

Nano-polycrystalline CBN Grade

# NCB100 SUMIBORON Binderless CBN

Ultimate CBN Grade Achieves Highly Efficient and Precise Finishing  
of Hard-to-Cut Materials



# NCB100

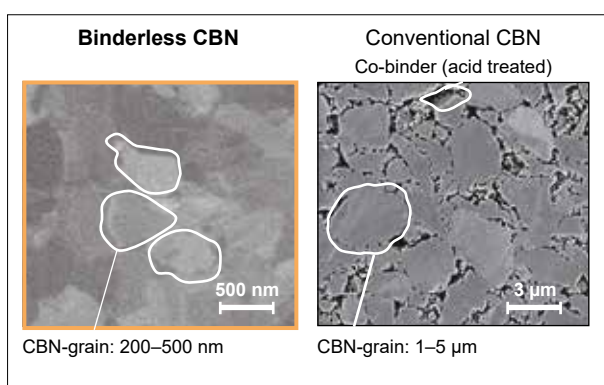


## ■ Features

SUMIBORON Binderless is a polycrystalline cubic boron nitrid (CBN) that directly binds nanometer- or sub-micron-level CBN particles without binder materials.

Binderless CBN is harder and has better thermal conductivity. Therefore, it enables higher efficiency and longer tool life in machining of hard-to-cut materials, such as titanium alloy and cobalt-chromium alloy.

## ■ Microstructure of Sintered Body



## ■ Physical Properties

	Binderless CBN	Conventional CBN
CBN Content (%)	100	90–95
Binder Material	–	WC–Co
Hardness (GPa)	51–54	41–44
Thermal Conductivity (W/m·K)	180–200	100–120

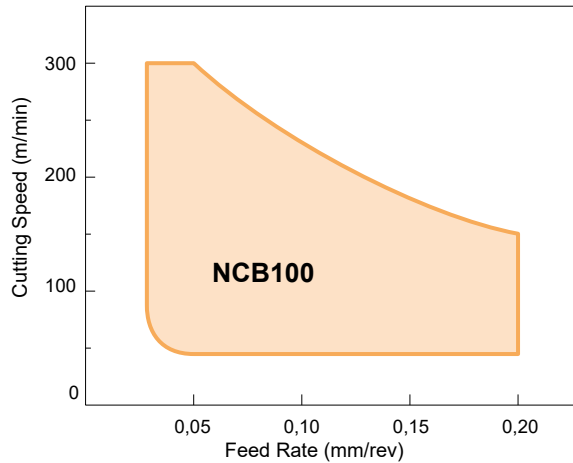
## SUMIBORON Binderless CBN

### ■ Advantages

- Higher efficient machining and longer tool life have been realized by the effects of higher hardness and thermal conductivity than conventional CBN grades.
- Achieves high precise machining and better surface integrity because of less adhesion by not containing any binder materials.
- Ideal tool material for high-efficient finishing of hard-to-cut materials, such as titanium alloy and cobalt-chromium alloy, cemented carbides and cermets.
- NCB100 is able to maintain excellent dimensional accuracy and surface roughness for a long period.
- Shows improved work efficiency and cost reduction by less frequency of exchanging inserts compared to conventional tool grades.

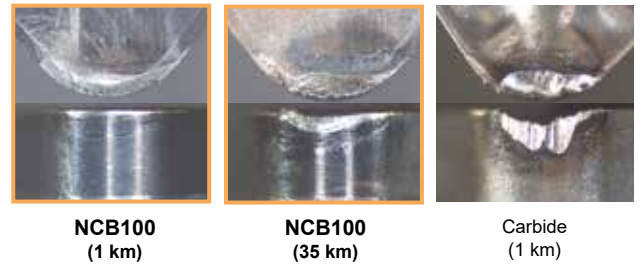
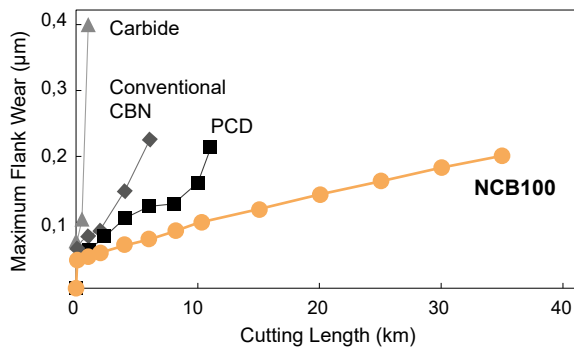


## Application Range and Performance - Turning of Titanium Alloy (Ti-6Al-4V)



### Wear Resistance

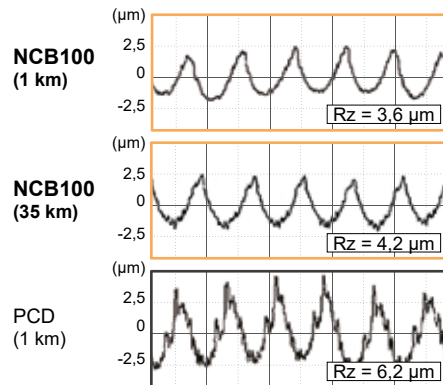
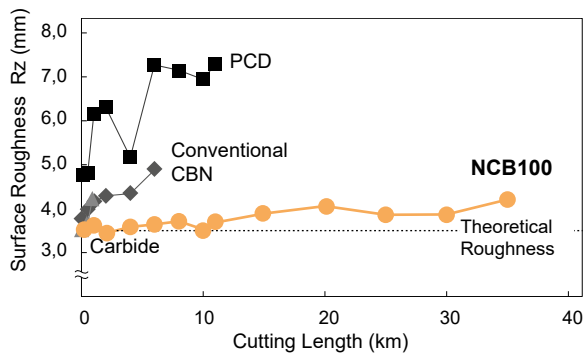
In high-speed machining NCB100 shows 35 times better wear resistance compared to carbide, because of its excellent physical properties.



Work Material: Ti-6Al-4V  
 Insert: CNGA 120408 NU  
 Cutting Conditions:  $v_c = 150$  m/min,  $f = 0,15$  mm/rev,  $a_p = 0,5$  mm, wet

### Surface Roughness

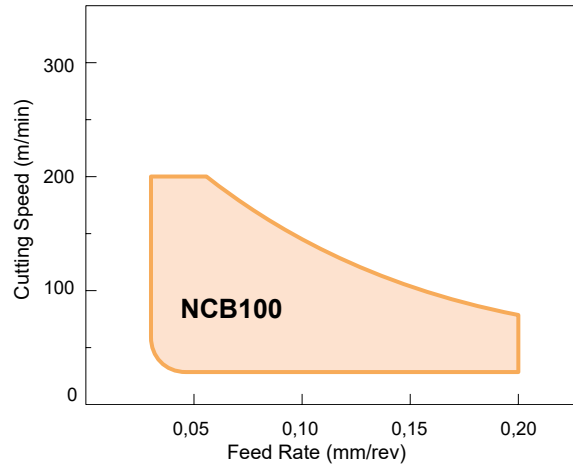
NCB100 keeps a constant surface roughness, which is close to the theoretical (calculated) surface roughness.



Work Material: Ti-6Al-4V  
 Insert: CNGA 120408 NU  
 Cutting Conditions:  $v_c = 150$  m/min,  $f = 0,15$  mm/rev,  $a_p = 0,5$  mm, wet

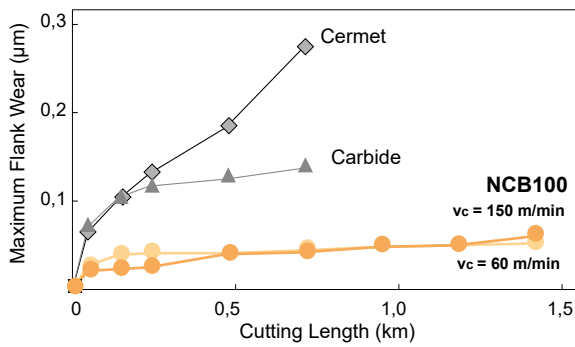
# NCB100

## Application Range and Performance - Turning of Cobalt-Chromium Alloy (Co-Cr)



### Wear Resistance

NCB100 shows excellent wear resistance on a cutting speed of 150 m/min and can be used at high efficiency machining.



NCB100 (0,5 km)



Cermet (0,5 km)

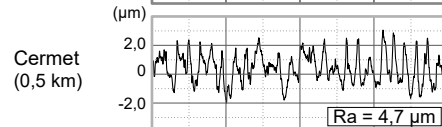
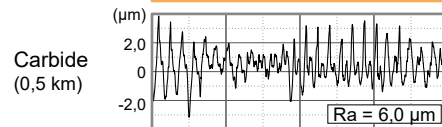
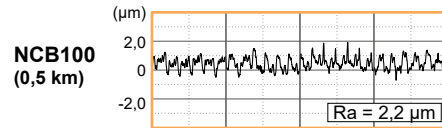
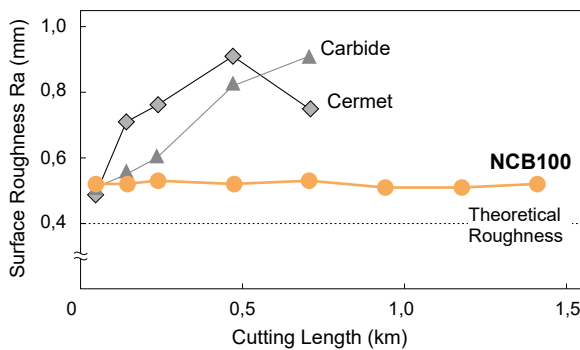


Carbide (0,5 km)

Work Material: Co-Cr  
 Insert: VNGA 160408 NU  
 Cutting Conditions:  $v_c = 60, 150$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,4$  mm, wet

### Surface Roughness

NCB100 keeps stable surface roughness.



Work Material: Co-Cr  
 Insert: VNGA 160408 NU  
 Cutting Conditions:  $v_c = 60, 150$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,4$  mm, wet

## ■ Recommended Cutting Conditions

### Titanium Alloys

Min. - Optimum - Max.

Work Material		Grade	Cutting Conditions		
Composition	Hardness (HRC)		Depth of Cut (mm)	Feed Rate (mm/rev)	Cutting Speed (m/min)
Ti-6Al-4V	30-35	NCB100	0,1- <b>0,3</b> -0,5	0,05- <b>0,15</b> -0,20	50- <b>200</b> -300
Ti-5Al-5V-5Mo-3Cr	32-38	NCB100	0,1- <b>0,3</b> -0,5	0,05- <b>0,10</b> -0,20	50- <b>150</b> -250
Ti-10V-2Fe-3Al	32-38	NCB100	0,1- <b>0,3</b> -0,5	0,05- <b>0,10</b> -0,20	50- <b>150</b> -250

### Cobalt-Chromium Alloys

Min. - Optimum - Max.

Work Material		Grade	Cutting Conditions		
Composition	Hardness (HRC)		Depth of Cut (mm)	Feed Rate (mm/rev)	Cutting Speed (m/min)
Co-30Cr-5Mo	35-45	NCB100	0,10- <b>0,15</b> -0,30	0,05- <b>0,15</b> -0,20	50- <b>200</b> -300

### Carbides

Min. - Optimum - Max.

Work Material		Grade	Cutting Conditions		
Composition	Hardness (HRA)		Depth of Cut (mm)	Feed Rate (mm/rev)	Cutting Speed (m/min)
WC-20Co	<85	NCB100	0,03- <b>0,10</b> -0,20	0,03- <b>0,10</b> -0,20	5- <b>20</b> -40

SUMIDIA BINDERLESS NPD10 is recommended for: > 85 HRA

### Other Work Materials

Min. - Optimum - Max.

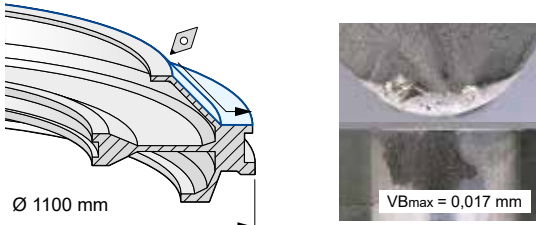
Work Material		Grade	Cutting Conditions		
Composition	Hardness (HV)		Depth of Cut (mm)	Feed Rate (mm/rev)	Cutting Speed (m/min)
Pure Titanium	130-230	NCB100	0,1- <b>0,3</b> -0,5	0,05- <b>0,10</b> -0,20	100- <b>250</b> -400
Cermet	1.000-1.500	NCB100	0,1- <b>0,2</b> -0,3	0,05- <b>0,10</b> -0,20	10- <b>30</b> -50

# NCB100

## Application Examples

**Ti-6Al-4V, Turbine disk**

Excellent wear resistance in high speed finishing.



Ø 1100 mm

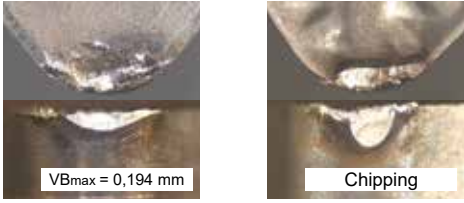
VB<sub>max</sub> = 0,017 mm

**NCB100 (26 km)**

Insert: CNGA 120408 NU  
Cutting Conditions:  $v_c = 140$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,2$  mm, wet

**Ti-5Al-5V-5Mo-3Cr, Landing Gear Parts**

Excellent flank and crater wear resistance.



VB<sub>max</sub> = 0,194 mm

Chipping

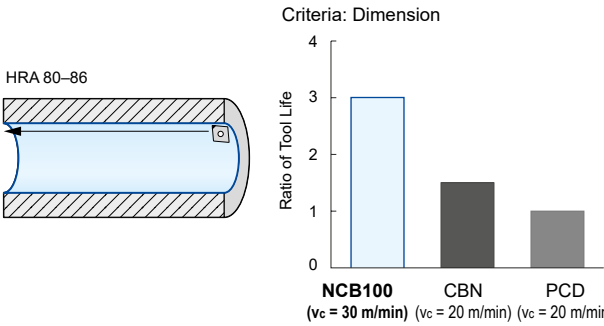
**NCB100 (5 km)**

Carbide (0,3 km)

Insert: CNGA 120408 NU  
Cutting Conditions:  $v_c = 150$  m/min,  $f = 0,1$ mm/rev,  $a_p = 0,4$  mm, wet

**Carbide, Finishing of Inner Diameter**

Excellent wear resistance in finishing of Co-rich carbide.



HRA 80–86

Criteria: Dimension

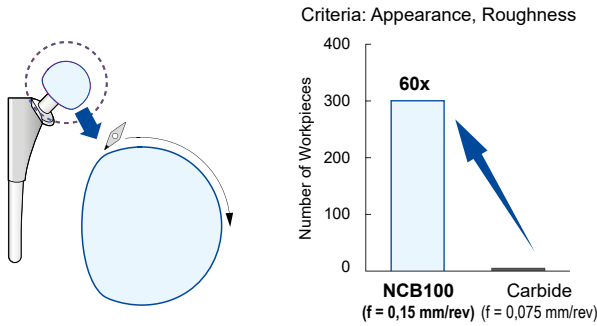
Material	Ratio of Tool Life
NCB100	3
CBN	1.5
PCD	1

( $v_c = 30$  m/min) ( $v_c = 20$  m/min) ( $v_c = 20$  m/min)

Insert: CCGW 09T304 NU  
Cutting Conditions:  $v_c = 30$  m/min,  $f = 0,1$  mm/rev,  $a_p = 0,1$  mm, dry

**Cobalt-Chromium Alloy, Head for Artificial Joint**

Much longer tool life in double efficiency than carbide.



Criteria: Appearance, Roughness

Material	Number of Workpieces
NCB100	300
Carbide	5

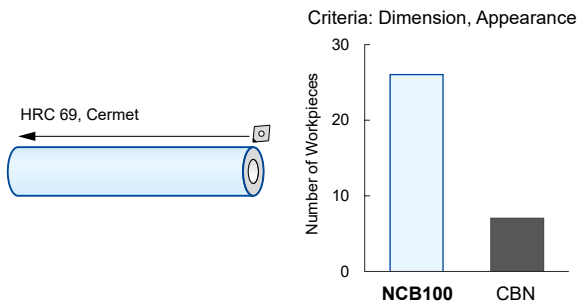
60x

( $f = 0,15$  mm/rev) ( $f = 0,075$  mm/rev)

Insert: VNGA 160408 NU  
Cutting Conditions:  $v_c = 65$  m/min,  $f = 0,15$  mm/rev,  $a_p = 0,2$  mm, wet

**Cermet, Parts for Mold Injection**

Better wear resistance in machining of hard cermet.






HRC 69, Cermet

Criteria: Dimension, Appearance

Material	Number of Workpieces
NCB100	25
CBN	7








Insert: CNGA 120412 NU  
Cutting Conditions:  $v_c = 32$  m/min,  $f = 0,12$  mm/rev,  $a_p = 0,25$  mm, dry

## ■ Negative Type Inserts

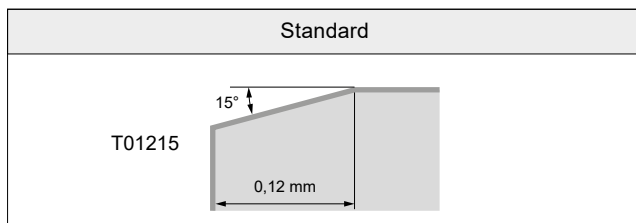
Shape	Cat. No.	Stock	No. Cutt. Edges	Dimensions (mm)				
				Cutting Edge Length	Inscribed Circle	Thick-ness	Screw Hole Ø	Nose Radius
	CNGA 120404 NU	○	1	2,5	12,7	4,76	5,16	0,4
	120408 NU	○		2,4				0,8
	120412 NU	○		2,3				1,2
	DNGA 150404 NU	○	1	2,5	12,7	4,76	5,16	0,4
	150408 NU	○		2,1				0,8
	150412 NU	○		2,0				1,2
	VNGA 160404 NU	○	1	2,5	9,525	4,76	3,81	0,4
	160408 NU	○		1,6				0,8

○ Japan stock

## ■ Positive Type Inserts

Shape	Relief Angle	Cat. No.	Stock	No. Cutt. Edges	Dimensions (mm)				
					Cutting Edge Length	Inscribed Circle	Thick-ness	Screw Hole Ø	Nose Radius
	7°	CCGW 060204 NU	○	1	2,3	6,35	2,38	2,8	0,4
	7°	CCGW 09T304 NU	○	1	2,5	9,525	3,97	4,4	0,4
		09T308 NU	○		2,4				0,8
	7°	DCGW 070204 NU	○	1	2,5	6,35	2,38	2,8	0,4
	7°	DCGW 11T304 NU	○	1	2,5	9,525	3,97	4,4	0,4
		11T308 NU	○		2,1				0,8
	5°	VBGW 110304 NU	○	1	2,5	6,35	3,18	2,8	0,4
		110308 NU	○		1,6				0,8
	5°	VBGW 160404 NU	○	1	2,5	9,525	4,76	4,4	0,4
		160408 NU	○		1,6				0,8
	7°	VCGW 160404 NU	○	1	2,5	9,525	4,76	4,4	0,4
		160408 NU	○		1,6				0,8

## ■ Cutting Edge Preparation





**CARBIDE - CBN - DIAMOND**

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