

Bearing manufacture: grinding, superfinishing and dressing

Complete bearing range with raceway and end-face grinding, profile drawings and related CBN and diamond applications.



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Tools for bearing manufacture and related precision processes

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Bearing components place demanding requirements on raceway geometry, cylindricity, end faces and surface finish. EHWA combines vitrified CBN grinding tools with superfinishing stones and diamond dressing tools. The range covers internal and raceway grinding, face and double-disc grinding, and profiles for linear guides and ball screws.

The underlying EHWA documents also cover CV joints, injector bores and the manufacture of rotary tungsten carbide tools. These related applications have their own chapters, including their tools, test data and micrographs. The bearing document describes EHWA's collaboration with leading bearing and aircraft engine manufacturers; the data presented here support technical selection for the particular manufacturing task.

Manufacturing task	Tool family	Focus
Bore, inner and outer raceways, lip and ring end face	Vitrified CBN tools	Stock removal, geometric accuracy and low thermal load
Superfinishing bearing raceways	CBN honing stones	Fine surface finish and consistent machining
Dressing bearing grinding wheels	Diamond rotary dressers and metal cup dressers	Contour, dressing performance and dimensional stability
Ring and roller end faces	Face, double-disc and horseshoe wheels	Productivity and surface finish
Linear guides and ball screws	Profile rotary dressers	Defined raceway profiles
CV joints and injector components	Dedicated CBN mounted grinding tools	Component-specific geometry and process performance
Rotary and micro tools	Porous hybrid, polyimide and MNC wheels	Flutes, cutting edges and profile stability

The technical ranges and comparisons relate to the EHWA applications shown. Workpiece, machine, grinding wheel, dressing and coolant are coordinated for the particular process. Editorial version: 13 October 2026.



Taper roller bearing: components and raceways.



Vitrified CBN grinding tools.



CBN stones for superfinishing.



Rotary dressers for bearings.



Metal cup dressers for internal grinding.



Wheels for face and double-disc grinding.



Open wheel for taper roller end faces.



Rotary dresser for linear guides.



Rotary dresser for ball screws.

Vitrified CBN tools for bearing rings

Vitrified CBN wheels and mounted grinding tools are designed for high stock removal and precision grinding of bearing surfaces. The source documents describe higher removal rates and shorter cycle times with reduced grinding forces. Lower mechanical and thermal loading supports consistent machining, good surface finish and cylindricity, and less dimensional deviation.

The five positions on the bearing ring distinguish the grinding surfaces:

Position	Source abbreviation	Grinding surface
01	ID	Inner race internal diameter
02	IR	Inner raceway
03	OR	Outer raceway
04	Lip	Lip or adjoining shoulder
05	Ring face	Ring end face

Process ranges in both bearing documents

Parameter	EHWA specification
Wheel speed	30-80 m/s
Stock removal, on diameter	0.1-0.35 mm D
Dressing amount	5-30 μm
Dressing ratio	0.3-0.6
Dressing tool	Diamond rotary dresser
Coolant	Oil or emulsion

These specifications agree in the two bearing editions used here. Dressing ratio conventionally describes dresser peripheral speed divided by grinding wheel peripheral speed. Rotation direction and machine convention form part of process selection; the source does not separate the stated range by direction.

Four core and mounting designs

Ceramic core, steel core, steel quill and steel head are four distinct tool constructions. Selection combines the required grinding geometry with the mounting and available space. The illustrations retain all designs and the separate detail views from both documents.



CBN tools: wheels and mounted grinding tools.



CBN tools: additional designs.



Bearing rings: geometrical grinding surfaces.



Bearing rings with the five original position markers.



Tool with ceramic core.



Tool with steel core.



Tool with steel quill.



Tool with steel head.



Ceramic core: additional view.



Steel core: additional view.



Steel quill: additional view.



Steel head: additional view.

CBN stones for superfinishing

Superfinishing stones improve the raceway surface after grinding. The EHWA document describes shorter honing cycles, higher removal rates and improved surface finish. It states a tool life advantage of five to ten times that of conventional stones; the following application provides a specific comparison.

The micrographs contrast small, evenly distributed pores with a coarse pore structure. The CBN stone construction supports consistent machining. A sulphur-free design and more consistent performance with less scrap are further stated benefits; these are not converted into a general environmental lifecycle claim.

Taper roller bearing raceway: complete example

Test parameter	Source specification
Workpiece / operation	Superfinishing a taper roller bearing raceway
Workpiece speed Vw	100-200 rpm
Stock removal	5 µm
Surface roughness	Ra 0.06 µm
Stone specification	B2400K120VHWPN
Conventional stone life	1,500 parts
EHWA CBN stone life	15,000 parts

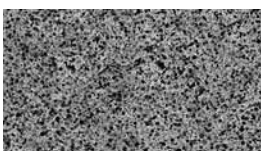
The source designates stone life as EA, the number of parts processed. The comparative values belong to this catalogue example; the source does not provide every test condition. The raceway/CBN stone contact is shown with the original movement directions.



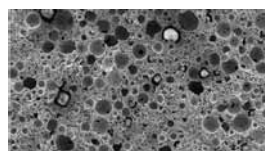
Superfinishing stones in different designs.



Superfinishing a bearing ring.

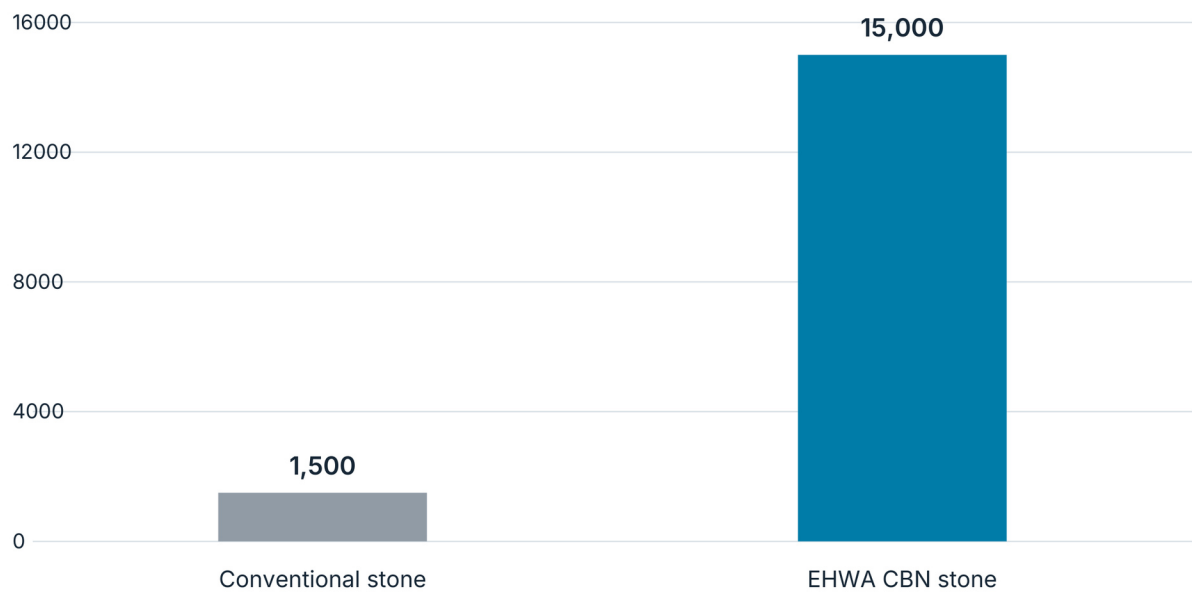


CBN stone microstructure with small, evenly distributed pores.



Comparison microstructure with coarse pores.

Stone life: parts processed



Stone life comparison: 1,500 / 15,000 parts.

Bearing ring



CBN stone contact with a taper roller bearing raceway.

Diamond rotary dressers for bearings

Diamond rotary dressers form and sharpen the grinding surface of vitrified CBN wheels. They support precise, complex contours with lower dressing loads, good dressing performance and long tool life. Shorter process cycles are a further benefit of the designs described in the sources.

Applications include ball, roller and hub bearings and water pump bearings. Each source shows three specific tool/component pairs. Cylindrical and disc rotary dressers and their dressing layer details are retained as separate views.

Application example	Tool and component pairing
Water pump bearing	Cylindrical rotary dresser and the illustrated bearing assembly
Ball bearing	Disc-shaped rotary dresser and ball bearing group
Taper hub bearing	Profile rotary dresser and the corresponding bearing ring

Profile design follows the required grinding wheel contour. The illustrations show the geometrical variety of the range without assuming identical process values for every design.



Rotary dressers: cylindrical and disc designs.



Detail of the diamond dressing surface.



Rotary dresser for water pump bearings.



Water pump bearing application example.



Rotary dresser for ball bearings.



Ball bearing application examples.



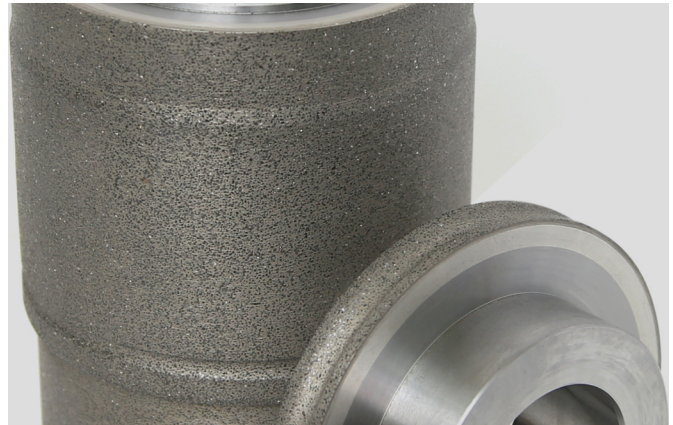
Rotary dresser for taper hub bearings.



Ring for the taper hub bearing application.



Bearing rotary dressers: additional view.



Profiled diamond dressing layer: additional view.



Water pump bearing dresser: additional view.



Water pump bearing: additional view.



Ball bearing dresser: additional view.



Ball bearing application: additional view.



Taper hub bearing dresser: additional view.



Hub bearing ring: additional view.

Metal cup dressers for bearing internal grinding

Metal cup dressers are intended for dressing tools used in bearing internal grinding. Precision dressing reduces grinding deviation after dressing. Longer dressing intervals and strong dressing performance support a stable manufacturing process.

The source states a life of 20,000-30,000 operations depending on grinding wheel size. This relationship forms part of the specification: the count is not a uniform value for every wheel. The range includes metal cup dressers and rotary cup dressers with the dressing layer and construction variants shown.

Dressing layer width and process effect

Two comparisons refer to vitrified wheels with a steel quill and a steel head respectively. They show dressing performance and workpiece dimensional stability against tip or diamond layer width. The sources identify the variants as **2.5W** and **1W**.

Both diagrams retain the original 0-120 display scale and bar relationships. The source provides no physical unit for these scales; the illustrations compare the designated width variants. Dressing performance and dimensional stability are therefore considered separately.



Metal cup dressers in three designs.



Detail of the diamond cup dressing surface.



Additional cup dresser edge detail.



Metal cup dresser design examples.

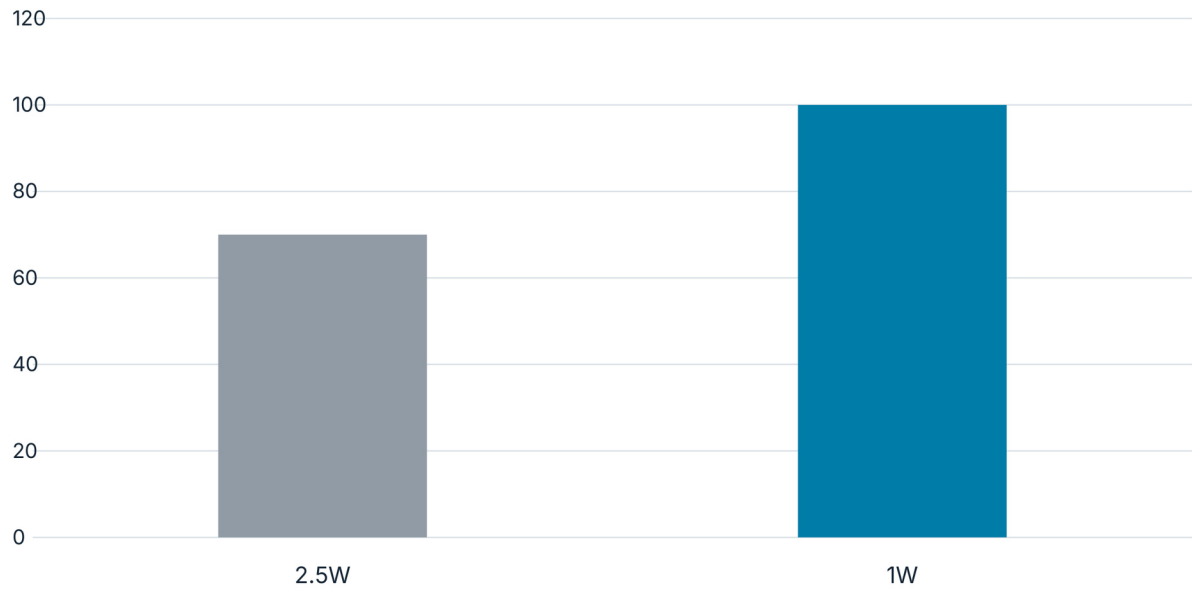


Rotary cup dresser design examples.



Vitrified grinding wheel with steel quill.

Dressing performance



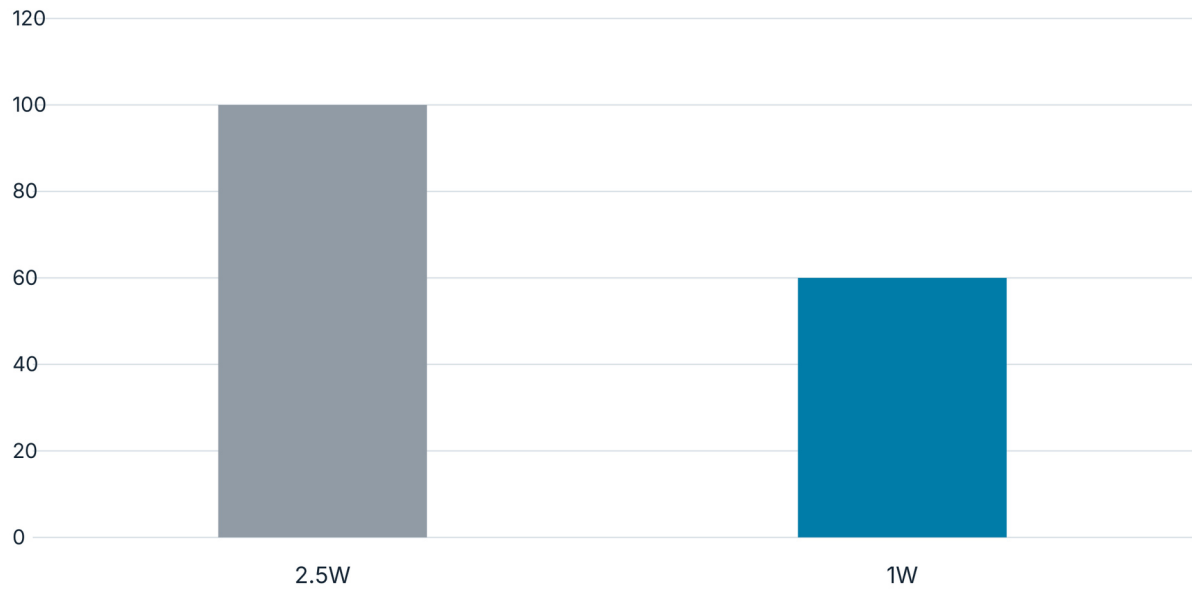
Original display scale; unit not stated

Dressing performance: comparison of dressing layer widths 2.5W and 1W.



Vitrified grinding wheel with steel head.

Dimensional stability

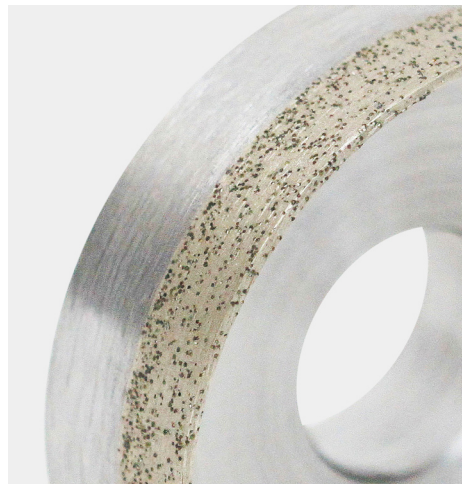


Original display scale; unit not stated

Dimensional stability: comparison of dressing layer widths 2.5W and 1W.



Metal cup dressers: additional view.



Cup dresser diamond layer: additional detail view.



Metal cup dressers: additional designs.



Rotary cup dressers: additional designs.



Vitrified wheel with steel quill: comparison case.



Vitrified wheel with steel head: comparison case.

Face and double-disc grinding of bearing components

Face and double-disc wheels grind the end faces of bearing rings and rollers. The EHWA designs target higher productivity, shorter cycles, lower machining costs and long wheel life. End-face surface finish is an essential selection objective alongside stock removal performance.

The range shows different grinding surfaces, including a honeycomb design and a radially segmented design. Applications cover needle bearing rollers, roller bearing rollers and inner and outer rings. The bearing photographs relate the operation to real component families.

Component family	Grinding surface	Stated benefit
Needle bearing rollers	Roller end faces	Short machining cycles
Roller bearing rollers	Roller end faces	Tool life and surface finish
Inner and outer rings	Ring end faces	Productivity and consistent face grinding

The wheel forms shown support selection by component geometry and machine process.



Grinding wheels for bearing end faces.



Detail of the segmented grinding face.



Ball bearings: end-face application example.



Roller bearing: end-face application example.

Horseshoe wheels for taper roller end faces

The open, horseshoe-shaped grinding wheel is intended for taper roller end-face grinding. The source shows a main design with a taper roller bearing and two further open wheel forms. Stated benefits are longer tool life and cost savings, higher removal rates and good surface finish.

The tool life comparison shows the previous design at **100%** and the improved design at **150%**. This is a relative comparison for the catalogue case shown. The original chart title is "Tool life (pcs)", while the bars are labelled as percentages; no absolute part counts are inferred.



Horseshoe wheel and taper roller bearing.

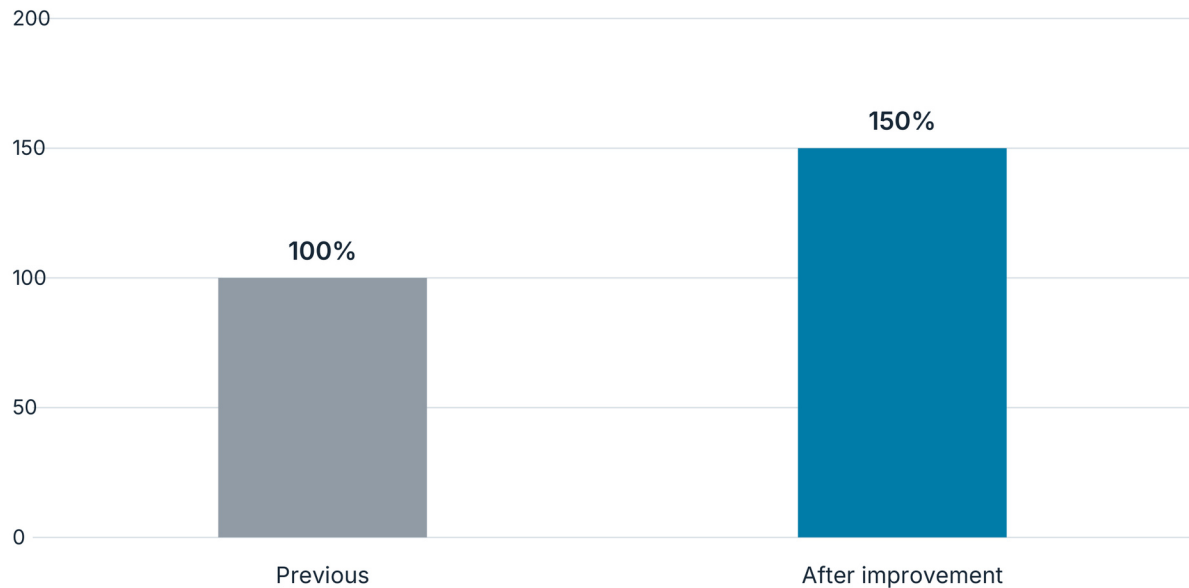


Taper roller bearing detail.



Two further open grinding wheel forms.

Relative tool life comparison (%)



Relative tool life comparison: previous 100%, improved 150%.

Profile rotary dressers for linear guides

A linear guide consists of a guide block, rail and recirculating balls between them. It provides precise linear motion; the source names automotive manufacturing equipment as an application. The ball raceway seats in the block and rail require matching contours.

Diamond rotary dressers profile the CBN grinding wheel used to machine these ball raceways. The catalogue distinguishes block and rail designs. Each design has a tool photograph, a complete dimensioned profile drawing and a separate wheel/component contact illustration.

Guide block: profile drawing

The original dimensions include widths 3 / 24 / 3, spacing 6.381 / 11.239 ± 0.003 / (6.381), four R0.3 transitions and the two radii (R1), (R2) at $R3.3 \pm 0.003$. The drawing retains these values with all dimension lines and positional relationships.

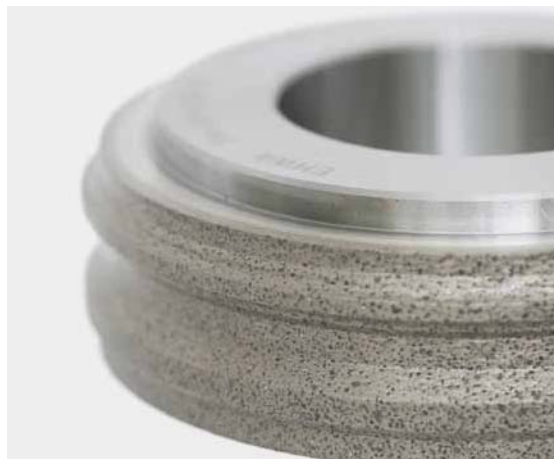
Guide rail: profile drawing

The second drawing includes 11.577 with $+0/-0.01$ tolerance, the two reference dimensions (5.7885), (4.4), R0.4, radii (R1)/(R2) 3.3 with $+0.005/0$ and R0.6 with $+0.03/0$. Further width, height, diameter and angular tolerances are retained completely in the drawing. The 45° angles with $\pm 0^\circ 10'$ belong to this rail profile.

Dimensions remain as shown in the source drawings. No general unit is printed within these drawing details; the approved component drawing determines the unit, datum system and tool contour.



Rotary dresser for linear guides.

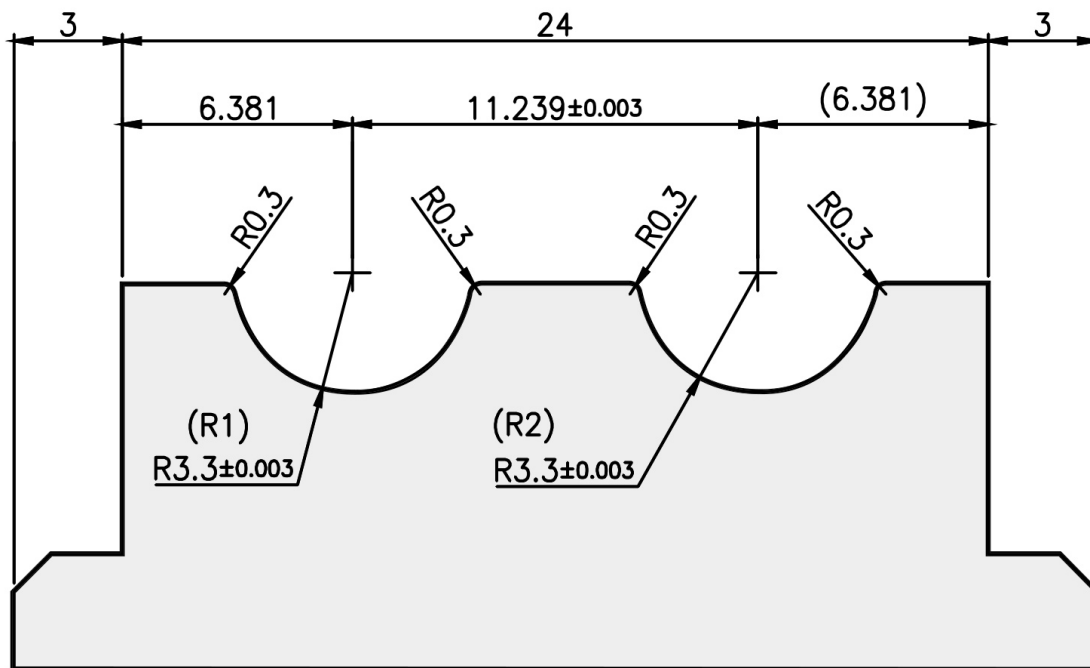


Profile and dressing layer detail.

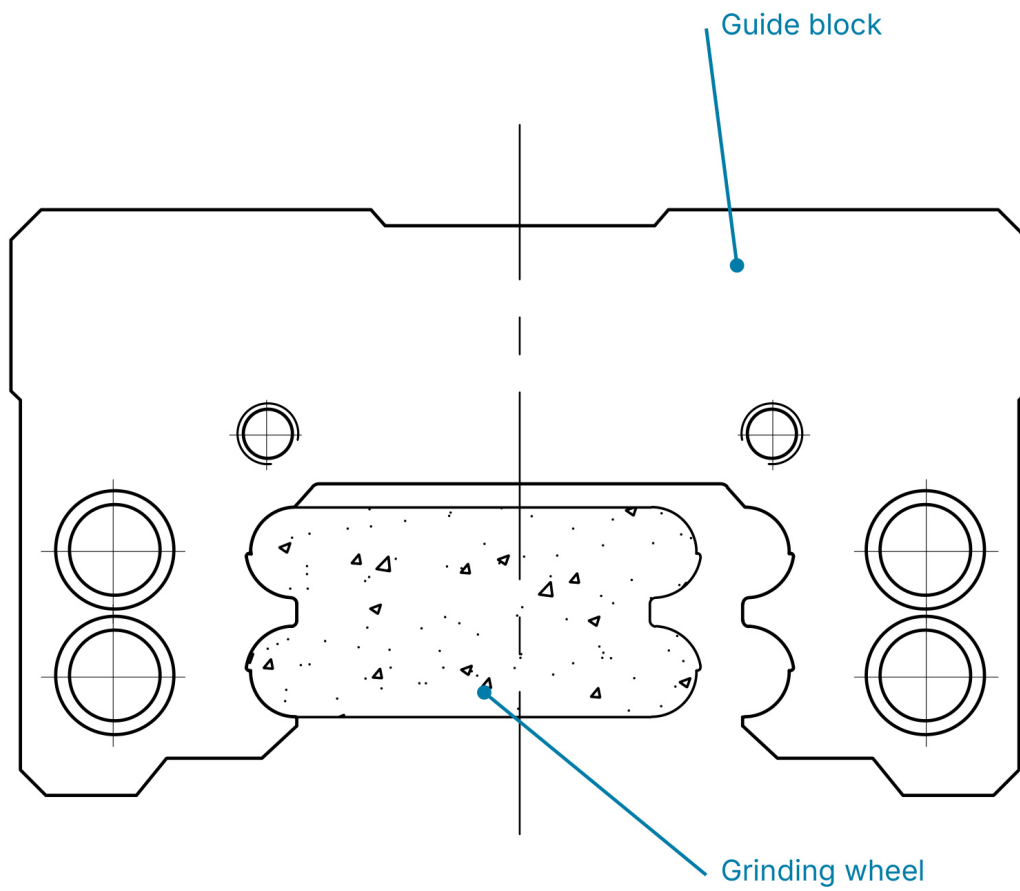


Rotary dresser for the guide block raceway.

Original dimensions and tolerances



Dimensioned guide block profile, including all original tolerances.

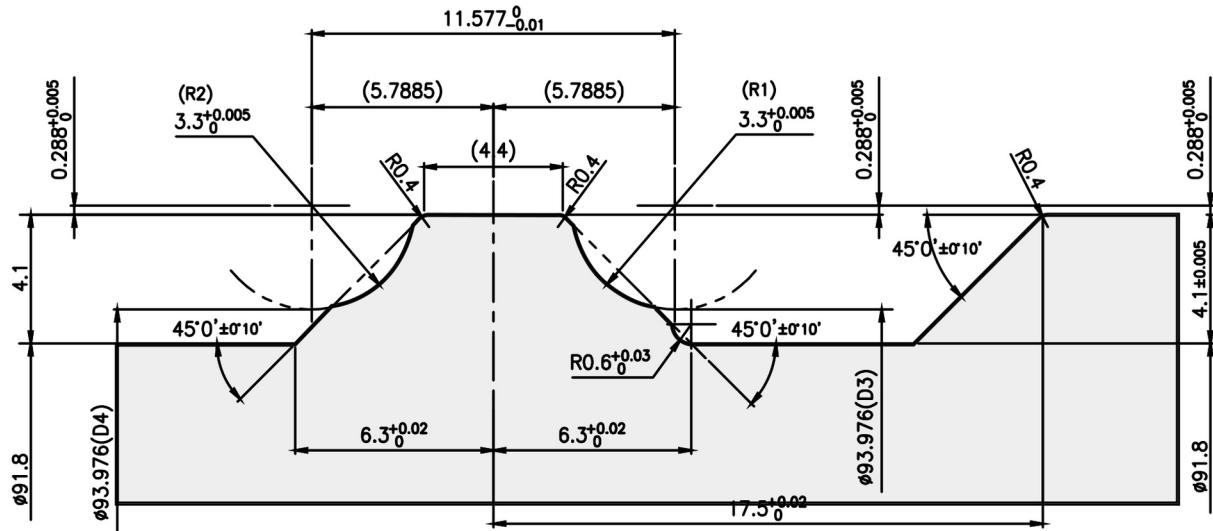


Profile contact between guide block and grinding wheel.

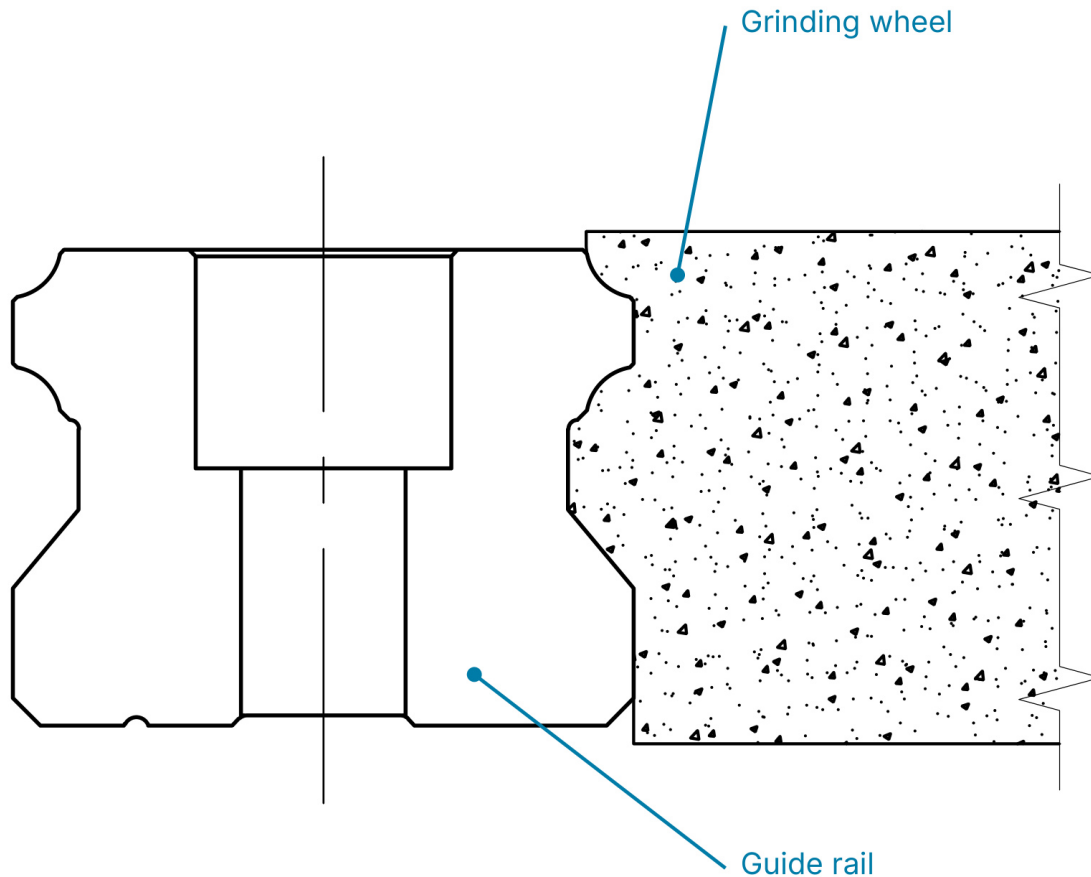


Rotary dresser for the guide rail raceway.

Original dimensions and tolerances



Dimensioned guide rail profile, including all original tolerances.



Profile contact between guide rail and grinding wheel.

Profile rotary dressers for ball screws

A ball screw converts rotary motion into linear motion. Screw, nut and balls form the functional assembly. The EHWA rotary dressers combine high diamond concentration with precision dressing and long life.

The illustrated R-profile retains its complete technical drawing: overall width 16, the two partial widths 8, reference dimensions (12.515), (0.615), (0.319), (0.113), diameter $\varnothing 7.144$, heights 0.7 / 4 / 3.3, 15° angles on both sides, max. R0.5 and both $R4.015 \pm 0.005$ radii. The 45° angles designated V1 and V2 have an asymmetric tolerance of $+0/-2^\circ$. These angles differ from the guide rail drawings in the preceding chapter.

The drawing preserves the location and direction of every dimension. As with the linear guide profile, no general unit is printed within the detail. The complete component drawing and required raceway geometry govern tool design.



Rotary dresser for ball screws.



Profile dresser detail.



R-profile rotary dresser.



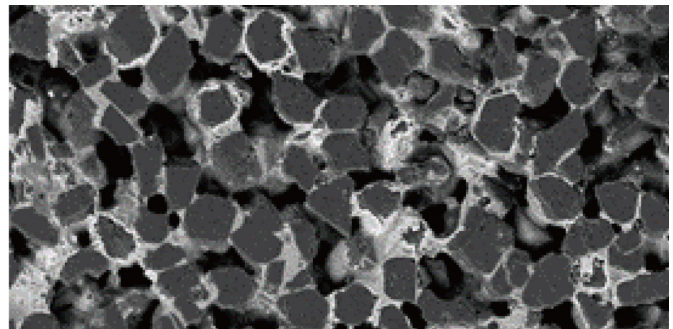
Vitrified CBN tools for CV joints.



CV joint outer race and tracks.



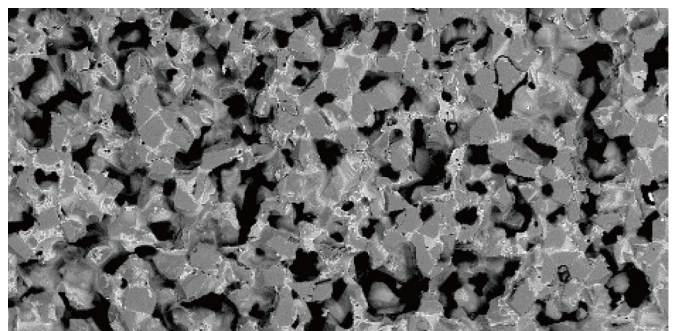
Cage window grinding: component and tool designs.



CBN microstructure for the cage window case.



Outer race grinding: component and tool designs.



Vitrified wheel pore structure for the outer race.

Injector bore and seat grinding

For injector components, EHWA shows cylindrical bore grinding tools and pointed seat grinding tools. Coolant holes and slots form part of the tool geometry. Free-cutting abrasive, longer dressing intervals, more efficient tool utilization and consistent grinding performance are the stated benefits.

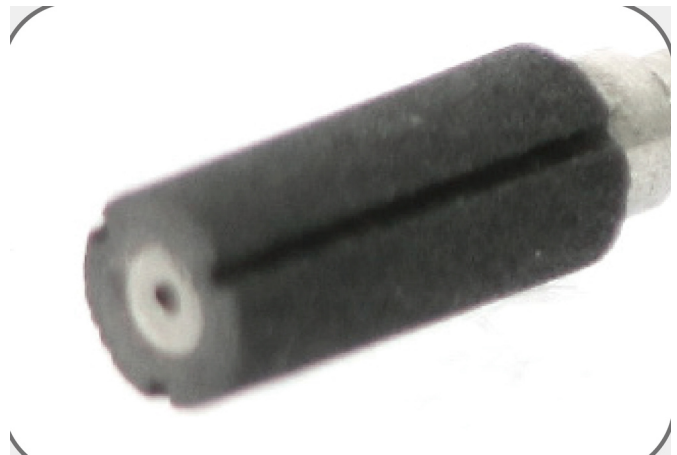
The precise shape includes the coolant hole and slots. End and side views make this geometry visible; the complete standard specifications appear in the table.

Specification feature	Source specification
Grinding operation	Bore and seat
Coolant hole size	H 0.5-1.0 mm
Grinding tool size	D 1.5-20 mm
CBN grit size	29-76 µm
Slot	0.4-1.5 mm

H and D remain as the source designations. The particular tool design follows the bore, seat, mounting and coolant supply requirements.



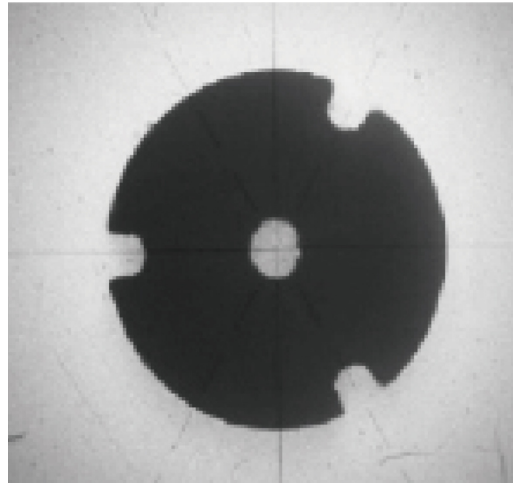
Tool range for injector bore and seat grinding.



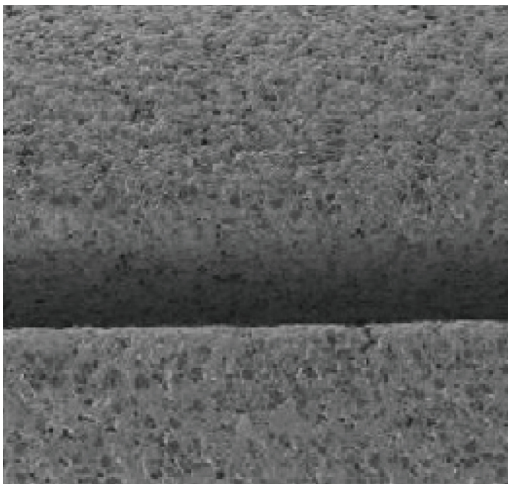
Bore grinding tool with coolant hole and slot.



Pointed grinding tool for seat grinding.



Slot shape in the end view.



Slot shape in the side view.

Related range: porous hybrid bond for rotary tools

The porous hybrid bond combines an open structure with strong grinding performance. It supports abrasive protrusion and coolant flow and can therefore reduce grinding load. Higher permissible feed rates enable shorter cycle times. Further benefits are high stock removal, reduced residual stress and thermal damage, high dimensional stability, good surface finish and edge quality, long dressing intervals and low power consumption.

Applications include fluting tungsten carbide drills and end mills, gashing tungsten carbide drills and clearance angle grinding. The source shows two micrographs and wheel shape 1A1.

Test on ANCA MX7 Linear

Specification: **D54 Porosity hybrid bond**. Both charts belong to this test and show maximum spindle load as a percentage.

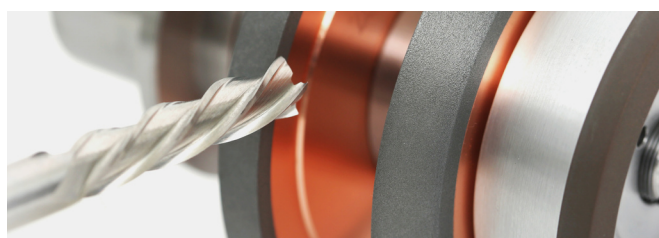
Feed rate (mm/min)	EHWA - porous hybrid: maximum spindle load (%)	Competitor: maximum spindle load (%)
100	14	15
120	15	16
160	19	20
200	23	24
240	26	27
260	28	30
280	30	31

Wheel speed (m/s)	EHWA - hybrid (%)	EHWA - porous hybrid (%)	Competitor (%)
18	17	14	15
20	17	14	15
22	17	14	15
24	18	15	16

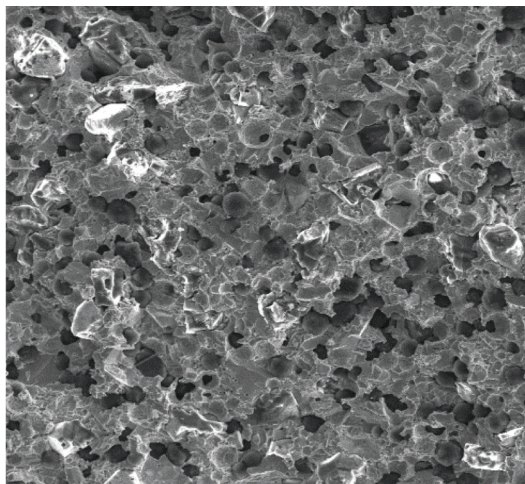
The curves explicitly distinguish the conventional EHWA hybrid bond and the EHWA porous hybrid bond. The values are presented as test data and are not transferred to other machines or tools.



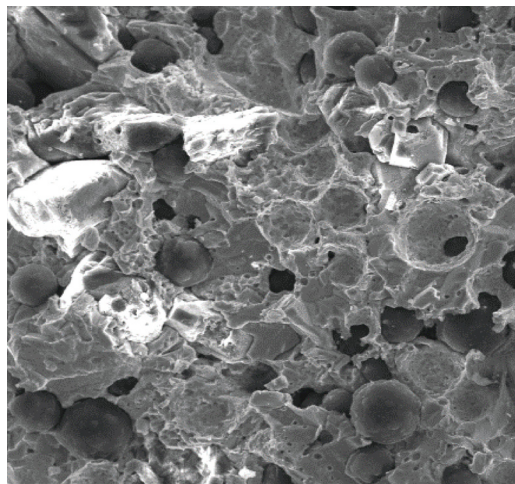
Diamond wheels with porous hybrid bond.



Flute grinding detail with porous hybrid bond.



Porous hybrid bond: first micrograph.

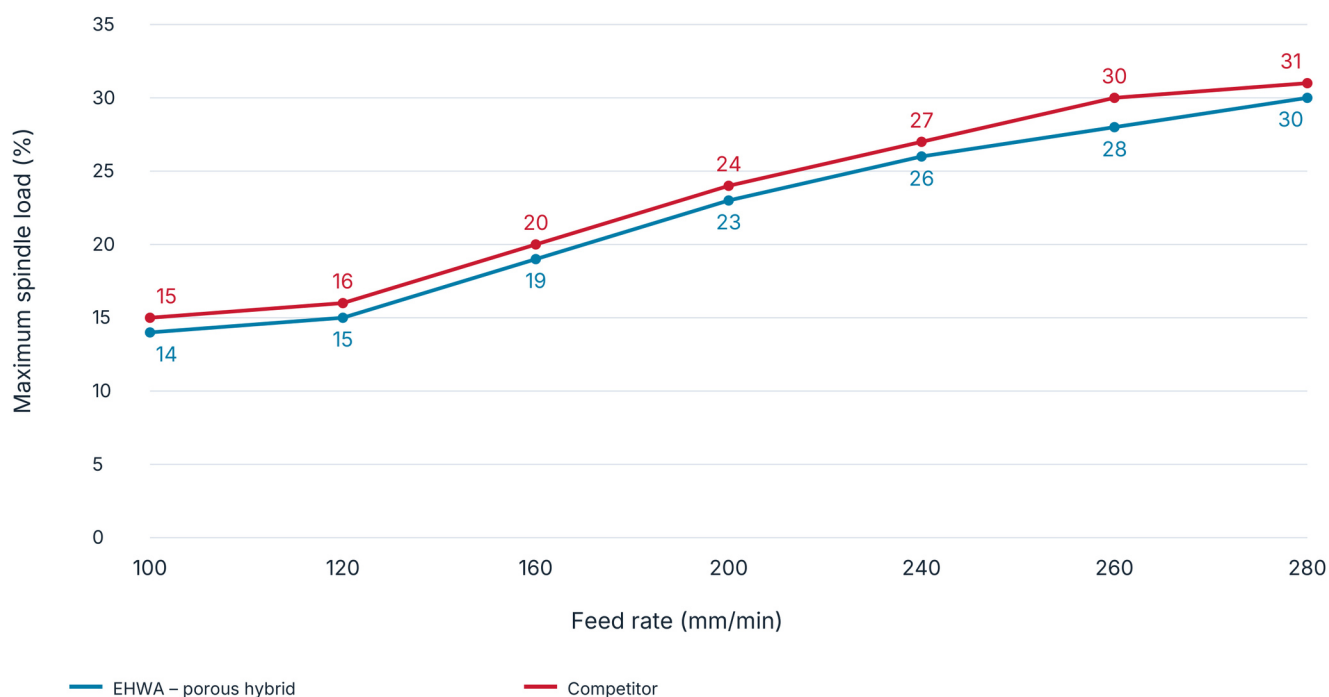


Porous hybrid bond: second micrograph.



Porous hybrid wheel in shape 1A1.

Feed rate and maximum spindle load



Maximum spindle load against feed rate.

Wheel speed and maximum spindle load



Maximum spindle load against wheel speed.

Related range: diamond wheels for micro tools

Micro drills, micro end mills and router bits require clean cutting edges and precise geometry. EHWA grinding wheels target high productivity and low tooling cost. The source states strong heat resistance, improved surface and edge quality, and precise dimensional and cutting edge stability.

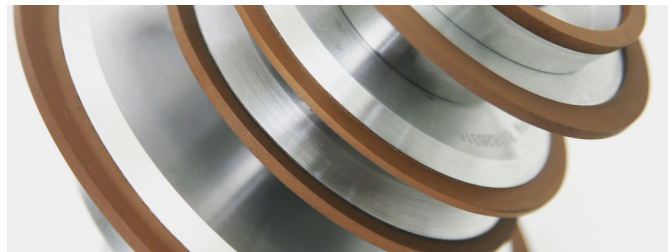
The range shows hybrid bond and high-performance polyimide bond with separate micrographs. For manufacturing micro rotary tools, the source names machines from **ROLLOMATIC**, **ANCA** and **WALTER**, among others. Two photographs of real micro cutting tools retain their original magnification markings **X200** and **X50**.

Application / design	Association
Micro drills, micro end mills, router bits	Rotary micro cutting tools
Hybrid bond	The illustrated porous microstructure
High-performance polyimide bond	Separate micrograph for the thermally stable bond family
X200 / X50	Original magnification markings on the tool photographs

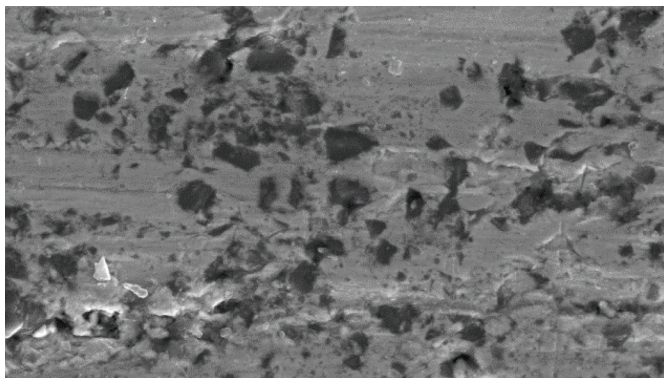
Tool selection combines grinding geometry, bond and the requirements for cutting edge and surface quality.



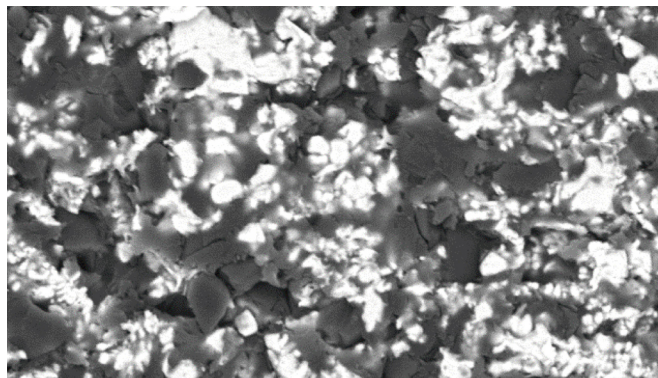
Diamond grinding wheels for micro rotary tools.



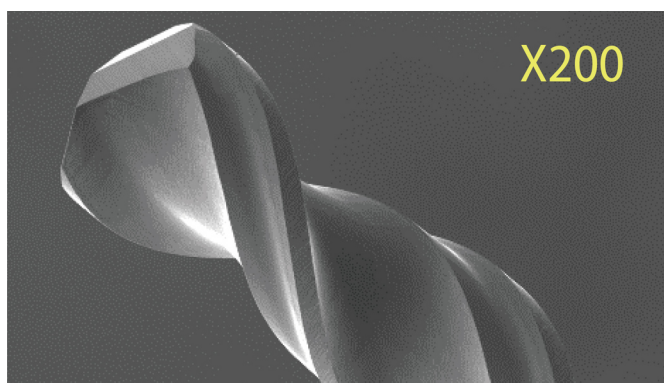
Micro-tool grinding wheel detail.



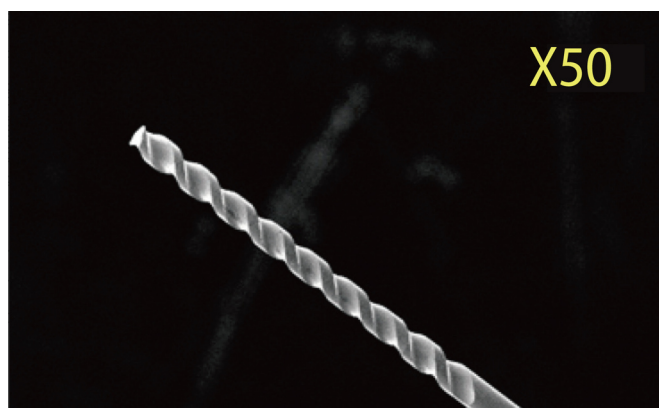
Micro-tool hybrid bond microstructure.



High-performance polyimide bond microstructure.



Micro cutting tool, original magnification X200.



Micro cutting tool, original magnification X50.

Related range: MNC hybrid bond and MEViOUS

The metal/vitrified hybrid grinding wheel combines the wear resistance of metal bond with the grinding performance of vitrified bond. Long tool life and good profile stability are the central benefits. The micrographs identify metal, vitrified phase and diamond at the original marked locations, together with a further unlabelled view.

The document associates the range with the **MEViOUS** brand. Applications include tungsten carbide end mills and drills, other alloy tools and gear honing stones.

Range feature	Source specification
Grit size	#60-#3000
Wheel size	40D-450D
MNC bond	MJ, MS Series

The D designation is retained as printed; this table does not state an expanded unit.

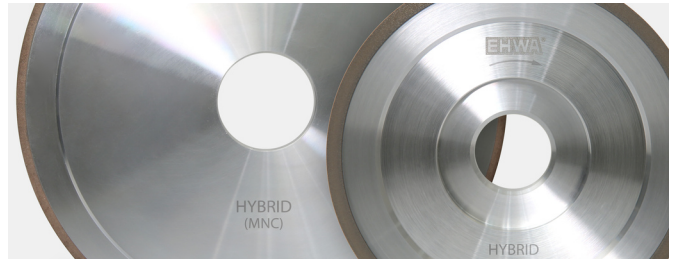
Complete relative performance comparison in this document

Comparison feature	EHWA	Competitor
Tool life, source designation "Tool life (ea)"	120%	100%
Surface roughness, source designation "Surface roughness"	115%	100%

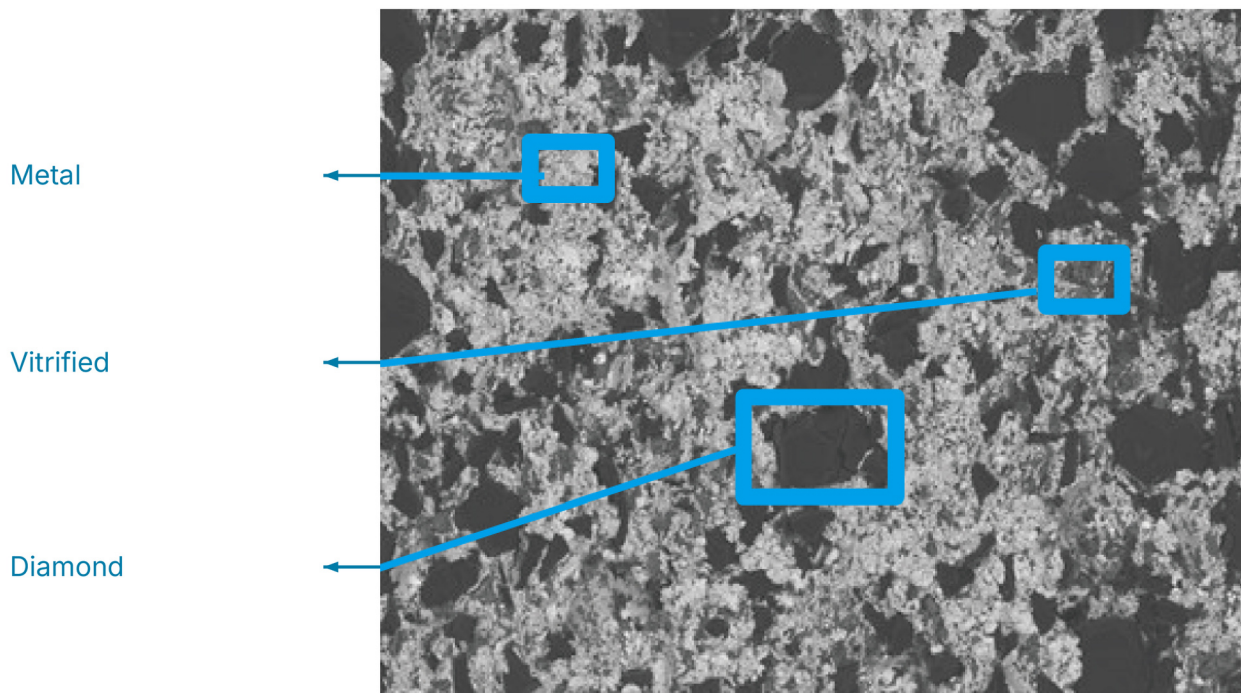
The source presents both features as relative comparisons. For roughness it provides neither absolute Ra/Rz values nor a definition of the comparison index; 115% is therefore not converted into a general roughness improvement. This test remains separate from other MEViOUS trials.



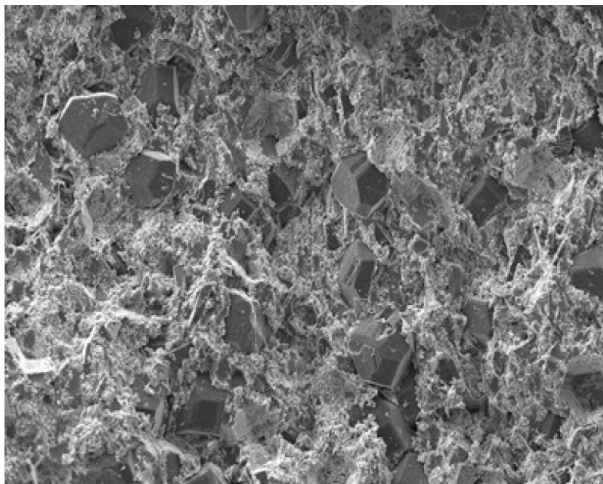
Metal/vitrified hybrid wheels and workpiece examples.



Metal/vitrified hybrid grinding wheel detail.



MNC microstructure: metal, vitrified phase and diamond at original markers.

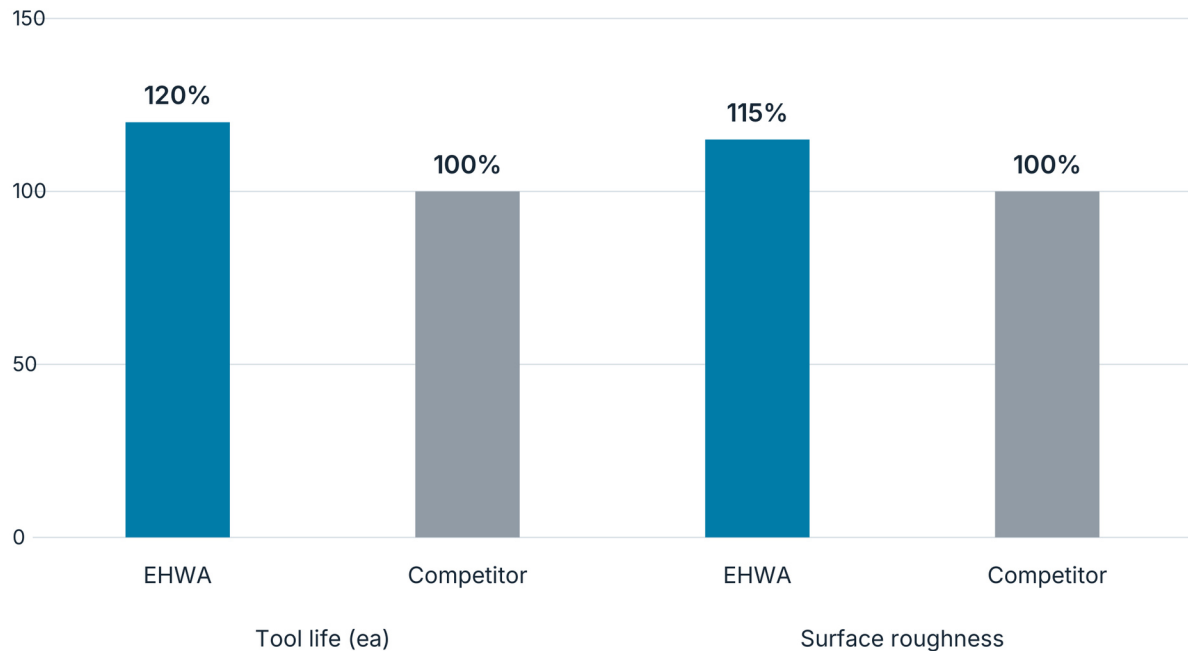


Further MNC hybrid micrograph.



Tungsten carbide tools and gear honing stones.

Relative MNC comparison (%)



MNC: relative comparison of tool life and surface roughness.

Coordinate the right manufacturing process

For a tool recommendation, useful information includes the component drawing and material, grinding surface, machine and mounting, stock removal, target geometry and surface finish, and dressing and coolant conditions. Raceway profiles particularly require the dimensions and datum system; micro tools place cutting edge geometry and thermal loading at the centre of selection.

EHWA Europe supports the selection of grinding tools, superfinishing stones and dressers. Send your application to info@ehwadia.de or contact the team on +49 6173 99778-0.

Sources and technical scope

The complete content is based on the EHWA documents **Bearing**, pp. 1-10 (printed pp. 26-35), and **2.Tooling-Bearing-Glass**, pp. 1-8. Shared CBN, rotary dresser and cup dresser content is consolidated; different applications, technical drawings, images and tests remain included. The publication years of these two source documents are not explicitly printed.

Additional technical context: [EHWA Grinding Catalogue ENG 2022, p. 44](#) on cycle time with porous hybrid bond and [TYROLIT: Your partner for tool grinding, p. 107](#) on dressing speed ratio. EHWA process values remain those of the two bearing documents.