

Insert Grades



Summary of Insert Grades	A2-A5
--------------------------	-------

Turning	A2
Small Parts Machining	A3
Grooving / Cut-Off / Threading	A4
Drilling	A5
Milling	A5

Insert Grades	A6-A21
---------------	--------

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

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, uncoated carbide, ceramic, PCD and CBN.

Turning

Workpiece material		Steel					Stainless steel / Cast steel					Cast iron			
Cutting range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN series	TN610					TN610								
		TN620					TN620								
		TN60					TN60					TN60			
		TN90					TN90								
	TC series		TC60					TC60							
	CCX (CVD coated)	CCX										CCX			
Coated carbide	PV series		PV90					PV90							
	MEGACOAT											PV7005			
	MEGACOAT NANO	PV710					PV710								
		PV720					PV720								
		PV730					PV730								
	CA series	CA115P										CA310			
		CA125P					CA6515					CA315			
		CA510					CA6525					CA320			
		CA515										CA4505			
		CA025P										CA4515			
		CA525													
		CA530													
	PR series	PR930					PR930								
		PR1025					PR1025								
	MEGACOAT		PR1225					PR1225							
	MEGACOAT NANO			PR1535				PR1535							
	MEGACOAT NANO PLUS	PR1705													
		PR1725					PR1725								
	MEGACOAT TOUGH						PR1205								
Ceramic												KA30			
												KT66			
												A66N			
												PT600M			
												KS6015			
												KS6050			
												CS7050			
Carbide													KW10		
CBN												KBN475			
												KBN60M			
												KBN900			

*White bars indicate older grades

Insert Grades

Turning

Workpiece Material		Non-ferrous Metals				Difficult-to-cut materials Titanium / Titanium Alloys				Hard Materials				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										
	MEGACOAT HARD					PR005S		CA6525									
	MEGACOAT TOUGH					PR115S		PR120S									
	MEGACOAT NANO							PR153S									
Cermet														TN610			
														TN60			
Ceramic							KS001			KT66							
							KS6030			A66N							
							KS6040			PT600M							
CBN										KBN510							
										KBN525							
										KBN900							
MEGACOAT										KBN05M							
										KBN10M							
										KBN25M							
										KBN35M							
MEGACOAT TOUGH										KBN010							
										KBN020							

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys				Hard materials				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
MEGACOAT NANO Coated carbide									PR153S								
Carbide						SW05											
							SW10										
								SW25									
DLC coated carbide																	
PCD																	

Small Parts Machining

Workpiece material		Steel					Stainless steel / Cast steel					Cast iron			
Cutting range		Finishing ←→ Roughing					Finishing ←→ Roughing					Finishing ←→ Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated carbide	PR series	PR930					PR930								
		PR1025					PR1025								
	MEGACOAT	PR1225					PR1225								
	MEGACOAT NANO	PR1535					PR1535								
	MEGACOAT NANO PLUS	PR1705													
PR1725					PR1725										

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys				Hard materials				Sintered steel			
Cutting range		Finishing ↔ Roughing				Finishing ↔ Roughing				Finishing ↔ Roughing				Finishing ↔ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Carbide																	
DLC coated carbide																	

800.823.7284

www.kyoceraprecisiontools.com

*White bars indicate older grades

INSERT GRADES	A
TURNING INSERTS	B
CBN / PCD INSERTS	C
TURNING HOLDERS	D
SMALL TOOLS	E
BORING	F
GROOVING	G
CUT-OFF	H
THREADING	J
DRILLING	K
MILLING	M
QUICK CHANGE TOOLING	N
SPARE PARTS	P
TECHNICAL	R
INDEX	T

Grooving / Cut-Off / Threading

Workpiece material		Steel					Stainless steel / Cast steel					Cast iron				
Cutting range		Finishing ←→ Roughing					Finishing ←→ Roughing					Finishing ←→ Roughing				
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30	
Cermet	MEGACOAT	PV7040										PV7040				
	TN series	TN620					TN620									
		TN6020					TN6020									
		TN60					TN60						TN60			
		TN90					TN90									
TC series	TC40											TC40				
	TC60						TC60									
Coated carbide	CR series	CR9025					CR9025									
	PR series	PR915					PR915						PR905			
		PR930					PR930									
		PR1025					PR1025									
		PR1115														
	MEGACOAT	PR1215					PR1215						PR1215			
		PR1225					PR1225									
	MEGACOAT NANO	PR1535					PR1515									
		PR1625					PR1625									
	MEGACOAT NANO EX	PR2015											PR2015			
PR2025					PR2025											
Ceramic												A65				
												A66N				
												PT600M				
Carbide												KW10				
												GW15				

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Titanium / Titanium alloys				Hard materials				Sintered Steel			
Cutting range		Finishing $\longleftrightarrow$ Roughing				Finishing $\longleftrightarrow$ Roughing				Finishing $\longleftrightarrow$ Roughing				Finishing $\longleftrightarrow$ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
MEGACOAT Coated carbide														PR1215			
Cermet														PR1225			
Cermet														TN60			
Ceramic										A65							
Carbide		KW10				KW10				A66N							
		GW05				GW15				PT600M							
		GW15															
DLC coated carbide		PDL015															
		PDL025															
CBN										KBN510				KBN570			
										KBN525							
PCD		KPD001				KPD001											
		KPD010				KPD010											

*White bars indicate older grades

Drilling

Workpiece material		Steel					Stainless steel / Cast steel					Cast iron			
Cutting range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated carbide	CA series		CA520D					CA6535				CA415D			
	MEGACOAT		PR1225					PR1225				PR1210			
			PR1230												
	MEGACOAT NANO		PR1535					PR1535							
Carbide												KW10			
												GW15			

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

Milling

Workpiece material		Steel					Stainless steel / Cast steel					Cast iron			
Cutting range		Finishing ← → Roughing					Finishing ← → Roughing					Finishing ← → Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cement	TN series		TN620M					TN60							
			TN60					TN100M							
Coated carbide	MEGACOAT NANO		PV60M												
	CA series							CA6535				CA420M			
	MEGACOAT		PR1225					PR1225				PR1210			
			PR1230												
Coated carbide	MEGACOAT NANO		PR1525					PR1525				PR1510			
								PR1535							
	MEGACOAT NANO EX		PR1825					PR1835				PR1810			
			PR1835												
Carbide												KW10			
												GW25			

Workpiece material		Non-ferrous metals				Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys				Difficult-to-cut materials Titanium / Titanium alloys				Hard materials			
Cutting range		Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	S01	S10	S20	S30	H01	H10	H20	H30
Coated carbide	CA series					CA6535				CA6535							
	MEGACOAT									PR1210							
	MEGACOAT HARD													PR015S			
	MEGACOAT NANO					PR1535				PR1535							
Carbide		KW10								KW10							
		GW25								GW25							
DLC coated carbide		PDL025															
PCD		KPD001								KPD001							
										KPD010							

*White bars indicate older grades

INSERT GRADES	A
TURNING INSERTS	B
CBN / PCD INSERTS	C
TURNING HOLDERS	D
SMALL TOOLS	E
BORING	F
GROOVING	G
CUT-OFF	H
THREADING	J
DRILLING	K
MILLING	M
QUICK CHANGE TOOLING	N
SPARE PARTS	P
TECHNICAL	R
INDEX	T

Cermet

Cermet

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

PVD Coated Cermet (MEGACOAT / MEGACOAT NANO Cermet)

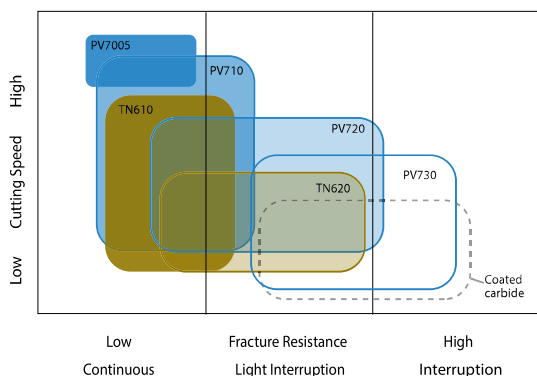
PVD coated cermet is coated on cermet substrate with a thin layer of high wear resistance and high adhesion resistance by PVD (Physical Vapor Deposition) technology. Generally because of the low processing temperature of PVD compared with CVD, PVD coated cermet features less deterioration and more bending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



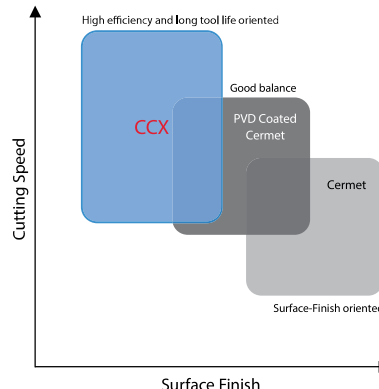
Features of cermet and PVD coated cermet

Classification	Grade	Color	Main Component (Coating Composition)	Advantages and Applications
P Steel	Cermet	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
			TiCN	- Three types of special reinforcement technology realized the superior fracture resistance and wear resistance - Application: Stable machining of steel
			TiCN+NbC	Application: Machining of steel, continuous to interruption
			TiCN	Application: Uncoated cermet for grooving of steel
			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
			TiCN+NbC	- Tough cermet with improved oxidation resistance and thermal shock resistance - Application: Milling of steel at high speed
			TiC+TiN	- Good balance of wear resistance and toughness - Application: Grooving and threading of steel
	CVD Coated Cermet	Gold	TiCN (TiCN+Al ₂ O ₃ +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	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
				- Superior wear and adhesion resistant MEGACOAT NANO on the special reinforcement cermet - Application: First choice PVD coated cermet for steel machining, high efficient machining and high quality surface finish
				- Fracture resistant grade with MEGACOAT NANO on wear resistant, tough cermet - Application: Wear resistant PVD coated cermet for steel machining and high quality surface finish
			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	Blackish Red	TiC+TiN (MEGACOAT)	- MEGACOAT Cermet for Grooving - Application: Excellent surface finish and longer tool life in steel grooving
			TiC+TiN MEGACOAT	- Heat-resistant MEGACOAT on cermet with excellent wear resistance - Application: High speed finishing of gray and nodular cast iron
K Cast iron				

Application Map



Coating Properties



Uncoated CERMET

TN610/TN620

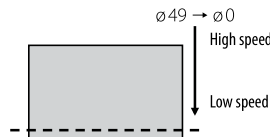
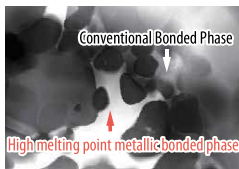
Special reinforcement technology (hybrid technology)
Superior surface finish and machining stability

1

Excellent surface finish

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

Specialized Strengthening Technology
High Melting Point
"Hybrid Bonded Phase"



Surface finish comparison
(In-house evaluation)

Cutting Conditions: $V_c = 590 \sim 0$ sfm (Constant Rate), D.O.C. = 0.020"
 $f = 0.004$ ipr, Wet, CNMG431 type Workpiece: 1010

PV720

Competitor A

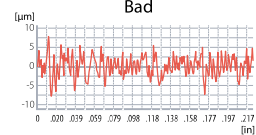
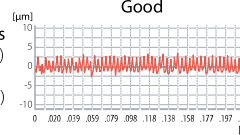


Surface Finish

Good

Bad

Surface roughness
($\phi 0.158" \sim \phi 0.591"$)
($V_c = 50 \sim 180$ sfm)



CVD Coated Cermet for Finishing

CCX

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

1

Superior wear resistance to PVD coated cermets

2

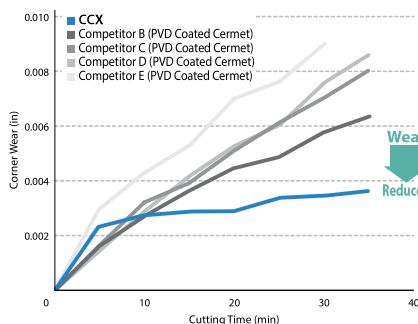
Unique cermet base material with thick CVD coating

Alloy Steel

High Speed Comparison: $V_c = 1,310$ sfm

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

Wear Resistance Comparison (Internal evaluation)

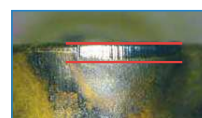


Cutting Conditions: $V_c = 1,310$ sfm, D.O.C. = 0.012", $f = 0.005$ ipr, Wet
CNMG432 Type External Turning

800.823.7284
www.kyoceraprecisiontools.com

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)



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

INSERT
GRADES

A

TURNING
INSERTS

B

CBN / PCBN
INSERTS

C

TURNING
HOLDERS

D

SMALL
TOOLS

E

BORING

F

GROOVING

G

CUT-OFF

H

THREADING

J

DRILLING

K

MILLING

M

QUICK CHANGE
TOOLING

N

SPARE PARTS

P

TECHNICAL

R

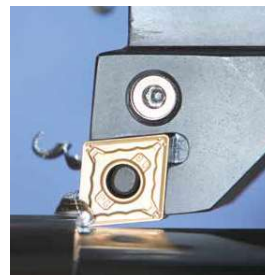
INDEX

T

CVD Coated Carbide (Turning)

CVD Coated Carbide

Using chemical vapor deposition coating technology, CVD coated carbide grades provide stable, efficient machining at high speeds or for heavy interrupted applications.



Features

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

Features of CVD coated carbide

Classification	Grade	Color	Coated Composition	Advantages and Applications
P Steel	CA115P	Black + Gold	TiCN+Al ₂ O ₃ +TiN	• The combination of a high-hardness + high-temperature, deformation-resistant special base material and crystallization control technology enables a thick film with both wear resistance and chipping resistance • Application: Highly versatile and wide application range, the first recommendation for steel machining
	CA125P		TiCN+Al ₂ O ₃ +TiN	• High toughness + high temperature deformation resistance special base material combined with crystallization control technology to achieve high toughness with both wear resistance and chipping resistance • Application: High speed and high efficiency steel machining
	CA510	Gold	TiCN+Al ₂ O ₃ +TiN	• Special substrate with thermal deformation resistance along with a thick and tough coating layer providing high wear resistance • Application: High speed and high efficiency steel machining
	CA515		TiCN+Al ₂ O ₃ +TiN	• Improved wear resistance and stability due to special substrate with heat deformation resistance and hard and tough coating layer with reinforced interface • Application: Light interrupted machining of steel
	CA025P		TiCN+Al ₂ O ₃ +TiN	• CVD coating with improved wear resistance. Adopted base material, excellent chipping resistance and resistance to wear. • Application: Continuous to interrupted processing of steel
	CA525		TiCN+Al ₂ O ₃ +TiN	• Stable and long tool life machining due to special substrate with heat deformation resistance and tougher coating layer and reinforced interface • Application: Interrupted to general machining of steel
	CA530		TiCN+Al ₂ O ₃ +TiN	• Special tough substrate and tough coating layer providing high stability and wear resistance • Application: General to heavy interrupted machining (stability oriented)
	CR9025		TiCN+TiN	• Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance • Application: Cut-off, grooving and multi-function machining of steel
M Stainless Steel	CA6515		TiCN+Al ₂ O ₃ +TiN	• Specialized carbide substrate for machining stainless steel, excellent wear resistance • Application: Continuous machining of stainless steel
	CA6525		TiCN+Al ₂ O ₃ +TiN	• Specialized carbide substrate for machining stainless steel, excellent notching resistance and toughness • Application: First choice for general machining of stainless steel, from finishing to roughing, continuous to interruption
K Cast Iron	CA310	Rose Gold	TiCN+Al ₂ O ₃ +Ti base	• Grade for high-speed continuous machining and improved tool life through the deposition of a thickened Al₂O₃ coating layer • Application: For finishing to roughing of gray cast iron
	CA315		TiCN+Al ₂ O ₃ +Ti base	• Both high abrasion resistance and stability are compatible, high efficiency and long life performance are demonstrated. Can be adapted to both continuous machining and interrupted machining. • Application: Compatible with a wide processing area for cast iron and gray cast iron. First recommendation for cast iron
	CA320		TiCN+Al ₂ O ₃ +Ti base	• Improved stability with CVD layer structure with high adhesion • Application: Heavily interrupted or High-speed machining for Nodular Cast Iron. 1st Recommendation for 70-50-05 cast iron or higher.
	CA4505	Blackish Gray	TiCN+Al ₂ O ₃	• Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer • Application: For gray cast iron and nodular cast iron at high speed in continuous to light interrupted machining
	CA4515		TiCN+Al ₂ O ₃	• Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer • Application: First choice for gray cast iron and nodular cast iron in light to heavy interrupted machining

Next Generation CVD Coated Carbide Grade for Steel

CA115P / CA125P

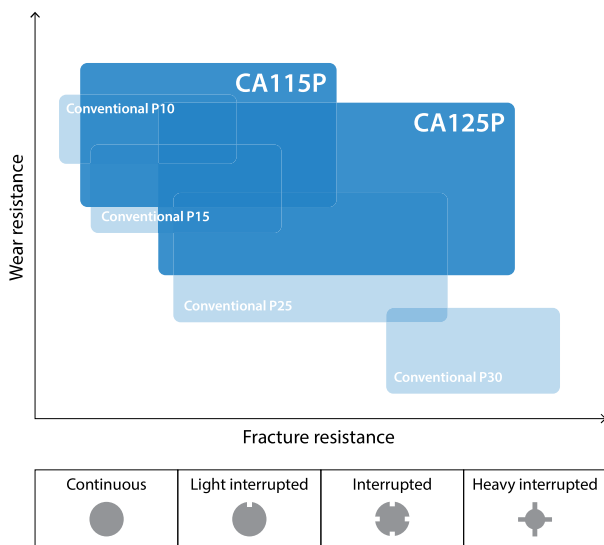
The new standard for steel machining

Longer tool life in a wide range of machining environments

Expanded lineup of chipbreakers for steel machining in various applications

1 Extended tool life in a wide variety of applications

Application Map



CA115P

Continuous-light interrupted machining of steel

For high-efficiency machining with wear and chipping resistance

CA125P

Continuous-heavy interrupted steel machining

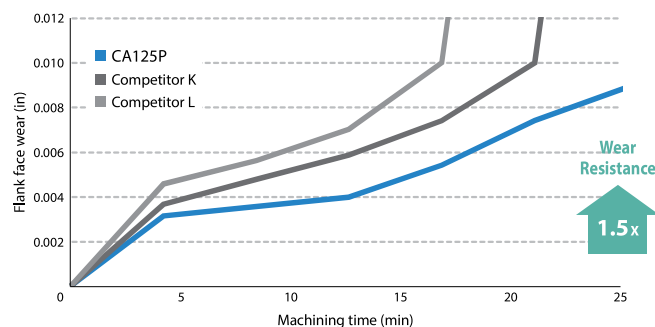
First recommendation for steel machining
High versatility

2 Newly developed proprietary coating and carbide substrate with superior wear and fracture resistance

Optimized coating properties on rake and flank faces provide wear resistance and fracture resistance

Ultra-uniform alumina film reduces crater wear

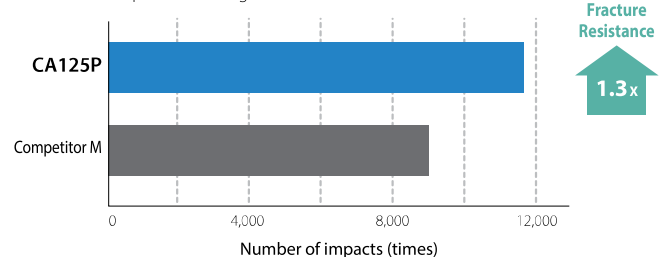
Wear resistance comparison (Internal evaluation)



Cutting Conditions : $V_c = 980$ sfm, $D.O.C. = 0.059''$, $f = 0.012$ ipr, Wet Workpiece : 4137

Fracture resistance comparison (Internal evaluation)

Interrupted machining $n = 3$ mean



Cutting Conditions : $V_c = 980$ sfm, $D.O.C. = 0.059''$, $f = 0.014$ ipr, Wet Workpiece : 1045 (4 grooves)

3 A large variety of chipbreakers cover a wide range of machining applications and conditions

INSERT GRADES	A
TURNING INSERTS	B
CBN / PCVD INSERTS	C
TURNING HOLDERS	D
SMALL TOOLS	E
BORING	F
GROOVING	G
CUT-OFF	H
THREADING	J
DRILLING	K
MILLING	M
QUICK CHANGE TOOLING	N
SPARE PARTS	P
TECHNICAL	R
INDEX	T

PVD Coated Carbide (Turning)

PVD Coated Carbide (MEGACOAT / MEGACOAT NANO)

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

PVD Coated Super Micro-Grain Carbide

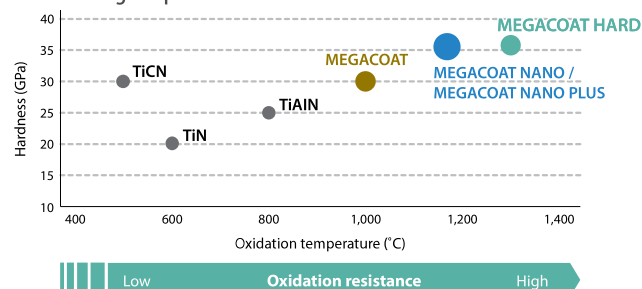
- Smooth fine surface of PVD coated carbide provides good surface finish and high precision machining
- Stable machining with excellent toughness

Features of PVD coated carbide



Classification	Grade	Color	Coated Composition	Advantages and Applications
P Steel	PR915 Super Micro-Grain	Bluish Violet	TiAlN	• Application: Stable and reliable high precision machining of steel
	PR930 Super Micro-Grain	Reddish Gray	TiCN	• Application: Low machining speed, precise machining with sharp edge
	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	Blackish Red	MEGACOAT NANO	• Adopted special nano multi-layer coating "MEGACOAT NANO" excellent in wear resistance and lubricity • Stable processing with steel and stainless steel grooving - Long tool life
	PR1705	Silver	MEGACOAT NANO PLUS	• High-hardness ultrafine particle carbide substrates with special multilayer nano coating MEGACOAT NANO PLUS offer excellent wear resistance and high precision machining. • Application: For free-cutting steel turning. Long tool life with excellent wear resistance and high-precision machining.
	PR1725	Silver	MEGACOAT NANO PLUS	• New coating technology (MEGACOAT NANO PLUS) with superior wear resistance and adhesion resistance • Application: General grade for steel and stainless steel machining provides stability and longer tool life
	PR2025	Blackish Red	MEGACOAT NANO EX	• Long tool life and high stability with the combination of high content aluminum nano coating layer for excellent wear and fracture resistance • Application: Grooving and cut-off operations in carbon steels and alloy steels
M Stainless Steel	PR1225	Blackish Red	MEGACOAT	• Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate • Application: Light interrupted to interrupted machining of stainless steel
	PR1515	Blackish Red	MEGACOAT NANO	• Improved wear resistance and stability by using fine granite carbide base metal and special nano multi-layer coating "MEGACOAT NANO" • Application: For thread cutting of stainless steel
	PR1535			• Nano thin multi-layer coating (MEGACOAT NANO) improved wear resistance and stability • Application: Medium to roughing of stainless steel and heat-resistant alloys, cut-off of stainless steel
	PR2035	Blackish Red	MEGACOAT NANO EX	• Long tool life and high stability with the combination of high content aluminum nano coating layer with high fracture resistance • Application: Grooving and cut-off operations in stainless steel (
K Cast Iron	PR905	Bluish Violet	TiAlN	• Smooth fine surface PVD coated hard carbide with plastic deformation resistance • Application: Suitable for machining gray and nodular cast iron
	PR2015	Blackish Red	MEGACOAT NANO EX	• Long tool life and high stability with the combination of high content aluminum nano coating layer for high wear resistance • Application: Grooving and cut-off operations in gray and nodular cast iron
S Heat-Resistant Alloys	PR005S	Dark Gray	MEGACOAT HARD	• Superior high temperature properties of special carbide substrate and excellent heat-resistance of MEGACOAT HARD enables high wear resistance • Application: Finish processing of heat-resistant alloys, also for high speed machining
	PR015S		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
	PR115S	Dark Gray	MEGACOAT TOUGH	• Using a special carbide base material with excellent heat resistance and high adhesion "MEGACOAT TOUGH" to achieve excellent wear resistance • Application: Continuous, finishing of heat-resistant alloys
	PR125S		MEGACOAT TOUGH	• Using a special carbide base material with good heat resistance and stability and high adhesion "MEGACOAT TOUGH" to improve wear resistance and stability • Application: Continuous, finishing of stainless steel, continuous to light interrupted machining of heat-resistant alloys

PVD Coating Properties



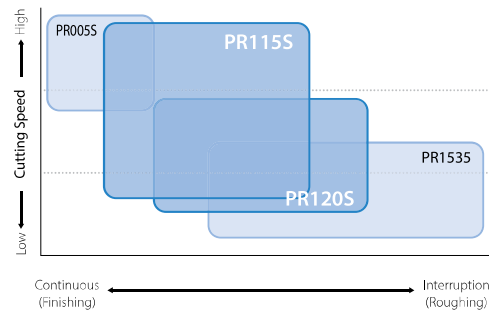
PVD Coating for Heat-Resistant Alloy

PR115S/PR120S

Unique carbide substrate with excellent heat-resistant properties and new coating technology "MEGACOAT TOUGH" provides longer tool life for heat-resistant alloy machining

Low cutting force and stable machining with specialized chipbreakers (SQ/SG/SX)

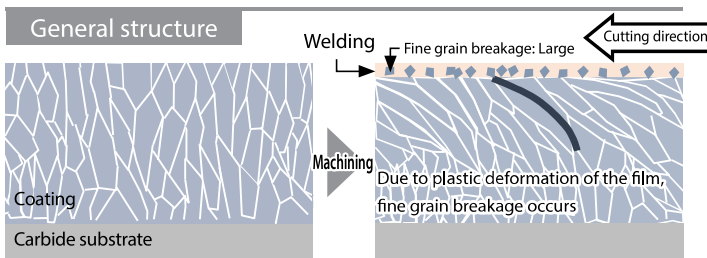
S Heat-Resistant Alloys Application map



1. Wear Resistant Layer

Thick-film PVD suppresses abrasive wear
Reduces notch damage with ultra-fine grain structure

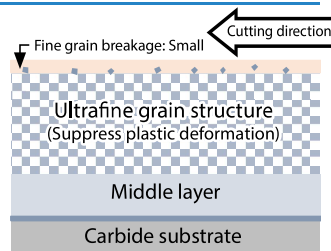
Damage to the coating during machining of heat-resistant alloys (Image)



PR115S/PR120S

Due to ultrafine structure of the membrane, controls fine grain breakage

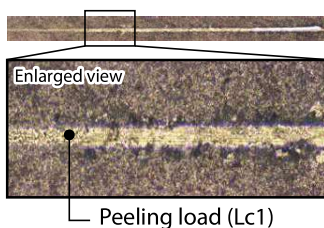
Due to grain breakage and dropping of welding, controls wear and tear



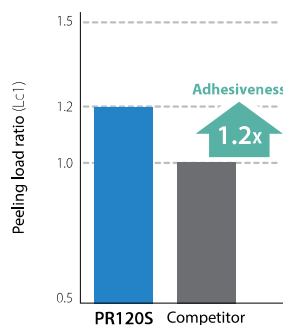
3. Special Adhesive Layer

Adhesion layer at carbide substrate/main layer interface, high affinity and improved adhesion

Scratch test results



Peeling load (Lc1) (Internal evaluation)



M Stainless Steel Application map

Application map for Stainless Steel. The Y-axis represents Cutting Speed (Low to High), and the X-axis represents Cutting Type (Continuous (Finishing) to Interruption (Roughing)). The map shows the following ranges:

- PR120S:** High speed, Continuous (Finishing) to Interruption (Roughing).
- PR153S:** Low speed, Interruption (Roughing).

2. Middle Layer

TiAlN layer provides superior oxidation resistance
Controls crater wear

Crater wear comparison (Internal evaluation) After machining for 50 min

Crater wear comparison between PR120S and Conventional A. The image shows the results after machining for 50 min. PR120S shows significantly less crater wear and chipping compared to Conventional A.

Cutting conditions : Vc = 490 sfm, D.O.C. = 0.039", f = 0.003 ipt, Wet 316L DCGT3251 Type

4. Unique Carbide Substrate

Carbide substrate for heat-resistant alloy machining
Excellent thermal properties with high thermal conductivity

Micrographs comparing the mixed structure of fine and coarse grain (PR115S) and the coarse grain structure (PR120S). PR115S is labeled "Mixed structure of fine and coarse grain" and "Excellent heat resistance". PR120S is labeled "Coarse grain structure" and "Excellent heat resistance and stability".

800.823.7284
www.kyoceraprecisiontools.com

INSERT GRADES	A
TURNING INSERTS	B
CBN /PCD INSERTS	C
TURNING HOLDERS	D
SMALL TOOLS	E
BORING	F
GROOVING	G
CUT-OFF	H
THREADING	J
DILLING	K
MILLING	M
QUICK CHANGE TOOLING	N
SPARE PARTS	P
TECHNICAL	R
INDEX	T

A11

PVD / CVD Coated Carbide (Milling / Drilling)

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.

CVD Coated Carbide

CVD coated carbide grades provide stable, efficient machining at high speeds or for heavy interrupted applications. Ti-base (TiN, TiCN) coating with superior hardness and wear resistance or ceramic-base (Al₂O₃) coating with high-thermal stability is applied on a tough carbide substrate. Superior fracture resistance and wear resistance.



Features of PVD / CVD Coated Carbide for Milling and Drilling

Classification	Grade	Color	Coated Composition	Advantages and Applications
P Steel	PR1230	Blackish Red	MEGACOAT	- Superior wear and oxidation-resistant MEGACOAT on a special tough carbide substrate - Application: Stable and high feed milling and drilling of steel
	PR1525	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 longer tool life for milling of steel and stainless steel
	PR1825	Blackish Gray	MEGACOAT NANO EX	- Special nano layer + multi-layer lamination technology for excellent abrasion resistant, oxidation resistant, and fracture resistance - Application: Next-generation wear resistant grade for steel milling
	CA520D	Gold	TiCN+Al ₂ O ₃ +TiN (CVD)	- Improved abrasion resistance and fracture resistance by improving high toughness - Combination of high toughness substrate, toughened coating and enhanced interface allow both wear and fracture resistance - Application: Drilling of steel - first recommended grade (for high speed machining)
M Stainless Steel	PR1225	Blackish Red	MEGACOAT	- Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate - Application: General machining and high feed milling and drilling of steel and stainless steel
	PR1835	Blackish Gray	MEGACOAT NANO EX	- Special nano layer + multi-layer lamination technology for excellent abrasion resistant, oxidation resistant, and fracture resistance - Application: Next-generation grade for stainless steel and stable steel milling
K Cast Iron	PR1210	Blackish Red	MEGACOAT	- Superior wear and oxidation-resistant MEGACOAT coated on special carbide substrate - Application: Highly efficient stable milling and drilling of gray and nodular cast iron
	PR1510	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: Highly fracture resistance and wear resistance for gray and nodular cast iron
	PR1810	Blackish Gray	MEGACOAT NANO EX	- Special nano layer + multi-layer lamination technology for excellent abrasion resistant, oxidation resistant, and fracture resistance - Application: Next-generation grade for cast iron milling
	CA415D	Gold	TiCN+Al ₂ O ₃ +TiN	- Special carbide substrate for cast iron, toughened coating and enhanced interface allow both wear and fracture resistance - Application: Drilling of cast iron - 1st recommended material for high speed processing
	CA420M		TiCN+Al ₂ O ₃ +TiN (CVD)	- Kyocera's unique crystal control technology and advanced layer adhesion CVD coating with superior wear resistance and toughness - Application: Milling of gray and nodular cast iron
S Heat-Resistant Alloys Titanium Alloys	PR1535	Blackish Red	MEGACOAT NANO	- Nano thin multi-layer coating (MEGACOAT NANO) improved wear resistance and stability - Application: For milling of Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel
S Heat-Resistant Alloys	CA6535	Gold	TiCN+Al ₂ O ₃ +TiN (CVD)	- High heat-resistance and wear resistance with CVD coating - Application: For milling of Ni-base heat-resistant alloys and martensitic stainless steel
H Hard Material	PR015S	Blackish Gray	MEGACOAT HARD	- Substrate with improved thermal properties reduces sudden fracture and decrease edge wear. MEGACOAT HARD coating technology delivers the high hardness and superior wear resistance - Excellent wear and chipping resistance maintains stable machining for high hard materials - Application: Difficult-to-cut materials and high hard (less than 60HRC) machining

Next-Generation PVD Coating for Milling

PR18 Series

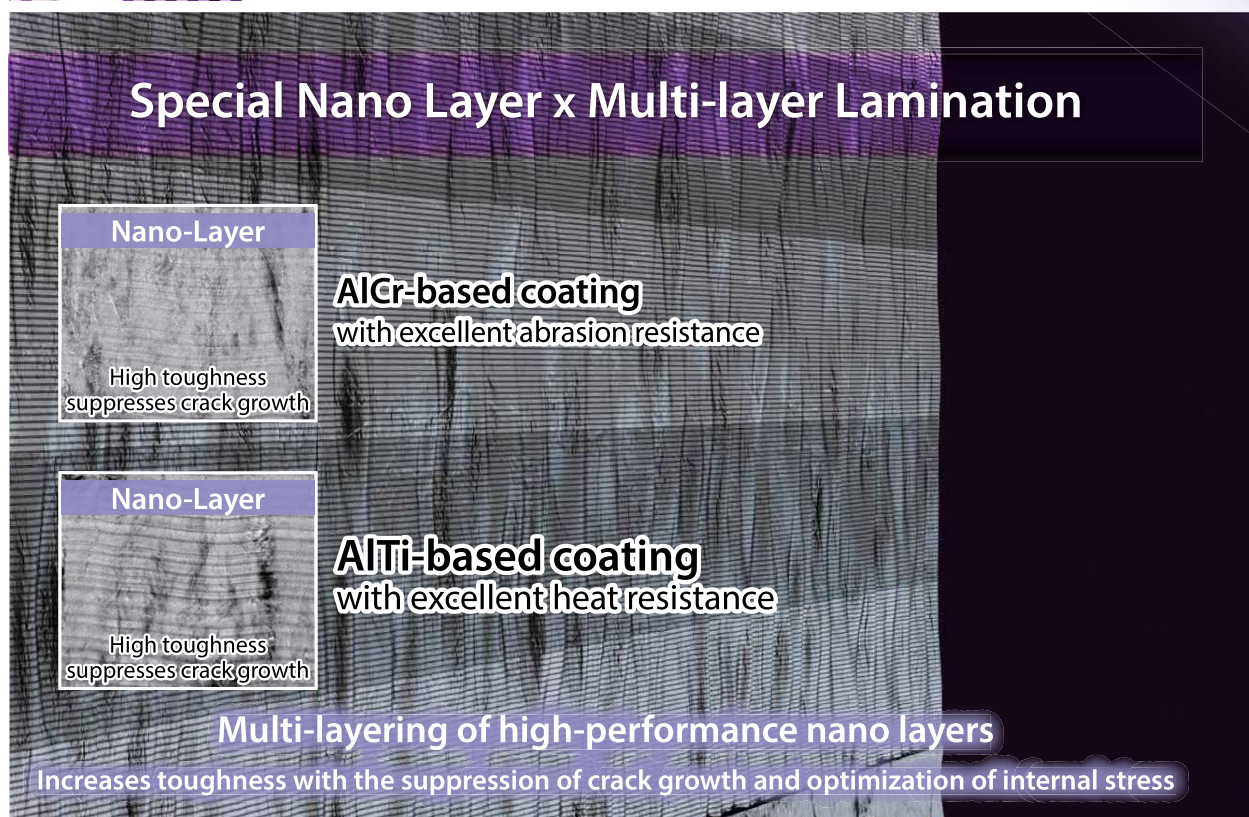
Double lamination technology with special nano layer MEGACOAT NANO EX provides longer tool life
Features 3 grades: PR1825/PR1835/PR1810 Available for various machining environments



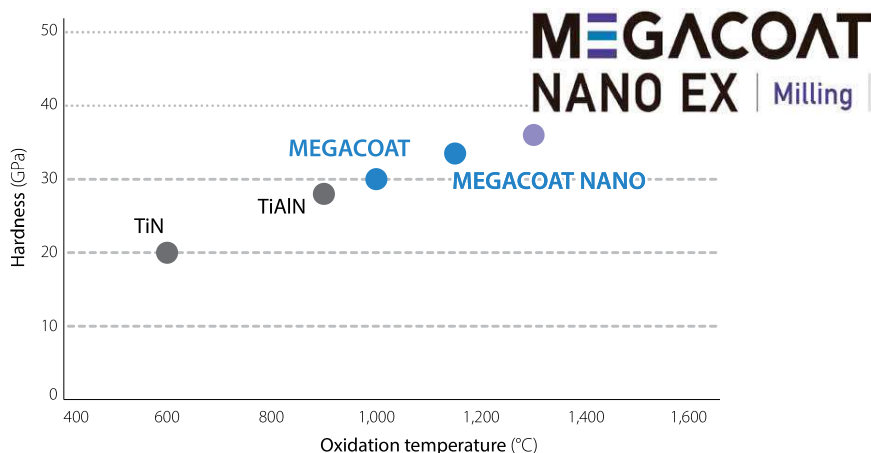
MEGACOAT
NANO EX | Milling |

Double Lamination Technology Maintains Longer Tool Life

Multi-layer structure with two unique nano layers
Superior abrasion resistance and fracture resistance



Coating Characteristics (Internal Evaluation)



INSERT GRADES	A
TURNING INSERTS	B
CBN / PCD INSERTS	C
TURNING HOLDERS	D
SMALL TOOLS	E
BORING	F
GROOVING	G
CUT-OFF	H
THREADING	J
DRILLING	K
MILLING	M
QUICK CHANGE TOOLING	N
SPARE PARTS	P
TECHNICAL	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 cast iron, non-ferrous metals and non-metals
- SW series: Suitable for machining of titanium and titanium alloy

Features of carbide

Classification	Grade	Color	Main Component	Advantages and Applications
N Non-Ferrous Metals	KW10	Gray	WC+Co	• ISO identification symbol K carbide (K10 class) • Application: Machining cast iron, non-ferrous materials and non-metals
	GW05			• ISO identification symbol K carbide (K05 class) • Application: Excellent wear resistance for machining of cast iron and non-ferrous metal
	GW15			• ISO identification symbol K carbide (K10 class), tough micro-grain carbide • Application: Machining cast iron, non-ferrous materials and non-metals
	GW25			• ISO identification symbol K carbide (K30 class) • Application: Milling operations of aluminum
S Heat-Resistant Alloys Titanium Alloys	SW05			• ISO identification symbol K carbide (K05 class) • Application: Titanium alloys for continuous machining and finishing
	SW10 (Made to Order)			• ISO identification symbol K carbide (K10 class) • Application: Titanium alloys for continuous and light interrupted machining
	SW25 (Made to Order)			• ISO identification symbol K carbide (K25 class) • Application: Titanium alloys for interrupted and light interrupted machining



DLC Coated Carbide

DLC Coated Carbide

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

Features

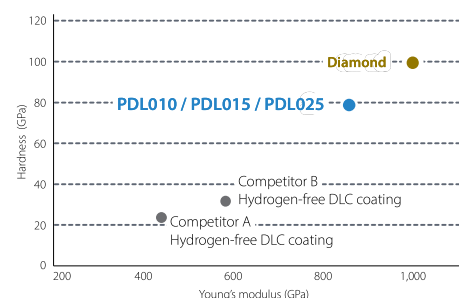
- High Hardness with Kyocera's proprietary hydrogen-free DLC coating
- Excellent surface finish achieved through anti-adhesion performance

Features of DLC coated carbide

Classification	Grade	Color	Main Component	Advantages and Applications
N Non-Ferrous Metals	PDL010	Iridescent	C	• DLC coating of original technology has high hardness, excellent adhesion resistance and film peeling resistance • Application: Excellent surface finish and long tool life machining of aluminum alloys
	PDL015			• DLC coating of original technology has high hardness, excellent adhesion resistance and film peeling resistance • Application: Grooving of aluminum alloy
	PDL025			• DLC coating of original technology has high hardness, excellent adhesion resistance and film peeling resistance • Application: General purpose long tool life and stable machining of aluminum alloys



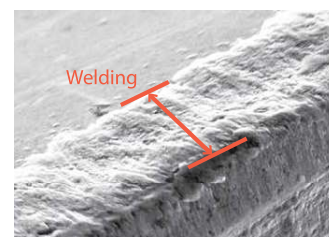
Coating Properties



Welding Resistance Comparison



PDL025



Competitor A

Cutting Conditions: Vc = 2,630 sfm, fz = 0.004 ipt, D.O.C. x ae = 0.118" x 0.197", Dry
Cutter Dia. 01.000" Workpiece: S052 Cutting Length: 187ft

Ceramic

Ceramic

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

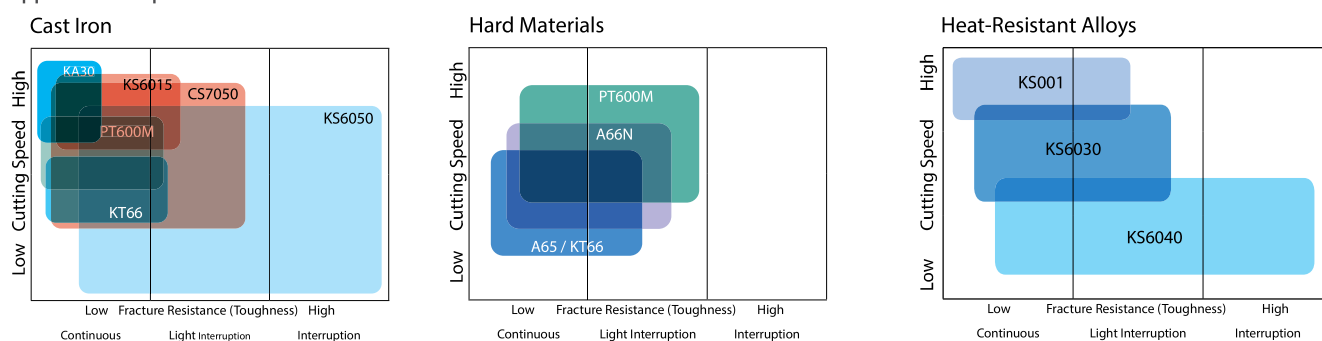
Features

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

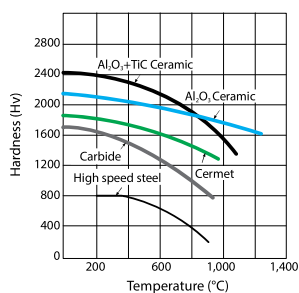
Features of Ceramic

Classification	Grade	Color	Main Component (Coating Composition)	Coating Layer	Substrate Hardness (GPa)	Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)	Advantages and Applications
K Cast Iron	KA30	White	Al ₂ O ₃	-	17.5	4.0	750	- Aluminum oxide ceramic (Al₂O₃) - Application: Finishing of cast iron at high cutting speeds without coolant
	KS6015	Gray	Si ₃ N ₄		15.2	7.8	1,000	- Silicon nitride ceramic with superior wear resistance reduces heat at the cutting edge - Application : Roughing and high speed machining of cast iron (with or without coolant)
	KS6050	Gray	Si ₃ N ₄		15.6	8.0	1,200	- Silicon nitride ceramic (Si₃N₄) - Application: Roughing and interrupted machining of cast iron. Focusing on stability (with or without coolant)
	CS7050	Grayish White	Si ₃ N ₄ (Special Al ₂ O ₃ COAT)	Thin Coating				- Silicon nitride ceramic (Si₃N₄) + CVD Coating (Special Al₂O₃ COAT) - Application: Finishing and continuous machining, and high speed and high efficient machining. (with or without coolant)
K Cast Iron H Hard Material	KT66	Black	Al ₂ O ₃ +TiC	-	20.1	4.1	980	- Aluminum oxide and titanium carbide ceramic (Al₂O₃+TiC) - Application: Semi-roughing to finishing of cast iron, hard materials and hardened roll materials
	A65	Black	Al ₂ O ₃ +TiC					- Aluminum oxide and titanium carbide ceramic (Al₂O₃+TiC) - Application: Semi-roughing to finishing of cast iron, and hard materials
	A66N	Gold	Al ₂ O ₃ +TiC (TiN COAT)	Thin Coating				- TiN PVD coated aluminum oxide and titanium carbide ceramic (TiN coated Al₂O₃+TiN) - Application: Semi-roughing to finishing of hard materials
	PT600M	Blackish Red	Al ₂ O ₃ +TiC (MEGACOAT)					- Heat-resistant MEGACOAT on aluminum oxide and titanium carbide ceramic (MEGACOAT Al₂O₃+TiC) - Application: Semi-roughing to finishing of cast iron, hard materials and hardened roll materials
S Heat-Resistant Alloys	KS001	Gray	Al ₂ O ₃ +SiC	-	20.6	7.0	-	- Silicon-carbide ceramic inserts with ultra-strong whiskers for excellent wear and fracture resistance - Application: High-speed machining of HRSA, roughing-finishing with continuous to light interruption
	KS6030	Gray	SiAlON		15.2	6.0	600	- SiAlON Ceramic with superior wear resistance and high resistance against boundary wear - Application: Finishing to medium machining of heat-resistant alloys
	KS6040	Brown			16.7	7.0	900	- High stability SiAlON ceramic with wear resistance and fracture resistance - Application: Roughing of heat-resistant alloys

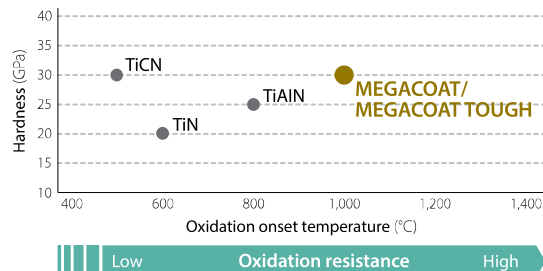
Application Maps



High-Temperature Hardness



PVD Coating Properties



Insert Grades

CBN (Cubic Boron Nitride)

CBN

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

Features

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



Features of CBN

Classification	Grade	Color	Ave. Grain Size (μm)	Substrate Hardness (GPa)	Transverse Strength (MPa)	Advantages and Applications
H Hard Material	KBN510	Black	2	28	1,000	• Excellent wear resistance and crack resistance, non-coated CBN • Application: Finishing and continuous machining of hardened die steel
	KBN525		1 and under	25	1,250	• Application: General purpose for hardened steel
	KBN05M (MEGACOAT)	Blackish Red	0.5-1.5	27	1,000	• Heat-resistant MEGACOAT on highly heat-resistant CBN substrate • Application: High speed finishing of hardened steel
	KBN10M (MEGACOAT)		2	28		• Application: High speed finishing of hardened die steel
	KBN25M (MEGACOAT)		1 and under	25	1,250	• Heat-resistant MEGACOAT on micro-grain CBN with heat-resistant binder phase • Application: Stable machining of hardened steel at high cutting speeds
	KBN010 (MEGACOAT TOUGH)		0.5-1.5	27	1,000	• High toughness CBN coated with high wear resistance enables machining in a wide range of cutting areas • Application: Continuous finishing of hardened steel
	KBN020 (MEGACOAT TOUGH)		3	31-32	1,300	• High toughness CBN coated with high wear resistance enables machining in a wide range of cutting areas • Application: Continuous to interrupted machining of hardened steel
Sintered Steel	KBN570	Black	2-4	34	1,350	• High content CBN • Application: Processing of Sintered steel (burr suppression)
	KBN70M (MEGACOAT)	Blackish Red				• Heat-resistant MEGACOAT on CBN rich substrate • Application: Stable machining of sintered steel (ferrous Sintered alloys)
K Cast Iron	KBN475	Black	2	39	1,400	• Excellent wear resistance due to high CBN content and special binder • Application: High speed machining of gray cast iron
	KBN60M (MEGACOAT)	Blackish red	0.5-6	33	1,250	• Heat-resistant MEGACOAT on CBN rich substrate with hard binder phase • Application: High speed finishing of gray cast iron
	KBN900 (TIN COAT)	Gold	9	31	630	• TIN coated solid CBN • Application: Heavy duty, interrupted machining and finishing of hardened steel, hardened roll steel and cast iron

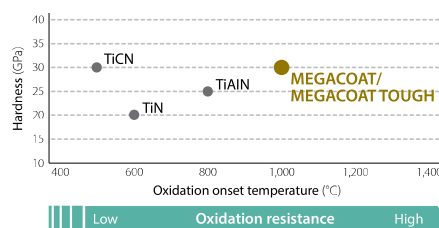
For KBN35M, see page A18.

MEGACOAT TOUGH CBN

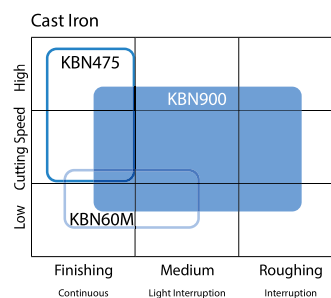
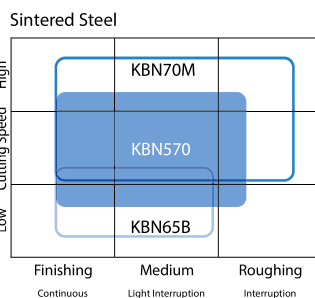
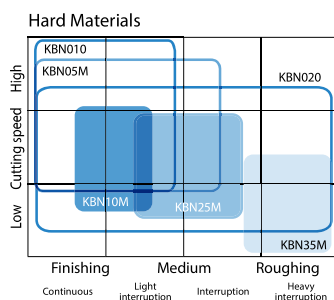
An adhesion layer is laminated between the high wear resistance layer and the CBN. This reduces layer peeling to achieve long tool life and stable machining.



PVD Coating Properties



Application Map



PCD (Polycrystalline Diamond)

PCD

PCD is a synthetic diamond sintered under high temperatures and pressures.

Features

- Applicable for milling of non-ferrous metals and non-metals
- Reduced edge build-up allows for high precision machining
- Diversified applications for machining of non-ferrous metals and non-metals
- Finished surface will be rainbow colored (A mirror-like finished surface will not be obtained)



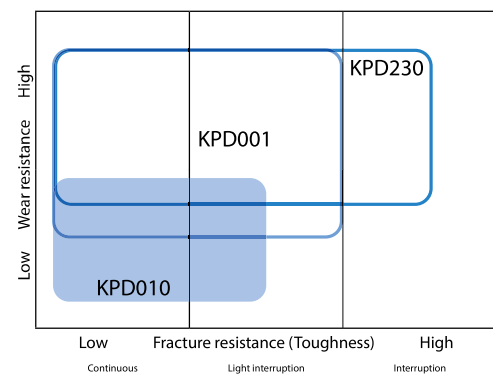
Features of PCD

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

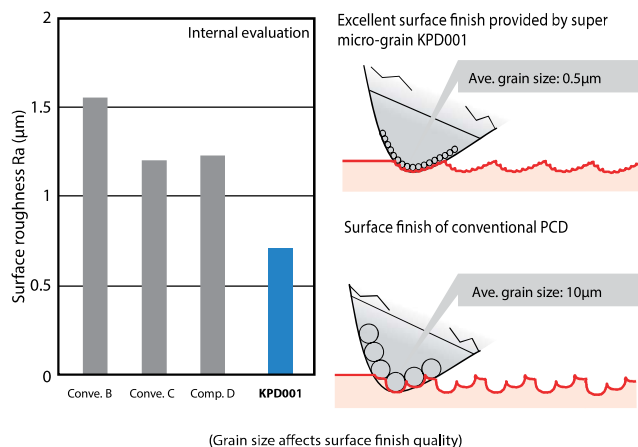
Applications

Workpiece Material		Non-Ferrous Metals				Difficult-to-Cut Materials			
Cutting Range		Finishing ← → Roughing				Finishing ← → Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30
Turning Milling	PCD	KPD001				KPD001			
		KPD010				KPD010			
		KPD230							
		KPD250							

Application Map



Surface finish roughness comparison of aluminum machining



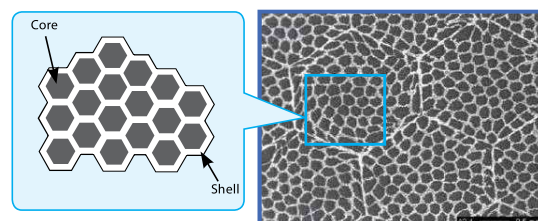
Honeycomb Structure CBN

Honeycomb Structure CBN

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

Features

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

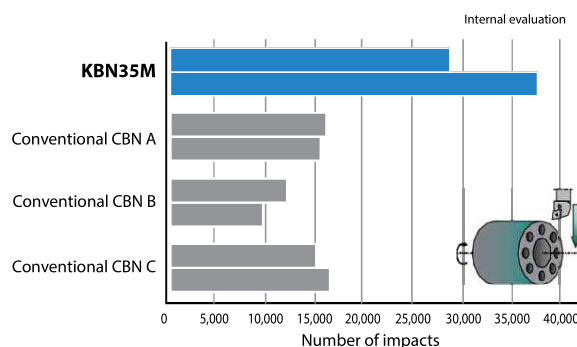
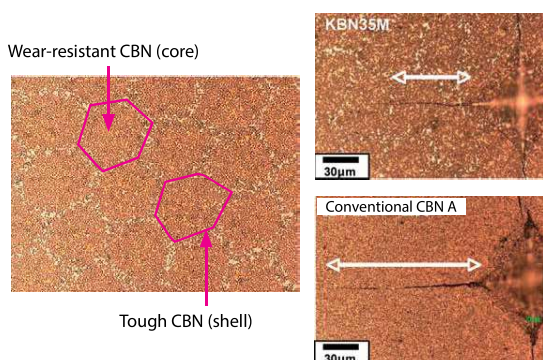


Features of Honeycomb Structure CBN

Classification	Grade	Color	Main Component	Advantages and Applications
Hard Material	KBN35M (MEGACOAT)	Blackish Red	CBN	• Honeycomb structure CBN composite material consisting of wear resistant CBN (core) and tough CBN (shell) • Heat-resistant MEGACOAT on tough Honeycomb structure CBN • Application: Stable machining of hardened steel with interrupted machining

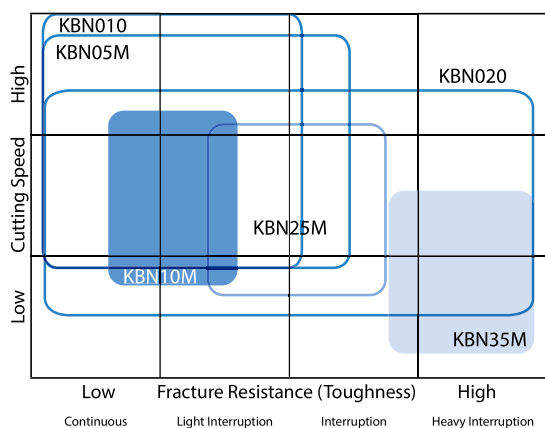
KBN35M (MEGACOAT honeycomb structure CBN)

Tough CBN (shell) prevents crack growth



Application Map

Hard Materials



Insert Grades

Insert Material Selection Table

Highlighted items are recommended choices.

Applications		Cutting Range	Steel	Stainless Steel	Gray Cast Iron	Nodular Cast Iron	Non-ferrous Metals	Heat-Resistant Alloys	Titanium Alloys	Hard Materials	Sintered Steel
Turning		Finishing	TN610 CCX TN620 TN60 PV710	TN610 TN620 TN60 PV720	KBN475 KBN60M KA30	TN60		KS6040		KT66 A66N PT600M	TN610 TN60
		Roughing	PV720 PV730 CA510 CA115P CA125P CA530	CA6515 CA6525 PR1535	CA5505 CA310 CA315	CA5505 CA310 CA320	KPD001 KPD010 PDL010 PDL025 KW10	KW10 CA6515 CA6525 PR0055 PR1155 PR1205 PR1535	KPD001 KPD010 KW10 SW05 SW10 SW25	KBN010 KBN05M KBN020 KBN25M KBN35M KBN900	KBN570 KBN70M
Small Tools		Finishing	TN610 TN620 PV710	TN610 TN620 PV720							TN610 TN60
		Roughing	PV720 PR1705 PR1725 PR930 PR1025 PR1535	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	KBN010 KBN05M KBN020 KBN25M	KBN570 KBN70M
Boring		Large	TN610 TN620 PV710	TN60							TN610 TN60
		Bore Dia.	PV720 PV730 CA115P CA125P CA530 PR1705 PR1725 PR1025 PR930 PR1535	CA6515 CA6525 PR1725 PR1025 PR1225 PR930 PR1535	KBN475 KBN60M PV7005 CA310 CA315 KW10	PV7005 CA310 CA315 CA320 KW10	KPD001 KPD010 PDL010 PDL025 GW05 KW10	CA6515 CA6525 PR1125 PR1225 PR1535	KPD001 KPD010 KW10 SW05 PR1535	PT600M KBN010 KBN05M KBN020 KBN25M	KBN570 KBN70M
Cut-Off		Small	CR9025 PR930 PR915 PR1215 PR1225 PR1535	CR9025 PR930 PR915 PR1215 PR1225 PR1535							
		Cutting Dia.			KW10 PR1215	KW10 PR1215	PDL025 KW10	KW10 PR1225 PR660	KW10		
Cut-Off		Large	PR1025 PR2025 PR1535	PR1025 PR1535 PR2035	KW10 PR2015	KW10 PR2015	PDL025 KW10	KW10 PR1025 PR1225	KW10		
		Small									
Grooving		Glossy Finish	TC40 TN620	TC40 TN620							TC40
		Stable	TN90 PV7040 PR930 PR1115 PR1215 PR1225 PR2025	TN90 PV7040 PR930 PR1115 PR1215 PR1225 PR2025	KW10 GW15 PR905 PR2015 PR1215	KW10 GW15 PR905 PR2015 PR1215	KPD001 PDL025 KW10 GW15	PR915 KW10 PR1215 PR1225 PR1535	KPD001 KW10	KBN510 KBN525 PT600M	KBN570
Threading		Glossy Finish	TC60 PR1215 PR1115 PR930	TC60 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 PR1825 PR1835	CA6535 PR1525 PR1835 PR1535	PR1810 PR1510 KW10	PR1810 PR1510 KW10	KPD230 KPD001 KPD010 PDL025 KW10 GW25	CA6535 PR1225 PR1535	KPD230 KPD001 KW10 PR905 PR1210 PR1535	PR0155	
		Roughing									

Grade Properties

Cermet

Grade	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
TN610	Gray	TiCN	-	6.6	1,750	17.2	6.0	2,100
TN620				6.9	1,550	15.2	9.0	2,500
TN620M				6.9	1,550	15.2	9.0	2,500
TN6020				6.4	1,500	14.7	10.0	2,500
TN60		TiCN+NbC		6.6	1,600	15.7	9.0	1,760
TN90				6.4	1,450	14.2	10.0	1,960
TN100M				6.7	1,520	14.9	10.5	1,860
TC40		TiC+TiN		6.0	1,650	16.2	9.0	1,570
TC60		NbC		8.1	1,500	14.7	10.5	1,670

CVD Coated Cermet

Grade	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
CCX	Gold	TiCN+Al ₂ O ₃ +TiN	Thin Coating	7.0	1,500	14.7	10.0	2,600

PVD Coated Cermet

Grade	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
PV710	Gold	MEGACOAT NANO	Thin Coating	6.6	1,750	17.2	6.0	2,100PV730
PV720				6.9	1,550	15.2	9.0	2,500
PV730				7.0	1,550	14.2	10.0	2,500
PV7005	Blackish Red	MEGACOAT		6.0	1,650	16.2	8.5	1,470
PV7040				6.0	1,650	16.2	9.0	1,570
PV60M	Gold	MEGACOAT NANO		6.6	1,600	15.7	9.0	1,760

CVD Coated Carbide

Grade	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
CA025P	Gold	TiCN+Al ₂ O ₃ +TiN	Thick Coating	14.2	1,400	13.7	13.5	2,800
CA115P	Gold + Black	TiCN+Al ₂ O ₃ +TiN		13.9	1,440	14.1	13.0	2,250
CA125P				13.8	1,400	13.7	14.5	2,300
CA310	Rose Gold	TiCN+Al ₂ O ₃ +Ti Base		15	1,570	15.4	12.0	2,780
CA315				15	1,570	15.4	12.0	2,780
CA320				15	1,570	15.4	12.0	2,780
CA415D	Gold	TiCN+Al ₂ O ₃ +TiN		15	1,570	15.4	12.0	2,780
CA420M				14.5	1,600	15.8	13.0	3,400
CA4505	Blackish Gray	TiCN+Al ₂ O ₃		15.0	1,790	17.5	9.5	2,350
CA4515				15.0	1,570	15.4	12.0	2,780
CA510	Gold	TiCN+Al ₂ O ₃ +TiN		14.5	1,470	14.4	11.5	2,500
CA515				14.4	1,440	14.1	12.5	2,650
CA520D				14.7	1,370	13.4	16.0	3,100
CA525				14.2	1,360	13.3	13.5	2,750
CA530				13.9	1,340	13.1	14.5	2,850
CA6515			Thin Coating	14.7	1,530	15.0	12.0	2,780
CA6525				14.7	1,370	13.4	16.0	3,100
CA6535				14.3	1,320	12.9	16.0	3,700
CR9025				TiCN+TiN	Thick Coating	14.5	1,400	13.7

INSERT GRADES	A
TURNING INSERTS	B
CBN /PCD INSERTS	C
TURNING HOLDERS	D
SMALL TOOLS	E
BORING	F
GROOVING	G
CUT-OFF	H
THREADING	J
DRILLING	K
MILLING	M
QUICK CHANGE TOOLING	N
SPARE PARTS	P
TECHNICAL	R
INDEX	T

Grade Properties

PVD Coated Carbide

Grade	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)	
					(HV)	(GPa)			
PR005S	Gray Black	MEGACOAT HARD	Thin Coating	15.0	1,750	17.2	8.0	2,000	
PR015S				14.9	1,680	16.5	9.0	2,400	
PR115S		MEGACOAT TOUGH		14.9	1,680	16.5	9.0	2,400	
PR120S				14.6	1,500	14.7	14.0	2,700	
PR905	Bluish violet	TiAlN		14.8	1,720	16.8	9.0	2,450	
PR915				14.1	1,700	16.7	11.0	4,140	
PR930	Reddish Gray	TiCN		14.1	1,700	16.7	11.0	4,140	
PR1025				14.5	1,600	15.8	13.0	3,400	
PR1115	Purple Red	TiAlN		14.7	1,700	16.7	11.0	3,000	
PR1210	Blackish Red	MEGACOAT		14.8	1,720	16.8	9.0	2,450	
PR1215				14.7	1,700	16.7	11.0	3,000	
PR1225				14.5	1,600	15.8	13.0	3,400	
PR1230				13.7	1,450	14.2	13.0	2,250	
PR1510	Redish Gray	MEGACOAT NANO		14.8	1,720	16.8	9.0	2,450	
PR1515				14.7	1,700	16.7	11.0	3,000	
PR1525				14.5	1,600	15.8	13.0	3,400	
PR1535				14.3	1,320	12.9	16.0	3,700	
PR1625				14.5	1,600	15.8	13.0	3,400	
PR1705	Silver	MEGACOAT NANO PLUS		14.9	1,800	17.6	10.0	3,300	
PR1725				14.5	1,600	15.8	13.0	3,400	
PR1810	Redish Gray	MEGACOAT NANO EX		14.9	1,680	16.5	9.0	2,400	
PR1825				14.5	1,600	15.8	13.0	3,400	
PR1835				14.3	1,320	12.9	16.0	3,700	
PR2015	Blackish Red			14.7	1,700	16.7	11.0	3,000	
PR2025				14.5	1,600	15.8	13.0	3,400	
PR2035		14.3		1,320	12.9	16.0	3,700		

Carbide

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

DLC Coated Carbide

Grade	Color	Main Component	Coating Layer	Ratio	Hardness of Substrate		Fracture Toughness (MPa·m ^{1/2})	Transverse Strength (MPa)
					(HV)	(GPa)		
PDL010	Iridescent	C	Thin Coating	15.0	1,650	16.2	10.0	1,470
PDL015				14.7	1,700	16.7	11.0	3,000
PDL025				14.5	1,600	15.8	13.0	3,400