# SUMIBORON L

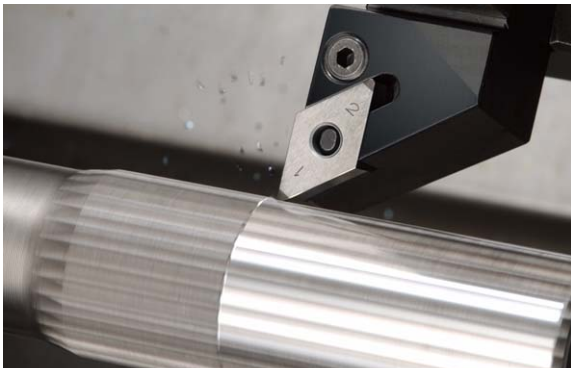
## L1 to L123




Stock Indications and Symbols

●● mark: Standard stocked item
● mark: To be replaced by a new item featured on the same page
▲ mark: To be replaced by new item (Please confirm stock availability)
＊ mark: Semi-standard stock (Please confirm stock availability)
○○ mark: Stock or planned stock (Please confirm stock availability)
No mark: Made-to-order item
— mark: We cannot produce

# SUMIBORON Series



## General Features

In 1977, Sumitomo Electric Hardmetal successfully developed a revolutionary CBN sintered tool - SUMIBORON.

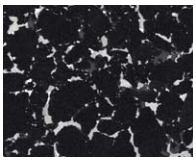
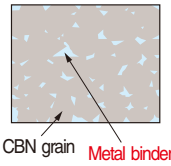
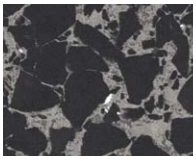
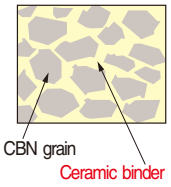
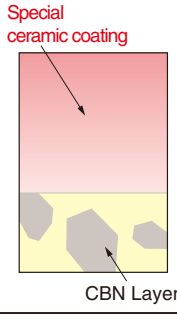
The main component in SUMIBORON is Cubic Boron Nitride with a special ceramic binder sintered under super high pressure and temperature. As compared to other conventional tool materials, CBN has higher hardness and excellent heat resistance. With these distinct characteristics, SUMIBORON can perform machining of hardened steel, high hardness cast iron and exotic metals where previously only grinding was done. Furthermore, excellent efficiency and longer tool life can also be achieved from high speed machining of cast irons.

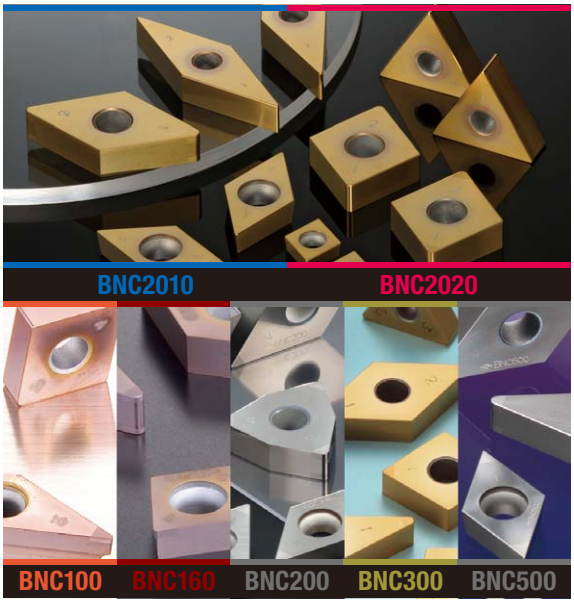
## Characteristics

The sintered CBN tool - SUMIBORON is mainly used for the machining of ferrous metals due to its low chemical reactivity with iron. There are 3 different classifications of CBN as follows:

- A) in the chart below shows high CBN content group, where each grain is fused together. Applicable for the machining of high hardness materials like cast iron, heat resistive alloys and carbides.
- B) below shows a group where CBN grains are held together with a special ceramic binder which has a strong binding force. These provide excellent wear resistance and toughness in the machining of hardened steel and cast iron.
- C) below shows SUMIBORON with a special ceramic coating (Coated SUMIBORON). The CBN substrate along with the coating layer exhibit hardness, toughness, heat resistance and oxidation resistance, required by a tool material for excellent cutting performance.

## Classifications/ Applications

| | Classifications | Structure | Diagram | Grade | Work Material |
|---|---|---|---|---|---|
| A) | Mainly CBN grains fused together |  |   | BN700<br>BN7000<br>BN7500<br>BNS800 | K Cast Iron (FC) Sintered Alloy Sintered Alloy<br>S Exotic Alloys<br>Sintered Alloy Sintered Alloy<br>K Cast Iron (FC) S Exotic Alloys |
| B) | Mainly CBN grains held together with a binder |  |   | BN1000<br>BN2000<br>BN350<br>BNX10<br>BNX20<br>BNX25<br>BN500 | H Hardened Steel<br>K Cast Iron (FC/FCD) |
| C) | Sintered CBN body with special ceramic coating |  |   | New BNC2010<br>New BNC2020<br>BNC300<br>BNC100<br>BNC160<br>BNC200<br>BNC500 | H Hardened Steel<br>K Cast Iron (FCD) |




New Coated SUMIBORON Series, achieving higher speed, higher efficiency and higher precision.

## General Features

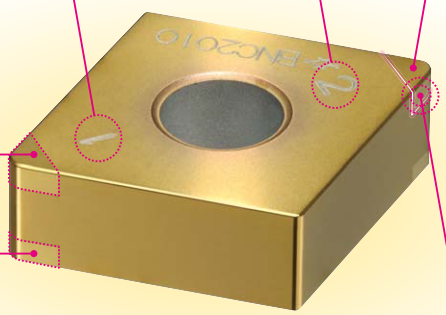
Using a high heat resistant and tough CBN substrate coupled with a special ceramic coating, this series caters to a wide variety of applications with improved precision and longer tool life as compared to conventional CBN.
There is a comprehensive lineup of economical and easy-to-use insert selection, such as the cost effective double-sided, multi-cornered, one-use type inserts.
BNC2010 and BNC2020 are the latest additions to the Coated SUMIBORON series, to provide even better stability and longer tool life for hardened steel machining.

## Characteristics

**Easy Edge Management**
Numbering of all the cutting edges.

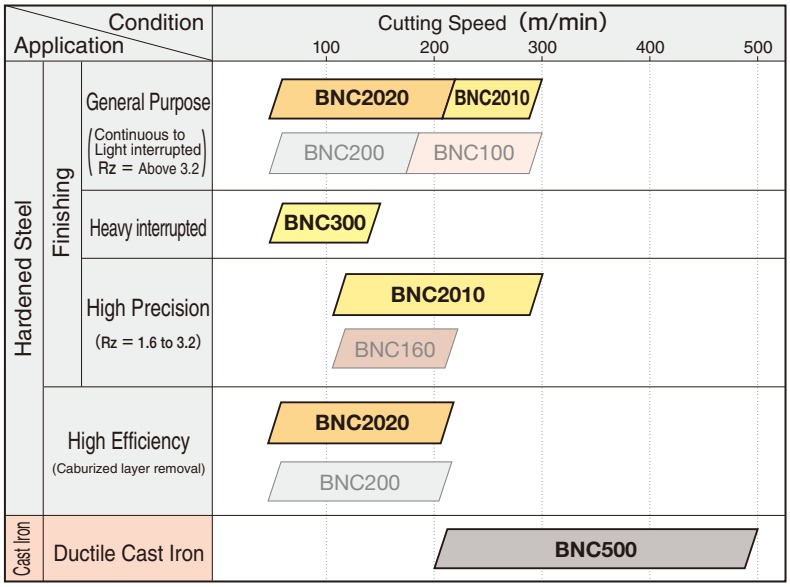
**Strong Brazing**
Utilizing a new brazing method with improved strength.

**Double sided,Multi-cornered One-use Insert**
More cost effective than conventional One-use inserts.

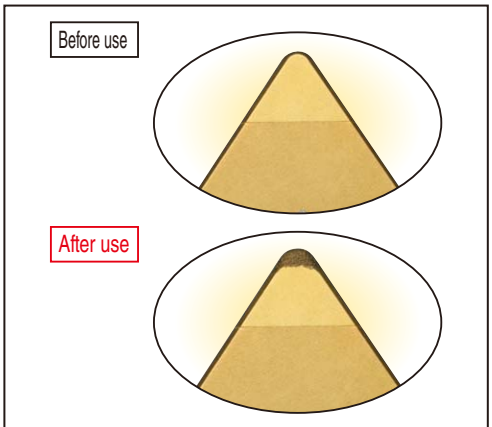


**Special Ceramic Coating and Newly Developed CBN Substrate**
Provides longer tool life.

## Cutting Performance

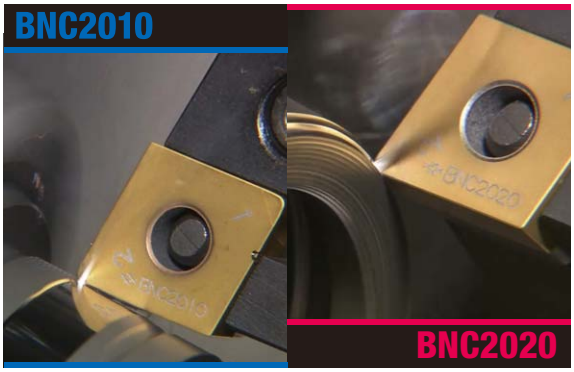



## Cutting Edge Management




- The edge numbers are still visible after machining, which makes the management of used cutting edges easy.
- BNC2010 and BNC2020 are coated in gold, which makes it easy to distinguish used edges.

# BNC2010/BNC2020




## The Trump Card for Longer Tool Life and Cost Reduction

### ■ General Features

Provides improved machining accuracy and longer tool life as compared to conventional Coated SUMIBORON by combining newly developed CBN substrate and ceramic coating.
Exhibits excellent performance in high-precision and general cutting of hardened steel and enables reductions in machining costs.

### ■ Characteristics

● BNC2010

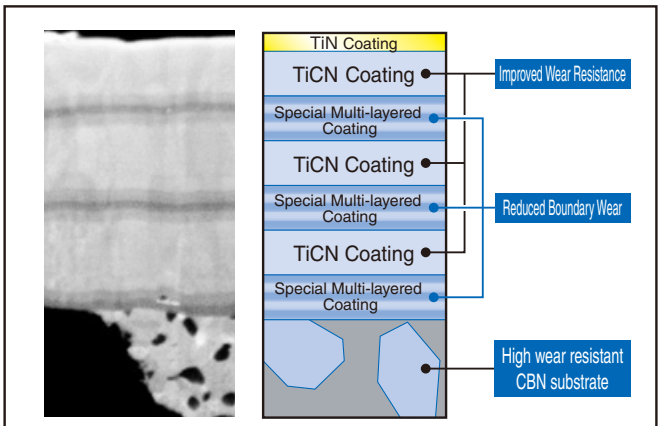
- **For high-precision finishing requiring good surface roughness and dimensional accuracy.**
  Ideal for high-precision machining thanks to excellent wear resistance.
- **Further maintains excellent surface roughness.**
  Consistently excellent surface roughness thanks to coating with high notch wear resistance and CBN substrate.

● BNC2020

- **General-purpose grade suitable for typical hardened steel machining applications.**
  Achieves further stability in machining of a wide range of hardened steel components.
- **Achieves long tool life thanks to highly wear-resistant, highly adhesive coating and tough CBN substrate.**
  Achieves stable and long tool life even in high-efficiency and interrupted machining.

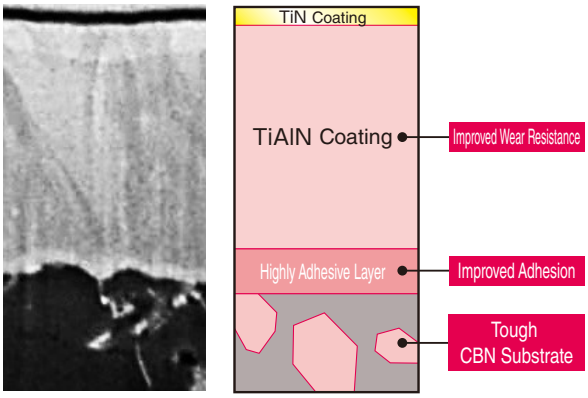
### ■ CBN Substrate and Coating Structure of BNC2010 and BNC2020

BNC2010



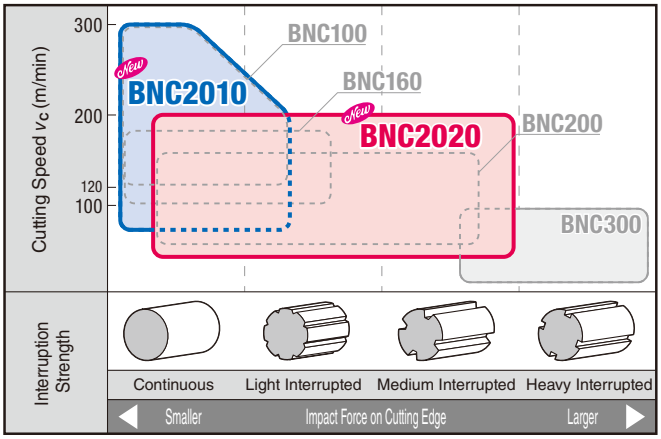

Achieving excellent notch wear resistance with a coating structure of TiCN layers and special multi-layered coatings.

BNC2020




Achieving even better stability with a TiAlN layer and a highly adhesive coating layer.

### ■ Application




### ■ Recommended Cutting Conditions

● BNC2010

| Cutting Speed $v_c$ (m/min) | |
|---|---|
| 120 150 200 250 300 | |
| Feed Rate $f$ (mm/rev) | Depth of Cut $a_p$ (mm) |
| 0.03 to 0.25 | 0.03 to 0.35 |

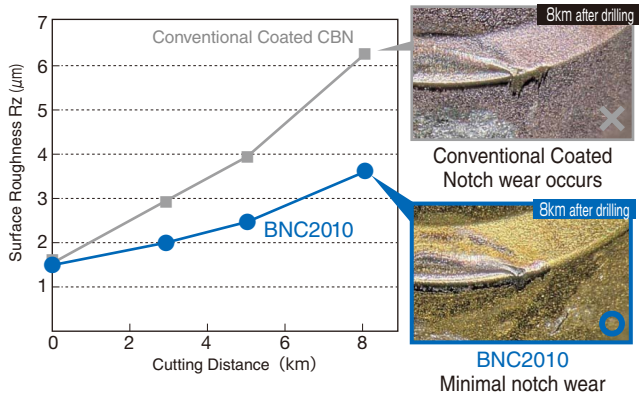
● BNC2020

| Cutting Speed $v_c$ (m/min) | |
|---|---|
| 50 100 150 200 220 | |
| Feed Rate $f$ (mm/rev) | Depth of Cut $a_p$ (mm) |
| 0.03 to 0.40 | 0.03 to 0.50 |

# BNC2010/BNC2020

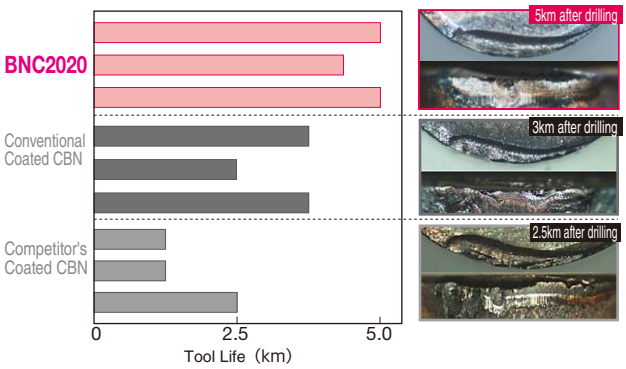
## ■ Performance

### ● BNC2010




Work Material : SCM415 58-62HRC (Continuous)
Insert : 4NC-DNGA150408 Edge Treatment : S01225
Cutting Conditions : $V_c$=160m/min $f$=0.08mm/rev $a_p$=0.1mm Wet

### ● BNC2020



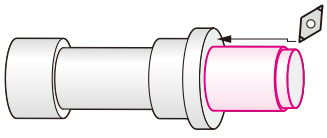

Work Material : SCM415-5V 58-62HRC (Interrupted Cut)
Insert : 4NC-CNGA120412 Edge Treatment : S01225
Cutting Conditions : $V_c$=130m/min $f$=0.1mm/rev $a_p$=0.6mm Dry

## ■ Application Examples

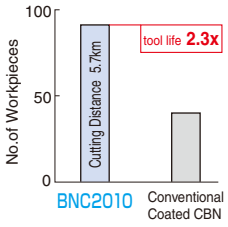
### BNC2010

【Continuous External Turning of Main Shaft】(58 to 60HRC)

BNC2010 provides excellent wear resistance and achieves excellent surface roughness.



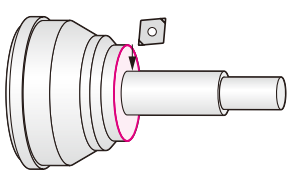
Surface Roughness Ra=0.6μm



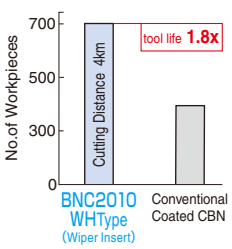

Insert : 4NC-DNGA150408 (BNC2010)
Cutting Conditions : $V_c$=200m/min $f$=0.10mm/rev $a_p$=0.35mm Dry

【CVJ Outer Race Facing】(58 to 60HRC)

BNC2010 with a WH type wiper insert maintains excellent surface roughness for a long time.



Surface Roughness Rz=1.6μm

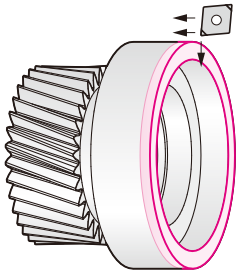


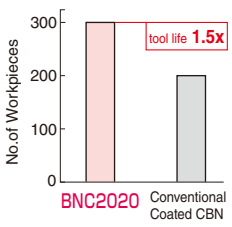

Insert : 2NC-CNGA120412WH (BNC2010)
Cutting Conditions : $V_c$=150m/min $f$=0.2mm/rev $a_p$=0.2mm Dry

### BNC2020

【Carburized Layer Removal for Sun Gear】(58 to 60HRC)

BNC2020 achieves long tool life in high load cutting.

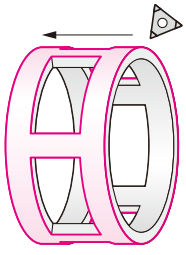


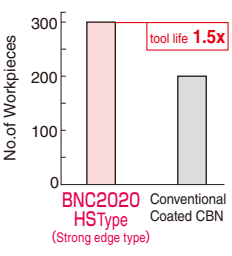



Insert : 4NC-CNGA120408 (BNC2020)
Cutting Conditions : $V_c$=100m/min $f$=0.15mm/rev $a_p$=0.5mm Wet

【Interrupted Machining of CVJ Cage Window】(58 to 60HRC)

Strong edged HS type BNC2020 exhibits stability in interrupted cutting.

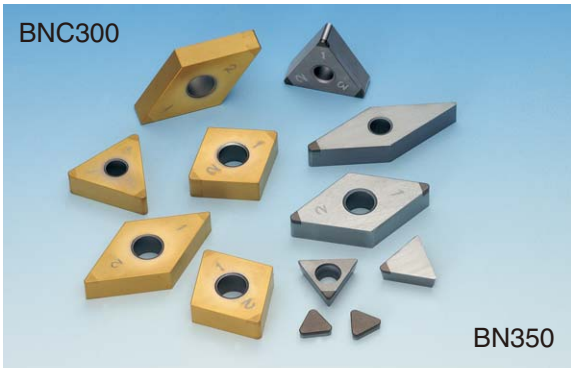





Insert : 3NC-TNGA160420HS (BNC2020)
Cutting Conditions : $V_c$=120m/min $f$=0.10mm/rev $a_p$=0.15mm Dry

# BNC300 / BN350

H Hardened Steel




The Ultimate In Interrupted Machining Of Hardened Steel!

## General Features

**BNC300**

Newly developed CBN substrate that emphasizes on toughness coupled with a highly wear resistant TiAlN based coating layer that has improved adhesion strength. With a good balance of fracture and wear resistance, stable and longer tool life can be achieve in interrupted cut or in a mixture of continuous and interrupted cutting.

**BN350**

SUMIBORON series highest fracture resistance and toughest CBN. Reliable grade for achieving stable tool life in heavy interrupted cutting conditions.

## Characteristics

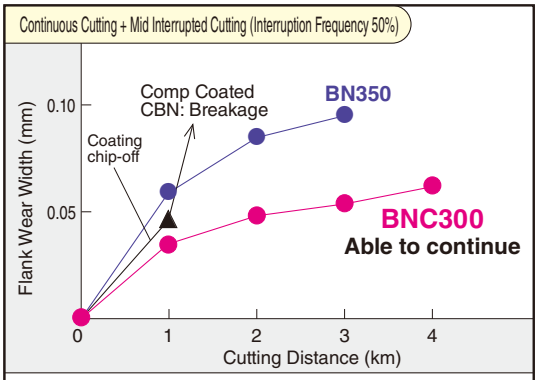
**BNC300**

- **Stable and long tool life in interrupted cutting**
  Achieving stable and long tool life in heavy interrupted cutting, with superior fracture resistance.
- **Superior dimensional precision**
  Good adhesion strength, TiAlN based, high wear resistance coating. Achieving superior dimensional precision even in interrupted cutting.
- **Suitable for different types of workpieces**
  Achieving significantly longer tool life even on workpieces that have a mixture of continuous and interrupted cutting.

**BN350**

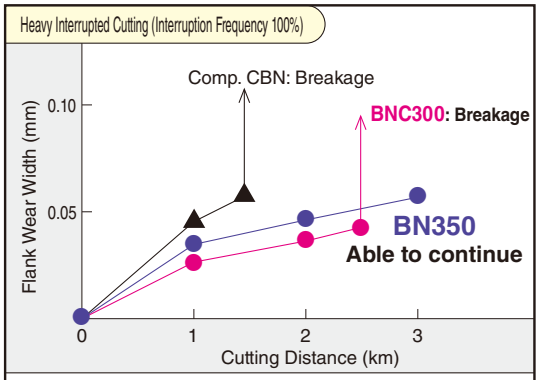
- **Stable and long tool life in interrupted cutting**
  Stable and long tool life with superior fracture resistance, that prevents fractures which commonly occurs during interrupted cutting.

## Cutting Performance




Work Material: SCr420 (58-62HRC) Insert: 4NC-CNGA120408
Cutting Conditions: $v_c$=120m/min, $f$=0.1mm/rev, $a_p$=0.2mm, Dry

● BN300 has superior balance of fracture and wear resistance.

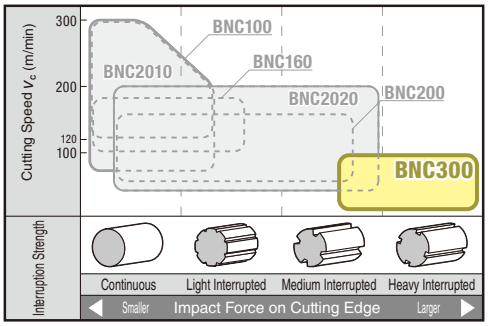



Work Material: SCr420 (58-62HRC) Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=100m/min, $f$=0.1mm/rev, $a_p$=0.2mm, Dry

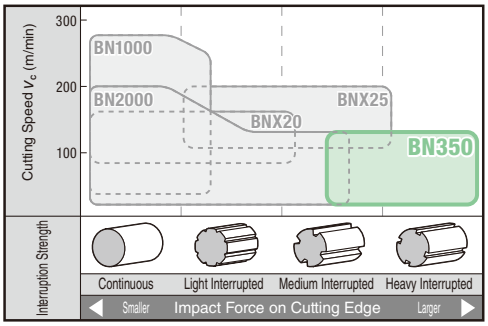
● BN350 exhibits very good fracture resistance.

## Application Range

● Coated SUMIBORON




● SUMIBORON



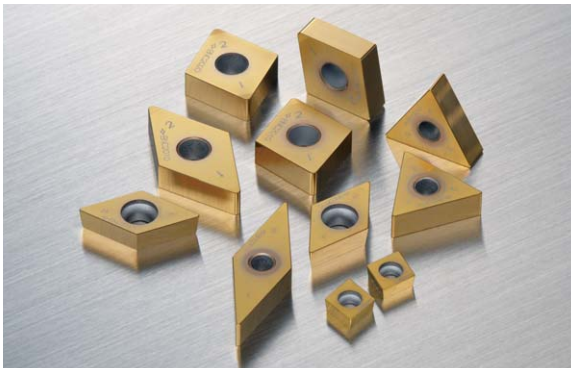

## Recommended Cutting Conditions (For BNC300/BN350)

Cutting Speed $v_c$(m/min)
50 80 100 120 150

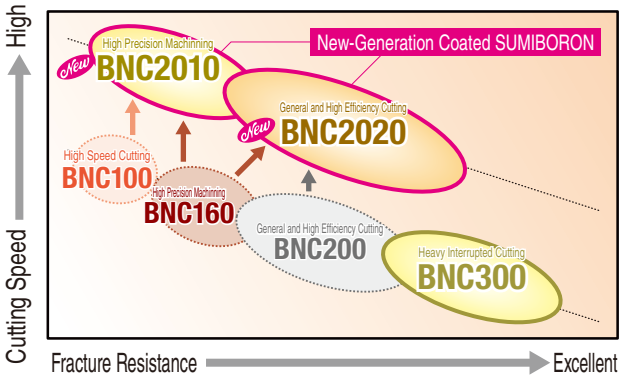
| Feed Rate $f$ (mm/rev) | D.O.C. $a_p$ (mm) |
|---|---|
| 0.03 to 0.20 | 0.03 to 0.30 |

* Cutting Conditions: Dry

L SUMIBORON



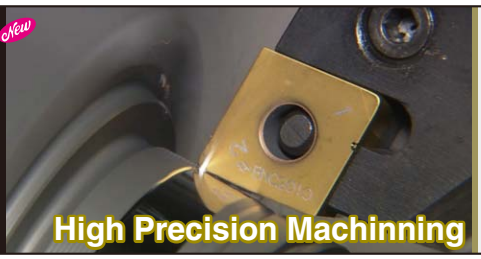
New-Generation Coated SUMIBORON Released




## ■ Characteristics of Grades

### BNC2010 New

Carbon Content : 50 to 55%
Grain Size : 2μm
Hardness HV : 30 to 32GPa
TRS : 1.10 to1.20GPa
Main Coating Components : Multi-layered TiCN
Coating Thickness : 1.5μm

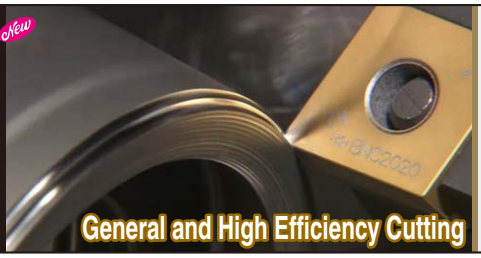



Newly developed CBN substrate with high crater wear resistance coated with special multi-layered TiCN, which exhibits excellent notch wear resistance.

Ideal for finishing of hardened steel requiring excellent accuracy or surface roughness. Able to stably maintain 1.6S finishing.

### BNC2020 New

Carbon Content : 70 to 75%
Grain Size : 5μm
Hardness HV : 34 to 36GPa
TRS : 1.20 to 1.30GPa
Main Coating Components : Multi-layered TiAlN
Coating Thickness : 1.5μm

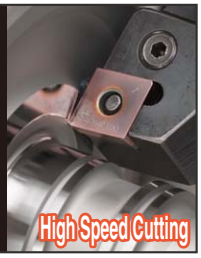



Newly developed tough CBN substrate with highly wear-resistant TiAlN coating. Provides improved stability by inserting a highly adhesive layer between the substrate and the TiAlN layer.

Ideal for general machining including finishing and interrupted cutting as well as high-efficiency machining such as carburized layer removal.

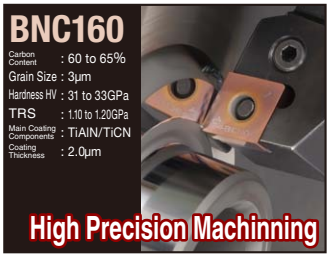
### BNC100

Carbon Content : 40 to 45%
Grain Size : 1μm
Hardness HV : 29 to 32GPa
TRS : 1.05 to 1.15GPa
Main Coating Components : TiAlN/TiCN
Coating Thickness : 2.0μm




### BNC160

Carbon Content : 60 to 65%
Grain Size : 3μm
Hardness HV : 31 to 33GPa
TRS : 1.10 to 1.20GPa
Main Coating Components : TiAlN/TiCN
Coating Thickness : 2.0μm

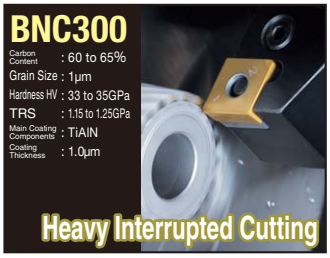



### BNC200

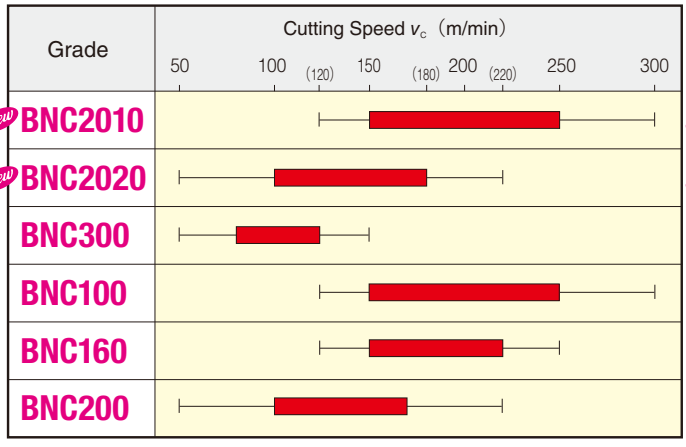
Carbon Content : 65 to 70%
Grain Size : 4μm
Hardness HV : 33 to 35GPa
TRS : 1.15 to 1.25GPa
Main Coating Components : TiAlN
Coating Thickness : 2.0μm

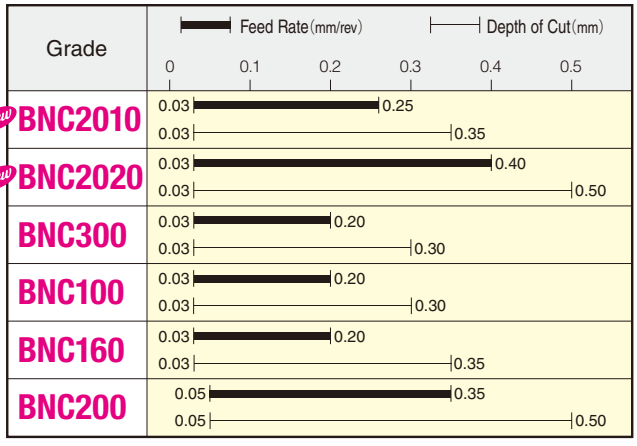

### BNC300

Carbon Content : 60 to 65%
Grain Size : 1μm
Hardness HV : 33 to 35GPa
TRS : 1.15 to 1.25GPa
Main Coating Components : TiAlN
Coating Thickness : 1.0μm



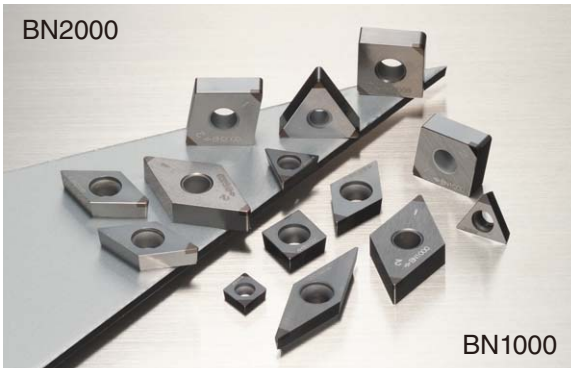

## ■ Recommended Cutting Conditions



# BN1000 / BN2000

H Hardened Steel




## General Features

An uncoated type of SUMIBORON that has a newly developed high-purity ceramic binder.
Both fracture and wear resistance are combined to achieve a stable tool life in a wide variety of hardened steel machining.
We offer a wide selection of tools starting with single-cornered types.

## Characteristics

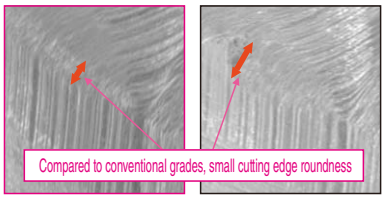
**BN1000**

- **Superior high-speed machining grade with the highest wear resistance of any uncoated SUMIBORON.**
  Delivers excellent tool life in continuous cutting to light-interrupted cutting.
- **Improved fracture resistance while also emphasizing wear resistance.**
  Improved hardness and heat resistance from the high-purity TiCN ceramic binder.

**BN2000**

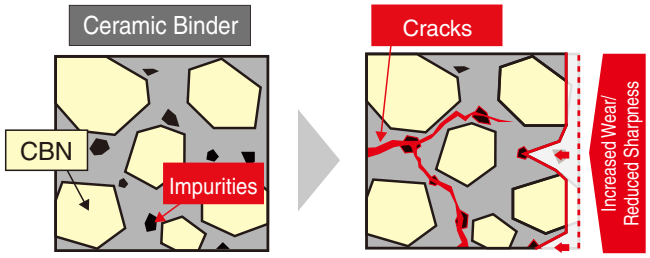
- **General purpose grade suitable for typical hardened steel machining applications.**
  Provides stable tool life in everything from continuous cutting to light-to-medium interrupted cutting.
- **High degrees of both fracture resistance and wear resistance.**
  Significant improvements in the performance of both by employing a high-purity ceramic binder.
- **Stable surface roughness by increasing sharpness (Figure on right).**

### Sharpness Comparison



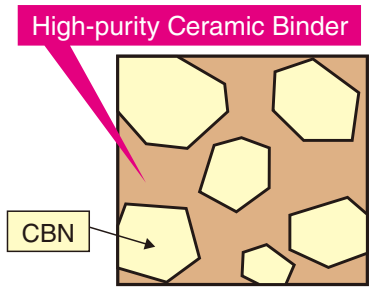

## Newly Developed High-Purity Ceramic Binder

Conventional Grade



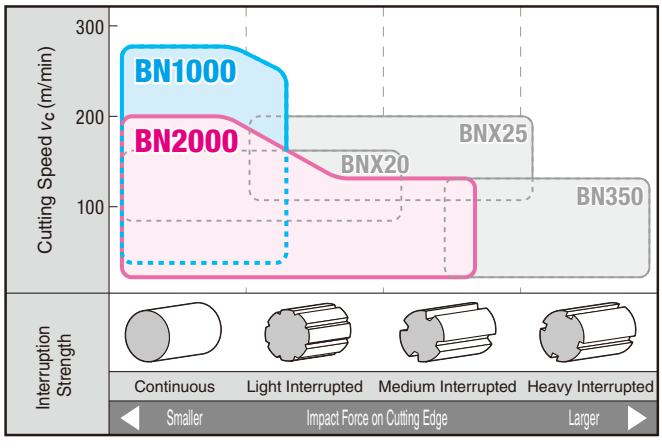

The impurities contained in the ceramic binder for conventional grades brings about a strengthening in the sintered body and a decrease in heat resistance, which becomes the cause of cracks (chipping) and wear.

BN1000/BN2000



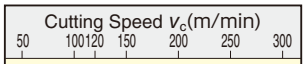

With the newly developed high-purity ceramic binder, the BN1000/BN2000 achieve toughness and improved heat resistance by decreasing impurities to an extreme!

## Application Range



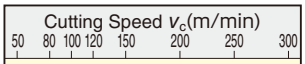

## Recommended Cutting Conditions

**BN1000**




| Feed Rate $f$ (mm/rev) | D.O.C.$a_p$ (mm) |
|---|---|
| 0.03 to 0.15 | 0.03 to 0.2 |

**BN2000**




| Feed Rate $f$ (mm/rev) | D.O.C. $a_p$ (mm) |
|---|---|
| 0.03 to 0.2 | 0.03 to 0.3 |

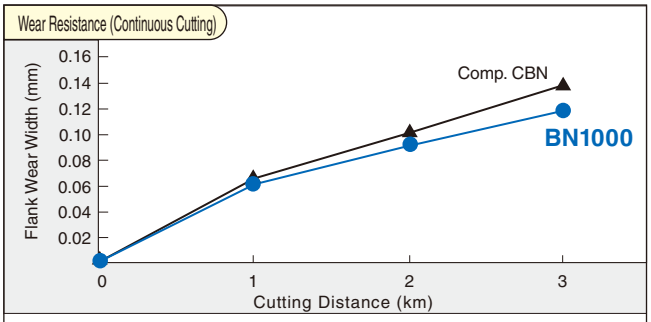
* Coolant: Continuous Cutting Dry, Wet
Interrupted Cutting Dry

Uncoated SUMIBORON for Hardened Steel Machining

# BN1000 / BN2000

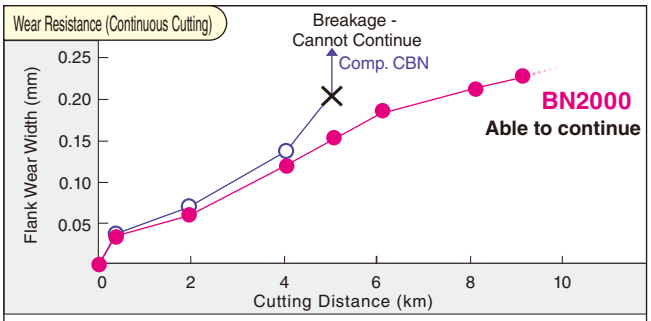
## Cutting Performance

### BN1000



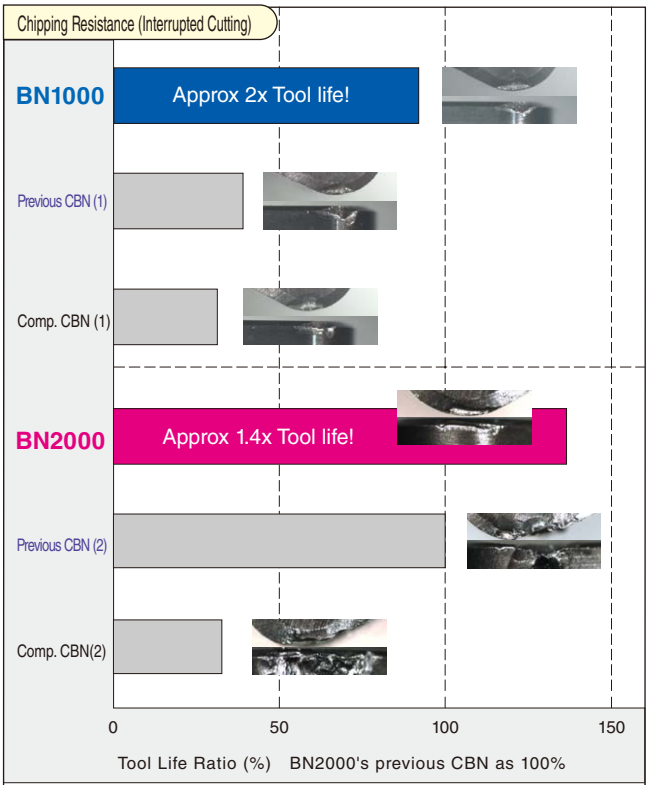

Work Material: SUJ2 Round Bar (58-62HRC)
Cutting Conditions: $v_c$=150m/min, $f$=0.1mm/rev, $a_p$=0.2mm, Dry

### BN2000




Work Material: SCM415H Round Bar (58-62HRC)
Cutting Conditions: $v_c$=100m/min, $f$=0.1mm/rev, $a_p$=0.2mm, Dry

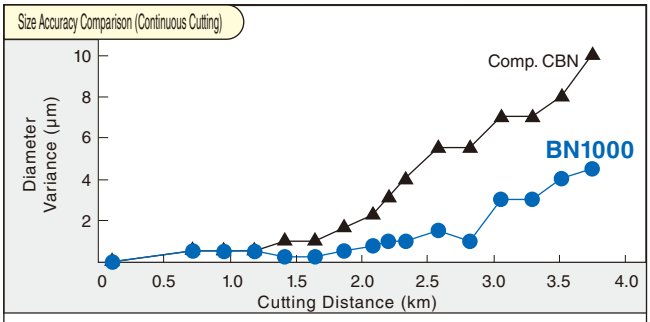
### BN1000 / BN2000




Work Material: SCM415H 8V Grooved (58-62HRC)
Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=150m/min, $f$=0.1mm/rev, $a_p$=0.2mm, Dry

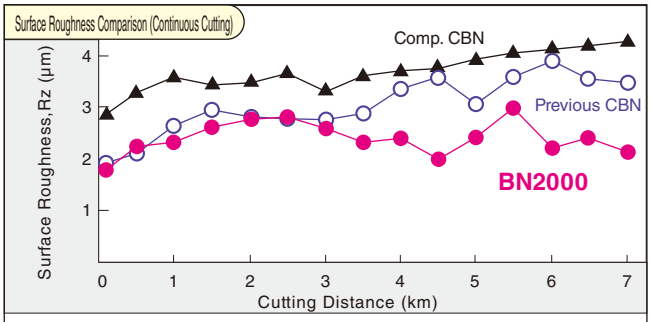
## Machining Precision

### BN1000




Work Material: SCM415H $\phi$130 Diameter (58-62HRC)
Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=200m/min, $f$=0.1mm/rev, $a_p$=0.1mm, Wet

### BN2000

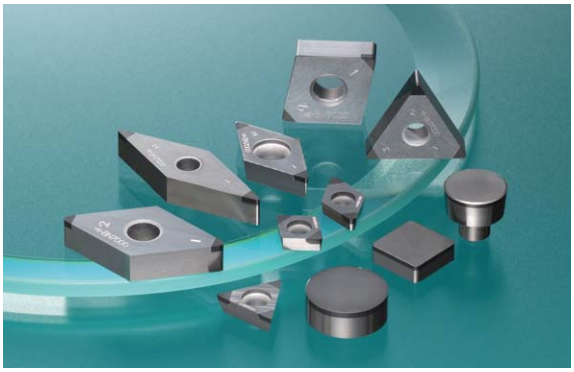



Work Material: SCM415H Round Bar (58-62HRC)
Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=100m/min, $f$=0.08mm/rev, $a_p$=0.2mm, Dry

# BN7000

K Cast Iron | Powdered Metal

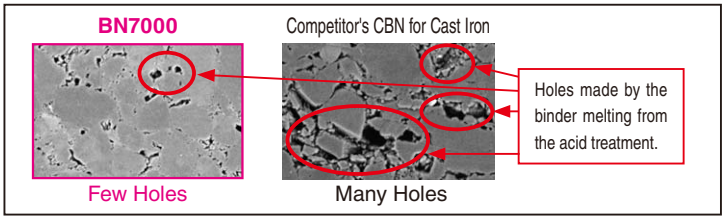
**For high-speed finishing of cast iron, powdered metals, and difficult-to-machine materials!**



## General Features

Medium-grain CBN sintered to a high density to achieve the maximum content percentage. Also delivers superior fracture resistance by increasing the binding strength between CBN particles. Provides stable, long tool life for high-speed finishing work with cast iron, powdered metals, and difficult-to-machine materials.

Acid-treated CBN Sintered Body Structure




## Characteristics

**● Excellent for high speed finishing of Cast Iron!**

Good wear and fracture resistance in high speed machining of Grey Cast Iron.

**● High efficiency machining of powdered metal**

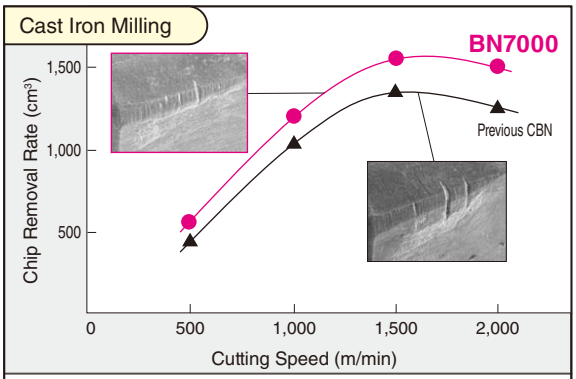
With 4 different types of edge treatment, stable and long tool life can be achieved from machining of Sintered Alloys of any shape or hardness.

**● Able to machine any Exotic Metals.**

Long tool life can also be achieved for the machining of exotic materials such as Roll, HSS and Heat-Resistive Alloy etc.

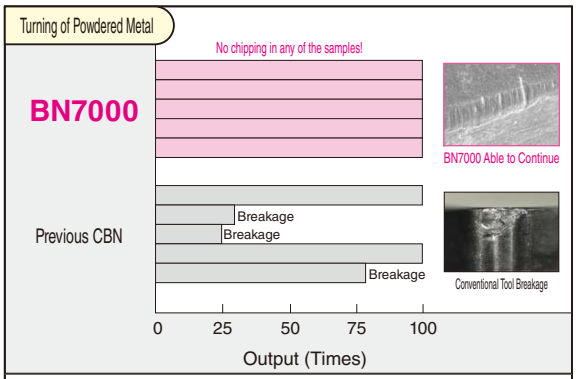
## Cutting Performance

Cast Iron Milling



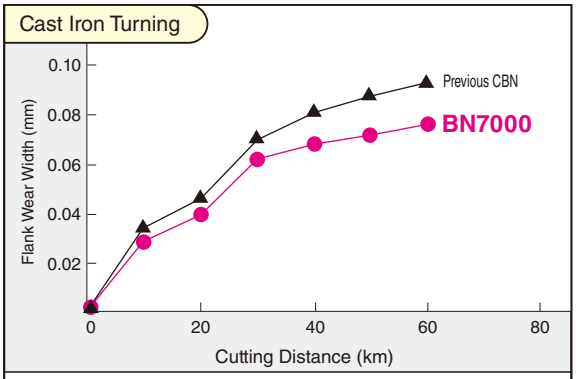

Work Material: FC250 (Pearlite)
Insert: FMU4100R SNEW1203ADTR
Cutting Conditions: $v_c$=500 to 2,000m/min, $f$=0.2mm/rev, $a_p$=0.3mm, Dry

Turning of Powdered Metal



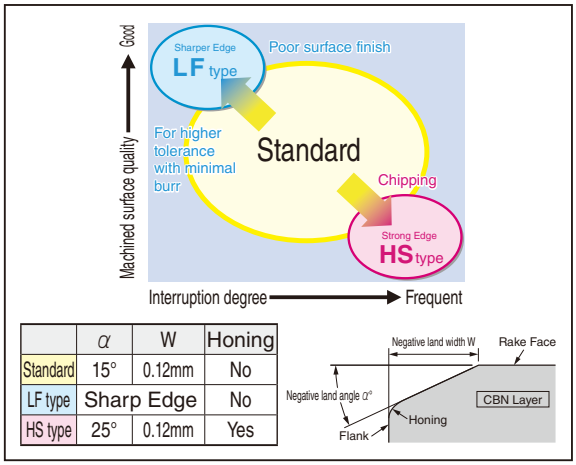

Work Material: SMF4040 (70HRB, Interrupted Machining)
Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=250m/min, $f$=0.1mm/rev, $a_p$=0.3mm, Dry

Cast Iron Turning




Work Material: FC300 (Pearlite)
Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=800m/min, $f$=0.15mm/rev, $a_p$=0.2mm, Wet

## Recommended Edge Treatment




| | α | W | Honing |
|---|---|---|---|
| Standard | 15° | 0.12mm | No |
| LF type | Sharp Edge | | No |
| HS type | 25° | 0.12mm | Yes |

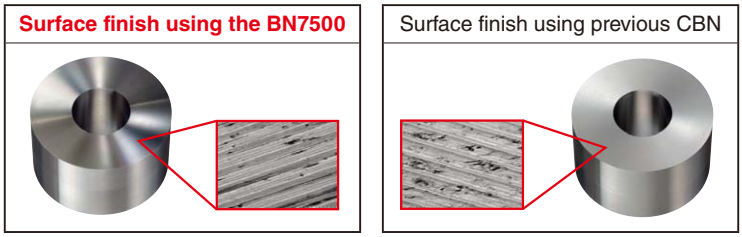
SUMIBORON for Powdered Metal Machining

# BN7500

Achieves High Precision, High Efficiency Machining of Powdered Metal

## General Features

High density sintered material made of micro-grained CBN grains provide excellent sharpness and wear resistance for high quality surfaces in sintered alloy finishing.




★ The previous CBN left white blemishes on the finished surface whereas the BN7500 leaves a better, glossy surface finish.

## Characteristics

**● Excellent for finishing of powdered metal**

Excellent machined surface finish and surface appearance.

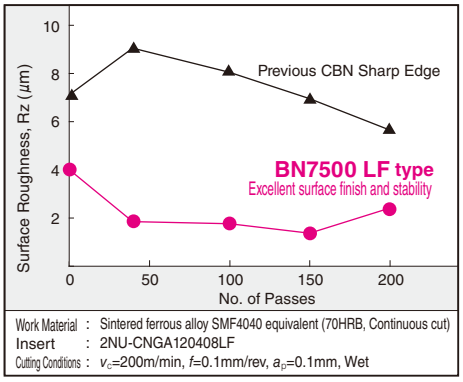
**● Available with 5 different types of edge treatment for machining sintered alloys of any shape or hardness**

The LF type has a sharper edge designed specifically for machining sintered alloys with minimal burr and improved machining precision. The HS Type has a strengthened cutting edge for stable chipping resistance during interrupted cutting and finishing.

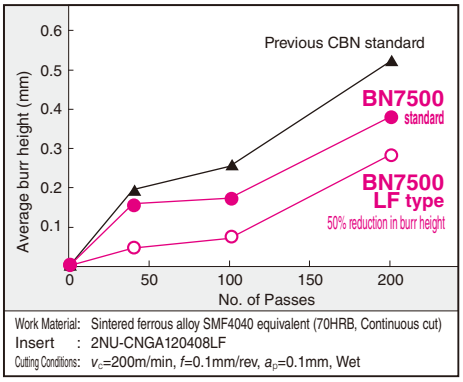
Provides machining stability by reducing the variation in early milling surface roughness with the LE edge treatment, which emphasizes superior surface finish.

The LS Type, excelling in fracture resistance and cutting edge balance, also supports finishing that includes light interrupted cutting.

## Cutting Performance

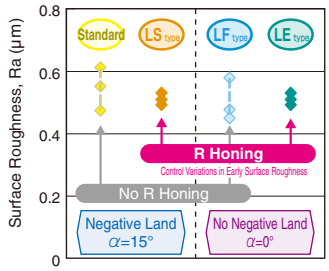



Work Material : Sintered ferrous alloy SMF4040 equivalent (70HRB, Continuous cut)
Insert : 2NU-CNGA120408LF
Cutting Conditions : $v_c$=200m/min, $f$=0.1mm/rev, $a_p$=0.1mm, Wet



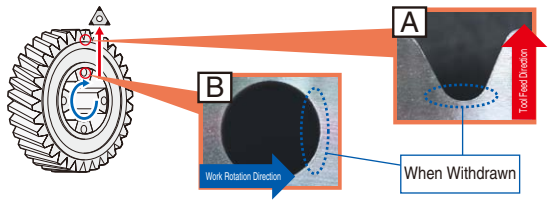

Work Material: Sintered ferrous alloy SMF4040 equivalent (70HRB, Continuous cut)
Insert : 2NU-CNGA120408LF
Cutting Conditions: $v_c$=200m/min, $f$=0.1mm/rev, $a_p$=0.1mm, Wet

● Early Milling Finishing Surface Roughness



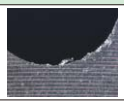
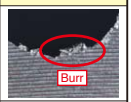
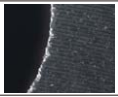
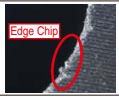

★Able to control early surface roughness variations by applying R honing to the edge.

## ● Feed and Burr Relationship



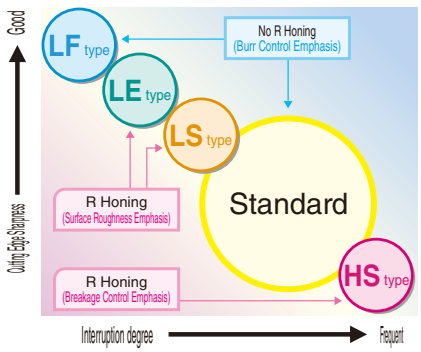

★ The LF Type without R honing has a cutting edge sharpness superior to the LE Type with R honing and can control burrs better.

★ For a feed rate 0.1 mm/rev or higher, LS Type has a cutting edge sharpness superior to the standard type and can control burrs better.

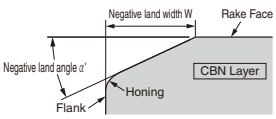
| | LF type | LE type | LS type | Standard |
|---|---|---|---|---|
| Diagram A |  |  |  |   |
| Diagram B |  |  |  |   |

Work Material: VVT Facing
Insert: 3NU-TNGA160404
Cutting Conditions: $v_c$=200m/min, $f$=0.1mm/rev, $a_p$=0.1mm, Wet

## Recommended Edge Treatment

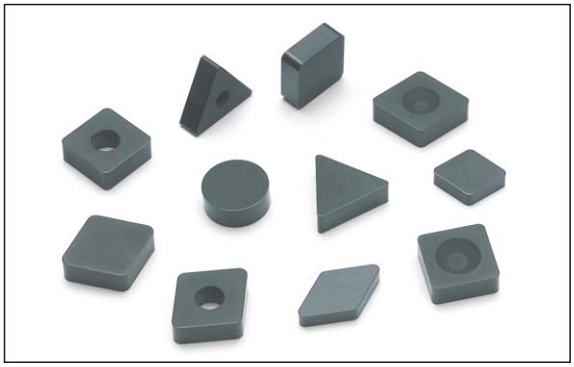



| | α° | W | Honing |
|---|---|---|---|
| Standard | 15° | 0.12mm | No |
| LF type | α°= 0° (No Negative Land) | | |
| LE type | | | |
| LS type | 15° | 0.07mm | Yes |
| HS type | 25° | 0.05mm | |



# BNS800

K Cast Iron



## From Finishing to Roughing of Cast Iron and Exotic Metals!

### ■ General Features

New solid structure CBN insert. As all the edges can be used, total machining cost will be lower, compared to conventional CBN inserts. Biggest demand for this insert will be in Cast Iron machining. As conventional brazed CBN inserts are not suitable for high speed cutting and roughing, BNS800 can be used even for high speed finishing processes with many times the tool life of ceramic inserts. Additionally, RM type cutter is developed exclusively for Solid SUMIBORON and is suitable for high-speed rough milling.

### ■ Characteristics

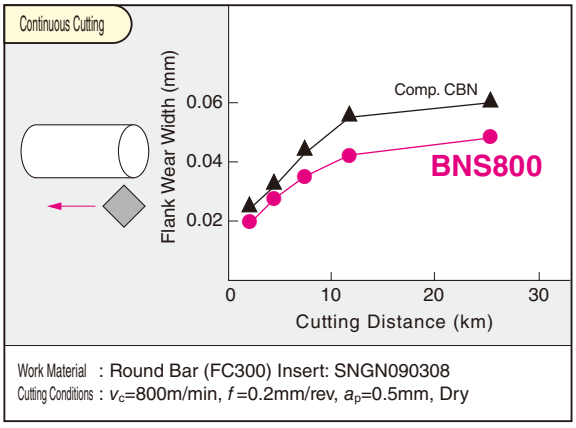
**● Larger Cutting Depths**
100% solid CBN structure where the whole edge can be use.

**● High Precision Machining**
Excellent balance of wear resistance and toughness.

**● Total Cost Effectiveness**
All corners of the insert can be utilized.

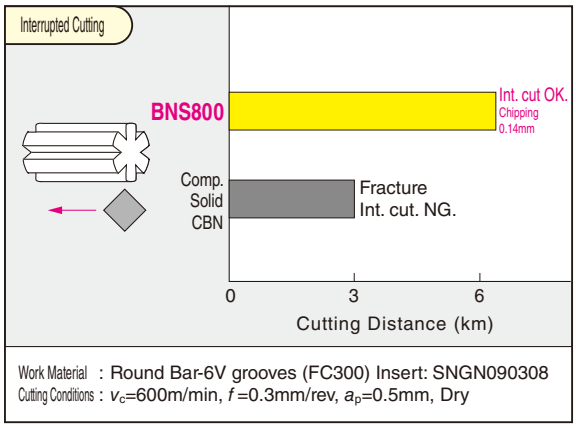
Refer to pages L98 to L99 for BNS800 special holders and page L113 for RM Type milling cutter.

### ■ Cutting Performance




Work Material : Round Bar (FC300) Insert: SNGN090308
Cutting Conditions : $v_c$=800m/min, $f$=0.2mm/rev, $a_p$=0.5mm, Dry

● Wear resistance is better than competitor's.

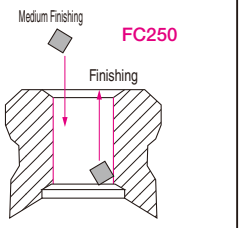



Work Material : Round Bar-6V grooves (FC300) Insert: SNGN090308
Cutting Conditions : $v_c$=600m/min, $f$=0.3mm/rev, $a_p$=0.5mm, Dry

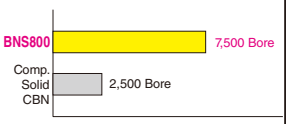
● Double the competitor's fracture resistance.

### ■ Application Example

● Cylinder Bore

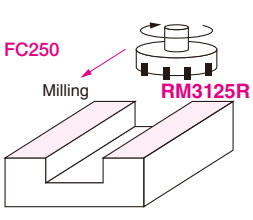



<Tool life criteria: Finishing>

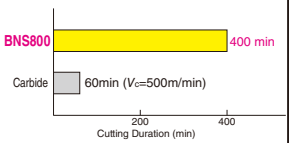



| Cutting Conditions | Med. Finish | Finishing |
|---|---|---|
| Grade | BNS800 | |
| Cat.No. | SNGN090308 | |
| $v_c$ | 1,000m/min | |
| $f$ | 0.3mm/rev | 0.25mm/rev |
| $a_p$ | 0.2mm | |
| Coolant | Wet | |

● Machine Bed

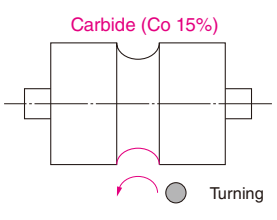



<Tool life criteria: Finishing>

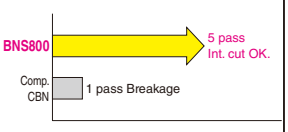



| Cutting Conditions | Roughing |
|---|---|
| Grade | BNS800 |
| Cat.No. | SNEN090308W |
| $v_c$ | 1,500m/min |
| $f_z$ | 0.2mm/t |
| $a_p$ | 2.5mm (2 pass) |
| Coolant | Dry |

● Carbide Roll

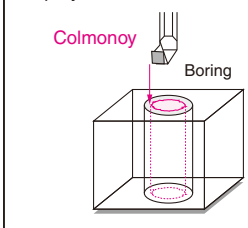



<Tool life criteria: breakage>

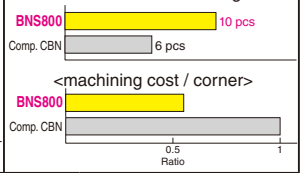



| Cutting Conditions | Finishing |
|---|---|
| Grade | BNS800 |
| Cat.No. | RNGN090300 |
| $v_c$ | 40m/min |
| $f$ | 0.15mm/rev |
| $a_p$ | 0.2mm |
| Coolant | Wet |

● Sprayed Face Bore



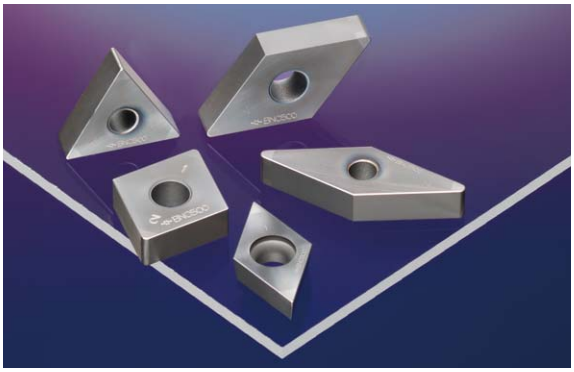

<Tool life criteria: breakage>




| Cutting Conditions | Roughing | Finishing |
|---|---|---|
| Grade | BNS800 | |
| Cat.No. | SNGN090312 | SNGN090308 |
| $v_c$ | 80m/min | |
| $f$ | 0.04mm/rev | 0.03mm/rev |
| $a_p$ | to 3mm | 0.5mm |
| Coolant | Wet | |

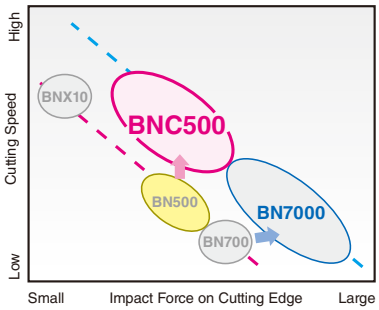
# BNC500

## Coated CBN Grades for Ductile Cast Iron Machining



### ■ General Features

Broad improvements in the toughness of the CBN sintered body and wear resistance from the application of a newly developed high-purity TiC binder. In addition, it demonstrates exceptional wear resistance by combining a ceramic coating with excellent heat resistance. High-speed and high-precision machining is achieved when finishing ductile cast iron. It also provides a long, stable tool life in machining high-strength ductile cast iron, special cast irons such as vermicular cast iron, and centrifugally-cast cast iron.




### ■ Characteristics

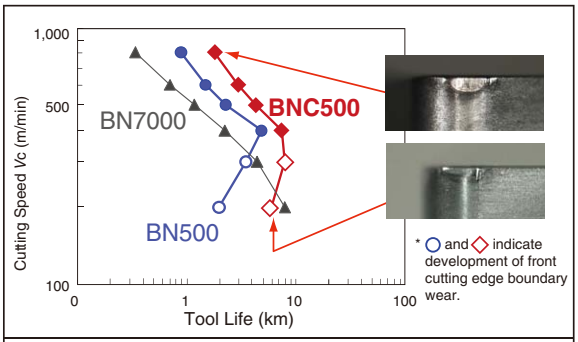
**● Achieves a Long, Stable Tool Life at $v_c$=400 m/min or Higher**

Superior wear resistance, makes stable machining possible under high-speed conditions.

**● Supports High-precision Machining**

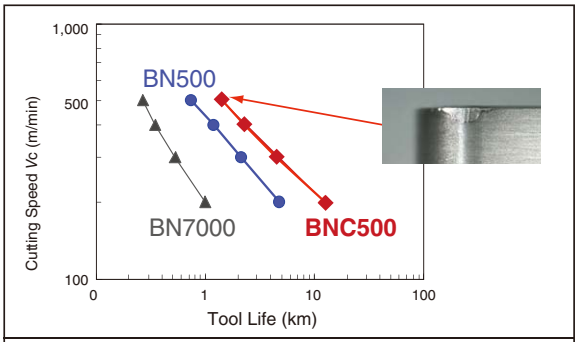
Can maintain excellent dimensional tolerance and surface roughness over many hours.

### ● FCD450 Continuous Cut (V-T Chart)



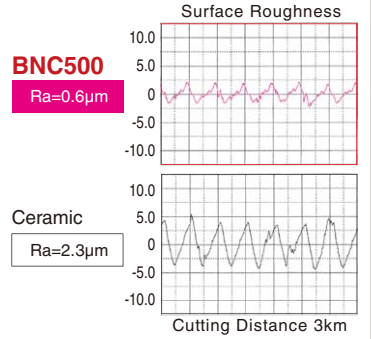

Work Material: FCD450(160HB) Insert: 4NC-CNGA120408
Cutting Conditions: $f$=0.2mm/rev, $a_p$=0.2mm, Wet
Tool life limit set at: VBmax=0.2mm

### ● FCD700 Continuous Cut (V-T Chart)



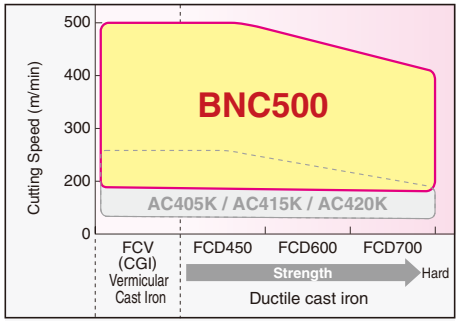

Work Material: FCD700(260HB) Insert: 4NC-CNGA120408
Cutting Conditions: $f$=0.2mm/rev, $a_p$=0.2mm, Wet
Tool life limit set at: VBmax=0.2mm

### ■ Machined Surface Quality

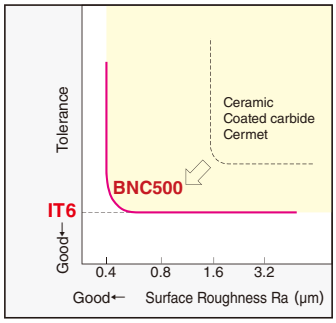



Work Material: FCD700 (260HB)
Cutting Conditions: $v_c$=400m/min,
$f$=0.2mm/rev, $a_p$=0.2mm, Wet

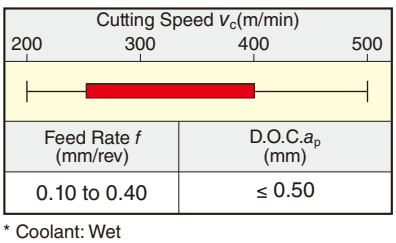
### ■ Application Range




### ■ High Precision Machining




### ■ Recommended Cutting Conditions




| Feed Rate $f$ (mm/rev) | D.O.C.$a_p$ (mm) |
|---|---|
| 0.10 to 0.40 | ≤ 0.50 |

* Coolant: Wet

# Grade Comparison Chart

## ■ CBN Grades

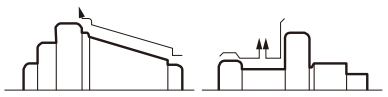
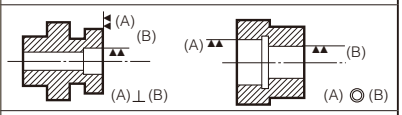
| Classification | Grade | Sumitomo Electric | Mitsubishi | Tungaloy | Kyocera | Hitachi | Sandvik | Kennametal | Dijet | SECO Tools |
|---|---|---|---|---|---|---|---|---|---|---|
| K Cast Iron | K01 | **BNC500*<br>BN7000<br>BN500** | MB710 | BX930<br>BX870<br>BX910 | KBN60M | | CB7525<br>CB7925 | KB1340 | JBN795 | |
| | K10 | **BN7000<br>BN500** | MB710<br>MB730 | BX950 | KBN900 | BH200 | CB7525<br>CB7925 | | JBN330 | CBN200,CBN300<br>CBN300P,CBN400C |
| | K20 | **BN7000<br>BNS800** | MBS140 | BXC90<br>BX90S | KBN900 | BH250 | | | | CBN200,CBN300<br>CBN300P,CBN400C |
| | K30 | **BNS800** | | BXC90<br>BX90S | | | | KB5630 | | CBN500 |
| N Non-Ferrous Metal | N01 | **BN700<br>BN7000** | | | | | | | | |
| S Exotic Alloy | S01 | **BN7000** | MB730 | BX470<br>BX480<br>BX950 | KBN65M<br>KBN70M | | | KB5630<br>KB1340 | | |
| H Hardened Steel | H01 | **BNC2010<br>BNC2020<br>BNC100<br>BN1000<br>BN2000<br>BNX10** | MBC010<br>MB810 | BXM10<br>BX310 | KBN05M<br>PT600M | BH100 | | KB5610 | | CBN10<br>CBN100<br>CBN060K |
| | H10 | **BNC2010<br>BNC2020<br>BNC160<br>BNC200<br>BN2000** | MBC020<br>BC8020<br>MB820 | BXM20<br>BX330 | KBN25M | BH150 | CB7015 | KB5610<br>KB5625 | JBN300 | CBN10,CBN100<br>CBN150,CBN060K<br>CBN160C |
| | H20 | **BNC2020<br>BNC200<br>BNX20** | MBC020<br>BC8020<br>MB825 | BXC50<br>BX360 | KBN35M<br>KBN900 | BH250 | CB7025<br>CB20 | KB5625<br>KB5630 | JBN245 | CBN150<br>CBN160C |
| | H30 | **BNC300<br>BN350<br>BNX25** | MB835<br>BC8020 | BX380 | | | CB7525 | KB5630 | | |

*: For ductile cast iron cutting

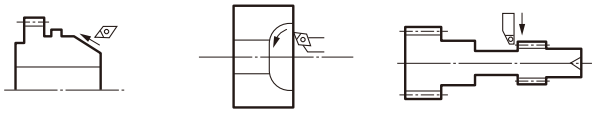
## HARDENED STEEL MACHINING (1)

### Merits of using CBN

Below is an analysis on the use of CBN as compared to grinding:
In terms of cost investments, it is much lower in machine cost and overhead cost due to the fact that a CNC lathe is cheaper than a grinding machine. As for the quality of surface finish, inserts can machine different profiles with excellent surface finish, in a single set-up. Environmentally, sludge treatment for grinding is a hazard to the environment but the chips from the turning process can be collected and recycled.

| | Advantages | Details |
|---|---|---|
| Cost | Facility Investment is low | · Cheaper machines. · Streamlined processes. · Improved efficiency with less machine required. |
| | Profile finishing in a single set-up |  |
| Quality | Improved precision |   |
| Environment | Environmentally friendly | Sludge management → Chips management (recyclable) |

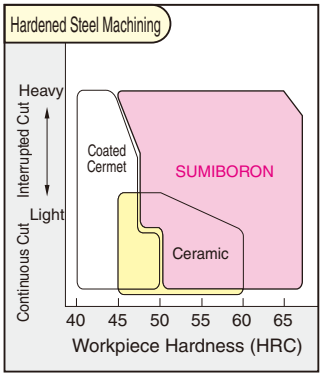
**Machining Versatility In Using CBN**

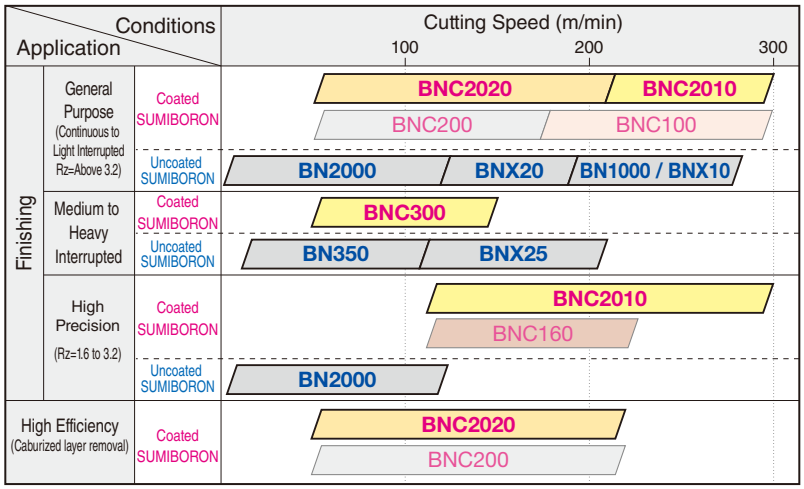



### Recommended Grade

| | Grade | Binder | Carbon Content(%) | Grain Size(μm) | Hardness(GPa) | TRS(GPa) | Coating | Coating Thickness(μm) | Characteristics |
|---|---|---|---|---|---|---|---|---|---|
| Coated | New BNC2010 | TiCN | 50 to 55 | 2 | 30 to 32 | 1.10 to 1.20 | TiCN multi-layered | 1.5 | Improved wear resistant coating and substrate achieve excellent and stable surface roughness. |
| Coated | New BNC2020 | TiN | 70 to 75 | 5 | 34 to 36 | 1.20 to 1.30 | TiAlN multi-layered | 1.5 | Provides long tool life in general and high-efficiency cutting thanks to tough substrate coated with a highly wear-resistant, highly adhesive layer. |
| Coated | BNC300 | TiN | 60 to 65 | 1 | 33 to 35 | 1.15 to 1.25 | TiAlN | 1 | Suitable for finishing work materials with both continuous and interrupted cutting. |
| Coated | BNC100 | TiN | 40 to 45 | 1 | 29 to 32 | 1.05 to 1.15 | TiAlN/TiCN | 2 | Suitable for high-speed finishing thanks to highly wear-resistant coating. |
| Coated | BNC160 | TiN | 60 to 65 | 3 | 31 to 33 | 1.10 to 1.20 | TiAlN/TiCN | 2 | Achieves stable, high-precision finishing of hardened steel. |
| Coated | BNC200 | TiN | 65 to 70 | 4 | 33 to 35 | 1.15 to 1.25 | TiAlN | 2 | Provides long tool life thanks to tough substrate and highly wear-resistant coating. |
| Uncoated | BN1000 | TiCN | 40 to 45 | 1 | 27 to 31 | 0.90 to 1.00 | — | — | Achieves ultimate wear and fracture resistance. Suitable for high-speed cutting. |
| Uncoated | BN2000 | TiN | 50 to 55 | 2 | 31 to 34 | 1.05 to 1.15 | — | — | General-purpose grade for hardened steel machining with high degree of fracture and wear resistance. |
| Uncoated | BNX20 | TiN | 55 to 60 | 3 | 31 to 33 | 0.95 to 1.10 | — | — | Achieves excellent crater wear resistance. Suitable for high-efficiency cutting under high temperature conditions. |
| Uncoated | BN350 | TiN | 60 to 65 | 1 | 33 to 35 | 1.20 to 1.30 | — | — | Achieves ultimate cutting edge strength. Suitable for heavy interrupted cutting. |
| Uncoated | BNX10 | TiCN | 40 to 45 | 3 | 27 to 31 | 0.80 to 0.90 | — | — | Excellent wear resistance. Suitable for continuous high-speed cutting. |
| Uncoated | BNX25 | TiN | 65 to 70 | 4 | 29 to 31 | 1.00 to 1.10 | — | — | Exhibits superior fracture resistance in high speed cutting. Suitable for high-speed interrupted cutting of hardened steel. |

### Application Range



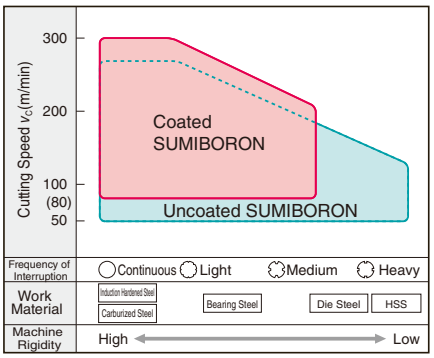
## HARDENED STEEL MACHINING (2)

Recommended Grade BNC2010/BNC2020/BNC300/BNC100/BNC160/BNC200
BN1000/BN2000/BN250/BN350/BNX10/BNX20/
BNX25

### ■ Applications

Coated SUMIBORON: 1st recommendation for hardened steel machining, best performance in high-speed, high-efficiency machining.
Uncoated SUMIBORON: Optimal for machining small items with a limited cutting speed and hardened steel.

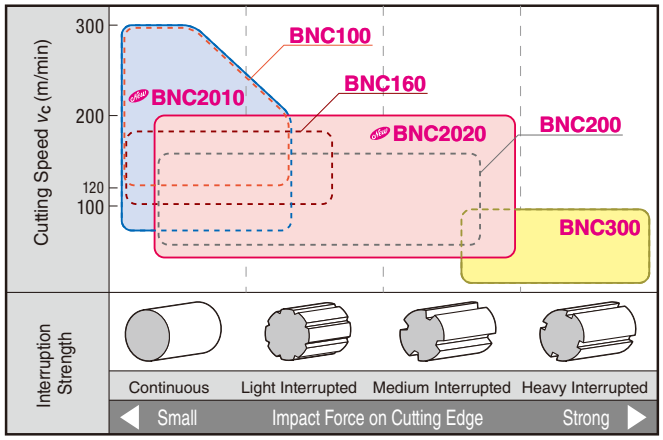
| Series | Applications |
|---|---|
| Coated SUMIBORON | · Machining requiring high speed and high accuracy<br>· Machining requiring high efficiency, such as carburized layer removal<br>· Our first recommendation for hardened steel machining |
| Uncoated SUMIBORON | · Small product machining at low cutting speeds<br>· Machining with low-rigidity tooling<br>· Uncoated SUMIBORON is ideal for the machining of die components containing large amounts of hard grains, since coating is often ineffective for this type of machining. |




### ■ Application Range

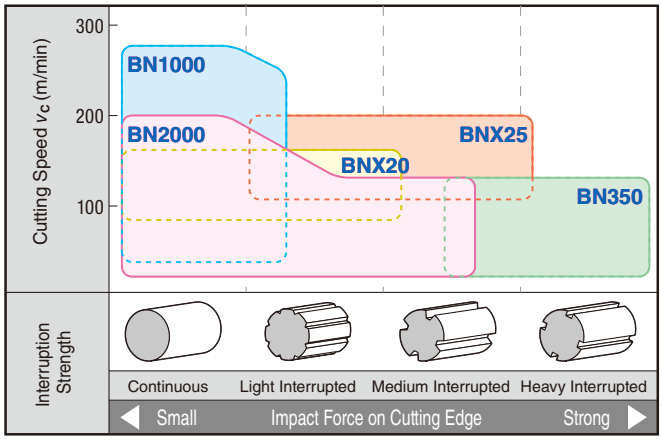
● Induction Hardened Steel (S45C / S55C etc.), Carburized steel

Coated SUMIBORON



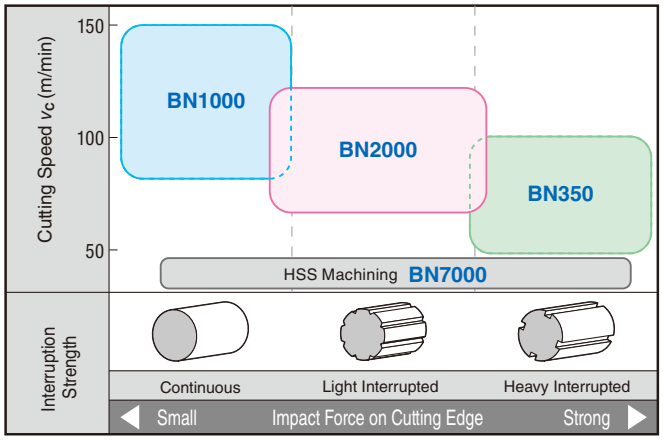

● Induction Hardened Steel (S45C / S55C etc.), Carburized steel

Uncoated SUMIBORON




● Die Steel (SKD11 / SKD61 etc.), HSS

Uncoated SUMIBORON

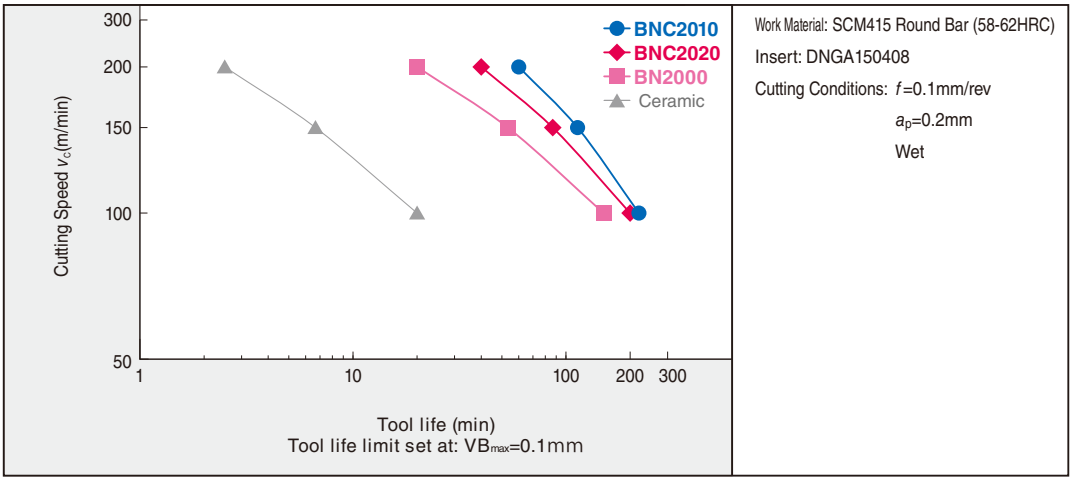



### ■ Recommended Cutting Conditions

| | Grade | Cutting Speed $v_c$ (m/min) 50 100(120) 150(170) 200(220) 250 300 | $f$ (mm/rev) | $a_p$ (mm) |
|---|---|---|---|---|
| Coated | BNC2010 | | 0.03 to 0.25 | 0.03 to 0.35 |
| | BNC2020 | | 0.03 to 0.40 | 0.03 to 0.50 |
| | BNC300 | | 0.03 to 0.20 | 0.03 to 0.30 |
| | BNC100 | | 0.03 to 0.20 | 0.03 to 0.30 |
| | BNC160 | | 0.03 to 0.20 | 0.03 to 0.35 |
| | BNC200 | | 0.05 to 0.35 | 0.05 to 0.50 |
| Uncoated | BN1000 | | 0.03 to 0.15 | 0.03 to 0.20 |
| | BN2000 | | 0.03 to 0.20 | 0.03 to 0.30 |
| | BN350 | | 0.03 to 0.20 | 0.03 to 0.30 |
| | BNX10 | | 0.03 to 0.15 | 0.03 to 0.20 |
| | BNX20 | | 0.03 to 0.30 | 0.03 to 0.50 |
| | BNX25 | | 0.03 to 0.30 | 0.03 to 0.50 |

## HARDENED STEEL MACHINING (3)

### ■ Application Examples (Continuous cutting)

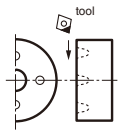



Work Material: SCM415 Round Bar (58-62HRC)
Insert: DNGA150408
Cutting Conditions: $f$=0.1mm/rev
$a_p$=0.2mm
Wet

### ■ Application Examples (Interrupted cutting)

**Light Int. - face with 4 holes (Freq, of Int, 25%)**

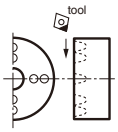
Work Material: SCr420H 58-62HRC
Cutting Conditions
Cutting speed: 100m/min
Feed Rate: 0.1mm/rev
Depth of cut: 0.2mm
Dry
Insert: CNMA120408




| Grade | Tool life 50 100 |
|---|---|
| **BN2000** | |
| **BNC300** | |
| **BN350** | |
| **BNX25** | |

**Med. Int. - face with 8 holes (Freq, of Int, 50%)**

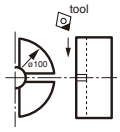
Work Material: SCr420H 58-62HRC
Cutting Conditions
Cutting speed: 100m/min
Feed Rate: 0.1mm/rev
Depth of cut: 0.2mm
Dry
Insert: CNMA120408




| Grade | Tool life 50 100 |
|---|---|
| **BN2000** | |
| **BNC300** | |
| **BN350** | |
| **BNX25** | |

**Heavy Int. - U grooved face (Freq, of Int, 100%)**

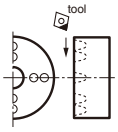
Work Material: SCr420H 58-62HRC
Cutting Conditions
Cutting speed: 100m/min
Feed Rate: 0.1mm/rev
Depth of cut: 0.2mm
Dry
Insert: CNMA120408




| Grade | Tool life 50 100 |
|---|---|
| **BN2000** | |
| **BNC300** | |
| **BN350** | |
| **BNX25** | |

**Hi Speed Int. - face with 8 holes (Freq, of Int, 50%)**

Work Material: SCr420H 58-62HRC
Cutting Conditions
Cutting speed: 200m/min
Feed Rate: 0.1mm/rev
Depth of cut: 0.2mm
Dry
Insert: CNMA120408




| Grade | Tool life 50 100 |
|---|---|
| **BN2000** | |
| **BNC300** | |
| **BN350** | |
| **BNX25** | |

# Guidance for SUMIBORON Grades

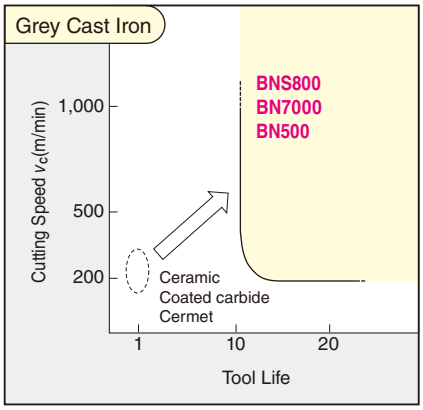
K Cast Iron

## CAST IRON MACHINING

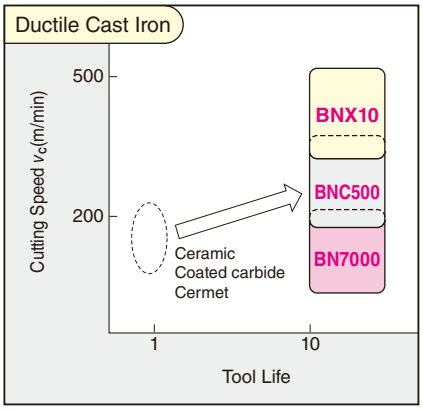
### Merits of using CBN

Following chart shows merits of using CBN in cast iron machining compared with conventional tool, such as carbide, cermet or ceramics.
SUMIBORON has longer tool life than conventional tools in high speed machining and brings higher efficiency and superior precision.

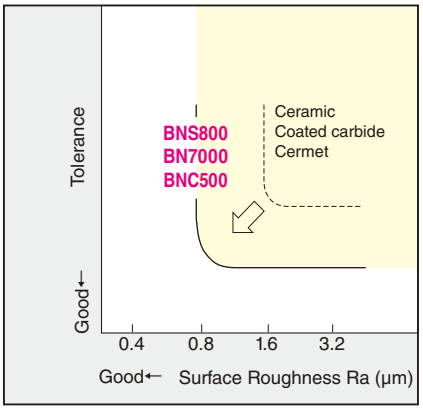
High Speed Machining




High Speed Machining




High Precision Machining



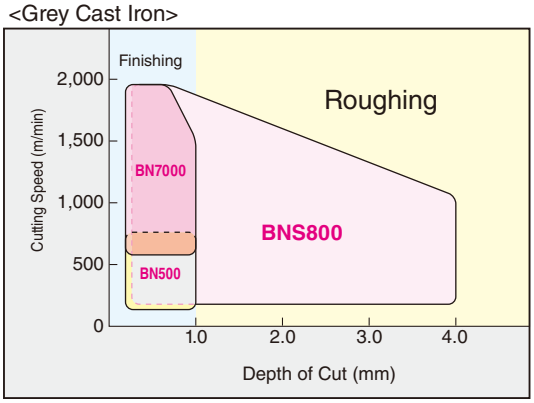

### Recommended Grade

| | Grade | Binder | Carbon Content(%) | Grain Size(μm) | Hardness(GPa) | TRS(GPa) | Coating | Coating Thickness(μm) | Characteristics |
|---|---|---|---|---|---|---|---|---|---|
| Uncoated | BNS800 | Al Compound | 85 to 90 | 8 | 39 to 42 | 0.95 to 1.10 | — | — | Grade with 100% solid CBN structure and excellent thermal shock resistance. |
| Uncoated | BN7000 | Co Compound | 90 to 95 | 2 | 41 to 44 | 1.30 to 1.40 | — | — | Exhibits improved wear and fracture resistance in cutting of cast iron and exotic alloys. |
| Uncoated | BN500 | TiC | 65 to 70 | 6 | 32 to 34 | 1.00 to 1.10 | — | — | Optimized for cast iron cutting. Provides superior wear and fracture resistance. |
| Coated | BNC500 (Ductile Cast Iron) | TiC | 60 to 65 | 4 | 32 to 34 | 1.00 to 1.10 | TiAlN | 2 | Suitable for machining of hard-to-cut cast iron thanks to the highly wear-resistant substrate and coating. |

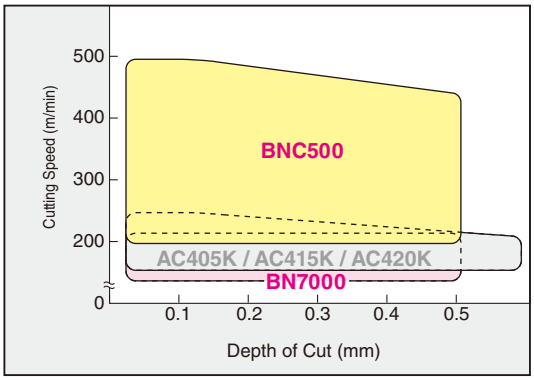
* Refer to pages L20 and L21 for machining of sintered components, rolls, hard facing alloys and heat resistive alloys.

### Application Range

<Grey Cast Iron>




<Ductile Cast Iron>




<Special Cast Iron>

| Work | Hardness (HB) | Structure | Examples | Cutting Speed (m/min) 100 200 300 350 400 500 |
|---|---|---|---|---|
| Ni-resist Cast Iron | 150 to 200 | Austenite | Piston ring | BNC500 |
| High-Cr Cast Iron | 250 to 350 | Austenite | Pump parts | BNS800 |
| FCV (CGI) | 400 to 580 | Pearlite | Engine block Cylinder head Disc brakes | BNC500 |

## Recommended Cutting Conditions

### Turning

| Work Material | | Grade | Recommended Cutting Conditions | | |
|---|---|---|---|---|---|
| Material Name | Hardness Code | | $v_c$ (m/min) 100 – 1,000 – 2,000 | $f$ (mm/rev) | $a_p$ (mm) |
| Grey Cast Iron | FC200 to FC300 (HB≤230) | BN7000 | 500 – 2,000 | 0.1 to 0.5 | ≤1.0 |
| | | BNS800 | 200 – 2,000 | 0.1 to 1.0 | ≤4.0 |
| | | BN500 | 200 – 700 | 0.1 to 0.5 | ≤1.0 |
| Alloy Cast Iron | (HB≥200) | BN7000 | 200 – 800 | 0.1 to 0.4 | ≤0.5 |
| | | BNS800 | 200 – 1,000 | 0.1 to 0.8 | ≤2.0 |
| Ductile Cast Iron | FCD450 to FCD550 | BN7000 | 80 – 200 | 0.1 to 0.4 | ≤0.6 |
| | | BNC500 | 150 – 500 | 0.1 to 0.4 | ≤0.5 |
| | FCD600 to FCD700 | BNC500 | 200 – 400 | 0.1 to 0.4 | ≤0.5 |
| Vermicular Cast Iron FCV (CGI) | — | BNC500 | 200 – 500 | 0.1 to 0.4 | ≤0.4 |

Coolant recommendation: Wet (BNS800: Wet or Dry)

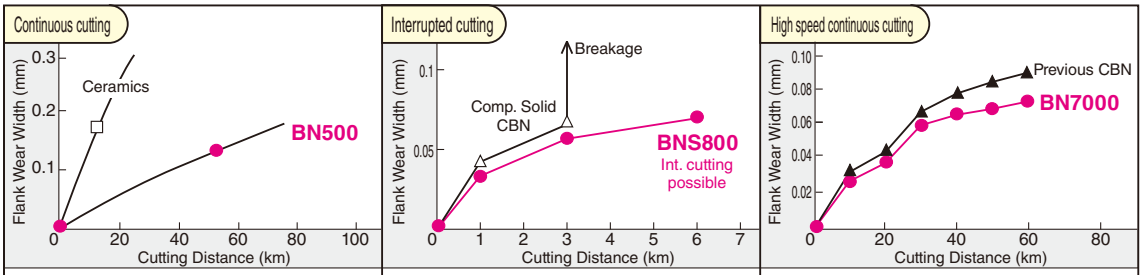
### Milling

| Work Material | | Grade | Recommended Cutting Conditions | | |
|---|---|---|---|---|---|
| Material Name | Hardness Code | | $v_c$ (m/min) 100 – 1,000 – 2,000 | $f$ (mm/rev) | $a_p$ (mm) |
| Grey Cast Iron | FC200 to FC300 (HB≤200) | BN7000 | 800 – 2,000 | 0.1 to 0.5 | ≤0.5 |
| | | BNS800 | 800 – 2,000 | 0.1 to 1.0 | ≤4.0 |

Coolant recommendation: Dry

## Cutting Performance

Grey Cast Iron turning → Recommended Grade: BNS800 / BN7000 / BN500



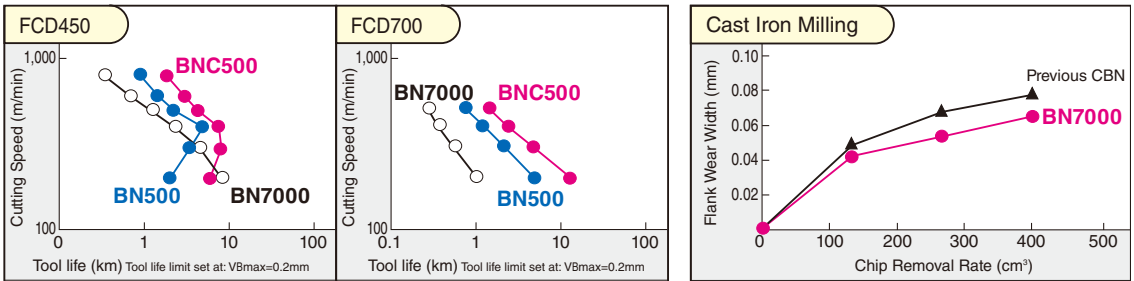

Work Material: FC300 Insert: SNGN120412
Cutting Conditions: $v_c$=500m/min, $f$=0.3mm/rev, $a_p$=0.15mm, Wet

Work Material: FC300 Insert: SNGN090308
Cutting Conditions: $v_c$=600m/min, $f$=0.3mm/rev, $a_p$=0.5mm, Dry

Work Material: FC300 (Pearlite) Insert: 2NU-CNGA120408
Cutting Conditions: $v_c$=800m/min, $f$=0.15mm/rev, $a_p$=0.2mm, Wet

Ductile Cast Iron turning → Recommended Grade: BNC500

Grey Cast Iron milling → Recommended Grade: BNS800 / BN7000




Work Material: FCD450 (Continuous cutting)
Cutting Conditions: $f$=0.2mm/rev, $a_p$=0.2mm, Wet

Work Material: FCD700 (Continuous cutting)
Cutting Conditions: $f$=0.2mm/rev, $a_p$=0.2mm, Wet

Work Material: FC250 (Pearlite) Insert: FMU4100R SNEW1203ADTR
Cutting Conditions: $v_c$=1,500m/min, $f$=0.2mm/rev, $a_p$=0.3mm, Dry

# SINTERED COMPONENT MACHINING

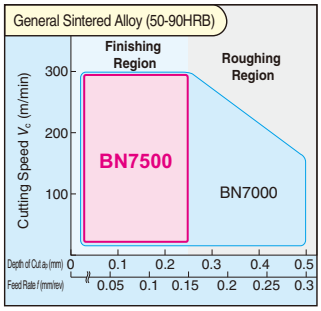
## Merits of Sintered Component machining with SUMIBORON

As compared to carbide or cermet, edge wear is very small for SUMIBORON, which also has better wear resistance and can be form to a sharp edge easily. Good machining precision and surface finish can be achieved because SUMIBORON is able to prevent burrs and chipping on the edges of the workpiece.

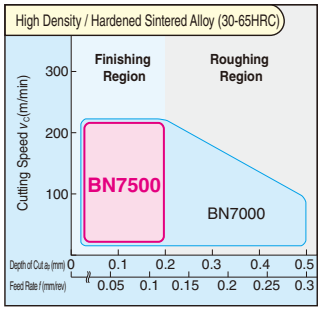
## Sintered Alloy

### Recommended Grade

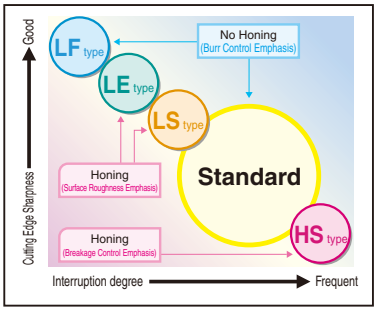
#### General Sintered Alloy




#### High Density/Hardened Sintered Alloy



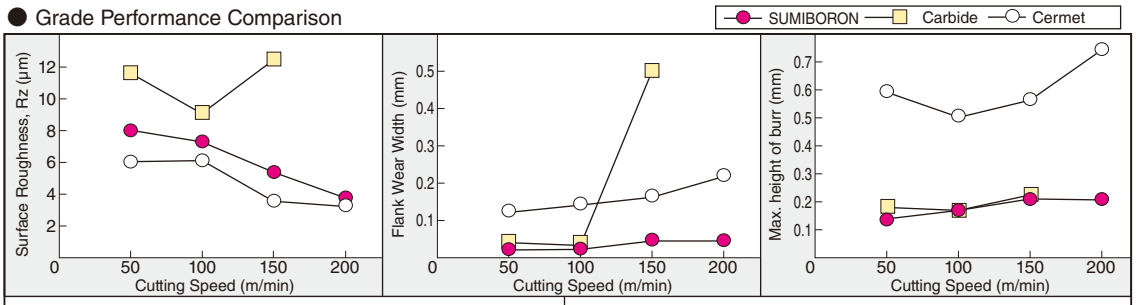

### Recommended Edge Treatment




| Grade | Binder | Carbon Content (%) | Grain Size (μm) | Hardness (GPa) | TRS (GPa) | Coating | Coating Thickness (μm) | Characteristics |
|---|---|---|---|---|---|---|---|---|
| BN7500 | Co Compound | 90 to 95 | 1 | 41 to 44 | 1.40 to 1.50 | — | — | Maintains excellent cutting edge sharpness. Suitable for finishing of sintered alloys. |
| BN7000 | Co Compound | 90 to 95 | 2 | 41 to 44 | 1.30 to 1.40 | — | — | Exhibits improved wear and fracture resistance in roughing of sintered materials. |

### Cutting Performance

#### Grade Performance Comparison




Work Material: SMF4040 equivalent
Process details: ø80-ø100mm heavy interrupted facing with grooves and drilled holes. (after 40 passes)
Insert: TNGA160404
Cutting Conditions: $f$=0.1mm/rev, $a_p$=0.1mm, Wet

For general sintered alloy, carbide and cermet can perform up to $v_c$=100m/min. But around $v_c$=120m/min, wear growth becomes rapid and surface roughness deteriorates with increased burrs. On the other hand, SUMIBORON exhibits stability and superior wear resistance, burr prevention and surface roughness especially at high speeds.

## Valve Seat Ring (VSR)

* VSR has both (Intake: IN) and (Exhaust: EX) with the exhaust being hardened.

### Recommended Grade

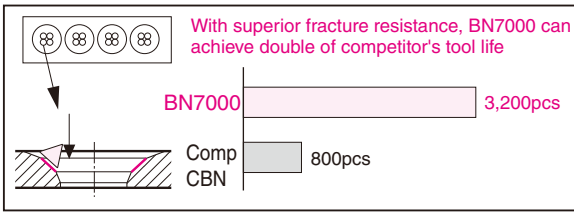
#### Grade Performance Comparision

| | Gasoline VSR material | Diesel VSR material |
|---|---|---|
| Plunge cut | BN7000 BN7500 / BN350 | BN7000 BN7500 / BN350 |
| Traverse cut | BN7000 BN7500 / BN500 | BN7000 BN7500 / BN500 |
| Hardness (HV) | low ← 300HV → high | low ← 300HV → high |

### Recommended Cutting Conditions

| Cutting Speed $v_c$ (m/min) | Feed Rate $f$ (mm/rev) | Depth of Cut $a_p$ (mm) |
|---|---|---|
| 50 to 125 | 0.03 to 0.2 | 0.05 to 0.5 |

### Application Examples



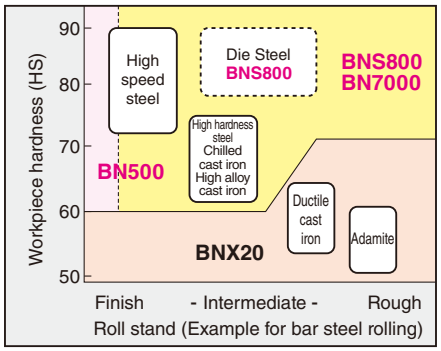

Work Material: Sintered alloy (150-250HV)
Process: VSR(IN) 45° Surface Finishing
Insert : TBGN060104B BN7000
Cutting Conditions: $v_c$=100m/min $f$=0.08mm/rev Wet

## ROLL MACHINING

### Merits of Roll Machining with SUMIBORON

Enables the machining of high hardness rolls which were difficult to machine by conventional tools, thus drastically improving machining efficiency.

### Recommended Grade




### Recommended Cutting Conditions

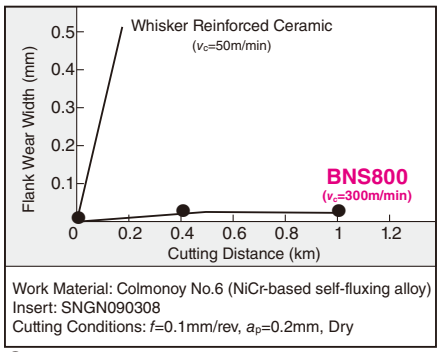
| Work | | Recommended Cutting Conditions | | |
|---|---|---|---|---|
| Material type | Hardness (HS) | $v_c$(m/min) 20 40 60 80 100 120 140 | $f$ (mm/rev) | $a_p$ (mm) |
| Adamite | ≥40 | | 0.1 to 0.5 | 0.2 to 3.0 |
| Chilled cast iron | ≥60 | | 0.1 to 0.5 | 0.2 to 3.0 |
| High alloy cast iron | ≥60 | | 0.1 to 0.5 | 0.2 to 3.0 |
| High speed steel | ≥70 | | 0.1 to 0.4 | 0.1 to 3.0 |

## HARD FACING ALLOYS MACHINING

### Merits of machining Hard Facing Alloys with SUMIBORON

Enables the machining of Hard Facing Alloys, once considered difficult to machine.
Recommended grade is BNS800.

### Cutting Performance




Work Material: Colmonoy No.6 (NiCr-based self-fluxing alloy)
Insert: SNGN090308
Cutting Conditions: $f$=0.1mm/rev, $a_p$=0.2mm, Dry

● BNS800 has low wear even at cutting speeds of $v_c$=300m/min

### Recommended Cutting Conditions

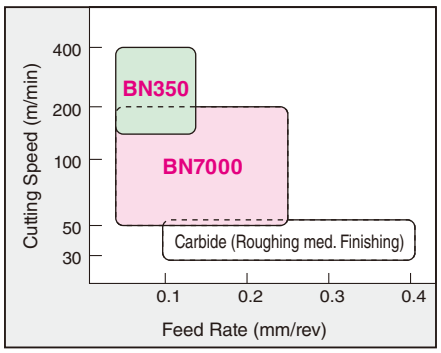
| Work | | Recommended Cutting Conditions | | |
|---|---|---|---|---|
| Material type | Material | $v_c$(m/min) 50 100 200 300 | $f$ (mm/rev) | $a_p$ (mm) |
| Ni-based Self-fluxing alloy | Colmonoy No.6 | | 0.05 to 0.2 | 0.1 to 3.0 |
| Co-based Self-fluxing alloy | Stellite | | 0.05 to 0.2 | 0.1 to 1.0 |

## HEAT RESISTIVE ALLOYS MACHINING

### Merits of cutting heat resistive alloys with SUMIBORON

Provides long tool life in the finishing of heat resistive alloys.

### Recommended Grade




● SUMIBORON is best suited for finishing of heat resistive steel

### Recommended Cutting Conditions

| Work | | Recommended Cutting Conditions | | |
|---|---|---|---|---|
| Material type | Material | $v_c$(m/min) 50 100 150 200 | $f$ (mm/rev) | $a_p$ (mm) |
| Ni-based heart resistant alloy | Inconel 718 | | 0.05 to 0.2 | 0.1 to 1.0 |
| Co-based heart resistant alloy | Stellite | | 0.05 to 0.2 | 0.1 to 1.0 |

# Insert Identification

## Regrindable Type

**CNMA120408(-)B**

(1) (2)

- (1) Insert ISO Code — (ISO Standard Classification) ☞B2/B3
- (2) Additional Information — Chart 1

Chart 1 (2) Additional Information

| New symbol | Old symbol | Code Description |
|---|---|---|
| (–)B | (–)B | Full-top CBN insert |
| –BSTN | –BSN | Full-top CBN insert (Small edge treatment) |

## One-use Type

**2NU - CNGA120408LT**

(1) (2) (3) (4)

- (1) No. of Cutting Edges — Chart 2
- (2) Type Code — Chart 3
- (3) Insert ISO Code — (ISO Standard Classification) ☞B2/B3
- (4) Additional Information — Chart 4

Chart 2 (1) No. of Cutting Edges

| Code | No. of Cutting Edges | Type |
|---|---|---|
| (No Code) | 1 cutting edge | Single Corner |
| 2 | 2 cutting edges | Multi-Corner |
| 3 | 3 cutting edges | |
| 4 | 4 cutting edges | |
| 6 | 6 cutting edges | |

Chart 3 (2) Type Code

| Code | Series | Grade |
|---|---|---|
| NC | Coated SUMIBORON | BNC2010,2020, BNC100,160, BNC200, 300, 500 |
| NU | SUMIBORON | BNX10, 20 BN1000, 2000, 350 BN500, 700, 7000, 7500 |
| NS | | BNX25 |

* NS type is the one-use type insert, using the latest brazing technique, for BNX25 grade. The shape is similar to NU type.

Chart 4 (4) Additional Information ☞L26

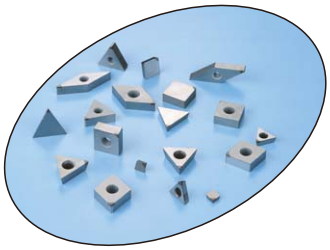
| New symbol | Old symbol | Code Description | |
|---|---|---|---|
| | | SUMIBORON | Coated SUMIBORON |
| (No Code) | (No Code) | Standard Type | |
| LF LE | F | Sharp Edge Type | – |
| LT | S | Small Edge Treatment Type | – |
| LS | M | General Type for Continuous Cutting | Fine Boring Type |
| HT HS | T | Strong Edge Type | Strong Edge Type |
| PM* | PM* | For interrupted cutting of hardened steel | – |
| WG WH W | W | Wiper Insert | |
| N-FV N-LV N-SV | N-SV | Chipbreaker Type | |

* In the future, the edge treatment code PM Type will be unified with the HS Type.

## Grade Selection

| Work | Colour Code | Series | | |
|---|---|---|---|---|
| | | Coated SUMIBORON | SUMIBORON | Solid SUMIBORON |
| Hardened Steel | Grey | New BNC2010<br>New BNC2020<br>BNC100<br>BNC160<br>BNC200<br>BNC300 | BN1000<br>BN2000<br>BN350<br>BNX10<br>BNX20<br>BNX25 | – |
| Cast Iron | Pink | BNC500 | BN500<br>BN7000<br>BN700 | BNS800 |
| Sintered component | Purple | – | BN7500<br>BN7000<br>BN700 | – |

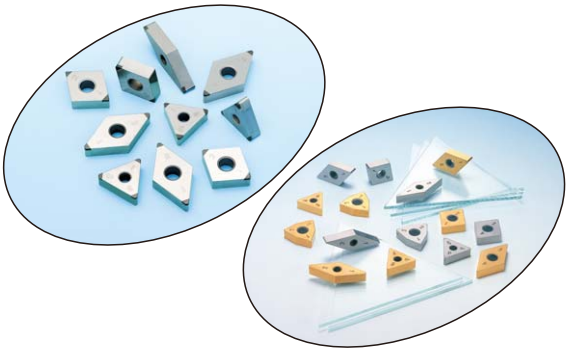
## One-use Insert NU Type / NS Type



■ Characteristics

- Affordable version of the once expensive sintered CBN material, at its best size.
- One-use type eliminates regrinding thus making tool management easy.
- Reduce required storage space with 10pcs pack.

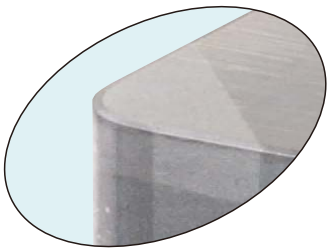
## Multi-cornered, One-use Insert



■ Characteristics

- Insert with several brazed SUMIBORON one-use corners. Price per edge is more reasonable compared to normal single cornered, one-use type insert.
- Coated SUMIBORON is available as a double-faced insert. Diamond shaped inserts have 4 cutting edges and Triangle shaped inserts have 6 cutting edges etc.
- Multi-cornered, one-use type has G-class specification with side faces ground. In addition, all edges are numbered for easy cutting edge management.

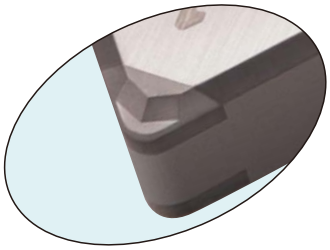
## One-use Wiper Insert
## WG Type / WH Type / W Type



■ Characteristics

- SUMIBORON one-use insert with wiper edge for Hardened Steel machining.
- Excellent surface roughness comparable to grinding.
- Improved efficiency with higher speeds and feeds.
- New lineup includes WG Type for low-feed cutting and WH Type for high-feed cutting.

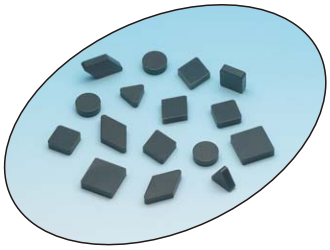
## One-use insert with chipbreaker
## Break Master FV Type / LV Type / SV Type



■ Characteristics

- SUMIBORON one-use insert with chipbreaker. SV type is perfect for carburised layer removal while LV / FV types are best suited to finishing of hardened steel.
- Breaker included on the CBN edge, chipbreaking effect can be maintained throughout.
- Unique breaker design can be applied to both hardened and non-hardened parts with effective chip control.

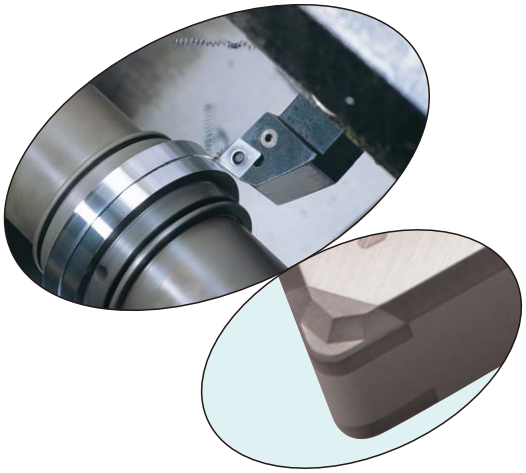
## Solid SUMIBORON



■ Characteristics

- 100% solid CBN structure. With no brazed portion, this grade is excellent for the roughing of Cast Iron at large depth of cut.

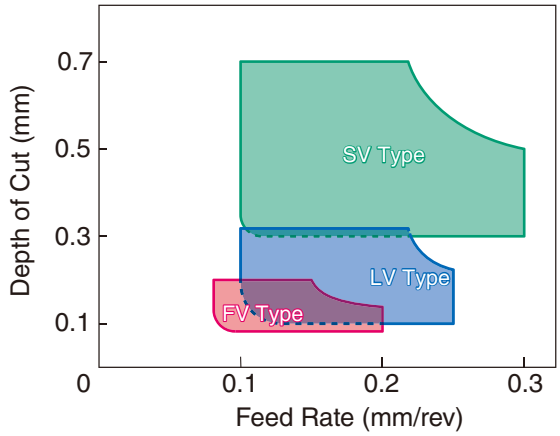
# Break Master FV Type / LV Type / SV Type



## Characteristics

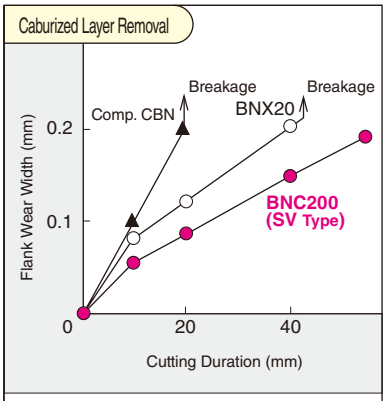
- SUMIBORON one-use insert with chipbreaker. SV type is perfect for carburised layer removal while FV / LV types are best suited to finishing of hardened steel.
- Breaker included on the CBN edge, chipbreaking effect can be maintained throughout machining process.
- Unique breaker design can be applied to both hardened and non-hardened parts with effective chip control.
- The SV Type lineup includes both the BNC2010 / BNC160 for good wear resistance and the BNC2020 / BNC200 with Coated SUMIBORON, which enables high efficiency machining.
- The FV Type and LV Type lineups include the BNC2010/ BNC160 for good wear resistance, the general-purpose BN2000 with Uncoated SUMIBORON, and the general-purpose BNC2020/BNC200 with Coated SUMIBORON.

## Application Range




* For hardened parts (above HRC50), please use less than 0.5mm depth of cut.

## Cutting Performance

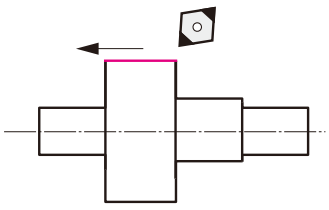



Work Material: SCr420(30-62HRC),
Insert: 4NC-CNGG120412N-SV
Cutting Conditions: $v_c$=100m/min, $f$=0.13mm/rev,
$a_p$=0.4mm × 3 passes, Dry

● Stable tool life with BNC200 (SV Type)

## Application Example

External Caburized Layer Removal



· No constant stoppages or incorrect part dimension problems and the chips are small.
· Double the tool life of competitor's CBN

Work Material:SCr420 Carburized Steel (shaft)
Insert: 4NC-CNGG120408N-SV(BNC200)
Cutting Conditions: $v_c$=150m/min, $f$=0.15mm/rev,
$a_p$=0.5mm × 2 passes, Wet

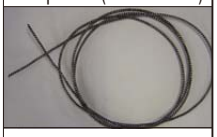
Break Master-SV Type

Tool life=200pcs

BNC200 (no breaker)

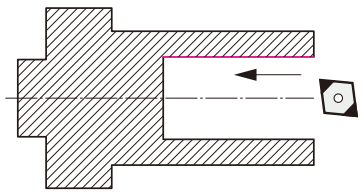
Tool life=200pcs

Comp CBN (with breaker)



Tool life=100pcs

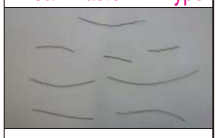
Finishing of Hardened Steel



· Improved chip control during boring.

Work Material: Carburized Steel 60HRC (Automotive Component)
Insert: 2NC-CCGT060204N-FV(BNC200)
Cutting Conditions: $v_c$=80m/min, $f$=0.08mm/rev,
$a_p$=0.15mm, Wet

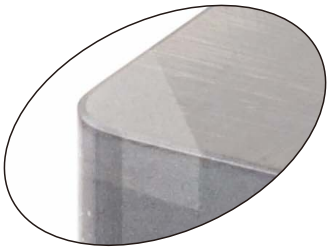
Break Master-FV Type



Tool life=300pcs

BNC200 (no breaker)

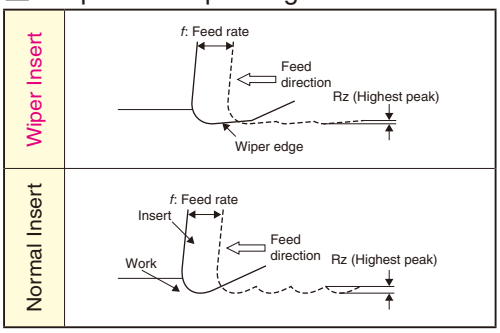
Tool life=300pcs



## Characteristics

- SUMIBORON one-use insert with wiper flat for Hardened Steel machining.
- Excellent surface finish similar to grinding
- Improved efficiency with higher speeds and feeds
- Lineup includes WG type for low-feed cutting and WH type for high-feed cutting.

## Purpose of Wiper Edge



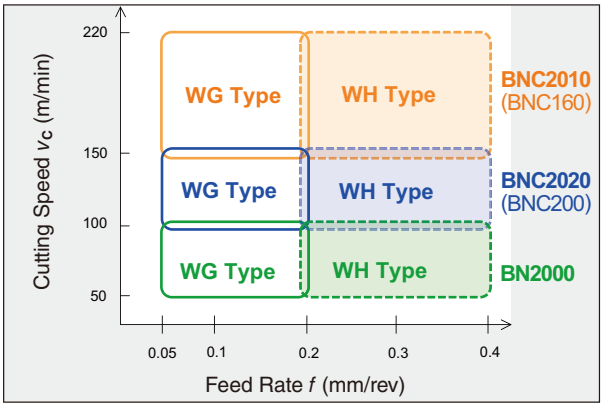

## Surface Roughness of Wiper Insert

| | Wiper Insert (WG Type/WH Type) | | Standard Insert (No Wiper Nose Radius R0.8) | |
|---|---|---|---|---|
| | Low feed cutting ($f$ = 0.10) | High feed cutting ($f$ = 0.30) | Low feed cutting ($f$ = 0.10) | High feed cutting ($f$ = 0.30) |
| Surface Roughness |  WG Type |  WH Type |  |  |
| Surface Roughness Rz (Highest peak) | 0.63 μm | 1.39 μm | 1.98 μm | 9.20 μm |

The wiper flat offers good surface finish and improved efficiency.

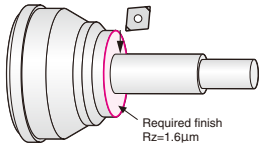
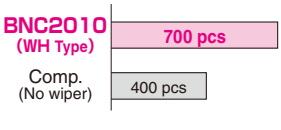
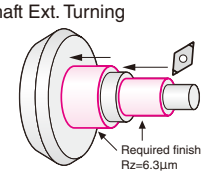
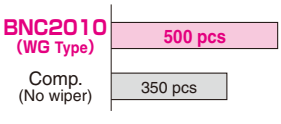
## Recommended Cutting Conditions (Surface Roughness Standard: 1.6s to 3.2s)

- For optimum effectiveness, use wiper inserts for continuous cutting. For copy turning, inserts with nose-radius are recommended.
- Chattering and undulation may occur, please use work material and machines with high rigidity.




WG Type: Recommended feed rate of $f$ = 0.20 or lower (Surface Finish Rz = 1.6 to 3.2 μm)
WH Type: Recommended feed rate of $f$ = 0.20 or higher (Surface Finish Rz = 1.6 to 3.2 μm)
Lineup includes five grades (BN2000, BNC2010, BNC2020, BNC200, BNC160) to suit different cutting speeds.

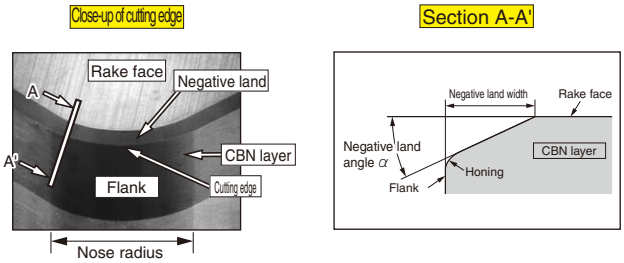
## Application Example

| Condition | Work<br>① Part Name<br>② Grade | Tool<br>Insert | Cutting Conditions<br>$v_c$ = Cutting Speed (m/min)<br>$f$ = Feed Rate (mm/rev)<br>$a_p$ = Depth of cut (mm) | Results |
|---|---|---|---|---|
| CVJ Outer Race Facing   | ① CVJ Outer Race<br>② Carburized steel 58 to 62HRC | 4NC-CNGA120412WH (BNC2010) | $v_c$ = 150m/min<br>$f$ = 0.20mm/rev<br>$a_p$ = 0.2mm<br>Dry |   |
| Shaft Ext. Turning   | ① Shaft<br>② Carburized steel 58 to 62HRC | 4NC-DNGA150408WG (BNC2010) | $v_c$ = 140m/min<br>$f$ = 0.20mm/rev<br>$a_p$ = 0.15mm<br>Dry |   |

# Edge Specification of SUMIBORON Inserts

## SUMIBORON Insert and Edge Treatment

All SUMIBORON inserts are enhanced with the optimum cutting edge preparation for the various grades and geometries (shown on the right). This is to avoid cutting edge fracture caused by the heavy loads generated during the machining of high hardness materials such as Hardened Steel. As the pioneer of CBN tools "SUMIBORON," this vast selection of grades and edge treatment combinations is our trump card for Hardened Steel machining.




## ■ SUMIBORON Insert Cutting Edge Specification List

| Series | Work Material | Grade | Negative/ Positive | Standard | | | | Low Resistance Type L | | | | | Strong Edge Type H | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Identification Code | R | W | Honing | Notation | Identification Code | R | W | Honing | Notation | Identification Code | R | W | Honing |
| Uncoated SUMIBORON | Hardened Steel | BNX10 | Negative/Positive | T01225 | 25° | 0.12 | No | — | — | — | — | — | — | — | — | — | — |
| | | BNX20 | Negative/Positive | S01225 | 25° | 0.12 | Yes | LT | T01215* | 15° | 0.12 | No | — | — | — | — | — |
| | | BNX25 | Negative/Positive | S01725 | 25° | 0.17 | Yes | — | — | — | — | — | — | — | — | — | — |
| | | BN1000 | Negative/Positive | S01225 | 25° | 0.12 | Yes | — | — | — | — | — | — | — | — | — | — |
| | | BN250 | Negative | S01225 | 25° | 0.12 | Yes | LT | T01215 | 15° | 0.12 | No | — | — | — | — | — |
| | | | Positive | S01235 | 35° | 0.12 | Yes | LS | S01225 | 25° | 0.12 | Yes | | | | | |
| | | BN2000 | Negative/Positive | S01225 | 25° | 0.12 | Yes | LT | T01215 | 15° | 0.12 | No | HS | S01235 | 35° | 0.12 | Yes |
| | | BN350 | Negative | T01225 | 25° | 0.12 | No | — | — | — | — | — | HT | T01235 | 35° | 0.12 | No |
| | | | Positive | T01235 | 35° | 0.12 | No | | | | | | — | — | — | — | — |
| | Cast Iron Exotic Alloy | BN500 | Negative/Positive | T01215 | 15° | 0.12 | No | — | — | — | — | — | — | — | — | — | — |
| | | BN700 | Negative/Positive | T01215 | 15° | 0.12 | No | LF | Sharp edge | 0° | 0 | No | HS | S01225 | 25° | 0.12 | Yes |
| | | BN7000 | Negative/Positive | T01215 | 15° | 0.12 | No | LF | Sharp edge | 0° | 0 | No | HS | S01225 | 25° | 0.12 | Yes |
| | | BN7500 | Negative/ Positive | T01215 | 15° | 0.12 | No | LF | Sharp edge | 0° | 0 | No | HS | S00525 | 25° | 0.05 | Yes |
| | | | | | | | | LE | Sharp edge | 0° | 0 | Yes | | | | | |
| | | | | | | | | LS | S00715 | 15° | 0.07 | Yes | | | | | |
| | | BNS800 | Negative | T02020 | 20° | 0.20 | No | LF | Sharp edge | 0° | 0 | No | — | — | — | — | — |
| Coated SUMIBORON | Hardened Steel | BNC2010 | Negative/Positive | S01225 | 25° | 0.12 | Yes | — | — | — | — | — | HS | S01730 | 30° | 0.17 | Yes |
| | | BNC2020 | Negative/Positive | S01225 | 25° | 0.12 | Yes | — | — | — | — | — | HS | S02735 | 35° | 0.27 | Yes |
| | | BNC100 | Negative/Positive | S01225 | 25° | 0.12 | Yes | LS | S01715 | 15° | 0.17 | Yes | — | — | — | — | — |
| | | BNC160 | Negative/Positive | S01225 | 25° | 0.12 | Yes | LS | S01020 | 20° | 0.10 | Yes | HS | S01730 | 30° | 0.17 | Yes |
| | | BNC200 | Negative/Positive | S01225 | 25° | 0.12 | Yes | LS | S01015 | 15° | 0.10 | Yes | HS | S01735 | 35° | 0.17 | Yes |
| | | BNC300 | Negative/Positive | S01225 | 25° | 0.12 | Yes | — | — | — | — | — | HS | S01735 | 35° | 0.17 | Yes |
| | Cast Iron | BNC500 | Negative/Positive | S01215 | 15° | 0.12 | Yes | — | — | — | — | — | HS | S01225 | 25° | 0.12 | Yes |

* BNX20 Identification code will be T00715 for inserts with inscribed circle of less than $\phi$4.76.

## ■ Cutting edge treatment of inserts with wipers / chipbreakers

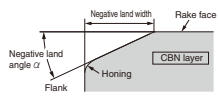
| Series | Work Material | Grade | Other Types | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Notation | Identification Code | R | W | Honing | Type |
| Uncoated SUMIBORON | Hardened Steel | BN2000 | WG | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | WH | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | N-FV | — | 0° | 0 | Yes | With breaker |
| | | | N-LV | S00535 | 35° | 0.05 | Yes | With breaker |
| | Cast Iron Exotic Alloy | BNS800 | W | T02020 | 20° | 0.20 | No | Wiper |
| | | | LFW | Sharp edge | 0° | 0 | No | Wiper Sharp edge |
| Coated SUMIBORON | Hardened Steel | BNC2010 BNC2020 | WG | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | WH | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | N-FV | — | 0° | 0 | Yes | With breaker |
| | | | N-LV | S00535 | 35° | 0.05 | Yes | With breaker |
| | | | N-SV | S01235 | 35° | 0.12 | Yes | With breaker |
| | | BNC100 | W | S01715 | 15° | 0.17 | Yes | Wiper |
| | | BNC160 BNC200 | WG | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | WH | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | W | S01215 | 15° | 0.12 | Yes | Wiper |
| | | | N-FV | — | 0° | 0 | Yes | With breaker |
| | | | N-LV | S00535 | 35° | 0.05 | Yes | With breaker |
| | | | N-SV | S01235 | 35° | 0.12 | Yes | With breaker |
| | Cast Iron | BNC500 | W | S01215 | 15° | 0.12 | Yes | Wiper |

## ■ Edge treatment identification code

| Edge Treatment Notation | | | | |
|---|---|---|---|---|
| No | Standard type | | | |
| L | Low cutting forces | + | F | Sharp edge |
| | | | E | Honing |
| H | Strong edge type | | T | Negative land |
| | | | S | Negative land + Honing |
| WG/WH/W | Wiper | | | |
| N-FV/N-LV/ N-SV | With Chipbreaker | | | |

● Edge treatment identification code

(Ex) S 0 1 2 2 5



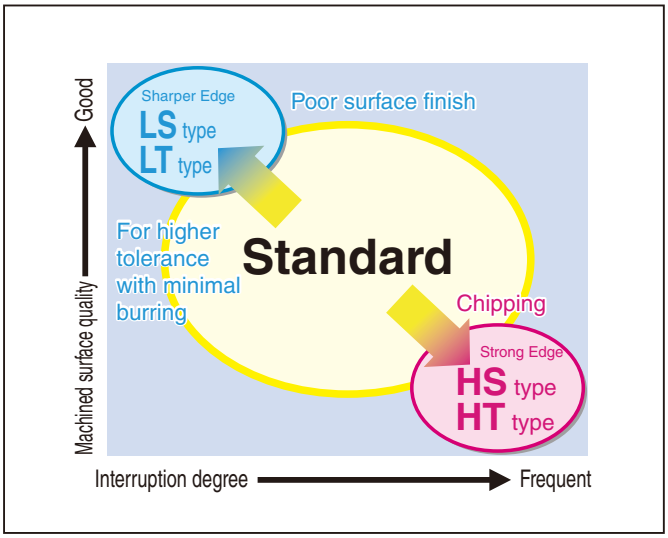

Treatment type — T : Negative land, S : Negative land + honing

Negative land width — Negative land angle

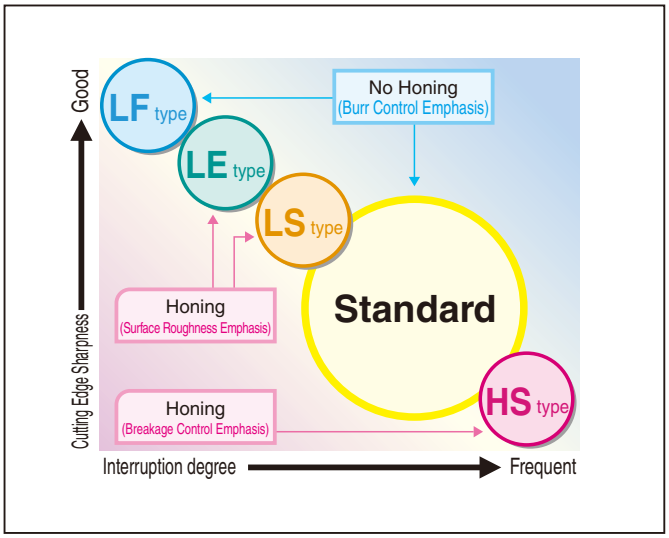
Ex: S01225
→25°/0.12mm width negative land with honing

## ■ Edge Treatment Performance

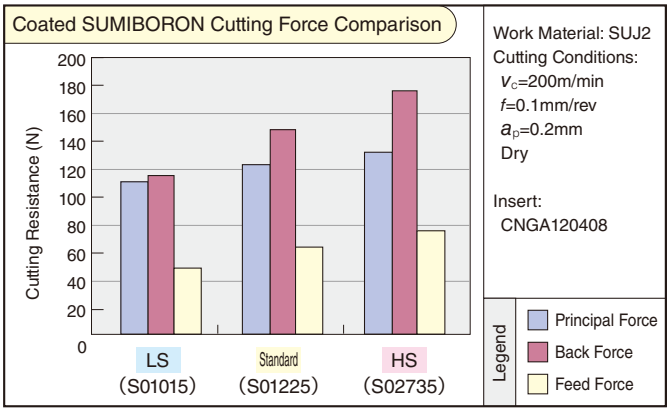
### Machining of Hardened Steel



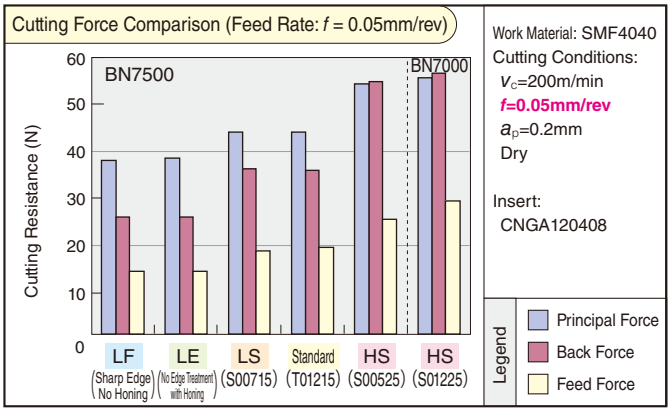

### Powdered Alloy Machining



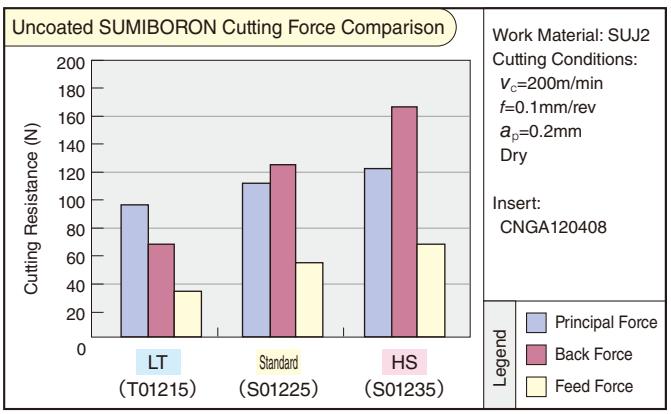

### Coated SUMIBORON Cutting Force Comparison



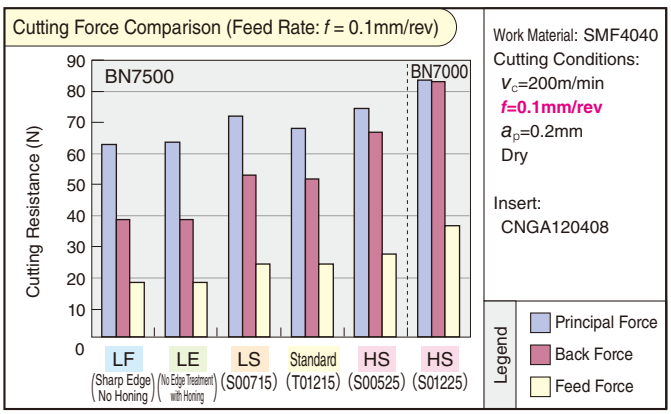

### Cutting Force Comparison (Feed Rate: $f$ = 0.05mm/rev)



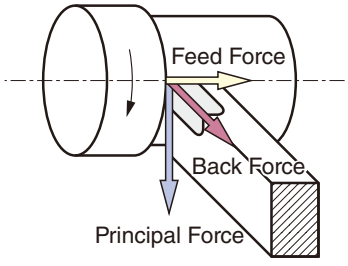

### Uncoated SUMIBORON Cutting Force Comparison




### Cutting Force Comparison (Feed Rate: $f$ = 0.1mm/rev)




## ● Three Force Components of Cutting Force




### Cutting Force Comparison (Feed Rate: $f$ = 0.15mm/rev)