Information for use of Diamond and Boron Nitride (CBN) Wheels as well as Discs

Diamond is a mineral, a natural crystaline substance, the transparent form of pure carbon ant the hardest surface known. Today the grit can be artificially produced by synthesis at very high pressure and temperatures. Diamond is not suitable for steel grinding by reason of its iron affinity at high temperatures, due to the thermal resistance up to 700 °. The grinding process developes a considerable evolution of heat which causes a chemical reaction at the contact area. This causes a structural change and creates an isproportion surface.
Therefore, diamond is used to work hard and brittle material such as carbide, glass, ceramic, stone etc.

CBN (cubic boron nitride) is only a synthetic material, produced by high pressure synthesis from hexagonal boron nitride. It has analogous properties as diamond. Diamond has a higher chemical resistance and heat stability up to 1200 ° C. From these proberties it is designed foremost for grinding of heat treated and hardened steels.

RESIN BOND

Resin bonded Diamond- and CBN Grit delivers an excellent smooth surface pattern on the machined workpiece, still grinding with high material removal capacity.
This type of bonding is mainly used for grinding and cutting of carbide, high-alloy steels and other metallic raw materials as well as for glass processing.

METAL BOND

Metalbonded diamond and CBN grit is considerable more hard wearing and jolt restistant than resin bonded grinding and cutting discs.
As a result of the harder bond, the discs do not achieve as large removal volumes as the resin bonded discs, however a much larger lifetime.
This bondtype with diamond grit is mostly used for non-metallic materials such as glass, ceramic and hard metal/carbide. CBN grit is mainly used for the machining of alloy steels with hardness above 58HRC.

ELECTRO PLATED

Electroplated bonds grind very effective and achieves an excellent cutting efficiency. This results from the the diamond- or CBN grit projecting well out of the bond, however, this single coat process shorten the lifetime of the tool. This type of bond is generally used for grinding pre-sintered hard metal, duroplastic, GFK and Graphit. The CBN grit is mainly used for processing alloy steels with hardness more than HRc58.

Electroplated bonds are producible in almost all forms, furthermore, we also can recoat or replate your tool body.
Moreover, the tool can be recoated with new abrasive (provided the tool body ist not damaged)

CERAMIC BOND

Ceramic bonded CBN tools can be dressed and profiled. This bond features itself by a high removal performance. Resulted by the dressing of the grinding spindle during processing this bond is ideal for high precision grinding.

The forms of the wheels shown in this catalogue only present a small part of our possiblities. Also other forms are producible.

We appreciate your sending a technical drawing together with all technical data/specifications.
On receipt we will work out a detailed submission.

Information for use of Diamond and Boron Nitride (CBN) Wheels

Concentration

The concentration gives information on the volume percent of grit which is used in the rim. The basis for defining concentrations is by diamond 4,4 carat/cm3 rim volume by concentration C100.

Frequently used concentration values are:

Concentration	Diamond Carat/cm³	CBN Carat/cm³
C25	1,1	1,05
C50 / V120	2,2	2,09
C75 / V180	3,3	3,13
C100 / V240	4,4	4,18
C125 / V300	5,5	5,22
C150 / V360	6,6	6,27

High Concentrations of 75-150 are typical for coarse grits or wheels with small contact area or small rim width. Low Concentration 25-50 are used with fine grits for wheels of large rim width.
We guarantee that the diamond and boron nitride grit content of Kraus & Winter diamond and boron nitride wheels corresponds to these concentrations values.

Grit size

For optimum stock removal capability it is generally an advantage to use the largest grit size allowing surface quality requirements.
KRAUS & WINTER diamond and boron nitride grit sizes are conformed to the FEPA-Standard.
This standard prescribes the most precise test sieve specifications for abrasive grits under consideration of the latest technological development.

Grit	Rough grinding	Finish grinding	Fine grinding	Läpping
Diamond	D181-D151	D126-D91	D64-D46	D30-D15
CBN	B151	B126	B91	B46

Surface Roughness Table

Diamond	CBN	Ra Surface Roughness* Electro	Metal/Resin	Grinding Operation
D301		3,2	3,2	Roughing
D251	B251	1,6	2,0	
D181	B181	1,0	1,2	Very Rough Grinding
D151	B151	1,0	0,8	
D126	B126	0,8	0,6	
D107	B107	0,8	0,4	Rough Grinding
D91	B91	0,7	0,3	
D76	B76	0,7	0,2	
D64	B64	0,5	0,2	Finishing Grinding
D54	B54	0,4	0,15	
D46	B46	0,4	0,1	
D35	B35	0,3	0,1	
D25	B25	0,3	0,08	Super Finish Grinding
D15		0,2	0,06	

* It is not possible to define the coherence between the roughness grade and the grit size exact - not even when the use is described accurately.
The following parameter define the result:
Material
Structural status
Cooling medium
Kinematics
Forward Feed and Speed

Furthermore, you have to take into account that normally at the beginning of the use the roughness grade is the maximum. At first this alters quickly and after some time only slowly - whereby the limit result is an asymptotic solution.

Therefore, only rough descriptions can be made, however without any obligation.

Standard Grit Size for Diamond and CBN (Bornitride)

In the following grain table we not only have the FEPA but also the US-mesh designation, mesh opening in micron (µ) and conventionel grain designations listed. You can then perform conversion yourself.

Diamond Standard FEPA		CBN Standard FEPA		US-Standard (US Mesh)		Aperture width µ	Grit Size Siliziumcarbide Corundum
narrow	wide	narror	wide	narrow	wide		
D1181 D1001	D1182	-	-	16/18 18/20	16/20	1180-1000 1000-850	20
D851 D711	D852	-	-	20/25 25/30	20/30	850-710 710-600	24 30
D601 D501	D602	B501	-	30/35 35/40	30/40	600-500 500-425	36 40
D427 D356	D427	B426 B356	B427	40/45 45/50	40/50	425-355 355-300	46 50
D301	-	B301	-	50/60	-	300-250	60
D251 D213	D252	B251 B213	B252	60/70 70/80	-	250-212 212-180	70 80
D181	-	B181	-	80/100	-	180-150	90
D151	-	B151	-	100/120	-	150-125	100
D126	--	B126	-	120/140	-	125-106	120
D107	-	B107	-	140/170	-	106-90	150
D91	-	B91	-	170/200	-	90-75	180
D76	-	B76	-	200/230	-	75-63	200
D64	-	B64	-	230/270	-	63-53	220
D54	-	B54	-	270/325	-	53-45	250
D46	-	B46	-	325/400	-	45-38	280
D35	-	-	-	400/500	-	40-32	320
D30	-	B30	-	450/550	-	32-25	340
D25	-	-	-	600	-	30-20	380
D20	-	-	-	-	-	25-15	-
D15	-	B15	-	1200	-	20-10	600
D10	-	-	-	-	-	15-8	-
D7	-	-	-	2400	-	12-6	1000
D6	-	-	-	-	-	8-4	-
D3	-	-	-	6000	-	4-2	-
D1	-	-	-	8000	-	2-1	-

Wheel peripheral speed for Diamond and Boron Nitride Wheels

Wheel cutting speed is very influential on the performance and life of diamond and boron nitride wheels as well as on the quality aspect of the grinding operation.

We therefore strongly recommend to select wheel diameter and spindles speed in accordance with the correct wheel peripheral speed which is fundamental for the economy of a grinding job.

Underneath we have listed the recommended peripheral speed as well as conversion table of wheel diameter/wheel peripheral speed (m/s) to spindle speed (revs./min).

Diamond wheels for tungsten carbide	Resin bond		Metal bond		Electro plated bond
	wet m/s	dry m/s	wet m/s	dry m/s	wet/dry m/s
Tool grinding	25-30	16-22	12-20	12-20	20-30
Internal circular grinding	10-20	8-15	10-18	8-12	10-20
Surface grinding	25-35	-	20-30	-	20-30
Cylindrical surface grinding	25-35	-	20-30	-	20-30
Deep grinding	20-30	-	80-140	-	20-140

Boron nitride (CBN) wheels for hardened steel	Resin bond		Metal bond		Electro plated bond
	wet m/s	dry m/s	wet m/s	dry m/s	wet/dry m/s
Tool grinding	25-35	16-28	15-25	10-15	20-30
Internal circular grinding	15-25	10-20	12-20	10-15	10-20
Surface grinding	30-40	-	15-20	-	20-30
Cylindrical surface grinding	30-40	-	15-25	-	20-30
Deep grinding	20-30	30-40	80-140	-	20-140

Conversion table of cut speed / diameter (m/s) on rotations by minute (RPM)

D	8 m/s	12 m/s	15 m/s	18 m/s	20 m/s	22 m/s	28 m/s	30 m/s
5	30560	45800	57300	68800	76400	84000	178254	190986
10	15280	22930	28650	34380	38200	42000	53500	57300
15	10170	15300	19100	22900	25500	28000	35650	38200
25	6130	9200	11460	13800	15300	16850	21400	23000
50	3050	4580	5730	6870	7650	8400	10700	11450
75	2040	3060	3820	4580	5100	5600	7150	7650
100	1530	2290	2870	3440	3825	4200	5350	5730
125	1220	1830	2290	2750	3050	3355	4280	4600
150	1020	1530	1910	2290	2550	2800	3570	3800
200	765	1145	1430	1720	1910	2120	2675	2875
250	610	920	1150	1380	1525	1685	2140	2300
300	510	765	950	1145	1275	1400	1780	1900
350	440	655	820	980	1090	1200	1530	1640
400	380	570	715	860	960	1050	1340	1450
450	340	510	635	760	850	930	1190	1270
500	305	460	570	690	765	840	1070	1145
600	255	385	480	575	640	700	890	955

D	40 m/s	50 m/s	60 m/s	70 m/s	80 m/s	90 m/s	100 m/s	110 m/s
5	152789	190986	229183	267380	305577	343775	381972	420169
10	76500	95500	114592	133690	152789	171887	190986	210085
15	50800	63800	76400	89127	101859	114592	127324	140056
25	30600	38200	45840	53520	61120	68730	76400	82000
50	15300	19100	22920	26760	30560	34360	38200	42000
75	10160	15280	15280	17840	20360	22920	25480	28000
100	7620	9550	11460	13380	15280	17180	19100	21000
125	6120	7640	9180	10700	12220	13760	15280	16800
150	5080	6380	7640	8920	10180	11460	12740	14000
200	3820	4775	5730	6690	7640	8590	9550	10510
250	3060	3820	4590	5350	6110	6880	7640	8400
300	2540	3180	3820	4460	5090	5730	6370	7000
350	2180	2730	3270	3820	4370	4910	5460	6000
400	1910	2390	2870	3340	3820	4300	4780	5250
450	1700	2120	2450	2970	3390	3820	4240	4670
500	1530	1910	2290	2670	3060	3440	3820	4200
600	1280	1590	1910	2230	2550	2870	3180	3500

Informations about the coating thickness of electro plated Diamond and CBN-Tools

The advantage of electro plated bond is, that it is possible to coat almost all forms and shapes. Moreover, the tool can be recoated after being worn down.

Disadvantage is that only one grit size thickness exist. Therefore, lifetime is considerably shorter compared with other types of coating.

Naturally all other measurments and grains are suppliable. To this, we ask for consignment of a drawing or exact specifications as well as the desired quantity.

Furthermore, your pieces can be coated. For this we, too need a detailed drawing or specifications as well as quantity for the creation of an offer.

Coating thickness and Tolerance from eletro plated Tools.

Grit Size FEPA	Coating Thickness mm	Coat Tolerance mm	Profil Tolerance mm
601	0,75	+/- 0,05	+/- 0,10
427	0,50	+/- 0,05	+/- 0,10
301	0,35	+/- 0,04	+/- 0,08
251	0,30	+/- 0,04	+/- 0,08
213	0,28	+/- 0,04	+/- 0,08
181	0,25	+/- 0,03	+/- 0,06
151	0,20	+/- 0,03	+/- 0,06
126	0,15	+/- 0,02	+/- 0,04
107	0,14	+/- 0,02	+/- 0,04
91	0,12	+/- 0,02	+/- 0,04
76	0,11	+/- 0,02	+/- 0,04
64	0,10	+/- 0,02	+/- 0,04
54	0,09	+/- 0,02	+/- 0,04
46	0,07	+/- 0,02	+/- 0,04
35	0,05	+/- 0,02	+/- 0,04
25	0,04	+/- 0,02	+/- 0,04
15	0,03	+/- 0,02	+/- 0,04

You should consider this layer thicknesses for the manufacture of blanks, if these tools should later be provided with a electro plated diamant- or CBN-layer.