

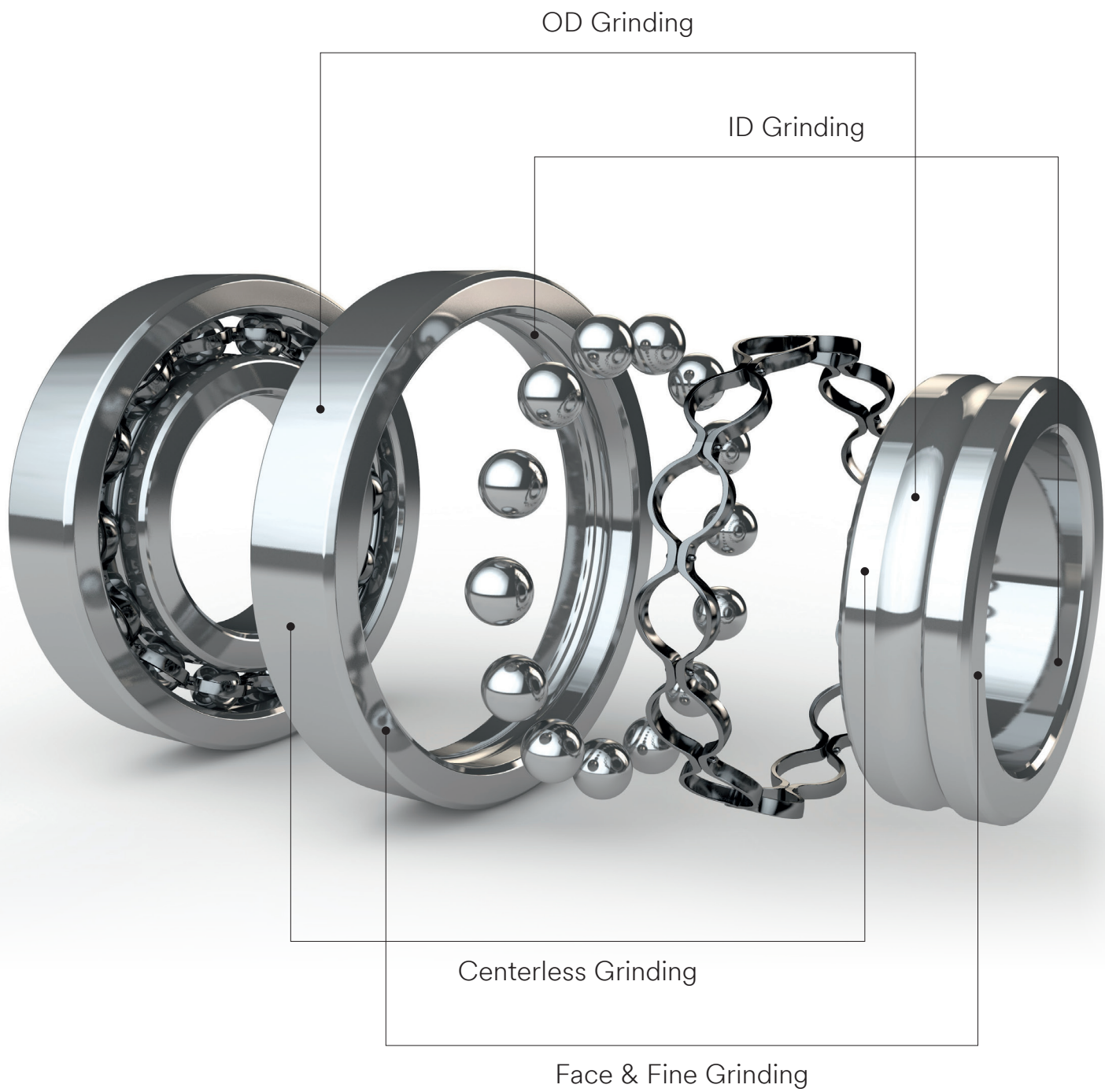


3M™ Precision  
Grinding & Finishing

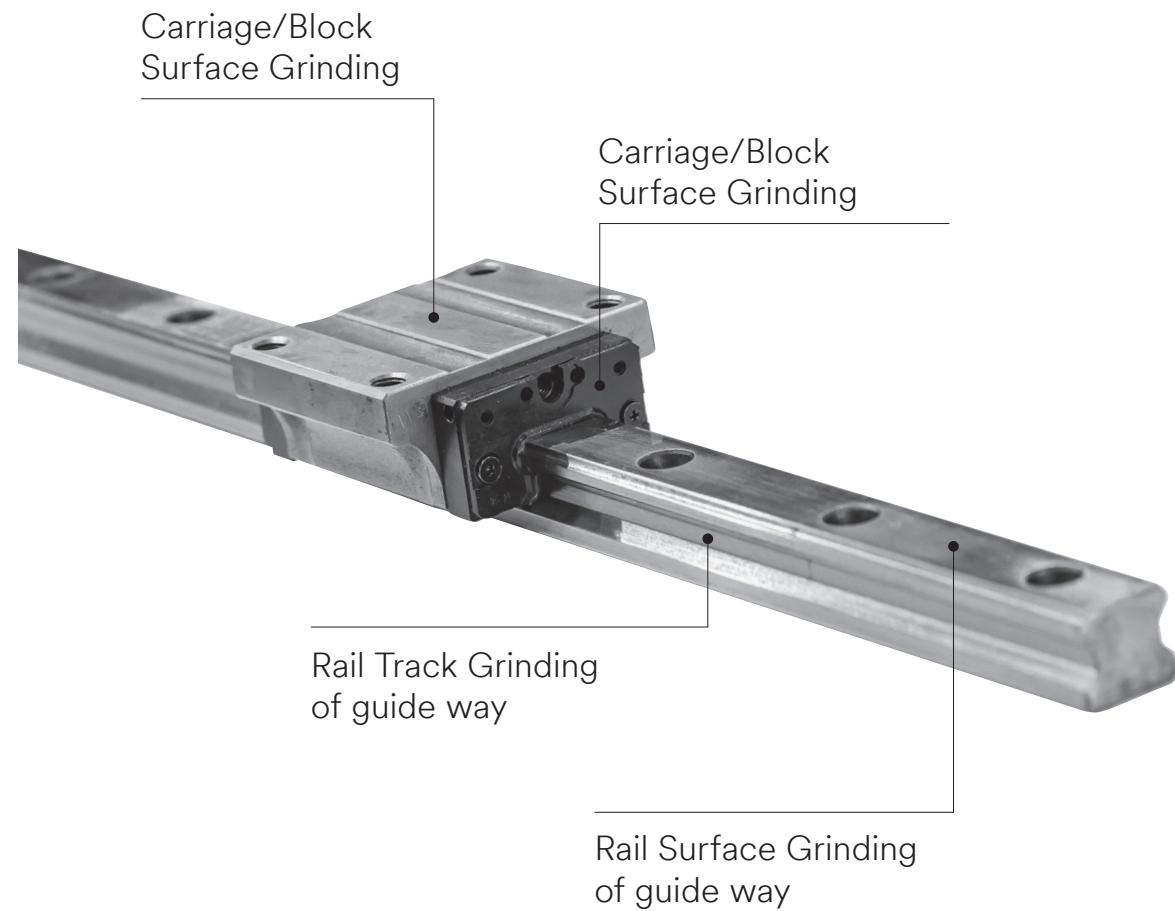
# Solutions for Bearing Industry



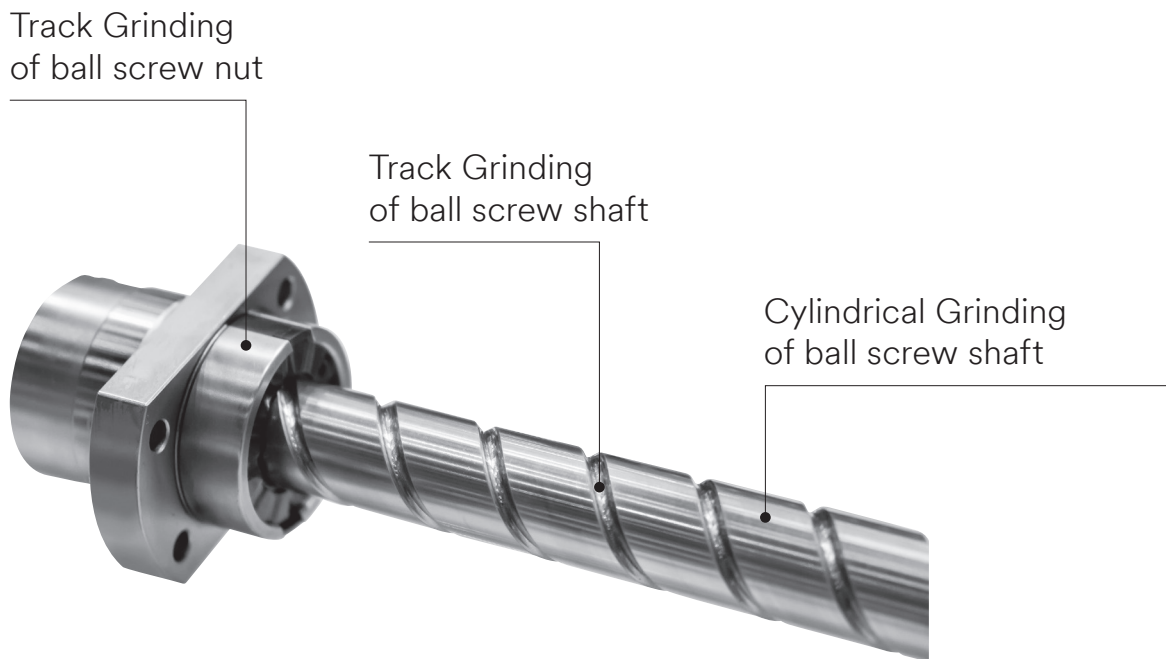
# Rotary Bearing



# Linear Bearing



# Ballscrew and Ballnut





# 3M™ Technologies at a glance

## 3M Precision-Shaped Grain Technology

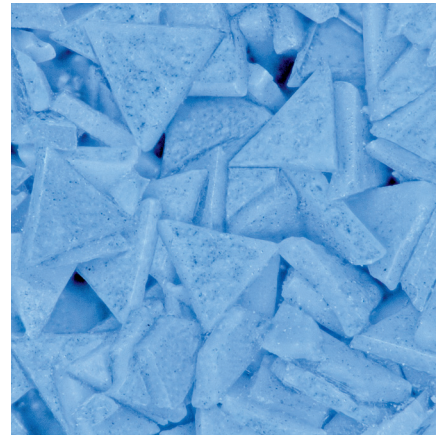
Looking for boosting performance in your precision grinding operation?

The answer is 3M Precision-Shaped Grain – the revolutionary technology that powers 3M™ Cubitron™ II Vitrified Grinding Wheels. This ceramic aluminum oxide grain is proven to increase efficiency and productivity where precision matters most, like in the bearing industry.

**Cuts cooler. Cuts faster. Lasts longer.**

3M Precision-Shaped Grain is a triangular-shaped ceramic grain that wears evenly to provide exceptional durability with remarkable consistency. As the grain wears, it continuously fractures to form sharp points and edges that slice cleanly through the material. The ensuing heat dissipates directly from the workpiece into the chip, greatly minimizing the risk of overheating and helping to produce higher-quality parts.

This all results in vitrified grinding wheels that cut cooler, faster and longer than wheels made with traditional ceramic abrasive grain.



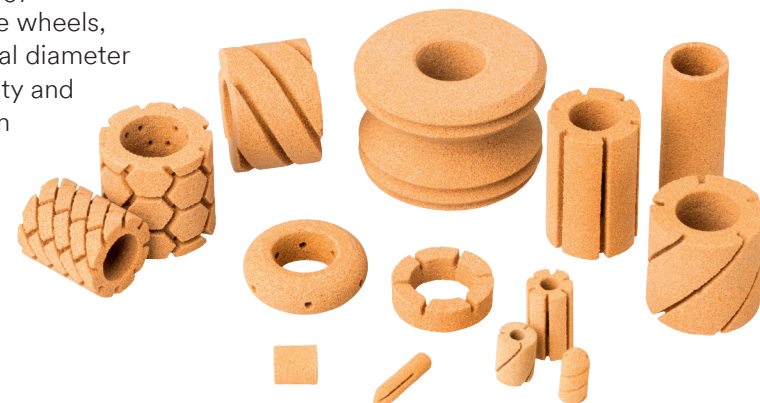
## Innovate with 3D Printed Grinding Wheels: A Technological Breakthrough

### The 3D Printing Process

3D printed structures are made by the addition of thousands of minuscule layers of media – in this case, cubic boron nitride. By harnessing this innovative technology, abrasive tools can be built layer by layer according to 3D modeling. This process ensures uniform distribution of grit and pores throughout the structure.

**Customized for you. Printed by 3M.**

For the first time, 3M is applying 3D printing technology to abrasive manufacturing. By 3D printing precision superabrasive wheels, we set a new standard for precision-structured internal diameter grinding tools, with unprecedented geometric flexibility and customizing capabilities. This inherent design freedom offers new possibilities for the most complex internal grinding applications.



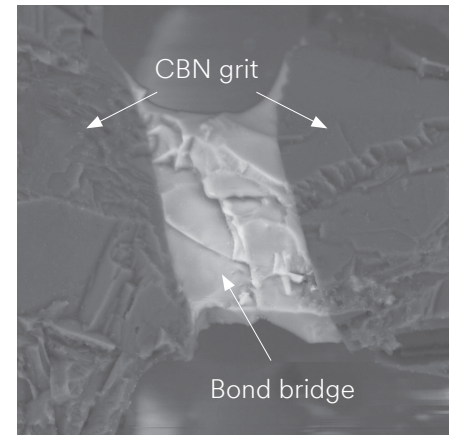
## High-performance grinding with highly porous, wear-resistant bonding systems: 3M™ Vitrified CBN Grinding Wheels 1PVZ

Compared to standard bonds, these 3M™ Vitrified CBN Grinding Wheels meet the highest demands on the specific material removal rate Q'w and high performance in terms of long-lasting durability, perfect profile retention, longer run between each dressing interval and significant reduction of grinding time.

**With the development of our vitrified CBN grinding wheels 1PVZ we have succeeded in enabling absolute high-performance applications with minimum bond.**

- ▶ Complete, homogeneous grit bond through adapted melting features of the vitrified bond and optimized sintering process management.
- ▶ Bond bridges have increased bending strength and E-modulus. The thermal expansion coefficient of the bond is matching with the CBN grain and avoids micro-cracks.
- ▶ Reducing the bond by 3 % leads to a more open porous structure of the abrasive surface.

**With 3M™ Vitrified CBN Grinding Wheels 1PVZ you grind efficiently, economically and at the highest level!**



## New Engineered Structure available for Linear Bearings

For improved performance in the bearing industry, the new engineered structure of 3M™ Cubitron™ II Vitrified Grinding Wheels 92VC can supply the results you need. This advanced grinding solution from 3M is built for linear guide rail grinding and carrier/block grinding, profile grinding and surface grinding applications.

### Engineered for Higher Performance

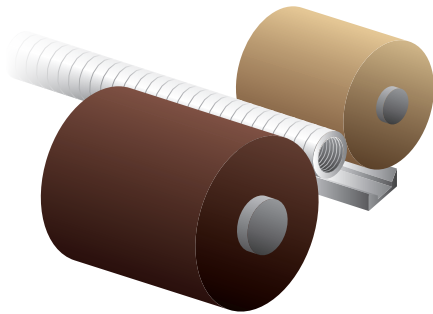
Take advantage of the newest advancement in vitrified grinding wheel structure: 3M Precision-Shaped Grain with a new engineered structure. The grains deliver higher stock removal capabilities and less required dressing compared to standard grains. Meanwhile, the new engineered wheel structure allows constant unit pressure during grinding thanks to a more homogenous distribution of grains and pores.

The combination of these characteristics allows a grinding wheel to deliver 20-30% higher performance compared to standard vitrified grinding wheels — shortening grinding time, increasing capacity and improving cost per grinded part.





# Centerless Grinding & Finishing



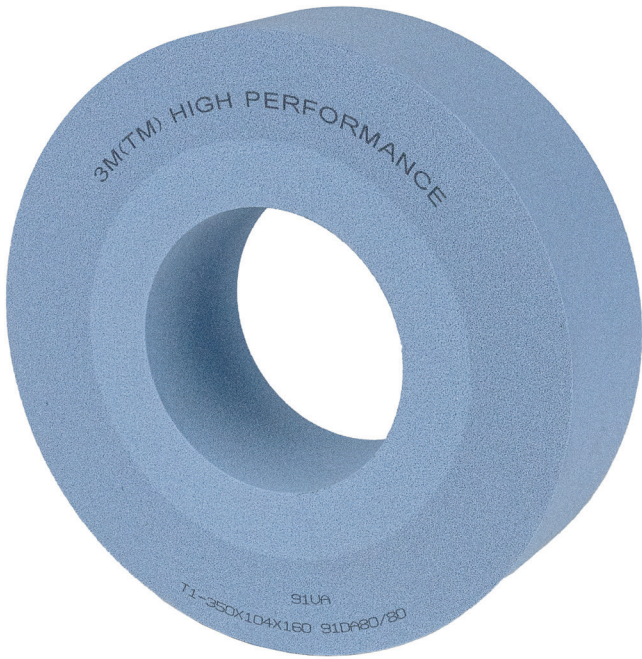
3M supplies both: resin and vitrified centerless grinding wheels, which are tailored to suit the ring type and the grinding method utilised, for example several or single pass, separate or combined roughing and finishing, through-feed speed etc. The abrasives and bonds are chosen to fit the ring dimensions, and to give maximum performance, combined with a long wheel life.

### 3M™ Vitrified Conventional Grinding Wheels

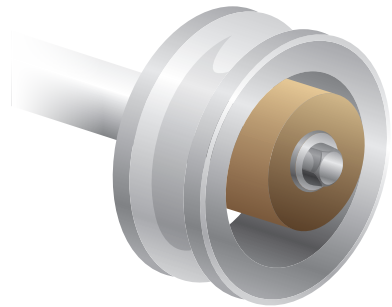
3M Product ID	Operation Type	Specification
33VK	Roughing	31A80 L6V301W
91VA		91DA80/80 L6V901W
92VC		93DA80/80 L6V901W
33VK	Finishing	31A120 L6V301W
91VA		91DA120/120 L6V901W
92VC		93DA120/120 L6V901W

### 3M™ Vitrified CBN Grinding Wheels

3M Product ID	Operation Type	Specification
1PVZ	Infeed	B126-VZ125R/194
1PVZ	Through feed	B91-VZ100R/Z



# Bore Grinding



Internal grinding of inner rings, bore grinding, involves the typical problems of internal grinding.

A relatively small wheel with few cutting edges, a large contact arc and the risk of non-rigidity in the grinding spindle create the demand for very cool-cutting abrasives. 3M manufactures bore grinding wheels with conventional abrasives as well as vitrified CBN.

### 3M™ Vitrified Conventional Grinding Wheels

3M Product ID	Operation Type	Specification
92VC	Roughing	93DA80/80 J7V601W
91VA		93DA80/80 H15VPMFV601W
91VA		91DA80/80 H15VPMFV601W
33VC		54A80 H15VPMF604W
92VC	Finishing	93DA120/120 J7V601W
91VA		93DA120/120 H15VPMFV601W
91VA		91DA120/120 H15VPMFV601W
33VC		54A120 H15VPMF604W

### 3M™ Vitrified CBN Grinding Wheels

3M Product ID	Operation Type	Specification
1PVZ	Roughing	B126-VZ125R/194
	Finishing	B76-VZ125R/194

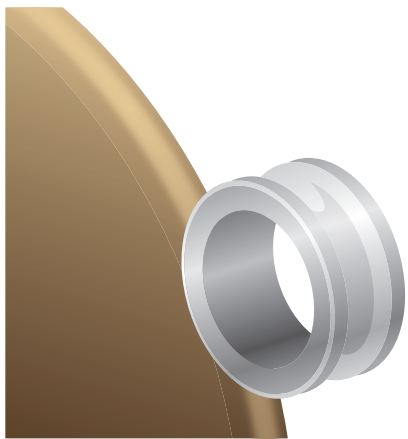
### 3M™ Vitrified CBN Grinding Wheels (≤ Ø 50 mm)

3M Product ID	Operation Type	Specification
1PVP	Roughing	B91-VP150P/194
	Finishing	B76-VP150P/194



# Track Grinding & Finishing

Inner and outer ring tracks have many different shapes. 3M supplies raceway grinding wheels with specifications chosen to grind as efficient as possible. They are designed to meet the form and surface finish requirements of the raceway, to the specific machining parameters, and with a maximised dressing interval.



## 3M™ Vitrified Conventional Grinding Wheels

3M Product ID	Operation Type	Specification
92VC	Roughing	93DA80/80 H8V601W
91VA		91DA80/80 H8V601W
91VB		220NA80/8 J9V722
33VB		41A80 J9V722
92VC	Finishing	93DA120/120 H8V601W
91VA		91DA120/120 H8V601W
91VB		220NA120 J9V722
33VB		41A100 J9V722

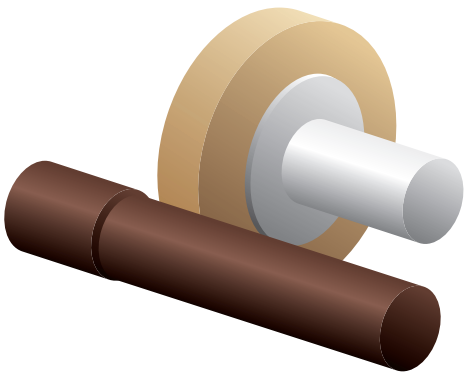
## 3M™ Vitrified CBN Grinding Wheels

3M Product ID	Operation Type	Specification
1PVZ	Roughing	B126-VZ150R/194



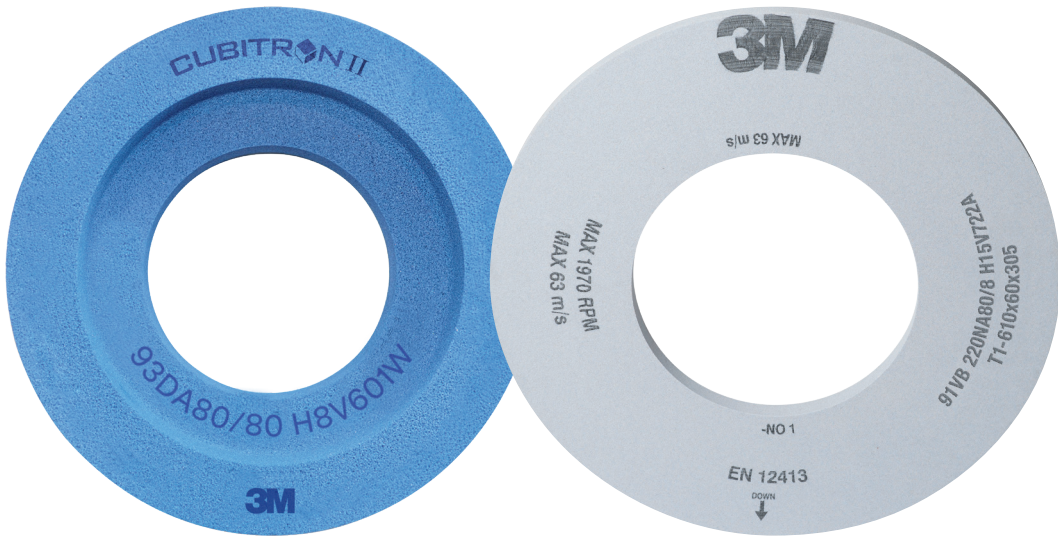
# Outer Ring OD Grinding & Finishing

Outer rings have many different shapes. Consequently the operation types and the tooling solutions vary considerably. The cool-cutting abrasives and bonds of 3M wheels are chosen to give optimum stock removal rate, combined with a high dressing interval and a long wheel life.



## 3M™ Vitrified Conventional Grinding Wheels

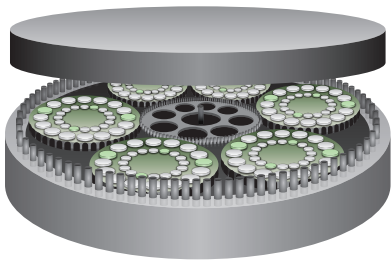
3M Product ID	Operation Type	Specification
92VC	Roughing	93DA80/80 H15VPMF601W
91VA		91DA80/80 H15VPMF601W
91VB		220NA80/8 H15V722A
33VB		41A80 H9V722
92VC	Finishing	93DA120/120 H15VPMF601W
91VA		91DA120/120 H15VPMF601W
91VB		220NA120 H15V722A
33VB		41A100 H9V722





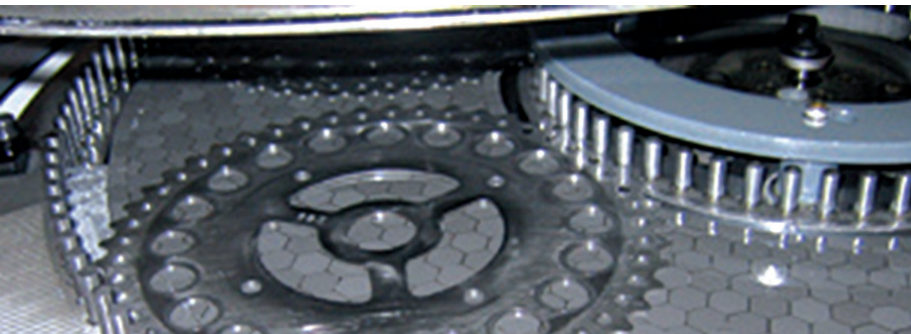
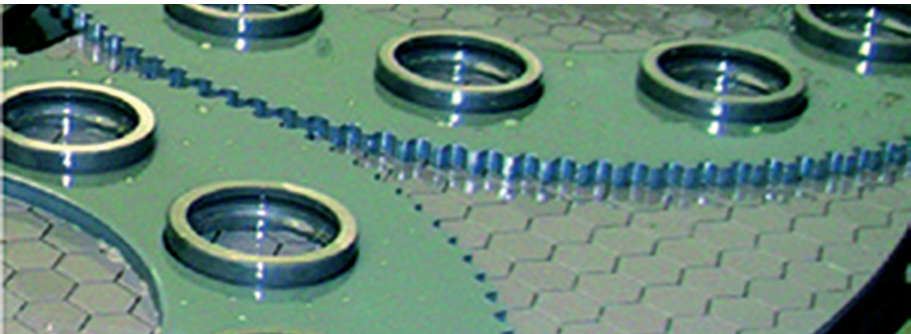
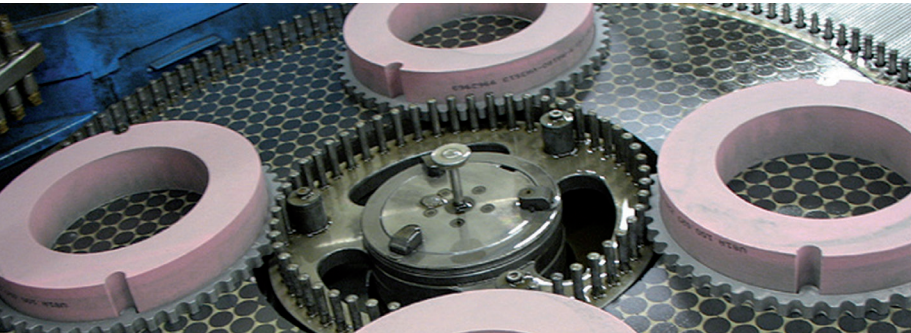
# Face & Fine Grinding

Several grinding operations are required to manufacture bearing rings. 3M has many years of experience with all these types of operations, and we constantly develop new abrasive tools for them.



### 3M™ CBN Fine Grinding Wheels

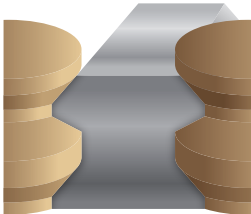
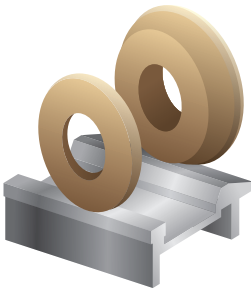
3M Product ID	Operation Type	Specification
1TVB	Roughing and Finishing	B46-VB
1TVU	Outer Ring and Inner Ring	B46-VT



# Linear Bearing Ballscrew and Ballnut

3M supplies high performance of grinding tools to meet tight surface finish and geometrical straightness requirements for linear guide way component which is a very challenging grinding operation as the length of component is reaching 4 meters or more.

Ballscrews and ballnuts are used in several applications requiring high speed, high accuracy and long service times. 3M wheels are chosen to achieve shorter cycle times, combined with an improved surface roughness, better form holding and a long wheel life.



### 3M™ Vitrified Conventional Grinding Wheels

3M Product ID	Operation Type			Carbon Steel	Stainless Steel	Specification
92VC	Linear Guide Way	Rail	Track	✓	✓	93DA80/80 H15VPLFF601W
			Surface	✓	✓	93DA80/80 F15VPLFF601W
		Slide Block	Track	✓	✓	93DA80/80 H15VPLFF601W
			Surface	✓	✓	93DA80/80 F15VPLFF601W
	Ballscrew and Ballnut	Shaft	Cylindrical	✓	✓	93DA80/80 H8V601W
						93DA120/120 H8V601W
			OD Track	✓	✓	93DA80/80 H15VPLFF601W
						93DA120/120 H15VPLFF601W
		Nut	ID Track	✓	✓	93DA80/80 J7V601W
						93DA120/120 J7V601W

### 3M™ Diamond Rotary Dressers

3M Product Name	6JGN Diamond Profile Roll
Manufacturing Method Type	Negative Electroplated
Diamond Layer	Random (NZ) or Handset (NS) Diamond Orientation
MFG Process Complexity	High
Bond Type	Electroplated Bond
Rework possibility	Limited reprofiling possible
Application	Designed for the highest precision
Dimension and tolerance (mm)	
D(mm)	50-250
R (tolerance)	+/- 0.002
B (max)	320
H (min.)	10
Shape tolerance	0.002



# Expertise Delivery: A Reliable Resource at your Service

## Because we are more than a bonded abrasive wheels supplier.

Being global, acting local! In each of the main geographical regions, we have local teams of experienced Application Engineers supported by a global organization.

Our technical community is available upon request for closer analysis of your grinding process. On demand, we are assisting our customers with on-site support including hands-on their specific process environment.

Feel free to consult us for:

- ▶ Overall grinding process improvement
- ▶ Dealing with quality issues and troubleshooting diagnostic
- ▶ Developing new products subject to grinding operations

Our service includes technical seminars on any grinding topics of your particular interest and online technical consulting is also available in case of emergencies.

Do not hesitate anymore and involve us into your grinding journey for a valuable collaboration.



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