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Summary of insert grades	A2-A5
Turning	A2
Small parts machining	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	A18
Insert material selection table	A19
Grade properties	A20

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				Stainless steel / Cast steel					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, TN620, TN60, TN90					TN610, TN620, TN60, TN90					TN60					
	TC series		TC60M					TC60M									
	CCX (CVD coated)	CCX											CCX				
	PV series		PV90					PV90									
	MEGACOAT												PV7005				
	MEGACOAT NANO	PV710, PV720, PV730					PV710, PV720, PV730										
Coated carbide	CA series	CA510, CA515, CA025P, CA525, CA530					CA6515, CA6525					CA310, CA315, CA320					
		CA5505, CA5515, CA5525, CA5535											CA4505, CA4515				
	PR series	PR930, PR1025					PR930, PR1025										
	MEGACOAT		PR1225					PR1225									
	MEGACOAT NANO		PR1535					PR1535									
	MEGACOAT NANO PLUS	PR1705, PR1725					PR1725										
	Ceramic													KA30, KT66, A66N, PT600M, KS6015, KS6050, CS7050			
														KW10			
														KBN475, KBN60M, KBN900			



Turning

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Titanium / Titanium alloys				Hard materials				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										
	MEGACOAT HARD						PR005S										
	MEGACOAT NANO						PR015S										
	Cermet														TN610		
															TN60		
	Ceramic						KS6030				KT66						
							KS6040				A66N						
											PT600M						
CBN											KBN510						
											KBN525						
MEGACOAT											KBN900						
											KBN05M						
											KBN10M						
											KBN25M						
	MEGACOAT TOUGH										KBN35M						
											KBN020						
															KBN70M		
															KBN570		

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys				Hard materials				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
	MEGACOAT NANO Coated carbide																
Carbide							GW05				SW05						
							KW10				SW10						
											SW25						
DLC coated carbide																	
PCD																	

Small parts machining

Workpiece material		Steel				Stainless steel / Cast steel					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														
	MEGACOAT														
	MEGACOAT NANO														
	MEGACOAT NANO PLUS														

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys				Hard materials				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
	Carbide																

A

Grooving / Cut-Off / Threading

Insert grades

Workpiece material		Steel					Stainless steel / Cast steel					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
Cermets	MEGACOAT	PV7040										PV7040			
	TN series	TN620					TN620								
		TN6020					TN6020								
		TN60					TN60					TN60			
TC series	TN90					TN90									
	TC40N										TC40N				
Coated carbide	CR series	CR9025					CR9025								
	PR series	PR915					PR915					PR905			
		PR930					PR930								
		PR1025					PR1025								
		PR1115													
	MEGACOAT	PR1215					PR1215					PR1215			
		PR1225					PR1225								
	MEGACOAT NANO	PR1535					PR1535								
PR1625					PR1625										
Ceramic											A65 A66N PT600M				
Carbide											KW10 GW15				

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Titanium / Titanium alloys				Hard materials				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			
MEGACOAT Coated carbide																PR1215 PR1225				
Cermet																TN60				
Ceramic											A65 A66N PT600M									
Carbide	KW10 GW05 GW15				KW10 GW15															
DLC coated carbide	PDL025																			
CBN											KBN510 KBN525				KBN570					
PCD	KPD001 KPD010				KPD001 KPD010															

Drilling

Workpiece material		Steel					Stainless steel / Cast steel					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			
	MEGACOAT		PR1225				PR1225				PR1210				
	MEGACOAT NANO		PR1535				PR1535								
Carbide												KW10		GW15	

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Titanium / Titanium alloys				Hard materials			
Cutting range		Finishing ↔ Roughing				Finishing ↔ Roughing				Finishing ↔ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
MEGACOAT Coated carbide										PR1230			
Carbide		KW10					KW10						
		GW15					GW15						

Milling

Workpiece material		Steel					Stainless steel / Cast steel					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							
	MEGACOAT NANO		PV60M				TN100M								
Coated carbide	CA series							CA6535				CA420M			
	MEGACOAT		PR1225				PR1225				PR1210				
	MEGACOAT NANO		PR1525				PR1535				PR1510				
Carbide												KW10		GW25	

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys				Difficult-to-cut materials Titanium / Titanium alloys				Hard materials			
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									PR1210							
	MEGACOAT HARD												PR015S				
	MEGACOAT NANO					PR1535				PR1535							
Carbide		KW10								KW10							
DLC coated carbide		GW25								GW25							
PDL025		PDL025															
CBN																	
PCD	KPD001	KPD001							KPD001								
	KPD010	KPD010						KPD010									
	KPD230	KPD230															
	KPD250	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)

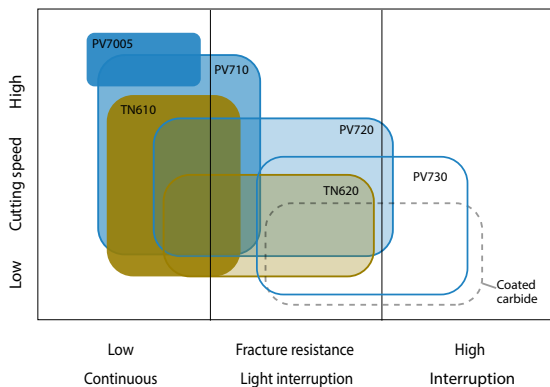
PVD coated cermet is coated on cermet substrate with a thin layer of high wear resistance and high adhesion resistance by PVD (Physical Vapor Deposition) technology. Generally because of the low processing temperature of PVD compared with CVD, PVD coated cermet features less deterioration and more bending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



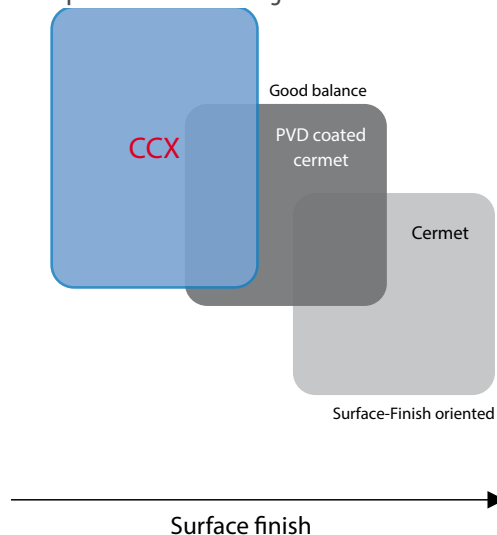
Features of cermet and PVD coated cermet

Classification	Grade	Color	Main component (Coated composition)	Advantages and applications	
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	Cermet	TN610	TiCN	<ul style="list-style-type: none"> 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	TiCN	<ul style="list-style-type: none"> Three types of special reinforcement technology realized the superior fracture resistance and wear resistance Application: Stable machining of steel 	
		TN60	TiCN+NbC	<ul style="list-style-type: none"> Application: Machining of steel, continuous to interruption 	
		TN6020	TiCN	<ul style="list-style-type: none"> Application : Uncoated cermet for grooving of steel 	
		TN620M	TiCN	<ul style="list-style-type: none"> Tough cermet for milling with excellent balance of wear resistance and toughness Application : Milling of steel with high quality surface finish and long tool life 	
		TN100M	TiCN+NbC	<ul style="list-style-type: none"> Tough cermet with improved oxidation resistance and thermal shock resistance Application: Milling of steel at high speed 	
		TC40N	TiC+TiN	<ul style="list-style-type: none"> Good balance of wear resistance and toughness Application: Grooving and threading of steel 	
	CVD Coated Cermet	CCX	Gold	TiCN (TiCN+Al ₂ O ₃ +Tin)	<ul style="list-style-type: none"> Specialized high-strength micro grain cermet base material with superior wear-resistant thick CVD coating Excellent wear resistance leads long tool life in high speed machining Application : High speed finishing to light interrupted machining of steel
	MEGACOAT NANO Cermet	PV710	Gold	TiCN (MEGACOAT NANO)	<ul style="list-style-type: none"> 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		TiCN (MEGACOAT NANO)	<ul style="list-style-type: none"> 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
		PV60M	Gold	TiCN+NbC (MEGACOAT NANO)	<ul style="list-style-type: none"> Improved stable grade for milling by MEGACOAT NANO coating technology Application: Milling of steel with high quality surface finish and stable machining
	MEGACOAT Cermet	PV7040	Blackish Red	TiC+TiN (MEGACOAT)	<ul style="list-style-type: none"> MEGACOAT Cermet for Grooving Application: Excellent surface finish and longer tool life in steel grooving
		PV7005		TiC+TiN MEGACOAT	<ul style="list-style-type: none"> Heat-resistant MEGACOAT on cermet with excellent wear resistance Application: High speed finishing of gray and nodular cast iron

Application map



Properties of PVD coating



Uncoated CERMET

TN610/TN620

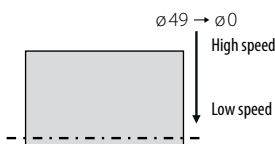
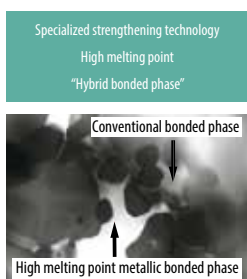
Special reinforcement technology (hybrid technology)
Superior surface finish and machining stability.

MEGACOAT NANO CERMET

PV710/PV720/PV730

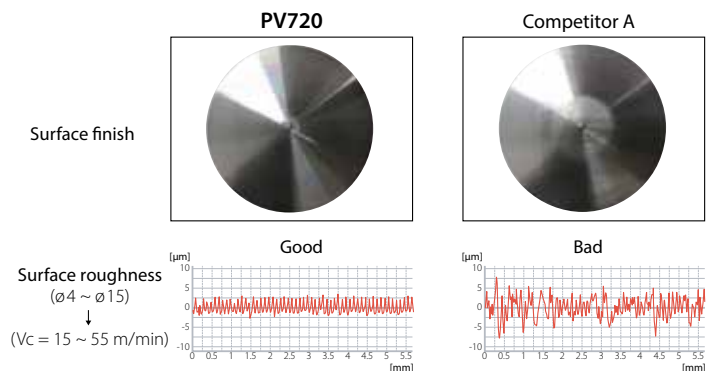
1 Excellent surface finish

- Combining the conventional cermet bonded phase (nickel, cobalt) and the special high melting point metallic bonded phase
- Provides high adhesion resistance to eliminate galling of the workpiece



Surface finish comparison (In-house evaluation)

Cutting conditions: $V_c = 180 \sim 0$ m/min (Constant rotational speed), $a_p = 0.5$ mm, $f = 0.1$ mm/rev, wet, CNMG120404 type, workpiece: S10C



CVD coated cermet for finishing

CCX

Excellent high speed finishing leads to greater productivity. Applicable to a wide range of cutting conditions from general to high speed machining. Maintains long tool life in soft steel, general steel and cast iron machining

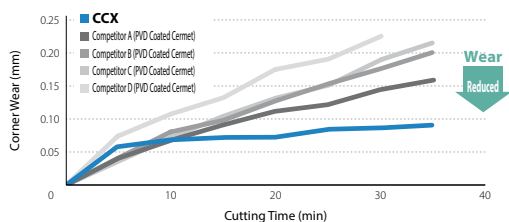
1 Superior wear resistance to PVD coated cermets

2 Unique cermet base material with thick CVD coating

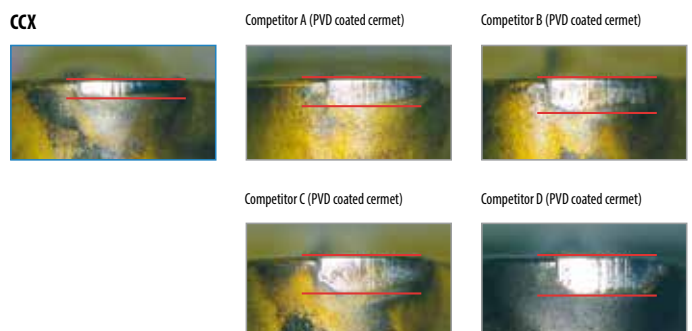
Alloy Steel - SCM435 High speed comparison: $V_c = 400$ m/min

CCX provided better tool life than competitor's PVD cermets by greatly reducing the amount of wear

Wear resistance comparison (Internal evaluation)



Cutting edge (After machining 35 min)



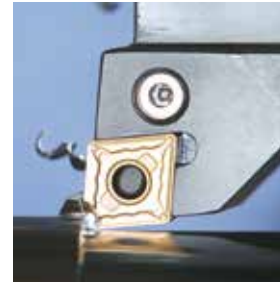
* Picture shows 30 min after machining due to a large amount of wear

Cutting conditions: $V_c = 400$ m/min, $a_p = 0.3$ mm, $f = 0.12$ mm/rev, Wet, CNMG120408 type, external turning

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

Features of CVD coated carbide

Classification	Grade	Color	Coated composition	Advantages and applications
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	CA510	Gold	TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • 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		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • 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
	CA025P		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • CVD coating with improved wear resistance. Adopted base material, excellent chipping resistance, resistance to wear and resistance to improve chip performance • Application: Continuous to interrupted processing of steel
	CA525		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • 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		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Special tough substrate and tough coating layer providing high stability and wear resistance • Application: General to heavy interrupted machining (stability oriented)
	CA5505		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Application: High speed continuous machining of steel, continuous to light interrupted machining of cast iron
	CA5515		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Application: Machining of steel, continuous to light interruption
	CA5525		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Application: For general machining of steel, roughing to interruption
	CA5535		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Application: Roughing to heavy interrupted machining of steel
	CR9025		TiCN+TiN	<ul style="list-style-type: none"> • Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance • Application: Cut-off, grooving and multi-function machining of steel
<div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless steel </div>	CA6515		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Specialized carbide substrate for machining stainless steel, excellent wear resistance • Application: Continuous machining of stainless steel
	CA6525		TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> • 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
<div style="background-color: #C00000; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div>	CA310	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	<ul style="list-style-type: none"> • 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		TiCN+Al ₂ O ₃ +Ti base	<ul style="list-style-type: none"> • Both high abrasion resistance and stability are compatible, high efficiency and long life performance are demonstrated. Can be adapted to both continuous machining and interrupted machining. • Application: Compatible with a wide processing area for cast iron and gray cast iron. First recommendation for cast iron
	CA320		TiCN+Al ₂ O ₃ +Ti base	<ul style="list-style-type: none"> • Improved stability with CVD layer structure with high adhesion • Application : Heavily interrupted or High-speed machining for Nodular Cast Iron. The 1st Recommendation for the FC0500 or higher application
	CA4505	Blackish gray	TiCN+Al ₂ O ₃	<ul style="list-style-type: none"> • 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		TiCN+Al ₂ O ₃	<ul style="list-style-type: none"> • 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



CVD coated carbide grade for steel

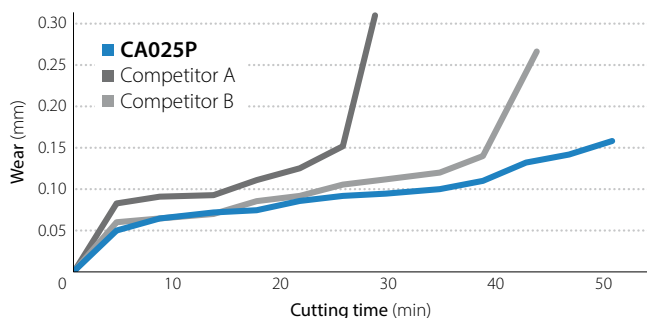
CA025P

Next generation CVD coating for longer tool life

1 Improved wear resistance with new CVD grade for steel

Thickened alumina with good thermal resistance (Twice as thick as conventional coating)
Improved plastic deformation resistance by increased temperature strength

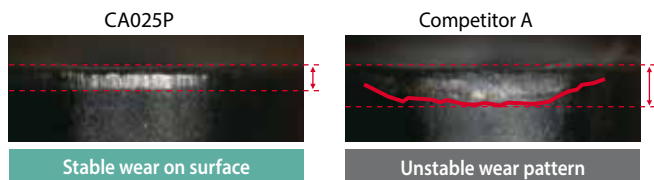
Wear resistance comparison (Internal evaluation)



Cutting conditions: $V_c = 300$ m/min, $a_p = 1.5$ mm, $f = 0.3$ mm/rev, wet workpiece: SCM435

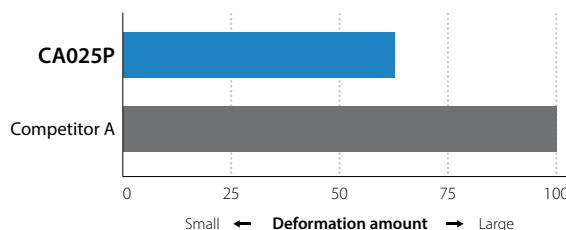
Wear comparison (Internal evaluation) Cutting time: 25.2 min

CA025P maintains smooth and flat wear with stable tool life



Cutting conditions: $V_c = 300$ m/min, $a_p = 1.5$ mm, $f = 0.3$ mm/rev, wet workpiece : SCM435

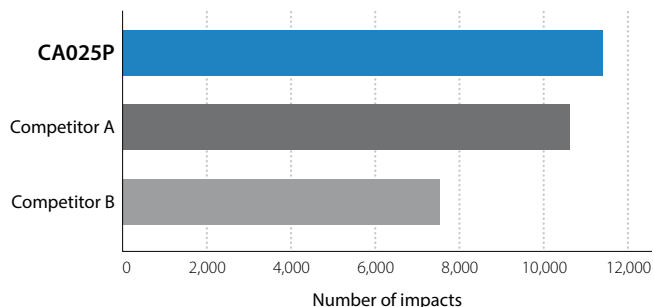
Plastic deformation comparison under high temperature (Internal evaluation)
Comparison with Competitor A



2 Excellent fracture resistance

New substrate with high stability provides excellent chipping resistance

Fracture resistance comparison (Internal evaluation) Average of 5 times

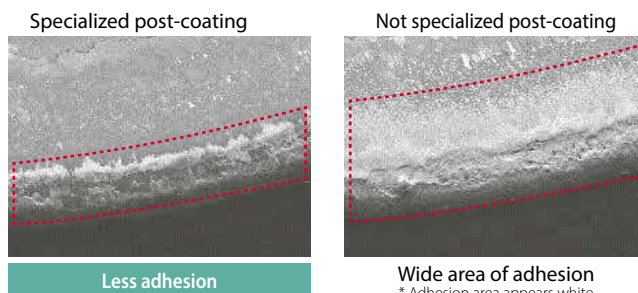


Cutting conditions: $V_c = 250$ m/min, $a_p = 1.5$ mm, $f = 0.35$ mm/rev, wet Workpiece: SCM435 (with 4 slots)

3 Excellent adhesion resistance and chipping resistance

Specialized post-coating process prevents adhesion

Adhesion on the edge after cutting (Internal evaluation)



Cutting conditions: $V_c = 270$ m/min, $a_p = 1.0$ mm, $f = 0.1$ mm/rev, wet Workpiece: SCM435 (with 4 slots)

PVD coated carbide (Turning)

PVD coated carbide (MEGACOAT / MEGACOAT NANO)

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.



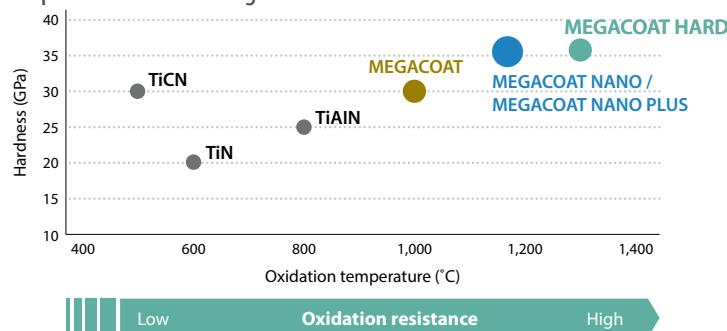
PVD coated super micro-grain carbide

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

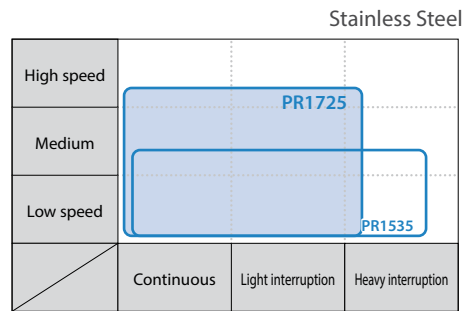
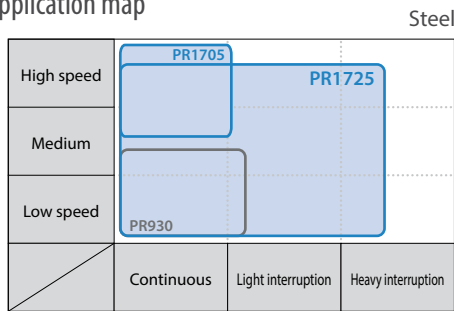
Features of PVD coated carbide

Classification	Grade	Color	Coated composition	Advantages and applications
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	PR915 <small>Super micro-grain</small>	Bluish violet	TiAlN	• Application: Stable and reliable high precision machining of steel
	PR930 <small>Super micro-grain</small>	Reddish gray	TiCN	• Application: Low machining speed, precise machining with sharp edge
	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
	PR1625	Reddish green	MEGACOAT NANO	• Adopted special nano multi-layer coating "MEGACOAT NANO" excellent in wear resistance and lubricity • Stable processing with steel and stainless steel grooving - Long tool life
	PR1705	Silver	MEGACOAT NANO PLUS	• High-hardness ultrafine particle carbide substrates with special multilayer nano coating MEGACOAT NANO PLUS offer excellent wear resistance and high precision machining. • Application: For free-cutting steel turning. Long tool life with excellent wear resistance and high-precision machining.
	PR1725	Silver	MEGACOAT NANO PLUS	• New coating technology [MEGACOAT NANO PLUS] with superior wear resistance and adhesion resistance • Application: General grade for steel and stainless steel machining provides stability and longer tool life
<div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless steel </div>	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	• Improved wear resistance and stability by using fine granite carbide base metal and special nano multi-layer coating "MEGACOAT NANO" • Application: For thread cutting of stainless steel
	PR1535			• 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
<div style="background-color: #D62728; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div>	PR905	Bluish violet	TiAlN	• Smooth fine surface PVD coated hard carbide with plastic deformation resistance • Application: Suitable for machining gray and nodular cast iron
<div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant alloys </div>	PR005S	Grey black	MEGACOAT HARD	• Superior high temperature properties of special carbide substrate and excellent heat-resistance of MEGACOAT HARD enables high wear resistance • Application: Finish processing of heat-resistant alloys, also for high speed machining
	PR015S	Grey black	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 machining and finishing of heat-resistant alloys

Properties of PVD coating



Application map



PVD coated carbide for small parts machining

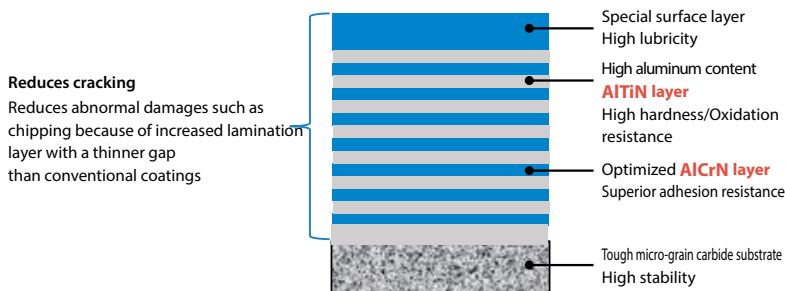
PR1725

1st recommendation for steel machining
Excellent surface finish and long tool life
Great performance in small parts machining applications

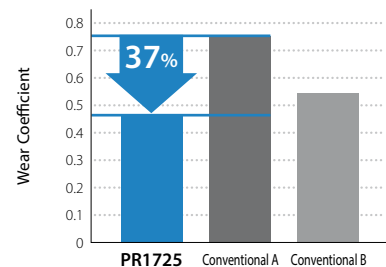


MEGACOAT NANO PLUS

AlTiN/AlCrN Nano laminated film with superior wear resistance and adhesion resistance. Excellent surface finish and long tool life



Wear coefficient comparison (Internal evaluation)



Superior wear and chipping resistance

High hardness with nano laminated film layer properties
Internal stress optimization reduces chipping

Excellent surface finish

Special surface layer with great lubricity reduces adhesion

Applicable to various workpiece materials

Excellent oxidation resistance. Superior high temperature properties maintains good performance in steel, stainless steel and free-cutting steel

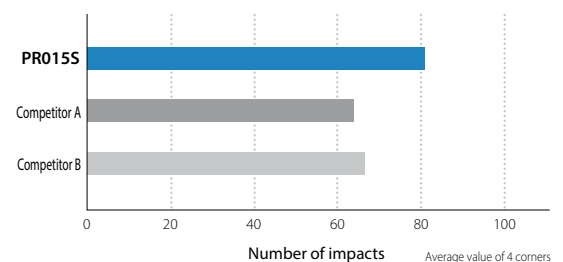
High machining stability

Tough micro-grain carbide substrate provides stable machining

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 : Ni-based Superalloy
Cylindrical workpiece with 1 flat face

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 (Al₂O₃) coating with high-thermal stability is applied on a tough carbide substrate. Superior fracture resistance and wear resistance.



Insert grades

Features of PVD / CVD coated carbide

Classification	Grade	Color	Coated composition	Advantages and applications
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	PR1230	Blackish red	MEGACOAT	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 ₂ O ₃ +TiN (CVD)	<ul style="list-style-type: none"> • Improved abrasion resistance and fracture resistance by improving high toughness • Combination of high toughness substrate, toughened coating and enhanced interface allow both wear and fracture resistance • Application: Drilling of steel - first recommended grade (for high speed machining)
<div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless steel </div>	PR1225	Blackish red	MEGACOAT	<ul style="list-style-type: none"> • 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
<div style="background-color: #D9534F; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div>	PR1210	Blackish red	MEGACOAT	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 ₂ O ₃ +TiN	<ul style="list-style-type: none"> • Special carbide substrate for cast iron, toughened coating and enhanced interface allow both wear and fracture resistance • Application: Drilling of cast iron - 1st recommended material for high speed processing
	CA420M		TiCN+Al ₂ O ₃ +TiN (CVD)	<ul style="list-style-type: none"> • 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
<div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant alloys Titanium alloys </div>	PR1535	Reddish green	MEGACOAT NANO	<ul style="list-style-type: none"> • 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
<div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant alloys </div>	CA6535	Gold	TiCN+Al ₂ O ₃ +TiN (CVD)	<ul style="list-style-type: none"> • High heat-resistance and wear resistance with CVD coating • Application: For milling of Ni-base heat-resistant alloys and martensitic stainless steel
<div style="background-color: #696969; color: white; padding: 5px; text-align: center; border-radius: 5px;"> H Hard material </div>	PR015S	Blackish Gray	MEGACOAT HARD	<ul style="list-style-type: none"> • Substrate with improved thermal properties reduces sudden fracture and decrease edge wear. MEGACOAT HARD coating technology delivers the high hardness and superior wear resistance • Excellent wear and chipping resistance maintains stable machining for high hard materials • Application : Difficult-to-cut materials and high hard (less than 60HRC) machining



Excellent 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

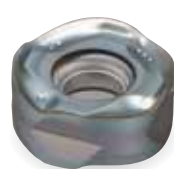
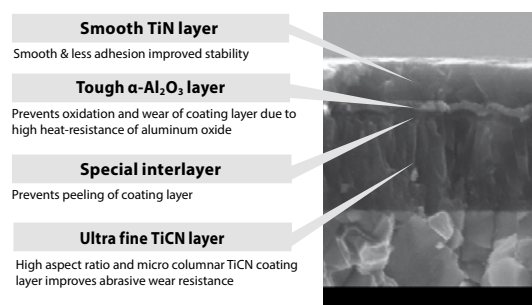
Suitable for variety of workpiece materials

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



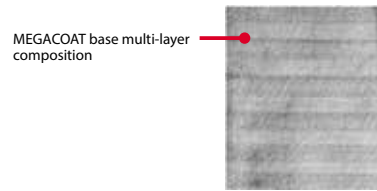
CA6535

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.



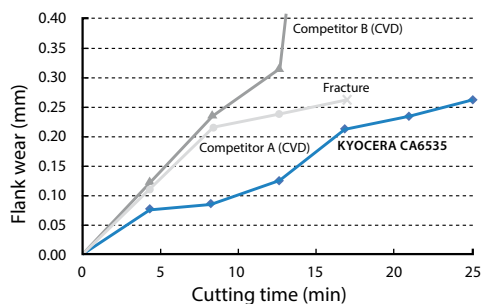
PR1535

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)



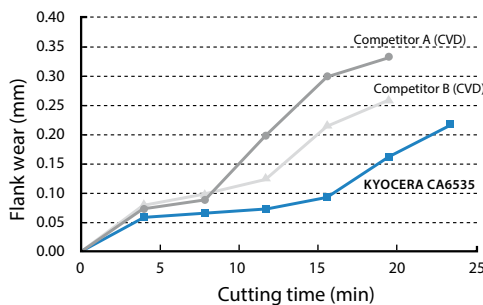
Tool life comparison: Longer tool life and more stable machining than competitors

Ni-base heat-resistant alloys



Cutting conditions: Vc = 50 m/min, ap = 1.0 mm, fz = 0.15 mm/t, wet
Internal evaluation

Martensitic stainless steel



Cutting conditions: Vc = 300 m/min, ap = 2.0 mm, fz = 0.2 mm/t, wet
Internal evaluation

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
- GW05, GW15, GW25: Suitable for machining cast iron, non-ferrous metals and non-metals
- SW series: Suitable for machining of titanium and titanium alloy



Features of carbide

Classification	Grade	Color	Main component	Advantages and applications
	KW10	Gray	WC+Co	• ISO identification symbol K carbide (K10 relevant) • Application: Machining cast iron, non-ferrous materials and non-metals
	GW05			• ISO identification symbol K carbide (K05 relevant) • Application: Excellent wear resistance for machining of cast iron and non-ferrous metal
	GW15			• ISO identification symbol K carbide (K10 relevant), tough micro-grain carbide • Application: Machining cast iron, non-ferrous materials and non-metals
	GW25			• ISO identification symbol K carbide (K30 relevant) • Application: Milling operations of aluminum
	SW05			• ISO identification symbol K carbide (K05 relevant) • Application: Titanium alloys for continuous machining and finishing
	SW10 (Made to order)			• ISO identification symbol K carbide (K10 relevant) • Application: Titanium alloys for continuous and light interrupted machining
	SW25 (Made to order)			• 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

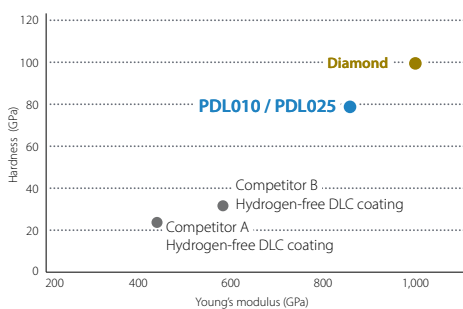
- High Hardness with Kyocera's proprietary hydrogen-free DLC coating
- Excellent surface finish achieved through anti-adhesion performance



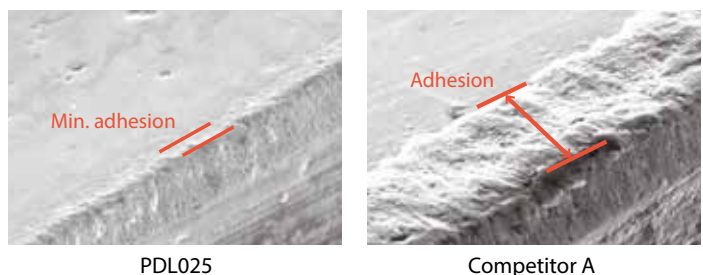
Features of DLC coated carbide

Classification	Grade	Color	Coated composition	Advantages and applications
	PDL010	Rainbow color	C	• DLC coating of original technology has high hardness, excellent adhesion resistance and film peeling resistance • Application: Excellent finished surface processing and long service life of aluminum alloy
	PDL025			• High Hardness with Kyocera's Proprietary Hydrogen-free DLC Coating • Application: Long tool life and stable machining of aluminum alloys

Coating properties



Adhesion resistance comparison



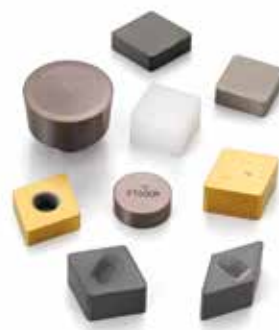
Cutting conditions: Vc = 800 m/min, fz = 0.1 mm/t, ap x ae = 3x5 mm
 Dry, cutter dia. ø 25 mm, workpiece material: A5052 cutting length: 57 m (Internal evaluation)



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

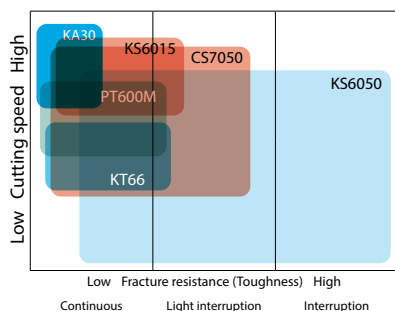
- Excellent wear resistance enables high speeds machining of cast iron
- Ceramic maintains good surface finishes due to the low affinity to workpiece materials
- Silicon nitride ceramic can machine cast iron with coolant due to its superior thermal shock resistance

Features of ceramic

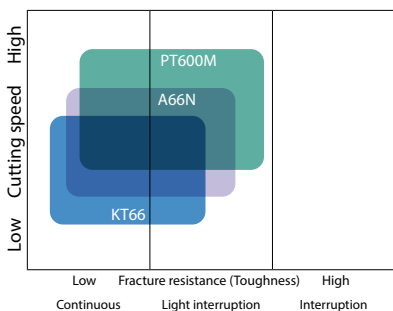
Classification	Grade	Color	Main component (Coated composition)	Coating layer	Hardness of substrate (GPa)	Fracture toughness (MPa·m ^{1/2})	Transverse strength (MPa)	Advantages and applications
	KA30	White	Al ₂ O ₃	-	17.5	4.0	750	<ul style="list-style-type: none"> • Aluminum oxide ceramic (Al₂O₃) • Application: Finishing of cast iron at high cutting speeds without coolant
	KS6015	Gray	Si ₃ N ₄		15.2	7.8	1,000	<ul style="list-style-type: none"> • Silicon nitride ceramic with superior wear resistance reduces heat at the cutting edge. • Application : Roughing and high speed machining of cast iron (with or without coolant)
	KS6050	Gray	Si ₃ N ₄		15.6	8.0	1,200	<ul style="list-style-type: none"> • Silicon nitride ceramic (Si₃N₄) • 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
 	KT66	Black	Al ₂ O ₃ +TiC	Thin coating	20.1	4.1	980	<ul style="list-style-type: none"> • Aluminum oxide and titanium carbide ceramic (Al₂O₃+TiC) • Application: Semi-roughing to finishing of cast iron, and hard materials
	A66N	Gold	Al ₂ O ₃ +TiC (TiN COAT)					<ul style="list-style-type: none"> • TiN PVD coated aluminum oxide and titanium carbide ceramic (TiN coated Al₂O₃+TiN) • Application: Semi-roughing to finishing of hard materials
	PT600M	Blackish red	Al ₂ O ₃ +TiC (MEGACOAT)					<ul style="list-style-type: none"> • Heat-resistant MEGACOAT on aluminum oxide and titanium carbide ceramic (MEGACOAT Al₂O₃+TiC) • Application: Semi-roughing to finishing of cast iron, hard materials and hardened roll materials
	KS6030	Gray	SiAlON	-	15.2	6.0	600	<ul style="list-style-type: none"> • SiAlON Ceramic with superior wear resistance and high resistance against boundary wear • Application: Finishing to medium machining of heat-resistant alloys
	KS6040	Brown			16.7	7.0	900	<ul style="list-style-type: none"> • High stability SiAlON ceramic with wear resistance and fracture resistance • Application: Roughing of heat-resistant alloys

Application map

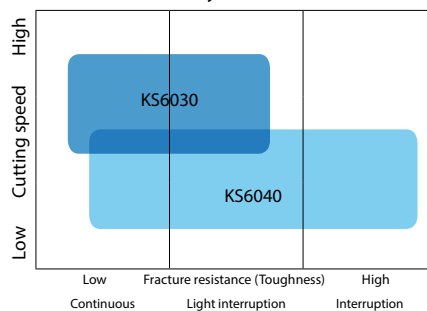
Cast iron



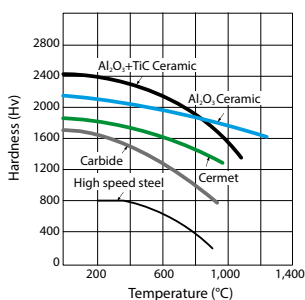
Hard materials



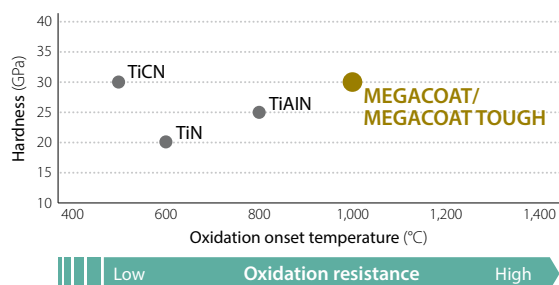
Heat-resistant alloys



High-Temperature hardness



Properties of PVD coating



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

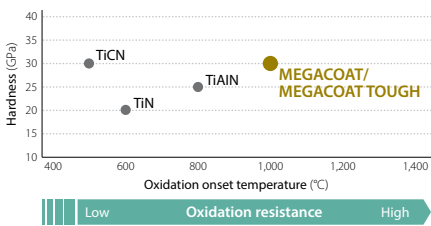
Features of CBN

Classification	Grade	Color	Ave. grain size (µm)	Hardness of substrate (GPa)	Transverse strength (MPa)	Advantages and Applications
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> H Hard materials </div>	KBN510	Black	2	28	1,000	<ul style="list-style-type: none"> • Excellent wear resistance and crack resistance, non-coated CBN • Application: Finishing and continuous machining of hardened die steel
	KBN525		1 and under	25	1,250	<ul style="list-style-type: none"> • Application: General purpose for hardened steel
	KBN05M (MEGACOAT)	Blackish red	0.5-1.5	27	1,000	<ul style="list-style-type: none"> • Heat-resistant MEGACOAT on highly heat-resistant CBN substrate • Application: High speed finishing of hardened steel
	KBN10M (MEGACOAT)		2	28		<ul style="list-style-type: none"> • Application: High speed finishing of hardened die steel
	KBN25M (MEGACOAT)		1 and under	25	1,250	<ul style="list-style-type: none"> • Heat-resistant MEGACOAT on micro-grain CBN with heat-resistant binder phase • Application: Stable machining of hardened steel at high cutting speeds
	KBN020 (MEGACOAT TOUGH)		3	31-32	1,300	<ul style="list-style-type: none"> • High toughness CBN coated with high wear resistance enables machining in a wide range of cutting areas • Application: Continuous to interrupted machining of hardened steel
Sintered steel	KBN570	Black	2-4	34	1,350	<ul style="list-style-type: none"> • High content CBN • Application: Processing of sintered steel (burr suppression)
	KBN70M (MEGACOAT)	Blackish red				<ul style="list-style-type: none"> • Heat-resistant MEGACOAT on CBN rich substrate • Application: Stable machining of sintered steel (ferrous sintered alloys)
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> K Cast iron </div>	KBN475	Black	2	39	1,400	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

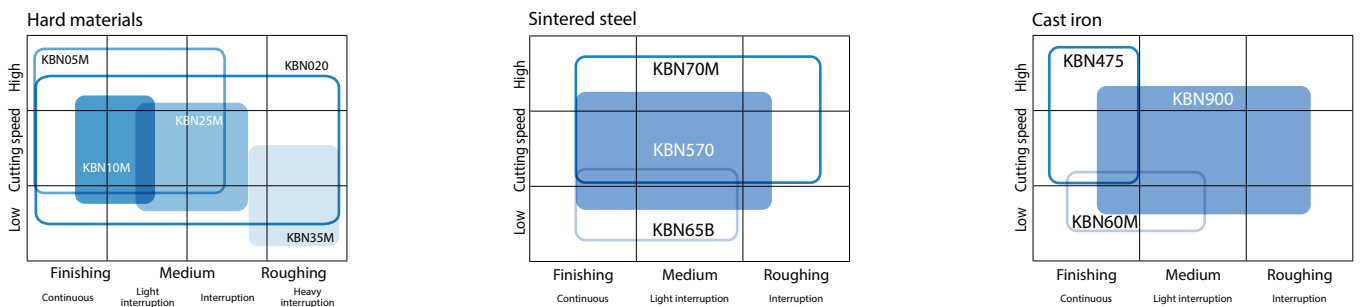
Properties of PVD coating



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





PCD (Polycrystalline diamond)

PCD

PCD 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 (A mirror-like finished surface will not be obtained)

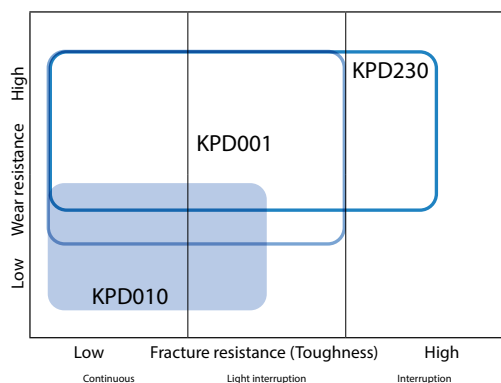
Features of PCD

Classification	Grade	Ave. grain size (µm)	Advantages and applications
	KPD001	0.5	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Superior wear resistance due to rough grain PCD (25µm) • Application: High speed machining of high silicon aluminum alloy and machining of carbide

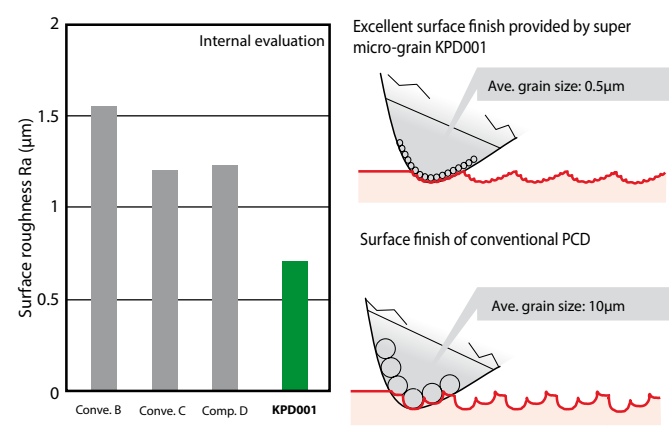
Applications

Workpiece material		Non-ferrous metals				Difficult-to-cut materials			
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)

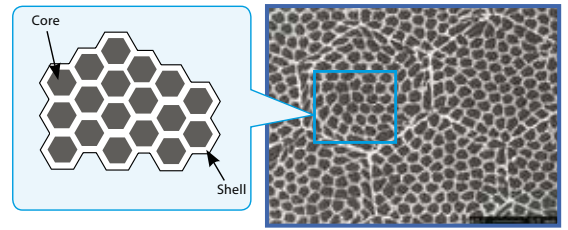
Honeycomb structure CBN

Honeycomb structure CBN

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 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

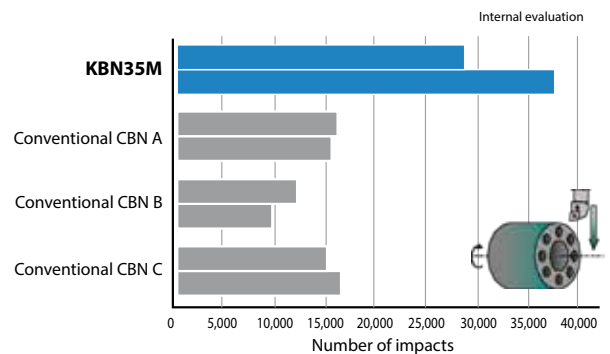
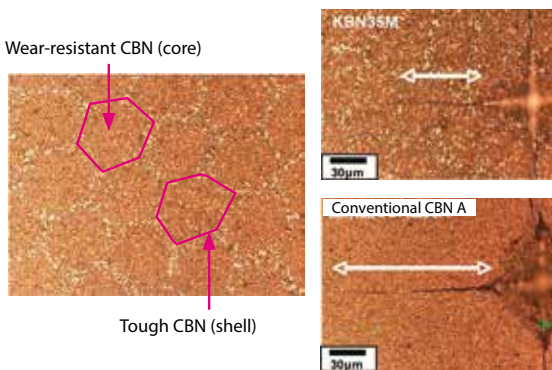


Features of honeycomb structure CBN

Classification	Grade	Color	Main component	Advantages and applications
H Hard materials	KBN35M (MEGACOAT)	Blackish red	CBN	<ul style="list-style-type: none"> • 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

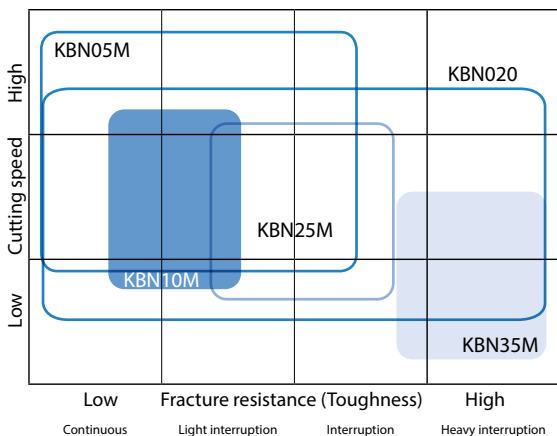
KBN35M (MEGACOAT honeycomb structure CBN)

Tough CBN (shell) prevents crack growth





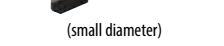






Application map

Hard materials



Insert material selection table

Applications		Cutting range	Steel	Stainless steel	Gray cast iron	Nodular cast iron	Non-ferrous metals	Heat-resistant alloys	Titanium alloys	Hard materials	Sintered steel
Turning		Finishing	TN610 CCX TN620 TN60 PV710 PV720 PV730 CA510 CA515 CA025P	TN610 TN620 TN60 PV720 CA6515 CA6525 PR1535 CA530	KBN475 KBN60M KA30 PV7005 CA5505 CA310 CA315 CA320	TN60 PV7005 CA5505 CA310 CA315 CA320	KPD001 KPD010 PDL010 PDL025 KW10	KS6040 KW10 CA6525 PR0055 PR0155 PR1535	KPD001 KPD010 KPD010 SW05 SW10 SW25	KT66 A66N PT600M KBN05M KBN020 KBN10M KBN25M KBN35M KBN900	TN610 TN60 KBN570 KBN70M
		Roughing	CA530	CA530							
Small tools		Finishing	TN610 TN620 PV710 PV720 PR1705 PR1725 PR930 PR1025 PR1535	TN610 TN620 PV720 PR1725 PR930 PR1025 PR1225 PR1535	CA310 CA315 KW10	CA310 CA315 CA320 KW10	KPD001 KPD010 PDL010 PDL025 GW05 KW10	CA6515 PR1125 PR1225 PR1535	KPD001 KPD010 KW10 PR1535	KBN05M KBN020 KBN10M KBN25M	TN610 TN60 KBN570 KBN70M
		Roughing									
Boring		Large	TN610 TN620 PV710 PV720 PV730 CA515 CA025P CA530 PR1705 PR1725 PR1025 PR930 PR1535	TN60 CA6515 CA6525 PR1725 PR1025 PR1225 PR930 PR1535	KBN475 KBN60M PV7005 CA310 KW10	PV7005 CA310 CA320 KW10	KPD001 KPD010 PDL010 PDL025 GW05 KW10	CA6515 CA6525 PR1125 PR1225 PR1535	KPD001 KPD010 KW10 SW05 PR1535	PT600M KBN05M KBN020 KBN10M KBN25M	TN610 TN60 KBN570 KBN70M
		Small									
Cut-Off		Large	CR9025 PR930 PR915 PR1215 PR1225 PR1535	CR9025 PR930 PR915 PR1215 PR1225 PR1535	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 PR1625	TC40N TN620 TN90 PV7040 PR930 PR1115 PR1215 PR1225 PR1625	PR905 PR1215 KW10 GW15	PR905 PR1215 KW10 GW15	KPD001 PDL025 KW10 GW15	PR915 KW10 PR1215 PR1225 PR1535	KPD001 KW10	KBN510 KBN525 PT600M	TC40N KBN570
		Stable									
Threading		Glossy finish	TC60M PR1215 PR1115 PR930	TC60M PR1515 PR1115 PR930	KW10 GW15	KW10 GW15	KW10 GW15	KW10 GW15	KW10 GW15	-	PR1515 PR1115
		Stable									
Drilling		Wear resistance	CA520D PR1225 PR1230 PR1535	PR1225 PR1535	CA415D PR1210 KW10	PR1210 KW10	KW10 GW15	PR1225 KW10 GW15	KW10	-	-
		Toughness									
Milling		Finishing	TN100M TN620M PV60M PR1225 PR1230	CA6535 PR1225 PR1525 PR1535	PR1210 PR1510 KW10	PR1210 PR1510 KW10	KPD230 KPD001 KPD010 PDL025 KW10 GW25	CA6535 PR1225 PR1535	KPD230 KPD001 KW10 PR905 PR1210 PR1535	PR0155	-
		Roughing									

Highlighted materials are recommended choice.

Grade properties

Cermet

Grade	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				6.9	1,550	15.2	9.0	2,500
TN620M				6.9	1,550	15.2	9.0	2,500
TN6020				6.4	1,500	14.7	10.0	2,500
TN60		TiCN+NbC		6.6	1,600	15.7	9.0	1,760
TN90				6.4	1,450	14.2	10.0	1,960
TN100M				6.7	1,520	14.9	10.5	1,860
TC40N				6.0	1,650	16.2	9.0	1,570
TC60M		NbC		8.1	1,500	14.7	10.5	1,670

CVD coated cermet

Grade	Color	Coated composition	Coating layer	Ratio	Hardness of substrate		Fracture toughness (MPa·m ^{1/2})	Transverse strength (MPa)
					(HV)	(GPa)		
CCX	Gold	TiCN+Al ₂ O ₃ +TiN	Thin coating	7.0	1,500	14.7	10.0	2,600

PVD coated cermet

Grade	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	2,100PV730
PV720				6.9	1,550	15.2	9.0	2,500
PV730				7.0	1,550	14.2	10.0	2,500
PV7005	Blackish red	MEGACOAT		6.0	1,650	16.2	8.5	1,470
PV7040				6.0	1,650	16.2	9.0	1,570
PV90	Gold	TiN		6.4	1,450	14.2	10.0	1,960
PV60M	Gold	MEGACOAT NANO		6.6	1,600	15.7	9.0	1,760

CVD coated carbide

Grade	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	1,570	15.4	12.0	2,780	
CA315				15	1,570	15.4	12.0	2,780	
CA320				15	1,570	15.4	12.0	2,780	
CA415D	Gold	TiCN+Al ₂ O ₃ +TiN		15	1,570	15.4	12.0	2,780	
CA420M				14.5	1,600	15.8	13.0	3,400	
CA4505	Blackish gray	TiCN+Al ₂ O ₃		15.0	1,790	17.5	9.5	2,350	
CA4515				15.0	1,570	15.4	12.0	2,780	
CA510	Gold	TiCN+Al ₂ O ₃ +TiN		14.5	1,470	14.4	11.5	2,500	
CA515				14.4	1,440	14.1	12.5	2,650	
CA520D				14.7	1,370	13.4	16.0	3,100	
CA025P				14.2	1,400	13.7	13.5	2,800	
CA525				14.2	1,360	13.3	13.5	2,750	
CA530				13.9	1,340	13.1	14.5	2,850	
CA5505				14.7	1,730	17.0	10.0	2,540	
CA5515				14.7	1,550	15.2	12.0	2,750	
CA5525				14.5	1,400	13.7	12.0	2,780	
CA5535				14.1	1,340	13.1	16.5	2,970	
CA6515				Thin coating	14.7	1,530	15.0	12.0	2,780
CA6525					14.7	1,370	13.4	16.0	3,100
CA6535					14.3	1,320	12.9	16.0	3,700
CR9025					Thick coating	14.5	1,400	13.7	12.0



Grade properties

PVD coated carbide

Grade	Color	Coated composition	Coating layer	Ratio	Hardness of substrate		Fracture toughness (MPa·m ^{1/2})	Transverse strength (MPa)
					(HV)	(GPa)		
PR005S	Gray black	MEGACOAT HARD	Thin coating	15.0	1,750	17.2	8.0	2,000
PR015S				14.9	1,680	16.5	9.0	2,400
PR905	Bluish violet	TiAlN		14.8	1,720	16.8	9.0	2,450
PR915				14.1	1,700	16.7	11.0	4,140
PR930	Reddish gray	TiCN		14.1	1,700	16.7	11.0	4,140
PR1025				14.5	1,600	15.8	13.0	3,400
PR1115	Purple red	TiAlN		14.7	1,700	16.7	11.0	3,000
PR1210	Blackish red	MEGACOAT		14.8	1,720	16.8	9.0	2,450
PR1215				14.7	1,700	16.7	11.0	3,000
PR1225				14.5	1,600	15.8	13.0	3,400
PR1230				13.7	1,450	14.2	13.0	2,250
PR1510	Reddish green	MEGACOAT NANO		14.8	1,720	16.8	9.0	2,450
PR1515				14.7	1,700	16.7	11.0	3,000
PR1525				14.5	1,600	15.8	13.0	3,400
PR1535				14.3	1,320	12.9	16.0	3,700
PR1625				14.5	1,600	15.8	13.0	3,400
PR1705			Silver	MEGACOAT NANO PLUS	14.9	1,800	17.6	10.0
PR1725	14.5	1,600			15.8	13.0	3,400	

Carbide

Grade	Color	Main component	Coating layer	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
GW05				14.9	1,800	17.6	10.0	3,300
GW15				14.7	1,700	16.7	11.0	3,000
GW25				14.5	1,600	15.8	13.0	3,400
SW05				15.0	1,790	17.5	9.5	2,350
SW10				14.8	1,720	16.8	9.0	2,450
SW25				14.7	1,370	13.4	16.0	3,100

DLC coated carbide

Grade	Color	Coated composition	Coating layer	Ratio	Hardness of substrate		Fracture toughness (MPa·m ^{1/2})	Transverse strength (MPa)
					(HV)	(GPa)		
PDL010	Rainbow color	C	Thin coating	15.0	1,650	16.2	10.0	1,470
PDL025				14.5	1,600	15.8	13.0	3,400

