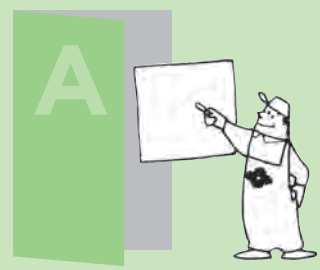


# Insert Grades

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# Grades for Turning



Insert Grades

A

Work Material	P General Steel (Carbon Steel, Alloy Steel), Mild Steel					M Stainless Steel					K Cast Iron							
	Wear Resistance ← Fracture Resistance					Wear Resistance ← Fracture Resistance					Wear Resistance ← Fracture Resistance							
Classification	—	P01	P10	P20	P30	P40	—	M01	M10	M20	M30	M40	—	K01	K10	K20	K30	
Coated Carbide 		<b>AC8115P</b> <i>New</i>								<b>AC6020M</b>								
			AC8015P								<b>AC6030M</b>							
				<b>AC8020P</b>							<i>New</i> <b>AC6135M</b>							
					<b>AC8025P</b>						<i>New</i> <b>AC6145M</b>							
						<b>AC8035P</b>												
For Small Lathes 																		
											<b>AC1030U</b>							
Coated Cermet 																		
Cermet 																		
Cemented Carbide 																		
Ceramic 																		
Uncoated CBN Coated CBN 																		

Work Material	S Exotic Alloy				H Hardened Steel				Work Material	N Non-Ferrous Metal					
	Wear Resistance ← Fracture Resistance				Wear Resistance ← Fracture Resistance					Wear Resistance ← Fracture Resistance					
Classification	—	S01	S10	S20	S30	—	H01	H10	H20	H30	—	N01	N10	N20	N30
Coated Carbide 															
Ceramic 															
Coated CBN 															
Uncoated CBN 															

Work Material	Sintered Alloy				
	Wear Resistance ← Fracture Resistance				
Classification	—	01	10	20	30
Coated Carbide 					
Cermet 					
Uncoated CBN 					

Work Material	Cemented Carbides and Hard Brittle Materials				
	Wear Resistance ← Fracture Resistance				
Classification	—	01	10	20	30
Polycrystalline Diamond 					



# Grade Comparison Chart

## ■ CVD Coated Grades








Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	MOLDINO	NTK	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec	
For Turning	Steel	P05	<b>AC8115P</b> <b>AC8015P</b>	UE6105 MC6115	T9105 T9205	CA510 CA5505	HG8010		GC4405 GC4305 GC4205	KCP05 KCP05B	TP0501 TP0500	WKP01G WPP05G WPP05S WPP05	IC8005 IC8150 IC9015	TT8105 TT8105B	
		P10	<b>AC8115P</b> <b>AC8020P</b> <b>AC8015P</b>	MC6115 MC6015 UE6110	T9105 T9115 T9205 T9215	CA115P CA510 CA515 CA5515	HG8010	CP7	GC4415 GC4305 GC4315 GC4215	KCP10 KCP10B	TP1501 TP1500	WPP10S WPP10 WPP10G	IC8150 IC8080 IC9015 IC9150 IC9080	TT8115 TT8115B	
		P20	<b>AC8020P</b> <b>AC8025P</b> <b>AC820P</b>	MC6025 MC6125 UE6020	T9115 T9125 T9215 T9225	CA125P CA025P CA525	GM25 HG8025 GM8020		CP7	GC4425 GC4325 GC4225	KCP25 KCP25B KCP25C	TP2501 TP2500	WPP20S WPP20 WPP20G	IC8150 IC8250 IC9015 IC9150 IC9250	TT5100 TT8125 TT8125B
		P30	<b>AC8035P</b> <b>AC830P</b> <b>AC630M</b>	MC6135 MC6035 UE6035	T9125 T9135 T9235	CA025P CA525 CA530	GM25 GM8035			GC4325 GC4335 GC4235	KCP30 KCP30B	TP3501 TP3500	WPP30S WPP30 WPP30G	IC8080 IC9350	TT7100 TT8135 TT8135B
		P40	<b>AC8035P</b> <b>AC830P</b> <b>AC630M</b>	MC6135 MC6035	T9135 T9235 T6130	CA530 CA5535	GX30 GM8035			GC4335 GC4235 GC30	KCP40 KCP40B	TP3501 TP3500		IC9350	TT7100
	Stainless Steel	M10 S10	<b>AC6020M</b>	MC7015 MV9005 US7020 US905	T6215 T9115 T9215	CA6515	HS9105			GC2015 GC1515 S05F S205	KCM15	TM1501		IC9250 IC520M	TT9215 TT3005
		M20 S20	<b>AC6020M</b> <b>AC6030M</b> <b>AC630M</b>	MC7025 US7020	T6120 T9125 T9215	CA6525	HG8025 HS9115			GC2025 GC1515	KCM25	TP2501 TM2000 TM2501		IC9025 IC9325 IC4050	TT5100 TT9225
		M30	<b>AC6030M</b> <b>AC630M</b>	MC7025 US735	T6130	CA6535	GM8035 GX30 GM25			GC2035 GC235	KCM35	TP3501 TM3501 TM4000		IC9350 IC4050 IC635	TT9235
		M40	<b>AC6030M</b> <b>AC630M</b>	US735						GC235 GC2035		TM4000			TT7800
	Cast Iron	K05	<b>AC4010K</b>	MC5005 MC5105 UC5105	T505 T5105	CA310 CA4505 CA4010	HX3505	CP1		GC3205 GC3210	KCK05	TK0501 TK1001	WKP01G WKK10S WAK10	IC5005	TT7005 TT7505
		K10	<b>AC4010K</b> <b>AC4015K</b>	MC5015 MC5020 MC5115 UC5115	T515 T5105 T5115	CA315 CA4505 CA4515 CA4115	HX3305 HX3515 HG8010	CP1		GC3210	KCK15 KCK15B	TK1001 TK1501	WKK10S WKK20S WAK10 WAK20	IC5100 IC9150 IC4100	TT7015
		K20	<b>AC4015K</b> <b>AC420K</b> <b>AC4125K</b> <b>AC8025P</b>	MC5015 MC5125 UC5115 UE6110	T515 T5115 T5125	CA320 CA4515 CA4120 CA4115	HX3515 GM8020			GC3225	KCK15 KCK20 KCK15B	K2001	WKK20S WAK20 WAK30	IC9150 IC5100 IC4100	TT7015
For Milling	Steel	P10	<b>ACP2000</b> <b>ACP100</b>	MV1020					GC4220 GC4330	KCPM20	MP1501 MP1500 MP2501 MP2500	WKP25S WKP25 WKP35S WKP35G	IC5400	TT7800	
		P20	<b>ACP2000</b> <b>ACP100</b>	F7030 MC7020 MV1020 MV1030	T3225		GX2140		GC4330 GC4340	KSPM20 KCPK30	MP2501 MP2500 MP3501	WKP25S WKP25 WKP35S WKP35G	IC5500	TT7800	
		P30	<b>ACP2000</b> <b>ACP100</b>	MC7020 MV1020 MV1030	T3130 T3225		GX2160		GC4340	KCPK30 KCPM30	MP3501			IC5500	TT7800
	Stainless Steel	M10	<b>ACM200</b>								KCPM20				
		M20	<b>ACM200</b>	F7030 MC7020 MV1020	T3130 T3225	CA6535	GX2160 AX2040		GC2040	KCPM20 KCPM30	MP2500 MP2501 MS2500	WMP45G WSM45X		TT7800 TT8525	
		M30	<b>ACM200</b>	MV1030							KCPM20 KCPM30	MP2500 MP2501 T350M		IC5820	TT7800 TT8525
	Cast Iron	K10	<b>ACK2000</b> <b>ACK200</b>	MV1020 MC5020 MC520	T1215 T1115						KCK15	MP1501		IC5100	TT6800
		K20	<b>ACK2000</b> <b>ACK200</b>	MC520 MV1020 MC5020 MV1030	T1215	CA420M	GX2120		GC3330 GC3220 GC3040	KC915M KC930M KC935M	MP1501 MK1500 MP3501	WAK15 WKP25S WKP35S WKP35G	IC5100 DT7150	TT6800	

## ■ PVD Coated Grades

Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	MOLDINO	NTK	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec	
For Turning	Steel	P10	<b>AC1030U</b> <b>ACZ150</b> <b>AC5005S</b> <b>AC5015S</b> <b>AC5025S</b> <b>AC520U</b>	VP15TF MS6015	AH110 AH120 AH710 AH725	PR915 PR930 PR1005 PR1215 PR1225 PR1705		TM1 VM1 DT4 DM4	GC1525	KCU10 KC5510	TS2000	WSM10	IC507 IC807 IC907		
		P20	<b>AC1030U</b> <b>AC5025S</b> <b>AC520U</b> <b>AC530U</b>	VP15TF VP20RT	AH120 AH725 AH3135	PR1225 PR1425 PR1725	IP2000	TM1 TM4 VM1 QM3 DM4	GC15 GC1125 GC1525	KCU25 KC5525	TS2500	WSM20	IC507 IC807 IC907	TT9030	
		P30	<b>AC1030U</b> <b>AC530U</b>	VP15TF VP20RT	AH120 AH725 SH730 AH730	PR1425 PR1525 PR1535	IP3000 CY250	QM3		GC1125				IC328 IC928	TT8020 TT9030
		P40	<b>AC1030U</b>			PR660	IP3000			GC4335 GC4235				IC830	TT8020

# Grade Comparison Chart

## ■ PVD Coated Grades (continued)

Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	MOLDINO	NTK	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec		
For Turning	 	M10 S10	AC5005S AC5015S AC5025S AC510U AC520U AC9115T	MP9005 MP9015 VP15TF VP05RT VP10RT	AH110 AH710 AH725 AH905 AH6225 AH8005	PR0055 PR015S PR915 PR1025 PR1215 PR1225 PR1305 PR1310 PR1705 PR1155	IP050S IP100S JP910S JP9115	TM1 VM1 DT4 DM4 ZM3 ST4	H5D6 GC1105 GC1115 GC1205	KCS10 KCS10B KC5510 KCU10 KCU10B KC5010	TH1000 TS2000	WSM01 WSM10 WSM10S WSM13G WSM23G	IC804 IC807 IC808 IC907 IC908	TT3005 TT3010 TT5080 TT8010		
		M20 S20	AC5015S AC5025S AC1030U AC520U AC6135M AC9125T	MP9015 MP9025 VP15TF VP20RT VP20MF UP20M MS7025 MS9025	AH630 AH120 AH725 AH6225 AH8015	PR015S PR915 PR1025 PR1125 PR1215 PR1225 PR1325 PR1725 PR120S	IP100S HS9115	DT4 DM4 ZM3 QM3 TM4 ST4 NTK650	GC15 GC1115 GC1125 GC1210	KC5525 KCU25 KC5025 KC5010 KCU25B	TS2500	WSM20 WSM20S WSM33G	IC330 IC806 IC830 IC808 IC908 IC928	TT3020 TT8010 TT8020 TT9030		
		M30	AC5025S AC6040M AC1030U AC520U AC530U AC6135M	MP7035 VP15TF VP20MF MS7025 MS9025	AH630 AH645 AH725 AH6235	PR1125 PR1525 PR1535		QM3 TM4 DT4 DM4	GC1125	KCM25S KCS25S		WSM30 WSM30S WSM33G WSM43G	IC328 IC330 IC830 IC840 IC882	TT8020		
		M40	AC6040M AC1030U AC530U AC6145M	MP7035 VP15TF MS6015 MS7025	AH645 AH6235	PR1125 PR1535	GX30							IC830 IC928	TT8020	
		K10	AC1030U AC510U ACZ150 AC5015S	VP10RT	AH110 AH120	PR905	HX3305 HG3305 HG3315 HX3515 HG8010 TH315 ATH10E			GC15				IC810	TT9030	
		K20	AC1030U AC510U ACZ150 AC5015S AC5025S	VP10RT VP20RT VP15TF	AH120	PR905			DM4 QM3							TT9030
		K30	AC1030U AC530U	VP15TF VP20RT	AH110 AH120 AH725										IC830 IC908 IC910 IC928	
	For Milling		P10	ACU2500 ACP200	VP15TF MP6120	AH110 AH710 AH725 AH7020	PR1225 PR1825	PN215 PN15M JP4105 JP4115	DT4 DM4	GC1010 GC1230	KC505M KC510M KC515M KCKP10	F25M	WXM15 WHH15X		TT2510 TT7080	
			P20	ACP3000 ACU2500 ACP200 ACP300	VP15TF MP6120	AH9030 AH120 AH725 AH3225 AH7020	PR1825 PR1525 PR1225 PR1230 PR1835	JP4120 CY150 CY9020 JS4045	TM4 DT4 DM4	GC1010 GC1025 GC1130 GC1230	KC522M KC525M KCSM30	MP3000 F30M F32M F40M	WXM15 WHH15X	IC808 IC810 IC908 IC910	TT7080 TT9030 TT9080	
			P30	ACP3000 ACU2500 ACP200 ACP300	VP15TF VP30RT MP6130	AH3135 AH3225 AH120 AH130 AH140 AH725 AH7030	PR1835 PR1525 PR1230	JS4045 JS4060 CY25 CY250 CY250V PTH30E	DM4 TM4 ZM3	GC1030 GC1130 GC2030	KC725M KC735M KC525M KC530M KCPM40 KCSM30	F40M T60M MP3000	WSP45 WSP45G WSP45S	IC328 IC330 IC830 IC928	TT8080 TT8525B	
P40			ACP3000 ACU2500 ACP300	VP30RT	AH140		JS4060 PTH40H				KC725M KC735M KCPM40		WSP45 WSP45G WSP45S	IC830 IC845 IC928	TT8020 TT8080 TT8525B	
 		M10	ACS1000 ACU2500 ACM100	MP9120 VP15TF	AH110 AH120 AH330 AH725 AH8005 AH8015	PR1210 PR1225	CY9020 JP4120 PN08M PN15M PN208 PN215	DT4 DM4 ZM3	GC1010 GC1025 GC1030 GC1130	KC515M SP4019 SP6519			IC808 IC908			
		M20	ACS1000 ACS2500 ACU2500	MP7030 MP7130 MP9030 MP9120 MP9130 UP20M VP15TF VP20RT	AH120 AH130 AH330 AH725 AH3225 AH8015	PR1210 PR1225 PR1225 PR830 PR1835	JP4120 CY150 JS1025	DT4 DM4 ZM3	S30T	KC522M KC525M SP4019 SP6519 X700	F25M F30M F32M MP3000 MS2050 MM4500	WSM35 WSM35S WSM35G	IC328 IC330 IC808 IC830 IC840 IC908 IC928	TT9080 TT9030		
		M30	ACS2500 ACS3000 ACM300	MP7030 MP7130 MP7140 MP9030 MP9130 MP9140 UP20M VP15TF VP20RT	AH130 AH140 AH330 AH725 AH3135	PR1525 PR1535 PR830 PR1835	JM4160 PTH30E JS1025	DT4 DM4 ZM3	GC2030 GC1040 S30T	KC522M KC525M KC530M KC725M KC735M KCPM40 KCSM30 KCSM40 X700	F30M F32M F40M MP2050 MS2050	WSM35 WSM35S WSM35G WSP45 WSP45G WSP45S	IC328 IC330 IC830 IC840 IC882 IC928	TT8020 TT8080 TT9080		
		M40	ACS3000 ACM300	MP7140 MP9140 VP30RT	AH140	PR1535 PR1835	JM4160 PTH40H				KC725M KCPM40 KCSM40		WSP45 WSP45G WSP45S	IC328 IC330 IC882	TT8020 TT8080	
		K05	ACK3000	MP8010	AH110		TH308 ATH80D			GC1010	KCKP10	MH1000				
		K10	ACK3000 ACU2500	MP8010	AH110 AH120 AH7020	PR1810 PR1210	ATH10E TH315 CY100H			GC1010 GC1020	KC514M KC515M KC520M KCK20 KCK20B	MH1000	WXM15 WHH15X	IC810 IC910	TT7515	
		K20	ACK3000 ACU2500 ACK300	VP15TF VP20RT	AH120 AH7020 AH9030	PR1810 PR1210 PR1510	JP4120 PTH135 CY100H CY9020		DM4	GC1020	KC514M KC524M KCK20 KCK20B KCKP30	MK2050 MK3000	WKK25S WKK25G	IC808 IC810 IC908 IC910	TT6080 TT7515	
		K30	ACK3000 ACU2500 ACK300	VP15TF VP20RT	AH120 AH7030	PR1810 PR1510 PR1210	JS4045 CY150 CY250			GC1020	KC520M KC522M KC524M KC725M	MK2050		IC810 IC910	TT6080	

Insert Grades  
**A**

Note: The above data was collected from various published catalogues. The information may therefore not be up to date.

# Grade Comparison Chart

## ■ Cermet

Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	MOLDINO	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec	
For Turning		P10	<b>T1500Z*</b> <b>T1000A</b> <b>T1500A</b>	AP25N* VP25N* NX2525	GT720* GT9530* AT9535* J9530* NS520	TN60 TN6020 TN610 TN620 PV710* PV720* CCX*	CZ25* CH550	CT5015	KT125 HTX KT1120			IC20N IC30N IC520N*	PV3030* PV3010* CT3000	
		P20	<b>T1500Z*</b> <b>T2500Z*</b> <b>T1500A</b> <b>T2500A</b>	AP25N* NX2525 NX3035 MP3025*	NS9530 GT9530* AT9530* J9530*	TN90 TN620 TN6020 PV720* CCX*	CZ25* CH550	GC1525*	KT6215 KT315* KT175 KT5020*	CM CMP C15M TP1020			IC20N IC30N IC520N* IC530N*	CT7000
		P30	<b>T2500Z*</b> <b>T2500A</b>	NX2525 MP3025* VP45N*	NS9530 GT9530* AT9530*	TN620 PV720* PV730*								
For Milling		K10	<b>T1000A</b>	AP25N* VP25N* NX2525	GT720* GT9530* NS9530 J9530* NS520	TN610 PV7005* PV710* CCX*	CH550	CT5015	KT125 HTX				PV3030* CT3000	
		P30	<b>T2500A</b> <b>T2500A</b> <b>T4500A</b>	NX2525 MX3030 NX4545 VP45N*	NS540 NS740	TN60 TN90 TN100M TN620M	MZ1000* MZ2000* MZ3000* CH7030 CH7035	CT530	KT530M* KTPK20*	C15M			IC30N	

\* mark indicates coated cermet

## ■ Cemented Carbide



Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	MOLDINO	NTK	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec		
For Turning / For Milling		P10	<b>ST10P</b>		TH10		WS10		S1P							
		P20	<b>ST20E</b>	UTi20T	KS20		EX35		SMA	K125M				IC07 IC50M	UF10	
		P30	<b>A30</b> <b>A30N</b>	UTi20T	KS15F UX30		PW30	EX35 EX40		SM30				IC54 IC28	P30	
		P40	<b>ST40E</b>		TX40			EX45		S6				IC54 IC28		
		M10	<b>EH510</b>		TH10		EX35 WA10B	KM1	H10A	KU10,K313 K68,KYSM10	890			IC07,IC20 IC08		
		M20	<b>EH520</b>	UTi20T	KS20		EX35		H13A	K313 K68	HX 883			IC07,IC20 IC08	UF10	
		M30	<b>A30</b> <b>A30N</b>	UTi20T	UX30				H10F SM30					IC28		
		K01	<b>H2</b> <b>H1</b>	HTi05T	KSO5F		WH01 WH05			KU10,K313 K68,K115M				IS8		
		K10	<b>H1</b> <b>EH510</b>	HTi10	TH10	KW10 GW15	WH10	KM1	H13A	KU10,K313 K68,K115M K110M KY3500	890			IC20,IS8	K10	
		K20	<b>G10E,H10E</b> <b>EH520</b>	UTi20T	KS15F KS20	GW25	WH20	KM3	H13A	KMF KY3500 KYHS10	890 883 HX			IC20 IS8		
		K30	<b>G10E,H10E</b>	UTi20T			WH30			KY3500	883					
	Micro-fine Grained Carbide		S10 S20	<b>EH510</b> <b>EH520</b>	RT9005 RT9010 MT9015 TF15	TH10 KSO5F KS15F KS20	SW05,SW10 SW25,KW10 GW15	WH10	H10A H10F H13A	KU10,K313 K68,KMF K110M,KYHS10 K1025	HX H25			IC20,IC07 IC08,IC28	K10	
			Z01	<b>FO</b>	SF10,MF07 MF10,TBA16A	F,MD1508 MDO8F		NM08							IC07	UF1A
			Z10	<b>AFU</b> <b>XF1</b>	HTi10 MF20	M,MD10 MD05F,MD07F	FW30	NM15		6UF,8UF PN90,H6FF		890			IC07	UF1A
			Z20	<b>AFO</b> <b>AF1</b>	TF15 MF30	EM10,MD20 MD15		BRM20 EF20N		12UF		890 883			IC08	UF10
	Z30	<b>A1</b>		UM			NM25		N6F,H10F		883		IC08			

## ■ Ceramic

Application	Work Material	Sumitomo Electric	Tungaloy	Kyocera	NTK	Sandvik	Kennametal	TaeguTec
For Turning / For Milling		<b>NB100C</b>	WG300 LX11	A66N A65 KT66 PT600M	HC4,HC7 ZC7,WA1	GC6050 CC650 CC670	KY1615 KY4300	AB20 AB2010
		<b>NB90S</b>	LX11,LX21 CXC73,FX105 CX710	A65,A66N KA30,KS500 KS6000,KT66 PT600M CS7050,KS6050	HC1,HW2,HC2,HC6 HC7,WA1, SX1, SX2 SP2, SX9, SX8	CC620,CC650 CC6090 GC1690	KY1615, KY1310 KY1320, KY3500 KY4300	AW120, AB30 AS500, AS10 SC10


# Grade Comparison Chart

## ■ CBN

Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	NTK	Chukyo	Sandvik	Kennametal	SECO Tools	ISCAR	
For Turning / For Milling		K01	<b>NCB100</b> <b>BNC500*</b> <b>BN7125</b> <b>BN500</b>	BC5110 MB710 MB5015	BX910 BX930 BX870	KBN475 KBN60M	B30 B16		CB50 CB7525	KB1340		IB50 IB85	
		K10	<b>BN7125</b> <b>BN500</b>	MB710,MB730 MB5015,MB4020	BX470,BX480 BX950	KBN60M KBN900	B23 B16	HB55,HB56 HB569 HB580,HB57	CB7925		CBN200,CBN300 CBN300P,CBN400C		IB55 IB90
		K20	<b>BN7125</b> <b>BNC8115</b> <b>BNS8125</b>	MB730,MB4020 MB4120,MBS140	BX470,BX480 BXC90,BX90S	KBN900		HB56,HB569 HB580,HB57					
		K30	<b>BNC8115</b> <b>BNS8125</b>	MB4120,MBS140 BC5030	BXC90 BX90S			HB57			KB5630	CBN500	
		S01	<b>NCB100</b> <b>BN7125</b>	MB730 MB4020 MB4120	BX940,BX950 BX470,BX480 M714B			HB55 HB580 HB52			KB5630 KB1340		IB85 IB05S IB10S
		H01	<b>BNC2105</b> <b>BNC2010</b> <b>BNC2115</b> <b>BN1000</b> <b>BN2000</b> <b>BNX10</b>	BC8105 BC8110 BC8210 MB8110 MB8210	BXA10 BXM10 BX310	KBN05M KBN10M KBN010 KBN510	B5K B52	HB55 HB550 HB580 HB590	CB7105	KBH10B KB5610	CH0550 CBN10 CBN100 CBN060K		IB05H IB50 IB10HC
		H10	<b>BNC2010</b> <b>BNC2020</b> <b>BNC2115</b> <b>BNC2125</b> <b>BN2000</b>	BC8110 BC8210 BC8120 BC8220 MB8110 MB8210 MB8025	BXA10 BXM10 BX330 BX530	KBN05M KBN010 KBN25M KBN020 KBN525	B5K B6K B52 B36	HB55 HB59 HB550 HB580 HB52	CB7015 CB7115 CB20	KBH20B KBH20 KBH10B KB5610 KB5625	CBN10 CBN100 CBN150 CBN060K CBN160C		IB10H IB55 IB25HA
		H20	<b>BNC2020</b> <b>BNC2125</b> <b>BNX20</b>	BC8020 BC8120 BC8220 MB8025 MB8120 MB8220	BXA20 BXA40 BXM20 BX360	KBN25M KBN020 KBN900	B36 B40 B6K	HB57,HB59 HB590 HB580	CB7025 CB7125 CB50	KBH20B KBH20 KB5625 KB5630	CH2540 CBN150 CBN160C		IB20H,IB20HC IB25H,IB25HC
		H30	<b>BNC300</b> <b>BNC2135</b> <b>BN350</b>	BC8130 MB8130	BXA30 BXC50 BX380 BR35F	KBN020 KBN35M KBN900	B40	HB57 HB580	CB7135 CB7525	KB5630	CH3515		IB90

\* mark: For ductile cast iron cutting

## ■ Polycrystalline Diamond

Application	Work Material	Classification Code	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	NTK	Chukyo	Sandvik	Kennametal	SECO Tools	ISCAR	
For Turning / For Milling		N01	<b>DA1000</b> <b>DA90</b> <b>DA1090</b> <b>NPDI0</b>	MD205	DA160 DX180 DX200	KPD001	PD1		CD05 CD10	KD1400		ID5	
		N10	<b>DA1000</b> <b>DA150</b>	MD205 MD220	DX140	KPD001 KPD010 KPD230	PD2	HD100 HD30 HD60	CD1810	KD1400 KD1425	PCD05 PCD10	ID5	
		N20	<b>DA1000</b> <b>DA2200</b>	MD220 MD230	DX120 DX110	KPD230 KPD250	PD2	HD100 HD30 HD50			KD1400 KD1425	PCD05 PCD20	
		N30	<b>DA1000</b> <b>DA2200</b>	MD2030 MD230	DX110			HD30,HD50 HD700 HD100			KD1400	PCD05 PCD30 PCD30M	

Note: The above data was collected from various published catalogues. The information may therefore not be up to date.

# Chipbreaker Comparison Chart

## ■ Negative type Inserts

Work Material	Application	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Mitsubishi-Hitachi	NTK	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec
<b>P</b> Steel	Fine Cutting	<b>FA</b>	FH,FP	TF	GP			QF	FF	FF1		SF	FLP, FA,FS
		<b>FL,FB</b>	FS,FY	NS,ZF	XP,XF,VF, VC,SK	FE	WM			FF2	FP5		FA,FX
	Finishing	<b>LU,FE</b>	SA,SY	NM	PP,XQ,CQ	BE	ZF1	LC	FN		NF3		FG,FLP
		<b>SU</b>	SH	TS,TSF	HQ	CE,B,BH	UL,WV	XF,MF	CT	MF2		NF	FC
	Finishing (Wiper Edge)	<b>LUW</b>		AFW,FW	WP,WF			WL,WP		W-FF2	FW5		
		<b>SEW</b>	SW	ASW,SW	WQ			WF,WMX	FW	W-MF2	NF	WF	WS
	Finishing to Light Cutting	<b>SE,SX</b>	LP	AS,ZM	CJ,XS,VC	AB,CT	ZW1,WR	PF,KF	LF,33		MP3,NS6	F3P,TF	MLP,FC,FP
	Medium Cutting	<b>GU(UG)</b>	MA,MV	TM,TQ	HS,PS, PMG	AH	ZP	XM,QM, PMC	P,MG, MV	M3	MU5	GN	MGP, MC
		<b>GE,UX</b>	MH,MP	DM,AM	PQ,GS, PT,PG	AE,AY	Z5	PM,SM, KM,HM	MN, MP1		MP5,NM4, NM6	RF,LF	MGP, MT
	Medium Cutting (Wiper Edge)	<b>GUW</b>	MW		WE			WM	MW, RW	W-M3	NM, NW5	WG	WT
	Roughing	<b>MU,ME</b>	RP,GH	TH,S	HT,GT, PH	RE,AR	G	PR,XMR, KR	RP	M5,MR7	RP5,NM9, RP7	M3P, NR	RT, RGP
		<b>MX</b>	HAS,MT	CH					RN	MR6			RT
	Heavy Cutting	<b>HG</b>	HZ,HX, HL	THS, TRS	PX, Standard	TE,UE		QR	RM,MR	R4,R5, M6	NR6,NRF, HU3	NM	RX,RH
		<b>HP</b>	HH,HXD, HR	65				HR,SR	RH	R7,MR7	NR8	TNM	RX,RH
<b>HU,HW</b>		HV			H					HU7		HT,HD,HY	
<b>HF</b>		HCS	TUS		HX,HE		MR			RR9	NRR	R3P	HZ
<b>M</b> Stainless Steel	Finishing	<b>SU,EF</b>	LM,SH	SS	MQ,GU	SE,MP, AB	ZF1	MF	FP,FS, LF	MF2	NF4, FM5	F3M	EA,SF
	Light to Medium Cutting	<b>EX,EG</b>	GM,MS	SF,SA	MS,MU	PV	ZP	23	MS	MF1,M1	MM5	TF,VL	EM,ML
	Medium Cutting	<b>GU,EH</b>	MM	SM,SDM		DE		MM,MMC, SMR	MP	MF3,M3	NM4,MS3, MU5	M3M, PP	EM,ML
	Roughing	<b>HM</b>	ES,1M, 2M,HL	S		AE			UP	MF4, MF5	NR4, RM5		VF
<b>EM,MU</b>		RM,GH, HM	SH	TK			MR,MRR	RP	M5,MR3, MR4	HU5	MR,R3M, M4MW	ET	
<b>K</b> Cast Iron	Light Cutting	<b>UZ</b>	LK,MA, MK	CM,CF	Standard, C, KQ	V,VA		KF	UN	M4	NM5	GN	MT
	Medium Cutting	<b>GZ(UX)</b>	GK,RK, GH	Standard, CH, 33	ZS,GC, KG,KH	Y,RE		KM,KR, KRR		MR7	RK5,RK7, MK5,HU7		RT,KT, MG
<b>N</b> Non-Ferrous Metal	Finishing	<b>AX</b>		P	AH				MS		MN3	12	ML
<b>S</b> Exotic Alloy	Finishing	<b>EF</b>	LS,FJ	HRF				SF,SGF			NFT,FM5	F3S	EA,SF
	Medium Cutting	<b>EG,EX</b>	MS,MJ	HMM,SA, HRM	SQ	VI		SM, SMC		M1	NMT,NMS, MM5,RK5	VL	MGS, MP
	Roughing	<b>MU</b>	RS,GJ		SG,SX			SMR		MR3, MR4	NRT,HU5, NRS,RM5		ET
<b>H</b> Hardened Steel	Finishing	<b>GH, FV*</b>		HP*									
	Light Cutting	<b>LV*</b>	BF*	HF*	HH*, HL*							HF*	
	Carburised Layer Removal	<b>SV*</b>	BM* BR*	HM* HS*	HD*							HM*	

( ) indicates a discontinued item.\* mark indicates CBN/PCD tool breaker

Note: The above data was collected from various published catalogues. The information may therefore not be up to date.

# Chipbreaker Comparison Chart

## Positive type Inserts

Work Material	Application	Sumitomo Electric	Mitsubishi	Tungaloy	Kyocera	Mitsubishi-Hitachi	NTK	Sandvik	Kennametal	SECO Tools	WALTER	ISCAR	TaeguTec
<b>P</b> Steel	Fine Cutting / Finishing	<b>FF</b>		O1	CF		AMX,FG						SL
	Finishing	<b>FC</b>	FJ,AM	JRP,JTS	GF,VF,P,PF		AM3,AZ7	UM		GT-F1	FL2		SA,SM
		<b>FB,LU (FP,FK)</b>	FP,FM,FV,SQ	PSF,PF,23,SS,JSS	GP,XP,PP,MP,Q,DP	JQ,MP	ZR	PF,UF,MP,XF	11,UF,MP,KF,XF	FF1	FP4,FM4	PF	FA,FX
	Finishing (Wiper Edge)	<b>SDW</b>						WK,WM	MW	W-F2		WG	
		<b>LUW</b>	SW		WP			WF	FW	W-F1	FW4	WF	WT
	Finishing to Light Cutting	<b>SI, SL</b>	SMG	JS,CM,PSS,JP	CK,SKS		YL,1L, TMV				FM2, FP2	FIM-20P, FIM-12P	SA,SM
		<b>LB</b>	LP,LM		XQ		AM2		LF				
Light to Medium Cutting	<b>SC</b>			GQ, SK, Standard		AF1,CL		MP	MF2				
	<b>SU,GU (SK,SF)</b>	SV,MP	PS,TSF, TM	HQ,XQ, GK	JE	AZ8,AM2, AM5	PM,UM, XM		F1	MP4,MM4, FP6,PM5	SM,14	FG,PC, SH	
Medium Cutting	<b>MU</b>	MP,MM, MK,MV	PM				PR,UR, MMC,MPC, XR	MF	F2,M3,M5	RP4,RM4, MP6	19	MT,PMR, SH	
<b>M</b> Stainless Steel	Fine Cutting / Finishing	<b>FF</b>											SL
	Finishing	<b>FC</b>	FM,FV	PSF,PF,SS, JSS,JP			AZ7	MF,XF	11,UF	FF1	FL2, FM6	PF	FA,FX, SM
	Finishing to Light Cutting	<b>SI, SL</b>	SMG	JS,JP			YL,1L, CL, TMV	UF	LF,FP		FM2, FP2	FIM-20P, FIM-12P	SM
		<b>LB</b>	LM		MQ					F1			
	Light to Medium Cutting	<b>SU,GU</b>	SV		HQ		AM5	MM	MP	MF2	FM4,MM4, PS5	SM	PC,FG
Medium Cutting	<b>MU</b>	MM, MV, Blank	PM				UM,MR, XR,UR	MF	F2,M3, M5	PM5, RM4		MT,PMR, SH	
<b>K</b> Cast Iron	Fine Cutting / Finishing	<b>FF</b>		CF									SL
	Finishing	<b>FC</b>						KF,XF	11,UF		FK6,FL2, FP2		SM
	Light to Medium Cutting	<b>MU</b>	MK				AF1,FM	KM,UM, XR	FP,LF, MF,MP	M5	FP2,MK4, RK4		MT
<b>N</b> Non-Ferrous Metal	Finishing	<b>AG,AW,AY</b>	AZ	AL,PP	AH,AP			AL	HP	AL	PM2,MN2	AS,AF	FL
	Finishing to Light Cutting	<b>LD*, GD*</b>											SA
<b>S</b> Exotic Alloy	Fine Cutting / Finishing	<b>FF</b>											SL
	Finishing	<b>FC, SI, SL</b>	FS	PSS	PP,MP			WF,MP			FM4, FM2	FIM-20P, FIM-12P	SM,SH, FG
	Light to Medium Cutting	<b>SU,GU</b>	LS,MS	PS,PM	HQ,GK			UM,PM		MF2,R2, R3	FV4,MV4, MM4		SH,PC
<b>H</b> Hardened Steel	Finishing	<b>FV*</b>		HP*									
	Light Cutting	<b>LV*</b>	BF*										

( ) indicates a discontinued item.\* mark indicates CBN/PCD tool breaker

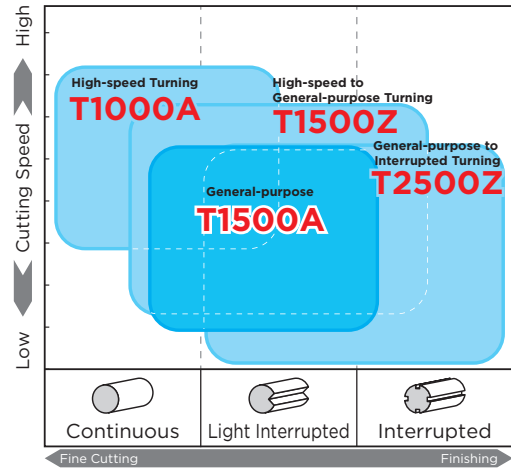
Insert Grades

A

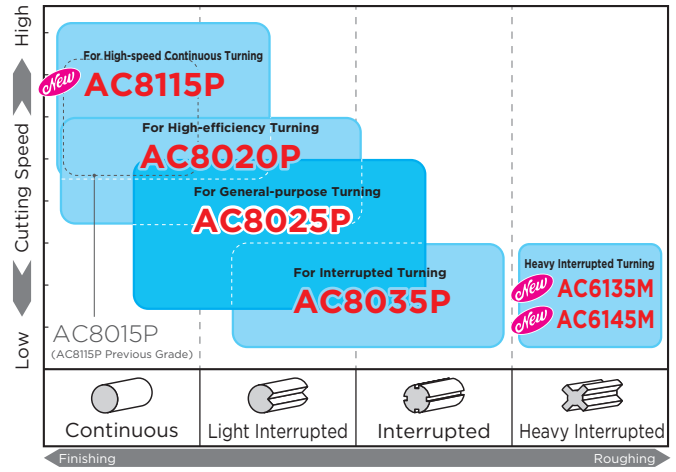
Note: The above data was collected from various published catalogues. The information may therefore not be up to date.

## Grades

### ● Fine Cutting to Finishing (Cermet)

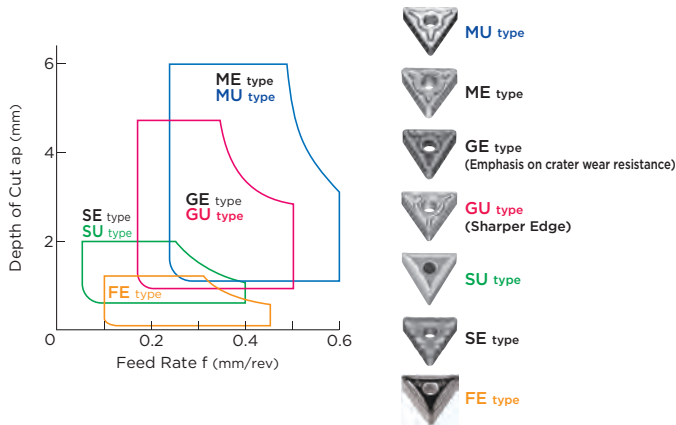


### ● Finishing to Roughing (Coated Carbide)

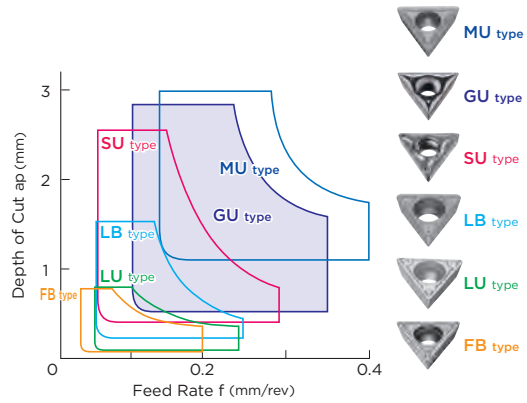


## Main Chipbreakers

### Negative type

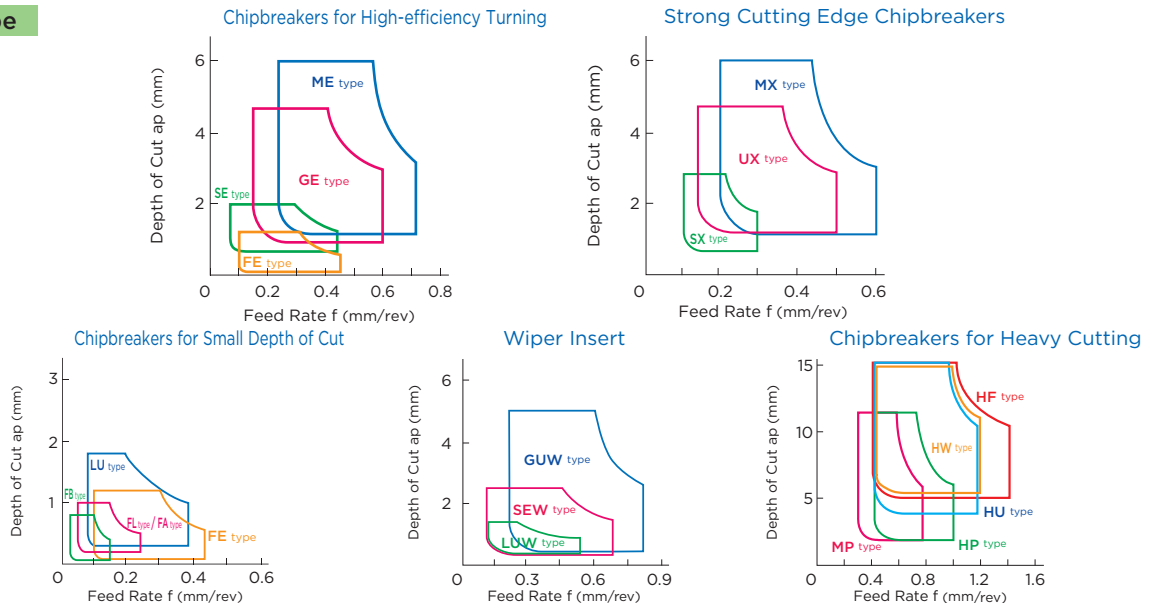


### Positive type



## Sub-Chipbreakers

### Negative type



## Grades

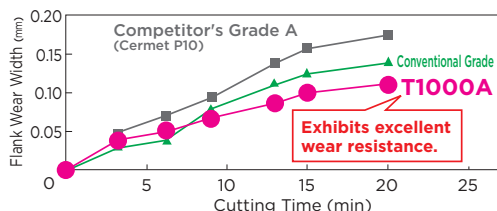
Uncoated Cermet **T1000A / T1500A / T1500Z / T2500Z** Coated Cermet

**T1000A:** High-hardness cermet with outstanding wear resistance and toughness. Realises high dimensional accuracy for continuous steel machining or finishing of sintered alloy or cast iron.  
**T1500A:** General-purpose cermet made from hard grains with different grain sizes, delivering functionality that provides an excellent balance of wear resistance and toughness. Also achieves good surface finish quality.  
**T1500Z:** Employs Brilliant Coat PVD coating with excellent lubricity to provide better wear resistance and consistent surface finishes in low-speed cutting applications such as machining of small products or low carbon steel.  
**T2500Z:** A new cermet substrate with excellent thermal conductivity is used to achieve outstanding thermal crack resistance. Also uses Brilliant Coat, which has excellent lubricity.

## Cutting Performance

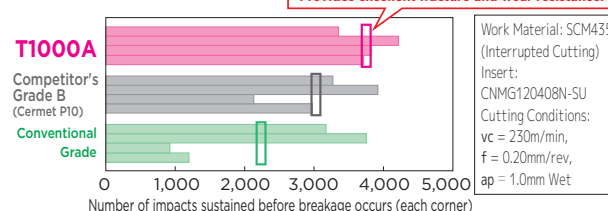
### T1000A

#### ● Wear Resistance



Work Material: SCM435  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 320m/min, f = 0.20mm/rev, ap = 1.5mm Dry

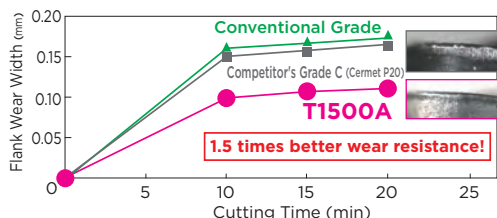
#### ● Fracture Resistance



Work Material: SCM435 (Interrupted Cutting)  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 230m/min, f = 0.20mm/rev, ap = 1.0mm Wet

### T1500A

#### ● Wear Resistance



Work Material: SCM435  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 230m/min, f = 0.20mm/rev, ap = 1.0mm Wet

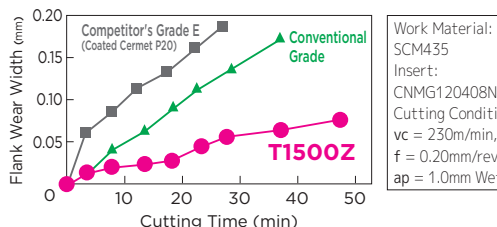
#### ● Machined Surface Quality



Work Material: S25C  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 185 to 0m/min, f = 0.15mm/rev, ap = 1.5mm Wet

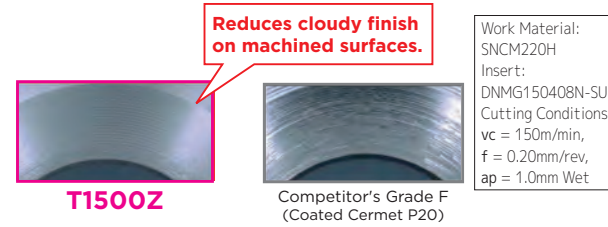
### T1500Z

#### ● Wear Resistance



Work Material: SCM435  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 230m/min, f = 0.20mm/rev, ap = 1.0mm Wet

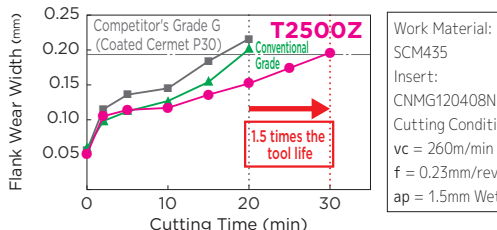
#### ● Machined Surface Quality



Work Material: SNCM220H  
 Insert: DNMG150408N-SU  
 Cutting Conditions: vc = 150m/min, f = 0.20mm/rev, ap = 1.0mm Wet

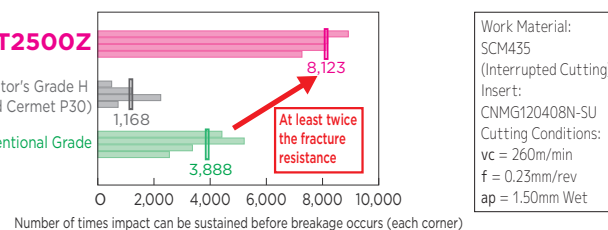
### T2500Z

#### ● Wear Resistance



Work Material: SCM435  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 260m/min, f = 0.23mm/rev, ap = 1.5mm Wet

#### ● Fracture Resistance



Work Material: SCM435 (Interrupted Cutting)  
 Insert: CNMG120408N-SU  
 Cutting Conditions: vc = 260m/min, f = 0.23mm/rev, ap = 1.50mm Wet

## Recommended Cutting Conditions

Work Material	Application	Chipbreaker	Grade	Cutting Conditions		
				Depth of Cut ap (mm)	Feed Rate f (mm/rev)	Cutting Speed VC (m/min)
Mild Steel (SS400, etc.)	Fine Cutting	FB / FL	T1500Z	0.2- <b>0.5</b> -1.0	0.05- <b>0.15</b> -0.25	150- <b>280</b> -400
	Finishing	FE / LU	T2500Z	0.3- <b>1.0</b> -1.8	0.08- <b>0.20</b> -0.35	150- <b>280</b> -400
Carbon Steel Alloy Steel (S45C, SCM435, etc.)	Fine Cutting	FB / FA	T1500A	0.2- <b>0.5</b> -1.0	0.05- <b>0.15</b> -0.25	100- <b>200</b> -300
	Finishing	FE / SU	T1500A	0.5- <b>1.0</b> -2.0	0.08- <b>0.20</b> -0.35	100- <b>200</b> -300
	Medium	GU	T1500Z	0.8- <b>2.2</b> -4.0	0.15- <b>0.25</b> -0.50	100- <b>200</b> -300
Hard Steel Alloy Steel (SCM440H, etc.)	Fine Cutting	FB / FA	T1000A	0.2- <b>0.5</b> -1.0	0.05- <b>0.15</b> -0.25	50- <b>150</b> -250
	Finishing	FE / SU	T1500Z	0.5- <b>1.0</b> -2.0	0.08- <b>0.20</b> -0.35	50- <b>150</b> -250
	Medium	GU	T1500Z	0.8- <b>2.2</b> -4.0	0.15- <b>0.25</b> -0.50	50- <b>150</b> -250

## Grades

**AC8115P** / **AC8020P** / **AC8025P** / **AC8035P**

- AC8115P:** Advancement in fine crystal alumina grain orientation control technology greatly reduces the progress of crater damage. Achieves excellent wear resistance in high-efficiency and dry machining.
- AC8020P:** Alumina coating with even higher strength balances outstanding stability and wear resistance in turning mill-scale on forged materials. Gold-coloured exterior makes used corners easily identifiable.
- AC8025P:** Our 1st recommended grade for turning steel. Surface smoothing technology significantly suppresses adhesion of work material components. Achieves long, stable tool life with various cutting speeds and work materials.
- AC8035P:** Tensile stress removal of the coating layer greatly improves fracture resistance. Achieves long, stable tool life in heavy interrupted cutting.



## Cutting Performance

### AC8115P

- Fine crystal alumina grain orientation control technology suppresses crater damage caused by chip abrasion

Conventional Grade	AC8115P
<p>Machining for 20 minutes</p>	<p>Machining for 20 minutes</p>
<p>Exposed substrate</p>	<p>Minor wear</p>
<p>Machining for 40 minutes</p>	<p>Machining for 40 minutes</p>
<p>Tool Life</p>	<p>Able to continue</p>
<p>Tool life reached due to plastic deformation</p>	<p>Tool Life</p>
<p>Work Material: SCM435 (External Continuous) Insert: CNMG120408N-GE Cutting Conditions: <math>v_c = 270\text{m/min}</math>, <math>f = 0.3\text{mm/rev}</math>, <math>a_p = 1.5\text{mm}</math>, Wet</p>	<p>Suppresses crater damage due to chip scraping At least 1.5x crater wear resistance</p>

### AC8020P

- Alumina coating with even higher strength suppresses chipping

Conventional Grade	AC8020P
<p>400 impacts Minimal chipping</p>	<p>400 impacts Minor damage</p>
<p>1,600 impacts Tool Life</p>	<p>1,600 impacts Minor damage</p>
<p>Chipping</p>	<p>4,000 impacts Minimal chipping</p>
<p>Work Material: SCM435 (Forged Material with Interrupted Sections) Insert: CNMG120408N-GU Cutting Conditions: <math>v_c = 250\text{m/min}</math>, <math>f = 0.3\text{mm/rev}</math>, <math>a_p = 1.5\text{mm}</math> Wet</p>	<p>Balance of high wear resistance and stability Chipping resistance improved 2.5 times or more</p>

### AC8025P

- Surface smoothing treatment significantly suppresses adhesion and chipping

Conventional Grade	AC8025P
<p>Machining for 2 minutes</p>	<p>Machining for 2 minutes</p>
<p>Adhesion</p>	<p>Normal wear</p>
<p>Machining for 70 minutes</p>	<p>Machining for 70 minutes</p>
<p>Chipping</p>	<p>Minor damage only, able to continue</p>
<p>Unable to continue</p>	<p>Machining for 120 minutes</p>
<p>Work Material: SCM415 (Face) Insert: CNMG120408N-GU Cutting Conditions: <math>v_c = 100</math> to <math>300\text{m/min}</math>, <math>f = 0.3\text{mm/rev}</math>, <math>a_p = 1.5\text{mm}</math> Wet</p>	<p>Suppresses adhesion with ultra-smooth surface At least twice the adhesion/fracture resistance</p>

### AC8035P

- Special surface treatment reduces tensile stress in the coating layer, significantly suppressing fractures

Conventional Grade	AC8035P
<p>Feed Rate <math>f</math> (mm)</p> <p>No. of Impacts</p>	<p>Feed Rate <math>f</math> (mm)</p> <p>No. of Impacts</p>
<p>Unable to continue</p>	<p>All corners able to continue</p>
<p>Work Material: SCM435 (External Interrupted) Insert: CNMG120408N-GU Cutting Conditions: <math>v_c = 160\text{m/min}</math>, <math>f = 0.2</math> to <math>0.3\text{mm/rev}</math>, <math>a_p = 2.0\text{mm}</math> Dry</p>	<p>Suppresses crack growth and fractures by reducing tensile stress At least twice the fracture resistance</p>

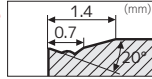
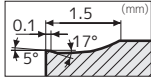
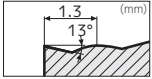
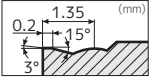
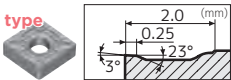
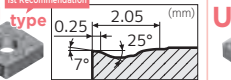
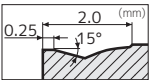
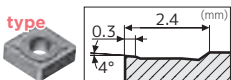
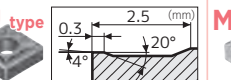
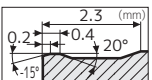
Application Guide

1st Recommended Grade

1st Recommended Chipbreaker

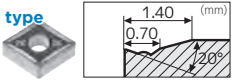
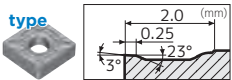
General-purpose machining **AC8025P**

**GU type** 

	Chipbreakers for High-efficiency Machining		Main Chipbreaker	Strong Cutting Edge Chipbreakers
Finishing to Small Depth of Cut	<b>FE type</b> 	<b>SE type</b> 	<b>SU type</b> 	<b>SX type</b> 
General-purpose	<b>GE type</b> 		<b>GU type</b> 	<b>UX type</b> 
Roughing to Large Depth of Cut	<b>ME type</b> 		<b>MU type</b> 	<b>MX type</b> 

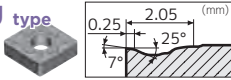
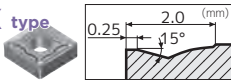
For high-speed and dry machining

High-speed Machining **AC8115P** *New*

To improve tool life at small depths of cut	<b>FE type</b> 
To increase feed rate	<b>GE type</b> 

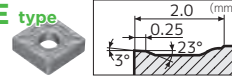
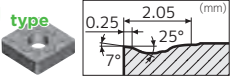
For heavy interrupted cutting emphasizing stability

Interrupted Machining **AC8035P**

To improve tool life	<b>GU type</b> 
To improve machining stability	<b>UX type</b> 

For high-efficiency machining of hard steel and forgings

High Efficiency **AC8020P**

To increase feed rate	<b>GE type</b> 	To increase cutting speed	<b>GU type</b> 
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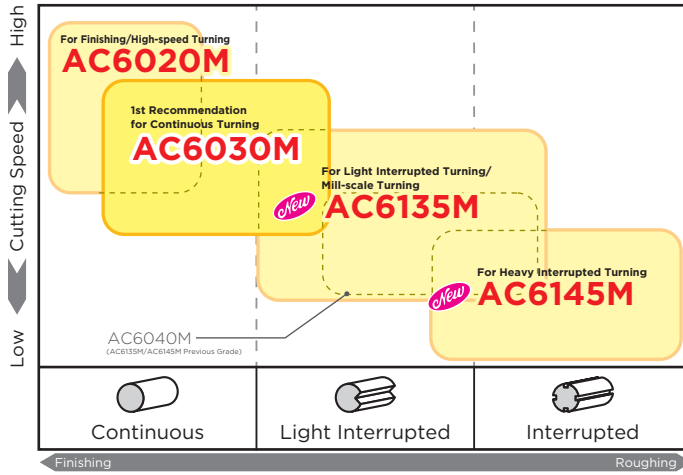
Recommended Cutting Conditions

(Red text indicates 1st recommendation)

Work Material	Application	Chipbreaker	Grade	Cutting Conditions Min. - Optimum - Max.		
				Depth of Cut $a_p$ (mm)	Feed Rate $f$ (mm/rev)	Cutting Speed $V_C$ (m/min)
Mild Steel Low Carbon Steel (SS400, S15C, etc.)	Fine Cutting	FB, FE	<b>T1500Z</b>	0.2- <b>0.6</b> -1.0	0.05- <b>0.15</b> -0.25	100- <b>250</b> -400
	Continuous	GU, GE	<b>AC8115P</b>	1.0- <b>2.5</b> -4.0	0.1- <b>0.25</b> -0.4	260- <b>350</b> -500
	General to Interrupted	<b>GU, GE</b>	<b>AC8025P</b>	1.0- <b>2.5</b> -4.0	0.2- <b>0.35</b> -0.5	200- <b>260</b> -320
Medium to High Carbon Steel Alloy Steel Hard Steel (S45C, SCM435, SCM440H, etc.)	Heavy Interrupted	MU, ME	<b>AC8035P</b>	1.5- <b>4.0</b> -6.0	0.3- <b>0.45</b> -0.6	140- <b>150</b> -220
	Fine Cutting	FB, FE	<b>T1500Z</b>	0.2- <b>0.6</b> -1.0	0.05- <b>0.15</b> -0.25	50- <b>200</b> -300
	Continuous to General	<b>GU, GE</b>	<b>AC8020P</b>	1.0- <b>2.5</b> -4.0	0.2- <b>0.35</b> -0.5	150- <b>235</b> -290
	Interrupted	GU, GE	<b>AC8025P</b>	1.0- <b>2.5</b> -4.0	0.2- <b>0.35</b> -0.5	130- <b>165</b> -230
	Heavy Interrupted	MU, ME	<b>AC8035P</b>	1.5- <b>4.0</b> -6.0	0.3- <b>0.45</b> -0.6	90- <b>135</b> -160

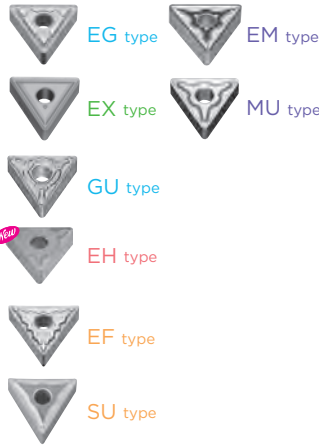
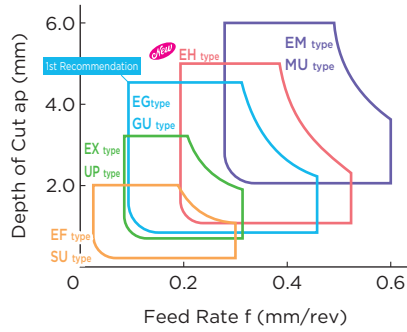


## Grades

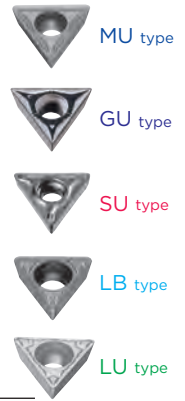
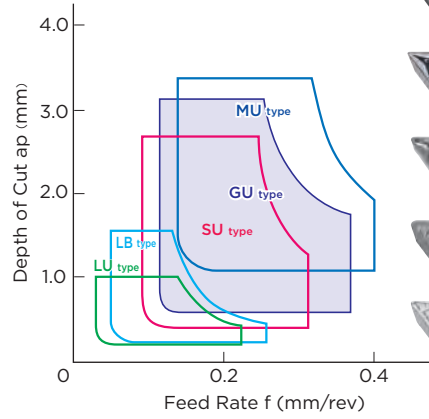


## Chipbreakers

### Negative type



### Positive type



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



## Recommended Cutting Conditions

(Red text indicates 1st recommendation)

Work Material	Application	Chipbreaker	Grade	Cutting Conditions		
				Depth of Cut $a_p$ (mm)	Feed Rate $f$ (mm/rev)	Min. - Optimum - Max. Cutting Speed $VC$ (m/min)
Ferritic (SUS405, SUS410L, SUS430, etc.)	Finishing	EF(SU)	<b>AC6020M</b>	0.5- <b>1.5</b> -2.0	0.05- <b>0.15</b> -0.25	170- <b>230</b> -300
	Continuous	<b>EG/GU/EX</b>	<b>AC6030M</b>	1.0- <b>2.5</b> -4.0	0.10- <b>0.25</b> -0.40	140- <b>170</b> -250
	Light Interrupted	GU/EH	<b>AC6135M</b>	1.0- <b>3.0</b> -5.0	0.20- <b>0.35</b> -0.50	140- <b>170</b> -200
	Interrupted	EH/EM	<b>AC6145M</b>	1.5- <b>3.5</b> -6.0	0.25- <b>0.40</b> -0.60	100- <b>130</b> -160
Martensitic (SUS410, SUS420J2, SUS440C, etc.)	Finishing	EF(SU)	<b>AC6020M</b>	0.5- <b>1.5</b> -2.0	0.05- <b>0.15</b> -0.25	120- <b>180</b> -240
	Continuous	<b>EG/GU/EX</b>	<b>AC6030M</b>	1.0- <b>2.5</b> -4.0	0.10- <b>0.25</b> -0.40	100- <b>150</b> -200
	Light Interrupted	GU/EH	<b>AC6135M</b>	1.0- <b>3.0</b> -5.0	0.20- <b>0.35</b> -0.50	80- <b>130</b> -180
	Interrupted	EH/EM	<b>AC6145M</b>	1.5- <b>3.5</b> -6.0	0.25- <b>0.40</b> -0.60	60- <b>100</b> -140
Austenitic (SUS304, SUS316, SUS321, etc.)	Finishing	EF(SU)/EX	<b>AC6030M</b>	0.5- <b>1.5</b> -2.0	0.05- <b>0.15</b> -0.25	120- <b>180</b> -240
	Continuous	EG/GU	<b>AC6135M</b>	1.0- <b>2.5</b> -4.0	0.10- <b>0.25</b> -0.40	100- <b>150</b> -200
	Light Interrupted	<b>GU/EH</b>	<b>AC6135M</b>	1.0- <b>3.0</b> -5.0	0.20- <b>0.35</b> -0.50	80- <b>130</b> -180
	Interrupted	EH/EM	<b>AC6145M</b>	1.5- <b>3.5</b> -6.0	0.25- <b>0.40</b> -0.60	60- <b>100</b> -140
Duplex (SUS329J1, SUS329J3L, SUS329J4L, etc.)	Finishing	EF(SU)/EX	<b>AC6030M</b>	0.5- <b>1.5</b> -2.0	0.05- <b>0.15</b> -0.25	100- <b>140</b> -180
	Continuous	EG/GU	<b>AC6135M</b>	1.0- <b>2.5</b> -4.0	0.10- <b>0.25</b> -0.40	80- <b>120</b> -160
	Light Interrupted	<b>GU/EH</b>	<b>AC6135M</b>	1.0- <b>3.0</b> -5.0	0.20- <b>0.35</b> -0.50	70- <b>100</b> -140
	Interrupted	EH/EM	<b>AC6145M</b>	1.5- <b>3.5</b> -6.0	0.25- <b>0.40</b> -0.60	50- <b>80</b> -120
Precipitation Hardened Structure (SUS630, SUS631, SUS632J1, etc.)	Finishing	EF(SU)	<b>AC6020M</b>	0.5- <b>1.5</b> -2.0	0.05- <b>0.15</b> -0.25	90- <b>115</b> -140
	Continuous	<b>EG/GU/EX</b>	<b>AC6030M</b>	1.0- <b>2.5</b> -4.0	0.10- <b>0.25</b> -0.40	70- <b>90</b> -130
	Light Interrupted	GU/EH	<b>AC6135M</b>	1.0- <b>3.0</b> -5.0	0.20- <b>0.35</b> -0.50	50- <b>80</b> -120
	Interrupted	EH/EM	<b>AC6145M</b>	1.5- <b>3.5</b> -6.0	0.25- <b>0.40</b> -0.60	40- <b>70</b> -100

## Grades

**ABSOTECH** **ABSOTECH** *New* **ABSOTECH** *New* **ABSOTECH**  
**AC6020M / AC6030M / AC6135M / AC6145M**

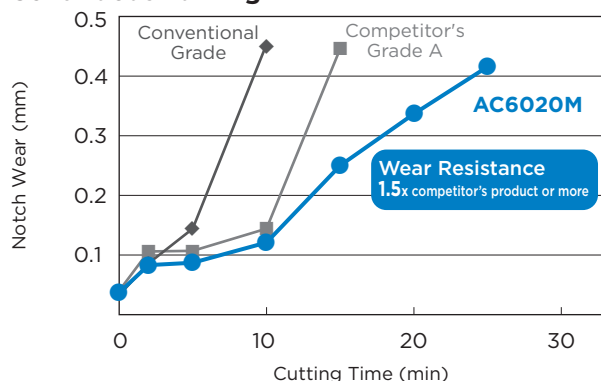
- AC6020M:** The combination of a CVD coating and a high-hardness carbide substrate realises long and stable tool life in finishing and high-speed turning.
- AC6030M:** 1st recommended grade for continuous turning, using CVD coating to drastically reduce the occurrence of abnormal damage, a problem in stainless steel turning, to achieve a long and stable tool life.
- AC6135M:** Balances excellent wear resistance and fracture resistance in light interrupted turning and mill-scale work through the use of new PVD coating.
- AC6145M:** The combination of a PVD coating and a high-toughness carbide substrate realises absolute stability in heavy interrupted turning.



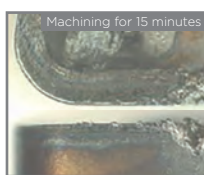
## Cutting Performance

### AC6020M

#### Continuous Turning



AC6020M



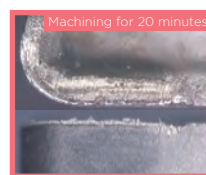
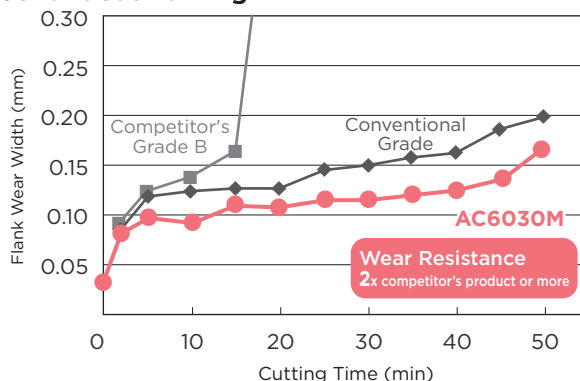
Competitor's Grade A

Work Material: SUS316L Insert: CNMG 120408  
 Cutting Conditions:  $v_c = 150\text{m/min}$ ,  $f = 0.3\text{mm/rev}$ ,  $a_p = 2.0\text{mm}$  Wet

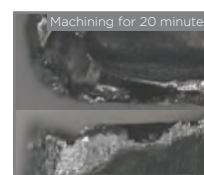


### AC6030M

#### Continuous Turning



AC6030M



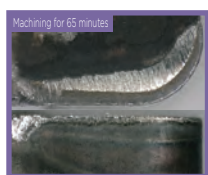
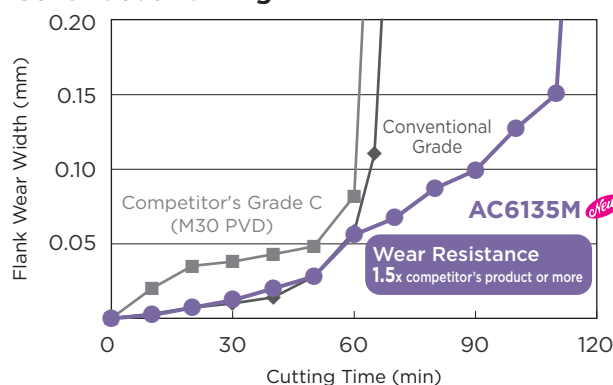
Competitor's Grade B

Work Material: SUS316 Insert: CNMG 120408  
 Cutting Conditions:  $v_c = 200\text{m/min}$ ,  $f = 0.2\text{mm/rev}$ ,  $a_p = 2.0\text{mm}$  Wet

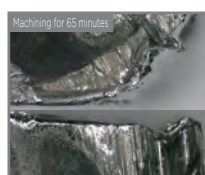


### AC6135M

#### Continuous Turning



AC6135M



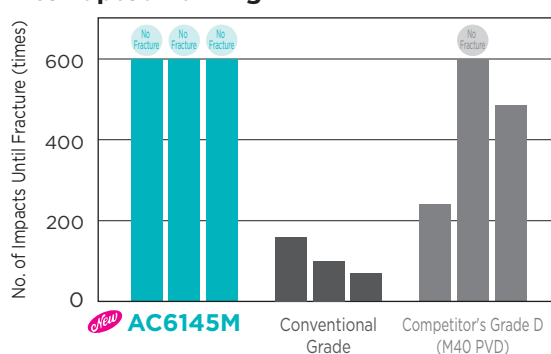
Competitor's Grade C (M30 PVD)

Work Material: SUS316 Insert: CNMG 120408  
 Cutting Conditions:  $v_c = 150\text{m/min}$ ,  $f = 0.2\text{mm/rev}$ ,  $a_p = 2.0\text{mm}$  Wet



### AC6145M

#### Interrupted Turning



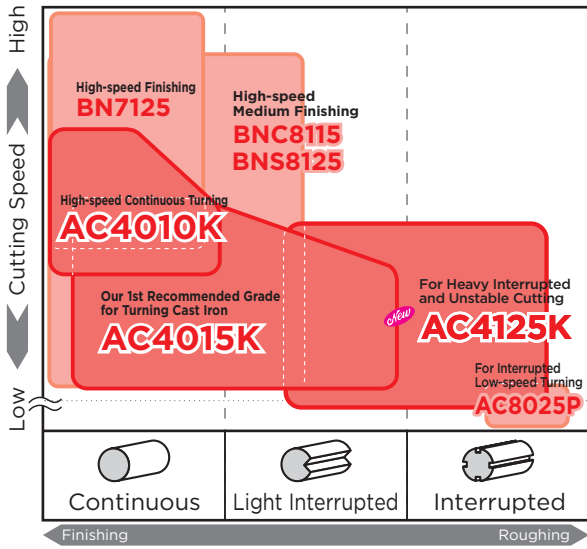
Work Material: SUS316 Insert: CNMG 120408  
 Cutting Conditions:  $v_c = 70\text{m/min}$ ,  $f = 0.25\text{mm/rev}$ ,  $a_p = 1.0\text{mm}$  Wet



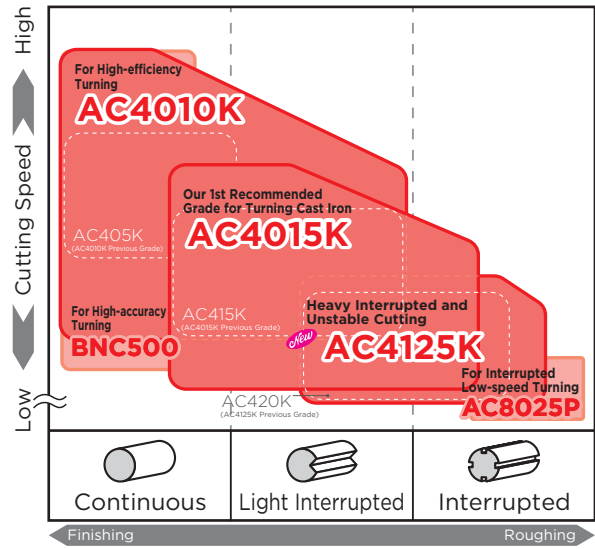
## Grades

 Coated SUMIBORON / SUMIBORON / Solid SUMIBORON / Solid SUMIBORON  
**BNC500 / BN7125 / BNC8115 / BNS8125...** 

### ● FC (Grey Cast Iron)

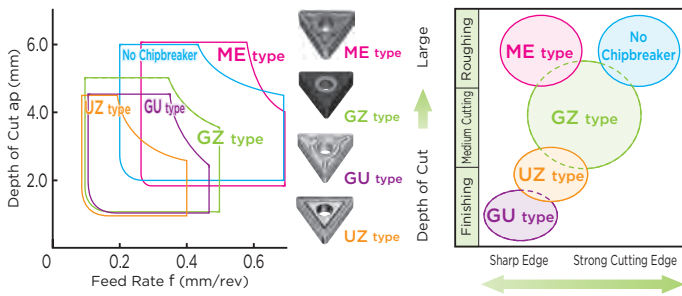


### ● FCD (Ductile Cast Iron)

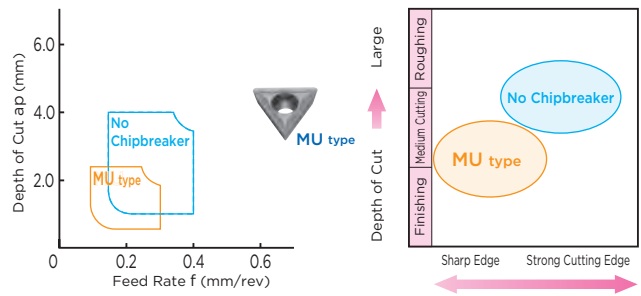


## Chipbreakers

### Negative type



### Positive type



## Recommended Cutting Conditions

(Red text indicates 1st recommendation)

Work Material	Application	Grade	Cutting Conditions		
			Depth of Cut $a_p$ (mm)	Feed Rate $f$ (mm/rev)	Cutting Speed VC (m/min)
Grey Cast Iron (FC250, etc.)	High-speed	BN7125	0.1 - <b>0.3</b> - 1.0	0.10 - <b>0.20</b> - 0.50	500 - <b>1,500</b> - 2,000
	Continuous to General	<b>AC4010K</b>	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.25</b> - 0.40	200 - <b>400</b> - 700
	Interrupted	AC4015K	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.30</b> - 0.50	180 - <b>300</b> - 450
	Heavy Interrupted	AC4125K	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.30</b> - 0.60	150 - <b>200</b> - 300
Ductile Cast Iron (FCD450, etc.)	High-speed	BNC500	0.1 - <b>0.2</b> - 0.5	0.10 - <b>0.20</b> - 0.40	150 - <b>350</b> - 500
	Continuous to General	AC4010K	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.25</b> - 0.40	180 - <b>300</b> - 450
	Interrupted	<b>AC4015K</b>	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.30</b> - 0.50	160 - <b>250</b> - 400
High-strength Ductile Cast Iron (FCD700, etc.)	High-speed	BNC500	0.1 - <b>0.2</b> - 0.5	0.10 - <b>0.20</b> - 0.40	200 - <b>350</b> - 500
	Continuous to General	AC4010K	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.25</b> - 0.40	160 - <b>250</b> - 400
	Interrupted	<b>AC4015K</b>	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.30</b> - 0.50	140 - <b>200</b> - 350
	Heavy Interrupted	<b>AC4125K</b>	0.5 - <b>2.0</b> - 6.0	0.10 - <b>0.30</b> - 0.60	80 - <b>150</b> - 220



## Grades

**ABSOTEC** **ABSOTEC** *new* **ABSOTEC**  
**AC4010K / AC4015K / AC4125K**

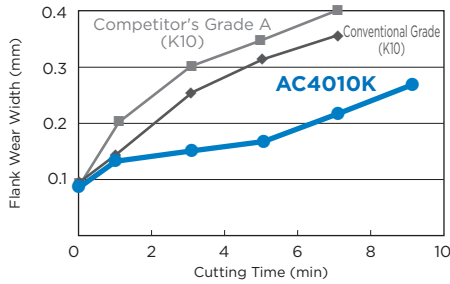
**AC4010K:** Our 1st recommended grade for turning grey cast iron.  
 New ultra-thick film CVD coating enables ultra-high-speed turning at  $v_c = 700\text{m/min}$ .  
**AC4015K:** Our 1st recommended grade for turning of ductile cast iron.  
 High-adhesion and high-strength coating enables stable and long tool life.  
**AC4125K:** Our 1st recommended grade for interrupted turning of cast iron.  
 Especially effective for stable long life in roughing of parts like differential cases and carriers.



## Cutting Performance

### AC4010K/AC4015K Wear Resistance

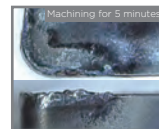
#### ● Grey Cast Iron



AC4010K+GZ



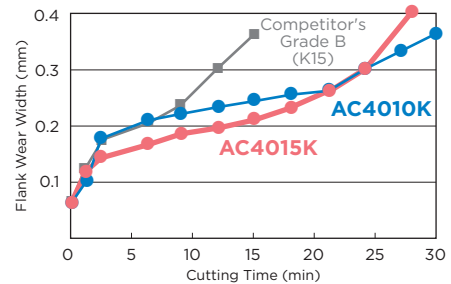
Conventional Grade (K10)



Competitor's Grade A (K10)

Work Material: FC250 Continuous Cutting Insert: CNMG120408  
 Cutting Conditions:  $v_c = 600\text{m/min}$ ,  $f = 0.4\text{mm/rev}$ ,  $ap = 2.0\text{mm}$ , Dry

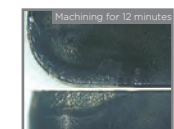
#### ● Ductile Cast Iron



AC4010K+GZ



AC4015K+GZ

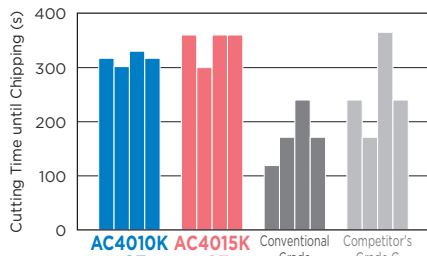


Competitor's Grade B (K15)

Work Material: FCD700 Continuous Cutting Insert: CNMG120408  
 Cutting Conditions:  $v_c = 140\text{m/min}$ ,  $f = 0.3\text{mm/rev}$ ,  $ap = 1.5\text{mm}$  Wet

### AC4010K/AC4015K/AC4125K Chipping Resistance

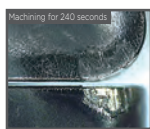
#### ● Ductile Cast Iron



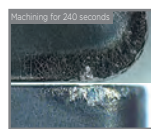
AC4010K



AC4015K

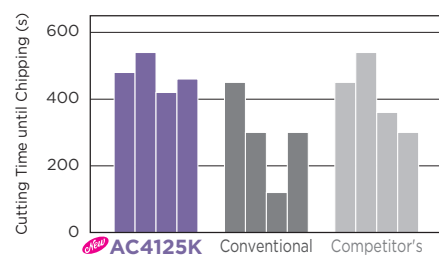


Conventional Grade (K15)



Competitor's Grade C (K15)

Work Material: FCD450 Interrupted Cutting Insert: CNMG120408  
 Cutting Conditions:  $v_c = 450\text{m/min}$ ,  $f = 0.3\text{mm/rev}$ ,  $ap = 1.5\text{mm}$  Wet



AC4125K+GZ



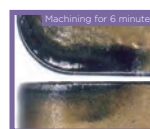
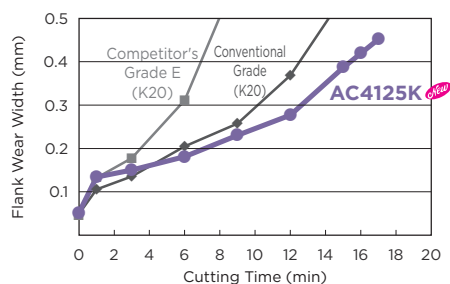
Conventional Grade (K20)



Competitor's Grade D (K20)

Work Material: FCD450 Interrupted Cutting Insert: CNMG120408  
 Cutting Conditions:  $v_c = 450\text{m/min}$ ,  $f = 0.3\text{mm/rev}$ ,  $ap = 1.5\text{mm}$  Wet

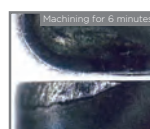
### AC4125K Wear Resistance



AC4125K+GZ



Conventional Grade (K20)



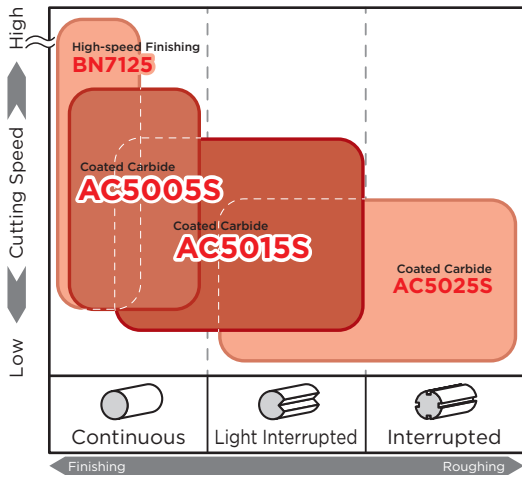
Competitor's Grade E (K20)

Work Material: FCD700 Continuous Cutting Insert: CNMG120408  
 Cutting Conditions:  $v_c = 140\text{m/min}$ ,  $f = 0.3\text{mm/rev}$ ,  $ap = 1.5\text{mm}$  Wet

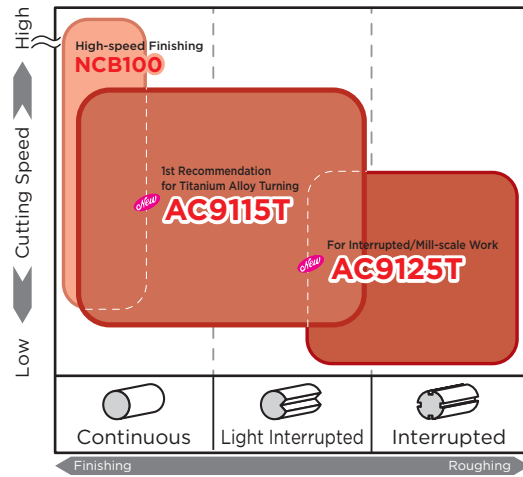
## Grades

CBN SUMIBORON SUMIBORON BINDERLESS  
**BN7125/NCB100** ... 

### ● Heat-Resistant Alloy

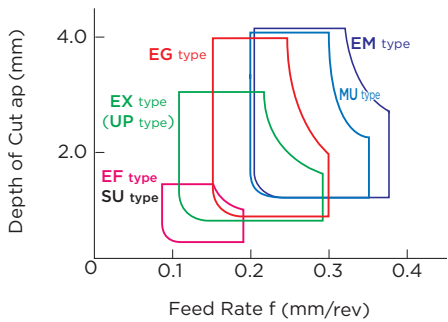


### ● Titanium Alloy

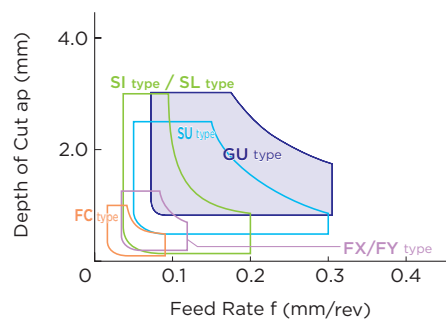


## Chipbreakers

### Negative type



### Positive type



## Recommended Cutting Conditions

(Red text indicates 1st recommendation)

Work Material	Application	Chipbreaker	Grade	Cutting Conditions		
				Depth of Cut ap (mm)	Feed Rate f (mm/rev)	Min. - Optimum - Max. Cutting Speed VC (m/min)
Heat-Resistant Alloy (Ni-based Material) (Fe-based Material) (Co-based Material)	Finishing	<b>EF</b>	<b>AC5005S</b>	0.2- <b>0.5</b> -1.5	0.10- <b>0.12</b> -0.20	50- <b>70</b> -110
	Continuous	EX	<b>AC5015S</b>	0.5- <b>1.0</b> -3.0	0.10- <b>0.20</b> -0.30	40- <b>60</b> -90
	Light Interrupted	<b>EG</b>	<b>AC5015S</b>	0.5- <b>2.0</b> -4.0	0.15- <b>0.25</b> -0.30	40- <b>60</b> -90
	Interrupted	MU/EM	<b>AC5025S</b>	1.0- <b>2.0</b> -4.0	0.20- <b>0.25</b> -0.40	30- <b>55</b> -80
Titanium Alloy (Pure Titanium (99.5%) α + β Alloy)	Finishing	<b>EF</b>	<b>AC9115T</b>	0.2- <b>0.5</b> -1.5	0.1- <b>0.15</b> -0.2	50- <b>75</b> -100
	Continuous	<b>EG/EX</b>	<b>AC9115T</b>	0.5- <b>1.0</b> -2.5	0.1- <b>0.20</b> -0.25	40- <b>60</b> -80
	Light Interrupted	<b>EG/EM</b>	<b>AC9115T</b>	0.5- <b>2.0</b> -3.5	0.15- <b>0.25</b> -0.3	35- <b>50</b> -65
	Interrupted	<b>EM/EG</b>	<b>AC9125T</b>	1.0- <b>2.0</b> -3.5	0.2- <b>0.25</b> -0.3	30- <b>40</b> -50



## Grades

**ABSOTECH** AC5005S / **ABSOTECH** AC5015S / **ABSOTECH** AC5025S / **new ABSOTECH** AC9115T / **new ABSOTECH** AC9125T

- New PVD coated grades with excellent wear and thermal resistance

AC5005S: High-speed, high-efficiency grade with excellent high-thermal strength and outstanding wear resistance in high-efficiency turning.

AC5015S: Our 1st recommended grade for turning exotic alloys as it realises stable tool life in high-speed, high-efficiency machining.

AC5025S: High-toughness grade that achieves stable and long tool life in interrupted cutting and turning mill-scaled work.

- PVD coating grade with excellent wear resistance, dedicated for titanium alloy machining

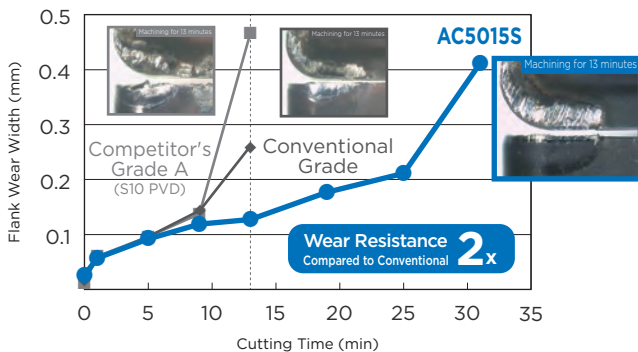
AC9115T: First recommended grade for exceptionally long tool life in a wide range of applications.

AC9125T: High-toughness grade realising exceptionally long tool life in interrupted turning.

## Cutting Performance

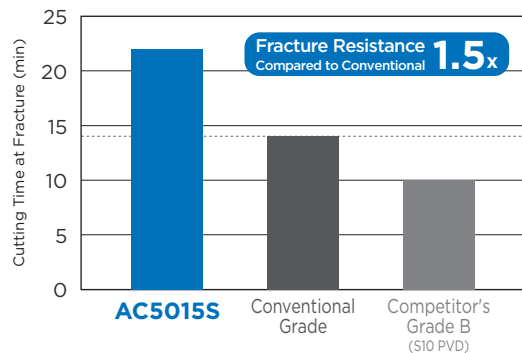
### AC5015S

- Wear Resistance



Work Material: Inconel 718 (44HRC) Insert: CNMG120408  
Cutting Conditions: vc = 40m/min, f = 0.1mm/rev, ap = 1.5mm Wet

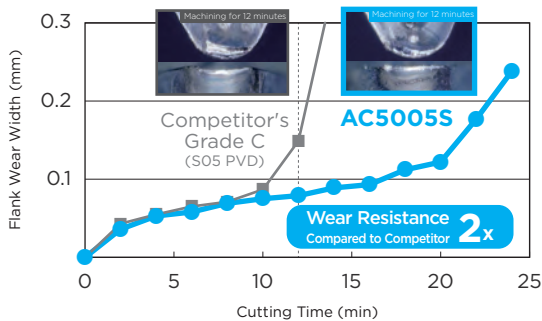
- Fracture Resistance



Work Material: Hastelloy (22HRC) Insert: CNMG120408  
Cutting Conditions: vc = 50m/min, f = 0.1mm/rev, ap = 1.5mm Wet

### AC5005S

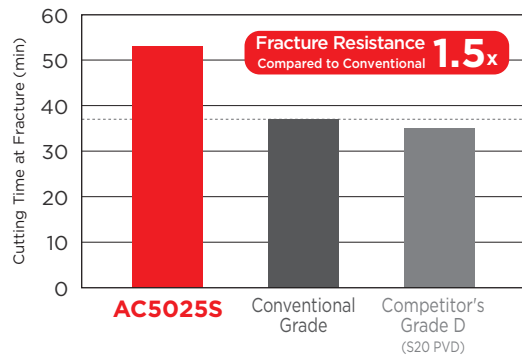
- Wear Resistance (High-speed)



Work Material: Inconel 718 (44HRC) Insert: DNMG150408  
Cutting Conditions: vc = 100m/min, f = 0.15mm/rev, ap = 0.5mm Wet

### AC5025S

- Fracture Resistance



Work Material: Hastelloy (22HRC) Insert: CNMG120408  
Cutting Conditions: vc = 50m/min, f = 0.1mm/rev, ap = 1.5mm Wet

### AC9115T

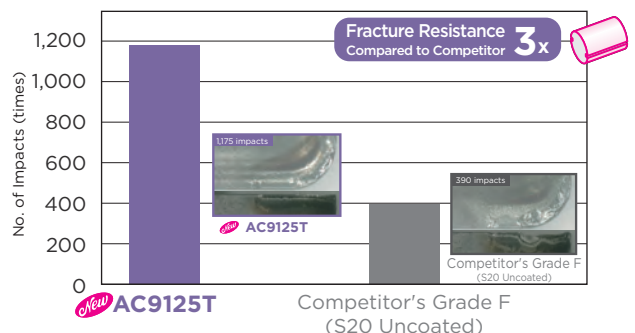
- Wear Resistance



Work Material: Ti-6Al-4V Insert: CNMG120408  
Cutting Conditions: vc = 70m/min, f = 0.3mm/rev, ap = 1.5mm Wet

### AC9125T

- Fracture Resistance



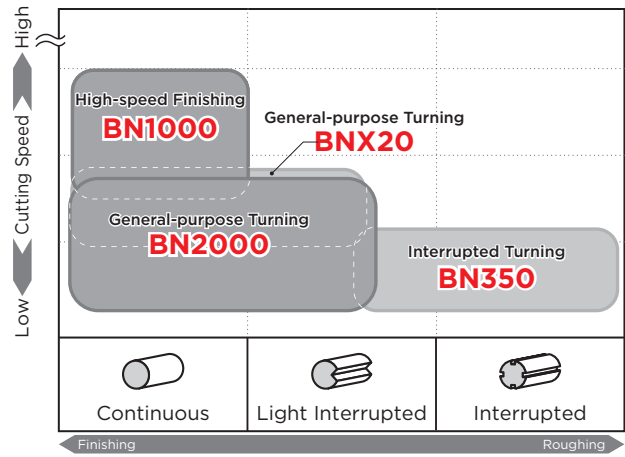
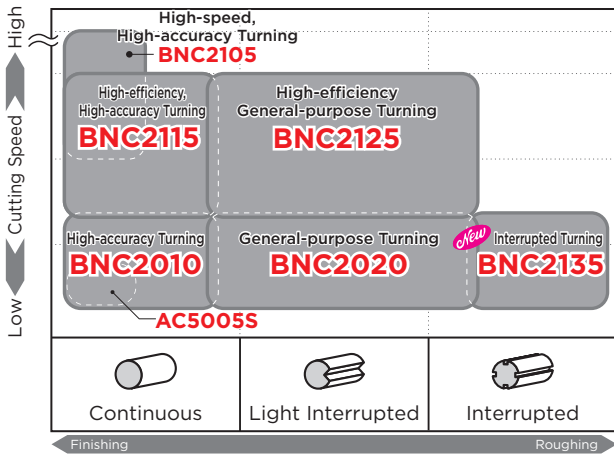
Work Material: Ti-6Al-4V 2 Grooves Insert: CNMG120408  
Cutting Conditions: vc = 40m/min, f = 0.3mm/rev, ap = 1.5mm Wet



## Grades

### ● Coated SUMIBORON, Coated Carbide

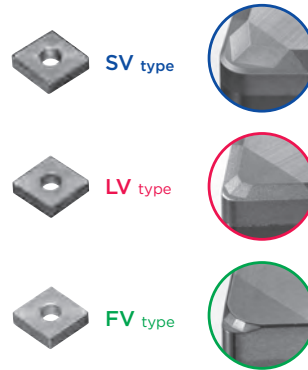
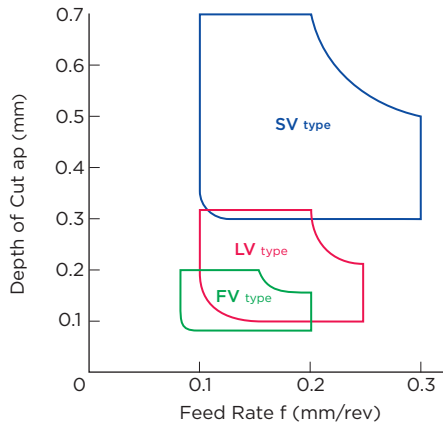
### ● Uncoated SUMIBORON



## Chipbreakers

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

SV type Chipbreaker: For chip control during carburised layer removal



## Recommended Cutting Conditions

(Red text indicates 1st recommendation)

Application	Grade	Cutting Conditions		
		Depth of Cut $a_p$ (mm)	Feed Rate $f$ (mm/rev)	Cutting Speed $VC$ (m/min)
Continuous	<b>BNC2105</b>	0.03- <b>0.15</b> -0.20	0.03- <b>0.10</b> -0.15	150- <b>200</b> -350
	<b>BNC2115</b>	0.03- <b>0.20</b> -0.35	0.03- <b>0.10</b> -0.20	110- <b>180</b> -300
	<b>BNC2010</b>	0.03- <b>0.20</b> -0.35	0.03- <b>0.10</b> -0.20	50- <b>140</b> -180
	<b>BN1000</b>	0.03- <b>0.15</b> -0.20	0.03- <b>0.10</b> -0.15	120- <b>180</b> -300
	<b>AC5005S</b>	0.03- <b>0.50</b> -1.00	0.02- <b>0.05</b> -0.10	40- <b>70</b> -100
General	<b>BNC2125</b>	0.05- <b>0.30</b> -0.50	0.05- <b>0.20</b> -0.40	110- <b>160</b> -300
	<b>BNC2020</b>	0.05- <b>0.30</b> -0.50	0.03- <b>0.20</b> -0.40	50- <b>120</b> -180
	<b>BN2000</b>	0.03- <b>0.20</b> -0.30	0.03- <b>0.10</b> -0.20	30- <b>100</b> -200
	<b>BNX20</b>	0.03- <b>0.30</b> -0.50	0.03- <b>0.15</b> -0.30	70- <b>130</b> -170
Interrupted	<b>BNC2135</b>	0.03- <b>0.20</b> -0.30	0.03- <b>0.10</b> -0.20	50- <b>100</b> -150
	<b>BNC300</b>	0.03- <b>0.20</b> -0.30	0.03- <b>0.10</b> -0.20	50- <b>100</b> -150
	<b>BN350</b>	0.03- <b>0.20</b> -0.30	0.03- <b>0.10</b> -0.20	50- <b>100</b> -150



## Grades

**BNC2105 / BNC2115 / BNC2125 / *New* BNC2135 / BN1000 / BN2000**

**BNC2105** : Grade for high-speed finishing. Stable performance in high-speed turning of hardened steel, thanks to outstanding wear resistance.

**BNC2115** : High-precision grade realizing long tool life with excellent surface roughness and stable machining. Maintains excellent surface roughness thanks to a coating with high notch wear resistance and tough CBN substrate.

**BNC2125** : 1st recommended grade, balancing excellent wear resistance and fracture resistance in hardened steel turning. Along with a tough CBN substrate, the coating combines wear resistance and toughness to achieve long, stable tool life even in high-efficiency and interrupted turning.

**BNC2135** : Utilising a highly fracture-resistant coating and a high-strength substrate to achieve long and stable tool life in interrupted turning.

**BN1000** : For high-speed turning, BN1000 provides the highest wear resistance of all uncoated SUMIBORON grades, improving fracture resistance while maintaining an emphasis on wear resistance.

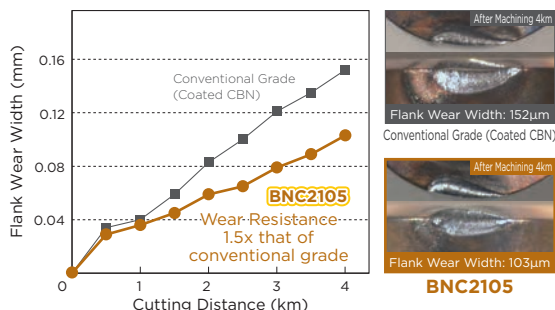
**BN2000** : General-purpose grade for general hardened steel turning with a high degree of fracture and wear resistance.



## Cutting Performance

### BNC2105

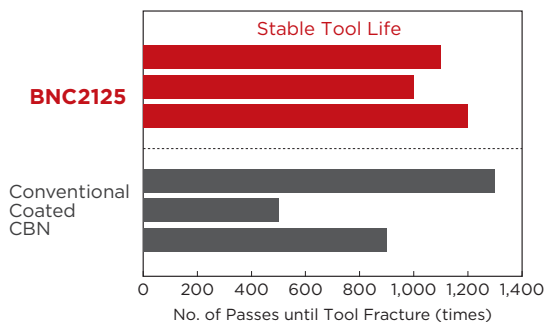
#### ● Wear Resistance (Continuous Turning)



Work Material: SUJ2 (58-62HRC)  
Tool Cat. No.: 4NC-DNGA150408  
Cutting Conditions:  $v_c = 200\text{m/min}$ ,  $f = 0.1\text{mm/rev}$ ,  $a_p = 0.1\text{mm Wet}$

### BNC2125

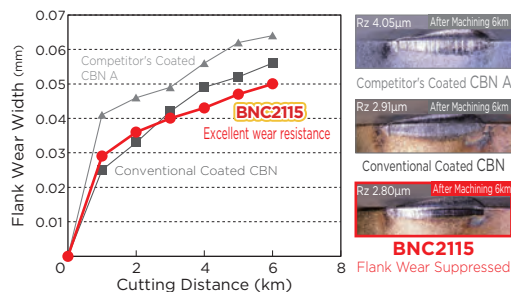
#### ● Fracture Resistance (High-load Turning)



Work Material: SUJ2 (58-62HRC)  
Tool Cat. No.: 4NC-DNGA150408  
Cutting Conditions:  $v_c = 150\text{m/min}$ ,  $f = 0.15\text{mm/rev}$ ,  $a_p = 0.5\text{mm}$ , 63m/times Wet

### BNC2115

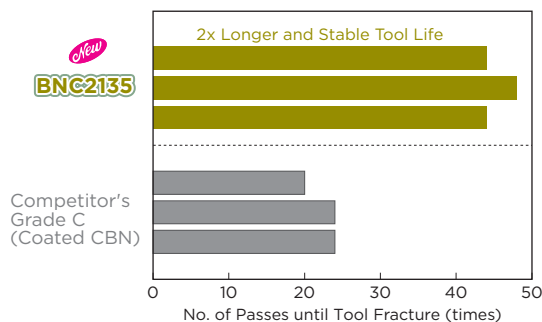
#### ● Wear Resistance (Continuous Turning)



Work Material: SCM415H (58-62HRC)  
Tool Cat. No.: 4NC-DNGA150408  
Cutting Conditions:  $v_c = 200\text{m/min}$ ,  $f = 0.1\text{mm/rev}$ ,  $a_p = 0.15\text{mm Wet}$

### BNC2135

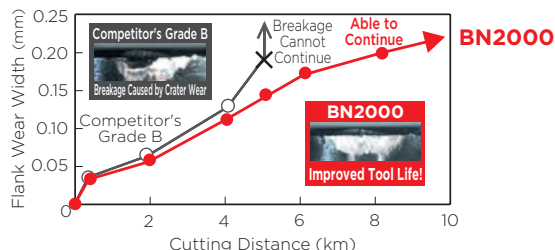
#### ● Fracture Resistance (Heavy Interrupted Turning)



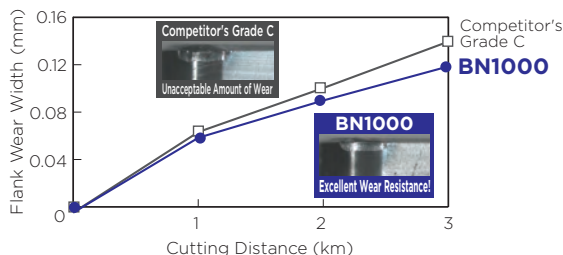
Work Material: SCM415H Heavy Interrupted Grooved Facing (58-62 HRC)  
Tool Cat. No.: 4NC-CNGA120408  
Cutting Conditions:  $v_c = 120\text{m/min}$ ,  $f = 0.1\text{mm/rev}$ ,  $a_p = 0.2\text{mm Wet}$

## BN1000 / BN2000

#### ● Wear Resistance (Continuous Turning)



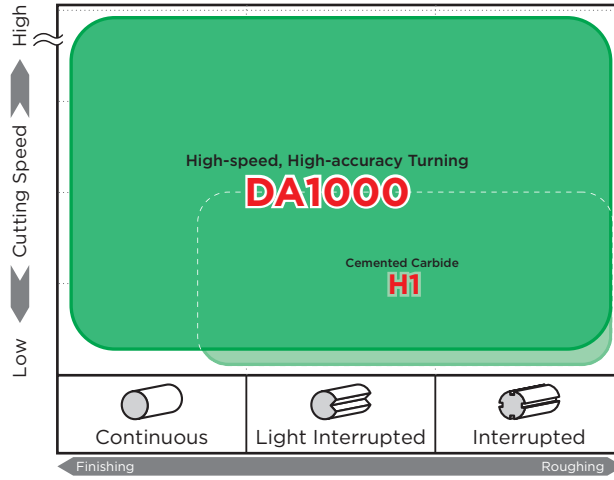
Work Material: SCM415H Round Bar (58-62HRC)  
Insert: 2NU-CNGA120408  
Cutting Conditions:  $v_c = 100\text{m/min}$ ,  $f = 0.1\text{mm/rev}$ ,  $a_p = 0.2\text{mm Dry}$



Work Material: SUJ2 Round Bar (62HRC)  
Insert: 2NU-CNGA120408  
Cutting Conditions:  $v_c = 150\text{m/min}$ ,  $f = 0.1\text{mm/rev}$ ,  $a_p = 0.2\text{mm Dry}$

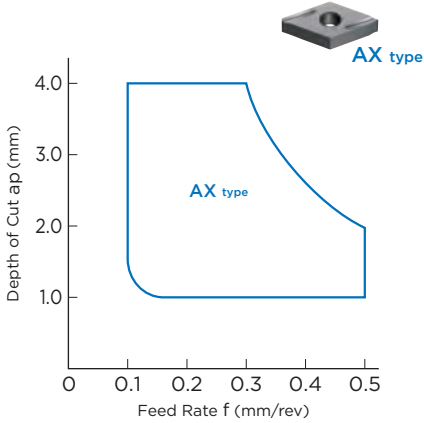
## Grades

PCD SUMIDIA **DA1000** ... M6

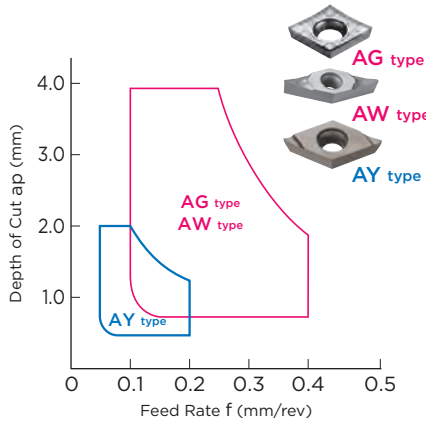


## Main Chipbreakers

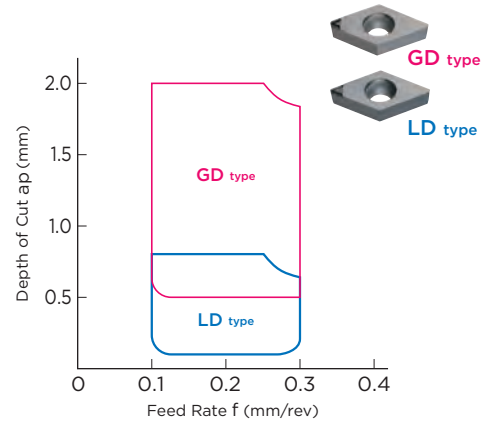
### Negative type



### Positive type



### Positive type (PCD)



## Recommended Cutting Conditions

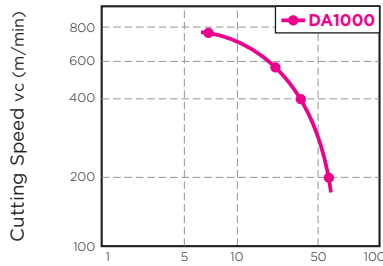
Application	Series	Grade	Cutting Conditions		
			Depth of Cut $ap$ (mm)	Feed Rate $f$ (mm/rev)	Cutting Speed $VC$ (m/min)
Continuous General Interrupted	SUMIDIA	<b>DA1000</b>	0.1- <b>0.5</b> -3.0	0.05- <b>0.10</b> -0.20	up to 2,000
	Cemented Carbide	<b>H1</b>	0.3- <b>1.0</b> -5.0	0.1- <b>0.20</b> -0.5	up to 1,000

## Grades DA1000

- Ultra-high-density sintered ultra-fine grained diamond
- Significantly improved surface roughness on machined surfaces
- World's highest wear resistance and strength
- Suitable for use on a wide variety of aluminum and non-ferrous alloys

### Cutting Performance

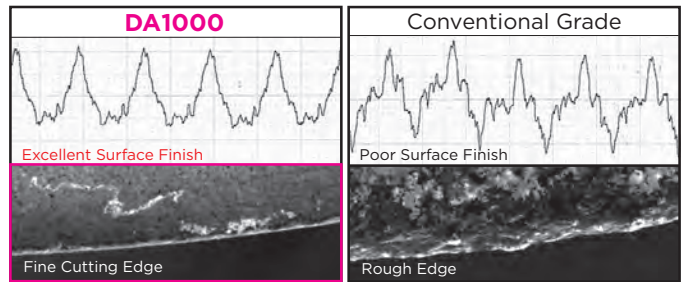
#### ● Wear Resistance



Flank Wear Width = Cutting Time until 0.1mm (min)

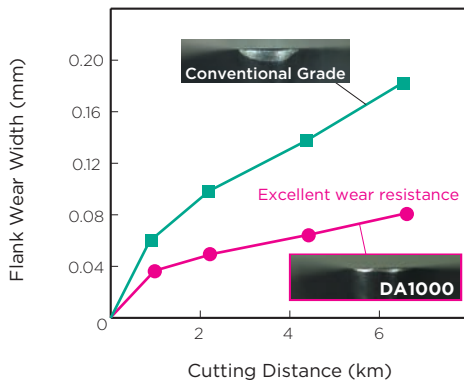
Work Material: 17% Si-Al Alloy  
 Insert: TPGN160304  
 Cutting Conditions:  $v_c = 200$  to  $800$  m/min,  $f = 0.12$  mm/rev,  $a_p = 0.5$  mm Wet

#### ● Cutting Edge Surface Roughness Comparison



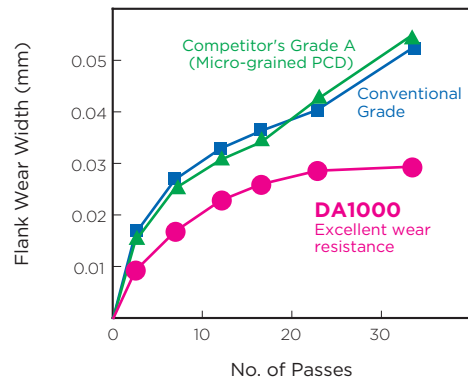
Work Material: 17% Si-Al Alloy  
 Insert: TPGW160308  
 Cutting Conditions:  $v_c = 1,000$  m/min,  $f = 0.15$  mm/rev,  $a_p = 0.2$  mm Wet

#### ● Wear Resistance in Turning Applications



Work Material: 17% Si-Al Alloy  
 Insert: TPGN160304  
 Cutting Conditions:  $v_c = 800$  m/min,  $f = 0.12$  mm/rev,  $a_p = 0.5$  mm Wet

#### ● Wear Resistance in Milling Applications



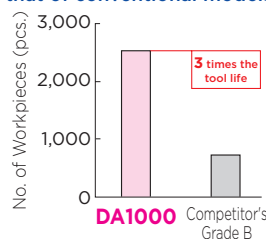
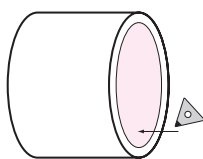
Work Material: ADC12 (12% Si-Al Alloy)  
 Insert: NF-SNEW1204ADFR  
 Cutting Conditions:  $v_c = 2,000$  m/min,  $f = 0.15$  mm/rev,  $a_p = 3.0$  mm Wet

### Application Examples

#### DA1000

##### [Copper Alloy Bushing]

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

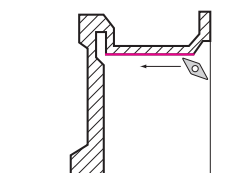


Insert: NF-TPGN160308  
 Cutting Conditions:  $v_c = 300$  m/min,  $f = 0.07$  mm/rev,  $a_p = 0.08$  mm Wet

#### H1

##### [ADC12 Aluminum Wheel]

Excellent adhesion resistance.  
 Longer tool life.



Insert: VCGT160408N-AG  
 Cutting Conditions:  $v_c = 2,200$  m/min,  $f = 0.25$  mm/rev,  $a_p = 2.0$  mm Wet

# For Small Lathes

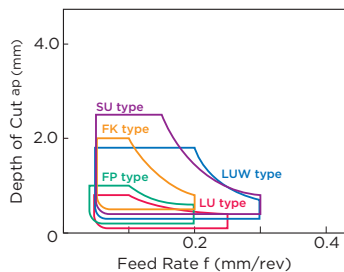
## Grades

Insert Grade	Application Range			Applicable Work Material					
	High-precision	Finishing to Light Cutting	Medium Cutting	P General Steel	M Stainless Steel	K Cast Iron	N Non-Ferrous Metal	S Heat-Resistant Alloy	H Hardened Steel
Coated Carbide (PVD)	ACZ150			◎	◎		○		
	AC5015S			○	◎	○		◎	
	AC5025S			○	◎	○		◎	
	AC530U			◎	◎	○	○	○	
	AC1030U			◎	◎	○	○	○	
Uncoated Cermet Coated Cermet	T1000A			◎	○	◎	○		
	T1500A/T1500Z			◎	○	○	○		
Cemented Carbide	BL130			○	○	○	○		
	H1			○	○	○	◎		
	EH510			○	○	○	○	◎	
CBN (SUMIBORON)	BN1000/BN2000								◎
	BN7125					◎		○	
PCD (SUMIDIA)	DA1000						◎		

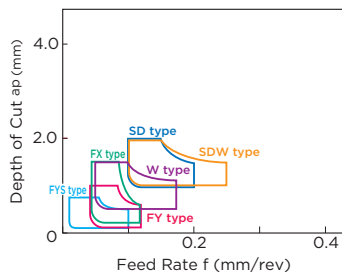
◎ 1st Recommendation ○ 2nd Recommendation

## Chipbreakers

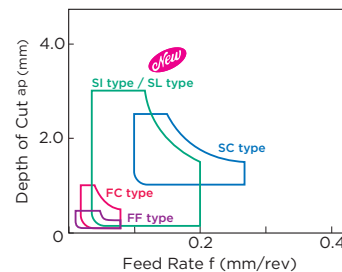
● M Class Finishing to Light Cutting



● G Class Ground type



● G Class Bumpy Chipbreaker



## Recommended Cutting Conditions

(Red text: 1st Recommendation, Blue text: 2nd Recommendation)

Work Material	P Free-Cutting Steel		P Carbon Steel		M Stainless Steel		S Heat-Resistant Alloy		H Hardened Steel		N Aluminum Alloy		N Brass	
	vc(m/min)	f(mm/rev)	vc(m/min)	f(mm/rev)	vc(m/min)	f(mm/rev)	vc(m/min)	f(mm/rev)	vc(m/min)	f(mm/rev)	vc(m/min)	f(mm/rev)	vc(m/min)	f(mm/rev)
ACZ150	50 to 200	0.02 to 0.10	50 to 150	0.01 to 0.08	50 to 150	0.01 to 0.05					70 to 300	0.05 to 0.20	70 to 300	0.05 to 0.20
AC5015S	50 to 200	0.02 to 0.15	50 to 200	0.02 to 0.10	50 to 200	0.02 to 0.10	30 to 100	0.02 to 0.10					70 to 300	0.05 to 0.20
AC5025S	50 to 200	0.02 to 0.15	50 to 200	0.02 to 0.10	50 to 200	0.02 to 0.10	30 to 100	0.02 to 0.10					70 to 300	0.05 to 0.20
AC530U	50 to 200	0.02 to 0.15	50 to 200	0.02 to 0.10	50 to 200	0.02 to 0.10							70 to 300	0.05 to 0.20
AC1030U	50 to 200	0.02 to 0.15	50 to 150	0.02 to 0.10	50 to 150	0.02 to 0.10							70 to 300	0.05 to 0.20
T1000A	50 to 200	0.02 to 0.15	50 to 200	0.02 to 0.10	50 to 150	0.02 to 0.10					70 to 300	0.05 to 0.20	70 to 300	0.05 to 0.20
T1500A	50 to 200	0.02 to 0.15	50 to 200	0.02 to 0.10	50 to 150	0.02 to 0.10					70 to 300	0.05 to 0.20	70 to 300	0.05 to 0.20
T1500Z	50 to 200	0.02 to 0.15	50 to 200	0.02 to 0.10	50 to 150	0.02 to 0.10					70 to 300	0.05 to 0.20	70 to 300	0.05 to 0.20
BN1000									120 to 300	0.03 to 0.15				
BN2000									50 to 200	0.03 to 0.20				
BN7125							50 to 200	0.05 to 0.25						
DA1000											70 to 300	0.02 to 0.10	70 to 300	0.02 to 0.10

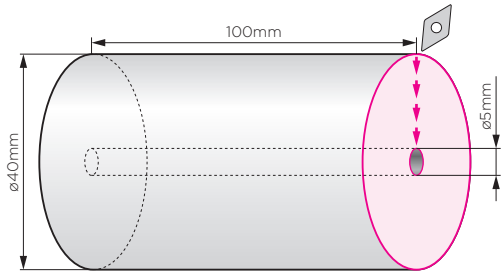
ABSOLUTECH

## Grades AC1030U

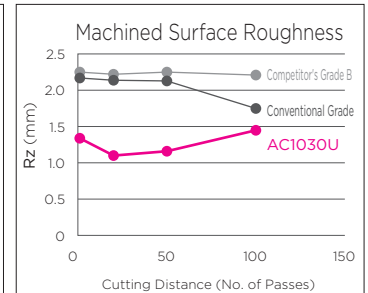
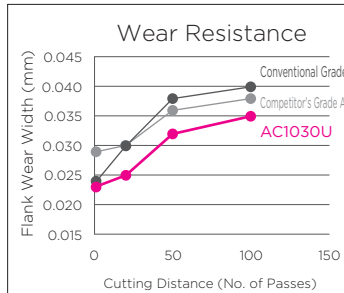
Employs a new PVD coating and a dedicated tough carbide substrate. High-quality cutting edge suppresses adhesion and micro-chipping, realising excellent machined surface quality.

### Cutting Performance

#### AC1030U

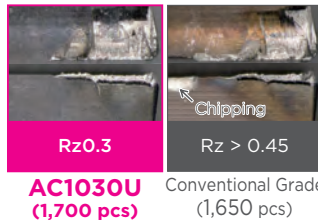
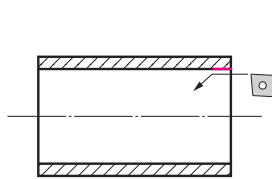


Work Material: SUS304 Insert: DCGT11T302R-FY  
Cutting Conditions:  $v_c = 100\text{m/min}$ ,  $f = 0.05\text{mm/rev}$ ,  $a_p = 0.1\text{mm}$  Wet (Oil-based)



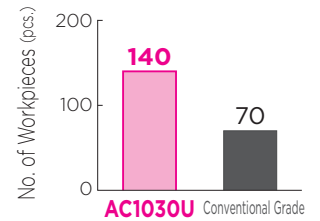
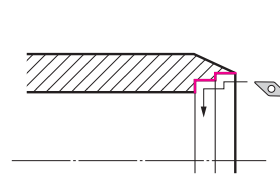
### Application Examples

#### [STKM12C-EC Pipe]



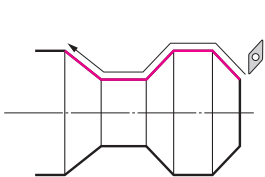
Insert: CCGT060201L-FX  
Cutting Conditions:  $v_c = 196\text{m/min}$ ,  $f = 0.04\text{mm/rev}$ ,  $a_p = 0.4\text{mm}$  Wet

#### [S45C Shaft Stator]



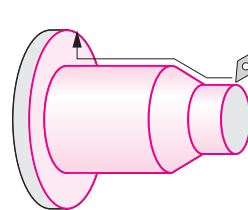
Insert: VCGT110302R-FX  
Cutting Conditions:  $v_c = 195\text{m/min}$ ,  $f = 0.12\text{mm/rev}$ ,  $a_p = 0.175$  to  $0.25\text{mm}$  Wet

#### [SUS304 Body Valve]



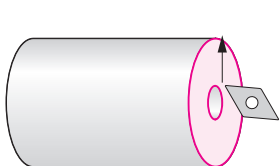
Insert: VCGT110301R-FY  
Cutting Conditions:  $v_c = 131.5\text{m/min}$ ,  $f = 0.025\text{mm/rev}$ ,  $a_p = 0.2\text{mm}$  Wet

#### [Stainless Steel Nozzle Component]



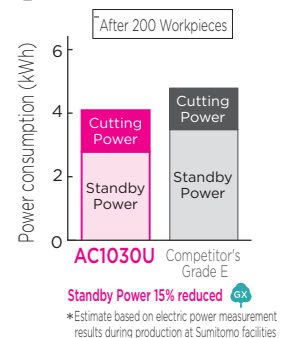
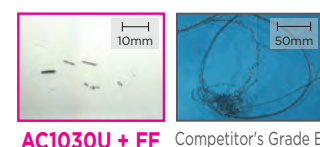
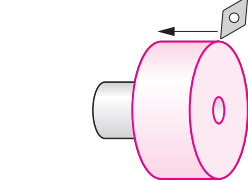
Insert: DCGT070202MN-SI  
Cutting Conditions:  $v_c = 200\text{m/min}$ ,  $f = 0.06$  to  $0.08\text{mm/rev}$ ,  $a_p = 0.1\text{mm}$  Wet (Oil-based)

#### [S45C Sleeve Component]



Insert: DCGT11T302MN-SL  
Cutting Conditions:  $v_c = 90\text{m/min}$ ,  $f = 0.05\text{mm/rev}$ ,  $a_p = 0.10\text{mm}$  Wet (Oil-based)

#### [SCM415 Valve Component]



Insert: DCGT11T302MN-FF  
Cutting Conditions:  $v_c = 80\text{m/min}$ ,  $f = 0.050\text{mm/rev}$ ,  $a_p = 0.075\text{mm}$  Wet (Oil-based)

# Coated Carbide

Insert Grades

A

Coated Carbide

Cermet

Cemented Carbide

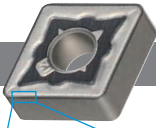
CBN

PCD

Ceramic

## Features

**ABSOTECH** : New coating technology that realises absolute stability



### CVD



- Special Surface Treatment: Chipping resistance and adhesion resistance are significantly improved by special surface treatments applied to suit the application
- High Strength Alumina Layer: Significantly improves the coating strength by controlling crystal growth direction
- High Hardness Micro-grained TiCN Layer: Significantly improves the coating hardness by using a fine and uniform crystal structure
- High Adhesion Technology: Significantly improves adhesion strength through a smooth interface between the coating and carbide substrate

- Suppresses abnormal damage such as chipping and adhesion. Stable machining is achieved in various situations.
- Next-level high strength and high hardness coating is achieved. Achieves long and stable tool life even in high-efficiency machining.

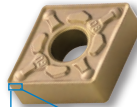
[ABSOTECH] For CVD Turning

■ Applicable Grades (For Turning)

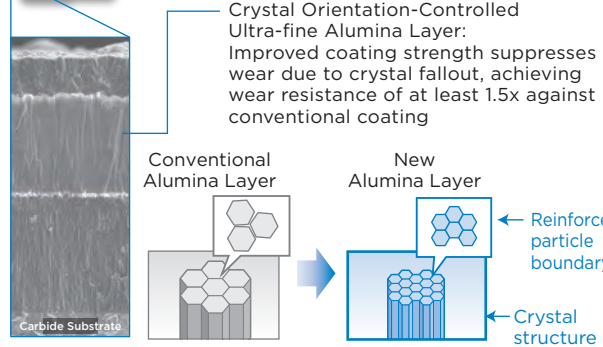
- Steel : AC8015P, AC8020P, AC8025P, AC8035P, AC8115P
- Stainless Steel : AC6020M, AC6030M
- Cast Iron : AC4010K, AC4015K, AC4125K

■ Applicable Grades (For Milling) : ACP2000, ACK2000

### Latest technology

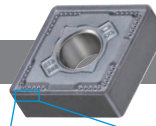


■ Applicable Grades (For Turning): AC4125K, AC8115P

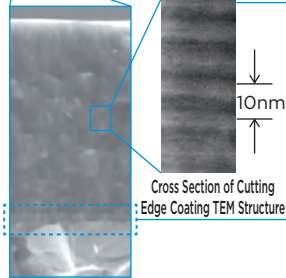


Crystal Orientation-Controlled Ultra-fine Alumina Layer: Improved coating strength suppresses wear due to crystal fallout, achieving wear resistance of at least 1.5x against conventional coating

Reinforced particle boundary  
Crystal structure refined



### PVD



Our proprietary super multi-layered coating structure: Advanced nanotechnology enables nanometre-level thickness (1 nanometre is one billionth of a metre). Hardness, thermal resistance and toughness are significantly improved by alternately layering one thousand layers of super thin films

High Adhesion Technology: Significantly improves adhesion strength through advanced control technology at the interface of the coating and carbide substrate

- Optimised coating composition according to application. Achieves stable machining regardless of the work material.
- Significantly improves chipping resistance by improving coating adhesion strength. Stable machining is realised even under high load conditions.

[ABSOTECH] For PVD Turning/Milling

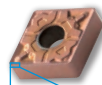
■ Applicable Grades (For Turning)

- Stainless Steel : AC6040M, AC6135M, AC6145M
- Heat-Resistant Alloy : AC5005S, AC5015S, AC5025S
- Titanium Alloy : AC9115T, AC9125T
- For Small Lathes : AC1030U

■ Applicable Grades (For Milling) : ACS1000, ACS2500, ACS3000, ACU2500, ACP3000, ACK3000

### Latest technology

■ Applicable Grades (For Turning) Stainless Steel: AC6135M, AC6145M



TiAlBCN-based multi-layered coating provides excellent wear, fracture and adhesion resistance and exhibits absolute stability in the turning of stainless steels

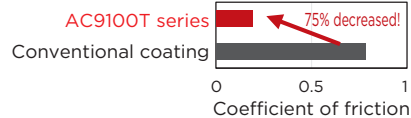


- Adhesion Resistance Layer: The use of a TiCN-based composition with excellent lubricity suppresses adhesion and the resulting chipping
- Wear Resistance Layer: The use of our proprietary high-hardness TiAlBN-based super multi-layered coating significantly suppresses crater wear and flank wear
- Chipping Resistance Layer: The use of an ultra-fine grain TiAlBN-based composition with excellent toughness suppresses unexpected chipping
- High Adhesion Technology: Improved stability with special technology enhancing coating adhesion strength

■ Applicable Grades (For Turning) Titanium Alloy: AC9115T, AC9125T



Utilising the industry's first WC-based composition that suppresses chemical reactions to titanium alloy, which significantly improves wear resistance  
Coefficient of friction for Ti-6Al-4V (Load: 1N, test time: 30 seconds)

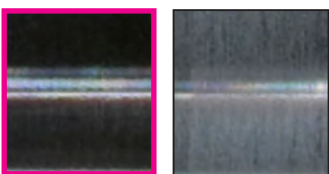


## Brilliant Coat



### PVD

Brilliant Coat provides excellent lubricity for higher quality machining  
● PVD coating with excellent wear resistance and lubricity  
● Suppresses reactions with work material and realises beautiful machined surfaces



Brilliant Coat      Conventional coating

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

■ Applicable Grades: (For Turning) T1500Z, T2500Z

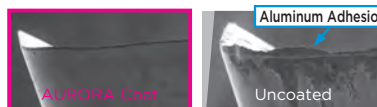
## AURORA Coat (DLC: Diamond Like Carbon)



### PVD

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

● Comparison of Cutting Edge Adhesion after Cutting ADC12






Work Material: ADC12  
Cutting Conditions:  $v_c = 300\text{m/min}$   
 $f_z = 0.15\text{mm/t}$   
 $a_p = 5\text{mm}$   
 $a_e = 5\text{mm Dry}$

- Second only to diamond in terms of hardness, this flat and 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 aluminum alloys, copper alloys, resins and more




■ Applicable Grades: (For Milling) DL1000, DL2000 (For Endmilling) DL1000, DL1200 (For Drilling) DL1300, DL1500

## Characteristic Values

 For Turning (CVD)

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Coating type	Coating Thickness (μm)	Features	Old Grades
	AC810P	91.0	2.2	Super FF Coat	18	<ul style="list-style-type: none"> <li>For high-speed and high-efficiency machining of steel</li> <li>Grade emphasising wear resistance for high- to medium-speed cutting</li> </ul>	AC700G
	AC8015P	91.0	2.3	ABSOTECH	14	<ul style="list-style-type: none"> <li>For high-speed and high-efficiency machining of steel</li> <li>Crystal orientation control technology is used to drastically suppress the advancement of crater wear, achieving long, stable tool life during high-speed and high feed cutting</li> </ul>	AC810P
	<i>new</i> AC8115P	91.4	2.3	ABSOTECH	20	<ul style="list-style-type: none"> <li>Advancement in fine crystal alumina grain orientation control technology greatly reduces the progress of crater damage.</li> <li>Supports dry machining as well as high-speed, high-efficiency machining of steel</li> </ul>	AC8015P
	AC820P	90.1	2.2	Super FF Coat	14	<ul style="list-style-type: none"> <li>General-purpose grade with a superior balance of fracture and wear resistance</li> </ul>	AC2000
	AC8020P	90.5	2.2	ABSOTECH	18	<ul style="list-style-type: none"> <li>Our 1st recommended grade for turning mill-scale on forged material</li> <li>Alumina coating with even higher strength balances outstanding stability and wear resistance in turning mill-scale work</li> </ul>	AC820P
	AC8025P	90.1	2.3	ABSOTECH	12	<ul style="list-style-type: none"> <li>Our 1st recommended grade for turning steel</li> <li>Smooth surface treatment suppresses abnormal damage from adhesion/chipping while realizing stable tool life over a wide range of work materials and cutting speeds</li> </ul>	AC820P
	AC830P	89.4	2.6	Super FF Coat	8	<ul style="list-style-type: none"> <li>For interrupted machining of steel</li> <li>Tough grade with an emphasis on fracture resistance</li> </ul>	AC3000
	AC8035P	89.4	2.6	ABSOTECH	9	<ul style="list-style-type: none"> <li>For interrupted machining of steel</li> <li>Coating layer tensile stress removal technology greatly improves fracture resistance and achieves long, stable tool life in heavy interrupted cutting</li> </ul>	AC830P
	AC6020M	90.1	2.3	ABSOTECH	5	<ul style="list-style-type: none"> <li>For high-speed machining of stainless steel</li> <li>Adopts a high-hardness carbide substrate and new coating to realise excellent wear resistance and fracture resistance, resulting in stable long tool life in high-speed machining</li> </ul>	AC610M
	AC6030M	89.5	2.7	ABSOTECH	5	<ul style="list-style-type: none"> <li>Our 1st recommended grade for turning stainless steel</li> <li>Drastically reduces the occurrence of abnormal damage in stainless steel machining and achieves long and stable tool life thanks to the new coating</li> </ul>	AC630M
	AC630M	89.5	2.7	Super FF Coat	5	<ul style="list-style-type: none"> <li>General-purpose grade with a superior balance of fracture and wear resistance for stainless steel machining</li> <li>Supports continuous and light cutting of steel with low cutting speeds</li> </ul>	AC304
	AC405K	92.0	2.4	Super FF Coat	18	<ul style="list-style-type: none"> <li>For high-speed cast iron turning</li> <li>Grade emphasising wear resistance for high- to medium-speed cutting</li> </ul>	AC410K
	AC4010K	91.1	2.5	ABSOTECH	20	<ul style="list-style-type: none"> <li>Our 1st recommended grade for turning grey cast iron</li> <li>For high-speed cast iron turning</li> <li>New thick coating realises stable long tool life even with ultra-high-speed machining of grey cast iron at <math>vc = 700m/min</math></li> </ul>	AC405K
	AC4015K	91.1	2.5	ABSOTECH	16	<ul style="list-style-type: none"> <li>Our 1st recommended grade for turning ductile cast iron</li> <li>New high-adhesion, high-strength coating realises high wear resistance and chipping resistance for stable long tool life over a wide range of cutting conditions</li> </ul>	AC415K
	AC420K	91.1	2.5	Super FF Coat	12	<ul style="list-style-type: none"> <li>For interrupted machining of cast iron</li> <li>Designed as a grade with emphasis on fracture resistance and chipping resistance, outstanding stability is realised with heavy interrupted cutting and unstable cutting of cast iron</li> </ul>	AC700G
	<i>new</i> AC4125K	91.1	2.5	ABSOTECH	12	<ul style="list-style-type: none"> <li>Our 1st recommended grade for interrupted machining of cast iron</li> <li>Especially effective for stable long life in roughing of parts like differential cases and carriers</li> </ul>	AC420K

 For Milling (CVD)

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Coating type	Coating Thickness (μm)	Features	Old Grades
	ACP100	89.3	3.1	Super FF Coat	6	<ul style="list-style-type: none"> <li>For high-speed machining of steel</li> <li>Grade emphasising wear resistance for high-speed cutting</li> </ul>	AC230
	ACP2000	89.5	3.2	ABSOTECH	10	<ul style="list-style-type: none"> <li>For high-speed machining of steel</li> <li>Stable long tool life in high-speed machining is realised by adopting a tough carbide substrate and a new coating with excellent thermal crack resistance</li> </ul>	ACP100
	ACM200	89.8	3.4	Super FF Coat	6	<ul style="list-style-type: none"> <li>For machining high-hardness stainless steel</li> <li>Adopts newly developed high-strength carbide substrate with excellent wear resistance and thermal resistance, realizing outstanding stability when machining hardened stainless steel</li> </ul>	AC230
	ACK100	92.0	2.4	Super FF Coat	6	<ul style="list-style-type: none"> <li>For high-speed cast iron milling</li> <li>Adopts a high-hardness substrate with high wear resistance</li> </ul>	—
	ACK200	91.7	2.5	Super FF Coat	6	<ul style="list-style-type: none"> <li>For high-speed cast iron milling</li> <li>Adopts a tough carbide substrate with excellent wear resistance and thermal crack resistance</li> </ul>	AC211
	ACK2000	91.7	3.1	ABSOTECH	10	<ul style="list-style-type: none"> <li>For high-speed cast iron milling</li> <li>Stable long tool life in high-speed machining is realised by adopting a tough carbide substrate and a new coating with excellent thermal resistance</li> </ul>	ACK100 ACK200

## Characteristic Values

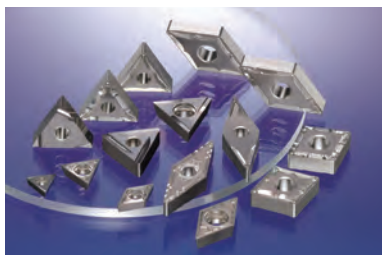
## For Turning (PVD)

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Coating Type	Coating Thickness (µm)	Features	Old Grades
<b>P</b> Steel	<b>AC530U</b>	91.4	3.3	Super ZX Coat	3	<ul style="list-style-type: none"> <li>For interrupted machining of steel and stainless steel</li> <li>Adopts a micro-grained tough carbide substrate and super multi-layered coating to realise outstanding fracture resistance</li> </ul>	ACZ310
	<b>AC6040M</b>	91.6	3.8	ABSOTECH	3	<ul style="list-style-type: none"> <li>Improved stability in interrupted machining through utilising a coating with excellent adhesion resistance and peel-off resistance</li> </ul>	AC530U
<b>M</b> Stainless Steel	<b>AC6135M</b>	91.6	3.8	ABSOTECH	3	<ul style="list-style-type: none"> <li>Our 1st recommended grade for interrupted machining of stainless steel</li> <li>Outstanding stability in interrupted machining through utilising a multi-layered coating, balancing high wear resistance and adhesion resistance</li> <li>Can also be used for interrupted machining of steel</li> </ul>	—
	<b>AC6145M</b>	89.8	3.4	ABSOTECH	3	<ul style="list-style-type: none"> <li>Grade specialized for fracture resistance, ideal for heavy interrupted machining of stainless steel</li> <li>Achieves long and stable tool life in heavy interrupted machining through the use of a high-toughness substrate</li> </ul>	—
	<b>AC5005S</b>	93.1	2.8	ABSOTECH	5	<ul style="list-style-type: none"> <li>For high-speed and high-efficiency machining of exotic alloys</li> <li>Utilising a dedicated carbide substrate with exceptional high-temperature strength realises excellent wear resistance in high-speed, high-efficiency machining</li> </ul>	—
<b>S</b> Exotic Alloy	<b>AC510U</b>	92.6	2.6	Super ZX Coat	3	<ul style="list-style-type: none"> <li>For continuous to partially interrupted machining of exotic alloys</li> <li>Grade with an emphasis on wear resistance and thermal resistance for continuous machining of exotic alloys</li> <li>Can also be used for interrupted machining of cast iron</li> </ul>	EH510Z EH10Z
	<b>AC5015S</b>	92.7	3.2	ABSOTECH	5	<ul style="list-style-type: none"> <li>Our 1st recommended grade for machining exotic alloys</li> <li>Adopts a carbide substrate with excellent thermal resistance and a new coating with excellent wear resistance and chipping resistance, realizing stable long tool life over a wide range of cutting conditions</li> </ul>	AC510U
	<b>AC520U</b>	91.7	3.0	Super ZX Coat	3	<ul style="list-style-type: none"> <li>For interrupted machining of exotic alloys</li> <li>Grade with an emphasis on fracture resistance for interrupted machining of exotic alloys</li> <li>Also suitable for interrupted machining of stainless steel</li> </ul>	EH520Z EH20Z
	<b>AC5025S</b>	91.8	3.6	ABSOTECH	5	<ul style="list-style-type: none"> <li>For partially interrupted to interrupted machining of exotic alloys</li> <li>Adopts a carbide substrate with excellent fracture resistance and a new coating with excellent wear resistance and chipping resistance, realizing stable long tool life under unstable cutting conditions</li> </ul>	AC520U
	<b>AC9115T</b>	92.6	2.6	ABSOTECH	1	<ul style="list-style-type: none"> <li>Our 1st recommended grade for titanium alloy machining</li> <li>Utilising a specialised coating with reaction resistance in titanium alloy turning realises long tool life with significantly improved wear resistance</li> </ul>	—
	<b>AC9125T</b>	91.7	3.0	ABSOTECH	1	<ul style="list-style-type: none"> <li>For interrupted machining of titanium alloy</li> <li>Utilising a high-toughness substrate for improved stability in interrupted machining applications</li> </ul>	—
	<b>AC503U</b>	93.2	1.7	Super ZX Coat	3	<ul style="list-style-type: none"> <li>For roughing of hardened steel</li> <li>Adopts a high-hardness carbide substrate coupled with a super multi-layered coating to realise outstanding wear resistance</li> </ul>	—
For Small Lathes	<b>AC1030U</b>	91.6	3.8	ABSOTECH	2	<ul style="list-style-type: none"> <li>Our 1st recommended grade for high-precision machining</li> <li>Adopts a new coating with excellent adhesion resistance and peel-off resistance which realises outstanding stability and machined surface quality due to the improved cutting edge quality</li> </ul>	—

## For Milling (PVD)

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Coating Type	Coating Thickness (µm)	Features	Old Grades
<b>P</b> Steel	<b>ACU2500</b>	91.6	3.8	ABSOTECH	3	<ul style="list-style-type: none"> <li>General-purpose grade covering steel, stainless steel, and cast iron machining</li> <li>Adopts a carbide substrate with excellent fracture resistance and wear resistance, plus a new coating with excellent wear resistance and chipping resistance, realising stable long tool life on various work materials</li> </ul>	—
	<b>ACP200</b>	89.5	3.2	(New) Super ZX Coat	3	<ul style="list-style-type: none"> <li>Our 1st recommended grade for steel applications</li> <li>General-purpose grade with an excellent balance of wear and fracture resistance</li> <li>Also suitable for machining stainless steel</li> </ul>	ACZ330
	<b>ACP300</b>	89.3	3.1	(New) Super ZX Coat	3	<ul style="list-style-type: none"> <li>For interrupted machining of steel</li> <li>Tough grade with an emphasis on fracture resistance</li> <li>Also suitable for interrupted machining of stainless steel</li> </ul>	ACZ350
	<b>ACP3000</b>	89.5	3.2	ABSOTECH	3	<ul style="list-style-type: none"> <li>Our 1st recommended grade for milling steel</li> <li>Carbide substrate with excellent thermal crack resistance, plus a new coating with excellent wear resistance and chipping resistance, realising stable long tool life over a wide range of cutting conditions</li> </ul>	ACP200 ACP300
<b>M</b> Stainless Steel	<b>ACM300</b>	89.8	3.4	(New) Super ZX Coat	3	<ul style="list-style-type: none"> <li>Our 1st recommended grade for milling stainless steel</li> <li>Adopts a high-strength carbide substrate and a super multi-layered coating for next-level wear resistance and fracture resistance</li> </ul>	—
<b>K</b> Cast Iron	<b>ACK300</b>	91.4	3.3	(New) Super ZX Coat	3	<ul style="list-style-type: none"> <li>General-purpose grade with an excellent balance of wear and fracture resistance</li> </ul>	ACZ310
	<b>ACK3000</b>	91.7	3.1	ABSOTECH	3	<ul style="list-style-type: none"> <li>Our 1st recommended grade for milling cast iron</li> <li>Adopts a high thermal conductivity carbide substrate and a new coating with excellent wear resistance and chipping resistance, realizing stable long tool life over a wide range of cast iron machining operations</li> </ul>	ACK300
<b>N</b> Non-Ferrous Metal	<b>DL1000</b>	92.9	2.1	AURORA Coat (DLC)	0.5	<ul style="list-style-type: none"> <li>For milling non-ferrous metal, utilising DLC coat with a low coefficient of friction and excellent adhesion resistance</li> </ul>	—
	<b>DL2000</b>	91.6	3.8	AURORA Coat (DLC)	0.5	<ul style="list-style-type: none"> <li>For milling non-ferrous metal, utilising DLC coat with a low coefficient of friction and excellent adhesion resistance</li> </ul>	—
<b>S</b> Exotic Alloy	<b>ACS1000</b>	91.6	3.8	ABSOTECH	3	<ul style="list-style-type: none"> <li>For high-efficiency milling of exotic alloys</li> <li>High-hardness carbide substrate coupled with a chipping-resistant coating provides long and stable tool life in high-speed, high-efficiency machining applications</li> </ul>	—
	<b>ACS2500</b>	90.8	4.2	ABSOTECH	3	<ul style="list-style-type: none"> <li>First recommendation for titanium alloy applications</li> <li>Carbide substrate with excellent wear and adhesion resistance, coupled with a chipping-resistant coating, balances excellent wear and fracture resistance</li> </ul>	ACM200
	<b>ACS3000</b>	89.8	3.4	ABSOTECH	3	<ul style="list-style-type: none"> <li>Suitable for a wide range of exotic alloy machining applications</li> <li>Realises superb stability due to a high-toughness carbide substrate with a highly chipping-resistant coating</li> </ul>	ACM300

\*Brilliant Coat may appear a slightly different colour or lustre due to light interference, but these variations do not affect the performance.



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

Grade with Better Wear Resistance **T1000A**, General-purpose Grade **T1500A**, General-purpose Coated Grade **T1500Z**, Grade with Better Toughness **T2500Z** in the Lineup.

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

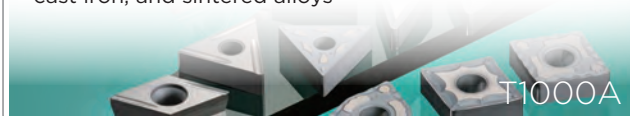
### Features

#### Uncoated

##### T1000A

High-hardness grade with superior 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 sintered alloys



#### Coated

##### T1500Z

General-purpose coated grade that employs our proprietary Brilliant Coat<sup>®</sup> PVD coating with excellent lubricity

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

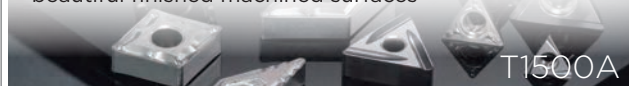


#### Uncoated

##### T1500A

A general-purpose grade that provides both wear and fracture resistance with higher-quality surface finishes

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

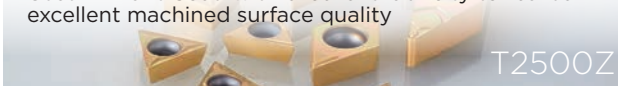


#### Coated

##### T2500Z


Tough grade with excellent fracture resistance and thermal crack resistance

- Fine, uniform grain structure greatly improves toughness
- Improves thermal crack resistance due to high thermal conductivity and realises stable, long tool life
- Uses Brilliant Coat<sup>®</sup> with excellent lubricity to realise excellent machined surface quality





### Characteristic Values

#### For Turning

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Coating type	Coating Thickness (µm)	Features	Old Grades
 	<b>T1000A</b>	93.3	1.8	—	—	<ul style="list-style-type: none"> <li>· For continuous machining of steel</li> <li>· High-hardness grade with superior wear resistance</li> <li>· Supports finishing of cast iron and sintered alloys</li> </ul>	T110A
	<b>T1500A</b>	92.0	2.2	—	—	<ul style="list-style-type: none"> <li>· Our 1st recommended cermet grade for machining steel</li> <li>· General-purpose grade with an excellent balance of wear and fracture resistance, achieving an excellent machined surface over a wide range of cutting conditions</li> </ul>	T1200A
	<b>T2500A</b>	91.8	2.4	—	—	<ul style="list-style-type: none"> <li>· For interrupted machining of steel</li> <li>· Fine, uniform grain structure greatly improves toughness, realising long tool life and excellent surface finishes even with interrupted cutting</li> </ul>	—
	<b>T1500Z</b>	92.0	2.2	Brilliant Coat <sup>®</sup>	3	<ul style="list-style-type: none"> <li>· Adopts Brilliant Coat for excellent lubricity and higher machined surface quality</li> </ul>	T2000Z
	<b>T2500Z</b>	91.8	2.4	Brilliant Coat <sup>®</sup>	3	<ul style="list-style-type: none"> <li>· For finishing of steel</li> <li>· The use of Brilliant Coat with excellent lubricity and a tough cermet substrate realises excellent machined surface quality and superb stability</li> </ul>	T3000Z

#### For Milling

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Coating type	Coating Thickness (µm)	Features	Old Grades
 	<b>T1500A</b>	92.0	2.2	—	—	<ul style="list-style-type: none"> <li>· For finishing of steel and stainless steel</li> <li>· Excellent balance of wear and fracture resistance, achieving excellent machined surface quality over a wide range of cutting conditions</li> </ul>	T1200A
	<b>T250A</b>	91.4	2.1	—	—	<ul style="list-style-type: none"> <li>· For finishing of steel and stainless steel</li> <li>· Tough grade with enhanced crack development resistance</li> </ul>	—
	<b>T2500A</b>	91.8	2.4	—	—	<ul style="list-style-type: none"> <li>· For finishing of steel and stainless steel</li> <li>· Fine, uniform grain structure greatly improves toughness, realising long tool life and excellent surface finishes</li> </ul>	T250A
	<b>T4500A</b>	91.0	2.3	—	—	<ul style="list-style-type: none"> <li>· For finishing of steel and stainless steel</li> <li>· Tough grade with excellent fracture resistance and reduced thermal cracking</li> </ul>	—

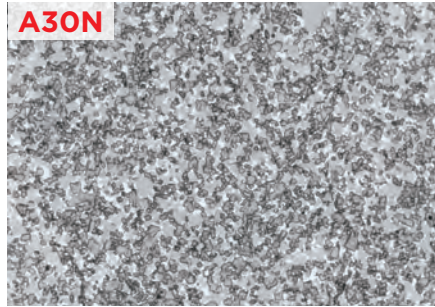
\*Brilliant Coat may appear a slightly different colour or lustre due to light interference, but these variations do not affect the performance.

**IGETALLOY cemented 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.**

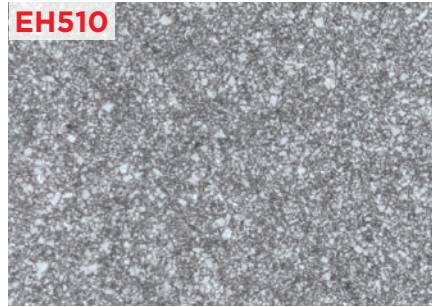
The IGETALLOY range consists of cemented carbide grades with various characteristics that correspond to the cutting tool application. This is achieved by varying the carbide components: the WC structure (main component) and additives such as TiC, TaC, and Co (binder).

The wide selection of IGETALLOY grades provides excellent wear resistance and toughness in various cutting conditions.

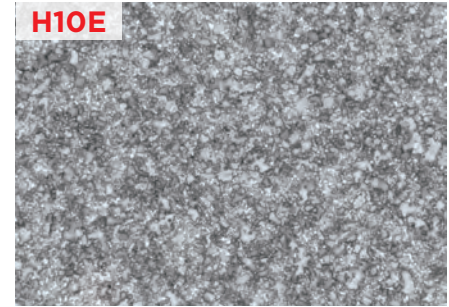
● For Steel



● For Stainless Steel



● For Cast Iron



## Characteristic Values

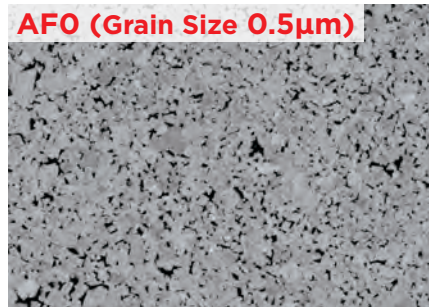
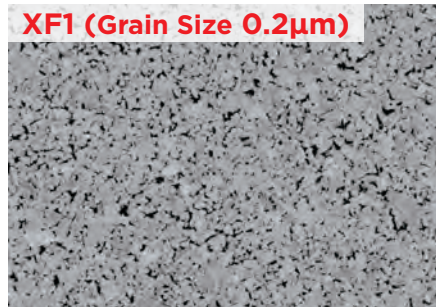
Work Material	Grade	Hardness (HRA)	TRS (GPa)	Thermal Conductivity (W/m/°C)	Young's Modulus (GPa)
<b>P</b> Steel	ST10P	92.1	1.9	25	470
	ST20E	91.8	1.9	42	550
	ST40E	90.4	2.6	75	—
<b>M</b> Stainless Steel	A30	91.3	2.1	35	520
	A30N	91.0	2.4	35	500
<b>K</b> Cast Iron	BL130	94.3	2.9	56	660
	H2	93.2	1.8	105	600
	H10E	92.3	2.0	67	560
	G10E	91.1	2.2	105	620
<b>N</b> Non-Ferrous Metal	H1	92.9	2.1	109	650
	H20	91.6	3.8	—	590
<b>S</b> Exotic Alloy	EH510	92.6	2.6	76	630
	EH520	91.7	3.0	78	600

## The IGETALLOY micro-fine grained carbide series performs at a world-class level to deliver superior performance in small drills and other tools.

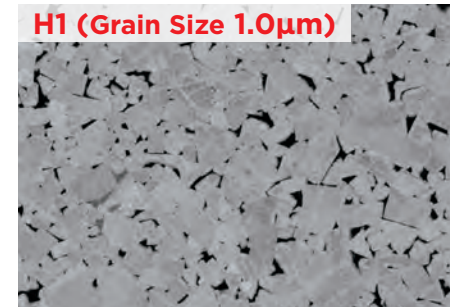
IGETALLOY micro-fine grained cemented carbides feature a WC structure between 0.2 and 1 $\mu$ m and are extremely strong and hard. They also provide excellent sharpness and superb surface quality on machined surfaces.

These features provide excellent performance in a variety of applications from  $\varnothing$ 0.1mm PCB drills and endmill materials to thin-bladed slitters and precision molds.

### ● Ultra-fine Grained Carbide



### ● Micro-grained Carbide



## Characteristic Values

Classification	Grade	Properties					Features	Applications
		Grain Size <sup>*1</sup> ( $\mu$ m)	Co Content (wt%)	TRS <sup>*2</sup> (GPa)	Hardness (HRA)	Hardness HV (GPa)		
Ultra-fine Grained Carbide	<b>XF1</b>	0.2	9.0	4.0	93.5	20.4	World's smallest grain size ultra-fine grained carbide	Microdrills, Very Small Diameter Drills
	<b>AF1</b>	0.5	12.0	4.4	92.5	17.3	World's toughest ultra-fine grained carbide	Microdrills, Mini-tools, Punches
	<b>AFO</b>	0.5	10.0	4.1	93.0	18.1	Tough, wear-resistant ultra-fine grained carbide	Microdrills, Routers
	<b>AFU</b>	0.5	8.0	3.8	93.6	19.4	Wear-resistant ultra-fine grained carbide	PCB Drills, Endmills for High-Hardness Materials
Micro-fine Grained Carbide	<b>A1</b>	0.7	13.0	4.2	91.4	15.6	Tough micro-fine grained carbide	Endmills, Taps, Drills for Cast Iron, Punches
	<b>KH12</b>	0.7	10.0	4.0	92.4	17.0	Micro-fine grained carbide with excellent wear resistance and toughness	Endmills, Drills for Steel
	<b>KH15</b>	0.7	12.0	4.4	92.0	16.3	Micro-fine grained carbide with a balance of hardness and strength	Endmills for Exotic Alloys
	<b>FO</b>	0.7	5.0	3.6	93.6	20.1	Micro-fine grained carbide with superior wear resistance	PCB Drills, Routers
Micro-grained Carbide	<b>KH03</b>	1.0	10.0	3.8	91.4	15.2	Micro-grained carbide with excellent strength and toughness	Molds/Dies, Drills, Endmills
	<b>KH05</b>	1.0	13.0	3.5	90.4	13.6	Tough, micro-grained carbide	Molds/Dies
	<b>H1</b>	1.0	5.0	3.3	93.2	17.7	Micro-grained carbide with superior wear resistance	Drills for Cast Iron and High-Hardness, Reamers
	<b>EH10</b>	1.2	6.0	3.4	92.4	17.3	Fine-grained carbide with good balance of hardness and toughness	Drills for Exotic Alloy, Reamers
	<b>ZF16A</b>	1.0	6.0	3.5	93.0	17.6	Wear and chipping resistant micro-grained carbide for high-speed machining	PCB Drills

\*1: Grain size shown is the average grain size of the WC (tungsten carbide) material. \*2: Transverse rupture strength differs between round bars and plates.



**High hardness and thermal resistance for cutting hardened steel and hard cast iron. High-speed finishing of grey cast iron with long tool life is also possible.**

"SUMIBORON" was first successfully developed in Japan by our company in 1977. "Coated SUMIBORON" with a special ceramic coating and "SUMIBORON BINDERLESS" made by directly bonding CBN particles without a binder are new additions to our product lineup.

## Features

Structure Features	Structure	CBN Content	Hardness (GPa)	Grades	Work Materials/Applications	Features
Pure CBN particles, firmly bonded		<b>High</b>  <b>Low</b>	<b>54</b>  <b>27</b>	NCB100	Cast Iron, Titanium Alloy, Pure Titanium, Cobalt-chrome Alloy, Cemented Carbide, Cermet	· Containing no binder, its structure of directly bonded nano- to sub-micron CBN particles provides high hardness and thermal conductivity, making it highly efficient with a longer tool life when machining exotic alloys such as titanium alloys and cobalt-chrome alloys
Mainly CBN grains fused together				BN7125 BN7115 BNC8115 BNS8125	Cemented Carbide, Chilled Cast Iron, Ni-Hard Cast Iron, Sintered Ferrous Alloy, Heat-Resistant Alloy, Cast Iron	· High CBN content. Structure consists of strongly fused CBN grains · Suited to cutting cast iron, heat-resistant alloy, cemented carbide and other high-hardness materials
Mainly CBN grains held together with a binder				BN1000 / BN2000 / BN350 BNX10 / BNX20 / BN500 BNC2115 / BNC2125 / BNC2105 / BNC2135 / BNC2010 / BNC2020 / BNC300 / BNC200 / BNC500	Alloy Steel, Case Hardened Steel, Carbon Tool Steel, Bearing Steel, Die Steel, Ductile Cast Iron	· CBN grains are fused together strongly with a special ceramic binder · Strong CBN binding provides superior wear resistance and toughness when cutting hardened steel and cast iron

## Grade Range Map

Work Material	Series	High-speed Cutting	Finishing to Light Cutting	Medium Cutting	Rough to Heavy Cutting			
	Classification	—	H01	H10	H20	H30		
	Coated SUMIBORON	BNC2105		BNC2115		BNC2125		
		BNC2010			BNC2135			
		BNC2020			BNC300			
		BNC200						
		BN1000		BN2000				
		BNX10		BNX20		BN350		
	Sintered Alloy	Classification	—	01	10	20	30	
		Uncoated SUMIBORON	BN7115		BN7125			
			BNC500*		BNC8115			
	Uncoated SUMIBORON	NCB100		BN500		BNS8125		
		BN7125						
		BN7125						
		S01		S10		S20		S30
		NCB100		BN7125		BNS8125		
	Uncoated SUMIBORON	S01		S10		S20	S30	
		NCB100		BN7125				
		BN7125		BNS8125				

\*Dedicated for Ductile Cast Iron

## Characteristic Values

Work Material	Grade	Binder	CBN Content (%)	Grain Size (µm)	Hardness HV (GPa)	TRS (GPa)	Main Coating Components	Coating Thickness (µm)	Features
<b>H</b> Hardened Steel	<b>BNC2105</b>	TiCN	45 to 50	3	30 to 32	1.1 to 1.2	TiAlBN Super Multi-layered Coating	3	Grade with excellent wear resistant coating and a CBN substrate ideal for high-speed finishing applications.
	<b>BNC2115</b>	TiN	60 to 65	3	31 to 33	1.3 to 1.4	TiAlSiN Super Multi-layered Coating	3	Utilizing a coating with exceptional notch wear resistance and a tough CBN substrate to achieve stable and excellent surface finish.
	<b>BNC2125</b>	TiN	65 to 70	4	33 to 35	1.5 to 1.6	TiAlBN Super Multi-layered Coating	3	Combination of a tough CBN substrate and a coating that has a balance of wear resistance and toughness, to achieve even more stable machining.
	<b>BNC2135</b>	TiN	60 to 65	1	33 to 35	1.6 to 1.7	TiAlN/AlCrN	1	Utilising a highly fracture-resistant coating and a high-strength CBN substrate to achieve long and stable tool life in interrupted machining.
	<b>BNC2010</b>	TiCN	50 to 55	2	30 to 32	1.1 to 1.2	TiCN Multi-layered Coating	2	Improved wear resistance from coating and substrate, achieves excellent and consistent surface roughness.
	<b>BNC2020</b>	TiN	70 to 75	5	34 to 36	1.4 to 1.5	TiAlN Multi-layered Coating	2	Utilising a tough substrate along with a highly wear-resistant and adhesive coating layer, to achieve long tool life in general-purpose to high-efficiency machining.
	<b>BNC300</b>	TiN	60 to 65	1	33 to 35	1.5 to 1.6	TiAlN	1	Suitable for finishing of workpieces with a mixture of continuous and interrupted cutting portions.
	<b>BNC200</b>	TiN	65 to 70	4	33 to 35	1.4 to 1.5	TiAlN	3	A tough CBN substrate and a coating with high wear resistance provide a long tool life.
	<b>BN1000</b>	TiCN	40 to 45	1	27 to 31	0.9 to 1.0	—	—	Grade with ultimate wear and fracture resistance, suitable for high-speed cutting.
	<b>BN2000</b>	TiN	50 to 55	2	31 to 34	1.1 to 1.2	—	—	General-purpose grade for hardened steel machining with a high degree of fracture and wear resistance.
	<b>BNX20</b>	TiN	55 to 60	3	31 to 33	1.0 to 1.1	—	—	Grade with excellent crater wear resistance, suitable for high-efficiency cutting under high-temperature conditions.
	<b>BN350</b>	TiN	60 to 65	1	33 to 35	1.5 to 1.6	—	—	Grade with the highest cutting edge strength, suitable for heavy interrupted cutting.
<b>BNX10</b>	TiCN	40 to 45	3	27 to 31	0.9 to 1.0	—	—	Highly wear-resistant grade, suitable for high-speed continuous machining.	
<b>K</b> Cast Iron	<b>BN7115</b>	Co Compound	90 to 95	1	41 to 44	2.2 to 2.3	—	—	Grade with the best cutting edge sharpness and fracture resistance, suitable for finishing of sintered alloy.
	<b>BN7125</b>	Co Compound	90 to 95	2	41 to 44	1.9 to 2.0	—	—	General-purpose grade with excellent wear resistance, fracture resistance, and thermal shock resistance, suitable for machining of cast iron and exotic alloys
	<b>BNS8125</b>	Al Alloy	85 to 90	8	39 to 42	0.95 to 1.15	—	—	Grade with 100% solid CBN structure that exhibits excellent wear and fracture resistance
	<b>BNC8115</b>	Al Alloy	85 to 90	8	39 to 42	0.95 to 1.15	TiAlN	2	Grade with 100% solid CBN structure, using PVD coating with excellent wear resistance to enable roughing operations.
	<b>BNC500</b> (For Ductile Cast Iron)	TiC	60 to 65	4	32 to 34	1.1 to 1.2	TiAlN	3	Grade suitable for machining of hard-to-cut cast iron, thanks to the highly wear-resistant substrate and coating.
	<b>BN500</b>	TiC	65 to 70	6	32 to 34	1.0 to 1.1	—	—	Grade optimised for cast iron cutting. Provides superior wear and fracture resistance.
	<b>BN7000</b>	Co Compound	90 to 95	2	41 to 44	1.8 to 1.9	—	—	Grade exhibiting improved wear and fracture resistance in roughing of sintered materials and machining of cast iron and exotic alloys
<b>S</b> Exotic Alloy	<b>BN7500</b>	Co Compound	90 to 95	1	41 to 44	2.0 to 2.1	—	—	Grade maintaining good cutting edge sharpness, suitable for finishing of sintered alloys
	<b>NCB100</b>	—	100	Up to 0.5	51 to 54	1.8 to 1.9	—	—	Achieves high efficiency, improved machining accuracy, and longer tool life in machining of exotic alloys such as titanium alloy and cobalt-chrome alloys

TRS measured with test piece equivalent to the insert's CBN layer

**CBN** SUMIBORON Coated SUMIBORON series ••• **L2 -**

# Polycrystalline Diamond

Insert Grades

A

Coated Carbide

Cermet

Cemented Carbide

CBN

PCD

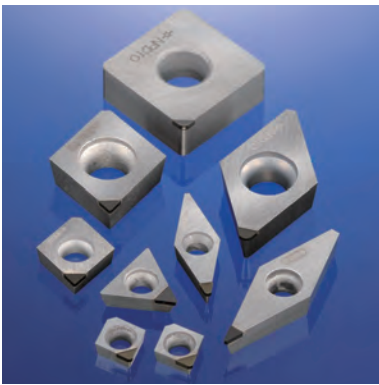
Ceramic



**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 in high speed, high-efficiency and high precision machining of non-metal and non-ferrous metal applications including aluminum, copper, magnesium and zinc alloys.

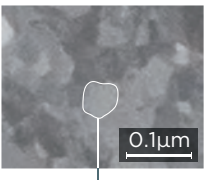
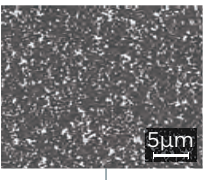
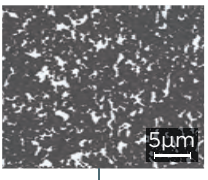
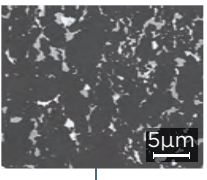
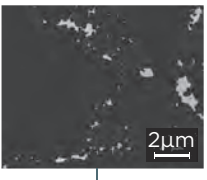



**SUMIDIA BINDERLESS uses nano-polycrystalline diamond for the cutting edge, demonstrating excellent wear resistance and fracture resistance. In particular, it achieves extended tool life and machining accuracy superior to conventional polycrystalline diamond when machining hard brittle materials such as cemented carbide.**

## Features

- High density sintered material made of diamond particles ranging from sub-microns to tens of microns.



### Structure

SUMIDIA BINDERLESS	SUMIDIA				
NPD10	DA1000	DA2200	DA150	DA1090	DA90
					
Diamond particles					
	*White areas in the image are the binder material				

## Grade Range Map

Work Material	Series	Finishing to Light Cutting		Medium Cutting	Rough to Heavy Cutting
		01	10	20	30
Hard Brittle Materials	Classification	01	10	20	30
	SUMIDIA BINDERLESS	NPD10			
	SUMIDIA			DA1090 DA90	
Non-Ferrous Metal	Classification	N01	N10	N20	N30
	SUMIDIA	DA1000			
				DA2200	
		DA1090	DA150		
		DA90			

## Characteristic Values

Work Material	Grade	Binder	CBN Content (%)	Grain Size (µm)	Hardness HK (GPa)	TRS (GPa)	Features
	<b>NPD10</b>	—	100	up to 0.05	120 to 130	≈ 3.15	100% diamond structure that directly binds nano-order diamond particles with high strength. Demonstrates optimum wear and fracture resistance as well as the best edge sharpness.
	<b>DA1000</b>	Co	90 to 95	up to 0.5	50 to 60	≈ 2.60	High-density sintered material made of ultra-fine grain diamond that exhibits optimum wear and fracture resistance as well as excellent edge sharpness.
	<b>DA2200</b>	Co	85 to 90	0.5	45 to 55	≈ 2.45	Sintered material made of ultra-fine grain diamond that demonstrates both wear and fracture resistance and excellent edge sharpness.
	<b>DA150</b>	Co	85 to 90	5	50 to 60	≈ 1.95	Micro-grained sintered diamond particles with both machinability and wear resistance.
	<b>DA1090</b>	Co	92 to 97	Up to 50	55 to 70	≈ 1.30	A polycrystalline diamond material with the highest diamond content, made by sintering coarse diamond particles at high density. High density and enhanced particle binding strength exhibit excellent wear and fracture resistance.
	<b>DA90</b>	Co	90 to 95	50	50 to 65	≈ 1.10	Coarse sintered diamond particles, with high diamond content for excellent wear resistance.

TRS measured with test piece equivalent to insert PCD layer

 **SUMIDIA series** ... 

 **SUMIDIA BINDERLESS** ... 



## Superb wear resistance enables ultra-high-speed machining.

Sumitomo Electric Hardmetal's Advanced Ceramic utilises a special process to produce extremely tough grades.

This new development permits ultra-high-speed cutting of cast iron, heat-resistant alloy, and ultra-hard rolled material with stability.

### Grade Range Map



#### For Turning

For Turning	High-speed Cutting	Finishing to Light Cutting		Medium Cutting		Rough to Heavy Cutting	
	—	01	10	20	30	40	—
<b>K</b> Cast Iron	NB90S						
<b>H</b> Hardened Steel	NB100C						

### Characteristic Values



#### For Turning

Work Material	Grade	Hardness (HRA)	TRS (GPa)	Main Coating Components	Coating Thickness (μm)	Features
<b>K</b> Cast Iron	NB90S	94.8	0.9	—	—	Al <sub>2</sub> O <sub>3</sub> + carbon-based ceramic Suitable for medium cutting to finishing of cast iron
<b>H</b> Hardened Steel	NB100C	95.0	1.0	TiAlN type	2	Al <sub>2</sub> O <sub>3</sub> -based high strength ceramic with ZX Coat Low-speed/continuous light cutting of hardened steel

# Material Properties

## Material Properties

Material		Specific Gravity	Hardness (mHv) (GPa)	Young's Modulus (GPa)	Thermal Conductivity (W/m/°C)	Coefficient of Linear Expansion (X 10 <sup>-6</sup> /°C)	Melting Point (°C)
Tungsten Carbide	<b>WC</b>	15.6	21	690	126	5.1	2,900
Titanium Carbide	<b>TiC</b>	4.94	31	450	17	7.6	3,200
Tantalum Carbide	<b>TaC</b>	14.5	18	280	21	6.6	3,800
Niobium Carbide	<b>NbC</b>	8.2	20	340	17	6.8	3,500
Titanium Nitrate	<b>TiN</b>	5.43	20	260	29	9.2	2,950
Aluminum Oxide	<b>Al<sub>2</sub>O<sub>3</sub></b>	3.98	29	410	29	8.5	2,050
Silicon Nitride	<b>Si<sub>3</sub>N<sub>4</sub></b>	3.17	25	310	29	3.0	> 1,900 (decomposes)
Cubic Boron Nitride	<b>cBN</b>	3.48	44	700	1,300	4.7	—
Diamond	<b>C</b>	3.52	> 90	970	2,100	3.1	—
Cobalt	<b>Co</b>	8.9	—	100 to 180	69	12.3	1,495
Nickel	<b>Ni</b>	8.9	—	200	92	13.3	1,455
Cemented Carbide	<b>WC-5% Co</b>	15.0	18	630	79	5.0	—
	<b>WC-10% Co</b>	14.6	14	580	75	5.0	—
	<b>WC-20% Co</b>	13.5	10	530	67	6.0	—
High Speed Steel		8.7	8	210	17	11.0	—

