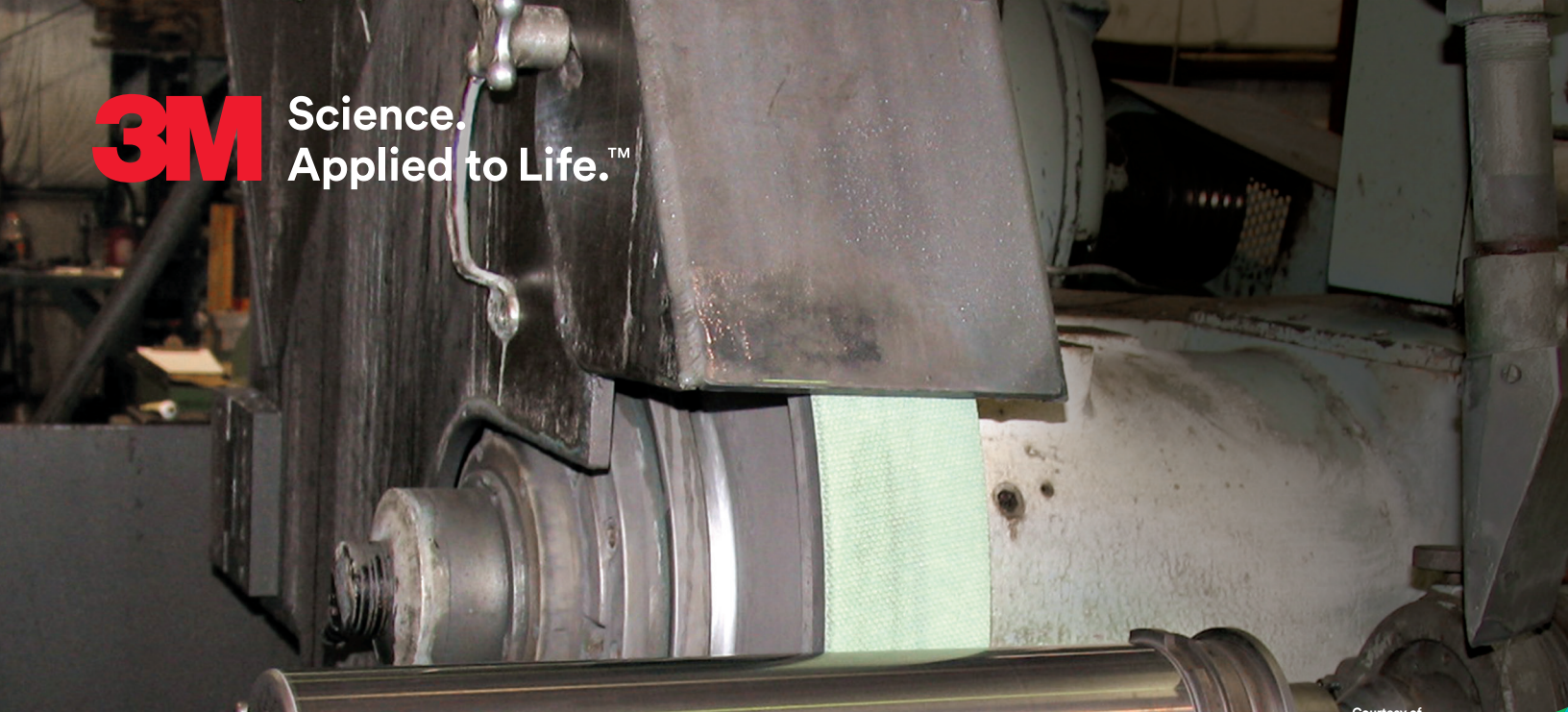
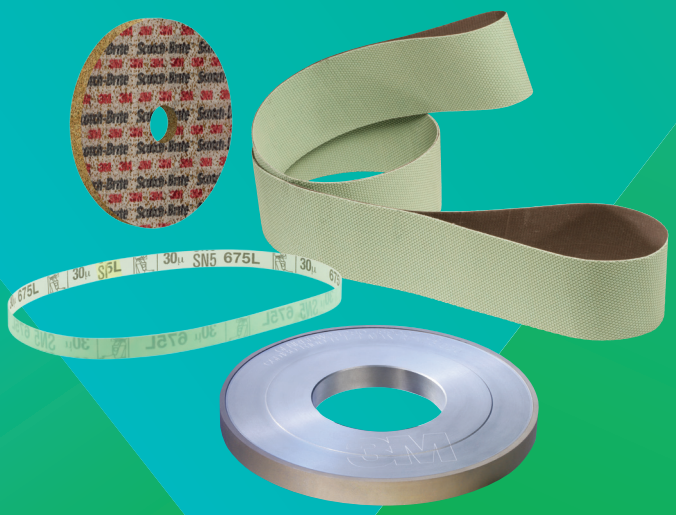
3M Science. Applied to Life.™



Courtesy of Abbott Machine Co.

Hard-to-grind materials cut down to size.



From rough grinding to final finishing, 3M brings you a complete range of abrasive solutions designed to meet today's tough processing challenges.

3M.com/abrasives

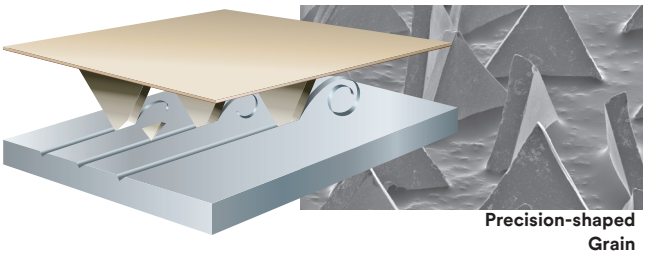
Cut to the science of the matter.

3M abrasive technologies.

Shaping a new era of grinding performance.

CUBITRON™ II

The precision-shaped grain found in 3M™ Cubitron™ II Abrasives combines the advanced material properties of our original Cubitron grain with the precise microreplicated structures pioneered in 3M™ Trizact™ Abrasives. As the triangular shaped grain wears, it continuously fractures to form sharp points and edges.



Precision-shaped Grain

Conventional ceramic abrasive grain is irregular and blocky in shape. Instead of a clean, machining action, the grain tends to "plow" through the metal, causing heat to build up in the workpiece and the abrasive — resulting in a slower cut, shorter belt life and undesirable effects, such as burnishing.

Conventional

Revolutionary 3M technologies deliver required geometry tolerances without sacrificing cut rates on hard-to-grind materials. Consistently and easily achieve finishing specs part after part.

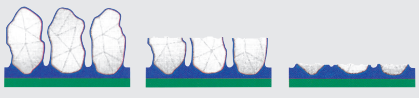
Scotch-Brite™

The fast yet forgiving cut and consistent performance of Scotch-Brite™ Abrasives allows you to improve surfaces without significantly changing the shape of dimension or the workpiece—and helps prevent undercutting and gouging.

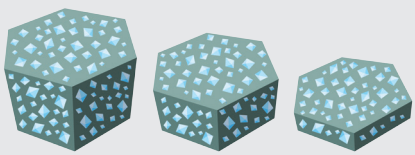
Flexible, non-woven construction with high concentration of active mineral sites for fast, consistent cutting without compromising final finish. Specially coated to minimize loading. Produces controlled, uniform scratch throughout life of the abrasive.

Trizact™

Derived from patented 3M microreplication technology, 3M™ Trizact™ Abrasives consist of precisely-shaped three-dimensional structures distributed uniformly over the substrate. Unlike conventional abrasives, which are constructed from randomly-spaced and irregular-shaped minerals, the uniform configuration of Trizact abrasives helps deliver consistent performance.



Conventional abrasives start out sharp, but dull quickly.



The three-dimensional structures of 3M™ Trizact™ Abrasives contain multiple layers of mineral. As these structures wear, fresh, sharp mineral is constantly exposed to the workpiece, resulting in faster, more consistent cutting throughout the life of the belt.

Base Steel Dimensioning

3M™ Cubitron™ II Abrasive Belt 984F

New 3M™ Cubitron™ II Abrasive Belts have raised the bar for grinding performance and productivity — thanks to a breakthrough 3M technology that re-writes the rules for speed, consistency and belt life.

- Cuts cooler — diverts heat from the workpiece and belt to the swarf
- Helps eliminate burnishing and heat stress
- 3M's highest performing belt in most metal working applications

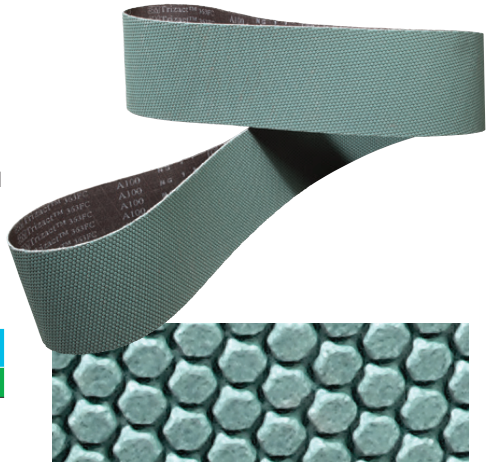
3M™ Trizact™ Cloth Belt 363FC

3M's newest belt for cylindrical and centerless grinding provides outstanding performance when dimensioning the base material prior to thermal spray coating of parts. Combine the unmatched consistency of this Trizact abrasive with the ease and versatility of a belt dimensioning process for fast, predictable results on stainless, mild and hardened steel. Grade A300 provides quick cutting and accurate dimensioning of base metal prior to thermal spray coating. Finer finishes can be quickly achieved through simple belt changes to the appropriate abrasive grade.

Base Material Prep and Dimensioning with 3M™ Trizact™ Cloth Belt 363FC

		Sequential Surface Finishes Obtained Ra (micro inch) Target Removal (inches off the diameter)					
Roll Material		**A300**	**A160**	**A100**	**A65**	**A45**	**A35**
Mild Steel	Ra	60–70	55–65	40–50	30–35	20–25	12–18
	Target Removal	0.010–0.015	0.005–0.0075	0.005	0.004	0.0025	0.001

Operating Conditions	Recommended	Acceptable Range
Belt Speed (SFPM)	6,000	4,000–7,000
Workpiece Speed	75	50–150
Traverse Rate	1/4 inch/rev	1/10–1/2 inch/rev
Contact Wheel	Incompressible Aluminum, Steel, Polymer; 1/4" wider than abrasive belt	
Alternate Contact Wheel	90 Shore A, smooth or serrated	
Coolant	Water with 4–8% synthetic coolant	



3M™ Trizact™ Cloth Belt 363FC is available in A300 to A35 grades.

- Faster than conventional bonded wheels
- Up to 5 times extended belt life over conventional coated abrasives
- Improved finish consistency
- Reduced taper on long parts
- Improved part-to-part size

Chrome Grinding

3M™ Trizact™ Cloth Belt 347FC

Similar to Trizact belts 363FC, the new 347FC belts feature a unique formulation and abrasive pattern well suited for hard chrome grinding and finishing. 347FC belts deliver consistent grinding performance without loading and dulling. Available in grades A300 for quick stock removal to A30 for fine finishes in belts up to 25" wide.

Grade A160 strips and finishes. Rely on A160 for efficient stock removal and also to achieve a fine finish!

Base Material Prep and Dimensioning with 3M™ Trizact™ Cloth Belt 347FC

		Sequential Surface Finishes Obtained Ra (micro inch) Infeed (inches on radius)		
Roll Material		**A160**	**A65**	**A45**
Chrome	Ra	5–12	3–4	2–3
	Infeed	0.0004	0.00025	0.00025

Operating Conditions	Recommended	Acceptable Range
Belt Speed (SFPM)	6,000	4,000–7,000
Workpiece Speed	75	50–150
Traverse Rate	1/4 inch/rev	1/10 inch/rev – 1/2 belt width/rev
Contact Wheel	Incompressible Aluminum, Steel, Polymer; 1/4" wider than abrasive belt	
Alternate Contact Wheel	90 Shore A, smooth or serrated	
Coolant	Water with 4–8% synthetic coolant	

3M™ Cloth Belt 966F

Constructed with tough, durable ceramic abrasive grain, 966F belts are ideally suited for stripping chrome from old parts as they are being rebuilt. 966F belts are also suited for wet grinding and finishing of heat sensitive high nickel alloys, where a coolant flood is needed, as well as titanium and stainless steel.

Base Material Prep and Dimensioning with 3M™ Cloth Belt 966F

Operating Conditions	
Contact Wheel	Incompressible Aluminum, Steel, Polymer; 1/4" wider than abrasive belt
Alternate Contact Wheel	90 Shore A, smooth or serrated
Abrasive Speed	6000–7000 sfpm
Coolant	Water with 4–8% synthetic coolant
Rod Rotation	100 sfpm
Head Traverse Speed	.020"–.070"/revolution (depending on chrome/coating thickness)
Head Motor Load	33% over no-load

Thermal Spray Grinding

Contour/Complex Shapes

Scotch-Brite™ 645DC Diamond Unitized Wheels

Scotch-Brite™ 645DC Diamond Unitized Wheels are a must-see for thermal spray, composites, carbon fiber and ceramic processing jobs. Scotch-Brite™ 645DC provides opportunities for step consolidation and consistent finishes. Scotch-Brite™ 645DC removes and finishes thermal spray parts in one step with Ra in the 12–16 range. Available in 12", 6" and 3" diameters and in multiple thicknesses.

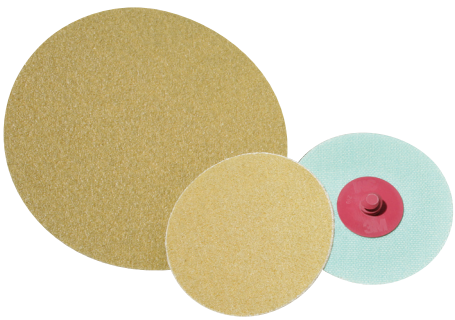
Consistently Fine, Burr-Free Finish with Scotch-Brite™ 645DC Diamond Unitized Wheel

Operating Conditions	
Wheel Diameter	**Maximum RPM**
3"	15,100
6"	6,000
12"	2,200

3M™ Diamond Microfinishing Film Belt 675L

Designed with superior flexibility, 675L film belts can be used wet or dry to finish highly contoured thermal sprayed surfaces such as progressive cavity pumps and extruder screws. Available in grades 125 and 74 micron to refine thermal sprayed surfaces and 45, 30, 20 and 9 micron for finer finishes.

3M™ Diamond Cloth Disc 674W

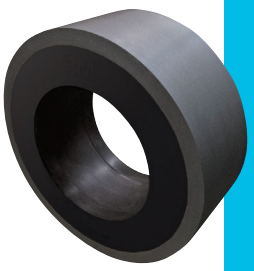


3M Diamond Cloth Discs 674W are designed to provide long-lasting cutting performance when used for finishing ceramics, carbides and hard coated materials. The unique construction allows Diamond Cloth 674W to deliver outstanding consistency throughout the life of the disc, for improved control and fewer rejects. They provide optimal performance when run wet, but can also be run dry. Compared to flexible metal bond diamond abrasives, 3M Diamond Cloth Discs 674W last longer, and deliver a faster, more consistent cut. They also provide a finer finish, with less chance of burn through — helping you improve productivity.

Cylindrical Parts

3M™ Diamond Wheel 637BI

3M Diamond Wheels 637BI feature a breakthrough technology for hard-to-grind materials that enables faster, non-stop grinding performance — with little to no need for wheel conditioning. Dressing stick use is reduced or eliminated allowing for higher throughput, lower cost-per-part, and greater worker safety. These fast-cutting, long-lasting wheels are available in a wide range of grades, shapes and sizes — from 3" cup wheels to 24" centerless grinding wheels.

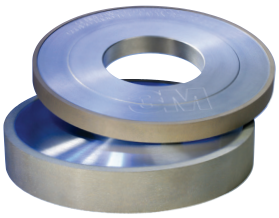


Faster, safer and more cost-effective way to achieve desired size and finish.

- Consistent and fast-cutting — at rates up to 25% higher than typical wheels
- Reduced consumables cost — can eliminate the need for dressing sticks
- Higher productivity — allows increased feed rates, while reducing or eliminating the need for wheel conditioning
- Lower maintenance costs — reduces debris in coolant, minimizing wear and tear on equipment and reducing the particle load on the filtration system
- Enhanced worker safety — can avoid the risks associated with manual sticking

3M™ Resin Bond Superabrasive Wheels

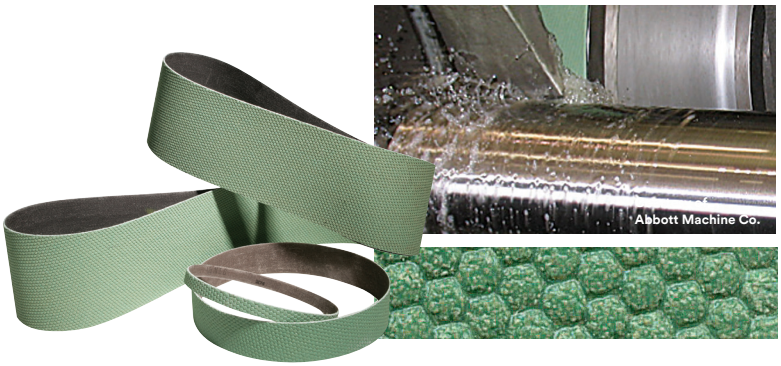
3M manufactures a full line of bonded and single layer superabrasive products utilizing the latest induction and furnace heating techniques. They provide excellent form retention as well as abrasion and heat resistance when grinding tough materials such as carbides, quartz, ceramics and hard metals.



3M™ Trizact™ Diamond Cloth Belt 663FC

3M Trizact Diamond Cloth Belt 663FC represents the next generation in abrasive technology — combining the predictable dimensioning traditionally associated with bonded wheels with the speed, consistency and ease of use of 3M abrasive belts.

663FC belts cut up to 70% faster than typical bonded wheels. And because they are easy to use, even less-experienced operators can achieve consistent, effective stock removal throughout the life of the belt. This also means that lower grinding forces can be used, minimizing the chance of deformation, chatter and other grinding defects on lightweight/thin-walled components.



Roll Grinding with 3M™ Trizact™ Diamond Cloth Belt 663FC

		Sequential Surface Finishes Obtained Ra (micro inch) Infeed (inches on radius)		
Roll Material		**70µ**	**40µ**	**20µ**
Tungsten Carbide	Ra	20–30	10–20	4–10
	Infeed	0.0008	0.0005	0.00025
Chrome Carbide	Ra	25–35	15–25	6–12
	Infeed	0.0012	0.0008	0.0005
Nickel Based	Ra	40–50	30–40	20–30
	Infeed	0.0017	0.0012	0.0006
Chrome Oxide	Ra	60–80	40–50	20–30
	Infeed	0.003	—	—

Operating Conditions	Recommended	Acceptable Range
Belt Speed (SFPM)	6,000	4,000–7,000
Workpiece Speed	75	50–150
Traverse Rate	1/4 inch/rev	1/10 inch/rev – 1/2 belt width /rev
Contact Wheel	Incompressible Aluminum, Steel, Polymer; 1/4" wider than abrasive belt	
Alternate Contact Wheel	90 Shore A, smooth or serrated	
Coolant	Water with 4–8% synthetic coolant	

Superfinishing/Finishing

3M™ Diamond Microfinishing Film Rolls 675L

Designed especially for fast finish reduction on hard materials, new 675L film allows target finishes to be achieved in fewer passes for greater productivity. Can cut superfinishing time in half or more, compared to stones. Currently available in grades ranging from 125 to 9 micron, 675L film offers an efficient, economical alternative in most applications except those requiring the finest possible finishes. Use 3M Diamond Lapping Film to achieve finishes <2 Ra Micro Inch.

Superfinishing with 3M™ Diamond Microfinishing Film 675L

Sequential Surface Finishes Obtained (Ra Micro Inch)					
Roll Material		**74µ**	**45µ**	**30µ**	**20µ**
Tungsten Carbide	Ra	12–16	8–12	5–8	2.5–5
Chrome Carbide	Ra	15–20	10–14	6–10	4–6
Nickel Based	Ra	20–55	14–19	6–10	4–6
Chrome Oxide	Ra	~55	~45	—	—

Operating Conditions	Recommended	Acceptable Range
Workpiece Speed	300 sfpm	150-350
Traverse Rate	0.07 inch/rev	0.03-0.1
Abrasive Support	65 Shore A Roller	—
Abrasive Speed	0.5–1.0 inch/min	—
Pressure	20 lbs/inch width	10–40
Oscillation	Alternating Moderate/None	
Coolant	Water with 4–8% synthetic coolant	

3M™ Diamond Lapping Film 661X and 663X

Diamond Lapping Films are widely used for finishing and polishing hard-to-grind materials such as carbide, ceramics, hardened metals, exotic alloys and composites. They combine micron-graded diamond particles, a resin bonding system and a highly uniform polyester film backing for a more consistent, cleaner and faster alternative to diamond compounds or slurries. Use 3M Diamond Lapping Film to achieve finishes <2 Ra micro inch.

661X and 663X films both have a 3 mil polyester backing.

661X film is available in 0.1–30 micron grades. 663X film is available in coarser grades of 15, 30, 45 and 60 microns.

3M™ Diamond Polishing Cloth Belts 651WY and 652WY

Constructed with micron-graded diamond particles bonded to a durable water-resistant backing. These tough belts perform well in both wet and dry applications.

Ideal for many hard-to-finish materials, including:

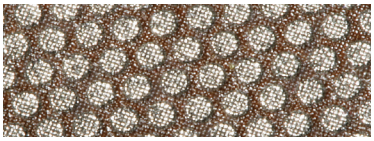
- Thermal spray parts
- Ceramics
- Composites
- HVOF coatings
- Chilled iron
- Non-ferrous metal

651WY is available in grades 100-1800 mesh.

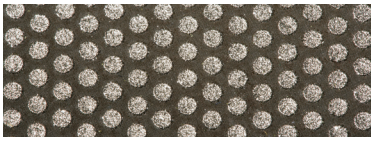
652WY is available in 3,000-50,000 mesh.

3M™ Flexible Diamond Rolls and Belts

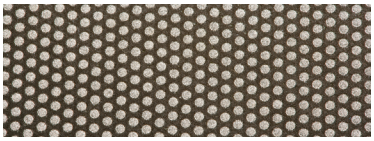
Used in rolls on superfinishers or in belt form, 3M Flexible Diamond products allow you to achieve your required finish. A metal bond securely anchors micron-graded diamonds to a variety of flexible backings in an open dot pattern. This provides durability and long life while allowing conformance on a variety of contours.



Large dots for anti-loading (Pattern 21)



Medium dots for aggressive cutting (Pattern B2)



Small dots for fine finishes (Pattern 18)

3M™ Abrasive Selection Guide for Hard-to-Grind Materials

3M Abrasive	Base Steel Dimensioning	Chrome Grinding	Thermal Spray Grinding	Superfinishing and Finishing
3M™ Cubitron™ II Abrasive Belt 984F	▲			
3M™ Trizact™ Cloth Belt 363FC	▲			
3M™ Cloth Belt 966F	▲	▲		
3M™ Trizact™ Cloth Belt 347FC		▲		
3M™ Trizact™ Diamond Cloth Belt 663FC			▲	
3M™ Diamond Polishing Cloth Belts 651WY and 652WY			▲	▲
3M™ Diamond Lapping Film 661X and 663X				▲
3M™ Diamond Microfinishing Film 675L			▲	▲
3M™ Flexible Diamond Rolls and Belts			▲	▲
3M™ Diamond Cloth Disc 674W			▲	
3M™ Diamond Wheel 637BI			▲	
3M™ Resin Bond Superabrasive Wheels			▲	
Scotch-Brite™ 645DC Diamond Unitized Wheels			▲	

The CAM Center is Your Resource for Surface Modification Solutions

Let's work together.

The 3M Customer Abrasive Methods (CAM) Center can help your business reduce process steps, increase throughput, and lower overall manufacturing costs. When you work with 3M, your company can benefit from the industry's foremost technical experts on surface modification. Utilizing a 30,000 sq foot facility with over 80 grinding and finishing machines and portable tools, CAM Center engineers can help you specify new equipment to optimize your process or work with you to develop a new or improved finishing method.

Contact your 3M representative for more details.

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3M Abrasive Systems Division
3M Center, Building 21-1W-10
St. Paul, MN 55144 USA

Phone 1-866-279-1235
Web 3M.com/abrasives