INSERT GRADES

A1 - A17

TURNING

Workpiece Material	Steel (Carbon Steel / Alloy Steel)					Stainless Steel & Cast Steel					Cast Iron (Gray Cast Iron / Nodular Cast Iron)			
Cutting Range	Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
Classification	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet – TN Series	TN6010, TN620, TN6020, TN60, TN90					TN6010, TN6020, TN60, TN90					TN60			
Cermet – MEGACOAT (PV Series)	PV7010, PV7025					PV7010, PV7025					PV7005			
Cermet – MEGACOAT NANO (PV Series)	PV720													
Coated Carbide – CA Series	CA510, CA515, CA525, CA530, CA5505, CA5515, CA5525, CA5535						CA6515, CA6525				CA4505, CA4515			
Coated Carbide – PR Series	PR930, PR1005, PR1025, PR1115						PR930, PR1025, PR1125							
Coated Carbide – MEGACOAT (PR Series)	PR1225						PR1225							
Coated Carbide – MEGACOAT NANO (PR Series)	PR1425, PR1535						PR1425, PR1535							
Carbide											KW10			
CBN											KBN60M			

Workpiece Material	Non-Ferrous (Aluminum / Non-Ferrous Metals / Non-Metals)				Heat Resistant Alloys (Inconel / Titanium)				Hard Materials (Hardened Steel / Chilled Cast Iron)				Powdered 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	CA6525									
Coated Carbide – PR Series							PR1125							PR930		
Coated Carbide – MEGACOAT (PR Series)					PR1305	PR1310	PR1325									
Coated Carbide – MEGACOAT NANO (PR Series)							PR1535									
Cermet													TN6010, TN60			
CBN									KBN510, KBN525							
MEGACOAT									KBN05M, KBN10M, KBN25M, KBN30M, KBN35M					KBN65M, KBN70M		
Carbide		KW10			SW05	SW10	SW25									
PCD	KPD001, KPD010				KPD001, KPD010											

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GROOVING / CUT-OFF / THREADING

Workpiece Material	Steel (Carbon Steel / Alloy Steel)					Stainless Steel & Cast Steel					Cast Iron (Gray Cast Iron / Nodular Cast Iron)			
Cutting Range	Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
Classification	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet — MEGACOAT (PV Series)	PV7040										PV7040			
Cermet — TN Series	TN6020	TN6020				TN6020	TN6020							
	TN90	TN90				TN90	TN90							
Cermet — TC Series	TC40N	TC40N									TC40N	TC40N		
	TC60M	TC60M				TC60M	TC60M							
Coated Carbide — CR Series	CR9025	CR9025				CR9025	CR9025							
Coated Carbide — PR Series	PR660	PR660				PR660	PR660							
	PR915	PR915				PR915	PR915				PR905	PR905		
	PR930	PR930				PR930	PR930							
	PR1025	PR1025				PR1025	PR1025							
	PR1115	PR1115				PR1115	PR1115							
Coated Carbide — MEGACOAT (PR Series)	PR1215	PR1215				PR1215	PR1215				PR1215	PR1215		
	PR1225	PR1225				PR1225	PR1225							
Coated Carbide — MEGACOAT NANO (PR Series)	PR1425	PR1425				PR1425	PR1425							
Carbide											KW10	KW10		
											GW15	GW15		

Workpiece Material	Non-Ferrous (Aluminum / Non-Ferrous Metals / Non-Metals)				Heat Resistant Alloys (Inconel / Titanium)				Hard Materials (Hardened Steel / Chilled Cast Iron)				Powdered 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 — PR Series														PR930		
Coated Carbide — MEGACOAT (PR Series)							PR1535							PR1215		
														PR1225		
Carbide		KW10				KW10										
		GW15				GW15										
CBN									KBN510					KBN570		
									KBN525							
PCD	KPD001				KPD001											
	KPD010				KPD010											

DRILLING

Workpiece Material	Steel (Carbon Steel / Alloy Steel)					Stainless Steel & HRA Nickel-based Alloys					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 – PR Series				PR660					PR660			PR905		
Cermet – MEGACOAT (PV Series)			PR1225	PR1230				PR1225				PR1210		
Carbide														

Workpiece Material	Non-Ferrous (Aluminum / Non-Ferrous Metals / Non-Metals)				Heat Resistant Alloys (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 – PR Series						PR905						
Coated Carbide – MEGACOAT (PR Series)							PR1210			PR1230		
Carbide		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 – TN Series		TN100M					TN100M							
Carbide – CA Series								CA6535						
Carbide – PR Series			PR830					PR830				PR905		
								PR1025						
Carbide – MEGACOAT (PR Series)		PR1225	PR1230					PR1225				PR1210		
Carbide – MEGACOAT NANO (PR Series)		PR1525						PR1525				PR1510		
Carbide														

Workpiece Material	Non-Ferrous (Aluminum / Non-Ferrous Metals / Non-Metals)				Heat Resistant Alloys (Ni-Base)				Heat Resistant Alloys (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
CA Series					CA6535											
Coated Carbide – PR Series									PR905							
Coated Carbide – MEGACOAT (PR Series)										PR1210						
Coated Carbide – MEGACOAT NANO (PR Series)						PR1535				PR1535						
Carbide	KW10									KW10						
	GW25									GW25						
PCD	KPD001								KPD001							
	KPD230								KPD230							

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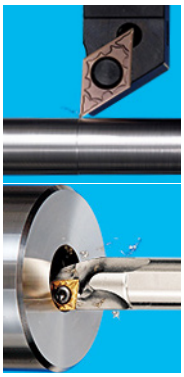
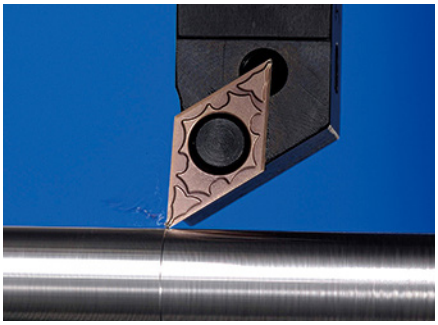
Applications		Cutting Range	P	M	K	N	S		H	Powdered Metal
			Steel	Stainless Steel	Cast Iron	Non-ferrous Metals	Heat-Resistant Alloys	Titanium Alloys	Hard Materials	
Back Turning		Large Cutting Dia. Small	TC60M PR1005 PR1025 PR1225 PR1425 PR930	PR1025 PR1225 PR930	KW10	KPD001 KW10	PR1025 PR1225	KPD001 KW10	-	PR1425 PR930
External and Internal Turning		Large Cutting Dia. Small	TN6010 TN6020 TN60 PV7010 PV720 PV7025 CA5515 CA5525 PR1005 PR1025 PR1425 PR1225 PR930	TN620 TN60 PV720 PV7025 CA6515 CA6525 PR1025 PR1225 PR1125 PR930	KBN60M CA4505 CA4515 KW10	KPD001 KPD010 KW10	CA6515 CA6525 PR1125 PR1305 PR1310 PR1325	KPD001 KPD010 KW10 SW05 SW10 SW25	KBN05M KBN10M KBN25M KBN30M KBN35M	TN6010 TN60 KBN65M KBN70M PR930
Cut-Off		Depends on workpiece material	PR1025 PR1225	PR1025 PR1225	KW10	KW10	KW10 PR1025	KW10	-	-
Grooving		Glossy Finish Stable Cutting	TC40N TN90 PR930 CR9025 PR1115 PR1025 PR1215 PR1225	TC40N TN90 PR915 CR9025 PR1115 PR1025 PR1215 PR1225	PR905 PR1215 KW10 GW15	KPD001 KW10 GW15	PR915 KW10 PR1115 PR1225	KPD001 KW10	KBN510 KBN525	TC40N PR930
Threading		Glossy Finish Stable Cutting	TC60M PR930 PR1115 PR1425	TC60M PR930 PR1025 PR1115 PR1225	KW10 GW15	KW10 GW15	KW10 GW15 PR1115	KW10 GW15	-	PR1425 PR930
Drilling		Wear Resistance Toughness	PR1025 PR1225 PR1230 PR660	PR1025 PR1225 PR660	PR905 PR1210	KW10 GW15	PR1025 PR1225 PR660	KW10 GW15	-	-
Milling		Finishing Roughing	TN100M PR830 PR1225 PR1230 PR1525	CA6535 PR830 PR1225 PR1525 PR1535	PR1210 PR1510 KW10	KPD230 KPD001 KPD010 KW10 GW25	CA6535 PR830 PR660 PR1225 PR1525	KPD230 KPD001 KW10 PR905 PR1210 PR1535	-	-

Highlighted items are recommended choice

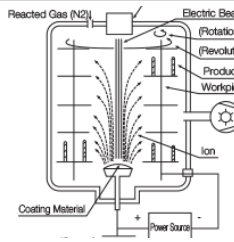
PVD COATED CARBIDE FOR TURNING

PVD COATED CARBIDE (MEGACOAT / MEGACOAT NANO)

KYOCERA's PVD coated carbides for milling and drilling utilize very tough carbide substrates. The low processing temperature, compared with CVD, leads to improved bending strength, less deterioration of the coating and superior tool life with stable machining.



PVD (Physical Vapor Deposition)



Features
① No Deterioration
② No Loss of Bending Strength
③ Excellent Chipping Resistance

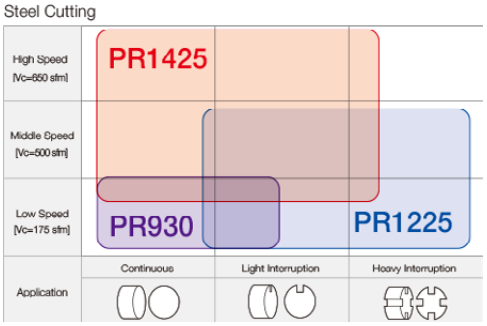
Processing Temperature: 400° ~ 600°C

FEATURES OF PVD COATED CARBIDE FOR TURNING

Material	Description	Color	Main Component (Coating Composition)	Advantages
P Steel	**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, long tool life achieved through anti-adhesion performance
	PR1025	Reddish Gray	TiCN	· TiCN base PVD coated micro-grain carbide · Application: General purpose cutting of steel and stainless steel, stable and long 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-resistant and long tool life for steel and stainless steel cutting
	PR1425	Blackish Red	MEGACOAT NANO	· Nano thin multi-layer coating performs with superior wear resistance and high oxidation resistance. · Application: various applications of steel cutting, High speed stainless steel cutting, extended tool life
M Stainless Steel	**PR1125**	Purple Red	TiAlN	· Hard TiAlN base PVD coated super micro-grain carbide, superior toughness and heat resistance · Application: Finishing and light interrupted 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
K Cast Iron	**PR905**	Bluish Violet	TiAlN	· Smooth fine surface PVD coated hard carbide with plastic deformation resistance · Application: Suitable for milling of gray and nodular cast iron
S Heat-Resistant Alloys	**PR1305**	Blackish Red	MEGACOAT	· MEGACOAT on hard and superior heat resistant carbide, superior wear resistance · Application: Finishing of heat-resistant alloys
	PR1310	Blackish Red	MEGACOAT	· MEGACOAT on hard and superior heat resistant carbide, superior wear and oxidation resistance · Application: First choice for continuous and light interrupted 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
	PR1535	Blackish Red	MEGACOAT NANO	· Stabilized turning operations and long tool life with MEGACOAT NANO coating technology · Application: PVD for titanium alloy and precipitation hardened stainless steel

Application Maps

Steel Cutting



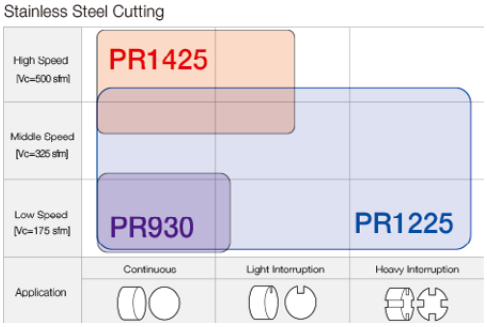
PR1425
1st choice grade

PR1225
High reliability in interrupted cutting

PR1225
Stable cutting at low to middle speed

PR930
Stable cutting at low speed

Stainless Steel Cutting



PR1225
1st choice grade

PR1425
Extended tool life in high speed cutting

PR930
Extended tool life in low speed cutting

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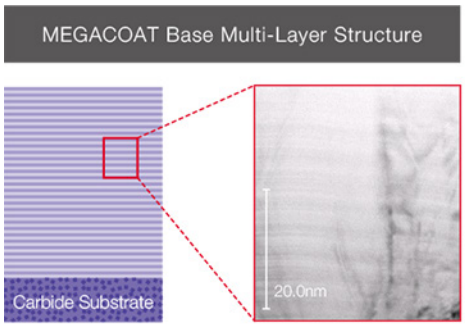
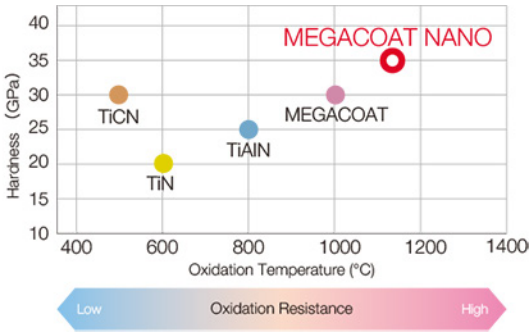
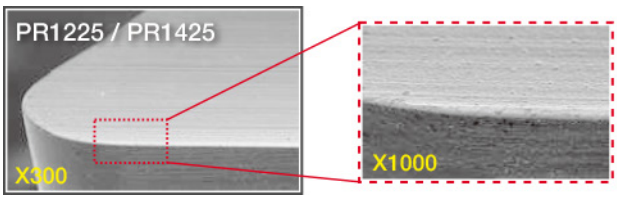
MEGACOAT NANO PR1425 (Grade Properties)



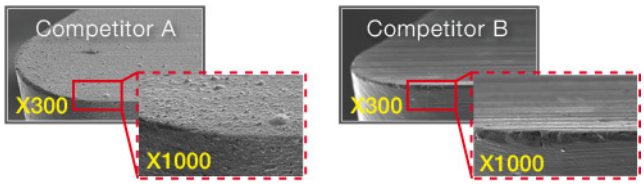


Prevents wear and fracture with high hardness (35GPa) and superior oxidation resistance (oxidation temperature: 1,150°C)

Cutting Edge Quality (Sharp Edge Insert)



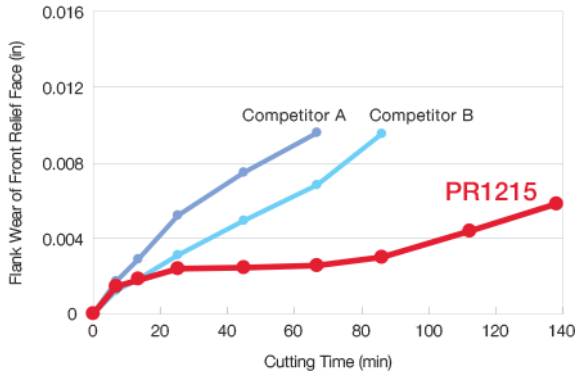
Superior edge-sharpening performance and smooth surface



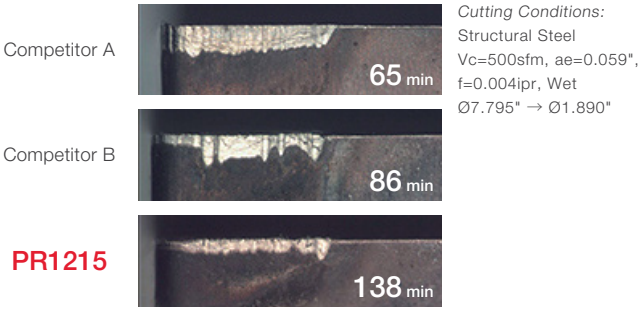
Delamination (coating peeling) and rough surface

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

PR1215 Wear Resistance Comparison
(Off-Centered Grooving)



Flank Wear of Front Relief Face



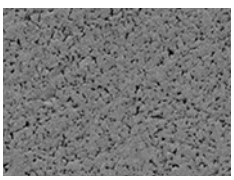
Cutting Conditions:
Structural Steel
Vc=500sfm, ae=0.059",
f=0.004ipr, Wet
Ø7.795" → Ø1.890"

PR13-Series Advantages

Superior wear and fracture resistance attained with uniform grain size and MEGACOAT on superior thermal shock resistant carbide

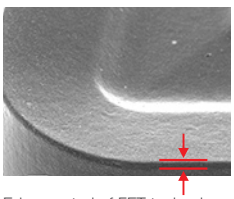
New edge preparation technology (FET: Fine Edge Treatment) controls and minimizes R horning and realizes large tip rake angle, and thus prevents burrs and notching. It provides good finished surface

Special Carbide Substrate



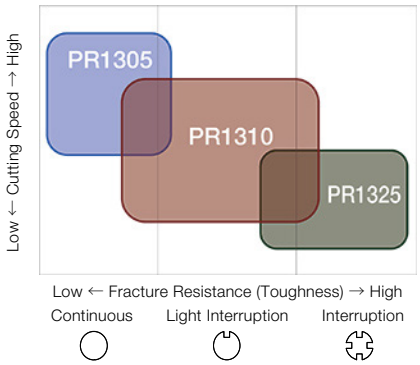
Uniform grain size enables superior thermal shock resistance and constant hardness

New Edge Preparation Technology

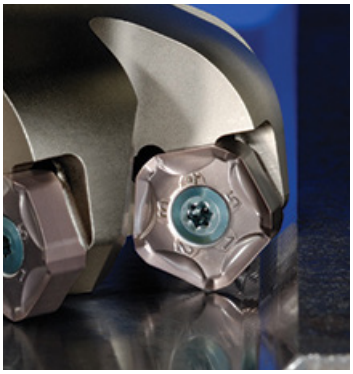


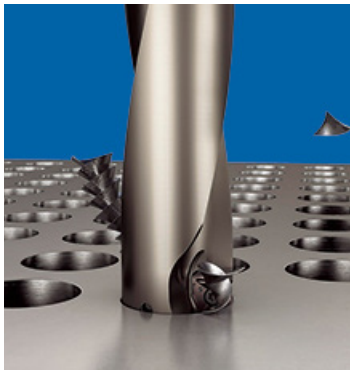
Edge control of FET technology (FET: Fine Edge Treatment)

Heat-Resistant Alloys (Ni-based)



PVD & CVD COATED CARBIDE FOR MILLING & DRILLING





MEGACOAT / MEGACOAT NANO

KYOCERA's PVD coated carbides for milling and drilling utilize very tough carbide substrates.

The low processing temperature, compared with CVD, leads to improved bending strength, less deterioration of the coating and superior tool life with stable machining.

FEATURES OF PVD COATED CARBIDE FOR MILLING & DRILLING

Material	*Description*	*Color*	*Main Component (Coating Composition)*	*Advantages*
P Steel	**PR830**	Gold	TiAlN+TiN	· Improved high temperature stability and wear resistance by TiAlN base PVD coating · Application: Stable and long tool life for milling of steel
	PR1230	Blackish Red	MEGACOAT	· Superior wear and oxidation resistant MEGACOAT on a special tough carbide substrate · Application: Stable and high feed rate milling and drilling of steel
	PR1525	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: Stable and long tool life milling of Steel and Stainless Steel
M Stainless Steel	**PR1025**	Reddish Gray	TiCN	· TiCN base PVD coated on micro-grain carbide · Application: Stable and long tool life milling of stainless steel
	PR1225	Blackish Red	MEGACOAT	· Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate · Application: General and high feed drilling of steel and stainless steel
K Cast Iron	**PR1210**	Blackish Red	MEGACOAT	· Superior wear and oxidation resistant MEGACOAT on special carbide substrate for cast iron · Application: Highly efficient stable milling and drilling of gray and nodular cast iron and titanium alloys
	PR1510	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: For gray and nodular cast iron, stable wear resistance and toughness
	CA420M	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: For gray and nodular cast iron, stable wear resistance and toughness
S Heat-Resistant Alloys	**PR1535**	Blackish Red	MEGACOAT NANO	· Stabilized milling operation and long tool life with MEGACOAT NANO coating technology · Application: PVD for titanium alloy and precipitation hardened stainless steel
	CA6535	Gold	TiCN+Al_2O_3+TiN (CVD)	· High heat resistance and wear resistance with CVD coating with improved stability due to thin film coating · Application: CVD for Ni-base heat resistant alloy and martensitic stainless steel

2 New Grades for Extending Tool Life

when machining heat resistant alloys and difficult-to-cut materials

CA6535 (CVD) NEW

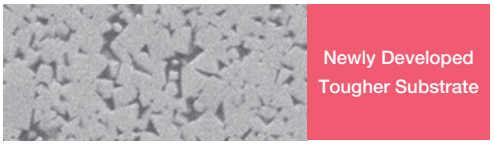
for Ni-base heat resistant alloy and martensitic stainless steel

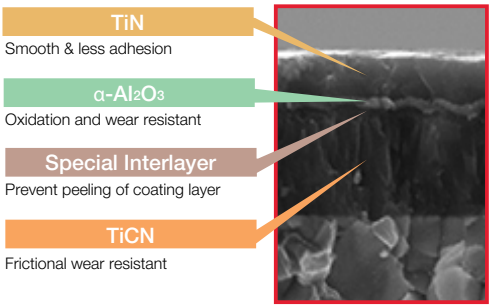
PR1535 (PVD) NEW

for titanium alloy and precipitation hardened stainless steel

New grades for difficult-to-cut material

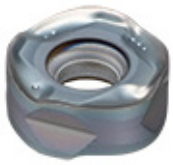
- Stable cutting prevents insert fracturing
- Good for high efficiency machining





CA6535

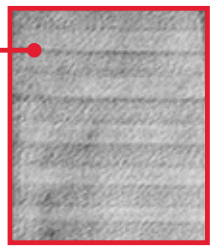
Ni-base heat resistant alloy and martensitic stainless steel
ı heat resistance and wear resistance with CVD coating
roved stability due to thin film coating technology



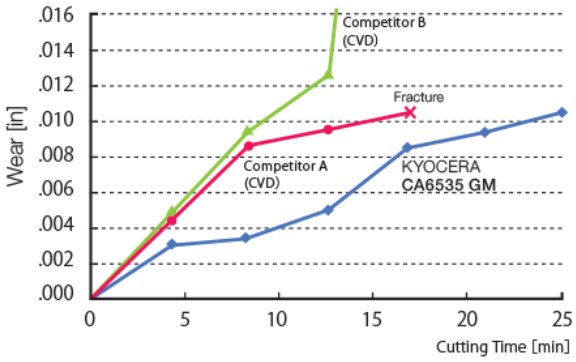
PR1535

titanium alloy and precipitation hardened stainless steel
ɔilized milling operation and long tool life with Kyocera's MEGACOAT NANO coating technology
roved stability due to thin film coating technology

MEGACOAT
Layer structure



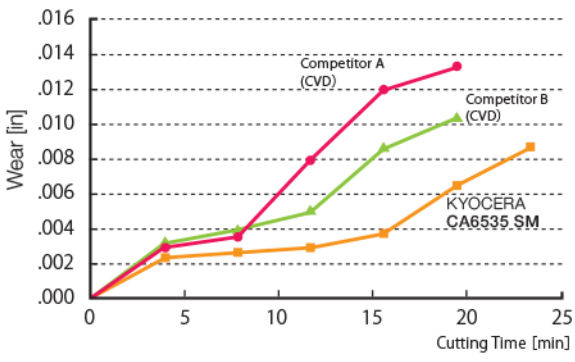
• Ni-base Heat Resistant Alloy



< Cutting Condition > Vc=175sfm, ap=0.039", fz=0.006ipt, WET

1st recommendation GM chipbreaker

• Martensitic Stainless Steel

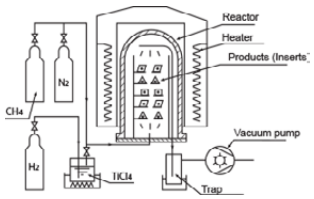


< Cutting Condition > Vc=975sfm, ap=0.079", fz=0.008ipt, WET

1st recommendation SM chipbreaker

CVD COATED CARBIDE

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

CVD COATED CARBIDE

KYOCERA's CVD coated carbide grades are based on ceramic thin film technology and provide stable, efficient cutting at high speeds or heavily interrupted applications.

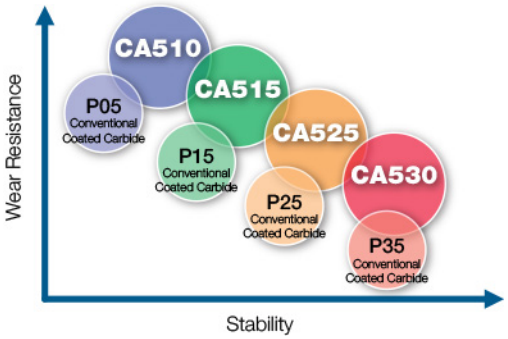
- Applicable from low to high speed cutting and from finishing to roughing
- Stable cutting is achieved due to the superior toughness and crack resistance
- Cutting times are reduced due to good chip control from effective chipbreakers

FEATURES OF CVD COATED CARBIDE

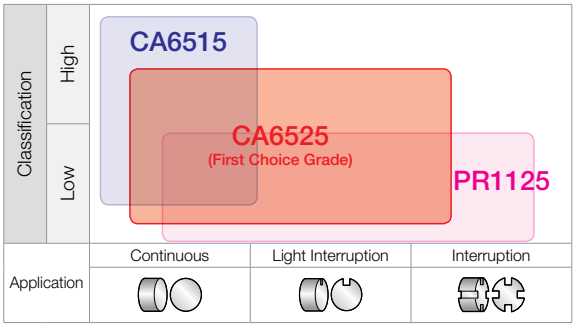
Material	*Description*	*Color*	*Main Component (Coating Composition)*	*Advantages*
P Steel	**CA510**	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Special substrate with thermal deformation resistance along with a thick and tough film coating for wear resistance · Application: High speed and high efficiency steel machining
	CA515	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Special substrate and tough coating film provides thermal deformation and high wear resistance · Application: Continuous to light interrupted steel machining (general use)
	CA525	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Special substrate and tough coating film provides high wear and fracture resistance · Application: 1st choice for steel machining
	CA530	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Special tough substrate and tough coating film provides high stability and wear resistance · Application: General to heavy interrupted machining (stability oriented)
	CA5505	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Improved wear resistance due to hard carbide substrate and micro columnar structure of coated composition · Application: High speed continuous cutting of steel, continuous to light interrupted cutting of cast iron
	CA5515	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Improved wear resistance and longer tool life due to micro columnar structure of coated composition · Application: High speed cutting of steel, continuous to light interruption
	CA5525	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Improved toughness and wear resistance due to tougher carbide substrate and micro columnar structure of coated composition · Application: First choice for general cutting of steel, roughing to interruption
	CA5535	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Improved toughness due to tougher carbide substrate · Application: Roughing to heavy interrupted cutting of steel
	CR9025	Gold	Columnar TiCN+TiN	· Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance · Application: Cut-off, grooving and multi-function cutting of steel
M Stainless Steel	**CA6515**	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Specialized carbide substrate for stainless steel cutting, excellent wear resistance · Application: Continuous to light interrupted cutting of stainless steel
	CA6525	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Specialized carbide substrate for stainless steel cutting, excellent notching resistance and toughness · Application: First choice for general cutting of stainless steel, from finishing to roughing, continuous to interruption
K Cast Iron	**CA4010**	Gold	Columnar TiCN+Al_2O_3+TiN	· 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_2O_3+TiN	· Improved wear resistance due to micro columnar structure of coated composition · Application: Nodular cast iron cutting, continuous to light interruption
	CA4120	Gold	Micro Columnar TiCN+Al_2O_3+TiN	· Improved toughness and wear resistance due to tougher carbide substrate and micro columnar structure of coated composition · Application: Roughing to heavy interrupted cutting of nodular cast iron
	CA4505	Blackish gray	Micro Columnar TiCN+Al_2O_3	· Stable, long tool life due to improved bounding force of coated layers and special treatment on the surface of top coated 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_2O_3	· Stable, long tool life due to improved bounding force of coated layers and special treatment on the surface of top coated layer · Application: First choice for gray cast iron and nodular cast iron in light to heavy interrupted cutting

Application Map

Steel



Stainless Steel



KYOCERA

CA5-Series NEW

CVD COATED CARBIDE GRADE FOR STEEL

New Innovations in Steel Machining

with **CA5** Series **Grades** &
P Series **Chipbreakers**

CA510

Special substrate with thermal deformation resistance along with a thick and tough film coating for wear resistance

Application: High speed and high efficiency steel machining

CA515

Special substrate and tough coating film provides thermal deformation and high wear resistance

Application: Continuous to light interrupted steel machining (general use)

CA525

Special substrate and tough coating film provides high wear and fracture resistance

Application: 1st Choice for steel machining

CA530

Special tough substrate and tough coating film provides high stability and wear resistance

Application: General to heavy interrupted machining (stability oriented)

High Adhesion Strength Coating Layer with Ultra Fine Interface

Long tool life and stable machining with **40%** improved adhesion strength!

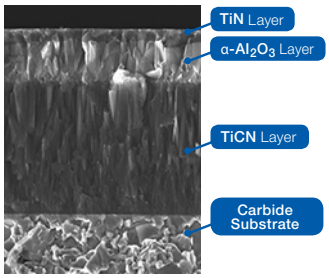
Smooth and Flat Surface Reduces Cutting Forces

Sharp cutting and stable machining with a smooth, flat surface preventing sudden breakage caused by material welding onto the cutting edge

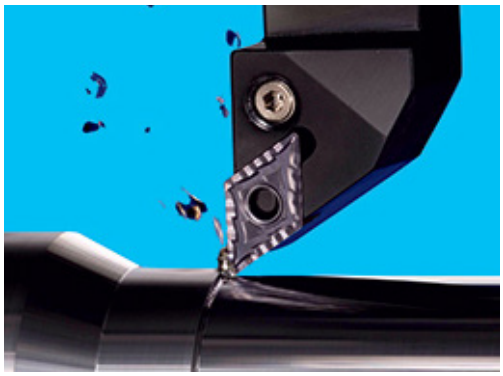
Innovative Coating Layers Produce Superior Hardness and Toughness

Special crystal control technology

Long tool life with the high aspect ratio of α-Al_2O_3 layer



CERMET



CERMET

KYOCERA is known as the leading manufacturer of cermets. Cermet is a composite material combining Ceramic and Metal. Typical materials used in cermets are TiC, TiN, TiCN and NbC. Designed to provide long tool life and excellent surface finishes, cermets combine toughness with superior wear resistance.

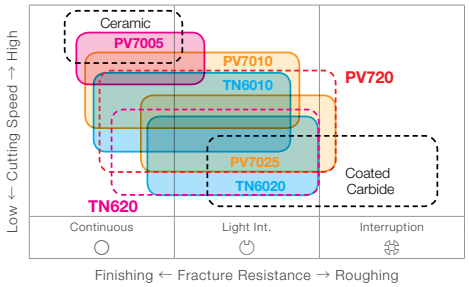
PVD COATED CERMET

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 & PVD COATED CERMET

Material		Description	Color	Main Component (Coating Composition)	Advantages
P Steel	Cermet	**TN620**	Gray	TiCN	· Inner structure has high toughness and chipping resistance along with thermal shock resistance. · Application: Recommended cermet for stable steel machining and high quality surface finish
		TN6010 (Super Micro-Grain)	Gray	TiCN	· Improved surface cermet with superior wear resistance and toughness · Application: Economical uncoated cermet for steel
		TN60	Gray	TiCN+NbC	· Typical choice cermet with superior wear resistance and toughness · Application: Cutting of steel and stainless steel
		TN6020 (Super Micro-Grain)	Gray	TiCN	· Super micro-grain cermet with superior wear resistance and toughness · Application: First choice cermet for steel and stainless steel cutting
		TN100M	Gray	TiCN+NbC	· Tough cermet with improved oxidation resistance and thermal shock resistance · Application: Milling of steel at high speed
		TC40	Gray	TiC+TiN	· Good balance of wear resistance and toughness · Application: Grooving and threading of steel
	PVD	**PV720**	Blackish Red	TiCN (MEGACOAT NANO)	· MEGACOAT NANO efficient machining with high quality surface finishes and superior wear and adhesion resistance. · Application: Recommended cermet for stable steel machining and high quality surface finish
		PV7010 (Super Micro-Grain)	Blackish Red	TiCN (MEGACOAT)	· Heat-resistant MEGACOAT on improved surface cermet with excellent wear resistance and toughness · Application: Stable and improved tool life in steel cutting, excellent surface finish
		PV7025 (Super Micro-Grain)	Blackish Red	TiCN (MEGACOAT)	· MEGACOAT on the super micro-grain cermet · Application: High strength and long life given by MEGACOAT.
		PV7040	Blackish Red	TiC+TiN (MEGACOAT)	· MEGACOAT on the super micro-grain cermet · Application: High strength and long life given by MEGACOAT.
K Cast 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



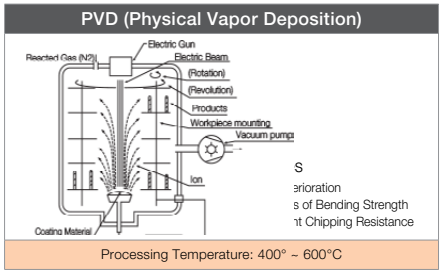
PV-Series (MEGACOAT / MEGACOAT NANO)

PV720: MEGACOAT NANO for Steel
PV7010: MEGACOAT for Steel

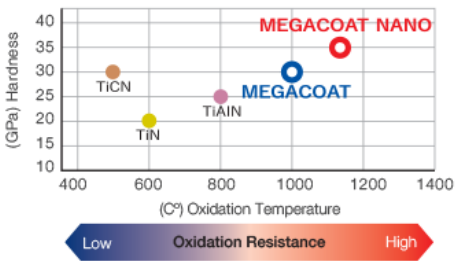
TN-Series (Uncoated Cermet)

TN620: Uncoated Cermet for Steel
TN6010: Uncoated Cermet for Steel

PVD (Coating)



PVD (Properties)

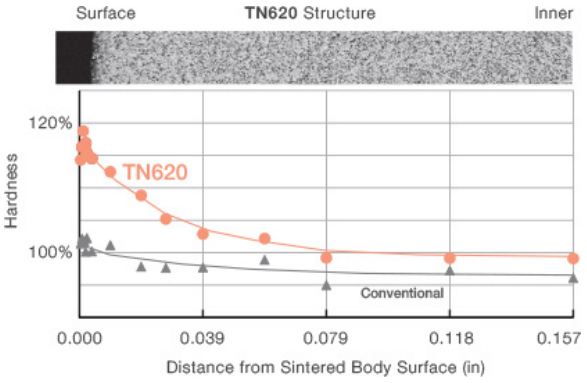


TN620 (CERMET) NEW
for steel machining

PV720 (MEGACOAT NANO CERMET) NEW
for steel machining

SURFACE HARDENED *"HYBRID STRUCTURE"*

Surface-Hardened Hybrid Structure



Surface Structure
(High Hardness Cermet)
- High wear resistance

Inner Structure
(High Toughness Cermet)
- Chipping and thermal shock resistance

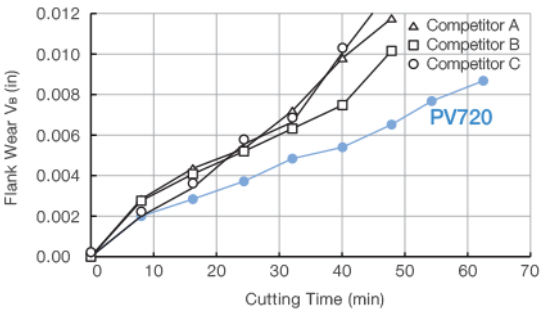
(Internal Evaluation)

TN620's inner structure has high toughness and chipping resistance along with thermal shock resistance. TN620 has a higher hardness and greater wear resistance than that of the conventional micro grain cermet.

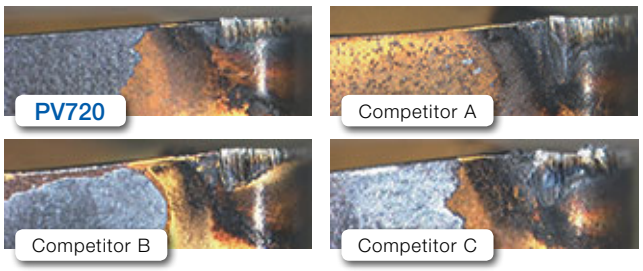
EASY TO VIEW CUTTING EDGE WEAR

PV720 improves performance by adopting composite lamination of MEGACOAT NANO and special TiN to combine high adhesion resistance and great visibility of the used cutting edge even in dim light.

Wear Resistance Comparison



Cutting Conditions
Workpiece : 4137 Steel
Vc = 820sfm
D.O.C. = 0.039"
f = 0.008ipr : Wet
Insert: CNMG432PQ



Flank wear condition after machining 48 minutes.

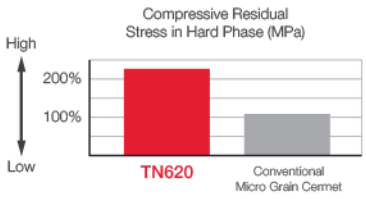
(Internal Evaluation)

EASY TO VIEW CUTTING EDGE WEAR

Improved strength with uniform micro grain hard phase and superior compressive stress with high melting point bonded phase. This combination yields greater fracture resistance.

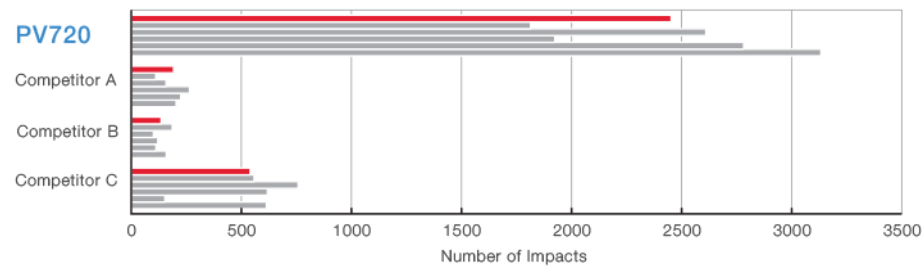
TN620 Structure

Surface Structure *Inner Structure*



(Internal Evaluation)

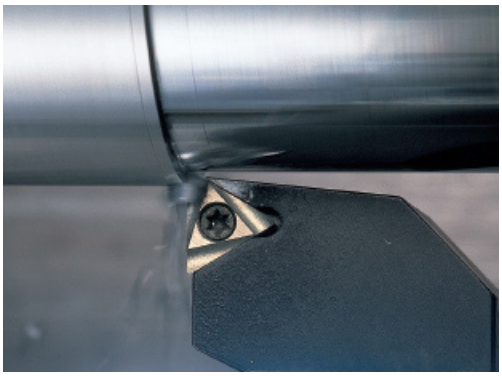
Fracture Resistance Comparison



Cutting Conditions
Workpiece : 1045 Structural Steel
Vc = 820sfm
D.O.C. = 0.039"
f = 0.008ipr : Wet
Insert: CNMG432PQ

(Internal Evaluation)

CARBIDE



CARBIDE

Due to its superior mechanical features carbide is used in a variety of applications. KYOCERA produces a variety of carbides, including KW10 for non-ferrous materials and micro-grain carbides for precision cutting.

FEATURES

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

FEATURES OF CARBIDE

Material	Description	Color	Main Component (Coating Composition)	Advantages
P Steel	**PW30**	Gray	WC+Co+TiC+TaC	· ISO identification symbol P carbide (K10 relevant) · Application: Milling of steel, stable wear resistance and toughness
N Non-Ferrous Materials	**KW10**	Gray	WC+Co	· ISO identification symbol K carbide (K10 relevant) · Application: Stable cutting of cast iron, non-ferrous materials, non-metals, and titanium alloys
	GW15	Gray	WC+Co	· ISO identification symbol K carbide (equivalent to K10), tough micro-grain carbide · Application: High wear resistance and toughness for non-ferrous materials, and non-metals, and titanium alloys
	GW25	Gray	WC+Co	· ISO identification symbol K carbide (K30 relevant) · Application: Stable wear resistance and anti-chipping performance for milling operations of aluminum
S Heat-Resistant Alloys	**SW05**	Gray	WC+Co	· ISO identification symbol K carbide (K05 relevant) · Application: Continuous cutting and finishing of titanium alloys maintaining superior wear resistance
	SW10 (Made to order)	Gray	WC+Co	· ISO identification symbol K carbide (K10 relevant) · Application: Continuous and light interrupted cutting of titanium alloys maintaining superior wear resistance and stable result
	SW25 (Made to order)	Gray	WC+Co	· ISO identification symbol K carbide (K25 relevant) · Application: Interrupted and light interrupted cutting of titanium alloys maintaining stable result

SW Series Cutting Performance Evaluation

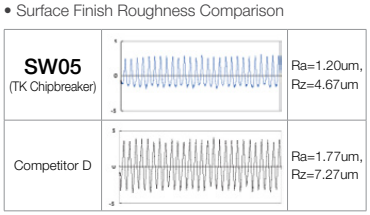
High Wear Resistance

In-house Cutting Test (Ti-6Al-4V)

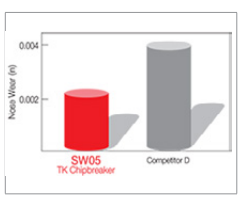
<Cutting Conditions>
Vc=200sfm, D.O.C.=0.020",f=0.006ipr, wet
Ti-6Al-4V
Continuous (External)
CNMG432

Workpiece Surface Roughness and
Insert Wear after cutting for 153 minutes

• Surface Finish Roughness Comparison



• Insert Wear

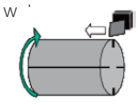


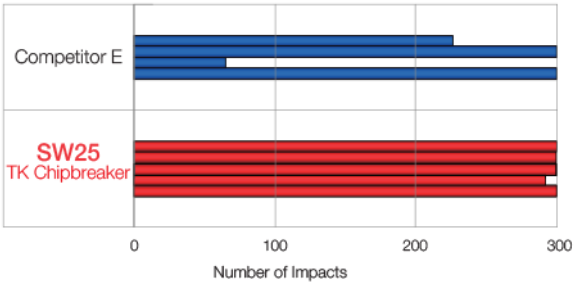
Internal Evaluation

Improved Fracture Resistance

In-house Cutting Test (Ti-6Al-4V)

<Cutting Conditions>
Vc=200sfm, D.O.C.=0.020", f=0.012ipr, w
Ti-6Al-4V(4 grooves)
Interrupted (External),
CNMG432





Internal Evaluation

CBN

CBN

KYOCERA CBN is second only to diamond in hardness. CBN (Cubic Boron Nitride) is a synthetically produced material with high thermal conductivity which provides stable cutting.

FEATURES

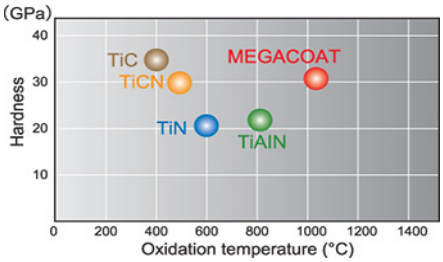
- Superior wear resistance when cutting hardened materials
- Suitable for high speed cutting of cast iron and sintered steel
- High thermal conductivity provides stable cutting

FEATURES OF CBN

Material	Description	Color	Av. Grain Size (μm)	CBN Content Rate (%)	Hardness of Substrate (GPa)	Transverse Strength (MPa)	Advantages
H Hardened 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 grade 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 cutting of hardened steel at high speed
	KBN30M (MEGACOAT)	Blackish Red	1-4	65	30	1,350	· Heat-resistant MEGACOAT on tougher CBN · Application: Stable cutting 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
	KBN65M (MEGACOAT)	Blackish Red	2	85	32	1,150	· Heat-resistant MEGACOAT on CBN with heat-resistant binder phase · Application: Stable cutting of sintered steel (ferrous sintered alloy) at low speed
	KBN70M (MEGACOAT)	Blackish Red	2-4	90	34	1,350	· Heat-resistant MEGACOAT on CBN rich substrate · Application: General cutting of sintered steel (ferrous sintered alloy) at high speed
K Cast Iron	**KBN60M** (MEGACOAT)	Blackish Red	0.5-6	80	33	1,250	· Heat-resistant MEGACOAT on CBN rich substrate with hard binder phase · Application: High speed finishing of gray cast iron
	KBN900 (TiN COAT)	Gold	9	90	31	1,050	· TiN coated solid CBN · Application: Heavy duty, interrupted cutting and finishing of hardened steel, hardened roll steel and cast iron

MEGACOAT CBN

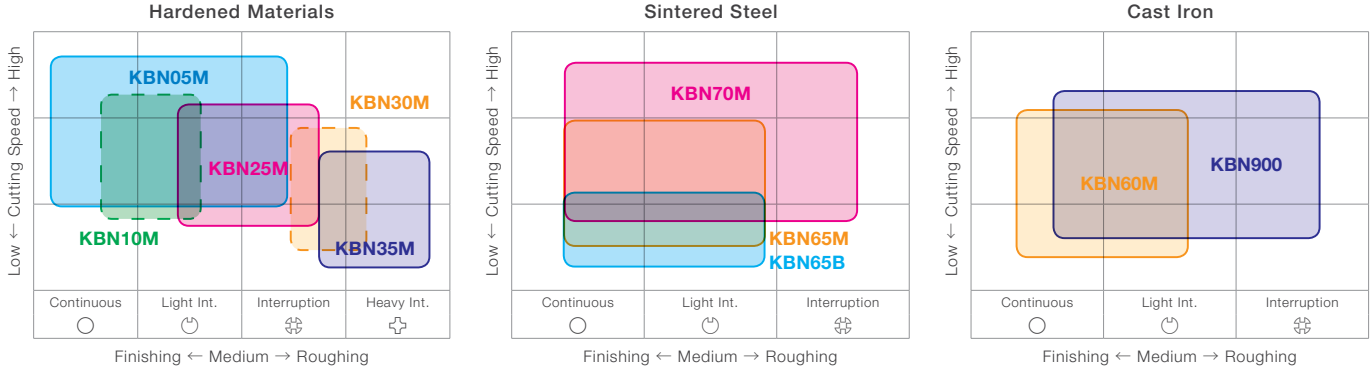
Properties of PVD Coated Layer



Advantages of MEGACOAT

- Long tool life and stable cutting due to superior heat-resistance and hardness
- Improvement of crater wear (oxidation, diffusional wear) resistance
- High thermal stability and surface smoothness provde excellent surface finish

Application Map



PCD

PCD

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

FEATURES

- Applicable for non-ferrous metals, non-metals turning, milling and other various type of cutting
- Long tool life due to extreme hardness
- Capable of high cutting speeds which increases cutting productivity
- Reduced edge build-up allows for high precision cutting
- Diversified applications for cutting of non-ferrous materials and non-metals
- Finished surface will be rainbow colored.
  (a mirror-like finished surface will not be obtained when single crystal diamond is used.)

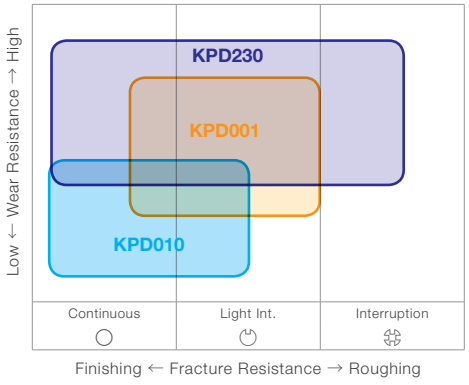
FEATURES OF PCD

Material	Description	Av. Grain Size (μm)	Advantages
N Non-Ferrous Materials	KPD001	0.5	· Super Micro-Grain PCD features cutting edge strength, wear resistance, fracture resistance, good edge-sharpening performance and long, stable tool life. · Application: High speed cutting of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, fiberglass, carbide and ceramics.
	KPD010	10	· Good wear resistance and toughness, good grindability · Application: General purpose, high speed cutting of aluminum alloys, non-ferrous metals and non-metals including plastics, fiberglass, carbide and ceramics.
	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

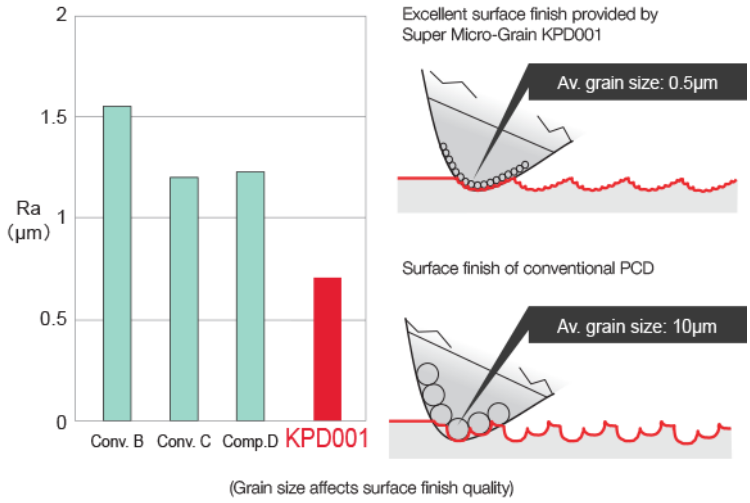
Applications

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

Application Map



Surface Finish Roughness Comparison of Aluminum Cutting



(Grain size affects surface finish quality)

Grade Name	Color	Main Component	Coating Layer	Density	Hardness of Substrate (HV)	Hardness of Substrate (GPa)	Fracture Toughness ($MPam^{1/2}$)	Flexural Toughness (MPa)
Cermet								
TN620	Gray	TiCN	-	6.9	1,550	15.2	9.0	2,500
TN6010	Gray	TiCN	-	6.5	1,700	16.7	7.0	2,000
TN6020	Gray	TiCN	-	6.4	1,500	14.7	10.0	2,500
TN60	Gray	TiCN+NbC	-	6.6	1,600	15.7	9.0	1,760
TN90	Gray	TiCN+NbC	-	6.4	1,450	14.2	10.0	1,960
TN100M	Gray	TiCN+NbC	-	6.7	1,520	14.9	10.5	1,860
TC40	Gray	TiC+TiN	-	6.0	1,650	16.2	9.0	1,570
TC60	Gray	NbC	-	8.1	1,500	14.7	10.5	1,670
PVD Coated Cermet								
PV720	Gold	MEGACOAT NANO	Thin coating	6.9	1,550	15.2	9.0	2,500
PV7005	Blackish red	MEGACOAT	Thin coating	6.0	1,650	16.2	8.5	1,470
PV7010	Blackish red	MEGACOAT	Thin coating	6.5	1,700	16.7	7.0	2,000
PV7025	Blackish red	MEGACOAT	Thin coating	6.4	1,500	14.7	10.0	2,500
PV7040	Blackish red	MEGACOAT	Thin coating	6.0	1,650	16.2	9.0	1,570
PV60	Gold	TiN	Thin coating	6.6	1,600	15.7	9.0	1,760
PV90	Gold	TiN	Thin coating	6.4	1,450	14.2	10.0	1,960
CVD Coated Carbide								
CA420M	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick Coating	14.5	1,600	15.8	13.0	3,400
CA4010	Gold	Columnar TiCN+Al_2O_3+TiN	Thick coating	14.8	1,670	16.4	10.0	3,000
CA4115	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4120	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4505	Blackish gray	Micro columnar TiCN+Al_2O_3	Thick coating	14.9	1,780	17.4	9.5	2,350
CA4515	Blackish gray	Micro columnar TiCN+Al_2O_3	Thick coating	14.9	1,570	15.4	12.0	2,780
CA510	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.5	1,470	14.4	11.5	2,500
CA515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.4	1,440	14.1	12.5	2,650
CA525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.2	1,360	13.3	13.5	2,750
CA530	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	13.9	1,340	13.1	14.5	2,850
CA5505	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,730	17.0	10.0	2,540
CA5515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA5525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.5	1,400	13.7	12.0	2,780
CA5535	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.1	1,340	13.1	16.5	2,970
CA6515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thin coating	14.7	1,530	15.0	12.0	2,780
CA6525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thin coating	14.7	1,370	13.4	16.0	3,100
CA6535	Gold	Micro columnar TiCN+Al_2O_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								
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	12.0	2,250
PR730	Gold	TiAlN+TiN	Thin coating	13.7	1,450	14.2	12.0	2,250
PR830	Gold	TiAlN+TiN	Thin coating	13.7	1,450	14.2	12.0	2,250
PR905	Bluish violet	TiAlN	Thin coating	14.8	1,670	16.4	10.0	3,000
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	1,670	16.4	10.0	3,000
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	12.0	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	1,670	16.4	10.0	3,000
PR1325	Blackish red	MEGACOAT	Thin coating	14.7	1,370	13.4	16.0	3,100
PR1425	Blackish red	MEGACOAT	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1510	Blackish red	MEGACOAT	Thin coating	14.8	1,720	16.8	9.0	2,450
PR1525	Blackish red	MEGACOAT	Thin coating	14.5	1,600	15.8	13.0	3,400
Carbide								
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	1,670	16.4	10.0	3,000
SW25	Gray	WC+Co	-	14.7	1,370	13.4	16.0	3,100