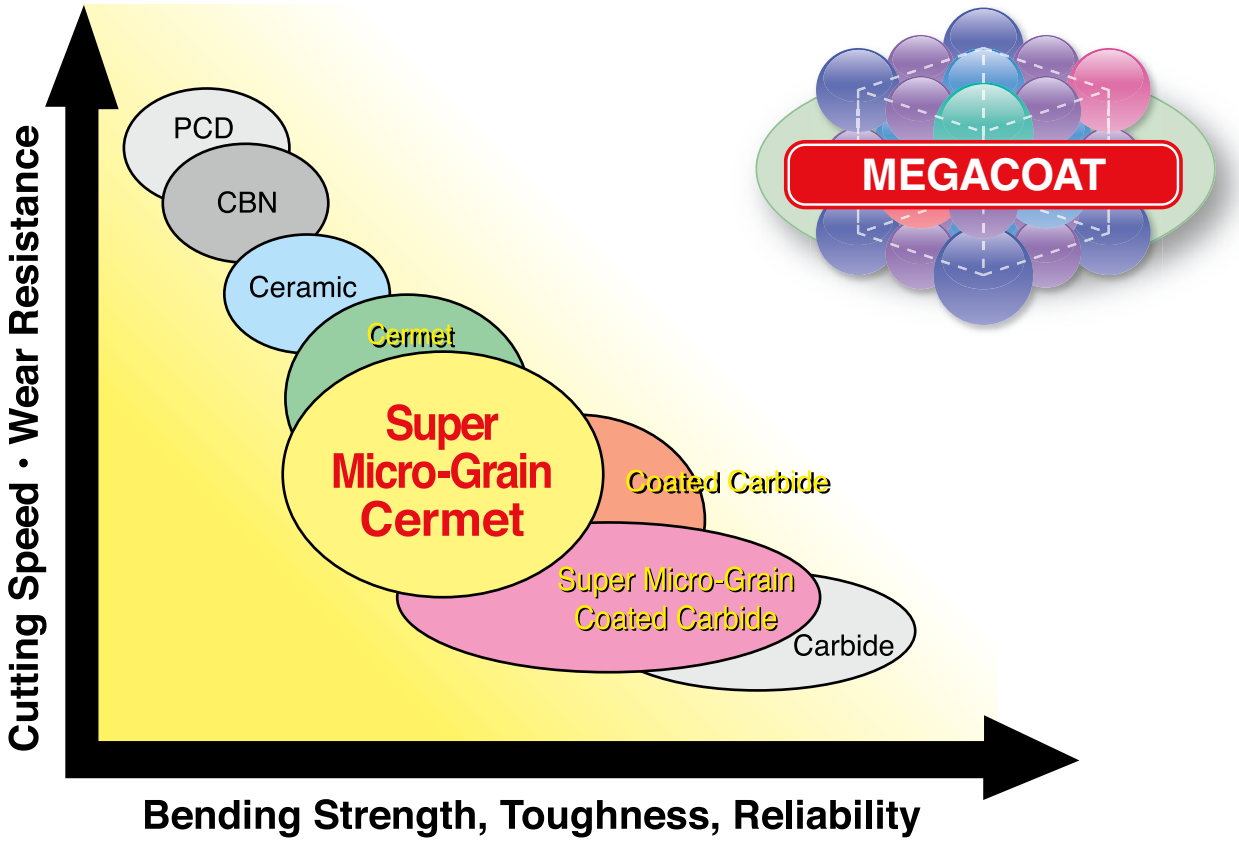
Insert Grades

A1~A16



Summary of Insert Grades

PCD A8

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		N01	N10	N20	N30	S01	S10	S20	S30
Turning Milling	PCD	KPD001 KPD010 KPD230				KPD001 KPD010 KPD230			

CBN A9

Workpiece Material		Hardened Material (Heat treated Steel / Chilled Cast Iron)				Sintered metal				Cast Iron (Gray Cast Iron / Nodular Cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		H01	H10	H20	H30	01	10	20	30	K01	K10	K20	K30
Turning	CBN	KBN510 KBN525 KBN05M KBN10M KBN25M KBN30M KBN35M KBN900					KBN65M KBN70M			KBN60M KBN900			

Ceramic A10

Workpiece Material		Hardened Material (Heat treated Steel / Chilled Cast Iron)				Hard-to-machine Material (High temperature alloy / Inconel)				Cast Iron (Gray Cast Iron / Nodular Cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		H01	H10	H20	H30	S01	S10	S20	S30	K01	K10	K20	K30
Turning	Ceramic	A65 A66N PT600M				CF1				KA30 A65 A66N PT600M KS6000			

Cell Fiber A11

Workpiece Material		Hardened Material (Heat treated Steel / Chilled Cast Iron)				Hard-to-machine Material (High temperature alloy / Inconel)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		H01	H10	H20	H30	S01	S10	S20	S30
Turning	Cell Fiber	KBN35M				CF1			

Cermet A12

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Turning Milling	TN Series	TN6010 TN60 TN90 TN100M					TN6010 TN60 TN90 TN100M					TN60			
	TC Series	TC40 TC60					TC60					TC40			
	Super micro-grain	TN6020					TN6020								

PVD Cermet A12

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Turning	PV Series	PV7010 PV7020 PV60 PV90					PV7010 PV7020 PV60 PV90					PV7005			

CVD Coated Carbide A13

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Turning	CA Series	CA5505, CA5515, CA5525, CA5535					CA6515, CA6525					CA4010, CA4115, CA4120, CA4505, CA4515			
	CR Series	CR9025					CR9025								

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)				Hardened Material (Heat treated Steel / Chilled Cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Turning	CA Series						CA6515, CA6525						

PVD Coated Carbide A14, A15

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Turning Milling Drilling	PR Series	PR630, PR660, PR730, PR830, PR1005, PR1025, PR1115, PR1230					PR630, PR660, PR730, PR830, PR1025, PR1125, PR1225					PR905, PR1210			

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)				Hardened Material (Heat treated Steel / Chilled Cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Turning Milling Drilling	PR Series					PR660, PR915, PR1125				PR1230			

PVD Coated Carbide for High Precision Machining A14, A15

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Turning Milling Drilling	PR Series	PR930, PR1005, PR1025, PR1115, PR1225					PR930, PR1025, PR1125, PR1115, PR1225								

Carbide A15

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Turning Milling Drilling	Carbide												KW10, GW15		

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)				Hardened Material (Heat treated Steel / Chilled Cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Turning Milling Drilling	Carbide		KW10, GW15				KW10						

Summary of Insert Grades

Turning

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN Series	TN6010, TN60, TN90					TN6010, TN60, TN90					TN60			
	TC Series	TC40N, TC60M					TC60M					TC40N			
	Super micro-grain	TN6020					TN6020								
	PV Series	PV7010, PV7020, PV60, PV90					PV7010, PV7020, PV60, PV90					PV7005			
Coated Carbide	CA Series	CA5505, CA5515, CA5525, CA5535					CA6515, CA6525					CA4010, CA4115, CA4120, CA4505, CA4515			
	CR Series	CR7015, CR7025, CR9025					CR7015, CR9025					CR7015			
	PR Series	PR630, PR660, PR915, PR930, PR1005, PR1025, PR1115					PR630, PR660, PR915, PR930, PR1025, PR1125, PR1225								
Ceramic												A65, KT66, A66N, PT600M, KS6000			
Carbide												KW10, GW15			
CBN												KBN60M, KBN900			

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)				Hardened Material (Heat treated Steel / Chilled Cast Iron)				Sintered metal			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	CA Series						CA6515, CA6525										
	CR Series						CR7015										
	PR Series							PR1125							PR930		
Cermet														TN6010, TN60			
Ceramic							CF1			KT66, A66N, PT600M							
Carbide			KW10, GW15				KW10										
CBN										KBN510, KBN525, KBN05M, KBN10M, KBN25M, KBN30M, KBN35M, KBN900					KBN65M, KBN70M		
PCD		KPD001, KPD010				KPD001, KPD010											

Milling

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN Series	TN60, TN100M					TN60, TN100M								
Cermet	TC Series		TC60M					TC60M							
Coated Carbide			PR730, PR830, PR1225, CA2325, PR1230	PR630, PR660				PR730, PR830, PR1025, PR1225	PR630, PR660				PR905, PR1210		
Carbide												KW10, GW25			

Workpiece Material	Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)				Hardened Material (Heat treated Steel / Chilled Cast Iron)			
Cutting Range	Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification	N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide							PR660					
Carbide		KW10, CW12, GW25				KW10, GW25						
CBN									KBN525			
PCD	KPD001, KPD010, KPD230				KPD001, KPD010, KPD230							

Drilling

Workpiece Material		General Steel (Carbon Steel / Alloy Steel)					Stainless Steel (Stainless Steel / Steel Castings)					Cast Iron (Gray Cast Iron / Nodular Cast			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
ISO Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated Carbide			CA2325, PR660, PR730, PR830, PR915, PR930, PR1025, PR1225, PR1230					PR660, PR730, PR830, PR915, PR930, PR1025, PR1225					PR905, PR1210		
Carbide												KW10, GW15			

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal)				Heat Resistant Material (Titanium Alloy / Ni Alloy)				Hardened Material (Heat treated Steel / Chilled Cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
ISO Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	PR Series							PR660			PR1230		
Carbide			KW10, SW11, GW15				PR905, KW10, GW15						

Summary of Insert Grades

Insert Material Selection Table

Operation		Cutting Range	P	M	K		N	S		H	Sintered Metal
			Steel	Stainless Steel	Gray Cast Iron	Nodular Cast Iron	Non-ferrous Metal	Heat Resist Steel	Titanium Alloy	Hardened Material	
Turning		Finishing	TN6010							KT66	
										A66N	
										A65	
			TN60	TN60	KA30	TN60				PT600M	
			TN6020	PV7020	KS6000	PV7005		CF1		KBN510	TN6010
			PV7010	CA6515	PV7005	CA5505	KPD001	KW10	KPD001	KBN525	TN60
			PV7020	CA5525	CA5505	CA4115	KPD010	CA6515	KPD010	KBN05M	PR930
			CA5505	CA5535	CA4010	CA4120	KW10	CA6525	KW10	KBN10M	KBN65M
			CA5515	CA6525	CA4505	CA4505		PR1125		KBN25M	KBN70M
			CA5525	PR1125	CA4515	CA4515		PR660		KBN30M	
			CA5535	PR660						KBN35M	
		Roughing								KBN900	
Small Tools		High speed	TN6010								
			TN60								
			TN6020							KBN510	
			PV7010	PV7020	CA4010		KPD001	CA6515	KPD001	KBN525	TN6010
			PV7020	PR930	CA4115	CA4115	KPD010	PR1125	KPD010	KBN05M	TN60
			PR1005	PR1025	CA4120	CA4120	KW10	PR660	KW10	KBN10M	PR930
			PR930	PR1225	CA4505	KW10				KBN25M	KBN65M
			PR1025		CA4515					KBN30M	KBN70M
		Low speed	PR1225		KW10						
Boring		Large	TN6010								
			TN60	TN60	PV7005					PT600M	
			TN6020	PV7020	CA4010	PV7005				KBN510	TN6010
			PV7010	CA6515	CA4115	CA4115				KBN525	TN60
			PV7020	CA5525	CA4120	CA4120	KPD001	CA6515	KPD001	KBN05M	PR930
			CA5515	CA6525	CA4505	CA4505	KPD010	CA6525	KPD010	KBN10M	KBN65M
			CA5525	PR930	CA4515	CA4515	KW10	PR1125	KW10	KBN25M	KBN70M
			CA5535	PR1125	KW10	KW10		PR660		KBN30M	
			PR930	PR1025	KBN60M						
		Small	PR1025								
Cut-off		Large									
			CR9025	CR9025							
			PR660	PR660	KW10	KW10	KW10	KW10	KW10	-	-
			PR930	PR930				PR660			
		Small	PR915	PR915							
		(Depends on the workpiece material)			KW10	KW10	KW10	KW10	KW10	-	-
			PR1025	PR1025				PR1025			
Grooving		Surface finishing	TC40	TC40							
			TN6020	TN6020							
			TN90	TN90						KBN510	
			TC60	TC60	PR905	PR905	KPD001	PR915	KPD001	KBN525	TC40N
			PR630	PR630	KW10	KW10	KW10	KW10	KW10	PT600M	PR930
			PR915	PR915	GW15	GW15					
			PR930	PR930							
		Stable cutting	PR1115	PR1115							
Threading		Surface finishing									
			TC60	TC60							
			PR630	PR630						-	
			PR930	PR930	KW10	KW10	KW10	KW10	KW10		PR930
			PR1115	PR1115	GW15	GW15					
		Stable cutting									
Drilling		Good Wear Resistance									
			PR930								
			PR730	PR730	PR510	PR510		PR660			
			PR830	PR830	PR905	PR905		PR1025			
			PR915	PR915	PR1210	PR1210	KW10	PR1230	KW10	-	-
			PR1025	PR1025	KW10	KW10		KW10			
			PR1225	PR1225				GW15			
			PR1230	PR660							
		Flexural resistance	PR660								
Milling		Finishing	TN100M								
			PR630				KPD230		KPD230		
			PR730	PR630			KPD001	PR630	KPD001		
			PR830	PR730	PR905	PR905	KPD010	PR730	KPD010		
			PR1025	PR830	PR1210	PR1210	CW12	PR830	KW10	-	-
			PR660	PR1025	KW10	KW10	KW10	PR1025	PR905		
			PR1225	PR660			GW25	PR660			
		Roughing	PR1230	PR1225							

• Colored material is first recommendation.

Material Feature List

Cermet

Symbol	Color	Main Component	Ratio	Base Material Hardness (HV)	Base Material Hardness (GPa)	Fracture Toughness ($MPam^{1/2}$)	Transverse Strength (MPa)
TN6010	Gray	TiCN	6.5	1,700	16.7	7.0	2,000
TN6020	Gray	TiCN	6.4	1,500	14.7	10.0	2,500
TN60	Gray	TiCN+NbC	6.6	1,600	15.7	9.0	1,760
TN90	Gray	TiCN+NbC	6.4	1,450	14.2	10.0	1,960
TN100M	Gray	TiCN+NbC	6.7	1,520	14.9	10.5	1,860
TC40	Gray	TiC+TiN	6.0	1,650	16.2	9.0	1,570
TC60	Gray	NbC	8.1	1,500	14.7	10.5	1,670

PVD Coated Cermet

Symbol	Color	Coating Composition	Coating Layer	Gravity	Base Material Hardness (HV)	Base Material Hardness (GPa)	Fracture Toughness ($MPam^{1/2}$)	Transverse Strength (MPa)
PV7005	Blackish red	MEGACOAT	Thin	6.0	1,650	16.2	8.5	1,470
PV7010	Blackish red	MEGACOAT	Thin	6.5	1,700	16.7	7.0	2,000
PV7020	Gold	TiAlN+TiN	Thin	6.4	1,500	14.7	10.0	2,500
PV60	Gold	TiN	Thin	6.6	1,600	15.7	9.0	1,760
PV90	Gold	TiN	Thin	6.4	1,450	14.2	10.0	1,960

CVD Coated Carbide

Symbol	Color	Coating Composition	Coating Layer	Gravity	Base Material Hardness (HV)	Base Material Hardness (GPa)	Fracture Toughness ($MPam^{1/2}$)	Transverse Strength (MPa)
CA2325	Gold	TiCN+Al_2O_3+TiN	Thin	13.7	1,450	14.2	12.0	2,250
CA4010	Gold	Columnar TiCN+Al_2O_3+TiN	Thick	14.8	1,670	16.4	10.0	3,000
CA4115	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick	14.7	1,550	15.2	12.0	2,750
CA4120	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick	14.7	1,550	15.2	12.0	2,750
CA4505	Black	Micro columnar TiCN+Al_2O_3	Thick	14.9	1,780	17.4	9.5	2,350
CA4515	Black	Micro columnar TiCN+Al_2O_3	Thick	14.9	1,570	15.4	12.0	2,780
CA5505	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick	14.7	1,730	17.0	10.0	2,540
CA5515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick	14.7	1,550	15.2	12.0	2,750
CA5525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick	14.5	1,400	13.7	12.0	2,780
CA5535	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick	14.1	1,340	13.1	16.5	2,970
CA6515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thin	14.7	1,530	15.0	12.0	2,780
CA6525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thin	14.7	1,580	13.5	16.0	3,100
CR9025	Gold	Columnar TiCN+TiN	Thick	14.5	1,400	13.7	12.0	2,780

PVD Coated Carbide

Symbol	Color	Coating Composition	Coating Layer	Gravity	Base Material Hardness (HV)	Base Material Hardness (GPa)	Fracture Toughness ($MPam^{1/2}$)	Transverse Strength (MPa)
PR630	Gold	TiN	Thin	12.5	1,500	14.7	11.0	2,160
PR660	Gold	TiN	Thin	13.7	1,450	14.2	12.0	2,250
PR730	Gold	TiAlN+TiN	Thin	13.7	1,450	14.2	12.0	2,250
PR830	Gold	TiAlN+TiN	Thin	13.7	1,450	14.2	12.0	2,250
PR905	Bluish purple	TiAlN	Thin	14.8	1,670	16.4	10.0	3,000
PR915	Bluish purple	TiAlN	Thin	14.1	1,700	16.7	11.0	4,140
PR930	Reddish gray	TiCN	Thin	14.1	1,700	16.7	11.0	4,140
PR1005	Reddish gray	TiCN	Thin	14.9	1,800	17.6	10.0	3,300
PR1025	Reddish gray	TiCN	Thin	14.5	1,600	15.8	13.0	3,400
PR1115	Purple red	TiAlN	Thin	14.7	1,700	17.2	11.0	3,000
PR1125	Purple red	TiAlN	Thin	14.5	1,600	15.8	13.0	3,400
PR1210	Blackish red	MEGACOAT	Thin	14.8	1,670	16.4	10.0	3,000
PR1225	Blackish red	MEGACOAT	Thin	14.5	1,600	15.8	13.0	3,400
PR1230	Blackish red	MEGACOAT	Thin	13.7	1,450	14.2	12.0	2,250

Carbide

Symbol	Color	Main Component	Gravity	Base Material Hardness (HV)	Base Material Hardness (GPa)	Fracture Toughness ($MPam^{1/2}$)	Transverse Strength (MPa)
KW10	Gray	WC+Co	15.0	1,650	16.2	10.0	1,470
GW15	Gray	WC+Co	14.7	1,700	17.2	11.0	3,000
GW25	Gray	WC+Co	14.5	1,600	15.8	13.0	3,400

PCD

PCD

Kyocera diamond material is a synthetic diamond sintered under high temperatures and pressures. PCD (Polycrystalline diamond) is ideal for non-ferrous metals and non-metals.

Advantages

- Long tool life due to extreme hardness
- Stable machining due to high thermal conductivity
- Capable of high cutting speeds which increases machining productivity
- Reduced edge build up allows for high precision machining
- Diversified applications for machining of non-ferrous metals and non-metals

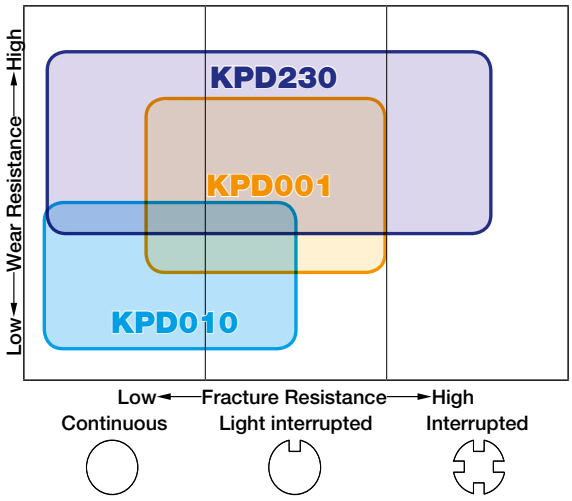
Features of PCD

Material	Symbol	Av. grain size (μm)	Advantages
N Non-ferrous metal	KPD001	0.5	• Super Micro-Grain PCD features cutting edge strength, wear resistance, chipping resistance, good edge-sharpening performance and long, stable tool life • High speed machining of aluminum alloy, brass and non-ferrous metals including carbide, ceramic, fiberglass, and plastics
	KPD010	10	• Universal grade well balanced for both wear resistance and grindability • High speed machining of aluminum alloy, brass and non-ferrous metals including carbide, ceramic, fiberglass, and plastics
	KPD230	2-30	• Superior wear and chipping resistance due to the high density, micro-grain mixed sintered diamond • High speed machining of aluminum alloy, brass and non-ferrous metals including carbide, ceramic, fiberglass, and plastics

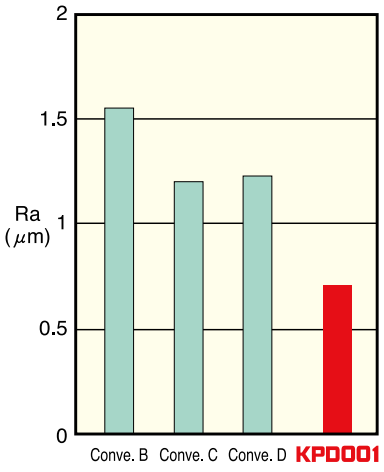
Application

Workpiece Material		Non-ferrous Material (Aluminum / Non-ferrous Metal / Non metal)				Hard-to-machine Material (Titanium Alloy / Ni Alloy)			
Cutting Range		Finishing ←			→ Roughing	Finishing ←			→ Roughing
Classification		N01	N10	N20	N30	S01	S10	S20	S30
Turning Milling	PCD	KPD001				KPD001			
		KPD010				KPD010			
		KPD230				KPD230			

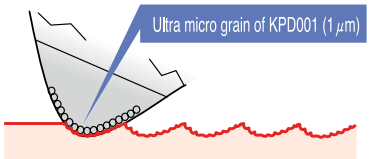
PCD Area Map



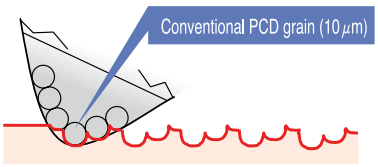
Finishing surface comparison in Aluminum machining



Excellent surface finish provided by the ultra micro grain KPD001



Surface finish of conventional PCD



(Grain size affects finishing surface quality)

CBN

CBN

Kyocera CBN is second only to diamond in hardness. CBN(Cubic Boron Nitride) is a synthetically produced material with high thermal conductivity providing stable machining.

Advantages

- Superior wear resistance when machining hardened materials
- Suitable for high speed machining of cast iron and heat treated steel
- High thermal conductivity provides stable machining

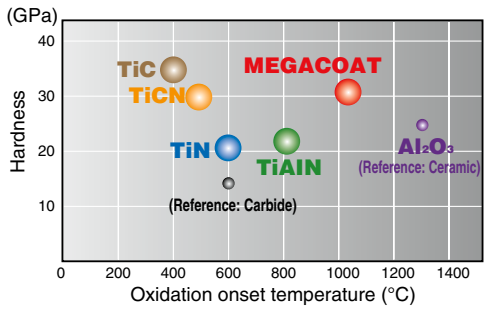
Features of CBN

Material	Symbol	Color	Av. grain size (μm)	CBN content (%)	Base Material Hardness (GPa)	Transverse Strength (MPa)	Advantages
H Hardened material	KBN510	Black	2	50	28	1,000	• Excellent wear resistanse and crack resistance • Application: Finishing and the continuous machining of hard die steel
	KBN525	Black	under 1	45	25	1,250	• Well balanced for both toughness and wear resistance from its micro grain CBN and heat resistant binder phase • Application: General grade for hardened alloy steel, high stability at high speed and high feed machining
	KBN05M (MEGACOAT)	Blackish red	0.5-1.5	55	27	1,000	• Highly heat resistant MEGACOATsubstrate • Application: High speed finishing of hard alloy steel
	KBN10M (MEGACOAT)	Blackish red	2	50	28	1,000	• Hard binder phase with MEGACOAT, superior anti-crater wear resistance • Application: High speed finishing of hardened die steel
	KBN25M (MEGACOAT)	Blackish red	under 1	45	25	1,250	• Heat resistant MEGACOAT on micro grain CBN with heat resistant binder phase • Application: Stable machining of hardened alloy steel at high speed
	KBN30M (MEGACOAT)	Blackish red	1-4	65	30	1,350	• Heat resistant MEGACOAT on tougher substrate • Application: Stable machining of hardened alloy steel for continuous to interrupted machining
Ferrous sintered alloy	KBN65B	Black	2	85	32	1,150	• Superior wear resistance due to excellent heat resistant binder phase • Application: For ferrous sintered alloy
	KBN65M (MEGACOAT)	Blackish red	2	85	32	1,150	• Heat resistant MEGACOAT on substrate with heat resistant binder phase • Application: Stable machining of ferrous sintered alloy
	KBN70M (MEGACOAT)	Blackish red	2-4	90	34	1,350	• Heat registant MEGACOAT on CBN rich substrate • Application: General machining of ferrous sintered alloy
K Cast Iron	KBN60M (MEGACOAT)	Blackish red	0.5-6	80	33	1,250	• Heat resistant MEGACOAT on CBN rich substrate with hard binder phase • Application: High speed finishing of gray cast iron
	KBN900 (TiN COAT)	Gold	9	90	31	1,050	• TiN coated solid CBN • Application: Heavy duty, interrupted and finishing operations of hardened steel and cast steel

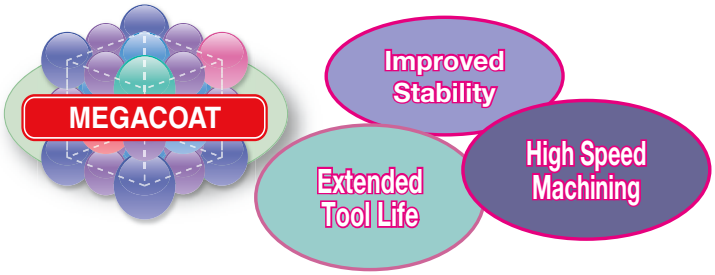
• [KBN35] Reference page A11

MEGACOAT CBN

Features of PVD coated layer

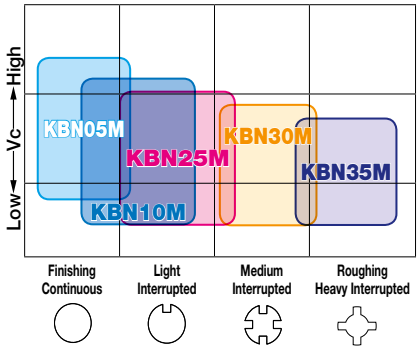


Features of MEGACOAT CBN

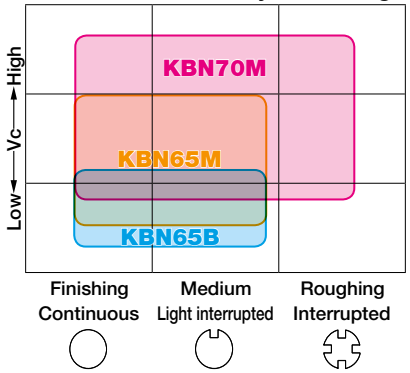


Material Application Map

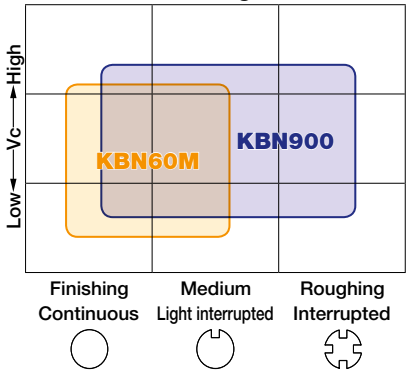
Hardened materials machining



Ferrous sintered alloy machining



Cast Iron Machining



Ceramic

Ceramic

Kyocera's ceramic inserts are capable of running at high speeds, thus reducing expensive machining times. Hard turning of 38Rc to 64Rc carbon and alloy steels or rough to finish turning of cast irons is recommended for ceramic inserts. Kyocera's ceramic grades are designed to resist oxidation and maintain hardness at elevated temperatures.

Advantages

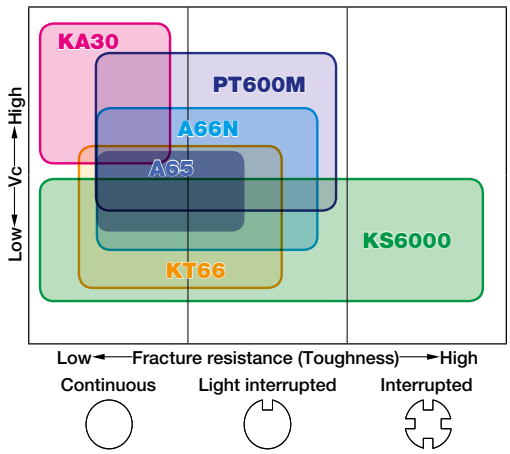
- Excellent wear resistance enables high cutting speeds
- Ceramic maintains good surface finished due to the low affinity to workpiece materials
- Ceramic grade KS6000 has improved thermal shock resistance allowing cast iron machining with coolant

Features of Ceramic

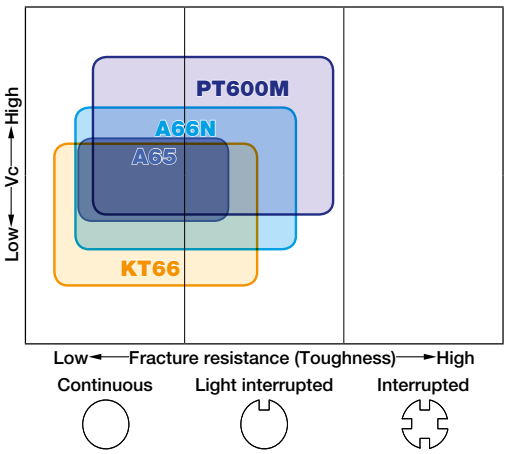
Material	Symbol	Color	Main Component	Coating layer hardness (GPa)	Base Material Hardness (GPa)	Fracture Toughness ($MPa \cdot m^{1/2}$)	Transverse Strength (MPa)	Advantages
K Cast Iron	KA30	White	Al_2O_3	-	17.5	4.0	750	• Aluminum Oxide Ceramic (Al_2O_3) • For finishing of cast iron at high cutting speeds without coolant
K Cast Iron	KS6000	Gray	Si_3N_4	-	15.7	6.5	1230	• Silicon Nitride Ceramic (Si_3N_4) • Designed for interrupted, high feed machining of cast iron (with or without coolant).
K Cast Iron	KT66	Black	Al_2O_3+TiC	-	20.1	4.1	980	• Aluminum Oxide and Titanium Carbide (Al_2O_3+TiC) • Application: Hardened material / Rolled steel machining
K Cast Iron	A65	Black	Al_2O+TiC_3	-	20.1	4.1	980	• Aluminum Oxide and Titanium Carbide (Al_2O_3+TiC) • Application: Semi-roughing to finishing of steel, cast iron and hardened materials
H Hardened material	A66N (TiN COAT)	Gold	Al_2O_3+TiC	20	20.1	4.1	980	• Aluminum Oxide and Titanium Carbide (Al_2O_3+TiC) + TiN Coated Ceramic • Application: PVD coated ceramics for hardened materials machining
H Hardened material	PT600M (MEGACOAT)	Blackish red	Al_2O_3+TiC	30	20.1	4.1	980	• Aluminum Oxide and Titanium Carbide (Al_2O_3+TiC) + MEGACOAT Coated Ceramic • Application: Hardened materials, rolled steel and cast iron machining

Ceramic Area Map

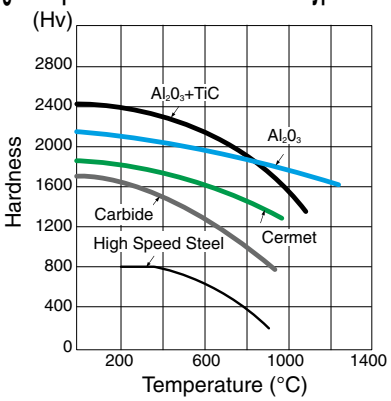
Cast iron Machining



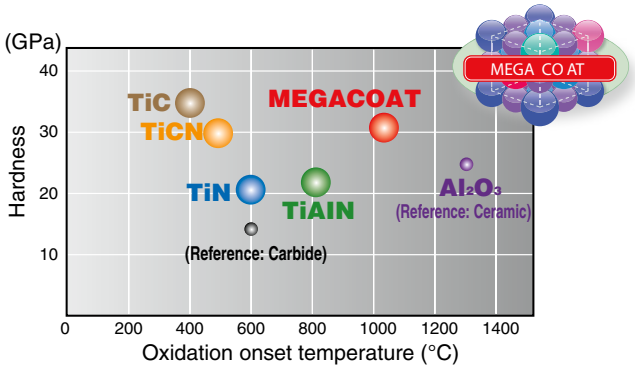
Hardened materials machining



High Temperature Hardness for various types of tool materials



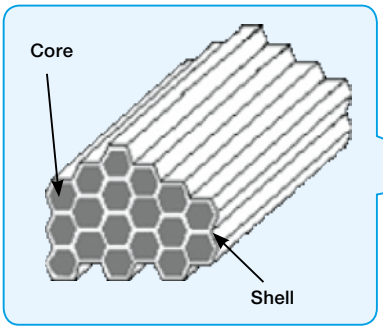
Features of PVD Coating

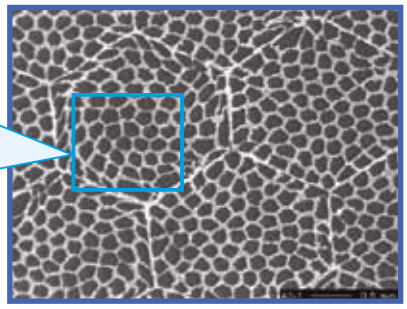


Cell Fiber

Cell Fiber

Continuing with Kyocera's long tradition of cutting edge ceramic technology, cell fiber ceramic combines toughness and wear resistance into one insert, similar to whisker reinforced ceramics. Cell fibers feature a hard, wear resistant ceramic core and a tough ceramic shell. The tough shell stops cracks that form in the core.





Advantages

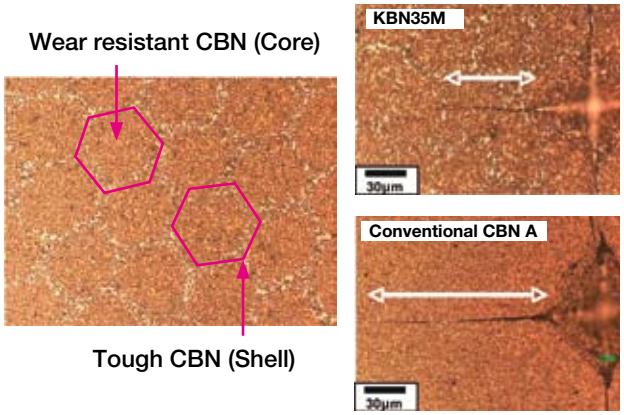
- Excellent performance in high temp alloys under 50 Rc
- Combats thermal shock created by coolant interruptions
- Improved resistance to notching

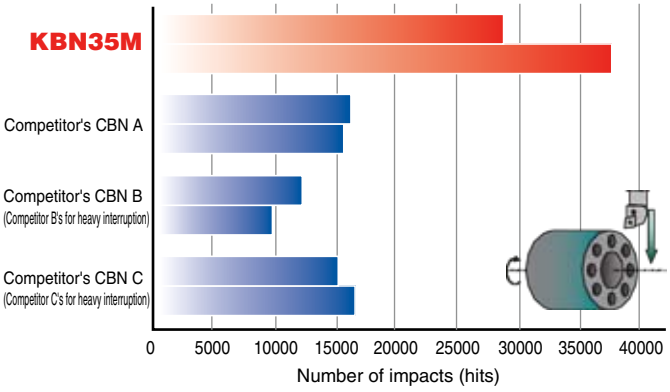
Features of Cell Fiber

Material	Symbol	Color	Main Component	Advantages
H Hardened material	KBN35M (MEGACOAT)	Blackish red	CBN	• Cell fiber composite material consisting of wear resistant CBN (core) and tough CBN (shell) • High oxidation resistant MEGACOAT on very tough cell fiber based substrate • Application: Stable machining of hardened alloy steel with interruption
S Heat resistant alloy	CF1	Gray	Ceramic	• Cell fiber composite material consisting of wear resistant ceramic (core) and tough ceramic (shell) • Application: Heat resistant alloys like inconel

KBN35M (MEGACOAT Cell Fiber CBN)

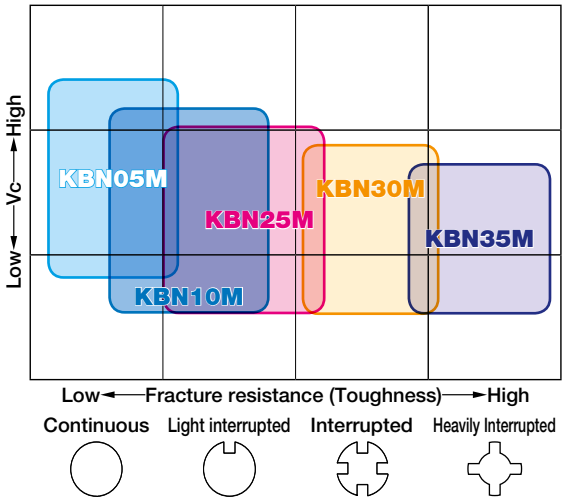
● Tough CBN (Shell) prevents crack propogation



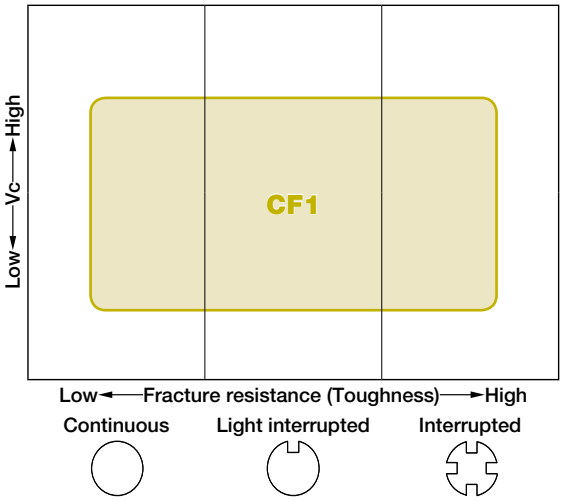


Material Application Map

● Hardened materials machining



● Heat resistant alloys machining



Cermet

Cermet

Kyocera is known as the leading manufacturer of cermets. Kyocera's cermet inserts come in a wide variety of grades and designs in order to satisfy demanding operations. Designed to provide long tool life and excellent surface finishes, cermets combine toughness with superior wear resistance.

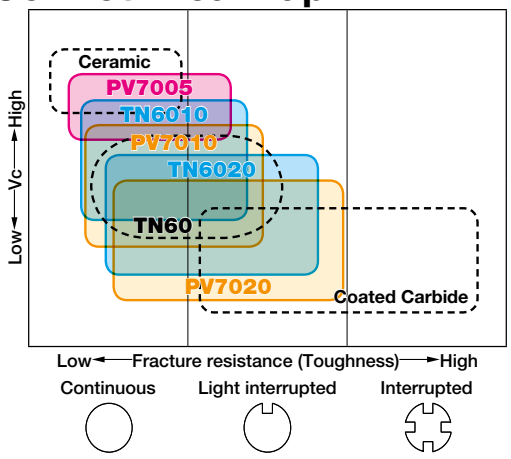
PVD Coated Cermet

PVD Cermet is coated with a thin layer with both high wear resistance and adhesion resistance. Because of the low processing temperature compared to CVD, PVD Coated Cermet features less layer deteriation and more bending strength.

Features of Cermet

Material	Symbol		Color	Main Component (Coated Composition)	Advantages
P Steel	Cermet	TN6010 (Super Micro-Grain)	Gray	TiCN	• Improved surface cermet which has both superior wear resistance and toughness • Application: Economical uncoated cermet for steel
		TN60	Gray	TiCN+NbC	• Standard cermet with superior wear resistance and toughness • Application: Machining of steel, stainless steel, cast iron and non-ferrous metal when excellent surface finish and close size control is required
		TN6020 (Super Micro-Grain)	Gray	TiCN	• Ultra micro grain cermet with high nitrogen content • Application: Standard cermet which has superior wear resistance and toughness
		TN100M	Gray	TiCN+NbC	• Tough cermet for milling applications with improved oxidation and thermal shock resistance • Application: Prevention of oxidational wear in high speed steel milling
		TC40	Gray	TiC+TiN	• Good balance of wear resistance and toughness • Application: Extended tool life in steel grooving and threading
	PVD	PV7010 (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	• MEGACOAT cermet, improved surface substrate with excellent wear resistance and toughness • Application: Stable and improved tool life in steel machining, excellent surface finish
		PV7020 (Super Micro-Grain)	Gold	TiCN (TiAlN+TiN)	• TiAlN base PVD-FS(fine surface) coating on ultra micro grain substrate • Application: Standard, well balanced PVD cermet for steel
K Cast Iron		PV7005	Blackish red	TiC+TiN (MEGACOAT)	• MEGACOAT Cermet with superior wear resistance • Application: Stable long tool life in finishing application of gray cast iron and nodular cast iron

Cermet Area Map



New Cermet Grades: PV7010,PV7005,TN6010

MEGACOAT Cermet

- Improved tool life and high speed capability due to its superior heat resistance and hardness
- Stability improvement by prevention of crater wear (oxidation, diffusional wear)
- High thermal stability and surface smoothness provide excellent surface finish

PV7010 : MEGACOAT for steel
PV7005 : MEGACOAT for cast iron

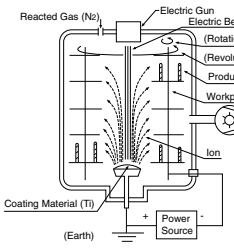
Improved Surface Cermet

- Achieves a balance between wear resistance and toughness
  (New cermet has hard surface and tougher innner phase)
- Economical uncoated cermet

TN6010 : Uncoated Cermet for Steel

PVD Coated Cermet

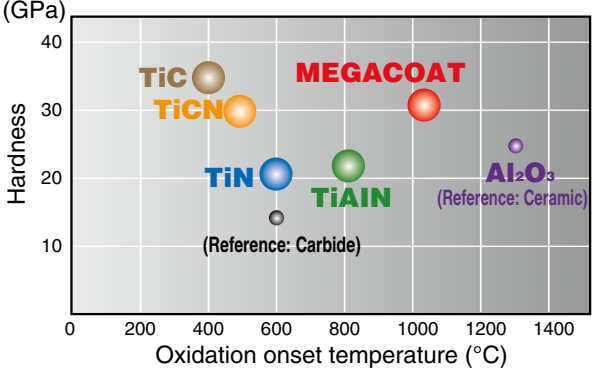
Physical Vapor Deposition



Features
1. No deterioration
2. No loss of Transverse Strength
3. Excellent Chipping resistance

Processing temperature 400～600°C

Features of PVD Coating



CVD Coated Carbide

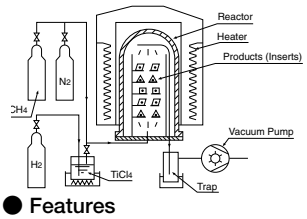
CVD Coated Carbide

Kyocera's CVD coated carbide grades use ceramic thin film coating technology and provide stable, efficient machining at high speeds or heavy interrupted applications.

Advantages

- Applicable to a wide variety of applications, from low to high speed machining and from finishing to roughing
- Stable machining is achieved due to the superior toughness and crack resistance
- Machining times are reduced due to good chip control from effective chipbreakers

Chemical Vapor Deposition



● Features

1. Equally deposited on face
2. Easy application for multi layer deposition
3. Enabling thick coating

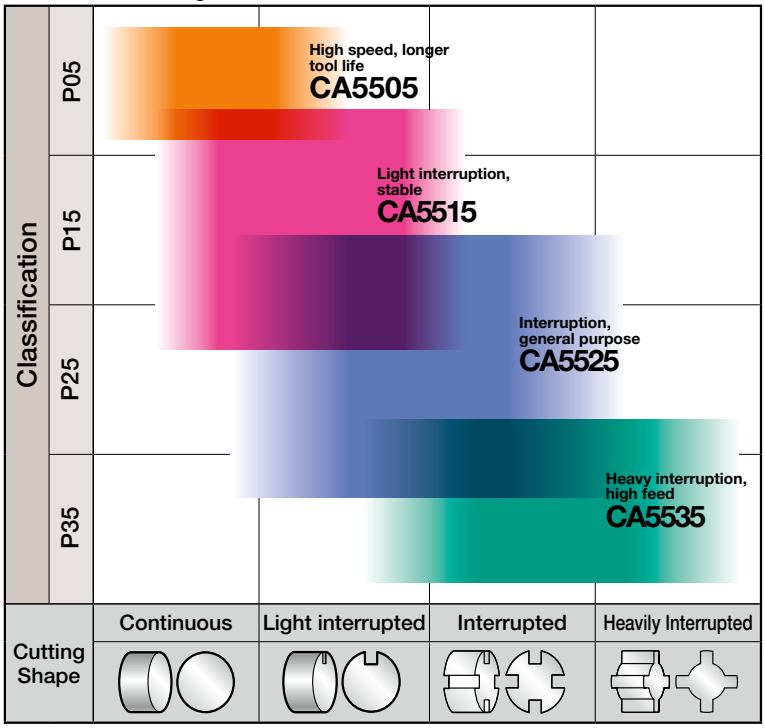
Processing temperature 900~1100°C

Features of CVD Coated Carbide

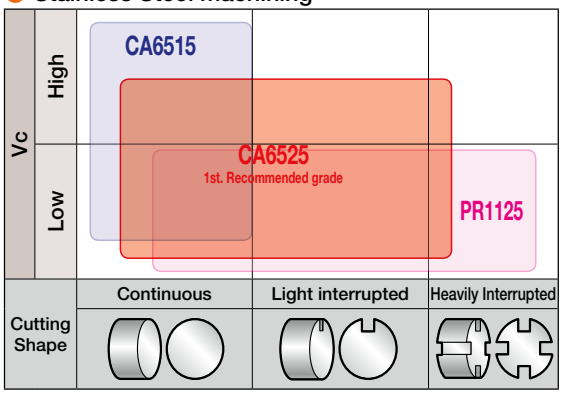
Material	Symbol	Color	Coated Composition	Advantages
P Steel	CA5505	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved toughness and wear resistance from its micro columnar structure, wear resistance oriented, longer tool life • Application: High speed continuous steel turning, continuous to light interruption of cast iron
	CA5515	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved wear resistance by its micro columnar structure, longer tool life • Application: First choice for continuous to light interrupted high speed cutting of steel
	CA5525	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved toughness and wear resistance by its micro columnar structure, wear resistance oriented, reliable machining • Application: First choice for interrupted and general cutting of steel
	CA5535	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved toughness by micro columnar structure and its high flexural toughness substrate • Application: For heavy duty and heavy interruption of steel
	CR9025	Gold	Columnar TiCN+TiN	• Improved toughness and stability due to its special substrate's superior anti plastic deformation performance • Application: Cut-off, grooving and multi-function machining of steel
M Stainless Steel	CA6515	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Special substrate, excellent wear resistance • Application: Continuous to light interrupted high speed cutting of stainless steel
	CA6525	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Special substrate, excellent notching resistance and toughness • Application: From continuous to roughing of stainless steel, general purpose
K Cast Iron	CA4010	Gold	Columnar TiCN+Al_2O_3+TiN	• Excellent high temperature stability from micro-grain thick film coating • Application: High speed machining of cast iron, from continuous to light interruption
	CA4505	Black	Micro columnar TiCN+Al_2O_3+TiN	• Suitable for high-speed and efficient cutting • Improved tool life through superior wear resistance
	CA4515	Black	Micro columnar TiCN+Al_2O_3+TiN	• First choice for stability • Wide application range for continuous to heavy interrupted cutting

Material Application Map

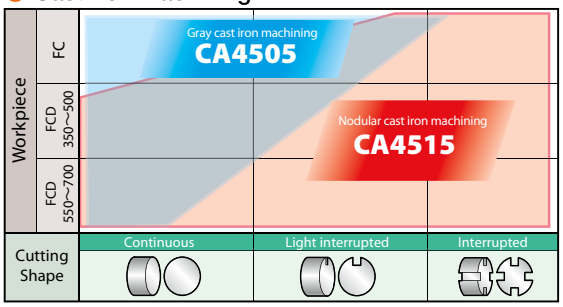
● Steel machining



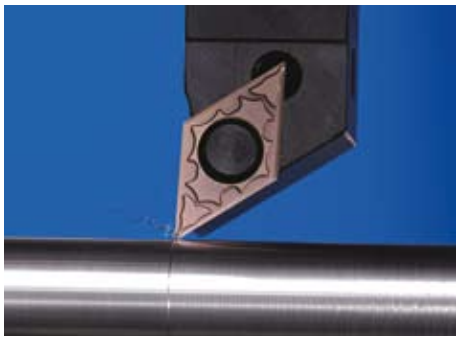
● Stainless Steel machining



● Cast Iron machining



PVD Coated Carbide for Turning



PVD Coated Carbide

Kyocera's PVD coated carbide grades are based on ceramic thin film technology and are good for milling, threading, grooving, and stainless steel cutting. Very tough carbide substrate and innovative coating technology promote excellent wear resistance and strong coating adhesion for long tool life and stable machining.

Advantages

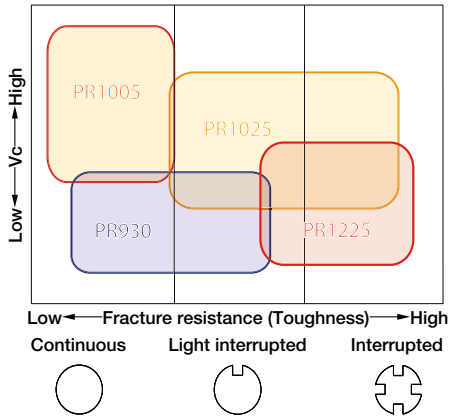
- Good for low to high speeds and finishing to heavy roughing machining
- Stable machining with excellent toughness
- Special coatings provide good surface finish and high precision machining

Features of PVD Coated Carbide

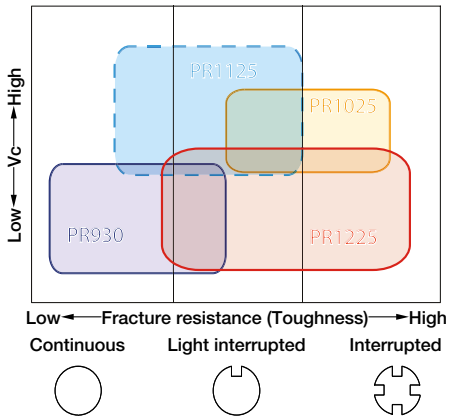
Material	Symbol	Color	Coated Composition	Advantages
P Steel	PR915 (Super Micro-Grain)	Bluish violet	TiAlN	• TiAlN based PVD coating on ultra micro grain carbide, superior wear resistance and anti-oxidation performance • Application: Stable and reliable high presicion machining of steel
	PR930 (Super Micro-Grain)	Reddish gray	TiCN	• Hard TiCN based PVD coating on ultra micro grain carbide • Application: Low cutting speed, precise machining with sharp cutting edge
	PR1005	Reddish gray	TiCN	• TiCN based PVD coating on hard micro grain carbide • Application: Turning of free cutting steel, long tool life achieved through anti-welding performance
	PR1025	Reddish gray	TiCN	• TiCN based PVD coating on micro grain carbide • Application: General purpose machining of steel and stainless steel, stable and long tool life
	PR1115	Purple red	TiAlN	• Hard TiAlN based PVD coating on ultra micro grain carbide • Application: Superior anti oxidation performance with well balanced wear resistance and toughness
M Stainless Steel	PR1125	Purple red	TiAlN	• Hard TiAlN based PVD coating on ultra micro grain carbide, superior toughness and heat resistance • Application : Finishing to interrupted machining of stainless steel
K Cast Iron	PR905	Bluish violet	TiAlN	• Smooth fine surface (FS) coating resistant to micro chipping • Application: Suitable for milling gray and nodular cast iron and turning high temperature alloys

Material Application Map

● Steel machining

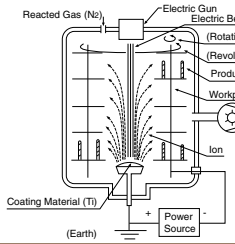


● Stainless steel / Hard-to-machine Material machining



PVD Coated Carbide

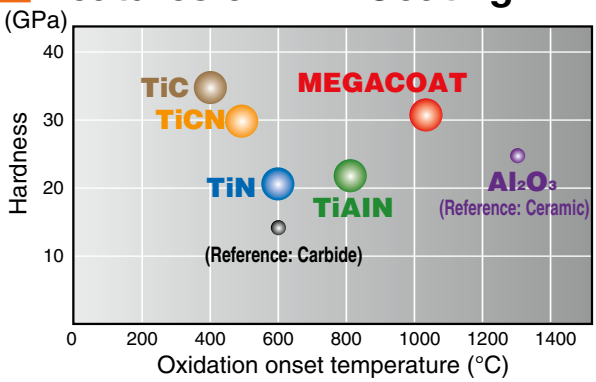
Physical Vapor Deposition



● Features
1. No deterioration
2. No loss of Transverse Strength

Processing temperature 400~600°C

Features of PVD Coating



PVD Coated Carbide for milling and drilling

PVD Coated Carbide

Kyocera's PVD coated carbide is coated on a carbide substrate using thin PVD technology. Because of the low process temperature it features superior tool strength, long tool life and stable machining for milling and drilling.

Features of PVD Coated Carbide

Material	Symbol	Color	Coated Composition	Advantages
P Steel	PR630	Gold	TiN	• High adhesion strength of TiN PVD coating layer • Application: Milling, threading, grooving of steel
	PR730	Gold	TiAlN+TiN	• Superior oxidation resistance with well balanced wear resistance and toughness • Application: Stable and long tool life at high speed machining of die steel and steel
	PR830	Gold	TiAlN+TiN	• Improved high temperature stability and wear resistance by TiAlN based FS (fine surface) PVD • Application: Stable and long tool life for milling die steel and steel
	PR1230	Blackish red	MEGACOAT	• Superior wear and oxidation resistant MEGACOAT on special tough carbide substrate • Application: General and high feed drilling of steel
M Stainless Steel	PR660	Gold	TiN	• Superior welding resistant TiN based PVD coating on special tough carbide substrate • Application: Covers a variety of workpieces such as steel, stainless steel and heat resistance casting steel
	PR1025	Reddish gray	TiCN	• Superior welding resistant TiCN based PVD coating on micro grain carbide substrate • Application: Stable and long tool life milling of stainless steel
	PR1225	Blackish red	MEGACOAT	• Superior wear and oxidation resistant MEGACOAT on micro grain carbide substrate • Application: General and high feed drilling of steel and stainless steel
K Cast Iron	PR905	Bluish violet	TiAlN	• TiAlN based PVD-FS(fine surface) coating on special carbide substrate for cast iron • Application: High efficient stable milling and drilling of gray cast iron and nodular cast iron
	PR1210	Blackish red	MEGACOAT	• Superior wear and oxidation resistant MEGACOAT on special carbide substrate for cast iron • Application: High efficient stable drilling of gray cast iron and nodular cast iron

Carbide

Carbide

Carbide is used for a variety of applications with its superior mechanical features. Kyocera produces a variety of carbides, including KW10 for non-ferrous metals and micro-grain carbides for precision machining.

Advantages

- Tough and hard
- Good thermal conductivity
- Suitable for machining non-ferrous metals and non-metals
- Stable machining at slow cutting speeds, including milling operations.

Features of Carbide

Material	Symbol	Color	Main Component	Advantages
N Non-ferrous metal	KW10	Gray	WC+Co	• Type K Carbide (K10 relevant) • Application: High wear resistance and anti-chipping performance for cast iron and non-ferrous metals
	GW15	Gray	WC+Co	• K grade carbide (equivalent to K10), excellent chipping resistant micro grain carbide • Application: Features stable wear resistance and chipping resistance for cast iron, non-ferrous metal and nonmetal
	GW25	Gray	WC+Co	• Type K Carbide (K30 relevant) • Application: High wear resistance and anti-chipping performance for milling operations in aluminum