



TECHNICAL SOLUTIONS FOR GRINDING

BEARING INDUSTRY



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TECHNICAL GUIDE



BEARINGS

Bearings are mechanical devices used to reduce friction between two components that have a relative movement, most often rotational.

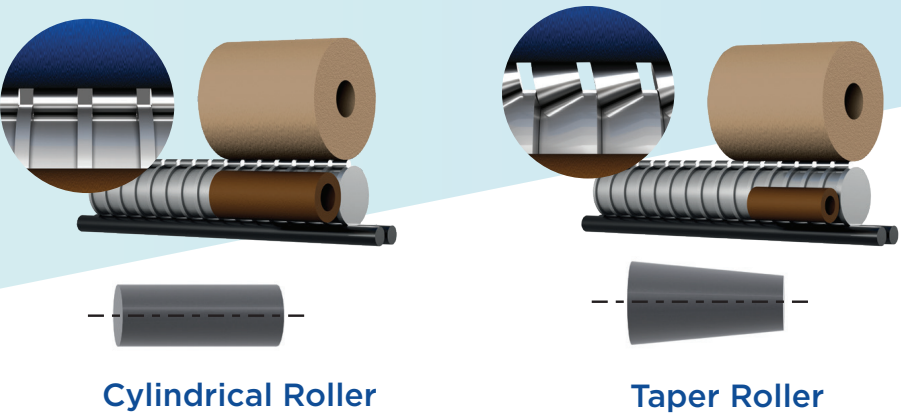


Many shapes, sizes and types of bearings exist including: ball bearings, roller bearings, needle bearings, and tapered roller bearings. Bearings may be classified according to: the motions they allow, their principle of operation as well as by the direction of the applied load they can handle. Surface quality and tight dimensional accuracy resulting of the grinding and finishing operations, are key to ensure the lifetime of the bearing. Several steps are involved in the manufacturing of the elements composing the bearing: rings, rolling elements, and cages. Abrasives play a critical role in the final quality of the bearing and can significantly impact the efficiency of the grinding process.

ROLLING ELEMENTS GRINDING

DIAMETER GRINDING

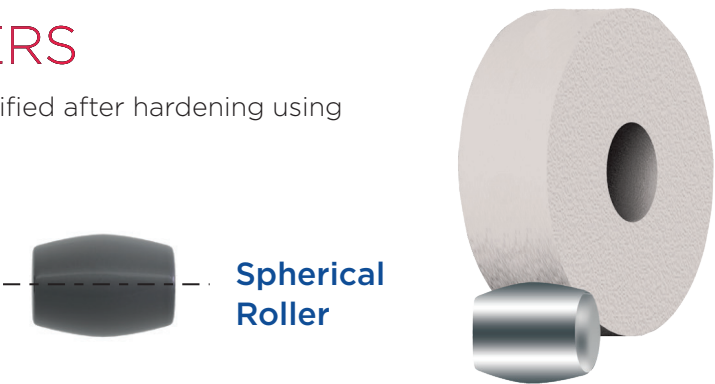
Diameter Grinding is carried out after rollers have been heat treated. Centreless throughfeed grinding is performed on the diameter of cylindrical rollers. For taper rollers, a special steel profiled worm wheel is used to carry the rollers.



	PRODUCT	FEATURES	BENEFITS
BEST	19A80JRNTR	- Semi friable abrasive - Optimised rubber bond	- High material removal rates - Best in class surface finish

SPHERICAL ROLLERS

The diameter of spherical rollers is rectified after hardening using an Outside Diameter grinding wheel.



TIER	PRODUCT	FEATURES	BENEFITS
BEST		- High performance ceramic - Engineered microstructure ceramic grain - Latest grain technology	- Free cutting action - Long life - For low, medium and high force
BETTER	32 A	Mono Crystalline Aluminium Oxide	- High material removal rates - Good surface finish - Low wear
GOOD	19 A	Semi Friable Aluminium Oxide	- Good cut-rate - Good form holding

FACE GRINDING

CYLINDRICAL AND SPHERICAL ROLLERS

The faces of Cylindrical and Spherical Rollers are rectified after hardening using a double disc grinder. The faces are ground to reach tight parallelism and surface finish quality requirements.



TIER	PRODUCT	FEATURES	BENEFITS
BEST	VORTEX	- High performance - Engineered microstructure grain - Latest grain technology	- Free cutting action - Long life - For low, medium and high force
BETTER	38A B24/B80X	White Aluminium Oxide	- Fast cut - High material removal
GOOD	19A B24	Semi Friable Aluminium Oxide	- Good finish - Long life

TAPER ROLLERS

Rectification of the faces of taper rollers is performed using a disc grinder type 35.

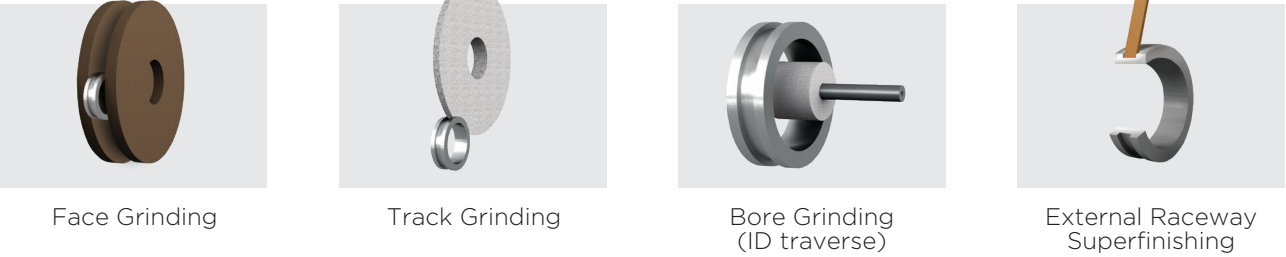


TIER	PRODUCT	FEATURES	BENEFITS
BEST	19A B24	Semi Friable Aluminium Oxide	- Low wear - Good finish - Long life

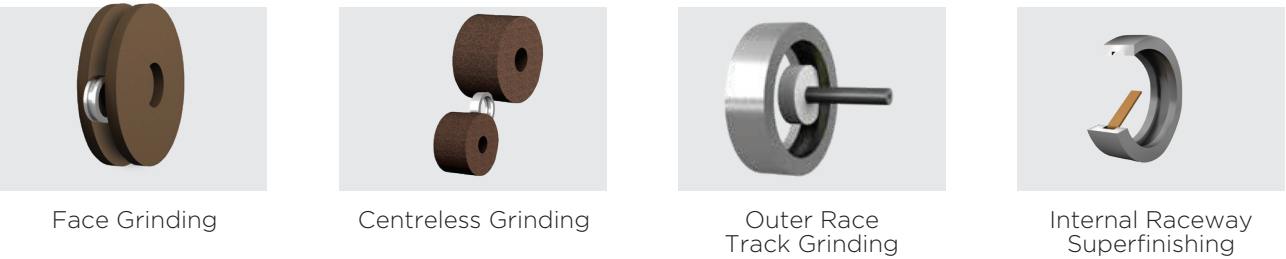
BEARING GRINDING

Typical grinding applications for internal and external rings are Face Grinding, Centerless Grinding, Track Grinding, Bore Grinding and Super Finishing

INNER RINGS



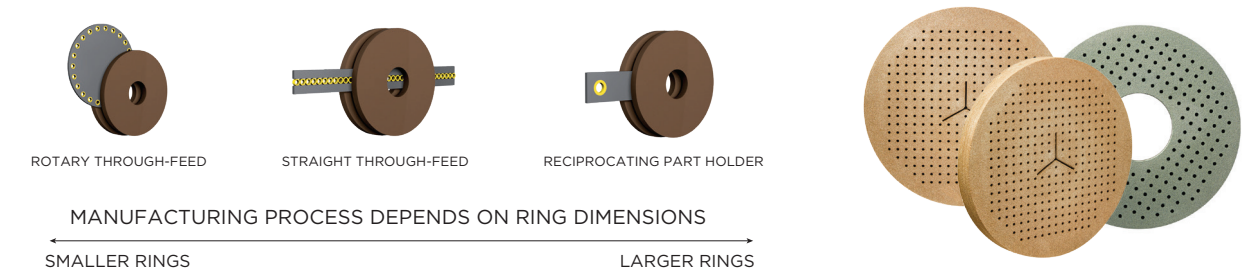
OUTER RINGS



FACE GRINDING

INNER AND OUTER RINGS

After heat treatment, the ring faces are made flat and parallel. This operation is performed for all types of bearings. This is done by grinding the sides of the rings on a double-disc grinding machine which enables high-quality grinding at high production rates.



TIER	PRODUCT	FEATURES	BENEFITS
BEST	VORTEX QUANTUM	- High performance - Engineered microstructure grain - Latest grain technology	- Free cutting action - Long life - For low, medium and high force
BETTER	38A B80X	White Aluminium Oxide	- Burn free grinding - Cool Cutting - High material removal
GOOD	19A B24	Semi Friable Aluminium Oxide	- Good finish - Long life

CENTERLESS GRINDING OF OUTER RINGS



TIER	PRODUCT	FEATURES	BENEFITS
BEST	RB / SG/ NQ 	- Engineered microstructure ceramic grain - Latest grain technology - Engineered grain boundaries	- Free cutting action - Long life - For low, medium and high force
BETTER	38A	White Aluminium Oxide	- Cool Cutting - High material removal
GOOD	19A	Semi Friable Aluminium Oxide	- Good finish - Long life

Centerless throughfeed grinding of the outer rings is performed to ensure the right ovality and to remove surface defects from the hardening process.

ALSO AVAILABLE WITH VITRIUM3 BOND TECHNOLOGY

Vitrium 3 bond provides unprecedented grain adhesion and lowers cost in three ways.

- Cool Cutting
- Precise Profile
- High Speed



VITRIFIED cBN GRINDING WHEELS - FOR CENTRELESS GRINDING

APPLICATION:

Centreless Grinding

DESIGN FEATURES:

- Design available: Metal and Ceramic Core
- cBN Layer thickness available from 3mm to 10mm
- Premium cBN grains provide strong performance-to-price ratio
- Durable bond system designed to maximize wheel life
- Sharp-acting wheels for efficient cutting action with low grinding forces



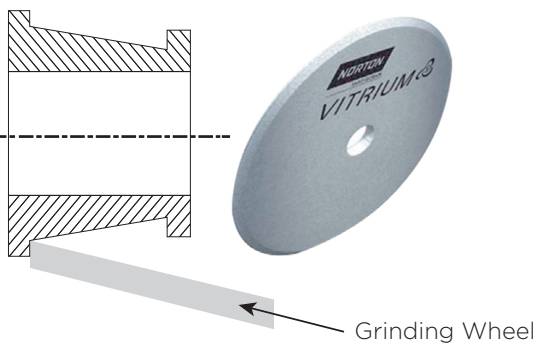
OUTSIDE DIAMETER GRINDING OF INNER RING TRACK

The raceways are pre-shaped by turning, and the dimensional requirements in terms of roundness and tolerance are obtained by external grinders for the external raceways.



TIER	PRODUCT	FEATURES	BENEFITS
BEST	NQN 	- Engineered microstructure ceramic grain - Latest grain technology - Engineered grain boundaries	- Burn free grinding - Sustained surface finish - Long life
BETTER	NQ/SG	- Micro-crystalline ceramic grains - Self sharpening	- Very sharp - Durable - Free cutting
GOOD	38A	White Aluminium Oxide	- Good form holding - Good cut-rate - Free cutting

LIP/FLANGE GRINDING OF TAPER-BEARING INNER RINGS

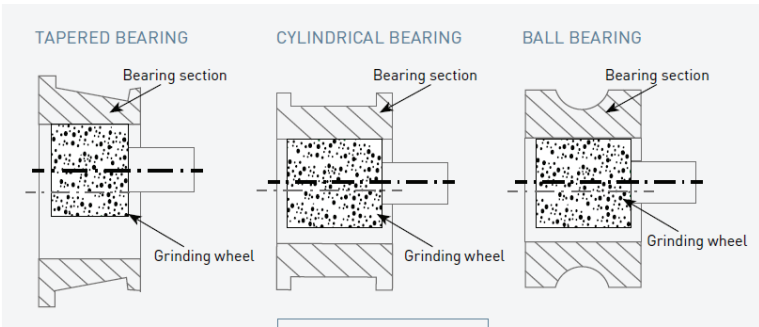


TIER	GRIT TYPE	FEATURES	BENEFITS
BEST	RB / NQN 	- Engineered microstructure ceramic grain - Latest grain technology - Engineered grain boundaries	- Free cutting action - Long life - For low, medium and high force
BETTER	SG/ 32A	- Medium ceramic content - Tougher grain - Dilution with strong abrasive	- Good cutting effect - Longer wheel life
GOOD	38A	White Aluminium Oxide	- Good form holding - Good cut-rate - Free cutting

INNER RING BORE GRINDING

A critical operation in producing bearing rings is Internal Diameter Grinding (ID grinding) to make the bore straight and smooth. Perfect macrogeometry (linearity, roundness, conicity) is required to allow the bearing to work without vibration. The finish provided is also critical to minimise friction and allow the final superfinishing operation.

In most cases, grinding is performed in a single operation with only one wheel. Vitrified bonds are most commonly used in these applications.



TIER	PRODUCT	FEATURES	BENEFITS
BEST	NQN / RB 	- Engineered microstructure ceramic grain - Latest grain technology - Engineered grain boundaries	- Burn free grinding - Sustained surface finish - Long life
BETTER	NQ 	- Micro-crystalline ceramic grains - Self sharpening	- Very sharp - Durable - Free cutting
GOOD	38A/ 32A	- White Aluminium Oxide - Mono Crystalline Aluminium Oxide	- Good form holding - Good cut-rate - Free cutting

VITRIFIED cBN INNER RING BORE GRINDING WHEELS

Designed for superior performance in internal grinding - bore & form. Best suited for bearing, gear transmission, fuel injection, CV components, hob & broach grinding, auto & auto ancillary industries, and other ferrous applications.



OUTER RING RACEWAY GRINDING

The raceways are pre-shaped by turning, and the dimensional requirements in terms of roundness and tolerance are obtained by external grinders for the external raceways

The technical objectives are:

- 1. Roughness / surface finish
- 2. Race width
- 3. Race deformation
- 4. Race profile / radius



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BETTER	NQ 	- Micro-crystalline ceramic grains - Self sharpening	- Very sharp - Durable - Free cutting
GOOD	38A/ 32A	- White Aluminium Oxide - Mono Crystalline Aluminium Oxide	- Good form holding - Good cut-rate - Free cutting

DRESSER RECOMMENDATION - FACE GRINDING & CENTRELESS

BLADE (FLIESEN TOOLS)

- Uniform cross section allows for consistent life throughout tool uses
- Controlled diamond position
- Available in Grit & Synthetic needles - CVD/MCD
- Often made-to-order but sizable stock offering available

CLUSTER / NIB (IGEL) TOOLS

- Used for straight dressing of large diameter grinding wheel or disc wheels
- Because of the large diamond section, dressing can be accomplished faster
- Available in a variety of diamond sizes and concentrations, shank designs as per requirement

DRESSER RECOMMENDATIONS

ID GRINDING

BEST - ROTARY CUP



■ Dressing is done with cup type dressers where the edge of the roller dresser is used

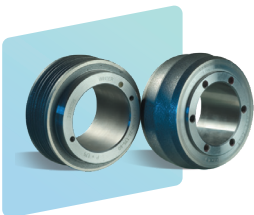
GOOD - SINGLE / CONE LAPPED TOOLS



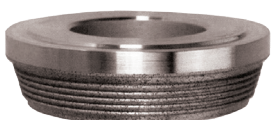
■ Single point dressers are used for straight dressing and for dressing grinding wheels with simple profiles

DRESSER RECOMMENDATION FOR

TRACK GRINDING



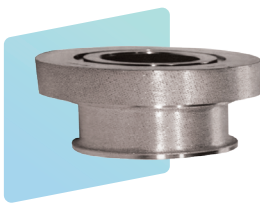
ROLLER DRESSERS



REVERSE PLATED DRESSERS

WINTER ROLLER DRESSERS - PROFILE

Rotating profile roller dressers, also known as rotary truers, are particularly suitable for complex profiles in mass production and have the same profile as the workpiece.

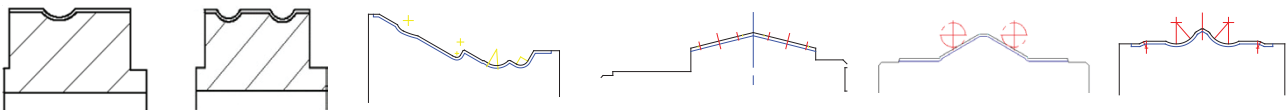


REVERSE INFILTRATED DRESSERS



WINTER DRESSING DISCS

Contour-controlled dressing tools enable complex grinding wheel profiles to be dressed as well as simple cylindrical grinding wheels of different widths. In addition, by specifying the dressing tool and selecting the individual dressing parameters, it is possible to influence the dressing result and thereby, the quality of the workpiece.



Single Track

Double Track

Hub Bearing

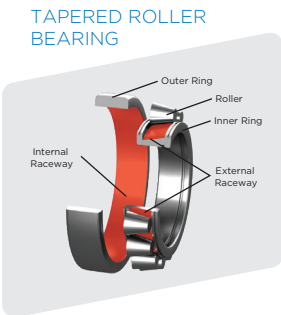
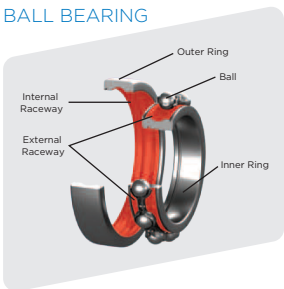
Coordinated Profile

SUPER FINISHING OF INNER AND

OUTER TRACK

ABRASIVE CHARACTERISTICS

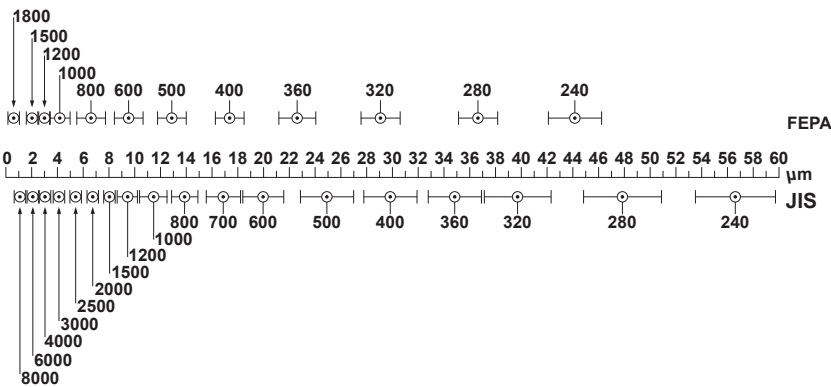
GRIT TYPE	GRIT TYPE	GRIT TYPE
White Aluminium Oxide	SA	High removal
Green Silicon Carbide	MVC	Very good finish



The table is a guide to help choosing the right grit size for surface finishing and stock removal.

GRIT	RA (MICRONS)	STOCK REMOVAL (MICRONS)
400-500	0.5-0.6	18
500	0.4	16
600	0.2	14
800	0.12	12
1000	0.1	6/8
1200	0.05	4
1500	0.025	2
1800	0.02	

The diagram shows the correspondence between grit dimensions, FEPA (European) standard and JIS (Japanese) standard:



FINAL TREATMENT (S5 - W)

Sticks and stones can be impregnated with Sulfur and Wax. The Sulfur Treatment (S5) improves the cutting ability of the abrasive and improves the final surface roughness. Due to health and environment regulations and industry standards, new treatments based on wax (W and F11) are now available.

- S5 Sulfur Impregnation
- W Wax Impregnation

