

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

Innovations

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

1951
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WINTER presented the special bond “VF/VFF” for grinding and finishing polycrystalline diamond and cBN materials.

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

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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.

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.

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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.

Expertise

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

Information

Further information on applications and products can be found at www.winter-superabrasives.com
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.

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.

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.
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.
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.

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.

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
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

<table>
<thead>
<tr>
<th>Type</th>
<th>Manufacture</th>
<th>Bond</th>
<th>Grit distribution</th>
<th>Grit density</th>
</tr>
</thead>
<tbody>
<tr>
<td>UZ</td>
<td>Reverse process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
<tr>
<td>TS</td>
<td>Reverse process</td>
<td>Infiltrated</td>
<td>Statistical/ controlled</td>
<td>Maximum/ controlled</td>
</tr>
<tr>
<td>SG</td>
<td>Positive process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
</tbody>
</table>

**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.

→ 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".

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.
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: Machine generates increased noise when dressing

Cause and corrective action: Imbalance or radial runout of the diamond roller dresser or grinding wheel, or excessive dressing forces.

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

1.1. 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

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

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 (a₀): __________________________________________
Angular/straight plunge grinding: _____________________________________________
Spark-out time/revolutions: ________________________________________________

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Schützenwall 13–17, 22844 Norderstedt, Germany, Phone: +49 40 5258-0, Fax: +49 40 5258-215
www.winter-superabrasives.com, plated@saint-gobain.com

WINTER diamond tools for dressing grinding wheels
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).

32 Manufacturing process
32 Dressing tools for gear generation
32 Plated gear tools for honing and continuous generation and profile grinding
33 Dressing tools
33 Continuous gear generation grinding
34 Honing processes, continuous hob grinding and profile grinding
34 Machining bevel gears
35 Complete solutions
35 External cylindrical grinding, bore grinding and top-and-bottom grinding operations
35 Gear grinding
36 Checklist for the manufacture of a new dressing tool for grinding worms
37 Checklist for the manufacture of a new dressing tool for honing rings
## Manufacturing process

### Dressing tools for continuous generating grinding

<table>
<thead>
<tr>
<th>Type</th>
<th>Manufacture</th>
<th>Bond</th>
<th>Grit distribution</th>
<th>Grit density</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>Positive process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
<tr>
<td>VU</td>
<td>Reverse process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
</tbody>
</table>

### Plated gear tools for honing and continuous generating and profile grinding

<table>
<thead>
<tr>
<th>Type</th>
<th>Manufacture</th>
<th>Bond</th>
<th>Grit distribution</th>
<th>Grit density</th>
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</thead>
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<tr>
<td>SG</td>
<td>Positive process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
<tr>
<td>VU</td>
<td>Double reverse process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
</tbody>
</table>
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

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

**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
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:**

<table>
<thead>
<tr>
<th>Design data:</th>
<th>Workpiece drawing/diagrams with tolerances and flank assignment shown – by post or email (.dxf, .dwg, .pdf or .tif format)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diagram of flank lines and profile modifications with all data and tolerances for traction flank and thrust flank</td>
</tr>
<tr>
<td></td>
<td>Traction flank and thrust flank assignment on the tool specified where profile modification differs on each flank</td>
</tr>
<tr>
<td>Profile crowning</td>
<td>[ C_i = ]</td>
</tr>
<tr>
<td>Profile angle deviation</td>
<td>[ f_H = ]</td>
</tr>
<tr>
<td>Tip relief</td>
<td>[ C_i = ]</td>
</tr>
<tr>
<td>Tip relief start diameter</td>
<td>[ d_i = ]</td>
</tr>
<tr>
<td>Crowning</td>
<td>[ C_i = ]</td>
</tr>
<tr>
<td>Tooth trace angle deviation</td>
<td>[ f_H = ]</td>
</tr>
<tr>
<td>Tooth root is ground</td>
<td>[ r_{ho} = ]</td>
</tr>
<tr>
<td>Tool tip radius and/or Fillet radius</td>
<td>[ r_i = ]</td>
</tr>
<tr>
<td>Tool tip height</td>
<td>[ h_{top} = ]</td>
</tr>
<tr>
<td>Drawing requested for approval</td>
<td></td>
</tr>
</tbody>
</table>

| Gear data: | Normal module | \[ m_n = \] |
| Number of teeth | \[ z = \] |
| Pressure angle | \[ \alpha_n = \] |
| Helix angle and direction | \[ \beta = \] |
| Tip diameter | \[ d_i = \] |
| Root diameter | \[ d_f = \] |
| Usable tip circle diameter | \[ d_{Na} = \] |
| Usable root circle diameter | \[ d_{Nf} = \] |
| Surface quality required | \[ R_s / R_a = \] |
| Diometric two-ball/two-roller measurement \[ M_{n} / M_{a} = \] |
| Measuring ball Ø and/or measuring roller Ø | \[ D_{m} = \] |
| or | \[ k = \] |
| Base tangent length | \[ W_i = \] |
| Number of measuring teeth | \[ k = \] |
| or | \[ S_n = \] |

**Correction undertaken on the machine:**

- Pressure angle \[ \alpha_n = \]
- Module \[ m = \]

**Grinding worm:**

- Dimensions
  - Right-hand
  - Left-hand
- Number of threads
- 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: \[ C_{ch} = \]
Profile angle deviation: \[ \phi_{f_H} = \]
Tip relief: \[ C_o = \]
Tip relief start diameter: \[ d_{co} = \]
Crowning: \[ C_b = \]
Tooth trace angle deviation: \[ \phi_{f_H} = \]

Workpiece position definition
- Drawing requested for approval

Gear data:
- Normal module: \[ m_n = \]
- Number of teeth: \[ z = \]
- Pressure angle: \[ \alpha_n = \]
- Helix angle and direction: \[ \beta = \]
- Tip diameter: \[ d_o = \]
- Root diameter: \[ d_r = \]
- Usable tip circle diameter: \[ d_{nt} = \]
- Usable root circle diameter: \[ d_{nf} = \]
- Surface quality required: \[ R_{a}/R_z = \]
- Diametric two-ball/two-roller measurement: \[ M_{d_m}/M_{d_b} = \]
- Measuring ball Ø and/or measuring roller Ø: \[ D_{m} = \]
- or base tangent length: \[ W_b = \]
- Number of measuring teeth: \[ k = \]
- or normal tooth thickness: \[ S_n = \]

Honing ring:
- Coating/Grind size:  
  - D91
  - D126
  - D151
  - D181

Cutting material: __________________________________________ __________
Dimensions: __________________________________________ __________
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

Information

Further information on applications and products can be found at www.winter-superabrasives.com
# Manufacturing process

## Types of rotary CNC dressing discs

<table>
<thead>
<tr>
<th>Type</th>
<th>Manufacture</th>
<th>Bond</th>
<th>Grit distribution</th>
<th>Grit density</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>Positive process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
<tr>
<td>TS</td>
<td>Reverse process</td>
<td>Infiltrated</td>
<td>Controlled or statistical</td>
<td>Controlled or maximum</td>
</tr>
<tr>
<td>PCD/CVD/MCD</td>
<td>Reverse process</td>
<td>Infiltrated</td>
<td>Controlled</td>
<td>Controlled</td>
</tr>
<tr>
<td>SD</td>
<td>Positive process</td>
<td>Sintered</td>
<td>Statistical</td>
<td>Controlled</td>
</tr>
<tr>
<td>UZ</td>
<td>Reverse process</td>
<td>Electroplated</td>
<td>Statistical</td>
<td>Maximum</td>
</tr>
<tr>
<td>DDS</td>
<td>Positive process</td>
<td>Sintered</td>
<td>Controlled</td>
<td>Controlled</td>
</tr>
</tbody>
</table>
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.

Is dressing on the grinding machine possible?  
\[ \text{no} \rightarrow \text{External profiling?} \]

yes

Can rotary dressing be done on the grinding machine?  
\[ \text{no} \rightarrow \text{Stationary dressing tools} \]

yes

Can CNC-dressing be done on the grinding machine?  
\[ \text{no} \rightarrow \text{Profile roller dresser} \]

yes

What type of grinding wheel bond will be dressed?  

Vitrified bonded or resin-bonded diamond grinding wheels

Vitrified bonded cBN grinding wheels

Conventional grinding wheels

Which profile is dressed?

Concave/convex

Convex/cylindrical

Concave/convex

Convex/cylindrical

DDS

SG/SD/DDS

SG/SD

TS / radii < 0.4 mm: PCD/CVD/MCD

TS/SD/UZ/SG

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

**Dressing disc characteristics**
- Wear-resistance
- Can dress the smallest radii
- Self-sharpening
- Can be remachined

**Recommended use**
- Special corundum grinding wheels
- Special fused alumina grinding wheels
- Vitrified bonded cBN grinding wheels
- Vitrified bonded diamond 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
- SG 99
## Range of SG dressing discs in stock

<table>
<thead>
<tr>
<th>SG 40</th>
<th>Design code</th>
<th>D</th>
<th>X</th>
<th>W</th>
<th>T</th>
<th>H</th>
<th>Bore tolerance</th>
<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>302SG71P</td>
<td>100</td>
<td>0.6</td>
<td>5</td>
<td>20</td>
<td>25</td>
<td>H6</td>
<td>D602</td>
<td>Bronze</td>
<td>00310337534</td>
<td>Semi-manufactured part</td>
<td></td>
</tr>
<tr>
<td>310SG71P</td>
<td>120</td>
<td>0.6</td>
<td>5</td>
<td>20</td>
<td>25</td>
<td>H6</td>
<td>D602</td>
<td>Bronze</td>
<td>00310337535</td>
<td>Semi-manufactured part</td>
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</tr>
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<td>305SG71P</td>
<td>150</td>
<td>0.6</td>
<td>5</td>
<td>20</td>
<td>25</td>
<td>H6</td>
<td>D602</td>
<td>Bronze</td>
<td>00310337536</td>
<td>Semi-manufactured part</td>
<td></td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Design code</th>
<th>D</th>
<th>X</th>
<th>W</th>
<th>T</th>
<th>H</th>
<th>Bore tolerance</th>
<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5SG71P</td>
<td>110</td>
<td>0.4</td>
<td>5</td>
<td>10.5</td>
<td>75</td>
<td>H3</td>
<td>D426</td>
<td>Steel</td>
<td>66260136400</td>
<td></td>
</tr>
</tbody>
</table>

**Machine:** e.g. Junker

**Application:** Dressing of conventional and vitrified bonded cBN grinding wheels

**Delivery:** Ex stock

### SG 40

<table>
<thead>
<tr>
<th>Design code</th>
<th>D</th>
<th>X</th>
<th>W</th>
<th>T</th>
<th>H</th>
<th>Bore tolerance</th>
<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG71P</td>
<td>110</td>
<td>0.8</td>
<td>5</td>
<td>10.85</td>
<td>75</td>
<td>H3</td>
<td>D852</td>
<td>Bronze</td>
<td>66260129200</td>
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</tr>
</tbody>
</table>

**Machine:** e.g. Junker

**Application:** Dressing of conventional and vitrified bonded cBN grinding wheels

**Delivery:** Ex stock

### SG 40

<table>
<thead>
<tr>
<th>Design code</th>
<th>D</th>
<th>X</th>
<th>W</th>
<th>T</th>
<th>H</th>
<th>Bore tolerance</th>
<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
</table>
| 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

---

All dimensions in mm

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Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.
## SG 40

<table>
<thead>
<tr>
<th>Design code</th>
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<th>W</th>
<th>T</th>
<th>H</th>
<th>Bore tolerance</th>
<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG71P</td>
<td>140</td>
<td>0.6</td>
<td>5</td>
<td>12</td>
<td>50</td>
<td>H3</td>
<td>D602</td>
<td>Steel</td>
<td>6626034649</td>
<td>ex stock</td>
</tr>
</tbody>
</table>

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

## SG 40

<table>
<thead>
<tr>
<th>Design code</th>
<th>D</th>
<th>X</th>
<th>W</th>
<th>T</th>
<th>H</th>
<th>Bore tolerance</th>
<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG71P</td>
<td>150</td>
<td>0.4</td>
<td>5</td>
<td>19</td>
<td>52</td>
<td>H3</td>
<td>D426</td>
<td>Steel</td>
<td>66260355740</td>
<td>case-hardened bore</td>
</tr>
</tbody>
</table>

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

## SG 40

<table>
<thead>
<tr>
<th>Design code</th>
<th>D</th>
<th>X</th>
<th>W</th>
<th>T</th>
<th>H</th>
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<th>Grit size</th>
<th>Body</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG71P</td>
<td>150</td>
<td>1.2</td>
<td>10</td>
<td>50</td>
<td>56</td>
<td>H3</td>
<td>D602</td>
<td>Steel</td>
<td>66260132775</td>
<td>case-hardened bore</td>
</tr>
</tbody>
</table>

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

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**WINTER Facts**

**Profile Dressers**

**Gear Dressers**

**CNC Dressers**

**Stationary Dressers**

**Ancillary Dressers**

**Dressing Parameters**

**Service**

**Glossary**

**Contact**

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44 WINTER diamond tools for dressing grinding wheels
### SG 60

<table>
<thead>
<tr>
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**Machine:**
e.g. Junker

**Application:**
Dressing of conventional and vitrified bonded cBN grinding wheels

**Delivery:**
Ex stock

### SG 99

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</table>

**Machine:**
e.g. Schaudt

**Applications:**
Dressing conventional grinding wheels

**Delivery:**
Ex stock

* This refers to the conicity of the outer diameter

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All dimensions in mm

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Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.
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 \( 30^\circ \)
• 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:

<table>
<thead>
<tr>
<th>Design</th>
<th>Characteristics</th>
<th>Strengths</th>
</tr>
</thead>
<tbody>
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<td>Wear resistance</td>
<td>Vitrified bonded cBN grinding wheels</td>
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<td>TS 10 N</td>
<td>Can dress the smallest radii</td>
<td>Special corundum grinding wheels</td>
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<tr>
<td>TS 20</td>
<td>Can be remachined</td>
<td>Vitrified bonded diamond grinding wheels</td>
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<td>TS 20 N</td>
<td>Self-sharpening</td>
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<td>TS 60 N</td>
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# TS dressing discs held in stock

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All dimensions in mm
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.)

Dressing disc characteristics

- Wear-resistance
- Can dress the smallest radii
- Can be remachined
- Self-sharpening

Recommended use

- Special corundum grinding wheels
- Vitrified bonded cBN grinding wheels
- Vitrified bonded diamond grinding wheels

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

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</table>

- **Machine:** e.g. Studer
- **Applications:** Dressing conventional grinding wheels
- **Delivery:** Ex stock

All dimensions in mm

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

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<tr>
<th>Characteristics</th>
<th>Recommended use</th>
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<td>Wear-resistance</td>
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<tr>
<td>Can dress the smallest radii</td>
<td>Vitrified bonded cBN grinding wheels</td>
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<tr>
<td>Self-sharpening</td>
<td>Vitrified bonded diamond grinding wheels</td>
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<tr>
<td>Can be remachined</td>
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**Strengths:**

- Self-sharpening

**Strengths:**

- Highest possible diamond concentration
- Statistical diamond distribution
- High precision manufacturing process gives extremely high accuracy of the diamond layer
- Can dress the smallest radii
- Can be remachined

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.
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 two-piece 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 0.8 mm – 1.2 mm
• Radii depending on layer width 0.4 mm – 0.6 mm

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

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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

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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

All dimensions in mm

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page
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
Cutting speed: \( v_c = 75 \text{ m/s} \)
Axial feed: \( v_{fa} = 40 \text{ mm/min} \)
Infeed: \( a_e = 0.2 \text{ mm} \)

Dressing parameters
Dressing tool: WINTER DDS dressing disc
Dressing cut: \( a_{ed} = 4 \times 2 \mu \text{m} \)
Speed ratio: \( q_d = 0.7 \) Counter-directional
Overlap ratio: \( U_d = 4 \)

Results
Surface finish:
\( R_a = 0.17 \mu \text{m} \) at \( v_{fa} = 5 \text{ mm/min} \)
\( R_a = 0.74 \mu \text{m} \) at \( v_{fa} = 40 \text{ mm/min} \)

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
Cutting speed: \( v_c = 60 \text{ m/s} \)
Transverse infeed: \( a_t = 0.2 \text{ mm} \)
Allowance: \( a_{tot} = 1 \text{ mm} \)

Dressing parameters
Dressing tool: WINTER DDS dressing disc
Dressing cut: \( a_{ed} = 2 \mu \text{m} \)
Speed ratio: \( q_d = 0.3 \)
Overlap ratio: \( U_d = 3–9 \)

Results
Surface finish:
\( R_z \leq 3 \mu \text{m} \)
Centreless grinding

**Machine parameters**
- Machine: SCHAUDT MIKROSA KRONOS S cylindrical grinding machine
- Coolant: Emulsion
- Workpiece: Si₃N₄

**Grinding parameters**
- Grinding wheel: 1VG 3A1-400-15
- Cutting speed: \( v_c = 120 \text{ m/s} \)
- Allowance: \( a_w = 0.7 \text{ mm} \)

**Dressing parameters**
- Dressing tool: WINTER DDS dressing disc
- Dressing cut: \( a_{ed} = 3 \mu\text{m} \)
- Cutting speed: \( v_{cd} = 40 \text{ m/s} \)
- Speed ratio: \( q_d = 0.4 \)

**Results**
- Surface roughness: \( R_z = 2.02 \mu\text{m} \)
- Diameter tolerance: \( D \pm 2 \mu\text{m} \)
- 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
- Cutting speed: \( v_c = 18-44 \text{ m/s} \)
- Feed: \( v_f = \text{up to 200 mm/min} \)
- Allowance: \( a_e = 3.5 \text{ mm} \)
- Material removal rate: \( Q'_{\text{wmax}} = 8.75 \text{ mm}^3/(\text{mm} \cdot \text{s}) \)

**Dressing parameters**
- Dressing tool: WINTER DDS dressing disc
- Dressing cut: \( a_{ed} = 3 \mu\text{m} \)
- Cutting speed: \( v_{cd} = 18 \text{ m/s} \)
- 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: \( v_c = 40 \text{ m/s} \)
Feed: \( v_f = 4 \text{ mm/min} \)
Allowance: \( a_e = 3.5 \text{ mm, radial} \)

Dressing parameters
Dressing tool: WINTER DDS dressing disc
Dressing cut: \( a_{ed} = 3 \text{ µm} \)
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: \( v_c = 45 \text{ m/s} \)
Allowance: \( a_{esf} = 0.3 \text{ mm} \)

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

Results
Good profile accuracy, very good dimensional accuracy and low roughness values
Checklist
for 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_rad): 
Axial dressing feed (f_ad): 

SAINT-GOBAIN Diamantwerkzeuge GmbH & Co. KG, 
Schützenwall 13–17, 22844 Norderstedt, Germany, Phone: +49 40 5258-0, Fax +49 40 5258-215 
www.winter-superabrasives.com

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

Further information on applications and products can be found at www.winter-superabrasives.com
**Information on choosing your tool**

<table>
<thead>
<tr>
<th>Application</th>
<th>Centreless / through-feed grinding</th>
<th>Angular plunge / profile grinding</th>
<th>Straight plunge grinding</th>
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<tr>
<td><strong>Dressing tool Recommended</strong></td>
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<td><strong>Designation of abrasives</strong></td>
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<td>Quantum, SG, TG, XG, ES, sintered aluminas</td>
<td>Quantum, SG, TG, XG, ES, sintered aluminas</td>
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<td>Regulating wheel or vitrified bond</td>
<td>Silicon carbide (SiC)</td>
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<td>Quantum, SG, TG, XG, ES, sintered aluminas</td>
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</table>

| Diamond Dresser®                        |                                    |                                  |                          |
| page 62 Ti-Tan™                         | o                                  | 0                                | 0                        |
| page 62 Furioso™                        | 0                                  | o                                | 0                        |
| page 64 D25 – MCD needle blade dressers | o o o                              |                                  |                          |
| page 66 D30 – CVD needle blade dressers | 0                                  |                                  | 0                        |
| page 67 D35 – CVD needle blade dressers | 0                                  |                                  | 0                        |
| page 68 Needle blade with natural diamond | o o o                              |                                  |                          |
| page 70 Standard blade with diamond grit | o o o                              |                                  |                          |
| page 74 D12 – single point dresser with MCD needle | o o o | 0 |                           |
| page 75 D30 – single point dresser with CVD needle | o o o | o |                           |
| page 76 D53 – single point dresser with PCD plate | o o o | 0 |                           |
| page 77 Profile diamond / ground DiArm chisel | o o o | 0 | 0                         |
| page 80 Single point dresser with natural diamond | o o o | 0 |                           |
| page 82 Rondist rotatable tools with diamond or CVD | o o o | 0 |                           |
| page 83 PCD and CVD insert dressers | o o o                             |                                  |                          |
| page 86 D21 – multi-point dressers with natural diamonds in 2 or 3 rows | o o o | 0 |                           |
| page 89 Igel® and pro-dress multi-point dressers | o o o | 0 | 0                         |
**Information on choosing your tool**

<table>
<thead>
<tr>
<th>Dressers</th>
<th>Stationary Dressers</th>
<th>Dressing Parameters</th>
<th>Service</th>
<th>Glossary</th>
<th>Contact</th>
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<td>Profile Dressers</td>
<td>CNC</td>
<td>Ancillary Dressers</td>
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<th>All conventional grinding wheels</th>
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*First choice
Second choice*
Diamond Fliesen® tools

Diamond Fliesen® 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 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. MKT).

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.

<table>
<thead>
<tr>
<th>Blade size</th>
<th>Grind wheel grit size [mesh]</th>
<th>For Altos, Altos IPX, sintered and extruded aluminas</th>
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All dimensions in mm

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks
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<th>Grinding wheel grit size [mesh]</th>
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**Explanation of the specification**

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<th>Designation</th>
<th>Width</th>
<th>Effective length</th>
<th>Total length</th>
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</table>

Twin blade with cooling channel

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

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.
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)

<table>
<thead>
<tr>
<th>Number of needles</th>
<th>Grit size Grinding wheel [Mesh]</th>
<th>Designation</th>
<th>Effective cutting width T</th>
<th>Width at tip B</th>
<th>Order number</th>
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<td>2585 / 1</td>
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</tr>
<tr>
<td></td>
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<td>25115 / 1</td>
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<td></td>
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<tr>
<td>2</td>
<td>80-120</td>
<td>2565 / 2</td>
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<td>25115 / 5</td>
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</tbody>
</table>

All dimensions in mm

* Available ex stock

Minimum order quantity for articles not in stock: 4 items, delivery: 4 weeks
D25 standard range (off-centred version, OC)

<table>
<thead>
<tr>
<th>Number of needles</th>
<th>Grit size Grinding wheel (mesh)</th>
<th>Designation</th>
<th>Effective cutting width</th>
<th>Width at tip</th>
<th>Order number</th>
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</table>

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. MKI).
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

<table>
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<tr>
<th>Number of needles</th>
<th>Grit size Grinding wheel [Mesh]</th>
<th>Designation</th>
<th>Effective cutting width T</th>
<th>Width at tip B</th>
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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
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

<table>
<thead>
<tr>
<th>Number of needles</th>
<th>Grit size (Grinding wheel [Mesh])</th>
<th>Designation</th>
<th>Effective cutting width [T]</th>
<th>Width at tip [B]</th>
<th>Order number</th>
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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. MKI).

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

<table>
<thead>
<tr>
<th>Blade size</th>
<th>Specification</th>
<th>W</th>
<th>X1</th>
<th>X2</th>
<th>Bond</th>
<th>Size of needles</th>
<th>Order number</th>
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<td>33</td>
<td>T645E</td>
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<td>69014185755</td>
</tr>
</tbody>
</table>

All dimensions in mm

1) Available ex stock

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks
**Special designs of needle blade tools**

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

<table>
<thead>
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<th>Blade size</th>
<th>Specification</th>
<th>( W )</th>
<th>( X )</th>
<th>( X_1 )</th>
<th>Bond</th>
<th>Size of needles</th>
<th>Order number</th>
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<td>T645J</td>
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<td>33</td>
<td>T645J</td>
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</table>

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

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<th>Specification</th>
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<th>( X )</th>
<th>( X_1 )</th>
<th>Bond</th>
<th>Size of needles</th>
<th>Order number</th>
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</thead>
<tbody>
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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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Width</th>
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<th>Total length</th>
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<td>2 FDS</td>
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<tr>
<td>3 FAS</td>
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Order sample

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<th>Diamond grit size</th>
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All dimensions in mm

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 (Al₂O₃)

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<th>X₁</th>
<th>X₂</th>
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</table>

All dimensions in mm

b) 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

<table>
<thead>
<tr>
<th>Blade size</th>
<th>Grit size of grinding wheel (Mesh)</th>
<th>Shape</th>
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<th>X</th>
<th>X1</th>
<th>Grit size of blade</th>
<th>Order number</th>
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<tbody>
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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

* 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.

<table>
<thead>
<tr>
<th>Tool holder</th>
<th>Shank</th>
<th>Order number</th>
<th>Clamping length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid brazed tool holder</td>
<td>MK0 MK1</td>
<td>66260386838</td>
<td>25.5</td>
</tr>
<tr>
<td></td>
<td>Cylindrical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigid brazed tool holder</td>
<td>to customer specification</td>
<td>66260196356</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swivel holder for single blade tools</td>
<td>MK0</td>
<td>66260389757</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MK1</td>
<td>66260389454</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cylindrical, diameter 10</td>
<td>66260390721</td>
<td>50</td>
</tr>
</tbody>
</table>

All dimensions in mm

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.

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Needle dimensions</th>
<th>Shank</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>D12</td>
<td>D</td>
<td>T</td>
<td>L</td>
</tr>
<tr>
<td>1265</td>
<td>0.6</td>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td>1265</td>
<td>0.6</td>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td>1265</td>
<td>0.6</td>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td>1285</td>
<td>0.8</td>
<td>1.1</td>
<td>4</td>
</tr>
<tr>
<td>1285</td>
<td>0.8</td>
<td>1.1</td>
<td>4</td>
</tr>
<tr>
<td>1285</td>
<td>0.8</td>
<td>1.1</td>
<td>4</td>
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<tr>
<td>12115</td>
<td>1.15</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>12115</td>
<td>1.15</td>
<td>1.5</td>
<td>4</td>
</tr>
</tbody>
</table>

Order sample

<table>
<thead>
<tr>
<th>Type</th>
<th>Shank</th>
<th>Clamping length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1285</td>
<td>Cylindrical Ø 10</td>
<td>40</td>
</tr>
</tbody>
</table>

Other shank dimensions available on request.

All dimensions in mm

*) 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Needle dimensions</th>
<th>Shank</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>D30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3023</td>
<td>0.2</td>
<td>3</td>
<td>MK1 40</td>
</tr>
<tr>
<td>3023</td>
<td>0.2</td>
<td>3</td>
<td>MK0 25</td>
</tr>
<tr>
<td>3023</td>
<td>0.2</td>
<td>3</td>
<td>Cylindrical Ø 10 40</td>
</tr>
<tr>
<td>3033</td>
<td>0.3</td>
<td>3</td>
<td>MK1 40</td>
</tr>
<tr>
<td>3033</td>
<td>0.3</td>
<td>3</td>
<td>MK0 25</td>
</tr>
<tr>
<td>3033</td>
<td>0.3</td>
<td>3</td>
<td>Cylindrical Ø 10 40</td>
</tr>
<tr>
<td>3044</td>
<td>0.4</td>
<td>4</td>
<td>MK1 40</td>
</tr>
<tr>
<td>3044</td>
<td>0.4</td>
<td>4</td>
<td>MK0 25</td>
</tr>
<tr>
<td>3044</td>
<td>0.4</td>
<td>4</td>
<td>Cylindrical Ø 10 40</td>
</tr>
<tr>
<td>3064</td>
<td>0.6</td>
<td>4</td>
<td>MK1 40</td>
</tr>
<tr>
<td>3064</td>
<td>0.6</td>
<td>4</td>
<td>MK0 25</td>
</tr>
<tr>
<td>3064</td>
<td>0.6</td>
<td>4</td>
<td>Cylindrical Ø 10 40</td>
</tr>
<tr>
<td>3084</td>
<td>0.8</td>
<td>4</td>
<td>MK1 40</td>
</tr>
<tr>
<td>3084</td>
<td>0.8</td>
<td>4</td>
<td>MK0 25</td>
</tr>
<tr>
<td>3084</td>
<td>0.8</td>
<td>4</td>
<td>Cylindrical Ø 10 40</td>
</tr>
<tr>
<td>30124</td>
<td>1.2</td>
<td>4</td>
<td>MK1 40</td>
</tr>
<tr>
<td>30124</td>
<td>1.2</td>
<td>4</td>
<td>MK0 25</td>
</tr>
<tr>
<td>30124</td>
<td>1.2</td>
<td>4</td>
<td>Cylindrical Ø 10 40</td>
</tr>
</tbody>
</table>

Order sample

<table>
<thead>
<tr>
<th>Type</th>
<th>Shank</th>
<th>Clamping length</th>
</tr>
</thead>
<tbody>
<tr>
<td>3084</td>
<td>Cylindrical Ø 10</td>
<td>40</td>
</tr>
</tbody>
</table>

Other shank dimensions available on request.

All dimensions in mm
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

<table>
<thead>
<tr>
<th>Type</th>
<th>PCD dimensions</th>
<th>Shank</th>
<th>Clamping length L₁</th>
<th>L₂</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>D53</td>
<td>B 0.5 H 2 X 8</td>
<td>MK1</td>
<td>40</td>
<td>13</td>
<td>6901464952</td>
</tr>
<tr>
<td>5320</td>
<td>2 8</td>
<td>MK0</td>
<td>25</td>
<td>13</td>
<td>66260333171</td>
</tr>
<tr>
<td>5320</td>
<td>2 8</td>
<td>Diameter 10</td>
<td>40</td>
<td>13</td>
<td>66260199498</td>
</tr>
</tbody>
</table>

Order sample

<table>
<thead>
<tr>
<th>Type</th>
<th>Shank</th>
<th>Clamping length</th>
</tr>
</thead>
<tbody>
<tr>
<td>5320</td>
<td>Diameter 10</td>
<td>40</td>
</tr>
</tbody>
</table>

All dimensions in mm

Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks
Profile diamonds are high quality dressing tools available for all major dressing units (e.g. Diaform, Schaudt, and Fortuna). 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 and PCD inserts.

### Profile diamond types

<table>
<thead>
<tr>
<th>Type</th>
<th>Diamond weight</th>
<th>Angle $\alpha$</th>
<th>Radius R</th>
<th>Tool length</th>
<th>Designation</th>
<th>Dressing / Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD410</td>
<td>1.0</td>
<td>70°</td>
<td>0.4</td>
<td>44</td>
<td>PD410 70/400</td>
<td>Schaudt</td>
</tr>
</tbody>
</table>

#### Tool length

<table>
<thead>
<tr>
<th>Type</th>
<th>Diamond weight</th>
<th>Angle $\alpha$</th>
<th>Radius R</th>
<th>Tool length</th>
<th>Designation</th>
<th>Dressing / Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD414 Type S</td>
<td>0.25–0.5 depending on the geometry</td>
<td>40°</td>
<td>0.125</td>
<td>36</td>
<td>PD414 40/125 S</td>
<td>Diaform Dressing unit: AT, ATR, BT, BTR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.250</td>
<td></td>
<td>PD414 40/250 S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.500</td>
<td></td>
<td>PD414 40/500 S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60°</td>
<td>0.125</td>
<td></td>
<td>PD414 60/125 S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.250</td>
<td></td>
<td>PD414 60/250 S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.500</td>
<td></td>
<td>PD414 60/500 S</td>
<td></td>
</tr>
<tr>
<td>PD414 Type L</td>
<td>0.25–0.5 depending on the geometry</td>
<td>30°</td>
<td>0.125</td>
<td>45,5</td>
<td>PD414 40/125 L</td>
<td>Diaform Dressing unit: 2A, 2AR, 2B, 2BR, 3A, 3AR, 3B, 3BR, 4A, 4AR, 4B, 4BR, 5/1, 5/2, 5/2R, 5/50, 6/1, 6/2, 8/1, 8/2, 10/2, 12/1, 12/2, 14/1, 14/2, 16/1, 16/2, 18/1, 18/2, CNC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.250</td>
<td></td>
<td>PD414 40/250 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.500</td>
<td></td>
<td>PD414 40/500 L</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>40°</td>
<td>0.125</td>
<td></td>
<td>PD414 60/125 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.250</td>
<td></td>
<td>PD414 60/250 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.500</td>
<td></td>
<td>PD414 60/500 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60°</td>
<td>0.125</td>
<td></td>
<td>PD414 60/125 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.250</td>
<td></td>
<td>PD414 60/250 L</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.500</td>
<td></td>
<td>PD414 60/500 L</td>
<td></td>
</tr>
</tbody>
</table>

All dimensions in mm

| Note: 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

#### WINTER diamond tools for dressing grinding wheels

<table>
<thead>
<tr>
<th>Type</th>
<th>Diamond weight</th>
<th>Angle $\alpha$</th>
<th>Radius R</th>
<th>Tool length</th>
<th>Designation</th>
<th>Dressing / Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD414</td>
<td>0.25-0.5 depending on the geometry</td>
<td>30°</td>
<td>0.125</td>
<td>58</td>
<td>PD414 40/125 L</td>
<td>Diaform Dressing unit: 5/4, 6/4, 12/4, 14/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40°</td>
<td>0.125</td>
<td></td>
<td>PD414 40/250 L</td>
<td></td>
</tr>
<tr>
<td>PD414</td>
<td></td>
<td>60°</td>
<td>0.125</td>
<td></td>
<td>PD414 60/125 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.250</td>
<td></td>
<td>PD414 60/250 L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.500</td>
<td></td>
<td>PD414 60/500 L</td>
<td></td>
</tr>
<tr>
<td>PD425</td>
<td>1.0</td>
<td>55°</td>
<td>0.2</td>
<td>42</td>
<td>PD425 55/200</td>
<td>Fortuna</td>
</tr>
<tr>
<td>PD426</td>
<td>1.0</td>
<td>60°</td>
<td>0.2</td>
<td>24</td>
<td>PD426 60/200</td>
<td>MSO</td>
</tr>
<tr>
<td>PD428</td>
<td>0.5</td>
<td>50°</td>
<td>0.1</td>
<td>22</td>
<td>PD428 50/100</td>
<td>Jung / RA38-53</td>
</tr>
</tbody>
</table>

All dimensions in mm

* Available ex stock

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks
Standard range of profile diamonds

<table>
<thead>
<tr>
<th>Designation α / R</th>
<th>Dimensions Ø x L</th>
<th>ct</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/250L</td>
<td></td>
<td>0.25</td>
<td>66260343187</td>
</tr>
<tr>
<td>40/125L</td>
<td></td>
<td>0.25</td>
<td>66260340672</td>
</tr>
<tr>
<td>40/250L</td>
<td></td>
<td>0.25</td>
<td>66260351876</td>
</tr>
<tr>
<td>40/125L</td>
<td></td>
<td>0.33</td>
<td>66260389254</td>
</tr>
<tr>
<td>40/250L</td>
<td></td>
<td>0.33</td>
<td>662603339381</td>
</tr>
<tr>
<td>60/250L</td>
<td>9.52 x 45.5</td>
<td>0.33</td>
<td>66260340002</td>
</tr>
<tr>
<td>60/500L</td>
<td></td>
<td>0.33</td>
<td>66260375854</td>
</tr>
<tr>
<td>30/125L</td>
<td></td>
<td>0.50</td>
<td>66260339047</td>
</tr>
<tr>
<td>30/250L</td>
<td></td>
<td>0.50</td>
<td>66260339689</td>
</tr>
<tr>
<td>40/125L</td>
<td></td>
<td>0.50</td>
<td>66260199494</td>
</tr>
<tr>
<td>40/250L</td>
<td></td>
<td>0.50</td>
<td>66260368449</td>
</tr>
<tr>
<td>40/500L</td>
<td></td>
<td>0.50</td>
<td>66260339689</td>
</tr>
<tr>
<td>60/500L</td>
<td></td>
<td>0.50</td>
<td>66260336405</td>
</tr>
</tbody>
</table>

Special Shapes
In addition to the standard types other geometries are available upon request.
Unground Profile diamond tools or WINTER Diamond Fliesen are recommended for the pre-profiling process.
For Diaform units the following WINTER Fliese is available ex stock.

<table>
<thead>
<tr>
<th>Shape</th>
<th>W</th>
<th>X</th>
<th>Holder geometry</th>
<th>Diamond size</th>
<th>Bond</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1TFDS90</td>
<td>10</td>
<td>12</td>
<td>Z9.52-30-5-15</td>
<td>D711</td>
<td>T645</td>
<td>66260384883</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Recommended diamond size [ct]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.15…0.35</td>
</tr>
<tr>
<td>2</td>
<td>0.25…0.50</td>
</tr>
<tr>
<td>3</td>
<td>0.35…0.75</td>
</tr>
<tr>
<td>4</td>
<td>0.50…1.00</td>
</tr>
<tr>
<td>5</td>
<td>0.60…1.25</td>
</tr>
<tr>
<td>6</td>
<td>0.70…1.50</td>
</tr>
<tr>
<td>7</td>
<td>0.85…1.75</td>
</tr>
<tr>
<td>8*</td>
<td>1.00…2.00</td>
</tr>
</tbody>
</table>

* Diamonds >2 ct available on request

All dimensions in mm

Minimum order quantity for articles not in stock: 1 item, delivery: 4 weeks
### Single point dressers

<table>
<thead>
<tr>
<th>Type of dressing tool</th>
<th>Grade of diamond</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEA (single point dressers)</td>
<td>Basram</td>
<td>Top grade, at least 4–6 working points, regular octahedron, no inclusions, no cracks</td>
</tr>
<tr>
<td></td>
<td>Diacar</td>
<td>Good industrial grade, at least 3–5 working points, regular octahedron, virtually no inclusions, no cracks</td>
</tr>
<tr>
<td></td>
<td>Vatom</td>
<td>Standard grade, at least 2-3 working points, limited irregular shape, few inclusions, no cracks</td>
</tr>
<tr>
<td></td>
<td>ZA</td>
<td>Normal grade, at least 1-2 working points, few inclusions and may have cracks</td>
</tr>
<tr>
<td></td>
<td>Industry</td>
<td>Simple industrial grade, at least 1 working point</td>
</tr>
</tbody>
</table>

**LEW (‘basic’ single point dressers)**

<table>
<thead>
<tr>
<th>Type of dresser</th>
<th>Diamond [ct]</th>
<th>Grade of diamond</th>
<th>Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEA -</td>
<td>0.5 -</td>
<td>Vatom -</td>
<td>MK1-40</td>
</tr>
</tbody>
</table>

### Range of single point dressers in stock

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

### Range of ‘basic’ single point dressers in stock

<table>
<thead>
<tr>
<th>Specification</th>
<th>Grade of diamond</th>
<th>Shape – Overall length</th>
<th>Diamond [ct]</th>
<th>Working points</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEW-0.25-MK0-25.5</td>
<td>Basic</td>
<td>MK0 × 25.5</td>
<td>0.25</td>
<td>1</td>
<td>66260342633 ¹</td>
</tr>
<tr>
<td>LEW-0.1-MK1-40</td>
<td>Basic</td>
<td>MK1 × 40</td>
<td>0.10</td>
<td>1</td>
<td>66260386731 ¹</td>
</tr>
<tr>
<td>LEW-0.1-MK1-90</td>
<td>Basic</td>
<td>Ø 8 × 90</td>
<td>0.10</td>
<td>1</td>
<td>66260386964 ¹</td>
</tr>
<tr>
<td>LEW-0.1-MK0-25.5</td>
<td>Basic</td>
<td>MK0 × 25.5</td>
<td>0.10</td>
<td>1</td>
<td>66260387348 ¹</td>
</tr>
<tr>
<td>LEW-0.1-Z8-30</td>
<td>Basic</td>
<td>Ø 8 × 30</td>
<td>0.10</td>
<td>1</td>
<td>66260389256 ¹</td>
</tr>
</tbody>
</table>

---

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.
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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Grinding wheels</th>
<th>Diamond specification</th>
<th>Quantity of hard material per rotatable tool</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grit size</td>
<td>Diameter (mm)</td>
<td>Size</td>
<td>Weight</td>
</tr>
<tr>
<td>RO2096</td>
<td>46 - 80</td>
<td>&lt; 600</td>
<td>Diamond needles</td>
<td>2 ct</td>
</tr>
<tr>
<td>RO5096</td>
<td>36 - 60</td>
<td>&gt; 600</td>
<td>Diamond needles</td>
<td>5 ct</td>
</tr>
<tr>
<td>RO1008</td>
<td>46 - 100</td>
<td>&lt; 1000</td>
<td>Triangular diamonds</td>
<td>1.30 ct</td>
</tr>
<tr>
<td>RO1008</td>
<td>46 - 100</td>
<td>≤ 1000</td>
<td>Triangular CVD</td>
<td>Length of sides = 3.5 mm, Depth = 1.0 mm</td>
</tr>
<tr>
<td>RO15/5</td>
<td>60 - 120</td>
<td>5 - 40</td>
<td>Diamond grit D501</td>
<td>0.65 ct</td>
</tr>
</tbody>
</table>

Holders for rotatable tools

<table>
<thead>
<tr>
<th>Specification</th>
<th>Shape of holder</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2096/5096</td>
<td>MK1</td>
<td>66260385746</td>
</tr>
<tr>
<td>2096/5096</td>
<td>MK0</td>
<td>66260386916</td>
</tr>
<tr>
<td>2096/5096</td>
<td>Z12-35</td>
<td>66260381329</td>
</tr>
<tr>
<td>1008</td>
<td>MK1</td>
<td>66260386640</td>
</tr>
<tr>
<td>1008</td>
<td>MK0</td>
<td>7958703355</td>
</tr>
<tr>
<td>1008</td>
<td>Z10-39.5</td>
<td>66260391408</td>
</tr>
<tr>
<td>W15/5</td>
<td>MK1</td>
<td>69014125429</td>
</tr>
<tr>
<td>W15/5</td>
<td>MK0</td>
<td>66260385884</td>
</tr>
<tr>
<td>W15/5</td>
<td>W15/5</td>
<td>66260370419</td>
</tr>
</tbody>
</table>

All dimensions in mm

* Available ex stock

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.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Type</th>
<th>Shank length A</th>
<th>Radius R</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCD</td>
<td>6.0</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td>CVD</td>
<td>6.0</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>0.800</td>
<td></td>
</tr>
</tbody>
</table>

All dimensions in mm

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.
## Order sample

<table>
<thead>
<tr>
<th>Type</th>
<th>Diamond</th>
<th>Dimensions</th>
<th>Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert dresser</td>
<td>PCD</td>
<td>6.0 mm</td>
<td>0.125 mm</td>
</tr>
</tbody>
</table>

## Info

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

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

All dimensions in mm
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

<table>
<thead>
<tr>
<th>Type</th>
<th>Machine mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>MK1</td>
</tr>
<tr>
<td>400K</td>
<td>MK1</td>
</tr>
<tr>
<td>402</td>
<td>MK0</td>
</tr>
<tr>
<td>402K</td>
<td>MK0</td>
</tr>
<tr>
<td>403</td>
<td>Cylindrical</td>
</tr>
</tbody>
</table>

Other shank dimensions on request.

All dimensions in mm

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

#### Other diamond holders

<table>
<thead>
<tr>
<th>Type</th>
<th>Machine mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>405</td>
<td>Landis ø 6; ø 6.5; ø 8</td>
</tr>
<tr>
<td>406</td>
<td>D (diamond tip) centred</td>
</tr>
<tr>
<td>407</td>
<td>Jung NT 65 taper 1:13.15</td>
</tr>
<tr>
<td>409</td>
<td>Jung JgN 1751 taper 1:13.15</td>
</tr>
<tr>
<td>411</td>
<td>Jung JgN 1751 taper 1:20</td>
</tr>
<tr>
<td>412</td>
<td>Jung FA 42-12 taper 1:10</td>
</tr>
</tbody>
</table>

Other shank dimensions on request.

All dimensions in mm
<table>
<thead>
<tr>
<th>Type</th>
<th>Machine mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>413</td>
<td>Jung C 8 taper 1:13.15</td>
</tr>
<tr>
<td>417</td>
<td>Jung C 8 taper 1:20</td>
</tr>
<tr>
<td>420</td>
<td>Niles</td>
</tr>
<tr>
<td>421</td>
<td>Niles</td>
</tr>
<tr>
<td>422</td>
<td>Kolb KZ 1 + 2 taper 1.50</td>
</tr>
<tr>
<td>424</td>
<td>Cover</td>
</tr>
</tbody>
</table>

Other shank dimensions on request.

All dimensions in mm

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Segment dimensions</th>
<th>Diamond</th>
<th>Shank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>Height</td>
<td>Number / rows</td>
<td>Grit size</td>
</tr>
<tr>
<td>D21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2101</td>
<td>12</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2102</td>
<td>12</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2103</td>
<td>12</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2104</td>
<td>12</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2105</td>
<td>18</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2106</td>
<td>18</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2107</td>
<td>18</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2108</td>
<td>18</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2109</td>
<td>18</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

**Order sample**

<table>
<thead>
<tr>
<th>Type</th>
<th>Shank / D</th>
<th>Clamping length</th>
<th>Mounting angle / °</th>
</tr>
</thead>
<tbody>
<tr>
<td>2104</td>
<td>16</td>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

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.

Diamond size selection

<table>
<thead>
<tr>
<th>Igel®</th>
<th>Dimensions of diamond section (diameter Ø and length X)</th>
<th>Diamond (ct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG 1</td>
<td>8 × 4</td>
<td>1</td>
</tr>
<tr>
<td>IG 2.5</td>
<td>8 × 11</td>
<td>2.5</td>
</tr>
<tr>
<td>IG 3.5</td>
<td>8 × 11</td>
<td>3.5</td>
</tr>
<tr>
<td>IG 5</td>
<td>11 × 11</td>
<td>5</td>
</tr>
</tbody>
</table>

Order sample

<table>
<thead>
<tr>
<th>Bond (first letter of the bonding material)</th>
<th>Size of Igel®</th>
<th>Diamond (ct)</th>
<th>Dimensions</th>
<th>Holder</th>
<th>Grit size</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>IG -</td>
<td>2.5 -</td>
<td>8 - 11 -</td>
<td>MK1-40</td>
<td>D 1001</td>
<td>H710</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Igel®</th>
<th>Grinding wheel grit size</th>
<th>Grit size of Igel®</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG 1, IG 2.5, IG 3.5, IG 5</td>
<td>60 - 80</td>
<td>D711</td>
<td>H710</td>
</tr>
<tr>
<td>IG 1, IG 2.5, IG 3.5, IG 5</td>
<td>46 - 60</td>
<td>D1001</td>
<td>H710</td>
</tr>
<tr>
<td>IG 1, IG 2.5, IG 3.5, IG 5</td>
<td>36 - 46</td>
<td>D2240</td>
<td>H710</td>
</tr>
</tbody>
</table>

### Bond for SiC grinding wheels

<table>
<thead>
<tr>
<th>Igel®</th>
<th>Grit size</th>
<th>Grinding wheel</th>
<th>Grit size of Igel®</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG 1, IG 2.5, IG 3.5, IG 5</td>
<td>60 - 80</td>
<td>D711</td>
<td>H770</td>
<td></td>
</tr>
<tr>
<td>IG 1, IG 2.5, IG 3.5, IG 5</td>
<td>46 - 60</td>
<td>D1001</td>
<td>H770</td>
<td></td>
</tr>
<tr>
<td>IG 1, IG 2.5, IG 3.5, IG 5</td>
<td>36 - 46</td>
<td>D2240</td>
<td>H770</td>
<td></td>
</tr>
</tbody>
</table>

### Igel® range in stock

<table>
<thead>
<tr>
<th>Specification</th>
<th>Dimensions Diameter D × Length X</th>
<th>Diamond</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIG1-8-4-MK1-40*D1001 H710</td>
<td>8 × 4</td>
<td>D1001  1.0</td>
<td>66260195955 1)</td>
</tr>
<tr>
<td>HIG2.5-8-11-MK1-40*D711 H710</td>
<td>8 × 11</td>
<td>D711  2.5</td>
<td>66260387566 1)</td>
</tr>
<tr>
<td>HIG2.5-8-11-MK0-25.5*D1001 H710</td>
<td>8 × 11</td>
<td>D1001  2.5</td>
<td>66260195957 1)</td>
</tr>
<tr>
<td>HIG2.5-8-11-MK1-40*D2240 H710</td>
<td>8 × 11</td>
<td>D2240  2.5</td>
<td>66260385203 1)</td>
</tr>
<tr>
<td>HIG3.5-8-11-MK0-25.5*D711 H710</td>
<td>8 × 11</td>
<td>D711  3.5</td>
<td>66260389441 1)</td>
</tr>
<tr>
<td>HIG3.5-8-11-MK1-40*D711 H710</td>
<td>8 × 11</td>
<td>D711  3.5</td>
<td>66260195960 1)</td>
</tr>
<tr>
<td>HIG5-11-11-MK1-40*D711 H710</td>
<td>11 × 11</td>
<td>D711  5.0</td>
<td>66260195972 1)</td>
</tr>
<tr>
<td>HIG5-11-11-MK1-40*D1001 H710</td>
<td>11 × 11</td>
<td>D1001  5.0</td>
<td>66260195959 1)</td>
</tr>
<tr>
<td>HIG5-11-11-MK1-40*D2240 H710</td>
<td>11 × 11</td>
<td>D2240  5.0</td>
<td>66260195953 1)</td>
</tr>
</tbody>
</table>

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.

Order sample

<table>
<thead>
<tr>
<th>Bond (first letter)</th>
<th>Design</th>
<th>Dimensions</th>
<th>Holder</th>
<th>Grit size</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>pro58</td>
<td>5 - 8 -</td>
<td>MK1-40</td>
<td>D151</td>
<td>H760</td>
</tr>
</tbody>
</table>

pro-dress® for alumina grinding wheels

<table>
<thead>
<tr>
<th>pro-dress®</th>
<th>Grinding wheel grit size</th>
<th>Grit size pro-dress®</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>pro48, pro58, pro68, pro88</td>
<td>320 - 600</td>
<td>D76</td>
<td>H760</td>
</tr>
<tr>
<td></td>
<td>220 - 320</td>
<td>D107</td>
<td>H760</td>
</tr>
<tr>
<td></td>
<td>180 - 220</td>
<td>D151</td>
<td>H760</td>
</tr>
<tr>
<td></td>
<td>120 - 180</td>
<td>D213</td>
<td>H760</td>
</tr>
<tr>
<td></td>
<td>100 - 120</td>
<td>D301</td>
<td>H760</td>
</tr>
</tbody>
</table>

All dimensions in mm

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.
<table>
<thead>
<tr>
<th>pro-dress®</th>
<th>Grinding wheel grit size</th>
<th>Grit size pro-dress®</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>pro48, pro58, pro68, pro88</td>
<td>80 - 100</td>
<td>D426</td>
<td>H710</td>
</tr>
<tr>
<td></td>
<td>60 - 80</td>
<td>D601</td>
<td>H710</td>
</tr>
<tr>
<td></td>
<td>54 - 60</td>
<td>D711</td>
<td>H710</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>pro-dress®</th>
<th>Grit size Grinding wheel</th>
<th>Grit size pro-dress®</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>pro48, pro58, pro68, pro88</td>
<td>320 - 600</td>
<td>D76</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>220 - 320</td>
<td>D107</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>180 - 220</td>
<td>D151</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>120 - 180</td>
<td>D213</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>100 - 120</td>
<td>D301</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>80 - 100</td>
<td>D426</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>60 - 80</td>
<td>D601</td>
<td>ST469</td>
</tr>
<tr>
<td></td>
<td>54 - 60</td>
<td>D711</td>
<td>ST469</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>pro-dress®</th>
<th>Grit size Grinding wheel</th>
<th>Grit size pro-dress®</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>pro48, pro58, pro68, pro88</td>
<td>320 - 600</td>
<td>D76</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>220 - 320</td>
<td>D107</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>180 - 220</td>
<td>D151</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>120 - 180</td>
<td>D213</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>100 - 120</td>
<td>D301</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>80 - 100</td>
<td>D426</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>60 - 80</td>
<td>D601</td>
<td>H770</td>
</tr>
<tr>
<td></td>
<td>54 - 60</td>
<td>D711</td>
<td>H770</td>
</tr>
</tbody>
</table>

**pro-dress® range in stock**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Dimensions Diameter D × Length X</th>
<th>Diamond</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPRO48-4-8-Z6-24*D301 H760</td>
<td>4 x 8</td>
<td>D301</td>
<td>0.6</td>
</tr>
<tr>
<td>HPRO58-5-8-Z6-25*D426 H710</td>
<td>5 x 8</td>
<td>D426</td>
<td>1</td>
</tr>
<tr>
<td>HPRO68-6-8-MKO-25.5*D213 H760</td>
<td>6 x 8</td>
<td>D213</td>
<td>1.3</td>
</tr>
</tbody>
</table>

All dimensions in mm

Minimum order quantity for articles not in stock: 6 item, delivery: 6 weeks
Dressing side feed and positions in relation to the grinding wheel for stationary dressing tools

<table>
<thead>
<tr>
<th>Grinding wheel grit size</th>
<th>Recommended dressing feed (mm/rev)</th>
<th>Grinding wheel speed (rpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>150</td>
<td>0.05</td>
<td>25</td>
</tr>
<tr>
<td>100</td>
<td>0.15</td>
<td>75</td>
</tr>
<tr>
<td>60</td>
<td>0.25</td>
<td>125</td>
</tr>
<tr>
<td>46</td>
<td>0.35</td>
<td>175</td>
</tr>
<tr>
<td>&lt; 46</td>
<td>0.45</td>
<td>225</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Grind wheel grit size</th>
<th>Recommended dressing feed (mm/rev)</th>
<th>Grinding wheel speed (rpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5500</td>
</tr>
<tr>
<td>150</td>
<td>0.05</td>
<td>275</td>
</tr>
<tr>
<td>100</td>
<td>0.15</td>
<td>825</td>
</tr>
<tr>
<td>60</td>
<td>0.25</td>
<td>1375</td>
</tr>
<tr>
<td>46</td>
<td>0.35</td>
<td>1925</td>
</tr>
<tr>
<td>&lt; 46</td>
<td>0.45</td>
<td>2475</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>with straight holding fixture</th>
<th>with tilted holding fixture</th>
<th>when straight dressing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diamantfliesen®</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td>Inclination is compensated by swivelling the blade in the holding fixture $\alpha = 0...30^\circ$ or rigidly brazed</td>
</tr>
<tr>
<td><strong>Igel®</strong></td>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
<td>If the holding fixture is tilted, please state the angle of inclination $\alpha^*$</td>
</tr>
<tr>
<td><strong>pro-dress®</strong></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
<td>If the holding fixture is tilted, please state the angle of inclination $\alpha^*$</td>
</tr>
<tr>
<td><strong>Rotatables 2096/5096</strong></td>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td><strong>Rotatables 1008</strong></td>
<td><img src="image9" alt="Diagram" /></td>
<td><img src="image10" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td><strong>Single point dresser</strong></td>
<td><img src="image11" alt="Diagram" /></td>
<td><img src="image12" alt="Diagram" /></td>
<td>$\alpha = 5...45^\circ$</td>
</tr>
<tr>
<td><strong>Profile diamond</strong></td>
<td><img src="image13" alt="Diagram" /></td>
<td><img src="image14" alt="Diagram" /></td>
<td>$\alpha = 5...10^\circ$</td>
</tr>
</tbody>
</table>

All dimensions in mm
<table>
<thead>
<tr>
<th>Work setting for profile dressing</th>
<th>Effective cutting width $b_0$ [mm]</th>
<th>Contact ratio $U_d$</th>
<th>Dressing infeed amount $a_m$ [mm]</th>
<th>Dressing side feed $f_m$ [mm/U]</th>
<th>Other notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td>$-0.8 \cdot d_i$ &lt;br&gt; $d_i = \text{theoretical diameter of diamond grit}$</td>
<td>2 - 8</td>
<td>0.01 - 0.03</td>
<td>0.05 - 0.5</td>
<td>Slightly diagonal setting possible when dressing straight =Recutting effect =feiner surface quality</td>
</tr>
<tr>
<td><img src="image2" alt="Diagram" /></td>
<td>$-0.8 \cdot d_i$ &lt;br&gt; per active grit</td>
<td>2 - 8</td>
<td>0.01 - 0.05</td>
<td>0.3 - 1.0</td>
<td>Because of the large number of active diamonds during dressing the dressing feed $f_m$ and/or the feed rate $v_{mf}$ must be increased accordingly</td>
</tr>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td>$-0.8 \cdot d_i$ &lt;br&gt; According to the degree of wear</td>
<td>2 - 8</td>
<td>0.01 - 0.05</td>
<td>0.3 - 1.0</td>
<td>Because of the large number of active diamonds during dressing the dressing feed $f_m$ and/or the feed rate $v_{mf}$ must be increased accordingly</td>
</tr>
<tr>
<td><img src="image4" alt="Diagram" /></td>
<td>$-0.8 \cdot d_i$ &lt;br&gt; According to the profile of the diamond (angle/radius)</td>
<td>2 - 8</td>
<td>0.01 - 0.02</td>
<td>0.03 - 0.10</td>
<td>Please observe the manufacturer’s instructions for equipment and machines</td>
</tr>
</tbody>
</table>

All dimensions in mm

Please feel free to contact our expert advisors at any time. Contact details can be found on the last page.
WINTER diamond tools for dressing grinding wheels

Checklist
for stationary dressing tools

1. Workpiece
   1.1 Drawing of workpiece
   1.2 Workpiece material
   1.3 Surface finish required

2. Machine
   2.1 Manufacturer
   2.2 Model/type
   2.3 Grinding process
   2.4 Cooling lubricant

3. Grinding wheel
   3.1 Dimensions
   3.2 Specification
   3.3 Manufacturer

4. Diamond dresser in use
   4.1 Designation
   4.2 Dimensions
   4.3 Specification

5. Dressing process
   5.1 Straight dressing
   5.2 Copy dressing / profile dressing

6. Current dressing insert data
   6.1 Grinding wheel cutting speed during dressing
   6.2 Dressing infeed/stroke
   6.2.1 Dressing infeed/stroke

7. Requirement or problem

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

Information

Further information on applications and products can be found at www.winter-superabrasives.com

100 Dressing tools for vitrified bonded grinding wheels
102 Dressing tools for resin-bonded grinding wheels
102 Electroplated and sintered metal bond dressing tools
103 Dressing tools for diamond and cBN grinding wheels
103 WINTER dressing unit
103 Cleaning and sharpening stones
104 Manual dressing tools
104 D20 manual dressing tool with natural diamond in an electroplated bond
105 Multigrit manual dressing tool with natural diamond in a sintered metal bond
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

<table>
<thead>
<tr>
<th>Shape</th>
<th>D</th>
<th>T</th>
<th>X</th>
<th>S</th>
<th>L</th>
<th>Grit size</th>
<th>Bond</th>
<th>Concentration</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4BZ 07B</td>
<td>15</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>30</td>
<td>D301</td>
<td>BZ 387</td>
<td>C135</td>
<td>66260100343 1</td>
</tr>
<tr>
<td>505 07B</td>
<td>15</td>
<td>10</td>
<td>4</td>
<td>30</td>
<td>D426</td>
<td>G825</td>
<td>S33</td>
<td>60157644198 1</td>
<td></td>
</tr>
</tbody>
</table>

### Diamond dressing cups for dressing vitrified bonded cBN grinding wheels

<table>
<thead>
<tr>
<th>Shape</th>
<th>D</th>
<th>T</th>
<th>X</th>
<th>H</th>
<th>Grit size</th>
<th>Bond</th>
<th>Concentration</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2BZ6A9</td>
<td>15</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>D301</td>
<td>BZ 387</td>
<td>C135</td>
<td>66260379145</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Shape</th>
<th>D</th>
<th>T</th>
<th>X</th>
<th>H</th>
<th>Grit size</th>
<th>Bond</th>
<th>Concentration</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1BZ6A9</td>
<td>15</td>
<td>2</td>
<td>1.5</td>
<td>7</td>
<td>D213</td>
<td>BZ 387.1</td>
<td>C135</td>
<td>66260112087</td>
</tr>
</tbody>
</table>

All dimensions in mm
² 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

<table>
<thead>
<tr>
<th>Application</th>
<th>Shape</th>
<th>Specification</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>1509H-80-20-8</td>
<td>D301 / S11</td>
<td>66260134287 ²</td>
</tr>
</tbody>
</table>

### WINTER dressing cylinder

<table>
<thead>
<tr>
<th>Application</th>
<th>Shape</th>
<th>Specification</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>1544B-40-20</td>
<td>D301 / S11</td>
<td>60157642712</td>
</tr>
</tbody>
</table>

All dimensions in mm

1) Available ex stock

² Minimum order quantity for articles not in stock: 1 item, delivery: 5 weeks
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

<table>
<thead>
<tr>
<th>Replacement grinding wheels</th>
<th>For grit sizes</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>37C46-N5VS</td>
<td>D91 - D181</td>
<td>69936679412</td>
</tr>
<tr>
<td>39C60-MV</td>
<td>D64 - D126</td>
<td>66253051624</td>
</tr>
<tr>
<td>39C802-IV</td>
<td>≤ D64</td>
<td>66253052726</td>
</tr>
<tr>
<td>Accessories</td>
<td>1 set consisting of: 3 brake segments, 3 springs and 3 screws</td>
<td>66260274670</td>
</tr>
</tbody>
</table>

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

Cleaning and sharpening stones

<table>
<thead>
<tr>
<th>Cleaning and sharpening stones</th>
<th>WINTER</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>WINTER stone No. 1AW (100x20x20)</td>
<td>Special white fused alumina, vitrified bonded, 360 mesh, for sharpening resin bond grinding wheels with grit size &lt; D46</td>
<td>66260395639</td>
</tr>
<tr>
<td>WINTER stone No. 2 (100x24x13)</td>
<td>Special white fused alumina, vitrified bonded, 180 mesh, for sharpening resin and metal-bonded grinding and cut-off wheels with grit size ≥ D46</td>
<td>66260195816</td>
</tr>
<tr>
<td>WINTER stone No. 3 (100x40x15)</td>
<td>Silicon carbide, rubber-bonded, 80 mesh, for cleaning and sharpening electroplated and vitrified bonded grinding wheels and pins</td>
<td>66260195817</td>
</tr>
<tr>
<td>WINTER stone No. 3A (80×15×10)</td>
<td>See WINTER stone No. 3</td>
<td>66260389357</td>
</tr>
<tr>
<td>WINTER stone No. 3B (100×50×25)</td>
<td>See WINTER stone No. 3</td>
<td>66260386167</td>
</tr>
<tr>
<td>WINTER stone No. 4 (90×70×20)</td>
<td>Special pink fused alumina, vitrified bonded, 60 mesh, for sharpening metal bond grinding wheels with grit size ≥ D251</td>
<td>60157642665</td>
</tr>
<tr>
<td>WINTER stone No. 5 (100×50×25)</td>
<td>See WINTER stone No. 2</td>
<td>66260389054</td>
</tr>
</tbody>
</table>

Cleaning and sharpening stones

<table>
<thead>
<tr>
<th>Cleaning and sharpening stones</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone WA150GV (25x25x150)</td>
<td>Cleaning and sharpening vitrified and resin bond grinding wheels ≥ D54, recommended for sharpening Q-Flute</td>
</tr>
<tr>
<td>Stone WA220GV (25x25x150)</td>
<td>Cleaning and sharpening vitrified and resin bond grinding wheels</td>
</tr>
<tr>
<td>Stone WA320GV (25x25x150)</td>
<td>Cleaning and sharpening vitrified and resin bond grinding wheels ≤ D46</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Segment dimensions</th>
<th>Design</th>
<th>Diamond content [ct]</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 20 L B lateral straight</td>
<td>2001 45 12 x x</td>
<td>5</td>
<td>66260139141⁠</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2002 20 12 x x</td>
<td>2.2</td>
<td>66260195353⁠</td>
<td></td>
</tr>
</tbody>
</table>

All dimensions in mm
⁠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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Segment dimensions</th>
<th>Design</th>
<th>Diamond content [ct]</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Igel</td>
<td>L</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Igel-P</td>
<td>25</td>
<td>7</td>
<td>lateral</td>
<td>1.3</td>
</tr>
<tr>
<td>Igel-T</td>
<td>25</td>
<td>7</td>
<td>straight</td>
<td>1.3</td>
</tr>
</tbody>
</table>

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 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, \( a_{\text{up}} \), and the axial dressing feed, \( f_{\text{ad}} \). Together with the dressing feed, the diamond grit size is another important factor that affects the grinding result. The effective dressing width, \( b_{\text{r}} \), and the associated overlap, \( U_{\text{r}} \), affect the active surface roughness, \( R_{\text{ts}} \), of the grinding wheel.

In the case of CNC dressing discs the dressing results are also affected by the speed factor, \( q_{\text{d}} \), 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

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

WINTER diamond tools for dressing grinding wheels
Process parameters

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

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

Dressing infeeds for alumina grinding wheels:
- Total infeed $a_{\text{ed tot}}$ for special fused alumina grinding wheels: 20 μm – 40 μm, depending on the grit size of the grinding wheel
- Total infeed $a_{\text{ed tot}}$ 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 $a_{\text{ed}}$ per dressing pass: 1 μm – 3 μm
- Maximum dressing amount $a_{\text{ed tot}}$: 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 $a_{\text{ed tot}}$ will be 10 μm – 12 μm

**General notes:**
- Avoid dressing passes without infeed $a_{\text{ed}}$
- 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

**Grinding with vitrified cBN grinding wheels**
- Dressed topography
  - Grit protrusion low
  - Active surface roughness low
  - Grinding forces high

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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, $R_{a_t}$, 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, $f_{ax}$. 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, $a_{up}$.

$$U_d = \frac{a_{up}}{f_{ad}} = \frac{d_k/v_{f ad}/n_{sd}}{f_{ad}/(v_{cd} \times 60,000)}$$

$U_d$ $[-]$ : Overlap ratio

- $a_{up}$ [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
- $v_{f ad}$ [m/s] : Cutting speed while dressing
- $v_{cd}$ [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:**

<table>
<thead>
<tr>
<th>Overlap ratio $U_d$</th>
<th>Rough grinding</th>
<th>Finish grinding</th>
<th>Super finish grinding</th>
</tr>
</thead>
<tbody>
<tr>
<td>$a_{up}/f_{ad}$</td>
<td>2 - 4</td>
<td>4 - 8</td>
<td>8 - 20</td>
</tr>
</tbody>
</table>

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.

![Graph showing speed ratio and active roughness](image-url)
The different dressing forces are explained by the different paths (cycloids) of the grinding wheel and roller dresser.

Dressing speed ratio

<table>
<thead>
<tr>
<th>Uni-directional dressing:</th>
<th>Counter-directional dressing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>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, $R_{au}$, on the grinding wheel.</td>
<td>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, $R_{au}$, on the grinding wheel.</td>
</tr>
<tr>
<td>• Greater influence on the grinding wheel topography</td>
<td>• Lesser influence on the grinding wheel topography</td>
</tr>
<tr>
<td>• Higher dressing forces</td>
<td>• Lower dressing forces</td>
</tr>
<tr>
<td>• Higher stresses on the roller dresser</td>
<td>• Lower stresses on the roller dresser</td>
</tr>
</tbody>
</table>

Notes

1. Wherever possible, dress at grinding speed
2. Please check Radial run-out Axial run-out Imbalance Prevent dynamic imbalance $v_c = v_{cd}$
3. 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.

![Graph showing the effect of dwell revolutions on active surface roughness](image)

\[ R_{ts} \] 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

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.

\[ f_{rd} = 0.72 \mu m \text{ uni-directional} \]
\[ f_{rd} = 0.18 \mu m \text{ uni-directional} \]

\[ f_{rd} \] Dressing infeed per grinding wheel revolution

Trial conditions:
Grinding wheel EK 60L7 kg
Diamond rotary dresser UZ, D852
\[ v_c = 29 \text{ m/s} \]

1) G. Pahlitzsch and R. Schmidt “Wirkung von Korngröße und Konzentration beim Abrichten von Schleifscheiben mit diamantbestückten Rollen”

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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.

**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

Source: Dittel
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.

<table>
<thead>
<tr>
<th>Dressing cycles</th>
<th>Dressing amount</th>
<th>Dressing time</th>
<th>Grinding wheel service life</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 %</td>
<td>100 %</td>
<td>0 %</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Conventional dressing | Touch dressing

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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.
116 Service
In addition to design and production of grinding tools, WINTER offers you a multitude of services.

120 Glossary
Compiled for you: this little reference guide explains terms around grinding: bonds, roughness, material removal rates, etc.

130 Index
This catalogue-spanning index helps you to easily find the right information for your application and the corresponding grinding tools.

139 Contact
Whom to ask first?
Who is my nearest contact person?
Where can I get quick and easy help?
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 anchored 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:

<table>
<thead>
<tr>
<th>Diamond</th>
<th>Carat / cm³</th>
<th>Volume %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C50</td>
<td>2,2</td>
<td>12,5</td>
</tr>
<tr>
<td>C75</td>
<td>3,3</td>
<td>18,75</td>
</tr>
<tr>
<td>C100</td>
<td>4,4</td>
<td>25</td>
</tr>
<tr>
<td>C125</td>
<td>5,5</td>
<td>31,25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>cBN</th>
<th>Carat / cm³</th>
<th>Volume %</th>
</tr>
</thead>
<tbody>
<tr>
<td>V120</td>
<td>2,09</td>
<td>12</td>
</tr>
<tr>
<td>V180</td>
<td>3,13</td>
<td>18</td>
</tr>
<tr>
<td>V240</td>
<td>4,18</td>
<td>24</td>
</tr>
<tr>
<td>V300</td>
<td>5,22</td>
<td>30</td>
</tr>
</tbody>
</table>

These definitions are not applicable for single layer electroplated tools.

Conditioning

Conditioning of a grinding wheel consists of dressing and cleaning:

<table>
<thead>
<tr>
<th>Dressing</th>
<th>Cleaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profiling</td>
<td>Sharpening</td>
</tr>
<tr>
<td>Influences macrostructure</td>
<td>Influences microstructure</td>
</tr>
<tr>
<td>Produces concentricity and grinding wheel profile</td>
<td>Generates topography and grain exposure by eroding the bond</td>
</tr>
<tr>
<td>Need: Shape or re-shape the wheel surface</td>
<td>Need: Create grit protrusion</td>
</tr>
</tbody>
</table>

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 distinguish 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.

<table>
<thead>
<tr>
<th>Body material type</th>
<th>Label</th>
<th>Vibration Absorption</th>
<th>Heat Transmission</th>
<th>Mechanical Stiffness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resin with metal fillers</td>
<td>H</td>
<td>medium</td>
<td>sufficient</td>
<td>good</td>
</tr>
<tr>
<td>Resin with non-metallic fillers</td>
<td>B or D</td>
<td>good</td>
<td>bad</td>
<td>satisfactory (not sufficient with thin-walled bodies)</td>
</tr>
<tr>
<td>Aluminium</td>
<td>A</td>
<td>bad</td>
<td>good</td>
<td>very good</td>
</tr>
<tr>
<td>Steel</td>
<td>E</td>
<td>bad</td>
<td>satisfactory</td>
<td>very good</td>
</tr>
<tr>
<td>Copper</td>
<td>C</td>
<td>bad</td>
<td>very good</td>
<td>very good</td>
</tr>
<tr>
<td>Composite material</td>
<td>CFK</td>
<td>good</td>
<td>bad</td>
<td>good</td>
</tr>
</tbody>
</table>
**Grit Sizes**

The sieve-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.

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

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

<table>
<thead>
<tr>
<th>WINTER diamond classification</th>
<th>Grit size [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 25</td>
<td>40 - 60</td>
</tr>
<tr>
<td>D 20 C</td>
<td>34 - 45</td>
</tr>
<tr>
<td>D 20 B</td>
<td>25 - 37</td>
</tr>
<tr>
<td>D 20 A</td>
<td>20 - 30</td>
</tr>
<tr>
<td>D 15</td>
<td>8 - 25</td>
</tr>
<tr>
<td>D 15 C</td>
<td>15 - 25</td>
</tr>
<tr>
<td>Material</td>
<td>Moh’s Hardness</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Diamond</td>
<td>10</td>
</tr>
<tr>
<td>cBN</td>
<td>9,9</td>
</tr>
<tr>
<td>Silicon carbide</td>
<td>9,6</td>
</tr>
<tr>
<td>Corundum</td>
<td>9</td>
</tr>
<tr>
<td>Quartz</td>
<td>7</td>
</tr>
<tr>
<td>Manganese</td>
<td>5</td>
</tr>
<tr>
<td>Gypsum</td>
<td>2</td>
</tr>
<tr>
<td>Talc</td>
<td>1</td>
</tr>
</tbody>
</table>

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 \([\text{mm}^3/(\text{s} \cdot \text{mm})]\).

Parameters influencing Grinding Results

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

<table>
<thead>
<tr>
<th>Appraisal criterion</th>
<th>Cutting Force (F) (= f(\ldots))</th>
<th>Grinding Ratio (G) (= f(\ldots))</th>
<th>Roughness (R_a) (= f(\ldots))</th>
<th>Temperature (\theta) (= f(\ldots))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influencing Parameters</td>
<td>Cutting Speed (v_c) (m/s)</td>
<td>(F) (V_c)</td>
<td>(G) (V_c)</td>
<td>(R_a) (V_c)</td>
</tr>
<tr>
<td>Machine- and Operation Parameters</td>
<td>Material Removal Rate (Q_w) (mm(^3)/s)</td>
<td>(F) (Q_w)</td>
<td>(G) (Q_w)</td>
<td>(R_a) (Q_w)</td>
</tr>
<tr>
<td>Coolant (Oil Content)</td>
<td>(F) Oil Content</td>
<td>(G) Oil Content</td>
<td>(R_a) Oil Content</td>
<td>(\theta) Oil Content</td>
</tr>
<tr>
<td>Grinding Wheel</td>
<td>Grit Size (µm)</td>
<td>(F) Grit Size</td>
<td>(G) Grit Size</td>
<td>(R_a) Grit Size</td>
</tr>
<tr>
<td></td>
<td>Concentration (Carat/cm(^3))</td>
<td>(F) Concentration</td>
<td>(G) Concentration</td>
<td>(R_a) Concentration</td>
</tr>
</tbody>
</table>
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:
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:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Shape</th>
<th>Dimension</th>
<th>Grit Size</th>
<th>Bond</th>
<th>Concentration</th>
<th>Body Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1TV9</td>
<td>100-2-10-20</td>
<td>D126</td>
<td>K+888R</td>
<td>C75</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

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 occurrence 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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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: Standard Catalogue
WINTER Stock Programme for Diamond and cBN Tools

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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?

For your inquiries please ask your sales engineer:

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