WINTER
diamond sawblades
CBN sawblades

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WINTER diamond and CBN sawblades

Diamond OD sawblades provide economic cutting of hard, short-chipping and wear-resistant materials such as glass, ceramics and carbides. The trend to sintered materials is increasing the application of diamond sawblades. Diamond sawblades are likewise used in food processing and in medicine, thanks to their clean cutting characteristics and the virtual absence of residues from a diamond cut.

The development of cubic boron nitride (CBN) has produced a perfect complement to diamond. The specific properties of this cutting material enable it to machine heavy-duty, high-speed steels and hardened steels upwards of 55 HRC, and also magnetic materials.

An overview of material successfully cut with WINTER diamond and CBN sawblades is given on page 9.

These tools comprise a steel core carrying a cutting layer on their periphery. The cutting layer consists of sintered metal, synthetic resin or an electroplated layer, impregnated with diamond or CBN grit. The various combinations of bond, abrasive material, concentration and grit size produce different tool characteristics, adapted to the various applications on the basis of experience and experiment.

Table of maximum operating speeds for diamond and CBN blades not requiring permits (to Accident Prevention Regulations VBG 49)

Core		Cutting edge	Application	Cutting method	Maximum operating speed (m/s) for grinding layer / bond			
					Plated	Metal	Resin	Vitrified
Metal	Core material, e.g. cast, rolled, forged	Continuous	Machine-guided and **hand operated** blades	Wet	80	80	63	-
				Dry	80	80	-	-
		Segmented	Machine-guided and **hand operated** blades	Wet	80	63	63	-
				Dry	80	63	-	-
		Continuous or segmented	Off-hand	Wet and dry	80	63[1)]	-	-
	sintered	Continuous	Machine-guided and **hand operated** blades	Wet	-	63	-	-
Resin		Continuous	Machine-guided and **hand operated** blades	Wet and dry	-	-	63	-

Note: [1)] Off-hand cutting with metal-bond sawblades only with welded or sintered connection between grinding blade and core.

Our range of research - our range of products

New development and modification in material; constant demands for higher quality sawing; adaptation to new production techniques, machines and parameters; the imperative for ever greater economy in production - these are the driving forces behind WINTER's developments in diamond and CBN sawblade technology.

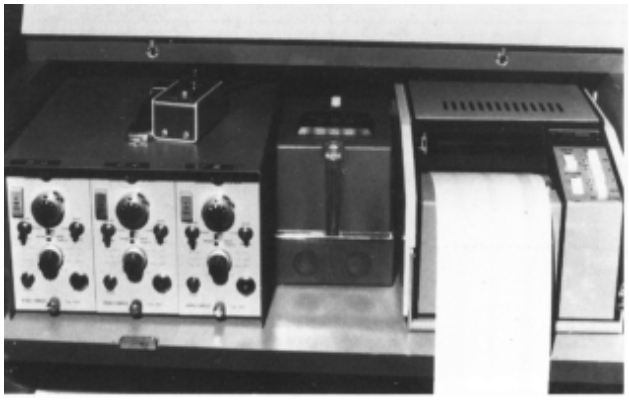
Experience gathered over the decades; the results of our own research and development efforts; manufacturing know-how resulting from the production of over 50 product groups - this is the key to the continual advances in the quality and sophistication of WINTER sawblades.

Test runs on machines in our own applications laboratory and in-plant cooperation with our customers enable us to provide problem solutions which meet the demands of practice.

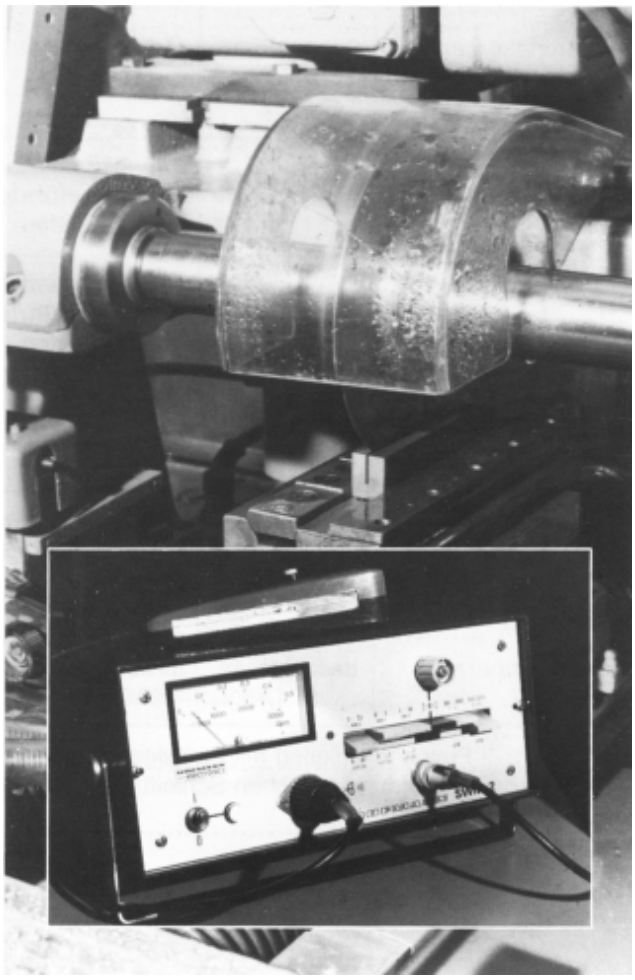
The resulting range of blades is well tailored to fit the market, and is shown in this catalogue. You, too, can benefit from the high quality of WINTER diamond blades.

Please contact us if you require more detailed information, or if you have a concrete problem to be solved. For specific applications please use the form on page 20 to give us the details. We will then work out a recommendation specifically to suit your application.

Temperature measurement



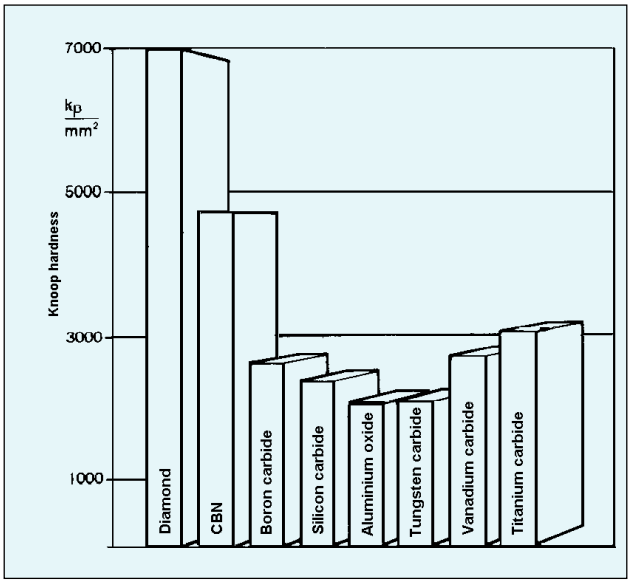
Force measurement



Oscillation measurement

Superabrasives - diamond and CBN

Synthetic diamond - today's most widely used super-abrasive - and cubic boron nitride (CBN) are manufactured in high-temperature/high-pressure synthesis technique. Natural diamond continues to be used only in exceptional cases where the application demands it.



Hardness comparison between abrasives and hard workpiece material constituents

Diamond is the hardest of all known substances. Its abrasion resistance is considerably greater than that of all other abrasives and its thermal conductivity exceeds that of copper.

Cubic boron nitride lies between diamond and boron carbide on the Knoop hardness scale. Unlike diamond grinding, CBN grinding involves no chemical reaction between the abrasive and the workpiece material. Hence the superiority of CBN in working heavy-duty high-speed steels and hardened steels with ratings upwards of 55 HRC.

WINTER uses different types of diamond and CBN, depending on the type of bond and the cutting application. A distinction can be made between friable grits with very irregular surface used in easy-wearing alloys, and blocky crystals used especially in metal bonds.

The use of metal clad grits improves retention in the bond and give an excellent heat-sink effect.

The correct combination of grit and bond is the subject of constant research in experiments conducted under realistic working conditions.

Grit sizes

WINTER diamond and CBN grits are classified to the FEPA standard, as shown on the right.

The FEPA system works as follows: the number is derived from the mesh width of the coarsest sieve used, plus the number of sieve size intervals between the coarsest and the finest sieve used

Example:
D426 means that the coarsest sieve had mesh width 425 µm, and the finest sieve was 1 sieve interval finer, namely 355µm. D427 means the coarsest sieve used had a mesh width of 425µm, and the finest sieve was 2 sieve intervals finer, namely 300µm.

International Standardization of Grit Sizes for Diamond and Cubic Boron Nitride

Sieve Grit Designations

Diamond FEPA Standard **Winter designation**		**CBN** FEPA Standard **Winter designation**		**Diamond and CBN** US Standard **ASTM-E-11-70**		Nominal mesh size to ISO 6106 DIN 848 Pt 1, 1980
narrow	wide	narrow	wide	narrow	wide	µm
D 601	**D 602**	B 601	D 602	**30 / 35**	**30 / 40**	600/500
D 501		B 501		**35 / 40**		500/425
D 426	**D 427**	**B 426**	**D 427**	**40 / 45**	**40 / 50**	425/355
D 356		**B 356**		**45 / 50**		355/300
D 301		**B 301**		**50 / 60**		300/250
D 251	**D 252**	**B 251**	**D 252**	**60 / 70**		250/212
D 213		**B 213**		**70 / 80**		212/180
D 181		**B 181**		**80 / 100**		180/150
D 151		**B 151**		**100 / 120**		150/125
D 126		**B 126**		**120 / 140**		125/106
D 107		**B 107**		**140 / 170**		106/90
D 91		**B 91**		**170 / 200**		90/75
D 76		**B 76**		**200 / 230**		75/63
D 64		**B 64**		**230 / 270**		63/53
D 54		**B 54**		**270 / 325**		53/45
D 46		**B 46**		**325 / 400**		45/38

FEPA = Fédération Européenne des Fabricants de Produits Abrasifs. D / B 501...D / B 602 = for electroplated tools only.

The table shows FEPA nominal grit sizes, compared with the US standard ASTM-E-11-70. The US standard gives the sizes in “mesh”, i.e. the approximate number of sieve meshes per inch - high “mesh” numbers mean fine grits, and low numbers mean coarse grits.

Concentrations

The proportion of abrasive grit in the diamond or CBN layer, the “concentration”, has a major effect on the operating characteristics and on the price of a sawblade. The concentration of a diamond tool is defined by leading tool manufacturers on the following basis:

Concentration 100 = 4.4 ct per cm³ layer volume (grit + bond).

Thus a nominal concentration of 100 means that the diamond proportion is 25% by volume of the abrasive layer, assuming that diamond density is 3.52 g/cm³ and 1 ct = 0.2 g. Nominal diamond concentrations in sawblades span the considerable range from 0.5 ct/cm³ to 6 ct/cm³ (concentrations of 12 to 135).

For CBN tools concentration is given uncoded in percent by volume, e.g. V120 =12% by volume, V180 = 18% by volume, etc. A CBN concentration of V 240 is thus approximately equivalent to a diamond concentration of C 100.

For electroplated tools, the maximum concentration is designated as S33. Reduced concentrations are identified with S < 33.

The choice of concentration is dependent on:

- Cutting task
- Operational conditions
- Bond type
- Grit size.

Grit concentration affects tool life, but also cutting rate.

A higher concentration generally means longer tool life, but does not necessarily give the optimum economics for a particular sawing operation.

Bonds

Alongside grit size and concentration, the third decisive parameter for the cutting of a diamond or CBN sawblade is its bond. The development of bonds is the keystone to advanced diamond tool manufacture.

WINTER diamond and CBN sawblades are manufactured with two different types of bond:

Metal bonds:	Bronze bonds = Type Bz or MSS Electroplated bonds = Type NK, S or GSS
Resin bonds:	Type K-plus or KSS

Metal bonds are resistant to wear and comparatively insensitive to shock. They feature long tool life with lower material removal rate.

Resin bonds give low cutting forces and temperatures. This makes them free-cutting and especially suitable for edge-sensitive workpiece materials.

Electroplated bonds with a single layer of diamond have a special position among the metal bonds. The diamond particles are only partly embedded in the bond matrix, so that their accurately defined projection from the bond surface gives the tool exceptionally good cutting ability. This makes the electroplated-bond tool specially suitable for cutting thermosetting plastics, glass fibre reinforced plastics (GRP), ferrites, “green” materials, etc.

Application notes

1. Can it be cut?

Diamond sawblades are as a rule for hard, short-chipping materials, such as:

Glass

Ceramics (green and fired)

Carbides

Graphite

Quartz

Ferrites

Semiconductor materials.

For further workpiece materials and workpiece groups see page 9.

CBN is used for cutting materials with affinity to carbon, in particular steel, with hardness upwards of 55 HRC. Examples are high-alloy steel grades such as HSS and chrome steel with 12% Cr.

Soft, long-chipping materials tend to smear; they clog up the cutting layer and make the diamond sawblade useless. Compromises can be achieved with electroplated bonds.

2. Cutting layer specifications

Selection of cutting layer specifications demands comprehensive experience.

For correct selection of type, it is important to have the greatest possible accuracy of information on the application for which the tool is required (see also Questionnaire on page 20.

The following are indispensable for correct selection of specification:

- Full designation of workpiece material, in order to permit access to application tests already carried out.

- The requirements for quality of cut edges (e.g. max. size of edge chipping); the smaller the permissible edge break-out, the smaller the cutting forces must be.

- Machining parameters (see Questionnaire page 20), whereby the range of variants should be given in order to get an optimal variation range (e.g. speed from/to feed from/to).

- Sufficient spindle power (see point 4). High drive power permits the use of higher grit concentration.

- Low drive power requires a sawblade that works with low cutting forces, e.g. in resin bond with low grit concentration.

If a tool specification (sawblade cutting layer) has to be adapted to an existing machine with fixed parameters, the following rule should be observed: the higher the peripheral speed, the higher is the effective hardness of the blade.

3. Sawblade dimensions

Blade dimensions are determined by the machine and the height of workpiece to be cut. Normally, flange diameter is specified as at least $^1/_3$ of sawblade diameter, i.e. the maximum workpiece height which can be sawn is $^1/_3$ of the blade diameter.

If there is a choice between different cutting layers, e.g. for Bz blades x = 5 or 10 mm, the largest dimension should be chosen; blade costs per cut are lower for greater height of the cutting layer, since the extra performance more than offsets the price of the additional layer height.

When especially clean, straight cut surfaces are required, a stable sawblade core is essential; the stability of the blade can also be increased by increasing the flange diameter.

A summary of the internationally valid designations for continuous-rim sawblades and the associated flanges has been compiled by FEPA.

4. Machine specification

There are a large number of machines suitable for diamond and CBN sawblades, though designs differ widely.

Generally valid principles can be specified for such factors as dynamic stability, since any oscillation during the cutting operation may 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 spindle driving power is essential. Insufficient motor output prevents the optimum exploitation of the diamond tool. The dreaded dulling of the diamond sawblade is often the result of “babying” the tool. Diamond and bond must be made to work hard if the self-sharpening effect is to occur. It

Application notes

may be assumed that bonds will have greater resistance to wear and will thus be more economical if the spindle drive permits high cutting rates.

Sawblades with diameters greater than 300 mm should be given a drive power of 1.5 kW; for ganged saws a further 0.5 should be provided for each additional sawblade.

5. Operating 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. In order to avoid unnecessary tool wear it is recommended that depth of cut should be increased in steps until the damaging effects of a dull tool become apparent. The optimum depth of cut is then slightly less than the limit depth of cut at which effective cutting ceases to be possible.

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 sawblade types.

It is essential for us to receive detailed inquiries from our customers, specifying the workpiece material and the operating parameters, in order for us to give practical recommendations and proposals (Questionnaire page 20).

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-sludging materials, whereas higher speeds (30-40 m/s) are used for porous, coarse-sludging materials.

6. Coolant criteria

The use of coolant always tends to lengthen blade life. Metal bond sawblades, with the exception of the S-type, are invariably used with coolant; resin bond continuous-rim blades can also work dry. Dry or wet cutting is indicated by the letter following the hardness indication, e.g. K+ 888R (dry cutting) or K+ 888RY (wet cutting).

Different coolants are used for the different workpiece materials, e.g. water, mineral base oil, emulsions, synthetic oils, etc.

It is important for coolant flow to be sufficient and to be accurately directed at the tool/workpiece interface. The coolant is supplied via coolant nozzles, by a special flange or in dip technique.

7. Flange diameter

Flange diameter affects the directional stability of the blade; high material removal rates require a large flange.

As a general rule, one third of blade diameter should be taken up by the flange. For particularly thin cores, such as with NK type blades, the flange often extends right up to the diamond layer. As a general rule, the largest possible flange diameter should always be used.

Selection data by materials

Workpiece material	Examples	Blade Type
Acrylic glass		S
Agate		Bz
Al-Ni-Co		KSS
Alumina (special fused)		Bz
Aramit fibre plastics		Bz
Barium titanate		K-plus
Boron carbide		Bz
Brake linings	Brake linings	S
Cemented carbide		Bz/K-plus
CERAMICS		
Oxide ceramics, sintered		
Al_2O_3 (aluminium oxide)	Laboratory	Bz
Al_2O_3 (e.g. tubes)	Crucibles	K-plus
Al_2O_3	Electronics/ resistors	NK
	Seals	Bz
-Carbide ceramics	Electronics	K-plus
-TIC (titanium carbide)	Electronics	Bz
-Nitride ceramics		
Si_3N_4 (HPSN) silicon nitride	Cutting ceramics	K-plus
-Ceramic tiles	Wall, floor	Bz
-Ceramic, unfired	Blanks	S
Chrome nickel (10% Cr, 90% Ni)		KSS
CRP (carbon reinforced plastic)	Bodywork components in aircraft construction	Bz
Epoxy resin boards		S
(copper-clad with printed circuits)		NK
Eternite (asbestos-free)		S/Bz
Formica (nameplates)		S
Germanium (semiconductor)		Bz
GGG (semiconductor)		S/K-plus
Glass (optical)		Bz
Glass fibres (bundled)	Optical fibres	Nk/K-plus
Glass (sheet)		Bz
Glass ceramics		Bz/K-plus
Glas hard laminate (cast epoxy resin)		S
Glass fibre reinforced polyester 10 mm		S
Glass laminates with plastic intermediate layer	Safety glass Bullet-proof glass	Bz 34 SG
Glass (quartz glass tubes)	Halogen lamps	K-plus
Glass wool (coarse-mesh)		S
Glass (“Pyrostop”)	Flame retardant	Bz 34 SG
Glass (thick)	Optics	Bz 34 E
Glass (technical; hollow glass)	Lamps	Bz
Glass fibre rod		S
Glass hard laminate		K-plus
Granite		Bz
Graphite		S/Bz
GRP	Window sections	S
	Constructional sections	Bz

Workpiece material	Examples	Blade Type
GRP (with internal thermoplastic ring)		S
Helopal panels (plastic)		S
Hematite		Bz
HSS punches		KSS
HSS hardened		KSS
Insulators, ceramic	(high-voltage, special ceramic material)	Bz
Lapis lazuli		Bz
MAGNETIC MATERIALS		
Ferrite, sintered		K-plus/Bz
cast		MSS
Rare earth magnetic materials		K-plus
Samarium cobalt		Bz/K-plus
Malachite		Bz
Marble		Bz/S
Melamine resin		S
Metal coated ceramics		NK
Moybdenum		KSS
Mycalex (cast stone)		Bz/S
Ni hard rods		KSS
Piezoceramics		NK
Polycarbonate (glass fibre reinforced)		NK
Polyester sheets, paper-coated both sides		S
Polystyrene		S
Printed circuit boards		S/NK
PVC hard		S/NK
Quartz (fusible)		Bz/K-plus
Quartz (synthetic)		Bz
Rhodochrosite		Bz
Rose quartz		Bz
Sapphire		Bz/K-plus
Sendust (9.5% Si, 6%Al, 84.9% Fe)		NK
Silicon (polycrystalline)		Bz
Silicon carbide (fine pressed & crushed)		Bz
Silicon (monocrystalline)		Bz
Silicon (semiconductor)	Semiconductors	Bz
Silicon nitride HPSN	Cutting ceramics Indexable inserts	K-plus
Silicon carbide (recryst.) (ReSiC)		K-plus
Steatite		K-plus/Bz/MSS
Stellite (Hantung G HRC58-60)		Bz
Tiger's eye		Bz
Titanium		K-plus
Titanium carbide	Electronic components	NK Bz
Titanium zirconate		Bz
Topaz		Bz
Tungsten		NK/KSS
Tungsten wires		Bz
Uranium dioxide		Bz
Uranium		Bz
Zirconium		Bz

Bz and **MSS** program pages 12-13; **K-plus** and **KSS** page 14; **NK** page 15; **S** and **GSS** page 16-17; **Bz 34 SG** page 18-19

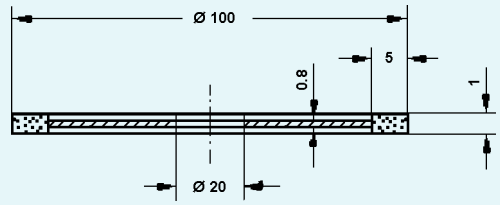
WINTER
diamond sawblades

Diamond sawblades in the Superstandard programme are available ex stock at favourable prices.

Superstandard programme

for cutting ceramics, carbide, quartz glass and similar materials.

1A1R
(K34D)-100-1-5-0.8-20

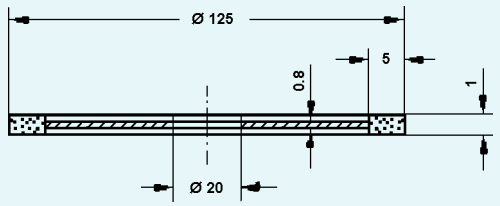


Available ex stock in

Grit size	Bond	Concen-tration	Material No.
[1] D 151	K-plus 888 RY	C 50	83423298
[2] D 151	K-plus 4821	C 100	83421864

Particularly suitable for cutting (1) CERAMICS and (2) CARBIDES.

1A1R
(K34D)-125-1-5-0.8-20

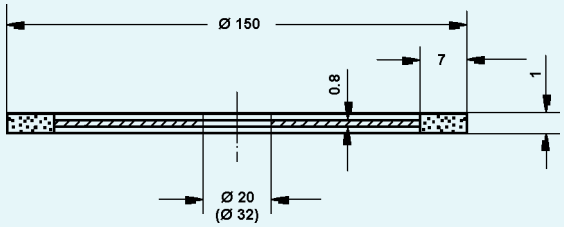


Available ex stock in

Grit size	Bond	Concen-tration	Material No.
D 151	K-plus 4821	C 100	83421872

Particularly suitable for cutting CARBIDES.

1A1R
(K34D)-150-1-7-0.8-20 (-32)

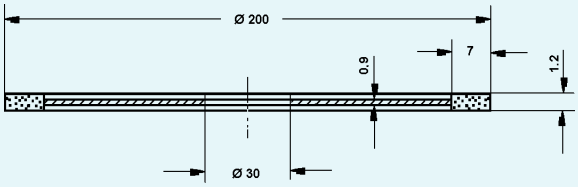


Available ex stock in

Grit size	Bond	Concen-tration	Material No.
[1] D 151	K-plus 4821	C 100	83421880
[2] D 151	K-plus 4821	C 100	83423808

Particularly suitable for cutting CARBIDES.
[1] Bore diameter Ø 20mm, [2] Bore diameter Ø 32mm

1A1R
(K34D)-200-1.2-7-0.9-30



Available ex stock in

Grit size	Bond	Concen-tration	Material No.
D 151	K-plus 4821	C 100	83423962

Particularly suitable for cutting CARBIDES.

Diamond sawblades in the
Superstandard programme are available
ex stock at favourable prices.

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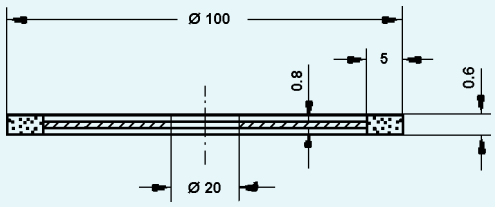
diamond sawblades

Superstandard programme

for cutting ceramics, carbide, quartz glass and similar materials.

1A1R
(Bz34D)-100-0.8-5-0.6-20

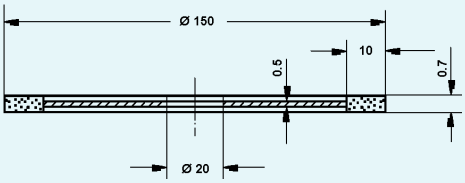


Available ex stock in

Grit size	Bond	Concen-tration	Material No.
D 126	**Bz 309**	**C 45**	**83402431**

Particularly suitable for cutting CERAMICS

1A1R
(Bz34D)-150-0.7-10-0.5-20

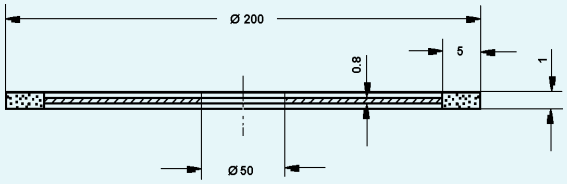


Available ex stock in

Grit size	Bond	Concen-tration	Material No.
D 91	**Bz 359**	**C 23**	**83421378**

Particularly suitable for cutting QUARTZ GLASS.

1A1R
(Bz34D)-200-1-5-0.8-50

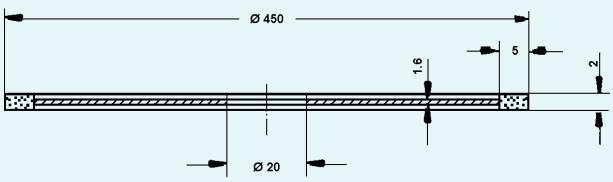


Available ex stock in

Grit size	Bond	Concen-tration	Material No.
D 126	**Bz 308**	**C 45**	**83421378**

Particularly suitable for cutting CERAMICS.

1A1R
(Bz34D)-450-2-5-1.6-20



Available ex stock in

Grit size	Bond	Concen-tration	Material No.
D 126	**Bz 335**	**C 16**	**83431243**

Particularly suitable for cutting HOLLOW GLASS.

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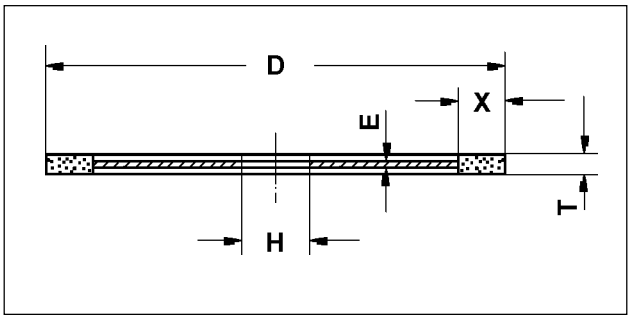
CBN sawblades

Continuous-rim Bronze bond:

Bz type: for diamond sawblades
MSS type: for CBN sawblades



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

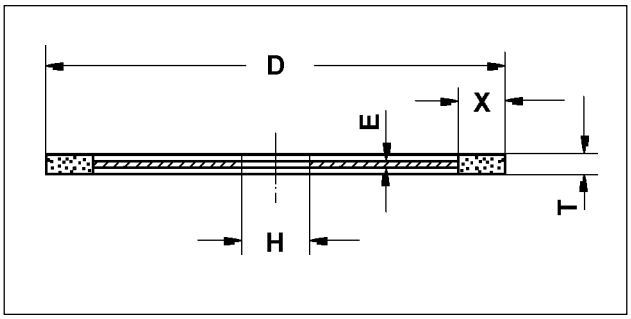
Main applications:
Type Bz Semiconductor, magnetic and oxide ceramic materials, glass, porcelain, earthenware, ferrites, precious and semi-precious stones and refractory materials.
Type MSS Heavy-duty high-speed steels, hardened steels ≥ 60 HRC and magnetic materials.

FEPA designation	Catalog & order no.	D	T	X	E	H	Grit size	Typical concentrations
1A1R	BZ34D - 100	0.5	5	0.4				
1A1R	BZ34D - 100	0.6	5	0.5				
1A1R	BZ34D - 100	0.8	5	0.6				
1A1R	BZ34D - 100	1.0	5	0.8				
1A1R	BZ34D - 100	1.2	5	1.0				
1A1R	BZ34D - 100	1.5	5	1.3				
1A1R	BZ34D - 100	0.6	10	0.4				
1A1R	BZ34D - 100	0.8	10	0.6				
1A1R	BZ34D - 100	1.0	10	0.8				
1A1R	BZ34D - 100	1.2	10	1.0				
1A1R	BZ34D - 100	1.5	10	1.3				
1A1R	BZ34D - 125	0.5	5	0.4				
1A1R	BZ34D - 125	0.6	5	0.5				
1A1R	BZ34D - 125	0.8	5	0.6				
1A1R	BZ34D - 125	1.0	5	0.8				
1A1R	BZ34D - 125	1.2	5	1.0				
1A1R	BZ34D - 125	1.5	5	1.3				
1A1R	BZ34D - 125	0.6	10	0.4				
1A1R	BZ34D - 125	0.8	10	0.6				
1A1R	BZ34D - 125	1.0	10	0.8				
1A1R	BZ34D - 125	1.2	10	1.0				
1A1R	BZ34D - 125	1.5	10	1.3				
1A1R	BZ34D - 150	0.6	5	0.5				
1A1R	BZ34D - 150	0.8	5	0.6				
1A1R	BZ34D - 150	1.0	5	0.8				
1A1R	BZ34D - 150	1.2	5	0.9				
1A1R	BZ34D - 150	1.5	5	1.2				
1A1R	BZ34D - 150	1.8	5	1.5				
1A1R	BZ34D - 150	0.8	10	0.6				
1A1R	BZ34D - 150	1.0	10	0.8				
1A1R	BZ34D - 150	1.2	10	1.0				
1A1R	BZ34D - 150	1.5	10	1.3				
1A1R	BZ34D - 150	1.8	10	1.6				
1A1R	BZ34D - 175	0.8	5	0.6				
1A1R	BZ34D - 175	1.0	5	0.8				
1A1R	BZ34D - 175	1.2	5	0.9				
1A1R	BZ34D - 175	1.5	5	1.2				
1A1R	BZ34D - 175	1.8	5	1.4				
1A1R	BZ34D - 175	1.0	10	0.7				
1A1R	BZ34D - 175	1.2	10	0.9				
1A1R	BZ34D - 175	1.5	10	1.2				
1A1R	BZ34D - 175	1.8	10	1.5				

Standard bore diam. 20 mm, other dias. on request.

The following grit sizes are available:
Diamond: D64, D91, D107, D126, D151, D181, D213, D301
CBN: B91, B107, B126, B151, B181

Diamond: C16, C19, C23, C45, C90
CBN: V120, V180, V240



WINTER
diamond sawblades
CBN sawblades

Continuous-rim Bronze bond:

Bz type: for diamond sawblades
MSS type: for CBN sawblades

FEPA designation	Catalog & order no.	D	T	X	E	H	Grit size	Typical concentrations
1A1R	BZ34D - 200	0.8	5	0.6	Standard bore diam. 20 mm, other dias. on request.	The following grit sizes are available: **Diamond:** D64, D91, D107, D126, D151, D181, D213, D301 **CBN:** B91, B107, B126, B151, B181	**Diamond:** C16, C19, C23, C45, C90 **CBN:** V120, V180, V240
1A1R	BZ34D - 200	1.0	5	0.8			
1A1R	BZ34D - 200	1.2	5	0.9			
1A1R	BZ34D - 200	1.5	5	1.2			
1A1R	BZ34D - 200	1.8	5	1.4			
1A1R	BZ34D - 200	1.0	10	0.7			
1A1R	BZ34D - 200	1.2	10	0.9			
1A1R	BZ34D - 200	1.5	10	1.2			
1A1R	BZ34D - 200	1.8	10	1.5			
1A1R	BZ34D - 250	1.0	5	0.7			
1A1R	BZ34D - 250	1.2	5	0.8			
1A1R	BZ34D - 250	1.5	5	1.1			
1A1R	BZ34D - 250	1.8	5	1.4			
1A1R	BZ34D - 250	1.0	10	0.7			
1A1R	BZ34D - 250	1.2	10	0.8			
1A1R	BZ34D - 250	1.5	10	1.1			
1A1R	BZ34D - 250	1.8	10	1.4			
1A1R	BZ34D - 300	1.2	5	0.8			
1A1R	BZ34D - 300	1.5	5	1.1			
1A1R	BZ34D - 300	1.8	5	1.4			
1A1R	BZ34D - 300	1.2	10	0.8			
1A1R	BZ34D - 300	1.5	10	1.1			
1A1R	BZ34D - 300	1.8	10	1.4			
1A1R	BZ34D - 350	1.5	5	1.1			
1A1R	BZ34D - 350	1.8	5	1.4			
1A1R	BZ34D - 350	2.0	5	1.6			
1A1R	BZ34D - 350	1.5	10	1.1			
1A1R	BZ34D - 350	1.8	10	1.4			
1A1R	BZ34D - 350	2.0	10	1.6			
1A1R	BZ34D - 400	1.5	5	1.1			
1A1R	BZ34D - 400	1.8	5	1.4			
1A1R	BZ34D - 400	2.0	5	1.6			
1A1R	BZ34D - 400	1.5	10	1.1			
1A1R	BZ34D - 400	1.8	10	1.4			
1A1R	BZ34D - 400	2.0	10	1.6			
1A1R	BZ34D - 450	1.8	5	1.4			
1A1R	BZ34D - 450	2.0	5	1.6			
1A1R	BZ34D - 450	2.4	5	2.0			
1A1R	BZ34D - 450	1.8	10	1.4			
1A1R	BZ34D - 450	2.0	10	1.6			
1A1R	BZ34D - 450	2.4	10	2.0			

Standard tolerances - cutting width (T) Type Bz - Metal bond

Ø (mm)	Tol. (mm)
up to 100	± 0.07
up to 250	± 0.10
≥ 300	+ 0.20
	- 0.10

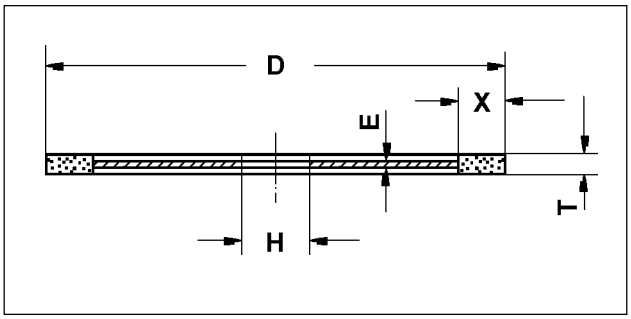
Restricted tolerances can be quoted on request. The specification of restricted tolerances is dependent on: grit size, layer specification, concentration, cutting depth and flange diameter, etc.

Technical details can be supplied on request, after examination of the individual case.

WINTER
diamond sawblades
CBN sawblades

Continuous-rim
Resin bond:

K-plus type: for diamond sawblades
KSS type: for CBN sawblades



Resin bond K-plus type sawblades feature exceptionally good free-cutting characteristc 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 thin-walled hollow workpieces.

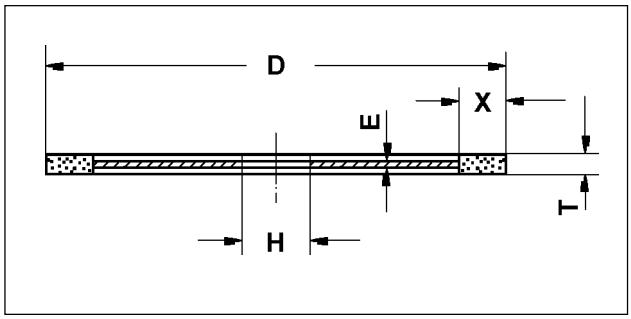
Main applications:
K-plus type Quartz glass, carbides, magnetic materials and glass.
KSS type Heavy-duty high-speed steels, hardened steels ≥ 60 HRC and magnetic workpiece materials.

FEPA designation	Catalog & Order no.	D	T	X	E	H	Grit size	Typical Concentrations
1A1R	K34D -	100 -	0.6 -	5 -	0.5 -	Standard bore diam. 20 mm, other dias. on request.	The following grit sizes are available: **Diamond:** D64, D91, D107, D126, D151, D181, D213, D301 **CBN:** B91, B107, B126, B151, B181	**Diamond:** C38, C50, C75, C100 **CBN:** V120, V180, V240
1A1R	K34D -	100 -	0.8 -	5 -	0.6 -			
1A1R	K34D -	100 -	1.0 -	5 -	0.8 -			
1A1R	K34D -	100 -	1.2 -	5 -	1.0 -			
1A1R	K34D -	125 -	0.6 -	5 -	0.5 -			
1A1R	K34D -	125 -	0.8 -	5 -	0.6 -			
1A1R	K34D -	125 -	1.0 -	5 -	0.8 -			
1A1R	K34D -	125 -	1.2 -	5 -	1.0 -			
1A1R	K34D -	150 -	0.6 -	7 -	0.5 -			
1A1R	K34D -	150 -	0.8 -	7 -	0.6 -			
1A1R	K34D -	150 -	1.0 -	7 -	0.8 -			
1A1R	K34D -	150 -	1.2 -	7 -	1.0 -			
1A1R	K34D -	150 -	1.5 -	7 -	1.3 -			
1A1R	K34D -	175 -	0.8 -	7 -	0.6 -			
1A1R	K34D -	175 -	1.0 -	7 -	0.8 -			
1A1R	K34D -	175 -	1.2 -	7 -	1.0 -			
1A1R	K34D -	175 -	1.5 -	7 -	1.3 -			
1A1R	K34D -	200 -	0.8 -	7 -	0.6 -			
1A1R	K34D -	200 -	1.0 -	7 -	0.8 -			
1A1R	K34D -	200 -	1.2 -	7 -	0.9 -			
1A1R	K34D -	200 -	1.5 -	7 -	1.2 -			
1A1R	K34D -	250 -	1.0 -	7 -	0.7 -			
1A1R	K34D -	250 -	1.2 -	7 -	0.9 -			
1A1R	K34D -	250 -	1.4 -	7 -	1.1 -			
1A1R	K34D -	250 -	1.7 -	7 -	1.4 -			
1A1R	K34D -	300 -	1.0 -	7 -	0.7 -			
1A1R	K34D -	300 -	1.2 -	7 -	0.9 -			
1A1R	K34D -	300 -	1.4 -	7 -	1.1 -			
1A1R	K34D -	300 -	1.7 -	7 -	1.4 -			
1A1R	K34D -	400 -	1.2 -	7 -	0.9 -			
1A1R	K34D -	400 -	1.5 -	7 -	1.2 -			
1A1R	K34D -	400 -	1.7 -	7 -	1.4 -			
1A1R	K34D -	400 -	1.9 -	7 -	1.6 -			
1A1R	K34D -	400 -	2.3 -	7 -	1.6 -			
1A1R	K34D -	500 -	2.3 -	7 -	2.0 -			
1A1R	K34D -	550 -	2.3 -	7 -	2.0 -			

Tolerances: see page 13.

Restricted tolerances can be quoted on request. The specification of restricted tolerances is dependent on: grit size, layer specification, concentration, cutting depth and flange diameter, etc.

Technical details can be supplied on request, after examination of the individual case.



WINTER
diamond sawblades

Continuous-rim Electroplated bond:

Multi-layer
NK type: (as diamond sawblades only)

NK sawblades with electroplated, **multi-**layer diamond layer have comparable bond characteristics and cutting behaviour to Bz tools.

The range of materials for which they are suitable is almost identical. NK blades add to the Bz range in that the special WINTER manufacturing technique permits production of blades having cutting widths down to 0.15 mm.
NK blades are thus especially suitable for precision cutting of sensitive and/or expensive materials - tasks required more and more often, especially in the semiconductor industry.

FEPA designation	Catalog & Order no.	D	T	X	E	H	Diamond grit size	Typical concentration
1A1R	NK34D	50	0.15	1	0.10	Standard bore diam. 20 mm, other dias. on request. Other bore dias. on request	D46 / D64	S33 only
1A1R	NK34D	50	0.2	2	0.15		D46 / D64 / D91	
1A1R	NK34D	50	0.25	2	0.20		D64 / D91 / D126	
1A1R	NK34D	50	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	50	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	50	0.5	2	0.40		D64 / D91 / D126 / D181	
1A1R	NK34D	60	0.15	1	0.10		D46 / D64	
1A1R	NK34D	60	0.2	2	0.15		D46 / D64 / D91	
1A1R	NK34D	60	0.25	2	0.20		D64 / D91 / D126	
1A1R	NK34D	60	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	60	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	60	0.5	2	0.40		D64 / D91 / D126 / D181	
1A1R	NK34D	75	0.15	1	0.10		D46 / D64	
1A1R	NK34D	75	0.2	2	0.15		D46 / D64 / D91	
1A1R	NK34D	75	0.25	2	0.20		D64 / D91 / D126	
1A1R	NK34D	75	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	75	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	75	0.5	2	0.40		D64 / D91 / D126 / D181	
1A1R	NK34D	80	0.15	1	0.10		D46 / D64	
1A1R	NK34D	80	0.2	2	0.15		D46 / D64 / D91	
1A1R	NK34D	80	0.25	2	0.20		D64 / D91 / D126	
1A1R	NK34D	80	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	80	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	80	0.5	2	0.40		D64 / D91 / D126 / D181	
1A1R	NK34D	100	0.15	1	0.10		D46 / D64	
1A1R	NK34D	100	0.2	2	0.15		D46 / D64 / D91	
1A1R	NK34D	100	0.25	2	0.20		D64 / D91 / D126	
1A1R	NK34D	100	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	100	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	100	0.5	2	0.40		D64 / D91 / D126 / D181	
1A1R	NK34D	125	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	125	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	125	0.5	2	0.40		D64 / D91 / D126 / D181	
1A1R	NK34D	150	0.3	2	0.25		D64 / D91 / D126 / D181	
1A1R	NK34D	150	0.4	2	0.30		D64 / D91 / D126 / D181	
1A1R	NK34D	150	0.5	2	0.40		D64 / D91 / D126 / D181	

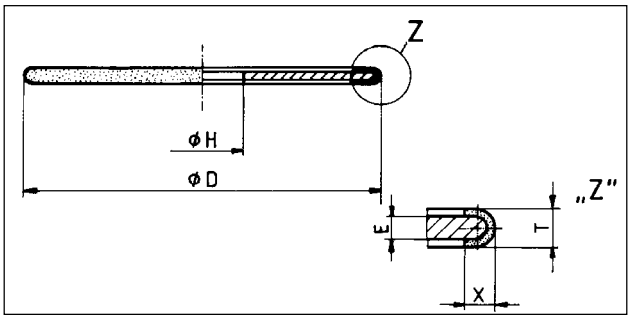
Tolerances

Cutting width	(T) ± 0.03
OD	(D) ± 0.30
Blade thickness	(E) ± 0.02
Layer depth	(X) ± 0.50

WINTER
diamond sawblades
CBN sawblades

Continuous-rim Electroplated bond:

S type : for diamond sawblades
GSS type: for CBN sawblades



S type sawblades have a **single-**layer electroplated diamond section and GSS blades a **single** layer of CBN. The considerable protrusion of the grit above the bond surface provides sufficient chip removal rate. Performance does, however, drop off after considerable cutting service as abrasion causes wear flats in the grit points.
S type sawblades are mostly used for dry cutting - including off-hand cutting - and are particularly suited to the cutting of thermosetting plastics, **GRP**, pre-sintered and pre-fired ("green") materials, electrocarbons, graphite, soft ferrites, farinaceous products, deep-frozen fish, bones, etc.

GSS type CBN blades are used for high-speed cutting, e.g. of hardened HSS.

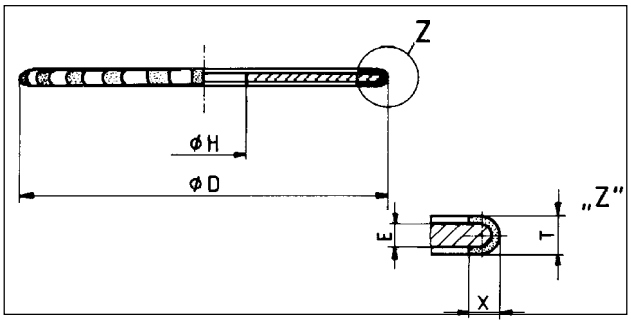
Catalog & Order no.	D	T	X	E	H	Grit size		Concentration
						Diamond	CBN	
S34D	100	1.1	1.0	0.7	Standard bore diam. 20 mm, other dias. on request.	D181	B151	S33 only
S34D	100	1.7	1.0	1.2		D213	B252	
S34D	100	2.0	1.0	1.2		D301	-	
S34D	100	2.2	1.0	1.2		D427	B427	
S34D	125	1.1	1.0	0.7		D181	B151	
S34D	125	1.7	1.0	1.2		D213	B252	
S34D	125	2.0	1.0	1.2		D301	-	
S34D	125	2.2	1.0	1.2		D427	B427	
S34D	150	1.1	1.0	0.7		D181	B151	
S34D	150	1.7	1.0	1.2		D213	B252	
S34D	150	2.0	1.0	1.2		D301	-	
S34D	150	2.2	1.0	1.2		D427	B427	
S34D	175	1.6	1.5	1.2		D181	B151	
S34D	175	1.7	1.5	1.2		D213	B252	
S34D	175	2.0	1.5	1.2		D301	-	
S34D	175	2.2	1.5	1.2		D427	B427	
S34D	200	1.6	1.5	1.2		D181	B151	
S34D	200	1.7	1.5	1.2		D213	B252	
S34D	200	2.0	1.5	1.2		D301	-	
S34D	200	2.2	1.5	1.2		D427	B427	
S34D	225	1.9	1.5	1.5		D181	B151	
S34D	225	2.0	1.5	1.5		D213	B252	
S34D	225	2.3	1.5	1.5		D301	-	
S34D	225	2.5	1.5	1.5		D427	B427	
S34D	250	1.9	1.5	1.5		D181	B151	
S34D	250	2.0	1.5	1.5		D213	B252	
S34D	250	2.3	1.5	1.5		D301	-	
S34D	250	2.5	1.5	1.5		D427	B427	
S34D	300	1.9	1.5	1.5		D181	B151	
S34D	300	2.0	1.5	1.5		D213	B252	
S34D	300	2.3	1.5	1.5		D301	-	
S34D	300	2.5	1.5	1.5		D427	B427	
S34D	350	1.9	1.5	1.5		D181	B151	
S34D	350	2.0	1.5	1.5		D213	B252	
S34D	350	2.3	1.5	1.5		D301	-	
S34D	350	2.5	1.5	1.5		D427	B427	
S34D	400	1.9	1.5	1.5		D181	B151	
S34D	400	2.0	1.5	1.5		D213	B252	
S34D	400	2.3	1.5	1.5		D301	-	
S34D	400	2.5	1.5	1.5		D427	B427	

Standard tolerances - Cutting width (T)

S type, metal bond

Grit size	Tolerance (mm)
≤ D181	± 0.1
> D181	+ 0.2 - 0.1

Technical details can be supplied on request, after examination of the individual case.



WINTER
diamond sawblades

Segmented design
Electroplated bond
single-layer:

S type: as diamond sawblade only

S type sawblades can also be supplied with segmented rim. Segmentation improves cooling of the cutting layer and swarf ejection.
Prefered applications are cuts in compact materials and the cutting of coarse-sludging materials.

Catalog & Order no.	D	T	X	E	H	No. of segments	Diamond grit size	Concentration
S34H	100	1.7	1.0	1.2	Standard bore diam. 20 mm, other dias. on request.	24	D213	S33 only
S34H	100	2.0	1.0	1.2		24	D301	
S34H	100	2.2	1.0	1.2		24	D427	
S34H	125	1.7	1.0	1.2		30	D213	
S34H	125	2.0	1.0	1.2		30	D301	
S34H	125	2.2	1.0	1.2		30	D427	
S34H	150	1.7	1.0	1.2		36	D213	
S34H	150	2.0	1.0	1.2		36	D301	
S34H	150	2.2	1.0	1.2		36	D427	
S34H	175	1.7	1.5	1.2		27	D213	
S34H	175	2.0	1.5	1.2		27	D301	
S34H	175	2.2	1.5	1.2		27	D427	
S34H	200	1.7	1.5	1.2		31	D213	
S34H	200	2.0	1.5	1.2		31	D301	
S34H	200	2.2	1.5	1.2		31	D427	
S34H	225	2.0	1.5	1.5		35	D213	
S34H	225	2.3	1.5	1.5		35	D301	
S34H	225	2.5	1.5	1.5		35	D427	
S34H	250	2.0	1.5	1.5		39	D213	
S34H	250	2.3	1.5	1.5		39	D301	
S34H	250	2.5	1.5	1.5		39	D427	
S34H	300	2.0	1.5	1.5		47	D213	
S34H	300	2.3	1.5	1.5		47	D301	
S34H	300	2.5	1.5	1.5		47	D427	
S34H	350	2.5	1.5	2.0		55	D213	
S34H	350	2.8	1.5	2.0		55	D301	
S34H	350	3.0	1.5	2.0		55	D427	
S34H	400	3.0	1.5	2.5		63	D213	
S34H	400	3.3	1.5	2.5		63	D301	
S34H	400	3.5	1.5	2.5		63	D427	

Standard tolerances - Cutting width (T)

S type, metal bond

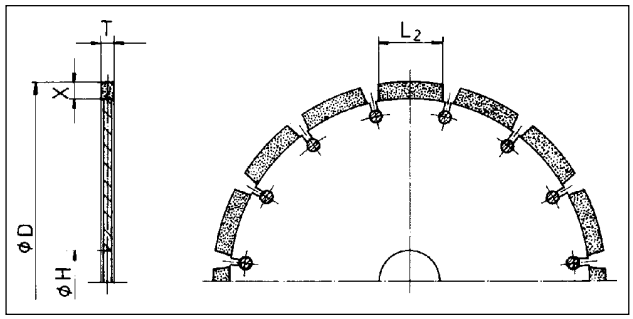
Grit size	Tolerance (mm)
≤ D181	± 0.1
> D181	+ 0.2 - 0.1

Technical details and prices can be supplied on request, after examination of the individual case.

WINTER
diamond sawblades

Segmented design
Bronze bond:

Type 34SG: specially for safety glass
Type 34E: close-segment design



Type 34SG

An interrupted rim is necessary for certain applications, e.g. to improve chip removal and to improve the supply of coolant.

This range of diamond sawblades is mainly used for cutting laminated glass with plastic insert layers.

Type 34SG with low-noise steel cores (DLN-N)

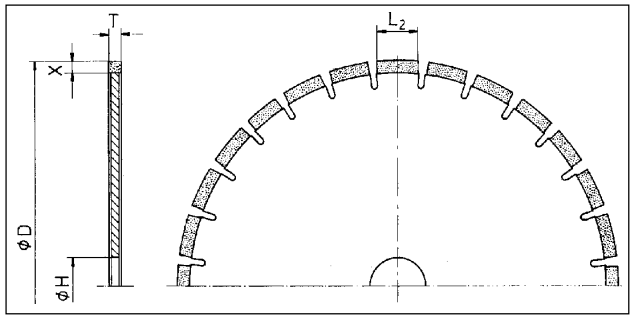
FEPA design-nation	Catalog & Order no.	Diameter D mm	Segment length L_2 mm	Cutting width T mm	Segment height X_1 mm	Layer depth X mm	Core thickness E mm	No. of segments	Bore H mm	Type
1A1RSS	**34SG-N-DLN**	**300**	40	2.8	10	10	1.8	21	50	BZ339A2DK120
1A1RSS	**34SG-N-DLN**	**350**	40	2.8	10	10	2.2	25	50	
1A1RSS	**34SG-N-DLN**	**350**	40	3.2	10	10	2.5	25	50	
1A1RSS	**34SG-N-DLN**	**400**	40	3.6	10	10	2.8	28	60	
1A1RSS	**34SG-N-DLN**	**500**	40	3.6	10	10	2.2	36	50	

Order example for Ø 400 mm sawblade

	34SG-N-DLN	-	**400**	-	40	-	3.6	-	10	-	10	-	2.5	-	28	-	60	-	Type

Type 34E

The 34E blade type has proven itself over many years, and is mainly used for cutting thick glass, ceramics, quartz glass and precious stones.

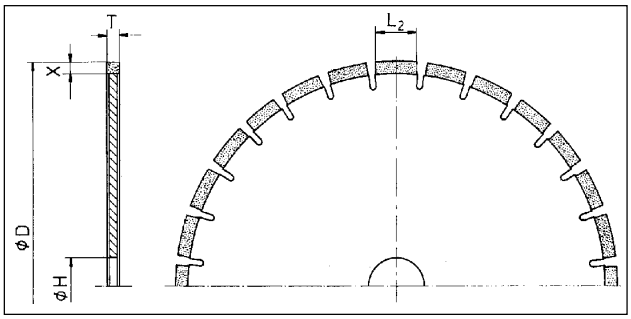


FEPA design-nation	Catalog & Order no.	Diameter D mm	Segment length L_2 mm	Cutting width T mm	Segment length X_1 mm **)	Layer depth X mm 5 7 10	Core thickness E mm	No. of segments	Bore H mm	Type
1A1RSS	**34E-E**	**200**	40	2.4	5	5	1.3	13	Optional	BZ339A04K120
1A1RSS	**34E-E**	**250**	40	2.4	5	5	1.3	17		
1A1RSS	**34E-E**	**300**	40	2.4	5	5	1.8	21		
1A1RSS	**34E-E**	**300**	40	2.8	5	5	1.8	21		
1A1RSS	**34E-E**	**350**	40	2.8	5	5	2.2	25		
1A1RSS	**34E-E**	**400**	40	3.2	5	5	2.5	28		

Order example for Ø 400 mm sawblade

	34E-E	-	**400**	-	40	-	3.2	-	5	-	5	-	2.5	-	28	-	H	-	Type

Type selection: in order to ensure optimal specification of the blade, it is advisable to give us details of your application.



WINTER
diamond sawblades

Ausführung 34E

The proven diamond sawblade design type 34OG is mainly used for machining optical glass.

This type is appropriate for achievement of good radial and axial runout and small cutting widths.

FEPA designation	Catalog & Order no.	Diameter D mm	Segment length L_2 mm	Cutting width T mm	Segment length X_1 mm **)	Layer depth X mm 5 7 10	Core thickness E mm	No. of segments	Bore H mm	Type
1A1RSS	**34OG-E**	**300**	40	1.8	5	5	1.3	21	Optional	BZ339A04K120
1A1RSS	**34OG-E**	**350**	40	1.8	5	5	1.3	25		
1A1RSS	**34OG-E**	**400**	40	1.8	5	5	1.3	28		
1A1RSS	**34OG-E**	**450**	40	1.8	5	5	1.3	32		
1A1RSS	**34OG-E**	**500**	40	1.8	5	5	1.3	36		
1A1RSS	**34OG-E**	**600**	40	2.8	5	5	2	42		
1A1RSS	**34OG-E**	**700**	40	2.8	5	5	2	50		
1A1RSS	**34OG-E**	**800**	40	2.8	5	5	2	57		

Order example for Ø 400 mm sawblade

	34OG-E	**-**	**400**	**-**	40	-	1.8	-	5	-	5	-	1.3	-	28	-	H	-	Type

Type selection: in order to ensure optimal specification of the blade, it is advisable to give us details of your application.

SAINT-GOBAIN Diamantwerkzeuge GmbH & Co. KG

Schützenwall 13-17, D-22844 Norderstedt

Application of diamond / CBN sawblades

Company: _____

Address: _____

_____

Technical advice ☐
Quotation ☐
Order ☐
Complaint ☐

Please give detailed information on intended cutting application - your effort is much appreciated!

Workpiece

* **1. Material designation (specification)** _____

2. Material quality (e.g. hardness, composition) _____

3. Dimensions _____ mm

4. Cross section to be cut _____ mm²

Sketch enclosed ☐

* **5. Required cut quality** _____

Machine Data

1. Manufacturer _____

2. Type _____

3. Spindle speed _____ rpm

4. Motor output _____ HP / kW

* **5. Flange diameter** _____ mm

Operating Parameters

* ☐ **1. Off-hand cutting**

* ☐ **2. Machine cutting**

3. Mounting ☐ Mechanical clamping ☐ Other
☐ Cementing / bonding _____

* ☐ **4. Dry cutting**

* ☐ **5. Wet cutting**

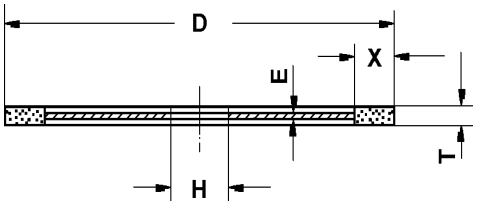
6. Coolant _____ Coolant flow _____ L/h

* ☐ **7. Speed (from/to)** _____ rpm

8. Feed rate (from/to) ☐ a. Mechanical _____ mm/min
☐ b. Manual _____ mm/min

9. Depth of cut _____

Diamond/CBN sawblade



1. Ordering designation _____
* **2. Outer diameter (D)** _____ mm
* **3. Cutting width (T)** _____ mm
4. Layer depth (X) _____ mm
5. Core thickness (E) _____ mm
6. Bore diameter (H) _____ mm
7. Bond _____
8. Grit size _____
9. Grit type: ☐ Diamond
☐ CBN
10. Concentration _____
11. Sawblade life _____ cm² or h

*** = Data indispensable for technical advice (quotation)**