

DIAMOND & CBN WHEELS

**NORTON
ADVANTAGE**

Diamond & CBN Grinding Wheels

Diamond and CBN (Cubic Boron Nitride) grinding wheels are available in a wide range of Resin, Vitrified and Metal bonds.



Diamond and CBN wheels are designed to grind very hard materials like Tungsten Carbide, HSS, Hardened Steel, Aero space alloys, Ceramics, Glass and Refractory materials to a high level of precision and quality. Various factors affect selection of the right superabrasive grinding wheel. Application/ Product Engineers from Grindwell Norton will help you select the right product fine-tuned to meet the exact application need. Grindwell Norton also offers a wide range of Resin bond, Metal bond, vitrified bond and Electro-plated wheels for tool regrinding and for job working applications on Carbides, Tool Steels, HSS, Ceramics, Glass, and Refractory materials. These wheels have been optimised in design for various wheel factors like Diamond & CBN type, grit, concentration, bond, and grade to suit a variety of jobs.

TYPICAL APPLICATIONS

Diamond Wheels

- ▶ Tungsten Carbide
- ▶ Hard alloys
- ▶ Ferrites & Ceramics
- ▶ Wear resistant Coatings
- ▶ Glass
- ▶ Gem stones
- ▶ Plastics
- ▶ Graphite
- ▶ Cast Iron

TYPICAL APPLICATIONS

CBN Wheels

- ▶ High Speed Steel
- ▶ Alloy Tool Steels
- ▶ Super Alloys
- ▶ Case hardened Steels

NORTON DIAMOND & CBN WHEELS

FEATURES

- ▶ Best manufacturing techniques
- ▶ Optimised specifications
- ▶ Full range of wheels
- ▶ Stocked in variety of shapes, sizes & bonds

BENEFITS

- ▶ Best performance
- ▶ Superior value
- ▶ Affordable price
- ▶ Low inventories
- ▶ Overall economy

TechTips



- ▶ Truing makes the wheel concentric with the spindle.
- ▶ Dressing opens the wheel's cutting face.
- ▶ Always true and dress diamond and CBN wheels prior to use.
- ▶ Diamond and CBN wheels of grit sizes 100 - 180 mesh can be trued with a Brake Controlled Truing Device mounted with AlO or SiC wheels.

See *Diamond and CBN Wheel Care and Usage* section (Page S8) for more details.

DIAMOND & CBN WHEELS

How to Designate?

Norton Diamond & CBN Wheels are fully designated by Wheel Type, Abrasive, Mesh Size, Grade, Concentration and Bond Type. To designate and order a special wheel fully, the following important steps have to be followed:

1. Specify wheel type
2. Specify Abrasive type, mesh, concentration
3. Specify dimensions

1. Specify Type of Wheel:

The wheel shown below is a 6A2 wheel

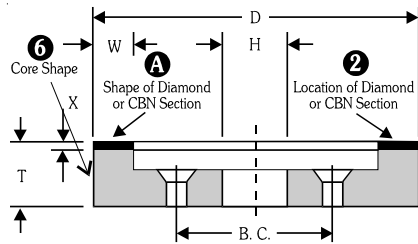


Fig. 1

2. Specify Abrasive, Mesh Size, Grade, Conc.:

Wheel Type	Abrasive	Mesh Size	Grade	Conc	Bond
6A2	ASD	126	R	75	B2
Choose from chart	Choose diamond or CBN type	Choose mesh size in FEPA	Choose proper grade	Choose right concentration	Choose bond type

3. Specify Dimensions:

The important wheel dimensions to be specified are

- 1 = Diameter of the wheel 'D'
- 2 = Width of the Abrasive Section W or V
- 3 = Depth of Abrasive X
- 4 = Overall thickness of wheel T
- 5 = Bore of the wheel H

Note: See example in Fig. 1

Type of Wheel:

This indicates the shape of the wheel and is typified by 4 digits.

1ST DIGIT INDICATES CORE SHAPE WHICH CAN BE 1, 2, 3, 4, 6, 9, 11, 12, 14, 15	2ND DIGIT INDICATES SHAPE OF THE ABRASIVE SECTION AND IS INDICATED BY 1 OR 2 ALPHABETS AND CHOSEN FROM CHART	3rd Digit INDICATES THE LOCATION OF THE ABRASIVE SECTION
1	A GN	1 - Periphery
2	AH H	
3	B J	2 - Side
4	BT K	
6	C L	3 - Both Sides
9	CH LL	4 - Inside Bevel or Arc
11	D M	5 - Outside Bevel or Arc
12	DD P	6 - Part of Periphery
14	E Q	8 - Throughout
15	EE QQ	9 - Corner
	ER S	
	ET U	
	F V	
	FF Y	
	G	

DIAMOND & CBN WHEELS



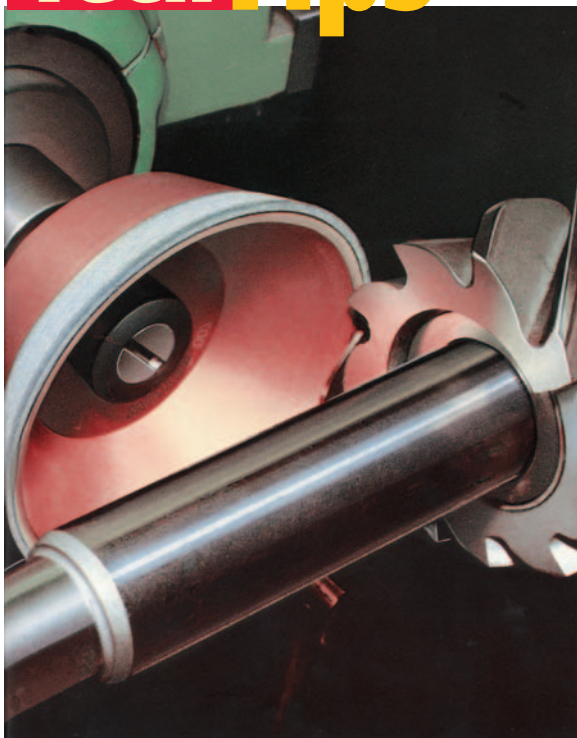
STOCK AVAILABILITY

Norton Range Diamond & CBN Wheels

	S.S.	BOND	TYPE	DIAM	WIDTH	DI	BORE	DIA/CBN	CONC.	BOND
	CODE			D	W	X	H	GRIT		
	SA15	Resin	11V9	90	10	1.5	31.75	ASD126	R50	B1
	SA13	Resin	11V9	100	10	1.5	31.75	ASD91	R50	B1
	SA131	Resin	11V9	100	10	1.5	31.75	SD107	R50	B1
	SA1	Resin	11V9	100	10	2	31.75	ASD126	R50	B1
	SA17	Resin	11V9	100	10	2	31.75	ASD64	R50	B1
	SA36	Resin	11V9	100	10	2	31.75	ASD126	R75	B1
	SA37	Resin	11V9	125	10	2	31.75	ASD126	R75	B1
	SA49	Resin	11V9	125	10	3	31.75	ASD126	R75	B1
	SA44	Resin	11V9	125	6	2	31.75	ASD91	R75	B1
	SA11	Resin	11V9	100	10	2	31.75	CB126	R75	B1
	SA71	Metal	1A1R	100	0.8	5	31.75	D151	C100	MB
	SA72	Metal	1A1R	125	1	5	31.75	D151	C100	MB
	SA73	Metal	1A1R	125	1.5	5	31.75	D151	C100	MB
	SA74	Metal	1A1R	150	1	5	31.75	D151	C100	MB
	SA75	Metal	1A1R	150	1.5	5	31.75	D151	C100	MB
	SA76	Metal	1A1R	200	1	5	31.75	D151	C100	MB
	SA77	Metal	1A1R	200	1.5	5	31.75	D151	C100	MB
	SA78	Metal	1A1R	300	3	3	50	D151	C100	MB
	SA83	Resin	1A8	15	10	3	6	SD126	R100	B2
	SA84	Resin	1A8	18	10	3	10	SD126	R100	B2
	SA85	Resin	1A8	20	10	3	10	SD126	R100	B2
	SA86	Resin	1A8	25	10	3	10	SD126	R100	B2
	SA87	Resin	1A8	30	10	3	10	SD126	R100	B2
	SA88	Resin	1A8	40	10	3	10	SD126	R100	B2
	SA50	Resin	6A9	125	7	3	31.75	ASD64	R75	B1
	SA51	Resin	6A9	125	6	1.5	31.75	ASD91	R75	B1
	SA7	Resin	12V9	75	6	2	20	ASD76	R50	B1
	SA41	Resin	12V9	100	6	1.5	31.75	ASD107	R75	B1
	SA42	Resin	12V9	100	6	2	31.75	ASD107	R75	B1
	SA52	Resin	1A1	100	4	3	20	ASD30	R100	B4
	SA54	Resin	1A1	100	5	2	31.75	ASD126	R75	B2
	SA23	Resin	1A1	150	12	3	31.75	ASD126	R75	B2
	SA3	Resin	1A1	150	12	3	31.75	ASD126	R50	B2
	SA38	Resin	1A1	150	12	3	31.75	ASD30	R50	B2
	SA12	Resin	1A1	150	12	3	31.75	CB126	R75	B4
	SA25	Resin	1A1	150	6	3	31.75	ASD126	R75	B2
	SA79	Metal	1A1	150	10	5	31.75	D126	R50	MB
	SA56	Resin	1A1	250	25	4	76.2	ASD151	R75	B2
	SA4	Resin	1A1	300	12	3	127	ASD126	R75	B2
	SA24	Resin	1A1	300	12	3	127	ASD126	R50	B2
	SA55	Resin	1A1	300	12	3	127	ASD126	R100	B4
	SA57	Resin	1A1	300	15	3	127	ASD126	R75	B2
	SA58	Resin	1A1	350	12	3	127	ASD126	R100	B2
	SA35	Metal	1A1	300	12	3	127	D126	C50	MB
SA70	Metal	1A1	300	12	5	127	D126	C50	MB	
	SA27	Resin	11A2	100	10	2	31.75	ASD126	R75	B2
	SA80	Resin	11A2	100	10	2	31.75	SD107	R50	B2
	SA8	Resin	11A2	100	10	2	31.75	ASD126	R50	B2
	SA59	Resin	11A2	125	10	2	31.75	ASD126	R50	B2

SUPER ABRASIVES

TechTips



WHEEL CARE AND USAGE

For achieving the best results using Norton Diamond and CBN products, the following steps of mounting, truing and dressing should be followed.

Mounting - putting wheel on machine spindle

- ▶ Examine wheel flanges and spindle carefully.
- ▶ Inspect machine spindle for excessive runout.
- ▶ Mount wheel between hand-tightened flanges.
- ▶ Using a dial indicator, tap the wheel lightly with a rubber or wooden block to minimize runout to less than .0010".
- ▶ Tighten flange securely and recheck with indicator.
- ▶ Allow a newly mounted wheel to operate for one full minute before grinding.

Truing - making wheel round and concentric with the spindle axis

- ▶ Prior to truing the wheel, run a wax crayon over the wheel face.
- ▶ Any crayon left on wheel face after truing will reveal untrued areas.
- ▶ Norton Brake Controlled Truing Devices are most commonly used to true Diamond and CBN straight, cup and cylinder wheels
 - Always use Brake Controlled Truing Device wet.
 - Bring the Diamond/CBN wheel and the truing wheel together until they almost touch.
 - Start the Diamond/CBN wheel to normal speed; start truing wheel in the same direction.
 - Bring the two wheels together until they touch.
 - Make sure the truing wheel is spinning at the time of contact.
 - Traverse the wheel back and forth at 30 to 60 inches per minute.
 - Bring grinding wheel down by .0005" to .001" at the end of each traverse.
 - At the end of truing, the Diamond/CBN wheel should be smooth and running true.

Dressing - opening the face of a trued wheel

- ▶ Dressing sticks should be one or two grit sizes finer than the Diamond/CBN Wheel and in H or J grade.

Properly Dressed Wheel Face



AFTER TRUING
The wheel face is smooth and closed.



AFTER DRESSING
(Wheel face is open with the grits exposed, ready for efficient grinding action.)

AFTER DRESSING CBN Grit



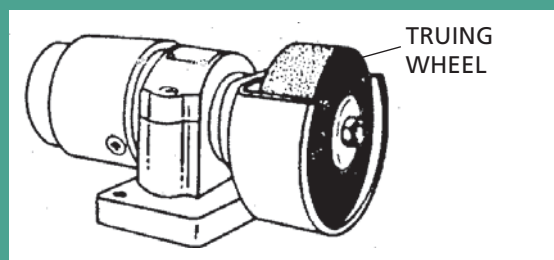
Tall
(bond supporting
grit)



Path connecting
the talls for coolant
& chip flow

Note: Dress the wheel by pushing stick across wheel face.

Brake Truing Device



For best dressing results brake controlled truing device is used.

SUPERABRASIVES - GRINDING HINTS AND FAULT-FINDING

Adhering to the following suggestions will help ensure the most efficient and cost-effective performance from super abrasive products.

Avoid steel when using Diamond Wheels

When using a diamond wheel try to keep the amount of steel ground to an absolute minimum. On brazed tools, use an ALUNDUM wheel, and back off the steel shank. A high lubricity grinding fluid should be used. For some tool steels, armoured (AMD) diamond wheel may prove most economical.

Use Rigid work support

All workpieces should be supported firmly during the grinding process. Any amount of vibration will cause wheel wear and produce chatter or wave marks on the ground surface. On work ground between centres, be sure the centreholds are properly prepared. Minimize work overhang. If the ground edge is supported by a work finger, ensure the finger is strong enough to provide vibration-free support.

Grind Wet

If at all possible, diamond wheels should be used with a full flood coolant properly directed into the grinding zone. (Vitrified bond diamond wheels should be used only with a flood coolant.) Water with a rust inhibitor is recommended. When a flood application can not be used, try a mist or spray application. These systems use compressed air to "atomize" water or

soluble oil. The spray is directed at the grinding zone and helps dissipate heat in the workpiece and wheel. Although not as effective as the flood procedure, it does increase wheel life and helps prevent heat damage to the work.

Avoid Excessive Feeds

Every grinding operation is different. What is an excessive removal rate on one operation may be entirely acceptable on another. Excessive feeds on a given operation will always cause premature wheel wear. If you smell resin, reduce infeed because you are burning up the bond. Excessively high feed rates are characterized by:-

- A harsh grinding sound
- Chatter
- Burn
- Vibration
- High wheel wear rate
- Smell

Dress Core

As the abrasive section of a cup wheel wears, the core material (that part of the superabrasive wheel which holds and supports the abrasive bearing section) may become exposed. The core materials should not contact the workpieces during grinding as they cause heat build up. However, some core materials as in some 11V9's are self dressing. A single point carbide or steel tool is the best way to dress reasloy core. The tool is clamped in a vise with its cutting edge directed accurately to remove enough core material to leave a 1/16" of abrasive section exposed.

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES	SUGGESTED CORRECTION
Burning (excessive heat)	<ul style="list-style-type: none"> - Wheel loaded or glazed - Excessive feed rate - Wheel too durable - Poor placement of coolant interface 	<ul style="list-style-type: none"> - Dress wheel with a dressing stick - Reduce infeed of wheel or workpiece - Use freer cutting specification or slow down wheel speed - Apply coolant directly to wheel/workpiece
Poor finish	<ul style="list-style-type: none"> - Excessive dressing - Grit size too coarse - Poor coolant flow or location interface 	<ul style="list-style-type: none"> - Use lighter dressing pressure; stop dressing as soon as wheel starts to consume stick rapidly - Select finer grit sizes - Apply heavy flood to reach wheel/workpiece
Chatter	<ul style="list-style-type: none"> - Wheel out of truth 	<ul style="list-style-type: none"> - True wheel, ensure it is not slipping on mount
Short wheel life	<ul style="list-style-type: none"> - Incorrect coolant flow - Low wheel speed - Excessive dressing - Wheel too soft or too hard 	<ul style="list-style-type: none"> - Apply coolant to flood wheel/ workpiece - Increase wheel speed - Use lighter dressing pressure - Change grit or grade, use higher concentration

DIAMOND & CBN WHEELS

Grinding Parameters For Resin Bond Diamond & CBN Wheels

Grinding Process	Parameter		For Diamond	For CBN
Surface Grinding	Cutting speed (m/s)		23-36	28-33
	Oscillation (m/min)		8-15	10-20
	Depth of cut (mm)	Roughing Finishing	0.05-0.08 0.002-0.02	0.06-0.1 0.005-0.03
External Cylindrical Grinding	Cutting speed (m/s)		23-36	28-33
	Oscillation (m/min)		5-15	10-20
	Workpiece speed (m/min)	10-20	10-20	
	Depth of cut/Infeed (mm)	Roughing Finishing	0.03-0.05 0.003-0.02	0.04-0.08 0.004-0.03
Internal Grinding	Cutting speed (m/s)	Resin Bond Electroplated	15-20 5-10	18-25 8-15
	Oscillation (m/min)		2-3	3-5
	Workpiece speed (m/min)	25-30	30-35	
	Depth of cut/Infeed (mm)	Roughing Finishing	0.003-0.02 0.003-0.008	0.003-0.03 0.003-0.05
Tool & Cutter Grinding	Cutting speed (m/s)	Wet Dry	18-25 15-18	25-35 18-30
	Table Speed (m/min)		2-3	3-5
	Depth of cut/Infeed (mm)	0.02-0.2	0.02-0.3	
Creepfeed Grinding	Cutting speed (m/s)		25-30	30-45
	Feed Rate (mm/min)		25-250	50-750
	Depth of cut		Total Allowance	Total Allowance

Guidelines For Dressing And Truing

Bond	Abrasive	Dressing Method		Remarks
		Good	Best	
Resin Bond	Diamond	Dressing Stick 37C 220	Brake Truing Device 37C 220 Wheel	Always dress wet
Resin Bond	CBN	Dressing Stick 38A 220	Brake Truing Device 38A 220	Always dress wet
Metal Bond	Diamond and CBN	Dressing Stick on vice	Profile or T/C grinder with wheel	Wet or dry
Vitrified Wheels	Diamond Low Conc.	Dressing Stick 39C - 2 grits finer than wheel	Nibs with traverse Dressing	Always dress wet
Vitrified Wheels	CBN Low. Conc.	Gem Dressers or nibs	Rotary Dressing	Always dress wet
Vitrified Wheels	CBN High Conc.	—	Rotary Truing	Always dress wet
CVSG Wheels	CBN	Single Pt.Gem quality Dressers	Rotary Truing	

Different Dressing Ratios for Bond Types

Wheel Type	Truing Operation	Truing Mode	Wheel/Truer speed ratio $q=V_r/V_s$	Depth of Truing Pass	Truer Traverse Feed (mm/rev)
Resin Bond Wheel	Roughing	Counter-directional	-0,5 to -0,75	0,005 (max)	0,1 to 0,2
Resin Bond Wheel	Roughing	Uni-directional	0,5 to 0,75	0,003 (max)	0,1 to 0,2