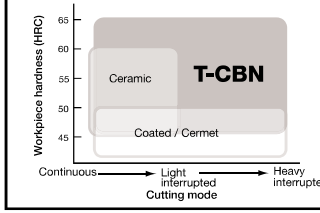
T-CBN (PCBN) Series

H T-CBN series for machining hardened steels and hard materials

■ Application area

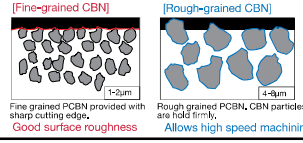


Necessity of PCBN grades

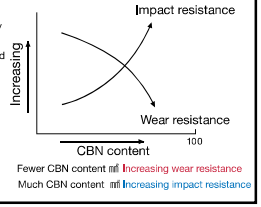
The condition necessary to cut the work: material is: Hardness of tool ≥ Hardness of tool X 3

- Hardened steel (60HRC) → 700 Hv ● Cemented carbide → 1600 Hv
- PCBN (BX360) → 3300 Hv

● Effects of grain size of CBN on surface roughness and cutting speed



● Features of CBN grades for machining hardened steel and other hard materials



Basic selection of T-CBN grades in machining of hardened steel and hard material

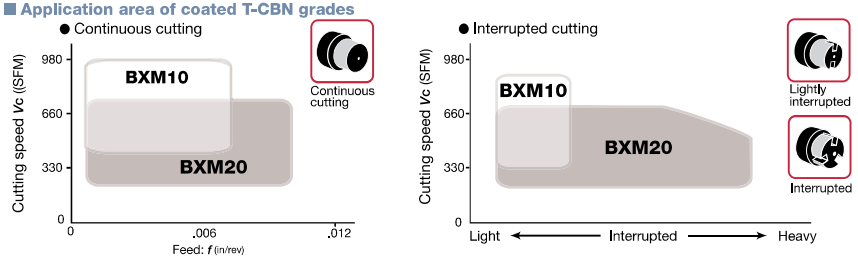
● Coated T-CBN grades

- **BXM10** For high speeds cutting
- **BXM20** For general purpose

● Uncoated T-CBN grades

- **BX310** For high speeds / Priority on wear resistance in continuous cutting
- **BX330** For medium speeds / Priority on surface quality
- **BX360** For low to medium speeds / General purpose grade, excels in impact resistance
- **BX380** For low to medium speeds / Priority on impact resistance in heavily interrupted cutting

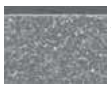
■ Application area of coated T-CBN grades



BXM10 For high speeds
Longer life at high speed

BXM20 For general purpose
First choice

Effects of Coated T-CBN grades



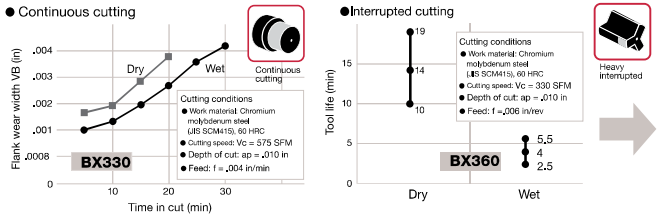
Coated on hard CBN
Hardness:
CBN > Coating layer

● Protect CBN from oxidation wear
Since the coating layer intercepts air, oxidation wear of CBN can be prevented.

● Peeling of coating layer can be protected
Hard and deformation resistant CBN is excellent substrate material.

→ **Improved resistance to flank wear**

Effects of coolant in machining of hardened steel

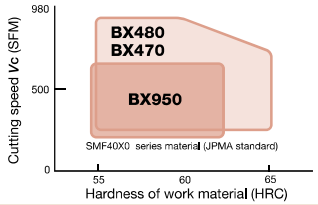


- In continuous cutting, wet cutting is superior to dry cutting in tool life for wear.
- In interrupted cutting, dry cutting is superior to wet cutting in tool life for fracture.

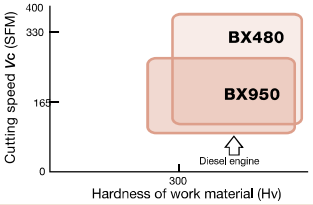
S T-CBN series for machining sintered metals

■ Application area

● Ferrous sintered metal



● Valve seat



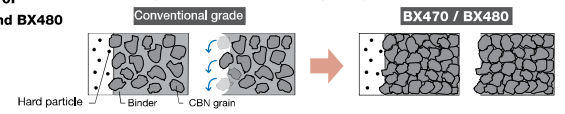
BX470
Priority on burr prevention and surface finish

BX480
Priority on wear resistance and versatility

BX950
For general sintered metal parts

Features of BX470 and BX480

● Machining of sintered metal including hard particles

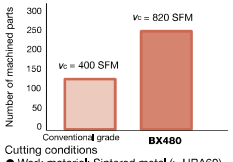


● Features of **BX470** and **BX480**

CBN content: 95 vol%
Hv = 4000 ~ 4300

The world highest CBN content as a commercially available material.
*as of July 2010

■ **BX480** (Facing of gears)

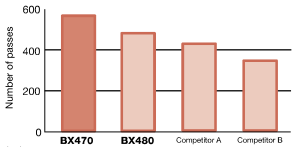


Cutting conditions
- Work material: Sintered metal (> HRA60)
- Insert: DCMW11T308
- Depth of cut: ap = .008 ~ .020 in
- Feed : f = .003 in/rev
- Coolant : Water soluble type ● Interrupted cutting

■ **BX470/BX480** Tool failure after machining sintered metal

Cutting conditions
- Work material: Sintered metal (> HRA60), Nitriding, Hard particles included
- Cutting speed: Vc = 360 SFM ● Depth of cut: ap = .006 in
- Feed: f = .004 in/rev ● Coolant : Water soluble type
- Interrupted cutting

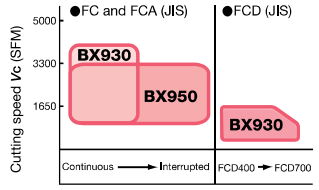
■ **BX470** (Tool life criterion: Burr occurrence)



Cutting conditions
- Work material: Ferrous sintered metal
- Cutting speed: Vc = 330 SFM
- Depth of cut: ap = .006 ~ .012 in
- Feed: f = .003 ~ .009 in/rev
- Dry and interrupted cutting

K T-CBN series for machining grey and ductile cast irons

■ Application area

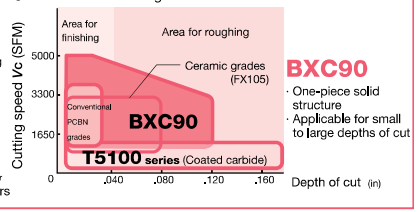


BX930
- General purpose, first choice grade.
- Dedicated grade for machining ductile cast iron

BX950
- Suitable for interrupted machining
- Excels in impact resistance

BX870 Note: Made to order
- For machining cylinder liners

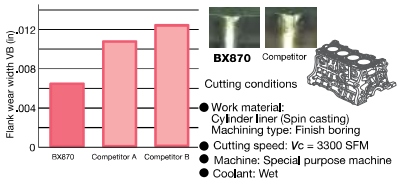
● Solid coated T-CBN grades



BXC90
- One-piece solid structure
- Applicable for small to large depths of cut

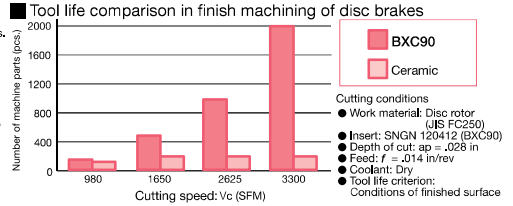
■ Machining of cylinder liners (Machining example of **BX870**)

●Wear width after machining 1000 pcs. ●Tool failure after machining 1000 pcs.



Cutting conditions
- Work material: Cylinder liner (Spin casting) Machining type: Finish boring
- Cutting speed: Vc = 3300 SFM
- Machine: Special purpose machine
- Coolant: Wet

■ Tool life comparison in finish machining of disc brakes



Cutting conditions
- Work material: Disc rotor (JIS FC250)
- Insert: SNGN 120412 (BXC90)
- Depth of cut: ap = .028 in
- Feed: f = .014 in/rev
- Coolant: Dry
- Tool life criterion: Conditions of finished surface

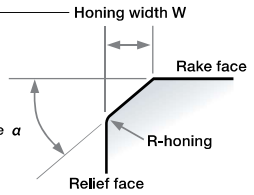
Honing specifications

●T-CBN inserts with special honing specifications are made to order. Refer to the following description.

Designation system for honing

Example:
Honing width .006 in
Honing angle - 30°
With R-honing

S	0	1	5	3	0
Shape		Honing width (W)		Honing angle (α)	



Shape
T ··· Chamfered honing
S ··· Chamfered + R-honing
E ··· R-honing alone
F ··· Sharp edges

● Symbol

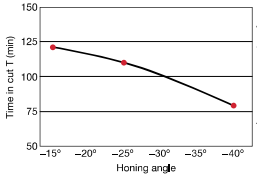
W	Amount of honing
005	.002 in
010	.004 in
013	.005 in
015	.006 in
020	.008 in

α	Honing angle
10°	- 10°
15°	- 15°
20°	- 20°
25°	- 25°
30°	- 30°
35°	- 35°
40°	- 40°

● Honing specification can be selected in combination of items described here.
● Inserts with "R" honing alone are available.
Note: There are unavailable combinations.
For details, ask your nearest Tungaloy sales office.

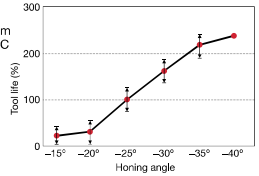
Honing specifications for machining hardened steels and other hard materials
Standard honing: .005" × 25° + R-honing
"-L" honing : .005" × 15° + R-honing
"-H" honing : .005" × 35° + R-honing

● Relationship between honing angle and tool life in continuous turning



Cutting conditions
Work material: Chromium molybdenum steel (JIS SCM415), 60 HRC
Insert: TNGN 331 (BX360)
Cutting speed: *Vc* = 330 SFM
Feed: f = .006 in/rev
Depth of cut: *ap* = .010 in
Coolant: Dry
Tool life criterion: VBmax = .006 in
Honing: 0.13 × □□°+ R-honing

● Relationship between honing angle and tool life in interrupted turning



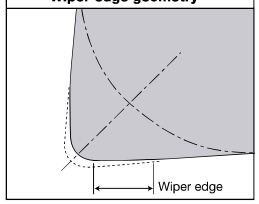
Cutting conditions
Work material: Chromium molybdenum steel (JIS SCM415), 60 HRC
Insert: TNGN 331 (BX360)
Cutting speed: *Vc* =330 SFM
Feed: *f* = .006 in/rev
Depth of cut: *ap* = .010 in
Coolant: Dry
Tool life criterion: Fracture
Honing: 0.13 × □□° + R-honing

●General rule
• For continuous cutting, small honing angle is favorable to minimize wear in general.
• For interrupted cutting, large honing angle is favorable to minimize fracture in general.

Wiper insert

●A finishing edge (wiper edge) is formed at the point of intersection between corner radius and straight cutting edge.

Wiper edge geometry

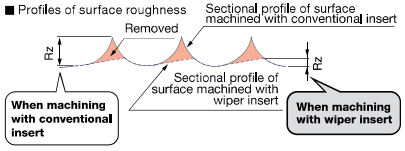


■ Effect of wiper edge

●Doubles the productivity → Reduced machining time
The wiper edge can double the feed rate and moreover does not deteriorate the surface roughness. (Note: Feed rate: *f < .012 in/rev)

●Superior surface roughness → By integrating roughing and finishing into one process, productivity can be increased.
Compared with conventional inserts only with corner radius, surface roughness can be improved with the wiper edge.

■ Profiles of surface roughness



■ Recommended toolholders for wiper-edged inserts

	2QP-CNGA 432 WL	3QP-WNGA 432 WL	2QP-DNGA 432 WJ	3QP-TNGA 431 WG
End cutting angle	95°		93°	91°
External toolholder	ACLNR/L*****12-A	AWLNR/L*****08-A	ADJNR/L*****15-A	ATGNR/L*****16-A ATFNR/L*****16-A
	DCLNR/L*****12	DWLNR/L*****08	DDJNR/L*****15	DTGNR/L*****16 DTFNR/L*****16
Internal toolholder	A***-ACLNR/L12-D***	A***-AWLNR/L08-D***	A***-ADUNR/L15-D***	A***-ATFNR/L16-D***

Negative inserts · Multi-corner type

Specification	Shape	Cat. No. (Inch)	Cat. No. (Metric)	BXM10	BXM20	BXC50	BX310	BX330	BX360	BX380	BX470	BX480	BX930	BX950	No. of Corners	Inner circle ød	Thickness s	Hole dia. ød1	Corner radius re	CBN length a
Sharp edge		2QP-CNGA 430-F	2QP-CNGA120402F												2	.500	.187	.203	.008	.087
		2QP-CNGA 431-F	2QP-CNGA120404F								●				2	.500	.187	.203	.016	.087
		2QP-CNGA 432-F	2QP-CNGA120408F								●				2	.500	.187	.203	.031	.094
		2QP-CNGA 433-F	2QP-CNGA120412F												2	.500	.187	.203	.047	.091
General purpose		2QP-CNGA 430	2QP-CNGA120402												2	.500	.187	.203	.008	.087
		2QP-CNGA 431	2QP-CNGA120404	●	●		●	●	●	●	●	●	●	●	2	.500	.187	.203	.016	.094
		2QP-CNGA 432	2QP-CNGA120408	●	●		●	●	●	●	●	●	●	●	2	.500	.187	.203	.031	.091
		2QP-CNGA 433	2QP-CNGA120412		●		●	●	●	●	●	●	●	●	2	.500	.187	.203	.047	.091
Light honing		2QP-CNGA 431-L	2QP-CNGA120404-L		●			●							2	.500	.187	.203	.016	.087
		2QP-CNGA 432-L	2QP-CNGA120408-L		●			●							2	.500	.187	.203	.031	.094
		2QP-CNGA 433-L	2QP-CNGA120412-L		●										2	.500	.187	.203	.047	.091
Heavy honing		2QP-CNGA 431-H	2QP-CNGA120404-H		●					●					2	.500	.187	.203	.016	.087
		2QP-CNGA 432-H	2QP-CNGA120408-H		●				●	●					2	.500	.187	.203	.031	.094
		2QP-CNGA 433-H	2QP-CNGA120412-H		●				●	●					2	.500	.187	.203	.047	.091
Wiper edge		2QP-CNGA 431WL	2QP-CNGA120404WL	●	●										2	.500	.187	.203	.016	.087
		2QP-CNGA 432WL	2QP-CNGA120408WL	●	●										2	.500	.187	.203	.031	.094
		2QP-CNGA 433WL	2QP-CNGA120412WL		●										2	.500	.187	.203	.047	.091
Wiper edge		2QP-CNMA 431W	2QP-CNMA120404W					●							2	.500	.187	.203	.016	.091
		2QP-CNMA 432W	2QP-CNMA120408W					●							2	.500	.187	.203	.031	.087
		2QP-CNMA 433W	2QP-CNMA120412W					●							2	.500	.187	.203	.047	.094
General purpose		T2QP-CNGA 431	T2QP-CNGA120404						●						2	.500	.187	.203	.016	.091
		T2QP-CNGA 432	T2QP-CNGA120408						●						2	.500	.187	.203	.031	.087
General purpose		4QP-CNGA 431	4QP-CNGA120404			●									4	.500	.187	.203	.016	.091
		4QP-CNGA 432	4QP-CNGA120408			●									4	.500	.187	.203	.031	.087
		4QP-CNGA 433	4QP-CNGA120412			●									4	.500	.187	.203	.047	.094
Heavy honing		4QP-CNGA 431-H	4QP-CNGA120404-H												4	.500	.187	.203	.016	.091
		4QP-CNGA 432-H	4QP-CNGA120408-H												4	.500	.187	.203	.031	.087
		4QP-CNGA 433-H	4QP-CNGA120412-H												4	.500	.187	.203	.047	.094
Wiper edge		4QP-CNMA 431W	4QP-CNMA120404W												4	.500	.187	.203	.016	.091
		4QP-CNMA 432W	4QP-CNMA120408W												4	.500	.187	.203	.031	.087
		4QP-CNMA 433W	4QP-CNMA120412W												4	.500	.187	.203	.047	.094
Sharp edge		2QP-DNGA 430-F	2QP-DNGA150402F												2	.500	.187	.203	.008	.098
		2QP-DNGA 431-F	2QP-DNGA150404F												2	.500	.187	.203	.016	.083
		2QP-DNGA 432-F	2QP-DNGA150408F												2	.500	.187	.203	.031	.079
		2QP-DNGA 433-F	2QP-DNGA150412F												2	.500	.187	.203	.047	.091
General purpose		2QP-DNGA 431	2QP-DNGA150404	●	●		●	●	●	●	●	●	●	●	2	.500	.187	.203	.016	.083
		2QP-DNGA 432	2QP-DNGA150408	●	●		●	●	●	●	●	●	●	●	2	.500	.187	.203	.031	.098
		2QP-DNGA 433	2QP-DNGA150412	●	●				●	●		●	●	●	2	.500	.187	.203	.047	.083
Light honing		2QP-DNGA 431-L	2QP-DNGA150404-L		●			●							2	.500	.187	.203	.016	.079
		2QP-DNGA 432-L	2QP-DNGA150408-L		●			●							2	.500	.187	.203	.031	.098
		2QP-DNGA 433-L	2QP-DNGA150412-L		●										2	.500	.187	.203	.047	.083
Heavy honing		2QP-DNGA 431-H	2QP-DNGA150404-H		●				●	●					2	.500	.187	.203	.016	.079
		2QP-DNGA 432-H	2QP-DNGA150408-H		●				●	●					2	.500	.187	.203	.031	.106
		2QP-DNGA 433-H	2QP-DNGA150412-H		●				●	●					2	.500	.187	.203	.047	.098
Wiper edge		2QP-DNGA 431WJ	2QP-DNGA150404WJ	●	●										2	.500	.187	.203	.016	.083
		2QP-DNGA 432WJ	2QP-DNGA150408WJ	●	●										2	.500	.187	.203	.031	.079
General purpose		2QP-DNGA 441	2QP-DNGA150604		●										2	.500	.187	.203	.016	.098
		2QP-DNGA 442	2QP-DNGA150608		●										2	.500	.187	.203	.031	.083
		2QP-DNGA 433	2QP-DNGA150612		●										2	.500	.187	.203	.047	.079

Note:
Letter "T" in the first position of Cat. No. shows that the standard packing quantity is 10 pieces.
3-6 Please refer to wiper type inserts, W, WL, WJ.

● : Stocked item

Standard honing specifications 3-6

	BXM10	BXM20	BXC50	BX310	BX330	BX360	BX380	BX470	BX480	BX930	BX950
Negative inserts	S01325	S01325	S01325	S01325	S01325	S01325	S01325	T01315	S01325	S01315	S01325
Positive inserts	S01325	S01325	–	S00515	S00515	S00515	–	T01315	–	S00515	S00515