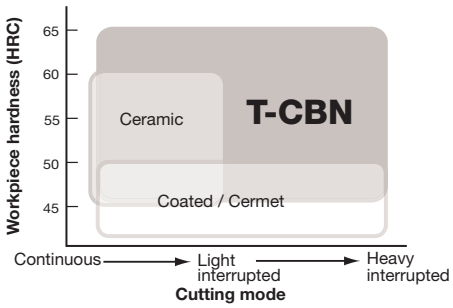
T-CBN (PCBN) Series

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

■ Application area



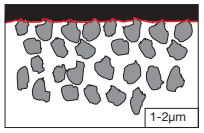
Necessity of PCBN grades

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

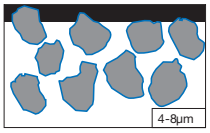
● Effects of grain size of CBN on surface roughness and cutting speed

[Fine-grained CBN]



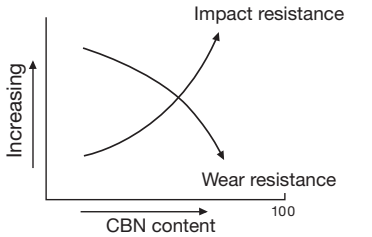
Fine grained PCBN provided with sharp cutting edge.
Good surface roughness

[Rough-grained CBN]



Rough grained PCBN. CBN particles are hold firmly.
Allows high speed machining

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



Fewer CBN content ⇨ Increasing wear resistance
Much CBN content ⇨ Increasing impact resistance

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
First recommendation

● Uncoated T-CBN grades

BX310 For high speeds / Priority on wear resistance in continuous cutting

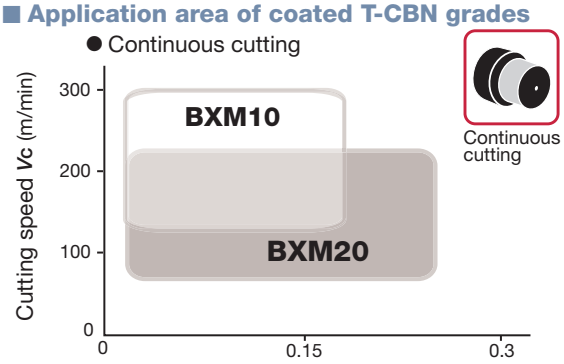
BX330 For medium speeds / Priority on surface quality

BX360 For low to medium speeds / General purpose grade, excels in impact resistance

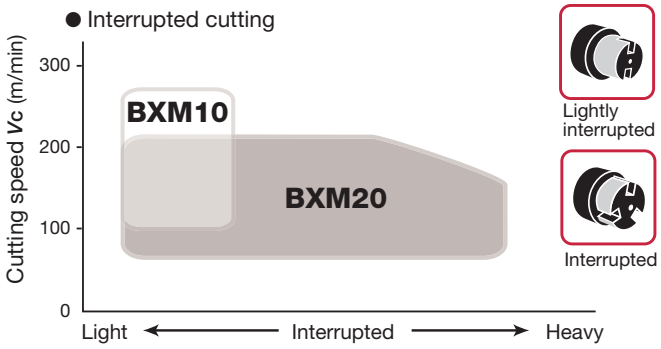
BX380 For low to medium speeds / Priority on impact resistance in heavily interrupted cutting

■ Application area of coated T-CBN grades

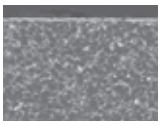
● Continuous cutting



● Interrupted cutting



Effects of Coated T-CBN grades



Coated on hard CBN
Hardness:
CBN > Coating layer

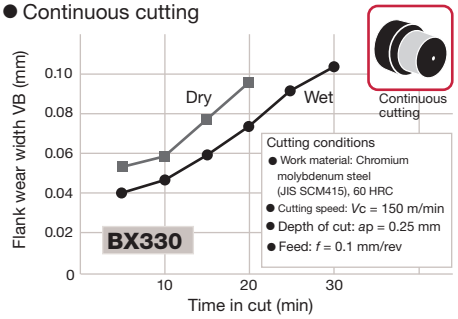
● Protect CBN from oxidation wear
Since the coating layer intercepts air, oxidation wear of CBN can be prevented.

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

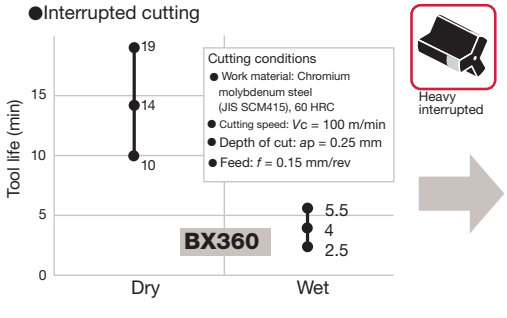
→ **Improved resistance to flank wear**

Effects of coolant in machining of hardened steel

● Continuous cutting



●Interrupted cutting

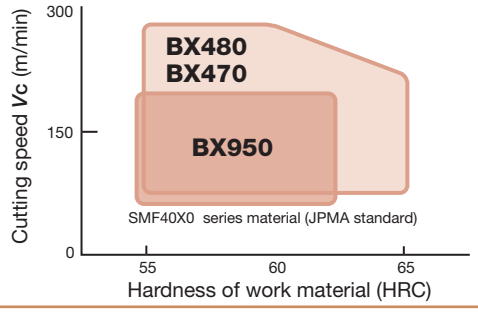


● In continuous cutting, wet cutting is superior to dry cutting in tool life for wear.
● In interrupted cutting, dry cutting is superior to wet cutting in tool life for fracture.

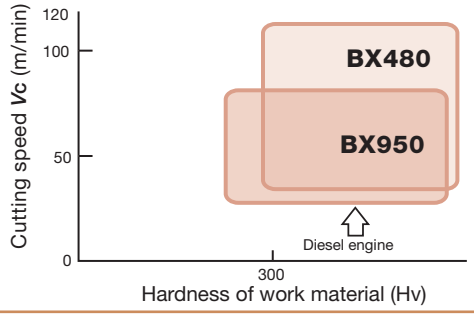
S T-CBN series for machining sintered metals

Application area

● Ferrous sintered metal



● Valve seat



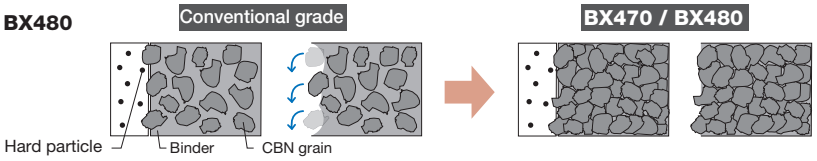
BX470
Priority on burr prevention and surface finish

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



Binder phase are selectively worn away by hard particles.
⇨ Wear proceeds with falling-out of CBN grains,

By increasing CBN content, wear of binder layer is suppressed.
⇨Improved wear resistance

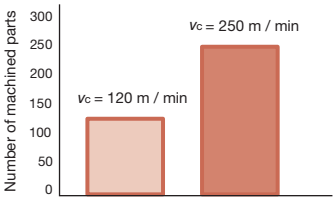
●Features of **BX470** and **BX480**

CBN content: 95 vol%
Hv = 4100 ~ 4300

The world highest CBN content as a commercially available material.

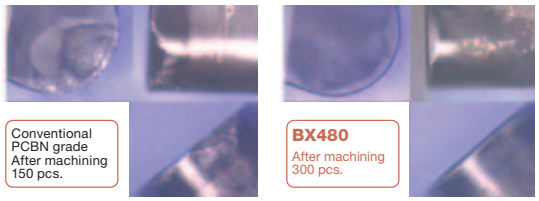
*as of July 2010

BX480 (Facing of gears)



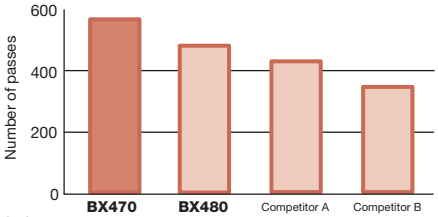
Cutting conditions
● Work material: Sintered metal (> HRA60)
● Insert: DCMW11T308
● Depth of cut: ap = 0.2 ~ 0.5 mm
● Feed : f = 0.07 mm/rev
● Coolant : Water soluble type ● Interrupted cutting

BX470/BX480 Tool failure after machining sintered metal



Cutting conditions
● Work material: Sintered metal (> HRA60), Nitriding, Hard particles included
● Cutting speed: Vc = 110 m/min ● Depth of cut: ap = 0.15 mm
● Feed: f = 0.1 mm/rev ● Coolant : Water soluble type
● Interrupted cutting

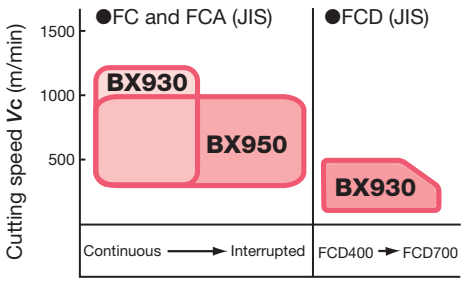
BX470 (Tool life criterion: Burr occurrence)



Cutting conditions
● Work material: Ferrous sintered metal
● Cutting speed: Vc = 100 m/min
● Depth of cut: ap = 0.15 ~ 0.3 mm
● Feed: f = 0.07 ~ 0.25 mm/rev
● Dry and interrupted cutting

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

Application area

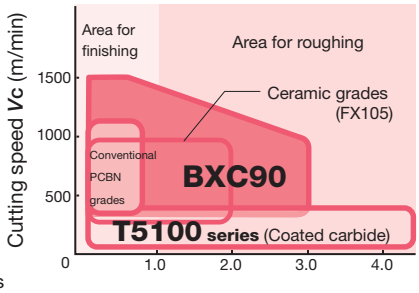


BX930
· General purpose, first choice grade.
· Dedicated grade for machining ductile cast iron

BX950
· Suitable for interrupted machining
· Excels in impact resistance

BX910
· For machining cylinder liners

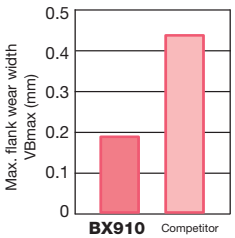
● Solid coated T-CBN grades

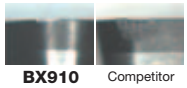


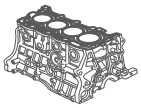
BXC90
· One-piece solid structure
· Applicable for small to large depths of cut

Machining of cylinder liners (Machining example of BX910)

●Wear width after machining 120 pcs. ●Tool failure after machining 120 pcs.

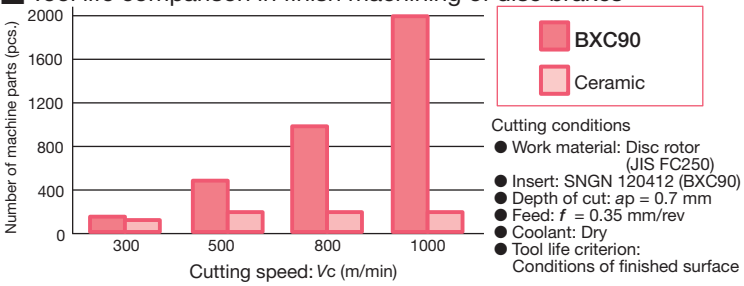






Cutting conditions
● Work material:
Cylinder liner (Spin casting)
Machining type: Finish boring
● Cutting speed: Vc = 1,000 m/min
● Machine: Special purpose machine
● Coolant: Wet

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 = 0.7 mm
● Feed: f = 0.35 mm/rev
● Coolant: Dry
● Tool life criterion:
Conditions of finished surface

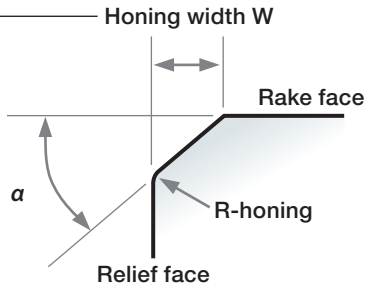
Honing specifications

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

Designation system for honing

Example:
Honing width 0.15 mm
Honing angle - 30°
With R-honing

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



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

● Symbol

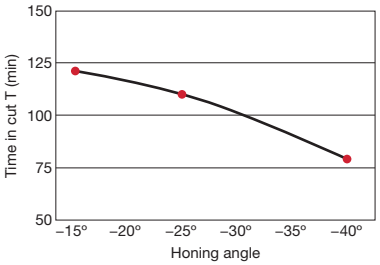
W	Amount of honing
005	0.05 mm
010	0.10 mm
013	0.13 mm
015	0.15 mm
020	0.20 mm

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.

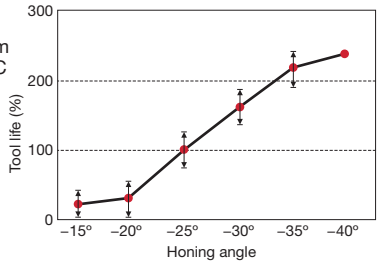
Honing specifications for machining hardened steels and other hard materials
Standard honing: 0.13 × 25° + R-honing
"-L" honing : 0.13 × 15° + R-honing
"-H" honing : 0.13 × 35° + R-honing

● Relationship between honing angle and tool life in continuous turning



Cutting conditions
Work material: Chromium molybdenum steel (JIS SCM415), 60 HRC
Insert: TNGN160404 (BX360)
Cutting speed: *Vc* = 100 m/min
Feed: *f* = 0.15 mm/rev
Depth of cut: *ap* = 0.25 mm
Coolant: Dry
Tool life criterion: VBmax = 0.15 mm
Honing: 0.13 × □□°+ R-honing

● Relationship between honing angle and tool life in interrupted turning



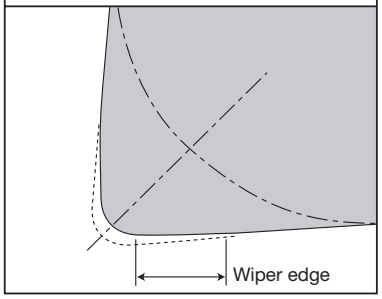
Cutting conditions
Work material: Chromium molybdenum steel (JIS SCM415), 60 HRC
Insert: TNGN160404 (BX360)
Cutting speed: *Vc* =100 m/min
Feed: *f* = 0.15 mm/rev
Depth of cut: *ap* = 0.25 mm
Coolant: Dry
Tool life criterion: Fracture
Honing: 0.13 × □□° + R-honing

●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

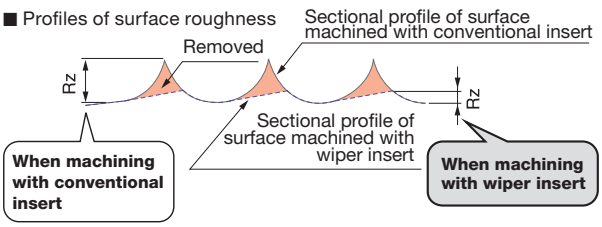
●Doubles the productivity → Reduced machining time

The wiper edge can double the feed rate and moreover does not deteriorate the surface roughness. (Note: Feed rate: *f* < 0.3 mm/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-CNGA1204**WL	3QP-WNGA080408WL	2QP-DNGA1504**WJ	3QP-TNGA1604**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***