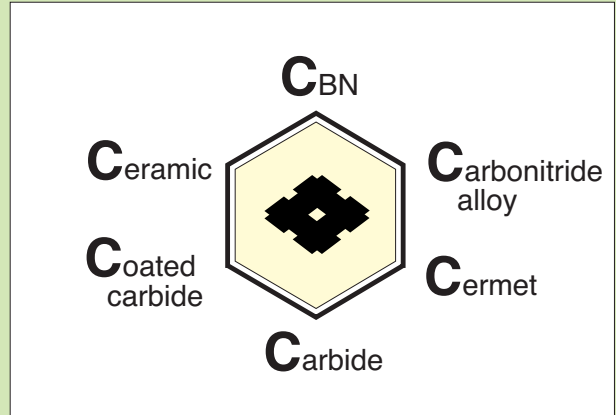


Grades

B



B1 ~ B26



Grades

"ACE-Coat" Series	Coated Grade "ACE-Coat Series"	B2
	"Super FF / ZX" Series	B3
	New	
"ACE-Coat" Series for Steel	AC700G / AC900G / AC820P / AC830P	B4 - 5
for Cast Iron	AC410K / AC700G / AC900G	B6 - 7
for Stainless Steel	AC610M / AC630M	B8 - 9
for Heat Resistant Alloy	AC510U / AC520U New	B10
for Small Parts	AC530U	B11
"ACE-Coat" Series for Milling	ACP100 / ACP200 / ACP300 / ACK200 / ACK300	B12-13
Coated Cermet	T2000Z / T3000Z	B14-15
Uncoated Cermet	T1200A / T250A	B16
Uncoated Carbides	"Igetalloy"	B17
DLC (Diamond Like carbon)	"Aurora" Coat Series	B18
	"ZX" Coating Series	B19
	Advanced Ceramic	B20
Properties	Sumitomo Grades	B21
	Basic Materials	B22
Cutting conditions	Recommended for Main Grades	B23
Comparison Chart	Grades	B24-25

Refer to page L1 ~ and M1 ~ for SumiBoron and SumiDia Products.

"ACE-Coat" Series

High Efficiency & High Reliability Grades

Grades



General Features

Sumitomo's "ACE-Coat" series for turning features a special substrate with an extra tough layer coated with super hard thin films. All these components enable the insert to have excellent wear resistance, toughness and hardness properties. Consequently, steels and cast irons can be machined with higher efficiency.

Turning Application

	Material	Grade	Characteristic · Application
High Speed Finishing - Light Cutting	Steel	AC700G	• Premium grade for "High-Speed" machining of steel.
		AC820P ^{New}	• Excellent plastic deformation and fracture resistance. • Main grade for general machining of steel.
		AC830P ^{New}	• Very tough grade for strong interrupted cutting and rough machining of steel
Medium Cutting	Stainless Steel	AC610M	• M10 grade provides high wear resistance. • Suitable for high performance machining of stainless steel.
		AC630M	• Special substrate with high toughness and special wear resist CVD coating. • Main grade for stainless steel.
		AC410K	• K01 grade provides high wear resistance. • Grey cast iron and ductile cast iron high speed continuous machining.
Heavy Roughing	Cast Iron	AC700G	• High toughness substrate with high adhesive coating for roughing of grey and ductile cast iron.
		AC900G	• Extremely tough grade for hard roughing and heavy interrupted cut of grey and ductile cast iron.
		AC900G	

Milling Application

	Material	Grade	Characteristic · Application
High Speed Finishing - Light Cutting	Steel	ACP100	• Excellent thermal cracking resistance and high wear resistance suitable for high speed wet machining of steel
		ACP200	• PVD Super ZX coating provides excellent wear resistance. • Medium to high speed milling of steel.
Medium Cutting	Stainless Steel	ACP200	• PVD Super ZX coating provides excellent wear resistance. • Medium to high speed milling of steel.
		ACP300	• Super tough substrate with PVD Super ZX-coating • For milling of stainless steel
Heavy Roughing	Cast Iron	ACK200	• Tough fine grades substrate with CVD Super FF coating • For milling of cast iron
		ACK300	• PVD Super ZX coated insert has excellent notch wear resistance. • High speed, high feed milling of cast iron.

"Super FF" CVD Coating

Feature of Coating

"Super FF"	Conventional coating
Surface roughness	Surface roughness
Ra = 0,02 μm	Ra = 0,15 μm

"Super FF / ZX" Series



General Features

The "Super FF coat" is a smooth multi-layer thin film structure of titanium carbonitride and aluminum oxide which provides improved resistance to chip adhesion and wear. This is newly developed CVD coating which is suitable for higher speed turning and milling applications of Steel and Cast Iron.

The "Super ZX coat" is a newly developed PVD coating with super multi layer structure of TiAlN and AlCrN which provide excellent hardness and oxidation resistance by optimizing Titanium and Aluminum quantity and adding Chromium. This PVD coating is suitable for turning and milling of Steels, Stainless Steels and Non-ferrous metals to increase productivity and to extend tool life.

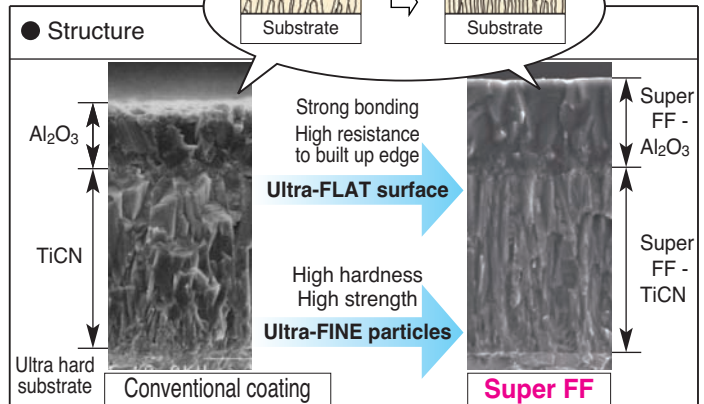
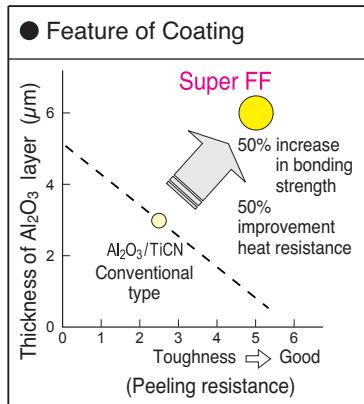
"Super FF" CVD Coating

- Higher bonding strength and adhesion resistance by Flat surface of coating
- Higher hardness and strength by ultra Fine grain of MT-TiCN layer
- 1,5 times higher speed and efficiency machining is possible
- Double tool life compared to conventional grades

Application

AC820P, AC830P	New (For steel turning)
AC410K	(For cast iron turning)
AC610M, AC630M	(For stainless steel turning)
ACP100, ACK200	(For milling)

Characteristics / Performance



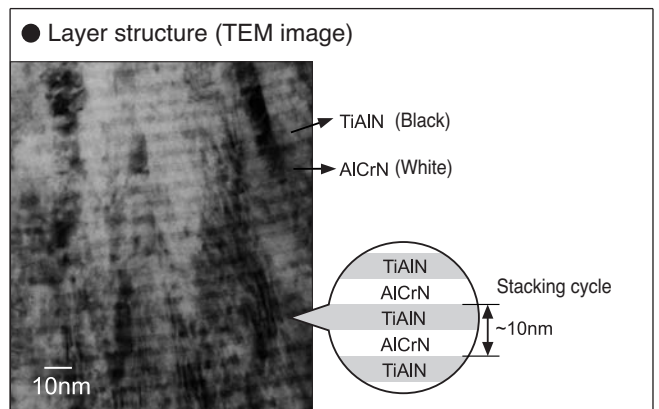
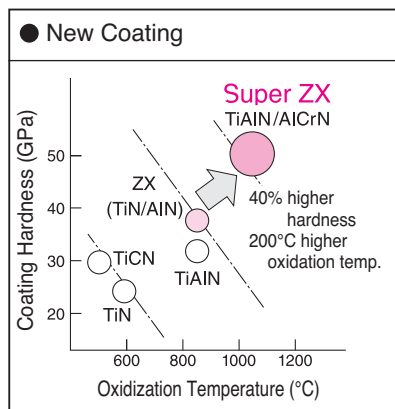
"Super ZX" PVD Coating

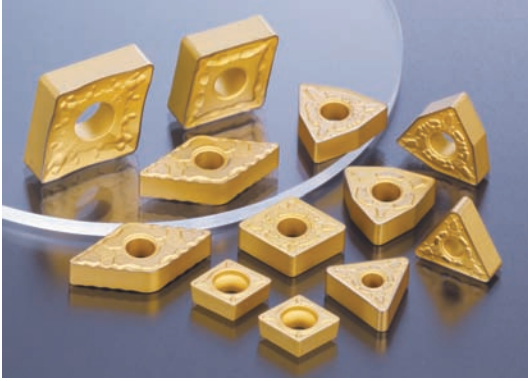
- Super multi layer structure from TiAlN and AlCrN, nano size of each layer
- 40% higher hardness, 200°C higher oxidation temperature
- 1,5 times higher speed and efficiency machining is possible
- Double tool life compared to conventional grades

Application

ACP200, ACP300, ACK300	(For milling)
AC510U New , AC520U New , AC530U	(For turning)

Characteristics / Performance



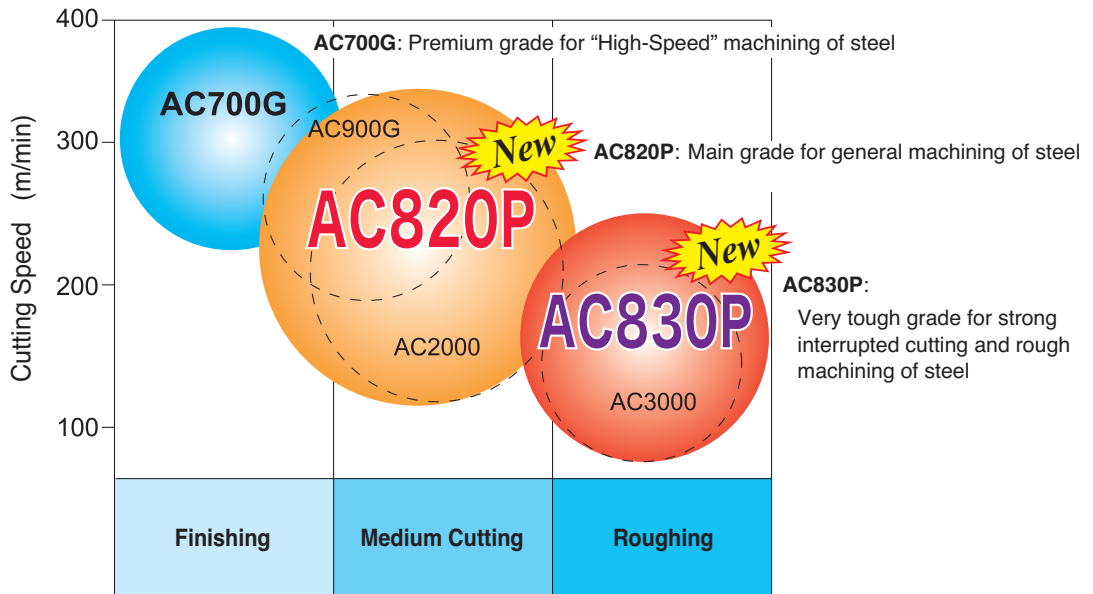


General Features

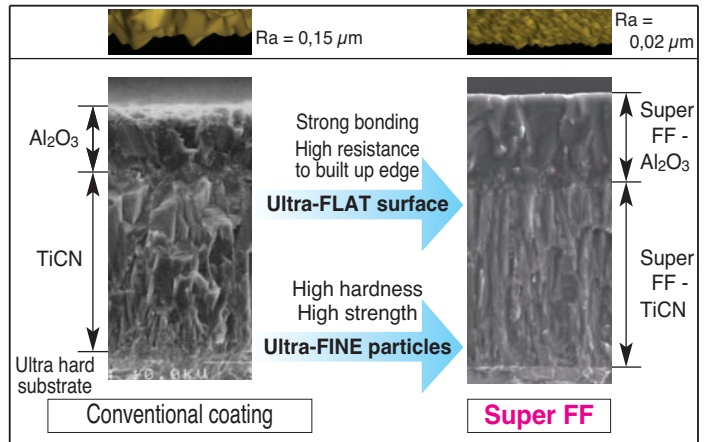
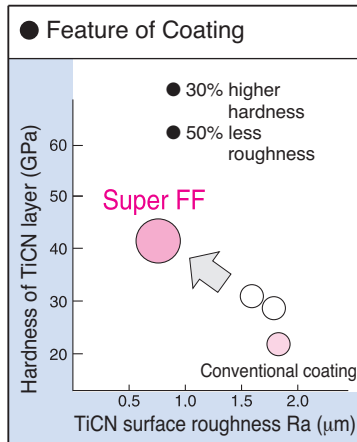
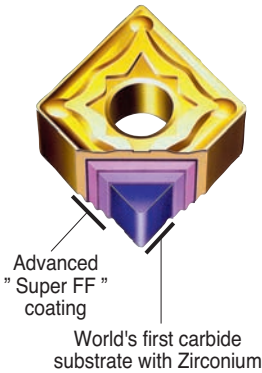
"ACE-Coat" AC820P and AC830P are newly developed "Super FF" (Super Flat and Super Fine grain Al_2O_3 & TiCN layers) coated grades suitable for general machining of carbon and alloy steels. Along with continuous and interrupted cut capability, the tough grade AC830P delivers rigidity values higher than a P30 grade and toughness values better than a P20 grade.

AC700G and AC900G with its tough alumina coating, are suitable of both high speed machining of steel and roughing of cast iron.

Application Range



Characteristics / Performance



Recommended Conditions

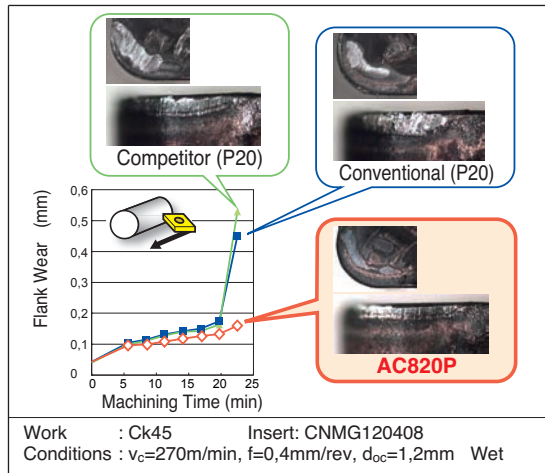
Reference to using CNMG120408 insert

Depth of cut: 1~5mm

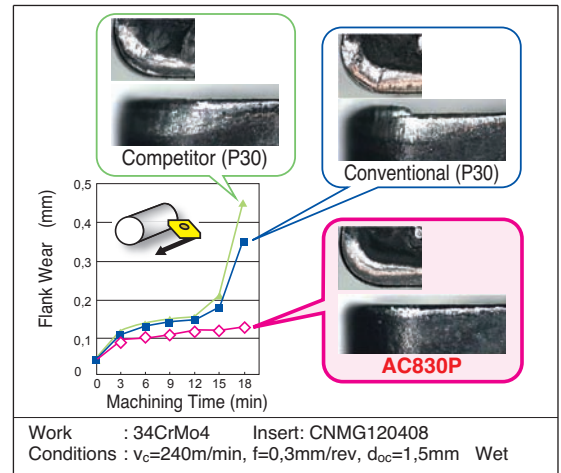
Work Material	Cutting Speed (m/min)		
	AC700G	AC820P New	AC830P New
Low Carbon Steel (Below HB180)	260 — 420	200 — 320	140 — 250
Carbon Steel / Alloy Steel (Below HB280)	210 — 340	150 — 300	110 — 180
Carbon Steel / Alloy Steel (Above HB280)	170 — 280	130 — 250	90 — 150
Feed rate (mm/rev)	0,1 — 0,4	0,1 — 0,5	0,3 — 0,6

■ Performance

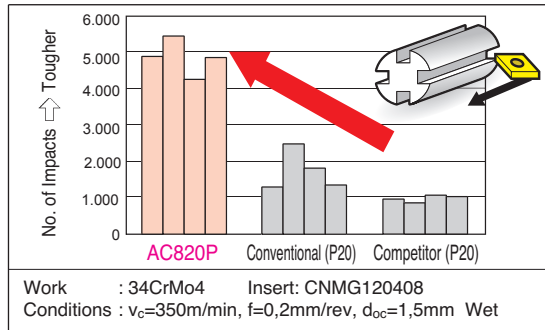
● Wear Resistance of AC820P



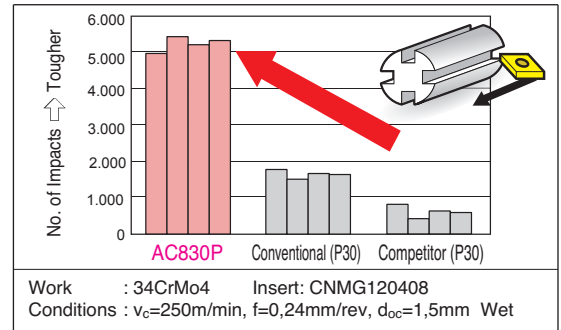
● Wear Resistance of AC830P



● Fracture Resistance of AC820P

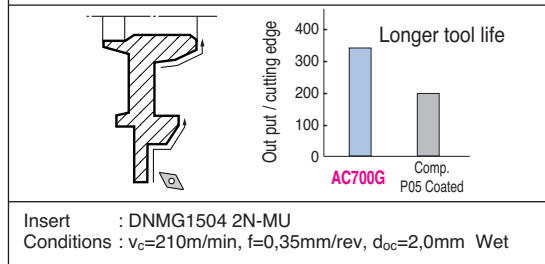


● Fracture Resistance of AC830P

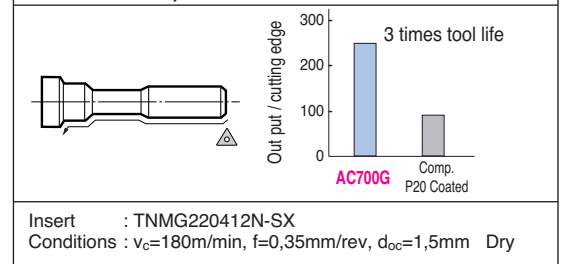


■ Application Example of AC700G

● Ck45 / Hub

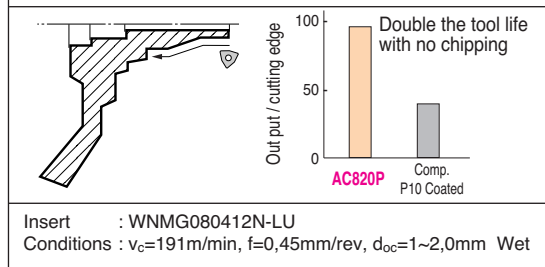


● Ck30 / Propeller Shaft

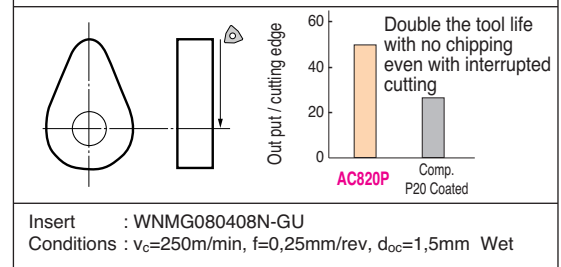


■ Application Example of AC820P

● Ck48 / Knuckle

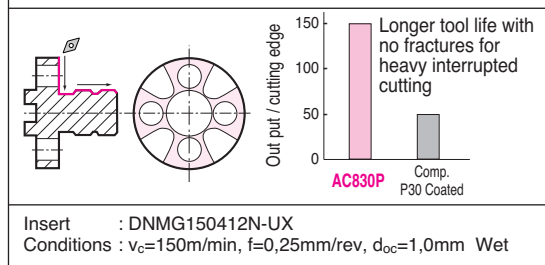


● 34CrMo4 / Cam Part

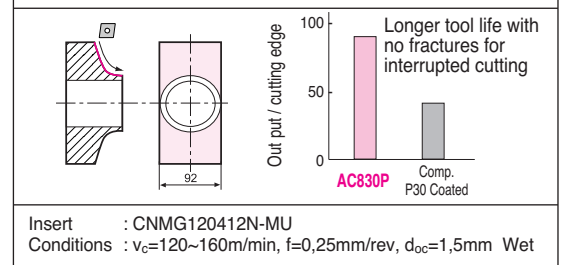


■ Application Example of AC830P

● C55 / Hub



● C50 / Machine Part





General Features

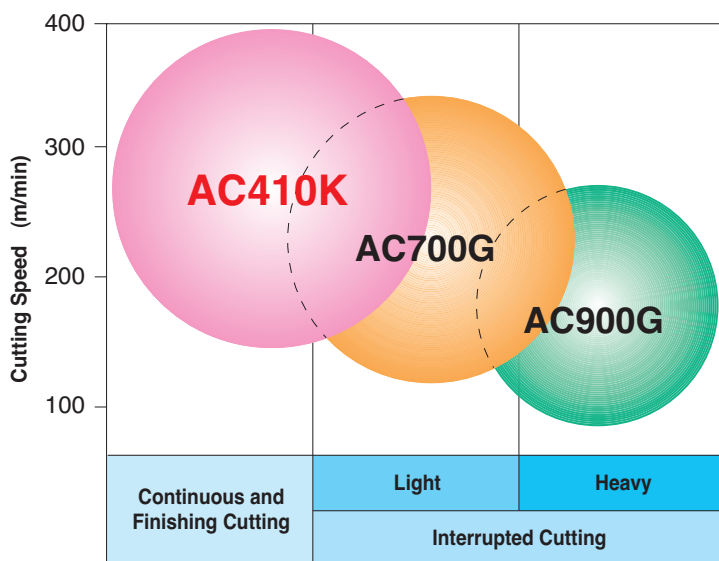
The ultimate grades for grey and ductile cast iron machining. ACE-coat AC410K and AC700G feature newly developed ultra tough zirconium enriched substrates, plus a new thick Al₂O₃ layered CVD coating, which provides superior wear resistance and protection against delamination and chipping under extreme conditions.

AC410K first choice for continuous cutting at higher speeds machining of ductile and grey cast iron

AC700G multi-grade for roughing of ductile and grey cast iron also in medium interrupted cutting

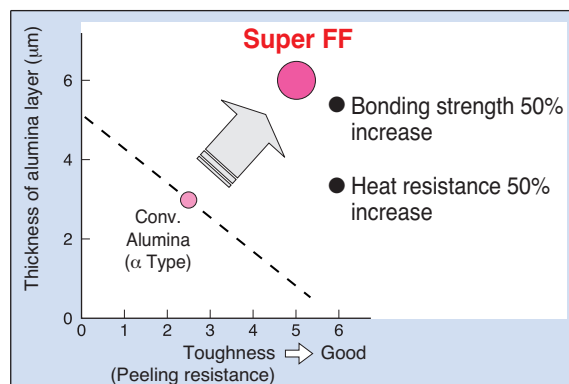
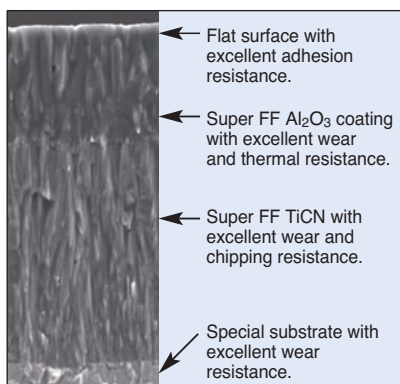
AC900G extremely tough grade for heavy roughing and interrupted cuts.

Application Range



AC410K Features

- The newly developed tough Super FF Al₂O₃ film at high temperatures is 30% harder and 150% more resistant to chipping and peeling.
- Compared with a competitors grade the tool life was double.
- The cutting efficiency is improved by 50% substantially improving productivity.
- Suitable for dry machining.



Recommended Cutting Condition

● Grey Cast Iron (GG)

Application	Recommended		Cutting Speed (m/min)	
	Grade	Chipbreaker	Feed (mm/rev)	Feed (mm/rev)
Light and Continuous Cutting	AC410K	NUZ	100 ————— 400 0,1 ————— 0,6	
Medium ~ Rough Cutting	AC700G	— (NUZ)	100 ————— 350 0,1 ————— 0,8	
Interrupted Cutting	AC900G	NUX (NUZ)	100 ————— 300 0,1 ————— 0,6	
Heavy Duty Cutting	AC900G	— (NUX)	100 ————— 250 0,1 ————— 0,6	

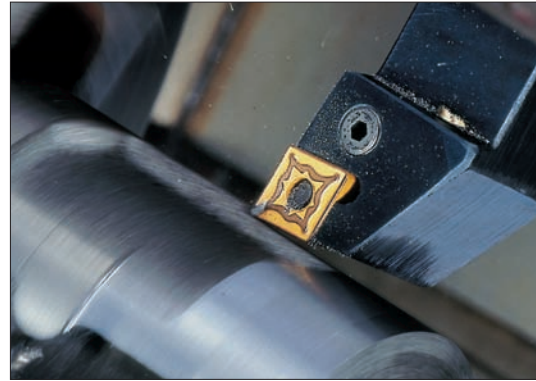
● Ductile Cast Iron (GGG)

Application	Recommended		Cutting Speed (m/min)	
	Grade	Chipbreaker	Feed (mm/rev)	Feed (mm/rev)
Light and Continuous Cutting	AC410K	NUZ	150 ————— 350 0,1 ————— 0,5	
Medium ~ Rough Cutting	AC700G	NUX	100 ————— 280 0,1 ————— 0,4	
Interrupted Cutting	AC900G	NUX (NUZ)	100 ————— 250 0,1 ————— 0,4	
Heavy Duty Cutting	AC820P	NUX (NMU)	100 ————— 200 0,1 ————— 0,4	



AC410K

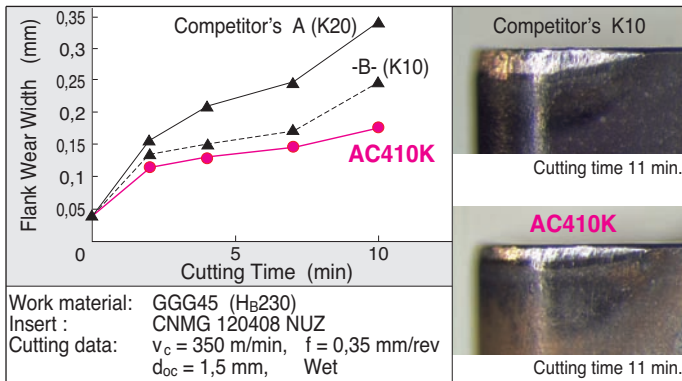
The Super FF coat on grade AC410K is a smooth multilayer thin film structure of titanium carbonitride and aluminium oxide which provides improved resistance to chip adhesion and wear. This newly developed CVD grade is suitable for higher speed turning of Ductile Cast Iron and Grey Cast Iron in the light to medium rough, continuous cutting application range. AC410K compliments heavy roughing grades AC820P for Ductile Cast Iron and AC700G for Grey Cast Iron.



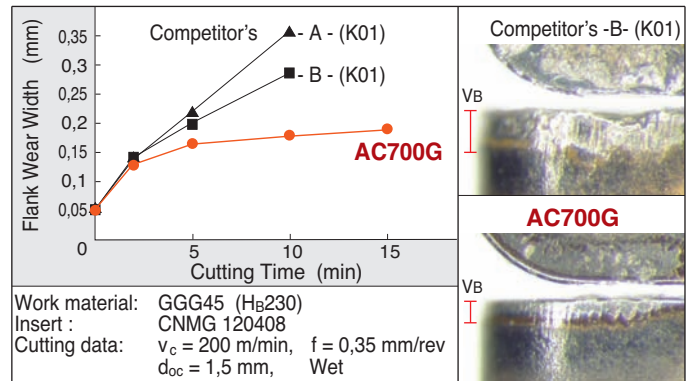
AC700G / AC900G

The reliable grades AC700G and AC900G were developed for roughing of ductile and grey cast irons and employed a coating technology which smooths the surface film and improves resistance to fusion peeling. The new AC700G and AC900G offer reliable edge security under extreme conditions, and can be used on roughing and medium to heavy interrupted cut applications.

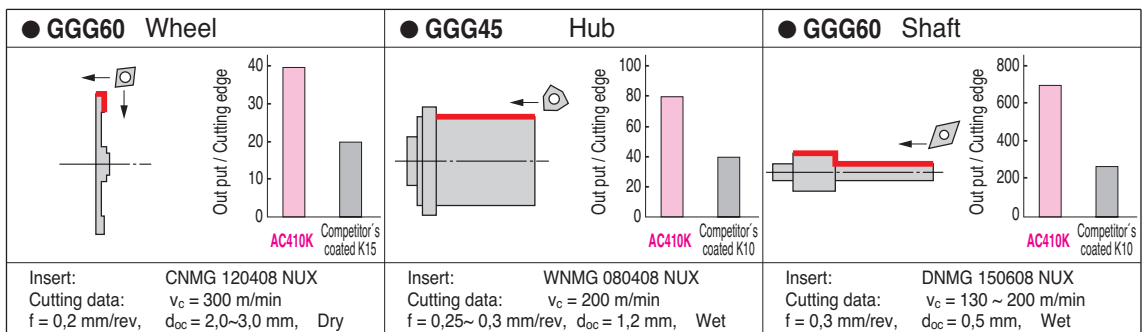
AC410K Performance (Continuous Cutting)



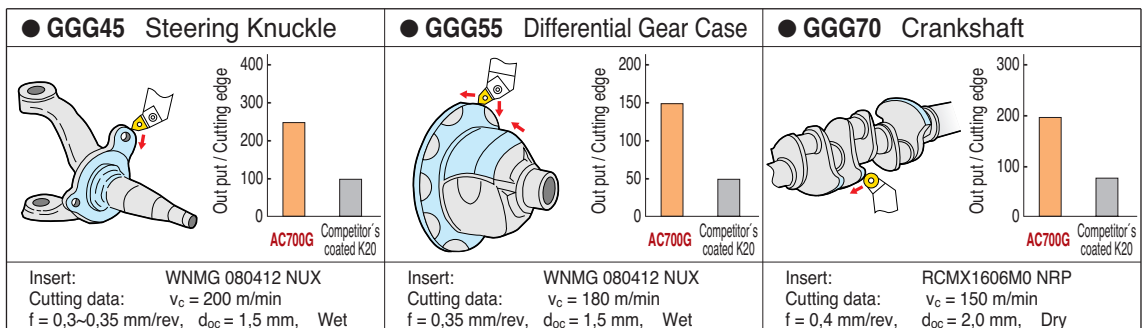
AC700G Performance (Interrupted Cutting)



Application eg. of AC410K



Application eg. of AC700G





General Features

AC610M and AC630M are special "Super FF" coated grades for the machining of stainless steel.

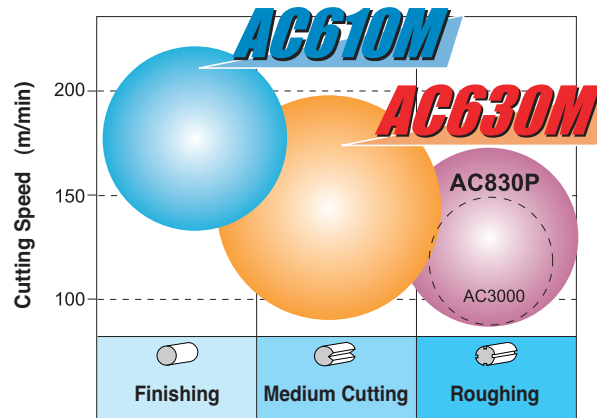
Due to improved welding resistance and notch wear resistance resulting from the latest coating technology, improved notch wear resistance leads to a more stable and long tool life.

Advantages

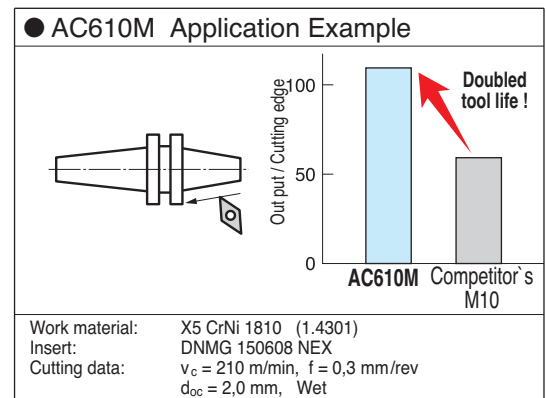
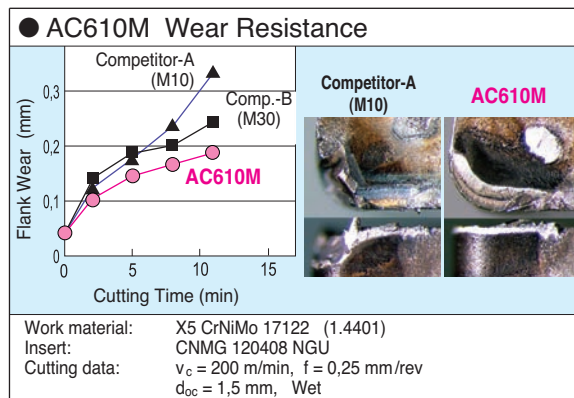


- Fine grain TiCN layer provides high peeling resistance to special carbide substrate and excellent wear resistance
- Newly developed fine grain α -Al₂O₃ coating with high hardness and high adhesion resistance
- **AC610M** : High wear resistance grade for high performance machining of stainless steel
- **AC630M** : Main grade with special tough substrate provides smooth and reliable machining of stainless steel

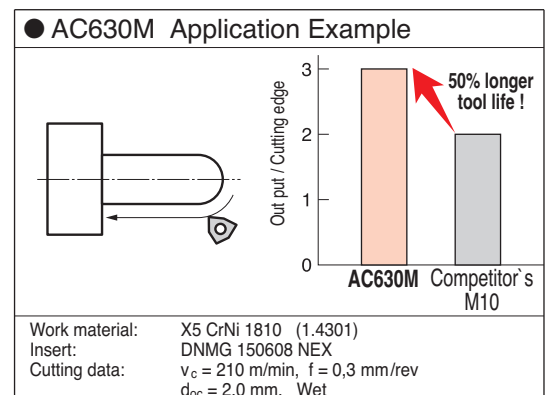
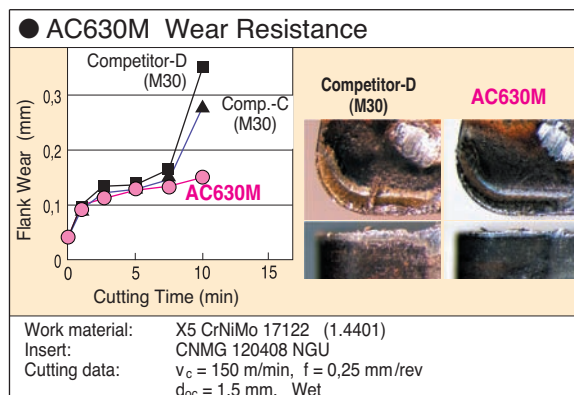
Application Range

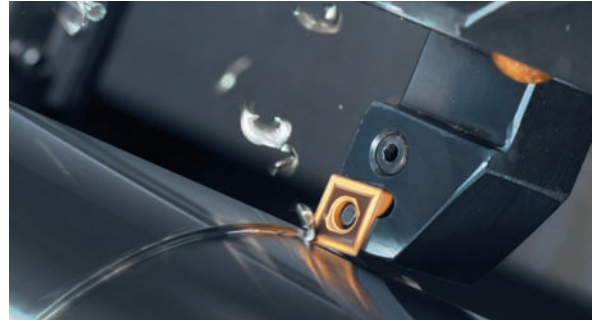


Efficiency of AC610M



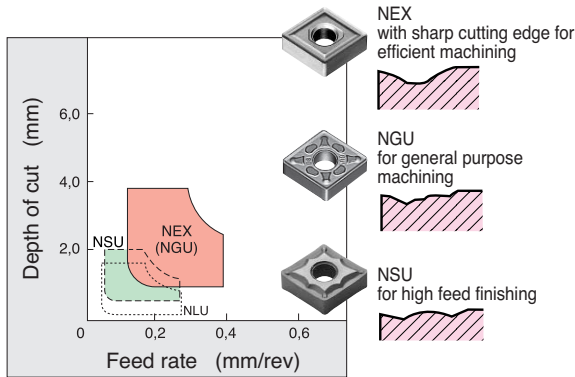
Efficiency of AC630M



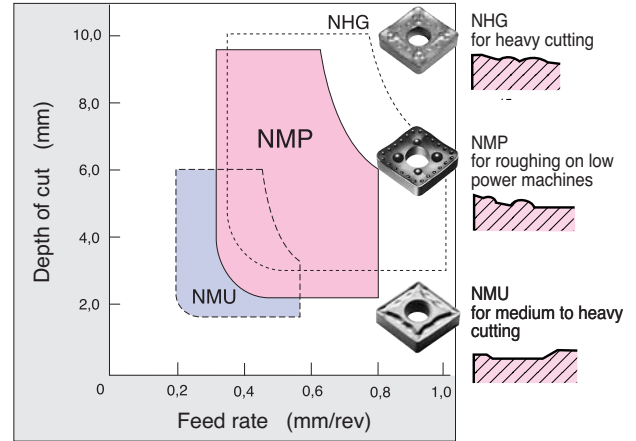


■ Chipbreakers

- For finishing and light cut operations



- For roughing operations



■ Recommended Cutting Conditions

Feed rate: f (mm/rev)
Cutting speed: v_c (m/min)

	Work material	W-No.	DIN EN	JIS (UNS)	AISI	AC610M			AC630M		
						$f = 0,2$	$f = 0,4$	$f = 0,6$	$f = 0,2$	$f = 0,4$	$f = 0,6$
						v_c	v_c	v_c	v_c	v_c	v_c
1	Free-machining stainless steels Ferritic stainless steels Martensitic stainless steels Easy to machine	1.4305	X8 CrNiS 18 9	SUS303	303	300	235	195	235	180	155
		1.4005	X12 CrS 13	SUS416	416						
		1.4029	X29 CrS 13	SUS420F	420F						
				SUS440F							
		1.4002	X6 CrAl 13	SUS405	405						
2	Ferritic stainless steels Martensitic stainless steels Good machinability	1.4105	X6 CrMoS 17	SUS430F	430F	265	205	170	210	160	140
				SUS403	403						
		1.4006	X12 Cr 13	SUS410	410						
		1.4021	X20 Cr 13	SUS420J1	420						
		1.4028	X30 Cr 13	SUS420J2	420						
		1.4016	X6 Cr 17	SUS430	430						
		1.4057	X19 CrNi 17 2	SUS431	431						
1.4308	X6 CrNi 18 9	SCS13									
3	Martensitic stainless steels Austenitic stainless steels Difficult to machine	1.4301	X5 CrNi 18 10	SUS304	304	230	180	150	180	140	120
		1.4307	X2 CrNi 19 11	SUS304L	304L						
		1.4311	X2 CrNiN 18 10	SUS304LN	304LN						
		1.4401	X4 CrNiMo 17 12 2	SUS316	316						
		1.4404	X2 CrNiMo 17 12 2	SUS316L	316L						
		1.4571	X6 CrNiMoTi 17 12 2	SUS316Ti	(S31635)						
				SUS317	317						
		1.4541	X6 CrNiTi 18 10	SUS321	321						
		1.4109	X70 CrMo 15	SUS440A	440A						
				SUS440B	440B						
				SUS440C	440C						
4	Austenitic stainless steels Very difficult to machine	1.4319	X5 CrNi 17 7	SUS301	301	185	145	120	145	110	95
		1.4306	X2 CrNi 18 9	SUS302	302						
				SUS304N1	304N						
				SUS304N2	(S30452)						
				SUS309S	309S						
			X6 CrNi 25 20	SUS310S	310S						
		1.4406	X2 CrNiMoN 17 12 2	SUS316LN	316LN						
		1.4550	X6 CrNiNb 18 10	SUS347	347						
5	Austenitic-Martensitic (Duplex) stainless steels Precipitation hardening stainless steels Extremely difficult to machine			SUS316J1		140	110	90	110	85	70
		1.4542	X5 CrNiCuNb 16 4	SUS630	S17400						
		1.4568	X7 Cr NiAl 17 7	SUS631	S17700						
			X4 CrNiMo 27 5 2	SUS329J1							
		1.4462	X2 CrNiMoN 22 5 3	SUS329J3L	31803						
		1.4507	X2 CrNiMoCuN 25 6 3	SUS329J4L	32250						
		1.45742	X5 CrNiCuNb 17 4	SCS24	S17400						



General Features

AC510U and AC520U are special grades for the machining of exotic metals such as Heat Resisting Steels and Titanium Alloys.

With better wear and notch-wear resistance, these grades exhibit a more stable tool life as compared to conventional grades.

Advantages

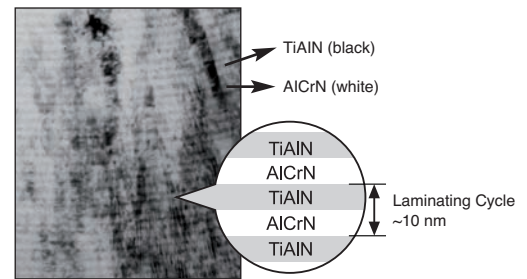


- For super alloys with Fe, Ni or Co base and Titanium alloys
- Super ZX Coat shows superior wear and thermal resistance
- Twice or more longer tool life

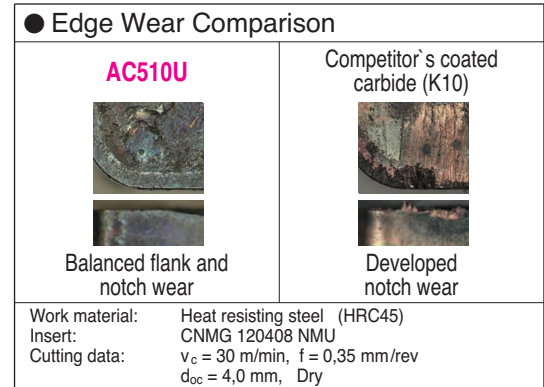
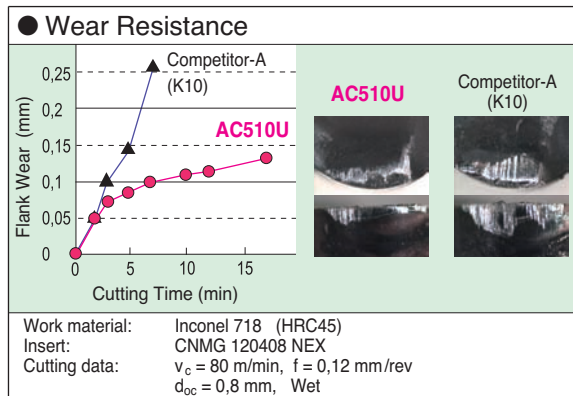


- AC510U:** For continuous cutting
- AC520U:** For roughing, interrupted cutting

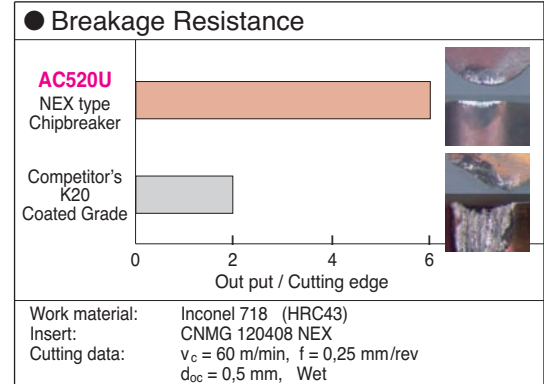
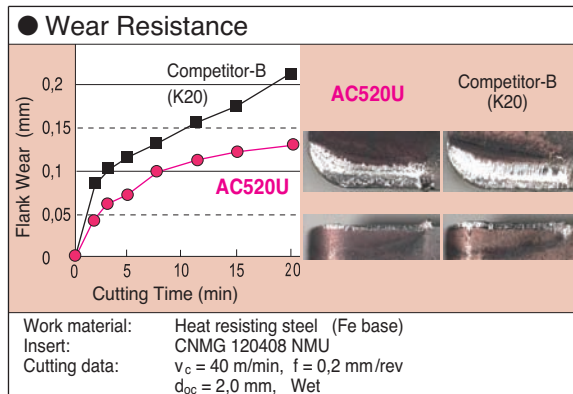
"Super ZX" 1000x TiAlN/AICrN layers



Efficiency of AC510U



Efficiency of AC520U



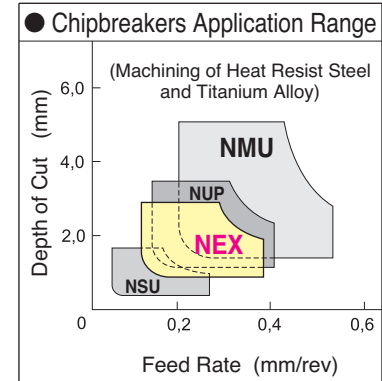
Recommended Conditions

Application Field

Finishing ~ Light Cutting	Medium ~ Interrupted Cutting
AC510U	
	AC520U

Recommended Conditions

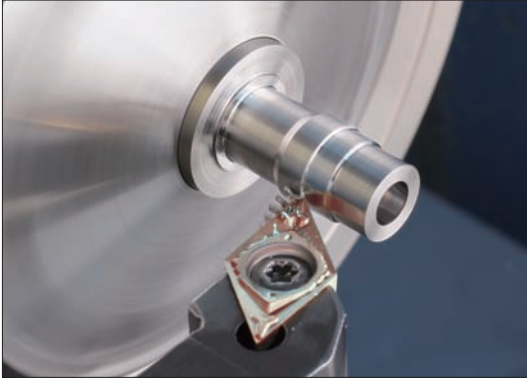
Work material	v_c (m/min)	f (mm/rev)
Ni - based alloys (Inconel718/x750, Waspalloy)	30 — 80	0,1 — 0,3
Fe - based alloys (A286, Incoloy800/801)	30 — 70	0,1 — 0,3
Co - based alloys (Stellite, S816, HS30)	30 — 60	0,1 — 0,3
Ti - based alloys (Ti-6Al-4V)	30 — 70	0,1 — 0,3



Superb "Super ZX" Coated Grade
for High Precision Small Parts Turning

ACE-Coat
AC530U

Grades



Ultra hard "Super ZX" coated grade with extra tough substrate

- Excellent grade for
 - High performance turning of small precision components
 - Suitable for most steels
 - Ideal for grooving applications

■ Advantages

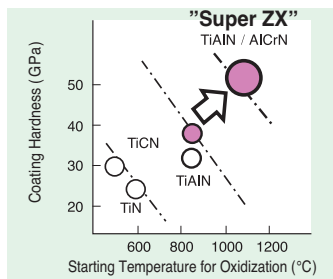


- The ultra hard Super ZX coat doubles tool life.
- The ultra smooth Super ZX coat prevents chip adhesion and increases productivity.
- The newly developed chip breaker efficiently clears swarf from the cutting area.
- Improves productivity - machines more parts per hour than a competitors grade

■ Performance

- Increased feed rates from high shear cutting action and efficient chip evacuation
- 40% increase in coating hardness and 200% increase in oxidation resistance

● Oxidation Temperature

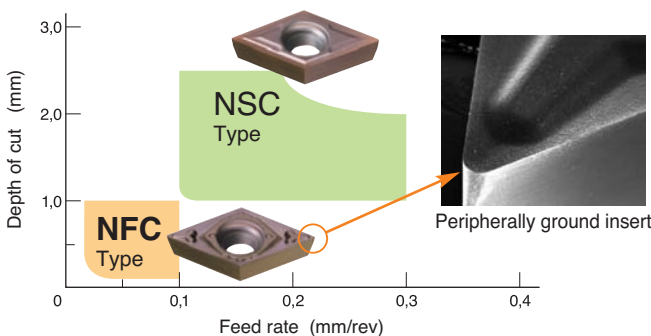


■ Recommended Cutting Conditions

Work material	v _c (m/min)	f (mm/rev)
Free-cutting steel	50 ————— 200	0,02 ————— 0,15
Carbon steel Alloy steel	50 ————— 200	0,02 ————— 0,1
Stainless steel	50 ————— 200	0,02 ————— 0,1

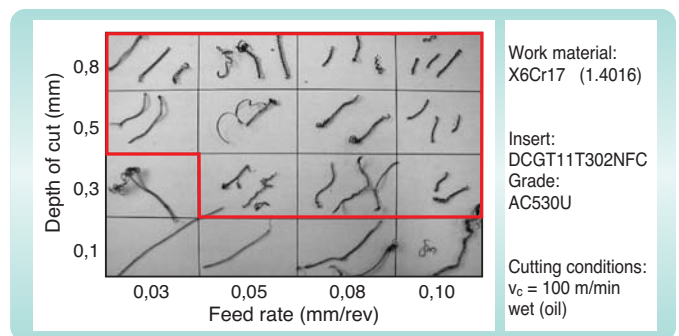
■ New NFC Type Chip Breaker

● Application Range



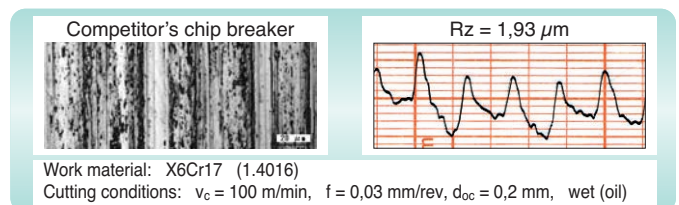
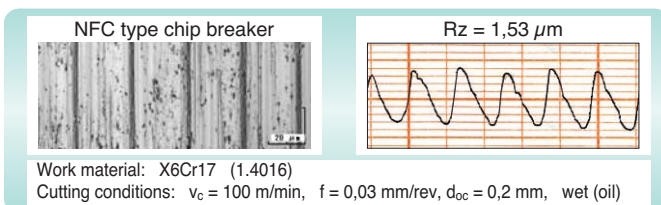
Excellent Chip Control

New higher speed cutting breaker for efficient and reliable chip removal



Excellent Surface Finish

The precision ground sharp cutting edge greatly improves surface finish

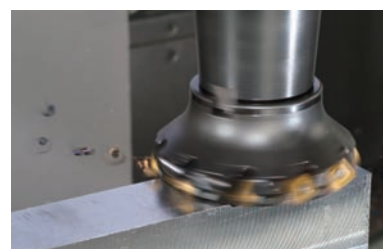




General Features

Introducing 5 new "ACE-Coat" grades which utilize the latest in CVD coating "Super FF" and PVD coating "Super ZX", for high cutting edge reliability during high speed and high efficiency milling operations.

Achieving stability and longer tool life with "ACE-Coat" ACP100, ACP200 and ACP300 for general steel, die steel and stainless steel, and "ACE-Coat" ACK200 and ACK300 for cast iron and ductile cast iron.



Characteristics

Coated Grades for General Steel, Die Steel and Stainless Steel

Grade	Coating	Applications	Characteristics
ACP100	"Super FF" (Flat and Fine)	General ~ High speed machining and wet cutting	Excellent wear and thermal crack resistance with new Ti-based CVD "Super FF (Flat and Fine) Coating"
ACP200	"Super ZX"	General machining of general steel and die steel	Excellent balance of wear and chipping resistance by Cr added new PVD "Super ZX Coating" and tough carbide substrate.
ACP300	"Super ZX"	General to heavy duty machining of steel and stainless steel	Excellent toughness by Cr added new PVD "Super ZX Coating" and extremely tough carbide substrate.

Coated Grades for Cast Iron

Grade	Coating	Applications	Characteristics
ACK200	"Super FF" (Flat and Fine)	General machining of cast iron and ductile cast iron	Excellent wear resistance and tough CVD "Super FF (Flat and Fine) Coating" with Ti-based Al ₂ O ₃ layer.
ACK300	"Super ZX"	General to heavy cut machining of cast iron and ductile cast iron	Excellent toughness with fine grain carbide substrate. Cr added new PVD "Super ZX Coating" could improve hardness and oxidation resistance.

Application Field

ISO	Light Cutting	Medium Cutting	Roughing	Heavy Roughing
	P10 (M10)	P20 (M20)	P30 (M30)	P40 (M40)
P Steel M Stainless Steel	ACP100			
	ACP200			
ACP300				
ISO	Finishing	Light Cutting	Medium Cutting	Roughing
	K01	K10	K20	K30
K Cast Iron	ACK200			
	ACK300			

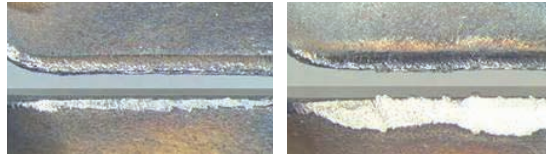
Recommended Cutting Condition

ISO	Work Material	Cutting speed: v_c (m/min)		Feed rate: f_t (mm/tooth)	
		80	300	0,1	0,4
P Steel	Carbon Steel / Alloy Steel	80	300	0,1	0,4
	Die Steel (~ HRC30)	80	230	0,1	0,3
	Die Steel (HRC30~60)	80	200	0,1	0,3
M Stainless Steel	Stainless Steel	80	250	0,1	0,3
K Cast Iron	GG Grey Cast Iron	80	250	0,1	0,3
	GGG Ductile Cast Iron	80	230	0,1	0,3

Application Example of ACP100

(Edge Wear Comparison)

Work material: X155CrVMo12-1 (Alloy tool steel, raw material)
 Cutter: WGC4100RS, Insert: SEMT13T3AGSN-G
 Cutting data: $v_c = 150$ m/min, $f_t = 0,15$ mm/teeth
 $d_{oc} = 2,0$ mm, $w_{oc} = 50$ mm, Dry

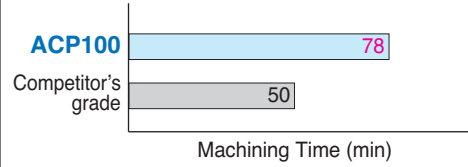


ACP100

Competitor's grade

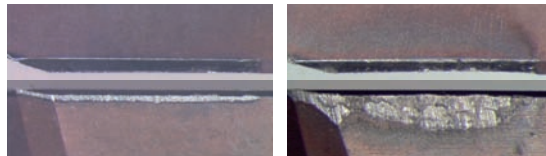
(Tool Life or Output Comparison)

Work material: C50
 Cutter: GC4100RS, Insert: SEMT13T3AGSN-H
 Cutting data: $v_c = 150$ m/min, $f_t = 0,32$ mm/teeth
 $d_{oc} = 2,0$ mm, $w_{oc} = 50$ mm, Dry



Application Example of ACP200

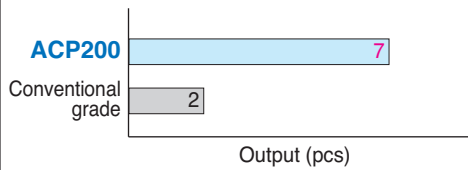
Work material: X40CrVMo5-1 (Alloy tool steel, raw material)
 Cutter: FPG4160RS, Insert: SDKN42MT
 Cutting data: $v_c = 180$ m/min, $f_t = 0,2$ mm/teeth
 $d_{oc} = 2,0$ mm, Dry



ACP200

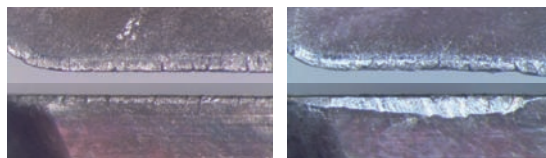
Conventional Grade

Work material: 42CrMo4
 Cutter: WGC4080RS, Insert: SEET13T3AGSN-G
 Cutting data: $v_c = 254$ m/min, $f_t = 0,2$ mm/teeth
 $d_{oc} = 2,0$ mm, Dry



Application Example of ACP300

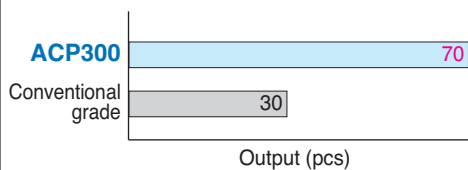
Work material: X10CrNiS189
 Cutter: UFO4160RS, Insert: SFKN12T3AZTN
 Cutting data: $v_c = 200$ m/min, $f_t = 0,15$ mm/teeth
 $d_{oc} = 2,0$ mm, Dry



ACP300

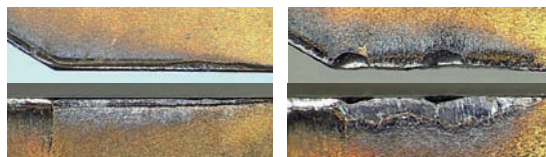
Conventional grade

Work material: XCrNiMo17122
 Cutter: FPG4160RS, Insert: SDKN42MT
 Cutting data: $v_c = 63$ m/min, $f_t = 0,2$ mm/teeth
 $d_{oc} = 1,5$ mm, Wet



Application Example of ACK200

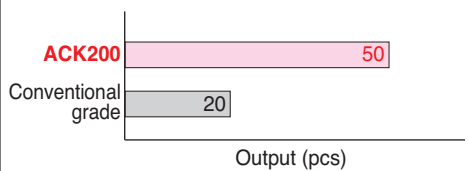
Work material: GG25
 Cutter: DPG 4200RS, Insert: SPCH42R
 Cutting data: $v_c = 150$ m/min, $f_t = 0,15$ mm/teeth
 $d_{oc} = 3,0$ mm, Dry



ACK200

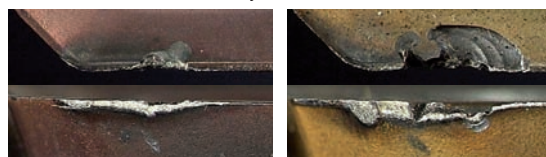
Conventional grade

Work material: GGG40.3
 Cutter: UFO4100RS, Insert: SFKN12T3AZTN
 Cutting data: $v_c = 230$ m/min, $f_t = 0,3$ mm/teeth
 $d_{oc} = 3,0$ mm, Dry



Application Example of ACK300

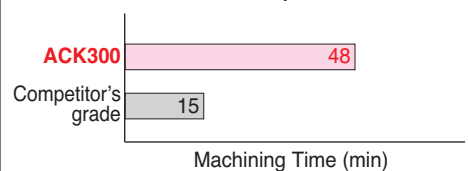
Work material: GGG40.3
 Cutter: WGC4100RS, Insert: SEMT13T3AGSN-G
 Cutting data: $v_c = 200$ m/min, $f_t = 0,12$ mm/teeth
 $d_{oc} = 2,0$ mm, Dry



ACK300

Competitor's grade

Work material: GG25
 Cutter: WGC4160RS, Insert: SEMT13T3AGSN-G
 Cutting data: $v_c = 250$ m/min, $f_t = 0,2$ mm/teeth
 $d_{oc} = 2,0$ mm, Dry



Cermet / Coated Cermet

Grades



General Features

Cermets are used to produce excellent surface finish and high precision machining because of their low adhesion with steels. The most versatile cermets developed by Sumitomo are the latest T1200A for turning and T250A for milling. In addition, PVD coated cermet grades also widen the range of applications.

Turning Application

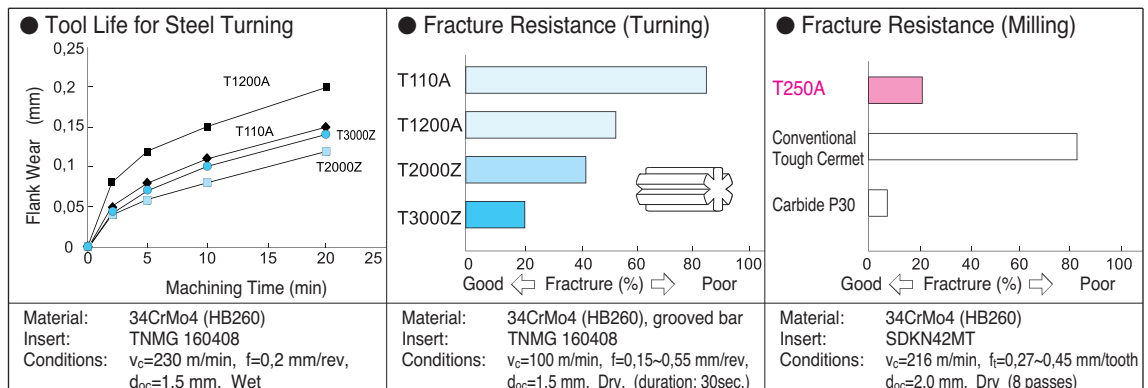
Type	Grade	Characteristic · Application
Cermet	T110A	<ul style="list-style-type: none"> High wear resistance and toughness. For finishing of steels and cast iron.
	T1200A	<ul style="list-style-type: none"> Excellent high wear resistance with good toughness. Finishing to medium speed machining of steel.
	T130A	<ul style="list-style-type: none"> High content, fine cermet grain improve toughness. Medium to low speed machining of steel.
Coated Cermet	T2000Z	<ul style="list-style-type: none"> ZX-Coating improves adhesion resistance. High speed machining of steel.
	T3000Z	<ul style="list-style-type: none"> ZX-Coating with good adhesion strength. Medium to finish interrupted machining of steel

Material	Grade	Application
Steel (P)	Cermet	High Speed Finishing - Light Cutting
Steel (P)	Coated Cermet	Medium Cutting
Cast Iron (K)	Cermet	Roughing

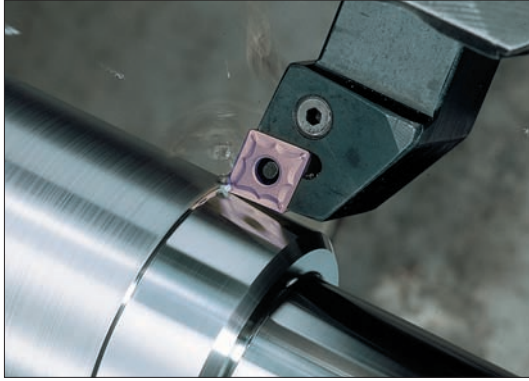
Milling Application

Type	Grade	Characteristic · Application
Cermet	T250A	<ul style="list-style-type: none"> Strong cutting edge enhances chipping resistance. General steel and stainless steel.

Performance



ZX-Coated Grade for Turning of Steels



General Features

ZX-Coated new cermet grades are suitable for light to medium turning of alloy steels, carbon steels, and soft steels at depths of cut up to 3mm.

T2000Z makes holding size more reliable, increases tool life, gives excellent surface finish, and can be used wet or dry.

T3000Z is a new tough grade for roughing and interrupted cuts.

Grades

Advantages



- New high hardness ZX-coating doubles the tool life as compared to conventional cermets.
- Improvements on the density and smoothness of the coating results in consistent beautiful finishing.
- **T2000Z**: For continuous machining, from high speed cutting to medium cutting.
- **T3000Z**: Special tough cermet substrate for medium to interrupted cutting



Performance

Wear Resistance	Edge Comparison	Breakage Resistance
<p>Flank Wear (mm)</p> <p>Cutting Time (min)</p> <p>Competitor's coated cermet</p> <p>T3000Z</p> <p>T2000Z</p>	<p>Competitor's coated cermet</p> <p>T3000Z</p>	<p>(Brittle) ← → (Tougher)</p> <p>Number of impact</p> <p>T3000Z</p> <p>T2000Z</p> <p>Competitor's coated cermet</p>
<p>Insert: CNMG 120408 (HB260)</p> <p>Work material: 34CrMo4</p> <p>Cutting data: $v_c = 200$ m/min, $f = 0,30$ mm/rev, $d_{oc} = 1,5$ mm, Wet</p>		<p>Insert: CNMG 120408</p> <p>Work material: 34CrMo4</p> <p>Cutting data: $v_c = 200$ m/min, $f = 0,25$ mm/rev, $d_{oc} = 1,5$ mm, Wet</p>

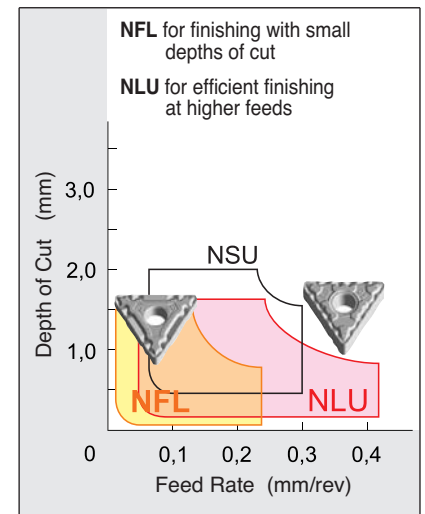
Application Range

High Speed Cutting	Finishing	Medium Cutting	Interrupted Cutting
	T2000Z		
		T3000Z	
	T110A		
		T1200A	

Recommended Cutting Condition

Work Material		Cutting Speed v_c (m/min)	Feed Rate f (mm/rev)
Low Carbon Steel	<HB150	100 — 400	0,1 — 0,3
Carbon Steel	<HB280	100 — 300	0,1 — 0,3
Alloy Steel	HB280 ~350	50 — 250	0,1 — 0,2

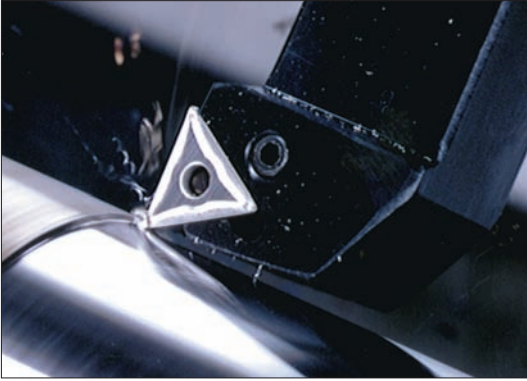
New Chip Breakers



For Steel Turning

T1200A

Grades



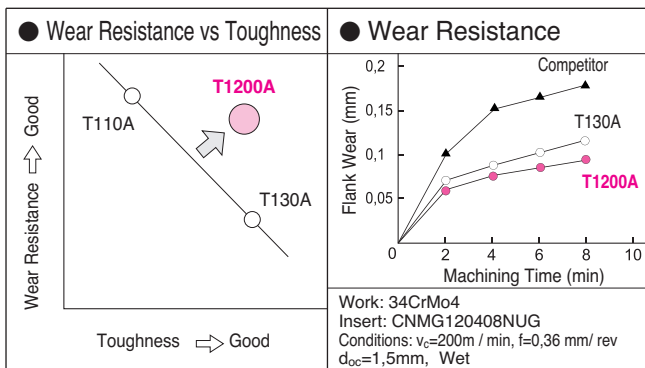
General Features

T1200A was developed for a wide application range from finishing to rough machining. With its improved wear and fracture resistance, high speed machining of steel is also possible. Furthermore, with good thermal cracking resistance, wet cutting can be performed.

Advantages

- High efficiency high speed machining with improved wear resistance.
- Sharp cutting edge that produces excellent surface finish.
- Wet cut possible with good thermal cracking resistance.
- Stable tool life with good fracture resistance
- Available in a variety of chipbreakers.

Performance

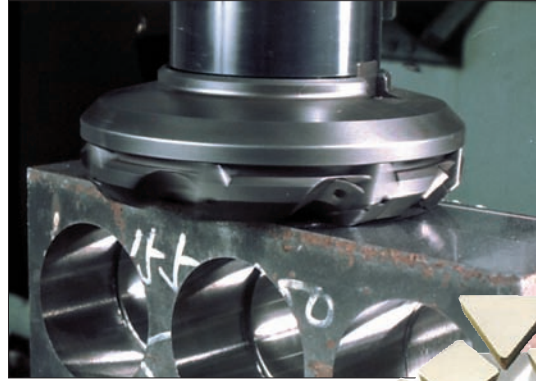


Recommended conditions

● Application Range					● Recommended conditions	
ISO	P05	P10	P20	P30	Cutting speed (m/min) Feed (mm/rev)	
Grade			T1200A		Soft Steel (Below HB150)	100 — 300 0,1 — 0,3
		T110A			Carbon Steel Alloy Steel (Below HB280)	100 — 250 0,1 — 0,3
			T130A		Carbon Steel Alloy Steel (Above HB280)	50 — 200 0,1 — 0,2

For Steel Milling

T250A



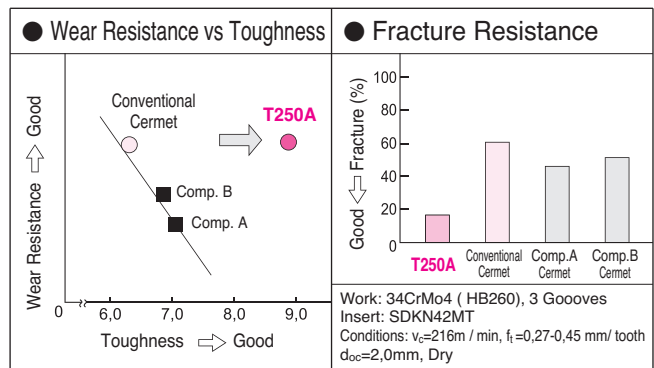
General Features

T250A features a strong cutting edge and excellent wear resistance with a tool life 2 to 3 times that of conventional cermets. With its high toughness properties, high efficiency and excellent tool life can be expected in the milling of Alloy steel, Carbon steel, Stainless steel, Die steel as well as some special materials.

Advantages

- 30% higher K_{1C} value, as compared to conventional cermets, improves edge toughness and tool life.
- High toughness and hardness improve wear resistance.
- Stable milling of general steel, stainless steel and die steel etc.

Performance



Recommended conditions

● Application Range					● Recommended conditions	
ISO	P05	P10	P20	P30	Cutting speed (m/min) Feed (mm/tooth)	
Grade				T250A	Carbon Steel Alloy Steel	120 — 250 0,1 — 0,3
					Soft Steel	150 — 300 0,1 — 0,3
					Stainless Steel	80 — 230 0,1 — 0,2
					Die Steel	60 — 180 0,1 — 0,2

"Igetalloy" Carbides



General Features

Sumitomo has been developing carbide grades for the past 70 years. Since then many grades have been developed, improved as well as terminated, all with respect to the ever changing industrial needs.

With this vast experience, the development of the high toughness A30 for steel machining, EH10 and EH20 for hard-to-cut materials are just some examples of our achievements.

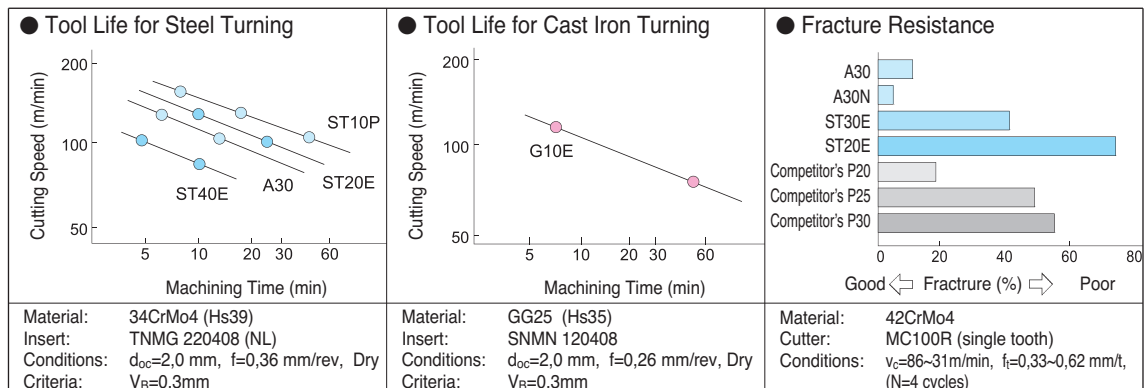
Turning Application

		Class	Grade	Characteristic · Application
High Speed Cutting		P Class	ST10P	· Medium to high speed finishing of steels.
			ST20E	· General machining of steels.
			A30	· Low to medium speed roughing of steels.
			ST40E	· Low speed, roughing of steels.
Low Speed Cutting		K Class	H1	· High speed finishing of non-ferrous metals.
			EH10	· General machining of cast irons.
			G10E	· Machining of cast iron and aluminium.

Milling Application

		Class	Grade	Characteristic · Application
Roughing		P Class	A30N	· General machining of steels
		K Class	G10E	· Milling of cast iron

Performance



Aurora Coat Series

DLC-Coated Grade for Aluminium

Grades



■ Features

Sumitomo's "AURORA" COAT is a high hardness, low coefficient layer of "Diamond Like Carbon" (DLC).

Other than producing excellent surface finish for machining of Aluminium and non-ferrous metals, DLC coat can be used for dry cutting and is environmental friendly.

■ Advantages and Applications

- **Super smooth surface and low coefficient of friction**
Achieving beautiful finishing on Aluminium and non-ferrous metals with its high resistance to build-up edge.
- **High coating strength withstand tough cutting conditions**
Special DLC coating technique that improves coating adhesion. It is the world's first application of DLC coat on cutting tools.
- **Wide application possibilities**
- **A Spectrum of colours**
Glittering colours are result of the special coating technique.

There are 7 interfacing colours in the AURORA COAT but have no effects on cutting performance.

■ Performance of DLC coating

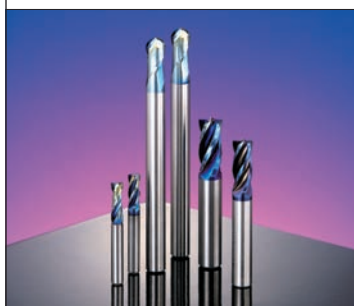
Grade	Rake Face	Surface Roughness	Conditions
Aurora Coated DL1000			Work material: ADC12 Tool: WEM3032E Cutting data: v _c = 300 m/min f _t = 0,15 mm/tooth d _{oc} = 5 mm W _{oc} = 5 mm Cutting length: 36 m Dry
Uncoated Carbide			

■ Applicable Products

- WaveMill Insert (DL1000)



- Aurora Coated Endmills (ASM2000/4000DL, SNB2000DL)



- Aurora Coated Drills (DLH Type)



ZX-Coating Series

Grades



■ Features

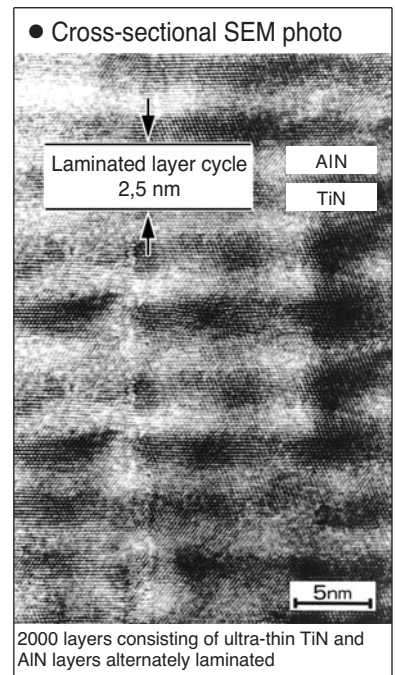
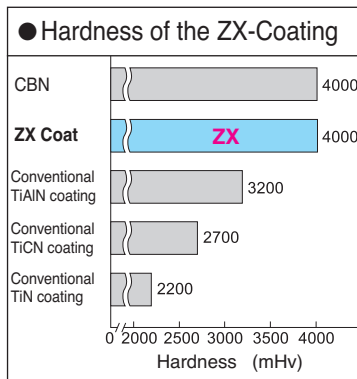
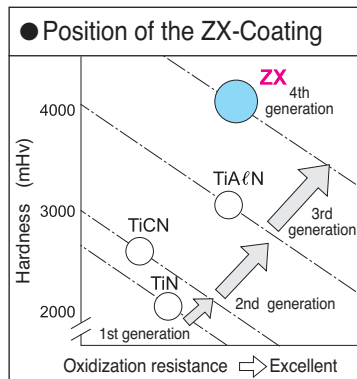
ZX is the worlds first 2000 layer TiN/AlN ultra hard coating, available on a wide range of milling and drilling tools developed specifically for high feed machining a broad range of workpiece materials including steels, stainless steels, high temperature alloys and irons.

The super lattice ZX-Coating is only 2,5 microns thick (1,25 nano-metres x 2000) and at Hv4000 has a hardness approaching that of CBN. In addition the ZX-Coating has a smooth surface which improves the finish on machined workpieces. Its resistance to high temperatures results in high feed rates and greatly extended tool life.

■ Advantages

- Almost as hard as CBN
- Greatly extended tool life due to extreme hardness of ZX-Coating (Hv4000) compared to TiCN (Hv2700) and Ti/AlN (Hv3200)
- Smooth coating surface generates improved finish on workpiece.
- Available on a wide range of milling and drilling tools

■ Performance



● Super Multi-Drills HK Type



● ZX-Coated Endmills



Advanced Ceramic

Grades



General Features

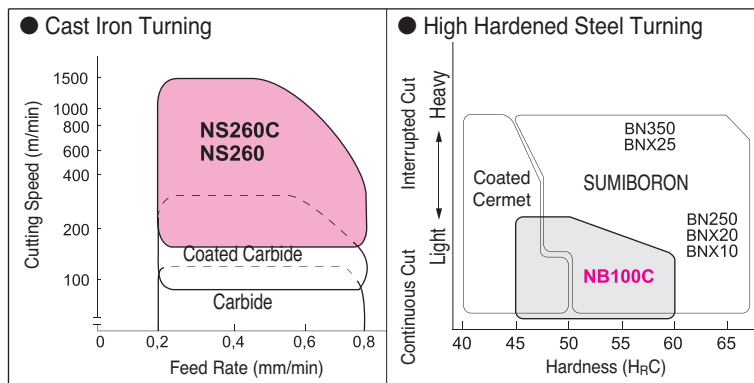
Sumitomo's "Advanced Ceramic" utilizes a special process and materials to enhance the toughness of ceramic cutting tools. This new development permits ultra-high speed machining of cast iron with high reliability.

All this and more can be found in our latest NS260 and NS260C, with improved grain boundary microstructure for higher hot hardness and good notch wear resistance.

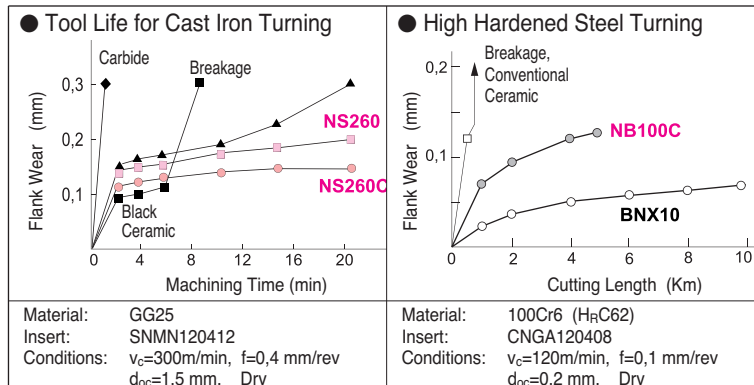
Application

	K Cast Iron	H Hardened Steel	Type	Grade	Characteristic · Application
High Speed Cutting ↑	NS260C		Advance Si ₃ N ₄ Ceramic	NS260	<ul style="list-style-type: none"> High strength, high toughness Si₃N₄ ceramic. Roughing, interrupted turning and wet cutting of cast iron.
				NS260C	<ul style="list-style-type: none"> High wear resistance coating. Suitable for high speed continuous cutting.
Roughing	NS260	NB100C	Al ₂ O ₃ Ceramic	NB100C	<ul style="list-style-type: none"> Very tough Al₂O₃ based ceramic with new ZX-coating. Low speed, continuous turning of Hardened Steel

Application Range



Performance



Grade Properties Chart

Coated Carbide Grades

Class	Grade	Hardness (HRA)	T.R.S. (GPa)	Coating Type	Layer Compositions	Coating Thickness (μm)
P Steel	AC700G	91,0	2,2	CVD	Al ₂ O ₃ + TiCN	12
	AC900G	90,1	2,2	CVD	Al ₂ O ₃ + TiCN	12
	AC820P	90,1	2,2	CVD	Super FF, Al ₂ O ₃ + TiCN	14
	AC2000	90,1	2,2	CVD	Al ₂ O ₃ + TiCN	10
	AC830P	89,4	2,6	CVD	Super FF, Al ₂ O ₃ + TiCN	8
	AC3000	89,4	2,6	CVD	Al ₂ O ₃ + TiCN	10
	ACP100	89,3	3,1	CVD	Super FF, Al ₂ O ₃ + TiCN	6
	ACP200	89,5	3,2	PVD	Super ZX, AlCrN / TiAlN	3
	ACP300	89,3	3,1	PVD	Super ZX, AlCrN / TiAlN	3
M Stainless Steel	AC610M	91,0	2,2	CVD	Super FF, Al ₂ O ₃ + TiCN	5
	AC630M	89,5	2,7	CVD	Super FF, Al ₂ O ₃ + TiCN	5
	AC530U	91,4	3,3	PVD	Super ZX, AlCrN / TiAlN	3
K Cast Iron	AC410K	92,0	2,4	CVD	Super FF, Al ₂ O ₃ + TiCN	18
	AC700G	91,0	2,2	CVD	Al ₂ O ₃ + TiCN	12
	ACK200	91,7	2,5	CVD	Super FF, Al ₂ O ₃ + TiCN	6
	ACK300	91,4	3,3	PVD	Super ZX, AlCrN / TiAlN	3
S Exotic Metal	AC510U	92,6	2,6	PVD	Super ZX, AlCrN / TiAlN	3
	AC520U	91,7	3,0	PVD	Super ZX, AlCrN / TiAlN	3
N Non-ferrous Metal	DL1000	92,9	2,1	PVD	DLC (Diamond Like Carbon)	0,5

Uncoated Carbide Grades

Class	Grade	Hardness (HRA)	T.R.S. (GPa)	Young's Modulus (GPa)	Thermal Conductivity Coefficient (W/m·°C)	Compressive Strength (GPa)	Linear Expansion Coefficient (x 10 ⁻⁶ /°C)
P Steel	ST10P	92,1	1,9	470	25	4,9	6,2
	ST20E	91,8	1,9	550	42	4,9	5,2
	A30	91,3	2,1	520	—	—	5,2
	A30N	91,2	2,2	520	—	—	—
	ST40E	90,4	2,6	—	75	—	—
M Stainless Steel	U10E	92,4	1,8	460	—	5,9	—
	U2	91,5	2,2	—	88	—	—
	A30	91,3	2,1	520	—	—	5,2
K Cast Iron	BL130	94,3	2,9	—	—	—	—
	H2	93,2	1,8	600	105	6,1	4,4
	H1	92,9	2,1	650	109	6,1	4,7
	EH10	92,4	3,4	640	105	—	4,5
	H10E	92,3	2,0	—	67	—	—
	EH20	91,3	3,5	620	105	—	4,5
	G10E	91,1	2,2	620	105	5,7	—
	KH03	91,4	3,3	—	—	—	—
Ultra Fine Grained	AF1	92,5	4,4	570	—	5,7	5,7
	F0	93,6	2,0	650	—	—	—
	F1	92,9	2,4	590	—	—	—
	A1	91,4	3,2	550	—	—	—

Grade Properties Chart

■ Cermet Grades

Class	Grade	Hardness (HRA)	T.R.S. (GPa)	Coating Type	Layer Compositions	Coating Thickness (μm)
Coated	T2000Z	15,2	2,3	PVD	TiN/AlN Multi-Layer	3
	T3000Z	13,9	2,4	PVD	TiN/AlN Multi-Layer	3
Uncoated	T110A	16,5	1,6	–	–	–
	T1200A	15,7	2,2	–	–	–
	T250A	14,0	2,1	–	–	–

■ Ceramic Grades

Coated	NB100C	21,0	1,0	PVD	TiN/AlN Multi-Layer	3
Uncoated	NS260	15,7	1,3	–	–	–

■ Properties of Basic Materials

Material		Specific Gravity	Micro Vickers Hardness (GPa)	Young's Modulus (GPa)	Thermal Conductivity Coefficient (W/m·°C)	Linear-Thermal Expansion Coefficient (x 10 ⁻⁶ /°C)	Melting Point (°C)
Tungsten Carbide	WC	15,6	21	690	126	5,1	2.900
Titanium Carbide	TiC	4,94	31	450	17	7,6	3.200
Tantalum Carbide	TaC	14,5	18	280	21	6,6	3.800
Niobium Carbide	NbC	8,2	20	340	17	6,8	3.500
Titanium Nitrate	TiN	5,43	20	260	29	9,2	2.900
Aluminium Oxide	Al₂O₃	3,98	29	410	29	8,5	2.050
Silicon Nitride	Si₃N₄	3,17	25	310	29	3,0	>1.900 (Disintegrate)
Cubic Boron Nitride	CBN	3,48	44	700	1.300	4,7	–
Carbon	C	3,52	>90	970	2.100	3,1	–
Cobalt	Co	8,9	–	100~180	69	12,3	1.495
Nickel	Ni	8,9	–	200	92	13,3	1.495
Carbide	WC- 5% Co	15,0	18	630	79	5,0	–
	WC-10 Co	14,6	14	580	75	5,0	–
	WC-20% Co	13,5	10	530	67	6,0	–
High Speed Steel		8,7	8	210	17	11,0	–

Cutting Conditions

Remarks:

- Mentioned cutting conditions are considered for an approach angle of 90°-95° and usage coolant.
- The conditions should be adjusted in accordance to the machine stability and workpiece conditions.

Recommended Cutting Conditions for Main Grade

ISO	Material	Hardness Brinell (HB)	Coated Carbide					
			AC410K	AC700G	AC900G	AC820P	AC830P	AC530U
			Feed Rate f (mm/rev)					
			0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6
			Cutting Speed v_c (m/min)					
P Steel	unalloyed steel, <0,15%C, annealed	125		380		320	270	230
	" , <0,45%C, annealed	190		330		270	230	200
	" , <0,45%C, tempered	250		280		210	205	180
	low alloyed steel, annealed	180		300		250	210	200
	" , tempered	275		260		200	160	120
	" , tempered	300		220		160	120	-
	" , tempered	350		200		120	90	-
	high alloyed and tool steel, annealed	200		220		170	150	-
" , tempered	325		130		90	70	-	
M Stainless Steel	stainless steel, ferritic/martensitic, annealed	200						160
	martensitic, tempered	240						120
	austenitic, plunged	180						140
K Cast Iron	lamellar cast iron, pearlitic	180	350	300	180			160
	" , pearlitic(martensitic)	260	275	230	150			120
	nodular cast iron, ferritic	160	310	250	160			160
	nodular cast iron, perlitic	250	240	180	130			100
	malleable cast iron, ferritic	130	310	250	220			180
	malleable cast iron, perlitic	230	240	190	160			120
S Exotic Metal	heat resistant alloys, Fe basis	200						
	heat resistant alloys, Ni or Co basis	250						
	heat resistant alloys, Ni or Co basis	350						
	pure Titanium	400						
	Titanium alloys	950						

Recommended Cutting Conditions for Main Grade

ISO	Material	Hardness Brinell (HB)	Coated Carbide				Coated Cermet	
			AC610M	AC630M	AC510U	AC520U	T2000Z	T3000Z
			Feed Rate f (mm/rev)					
			0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6	0,2 - 0,4 - 0,6
			Cutting Speed v_c (m/min)					
P Steel	unalloyed steel, <0,15%C, annealed	125					350	300
	" , <0,45%C, annealed	190					300	250
	" , <0,45%C, tempered	250					250	200
	low alloyed steel, annealed	180					300	230
	" , tempered	275					260	200
	" , tempered	300					220	170
	" , tempered	350						
	high alloyed and tool steel, annealed	200						
" , tempered	325							
M Stainless Steel	stainless steel, ferritic/martensitic, annealed	200	205	160				
	martensitic, tempered	240	145	110				
	austenitic, plunged	180	180	140				
K Cast Iron	lamellar cast iron, pearlitic	180						
	" , pearlitic(martensitic)	260						
	nodular cast iron, ferritic	160						
	nodular cast iron, perlitic	250						
	malleable cast iron, ferritic	130						
	malleable cast iron, perlitic	230						
S Exotic Metal	heat resistant alloys, Fe basis	200			100	60		
	heat resistant alloys, Ni or Co basis	250			60	40		
	heat resistant alloys, Ni or Co basis	350			40	25		
	pure Titanium	400						
	Titanium alloys	950			70	50		

Grade Comparison Chart

Grades

Coated Carbide

Application	Class	Grade	Sumitomo	Mitsubishi	Tungaloy	Sandvik	Walter	Iscar	Kyocera	Kennametal	Valenite	SECO	
Turning	Steel	P01	AC700G	UE6005	T9005	GC4205	WAP01	IC428	CA5505	KT315 KC9105	VP5515 VP1510	TP1000	
		P10	AC820P (AC2000) AC900G	UE6110 UC6010	T9015	GC4215 GC4225	WPP10 WAP10	IC8150 IC9015	CA5515	KC9110 KC9125	SV310 SV315 SV515	TP1000 TP2000 TP2500	
		P20	AC820P (AC2000) AC900G	UE6110 UE6020	T9025 AH730	GC4225	WPP20 WAP20	IC8250 IC9015	CA5525	KC9125	SV315 SV325 VP5525	TP2000 TP2500	
		P30	AC830P (AC3000) AC630M	UE6035 US735 VP20MF VP15TF	T9035 GH730	GC4235	WPP30 WAP30	IC8350 IC8025	PR630 CA5535	KC9140	VP5535 SV325 SV230	TP3000	
		P40	AC830P (AC3000) AC630M	UE6035 US735 UH6400	T9035	GC4235	WTN53	IC8350 IC8025	PR660	KC9140	SV235 V1N VP5535	TP3000	
	Stainless Steel	M10 S10	AC610M (EH510Z) AC510U (EH520Z)	VP10MF VP05RT VP10RT US7020	T9015 AH110 J740	GC1005 GC1105	WAM10 WXN10	IC808 IC8025 IC907	CA6615 PR905 PR915	KT315 KC5010 KC5510	SV310 SV315 VC929	TP1000	
		M20 S20	AC610M (EH20Z) AC520U (EH520Z)	US7020 VP20MF UP20M	T6020 AH120 J740	GC2030 GC1025 GC4125	WAM20 WXM20	IC808 IC9025 IC908	CA6515 PR930 PR660	KC5525 KC9225 KC5020 KC9240	VPS525 VC901 SV230	TP2500	
		M30	AC630M (AC3000) AC830P (AC3000) AC530U	US735 VP15TF VP20MF	GH330 T6030	GC2035 GC1020	WAM30 WTP30 WSM30	IC807 IC3028	CA6525 PR660 PR1125	KC9240	VC901 V1N	TP3000	
		M40	AC630M AC530U	US735 VP15TF	GH330	GC2145		IC807	PR660 PR1125	KC9245	V1N		
	Cast Iron	K01	AC410K (AC300G)	UC5105 UC5115	T5010	GC3205	WAK10 WAP01	IC5005 IC428 IC570	CA4010 CA4115	KC9315 KC5010	SV405 SV510	TK1000	
		K10	AC410K (AC300G) AC700G	UC5105 UC5115	T5115	GC3210	WAK10 WAP10	IC9015 IC8048	CA4115 CA4120	KC9315	SV410 SV515	TK1000	
		K20	AC900G AC820P (AC2000)	UC5115 VP15TF	T5125	GC3215	WAK20 WAP20	IC8048 IC3028	CA4120	KC9325	SV415 SV515	TK2000	
	Milling	Steel	ACP100		F7030	T3030	GC4220 GC4230 GC4240	WQM25 WPK25	IC9150		KC930M KC935M	V1N	T25M T250M
			ACP200 ACP300		VP15TF VP30RT	AH120 GH330 AH330	GC1030 GC1025 GC2030	WPK25 WPK35 WXP45	IC9250 IC9350 IC908	PR630 PR730 PR830	KC792M KC725M KC735M	VC935	T350M F25M F40M
		Stainless Steel	ACP300 EH20Z		VP15TF VP30RT VP15TF	T3030 GH330 AH120 AH140	GC1025 GC2030 GC2040 GC1030	WAP35 WXM35	IC9250 IC9350 IC928	PR1025 PR660 PR730	KC930M KC725M KC735M	V1N VC935	T25M T250M T350M F40M
Cast Iron		ACP200		F5010 F5020 VP20RT	T1015 T1020	GC3020 GC3040 GC3220	WAK15 WAK25	IC4010 IC9150	PR905	kC920M KC925M	VN5	T150M T200M	
		ACK300 EH20Z		VP15TF VP20RT	AH110 AH120	GC3040 GC1020	WKP35	IC4100 DT7150	PR905	kC520M KC525M	VC928	T200M F30M	

Cermet




Application	Class	Sumitomo	Mitsubishi	Tungaloy	Sandvik	Ceramtec	Iscar	Kyocera	Kennametal	Valenite	SECO
Turning	Steel	T110A	AP25N*	GT720 NS520 NS720		SC15		TN30 PV30*		VC605	
		T1200A T2000Z*	NX2525 AP25N* UP35N* NX3035 NX55	NS530 GT530* AT530* NS720* GT720* NS730* GT730*	CT5015 GC1525* CT530	SC15 SC35	IC20N IC30N IC520N IC530N	TN60 PV60* TN6020 PV7020*	KT6215 KT315*	VC610	CMP
		T130A T3000Z*	NX3035 NX99	NS540		SC35 SC45		TN90 PV90*			
	Cast Iron	T110A	NX2525 NX25N*	NS520	CT5015	SC15 SC35		TN30 PV30*	KT315*	VC605	
Milling	Steel	T250A	NX4545 VP45N*	NS540 NS740		SC60	IC30N	TC60M TN100M	KT530M*	VC630	C15M

* denotes coated cermet



Grade Comparison Chart

Grades

■ Uncoated Carbide

Class	Grade	Sumitomo	Mitsubishi	Tungaloy	Sandvik	Dijet	Iscar	Kyocera	Kennametal	Valenite	SECO
 Steel	P10	ST10P		TX10S	S1P	SRT	IC70		P10	VC7 VC165	S10M
	P20	ST20E	UTi20T	TX20 TX25	SMA	SRT DX30	IC70		K125M TTM	VC7	S25M
	P30	A30 A30N	UTi20T	TX30 UX30	SM30	SR30 DX25	IC54 IC28	PW30	GK K600 TTR	VC5 VC35M	S25M
	P40	ST40E		TX40	S6	SR30 DX35	IC54 IC28		G13	VC111	S60M
 Stainless Steel	M10	U10E EH510		TU10	H10A	UMN	IC20		K313	VC29 VC2	S10M
	M20	U2 EH510	UTi20T	TU20 UX25	H13A	DX25 UMS	IC20		K68, KMF K125M TTM	VC28 VC901	HX
	M30	A30 A30N	UTi20T	UX30	H10F SM30	DX25 UMS	IC28		K600 TTR	VC35M	HX
 Cast Iron	K01	H2 H1	HTi05T	TH03 KS05F	H1P	KG03			K605		
	K10	H1 EH10 EH510	HTi10	TH10 G1F	H1P H10 HM	KG10 KT9	IC20 IC09T	KW10 GW15	K313, THM K110M THM-U	VC3 VC29	HX
	K20	G10E EH20 EH520	UTi20T	G2F, G2, KS15F KS20	H13A	KG20 CR1	IC20 IC09T	GW25	K715 KMF K600	VC2 VC29 VC28	883
	K30	G10E	UTi20T	G3		KG30	IC28		THR	VC111 VC101	
Fine-grained Carbide	F0		SF10, MF07 MF10	F, MD1508 MD08F		FB05, FB10 FZ05	IC07				
	F1, AFU XF1		HTi10 MF20	M, MD05F MD10, MD07F	6UF, 8UF PN90, H6FF	FB10, FB15 FZ15	IC07	FW30			890
	AF0, SF1 AF2		TF15 MF30	EM10, MD15 MD20	12UF	FB10, FB15 FZ15	IC08				890 883
	A1 CC			UM	N6F H10F	FB20 FZ20	IC08				883

■ Ceramic

Class	Sumitomo	Tungaloy	Kyocera	Sandvik	Kennametal	Dijet	Nippon Tungsten	NTK
 Hardened Steel	NB100C	WG300 LX11	A66N A65 KT66	GC6050 CC650 CC670	KY1615 KY4300	CA100	NPC-A2 WIN	HC4 HC7 ZC7 WA1
 Cast Iron	NS260C NS260	LX11 LX21 CXC73 FX105 CX710	A65 A66N KA30 KS500 KS6000 KT66	GC6050 CC650 CC670	KY1615 KY1310 KY1320 KY3500 KY4300	CA010 CS100	NAICON-NXA NAICON-NX	HC1 HW2 HC2 HC6 HC7 WA1 SX1 SX2 SP2 SX9 SX8

