

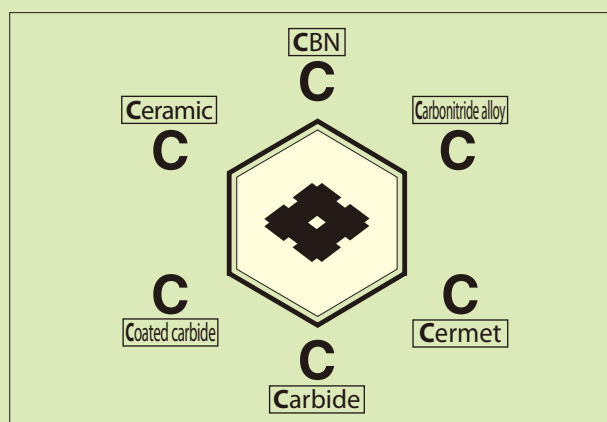
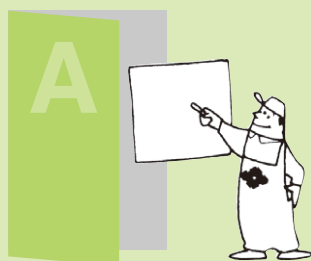
Grades

A1 to A45

A

A

Grades



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Selection of Sumitomo Grades (Milling)








A
Grades

Cutting Process	P General Steel (Carbon Steel, Alloy Steel), Soft Steel						M Stainless Steel						K Cast Iron					
	High-Speed	Finishing to Light		Medium	Rough to Heavy		High-Speed	Finishing to Light	Medium	Rough to Heavy		High-Speed	Finishing	Medium				
	Wear Resistance ← Fracture Resistance						Wear Resistance ← Fracture Resistance						Wear Resistance ← Fracture Resistance					
ISO Classification	—	P01	P10	P20	P30	P40	—	M01	M10	M20	M30	M40	—	K01	K10	K20	K30	
Coated Carbide 				ACP100				New ACM100										
				ACP200				New ACM200								ACK200		
					ACP300					New ACM300								ACK300
									ACK300									
					ACP300			ACP300										
Cermet 			T250A						T250A									
					T4500A					T4500A								
Carbide 					A30N						A30N					G10E		
Ceramic 														NB90M				
Uncoated CBN Coated CBN 																	BNS800	
																	BN7000	

Cutting Process	S Exotic Alloy						H Hardened Steel					N Non-Ferrous Metal				
	High-Speed	Finishing to Light		Medium	Rough to Heavy		High-Speed	Light	Medium			High-Speed	Light	Medium		
	Wear Resistance ← Fracture Resistance						Wear Resistance ← Fracture Resistance					Wear Resistance ← Fracture Resistance				
ISO Classification	—	S01	S10	S20	S30	S40	—	H01	H10	H20	H30	—	N01	N10	N20	N30
Coated Carbide 																




Grade Comparison Chart

Coated Carbide

Application	Classification	Grade	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Hitachi	Sandvik	Kennametal	Dijet	Valenite	SECO Tools	WALTER	ISCAR
A Grades		P05	AC810P	UE6105	T9105	CA510 CA5505	HG8010	GC4205	KCP05 KC9105	JC110V	VP5515 VP1510	TP0500	WPP05	IC8005 IC428
		P10	AC810P AC820P	UE6110	T9115	CA515 CA5515	HG8010	GC4315 GC4215	KCP10 KC9110	JC110V JC215V	SV310 SV315 SV515	TP1500	WPP10S WPP10	IC8150 IC9015
		P20	AC820P	MC6025 UE6020	T9125	CA525 CA5525	IP2000 HG8025 GM25	GC4325 GC4225	KCP25 KC9125	JC215V	SV315 SV325 VP5525	TP2500	WPP20S WPP20	IC8250 IC9015
		P30	AC830P AC630M	UE6035 VP15TF	T9135	CA530 CA5535	IP3000 GM8035	GC4235	KCP30 KC9140	JC215V JC325V	VP5535 SV325 SV230	TP3500	WPP30S WPP30	IC8350 IC8025
		P40	AC830P AC630M	UE6035 UH6400	T9135	PR660	IP3000 GM8035	GC4235	KC9140	JC325V JC450V	SV235 V1N VP5535	TP3500	WTN53	IC8350 IC8025
	 	M10 S10	AC610M AC510U	MC7015 US7020 MP9005 US905 VP05RT VP10RT	T9115 AH110 AH905	CA6515 PR915 PR1025 PR1215 PR1225	IP050S IP100S	GC2015 GC1105 GC1115	KCM15 KC5510 KCU10	JC605X JC5003 JC110V	SV310 SV315 VC929	TP1500 TS2000	WSM10	IC807 IC8025 IC907
		M20 S20	AC6030M AC610M AC520U	MC7025 US7020 MP9015 VP20MF UP20M	T6120 T6020 T9125 AH630 AH120 AH725	CA6525 PR915 PR930 PR1025 PR1125 PR1215 PR1225	IP100S HG8025	GC2025 GC1125	KCM25 KC5525 KCU25 KC5020	JC110V JC5015 JC8015 JC525X	VPS525 VC901 SV230	TP2500 TM2000 TS2500	WSM20 WMP20S	IC808 IC8080 IC908
		M30	AC6030M AC6040M AC630M AC830P AC530U	MC7025 MP7035 US735 VP15TF VP20MF	AH725 T6130 T6030 AH630 AH645	CA6525 PR1125	GM8035 GX30	GC2035	KCM35 KC9240	JC5015 JC8015 JC525X	VC901 V1N	TP3500 TM4000	WSM30	IC8080 IC830
		M40	AC6040M AC530U	MP7035 US735 VP15TF	AH645	PR1125	GX30	GC235			V1N	TM4000		IC830 IC928
		K05	AC405K	MC5005 UC5105 UC5115	T5105 T5115	CA4505 CA4010	HG3305 HX3305	GC3205	KCK05	JC105V JC050W	SV405 SV510	TK1000 TK1001	WAK10 WKK10S	IC5005
		K10	AC415K	MC5005 MC5015 UC5105 UC5115	T5115 T5125	CA4505 CA4515 CA4115	HX3305 HG3305 HG3315 HX3315	GC3210	KCK15	JC105V	SV410 SV515	TK1000 TK1001	WAK10 WAK20 WKK10S WKK20S	IC5010 IC5100
		K20	AC420K	MC5015 UC5115 VP15TF UE6110	T5125 T9125	CA4515 CA4120 CA4115	HX3315 HG3315 HG8010	GC3215	KCK20	JC215V	SV415 SV515	TK2000 TK2001	WAK20 WAK30 WKK20S	IC8150
	  	P10	ACP100	FH7020 F7030	T3130 T3030		JP4005 JP4020	GC4220 GC4230	KC715M KC930M KC935M	JC8003 JC730	V1N	T250M T350M MP1500 MP2500	WKP25 WKP25S WPP20 WKP35S	IC4100 IC520M IC4050 DT7150
		P20	ACP200	VP15TF VP20RT	AH9030 AH120 AH725	PR1525 PR1225 PR830	JS4045 GX2140	GC1010 GC1025 GC2040 GC4240	KTPK20 KCPM20	JC6235 JC5040 JC8015 JC5015 JC5118	VC935	MP3000 F25M F30M	WSM20	IC808 IC810 IC380
		P30	ACP300	VP30RT	AH3035 AH130 AH140 SH730	PR1525 PR1230	JS4060 JX1045 JX1060 CY150 CY250	GC1030 GC2030	KCPK30 KCPM30 KC725 KC730 KC735	JC5040 JC8050		MM4500 F40M	WSM30 WSM35 WSP45S WSP45	IC830 IC928 IC330
		M10	ACM100 ACK300			PR1025 PR1225	JX1020 CY9020 JP4020	GC1025 GC1030	KC522M					
		M20	ACM200	F7030 VP15TF VP20RT	GH330 AH330 AH120 AH130	PR1525 PR1025 PR1225	JX1015 CY150 CY15	GC2030	KC730M KC525M	JC5015 JC5030 JC5040		F25M F30M	WSM35 WXM35	IC908 IC928
		M30	ACM300	F7030 VP30RT MP7030	AH130 AH140	CA6535 PR1535	JX1045 JX1060 GX2160	GC2040	KC994M KC725M	JC5015 JC5030 JC5040	VC935	F30M F40M	WSM35 WXM35	IC328 IC330 IC830
		K20	ACK200	MC5020 F5010 F5020	T1115	PR905	JP4020	GC3220 GC3020 GC3040 K15W K20W	KCK15 KCK20 KC915M KC930M KC935M	JV608X JC600 JC605W JC610 JC8003	VN5	MK1500 MK3000 T150M	WAK15 WKK25 WKP25S	IC5100 DT7150
		K30	ACK300	VP15TF VP20RT	AH725 AH120 AH110 AH330 GH110 GH130	PR1510 PR1210	GX2140 JS4045 JX1045 CY150 CY250	GC1010 GC1020 GC1025 GC1030	KTPK20 KCPK30 KC510M KC520M KC525M	JC6235 JC5003 JC5015 JC5080 JC8015	VC928	MK2050 MK2000 MH1000	WKP35S WPP20	IC830 IC810 IC908 IC910 IC928 IC950


Grade Comparison Chart

■ Cermet




Application	Classification	Grade	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Hitachi	Sandvik	Kennametal	Dijet	Valenite	SECO Tools	WALTER	ISCAR
Turning		P10	T1000A T110A	AP25N* NX2525	GT720* NS520	TN30 PV30* TN6010 PV7010*	CZ25*	CT5015	KT125 HTX KT1120	LN10 CX50	VC605			IC20N IC520N
		P20	T1500A T1500Z* T2000Z*	AP25N* NX2525 NX3035	NS530 GT530* NS730 GT730* NS9530 GT9530*	TN60 TN6020 PV60* PV7020* PV7025*	CH550	GC1525*	KT6215 KT315* KT175 KT5020*	CX50 CX75	VC610	CM CMP C15M TP1020		IC30N IC530N
		P30	T3000Z*	NX3035 MP3025*		PV7025* PV90*				CX90 CX99				
		K10	T1000A T110A	AP25N* NX2525	GT720* NS520	TN30 PV30* TN6010 PV7005* PV7010*		CT5015	KT125 HTX	LN10 CX50	VC605			
Milling			T250A T4500A	NX4545 VP45N*	NS540 NS740	TC60M TN100M	MZ1000* MZ2000* MZ3000*	CT530	KT530M*	CX90	VC630	C15M		IC30N

★ Coated Cermet Inserts

■ Carbide

Classification	Grade	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Hitachi	Sandvik	Kennametal	Dijet	SECO Tools	ISCAR
	P10	ST10P				WS10	S1P		SRT		
	P20	ST20E	UTi20T	UX30		EX35	SMA	K125M	SR20		IC07 IC50M
	P30	A30 A30N	UTi20T	UX30	PW30	EX40	SM30		DX30		IC54 IC28
	P40	ST40E				EX45	S6		SR30		IC54 IC28
	M10	U10E EH510				WA10B	H10A	KU10,K313 K68,KYSM10	UMN	890	IC07,IC20 IC08
	M20	U2 EH520	UTi20T	UX30			H13A	K313 K68	DX25 UMS	HX 883	IC07,IC20 IC08
	M30	A30 A30N	UTi20T	UX30			H10F SM30		UMS UM40		IC28
	K01	H2 H1	HTi05T			WH01 WH05		KU10,K313 K68,K115M	KG03		IB50,IB85 IS8
	K10	H1 EH10 EH510	HTi10	TH10	KW10 GW15	WH10	H13A	KU10,K313 K68,K115M K110M KY3500	KG10 KT9 CR1	890	IB50,IB85 IB55,IB90 IC20,IS8
	K20	G10E EH20 EH520	UTi20T	UX30	GW25	WH20	H13A	KMF KY3500 KYHS10	KT9 CR1 KG20	890 883 HX	IC20 IS8
	K30	G10E	UTi20T			WH30		KY3500	KG30	883	
	—	EH510 EH520	RT9005 RT9010 MT9015 TF15	TH10 KS20	SW05,SW10 SW25,KW10 GW15	WH10	H10A H10F H13A	KU10,K313 K68,KMF K110M,KYHS10 K1025(KMF)	KG10 KG20	HX H25	ID5,IB85 IC20,IC07 IC08,IC28
	Fine-grained Carbide	F0	SF10,MF07 MF10	F,MD1508 MD08F		NM08			FB05,FB10 FZ05		IC07
		F1,AFU XF1	HTi10 MF20	M,MD10 MD05F,MD07F	FW30	NM15	6UF,8UF PN90,H6FF		FZ10,FB15 FZ15	890	IC07
		AF0,AF1 SF2	TF15 MF30	EM10,MD20 MD15		BRM20 EF20N	12UF		FB20,FZ15 FB15	890 883	IC08
		A1		UM		NM25	N6F H10F		FZ20 FB20	883	IC08

■ Ceramic

Classification	Sumitomo Electric	Tungaloy	Kyocera	Sandvik	Kennametal	Dijet	Nippon Tungsten	NTK
	NB100C	WG300 LX11	A66N A65 KT66	GC6050 CC650 CC670	KY1615 KY4300	CA100	NPC-A2 WIN	HC4,HC7 ZC7,WA1
	WX120	WG300	CF1	CC6060 CC6065 CC670	KY4300 KY1540	CA200	WHISKAL	WA1 SX9
	NB90S NB90M	LX11,LX21 CXC73,FX105 CX710	A65,A66N KA30,KS500 KS6000,KT66	CC620,CC650 CC6090 GC1690	KY1615,KY1310 KY1320,KY3500 KY4300	CA010 CS100	NAICON-NXA NAICON-NX	HC1,HW2,HC2,HC6 HC7,WA1,SX1,SX2 SP2,SX9,SX8

(Note) The data on pages A4 and A5 was collected from the various published catalogues therefore the information may not be updated.

A

Grades

A5

Grade Comparison Chart

■ CBN

Classification	Grade	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Hitachi	Sandvik	Kennametal	Dijet	SECO Tools
<div>K</div> <div>Cast Iron</div>	K01	BNC500* BN7000 BN500	MB710	BX930 BX870 BX910	KBN60M		CB7525 CB7925	KB1340	JBN795	
	K10	BN7000 BN500	MB710 MB730	BX950	KBN900	BH200	CB7525 CB7925		JBN330	CBN200, CBN300 CBN300P, CBN400C
	K20	BN7000 BNS800	MBS140	BXC90 BX90S	KBN900	BH250				CBN200, CBN300 CBN300P, CBN400C
	K30	BNS800		BXC90 BX90S				KB5630		CBN500
<div>N</div> <div>Non-Ferrous Metal</div>	N01	BN700 BN7000								
<div>S</div> <div>Exotic Alloy</div>	S01	BN7000	MB730	BX470 BX480 BX950	KBN65M KBN70M			KB5630 KB1340		
<div>H</div> <div>Hardened Steel</div>	H01	BNC2010 BNC2020 BNC100 BN1000 BN2000 BNX10	MBC010 MB810	BXM10 BX310	KBN05M PT600M	BH100		KB5610		CBN10 CBN100 CBN060K
	H10	BNC2010 BNC2020 BNC160 BNC200 BN2000	MBC020 BC8020 MB820	BXM20 BX330	KBN25M	BH150	CB7015	KB5610 KB5625	JBN300	CBN10, CBN100 CBN150, CBN060K CBN160C
	H20	BNC2020 BNC200 BNX20	MBC020 BC8020 MB825	BXC50 BX360	KBN35M KBN900	BH250	CB7025 CB20	KB5625 KB5630	JBN245	CBN150 CBN160C
	H30	BNC300 BN350 BNX25	MB835 BC8020	BX380			CB7525	KB5630		

* For cutting ductile cast iron

■ Polycrystalline Diamond

Classification	Grade	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Sandvik	Kennametal	Dijet	SECO Tools
<div>N</div> <div>Non-Ferrous Metal</div>	N01	DA1000 DA150	MD205	DX180 DX160	KPD001	CD05 CD10	KD1400	JDA30 JDA735	
	N10	DA1000 DA150	MD205 MD220	DX140	KPD001 KPD010 KPD230	CD1810	KD1400 KD1425		PCD05 PCD10
	N20	DA1000	MD220 MD230	DX120	KPD230		KD1400 KD1425	JDA10 JDA715	PCD05 PCD20
	N30	DA1000	MD230	DX110			KD1400		PCD05 PCD30 PCD30M

(Note) The above data was collected from the various published catalogues therefore the information may not be updated.






Chipbreaker Comparison Chart

Negative

Classification	Application	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Hitachi	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR
	Fine Finishing	FA	FH	TF	GP		QF	FF	FF1		SF
		FL	FS,FY	NS,ZF	XP,XF	FE				FP5	
	Finishing	LU	SA,SY	SS,NM	XQ,CQ	BE	LC	FN		NF3	
		SU	SH	TS,TSF,11	PP,HQ	CE,B,BH	XF,MF		MF2		NF,TF
	Wiper Edge	LUW		AFW	WP		WL,WP				
		SEW	SW	ASW	WQ		WF,WMX	FW	W-MF2	NF	WF
	Finishing to Light	SE,SX	LP	AS,ZM,27	CJ,XS	AB,CT	PF,KF	LF	MF5	MP3,NS6	F3P
	Medium	GU(UG)	MA,MV	TM,37	HS,PS	AH	XM,QM	P,MG	M3		HT,M4M,GN
		GE,UX	MH,MP	DM,CM	PQ,CS,GS,PT	AE,AY	PM,SM,KM	MN		MP5,NM4,NM6	
	Wiper Edge	GUW	MW				WM	MW	W-M3	NM	HTW,M4MW,WG
	Rough	MU,ME	RP,GH	TH	HT,GT,PH	RE,AR	MG-PR,XMR,KR	RP	M5,MR7	RP5,NM7,NM9	M3P,NR
		MX	HAS,MT	CH				RN			
	Heavy	HG	HA,HZ,HX,HBS	THS,TU,57	PX,HX	TE,UE	MM-PR,QR	RM,MR	R4,R5,R6	NR6,NRF	NM,HR
		HP	HH,HXD	65			HR,SR	RH	R7	NR8	
		HU,HW	HV,HDS			H					
		HF	HCS	TUS		HX,HE	MR		RR9	NRR	R3P,T3P
	Finishing	SU,EF	LM,SH	SS	MQ,GU	SE,MP	MF	FP,FS,LF	MF2	NF4	
	Light to Medium	EX,EG	GM,MS	SF,SA	SU,MS,MU	PV	23	MS	MF1,M1		TF,VL
	Medium	GU	MM	SM	HU	DE	MM	MP	MF3,M3	NM4	M3M,PP
	Rough	HM	ES,1M,2M	S	ST					NR4	
		EM,MU	RM,GH	SH	TK		MR		M5,MR3		MR,MH
	Light	UZ	LK,MA,MK,SW	CM,CF	Standard	V,VA	KF	UN	M5	NM5	GN
	Medium	GZ(UX)	GK,RK,GH,MW	Standard,CH,33	ZS,GC	Y,RE	KM,KR	UM	MR7		
	Finishing	AX		P	A3,AH			MS,GP			
	Finishing	EF	LS,FJ				SF			NFT	
	Medium	EG,EX	MS,MJ	HMM,SA			SM			NMT	
	Rough	MU	RS,GJ				SMR			NRT	
	Finishing	GH,FV *									
	Light	LV *									
	Carburized Layer Removal	SV *									

() indicates a discontinued item. ★ Sintered body chipbreakers

Positive

Classification	Application	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Hitachi	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR
	Finishing	FC	FJ,AM	01	CF,GF		UM		GT-F1	PF5	
		FB,LU (FP,FK)	FP,FM,FV,SQ	PSF,PF,23,SS,JSS	GP,XP	JQ,MP	PF,UF,MF,KF	11,UF	FF1	PF4	PF
	Wiper Edge	LUW	SW				WF	FW	W-F1	PF	WF
		SDW					WK				
	Finishing to Light	SI	SMG	JS	CK						
	Light	LB,SU (SK,SF)	LP,LM,SV,MQ	PSS,PS,24,TS,TJS	HQ,XQ,GK	JE	PM,UM,MM	LF	F1	PS5	SM,14
		SC			MF,GQ						
	Light to Medium	MU	MP,MM,MK,MV	PM			PR,UR,MR,KR	MF	F2	PM5	17,19
	Finishing	AG,AW,AY	AZ	AL,PP	AH,A3		AL	HP	AL	PM2	AS,AF
	Finishing to Light	LD *,GD *									
	Finishing	FV *									
	Light	LV *									

() indicates a discontinued item. ★ Sintered body chipbreakers

(Note) The above data was collected from the various published catalogues therefore the information may not be updated.

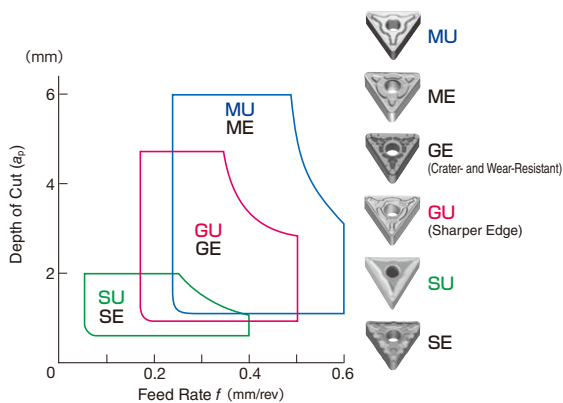
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Grades

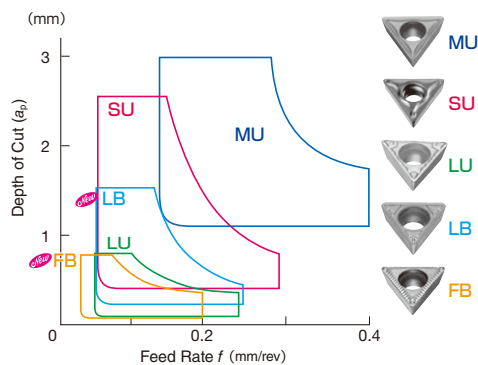
A7

Main Chipbreakers

Negative Type

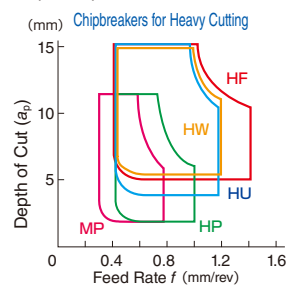
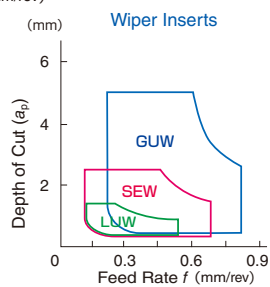
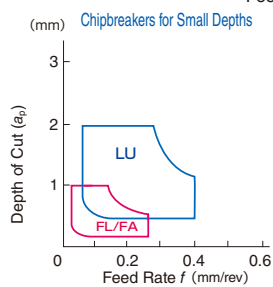
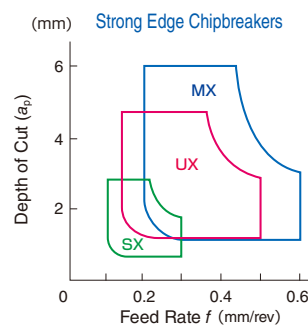
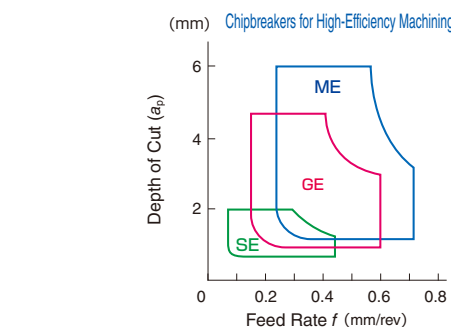


Positive Type



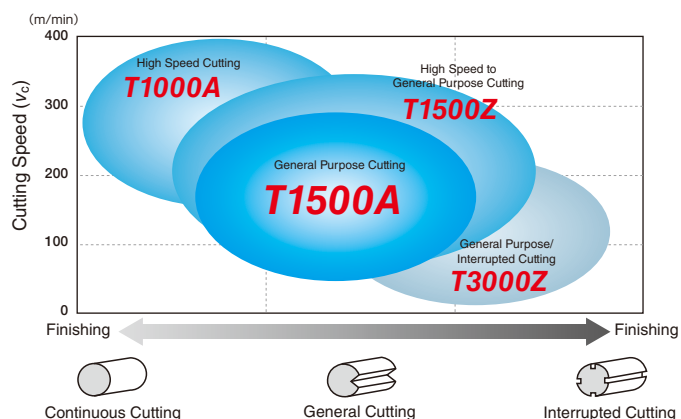
Sub-Chipbreakers

Negative Type

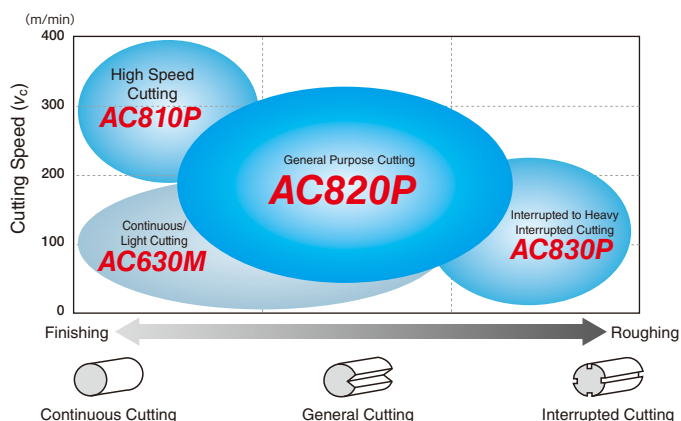


Grades

● Fine Finishing To Finishing



● Finishing to Rough Cutting



Recommended Cutting Conditions/ Representative Chipbreakers



Steel

Work
Material



Recommended Cutting Conditions

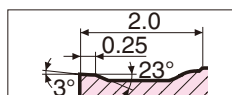
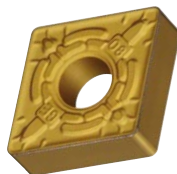
(Red text indicates 1st recommendation.)

Work Material	Cutting Process	Chipbreaker	Grade	Cutting Conditions		
				Depth of Cut a_p (mm)	Feed Rate f (mm/rev)	Cutting Speed V_c (m/min)
Soft Steel	Fine Finishing	FL	T1500Z	0.2- 0.6 -1.0	0.05- 0.15 -0.25	100- 250 -400
	Finishing	LU	AC810P	0.5- 1.0 -1.5	0.1- 0.25 -0.4	260- 340 -420
	Medium	GU	AC820P	1.0- 2.5 -4.0	0.2- 0.35 -0.5	200- 260 -320
	Rough	MU	AC830P	2.0- 4.0 -6.0	0.3- 0.45 -0.6	140- 180 -220
Medium Carbon Steel	Fine Finishing	FL	T1500Z	0.2- 0.6 -1.0	0.05- 0.15 -0.25	100- 200 -300
	Finishing	LU	AC810P	0.5- 1.0 -1.5	0.1- 0.25 -0.4	210- 275 -340
	Medium	GU	AC820P	1.0- 2.5 -4.0	0.2- 0.35 -0.5	150- 190 -230
	Rough	MU	AC830P	2.0- 4.0 -6.0	0.3- 0.45 -0.6	110- 135 -160
High Carbon Steel	Fine Finishing	FL	T1500Z	0.2- 0.6 -1.0	0.05- 0.15 -0.25	50- 150 -250
	Finishing	LU	AC810P	0.5- 1.0 -1.5	0.1- 0.25 -0.4	170- 225 -280
	Medium	GU	AC820P	1.0- 2.5 -4.0	0.2- 0.35 -0.5	130- 165 -200
	Rough	MU	AC830P	2.0- 4.0 -6.0	0.3- 0.45 -0.6	90- 120 -150

Breaker

General Purpose GE Type Chipbreaker

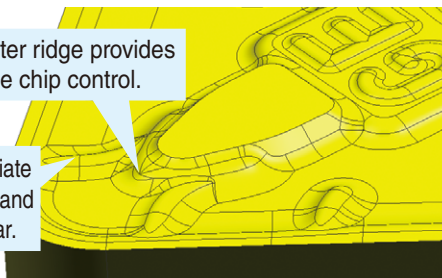
Achieves high efficiency and longer tool life with reduced rake face wear.
Delivers stable chip control performance from shallow cutting depths onwards.



Cross Section of Chipbreaker

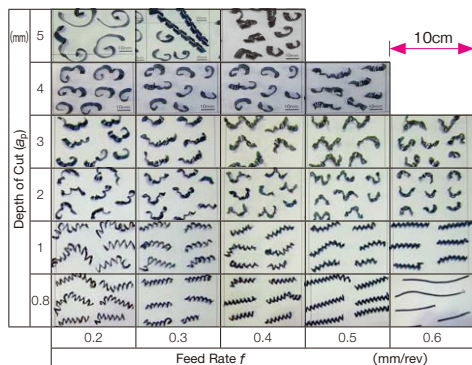
The center ridge provides stable chip control.

The side ridges alleviate stress concentration and reduce rake face wear.



GE Type Chip Control

Work Material: SCM415 Cutting Conditions: $v_c=200$ m/min Dry

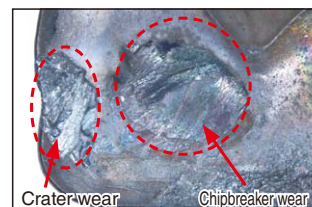


Wear Resistance

Work Material: SCM435 Cutting Conditions: $v_c=250$ m/min $f=0.4$ mm/rev $a_p=2.0$ mm



GE Type Chipbreaker

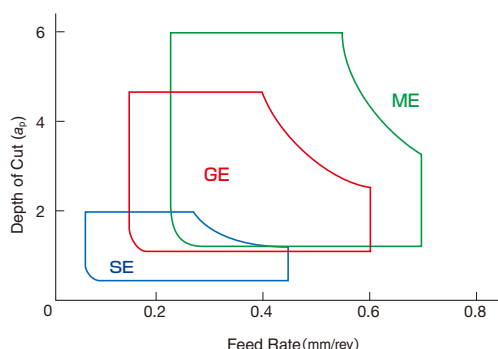


Conventional Chipbreaker

**Reduces rake face wear (crater wear and chipbreaker wear).
Achieves longer tool life and reduces machining costs.**

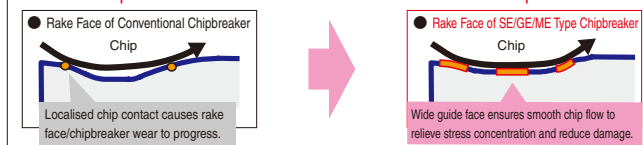
Shared Features of the High Efficiency Chipbreaker Series

Application Range



Characteristics

Rake face profile relieves stress concentration with smooth chip evacuation



Grades

High Speed Cutting General Purpose Cutting Interrupted Cutting

AC810P / AC820P / AC830P

AC800P Series covers a wide range of machining applications from high speed to interrupted cutting.

- All grades feature **Super FF Coat**, which has excellent wear and chipping resistance.
- Versatile GE Type chipbreaker suited to high-feed applications. High efficiency, long tool life.

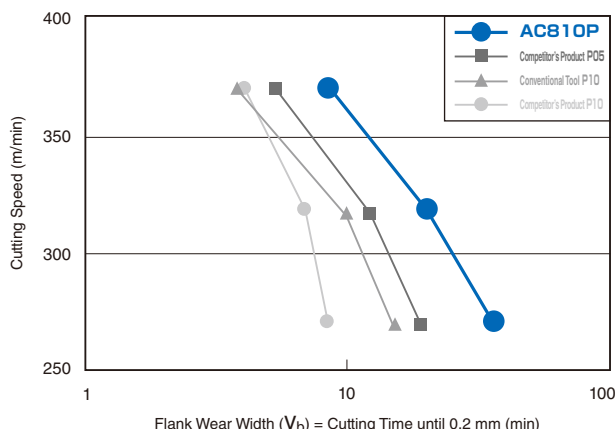
AC810P : In addition to **FF-TiCN**, which has excellent peel-off and wear resistance, this grade features a **tough, thick Alumina coating** enhanced by newly developed **grain growth control technology**, excellent wear resistance and long tool life in high-speed, high-feed cutting.

AC820P : In addition to **FF-TiCN**, which has excellent peel-off and wear resistance, this grade features a high-density structured **FF-Al₂O₃** layer using new **smooth surface treatment technology**, and also employs **coating thickness control technology** to achieve excellent versatility, stability, and long tool life.

AC830P : In addition to **FF-TiCN**, which has excellent peel-off and wear resistance, this grade features a strengthened **FF-Al₂O₃** layer using new **stress control technology**, and moreover provides excellent reliability and wear resistance in heavy interrupted cutting to achieve long tool life.

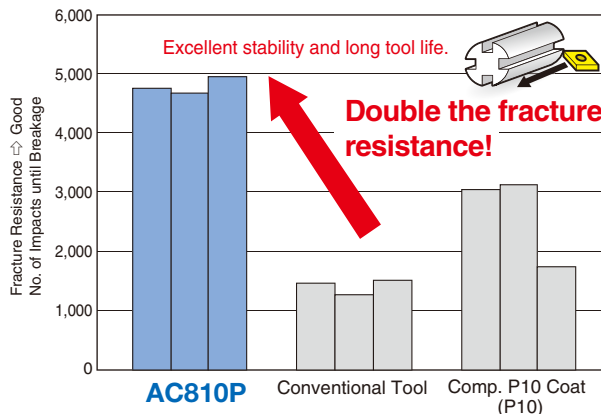
AC810P Cutting Performance

● Continuous Cutting (V-T chart)



Work Material: SCM435 (Continuous) Insert: CNMG120408N-GU
Cutting Conditions: $v_c=270$ to 370 m/min $f=0.3$ mm/rev $a_p=1.5$ mm Wet

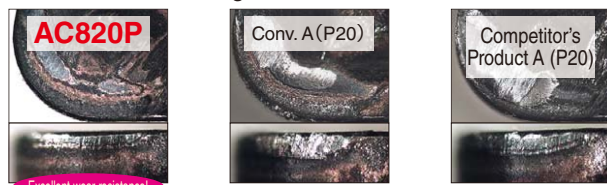
● Interrupted Cutting



Work Material: SCM435 (Interrupted) Insert: CNMG120408N-GU
Cutting Conditions: $v_c=330$ to 350 m/min $f=0.19$ to 0.22 mm/rev $a_p=1.5$ mm Wet

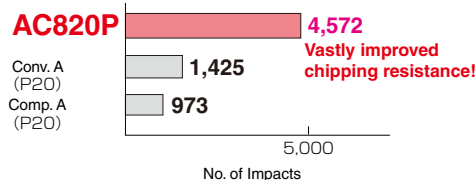
AC820P Cutting Performance

● Continuous Cutting



Work Material: S45C (Continuous) Insert: CNMG120408N-GE
Cutting Conditions: $v_c=270$ m/min $f=0.4$ mm/rev $a_p=1.2$ mm Wet $T=21$ min

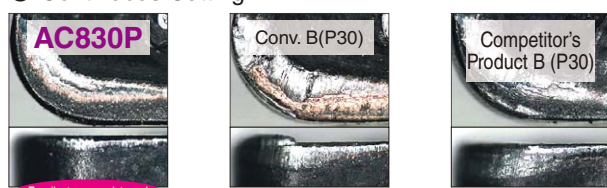
● Interrupted Cutting



Work Material: SCM435 (Interrupted) Insert: CNMG120408N-GE
Cutting Conditions: $v_c=350$ m/min $f=0.2$ mm/rev $a_p=1.5$ mm Wet

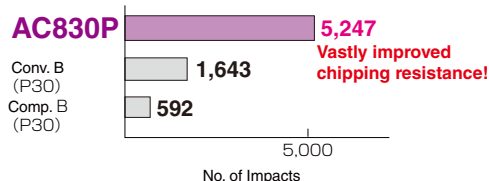
AC830P Cutting Performance

● Continuous Cutting

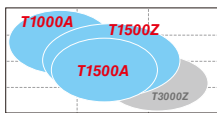


Work Material: SCM435 (Continuous) Insert: CNMG120408N-GU
Cutting Conditions: $v_c=240$ m/min $f=0.3$ mm/rev $a_p=1.5$ mm Wet $T=18$ min

● Interrupted Cutting



Work Material: SCM435 (Interrupted) Insert: CNMG120408N-GU
Cutting Conditions: $v_c=250$ m/min $f=0.24$ mm/rev $a_p=1.5$ mm Wet



Representative Grades / Performance Recommended Cutting Conditions



Steel

Work
Material

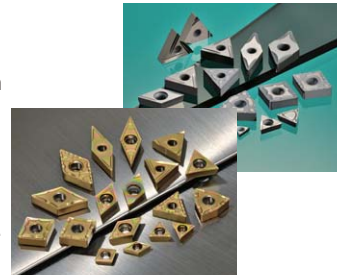
Grades

Uncoated Cermet **T1000A / T1500A / T1500Z**
Coated Cermet

T1000A : A high hardness cermet that combines excellent wear resistance and toughness. Achieves high tolerances in continuous cutting of steel and finishing of powdered metal and cast iron.

T1500A : A general purpose cermet made from hard grains with different grain sizes and functionality that provides a good balance of wear resistance and toughness. Also achieves good surface finish.

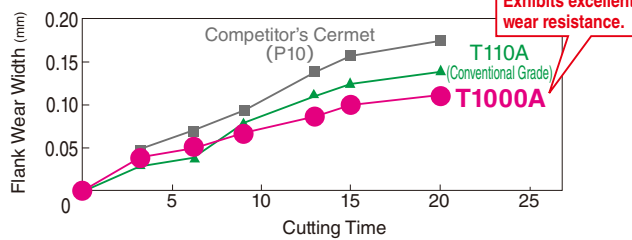
T1500Z : Employs Brilliant Coat PVD coating with excellent lubricity to provide better wear resistance and stable finished surfaces in low-cutting-speed applications such as machining small workpieces or low carbon steel.



Performance

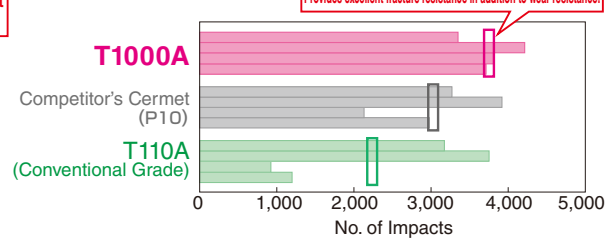
T1000A Performance

Wear Resistance



Work Material : SCM435 Insert : CNMG120408N-SU
Cutting Conditions: $v_c=320\text{m/min}$ $f=0.20\text{mm/rev}$ $a_p=1.5\text{mm Dry}$

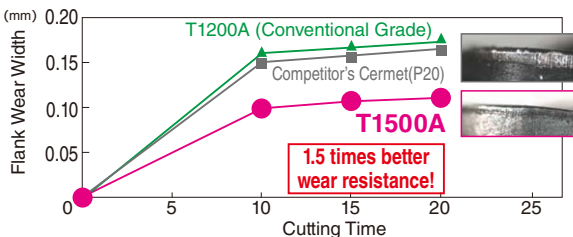
Fracture Resistance



Work Material : SCM435 Insert : CNMG120408N-SU
Cutting Conditions: $v_c=230\text{m/min}$ $f=0.20\text{mm/rev}$ $a_p=1.0\text{mm Wet}$

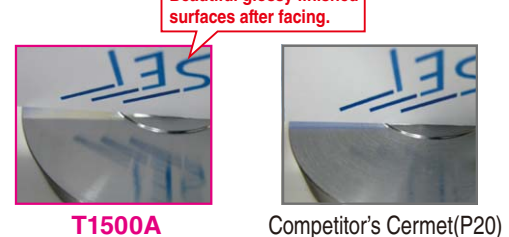
T1500A Performance

Wear Resistance



Work Material : SCM435 Insert : CNMG120408N-SU
Cutting Conditions: $v_c=230\text{m/min}$ $f=0.20\text{mm/rev}$ $a_p=1.0\text{mm Wet}$

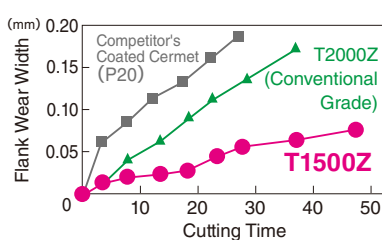
Machined Surface Finish



Work Material : S45C Insert : DNMG150404N-LU
Cutting Conditions: $v_c=150\text{m/min}$ $f=0.12\text{mm/rev}$ $a_p=0.1\text{mm Wet}$

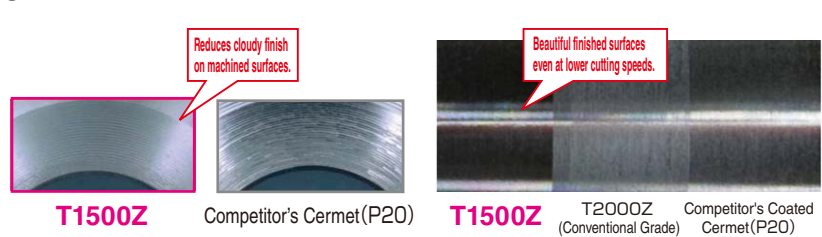
T1500Z Performance

Wear Resistance



Work Material : SCM435 Insert : CNMG120408N-SU
Cutting Conditions: $v_c=230\text{m/min}$ $f=0.20\text{mm/rev}$ $a_p=1.0\text{mm Wet}$

Machined Surface Finish



Work Material : SNCM220H Insert : DNMG150408N-SU
Cutting Conditions: $v_c=150\text{m/min}$ $f=0.20\text{mm/rev}$ $a_p=1.0\text{mm Wet}$

Work Material : STKM13A Insert : CNMG120408N-SU
Cutting Conditions: $v_c=100\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=1.0\text{mm Wet}$

Recommended Cutting Conditions

Work Material	Cutting Process	Chipbreaker	Grades	Cutting Conditions		
				Depth of Cut a_p (mm)	Feed Rate f (mm/rev)	Min. - Optimum - Max. Cutting Speed V_c (m/min)
Soft Steel (SS41 and others)	Fine Finishing	FA/FL	T1500Z	0.2-0.5-1.0	0.05-0.15-0.25	150-280-400
	Finishing	LU	T3000Z	0.3-1.0-1.8	0.08-0.20-0.35	150-280-400
Alloy Steel Carbon Steel (S45C, SCM435, and others)	Fine Finishing	FA/FL	T1500A	0.2-0.5-1.0	0.05-0.15-0.25	100-200-300
	Finishing	SU/SE	T1500A	0.5-1.0-2.0	0.08-0.20-0.35	100-200-300
	Medium	GU	T1500Z	0.8-2.2-4.0	0.15-0.25-0.50	100-200-300
High Carbon Steel Carbon Steel (SCM440H and others)	Fine Finishing	FA/FL	T1000A	0.2-0.5-1.0	0.05-0.15-0.25	50-150-250
	Finishing	SU/SE	T1500Z	0.5-1.0-2.0	0.08-0.20-0.35	50-150-250
	Medium	GU	T1500Z	0.8-2.2-4.0	0.15-0.25-0.50	50-150-250

A

Grades

Steel

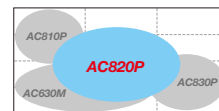
Stainless Steel

Cast Iron

Exotic Alloy

Hardened Steel

Non-Ferrous Metal

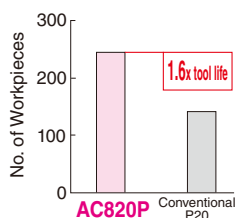
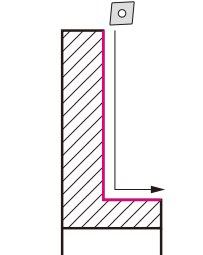


Application Examples

AC820P

S48C Turbine Hub

Good stability and wear resistance in rough cutting of mill-scaled work with 1.6x tool life.

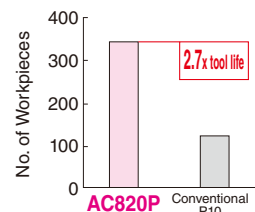
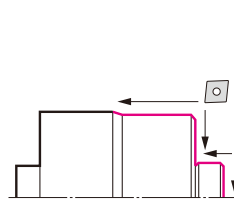


Insert: CNMG120408N-GE (AC820P)

Cutting Conditions: $v_c=210\text{m/min}$ $f=0.3\text{mm/rev}$ $a_p=1.0\text{mm}$ Wet

SCr420H Output Shaft

Good wear resistance in high-speed conditions and 2.7x tool life.

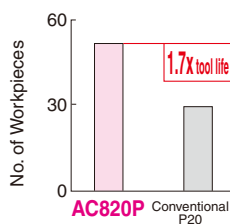
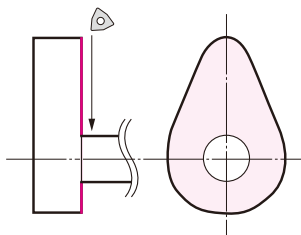


Insert: CNMG120408N-SX (AC820P)

Cutting Conditions: $v_c=$ up to 400m/min $f=0.25\text{mm/rev}$ $a_p=0.5$ to 1.2mm Wet

SCM435 Balancer

High reliability in interrupted cutting with 1.7x tool life.

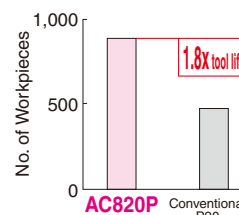
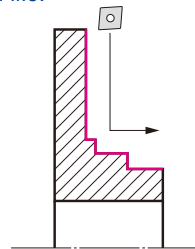


Insert: WNMG080408N-GU (AC820P)

Cutting Conditions: $v_c=220\text{m/min}$ $f=0.18\text{mm/rev}$ $a_p=10\text{mm}$ Wet

SCM415 Turbine Hub

Low alloy steel and good finishing. Stable cutting with 1.8x tool life.

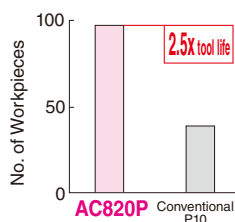
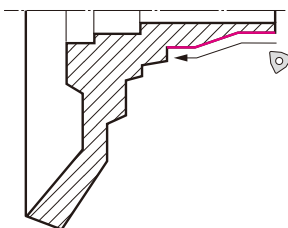


Insert: CNMG120408N-GU (AC820P)

Cutting Conditions: $v_c=200\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

S48C Compact Knuckle

No sudden breakages and significantly improved stability with 2.5x tool life.

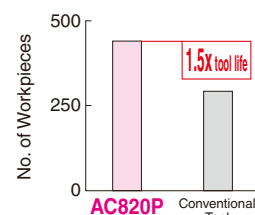
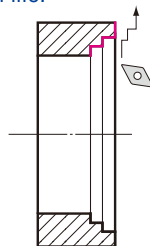


Insert: WNMG080412N-LU (AC820P)

Cutting Conditions: $v_c=192\text{m/min}$ $f=0.45\text{mm/rev}$ $a_p=1.0$ to 2.0mm Wet

S45C Ring

Good wear resistance in rough cutting of mill-scaled work and 1.5x tool life.

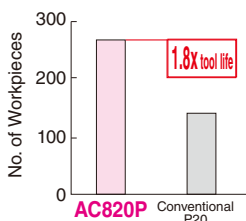
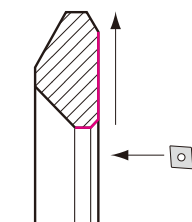


Insert: DNMG150412N-SX (AC820P)

Cutting Conditions: $v_c=200\text{m/min}$ $f=0.15$ - 0.35mm/rev $a_p=1.0$ to 2.0mm Wet

SCM425 Gear

Good wear resistance in high-feed conditions with 1.8x tool life.

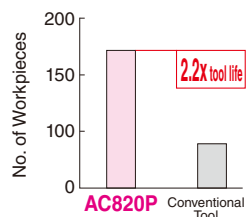
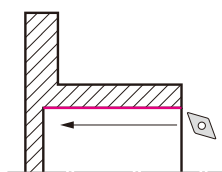


Insert: CNMG120408N-MU (AC820P)

Cutting Conditions: $v_c=220\text{m/min}$ $f=0.5\text{mm/rev}$ $a_p=5\text{mm}$ Wet

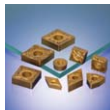
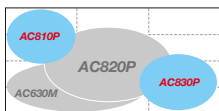
S35C Carrier Flange

Positive type with good wear resistance and 2.2x tool life.



Insert: DCMT11T308N-SU (AC820P)

Cutting Conditions: $v_c=180\text{m/min}$ $f=0.17\text{mm/rev}$ $a_p=1\text{mm}$ Wet



Application Examples (2)



Steel

Work
Material

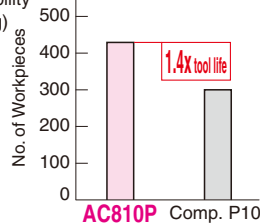
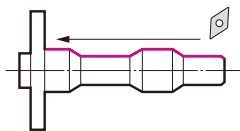
Application Examples

AC810P

SCr415 Hub

Good tool life in rough cutting of mill-scaled work.

In rough cutting of mill-scaled work, **AC810P** provides superior wear resistance and cutting edge stability compared to competitor's grade (P10 coating) and has achieved 1.4 times longer tool life.

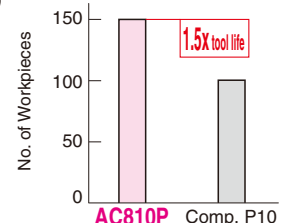
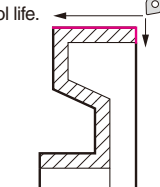


Insert: DNMG150612N-GE (AC810P)
Cutting Conditions: $v_c=204\text{m/min}$ $f=0.35$ to 0.45mm/rev $a_p=1.5$ to 3.0mm Wet

S45C Hub

Good tool life in rough cutting of mill-scaled work.

In rough cutting of mill-scaled work, **AC810P** provides superior wear resistance compared to competitor's grade (P10 coating) and has achieved 1.5 times longer tool life.

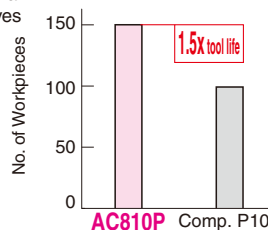
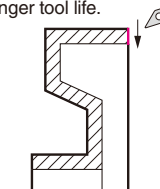


Insert: WNMG080412N-GU (AC810P)
Cutting Conditions: $v_c=250\text{m/min}$ $f=0.4\text{mm/rev}$ $a_p=1.5\text{mm}$ Wet

S45C Hub

Long tool life and stable cutting edge.

AC810P gives higher cutting edge stability than competitor's grade (P10 coating) and achieves 1.5 times longer tool life.

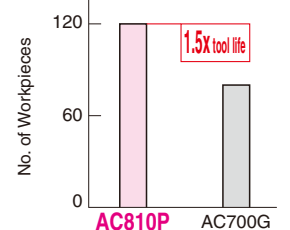
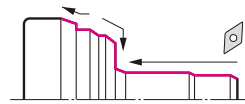


Insert: VBMT160408N-SU (AC810P)
Cutting Conditions: $v_c=240\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=0.7\text{mm}$ Wet

S45C CVJ Outer Race

Long tool life in high speed machining applications.

In high-speed dry machining, **AC810P** provides superior wear resistance compared to conventional grade (AC700G) and has achieved 1.5 times longer tool life.

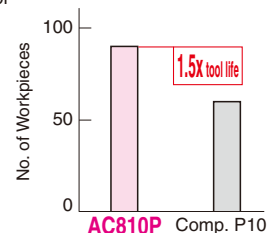
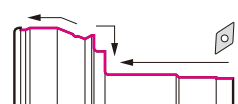


Insert: DNMG150612N-LU (AC810P)
Cutting Conditions: $v_c=350\text{m/min}$ $f=0.20$ to 0.45mm/rev $a_p=0.4$ to 0.5mm Dry

S53C CVJ Outer Race

Long tool life in dry cutting applications.

In dry machining, **AC810P** provides superior wear resistance compared to competitor's grade (P10 coating) and has achieved 1.5 times longer tool life.

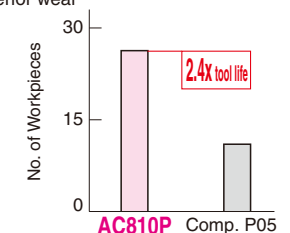
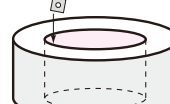


Insert: DNMG150612N-GE (AC810P)
Cutting Conditions: $v_c=270\text{m/min}$ $f=0.35$ to 0.38mm/rev $a_p=1.5\text{mm}$ Dry

S45C Coupling

On par with P05 grade.

In high-feed cutting, **AC810P** provides superior wear resistance compared to competitor's grade (P05 coating) and has achieved 2.4 times longer tool life.



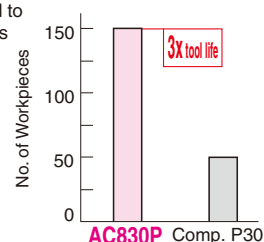
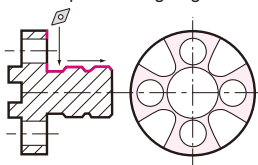
Insert: SNMG150616N-MU (AC810P)
Cutting Conditions: $v_c=175\text{m/min}$ $f=0.66\text{mm/rev}$ $a_p=2.6\text{mm}$ Wet

AC830P

S55C Hub Unit

Long tool life in both interrupted and continuous cutting!

AC830P offers reduced chipping compared to competitor's grade (P30) in both continuous and interrupted cutting to give 3x tool life.

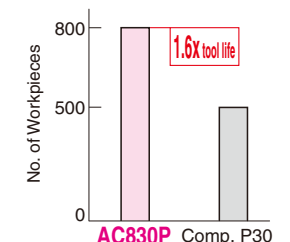
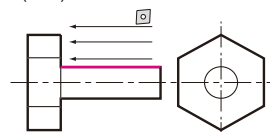


Insert: DNMG150412N-UX (AC830P)
Cutting Conditions: $v_c=150\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=1.0\text{mm}$ Wet

SS400 Bolt

Long tool life in both interrupted and continuous cutting!

AC830P offers superior chipping and wear resistance compared to competitor's grade (P30) and has 1.6x tool life.



Insert: CNMG120408N-GU (AC830P)
Cutting Conditions: $v_c=170\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=2.5\text{mm}$ Wet

A

Grades

Steel

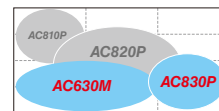
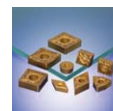
Stainless
Steel

Cast Iron

Exotic
Alloy

Hardened
Steel

Non-Ferrous
Metal



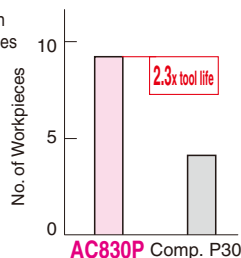
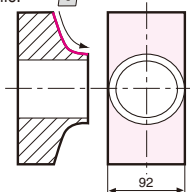
Application Examples

AC830P

S50C Machine Component

Improved efficiency and long tool life.

AC830P provides cutting speed that is 25% faster than competitor's grade (P30 coating) and achieves 2.3 times longer tool life.



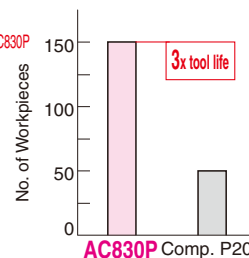
Insert : CNMG120412N-MU (AC830P)

Cutting Conditions : $v_c=120$ to 150m/min $f=0.25\text{mm/rev}$ $a_p=1.5\text{mm}$ Wet

SCM415 Cam Shaft

On par with P20 grade.

In comparison to competitor's grade (P20 coating) which suffered from sudden breakages leading to unstable tool life (30 to 70 workpieces), AC830P provides stable tool life that is 3 times longer (140 to 160 workpieces).



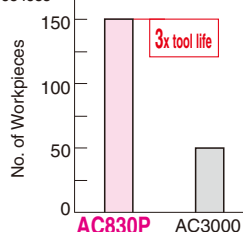
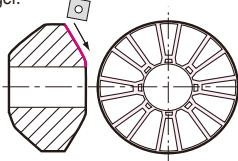
Insert : DNMG150408N-GU (AC830P)

Cutting Conditions : $v_c=220\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=1.0\text{mm}$ Wet

SCr420 Pinion Gear

Stable, long tool life in heavy interrupted cutting.

In heavy interrupted cutting of gears, AC830P provides less abnormal damage compared to conventional grade (AC3000) and has achieved stable tool life that is 3 times longer.



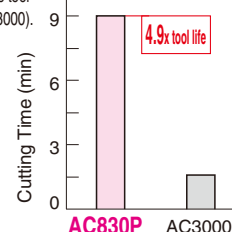
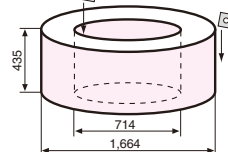
Insert : SNMG120412N-UX (AC830P)

Cutting Conditions : $v_c=170\text{m/min}$ $f=0.35\text{mm/rev}$ $a_p=1.5\text{mm}$ Wet

SNCM420 Large Gear for Construction Equipment

Stable, long tool life in heavy cutting.

In heavy cutting with varying cut depths, AC830P achieves stable tool life that is 4.9 times longer compared to conventional grade (AC3000).



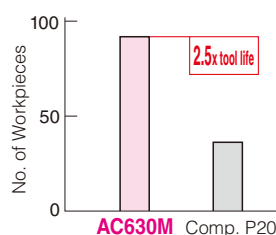
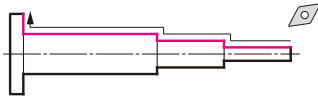
Insert : SNMM190616N-HG (AC830P)

Cutting Conditions : $v_c=115\text{m/min}$ $f=0.8\text{mm/rev}$ $a_p=5$ to 10mm Wet

AC630M

SNCM439 Shaft

AC630M suppresses vibration and has 2.5x tool life of competitor's P20 grade.

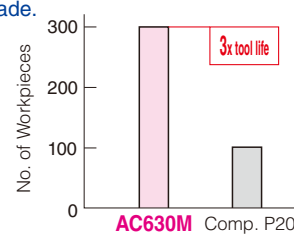
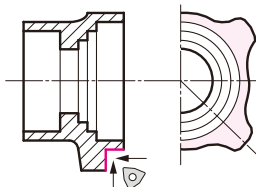


Insert : DNMG150404N-EX (AC630M)

Cutting Conditions : $v_c=180\text{m/min}$ $f=0.18\text{mm/rev}$ $a_p=0.5\text{mm}$ Wet

S53C Hub

AC630M has no chipping during light interrupted cutting and has 3x tool life of competitor's P20 grade.



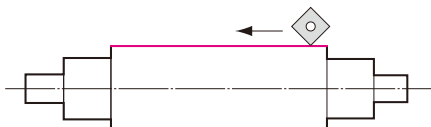
Insert : WNMG080412N-GU (AC630M)

Cutting Conditions : $v_c=180\text{m/min}$ $f=0.35\text{mm/rev}$ $a_p=0.8\text{mm}$ Wet

AC900G

Alloy Steel Forged Steel Roll

Reduced cutting resistance during rough cutting of mill-scaled work and improved feed rate have improved efficiency by 1.5x.

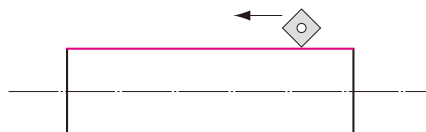


Insert : SNMM310924N-HW (AC900G)

Cutting Conditions : $v_c=98\text{m/min}$ $f=1.2\text{mm/rev}$ $a_p=15$ to 20mm Wet

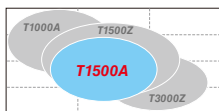
Alloy Steel Axle

Stable tool life on rough, mill-scaled work.



Insert : SNMM310924N-MP (AC900G)

Cutting Conditions : $v_c=50\text{m/min}$ $f=1.0\text{mm/rev}$ $a_p=15$ to 21mm Dry



Application Examples(4)



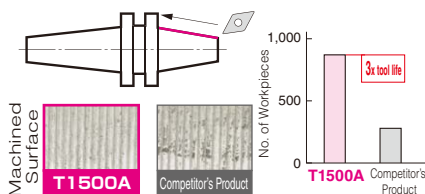
Steel

Work
Material

Application Examples

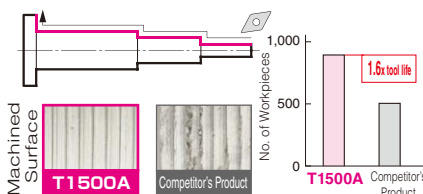
T1500A (M Class Insert)

SCM415 Arbor



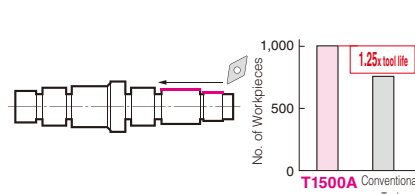
Insert : DNMG150408N-LU (T1500A)
Cutting Conditions : $v_c=200\text{m/min}$ $f=0.25\text{mm/rev}$
 $a_p=0.3\text{mm}$ Wet

SCM435 Shaft



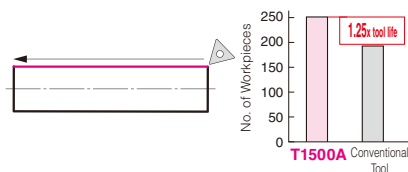
Insert : DNMG150408N-SU (T1500A)
Cutting Conditions : $v_c=200\text{m/min}$ $f=0.18\text{mm/rev}$
 $a_p=0.15\text{mm}$ Wet

SCM435 Gear Shaft



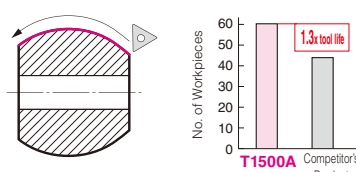
Insert : DNMG150404N-LU (T1500A)
Cutting Conditions : $v_c=90$ to 140m/min $f=0.15\text{mm/rev}$
 $a_p=0.25\text{mm}$ Wet

S45C Shaft



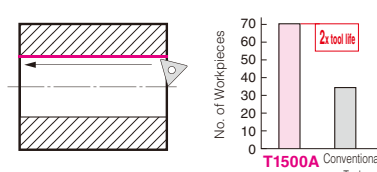
Insert : TNMG160404N-FL (T1500A)
Cutting Conditions : $v_c=200\text{m/min}$ $f=0.12\text{mm/rev}$
 $a_p=0.35\text{mm}$ Wet

SUS316 Valve



Insert : TNMG160408N-SU (T1500A)
Cutting Conditions : $v_c=140\text{m/min}$ $f=0.12\text{mm/rev}$
 $a_p=0.15\text{mm}$ Wet

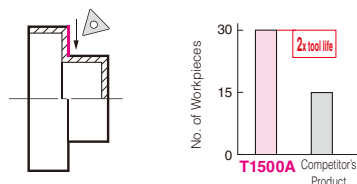
STKM13A Machine Component



Insert : TNMG160404N-SU (T1500A)
Cutting Conditions : $v_c=150\text{m/min}$ $f=0.07\text{mm/rev}$
 $a_p=0.1\text{mm}$ Wet

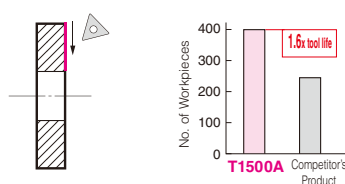
T1500A (G Class Insert)

SAPH400 Automotive Component



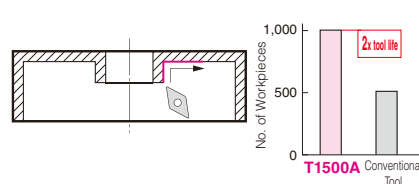
Insert : TNGG160402L-UM (T1500A)
Cutting Conditions : $v_c=180\text{m/min}$ $f=0.25\text{mm/rev}$
 $a_p=0.25\text{mm}$ Wet

S45C Transmission Part



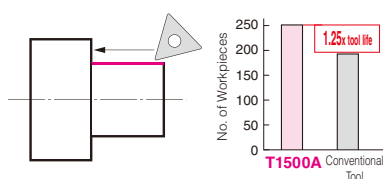
Insert : TNGG160402L-FY (T1500A)
Cutting Conditions : $v_c=300\text{m/min}$ $f=0.05\text{mm/rev}$
 $a_p=0.1\text{mm}$ Wet

SPH440 Drum Brake Component



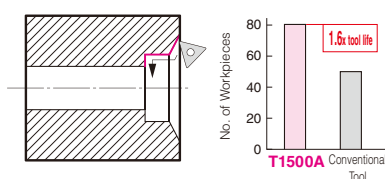
Insert : DNGG150404R-UM (T1500A)
Cutting Conditions : $v_c=280\text{m/min}$ $f=0.07\text{mm/rev}$
 $a_p=0.25\text{mm}$ Wet

SCM435 Pump Part



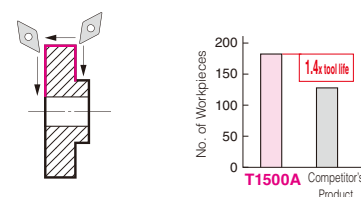
Insert : TNGG160404R-UM (T1500A)
Cutting Conditions : $v_c=100\text{m/min}$ $f=0.25\text{mm/rev}$
 $a_p=1.0\text{mm}$ Wet

S45C Sleeve



Insert : TPGT110304L-SD (T1500A)
Cutting Conditions : $v_c=200\text{m/min}$ $f=0.15\text{mm/rev}$
 $a_p=0.2\text{mm}$ Wet

S45C Machine Component



Insert : DCGT070202L-FX (T1500A)
Cutting Conditions : v_c to 240m/min $f=0.03\text{mm/rev}$
 $a_p=0.05\text{mm}$ Wet

A

Grades

Steel

Stainless
Steel

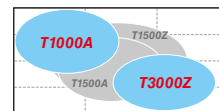
Cast Iron

Exotic
Alloy

Hardened
Steel

Non-Ferrous
Metal

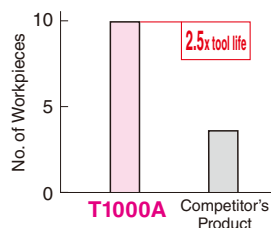
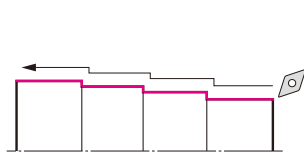
A15



Application Examples

T1000A

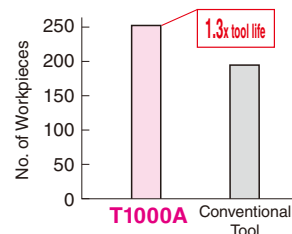
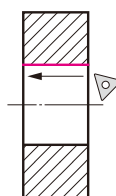
SCM440 Shaft



Insert: DNMG150408N-SU (T1000A)

Cutting Conditions: $v_c=180\text{m/min}$, $f=0.10$ to 0.25mm/rev , $a_p=0.4\text{mm}$, Wet

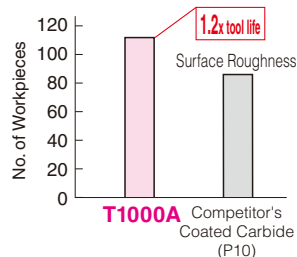
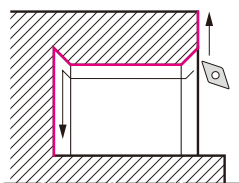
S45C Flange



Insert: TPGT110304L-SD (T1000A)

Cutting Conditions: $v_c=180\text{m/min}$, $f=0.08\text{mm/rev}$, $a_p=0.15\text{mm}$, Wet

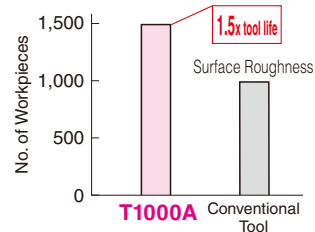
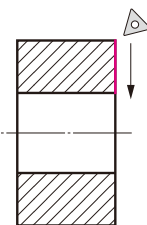
S30C Automotive Component



Insert: DCMT070208N-SU (T1000A)

Cutting Conditions: $v_c=230\text{m/min}$, $f=0.05\text{mm/rev}$, $a_p=0.3$ to 0.7mm , Wet

S25C Automotive Component

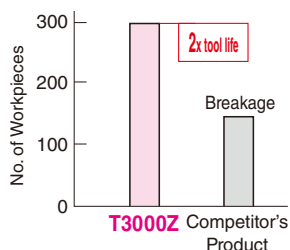
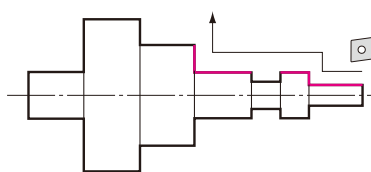


Insert: TNGG160404L-FX (T1000A)

Cutting Conditions: $v_c=80$ to 170m/min , $f=0.10\text{mm/rev}$, $a_p=0.2\text{mm}$, Dry

T3000Z

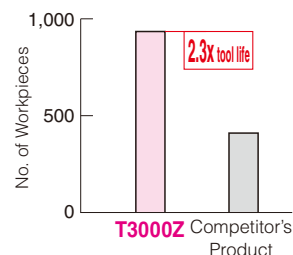
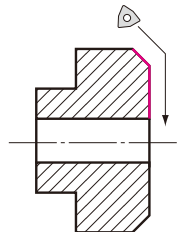
S48C Shaft (Interrupted Cutting)



Insert: CNMG120408N-SX (T3000Z)

Cutting Conditions: $v_c=220\text{m/min}$, $f=0.25\text{mm/rev}$, $a_p=1.8\text{mm}$, Wet

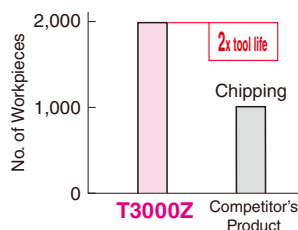
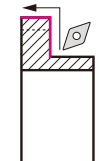
SCr420H Cone Clutch



Insert: WNMG080408N-LU (T3000Z)

Cutting Conditions: $v_c=200\text{m/min}$, $f=0.20\text{mm/rev}$, $a_p=1.0\text{mm}$, Wet

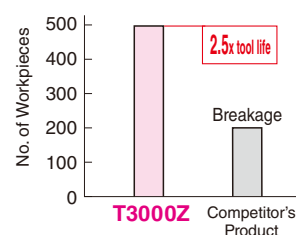
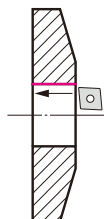
SCr420H Clutch Gear (Interrupted Cutting)



Insert: DNMG150408N-LU (T3000Z)

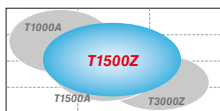
Cutting Conditions: $v_c=200\text{m/min}$, $f=0.3\text{mm/rev}$, $a_p=0.3$ to 0.5mm , Wet

S45C Machine Component



Insert: CPMT090304N-SU (T3000Z)

Cutting Conditions: $v_c=100\text{m/min}$, $f=0.20\text{mm/rev}$, $a_p=1.0\text{mm}$, Wet



Application Examples (6)



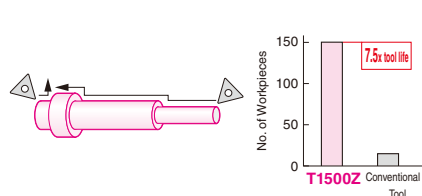
Steel

Work
Material

Application Examples

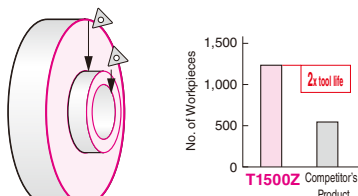
T1500Z

SCM415 Shaft



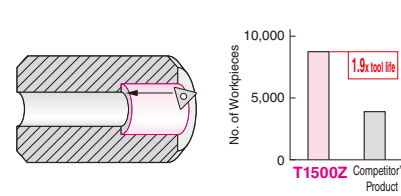
Insert: TNMG160408N-SU (T1500Z)
Cutting Conditions: $v_c=220\text{m/min}$, $f=0.26$ to 0.34mm/rev ,
 $a_p=0.2$ to 0.25mm , Wet

SCM420H Automotive Component



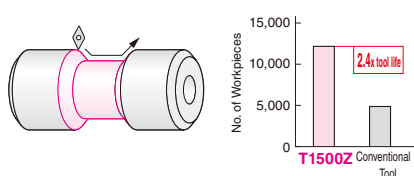
Insert: TNMG160408N-LU (T1500Z)
Cutting Conditions: $v_c=200\text{m/min}$, $f=0.15\text{mm/rev}$,
 $a_p=1.0\text{mm}$, Wet

S48C Guide



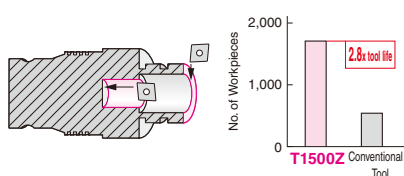
Insert: TPMT090204N-LU (T1500Z)
Cutting Conditions: $v_c=162\text{m/min}$, $f=0.13\text{mm/rev}$,
 $a_p=0.55\text{mm}$, Wet

S45C Sleeve



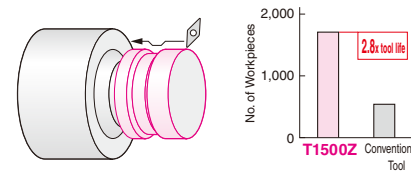
Insert: DCMT11T304N-LU (T1500Z)
Cutting Conditions: $v_c=230\text{m/min}$, $f=0.10\text{mm/rev}$,
 $a_p=0.50\text{mm}$, Wet

S43C Lower Shaft



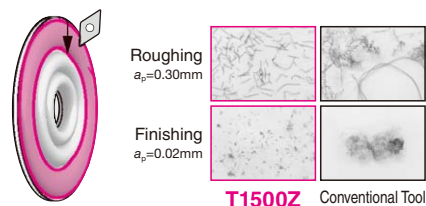
Insert: CPGT080208N-SD (T1500Z)
Cutting Conditions: $v_c=140\text{m/min}$, $f=0.15\text{mm/rev}$,
 $a_p=0.5\text{mm}$, Wet

S43C Machine Component



Insert: VNMG160408N-FL (T1500Z)
Cutting Conditions: $v_c=180\text{m/min}$, $f=0.2\text{mm/rev}$, $a_p=0.2$
to 0.9mm , Wet

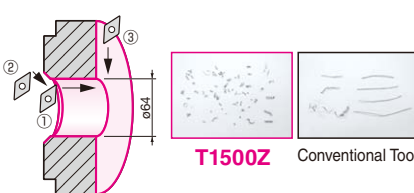
SAPH440 (Press Material) Piston Component



Criteria : Undulation of Finished Surface

Insert: DCMT11T308N-FB (T1500Z)
Cutting Conditions : $v_c=360\text{m/min}$ $f=0.14\text{mm/rev}$
 a_p =Rough : 0.30mm Finishing : 0.02mm Wet

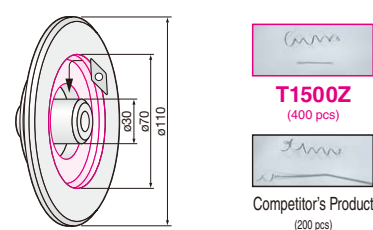
SCM420H Clutch Component



Criteria : Surface Properties (Clouding and Exit Burrs)

Insert: DCMT11T304N-FB (T1500Z)
Cutting Conditions : $v_c=220\text{m/min}$ $f=$ ① 0.15 ② 0.12
③ 0.18mm/rev $a_p=0.25\text{mm}$ Wet

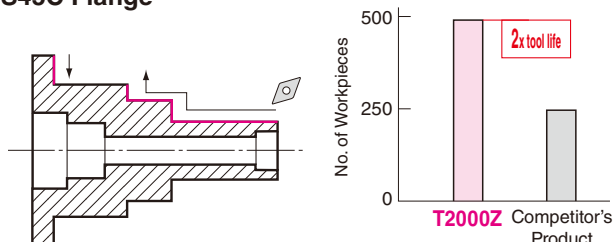
S45C Hub



Insert: VBMT160408N-LB (T1500Z)
Cutting Conditions : $v_c=240\text{m/min}$ $f=0.25$ to 0.28mm/rev
 $a_p=0.6\text{mm}$ Wet

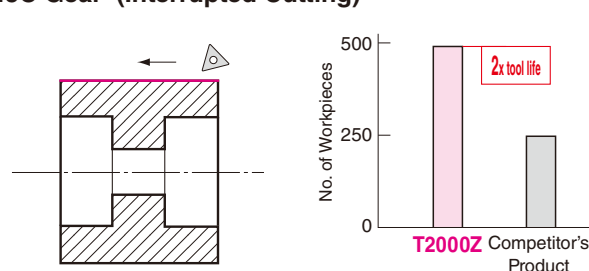
T2000Z

S45C Flange



Insert: DNMG150408N-SU (T2000Z)
Cutting Conditions: $v_c=200\text{m/min}$, $f=0.28\text{mm/rev}$, $a_p=1.5\text{mm}$, Wet

S45C Gear (Interrupted Cutting)



Insert: TNGG160404R-UM (T2000Z)
Cutting Conditions: $v_c=300\text{m/min}$, $f=0.15\text{mm/rev}$, $a_p=2.0\text{mm}$, Wet

A

Grades

Steel

Stainless Steel

Cast Iron

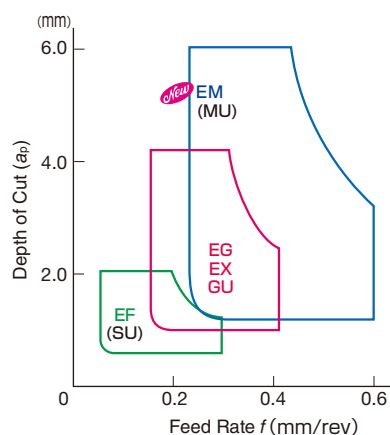
Exotic Alloy

Hardened Steel

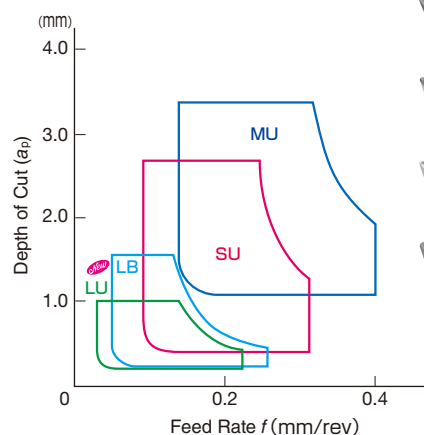
Non-Ferrous Metal

Chipbreakers

Negative Type

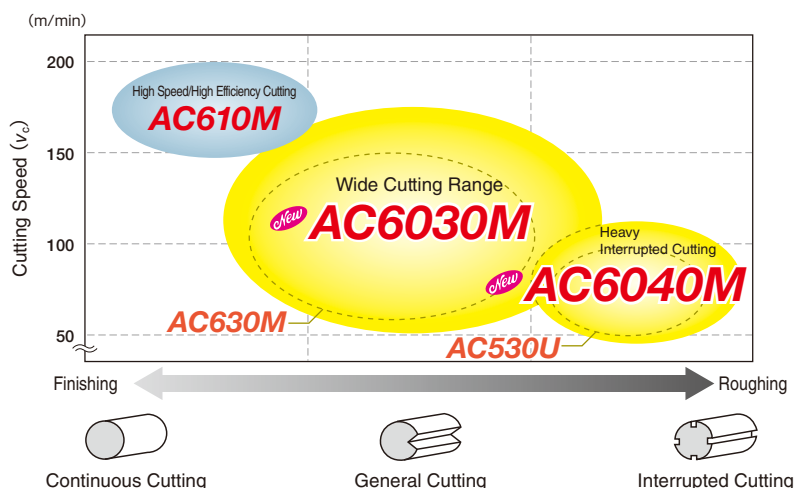


Positive Type



Refer to the chapter on Small Tools (page D7) for the Chipbreaker Selection Guide for ground inserts (G Class) inserts.

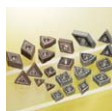
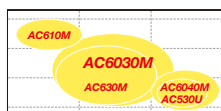
Grades



Recommended Cutting Conditions

(Red text indicates 1st recommendation.)

Work Material			Cutting Process	Chipbreaker	Grade	Cutting Conditions		
						Depth of Cu a_p (mm)	Feed Rate f (mm/rev)	Cutting Speed V_c (m/min)
Cr-based	Ferritic	SUS405, SUS410L, SUS430, SUS430F, SUS434, SUS447FJ1	Finishing	EF (SU)	AC610M	0.5-1.5-2.0	0.05-0.15-0.25	170-225-300
			Medium	EG · GU · EX	AC6030M	1.0-2.5-4.0	0.10-0.25-0.40	140-180-235
			Rough	EM (MU)	AC6040M	1.5-3.5-6.0	0.20-0.35-0.60	120-150-180
	Martensitic	SUS403, SUS410, SUS420J2, SUS420F, SUS440F	Finishing	EF (SU)	AC6030M	0.5-1.5-2.0	0.05-0.15-0.25	120-175-230
			Medium	EG · GU · EX	AC6030M	1.0-2.5-4.0	0.10-0.25-0.40	100-140-180
			Rough	EM (MU)	AC6040M	1.5-3.5-6.0	0.20-0.35-0.60	80-120-160
Cr/Ni-based	Austenitic	SSU304, SUS304L, SUS316, SUS316L, SUS303, SUS321	Finishing	EF (SU)	AC6030M	0.5-1.5-2.0	0.05-0.15-0.25	145-200-265
			Medium	EG · GU · EX	AC6030M	1.0-2.5-4.0	0.10-0.25-0.40	120-160-210
			Rough	EM (MU)	AC6040M	1.5-3.5-6.0	0.20-0.35-0.60	100-135-170
	Two-Phase Austenitic/Ferritic	SUS329J1, SUS329J3L, SSU329J4L	Finishing	EF (SU)	AC6030M	0.5-1.5-2.0	0.05-0.15-0.25	120-160-200
			Medium	EG · GU · EX	AC6030M	1.0-2.5-4.0	0.10-0.25-0.40	95-125-160
			Rough	EM (MU)	AC6040M	1.5-3.5-6.0	0.20-0.35-0.60	75-105-135
	Deposition Hardened Structures	SUS630, SUS631, SUS632J1	Finishing	EF (SU)	AC6030M	0.5-1.5-2.0	0.05-0.15-0.25	90-115-140
			Medium	EG · GU · EX	AC6030M	1.0-2.5-4.0	0.10-0.25-0.40	70- 90-110
			Rough	EM (MU)	AC6040M	1.5-3.5-6.0	0.20-0.35-0.60	50- 75-100



Representative Grades / Performance



Stainless Steel

Work Material

Grades

New AC6030M / New AC6040M / AC610M / AC630M / AC520U / AC530U

AC6030M : Employs Absotech Platinum, a new CVD coating. The first recommended grade for general machining of stainless steel that drastically reduces the occurrence of abnormal damage, which is a problem in stainless steel machining, and achieves long and stable machining thanks to the improved coating strength and excellent adhesion.

AC6040M : Employs Absotech Bronze, a new PVD coating, and exclusive tough carbide substrate. The first recommended grade for interrupted machining of stainless steel that drastically improves the reliability in unstable machining thanks to the excellent adhesion and peel-off resistance of the new PVD coating as well as the improved fracture resistance of the exclusive carbide substrate.

AC610M : High hardness carbide substrate coupled with Super FF Coat. For high efficiency machining with superior wear resistance.

AC630M : High toughness carbide substrate coupled with Super FF Coat. A general purpose grade with sharp cutting edges for superior stability.

AC520U : Tough carbide grade that utilises the high wear resistant Super ZX Coat for excellent stability

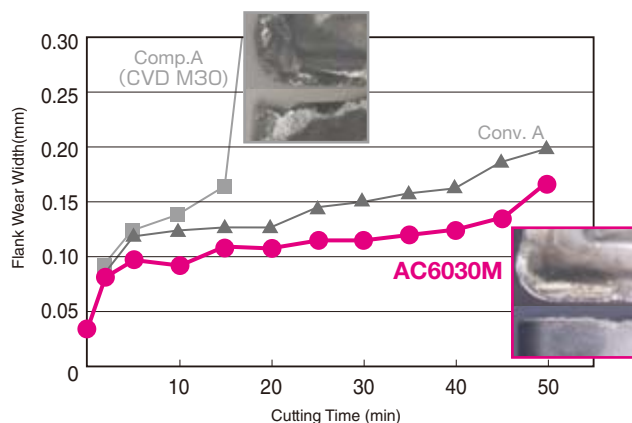
AC530U : Tough grade with long tool life and high efficiency for precision machining of stainless steel and small components.

From page D6

Performance

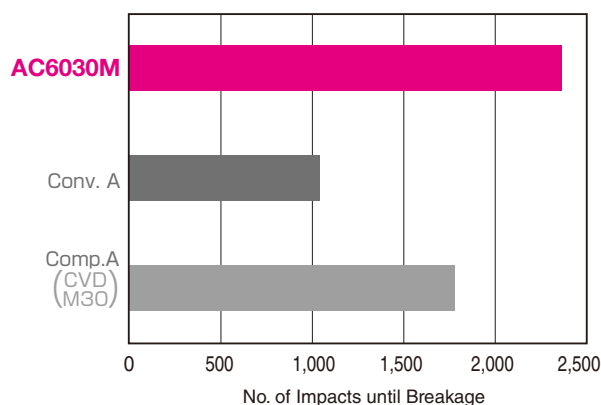
New AC6030M Cutting Performance

● Continuous Cutting



Work Material : SUS316 Insert : CNMG120408N-EX
Cutting Conditions : $v_c=200\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

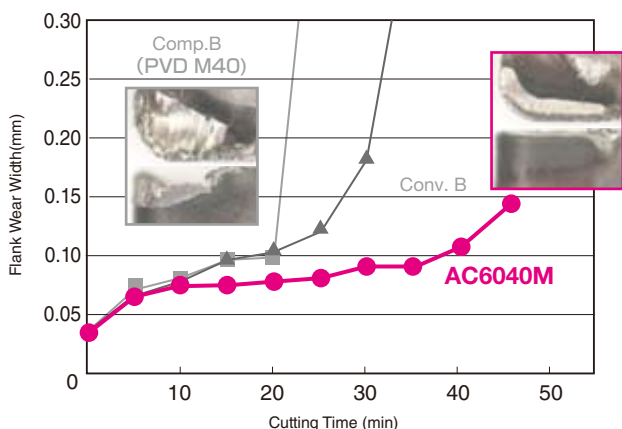
● Interrupted Cutting



Work Material : SUS316 Insert : CNMG120408N-GU
Cutting Conditions : $v_c=100\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=1.0\text{mm}$ Wet

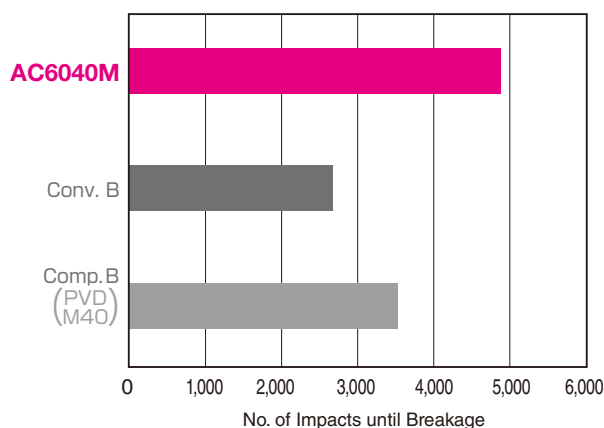
New AC6040M Cutting Performance

● Continuous Cutting



Work Material : SUS316 Insert : CNMG120408N-GU
Cutting Conditions : $v_c=150\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

● Interrupted Cutting



Work Material : SUS316 Insert : CNMG120408N-GU
Cutting Conditions : $v_c=230\text{m/min}$ $f=0.23\text{mm/rev}$ $a_p=0.80\text{mm}$ Dry

A

Grades

Steel

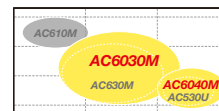
Stainless Steel

Cast Iron

Exotic Alloy

Hardened Steel

Non-Ferrous Metal

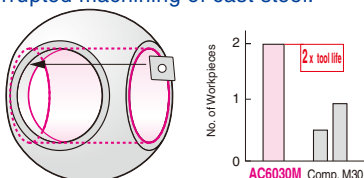


Application Examples

New AC6030M

[SCS13 Valve Ball]

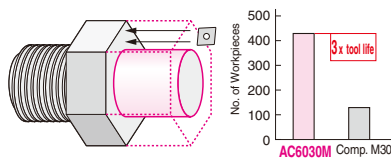
Achieves stable, 2 times longer tool life in interrupted machining of cast steel.



Insert : CNMG120412N-EM (AC6030M)
Cutting Conditions : $v_c=100\text{m/min}$ $f=0.30$ to 0.35mm/rev
 $a_p=2.5\text{mm}$ Wet

[SUS304 Joint Component]

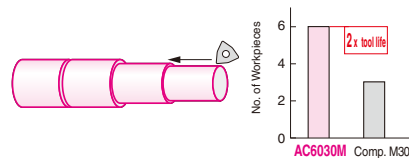
Enables roughing to finishing from hexagonal bars with one grade and achieves 3 times longer tool life.



Insert : CNMG120412N-GU (AC6030M)
Cutting Conditions : $v_c=50$ to 75m/min $f=0.16\text{mm/rev}$
 $a_p=2.0\text{mm}$ Wet

[SUS304 Shaft]

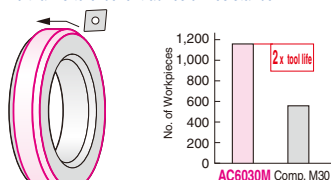
Achieves 2 times longer tool life thanks to excellent wear resistance.



Insert : WNMG080408N-EX (AC6030M)
Cutting Conditions : $v_c=60$ to 70m/min $f=0.32\text{mm/rev}$
 $a_p=3.0\text{mm}$ Wet

[SUS430 Motorcycle Component]

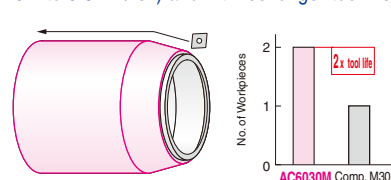
Provides stable machined surface quality and achieves 2 times longer tool life thanks to excellent adhesion resistance.



Insert : CNMG120404N-EF (AC6030M)
Cutting Conditions : $v_c=120\text{m/min}$ $f=0.10\text{mm/rev}$
 $a_p=0.8$ to 1.5mm Wet

[SCS11 Pump Part]

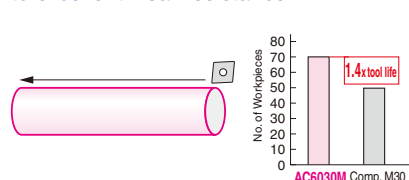
Provides 2.5 times efficiency ($V_c=60$ to 100m/min , $f=0.2$ to 0.3mm/rev) and 2 times longer tool life.



Insert : CNMG120408N-EG (AC6030M)
Cutting Conditions : $v_c=100\text{m/min}$ $f=0.3\text{mm/rev}$
 $a_p=0.5\text{mm}$ Wet

[SUS304 Shaft]

Achieves 1.4 times longer tool life thanks to excellent wear resistance.

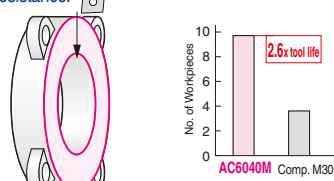


Insert : CNMG120408N-GU (AC6030M)
Cutting Conditions : $v_c=160\text{m/min}$ $f=0.25\text{mm/rev}$
 $a_p=3.0\text{mm}$ Wet

New AC6040M

[SCS14 Flange]

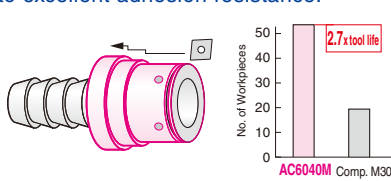
Achieves 2.6 times longer tool life thanks to excellent fracture resistance.



Insert : CNMG120408N-GU (AC6040M)
Cutting Conditions : $v_c=200$ to 360m/min $f=0.12\text{mm/rev}$
 $a_p=0.4\text{mm}$ Wet

[SUS304 Nozzle]

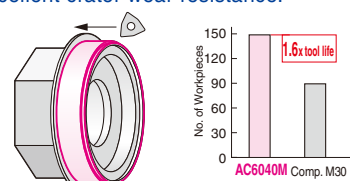
Achieves 2.7 times longer tool life thanks to excellent adhesion resistance.



Insert : CNMG120408N-GU (AC6040M)
Cutting Conditions : $v_c=150\text{m/min}$ $f=0.15\text{mm/rev}$
 $a_p=1.5\text{mm}$ Wet

[SCS14 Valve Joint]

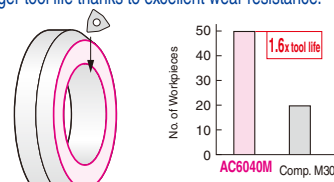
Achieves 1.6 times longer tool life thanks to excellent crater wear resistance.



Insert : WNMG080408N-EX (AC6040M)
Cutting Conditions : $v_c=130$ to 160m/min $f=0.10\text{mm/rev}$
 $a_p=0.7\text{mm}$ Wet

[SCS13 Flange Joint Component]

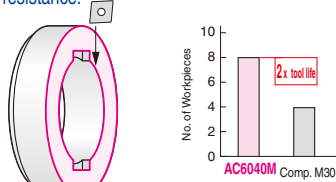
Provides stable machined surfaces and achieves 1.6 times longer tool life thanks to excellent wear resistance.



Insert : WNMG080408N-EX (AC6040M)
Cutting Conditions : $v_c=140$ to 200m/min $f=0.08\text{mm/rev}$
 $a_p=0.5\text{mm}$ Wet

[SCS13 Coupling]

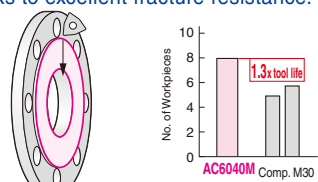
Achieves 2 times longer tool life thanks to excellent fracture resistance.



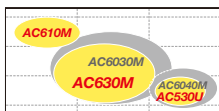
Insert : CNMG120408N-EG (AC6040M)
Cutting Conditions : $v_c=70$ to 180m/min $f=0.14\text{mm/rev}$
 $a_p=2.5\text{mm}$ Wet

[SUS14 Valve Flange]

Achieves over 1.3 times longer stable tool life thanks to excellent fracture resistance.



Insert : WNMG080408N-GU (AC6040M)
Cutting Conditions : $v_c=180$ to 340m/min $f=0.15\text{mm/rev}$
 $a_p=0.4\text{mm} \times 4\text{pass}$ Wet



Application Examples (2)

M
Stainless Steel

Stainless Steel

Work
Material

A

Grades

Steel

Stainless
Steel

Cast Iron

Exotic
Alloy

Hardened
Steel

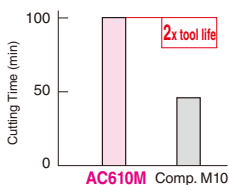
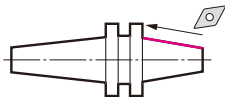
Non-Ferrous
Metal

Application Examples

AC610M

SUS304 Arbor

AC610M has good wear resistance with 2x tool life of competitor's.

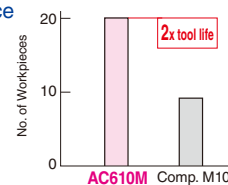
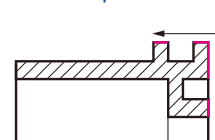


Insert : DNMG150408N-EX (AC610M)

Cutting Conditions : $v_c=210\text{m/min}$ $f=0.3\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

SUS410 Sleeve

AC610M features superior wear resistance compared to competitor's with 2x tool life.



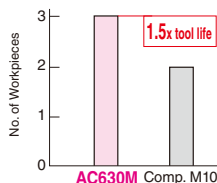
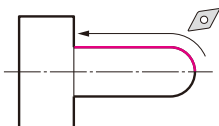
Insert : DNMG150408N-GU (AC610M)

Cutting Conditions : $v_c=215\text{m/min}$ $f=0.35\text{mm/rev}$ $a_p=0.85\text{mm}$ Wet

AC630M

SUS304 Machine Component

AC630M enables stable cutting without breakages with 1.5x the tool life of competitor's grade.

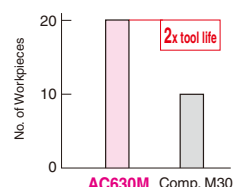
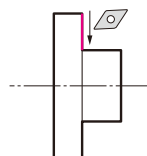


Insert : DNMG150408N-EX (AC630M)

Cutting Conditions : $v_c=130\text{m/min}$ $f=0.4\text{mm/rev}$ $a_p=0.5\text{mm}$ Wet

SUS316L Automotive Component

AC630M enables stable cutting even in light interrupted cutting with 2x the tool life of competitor's grade.

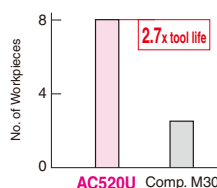
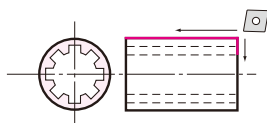


Insert : DNMG150408N-GU (AC630M)

Cutting Conditions : $v_c=150\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=1.6\text{mm}$ Wet

AC520U

SUS304 Machine Component

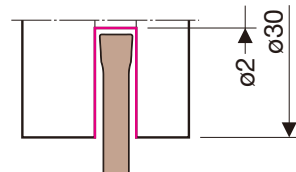


Insert : CNMG120408N-EX (AC520U)

Cutting Conditions : $v_c=150\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

Grooving SUS304 Measuring Component

Enables stable machining without chattering thanks to excellent chip control performance and a high rigidity holder.

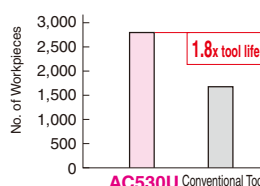
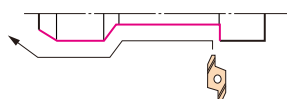


Insert : GCM N3002-GG (AC520U) Toolholder : GNDL R2525M-320

Cutting Conditions : $v_c=60\text{m/min}$ $f=0.025\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet Cutting edge : 3mm

AC530U

SUS416 Pulley Shaft

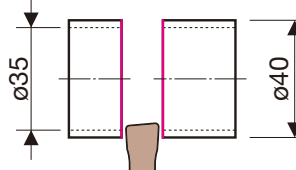


Insert : BTR3515 (AC530U)

Cutting Conditions : $v_c=60\text{ to }90\text{m/min}$ $f=0.04\text{mm/rev}$ $a_p=1.5\text{ to }2.5\text{mm}$ Wet

Cutting Off Round Hollow SUS303 Pipe

Enables stable machining thanks to superior cutting performance and excellent chip control.

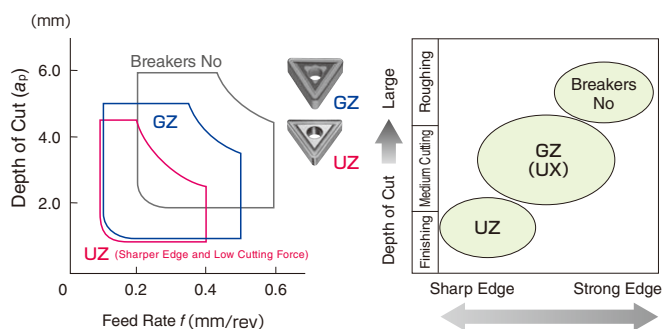


Insert : GCMR2002-CG-05 (AC530U) Toolholder : GNDL R2020K-220

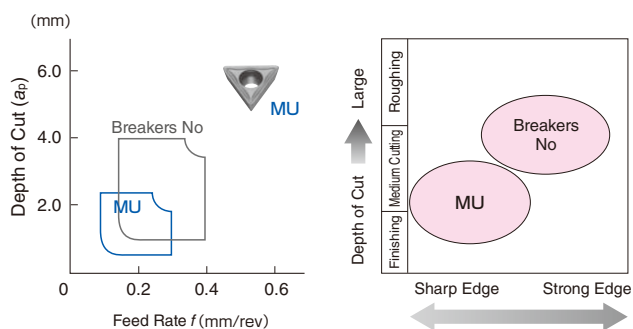
Cutting Conditions : $v_c=140\text{m/min}$ ($n=1,000\text{rpm}$) $f=0.03\text{mm/rev}$ Wet Cutting edge : 2mm

Chipbreakers

Negative Type



Positive Type

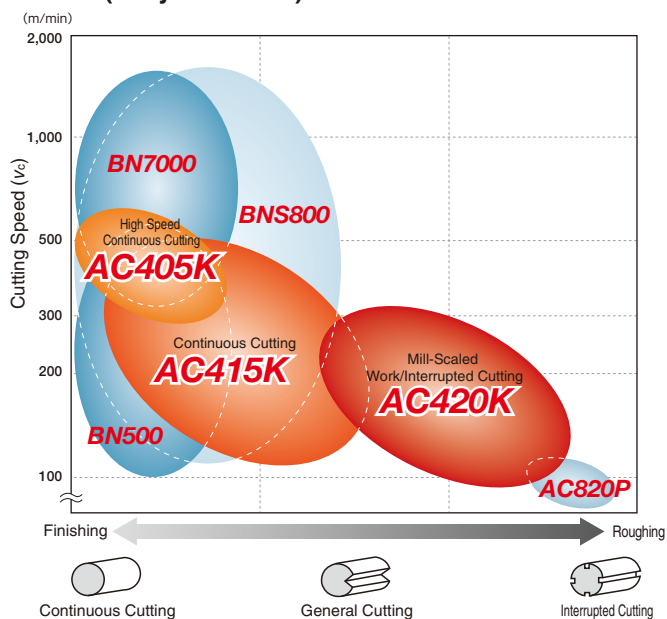


Grades

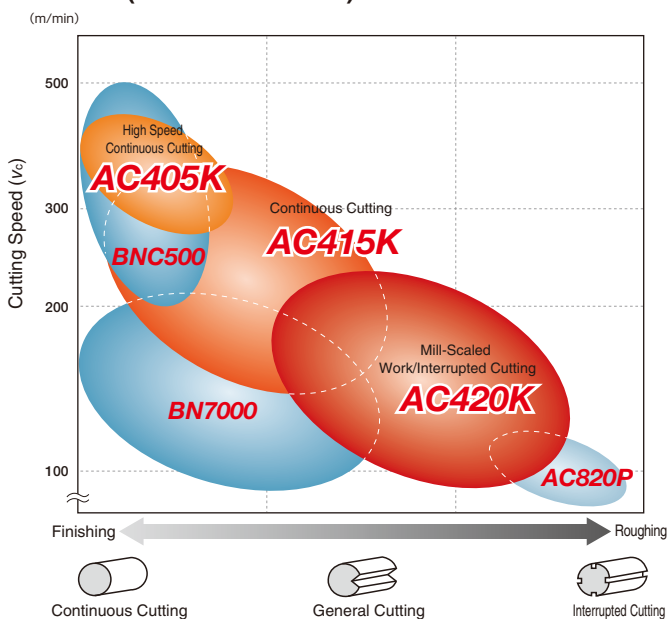
CBN Coated SUMIBORON / SUMIBORON / SUMIBORON / SUMIBORON / SUMIBORON ... Page L18

BNC500 / BN500 / BN7000 / BN700 / BNS800

● FC (Grey Cast Iron)



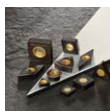
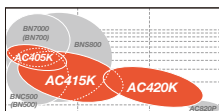
● FCD (Ductile Cast Iron)



Recommended Cutting Conditions

(Red text indicates 1st recommendation.)

Application	Cutting Process	Chipbreakers	Grades	FC (Grey Cast Iron) Min. - Optimum - Max.		FCD (Ductile Cast Iron) Min. - Optimum - Max.	
				Feed Rate f (mm/rev)	Cutting Speed v_c (m/min)	Feed Rate f (mm/rev)	Cutting Speed v_c (m/min)
High Speed Cutting	Continuous to General	No	BN7000	0.1-0.2-0.5	500-1,500-2,000	0.1-0.20-0.4	80-150-200
	Continuous	No	BNC500	—	—	0.1-0.20-0.4	200-350-500
Finishing	Continuous	UZ	AC405K	0.1-0.25-0.4	230-400-570	0.1-0.25-0.4	170-350-500
	General	UZ	AC415K	0.1-0.25-0.4	200-350-500	0.1-0.25-0.4	150-300-450
	Interrupted	GZ	AC415K	0.1-0.30-0.5	150-275-400	0.1-0.30-0.5	150-250-350
Light Interrupted Medium	Continuous	GZ	AC405K	0.1-0.30-0.5	170-315-460	0.1-0.30-0.5	170-285-400
	General	GZ	AC415K	0.1-0.30-0.5	150-275-400	0.1-0.30-0.5	150-250-350
	Interrupted	GZ	AC420K	0.1-0.30-0.5	100-200-300	0.1-0.30-0.5	80-150-220
Roughing (Mill-Scaled Work)	Continuous	GZ	AC415K	0.1-0.30-0.5	150-275-400	0.1-0.30-0.5	150-250-350
	General	GZ	AC420K	0.1-0.30-0.5	100-200-300	0.1-0.30-0.5	80-150-220
	Interrupted	No	AC420K	0.2-0.35-0.6	100-175-250	0.2-0.35-0.6	80-130-180



Representative Grades / Application Examples



Cast Iron

Work Material

A

Grades

Steel

Stainless Steel

Cast Iron

Exotic Alloy

Hardened Steel

Non-Ferrous Metal

Grades

High Speed Continuous Cutting General Purpose Mill-Scaled Work/Interrupted Cutting

AC405K / AC415K / AC420K

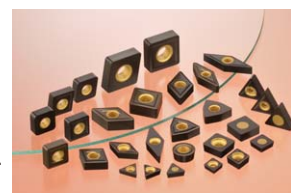
AC405K : Suitable for high-speed continuous cutting. Excellent resistance to wear and plastic deformation.

AC415K : First recommended grade for cast iron turning. Provides stability and long tool life in a wide range of processes.

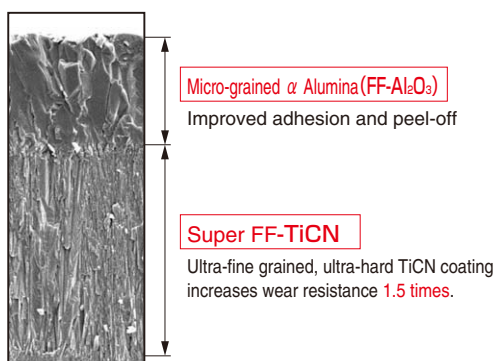
AC420K : Superior fracture resistance provides excellent stability in interrupted unstable cutting and when cutting mill-scaled work.

- Improvements to super FF-TiCN coating grain and hardness provide significantly improved wear resistance.

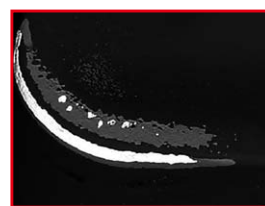
Newly developed stress control technology enhances micro-grained α Alumina (FF- Al_2O_3) coating for superior reliability.



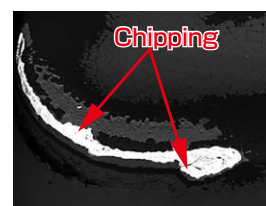
- Coating Structure



Coating stress control technology reduces abnormal damage caused by chipping.

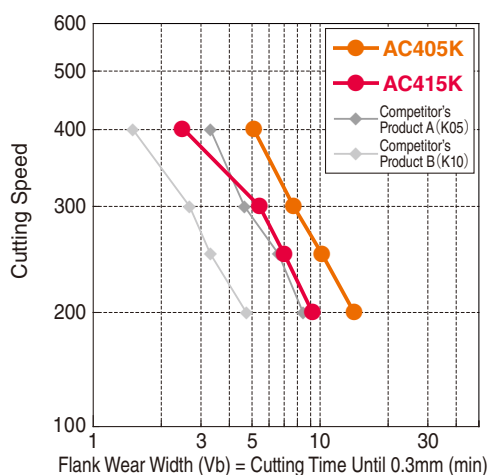


AC400K Series Coating



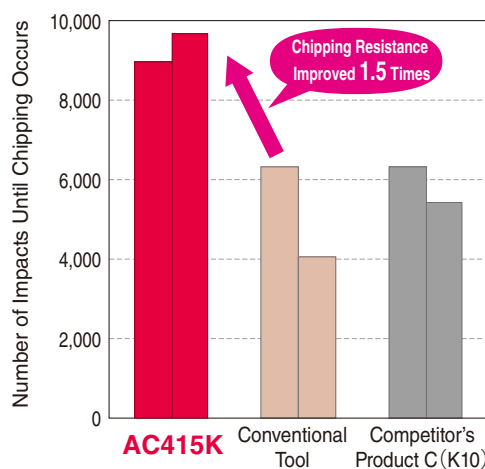
Conventional Coating

AC405K/AC415K Wear Resistance



Work Material : FCD450(Round Bar) Insert : CNMG120408N-GZ
Cutting Conditions : $v_c=200$ to 400m/min $f=0.30$ mm/rev $a_p=1.5$ mm Wet

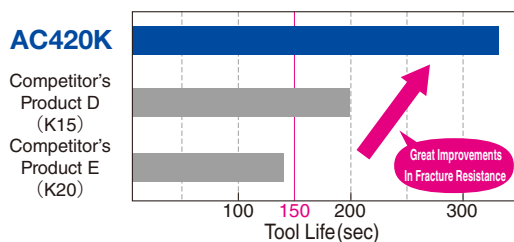
AC415K Chipping Resistance



Work Material : FCD450 Insert : CNMG120408N-GZ
Cutting Conditions : $v_c=300$ m/min $f=0.25$ mm/rev $a_p=1.5$ mm Wet

AC420K Fracture Resistance

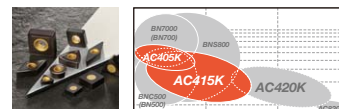
FCD450 Grooved (Heavy Interrupted Acceleration Test)



Edge Wear Comparison (After 150 s)



Work Material : FCD450 Toolholder : PCLNR2525-43 Insert : CNMG120408N-GZ
Cutting Conditions : $v_c=350$ m/min $f=0.25$ mm/rev $a_p=1.5$ mm Wet



A

Grades

Steel

Stainless
Steel

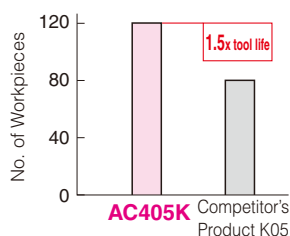
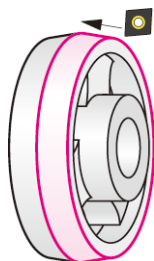
Cast Iron

Exotic
AlloyHardened
SteelNon-Ferrous
Metal

AC405K

FC200 Compressor Component (Pulley)

AC405K achieves 1.5 times longer tool life through improved wear resistance.

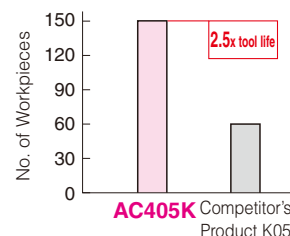
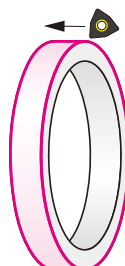


Insert: CNMG120412N-GZ (AC405K)

Cutting Conditions: $v_c=500\text{m/min}$, $f=0.25\text{mm/rev}$, Up to $a_p=2.0\text{mm}$, Dry

FCD650 Ring

Thanks to reduced chipping and improved wear resistance, AC405K eliminates problems with unstable tool life and achieves 2.5 times longer stable tool life.

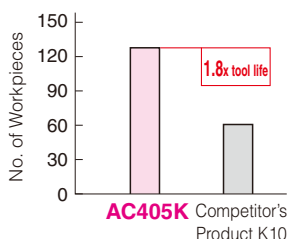


Insert: WNMG080408N-UZ (AC405K)

Cutting Conditions: $v_c=340\text{m/min}$, $f=0.3\text{mm/rev}$, $a_p=0.2\text{mm}$, Wet

FCD700 Input Shaft

Thanks to reduced chipping and improved wear resistance, AC405K achieves 1.8 times longer tool life.

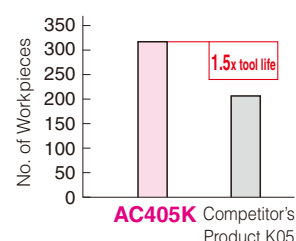
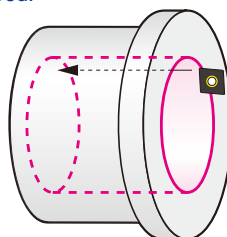


Insert: DNMG150408N-UZ (AC405K)

Cutting Conditions: $v_c=200\text{m/min}$, $f=0.45\text{mm/rev}$, $a_p=0.25$ to 0.40mm , Wet

FCD450 Sleeve

Excellent wear resistance achieves 1.5 times longer tool life in continuous hole finishing applications. The number of tool compensations required has also been halved.



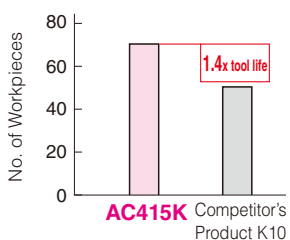
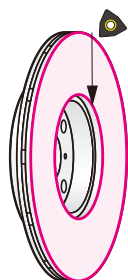
Insert: CNMG120408N-UZ (AC405K)

Cutting Conditions: $v_c=300\text{m/min}$, $f=0.20\text{mm/rev}$, $a_p=0.5\text{mm}$, Wet

AC415K

FC200 Brake Disc

AC415K achieves 1.4 times longer tool life through improved wear resistance.

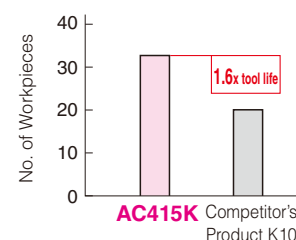
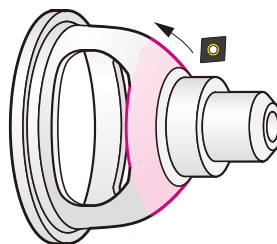


Insert: WNMA080412 (AC415K)

Cutting Conditions: $v_c=450\text{m/min}$, $f=0.25\text{mm/rev}$, $a_p=$ Up to 1.5mm , Dry

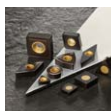
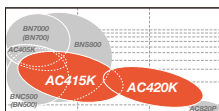
FCD450 Differential Case

Thanks to reduced chipping and improved wear resistance, AC415K eliminates problems with unstable tool life and achieves 1.6 times longer tool life.



Insert: CNMG120408N-GZ (AC415K)

Cutting Conditions: $v_c=240\text{m/min}$, $f=0.3\text{mm/rev}$, $a_p=2.0$ to 3.0mm , Wet



Application Examples (2)



Cast Iron

Work
Material

A

Grades

Steel

Stainless
Steel

Cast Iron

Exotic
Alloy

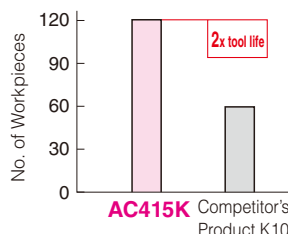
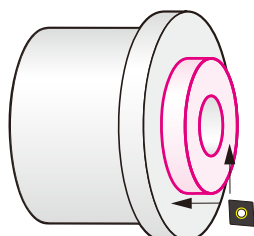
Hardened
Steel

Non-Ferrous
Metal

AC415K

FCD500 Hub

AC415K delivers 2 times longer tool life in light interrupted cutting of mill-scaled work thanks to improved chipping and wear resistance.

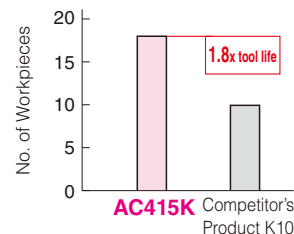
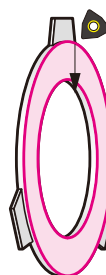


Insert: CNMA120408 (AC415K)

Cutting Conditions: $v_c=230\text{m/min}$, $f=0.2$ to 0.3mm/rev , $a_p=1.5$ to 2.0mm , Wet

FC250 Pressure Plate

Reduces occurrence of sudden breakages and achieves 1.8 times longer stable tool life in heavy interrupted cutting.



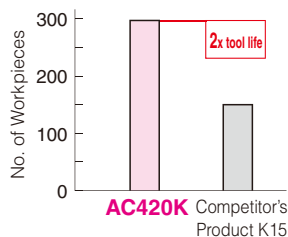
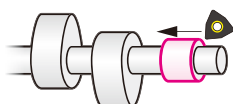
Insert: WNMA080412 (AC415K)

Cutting Conditions: $v_c=230\text{m/min}$, $f=0.30\text{mm/rev}$, $a_p=1.5$ to 2.5mm , Dry

AC420K

FCD700 Cam Shaft

AC420K delivers 2 times longer tool life when cutting hardened steel and mill-scaled work.

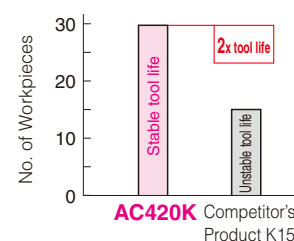
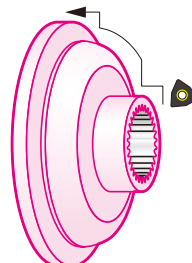


Insert: WNMA080408 (AC420K)

Cutting Conditions: $v_c=100$ to 250m/min , $f=0.15$ to 0.30mm/rev , $a_p=1.0\text{mm}$, Wet

FCD450 Drive Sprocket

AC420K delivers 2 times longer stable tool life in unstable machining of mill-scaled work.

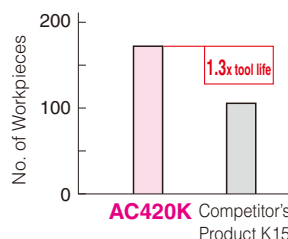


Insert: WNMA080412 (AC420K)

Cutting Conditions: $v_c=200\text{m/min}$, $f=0.32\text{mm/rev}$, $a_p=3.0\text{mm}$, Wet

FCD500 Shaft

AC420K delivers 1.3 times longer stable tool life in heavy interrupted cutting.

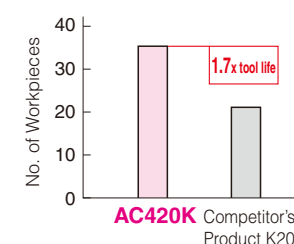
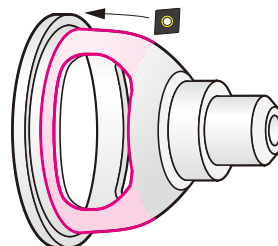


Insert: DNMG150412N-GZ (AC420K)

Cutting Conditions: $v_c=100$ to 270m/min , $f=0.15$ to 0.40mm/rev , $a_p=1.5\text{mm}$, Wet

FCD450 Differential Case

Reduces occurrence of sudden breakages and achieves 1.7 times longer stable tool life in heavy interrupted cutting.

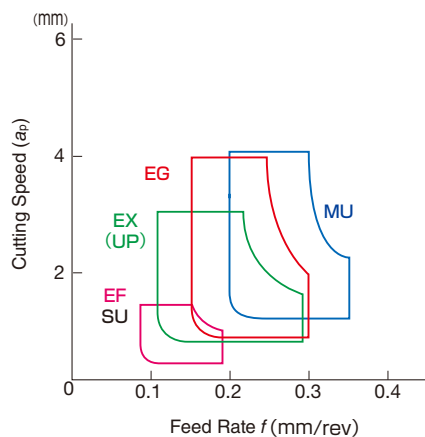


Insert: CNMA120408 (AC420K)

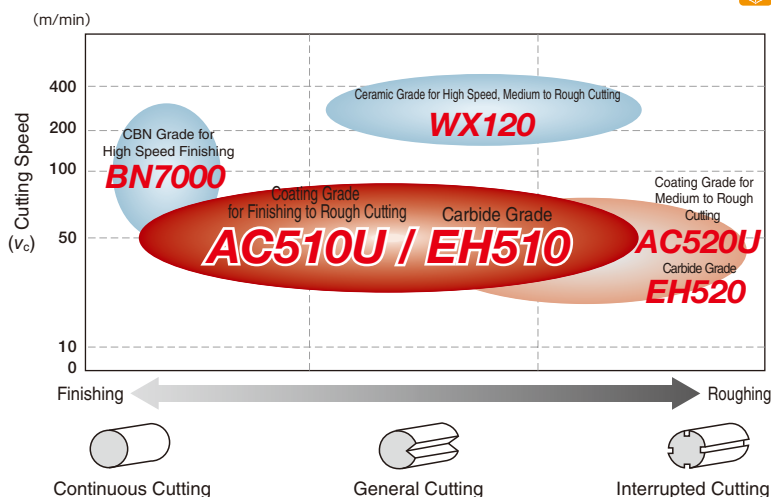
Cutting Conditions: $v_c=250\text{m/min}$, $f=0.30\text{mm/rev}$, $a_p=2.0$ to 3.0mm , Wet

Chipbreakers

Negative Type



Grades

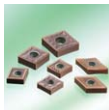
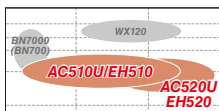


CBN SUMIBORON BN7000 ... PageL21

Recommended Cutting Conditions

(Red text indicates 1st recommendation.)

Work Material	Cutting Process	Chipbreakers	Grades	Cutting Conditions		
				Depth of Cut a_p (mm)	Feed Rate f (mm/rev)	Cutting Speed V_c (m/min)
Heat-Resistant Alloy (Ni-based Alloy Fe-based Alloy Co-based Alloy)	Finishing	EF(SU)	AC510U	0.2-0.5-1.5	0.1-0.12-0.2	50-60-90
	Light	EX	AC510U	0.5-1.0-3.0	0.1-0.20-0.3	40-50-80
	Medium	EG	AC510U	0.5-2.0-4.0	0.15-0.25-0.3	40-50-80
	Rough	MU	AC520U	1.0-2.0-4.0	0.2-0.25-0.35	30-45-60
Titanium Alloy (Pure Titanium (99.5%) $\alpha + \beta$ Alloy)	Finishing	EF(SU)	EH510 (AC510U)	0.2-0.5-1.5	0.1-0.15-0.2	50-65-80
	Light	EX	AC510U	0.5-1.0-2.5	0.1-0.20-0.25	40-55-70
	Medium	EG	EH510 (AC510U)	0.5-2.0-3.5	0.15-0.25-0.3	40-55-70
	Rough	MU	AC520U	1.0-2.0-3.5	0.2-0.25-0.3	30-40-50



Representative Grades /Performance/ Application Examples



Exotic Alloy

Work
Material

Grades AC510U / AC520U / EH510 / EH520

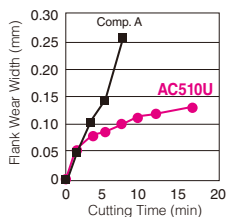
- PVD (Super ZX Coat) grade with excellent wear and thermal resistance.

AC510U : Excellent sharpness and reliability. A general purpose grade suitable for a wide range of applications from roughing to finishing.

AC520U : Excellent fracture resistance. A tough grade that is perfect for heavy interrupted cutting and mill-scaled work.

AC510U Cutting Performance

- Turning of Thermal Resistant (Ni-based) Alloys



Half the wear of competitor's grade with 2x tool life!



AC510U



Comp. A

Work Material: Inconel 718 (45HRC)
Insert: CNMG120408N-EX (AC510U)
Cutting Conditions: $v_c=80\text{m/min}$ $f=0.12\text{mm/rev}$ $a_p=0.8\text{mm}$ Wet

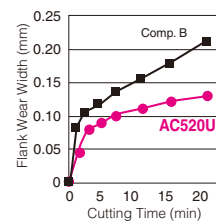
- Carbides with excellent thermal, wear, and fracture resistance for use with titanium alloys.

EH510 : General purpose grade for titanium machining that features excellent wear and thermal resistance. For applications from roughing to finishing.

EH520 : Tough grade for titanium machining with excellent fracture and thermal resistance. Perfect for interrupted cutting and mill-scaled work.

AC520U Cutting Performance

- Turning of Thermal Resistant (Fe-based) Alloys



Stable turning with no notch wear!



AC520U



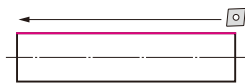
Comp. B

Work Material: Heat resistant ferrous alloy
Insert: CNMG120408N-MU (AC520U)
Cutting Conditions: $v_c=40\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

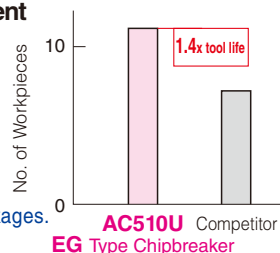
Application Examples

AC510U/EH510

Inconel 718 Shaft Component

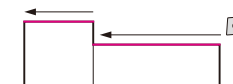


Stable, long tool life with no breakages.
Small chips.

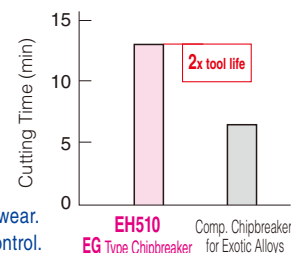


Insert: CNMG120408N-EG (AC510U)
Cutting Conditions: $v_c=45\text{m/min}$ $f=0.23\text{mm/rev}$ $a_p=2\text{mm}$ Wet

Titanium Ti-6Al-4V



Tool life doubled with reduced crater wear.
Now with drastically improved chip control.



Insert: CNMG120412N-EG (EH510)
Cutting Conditions: $v_c=65\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=2.5\text{mm}$ Wet

Inconel 718 Pin

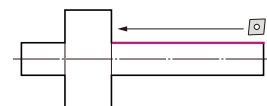


Achieving 13x higher efficiency and stable tool life with cutting speeds of 40m/min as compared to 30m/min for conventional grades.

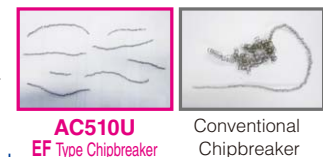


Insert: CNMG120408N-EX (AC510U)
Cutting Conditions: $v_c=40\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

Inconel 718 Shaft Component



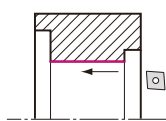
Drastically improved chip control.
Eliminate final polishing process without damaging work.



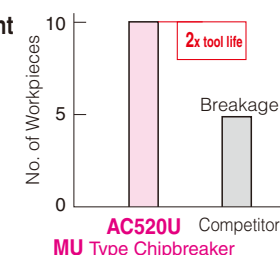
Insert: CNMG120408N-EF (AC510U)
Cutting Conditions: $v_c=45\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.25\text{mm}$ Wet

AC520U

Inconel 718 Machine Component

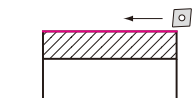


Stable, long tool life with no breakage.

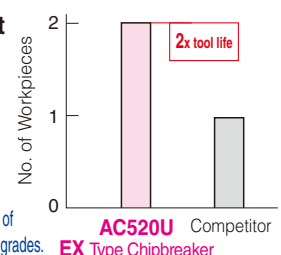


Insert: CNMG120412N-MU (AC520U)
Cutting Conditions: $v_c=35\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=2.5\text{mm}$ Wet

Stellite Machine Component



Achieving 1.5x higher efficiency with cutting speeds of 30m/min as compared to 20m/min for conventional grades.



Insert: CNMG120408N-EX (AC520U)
Cutting Conditions: $v_c=30\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=1.0\text{mm}$ Wet

A

Grades

Steel

Stainless Steel

Cast Iron

Exotic Alloy

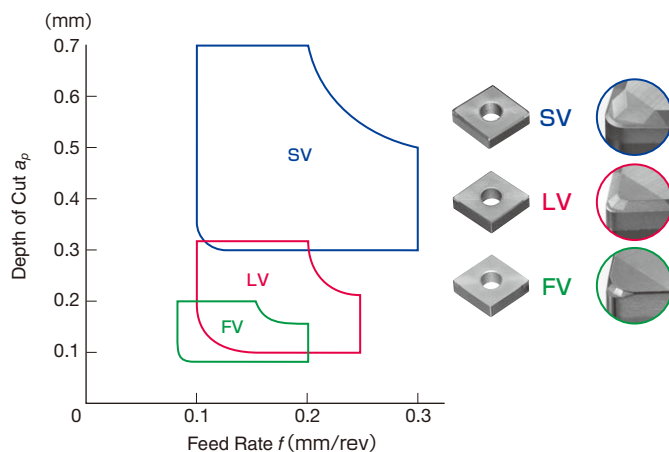
Hardened Steel

Non-Ferrous Metal

Chipbreakers

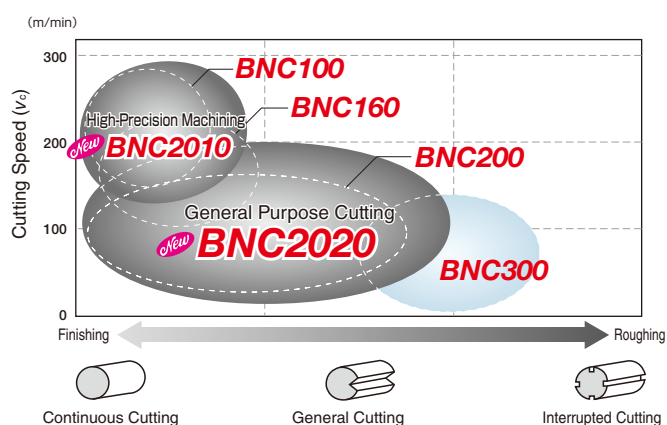
LV Type / FV Type Chipbreaker : For chip control during finishing of hardened steel

SV Type Chipbreaker : For chip control during carburized layer removal

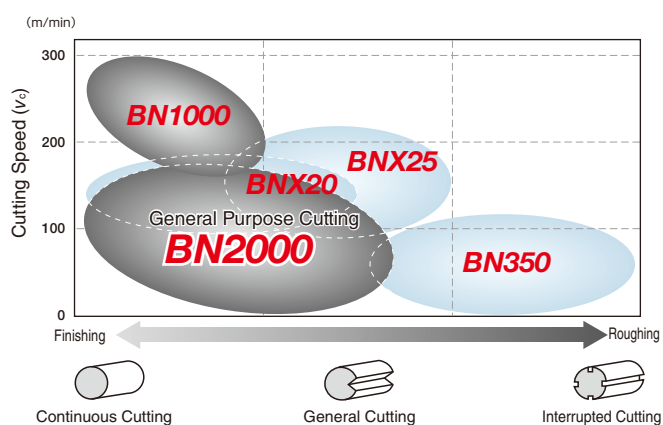
CEN SUMIBORON Break Master ...  Page L24

Grades

● Coated SUMIBORON



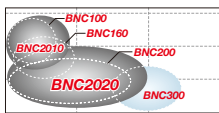
● Uncoated SUMIBORON

CEN SUMIBORON ...  Page L2

Recommended Cutting Conditions

(Red text indicates 1st recommendation.)

Cutting Process	Grade	Cutting Conditions			Min. - Optimum - Max.
		Depth of Cut a_p (mm)	Feed Rate f (mm/rev)	Cutting Speed v_c (m/min)	
Continuous Cutting	BNC2010	0.03- 0.20 -0.35	0.03- 0.10 -0.20	120- 200 -300	
	BNC100	0.03- 0.20 -0.30	0.03- 0.10 -0.20	120- 200 -300	
	BN1000	0.03- 0.15 -0.20	0.03- 0.10 -0.15	100- 150 -300	
	BNX10	0.03- 0.10 -0.20	0.03- 0.10 -0.15	120- 180 -300	
General Turning	BNC2020	0.03- 0.30 -0.50	0.03- 0.20 -0.40	50- 130 -220	
	BNC160	0.03- 0.20 -0.35	0.03- 0.10 -0.25	120- 180 -220	
	BNC200	0.03- 0.30 -0.50	0.03- 0.10 -0.30	50- 130 -220	
	BN2000	0.03- 0.20 -0.30	0.03- 0.10 -0.20	50- 100 -200	
	BNX20	0.03- 0.20 -0.35	0.03- 0.15 -0.30	70- 130 -170	
Interrupted Cutting	BNC300	0.03- 0.20 -0.30	0.03- 0.10 -0.20	50- 100 -150	
	BN350	0.03- 0.20 -0.30	0.03- 0.10 -0.20	50- 100 -150	
	BNX25	0.03- 0.20 -0.50	0.03- 0.15 -0.30	120- 160 -220	



Representative Grades / Application Examples



Hardened Steel

Work Material

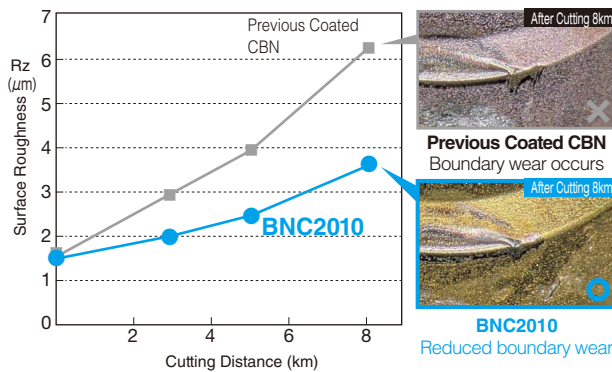
Grades

New BNC2010 / New BNC2020

- BNC2010** : For high-precision finishing requiring good surface roughness and dimensional accuracy.
Enables stable machining and provides excellent surface roughness thanks to superior boundary wear resistant coating and CBN substrate.
- BNC2020** : General purpose grade suitable for typical hardened steel machining applications.
Achieves long tool life thanks to highly-wear-resistant and highly-adhesive coating and tough CBN substrate.

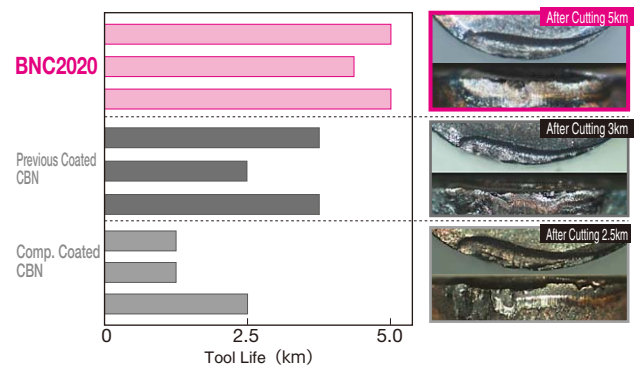


● BNC2010 Cutting Performance



Work Material : SCM415 58-62HRC (Continuous)
Insert : 4NC-DNGA150408 Edge Treatment : S01225
Cutting Conditions : $v_c=160\text{m/min}$ $f=0.08\text{mm/rev}$ $a_p=0.1\text{mm}$ Wet

● BNC2020 Cutting Performance



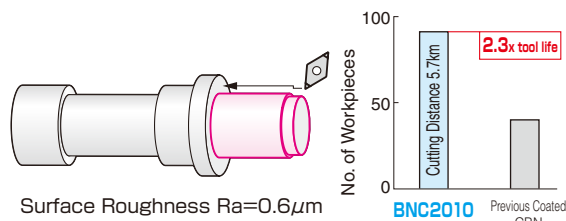
Work Material : SCM415-5V 58-62HRC (Interrupted Cutting)
Insert : 4NC-CNGA120412 Edge Treatment : S01225
Cutting Conditions : $v_c=130\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.6\text{mm}$ Dry

Application Examples

New BNC2010

[Continuous External Turning of Main Shaft] (58 to 60HRC)

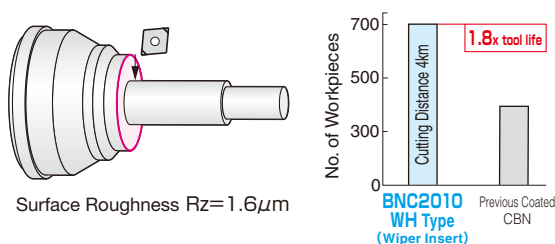
BNC2010 provides excellent wear resistance and achieves excellent surface roughness.



Insert : 4NC-DNGA150408 (BNC2010)
Cutting Conditions : $v_c=200\text{m/min}$ $f=0.10\text{mm/rev}$ $a_p=0.35\text{mm}$ Dry

[Facing of CVJ Outer Race] (58 to 60HRC)

BNC2010 with WH type wiper insert maintains excellent surface roughness for a long time.

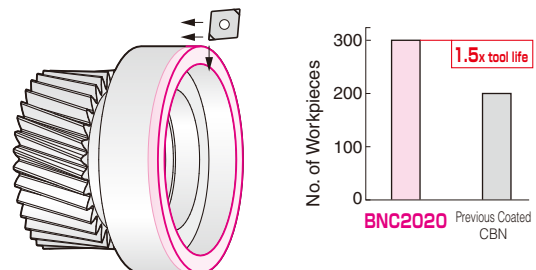


Insert : 2NC-CNGA120412WH (BNC2010)
Cutting Conditions : $v_c=150\text{m/min}$ $f=0.2\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry

New BNC2020

[Carburized Layer Removal for Sun Gear] (58 to 60HRC)

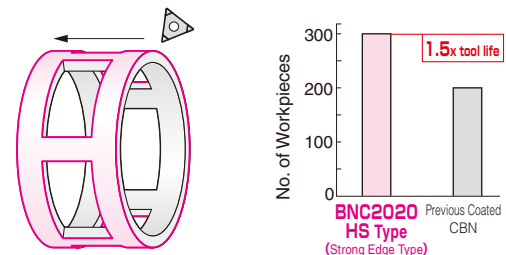
BNC2020 achieves long tool life in high load cutting.



Insert : 4NC-CNGA120408 (BNC2020)
Cutting Conditions : $v_c=100\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=0.50\text{mm}$ Wet

[Interrupted Machining of CVJ Cage Window] (58 to 60HRC)

BNC2020 strong edge HS type provides stable performance in interrupted cutting.



Insert : 3NC-TNGA160420HS (BNC2020)
Cutting Conditions : $v_c=120\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.15\text{mm}$ Dry

A

Grades

Steel

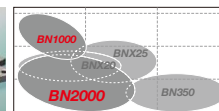
Stainless Steel

Cast Iron

Exotic Alloy

Hardened Steel

Non-Ferrous Metal



Grades **BN2000 / BN1000**

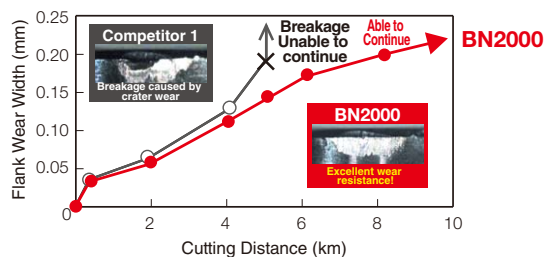
BN2000: General purpose grade suitable for typical hardened steel machining applications.

Provides a high degree of fracture and wear resistance.

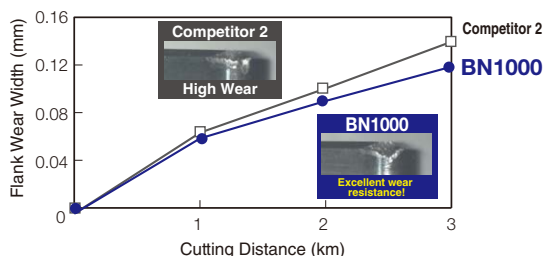
BN1000: For high speed machining. BN1000 provides the highest wear resistance of all uncoated SUMIBORON grades.

Features improved fracture resistance while still placing a priority on wear resistance.

● Wear Resistance (Continuous Cutting)



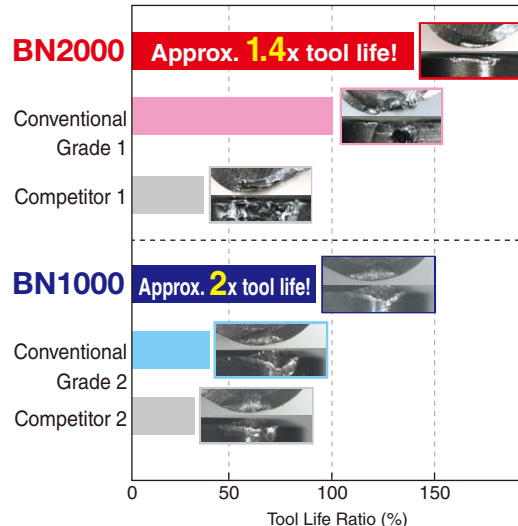
Work Material: SCM415H Round Bar (58-62HRC)
Cutting Conditions: $v_c=100\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry



Work Material: SUJ2 Round Bar (58-62HRC)
Cutting Conditions: $v_c=150\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry

● Chipping Resistance (Interrupted Cutting)

(Comparison based on conventional BN2000 as 100%.)



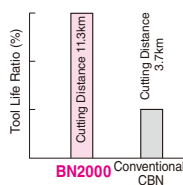
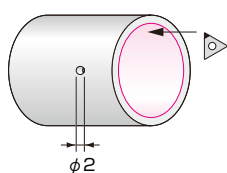
Work Material: SCM415H 8V Grooved Material (58-62HRC)
Insert: 2NU-CNGA120408
Cutting Conditions: $v_c=150\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry

Application Examples

BN2000

SCM415H Clutch Component

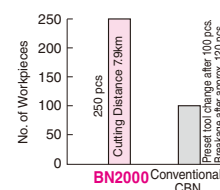
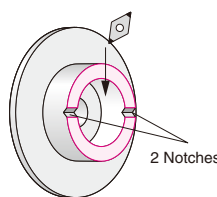
Employs BN2000 for superior fracture resistance compared to conventional grade and longer tool life.



Insert: NU-TPGW110308(BN2000)
Cutting Conditions: $v_c=135\text{m/min}$ $f=0.08\text{mm/rev}$ $a_p=0.15\text{mm}$ Dry

SCM415H CVT Pulley Slide

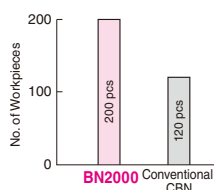
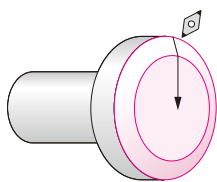
Whereas conventional products required replacement after 100 workpieces (preset tool change,) BN2000 has no breakage after 250 workpieces.



Insert: 2NU-DNGA150408(BN2000)
Cutting Conditions: $v_c=150\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry

SKD11 Plunger

Long tool life and more stable surface roughness than coated CBN at extremely low cutting speeds.

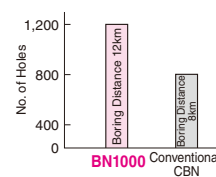
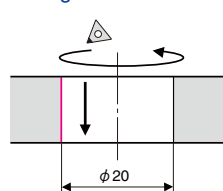


Insert: 2NU-DNGA150408(BN2000)
Cutting Conditions: $v_c=0$ to 100m/min $f=0.03$ to 0.25mm/rev $a_p=0.04\text{mm}$ Dry

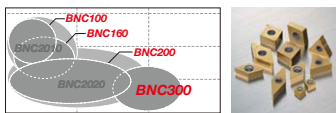
BN1000

SUJ2 Internal Boring

BN1000 ensures less friction than conventional grades and achieves long tool life.



Insert: NU-TPGW110304(BN1000)
Cutting Conditions: $v_c=120\text{m/min}$ $f=0.06\text{mm/rev}$ $a_p=0.2\text{mm}$ Wet



Application Examples



Hardened Steel

Work Material

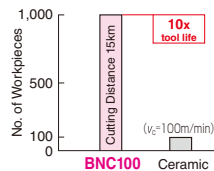
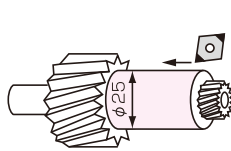
Application Examples

BNC100 / BNC160 / BNC200 / BNC300 / BNX10 / BNX20 / BNX25 / BN350

BNC100

Shaft Component (Carburised Material 58 to 62HRC)

BNC100 provides 1.5x cutting speed and 10x tool life.



Continuous Turning Of Hardened Steel

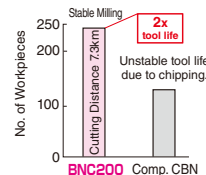
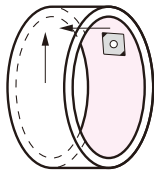
Insert: 4NC-CNGA120408(BNC100)

Cutting Conditions: $v_c=150\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.15\text{mm}$ Wet

BNC200

Bearing Steel (62HRC)

Provides superior stability and 2 times longer tool life than competitor's CBN.



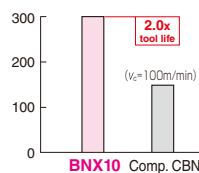
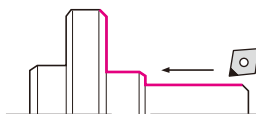
Insert: 4NC-CNGA120412(BNC200)

Cutting Conditions: $v_c=150\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=0.25\text{mm}$ Dry

BNX10

S30C Shaft Component (60HRC)

Double the efficiency and more than double the tool life of competitor's CBN.



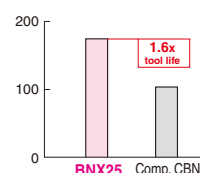
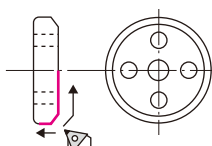
Insert: NU-CNMA120412(BNX10)

Cutting Conditions: $v_c=200\text{m/min}$ $f=0.08\text{mm/rev}$ $a_p=0.15\text{mm}$ Wet

BNX25

SCM420 Gear Component (60HRC)

Lower variance and 1.6 times longer tool life than competitor's CBN.



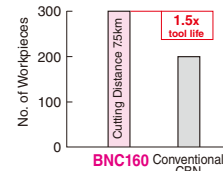
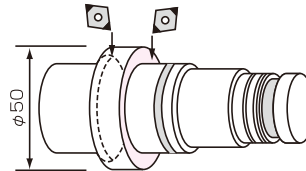
Insert: NS-TNMA160408(BNX25)

Cutting Conditions: $v_c=150\text{m/min}$ $f=0.12\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry

BNC160

Shaft Component (Carburised Material 58 to 62HRC)

BNC160 has excellent wear resistance while LS type gives best surface roughness stability in machining at $R_z = 1.6 \mu\text{m}$, and achieves 1.5x tool life.



Surface Roughness $R_z=1.6\mu\text{m}$

Face Finishing of Hardened Steel

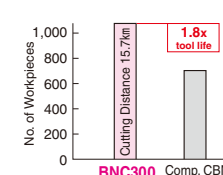
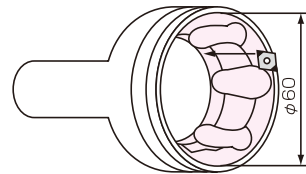
Insert: 4NC-CNGA120408LS(BNC160)

Cutting Conditions: $v_c=200\text{m/min}$ $f=0.05\text{mm/rev}$ $a_p=0.1\text{mm}$ Dry

BNC300

CVJ Component (Induction-Hardened Steel 58 to 63HRC)

BNC300HS has no chipping, gives stable performance for 900 workpieces, and now has an extended preset tool life that is 1.8 times longer.



Boring of Hardened Steel

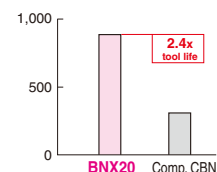
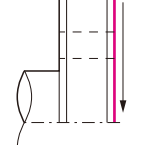
Insert: 4NC-DNGA150412HS(BNC300)

Cutting Conditions: $v_c=100\text{m/min}$ $f=0.12\text{mm/rev}$ $a_p=0.2\text{mm}$ Dry

BNX20

SCM415 Flange Component (62HRC)

Better wear resistance and 2.4 times longer tool life than competitor's CBN.



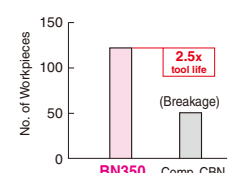
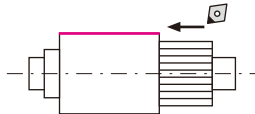
Insert: NU-TNMA160408(BNX20)

Cutting Conditions: $v_c=150\text{m/min}$ $f=0.1\text{mm/rev}$ $a_p=0.12\text{mm}$ Dry

BN350

SCr420H Gear Shaft Component (58 to 62HRC)

Better fracture resistance and 2.5 times longer tool life than competitor's CBN.



Insert: NU-CNMA120412(BN350)

Cutting Conditions: $v_c=125\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=0.3\text{mm}$ Dry

A

Grades

Steel

Stainless Steel

Cast Iron

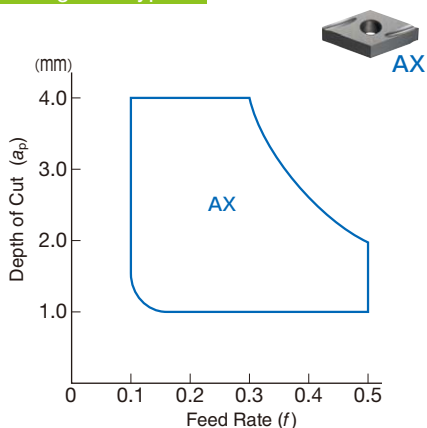
Exotic Alloy

Hardened Steel

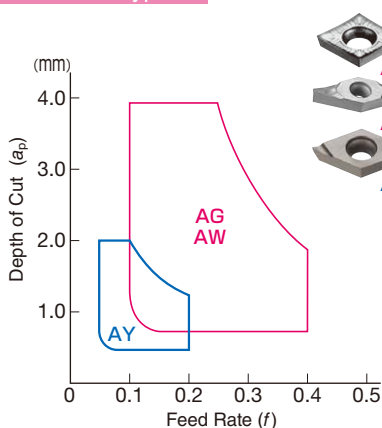
Non-Ferrous Metal

Chipbreakers

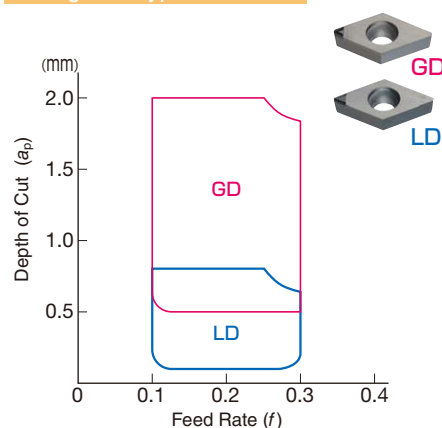
Negative Type



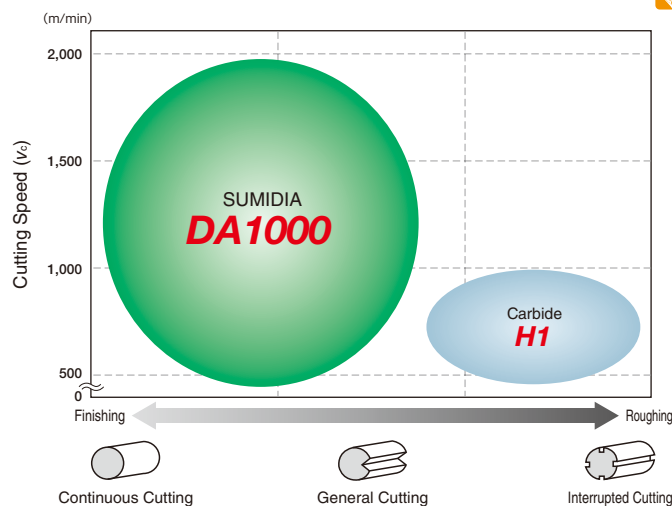
Positive Type



Negative Type (PCD)



Grades



SUMIDIA

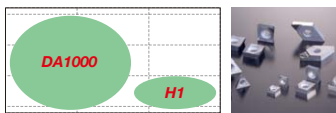
DA1000 ...

Page M3

Recommended Cutting Conditions

(Red text indicates 1st recommendation.)

Cutting Process	Category	Grades	Cutting Conditions		
			Depth of Cut a_p (mm)	Feed Rate f (mm/rev)	Min. - Optimum - Max. Cutting Speed V_c (m/min)
Continuous Cutting General Turning Interrupted Cutting	SUMIDIA	DA1000	0.1- 0.5 -3.0	0.05- 0.10 -0.20	Up to 2,000
		DA2200	0.1- 0.5 -3.0	0.05- 0.10 -0.20	Up to 2,000
		DA150	0.1- 0.5 -3.0	0.05- 0.10 -0.20	Up to 2,000
		DA90	0.1- 0.5 -3.0	0.05- 0.10 -0.20	Up to 2,000
	Carbide	H1	0.3- 1.0 -5.0	0.1- 0.20 -0.5	Up to 1,000



Application Examples



Non-Ferrous Metal

Work Material

A

Grades

Steel

Stainless Steel

Cast Iron

Exotic Alloy

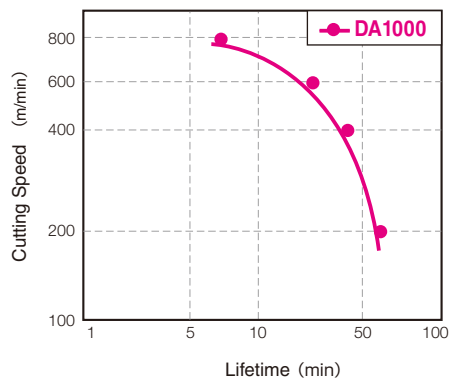
Hardened Steel

Non-Ferrous Metal

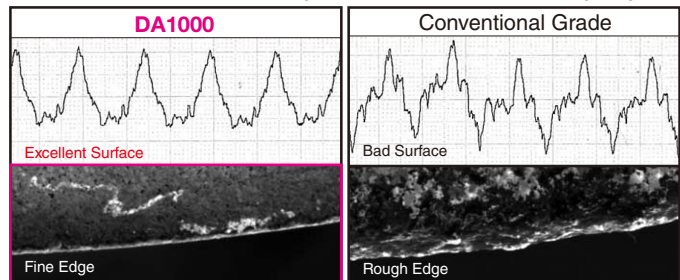
Grades DA1000

- Ultra-high-density, sintered ultra-fine diamond particles
- Significantly improved surface roughness on machined surfaces
- World's best wear resistance and strength
- Suitable for use with all aluminium and non-ferrous alloys

● DA1000 Wear Resistance



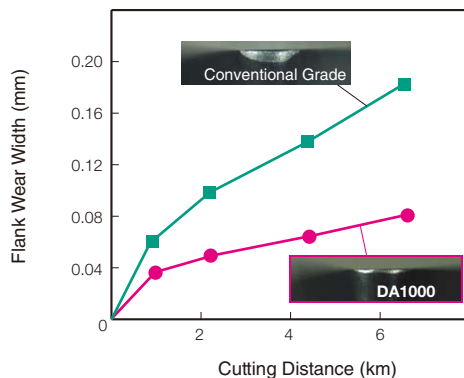
● Comparison of Surface Roughness of Nose Radius Cutting Edge



Insert: TPGW160308

Cutting Conditions: $v_c=1,000\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=0.2\text{mm}$ Wet

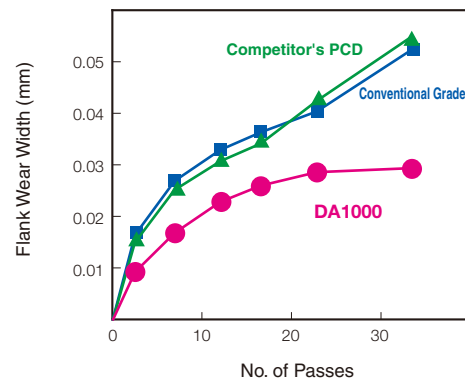
● Wear Resistance in Turning Applications



Insert: TPGN160304

Cutting Conditions: $v_c=800\text{m/min}$ $f=0.12\text{mm/rev}$ $a_p=0.5\text{mm}$ Wet

● Wear Resistance in Milling Applications



Insert: NF-SNEW1204ADFR

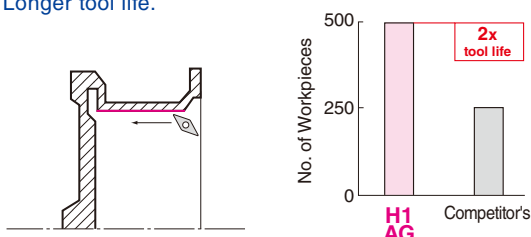
Cutting Conditions: $v_c=2,000\text{m/min}$ $f=0.15\text{mm/rev}$ $a_p=3.0\text{mm}$ Wet

Application Examples

H1 + AG Type Breakers

ADC12 Aluminium Wheel

Excellent adhesion resistance.
Longer tool life.



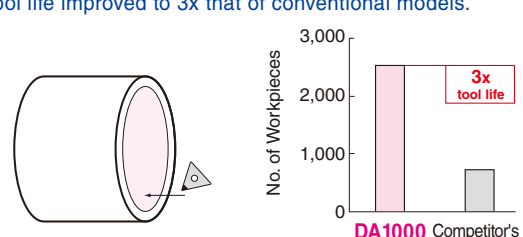
Insert: VCGT160408N-AG(H1)

Cutting Conditions: $v_c=2,200\text{m/min}$ $f=0.25\text{mm/rev}$ $a_p=2.0\text{mm}$ Wet

DA1000

Copper Alloy Bush

Stable surface roughness with no edge breakage (3.2S).
Tool life improved to 3x that of conventional models.



Insert: NF-TPGN160308(DA1000)

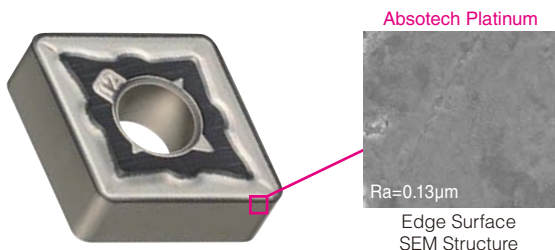
Cutting Conditions: $v_c=300\text{m/min}$ $f=0.07\text{mm/rev}$ $a_p=0.08\text{mm}$ Wet

Sumitomo Electric Hardmetal's Coated Series are high-quality, high-performance grades that combines a proprietary, special ultra-hard carbide substrate with a multi-layered coating that provides excellent wear and heat resistance plus superior adhesion strength. Utilised in high-speed, high-efficiency applications on a wide range of work material including, steel, cast iron, and exotic alloys.

Characteristics

Absotech Platinum

New CVD

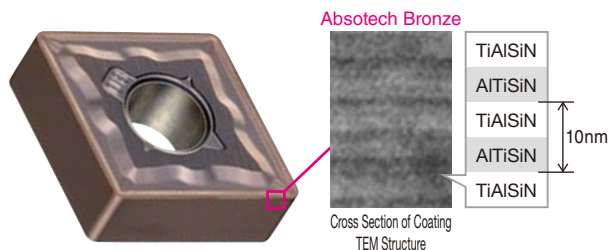


Achieves a good balance between drastically-improved coating strength and excellent surface smoothness and enables stable machining thanks to newly-developed boride-based titanium compound coating.

- Achieves over 2 times chipping resistance compared with conventional coating thanks to the improved coating strength.
 - Drastically improves the adhesion resistance and reduces the occurrence of abnormal damage thanks to excellent surface smoothness.
 - Improves the corner visibility with a unique color tone.
- Applicable Grades : (For Stainless Steel Turning) AC6030M

Absotech Bronze

New PVD

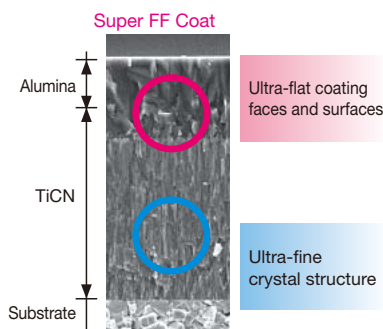


Employing our unique super multi-layered thin coating structure, similar to the Super ZX Coat, this new composition is a highly thermal resistant coating with improved coating adhesion strength to the substrate.

- Utilizing a new TiAlSiN-based super multi-layered composition structure to achieve excellent wear and oxidation resistance.
 - Drastically improves the peel-off resistance of the coating by improving the boundary control technology between the carbide substrate and coating.
 - Achieves over 2 times greater fracture resistance in stainless steel machining compared with conventional grades.
- Applicable Grades : (For Stainless Steel Turning) AC6040M

Super FF Coat

CVD

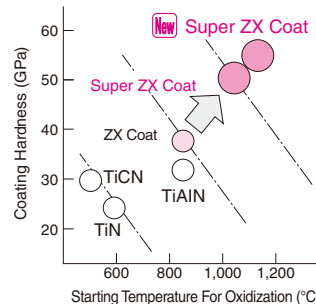


Our unique CVD process achieves ultra-flat boundary faces between coating layers and super ultra-fine coating particles.

- Smooth coating surface provides excellent adhesion and chipping resistance. Improved coating adhesion strength.
 - Harder than conventional coatings with huge improvements in wear resistance.
 - High speed, high efficiency machining of more than 1.5 times that of conventional grades is possible.
 - Achieving more than double the tool life of conventional grades under conventional cutting conditions.
- Applicable Grades : (For Steel Turning) AC810P, AC820P, AC830P
(For Cast Iron Turning) AC405K, AC415K, AC420K
(For Stainless Steel Turning) AC610M, AC630M
(For Milling) ACP100, ACK200

NEW Super ZX Coat / Super ZX Coat

PVD



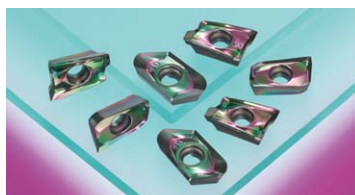
Utilising our proprietary thin layer coating technology and advanced nanotechnology, high coating hardness and excellent oxidation resistance are achieved by a coating structure that consist of approximately 1,000 alternating, nanometre-thin (1 nanometre = 1 billionth of a metre) layers.

- Coating hardness increased by 40% and starting temperature for of oxidation increased by 200°C compared to conventional grades.
 - At least 1.5x improvement in high-speed and high-efficiency cutting compared to conventional grades.
 - Achieving more than double the tool life of conventional grades under conventional cutting conditions.
- Applicable Grades : (For Turning) AC503U, AC510U, AC520U, AC530U
(For Milling) ACK300, ACP200, ACP300

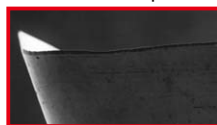
AURORA Coat (DLC:Diamond Like Carbon)

PVD

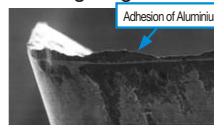
Using our proprietary PVD process technology, we have developed a hydrogen-free DLC coating that is extremely hard and smooth.



ADC12 Comparison of Cutting Edge Adhesion After Cutting



AURORA Coat



Uncoated

Work Material : ADC12
Cutting Conditions : V_c : 300m/min
 f_z : 0.15mm/t
 a_p : 5mm
 a_e : 5mm Dry

- Second only to diamond in terms of hardness, this smooth coating has a low coefficient of friction and provides excellent adhesion resistance to deliver better-quality machined surfaces.
- Can be used for high-speed, high-efficiency cutting of aluminium alloys, copper alloys, resins, and more.

- Adopted Grades (For Milling) DL1000
(For Endmilling) DL1000, DL1200
(For Drilling) DL1300, DL1500

Characteristic Values

For Turning(CVD)

Class	Grade	Hardness (HRA)	TRS (GPa)	Coating Type	Coating Thickness (μm)	Characteristics	Old Grades
P Steel	AC810P	91.0	2.2	Super FF Coat	18	A P10 grade with excellent wear resistance that utilises a special carbide substrate with Super FF Coat for high to medium speed cutting.	AC700G
	AC820P	90.1	2.2	Super FF Coat	14	A P20 grade that features stability and longer tool life. Employs special carbide substrate and Super FF Coat to improve on P20 wear and fracture resistance.	AC2000
	AC830P	89.4	2.6	Super FF Coat	8	Stable long-life grade employs special tough, carbide substrate and Super FF Coat. Improves on P30 grade fracture resistance and approaches P20 grade in terms of wear resistance.	AC3000
	AC630M	89.5	2.7	Super FF Coat	5	Superior performance in continuous and light cutting, and other low-speed applications that require sharp edges.	AC230
M Stainless Steel	AC610M	91.0	2.2	Super FF Coat	5	A high efficiency M10 grade featuring improved wear resistance during stainless steel cutting. Employs special, ultra-hard substrate and thin Super FF Coat.	—
	AC6030M	89.5	2.7	Absotech Platinum	5	The first recommended grade for general machining of stainless steel that drastically reduces the occurrence of abnormal damage in stainless steel machining and achieves long and stable tool life by employing a new coating: Absotech Platinum.	—
	AC630M	89.5	2.7	Super FF Coat	5	A general purpose grade featuring improved wear and fracture resistance during stainless steel cutting. Utilises a special tough carbide substrate with a thin Super FF Coat.	AC304
K Cast Iron	AC405K	92.0	2.4	Super FF Coat	18	Employs an ultra-hard substrate and ultra-hard Super FF Coat to provide excellent resistance to wear and plastic deformation. Suitable for high-speed continuous cutting of cast iron.	AC410K
	AC415K	91.1	2.5	Super FF Coat	18	Employs a special dedicated ultra-hard substrate that is also suitable for interrupted cutting and ultra-hard Super FF Coat to provide stability and long tool life in a wide range of processes. First recommended grade for cast iron turning.	AC410K
	AC420K	91.1	2.5	Super FF Coat	12	A new, extremely versatile grade that can be used for rough, interrupted cutting of ductile and grey cast iron. Employs special, ultra-hard carbide substrate and Super FF Coat to provide stability and long tool life.	AC700G
	AC820P	90.1	2.2	Super FF Coat	14	A grade suited to heavy interrupted cutting of ductile cast iron.	AC2000

For Milling(CVD)

Class	Grade	Hardness (HRA)	TRS (GPa)	Coating Type	Coating Thickness (μm)	Characteristics	Old Grades
P Steel	ACP100	89.3	3.1	Super FF Coat	6	A grade that employs a tough carbide substrate and thin-layer Super FF Coat to provide superior thermal crack and wear resistance in high-speed milling of steel.	AC230
M Stainless Steel	ACM200	89.8	3.4	Super FF Coat	6	A grade ideal for hardened steel machining that provides excellent wear and heat resistance by employing a newly-developed ultra-hard carbide and Super FF Coat.	AC230
K Cast Iron	ACK200	91.7	2.5	Super FF Coat	6	A grade that employs a tough carbide substrate and thin-layer Super FF Coat to provide superior thermal crack and wear resistance for high-speed milling.	AC211

A

Grades

Coated Carbide

Cermets

Ceramic

Carbide

CBN Layer

PCD

Characteristic Values

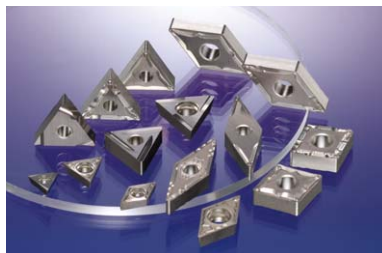
For Turning (PVD)

Class	Grade	Hardness (HRA)	TRS (GPa)	Main Coating Components	Coating Thickness (µm)	Characteristics	Old Grades
P Steel	T1500Z (Cermet)	92.0	2.2	Brilliant Coat*	3	• Brilliant Coat* PVD coating gives excellent lubricity for higher quality machining. General-purpose coated cermet grade that can maintain high-quality machined surfaces and also gives excellent wear resistance.	T2000Z
	T3000Z (Cermet)	91.3	2.4	ZX Coat	3	• An ultra-reliable coating grade with tough cermet substrate.	—
	AC530U	91.4	3.3	Super ZX Coat	3	• For interrupted and general steel cutting. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers, coupled with a fine-grained super tough substrate for excellent fracture resistance.	ACZ310
	AC520U	91.7	3.0	Super ZX Coat	3	• Interrupted machining and stainless steel machining. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers, coupled with a super tough substrate for excellent fracture resistance.	EH520Z EH20Z
M Stainless Steel	AC6040M	91.6	3.8	Absotech Bronze	3	• The first recommended grade for interrupted machining of stainless steel that drastically improves the reliability in unstable machining thanks to the excellent adhesion and peel-off resistance of the new Absotech Bronze PVD coating, as well as the improved fracture resistance of the exclusive ultra-hard carbide substrate.	AC530U
	AC530U	91.4	3.3	Super ZX Coat	3	• Heavy interrupted machining and stainless steel machining. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers, coupled with a fine-grained super tough substrate for excellent fracture resistance.	ACZ310
K Cast Iron	AC510U	92.6	2.6	Super ZX Coat	3	• General to interrupted machining of cast iron and ductile cast iron. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers, coupled with a fine-grained super tough substrate for excellent fracture resistance.	EH510Z EH10Z
S Exotic Alloy	AC510U	92.6	2.6	Super ZX Coat	3	• Finishing to medium cutting of exotic alloys. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers. Superior wear and heat resistance, and stable, long tool life.	EH510Z EH10Z
	AC520U	91.7	3.0	Super ZX Coat	3	• Medium to rough cutting of exotic alloys. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers. Superior wear and heat resistance, and stable, long tool life even in interrupted cutting.	EH520Z EH20Z
H Hardened Steel	AC503U	93.2	1.7	Super ZX Coat	3	• For hardened steel. • Utilizing the super multi-layered PVD coating of nanometre thick TiAlN and AlCrN layers, coupled with an ultra-hard substrate for excellent wear resistance.	—
Small Product Machining	ACZ150	91.4	3.3	ZX Coat	1	• For small tools, and high-precision finishing to general finishing applications. • TiN ultra-thin coating and fine-grained, super tough substrate combine to give good edge sharpness and superior cut finish.	—

For Milling (PVD)

Class	Grade	Hardness (HRA)	TRS (GPa)	Main Coating Components	Coating Thickness (µm)	Characteristics	Old Grades
P Steel	ACP200	89.5	3.2	(New) Super ZX Coat	3	• For general machining of general and die steel. • Employs PVD coating consisting of multiple nanometre-thin layers. A general grade that achieves a good balance between fracture resistance and wear resistance when combined with an exclusive tough substrate.	ACZ330
	ACP300	89.3	3.1	(New) Super ZX Coat	3	• For interrupted machining and stainless steel machining. • Employs PVD coating consisting of multiple nanometre-thin layers. Provides excellent fracture resistance when combined with an ultra-tough substrate.	ACZ350
M Stainless Steel	ACM100	91.4	3.3	(New) Super ZX Coat	3	• A grade that provides excellent wear resistance by employing an ultra-hard fine-grained carbide and New Super ZX Coating.	ACZ310
	ACM300	89.8	3.4	(New) Super ZX Coat	3	• The first recommended grade for stainless steel machining that achieves a good balance between wear resistance and fracture resistance by employing a newly-developed ultra-hard carbide and New Super ZX Coating.	—
K Cast Iron	ACK300	91.4	3.3	(New) Super ZX Coat	3	• For general and interrupted machining of cast iron and ductile cast iron. • Employs PVD coating consisting of multiple nanometre-thin layers. Provides excellent fracture resistance when combined with a fine-grained tough substrate.	ACZ310
N Non-Ferrous Metal	DL1000	92.9	2.1	AURORA Coat (DLC Coat)	0.5	• For machining of non-ferrous metals including aluminum and copper alloy as well as resin. • Coated with DLC, which provides a low friction coefficient and excellent adhesion resistance.	—

*There may be minor differences in the colour tone/lustre of Brilliant Coat grades due to the interference of light. Such differences have no effect on performance.



Various grades and expanded lineup of catalogue items meet a wide range of finishing needs.

Lineup includes wear-resistant T1000A, general purpose T1500A, general purpose coated cermet T1500Z, and tough T3000Z grades.

Expanded lineup of catalogue items for a wide variety of finishing applications.

Characteristics

Uncoated Cermet

T1000A (Exclusive Grade)

Exclusive cermet grade with excellent wear resistance

- Improved wear and fracture resistance.
- Solid solution hard phase reduces reaction with steel.
- Perfect for high-speed continuous finishing of steel, cast iron, and powdered metal.



T1500A (New General Purpose Grade)

General purpose coated cermet grade that employs new Brilliant Coat* PVD coating with excellent lubricity

- Excellent wear resistance provides long tool life.
- Reduces adhesion of work material for beautiful finished surfaces.



Coated Cermet

T1500A (General Purpose Grade)

General purpose cermet grade that provides both wear and fracture resistance with better quality finished surfaces

- Mixing hard phases of different functionality, grain size, and compositions improves balance of wear and fracture resistance.
- Improved edge treatment technology provides beautiful finished surfaces.

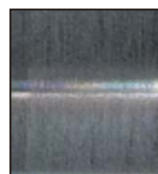


Surface Finish Comparison



T1500Z

Excellent Wear Resistance



Conventional Coated Cermet

Glossy Finished Surfaces

Work Material : STKM13A
Insert : CNMG120408N-LU
Cutting Conditions : $v_c=100\text{m/min}$
 $f=0.15\text{mm/rev}$
 $a_p=1.0\text{mm}$ Wet

Reduced Blemishes

Characteristic Values

For Turning

Class	Grade	Hardness (HRA)	TRS (GPa)	Coating Type	Coating Thickness (μm)	Characteristics	Old Grades
P Steel	T1000A	93.3	1.8	—	—	Uncoated cermet grade with excellent wear resistance that provides good cost efficiency. Demonstrates excellent wear resistance in continuous finishing applications, and stable finishing of cast iron and sintered alloy as well as steel.	T110A
	T1500A	92.0	2.2	—	—	A general purpose grade that employs a substrate with improved balance of fracture and wear resistance to deliver superior finished surfaces in a wide variety of cutting conditions.	T1200A
	T1500Z	92.0	2.2	PVD Brilliant Coat*	3	Brilliant Coat's* new PVD coating gives excellent lubricity for higher quality machining. General-purpose coated cermet grade that can maintain high-quality machined surfaces and also gives excellent wear resistance.	T2000Z
	T3000Z	91.3	2.4	PVD ZX Coat	3	An ultra-reliable coating grade with tough cermet substrate.	—
K Cast Iron	T1000A	93.3	1.8	—	—	Exclusive uncoated cermet grade with excellent cost efficiency suitable for cast iron finishing, which requires high hardness.	T110A

For Milling

Class	Grade	Hardness (HRA)	TRS (GPa)	Coating Type	Coating Thickness (μm)	Characteristics	Old Grades
P Steel	T1500A	92.0	2.2	—	—	A general-purpose grade that employs a substrate with an improved balance between fracture and wear resistance to deliver superior finished surfaces in a wide variety of cutting conditions.	T1200A
M Stainless Steel	T250A	91.4	2.1	—	—	Tough cermet grade with enhanced crack advancement resistance.	—
	T4500A	91.0	2.3	—	—	Cermet grade with excellent fracture resistance and reduced occurrence of thermal cracking.	—

*There may be minor differences in the colour tone/lustre of Brilliant Coat grades due to the interference of light. Such differences have no effect on performance.

Igetalloy carbides have a solid history and a wide variety of grades to suit many different applications. They are widely used and appreciated for their superior performance.

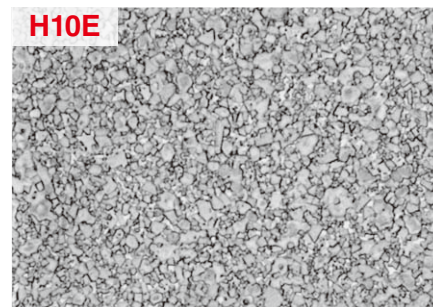
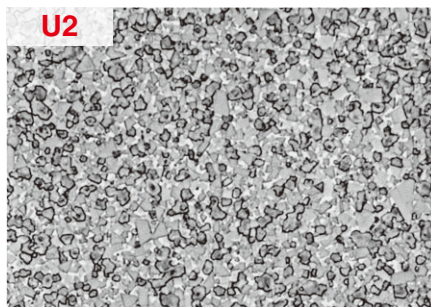
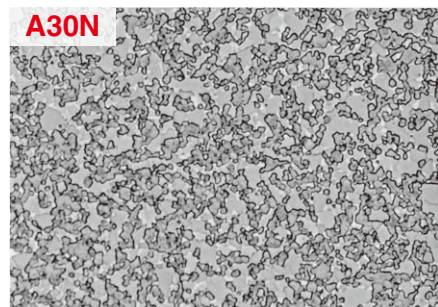
The Igetalloy line-up consists of a variety of characteristics that correspond to the uses of the tools. This is possible by varying the components: the WC structure (the main component) and the additives amounts such as TiC, TaC, and Co (the binder).

The wide selection of Igetalloy grades provide excellent wear resistance and toughness in various cutting conditions.

● For Steel

● For Stainless Steel

● For Cast Iron



Characteristic Values

Application	Grade	Hardness (HRA)	TRS (GPa)	Thermal Conductivity (W/m·°C)	Young Modulus (GPa)	Compressive Strength (GPa)	Linear-Thermal Expansion Coefficient (X 10 ⁻⁶ /°C)
P Steel	ST10P	92.1	1.9	25	470	4.9	6.2
	ST20E	91.8	1.9	42	550	4.8	5.2
	A30	91.3	2.1	35	520	—	5.2
	A30N	91.2	2.2	35	520	—	—
	ST40E	90.4	2.6	75	—	—	—
M Stainless Steel	U10E	92.4	1.8	—	460	5.9	—
	EH510	92.6	2.6	76	—	—	—
	U2	91.5	2.2	88	—	—	—
	EH520	91.7	3.0	78	—	—	—
	A30	91.3	2.1	35	520	—	5.2
	A30N	91.0	2.4	35	—	—	—
K Cast Iron	BL130	94.3	2.9	56	—	—	—
	H2	93.2	1.8	105	600	6.1	4.4
	H1	92.9	2.1	109	650	6.1	4.7
	EH10	92.4	3.4	105	640	—	4.5
	EH510	92.6	2.6	76	—	—	—
	H10E	92.3	2.0	67	—	—	—
	EH20	91.3	3.5	105	620	—	4.5
	EH520	91.7	3.0	78	—	—	—
	G10E	91.1	2.2	105	620	5.7	—
N Non-Ferrous Metal	H1	92.9	2.1	109	650	6.1	4.7
S Exotic Alloy	EH510	92.6	2.6	76	—	—	—
	EH520	91.7	3.0	78	—	—	—

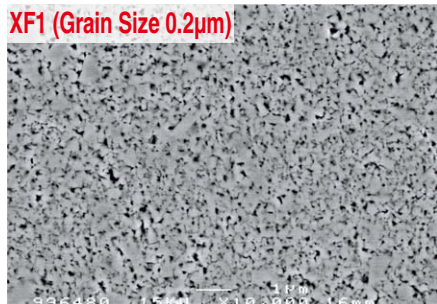
The Igetalloy micro-fine grained carbide series provides world class levels of micro-fine grain structure and delivers superior performance in small drills and other tools.

Igetalloy micro-fine grained carbides feature a WC structure of between 0.2 to 1µm, and are extremely strong and hard. They also provide excellent sharpness and superb surface quality on worked surfaces.

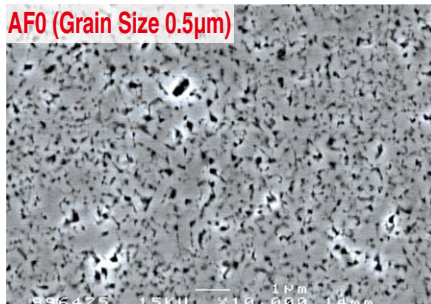
These features give excellent performance in a variety of applications from ø0.1mm PCB drills and endmill materials, to thin slitting blades and precision dies.

● Ultra-fine Grain

XF1 (Grain Size 0.2µm)

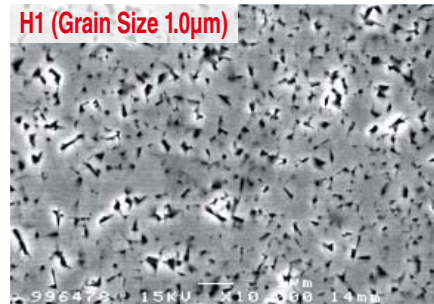


AF0 (Grain Size 0.5µm)



● Fine-grained Carbide

H1 (Grain Size 1.0µm)



Characteristic Values

Class	Grade	Properties					Characteristics	Applications
		Grain Size (µm)	CO Content (wt%)	TRS (GPa)	Hardness (HRA)	Hardness HV (GPa)		
Ultra-fine Grain	XF1	0.2	9.0	4.0	93.5	19.2	World's smallest grained carbide.	Micro drills, Small diameter drills
	AF1	0.5	12.0	4.4	92.5	17.3	World's toughest ultra-fine grained carbide.	Micro drills, Mini tools, Punches
	AF0	0.5	10.0	4.1	93.0	18.0	High toughness and wear resistant ultra-fine grained carbide.	Micro drills, Routers
	AFU	0.5	8.0	3.8	93.6	19.4	Enhanced wear resistant ultra-fine grained carbide.	Micro drills, Endmills for ultra-hard materials
Micro-fine Grained Carbide	A1	0.7	13.0	3.2	91.4	15.6	Tough micro-grained carbide.	Endmills, Taps, Drills for cast iron, Punches
	KH12	0.7	10.0	4.0	92.4	17.2	Micro-fine grained carbide with good balance of hardness and toughness.	Endmills, Drills for steel
	F0	0.7	5.0	2.0	93.6	20.1	Superior wear resistant micrograined carbide.	Micro drills, Routers
Fine-grained Carbide	KH03	1.0	10.0	3.3	91.4	15.2	Fine-grained carbide with good hardness and toughness.	Dies, Drills, Endmills
	KH05	1.0	13.0	3.5	90.4	13.6	High toughness fine grained carbide.	Dies
	H1	1.0	5.0	2.1	92.9	17.7	Superior wear resistant finegrained carbide.	Drills for cast iron, Reamers
	EH10	1.2	6.0	3.4	92.4	17.3	Fine-grained carbide with good balance of hardness and toughness. Fine-grained carbide.	Drills for exotic alloy, Reamers
	ZF16	1.0	6.0	3.5	93.0	18.6	Wear and chipping resistant fine-grained carbide for high speed machining.	Micro drills

Carbide Materials... From pages K2



High hardness and heat resistance for cutting high hardness steel and hard cast iron. Long tool life with high-speed finishing of grey cast iron.

In 1977, Sumitomo Electric successfully developed a revolutionary CBN sintered tool - SUMIBORON. The main component in SUMIBORON is Cubic Boron Nitride with a special ceramic binder sintered under super high pressure and temperature. As compared to other conventional tool materials, CBN has higher hardness and excellent heat resistance.

With these distinct characteristics, SUMIBORON can perform machining of hardened steel, high hardness cast iron and exotic metals where previously only grinding was done. Furthermore, excellent efficiency and longer tool life can also be achieved from high speed machining of cast irons.

Characteristics

Classifications	Structure	CBN Content	Hardness (GPa)	Grades	Application	Characteristics
Mainly CBN grains fused together		High	44	BN700 BN7000 BN7500 BNS800	<ul style="list-style-type: none"> Carbide Chilled cast iron Ni-Hard cast iron Heat-resistant alloy, Cast iron Sintered ferrous alloy 	<ul style="list-style-type: none"> High carbon content. Structure consists of strongly fused CBN grains. Suited to cutting cast iron, heat-resistant alloy, ultra-hard alloy, and other hard materials.
Mainly CBN grains held together with a binder		Low	21	BN500 · BNC500 BN1000 · BN2000 BN350 · BNX10 BNX20 · BNX25 BNC2010 · BNC2020 BNC100 · BNC160 BNC300 · BNC200	<ul style="list-style-type: none"> Alloy steel Case hardened steel Carbon tool steels Bearing steel, Die steel Ductile cast iron 	<ul style="list-style-type: none"> CBN grains are fused together strongly with a special ceramic binder. Strong CBN binding force gives superior wear resistance and toughness when cutting hardened steel and cast iron.

Grade Range Map

Application	Series	Finishing to Light		Medium	Medium	Rough to Heavy
	Classification	—	HO1	H10	H20	H30
	Coated SUMIBORON	BNC2010		BNC2020		BNC300
		BNC100		BNC160	BNC200	
		BN1000		BN2000		BNX25, BN350
		BNX10			BNX20	
	Uncoted SUMIBORON					
	Classification	—	O1	10	20	30
	Uncoted SUMIBORON	BN7500		BN7000		
	Classification	—	KO1	K10	K20	K30
	Coated SUMIBORON	BNC500*				
	Uncoted SUMIBORON			BNS800		
		BN7000		BN500		

*For Ductile Cast Iron

Characteristic Values

Class	Grade	Binder	Carbon Content (%)	Grain Size (μm)	Hardness HV (GPa)	TRS (GPa)	Main Coating Components	Coating Thickness (μm)	Characteristics
H Hardened Steel	New BNC2010	TiCN	50 to 55	2	30 to 32	1.10 to 1.20	TiCN multi-layered	1.5	Improves the wear resistance of coating and substrate and stably achieves excellent surface roughness.
	New BNC2020	TiN	70 to 75	5	34 to 36	1.20 to 1.30	TiAlN multi-layered	1.5	Provides long tool life in general and high-efficiency cutting thanks to tough substrate coated with a highly wear-resistant and highly adhesive layer.
	BNC300	TiN	60 to 65	1	33 to 35	1.15 to 1.25	TiAlN	1	Suited for finishing when there is a combination of continuous and interrupted cutting.
	BNC100	TiN	40 to 45	1	29 to 32	1.05 to 1.15	TiAlN/TiCN	2	Highly wear resistant coating makes this grade suited for high speed finishing.
	BNC160	TiN	60 to 65	3	31 to 33	1.10 to 1.20	TiAlN/TiCN	2	Stable, high precision finishing of hardened steel.
	BNC200	TiN	65 to 70	4	33 to 35	1.15 to 1.25	TiAlN	2	Tough substrate with high wear resistant coating provide longer tool life.
	BN1000	TiCN	40 to 45	1	27 to 31	0.90 to 1.00	—	—	Ultimate wear and fracture resistance. Suited to high-speed cutting.
	BN2000	TiN	50 to 55	2	31 to 34	1.05 to 1.15	—	—	A general purpose grade for hardened steel that provides a high degree of fracture and wear resistance.
	BNX20	TiN	55 to 60	3	31 to 33	0.95 to 1.10	—	—	Crater resistant grade, suitable for high efficiency cutting under high temperature conditions.
	BN350	TiN	60 to 65	1	33 to 35	1.20 to 1.30	—	—	High cutting edge strength, suited to heavy interrupted cutting.
	BNX10	TiCN	40 to 45	3	27 to 31	0.80 to 0.90	—	—	Optimum wear resistance. Suited to continuous, high-speed cutting.
	BNX25	TiN	65 to 70	4	29 to 31	1.00 to 1.10	—	—	Excellent fracture resistance during high speed cutting. Suited to high speed interrupted cutting of hardened steel.
Sintered alloy	BN7500	Co Compound	90 to 95	1	41 to 44	1.40 to 1.50	—	—	Maintains optimum cutting edge sharpness. Suited for finishing of sintered alloy.
	BN7000	Co Compound	90 to 95	2	41 to 44	1.30 to 1.40	—	—	Improved wear and fracture resistance in rough cutting of sintered components.
K Cast Iron	BNS800	Al Alloy	85 to 90	8	39 to 42	0.95 to 1.10	—	—	100% solid CBN structure with good thermal impact resistance.
	BN7000	Co Compound	90 to 95	2	41 to 44	1.30 to 1.40	—	—	Improved wear and fracture resistance in rough cutting of cast iron and exotic alloy.
	BN500	TiC	65 to 70	6	32 to 34	1.00 to 1.10	—	—	Optimized for cast iron cutting. Maintains good wear and fracture resistance.
	BNC500 (For Ductile Cast Iron)	TiC	60 to 65	4	32 to 34	1.00 to 1.10	TiAlN	2	Substrate with excellent wear resistance and coating makes this grade suited for hard-to-cut cast iron.





Excellent wear resistance, longer tool life, and high-speed, high-efficiency, high-precision cutting of non-ferrous metals and non-metals.

SUMIDIA is a polycrystalline diamond material made from sintered diamond powder that was first created using our proprietary technology in 1978.

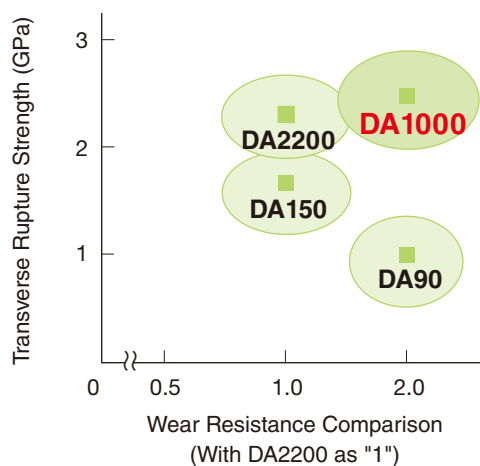
SUMIDIA's superior wear resistance achieves longer tool life, high speed, high efficiency and high precision in non-metal cutting and non-ferrous metal applications including aluminium, copper, magnesium and zinc alloys.



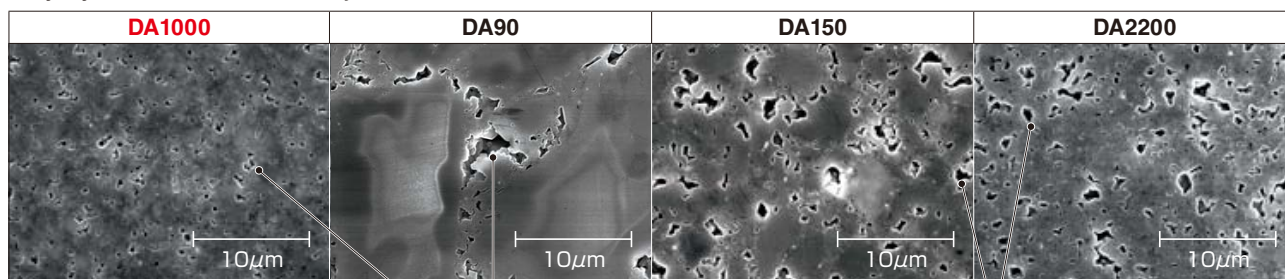
Characteristics

DA1000

The DA1000 utilises Sumitomo Electric Hardmetal's proprietary sintering technology to achieve a high-density sintered material made of ultra-fine diamond particles that has superior wear and fracture resistance and longer tool life.




Polycrystalline Diamond Subjected to Acid Treatment




Holes formed when binder is dissolved during acid treatment

Grade Range Map

Class	Series	Finishing to Light		Medium	Rough to Heavy
	Classification	N01	N10	N20	N30
	SUMIDIA	DA1000			
		DA2200			
		DA150			
		DA90			

Characteristic Values

Class	Grade	Binder	Carbon Content (%)	Grain Size (µm)	Hardness HV (GPa)	TRS (GPa)	Characteristics
	DA1000	Co	90 to 95	Up to 0.5	110 to 120	≈ 2.60	High density sintered material made of ultra-fine diamond particles that demonstrates optimum wear and fracture resistance, and edge sharpness.
	DA2200	Co	85 to 90	0.5	90 to 100	≈ 2.45	Sintered material made of ultra-fine diamond particles that demonstrates optimum wear and fracture resistance, and edge sharpness.
	DA150	Co	85 to 90	5	100 to 120	≈ 1.95	Sintered material made of fine diamond particles that provides a good balance of workability and wear resistance.
	DA90	Co	90 to 95	50	100 to 120	≈ 1.10	Sintered material made of coarse diamond particles with high diamond content and excellent wear resistance.



SUMIDIA Series ...



From page M2

A

Grades

Coated
Carbide

Cermets

Ceramic

Carbide

CBN
Layer

PCD






Superb wear for ultra-high speed machining.

Sumitomo Electric Hardmetal's "Advanced Ceramic" is created through a unique process that ensures excellent sharpness, making possible stable ultra-high speed cutting of cast iron, and cutting of heat-resistant alloys and ultra-hard rolled materials.

Grade Range Map





For Turning

For Turning	High-Speed	Finishing to Light		Medium	Rough to Heavy	
	—	01	10	20	30	40
<div> Cast Iron</div>	NB90S					
<div> Exotic Alloy</div>	WX120					
<div> Hardened Steel</div>	NB100C					



For Milling

	High-Speed	Finishing to Light		Medium	Rough to Heavy	
For Milling	—	01	10	20	30	40
						

Characteristic Values



For Turning

Class	Grade	Hardness (HRA)	TRS (GPa)	Main Coating Components	Coating Thickness (μm)	Characteristics
K Cast Iron	NB90S	94.8	0.9	—	—	Contains Al ₂ O ₃ and carbide. Suitable for medium to finishing of cast iron.
S Exotic Alloy	WX120	90.0	1.2	—	—	Enhanced with SiC whiskers. For heat-resistant alloy and ultra-hard roll cutting.
H Hardened Steel	NB100C	95.0	1.0	TiAlN	2	Ultra-strong. Contains Al ₂ O ₃ and ZX Coat. Continuous low-speed turning of hardened steel.



For Milling

Class	Grade	Hardness (HRA)	TRS (GPa)	Main Coating Components	Coating Thickness (μm)	Characteristics
K Cast Iron	NB90M	94.5	0.7	—	—	Contains Al ₂ O ₃ and tough carbide. For high speed finish milling of cast iron.

Material Properties

Material		Specific Gravity	Micro Vickers Hardness (mHv) (GPa)	Young Modulus (GPa)	Thermal Conductivity (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	2,950
Aluminium Oxide	Al₂O₃	3.98	29	410	29	8.5	2,050
Silicon Nitride	Si₃N₄	3.17	25	310	29	3.0	>1,900 (decomposes)
Cubic Boron Nitride	cBN	3.48	44	700	1,300	4.7	—
Diamond	C	3.52	>90	970	2,100	3.1	—
Cobalt	Co	8.9	—	100 to 180	69	12.3	1,495
Nickel	Ni	8.9	—	200	92	13.3	1,455
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	—

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Grades