

USER GUIDE FOR THE AEROSPACE & FOUNDRY MARKETS



NORTON

SAINT-GOBAIN®



THE MOST ADVANCED AEROSPACE & FOUNDRY GRINDING PROCESSES

Norton's abrasive solutions for aerospace and foundry provide our customers with a complete range of professional and highly technical coated abrasives. It's Norton's aim to ensure our customers experience excellent performance in all applications from high stock removal through to low surface finishing.

This is an 'at-a-glance' guide to our specialist Norton products for rough grinding, deburring, polishing and edge finishing in the most advanced aerospace and foundry grinding processes.

CONTENT

General Application Information	04
Norton for Aerospace and Foundry	06
Backstand Operations	09
File Belt Machines	19
Mini Angle Grinders	23
Hints & Tips	31
Product Guide by Application	35





EXPERTS IN AEROSPACE GRINDING SOLUTIONS

Norton holds significant expertise in Aerospace applications offering a range of innovative products and technical abrasive solutions in the coated market such as specialties and non-woven abrasives for blending, refining, de-burring, surface preparation, cleaning and polishing. All designed to ensure productivity is maximised and operating costs minimised. We constantly improve our abrasives in order to follow the market demand and material evolution whether you work on turbine blades (fix and mobile), fittings and blocks.



MORE THAN 100 YEARS IN ABRASIVES FOR FOUNDRY

The Foundry market covers a number of sectors and applications and through thorough analysis of the complete abrasive process Norton is able to provide incomparable solutions for the most demanding applications in the industry.

Norton's Coated abrasive products cover the whole spectrum; from stock removal to fine finishing, offering products with tough backing material & coarse grits for removing large amounts of material, quickly for use in demanding power grinding and back stand applications, as well as products with flexible backings and finer grits for finishing and polishing.

NORTON PRODUCT QUALITY & PERFORMANCE

To give our customers a choice of the best price and performance level for them, we have designed a tiering system for all Norton products called GOOD, BETTER, BEST. This system helps you choose the right product for the job and get the appropriate level of performance that you need.

GOOD



For users who are looking for Norton quality products, with consistent above average performance.

BETTER



The core lines of Norton. These products provide high performance solutions with high levels of productivity.

BEST



Norton's high performance, high technology products are designed to add value to abrasive applications, providing exceptional performance.



ROUGH GRINDING

Gate removal and roughing of new and repaired components (ie: turbine blades).

Objective: Fast material removal.



DEBURRING

Deburring of edges on new and repaired components.

Objective: Sharp edges and defects removal.



FINISHING/POLISHING

Surface grinding and blending to achieve a constant quality throughout the part.

Objective: Smooth surface finish and low Ra expected.



SPOT GRINDING

Technical products adapted to the parts and metal ground.

Objective: Grinding difficult to reach areas.



TYPICAL PARTS MACHINED IN AEROSPACE

Turbine rotor blades and nozzle guide vanes (NGV) are exposed to enormous stress during operation: high temperatures of up to 1400°C, high pressure and tremendous centrifugal force above the speed of sound. These 'hot' components are usually made of high performance nickel super alloys that are hard to grind. Machining of turbine blades requires great precision and cool-cutting to maintain component integrity.



Turbine rotor blade



Nozzle guide vane (NGV)



TITANIUM

The key properties of Titanium are its resistance to corrosion, often associated to erosion, and resistance to fire. Its mechanical properties allow manufacturing thin and light parts especially in the aerospace and medical industry – low and high pressure / medium temperature. The maximum use temperature is 600°C.

MARKET

- Aerospace
- Medical
- Chemical Industry

Density: 4.5 kg/dm³ vs (7.7kg/dm³ for Steel)

Magnetic: No

Recommended Abrasive Speed: 10-15m/s

WHAT YOU NEED TO KNOW:

Titanium has got a low thermic conductivity (10x less than carbon steel) which reduces heat dissipation. This, added to its dulling capabilities, makes it difficult to grind – extremely heat sensitive and constant cooling is strongly recommended. A sharp and extremely hard grit is advised to reduce the force requested to cut this "elastic" material: Ceramic/Diamond (for rough operations) & Silicon carbide / Diamond (for finishing).



STAINLESS STEEL

Stainless steels are alloys of Iron and Carbon steel with the addition of Chrome. Above 10.5% of Chrome, we generate a protective layer of Chrome Oxide which gives the stainless property to the steel.

MARKET

- Mechanical Industry
- Food Industry
- Chemical Industry
- Medical / Surgery

Density: 8.25 kg/dm³ vs (7.7kg/dm³ for Steel)

Magnetic: No

Recommended Abrasive Speed: 20-30m/s

WHAT YOU NEED TO KNOW:

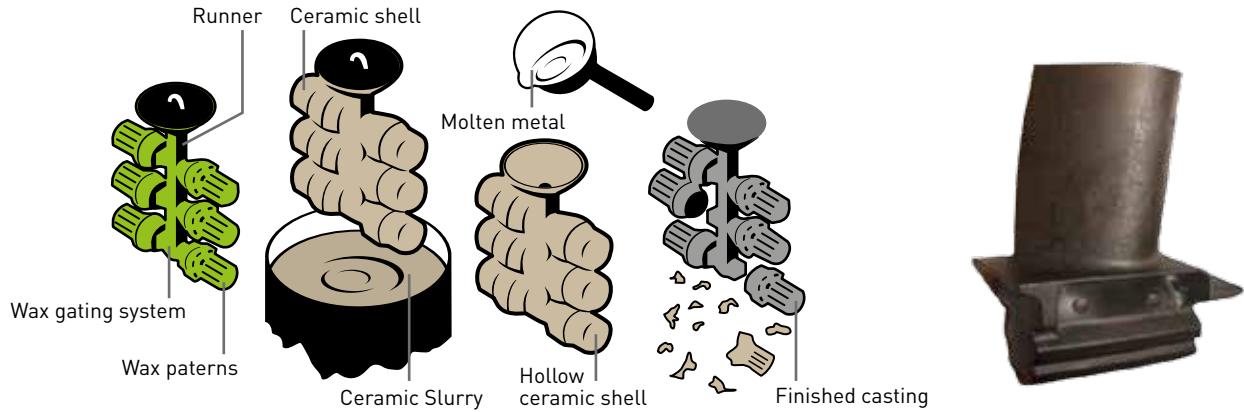
Molybdenum, Chrome, Nickel and Titanium make the grinding operation more difficult. To grind Stainless Steel, it is advised to use a tenacious grain with good cutting edges: Zirconia or Ceramic. Lubrication during the operation will avoid the material to stick to the grit. The grinding effort can be up to 50% more than on carbon steel.



TYPICAL PARTS MACHINED IN THE FOUNDRY INDUSTRY

Different types of casting are processes in foundries. Sand casting (sand), Investment casting (wax) and Die casting (metal mold) are the most commonly known.

Casting is most often used for making complex shapes that would be difficult or uneconomical to make by other methods.



SUPERALLOYS

Inconel, Hastelloy and Rene Alloys are considered, in the metal industry, to be part of the superalloys Nickel based (constituted of Nickel, Chrome, Iron). Its mechanical properties and aspect are comparable to stainless steels. However, they develop an extreme capacity to resist heat.

MARKET

- Aerospace – Hot components
- Mechanical Sport - Exhaust
- Nuclear Industry

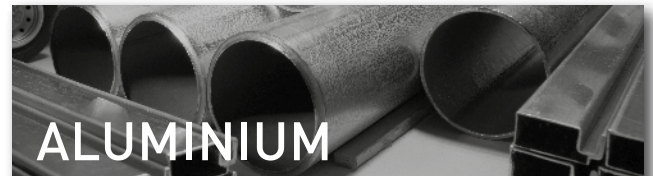
Density: 8.25 kg/dm³ vs (7.7kg/dm³ for Steel)

Magnetic: No

Recommended Abrasive Speed: 25-40m/s

WHAT YOU NEED TO KNOW:

Like all highly alloyed metals, the machining operation is extremely difficult. 70% of the heat generated goes back into the cutting tool (against 15% for steel). We therefore advise an abundant lubrication of the part on the grinding area. A tough grit will be recommended for such metals: Ceramic with supersize.



ALUMINIUM

Aluminium is a metal classified as malleable and comes in a silver grey color. It is renowned for its resistance to oxidation and low density. It is also a nonflammable and anti-spark metal. It is mostly combined with other minerals and comes from Bauxite. This is a low cost to produce metal, easy to transform, with a low strength to deformation.

MARKET

- Aerospace “moving to composites”
- Transportation
- Construction
- Packaging

Density: 2.7 kg/dm³ vs (7.7kg/dm³ for Steel)

Magnetic: No

Recommended Abrasive Speed:

- 20-30m/s – hard alu alloys
- 30-40m/s – soft alu alloys

WHAT YOU NEED TO KNOW:

The material is easy to cut but it's malleability makes it difficult to handle. Metal tends to melt and stick to the grit, loading the belts. To avoid clogging the belts, you can use grease and reduce the pressure to lower the heat generation. A sharp grit combined with an open distribution is recommended: Zirconia grain will ensure a great cut as well as Delta ceramic thanks to its elongated shape.

PRODUCT SOLUTIONS FOR BACK STAND OPERATIONS



09

Backstand machines, whether manual or automated can be used for heavy stock removal through to fine finishing.

Norton provides a full range of belt sizes (from P16 to P3000) and grits for all machines and applications.

To ensure you choose the right belt for you, this specialist range has been categorised by the type of material being ground and the process being used.

In addition, the pressure setting on your machine is an important factor in choosing your belt. Check your machine and use the recommendations in the tables.

TIP:

The smaller the point of contact, the higher the applied working pressure will be. High speed should be used for stock removal.

Inconel and Exotic Alloys	10
Titanium	11
Aluminium	12
Carbon steel	13
Stainless steel	14
Success stories	15

INCONEL & EXOTIC ALLOYS



BEST ++++++

BETTER +++++

GOOD ++++

High Stock Removal

PRODUCT RECOMMENDATION	R996	R976	R929
Backing	Heavy Polyester	Heavy Polyester	Light Polyester
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Cer P36 - P60
Comment	Extremely tough ceramic ensuring a great cut at high pressure	One of the greatest supersized ceramic belts on the market for off hand applications	This none supersized tough ceramic belt offers a great economical solution



Semi-Finishing Operation

PRODUCT RECOMMENDATION	R976	R946	R929
Backing	Heavy Polyester	Light Polycotton	Light Polyester
Pressure			
Grit Range	Cer P60 - P120	Cer P60 - P120	Cer P60 - 120
Comment	The finer R976 grits working at lower pressure will ensure a quick and cool cut as well as longevity	This is a unique extra flexible supersized ceramic polycotton belt adapted to complex shaped parts	This none supersized tough ceramic belt offers a great economical solution



Finishing Operation

PRODUCT RECOMMENDATION	U243	R946	R376
Backing	Light Cotton	Light Polycotton	Light Cotton
Pressure			
Grit Range	Alox X80 - X16	Cer P120 - P320	Alox P120 - P400
Comment	Astonishing belt allowing sequence jumps, generating large savings while providing an excellent surface finish	Much better cut rate than competitors flexible Alox belts. Its supesize guarantees a cooler cut	Its active filler gives this premium alox belt a cool cutting effect



TITANIUM

Backstand
Operation



BEST +++++

BETTER ++++

GOOD +++

High Stock Removal

PRODUCT RECOMMENDATION	R996	RX66	R976
Backing	Heavy Polyester	Heavy Polyester	Heavy Polyester
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Cer P36 - P60
Comment	Extremely tough ceramic ensuring a great cut at high pressure	This specific elongated ceramic grit is perfectly adapted to Titanium work. In addition, its cool cut avoids surface contamination	One of the greatest supersized ceramic belts on the market for off hand applications



Semi-Finishing Operation

PRODUCT RECOMMENDATION	R976	R473	R427 / R426
Backing	Heavy Polyester	Heavy Polyester	Heavy Cotton / Light Polycotton
Pressure			
Grit Range	Cer P80 - P120	SiC P80 - P150	SiC P80 - P150
Comment	The finer R976 grits working at lower pressure will ensure a quick and cool cut as well as longevity	This aggregate will drastically increase the lifetime of the belt (2-3x vs conventional) thanks to its compact grain technology	These SiC belts will avoid contaminating the work surface



Finishing Operation

PRODUCT RECOMMENDATION	R473 / U464	R426	R427
Backing	Polyester / Heavy Cotton	Light Polycotton	Heavy Cotton
Pressure			
Grit Range	SiC P80 - P600	SiC P120 - P400	SiC P120 - P240
Comment	Life and surface integrity are ensured with these long life aggregate and NORaX products	This SiC superflexible belt offers great conformability for shaped parts	The Silicon Carbide is a must for Titanium blade finishing



Backstand Operation

ALUMINIUM



BEST ++++++

BETTER +++++

GOOD ++++

High Stock Removal

PRODUCT RECOMMENDATION	RX84	R929	R822
Backing	Heavy Polyester	Light Polycotton	Heavy Cotton
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Zirc P36 - P60
Comment	Thanks to its elongated grain and great orientation, RX84 provides a generous cut rate throughout the product life	The versatility of R929 allows the belt to perform best on Aluminum	This heavy cotton file belt provides amazing results thanks to its self sharpening grain



Semi-Finishing Operation

PRODUCT RECOMMENDATION	RX84	R929	R293
Backing	Heavy Polyester	Light Polyester	Light Polyester
Pressure			
Grit Range	Cer P80 - P120	Cer P80-P120	Alox P80 - P150
Comment	Thanks to its elongated grain and great orientation, RX84 provides a generous cut rate throughout product life	The versatility of R929 allows the belt to perform best on Aluminum	This Alox belt boosted with ceramic grain in coarse grits achieves amazing price performance ratio



Finishing Operation





PRODUCT RECOMMENDATION	R946	R426	R309
Backing	Light Polycotton	Light Polycotton	Light Cotton
Pressure			
Grit Range	Cer P120 - P320	SiC P120 - P400	Alox P120 - P400
Comment	Much better cut rate than competitors flexible Alox belts. Its supesize guarantees a cooler cut	This SiC superflexible belt offers great conformability for shaped parts	This flexible premium Aluminium Oxide belt combined with the semi-open coat distribution finds itself particularly well geared up for soft metals









BEST ++++++ BETTER +++++ GOOD +++





High Stock Removal

PRODUCT RECOMMENDATION	R976	R929 / R984	R293	
Backing	Heavy Polyester	Light Polyester	Light Polyester	 <p>R984</p>
Pressure				
Grit Range	Cer P36 - P60	Cer P24 - P60	Alox P36 - P60	
Comment	One of the greatest supersized ceramic belts on the market for off hand applications	These non supersized ceramic belts provide a more economical solution for rough grinding operations on carbon steel	This Alox belt boosted with ceramic grain in coarse grit achieves amazing price / performance ratio	

Semi-Finishing Operation

PRODUCT RECOMMENDATION	R976	R929 / R984	R293	
Backing	Heavy Polyester	Light Polyester	Light Polyester	 <p>R293</p>
Pressure				
Grit Range	Cer P60 - P120	Cer P60 - P120	Alox P60 - P120	
Comment	One of the greatest supersized ceramic on the market for off hand applications	These non supersized ceramic belts provide a more economical solution for rough grinding operations on carbon steel	This Alox belt boosted with ceramic grain in coarse grit achieves amazing price / performance ratio	

Finishing Operation

PRODUCT RECOMMENDATION	R946	R376	R265	
Backing	Light Polycotton	Light Cotton	Heavy Cotton	 <p>R265</p>
Pressure				
Grit Range	Cer P120 - P320	Alox P120 - P400	Alox P120 - P400	
Comment	Much better cut rate than competitors flexible Alox belts. Its supsize guarantees a cooler cut	Its active filler gives this premium alox belt a cool cutting effect	This heavy cotton Aluminium Oxide belt is an excellent entry level product for general purpose applications	

Backstand Operation

STAINLESS STEEL



BEST ++++++

BETTER +++++

GOOD ++++

High Stock Removal

PRODUCT RECOMMENDATION	R996	R976	R874
Backing	Heavy Polyester	Heavy Polyester	Heavy Polyester
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Zirc P24 - P60
Comment	Extremely tough ceramic ensuring a great cut at high pressure with a supersize layer limiting heat generation on stainless steel	One of the greatest supersized ceramic belts on the market excelling at medium pressure	The Zirconia grit microstructure and sharp edges make this belt one of the top performers on stainless steel



Semi-Finishing Operation

PRODUCT RECOMMENDATION	R976	R946	R874
Backing	Heavy Polyester	Light Polycotton	Heavy Polyester
Pressure			
Grit Range	Cer P60 - P120	Cer P60 - P120	Zirc P60 - 120
Comment	One of the greatest supersized ceramic belts on the market excelling at medium pressure	Much better cut rate than competitors flexible Alox belts. Its supersize guarantees a cooler cut	The Zirconia grit microstructure and sharp edges make this belt one of the top performers on stainless steel



Finishing Operation

PRODUCT RECOMMENDATION	U243	R946	R376
Backing	Light Cotton	Light Polycotton	Light Cotton
Pressure			
Grit Range	Alox X80 - X16	Cer P120 - P320	Alox P120 - P400
Comment	Astonishing belt allowing sequence jumps, generating large savings while providing an excellent surface finish	Much better cut rate than competitors flexible Alox belts. Its supersize guarantees a cooler cut	Its active filler gives this premium alox belt a cool cutting effect





R996 SUCCESS STORY: TURBINE BLADES

Machine/application information

Application: Aircraft engine parts

Machine: Backstand off hand

Pressure: High

Material: R996

Belt information

Belt size: 30 x 3500

Grit size: P40

Competitor information

Competitor: Competitor 1

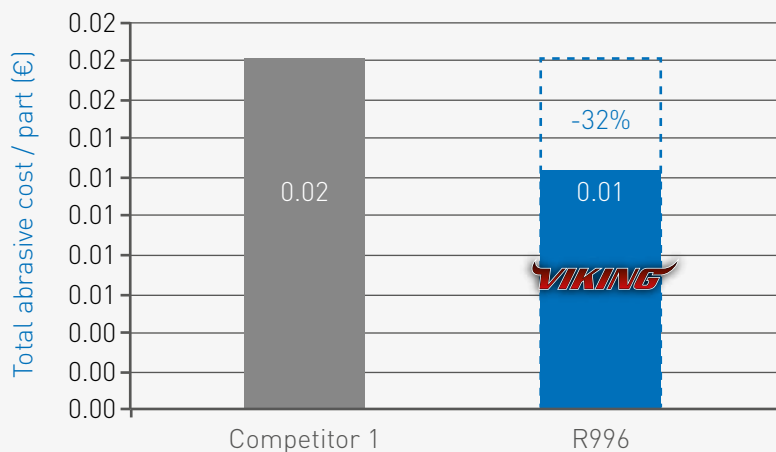
Parts/belts to customer: 550

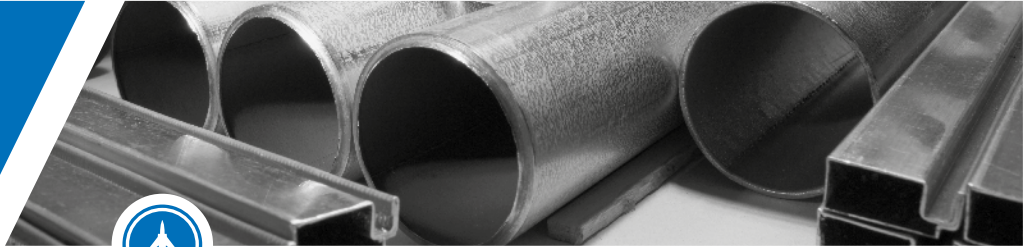
Part information

Material: High Nickel alloy

Result

Parts/belts to customer: R996 810 parts per belt / reduction of 32% abrasive cost





R996 SUCCESS STORY: AEROSPACE FOUNDRY

Machine/application information

Application: High stock removal

Machine: Manual centerless machine

Pressure: High

Material: 90 shoreA

Belt information

Belt size: 50 x 4000

Grit size: P36

Competitor information

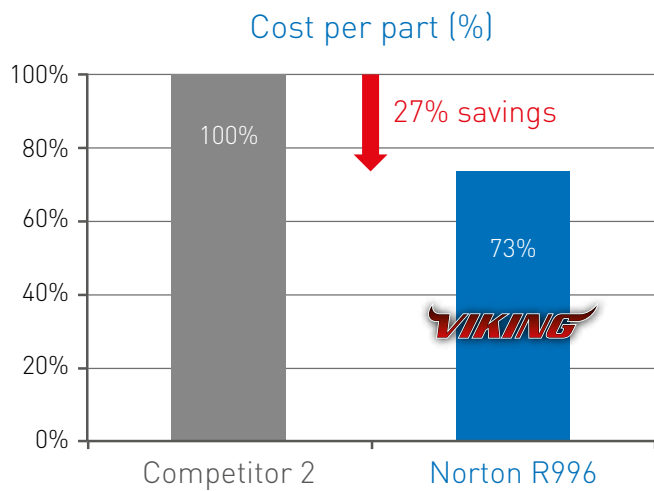
Competitor: Competitor 2

Part information

The belt performance from competition is higher than R996.

Competitor 2 = 47 pcs vs R996 = 32 pcs

However, the cost/performance ratio is in favor of R996





R996 SUCCESS STORY: AEROSPACE PARTS

Machine/application information

Application: Swing arm grinding

Machine: Backstand off hand

Pressure: Medium to high

Material: R996

Belt information

Belt size: 50 x 3500

Grit size: P40

Competitor information

Competitor: Competitor 3

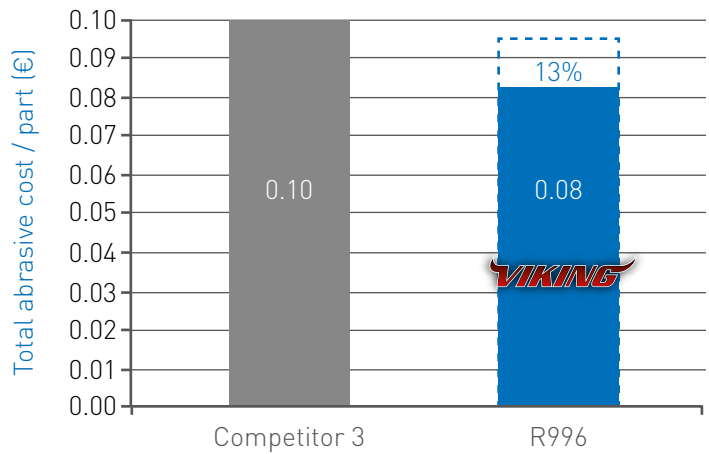
Parts/belts to customer: 40

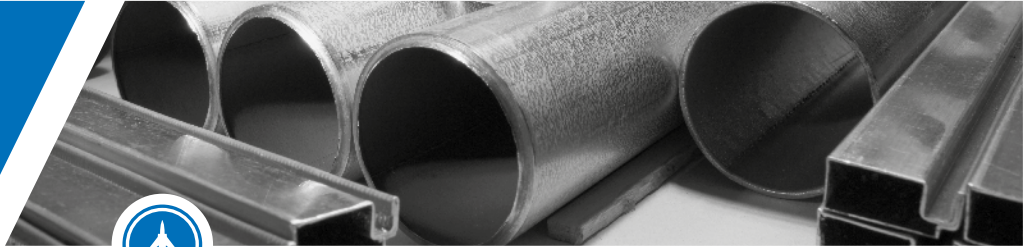
Part information

Material: High Nickel alloy

Result

Parts/belts to customer: R996 46 parts per belt saving 13% abrasive cost





R996 SUCCESS STORY: TURBINE BLADES

Machine/application information

Application: Blade grinding
Machine: Backstand off hand
Pressure: Medium
Material: R996

Belt information

Belt size: 30 x 3500
Grit size: P50

Competitor information

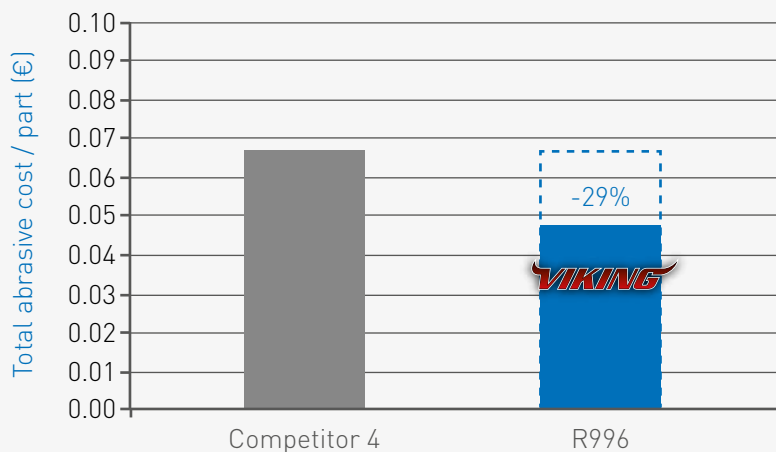
Competitor: Competitor 4
Parts/belts to customer: 90

Part information

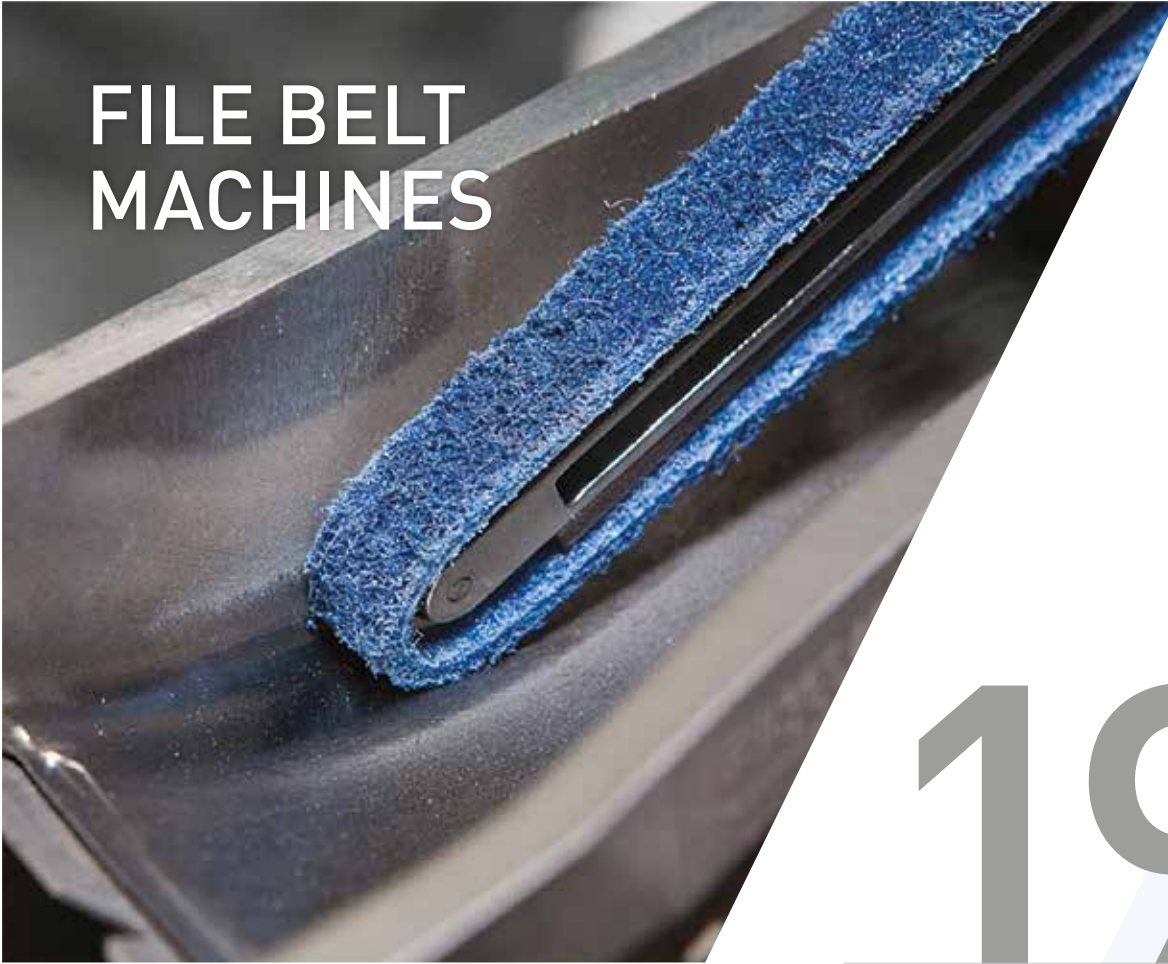
Material: Titanium

Result

Parts/belts to customer: R996 127 parts per belt saving 29% abrasive cost



FILE BELT MACHINES



19

A file belt is a common tool found in forges and foundries, the file belt tool is used to reach difficult areas to de-burr, remove welds and clean.

Norton offers a range of file belts designed to perform on intricate shapes and contours.

To ensure you choose the right file belt for you, this specialist range has been categorised by the type of material ground and the process being used.

TIP:

The pressure setting on your machine is an important factor in choosing your file belt. Check your machine and use the recommendations in the tables.

Stainless Steel and Inconel	20
Titanium	21
Aluminium	22

STAINLESS STEEL & INCONEL



BEST ++++++

BETTER +++++

GOOD ++++

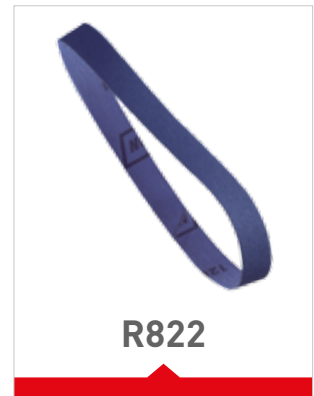
High Stock Removal

PRODUCT RECOMMENDATION	R996	R929	R822
Backing	Heavy Polyester	Light Polyester	Heavy Cotton
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Zirc P36 - P60
Comment	The heavy polyester combined with a tough ceramic allows you to remove lots of material very quickly, increasing productivity	Very well adapted to file belt operation in order to grind hard to reach areas on parts and quickly remove material	This heavy cotton file belt provides amazing results thanks to its self sharpening grain



Semi-Finishing Operation

PRODUCT RECOMMENDATION	R996	R929	R822
Backing	Heavy Polyester	Light Polyester	Heavy Cotton
Pressure			
Grit Range	Cer P60 - P80	Cer P60 - P120	Zirc P60 - 120
Comment	The heavy polyester combined with a tough ceramic allows you to remove lots of material very quickly, increasing productivity	Very well adapted to file belt operation in order to grind hard to reach areas on parts and quickly remove material	This heavy cotton self sharpening Zirconium grit file belt provides an exceptional cut rate with grits going as fine as P150



Finishing Operation

PRODUCT RECOMMENDATION	U264	RAPID PREP XF	R293
Backing	Heavy Cotton	Non-Woven	Light Polyester
Pressure			
Grit Range	Alox X100 - X16	Coa Med Fine Very Fine	Alox P120 - P400
Comment	This microstructured abrasive increases by x3 or more the life of a conventional product and will provide a much finer surface finish	A very flexible backing for surface conditioning and finishing work.	This resistant polyester belt will provide a great economical solution in Aluminium Oxide



TITANIUM

File Belt
Machines



BEST ++++++

BETTER +++++

GOOD ++++

High Stock Removal

PRODUCT RECOMMENDATION	R996	RX66	R976
Backing	Heavy Polyester	Heavy Polyester	Heavy Polyester
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Cer P36 - P60
Comment	The heavy polyester combined with a tough ceramic allows you to remove lots of material very quickly, increasing productivity	This specific elongated ceramic grit is perfectly well adapted to Titanium work. In addition, it's cool cut avoids surface contamination	One of the greatest supersized ceramic on the market excelling at medium pressure



Semi-Finishing Operation

PRODUCT RECOMMENDATION	R976	U464	R427 / R426
Backing	Heavy Polyester	Heavy Cotton	Heavy Cotton / Light Polycotton
Pressure			
Grit Range	Cer P80 - P120	SiC X70 - X110	SiC P80 - P150
Comment	One of the greatest supersized ceramic on the market excelling at medium pressure	This microstructured abrasive increases by x3 or more the life of a conventional product and will provide a much finer surface finish	These SiC belts will avoid contaminating the work surface



Finishing Operation

PRODUCT RECOMMENDATION	S4713	R426	R427
Backing	Non-Woven	Light Polycotton	Heavy Cotton
Pressure			
Grit Range	SiC SuperFine	SiC P120 - P400	SiC P120 - P240
Comment	The Non Woven technology outperforms competitors and will not damage the geometry of your part	Extremely flexible belt with a resistant and homogeneous backing for better surface quality	This SiC heavy cotton belt is well adapted to Titanium finishing





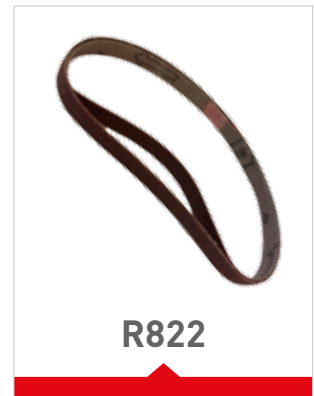
BEST ++++++

BETTER +++++

GOOD ++++

High Stock Removal

PRODUCT RECOMMENDATION	RX84	R929	R822
Backing	Heavy Polyester	Light Polyester	Heavy Cotton
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Zirc P36 - P60
Advice	Thanks to its elongated grain and great orientation, RX84 provides a generous cut rate throughout product life	Very well adapted to file belt operation in order to grind hard to reach areas on parts and quickly remove material	This heavy cotton file belt provides amazing results thanks to its self sharpening grain



Semi-Finishing Operation

PRODUCT RECOMMENDATION	RX84	R929	R822
Backing	Heavy Polyester	Light Polyester	Heavy Cotton
Pressure			
Grit Range	Cer P36 - P60	Cer P36 - P60	Zirc P60-P150
Advice	Thanks to its elongated grain and great orientation, RX84 provides a generous cut rate throughout product life	Very well adapted to file belt operations in order to grind hard to reach areas on parts and quickly remove material	This heavy cotton self sharpening Zirconium grit file belt provides an exceptional cut rate with grits going as fine as P150



Finishing Operation

PRODUCT RECOMMENDATION	R946	R426	R293
Backing	Light Polycotton	Light Polycotton	Light Polyester
Pressure			
Grit Range	Cer P80 - P320	SiC P120 - P400	Alox P120 - P400
Advice	Much better cut rate than competitors flexible Alox belts. Its supsize guarantees a cooler cut	This SiC superflexible belt offers great conformability for shaped parts and great cloth resistance for file belts shape	This resistant polyester belt will provide a great economical solution in Aluminium Oxide



MINI ANGLE GRINDERS



23

Mini angle grinders are a common tool found in foundry and forge work shops, they are very versatile and have a variable speed.

The tool-free fastening systems make fast work of disc changes to maximise productivity and minimise downtime. They can be used on contours as well as flat surfaces in general purpose and specialised grinding.

To ensure you choose the right belt for you, this specialist range has been categorised by the type of material ground and the process being used.

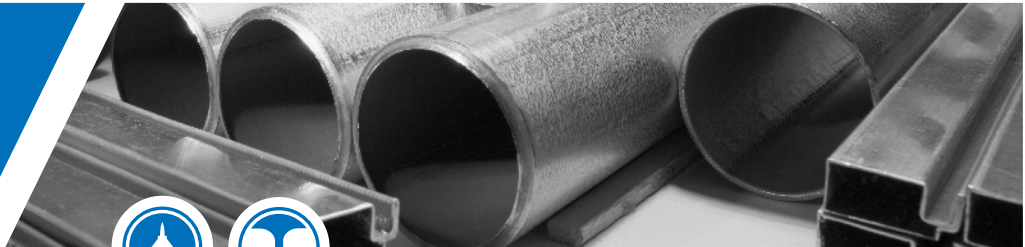
TIP:

The shape of your working area and speed of the tool are an important factor in choosing your product. Check your machine and use the recommendations in the tables.

All ferrous and heat sensitive metals

24

Mini Angle Grinders



SPEEDLOK DISCS

SpeedLok discs are extremely useful when working on small areas. Norton offer a wide variety of SpeedLok discs for grinding, blending and finishing on all types of metal.

High Stock Removal & Semi Finishing

PRODUCT RECOMMENDATION	R980P	Zirconia Plus	ARY19 / R422
Backing	Polyester	Polyester	Polyester / Cotton
Disc diameter	Ø15 - Ø75mm		
Grit Range / Type	Cer 'P36 - P120'	Zirc 'P36 - P120'	Alox 'P24 - P320' - SiC 'P60 - P120'*
Advice	This aggressive disc will help you to remove all defects quickly.	For a better cut and cool grinding on exotic alloys.	R422 - SiC grit - is the ideal disc for Titanium and non-ferrous aircraft and engine parts grinding.



PRODUCT SELECTION GUIDE

OPTIMUM TOOL SPEED TABLE (FOR MAXIMUM DISC CUT RATE & LIFE)

DIA (mm)	STAINLESS	ALUMINIUM	MILD STEEL	TITANIUM	GLASS	COMPOSITES
38	20000	20000	30000	9000	9000	15000
50	15000	15000	20000	7000	7000	10000
75	10000	10000	15000	4500	4500	8000








Mini Angle Grinders



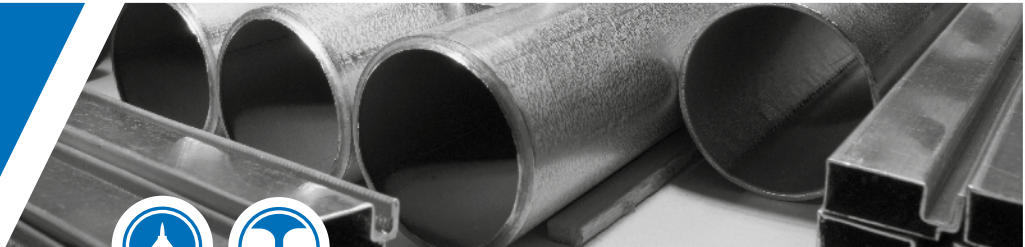
Finishing operation

PRODUCT RECOMMENDATION	Vortex Rapid Prep	Rapid Prep	Buffing Discs
Backing	Non-Woven	Non-Woven	Non-Woven
Recommended Speed (rpm)	Ø38 '14000 rpm' - Ø50 '10000 rpm' - Ø 75 '7000 rpm'		
Disc diameter	Ø25 - Ø75mm		
Grit Range / Type	Alox 'Extra Coarse - very fine'	Alox 'Extra Coarse - very fine'	Alox 'coarse - very fine'
Advice	Unique combination of aggressive performance, long life and improved finish.	Excellent product against competitors.	Very smooth and easy to work with. No risk of damaging the part or removing too much material.
			

Blending Operation




PRODUCT RECOMMENDATION	Vortex Rapid Blend	Rapid Blend	High Strength Beartex
Backing	Non-Woven	Non-Woven	Non-Woven
Recommended Speed (rpm)	Ø50 '15000 rpm' - Ø 75 '10000 rpm' (/2 for Titanium)		
Disc diameter	Ø50 - Ø75mm		
Grit Range / Type	Alox 'Medium'	Alox & SiC 'Medium - Fine'	Alox 'Med & V Fine'
Advice	Very high cut for a unitized disc. It outperforms all competitors in this market & applications.	Excellent for light deburring of flashing & blending alloys. Extremely low smearing compared to competitors.	Long lasting but conformable material. It will provide an excellent finish with greater flexibility.
			

Mini Angle Grinders



CARTRIDGE & SPIRAL ROLLS

Cartridge and Spiral rolls can be used in general purpose applications as well as more specific problematic applications. They are ideal for deburring, removing machine marks or flattening weld wave in corners.

	BEST +++++	BETTER ++++	
PRODUCT RECOMMENDATION	R920	R230	R422
Backing	Stainless steel, Cobalt, Inconel, Titanium and hard to grind alloys	Carbon steel	Non-Ferrous metal and Titanium
Standard dimensions	6x38x3,2 - 10x38x3,2 - 13x38x3,2 - x19x50x,4,8		
Grit Range / Type	Cer 'P60 - P80 - P120'	Alox 'P60 - P80 - P120'	SIC 'P60 - P80 - P120'
Advice	Superb cool cutting action and extremely quick to remove material.	Excellent for light deburring of flashing and good product life. These easily replace all hand made tools.	Great solution for Titanium refurbishing.
			







SPIRABANDS

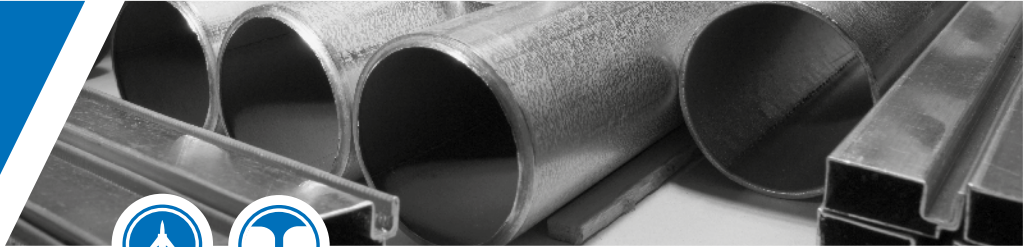
Spirabands are an excellent tool for deburring applications but also general grinding, cleaning and finishing.

The spiral joint eliminates the shadow marks from the work surface and provides a smooth cutting action.

BEST **+++++** BETTER **++++**

PRODUCT RECOMMENDATION	R920	R822
Backing	Stainless steel, Cobalt, Inconel, Titanium and hard to grind alloys	Carbon steel, stainless steel
Standard dimensions	15x30 - 22x20 - 25x25 - 45x30	
Grit Range / Type	Cer 'P36 - P60'	Zirc 'P36 - P80'
Advice	Superb cool cutting action and extremely quick to remove material - quick change thanks to its rubber holder.	Zirconium grit gives a great cut and constantly provides sharp edges to grind material.
		

Mini Angle Grinders



FLAP WHEELS

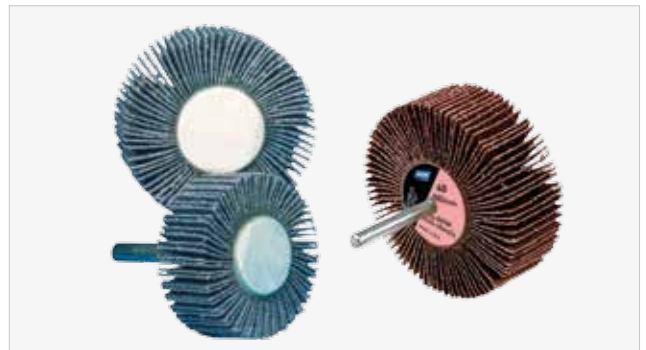
GRINDING AND BLENDING SMALL OR HARD-TO-REACH AREAS.



SPINDLE-MOUNTED MICRO-MINI FLAP WHEELS

Ideal for ID grinding of holes, radii and grooves as small as 25mm, found in airframe tubing and numerous other aircraft and engine components.

Our smallest aluminum oxide flap wheels are available in 10 to 30mm diameters and are mounted on 3mm steel spindles.



SPINDLE-MOUNTED MINI FLAP WHEELS

Several qualities of flaps are available in Silicon Carbide for landing gear equipment, Zirconium for aggressive and quick operation and Aluminum Oxide to grind and polish intricate surfaces. In addition to our conventional range, we offer non woven flap wheels interleaf and standard for light, conformable finishing operations.

PRODUCT SELECTION GUIDE

MATERIALS / APPLICATIONS	BEST	BETTER	GOOD
Stainless Steel / Heat Sensitive Alloys	R822 (P40 - P60 - P80)	R207 (P40 to P320)	
Carbon Steel / Weld / Ferrous Metal	R265 (P40 to P320)	R207 (P40 to P320)	
Titanium / Brass / Aluminum / Non Ferrous Metal	R427 (P40 - P240)	R207 (P40 to P320)	

MATERIALS / APPLICATIONS	BEST	BETTER	GOOD
Non Woven	Deburring	Cleaning	Blend/Finishing
All Metals	F2302	F2401	F4300/F2501

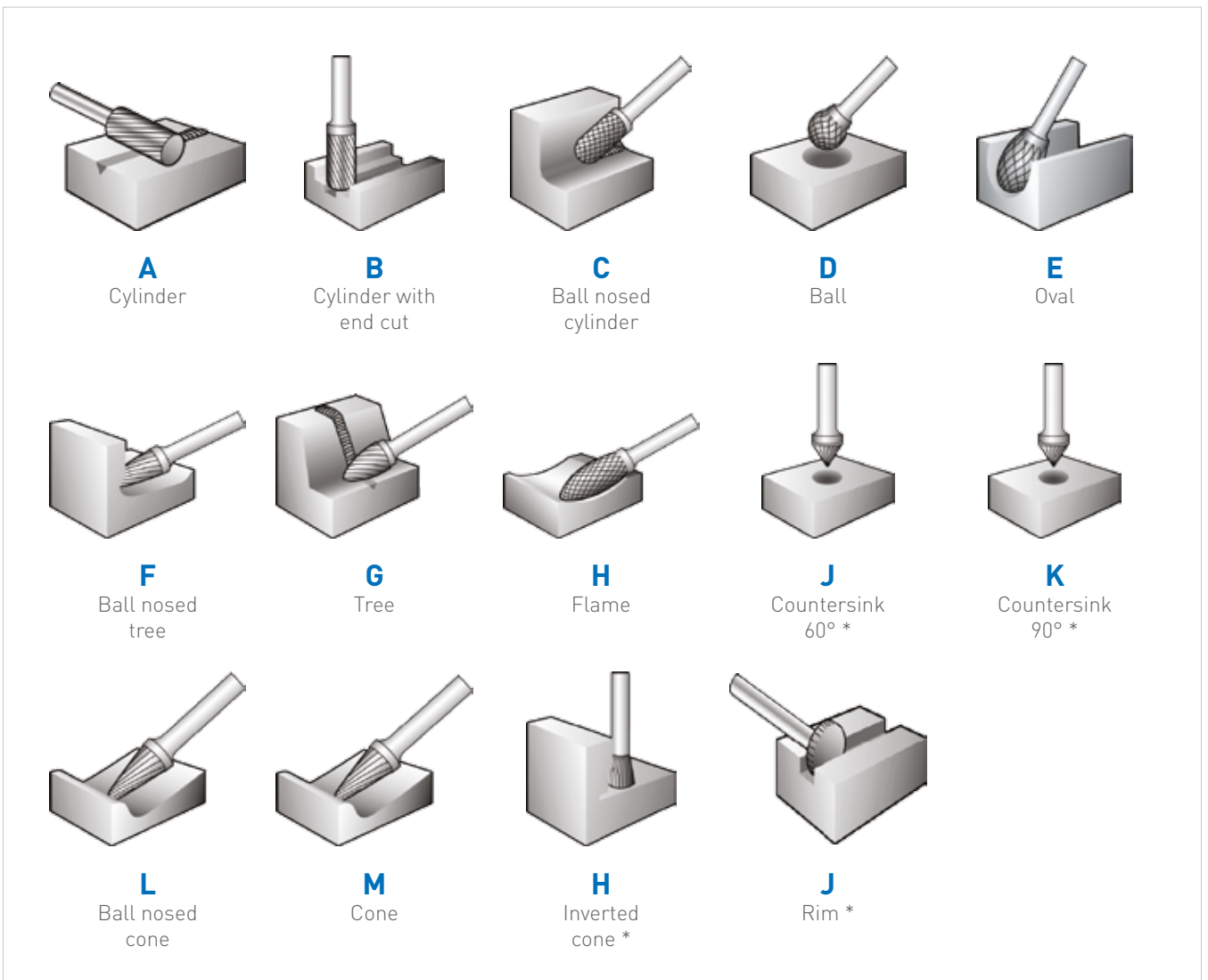




CARBIDE BURRS

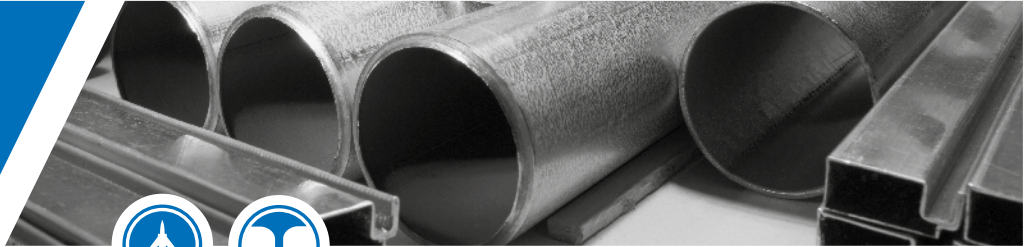
State of the art, "Inox" & "Steel" brings innovation to the Norton Carbide burr offering. The specially designed geometries suit the growing market demands for stainless steel, steel and cast steel applications. This is a cost effective alternative to standard solutions due to the greater rate of stock removal.






This extended line of carbide burrs covers a variety of teeth and cutting shapes providing optimum adaptation to the key characteristics of various application materials.



* Made to order

Mini Angle Grinders



					
Cut Style	INOX	STEEL	D Double Cut	DTECH Double Cut Extra	ALU Aluminium Special
Qualities	Developed cutting geometry - generating high stock removal on stainless steel and on Ferritic, Austenitic & Martensitic based materials, ensuring production savings and reduced downtime, reducing heat buildup at the cutting edge and work piece.	Specially designed geometry to suit growing market demands for steel and cast steel applications, producing large chips with increased stock removal.	Universal cutting style, fast material removal, smooth finish and granular chip break.	Better stock removal. Stronger tooth formation (decreased tooth wedge angle) longer tool life and reduced chipping.	For deburring of aluminium alloys & plastic wide tooth formation, easy chip flow.

XTREM					
Hardened Steel		+++++	+++	+++	
Stainless Steel	+++++		+++	+++	
Cast Iron			+++++	+++	
Titanium			+++	+++++	
Nickel			+++	+++++	
Copper/copper alloys			+++	+++++	
Aluminium					+++++
Plastics					+++++



HINTS & TIPS



31

Troubleshooting	32
Important Parameters	33



INADEQUATE PRODUCT LIFE

PROBLEM	POSSIBLE CAUSE	SUGGESTED CORRECTION
DULLING/GLAZING	Grit too fine	Use coarser grit
	Grinding pressure too heavy or too light	Adjust grinding pressure
	Insufficient belt flex	Order correct specification
	Improper coated abrasive specification or type	Order correct specification
	Contact wheel not aggressive enough	Change to more aggressive contact wheel
	Excessive belt and/or contact roll speed	Reduce belt and/or roll speed
	Insufficient in feed pressure	Increase in feed pressure
	Faulty or insufficient coolant or grinding aid	Redirect or increase coolant flow
LOADING	Improper coated abrasive product specification	Order correct specification (Openkote)
	Excessive grinding pressure	Decrease pressure
	Excessive in feed pressure or speed	Decrease in feed pressure or speed
	Insufficient or misdirected coolant	Increase or redirect coolant flow
	Insufficient exhaust	Increase exhaust
SHEDDING	Improper coated abrasive product specification	Order correct specification
	Excessive product flex	Order correct flex specification
	Excessively heavy cut	Adjust cut depth
	In feed too fast	Reduce in feed speed
	Contact roll too aggressive	Use less aggressive contact roll
	Worn contact roll	Dress or replace contact roll
	Grinding in one area of belt only	Oscillate belt. Use entire surface of belt





IMPORTANT PARAMETERS

Hints & Tips



IMPORTANT PARAMETERS

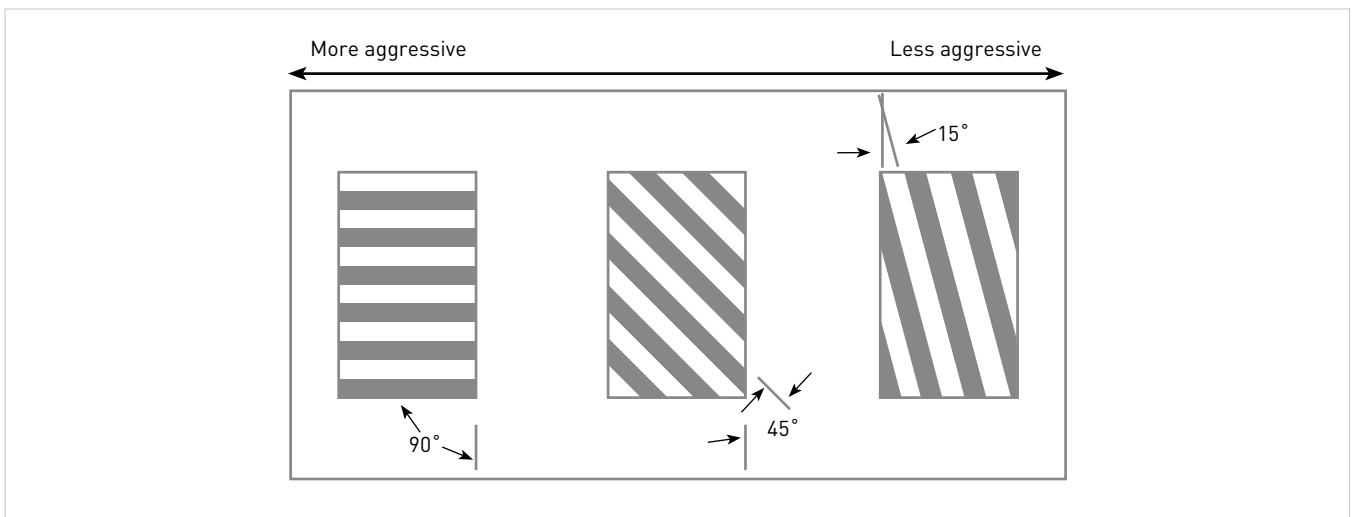
The importance of contact wheels for coated abrasive belts.

SOFT CONTACT

Soft contact wheels offer lower cut rates, a finer surface finish and follow the contours of the work piece more effectively than a hard contact wheel. Soft contact wheels suit light stock removal and finishing applications. Lower pressure should be used with soft contact wheels.

HARD CONTACT

Hard contact wheels provide higher cut rates and leave a coarser surface finish. Use with stiffer belt backings and a harder grain. Use ceramic for a more aggressive, fast cutting action. When using hard contact wheels it is important to use high pressure (off-hand or automatic) as the higher pressure will help to break down the harder grain types.



While the serrations on the contact wheel can add to the aggression, the width of the gap between the serrations can also aid aggression. The lower the land to groove ratio the more aggressive the wheel will act. The standard land to groove ratio are as follows:

THE STANDARD LAND TO GROOVE RATIO ARE AS FOLLOWS:	
1:1 Land to groove ratio	LESS AGGRESSIVE
1:2 Land to groove ratio	MORE AGGRESSIVE
1:3 Land to groove ratio	MOST AGGRESSIVE

IMPORTANT PARAMETERS



RECOMMENDED SPEED

	RECOMMENDED GRIT	BELT SPEED (m/s)
Carbon steel	Alox, Zirconium and Ceramic	25 -35
Stainless steel	Zirconium and Ceramic	20 - 30
Non-Ferrous metal (soft: aluminum, brass,...)	Alox and Zirconium	15 - 25
Non-Ferrous metal (hard: titanium, hard aluminum alloys, ...)	Silicon Carbide and Ceramic	10 - 20
Cast Iron	Alox and Zirconium	25 - 35

ABRASIVE STRUCTURE

The diagrams below show the difference between the three types of abrasive; Norax, Conventional and Aggregate:

CONVENTIONAL

Conventional Abrasive is used for aggressive and quick material removal.



A 3rd cooling agent layer (in pink) can be added to reduce the heat generation.

AGGREGATE

Aggregate abrasive is used for long lasting abrasion.



NORaX

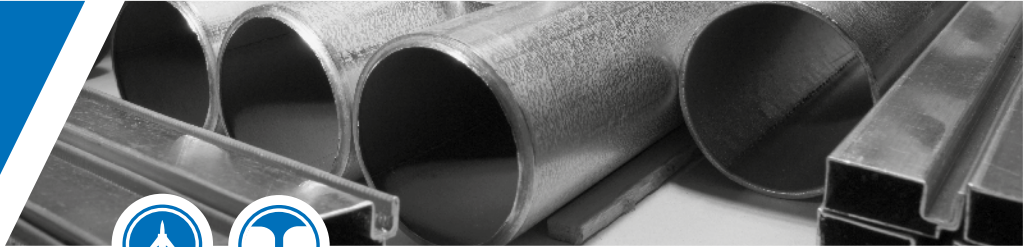
NORaX abrasive is used for fine surface finishing and step sequence jumps.



PRODUCT BY
APPLICATION

35

Product by Application



PRODUCT RECOMMENDATION	R996	R976	RX66	R293
Grit Range	36 - 80	36 - 120	40 - 120	24 - 400
Grit Type	Ceramic	Ceramic	Ceramic	Aluminium Oxide
Shape	Belt	Belt	Belt	Belt
Machine	Fixed / off hand machine	Fixed machine	Fixed / off hand machine	Fixed / off hand machine
Application	Deburring / Calibrating	Deburring / Calibrating / Semi-finishing	Deburring / Calibrating / Semi-finishing	Deburring / Calibrating / Semi-finishing / Finishing
Targeted Area	Profiles, Gates, Wedge faces, Root end	Wedge faces, Extremity, Profiles	Wedge faces, Extremity, Profiles	Profiles, surfaces
Flexibility	Very Stiff	Stiff	Stiff	Stiff
Material	Super alloys, Titanium, Stainless Steel	Super alloys, Titanium, Stainless Steel	Titanium	Carbon steel, Stainless steel and Aluminium
Wet/Dry				
Cooling agent	Yes	Yes	Yes	No



PRODUCT RECOMMENDATION	R946	R376	RX84	R929
Grit Range	60 - 320	60 - 400	36 - 80	36 - 120
Grit Type	Ceramic	Aluminium Oxide	Ceramic	Ceramic
Shape	Belt	Belt	Belt	Belt
Machine	Fixed / off hand machine	Fixed machine	Fixed / off hand machine	Fixed / off hand machine
Application	Semi-finishing / Finishing	Semi-finishing / Finishing	Deburring / Calibrating	Deburring / Calibrating / Semi-finishing
Targeted Area	Fir tree, root form, radius	Fittings, profiles	Joints, machining burrs	Carters, fittings
Flexibility	Super Flexible	Flexible	Stiff	Stiff
Material	Special alloys, Aluminium and Stainless steel	Stainless steel and Carbon steel	Aluminium	Aluminium, Steel, Stainless steel
Wet/Dry				
Cooling agent	Yes	No	No	No



Product by Application

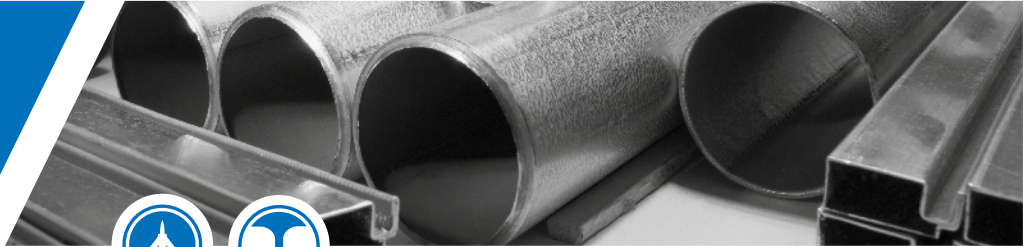


PRODUCT RECOMMENDATION	R984	R874	U243	R473
Grit Range	24 - 120	24 - 120	X80 - X4	60 - 600
Grit Type	Ceramic	Zirconium	Aluminium Oxide	Silicon Carbide
Shape	Belt	Belt	Belt	Belt
Machine	Fixed machine	Fixed machine	Fixed machine	Fixed machine
Application	Deburring / Calibrating / Semi-finishing	Deburring / Calibrating / Semi-finishing	Finishing	Semi-finishing / Finishing
Targeted Area	Joints, machining burrs, welds	Profiles, Gates, Wedge faces, Root end	Surfacing flat areas	Blade faces / Flat areas
Flexibility	Stiff	Very Stiff	Flexible	Stiff
Material	Carbon steel	Stainless steel, Cast iron	Aluminium, Steel, Stainless steel	Titanium
Wet/Dry				
Cooling agent	No	No	No	No



PRODUCT RECOMMENDATION	U464	R426	R427	R265
Grit Range	X110 - X70	80 - 400	24 - 240	36 - 400
Grit Type	Silicon Carbide	Silicon Carbide	Silicon Carbide	Aluminium Oxide
Shape	Belt	Belt	Belt	Belt
Machine	Fixed / off hand machine	Fixed / off hand machine	Fixed / off hand machine	Fixed machine
Application	Semi-finishing / Finishing	Semi-finishing / Finishing	Deburring / Calibrating / Semi-finishing / Finishing	Deburring / Calibrating / Semi-finishing / Finishing
Targeted Area	Blade faces / Flat areas	Profiles, Extremity	Profiles, Extremity	Surfaces
Flexibility	Medium	Super Flexible	Medium	Medium
Material	Titanium	Titanium, Aluminium, Non ferrous metals	Titanium, Aluminium, Non ferrous metals	Carbon steel
Wet/Dry				
Cooling agent	No	No	No	No

Product by Application



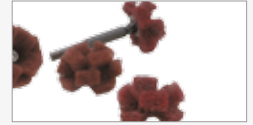
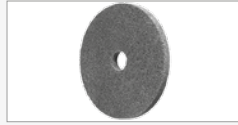
PRODUCT RECOMMENDATION	R287	S2203	S2303	U2305
Grit Range	60 - 400	Coarse	Medium	Medium
Grit Type	Aluminium Oxide	Vortex	Vortex	Vortex
Shape	Belt	Specialties	Specialties	Specialties
Machine	Fixed / off hand machine	Off hand machine	Off hand machine	Off hand machine
Application	Semi-finishing / Finishing	Deburring	Cleaning / Surface Conditioning / Finishing	Scratch removal on fan casings and compressors
Targeted Area	Radius	Turbine vanes, turbine structures, fan and inlet cowls	Turbine vanes, turbine structures, fan and inlet cowls	Fan casings and compressors
Flexibility	Flexible	Medium	Medium	Medium to Hard
Material	Carbon steel	All metal	All metal	All metal
Wet/Dry	☒	☒ ☒	☒ ☒	☒ ☒
Cooling agent	No	No	No	No



PRODUCT RECOMMENDATION	R920	Norzon Plus	ARY19	R422
Grit Range	36 - 120	36 - 120	36 - 320	36 - 320
Grit Type	Ceramic	Zirconium	Aluminium Oxide	Silicon Carbide
Shape	Belt / Specialties	Belt / Specialties	Specialties	Specialties
Machine	Fixed / off hand machine	Fixed / off hand machine	Off hand machine	Off hand machine
Application	Deburring / Calibrating / Semi-finishing	Deburring / Calibrating / Semi-finishing	Deburring / Calibrating / Semi-finishing / Finishing	Semi-Finishing
Targeted Area	Profiles, Gates, Wedge faces, Root end	Machine burrs, welds, edges	Burrs and edges	Burrs and edges
Flexibility	Very Stiff	Medium	Medium	Medium
Material	Inconel, Special alloys, Stainless steel	Stainless steel, Carbon steel	Stainless steel, Carbon steel, Aluminium	Titanium
Wet/Dry	☒ ☒	☒	☒	☒
Cooling agent	Yes	No	No	No



Product by Application



PRODUCT RECOMMENDATION	U4401	F2303	R4101	F2300
Grit Range	Fine	Medium	Extra coarse	Medium
Grit Type	Silicon Carbide	Aluminium Oxide	Silicon Carbide	Aluminium Oxide
Shape	Specialties	Specialties	Specialties	Specialties
Machine	Off hand machine	Off hand machine	Off hand machine	Off hand machine
Application	Scratch removal on fan casings and compressors	Edge deburring, oxydation removing, tools marks blending	Cleaning / Stripping	Edge deburring, oxydation removing, tools marks blending
Targeted Area	Fan casings and compressors	Aircraft structures	Aircraft structures	Aircraft structures
Flexibility	Stiff	Medium	Stiff	Medium
Material	All metal	Aluminium, steel	All metal	All metal
Wet/Dry				
Cooling agent	No	No	No	No



PRODUCT RECOMMENDATION	Diamond & CBN
Grit Range	M3 - M300
Grit Type	Diamond & CBN
Shape	Belt / Specialties
Machine	Fixed / off hand machine
Application	Semi-finishing / Finishing
Targeted Area	Air Intakes, Engine Blades, Buckets for Gas Turbine Blades
Flexibility	Very Stiff to Flexible
Material	Very Hard metal / Ceramic / HVOF
Wet/Dry	
Cooling agent	No

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