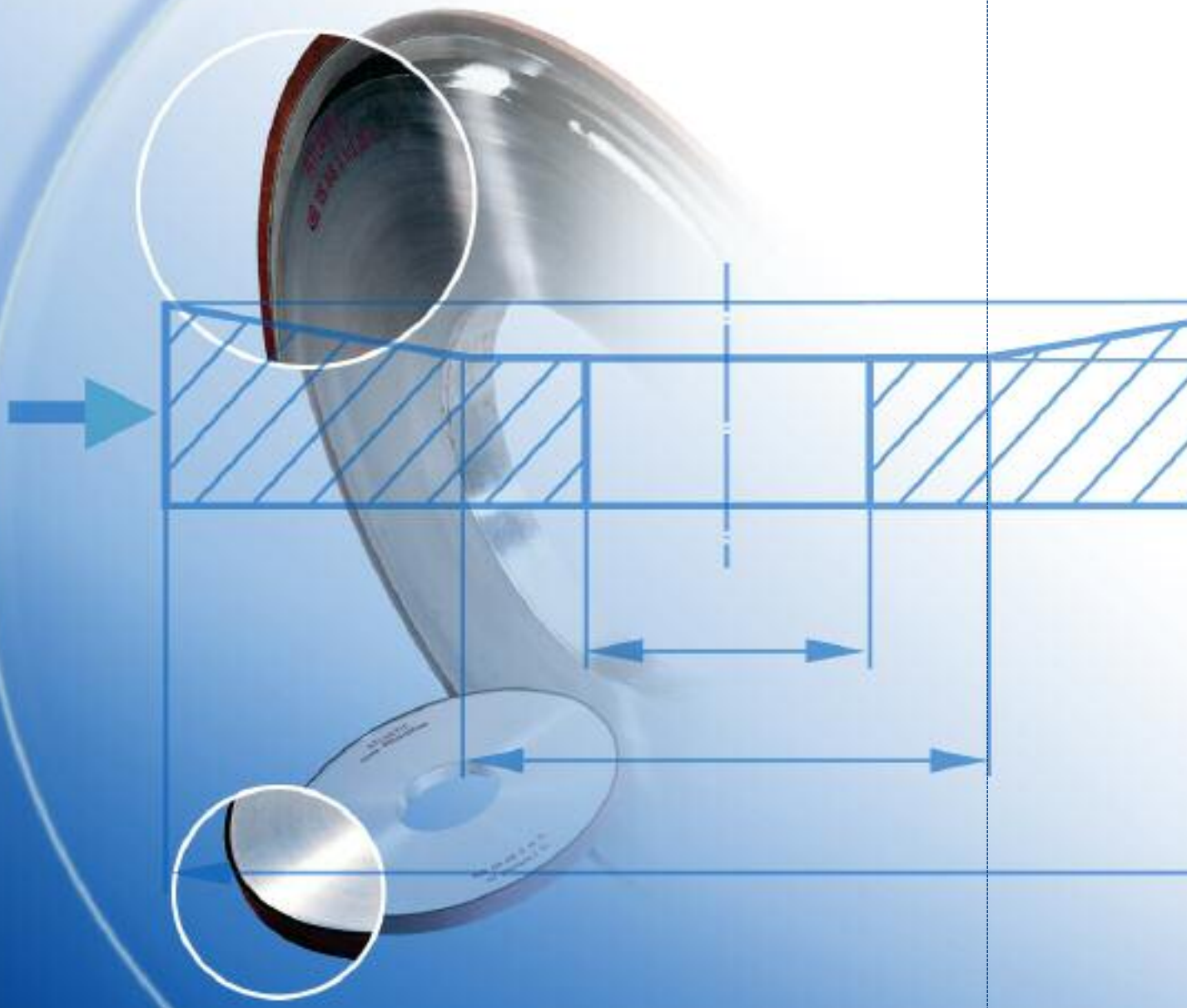
ATLANTIC
GRINDING WHEELS + HONING STONES

creative & dynamic

Diamond and CBN grinding wheels for the perfect finish



The proven product range with maximum tool life

A wide selection for the perfect finish

The use of high performance abrasives has become an important factor regarding both the function and economic viability of production in most areas of industry. The progress in tool development relates directly to the continuous optimisation of the quality of abrasive products; Atlantik GmbH has sold such products throughout the world for over 80 years under the trade name **ATLANTIC**.

Atlantik GmbH is your competent partner for the service and customer orientated production of bonded abrasives in all types of grain (aluminium oxide, silicon carbide, sintered aluminium oxide, diamond and cubic boron nitride) in both resin and vitrified bonds.

More possibilities from A – Z with millions of permutations

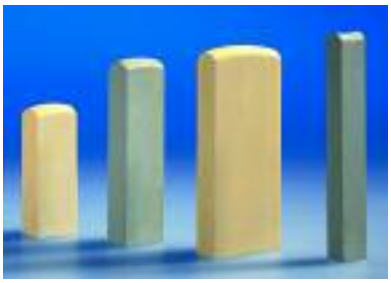
ATLANTIC abrasive products are used in the automobile, steel and bearing industries as also indeed within their supply chain.
In order to satisfy the requirements, **ATLANTIC** abrasive products achieve high stock removal rates and good surface finish.

Today, the company produces approx. 40 000 different products from which numerous variations are also possible.

Competence to the core

The various application requirements can seldom be fulfilled with a universal specification.
The quality is specifically tailored to the application.

- **Grinding wheels and segments**
- **Diamond and CBN wheels**
- **Honing and superfinishing stones**



Contents

Ideal for high production volumes

Due to their outstanding wheel life and resistance to wear, diamond and CBN grinding wheels have successfully replaced many machining and stock removal techniques using conventional grit type wheels. They are particularly cost effective in high volume production.

Diamond wheels

They are particularly cost effective for grinding brittle and short-chip materials e.g. ceramic, glass, tungsten carbide, titanium, alloyed steel, graphite, magnetic sintered and composite materials.

Diamond is the hardest grinding media known to-date (Knoops hardness 8,000) and like cubic boron nitride, is synthetically manufactured. Diamond can even be used for machining plastic and for some special applications e.g. honing of steel and grey cast iron.

Crystalline cubic boron nitride

CBN does not have quite the same hardness characteristic as diamond; however, the disintegration temperature is greater than 1,500 °C and is produced by a combination of high pressure and high temperature.

CBN (Knoops hardness 4,700) is considerably harder than alumina and silicon carbide; due to its low wear rate, it produces the required profile and geometric tolerances in most instances. Maximum cost effectiveness of CBN is achieved when grinding hardened high alloyed, difficult to grind steels over 60 HRC e.g. tool or chrome steel. Contrary to diamond, CBN is suitable for grinding carbide forming materials.

Wheel shapes – coding systems

Customer orientated quality without compromise

A letter – numeral coding system is used to specify the **ATLANTIC** products. By using a complete combination of quality control methods, maintaining the precise quality is guaranteed. The documentation of this data ensures traceability and the ability to reproduce the identical **ATLANTIC** product.

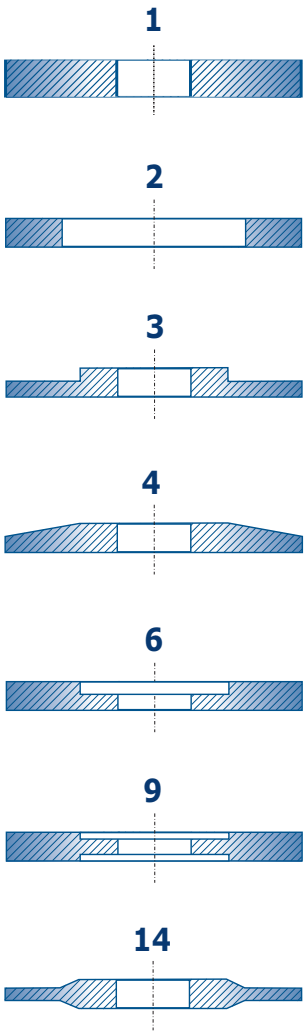
1 Grain type
2 Grit size
3 Hardness
4 Structure
5 Bond characteristic
6 **ATLANTIC** bonding type
7 Concentration

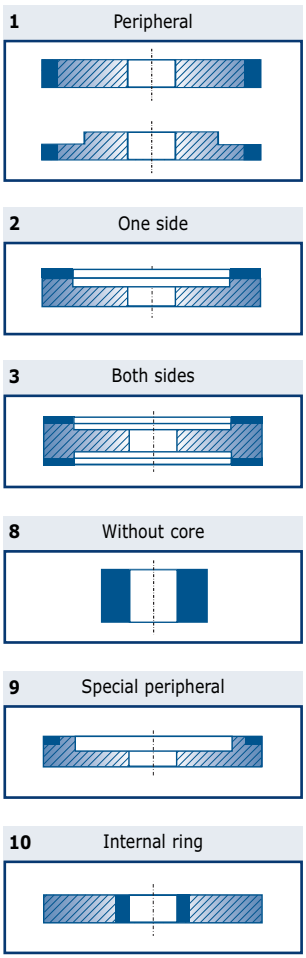
Coding system

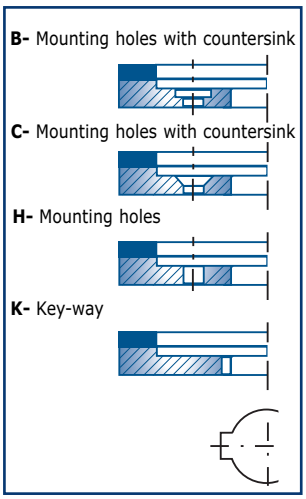
Coding

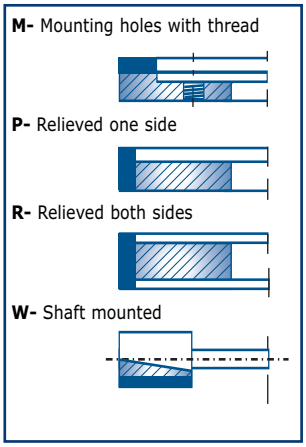
example

6	A	2	C
Core shape	Shape of CBN / diamond layer	Configuration of CBN / diamond layer	Exceptions (e.g. with mounting holes)









ATLANTIC
GRINDING WHEELS + HONING STONES

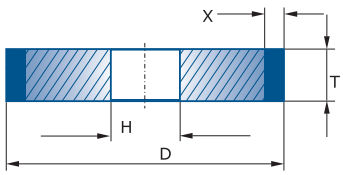
Save costs with greater depth of layer (X)

The greater the depth, the more cost effective; this means longer tool life and less downtime. The additional volume of grain results in only a marginal increase in manufacturing cost i.e. double the depth does not automatically mean twice the price; the wheel life can however be doubled if used correctly.

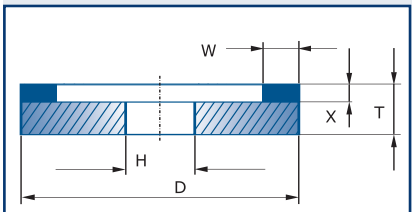
Explanation of symbols (extract from EN 13236)

D	⇨	Outer diameter
E	⇨	Back wall of cup and recessed wheel
H	⇨	Internal diameter
J	⇨	Diameter of wheel boss
L	⇨	Shaft length for mounted points / length of honing stones
R	⇨	Radius
S_d	⇨	Shaft diameter for mounted points
T	⇨	Overall width
W	⇨	Width of layer (also wheel width per EN 13236)
X	⇨	Depth of layer

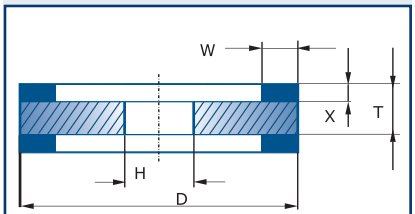
shape 1A1



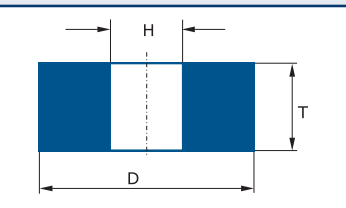
shape 1A2



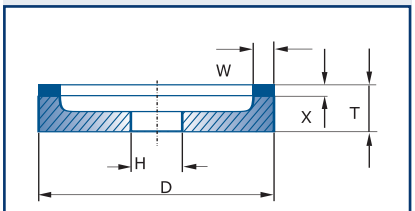
shape 1A3



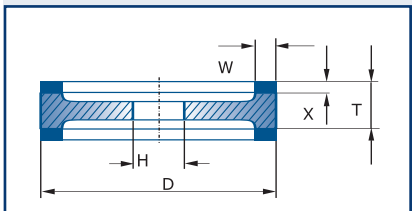
shape 1A8



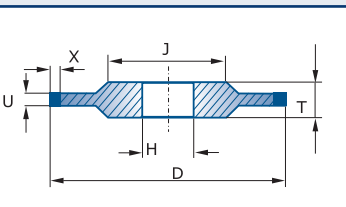
shape 6A2



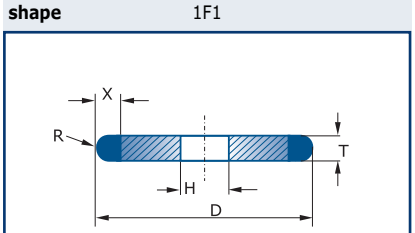
shape 9A3



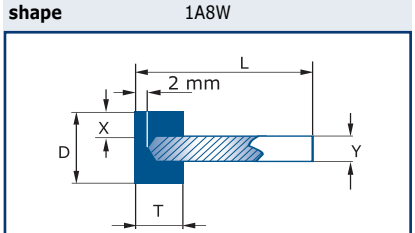
shape 14A1



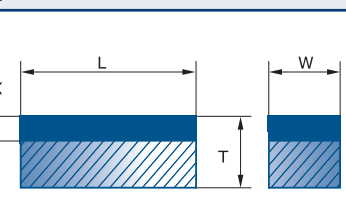
shape 1F1



shape 1A8W



shape HHA



Ideal: a small contact area

The contact area between the workpiece and the diamond/CBN layer should be kept as small as possible.

Advantages: of a small contact area

+ wheel cuts more freely (higher traverse speeds possible)
+ wheel grinds cooler
+ better geometry on flat surfaces
+ better removal of swarf through better coolant effect
+ reduced tool costs

Advantages: of a larger contact area

+ better surface finish
+ better wheel life

Grain types

CBN grain types

Type	Application	Bonding	Available grit sizes
N1B	Universal application - tool steel >58 HRC, HSS, stainless, alloyed steels – grain is not coated	**V**	252 - 46
M1B	Finishing operations – roller bearing steels, tool steels, high alloys and stainless with > 58 HRC	**V**	35 - 3
40B	As in N1B but longer tool life	**V**	252 - 46
N2B	As in N1B but with resin bond only	**B**	252 - 46
M2B	As in M1B but with resin bond only	**B**	30 - 15
42B	As in N2B but with considerably longer tool life	**B**	252 - 46
50B	Precision grinding of hardened and soft iron alloys and cast iron	**V**	252 - 46
51B	**Titanium** coated workpieces	**V**	252 - 46
52B	For extremely tough wear resistant tool steels and carbon sintered steels	**B**	252 - 76
55B	Precision grinding for hard / soft iron alloys - require grain with good thermal conductivity	**V**	602 - 91
56B	As 55B with resin bond only	**B**	602 - 181

Diamond grain types

Type	Application	Bonding	Available grit sizes
VGD	Not coated - irregular shape - bonds well - very friable - keeps sharp. Recommended for **wet** grinding of tungsten carbide, PCD, glass and ceramics	**B** **V**	301 - 76
VMD	Fine grit version of VGD	**B** **V**	30 - 3
BMD	Fine grit similar to VMD, greater physical hardness - less friable - square shaped - particularly suitable for grinding PCD and PCB	**B** **V**	30 - 3
56D	Identical to **VGD** but coated to give longer tool life with the same friability	**B**	301 - 46
MND	Fine grit version of 56D	**B**	30 - 15
GDD	Good thermal conductivity – coated for **dry** grinding – bonds well	**B**	151 - 46
88D	Particularly cost-effective for wet grinding of short-chip materials e.g. **tungsten carbide**	**B**	252 - 46
CSD	Special grain type for grinding **carbide / steel combination** with a steel content of less than 30 %	**B**	252 - 46

Diamond and CBN grit sizes

ATLANTIC
GRINDING WHEELS + HONING STONES

CBN and diamond for cost effective stock removal

In order to achieve a satisfactory stock removal rate and wheel infeed, it is essential to maintain a certain height of grit standing proud of the bond; this should lie between 20-30 % of the average grit diameter. If an infeed rate is excessive, the grain particles will be prematurely discarded from the bond.

Basically, by using a coarser grit size (dependent upon the surface finish), the stock can be removed more economically.

Achievable surface finishes

Average values (alteration necessary in certain cases)

Surface finish		CBN - common grit sizes		Diamond - common grit sizes	
R_a [µm]	Rt [µm]	Surface	cylindrical	Surface	cylindrical
0.5	2.1 - 4.0	126 - 151	64 - 76	151 - 181	107 - 151
0.4	1.7 - 3.5	91 - 107	54 - 64	126 - 151	107 - 126
0.3	1.3 - 2.5	64 - 76	46 - 54	107	76 - 91
0.2	0.9 - 1.8	54	46	91	54 - 64
0.1	0.5 - 1.2	25 - 46		64	46

Diamond and CBN grit sizes

Fepa - Standard		Nominal mesh size µm	US - Mesh ANSI - B74.16.71		UK - Standard ASTM - E -11-70
narrow	wide		narrow	wide	narrow
1181	1182	1180 / 1000	16 / 18	16/ 20	18 / 20
1001		1000 / 850			
851	852	850 / 710	20 / 25	20/ 30	25 / 30
711		710 / 600			
601	602	600 / 500	30 / 35	30/ 40	35 / 40
501		500 / 425			
426	427	425 / 355	40 / 45	40/ 50	45 / 50
356		355 / 300			
301		300 / 250	50 / 60		50 / 60
Common grit sizes used					
251	252	250 / 212	60 / 70		70 / 80
213		212 / 180			
181		180 / 150	80 / 100		80 / 100
151		150 / 125	100 / 120		100 / 120
126		125 / 106	120 / 140		120 / 140
107		106 / 90	140 / 170		140 / 170
91		90 / 5	170 / 200		170 / 200
76		75 / 63	200 / 230		200 / 230
64		63 / 53	230 / 270		230 / 270
54		53 / 45	270 / 325		270 / 325
46		45 / 38	325 / 400		325 / 400

Micro grits

Fepa	limits (µm)	ANSI
M63	42 / 64	45
M40	27 / 53	30
M25	16 / 34	15
M16	10 / 22	9
M10	6 / 14	

Fepa	limits (µm)
M6.3	4 / 9
M4.0	2.5 / 6.5
M2.5	1.5 / 3.5
M1.6	1 / 2.5
M1.0	0.5 / 1.5

Hardness – structure

Hardness identification

The hardness of a CBN or diamond grinding wheel is identified by a letter after the grit size. Superabrasives however, do not cover the total range found in conventional wheels i.e. very soft **A** to very hard **Z**.

The hardness of **resin** bonded superabrasives is defined as follows:

J ⇨ very soft

N ⇨ soft

R ⇨ medium hard

V ⇨ hard

Vitrified bonded wheels lie mainly in the hardness range from **M** to maximum **R**.

Harder specifications for:

- long chip materials
- narrow width of diamond / CBN layer
- grinding where highly effective coolant / lubricant is used

Softer specifications for:

- short-chip materials
- wider layers of diamond / CBN
- dry grinding or low concentration soluble
- fine grit sizes

Structure

Individual solutions for maximum economy

The structure of a grinding wheel is defined as the ratio between the volume of grain, bonding and pores. The greater the volume of grain and / or bond means less space for the pores which in turn means a denser product.

Vitrified bonds –
structure is denoted by a number from **40 (open) to 50 (dense)**

Resin bonds

> 16 ⇨ (very open / very soft)

11-15 ⇨ (open / soft)

5-10 ⇨ (normal / medium hardness)

< 5 ⇨ (dense / hard)

Advantages of **open** structure

- softer, cooler cutting
- less heat generation at point of contact
- good absorbtion of coolant
- less chance of 'loading'
- easy to condition/dress

Disadvantages of **open** structure

- higher wear rate
- poor profile holding capability

Advantages of **dense** structure

- good profile holding capability
- better surface finish
- better stock removal
- more cost effective due to longer wheel life

Disadvantages of **denser** structure

- danger of loading
- danger of burning
- complicated conditioning / dressing process

ATLANTIC GRINDING WHEELS + HONING STONES

Vitrified bonds

Identification	Characteristic	Application
V YA	friable flowing bond with high % glass	only for rough grinding (seldom used)
V YA1		good profile holding **universal**
V YA2		as VYA1 but for finer than B91
V YC		tougher than VYA1

Notes:

- mainly used with CBN
- mainly used for wet grinding
- no limit on shelf life / resistant to high pH-value
- better profile holding capability in comparison to resin bond
- good for long-chip materials (higher porosity)
- can be conditioned/dressed with normal dressing tools

Resin bonds

Identification	Characteristic	Bond wear rate
B XA	very elastic and tough	higher
B XB	hard and friable	lower
B XC	elastic and cool cutting	higher
B XE	used for micro grits	lower

Notes:

- universal application
- wet or dry grinding
- limited shelf life after contact with high pH-coolant
- poor profile holding capability in comparison to metal or vitrified bond
- good for short-chip materials
- sometimes complicated dressing process required
- after conditioning, hand dressing is generally required to cut back the bond

Concentration – conditioning – dressing

The concentration is the weight in carats of diamond or CBN per cm³ of the layer. One carat equals 0.2 g. The base value of 100 concentration equates exactly to 4.4 carat/cm³.

Concentration	ct / cm³
25	1.1
50	2.2
75	3.3
100	4.4

Concentration	ct / cm³
125	5.5
150	6.6
175	7.7
200	8.8

Applications for **low** concentration **(25-50)**

- finish grinding / finishing
- extremely wide layers

Applications for **medium** concentration **(50-100)**

- medium grit sizes
- plain wheels for surface and cylindrical grinding
- bondings with medium hardness
- wider layers

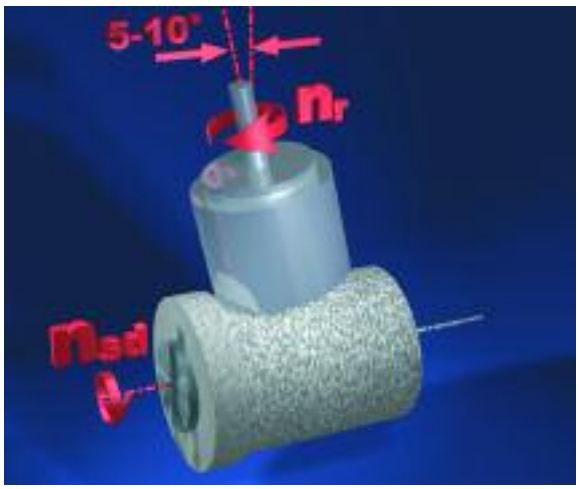
Applications for **high** concentration **(125-200)**

- internal grinding
- creep-feed and profile grinding (good profile holding)
- bondings with greater hardness
- narrow layers

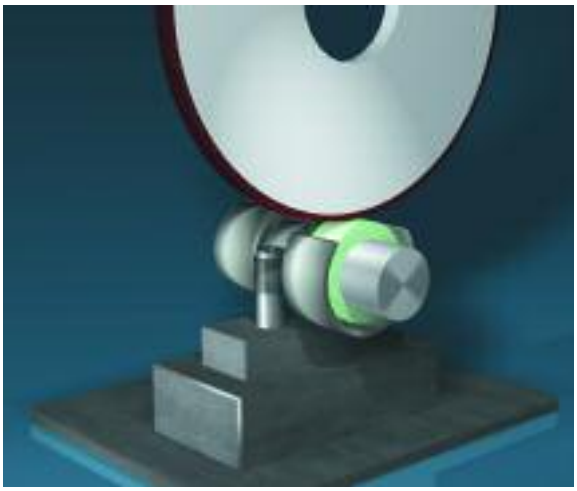
Dressing possibilities

Conditioning of diamond and CBN can be divided into dressing, profiling and sharpening. Dressing (mainly associated with vitrified bonded wheels) produces the required concentricity, flatness and geometric accuracy. In general, the same dressing tools are used as for conventional wheels e.g. blade type, multi-point / single point diamond or roller. The profile to be dressed and the machine capability determine whether a rotating or fixed dressing tool should be used. A rotating dressing tool is always preferable due to cost reasons. Maximising the time taken between dressing does not necessarily give the best result. By reducing the dressing infeed at shorter intervals, one can maintain a consistently good result in terms of holding geometric tolerances, taking greater care of the dressing tool and enhancing tool life.

Examples of dressing with a rotary dressing tool



Dressing with rotary cup-wheel

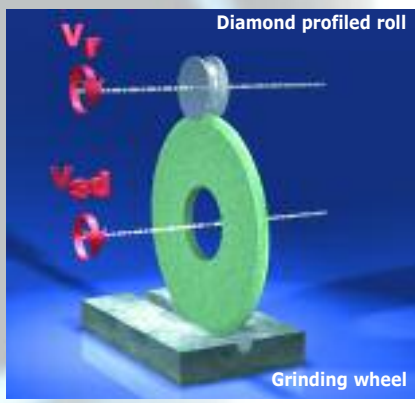


Centrifugal brake dressing tool

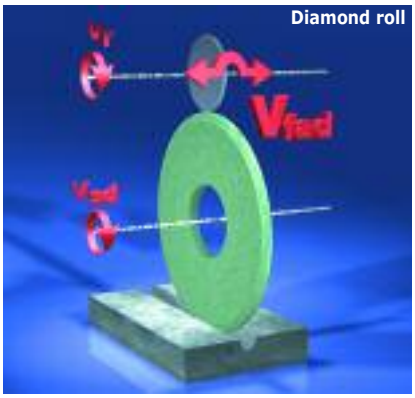
ATLANTIC
GRINDING WHEELS + HONING STONES

Profiling

A rotating diamond dresser is normally used to generate the required profile on the periphery of the grinding wheel. This is achieved by the dressing tool following the contour i.e. path controlled, or by using a pre-profiled diamond roll.



Pre-profiled rotary dresser



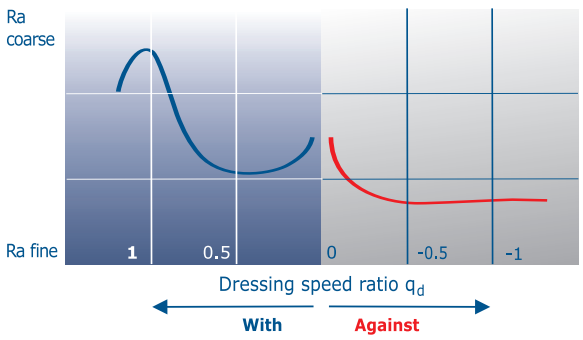
Path-controlled rotary dresser

Influencing factors using a pre-profiled diamond roll

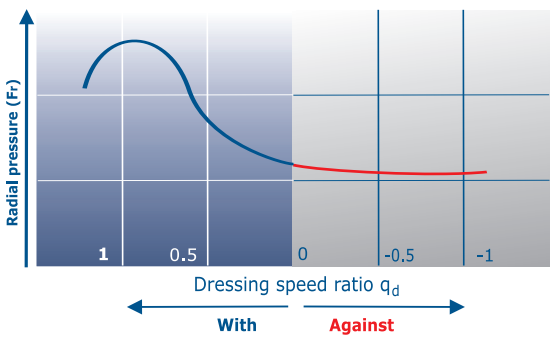
- **S**peed ratio $q_d = v_r / v_{sd}$
- **S**ame/opposite rotational direction
- **D**ressing infeed per grinding wheel v_{fd}

Influencing factors using a path-controlled rotary dresser

- **S**peed ratio $q_d = v_r / v_{sd}$
- **S**ame / opposite rotational direction
- **C**ross traverse per grinding wheel revolution f_d
- **I**nfeed a_d



Effect of dressing in the same / opposite rotational direction in conjunction with the dressing speed ratio (q_d) on the initial surface finish.



Effect of dressing in the same / opposite rotational direction in conjunction with the dressing speed ratio (q_d) on the radial pressure (F_r)

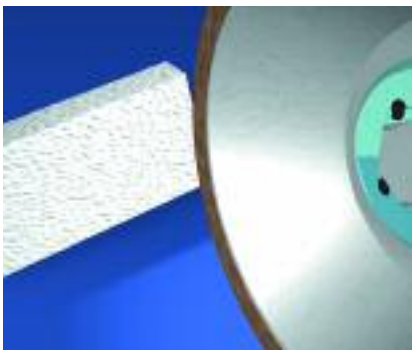
Sharpening

Sharpening applies only when a layer becomes blunt and / or at the end of a normal dressing or profiling cycle. By exposing the grit, each grain particle stands proud of the bonding (20-30 % of the grit diameter).

Sharpening results in the removal of loaded material or foreign particles and cuts back the bonding.

Sharpening after normal dressing or profiling is necessary when the bonding has not been sufficiently cut back to achieve the correct grain exposure.

Normally, an aluminium oxide sharpening / dressing stone is used.



A wide selection for the perfect finish

The use of high performance abrasives has become an important factor regarding both the function and economic viability of production in most areas of industry. The progress in tool development relates directly to the continuous optimisation of the quality of abrasive products; Atlantik GmbH has sold such products throughout the world for over 80 years under the trade name **ATLANTIC**.

Atlantik GmbH is your competent partner for the service and customer orientated production of bonded abrasives in all types of grain (aluminium oxide, silicon carbide, sintered aluminium oxide, diamond and cubic boron nitride) in both resin and vitrified bonds.

More possibilities from A – Z with millions of permutations

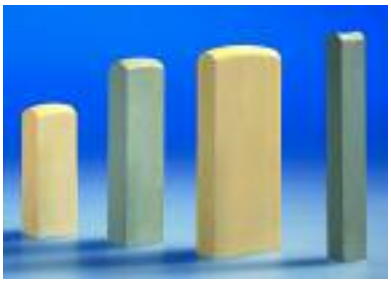
ATLANTIC abrasive products are used in the automobile, steel and bearing industries as also indeed within their supply chain.
In order to satisfy the requirements, **ATLANTIC** abrasive products achieve high stock removal rates and good surface finish.

Today, the company produces approx. 40 000 different products from which numerous variations are also possible.

Competence to the core

The various application requirements can seldom be fulfilled with a universal specification.
The quality is specifically tailored to the application.

- **Grinding wheels and segments**
- **Diamond and CBN wheels**
- **Honing and superfinishing stones**



Contents

Ideal for high production volumes

Due to their outstanding wheel life and resistance to wear, diamond and CBN grinding wheels have successfully replaced many machining and stock removal techniques using conventional grit type wheels. They are particularly cost effective in high volume production.

Diamond wheels

They are particularly cost effective for grinding brittle and short-chip materials e.g. ceramic, glass, tungsten carbide, titanium, alloyed steel, graphite, magnetic sintered and composite materials.

Diamond is the hardest grinding media known to-date (Knoops hardness 8,000) and like cubic boron nitride, is synthetically manufactured. Diamond can even be used for machining plastic and for some special applications e.g. honing of steel and grey cast iron.

Crystalline cubic boron nitride

CBN does not have quite the same hardness characteristic as diamond; however, the disintegration temperature is greater than 1,500 °C and is produced by a combination of high pressure and high temperature.

CBN (Knoops hardness 4,700) is considerably harder than alumina and silicon carbide; due to its low wear rate, it produces the required profile and geometric tolerances in most instances. Maximum cost effectiveness of CBN is achieved when grinding hardened high alloyed, difficult to grind steels over 60 HRC e.g. tool or chrome steel. Contrary to diamond, CBN is suitable for grinding carbide forming materials.

Wheel shapes – coding systems

Customer orientated quality without compromise

A letter – numeral coding system is used to specify the **ATLANTIC** products. By using a complete combination of quality control methods, maintaining the precise quality is guaranteed. The documentation of this data ensures traceability and the ability to reproduce the identical **ATLANTIC** product.

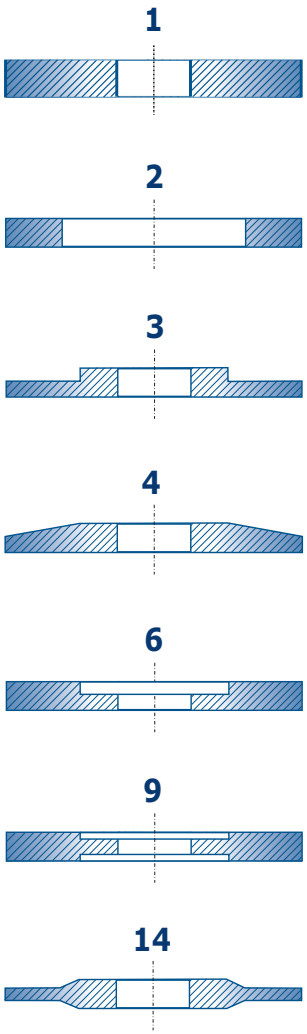
1 Grain type
2 Grit size
3 Hardness
4 Structure
5 Bond characteristic
6 **ATLANTIC** bonding type
7 Concentration

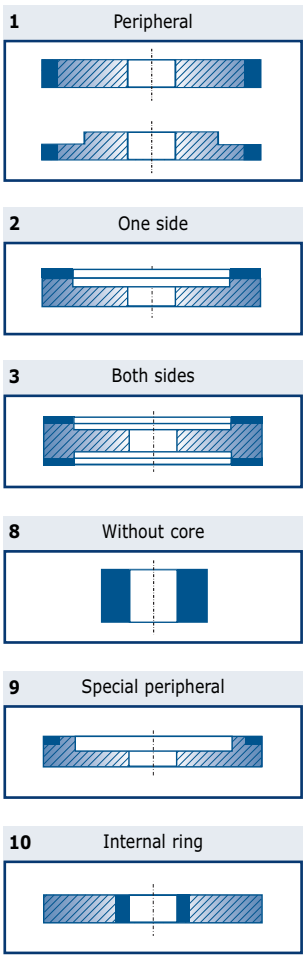
Coding system

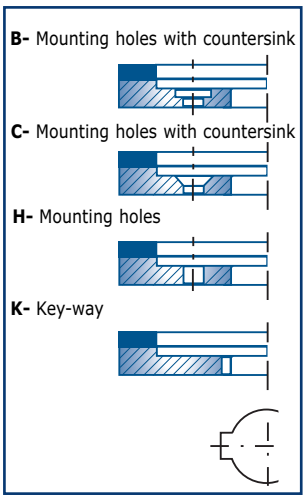
Coding

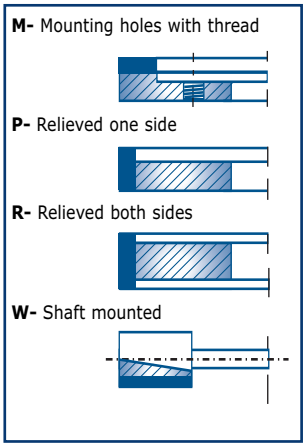
example

6	A	2	C
Core shape	Shape of CBN / diamond layer	Configuration of CBN / diamond layer	Exceptions (e.g. with mounting holes)









ATLANTIC
GRINDING WHEELS + HONING STONES

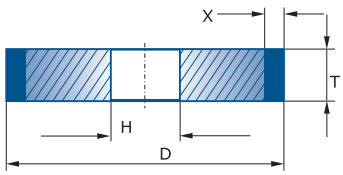
Save costs with greater depth of layer (X)

The greater the depth, the more cost effective; this means longer tool life and less downtime. The additional volume of grain results in only a marginal increase in manufacturing cost i.e. double the depth does not automatically mean twice the price; the wheel life can however be doubled if used correctly.

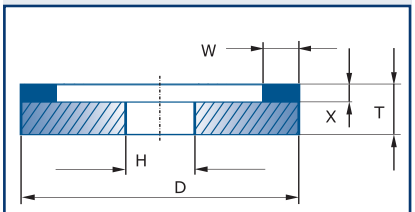
Explanation of symbols (extract from EN 13236)

D	⇨	Outer diameter
E	⇨	Back wall of cup and recessed wheel
H	⇨	Internal diameter
J	⇨	Diameter of wheel boss
L	⇨	Shaft length for mounted points / length of honing stones
R	⇨	Radius
S_d	⇨	Shaft diameter for mounted points
T	⇨	Overall width
W	⇨	Width of layer (also wheel width per EN 13236)
X	⇨	Depth of layer

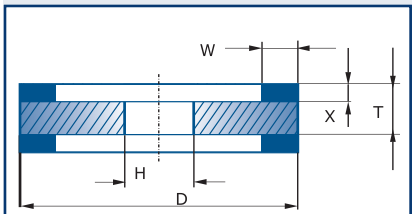
shape 1A1



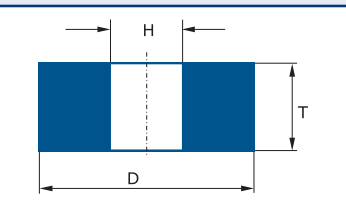
shape 1A2



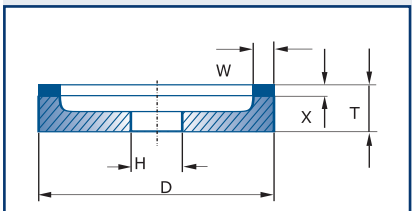
shape 1A3



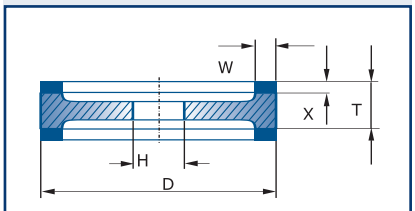
shape 1A8



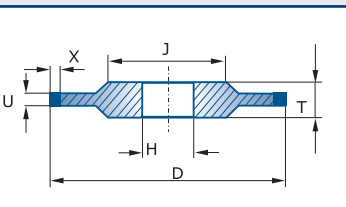
shape 6A2



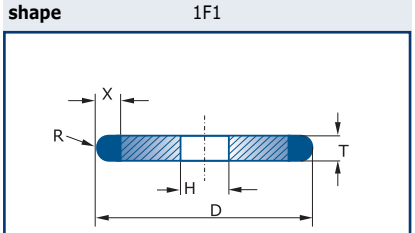
shape 9A3



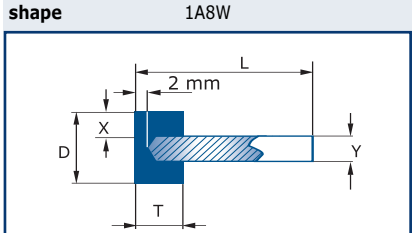
shape 14A1



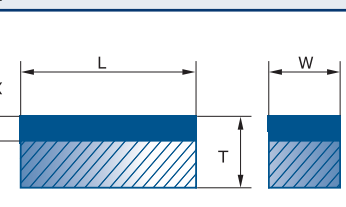
shape 1F1



shape 1A8W



shape HHA



Ideal: a small contact area

The contact area between the workpiece and the diamond/CBN layer should be kept as small as possible.

Advantages: of a small contact area

+ wheel cuts more freely (higher traverse speeds possible)
+ wheel grinds cooler
+ better geometry on flat surfaces
+ better removal of swarf through better coolant effect
+ reduced tool costs

Advantages: of a larger contact area

+ better surface finish
+ better wheel life

Grain types

CBN grain types

Type	Application	Bonding	Available grit sizes
N1B	Universal application - tool steel >58 HRC, HSS, stainless, alloyed steels – grain is not coated	**V**	252 - 46
M1B	Finishing operations – roller bearing steels, tool steels, high alloys and stainless with > 58 HRC	**V**	35 - 3
40B	As in N1B but longer tool life	**V**	252 - 46
N2B	As in N1B but with resin bond only	**B**	252 - 46
M2B	As in M1B but with resin bond only	**B**	30 - 15
42B	As in N2B but with considerably longer tool life	**B**	252 - 46
50B	Precision grinding of hardened and soft iron alloys and cast iron	**V**	252 - 46
51B	**Titanium** coated workpieces	**V**	252 - 46
52B	For extremely tough wear resistant tool steels and carbon sintered steels	**B**	252 - 76
55B	Precision grinding for hard / soft iron alloys - require grain with good thermal conductivity	**V**	602 - 91
56B	As 55B with resin bond only	**B**	602 - 181

Diamond grain types

Type	Application	Bonding	Available grit sizes
VGD	Not coated - irregular shape - bonds well - very friable - keeps sharp. Recommended for **wet** grinding of tungsten carbide, PCD, glass and ceramics	**B** **V**	301 - 76
VMD	Fine grit version of VGD	**B** **V**	30 - 3
BMD	Fine grit similar to VMD, greater physical hardness - less friable - square shaped - particularly suitable for grinding PCD and PCB	**B** **V**	30 - 3
56D	Identical to **VGD** but coated to give longer tool life with the same friability	**B**	301 - 46
MND	Fine grit version of 56D	**B**	30 - 15
GDD	Good thermal conductivity – coated for **dry** grinding – bonds well	**B**	151 - 46
88D	Particularly cost-effective for wet grinding of short-chip materials e.g. **tungsten carbide**	**B**	252 - 46
CSD	Special grain type for grinding **carbide / steel combination** with a steel content of less than 30 %	**B**	252 - 46

Diamond and CBN grit sizes

ATLANTIC
GRINDING WHEELS + HONING STONES

CBN and diamond for cost effective stock removal

In order to achieve a satisfactory stock removal rate and wheel infeed, it is essential to maintain a certain height of grit standing proud of the bond; this should lie between 20-30 % of the average grit diameter. If an infeed rate is excessive, the grain particles will be prematurely discarded from the bond.

Basically, by using a coarser grit size (dependent upon the surface finish), the stock can be removed more economically.

Achievable surface finishes

Average values (alteration necessary in certain cases)

Surface finish		CBN - common grit sizes		Diamond - common grit sizes	
R_a [µm]	Rt [µm]	Surface	cylindrical	Surface	cylindrical
0.5	2.1 - 4.0	126 - 151	64 - 76	151 - 181	107 - 151
0.4	1.7 - 3.5	91 - 107	54 - 64	126 - 151	107 - 126
0.3	1.3 - 2.5	64 - 76	46 - 54	107	76 - 91
0.2	0.9 - 1.8	54	46	91	54 - 64
0.1	0.5 - 1.2	25 - 46		64	46

Diamond and CBN grit sizes

Fepa - Standard		Nominal mesh size µm	US - Mesh ANSI - B74.16.71		UK - Standard ASTM - E -11-70
narrow	wide		narrow	wide	narrow
1181	1182	1180 / 1000	16 / 18	16/ 20	18 / 20
1001		1000 / 850			
851	852	850 / 710	20 / 25	20/ 30	25 / 30
711		710 / 600			
601	602	600 / 500	30 / 35	30/ 40	35 / 40
501		500 / 425			
426	427	425 / 355	40 / 45	40/ 50	45 / 50
356		355 / 300			
301		300 / 250	50 / 60		50 / 60
Common grit sizes used					
251	252	250 / 212	60 / 70		70 / 80
213		212 / 180			
181		180 / 150	80 / 100		80 / 100
151		150 / 125	100 / 120		100 / 120
126		125 / 106	120 / 140		120 / 140
107		106 / 90	140 / 170		140 / 170
91		90 / 5	170 / 200		170 / 200
76		75 / 63	200 / 230		200 / 230
64		63 / 53	230 / 270		230 / 270
54		53 / 45	270 / 325		270 / 325
46		45 / 38	325 / 400		325 / 400

Micro grits

Fepa	limits (µm)	ANSI
M63	42 / 64	45
M40	27 / 53	30
M25	16 / 34	15
M16	10 / 22	9
M10	6 / 14	

Fepa	limits (µm)
M6.3	4 / 9
M4.0	2.5 / 6.5
M2.5	1.5 / 3.5
M1.6	1 / 2.5
M1.0	0.5 / 1.5

Hardness – structure

Hardness identification

The hardness of a CBN or diamond grinding wheel is identified by a letter after the grit size. Superabrasives however, do not cover the total range found in conventional wheels i.e. very soft **A** to very hard **Z**.

The hardness of **resin** bonded superabrasives is defined as follows:

J ⇨ very soft

N ⇨ soft

R ⇨ medium hard

V ⇨ hard

Vitrified bonded wheels lie mainly in the hardness range from **M** to maximum **R**.

Harder specifications for:

- long chip materials
- narrow width of diamond / CBN layer
- grinding where highly effective coolant / lubricant is used

Softer specifications for:

- short-chip materials
- wider layers of diamond / CBN
- dry grinding or low concentration soluble
- fine grit sizes

Structure

Individual solutions for maximum economy

The structure of a grinding wheel is defined as the ratio between the volume of grain, bonding and pores. The greater the volume of grain and / or bond means less space for the pores which in turn means a denser product.

Vitrified bonds –
structure is denoted by a number from **40 (open) to 50 (dense)**

Resin bonds

> 16 ⇨ (very open / very soft)

11-15 ⇨ (open / soft)

5-10 ⇨ (normal / medium hardness)

< 5 ⇨ (dense / hard)

Advantages of **open** structure

- softer, cooler cutting
- less heat generation at point of contact
- good absorbtion of coolant
- less chance of 'loading'
- easy to condition/dress

Disadvantages of **open** structure

- higher wear rate
- poor profile holding capability

Advantages of **dense** structure

- good profile holding capability
- better surface finish
- better stock removal
- more cost effective due to longer wheel life

Disadvantages of **denser** structure

- danger of loading
- danger of burning
- complicated conditioning / dressing process

ATLANTIC GRINDING WHEELS + HONING STONES

Vitrified bonds

Identification	Characteristic	Application
V YA	friable flowing bond with high % glass	only for rough grinding (seldom used)
V YA1		good profile holding **universal**
V YA2		as VYA1 but for finer than B91
V YC		tougher than VYA1

Notes:

- mainly used with CBN
- mainly used for wet grinding
- no limit on shelf life / resistant to high pH-value
- better profile holding capability in comparison to resin bond
- good for long-chip materials (higher porosity)
- can be conditioned/dressed with normal dressing tools

Resin bonds

Identification	Characteristic	Bond wear rate
B XA	very elastic and tough	higher
B XB	hard and friable	lower
B XC	elastic and cool cutting	higher
B XE	used for micro grits	lower

Notes:

- universal application
- wet or dry grinding
- limited shelf life after contact with high pH-coolant
- poor profile holding capability in comparison to metal or vitrified bond
- good for short-chip materials
- sometimes complicated dressing process required
- after conditioning, hand dressing is generally required to cut back the bond

Concentration – conditioning – dressing

The concentration is the weight in carats of diamond or CBN per cm³ of the layer. One carat equals 0.2 g. The base value of 100 concentration equates exactly to 4.4 carat/cm³.

Concentration	ct / cm³
25	1.1
50	2.2
75	3.3
100	4.4

Concentration	ct / cm³
125	5.5
150	6.6
175	7.7
200	8.8

Applications for **low** concentration **(25-50)**

- finish grinding / finishing
- extremely wide layers

Applications for **medium** concentration **(50-100)**

- medium grit sizes
- plain wheels for surface and cylindrical grinding
- bondings with medium hardness
- wider layers

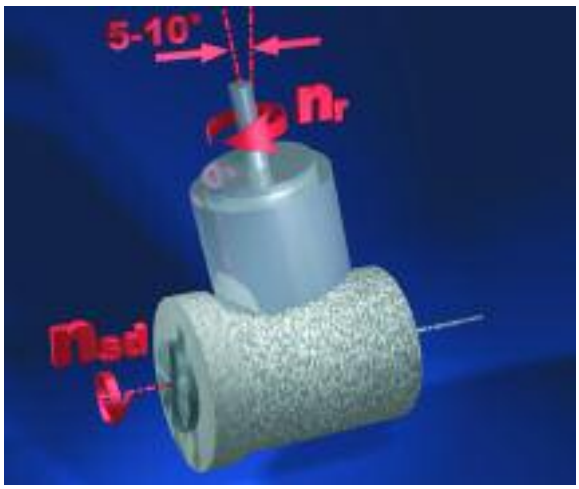
Applications for **high** concentration **(125-200)**

- internal grinding
- creep-feed and profile grinding (good profile holding)
- bondings with greater hardness
- narrow layers

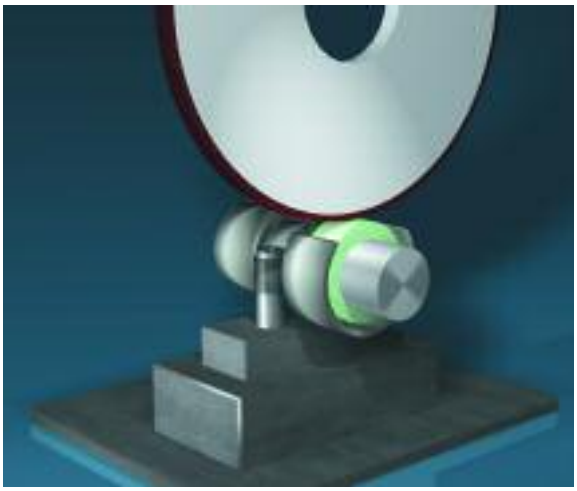
Dressing possibilities

Conditioning of diamond and CBN can be divided into dressing, profiling and sharpening. Dressing (mainly associated with vitrified bonded wheels) produces the required concentricity, flatness and geometric accuracy. In general, the same dressing tools are used as for conventional wheels e.g. blade type, multi-point / single point diamond or roller. The profile to be dressed and the machine capability determine whether a rotating or fixed dressing tool should be used. A rotating dressing tool is always preferable due to cost reasons. Maximising the time taken between dressing does not necessarily give the best result. By reducing the dressing infeed at shorter intervals, one can maintain a consistently good result in terms of holding geometric tolerances, taking greater care of the dressing tool and enhancing tool life.

Examples of dressing with a rotary dressing tool



Dressing with rotary cup-wheel

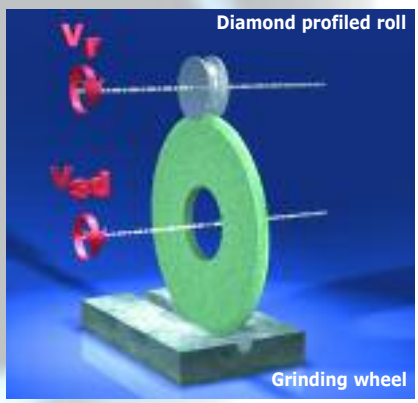


Centrifugal brake dressing tool

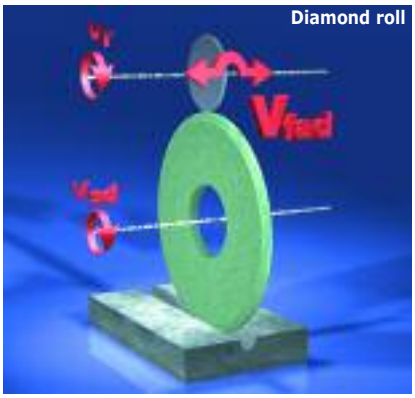
ATLANTIC
GRINDING WHEELS + HONING STONES

Profiling

A rotating diamond dresser is normally used to generate the required profile on the periphery of the grinding wheel. This is achieved by the dressing tool following the contour i.e. path controlled, or by using a pre-profiled diamond roll.



Pre-profiled rotary dresser



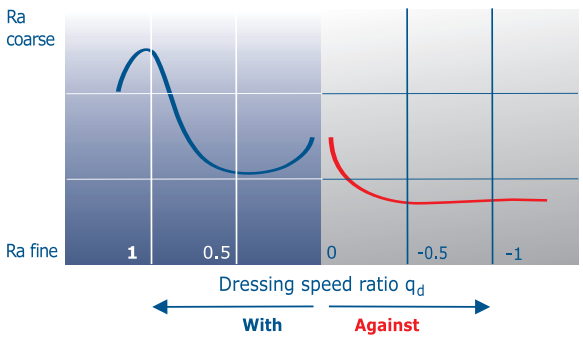
Path-controlled rotary dresser

Influencing factors using a pre-profiled diamond roll

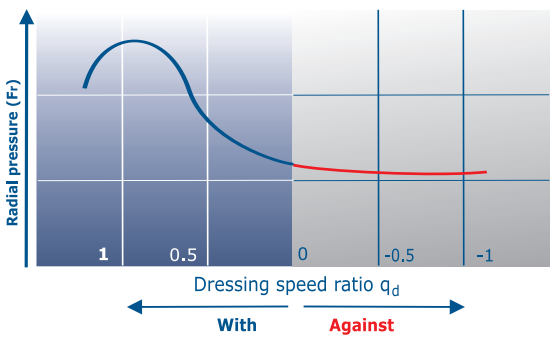
- **S**peed ratio $q_d = v_r / v_{sd}$
- **S**ame/opposite rotational direction
- **D**ressing infeed per grinding wheel v_{fd}

Influencing factors using a path-controlled rotary dresser

- **S**peed ratio $q_d = v_r / v_{sd}$
- **S**ame / opposite rotational direction
- **C**ross traverse per grinding wheel revolution f_d
- **I**nfeed a_d



Effect of dressing in the same / opposite rotational direction in conjunction with the dressing speed ratio (q_d) on the initial surface finish.



Effect of dressing in the same / opposite rotational direction in conjunction with the dressing speed ratio (q_d) on the radial pressure (F_r)

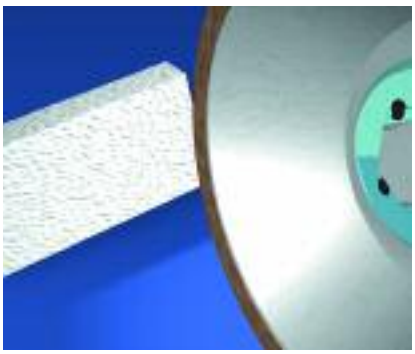
Sharpening

Sharpening applies only when a layer becomes blunt and / or at the end of a normal dressing or profiling cycle. By exposing the grit, each grain particle stands proud of the bonding (20-30 % of the grit diameter).

Sharpening results in the removal of loaded material or foreign particles and cuts back the bonding.

Sharpening after normal dressing or profiling is necessary when the bonding has not been sufficiently cut back to achieve the correct grain exposure.

Normally, an aluminium oxide sharpening / dressing stone is used.



Recommend specifications
– Internal grinding –

The following tables list successful applications using **ATLANTIC** diamond and CBN grinding wheels

Internal grinding

Hardened steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 126-R08 B XA 75	N1B 126-P50 V YA1 200
0.2 - 0.4	N2B 107-R08 B XA 75	N1B 107-P50 V YA1 150
< 0.2	N2B 76-R05 B XA 50	N1B 76-Q50 V YA2 100
≤ 0.1	N2B 46-R05 B XA 50	N1B 46-Q50 V YA2 75

Soft steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	42B 126-R05 B XA 75	50B 126-P50 V YA1 200
0.2 - 0.4	42B 107-R05 B XA 75	50B 107-P50 V YA1 150
< 0.2	42B 76-V03 B XA 50	50B 76-Q50 V YA2 100
≤ 0.1	42B 46-V03 B XA 50	50B 46-Q50 V YA2 75

Super-refined alloyed steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 126-R08 B XA 75	N1B 126-P50 V YA1 200
0.2 - 0.4	N2B 107-R08 B XA 75	N1B 107-P50 V YA1 150
< 0.2	N2B 76-R05 B XA 50	N1B 76-Q50 V YA2 100
≤ 0.1	N2B 46-R05 B XA 50	N1B 46-Q50 V YA2 75

Tool steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	52B 126-R08 B XA 75	40B 126-P50 V YA1 200
0.2 - 0.4	52B 107-R08 B XA 75	40B 107-P50 V YA1 150
≤ 0.2	52B 76-R05 B XA 50	40B 76-Q50 V YA2 100
≤ 0.1	42B 46-R05 B XA 50	40B 46-Q50 V YA2 75

High alloyed steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 126-R05 B XA 75	N1B 126-P50 V YA1 200
0.2 - 0.4	N2B 107-R05 B XA 75	N1B 107-P50 V YA1 150
< 0.2	N2B 76-V03 B XA 50	N1B 76-Q50 V YA2 100
≤ 0.1	N2B 46-V03 B XA 50	N1B 46-Q50 V YA2 75

Non-ferrous metals

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 126-R05 B XA 75	N1B 126-P50 V YA1 200
0.2 - 0.4	N2B 107-R05 B XA 75	N1B 107-P50 V YA1 150
< 0.2	N2B 76-V03 B XA 50	N1B 76-Q50 V YA2 100
≤ 0.1	N2B 46-V03 B XA 50	N1B 46-Q50 V YA2 75

Tungsten carbide / ceramics

Surface finish in µm Ra	Tungsten carbide	Ceramics / glass
> 0.4	88D 126-V00 B XB 150	VGD 126-V00 B XB 150
0.2 - 0.4	88D 107-V00 B XB 150	VGD 107-V00 B XB 150
< 0.2	88D 76-V02 B XB 100	VGD 76-V02 B XB 100
≤ 0.1	88D 46-V02 B XB 100	88D 46-V02 B XB 100

Recommended specifications
– cylindrical grinding –

ATLANTIC
GRINDING WHEELS + HONING STONES

Cylindrical grinding

Hardened steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 64-R10 B XA 75	N1B 64-N42 V YA2 150
0.2 - 0.4	N2B 54-R10 B XA 50	N1B 54-N42 V YA2 100
< 0.2	N2B 46-R09 B XA 50	N1B 46-M44 V YA2 75

Soft steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	42B 64-N11 B XA 75	50B 64-O44 V YA2 200
0.2 - 0.4	42B 54-N11 B XA 50	50B 54-O44 V YA2 150
< 0.2	42B 46-N11 B XA 50	50B 46-N46 V YA2 100

Super-refined alloyed steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 64-R10 B XA 75	N1B 64-N42 V YA2 150
0.2 - 0.4	N2B 54-R10 B XA 50	N1B 54-N42 V YA2 100
< 0.2	N2B 46-R09 B XA 50	N1B 46-M44 V YA2 75

Tool steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	42B 64-R05 B XA 75	40B 64-P50 V YA2 125
0.2 - 0.4	42B 54-R05 B XA 50	40B 54-P50 V YA2 100
< 0.2	42B 46-V03 B XA 50	40B 46-Q50 V YA2 100

High alloyed steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 64-R10 B XA 75	N1B 64-N42 V YA2 150
0.2 - 0.4	N2B 54-R10 B XA 50	N1B 54-N42 V YA2 100
< 0.2	N2B 46-R09 B XA 50	N1B 46-M44 V YA2 75

Non-ferrous metals

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 64-R05 B XA 75	N1B 64-P50 V YA2 200
0.2 - 0.4	N2B 54-R05 B XA 50	N1B 54-P50 V YA2 150
< 0.2	N2B 46-V03 B XA 50	N1B 46-Q50 V YA2 100

Tungsten carbide / ceramics

Surface finish in µm Ra	Tungsten carbide	Ceramic / glass
> 0.4	88D 64-V00 B XB 150	VGD 64-V00 B XB 150
0.2 - 0.4	88D 54-V00 B XB 150	VGD 54-V00 B XB 150
< 0.2	88D 46-V02 B XB 100	VGD 46-V02 B XB 100

Recommended specifications
– surface grinding –

Surface grinding (only shape available 1A1 or similar)

Hardened steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 151-N11 B XA 75	N1B 151-N42 V YA1 125
0.2 - 0.4	N2B 126-N11 B XA 75	N1B 126-N42 V YA1 125
< 0.2	N2B 91-N12 B XA 50	N1B 91-M40 V YA2 100
≤ 0.1	N2B 46-N12 B XC 50	N1B 46-M40 V YA2 100

Soft steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	42B 151-R10 B XA 75	50B 151-P50 V YA1 150
0.2 - 0.4	42B 126-R10 B XA 75	50B 126-P50 V YA1 125
< 0.2	42B 91-R08 B XA 50	50B 91-Q50 V YA2 100

Super-refined alloyed steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 151-N11 B XA 75	N1B 151-N42 V YA1 125
0.2 - 0.4	N2B 126-N11 B XA 75	N1B 126-N42 V YA1 125
< 0.2	N2B 91-N12 B XA 50	N1B 91-M40 V YA2 100
≤ 0.1	N2B 46-N12 B XC 50	N1B 46-M40 V YA2 100

Tool steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	52B 252-N12 B XA 50	40B 252-N42 V YA1 75
0.2 - 0.4	52B 151-N12 B XA 50	40B 151-N42 V YA1 75
< 0.2	52B 126-R10 B XA 50	40B 126-M40 V YA1 50
≤ 0.1	52B 76-R10 B XA 50	40B 76-M40 V YA2 50

High alloyed steel

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 151-N11 B XA 75	N1B 151-N42 V YA1 125
0.2 - 0.4	N2B 126-N11 B XA 75	N1B 126-N42 V YA1 125
< 0.2	N2B 91-N12 B XA 50	N1B 91-M40 V YA2 100
≤ 0.1	N2B 46-N12 B XC 50	N1B 46-M40 V YA2 100

Non-ferrous metals

Surface finish in µm Ra	Resin bond	Vitrified bond
> 0.4	N2B 126-R10 B XA 75	N1B 126-N42 V YA1 150
0.2 - 0.4	N2B 107-R10 B XA 50	N1B 107-N42 V YA1 150
< 0.2	N2B 76-R08 B XA 50	N1B 76-M40 V YA2 100

Tungsten carbide / ceramics

Surface finish in µm Ra	Tungsten carbide	Ceramic / glass
> 0.4	88D 252-R08 B XC 150	VGD 181-R07 B XC 150
0.2 - 0.4	88D 151-R08 B XC 150	VGD 151-R07 B XC 150
< 0.2	88D 126-R10 B XC 100	VGD 126-R08 B XC 100
≤ 0.1	88D 76-R10 B XC 100	

Coolant
Cutting and traverse speed

ATLANTIC
GRINDING WHEELS + HONING STONES

The functions of coolant	
Cooling	⇨ to conduct heat away from the ground component
Lubricant	⇨ minimizing the friction between grit and workpiece
Cleansing	⇨ the removal of swarf and abrasive waste from the contact zone

Required properties of a coolant

A coolant should have the following properties:

- ⇨ to act as a corrosion inhibitor
- ⇨ does not foam
- ⇨ remains stable for long periods
- ⇨ no health hazard
- ⇨ good wetting ability

Types of coolant

Mineral oil

Guarantees maximum lubrication, thus reducing pressure. Grain wear and heat generation are reduced which means an increase in tool life **(up to a factor of 10)** with less damage to the contact area.

Soluble oil

Soluble oils are generally based on water soluble concentrates of mineral oil. This gives a compromise between lubrication and the ability to cool. The higher the percentage of concentrate mixed with the water, the better the lubrication property. Normal concentration levels are 3-8 %.

Synthetic solutions

Synthetic solutions give maximum coolant effect like water, but give a minimum lubrication effect.

Cutting speed

CBN wheels

CBN wheels are particularly suited to high speed grinding. **ATLANTIC** CBN wheels are currently rated for a maximum cutting speed of 125 m/s. Generally speaking, an increase in the peripheral speed enhances the G factor and the Q factor (volume of stock removed in a given time); this of course depends on machine capability and coolant / lubrication equipment. Dry grinding requires lower cutting speeds; this ranges from 20-30 m/s depending on the type of bonding used.

Diamond wheels

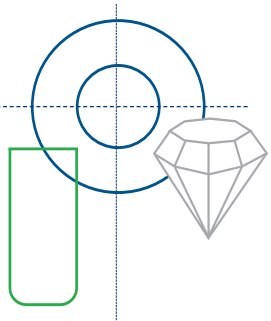
The grinding proceess produces high temperatures which in turn have a detrimental effect on the diamond grain particles; Atlantik GmbH therefore recommend a cutting speed of maximum 50 m/s. For customers requiring higher production rates (e.g. greater Q factor) higher cutting speeds are required. However, the heat generated must be reduced through either an optimised coolant system (very complex) or by using a coated diamond grain which is capable of heat dissipation (e.g. **ATLANTIC** GDD grain type).

Traverse speed(V_{fa})

Grinding application	Traverse speed in m/min
● InternaL	0.5 - 2 m/min
● Cylindrical	~ 1/3 of layer width per workpiece revolution
● Surface (cup wheel)	2 - 5 m/min
● Surface (shape 1A1)	5 - 20 m/min

Atlantik GmbH
Gartenstrasse 7-17
D-53229 Bonn / Germany
Tel. + 49 (228) 408-0
Fax + 49 (228) 408-290
e-mail: info@atlantic-bonn.de
www.atlantic-bonn.de

ATLANTIC
GRINDING WHEELS + HONING STONES
creative & dynamic



Product range – Grinding wheels – Honing stones

The required results can be achieved by the use of optimally selected abrasive media and individually tailored specifications from the **ATLANTIC** product range.

We manufacture:

- **Grinding wheels and segments**
- **Honing and superfinishing stones**
- **From 2 to 1 250 mm diameter**
- **In aluminium oxide and silicon carbide**
- **In diamond and CBN**
- **In vitrified and resin bond**
- **Up to grit size 2 000 and superfine qualities to achieve the finest surface finish**

in all common sizes and profiles – special profiles are manufactured to drawing at customer's request.

- **Surface grinding**
- **Profile surface grinding**
- **Cylindrical grinding**
- **Internal grinding**
- **Centerless grinding**
- **Bar grinding**
- **Roll grinding**
- **Thread grinding**
- **Gear tooth grinding**
- **Crankshaft grinding**
- **Cam grinding**
- **Ball grinding**
- **Tool grinding**
- **Track grinding**
- **Hypodermic needle grinding**

CBN 5000/1.07 GB