

# Insert Grades

**A1~A21**

## Summary of Insert Grades

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## Insert Grades

**A6~A21**

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A

# Summary of Insert Grades

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

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

## Turning

Workpiece Material			Steel (Carbon steel / Alloy steel)					Stainless Steel / Cast Steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range			Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification			P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	Uncoated	TN Series	TN610					TN610					TN60			
			TN620					TN620								
			TN60					TN60								
			TN90					TN90								
	CVD	TC Series	TC60M					TC60M								
	PVD	CCX (CVD Coated)	CCX										CCX			
PV Series		PV90					PV90					PV7005				
Coated Carbide	CVD	CA Series	CA510					CA6515					CA310			
			CA515										CA315			
			CA025P										CA320			
			CA525										CA4505			
			CA530										CA4515			
			CA5505													
			CA5515													
			CA5525													
			CA5535													
			PVD	PR Series	PR930								PR930			
PR1025					PR1025											
MEGACOAT (PR Series)	PR1225					PR1225										
	PR1535					PR1535										
MEGACOAT NANO (PR Series)	PR1705					PR1725										
	PR1725															
Ceramic													KA30			
Carbide													KT66			
													A66N			
													PT600M			
													KS6015			
													KS6050			
CBN													CS7050			
													KW10			
CBN													KBN475			
													KBN60M			
													KBN900			

## Turning

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Heat-resistant alloys / Ni-base heat-resistant alloys)				Hard Materials (Hardened steel / Chilled cast iron)				Sintered Steel			
Cutting Range		Finishing↔Roughing				Finishing↔Roughing				Finishing↔Roughing				Finishing↔Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	CVD																
	CA Series					CA6515											
						CA6525											
PVD	MEGACOAT HARD (PR Series)					PR005S											
						PR015S											
PVD	MEGACOAT NANO (PR Series)									PR1535							
Cermet														TN610			
														TN60			
Ceramic						CF1				KT66							
						KS6030				A66N							
						KS6040				PT600M							
CBN										KBN510							
										KBN525							
										KBN900							
MEGACOAT										KBN05M							
										KBN10M							
										KBN25M				KBN70M			
										KBN35M				KBN570			

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)				Sintered Steel			
Cutting Range		Finishing↔Roughing				Finishing↔Roughing				Finishing↔Roughing				Finishing↔Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	PVD																
	MEGACOAT NANO (PR Series)					PR1535											
Carbide						SW05											
						SW10											
						SW25											
DLC Coated Carbide		GW05															
		KW10															
PCD		PDL010															
		PDL025															
		KPD001				KPD001											
		KPD010				KPD010											
		KPD230															
PCD		KPD250															

## Small Parts Machining

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
Coated Carbide	PVD	PR Series	PR930					PR930								
			PR1025					PR1025								
		MEGACOAT (PR Series)	PR1225					PR1225								
		MEGACOAT NANO (PR Series)	PR1535					PR1535								
		MEGACOAT NANO PLUS (PR Series)	PR1705		PR1725				PR1725							

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		GW05															

# Summary of Insert Grades

## Grooving / Cut-off / Threading

Insert Grades

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	PVD	MEGACOAT (PV Series)	PV7040										PV7040			
		Uncoated	TN Series	TN620					TN620							
	TN6020						TN6020									
	TN60						TN60					TN60				
	TC Series	TN90					TN90									
TC40N					TC60M						TC40N					
Coated Carbide	CVD	CR Series	CR9025					CR9025								
	PVD	PR Series	PR915					PR915					PR905			
			PR930					PR930								
			PR1025					PR1025								
			PR1115													
		MEGACOAT (PR Series)	PR1215					PR1215					PR1215			
			PR1225					PR1225								
		MEGACOAT NANO (PR Series)	PR1535					PR1535								
			PR1625					PR1625								
	Ceramic												A65			
													A66N			
												PT600M				
Carbide												KW10				
												GW15				

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)				Sintered Steel			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	PVD													PR1215 PR1225			
														TN60			
Cermet										A65 A66N PT600M							
Ceramic																	
Carbide		KW10 GW05 GW15				KW10 GW15											
DLC Coated Carbide		PDL025															
CBN										KBN510 KBN525				KBN570			
PCD		KPD001 KPD010				KPD001 KPD010											

## Drilling

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

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	PVD	MEGACOAT (PR Series)									PR1230		
Carbide			KW10				KW10						
			GW15				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	Uncoated	TN Series		TN620M				TN60							
			TN60					TN100M							
	PVD	MEGACOAT NANO (PV Series)		PV60M											
Coated Carbide	CVD	CA Series							CA6535			CA420M			
		MEGACOAT (PR Series)		PR1225					PR1225			PR1210			
				PR1230											
	PVD	MEGACOAT NANO (PR Series)		PR1525					PR1525			PR1510			
Carbide												KW10			
												GW25			

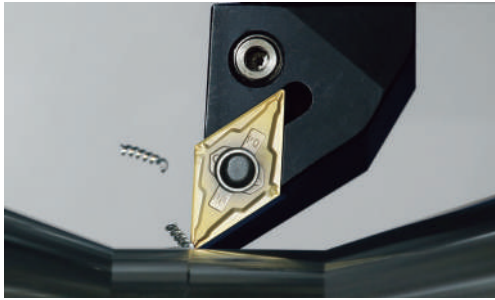
  

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Difficult-to-cut Materials (Heat-resistant alloys / Ni-base heat-resistant alloys)				Difficult-to-cut Materials (Titanium / Titanium alloys)				Hard Materials (Hardened steel / Chilled cast iron)			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	CVD	CA Series						CA6535				CA6535					
		MEGACOAT (PR Series)										PR1210					
		MEGACOAT HARD (PR Series)												PR015S			
	PVD	MEGACOAT NANO (PR Series)															
Carbide			KW10									KW10					
			GW25									GW25					
DLC Coated Carbide			PDL025														
PCD			KPD001									KPD001					
			KPD010									KPD010					
			KPD230														
			KPD250														

Insert Grades  
Turning  
Infeedable Inserts  
CN & PCD Tools  
External  
Small Parts  
Machining  
Boring  
Grooving  
Cut-off  
Threading  
Drilling  
Milling  
Tools for  
Turning Mill  
Spare Parts  
Technical  
Information

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## Cermet



### Cermet

KYOCERA is known as one of the leading manufacturers of cermets.

Cermets combine toughness with superior wear resistance, and provide longer tool life and excellent surface finishes.

Typical materials used in cermets are TiC, TiN, TiCN and NbC.

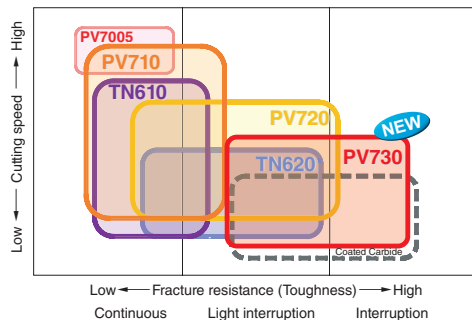
### PVD Coated Cermet (MEGACOAT / MEGACOAT NANO Cermet)

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

## Features of Cermet and PVD Coated Cermet

Classification	Symbol	Color	Main Component (Coated Composition)	Advantages and Applications	
<div>PSteel</div>	Cermet	TN610	Gray	TiCN	· High wear resistant cermet due to three types of special reinforcement technology · Application : Cermet for steel machining, long tool life in high speed and continuous
		TN620	Gray	TiCN	· Three types of special reinforcement technology realized the superior fracture resistance and wear resistance · Application : Stable machining of steel
		TN60	Gray	TiCN+NbC	· Application : Machining of steel, continuous to interruption
		TN6020 (Super Micro-Grain)	Gray	TiCN	· Application : Uncoated cermet for grooving of steel
		TN620M	Gray	TiCN	· 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	Gray	TiCN+NbC	· Tough cermet with improved oxidation resistance and thermal shock resistance · Application : Milling of steel at high speed
		TC40N	Gray	TiC+TiN	· Good balance of wear resistance and toughness · Application : Grooving and threading of steel
	CVD Coated Cermet	CCX	Gold	TiCN (TiCN+Al <sub>2</sub> O <sub>3</sub> +Tin)	· 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)	· Superior wear and adhesion resistant MEGACOAT NANO on the high wear resistant cermet · Application : Long tool life and stability in high speed continuous machining of steel, excellent surface
		PV720	Gold	TiCN (MEGACOAT NANO)	· Superior wear and adhesion resistant MEGACOAT NANO on the special reinforcement cermet · Application : The 1st choice PVD coated cermet for steel machining provides high efficient machining and high quality surface finish
		PV730	Gold	TiCN (MEGACOAT NANO)	· Specialized high-strength micro grain cermet with MEGACOAT NANO coating technology with wear and adhesion resistance · Application : Stable machining and high quality surface finish of steel machining
		PV60M	Gold	TiCN+NbC (MEGACOAT NANO)	· 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)	· MEGACOAT cermet for grooving · Application : Excellent surface finish and longer tool life in steel grooving
KCast Iron	PV7005	Blackish Red	TiC+TiN (MEGACOAT)	· Heat-resistant MEGACOAT on cermet with excellent wear resistance · Application : High speed finishing of gray and nodular cast iron	

## Application Map (Hybrid Cermet)



### TN Series

(Uncoated Cermet)

TN610 : Superior wear resistant cermet

TN620 : Superior fracture and wear resistance

### PV Series

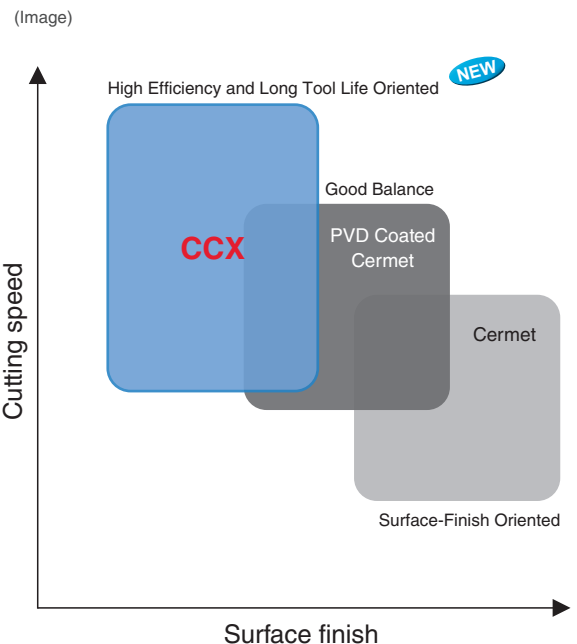
(MEGACOAT NANO Cermet)

PV710 : Long tool life and stable machining of steel at high speed and continuous

PV720 : High efficiency and excellent surface finish (1st choice)

PV730 : Stable machining and high quality surface finish

## Application Map



Uncoated Cermet

# TN610 / TN620

Special Reinforcement Technology (Hybrid Technology)  
Realized the Superior Surface Finish and Stability

MEGACOAT NANO Cermet

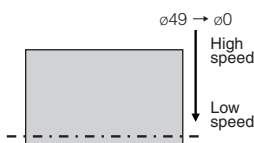
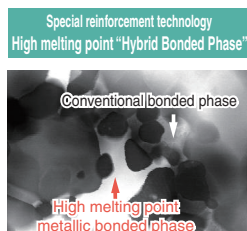
# PV710 / PV720 / PV730

NEW

## 1 Excellent Surface Finish

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

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

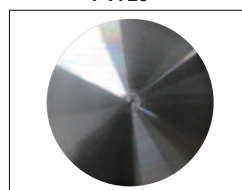


### Surface finish comparison

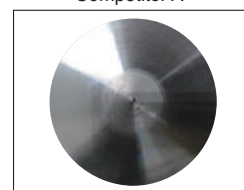
(Internal evaluation) Cutting Conditions :  $V_c=180 \sim 0$  m/min (Constant rate),  $a_p = 0.5$  mm  
 $f = 0.1$  mm/rev, Wet, CNMG120404 type Workpiece Material : S10C

Surface Finish

PV720



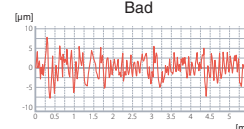
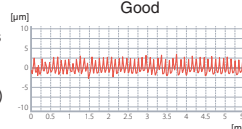
Competitor A



Good

Bad

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



For Finishing

## CCX

Kyocera's New Insert Grade Technology. 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, Carbon Steel and Cast Iron Machining.

## 1 Excellent High Speed Finishing Leads to Greater Productivity

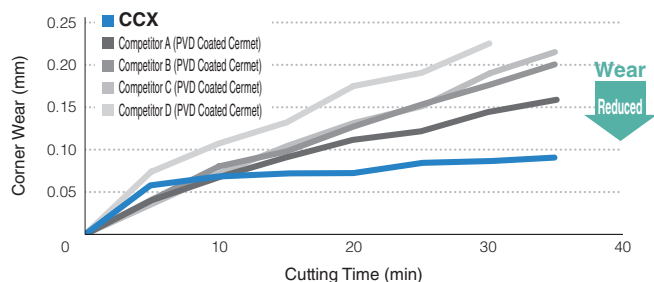
## 2 Unique Cermet Base Material with Thick CVD Coating

## 3 Superior Wear Resistance to PVD Coated Cermets

Alloy Steel (SCM435) High Speed Comparison :  $V_c = 400$  m/min

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

Wear Resistance Comparison (Internal evaluation)



Cutting Edge (After Machining 35 min)

CCX



Competitor A (PVD Coated Cermet)



Competitor B (PVD Coated Cermet)



Competitor C (PVD Coated Cermet)



Competitor D (PVD Coated Cermet)



Cutting Conditions :  $V_c = 400$  m/min,  $a_p = 0.3$  mm,  $f = 0.12$  mm/rev, Wet CNMG120408 type External Turning

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

Insert Grades	A
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## CVD Coated Carbide (Turning)



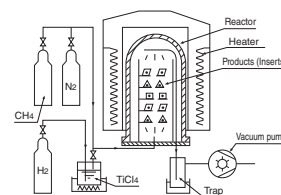
### CVD Coated Carbide

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

### Features

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

### CVD (Chemical Vapor Deposition)



#### ● Features

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

Processing temperature : 900~1100°C

## Features of CVD Coated Carbide

Classification	Symbol	Color	Coated Composition	Advantages and Applications
<b>P</b> Steel	CA510	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Special substrate with thermal deformation resistance along with a thick and tough coating layer providing high wear resistance</li> <li>· Application : High speed and high efficiency steel machining</li> </ul>
	CA515	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Improved wear resistance and stability due to special substrate with heat deformation resistance and hard and tough coating layer with reinforced interface</li> <li>· Application : Light interrupted machining of steel</li> </ul>
	CA025P	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Tough CVD coating and substrate with excellent wear resistance, improved fracture resistance, deposition resistance and chipping resistance</li> <li>· Application : Stable machining of steel for continuous to interrupted machining</li> </ul>
	CA525	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Stable and long tool life machining due to special substrate with heat deformation resistance and tougher coating layer and reinforced interface</li> <li>· Application : Interrupted to general machining of steel</li> </ul>
	CA530	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Special tough substrate and tough coating layer providing high stability and wear resistance</li> <li>· Application : General to heavy interrupted machining (stability oriented)</li> </ul>
	CA5505	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Application : High speed continuous machining of steel, continuous to light interrupted machining of cast iron</li> </ul>
	CA5515	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Application : Machining of steel, continuous to light interruption</li> </ul>
	CA5525	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Application : For general machining of steel, roughing to interruption</li> </ul>
	CA5535	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Application : Roughing to heavy interrupted machining of steel</li> </ul>
	CR9025	Gold	TiCN+TiN	<ul style="list-style-type: none"> <li>· Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance</li> <li>· Application : Cut-off, grooving and multi-function machining of steel</li> </ul>
<b>M</b> Stainless Steel	CA6515	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Specialized carbide substrate for machining stainless steel, excellent wear resistance</li> <li>· Application : Continuous machining of stainless steel</li> </ul>
	CA6525	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	<ul style="list-style-type: none"> <li>· Specialized carbide substrate for machining stainless steel, excellent notching resistance and toughness</li> <li>· Application : The 1st choice for general machining of stainless steel, from finishing to roughing, continuous to interruption</li> </ul>
<b>K</b> Cast Iron	CA310	Rose Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +Ti base	<ul style="list-style-type: none"> <li>· Grade for high-speed continuous machining and improved tool life through the deposition of a thickened Al<sub>2</sub>O<sub>3</sub> coating layer</li> <li>· Application : For finishing to roughing of gray cast iron</li> </ul>
	CA315	Rose Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +Ti base	<ul style="list-style-type: none"> <li>· High efficiency and long tool life</li> <li>· For continuous to interrupted machining with a good balance of wear resistance and stability</li> <li>· Excellent performance for machining gray and nodular cast iron</li> <li>· For machining of nodular cast iron</li> </ul>
	CA320	Rose Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +Ti base	<ul style="list-style-type: none"> <li>· Improved stability with CVD layer structure with high adhesion</li> <li>· Application : Heavily interrupted or High-speed machining for Nodular Cast Iron.</li> <li>· The 1st recommendation for the FCD500 or higher application</li> </ul>
	CA4505	Blackish Gray	TiCN+Al <sub>2</sub> O <sub>3</sub>	<ul style="list-style-type: none"> <li>· Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer</li> <li>· Application : For gray cast iron and nodular cast iron at high speed in continuous to light interrupted machining</li> </ul>
	CA4515	Blackish Gray	TiCN+Al <sub>2</sub> O <sub>3</sub>	<ul style="list-style-type: none"> <li>· Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer</li> <li>· Application : The 1st choice for gray cast iron and nodular cast iron in light to heavy interrupted machining</li> </ul>



CVD Coated Carbide Grade for Steel

# CA025P

Next Generation CVD Coating for Longer Tool Life



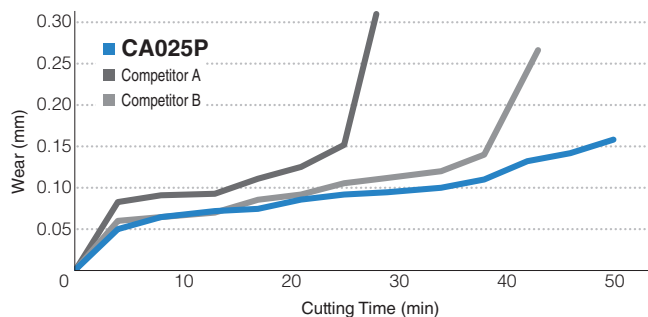
1

## Improved Wear Resistance with New CVD Grade for Steel

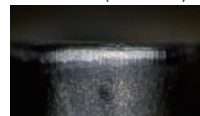
Thickened alumina with good thermal resistance (Twice as thick as conventional coating)

Improved plastic deformation resistance by increased temperature strength

### Wear Resistance Comparison (Internal evaluation)



CA025P (50.4 min)

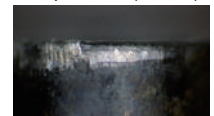


Good Surface Condition

Competitor A (29.4 min)



Competitor B (42 min)



Cutting Conditions :  $V_c = 300$  m/min,  $a_p = 1.5$  mm,  $f = 0.3$  mm/rev, Wet  
Workpiece Material : SCM435

### Wear Comparison (Internal evaluation) Cutting Time 25.2 min

CA025P maintains smooth and flat surface with stable tool life

CA025P



Stable Wear on Surface

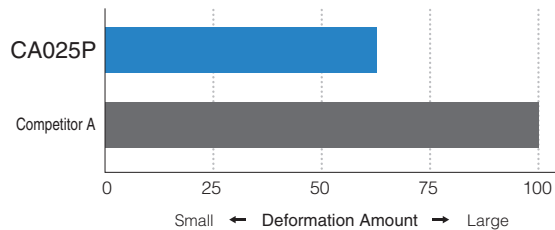
Competitor A



Unstable Wear Pattern

Cutting Conditions :  $V_c = 300$  m/min,  $a_p = 1.5$  mm,  $f = 0.3$  mm/rev, Wet  
Workpiece Material : SCM435

### Plastic Deformation Comparison under High Temperature (Internal evaluation) Comparison with Competitor A



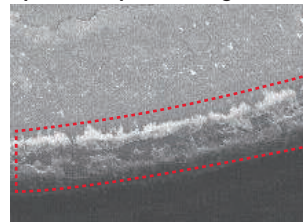
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## Excellent Adhesion Resistance and Chipping Resistance

Specialized post-coating process prevents adhesion

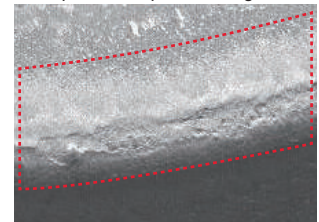
### Adhesion on the Edge after Cutting (Internal evaluation)

Specialized post-coating



Less Adhesion

Not Specialized post-coating



Wide area of adhesion  
\* Adhesion area appears white

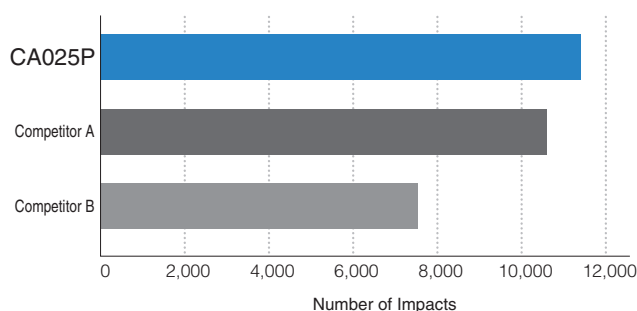
Cutting Conditions :  $V_c = 270$  m/min,  $a_p = 1.0$  mm,  $f = 0.1$  mm/rev, Wet  
Workpiece Material : SCM440 (with 4 slots)

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 Material : SCM440 (with 4 slots)

Insert Grades

A

Turning  
Indexable Inserts

B

CBN & PCD Tools

C

External

D

Small Parts  
Machining

E

Boring

F

Grooving

G

Cut-off

H

Threading

J

Drilling

K

Milling

M

Tools for  
Turning Mill

N

Spare Parts

P

Technical  
Information

R

Index

T

## PVD Coated Carbide (Turning)



### PVD Coated Carbide

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

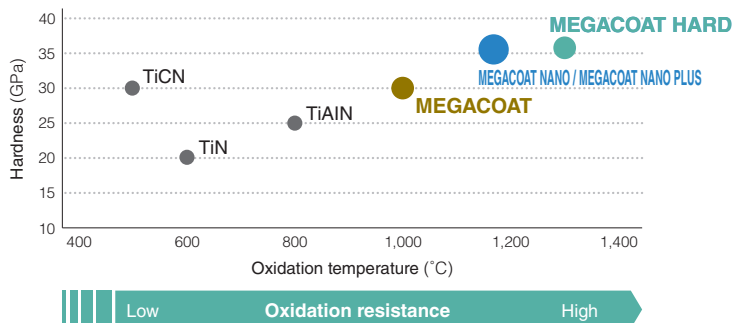
### PVD Coated Super Micro-Grain Carbide

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

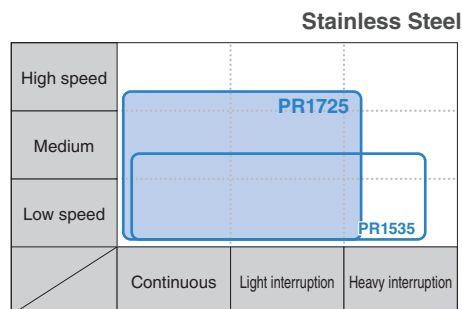
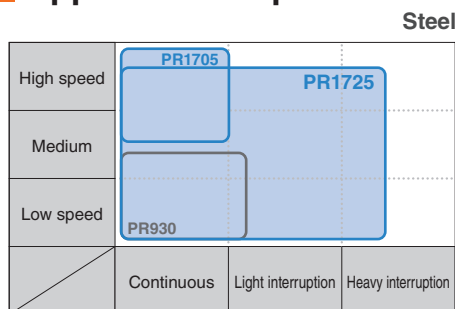
## Features of PVD Coated Carbide

Classification	Symbol	Color	Coated Composition	Advantages and Applications
<div>P</div> <div>Steel</div>	PR915 (Super Micro-Grain)	Bluish Violet	TiAlN	· Application : Stable and reliable high precision machining of steel
	PR930 (Super Micro-Grain)	Reddish Gray	TiCN	· Application : Low machining speed, precise machining with sharp edge
	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	· Nano thin multi-layer coating, [MEGACOAT NANO] provides superior wear resistance and high lubrication · Stable machining and long tool life for grooving of steel and stainless
	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>M</div> <div>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	· Nano thin multi-layer coating [MEGACOAT NANO] on micro-grain carbide substrate improved wear resistance and stability · Application : Threading of stainless steel
	PR1535	Reddish Green	MEGACOAT NANO	· Nano thin multi-layer coating [MEGACOAT NANO] improved wear resistance and stability · Application : Medium to roughing of stainless steel and heat-resistant alloys, cut-off of stainless steel
<div>K</div> <div>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>S</div> <div>Heat-resistant alloys</div>	PR005S	Blackish Gray	MEGACOAT HARD	· Superior high temperature properties of special carbide substrate and excellent heat-resistance of MEGACOAT HARD enables high wear resistance · Application : Finishing and high speed machining of heat-resistant alloys
	PR015S	Blackish Gray	MEGACOAT HARD	· Superior high temperature properties of special carbide substrate and MEGACOAT HARD improved heat-resistance and stability · Application : Recommended for continuous to light interruption machining and finishing of heat-resistant alloys

## Properties of PVD Coating



## Application Map



### New PVD Coating

# PR1725

1st Recommendation for Steel Machining. Excellent Surface Finish and Long Tool Life. Great Performance in Small Parts Machining Applications.



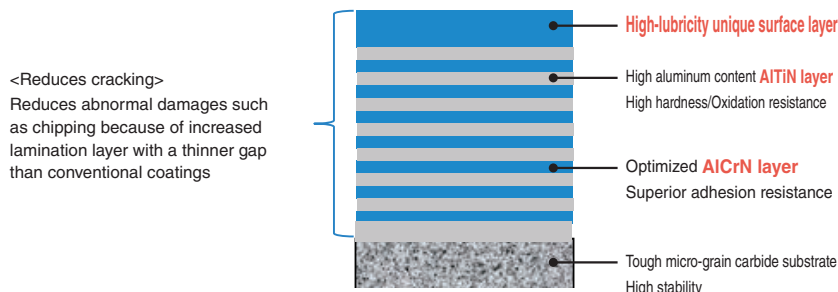
**1** MEGACOAT NANO PLUS Maintains Long Tool Life and Excellent Surface Finish

**2** One solution can be used in various workpiece materials

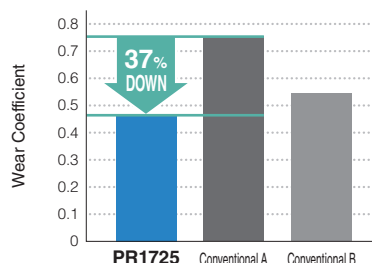
**3** Applicable to a Wide Range of Machining Applications

## 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

### Applicable to various workpiece materials

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

### Excellent surface finish

Special surface layer with great lubricity reduces adhesion

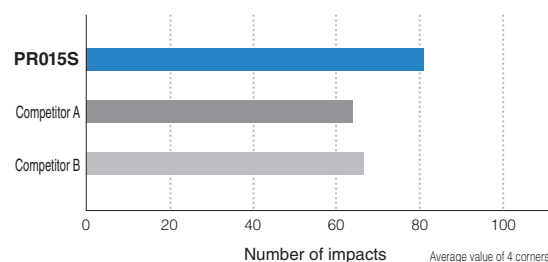
### High machining stability

Tough micro-grain carbide substrate provides stable machining

## Features of PR005S / PR015S

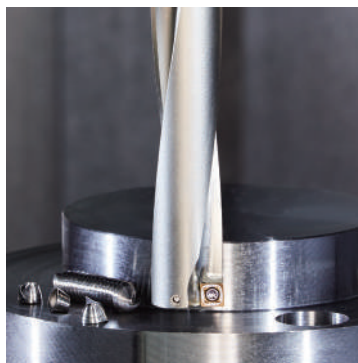
- 1) Improved thermal properties help to reduce sudden fracture and decrease edge wear  
Improved thermal conductivity by optimum distribution of WC coarse grains  
Resists heat concentration at the cutting edge to promote stable machining
- 2) Improved wear resistance with MEGACOAT HARD coating  
Excellent 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.

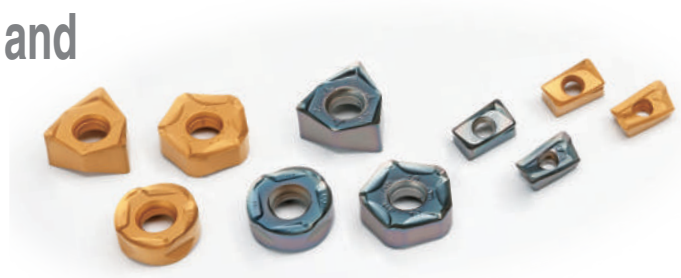
Ti-base (TiN, TiCN) coating with superior hardness and wear resistance or ceramic-base (Al<sub>2</sub>O<sub>3</sub>) coating with high-thermal stability is applied on a tough carbide substrate. Superior fracture resistance and wear resistance.

## Features of PVD / CVD Coated Carbide

Classification	Symbol	Color	Coated Composition	Advantages and Applications
<b>P</b> Steel	PR1230	Blackish Red	MEGACOAT	<ul style="list-style-type: none"> <li>Superior wear and oxidation-resistant MEGACOAT on a special tough carbide substrate</li> <li>Application : Stable and high feed milling and drilling of steel</li> </ul>
	PR1525	Reddish Green	MEGACOAT NANO	<ul style="list-style-type: none"> <li>New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance</li> <li>Application : Stable and longer tool life for milling of steel and stainless steel</li> </ul>
	CA520D	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN (CVD)	<ul style="list-style-type: none"> <li>Combination of High toughness substrate, Coating crystal control technology and advanced layer adhesion coating allow both wear and fracture resistance</li> <li>Application : 1st Recommendation for drilling of steel (at high speed application)</li> </ul>
<b>M</b> Stainless Steel	PR1225	Blackish Red	MEGACOAT	<ul style="list-style-type: none"> <li>Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate</li> <li>Application : General machining and high feed milling and drilling of steel and stainless steel</li> </ul>
<b>K</b> Cast Iron	PR1210	Blackish Red	MEGACOAT	<ul style="list-style-type: none"> <li>Superior wear and oxidation-resistant MEGACOAT coated on special carbide substrate</li> <li>Application : Highly efficient stable milling and drilling of gray and nodular cast iron</li> </ul>
	PR1510	Reddish Green	MEGACOAT NANO	<ul style="list-style-type: none"> <li>New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance</li> <li>Application : Highly fracture resistance and wear resistance for gray and nodular cast iron</li> </ul>
	CA415D	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN (CVD)	<ul style="list-style-type: none"> <li>Special carbide substrate for cast iron, coating crystal control technology and advanced layer adhesion coating enable superior wear resistance</li> <li>Application : 1st Recommendation for drilling cast iron (at high speed application)</li> </ul>
	CA420M	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN (CVD)	<ul style="list-style-type: none"> <li>Kyocera's unique crystal control technology and advanced layer adhesion CVD coating with superior wear resistance and toughness</li> <li>Application : Milling of gray and nodular cast iron</li> </ul>
<b>S</b> Heat-resistant alloys / Titanium alloys	PR1535	Reddish Green	MEGACOAT NANO	<ul style="list-style-type: none"> <li>Nano thin multi-layer coating [MEGACOAT NANO] improved wear resistance and stability</li> <li>Application : For milling of Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel</li> </ul>
<b>S</b> Heat-resistant alloys	CA6535	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN (CVD)	<ul style="list-style-type: none"> <li>High heat-resistance and wear resistance with CVD coating</li> <li>Application : For milling of Ni-base heat-resistant alloys and martensitic stainless steel</li> </ul>
<b>H</b> Hard Materials	PR015S	Blackish Gray	MEGACOAT HARD	<ul style="list-style-type: none"> <li>Substrate with improved thermal properties reduces sudden fracture and decrease edge wear. MEGACOAT HARD coating technology delivers the high hardness and superior wear resistance</li> <li>Excellent wear and chipping resistance maintains stable machining for high hard materials</li> <li>Application : Difficult-to-cut materials and high hard (less than 60HRC) machining</li> </ul>



# ● 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

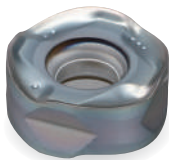
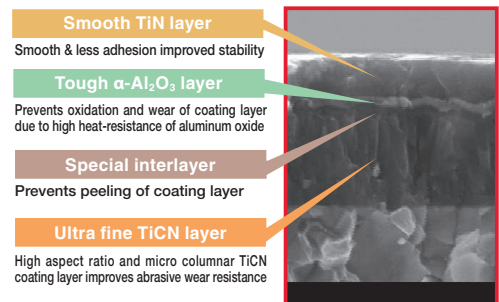
**Suitable for variety of workpiece materials**

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



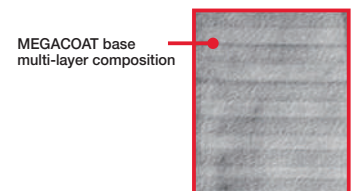
CA6535

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



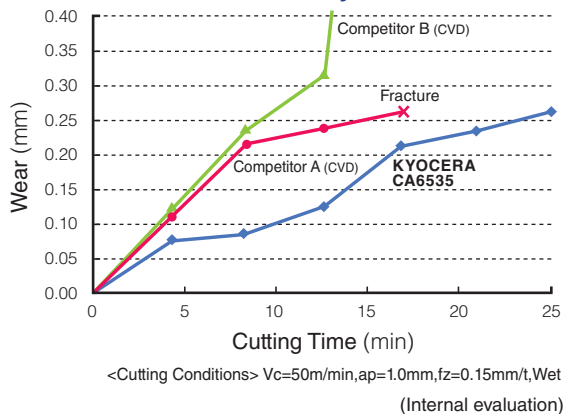
PR1535

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

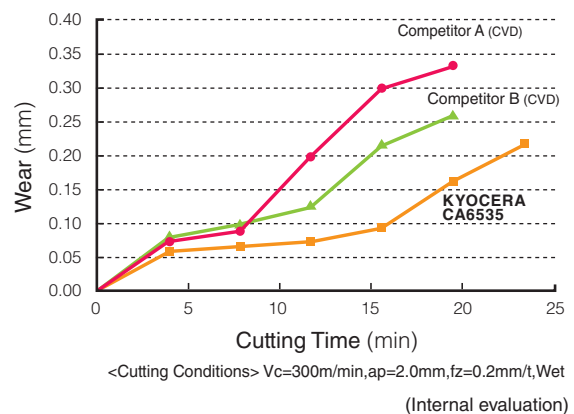


## ■ Tool Life Comparison

### ● Ni-base heat-resistant alloys



### ● Martensitic stainless steel



**Longer tool life and more stable machining than competitors!**

Insert Grades	A
Turning	B
Infeedable Inserts	C
External	D
Small Parts	E
Boring	F
Grooving	G
Cut-off	H
Threading	J
Drilling	K
Milling	M
Tools for Turning Mill	N
Spare Parts	P
Technical Information	R
Index	T

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

### Features of Carbide

Classification	Symbol	Color	Main Component	Advantages and Applications
<div>N</div> <div>Non-ferrous Metals</div>	KW10	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K10 relevant)</li> <li>· Application : Machining cast iron, non-ferrous materials and non-metals</li> </ul>
	GW05	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K05 relevant)</li> <li>· Application : Excellent wear resistance for machining of cast iron and non-ferrous metal</li> </ul>
	GW15	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K10 relevant), tough micro-grain carbide</li> <li>· Application : Machining cast iron, non-ferrous materials and non-metals</li> </ul>
	GW25	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K30 relevant)</li> <li>· Application : Milling operations of aluminum</li> </ul>
<div>S</div> <div>Heat-resistant alloys</div>	SW05	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K05 relevant)</li> <li>· Application : Titanium alloys for continuous machining and finishing</li> </ul>
	SW10 (Made to order)	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K10 relevant)</li> <li>· Application : Titanium alloys for continuous and light interrupted machining</li> </ul>
	SW25 (Made to order)	Gray	WC+Co	<ul style="list-style-type: none"> <li>· ISO identification symbol K carbide (K25 relevant)</li> <li>· Application : Titanium alloys for interrupted and light interrupted machining</li> </ul>

## 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

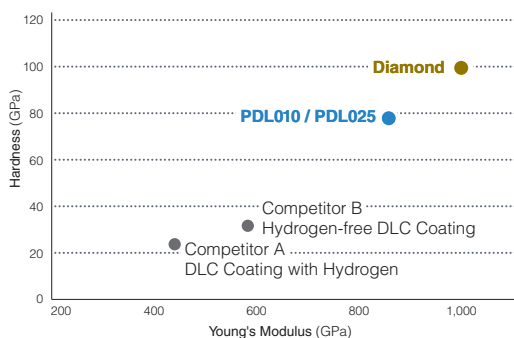
- High hardness with Kyocera's proprietary hydrogen-free DLC coating delivers hardness close to that of diamond provides longer tool life for aluminum alloys machining
- Excellent surface finish achieved through anti-adhesion performance

### Features of DLC Coated Carbide

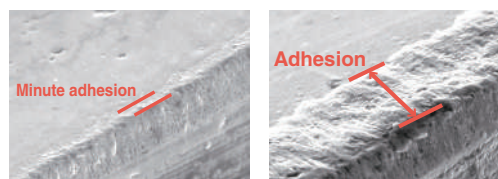
Classification	Symbol	Color	Coated Composition	Advantages and Applications
<div>N</div> <div>Non-ferrous Metals</div>	PDL010	Rainbow Color	C	<ul style="list-style-type: none"> <li>· High hardness with Kyocera's proprietary hydrogen-free DLC coating provides excellent adhesion and peeling resistance</li> <li>· Application: Long tool life machining and stable surface finishing for aluminum alloys</li> </ul>
	PDL025	Rainbow Color	C	<ul style="list-style-type: none"> <li>· High hardness with Kyocera's proprietary hydrogen-free DLC coating provides excellent adhesion and peeling resistance</li> <li>· Application : Long tool life and stable interrupted machining of aluminum alloys</li> </ul>

### Properties of DLC Coating

High hardness with Kyocera's proprietary hydrogen-free DLC coating delivers hardness close to that of diamond



### Superior adhesion resistance



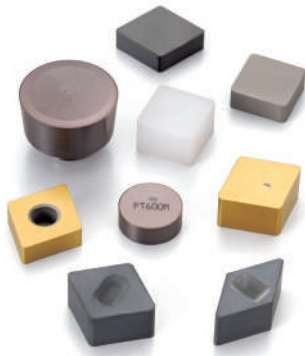
PDL025

Competitor A

Cutting Conditions :  $V_c = 800$  m/min,  $f_z = 0.1$  mm/t,  $a_p \times a_e = 3 \times 5$  mm, Dry  
 Cutter Dia.  $\phi 25$  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

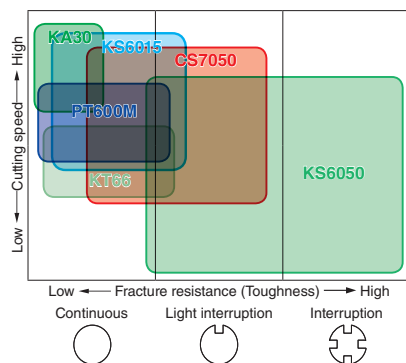
- Excellent wear resistance provides high speed machining of cast iron
- Ceramic maintains good surface finishes due to the low affinity to workpiece materials
- Silicon nitride ceramic can machine cast iron with coolant due to its superior thermal shock resistance

## Features of Ceramic

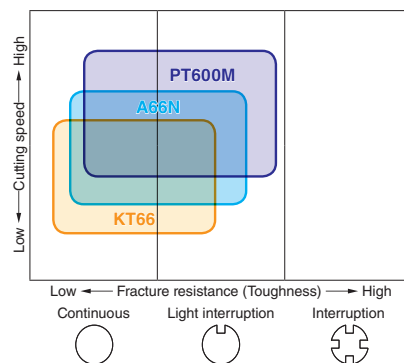
Classification	Symbol	Color	Main Component (Coated Composition)	Coating Layer	Hardness of Substrate (GPa)	Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)	Advantages and Applications
<div style="background-color: red; color: white; padding: 2px; text-align: center;">K</div> <div style="background-color: white; color: red; padding: 2px; text-align: center;">Cast Iron</div>	KA30	White	Al <sub>2</sub> O <sub>3</sub>	-	17.5	4.0	750	<ul style="list-style-type: none"> <li>Aluminum oxide ceramic (Al<sub>2</sub>O<sub>3</sub>)</li> <li>Application : Finishing of cast iron at high cutting speeds without coolant</li> </ul>
	KS6015	Gray	Si <sub>3</sub> N <sub>4</sub>	-	15.2	7.8	1,000	<ul style="list-style-type: none"> <li>Silicon nitride ceramic with superior wear resistance reduces heat at the cutting edge.</li> <li>Application : Roughing and high speed machining of cast iron (with or without coolant)</li> </ul>
	KS6050	Gray	Si <sub>3</sub> N <sub>4</sub>	-	15.6	8.0	1,200	<ul style="list-style-type: none"> <li>Silicon nitride ceramic (Si<sub>3</sub>N<sub>4</sub>)</li> <li>Application : Roughing and interrupted machining of cast iron. Focusing on stability. (with or without coolant)</li> </ul>
	CS7050	Grayish White	Si <sub>3</sub> N <sub>4</sub> (Special Al <sub>2</sub> O <sub>3</sub> COAT)	Thin coating	15.6	8.0	1,200	<ul style="list-style-type: none"> <li>Silicon nitride ceramic (Si<sub>3</sub>N<sub>4</sub>) + CVD Coating (Special Al<sub>2</sub>O<sub>3</sub> COAT)</li> <li>Application : Finishing and continuous machining, and high speed and high efficient machining (with or without coolant)</li> </ul>
<div style="background-color: red; color: white; padding: 2px; text-align: center;">K</div> <div style="background-color: white; color: red; padding: 2px; text-align: center;">Cast Iron</div>	KT66	Black	Al <sub>2</sub> O <sub>3</sub> +TiC	-	20.1	4.1	980	<ul style="list-style-type: none"> <li>Aluminum oxide and Titanium carbide ceramic (Al<sub>2</sub>O<sub>3</sub>+TiC)</li> <li>Application : Semi-roughing to finishing of cast iron, and hard materials</li> </ul>
<div style="background-color: gray; color: white; padding: 2px; text-align: center;">H</div> <div style="background-color: white; color: gray; padding: 2px; text-align: center;">Hard Materials</div>	A66N	Gold	Al <sub>2</sub> O <sub>3</sub> +TiC (TiN COAT)	Thin coating	20.1	4.1	980	<ul style="list-style-type: none"> <li>TiN PVD coated Aluminum oxide and Titanium carbide ceramic (TiN coated Al<sub>2</sub>O<sub>3</sub>+TiC)</li> <li>Application : Semi-roughing to finishing of hard materials</li> </ul>
	PT600M	Blackish Red	Al <sub>2</sub> O <sub>3</sub> +TiC (MEGACOAT)	Thin coating	20.1	4.1	980	<ul style="list-style-type: none"> <li>Heat-resistant MEGACOAT on Aluminum oxide and Titanium carbide ceramic (MEGACOAT Al<sub>2</sub>O<sub>3</sub>+TiC)</li> <li>Application : Semi-roughing to finishing of cast iron, hard materials and hardened roll materials</li> </ul>
<div style="background-color: brown; color: white; padding: 2px; text-align: center;">S</div> <div style="background-color: white; color: brown; padding: 2px; text-align: center;">Heat-resistant alloys</div>	KS6030	Gray	SiAlON	-	15.2	6.0	600	<ul style="list-style-type: none"> <li>SiAlON ceramic with superior wear resistance and high resistance against boundary wear</li> <li>Application : Finishing to medium machining of heat-resistant alloys</li> </ul>
	KS6040	Brown	SiAlON	-	16.7	7.0	900	<ul style="list-style-type: none"> <li>High stability SiAlON ceramic with wear resistance and fracture resistance</li> <li>Application : Roughing of heat-resistant alloys</li> </ul>

## Application Map

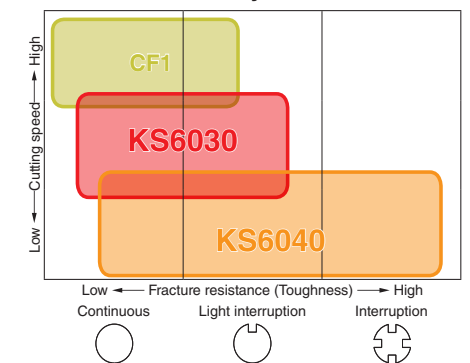
### Cast Iron



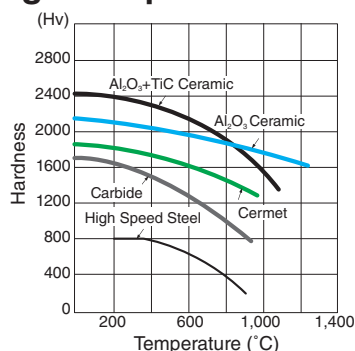
### Hard Materials



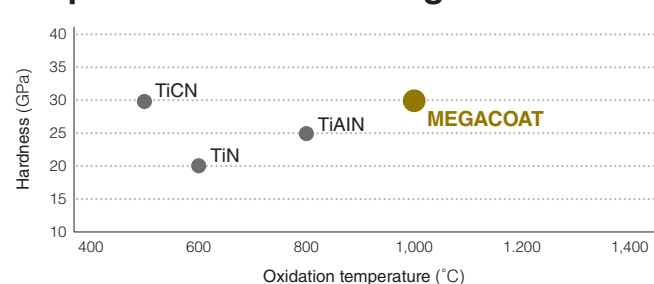
### Heat-resistant alloys



## High-Temperature Hardness



## Properties of PVD Coating



Low Oxidation resistance High



## CBN (Cubic Boron Nitride)



### CBN

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

### Features

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

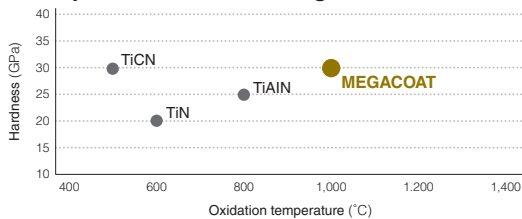
### Features of CBN

Classification	Symbol	Color	Ave. grain size (μm)	Hardness of Substrate (GPa)	Transverse Strength (MPa)	Advantages and Applications
<div>H</div> <div>Hard Materials</div>	KBN510	Black	2	28	1,000	<ul style="list-style-type: none"> <li>• Excellent wear resistance and crack resistance, non-coated CBN</li> <li>• Application : Finishing and continuous machining of hardened die steel</li> </ul>
	KBN525	Black	1 or less	25	1,250	<ul style="list-style-type: none"> <li>• Application : General purpose for hardened steel</li> </ul>
	KBN05M (MEGACOAT)	Blackish Red	0.5-1.5	27	1,000	<ul style="list-style-type: none"> <li>• Heat-resistant MEGACOAT on highly heat-resistant CBN substrate</li> <li>• Application : High speed finishing of hardened steel</li> </ul>
	KBN10M (MEGACOAT)	Blackish Red	2	28	1,000	<ul style="list-style-type: none"> <li>• Application : High speed finishing of hardened die steel</li> </ul>
	KBN25M (MEGACOAT)	Blackish Red	1 or less	25	1,250	<ul style="list-style-type: none"> <li>• Heat-resistant MEGACOAT on micro-grain CBN with heat-resistant binder phase</li> <li>• Application : Stable machining of hardened steel at high cutting speeds</li> </ul>
Sintered Steel	KBN570	Black	2-4	34	1,350	<ul style="list-style-type: none"> <li>• High CBN content ratio</li> <li>• Application : Machining of sintered steel (preventing burr formation)</li> </ul>
	KBN70M (MEGACOAT)	Blackish Red	2-4	34	1,350	<ul style="list-style-type: none"> <li>• Heat-resistant MEGACOAT on CBN rich substrate</li> <li>• Application : Stable machining of sintered steel (ferrous sintered alloys)</li> </ul>
<div>K</div> <div>Cast Iron</div>	KBN475	Black	2	39	1,400	<ul style="list-style-type: none"> <li>• Excellent wear resistance due to high CBN content and special binder</li> <li>• Application : High speed machining of gray cast iron</li> </ul>
	KBN60M (MEGACOAT)	Blackish Red	0.5-6	33	1,250	<ul style="list-style-type: none"> <li>• Heat-resistant MEGACOAT on CBN rich substrate with hard binder phase</li> <li>• Application : High speed finishing of gray cast iron</li> </ul>
	KBN900 (TiN COAT)	Gold	9	31	630	<ul style="list-style-type: none"> <li>• TiN coated solid CBN</li> <li>• Application : Heavy duty, interrupted machining and finishing of hardened steel, hardened roll steel and cast iron</li> </ul>

• For KBN35M, see page [A18](#)

### MEGACOAT CBN

#### Properties of PVD Coating

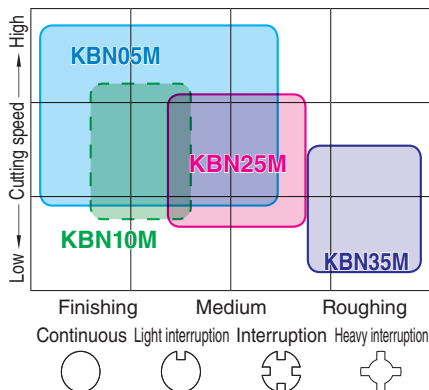


#### Advantages of MEGACOAT

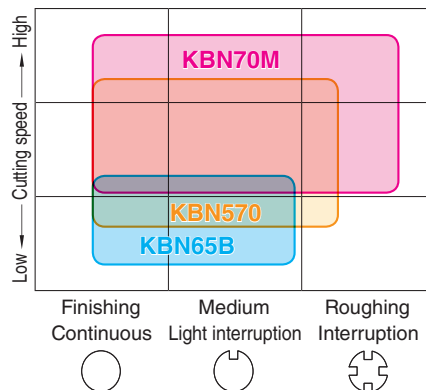
- Longer tool life and high speed machining due to superior heat resistance and hardness
- Stability improvement through prevention of crater wear (oxidation, diffusional wear)
- High thermal stability and surface smoothness provide excellent surface finish

### Application Map

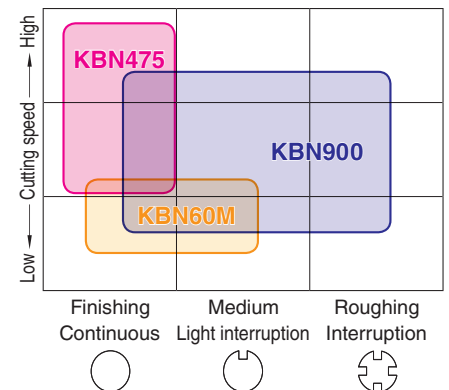
#### Hard Materials



#### Sintered Steel



#### Cast Iron



# PCD (Polycrystalline Diamond)



## PCD (Polycrystalline Diamond)

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

## Features

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

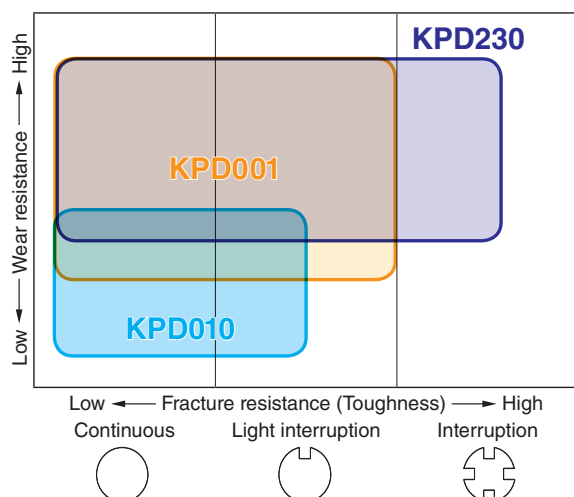
## Features of PCD

Classification	Symbol	Ave. grain size (μm)	Advantages and Applications
<div>N</div> <div>Non-ferrous Metals</div>	KPD001	0.5	<ul style="list-style-type: none"> <li>• Super micro-grain PCD features cutting edge strength, wear resistance, fracture resistance, good edge-sharpening performance and longer, stable tool life</li> <li>• Application : High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, and carbide</li> </ul>
	KPD010	10	<ul style="list-style-type: none"> <li>• Good wear resistance and toughness, good grindability</li> <li>• Application : High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, and carbide</li> </ul>
	KPD230	2-30	<ul style="list-style-type: none"> <li>• Superior abrasive wear resistance and toughness due to high density PCD with mixed rough and fine grains</li> <li>• Application : High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics</li> </ul>
	KPD250 (Made to order)	25	<ul style="list-style-type: none"> <li>• Superior wear resistance due to rough grain PCD (25μm)</li> <li>• Application : High speed machining of high silicon aluminum alloy and machining of carbide</li> </ul>

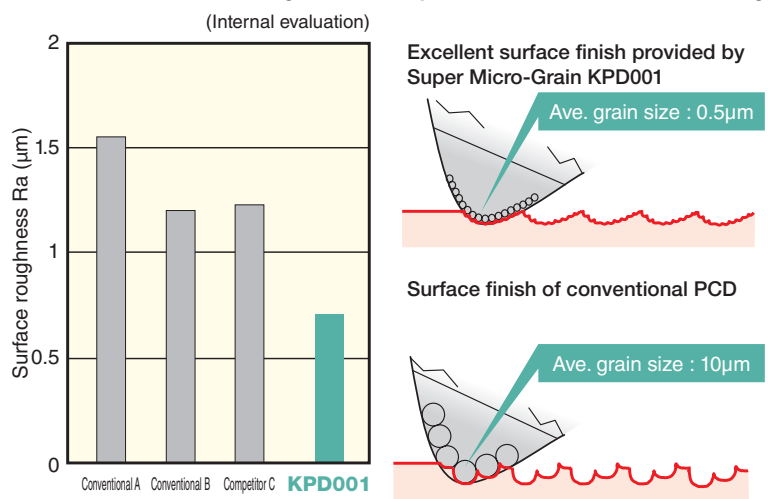
## Applications

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

## Application Map



## Surface Finish Roughness Comparison of Aluminum Machining



(Grain size affects surface finish quality)

Insert Grades	A
Turning	B
Indexable Inserts	C
CBN & PCD Tools	D
External	E
Small Parts	F
Boring	G
Grooving	H
Cut-off	J
Threading	K
Drilling	M
Milling	N
Tools for Turning Mill	P
Spare Parts	R
Technical Information	T

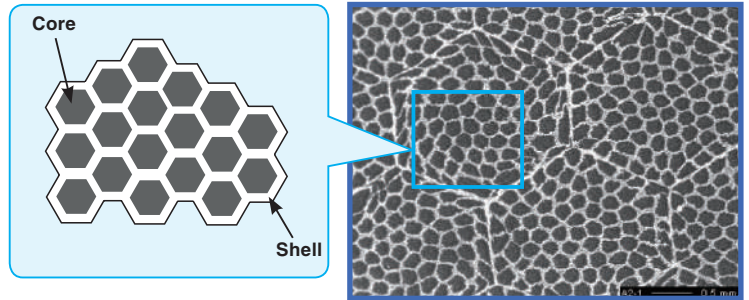
## Honeycomb structure CBN / Ceramic

### Honeycomb structure CBN / Ceramic

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

### Features

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



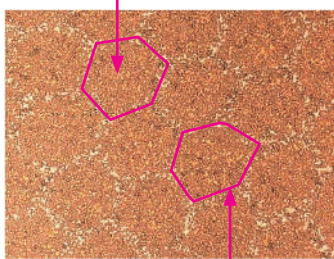
### Features of Honeycomb structure CBN / Ceramic

Classification	Symbol	Color	Main Component	Advantages and Applications
<b>H</b> Hard Materials	<b>KBN35M</b> (MEGACOAT)	Blackish Red	CBN	<ul style="list-style-type: none"> <li>· Honeycomb structure CBN composite material consisting of wear resistant CBN (core) and tough CBN (shell)</li> <li>· Heat-resistant MEGACOAT on tough Honeycomb structure CBN</li> <li>· Application : Stable machining of hardened steel at interrupted machining</li> </ul>
<b>S</b> Heat-resistant alloys	<b>CF1</b>	Gray	Ceramic	<ul style="list-style-type: none"> <li>· Honeycomb structure ceramic composite material consisting of wear resistant ceramic (core) and tough ceramic (shell)</li> <li>· Application : Machining of heat-resistant alloys like Ni-base heat-resistant alloys</li> </ul>

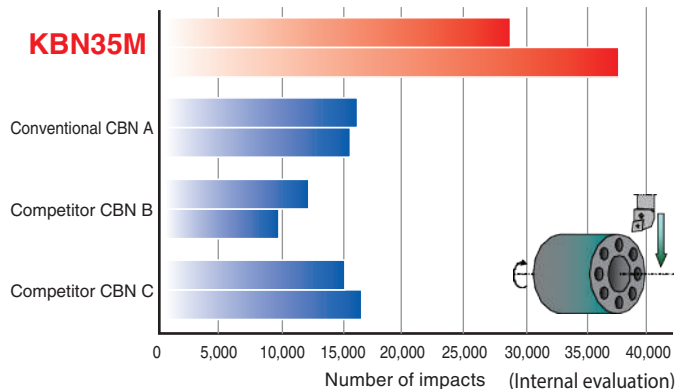
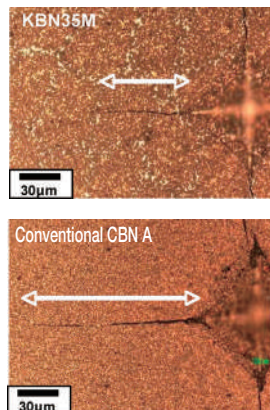
### KBN35M (MEGACOAT Honeycomb structure CBN)

- Tough CBN (shell) prevents crack growth

Wear-resistant CBN (core)

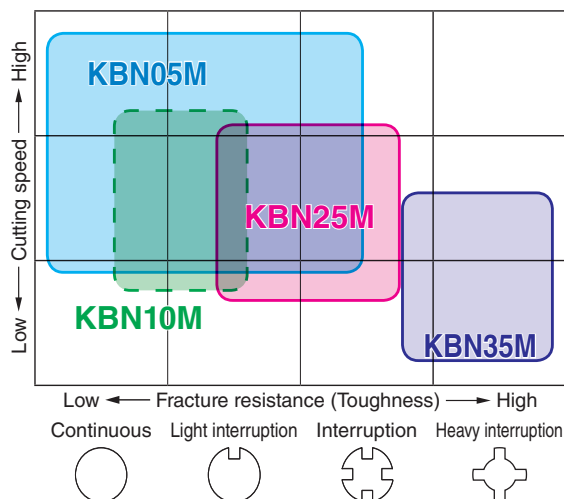


Tough CBN (shell)

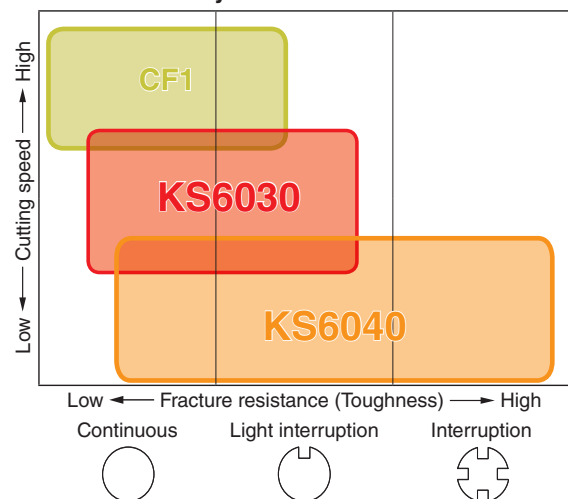


### Application Map

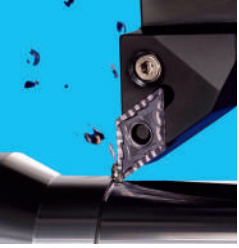








- Hard Materials



- Heat-resistant alloys



# Insert Material Selection Table

Applications		Cutting Range	P Steel	M Stainless Steel	K Gray Cast Iron	N Nodular Cast Iron	S Non-ferrous Metals	H Heat-resistant alloys	S Titanium alloys	H Hard Materials	Sintered Steel
Turning		Finishing	TN610 CCX TN620 TN60 PV710 PV720 PV730 CA510 CA515 CA025P CA530	TN610 TN620 TN60 PV720 CA6515 PR1535	KBN475 KBN60M KA30 PV7005 CA5505 CA310 CA315	TN60 PV7005 CA5505 CA310 CA315 CA320	KPD001 KPD010 PDL010 PDL025 KW10	CF1 KS6040 KW10 CA6515 CA6525 PR005S PR015S PR1535	KPD001 KPD010 KPD010 SW05 SW10 SW25	KT66 A66N PT600M KBN05M KBN10M KBN25M KBN35M KBN900	TN610 TN60 KBN570 KBN70M
		Roughing									
Small Parts Machining		Finishing	TN610 TN620 PV710 PV720 PR1705 PR1725 PR1725 PR930 PR1025 PR1535	TN610 TN620 PV720 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 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 PR1225 PR930 PR1535	KBN475 KBN60M PV7005 CA310 CA315 KW10	PV7005 CA310 CA320 KW10	KPD001 KPD010 PDL010 PDL025 GW05 KW10	CA6515 CA6525 PR1125 PR1225 PR1535	KPD001 KPD010 KW10 SW05 PR1535	PT600M KBN05M KBN10M KBN25M	TN610 TN60 KBN570 KBN70M
		Bore Dia.									
Cut-off		Small	CR9025 PR930 PR915 PR1215 PR1225 PR1535	CR9025 PR930 PR915 PR1215 PR1225 PR1535	KW10 PR1215	KW10 PR1215	PDL025 KW10	KW10 PR1225 PR660	KW10	-	-
		Cutting Dia.									
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	PR015S	-
		Roughing									

- Highlighted materials are recommended choice.

Insert Grades	A
Turning	B
Indexable Inserts	C
CBN & PCD Tools	D
External	E
Small Parts Machining	F
Boring	G
Grooving	H
Cut-off	J
Threading	K
Drilling	M
Milling	N
Tools for	P
Turning Mill	R
Spare Parts	T
Technical Information	
Index	

# Grade Properties

A

Insert Grades

## Cermet

Symbol	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
					(HV)	(GPa)		
TN610	Gray	TiCN	-	6.6	1,750	17.2	6.0	2,100
TN620	Gray	TiCN	-	6.9	1,550	15.2	9.0	2,500
TN620M	Gray	TiCN	-	6.9	1,550	15.2	9.0	2,500
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

## CVD Coated Cermet

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
					(HV)	(GPa)		
CCX	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	7.0	1,500	14.7	10.0	2,600

## PVD Coated Cermet

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
					(HV)	(GPa)		
PV710	Gold	MEGACOAT NANO	Thin Coating	6.6	1,750	17.2	6.0	2,100
PV720	Gold	MEGACOAT NANO	Thin Coating	6.9	1,550	15.2	9.0	2,500
PV730	Gold	MEGACOAT NANO	Thin Coating	7.0	1,450	14.2	10.0	2,500
PV7005	Blackish Red	MEGACOAT	Thin Coating	6.0	1,650	16.2	8.5	1,470
PV7040	Blackish Red	MEGACOAT	Thin Coating	6.0	1,650	16.2	9.0	1,570
PV90	Gold	TiN	Thin Coating	6.4	1,450	14.2	10.0	1,960
PV60M	Gold	MEGACOAT NANO	Thin Coating	6.6	1,600	15.7	9.0	1,760

## CVD Coated Carbide

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
					(HV)	(GPa)		
CA310	Rose Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +Ti base	Thick Coating	15.0	1,570	15.4	12.0	2,780
CA315	Rose Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +Ti base	Thick Coating	15.0	1,570	15.4	12.0	2,780
CA320	Rose Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +Ti base	Thick Coating	15.0	1,570	15.4	12.0	2,780
CA415D	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	15.0	1,570	15.4	12.0	2,780
CA420M	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.5	1,600	15.8	13.0	3,400
CA4505	Blackish Gray	TiCN+Al <sub>2</sub> O <sub>3</sub>	Thick Coating	15.0	1,790	17.5	9.5	2,350
CA4515	Blackish Gray	TiCN+Al <sub>2</sub> O <sub>3</sub>	Thick Coating	15.0	1,570	15.4	12.0	2,780
CA510	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.5	1,470	14.4	11.5	2,500
CA515	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.4	1,440	14.1	12.5	2,650
CA520D	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.7	1,370	13.4	16.0	3,100
CA025P	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.2	1,400	13.7	13.5	2,800
CA525	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.2	1,360	13.3	13.5	2,750
CA530	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	13.9	1,340	13.1	14.5	2,850
CA5505	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.7	1,730	17.0	10.0	2,540
CA5515	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.7	1,550	15.2	12.0	2,750
CA5525	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.5	1,400	13.7	12.0	2,780
CA5535	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thick Coating	14.1	1,340	13.1	16.5	2,970
CA6515	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thin Coating	14.7	1,530	15.0	12.0	2,780
CA6525	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thin Coating	14.7	1,370	13.4	16.0	3,100
CA6535	Gold	TiCN+Al <sub>2</sub> O <sub>3</sub> +TiN	Thin Coating	14.3	1,320	12.9	16.0	3,700
CR9025	Gold	TiCN+TiN	Thick Coating	14.5	1,400	13.7	12.0	2,780



## PVD Coated Carbide

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
					(HV)	(GPa)		
PR005S	Blackish Gray	MEGACOAT HARD	Thin Coating	15.0	1,750	17.2	8.0	2,000
PR015S	Blackish Gray	MEGACOAT HARD	Thin Coating	14.9	1,680	16.5	9.0	2,400
PR905	Bluish Violet	TiAIN	Thin Coating	14.8	1,720	16.8	9.0	2,450
PR915	Bluish Violet	TiAIN	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
PR1025	Reddish Gray	TiCN	Thin Coating	14.5	1,600	15.8	13.0	3,400
PR1115	Purple Red	TiAIN	Thin Coating	14.7	1,700	16.7	11.0	3,000
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
PR1510	Reddish Green	MEGACOAT NANO	Thin Coating	14.8	1,720	16.8	9.0	2,450
PR1515	Reddish Green	MEGACOAT NANO	Thin Coating	14.7	1,700	16.7	11.0	3,000
PR1525	Reddish Green	MEGACOAT NANO	Thin Coating	14.5	1,600	15.8	13.0	3,400
PR1535	Reddish Green	MEGACOAT NANO	Thin Coating	14.3	1,320	12.9	16.0	3,700
PR1625	Reddish Green	MEGACOAT NANO	Thin Coating	14.5	1,600	15.8	13.0	3,400
PR1705	Silver	MEGACOAT NANO PLUS	Thin Coating	14.9	1,800	17.6	10.0	3,300
PR1725	Silver	MEGACOAT NANO PLUS	Thin Coating	14.5	1,600	15.8	13.0	3,400

## Carbide

Symbol	Color	Main Component	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
				(HV)	(GPa)		
KW10	Gray	WC+Co	15.0	1,650	16.2	10.0	1,470
GW05	Gray	WC+Co	14.9	1,800	17.6	10.0	3,300
GW15	Gray	WC+Co	14.7	1,700	16.7	11.0	3,000
GW25	Gray	WC+Co	14.5	1,600	15.8	13.0	3,400
SW05	Gray	WC+Co	15.0	1,790	17.5	9.5	2,350
SW10	Gray	WC+Co	14.8	1,720	16.8	9.0	2,450
SW25	Gray	WC+Co	14.7	1,370	13.4	16.0	3,100

## DLC Coated Carbide

Symbol	Color	Coated Composition	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m <sup>1/2</sup> )	Transverse Strength (MPa)
					(HV)	(GPa)		
PDL010	Rainbow Color	C	Thin Coating	15.0	1,650	16.2	10.0	1,470
PDL025	Rainbow Color	C	Thin Coating	14.5	1,600	15.8	13.0	3,400

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Turnable Inserts  
CN & PCD Tools  
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