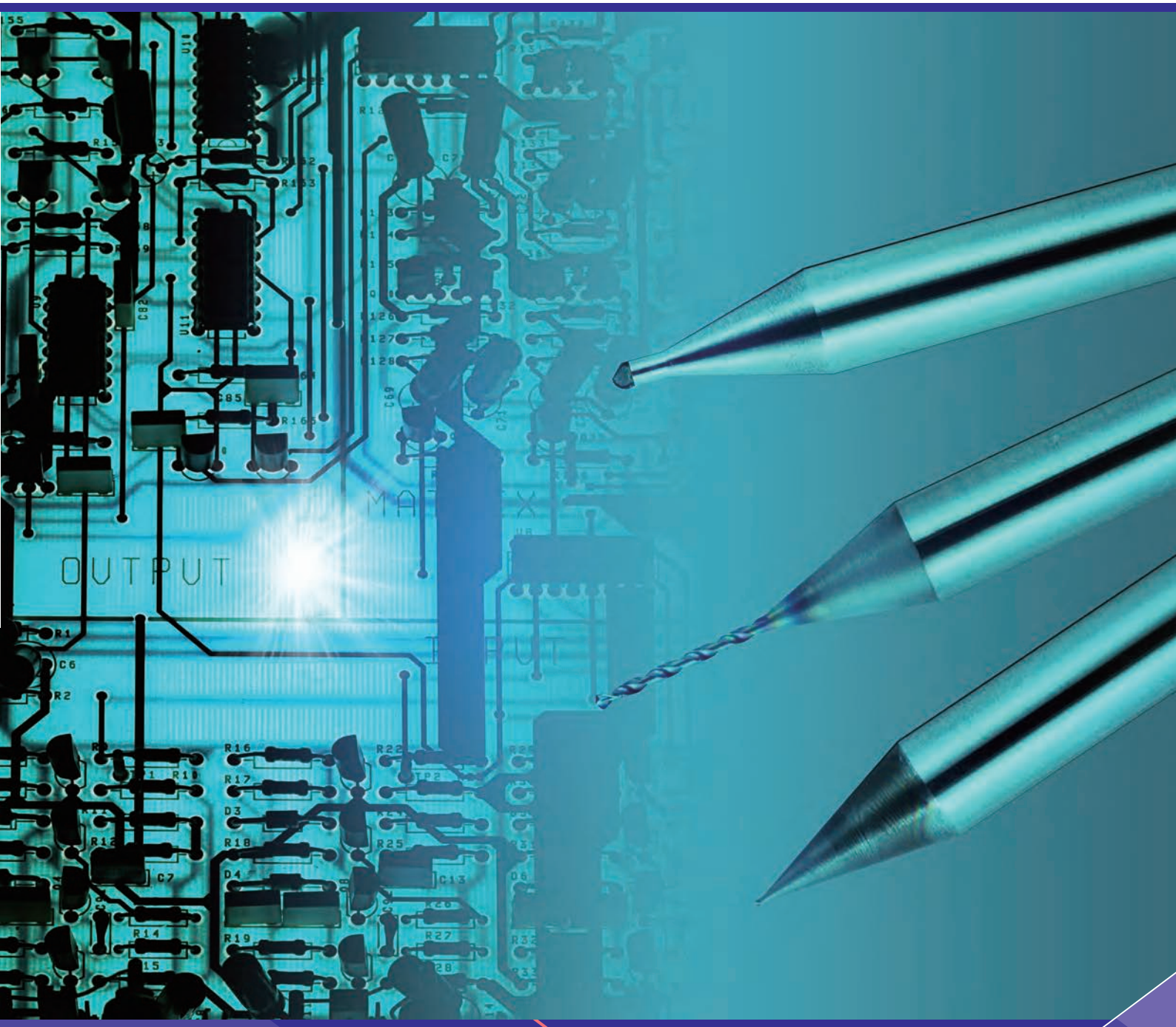
SUMITOMO
CARBIDE - CBN - DIAMOND
Global Support, Global Solutions.

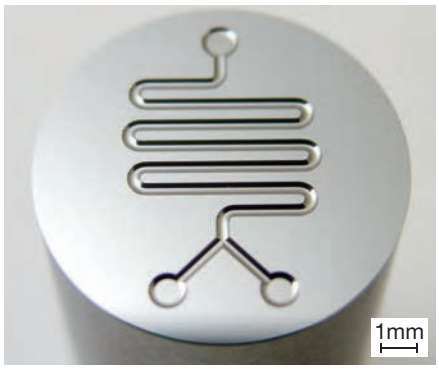
Micro Manufacturing and Die Processing Tools

Rev. 2



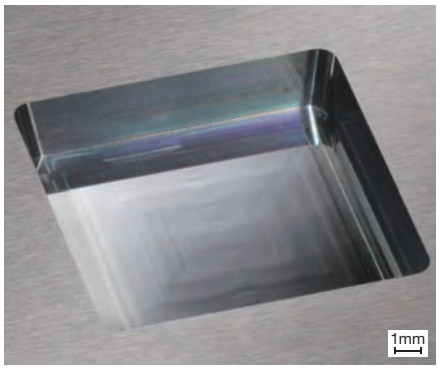
Micro Manufacturing and Die Processing Tools

μ-TAS Mold
Work Material : Cemented Carbide AF1 (Ultra-fine Grained Alloy, 92.5HRA)
Tool : NPDB Type, Ballnose Radius 0.3mm



Fly-Eye Lens Mold
Work Material : Cemented Carbide AF1 (Ultra-fine Grained Alloy, 92.5HRA)
Tool : NPDB Type, Ballnose Radius 0.5mm

Pocket Mold
Work Material : Cemented Carbide AF1 (Ultra-fine Grained Alloy, 92.5HRA)
Tool : NPDRS Type, Diameter 1.0mm, Ballnose Radius 0.05mm



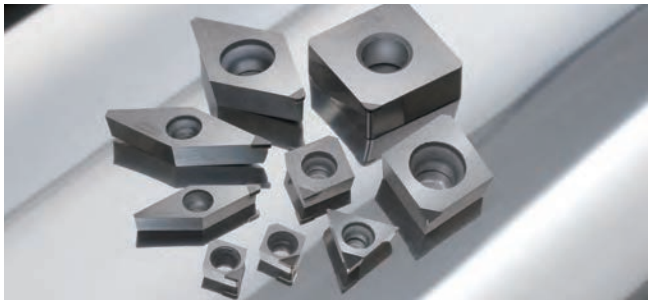
Swage Mold
Work Material : Cemented Carbide AF1 (Ultra-fine Grained Alloy, 92.5HRA)
Tool : NPDB Type, Ballnose Radius 0.5mm

Mold Finish Master SUMIDIA BINDERLESS Endmill Series
NPDRS Type/NPDB Type/NPDBS Type P.4

NPDRS Type : Diameter 0.2 to 2.0mm, Cutting Edge Length 0.6 to 4.0mm
NPDB / NPDBS Type : Ballnose Radius 0.1 to 1.0mm, Cutting Edge Length 0.4 to 3.0mm

SUMIDIA BINDERLESS Turning Inserts
NPD10 P.5

37 items in stock



SUMIDIA Coated Ballnose Endmills
SDCB Series P.5

Ballnose Radius 0.5, 1.0mm, Cutting Edge Length 1.5 to 10.0mm

SUMIDIA BINDERLESS Drills P.6

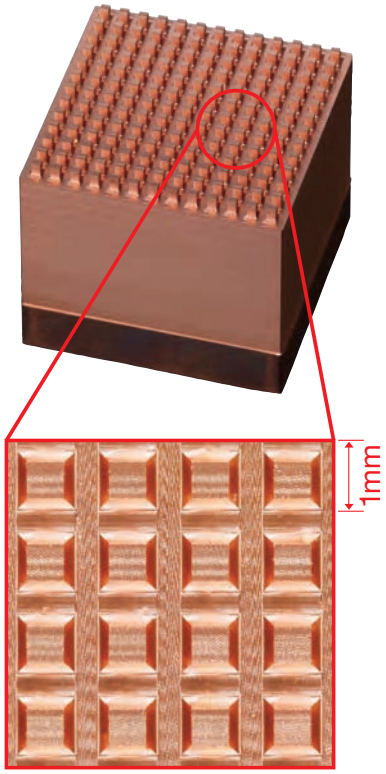
(Made-to-order item) Diameter 0.3 to 1.0mm

SUMIDIA Turning Inserts
DA90 P.5

SUMIBORON BINDERLESS Turning Inserts
NCB100 P.6

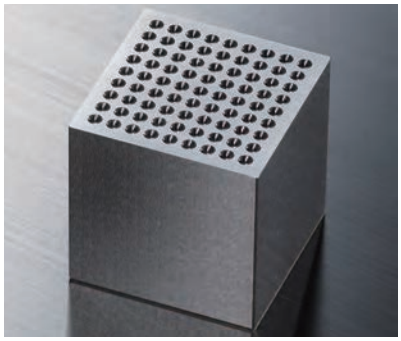
CVD Single-Crystal Diamond Inserts P.6

Copper Electrodes
Work Material : Tough-pitch Copper
Tool : BNBC Series, Ballnose Radius 0.3mm

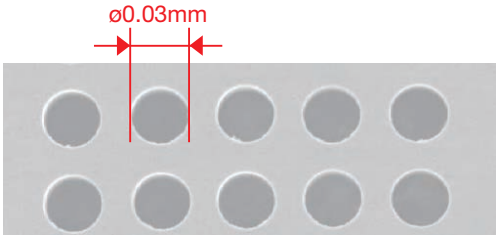


(Credit : NK Seiko Corporation)

LED Lens Mold
Work Material : ELMAX(60HRC)
Tool : BNBP Series, Ballnose Radius 0.5mm



Micro-nozzle Holes
Work Material : SUS304
Tool : MDUS Type, Diameter 0.03mm

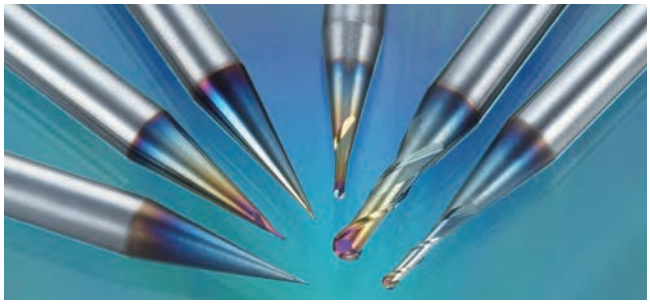


Aurora Coat (DLC) Long Neck Ballnose Endmills (for Copper Electrodes)

SNB 2 Series

P.7

Ballnose Radius 0.05 to 2.00mm, Cutting Edge Length 0.3 to 30.0mm



Mold Finish Master SUMIBORON Ballnose Endmills (for Copper Electrodes)

BNBC Series

P.7

Ballnose Radius 0.1 to 0.5mm, Cutting Edge Length 0.3 to 3.0mm

Mold Finish Master SUMIBORON Endmills (for Hardened Steel)

BNBR Series/BNBP Series

P.8 P.9

BNBR Series : Diameter 0.2 to 2.0mm, Corner Radius 0.05 to 0.50mm, Cutting Edge Length 0.5 to 7.5mm
BNBP Series : Ballnose Radius 0.2 to 1.0mm, Cutting Edge Length 1.2 to 8.0mm

MULTIDRILL series for Very Small and Small Diameter Hole Drilling

MDUS Type/MDSS Type/MDUP Type

P.11

MDUS Type : Diameter 0.03 to 0.19mm, MDSS Type : Diameter 0.20 to 1.00mm
MDUP Type : Diameter 0.03 to 0.18mm

SUMIBORON Ballnose Endmills

BNBS Series

P.10

Coated Cemented Carbide Endmills

GSX MILL Series/ GS MILL Series

P.10

Machining of Cemented carbide

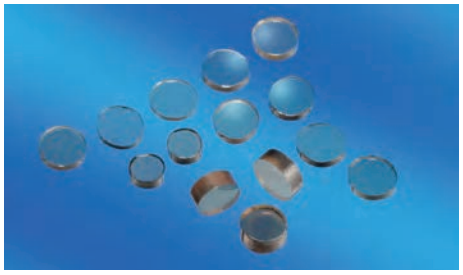
Mold Finish Master SUMIDIA BINDERLESS Endmills Series
NPDRS Type/NPDB Type/NPDBS Type

NPDRS Type : Diameter 0.2 to 2.0mm, Cutting Edge Length 0.6 to 4.0mm, NPDB / NPDBS Type : Ballnose Radius 0.1 to 1.0mm, Cutting Edge Length 0.4 to 3.0mm

Characteristics

- Using SUMIDIA BINDERLESS cutting edges ensure superior wear resistance and fracture resistance in addition to excellent dimensional accuracy even over sustained periods.
- Excellent machined surface finish is made possible by the cutting edge design specially optimized for finishing.
- The ability to cut cemented carbide and hard brittle materials directly means less processing with no need to perform grinding or EDM, and therefore less processing costs.

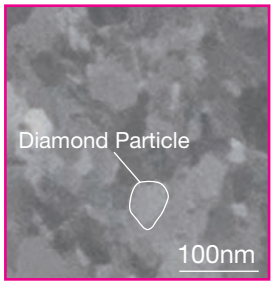
Nano-Polycrystalline Diamond SUMIDIA BINDERLESS



- Incorporates a polycrystalline structure with nano-sized ultra-fine diamond particles directly bonded with no binders.
- With hardness surpassing single-crystal diamonds, high-precision machining even of cemented carbide and hard brittle materials is possible.
- Excellent wear resistance and fracture resistance with no uneven wear and cleavability due to anisotropy peculiar to single-crystal diamonds.
- The cutting edge is sharper than conventional polycrystalline diamonds (PCDs), ensuring a superior machined surface quality.

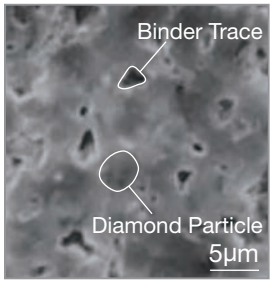
■ Comparison of Structures (SEM)

SUMIDIA BINDERLESS



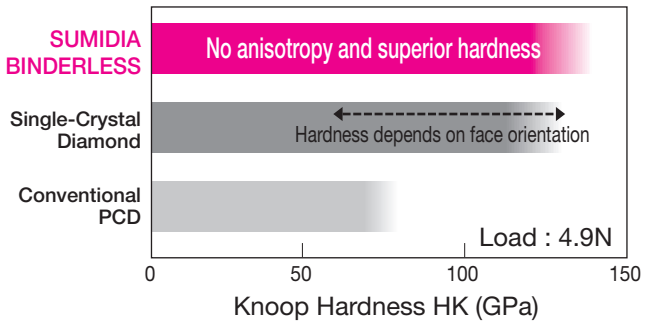
Diamond Particles (30 to 50nm)

Conventional PCD (Following Binder Removal)

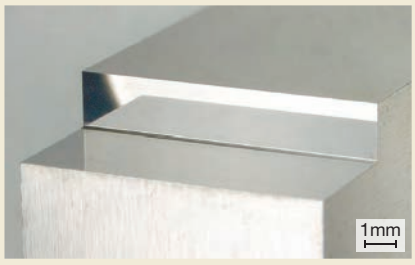


Diamond Particles (1 to 10μm)

■ Hardness



■ Application Examples



Work Material : Cemented Carbide AF1 (Ultra-fine Grained Alloy, 92.5HRA)
Tool : NPDRS1200R05-040, Diameter : 2.0mm, Corner Radius : 0.05mm, Cutting Edge Length : 4.0mm
Cutting Conditions : n =40,000min^{-1}, v_f=600mm/min
a_p=Side0.01mm / Bottom0.002mm, a_e=Side0.005mm / Bottom0.01mm
Air Blow
Cutting Time : 150min
Surface Roughness Ra : Side : 8.7nm / Bottom : 2.6nm

SUMIDIA BINDERLESS Turning Inserts
NPD10

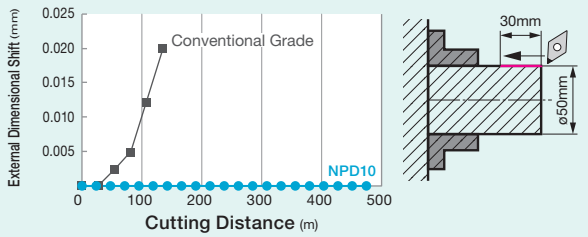
37 items in stock

Characteristics

- The excellent wear resistance of SUMIDIA BINDERLESS ensures high-precision machining of cemented carbide.
- Greatly reduced tool replacements compared to conventional diamond tools for improved work efficiency and reduced total costs.
- The ability to cut cemented carbide and hard brittle materials means less processing with no need to perform grinding or EDM, and therefore less processing costs.

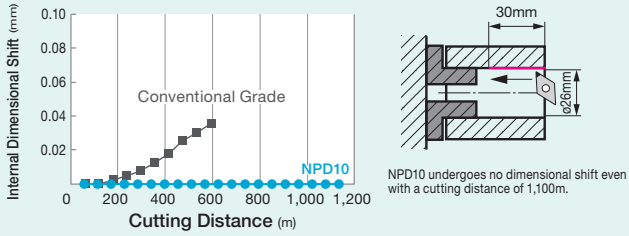
■ Machining Precision

External Dimensional Shift



Work Material : Cemented Carbide G6 (87HRA)
Tool : DCMW11T304RH
Cutting Conditions : v_c=20m/min, f=0.1mm/rev, a_p=0.1mm, Dry

Internal Dimensional Shift



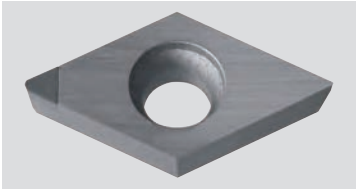
Work Material : Cemented Carbide D2 (91HRA)
Tool : DCMW11T304RH
Cutting Conditions : v_c=20m/min, f=0.05mm/rev, a_p=0.05mm, Dry

SUMIDIA Turning Inserts
DA90

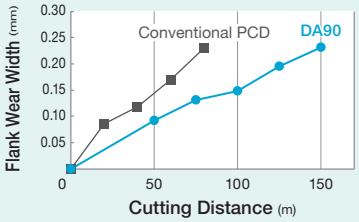
36 items in stock

Characteristics

- Ideal for roughing of cemented carbide and hard brittle materials.
- Adopts SUMIDIA NF inserts.
- The optimal design and incorporation of mass production techniques allows for excellent cost effectiveness with the same performance as conventional models.



Wear Resistance



Excellent wear resistance even under roughing conditions.

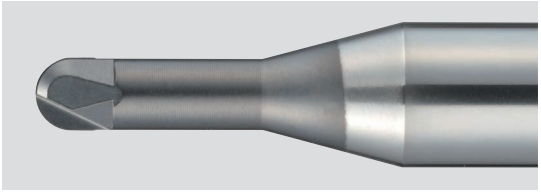
Work Material : Cemented Carbide VC50 (87HRA)
Tool : NF-DCMW070204
Cutting Conditions : v_c=20m/min, f=0.1mm/rev, a_p=0.2mm, Wet

SUMIDIA Coated Ballnose Endmills
SDCB Series

Ballnose Radius 0.5, 1.0mm, Cutting Edge Length 1.5 to 10.0mm

Characteristics

- Ideal for roughing and medium finishing of cemented carbide molds.
- Incorporates diamond coating technology developed in the aviation industry.
- With a high adhesion to base metals, the high-functionality special diamond coating provides excellent wear resistance and fracture resistance for stable cutting.



■ Application Examples

Work Material : Cemented Carbide AF1
(Ultra-fine Grained Alloy, 92.5HRA)
Tool : SUMIDIA Coated Endmill SDCB Series
Cutting Conditions : n =30,000min^{-1}
v_f =300mm/min
a_p =0.1mm, p_f =0.2mm
Dry

New material tools

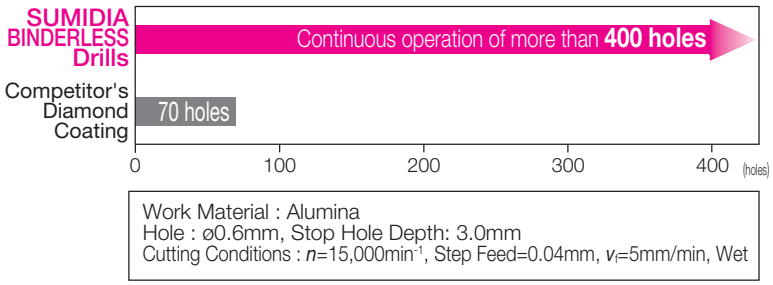
SUMIDIA BINDERLESS Drills

High-precision drilling and long tool life even when working with cemented carbide and ceramics.

(Made-to-order item) Diameter 0.3 to 1.0mm

Characteristics

- The SUMIDIA BINDERLESS cutting edge provides excellent fracture resistance thanks to the cleavage-free polycrystalline structure.
- With higher hardness and better wear resistance than single-crystal diamonds, high-precision machining is ensured even with cemented carbide.



Work Material : Alumina
Hole : ø0.6mm, Stop Hole Depth: 3.0mm
Cutting Conditions : n=15,000min^{-1}, Step Feed=0.04mm, v_f=5mm/min, Wet

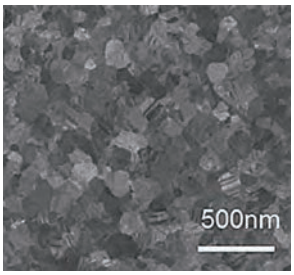
SUMIBORON BINDERLESS Turning Inserts NCB100

Higher hardness and better thermal conductivity than conventional CBNs. High-efficiency finishing of exotic alloys such as titanium alloy.

20 items in stock

Characteristics

- Excellent wear resistance and heat resistance thanks to high mechanical properties and high thermal conductivity even under high temperatures.
- The binderless, ultra-fine CBN polycrystalline structure leaves an excellent machined surface finish.
- The high contour accuracy of the cutting edge and the properties of the SUMIBORON BINDERLESS material ensure excellent dimensional accuracy even over sustained periods.



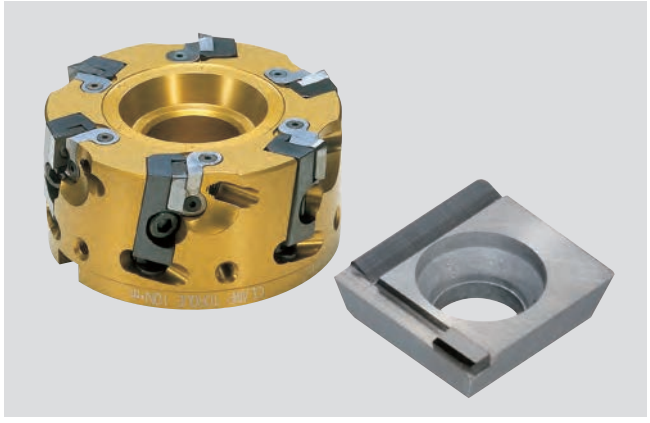
CVD Single-Crystal Diamond Inserts

For mirror finishing and burr-free machining of aluminium alloy.

(Made-to-order item)

Characteristics

- These inserts adopt a single-crystal diamond, utilizing Sumitomo Electric Hardmetal's CVD (chemical vapor deposition) technology, for the cutting edge.
- Can be used for mirror finishing and for drastically reducing burr generation thanks to a sharper cutting edge than polycrystalline diamond (PCD) products.

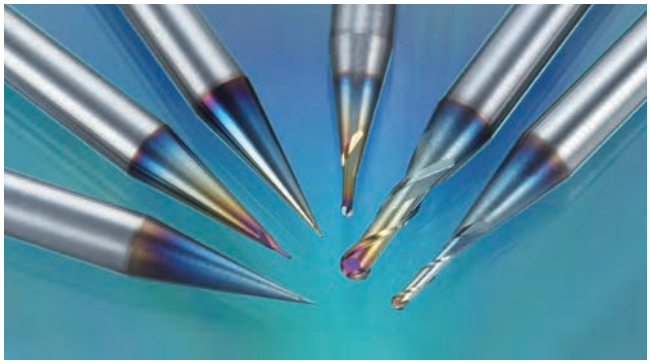


Copper electrode processing

Aurora Coat and CBN—Ideal for Copper Electrode Machining

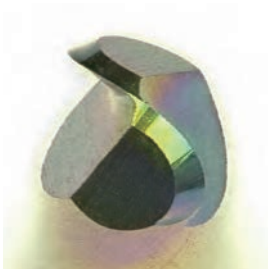
Aurora Coat Long Neck Ballnose Endmills
SNB 2 Series

Ballnose Radius 0.05 to 2.00mm, Cutting Edge Length 0.3 to 30.0mm



Characteristics

- Adopts Aurora Coat (DLC coat) technology for excellent adhesion resistance and wear resistance.
- Achieves longer tool life compared with cemented carbide tools coated with chromium nitride (CrN).
- With a low coefficient of friction, coating layers come out extremely smooth.
- Burr generation is suppressed.

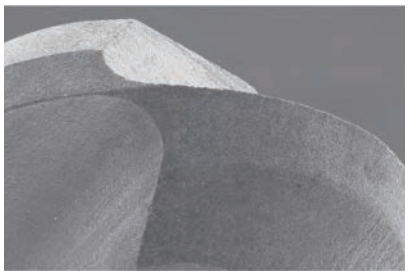


Mold Finish Master SUMIBORON Ballnose Endmills
BNBC Series

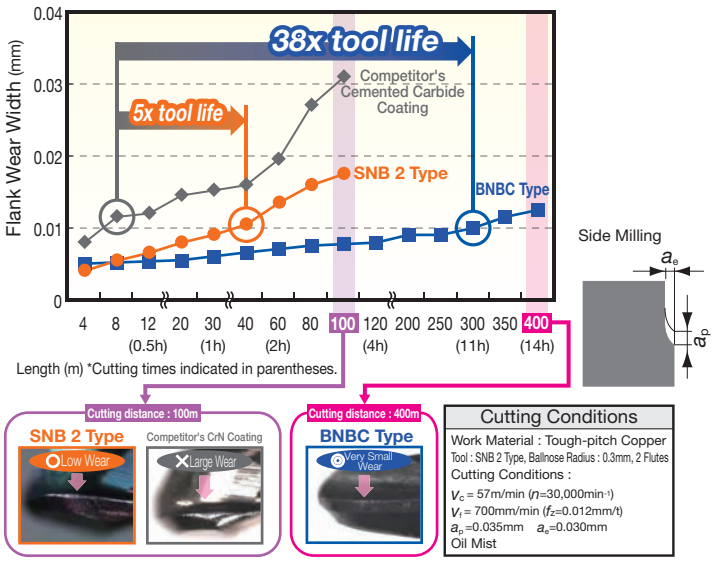
Ballnose Radius 0.1 to 0.5mm, Cutting Edge Length 0.3 to 3.0mm

Characteristics

- Adoption of material high in CBN provides excellent edge- sharpening performance and wear resistance.
- Achieves high-precision, high-quality machining thanks to a sharp cutting edge.
- The high burr suppression allows for sustainable high quality.



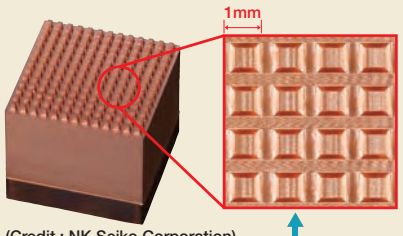
■ Performance



■ Application Examples

Work Material : Tough-pitch Copper

Process	Tool	Rotation Speed n (min^{-1})	Feed Rate V_f (mm/min)	a_p (mm)	a_e (mm)	Coolant
①	ø8 Cemented Carbide Square Endmills ASM2080	1,500	200	—	0.5	Wet
②	ø1 RE 0.05mm Mold Finish Master BNBR Type Radius Endmills	30,000	600	0.02	0.02	Wet
③	RE 0.3mm for Copper Electrodes Mold Finish Master BNBC Type Ballnose Endmills	40,000	1,200	0.01	0.01	Wet



(Credit : NK Seiko Corporation)

Provides smooth, burr-free surfaces for extended periods.

Milling of hardened steel

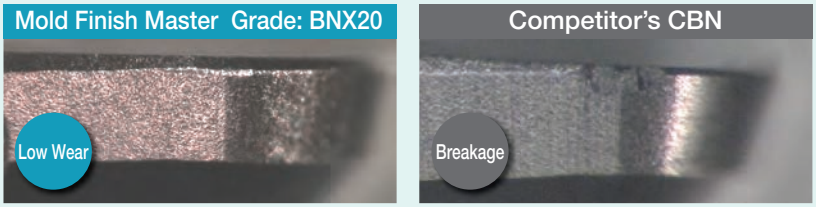
CBN Small-Diameter Endmills

Mold Finish Master SUMIBORON Radius Endmills
BNBR Series

The combination of SUMIBORON BNX20—offering excellent wear resistance even with high-speed machining—and an optimal cutting edge design ensures a longer tool life.

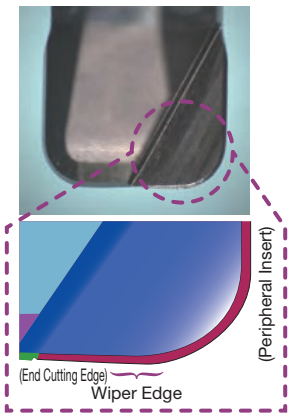
Diameter 0.2 to 2.0mm, Corner Radius 0.05 to 0.50mm, Cutting Edge Length 0.5 to 7.5mm

Tool Wear Comparison

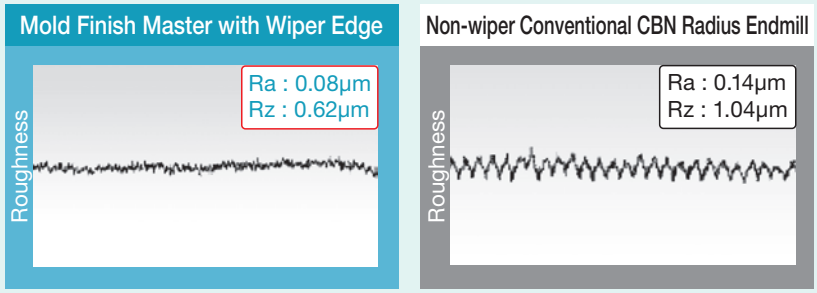


Work Material : STAVAX(52HRC)
Tool : BNBR 2D200R050-0604(ø2.0mm×RE0.5mm)
Cutting Conditions : n=20,000min^{-1}, v_f=400mm/min, a_p=0.03mm, p_f=0.7mm, Oil Mist

■ Improved machining surface quality through use of a wiper edge.

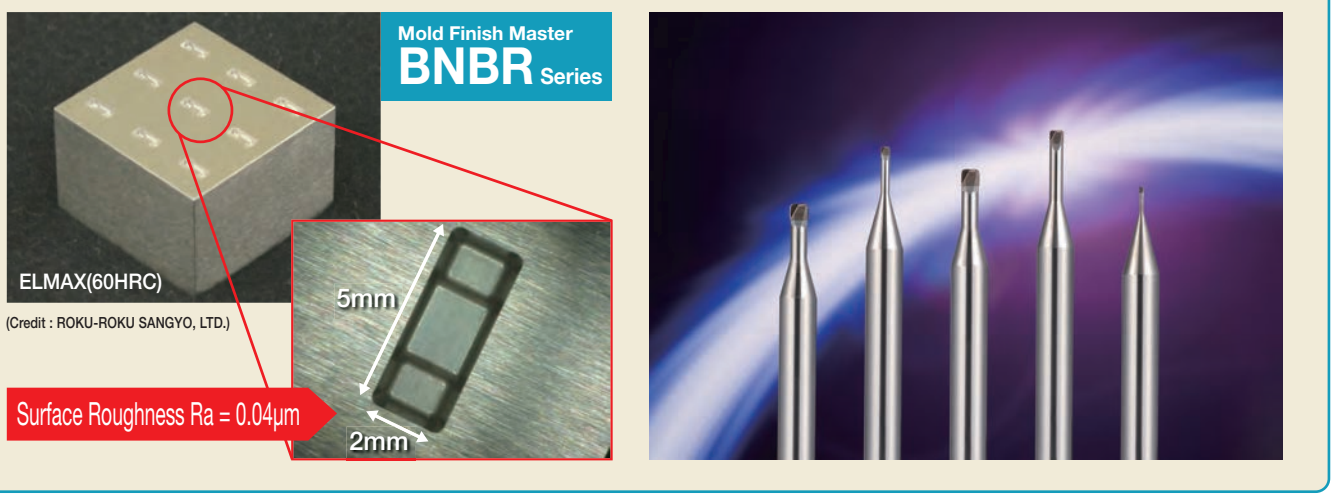


Machined Surface Comparison



*Wipers applicable to endmills with a diameter of ø1.0mm or more.

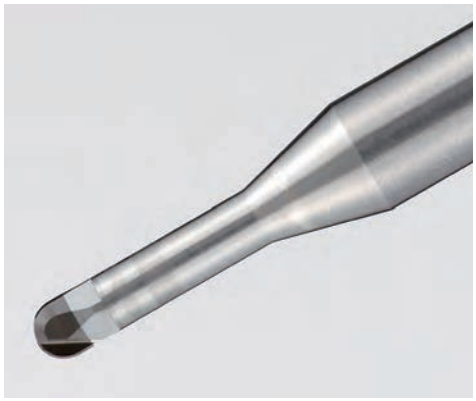
■ Workpiece Example

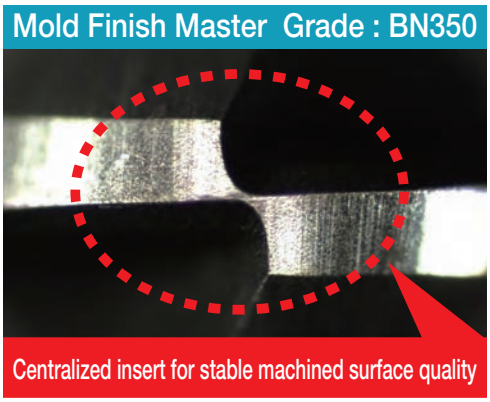


Mold Finish Master SUMIBORON Ballnose Endmills
BNBP Series

The combination of SUMIBORON BN350—ideal for low- to high-speed cutting of hardened steel—and a cutting edge designed with a negative rake angle provides stable tool life.

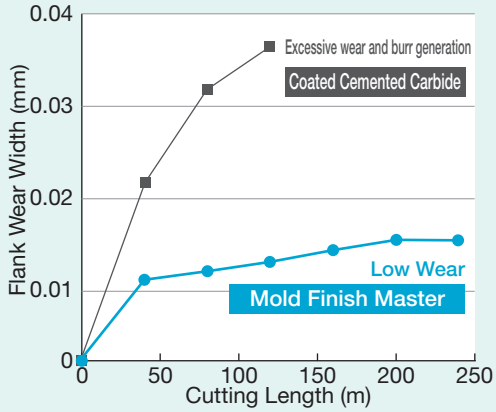
Ballnose Radius 0.2 to 1.0mm, Cutting Edge Length 1.2 to 8.0mm



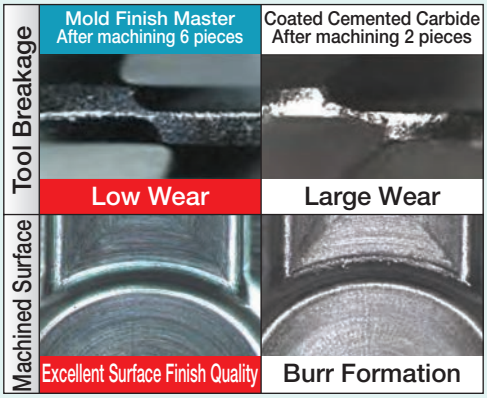


■ Excellent Wear Resistance and Machined Surface Quality

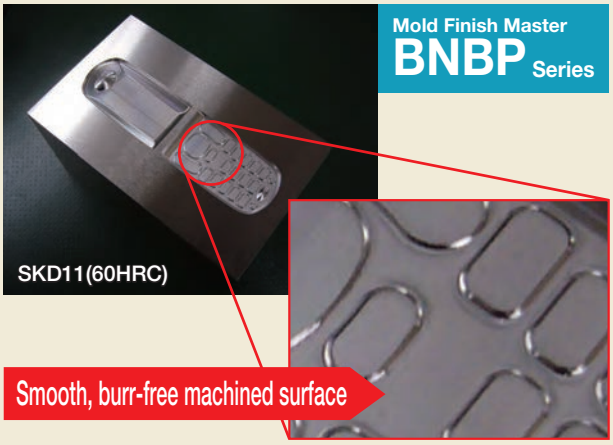
Tool Life Comparison



Work Material : STAVAX(52HRC)
Tool : BNBP 2R030-0154
Cutting Conditions : n =25,000min^{-1}
v_f =1,500mm/min
a_p =0.05mm
p_f =0.10mm
Oil Mist



■ Workpiece Example



Milling of hardened steel

SUMIBORON Ballnose Endmills
BNBS Series

Ballnose Radius 1.0 to 10.0mm

Characteristics

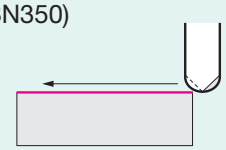
●The special SUMIBORON grade and unique spiral tool design ensures high efficiency and smooth end-milling of hardened steels.

High-Efficiency Endmill for Hardened Steel Machining

■ Performance

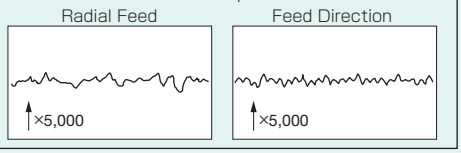
Machined Surface Quality

Work Material : SKD11(60HRC)
Tool : BNBS2100S (BN350)
Cutting Conditions : v_c =250m/min
f =0.04mm/t
a_p =0.3mm
p_f =0.3mm



Results

Cutting Length : 110m VB=0.128mm ⇒Uninterrupted Cutting Possible
Surface Finish : Radial Feed Rz1.8μm
Feed Direction Rz2.2μm



Coated Cemented Carbide Endmills

GSX MILL Series (Radius/Ballnose Endmills)
GSV-R Type/GSXVL-R Type/GSXB Type
"Global Standard" Cemented Carbide Endmills

GSV-R / GSXVL-R Type : Diameter 3.0 to 25.0mm, Corner Radius 0.2 to 3.0mm
GSXB Type : Ballnose Radius 0.2 to 10.0mm, Cutting Edge Length 0.8 to 50.0mm

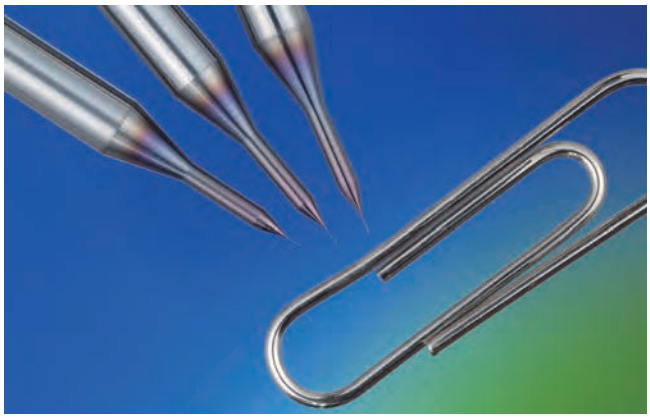
GS MILL Series (Hard Ballnose Endmills)
GSBH Type
Endmills for Hardened Steel Machining

Ballnose Radius 0.2 to 6.0mm, Cutting Edge Length 0.6 to 7.5mm

Small diameter drilling

Micro-MULTIDRILL
MDUS Type

Diameter 0.03 to 0.19mm



Characteristics

- High-precision shank with a tolerance of h3, circularity of 0.3μm or less, and cylindricity of 0.5μm or less.
- New ultra-thin TiAlN coating gives improved wear resistance.
- Perfect for steel, stainless steel, or copper machining.
- Available in sizes ranging from ø0.03 to ø0.19mm in 0.005mm increments.

Micro Multi Pointing Drills
MDUP Series

Diameter 0.03 to 0.18mm

Characteristics

- Use to drill guide holes for Micro MULTIDRILL MDUS type.

Mini-MULTIDRILL
MDSS Type

Diameter 0.20 to 1.00mm

Characteristics

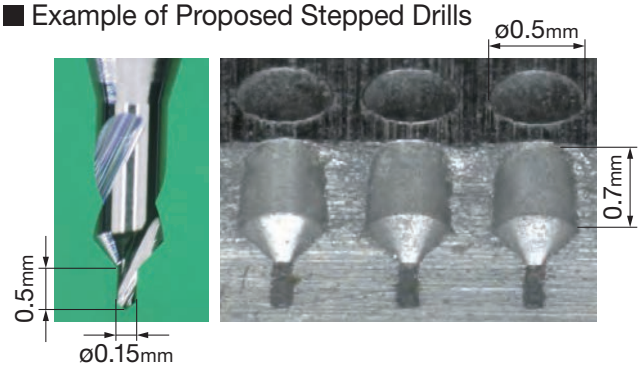
- The combination of a hard, tough cemented carbide substrate and a high-rigidity design (web thickness, web thickness ratio, helix angle) greatly improves fracture resistance.
- The PVD coating designed specifically for small drills significantly extends tool life.
- Suitable for a wide range of materials including carbon steel, alloy steel, die steel, and stainless steel.
- The unified shank diameter of ø3mm and overall length of 38mm provide greater ease of use.

Work Material : Machinable Ceramics (Shower Plate)
Tool : MDUP 0070-30C (Made-to-order item)
Cutting Conditions : n =10,000min^{-1}
f =0.005mm/rev
Step Feed =0.025mm
Hole Depth =0.5mm

Made-to-Order Fine Drill ø0.02mm-

- Cutting edges are available for various work materials including ceramics and resins.
- Customized designs are also available for improved efficiency, such as through the integration of processes by using a stepped drill.
- Various drill diameters (from ø0.02mm) are available to order. (Contact us for possible profiles.)

Example of Proposed Stepped Drills



Micro Manufacturing and Die Processing Tools

< SAFETY NOTES >

- Very hot or lengthy chips may be discharged while the machine is in operation. Therefore, machine guards, safety goggles or other protective covers must be used. Fire safety precautions must also be considered.
- Please handle with care as this product has sharp edges.
- Improper cutting conditions or mis-handling of the tool may result in breakages or projectiles. Therefore, please use the tool within its recommended conditions.
- When using non-water soluble cutting oil, precautions against fire must be taken and please ensure that a fire extinguisher is placed near the machine.

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