

Insert grades



A

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 |

Summary of insert grades

A

Kyocera promotes research and development to help improve customers' productivity and profitability. Kyocera provides high-quality inserts in various grades including cermet, coated carbide, coated super micro grain carbide, carbide, ceramic, PCD and CBN.



Insert grades

Turning

| Workpiece material | | Steel | | | | Stainless steel / Cast steel | | | | | Cast iron | | | | | | |
|--------------------|--------------------|------------------------------------|-------|-----|-----|------------------------------|--------------------------|-------|-----|-----|------------------------|---------------------|--|-----|-----|--|--|
| Cutting range | | Finishing ← → Roughing | | | | Finishing ← → Roughing | | | | | Finishing ← → Roughing | | | | | | |
| Classification | | P01 | P10 | P20 | P30 | P40 | M01 | M10 | M20 | M30 | M40 | K01 | K10 | K20 | K30 | | |
| Cermet | TN series | TN610, TN620, TN60, TN90 | | | | | TN610, TN620, TN60, TN90 | | | | | | TN60 | | | | |
| | TC series | | TC60M | | | | | TC60M | | | | | | | | | |
| | CCX (CVD coated) | CCX | | | | | | | | | | | CCX | | | | |
| | PV series | | PV90 | | | | | PV90 | | | | | | | | | |
| | MEGACOAT | | | | | | | | | | | | PV7005 | | | | |
| | MEGACOAT NANO | PV710, PV720, PV730 | | | | | PV710, PV720, PV730 | | | | | | | | | | |
| Coated carbide | CA series | CA510, CA515, CA025P, CA525, CA530 | | | | | CA615, CA625 | | | | | CA310, CA315, CA320 | | | | | |
| | | CA5505, CA5515, CA5525, CA5535 | | | | | | | | | | CA4505, CA4515 | | | | | |
| | PR series | PR930 | | | | | PR930 | | | | | | | | | | |
| | | PR1025 | | | | | PR1025 | | | | | | | | | | |
| | MEGACOAT | PR1225 | | | | | PR1225 | | | | | | | | | | |
| | MEGACOAT NANO | PR1535 | | | | | PR1535 | | | | | | | | | | |
| | MEGACOAT NANO PLUS | PR1705, PR1725 | | | | | PR1725 | | | | | | | | | | |
| | Ceramic | | | | | | | | | | | | KA30, KT66, A66N, PT600M, KS6015, KS6050, CS7050 | | | | |
| | | Carbide | | | | | | | | | | | KW10 | | | | |
| | | CBN | | | | | | | | | | | KBN475, KBN60M, KBN900 | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

A2

Summary of insert grades

A

Turning

| Workpiece material | Non-ferrous metals | | | | Difficult-to-cut materials Titanium / Titanium alloys | | | | Hard materials | | | | Sintered steel | | | |
|--------------------|--------------------|-----|----------|-----|--|-----|----------|-----|----------------|-----|----------|-----|----------------|----|----------|----|
| | Finishing | | Roughing | | Finishing | | Roughing | | Finishing | | Roughing | | Finishing | | Roughing | |
| Classification | N01 | N10 | N20 | N30 | S01 | S10 | S20 | S30 | H01 | H10 | H20 | H30 | 01 | 10 | 20 | 30 |
| Coated carbide | CA series | | | | CA6515 | | | | CA6525 | | | | | | | |
| | MEGACOAT HARD | | | | PR005S | | | | PR015S | | | | | | | |
| | MEGACOAT NANO | | | | PR153S | | | | | | | | | | | |
| Cermet | | | | | | | | | | | | | TN610 | | | |
| | | | | | | | | | | | | | TN60 | | | |
| Ceramic | | | | | KS6030 | | | | KT66 | | | | | | | |
| | | | | | KS6040 | | | | A66N | | | | | | | |
| CBN | | | | | | | | | KBN510 | | | | | | | |
| | | | | | | | | | KBN525 | | | | | | | |
| | | | | | | | | | KBN900 | | | | | | | |
| MEGACOAT | | | | | | | | | KBN05M | | | | | | | |
| | | | | | | | | | KBN10M | | | | KBN70M | | | |
| | | | | | | | | | KBN25M | | | | KBN570 | | | |
| | | | | | | | | | KBN35M | | | | | | | |
| MEGACOAT TOUGH | | | | | | | | | KBN020 | | | | | | | |



Insert grades

| Workpiece material | Non-ferrous metals | | | | Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys | | | | Hard materials | | | | Sintered steel | | | |
|---------------------------------|--------------------|-----|----------|-----|---|-----|----------|-----|----------------|-----|----------|-----|----------------|----|----------|----|
| | Finishing | | Roughing | | Finishing | | Roughing | | Finishing | | Roughing | | Finishing | | Roughing | |
| Classification | N01 | N10 | N20 | N30 | S01 | S10 | S20 | S30 | H01 | H10 | H20 | H30 | 01 | 10 | 20 | 30 |
| MEGACOAT NANO Coated carbide | | | | | PR153S | | | | | | | | | | | |
| Carbide | GW05 | | | | SW05 | | | | | | | | | | | |
| | KW10 | | | | SW10 | | | | | | | | | | | |
| | PDL010 | | | | KW10 | | | | SW25 | | | | | | | |
| DLC coated carbide | PDL025 | | | | | | | | | | | | | | | |
| | KPD001 | | | | KPD001 | | | | | | | | | | | |
| PCD | KPD010 | | | | KPD010 | | | | | | | | | | | |
| | KPD230 | | | | | | | | | | | | | | | |
| | KPD250 | | | | | | | | | | | | | | | |

Small parts machining

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

| Workpiece material | Non-ferrous metals | | | | Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys | | | | Hard materials | | | | Sintered steel | | | |
|--------------------|--------------------|-----|----------|-----|---|-----|----------|-----|----------------|-----|----------|-----|----------------|----|----------|----|
| | Finishing | | Roughing | | Finishing | | Roughing | | Finishing | | Roughing | | Finishing | | Roughing | |
| Classification | N01 | N10 | N20 | N30 | S01 | S10 | S20 | S30 | H01 | H10 | H20 | H30 | 01 | 10 | 20 | 30 |
| Carbide | GW05 | | | | | | | | | | | | | | | |

A3

Summary of insert grades

A

Grooving / Cut-Off / Threading



Insert grades

| Workpiece material | | Steel | | | | Stainless steel / Cast steel | | | | | Cast iron | | | | | |
|--------------------|---------------|------------------------------------|-----|-----|-----|------------------------------|---------------------------------|-----|-----|-----|----------------------|--------------|-----------------------|-----|-----|--|
| Cutting range | | Finishing ↔ Roughing | | | | Finishing ↔ Roughing | | | | | Finishing ↔ Roughing | | | | | |
| Classification | | P01 | P10 | P20 | P30 | P40 | M01 | M10 | M20 | M30 | M40 | K01 | K10 | K20 | K30 | |
| Cermets | MEGACOAT | PV7040 | | | | | | | | | | PV7040 | | | | |
| | TN series | TN620 TN6020 TN60 TN90 | | | | | TN620 TN6020 TN60 TN90 | | | | | | TN60 | | | |
| | TC series | TC40N TC60M | | | | | TC60M CR9025 | | | | | | TC40N | | | |
| Coated carbide | CR series | CR9025 | | | | | CR9025 | | | | | | | | | |
| | PR series | PR915 PR930 PR1025 PR1115 | | | | | PR915 PR930 PR1025 | | | | | | PR905 | | | |
| | MEGACOAT | PR1215 PR1225 | | | | | PR1215 PR1225 | | | | | | PR1215 | | | |
| | MEGACOAT NANO | PR1535 PR1625 | | | | | PR1515 PR1535 PR1625 | | | | | | | | | |
| | Ceramic | | | | | | | | | | | | A65 A66N PT600M | | | |
| Carbide | | | | | | | | | | | | KW10 GW15 | | | | |

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

A4

Summary of insert grades

A

Drilling

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



Insert grades

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

Milling

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

| Workpiece material | Non-ferrous metals | | | | Difficult-to-cut materials Heat-resistant alloys / Ni-base heat-resistant alloys | | | | Difficult-to-cut materials Titanium / Titanium alloys | | | | Hard materials | | | | |
|--------------------|----------------------|-----|-----|-----|---|--------|-----|-----|--|--------|-----|-----|----------------------|--------|-----|-----|--|
| Cutting range | Finishing ↔ Roughing | | | | Finishing ↔ Roughing | | | | Finishing ↔ Roughing | | | | Finishing ↔ Roughing | | | | |
| Classification | N01 | N10 | N20 | N30 | S01 | S10 | S20 | S30 | S01 | S10 | S20 | S30 | H01 | H10 | H20 | H30 | |
| Coated carbide | CA series | | | | | CA6535 | | | | CA6535 | | | | | | | |
| | MEGACOAT | | | | | | | | | PR1210 | | | | | | | |
| | MEGACOAT HARD | | | | | | | | | | | | | PR015S | | | |
| | MEGACOAT NANO | | | | | PR1535 | | | | PR1535 | | | | | | | |
| Carbide | KW10 | | | | | | | | KW10 | | | | | | | | |
| | GW25 | | | | | | | | GW25 | | | | | | | | |
| DLC coated carbide | PDL025 | | | | | | | | | | | | | | | | |
| PCD | KPD001 | | | | | | | | KPD001 | | | | | | | | |
| | KPD010 | | | | | | | | KPD010 | | | | | | | | |
| | KPD230 | | | | | | | | | | | | | | | | |
| | KPD250 | | | | | | | | | | | | | | | | |

A5

Insert grades

A

Cermet



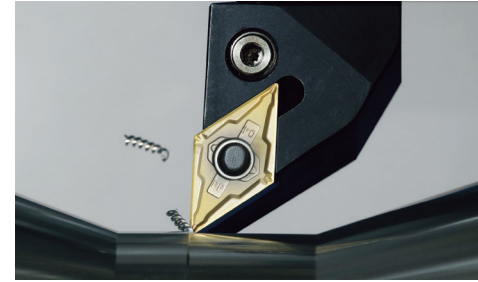
Insert grades

Cermet

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

PVD coated cermet (MEGACOAT / MEGACOAT NANO Cermet)

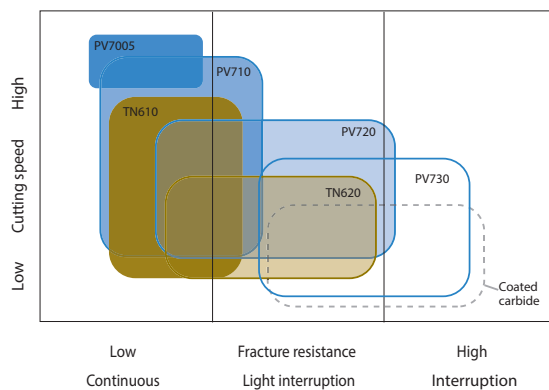
PVD coated cermet is coated on cermet substrate with a thin layer of high wear resistance and high adhesion resistance by PVD (Physical Vapor Deposition) technology. Generally because of the low processing temperature of PVD compared with CVD, PVD coated cermet features less deterioration and more bending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



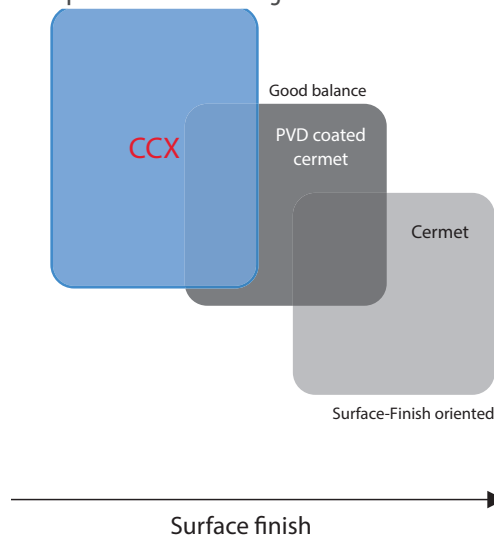
Features of cermet and PVD coated cermet

| Classification | Grade | Color | Main component (Coated composition) | Advantages and applications | |
|--|--|-------------------|-------------------------------------|---|---|
| <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div> | Cermet | TN610 | TiCN | <ul style="list-style-type: none"> High wear resistant cermet due to three types of special reinforcement technology Application: Cermet for steel machining, long tool life in high speed and continuous | |
| | | TN620 | TiCN | <ul style="list-style-type: none"> Three types of special reinforcement technology realized the superior fracture resistance and wear resistance Application: Stable machining of steel | |
| | | TN60 | TiCN+NbC | <ul style="list-style-type: none"> Application: Machining of steel, continuous to interruption | |
| | | TN6020 | TiCN | <ul style="list-style-type: none"> Application : Uncoated cermet for grooving of steel | |
| | | TN620M | TiCN | <ul style="list-style-type: none"> Tough cermet for milling with excellent balance of wear resistance and toughness Application : Milling of steel with high quality surface finish and long tool life | |
| | | TN100M | TiCN+NbC | <ul style="list-style-type: none"> Tough cermet with improved oxidation resistance and thermal shock resistance Application: Milling of steel at high speed | |
| | | TC40N | TiC+TiN | <ul style="list-style-type: none"> Good balance of wear resistance and toughness Application: Grooving and threading of steel | |
| | | CVD Coated Cermet | CCX | Gold | TiCN (TiCN+Al ₂ O ₃ +Tin) <ul style="list-style-type: none"> Specialized high-strength micro grain cermet base material with superior wear-resistant thick CVD coating Excellent wear resistance leads long tool life in high speed machining Application : High speed finishing to light interrupted machining of steel |
| | MEGACOAT NANO Cermet | PV710 | Gold | TiCN (MEGACOAT NANO) | <ul style="list-style-type: none"> Superior wear and adhesion resistant MEGACOAT NANO on the high wear resistant cermet Application: Long tool life and stability in high speed continuous machining of steel, excellent surface |
| | | PV720 | | TiCN (MEGACOAT NANO) | <ul style="list-style-type: none"> Superior wear and adhesion resistant MEGACOAT NANO on the special reinforcement cermet Application: First choice PVD coated cermet for steel machining, high efficient machining and high quality surface finish |
| | | PV60M | Gold | TiCN+NbC (MEGACOAT NANO) | <ul style="list-style-type: none"> Improved stable grade for milling by MEGACOAT NANO coating technology Application: Milling of steel with high quality surface finish and stable machining |
| | MEGACOAT Cermet | PV7040 | Blackish Red | TiC+TiN (MEGACOAT) | <ul style="list-style-type: none"> MEGACOAT Cermet for Grooving Application: Excellent surface finish and longer tool life in steel grooving |
| | | PV7005 | | TiC+TiN MEGACOAT | <ul style="list-style-type: none"> Heat-resistant MEGACOAT on cermet with excellent wear resistance Application: High speed finishing of gray and nodular cast iron |
| | <div style="background-color: #D9534F; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div> | | | | |

Application map



Properties of PVD coating



A6

Uncoated CERMET

TN610/TN620

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

MEGACOAT NANO CERMET

PV710/PV720/PV730

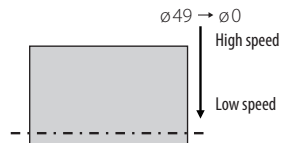
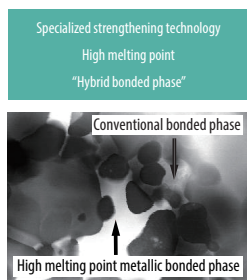
A



Insert grades

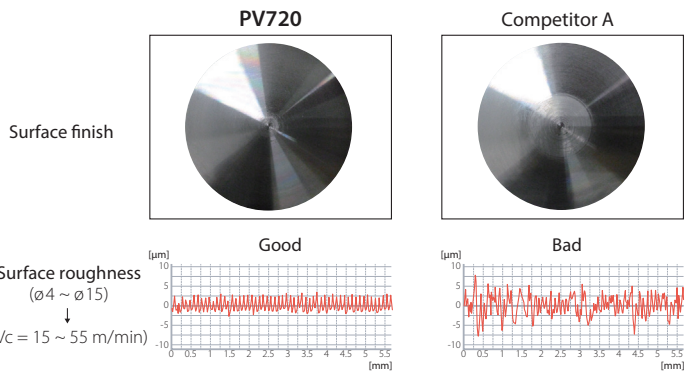
1 Excellent surface finish

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



Surface finish comparison (In-house evaluation)

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



CVD coated cermet for finishing

CCX

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

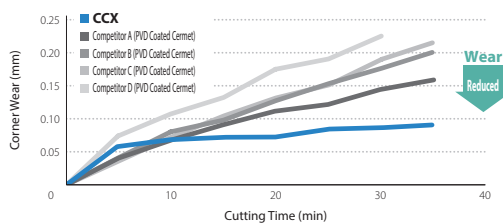
1 Superior wear resistance to PVD coated cermets

2 Unique cermet base material with thick CVD coating

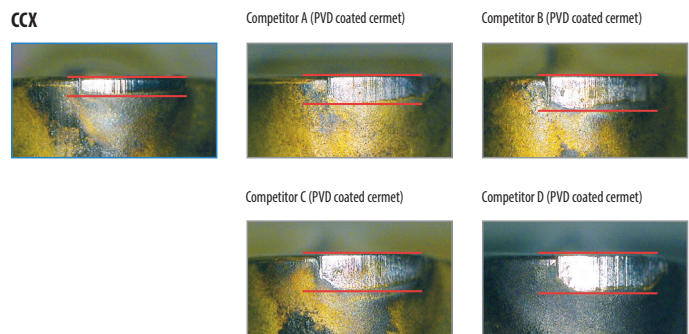
Alloy Steel - SCM435 High speed comparison: $V_c = 400$ m/min

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

Wear resistance comparison (Internal evaluation)



Cutting edge (After machining 35 min)



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

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

A7

Insert grades

A

CVD coated carbide (Turning)



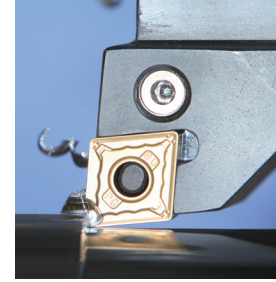
Insert grades

CVD coated carbide

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

Features

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



Features of CVD coated carbide

| Classification | Grade | Color | Coated composition | Advantages and applications |
|--|--------|---------------|--|--|
| <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div> | CA510 | Gold | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Special substrate with thermal deformation resistance along with a thick and tough coating layer providing high wear resistance • Application: High speed and high efficiency steel machining |
| | CA515 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Improved wear resistance and stability due to special substrate with heat deformation resistance and hard and tough coating layer with reinforced interface • Application: Light interrupted machining of steel |
| | CA025P | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • CVD coating with improved wear resistance. Adopted base material, excellent chipping resistance, resistance to wear and resistance to improve chip performance • Application: Continuous to interrupted processing of steel |
| | CA525 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Stable and long tool life machining due to special substrate with heat deformation resistance and tougher coating layer and reinforced interface • Application: Interrupted to general machining of steel |
| | CA530 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Special tough substrate and tough coating layer providing high stability and wear resistance • Application: General to heavy interrupted machining (stability oriented) |
| | CA5505 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Application: High speed continuous machining of steel, continuous to light interrupted machining of cast iron |
| | CA5515 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Application: Machining of steel, continuous to light interruption |
| | CA5525 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Application: For general machining of steel, roughing to interruption |
| | CA5535 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Application: Roughing to heavy interrupted machining of steel |
| | CR9025 | | TiCN+TiN | <ul style="list-style-type: none"> • Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance • Application: Cut-off, grooving and multi-function machining of steel |
| <div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless steel </div> | CA6515 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Specialized carbide substrate for machining stainless steel, excellent wear resistance • Application: Continuous machining of stainless steel |
| | CA6525 | | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Specialized carbide substrate for machining stainless steel, excellent notching resistance and toughness • Application: First choice for general machining of stainless steel, from finishing to roughing, continuous to interruption |
| <div style="background-color: #D9534F; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div> | CA310 | Rose Gold | TiCN+Al ₂ O ₃ +Ti base | <ul style="list-style-type: none"> • Grade for high-speed continuous machining and improved tool life through the deposition of a thickened Al₂O₃ coating layer • Application : For finishing to roughing of gray cast iron |
| | CA315 | | TiCN+Al ₂ O ₃ +Ti base | <ul style="list-style-type: none"> • Both high abrasion resistance and stability are compatible, high efficiency and long life performance are demonstrated. Can be adapted to both continuous machining and interrupted machining. • Application: Compatible with a wide processing area for cast iron and gray cast iron. First recommendation for cast iron |
| | CA320 | | TiCN+Al ₂ O ₃ +Ti base | <ul style="list-style-type: none"> • Improved stability with CVD layer structure with high adhesion • Application : Heavily interrupted or High-speed machining for Nodular Cast Iron. The 1st Recommendation for the FCD500 or higher application |
| | CA4505 | Blackish gray | TiCN+Al ₂ O ₃ | <ul style="list-style-type: none"> • Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer • Application: For gray cast iron and nodular cast iron at high speed in continuous to light interrupted machining |
| | CA4515 | | TiCN+Al ₂ O ₃ | <ul style="list-style-type: none"> • Stable, longer tool life due to improved bonding strength of coating layers and special treatment of the surface of the top coating layer • Application: First choice for gray cast iron and nodular cast iron in light to heavy interrupted machining |

A8



CVD coated carbide grade for steel

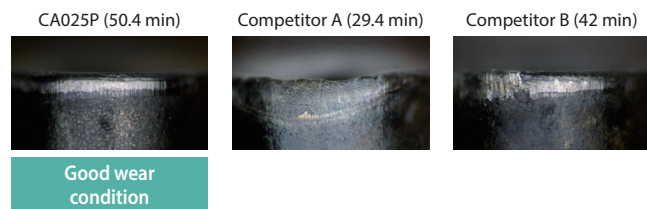
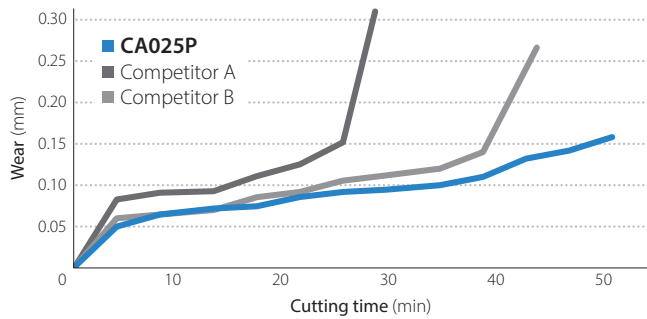
CA025P

Next generation CVD coating for longer tool life

1 Improved wear resistance with new CVD grade for steel

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

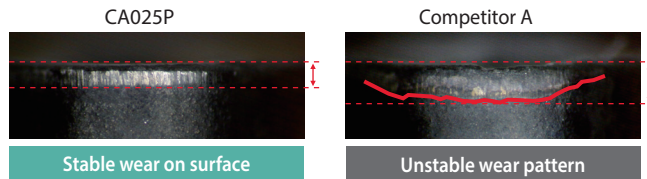
Wear resistance comparison (Internal evaluation)



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

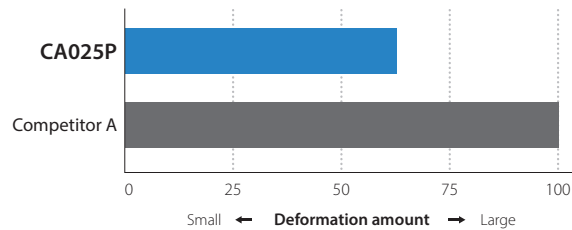
Wear comparison (Internal evaluation) Cutting time: 25.2 min

CA025P maintains smooth and flat wear with stable tool life



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

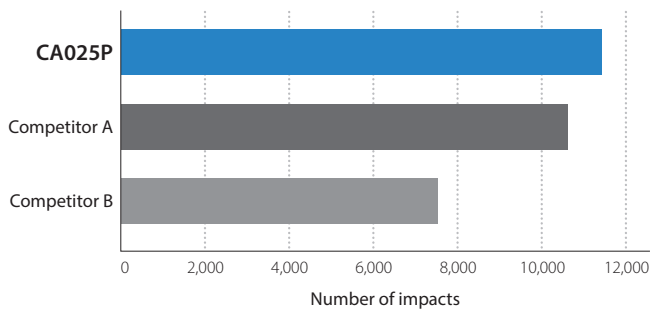
Plastic deformation comparison under high temperature (Internal evaluation)
Comparison with Competitor A



2 Excellent fracture resistance

New substrate with high stability provides excellent chipping resistance

Fracture resistance comparison (Internal evaluation) Average of 5 times

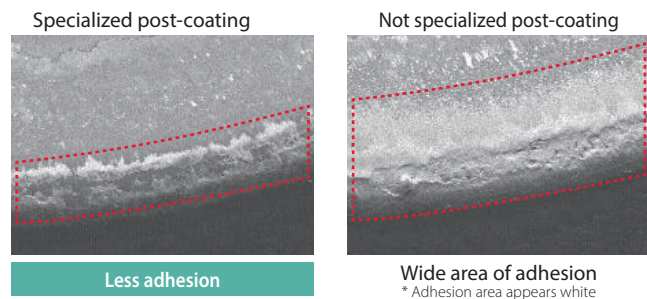


Cutting conditions: $V_c = 250$ m/min, $a_p = 1.5$ mm, $f = 0.35$ mm/rev, wet Workpiece: SCM435 (with 4 slots)

3 Excellent adhesion resistance and chipping resistance

Specialized post-coating process prevents adhesion

Adhesion on the edge after cutting (Internal evaluation)



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

Insert grades

A

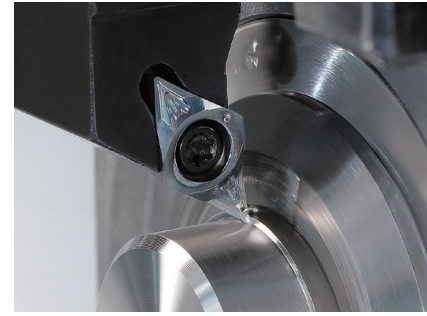
PVD coated carbide (Turning)



Insert grades

PVD coated carbide (MEGACOAT / MEGACOAT NANO)

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



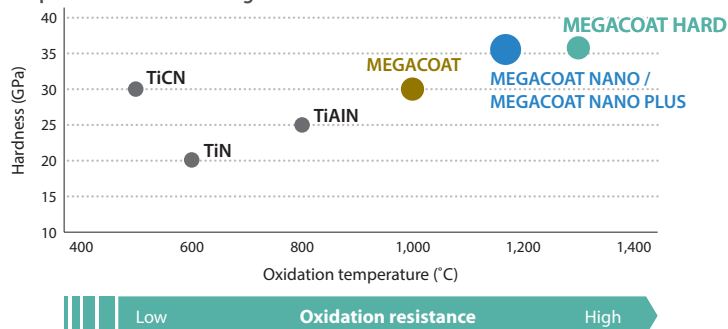
PVD coated super micro-grain carbide

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

Features of PVD coated carbide

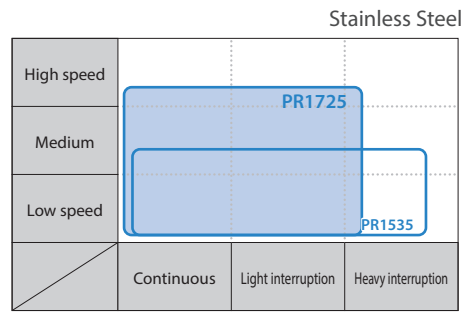
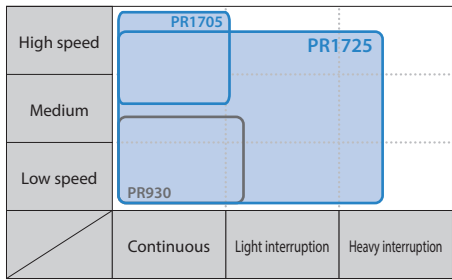
| Classification | Grade | Color | Coated composition | Advantages and applications |
|--|---|---------------|--------------------|---|
| <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div> | PR915 <small>Super micro-grain</small> | Bluish violet | TiAlN | • Application: Stable and reliable high precision machining of steel |
| | PR930 <small>Super micro-grain</small> | Reddish gray | TiCN | • Application: Low machining speed, precise machining with sharp edge |
| | PR1025 | Reddish gray | TiCN | • Application: General machining of steel and stainless steel, stable and longer tool life |
| | PR1115 | Purple red | TiAlN | • Superior oxidation resistance with well balanced wear resistance and toughness • Application: Machining of steel and stainless steel, for grooving, cut-off and threading |
| | PR1215 | Blackish red | MEGACOAT | • Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate • Application: Superior adhesion resistance and longer tool life for steel and stainless steel machining |
| | PR1625 | Reddish green | MEGACOAT NANO | • Adopted special nano multi-layer coating "MEGACOAT NANO" excellent in wear resistance and lubricity • Stable processing with steel and stainless steel grooving - Long tool life |
| | PR1705 | Silver | MEGACOAT NANO PLUS | • High-hardness ultrafine particle carbide substrates with special multilayer nano coating MEGACOAT NANO PLUS offer excellent wear resistance and high precision machining. • Application: For free-cutting steel turning. Long tool life with excellent wear resistance and high-precision machining. |
| | PR1725 | Silver | MEGACOAT NANO PLUS | • New coating technology [MEGACOAT NANO PLUS] with superior wear resistance and adhesion resistance • Application: General grade for steel and stainless steel machining provides stability and longer tool life |
| <div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless steel </div> | PR1225 | Blackish red | MEGACOAT | • Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate • Application: Light interrupted to interrupted machining of stainless steel |
| | PR1515 | Reddish green | MEGACOAT NANO | • Improved wear resistance and stability by using fine granite carbide base metal and special nano multi-layer coating "MEGACOAT NANO" • Application: For thread cutting of stainless steel |
| | PR1535 | | | • Nano thin multi-layer coating (MEGACOAT NANO) improved wear resistance and stability • Application: Medium to roughing of stainless steel and heat-resistant alloys, cut-off of stainless steel |
| <div style="background-color: #FF0000; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div> | PR905 | Bluish violet | TiAlN | • Smooth fine surface PVD coated hard carbide with plastic deformation resistance • Application: Suitable for machining gray and nodular cast iron |
| <div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant alloys </div> | PR005S | Grey black | MEGACOAT HARD | • Superior high temperature properties of special carbide substrate and excellent heat-resistance of MEGACOAT HARD enables high wear resistance • Application: Finish processing of heat-resistant alloys, also for high speed machining |
| | PR015S | Grey black | MEGACOAT HARD | • Superior high temperature properties of special carbide substrate and MEGACOAT HARD improved heat-resistance and stability • Application: Recommended for continuous to light interruption machining and finishing of heat-resistant alloys |

Properties of PVD coating



A10

Application map



Insert grades

PVD coated carbide for small parts machining

PR1725

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

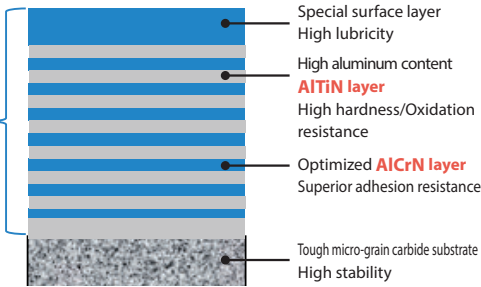


MEGACOAT NANO PLUS

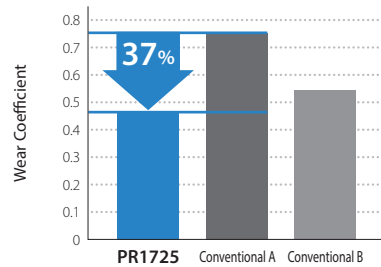
AlTiN/AlCrN Nano laminated film with superior wear resistance and adhesion resistance. Excellent surface finish and long tool life

Reduces cracking

Reduces abnormal damages such as chipping because of increased lamination layer with a thinner gap than conventional coatings



Wear coefficient comparison (Internal evaluation)



Superior wear and chipping resistance

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

Applicable to various workpiece materials

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

Excellent surface finish

Special surface layer with great lubricity reduces adhesion

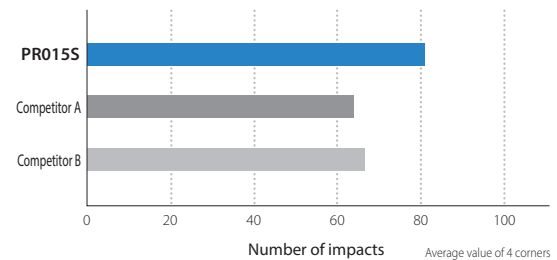
High machining stability

Tough micro-grain carbide substrate provides stable machining

Features of PR005S / PR015S

- Improved thermal properties help to reduce sudden fracture and decrease edge wear
Improved thermal conductivity by optimum distribution of WC coarse grains
Resists heat concentration at the cutting edge to promote stable machining
- Improved wear resistance with MEGACOAT HARD coating
Excellent wear resistance with high-hardness and resists boundary damage with improved thermal properties

Fracture resistance comparison (Internal evaluation)



Cutting conditions : Vc = 25m/min, ap = 1.0 mm, f = 0.10 mm/rev, Wet
CNMG120408 type Workpiece Material : Ni-based Superalloy
Cylindrical workpiece with 1 flat face

Insert grades

A

PVD / CVD coated carbide (Milling / Drilling)



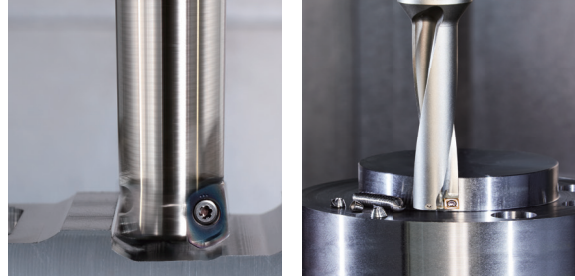
Insert grades

PVD coated carbide (MEGACOAT / MEGACOAT NANO)

PVD coated carbide grades for milling and drilling are coated on a very tough carbide substrate. Because of the low processing temperature of PVD compared with CVD, it features less deterioration and more bending strength.

CVD coated carbide

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



Features of PVD / CVD coated carbide

| Classification | Grade | Color | Coated composition | Advantages and applications |
|--|--------|---------------|--|---|
| <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; border-radius: 5px;"> P Steel </div> | PR1230 | Blackish red | MEGACOAT | <ul style="list-style-type: none"> • Superior wear and oxidation-resistant MEGACOAT on a special tough carbide substrate • Application: Stable and high feed milling and drilling of steel |
| | PR1525 | Reddish green | MEGACOAT NANO | <ul style="list-style-type: none"> • New coating technology (MEGACOAT NANO) is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance • Application: Stable and longer tool life for milling of steel and stainless steel |
| | CA520D | Gold | TiCN+Al ₂ O ₃ +TiN (CVD) | <ul style="list-style-type: none"> • Improved abrasion resistance and fracture resistance by improving high toughness • Combination of high toughness substrate, toughened coating and enhanced interface allow both wear and fracture resistance • Application: Drilling of steel - first recommended grade (for high speed machining) |
| <div style="background-color: #FFD700; color: black; padding: 5px; text-align: center; border-radius: 5px;"> M Stainless steel </div> | PR1225 | Blackish red | MEGACOAT | <ul style="list-style-type: none"> • Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate • Application: General machining and high feed milling and drilling of steel and stainless steel |
| <div style="background-color: #D9534F; color: white; padding: 5px; text-align: center; border-radius: 5px;"> K Cast iron </div> | PR1210 | Blackish red | MEGACOAT | <ul style="list-style-type: none"> • Superior wear and oxidation-resistant MEGACOAT coated on special carbide substrate • Application: Highly efficient stable milling and drilling of gray and nodular cast iron |
| | PR1510 | Reddish green | MEGACOAT NANO | <ul style="list-style-type: none"> • New coating technology (MEGACOAT NANO) is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance • Application: Highly fracture resistance and wear resistance for gray and nodular cast iron |
| | CA415D | Gold | TiCN+Al ₂ O ₃ +TiN | <ul style="list-style-type: none"> • Special carbide substrate for cast iron, toughened coating and enhanced interface allow both wear and fracture resistance • Application: Drilling of cast iron - 1st recommended material for high speed processing |
| | CA420M | | TiCN+Al ₂ O ₃ +TiN (CVD) | <ul style="list-style-type: none"> • Kyocera's unique crystal control technology and advanced layer adhesion CVD coating with superior wear resistance and toughness • Application: Milling of gray and nodular cast iron |
| <div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant alloys Titanium alloys </div> | PR1535 | Reddish green | MEGACOAT NANO | <ul style="list-style-type: none"> • Nano thin multi-layer coating (MEGACOAT NANO) improved wear resistance and stability • Application: For milling of Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel |
| <div style="background-color: #8B4513; color: white; padding: 5px; text-align: center; border-radius: 5px;"> S Heat-resistant alloys </div> | CA6535 | Gold | TiCN+Al ₂ O ₃ +TiN (CVD) | <ul style="list-style-type: none"> • High heat-resistance and wear resistance with CVD coating • Application: For milling of Ni-base heat-resistant alloys and martensitic stainless steel |
| <div style="background-color: #696969; color: white; padding: 5px; text-align: center; border-radius: 5px;"> H Hard material </div> | PR015S | Blackish Gray | MEGACOAT HARD | <ul style="list-style-type: none"> • Substrate with improved thermal properties reduces sudden fracture and decrease edge wear. MEGACOAT HARD coating technology delivers the high hardness and superior wear resistance • Excellent wear and chipping resistance maintains stable machining for high hard materials • Application: Difficult-to-cut materials and high hard (less than 60HRC) machining |

A12

Excellent grade for heat-resistant alloys and difficult-to-cut materials

CA6535

CVD: For martensitic stainless steel and Ni-base heat-resistant alloys

PR1535

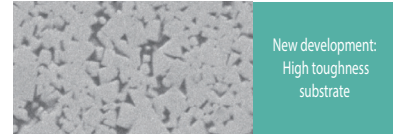
PVD: For Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel



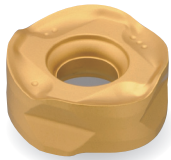
Insert grades

Suitable for variety of workpiece materials

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

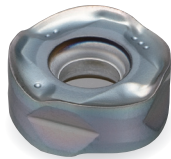
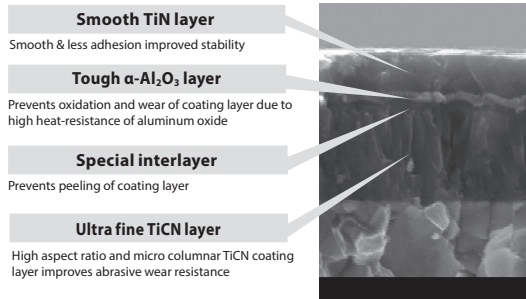


New development:
High toughness
substrate



CA6535

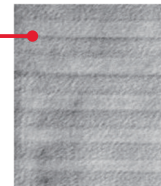
For martensitic stainless steel and Ni-base heat-resistant alloys.
High heat resistance and wear resistance with CVD coating.
Improved stability due to thin layer coating technology.



PR1535

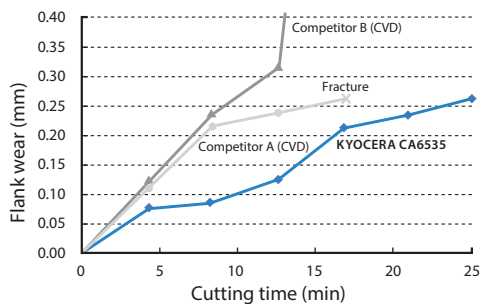
For Ni-base heat-resistant alloys, titanium alloys and precipitation hardened stainless steel.
Stable and longer tool life by special nano thin multi-layer coating (MEGACOAT NANO)

MEGACOAT base multi-layer composition



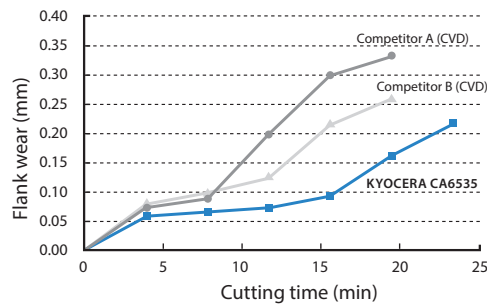
Tool life comparison: Longer tool life and more stable machining than competitors

Ni-base heat-resistant alloys



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

Martensitic stainless steel



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

Insert grades

A

Carbide



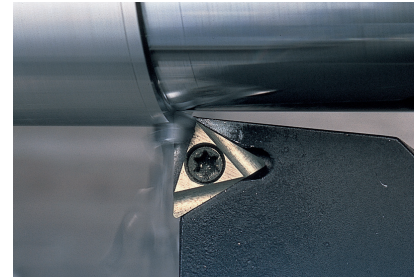
Insert grades

Carbide

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

Features

- KW10: Suitable for machining cast iron with high hardness and toughness
- GW05, GW15, GW25: Suitable for machining cast iron, non-ferrous metals and non-metals
- SW series: Suitable for machining of titanium and titanium alloy



Features of carbide

| Classification | Grade | Color | Main component | Advantages and applications |
|----------------|-------------------------|-------|----------------|---|
| | KW10 | Gray | WC+Co | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K10 relevant) • Application: Machining cast iron, non-ferrous materials and non-metals |
| | GW05 | | | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K05 relevant) • Application: Excellent wear resistance for machining of cast iron and non-ferrous metal |
| | GW15 | | | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K10 relevant), tough micro-grain carbide • Application: Machining cast iron, non-ferrous materials and non-metals |
| | GW25 | | | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K30 relevant) • Application: Milling operations of aluminum |
| | SW05 | | | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K05 relevant) • Application: Titanium alloys for continuous machining and finishing |
| | SW10 (Made to order) | | | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K10 relevant) • Application: Titanium alloys for continuous and light interrupted machining |
| | SW25 (Made to order) | | | <ul style="list-style-type: none"> • ISO identification symbol K carbide (K25 relevant) • Application: Titanium alloys for interrupted and light interrupted machining |

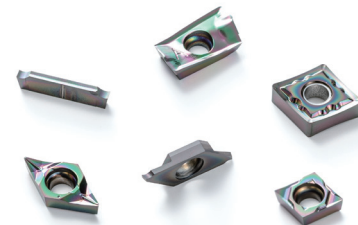
DLC coated carbide

DLC coated carbide

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

Features

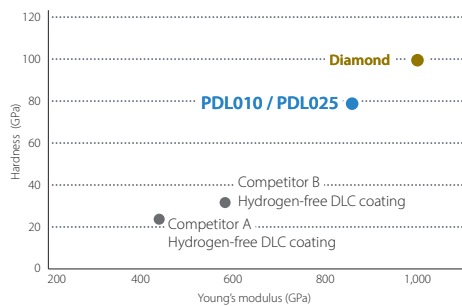
- High Hardness with Kyocera's proprietary hydrogen-free DLC coating
- Excellent surface finish achieved through anti-adhesion performance



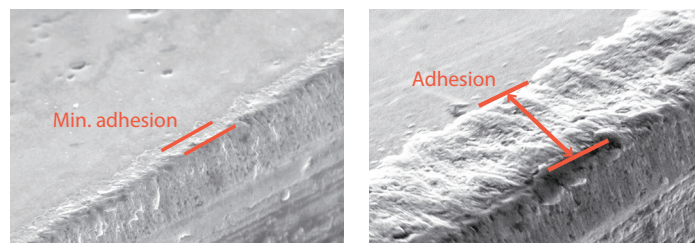
Features of DLC coated carbide

| Classification | Grade | Color | Coated composition | Advantages and applications |
|----------------|--------|---------------|--------------------|---|
| | PDL010 | Rainbow color | C | <ul style="list-style-type: none"> • DLC coating of original technology has high hardness, excellent adhesion resistance and film peeling resistance • Application: Excellent finished surface processing and long service life of aluminum alloy |
| | PDL025 | | | <ul style="list-style-type: none"> • High Hardness with Kyocera's Proprietary Hydrogen-free DLC Coating • Application: Long tool life and stable machining of aluminum alloys |

Coating properties



Adhesion resistance comparison



Cutting conditions: $V_c = 800$ m/min, $f_z = 0.1$ mm/t, $a_p \times a_e = 3 \times 5$ mm
 Dry, cutter dia. $\phi 25$ mm, workpiece material: A5052 cutting length: 57 m (Internal evaluation)

A14

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

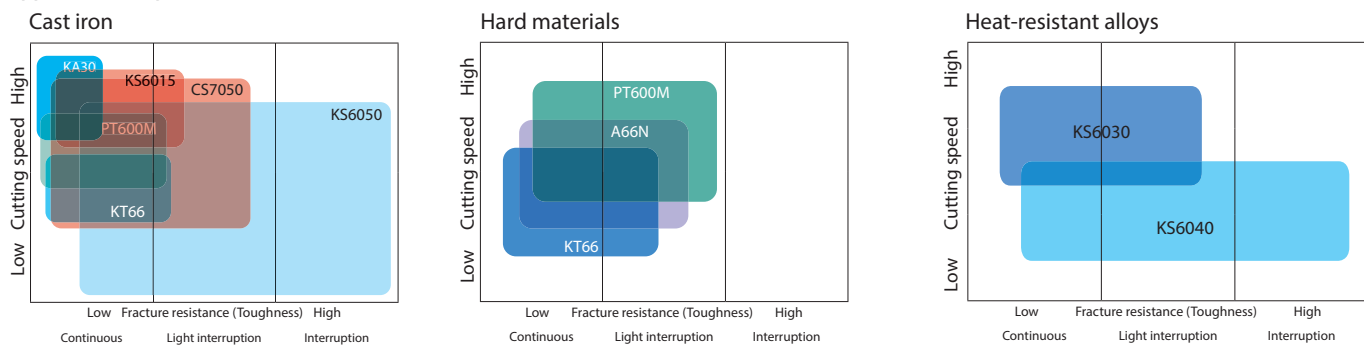


Insert grades

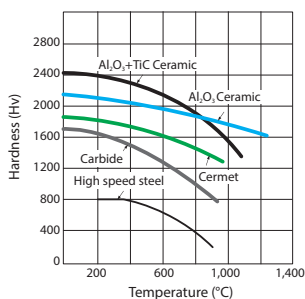
Features of ceramic

| Classification | Grade | Color | Main component (Coated composition) | Coating layer | Hardness of substrate (GPa) | Fracture toughness (MPa·m ^{1/2}) | Transverse strength (MPa) | Advantages and applications |
|-----------------------------------|--------|---------------|--|---------------|-----------------------------|--|---------------------------|--|
| K Cast iron | KA30 | White | Al ₂ O ₃ | - | 17.5 | 4.0 | 750 | • Aluminum oxide ceramic (Al ₂ O ₃) • Application: Finishing of cast iron at high cutting speeds without coolant |
| | 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 (Si ₃ N ₄) • 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 |
| K Cast iron | KT66 | Black | Al ₂ O ₃ +TiC | - | 20.1 | 4.1 | 980 | • Aluminum oxide and titanium carbide ceramic (Al ₂ O ₃ +TiC) • Application: Semi-roughing to finishing of cast iron, and hard materials |
| | A66N | Gold | Al ₂ O ₃ +TiC (TiN COAT) | | | | | Thin coating |
| H Hard material | PT600M | Blackish red | Al ₂ O ₃ +TiC (MEGACOAT) | Thin coating | | | | |
| S Heat-resistant alloys | 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 |

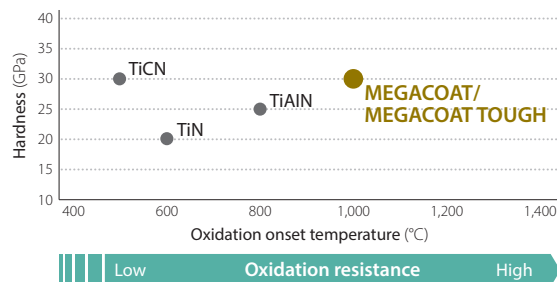
Application map



High-Temperature hardness



Properties of PVD coating



Insert grades

A

CBN (Cubic boron nitride)



Insert grades

CBN

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

Features

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



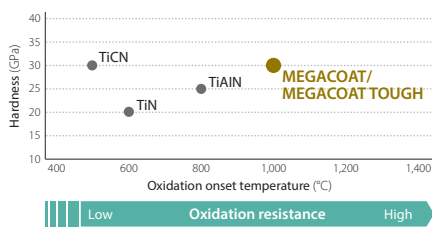
Features of CBN

| Classification | Grade | Color | Ave. grain size (µm) | Hardness of substrate (GPa) | Transverse strength (MPa) | Advantages and Applications |
|--|-------------------------|--------------|----------------------|-----------------------------|---------------------------|--|
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> H Hard materials </div> | KBN510 | Black | 2 | 28 | 1,000 | <ul style="list-style-type: none"> • Excellent wear resistance and crack resistance, non-coated CBN • Application: Finishing and continuous machining of hardened die steel |
| | KBN525 | | 1 and under | 25 | 1,250 | <ul style="list-style-type: none"> • Application: General purpose for hardened steel |
| | KBN05M (MEGACOAT) | Blackish red | 0.5-1.5 | 27 | 1,000 | <ul style="list-style-type: none"> • Heat-resistant MEGACOAT on highly heat-resistant CBN substrate • Application: High speed finishing of hardened steel |
| | KBN10M (MEGACOAT) | | 2 | 28 | | <ul style="list-style-type: none"> • Application: High speed finishing of hardened die steel |
| | KBN25M (MEGACOAT) | | 1 and under | 25 | 1,250 | <ul style="list-style-type: none"> • Heat-resistant MEGACOAT on micro-grain CBN with heat-resistant binder phase • Application: Stable machining of hardened steel at high cutting speeds |
| | KBN020 (MEGACOAT TOUGH) | | 3 | 31-32 | 1,300 | <ul style="list-style-type: none"> • High toughness CBN coated with high wear resistance enables machining in a wide range of cutting areas • Application: Continuous to interrupted machining of hardened steel |
| Sintered steel | KBN570 | Black | 2-4 | 34 | 1,350 | <ul style="list-style-type: none"> • High content CBN • Application: Processing of sintered steel (burr suppression) |
| | KBN70M (MEGACOAT) | Blackish red | | | | <ul style="list-style-type: none"> • Heat-resistant MEGACOAT on CBN rich substrate • Application: Stable machining of sintered steel (ferrous sintered alloys) |
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> K Cast iron </div> | KBN475 | Black | 2 | 39 | 1,400 | <ul style="list-style-type: none"> • Excellent wear resistance due to high CBN content and special binder • Application: High speed machining of gray cast iron |
| | KBN60M (MEGACOAT) | Blackish red | 0.5-6 | 33 | 1,250 | <ul style="list-style-type: none"> • Heat-resistant MEGACOAT on CBN rich substrate with hard binder phase • Application: High speed finishing of gray cast iron |
| | KBN900 (TIN COAT) | Gold | 9 | 31 | 630 | <ul style="list-style-type: none"> • TIN coated solid CBN • Application: Heavy duty, interrupted machining and finishing of hardened steel, hardened roll steel and cast iron |

For KBN35M, see page A18.

MEGACOAT CBN

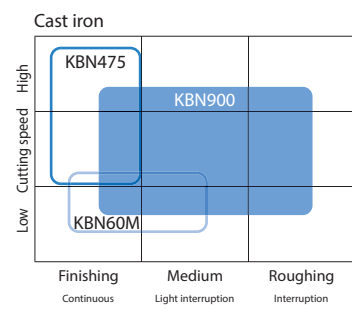
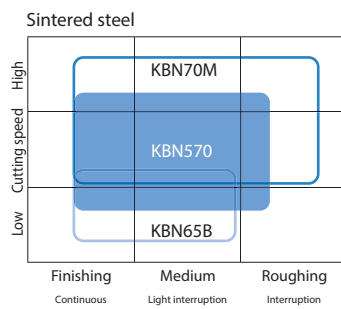
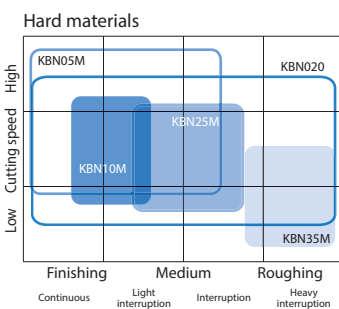
Properties of PVD coating



Advantages of MEGACOAT

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

Application map



A16

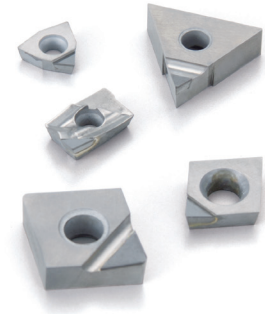
PCD (Polycrystalline diamond)

PCD

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

Features

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



Insert grades

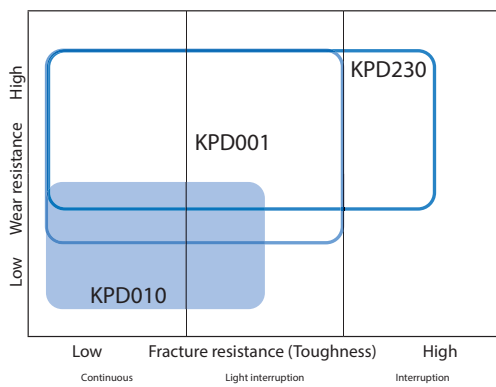
Features of PCD

| Classification | Grade | Ave. grain size (μm) | Advantages and applications |
|---|------------------------|----------------------|--|
| <div style="background-color: #008000; color: white; padding: 5px; text-align: center; width: 30px; margin: 0 auto;">N</div> <div style="background-color: #008000; color: white; padding: 2px; text-align: center; font-size: 8px; margin: 2px auto;">Non-ferrous metals</div> | KPD001 | 0.5 | <ul style="list-style-type: none"> • Super Micro-Grain PCD features cutting edge strength, wear resistance, fracture resistance, good edge-sharpening performance and longer, stable tool life • Application: High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, and carbide. |
| | KPD010 | 10 | <ul style="list-style-type: none"> • Good wear resistance and toughness, good grindability • Application: High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, and carbide. |
| | KPD230 | 2-30 | <ul style="list-style-type: none"> • Superior abrasive wear resistance and toughness due to high density PCD with mixed rough and fine grains • Application: High speed machining of aluminum alloys, brass, non-ferrous metals and non-metals including plastics. |
| | KPD250 (Made to order) | 25 | <ul style="list-style-type: none"> • Superior wear resistance due to rough grain PCD (25μm) • Application: High speed machining of high silicon aluminum alloy and machining of carbide |

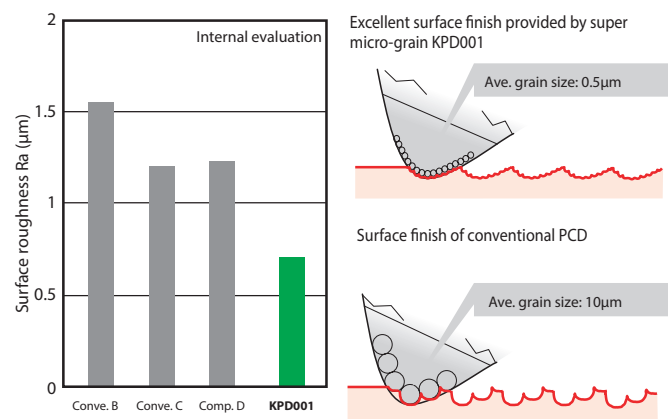
Applications

| Workpiece material | | Non-ferrous metals | | | | Difficult-to-cut materials | | | |
|--------------------|-----|------------------------|-----|-----|-----|----------------------------|-----|-----|-----|
| Cutting range | | Finishing ← → Roughing | | | | Finishing ← → Roughing | | | |
| Classification | | N01 | N10 | N20 | N30 | S01 | S10 | S20 | S30 |
| Turning Milling | PCD | KPD001 | | | | KPD001 | | | |
| | | KPD010 | | | | KPD010 | | | |
| | | KPD230 | | | | | | | |
| | | KPD250 | | | | | | | |

Application map



Surface finish roughness comparison of aluminum machining



(Grain size affects surface finish quality)

Insert grades

A

Honeycomb structure CBN



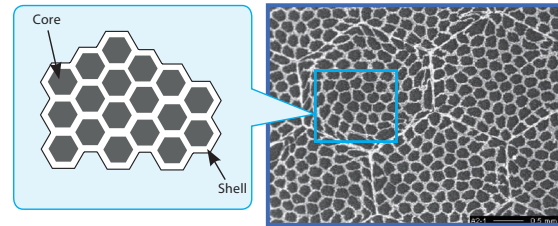
Insert grades

Honeycomb structure CBN

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

Features

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

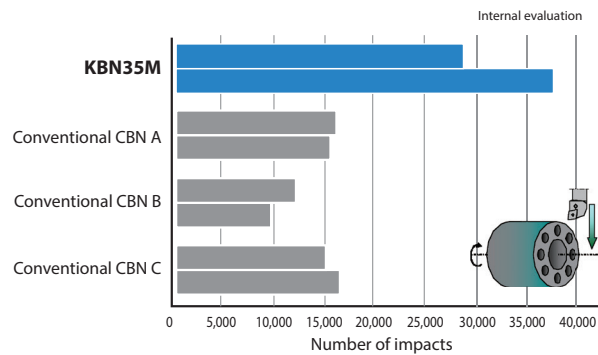
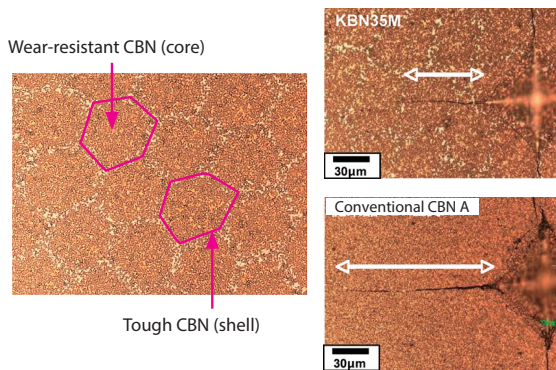


Features of honeycomb structure CBN

| Classification | Grade | Color | Main component | Advantages and applications |
|----------------------------|----------------------|--------------|----------------|--|
| H Hard materials | KBN35M (MEGACOAT) | Blackish red | CBN | <ul style="list-style-type: none"> • Honeycomb structure CBN composite material consisting of wear resistant CBN (core) and tough CBN (shell) • Heat-resistant MEGACOAT on tough Honeycomb structure CBN • Application: Stable machining of hardened steel at interrupted machining |

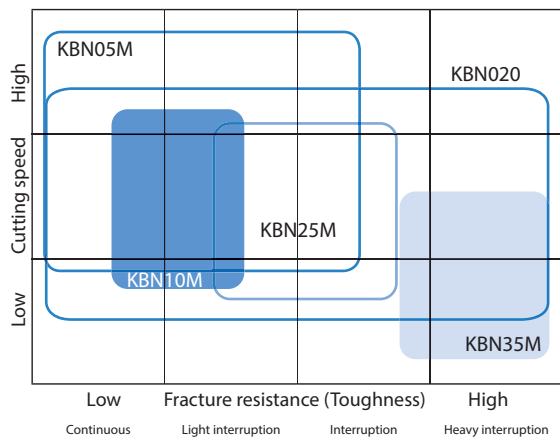
KBN35M (MEGACOAT honeycomb structure CBN)

Tough CBN (shell) prevents crack growth



Application map

Hard materials



A18

Insert material selection table

| Applications | | Cutting range | Steel | Stainless steel | Gray cast iron | Nodular cast iron | Non-ferrous metals | Heat-resistant alloys | Titanium alloys | Hard materials | Sintered steel | | |
|--------------------------|--------|-----------------------------------|--------|-----------------|----------------|-------------------|--------------------|-----------------------|-----------------|----------------|----------------|--------|--------|
| Turning | | Finishing ↕ Roughing | TN610 | TN610 | KBN475 | | | | | | | | |
| | | | CCX | TN620 | KBN60M | | | | | | | | |
| | | | TN620 | TN60 | KA30 | TN60 | | | KS6040 | | | KT66 | TN610 |
| | | | TN60 | PV720 | PV7005 | PV7005 | KPD001 | KW10 | | | A66N | PT600M | TN60 |
| | | | PV710 | CA6515 | CA5505 | CA5505 | KPD010 | CA6515 | KPD001 | | KBN05M | | |
| | | | PV720 | CA6525 | CA310 | CA310 | PDL010 | CA6525 | KPD010 | | KBN020 | | KBN570 |
| | | | PV730 | PR1535 | CA315 | CA315 | PDL025 | PR005S | SW05 | | KBN10M | | KBN70M |
| | | | CA510 | | | CA320 | KW10 | PR015S | SW10 | | KBN25M | | |
| | | | CA515 | | | | | PR1535 | SW25 | | KBN35M | | |
| | | | CA025P | | | | | | | | KBN900 | | |
| CA530 | | | | | | | | | | | | | |
| Small tools | | Finishing ↕ Roughing | TN610 | TN610 | | | | | | | | | |
| | | | TN620 | TN620 | | | | | | | | | |
| | | | PV710 | PV720 | CA310 | CA310 | KPD001 | CA6515 | KPD001 | | KBN05M | | TN610 |
| | | | PV720 | PR1725 | CA315 | CA315 | KPD010 | PR1125 | KPD010 | | KBN020 | | TN60 |
| | | | PR1705 | PR1025 | KW10 | CA320 | PDL010 | PR1225 | KW10 | | KBN10M | | KBN570 |
| | | | PR1725 | PR1225 | | KW10 | PDL025 | PR1535 | PR1535 | | KBN25M | | KBN70M |
| | | | PR930 | PR1535 | | | | | | | | | |
| | | | PR1025 | | | | | | | | | | |
| | | | PR1535 | | | | | | | | | | |
| | | | PR1535 | | | | | | | | | | |
| Boring | | Large ↕ Small | TN610 | | | | | | | | | | |
| | | | TN620 | TN60 | KBN475 | | | | | | | | |
| | | | PV710 | CA6515 | KBN60M | | | | | | | | |
| | | | PV720 | CA6525 | PV7005 | PV7005 | KPD001 | CA6515 | KPD001 | | PT600M | | TN610 |
| | | | PV730 | PR1725 | CA310 | CA310 | KPD010 | CA6525 | KPD010 | | KBN05M | | TN60 |
| | | | CA515 | PR1025 | CA310 | CA310 | PDL010 | PR1125 | KW10 | | KBN020 | | |
| | | | CA025P | PR1225 | CA315 | CA315 | PDL025 | PR1225 | SW05 | | KBN10M | | KBN570 |
| | | | CA530 | PR930 | KW10 | CA320 | GW05 | PR1535 | PR1535 | | KBN25M | | KBN70M |
| | | | PR1705 | PR1535 | | KW10 | KW10 | | | | | | |
| | | | PR1725 | | | | | | | | | | |
| Cut-Off | | Large ↕ Small | CR9025 | CR9025 | | | | | | | | | |
| | | | PR930 | PR930 | | | | | | | | | |
| | | | PR915 | PR915 | KW10 | KW10 | PDL025 | KW10 | KW10 | | | | |
| | | | PR1215 | PR1215 | PR1215 | PR1215 | KW10 | PR1225 | | | | | |
| | | | PR1225 | PR1225 | | | | PR660 | | | | | |
| PR1535 | PR1535 | | | | | | | | | | | | |
| Cut-Off (small diameter) | | Depends on the workpiece material | PR1025 | PR1025 | KW10 | KW10 | PDL025 | KW10 | KW10 | | | | |
| | | | PR1225 | PR1225 | | | KW10 | PR1025 | | | | | |
| | | | PR1535 | PR1535 | | | | PR1225 | | | | | |
| Grooving | | Glossy finish ↕ Stable | TC40N | TC40N | | | | | | | | | |
| | | | TN620 | TN620 | | | | | | | | | |
| | | | TN90 | TN90 | PR905 | PR905 | KPD001 | PR915 | KPD001 | | KBN510 | TC40N | |
| | | | PV7040 | PV7040 | PR1215 | PR1215 | PDL025 | KW10 | KW10 | | KBN525 | | |
| | | | PR930 | PR930 | KW10 | KW10 | KW10 | PR1215 | | | PT600M | | |
| | | | PR1115 | PR1115 | GW15 | GW15 | GW15 | PR1225 | | | | | |
| | | | PR1215 | PR1215 | | | | PR1535 | PR1535 | | | | |
| PR1225 | PR1225 | | | | | | | | | | | | |
| PR1625 | PR1625 | | | | | | | | | | | | |
| Threading | | Glossy finish ↕ Stable | TC60M | TC60M | KW10 | KW10 | KW10 | KW10 | KW10 | | | PR1515 | |
| | | | PR1215 | PR1515 | GW15 | GW15 | GW15 | GW15 | GW15 | | | PR1115 | |
| | | | PR1115 | PR1115 | | | | | | | | | |
| | | | PR930 | PR930 | | | | | | | | | |
| Drilling | | Wear resistance ↕ Toughness | CA520D | | CA415D | | | | | | | | |
| | | | PR1225 | PR1225 | PR1210 | PR1210 | KW10 | PR1225 | KW10 | | | | |
| | | | PR1230 | PR1535 | KW10 | KW10 | GW15 | KW10 | | | | | |
| | | | PR1535 | | | | GW15 | GW15 | | | | | |
| Milling | | Finishing ↕ Roughing | TN100M | CA6535 | | | KPD230 | CA6535 | KPD230 | | | | |
| | | | TN620M | PR1225 | PR1210 | PR1210 | KPD001 | PR1225 | KPD001 | | PR015S | | |
| | | | PV60M | PR1525 | PR1510 | PR1510 | KPD010 | PR1535 | KW10 | | | | |
| | | | PR1225 | PR1535 | KW10 | KW10 | PDL025 | | PR905 | | | | |
| | | | PR1230 | | | | KW10 | | PR1210 | | | | |
| | | | | | | | GW25 | | PR1535 | | | | |

Highlighted materials are recommended choice.



Insert grades

Insert grades

A

Grade properties



Insert grades

Cermet

| Grade | Color | Main component | Coating layer | Ratio | Hardness of substrate | | Fracture toughness (MPa·m ^{1/2}) | Transverse strength (MPa) |
|--------|-------|----------------|---------------|-------|-----------------------|-------|--|---------------------------|
| | | | | | (HV) | (GPa) | | |
| TN610 | Gray | TiCN | - | 6.6 | 1,750 | 17.2 | 6.0 | 2,100 |
| TN620 | | | | 6.9 | 1,550 | 15.2 | 9.0 | 2,500 |
| TN620M | | | | 6.9 | 1,550 | 15.2 | 9.0 | 2,500 |
| TN6020 | | | | 6.4 | 1,500 | 14.7 | 10.0 | 2,500 |
| TN60 | | TiCN+NbC | | 6.6 | 1,600 | 15.7 | 9.0 | 1,760 |
| TN90 | | | | 6.4 | 1,450 | 14.2 | 10.0 | 1,960 |
| TN100M | | | | 6.7 | 1,520 | 14.9 | 10.5 | 1,860 |
| TC40N | | | | 6.0 | 1,650 | 16.2 | 9.0 | 1,570 |
| TC60M | | NbC | | 8.1 | 1,500 | 14.7 | 10.5 | 1,670 |

CVD coated cermet

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

PVD coated cermet

| Grade | Color | Coated composition | Coating layer | Ratio | Hardness of substrate | | Fracture toughness (MPa·m ^{1/2}) | Transverse strength (MPa) |
|--------|--------------|--------------------|---------------|-------|-----------------------|-------|--|---------------------------|
| | | | | | (HV) | (GPa) | | |
| PV710 | Gold | MEGACOAT NANO | Thin coating | 6.6 | 1,750 | 17.2 | 6.0 | 2,100PV730 |
| PV720 | | | | 6.9 | 1,550 | 15.2 | 9.0 | 2,500 |
| PV730 | | | | 7.0 | 1,550 | 14.2 | 10.0 | 2,500 |
| PV7005 | Blackish red | MEGACOAT | | 6.0 | 1,650 | 16.2 | 8.5 | 1,470 |
| PV7040 | | | | 6.0 | 1,650 | 16.2 | 9.0 | 1,570 |
| PV90 | Gold | TiN | | 6.4 | 1,450 | 14.2 | 10.0 | 1,960 |
| PV60M | Gold | MEGACOAT NANO | | 6.6 | 1,600 | 15.7 | 9.0 | 1,760 |

CVD coated carbide

| Grade | Color | Coated composition | Coating layer | Ratio | Hardness of substrate | | Fracture toughness (MPa·m ^{1/2}) | Transverse strength (MPa) | | | |
|--------|---------------|--|---------------|--------------|-----------------------|---------------|--|---------------------------|-------|------|-------|
| | | | | | (HV) | (GPa) | | | | | |
| CA310 | Rose Gold | TiCN+Al ₂ O ₃ +Ti base | Thick coating | 15 | 1,570 | 15.4 | 12.0 | 2,780 | | | |
| CA315 | | | | 15 | 1,570 | 15.4 | 12.0 | 2,780 | | | |
| CA320 | | | | 15 | 1,570 | 15.4 | 12.0 | 2,780 | | | |
| CA415D | Gold | TiCN+Al ₂ O ₃ +TiN | | 15 | 1,570 | 15.4 | 12.0 | 2,780 | | | |
| CA420M | | | | 14.5 | 1,600 | 15.8 | 13.0 | 3,400 | | | |
| CA4505 | Blackish gray | TiCN+Al ₂ O ₃ | | 15.0 | 1,790 | 17.5 | 9.5 | 2,350 | | | |
| CA4515 | | | | 15.0 | 1,570 | 15.4 | 12.0 | 2,780 | | | |
| CA510 | Gold | TiCN+Al ₂ O ₃ +TiN | | 14.5 | 1,470 | 14.4 | 11.5 | 2,500 | | | |
| CA515 | | | | 14.4 | 1,440 | 14.1 | 12.5 | 2,650 | | | |
| CA520D | | | | 14.7 | 1,370 | 13.4 | 16.0 | 3,100 | | | |
| CA025P | | | | 14.2 | 1,400 | 13.7 | 13.5 | 2,800 | | | |
| CA525 | | | | 14.2 | 1,360 | 13.3 | 13.5 | 2,750 | | | |
| CA530 | | | | 13.9 | 1,340 | 13.1 | 14.5 | 2,850 | | | |
| CA5505 | | | | 14.7 | 1,730 | 17.0 | 10.0 | 2,540 | | | |
| CA5515 | | | | 14.7 | 1,550 | 15.2 | 12.0 | 2,750 | | | |
| CA5525 | | | | 14.5 | 1,400 | 13.7 | 12.0 | 2,780 | | | |
| CA5535 | | | | 14.1 | 1,340 | 13.1 | 16.5 | 2,970 | | | |
| CA6515 | | | | Thin coating | 14.7 | 1,530 | 15.0 | 12.0 | 2,780 | | |
| CA6525 | | | | | 14.7 | 1,370 | 13.4 | 16.0 | 3,100 | | |
| CA6535 | | | | | 14.3 | 1,320 | 12.9 | 16.0 | 3,700 | | |
| CR9025 | | | | | TiCN+TiN | Thick coating | 14.5 | 1,400 | 13.7 | 12.0 | 2,780 |

A20

Grade properties

PVD coated carbide

| Grade | Color | Coated composition | Coating layer | Ratio | Hardness of substrate | | Fracture toughness (MPa·m ^{1/2}) | Transverse strength (MPa) |
|--------|---------------|--------------------|---------------|--------|-----------------------|-------|---|------------------------------|
| | | | | | (HV) | (GPa) | | |
| PR0055 | Gray black | MEGACOAT HARD | Thin coating | 15.0 | 1,750 | 17.2 | 8.0 | 2,000 |
| PR0155 | | | | 14.9 | 1,680 | 16.5 | 9.0 | 2,400 |
| PR905 | Bluish violet | TiAlN | | 14.8 | 1,720 | 16.8 | 9.0 | 2,450 |
| PR915 | | | | 14.1 | 1,700 | 16.7 | 11.0 | 4,140 |
| PR930 | Reddish gray | TiCN | | 14.1 | 1,700 | 16.7 | 11.0 | 4,140 |
| PR1025 | | | | 14.5 | 1,600 | 15.8 | 13.0 | 3,400 |
| PR1115 | Purple red | TiAlN | | 14.7 | 1,700 | 16.7 | 11.0 | 3,000 |
| PR1210 | Blackish red | MEGACOAT | | 14.8 | 1,720 | 16.8 | 9.0 | 2,450 |
| PR1215 | | | | 14.7 | 1,700 | 16.7 | 11.0 | 3,000 |
| PR1225 | | | | 14.5 | 1,600 | 15.8 | 13.0 | 3,400 |
| PR1230 | | | | 13.7 | 1,450 | 14.2 | 13.0 | 2,250 |
| PR1510 | Reddish green | MEGACOAT NANO | | 14.8 | 1,720 | 16.8 | 9.0 | 2,450 |
| PR1515 | | | | 14.7 | 1,700 | 16.7 | 11.0 | 3,000 |
| PR1525 | | | | 14.5 | 1,600 | 15.8 | 13.0 | 3,400 |
| PR1535 | | | | 14.3 | 1,320 | 12.9 | 16.0 | 3,700 |
| PR1625 | | | | 14.5 | 1,600 | 15.8 | 13.0 | 3,400 |
| PR1705 | | | | Silver | MEGACOAT NANO PLUS | 14.9 | 1,800 | 17.6 |
| PR1725 | 14.5 | 1,600 | | | | 15.8 | 13.0 | 3,400 |



Insert grades

Carbide

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

DLC coated carbide

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

