



# TOOL & CUTTER, SURFACE, AND CYLINDRICAL APPLICATIONS TOOLROOM GRINDING WHEEL SELECTION 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 a good alternative
6. Adjust grit size depending on finish and corner holding (refer to Grit Size Guide)

		NARROW	NARROW – MEDIUM			MEDIUM – WIDE									
1. CONTACT AREA	PART TO BE GROUND	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 <small>Key in determining abrasive type Total grinding cost and productivity will depend on the abrasive selection</small>	PRODUCTIVITY	MAXIMUM	HIGH	STANDARD	MAXIMUM	HIGH	STANDARD	MAXIMUM	HIGH	STANDARD					
	STOCK REMOVAL RATE	VERY HEAVY TO MODERATE	VERY HEAVY TO MODERATE	MODERATE TO LIGHT	VERY HEAVY TO MODERATE	VERY HEAVY TO MODERATE	MODERATE TO LIGHT	LIGHT	VERY HEAVY TO MODERATE	VERY HEAVY TO MODERATE	MODERATE TO LIGHT	LIGHT			
3. GRINDING APPLICATION	4. MATERIAL TYPE	TOOL & CUTTER <b>HSS &amp; TOOL STEELS, Rc 50-68</b>	5NQ46-KVS	5SG46-KVS	32A46-KVBE	5NQ46-IVS	5SG46-IVS	32A46-HVBE 32A46-IVBE	38A46-HVBE 38A46-IVBE	5NQ46-GVSP	5SG46-6-VSP	32A46-GVBEP 32A46-FVBEP	38A46-GVBEP 38A46-FVBEP		
			SURFACE	HSS & TOOL STEELS, Rc 50-68; 400 SERIES STAINLESS STEELS	5NQ46-JVS	5SG46-KVS	32A46-JVBE	5NQ46-JVS	5SG46-JVS	32A46-IVBE 32A46-JVBE	38A46-IVBE	5NQ46-GVSP	5SG46-GVSP	32A46-GVBEP 32A46-FVBEP	38A46-GVBEP 38A46-FVBEP
				SOFT STEELS, Rc 30-45	5NQ46-KVS	5SG46-KVS	53A46-KVBE 32A46-KVBE	5NQ46-JVS	5SG46-JVS	53A46-JVBE 32A46-JVBE		5NQ46-HVSP	5SG46-HVSP	53A46-HVBEP 32A46-HVBEP	
				300 SERIES STAINLESS STEELS	5NQ46-KVS	5SG46-KVS	32A46-KVBE	5NQ46-JVS	5SG46-JVS	32A46-JVBE 37C46-JVK		5NQ46-HVSP	5SG46-HVSP	32A46-HVBEP	
				CAST IRONS: DUCTILE, GRAY, CHILLED				5NQ46-JVS	5SG46-JVS	32A46-J8VBE (DUCTILE) 37C46-JVK (CHILLED)		5NQ46-GVSP	5SG46-GVSP	53A46-GVBEP 37C46-HVK (CHILLED)	
NONFERROUS ALLOYS						37C46-JVK				37C46-IVK					
5. RECOMMENDED WHEEL SPECIFICATION	CYLINDRICAL	HSS & TOOL STEELS, Rc 50-68				5NQ60-LVS	5SG60-LVS	32A60-LVBE							
		HARDENED STEELS, Rc 45-55				5NQ60-JVS	5NQ60-JVS	32A60-JVBE							
		SOFT STEELS, Rc 30-45				5NQ60-KVS	5NQ60-JVS	32A60-KVBE							
		400 SERIES STAINLESS STEELS				5NQ60-JVS 5NQ60-KVS	5SG60-JVS 5SG60-KVS	32A60-KVBE							
		300 SERIES STAINLESS STEELS				5NQ46-JVS	37C46-JVK 5SG46-JVS	37C46-JVK 32A46-JVBE							
6. GRIT SIZE	GRIT	46	60	80	120	150	180	220							
	REQUIREMENT	General Purpose	Commercial Finish	Fine Finish	Very Fine Finish	Corner-Form Holding	Corner-Form Holding	Corner-Form Holding							
	FINISH	32 Ra & rougher	32 Ra & better	20 Ra & better	10 Ra & better										
	MINIMUM CORNER RADIUS	0.020"	0.016"	0.0105"	0.006"	0.005"	0.0035"	0.0026"							

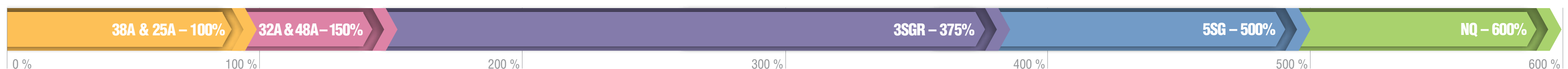
## UPGRADE TO VITRIUM<sup>3</sup> AND IMPROVE YOUR PROCESS AND PRODUCTIVITY IN 3 WAYS

Vitrium<sup>3</sup> bond (VS3) wheel for enhanced-performance NQ, SG, 32A, and 48A wheels

1. COOL CUTTING	2. PRECISE PROFILE	3. HIGH SPEED
<p>Improved holding power (using less bond-to-abrasive ratio) exposes a larger grain surface area, improving freer cut rate.</p>	<p>Superior grain-holding properties significantly improve wheel form and corner holding vs. other bond systems – reducing dressing time and dresser wear.</p>	<p>High Speed – Norton Vitrium<sup>3</sup> bond provides the ultimate wheel strength. This allows for high speed operation on equipment designed and rated for high speed.</p>

39C	37C	53A	25A	38A	48A	32A	3SGR	5SG	NQ (NORTON QUANTUM)	
NEW! 48A, 32A, 3SGR, 5SG, and Norton Quantum (NQ) wheels are available in new Vitrium <sup>3</sup> bond	Sharp, friable, high purity, green silicon carbide for carbides, titanium, plasma and sprayed materials.	Blocky-shaped black silicon carbide abrasive, for all nonferrous metals, cast irons, 300 series stainless steels, ceramics, and plastics.	A tough intermediate abrasive for less heat sensitive soft steels and cast irons.	Friable abrasive. Good for grinding tool steels at light to moderate feed rates.	The most friable abrasive for maximum coolness of cut on very heat-sensitive tool steels. For light to medium cut rates.	Strong and versatile aluminum oxide abrasive. Works well at moderate to heavy feed rates.	The toolroom benchmark. A strong, sharp, very versatile premium abrasive for a wide range of materials and applications.	High performance and durability for very demanding applications and very difficult to grind materials. Good value when maximum performance is not required.	Maximum durability, for the most demanding applications and most materials offering exceptional wheel life. Ideal for use on high performance grinding equipment.	New revolutionary advanced ceramic abrasive. Allows for more aggressive grinding with reduced cycle time. Performs well in low, medium and high force applications. Ideal for maximizing the performance of older grinding equipment.

## RELATIVE ABRASIVE PERFORMANCE



## WHEEL TYPES

	TYPE 1	TYPE 2	TYPE 5	TYPE 6	TYPE 7	TYPE 11	TYPE 12
CYLINDRICAL	■						
TOOL AND CUTTER	■	■		■		■	■
SURFACE	■	■	■		■		

## 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
VS3, VS3P	NEW! Vitrium <sup>3</sup> patented technology produces a strong, exceptionally cool-cutting bond with unprecedented form holding
VBE, VBEP	Toolroom standard, exceptional versatility, aluminum oxide abrasives only
VS, VSP	High performance, SG and NQ (Norton Quantum) abrasives only
VP2	High performance induced porosity bond, ideal for heat sensitive applications
VH	High performance form holding, for TG, SG, NQ & aluminum oxide abrasives
VFL	Pressed to size I.D. wheels less than 4-1/2" diameter, for TG, SG, NQ & aluminum oxide abrasives
V	Original Norton vitrified bond, excellent form/corner holding, fine grit aluminum oxide abrasives only
VK, VKP	For silicon carbide abrasives only

## GRINDING WHEEL SAFETY

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

## TECH<sup>tip</sup> 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, Norton SG, and NQ wheels for the most consistent performance and maximum tool life

## TECH<sup>tip</sup> DRESSING TOOLS

- Single Point Diamond:**
1. Infeed/pass should not exceed .0015" for aluminum oxide abrasives, .001" with Norton ceramic alumina wheels
  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 ceramic alumina wheels
  2. Dress traverse rate 20"-40" per minute for rough grinding and 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

Contact your Norton distributor for assistance at: (800) 991-4225 or [www.ahbinc.com](http://www.ahbinc.com)