TOOLROOM GRINDING WHEEL SELECTION GUIDE

TOOL & CUTTER, SURFACE, CYLINDRICAL AND INTERNAL GRINDING APPLICATIONS

HOW TO USE THIS GUIDE

1 Select contact area of part ground. 2 Select performance level required. 3 Select grinding application. 4 Select material type. 5 Wheel specification: first choice is preferred second choice is optional 6 Adjust for grit size depending on finish and corner holding (refer to Grit Size Guide).

1 CONTACT AREA GUIDE

NARROW - area of grind less than 25% of wheel width or less than 1/4" wide.
MEDIUM - area of grind 25%-50% of wheel width or 1/4" - 1/2" wide.
WIDE - area of grind greater than 50% of wheel width or over 1/2" wide.

2 PERFORMANCE LEVEL GUIDE

Key variable in determining the abrasive type selected.
Total grinding cost and **productivity** will depend on the abrasive selection.

3 GRINDING APPLICATION
4 MATERIAL TYPE
5 WHEEL SPECIFICATION

		CONTACT AREA	NARROW			MEDIUM - NARROW				WIDE - MEDIUM			
		PERFORMANCE/ PRODUCTIVITY	MAXIMUM	HIGH	STANDARD	MAXIMUM	HIGH	STANDARD		MAXIMUM	HIGH	STANDARD	
		STOCK REMOVAL RATE	VERY HEAVY TO MODERATE	HEAVY TO MODERATE	MODERATE TO LIGHT	VERY HEAVY TO MODERATE	HEAVY TO MODERATE	MODERATE TO LIGHT	LIGHT	VERY HEAVY TO MODERATE	HEAVY TO MODERATE	MODERATE TO LIGHT	LIGHT
TOOL & CUTTER	HSS & TOOL STEELS, RC 50-68		5SG46-KVS	32AA46-KVTR	32A46-K8VBE	5SG46-IVS, 5SG46-JVS	32AA46-IVTR, 32AA46-JVTR	32A46-H8VBE, 32A46-I8VBE	38A46-H8VBE, 38A46-I8VBE	5SG46-GVSP	32AA46-HVTRP, 32AA46-GVTRP	32A46-G12VBEP, 32A46-F12VBEP	38A46-G12VBEP, 38A46-F12VBEP
SURFACE	HSS & TOOL STEELS, RC 50-68; 400 SERIES STAINLESS STEELS		5SG46-JVS	32AA46-JVTR	32A46-J8VBE	5SG46-IVS, 5SG46-JVS	32AA46-IVTR, 32AA46-JVTR	32A46-I8VBE, 32A46-J8VBE	38A46-I8VBE	5SG46-GVSP	32AA46-HVTRP, 32AA46-GVTRP	32A46-G12VBEP, 32A46-F12VBEP	38A46-G12VBEP, 38A46-F12VBEP
SURFACE	SOFT STEELS, RC 30-45		5SG46-KVS	23A46-K8VBE, 32AA46-KVTR	53A46-K8VBE, 32A46-K8VBE	5SG46-JVS	23A46-J8VBE, 32AA46-JVTR	53A46-J8VBE, 32A46-J8VBE		5SG46-HVSP	23A46-H12VBEP, 32AA46-IVTRP	53A46-H12VBEP, 32A46-H12VBEP	
SURFACE	300 SERIES STAINLESS STEEL		5SG46-KVS	32AA46-KVTR	32A46-K8VBE	5SG46-JVS	32AA46-JVTR	32A46-J8VBE, 37C46-JVK		5SG46-HVSP	32AA46-IVTRP	32A46-H12VBEP	
SURFACE	CAST IRONS: DUCTILE, GRAY, CHILLED					5SG46-JVS	32AA46-JVTR	32A46-J8VBE (DUCTILE) 23A46-J8VBE (GRAY) 37C46-JVK (CHILLED)		5SG46-GVSP	23A46-G12VBEP	53A46-G12VBEP, 37C46-HVK (CHILLED)	
SURFACE	NONFERROUS ALLOYS							37C46-JVK				37C46-IVK	
CYLINDRICAL	HSS & TOOL STEELS, RC 50-68					5SG60-LVS	32AA60-LVTR	32A60-L8VBE					
CYLINDRICAL	HARDENED STEELS, RC 45-55					5SG60-JVS	32AA60-JVTR	32A60-J8VBE, 23A60-K5VBE					
CYLINDRICAL	SOFT STEELS, RC 30-45					5SG60-KVS	32AA60-KVTR	32A60-K8VBE, 23A60-L5VBE					
CYLINDRICAL	400 SERIES STAINLESS STEELS					5SG60-JVS, 5SG60-KVS	32AA60-JVTR, 32AA60-KVTR	32A60-K8VBE					
CYLINDRICAL	300 SERIES STAINLESS STEELS					5SG46-JVS	37C46-JVK, 32AA46-JVTR	37C46-JVK, 32A46-J5VBE					
INTERNAL	HSS & TOOL STEELS, RC 50-68; HARDENED STEELS, RC 45-55									5TG120-KVFL, 5SG80-KVFL	3SG80-KVFL, 32AA80-KVFL	32A80-KVFL	
INTERNAL	SOFT STEELS, RC 30-45									5SG60-MVFL	3SG60-MVFL, 32AA60-MVFL	53A60-MVFL,	
INTERNAL	400 SERIES STAINLESS STEELS									5TG120-KVFL, 5SG80-KVFL	3SG80-KVFL, 32AA80-KVFL	32A80-KVFL, 53A80-KVFL	
INTERNAL	300 SERIES STAINLESS STEELS										37C46-JVK, 32AA46-JVFL	37C46-JVK, 32A46-JVFL	

6 GRIT SIZE

	REQUIREMENT	FINISH	MINIMUM CORNER RADIUS
46	General Purpose	32 Ra & rougher	0.020"
60	Commercial Finish	32 Ra & better	0.016"
80	Fine Finish	20 Ra & better	0.0105"
120	Very Fine Finish	10 Ra & better	0.006"
150	Corner-Form Holding		0.005"
180	Corner-Form Holding		0.0035"
220	Corner-Form Holding		0.0026"

STRUCTURE

Select the most open structure specification that will hold the required form and tolerances for the application.

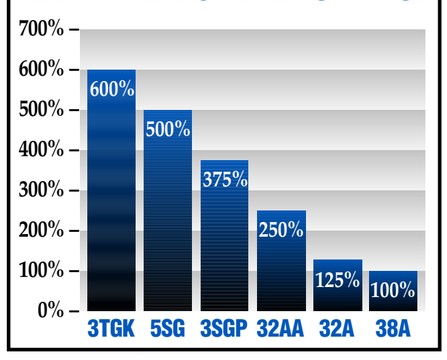
5, 6 Tight form holding, large amount of interrupted cuts.
8 General purpose, medium to wide contact area with good form holding.
10 Wide to medium contact area for good form holding, cooler cut & better chip clearance.
12 Wide to medium contact area for coolest cut & maximum chip clearance.

BONDS

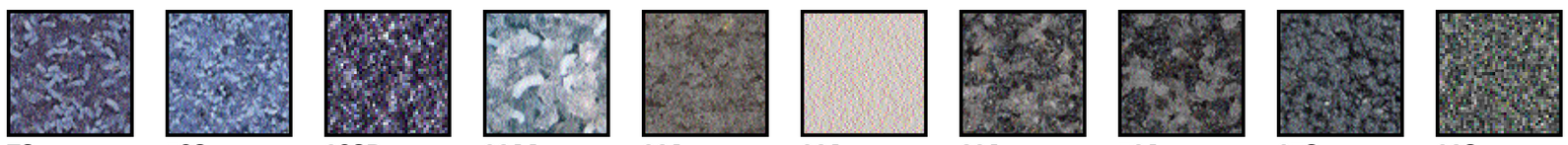
Vitrified bonds ending with a "P" denote porous open structure type products offering a very cool cut and high chip clearance for heat sensitive materials in wide area of contact grinding applications.

BOND TYPE	DESCRIPTION
VBE, VBEP	Toolroom standard, exceptional versatility, Alundum® abrasives only
VS, VSP	High performance, SG abrasives only
VTR, VTRP	Enhanced performance & versatility for all toolroom grinding, 32AA abrasive only
VH	High performance form holding, for TG, SG, & Alundum abrasives
VFL	Pressed to size I.D. wheels less than 4-1/2" diameter, for TG, SG, & Alundum abrasives
V	Original Norton® vitrified bond, excellent form/corner holding, Alundum abrasives only
VK, VKP	For silicon carbide (Crystolon®) abrasives only

RELATIVE ABRASIVE PERFORMANCE



TYPES OF ABRASIVE GRAIN



TG
Second generation ceramic abrasive. More durable than SG for extreme applications on the most difficult to grind materials offering maximum wheel life. Contact your Norton sales representative for specifications.

5SG
Maximum durability, for the most demanding applications & most difficult to grind materials offering exceptional wheel life.

3SGP
High performance & durability for very demanding applications & very difficult to grind materials. Good value when maximum performance is not required.

32AA
A Norton exclusive, with Norton's TG Abrasive. More aggressive & durable, cooler cutting, higher stock removal rates with up to twice the life of 32A.

32A
The toolroom benchmark. A strong, sharp, very versatile premium abrasive for a wide range of materials & applications.

38A
The most friable abrasive for maximum coolness of cut on very heat-sensitive tool steels. For light to medium cut rates.

23A
A tougher/ stronger intermediate abrasive for less heat sensitive hardened and soft steels.

53A
A tough intermediate abrasive for less heat sensitive soft steels and cast irons.

37C
Blocky shaped black silicon carbide abrasive, for all non-ferrous metals, cast irons, 300 series stainless steels, ceramics, plastics.

39C
Sharp, friable, high purity, green silicon carbide for carbides, titanium, plasma sprayed materials.

GRINDING WHEEL SAFETY

Substantially all Norton Company abrasive products meet or exceed industry standards as prescribed by ANSI B7.1 Safety Requirements.

The grinding wheels indicated in this chart are vitrified (glass) bonded abrasive products. Although by nature glass products are relatively fragile, these wheels are highly engineered products designed to perform safely as cutting tools when used as prescribed by your machine builder, ANSI B7.1 and OSHA.

KEEP IN MIND THE FOLLOWING GENERAL SAFETY RULES:

1. Always ring test a vitrified bonded wheel before mounting to determine if it is damaged. IF A WHEEL APPEARS TO BE DAMAGED, OR IF YOU HAVE ANY DOUBT ABOUT A WHEEL'S CONDITION, DO NOT USE IT.
2. Machine guards must be used with all wheels except for some exceptions for small wheels as detailed in ANSI B7.1 and OSHA regulations.
3. Never over speed a wheel. Maximum Operating Speed (MOS) indicated on a wheel should never be exceeded in terms of surface feet per minute.
4. Be sure the wheel fits the spindle properly.
5. Mounting flanges should comply with specifications detailed in ANSI B7.1. Never mount wheels between mismatched flanges - this is one of the most common causes of wheel failures.
6. Avoid excessive side pressure when truing or grinding with straight wheels.

GRINDING TROUBLESHOOTING

Check the obvious first. Before changing the grinding wheel specification, investigate the following most common causes for most grinding problems:

1. Diamond dressing tool condition (check if worn or dull, rotate tool or replace if necessary)
2. Coolant direction, volume & filtration
3. Wheel dressing procedures (dress more open to free up cut rate, dress more closed to improve finish)

PROBLEM	POSSIBLE CAUSE	CORRECTION
1. **Burn**	Poor coolant direction	Redirect coolant into grinding zone
	Restricted or low coolant volume	Increase coolant volume
	Too heavy cut rate	Reduce cut rate
	Wheel too hard	Use one grade softer wheel
	Wheel structure too closed	Use more open structure wheel
2. **Loading & Glazing**	Wheel too hard	Use one grade softer wheel
	Wheel structure too closed	Use a more open structure wheel
	Too durable abrasive	Use a sharper more friable abrasive
3. **Chatter**	Unsupported work	Increase work support
	Machine vibration	Check for worn bearings
	Too heavy cut rate	Reduce cut rate
	Wheel too hard	Use one grade softer wheel
	Wheel structure too closed	Use a more open structure wheel
	Wheel out of balance	Check wheel balance or try new wheel
4. **Poor surface finish**	Dirty coolant	Check coolant filter and quality
	Incorrect wheel dress	Dress wheel finer (slow down dressing tool traverse)
	Too coarse grit size	Use a finer grit size
5. **Not holding form**	Wheel too soft	Use one grade harder wheel
	Wheel structure too open	Use a more closed wheel structure
6. **Not holding corner**	Incorrect wheel dress	Dress wheel finer. Face and side true wheel
	Too large grit size	Use smaller grit size (maximum grit diameter less than 1.5 times corner radius)
	Wheel too soft	Use harder grade wheel
	Wheel structure too open	Use more closed structure wheel

Contact your Norton distributor or Norton sales representative for assistance, or check out the Norton Web Site: **www.nortonabrasives.com**

TECH TIPS

GRINDING

1. Consider one grade harder starting spec for surface grinding applications with interrupted cut.
2. Use a grit size with grit diameter less than the corner radius required.
3. True the wheel face and sides to eliminate any wheel runout for the tightest corner holding control.
4. For ID grinding, recommend using a wheel diameter (after truing) no larger than 75% of the bore diameter.
5. Increase stock removal rate to minimize burn and chatter with too hard of a wheel.
6. Decrease stock removal rate to reduce wheel breakdown for too soft of a wheel.
7. Use Norton SG® diamond dressing tools for TG and SG wheels for the most consistent performance and maximum tool life.

DRESSING TOOLS

Single Point Diamond:

1. Infeed/pass should not exceed .0015" for aluminum oxide abrasives, .001" with Norton SG.
2. Dress traverse rate 10"-20" per minute for rough grinding & slower for finish grind.
3. Use a 10°-15° drag angle to the wheel centerline.
4. Rotate the diamond often to extend tool life.
5. Use coolant when possible to extend diamond life.

Multi-Point Diamond Nibs:

1. Infeed/pass less than .002" for aluminum oxide abrasives, .0015" with Norton SG.
2. Dress traverse rate 20"-40" per minute for rough grinding & slower for finish.
3. Use at 90° to wheel face.
4. With new tool, run 3-5 passes at .005" per pass to expose diamonds and to ensure full face contact between dressing tool and wheel face.
5. Use coolant when possible to extend dressing tool life.

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