



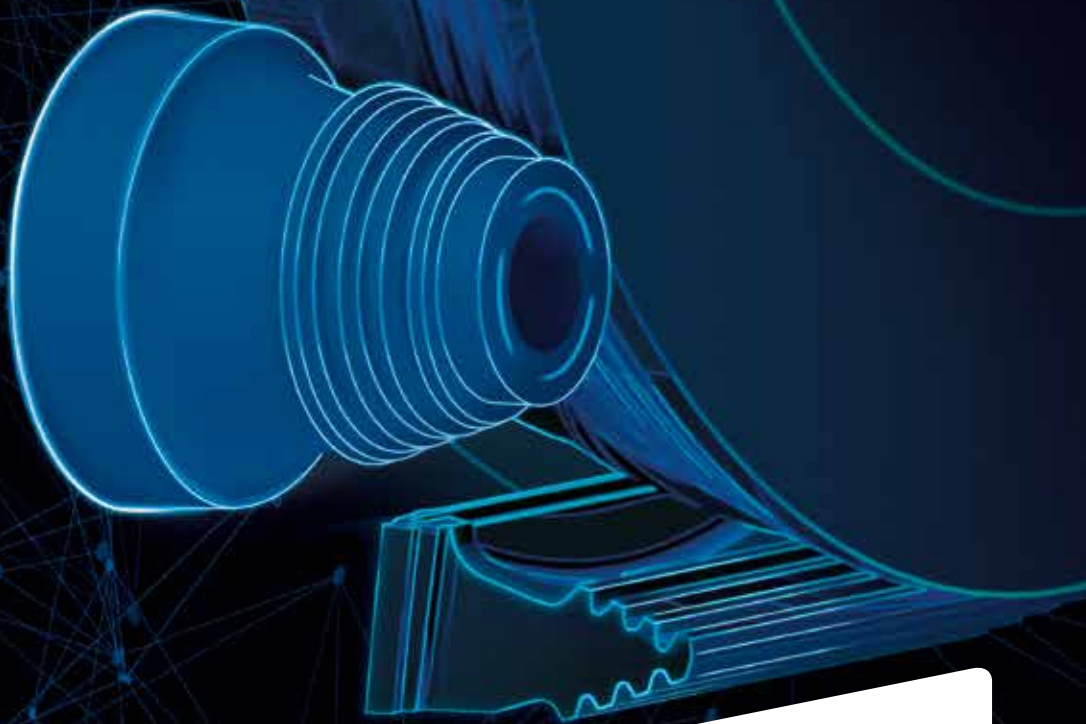
SAINT-GOBAIN

# WINTER



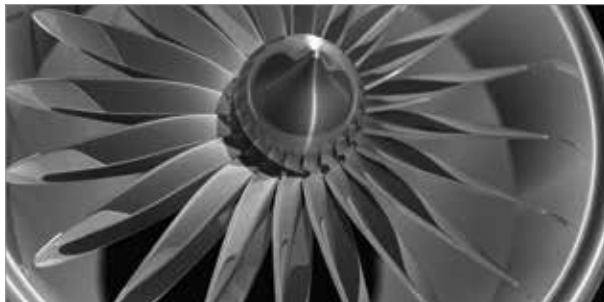
# DRESSING TOOLS

FOR DRESSING GRINDING WHEELS



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# OUR CUSTOMER CONNECTION

As a Saint-Gobain brand, our customer-first philosophy, diverse product portfolio and strong global presence are our hallmarks and, we are an important part of a network that spans 45 countries with new locations being added every year. Saint-Gobain Abrasives employ over 16,000 people and is the only manufacturer to offer such a comprehensive range of abrasives and dressing tools in the industry.

For over 160 years, Norton WINTER has been one of the most well respected names in the industry and is synonymous with high quality diamond and cBN grinding products. Our unique combination of unbeatable quality, market leading expertise and outstanding service, are the foundations on which our success is built.

## GLOBAL EXPERTISE

Saint-Gobain is a global top one hundred industrial company and leader in the production of glass, high performance materials and construction products. Saint-Gobain Group has a long and rich history of excellence having been established in 1665. Norton WINTER have been part of the group since 1996, adding a wealth of experience and a huge range of specialist products to an already strong portfolio of brands.

Today, the Saint-Gobain Group invests approximately €400 million per year in research and development and files over 300 patents per year to reinforce its reputation as a global leader of innovation and improvement.

## THE NORTON WINTER BRAND PROMISES:

### MARKET LEADING QUALITY

From day 1, Norton WINTER has stood for quality. From design to delivery, we exact the highest standards at every stage to ensure that we produce only the best products for our customers. Norton WINTER diamond tools are recognised for their exceptional performance and outstanding value for money.

### INNOVATION

To this day, the Norton WINTER philosophy is closely connected to innovation and technical progress. As a pioneer, we have always been, and continue to be, actively invested in the future development of grinding technologies. Take advantage of our team of dedicated R&D scientists at Norton WINTER's purpose-built European Grinding Technology Centre.

### CUSTOM-MADE SOLUTIONS

Over 75% of all Norton WINTER products are developed in close cooperation with our customers. Our product managers and application engineers relish the technological challenge of achieving the best grinding results for our customers. As such, we are happy to provide optimised grinding solutions to meet your specific requirements in a

way that delivers the greatest benefit. At all times our aim is to generate cost savings, improved productivity, reduced down time, and better quality at every stage of your process.

### OUTSTANDING SERVICE

At Norton WINTER we pride ourselves on offering a full service. From finding the perfect product to optimising your processes, we encourage all of our customers to take advantage of our technical expertise and years of industry experience. Our field sales force and customer service department are at your disposal.

### OPERATIONAL EXCELLENCE

As a responsible manufacturer, Norton WINTER continually strives to minimise its negative impact on the environment and upholds industry leading standards of health and safety. Norton WINTER carries international certification to ISA 9001 (Quality Management), ISO 14001 (Environmental Management) and OHSAS 18001 (Health and Safety Management). Additionally, all rotating Norton WINTER tools bear the OSA safety seal (OSA: Organization for the Safety of Abrasives), providing our customers with the highest safety specification in a tool application.

# SUPPORTING SUSTAINABILITY IN THE **ABRASIVES INDUSTRY**



Sustainable European Abrasive Manufacturers

Saint-Gobain is proud to be an active member of SEAM - Sustainable European Abrasive Manufacturers. An initiative from FEPA, the SEAM program guarantees that member organisations from within the abrasive supply chain manufacture and distribute products according to new standards, to support sustainable growth in production and distribution.

The aim is to balance environmental efficiency, production performance and labour safety by meeting a series of requirements related to three pillars: environment, labour and economy.

Saint-Gobain Abrasives is committed to preserving the environment and resources, reducing inequalities and improving daily life for all. It's more than an expectation, making a positive contribution has become a requirement for all our stakeholders. We all have a part to play in ensuring our processes, products and the health and safety of our employees is maintained and allows our industry to operate sustainably now and in the future.

For more information visit [www.nortonabrasives.com](http://www.nortonabrasives.com)

# A CORPORATE PERSPECTIVE

Saint-Gobain Abrasives are reshaping your world by bringing powerful, precise and user-friendly solutions that grind and finish all types of materials.

Our customers require only the smartest designs and highest performance products, that's why innovation and improvement are at the heart of everything we do. Material sciences and technological development are an obsession and the satisfaction of our customers is what drives us in the pursuit of perfections.

## **TRUST NORTON WINTER** ONE BRAND, ONE TECHNOLOGY LEADER

Norton WINTER, the premium brand for diamond and cBN grinding products, is one of the most well established and respected brands in the market. With over 160 years' experience, Norton WINTER offers a performance package designed to generate cost savings through increased productivity, less down time, and better quality.



SAINT-GOBAIN

# WINTER



# YOUR SAFETY IS **OUR PRIORITY**

Your safety is our top priority and we understand that the nature of our customers' work presents inherent risks. To help minimise those risks, all Norton WINTER products are manufactured in accordance with the most rigorous European and International health, safety and environmental regulations.

**THE ORGANISATION FOR  
THE SAFETY OF ABRASIVES**



We are proud to carry the oSa trademark. As a member of the oSa, we are positioned amongst the very best manufacturers with the highest levels of safety. Through a stringent monitoring and audit system year after year, we maintain our reputation as a reliably safe and responsible producer of quality abrasives. We conform to European and International standards, EN12413, EN13236 and EN13743 for bonded, diamond and coated products and ISO 9001, 14001 and OHSAS 18001 for our manufacturing sites. Where possible, always opt for products and suppliers who carry the oSa® trademark to ensure quality products of the highest safety level.

**THE FEDERATION OF  
EUROPEAN PRODUCERS  
OF ABRASIVES**



As a member of the FEPA association, we stay up-to-date with all technical, legal and scientific regulatory frameworks. Together with oSa, FEPA pursues the objective of supporting both currently attained safety standards and potential future developments.





Saint-Gobain Abrasives



Our products Consumers Professionals Resources About us Contact us



## Winter connects with Norton to become one brand... one technology leader

Norton Winter delivers high performance diamond and CBN tools for all precision grinding applications. With custom-made solutions and a comprehensive range of stock products, Norton Winter offers a performance package designed to generate cost savings through increased productivity, less down time, and better quality. Trust Norton Winter.

CLICK BELOW TO VIEW OUR MARKETS



Medical



Bearing & Gear



Tools



Transportation



Electronics



Glass



# DISCOVER MORE FROM OUR EXPERTS AT:

[www.nortonabrasives.com](http://www.nortonabrasives.com)

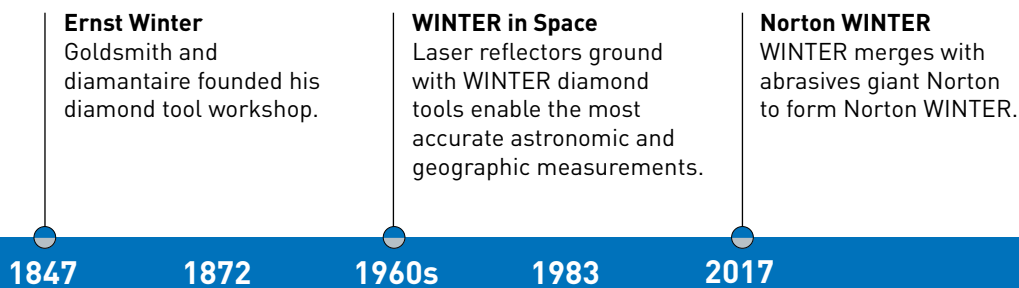


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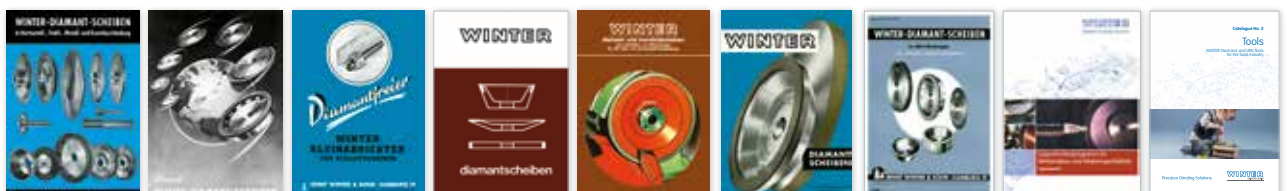
# WINTER

# SNAPSHOTS OF A LONG HISTORY

In 1847 Ernst Winter established a family-owned company with a simple vision of developing the best ultra-hard crystal tools that money could buy. Today, we still adhere to that vision and throughout our history have gone on to develop a reputation as industry pioneers, trend-setters and technological leaders. We are Norton WINTER.



## Posters and Brochures in the course of time





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

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

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

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

No. 1 2 3 4 5  
Preis per Stück Mk. 4 6 8 10 12  
(Umtausch gestattet)

**WINTER**

Diamant-Werkzeug Fabrik  
HAMBURG.

**Success from the beginning**  
Former letterhead and contemporary advertisement of WINTER with images showing medals received at important exhibitions.

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

Wir empfehlen  
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(Umtausch gestattet)

GOLDENE MEDAILLE:  
HAMBURGISCHE Weltausstellung und Industrie-Ausstellung  
HAMBURG 1889

GOLDENE MEDAILLE:  
EXPOSITION INTERNATIONALE D'ARTS ET D'INDUSTRIES  
PARIS 1889

GOLDENE MEDAILLE:  
Weltausstellung Paris 1900

HÖCHSTE AUSZEICHNUNG (Silberne Medaille)  
für Diamant-Werkzeuge Gruppe III, Klasse 15.

HAMBURG-EIMSBÜTTEL  
den 16. Juli 1911.

**ERNST WINTER & SOHN**  
Diamant-Werkzeugfabrik  
Diamant-Schleiferi.  
Rohdiamanten.  
Gegründet 1847.

Altena 1869.



# WINTER

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# INNOVATIONS

**AEON**

BEST-IN-CLASS PRECISION GRINDING

**FLUTE EVO**

FLUTE GRINDING HAS EVOLVED  
IMPROVED FLUTE SURFACE QUALITY

**CARBON FORCE**

FORCING THE LIMITS OF O.D. GRINDING

**ALLOS**

EXTREME MATERIAL REMOVAL  
MAXIMUM THERMAL CONTROL

**VITRON 7**

SAVES TIME AND DELIVERS MAXIMUM CONSISTENCY

**IDEAL PRIME**

IDEAL PRIME

**Xtrimium**

MASTER ALL GEAR GRINDING CHALLENGES

**DDS CUT**

ACCURATE AND AGGRESSIVE DRESSING OF GRINDING WHEELS

YOUR SINGLE SOURCE FOR GLOBAL GRINDING INNOVATIONS

**NORTON**

SAINT-GOBAIN

**WINTER**



# DIAMOND PROFILE ROLLER DRESSERS FOR HIGH PRECISION DRESSING OF GRINDING WHEELS

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## PRODUCTION OF UZ PROFILE ROLLER DRESSERS

Rotating profile roller dressers, also known as rotary truers, have similar profile as the workpiece.

These dressing tools are particularly suitable for complex profiles in mass production.

The advantages of profile roller dressers are

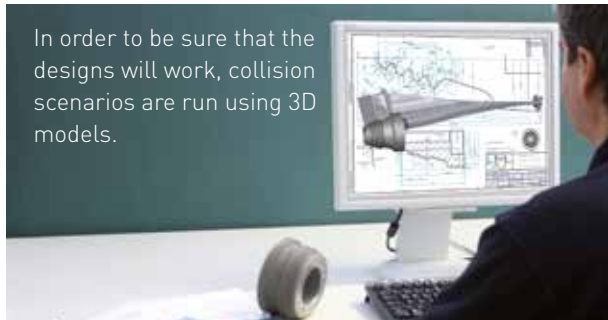
- Reduction of dressing costs per workpiece
- Optimized utilization of machine capacity
- Automation of the dressing process
- Repeatable high precision with low workpiece rejects
- Rapid incorporation of complex profiles in the grinding wheel



# PRODUCTION OF UZ PROFILEROLLER DRESSERS

## DESIGN: PRECISION FROM THE VERY START!

CAD drawings created in SOLID EDGE® are linked to the programs of the production and measuring machines.



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

## 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.



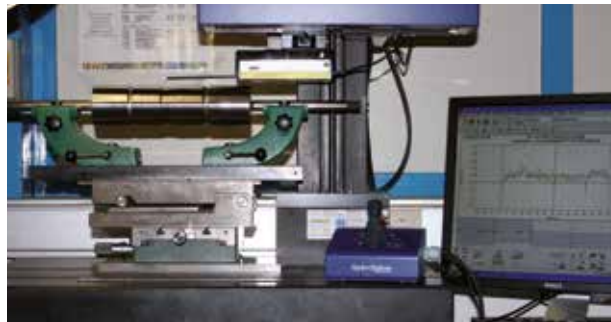
## THE DIAMONDS ARE SECURED TO THE RING IN A GALVANIC BATH.

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 special material. The form ring is turned off and the bore and contact surfaces are ground.



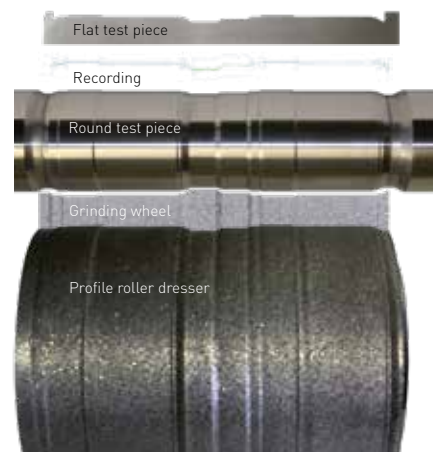
## CREATING THE TEST PIECE

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



## MEASURING THE PROFILE ACCURACY OF THE TEST PIECES

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



## MOUNTING THE PROFILE ROLLER DRESSER

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



## PRODUCTION OF UZ PROFILE ROLLER DRESSERS

# 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. Norton WINTER profile roller dressers are the means to high precision and rapid cycle times.



### MEDICAL TECHNOLOGY

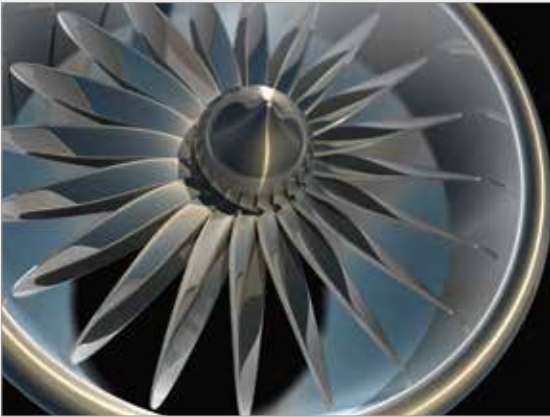
High precision grinding and dressing are taken as a matter of course in this industry. It is therefore obvious that Norton WINTER profile roller dressers are used here.

### AUTOMOTIVE & GEAR

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







## TURBINE INDUSTRY

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

## THE ROLLER BEARING INDUSTRY

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



## WIND FARMS

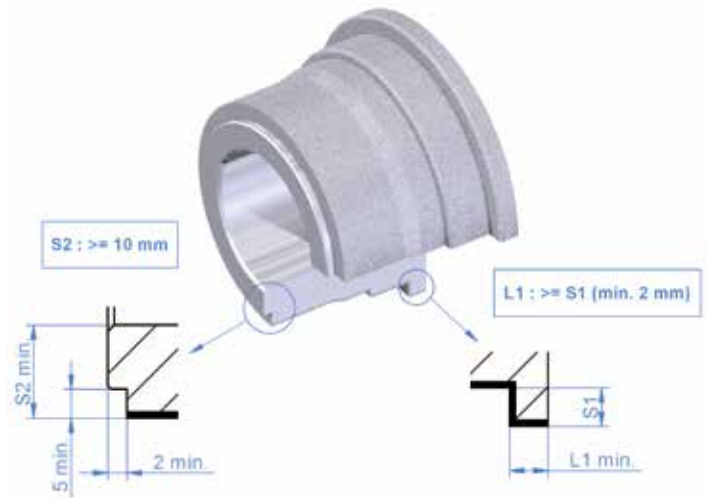
Renewable energy is the challenge of the times and will characterize future markets. Continuing demands for higher efficiency require high-quality tools and partners who go all the way into the future with you.

PRODUCTION OF UZ PROFILE ROLLER DRESSERS

# DIMENSIONS THAT CAN BE PRODUCED

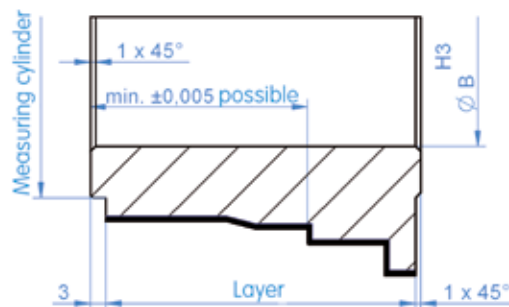
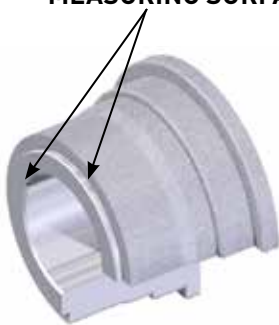
The dimensions and tolerances that can be obtained for different profiles are summarized on the next two pages. As a general rule, Norton WINTER diamond roller dressers have a 3 mm clocking ring on one face and a 1 mm integral spacer on the other face. The measuring cylinder allows the concentricity of the mounted diamond roller dresser to be checked, as it runs to within 0,002 mm concentric to the bore and diamond coating of the roller dresser. The working strip prevents a spacer ring or flange from coming into direct contact with the diamond coating. These features add 4 mm to the width of the diamond roller dresser.

### MINIMUM DEVIATIONS

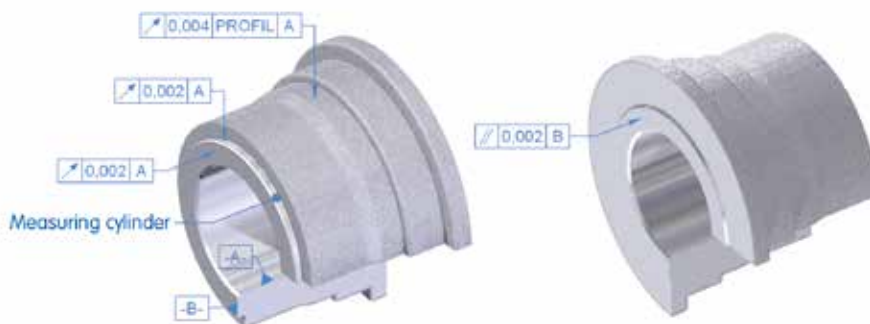


# STANDARD TOLERANCES

### MEASURING SURFACES



### RUNNING TOLERANCES



### INFO

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

### INSTALLATION DIMENSIONS OF A ROLLER DRESSER:




width over diamond coating = grinding wheel width +3 ~ +4 mm overall width of the roller dresser = diamond coating width +4 mm

### PLEASE NOTE:

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

Free size tolerances to DIN 7168 m

## TYPES **UZ, TS, SG**

TYPE	MANUFACTURE	BOND	GRIT DISTRIBUTION	GRIT DENSITY	
UZ	Reverse process	Electroplated	Statistical	Maximum	
TS	Reverse process	Infiltrated	Statistical/controlled	Maximum/controlled	
SG	Positive process	Electroplated	Statistical	Maximum	

### UZ VERSION

The diamond grit is statistically distributed over the surface of the profile roller dresser. The distance between the grits is determined by the grit size used. The dense coating of diamonds means that the diamond content is greater than in comparable profile roller dressers with manually applied diamonds. The manufacturing process is largely independent of the shape of the profile. Concave radii  $\geq 0,03$  mm and convex radii  $\geq 0,08$  mm are possible.

For use in applications with the most stringent surface and geometry requirements since this type can achieve profile accuracy of  $\geq 0,8$   $\mu\text{m}$ .

### 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  $\geq 0,3$  mm are possible.

The diamond coating can be re-machined, depending on its condition.

For use in applications with very stringent surface and geometry requirements; profile accuracy of  $\geq 2$   $\mu\text{m}$  can be achieved.

### SG VERSION

The diamond grit is statistically distributed. Convex and concave radii  $\geq 0,5$  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

## TYPES UZ, TS, SG

# THE EFFECT ON THE GRINDING BEHAVIOUR

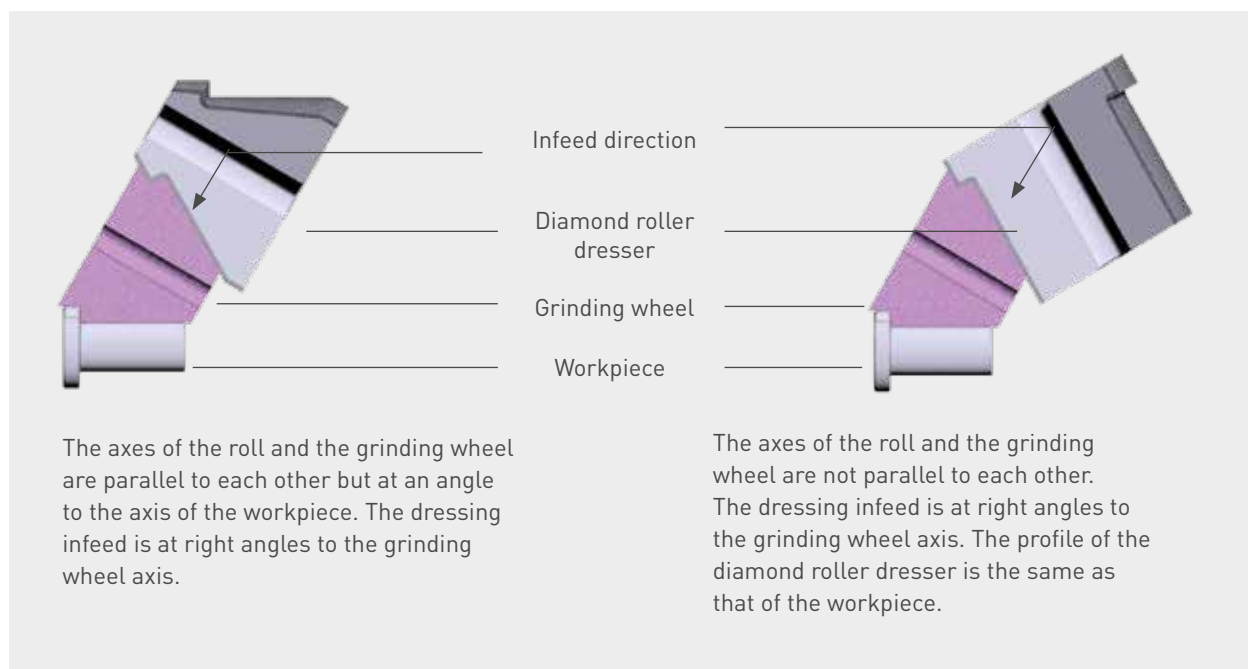
### THE ROLLER DRESSER – GRINDING WHEEL – WORKPIECE ARRANGEMENT

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 exposure of the diamond grits.

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

## MACHINING CONDITIONS

### DRIVE CAPACITY OF THE DRESSING SPINDLE

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

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

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

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

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

### MACHINE MOUNTING

The static and dynamic rigidity of the dressing system has a crucial influence on the dressing performance. The greatest system rigidity is achieved by installing bearings on both sides of the roller dresser. The high normal forces that occur with profile roller dressers require the roller dresser to have bearings on both sides.

In order to counteract the build-up of circumferential waviness on the grinding wheel during dressing, the dressing unit must possess radial rigidity. When dressing with continuous-path controlled diamond dressing wheels, the normal forces are considerably lower. In this case bearings on one side only (flying bearings) can be considered.

### RUNNING TRUTH AND VIBRATION

Special attention must be given to the geometric runout of the roller dresser and its balance quality. The tolerances for high precision profiles of 0,002 mm must be observed; so the radial and axial run-out of the diamond roller dresser spindle must not exceed 0,002 mm. Because of the rigidity requirements, the largest possible arbor diameter should be selected provided that it is still in proportion to the outer diameter. Bore diameters of Ø 40 to 80 mm are usual in the case of diamond roller dressers.

The required combination of tolerances between the roller dresser bore and the arbor is H3/h2. A fitting allowance of 0,003 to 0,005 mm enables the diamond roller dressers to be mounted and prevents running deviations in the diamond coating.

The most frequent sources of vibration during dressing are rotating imbalances. An important requirement, therefore, is precise balancing of the roller dresser and arbor. The natural frequencies of the dressing system should also be known. Knowing these, it is possible to select the dressing parameters so that the rotation frequencies of the dressing spindle and grinding wheel do not coincide with resonance points in the dressing unit or the overall system.

### COOLING

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

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



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

Optimally designed coolant nozzle grants controlled coolant jet

## CONTACT DETECTION

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

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

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

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

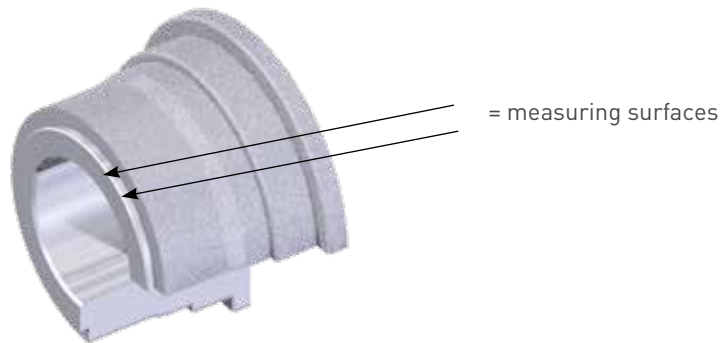
## ASSEMBLY AND REMOVAL OF ROLLER DRESSERS

# ASSEMBLY AND REMOVAL OF ROLLER DRESSERS

1. Norton 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. 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.
7. 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.

# TROUBLESHOOTING

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

## TROUBLESHOOTING

# CHECKLIST

### FOR PROFILE ROLLER DRESSERS

<b>CUSTOMER:</b>	
<b>CUSTOMER NO.:</b>	
<b>MACHINE:</b>	Machine type:
	Current dressing tool:
<b>DRESSING UNIT:</b>	Arbor diameter (mm):
	Arbor length (mm):
<b>WORKPIECE:</b>	Workpiece drawing:
	Surface finish desired:
	Grinding allowance (mm / Ø):
<b>GRINDING WHEEL:</b>	Specification:
	Dimensions
<b>DIAMOND ROLLER DRESSER:</b>	Greatest diameter allowed by the machine:
	Greatest width allowed by the machine:
<b>PARAMETERS:</b>	Grinding wheel circumferential speed (m/s) or speed (rpm)
	Circumferential speed of roller (m/s) or speed (rpm):
	Counter-directional or Uni-directional at point of contact:
	Radial infeed per dressing pass ( $a_{ed}$ ):
	Angular/straight plunge grinding:
	Spark-out time/revolutions:

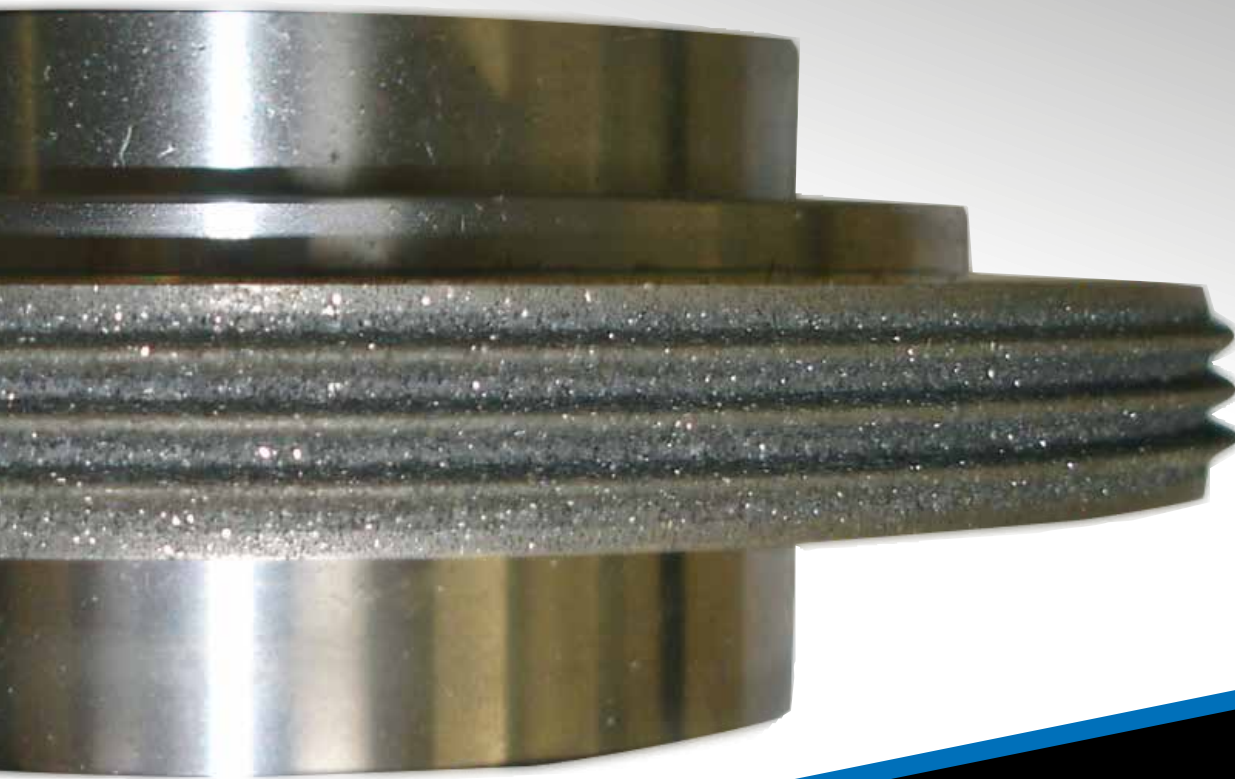


**NORTON**

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**WINTER**

DRESSING TOOLS



# DRESSING TOOLS FOR THE MACHINING OF GEAR TEETH

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## DRESSING TOOLS

High precision dressing tools are essential for accurate profiling and sharpening of grinding worms, profile grinding wheels and bevel grinding wheels. They determine the quality of the finished gears.

Norton WINTER rotary diamond dressing tools for gear generation 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
- Dressers for profile grinding
- Dressers for bevel grinding

# 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)

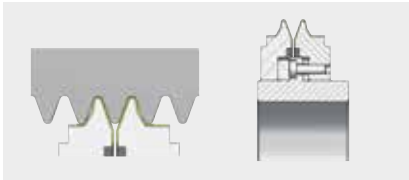
- A very good tool design where tooth root machining is required
- For small modules ( $< 1,5$ ) we recommend the use of reverse electroplated profile roller dressers
- For larger modules ( $> 1,5$ ) we recommend the use of positive electroplated profile roller dressers
- Both these dressing tools can 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

## CONTINUOUS GENERATING GRINDING



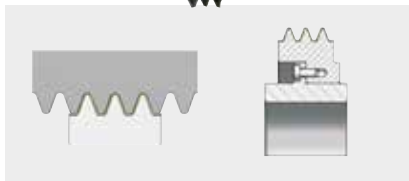
## ROLLER DRESSER SETS FOR SINGLE-PASS DRESSING (HP)

- 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
- 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



## BEVEL GRINDING



NORTON WINTER brand, 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 and we can provide the dressers assembled to new adapters, or assemble to used adapters.

We also provide the relaping service, please contact us for further information.

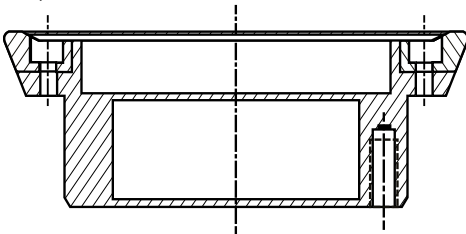
With grinding cups and the corresponding rotary dressing tools, Saint-Gobain offers a comprehensive grinding process solution:

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

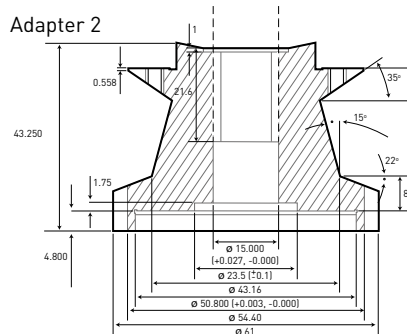
## BEVEL

DESIGN CODE	D	RADIUS	CLEARANCE ANGLE	H	ADAPTER	GRIT	ORDER NUMBER
V9TS71P	71,93	2,54	10°	50,8	2	CVD	66260187301
V2TS71P	75	1,0	3°	40	1	CVD	66260122721
V2TS71P	75	1,0	5°	40	1	CVD	66260142906
V3TS71P	100	0,95	5°	40	-	CVD	66260162228
TS71P	143,51	2,54	6°	50,8	2	Diamond	7958796008

Adapter 1



Adapter 2

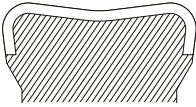
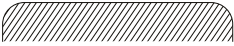
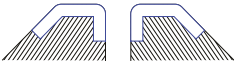


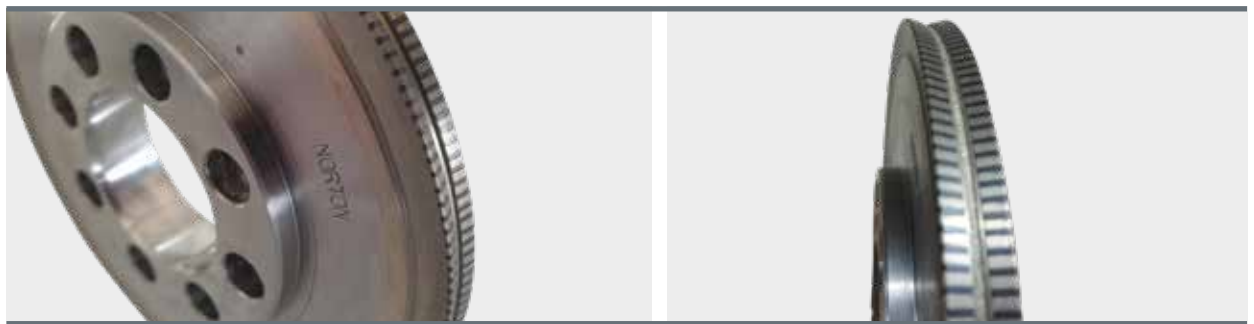
# PROFILE GRINDING



Profile grinding forms the exact shape of the gear teeth. The wheel runs between two opposing teeth to grind both surfaces at the same time. This is known as discontinuous grinding and is used on large contact areas.

## DRESSER FOR PROFILE GRINDING

	DESIGN CODE	D	RADIUS	CLEARANCE ANGLE	H	WIDTH	GRIT	ORDER NUMBER	COMMENT
<b>TYPE 1</b>									
	V5TS71P	160	1,0	5°	52	36	CVD	66260166015	-
<b>TS30N</b>									
	V1TS71P	160	1,6	-	12	12	Grit	66260177391	-
	V1TS71P	186	0,5	-	80	25	CVD	66260180326	-
<b>TYPE 2</b>									
	V1TS71S	120	1,5	5°	35	26 (Dt) 47	Grit	66260166017	Set of 2 dressers
	V1TS71P	230	0,8	2°	175	10 (Dt) 22	Grit	66260189586	Single dresser



# 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
- Norton WINTER electroplated or vitrified bonded diamond/cBN grinding wheels
- Norton WINTER diamond dressing tools.



# CHECKLIST

## FOR THE MANUFACTURE OF A NEW DRESSING TOOL FOR GRINDING WORMS

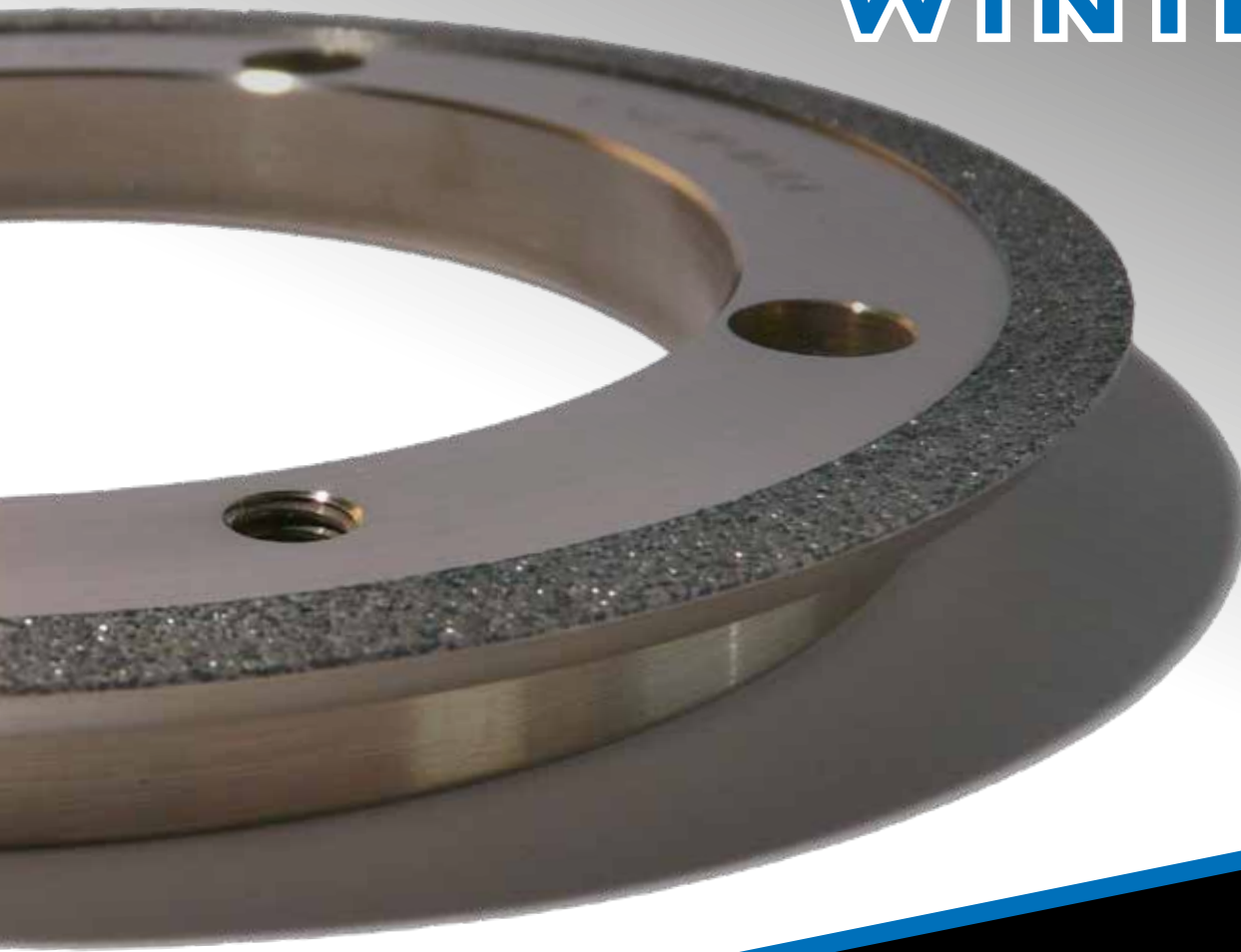
<b>CUSTOMER / CUSTOMER NO.:</b>	
<b>MACHINE / DRESSER:</b>	
<b>DESIGN DATA:</b>	<input type="checkbox"/> Workpiece drawing/diagrams with tolerances and flank assignment shown – by post or email (.dxf, .dwg, .pdf or .tif format)
	<input type="checkbox"/> Diagram of flank lines and profile modifications with all data and tolerances for traction flank and thrust flank
	<input type="checkbox"/> Traction flank and thrust flank assignment on the tool specified where profile modification differs on each flank
	Profile crowning $C_h =$
	Profile angle deviation $fH_o =$
	Tip relief $C_a =$
	Tip relief start diameter $d_{ca} =$
	Crowning $C_b =$
	Tooth trace angle deviation $fH_\beta =$
	<input type="checkbox"/> Tooth root is ground
	Tool tip radius $roh_{fp} =$
	and/or Fillet radius $r_f =$
	<input type="checkbox"/> Tool tip height $h_{ap} =$
	<input type="checkbox"/> Drawing requested for approval
	<b>GEAR DATA:</b>
Number of teeth $z =$	
Pressure angle $\alpha_n =$	
Helix angle and direction $\beta =$	
Tip diameter $d_a =$	
Root diameter $d_f =$	
Usable tip circle diameter $d_{Na} =$	
Usable root circle diameter $d_{Nf} =$	
Surface quality required $R_a/R_z =$	
Diametric two-ball/two-roller measurement $M_{dk}/M_{dr} =$	
Measuring ball $\emptyset$ and/or measuring roller $D_M =$	
or Base tangent length $W_k =$	
Number of measuring teeth $k =$	
or Normal tooth thickness $S_n =$	
<b>CORRECTION UNDERTAKEN ON THE MACHINE:</b>	
	Module $m =$
<b>GRINDING WORM:</b>	Dimensions <input type="checkbox"/> ` Right-hand
	Number of threads <input type="checkbox"/> ` Left-hand
	Specification used at the time



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CNC DRESSING  
DISCS

# CNC DRESSING DISCS

<b>MANUFACTURING PROCESS</b>	35	<b>SD DRESSING DISCS</b>	43
Types of rotary CNC dressing discs	35	<b>DDS DRESSING DISCS</b>	44
<b>SG DRESSING DISCS</b>	36	General	44
General	36	DDS dressing discs held as reference	45
Examples of SG dressers for quick reference	37	Advantages of CNC dressing of diamond grinding wheels with DDS dressing discs	47
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Range of TS dressers for quick referencing	40		
<b>PCD/CVD/MCD DRESSING DISCS</b>	41		
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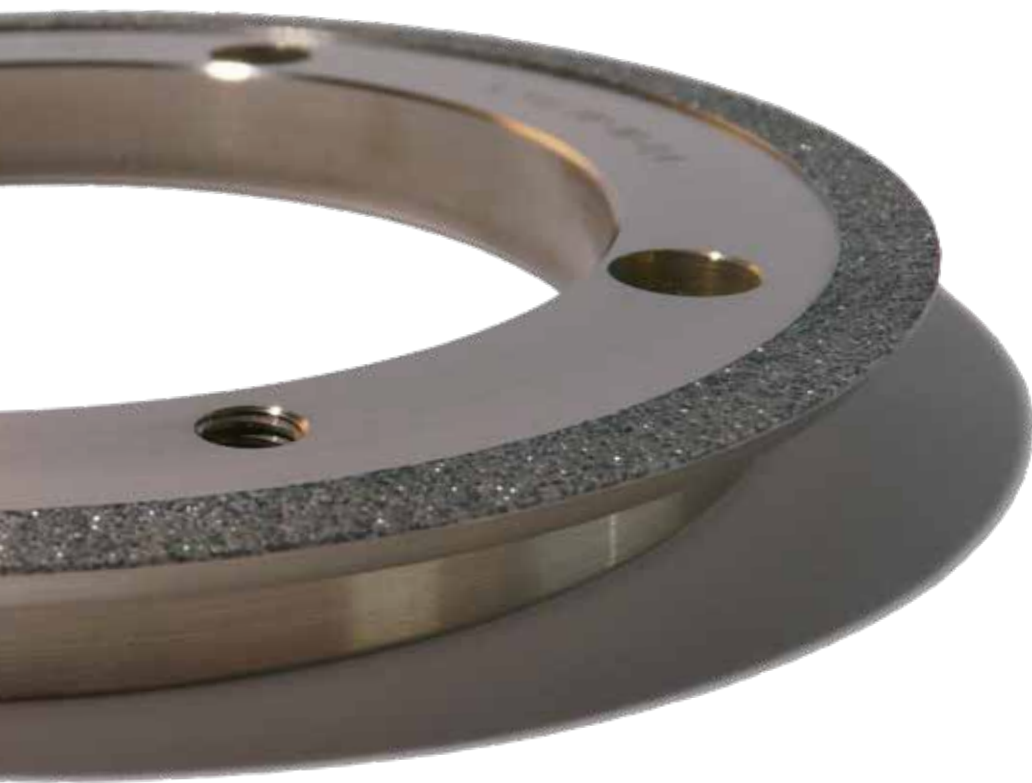
## CNC DRESSING DISCS

Contour controlled dressing tools enable complex grinding wheel profiles to be dressed as well as simple cylindrical grinding wheels of differing widths.

In addition it is possible, by specifying the dressing tool and selecting the individual dressing parameters, to influence the dressing result and thereby the quality of the workpiece.

The advantages of contour controlled dressing discs are

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



# MANUFACTURING PROCESS

## TYPES OF ROTARY CNC DRESSING DISCS

	TYPE	MANUFACTURE	BOND	GRIT DISTRIBUTION	GRIT DENSITY
	SG	Positive process	Electroplated	Statistical	Maximum
	TS	Reverse process	Infiltrated	Controlled or statistical	Controlled or maximum
	PCD/CVD/MCD	Reverse process	Infiltrated	Controlled	Controlled
	SD	Positive process	Sintered	Statistical	Controlled
	DDS DDSplus DDScut	Positive process	Sintered	Controlled	Controlled

# SG DRESSING DISCS

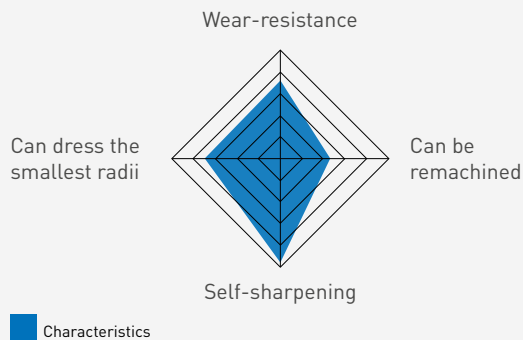
## GENERAL

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.

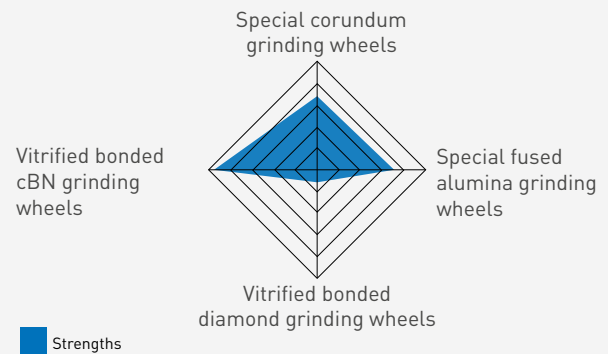
## APPLICATIONS:

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

### DRESSING DISC CHARACTERISTICS



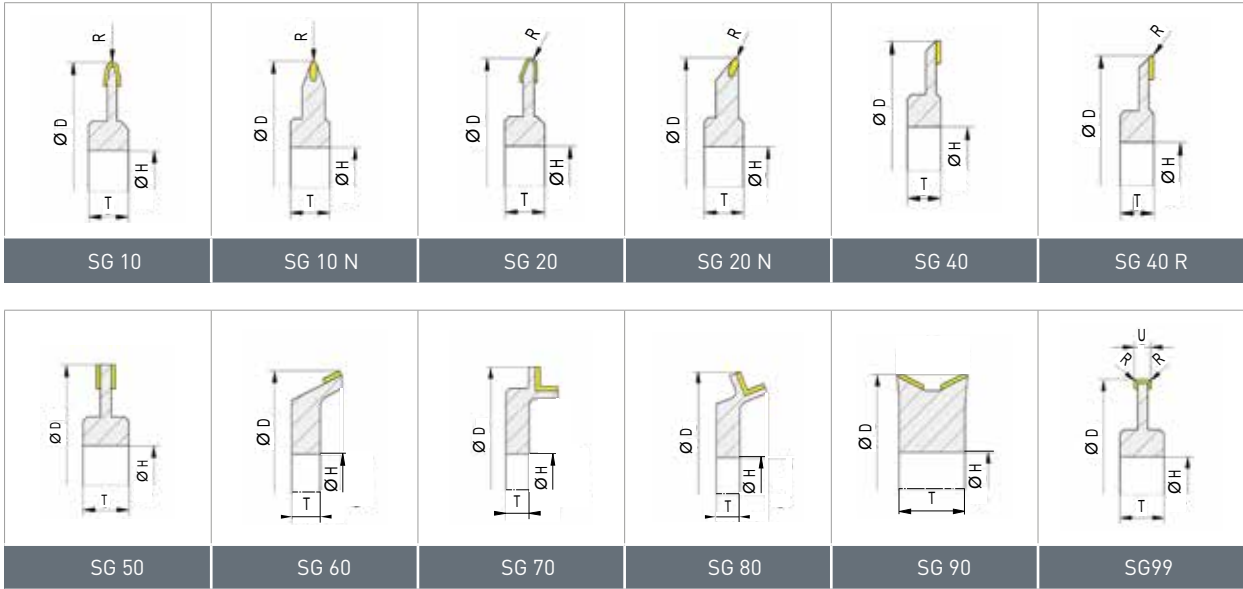
### RECOMMENDED USE



## 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:



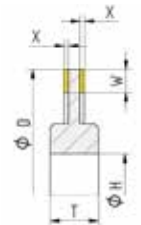
SG DRESSING DISCS

SG 40



DESIGN CODE	D	X	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
300SG71P	100	0,6	5	12	40	H3	D602	Steel	60157697961	
<b>MACHINE:</b> e.g. Studer <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
SG71P	110	0,8	5	10,85	75	H3	D852	Bronze	66260129200	-
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
306SG71P	120	0,4	5	19	52	H3	D426	Steel	66260347760	Case-hardened bore
<b>MACHINE:</b> e.g. Landis <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
1SG71P	140	0,6	5	12	50	H3	D602	Bronze	66260334649	-
<b>MACHINE:</b> e.g. Schaudt <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
302SG71P	140	0,6	5	12	50	H3	D602	Steel	69014159716	Hardened body
<b>MACHINE:</b> e.g. Schaudt <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
303SG71P	150	0,4	5	19	52	H3	D426	Steel	66260355740 <sup>1)</sup>	Case-hardened bore
<b>MACHINE:</b> e.g. Landis <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

SG 50

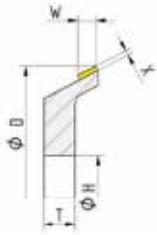


DESIGN CODE	D	2.X	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
4SG71P	120	1	5	19	52	H3	D501	Steel	66260132792	-
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
SG71P	150	1,2	10	50	56	H3	D602	Steel	66260132775	Case-hardened bore
<b>MACHINE:</b> e.g. Naxos <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

# CNC DRESSING DISCS

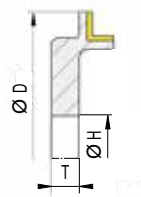
CNC DRESSING DISCS

## SG 60



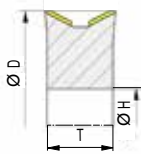
DESIGN CODE	D	X	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
SG71P	110,8	0,8	8	10	75	H3	D852	Steel	66260127188	Case-hardened bore
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
300SG71P	110	0,8	5	26	75	H3	D852	Bronze	66260166361	-
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

## SG 70



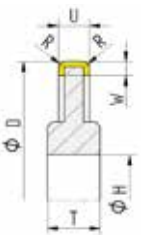
DESIGN CODE	D	X	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
300SG71P	195	1,0	5	8	75	H3	D1001	Bronze	66260179693	-
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

## SG 90



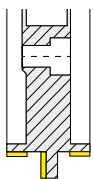
DESIGN CODE	D	X	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
300SG71P	235	0,6	7	25	112	H3	D602	Steel	66260192488	-
<b>MACHINE:</b> e.g. Danobat <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

## SG 99



DESIGN CODE	D	U	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
SG71P	173	3	3	16	50	H3	D602	Steel	66260131884	R = 0,3 / $\nabla 3^{\circ}$ *
<b>MACHINE:</b> e.g. Schaudt <b>APPLICATION:</b> Dressing conventional grinding wheels										
* This refers to the conicity of the outer diameter										

## SG 100



DESIGN CODE	D	X	W	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
300SG71P	120	0,8	5	13	40	H3	D852	Steel	66260203069	-
<b>MACHINE:</b> e.g. Danobat <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										
300SG71P	180	1,0	5*	8	75	H3	D1001	Bronze	66260180442	-
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

All dimensions in mm

Delivery time approx. 8 weeks

<sup>1)</sup> Available ex stock

## TS DRESSING DISCS

### GENERAL

Infiltrated dressing discs are characterized by high wear resistance and consist of a single-layer diamond coating.

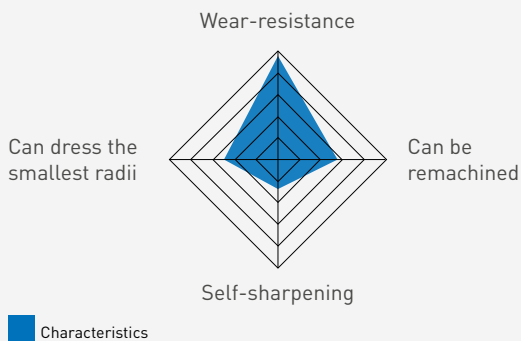
Edge reinforcements can be used to increase the wear resistance.

### APPLICATIONS:

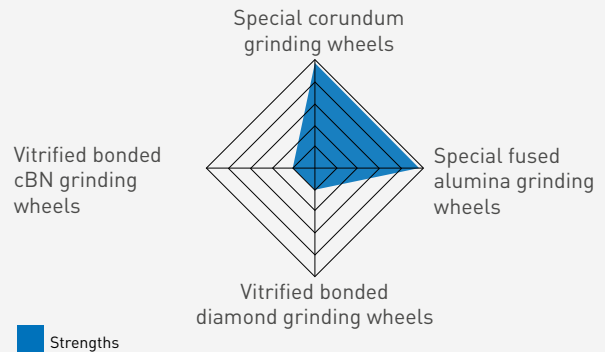
- Dressing all conventional grinding wheels



### DRESSING DISC CHARACTERISTICS



### RECOMMENDED USE

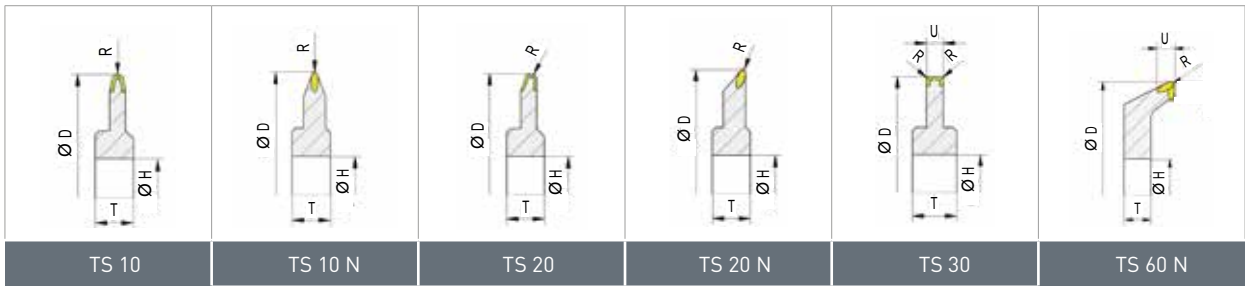


### ADVANTAGES:

- 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

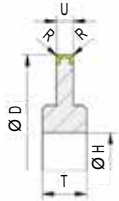
## TS DRESSING DISCS

### SOME OF OUR DESIGNS:



## TS DRESSING DISCS

### TS 30



DESIGN CODE	D	U	X	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
TS71Z	65	8	0,8	8	43	H3	D852	Steel	66260382820	Cylindrical statistical
<b>MACHINE:</b> e.g. Giustina <b>APPLICATION:</b> Dressing conventional grinding wheels										
2TS71P	85	10	0,8	13	15	H3	D1001	Steel	66260381629	Cylindrical statistical chamfer 1x20°
<b>MACHINE:</b> e.g. Junker <b>APPLICATION:</b> Dressing of conventional and vitrified bonded cBN grinding wheels										

All dimensions in mm

Delivery time approx. 8 weeks





# PCD/CVD/MCD DRESSING DISCS

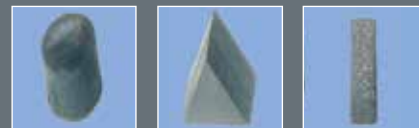
## GENERAL

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

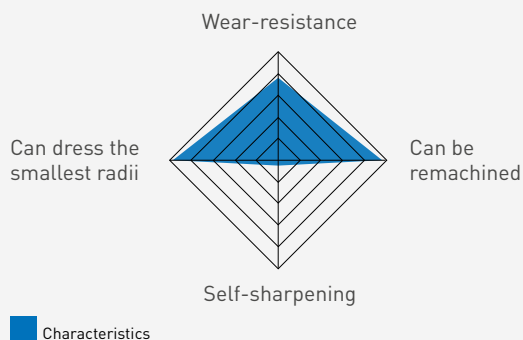
The design enables the dressing discs to be reworked a number of times.

## APPLICATIONS:

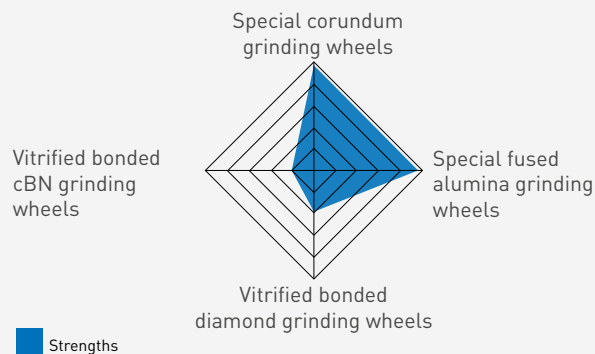
- PCD for dressing grinding wheels with special fused alumina
- CVD or MCD for dressing grinding wheels with sintered corundum (TG/SG/XG etc.)



## DRESSING DISC CHARACTERISTICS



## RECOMMENDED USE

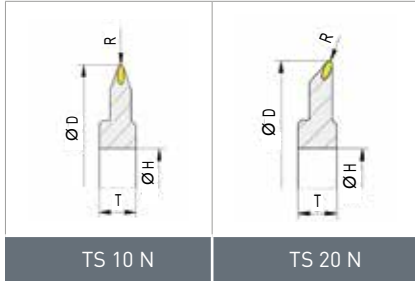


## ADVANTAGES:

- 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

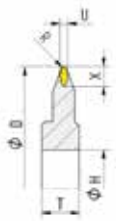
# PCD/CVD/MCD DRESSING DISCS

## SOME OF OUR DESIGNS:



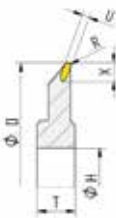
## CVD DRESSING DISCS

### TS 10 N



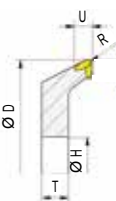
DESIGN CODE	D	U	X	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
YTS71P	100	0,71	1,5	12	40	H3	CVD	Steel	60157698362	R = 0,10 ±40°
<b>MACHINE:</b> e.g. Studer <b>APPLICATION:</b> Dressing conventional grinding wheels										
V3TS71P	150	0,71	1,5	16	52	H3	CVD	Steel	66260189171	R = 0,40 ±26°
<b>MACHINE:</b> e.g. Schaudt Mikrosa <b>APPLICATION:</b> Dressing conventional grinding wheels										

### TS 20 N



DESIGN CODE	D	U	X	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
YTS71P	100	0,67	1,5	12	40	H3	CVD	Steel	60157698367 <sup>1)</sup>	R = 0,25 ±40°
YTS71P	100	1,07	1,5	12	40	H3	CVD	Steel	60157698368	R = 0,50 ±40°
YTS71P	120	0,67	1,5	12	40	H3	CVD	Steel	60157698370	R = 0,25 ±40°
YTS71P	120	1,07	1,5	12	40	H3	CVD	Steel	60157698369	R = 0,50 ±40°
<b>MACHINE:</b> e.g. Studer <b>APPLICATION:</b> Dressing conventional grinding wheels										

### TS 60 N



DESIGN CODE	D	U	X	T	H	BORE TOLERANCE	GRIT SIZE	BODY	ORDER NUMBER	COMMENT
V4TS71P	160	0,67	1,5	10	52	H3	CVD	Steel	66260174551	R = 0,40 ±60° (for example Danobat)
<b>MACHINE:</b> e.g. Danobat <b>APPLICATION:</b> Dressing conventional grinding wheels										

All dimensions in mm  
<sup>1)</sup> Available ex stock

# SD DRESSING DISCS

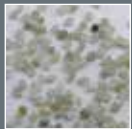
## GENERAL

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

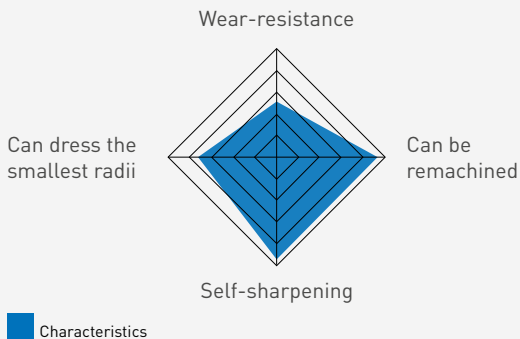
These dressing discs are highly suitable for centreless cylindrical process applications with very fine surface requirements and for pre-profiling operation like worm grinding with the advantage that we can adjust the pressure angle and tip width for more flexibility

## APPLICATIONS:

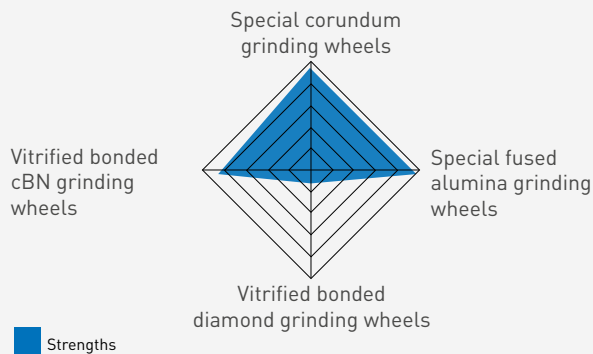
- Dressing vitrified bonded cBN grinding wheels
- Dressing all conventional grinding wheels



### DRESSING DISC CHARACTERISTICS



### RECOMMENDED USE

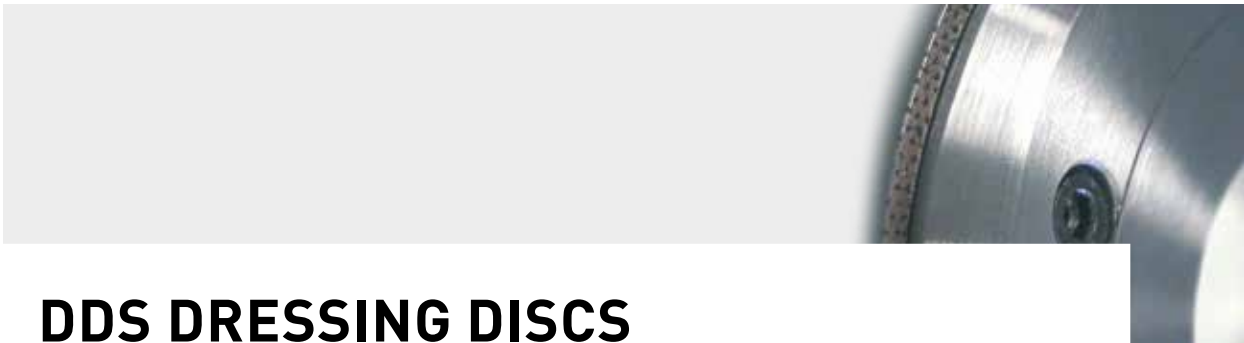


## ADVANTAGES:

- 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 mme

## SOME OF OUR DESIGNS:





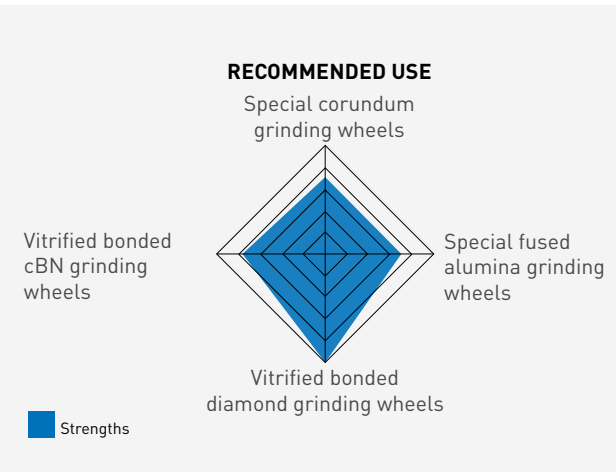
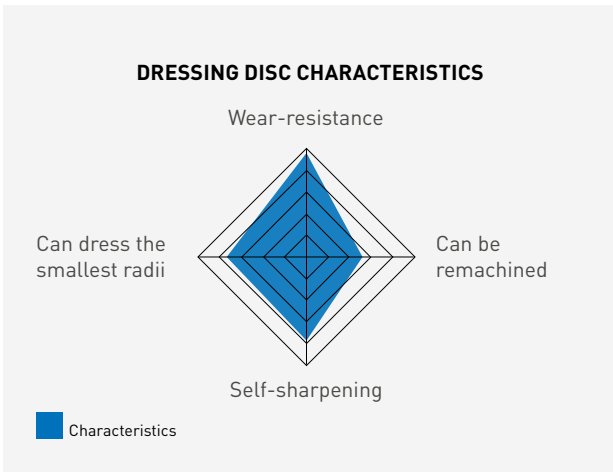
# DDS DRESSING DISCS

## GENERAL

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

## APPLICATIONS:

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

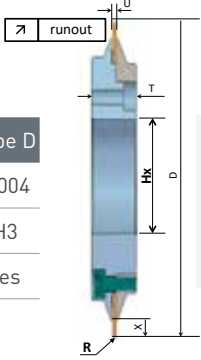


## ADVANTAGES:

- Controlled concentration of diamonds
- Extremely high accuracy as the diamond layer is ground
- Free standing diamond layer, so dressing of concave and convex profiles is possible
- Constant layer width
- Dressing of vitrified bonded diamond grinding wheels
- Diameters from 90 mm – 225 mm
- Layer widths from 0,8 mm – 1,2 mm
- Radii depending on layer width 0,4 mm – 0,6 mm

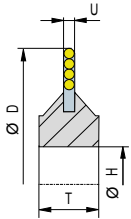
## VERSIONS OF STANDARD SHAPES

	Type A	Type B	Type C	Type D
OD runout	0,01	0,01	0,01	0,004
Bore tolerance	H5	H5	H3	H3
Radius	No	Yes	No	Yes



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



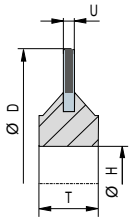


DESIGN CODE	D	U	T	H	BORE TOLERANCE	GRIT SIZE	TYPE	ORDER NUMBER	COMMENT
2DS71P	80	1	15	40	H5	D1001	A	7958752894	-
11DS71P	100	1	12	40	H3	D1001	C	7958709949	-
301DS71P	110	1	15	40	H5	D1001	B	66260152509	R 0,5
300DS71P	120	1	15	40	H5	D1001	B	69014194133 <sup>1)</sup>	R 0,5
10DS71P	150	1	15	52	H5	D1001	B	66260155154	R 0,5
300DS71P	225	1,4	24	72	H5	D14-16	B	7958790339	R 0,7

**MACHINE:** Various **APPLICATION:** Dressing conventional grinding wheels and vitrified bonded diamond and cBN grinding wheels

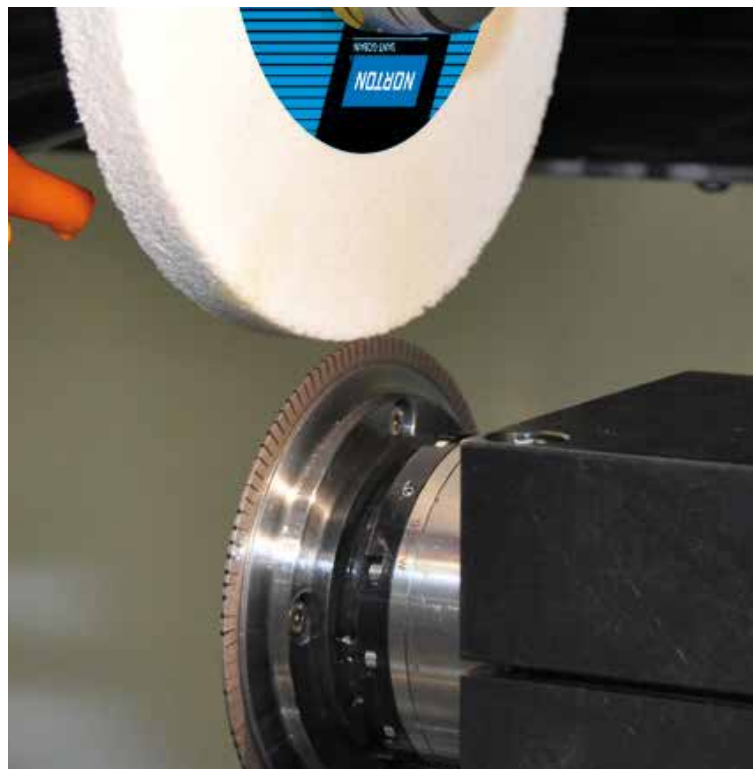


DDS Plus is a perfect combination of accurately positioned CVD logs and a metal bond providing a self-sharpening effect for dressing bonded wheels made of sintered grains.



DESIGN CODE	D	U	T	H	BORE TOLERANCE	GRIT SIZE	TYPE	ORDER NUMBER	COMMENT
301DS71P	90	1,5	12	15	H3	CVD	D	66260211729	R 0,75
300DS71P	100	1	15	40	H5	CVD	A	66260176572	
300DS71P	120	1	15	40	H5	CVD	A	7958785591	
300DS71P	120	2,2	12	52	H5	CVD	A	66260135562	with 5 cuts
301DS71P	152	1	15	52	H5	CVD	A	66260187366	

**MACHINE:** Various **APPLICATION:** Dressing conventional grinding wheels and special operations using cBN vitrified bonded wheels

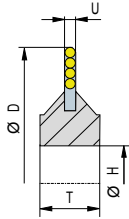


## PCD/CVD/MCD DRESSING DISCS



DDS Cut is a continued development of the original DDS, specifically for dressing diamond or cBN grinding wheels with a vitrified or resin bond. Thanks to its radial cuts on the diamond layer, DDS Cut provides more aggressive behaviour, generating a rougher surface on the grinding wheel, reducing the grinding forces and chances of burns on the work piece.

DESIGN CODE	D	U	T	H	BORE TOLERANCE	GRIT SIZE	TYPE	ORDER NUMBER	COMMENT
15DS71P	100	1	12	40	H5	D1001	A	66260167339	
35DS71P	120	1	15	40	H5	D1001	B	7958755643	R 0,5
5DS71P	120	1,2	15	52	H5	D1181	A	7958757479	
301DS71P	140	1,1	12,5	75	H3	D1181	D	66260211283	R 1,0
304DS71P	150	1	15	52	H3	D1001	C	66260171958	
300DS71P	170	1,2	12	75	H3	D1181	C	66260126091	
4DS71P	225	1,2	12	127	H3	D1181	C	66260149375	

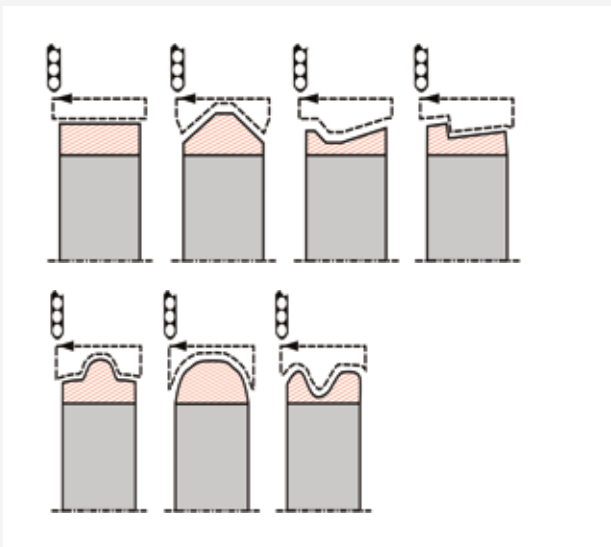


**MACHINE:** Various **APPLICATION:** Dressing conventional grinding wheels and vitrified bonded diamond and cBN grinding wheels



### PROFILE EXAMPLES

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



# ADVANTAGES OF CNC DRESSING OF DIAMOND GRINDING WHEELS WITH DDS DRESSING DISCS

## Precision dressing on the production machine

- Improved profile accuracy
- Very simple to automate
- Dressing at grinding speeds

## No need to remove the grinding wheel

- Reduced down times
- High-precision axial and radial running truth of the grinding wheel
- Improved workpiece quality

## Reproducible grinding wheel topography, improved process control

## SAMPLE APPLICATIONS

### PEEL GRINDING

MACHINE PARAMETERS	
MACHINE	STUDER S32 cylindrical grinding machine
COOLANT	Emulsion
WORKPIECE	Carbide K10
GRINDING PARAMETERS	
GRINDING WHEEL	1VG 3A1-500-5-4,5 D126 V+ 2046 J1SC C150 E
CUTTING SPEED	$v_c = 75 \text{ m/s}$
AXIAL FEED	$v_{fa} = 40 \text{ mm/min}$
INFEED	$a_e = 0,2 \text{ mm}$
DRESSING PARAMETERS	
DRESSING TOOL	Norton 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

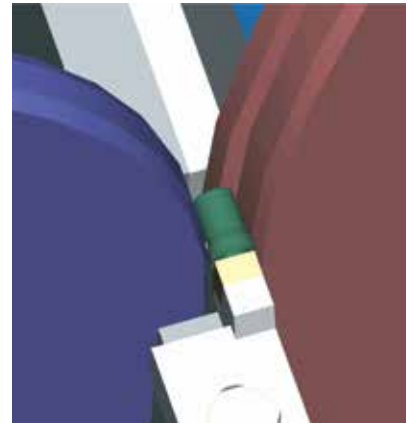
MACHINE PARAMETERS	
MACHINE	SCHÜTTE WU 305 tool grinding machine
COOLANT	Sintogrind fluid (Oelheld)
WORKPIECE	Bio-ceramics
GRINDING PARAMETERS	
GRINDING WHEEL	99VG 700-15 / D64 D64 V+ 2046 J1SC C150
CUTTING SPEED	$v_c = 60 \text{ m/s}$
TRANSVERSE INFEED	$a_e = 0,2 \text{ mm}$
ALLOWANCE	$a_{e \text{ tot}} = 1 \text{ mm}$
DRESSING PARAMETERS	
DRESSING TOOL	Norton 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	$R_z \leq 3 \mu\text{m}$



## SAMPLE APPLICATIONS WITH DDS DRESSING DISCS

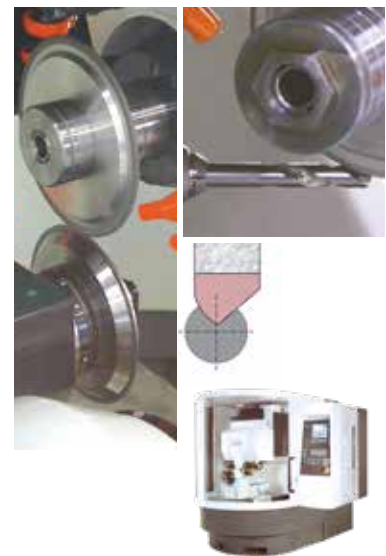
### CENTRELESS GRINDING

MACHINE PARAMETERS	
MACHINE	SCHAUDT MIKROSA KRONOS S cylindrical grinding machine
COOLANT	Emulsion
WORKPIECE	Si <sub>3</sub> N <sub>4</sub>
GRINDING PARAMETERS	
GRINDING WHEEL	VG 3A1-400-15
	D46 V+ 2046 J1SC C100
CUTTING SPEED	$v_c = 120$ m/s
ALLOWANCE:	$a_{e\text{ tot}} = 0,7$ mm
DRESSING PARAMETERS	
DRESSING TOOL	Norton WINTER DDS dressing disc
DRESSING CUT	$a_{ed} = 3$ μm
CUTTING SPEED	$v_{cd} = 40$ m/s
SPEED RATIO	$q_d = 0,4$
RESULTS	
SURFACE ROUGHNESS	$R_z = 2,02$ μm
DIAMETER TOLERANCE	$D \pm 2$ μm
	No measurable wear after 400 workpieces



### DRILL FLUTE GRINDING

MACHINE PARAMETERS	
MACHINE	WALTER Helitronic Power
COOLANT	Sintogrand fluid (Oelheld)
WORKPIECE	Carbide K10
GRINDING PARAMETERS	
GRINDING WHEEL	99VG 700-125-10
	D76 V+ 3438 J1SC C100
CUTTING SPEED	$v_c = 18-44$ m/s
FEED	$v_f = \text{up to } 200$ mm/min
ALLOWANCE	$a_e = 3,5$ mm
MATERIAL REMOVAL RATE	$Q'_{w\text{ max}} = 8,75$ mm <sup>3</sup> /(mm · s)
DRESSING PARAMETERS	
DRESSING TOOL	Norton WINTER DDS dressing disc
DRESSING CUT	$a_{ed} = 3$ μm
CUTTING SPEED	$v_{cd} = 18$ m/s
SPEED RATIO	$q_d = 0,7$
OVERLAP RATIO	$U_d = 3$
RESULTS	
	Markedly improved surface roughness and chipping compared with resin-bonded diamond grinding wheels





**EXTERNAL CYLINDRICAL PLUNGE GRINDING**

MACHINE PARAMETERS	
MACHINE	STUDER S32 CNC cylindrical grinding machine
COOLANT	Emulsion
WORKPIECE	Carbide K10
GRINDING PARAMETERS	
GRINDING WHEEL	99VG 700-400-5
	D91 V+ 2046 J1SC C125 E
CUTTING SPEED	$v_c = 40$ m/s
FEED	$v_{fr} = 4$ mm/min
ALLOWANCE	$a_e = 3,5$ mm, radial
DRESSING PARAMETERS	
DRESSING TOOL	Norton WINTER DDS dressing disc
DRESSING CUT	$a_{ed} = 3$ $\mu$ m
SPEED RATIO	$q_d = 0,7$
OVERLAP RATIO	$U_d = 7$
RESULT	
Good profile accuracy, very good dimensional accuracy and low roughness values	



CNC DRESSING DISCS

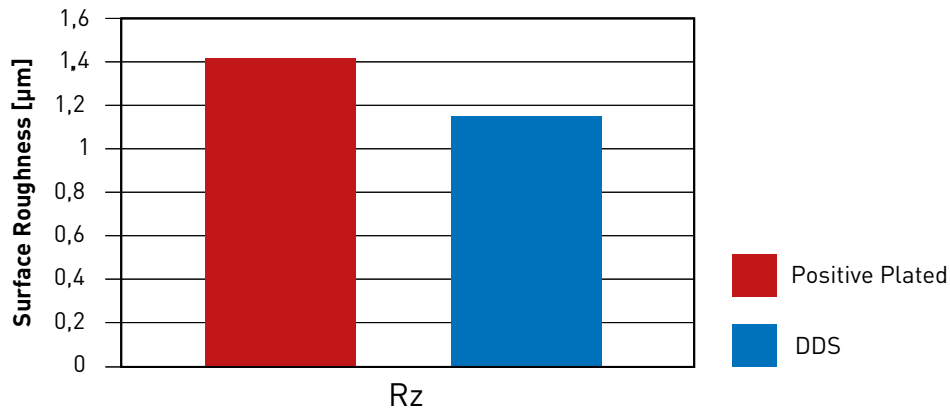
**SURFACE PROFILE GRINDING**

MACHINE PARAMETERS	
MACHINE	BLOHM MT 408 surface grinding machine
COOLANT	Rotorol (Oelheld)
WORKPIECE	SiC
GRINDING PARAMETERS	
GRINDING WHEEL	99VG 700-400-15
	D46 V+ 2046 J1SC C100
CUTTING SPEED	$v_c = 45$ m/s
ALLOWANCE	$a_e = 0,3$ mm
DRESSING PARAMETERS	
DRESSING TOOL	Norton WINTER DDS dressing disc
CUTTING SPEED	$v_{cd} = 35$ m/s
DRESSING CUT	$a_{ed} = 2$ $\mu$ m
SPEED RATIO	$q_d = 0,4$
OVERLAP RATIO	$U_d = 2$
RESULTS	
Good profile accuracy, very good dimensional accuracy and low roughness values	



## CASE STUDIES OF DDS DRESSING DISCS

### DDS-ROLLER DRESSER <-> POSITIVE PLATED ROLLER DRESSER



### BASIC DATA

MACHINE:	SCHAUDT MIKROSA KRONOS S cylindrical grinding machine
MATERIAL:	Emulsion
GRINDING WHEEL SPEC:	V+ 2646Ø 400 mm, D64 C100 (diamond vitrified wheel) Norton WINTER DDS Ø 120 mm, D 1181 µm

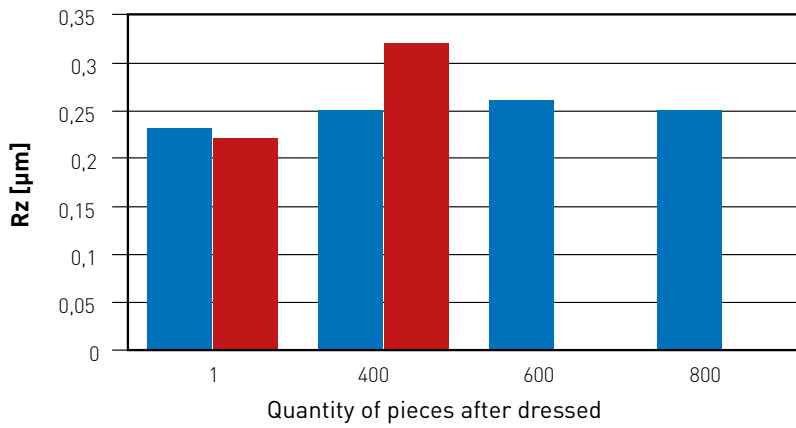
### GRINDING PARAMETERS

STOCK REMOVAL:	0,5 mm
INFEEED:	$v_f = 0,4$ mm/min
GRINDING SPEED:	$v_c = 70$ m/s

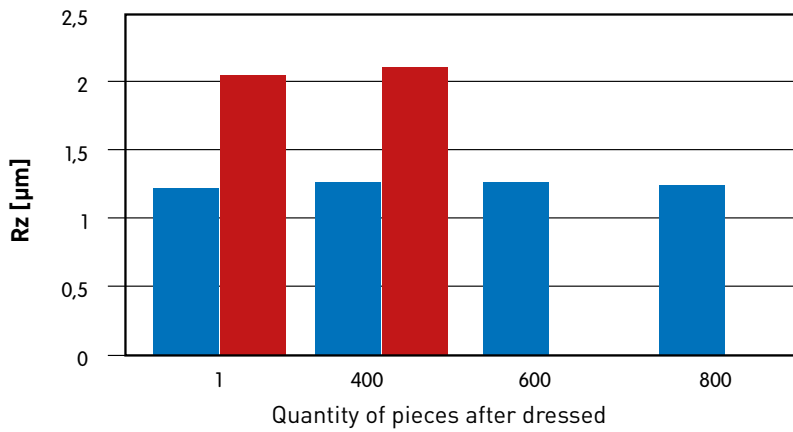
### DRESSING PARAMETER

UNIDIRECTIONAL	
GRIND WHEEL SPEED:	$v_{cd} = 40$ m/s
SPEED FACTOR:	$q_d = 0,63$
INFEEED:	$a_{ed} = 3$ µm
OVERLAP FACTOR:	$U_d = 2$

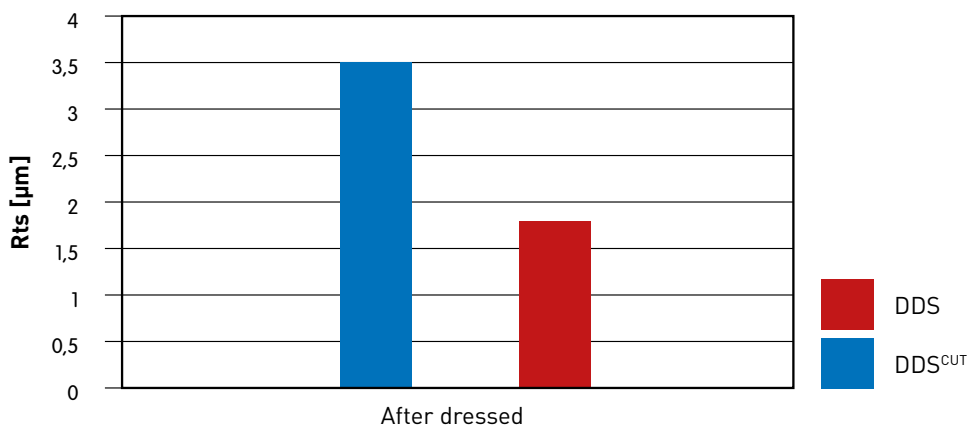
**NORTON WINTER DDS <-> NORTON WINTER DDS<sup>CUT</sup>**



**ROUNDNESS**



**GRINDING WHEEL ACTIVE ROUGHNESS**



## CHECKLIST

# CHECKLIST

### FOR DRESSING DISCS

<b>CUSTOMER / CUSTOMER NO.:</b>	
<b>MACHINE:</b>	
<b>DESIGN DATA:</b>	Machine type:
	Maximum acceptable dressing disc diameter (mm):
<b>CURRENT DRESSING TOOL:</b>	
<b>DRESSING UNIT:</b>	Arbor diameter (mm):
	Arbor length (mm):
<b>WORKPIECE:</b>	Workpiece drawing:
	Surface finish desired:
	Grinding allowance (mm / Ø):
<b>GRINDING WHEEL:</b>	Specification:
	Dimensions
<b>PARAMETERS:</b>	Profile or straight dressing:
	Grinding wheel circumferential speed (m/s) or speed (rpm):
	Circumferential speed of dressing disc (m/s) or speed (rpm):
	Counter-directional (GGL) / uni-directional dressing (GL):
	Radial infeed per dressing pass ( $a_{ed}$ ):
Axial dressing feed ( $f_{ad}$ ):	



**NORTON**

SAINT-GOBAIN

**WINTER**

STATIONARY  
DRESSING TOOLS

# STATIONARY DRESSING TOOLS

## INFORMATION ON CHOOSING YOUR TOOL

### DIAMOND FLIESEN® TOOLS

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

Examples of dressers for quick reference

D25 MCD needle blade dressers

D30 CVD needle blade

D35 CVD needle blade

Needle blade with natural diamond

Standard blade with diamond grit

Toolholders and shanks for diamond Fliesen® Tools

### SINGLE POINT DRESSERS

D12 single point dressers with MCD needles

D30 single point dressers with CVD needles

D53 single point diamond dressers with PCD plates

54	Profile diamond ground	68
	Single-point dressers with natural diamonds	70
55	Rondist rotatable tools with diamond or CVD	72
	PCD and CVD insert dressers	73

## TOOLHOLDERS AND SHANKS FOR COMMON MACHINE TYPES

56	<b>MULTI-POINT DRESSERS</b>	78
57	D21 multi-point dressers with natural diamond	78
59	Igel® multi-point dressers	79
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62	Dressing side feed and positions in relation to the grinding wheel for stationary dressing tools	83

64	<b>NORTON WINTER PRECISION TECHNOLOGY CHECKLIST FOR STATIONARY DRESSING TOOLS</b>	88
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## 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.



## 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. MT1).

## 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.



Norton  
WINTER  
**Ti-Tan**

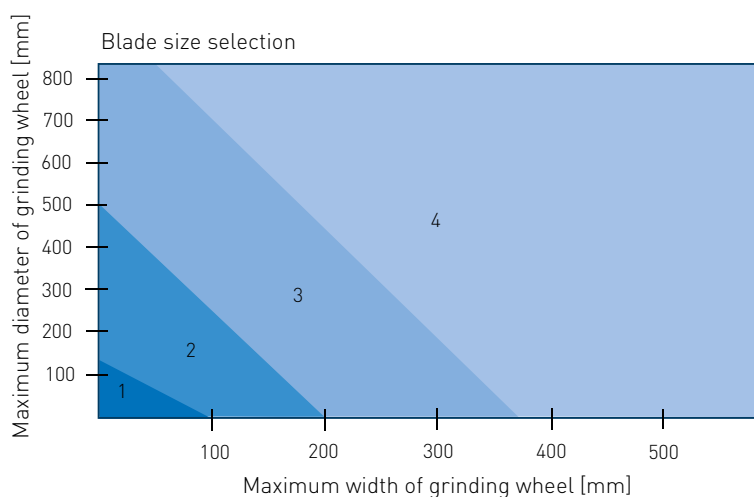


Norton  
WINTER  
**FURIOSO**

### 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.



# DIAMOND FLIESEN® TOOLS

	BLADE SIZE	GRINDING WHEEL GRIT SIZE [mesh]	SPECIFICATION	ORDER NUMBER
<b>FOR ALTOS, ALTOS IPX, SINTERED AND EXTRUDED ALUMINAS</b>				
	1	120-180	FRS 75 Ti-Tan	69014122959
		80-120	FRS 90 Ti-Tan	69014122960
		54-80	FRS 115 Ti-Tan	69014122965
		36-54	FRS 140 Ti-Tan	69014122970
	2	120-180	FBS 75 Ti-Tan	69014122972
		80-120	FBS 90 Ti-Tan	69014122974
		54-80	FBS 115 Ti-Tan	69014122975
		36-54	FBS 140 Ti-Tan	69014122979
	3	120-180	FAS 75 Ti-Tan	69014122981
		80-120	FAS 90 Ti-Tan	69014122983 <sup>1)</sup>
		54-80	FAS 115 Ti-Tan	69014122987 <sup>1)</sup>
		36-54	FAS 140 Ti-Tan	69014122989
	4	120-180	1TFAS 75 Ti-Tan	69014122991
		80-120	1TFAS 90 Ti-Tan	69014122993
		54-80	1TFAS 115 Ti-Tan	69014122994
		36-54	1TFAS 140 Ti-Tan	69014122995

	BLADE SIZE	GRINDING WHEEL GRIT SIZE [mesh]	SPECIFICATION	ORDER NUMBER
<b>FOR QUANTUM, VORTEX, SG, TG, XG, ES, SINTERED ALUMINAS</b>				
	1	120-180	FRS 75 Furioso	69014122937
		80-120	FRS 90 Furioso	69014122939
		54-80	FRS 115 Furioso	69014122940
		36-54	FRS 140 Furioso	69014122941
	2	120-180	FBS 75 Furioso	69014122944
		80-120	FBS 90 Furioso	69014122946
		54-80	FBS 115 Furioso	69014122947
		36-54	FBS 140 Furioso	69014122948
	3	120-180	FAS 75 Furioso	69014122950 <sup>1)</sup>
		80-120	FAS 90 Furioso	60157693885 <sup>1)</sup>
		54-80	FAS 115 Furioso	60157690579 <sup>1)</sup>
		36-54	FAS 140 Furioso	69014122952
	4	120-180	1TFAS 75 Furioso	69014122953
		80-120	1TFAS 90 Furioso	69014122954
		54-80	1TFAS 115 Furioso	69014122955
		36-54	1TFAS 140 Furioso	69014122956

<sup>1)</sup> Available ex stock

## EXPLANATION OF THE SPECIFICATION

DESIGNATION	WIDTH	EFFECTIVE LENGTH	TOTAL LENGTH
1 FRS	5	12	28
2 FBS	10	15	33
3 FAS	20	15	33
4 Twin blade with cooling channel			
1TFAS	20	15	35

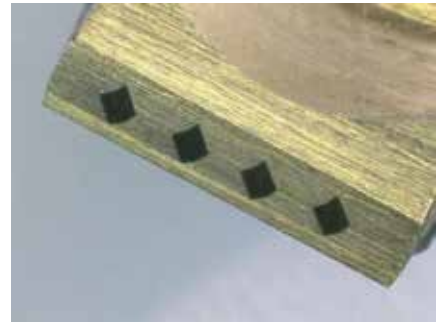
DESIGNATION	FEPA
75	D501
90	D711
115	D1001
140	D1181

All dimensions in mm



# D25 MCD NEEDLE BLADE DRESSERS

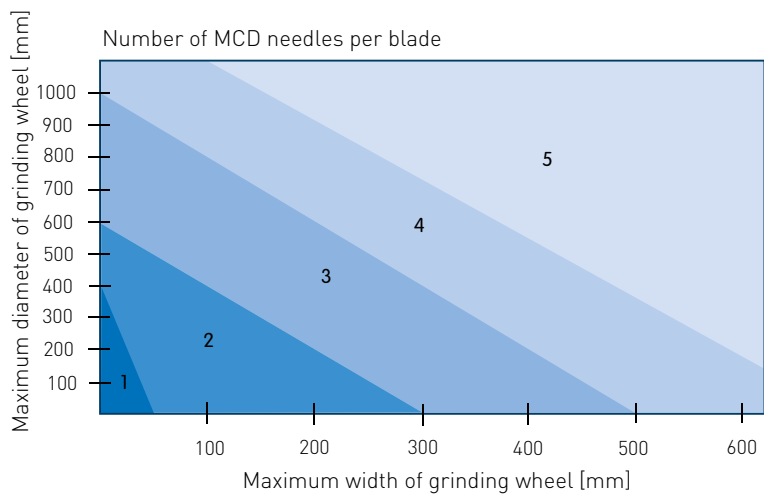
Preferably for profiling, but also for the straight dressing of hard grinding wheels, sintered alumina and silicon carbide grinding wheels. For straight plunge dressing we recommend the version with the hard material in the centre; for angular plunge dressing the off centred (OC) arrangement is suitable.



## SELECTING THE RIGHT BLADE TOOL

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

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



## D25 STANDARD RANGE (CENTRED VERSION)

	NUMBER OF NEEDLES	GRINDING WHEEL GRIT SIZE [mesh]	DESIGNATION	EFFECTIVE CUTTING WIDTH: T	WIDTH AT TIP: B	ORDER NUMBER
	1	80-120	2565 / 1	0,8	4,0	66260348671
		60	2585 / 1	1,1	4,0	66260348174
		46	25115 / 1	1,5	4,0	66260346380
	2	80-120	2565 / 2	0,8	6,0	66260139870
		60	2585 / 2	1,1	6,0	66260134397
		46	25115 / 2	1,5	6,0	66260339334
	3	80-120	2565 / 3	0,8	8,0	66260138695 <sup>1)</sup>
		60	2585 / 3	1,1	8,0	66260139398
		46	25115 / 3	1,5	8,0	66260139601
	4	80-120	2565 / 4	0,8	10,0	66260137996 <sup>1)</sup>
		60	2585 / 4	1,1	10,0	66260392047 <sup>1)</sup>
		46	25115 / 4	1,5	10,0	66260138202
	5	80-120	2565 / 5	0,8	10,0	66260378376
		60	2585 / 5	1,1	10,0	66260372054
		46	25115 / 5	1,5	10,0	69014128154

All dimensions in mm

<sup>1)</sup> Available ex stock

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

D25 STANDARD RANGE (OFF-CENTRED VERSION, OC)

	NUMBER OF NEEDLES	GRINDING WHEEL GRIT SIZE [mesh]	DESIGNATION	EFFECTIVE CUTTING WIDTH: T	WIDTH AT TIP: B	ORDER NUMBER
	1	80-120	2565 - OC / 1	0,8	4,0	66260349073
		60	2585 - OC / 1	1,1	4,0	66260345676
		46	25115 - OC / 1	1,5	4,0	66260344382
	2	80-120	2565 - OC / 2	0,8	6,0	66260344134
		60	2585 - OC / 2	1,1	6,0	66260138314
		46	25115 - OC / 2	1,5	6,0	66260139317
	3	80-120	2565 - OC / 3	0,8	8,0	66260135912 <sup>1)</sup>
		60	2585 - OC / 3	1,1	8,0	66260342479
		46	25115 - OC / 3	1,5	8,0	66260137318
4	80-120	2565 - OC / 4	0,8	10,0	66260392033 <sup>1)</sup>	
	60	2585 - OC / 4	1,1	10,0	66260137616 <sup>1)</sup>	
	46	25115 - OC / 4	1,5	10,0	66260137319	
5	80-120	2565 - OC / 5	0,8	10,0	69014128155	
	60	2585 - OC / 5	1,1	10,0	69014128156	
	46	25115 - OC / 5	1,5	10,0	69014128157	

All dimensions in mm

<sup>1)</sup> Available ex stock

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

D25 RADIUS AND ANGLE PREGRINDING

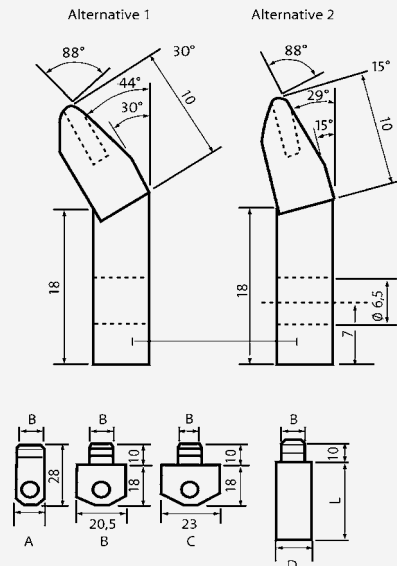
D25, D30 and D35 diamond Fliesen® tools are available with the diamond radius and angle preground.

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.

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. MT1).

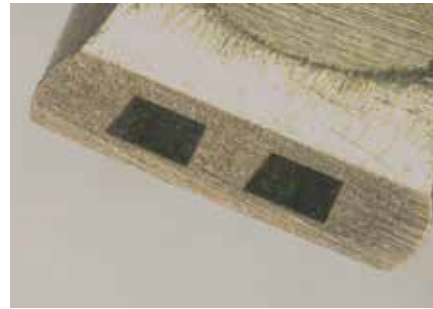
EXAMPLE OF SPECIAL BLADE TOOLS WITH PRE-POLISHED PROFILE



All dimensions in mm

# D30 CVD NEEDLE BLADE

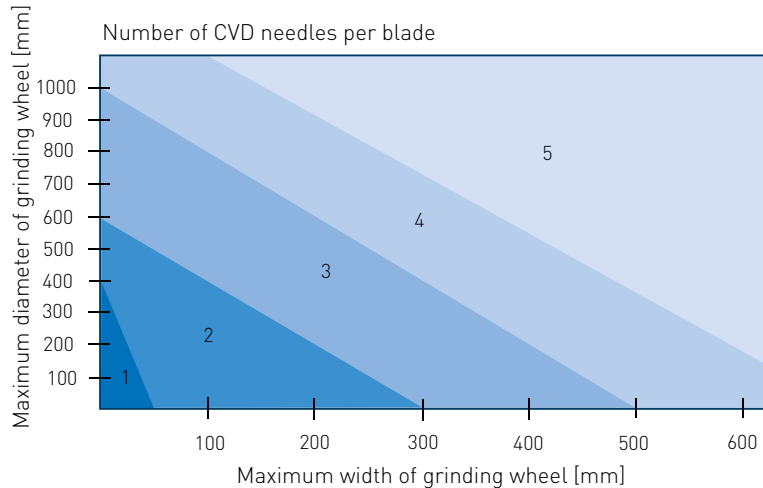
Because the CVD diamond material is centred, this blade is the first choice for high precision straight dressing of alumina, special fused alumina and sintered alumina grinding wheels. A highly durable tool with straight CVD needle inserts.



## SELECTING THE RIGHT BLADE TOOL

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

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



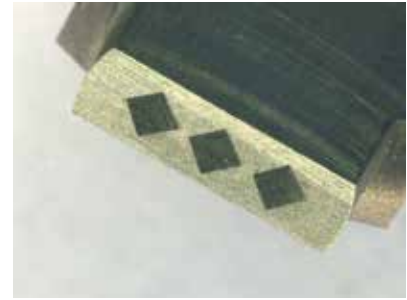
## D30 STANDARD RANGE

	NUMBER OF NEEDLES	GRINDING WHEEL GRIT SIZE [mesh]	DESIGNATION	EFFECTIVE CUTTING WIDTH: T	WIDTH AT TIP: B	ORDER NUMBER
	1	150-240	3044 / 1	0,4	3,0	66260350081
		80-120	3064 / 1	0,6	3,0	66260350933
		60	3084 / 1	0,8	3,0	69014128213
		46	30124 / 1	1,2	4,0	69014128215
	2	150-240	3044 / 2	0,4	4,0	66260137455
		80-120	3064 / 2	0,6	4,0	66260139158 <sup>1)</sup>
		60	3084 / 2	0,8	5,0	66260136762
		46	30124 / 2	1,2	6,0	66260196365
	3	150-240	3044 / 3	0,4	5,0	66260139756
		80-120	3064 / 3	0,6	6,0	66260391992 <sup>1)</sup>
		60	3084 / 3	0,8	7,0	66260139163 <sup>1)</sup>
		46	30124 / 3	1,2	8,0	66260139466
	4	150-240	3044 / 4	0,4	6,0	66260195857 <sup>1)</sup>
		80-120	3064 / 4	0,6	8,0	66260138561 <sup>1)</sup>
		60	3084 / 4	0,8	9,0	66260139464 <sup>1)</sup>
		46	30124 / 4	1,2	10,0	66260137467
	5	150-240	3044 / 5	0,4	7,0	69014128217
		80-120	3064 / 5	0,6	10,0	66260345996
		60	3084 / 5	0,8	10,0	69014128219
		46	30124 / 5	1,2	10,0	69014128221

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. MT1).

## D35 CVD NEEDLE BLADE

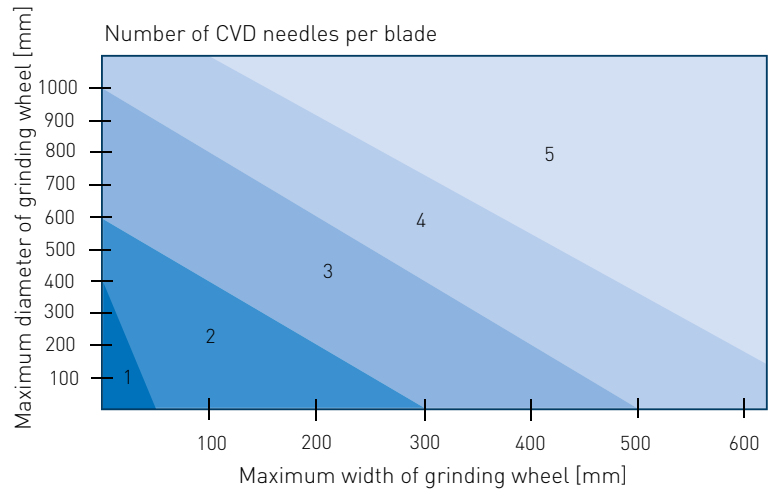
This blade with its off-centred CVD material is a first choice for angular plunge dressing of all alumina, special fused alumina and sintered alumina grinding wheels.  
A highly durable tool with CVD needles inserted diagonally.



### SELECTING THE RIGHT BLADE TOOL

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

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



## D35 STANDARD RANGE

	NUMBER OF NEEDLES	GRINDING WHEEL GRIT SIZE [mesh]	DESIGNATION	EFFECTIVE CUTTING WIDTH: T	WIDTH AT TIP: B	ORDER NUMBER
	1	150-240	3544 - OC / 1	0,6	3,0	66260346491
		80-120	3564 - OC / 1	0,8	3,0	66260346692
		60	3584 - OC / 1	1,1	3,0	66260345994
		46	35124 - OC / 1	1,5	4,0	66260346395
	2	150-240	3544 - OC / 2	0,6	4,0	66260336089
		80-120	3564 - OC / 2	0,8	4,0	66260337490
		60	3584 - OC / 2	1,1	5,0	66260337491 <sup>1)</sup>
		46	35124 - OC / 2	1,5	6,0	66260336994
	3	150-240	3544 - OC / 3	0,6	5,0	66260336752
		80-120	3564 - OC / 3	0,8	6,0	66260337624 <sup>1)</sup>
		60	3584 - OC / 3	1,1	7,0	66260337292 <sup>1)</sup>
		46	35124 - OC / 3	1,5	8,0	66260337195
	4	150-240	3544 - OC / 4	0,6	6,0	66260333197
		80-120	3564 - OC / 4	0,8	8,0	66260195223 <sup>1)</sup>
		60	3584 - OC / 4	1,1	9,0	66260336093 <sup>1)</sup>
		46	35124 - OC / 4	1,5	10,0	66260336196
	5	150-240	3544 - OC / 5	0,6	7,0	69014128150
		80-120	3564 - OC / 5	0,8	10,0	69014128151
		60	3584 - OC / 5	1,1	10,0	69014128152
		46	35124 - OC / 5	1,5	10,0	69014128153

Information on toolholders for diamond Fliesen® tools is given in the section on 'Toolholders and shanks for diamond Fliesen® tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MT1).

All dimensions in mm

<sup>1)</sup> Available ex stock

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

# NEEDLE BLADE WITH NATURAL DIAMOND

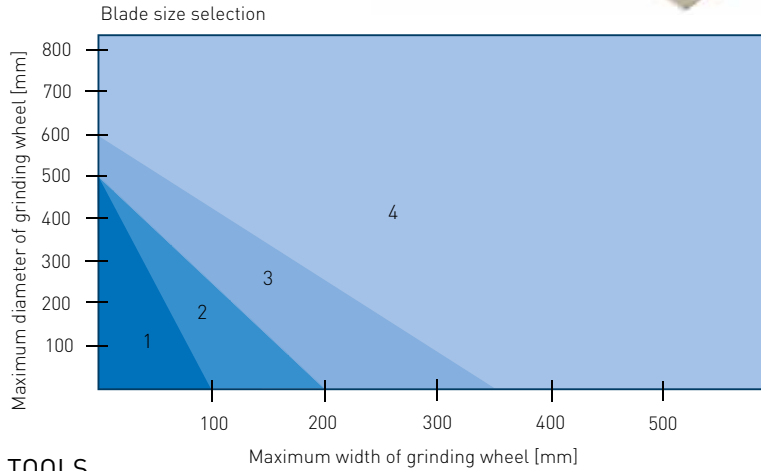
Suitable for angular plunge / straight and profile dressing of all alumina, special fused alumina, and sintered alumina grinding wheels in grit sizes 46–80. Exceptional natural diamond needles, set by hand in a special design, guarantee the long service life of these tools.



## SELECTING THE RIGHT BLADE TOOL

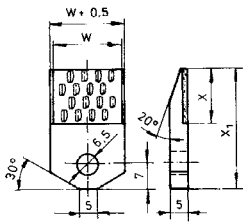
We have made it easy for you to select the most suitable blade dresser:

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



## STANDARD RANGE OF NEEDLE BLADE TOOLS

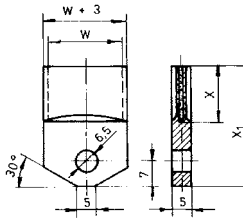
BLADE SIZE	SPECIFICATION	W			BOND	SIZE OF NEEDLES	ORDER NUMBER
		X	X <sub>1</sub>	X <sub>2</sub>			
1	FD180	10	12	28	T645E	N1000	69014185757 <sup>1)</sup>
2	FB180	10	15	33	T645E	N1100	69014185754 <sup>1)</sup>
3	FC180	20	10	28	T645E	N1100	69014185756 <sup>1)</sup>
4	FA180	20	15	33	T645E	N1100	69014185755 <sup>1)</sup>



## SPECIAL DESIGNS OF NEEDLE BLADE TOOLS

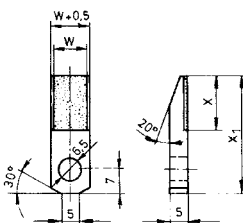
Needle blade tools in centered version with highly effective cutting width specifications  $b_d$  and consistent wear characteristics.

BLADE SIZE	SPECIFICATION	W	X	X <sub>1</sub>	BOND	SIZE OF NEEDLES	ORDER NUMBER
2	9TFB180	10	15	33	T645J	N800	69014185798
2	1TFB180	10	15	33	T645J	N1000	66260388626
4	8TFA180	20	15	33	T645J	N900	66260387342



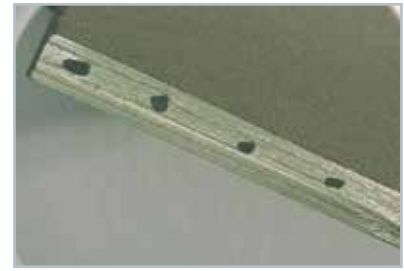
Needle blade tools in an off-centred versions with highly effective cutting width specifications  $b_d$  and consistent wear characteristics.

BLADE SIZE	SPECIFICATION	W	X	X <sub>1</sub>	BOND	SIZE OF NEEDLES	ORDER NUMBER
2	11TFB180	10	15	33	T645E	N1000	66260100089
2	13TFB180	10	15	33	T645E	N800	66260113218
4	14TFA180	20	15	33	T645E	N900	69014159391



Information on toolholders for diamond Fliesen® tools is given in the section on 'Toolholders and shanks for diamond Fliesen® tools'. A separate section of this chapter deals with shank versions for popular machine toolholders (e.g. MT1).

# STANDARD BLADE WITH DIAMOND GRIT



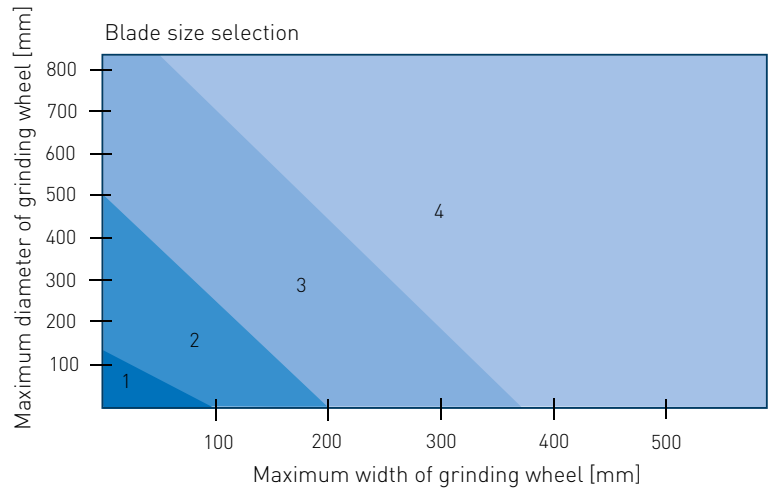
A universal dressing tool for straight and profiled dressing of alumina and sintered alumina grinding wheels with consistent surface finish over the whole of its working life.

For large grinding wheels and sets of grinding wheels we recommend mounting of two blade tools or use of a twin blade such as 1T FAS 115-20-15-35.

## SELECTING THE RIGHT BLADE TOOL

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

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



## EXPLANATION OF THE SPECIFICATION

DESIGNATION	WIDTH	EFFECTIVE LENGTH	TOTAL LENGTH	DESIGNATION	FEPA
1 FRS	5	12	28	75	D501
2 FBS	10	15	33	90	D711
2 FDS	10	12	28	115	D1001
3 FAS	20	15	33	140	D1181
3 FCS	20	10	28		
4 Twin blade with cooling channel					
1TFAS	20	15	35		

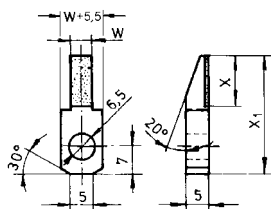
## ORDER SAMPLE

DRESSING TOOL	WIDTH OF DIAMOND SECTION W	EFFECTIVE LENGTH OF DIAMOND SECTION X	TOTAL LENGTH OF TOOL X <sub>1</sub>	DIAMOND GRIT SIZE	BOND
FAS 115 -	20 -	15 -	33	D1001	H770J

## RANGE OF STANDARD BLADE TOOL WITH DIAMOND GRIT

T645E BOND FOR ALUMINA GRINDING WHEELS, INCLUDING SINTERED ALUMINAS (AL<sub>2</sub>O<sub>3</sub>)

BLADE SIZE	GRIT SIZE GRINDING WHEEL [Mesh]	SHAPE	W	X	X <sub>1</sub>	GRIT SIZE OF BLADE	ORDER NUMBER
1	120-180	FRS 75	5	12	28	D501	66260382020
	80-120	FRS 90				D711	66260114636 <sup>1)</sup>
	54-80	FRS 115				D1001	66260388134



	BLADE SIZE	GRIT SIZE GRINDING WHEEL [Mesh]	SHAPE	W	X	X <sub>1</sub>	GRIT SIZE OF BLADE	ORDER NUMBER	
	2	120-180	FBS 75	10	15	33	D501	66260387135	
		80-120	FBS 90				D711	69014185726 <sup>1)</sup>	
		54-80	FBS 115				D1001	69014185727 <sup>1)</sup>	
		36-54	FBS 140				D1181	69014185728 <sup>1)</sup>	
	2	120-180	FDS 75		10	12	28	D501	69014185747 <sup>1)</sup>
		80-120	FDS 90				D711	69014185735 <sup>1)</sup>	
		54-80	FDS 115				D1001	69014185736 <sup>1)</sup>	
		36-54	FDS 140				D1181	69014185737 <sup>1)</sup>	
		3	120-180	FAS 75	20	15	33	D501	66260384327 <sup>1)</sup>
			80-120	FAS 90				D711	69014185720 <sup>1)</sup>
			54-80	FAS 115				D1001	69014185721 <sup>1)</sup>
			36-54	FAS 140				D1181	69014185722 <sup>1)</sup>
3		120-180	FCS 75		20	10	28	D501	69014185746
		80-120	FCS 90				D711	69014185732 <sup>1)</sup>	
		54-80	FCS 115				D1001	69014185718 <sup>1)</sup>	
		36-54	FCS 140				D1181	69014185716 <sup>1)</sup>	
		4	80-120	1T FAS 90	20	15	35	D711	66260389354
			54-80	1T FAS 115				D1001	66260388162 <sup>1)</sup>
			36-54	1T FAS 140				D1181	66260386770

**H770J BOND FOR SILICON CARBIDE (SiC) GRINDING WHEELS**

	BLADE SIZE	GRIT SIZE GRINDING WHEEL [Mesh]	SHAPE	W	X	X <sub>1</sub>	GRIT SIZE OF BLADE	ORDER NUMBER	
	2	120-180	FBS 75	10	15	33	D501	69014185749 <sup>1)</sup>	
		80-120	FBS 90				D711	69014185729 <sup>1)</sup>	
		54-80	FBS 115				D1001	69014185730 <sup>1)</sup>	
		36-54	FBS 140				D1181	66260384396	
	2	120-180	FDS 75		10	12	28	D501	66260378692 <sup>1)</sup>
		80-120	FDS 90				D711	69014185738 <sup>1)</sup>	
		54-80	FDS 115				D1001	66260387592	
		36-54	FDS 140				D1181	66260387481 <sup>1)</sup>	
		3	120-180	FAS 75	20	15	33	D501	69014185748 <sup>1)</sup>
			80-120	FAS 90				D711	69014185723 <sup>1)</sup>
			54-80	FAS 115				D1001	69014185724 <sup>1)</sup>
			36-54	FAS 140				D1181	69014185725
3		120-180	FCS 75		20	10	28	D501	66260385384
		80-120	FCS 90				D711	66260384227 <sup>1)</sup>	
		54-80	FCS 115				D1001	69014185734 <sup>1)</sup>	
		36-54	FCS 140				D1181	66260387133	

All dimensions in mm

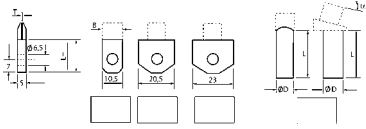





<sup>1)</sup> Available ex stock Minimum order quantity for articles not in stock: blade size 1 & 2: 4 items, blade size 3 & 4: 2 items, delivery: 4 weeks

# TOOLHOLDERS AND SHANKS FOR DIAMOND FLIESEN® TOOLS

Two types of shank for diamond Fliesen® tools are available for your machine toolholders:

- rigid brazed blade tool
- flexible swivel holder.

The variable adjustable angle of the flexible swivel holder allows the dresser to be placed in the best possible position with respect to the grinding wheel and simply clamped.

TOOL HOLDER	SHANK	ORDER NUMBER	CLAMPING LENGTH: L1	
Rigid brazed tool holder	MT0 MT1 Cylindrical	-	-	See section entitled 'Toolholders and shanks'
Rigid brazed tool holder	to customer specification			
Swivel holder for single blade	MT0	66260386838	25,5	
	MT1	66260196356 <sup>1)</sup>	40	
	Cylindrical, diameter 10	66260389757	50	
Swivel holder for dual blade tools	MT1	66260389454	40	
	Cylindrical diameter 12,7	66260390721	50	

All dimensions in mm



## 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

TYPE	NEEDLE DIMENSIONS			SHANK		ORDER NUMBER
	D	T	L	TYPE	CLAMPING LENGTH	
1265	0,6	0,8	4	MT1	40	66260334408
				MT0	25	66260136620
				Cylindrical Ø 10	40	69014164301
1285	0,8	1,1	4	MT1	40	66260340532
				MT0	25	66260369142
				Cylindrical Ø 10	40	66260138887
12115	1,15	1,5	4	MT1	40	66260334220
				MT0	25	69014146751
				Cylindrical Ø 10	40	66260345558

All dimensions in mm

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

#### ORDER SAMPLE

TYPE	SHANK	CLAMPING LENGTH
1285	Cylindrical Ø 10	40

Other shank dimensions available on request.

## D30 SINGLE POINT DRESSERS WITH CVD NEEDLES

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



### STANDARD RANGE OF D30 SINGLE POINT DRESSERS WITH CVD NEEDLES

TYPE	NEEDLE DIMENSIONS			SHANK		ORDER NUMBER
	D	T	L	TYPE	CLAMPING LENGTH	
3023	0,2	0,2	3	MT1	40	66260364163
				MT0	25	66260338571
				Cylindrical Ø 10	40	66260336272
3033	0,3	0,3	3	MT1	40	66260339183
				MT0	25	66260356104
				Cylindrical Ø 10	40	66260336101
3044	0,4	0,4	4	MT1	40	69014146755
				MT0	25	66260138967
				Cylindrical Ø 10	40	66260338797
3064	0,6	0,6	4	MT1	40	66260335519
				MT0	25	66260334913
				Cylindrical Ø 10	40	66260155917
3084	0,8	0,8	4	MT1	40	66260155970
				MT0	25	66260139868
				Cylindrical Ø 10	40	66260137229
30124	1,2	1,2	4	MT1	40	66260136169
				MT0	25	66260138367
				Cylindrical Ø 10	40	66260195542

All dimensions in mm

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

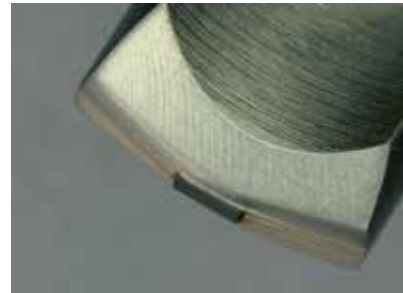
### ORDER SAMPLE

TYPE	SHANK	CLAMPING LENGTH
3084	Cylindrical Ø 10	40

Other shank dimensions available on request.

# D53 SINGLE POINT DIAMOND DRESSERS WITH PCD PLATES

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



## STANDARD RANGE OF D53 SINGLE POINT DIAMOND DRESSERS WITH PCD PLATES

TYPE	PCD DIMENSIONS			SHANK			ORDER NUMBER
	B	H	X	TYPE	CLAMPING LENGTH L <sub>1</sub>	L <sub>2</sub>	
5320	0,5	2	8	MT1	40	13	69014164952
				MT0	25	13	66260333171
				Diameter 10	40	13	66260199498

All dimensions in mm

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

### ORDER SAMPLE

TYPE	SHANK	CLAMPING LENGTH
5320	Diameter 10	40

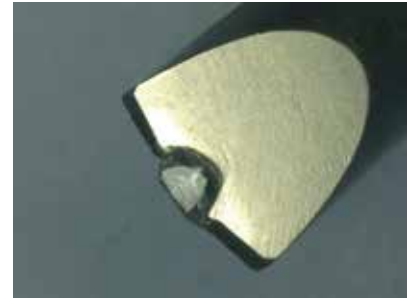
## SINGLE POINT DRESSERS

### PROFILE DIAMOND, GROUND

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.



#### STANDARD RANGE OF D53 PROFILE DIAMOND DRESSERS WITH PCD PLATES

TYPE	DIAMOND WEIGHT	ANGLE A $\alpha$	RADIUS R	TOOL LENGTH	DESIGNATION	DRESSING UNIT / MODEL
PD410	1,0	70°	0,4	44	PD410 70/400	Schaudt

TYPE	DIAMOND WEIGHT	ANGLE $\alpha$	RADIUS R	TOOL LENGTH	DESIGNATION	DRESSING UNIT / MODEL
PD414 Type S	0,25-0,5 depending on the geometry	40°	0,125	36	PD414 40/125 S	Diaform Dressing unit: AT, ATR, BT, BTR
			0,250		PD414 40/250 S	
			0,500		PD414 40/500 S	
		60°	0,125		PD414 60/125 S	
			0,250		PD414 60/250 S	
			0,500		PD414 60/500 S	
PD414 Type L	0,25-0,5 depending on the geometry	30°	0,125	45,5	PD414 30/125 L	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
			0,250		PD414 30/250 L	
			0,500		PD414 30/500 L	
		40°	0,125		PD414 40/125 L	
			0,250		PD414 40/250 L	
			0,500		PD414 40/500 L	
		60°	0,125		PD414 60/125 L	
			0,250		PD414 60/250 L	
			0,500		PD414 60/500 L	
PD414 Type X	0,25-0,5 depending on the geometry	30°	0,125	58	PD414 30/125 X	Diaform Dressing unit: 5/4, 6/4, 12/4, 14/4
			0,250		PD414 30/250 X	
			0,500		PD414 30/500 X	
		40°	0,125		PD414 40/125 X	
			0,250		PD414 40/250 X	
			0,500		PD414 40/500 X	
		60°	0,125		PD414 60/125 X	
			0,250		PD414 60/250 X	
			0,500		PD414 60/500 X	

TYPE	DIAMOND WEIGHT	ANGLE $\alpha$	RADIUS R	TOOL LENGTH	DESIGNATION	DRESSING UNIT / MODEL
PD425	1,0	55°	0,2	42	PD425 55/200	Fortuna

TYPE	DIAMOND WEIGHT	ANGLE $\alpha$	RADIUS R	TOOL LENGTH	DESIGNATION	DRESSING UNIT / MODEL
PD426	1,0	60°	0,2	24	PD426 60/200	MSO

TYPE	DIAMOND WEIGHT	ANGLE $\alpha$	RADIUS R	TOOL LENGTH	DESIGNATION	DRESSING UNIT / MODEL
PD428	0,5	50°	0,1	22	PD428 50/100	Jung / RA38-53

DIMENSIONS $\emptyset \times L$	CT	DESIGNATION $\alpha / R$	ORDER NUMBER
9,52 x 45,5	0,25	30/250L	66260343187
		40/125L	66260340672
		40/250L	66260349265
		40/125L	66260389254
	0,33	40/250L	66260339381
		60/250L	66260340002
		60/500L	66260387140
		30/125L	66260339047
	0,50	30/250L	66260340152
		40/125L	66260199494
		40/250L	60157642851
		40/500L	66260339689
		60/500L	66260336405

**SPECIAL SHAPES**

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

SHAPE	W	X	HOLDER GEOMETRY	DIAMOND SIZE	BOND	ORDER NUMBER
1TFDS90	10	12	Z9,52-30-5-15	D711	T645	66260384883

STATIONARY DRESSING TOOLS

## SINGLE POINT DRESSERS

# SINGLE POINT DRESSERS WITH NATURAL DIAMONDS

Single point dressers are used for straight dressing and for dressing grinding wheels with simple profiles.

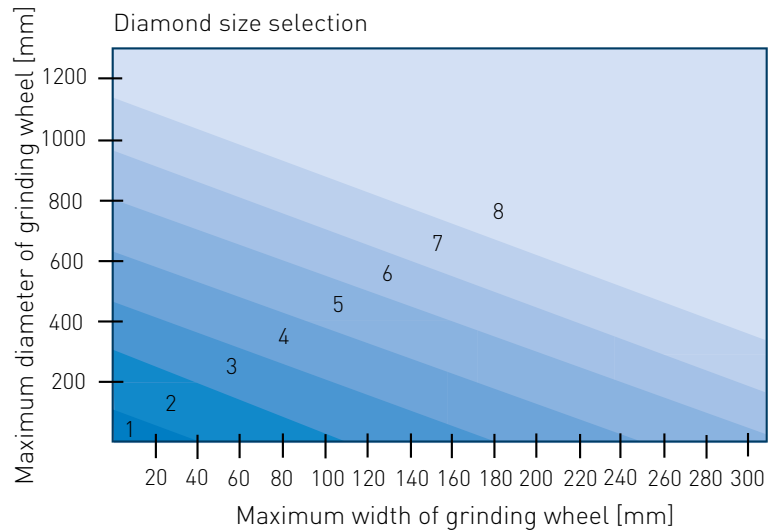
Diamonds have a number of working points, depending on the grade. Repositioning the diamonds enables these to be activated in turn. Please send your dresser back to us in good time. Re-brazing the diamond at the factory increases the service life of the tool and makes it even better value for money.



### SELECTING THE RIGHT DRESSER

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

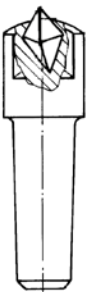
- Choose the size of diamond from the diagram according to the width and diameter of your grinding wheel,
- then choose the best tool from the table below.



### RECOMMENDED DIAMOND SIZE [CT]

1	0,15...0,35
2	0,25...0,50
3	0,35...0,75
4	0,50...1,00
5	0,60...1,25
6	0,70...1,50
7	0,85...1,75
8*	1,00...2,00

\* Diamonds >2 ct available on request

TYPE OF DRESSING TOOL	GRADE OF DIAMOND	DESCRIPTION
 LEA (single point dressers)	Diacar	Good industrial grade, at least 3-5 working points, regular octahedron, virtually no inclusions, no cracks
	Vatom	Standard grade, at least 2-3 working points, limited irregular shape, few inclusions, no cracks
	ZA	Normal grade, at least 1-2 working points, few inclusions and may have cracks
	Industry	Simple industrial grade, at least 1 working point
LEW (‘basic’ single point dressers)	Basic	Basic grade with one working point

## ORDER SAMPLE

TYPE OF DRESSER	DIAMOND [CT]	GRADE OF DIAMOND	HOLDER
LEA -	0,5 -	Vatom	MT1-40

The holder of a single point dresser can also be made with a head, depending on the size of the diamond.

## RANGE OF SINGLE POINT DRESSERS IN STOCK

SPECIFICATION	GRADE OF DIAMOND	SHAPE - OVERALL LENGTH	DIAMOND [CT]	WORKING POINTS	ORDER NUMBER
LEA-1-Diacar-MK1-40	Diacar	MT1 × 40	1,00	4	66260195848 <sup>1)</sup>
LEA-1-Vatom-MK1-40	Vatom	MT1 × 40	1,00	3	66260382005 <sup>1)</sup>
LEA-1-Standard-MK0-25,5	Industry	MT0 × 25,5	1,00	2	66260385415
LEA-1-Standard-MK1-40		MT1 × 40	1,00	2	66260389207
LEA-0,5-Standard-Z8-30		Ø 8 × 30	0,50	2	66260386391 <sup>1)</sup>
LEA-0,5-Standard-MK0-25,5		MT0 × 25,5	0,50	2	66260384683 <sup>1)</sup>
LEA-0,5-Standard-MK1-40		MT1 × 40	0,50	2	66260386875 <sup>1)</sup>
LEA-0,33-Standard-MK1-40		MT1 × 40	0,33	2	66260387542

All dimensions in mm

<sup>1)</sup> Available ex stock

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

## RANGE OF 'BASIC' SINGLE POINT DRESSERS IN STOCK

SPECIFICATION	GRADE OF DIAMOND	SHAPE - OVERALL LENGTH	DIAMOND [CT]	WORKING POINTS	ORDER NUMBER
LEW-0,25-MK0-25,5	Basic	MT0 × 25,5	0,25	1	66260342633
LEW-0,1-MK1-40		MT1 × 40	0,10	1	66260386731 <sup>1)</sup>
LEW-0,1-Z8-90		Ø 8 × 90	0,10	1	66260386964
LEW-0,1-MK0-25,5		MT0 × 25,5	0,10	1	66260340393 <sup>1)</sup>
LEW-0,1-Z8-30		Ø 8 × 30	0,10	1	66260389256

All dimensions in mm

<sup>1)</sup> Available ex stock

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

## SINGLE POINT DRESSERS

# RONDIST ROTATABLE TOOLS WITH DIAMOND OR CVD

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



	TYPE	GRINDING WHEELS		DIAMOND SPECIFICATION	QUANTITY OF HARD MATERIAL PER ROTATABLE TOOL		ORDER NUMBER
		GRIT SIZE [MESH]	DIAMETER [mm]		SIZE WEIGHT	QUANTITY	
	R02096	46 - 80	< 600	Diamond needles	2 ct	96	69014185803 <sup>1)</sup>
	R05096	36 - 60	> 600	Diamond needles	5 ct	96	66260390774
	R01008	46 - 100	≤ 1000	Triangular diamonds	1,30 ct	8	69014185801 <sup>1)</sup>
				Triangular CVDs	Length of sides = 3,5 mm Depth = 1,0 mm	8	66260354350 <sup>1)</sup>
	R015/5	60 - 120	5 - 40	Diamond grit D501	0,65 ct	Multi-layer	66260389341 <sup>1)</sup>

All dimensions in mm

<sup>1)</sup> Available ex stock

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

## HOLDERS FOR ROTATABLE TOOLS

SPECIFICATION	SHAPE OF HOLDER	ORDER NUMBER
2096/5096	MT1	66260385746
	MT0	66260386916
	Z12-35	66260381329
1008	MT1	66260386640
	MT0	7958703355
	Z10-39,5	66260391408
W15/5	MT1	69014125429
	MT0	66260385884
	W15/5	66260370419




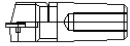
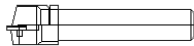
# PCD AND CVD INSERT DRESSERS

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



TOOL	TYPE	SHANK LENGTH A	RADIUS R			
	PCD	6,0	0,125			
			0,200			
			0,250			
			0,500			
			0,800			
			6,5	0,125		
		7,0	0,200			
			0,250			
			0,500			
			0,800			
			0,125			
			0,200			
		CVD	CVD	6,0	0,250	
					0,500	
					0,800	
					6,5	0,125
					0,200	
					0,250	
7,0	0,500					
	0,800					
	0,125					
	0,200					
	0,250					
	0,500					
0,800						

## SINGLE POINT DRESSERS

DRESSER HOLDER	DESIGNATION	SIZE
	PKD81A-966/1	MT1
	PKD81A-966/2	MT1
	PK81A-966/3	Cylindrical 12/10/8

See dimensions of the MT0 and MT1 at following page.

### ORDER SAMPLE

TYPE	DIAMOND	DIMENSIONS	RADIUS
Insert dresser	PCD	6,0 mm	0,125 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'.

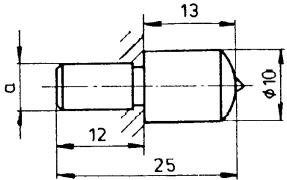
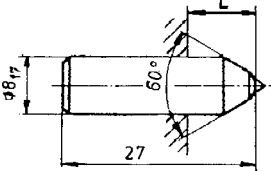
## DIAMOND HOLDER TO DIN 228

	TYPE	MACHINE MOUNTING
	400	MT1
	400K	MT1
	402	MT0
	402K	MT0
	403	Cylindrical

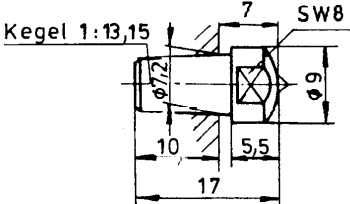
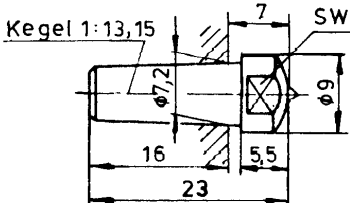
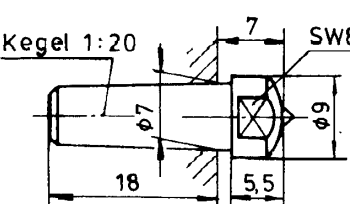
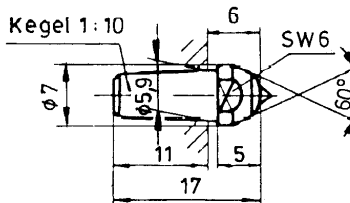
All dimensions in mm

Other shank dimensions on request.

## TOOLHOLDERS AND SHANKS FOR COMMON MACHINE TYPES

	TYPE	MACHINE MOUNTING
	405	Landis a Ø 6; Ø 6,5; Ø 8
	406	D (diamond tip) centred

## OTHER DIAMOND HOLDERS

	TYPE	MACHINE MOUNTING
	407	Jung NT 65 taper 1:13,15
	409	Jung JgN 1751 taper 1:13,15
	411	Jung JgN 1751 taper 1:20
	412	Jung FA 42-12 taper 1:10

All dimensions in mm

	TYPE	MACHINE MOUNTING
	413	Jung C 8 taper 1:13,15
	417	Jung C 8 taper 1:20
	420	Niles
	421	Niles
	422	Kolb KZ 1 + 2 taper 1:50
	424	Deckel

All dimensions in mm

Other shank dimensions on request.

# MULTI-POINT DRESSERS

Multi-point dressers consist of a holder and a diamond section. The dimensions of the diamond section, the grit size and the ratio of the bond to the diamond grit are determined by the grinding wheel to be dressed. If you supply us with your individual grinding wheel parameters we shall be pleased to recommend a suitable multi-point dresser. Please specify the holder and the mounting angle according to your machine mounting system (cylindrical or tapered e.g. MT1, MT0). In addition to their short delivery times multi-point dressers have more to offer:

## Lower costs

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

## Faster stock removal

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

## Long service life

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

## D21 MULTI-POINT DRESSERS WITH NATURAL DIAMOND

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



	TYPE	SEGMENT DIMENSIONS		DIAMOND		SHANK		ORDER NUMBER
	D21	WIDTH B	HEIGHT H	NUMBER / ROWS	GRIT SIZE	SHAPE / D	CLAMPING LENGTH	
	2101	12	10	3	851	14,8	22	66260196334
	2102		6	2	851	11	40	66260373763
	2103		10	3	1181	10	60	66260383028
	2104		6	2	1181	16	50	66260387928
	2105	18	10	3	851	10	40	66260322879
	2106		6	2	851	12	50	66260336054
	2107		10	3	1181	8	10	66260391179
	2108		6	2	1181	10	40	66260337072
	2109		10	3	2240	10,9	30	66260320914

### ORDER SAMPLE

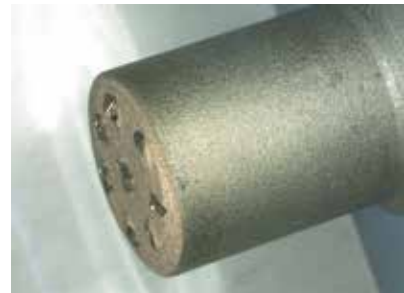
TYPE	SHANK / D	CLAMPING LENGTH	MOUNTING ANGLE / °
2104	16	50	0

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.

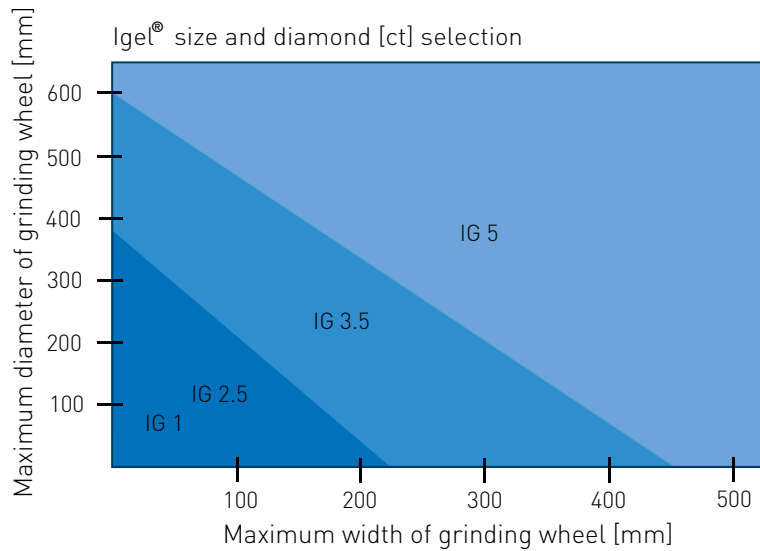
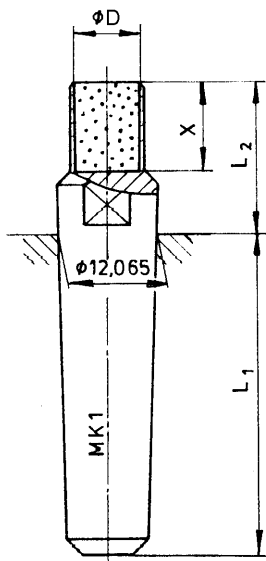
Igel® dressers are easy to handle and very economical in use. A great advantage of the Igel® is that it can be used at high dressing feed rates.



## SELECTING THE RIGHT DRESSER

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

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



IGEL®	DIMENSIONS OF DIAMOND SECTION (diameter Ø and length X)	DIAMOND [ct]
IG 1	8 × 4	1
IG 2,5	8 × 11	2,5
IG 3,5	8 × 11	3,5
IG 5	11 × 11	5

## ORDER SAMPLE

BOND (first letter of the bonding material)	SIZE OF IGEL®	DIAMOND [ct]	DIMENSIONS	HOLDER	GRIT SIZE	BOND
H	IG -	2,5 -	8 - 11 -	MT1-40	D 1001	H710

## MULTI-POINT DRESSERS

### BOND FOR ALL ALUMINA GRINDING WHEELS, INCLUDING SINTERED ALUMINA

IGEL®	GRINDING WHEEL GRIT SIZE	GRIT SIZE OF IGEL®	BOND
IG 1, IG 2,5, IG 3,5, IG 5	60 - 80	D711	H710
	46 - 60	D1001	H710
	36 - 46	D2240	H710

### BOND FOR SIC GRINDING WHEELS

IGEL®	GRINDING WHEEL GRIT SIZE	GRIT SIZE OF IGEL®	BOND
IG 1, IG 2,5, IG 3,5, IG 5	60 - 80	D711	H770
	46 - 60	D1001	H770
	36 - 46	D2240	H770

### BOND FOR SIC GRINDING WHEELS

SPECIFICATION	DIMENSIONS		DIAMOND		ORDER NUMBER
	DIAMETER D	LENGTH X	GRIT SIZE	ct	
HIG1-8-4-MK1-40*D1001 H710	8	4	D1001	1,0	66260195955
HIG2,5-8-11-MK1-40*D711 H710		11	D711		66260387566 <sup>1)</sup>
HIG2,5-8-11-MK0-25,5*D1001 H710			D1001		66260383700
HIG2,5-8-11-MK1-40*D1001 H710			D1001		66260195957 <sup>1)</sup>
HIG2,5-8-11-MK1-40*D2240 H710			D2240		66260385203
HIG3,5-8-11-MK0-25,5*D711 H710			D711	3,5	66260389441
HIG3,5-8-11-MK1-40*D711 H710			D711		66260195960 <sup>1)</sup>
HIG5-11-11-MK1-40*D711 H710	11	11	D711	5,0	66260195972
HIG5-11-11-MK1-40*D1001 H710			D1001		66260195959 <sup>1)</sup>
HIG5-11-11-MK1-40*D2240 H710			D2240		66260195953



# 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.

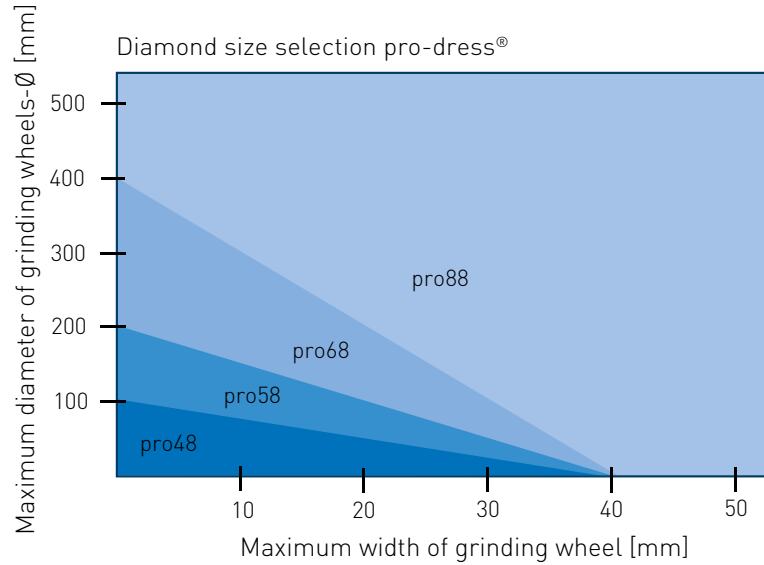
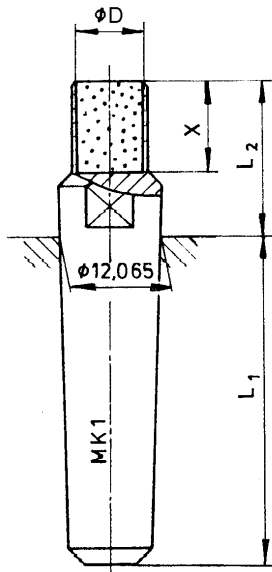
Its low dressing forces make it especially useful for external cylindrical grinding and fine surfaces.



## SELECTING THE RIGHT DRESSER

We have made it easy for you to select the most suitable pro-dress® tool:

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



PRO-DRESS®	DIMENSIONS OF DIAMOND TIP (diameter $\phi$ and length X)	DIAMOND [ct]
pro48	4 x 8	0,6
pro58	5 x 8	1,0
pro68	6 x 8	1,3
pro88	8 x 8	2,4

## ORDER SAMPLE

BOND (first letter)	DESIGN	DIMENSIONS	HOLDER	GRIT SIZE	BOND
H	pro58 -	5 - 8 -	MT1-40	D151	H760

## MULTI-POINT DRESSERS

### PRO-DRESS® FOR DRESSING ALUMINA GRINDING WHEELS (HARD GRADES)

PRO-DRESS®	GRINDING WHEEL GRIT SIZE	GRIT SIZE PRO-DRESS®	BOND
pro48, pro58, pro68, pro88	320 - 600	D76	H760
	220 - 320	D107	H760
	180 - 220	D151	H760
	120 - 180	D213	H760
	100 - 120	D301	H760
	80 - 100	D426	H710
	60 - 80	D601	H710
	54 - 60	D711	H710

### PRO-DRESS® FOR DRESSING ALUMINA GRINDING WHEELS (LOW HARDNESS GRADES, e.g. A and B)

PRO-DRESS®	GRINDING WHEEL GRIT SIZE	GRIT SIZE PRO-DRESS®	BOND
pro48, pro58, pro68, pro88	320 - 600	D76	ST469
	220 - 320	D107	ST469
	180 - 220	D151	ST469
	120 - 180	D213	ST469
	100 - 120	D301	ST469
	80 - 100	D426	ST469
	60 - 80	D601	ST469
	54 - 60	D711	ST469

### PRO-DRESS® FOR DRESSING SILICON CARBIDE (SiC) GRINDING WHEELS

PRO-DRESS®	GRINDING WHEEL GRIT SIZE	GRIT SIZE PRO-DRESS®	BOND
pro48, pro58, pro68, pro88	320 - 600	D76	H770
	220 - 320	D107	H770
	180 - 220	D151	H770
	120 - 180	D213	H770
	100 - 120	D301	H770
	80 - 100	D426	H770
	60 - 80	D601	H770
	54 - 60	D711	H770

### PRO-DRESS® RANGE

SPECIFICATION	DIMENSIONS		DIAMOND		ORDER NUMBER
	DIAMETER Ø	LENGTH X	GRIT SIZE	ct	
HPR048-4-8-Z6-24*D301 H760	4	8	D301	0,6	66260384896
HPR058-5-8-Z6-25*D426 H710	5	8	D426	1,0	66260196226
HPR068-6-8-MK0-25,5*D213 H760	6	8	D213	1,3	66260196258

All dimensions in mm

<sup>1)</sup> Available ex stock

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

# TECHNICAL NOTES

## DRESSING SIDE FEED AND POSITIONS IN RELATION TO THE GRINDING WHEEL FOR STATIONARY DRESSING TOOLS

GRINDING WHEEL GRIT SIZE	RECOMMEND-ED DRESSING FEED (mm/rev)	GRINDING WHEEL SPEED [RPM]									
		500	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500	5.000
150	0,05	25	50	75	100	125	150	175	200	225	250
100	0,15	75	150	225	300	375	420	525	600	675	750
60	0,25	125	250	375	500	625	750 *	875	1.000	1.125	1.250
46	0,35	175	350	525	700	875	1.050	1.225	1.400	1.575	1.750
< 46	0,45	225	450	675	900	1.125	1.350	1.575	1.800	2.025	2.250

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

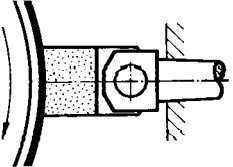
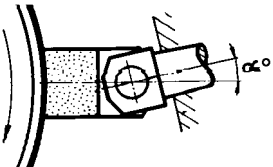
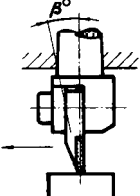
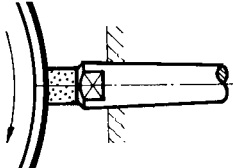
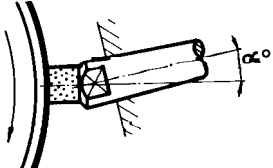
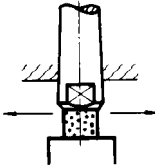
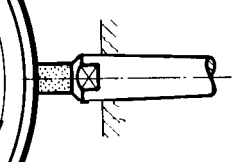
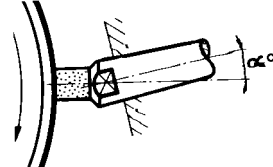
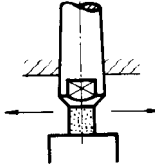
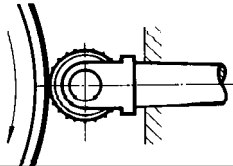
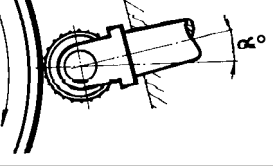
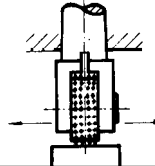
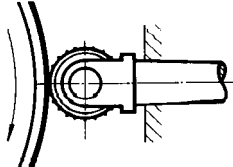
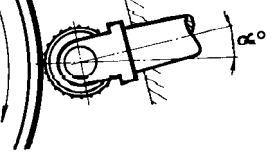
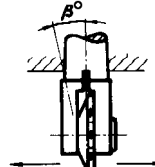
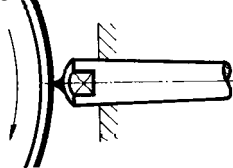
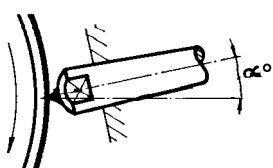
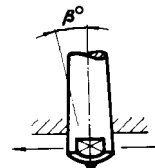

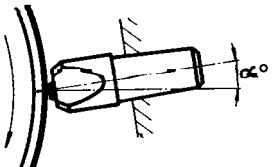
Dressing feed [mm/min]

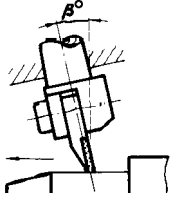
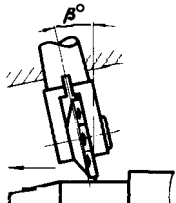



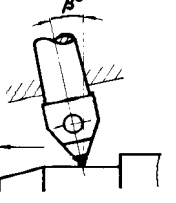
GRINDING WHEEL GRIT SIZE	RECOMMEND-ED DRESSING FEED (mm/rev)	GRINDING WHEEL SPEED [RPM]									
		5.500	6.000	6.500	7.000	7.500	8.000	8.500	9.000	9.500	10.000
150	0,05	275	300	325	350	375	400	425	450	475	500
100	0,15	825	900	975	1.050	1.125	1.200	1.275	1.350	1.425	1.500
60	0,25	1.375	1.500	1.625	1.750	1.875	2.000	2.125	2.250	2.375	2.500
46	0,35	1.925	2.100	2.275	2.450	2.625	2.800	2.975	3.150	3.325	3.500
< 46	0,45	2.475	2.700	2.925	3.150	3.375	3.600	3.825	4.050	4.275	4.500

Dressing feed [mm/min]

# TECHNICAL NOTES

## WORK SETTINGS FOR STATIONARY DRESSING TOOLS

WITH STRAIGHT HOLDING FIXTURE	WITH TILTED HOLDING FIXTURE	WHEN STRAIGHT DRESSING
<p>Diamantfliesen®</p> 		<p>Inclination is compensated by swivelling the blade in the holding fixture  <math>\alpha = 0..,30^\circ</math>                      or rigidly brazed</p>  <p>Vertical till  <math>\beta = 30^\circ</math></p>
<p>Igel®</p> 		<p>If the holding fixture is tilted, please state the angle of inclination <math>\alpha^\circ</math></p>  <p>Vertical</p>
<p>Pro-dress®</p> 		<p>If the holding fixture is tilted, please state the angle of inclination <math>\alpha^\circ</math></p>  <p>Vertical</p>
<p>Rondist 2096/5096</p> 		 <p>Vertical</p>
<p>Rondist 1008</p> 		 <p>Vertical or <math>\alpha = 30^\circ</math></p>
<p>Single point dresser</p> 		<p><math>\alpha = 5..,45^\circ</math></p>  <p>Vertical or <math>\alpha = 15^\circ</math> to main dressing direction</p>
<p>Profile diamond</p> 		<p><math>\alpha = 5..,10^\circ</math></p>

WORK SETTING FOR PROFILE DRESSING	EFFECTIVE CUTTING WIDTH $b_D$ [mm]	CONTACT RATIO $U_d$	DRESSING INFEEED AMOUNT $a_{ed}$ [mm]	DRESSING SIDE FEED $f_{ad}$ [mm/U]	OTHER NOTES
 <p><math>\beta = 30^\circ \dots 45^\circ</math></p>	$\sim 0,8 \cdot d_K$  $d_K =$ theoretical diameter of diamond grit	2 - 8	0,01 - 0,03	0,05 - 0,5	Slightly diagonal setting possible when dressing straight =Recutting effect =finer surface quality
			0,01 - 0,05	0,3 - 1,0	Because of the large number of active diamonds during dressing the dressing feed $f_{ad}$ and/or the feed rate $v_{fad}$ must be increased accordingly
			0,005 - 0,3	0,005 - 0,5	Because of the large number of active diamonds during dressing the dressing feed $f_{ad}$ and/or the feed rate $v_{fad}$ must be increased accordingly
	$\sim 0,8 \cdot d_K$ per active grit		0,01 - 0,05	0,3 - 1,0	Because of the four active diamonds the dressing feed $f_{ad}$ and/or the feed rate $v_{fad}$ must be increased accordingly
 <p><math>\beta = 30^\circ \dots 45^\circ</math></p>	$\sim 0,8 \cdot d_K$	2 - 8	0,01 - 0,03	0,05 - 0,5	
	According to the degree of wear	2 - 8	0,01 - 0,03	0,05 - 0,15	When sharpness deteriorates, rotate diamond insert approx. $60^\circ$ about its own axis, remount in good time. Do not allow wear flats to become larger than approx. $1 \text{ mm}^2$ Stop! Too late! <div style="display: flex; justify-content: space-around; margin-top: 5px;">    </div>
 <p><math>\beta = 30^\circ \dots 45^\circ</math></p>	According to the profile of the diamond (angle/radius)	2 - 8	0,01 - 0,02	0,03 - 0,10	Please observe the manufacturer's instructions for equipment and machines

# INFORMATION ON CHOOSING YOUR TOOL

Application		Centreless / through-feed grinding					Angular plunge / profile grinding			Straight plunge grinding		
		Designation of abrasives	All standard alumina (Al <sub>2</sub> O <sub>3</sub> )	Silicon carbide (SiC)	Quantum, SG, TG, XG, ES, Vortex, sintered alumina	Altos, Altos IPX, extruded alumina	Regulating wheel, rubber or vitrified bond	All standard aluminas (Al <sub>2</sub> O <sub>3</sub> )	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)	All standard aluminas (Al <sub>2</sub> O <sub>3</sub> )	Quantum, SG, TG, XG, ES, sintered aluminas
Dressing tool Recommended												
Diamond Flisesen®	page 55	Ti-Tan™			○	●			○		○	○
	page 55	Furioso™			●	○			○		○	●
	page 57	D25 – MCD needle blade dressers		○	○	○				●		
	page 59	D30 – CVD needle blade dressers	●		○						●	○
	page 60	D35 – CVD needle blade dressers						●	●		○	○
	page 61	Needle blade with natural diamond						○	○	○		
	page 62	Standard blade with diamond grit	○	●	○	○					○	○
Single point dressers	page 65	D12 – single point dresser with MCD needle										
	page 66	D30 – single point dresser with CVD needle										
	page 67	D53 – single point dresser with PCD plate					●					
	page 67	Profile diamond / ground Diaform chisel										
	page 70	Single point dresser with natural diamond					○					
	page 71	Rondist rotatable tools with diamond or CVD										
	page 72	PCD and CVD insert dressers	○		○	○						
Multipoint dressers	page 77	D21 – multi-point dressers with natural diamonds in 2 or 3 rows	○	○								
	page 78-82	Igel® and pro-dress multi-point dressers										

Grinding	Internal grinding / grinding wheels ≥ 500 mm			Internal grinding / grinding wheels < 500 mm			Flat / creep feed grinding			Profile grinding DIA-FORM equipment	Grinding wheels with very coarse or very fine grit, straight dressing		
	Silicon carbide (SiC)	All standard aluminas (Al <sub>2</sub> O <sub>3</sub> )	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)	All standard aluminas (Al <sub>2</sub> O <sub>3</sub> )	Quantum, SG, TG, XG, ES, sintered aluminas	Silicon carbide (SiC)	Vortex, all standard aluminas (Al <sub>2</sub> O <sub>3</sub> )	Altos, Altos IPX, sintered aluminas	Silicon carbide (SiC)	All conventional grinding wheels	All standard aluminas (Al <sub>2</sub> O <sub>3</sub> ), sintered aluminas	Silicon carbide (SiC)
			○					○	●				
			○					○	○				
	○		○	●				○	○	●			
		●	●					○	○		○		
	●	○	○	○				○	○	○		○	○
					○	○	●						
					●	●							
											●		
					○	○	○						
					○	○	○	○	○				
					○	○		○	○				
												●	●

- First choice
- Second choice

# CHECKLIST

## FOR STATIONARY DRESSING TOOLS

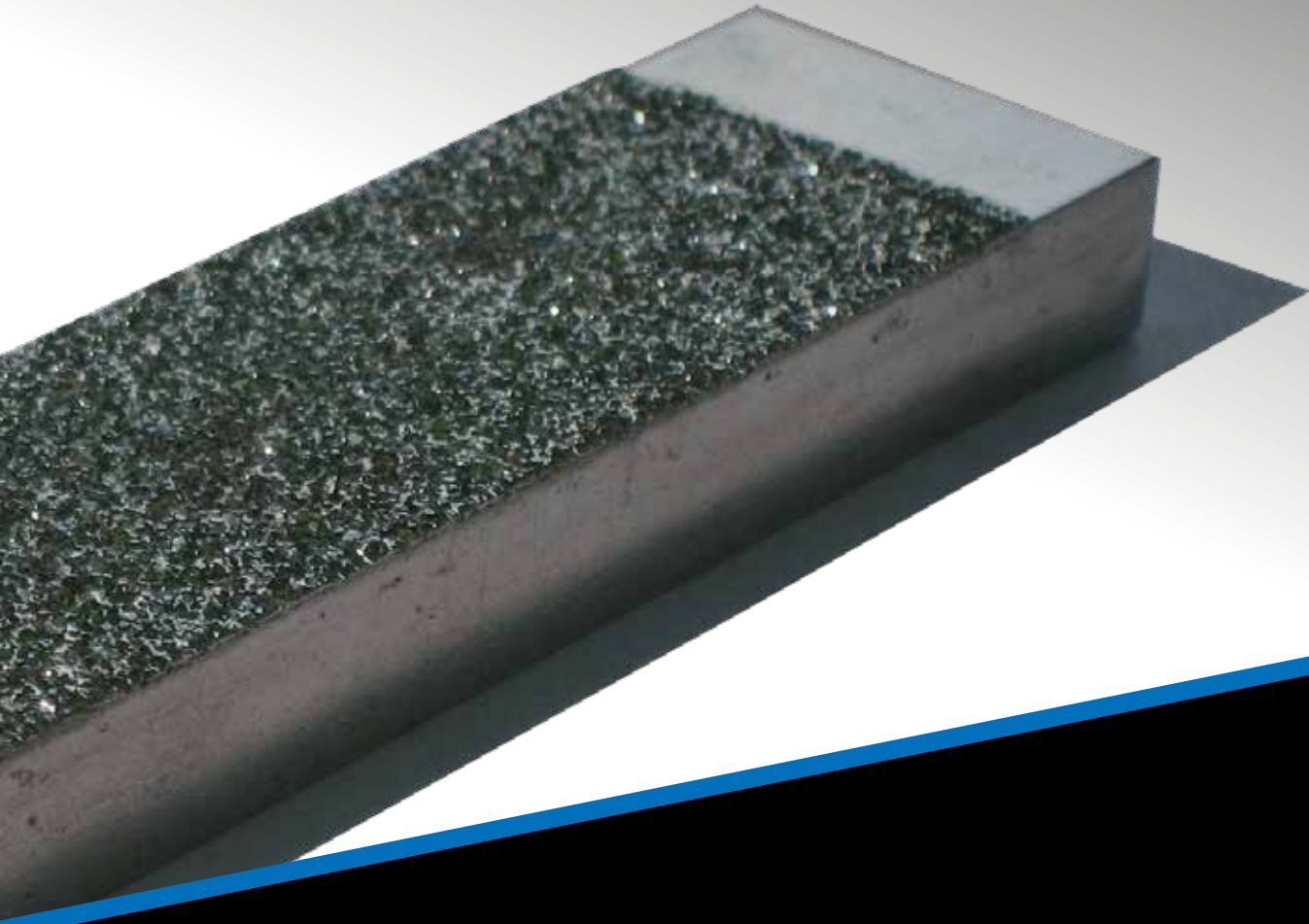
<b>COMPANY CUSTOMER NO.:</b>			
<b>1. WORKPIECE</b>	1.1 Drawing of workpiece		
	1.2 Workpiece material		
	1.3 Surface finish required	$R_a, R_t, R_z$	
<b>2. MACHINE</b>	2.1 Manufacturer		
	2.2 Model/type		
	2.3 Grinding process	Angular plunge grinding <input type="checkbox"/>	Straight plunge grinding <input type="checkbox"/>
	2.4 Cooling lubricant		
<b>3. GRINDING WHEEL</b>	3.1 Dimensions	mm	
	3.2 Specification		
	3.3 Manufacturer		
<b>4. DIAMOND DRESSER IN USE</b>	4.1 Designation		
	4.2 Dimensions	mm	
	4.3 Specification		
<b>5. DRESSING PROCESS</b>	5.1 Straight dressing	Circumferential <input type="checkbox"/>	On the face <input type="checkbox"/>
	5.2 Copy dressing / profile dressing		
<b>6. CURRENT DRESSING INSERT DATA</b>	6.1 Grinding wheel cutting speed during dressing	$v_{sd} =$	m/s
	6.2 Dressing infeed/ stroke	$a_{ed} =$	mm
	6.2 Dressing infeed/ stroke	$f_{ad} =$	mm
<b>7. REQUIREMENT OR PROBLEM</b>	$vf_{ad} =$	mm/min	



**NORTON**

SAINT-GOBAIN

**WINTER**



# ANCILLARY DRESSERS

## **DRESSING TOOLS FOR VITRIFIED BONDED GRINDING TOOLS**

91

## **DRESSING TOOLS FOR RESIN-BONDED GRINDING WHEELS**

92

Electroplated and sintered metal bond dressing tools

92

## **DRESSING TOOLS FOR DIAMOND AND CBN GRINDING WHEELS**

93

Norton Winter dressing unit

93

Cleaning and sharpening stones

93

## **MANUAL DRESSING TOOLS**

94

D20 manual dressing tool with natural diamond in an electroplated bond

94

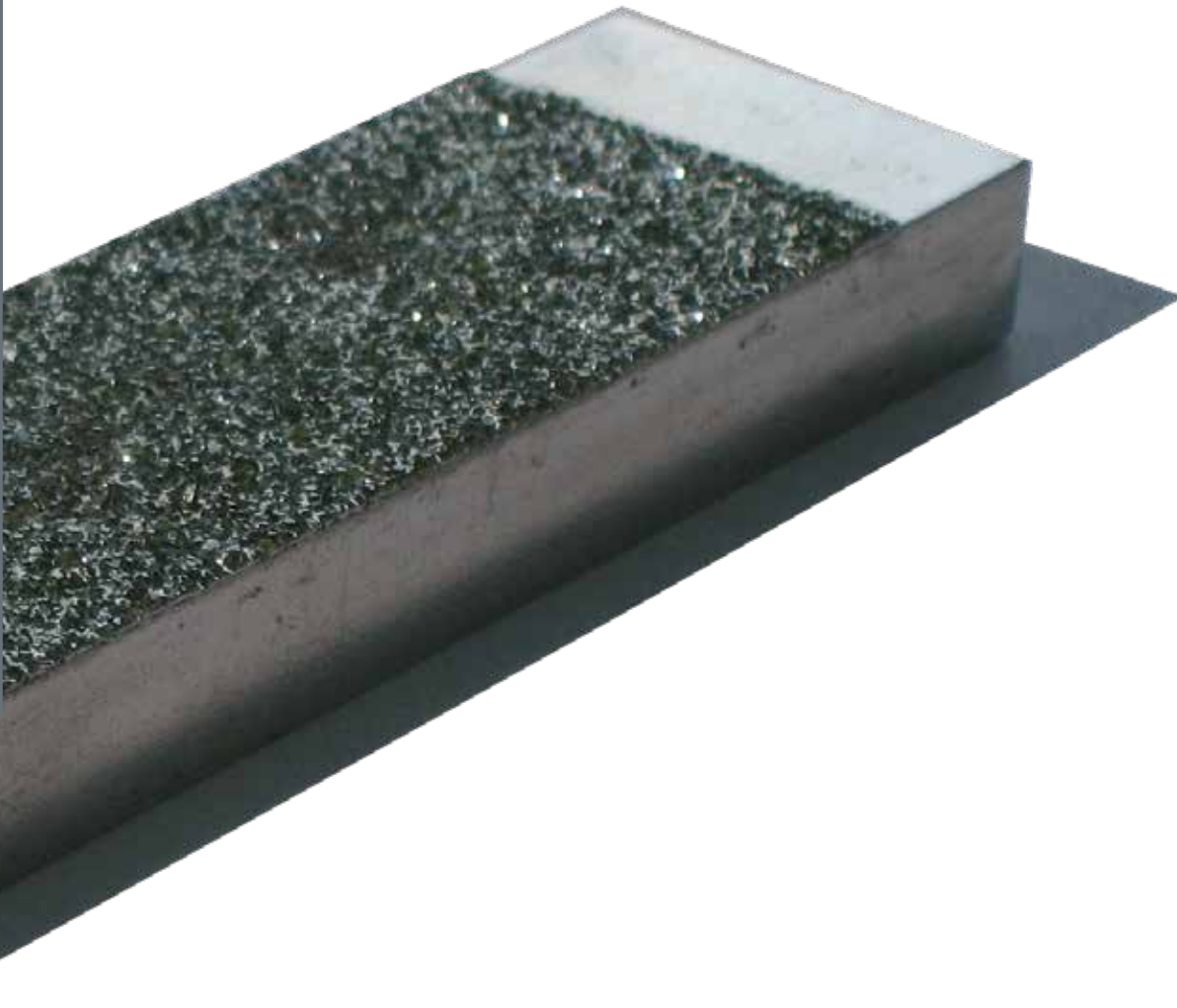
Multigrit manual dressing tool with natural diamond in a sintered metal bond

95

## ANCILLARY DRESSERS

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

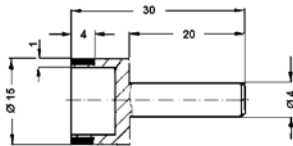
We offer an appropriate dressing solution for every application – from the dressing tool to the dressing unit. Most standard dressing tools are kept in stock and are available immediately. This chapter includes details of rotary dressing cups for internal grinding, sharpening stones for subsequent sharpening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



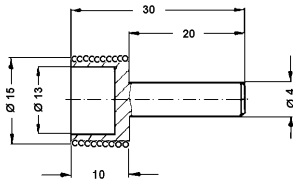
# DRESSING TOOLS FOR VITRIFIED BONDED GRINDING TOOLS

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

SHAPE	D	T	X	S	L	GRIT SIZE	BOND	CONCENTRATION	ORDER NUMBER
<b>DIAMOND DRESSING PINS FOR DRESSING VITRIFIED BONDED CBN GRINDING WHEELS</b>									

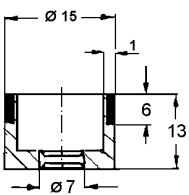


4BZ 07B	15	4	1	4	30	D301	BZ 387,1	C135	66260100343
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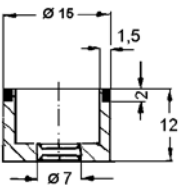


50S 07B	15	10		4	30	D426	G825	S33	60157644198
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SHAPE	D	T	X	H	GRIT SIZE	BOND	CONCENTRATION	ORDER NUMBER	
<b>DIAMOND DRESSING CUPS FOR DRESSING VITRIFIED BONDED CBN GRINDING WHEELS</b>									



2BZ6A9	15	6	1	7	D301	BZ 387	C135	66260379145
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1BZ6A9	15	2	1,5	7	D213	BZ 387,1	C135	66260112087
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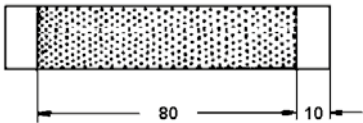
All dimensions in mm

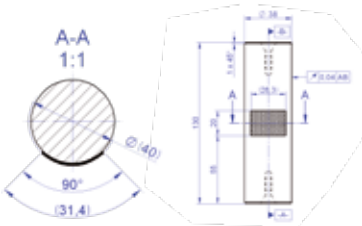
Minimum order quantity for articles not in stock: 1 item, delivery: 6 weeks

# DRESSING TOOLS FOR RESIN BONDED GRINDING WHEELS

## ELECTROPLATED AND SINTERED METAL BOND DRESSING TOOLS

Norton 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.

	APPLICATION	SHAPE	SPECIFICATION	ORDER NUMBER
<b>NORTON WINTER DRESSING BLOCK</b>				
	For truing resin bond diamond and cBN grinding wheels on surface grinders. If used with coolant, subsequent sharpening with WA150GV sharpening stone or Norton WINTER stone No. 2 is required.	1S09H-80-20-8	D301 / S11	66260134287 <sup>1)</sup>

	APPLICATION	SHAPE	SPECIFICATION	ORDER NUMBER
<b>NORTON WINTER DRESSING CYLINDER</b>				
	For dressing resin bond diamond and cBN grinding wheels on cylindrical grinders. If used with coolant, subsequent sharpening with WA150GV sharpening stone or Norton WINTER stone No. 2 is required.	1S44B-40-20	D301 / S11	60157642712

All dimensions in mm

<sup>1)</sup> Available ex stock

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

# DRESSING TOOLS FOR DIAMOND AND CBN GRINDING WHEELS

## NORTON WINTER DRESSING UNIT

This brake-controlled dressing unit, for dressing diamond and cBN grinding wheels, comes complete with two SiC wheels, one 37 C60-MV and one 39 C802-15V

Order no. 66260195821





REPLACEMENT GRINDING WHEELS	FOR GRIT SIZES	ORDER NUMBER
Norton WINTER dressing unit		69014151167
39C60-MV	D64 - D126	66253051624 <sup>1)</sup>
39C802-IV	≤ D64	66253052726 <sup>1)</sup>
Accessories	1 set consisting of: 3 brake segments, 3 springs and 3 screws	66260274670 <sup>1)</sup>

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

<sup>1)</sup> Available ex stock

## CLEANING AND SHARPENING STONES

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

CLEANING AND SHARPENING STONES		ORDER NUMBER
Stone WA150GV (25×25×150)	Cleaning and sharpening vitrified and resin bond grinding wheels ≥ D54, recommended for sharpening Q-Flute2	69936621643 <sup>1)</sup>
Stone WA220GV (25×25×150)	Cleaning and sharpening vitrified and resin bond grinding wheels	69936621630 <sup>1)</sup>
Stone WA320GV (25×25×150)	Cleaning and sharpening vitrified and resin bond grinding wheels ≤ D46	69936651380 <sup>1)</sup>

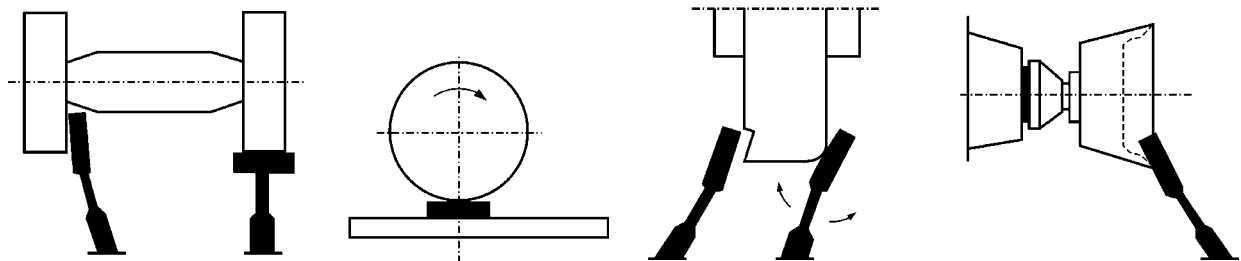
All dimensions in mm

<sup>1)</sup> Available ex stock

# 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 1.000 mm in diameter with grain sizes of 36–120 mesh.

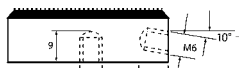

Examples showing the use of the straight and side versions of our manual dressing tools



## D20 MANUAL DRESSING TOOL WITH NATURAL DIAMOND IN AN ELECTROPLATED BOND

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

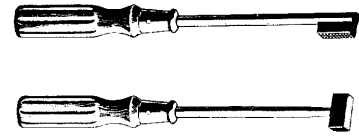


	TYPE	SEGMENT DIMENSIONS		DESIGN		DIAMOND CONTENT [ct]	ORDER NUMBER
	D 20	L	B	LATERAL	STRAIGHT		
	2001	45	12	x	x	5	66260139141 <sup>11</sup>
	2002	20	12	x	x	2,2	66260195353

All dimensions in mm

<sup>11</sup> Available ex stock

# MULTIGRIT MANUAL DRESSING TOOL WITH NATURAL DIAMOND IN A SINTERED METAL BOND



Models Igel-P (side-mounted) and Igel-T (end-mounted) have a fixed handle.

They are suitable for all alumina grinding wheels.

TYPE	SEGMENT DIMENSIONS		DESIGN	DIAMOND CONTENT [ct]	ORDER NUMBER
	L	B			
Igel-P	25	7	lateral	1,3	66260134089 <sup>1)</sup>
Igel-T	25	7	straight	1,3	66260133388

All dimensions in mm

<sup>1)</sup> Available ex stock





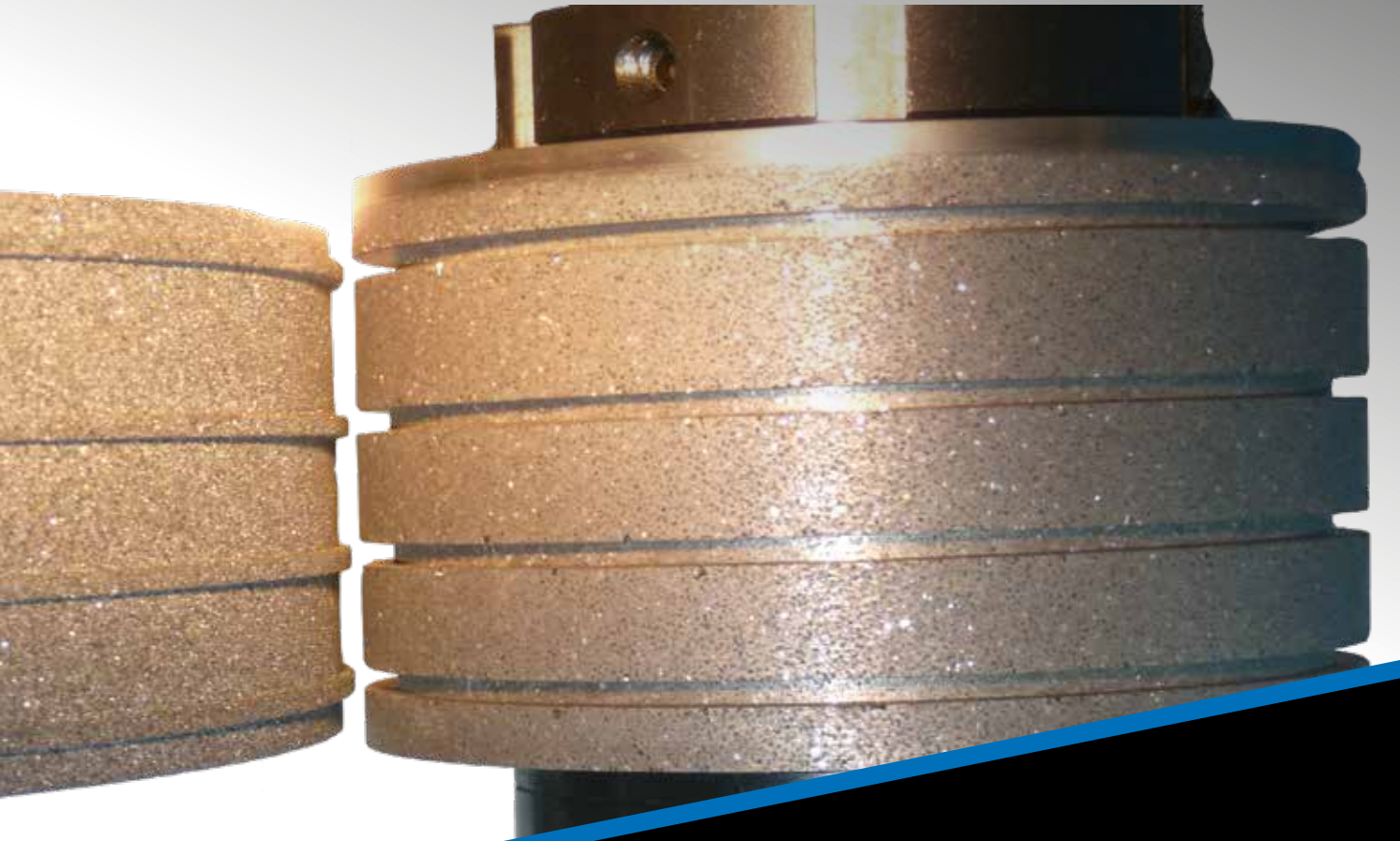




**NORTON**

SAINT-GOBAIN

# WINTER



## DRESSING PARAMETERS

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Speed ratio, $q_d$ , of rotary dressing tools	102		

## DRESSING PARAMETERS

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



# CONDITIONING

DRESSING		CLEANING
PROFILING	SHARPENING	
Macrostructure	Microstructure	Microstructure
Imparting running truth and correct wheel shape	Producing the wheel topography	Elimination of chips from the chip spaces
Intentional modification of grit and bond	Intentional setting back of the bond	No intention to modify the grinding wheel

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

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

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

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

## CHARACTERISTICS OF CONDITIONING PROCESSES

SYSTEM COMPONENT	PROCESS VARIABLES	TARGETS
Grinding wheel	Dressing forces	Grinding wheel profile
Dressing tool	Structure-borne noise signal	Grinding wheel running truth
Coolant conditions	Power from grinding and dressing spindles	Active surface roughness of the grinding wheel
Dressing parameters: - Overlap ratio (CNC) - Speed ratio - Grinding wheel speed - Infeed		Dressing wear ratio Workpiece quality

# PROCESS PARAMETERS

## INFEED $a_{ed}$ WHEN DRESSING WITH STATIONARY DRESSERS AND CNC DRESSING DISCS

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

### Dressing infeeds for conventional grinding wheels:

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

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

### Dressing infeed for cBN grinding wheels with vitrified bonds:

Infeed  $a_{ed}$  per dressing pass: 1  $\mu\text{m}$  – 3  $\mu\text{m}$

Maximum dressing amount  $a_{ed\ tot}$ : No more than 10% of the average grit diameter of the grinding wheel

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

### EXAMPLE USING VITRIFIED CBN GRINDING WHEELS

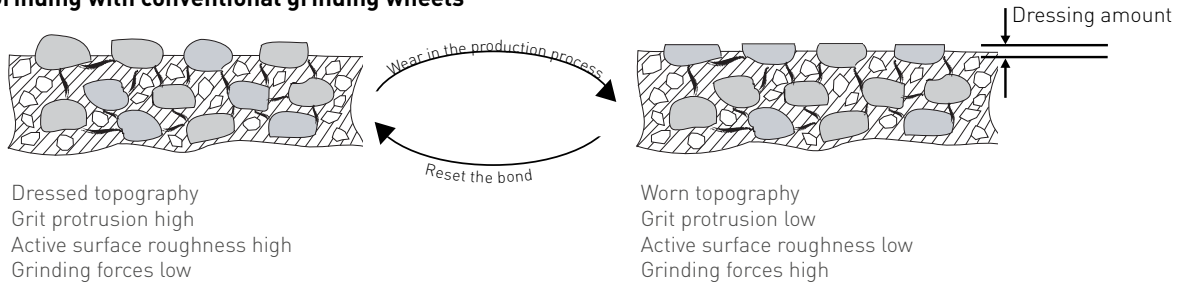
B126 indicates an average grit diameter of the grinding wheel of 118  $\mu\text{m}$ , so infeed  $a_{ed\ tot}$  will be 10  $\mu\text{m}$  – 12  $\mu\text{m}$

#### General notes:

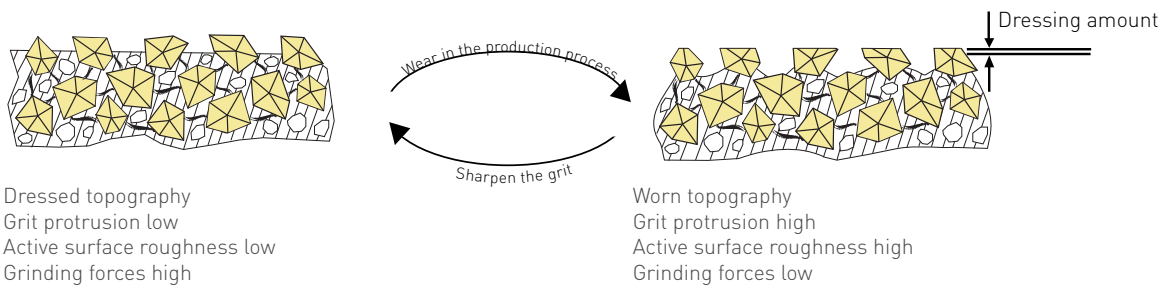
- Avoid dressing passes without infeed  $a_{ed}$
- Contact sensors are needed for accurate control and economics
- Ensure that suitable coolant is used

**THERE IS A FUNDAMENTAL DIFFERENCE BETWEEN DRESSING REQUIREMENTS NEEDED FOR CONVENTIONAL GRINDING WHEELS AND CBN GRINDING WHEELS WITH A VITRIFIED BOND:**

**Grinding with conventional grinding wheels**



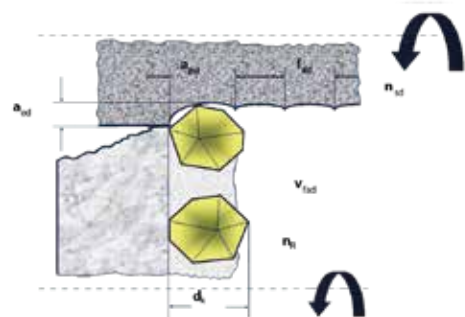
**Grinding with vitrified cBN grinding wheels**



**OVERLAP RATIO,  $U_D$ , FOR STATIONARY AND CNC DRESSING TOOLS**

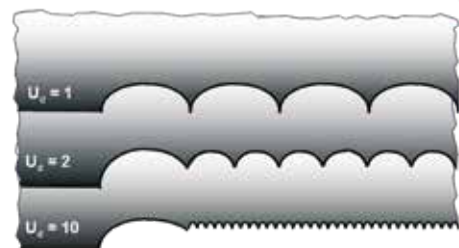
In addition to the geometric and dimensional accuracy of a grinding wheel, the required active surface roughness,  $R_{ts}$ , plays an important role. It defines the surface finish of the ground workpiece. Both CNC dressing tools and stationary dressing tools are driven over the grinding wheel profile to be dressed with an axial feed,  $f_{ad}$ . One of the advantages of CNC dressing is that different feed rates can be used on different sections of profile. Flat surfaces can be dressed with a smaller overlap ratio,  $U_d$ , in order to prevent burning in these areas. The overlap ratio,  $U_d$ , is defined as the number of revolutions executed by a grinding wheel, during which the dressing tool has traversed by its exact contact width,  $a_{pd}$ .

$U_D$	$= a_{pd} / f_{ad}$ $\approx d_k / [v_{fad} / n_{sd}]$ $\approx d_k / [v_{fad} * d_s * n / (v_{cd} * 60,000)]$
$U_D$	[ - ] : Overlap ratio
$A_{PD}$	[mm] : Contact width of dressing tool
$D_K$	[mm] : Grit size of dressing tool
$D_S$	[mm] : Diameter of grinding wheel
$F_{AD}$	[mm] : Axial feed for each grinding wheel revolution
$N_{SD}$	[rpm] : Grinding wheel speed
$V_{CD}$	[m/s] : Cutting speed while dressing
$V_{FAD}$	[mm/min] : Axial infeed speed while dressing



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

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



## INFEEED, $a_{ed}$ , 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 conventional grinding wheels:**

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

Total infeed,  $a_{ed\ tot}$ , for sintered alumina grinding wheels: 10  $\mu\text{m}$  – 20  $\mu\text{m}$ , 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.

Recommended infeed per wheel  
rev. = 0,7~1,0  $\mu\text{m}/\text{rev}$ .



## SPEED RATIO, $q_d$ , OF ROTARY DRESSING TOOLS

The speed ratio,  $q_d$ , ( $V_R/V_S$ ) 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: - 0,2 ...- 0,5

**Profile roller dresser**

Uni-directional: +0,3 ...+0,8

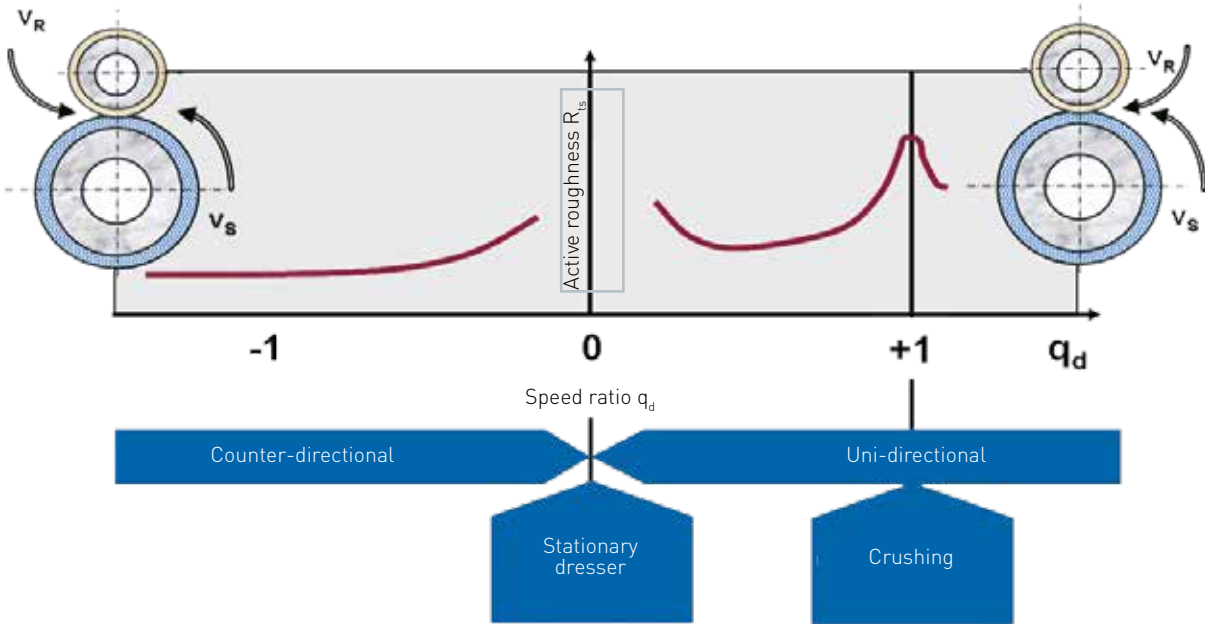
Counter-directional: - 0,2 ...- 0,5

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

Uni-directional: +0,6 ...+0,9

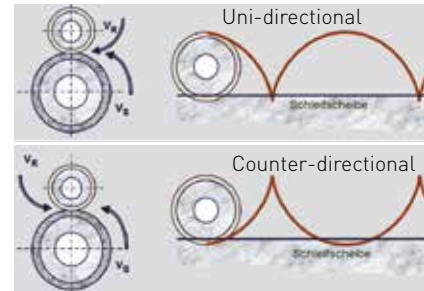
**ATTENTION**

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



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

Dressing speed ratio	$q_d = \frac{v_r}{v_{sd}}$
Circumferential speed of the roller dresser	$v_r$
Circumferential speed of the grinding wheel when dressing	$v_{sd}$
Dressing speed ratio	$q_d$
> 0:	Uni-directional
= 1:	Crushing
= 0:	Stationary dresser
< 0:	Counter-directional



**UNI-DIRECTIONAL DRESSING:**

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

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

**COUNTER-DIRECTIONAL DRESSING:**

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

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

**NOTES**

1. Wherever possible, dress at grinding speed to prevent dynamic imbalance  $v_c = v_{cd}$

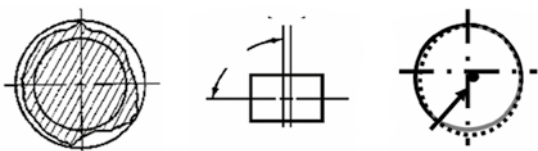
2. Avoid ratios that are whole numbers  $n_s : n_d$

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

Radial run-out

Axial run-out

Imbalance



# GENERAL

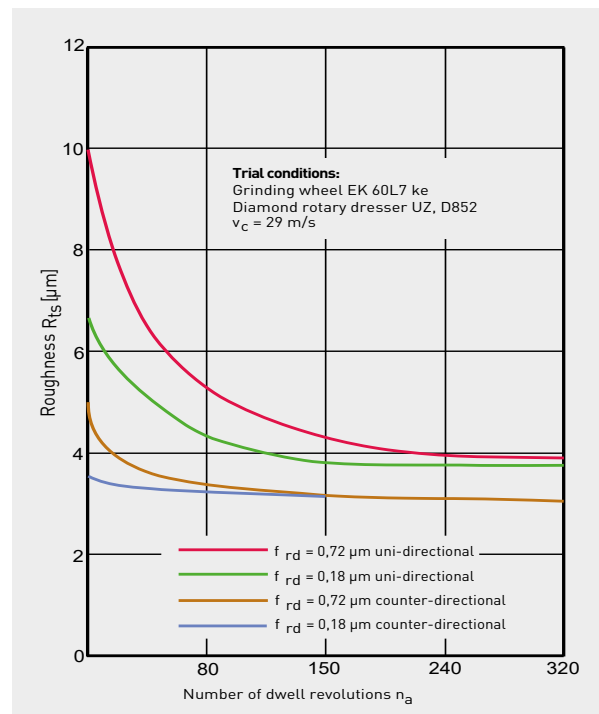
## OTHER INFLUENCES ON ACTIVE SURFACE ROUGHNESS AND WORKPIECE SURFACE FINISH WHEN USING PROFILE ROLLER DRESSERS

### DWELL REVOLUTION

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

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

Effect of the number of dwell revolutions on active surface roughness according to G. Pahlitzsch and R. Schmidt <sup>1)</sup>



### 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.

<sup>1)</sup> G. Pahlitzsch and R. Schmidt „Wirkung von Korngröße und Konzentration beim Abrichten von Schleifscheiben mit diamantbestückten Rollen“



# CONTACT DETECTION

A high-precision dressing spindle is required when a form roll is used to dress vitrified cBN or diamond grinding wheels. A contact detection device monitors the point at which the dressing disc touches the grinding wheel and supervises the complete dressing cycle.

Contactless measurement using noise signals transmitted through the machine structure and subsequently displayed on the monitor guarantees minimum loss of the grinding wheel coating and retention of the chip space.

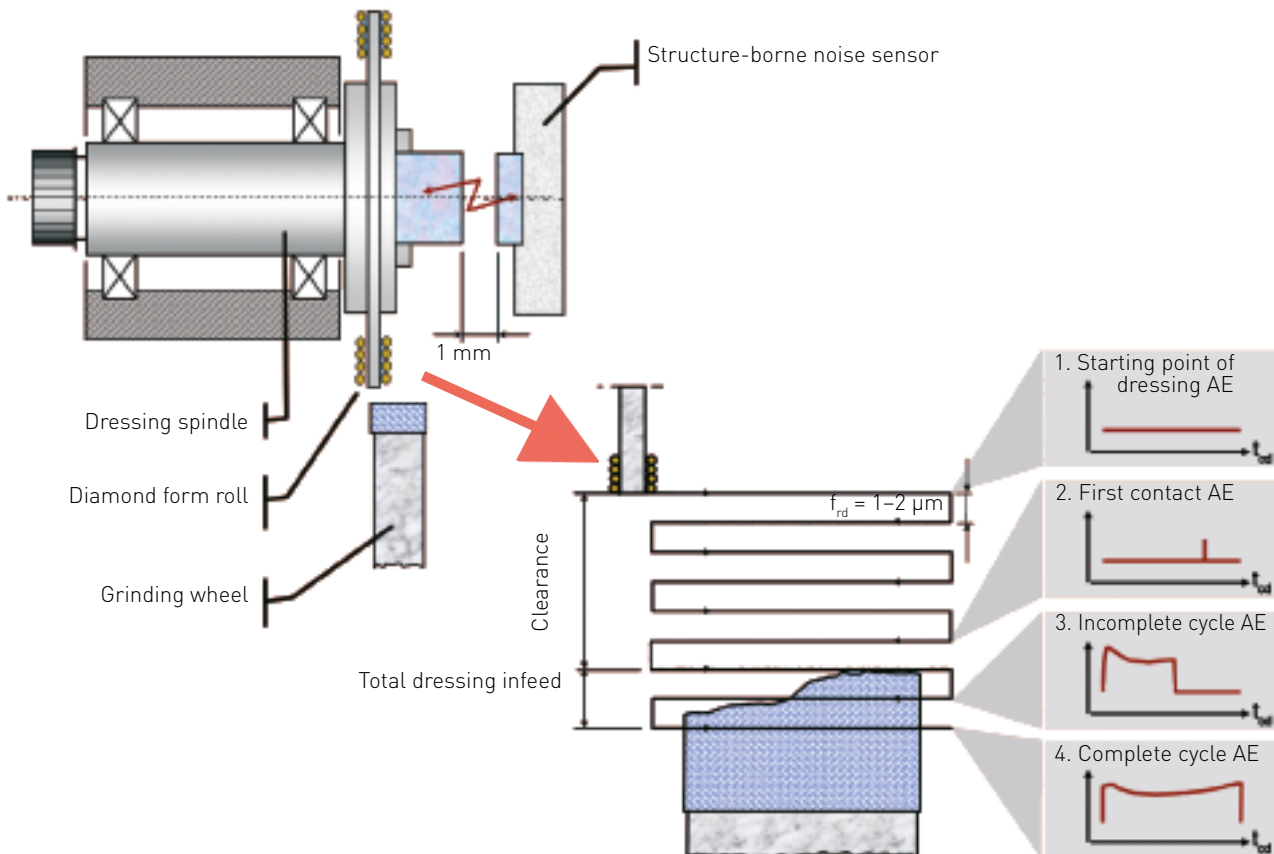
Minimizing the amount of dressing means that tool costs are markedly reduced and guarantees a high degree of process reliability together with a continuously controlled dressing and grinding process.



Source: Dittel

## ADVANTAGES OF CONTACT DETECTION:

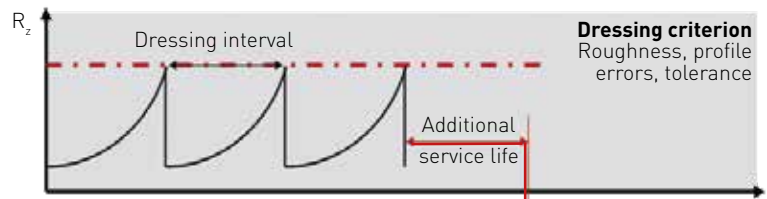
- Grinding processes are displayed
- Grinding processes are optimized
- 'Dead times' are identified
- Cycle times are reduced
- Tool life is prolonged
- Weak points are analyzed



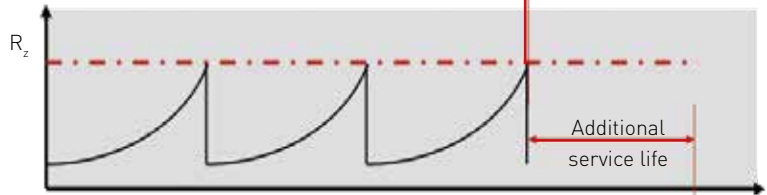
# GENERAL

## OPTIMIZED DRESSING PROCESS

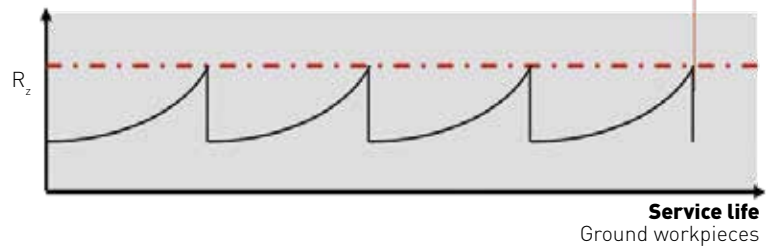
Initial process



Optimized grinding wheel  
Extended dressing cycles

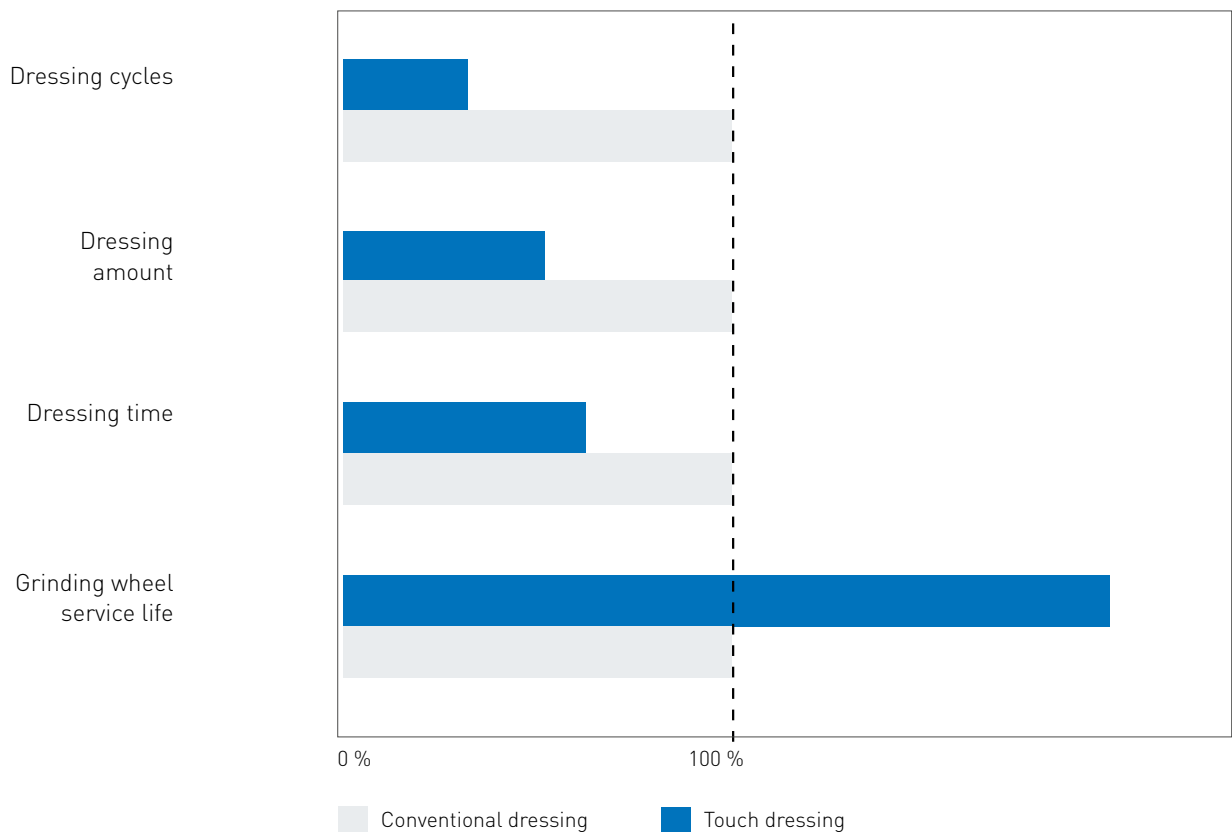


By using contact detection optimized dressing results in a reduced dressing infeed and prolongs the working life of the grinding wheel



## 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.





**NORTON**

SAINT-GOBAIN

# WINTER



# TECHNICAL INFORMATION

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## TECHNICAL INFORMATION

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

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

## SERVICE

Competition is keen, and cost pressures are acute. To improve productivity and technical capability, you need a supplier who co-operates efficiently. Norton 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 Norton 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

Norton 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.**

### NORTON 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.



## MAKE ASSURED, INFORMED, & FAST DECISIONS WHILE GRINDING

### PROCESS MONITORING AND DIAGNOSTIC SYSTEM

The new Norton 4Sight process monitoring and diagnostic system allows you to efficiently and cost effectively monitor the performance and productivity of your grinding process. Real-time data gathered through the Norton 4Sight system will provide you with the insights you need to optimize your process for improved operating performance, wheel life, work piece quality, and system productivity. With instant notifications, real-time dashboards and historical analytics reporting, the Norton 4Sight system can help you grind smartly and remotely. No installation on internal IT infrastructure is required, the Norton 4Sight system operates simply with additional ISP or cellular support.

Turn your machine into an Industry 4.0 smart grinding system and let the Norton 4Sight system put all of the data you need at your fingertips.

### KEY INDUSTRIES

ALL PRECISION ENGINEERING MARKETS





## 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



## DIAMOND WEAR PART

Capitalising on the superior material properties offered by PCD (polycrystalline diamond) and in house design and manufacturing facilities, the Norton WINTER team are able to offer solutions for your grinding projects, maximising output with minimised rework and defects thanks to our Diamond Wear Parts portfolio.

### POTENTIAL IMPROVEMENTS

- Lower tool cost per piece thanks to the extreme low wear on PCD compared to tungsten carbide and other tool materials.
- Improved and stable grinding process.  
Over half friction compared to tungsten carbide.
- Higher quality and increased productivity.  
PCD allows higher forces and higher RPM on the work piece.
- Less down time due to fewer tool changes and less corrections and scrap.

### EXAMPLES OF TOOLS SUITABLE FOR PCD

- Centre points for cylindrical grinding.
- Measuring points and fingers.
- Centreless work rest blades for plunge grinding.
- Shoes and shoe systems in centreless grinding.
- Shoes in steady rests

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

DIAMOND			cBN		
CONCENTRATION	Carat / cm <sup>3</sup>	Volume %	Concentration	Carat / cm <sup>3</sup>	Volume %
C50	2,2	12,5	V120	2,09	12
C75	3,3	18,75	V180	3,13	18
C100	4,4	25	V240	4,18	24
C125	5,5	31,25	V300	5,22	30

These definitions are not applicable for single layer electroplated tools.

## CONDITIONING

Conditioning of a grinding wheel consists of dressing and cleaning:

DRESSING		CLEANING
PROFILING	SHARPENING	
Macrostructure	Microstructure	Microstructure
Imparting running truth and correct wheel shape	Producing the wheel topography	Elimination of chips from the chip spaces
Intentional modification of grit and bond	Intentional setting back of the bond	No intention to modify the grinding wheel

## 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 (Rosival) 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, quartz, 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 Norton WINTER brake-dressing device, CNC rotary dressers, diamond dressing sticks, rotary profile dressers, etc.

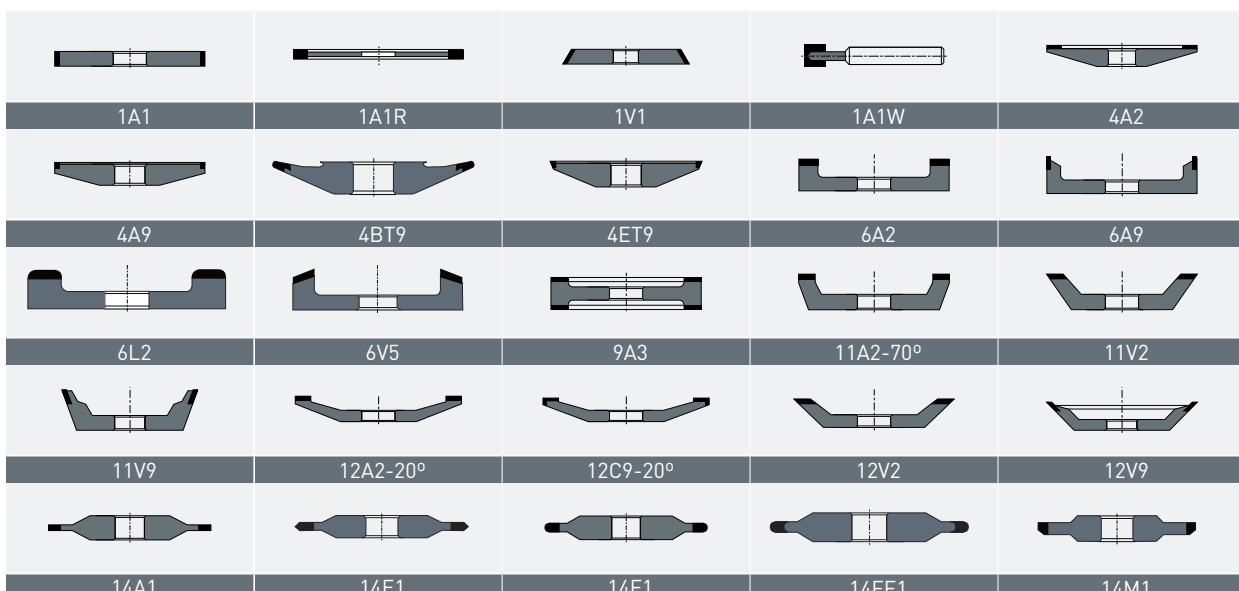
**Our engineers can offer advice to help you chose the best method for your application.**

## FEPA

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

## FEPA-SHAPES

These drawings show the most important grinding wheel geometries:



## GRINDING

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

## GRINDING RATIO (G-RATIO)

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

## GRINDING WHEEL BODIES

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

BODY MATERIAL TYPE	LABEL	VIBRATION ABSORPTION	HEAT TRANSMISSION	MECHANICAL STIFFNESS
Resin with metal fillers	H	medium	sufficient	good
Resin with non-metallic fillers	B or D	good	bad	satisfactory (not sufficient with thinwalled bodies)
Aluminium	A	bad	good	very good
Steel	E	bad	satisfactory	very good
Copper	C	bad	very good	very good
Composite material	CFK	good	bad	good

## GRIT SIZES

The 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.

FEPA GRIT SIZE D OR B	STANDARD [Mesh]	AVERAGE GRIT SIZE [ $\mu\text{m}$ ]	PARTICLES PER CT
1181	16/18	1100	60
1001	18/20	930	100
851	20/25	780	160
711	25/30	660	270
601	30/35	555	450
501	35/40	465	760
426	40/45	395	1200
356	45/50	330	2100
301	50/60	280	3500
251	60/70	233	6000
213	70/80	197	10000
181	80/100	167	16000
151	100/120	140	28000
126	120/140	118	46000
107	140/170	99	80000
91	170/200	83	135000
76	200/230	72	200000
64	230/270	63	300000
54	270/325	55	460000
46	325/400	47	750000
39	400/500	38	1400000
33	500/600	33	2100000

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

NORTON WINTER DIAMOND CLASSIFICATION	GRIT SIZE [µm]
D 25	40 - 60
D 20 C	34 - 45
D 20 B	25 - 37
D 20 A	20 - 30
D 15	8 - 25
D 15 C	15 - 25
D 15 B	10 - 20
D 15 A	8 - 15
D 10	6 - 10
D 7	5 - 10
D 5	3 - 7
D 3	2 - 5
D 1	0,5 - 2
D 0,7	0 - 1
D 0,25	0 - 0,5

## HARDNESS OF ABRASIVES

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

Moh's hardness: abrasion behaviour (measure of scratch resistance)

Rosival hardness: stock removal behaviour (measure of resistance to stock removal)

Vicker's Microhardness: indentation behaviour (resistance to penetration)

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

MATERIAL	MOH'S HARDNESS	ROSIWAL HARDNESS	VICKERS MICROHARDNESS (HV)
Diamond	10	140.000	10.000
cBN	9,9		9.000
Silicon carbide	9,6		2.600
Corundum	9	1.000	2.060
Quartz	7	120	1.120
Manganese	5	6,5	540
Gypsum	2	1,25	36
Talc	1	0,03	2,6

Diamond's stock removal resistance (Rosival 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  $\text{mm}^3/\text{s}$  and defines the volume of workpiece material ground per unit time (second).

The specific material removal rate,  $\text{MRR}'$  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.

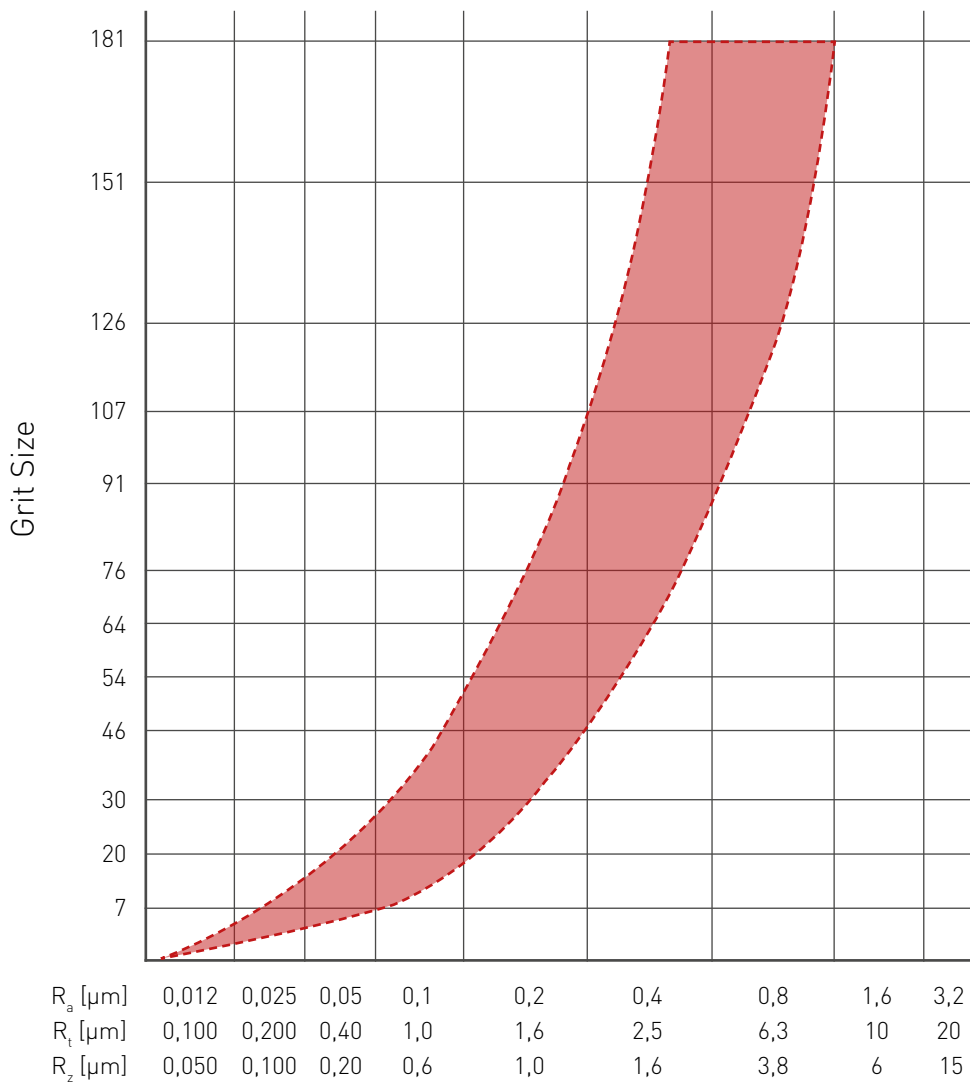
APPRAISAL CRITERION		CUTTING FORCE F $F = F(\dots)$	GRINDING RATIO G $G = F(\dots)$	ROUGHNESS $R_a$ $R_a = F(\dots)$	TEMPERATURE $\vartheta$ $\vartheta = F(\dots)$
INFLUENCING PARAMETERS					
Machine- and Operation Parameters	Cutting Speed $v_c$ (m/s)				
	Material Removal Rate $Q_w$ ( $\text{mm}^3/\text{s}$ )				
	Coolant (Oil Content)				
Grinding Wheel	Grit Size ( $\mu\text{m}$ )				
	Concentration (Carat/ $\text{cm}^3$ )				

# ROUGHNESS

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

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

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



## SPECIFICATION

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

**EXAMPLE:**

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

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

## SUPERABRASIVES

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

## WEAR EFFECTS ON DIAMOND AND CBN

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

Primarily, there are two main types of wear.

**MECHANICAL WEAR:**

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

**CHEMICAL AND THERMAL WEAR**

Carbon diffusion, graphitization, oxidation, and reaction with grinding fluids.

Diamond not only reacts with iron (above a certain threshold temperature), but also with chromium, vanadium and tungsten. cBN does not show chemical reaction with iron or other metals.

Therefore, cBN has proven to give better tool performance when machining, for example, high speed steel, although it is not as hard as diamond.

An outward sign of the occurrence of thermo-chemical wear is the rapid appearance of wear flats on the grains, when no grain chipping from mechanical wear is present.



NORTON

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WINTER

## 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 you sales engineer:**



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