

Insert Grades

A1~A21

Summary of Insert Grades

A2~A5

Turning	A2~A3
Small Tools	A3
Grooving / Cut-Off / Threading	A4
Drilling	A5
Milling	A5

Insert Grades

A6~A21

Cermet	A6
PVD Coated Cermet	A6
CVD Coated Carbide (Turning)	A8
PVD Coated Carbide (Turning)	A10
PVD / CVD Coated Carbide (Milling / Drilling)	A12
Carbide	A14
DLC Coated Carbide	A14
Ceramic	A15
CBN (Cubic Boron Nitride)	A16
PCD (Polycrystalline Diamond)	A17
Honeycomb structure CBN / Ceramic	A18
Insert Material Selection Table	A19
Grade Properties	A20

Summary of Insert Grades

A

Kyocera promotes research and development to help improve customers' productivity and profitability.

Kyocera provides high-quality inserts in various grades including Cermet, Coated Carbide, Coated Super Micro Grain Carbide, Carbide, Ceramic, PCD and CBN.

Turning

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN Series	TN610					TN610								
		TN6010					TN6010								
		TN620					TN620								
		TN6020					TN6020								
		TN60					TN60						TN60		
	TC Series	TN90					TN90								
		TC60M					TC60M								
	PV Series	PV7020					PV7020								
		PV90					PV90								
	MEGACOAT (PV Series)	PV7010					PV7010						PV7005		
Coated Carbide	CA Series	PV7025					PV7025								
		PV710					PV710								
		PV720					PV720								
		CA510										CA310			
		CA515					CA6515					CA315			
	PR Series	CA525					CA6525					CA320			
		CA530										CA4010			
		CA5505										CA4115			
		CA5515										CA4120			
		CA5525										CA4505			
Ceramic	PR Series	CA5535										CA4515			
		PR930					PR930								
		PR1005					PR1025								
		PR1025					PR1125								
		PR1115													
	MEGACOAT (PR Series)	PR1225					PR1225								
		PR1425					PR1425								
	MEGACOAT NANO (PR Series)	PR1535					PR1535								
Carbide	Ceramic											KA30			
												KT66			
												A66N			
												PT600M			
												KS6050			
	Carbide											CS7050			
												KW10			
												GW15			
CBN	CBN											KBN475			
												KBN60M			
												KBN900			
	CBN														



Turning

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Heat-resistant alloys / Ni-base heat-resistant alloys)				Hard Materials (Hardened steel / Chilled cast iron)				Sintered Steel			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	CA Series						CA6515										
	PR Series							CA6525									
	MEGACOAT (PR Series)						PR1305										
							PR1310										
							PR1325										
Coated Carbide	MEGACOAT HARD (PR Series)						PR005S										
							PR015S										
Coated Carbide	MEGACOAT NANO (PR Series)							PR1535									
Cermet														TN6010			
														TN60			
Ceramic							CF1			KT66							
							KS6030			A66N							
							KS6040			PT600M							
CBN										KBN510							
										KBN525							
										KBN900							
Coated Carbide	MEGACOAT									KBN05M							
										KBN10M							
										KBN25M							
										KBN30M							
										KBN35M							
														KBN65M			
														KBN70M			
														KBN570			

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)				Sintered Steel			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	MEGACOAT NANO (PR Series)							PR1535									
Coated Carbide	Carbide						SW05										
							SW10										
							SW25										
Coated Carbide	DLC Coated Carbide		KW10				KW10										
			GW15				GW15										
Coated Carbide	PCD		PDL025														
			KPD001				KPD001										
			KPD010				KPD010										
			KPD230														
Coated Carbide			KPD250														

PVD Coated Carbide for Small Tools

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated Carbide	PR Series		PR930					PR930							
			PR1005					PR1025							
			PR1025					PR1125							
			PR1115					PR1115							
			PR1225					PR1225							
Coated Carbide	MEGACOAT (PR Series)		PR1225					PR1225							
			PR1535					PR1535							
Coated Carbide	MEGACOAT NANO (PR Series)		PR1425					PR1425							

Summary of Insert Grades

A

Grooving / Cut-Off / Threading

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	MEGACOAT (PV Series)	PV7040										PV7040			
	TN Series	TN620					TN620								
		TN6020					TN6020								
		TN60					TN60					TN60			
Coated Carbide	TC Series	TC40N										TC40N			
		TC60M					TC60M								
	CR Series	CR9025					CR9025								
	PR Series	PR630					PR630								
		PR660					PR660								
		PR915					PR915					PR905			
		PR930					PR930								
		PR1025					PR1025								
		PR1115													
	MEGACOAT (PR Series)	PR1215					PR1215					PR1215			
		PR1225					PR1225								
	MEGACOAT NANO (PR Series)	PR1535					PR1535								
Ceramic												A65 A66N PT600M			
Carbide												KW10 GW15			

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast Iron)				Sintered Steel			
Cutting Range		Finishing  Roughing				Finishing  Roughing				Finishing  Roughing				Finishing  Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	MEGACOAT (PR Series)														PR1215 PR1225		
	Cermet													TN60			
	Ceramic									A65 A66N PT600M							
	Carbide	KW10 GW15				KW10 GW15											
	DLC Coated Carbide	PDL025															
	CBN									KBN510 KBN525					KBN570		
	PCD	KPD001 KPD010				KPD001 KPD010											



Drilling

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated Carbide	CA Series			CA520D					CA6535			CA415D			
	PR Series				PR660				PR660						
				PR830					PR830						
	MEGACOAT (PR Series)			PR1225					PR1225			PR1210			
				PR1230											
Coated Carbide	MEGACOAT NANO (PR Series)			PR1535					PR1535						
Carbide												KW10			
												GW15			

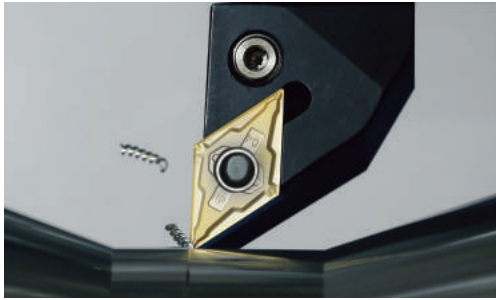
Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	MEGACOAT (PR Series)										PR1230		
Coated Carbide			KW10				KW10						
			GW15				GW15						
Carbide													

Milling

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN Series			TN620M				TN60							
				TN60				TN100M							
				TN100M											
Coated Carbide	TC Series			TC60M				TC60M							
	CA Series							CA6535				CA420M			
	PR Series			PR830				PR830							
	MEGACOAT (PR Series)			PR1225				PR1225				PR1210			
				PR1230											
Coated Carbide	MEGACOAT NANO (PR Series)			PR1525				PR1525				PR1510			
								PR1535							
Carbide												KW10			
												GW25			

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Heat-resistant alloys / Ni-base heat-resistant alloys)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	CA Series							CA6535				CA6535					
	MEGACOAT (PR Series)											PR1210					
	MEGACOAT NANO (PR Series)							PR1535				PR1535					
Coated Carbide			KW10									KW10					
			GW25									GW25					
DLC Coated Carbide			PDL025														
CBN																	
PCD			KPD001									KPD001					
			KPD010									KPD010					
			KPD230														
			KPD250														

Cermet



Cermet

KYOCERA is known as one of the leading manufacturer of cermets. Cermets combine toughness with superior wear resistance, and provide longer tool life and excellent surface finishes. Typical materials used in cermets are TiC, TiN, TiCN and NbC.

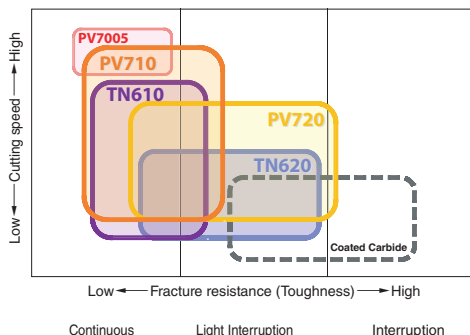
PVD Coated Cermet (MEGACOAT / MEGACOAT NANO Cermet)

PVD Coated Cermet is coated on cermet substrate with a thin layer of high wear resistance and high adhesion resistance by PVD (Physical Vapor Deposition) technology. Generally because of the low processing temperature of PVD compared with CVD, PVD coated cermet features less deterioration and more bending strength.

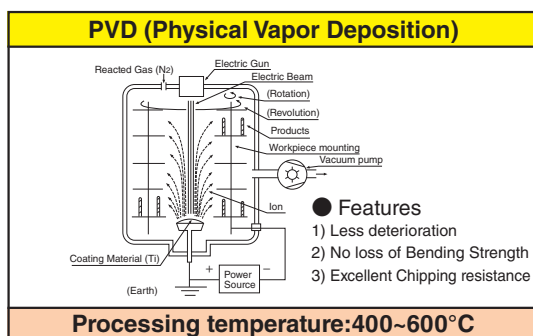
Features of Cermet and PVD Coated Cermet

Classification	Symbol	Color	Main Component (Coated Composition)	Advantages and Applications		
PSteel	Cermet	TN610	Gray	TiCN	· High wear resistant cermet due to three types of special reinforcement technology · Application: Cermet for steel machining, long tool life in high speed and continuous	
		TN620	Gray	TiCN	· Three types of special reinforcement technology realized the superior fracture resistance and wear resistance · Application: Stable machining of steel	
		TN6010 (Super Micro-Grain)	Gray	TiCN	· Application: Uncoated cermet for steel	
		TN60	Gray	TiCN+NbC	· Application: Machining of steel, continuous to interruption	
		TN6020 (Super Micro-Grain)	Gray	TiCN	· Application: Uncoated cermet for steel	
		TN620M	Gray	TiCN	· Tough cermet for milling with excellent balance of wear resistance and toughness	
		TN100M	Gray	TiCN+NbC	· Tough cermet with improved oxidation resistance and thermal shock resistance · Application: Milling of steel at high speed	
		TC40N	Gray	TiC+TiN	· Good balance of wear resistance and toughness · Application: Grooving and threading of steel	
	MEGACOAT NANO Cermet	PV710	Gold	TiCN (MEGACOAT NANO)	· Superior wear and adhesion resistant MEGACOAT NANO on the high wear resistant cermet · Application: Long tool life and stability in high speed continuous machining of steel, excellent surface	
		PV720	Gold	TiCN (MEGACOAT NANO)	· Superior wear and adhesion resistant MEGACOAT NANO on the special reinforcement cermet · Application: First choice PVD coated cermet for steel machining, high efficient machining and high quality surface finish	
		MEGACOAT Cermet	PV7010 (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	· Application: Long tool life in steel machining
			PV7025 (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	· Application: PVD coated cermet for steel machining
			PV7040	Blackish red	TiC+TiN (MEGACOAT)	· MEGACOAT Cermet for Grooving · Application: Excellent surface finish and longer tool life in steel grooving
			PV7005	Blackish red	TiC+TiN (MEGACOAT)	· Heat-resistant MEGACOAT on cermet with excellent wear resistance · Application: High speed finishing of gray and nodular cast iron
KCast Iron						

Application Map



PVD Coating



TN Series

(Uncoated Cermet)

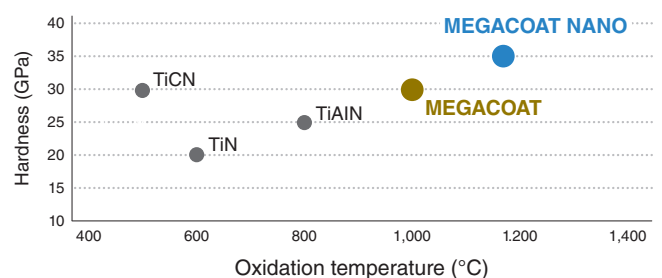
TN610 : Superior wear resistant cermet
TN620 : Superior fracture and wear resistance

PV Series

(MEGACOAT NANO Cermet)

PV710 : Long tool life and stable machining of steel at high speed and continuous
PV720 : High efficiency and excellent surface finish (1st choice)

Properties of PVD Coating



Low Oxidation resistance High

TN610 / TN620 PV710 / PV720

Three types of special reinforcement technology (Hybrid Technology) realized the superior surface finish and stability

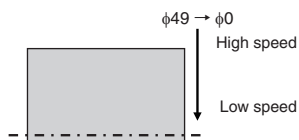
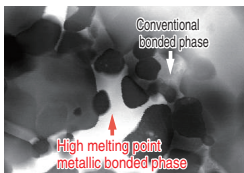


1 Excellent surface finish

Combining the conventional cermet bonded phase (nickel, cobalt) and the special high melting point metallic bonded phase

Minimizing softening bonded phase at cutting and high deposition resistance and excellent finishing surface quality

Special reinforcement technology 1
High melting point
“hybrid bonded phase”

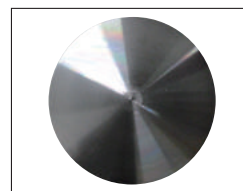


Surface finish comparison
(Internal evaluation)

Cutting Conditions: $V_c=180 \sim 0$ m/min (Constant rate), $a_p = 0.5$ mm
 $f = 0.1$ mm/rev, Wet, CNMG120404 type Workpiece Material: S10C

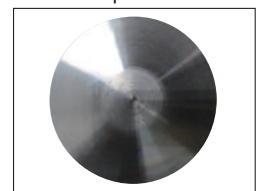
Surface Finish

PV720



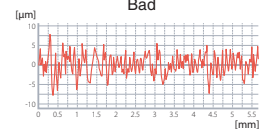
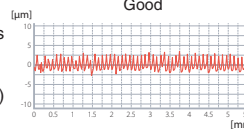
Good

Competitor A



Bad

Surface Roughness
($\phi 4 \sim \phi 15$)
($V_c = 15 \sim 55$ m/min)



2 Excellent fracture resistance

Improved strength by uniform micro grain hard phase and superior compressive stress by high melting point bonded phase. Fracture resistance improved

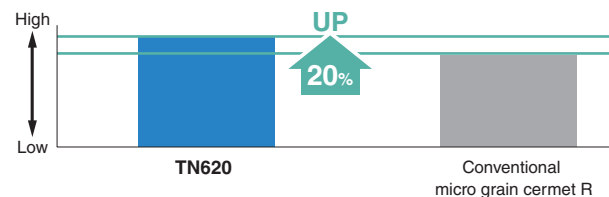
Special reinforcement technology 2 Micro grain “hybrid hard phase”

TN620 structure



Inner structure

Compressive residual stress in hard phase (Internal evaluation)



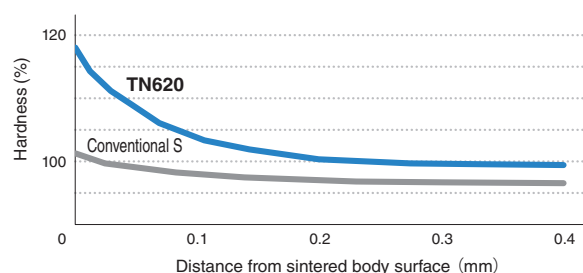
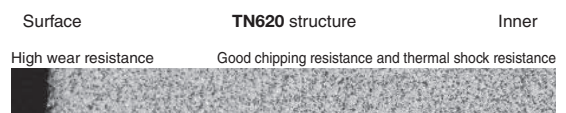
3 Excellent wear resistance

Excellent fracture resistance with the surface-hardened layer using the gradient composition technology

Good balance of stable wear resistance and fracture resistance

TN620's inner structure has high toughness and chipping resistance as well as thermal shock resistance. Surface area has higher hardness and wear resistance compared to the conventional micro grain cermet S. (see attached chart)
(Internal evaluation)

Special reinforcement technology 3 Special Surface-Hardened “Hybrid Structure”



CVD Coated Carbide (Turning)



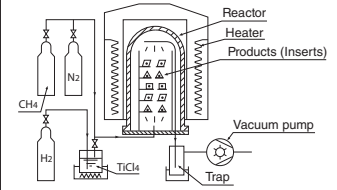
CVD Coated Carbide

Using Chemical Vapor Deposition coating technology, CVD coated carbide grades provide stable, efficient machining at high speeds or for heavy interrupted applications.

Features

- Applicable from low to high speed machining and from finishing to roughing
- Stable machining is achieved due to the superior toughness and crack resistance
- Cutting times are reduced due to good chip control from effective chipbreakers

CVD (Chemical Vapor Deposition)



● Features

- 1) Equally deposited on face
- 2) Easy application for multilayer deposition
- 3) Enabling thick coating

Processing temperature: 900~1100°C

Features of CVD Coated Carbide

Classification	Symbol	Color	Coated Composition	Advantages and Applications
P Steel	CA510	Gold	TiCN+Al ₂ O ₃ +TiN	· Special substrate with thermal deformation resistance along with a thick and tough coating layer providing high wear resistance · Application: High speed and high efficiency steel machining
	CA515	Gold	TiCN+Al ₂ O ₃ +TiN	· Improved wear resistance and stability due to special substrate with heat deformation resistance and hard and tough coating layer with reinforced interface · Application: Light interrupted machining of steel
	CA525	Gold	TiCN+Al ₂ O ₃ +TiN	· Stable and long tool life machining due to special substrate with heat deformation resistance and tougher coating layer and reinforced interface · Application: Interrupted to general machining of steel
	CA530	Gold	TiCN+Al ₂ O ₃ +TiN	· Special tough substrate and tough coating layer providing high stability and wear resistance · Application: General to heavy interrupted machining (stability oriented)
	CA5505	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: High speed continuous machining of steel, continuous to light interrupted machining of cast iron
	CA5515	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: Machining of steel, continuous to light interruption
	CA5525	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: For general machining of steel, roughing to interruption
	CA5535	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: Roughing to heavy interrupted machining of steel
	CR9025	Gold	TiCN+TiN	· Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance · Application: Cut-off, grooving and multi-function machining of steel
M Stainless steel	CA6515	Gold	TiCN+Al ₂ O ₃ +TiN	· Specialized carbide substrate for machining stainless steel, excellent wear resistance · Application: Continuous machining of stainless steel
	CA6525	Gold	TiCN+Al ₂ O ₃ +TiN	· Specialized carbide substrate for machining stainless steel, excellent notching resistance and toughness · Application: First choice for general machining of stainless steel, from finishing to roughing, continuous to interruption
K Cast Iron	CA310	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	· Grade for high-speed continuous machining and improved tool life through the deposition of a thickened Al₂O₃ coating layer · Application: For finishing to roughing of gray cast iron
	CA315	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	· High efficiency and long tool life · For continuous to interrupted machining with a good balance of wear resistance and stability · Excellent performance for machining gray and nodular cast iron · For machining of nodular cast iron
	CA320	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	· Improved stability with CVD layer structure with high adhesion · Application: Heavily interrupted or High-speed machining for Nodular Cast Iron. 1 st Recommendation for the FCD500 or higher application
	CA4010	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: Continuous to light interrupted high speed machining of cast iron
	CA4115	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: Continuous to light interrupted machining of nodular cast iron
	CA4120	Gold	TiCN+Al ₂ O ₃ +TiN	· Application: Roughing to heavy interrupted machining of nodular cast iron
	CA4505	Blackish gray	TiCN+Al ₂ O ₃	· Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer · Application: For gray cast iron and nodular cast iron at high speed in continuous to light interrupted machining
	CA4515	Blackish gray	TiCN+Al ₂ O ₃	· Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer · Application: First choice for gray cast iron and nodular cast iron in light to heavy interrupted machining

CA3 Series



A



Insert Grades

1 Improved coating adhesion provides stable machining

Strong Intra-coating Adhesion

Micro Intra-coating Structure

Higher adhesion by increasing bonding surface with Al_2O_3 layer

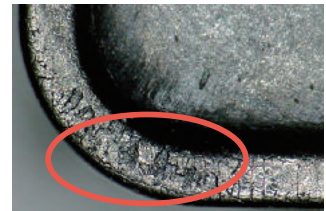
Impact-Resistant Intra-coating Structure

Interface strength is increased by 20% (compared to our products), which resists boundary destruction

Rake Face Condition (Internal evaluation)



CA3 Series (CA315)



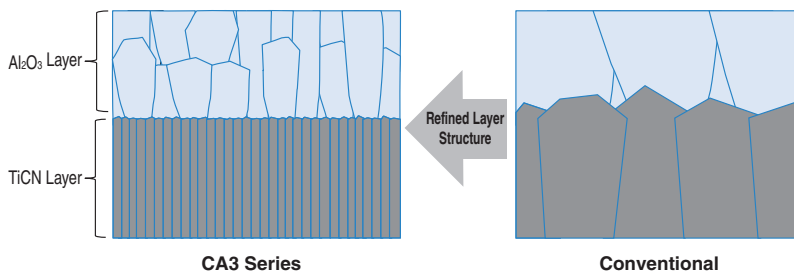
Competitor A

Cutting Conditions: $V_c = 150$ m/min, $a_p = 1.5$ mm

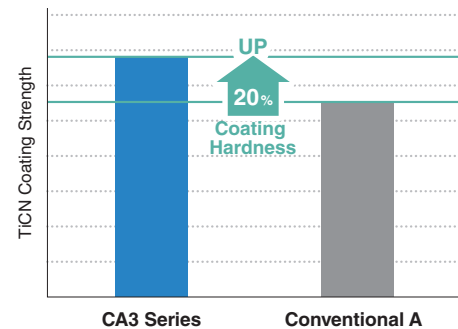
$f = 0.3$ mm/rev, Wet, CNMG120412 type, Facing, After Withstanding 3,000 Impacts
Workpiece Material: FCD700 (8 Grooves in Workpiece)

2 Micro TiCN Coating Provides Excellent Wear Resistance

Refined Layer Structure (Pattern diagram)

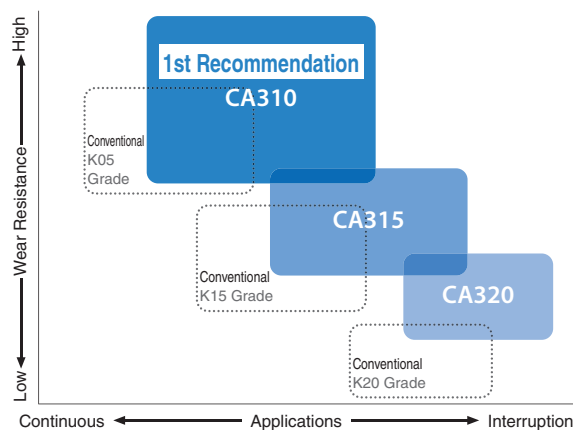


Coating Hardness Comparison (Internal evaluation)

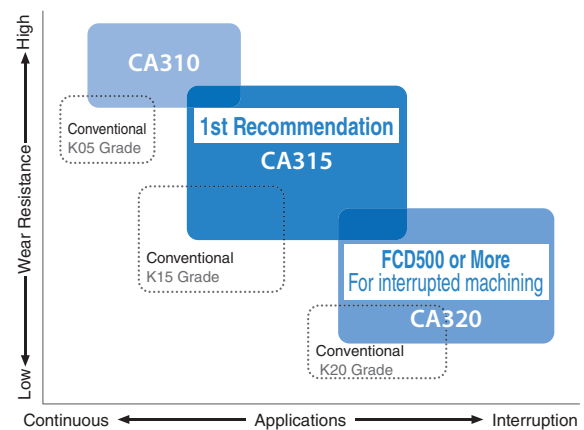


3 Unique Insert Grades For Various Cast Iron Machining Applications

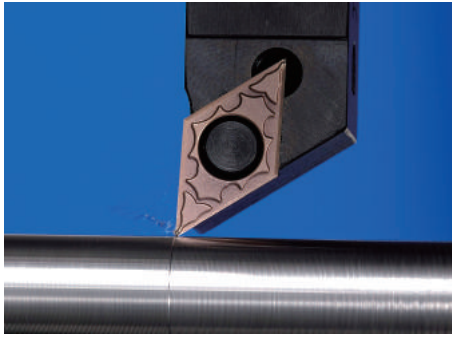
Gray Cast Iron 1st Recommendation CA310



Nodular Cast Iron 1st Recommendation CA315



PVD Coated Carbide (Turning)



PVD Coated Carbide

Using a Physical Vapor Deposition coating technology, Generally because of the low processing temperature of PVD compared with CVD, PVD coated carbide features less deterioration and more bending strength. PVD coated carbide grades are coated on a very tough carbide substrate and suitable for turning.

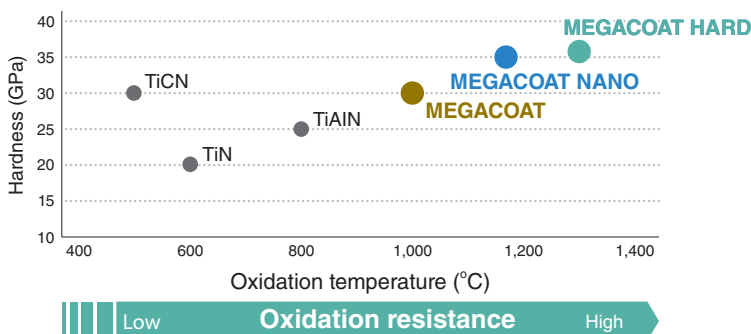
PVD Coated Super Micro-Grain Carbide

- Smooth fine surface of PVD coated carbide provides good surface finish and high precision machining
- Stable machining with excellent toughness

Features of PVD Coated Carbide

Classification	Symbol	Color	Coated Composition	Advantages and Applications
P Steel	PR915 (Super Micro-Grain)	Bluish violet	TiAlN	· Application: Stable and reliable high precision machining of steel
	PR930 (Super Micro-Grain)	Reddish gray	TiCN	· Application: Low machining speed, precise machining with sharp edge
	PR1005	Reddish gray	TiCN	· TiCN base PVD coated hard micro-grain carbide · Application: Turning of free-cutting steel, longer tool life achieved through anti-adhesion performance
	PR1025	Reddish gray	TiCN	· Application: General machining of steel and stainless steel, stable and longer tool life
	PR1115	Purple red	TiAlN	· Superior oxidation resistance with well balanced wear resistance and toughness · Application: Machining of steel and stainless steel, for grooving, cut-off and threading
	PR1215	Blackish red	MEGACOAT	· Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate · Application: Superior adhesion resistance and longer tool life for steel and stainless steel machining
	PR1425	Blackish red	MEGACOAT NANO	· New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance · Application: Various applications of machining steel, High speed machining of stainless steel, extended tool life
M Stainless steel	PR1125	Purple red	TiAlN	· Hard TiAlN base PVD coated super micro-grain carbide, superior toughness and heat resistance · Application: Finishing and light interrupted machining of stainless steel
	PR1225	Blackish red	MEGACOAT	· Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate · Application: Light interrupted to interrupted machining of stainless steel
	PR1515	Reddish green	MEGACOAT NANO	· Nano thin multi-layer coating [MEGACOAT NANO] on micro-grain carbide substrate improved wear resistance and stability · Application: Threading of stainless steel
	PR1535	Reddish green	MEGACOAT NANO	· Nano thin multi-layer coating [MEGACOAT NANO] improved wear resistance and stability · Application: Medium to roughing of stainless steel and heat-resistant alloys, cut-off of stainless steel
K Cast Iron	PR905	Bluish violet	TiAlN	· Smooth fine surface PVD coated hard carbide with plastic deformation resistance · Application: Suitable for machining gray and nodular cast iron
S Heat-resistant alloys	PR005S	Blackish gray	MEGACOAT HARD	· Superior high temperature properties of special carbide substrate and excellent heat-resistance of MEGACOAT HARD enables high wear resistance · Application: Finishing and high speed application of heat-resistant alloys
	PR015S	Blackish gray	MEGACOAT HARD	· Superior high temperature properties of special carbide substrate and MEGACOAT HARD improved heat-resistance and stability · Application: Recommended for continuous to light interruption machinings and finishing of heat-resistant alloys
	PR1305	Blackish red	MEGACOAT	· MEGACOAT on hard and superior heat-resistant carbide, superior wear resistance · Application: Finishing of heat-resistant alloys
	PR1310	Blackish red	MEGACOAT	· MEGACOAT on hard and superior heat-resistant carbide, superior wear and oxidation resistance · Application: First choice for continuous and light interrupted machining and finishing of heat-resistant alloys
	PR1325	Blackish red	MEGACOAT	· MEGACOAT on tough carbide · Application: Light interrupted machining and roughing of heat-resistant alloys

Properties of PVD Coating





Application Map

• Steel

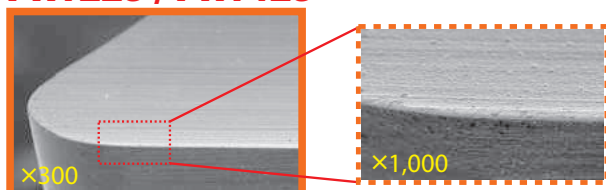
High [Vc=150~200m/min]	PR1425		
Medium [Vc=75~150m/min]		PR1225	
Low [Vc=75m/min and under]	PR930		PR1535
Applications	Continuous 	Light Interruption 	Heavy interruption

• Stainless steel

High [Vc=125m/min~]	PR1425	PR1225	
Medium [Vc=50~125m/min]			
Low [Vc=50m/min and under]	PR930		PR1535
Applications	Continuous 	Light Interruption 	Heavy interruption

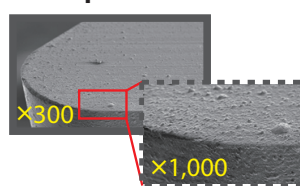
● Cutting edge quality (Sharp edge insert)

PR1225 / PR1425



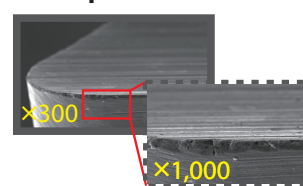
<Superior edge-sharpening performance and Smooth surface>

Competitor A



<Delamination (coating peeling) and rough surface>

Competitor B



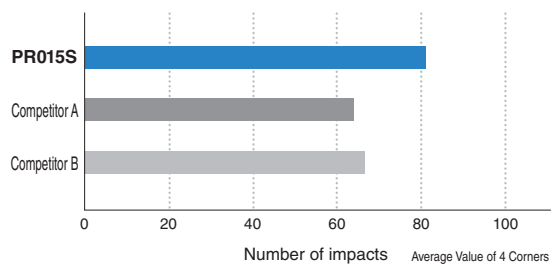
MEGACOAT Series (PR1225 / PR1425) shows high edge sharpening performance and adhesion resistance.

(Internal evaluation)

Features of PR005S / PR015S

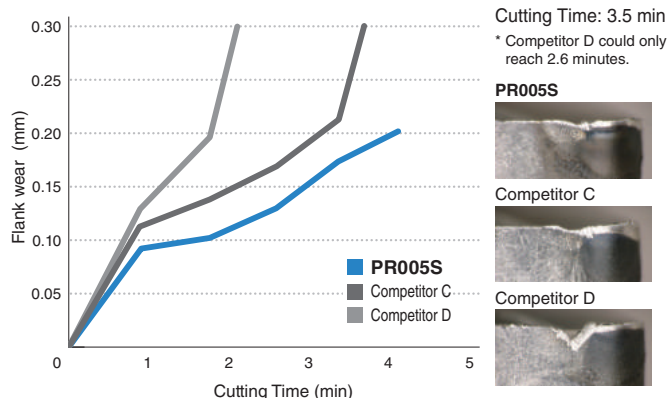
- Improved thermal properties help to reduce sudden fracture and decrease edge wear
Improved thermal conductivity by optimum distribution of WC coarse grains
Resists heat concentration at the cutting edge to promote stable machining
- Improved wear resistance with MEGACOAT HARD coating
Excellent wear resistance with high-hardness and resists boundary damage with improved thermal properties

Fracture Resistance Comparison (Internal evaluation)



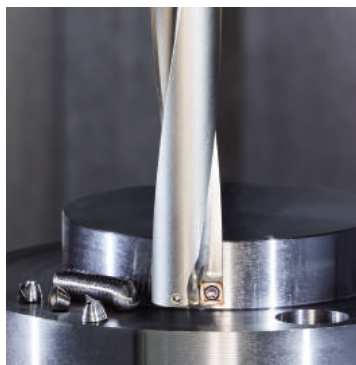
Cutting Conditions: Vc = 25m/min, ap = 1.0 mm, f = 0.10 mm/rev, Wet, CNMG120408 type Workpiece Material: Nickel-based Superalloy Cylindrical Workpiece with 1 Flat Face

Wear Resistance Comparison (Internal evaluation)



Cutting Conditions: Vc = 60 m/min, ap = 1.0 mm, f = 0.20 mm/rev, Wet, CNMG120408 type Workpiece Material: Nickel-based Superalloy

PVD / CVD Coated Carbide (Milling / Drilling)



PVD Coated Carbide (MEGACOAT / MEGACOAT NANO)

PVD coated carbide grades for milling and drilling are coated on a very tough carbide substrate. Because of the low processing temperature of PVD compared with CVD, it features less deterioration and more bending strength.

CVD Coated Carbide

CVD coated carbide grades provide stable, efficient machining at high speeds or for heavy interrupted applications. Ti-base (TiN, TiCN) coating with superior hardness and wear resistance or ceramic-base (Al_2O_3) coating with high-thermal stability is applied on a tough carbide substrate. Superior fracture resistance and wear resistance.

Features of CVD / PVD Coated Carbide

Classification	Symbol	Color	Coated Composition	Advantages and Applications
P Steel	PR830	Gold	TiAlN+TiN	- Improved high temperature stability and wear resistance by TiAlN base PVD coating - Application: Milling of steel
	PR1230	Blackish red	MEGACOAT	- Superior wear and oxidation-resistant MEGACOAT on a special tough carbide substrate - Application: Stable and high feed milling and drilling of steel
	PR1525	Reddish green	MEGACOAT NANO	- New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance - Application: Stable and longer tool life for milling of steel and stainless steel
	CA520D	Gold	TiCN+ Al_2O_3 +TiN	- Combination of High toughness substrate, Coating crystal control technology and advanced layer adhesion coating allow both wear and fracture resistance - Application: 1st Recommendation for drilling of steel (at high speed application)
M Stainless steel	PR1225	Blackish red	MEGACOAT	- Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate - Application: General machining and high feed milling and drilling of steel and stainless steel
K Cast Iron	PR1210	Blackish red	MEGACOAT	- Superior wear and oxidation-resistant MEGACOAT coated on special carbide substrate - Application: Highly efficient stable milling and drilling of gray and nodular cast iron
	PR1510	Reddish green	MEGACOAT NANO	- New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance - Application: Highly fracture resistance and wear resistance for gray and nodular cast iron
	CA415D	Gold	TiCN+ Al_2O_3 +TiN	- Special carbide substrate for cast iron, coating crystal control technology and advanced layer adhesion coating enable superior wear resistance - Application: 1st Recommendation for drilling cast iron (at high speed application)
	CA420M	Gold	TiCN+ Al_2O_3 +TiN (CVD)	- Kyocera's unique crystal control technology and advanced layer adhesion CVD coating with superior wear resistance and toughness - Application: Milling of gray and nodular cast iron
S Heat-resistant Alloys Titanium Alloys	PR1535	Reddish green	MEGACOAT NANO	- Nano thin multi-layer coating [MEGACOAT NANO] improved wear resistance and stability - Application: For milling of Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel
S Heat-resistant alloys	CA6535	Gold	TiCN+ Al_2O_3 +TiN (CVD)	- High heat-resistance and wear resistance with CVD coating - Application: For milling of Ni-base heat-resistant alloys and martensitic stainless steel



●New grade for heat-resistant alloys and difficult-to-cut materials



CA6535 (CVD) For martensitic stainless steel and Ni-base heat-resistant alloys

PR1535 (PVD) For Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel

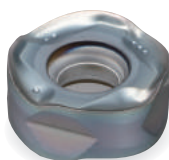
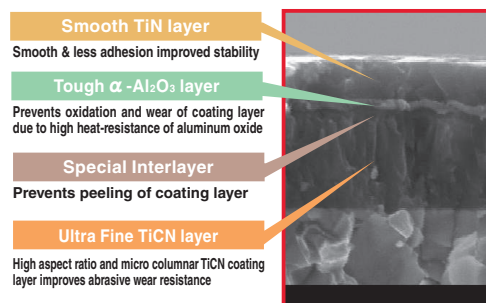
Suitable for variety of workpiece materials!

Stable machining by preventing sudden insert fracture
Suitable for high-efficiency machining



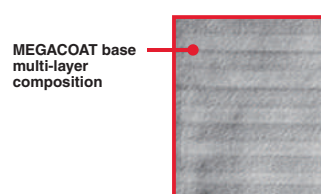
CA6535

For martensitic stainless steel and Ni-base heat-resistant alloys
High heat resistance and wear resistance with CVD coating
Improved stability due to thin layer coating technology



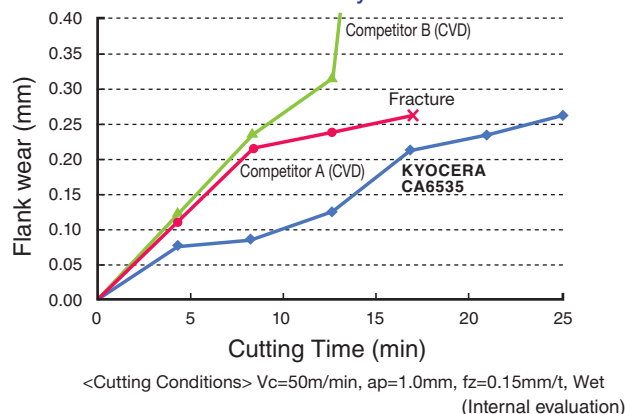
PR1535

For Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel
Stable and longer tool life by special nano thin multi-layer coating [MEGACOAT NANO]

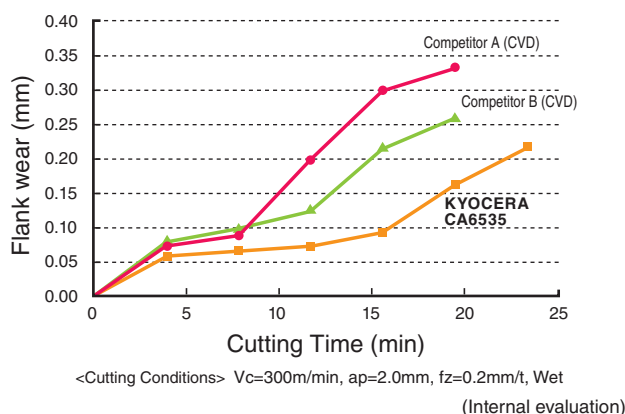


Tool Life Comparison

● Ni-base heat-resistant alloys



● Martensitic stainless steel



Longer tool life and more stable machining than competitors!

Insert Grades

A

Carbide



Carbide

Uncoated tungsten carbide grade is used in a variety of applications due to its superior mechanical properties.

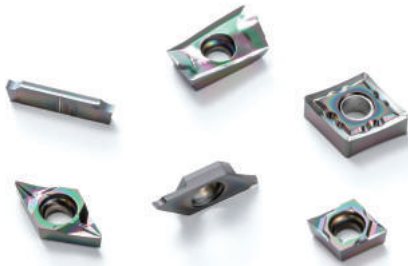
Features

- KW10: Suitable for machining cast iron with high hardness and toughness
- GW15, GW25 : Suitable for machining non-ferrous metals and non-metals
- SW series : Suitable for machining of titanium and titanium alloy

Features of Carbide

Classification	Symbol	Color	Main Component	Advantages and Applications
N Non-ferrous Metals	KW10	Gray	WC+Co	· ISO identification symbol K carbide (K10 relevant) · Application: Machining cast iron, non-ferrous materials and non-metals
	GW15	Gray	WC+Co	· ISO identification symbol K carbide (K10 relevant), tough micro-grain carbide · Application: Machining cast iron, non-ferrous materials and non-metals
	GW25	Gray	WC+Co	· ISO identification symbol K carbide (K30 relevant) · Application: Milling operations of aluminum
S Heat-resistant alloys	SW05	Gray	WC+Co	· ISO identification symbol K carbide (K05 relevant) · Application: Titanium alloys for continuous machining and finishing
	SW10 (Made to order)	Gray	WC+Co	· ISO identification symbol K carbide (K10 relevant) · Application: Titanium alloys for continuous and light interrupted machining
	SW25 (Made to order)	Gray	WC+Co	· ISO identification symbol K carbide (K25 relevant) · Application: Titanium alloys for interrupted and light interrupted machining

DLC Coated Carbide



DLC Coated Carbide

DLC (Diamond-Like Carbon) Coated Carbide is coated on carbide substrate with a thin layer of amorphous carbon.

Features

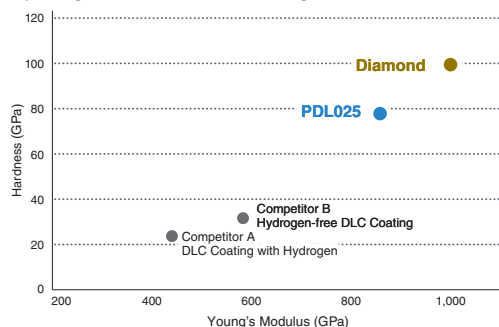
- High Hardness with Kyocera's Proprietary Hydrogen-free DLC Coating
- Excellent surface finish achieved through anti-adhesion performance

Features of DLC Coated Carbide

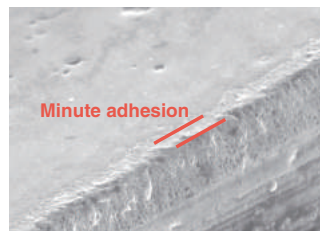
Classification	Symbol	Color	Coated Composition	Advantages and Applications
N Non-ferrous Metals	PDL025	Rainbow color	C	· High Hardness with Kyocera's Proprietary Hydrogen-free DLC Coating · Application: Long tool life and stable machining of aluminum alloys

Properties of DLC Coating

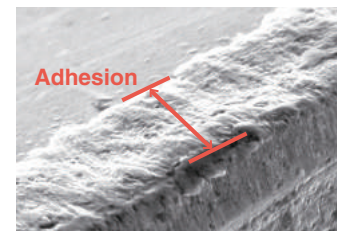
High Hardness with Kyocera's Proprietary Hydrogen-free DLC Coating



Superior adhesion resistance



PDL025



Competitor A

Cutting Conditions : Vc=800m/min, fz=0.1mm/t, apxae=3x5mm, Dry, Cutter Dia. φ25mm
Workpiece Material : A5052 Cutting length : 57m (Internal evaluation)



Ceramic



Ceramic

Ceramics inserts are capable of machining at high speeds. Recommended for hard turning of hardened steel or rough to finish turning of cast iron and heat-resistant alloys.

Features

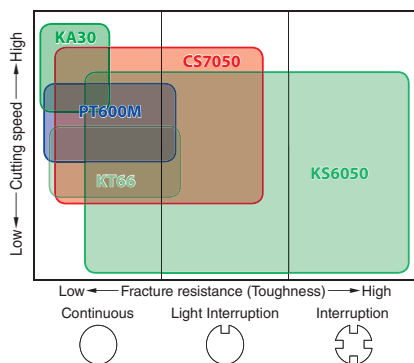
- Excellent wear resistance enables high speeds machining of cast iron
- Ceramic maintains good surface finishes due to the low affinity to workpiece materials
- Silicon nitride ceramic can machine cast iron with coolant due to its superior thermal shock resistance

Features of Ceramic

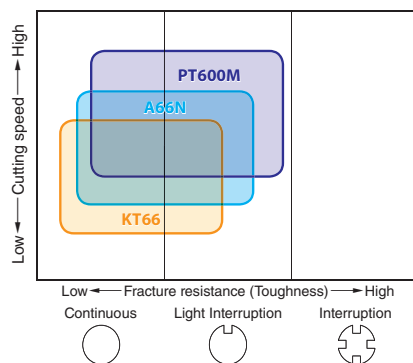
Classification	Symbol	Color	Main Component (Coated Composition)	Coating Layer	Hardness of Substrate (GPa)	Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)	Advantages and Applications
K Cast Iron	KA30	White	Al ₂ O ₃	-	17.5	4.0	750	• Aluminum Oxide ceramic (Al ₂ O ₃) • Application: Finishing of cast iron at high cutting speeds without coolant
	KS6050	Gray	Si ₃ N ₄	-	15.6	8.0	1,200	• Silicon nitride ceramic (Si ₃ N ₄) • Application: Roughing and interrupted machining of cast iron. Focusing on stability. (with or without coolant)
	CS7050	Grayish white	Si ₃ N ₄ (Special Al ₂ O ₃ COAT)	Thin coating	15.6	8.0	1,200	• Silicon nitride ceramic (Si ₃ N ₄)+CVD Coated Carbide (Special Al ₂ O ₃ COAT) • Application: Finishing and continuous machining, and high speed and high efficient machining. (with or without coolant)
K Cast Iron H Hard Materials	KT66	Black	Al ₂ O ₃ +TiC	-	20.1	4.1	980	• Aluminum Oxide and Titanium Carbide ceramic (Al ₂ O ₃ +TiC) • Application: Semi-roughing to finishing of cast iron, and hard materials
	A66N	Gold	Al ₂ O ₃ +TiC (TiN COAT)	Thin coating	20.1	4.1	980	• TiN PVD coated Aluminum Oxide and Titanium Carbide ceramic (TiN coated Al ₂ O ₃ +TiC) • Application: Semi-roughing to finishing of hard materials
	PT600M	Blackish red	Al ₂ O ₃ +TiC (MEGACOAT)	Thin coating	20.1	4.1	980	• Heat-resistant MEGACOAT on Aluminum Oxide and Titanium Carbide ceramic (MEGACOAT Al ₂ O ₃ +TiC) • Application: Semi-roughing to finishing of cast iron, hard materials and hardened roll materials
S Heat-resistant alloys	KS6030	Gray	SiAlON	-	15.2	6.0	600	• SiAlON Ceramic with superior wear resistance and high resistance against boundary wear • Application: Finishing to medium machining of heat-resistant alloys
	KS6040	Brown	SiAlON	-	16.7	7.0	900	• High stability SiAlON ceramic with wear resistance and fracture resistance • Application: Roughing of heat-resistant alloys

Application Map

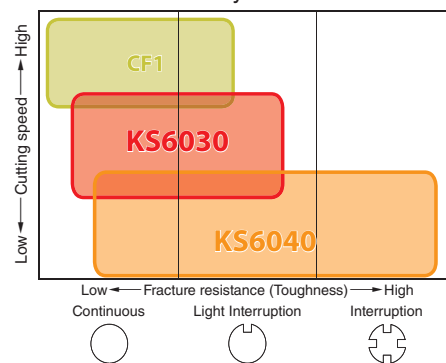
Cast Iron



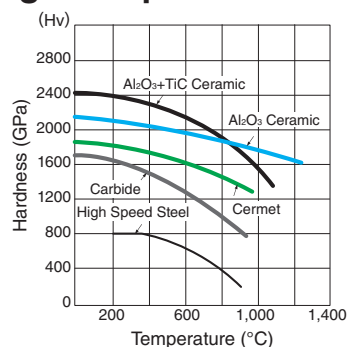
Hard Materials



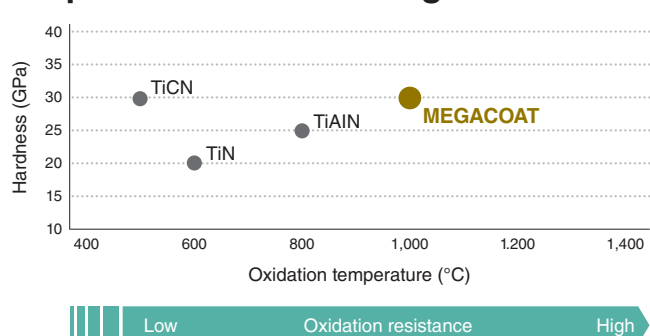
Heat-resistant alloys



High-Temperature Hardness



Properties of PVD Coating



Insert Grades

A

CBN (Cubic Boron Nitride)



CBN

CBN (Cubic Boron Nitride) is second only to diamond in hardness, and is a synthetically produced material with high thermal conductivity.

Features

- Superior wear resistance when machining hard materials
- Suitable for high speed machining of hard materials, sintered steel and cast iron
- High thermal conductivity provides stable machining

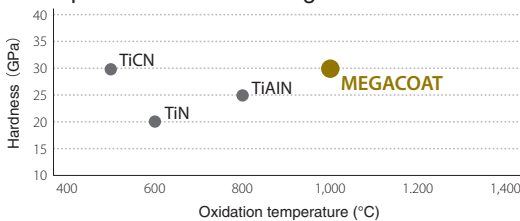
Features of CBN

Classification	Symbol	Color	Ave. grain size (μm)	Hardness of Substrate (GPa)	Transverse Strength (MPa)	Advantages and Applications
H Hard Materials	KBN510	Black	2	28	1,000	· Excellent wear resistance and crack resistance, non-coated CBN · Application: Finishing and continuous machining of hardened die steel
	KBN525	Black	1 and under	25	1,250	· Application: General purpose for hardened steel
	KBN05M (MEGACOAT)	Blackish red	0.5-1.5	27	1,000	· Heat-resistant MEGACOAT on highly heat-resistant CBN substrate · Application: High speed finishing of hardened steel
	KBN10M (MEGACOAT)	Blackish red	2	28	1,000	· Application: High speed finishing of hardened die steel
	KBN25M (MEGACOAT)	Blackish red	1 and under	25	1,250	· Heat-resistant MEGACOAT on micro-grain CBN with heat-resistant binder phase · Application: Stable machining of hardened steel at high cutting speeds
	KBN30M (MEGACOAT)	Blackish red	1-4	30	1,350	· Application: Stable machining of hardened steel for continuous to interrupted machining
Sintered Steel	KBN65B	Black	2	32	1,150	· Application: Stable machining of sintered steel (ferrous sintered alloy) at low speed
	KBN570	Black	2-4	34	1,350	· High CBN content ratio · Application: Machining of sintered steel (preventing burr formation)
	KBN65M (MEGACOAT)	Blackish red	2	32	1,150	· Heat-resistant MEGACOAT on CBN with heat-resistant binder phase · Application: Stable machining of sintered steel (ferrous sintered alloys)
	KBN70M (MEGACOAT)	Blackish red	2-4	34	1,350	· Heat-resistant MEGACOAT on CBN rich substrate · Application: Stable machining of sintered steel (ferrous sintered alloys)
K Cast Iron	KBN475	Black	2	39	1,400	· Excellent wear resistance due to high CBN content and special binder · Application: High speed machining of gray cast iron
	KBN60M (MEGACOAT)	Blackish red	0.5-6	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	31	630	· TiN coated solid CBN · Application: Heavy duty, interrupted machining and finishing of hardened steel, hardened roll steel and cast iron

· For KBN35M, see page [A18](#)

MEGACOAT CBN

Properties of PVD Coating

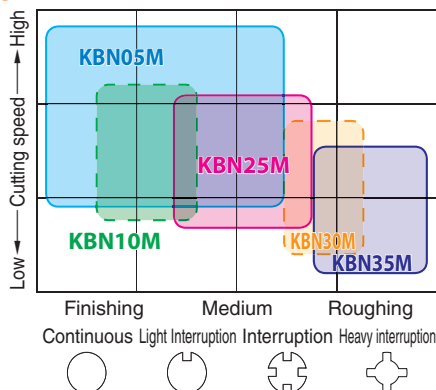


Advantages of MEGACOAT

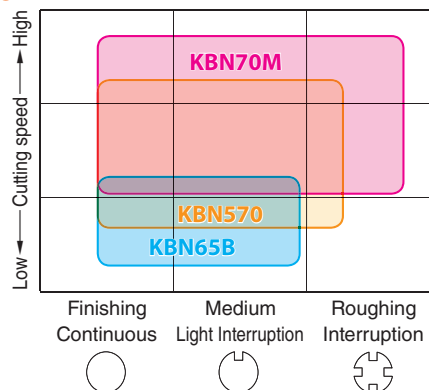
- Longer tool life and high speed machining due to superior heat resistance and hardness
- Stability improvement through prevention of crater wear (oxidation, diffusional wear)
- High thermal stability and surface smoothness provide excellent surface finish

Application Map

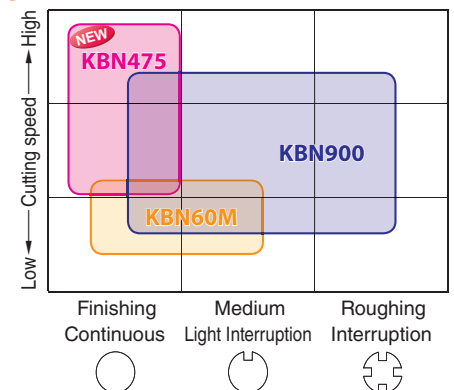
Hard Materials



Sintered Steel



Cast Iron





PCD (Polycrystalline Diamond)



PCD (Polycrystalline Diamond)

PCD (Polycrystalline Diamond) is a synthetic diamond sintered under high temperatures and pressures.

Features

- Applicable for milling of non-ferrous metals and non-metals
 - No edge build-up provides high precision machining
 - Diversified applications for machining of non-ferrous metals and non-metals
 - Finished surface will be rainbow colored
- (Because of polycrystalline diamond, a mirror-like finished surface will not be obtained)

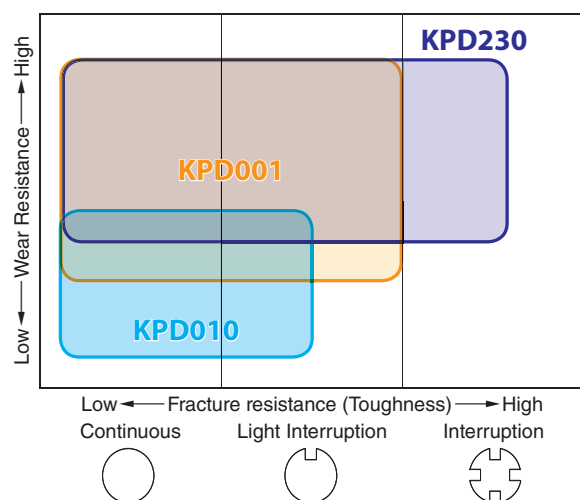
Features of PCD

Classification	Symbol	Ave. grain size (μm)	Advantages and Applications
N Non-ferrous Metals	KPD001	0.5	· Super Micro-Grain PCD features cutting edge strength, wear resistance, fracture resistance, good edge-sharpening performance and longer, stable tool life · Application: High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, and carbide
	KPD010	10	· Good wear resistance and toughness, good grindability · Application: High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, and carbide
	KPD230	2-30	· Superior abrasive wear resistance and toughness due to high density PCD with mixed rough and fine grains · Application: High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics
	KPD250 (Made to order)	25	· Superior wear resistance due to rough grain PCD (25μm) · Application: High speed machining of high silicon aluminum alloy and machining of carbide

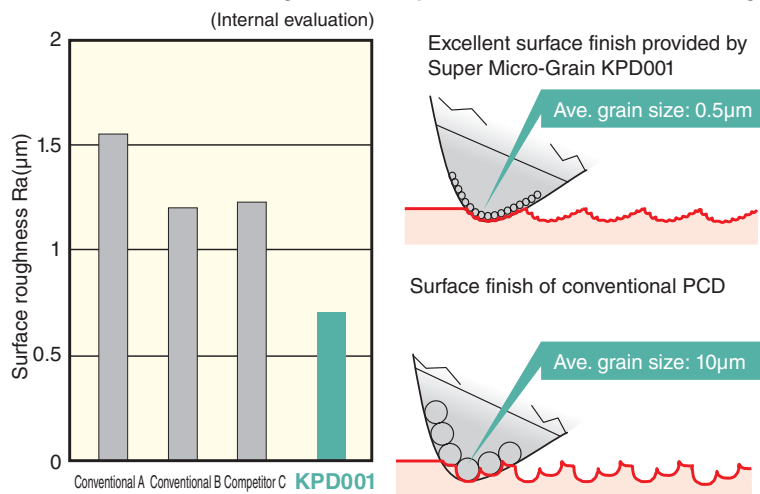
Applications

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30
Turning Milling	PCD	KPD001				KPD001			
		KPD010				KPD010			
		KPD230							
		KPD250							

Application Map



Surface Finish Roughness Comparison of Aluminum Machining



(Grain size affects surface finish quality)

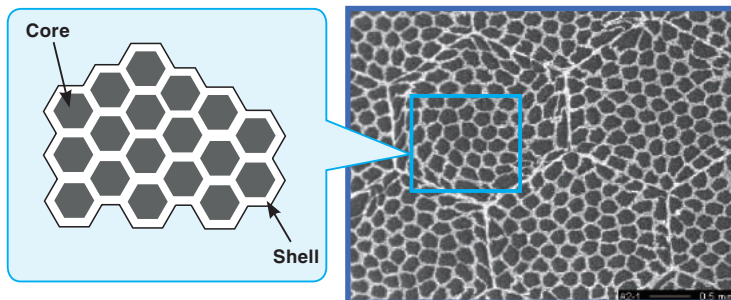
Honeycomb structure CBN / Ceramic

Honeycomb structure CBN / Ceramic

Honeycomb structure is the high structural controlled composite material consisting of a hard and superior wear-resistance core (gray portion) and a tough shell (white portion).

Features

- Honeycomb structure CBN / Ceramic combine a hard, wear-resistant core and a tough shell into one insert.
- The tough shell stops cracks that form in the core.
- CBN is suitable for interrupted machining of exceptionally hard material and ceramic is suitable for heat-resistant alloys

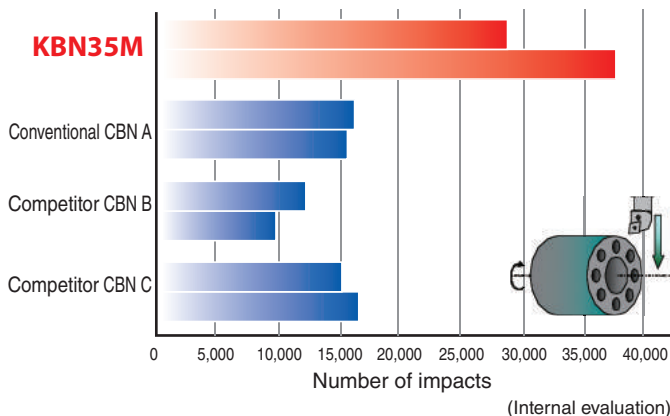
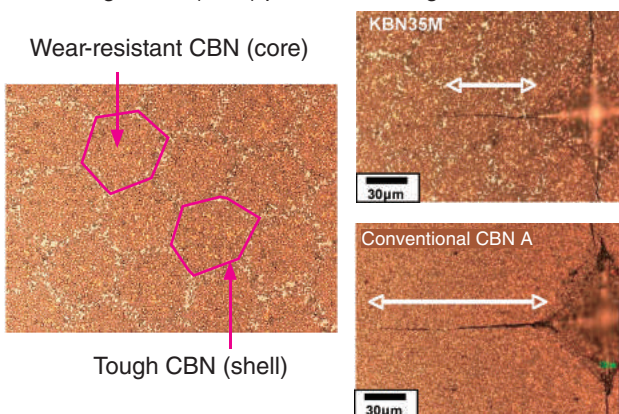


Features of Honeycomb structure CBN / Ceramic

Classification	Symbol	Color	Main Component	Advantages and Applications
H Hard Materials	KBN35M (MEGACOAT)	Blackish red	CBN	· Honeycomb structure CBN composite material consisting of wear resistant CBN (core) and tough CBN (shell) · Heat-resistant MEGACOAT on tough Honeycomb structure CBN · Application: Stable machining of hardened steel at interrupted machining
S Heat-resistant alloys	CF1	Gray	Ceramic	· Honeycomb structure ceramic composite material consisting of wear resistant ceramic (core) and tough ceramic (shell) · Application: Machining of heat-resistant alloys like Ni-base heat-resistant alloys

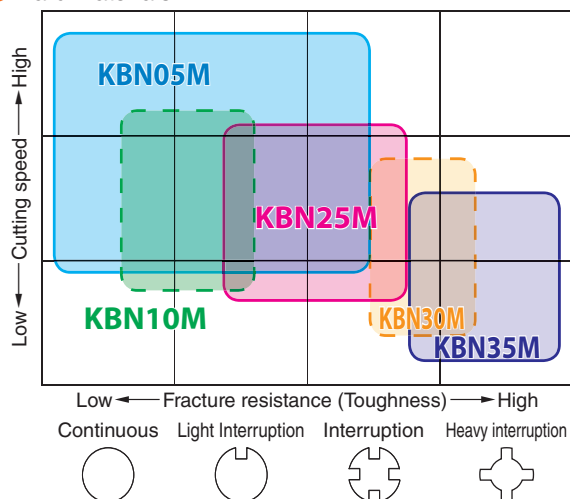
KBN35M (MEGACOAT Honeycomb structure CBN)

- Tough CBN (shell) prevents crack growth

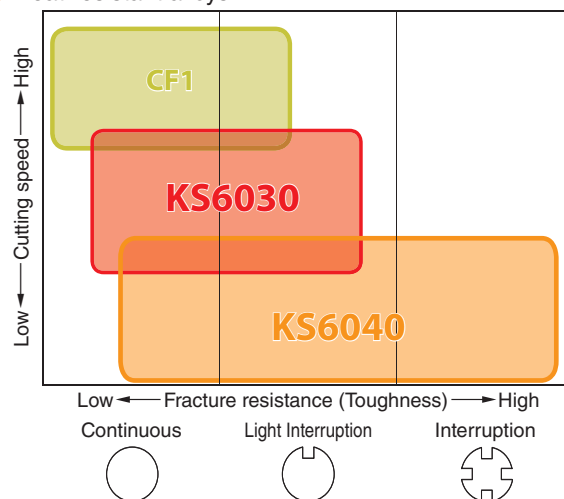


Application Map

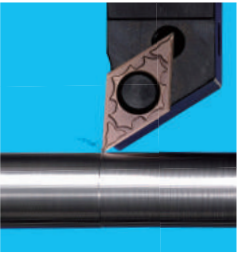
- Hard Materials



- Heat-resistant alloys



Insert Material Selection Table

Applications		Cutting Range	P Steel	M Stainless steel	K Gray Cast Iron	N Nodular Cast Iron	S Non-ferrous Metals	H Heat-resistant alloys	S Titanium alloys	H Hard Materials	Sintered Steel
Turning		Finishing	TN610 TN6010 TN620 TN60 PV710 PV7010 PV720 CA510 CA515 CA525	TN620 TN60 PV720 CA6515	KBN475 KBN60M KA30 PV7005 CA5505 CA310 CA315	TN60 CA310 CA315 CA320	KPD001 KPD010 PDL025 KW10	CF1 KS6040 KW10 CA6515 CA6525 PR005S PR015S PR1535	KPD001 KPD010 KPD010 SW05 SW25	KT66 A66N PT600M KBN05M KBN10M KBN25M KBN30M KBN35M KBN900	TN610 TN60 KBN570 KBN70M
		Roughing	CA530								
Small Tools		Finishing	TN610 TN6010 TN620 PV710 PV7010 PV720 PR930 PR1005 PR1025 PR1425	TN620 PV720 PR930 PR1025 PR1225 PR1535	CA310 CA315 KW10	CA310 CA315 CA320 KW10	KPD001 KPD010 PDL025 KW10	CA6515 PR1125 PR1225 PR1535	KPD001 KPD010 KW10 PR1535	KBN05M KBN10M KBN25M KBN30M	TN610 TN60 KBN570 KBN70M
		Roughing	PR1535								
Boring		Large	TN610 TN6010 TN620 PV710 PV7010 PV720 CA515 CA525 CA530 PR1025 PR1425 PR930 PR1535	TN60 CA6515 PV720 CA6525 PR1025 PR1125 PR1225 PR930 PR1535	KBN475 KBN60M PV7005 CA310 CA315 KW10	PV7005 CA310 CA320 KW10	KPD001 KPD010 PDL025 KW10	CA6515 CA6525 PR1125 PR1225 PR1535	KPD001 KPD010 KW10 SW05 PR1535	PT600M KBN05M KBN10M KBN25M KBN30M	TN610 TN60 KBN570 KBN70M
		Small									
Cut-Off		Large	CR9025 PR930 PR915 PR1215 PR1225 PR1535 PR660	CR9025 PR930 PR915 PR1215 PR1225 PR1535 PR660	KW10 PR1215	KW10 PR1215	PDL025 KW10	KW10 PR1225 PR660	KW10	-	-
		Small									
Cut-Off		(Depends on the workpiece material)	PR1025 PR1225 PR1535	PR1025 PR1225 PR1535	KW10	KW10	PDL025 KW10	KW10 PR1025 PR1225	KW10	-	-
Grooving		Glossy finish	TC40N TN620 TN90 PV7040 PR930 PR1115 PR1215 PR1225	TC40N TN620 TN90 PV7040 PR930 PR1115 PR1215 PR1225	PR905 PR1215 KW10 GW15	PR905 PR1215 KW10 GW15	KPD001 PDL025 KW10 GW15	PR915 KW10 PR1215 PR1225 PR1535	KPD001 KW10 KW10 PR1535	KBN510 KBN525 PT600M	TC40N KBN570
		Stable									
Threading		Glossy finish	TC60M PR1115 PR930	TC60M PR1115 PR930	KW10 GW15	KW10 GW15	KW10 GW15	KW10 GW15	KW10 GW15	-	PR1515 PR1115
		Stable									
Drilling		Wear Resistance	CA520D PR1225 PR1230 PR830 PR1535	PR1225 PR830 PR1535	CA415D PR1210 KW10	PR1210 KW10	KW10 GW15	PR660 PR1225 KW10 GW15	KW10	-	-
		Toughness									
Milling		Finishing	TN100M TN620M PR1225 PR1230 PR830	CA6535 PR1225 PR1525 PR830 PR1535	PR1210 PR1510 KW10	PR1210 PR1510 KW10	KPD230 KPD001 KPD010 PDL025 KW10 GW25	CA6535 PR1225 PR1535	KPD230 KPD001 KW10 PR905 PR1210 PR1535	-	-
		Roughing									

* Highlighted materials are recommended choice.



Insert Grades

Grade Properties

A



Insert Grades

Cermet

Symbol	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
TN610	Gray	TiCN	-	6.6	1,750	17.2	6.0	2,100
TN620	Gray	TiCN	-	6.9	1,550	15.2	9.0	2,500
TN620M	Gray	TiCN	-	6.9	1,550	15.2	9.0	2,500
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
TC40N	Gray	TiC+TiN	-	6.0	1,650	16.2	9.0	1,570
TC60M	Gray	NbC	-	8.1	1,500	14.7	10.5	1,670

PVD Coated Cermet

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
PV710	Gold	MEGACOAT NANO	Thin coating	6.6	1,750	17.2	6.0	2,100
PV720	Gold	MEGACOAT NANO	Thin coating	6.9	1,550	15.2	9.0	2,500
PV7005	Blackish red	MEGACOAT	Thin coating	6.0	1,650	16.2	8.5	1,470
PV7010	Blackish red	MEGACOAT	Thin coating	6.5	1,700	16.7	7.0	2,000
PV7025	Blackish red	MEGACOAT	Thin coating	6.4	1,500	14.7	10.0	2,500
PV7040	Blackish red	MEGACOAT	Thin coating	6.0	1,650	16.2	9.0	1,570
PV7020	Gold	TiAlN+TiN	Thin coating	6.4	1,500	14.7	10.0	2,500
PV90	Gold	TiN	Thin coating	6.4	1,450	14.2	10.0	1,960

CVD Coated Carbide

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
CA310	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	Thick coating	15.0	1,570	15.4	12.0	2,780
CA315	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	Thick coating	15.0	1,570	15.4	12.0	2,780
CA320	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	Thick coating	15.0	1,570	15.4	12.0	2,780
CA415D	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	15.0	1,570	15.4	12.0	2,780
CA420M	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.5	1,600	15.8	13.0	3,400
CA4010	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.8	1,720	16.8	9.0	2,450
CA4115	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4120	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4505	Blackish gray	TiCN+Al ₂ O ₃	Thick coating	15.0	1,790	17.5	9.5	2,350
CA4515	Blackish gray	TiCN+Al ₂ O ₃	Thick coating	15.0	1,570	15.4	12.0	2,780
CA510	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.5	1,470	14.4	11.5	2,500
CA515	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.4	1,440	14.1	12.5	2,650
CA520D	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,370	13.4	16.0	3,100
CA525	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.2	1,360	13.3	13.5	2,750
CA530	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	13.9	1,340	13.1	14.5	2,850
CA5505	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,730	17.0	10.0	2,540
CA5515	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA5525	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.5	1,400	13.7	12.0	2,780
CA5535	Gold	TiCN+Al ₂ O ₃ +TiN	Thick coating	14.1	1,340	13.1	16.5	2,970
CA6515	Gold	TiCN+Al ₂ O ₃ +TiN	Thin coating	14.7	1,530	15.0	12.0	2,780
CA6525	Gold	TiCN+Al ₂ O ₃ +TiN	Thin coating	14.7	1,370	13.4	16.0	3,100
CA6535	Gold	TiCN+Al ₂ O ₃ +TiN	Thin coating	14.3	1,320	12.9	16.0	3,700
CR9025	Gold	TiCN+TiN	Thick coating	14.5	1,400	13.7	12.0	2,780



PVD Coated Carbide

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
PR005S	Blackish gray	MEGACOAT HARD	Thin coating	15.0	1,750	17.2	8.0	2,000
PR015S	Blackish gray	MEGACOAT HARD	Thin coating	14.9	1,680	16.5	9.0	2,400
PR630	Gold	TiN	Thin coating	12.5	1,500	14.7	11.0	2,160
PR660	Gold	TiN	Thin coating	13.7	1,450	14.2	13.0	2,250
PR830	Gold	TiAlN+TiN	Thin coating	13.7	1,450	14.2	13.0	2,250
PR905	Bluish violet	TiAlN	Thin coating	14.8	1,720	16.8	9.0	2,450
PR915	Bluish violet	TiAlN	Thin coating	14.1	1,700	16.7	11.0	4,140
PR930	Reddish gray	TiCN	Thin coating	14.1	1,700	16.7	11.0	4,140
PR1005	Reddish gray	TiCN	Thin coating	14.9	1,800	17.6	10.0	3,300
PR1025	Reddish gray	TiCN	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1115	Purple red	TiAlN	Thin coating	14.7	1,700	16.7	11.0	3,000
PR1125	Purple red	TiAlN	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1210	Blackish red	MEGACOAT	Thin coating	14.8	1,720	16.8	9.0	2,450
PR1215	Blackish red	MEGACOAT	Thin coating	14.7	1,700	16.7	11.0	3,000
PR1225	Blackish red	MEGACOAT	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1230	Blackish red	MEGACOAT	Thin coating	13.7	1,450	14.2	13.0	2,250
PR1305	Blackish red	MEGACOAT	Thin coating	15.0	1,790	17.5	9.5	2,350
PR1310	Blackish red	MEGACOAT	Thin coating	14.8	1,720	16.8	9.0	2,450
PR1325	Blackish red	MEGACOAT	Thin coating	14.7	1,370	13.4	16.0	3,100
PR1425	Blackish red	MEGACOAT NANO	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1510	Reddish green	MEGACOAT NANO	Thin coating	14.8	1,720	16.8	9.0	2,450
PR1515	Reddish green	MEGACOAT NANO	Thin coating	14.7	1,700	16.7	11.0	3,000
PR1525	Reddish green	MEGACOAT NANO	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1535	Reddish green	MEGACOAT NANO	Thin coating	14.3	1,320	12.9	16.0	3,700

Carbide

Symbol	Color	Main Component	Ratio	Hardness of Substrate		Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
				(HV)	(GPa)		
KW10	Gray	WC+Co	15.0	1,650	16.2	10.0	1,470
GW15	Gray	WC+Co	14.7	1,700	16.7	11.0	3,000
GW25	Gray	WC+Co	14.5	1,600	15.8	13.0	3,400
SW05	Gray	WC+Co	15.0	1,790	17.5	9.5	2,350
SW10	Gray	WC+Co	14.8	1,720	16.8	9.0	2,450
SW25	Gray	WC+Co	14.7	1,370	13.4	16.0	3,100

DLC Coated Carbide

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa · m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
PDL025	Rainbow color	C	Thin coating	14.5	1,600	15.8	13.0	3,400