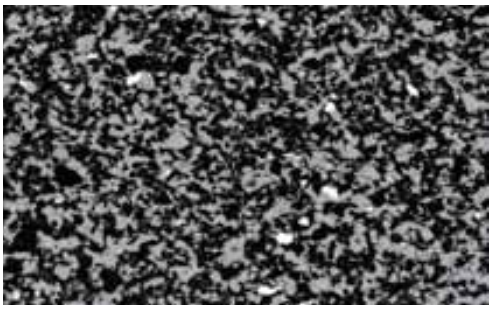
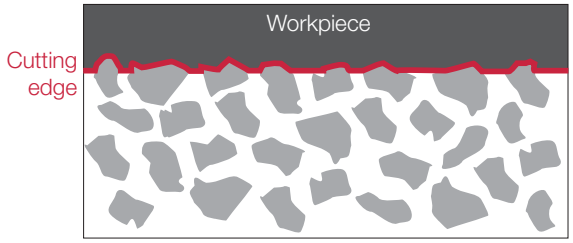
TUNGALOY'S CBN

CBN grain sizes and their effects on surface roughness

Fine grain (Grain size: ≤ 1 µm)





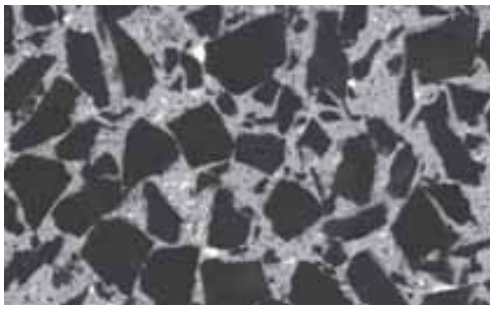
Fine-grain CBN grades

Sharp and uniform cutting edge

Better surface finish quality

Roughness (Rz < 1.6 µm)

Coarse grain (Grain size: 3 - 6 µm)



Coarse-grain CBN grade

Strong bond between grains

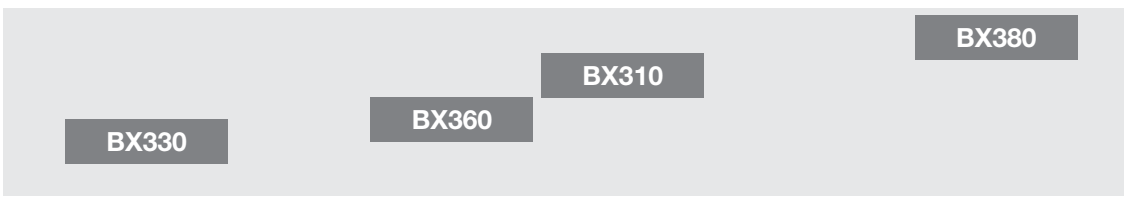
Higher speeds and feeds can be applied

Roughness (Rz < 6.3 µm)

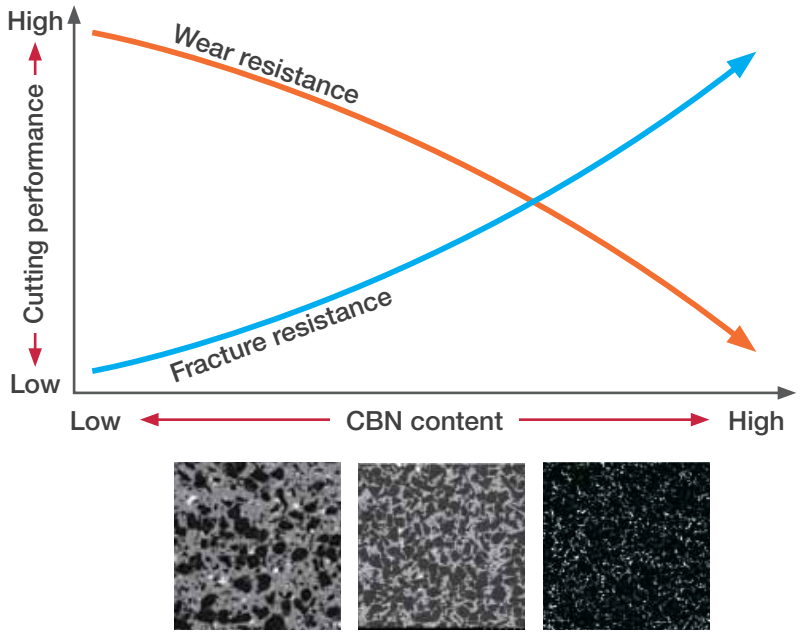
CBN inserts are generally used in a finishing process. A **CBN** insert grade with coarse abrasive grains will output a rough surface and may not be able to achieve the surface quality required. To achieve superior surface quality of Rz = 3.2 or better, always use a fine grain **CBN** insert.

Grain Size - Coated Grades

Grain Size - Uncoated Grades

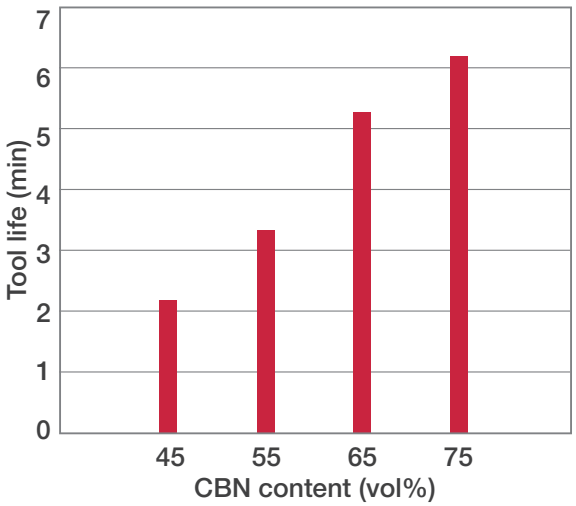


Wear and fracture resistance in terms of CBN content



The lower the CBN content is, the more wear resistant the grade will be, and the higher the CBN content is, the more fracture resistant the grade will be when turning hardened steel.

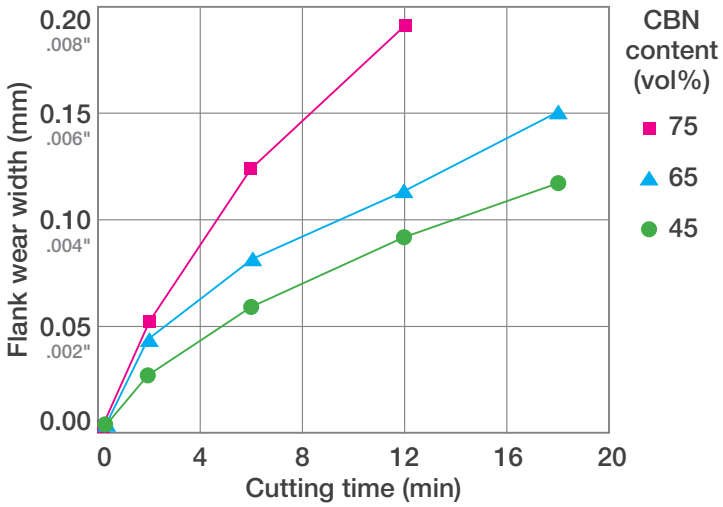
Interrupted Cutting



Cutting conditions
Cutting speed: *Vc* = 180 m/min (590 sfm)
Depth of cut: *ap* = 0.1 mm (.004")
Feed: *f* = 0.1 mm/rev (.004")
Coolant: Dry
Workpiece material: SCM435 (60HRC)

High CBN content
↓
High fracture resistance

Continuous Cutting



Cutting conditions
Cutting speed: *Vc* = 180 m/min (590 sfm)
Depth of cut: *ap* = 0.2 mm (.008")
Feed: *f* = 0.1 mm/rev (.004")
Coolant: Wet
Workpiece material: SCM415 (60HRC)

Low CBN content
↓
High wear resistance

Typical parts

Ring Gear

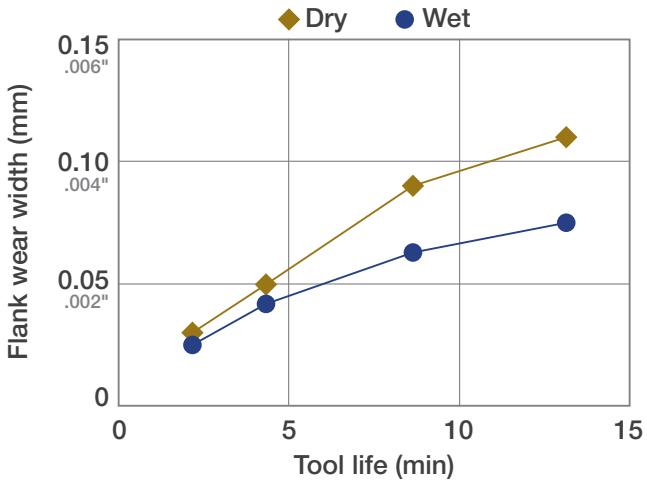
Idler Gear

Transmission Shaft

CVJ

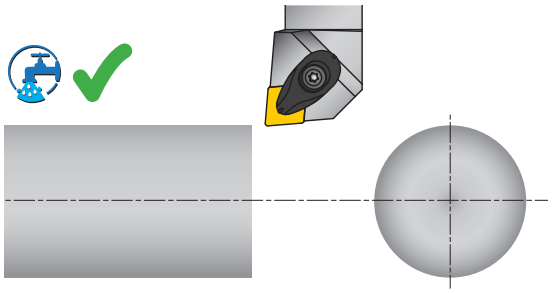
Tool Holders

Coolant effect - Continuous cutting

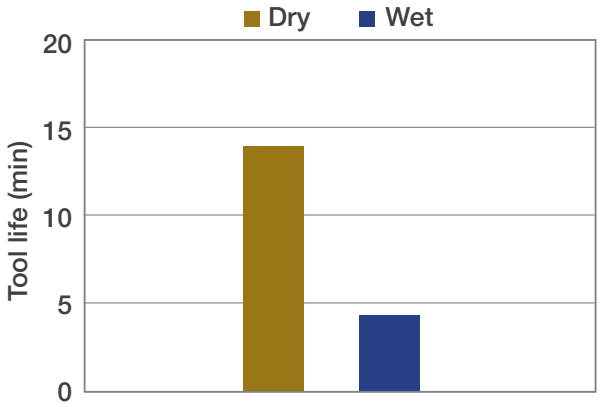


Wet cutting improves tool life for continuous cutting operations.

Cutting conditions
Cutting speed: *Vc* = 180 m/min (590 sfm)
Depth of cut: *ap* = 0.2 mm (.008")
Feed: *f* = 0.1 mm/rev (.004")
Workpiece material: SCM415 (60HRC)

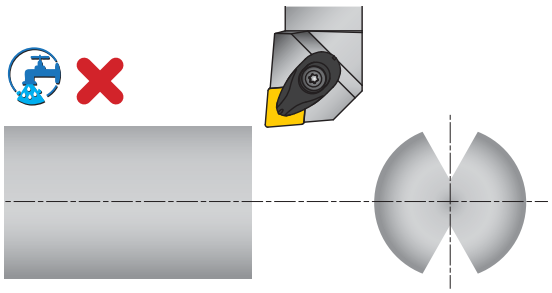


Coolant effect - Interrupted cutting



Dry cutting improves tool life for interrupted cutting operations.

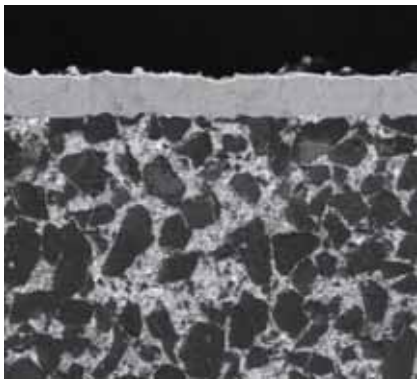
Cutting conditions
Cutting speed: *Vc* = 150 m/min (492 sfm)
Depth of cut: *ap* = 0.2 mm (.008")
Feed: *f* = 0.2 mm/rev (.008")
Workpiece material: SCM415 (60HRC)



Use of coolant

	Dry	Wet
Continuous cutting	✗	✓
Interrrupted cutting	✓	✗

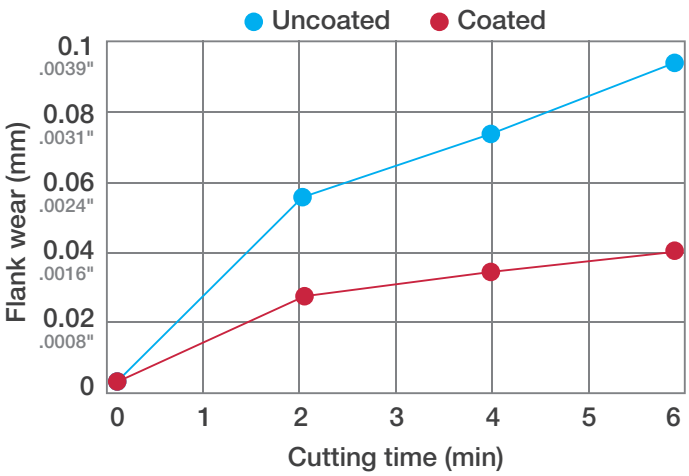
BENEFITS OF COATED CBN



Anti-oxidation wear
PVD coating protects **CBN** from interacting with oxygen.

Enhanced wear resistance
CBN has high thermal conductivity and plastic deformation resistance, preventing the coating from delaminating under extreme temperatures generated during hard turning process.

Coated Grades: BXA10, BXA20, BXA30, BXM10, BXM20, and BXC50



Cutting conditions
Cutting speed: *Vc* = 180 m/min (590 sfm)
Depth of cut: *ap* = 0.2 mm (.008")
Feed: *f* = 0.1 mm/rev (.004")
Coolant: Dry
Workpiece material: SCM415 (60HRC)

Insert wear after 6 minutes

Uncoated

Coated

EDGE PREPARATIONS

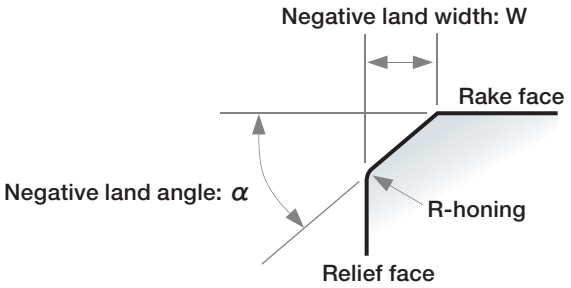
Edge preparation - Designation

Negative land angle → Large

Negative land width → Wide

W (mm) \ α	15°	25°	35°
0.05 .002"	LF	-	LC
0.13 .005"	L	Standard	-
0.18 .007"	-	-	H

BXA10 and BXA20 inserts



S	0	1	3	2	5
Edge prep. ID	Negative land width W			Negative land angle α	

S ··· Chamfered + R-honing

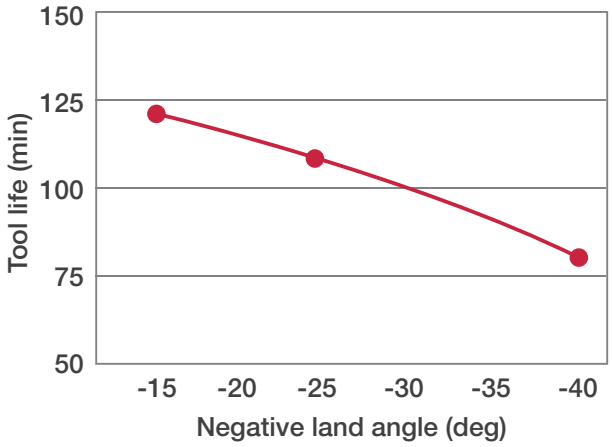
Five standard edge preparations are available for BXA10 and BXA20 inserts for hard turning.

Edge preparation - Selection guide

Based on the performance of the insert with standard edge preparation, the following solutions are recommended.

Standard (S01325)	Problem	Solution
	Generates burrs	-LF (S00515)
	Generates flank wear	-L (S01315)
	Generates crater wear	-LC (S00535)
	Generates fractures	-H (S01835)

Edge preparation - Continuous cutting

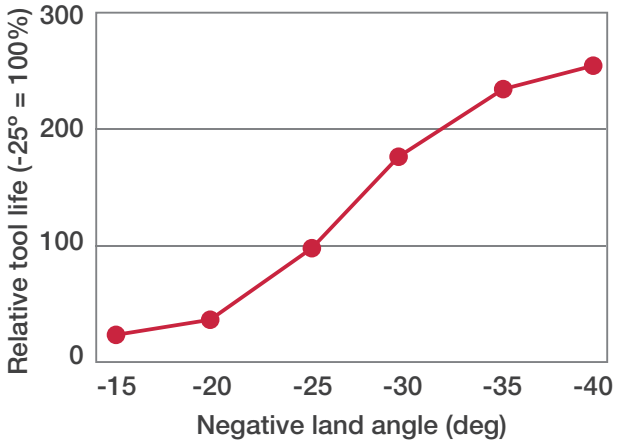


Cutting conditions
Cutting speed: *Vc* = 100 m/min (328 sfm)
Depth of cut: *ap* = 0.25 mm (.010")
Feed: *f* = 0.1 mm/rev (.004")
Coolant: Dry
Continuous cutting
Workpiece material: SCM415 (60HRC)
Criteria: VBmax=0.15mm

Edge preparations
Width: 0.13mm
Angles: -15, -25, and -40°
Honed to: R0.01~0.02 mm (R.0004" ~ .0008")

The smaller the negative land angle is, the more wear resistant the cutting edge will be in continuous cuts.

Edge preparation - Interrupted cutting



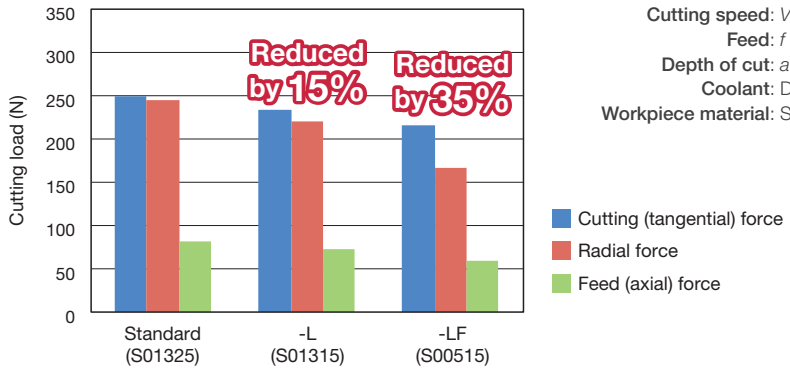
Cutting conditions
Cutting speed: *Vc* = 100 m/min (328 sfm)
Depth of cut: *ap* = 0.25 mm (.010")
Feed: *f* = 0.15 mm/rev (.006")
Coolant: Dry
Workpiece material: SCM415 (60HRC)
Criteria: Fracture

Edge preparations
Width: 0.13 mm
Angles: -15, -20, -25, -30, -35, and -40°
Honed to: R0.01~0.02 mm (R.0004" ~ .0008")

The larger the negative land angle is, the more fracture resistant the cutting edge will be in interrupted cuts.

Edge preparation - Cutting loads

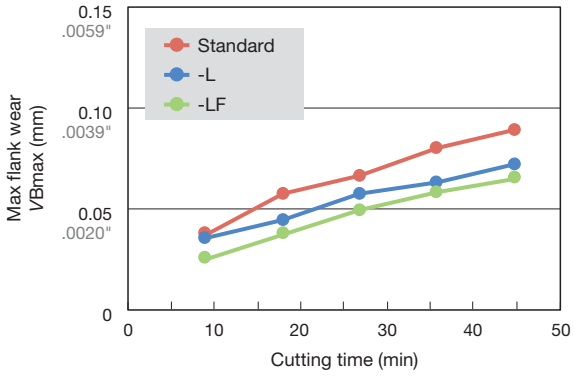
The -L and -LF edge preparations provide reduced cutting loads over the insert with standard edge preparation.



Cutting speed: *Vc* = 100 m/min (328 sfm)
Feed: *f* = 0.3 mm/rev (.012")
Depth of cut: *ap* = 0.2 mm (.008")
Coolant: Dry
Workpiece material: SCM415 (60HRC)

Edge preparation - Flank wear

The -L and -LF edge preparations provide reduced flank wear over the insert with standard edge preparation.



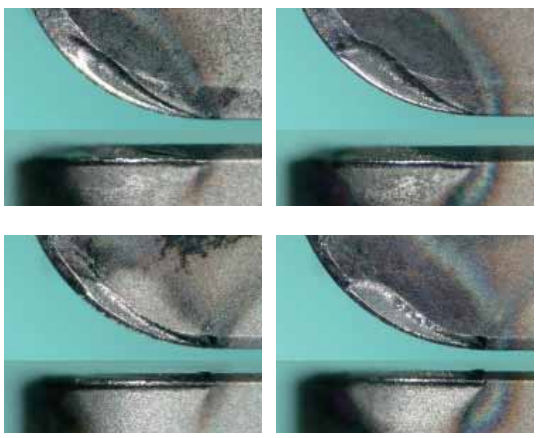
Cutting speed: *Vc* = 130 m/min (426 sfm)
Feed: *f* = 0.15 mm/rev (.006")
Depth of cut: *ap* = 0.2 mm (.008")
Coolant: Wet
Workpiece material: SCM415 (60HRC)

Edge preparation - Crater wear

The -LC edge preparation provides reduced crater wear over the insert with standard edge preparation. As a result, insert fracture induced by crater wear is reduced.

Standard (S01325)

-LC (S00535)



After 2 min | After 6 min

Cutting speed: *Vc* = 200 m/min (656 sfm)
Feed: *f* = 0.1 mm/rev (.004")
Depth of cut: *ap* = 0.2 mm (.008")
Coolant: Dry
Workpiece material: SCM415 (60HRC)