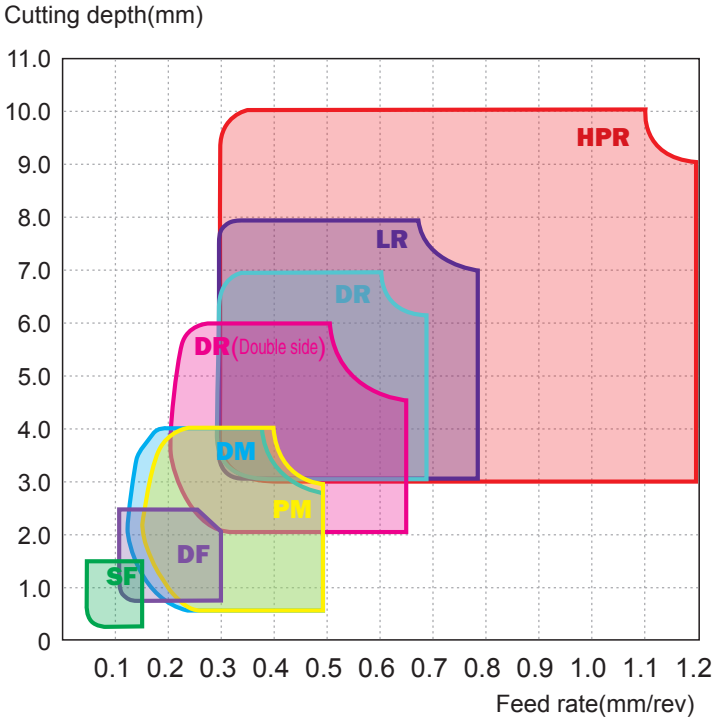
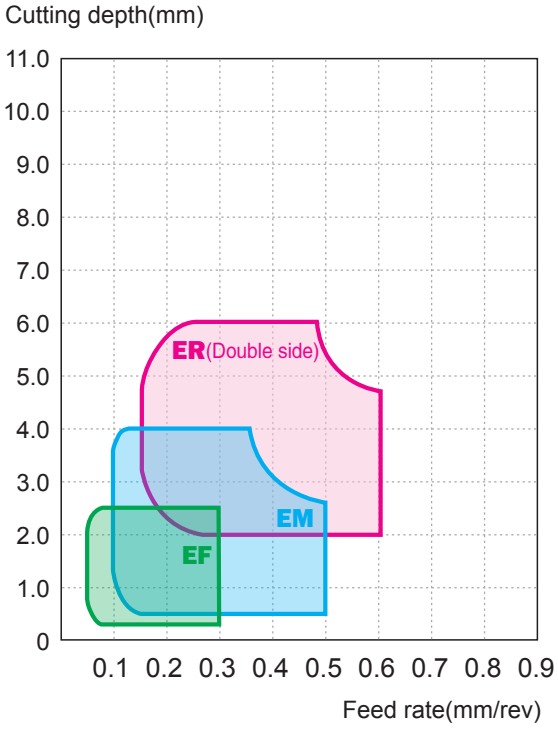
Chip breaking range reference for general turning inserts

Negative inserts

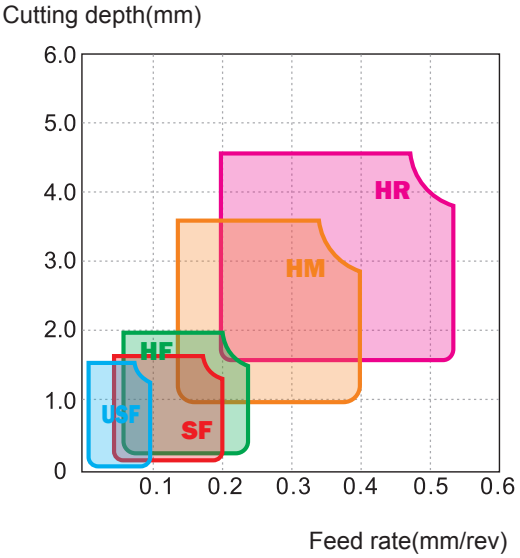


▶ Workpiece material: 45# steel

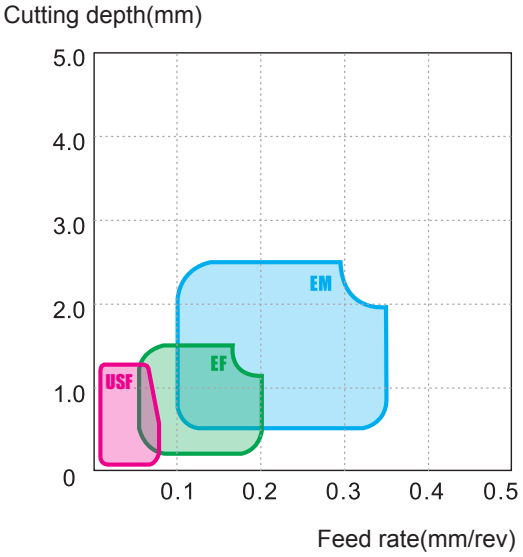


▶ Workpiece material: stainless steel (1Cr18Ni9Ti)

Positive inserts



▶ Workpiece material: 45# steel

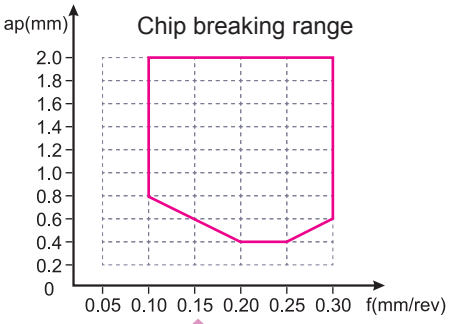


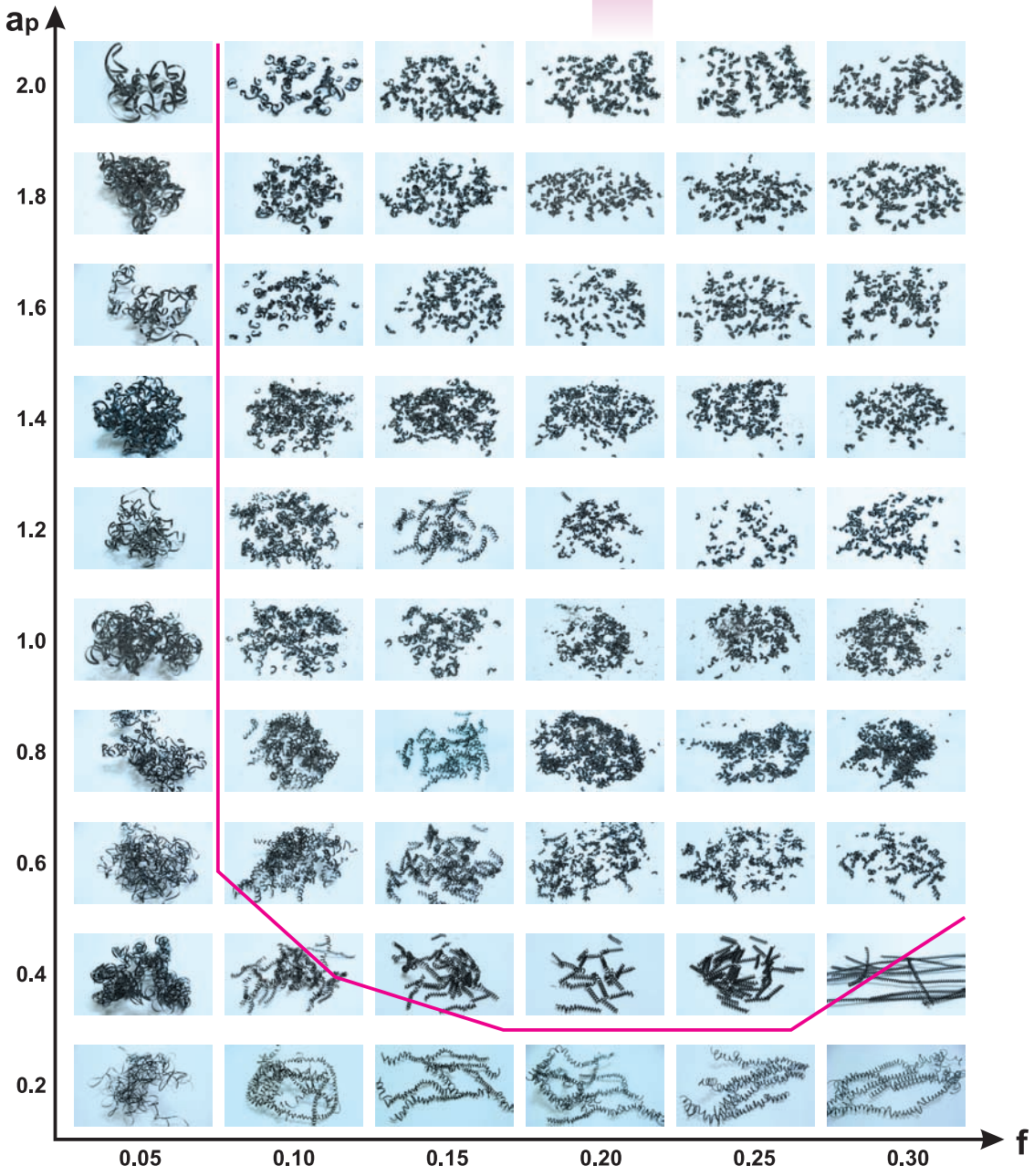
▶ Workpiece material: stainless steel (1Cr18Ni9Ti)

Cutting test for chip breaking range of general turning inserts

Case

Insert: CNMG120408-DF
Toolholder: PCLNL2525M12
Workpiece material: 45# steel
Cutting speed: 200m/min

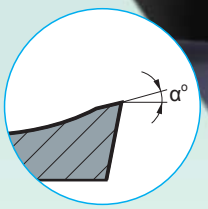




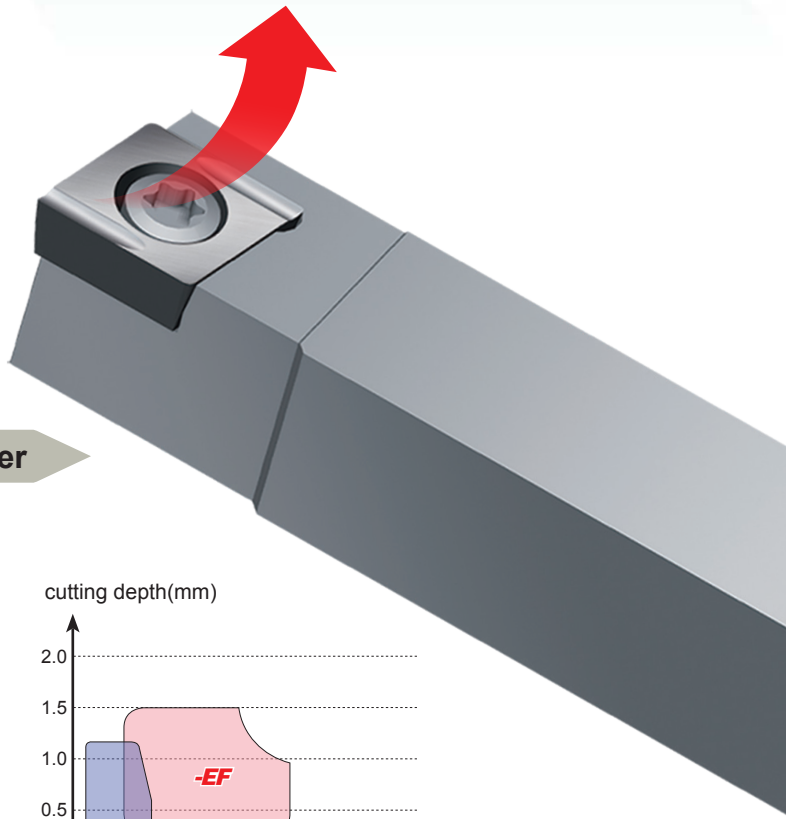
-USF

Precision turning chipbreaker

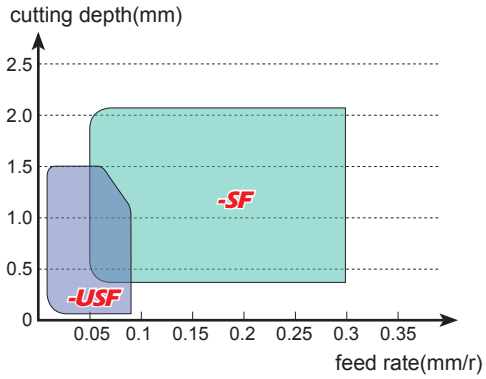
- Effective chip control due to the proper chipbreaker.
- Large rake angle makes cutting easier and faster.



- Nose radius precision controlled within 0.02mm for excellent machining precision.
- Special surface after-treatment for better surface quality.
- High strength screw clamping ensures good repeatability and accuracy .



Application range of USF chipbreaker



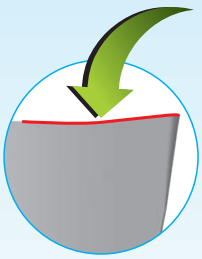
Workpiece material: 42CrMo

Workpiece material: 1Cr18Ni9Ti

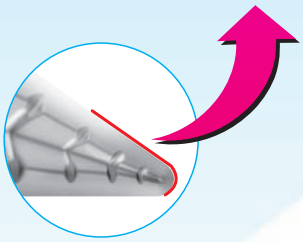
-LC chipbreaker for aluminum

- -LC inserts are designed with a special chipbreaker. Large rake angle and clearance angle make the cutting edge sharper, ensuring easier cutting while remaining effective chip breaking.
- Achieved the mirror rake face after special treatment. Reduced the friction resistence, and stick free. Accordingly, make the chip removal fluently and improve the surface quality and tool life.
- The G-class tolerance of insert, higher Repeated Position Accuracy, at the same time, it can effectively avoid the vibration during the machining process.

Optimized inclined angel makes controlling the chipping flow direction valid.

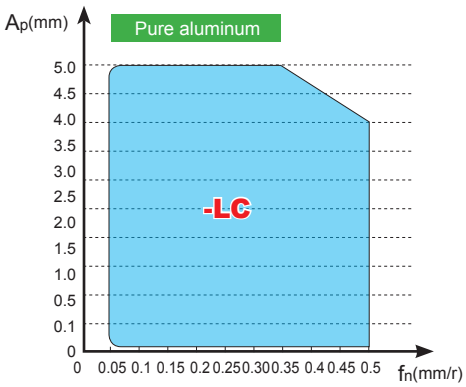


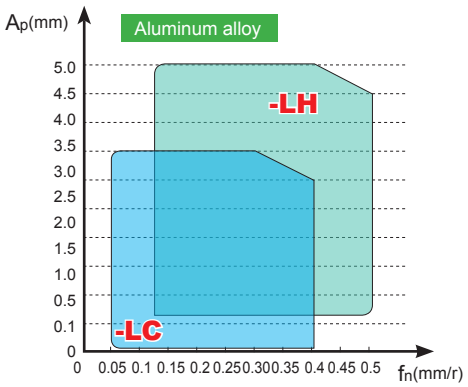
Smooth connection of insert nose and cutting edge makes rake face smoother.



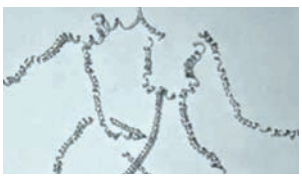
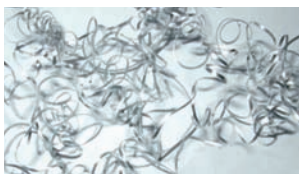
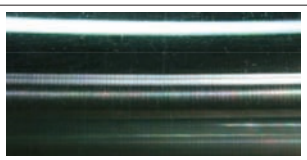
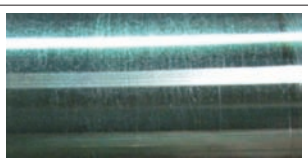
–LC and –LH chipbreaker characteristics and machining range

-LC chipbreaker can be used in machining of pure Al, while -LH chipbreaker can not.
-LC chipbreaker expand the chip breaking range of Al alloy machining.





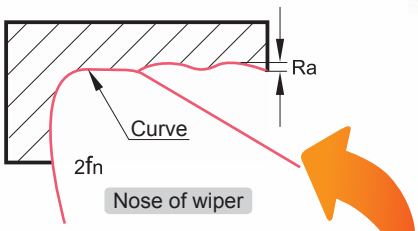
Workpiece material: Pure aluminum

Cutting parameters	V=350m/min Ap=0.2mm F=0.2mm/r	
Chips		
Surface quality		
	-LC chipbreaker	similar products from overseas manufacturers

- **-LH chipbreaker is more suitable for machining aluminum alloy in condition of large cutting depth and high feed rate.**
- **-LC chipbreaker is more suitable for machining aluminum alloy in condition of small cutting depth and low feed rate.**
- **-LC chipbreaker can be used in machining pure aluminum.**

-WGF/WGM

chipbreaker series
Turning inserts with wiper



High efficiency

Roughness remains the same when feed rate is doubled.

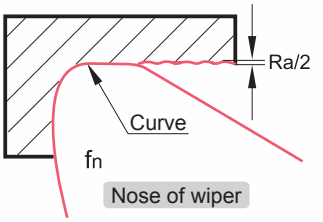
Wiper is assembled by three curves to form a circular arc edge. The nose of wiper provides less profile height on the surface that is formed by the cutting edge, resulting in a smooth turning surface.

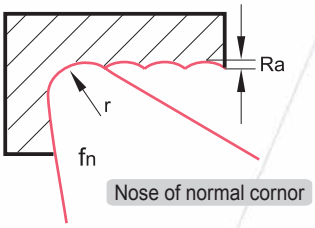
Inserts with wiper has high efficiency when used for finish and semi-finish turning. The surface quality remains the same even at double feed rate.

Wiper technique = high machining efficiency + high surface quality

High quality

Roughness value is reduced to half when feed rate remains the same.





When used for finishing, it can improve roughness of workpiece surface and achieve turning instead of grinding.
When used for semi-finishing, efficiency could be improved by doubling the feed rate, the roughness of workpiece surface remaining the same.

Guide to use

●Select reasonable approach angle of the tools

Minor angle being close to 0 degree is the reason that inserts with wiper can reduce roughness of the surface, which is determined by the shape of insert and approach angle of the tool holder. Therefore, acceptable roughness of surface is the result of reasonable approach (minor) angle. The finishing function of wiper would be reduced or invalid if unreasonable approach (minor) angle is chosen. For example, the approach angle should be 95°for CNMG / WNMG inserts, while 93°is the best for DNMX.TNMX inserts.

●Be careful with DNMX / TNMX inserts

DNMX / TNMX inserts with wiper don't have wide application. It cannot achieve a wiper result when minor angle is not 0 degree, like chamfer and profile surface, and will even cause over-cutting or no-cutting on workpiece, affecting the shape and size precision of workpiece. Please contact technical service regarding these problems.

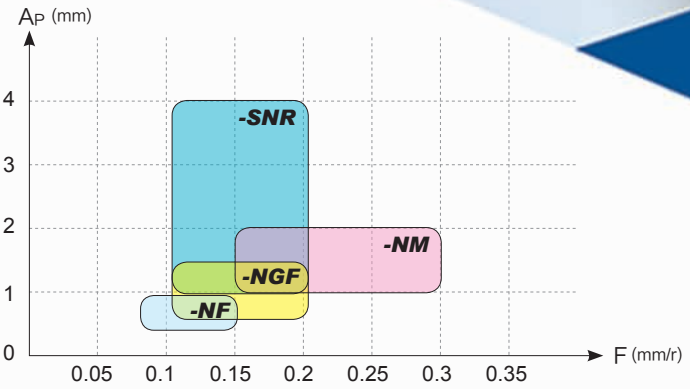
S- Ni-based Superalloy Machining

Difficulties Overcame

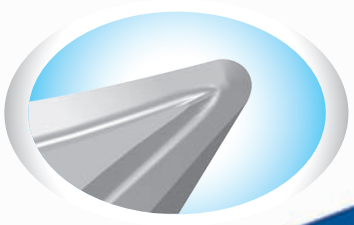
Features of Ni-based superalloy machining

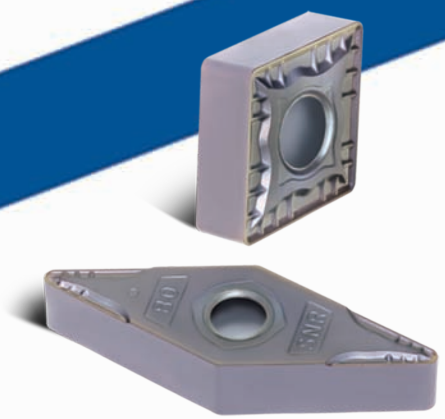
- High cutting resistance (containing a large amount of alloying elements, severe hardening, great plastic deformation ;
- High cutting temperature;
- Severe wear of inserts.

Chipbreaker for machining of Ni-based superalloy should have tough and sharp insert nose, smooth rake face and proper inclination angle.



-NM for semi-finishing ***-SNR*** for high efficiency roughing
-NF for finishing ***-NGF*** for general finishing





-SNR Chipbreaker for roughing with large depth of cut

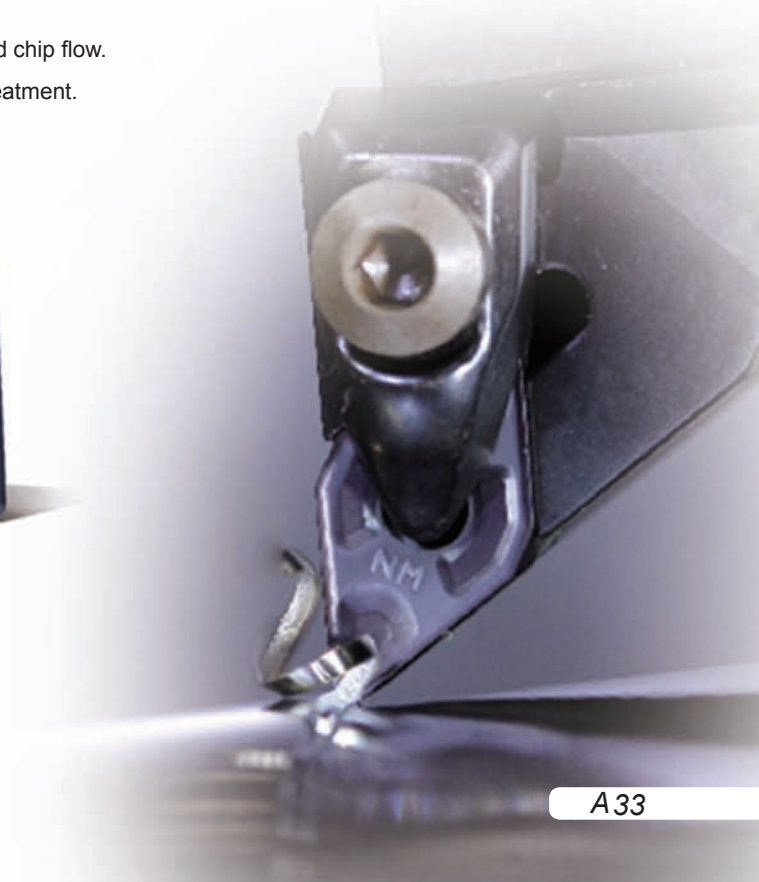
- Positive rake angle design, sharp cutting edge, low cutting resistance, effectively reducing groove wear;
- Cutting edge with variable rake angles increase cutting edge strength at large depths of cut. Edge strength increases as the depth of cut increases;
- Large slot width combined with unique edge rib design not only provides excellent chip breaking performance but also can effectively improve edge strength.

-NGF Chipbreaker for General Finishing

- Proper inclination angle design, sharp cutting edge, small cutting resistance;
- E-level tolerance of insert, high clamping accuracy, proper chipbreaker width, good chip breaking performance,excellent surface quality;
- Special edge treatment, high wear resistance.

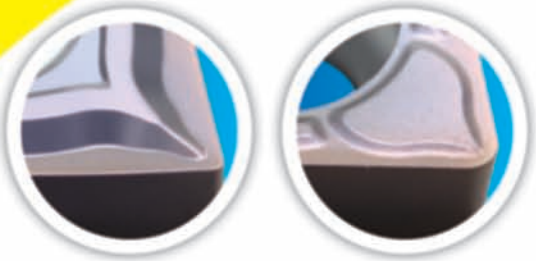
-NF/NM Chipbreaker for General Finishing

- -NF chipbreaker has sharp cutting edge, while -NM chipbreaker high cutting edge strength.
- Smooth surface of chipbreaker ensures unobstructed chip flow.
- High wear resistance of cutting edge after special treatment.



-EF -EM -ER

Specially designed for machining intensively adhesive and high-plasticity materials such as stainless steel, etc

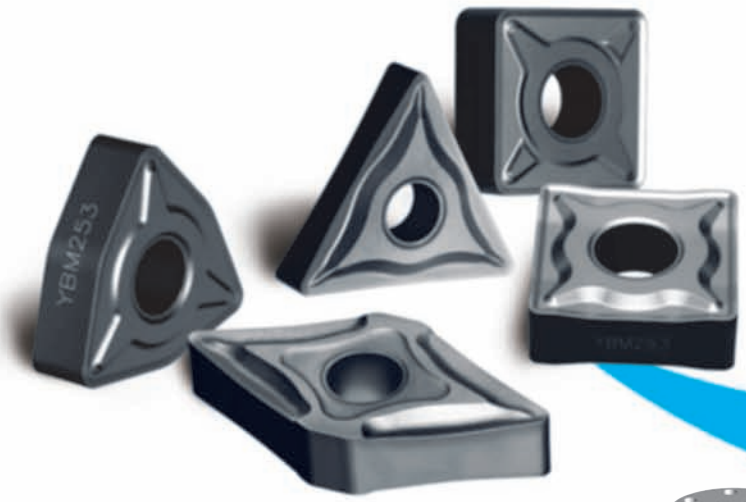


-EF

Rake angle and inclined angle are specially designed for intensively adhesive stainless steel and high-plasticity materials which are hard to be machined. Sharp cutting edge enables it to cut lightly and easily and achieve good surface quality by well controlling chip breaking. It is especially suitable for finishing these kinds of materials.

-EM

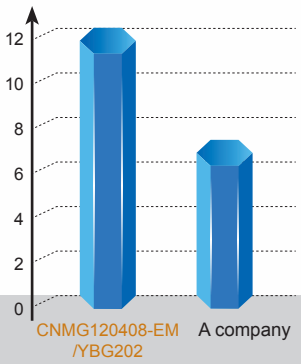
Inserts meet the requirements of machining intensively adhesive materials. Impact resistance of cutting edge is improved in addition to sharpness, which makes it suitable for semi-finishing and intermittent machining of adhesive materials such as austenitic stainless steel, etc.

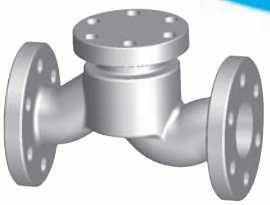


-ER

Specially designed double rake angle with wide land achieves balance between edge security and sharpness, and effectively reduces cutting resistance and wear on groove.

Number of machined parts / Cutting edge

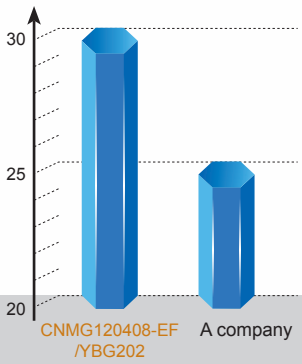




Machining external of valve

Machining end surface of valve
(intermittent machining)
Workpiece diameter:135mm
Rotating speed:350rpm
Feed rate:0.25mm/r
Cutting depth:1.5mm

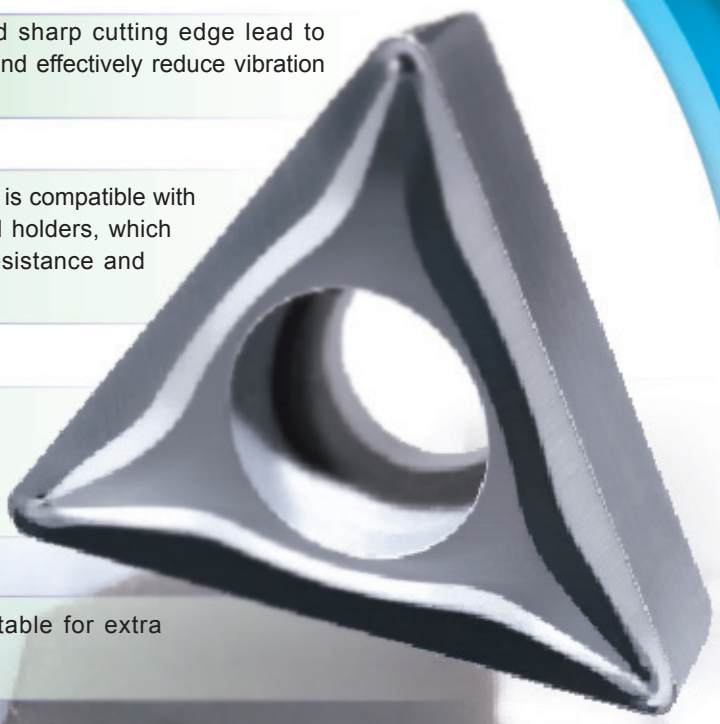
Number of machined parts / Cutting edge

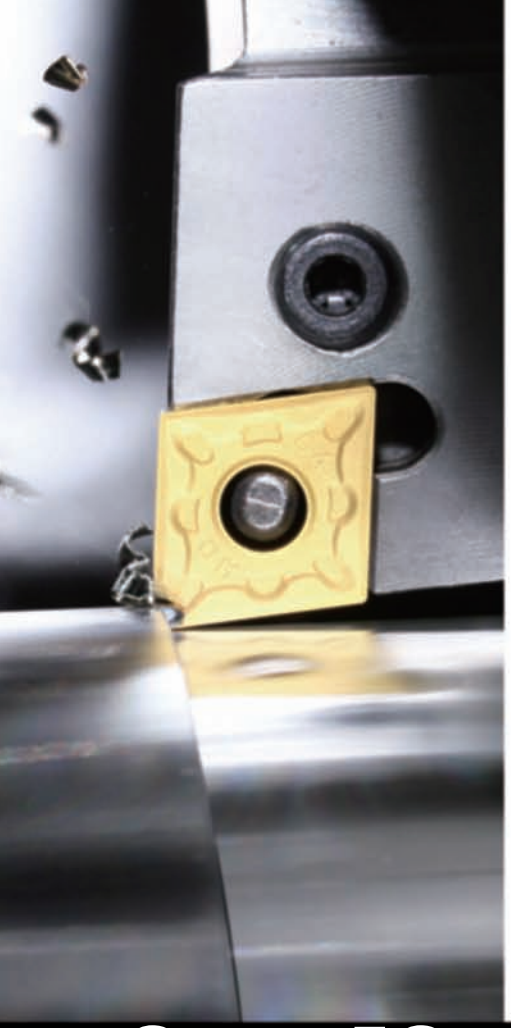


Machining external of valve
Workpiece diameter:89mm
Rotating speed:635rpm
Feed rate:0.15mm/r
Cutting depth:1.0mm

-SF Chipbreaker for finishing

- Unique nose design and sharp cutting edge lead to small cutting resistance and effectively reduce vibration of the tool holder.
- With high re-positioning precision, the insert is compatible with specially developed cemented carbide tool holders, which can increase the capability of vibration resistance and improve machining quality.
- Special treatment on insert's surface can reduce the possibility of chips adhering to the rake face of insert. Good performance of chip breaking and chip flowing ensures improved surface quality of workpiece.
- By adopting excellent grade, it is suitable for extra finishing of various materials.





YBC151

The combination of substrate with excellent wear resistance and coating composed of MT-TiCN, thick layer of Al_2O_3 and TiN makes it suitable for finishing steel.

YBC251

The substrate with good toughness and high security of cutting edge, in optimal combination with coating composed of MT-TiCN, thick layer of Al_2O_3 and TiN makes it suitable for steel semi-finishing.

YBC351

The best combination of substrate with high wear resistance and coating composed of MT-Ti (CN), thick Al_2O_3 layer and TiN makes it suitable for finishing and semi-finishing of cast iron materials.

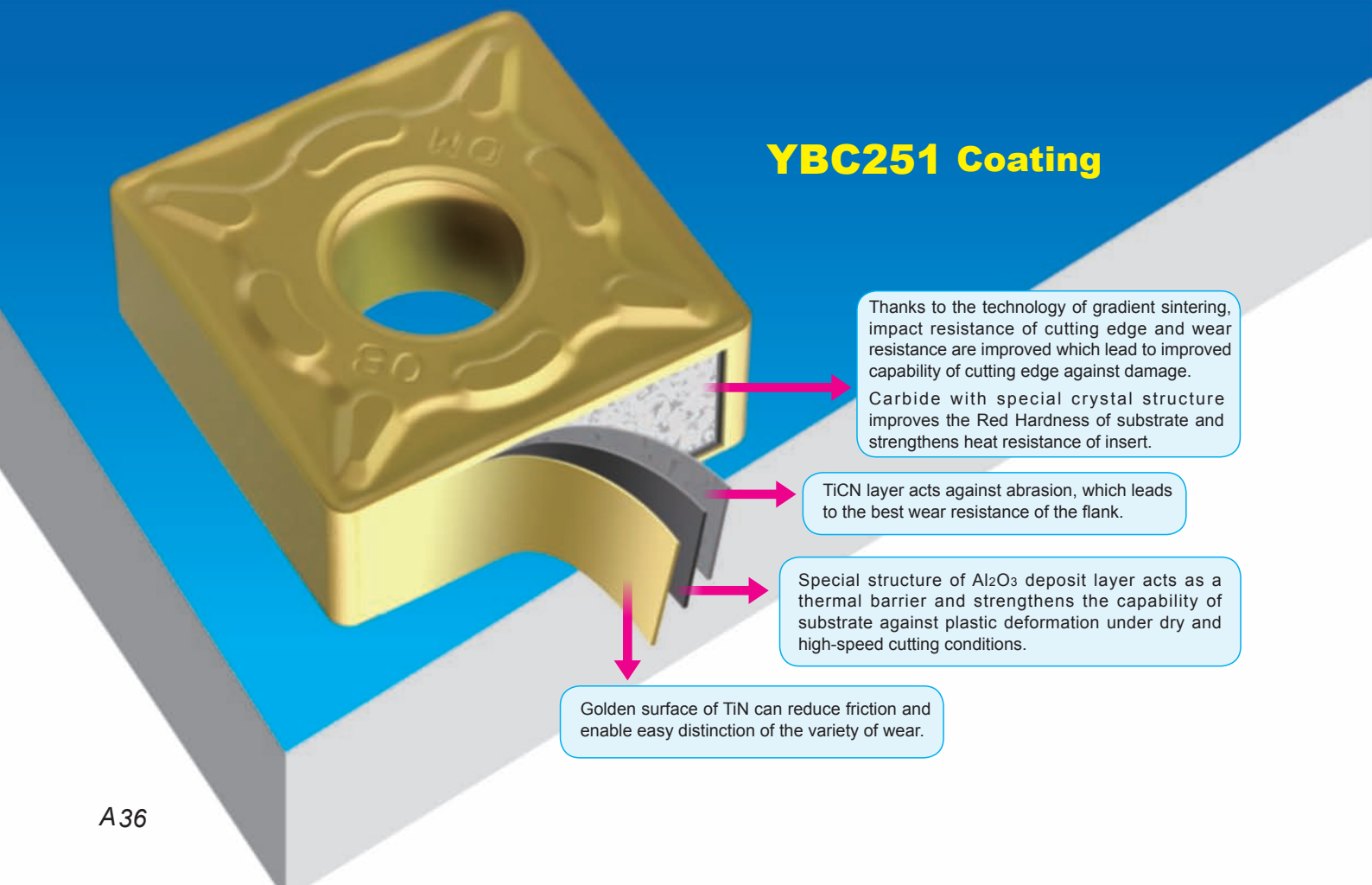
YBM151

Substrate with special structure, in combination with coating composed of TiCN, thin Al_2O_3 layer and TiN, with excellent resistance against diffusive wear and plastic deformation makes it suitable for finishing, semi-finishing and roughing of stainless steel.

YBM251

Combination of substrate with good toughness and strength and coating composed of TiCN, thin Al_2O_3 layer and TiN makes it suitable for semi-finishing and roughing of stainless steel.

Coated Cemented Carbide CVD

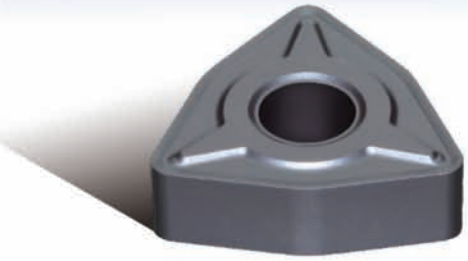


BLACK DIAMOND INSERTS

Innovation of machining techniques for stainless steel turning

YBM

YBM153



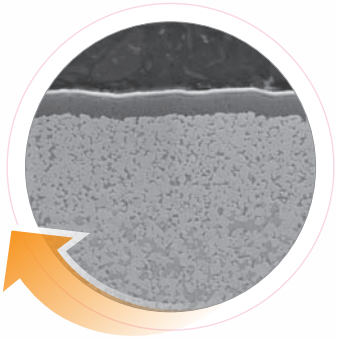
Best choice for roughing of stainless steel with high-speed under good working condition

Coating

- CVD coating with advanced ultra-fine grain coating technology, greatly improves wear resistance of inserts.
- Thanks to special treatment on transition layer, multi-layer coating are combined firmly.
- The exceptionally smooth coating surface and good low friction ability can reduce the occurrence of built-up edges.

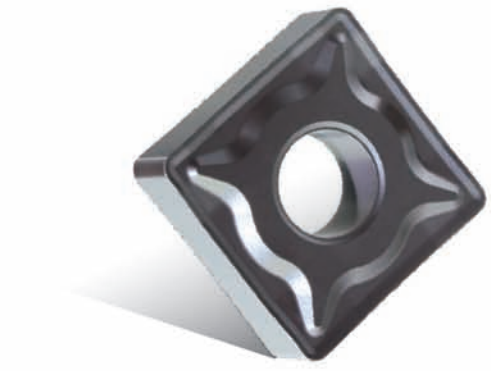
Substrate

- Added with resist high temperature rare element, inserts shows a good capability against plastic deformation and good capability of Red Hardness.
- Unique manufacturing technology improves high temperature toughness and wear resistance of substrate.



Application fields YBM153 is suitable for finishing and semi-finishing of stainless steel with high cutting efficiency under stable working condition. Such as medium-size fluid valve components in petrochemical industry, flange and other parts in auto pipeline, valve and valve body in auto engine systems, ship mechanical parts, aviation hydraulic parts, adapting pieces in IT and semiconductor industry, medium and long-axis in food processing machinery, construction machinery and general machinery.

YBM253



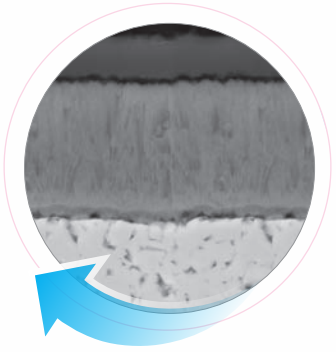
Ideal grade for turning of stainless steel with high cutting depth and high feed rate under bad working condition

Coating

- Ultra-fine grain coating technology provides better wear resistance and toughness;
- Improved remain internal stress design ensures good toughness and anti-cracking performance;
- Polishing treatment on coating surface makes it suitable for cutting adhesive materials.

Substrate

- With gradient carbide substrate insert has better impact resistance and cutting edge strength.



Application fields YBM253 grade is suitable for roughing of heavy stainless steel parts with high cutting depth and high feed rate under the condition with great impact.




BLACK DIAMOND INSERTS

Achieving both higher cutting speed and longer tool life

Second generation of YBC

Coated Cemented Carbide CVD

YBC152

Thick TiCN and thick Al_2O_3 coatings improve the impact toughness and abrasion resistance, which makes it suitable for finishing and semi-finishing of steel at high speed. Cutting speed can increase by more than 25%, while the tool life can increase by more than 30% at the same cutting speed.

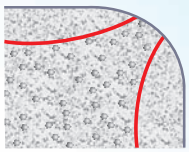
YBC252

Comprising of thick TiCN and thick Al_2O_3 coatings, the grade has high capability against plastic deformation and good hardness of cutting edge. It is preferred grade for machining of steel from finishing to roughing. Under the same cutting conditions, the cutting speed can be increased by more than 25%, while the tool life can be 30% longer under the same cutting speed.

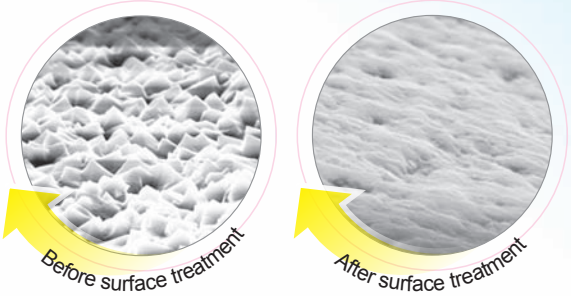
YBC352

Thickness TiCN and Al_2O_3 coating, with strongest toughness and plastic deformation resistance, the ideal grade for high efficient steel rough machining under the bad condition.

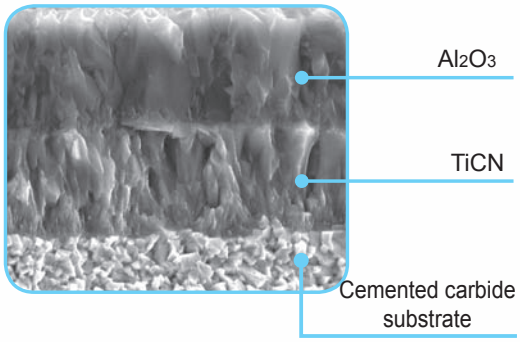
Perfect unification of toughness and anti-plastic deformation.
Specially designed cutting edge with “skeleton” realizes perfect unification of toughness and anti-plastic deformation.



Roughness of insert surface is improved after special treatment on surface, which effectively reduces cutting forces, prevents workpiece adhering to surface of inserts and improves operation stability of inserts.



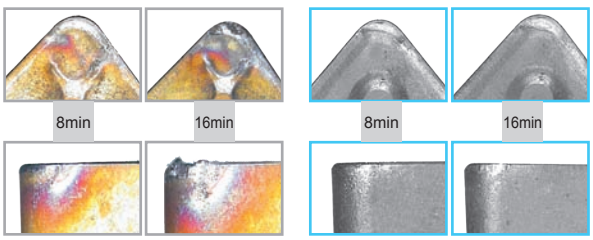
The perfect combination of fibrous TiCN and fine grain Al_2O_3 obviously improves abrasion resistance and anti-breakage of inserts.



Test comparison of inserts abrasion

Workpiece material：45#steel
Inserts：CNMG120408-DM
Cutting parameters：Vc=400m/min　a_p=1mm　fn=0.2mm/r

Grade from other company　　YBC152



YBD052

CVD coated grade, which is characterized by super fine grain and smooth surface, is the combination of hard substrate and coating (extra thick Al_2O_3 + thick TiCN). The grade is optimized for best wear resistance when machining gray cast iron at high speed under dry condition.

YBD102

CVD coated grade, which is the combination of hard substrate and coating (thick Al_2O_3 + thick TiCN), shows excellent wear resistance and impact resistance when machining nodular cast iron at high speed.

YBD152

CVD coated grade, which is the combination of hard substrate and coating (medium thick Al_2O_3 + thick TiCN), has good flaking resistance. It is suitable for turning of cast iron at high speed, and light intermittent cutting can be supported even at moderate speed. It is also suitable for milling of cast iron.

YBD252

CVD coated grade, which is the combination of hard substrate and coating (medium thick Al_2O_3 + thick TiCN), achieves the balance between wear resistance and toughness. It is suitable for wet milling of cast iron, which requires toughness (such as nodular cast iron) at moderate or low speed. It is also suitable for intermittent turning.

BLACK DIAMOND INSERTS YBD

First choice for high-efficiency and high-speed machining of cast iron

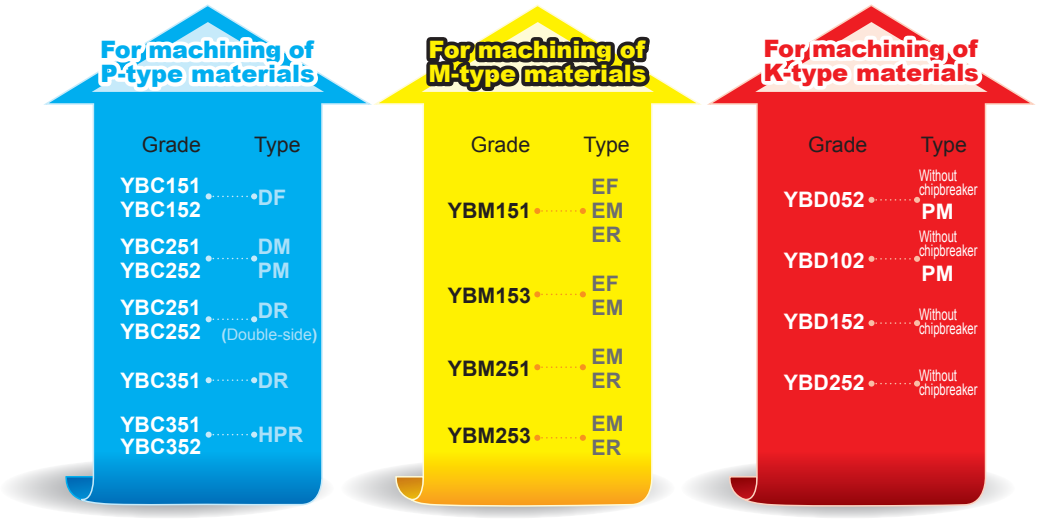
- The combination of thick coating and substrate with good hardness and impact resistance gives the inserts excellent impact resistance and stability under high temperature, and improves wear resistance of inserts. Inserts also satisfy the requirements of high speed and high feed rate when machining cast iron.
- The appearance of shining full black is easily identified.

Layer of fine grain with compact surface

Significant results

- Working efficiency has been improved. Both the coating and the substrate are suitable for machining cast iron at high speed and high feed rate. Cutting speed can be increased by **30% to 40%**.
- Cost is reduced as tool life is increased by **40%-50%**.
- High machining stability.

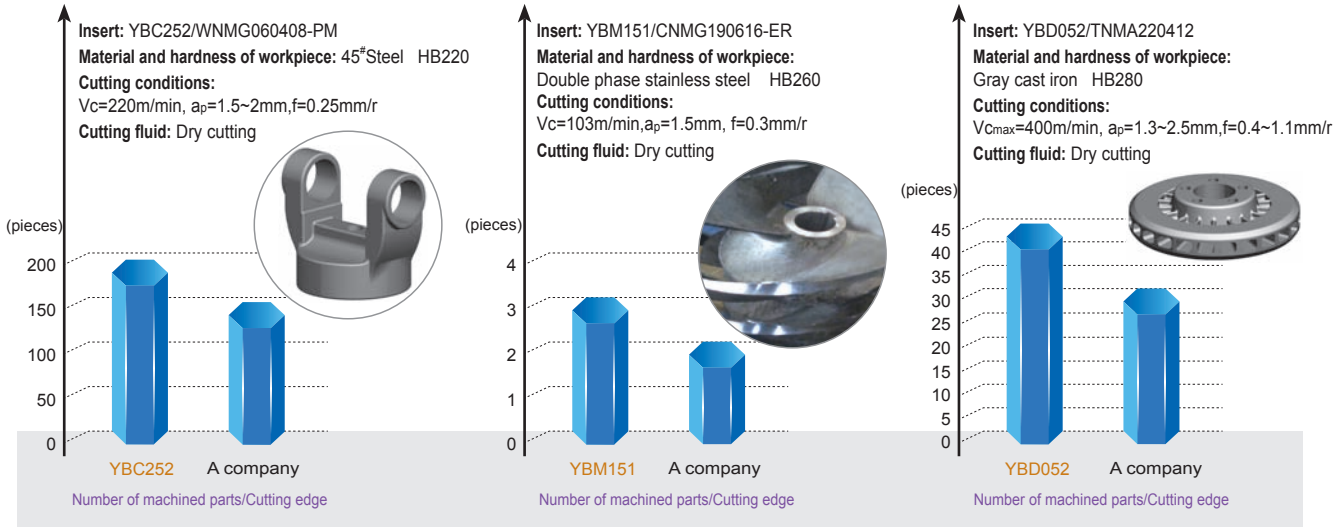
Recommended combination of grade and chipbreaker



Recommended cutting parameters

Workpiece material	Range of machining	Grade	Recommended cutting speed(m/min)
P Steel	For finishing	YBC151	180-460
		YBC152	220-500
	For semi-finishing	YBC251	160-440
		YBC252	180-480
	For roughing	YBC351	130-380
		YBC352	
M Stainless steel	For finishing For semi-finishing For roughing	YBM151 YBM153 YBM251 YBM253	110-280
K Cast iron	For finishing	YBD052	200-500
		YBD102	200-480
	For semi-finishing	YBD151	180-450
		YBD152	190-450
	For roughing	YBD252	150-380

Case

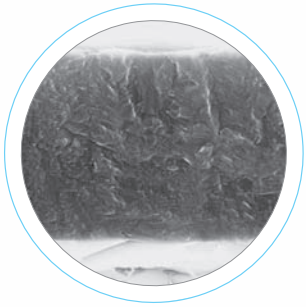


Coated Cemented Carbide PVD

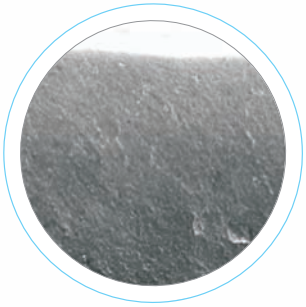
makes it easy to machine materials which are hard to be machined

New nano coating grade

- Special coating techniques make inserts smooth, which leads to low friction and unobstructed chip flow.
- Unique coating with nano structure closely integrates with substrate, ensuring higher hardness and toughness.
- Excellent thermal stability and chemical stability can effectively protect cutting edge.



nc-TiAlN coating(YBG202)



TiAlN base multi-elements coating (YBG105)

High-performance nanostructure coating guarantees good toughness and hardness of inserts. Special coating technology guarantees smooth surface and excellent wear resistance. Outstanding thermal stability and chemical stability effectively protect cutting edge.

YBG102

The combination of nc-TiAlN coating and fine grain substrate makes it suitable for turning of various materials and finishing and semi-finishing of high-temperature alloys.

YBG202

nc-TiAlN coating and ultra-fine grain substrate makes it suitable for finishing and semi-finishing of various materials and turning of super alloy.

YBG302

The combination of nc-TiAlN coating and tough cemented carbide substrate, which integrates security and wear resistance, makes it suitable for parting and grooving of various materials.

YBG105

Finishing and semi-finishing for materials difficult to cut PVD coated grade

PVD coated grade, new TiAlN based multilayer coating, has higher wear resistance and Anti-thermal-oxidation ability. It is suitable for finishing and semi-finishing turning of various materials difficult to cut, such as high temperature alloy, heat resistant alloy, etc.

YBG205

PVD coating grade for finishing of stainless steel

Suitable for relatively small workpieces which require high surface smoothness.

Superfine TiAlN nano coating added with wear-resistant and heat-resistant rare elements has high hardness and excellent heat-resistance, providing effective protection for the cutting edge. Special coating technology ensures stronger combination of coating and substrate. It is suitable for extra finishing of stainless steel.

YBG212

Nc-TiAlN coating combined with super tough substrate which made of super fine grain.It's suitable for finishing and roughing materials which are hard to be machined.

YBS103 New

Turning grade for Ni-based S material

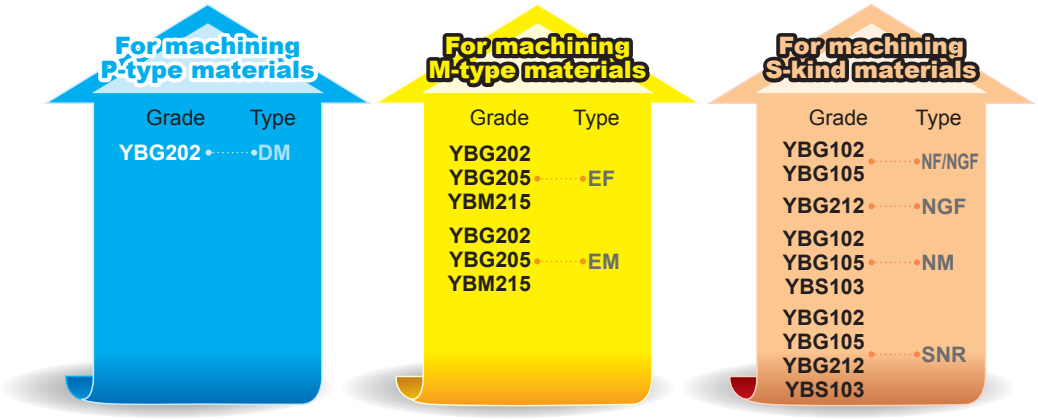
Fine wear resistance, and good capability against built-up edge and heat resistance. Suitable for turning of Ni-based materials.

YBM215 New

PVD coating of multiple layer nanometer

Improved capability of grade's wear resistance and anti-high temperature increases the strength between grade and substrate and the tool stability. This grade is very suitable for turning for stainless steel.

Recommended combination of grade and chipbreaker

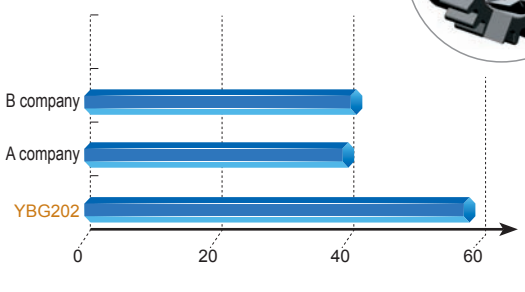


Recommended cutting parameters

Workpiece material	Range of machining	Grade	Recommended cutting speed(m/min)
P Steel	For finishing	YBG102	180-460
	For semi-finishing	YBG202 YBG205	150-380
M Stainless steel	For finishing～for semi-finishing	YBG202 YBG205 YBM215	170-300
S Heat resistant Alloy Ti alloy	For finishing～for semi-finishing	YBG102	30-60
		YBG105	40-70
		YBG212	30-50
		YBS103	40-90
	For roughing	YBG102	20-40
		YBG105	30-40
		YBG212	20-40
		YBS103	20-50

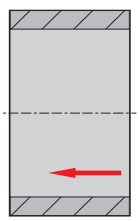
Case

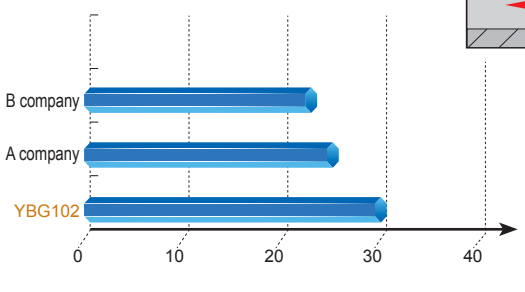
Insert : YBG202/TNMG120404-EF
Hardness and material of workpiece : 0Cr18Ni9 HB240
Cutting conditions : Vc=200m/min, a_p=1mm, f=0.15mm/r
Cutting fluid : Dry cutting



Number of machined parts/Cutting edge

Insert : YBG102/DNEG150404-NF
Hardness and material of workpiece :
High temperature alloy Inconel 718 HRC≥39
Cutting conditions : Vc=80m/min, a_p=0.3mm, f=0.15mm/r
Cutting fluid : Dry cutting





Tool life (min)

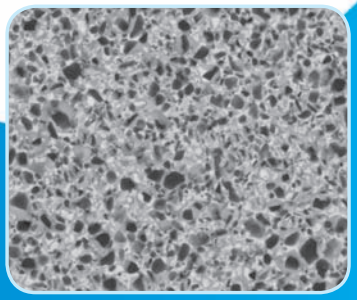
Cermet & Coated Cermet

The chemical stability between Ti(CN) base cermet inserts and workpieces is relatively high, which reduces the friction and temperature of the cutting edge during cutting, preventing mutual diffusion of atoms of the workpiece material and the inserts, and improving resistance to bonding abrasion. Therefore, Ti(CN) base cermet shows good capability of Red Hardness and resistance to crater wear. It is an optimal material for high-speed finishing and semi-finishing of steel. High temperature strength of cermet is higher than that of WC-Co, and toughness better than that of Al_2O_3 and Si_3N_4 ceramic. This fulfils the application blank of WC-base cemented carbide and Al_2O_3 and Si_3N_4 ceramic from finishing to semi-finishing at high speed.

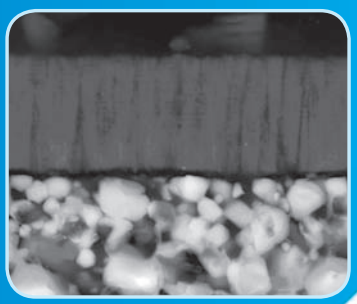
Product features

Scientifically designed structure ensures good material performance and long tool life. Refined production management assures the stability of product quality.

- Symmetrical fine grain organization, together with the control of symmetrical organization and toric phase structure, improves the strength and hardness of cermet.
- Intensified bonding phase and well-designed grain boundary improve the high temperature capacity, heat conductibility and thermal vibration resistance.
- Coating of Physical Vapor Deposition (PVD) is applied to cermet substrate with high toughness, so that the grade has high hardness and toughness with wide-range application.



Substrate of cermet grade of YNG151 (homogenized ultra-fine structure)



PVD coating organization structure of cermet

Recommended cutting parameters

Workpiece material	Range of machining	Grade	Recommended cutting speed(m/min)
P Steel	For finishing	YNG151	260-550
		YNG151C	260-580
M Stainless steel		YNG151	170-330
		YNG151C	160-350
K Cast iron		YNG151	250-400
		YNG151C	270-420

Case

Insert: YNG151/CNMG120404-SF

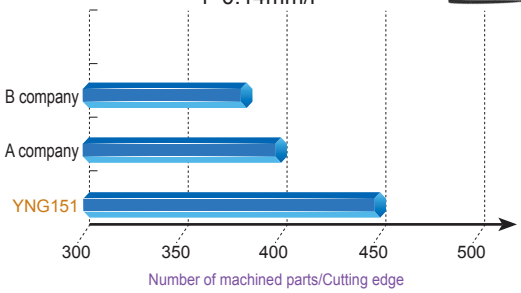
Hardness and material of workpiece:

20CrMnTi HB180-223

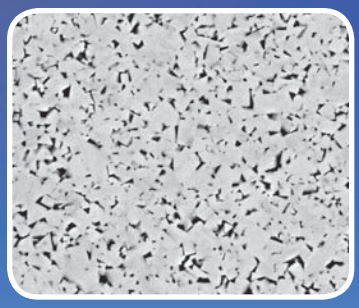
Cutting parameters: V_c=220m/min

a_p=0.5~1.0mm

f=0.14mm/r



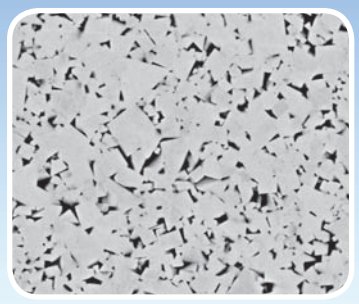
Outstanding chip breaking Good surface quality



Substrate of YD101: the combination of cemented carbide phrase WC of fine grain and bonding phase Co

Cemented Carbide Grade

Uncoated cemented carbide grade is widely used for machining of non-ferrous metal, high temperature alloy, etc. It is economical and can be universally applied.



Substrate of YD201: the combination of cemented carbide phase WC of middle grain and bonding phase Co

Recommended cutting parameters

Workpiece material	Range of machining	Grade	Recommended cutting speed(m/min)
K Cast iron	For semi-finishing For roughing	YD201	60-130
N Non-ferrous metal	For finishing For semi-finishing	YD101	110-1750
S Heat resistant Alloy Ti alloy	For finishing	YD101	20-50

Case

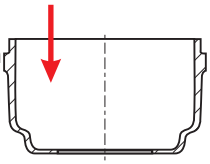
Insert：YD101/CCGX09T304-LH

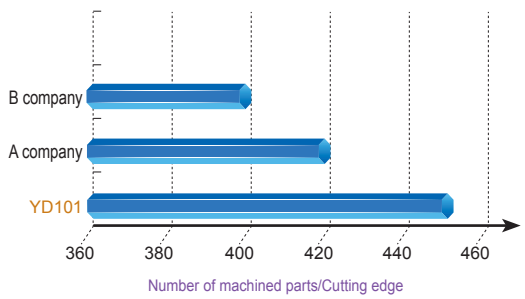
Workpiece material：ZL105 HB70

Cutting parameters：Vc=400m/min

a_p=1mm

f=0.3mm/r

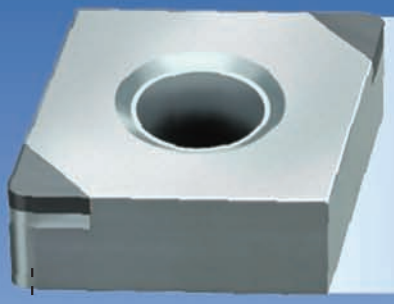


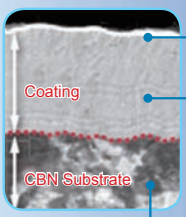


Workpiece has high surface quality and high dimensional precision.

PCBN

PCBN tool material has high hardness, high thermal stability and high chemical inertness,There will be no chemical reaction with iron materials under the high temperature, the cutting temperature can reach 1200-1300℃ ,Suitable for cutting hardened steel, cast iron, powder metallurgy and high temperature alloys.





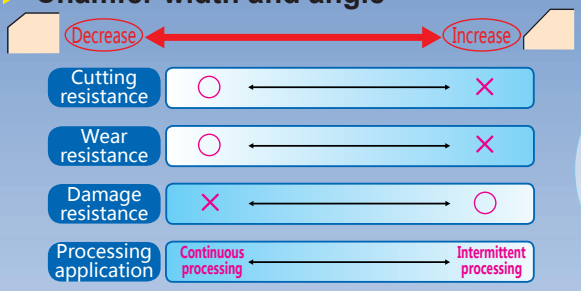
High-performance special ceramic coating

Incorporate a solid interface

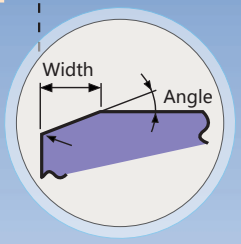
High wear resistance and good toughness

- **High hardness and high heat resistance to achieve tool long life and high-speed processing;**
- **Effectively inhibit crater wear and realize stable processing;**
- **Improve the stress of the matrix and reduce the micro chipping and spalling of the cutting edge.**

Chamfer width and angle

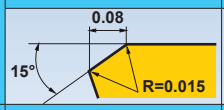
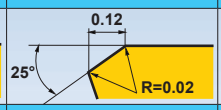
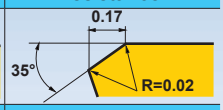
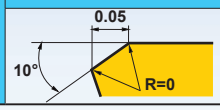
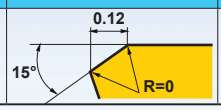
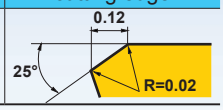


The shape of chamfering



Cutting edge specifications of PCBN inserts

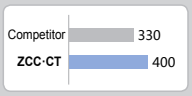
(The form below is just for typical example, the actual application shall be adjusted according to the corresponding situation.)

High hardness material processing	Low cutting force	Universal type	Highly damage resistance
			
Cast iron processing	Low cutting force	Universal type	High intensity of cutting edge
			

Case

Machining differential gears

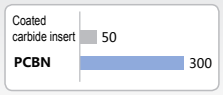
Workpiece material: carburizing steel 20CrMnTi, HRC58-62
Insert model: VNGA160404AS01225-2
Grade: BH0121
Cutting parameters: Vc=130m/min; f=0.1mm/r; ap=0.15mm
Processing method: turning the side of the inner groove
Cooling method: dry cutting
Processing requirements: surface finish Ra ＜ 0.8μm



- **21% increase in processing life**
- **42% savings in insert cost**

Machining cylinder liner

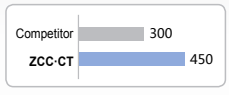
Workpiece material: gray cast iron HT250, HB220
Insert model: CNGA120416AS01015-2
Insert grade: BK1011
Cutting parameters: Vc=600m/min; f=0.2mm/r; ap=0.15mm
Processing method: turning outer circle
Cooling method: wet cutting
Processing requirements: surface finish Ra ＜ 1.6μm and no dimension deviation.



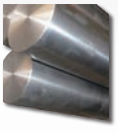
- **Machining life increased by 5 times**
- **Processing efficiency increased by 1 times**

Machining of high-temperature alloy bars

Workpiece material: nickel-based alloy Inconel 718, 43-48HRC
Insert model: VBGW160404AT01225-2
Insert grade: BS3011
Cutting parameters: Vc=150m/min; f=0.15mm/r; ap=0.25mm
Processing method: turning outer circle
Cooling method: dry cutting
Processing requirements: flank wear ≤ 0.2mm



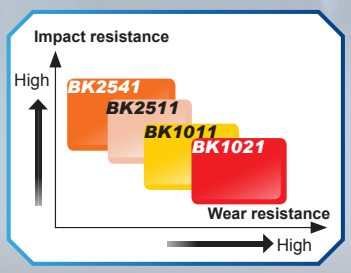
- **Machining life increased by 6 times**
- **Processing efficiency increased by 5 times**



Coated PCBN insert

By using a combination of strong PCBN substrate and heat-resistant ceramic coating,developed a new super-hard series product——Coated PCBN inserts, dedicated used for cutting all kinds of hardened steel. The tool life of coated PCBN inserts have been greatly improved, being compared with previous uncoated PCBN inserts.

K Cast iron processing category:



Finishing

BK1011 Extremely high wear resistance and edge retention;
Suitable for continuous to intermittent high-speed finishing, and capable of achieving consistent surface quality.

BK1021 Excellent wear resistance and good impact resistance;
Suitable for continuous to intermittent heavy-duty roughing, good versatility.

Typical applications: brake discs, brake drums, cylinder liners, compressor parts.

Semi-finishing / Roughing

BK2511 Great wear resistance and outstanding chemical stability;
Suitable for continuous to interrupted high speed roughing.

BK2541 Very high wear resistance and excellent fracture toughness;
Suitable for continuous to interrupted finishing, good versatility.

Typical application industries: brake discs, brake drums, cylinder liners, compressor parts, rolls, slurry pumps.

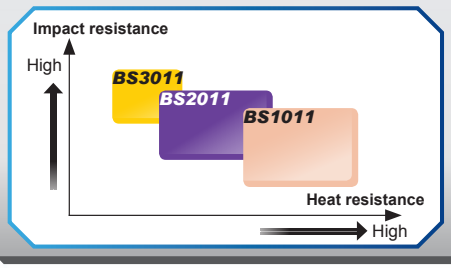
S Powder metallurgy and high temperature alloy processing category:

Finishing

BS1011
Excellent wear resistance and chemical stability;
Suitable for machining powder metallurgical parts in continuous to lightly interrupted operation;
Suitable for machining powder metallurgical parts with more than 10% alloying elements.

BS2011
Excellent heat resistance and chemical stability;
Suitable for continuous to lightly interrupted machining of powder metallurgical parts;
Suitable for processing powder metallurgical parts with an alloying element content of up to 10%.

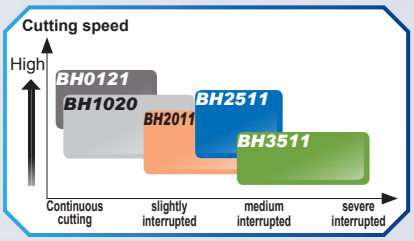
BS3011
Very high hardness and wear resistance.
Suitable for continuous to interrupted machining of powder metallurgy and high temperature alloy parts.
Typical application industries: automotive parts, high temperature resistant parts.



H Hardened steel processing:

Finishing

BH0121
Excellent heat and wear resistance;
Suitable for continuous to lightly interrupted high-speed finishing;
Suitable for machining carburized hardened steel such as 20CrMnTi, 20CrMn, 18Cr2Ni4WA, etc.

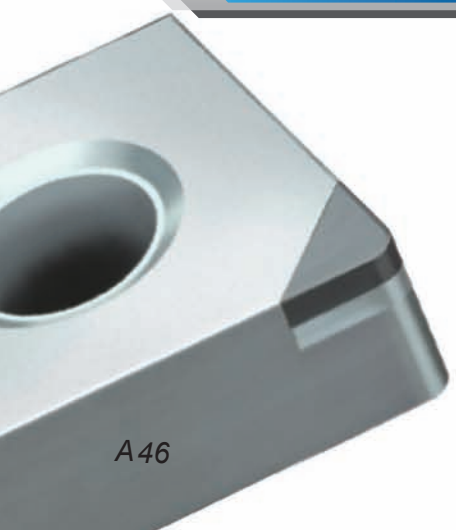


BH2511
Excellent heat resistance and impact strength;
Suitable for continuous to moderate intermittent finishing;
Suitable for machining carburized hardened steels such as 20CrMnTi, 20CrMn, 18Cr2Ni4WA, etc.
Typical application industries: Gears, bearings.

BH1020
Effective balance of wear resistance and chemical resistance;
Suitable for continuous to lightly intermittent finishing of all types of hardened steels, with good versatility.

BH2011
Excellent wear resistance and impact strength;
Suitable for continuous to moderate intermittent finishing;
Suitable for machining hardened bearing and die steels such as GCr15, 100Cr6, 18Cr2Ni4WA, etc.

BH3511
Excellent chipping resistance and very high fracture toughness;
Suitable for roughing and finishing all types of hardened steels in moderate to heavy interrupted work conditions.
Typical application industries: gears, bearings, molds.

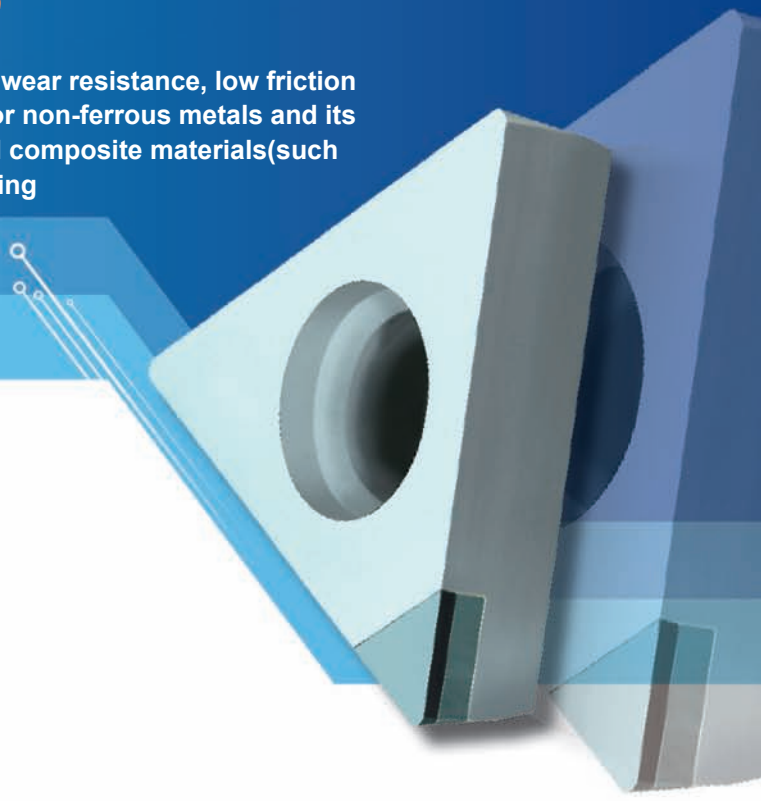


Recommended cutting data

Grade	Workpiece material	Cutting speed(m/min)	Feed amount(mm/r)	Depth of cut(mm)
BK1011	Gray cast iron	400-1500	0.02-0.5	0.1-0.3
	Hard cast iron	80-160	0.05-0.5	0.05-0.1
BK1021	Gray cast iron	400-1500	0.02-0.5	0.1-0.3
	Hard cast iron	80-160	0.05-0.5	0.05-0.1
BK2511	Gray cast iron	300-600	0.1-0.5	1-3
BK2541	Hard cast iron	50-150	0.1-0.5	1-3
BH0121	Hardened steel	150-250	0.05-0.5	0.05-0.1
BH1020		140-220	0.05-0.5	0.05-0.1
BH2011		100-170	0.05-0.5	0.05-0.1
BH2511		120-180	0.05-0.5	0.05-0.1
BH3511		80-150	0.05-0.4	0.05-0.2
BS1011	Powder metallurgy and high temperature alloys	70-180	0.05-0.25	0.03-0.2
BS2011		100-200	0.05-0.25	0.03-0.2
BS3011		50-160	0.05-0.25	0.03-0.25

PCD tools

PCD tool material has high hardness, excellent wear resistance, low friction coefficient,Excellent thermal conductivity, suitable for non-ferrous metals and its alloys(e.g. Cu, Al, Mg, etc.)Nonmetallic materials and composite materials(such as: MMC, ceramics, reinforced plastics, etc.) machining



N

DN0121
Super-fine grain particle size
great sharpness and edges durability

Application range: suitable for mirror effect occasion

DN0511
Fine grain particle size
Excellent toughness and relatively good wear-resistance

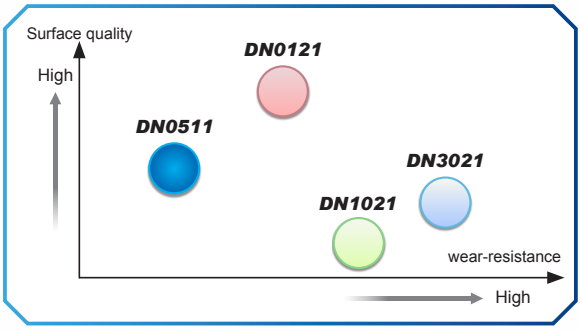
Application range:
strong universality, particular suitable for low-medium silumin materials in milling.

DN1021
medium grain particle size
Excellent toughness and wear-resistance

Application range:
strong universality, particular suitable for low-medium silumin materials in turning.

DN3021
mixed combined with fine particle and coarse particle
Excellent wear-resistance

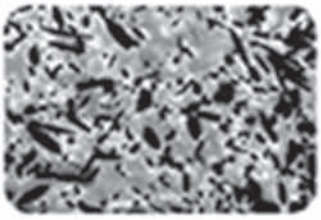
Application range:
suitable for MMC, high silumin, high-strength silumin and bimetallic materials



Recommended cutting data

Grade	Workpiece materials	Machining method	Cutting speed (m/min)
DN0121	Silumin (Si≤12%)	Turning	500~1000
		Milling	300~1500
	fibre reinforced composite materials	Turning /Milling	200~1000
DN0511	Silumin (Si≤12%)	Turning	900~3500
		Milling	600~2400
	Metal base compound	Turning /Milling	1500~1800
	Coppeer and magnesium alloyssilumin	Turning /Milling	400~1260
	Cemented carbide	Turning	20~40
DN1021	Silumin (Si≤12%)	Turning	400~1200
		Milling	250~1400
	Coppeer and magnesium alloyssilumin	Turning /Milling	400~1260
DN3021	Silumin (Si≤12%)	Turning	300~700
		Milling	500~1000
	Metal base compound	Milling	500~1000
	Unsintered ceramic materials	Turning	100~200
	Sintered Ceramic	Turning	20~50
	Bimetallic materials	Milling	200~300

Ceramic Grade



CN3100

A-siaon/β-siaon matrix, the latest developmed Siloxane sialon.

Applications: With excellent wear resistance, fracture toughness and thermal shock resistance, for use in general machining to finishing in high temperature alloy parts. It has better resistance of breakage at the depth of cut,compared with SiC/Al2O3 whisker ceramic material.

Physical properties

Grade	Density(g/cm^3)	HardnessHv(GPa)	Flexural strength(MPa)	Fracture toughness (MPa m$^{1/2}$)
CN3100	3.34	1720	⩾900	7.5

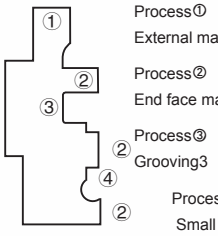
Recommended cutting data

Grade	Workpiece material	Operation	Cutting speed (m/min)	Feed rate(mm/r)	Depth of cut (mm)
CN3100	Nickel high temperature alloy	For roughing	150-260	0.1-0.3	<5

Case

Workpiece material：GH4169
Insert specification：RPGN090700T01020-V
Cutting data：Vc=200 m/min，ap=1 mm，
f=0.1（mm/r）

Workpiece shape and process：Figure 1，four working procedures, two blades and four cutting edges in the figure finish the milling of turbine disk section, and the wear resistance is excellent.



Process①
External machining1+End face machining1+Grooving1

Process②
End face machining2+End face machining2+End face machining2

Process③
Grooving3

Process④
Small grooving

Figure 1

Table of correctional coefficient between material hardness and cutting speed

Workpiece material		Theoretical Hardness	Correctional coefficient between hardness of materials and cutting speed								
			Hardness decrease ← Hardness difference(Measured value – Theoretical value) → Hardness increase								
			-60	-40	-20	0	+20	+40	+60	+80	+100
P		HB180	1.42	1.24	1.11	1.0	0.91	0.84	0.77	0.72	0.67
M		HB180	1.44	1.25	1.11	1.0	0.91	0.84	0.78	0.73	0.68
K	Grey cast iron	HB220	1.21	1.13	1.06	1.0	0.95	0.90	0.86	0.82	0.79
	Nodular cast iron	HB250	1.33	1.21	1.09	1.0	0.91	0.84	0.75	0.70	0.65
N		HB75			1.05	1.0	0.95				
S		HB350			1.12	1.0	0.89				
Rockwell hardness HRC				-6	-3	0	+3	+6	+9		
H		HRC60		1.10	1.02	1.0	0.96	0.93	0.90		
Actual Cutting Speed = Recommended Cutting Speed×Correctional Coefficient of Cutting Speed											

●Please find recommended cutting parameters on insert packing box.
Example: If the material you are going to machine is normal alloy steel, whose theoretical hardness is HB180, and the selected insert is CNMG120404-DF/YBC151, then the recommended cutting speed is V=150m/min. If the hardness measured value of the material is HB220, then the hardness difference value is 220-180= +40. Correctional coefficient found in the table is 0.84. Therefore, the actual applicable cutting speed is Vc=250×0.84=210m/min.

Correctional coefficient table between tool life and cutting speed

Tool life / Insert materials	Correctional coefficient between tool life and cutting speed					
	10 minutes	15 minutes (Standard life)	30 minutes	45 minutes	60 minutes	90 minutes
YBC151	1.12	1.00	0.82	0.73	0.67	0.60
YBC251	1.11	1.00	0.84	0.76	0.71	0.64
YBC351	1.11	1.00	0.84	0.76	0.70	0.63
YBC152	1.25	1.00	0.68	0.54	0.46	0.37
YBC252	1.55	1.00	0.47	0.30	0.22	0.14
YBM151	1.28	1.00	0.66	0.52	0.43	0.34
YBM153	1.32	1.00	0.64	0.48	0.37	0.31
YBM215	1.22	1.00	0.85	0.77	0.72	0.67
YBM251	1.19	1.00	0.75	0.63	0.56	0.47
YBM253	1.22	1.00	0.73	0.61	0.54	0.45
YBG202	1.10	1.00	0.85	0.77	0.72	0.66
YBG205	1.15	1.00	0.82	0.74	0.69	0.64
YBD052	1.22	1.00	0.80	0.65	0.60	0.55
YBD102	1.20	1.00	0.75	0.62	0.58	0.50
YBD152	1.11	1.00	0.70	0.60	0.50	0.40
YBG105	1.28	1.00	0.79	0.72	0.63	0.58
YBG212	1.25	1.00	0.75	0.70	0.60	0.50
YBS103	1.35	1.00	0.85	0.78	0.68	0.62
Actual cutting speed = Recommended cutting speed × Correctional coefficient of cutting speed						

Example: If the material you are going to machine is normal alloy steel, and the selected insert is CNMG120404-DF/YBC151, then the recommended cutting speed is V=250m/min (standard life is 15 minutes). If you expect the tool life to reach 60 minutes, the correctional coefficient found in the table is 0.67, then the applicable cutting speed is Vc=250×0.67=167.5m/min.