

Insert Grades

A1~A20



A

Summary of Insert Grades

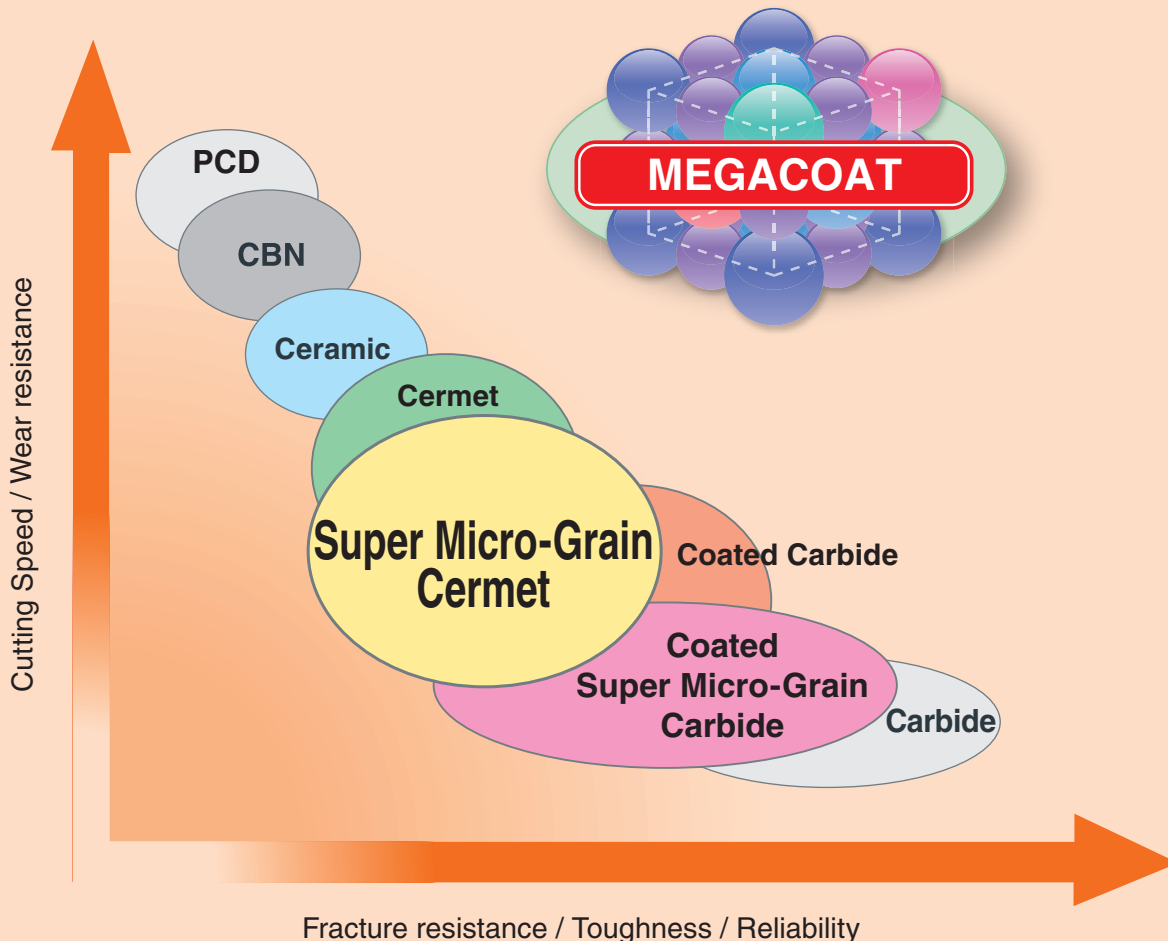
A2~A5

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

Insert Grades

A6~A20

Cermet	A6
PVD Coated Cermet	A6
CVD Coated Carbide	A8
PVD Coated Carbide (Super Micro-grain Carbide / Micro-grain Carbide)	A10
PVD/CVD Coated Carbide (Milling, Drilling)	A12
Carbide	A14
Ceramic	A15
CBN (Cubic Boron Nitride)	A16
PCD (Polycrystalline Diamond)	A17
Honeycomb structure CBN / Ceramic	A18
Grade Properties	A19
Insert Material Selection Table	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					Cutting Range					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	TN6010		TN6020		TN60		TN90		TN6010		TN6020		TN60		TN90		TN60	
		TC60M					TC60M												
		PV7020		PV90		PV7020		PV90											
		PV7010		PV7025		PV7010		PV7025		PV7005									
Coated Carbide	CA Series	CA515		CA525		CA5505		CA5515		CA5525		CA5535		CA4010		CA4115		CA4120	
		CA6515		CA6525		CA4505		CA4515											
		PR930		PR1005		PR1025		PR1115		PR930		PR1025		PR1125					
		PR1225					PR1225												
		PR1425					PR1425												
	Ceramic	Ceramic									KA30				KT66				
												A66N							
												PT600M							
												KS6000							
												KS6050							
												CS7050							
												KW10							
Carbide	Carbide													GW15					
														KBN60M					
CBN	CBN													KBN900					

Insert Grades



Turning

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-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						PR930			
	MEGACOAT (PR Series)					PR1305		PR1310									
								PR1325						TN6010			
	Cermet													TN60			
	Ceramic					CF1				KT66							
						KS6040				A66N							
										PT600M							
	CBN									KBN510							
										KBN525							
										KBN900							
	MEGACOAT									KBN05M							
										KBN10M				KBN65M			
										KBN25M				KBN70M			
										KBN30M							
										KBN35M							

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
Carbide						SW05											
						SW10											
						SW25											
		KW10				KW10											
		GW15				GW15											
PCD		KPD001				KPD001											
		KPD010				KPD010											

PVD Coated Carbide for Small Tools → A10

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								
	MEGACOAT (PR Series)	PR1225					PR1225								
	MEGACOAT NANO (PR Series)	PR1425					PR1425								

Summary of Insert Grades

A

Grooving / Cut-Off



Insert Grades

Workpiece Material	Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
	Finishing		Roughing			Finishing		Roughing			Finishing		Roughing	
Classification	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermets	MEGACOAT (PV Series)	PV7040									PV7040			
	TN Series	TN6020				TN6020					TN60			
		TN60				TN60					TN60			
TC Series	TN90				TN90					TC40N				
	TC40N					TC60M					TC40N			
CR Series			CR9025			CR9025								
Coated Carbide	PR Series	PR630				PR630					PR905			
		PR660				PR660					PR905			
	PR915				PR915					PR905				
	PR930				PR930					PR905				
	PR1025				PR1025					PR905				
MEGACOAT (PR Series)	PR1115				PR1215					PR1215				
	PR1225				PR1225					PR1215				
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			
	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	PR Series												PR930			
	MEGACOAT (PR Series)												PR1215			
													PR1225			
Cermet													TN60			
Ceramic									A65							
									A66N							
									PT600M							
Carbide	KW10				KW10											
	GW15				GW15											
CBN								KBN510					KBN570			
								KBN525								
PCD	KPD001				KPD001											
	KPD010				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	PR Series				PR660					PR660				PR905	
	MEGACOAT (PR Series)				PR730 PR830 PR915 PR930 PR1025 PR1225 PR1230					PR730 PR830 PR915 PR930 PR1025 PR1225				PR1210	
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			
Carbide			KW10 GW15					KW10 GW15							

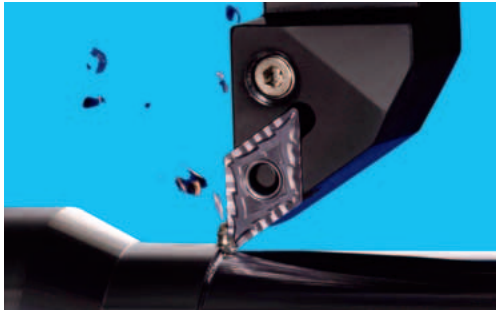
Milling

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			TN60						TN60							
	TC Series			TN100M						TN100M							
Coated Carbide	CA Series			TC60M						CA6535							
	PR Series			PR830						PR830 PR1025 PR1225				PR905			
	MEGACOAT (PR Series)			PR1225 PR1230						PR1225				PR1210			
	MEGACOAT NANO (PR Series)			PR1525						PR1525 PR1535				PR1510			
	Carbide			PW30										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								
	PR Series												PR905				
	MEGACOAT (PR Series)												PR1210				
	MEGACOAT NANO (PR Series)												PR1535				
Carbide			KW10 GW25										KW10 GW25				
CBN																KBN525	
PCD			KPD001 KPD010 KPD230										KPD001 KPD010 KPD230				

Insert Grades

A

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.

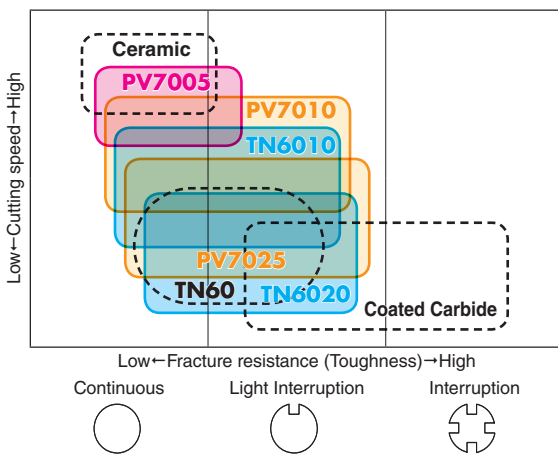
PVD Coated Cermet (MEGACOAT Cermet)

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	
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border: 1px solid black;"> P Steel </div>	Cermet	TN6010 (Super Micro-Grain)	Gray	TiCN	<ul style="list-style-type: none"> Improved surface cermet with superior wear resistance and toughness Application: Economical uncoated cermet for steel
		TN60	Gray	TiCN+NbC	<ul style="list-style-type: none"> Typical choice cermet with superior wear resistance and toughness Application: Cutting of steel and stainless steel
		TN6020 (Super Micro-Grain)	Gray	TiCN	<ul style="list-style-type: none"> Super micro-grain cermet with superior wear resistance and toughness Application: Recommended cermet for steel machining, superior wear resistance and toughness.
		TN100M	Gray	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	Gray	TiC+TiN	<ul style="list-style-type: none"> Good balance of wear resistance and toughness Application: Grooving and threading of steel
<div style="background-color: #FF0000; color: white; padding: 5px; text-align: center; border: 1px solid black;"> K Cast Iron </div>	MEGACOAT Cermet	PV7010 (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	<ul style="list-style-type: none"> Heat-resistant MEGACOAT on improved surface cermet with excellent wear resistance and toughness Application: Stable and improved tool life in steel machining, excellent surface finish
		PV7025 (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	<ul style="list-style-type: none"> MEGACOAT on the super micro-grain cermet Application: First choice PVD coated cermet for steel machining. High strength and longer tool life given by MEGACOAT.
		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	Blackish red	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



PV7025, PV7010, PV7005, PV7040 TN6020, TN6010

- MEGACOAT Cermet
- Longer tool life and stable cutting due to superior heat resistance and hardness.
- Improved oxidation resistance prevents crater wear and enables stable machining.
- High thermal stability and surface smoothness provide excellent surface finish

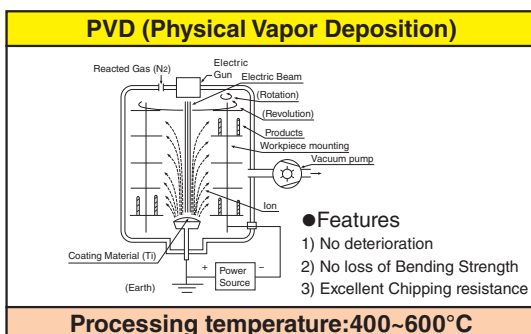
PV7025: MEGACOAT for Steel PV7040: MEGACOAT for Steel (Grooving)

- Improved Surface Cermet
- Hard surface and tougher inner phase
- Achieves balanced between wear resistance and toughness
- Economical uncoated cermet

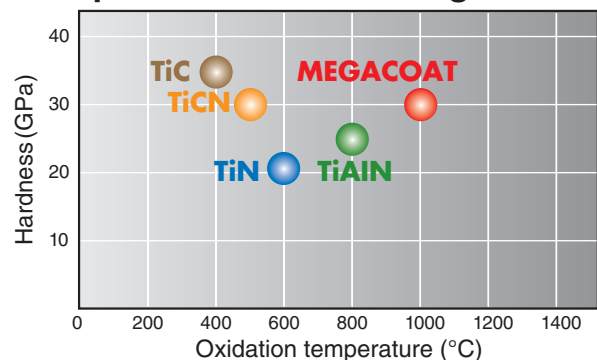


TN6020: Uncoated Cermet for Steel TN6010: Uncoated Cermet for Steel

PVD Coated



Properties of PVD Coating

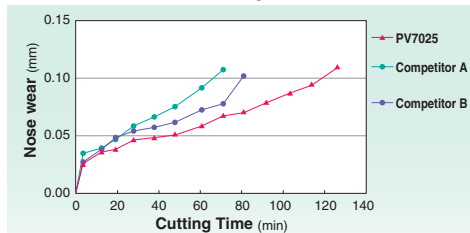




For steel MEGACOAT Cermet

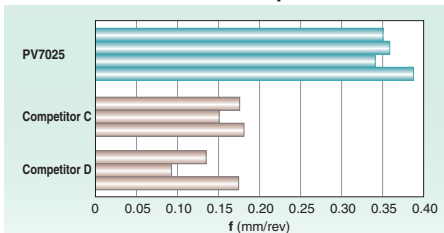
PV7025

Wear Resistance Comparison



<Cutting Conditions>
SCM435, Vc=200m/min, ap=1.0mm, f=0.2mm/rev, Wet

Fracture resistance comparison

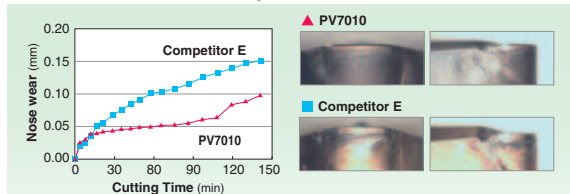


<Cutting Conditions>
S45C, Vc=100m/min, ap=2.0mm, f=0.05-0.4mm/rev, Wet

For steel MEGACOAT Cermet

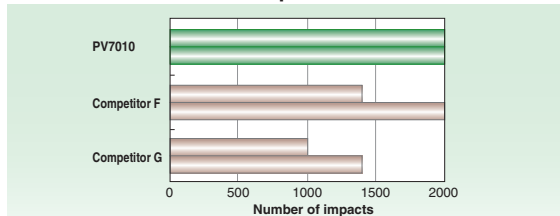
PV7010

Wear Resistance Comparison



<Cutting Conditions>
SCM435, Vc=250m/min, ap=1.0mm, f=0.2mm/rev, Wet, CNMG120408

Fracture resistance comparison

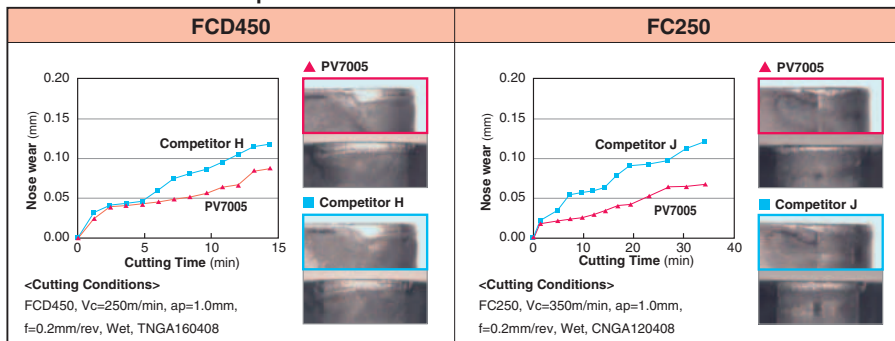


<Cutting Conditions>
S45C, Vc=250m/min, ap=1.5mm, f=0.2mm/rev, Dry, CNMG120408

For cast iron MEGACOAT Cermet

PV7005

Wear Resistance Comparison



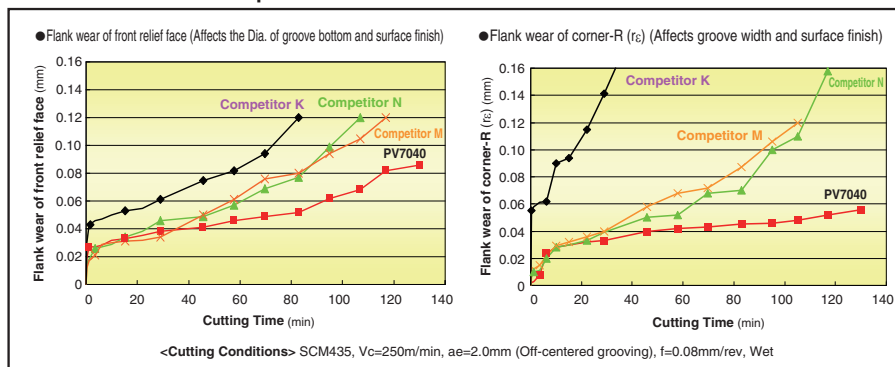
<Cutting Conditions>
FCD450, Vc=250m/min, ap=1.0mm, f=0.2mm/rev, Wet, TNGA160408

<Cutting Conditions>
FC250, Vc=350m/min, ap=1.0mm, f=0.2mm/rev, Wet, CNGA120408

For grooving steel MEGACOAT Cermet

PV7040

Wear Resistance Comparison



<Cutting Conditions> SCM435, Vc=250m/min, ae=2.0mm (Off-centered grooving), f=0.08mm/rev, Wet

Insert Grades

A

CVD Coated Carbide



Insert Grades



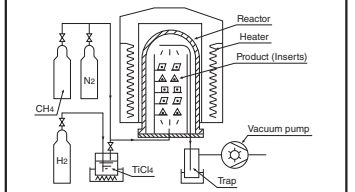
CVD Coated Carbide

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

Features

- Applicable from low to high speed cutting and from finishing to roughing
- Stable cutting 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

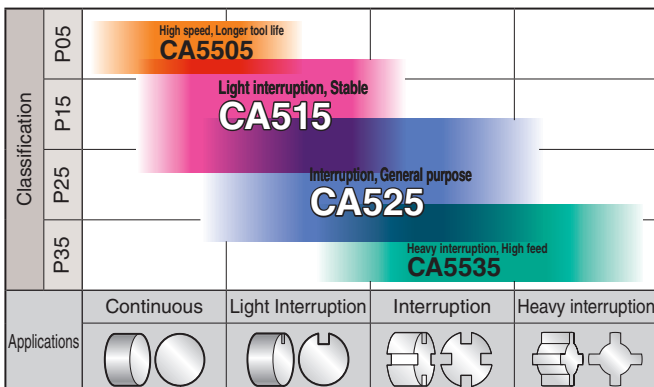
Processing temperature:900~1100°C

Features of CVD Coated Carbide

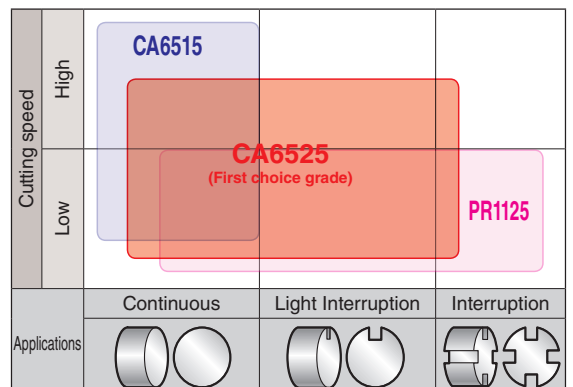
Classification	Symbol	Color	Main Component	Advantages
<div style="background-color: #007bff; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	CA515	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved wear resistance and stability due to special substrate with heat deformation resistance and hard and tough coating layer with reinforced interface. · Application: Light interrupted cutting of steel
	CA525	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Stable and long tool life cutting due to special substrate with heat deformation resistance and tougher coating layer and reinforced interface. · Application: Interrupted to general machining of steel
	CA5505	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved wear resistance due to hard carbide substrate and micro columnar composition of coating layer · Application: High speed continuous cutting of steel, continuous to light interrupted cutting of cast iron
	CA5515	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved wear resistance and longer tool life due to micro columnar composition of coating layer · Application: High speed cutting of steel, continuous to light interruption
	CA5525	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved toughness and wear resistance due to tougher carbide substrate and micro columnar composition of coating layer · Application: For general machining of steel, roughing to interruption
	CA5535	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved toughness due to tougher carbide substrate · Application: Roughing to heavy interrupted cutting of steel
	CR9025	Gold	Columnar 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 cutting of steel
<div style="background-color: #ffc107; color: white; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless Steel </div>	CA6515	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Specialized carbide substrate for machining stainless steel, excellent wear resistance · Application: Continuous to light interrupted machining of stainless steel
	CA6525	Gold	Micro columnar 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: #dc3545; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast Iron </div>	CA4010	Gold	Columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Excellent high temperature stability due to plastic deformation and oxidation wear resistance · Application: Continuous to light interrupted high speed cutting of cast iron
	CA4115	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved wear resistance due to micro columnar composition of coating layer · Application: Machining nodular cast iron, continuous to light interruption
	CA4120	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · Improved toughness and wear resistance due to tougher carbide substrate and micro columnar composition of coating layer · Application: Roughing to heavy interrupted cutting of nodular cast iron
	CA4505	Blackish gray	Micro columnar 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 cutting
	CA4515	Blackish gray	Micro columnar 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 cutting
<div style="background-color: #6c757d; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant Alloys </div>	CA6535	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	<ul style="list-style-type: none"> · CVD for milling with improved stability due to a thin coating layer High heat resistance and abrasive wear resistance · Application: For milling of Ni-base heat-resistant alloys and martensitic stainless steel

Application Map

● Steel



● Stainless Steel





CVD coated carbide grades for steel

CA515/CA525



New coating technology to provide longer tool life and stable machining

★ High Adhesion Strength of Coating Layer Ultra fine interface

- Longer tool life and stable machining by improved adhesion strength
- **40% improved** adhesion strength.

★ Smooth and Flat Surface

- Generates low cutting force and stable machining
- Prevents adhesion (edge build-up) and sudden fracturing

★ High Hardness with Tougher α -Al₂O₃ coating layer

- Longer tool life due to high-aspect ratio of micro columnar α -Al₂O₃ coating layer

★ New Carbide Substrate

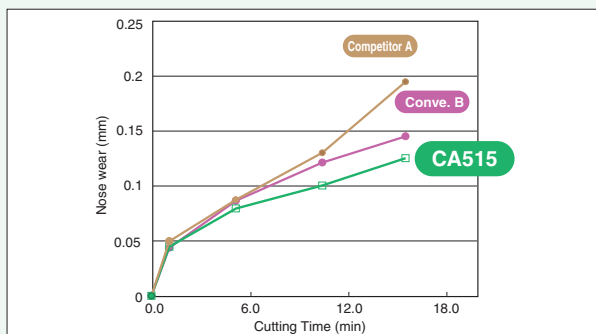
- Special carbide substrate with deformation resistance at high temperature
- **10% improved** hardness at high temperature
- Good for high efficient machining

CA515

For high speed cutting

Wear Resistance Comparison

SCM435
Vc=300m/min, ap=2.0mm, f=0.3mm/rev, wet

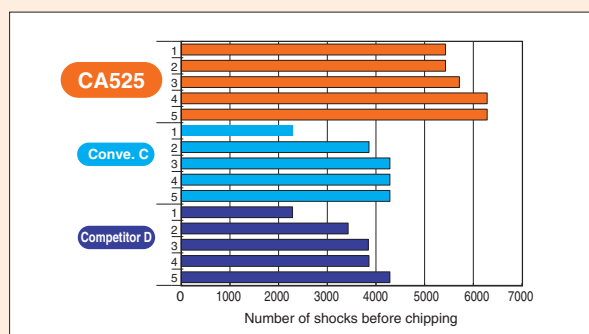


CA525

For stable and general machining

Fracture resistance comparison

SCM440 (with 4 slits)
Vc=300m/min, ap=1.5mm, f=0.3mm/rev, Wet



Case Studies

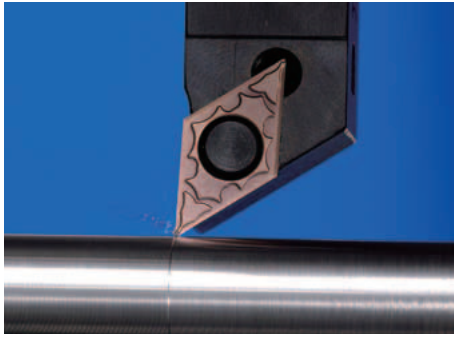
SCM440	
.Cover .Vc=140~150m/min .ap=3.0~3.5mm .f=0.35~0.4mm/rev .Wet .CNMG120408PT	
CA515	10pcs/edge
Competitor CVD Coated Carbide E	7pcs/edge
.CA515 Showed 1.4 times longer tool life compared with Competitor E (User Evaluation)	

S45C	
.Shaft .Vc=250m/min .ap=3.0mm .f=0.3mm/rev .Wet .CNMG120408PS	
CA525	10pcs/edge
Competitor CVD Coated Carbide F	6pcs/edge
Competitor PVD Coated Carbide G	Instant breakage
.CA525 showed 1.6 times longer tool life compared with Competitor F (User Evaluation)	
.Competitor G fractured without machining a single workpiece (User Evaluation)	

SCM420	
.Shaft .Vc=120m/min .ap=2.0mm .f=0.25mm/rev .Dry .TNMG160408R-ST	
CA525	10pcs/edge
Competitor CVD Coated Carbide H	2pcs/edge
.CA525 machined 5 times more workpieces compared with Competitor H (User Evaluation)	

SS400	
.Machine part .Vc=170m/min .ap=0.75mm .f=0.2mm/rev .Wet .CNMG120408PQ	
CA525	1400pcs/edge or more
Competitor CVD Coated Carbide I Molded Chipbreaker	800~1000pcs/edge
.CA525 showed stable tool life and 1.4 times longer tool life compared with Competitor I (User Evaluation)	
.Good chip control	

PVD Coated Carbide (for Turning)



PVD Coated Carbide (MEGACOAT/MEGACOAT NANO)

Using a Physical Vapor Deposition coating technology, PVD coated carbide grades are coated on a very tough carbide substrate and suitable for turning.

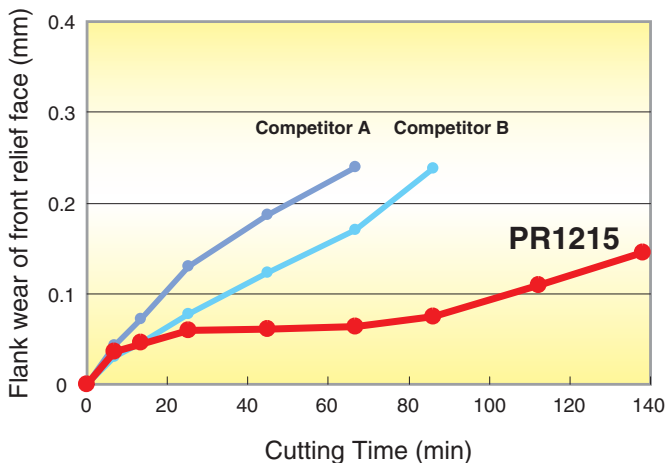
PVD Coated Super Micro-Grain Carbide

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

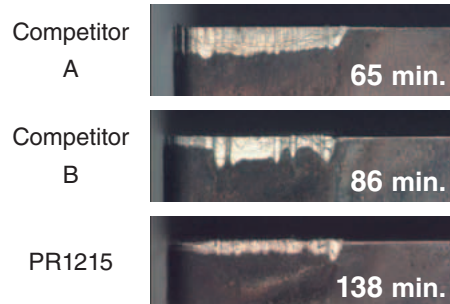
Features of PVD Coated Carbide

Classification	Symbol	Color	Main Component (Coated Composition)	Advantages
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	PR915 (Super Micro-Grain)	Bluish violet	TiAlN	· TiAlN base PVD coated super micro-grain carbide, superior wear and oxidation resistance · Application: Stable and reliable high precision cutting of steel
	PR930 (Super Micro-Grain)	Reddish gray	TiCN	· Hard TiCN base PVD coated super micro-grain carbide · Application: Low cutting speed, precise cutting 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	· TiCN base PVD coated micro-grain carbide · Application: General machining of steel and stainless steel, stable and longer tool life
	PR1115	Purple red	TiAlN	· Hard TiAlN base PVD coated super micro-grain carbide · Application: Superior anti-oxidation performance with well balanced wear resistance and toughness
	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 cutting of stainless steel, extended tool life
<div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless Steel </div>	PR1125	Purple red	TiAlN	· Hard TiAlN base PVD coated super micro-grain carbide, superior toughness and heat resistance · Application: Finishing and light interrupted cutting of stainless steel
	PR1225	Blackish red	MEGACOAT	· Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate · Application: Light interrupted to interrupted cutting of stainless steel
<div style="background-color: #FF0000; 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>	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 cutting and finishing of heat-resistant alloys
	PR1325	Blackish red	MEGACOAT	· MEGACOAT on tough carbide · Application: Light interrupted cutting and roughing of heat-resistant alloys

PR1215 Wear Resistance Comparison (Off-centered grooving)



Flank wear of front relief face

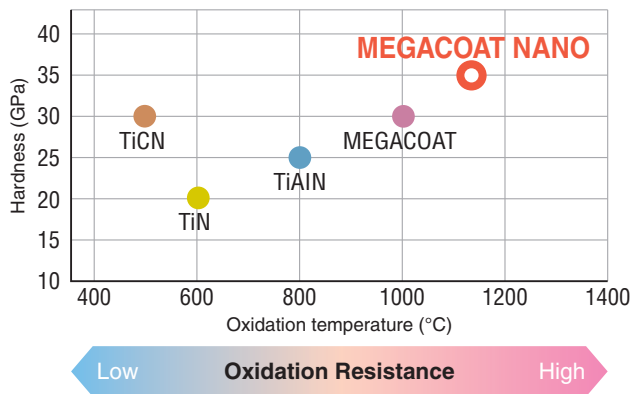
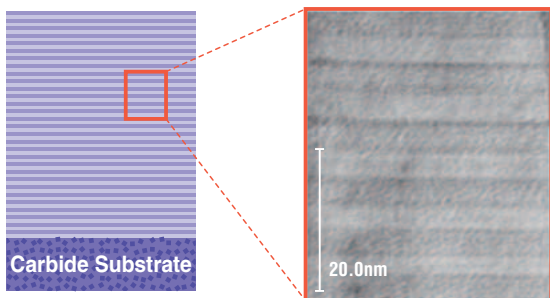


<Cutting Conditions> Vc=150m/min, ae=1.5mm, f=0.1mm/rev, Wet SNCM439 φ198→φ48



Properties of MEGACOAT NANO

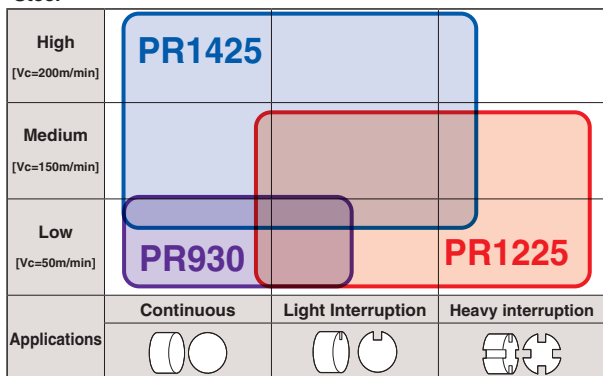
Multi-layer composition of MEGACOAT



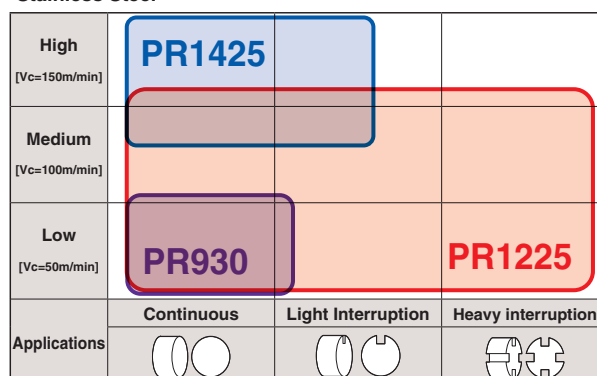
Prevents wear and fracture with high hardness (35GPa) and superior oxidation resistance (oxidation temperature: 1,150°C)

Application Map

• Steel

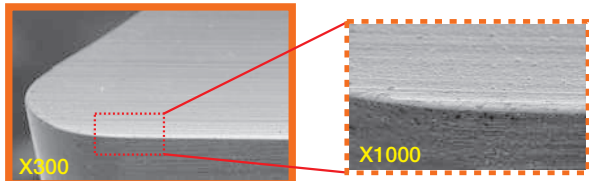


• Stainless Steel

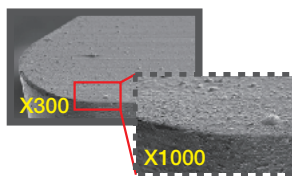


Cutting edge quality (Sharp edge insert)

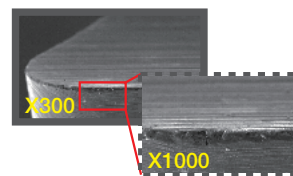
PR1225 / PR1425



Competitor A



Competitor B



<Superior edge-sharpening performance and Smooth surface>

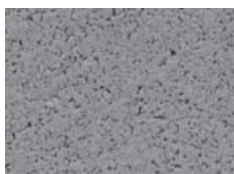
<Delamination (coating peeling) and rough surface>

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

Advantages of PR13 Series

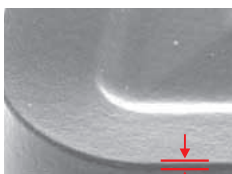
- 1) Superior wear and fracture resistance attained with uniform grain size and MEGACOAT on superior thermal shock resistant carbide
- 2) New edge preparation technology (FET: Fine Edge Treatment) controls and minimizes R honing and provides large tip rake angle, and thus prevents burrs and notching.

Special carbide substrate



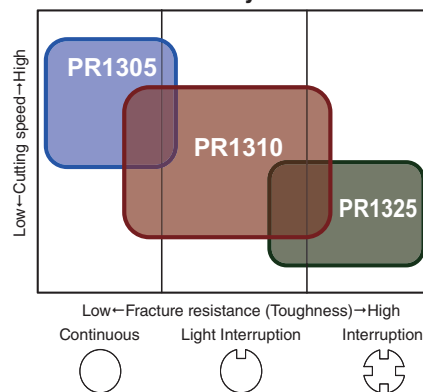
Uniform grain size enables superior thermal shock resistance and constant hardness

New edge preparation technology

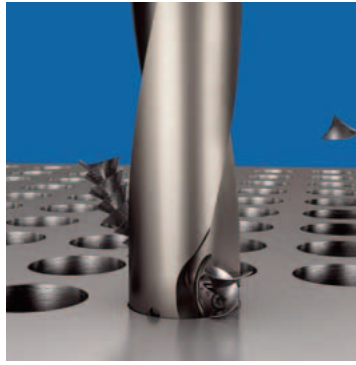


Edge control of FET technology

Heat-resistant Alloys



PVD/CVD Coated Carbide for Milling and 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 process temperature compared with CVD, it features no erosion of bending strength and less deterioration of substrate.

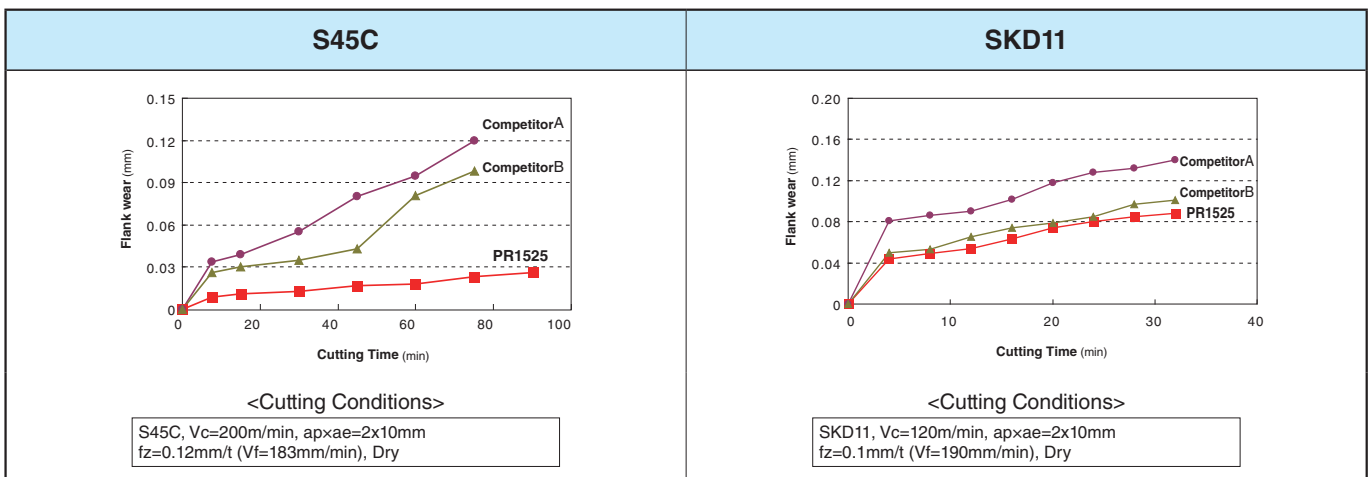
CVD Coated Carbide

CVD coated carbide grades provide stable, efficient cutting 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.

Features of CVD/PVD Coated Carbide

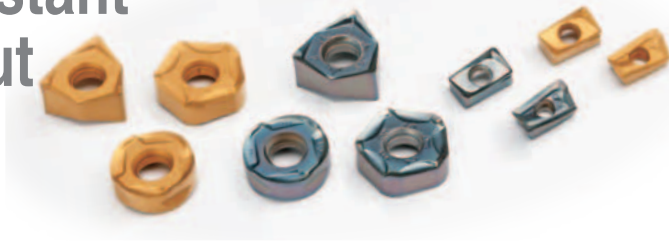
Classification	Symbol	Color	Main Component (Coated Composition)	Advantages
<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div>	PR830	Gold	TiAlN+TiN	<ul style="list-style-type: none"> Improved high temperature stability and wear resistance by TiAlN base PVD coating Application: Stable and longer tool life for milling of steel
	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 steel and stainless steel
<div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless Steel </div>	PR1025	Reddish gray	TiCN	<ul style="list-style-type: none"> TiCN base PVD coated on micro-grain carbide Application: Stable and longer tool life for milling stainless steel
	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 drilling of steel and stainless steel
<div style="background-color: #FF0000; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast Iron </div>	PR905	Bluish violet	TiAlN	<ul style="list-style-type: none"> TiAlN base PVD coated on special tough carbide substrate Application: Highly efficient stable milling and drilling of gray and nodular cast iron
	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
<div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S 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 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	Micro columnar TiCN+Al ₂ O ₃ +TiN (CVD)	<ul style="list-style-type: none"> CVD for milling with high stability due to thin coating layer High heat resistance and wear resistance with CVD coating Application: For milling of Ni-base heat-resistant alloys and martensitic stainless steel

Properties of wear resistance (PR1525)





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



NEW **CA6535** (CVD) For Ni-base heat-resistant alloys and martensitic stainless steel
PR1535 (PVD) For titanium alloys and precipitation hardened stainless steel

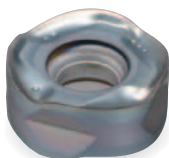
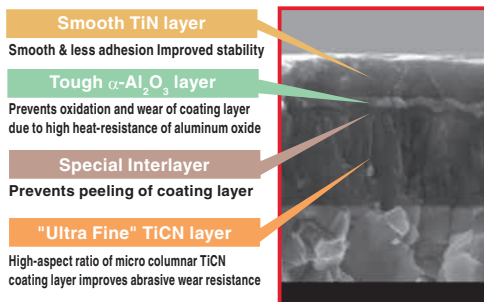
Suitable for variety of workpiece materials

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



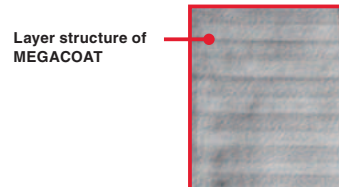
CA6535

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

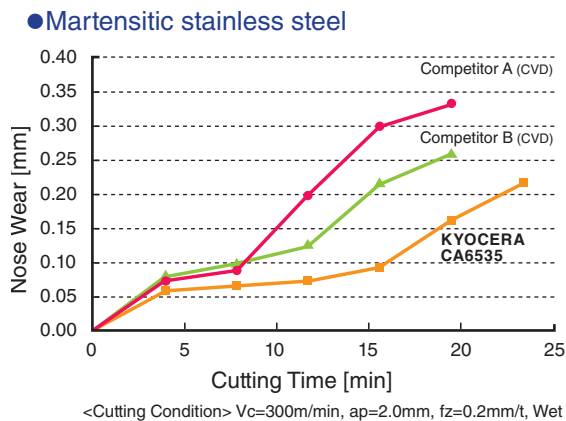
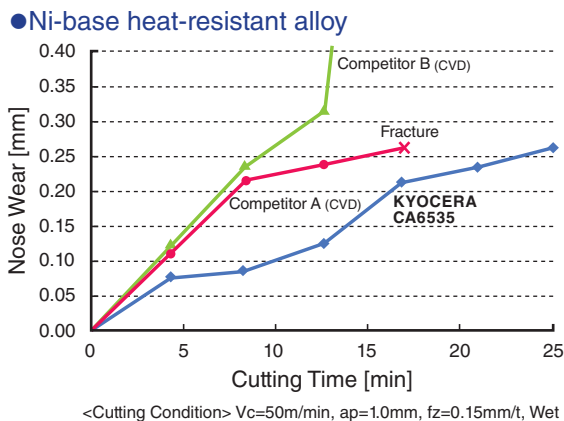


PR1535

For titanium alloys and precipitation hardened stainless steel
 Stable and longer tool life by special nano coating layer MEGACOAT NANO



■ Tool Life Comparison



Longer tool life and more stable machining than competitors!

Carbide






Carbide

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

Features

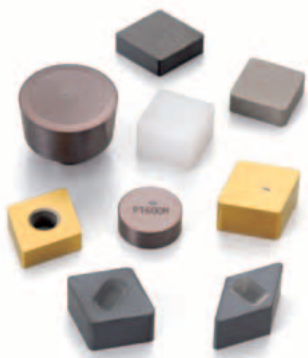
- Tough and hard
- Good thermal conductivity
- Suitable for machining non-ferrous metals and non-metals
- Stable cutting at low cutting speeds, including milling operations

Features of Carbide

Classification	Symbol	Color	Main Component	Advantages
	PW30	Gray	WC+Co+TiC+TaC	<ul style="list-style-type: none"> · ISO identification symbol P carbide (P30 relevant) · Application: Milling steel, stable wear resistance and toughness
	KW10	Gray	WC+Co	<ul style="list-style-type: none"> · ISO identification symbol K carbide (K10 relevant) · Application: Machining cast iron, non-ferrous materials and non-metals
	GW15	Gray	WC+Co	<ul style="list-style-type: none"> · ISO identification symbol K carbide (equivalent to K10), tough micro-grain carbide · Application: Machining cast iron, non-ferrous materials and non-metals
	GW25	Gray	WC+Co	<ul style="list-style-type: none"> · ISO identification symbol K carbide (K30 relevant) · Application: Milling operations of aluminum
	SW05	Gray	WC+Co	<ul style="list-style-type: none"> · ISO identification symbol K carbide (K05 relevant) · Application: Titanium alloys for continuous cutting and finishing
	SW10 (Made to order)	Gray	WC+Co	<ul style="list-style-type: none"> · ISO identification symbol K carbide (K10 relevant) · Application: Titanium alloys for continuous and light interrupted cutting
	SW25 (Made to order)	Gray	WC+Co	<ul style="list-style-type: none"> · ISO identification symbol K carbide (K25 relevant) · Application: Titanium alloys for interrupted and light interrupted cutting



Ceramic



Ceramic

Ceramics inserts are capable of cutting at high speeds. Recommended for hard turning of 38HRC to 64HRC hardened steel or rough to finish turning of cast iron and heat-resistant alloys.

Features

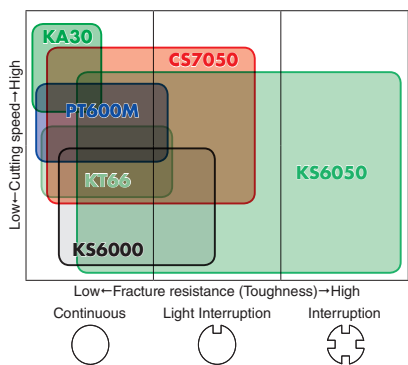
- Excellent wear resistance enables high cutting speeds
- Ceramic maintains good surface finishes due to the low affinity to workpiece materials
- Silicon nitride ceramic can machine cast iron with coolant due to its superior thermal shock resistance

Features of Ceramic

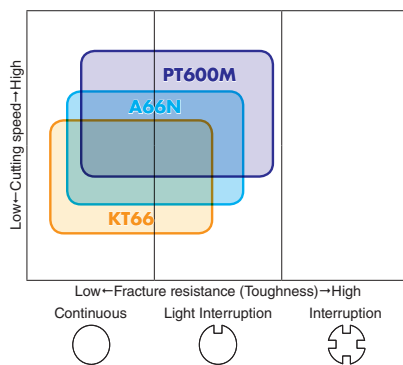
Classification	Symbol	Color	Main Component (Coated Composition)	Coating Layer	Hardness of Substrate (GPa)	Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)	Advantages
K Cast Iron	KA30	White	Al ₂ O ₃	-	17.5	4.0	750	· Aluminum Oxide ceramic (Al ₂ O ₃) · Application: Finishing of cast iron at high cutting speeds without coolant
	KS6000	Gray	Si ₃ N ₄	-	14.6	6.5	1,000	· Silicon nitride ceramic (Si ₃ N ₄) · Application: High feed and interrupted cutting of cast iron (with or 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 cutting 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 cutting, and high speed and high efficient cutting. (with or without coolant)
K Cast Iron	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
H 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	KS6040	Brown	SiAlON	-	16.7	7.0	900	· High stability SiAlON ceramic with wear resistance and fracture resistance. · Application: Light interrupted to interrupted cutting of heat resistant alloys

Application Map

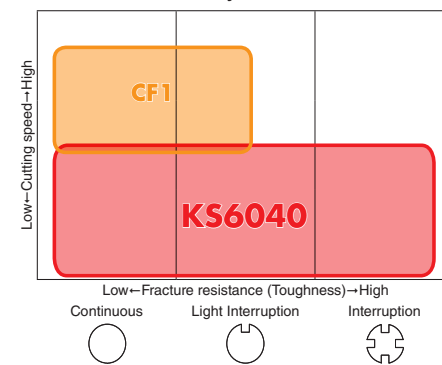
Cast Iron



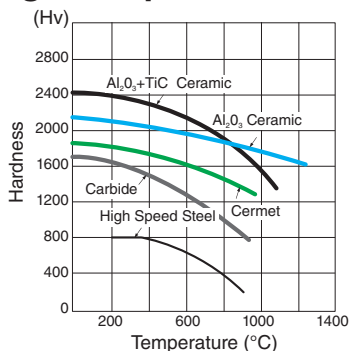
Hard materials



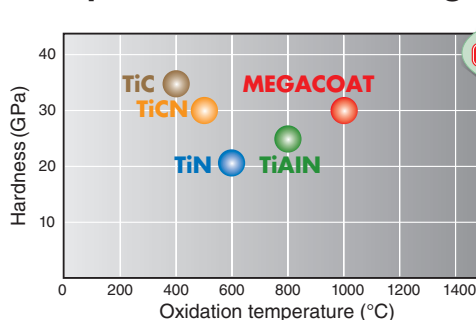
Heat-resistant Alloys



High-Temperature Hardness



Properties of PVD Coating



Insert Grades

A

CBN



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 cutting of cast iron and sintered steel
- High thermal conductivity provides stable machining

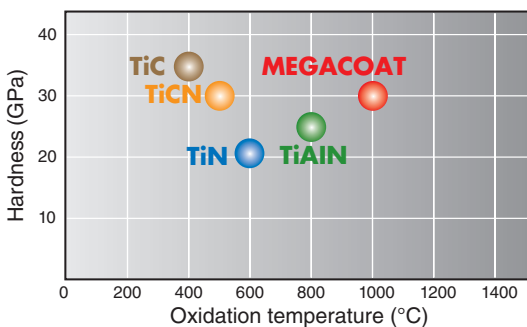
Features of CBN

Classification	Symbol	Color	Average grain size (μm)	CBN Content Rate (%)	Hardness of Substrate (GPa)	Transverse Strength (MPa)	Advantages
H Hard Materials	KBN510	Black	2	50	28	1,000	· Excellent wear resistance and crack resistance, non-coated CBN · Application: Finishing and continuous cutting of hardened die steel
	KBN525	Black	1 and under	45	25	1,250	· Good balance of toughness and wear resistance, non-coated CBN · Application: General purpose for hardened steel, high stability at high speed and high feed cutting
	KBN05M (MEGACOAT)	Blackish red	0.5-1.5	55	27	1,000	· Heat-resistant MEGACOAT on highly heat-resistant CBN substrate · Application: High speed finishing of hardened steel
	KBN10M (MEGACOAT)	Blackish red	2	50	28	1,000	· Heat-resistant MEGACOAT on CBN with hard binder phase, superior anti-crater wear resistance · Application: High speed finishing of hardened die steel
	KBN25M (MEGACOAT)	Blackish red	1 and under	45	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	65	30	1,350	· Heat-resistant MEGACOAT on tougher CBN · Application: Stable machining of hardened steel for continuous to interrupted cutting
Sintered Steel	KBN65B	Black	2	85	32	1,150	· Excellent wear resistance due to CBN with heat-resistant binder phase, non-coated CBN · Application: Stable cutting of sintered steel (ferrous sintered alloy) at low speed
	KBN570	Black	2-4	90	34	1,350	· High CBN content ratio(90%) · Application: Grooving sintered steel
	KBN65M (MEGACOAT)	Blackish red	2	85	32	1,150	· Heat-resistant MEGACOAT on CBN with heat-resistant binder phase · Application: Stable machining of sintered steel (ferrous sintered alloys) at low cutting speeds
	KBN70M (MEGACOAT)	Blackish red	2-4	90	34	1,350	· Heat-resistant MEGACOAT on CBN rich substrate · Application: General machining of sintered steel (ferrous sintered alloys) at high cutting speeds
K Cast Iron	KBN60M (MEGACOAT)	Blackish red	0.5-6	80	33	1,250	· Heat-resistant MEGACOAT on CBN rich substrate with hard binder phase · Application: High speed finishing of gray cast iron
	KBN900 (TiN COAT)	Gold	9	90	31	630	· TiN coated solid CBN · Application: Heavy duty, interrupted cutting and finishing of hardened steel, hardened roll steel and cast iron

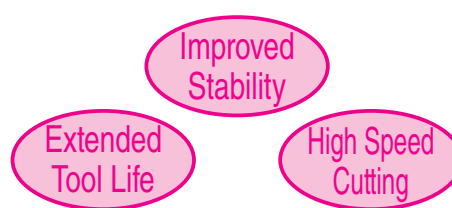
· For KBN35M, ref. page A18

MEGACOAT CBN

Properties of PVD Coating



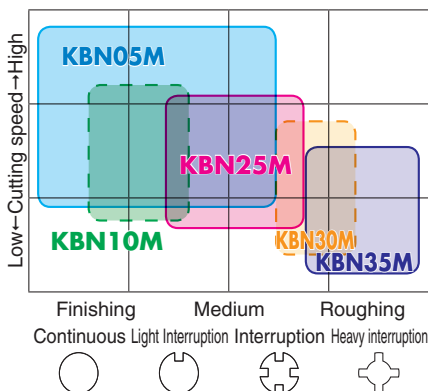
Advantages of MEGACOAT



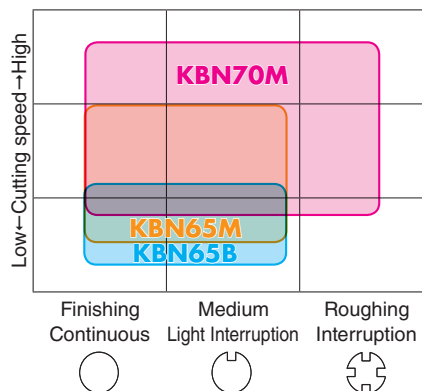
- Longer tool life and stable cutting due to superior heat-resistance and hardness.
- Stability improvement through prevention of crater wear (oxidation, diffusional wear)
- High thermal stability and surface smoothness provide excellent surface finish

Application Map

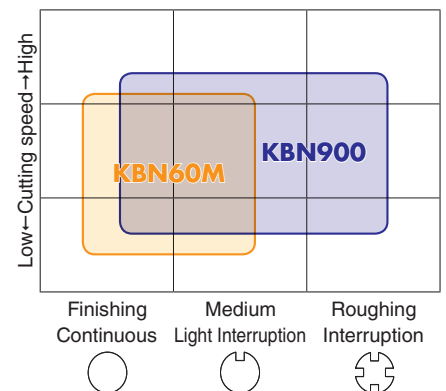
Hard Materials



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 machining non-ferrous metals and non-metals
- No edge build-up provides high precision machining
- Diversified applications for cutting 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.)

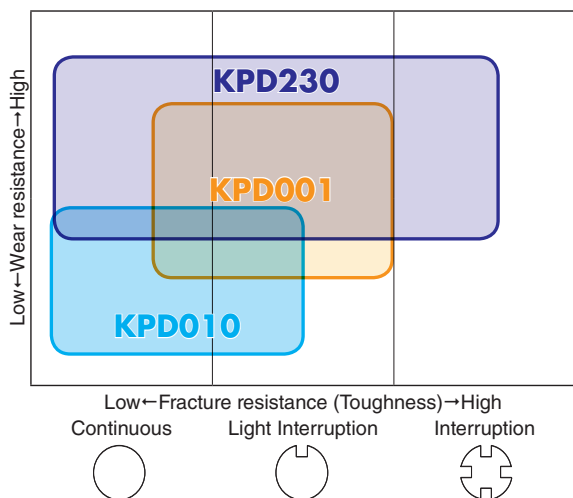
Features of PCD

Classification	Symbol	Average grain size (μm)	Advantages
	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 cutting of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, fiberglass and carbide
	KPD010	10	· Good wear resistance and toughness, good grindability · Application: High speed cutting of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, fiberglass 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 milling of aluminum alloys, non-ferrous metals, plastics and fiberglass

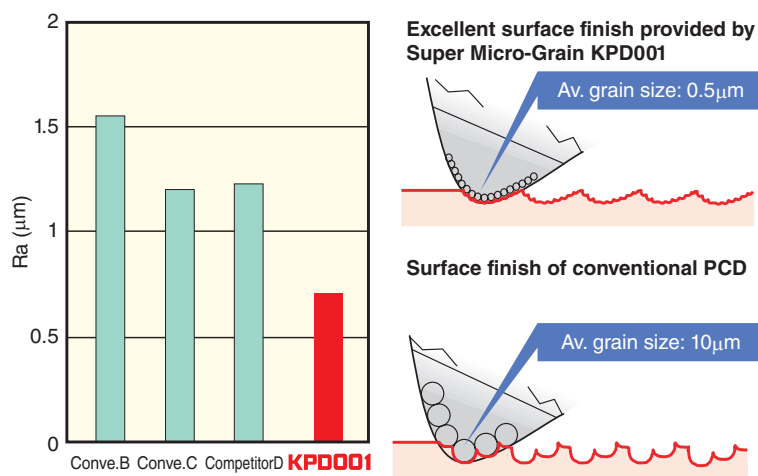
Applications

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

Application Map



Surface Finish Roughness Comparison of Aluminum Cutting



(Grain size affects surface finish quality)

Insert Grades

A

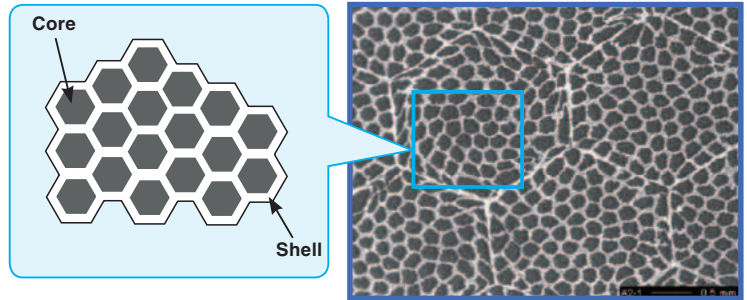
Honeycomb structure CBN / Ceramic

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 cutting of exceptionally hard material and ceramic is suitable for heat-resistant alloys



Features of Honeycomb structure CBN/ceramic

Classification	Symbol	Color	Main Component	Advantages
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 cutting
S Heat-resistant Alloys	CF1	Gray	Ceramic	<ul style="list-style-type: none"> · 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

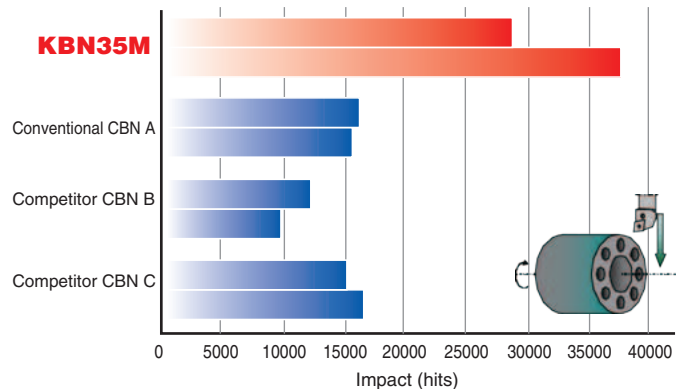
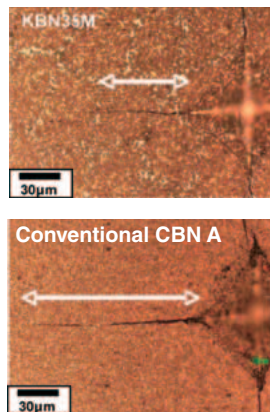
KBN35M (MEGACOAT Honeycomb structure CBN)

- Tough CBN (shell) prevents crack growth

Wear-resistant CBN (core)

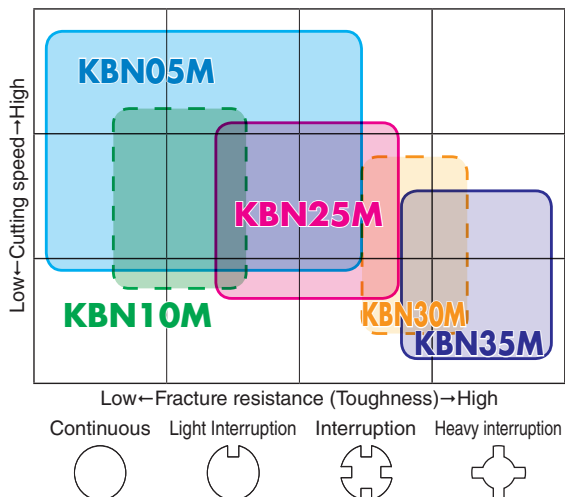


Tough CBN (shell)

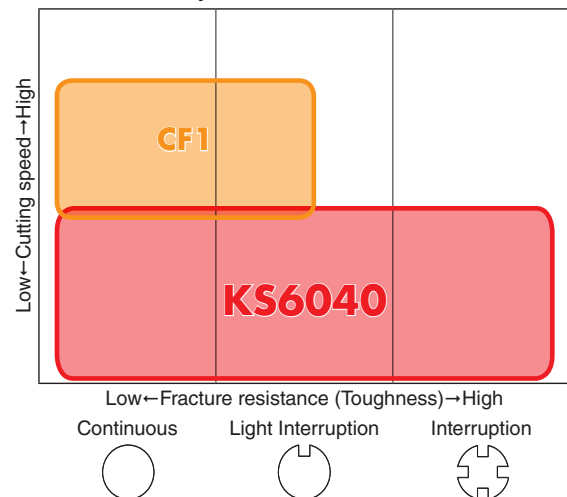


Application Map

- Hard Materials



- Heat-resistant Alloys



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)		
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	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
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	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
CA4010	Gold	Columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.8	1,720	16.8	9.0	2,450
CA4115	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4120	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4505	Blackish gray	Micro columnar TiCN+Al ₂ O ₃	Thick coating	15.0	1,790	17.5	9.5	2,350
CA4515	Blackish gray	Micro columnar TiCN+Al ₂ O ₃	Thick coating	15.0	1,570	15.4	12.0	2,780
CA515	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.4	1,440	14.1	12.5	2,650
CA525	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.2	1,360	13.3	13.5	2,750
CA5505	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,730	17.0	10.0	2,540
CA5515	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA5525	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.5	1,400	13.7	12.0	2,780
CA5535	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thick coating	14.1	1,340	13.1	16.5	2,970
CA6515	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thin coating	14.7	1,530	15.0	12.0	2,780
CA6525	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thin coating	14.7	1,370	13.4	16.0	3,100
CA6535	Gold	Micro columnar TiCN+Al ₂ O ₃ +TiN	Thin coating	14.3	1,320	12.9	16.0	3,700
CR9025	Gold	Columnar TiCN+TiN	Thick coating	14.5	1,400	13.7	12.0	2,780

PVD Coated Carbide

Symbol	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
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
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




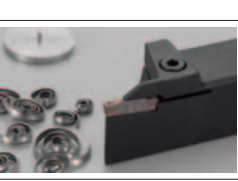





Carbide

Symbol	Color	Main Component	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
				(HV)	(GPa)		
PW30	Gray	WC+Co+TiC+TaC	12.5	1,500	14.7	12.0	2,160
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

Insert Grades

A

Insert Material Selection Table

Applications		Cutting Range	P Steel	M Stainless Steel	K Gray Cast Iron	K Nodular Cast Iron	N Non-ferrous Metals	S Heat-resistant Alloys	S Titanium Alloys	H Hard Materials	Sintered Steel	
Turning		Finishing ↑ ↓	TN6010		KBN60M			CF1		KT66	TN6010	
			TN60		KA30	TN60		KS6040		A66N	TN60	
			TN6020	TN60						PT600M		
			PV7010	PV7025	PV7005	PV7005	KPD001	KW10			PT600M	TN6010
			PV7025	CA6515	CA5505	CA5505	KPD010	CA6515	KPD001	KBN05M		TN60
			CA5505	CA525	CA4505	CA4505	KW10	CA6525	KPD010	KBN10M		PR930
			CA515	CA5535	CA4515	CA4515		PR1305	SW05	KBN25M		KBN65M
			CA5515	CA6525				PR1310	SW10	KBN30M		KBN70M
			CA525	PR1125				PR1325	SW25	KBN35M		
			CA5525							KBN900		
		Roughing	CA5535									
Small Tools		Finishing ↑ ↓	TN6010								TN6010	
			TN60								TN60	
			TN6020									
			PV7010	PV7025	CA4505	CA4505	KPD001	CA6515	KPD001	KBN05M		
			PV7025	PR930	CA4515	CA4515	KPD010	PR1125	KPD010	KBN10M		PR930
			PR930	PR1025	KW10	KW10	KW10	PR1225	KW10	KBN25M		KBN65M
			PR1005	PR1225						KBN30M		KBN70M
			PR1025									
			PR1225									
			PR1425									
		Roughing	PR1425									
Boring		Large ↑ ↓	TN6010									
			TN60									
			TN6020	TN60								
			PV7010	PV7025	KBN60M						PT600M	TN6010
			PV7025	CA6515	PV7005	PV7005	KPD001	CA6515	KPD001	KBN05M		TN60
			CA515	CA6525	CA4505	CA4505	KPD010	CA6525	KPD010	KBN10M		PR930
			CA5515	PR1025	CA4515	CA4515	KW10	PR1125	KW10	KBN25M		KBN65M
			CA525	PR1125	KW10	KW10		PR1225		KBN30M		KBN70M
			CA5525	PR1225								
			CA5535	PR930								
PR1025												
		Small	PR1425									
Cut-Off		Large ↑ ↓	CR9025	CR9025								
			PR930	PR930								
			PR915	PR915	KW10	KW10	KW10	KW10	KW10			
			PR1215	PR1215	PR1215	PR1215		PR1225				
			PR1225	PR1225				PR660				
		Small	PR660	PR660								
Cut-Off		(Depends on the workpiece material)	PR1025	PR1025	KW10	KW10	KW10	KW10	KW10			
			PR1225	PR1225				PR1025				
Grooving		Glossy finish ↑ ↓	TC40N	TC40N								
			TN6020	TN6020								
			TN90	TN90	PR905	PR905	KPD001	PR915	KPD001	KBN510	TC40N	
			PV7040	PV7040	PR1215	PR1215	KW10	KW10	KW10	KBN525	PR930	
			PR930	PR930	KW10	KW10	GW15	PR1215		PT600M	KBN570	
			PR1115	PR1115	GW15	GW15		PR1225				
		Stable Cutting	PR1225	PR1225								
Threading		Glossy finish ↑ ↓	TC60M	TC60M	KW10	KW10	KW10	KW10	KW10		PR930	
			PR930	PR930	GW15	GW15	GW15	GW15	GW15		PR1115	
			PR1115	PR1115								
		Stable Cutting	PR1115	PR1115								
Drilling		Wear Resistance ↑ ↓	PR930	PR830				PR660				
			PR830	PR830				PR1025	KW10			
			PR915	PR915	PR905	PR905	KW10	PR1225				
			PR1025	PR1025	PR1210	PR1210	GW15	KW10				
			PR1225	PR1225	KW10	KW10		GW15				
			PR1230	PR660								
		Toughness	PR660									
Milling		Finishing ↑ ↓	TN100M	CA6535	PR905	PR905	KPD230	CA6535	KPD230			
			PR830	PR830	PR1210	PR1210	KPD001	PR830	KPD001			
			PR1225	PR1225	PR1510	PR1510	KPD010	PR660	KW10			
			PR1230	PR1525	KW10	KW10	KW10	PR1225	PR905			
			PR1525	PR1535			GW25	PR1525	PR1210			
					Roughing	PR1535	PR1535			PR1535		

- Highlighted materials are recommended choice.