NORTON
SAINT-GOBAIN

WINTER

Transforming surfaces ...and beyond

PRECISION TECHNOLOGY
TOOL GRINDING

SAINT-GOBAIN

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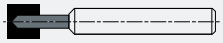

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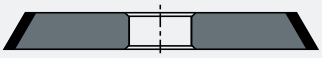

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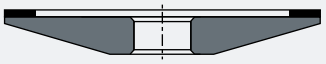

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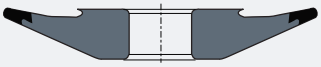

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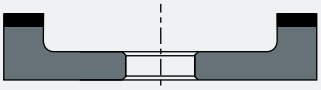

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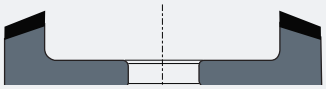

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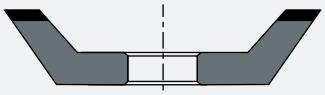

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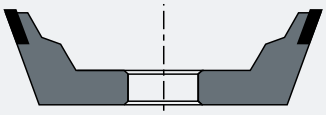

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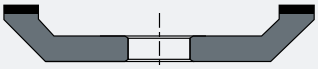

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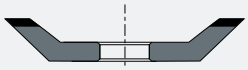

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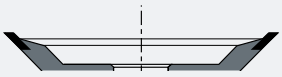

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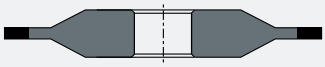

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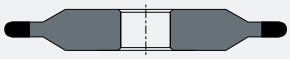

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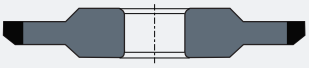

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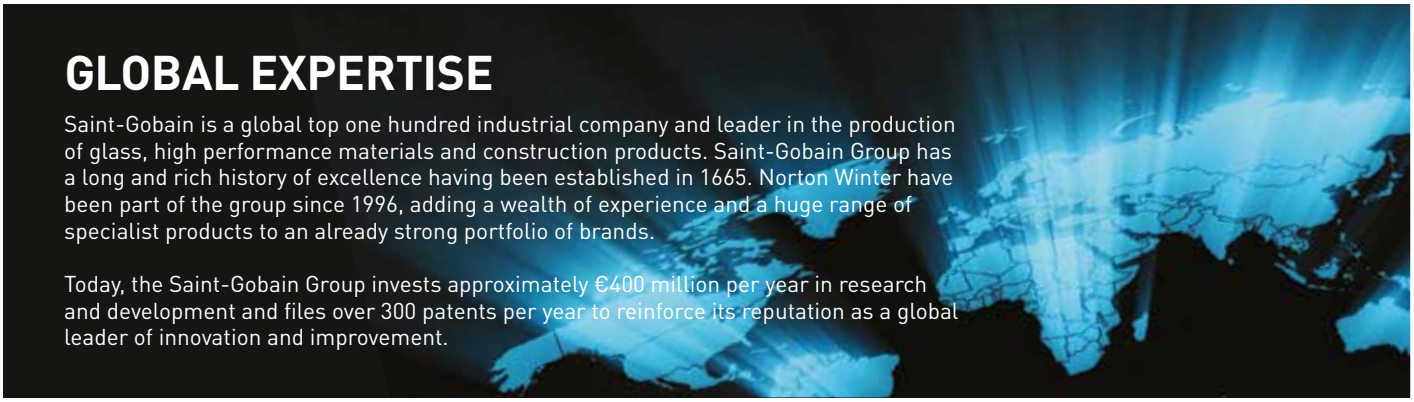
OUR CUSTOMER **CONNECTION**

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 10.000 people and is the only manufacturer to offer such a comprehensive range of abrasives and dressing tools in the industry.

Since 175 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.

NORTON WINTER

SAINT-GOBAIN

NEXT LEVEL GRINDING

Innovative solutions for a sustainable future.

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 175 years' experience, Norton Winter offers a performance package designed to generate cost savings through increased productivity, less down time, and better quality.

YOUR SAFETY IS **OUR PRIORITY**

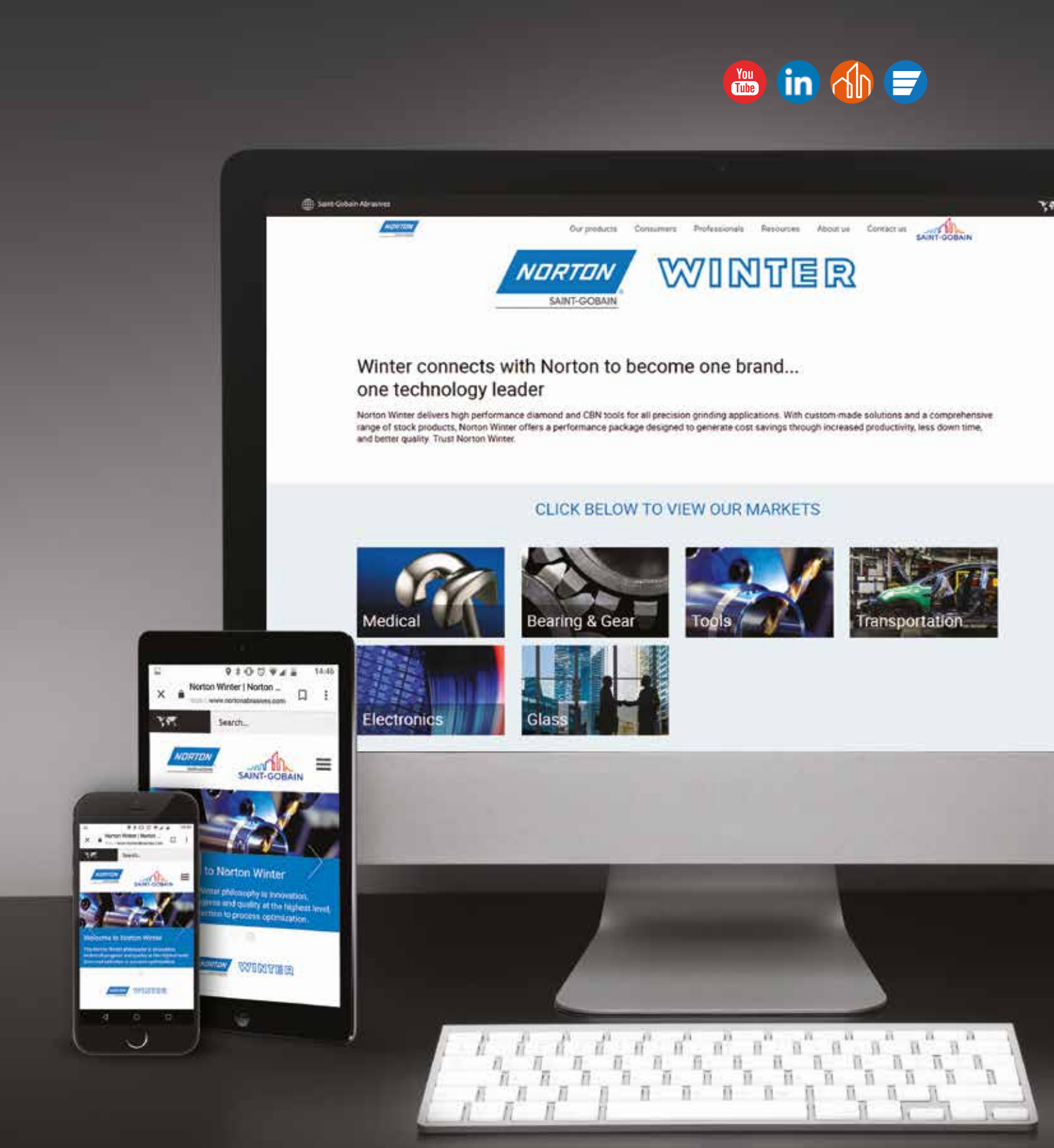
Your safety is our top priority and we understand that the nature of our customers' work presents inherent risks. To help minimise those risks, all Norton Winter products are manufactured in accordance with the most rigorous European and International health, safety and environmental regulations.

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.



DISCOVER MORE FROM OUR EXPERTS AT:

www.nortonabrasives.com

NORTON
SAINT-GOBAIN

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.

1847 **Ernst Winter**
Goldsmith and diamantaire founded his diamond tool workshop.

1872 **Winter in Hamburg**
The company establishes its first building in Hamburg.

1960s **Winter in Space**
Laser reflectors ground with Winter diamond tools enable the most accurate astronomic and geographic measurements.

1983 **Celebrities**
Helmut Schmidt (Federal Republic of Germany's former Chancellor) visits Winter and acts a "diamond maker".

2017 **Norton Winter**
Winter merges with abrasives giant Norton to form Norton Winter.

2022

175th anniversary of the Winter brand

Winter in Space

Posters and Brochures in the course of time

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

NORTON
SAINT-GOBAIN

WINTER INNOVATIONS

v-Prime

ROUND TOOLS

PCX PRIME

INNOVATIVE GRINDING TOOLS FOR PCB AND PCBN

FLUTE PRIME

HIGH PERFORMANCE GRINDING WHEELS FOR FLUTE GRINDING

DDS CUT

CNC CONTROLLED DRESSING OF BONDED & SUPER ABRASIVE GRINDING WHEELS

NORTON ALTOS X

NEW MICRO STRUCTURE FOR HIGHEST PERFORMANCE

PARADIGM

A PARADIGM SHIFT IN BONDED TECHNOLOGY

YOUR SINGLE SOURCE FOR GLOBAL GRINDING INNOVATIONS

NORTON
SAINT-GOBAIN
WINTER

ABRASIVE PRODUCTS FOR MACHINING ROUND TOOLS

ROUND TOOLS GENERAL INFORMATION

The product range for round tools is extensive. Different materials and tool geometries make various demands on the grinding tools used in manufacture.

Shorter grinding times, better suitability for automation and longer dressing intervals are required.
Specific grinding wheel characteristics such as edge stability and free-grinding behaviour have to be carefully balanced.

Information
Further information on applications and products can be found at
www.nortonabrasives.com

GENERAL INFORMATION

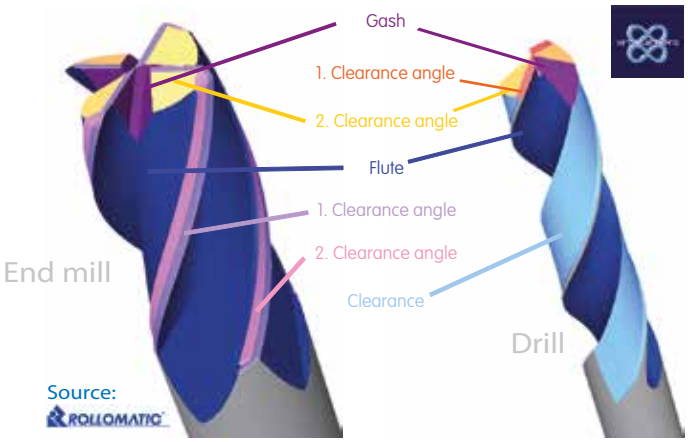
Drills, end mills, reamers, stepped tools and special-purpose tools in varying designs and geometries are described as round tools. Tool geometries are produced by grinding in successive production steps. A typical sequence starts with the preparation of the blank, (tools for trimming blanks can be found in the section for 'Diamond and cBN cut-off wheels') which is followed by flute grinding, gashing and grinding of the clearance angles.

FLUTE GRINDING | GASH | CLEARANCE ANGLE GRINDING

This section is structured according to the procedure described.

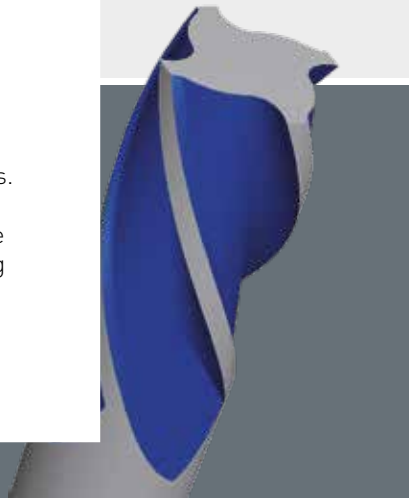
Here you see an example of an end mill and a drill. Generally, the same tool geometries are used for the individual process steps. Only flute grinding uses different grinding wheel designs.

While 1A1 and 1V1 grinding wheels are used primarily for end mills, profile grinding wheels such as 14F1 and similar (Norton Winter shape 700) are preferred for drill production.

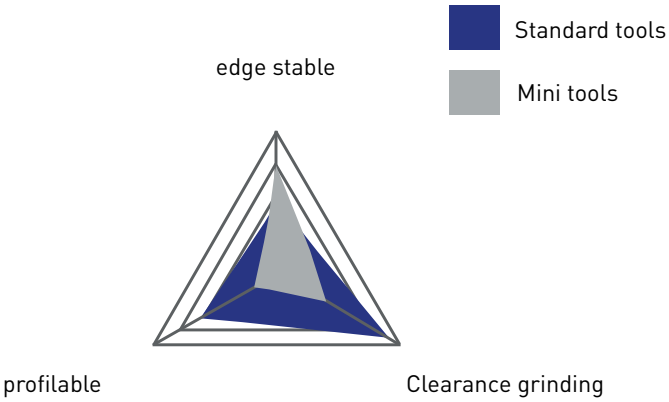


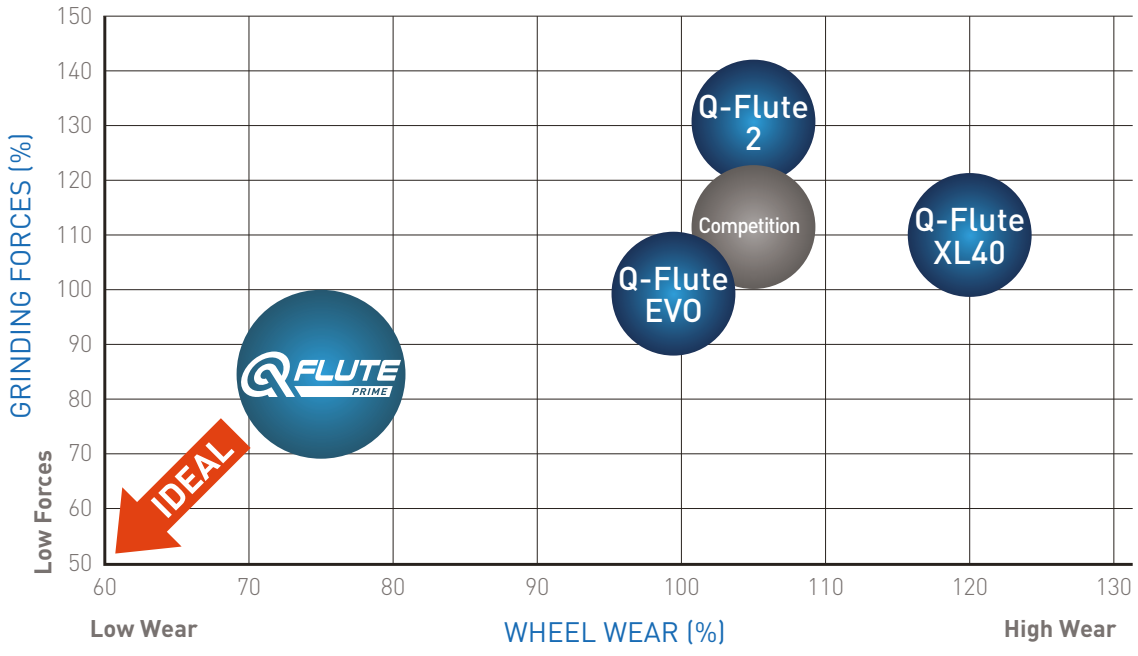
DIAMOND & CBN GRINDING WHEELS FOR FLUTE GRINDING

Flute grinding is the most time-consuming and thus most cost-intensive manufacturing step during drill and end mill production. It is necessary to optimise the machine and cooling lubricant systems as well as the abrasives. In recent years, machines have become more compact, spindle power has increased, axis paths have been reduced and machine controls have become more efficient. At the same time, Norton Winter has developed flute grinding tools which meet these increasing requirements and which now enable the improved machine capacity to deliver a higher and more economic output. Matched to the application and the system environment, innovative Norton Winter flute grinding wheels are always the best solution.



Grinding wheels in the Q-Flute range have proved to be particularly useful for standard tools.
The combination of excellent free-grinding behaviour and profile retention allows economic flute grinding with high feed rates. Q-Flute grinding wheels can also be dressed on the grinding machines.
Mini and micro tools require bond systems with exceptional edge stability. Norton Winter metal bonds and high-performance resin bonds are the number one choice here.





HIGH-PERFORMANCE FLUTE GRINDING

STOCK PROGRAMME Q-FLUTE EVO AND Q-FLUTE PRIME

The market's demand to have a comprehensive range of grinding tools available from stock, has grown steadily in recent years. In order to meet this market demand even better, we offer a stock programme of our current premium products Q-Flute EVO and Q-Flute PRIME. The aim is to be able to supply our customers with a much wider range of grinding wheel dimensions within the shortest possible time.

Norton Winter now has various dimensions of semi-finished parts in stock. These semi-finished parts can be finished into a variety of different finished products within a very short time after receipt of order.

The delivery time for all grinding wheel dimensions that can be produced from semi-finished parts is approx. 5 working days. This allows us to offer our customers maximum flexibility and the shortest possible delivery times.

In addition, Norton Winter offers a 60 % increased coating depth for 1A1 grinding wheels and thus significantly more abrasive layer for the money.

Q FLUTE EVO

Due to the trend towards ever smaller batch sizes and ever more demanding requirements in the machining of round tools the performance, efficiency and flexibility of the grinding tool are becoming more and more important. In order to meet these requirements, Norton Winter has developed the Q-Flute EVO as a highly flexible and powerful evolution of the well-known Q-Flute2 and XL.

Q-Flute EVO combines and improves the good features of Q-Flute² and Q-FLute XL40. This offers unique combination of free-grinding behaviour and profile stability.

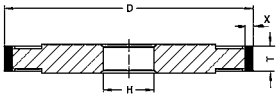
Q FLUTE PRIME

Q-Flute PRIME is the further development of Q-Flute EVO and the latest premium high-performance solution for flute grinding of round tools. Q-Flute PRIME is the solution for maximum increase in productivity. Compared to all previous specifications, it offers significantly better profile retention, as the grinding forces have been clearly reduced, as well as improved grinding quality (surface in the flute).

Q-Flute PRIME is showing the optimum combination of free grinding behaviour & edge stability.

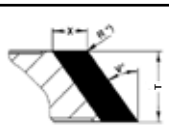
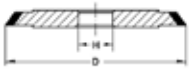
SPECIFICATION	APPLICATIONS
Q-Flute PRIME	Tungsten carbide, Oil and water based coolant
Q-Flute EVO	Tungsten carbide and HSS, Oil and water based coolant

SEMI FINISHED STOCK Q-FLUTE EVO AND Q-FLUTE PRIME

	SHAPE	D (mm)	T [mm]	X [mm]	H [mm]	GRITSIZE	BOND	BODY
	1A1	100° 125° 150	8° 10° 12° 15	16	≥20	D54	Q-Flute*	C

Delivery time approx. 5 working days after receipt of order

1V1 STOCK PROGRAMME

	SHAPE	D (mm)	T [mm]	X [mm]	V [°]	H [mm]	GRITSIZE	BOND	BODY
	1V1	100° 125° 150	8° 10° 12° 15	˙10 - 16 *	≤20	≥20	D54	Q-Flute*	C
									

Delivery time approx. 5 working days after receipt of order
*Usable layer depth depending on V[°]
Other shapes and dimensions on request.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
BZ480		Metal bond for mini and micro tools
µicro+ Sserie		Wear-resistant high-performance resin bonds for mini and micro tools
Q-Flute PRIME		High-performance resin bond for flute grinding
Q-FLute EVO		High-performance resin bond for flute grinding
K+920		More wear-resistant resin bond also dry grinding
K+921		More wear-resistant resin bond preferably wet grinding
K+1421R		Standard resin bond for CNC applications
K+1421N		Standard resin bond for CNC applications

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
MSS444		Metal bond for mini and micro tools
KSS920		Wear-resistant synthetic resin bond also dry sanding
KSS12N		Standard resin bond for CNC applications

STANDARD DIMENSIONS FOR FLUTE GRINDING

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Drills End mills Reamers	Tungsten carbide HSS Cermet	All CNC tool grinding machines	1A1, 1V1, 14F1 a.o. Ø 50...250 T 3...30 X 5...15	See table above	Oil Emulsion
Micro drills Mini end mills Burrs	Tungsten carbide HSS	Precision tool grinding machines for mini and micro tools	3A1, 4A9, 14V1 Ø 50...200 U 2...6 X 5...10	See table above	Oil Emulsion

Other dimensions on request

ROUND TOOLS FLUTE GRINDING

CASE STUDY NORTON WINTER Q-FLUTE EVO AND Q-FLUTE PRIME

CASE STUDY 1:

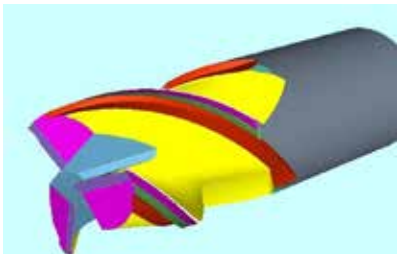
GRINDING WHEEL	D54 Q-Flute EVO
MACHINE	Walter Helitronic Vision
COOLANT	Oil
WORK PIECE	TC end mill Ø 12 mm
GRINDING PARAMETERS	
FEED RATE	160 mm/min
DEPTH OF CUT	3 mm
CUTTING SPEED	18 m/s
MRR'	8 $mm^3/mm \cdot s$

BENEFITS

- Easy Set up
- Also usage with low fee rates possible (Q'w≈3)
- Significant increase of productivity (Q'w≥6) by improved workpiece quality

CASE STUDY 2:

GRINDING WHEEL	D54 Q-Flute EVO
MACHINE	Walter Helitronic and Anca FX
COOLANT	Oil
WORK PIECE	TC end mill Ø 4...16 mm
GRINDING PARAMETERS	
FEED RATE	depending on depth of cut
DEPTH OF CUT	depending on work piece
CUTTING SPEED	18 m/s
MRR'	16 $mm^3/mm \cdot s$



BENEFITS

- Excellent self-sharpening thus no resharpening and less dressing
- Highly flexible for a wide range of products
- Replacing previously 4 different specifications

CASE STUDY 3

GRINDING WHEEL	D54 Q-Flute PRIME
MACHINE	Rollomatic Grindsmart 629XW
COOLANT	Oil
WORK PIECE	TC end mill Ø 10 mm
GRINDING PARAMETERS	
FEED RATE	200 mm/min
DEPTH OF CUT	3.5 mm
CUTTING SPEED	18 m/s
MRR'	11.6 $mm^3/mm \cdot s$
PARAMETER FLUTE POLISHING	
FEED RATE	v_f = 180 mm/min
INFEED	a_e = 0.05...0.1mm
CUTTING SPEED	v_c = 20 m/s

BENEFITS

- 40 % reduced spindle load
- 30 % lower cycle time
- + 100 % life time
- Polishing 3x faster
- Perfect cutting edge and surface quality

PROCESS PARAMETERS FOR FLUTE GRINDING OF TUNGSTEN CARBIDE AND HSS TOOLS (Q'_w)

Recommended operating parameters

Feed rate v_f [mm/min]

Infeed a_e [mm]	30	40	50	60	70	80	90	100	120	140	160	180	200	220	240	260	280	300
2.0	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	4.0	4.7	5.3	6.0	6.7	7.3	8.0	8.7	9.3	10.0
2.2	1.1	1.5	1.8	2.2	2.6	2.9	3.3	3.7	4.4	5.1	5.9	6.6	7.3	8.1	8.8	9.5	10.3	11.0
2.4	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2	12.0
2.6	1.3	1.7	2.2	2.6	3.0	3.5	3.9	4.3	5.2	6.1	6.9	7.8	8.7	9.5	10.4	11.3	12.1	13.0
2.8	1.4	1.9	2.3	2.8	3.3	3.7	4.2	4.7	5.6	6.5	7.5	8.4	9.3	10.3	11.2	12.1	13.1	14.0
3.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
3.2	1.6	2.1	2.7	3.2	3.7	4.3	4.8	5.3	6.4	7.5	8.5	9.6	10.7	11.7	12.8	13.9	14.9	16.0
3.4	1.7	2.3	2.8	3.4	4.0	4.5	5.1	5.7	6.8	7.9	9.1	10.2	11.3	12.5	13.6	14.7	15.9	17.0
3.6	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	7.2	8.4	9.6	10.8	12.0	13.2	14.4	15.6	16.8	18.0
3.8	1.9	2,5	3.2	3.8	4.4	5.1	5.7	6.3	7.6	8.9	10.1	11.4	12.7	13.9	15.2	16.5	17.7	19.0
4.0	2.0	2.7	3.3	4.0	4.7	5.3	6.0	6.7	8.0	9.3	10.7	12.0	13.3	14.7	16.0	17.3	18.7	20.0
4.2	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	8,4	9.8	11.2	12.6	14.0	15.4	16.8	18.2	19.6	21.0
4.4	2.2	2.9	3.7	4.4	5.1	5.9	6.6	7.3	8.8	10.3	11.7	13.2	14.7	16.1	17.6	19.1	20.5	22.0
4.6	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.7	9.2	10.7	12.3	13.8	15.3	16.9	18.4	19.9	21.5	23.0
4.8	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	9.6	11.2	12.8	14.4	16.0	17.6	19.2	20.8	22.4	24.0
5.0	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	10.0	11.7	13.3	15.0	16.7	18,3	20.0	21.7	23.3	25.0

Potential of improvements

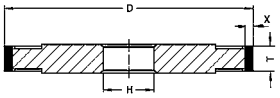
Minimum Q'_w — 3 FLUTE EVO

Minimum Q_w — Q FLUTE PRIME

The feed rates stated are guidelines only and apply to both diamond and cBN tools. Feed rates have to be adjusted for small workpiece diameters, extreme flute widths and grinding wheels with a diameter of less than 100 mm.

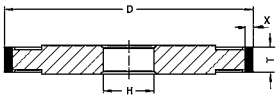
ROUND TOOLS FLUTE GRINDING

1A1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS						
SP1A1	100x8x16	20	D54	Q-FLUTE EVO	C	66260201920
SP1A1	100x10x16	20	D54	Q-FLUTE EVO	C	66260209550
SP1A1	100x12x16	20	D54	Q-FLUTE EVO	C	66260184104
SP1A1	100x15x16	20	D54	Q-FLUTE EVO	C	66260179735
SP1A1	125x8x16	20	D54	Q-FLUTE EVO	C	66260207962
SP1A1	125x10x16	20	D54	Q-FLUTE EVO	C	66260179733
SP1A1	125x12x16	20	D54	Q-FLUTE EVO	C	66260179732
SP1A1	125x15x16	20	D54	Q-FLUTE EVO	C	66260200719
SP1A1	150x8x16	20	D54	Q-FLUTE EVO	C	66260208669
SP1A1	150x10x16	20	D54	Q-FLUTE EVO	C	66260201343
SP1A1	150x12x16	20	D54	Q-FLUTE EVO	C	66260201341
SP1A1	150x15x16	20	D54	Q-FLUTE EVO	C	66260209557

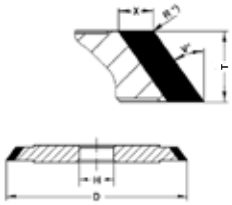
1A1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS						
SP1A1	100x8x16	20	D54	Q-FLUTE PRIME	C	66260241549
SP1A1	100x10x16	20	D54	Q-FLUTE PRIME	C	66260235697
SP1A1	100x12x16	20	D54	Q-FLUTE PRIME	C	66260234609
SP1A1	100x15x16	20	D54	Q-FLUTE PRIME	C	66260240764
SP1A1	125x8x16	20	D54	Q-FLUTE PRIME	C	66260240765
SP1A1	125x10x16	20	D54	Q-FLUTE PRIME	C	66260230313
SP1A1	125x12x16	20	D54	Q-FLUTE PRIME	C	66260236279
SP1A1	125x15x16	20	D54	Q-FLUTE PRIME	C	66260230315
SP1A1	150x8x16	20	D54	Q-FLUTE PRIME	C	66260227833
SP1A1	150x10x16	20	D54	Q-FLUTE PRIME	C	66260235071
SP1A1	150x12x16	20	D54	Q-FLUTE PRIME	C	66260240238
SP1A1	150x15x16	20	D54	Q-FLUTE PRIME	C	66260235068

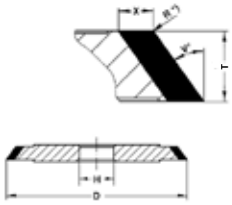
Delivery time approx. 5 working days after receipt of order.

1V1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	V (°)	H (mm)	GRIT SIZE	BOND	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS							
SP1V1	100x15x12	15	20	D54	Q-FLUTE EVO	C	66260181207
SP1V1	100x15x13	10	20	D54	Q-FLUTE EVO	C	66260179918
SP1V1	125x10x12	20	20	D54	Q-FLUTE EVO	C	66260179738
SP1V1	125x10x13	15	20	D54	Q-FLUTE EVO	C	66260207959
SP1V1	125x12x14	10	20	D54	Q-FLUTE EVO	C	66260201926
SP1V1	125x15x10	20	20	D54	Q-FLUTE EVO	C	66260179737
SP1V1	125x15x12	15	20	D54	Q-FLUTE EVO	C	66260200721
SP1V1	150x12x11	20	20	D54	Q-FLUTE EVO	C	66260201928

1V1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	V (°)	H (mm)	GRIT SIZE	BOND	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS							
SP1V1	100x10x14	10	20	D54	Q-FLUTE PRIME	C	66260233337
SP1V1	100x10x12	20	20	D54	Q-FLUTE PRIME	C	66260233683
SP1V1	100x15x10	20	20	D54	Q-FLUTE PRIME	C	66260227483
SP1V1	125x10x10	30	20	D54	Q-FLUTE PRIME	C	66260234030
SP1V1	125x12x11	20	20	D54	Q-FLUTE PRIME	C	66260236742
SP1V1	125x15x10	20	20	D54	Q-FLUTE PRIME	C	66260228294
SP1V1	150x10x12	20	20	D54	Q-FLUTE PRIME	C	66260241550
SP1V1	150x15x10	20	20	D54	Q-FLUTE PRIME	C	66260241551

Delivery time approx. 5 working days after receipt of order.

These tables show only examples of possible dimensions that can be produced from semi-finished parts! Other dimensions on request. Delivery time approx. 5 working days with availability of semi-finished parts also for non-listed dimensions.

ROUND TOOLS FLUTE GRINDING

DRESSING ON THE PRODUCTION MACHINE

Each tool change on a grinding machine causes a degree of run-out and positional error, which can produce small deviations from the nominal tool geometry. Demands made on the accuracy of round tools, however, are constantly increasing. Norton Winter Q-Flute grinding wheels are the solution to this problem. Q-Flute technology combines innovative flute grinding with the precise touch dressing process.

This innovative technology enables considerable quality improvements to the main and minor cutting edges, without adversely affecting grinding performance. By regularly regenerating the wheel topography, tighter tolerances and fully automatic shift operations are possible.

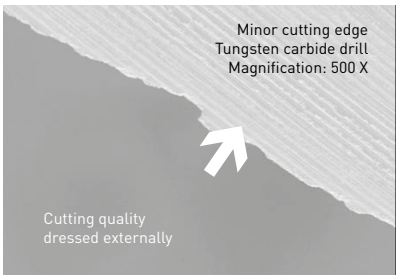
AREAS OF APPLICATION

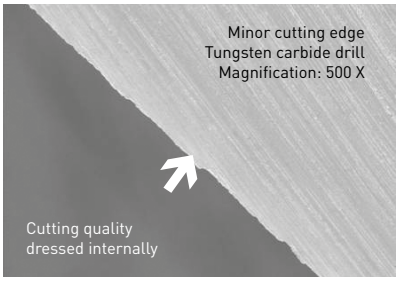
Norton Winter Q-Flute grinding wheels finding their areas of application at all applications where high MRR are required.

NORTON WINTER Q-FLUTE CASE STUDIES

CASE STUDY 1:

GRINDING WHEEL	D54 Q-Flute EVO
DRESSER	Norton Winter DDS Roller dresser
MACHINE	Walter Helitronic
COOLANT	Oil
WORK PIECE	TC drill Ø 10 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 170 mm/min
DEPTH OF CUT	a_e = 3.5 mm
CUTTING SPEED	v_c = 18 m/s
MRR'	Q'_w = 10 mm³/mm · s
DRESSING PARAMETERS	
SPEED RATIO	q_d = 0.9
OVERLAP RATE	U_d = 3
DRESSING INFEED	a_{ed} = 2x3 µm

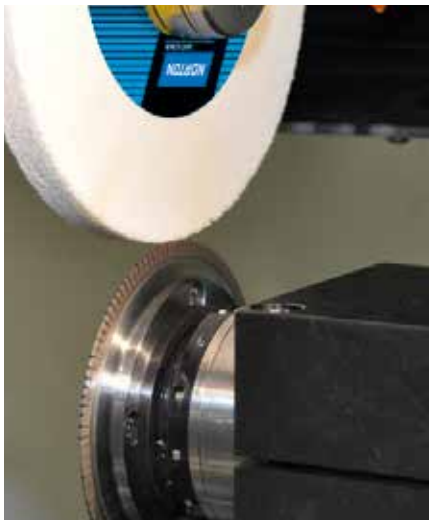




BENEFITS

- Very good cutting quality
- Maximum profile accuracy
- Tightest tolerances

NORTON WINTER DIAMOND DRESSING SYSTEM (DDS)



The Diamond Dressing System (DDS) allows CNC dressing of diamond grinding wheels directly on production grinders.

Despite the extreme hardness of diamond in both cases, the same physical correlations are found when dressing "softer" abrasive materials such as Al_2O_3, SiC, SG, TG and cBN.

Even when dressing specifically designed diamond grinding wheels with the DDS roller dresser, the result can be influenced by overlap rate and speed ratio.

DRESSING PARAMETERS

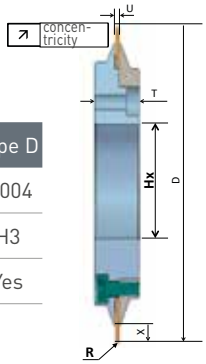
Speed ratio:	q_d = 0.6...0.9
Overlap rate:	U_d = 2...6
Dressing infeed:	a_{ed} = 1...5 µm

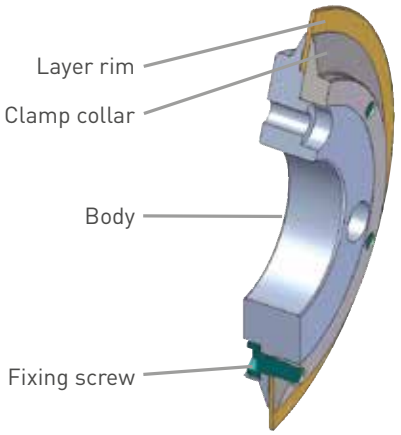
ADVANTAGES:

- 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 "dressable" 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 concen-tricity	0.01	0.01	0.01	0.004
Bore tolerance	H5	H5	H3	H3
Radius	No	Yes	No	Yes



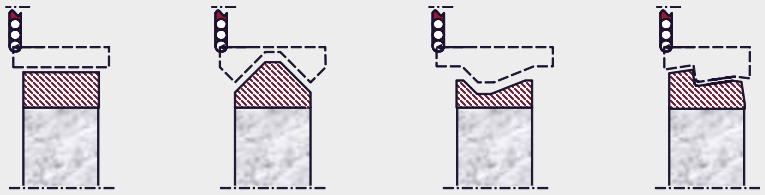


The DDS dressing disc has a patterned single-layer sintered diamond coating that is clamped into a two-part steel body.

PROFILE EXAMPLES

CNC-precision dressing
on the production machine

- greater profile accuracy
- very easy to automate
- dressing with production speeds

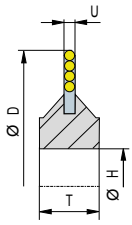


PLEASE NOTE

Further information and types of form rollers for CNC dressing can be found in catalogue 'Dressing Tools for Dressing Grinding Wheels'.

ROUND TOOLS FLUTE GRINDING

DDS

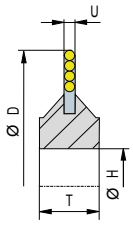


DESIGN CODE	D	U	T	H	BORE TOLERANCE	GRIT SIZE	TYPE	ORDER NUMBER	COMMENT
2DS71P	80	1	15	40	H5	D1001	A	7958752894	-
11DS71P	100	1	12	40	H3	D1001	C	7958709949	-
301DS71P	110	1	15	40	H5	D1001	B	66260152509	R 0.5
300DS71P	120	1	15	40	H5	D1001	B	69014194133 [1)]	R 0.5
10DS71P	150	1	15	52	H5	D1001	B	66260155154	R 0.5
300DS71P	225	1.4	24	72	H5	D14-16	B	7958790339	R 0.7

MACHINE: Various pplication: Dressing conventional grinding wheels and "dressable" diamond and cBN grinding wheels

DDS CUT

DDS Cut is a continued development of the original DDS, specifically for dressing diamond or cBN grinding wheels with 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: Dressing conventional grinding wheels and "dressable" diamond and cBN grinding wheels

PRECISION FLUTE GRINDING FOR MINI AND MICRO TOOLS

As well as innovation in new materials and tool designs, the recent trend towards miniaturisation has become considerably more important.

From mini- and micro- down to nano tools, nowadays tools with outer diameters below 0.1 mm are no longer exceptional. The production of these tools demands special grinding wheels with very small and stable edge radii.

Resin bonded grinding wheels are competing against metal bonded versions which are considerably slower by comparison (approx. 50 % of the feed rate of resin bonds) but they are characterized by greater edge stability. Metal bonded grinding wheels achieve a dressing interval up to five times longer.

The decision whether to use resin bonds or metal bonds is often a matter of personal preference. It is a question of process control whether profile retention with slower feed rates or high output with high feed rates will be cost-effective.

The Norton Winter range therefore consists of metal bonds with great edge stability (BZ bonds for diamond and MSS bonds for cBN) as well as resin bonds with perfect edge stability which are marketed under µicro⁺ brand. The tools of the Norton Winter µicro⁺ range are grinding wheel systems that have been specifically developed for these requirements, which despite fast feed rates are characterised by their perfect edge stability compared to traditional resin bonds.

AREAS OF APPLICATION

Classic areas of application are mini and micro drills and end mills for electronics, medical technology and automotive industry. In addition, these grinding wheels can be used for similar metal removal tasks, e.g. burrs.

RECOMMENDATIONS DIAMOND

Ø 0.05 mm - 0.75 mm	D10...D20A	µicro⁺6013	C125
Ø 0.75 mm - 2 mm	D20A...D25	µicro⁺6015	C125
Ø 0.75 mm - 2 mm	D20A...D46	BZ480	C125
Ø 2 mm - 4 mm	D33...D46	µicro⁺6065	C125

RECOMMENDATIONS CBN

Ø 0.75 mm - 2 mm	B15...B35	µicro⁺6005	V300
Ø 0.75 mm - 2 mm	B25...B46	MSS444	V240
Ø 2 mm - 4 mm	B39...B64	SP4006T	V240

NORTON WINTER µICRO⁺ CASE STUDIES

CASE STUDY 1

GRINDING TOOL	D46 µicro⁺ 6065 C135 A
GRINDING MACHINE	Kirner K360
COOLANT	Oil
WORK PIECE	Tungsten carbide burr, Ø 6 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 125 mm/min
INFEED	a_e = ca. 0.4 mm
CUTTING SPEED	v_c = 35 m/s
MRR'	Q'_w = 0.83 mm³/mm · s

BENEFITS

- Up to 300 % increase in feed rate
- Impressive increase in capacity
- Huge reduction in costs

ROUND TOOLS FLUTE GRINDING

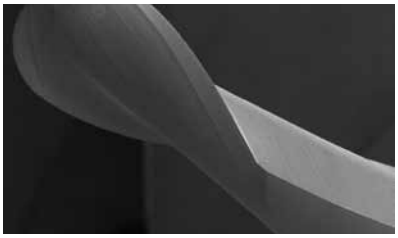
CASE STUDY 2

GRINDING TOOL	D15B µicro+ 6055 C125 A
GRINDING MACHINE	Rollomatic 620XS
COOLANT	Oil
WORK PIECE	Tungsten carbide drill, Ø 0.8 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 40 mm/min
INFEED	a_e = 0.3 mm
CUTTING SPEED	v_c = 25 m/s

BENEFITS
- 45 % cycle time reduction
- Perfect edge quality
- Longer dressing intervals

CASE STUDY 3

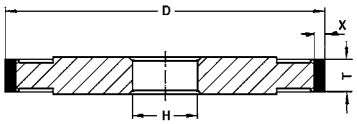
GRINDING TOOL	D15B µicro+ 6055 C125 E
GRINDING MACHINE	Rollomatic Nano6
COOLANT	Oil
WORK PIECE	Tungsten carbide end mill, Ø 0.05 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 0.8mm/min
INFEED	a_e = 0.015 mm
CUTTING SPEED	v_c = 25 m/s



BENEFITS
- Good dressability
- Very good surface quality
- Maximum profile accuracy

STANDARD FLUTE GRINDING

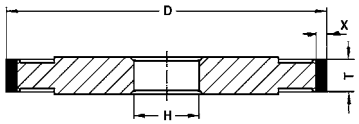
1A1/14A1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS							
K1A1	75x3x5	20	D46	K+920	C100	A	60157643388
K1A1	75x10x5	20	D64	K+1421R	C100	H	66260339426
K1A1	100x10x5	20	D64	K+1421R	C100	H	66260339422
K1A1	100x12x5	20	D64	K+1421R	C100	H	66260347629
K1A1	100x15x5	20	D64	K+1421R	C100	H	66260339419
K1A1	125x5x10	20	D64	K+1421R	C100	A	66260350079
K1A1	125x5x15	20	D126	K+921	C100	A	66260131770
K1A1	125x6x15	20	D64	K+921	C100	A	66260132044
K1A1	125x8x15	20	D64	K+921	C100	A	66260131843
K1A1	125x10x10	20	D64	K+1421R	C100	A	66260341750
K1A1	125x10x15	20	D64	K+921	C100	A	66260374178
K1A1	125x12x10	20	D64	K+1421R	C100	A	66260352659
1K14A1	150x2.3x7	50	D151	K+920	C100	A	66260129975 [1]
3K14A1	150x3.6x6	32	D151	K+920	C100	A	66260130484
K1A1	150x12x10	20	D64	K+1421R	C100	A	66260352657

[1] Delivery time 5 - 6 weeks

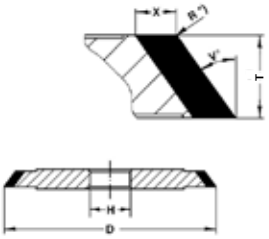
1A1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS							
K1A1	75x10x5	20	B107	KSS12N	V240	H	66260352656 [1]
K1A1	100x10x5	20	B107	KSS12N	V240	H	66260352654
K1A1	100x15x5	20	B107	KSS12N	V240	H	66260347909
K1A1	125x6x5	20	B107	KSS12N	V240	H	66260118167 [1]
K1A1	125x10x5	20	B107	KSS12N	V240	A	66260352653
K1A1	150x12x5	20	B107	KSS12N	V240	A	66260352652

[1] Delivery time 5 - 6 weeks

1V1 STOCK PROGRAMME

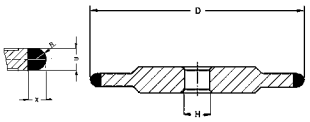


SHAPE	DxTxX (mm)	V (°)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
1K1V1	75x10x5	10	20	D64	K+1421R	C100	H	66260339433
1K1V1	100x10x5	10	20	D64	K+1421R	C100	H	66260339432
K1V1	100x15x5	20	20	D64	K+1421R	C100	H	66260347907 [1]
K1V1	100x15x5	30	20	D64	K+1421R	C100	H	66260342813
1K1V1	125x10x5	10	20	D64	K+1421R	C100	A	66260352633 [1]
1K1V1	125x10x5	30	20	D64	K+1421R	C100	A	66260115545 [1]
1K1V1	125x15x5	10	20	D64	K+1421R	C100	A	66260352641 [1]
K1V1	125x15x5	30	20	D64	K+1421R	C100	A	66260352640 [1]
K1V1	150x12x5	15	20	D64	K+1421R	C100	A	66260119886 [1]
CBN GRINDING WHEELS								
1K1V1	100x10x5	10	20	B107	KSS12N	V240	H	66260127891 [1]
K1V1	100x15x5	20	20	B107	KSS12N	V240	H	66260115554 [1]
1K1V1	125x12x5	10	20	B107	KSS12N	V240	A	66260119462 [1]

[1] Delivery time 5 - 6 weeks

ROUND TOOLS FLUTE GRINDING

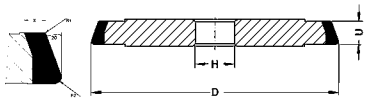
14F1 STOCK PROGRAMME



SHAPE	DxUxX (mm)	R (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
1K14F1	100x4x6	2	20	D64	K+1421R	C100	H	66260339416
K14F1	125x3x5	1.5	20	D64	K+1421R	C100	H	66260114821
1K14F1	150x1x5	0.5	20	D64	K+888TY	C125	A	66260116538
K14F1	150x2x5	1	20	D64	K+888R	C100	A	66260348744 [1]
1K14F1	150x3x7	1.5	20	D126	K+920	C100	A	66260133404
17K14F1	200x2x7	1	20	D64	K+920	C100	E	60157695294
4K14F1	200x3x7	1.5	20	D126	K+920	C100	E	66260381129
		1.5	20	D151	K+1313RY	C100	E	66260134511
CBN GRINDING WHEELS								
K14F1	100x3x5	1.5	20	B107	KSS12N	V240	A	66260340210
K14F1	100x4x5	2	20	B107	KSS12N	V240	A	66260116260
17K14F1	200x2x7	1	20	B64	KSS007N-63	V180	E	60157695901
4K14F1	200x3x7	1.5	20	B181	KSS007N-63	V180	E	66260133528
2K14F1	200x5x7	2.5	20	B181	KSS007N-63	V180	A	60157695651 [1]

[1] Delivery time 5 - 6 weeks

700 DELIVERY PROGRAMME

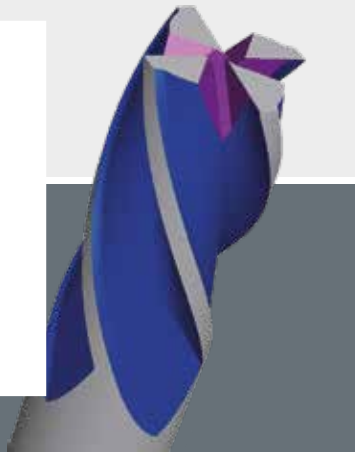


SHAPE	DxUxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	COMMENT
DIAMOND GRINDING WHEELS								
2K700	125x6x3	20	D46	K+1421R	C100	H	66260119545 [1]	"Drill [3] Ø 3...6"
2K700	125x10x5	20	D46	K+1421R	C100	A	66260384095 [1]	"Drill [3] Ø 6...8"
1K700	125x12x5	20	D46	K+1421R	C100	A	66260352647 [1]	"Drill [3] Ø 8...11"
1K700	125x16x5	20	D46	K+1421R	C100	H	66260384094 [1]	"Drill [3] Ø 11...15"
1K700	125x22x5	20	D46	K+1421R	C100	A	66260127878 [1]	"Drill [3] Ø 15...20"

[1] Delivery time 5 - 6 weeks
[3] Typically for Hertel SE Drill

DIAMOND & CBN GRINDING WHEELS FOR GASHING

Gashing reduces the width of the chisel edge of a drill or end mill in order to reduce the forces during subsequent use of the tool. 12V9 wheels or pointed 1V1 / 14V1 wheels are generally used (the typical angle is 45°). Occasionally, 1A1 and 11V9 wheels are used. The advantage of 1V1 wheels over 12V9 wheels is a more rigid body.



SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
V-PRIME	↑	Innovative high-performance resin bond for gashing and grinding of clearance angles
V-Pro4073		High-performance resin bond for gashing and grinding of clearance angles
K+921		More wear-resistant resin bond preferably wet grinding
K+1421R		Standard resin bond for CNC applications
K+888R		Universal resin bond for dry grinding
K+1410		Free-grinding resin bond for dry grinding

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
V-PRIME	↑	Innovative high-performance resin bond for gashing and grinding of clearance angles
V-Pro4073		High-performance resin bond for gashing and grinding of clearance angles
KSS980		More wear-resistant resin bond preferably wet grinding
KSSJY		Universal resin bond for dry grinding
KSS12N		Free-grinding resin bond for dry grinding

STANDARD DIMENSIONS FOR GASHING

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Drills End mills Reamers	Tungsten Carbide HSS Cermet	All CNC tool grinding machines	1A1, 1V1 Ø 50...150 T 3...30 X 5...15	V-Prime Q-Flute² V-Pro K+ / KSS BINDUNG	Oil Emulsion

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Drills End mills Reamers	Tungsten Carbide HSS Cermet	All CNC tool grinding machines	12V9 Ø 50...150 W 2...3 X 6...10	V-Prime V-Pro K+ / KSS BINDUNG	Oil Emulsion

Other dimensions on request

INNOVATIVE GASHING WITH V-PRIME & V-PRO

Norton WINTER V-PRIME is the new and improved version of V-PRO wheels for round tool grinding, delivering the ultimate edge stability.

V-PRIME has been designed to provide excellent edge stability in gashing. In today's challenging economic environment, it is more important than ever to maintain constant wheel geometry for as long as possible, without the need for correction, as this enables increased output and improved quality. The new V-PRIME can be easily implemented without any machine or process adjustments, offering manufacturers immediate improvements. The well-known and approved Norton Winter V-Pro will be kept for applications where a hard-brittle hybrid bond is preferred.

With V-PRIME and V-Pro, Norton WINTER now offers the perfect solution for every application problem to design an optimum process with the shortest cycle times and longest life times.

Apart from 12V9 grinding wheels, V-PRIME and V-Pro are available in other geometries for gashing of round tools

APPLICATION EXAMPLE - GASHING OF Ø 12 mm TUNGSTEN CARBIDE END MILL

GRINDING TOOL	D64 V-PRIME5406
GRINDING MACHINE	ANCA MX7 Linear
COOLANT	Oil
WORK PIECE	Tungsten carbide end mill, Ø 12 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 100 mm/min
INFEED	a_e = ≈1.3 mm
CUTTING SPEED	v_c = 22 m/s

BENEFITS

- ≈ 20 % reduction of grinding time
- Significant cost savings
- Faster machine set-up with easier wheel preparation

APPLICATION EXAMPLE - GASHING OF TUNGSTEN CARBIDE DRILLS

GRINDING TOOL	D64 V-Pro4073 C125 A
GRINDING MACHINE	ANCA TX7+
COOLANT	Oil
WORK PIECE	Tungsten carbide drill, Ø 9 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 60 mm/min
INFEED	a_e = 0.5 mm
CUTTING SPEED	v_c = 18 m/s

BENEFITS

- Reduction of down time through increased dressing intervals
- 25 % reduction of grinding time
- Considerable improvement of productivity

APPLICATION EXAMPLE–RE-GRINDING OF HSS END MILLS

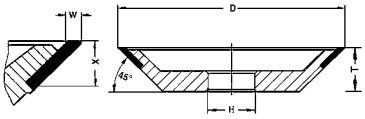
V-PRO

GRINDING TOOL	B107 V-Pro4073 V300 A
GRINDING MACHINE	Schneeberger Norma
COOLANT	Oil
WORK PIECE	HSS end mill, Ø 35 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 40 mm/min
INFEED	a_e = 1.5 mm
CUTTING SPEED	v_c = 35 m/s

BENEFITS

- Very good edge stability and lifetime
- 30 % reduced grinding time
- significant cost savings

12V9 STOCK PROGRAMME

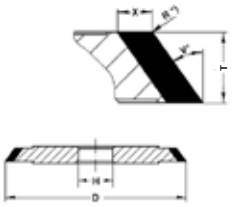


SHAPE	DxWxX (mm)	T (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
3K12V9	100x3x10	20	20	D46	V-PRIME5406		H	66260167741
		20	20	D64	V-PRIME5406		H	66260165036
4SP12V9	100x3x10	20	20	D46	V-Pro4073	C125	A	7958711384
		20	20	D64	V-Pro4073	C125	A	69014147396
5K12V9	125x3x10	25	20	D46	V-PRIME5406		H	66260165639
		25	20	D64	V-PRIME5406		H	66260165037
1SP12V9	125x3x10	25	20	D46	V-Pro4073	C125	A	7958709321
		25	20	D64	V-Pro4073	C125	A	69014144422
CBN GRINDING WHEELS								
4SP12V9	100x3x10	20	20	B107	V-Pro4073	V300	A	7958722543
1SP12V9	125x3x10	25	20	B107	V-Pro4073	V300	A	7958710238

11V9 V-Pro and V-Prime grinding wheels ex stock are shown in the next section „clearance angle grinding" of this chapter

GRINDING WHEELS FOR GASHING

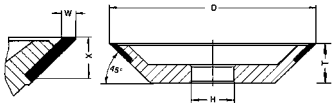
1V1 / 14V1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	V (°)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
K1V1	100x10x10	45	20	D64	V-PRIME5406		A	66260174928
1K1V1	125x10x5	45	20	D64	K+1421R	C100	A	66260352664
K1V1	125x10x10	45	20	D64	V-PRIME5406		A	66260176643
K1V1	125x15x5	45	20	D64	K+1421R	C100	A	66260352639 [1]
CBN GRINDING WHEELS								
K1V1	100x15x5	45	20	B107	KSS12N	V240	H	66260352663 [1]
1K1V1	125x12x5	45	20	B107	KSS12N	V240	A	66260352661

[1] Delivery time 5 - 6 weeks

12V9 STOCK PROGRAMME



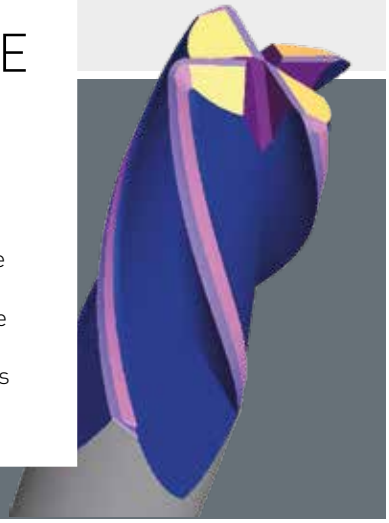
SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
2K12V9	50x2x6	20	19	45	D64	K+1421R	C100	A	66260128817 [1]
3K12V9	75x2x10	20	20	45	D64	K+1421R	C100	H	66260338583
2K12V9	75x3x10	20	20	45	D64	K+1421R	C100	H	66260352673
6K12V9	100x2x10	20	20	45	D64	K+1421R	C100	H	66260344811
3K12V9	100x3x10	20	20	45	D64	K+1421R	C100	H	66260339437
		20	20	45	D126	K+888R	C100	H	66260128545
9K12V9	125x2x10	20	25	45	D64	K+1410	C125	H	69014182731
	125x2x10	20	25	45	D91	K+921	C125	H	66260383462
5K12V9	125x3x10	20	25	45	D64	K+1421R	C100	H	66260334260
5K12V9	150x3x10	20	25	45	D64	K+1421R	C100	H	66260117874
CBN GRINDING WHEELS									
3K12V9	75x2x10	20	20	45	B107	KSS12N	V240	H	66260352670
6K12V9	100x2x10	20	20	45	B107	KSS12N	V240	H	66260352669
		20	20	45	B107	KSS980-60	V240	H	60157685426
1K12V9	100x3x15	20	20	45	B107	KSS12N	V240	H	66260352668
9K12V9	125x2x10	20	25	45	B107	KSS980-60	V240	H	60157685183
5K12V9	125x3x10	20	25	45	B107	KSS12N	V240	H	66260354629
6K12V9	125x3x15	20	25	45	B107	KSS12N	V240	H	66260352667
		20	25	45	B151	KSSJY-77	V240	H	66260128064

Besides gashing, the items listed on these pages are also suitable for flute grinding, clearance grinding and radius sharpening depending on machine software.

[1] Delivery time 5 - 6 weeks

DIAMOND & CBN GRINDING WHEELS FOR CLEARANCE ANGLE GRINDING

Grinding clearance angles on the cutting edge of a tool reduces the contact area between the tool and the workpiece during drilling or milling processes. One or two clearance angles are usually ground on the face. Up to two clearance angles / clearances can be produced on the circumference; on some tools these take the form of radial clearance grinding. For grinding clearance angles 11V9 cup wheels or similar geometries are typically used. Our extensive standard range can be found on the following pages of this catalogue. 12V9 or surface grinding wheels are also used. Compatible tools with these geometries are listed in the chapters on flute grinding and gashing.



NORTON WINTER BINDUNGSAUSWAHLHILFE

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
V-PRIME	↑	Innovative high-performance resin bond for gashing and grinding of clearance angles
V-Pro4073		High-performance resin bond for gashing and grinding of clearance angles
K+980		More wear-resistant, resin bond with high edge stability
K+921		More wear-resistant resin bond preferably wet grinding
K+1421R		Standard resin bond for CNC applications
K+888R		Universal resin bond for dry grinding
K+1410		Free-grinding resin bond for dry grinding

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
V-PRIME	↑	Innovative high-performance resin bond for gashing and grinding of clearance angles
V-Pro4073		High-performance resin bond for gashing and grinding of clearance angles
KSS980		More wear-resistant, resin bond with high edge stability
KSS12N		Standard resin bond for CNC applications

STANDARD DIMENSIONS FOR THE GRINDING OF CLEARANCE ANGLES

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Drills End mills Reamers	"Tungsten Carbide HSS Cermet"	"All CNC tool grinding machines"	6A9, 11V9, 12A2, ... Ø 75...125 W 2...3 X 10	V-Prime V-Pro K+ / KSS BONDS	Oil Emulsion

Other dimensions on request

INNOVATIVE CLEARANCE ANGLE GRINDING WITH V-PRIME AND V-PRO

Norton Winter V-PRIME is the new and improved version of V-PRO wheels for round tool grinding, delivering the ultimate edge stability.

V-PRIME has been designed to provide excellent edge stability in clearance angle grinding. In today's challenging economic environment, it is more important than ever to maintain constant wheel geometry for as long as possible, without the need for correction, as this enables increased output and improved quality. The new V-PRIME can be easily implemented without any machine or process adjustments, offering manufacturers immediate improvements.

The well-known and approved Norton Winter V-Pro will be kept for applications where a hard-brittle hybrid bond is preferred.

With V-PRIME and V-Pro, Norton WINTER now offers the perfect solution for every application problem to design an optimum process with the shortest cycle times and longest life times.

Apart from 11V9 grinding wheels, V-PRIME and V-Pro are available in other geometries for clearance angle grinding of round tools.

APPLICATION EXAMPLE - CLEARANCE GRINDING OF Ø 12 mm TUNGSTEN CARBIDE END MILL

GRINDING TOOL	D64 V-PRIME5406
GRINDING MACHINE	ANCA MX7 Linear
COOLANT	Oil
WORK PIECE	Tungsten carbide end mill, Ø 12 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 250 mm/min
INFEED	a_e = ≈0.3 mm
CUTTING SPEED	1. v_c = 22 m/s 2. v_c = 18 m/s

BENEFITS

- ≈ 15 % reduction of grinding time
- Significant cost savings
- Faster machine set-up with easier wheel preparation

APPLICATION EXAMPLE - CLEARANCE ANGLE (CIRCUMFERENCE)

GRINDING TOOL	D64 V-Pro4073 C125 A
GRINDING MACHINE	SAACKE
COOLANT	Oil
WORK PIECE	Tungsten carbide drills; Ø 11 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 120 mm/min
INFEED	a_e = 1.2 mm
CUTTING SPEED	v_c = 17 m/s

BENEFITS

- 2 times longer dressing interval
- Huge time savings
- Significant increase in productivity

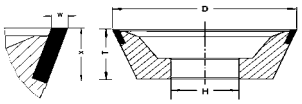
APPLICATION EXAMPLE – CLEARANCE GRINDING (POINT RELIEF)

GRINDING TOOL	B107 V-Pro4073 V300 A
GRINDING MACHINE	Walter Helitronic
COOLANT	Oil
WORK PIECE	HSS-Fräser Ø 24 mm
GRINDING PARAMETERS	
FEED RATE	v_f = 120 mm/min
INFEED	a_e = ≈ 1 mm
CUTTING SPEED	v_c = 40 m/s

BENEFITS

- Fantastic lifetime
- Significantly extended dressing cycle
- Huge reduction of cycle time

11V9 STOCK PROGRAMME



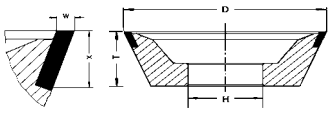
SHAPE	DxWxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
2K11V9	75x3x10	20	30	D46	V-PRIME5406		H	66260173572
		20	30	D64	V-PRIME5406		H	66260165023
1SP11V9	75x3x10	20	30	D46	V-Pro4073	C125	A	7958711381
		20	30	D64	V-Pro4073	C125	A	7958708546
10K11V9	100x3x10	20	35	D46	V-PRIME5406		H	66260165042
		20	35	D64	V-PRIME5406		H	66260164307
3SP11V9	100x3x10	20	35	D46	V-Pro4073	C125	A	7958704895
		20	35	D64	V-Pro4073	C125	A	69014133000
11K11V9	125x3x10	20	40	D46	V-PRIME5406		H	66260178973
		20	40	D64	V-PRIME5406		H	66260168014
1SP11V9	125x3x10	20	40	D46	V-Pro4073	C125	A	7958711383
		20	40	D64	V-Pro4073	C125	A	7958709384
CBN GRINDING WHEELS								
1SP11V9	75x3x10	20	30	B107	V-Pro4073	V300	A	7958713361
3SP11V9	100x3x10	20	35	B107	V-Pro4073	V300	A	7958710236
2SP11V9	125x3x10	20	40	B107	V-Pro4073	V300	A	7958747439 [2]

12V9 V-Pro and V-Prime grinding wheels ex stock are shown in the previous section „gashing" of this chapter

[2] Available while stocks last

STANDARD GRINDING WHEELS FOR CLEARANCE ANGLE GRINDING

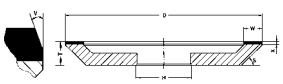
11V9 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
7K11V9	75x2x10	20	30	D64	K+1421R	C100	H	66260338587
		20	30	D64	K+1410	C125	D	60157685425
2K11V9	75x3x10	20	30	D64	K+1421R	C100	H	66260347304
8K11V9	100x2x10	20	35	D64	K+1421R	C100	H	66260338586
		20	35	D64	K+1410	C125	H	69014163728
		20	35	D64	K+980-42	C125	H	66260324844
		20	35	D91	K+921	C125	H	66260383968
		20	35	D126	K+888R	C100	H	66260344473
10K11V9	100x3x10	20	35	D64	K+1421R	C100	H	66260334264
11K11V9	125x3x10	20	40	D64	K+1421R	C100	H	66260338584
CBN GRINDING WHEELS								
7K11V9	75x2x10	20	30	B107	KSS12N	V240	H	66260352681
		20	30	B107	KSS980-60	V240	H	60157685182
8K11V9	100x2x10	20	35	B107	KSS12N	V240	H	66260352678
		20	35	B107	KSS980-60	V240	H	69014163185
10K11V9	100x3x10	20	35	B107	KSS12N	V240	H	66260352675
11K11V9	125x3x10	20	40	B107	KSS12N	V240	H	66260352674 [1]

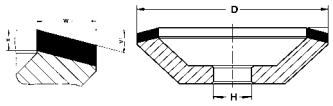
[1] Delivery time 5 - 6 weeks

12A2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS										
2K12A2	125x15x3	20	26	45	20	D46	K+1421R	C100	H	66260352597
CBN GRINDING WHEELS										
2K12A2	125x15x3	20	26	45	20	B91	KSS12N	V240	H	66260352593

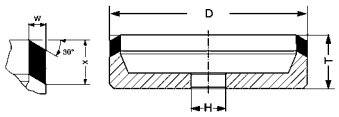
12V5 STOCK PROGRAMME - „ONEPASS-WHEELS“



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
K12V5	100x10x5	20	28	20	D46	K+1421R	C100	H	66260352645
CBN GRINDING WHEELS									
K12V5	100x10x5	20	28	20	B91	KSS12N	V240	H	66260127380 [1]

[1] Delivery time 5 - 6 weeks

6V5 STOCK PROGRAMME - „ONEPASS-WHEELS“



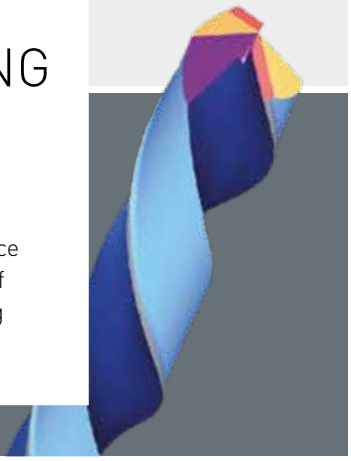
SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
1K6V5	100x4.5x10	20	34	30	D64	K+1421R	C100	H	66260370517
1K6V5	100x4.5	10	30	20	D64	PRIME5406		H	66260184210
CBN GRINDING WHEELS									
1K6V5	100x4.5x10	20	34	30	B107	KSS12N	V240	H	66260370513 [1]

[1] Delivery time 5 - 6 weeks

Apart from grinding clearance angles, the items listed on these pages are also suitable for flute grinding, OD grinding, gashing, radial clearance grinding and radius sharpening, depending on the machine software.

DIAMOND & CBN GRINDING WHEELS FOR UNIVERSAL GRINDING

Universal grinding tasks include all the applications on universal tool grinding machines. Grinding wheels for grinding and re-sharpening of different tools are listed. Depending on the type of bond, the grinding wheels are suitable for either / or dry and wet grinding. According to the tool type and machine type, different geometries are required. Different types of cup wheels and several surface grinding wheels are listed on the following pages. Detailed information on fields of application is shown below each table. 1A1 grinding wheels for OD and ID grinding are listed in the 'Mould and Die' chapter.



SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
BZ560		Metal bond for wet and dry grinding
M+789		Special bond for tungsten carbide-steel combination grinding, dry
K+1414R		Resin bond for tungsten carbide-steel combination grinding, dry
K+1414N		Resin bond for tungsten carbide-steel combination grinding, dry
K+1414J		Resin bond for tungsten carbide-steel combination grinding, dry
K+888RY		Universal resin bond for wet grinding
K+888NY		Universal resin bond for wet grinding
K+888R		Universal resin bond for dry grinding
K+888N		Universal resin bond for dry grinding
K+888J		Universal resin bond for dry grinding
K+888F		Fine-grit resin bond for polish grinding
K+1410		Free-grinding resin bond for dry grinding
K+777R		Universal resin bond for fine-grain applications
K+777N		Universal resin bond for fine-grain applications
K+777J		Universal resin bond for fine-grain applications
KR250		Free-grinding resin bond, wet/dry grinding
K+730		Very free-grinding fine-grain bond, dry grinding possible

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KSS920		More wear-resistant resin bond also dry grinding
KSSTY		Universal resin bond for wet grinding
KSSRY		Universal resin bond for wet grinding
KSS12		Standard resin bond for CNC applications
KSS10N		Universal resin bond for tool grinding
KSS10J		Universal resin bond for tool grinding
KR102		Free-grinding resin bond for wet grinding
KSS007		Free-grinding resin bond for dry grinding and under oil
KSS1065		Particularly free-grinding dry grinding bond

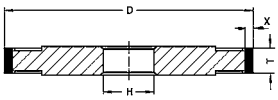
STANDARD DIMENSIONS FOR MANUAL GRINDING

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Drills End mills Reamers Cutting chisels Gravers	Tungsten carbide HSS Cermet	All universal tool grinding machines	1A1, 14A1, 14F1,... Ø 75..125 U 2...4,4 X 3...6	Various bonds (see above)	Dry Emulsion

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Drills End mills Reamers Cutting chisels Gravers	Tungsten carbide HSS Cermet	All universal tool grinding machines	4A2, 11V9, 12A2,... Ø 75...175 W 3...10 X 1...10	Various bonds (see above)	Dry Emulsion

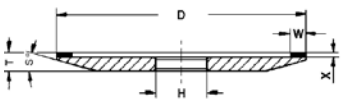
Other dimensions on request

1A1 STOCK PROGRAMME



SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS							
K1A1	100x6x10	20	D64	K+888R	C50	A	66260131547
K1A1	100x10x4	20	D126	K+1414N	C100	A	66260127052
APPLICATION For grinding tungsten carbide and carbide-tipped tools, for example OD grinding. Suitable for use on universal tool grinding machines.							
CBN GRINDING WHEELS							
K1A1	100x10x2	20	B126	KSSRY	V180	H	66260136247
K1A1	125x10x2	20	B126	KSS10N	V120	H	66260134925 [1]
APPLICATION For grinding HSS tools, for example OD grinding. Suitable for use on universal tool grinding machines.							

4A2 STOCK PROGRAMME



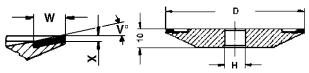
SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
K4A2	100x6x2	20	8	15	D64	K+888N	C50	H	66260137071 [1]
6K4A2	125x5x2	20	10	15	D46	K+888J	C50	H	60157643448
		20	10	15	D64	K+888R	C50	H	60157643256
1K4A2	125x6x2	20	10	15	D46	K+1410	C75	H	66260115833
		20	10	15	D64	K+1410	C100	H	66260128030
K4A2	150x5x4	20	13	15	D64	K+888N	C50	H	60157643184
K4A2	175x5x4	20	13	15	D64	K+888N	C50	H	60157643327
CBN GRINDING WHEELS									
K4A2	100x4x2	20	8	15	B107	KSS10N	V120	H	60157642646 [1]
K4A2	125x4x2	20	9	15	B107	KSS10N	V120	H	60157642812 [1]
K4A2	125x5x4	20	11	15	B126	KSS10J	V120	H	60157642977 [1]
3K4A2	150x3x2	20	17	20	B151	KSSRY	V240	A	66260134960 [1]
K4A2	150x4x2	20	11	15	B107	KSS10N	V120	H	60157642791
K4A2	175x5x4	20	13	15	B126	KSS10J	V120	H	60157643668
K4A2	200x6x2	20	11	15	B107	KSS10J	V120	H	60157643223 [1]

[1] Delivery time 5 - 6 weeks

APPLICATION
For face grinding, T < 10 mm: especially for narrow chip space. Suitable for universal tool grinding machines.

ROUND TOOLS UNIVERSAL GRINDING

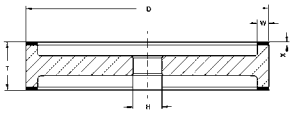
4V4 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS										
1K4V4	100x6x1	20	10	25	10	B151	KSSTY	V180	A	66260135829

APPLICATION for face grinding

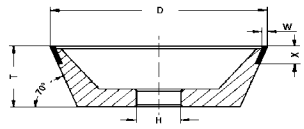
9A3 DELIVERY PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
1K9A3	175x5x2	20	30	D64	K+888N	C50	A	66260112486 [1]
		20	30	D126	K+888N	C75	A	66260116615 [1]
K9A3	175x8x2	20	35	D46	K+888NY	C31	A	66260136275 [1]
		20	35	D64	K+888NY	C31	A	66260134834 [1]

APPLICATION for grinding carbide-tipped cutters

11V9 STOCK PROGRAMME

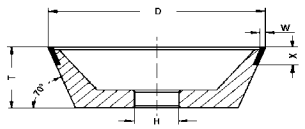


SHAPE	DxWxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
K11V9	75x2x10	20	30	D15C	K+888R	C50	H	66260111375 [1]
		20	30	D46	K+888R	C75	D	66260128403
		20	30	D64	K+888R	C75	D	60157644128
		20	30	D91	K+888R	C75	D	66260136470 [1]
8K11V9	75x2x10	20	30	D126	K+888R	C75	D	66260135883
K11V9	100x2x10	20	35	D15A	K+777R	C75	H	66260110921
		20	35	D64	K+888R	C75	D	60157642864
		20	35	D64	K+888R	C75	H	60157642816
		20	35	D91	K+888R	C75	D	60157642783
		20	35	D126	K+888R	C75	D	66260137065
		20	35	D126	K+1414J	C75	D	66260100363
		20	35	D126	K+1414N	C75	D	60157643573
		20	35	D151	K+1410	C75	D	66260129623
K11V9	100x3x10	20	35	D46	K+1414N	C75	D	60157643080
		20	35	D64	K+888R	C75	D	60157643467
		20	35	D91	K+888R	C75	D	66260134899
		20	35	D126	K+888R	C75	D	60157642950
		20	35	D126	K+1410	C75	D	66260136164 [1]
		20	35	D126	K+1414N	C75	D	66260134959
		20	35	D151	K+1410	C75	D	66260355670

[1] Delivery time 5 - 6 weeks

APPLICATION
For grinding tungsten carbide and carbide-tipped tools, gashing and grinding of clearance angles.
For use on universal tool grinding machines, dry and wet. Also for graver grinding machines.

11V9 STOCK PROGRAMME



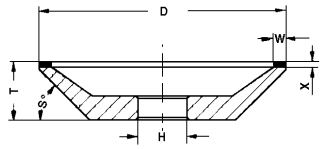
SHAPE	DxWxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
M11V9	95.3x3.2x9.3	20	35	D91	M+789	C50	D	60157642796
		20	35	D126	M+789	C50	D	66260136404
		20	35	D126	M+789	C75	D	60157643011
M11V9	95.3x3.2x9.3	31.75	35	D151	M+789	C75	D	07958739858 [1]
M11V9	125x3x10	20	40	D126	M+789	C75	D	60157643328
CBN GRINDING WHEELS								
K11V9	75x2x6	20	30	B181	KSS007N	V180	D	60157643817 [*]
K11V9	75x2x10	20	30	B126	KSS10N	V180	D	60157643665
		20	30	B181	KSS007N	V180	D	66260136571 [*]
K11V9	75x3x10	20	30	B126	KSS10N	V180	D	60157643113
K11V9	100x2x10	20	30	B126	KSS007N	V180	D	60157643642 [*]
		20	30	B126	KSS10N	V180	D	60157643300
		20	30	B151	KSS1066-63	V180	H	66260355615
		20	30	B181	KSS007N	V180	D	66260135739 [*]
		20	30	B181	KSS007N-63	V180	D	60157642872 [*]
K11V9	100x3x10	20	35	B126	KSS10N	V180	D	60157643042
K11V9	125x2x10	20	40	B126	KSS10N	V180	H	60157643879
		20	40	B181	KSS007N	V180	D	66260135770 [*]

[*] KSS007N for high material removal rate at vc > 30 m/s. Infeed ae = 0.05...0.15 mm

[1] Delivery time 5 - 6 weeks

APPLICATION
Zum Schleifen von HSS-Werkzeugen, Ausspitzen und Freiwinkelschleifen. Geeignet zum Einsatz auf Universal-Werkzeugschleifmaschinen im Trocken- und Nassschliff.

12A2 STOCK PROGRAMME



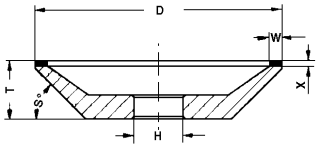
SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
1K12A2	75x3x4	20	24	45	D7	K+730	C50	B	60157643560
		20	24	45	D15B	K+777J	C50	B	66260135928
		20	24	45	D46	K+888J	C75	B	60157643552
		20	24	45	D64	K+888J	C75	B	66260136270
		20	24	45	D126	K+888R	C75	B	66260136273
K12A2	100x5x2	20	25	45	D46	K+888N	C50	H	60157643097
		20	25	45	D91	K+888R	C50	H	60157643285
		20	25	45	D91	K+888R-69	C50	A	66260147081 [1]
K12A2	100x6x4	20	27	45	D64	K+888R	C50	D	60157642582 [1]
		20	27	45	D126	K+888R	C75	B	60157642588
K12A2	100x10x2	20	25	45	D64	K+888J	C50	H	66260136330
		20	25	45	D126	K+888J	C50	H	60157642866
K12A2	100x10x4	20	27	45	D126	K+888N	C75	H	66260135975
K12A2	125x6x2	20	25	45	D46	K+888R	C50	H	60157642628
K12A2	125x12.5x2	20	25	45	D64	K+888J	C50	H	60157642835
		20	25	45	D91	K+888J	C50	H	60157642684
		20	25	45	D126	K+888J	C50	H	60157642792
K12A2	150x15x2	20	25	45	D91	K+777N	C50	H	66260136459

[1] Delivery time 5 - 6 weeks

APPLICATION For grinding tungsten carbide and carbide-tipped tools, e.g. reamers, gravers and cutters. For use on universal tool grinding machines, dry and wet grinding.

ROUND TOOLS UNIVERSAL GRINDING

12A2 STOCK PROGRAMME



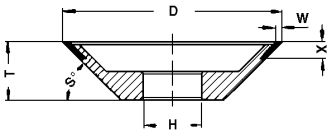
SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
M12A2	75x3x4	20	24	45	D91	M+789	C50	A	60157643230
M12A2	100x6x4	20	27	45	D126	M+789	C50	H	60157642688

APPLICATION
For grinding tungsten carbide-tipped tools with up to 50 % shank material. For use on universal tool and graver grinding machines, dry and wet grinding. Well suited for creep-feed grinding, e.g. for halving of gravers.

SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS									
1K12A2	75x3x4	20	24	45	B46	KSS10N	V180	B	60157643055
		20	24	45	B91	KSS10N	V180	B	66260135831
K12A2	100x5x2	20	25	45	B126	KSS10J	V120	H	60157643373
K12A2	150x5x2	20	18	20	B126	KSS10J	V120	H	66260134924
K12A2	200x5x4	20	24	20	B126	KSS10J	V120	H	66260127109

APPLICATION
For grinding HSS tools, especially cutting face. Suitable for use on universal tool grinding machines, dry and wet.

12V9 STOCK PROGRAMME



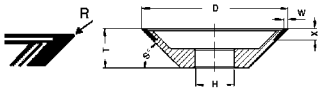
SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
K12V9	75x2x6	20	20	45	D46	K+1414N	C75	D	66260110121 [1]
		20	20	45	D64	K+888R	C75	D	60157643020
K12V9	75x2x10	20	20	45	D15B	K+888F	C100	H	66260129105 [1]
2K12V9	75x2x10	20	25	45	D15C	K+777N	C75	D	66260116643
		20	25	45	D64	K+888R	C75	D	60157642957
		20	25	45	D91	K+888R	C75	D	66260132226 [1]
		20	25	45	D126	K+888R	C75	D	60157643465
K12V9	75x3x6	20	20	45	D46	K+1414N	C75	H	66260119257
K12V9	100x2x6	20	20	45	D151	K+888RY	C75	H	60157643322
5K12V9	100x2x10	20	25	45	D46	K+888R	C75	D	66260118421
		20	25	45	D64	K+888R	C75	D	66260136069
		20	25	45	D126	K+888R	C75	D	60157643198
3K12V9	100x3x6	20	20	30	D91	K+888R	C75	A	66260107650

APPLICATION
For grinding tungsten carbide tools, gashing and grinding of cutting faces. For use on universal tool grinding machines, dry and wet.

SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS									
K12V9	75x2x6	20	20	45	B126	KSS10N	V180	D	66260139893
2K12V9	75x2x10	20	25	45	B126	KSS10N	V180	D	66260136065

[1] Delivery time 5 - 6 weeks

12V9 STOCK PROGRAMME



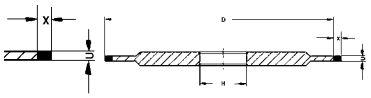
SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	R (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS										
3K12V9	75x3x6	20	20	45	1	B181	KSS007N	V180	D	60157643923 [1]
K12V9	100x2x6	20	35	45	-	B126	KSS10N	V180	D	60157643398
5K12V9	100x2x10	20	25	45	-	B126	KSS10N	V180	D	60157643440
4K12V9	100x2x10	20	24	45	-	B181	KSS007N-63	V180	H	66260114593 [*]
6K12V9	100x3x6	20	20	45	1	B181	KSS007N	V180	D	60157643800 [*]
3K12V9	125x3x6	20	25	45	1	B181	KSS007N	V180	D	60157643131 [*]
K12V9	125x3x10	20	25	45	-	B151	KSS007N-77	V180	D	66260112846 [*]

[*] KSS007N for high material removal rate at vc > 30 m/s, infeed ae = 0.05...0.15 mm

[1] Delivery time 5 - 6 weeks

APPLICATION
For grinding HSS tools, e.g. cutting face and for gashing. Suitable for use on all universal tool grinding machines, wet and dry

14A1 STOCK PROGRAMME

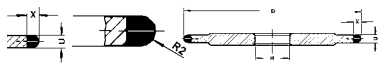


SHAPE	DxUxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS							
K14A1	100x2x5	20	D76	K+1414N	C75	A	60157642932 [1]
		20	D126	K+888R	C75	A	66260113077

[1] Delivery time 5 - 6 weeks

ANWENDUNG
For use on universal tool grinding machines, for gashing of tungsten carbide drills.

14F1 STOCK PROGRAMME



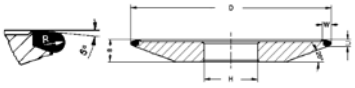
SHAPE	DxUxX (mm)	H (mm)	R (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
K14F1	100x4x5	20	2	D107	K+888R	C100	H	66260136216 [2]

APPLICATION
For profile grinding of tungsten carbide tools.

[2] Available while stocks last

ROUND TOOLS UNIVERSAL GRINDING

700 STOCK PROGRAMME



SHAPE	DxUxX (mm)	H (mm)	R (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
1K700	75x2.2x3	20	1	5	D126	K+888R	C100	A	60157643225
1K700	100x2.2x3	20	1	5	D151	K+1414R	C100	A	60157643078 [1]
1K700	100x4.4x5	20	2	5	D126	K+888R	C100	A	60157643091 [1]

APPLICATION
For grinding spiral tungsten carbide tools, e.g. on NC tool grinding machines.

CBN GRINDING WHEELS									
1K700	75x2.2x3	20	1	5	B126	KSS10N	V180	A	66260135767 [1]
		20	1	5	B151	KSSRY	V240	A	66260100354 [1]
1K700	100x2.2x3	20	1	5	B126	KSS10N	V180	A	60157643543 [1]
1K700	100x4.4x5	20	2	5	B126	KSS920	V180	A	60157643948 [1]
		20	2	5	B181	KSS007N	V180	A	60157642878 [1]
1K700	125x4.4x5	20	2	5	B126	KSS920	V180	A	66260135867 [2]
		20	2	5	B181	KSS007N	V180	H	60157642948 [1]

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last

APPLICATION
For grinding spiral HSS tools, e.g. on NC tool grinding machines. Reciprocating and creep-feed grinding. Suitable for cutting face grinding.

DIAMOND & CBN GRINDING WHEELS FOR SPECIAL TOOLS

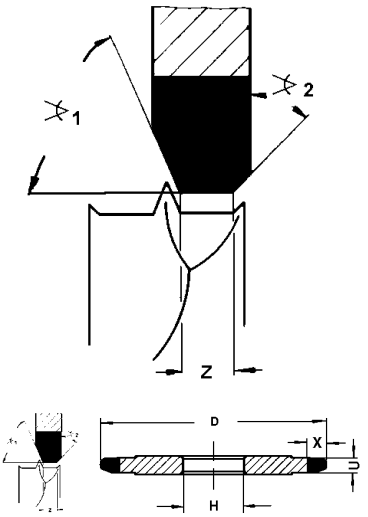
This chapter provides an insight into special tools. It is impossible to itemize the wide variety of round tools in detail. If you require grinding tools for different operations, please contact us, we will find the best solution for you.

PROFILE GRINDING OF TUNGSTEN CARBIDE DOWEL DRILLS

APPLICATION EXAMPLE

NORTON SAINT-GOBAIN WINTER

GRINDING TOOL	D64 K+888R C75 or K+921 C100
GRINDING MACHINE	Deckel S11
COOLANT	Dry
WORK PIECE	Tungsten carbide dowel drills, Ø 4 to 18 mm
GRINDING PARAMETERS	
FEED	v_f = approx. 300 mm/min (manual)
INFEED	a_e = by Hand
CUTTING SPEED	v_c = 18 m/s



BENEFITS

- High profile retention, quick removal
- Good surface, no heat damage

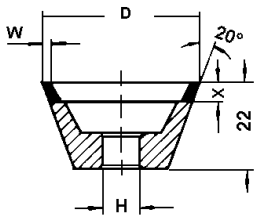
1D1 STOCK PROGRAMME

SHAPE	DxUxX (mm)	H (mm)	Z (mm)	V1 (°)	V2 (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	COMMENT
DIAMOND GRINDING WHEELS											
1K1D1	75x4.5x6	20	0.9	67.5	45	D64	K+888R	C75	H	60157642996	for Ø 4
1K1D1	75x4.5x6	20	1.4	67.5	45	D64	K+888R	C75	H	66260116659	for Ø 5
1K1D1	75x4.5x6	20	1.9	67.5	45	D64	K+888R	C75	H	66260136519	for Ø 6
1K1D1	75x5x6	20	2.8	67.5	45	D64	K+888R	C75	H	66260136520	for Ø 8
1K1D1	75x6x6	20	3.7	67.5	45	D64	K+888R	C75	H	66260136522	for Ø 10

APPLICATION
For profile grinding of dowel drills (clearance) with simultaneous grinding of centre point tips and rough cutting edges.
Other dimensions can be supplied. When ordering, please state drill diameter or Z dimension

GRINDING WHEELS FOR MACHINING ROUTER BITS

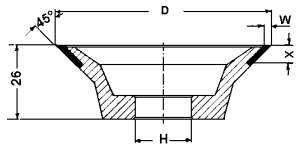
11V2 DELIVERY PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS							
K11V2	40x2x5	10	B126	KSS10N	V180	H	66260134764

APPLICATION
For grinding tooth faces of small router bits with chip thickness restriction

12V9 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS							
1K12V9	75x2.3x7.1	20	D46	K+888R	C75	H	60157642595
			D64	K+888R	C75	H	60157642687
CBN GRINDING WHEELS							
2K12V9	75x2.3x7.1	20	B126	KSS007-63	V180	H	66260113221

APPLICATION
For grinding tooth faces of small router bits with chip thickness restriction

ROUND TOOLS – OTHER APPLICATIONS

In addition to the applications already explained and described in detail, there are various other applications and/or machining steps in the production of round tools. In the following chapter, we will touch on and briefly describe some of them.
The following chapter does not claim to be complete; if you do not find an application there, we will also be able to offer you an optimal solution for it - please contact us.

1. ROUND TOOLS - POLISH GRINDING OF FLUTES AND CLEARANCE ANGLES

NORTON WINTER FLUTEPOLISH

After the flute geometry has been ground, it can be polished in an additional operation to produce a better surface finish. The polished flute surface improves the performance of drills and end mills when machining aluminium alloys, hardened steel or drilling hardwood. Polishing improves chip evacuation from the hole by reducing friction, in addition to significantly reducing the risk of built-up edges. Norton Winter-FlutePolish is the ideal complement in the production of shank tools to produce tools with better cutting edges for a more stable and longer tool life.

FEATURES

- Newly developed elastic bond
- Higher feed rates, shorter processing times
- High durability
- Reduced grinding wheel consumption
- High feeds and infeeds possible without problems

ADVANTAGES

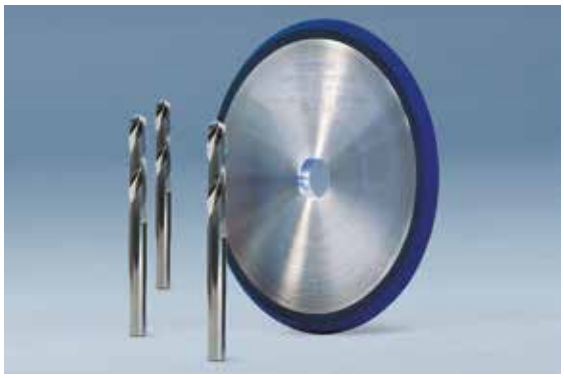
- Very good adaptation to the flute profile
- More even polishing of the entire flute shape
- Excellent surface finish (mirror finish)
- Reduced set-up and cycle times, increased productivity
- Improved tool life
- Reduction of total costs per workpiece
- Very stable performance and low risk of "burning" of the abrasive layer

FLUTE AND CLEARANCE ANGLE POLISHING WITH SP6101

SP6101 is the solution for applications where a "grinding" solution is required for flute polishing. It is a high performance bond that has been developed and optimised for polishing. It is possible to remove up to approx. 0.2 mm, thus the SP6101 produces the final groove profile with the perfect surface.

SP6101 is also the solution for all other surfaces on a shank tool where a perfect surface is required.

For more information and support in using our polishing solutions, please contact us.



2. OD GRINDING - PINCH- AND PEELGRINDING E.G. ON ROLLOMATIC NP4, NP5, SHAPESMART

Rough and Finish Operation

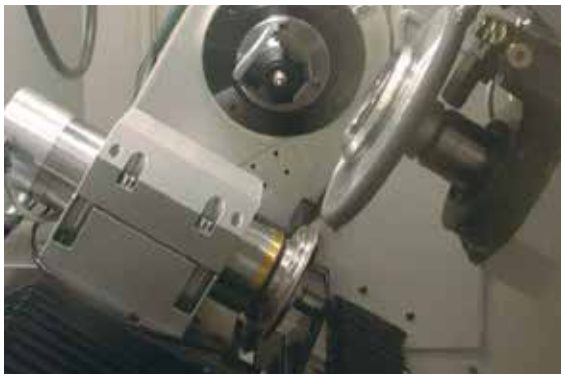
In peel grinding, shank tool blanks as well as punching and forming tools are ground to the required dimension. Complex profiles can also be applied in some cases. There are machine systems that only carry out roughing, but there are also machines performing roughing and finishing in one operation.

ROUGH OPERATION

MATERIAL:	TC, HSS
COOLANT:	Oil, Emulsion
BOND:	Metall bond BZ4415V1

CASE ROLLOMATIC SHAPE SMART

- Z.B. BZ700-250-6-6 31.75
- D/B64...D/B91 BZ4415V1

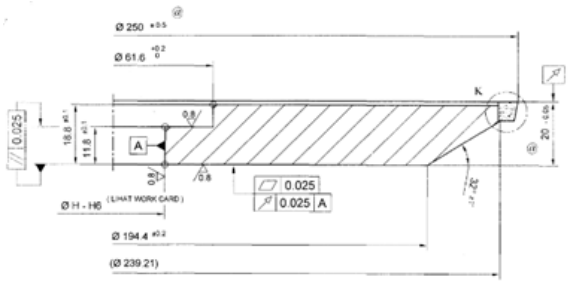


FINISH OPERATION

MATERIAL:	TC, HSS
COOLANT:	Oil, Emulsion
BOND:	Polimide/Hybrid-Bond

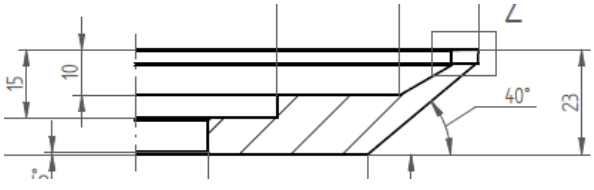
CASE ROLLOMATIC SHAPE SMART

- Z.B. SP2012 SP700-150-3-6 31.75
- D/B15A...D/B39 SP20../SP60..



With this system, roughing and finishing are carried out in one operation. We offer a set of grinding wheels to achieve the optimum workpiece quality with optimised cycle times with the best possible tool life.

Other shapes and dimensions are possible according to your specifications.



3. PROFILE GRINDING - CONDITIONING BY EDM

Due to increasing tolerance and lifetime requirements in profile-generating grinding applications, the trend is towards increasingly wear-resistant grinding wheel specifications. In some cases, complex or highly accurate profiles are required on the grinding wheels. Furthermore, such profiles are also generated by CNC movements using simple radii or pointed profile wheels.

The profiling of highly hard hybrid or metal bonds is very time-consuming, also with pointed profile wheels the pressure during profile grinding can cause the grinding wheel edge to break away. In addition, the grinding wheel layer has to been sharpened in most cases, which can again lead to a loss of accuracy. Furthermore, such hard bonds are often limited in their cutting efficiency.

This is where the advantages of eroding grinding wheel layers become apparent, a clear gain in accuracy and economic efficiency is achieved. CNC-controlled EDM machines are usually used, whereby high profile accuracies can be achieved. As it is done without contact, there is no pressure on the grinding wheel layer. By resetting the bond, there is also no need for sharpening. However, there is the challenge of not resetting the bond of the grinding wheel too far, because in that case the diamond or cBN grit can no longer be held. Even with optimum parameters for EDM, a bond with maximum grain retention force is needed to achieve maximum tool life and cutting performance.

For this purpose, we offer optimised hybrid bonds with the perfect combination of erodibility, profile retention and maximum cutting performance.

Examples of use would be the production of various gear cutting tools such as carbide hobs or power skiving tools.

ROUGHING	D64 SP4300
FINISHING	D15A....D20A SP4300

NOTES

NORTON®
SAINT-GOBAIN
WINTER

GRINDING TOOLS FOR MACHINING CIRCULAR SAWS AND BAND SAWS

SAWS

Various types of saws (e.g. circular saws and band saws)
are used in the woodworking and plastics processing industries.

Grinding technology is used to create the tooth geometry of these saws.
A basic distinction can be made between one-piece saws and composite saws.

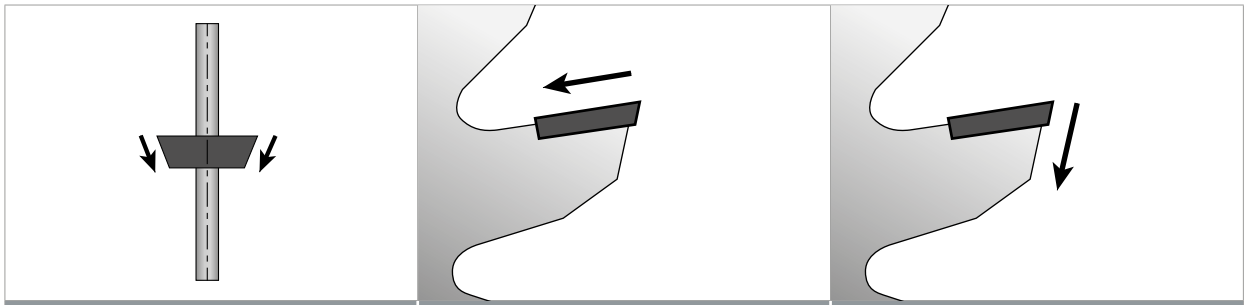
For example, HSS band saws and HSS circular saw blades are one-piece saws. The tooth geometry required for these saws is ground under CNC-controll using radial grinding wheels (see our 'profile S' programme). Saws of this type are sometimes also manufactured as segmented saws.

Composite saws, on the other hand, have carbide, cermet or diamond tips brazed onto a metal core.
The shape of the teeth (face, top and flank) is then ground sequentially (see illustration on next page).

Information
Further information on applications and products
can be found at
www.nortonabrasives.com

GRINDING TOOLS
FOR MACHINING CARBIDE-TIPPED CIRCULAR SAW BLADES

The manufacture of tungsten carbide-tipped circular saw blades consists of a number of steps that are performed sequentially on different machines. The first step is flank grinding, followed by the face and top grinding. Next the chip breaker flutes and hollow-tooth profiles are produced as required.



FLANK GRINDING | FACE GRINDING | TOP GRINDING

These steps can be carried out on a number of different machines, each needing its own grinding wheel geometry. With the unusually large range of Norton Winter grinding wheels available we offer the optimum tool for all machines and applications. The following table is colour coded to help you quickly and easily find the wheel you need for your saw grinding machine.

SAWS

MACHINE	MACHINE TYPE	CODING
VOLLMER BIBERACH	CB, CC, CE, CEN, CEP, CHC, CHC, CHM, CHP, CHT, CNHB, CX and others	1
	CHD	2
	CC, CEF, CFL, CHAFT, CHAFTE, CHHF, CHF and others	3
	CHX	4
VOLLMER DORNHAN	Finimat 600	1
	Finimat 800, Finimax	2
	Finimat Beta, Gamma	3
	Uniläpp	4
	Uniläpp F2	5
	Duo TS	6
WOODTRONIC	NC2, NC3, C4, C5	1
	CNC5	2
	CNC6F	3
AKEMAT	Akemat B / B10	1
	Akemat U / U10	2
	Akemat F / F10	3
WIDMA	Unimat	1
	HKS700/HIII	2
	HKS400, FS1000	3

For universal grinding machines and for Widma machines with bore H20 (BS700, HKS 500, HKS700, HKS700/H, HKS700/HI, HKS700/HII and others), please see our product programme in the chapter 'Milling cutters'.

GRINDING WHEELS FOR THE TOOTH FACE

Depending on the tooth pitch, differently shaped grinding wheels are needed to grind the tooth face. The greater the number of teeth around the circumference, the narrower the space between them and the thinner the grinding wheel has to be. Even the narrowest tooth gaps can be machined with our Tiger grinding wheels. For reasons of stability, conventional tooth gaps are mainly ground using 4A2, 12V2 or 222 grinding wheels.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
Tiger II L	↑	Wear-resistant bond to improve life for tooth-face grinding
Tiger II+		Wear-resistant bond to improve surface for tooth-face grinding
Tiger / Tiger II		Wear-resistant resin bond for tooth-face grinding
K+920 / K+921		Wear-resistant resin bond for tooth-face grinding
K+4821		Free-grinding CNC bond, e.g. for Cermet
K+888TY		Universal resin bond for wet grinding
K+888RY		Universal resin bond for wet grinding

STANDARD DIMENSIONS FOR GRINDING THE TOOTH FACE

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Circular saw blade tooth face grinding	Tungsten carbide Cermet	All established saw grinding machines	4A2, 12V2, 12V9, 222 Ø 100...200 W 2.3...8 X 2...5.5	Various bonds (see above)	Emulsion Oil

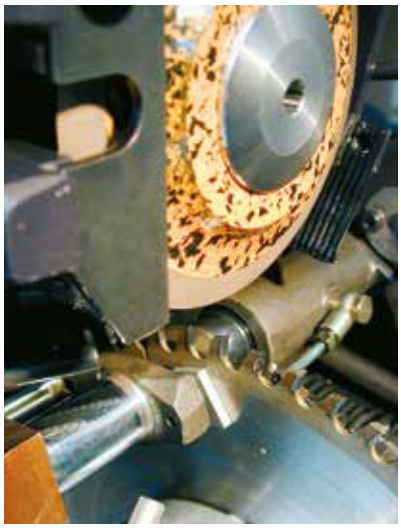
Other dimensions on request

TIGER

The Norton Winter Tiger grinding wheel is the solution for economically grinding the cutting face on carbide-tipped saw blades.

The innovative geometry of the Tiger grinding wheel enables the tooth face to be ground without difficulty even where the chip spaces are narrow. The new design of the Tiger grinding wheel enables markedly narrower pitches to be machined.

The approved Norton Winter K+bonds also guarantee long wheel life. Consequently, Tiger grinding wheels make every face grinding process not only faster, but economically more attractive.



SAWS CARBIDE-TIPPED CIRCULAR SAW BLADES - FACE

TIGER II TIGER II+ TIGER IIL

The Tiger II grinding wheel from Norton Winter is the improved version of the proven Tiger face grinding wheel.

Tiger II+ and Tiger IIL as the result of the successful development of Tiger II are the latest generation of TigerII grinding wheels;
Tiger II+ has been designed to offer improved quality of ground parts, whilst Tiger IIL offers improved lifetime.

It is designed with a stable alu-phenolic body that reduces grinding pressure even further and in addition offers a high degree of fracture resistance.

With an angle of 25°, and on the new Tiger II 20° an even narrower angle of just 20°, narrow pitches are no problem for the Tiger II grinding wheel.

The Tiger II grinding wheel is the perfect combination of innovative wheel geometry and Norton Winter's powerful K+ bonds.

RECOMMENDED USE

TIGER II

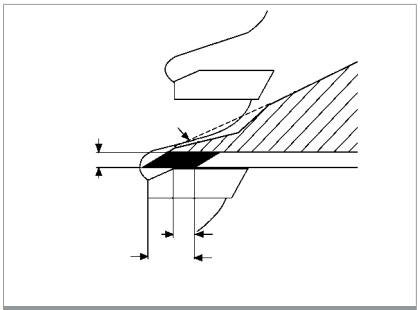
GRINDING TOOL	Tiger or Tiger II
MACHINE	Vollmer CHD
COOLANT	Oil
WORKPIECE	Carbide-tipped circular saw
GRINDING PARAMETERS	
FEED	v_f = 3...10 mm/s
INFEED	a_e = 0,05...0.2 mm
CUTTING SPEED	v_c = 45 m/s
SPECIFIC MATERIAL REMOVAL RATE	Q'_w = 0.15...2 mm³/mm · s

BENEFITS

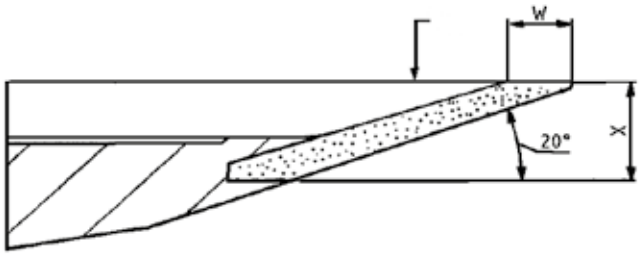
- For narrow chip spaces
- High fracture resistance

ADVANTAGES OF THE TIGER AND TIGER II FACE GRINDING WHEELS

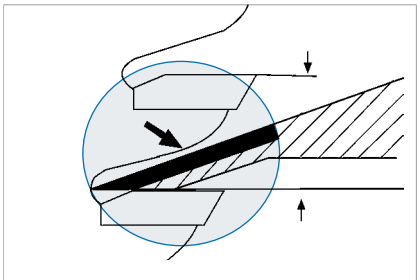
- Versions available for all automatic saw sharpening machines
- Particularly suitable for very narrow chip spaces
- Produces a very flat cutting face with no distortion
- No aluminium welding
- Self-dressing body (Tiger, Tiger II has no support of layer)
- Shorter grinding times, reduced grinding path (see diagram)
- Very long wheel life



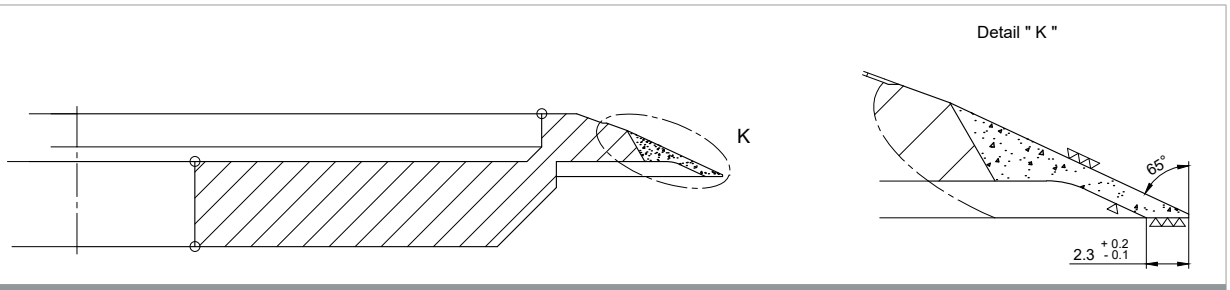
12V2



12V2



12V2



Tiger II for Vollmer CHX

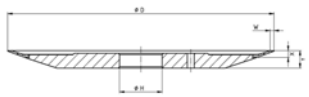
12V9 (TIGER) STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MACHINE
DIAMOND GRINDING WHEELS										
3K12V9	100x2.3x4	25	10	20		Tiger		D	66260387961	1 2 1
3K12V9	125x2.3x4	25	10	20		Tiger		D	66260135761 [2]	2 1 2
1K12V9	125x2.3x4	32	13	20		Tiger		D	66260383182	1
1K12V9	150x2.3x4	32	13	20		Tiger		D	66260385221	1
1K12V9	155x2.3x4	32	13	20		Tiger		D	66260378555 [1]	1 1
						Tiger G		D	66260354959	1 1
1K12V9	200x2.3x4	32	13	20		Tiger		D	66260383180	2 2 2

May differ slightly from illustration depending on the machine's adapter flange

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last

12V2 (TIGER II) STOCK PROGRAMME



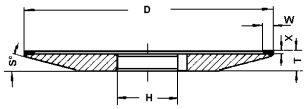
SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MACHINE
DIAMANT-SCHLEIFSCHEIBEN										
1K12V2	125x2.5x5.5	32	13	25		Tiger II		H	66260375783	1
1K12V2	125x2.5x5.5	32	13	25		Tiger II L		H	7958794771	1
1K12V2	125x2.5x5.5	32	13	25		Tiger II +		H	7958794767	1
1K12V2	125x2.9x5.5	32	13	20		Tiger II 20°		H	60157695569	1
1K12V2	125x2.9x5.5	32	13	20		Tiger II + 20°		H	7958794768	1
1K12V2	125x2.9x5.5	32	13	20		Tiger II L 20°		H	7958794773	1
1K12V2	155x2.5x5.5	32	13	25		Tiger II		A	69014168642	1 1
1K12V2	175-2.3-6.24	32	18	25		Tiger II		A	66260201039 [3]	4
1K12V2	175-2.9-6.24	32	18	20		Tiger II 20°		A	66260210611 [3]	4
K12V2	175-2.3-6.24	32	18	25		Tiger II		A	66260242520 [1], [4]	4
2K12V2	175-2.9-6.24	32	18	20		Tiger II 20°		A	66260216316 [1], [4]	4
1K12V2	200x2.5x5.5	32	13	25		Tiger II		H	66260382131	2 2 2
1K12V2	200x2.5x5.5	32	13	25		Tiger II L		H	7958794775	2 2 2
1K12V2	200x2.5x5.5	32	13	25		Tiger II +		H	7958794770	2 2 2
1K12V2	200x2.9x5.5	32	13	20		Tiger II 20°		H	60157680758	2 2 2
1K12V2	200x2.9x5.5	32	13	20		Tiger II + 20°		H	7958794769	2 2 2
1K12V2	200x2.9x5.5	32	13	20		Tiger II L 20°		H	7958794774	2 2 2

May differ slightly from illustration depending on the machine's adapter flange

[1] Delivery time 5 - 6 weeks
[3] For Top Grinding wheel x = 6 mm
[4] For Top Grinding wheel x = 10 mm

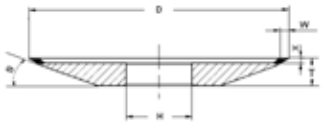
SAWS CARBIDE-TIPPED CIRCULAR SAW BLADES - FACE

4A2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MACHINE
DIAMOND GRINDING WHEELS										
1K4A2	100x4x3	25	12	25	D46	K+888RY	C75	H	66260137095 [2]	1 2 1

12V2 STOCK PROGRAMME

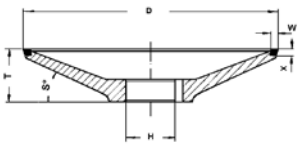


SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MACHINE
DIAMOND GRINDING WHEELS											
2K12V2	100x4x2	25	10	30	20	D46	K+921	C125	A	66260128232	1 2 1
		25	10	30	20	D76	K+4821	C125	A	66260333648	1 2 1
5K12V2	125x4x2	32	13	30	20	D20A	K+730	C75	A	66260114168 [2]	1
		32	13	30	20	D46	K+921	C125	A	66260115804	1
		32	13	30	20	D46	K+4821	C125	A	66260134429	1
		32	13	30	20	D76	K+888RY	C125	A	66260135735	1
		32	13	30	20	D76	K+4821	C125	A	66260134487	1
6K12V2	150x4x2	32	13	30	15	D46	K+921	C125	A	66260127225 [2]	1 1
		32	13	30	15	D46	K+888RY	C125	A	66260113968	1 1
		32	13	30	15	D64	K+921	C125	A	66260118587 [1]	1 1
1K12V2	175x4x3	32	18	30	15	D64	K+921	C125	A	66260201699 [3]	4
1K12V2	200x2x2	32	13	30	20	D46	K+921	C125	A	66260133948	2 2 2
2K12V2	200x4x2	32	13	30	20	D25	K+921	C100	A	66260130483	2 2 2
		32	13	30	20	D46	K+921	C125	A	66260117017	2 2 2
		32	13	30	20	D76	K+888RY	C125	A	66260115113	2 2 2
		32	13	30	20	D76	K+1414N	C100	A	7958707852	2 2 2

May differ slightly from illustration depending on the machine's adapter flange

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.
[3] For Top Grinding wheel x = 6 mm

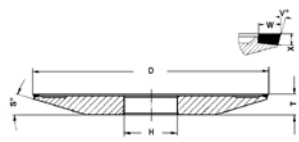
222 DELIVERY PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
DIAMOND GRINDING WHEELS											
1K222	125x3x3.3	25	26	15	25	D54	K+888RY	C75	A	60157642734 [1]	4

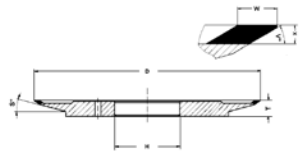
[1] Delivery time 5 - 6 weeks

222 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-CHINE
DIAMOND GRINDING WHEELS											
1K222	100x2x1.6	25	8	15	15	D76	K+888RY	C125	A	60157643361 [1]	1 2 1
1K222	100x3x3.3	25	10	15	25	D54	K+888RY	C75	A	60157642681 [1]	1 2 1
		25	10	15	25	D76	K+888RY	C75	A	66260137081 [1]	1 2 1
2K222	100x3x1.8	25	8	15	15	D54	K+888RY	C75	A	60157642713 [2]	1 2 1
		25	8	15	15	D64	K+888RY	C75	A	66260135818 [1]	1 2 1
1K222	125x2.5x1.2	32	11,5	15	15	D54	K+888RY	C75	A	60157642666 [2]	1
		32	11,5	15	15	D76	K+888RY	C125	A	66260135745	1
1K222	125x3x3.8	32	14	15	15	D54	K+888RY	C75	A	60157642674	1
1K222	150x3x1.5	32	11,5	15	15	D64	K+920	C100	A	66260135724	1 1
5K222	150x3x2	32	12	15	15	D91	K+888TY	C150	A	60157643360	1 1
1K222	160x3x2	32	12	15	15	D64	K+921	C125	A	66260128437 [1]	1

May differ slightly from illustration depending on the machine's adapter flange



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-CHINE
DIAMOND GRINDING WHEELS											
1K222	175x4x2	50,8	12	30	15	D76	K+888RY	C125	A	66260136435 [2]	3 5

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last

GRINDING WHEELS FOR TOP GRINDING

Top grinding describes the peripheral grinding process of circular saw blades. This has two purposes: it ensures that the circularity of the saw is optimized and it defines the wedge and clearance angles, both of which are crucial for the cutting performance of any circular saw.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

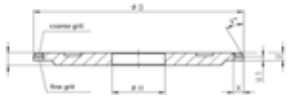
DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
K+921	↑	More wear-resistant resin bond preferably wet grinding
K+1313RY		Resin bond for mixed grinding and wet grinding
K+1421R		Standard resin bond for CNC applications
K+4821		Free-grinding CNC bond, e.g. for Cermet
K+888RY		Universal resin bond for wet grinding
K+1066		Resin bond for top grinding (resharpening, copes with body contact)
K+434		Free-grinding resin bond (synthetic coolant)
K+777N		Free-grinding resin bond (production grinding, oil)

STANDARD DIMENSIONS FOR GRINDING THE TOOTH BLADE

WORKPIECE	MATERIAL	MACHINE	GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Circular saw blade tooth top grinding	Tungsten carbide Cermet	All established saw grinding machines	4B1, 14M1, 222,... Ø 100...200 W 3...6 bzw. U 5...8 X 3...10	Various bonds (see above)	Emulsion Oil

Other dimensions on request

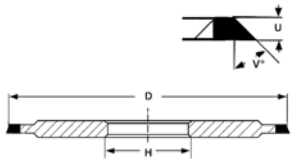
3M1 DOUBLE-LAYER DELIVERY PROGRAMME



SHAPE	DxUxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
DIAMOND GRINDING WHEELS											
1K3M1	125x5x5	32	8	15	2B	D20B	K+1313RY	C75	A	60157643272 [1]	2
						D126	K+1313RY	C100	A		
1K3M1	127x5x6	32	8	15	2B	D54	K+1313RY	C100	A	60157643404 [1]	2
						D126	K+1313RY	C125	A		

[1] Delivery time 5 - 6 weeks

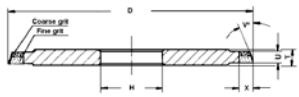
14B1 STOCK PROGRAMME



SHAPE	DxUxX (mm)	H (mm)	T (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
DIAMOND GRINDING WHEELS										
2K14B1	127x5x7	32	8	15	D54	K+921	C125	A	66260114938 [1]	2

[1] Delivery time 5 - 6 weeks

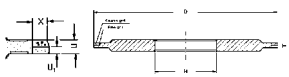
14B1 DOUBLE-LAYER STOCK PROGRAMME



SHAPE	DxUxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
DIAMOND GRINDING WHEELS											
1K14B1	127x5x7	32	8	5	2B	D46	K+4821	C75	H	66260134416	2
						D107	K+4821	C100	H		
1K14B1	127x5x7	32	8	15	2B	D54	K+1313RY	C100	A	66260117412	2
						D126	K+1313RY	C125	A		
						D46	K+4821	C75	A	60157643587 [1]	2
						D107	K+4821	C100	A		

[1] Delivery time 5 - 6 weeks

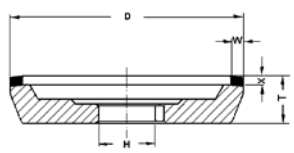
14M1 DOUBLE-LAYER STOCK PROGRAMME



SHAPE	DxUxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
DIAMOND GRINDING WHEELS											
1K14M1	150x5x8	32	10	8	2B	D46	K+921	C75	A	66260130887 [1]	1 2
						D107	K+921	C100	A		
						D46	K+1421R	C75	A	66260346277 [1]	1 2
						D107	K+1421R	C100	A		
1K14M1	200x5x8	32	10	8	2B	D20B	K+1066	C75	A	66260379464	2
						D91	K+1066	C100	A		
1K14M1	200x5x8	32	10	8	2B	D46	K+921	C75	A	66260375347	2
						D107	K+921	C100	A		

[1] Delivery time 5 - 6 weeks

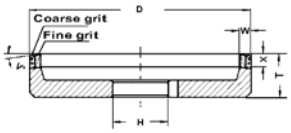
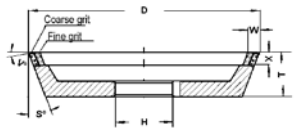
222 STOCK PROGRAMME

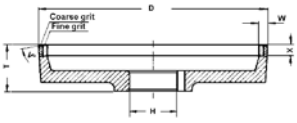


SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MACHINE
DIAMOND GRINDING WHEELS										
5K222	100x5x4	25	20	4	D76	K+888RY	C75	H	60157643743	1 2 1 2

SAWS CARBIDE-TIPPED CIRCULAR SAW BLADES - FACE

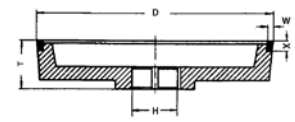
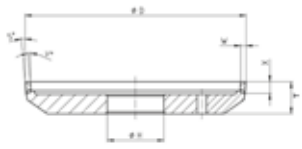
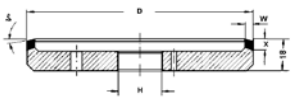
222 DOUBLE-LAYER STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
						DIAMOND GRINDING WHEELS					
	6K222	100x5x6	25	20	8	2B D46	K+888RY	C75	H	66260135827 [2]	1 2
						D126	K+888RY	C100	H		
	1K222	100x5x10	25	24	8	2B D46	K+434	C75	H	66260135783	1 2
						D126	K+434	C100	H		
	2K222	100x5x10	25	24	8	2B D46	K+888RY	C100	H	60157643263 [2]	1 2
						D126	K+888RY	C125	H		
	9K222	125x5x6	25	20	8	2B D46	K+888RY	C75	H	60157643868 [1]	4 1
						D126	K+888RY	C100	H		
	4K222	100x5x6	25	20	8	2B D46	K+888RY	C75	H	60157642914 [1]	1 2
						D126	K+888RY	C100	H		

SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
							DIAMOND GRINDING WHEELS					
	4K222	125x5x6	25	26	8	5 2B	D46	K+888RY	C75	H	60157643430 [1]	4
							D126	K+888RY	C100	H		

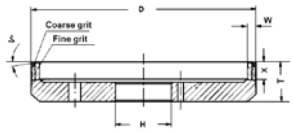
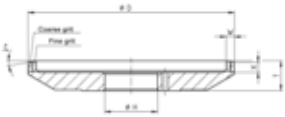
[1] Delivery time 5 - 6 weeks
[2] Available while stocks last

222 STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
						DIAMOND GRINDING WHEELS					
	1K222	125x3x5	25	26	5	5 D54	K+888RY	C100	A	60157642941 [2]	4
	1K222	125x3x6.5	32	18	5	35 D54	K+888RY	C100	A	60157642641	1 2
						D126	K+888RY	C100	A	66260111456	1 2
	1K222	125-3-6	32	18		D54	K+1313RY	C100	H	66260218530	1 2 4
	1K222	125-3-6	32	18		D54	K+921	C125	H	66260187367	1 2 4
	10K222	125-3-10	32	22	8	D64	V-PRIME 5406		H	66260164768	1 2
	27K222	125x5x6	32	18	8	D91	K+4821	C100	A	60157643295	1 4
	18K222	125x5x10	32	22	8	D64	K+777N	C75	H	60157643301	1 2

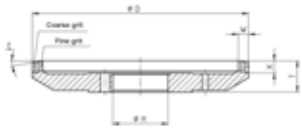
[2] Available while stocks last

222 DOUBLE-LAYER STOCK PROGRAMME

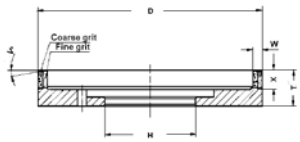
SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
											
DIAMOND GRINDING WHEELS											
3K222	125x5x6	32	18	8	2B	D46	K+434	C75	H	66260136498	1 2 4
						D126	K+434	C100	H		
		32	18	8	2B	D46	K+888RY	C75	H	66260136530	1 2 4
						D126	K+888RY	C100	H		
		32	18	8	2B	D126	K+1066	C125	H	66260224120 [1]	1 2 4
						D46	K+1066	C100	H		
		32	18	8	2B	D126	K+1313RY	C125	H	60157643856 [1]	1 2 4
						D46	K+11313RY	C100	H		
5K222	125x5x10	32	22	8	2B	D15C	K+888RY	C50	H	66260115711 [2]	1 2
						D91	K+888RY	C75	H		
		32	22	8	2B	D20B	K+1066	C100	H	66260127556	1 2
						D126	K+1066	C125	H		
		32	22	8	2B	D25	K+888RY	C100	H	60157643637	1 2
						D76	K+888RY	C125	H		
		32	22	8	2B	D39	K+1313RY	C75	H	66260152983	1 2
						D126	K+1313RY	C100	H		
		32	22	8	2B	D46	K+434	C75	H	60157642597	1 2
						D126	K+434	C100	H		
		32	22	8	2B	D46	K+921	C100	H	66260133442	1 2
						D126	K+921	C125	H		
		32	22	8	2B	D46	K+1066	C100	H	66260134470	1 2
						D126	K+1066	C125	H		
											
52K222	125x5x6	32	18	5	2B	D20B	K+1313RY-42	C75	H	66260352075 [1]	1 2
						D126	K+1313RY	C75	H		

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last

222 TRIPLE-LAYER STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
											
DIAMOND GRINDING WHEELS											
5K222	125x6x6	32	18	8	3B	D20B	K+1066	C75	H	66260132898	1 2
						D46	K+1066	C100	H		
						D126	K+1066	C100	H		

222 DOUBLE-LAYER STOCK PROGRAMME

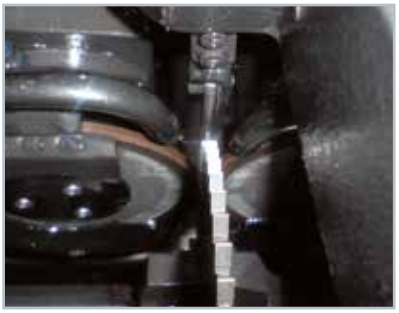
SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
											
DIAMOND GRINDING WHEELS											
31K222	125x5x6	50.8	20	8	2B	D46	K+888RY	C75	H	66260135844 [1]	3 5
						D126	K+888RY	C100	H		
8K222	125x5x10	50.8	20	8	2B	D20B	K+1313RY-42	C75	H	60157642975 [1]	3 5
						D126	K+1313RY	C100	H		
		50.8	20	8	2B	D46	K+888RY	C75	H	66260135843	3 5
						D126	K+888RY	C100	H		

[1] Delivery time 5 - 6 weeks

GRINDING WHEELS FOR FLANK GRINDING

The cutting width of the circular saw blade is defined during the flank grinding process.

Two grinding wheels are simoultaneously fed from both sides to obtain the defined tooth width



SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

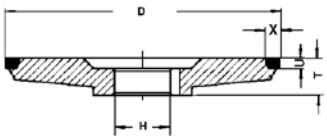
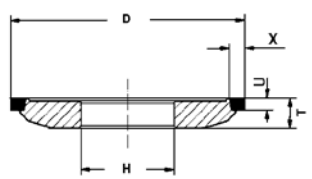
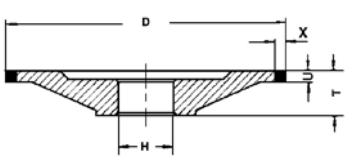
DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
K+921		More wear-resistant resin bond preferably wet grinding
K+888NY		Universal resin bond for wet grinding
K+888JY		Universal resin bond for wet grinding
K+730		Very free-grinding fine-grain bond, dry grinding possible

STANDARD DIMENSIONS FOR GRINDING TOOTH FLANKS

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Circular saw blade tooth flank grinding	Tungsten carbide Cermet	All established saw grinding machines	700 Ø 76...100 U 2.5... 4 X 4.5...6.5	Various bonds (see above)	Emulsion Oil

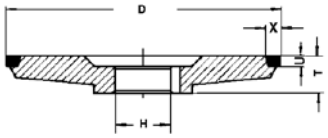
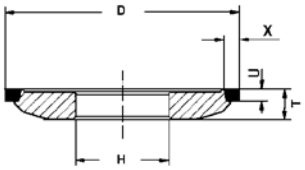
Other dimensions on request

700 STOCK PROGRAMME

	SHAPE	DxUxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
	DIAMOND GRINDING WHEELS									
	1K700	76x4x4.5	20	14	D54	K+921	C75	A	66260133242	3 6
					D91	K+730-42	C50	A	60157643342	3 6
					D126	K+888NY	C75	A	66260136474 [1]	3 6
	2K700	80x2x5	32	10	D64	K+921	C75	A	66260148351 [1]	3 3
	1K700	80x4x5	32	10	D64	K+921	C75	A	66260132865	3 3
	1K700	86x2.5x5	32	10	D54	K+921	C50	A	69014158598 [1]	3 3
	1K700	86x4x5	32	10	D54	K+921	C75	A	66260130320	3 3
	1K700	100x4x4	20	16.5	D126	K+888NY	C75	H	60157642956 [1]	3

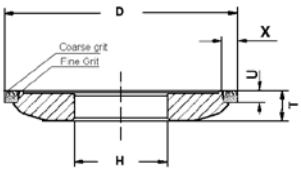
[1] Delivery time 5 - 6 weeks

700 STOCK PROGRAMME

	SHAPE	DxUxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
	DIAMOND GRINDING WHEELS									
	1K700	100x4x4.5	20	14	D54	K+921	C75	A	66260130080	6 3 3
					D91	K+730-42	C50	A	66260136591	6 3 3
					D91	K+888JY	C50	A	60157642952	6 3 3
					D126	K+888NY	C75	A	66260136408	6 3 3
	2K700	100x4x6.5	20	14	D54	K+921	C75	A	66260134535 [1]	6 3 3
					D126	K+888NY	C75	A	66260137143	6 3 3
	1K700	100x4x5	32	10	D54	K+921	C75	A	66260131923	3 3
					D64	K+921	C75	A	66260137345	3 3
					D91	K+730-42	C50	A	60157642622	3 3
					D107	K+888NY	C75	A	66260136539	3 3
					D126	K+888NY	C75	A	60157643744	3 3

[1] Delivery time 5 - 6 weeks

700 DOUBLE-LAYER STOCK PROGRAMME

	SHAPE	DxUxX (mm)	H (mm)	T (mm)		GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
	DIAMOND GRINDING WHEELS										
	3K700	86x4x5	32	10	2B	D54	K+921	C68	A	66260386978	3 3
						D91	K+921	C75	A		
	8K700	100x4x6.5	32	10	2B	D46	K+921	C50	A	66260399091	3 3
						D91	K+921	C75	A		

MOUNTED PINS FOR HOLLOW-TOOTH SAWS

There is a wide variety of tooth geometries to choose from on composite circular saw blades. Depending on the intended use of the saw, the tooth design can be flat, alternate, trapezoid or any combination of these.

A saw can also have hollow ground teeth. The concave shape of the teeth gives very fine cuts with no burrs, thus making the saw highly suitable for processing veneered wood and laminated chipboards. The rounded shape of hollow ground teeth is produced with 1A1W mounted pins. Calculation of the needed grinding pin diameter:

D = 2 x W + 1 (W = width of the saw blade)

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KS449		More wear-resistant resin bond preferably wet grinding
K+920		More wear-resistant resin bond also for dry grinding
K+921		More wear-resistant resin bond preferably wet grinding
K+888TY		Universal resin bond for wet grinding
K+888RY		Universal resin bond for wet grinding

1A1W STOCK PROGRAMME

SHAPE	DxTxX (mm)	S (°)	L_2xS_1xL_4 (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND GRINDING TOOLS								
5K1A1W	5x3x1.5	6	42x3.5x10	2°50'	D76	K+921	C125	60157643650
1K1A1W	6x3x1.5	6	42x3.5x10	2°50'	D76	K+921	C125	66260111416
8K1A1W	6.5x3x1.75	6	33x4.1x10	2°	D76	K+921-42	C125	66260134445
2K1A1W	6.5x3x1.75	6	42x3.1x10	2°50'	D76	K+921	C125	66260134718
		6	42x3.1x10	2°50'	D91	K+888TY	C150	60157643974
6K1A1W	6.5x3x1.75	6	42x4.1x10	-	D76	K+888RY	C125	66260111088
		6	42x4.1x10	-	D76	K+921	C125	66260368674 [2]
1K1A1W	6.5x3x1.75	6	42x5.1x10	2°50'	D76	K+920	C125	66260110241
		6	42x5.1x10	2°50'	D76	K+921	C125	66260133964
1K1A1W	6.5x3x2	6	42x4.5x10	-	D76	KS449-42	C125	66260341274
2K1A1W	7x3x2	6	42x5.1x10	2°50'	D76	K+921	C125	66260133966
		6	42x5.1x10	2°50'	D91	K+888TY	C150	60157643957 [2]
		6	42x5.1x10	2°50'	D91	K+920	C125	60157644164 [2]
		6	42x5.1x10	2°50'	D91	K+921	C125	60157643351 [2]

[2] Available while stocks last

GRINDING WHEELS FOR CHIP BREAKER FLUTES

Chip breaker flutes are sometimes ground into the clearance area of the saw tooth in order to optimize the chip breakage and chip removal during sawing operations. Profile wheels (Norton Winter shape 34P) or 1A1R grinding wheels with resin or metal bonds are used for this.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

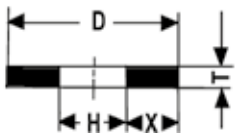
DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
BZ457	↑	Standard metal bond for chip breaker flutes
MR875		Standard metal bond for chip breaker flutes
K+888RY		Universal resin bond for wet grinding

34P STOCK PROGRAMME

SHAPE	DxTxX (mm)	E (mm)	R (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND GRINDING WHEELS								
1BZ34P	125x0.5x5	0.4	0.25	32	D126	BZ457	C135	66260388921
1K34P	125x0.8x5	0.6	0.4	32	D151	K+888RY	C75	66260383651 [1]

[1] Delivery time 5 - 6 weeks

1A1R DELIVERY PROGRAMME



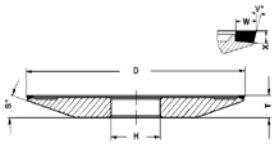
SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND GRINDING WHEELS						
1BZ1A1R	30x0.3x11	8	D76	MR875	C125	66260337005 [1]
1BZ1A1R	30x0.4x11	8	D91	MR875	C125	66260340908 [1]

[1] Delivery time 7 weeks, minimum order quantity 6 pcs.

GRINDING WHEELS
FOR STELLITE CIRCULAR SAW BLADES

Typical applications such as face, top and flank grinding are performed on HSS and Stellite circular saws as well as on tungsten carbide-tipped saw blades. The kinematics of the applications are identical with those for tungsten carbide-tipped saws.
The bond KSSRY has been particularly developped for cBN grinding wheels.

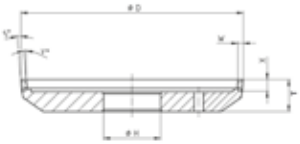
222 STOCK PROGRAMME FOR FACE GRINDING



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
CBN GRINDING WHEELS											
1K222	125x3x3.8	32	14	15	15	B107	KSSRY	V180	A	60157643417 [1]	1

[1] Delivery time 5 - 6 weeks

222 STOCK PROGRAMME FOR TOP GRINDING



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	MA-SCHINE
CBN GRINDING WHEELS											
1K222	125x3x6.5	32	18	5	35	B107	KSSRY	V240	A	60157643394	1 2

PLEASE NOTE
Please refer to our stock programme in chapter "Milling cutters".

GRINDING WHEELS
FOR HSS CIRCULAR SAW BLADES

HSS saw blades are ground from the solid on special CNC grinding machines.
Very wear resistant profile wheels like 14F1 and similar (Norton Winter shape 700) guarantee economic grinding processes.
For this application Norton Winter has developed the innovative ProCurve range, which is successfully used for both initial profiling and re-sharpening under oil- and emulsion coolant.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	RECOMMENDATION FOR USE
ProCurve	Profile stable high performance bond for HSS saws
EcoCurve	Universal bond for HSS saws

STANDARD DIMENSIONS FOR GRINDING ONE-PIECE CIRCULAR SAW BLADES

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Circular saw blades	HSS Tungsten carbide	All established saw grinding machines	700 Ø 150, 200 U 1.3...6 X 6.5...15	700 Ø 150, 200 U 1.3...6 X 6.5...15	Oil Emulsion

Other dimensions on request

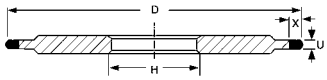
CASE STUDY (INITIAL PROFILING)

GRINDING TOOL	ProCurve
MACHINE	Loroch KBN 710
COOLANT	Oil
WORKPIECE	HSS circular saw blade, Ø 400 mm Thickness 2.5 mm, 180 teeth
GRINDING PARAMETERS	
FEED	v_f = 10.6 teeth / min
INFEED	a_e = 2.79 mm
CUTTING SPEED	v_c = 60 m/s

BENEFITS

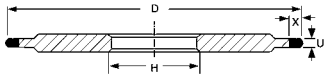
- 10 % higher feed rate
- No burn
- Very low burr formation

700 /14F1 STOCK PROGRAMME FOR LOROCH MACHINES



SHAPE	DxUxX (mm)	H (mm)	R (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN-SCHLEIFSCHEIBEN								
1K700	200x1.3x6.5	32	0,65		ProCurve		E	7958758236
2K700	200x1.6x7	32	0,8		ProCurve		E	7958761766
3K700	200x2x8	32	1		ProCurve		E	7958745748
2K700	200x2.5x8	32	1,25		ProCurve		E	7958756148
5K700	200x3x10	32	1,5		ProCurve		E	7958759735
3K700	200x3.5x10	32	1,75		ProCurve		E	7958761779 [1]
1K700	200x4x12.5	32	2		ProCurve		E	7958756329 [1]
1K700	200x5x15	32	2,5		ProCurve		E	7958761780 [1]
14F1	200x1.3x6.5	32	0,65	B107	ECO Curve		E	7958706686
14F1	200x1.6x7	32	0,8	B107	ECO Curve		E	7958714307
14F1	200x2x8	32	1	B107	ECO Curve		E	7958706684
14F1	200x2.5x8	32	1,25	B107	ECO Curve		E	7958716444
14F1	200x3x10	32	1,5	B107	ECO Curve		E	7958718179
14F1	200x4x12.5	32	2	B107	ECO Curve		E	7958716216

Other shapes and dimensions for e.g. Schmidt Tempo machines on request



SHAPE	DxUxX (mm)	H (mm)	R (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS								
1K700	200x1.3x6.5	32	0.65	D91	K+888TY	C125	E	66260129165 [1]
3K700	200x2x8	32	1	D91	K+888TY	C125	E	66260117948 [1]
5K700	200x3x10	32	1.5	D91	K+888TY	C125	E	69014129762 [1]

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last

Tungsten carbide saw blades are primarily designed with carbide tips on steel blades. However, some applications require solid metal blades. Here, the same wheel geometries as for HSS saw blades are applicable.

GRINDING WHEELS
FOR MACHINING BAND SAWS

Band saws are ground using peripheral grinding wheels. These have either simple profiles (14F1, 1V1) or coordinate profiles (Norton Winter shape 700).
Typical machines are the Vollmer-Biberach and Iseli. These machines are fitted with either cBN grinding wheels or conventional AL_2O_3 wheels.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

CBN-SCHLEIFSCHEIBEN	WEAR RESISTANCE	RECOMMENDATION FOR USE
KM64	↑	Standard resin bond for Stellite
KSS007N		Free-grinding resin bond for dry grinding

STANDARD DIMENSIONS FOR GRINDING BANDSAWS

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Band saws	HSS Stellite	All established band saw grinding machines	14F1, 1V1, 700 Ø 250, 300 U (variable) X (variable)	KSS007 KM64	Oil Emulsion

Other dimensions on request

CASE STUDY (INITIAL PROFILING)

NORTON SAINT-GOBAIN WINTER

GRINDING TOOL	1V1-300-10-10 50,8 B126 KSS007 V240 A
MACHINE	Vollmer CA 300
COOLANT	Emulsion
WORKPIECE	Stellite-tipped band saw, l = 11.76 m, Thickness 1.8 mm, 300 teeth
GRINDING PARAMETERS	
FEED	v_f = 20 teeth / min
INFEED	a_e = 1 mm
CUTTING SPEED	v_c = 63 m/s

BENEFITS
- Very low wear
- Good price-performance ratio

Because of the large number of profiles, we do not keep grinding wheels in stock. Please get in touch with us to find the best solutions for your machining requirements.

NOTES

NORTON
SAINT-GOBAIN

WINTER

GRINDING TOOLS FOR THE PRODUCTION OF INSERTS

TRENDS IN THE MACHINING OF INSERTS

In the area of inserts, a wide variety of materials and tool geometries are machined. This makes great demands on the grinding tools required.

In general, there is a trend towards higher demands on the quality of the cutting edge. A few years ago, grit sizes of D76 and coarser were used, grit sizes of D46 and finer are currently the state of the art.

Furthermore, there are trends towards specialisation on individual insert types in order to be able to use optimally adapted grinding tools to increase productivity and quality. However, there is also a demand for grinding tools with which the widest possible range of different inserts can be machined with the highest possible performance, in order to optimise the inventory of the grinding wheels required for this purpose.
The increasing cost pressure leads to ever new requirements and a growing need for optimisation of the grinding wheels used. Due to the different requirement criteria, individual solutions are thus in demand.

The current Norton Winter grinding wheel programme for the machining of inserts offers solutions for all application areas in this industry sector. Customised to the respective grinding task and the system environment, the innovative diamond grinding wheels from Norton Winter offer the ideal solutions under both oil and emulsion cooling.

REQUIREMENTS OF DIFFERENT INSERTS

NORTON SAINT-GOBAIN WINTER	STANDARD TUNGSTEN CARBIDE INSERTS	LARGE TUNGSTEN CARBIDE INSERTS	POLISHED TUNGSTEN CARBIDE INSERTS	CERMET INSERTS	CERAMIC INSERTS
LOW WHEEL WEAR	●			●	●
HIGH FEED RATES	●	●		●	
COOL GRINDING BEHAVIOUR		●	●	●	
OPTIMAL EDGE QUALITIES			●		●

INSERT+

DIAMOND GRINDING WHEELS
FOR PERIPHERAL GRINDING OF INSERTS

Inserts are produced in very large quantities. Every year, more than a billion inserts are produced worldwide. Accordingly, even time savings of a few seconds per insert mean large capacity gains. For this reason, stiffer, more powerful and increasingly automated machines with shorter traverse paths and faster controls and drives are being developed. In order to take advantage of these growing opportunities, the development of innovative, high-performance grinding wheel systems is ongoing in the field of indexable insert production. The demands on material development are also increasing. For example, the inserts must always be harder than the material to be machined. Accordingly, the grinding tools must also be optimised. In addition to the economic aspects, the quality requirements continue to increase, which means the best possible quality with consistent machining times.
This causes the increased need for extremely high-performance fine-grained diamond grinding wheels in insert peripheral grinding.

The Norton Winter INSERT+ family consists of specially developed grinding wheels for every type of insert. The programme includes in particular free-grinding specifications, with which e.g. in the area of standard inserts superb material removal rates can be achieved, as well as very robust, low-wear systems for the area of special inserts (ceramic, cBN...).
For polished inserts, fine-grit variants are included in the portfolio, where an impressive combination of best cutting edge quality and high material removal rate is achieved. Let yourself be convinced by the performance of our systems!

NORTON WINTER INSERT+

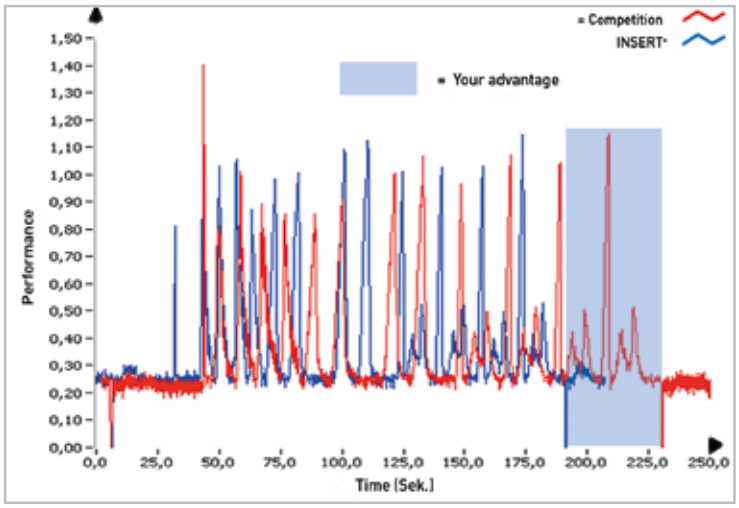
Can be used for the grinding of

- Tungsten carbide
- Cermet
- cBN
- Ceramic

...under emulsion and oil

Chipping < 10 µm

Picture: In this example, the time benefit generated by Norton Winter INSERT+ is 30 seconds per insert!



APPLICATION RECOMMENDATIONS

NORTON SAINT-GOBAIN WINTER	STANDARD TC INSERTS	BIG TC INSERTS	POLISHED TC INSERTS	CERMET INSERTS	SPECIAL INSERTS
D64...D76	SP4062 KS521 SP4006 W+7100 SZ4200	SP4006 SP4017 SZ4200		SP4017 W+3084 SP4201	K+980 SP4006
D46...D54					
D25...D35			W+3102 W+3084		
D15...D20		Paradigm			SP4017 Paradigm PCX-PRIME
>D15			SZ4201 PCX		

Grinding wheels for machining PcBN inserts please find in chapter "Grinding tools for PCD and PcBN machining".

STANDARD DIMENSIONS FOR PERIPHERAL GRINDING OF INSERTS

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Insert	Tungsten carbide Cermet Ceramic cBN	Agathon EWAG WAIDA Wendt ...	2A2T, 11A2,... Ø 250, 350, 400 W 3...25 X 3...15	Norton Winter INSERT+	Oil Emulsion

DRESSING RECOMMENDATIONS:

The success of the grinding process does not depend solely on the selection of the right grinding wheel. Grinding wheels are increasingly being adapted more closely to the respective requirements. Thus, the right conditioning and subsequently the selection of the best dressing tool are growing substantially in importance.
SAINT-GOBAIN Abrasives uses its decades of experience in this regard as a system supplier and provides customised dressing and grinding wheels in line with the job requirements.

For recommendations on dressing tools, please refer to the chapter „Dressing" in this catalogue.

INSERT+ EXAMPLES OF USE

CASE STUDY 1

INSERT+

WORKPIECE	Tungsten carbide insert
GRINDING TOOL	D39 INSERT+ 7100-W6 C115 A
GRINDING MACHINE	Agathon 400 EVO
COOLANT	Oil
GRINDING PARAMETERS	
FEED RATE (SIDES)	v_f = 30 / 15 mm/min
CUTTING SPEED	v_c = 24 m/s
ALLOWANCE / SIDE	a_e = 0.2 mm
DRESSING INTERVAL	40 inserts
CYCLE TIME	t = 60 s

BENEFITS

- 22 % incresed feed rate
- 10 % reduced cycle time
- Reduced grinding wheel wear

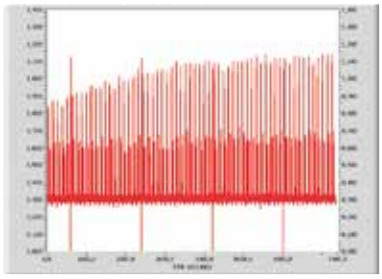
CASE STUDY 2

INSERT+

WORKPIECE	Polished tungsten carbide insert
GRINDING TOOL	D15C INSERT+ 4201 A
GRINDING MACHINE	Agathon LEO
COOLANT	Oil
GRINDING PARAMETERS	
FEED RATE (SIDES)	v_f = 15/5 mm/min
CUTTING SPEED	v_c = 21 m/s
ALLOWANCE / SIDE	a_e = 0.2 mm
DRESSING INTERVAL	20 inserts
CYCLE TIME	t = 43 s

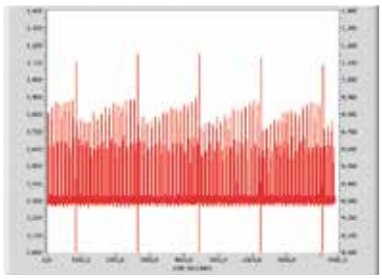
BENEFITS

- 20 % longer dressing interval
- 50 % lower dressing amount
- 10 % lower cycle time



Picture standard:

- Increasing power consumption
- Dressing effect insufficient



Picture "optimised with INSERT+"
Stable grinding process,
substantially lower grinding pressure

CASE STUDY 3

INSERT+

WORKPIECE	Tungsten carbide insert
GRINDING TOOL	D46 INSERT+ 4062 C100 A
GRINDING MACHINE	Agathon 400 Penta
COOLANT	Oil
GRINDING PARAMETERS	
FEED RATE (SIDES)	v_f = 18 mm/min
CUTTING SPEED	v_c = 18 m/s
ALLOWANCE / SIDE	a_e = 0.4 mm
DRESSING INTERVAL	10 inserts
CYCLE TIME	t = 97 s

BENEFITS

- 20 % higher lifetime
- 10 % seconds time savings per insert
- More than 15 % cost reduction per insert

DIAMOND GRINDING WHEELS
FOR TOP AND BOTTOM GRINDING OF INSERTS

With the Level⁺ series for the top and bottom grinding of inserts, Norton Winter is setting new standards with regard to evenness and precision.
The Norton Winter Level⁺ products, grinding wheel systems that have been specially developed for this application, are characterised by very free-grinding behaviour.
The grinding pressure can be significantly reduced and therefore long dressing intervals become possible.
The unique grinding characteristics of this product family also permit substantially higher feed rates so that impressive increases in productivity can be achieved.

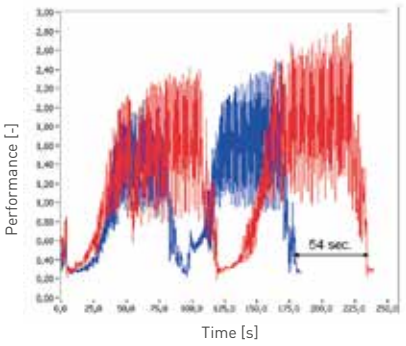
TOP AND BOTTOM GRINDING

STANDARD DIMENSIONS FOR TOP AND BOTTOM GRINDING OF INSERTS

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Inserts Plane knives etc.	Tungsten carbide Ceramic	Diskus Viotto Wendt	6A2 Ø 300...500 W 40...190 X 3...8	Norton Winter LEVEL⁺	Oil Emulsion

OTHER DIMENSIONS ON REQUEST

WORKPIECE	Tungsten carbide insert
GRINDING TOOL	Level⁺ 219
GRINDING MACHINE	Viotto
COOLANT	Emulsion
GRINDING PARAMETERS	
FEED RATE	v_f = 25 mm/min
SPEED (TOP)	n = 900 min-1
SPEED (BOTTOM)	n = 350 min-1
ALLOWANCE / SIDE	a_e = 0.15 mm
DRESSING INTERVAL	15 inserts
CYCLE TIME	t = 88 s



RED = Competition
BLUE = Level⁺
The illustration shows the time savings compared to the competition, based on two ground workpieces.

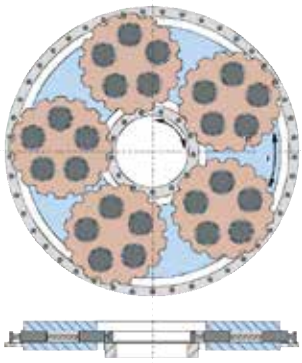
BENEFITS

- 20 % higher feed rate
- 25 % savings in grinding time
- 33 % longer dressing interval
- More constant grinding characteristics
- Lower power consumptio

TOP AND BOTTOM GRINDING WITH PLANETARY KINEMATICS

The Level⁺ GPK (Grinding with Planetary Kinematics) grinding wheel is a variant from the Level⁺ family, developed for top and bottom grinding with planetary kinematics.

The Level⁺ GPK is characterised by very free-grinding behaviour, which means that short grinding times, high material removal rates and high outputs are possible. In addition to the commercial benefits, this specification also has very constant grinding behaviour with tight dimensional tolerances and excellent surface qualities and workpiece evenness.



STANDARD DIMENSIONS FOR TOP AND BOTTOM GRINDING WITH PLANETARY KINEMATICS

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Inserts Plane knives etc.	Tungsten carbide	AMT Melchiorre Peter Wolters Stähli ...	6A2 Ø 500...1020 W 40...190	Norton Winter LEVEL⁺ GPK	Oil Emulsion

Other dimensions on request

ANWENDUNGSBEISPIEL:

LEVEL⁺

WORKPIECE	Tungsten carbide insert
GRINDING TOOL	D46 Level⁺ GPK
GRINDING MACHINE	Peter Wolters AC 700
COOLANT	Emulsion
GRINDING PARAMETERS	
WORKPIECES / LOAD	204 inserts
ALLOWANCE / SIDE	a_e = 0.25 mm
CYCLE TIME	t = 180 s

BENEFITS

- Dimensional tolerance - 5 µm
- Surface quality (Ra) 0.25 - µm
- Flatness - 1 µm

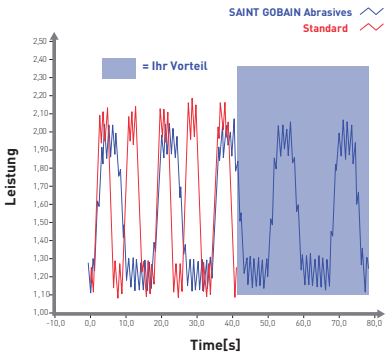
DIAMOND GRINDING WHEELS
FOR PROFILE GRINDING OF INSERTS

The profiling of inserts is a multi-faceted process. Various contours are generated, from simple flutes to complex profiles on the periphery of the inserts. Therefore, the applied profile wheels (e.g. 1E1, 1F1 or 1V1) are made from metal or resin bonds. With multi-process profiles (e.g. grooves for positive locking of the inserts in rotary holders) in the past, crushable metal or vitrified bonded systems were often used. Currently, there is a clear trend to insert profiles into optimised metal or hybrid bonds using EDM. This enables the use of significantly more form-stable bonds, which ultimately achieve better tool life and also higher performance.

APPLICATION EXAMPLE PROFILE WHEEL

NORTON SAINT-GOBAIN WINTER

WORKPIECE	TC - Profile Insert - Finish Profile R < 0.1 mm
GRINDING WHEEL	14E1-125-5-10-30 20 D46 BZ387 C125
COOLANT	Oil
GRINDING PARAMETERS	
INFEED	a_e = 0.2 mm
CUTTING SPEED	v_c = 28 m/s
CUTTING SPEED	v_f = 80 mm/min
DRESSING CYCLE	>100 pieces



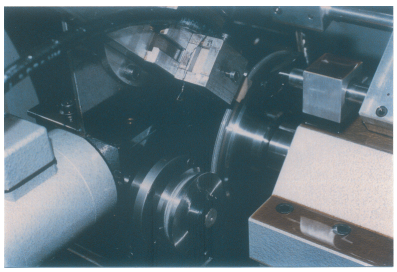
BENEFITS

- > 10 % increrased dressing interval

APPLICATION EXAMPLE PROFILE WHEEL

NORTON SAINT-GOBAIN WINTER

WORKPIECE	Tungsten carbide insert with pre-sintered threaded profile
GRINDING WHEEL	MC1A1-150-4.5-5 D64 DMC C75
COOLANT	Emulsion
GRINDING PARAMETERS	
PROFILE DEPTH	0.95 mm
RESIDUAL ALLOWANCE	0.6 mm
INFEED	a_e = 0.6 mm
CUTTING SPEED	v^c = 23 m/s
FEED RATE	v_f = 150 mm/min
SPECIFIC MATERIAL REMOVAL RATE	Q'_w = 1.5 mm³/mm · s



BENEFITS

- 80 % cost savings

DMC CONDITIONS OF USE

The crushing device should be part of the original machine; at least it should be strongly mounted onto the machine By doing so, the advantages of profiling, without annoying tool changing, can be utilised. Pre-forming of the layer to the required profile is also possible.

Crushing can be carried out either with a powered grinding wheel, which drives the profiling roller, or with a powered profiling roller driving the grinding wheel. (If attention is not paid to this point, the wear of the profile roller will increase).

Profile crushing should always be performed using flood coolant, as the grinding wheel and the crushing roll must be lubricated. Additionally, during crushing, the abrasive layer must be cleaned with a Norton Winter stone No. 2 or No. 5. This reduces profile distortion that may occur due to adherent wheel particles.

NOTES

NORTON
SAINT-GOBAIN
WINTER

GRINDING TOOLS FOR PCD & PCBN MACHINING

PCD / PCBN

Diamond is the hardest known material and is used as MCD (monocrystalline diamond) and PCD (polycrystalline diamond) in the tools industry in a multitude of ways. The machining of diamond is not only difficult due to its hardness. Diamond is very brittle and therefore needs very free-cutting grinding wheels to generate good cutting edge qualities.

The second hardest known cutting material is polycrystalline boron nitride (PcBN). When turning and milling hardened steels, cast iron and sintered metals, PcBN grinding tools provide enormous tool life advantages over conventional carbide tools.

Information
Further information on applications and products can be found at
www.nortonabrasives.com

GRINDING OF PCD AND PCBN INSERTS

The machining of superhard materials such as PCD and PCBN places particularly great demands on grinding tools. There are hardly any differences in hardness between the workpiece and the diamond grain used in the grinding wheel, meaning that wear-resistant but free-grinding systems are required. In the past, the use of metal bonds was standard when machining PCD and PcBN. In recent years, these have been increasingly replaced by state-of-the-art vitrified bonds. Vitrified bond diamond grinding wheels have now become the standard for the majority of PCD and PcBN tool grinding operations. They are convincing due to their free-grinding behaviour, which is now also accompanied by very good tool life due to further developments. Please contact us about your application so that we can jointly define the optimum solution for you.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
VFK		Metal bond for rough pre-grinding
VF		Metal bond for pre-grinding
VFF		Metal bond universal for pre- and finish grinding
VP		Metal bond for polish grinding
PCX-Prime		High performance Vitrified Diamond bond. Depending on hardness grade for all applications to to machine PCD, MCD, PcBN etc.

STANDARD DIMENSIONS FOR THE GRINDING OF PCD AND PCBN TOOLS

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Inserts Milling cutters etc.	PKD PcBN	Manual and CNC tool grinding machines	2A2, 6A2, 11A2,... Ø 100...400 W 3...20 X 6...15	Vitrified, hybrid or metal bonds	Oil Emulsion

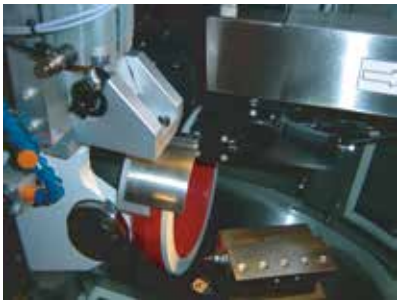
WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Inserts Milling cutters etc.	PKD PcBN	CNC tool grinding machines OD grinding machines	1A1, 14A1, etc. Ø 100...500 U 3...15 X 5...10	Vitrified, resin or metal bonds	Oil Emulsion

Other dimensions on request

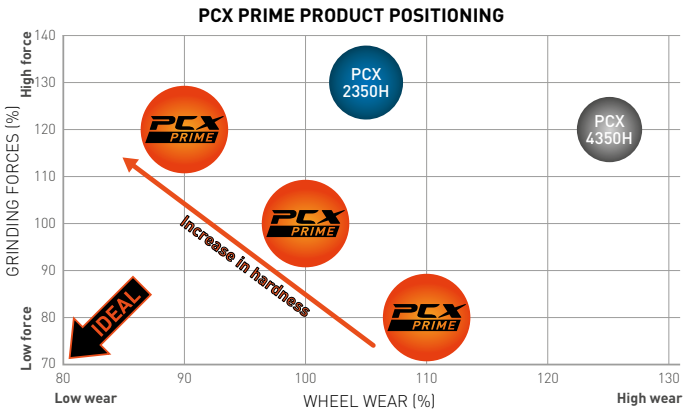
INNOVATIVE VITRIFIED BOND PCX PRIME

Machining of superhard materials is one of the most demanding, costly and time consuming grinding operations. Therefore, choosing the right grinding tool is the key to improving process efficiency.

Designed to meet the constantly growing PCD and PcBN tools industry's requirements for improved surface finish and lower grinding forces, Norton Winter PCX Prime offers a high quality grinding solution with the optimum combination of free grinding behaviour and edge stability, for those even the most difficult grinding tasks are no problem.



- **LONGER WHEEL LIFE**
  for less changes and downtimes
- **OPTIMISED FREE GRINDING BEHAVIOUR**
  for higher stability and part quality
- **REDUCED GRINDING FORCES**
  for lower workpiece load
- **EXCELLENT SURFACE QUALITY AND CUTTING EDGE CHIPPING**
- **HIGHER FEED RATES**
  for reduced recondition intervals
- **IMPROVED PRODUCTIVITY AND COST-PERFORMANCE RATIO**



PCX PRIME is available in all grain sizes, common shapes and dimensions. Customised tools can also be developed for specific requirements. Please contact our team of experts for a recommendation.

PCX PRIME PRODUCT AVAILABILITY

SHAPE	DIAMETER	COVERING WIDTHS
Cup wheels such as 2A2T, 6A2, 6A9, 11A2, 12A2 and others	40 - 400 mm	4 - 25 mm
Peripheral wheels such as 1A1, 1V1, 1F1 and others	50 - 500 mm	3 - 20 mm

Grain sizes: from D5

Norton Winter starting recommendation

PKD → **PCX PRIME E** Typical range: **PCX PRIME E – PCX PRIME I**

PcBN → **PCX PRIME I** Typical range: **PCX PRIME I – PCX PRIME O**

APPLICATION EXAMPLE 1

GRINDING TOOL	D15A PCX-PRIME E
GRINDING MACHINE	EWAG EASYGRIND
COOLANT	Emulsion
WORKPIECE	PCD- grooving insert (brazed, high TC content)
GRINDING PARAMETERS	
FEED RATE	v_f = 3 mm/min
STOCK	a_e = 0.3 mm
CUTTING SPEED	v_c = 18 m/s

BENEFITS
- 50 % reduction of wheel wear
- 20 % time saving
- Very good cutting edge quality and surface of the backing material
- Very stable grinding behaviour perfect quality on the carbide part

APPLICATION EXAMPLE 2

GRINDING TOOL	D15A PCX-PRIME I
GRINDING MACHINE	EWAG Ewamatic
COOLANT	Oil
WORKPIECE	PCD-tipped end mill
GRINDING PARAMETERS	
FEED RATE	v_f = 3 mm/min
STOCK	a_e = 0.3 mm
CUTTING SPEED	v_c = 18 m/s

BENEFITS
- 60 % reduction of grinding time
- Very good edge quality
- Perfect diminsional stability

APPLICATION EXAMPLE 3

GRINDING TOOL	D10 PCX-PRIME N
GRINDING MACHINE	Agathon 400 Penta
COOLANT	Oil
WORKPIECE	PcBN-tipped Insert
GRINDING PARAMETERS	
FEED RATE	v_f = 8 mm/min
STOCK	a_e = 0.3 mm
CUTTING SPEED	v_c = 21 m/s

BENEFITS
- 40 % improved wheel life
- 10 % reduced cycle time
- Very good edge quality
- Stable grinding behaviour & increased dressing intervall

APPLICATION EXAMPLE 4

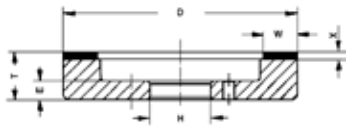
GRINDING TOOL	D20B PCX-PRIME K
GRINDING MACHINE	Agathon Combi 400
COOLANT	Oil
WORKPIECE	Solid PcBN Insert
GRINDING PARAMETERS	
FEED RATE	v_f = 8 mm/min
STOCK	a_e = 0.3 mm
CUTTING SPEED	v_c = 22 m/s

BENEFITS
- Wheel life + 100 %
- 10 % reduced cycle time
- All quality demands are reached

STANDARD TOOLS FOR MANUAL PCD MACHINING

Apart from modern vitrified and hybrid bonds, metal bonded PCD grinding tools are still popular. These multi-purpose tools feature impressive lifetime, and are insensitive to variations in grinding pressure - which is important for manual applications. The selection assistant at the beginning of this chapter will help you to choose the best bond for your grinding task.

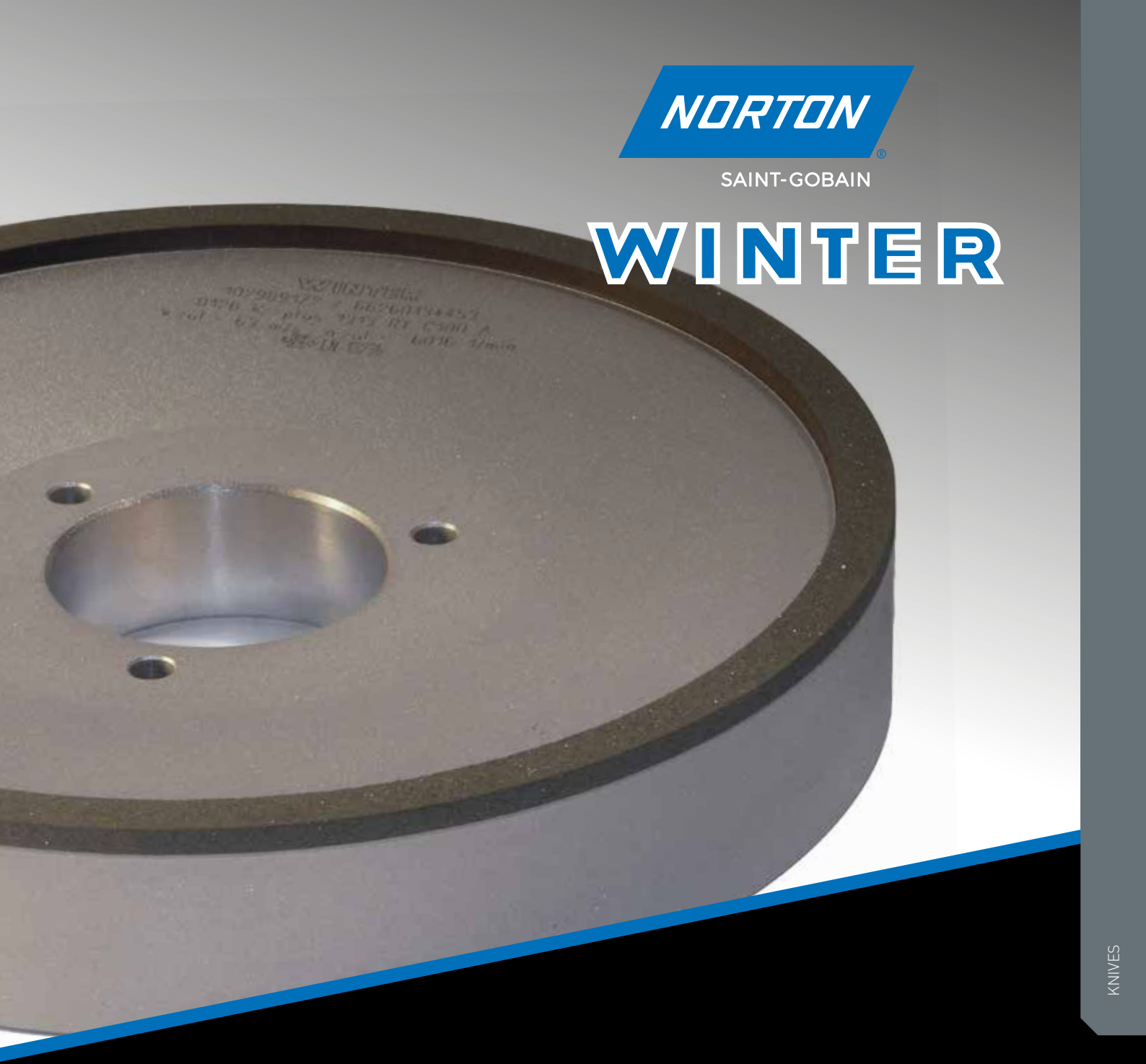
6A2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	E (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMANT-SCHLEIFSCHEIBEN									
8BZ6A2	150x6x8	40	40	10*)		VFK		A	60157643172
1BZ6A2	150x20x4	40	40	10*)		VF		A	66260135795 1)
		40	40	10*)		VFF		A	60157643132
		40	40	10*)		VP		A	66260135772

May differ slightly from illustration depending on the machine's adapter flange

1) Delivery time 5 - 6 weeks
*) For EWAG manual machines



NORTON
SAINT-GOBAIN
WINTER

KNIVES

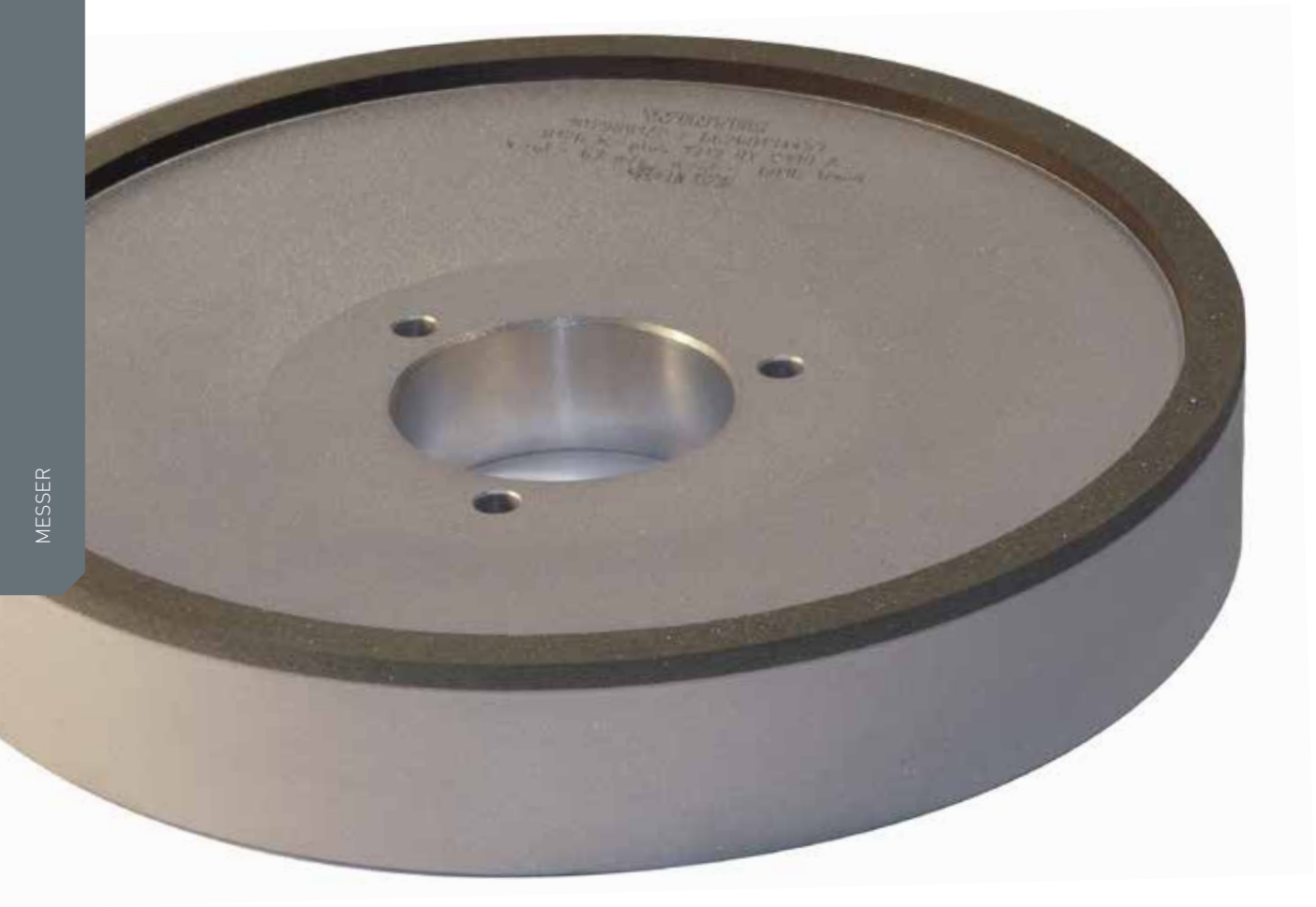
GRINDING TOOLS FOR KNIFE MACHINING

KNIVES

The knife industry includes various grinding applications in the manufacture of industrial knives such as flat, circular or profile knives.

The sharpness of the blade is the quality criterion for every type of knife. That is why most importance is given to the grinding of the blade facets. At the same time, this is also the most frequent application for superabrasive grinding tools in knife machining.

Information
Further information on applications and products can be found at
www.nortonabrasives.com



DIAMOND & CBN GRINDING WHEELS
FOR SURFACE AND PROFILE GRINDING

Norton Winter offers metal and resin bond grinding wheels for polish grinding of paper knives as well as roughly ground chopping knives for the recycling and shreddingsector.

Both cup wheels for the grinding of flat and circular knives as well as peripheral wheels for the profiling of e.g. profile knives are available ex stock.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
BZ587	↑	Standard metal bond for knife machining
K+1313RY		Resin bond for tungsten carbide-steel combination grinding, wet
K+920		More wear-resistant resin bond also for dry grinding
K+4821		Free-grinding CNC bond, e.g. for Cermet
K+888RY		Univeral resin bond for wet grinding

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
MSS587	↑	Standard metal bond for knife machining
KSS920		More wear-resistant resin bond also for dry grinding
KSSRY		Univeral resin bond for wet grinding
KSSJY		Univeral resin bond for wet grinding
KSS007N		Free-grinding resin bond for dry grinding

STANDARD DIMENSIONS FOR KNIFE MACHINING

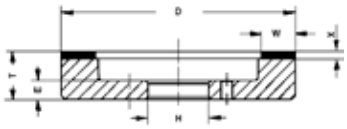
WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Flat knives Circular knives etc.	Tungsten carbide HSS	Göckel Reform Weinig	6A2, 222,... Ø 100...200 W 3...8 X 4...8	K+, KSS, BZ and MSS bonds	Oil Emulsion

WORKPIECE	MATERIAL	MACHINE	PERIPHERAL GRINDING WHEEL		COOLANT
			SHAPE	BOND	
Profile knives etc.	HSS	Universal blade grinding machines	14F1, 14A1 Ø 200 U 2...4 X 3...7	KSS bonds	Oil Emulsion

Other dimensions on request

GRINDING OF FLAT AND CIRCULAR KNIVES

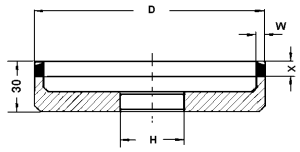
6A2 STOCK PROGRAMME



FORM	DxWxX (mm)	H (mm)	T (mm)	KORN-GRÖßE	BINDUNG	KONZEN-TRATION	GRUND-KÖRPER	BESTELL-NUMMER
METAL BONDED DIAMOND GRINDING WHEELS								
6BZ6A2	200x8x8	20	31	D64	BZ587	C25	A	66260111969 [1]
5BZ6A2	200x8x8	50	31	D64	BZ587	C25	A	66260110549 [4]
3BZ6A2	200x8x8	75	35	D64	BZ587	C25	A	66260348688 [5]
RESIN BONDED DIAMOND GRINDING WHEELS								
1K6A2	200x8x6	50	35	D126	K+1313RY	C100	A	7958762417 [4]
2K6A2	200x8x6	75	35	D126	K+1313RY	C100	A	7958762416 [5]
METAL BONDED CBN GRINDING WHEELS								
5BZ6A2	200x8x8	50	31	B126	MSS587	V120	A	66260133248 [4]
3BZ6A2	200x8x8	75	35	B126	MSS587	V120	A	66260368698 [5]
RESIN BONDED CBN GRINDING WHEELS								
2K6A2	125x3x4	20	18	B107	KSSRY	V120	H	66260134792 [6]
1K6A2	150x4x6	20	29	B181	KSS007N-63	V180	A	60157643468 [3]

May differ slightly from illustration depending on the machine's adapter flange
[1] Delivery time 5 - 6 weeks
[3] Universal tool grinding machines (bore can be adapted)
[4] Göckel grinding machines
[5] Reform grinding machines
[6] Weinig grinding machines

222 STOCK PROGRAMME

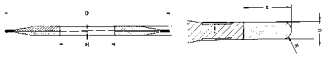


FORM	DxWxX (mm)	H (mm)	T (mm)	V (°)	KORN-GRÖßE	BIN-DUNG	KONZEN-TRATION	GRUND-KÖRPER	BESTELL-NUMMER
CBN GRINDING WHEELS									
3K222	100x3x6	20	30	3	B126	KSSRY	V120	A	60157643658 [6]

[6] Weinig grinding machines

GRINDING OF PROFILE KNIVES

14F1 STOCK PROGRAMME



FORM	DxUxX (mm)	H (mm)	T (mm)	R	KORN-GRÖßE	BINDUNG	KONZEN-TRATION	GRUND-KÖRPER	BESTELL-NUMMER
DIAMOND GRINDING WHEELS									
4K14F1	200x2x5	60	6	1	D54	K+888RY	C75	A	60157643156 [1), 3)]
K14F1	200x3x5	60	10	1.5	D64	K+920	C100	A	66260336122 [1), 3)]
3K14F1	200x4x6	60	5	2	D46	K+888RY	C100	H	66260111253 [1), 3)]
					D151	K+1313RY	C100	H	66260114210 [1), 3)]
9K14F1	200x2x7	20	10	1	D64	K+4821	C100	A	66260119930 [1)]
		30	10	1	D64	K+4821	C100	A	66260127332 [1)]
		31.75	10	1	D64	K+4821	C100	A	66260127734 [1)]
		32	10	1	D64	K+4821	C100	A	66260350546 [1)]
		40	10	1	D64	K+4821	C100	A	66260127638 [1)]
		50	10	1	D64	K+4821	C100	A	66260118539 [1)]
		60	10	1	D64	K+4821	C100	A	66260131361 [1)]
13K14F1	200x2x7	60	5	1	D64	K+4821	C100	A	66260119140 [3)]
7K14F1	200x4x7	20	10	2	D151	K+4821	C100	A	66260119142 [1)]
		30	10	2	D151	K+4821	C100	A	66260395343 [1)]
		31.75	10	2	D151	K+4821	C100	A	66260127145 [1)]
		32	10	2	D151	K+4821	C100	A	66260350535 [1)]
		40	10	2	D151	K+4821	C100	A	66260117349 [1)]
		50	10	2	D151	K+4821	C100	A	66260117251 [1)]
9K14F1	200x4x7	60	5	2	D151	K+4821	C100	H	66260127453 [2)]
CBN GRINDING WHEELS									
5K14F1	200x2x5	60	6	1	B126	KSS920	V180	A	60157642627 [2), 3)]
9K14F1	200x2x7	20	10	1	B126	KSSRY	V180	A	66260119631 [1)]
		30	10		B126	KSSRY	V180	A	66260128533 [1)]
		31.75	10		B126	KSSRY	V180	A	66260127835 [1)]
		32	10		B126	KSSRY	V180	A	66260350545 [1)]
		40	10		B126	KSSRY	V180	A	66260127441 [1)]
		50	10		B126	KSSRY	V180	A	66260127044 [1)]
		60	10		B126	KSSRY	V180	A	66260131760 [1)]
13K14F1	200x2x7	60	5	1	B126	KSSRY	V180	A	66260119546 [3)]
K14F1	200x3x5	60	10	1.5	B151	KSSR	V180	A	66260130748 [3)]
1K14F1	200x4x3	60	5	2	B151	KSSRY	V240	H	60157642904 [3)]

May differ slightly from illustration depending on the machine's adapter flange

[1)] Delivery time 5 - 6 weeks [2)] Available while stocks last [3)] Weinig grinding machines

222 STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS									
4K222	150x2x3.3	20	17	23	B107	KSSJY	V180	A	60157642630

700 STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	R	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
7K700	200x1x5	20	10	0.5	D64	K+920	C75	E	60157678914 [1]
					D126	K+920	C75	E	60157678913 [1]
CBN GRINDING WHEELS									
7K700	200x1x5	20	10	0.5	B151	KSSR	V180	E	60157678949

[1] Delivery time 5 - 6 weeks

NORTON
SAINT-GOBAIN
WINTER

GRINDING WHEELS FOR THE MACHINING OF MILLING TOOLS

MILLING CUTTERS

In the woodworking industry, milling cutters are used for a variety of machining tasks. In this sector, there is a very wide range of milling cutters.
The most common are groove, joint, rebating, chamfering and profile cutters.
There are one-piece milling cutters as well as screwed and welded designs.
All of these tools place different demands on the grinding process.

Another major application area is hob grinding. Hobs are used in gear manufacturing and need to be ground and re-sharpened precisely with super-abrasive grinding wheels.

Information
Further information on applications and products can be found at
www.nortonabrasives.com

DIAMOND AND CBN GRINDING WHEELS OR GRINDING OF CUTTING FACES & CLEARANCES

The grinding of milling tools represents the last machining step in the manufacture and re-working of milling cutters. In a similar way to round tools and saw blades, the tool faces and the clearances (top) are the main applications for grinding. The machining of the top is particularly important here, as the runout of the milling tools is ensured in this manufacturing step. This then forms the basis for an even cutting performance.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
K+1421R		Standard resin bond for CNC applications
K+1414N		Resin bond for tungsten carbide-steel combination grinding, dry
K+1414J		Resin bond for tungsten carbide-steel combination grinding, dry
K+888R		Universal resin bond for dry grinding
K+888N		Universal resin bond for dry grinding
K+888J		Universal resin bond for dry grinding
K+1410		Free-grinding resin bond for dry grinding

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KSSTY		Universal resin bond for wet grinding
KSSRY		Universal resin bond for wet grinding
KSSJY		Universal resin bond for wet grinding
KSS12N		Standard resin bond for CNC applications
KSS10N		Universal resin bond for tool grinding
KSS10J		Universal resin bond for tool grinding
KSS007N		Free-grinding resin bond for dry grinding
K+888N		Universal resin bond for dry grinding

STANDARD DIMENSIONS FOR THE MACHINING OF MILLING TOOLS FOR THE WOODWORKING INDUSTRY

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Milling tools for the wookworking industry	Tungsten carbide HSS	Universal tool grinding machines	4A2, 12A2, 222,... Ø 100...200 W 3...8 X 2...4	K+, KSS bonds	Oill Emulsion (dry)

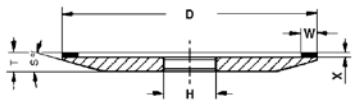
STANDARD DIMENSIONS FOR THE MACHINING OF HOBS

WORKPIECE	MATERIAL	MACHINE	CUP GRINDING WHEELS		COOLANT
			SHAPE	BOND	
Hobs	Tungsten carbide HSS	Universal tool grinding machines	4BT9, 222 Ø 100...150 W 1...10 X 1...3.3	K+, KSS, KM bonds	Oil Emulsion

Other dimensions on request

FACE GRINDING OF PROFILE CUTTERS

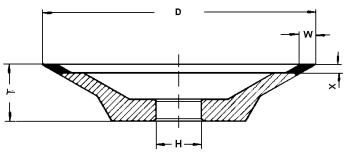
4A2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
K4A2	100x6x2	20	8	15	D64	K+888N	C50	H	66260137071 [1]
6K4A2	125x5x2	20	10	15	D46	K+888J	C50	H	60157643448
					D64	K+888R	C50	H	60157643256
1K4A2	125x6x2	20	10	15	D46	K+1410	C75	H	66260115833
					D64	K+1410	C100	H	66260128030
K4A2	150x5x4	20	13	15	D64	K+888N	C50	H	60157643184
K4A2	175x5x4	20	13	15	D64	K+888N	C50	H	60157643327
CBN GRINDING WHEELS									
K4A2	100x4x2	20	8	15	B107	KSS10N	V120	H	60157642646 [1]
K4A2	125x4x2	20	6	15	B107	KSS10N	V120	H	60157642812 [1]
K4A2	125x5x4	20	15	15	B126	KSS10J	V120	H	60157642977 [1]
3K4A2	150x3x2	20	17	20	B151	KSSRY	V240	A	66260134960 [1]
K4A2	150x4x2	20	6	15	B107	KSS10N	V120	H	60157642791
K4A2	150x4x3	20	12	15	B91	KSS12N	V240	A	66260127081 [1]
K4A2	175x5x4	20	13	15	B126	KSS10J	V120	H	60157643668
K4A2	200x6x2	20	11	15	B107	KSS10J	V120	H	60157643223 [1]

[1] Delivery time 5 - 6 weeks

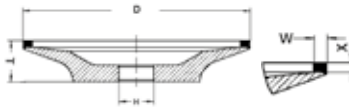
12V2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
1K12V2	125x5x3	20	26	30	D64	K+888N	C50	H	60157642736 [1]
1K12V2	125x5x4	20	26	29	D46	K+888N	C50	H	66260129020
1K12V2	125x8x4	20	26	30	D46	K+888N	C50	H	60157642744
					D64	K+888N	C75	H	66260136367

[1] Delivery time 5 - 6 weeks

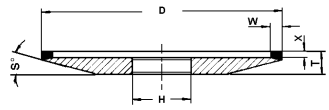
222 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
1K222	125x5x4	20	23	20	D64	K+1414J	C50	H	66260135758
16K222	125x5x4	20	23	20	D151	K+888R	C75	H	66260100321
		20	23	20	D181	K+888R	C100	H	60157643406 [1]
20K222	125x5x4	20	23	20	D46	K+888J	C50	H	66260349438
					D46	K+1410	C75	H	66260111759
					D64	K+888R	C50	H	66260117305
					D64	K+1410	C75	H	66260335191
					D91	K+888R	C50	H	66260117906
					D126	K+888R	C50	H	66260118608
					D151	K+888R	C75	H	66260130346
					D181	K+1410	C100	D	66260115578
					D181	K+1410	C100	H	66260352288
CBN GRINDING WHEELS									
20K222	125x5x4	20	23	20	B64	KSS007N-63	V120	D	66260115588
					B107	KSS10J	V120	H	66260133018
					B126	KSS10J	V120	H	66260350216
					B151	KSS007N-63	V120	H	66260135854
22K222	125x5x4	20	23 [*]	20	B107	KSS10J	V120	H	60157642903
1K222	150x5x4	20	23 [*]	20	B107	KSS007N-63	V120	H	66260115865

[*] 3 × 120° M6, pitch circle 32 3 × 120° Ø 6.6, pitch circle 36 [1] Delivery time 5 - 6 weeks

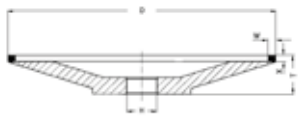
222 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
2K222	150x3x3.3	20	12	12	D64	K+1410	C75	A	66260345390
2K222	200x3x3.3	20	12	12	D64	K+1410	C75	A	66260340765
CBN GRINDING WHEELS									
4K222	150x2x3.3	20	17	23	B107	KSSJY	V180	A	60157642630 [*]
2K222	150x3x3.3	20	12	12	B107	KSS007N-63	V180	A	66260345388
5K222	175x3x3.3	20	12	12	B107	KSS007N-63	V180	A	66260347845 [1]
2K222	200x3x3.3	20	12	12	B107	KSS007N-63	V180	A	66260340761

[*] Drawing see page 88 [1] Delivery time 5 - 6 weeks May differ slightly from illustration depending on the machine's adapter flange

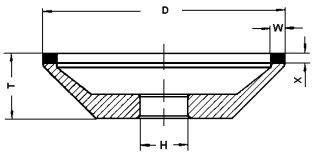
222 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
14K222	150x5x4	20	23	20	D64	K+888R	C50	H	66260135778
					D151	K+1414N	C75	H	66260128468
2K222	175x5x4	20	26	18	D64	K+888R	C50	H	66260135779
6K222	200x5x4	20	28	16	D64	K+888R	C50	H	60157643208
CBN GRINDING WHEELS									
14K222	150x5x4	20	23	20	B54	KSS10J	V120	H	66260110861
					B107	KSS10J	V120	H	66260135777
2K222	175x5x4	20	26	18	B107	KSS10J	V120	H	66260135775
6K222	200x5x4	20	28	16	B107	KSS10J	V120	H	60157643768

TOP GRINDING OF PROFILE CUTTERS

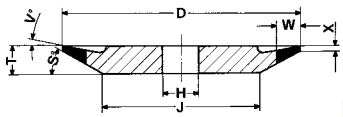
12A2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS									
K12A2	100x5x2	20	25	45	D46	K+888N	C50	H	60157643097
					D91	K+888R	C50	H	60157643285
					D91	K+888R-69	C50	A	66260147081
K12A2	100x6x4	20	27	45	D64	K+888R	C50	D	60157642582
					D126	K+888R	C75	B	60157642588
CBN GRINDING WHEELS									
K12A2	100x5x2	20	25	45	B126	KSS10J	V120	H	60157643373

GRINDING OF HOBS

4BT9 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	V (°)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS										
K4BT9	100x10x1	20	10	5	20	D126	K+1421R	C75	A	66260348380 [1]
										Up to module 6
CBN GRINDING WHEELS										
K4BT9	100x10x1	20	10	5	20	B126	KSS12N	V180	A	66260132772
										Bis zu Modul 6

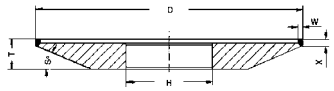
For creep feed and reciprocal grinding of straight- or spiral-fluted gear hobs [1] Delivery time 5 - 6 weeks

4V4 STOCK PROGRAMME

SHAPE	DxWxX (mm)	H (mm)	T (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS								
1K4V4	100x6x1	20	10	B151	KSSTY	V180	A	66260135829
								Up to module 6

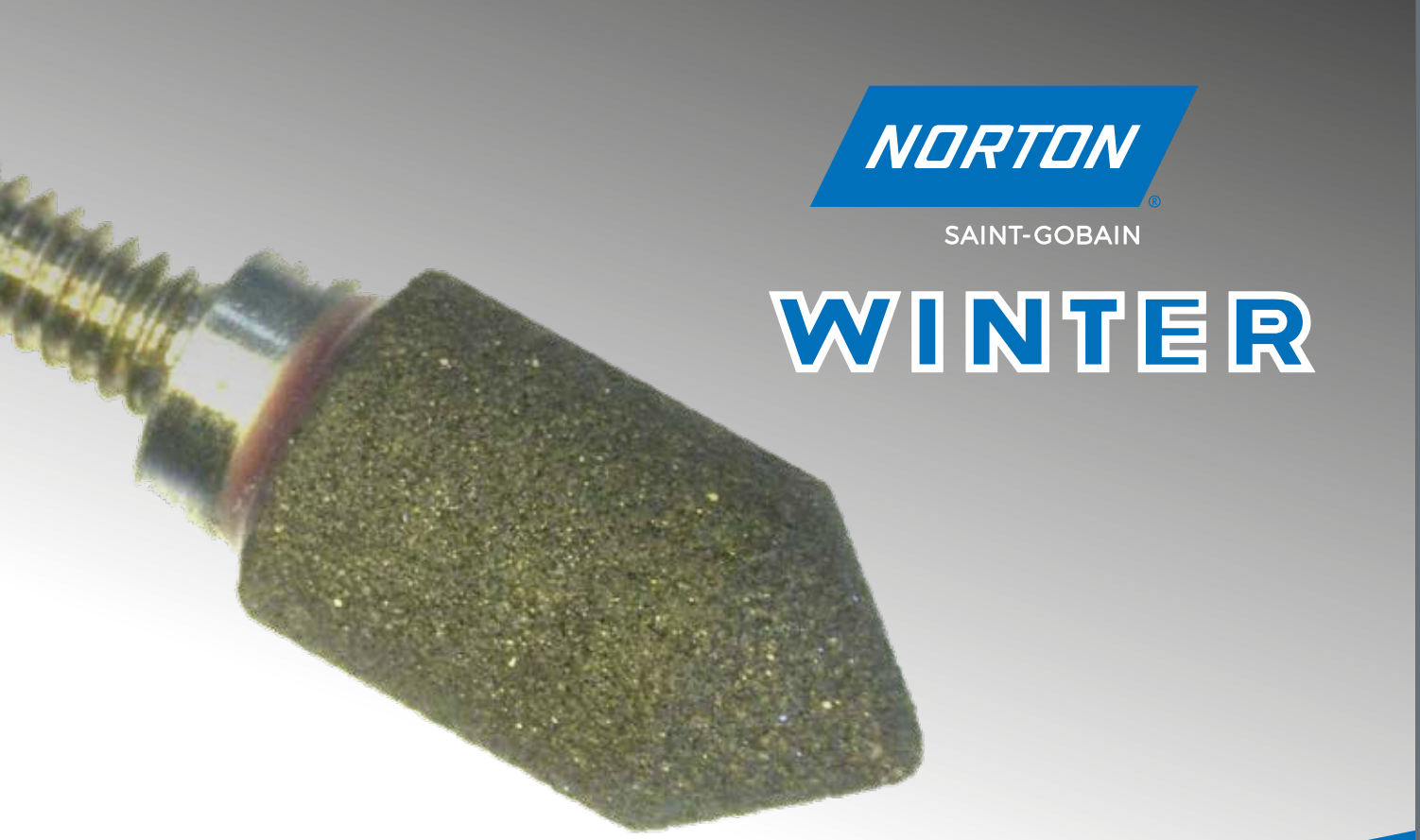
For creep feed and reciprocal grinding of straight-fluted hobs

222 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	T (mm)	S (°)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN GRINDING WHEELS									
1K222	150x2x3.3	50.8	17	20	B151	KSSRY	V300	A	60157644021
1K222	200x2x3.3	50.8	22	23	B151	KSSRY	V300	A	66260134942 [1]
									Up to module 6

For creep feed and reciprocal grinding of straight-fluted hobs [1] Delivery time 5 - 6 weeks



NORTON®
SAINT-GOBAIN
WINTER

GRINDING TOOLS FOR THE MOULD-AND-DIE INDUSTRY

MOULD AND DIE INDUSTRY

In the mould and die industry small lot sizes are the order of the day.
More often than not, products are manufactured on a ‘one-off’ basis according to exact customer specification; this requires flexible and efficient solutions.

Many companies use a high proportion of manual production steps. CNC operations and automated production lines are unusual, due to small lot sizes.

Information
Further information on applications and products can be found at
www.nortonabrasives.com

DIAMOND AND CBN GRINDING WHEELS
FOR SURFACE AND OD GRINDING

Vitrified and resin bonded diamond and cBN grinding wheels are used for surface and OD grinding.

The Norton Winter MAXI stock programme offers a substantial choice of resin bonded 1A1 standard grinding wheels for machining tungsten carbide and steel. Vitrified bonded tools are also specified for individual machining tasks. Please contact us regarding your requirements.

MAXI PROGRAMME

DEVELOPMENT TREND IN THE PERIPHERAL GRINDING OF INSERTS

	T(mm)			
D (mm)	10 mm	15 mm	20 mm	30 mm
200 mm	Dia/cBN	Dia/cBN	Dia	
225 mm	Dia/cBN	Dia/cBN		
250 mm	Dia/cBN	Dia/cBN	Dia/cBN	
300 mm	Dia	Dia/cBN	Dia/cBN	Dia/cBN
350 mm	Dia		Dia/cBN	Dia/cBN
400 mm	Dia	cBN	Dia/cBN	Dia/cBN
450 mm			cBN	
500 mm			Dia/cBN	Dia
600 mm				Dia

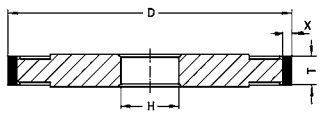
Available ex stock
Also availabe ex stock: K1A1-300-25-5 127 diamond.

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
Maxi 1313RY	↑	Special resin bond for tungsten carbide-steel combination grinding, wet
Maxi 1414R		Special resin bond for tungsten carbide-steel combination grinding, dry
Maxi 888RY		Universal resin bond for wet grinding
Maxi 888NY		Universal resin bond for wet grinding
Maxi 8837		Standard bond for surface and OD grinding
Maxi 125		Universal resin bond for surface and OD grinding > Ø250
Maxi 280		Universal resin bond for surface and OD grinding < Ø250
Maxi 777J		Universal resin bond for fine grit applications

CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
Maxi RY	↑	Universal resin bond for wet grinding
Maxi NY		Universal resin bond for wet grinding
Maxi 191		Universal resin bond for surface and OD grinding
Maxi 10N		Universal resin bond for tool grinding
Maxi 67		Standard bond for surface and OD grinding

1A1 STOCK PROGRAMME

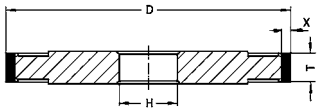


SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND GRINDING WHEELS							
11K1A1	200x10x5	51	D20B	Maxi 777J	C50	B	66260119254
			D91	Maxi 888NY	C75	B	66260119259
			D126	Maxi 888NY	C75	B	66260119262
11K1A1	200x20x5	51	D126	Maxi 888NY	C75	B	66260119266
11K1A1	225x10x5	51	D91	Maxi 280	C75	H	66260119623
11K1A1	250x15x5	76	D126	Maxi 888NY	C75	B	66260119337 [2]
11K1A1	250x20x5	76	D126	Maxi 1313RY	C75	B	66260119339
11K1A1	300x10x5	127	D91	Maxi 8837	C75	B	66260119219
			D126	Maxi 8837	C75	B	66260119221
11K1A1	300x15x5	127	D91	Maxi 125	C75	H	66260119648 [1]
			D91	Maxi 8837	C75	B	66260119208
			D126	Maxi 1313RY	C75	B	66260119206
			D126	Maxi 8837	C75	B	66260119210
11K1A1	300x20x5	127	D126	Maxi 8837	C75	B	66260119204
11K1A1	350x10x5	127	D126	Maxi 8837	C75	B	66260119187
11K1A1	350x20x5	127	D126	Maxi 8837	C75	B	66260119185
11K1A1	400x10x5	127	D126	Maxi 8837	C75	B	66260119231 [1]
11K1A1	400x20x5	127	D126	Maxi 1313RY	C75	B	66260119174
			D126	Maxi 8837	C75	B	66260119177
11K1A1	500x20x5	203.2	D126	Maxi 8837	C75	B	66260119514
			D126	Maxi 1313RY	C75	B	66260119518 [2]
K1A1	500x30x5	203.2	D126	Maxi 8837	C75	B	66260119523
K1A1	600x30x5	305	D126	Maxi 8837	C75	B	66260119524

Further dimensions up to 1000 mm diamter on request

[1] Delivery time 5 - 6 weeks [2] Available while stocks last.

1A1 STOCK PROGRAMME



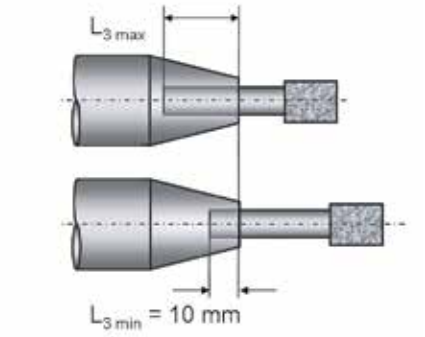
SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
CBN MOUNTED PINS							
11K1A1	225x10x5	51	B126	Maxi 10N	V120	B	66260119537
11K1A1	225x15x5	51	B126	Maxi 10N	V120	B	66260119543
11K1A1	250x10x5	51	B126	Maxi 191	V180	H	66260119752
11K1A1	250x15x5	51	B91	Maxi 191	V180	H	66260119753 [1]
			B126	Maxi 10N	V120	B	66260119391
11K1A1	250x20x5	51	B126	Maxi 10N	V120	B	66260119393
11K1A1	300x15x5	76.2	B126	Maxi 67	V120	B	66260119390
11K1A1	300x15x5	127	B126	Maxi 67	V120	B	66260119386
11K1A1	300x20x5	76	B126	Maxi 191	V180	H	66260119780
11K1A1	300x20x5	127	B126	Maxi 67	V120	B	66260119384
11K1A1	300x30x5	127	B126	Maxi 67	V120	B	66260119366
11K1A1	350x20x5	127	B126	Maxi 67	V120	B	66260119367
			B126	Maxi 191	V180	H	66260119781
11K1A1	350x30x5	127	B126	Maxi 67	V120	B	66260119370
11K1A1	400x20x5	127	B126	Maxi 67	V120	B	66260119374
			B126	Maxi 67	V180	B	66260119376
11K1A1	400x30x5	127	B126	Maxi 67	V120	B	66260119380
			B126	Maxi 67	V180	B	66260119381
11K1A1	500x20x5	203.2	B126	Maxi 67	V120	B	66260119409

Further dimensions up to 1000 mm diamter on requestt

[1] Delivery time 5 - 6 weeks

DIAMOND AND CBN GRINDING TOOLS FOR ID GRINDING

Many different materials are machined by ID grinding. The bond type of the grinding pin must be chosen according to the material.



VITRIFIED BONDS:
High resistance to wear and temperature, dressable, especially suited for hardened steels

RESIN BONDS:
Universally suitable for dry and wet grinding, especially for tungsten carbide and HSS

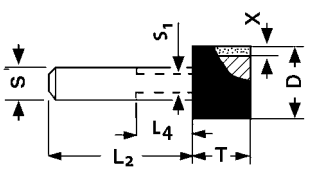
SINTERED METAL BONDS:
Extremely wear resistant with stable edge holding; well suited for short-chipping materials such as glass and ceramics

ELECTROPLATED METAL BONDS:
Single layer, high removal rates, surface roughness depending on grit size and condition of wear, especially suited for roughing tungsten carbide, glass and HSS

When choosing your mounted pins, please note that the diameter of the ID grinding tool should be no more than 70 % of your bore. This keeps the contact area between the mounted pin and the workpiece in a comfortable range and avoids burning.
When in use, mounted pins are particularly prone to bending stress which can lead to tool failure if a particular threshold value is exceeded. For this reason, the permitted speed nperm of a mounted pin must not be exceeded. It is printed on the packaging label and is often engraved on the shaft of the mounted pin. The permitted speed shown there applies to a minimum clamping length of L3 min = 10 mm.
Increasing the clamping length L3 min will result in a new permitted speed. The ratio of increased clamping length and increase of permitted speed is not proportional but requires a recalculation of the new maximum of speed.
It is imperative to observe the permitted speed at all costs.
If the permitted speed is smaller than the adjustable speed of the mounted pin, a different technical solution is required. If you have further questions, please contact us, we are pleased to help.

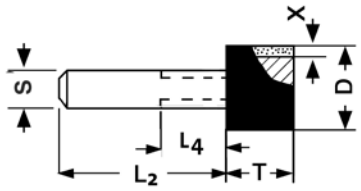
DIMENSIONING EXPLANATION

SAMPLE DESIGN K1A1W-8-6-2-6-60-4.1-8 D126 K+888RY C100		
K		Manufacturing process – internal abbreviation
Shape	1A1W	Cylindrical design
D	8	Head diameter
T	6	Head length
X	2	Layer thickness
S	6	Shaft diameter
L2	60	Shaft length
S1	4.1	Diameter of recess
L4	8	Length of recess
D126 K+888RY C100		Specification sample of resin bond grinding pin



VITRIFIED BONDED GRINDING TOOLS

Mounted pins and grinding wheels with vitrified bonds are used in wet grinding. Over and above the tried and tested Norton Winter VSS cBN vitrified bond systems, the N7 bond range which is well-known for OD grinding, has recently produced outstanding ID grinding results. Due to their high porosity, these innovative glass-ceramic systems permit cool grinding and a long tool life at the same time. They are also available now as mini grinding tools with 'N7 bore'.



FEASIBILITY MATRIX

C75-C200 V180-V480	DIAMETER D												
LAYER THICKNESS T	3	4	5	6	7	8	10	12	14	15	16	18	24
3	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
4	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
5	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
6	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
8	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
10	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
12	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
16	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN

SHAFT MATERIALS:

Steel	All applications
Tungsten carbide	Dimensions on request

Minimum order quantity for manufacture of non-stock items: 5 pieces per item
Special geometries on reques

MOUNTED PINS / GRINDING WHEELS – SUMMARY AND RECOMMENDATIONS FOR USE

BOND TYPE	VITRIFIED BOND
Abrasive	**cBN (diamond on request)**
Bond designation	**Vitrified**
Features	Extremely high grit retention; protection against abrasion; very good profiling characteristics, highly porous, thus good transport for the cooling lubricant into and chip removal from the contact zone
Application areas	Predominantly hardened chrome steels, HSS and tool steels
RECOMMENDED USE	
Grinding wheel shape	**1A1W mounted pins and 1A8 grinding wheels**
Grit size d_k	B15 - B126
Bond	**"N7 Bore" (glass ceramic system); VSS (cBN ceramic)**
Circumferential speed v_c	40–80 m/s, please observe n_{perm}
Table feed rate v_f	0.1...2 m/min
Workpiece speed n_w	100...1000 min^{-1}
Infeed a_e	0.002...0.020 mm
Coolant	Oil and emulsion

IMPORTANT NOTES WHEN USING MOUNTED PINS (SEE ALSO PAGE 100)

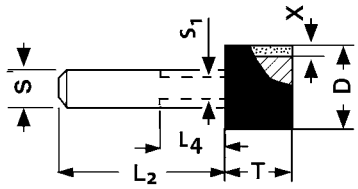
1A1W MOUNTED PINS IN VITRIFIED BOND						
SHAPE	D	T	CLAMPING LENGTH $L_{3\ MIN}$	N_{PERM} (1/min)	CLAMPING LENGTH $L_{3\ MAX}$	N_{PERM} (1/min)
1A1W	3.0	6.0	10.0	16.000	52.0	139.000
1A1W	4.0	6.0	10.0	16.000	52.0	137.000
1A1W	5.0	6.0	10.0	16.000	52.0	144.000
1A1W	6.0	6.0	10.0	32.000	52.0	150.000
1A1W	6.0	8.0	10.0	32.000	50.0	150.000
1A1W	7.0	6.0	10.0	32.000	52.0	136.000
1A1W	7.0	8.0	10.0	31.000	50.0	136.000
1A1W	8.0	6.0	10.0	32.000	52.0	120.000
1A1W	8.0	10.0	10.0	30.000	48.0	120.000
1A1W	9.0	6.0	10.0	31.000	48.0	106.000
1A1W	10.0	6.0	10.0	30.000	52.0	96.000
1A1W	10.0	10.0	10.0	27.000	48.0	96.000
1A1W	12.0	6.0	10.0	29.000	52.0	80.000
1A1W	12.0	12.0	10.0	25.000	46.0	80.000
1A1W	14.0	6.0	10.0	28.000	52.0	68.000
1A1W	15.0	6.0	10.0	27.000	52.0	64.000
1A1W	15.0	15.0	10.0	20.000	43.0	64.000
1A1W	16.0	6.0	10.0	27.000	52.0	60.000
1A1W	18.0	6.0	10.0	25.000	52.0	53.000
1A1W	20.0	6.0	10.0	24.000	52.0	48.000
1A1W	24.0	6.0	10.0	22.000	52.0	40.000

n_{perm} (rpm) according to clamping length L

VITRIFIED BONDED GRINDING TOOLS

Mounted pins and grinding wheels with vitrified bonds are used in wet grinding. Over and above the tried and tested Norton Winter VSS cBN vitrified bond systems, the N7 bond range which is well-known for OD grinding, has recently produced outstanding ID grinding results. Due to their high porosity, these innovative glass-ceramic systems permit cool grinding and a long tool life at the same time.

They are also available now as mini grinding tools with 'N7 bore'.



FEASIBILITY MATRIX

C75-C150 V120-V240	DIAMETER D												
LAYER THICKNESS T	3	4	5	6	7	8	10	12	14	15	16	18	24
2	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
3	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
4	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
5	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
6	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
8	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
10	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
12	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
16	-	-	-	-	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN

SHAFT MATERIALS:

Steel	All applications
Tungsten carbide	Dimensions on request
Heavy metal	Dimensions on request

Minimum order quantity for manufacture of non-stock items: 5 pieces per item
Special geometries on reques

MOUNTED PINS / GRINDING WHEELS – SUMMARY AND RECOMMENDATIONS FOR USE

BOND TYPE	RESIN BOND	
Abrasive	DIAMOND	CBN
Bond designation	**K+888RY** for mounted pins **1A1W** **K+888RY** for mounted pins **1A1**	**KSSRY** for mounted pins **1A1W** **KSSRY** for mounted pins **1A1**
Features	Consistently good material removal rate, good service life, cool and soft grinding behaviour, roughness depth according to grit size and conditions of use. Wet and dry grinding	Consistently good material removal rate, good service life, cool and soft grinding behaviour, roughness depth according to grit size and conditions of use. Wet and dry grinding
Application areas	Tungsten carbide For carbide-tipped saw blades, drawing dies and other mould and die manufacturing. On ID and coordinate grinding machines.	HSS and hardened chrome steels: Case-hardened steels with bore diameters up to 20 mm. On ID and coordinate grinding machines.
RECOMMENDED USE		
Shape (Order Number)	**1A1W mounted pins and 1A1 grinding wheels**	**1A1W mounted pins and 1A1 grinding wheels**
Grit size d_k	D7 - D15C - D46 - D64 - D76 - D91 - D126	B91 - B126 - B151
Bond	**K+ and KS Bonds**	**KSS Bonds**
Concentration	C50 to C150	V120 to V240
Circumferential speed v_c	15...25 m/s wet Please observe n_{perm} 10...20 m/s dry	...30 m/s wet Please observe n_{perm} ...20 m/s dry
Table feed rate v_f	0.5...5 m/min	0.5...5 m/min
Workpiece speed rate n_w	100...1000 min^{-1}	100...1000 min^{-1}
Feed rate s (= $v_f \cdot 10^3 : n_w$)	1 to 5 mm	1 to 5 mm
Infeed a_e	2...5 % of d_k	2...5 % of d_k
Coolant	Oil and emulsion	Oil and emulsion

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KS449		More wear-resistant resin bond preferably wet grinding
K+920		More wear-resistant resin bond preferably also dry grinding
K+921		More wear-resistant resin bond preferably wet grinding
K+888TY		Universal resin bond for wet grinding
K+888RY		Universal resin bond for wet grinding
K+1410		Free-grinding resin bond for dry grinding
K+777R		Universal resin bond for fine grit applications

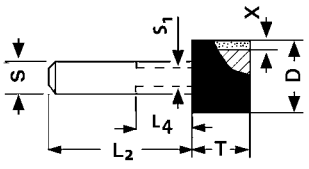
CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KSSRY		Universal resin bond for wet grinding
KSS10N		Universal resin bond for tool grinding

MPORTANT NOTES WHEN USING MOUNTED PINS (SEE ALSO PAGE 100)

1A1W MOUNTED PINS IN RESIN BOND						
SHAPE	D	T	CLAMPING LENGTH $L_{3\ MIN}$	N_{PERM} (1/min)	CLAMPING LENGTH $L_{3\ MAX}$	N_{PERM} (1/min)
1A1W	3.0	6.0	10.0	16.000	52.0	139.000
1A1W	4.0	6.0	10.0	16.000	52.0	137.000
1A1W	5.0	6.0	10.0	16.000	52.0	144.000
1A1W	6.0	6.0	10.0	32.000	52.0	150.000
1A1W	6.0	8.0	10.0	32.000	50.0	150.000
1A1W	7.0	6.0	10.0	32.000	52.0	136.000
1A1W	7.0	8.0	10.0	31.000	50.0	136.000
1A1W	8.0	6.0	10.0	32.000	52.0	120.000
1A1W	8.0	10.0	10.0	30.000	48.0	120.000
1A1W	9.0	6.0	10.0	31.000	48.0	106.000
1A1W	10.0	6.0	10.0	30.000	52.0	96.000
1A1W	10.0	10.0	10.0	27.000	48.0	96.000
1A1W	12.0	6.0	10.0	29.000	52.0	80.000
1A1W	12.0	12.0	10.0	25.000	46.0	80.000
1A1W	14.0	6.0	10.0	28.000	52.0	68.000
1A1W	15.0	6.0	10.0	27.000	52.0	64.000
1A1W	15.0	15.0	10.0	20.000	43.0	64.000
1A1W	16.0	6.0	10.0	27.000	52.0	60.000
1A1W	18.0	6.0	10.0	25.000	52.0	53.000
1A1W	20.0	6.0	10.0	24.000	52.0	48.000
1A1W	24.0	6.0	10.0	22.000	52.0	40.000

n_{perm} (rpm) according to clamping length L_3

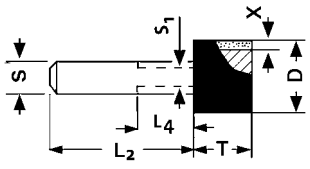
1A1W STOCK PROGRAMME



SHAPE	DxTxX (mm)	S	L_2 (mm)	S_1	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND MOUNTED PINS									
K1A1W	3x6x0.65	3	60	1.7	8	D15C	K+888RY	C100	60157643985
						D46	K+888RY	C100	60157643693 [1]
						D64	K+888RY	C100	60157644200
						D91	K+888RY	C100	66260110217 [1]
						D126	K+888RY	C100	66260133993
K1A1W	4x6x1.15	3	60	1.7	8	D15C	K+888RY	C100	66260100083
						D46	K+888RY	C100	60157644166
						D64	K+888RY	C100	60157643874 [1]
						D91	K+888RY	C100	60157643582
						D126	K+888RY	C100	66260133998
5K1A1W	5x3x1.5	6	42	3.5	10	D76	K+921	C125	60157643650 [3]
K1A1W	5x6x1.5	3	60	2.1	8	D7	K+777R	C100	60157644191
						D15C	K+888RY	C100	60157643428
						D46	K+888RY	C100	66260110138
						D64	K+888RY	C100	60157643946 [1]
						D126	K+888RY	C100	66260134003
1K1A1W	6x3x1.5	6	42	3.5	10	D76	K+921	C125	66260111416 [3]
K1A1W	6x6x1.5	6	60	3	8	D15C	K+888RY	C100	66260100095
						D46	K+888RY	C100	60157643902
						D64	K+888RY	C100	66260134007 [1]
						D91	K+888RY	C100	66260110235
K1A1W	6x6x1.5	6	60	3.1	8	D64	K+888RY	C125	66260134006
						D126	K+888RY	C100	66260134009
K1A1W	6x8x1.5	6	60	3	8	D46	K+888RY	C100	60157643976 [1]
8K1A1W	6x8x1.5	6	75	3.1	10	D15C	K+888RY	C100	60157643224
						D46	K+888RY	C100	60157644144 [1]
8K1A1W	6.5x3x1.75	6	33	4.1	10	D76	K+921-42	C125	66260134445 [3]
2K1A1W	6.5x3x1.75	6	42	3.1	10	D76	K+921	C125	66260134718 [3]
						D91	K+888TY	C150	60157643974 [3]
6K1A1W	6.5x3x1.75	6	42	4.1	10	D76	K+888RY	C125	66260111088
						D76	K+921	C125	66260368674 [2]
1K1A1W	6.5x3x1.75	6	42	5.1	10	D76	K+920	C125	66260110241 [3]
						D76	K+921	C125	66260133964 [3]
1K1A1W	6.5x3x2	6	42	4.5	10	D76	KS449-42	C125	66260341274
1K1A1W	6.5x6x1.75	6	60	3.1	8	D76	K+888RY	C100	66260113144 [1]
2K1A1W	7x3x2	6	42	5.1	10	D76	K+921	C125	66260133966 [3]
						D91	K+888TY	C150	60157643957 [2]
						D91	K+920	C125	60157644164 [2] [3]
K1A1W	7x6x2	6	60	3.1	8	D64	K+888RY	C100	66260134014
						D64	K+888RY	C125	60157644032 [1]
						D91	K+888TY	C150	66260134654

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.
[3] Layer chamfer angle V° = 2°50'

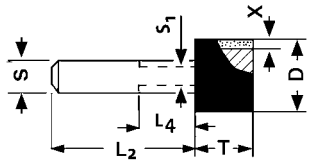
1A1W STOCK PROGRAMME



SHAPE	DxTxX (mm)	S	L_2 (mm)	S_1	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND MOUNTED PINS									
K1A1W	8x6x2	6	60	4.1	8	D15C	K+888RY	C100	60157643754
						D46	K+888RY	C100	60157643962
						D64	K+888RY	C100	60157644087
						D64	K+888RY	C125	66260134020
						D91	K+888RY	C100	66260134022
						D126	K+888RY	C100	66260134023
K1A1W	8x10x2	6	60	4.1	12	D15C	K+888RY	C100	60157644127
						D46	K+888RY	C100	66260134026 [1]
						D126	K+888RY	C100	66260134028
18K1A1W	8x10x2	6	75	4.1	12	D46	K+888RY	C100	66260100352 [2]
K1A1W	10x6x2	6	60			D46	K+888RY	C100	66260100065
						D64	K+888RY	C100	60157643781 [2]
						D64	K+888RY	C125	60157643973
						D91	K+888RY	C100	60157644098
						D126	K+888RY	C100	66260134036
K1A1W	10x10x2	6	60			D15C	K+888RY	C100	66260110355
						D46	K+888RY	C100	66260134038
						D126	K+888RY	C100	66260134040
22K1A1W	10x10x2	6	75			D15C	K+888RY	C100	66260110521
						D46	K+888RY	C100	60157644085 [2]
K1A1W	12x6x2	6	60			D46	K+888RY	C100	60157644002
						D64	K+888RY	C100	60157643710
						D64	K+888RY	C125	66260134081 [2]
						D91	K+888RY	C100	66260100327
						D126	K+888RY	C100	66260134045
K1A1W	12x12x2	6	60			D126	K+888RY	C100	66260100092 [1]
K1A1W	14x6x2	6	60			D126	K+888RY	C100	66260114956
K1A1W	15x6x2	6	60			D126	K+888RY	C100	66260134054
K1A1W	16x6x2	6	60			D46	K+888RY	C100	66260110126
						D126	K+888RY	C100	66260134059
K1A1W	18x6x2	6	60			D126	K+888RY	C100	66260127657
K1A1W	24x6x2	6	60			D126	K+888RY	C100	66260112903

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.
[3] Layer chamfer anglen V° = 2°50'

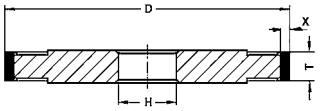
1A1W PROGRAMM



SHAPE	DxTxX (mm)	S	L_2 (mm)	S_1	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
CBN MOUNTED PINS									
K1A1W	3x6x0.65	3	60	1.8	8	B126	KSSRY	V240	66260134724 [1]
K1A1W	4x6x1.15	3	60	1.8	8	B126	KSSRY	V240	66260134735 [1]
K1A1W	5x6x1.5	3	60	2.1	8	B126	KSSRY	V240	66260134743
K1A1W	6x6x1.5	6	60	3.1	8	B91	KSSRY	V240	66260133970 [1]
						B126	KSSRY	V240	66260133969
K1A1W	6x8x1.5	6	60	3	10	B126	KSSRY	V240	66260134754
K1A1W	7x6x2	6	60	3	8	B126	KSSRY	V240	66260133906
K1A1W	8x6x2	6	60	4	8	B91	KSSRY	V240	66260134097
						B126	KSSRY	V240	66260133918
						B151	KSSRY	V240	60157643512 [1]
K1A1W	8x10x2	6	60	4	12	B126	KSSRY	V240	66260133924
K1A1W	10x6x2	6	60	-	-	B91	KSSRY	V240	66260134124
						B126	KSSRY	V240	66260133971 [1]
K1A1W	10x10x2	6	60	-	-	B126	KSSRY	V240	66260133936
K1A1W	12x6x2	6	60	-	-	B126	KSSRY	V240	60157643978 [1]
K1A1W	12x12x2	6	60	-	-	B126	KSSRY	V240	66260133954 [1]
K1A1W	14x6x2	6	60	-	-	B126	KSSRY	V240	66260134098 [1]
K1A1W	16x6x2	6	60	-	-	B126	KSSRY	V240	60157644185
K1A1W	18x6x2	6	60	-	-	B126	KSSRY	V240	66260100280 [1]
K1A1W	20x6x2	6	60	-	-	B126	KSSRY	V240	60157644104

[1] Delivery time 5 - 6 weeks
[3] Layer chamfer anglen V° = 2°50'

1A1 PROGRAMM

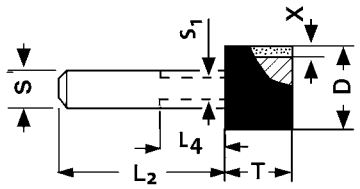


SHAPE	DxTxX (mm)	H (mm)	GRIT SIZE	BOND	CONCENTRATION	ORDER NUMBER
CBN MOUNTED PINS						
1K1A1	10x10x2	4	B126	KSSRY	V180	66260136508 [1]
K1A1	12x10x2	6	B126	KSSRY	V180	66260135986 [1]
K1A1	15x10x2	6	B126	KSSRY	V180	66260135985
K1A1	18x10x2	6	B126	KSSRY	V180	66260136448 [2]
K1A1	20x10x2	8	B126	KSSRY	V180	66260136444
K1A1	20x15x2	8	B126	KSSRY	V180	66260135984 [1]
K1A1	25x10x2	8	B126	KSSRY	V180	66260134811 [1]
K1A1	30x10x2	10	B126	KSSRY	V180	66260136445
K1A1	30x15x2	10	B126	KSSRY	V180	66260135983 [1]
K1A1	50x10x2	20	B126	KSSRY	V180	66260134895

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.

METAL BONDED GRINDING TOOLS

Metal bonded mounted pins are distinguished by a high level of profile retention and shock resistance. In addition, they conduct heat away fast, which is of particular benefit especially when sensitive materials are being machined.



FEASIBILITY MATRIX

C75-C150 V120-V240	DIAMETER D										
LAYER THICKNESS T	3	4	5	6	8	10	12	15	16	20	24
3	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
4	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
5	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
6	-Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
8	-	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
10	-	-	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
12	-	-	-	-	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN
15	-	-	-	-	-	-	-	Dia/ cBN	Dia/ cBN	Dia/ cBN	Dia/ cBN

SHAFT MATERIALS:

Steel	All applications
Tungsten carbide	Dimensions on request
Heavy metal	Dimensions on request

Minimum order quantity for manufacture of non-stock items: 5 pieces per item
Special geometries on reques

MOUNTED PINS / GRINDING WHEELS – SUMMARY AND RECOMMENDATIONS FOR USE

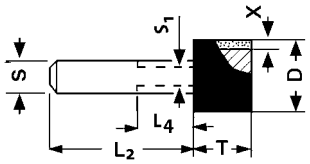
BOND TYPE	SINTERED METAL BOND
Abrasive	**Diamond (cBN on request)**
Bond designation	**BZ351** for mounted pins 1A1W
Features	Long service life, good material removal rate, great edge stability, surface roughness according to grit size and conditions of use. Suitable for wet and dry grinding, preferred for wet grinding.
Application areas	Tungsten carbide, hard short-chip materials (e.g. oxide ceramics), flat and hollow glass. On internal cylindrical and coordinate grinding machines. On high-speed manual machines.
RECOMMENDED USE	
Shape (Order number)	**1A1W mounted pins**
Grit size d_k	D64 - D91 - D126 - D151
Bond	**BZ351**
Concentration	C100
Circumferential speed v_c	15...20 m/s wet 12...18 m/s dry Please observe n_{perm}
Table feed rate v_f	0.5...5 m/min
Workpiece speed rate n_w	30...400 min^{-1}
Feed rate s (= $v_f \cdot 10^3 : n_w$)	1 to 10 mm
Infeed a_e	2 to 5 % of d_k
Coolant	Emulsion Spray mist or compressed air

IMPORTANT NOTES WHEN USING MOUNTED PINS (SEE ALSO PAGE 108)

1A1W MOUNTED PINS IN SINTERED METAL BOND						
SHAPE	D	T	CLAMPING LENGTH $L_{3\ MIN}$	N_{PERM} (1/min)	CLAMPING LENGTH $L_{3\ MAX}$	N_{PERM} (1/min)
1A1W	3.0	6.0	10.0	16.000	52.0	130.000
1A1W	4.0	6.0	10.0	15.000	52.0	138.000
1A1W	5.0	6.0	10.0	14.000	52.0	141.000
1A1W	6.0	6.0	10.0	32.000	52.0	150.000
1A1W	6.0	8.0	10.0	30.000	50.0	150.000
1A1W	8.0	6.0	10.0	30.000	52.0	120.000
1A1W	8.0	10.0	10.0	27.000	48.0	120.000
1A1W	10.0	6.0	10.0	29.000	52.0	96.000
1A1W	10.0	10.0	10.0	25.000	48.0	96.000
1A1W	12.0	6.0	10.0	27.000	52.0	80.000
1A1W	12.0	12.0	10.0	22.000	46.0	80.000
1A1W	15.0	6.0	10.0	25.000	52.0	64.000
1A1W	15.0	15.0	10.0	18.000	43.0	62.000
1A1W	20.0	6.0	10.0	22.000	52.0	48.000
1A1W	24.0	6.0	10.0	20.000	52.0	40.000

n_{perm} (rpm) according to clamping length L_3

1A1W PROGRAMM

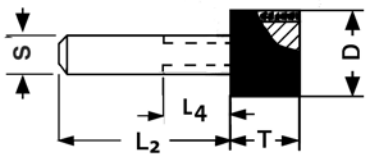


SHAPE	DxTxX (mm)	S	L_2 (mm)	S_1	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND MOUNTED PINS									
3BZ1A1W	3x6x0.75	3	60	2,1	8	D126	BZ351	C100	66260100307
BZ1A1W	4x6x1	3	60	-	-	D91	BZ351	C100	66260100317 [1]
BZ1A1W	5x6x1	3	60	-	-	D91	BZ351	C100	60157644066 [1]
						D126	BZ351	C100	60157643774 [1]
BZ1A1W	6x6x1	6	60	-	-	D126	BZ351	C100	66260100322 [1]
BZ1A1W	8x6x1	6	60	-	-	D91	BZ351	C100	60157644100 [1]
BZ1A1W	10x10x1	6	60	-	-	D126	BZ351	C100	60157644096 [1]

[1] Delivery time 5 - 6 weeks

ELECTROPLATED MOUNTED PINS

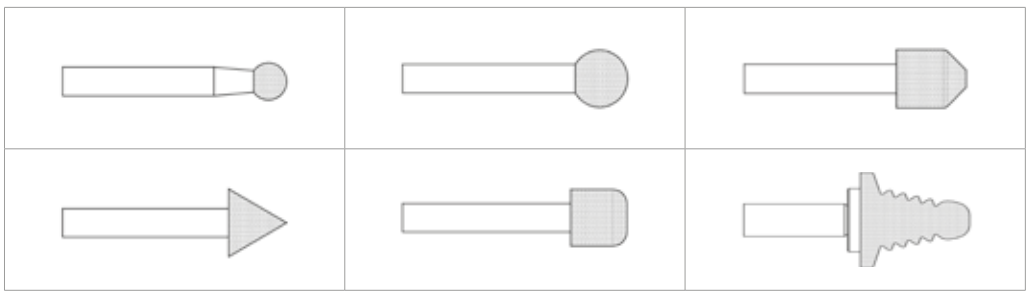
Electroplated mounted pins have three distinct advantages. Various special profiles can be manufactured to customer specifications and small head diameters from 0.4 mm are producible. Furthermore, distinct grain protrusion of diamond and cBN grits ensure high material removal rates. Apart from the extensive stock programme, various profile pins are available at short notice (see profile examples below). Please include the dimensions for D, T, S, S1, R, V and L2, when ordering. For spherical pin, the head length 'T' should be specified as '0'. The front face of the head of electroplated mounted pins from 6 mm diameter and above is specially designed to reduce the contact area. Minimum order quantity for manufacture of non-stock items: 5 pieces per item.



MOUNTED PINS / GRINDING WHEELS - SUMMARY AND RECOMMENDATIONS FOR USE

BOND TYPE	ELECTROPLATED SINGLE-LAYER METAL BOND	
Abrasive	DIAMOND	CBN
Bond designation	**Norton Winter S** for mounted pins 1A1W and grinding wheels 1A1	**Norton Winter GSS** for mounted pins 1A1W and grinding wheels 1A1
Features	High material removal rate, surface roughness according to grit size and wear level, special shapes possible. Dry and wet grinding	High material removal rate, uniform surface roughness after an initial running-in period, special shapes possible. Dry and wet grinding
Application areas	Carbide, hard short-chip materials (e.g. ceramic oxide), pre-sintered carbide. On ID and coordinate grinding machines.	HSS and high-alloyed hardened steel. On ID and coordinate grinding machines.
RECOMMENDED USE		
Shape (Order Number)	**1A1W mounted pins and 1A1 grinding wheels**	**1A1W mounted pins and 1A1 grinding wheels**
Grit size d_k	D46 - D64 -D91 D126 - D181	B46 - B64 - B91 B126 - B151 -B252
Bonds	**G820**	**G825**
Concentration	S33	S33
Circumferential speed v_c	...20 m/s wet Please observe n_{perm} ...15 m/s dry	...30 m/s wet Please observe n_{perm} ...20 m/s dry
Table feed rate v_f	0.5...5 m/min	0.5...5 m/min
Workpiece speed rate n_w	100...1000 min^{-1}	100...1000 min^{-1}
Feed rate s (= $v_f \cdot 10^3 : n_w$)	1 to 5 mm	1 to 5 mm
Infeed a_e	20 % of d_k	20 % of d_k
Coolant	Dry, emulsion or oil	Dry, emulsion or oil

EXAMPLES OF COMMON PROFILES

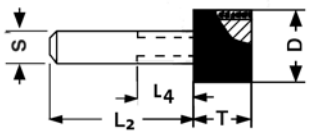


MPORTANT NOTES WHEN USING MOUNTED PINS (SEE ALSO PAGE 100)

1A1W SINGLE LAYER ELECTROPLATED MOUNTED PINS						
SHAPE	D	T	CLAMPING LENGTH $L_{3\ MIN}$	N_{PERM} (1/min)	CLAMPING LENGTH $L_{3\ MAX}$	N_{PERM} (1/min)
S1A1W	0.5	2.0	10.0	12.000	33.0	27000
S1A1W	0.6	2.0	10.0	18.000	33.0	41000
S1A1W	0.6	4.0	10.0	18.000	33.0	45000
S1A1W	0.7	2.0	10.0	23.000	33.0	57000
S1A1W	0.7	4.0	10.0	24.000	33.0	62000
S1A1W	0.8	2.0	10.0	24.000	31.0	50000
S1A1W	0.8	4.0	10.0	30.000	31.0	70000
S1A1W	0.9	2.0	10.0	30.000	31.0	66000
S1A1W	0.9	4.0	10.0	30.000	31.0	70000
S1A1W	1.0	2.0	10.0	35.000	31.0	82000
S1A1W	1.0	4.0	10.0	36.000	31.0	88000
S1A1W	1.1	4.0	10.0	42.000	28.0	91000
S1A1W	1.2	4.0	10.0	45.000	28.0	106000
S1A1W	1.3	4.0	10.0	48.000	28.0	120000
S1A1W	1.4	4.0	10.0	50.000	28.0	134000
S1A1W	1.5	4.0	10.0	50.000	28.0	134000
S1A1W	1.6	4.0	10.0	52.000	28.0	147000
S1A1W	1.7	4.0	10.0	53.000	28.0	150000
S1A1W	1.8	4.0	10.0	54.000	28.0	150000
S1A1W	1.9	4.0	10.0	54.000	28.0	150000
S1A1W	2.0	4.0	10.0	57.000	24.0	138000
S1A1W	2.2	4.0	10.0	57.000	24.0	143000
S1A1W	2.4	4.0	10.0	56.000	24.0	145000
S1A1W	2.5	4.0	10.0	56.000	24.0	146000
S1A1W	2.6	4.0	10.0	55.000	24.0	146000
S1A1W	2.8	4.0	10.0	54.000	24.0	145000
S1A1W	3.0	5.0	10.0	55.000	20.0	106000
S1A1W	3.5	5.0	10.0	51.000	20.0	96000
S1A1W	4.0	5.0	10.0	29.000	35.0	132000
S1A1W	4.5	5.0	10.0	28.000	30.0	83000
S1A1W	5.0	7.0	10.0	28.000	40.0	85000
S1A1W	6.0	7.0	10.0	39.000	40.0	150000
S1A1W	7.0	8.0	10.0	39.000	40.0	136000
S1A1W	8.0	10.0	10.0	38.000	40.0	120000
S1A1W	10.0	10.0	10.0	36.000	40.0	96000
S1A1W	12.0	10.0	10.0	33.000	40.0	80000
S1A1W	15.0	10.0	10.0	30.000	40.0	64000

n_{perm} (rpm) according to clamping length L_3

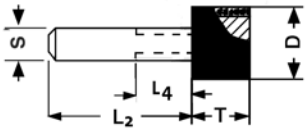
1A1W STOCK PROGRAMME



SHAPE	DxT (mm)	S	L_2 (mm)	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND MOUNTED PINS								
S1A1W	0.5x2	3	38	5	D91	G820	S33	60157644111 [1]
S1A1W	0.6x4	3	36	3	D91	G820	S33	66260110736 [1]
S1A1W	0.7x3	3	37	3	D91	G820	S33	60157644152 [2]
S1A1W	0.8x2	3	38	7	D91	G820	S33	60157643877
S1A1W	0.8x4	3	36	5	D91	G820	S33	60157643493
S1A1W	1x4	3	36	5	D91	G820	S33	66260134647
					D126	G820	S33	60157643706 [1]
S1A1W	1.2x4	3	36	8	D91	G820	S33	60157643847 [2]
					D126	G820	S33	60157643955 [1]
S1A1W	1.3x4	3	36	8	D126	G820	S33	60157643988 [1]
S1A1W	1.5x4	3	36	8	D91	G820	S33	66260134656 [1]
					D126	G820	S33	60157643944
S1A1W	2x4	3	36	12	D46	G820	S33	60157643916 [2]
					D91	G820	S33	66260134665
					D126	G820	S33	66260134666
					D181	G820	S33	60157643806 [1]
S1A1W	2.2x4	3	36	12	D91	G820	S33	66260134668
S1A1W	2.5x4	3	36	12	D91	G820	S33	66260134670 [1]
					D126	G820	S33	66260134671
S1A1W	3x5	3	35	15	D91	G820	S33	66260134675 [1]
					D126	G820	S33	66260134676
					D181	G820	S33	60157643785 [2]
S1A1W	3.5x5	3	35	-	D91	G820	S33	66260134678 [2]
					D126	G820	S33	66260134679
S1A1W	4x5	3	45	-	D91	G820	S33	66260134681 [1]
					D126	G820	S33	66260134682
					D181	G820	S33	66260100058 [2]
S1A1W	4x6	3	50	-	D91	G820	S33	66260110226 [2]
S1A1W	4.5x6	3	50	-	D91	G820	S33	66260110137 [2]
1S1A1W	5x6	3	50	-	D91	G820	S33	66260100334 [1]
S1A1W	5x7	3	43	-	D91	G820	S33	66260134687
					D126	G820	S33	66260134688
					D181	G820	S33	60157644114
S1A1W	6x7	6	53	13	D91	G820	S33	66260134690 [1]
					D126	G820	S33	66260134691
					D181	G820	S33	66260134692 [1]
S1A1W	6x7	6	75	-	D91	G820	S33	60157643963 [2]
S1A1W	7x8	6	52	-	D126	G820	S33	66260134694

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.

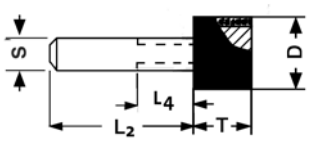
1A1W STOCK PROGRAMME



SHAPE	DxT (mm)	S	L_2 (mm)	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND MOUNTED PINS								
S1A1W	8x10	6	50	-	D91	G820	S33	66260134696
					D126	G820	S33	66260134697
					D181	G820	S33	66260134698 [2]
S1A1W	8x10	6	75	-	D91	G820	S33	66260110242 [2]
					D181	G820	S33	66260110167 [2]
S1A1W	10x10	6	50	-	D91	G820	S33	66260134699
					D126	G820	S33	66260134700 [1]
					D181	G820	S33	66260134701 [2]
S1A1W	10x10	6	75	-	D91	G820	S33	60157644175 [2]
					D181	G820	S33	60157644083 [2]
S1A1W	12x10	6	50	-	D126	G820	S33	66260134703
S1A1W	12x10	6	75	-	D91	G820	S33	60157643803 [2]
					D181	G820	S33	60157644091 [2]
S1A1W	15x10	6	50	-	D126	G820	S33	60157643885 [1]
CBN MOUNTED PINS								
S1A1W	0.5x2	3	38	5	B91	G825	S33	66260110140 [2]
S1A1W	0.6x4	3	36	3	B91	G825	S33	66260134726 [2]
S1A1W	0.7x4	3	36	3	B91	G825	S33	66260100338 [1]
S1A1W	0.8x4	3	36	5	B91	G825	S33	66260134734 [1]
S1A1W	1x2	3	38	7	B126	G825	S33	66260134739 [2]
S1A1W	1x4	3	36	5	B91	G825	S33	66260134744 [2]
					B126	G825	S33	66260134742 [2]
S1A1W	1.2x4	3	36	8	B91	G825	S33	66260134751 [2]
					B126	G825	S33	66260134749 [2]
S1A1W	1.3x4	3	40	8	B91	G825	S33	66260110421 [2]
S1A1W	1.4x4	3	36	8	B126	G825	S33	66260101138 [2]
S1A1W	1.5x4	3	36	8	B91	G825	S33	66260134757 [2]
					B126	G825	S33	66260134755 [2]
S1A1W	1.6x4	3	36	8	B91	G825	S33	66260110135 [2]
S1A1W	1.7x4	3	36	8	B126	G825	S33	60157643451 [2]
S1A1W	1.8x4	3	36	8	B91	G825	S33	60157643816 [2]
S1A1W	2x4	3	36	12	B91	G825	S33	66260133913 [2]
					B126	G825	S33	66260133911
					B151	G825	S33	60157644057 [2]
S1A1W	2.5x4	3	36	12	B91	G825	S33	66260133920 [1]
					B126	G825	S33	66260133919 [1]
S1A1W	2.8x4	3	36	12	B91	G825	S33	60157643883 [2]
S1A1W	3x5	3	35	15	B91	G825	S33	66260133929 [2]
					B126	G825	S33	66260133927
					B151	G825	S33	66260133926 [2]

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.

1A1W STOCK PROGRAMME



SHAPE	DxT (mm)	S	L_2 (mm)	L_4 (mm)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
CBN MOUNTED PINS								
S1A1W	3.5x5	3	35	-	B126	G825	S33	66260133931 [2]
					B151	G825	S33	66260133930 [2]
S1A1W	4x5	3	45	-	B91	G825	S33	66260133937 [1]
					B126	G825	S33	66260133935
S1A1W	4.5x5	3	45	-	B126	G825	S33	66260133939 [2]
S1A1W	5x7	3	43	-	B126	G825	S33	66260100061 [1]
					B151	G825	S33	60157643453 [1]
S1A1W	6x7	6	53	13	B91	G825	S33	66260133947 [2]
					B126	G825	S33	66260133946 [2]
					B151	G825	S33	60157643694
S1A1W	6x7	6	68	-	B252	G825	S33	66260100064 [2]
S1A1W	6x7	6	75	-	B126	G825	S33	60157643703
S1A1W	7x8	6	52	-	B126	G825	S33	66260133949
					B151	G825	S33	60157643834 [2]
S1A1W	8x10	6	50	-	B151	G825	S33	66260133952 [2]
S1A1W	8x10	6	70	-	B252	G825	S33	60157643793 [2]
S1A1W	8x10	6	75	-	B126	G825	S33	60157643605
S1A1W	10x10	6	50	-	B91	G825	S33	66260133958 [2]
					B151	G825	S33	66260133956 [2]
S1A1W	10x10	6	75	-	B126	G825	S33	60157644046 [1]
S1A1W	12x10	6	50	-	B126	G825	S33	66260133960 [2]
					B151	G825	S33	66260133959 [2]
S1A1W	15x10	6	50	-	B151	G825	S33	60157643797 [2]

[1] Delivery time 5 - 6 weeks
[2] Available while stocks last.

SMALL GRINDING TOOLS
FOR COORDINATE GRINDING

Apart from the range of 1A1W mounted pins, Norton Winter is also offering a programme of small grinding tools with special geometries (07B mounted pins) and 11V2 grinding wheels for coordinate grinding. Specific standard solutions are available ex stock.

APPLICATION AREAS

Grinding die sockets and beverage can ironing rings for the packaging industry on coordinate grinding machines

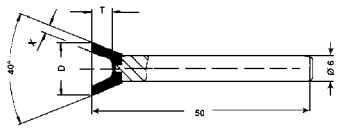
SPECIFICATION	1K07B-12-5-2-6-40 *B126 KSS10N V240
WORKPIECE	HSS DM05, EW9Co10
HARDNESS	62 – 64 HRC
MACHINING PARAMETERS	
CUTTING SPEED	v_c = 30 m/s
FEED RATE	v_f = 80...100 mm/min
INFEED	a_e = 0.02 mm
COOLANT	Oil or emulsion (1 to 4 %)

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
K+888R	↑	Universal resin bond for dry grinding

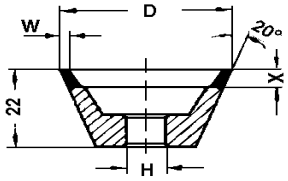
CBN GRINDING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KSS12N	↑	Standard resin bond for CNC applications
KSS10N		Universal resin bond for tool grinding

07B STOCK PROGRAMME



SHAPE	DxTxX (mm)	V (°)	GRIT SIZE	BOND	CONCEN-TRATION	ORDER NUMBER
DIAMOND MOUNTED PINS						
2K07B	15x5x2	40	D64	K+888RY	C100	60157643705
CBN MOUNTED PINS						
2K07B	10x5x2	40	B126	KSS10N	V240	60157643794
1K07B	12x5x2	40	B126	KSS10N	V240	66260107661
1K07B	15x5x2	40	B126	KSS10N	V240	60157644044

11V2 STOCK PROGRAMME



SHAPE	DxWxX (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER
DIAMOND MOUNTED PINS							
K11V2	40x2x5	10	D64	K+888R	C75	H	60157642670
CBN MOUNTED PINS							
2K11V2	20x2x5	8	B126	KSS12N	V180	H	60157643026
K11V2	30x2x5	8	B126	KSS12N	V180	H	66260136462
K11V2	40x2x5	10	B126	KSS10N	V180	H	66260134764

DIAMOND AND CBN CUT-OFF WHEELS

Diamond cutting wheels are used for efficient cutting of hard, short-chipping and wear resistant materials such as glass, ceramics and carbide. The current trend towards sintered materials has increased the use of diamond cutting wheels. They are successfully used in the food industry and medical science, due to their clean and almost residue-free cutting ability.
cBN was developed as an addition to diamond. The specific characteristics of this cutting material permit the machining of high-performance high-speed steel and hardened steel from 55 HRC as well as magnetic materials.
The cutting wheels consist of a steel core with the cutting layer on the periphery. The cutting layer in sintered metal, resin or electroplated metal bond contains either diamond or cBN. The combination of bond, type of abrasive, concentration and grit size leads to different tool characteristics which are specified to meet the requirements of different processes and applications.

EUROPEAN STANDARD EN 13236:2000 - COMMON MAXIMUM OPERATING SPEEDS FOR CUT-OFF WHEELS

BODY		CUTTING EDGE (ABRASIVE COATING)	APPLICATION MODE	GRINDING MODE	MAXIMUM OPERATING SPEED IN M/S ACCORDING TO BOND TYPE		
					Resin B	Metal M	Electroplated G
Metal	metal blank, e.g. cast, rolled, forged	closed	mechanically and manually guided cut-off grinding	wet cut-off grinding	63	80	80
				dry cut-off grinding	-	80	80
		segmented	mechanically and manually guided cut-off grinding	wet cut-off grinding	-	40 [a]	50 [a]
					-	80	80
				dry cut-off grinding	-	63	80
		closed or segmented	manually guided cut-off grinding	wet and dry cut-off grinding	-	63 [b]	80
	sintered	closed	mechanically and manually guided cut-off grinding	wet cut-off grinding	63	63	-
Resin		closed	mechanically and manually guided cut-off grinding	wet and dry cut-off grinding		-	-

[a] For difficult to machine materials, like e.g. granite, diorite, quartzite, armoured concrete
[b] The abrasive section must be welded or sintered to the core for cut-off wheels for free hand cutting with metal bond abrasive sections

APPLICATION NOTES

1. WHICH MATERIALS CAN BE CUT?

As a general rule, diamond cutting wheels are used to cut hard, short-chipping materials such as glass, ceramics (fired and unfired), carbide, graphite, quartz, ferrite and semiconductor materials.

Materials with an affinity for carbon, such as iron-based alloys, are cut using cubic boron nitride (cBN). High-alloy steels such as HSS and chrome steel with 12 % Cr are typical examples. Ideally, steel should have a minimum hardness of 55 HRC. Soft, long-chipping materials accumulate in the chip space, so they tend to clog. Compromises can be achieved with electroplated bonds.

2. WHICH CUTTING LAYER SPECIFICATION?

The following is indispensable for correct selection of layer specification:

- full description of workpiece material
- cutting edge quality requirements (e.g. maximum size of edge chipping) machining parameters, range of variants (e.g. speed from/to, feed rate from/to)
- details of drive power (see point 4)
- details of coolants

3. WHICH TOOL DIMENSIONS?

The tool dimensions are determined by the machine and the height of workpiece to be cut. Normally, the flange diameter should not fall below 1/3 of the cutting wheel diameter, i.e. the maximum workpiece height which can be sawn is less than one third of the blade diameter.

A stable cutting wheel core is essential for chip-free cutting edges. The directional stability of the blade can also be enhanced by increasing the flange diameter (diameter size required). Proportionately larger flanges are advisable for high cutting rates. A summary of the internationally approved designations for continuous-rim cutting wheels and the associated flanges has been compiled by FEPA.

4. WHICH MACHINE?

Generally valid principles apply to the highest possible dynamic stability, since any oscillation during the cutting operation can have a negative effect on tool behaviour. Peripheral speed plays an important role in the adaptation of the tool to the cutting operation, and should therefore be adjustable, at least by means of a change of drive pulley.

Sufficient motor drive output is essential as an undersized motor will prevent the optimum utilization of the diamond tool. Diamond and bond must be made to work hard if the self-sharpening effect is to occur. Bonds will have greater resistance to wear and will thus be more economical if the spindle drive permits high cutting rates. Cutting wheels with diameters exceeding 300 mm should be used with a drive power of at least 1.5 kW; for ganged wheels, a further 0.5 kW should be allowed for each additional cutting wheel.

5. WHICH OPERATION PARAMETERS?

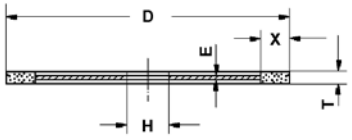
In the vast majority of cases, the full material thickness is cut in a single pass at a suitably chosen feed rate. However, step cutting rather than full cutting is used for particularly dense materials such as sapphire which wears the diamond layer without simultaneously removing a corresponding amount of the bond. The smaller the ratio of depth of cut to feed rate i.e. the shallower the cut, the greater is the sharpening effect of the cutting process. Feed rate is directly dependent on the spindle drive power and the hardness or toughness of the material to be cut. A general specification of cutting rates cannot be given in view of the large number of different materials which can be cut with the different cutting wheel types. There are optimal ranges of peripheral speed, dependent on the cutting operation. In general, low peripheral speeds (20–30 m/s) are used for dense, fine-debris materials, whereas higher speeds (30–40 m/s) are used for porous, coarse-debris materials.

6. COOLANT OR DRY CUT?

Metal bonded cutting wheels are invariably used with coolant (with the exception of the electroplated S-type), resin bond closed-rim blades can also work dry. Different coolants are used for the different workpiece materials, e.g. water, mineral based oils, emulsions, synthetic oils etc. It is important for coolant flow to be sufficient and to be accurately directed to the tool/workpiece interface. The coolant is supplied via coolant nozzles, by a special flange or by emersion.

RESIN BONDED CUT-OFF WHEELS

Resin bonded cutting wheels feature exceptionally good free-cutting characteristics due to low cutting forces and low cutting temperatures. The result is fast cutting with clean cut surfaces without edge chipping – which is particularly important for thinwalled hollow workpieces.



FEPA DESIGNATION	DxTxX (mm)	E (mm)	H (mm)	GRIT SIZE	NORMAL CONCENTRATIONS
K1A1R	100x0.6x5	0.5	Standard bore diameter 20 mm, other bore diameters on request	The following grit sizes are available: Diamond: D46, D64, D91, D107, D126, D151, D181, D213, D301 cBN: B91, B107, B126, B151, B181	The following concentrations are available: Diamond: D46, D64, D91, D107, D126, D151, D181, D213, D301 cBN: B91, B107, B126, B151, B181
	100x0.8x5	0.6			
	100x1.0x5	0.8			
	100x1.2x5	1.0			
K1A1R	125x0.6x5	0.5			
	100x0.8x5	0.6			
	125x1.0x5	0.8			
	125x1.2x5	1.0			
K1A1R	150x0.6x7	0.5			
	150x0.8x7	0.6			
	150x1.0x7	0.8			
	150x1.2x7	1.0			
	150x1.5x7	1.3			
K1A1R	175x0.8x7	0.6			
	175x1.0x7	0.8			
	175x1.2x7	1.0			
	175x1.5x7	1.3			
K1A1R	200x0.8x7	0.6			
	200x1.0x7	0.8			
	200x1.2x7	0.9			
	200x1.5x7	1.2			
K1A1R	250x1.0x7	0.7			
	250x1.2x7	0.9			
	250x1.4x7	1.1			
	250x1.7x7	1.4			
K1A1R	300x1.0x7	0.7			
	300x1.2x7	0.9			
	300x1.4x7	1.1			
	300x1.7x7	1.4			
K1A1R	400x1.2x7	0.9			
	400x1.5x7	1.2			
	400x1.7x7	1.4			
	400x1.9x7	1.6			
	400x2.3x7	2.0			
K1A1R	500x2.3x7	2.0			
K1A1R	550x2.3x7	2.0			

Standard tolerances

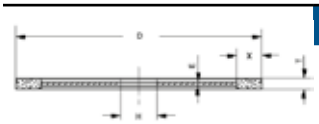
Ø < 100 mm	T ± 0.07
Ø ⩽ 250 mm	T ± 0.10
Ø ⩾ 300 mm	T + 0.20 - 0.10

SELECTION ASSISTANT FOR NORTON WINTER BOND SYSTEMS

DIAMOND CUT-OFF WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
K+4821	↑	Special resin bond for mechanically cutting of tungsten carbide
K+888RY		Universal resin bond for mechanically cutting

CBN CUTTING WHEELS	WEAR RESISTANCE	RECOMMENDATION FOR USE
KSSY	↑	Universal resin bond for mechanically cutting of HSS

1A1R STOCK PROGRAMME

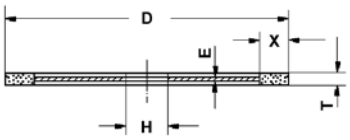


SHAPE	DxTxX (mm)	E (mm)	H (mm)	GRIT SIZE	BOND	CONCEN-TRATION	BODY	ORDER NUMBER	COMMENTS
DIAMOND GRINDING WHEELS									
K1A1R	100x1x5	0.8	20	D151	K+888RY	C50	E	69014185139	for Ceramics
		0.8	20	D151	K+4821	C100	E	69014185128	for Tungsten Carbide
2K1A1R	125x0.6x5	0.6	32	D151	K+888RY	C75	E	66260387932 [2]	ffür Hartmetall 4 × 90° Ø6 circle Ø90
K1A1R	125x1x5	0.8	20	D151	K+4821	C100	E	69014185129	for Tungsten Carbide
K1A1R	150x1x7	0.8	20	D151	K+4821	C100	E	69014185130	for Tungsten Carbide
11K1A1R	150x1x7	0.8	20	D151	K+4821	C100	E	66260112766	für Hartmetall 3 x 120° Ø4,5 Teilkreis Ø33,5
K1A1R	150x1x7	0.8	32	D151	K+4821	C100	E	69014185153	for Tungsten Carbide
K1A1R	200x1.2x7	0.9	30	D151	K+4821	C100	E	69014185154	for Tungsten Carbide
K1A1R	200x1.2x7	0.9	22	D151	K+4821	C100	E	66260386423	for Tungsten Carbide
K1A1R	250x1.2x7	0.9	25	D91	K+888RY	C50	E	66260118203 [1]	for Ceramics
K1A1R	300x1.4x7	1.1	40	D181	K+4821	C75	E	69014145654	for Tungsten Carbide
CBN MOUNTED PINS									
K1A1R	100x1x5	0.8	20	B151	KSSRY	V180	E	66260388124	for HSS
K1A1R	125x1x5	0.8	20	B151	KSSRY	V180	E	66260386108	for HSS
K1A1R	150x1x7	0.8	20	B151	KSSRY	V180	E	66260385838	for HSS

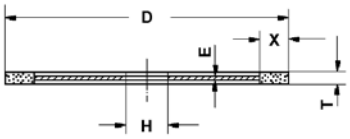
[2] Available while stocks last.

METAL BONDED CUT-OFF WHEELS

These bronze bonds. developed specially for saw blades, are wear resistant and relatively insensitive to shock. They feature considerably longer life than resin bonds, yet give much greater cutting forces, higer cutting temperatures and shorter cutting times.



FEPA DESIGNATION	DxTxX (mm)	E (mm)	H (mm)	GRIT SIZE	COMMON CONCENTRATIONS
BZ1A1R	100x0.5x5	0.4	Standard bore diameter 20 mm, other bore diameters on request	The following grit sizes are available: Diamond: D46, D64, D91, D107, D126, D151, D181, D213, D301 cBN: B91, B107, B126, B151, B181	The following concentrations are available: Diamond: C16, C19, C23, C45, C90 cBN: V120, V180, V240
	100x0.6x5	0.5			
	100x0.8x5	0.6			
	100x1.0x5	0.8			
	100x1.2x5	1.0			
	100x1.5x5	1.3			
BZ1A1R	100x0.6x10	0.4			
	100x0.8x10	0.6			
	100x1.0x10	0.8			
	100x1.2x10	1.0			
	100x1.5x10	1.3			
BZ1A1R	125x0.5x5	0.4			
	125x0.6x5	0.5			
	125x0.8x5	0.6			
	125x1.0x5	0.8			
	125x1.2x5	1.0			
	125x1.5x5	1.3			
BZ1A1R	125x0.6x10	0.4			
	125x0.8x10	0.6			
	125x1.0x10	0.8			
	125x1.2x10	1.0			
	125x1.5x10	1.3			
BZ1A1R	150x0.6x5	0.5			
	150x0.8x5	0.6			
	150x1.0x5	0.8			
	150x1.2x5	0.9			
	150x1.5x5	1.2			
	150x1.8x5	1.5			
BZ1A1R	150x0.8x10	0.6			
	150x1.0x10	0.8			
	150x1.2x10	1.0			
	150x1.5x10	1.3			
	150x1.8x10	1.6			
BZ1A1R	175x0.8x5	0.6			
	175x1.0x5	0.8			
	175x1.2x5	0.9			
	175x1.5x5	1.2			
	175x1.8x5	1.4			
BZ1A1R	175x1.0x10	0.7			
	175x1.2x10	0.9			
	175x1.5x10	1.2			
	175x1.8x10	1.4			



FEPA DESIGNATION	DxTxX (mm)	E (mm)	H (mm)	GRIT SIZE	COMMON CONCENTRATIONS
BZ1A1R	200x0.8x5	0.6	Standard bore diameter 20 mm, other bore diameters on request	The following grit sizes are available: Diamond: D46, D64, D91, D107, D126, D151, D181, D213, D301 cBN: B91, B107, B126, B151, B181	The following concentrations are available: Diamond: C16, C19, C23, C45, C90 cBN: V120, V180, V240
	200x1.0x5	0.8			
	200x1.2x5	0.9			
	200x1.5x5	1.2			
	200x1.8x5	1.4			
BZ1A1R	200x1.0x10	0.7			
	200x1.2x10	0.9			
	200x1.5x10	1.2			
	200x1.8x10	1.5			
BZ1A1R	250x1.0x5	0.7			
	250x1.2x5	0.8			
	250x1.5x5	1.1			
	250x1.8x5	1.4			
BZ1A1R	250x1.0x10	0.7			
	250x1.2x10	0.8			
	250x1.5x10	1.1			
	250x1.8x10	1.4			
BZ1A1R	300x1.2x5	0.8			
	300x1.5x5	1.1			
	300x1.8x5	1.4			
BZ1A1R	300x1.2x10	0.8			
	300x1.5x10	1.1			
	300x1.8x10	1.4			
BZ1A1R	350x1.5x5	1.1			
	350x1.8x5	1.4			
	350x2.0x5	1.6			
BZ1A1R	350x1.5x10	1.1			
	350x1.8x10	1.4			
	350x2.0x10	1.6			
BZ1A1R	400x1.5x5	1.1			
	400x1.8x5	1.4			
	400x2.0x5	1.6			
BZ1A1R	400x1.5x10	1.1			
	400x1.8x10	1.4			
	400x2.0x10	1.6			
BZ1A1R	450x1.8x5	1.4			
	450x2.0x5	1.6			
	450x2.4x5	2.0			
BZ1A1R	450x1.8x10	1.4			
	450x2.0x10	1.6			
	450x2.4x10	2.0			

Standard tolerances

Ø < 100 mm	T ± 0,07
Ø ⩽ 250 mm	T ± 0,10
Ø ⩾ 300 mm	T + 0,20 - 0,10

DIAMOND FILES

Norton Winter diamond files are mostly used in tool and die making for finishing form tools, die-cutting tools, drawing dies, and embossing dies. Their particular features are ease of handling, edge stability and long service life. They are available in four different grit sizes:

D181 for rough filing
D126 for universal use
D91 for finish filing
D20B and D46 for special applications
Other specifications on request.

NEEDLE FILES FOR MANUAL APPLICATIONS

PROFILE 09D		CROSS SECTION	LENGTH OF DIAMOND LAYER	TOTAL LENGTH	SHAFT Ø	GRIT SIZE	ORDER NUMBER
	Flat square 2112	5x1	70	140	3	D91	66260134227
						D126	66260134228
	Flat square with rounded corners 2112r	5x1	70	140	3	D91	66260134244 [2]
	Triangular 2132	3.5	70	140	3	D20B	66260114101 [2]
						D91	66260134230 [2]
						D126	66260134231
	Square 2142	2.5	70	140	3	D91	66260134232 [2]
						D126	66260134233 [2]
	Half-round 2152	5x2	70	140	3	D20B	66260114759 [2]
						D91	66260110230
						D126	66260134235

Plastic screw-on handle

[1] Lieferzeit 4 Wochen

[2] Available while stocks last.

PROFIL 09D		BODY CROSSSEC-TION	LENGTH OF DIAMOND LAYER	TOTAL LENGTH	SHAFT Ø	GRIT SIZE	ORDER NUMBER
	Round 2162	Ø 3	70	140	3	D91	60157644163 [2]
						D126	66260134237
	Blade 2172	5x1.5	70	140	3	D91	66260134238 [2]
						D126	60157644103 [2]
	Crossing file 2192	5x2	70	140	3	D91	66260107652 [2]
	Crossing file 2102T	5x2	70	140	3	D91	66260100085 [2]

Plastic screw-on handle

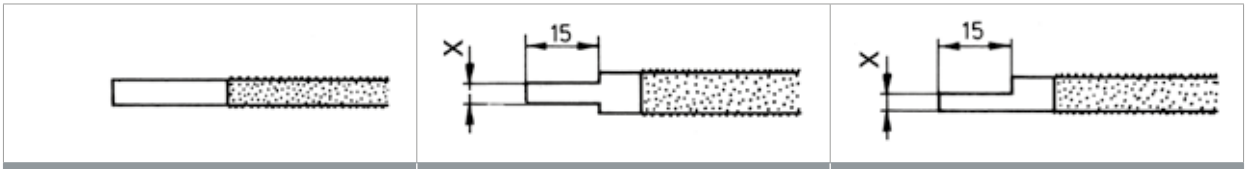
Other dimensions available at short notice on request [1] Delivery time 4 weeks [2] Available while stocks last.

FILES FOR MANUAL AND MACHINE USE

PROFIL 09B		BODY CROSSSEC-TION	LENGTH OF DIAMOND LAYER	TOTAL LENGTH	SHAFT Ø	GRIT SIZE	ORDER NUMBER
	Flat 7	4.5 × 2	80	150	A	D91	66260110152
					A	D126	66260100260 [2]
	Flat 13	9 × 3.2	80	150	A	D91	66260100285 [2]
					A	D126	66260134250
					A	D181	66260100100 [2]
	Flat 16	11 × 4	120	200	A	D91	66260110317 [2]
					A	D126	66260110225
					A	D181	66260100333 [2]
	Square 25	5	80	125	A	D91	60157644206 [2]
	Triangular 45	8	80	150	C/X = 3.5 mm	D91	66260110441 [2]
					C/X = 3.5 mm	D126	66260110458
	Triangular 48	10	120	200	C/X = 4.5 mm	D126	60157643782 [2]
	Round 76	Ø 6.3	80	150	C/X = 4 mm	D126	60157643624 [2]
	Half-round 92	8 × 3	80	150	A	D91	66260100395 [2]

Other dimensions available at short notice on request [2] Available while stocks last. All dimensions in mm

OTHER DIMENSIONS AVAILABLE AT SHORT NOTICE ON REQUEST.



VERSION A	VERSION B	VERSION C

SAW RODS FOR MANUAL AND MACHINE USE

PROFIL 10E		BODY CROSSSECTION	LENGTH OF DIAMOND LAYER	TOTAL LENGTH	SHAFT Ø	GRIT SIZE	ORDER NUMBER
	Round 701	Ø 0.80	65	130	0.5	D126	66260134284 [2]

[2] Available while stocks last.

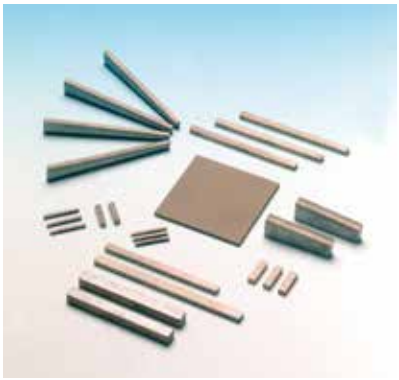
All dimensions in mm

Clamping zone free of diamonds both sides (20 / 45 mm)
Other dimensions available at short notice on request.

HONING STICKS

Honing is classified as machining with undefined cutting edges using a tool where grits are bound together whilst maintaining continuous surface contact between workpiece and tool for improving size, form and surface.
A periodic alteration of relative movements takes place between tool and workpiece, producing surfaces with parallel, criss-crossing grooves. In some cases a particular surface finish is required, for example to prevent the rupture of the lubricating film on cylinder liners. The advantages of diamond and cBN honing stones compared to conventional honing stones are

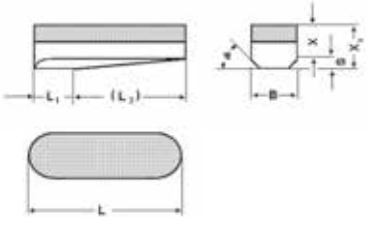
- Longer service life
- Better form stability
- Closer tolerances
- Cooler working, meaning no changes in the surface structure caused by thermal effects
- Less distortion



Diamond is exclusively used for honing workpieces, of all types of iron castings (cast iron, annealed cast iron and some cast steels).
Cylinder liners for internal combustion engines are typical examples.
cBN is primarily used for honing steel, e.g. machining steel, ball bearing steel, tool steel and alloy steel in all hardness conditions.

To achieve the required surface quality, it is important to correctly specify all process parameters: The right grit type (diamond or cBN), grit size, grit quality, the bond and the concentration must be selected according to the workpiece material and the workpiece hardness. Furthermore, the required surface quality and material removal rate will determine whether the process should be carried out in one step or several operations.

METAL BONDED HONING STICKS

	Item designation BZ08B	With diamond-free zone	Layer thickness X ≥ 1 layer width B ≥ 2 diamond-free zone S ≥ 0.5 layer length L ≤ 150
	Item designation BZ08D	Without underlayer	Layer thickness X ≥ 1 layer width B ≥ 2 layer length L ≤ 150
	Item designation BZ08E	Including strip mount	Layer thickness X ≥ 1 layer width B ≥ 2 layer length L ≤ 150 Tolerance at angle ß L_3 ≤ 12.5: ± 15° L_3 > 12.5: ± 10°

08B and 08D can only be used in conjunction with a strip mount.
08E is designed inclusive of strip mount for direct fitting.

ORDER EXAMPLE

SHAPE	L	B	X	X1	R	GRIT SIZE	BOND	CONCENTRATION
BZ08B	75	5	2	5	40	D76	BZ387	C75

APPLICATION DATA FOR REGRINDING METAL BONDED HONING TOOLS

The honing head should be ground to the diameter of the bore to be honed, in order to achieve the shortest possible running-in time after installation, i.e. soldering or gluing the stones to the honing shoes and fixing them to the honing spindle, so that a high percentage contact area is created right from the beginning.

SiC grinding wheel – resin bonded, e.g. Ø 200 mm, dry cut (uni-directional at point of contact)
Grinding speed (diamond /cBN) v_c = 15 m/s
Grinding speed (SiC) v_c = 23 m/s

GRIT SIZE OF DIAMOND AND CBN HONING STICKS	SPECIFICATIONS OF THE SIC GRINDING WHEELS
D15 / B15	400 HB3
D20 / B30	320 HB3
D46 / B46	240 HB3
D64 / B64	180 HB3
D91 / B91	120 HB3
D126 / B126	80 JB3
D151 / B151	80 JB3
D181 / B181	80 JB3

EXAMPLES OF PROVEN TOOL DESIGNS

WORKPIECE				
Workpiece material	Grey cast iron		Steel	
Hardness [HB/HRC]	HB 180-220		HRC 62 ±2	
Honing tools	Pre-honing	Finish honing	Pre-honing	Finish honing
Grit size	D91	D20B	B126	B54
Bond	BZ387	BZ387	MSS473	MSS473
Concentration	C100	C100	V120	V120
APPLICATION DATA				
Circumferential speed V_A [m/min]	52	52	51	51
Stroke speed V_H [m/min]	14	14	18	18
RESULTS				
Roughness R_t [µm]	5.8	1.8	4.5	2.2
Effective material removal rate MRR_{eff} [cm^3/min]	0.67	0.2	0.4	0.15
Material removal rate per stick surface MRR_{Ltotal} [$mm^3/mm^2 \cdot min$]	0.4	0.2	0.58	0.22
Honing ratio G [cm^3/cm^3]	4.500	3.300	1.200	650

WORKING DATA AND GRIT SIZES

HONING SPEED

The cutting speed (v_c) is based on the speed at the circumference of the honing tool (V_A) and its stroke speed (V_H).

SUGGESTED VALUES	MEDIAN PRACTICAL VALUES
v_c = 30-70 m/min	52 m/min
v_A = 20-60 m/min	49 m/min
v_H = 10-30 m/min	16 m/min

INTERSECTION ANGLE

The ratio of stroke speed (v_H) and speed at the circumference (V_A) gives the characteristic angle of intersection (α) of the honing pattern. Usually the two speeds are selected so that the intersection angle lies between 25° and 60°, with a median value in practice of 36°.

CONTACT PRESSURE RANGE

20–200 N/cm² (exceptions up to 600 N/cm²)

COOLANT

In honing, mineral oil-based honing oils and water-soluble emulsions are used. Typical fluid use is 30–150 l/min per bore.

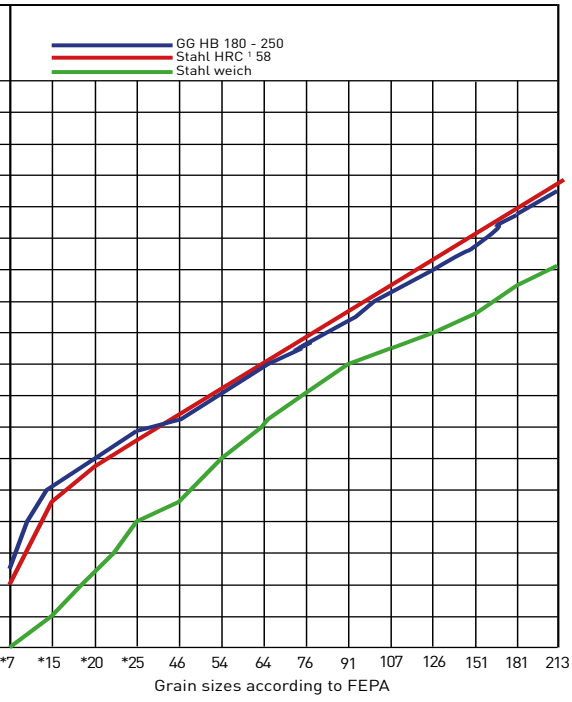
GRIT SIZES

The abrasive grit sizes specified for this process are classified according to FEPA standards, starting with B46 / D46. It is possible to manufacture tools different from those shown in the programmes. Please do not hesitate to contact us if you require assistance. Customers' own tools can also be coated. With regard to the determination of the nominal size, the undersizes which depend on the coating must be specified based on the grit size. Grit size tables can be found in the Service section of this catalogue.

ACHIEVABLE SURFACE FINISH VALUES WHEN HONING WITH METAL BOND HONING TOOLS

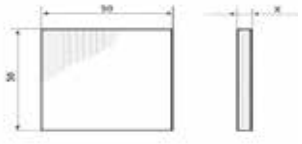
The practical values listed in the adjoining diagram serve as a quick reference. Accurate surface finish values always depend on the bond, grit size and concentration of the honing tool as well as the workpiece material, coolant and the process parameters. It is especially important to maintain a balanced ratio between grit size and concentration in order to prevent excessive levels of contact pressure. Concentration levels should be between C35 and C100 or V120 and V240 respectively, depending on grit size.

Rauheitswert R_a [µm]	R_z [µm]	R_t [µm]
1.6	10.9	12.8
1.4	9.5	11.2
1.2	8.2	9.6
1	6.8	8
0.9	6.1	7.2
0.8	5.4	6.4
0.7	4.8	5.6
0.63	4.25	5
0.5	3.4	4
0.4	2.7	3.2
0.3	2.1	2.4
0.25	1.7	2
0.2	1.4	1.6
0.15	1.02	1.2
0.13	0.85	1
0.1	0.7	0.8
0.08	0.54	0.64
0.063	0.43	0.5



*Norton Winter Grain Sizes
1) Calculation basis $1R_a = 8R_t = 0.85\ R_z$

RESIN BONDED HONING STICKS

	Item designation K08D-50-50-X	Without underlayer	Layer thickness X = 1.5 - 5 mm This blank has no base layer. It consists merely of a resin bonded diamond or cBN layer. The reference notes below show how these blanks are used.

BLANKS CAN BE CUT INTO INDIVIDUAL HONING STICKS BY USING EITHER

a) Hand- or fretsaw

b) Faster and cleaner cutting is achieved with a diamond cutting wheel, model BZ

Diameter:	100 - 150 mm
Thickness of cut:	0.6 - 0.8 mm
Layer specification:	D151 BZ309 C45

BOND THE STICK TO THE STRIP MOUNT E.G. WITH

a) UHU-Plus

b) Technicoll 2000 (Beiersdorf, Hamburg)

c) Loctite 307 / Activator T No. 747

The stick can subsequently be removed from the strip mount by heating to ~ 300 °C in an oven.

ORDER EXAMPLE

SHAPE	L	B	X	GRIT SIZE	BOND	CONCENTRATION
K08D	50	50	3	B126	KSSTY	V120

NORTON WINTER DIAPLAST® & NORTON WINTER DIAPLAST® SUSPENSION

Apart from bonded abrasives, Norton Winter also offers an unrivalled range of diamond pastes and suspensions. Norton Winter Diaplast® and Norton Winter Diaplast® suspension are the ideal lapping and polishing materials for lab and industrial application.

NORTON WINTER DIAPLAST® MEANS QUALITY:

- Fast removal from the workpiece, meaning economic machining times
- Relief and distortion-free samples
- Outstanding edge definition; optimum surface quality
- Economical in use in conjunction with Norton WINTER Diaplastol thinners

DIAMOND GRIT SIZE AND GRIT DISTRIBUTION

Norton Winter has extensive know-how in the preparation of diamond grits and the manufacture of diamond tools and diamond preparations. Grit sizes D25 to D0.7 are micro grits which are not classified by sieving but by special techniques. Norton Winter has developed in-house processes with high precision requirements, especially for this purpose. The classification of micron powders carried out by Norton Winter has closer tolerances than those stipulated by DIN and FEPA.

Up-to-date measuring systems and selection procedures are used for inspection and selection of individual diamond lots according to size and shape, thus ensuring a consistent level of quality.

It is important not only to keep within the specified grit size tolerances but also to maintain the particle size distribution within these limits. Even slightly oversized particles could cause surface scratches, whereas an excessive quantity of fines is uneconomical.

APPLICATIONS AND PRODUCT SPECIFICATIONS

DIAMOND BOND SYSTEM AND SOLUBILITY

The special characteristics of the paste and liquid carriers developed by Norton Winter guarantee uniform diamond distribution and thus constant concentration. This provides optimum distribution of the individual particles avoiding the formation of agglomerates.

The viscosity of Diaplast® suspension is carefully controlled to ensure that the suspended state of the diamond particles is maintained over a long period.

In conjunction with our thinner Norton Winter Diaplastol, it is important that a thin cooling lubricant film is formed to support the material removal rate provided by the diamond particles. The carriers used by Norton Winter have unlimited shelf life and a high degree of temperature stability.

Norton Winter Diaplast® diamond compounds types SS, N, M, E and Norton Winter Diaplast® suspension are supplied in alcohol/water and/or oil soluble form as standard. They are colourless, have unlimited shelf life and a high degree of temperature stability. All constituents are either biodegradable or do not pose a threat to the environment (special waste disposal procedures are required for larger quantities). Diaplast® Type T is universally-soluble.

PLEASE NOTE:
For preparatory machining tasks, for example

- diamond cutting wheels (catalogue No. 3, flat and crystal glass)
- diamond grinding wheels (from this catalogue)

are used. Why not make the experience of a leading diamond and cBN tool manufacturer work for you? Norton Winter is the right partner for lapping and polishing jobs in industry and the laboratory.

DIAMOND CONCENTRATION

The decisive parameters for material removal rate are number and size of the cutting edges of the diamond grit that engage the workpiece at any one time. The number of particles per unit of weight decreases with increasing grit size.

The diamond content increases with increasing grit size in Norton Winter diamond compound types SS and N and Norton Winter Diaplast® suspension. Diamond concentration is always the same for types T and E.

OVERVIEW OF NORTON WINTER DIAMOND PASTES

SS	For very fast material removal, extremely short machining times, top quality surface finish and geometric accuracy. Application on very hard material such as carbide and ceramics; materials with constituents of differing hardnesses; high-precision measuring and sensor surfaces.
N	For producing polished surfaces for metallographic, mineralogic and similar investigations. Applications on special steels, stainless steels.
T	The most economical paste for standard use in production. Application on large areas, in tool and die making as well as surface machining of rollers made of hardened steel, carbide, hard cast iron etc.
E	Economy paste for universal use. Machining of mass-produced parts and repairs and for when paste is frequently changed.

APPLICATIONS IN THE INDUSTRIAL FIELD:

- Aerospace
- Engine construction
- Hydraulics
- Plant manufacturing
- Tools Industry
- Automotive industry
- Engineering
- Manufacture of fittings
- Pump and mixer industry
- Turbine construction
- Electronics
- Glass and plastics
- Medical technology
- Rolling industry
- etc.

EXAMPLE APPLICATIONS

Typical examples of workpieces successfully lapped and polished with Norton Winter-Diaplast® diamond paste and Norton Winter-Diaplast® suspension

- Auditory ossical implants
- Die-cast molded pieces
- Ignition electrodes
- Measuring and sensor tools
- Plungers
- Sapphire windows
- Sliding-ring seals
- Slide rollers
- Wire and thread guides
- Ball bearings
- Drawing dies
- Implants (hip replacements)
- Molded parts
- Pump vanes
- Sealing gaskets
- Slideways
- Switch contacts/-balls
- Wire-drawing dies
- Dental implants
- Embossing punches
- Injection molds
- Pistons for pumps
- Rollers with smooth surfaces
- Sealing surfaces
- Slide bearings
- Valve tapers, balls and seatings
- etc

DIAPLAST® DELIVERY PROGRAMME

TYPE	DIAMOND GRIT SIZES										SOLUBILITY OF THE BOND *)
	D0.25	D0.7	D1	D3	D7	D15	D25	D54	D91	D126	
SS	x	x	x	x	x	x	x	x	-	-	A / O
N	x	x	x	x	x	x	x	x	x	x	A / O
E	x	x	x	x	x	x	x	x	x	x	A / O
T	-	-	x	x	x	x	x	x	-	-	U
Colour recognition	Silver	White	Yel-low	Green	Red	Blue	Brown	Black	Orange	Lila	*) A = soluble in alcohol-water U = universally soluble O = soluble in oil
Available as dosing syringe in sizes 5 g / 10 g / 20 g Other sizes on request											

Order example: Norton Winter Diaplast®-Paste - SS - D7 - 10 g - A

DIAPLAST® SUSPENSION

100 ml as combi-system
Flexible bottle with standard screw closure, suitable for use on dosing devices for automatic polishing processes

Accessories (additional pack):

- spray-head with eco-friendly mechanical pump system for uniform distribution of the diamonds on large polishing plates or on larger areas for machine polishing
- drip-feed fitting for precisely directed feeding by hand

250 ml with drip-feed fitting

500 ml and 1000 ml as refill bottle

TYPE	DIAMOND GRIT SIZES								SOLUBILITY OF THE BOND *)
	D0.25	D0.7	D1	D3	D7	D15	D25	D54	
Suspension	x	-	x	x	x	x	-	-	A / O
Colour recognition	Silver	-	Yellow	Green	Red	Blue	x	x	A / O
Available in the following sizes: 100 ml / 250 ml / 500 ml / 1000 ml Other sizes on request									*) A = soluble in alcohol-water O = soluble in oil

Order example: Norton Winter Diaplast®-Suspension - 100 ml - D3 - A

DIAPLASTOL THINNER DELIVERY PROGRAMME

			SOLUBILITY OF THE BOND *)
Diaplastol	Bottle with drip-feed fitting	100 ml	A / O
	Refill bottle	1000 ml	*) A = soluble in alcohol-water O = soluble in oil
	Canister	4500 ml	
Other sizes on request			

Order example: Norton Winter Diaplastol - 100 ml - A

DIAPLAST® PROGRAMME

TYP SS Highest concentration	IDENTIFICATION COLOUR	SOLUBILITY	5 gramme	10 gramme	20 gramme
D0.25	Silver	Soluble in wateralcohol	60157643984	60157643724 [2]	66260100076
D0.7	White	(Soluble in oil on request)	66260100265	66260100627 [2]	60157667492 [1]
D1	Yellow		66260110146	66260110232	60157644154
D3	Green		66260100287	60157644084	66260113334
D7	Red		66260110467	66260110535	66260110495
D15	Blue		66260110248	60157644016	66260116707
D25	Brown		60157644020	60157644176 [1]	66260114624
D54 FEPA	Black		66260110601	60157643824	69014166621 [1]

TYP N Highest concentration	IDENTIFICATION COLOUR	SOLUBILITY	5 gramme	10 gramme	20 gramme
D0.25	Silver	Soluble in wateralcohol	66260112531 [1]	66260107643 [1]	66260114891
D0.7	White	(Soluble in oil on request)	66260134316 [1]	69014166017 [1]	69014166357 [1]
D1	Yellow		60157643805	60157644162 [2]	60157643751
D3	Green		66260133498	60157643608	60157644170
D7	Red		66260133500	66260110340	66260100087
D15	Blue		66260110307	66260100292 [2]	60157643708
D25	Brown		66260110180	66260110143	60157644184
D54 FEPA	Black		66260110461	66260100256	66260113661

[1] Delivery time 2 -3 weeks
[2] Available while stocks last

DIAPLAST® PROGRAMME

TYP T Medium concentration	IDENTIFICATION COLOUR	SOLUBILITY	5 gramme	10 gramme
D1	Yellow	universal	66260100257 [1]	66260100291 [1]
D3	Green	universal	66260100365	66260110407
D7	Red	universal	60157644173	66260164645
D15	Blue	universal	60157643981	66260164646 [1]
D25	Brown	universal	66260100098 [1]	60157643431 [1]
D54 FEPA	Black	universal	60157643905	66260110448 [1]

TYP E Medium concentration	IDENTIFICATION COLOUR	SOLUBILITY	5 gramme	10 gramme
D1	Yellow	Soluble in wateralcohol	66260110438	69014169230 [1]
D3	Green	(Soluble in oil on request)	66260134307	66260110657 [1]
D7	Red		66260134308	66260113462 [1]
D15	Blue		66260134309	66260115252 [1]
D25	Brown		60157644070 [2]	66260114556 [1]
D54 FEPA	Black		60157644187	-

[1] Delivery time 2 -3 weeks
[2] Available while stocks last

DIAPLAST® SUSPENSION PROGRAMME

SUSPENSION 100 ml	IDENTIFICATION COLOUR	SOLUBILITY	ORDER NUMBER
D1	Yellow	Soluble in water-alcohol (Soluble in oil on request)	66260110642
D3	Green		66260100250
D7	Red		66260110667

DIAPLASTOL THINNER PROGRAMME

DIAPLASTOL	CONTENTS	SOLUBILITY	ORDER NUMBER
Spray bottle	100 ml	Soluble in water-alcohol (Soluble in oil on request)	66260118433 [1]
Refill bottle	1 litre		66260195804 [1]
Canister	4.5 litre		66260195809 [1]

POLISHING CLOTHS PROGRAMME

POLISHING CLOTHS	APPLICATION	DIAMETER (mm)	ORDER NUMBER
Polishing cloth soft	for diamond grit size D0.25 - D0.7	120	66260384527
		200	66260195806
		300	66260100068 [2]
Polishing cloth 31	for diamond grit size D1 - D3	120	66260387665
		200	66260195796 [2]
		300	66260381705 [2]
Polishing cloth 1007	for diamond grit size D7 - D54	200	66260386538 [2]
		300	66260100054 [2]

[1] Delivery time 2 -3 weeks
[2] Available while stocks last

APPLICATION NOTES FOR THE PREPARATION OF SPECIMENS FOR MICROSCOPIC EXAMINATIONS

PRACTICAL EXECUTION

Specimen preparation starts with mounting of the workpiece if applicable. Depending on the state of the specimen, it is rough-ground with silicon carbide abrasive paper or with Norton Winter diamond grinding wheels.
The specimen is then polished with Norton Winter Diaplast® compound or Norton Winter Diaplast® suspension.

SAMPLE MOUNTING

In most cases. the standard mounting media are plastics, which are processed either hot or cold. It is important that the mounting medium should bond to the specimen without any gaps, otherwise abrasive or polishing agents may be deposited between the specimen and the mount. The hardness of the mounting medium should be matched to the hardness of the specimen in order to avoid edge rounding.

GRINDING

The surface state of the specimens before polishing is critical for the economic efficiency of polishing with Norton Winter Diaplast® and for the quality of the final polish. Proper rough grinding can greatly reduce polishing time, enabling economical application of Norton Winter Diaplast® and giving good surface quality. It is important to ensure that any unevenness caused by sawing is completely removed by the grinding operation.

POLISHING

Polishing with Norton Winter Diaplast® diamond compound or Norton Winter Diaplast® suspension can be effected on both manual and automatic polishing machines. A separate polishing disc with polishing cloth must be used for every diamond grit size. Norton Winter polishing cloths can be used on commercial standard machines. Before starting polishing, slightly moisten the polishing cloth and distribute the polishing agent evenly on the polishing cloth. There are some cases where Norton Winter diamond suspensions are easier to handle than diamond compounds, as diamond distribution on the polishing cloth is more even. Diamond suspensions are preferable for automated polishing operations as feeding during the process is possible. Norton Winter Diaplast® diamond compound is soon saturated with the swarf of the material being machined, so that a little Norton Winter Diaplastol thinner must be applied in order to maintain the cutting action of the diamond grit. A thin cooling and lubricating film must be maintained.

The polishing pressure to be applied is dependent on the specimen material and the diamond grit size. As a rule, high polishing pressure can be used with hard materials, and lower pressure should be used for finer diamond grits.

The selection of the grit sizes to be used depends mainly on the hardness of the specimens and their individual structural constituents. The greater the hardness of the material to be polished the coarser the grit to be used at the beginning. The finest grit sizes (D0.25 to D1) are generally not used with very hard materials. Remember that the polishing process not only removes the scratch marks of the last grinding operation, but it may be required to remove sufficient material from the specimen surface to expose an undamaged microstructure. This means it is often necessary to start with a larger diamond grit size than would be necessary for removal of the scratch marks from the last grinding operation.

NOTE

When polishing with Norton Winter Diaplast® it is important to avoid any transfer of coarser grit to the next finer polishing operation. It is essential not only to keep the polishing device clean, but also to clean the specimens between the individual polishing stages. This may be done under running water with the aid of a brush (for coarser grit sizes) or with a cotton pad (for finer grit sizes). It is also recommended to use an ultrasonic cleaning bath between each polishing step.

POLISHING RECOMMENDATIONS

MATERIAL	SPECIMEN PRE-MACHINING	Norton Winter DIAPLAST® AS PASTE OR SUSPENSION	POLISHING UNDERLAY	NOTES
Carbides Stellite	Diamond wheel/ foil D126 or D91.	D15 D7 D3 D1*	1007 1007 31 31*	* Polishing stage may in some cases be dispensed with
Ferritic Pearlitic Martensitic Austenitic steels Cast Iron of all types	Wet grinding on diamond foil D46 and/or SiC paper to 600 grit	D15* D7 D3** D1 D0.25***	1007 1007 or 31 31** 31 Soft cloth***	* Only for hardened steel ** Can in some cases be dispensed with ***Not required In hard castings and martensitic steels. Intermediate etching with 1 % alcohol. HNO_3 before Diaplast® D1 is advanta- geous
Aluminium and aluminium alloys	Wet grinding on diamond foil D46 and/or SiC paper to 1000 grit	D7 D3 D1 D0.25	1007 or 31 31 31 or cloth soft Soft cloth*	Use little pressure * Can in some cases be dispensed with
Lead alloys	Wet grinding on SiC paper to 1000 grit	D3 D1 D0.25	31 31 Soft cloth	Use little pressure Samples sensitive to water! Clean only with Alcohol Grinding lubricant: petroleum jelly
Copper and copper alloys	Wet grinding on diamond foil D46 and/or SiC paper to 1000 grit	D7 D3 D1 D0.25*	1007 or 31 31 31 Soft cloth*	* For ultra-pure copper or very soft copper alloys, machining with D0.25 can be dispensed with; instead, use alumina on a soft polishing cloth and give a brief second polish
Magnesium alloys	Wet grinding on SiC paper to 1000 grit	D7 D3 D1 D0.25	1007 or 31 31 31 Soft clotht	Clean samples with alcohol
Nickel and nickel alloys	Wet grinding on diamond foil D46 and/or SiC paper to 1000 grit	D15 D7 D3 D1 D0.25	1007 1007 or 31 31 31 Soft cloth	
Silicon and germanium	Wet grinding on diamond foil D46 and/or SiC paper to 1000 grit	D7 D3 D1 D0.25	1007 31 31 or cloth soft Soft cloth	
Zinc and zinc alloys	Wet grinding on SiC paper to 1000 grit	D7 D3 D1 D0.25	1007 or 31 31 31 Soft cloth	A brief second polish with alumina 3 on a soft cloth may be required. Rinse with methanol. Intermediate etching with 5 % alcoh. HNO_3 before Diaplast® D1 recommended. Use little pressure

POLISHING RECOMMENDATIONS

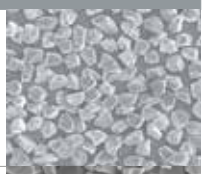
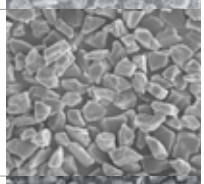
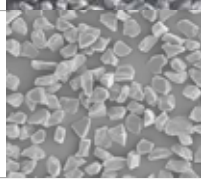
MATERIAL	SPECIMEN PRE-MACHINING	Norton WINTER DIAPLAST® AS PASTE OR SUSPENSION	POLISHING UNDERLAY	NOTES
Ore samples (of various compositions)	Diamond wheel/foil D126 or D91 or wet grinding to 1000 grit	D15 D7 D3 D1*	1007 1007 31 31*	* Whether machining with Norton Winter Diaplast D1 and D0.25 is necessary depends on the respective materia hardness. In samples with constituents of differing hardnesses this is normally necessary.
Ceramic samples	Diamond wheel D126 Diamond foil D64 or D46	D25 D15* D7 D3 D1 D0.25**	1007 1007* 1007 31 31 Soft cloth**	* Dispensed with in samples with constituents whose hardness differences are only slight. ** Is only necessary in samples also containing softer constituents
Carbon	Saw-cut	D7 D3 D1 D0.25*	1007 31 31 Soft cloth*	* Is only necessary in soft types of carbon.

These recommendations have been compiled on the basis of our experience with common materials.
Due to the large variety of alloys and material compositions, optimal results may require slight deviations from the above table in some cases.

It is possible, in principle, to miss out individual grit sizes, but this mostly results in longer polishing times which may cause relief formation. Our metallographic laboratory is available for consultation in difficult cases.

MICRON POWDER

Norton Winter micron powders consist of synthetic diamond, natural diamond and cBN with specific characteristics adapted to different industrial applications. The compounds are divided into the following types:

TYPE	HARD MATERIAL	COLOUR	SHAPE AND SURFACE	
Type M	Synthetic diamond	Greenish-yellow to pale yellow	Monocrystalline, predominantly blocky, distinct cutting edges, flat cleavage planes, defined structure.	
Type R	Synthetic diamond	Greenish-grey	Monocrystalline, irregular, blocky, many cutting edges, fragile structure. This type of grit is also available with metal coating. Its designation is then RC.	
Type P	Synthetic diamond	Black to dark grey	Polycrystalline, blocky shapes, many cutting surfaces, no platelets, no needle-shaped particles.	
Type N	Natural diamond	Colourless to pale grey	Monocrystalline, blocky to splintery, irregular, defined structure, many cutting edges.	
Type B	cBN	Black	Monocrystalline, blocky, distinct cutting edges This type of grit is also available with metal coating. Its designation is then BC.	

MICRON POWDERS WITH METAL COATING

For special applications, the use of metal-coated micron powders has proved to be advantageous, for instance in resin bond grinding wheels. Norton Winter micron powders with metal coating are available in sizes 15–25 µm, 20–30 µm and 25–37 µm. Grit size relates to the size of grit excluding the metal coating.

QUALITY

Due to the high quality standards Norton Winter imposes on classification, checking and packing under clean room conditions, a consistent level of grit quality is guaranteed.

MEASUREMENT OF GRIT SIZE

There is no universal procedure yet for determinati on of grit size. The method recommended by FEPA as 'Standard for Diamond Micron Powder Sizes' provides guidelines for grit size determination but they are not universally applied.

Norton Winter uses optical image analysis for measuring grit size. This method permits the additional determination of the form factor (ratio of width to length of the measured particles) of the grit. The results are comparable with those obtained by FEPA.

Up-to-date methods for chemical purity checking such as energy dispersive analysis (EDA) and atomic absorption spectroscopy (AAS) are also applied.

MICRON POWDERS STANDARD PROGRAMME

DESCRIPTION TYPE M [µm]	ORDER NUMBER
M 0-0,50	130003280
M 0,50-1	130003281
M 0,5-2	130003282
M 1-3	130003283 [1]
M 2-4	130003353
M 2-5	130003350
M 3-7	130003351 [1]
M 4-8	130003352 [1]
M 5-10	130003621 [1]
M 6-12	130003622 [1]
M 8-12	130003354 [1]
M 10-20	130003355 [1]
M 15-25	130003356 [1]
M 8-25	130003357 [1]
M 20-30	130003358 [1]
M 25-37	130003359 [1]
M 30-40	130003360 [1]
M 40-60	130003361 [1]
M 50-70	130003630 [1]

[1] Delivery time 5 - 6 weeks

DESIGNATION TYPE R [µm]	ORDER NUMBER
R 2-5	130003262
R 5-10	130003264 [1]
R 6-12	130003591 [1]
R 8-15	130003265 [1]
R 10-20	130003266 [1]
R 15-25	130003267 [1]
R 8-25	130003268 [1]
R 20-30	130003269 [1]
R 22-36	130003270 [1]
R 30-40	130003514 [1]
R 40-50	130003204 [1]

DESIGNATION TYPE [µm]	ORDER NUMBER
P MYPOLEX 5,5-8	130003290 [1]
P MYPOLEX 10-20	130003291
P MYPOLEX 20-30	130003292 [1]
P MYPOLEX 25-37	130003293 [1]

LAPPING TOOLS

MANUAL LAPPING TOOLS

Norton Winter manual lapping tools are used for sharpening, beveling and breaking off edges on tungsten-carbide tools directly on the machine. Resin bonded laps are used for finer cutting edges, i.e. for wood and metal mills or small cutting chisels. The metal bonded, more wear resistant laps are preferred for robust applications like larger cutting chisels or milling heads.

STOCK PROGRAMME

	SHAPE	L (mm)	B (mm)	X (mm)	GRIT SIZE	BOND	ORDER NUMBER
	K11C Blue Handle	30	9	2	D7	Kunstharz	60157644068 [2]
		30	9	2	D15	Kunstharz	66260134295
		30	9	2	D46	Kunstharz	66260110338
		30	9	2	D64	Kunstharz	66260107646
		30	9	2	D91	Kunstharz	60157644054
	BZ11C Red Handle	30	9	1	D46	Bronze	66260110195
		30	9	1	D64	Bronze	60157644202
		30	9	1	D91	Bronze	60157644110 [2]
		30	9	1	D126	Bronze	66260134302

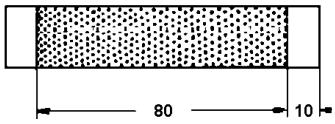
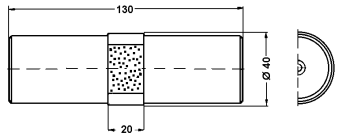
[2] Available while stocks last.

DRESSING TOOLS

ELECTROPLATED & SINTERED - METAL BONDED DRESSING TOOLS

For dressing vitrified and resin bonded diamond and cBN grinding wheels Norton Winter offers you suitable dressing tools. Thus electro-plated and sinter-metal bonded dressing tools are always available ex stock. Further details will be found in our catalogue No. 5 'Dressing Tools'.

STOCK PROGRAMME

	SHAPE	SPECIFICATION	ORDER NUMBER	APPLICATION
	**NORTON WINTER DRESSING BLOCK**			
	1S09H-80-20-8	D301 / S11	66260134287	For dressing resin bond cBN grinding wheels on surface grinders. If used with coolant, subsequent sharpening with WA150GV sharpening stone or Norton Winter stone No. 2 is required.
	**NORTON WINTER DRESSING CYLINDERS**			
	1S44B-40-20	D301 / S11	60157642712 [1]	For dressing resin bond cBN grinding wheels on OD grinders. If used with coolant, subsequent sharpening with WA150GV sharpening stone or Norton Winter stone No. 2 is required.

[1] Delivery time 5 - 6 weeks

For recommendations on dressing tools, please refer to our current catalogue "Norton Winter Dressing Tools for Dressing Abrasives.

DRESSING WHEELS FOR RESIN BONDED DIAMOND AND CBN GRINDING WHEELS

DRESSING RECOMMENDATIONS

SHAPE	D	T	H	ABRASIVE	GRIT SIZE HARDNESS STRUCTURE	BOND	ORDER NUMBER
01	200	10	32	39C	120 K	VS	69936675637
01	200	10	32	39C	240 K	VS	69078651221
01	250	10	51	39C	120 K	VS	69936642093
01	250	10	51	39C	240 K	VS	69078651223

NORTON WINTER DRESSING DEVICE

Dressing device (centrifugal clutch) and dressing wheels for dressing diamond and cBN grinding wheels.

ITEM	FOR GRIT SIZES	ORDER NUMBER
Dressing device		69014151167
Dressing wheel 39C60-MV	D64 zu D126	66253051624
Dressing wheel 39C802-IV	≤ D64	66253052726
Accessories	1 set consisting of: 3 clutch segments, 3 springs and 3 screws	66260274670

All dimensions in mm

Only use dry; subsequent sharpening with Norton Winter stone previously soaked in water only as necessary.

CLEANING AND SHARPENING STONES FOR DIAMOND AND CBN GRINDING WHEELS

CLEANING AND SHARPENING STONES	NORTON SAINT-GOBAIN WINTER	BESTELL-NUMMER
Norton Winter stone No. 1AW (100×20×20)	White corundum, vitrified bonded, 360 mesh Sharpening of resin bonded grinding wheels Grit size < D46	66260395639
Norton Winter stone No. 2 (100×24×13)	White corundum, vitrified bonded, 180 mesh Sharpening of resin bonded and metal bonded grinding and cutting wheels Grit size ≥ D46	66260195816
Norton Winter stone No. 3 (100×40×15)	Silicon carbide, rubber-bonded, 80 mesh Cleaning and sharpening of electro-plated and vitrified bonded grinding wheels and mounted pins	66260195817
Norton Winter stone No. 3A (80×15×10)	see Norton Winter stone No. 3	66260389357
Norton Winter stone No. 3B (100×50×25)	see Norton Winter stone No. 3	66260386167 [1]
Norton Winter stone No. 4 (90×70×20)	Ruby allumina, vitrified bonded, 60 mesh Sharpening of metal bonded grinding wheels Grit size ≥ D251	60157642665
Winter stone No. 5 (100×50×25)	see Winter stone No. 2	66260389054

CLEANING AND SHARPENING STONES	flexovit	BESTELL-NUMMER
Stone WA150GV (150x25×25)	Cleaning and sharpening of vitrified and resin bonded grinding wheels ≥ D54 Recommended for sharpening Q-Flute	69936621643
Stone WA220GV (150x25×25)	Cleaning and sharpening of vitrified and resin bonded grinding wheels	69936621630
Stone WA320GV (150x25×25)	Cleaning and sharpening of vitrified and resin bonded grinding wheels ≤ D46	69936651380

All dimensions in mm [1] Delivery time 5 - 6 weeks

TECHNICAL INFORMATION

The Norton Winter brand represents 175 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:

Unsere Außendienstmitarbeiter und unser Kundenservice beraten Sie jederzeit gerne bei Fragen zu allen Norton Winter Produkten und Schleifprozessen. Zu maßgeschneiderten Lösungen tragen darüber hinaus unser Produktmanagement und unsere Anwendungstechnik bei.

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 (Grinding Technology Centre Europe), 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. Technology Centre) with the R&D Department in Norderstedt, closely co-operate with our Research and Technology Centres in the USA, France and China.

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.

DIAMOND WEAR PARTS

By leveraging the superior material properties of PCD (polycrystalline diamond) and in-house design and manufacturing facilities, the Norton Winter team is able to provide customized solutions for your centerless grinding operations.

ADVANTAGES

- Lower cost per piece of tools thanks to the extremely low wear of PCD compared to tungsten carbide and other tool materials. Improved and more stable grinding process.
- Less friction compared to tungsten carbide.
- Higher quality and increased productivity.
- PCD allows higher forces and speeds on the workpiece. Reduced downtime due to longer tool life, less rework and lower waste.

EXAMPLES OF TOOLS SUITABLE FOR PCD

- Center points for cylindrical grinding
- Measuring points and fingers
- Centerless workpiece supports for infeed grinding
- Centerless grinding steady rests and systems
- 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 BONDS

Phenolic and polyimide resins are used as bonds, to which fillers are added in addition to the abrasive grit. Grinding wheels with resin bond occupy the lower section of the bond hardness scale. They are considered soft, fast, and cool-grinding, yielding only low grinding forces and allowing a wide range of adjustment.

SINTERED METAL BONDS

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

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

ELECTROPLATED BONDS

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

VITRIFIED BONDS

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

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

CONCENTRATION

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

DIAMOND		
Concentration	Carat / cm³	Volume %
C50	2.2	12.5
C75	3.3	18.75
C100	4.4	25
C125	5.5	31.25

CBN		
Concentration	Carat / cm³	Volume %
V120	2.09	12
V180	3.13	18
V240	4.18	24
V300	5.22	30

These definitions are not applicable for single layer electroplated tools.

CONDITIONING

Conditioning of a grinding wheel consists of dressing and cleaning:

DRESSING		CLEANING
PROFILING	SHARPENING	
Influences macrostructure	Influences microstructure	Influences microstructure
Produces concentricity and grinding wheel profile	Generates topography and grain exposure by eroding the bond	Removes chips from chip space
Need: Shape or re-shape the wheel surface	Reset of the: Bond Intended	Need: No change in the surface

CUBIC BORON NITRIDE (CBN)

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

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

DIAMOND

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

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

DIRECTION OF ROTATION INDICATOR

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

DRESSING = TRUING + SHARPENING

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

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

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

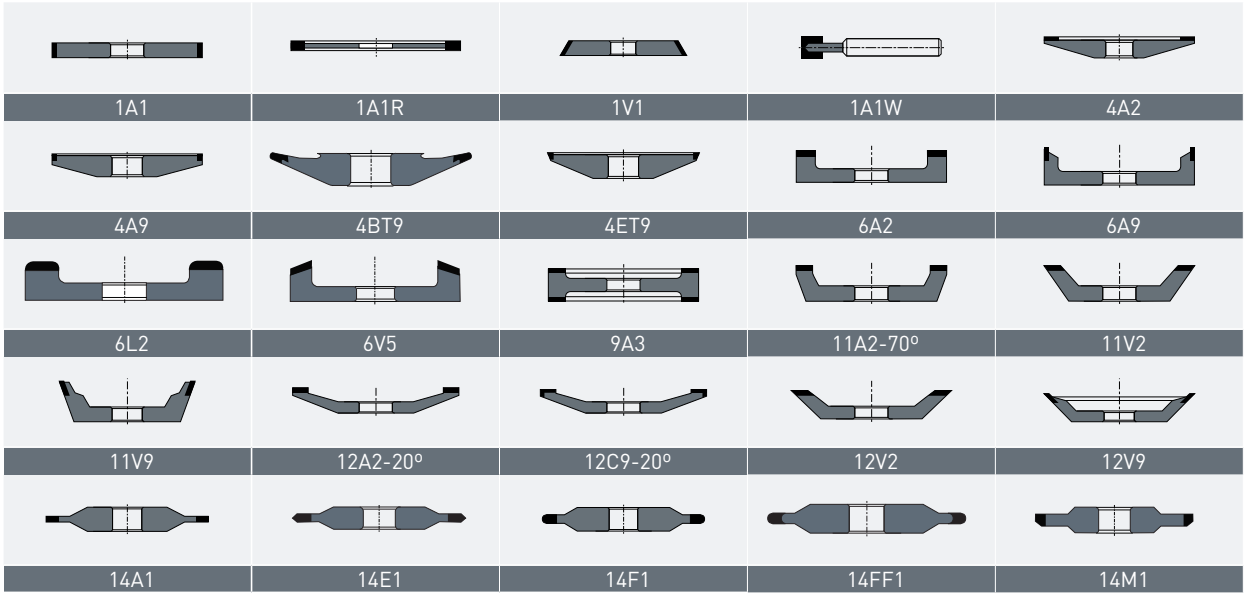
Our engineers can offer advice to help you chose the best method for your application.

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 BODY

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

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

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

NORTON WINTER DIAMOND CLASSIFICATION

The hardness value of a material is generally influenced by the method of measurement. Different measuring methods and equipment result in different scales and units which cannot easily be compared. Thus several scales exist, for example:
Moh's hardness: abrasion behaviour (measure of scratch resistance)
Rosiwal hardness: stock removal behaviour (measure of resistance to stock removal)
Vicker's Microhardness: indentation behaviour (resistance to penetration)

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

MATERIAL	MOH'S HARDNESS	ROSIWAL HARDNESS	VICKERS MICROHARDNESS (HV)
Diamond	10	140.000	10.000
cBN	9.9		9.000
Silicon carbide	9.6		2.600
Corundum	9	1.000	2.060
Quarz	7	120	1.120
Manganese	5	6.5	540
Gypsum	2	1.25	36
Talc	1	0.03	2.6

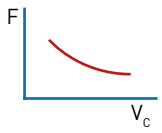
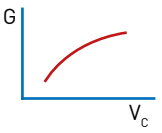
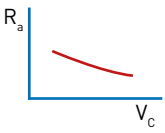
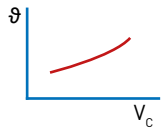
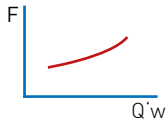
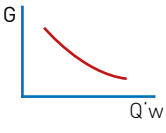
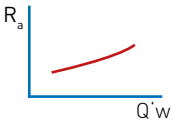
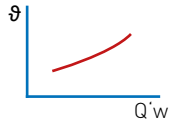
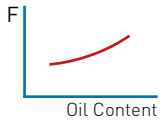
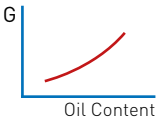
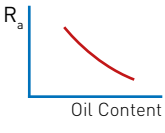
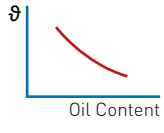
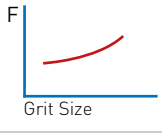
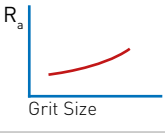
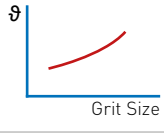
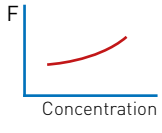
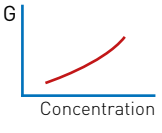
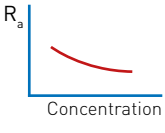
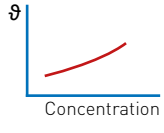
Diamond's stock removal resistance (Rosiwal hardness) is 140 times higher than corundum (alumina), even though its penetration hardness (Vickers) is only 5 times higher.

MATERIAL REMOVAL RATE

The material removal rate, MRR' or Q'w, is expressed in mm3/s and defines the volume of workpiece material ground per unit time (second).
The specific material removal rate, MRR' or Q'w, refers to the removal rate per millimetre of wheel contact width and is expressed in units of [mm3/(s. mm)].

PARAMETERS INFLUENCING GRINDING RESULTS

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

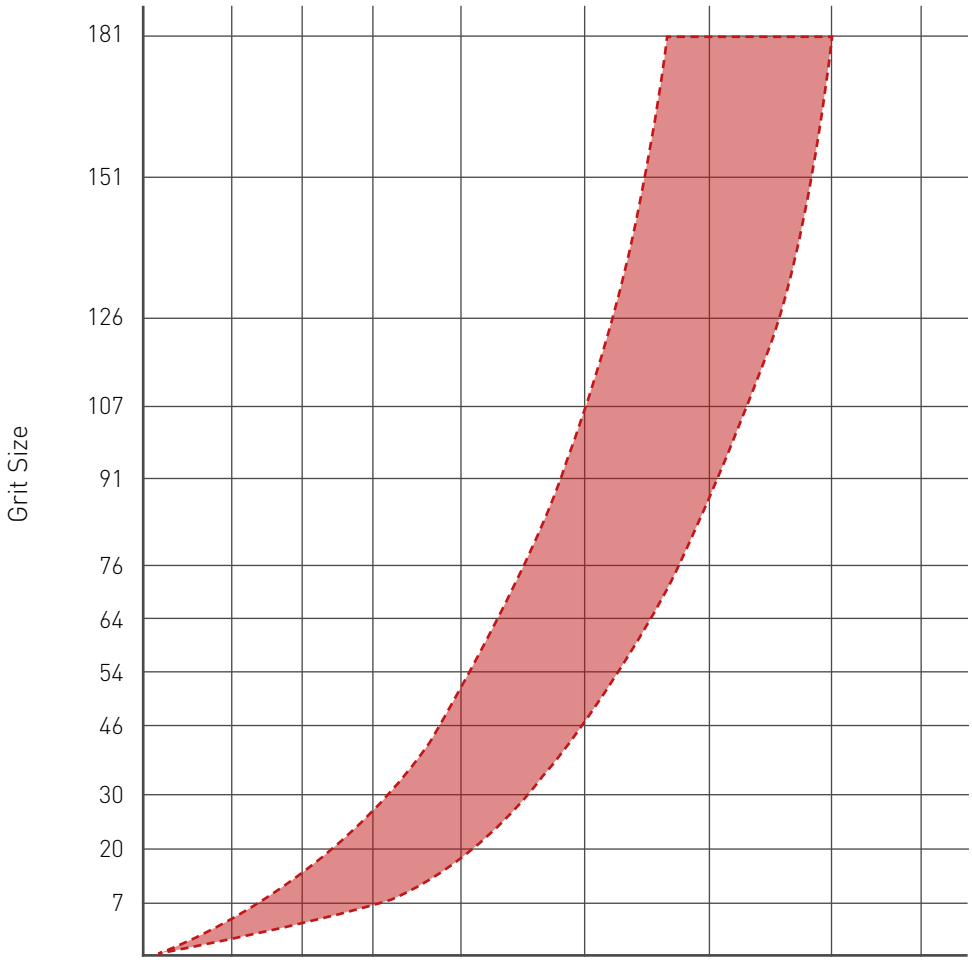
INFLUENCING PARAMTERS / APPRAISAL CRITERION		CUTTING FORCE F F = F(...)	GRINDING RATIO G G = F(...)	ROUGHNESS R_A R_A = F(...)	TEMPERATURE ϑ ϑ = F(...)
Machine- and Operation Paramters	Cutting Speed v_c (m/s)				
	Material Removal Rate Q'w (mm³/s)				
	Coolant (Oil Content)				
Grinding Wheel	Grit Size (µm)				
	Concentration (Carat/cm³)				

ROUGHNESS

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

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

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



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

SPECIFICATION

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

EXAMPLE:

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

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

SUPERABRASIVES

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

WEAR EFFECTS ON DIAMOND AND CBN

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

Primarily, there are two main types of wear.

MECHANICAL WEAR:

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

CHEMICAL AND THERMAL WEAR

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

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

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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