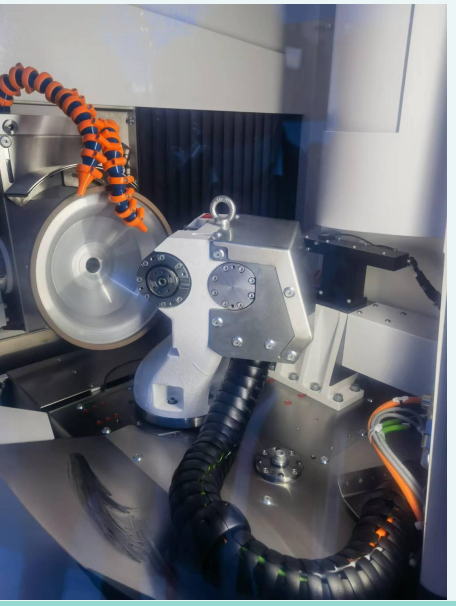
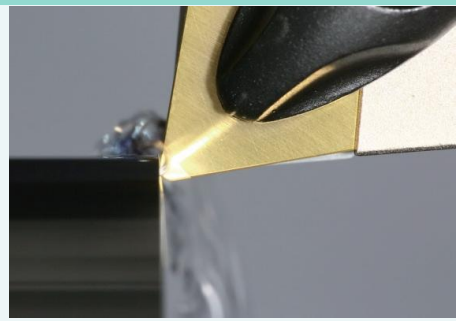






H K S PM N

MeRui Tools Co., Ltd

CBN&PCD INSERT
CERAMIC INSERT

2024 Edition





Cotent

1. CBN Grade·····19

2. Solid CBN Insert·····25

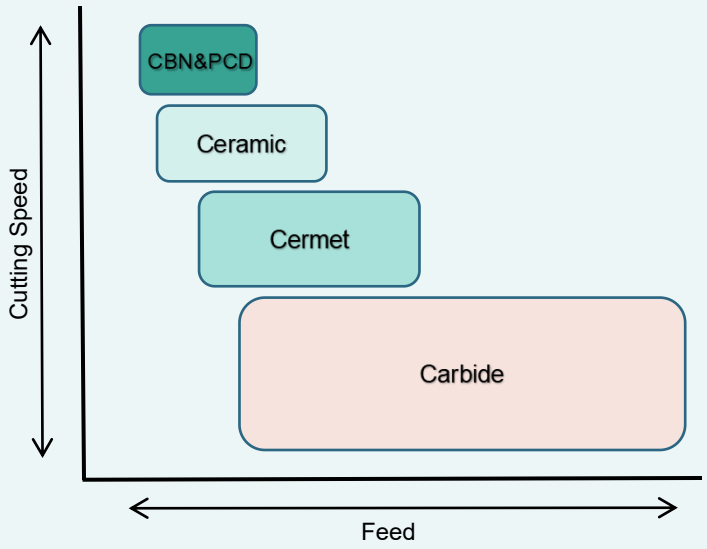
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C B N S E R I E S

Application Range



Polycrystalline Cubic Boron Nitride (CBN)

Chemically resistant and stable at high temperatures of up to 1,400°C. Boron nitride powder is the starting point for the production of CBN, which has been available since the end of the 1960s.It is produced under high pressure and at temperatures of over 1,500°C and the many different substrates are specifically adapted to the final application.

CBN is now considered the second hardest material after diamond cutting materials!

The applications of CBN take place in the automotive industry, aerospace, tool and die and mold making as well as in mechanical engineering. The wide range as cutting and abrasive material includes hardened steels, cast irons, chilled cast iron, sintered materials, stellites, nickel- and cobalt-based superalloys. In many applications, cubic boron nitride is preferred to diamond cutting materials because it is absolutely stable in air at temperatures up to 1400°C. Diamond, on the other hand, begins to decompose at a temperature of approx. 750°C. Compared to PCD, CBN is also characterized by its chemical resistance to ferrous materials.

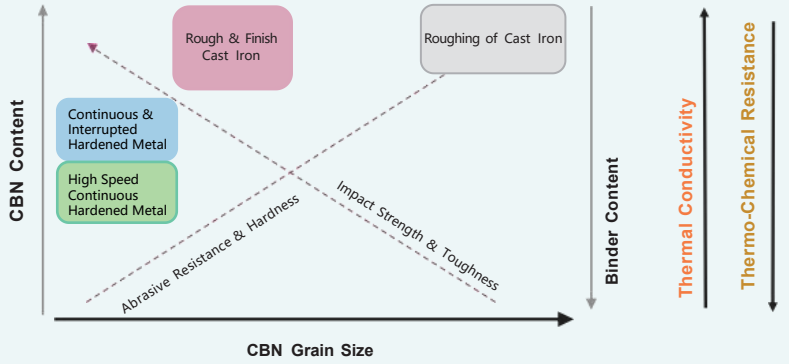
Polycrystalline Diamond (PCD)

PCD is a synthetically produced, extremely tough, intergrown mass of diamond particles with a random orientation in a metal matrix. It is produced by sintering selected diamond particles under high pressure and high temperatures.

Graphite serves as a catalyst allowing the PDC crystals to intergrow. PCD has a high thermal conductivity and good heat dissipation away from the cutting edge. In addition, PCD has the highest bending fracture strength of all cutting materials.

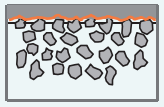
PCD is very well suited for machining aluminum with a Si content of up to 10% and/or other abrasive fillers. The thermal hardness is about 750°C. The areas of application are like those of CVD thick-film diamond, but CVD thick film has a higher cost effectiveness with hard-brittle materials or aluminum from a Si content of 10%.

C B N S E R I E S



Machining hardened steel and hard materials requires the consideration of certain conditions to ensure the workpiece is cut effectively. The part material characteristics and the CBN grade material characteristics

1. The hardness of the CBN insert ≥ Hardness of the part x 3
   Ex. Hardened steel part at 60 HRC 700 Hv
   So the CBN insert is 3300 Hv ►
   ►
2. The effect of CBN grain size on the surface finish and cutting speed.



Fine grained CBN — provides a sharp cutting edge and good surface finish



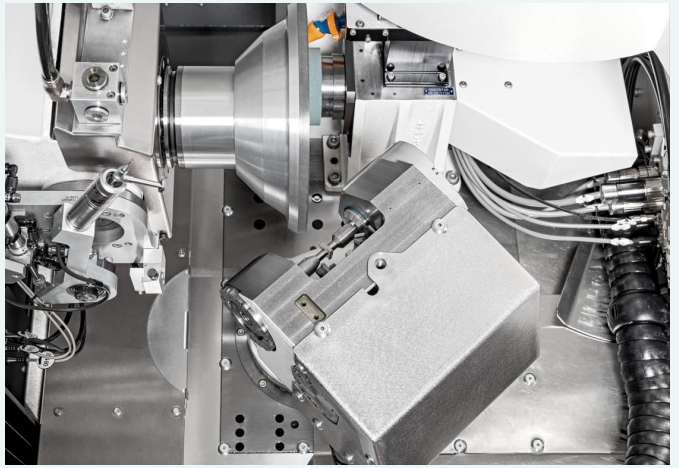
Rough grained CBN — particles hold firmly allowing high speed machining

CBN Application

The type of machining application will help define the best choice for the CBN grade. The insert selection is one of the first considerations when tooling up for an application. Hard part turning refers to materials at Rockwell hardness 55 Rc and above, and have been heat treated by one of the following: case-hardened, induction hardened, and through-hardened. The different types of steels include: carbon steels, alloy steels, tool steels, and bearing steels. Types of hard irons include: chilled, white, and high chrome irons. The part machining operation will be a semi-finishing or finishing operation. These applications will require an insert with resistance to flank wear. CBN grades excel in roughing and finishing operations because of their excellent resistance to wear and the ability to withstand the destructive effects of high cutting temperatures.

With materials harder than HRC55, its carbon content plays a significant role in deciding on the correct grade to apply. Materials with high carbon content will be very abrasive, requiring an insert composed of a high % of CBN and low ceramic binding. This blend will minimize flank wear on the cutting edge but has to be run at slower cutting speeds around 400 SFM to avoid crater wear.

A material with low carbon content will lessen the issue of flank wear. Therefore, the insert composition should have higher ceramic binding content which provides greater resistance to crater wear and enables the insert to be run at higher speeds of around 600 SFM.



IDENTIFICATION SYSTEM

ISO C N G A 12 04 08 S 020 20 - 2N
1 2 3 4 5 6 7 8 9 10 11

ANSI C N G A 4 3 2 S 020 20 - 2N
1 2 3 4 5 6 7 8 9 10 11

1 Shape	
	C
	D
	E
	H
	L
	R
	S
	T
	V
	W

11 Number of Edge	
1N	1
2N	2
3N	3
4N	4
6N	6
8N	8
F	Full Brazed
L	

2 Clearance Angle	
A	3°
C	5°
D	7°
E	15°
F	20°
G	25°
N	0°
P	11°

3 Tolerance			
Symbol	m	s	i.c
A	±0.005	±0.025	±0.025
C	±0.013	±0.025	±0.025
E	±0.025	±0.025	±0.025
F	±0.005	±0.025	±0.013
G	±0.025	±0.013	±0.025
H	±0.013	±0.025	±0.013
J	±0.005	±0.025	
K	±0.013	±0.025	
L	±0.025	±0.025	
M		±0.127	
N		±0.127	
U		±0.025	

4 Type	
A	With hole
B	With hole and one 70°-90° countersink
C	With hole and one 70°-90° countersink
F	Chipbreaker both sides
G	With hole, chipbreaker on both sides
H	With hole one 70°-90° countersink and chipbreak on one side
J	With hole two 70°-90° countersink and chipbreak on both side
M	With hole, chipbreaker on one sides
N	No hole, No chipbreaker
Q	With hole, one 40°-60° countersink
R	chipbreaker on one sides
T	With hole, one 40°-60° countersink, chipbreaker on one sides.
W	With hole, one 40°-60° countersink.
X	Special design

IDENTIFICATION SYSTEM

5 Cutting Edging Length (ISO)

C	D	R	S	T	V	W	I.C(mm)	I.C(inch)	ANSI
03	04	03	03	06		02	3.97	5/32	12
04	05	04	04	08		03	4.76	3/16	15
05	06	05	05	09	09	03	5.56	7/32	18
06	07	06	06	11	11	04	6.35	1/4	2
08	09	07	07	13	13	05	7.94	5/16	25
09	11	09	09	16	16	06	9.525	3/8	3
12	15	12	12	22	22	08	12.7	1/2	4
16	19	15	15	27	27	10	15.875	5/8	5
19	23	19	19	33	33	13	19.050	3/4	6
22	27	22	22	38	38		22.225	7/8	7
25	31	25	25	44	44		25.4	1	8
32	38	31	31	55	54		31.75	1-1/4	10

6 Thickness (ISO)

mm	ISO	inch	ANSI
1.59	01	1/16	1
1.98	T1	5/64	12
2.38	02	3/32	15
3.18	03	1/8	2
3.97	T3	5/32	25
4.76	04	3/14	3
5.56	05	7/32	35
6.35	06	1/4	4
7.94	07	5/16	5
9.525	09	3/8	6
12.7	12	1/2	8

7 Nose-Radius

mm	ISO	inch	ANSI
Sharp	00	0.000	0.0
0.2	02	0.008	05
0.4	04	1/64	1
0.8	08	1/32	2
1.2	12	3/64	3
1.6	16	1/16	4
2.0	20	5/64	5
2.4	24	3/32	6
2.8	28	7/64	7
3.2	32	1/8	8
00	Round Insert	0	Round Insert

8 Type of Cutting Edge

Code	Edge	Diagram
F	Sharp	
E	Honing	
T	Chamfering	
S	Chamfering + Honing	

9 Chamfer Width



010	0.10	045	0.45
015	0.15	050	0.50
020	0.20	100	1.00
025	0.25	200	2.00

10 Chamfer Angle



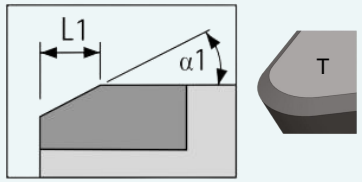
05	5°	20	20°
10	10°	25	25°
15	15°	30	30°

Overview of Cutting Edge Design

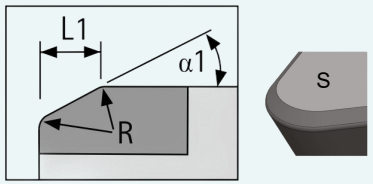
Along with the PcBN grade and the cutting parameters used, the selection of suitable cutting edge designs is the biggest variable to have a positive impact on the machining result produced by the indexable insert. Longer tool lives, better surface quality or increased dimensional accuracy on the part are in many cases dependent on the chamfer geometry selected.

Edge Shape

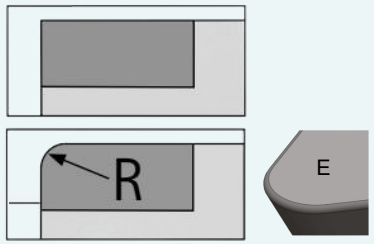
Chamfered cutting edge (T)
A chamfered cutting edge is the preferred design for a continuous to slightly interrupted cut. The chamfer prevents crater wear and burr formation depending on its characteristic.



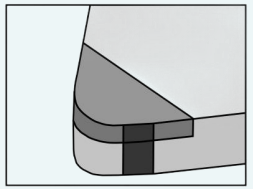
Chamfered and rounded cutting edge (S)
Rounding of the chamfered cutting edge lends the insert additional stability.
This design is particularly suitable for high loads with continuous and interrupted cut.



Sharp edged cutting edge (F)
Sharp edged and rounded cutting edge (E)
Sharp edged cutting edges transmit only low compressive forces on the part to be machined and are particularly suitable for thin-walled parts. Rounding lends additional stability



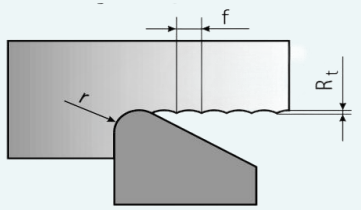
Wiper (W)
In comparison to a conventional turning insert, with the wiper geometry an Ra value several times better is achieved with the same feed.
If the same Ra value is to be achieved as with a standard turning insert, at least double the feed can be used with the turning insert with wiper geometry.



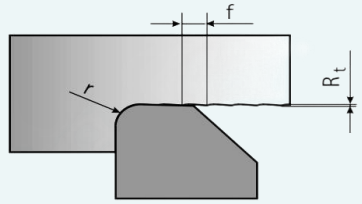
About Wiper Insert

- The wiper insert is designed with a wiper edge that is suitated where the stright edge meets the corner radius.
- In comparison to converntional inserts, the surface finish does not deteriorate even if the feed rate is doubled.
- Machining at high feed rates improves machining efficiency.

Standard geometry



Wiper geometry



2 to 4-times higher feed = same surface finish
Same feed = 2 to 4-times better surface finish
(Part and machine stability are prerequisites)

Note: Pay attention to tool setting angle!
C insert 95°
D insert 93° (double-sided wiper function only possible during diameter machining

Advantage

Improving surface Finish
Under the same machining conditions as coverntional inserts, but with the feed rate increased, the surface finishing of the workpiece can be improved.

Improving Efficiency
High feed rates not only shorten machining times but also make it possible to combine roughing and finishing operations.

Increased Tool Life
When changing to high feed conditions, the time require to cut one component is decreased, thus more parts can be machined with each insert. In addition, the high feed rate prevents rubbing, therefore, delaying the progression of wear and increasing the tool life of the insert.

Guidelines for Edge Preparation

Selecting the appropriate Edge Preparations

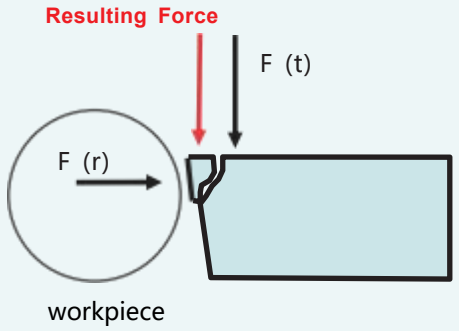
CBN insert performance is dependent upon the machining speed and the insert edge preparation.

The appropriate edge condition depends on the application. It is best to use inserts with a honed and chamfered edge preparation, especially for interrupted cuts. A chamfer with a hone provides a strong edge for machining hardened steels and irons. It is ideal to have the cutting forces directed into the

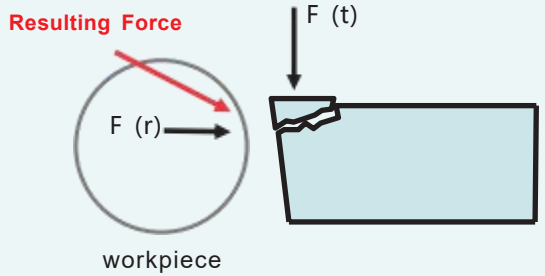
body of the insert (between tangential, axial and radial) this is achieved with a negative insert that has a chamfer and hone edge condition (P, S, Z style). If the forces are not balanced the insert will experience chipping and flaking. In cases requiring additional strength select an insert with a large nose radius.

Importance of edge preparation

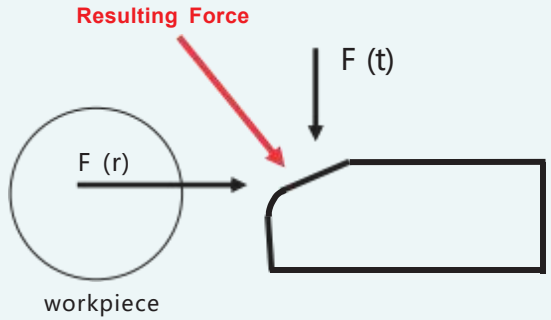
A combination of a high tangential force and a sharp insert edge can result in edge breakage. This is due to unbalanced radial and tangential forces. An example, at tool path entry or during interrupted cutting, all the pressure is directed into the top of the insert. This increases the risk of chipping.



A combination of high radial forces and a sharp insert edge can result in edge flaking. An example, If the feed rate is too high, the force generated will overpower the insert and cause flaking to occur.



This insert is placed in compression with the addition of a chamfer on the edge reducing the chances of breaking or flaking. Radial and tangential forces are balanced to provide the best tool life. The resulting force is directed into the body of the insert ; and is achieved with a negative insert geometry with a chamfer and hone for the edge preparation.



Guidelines for Machining with CBN

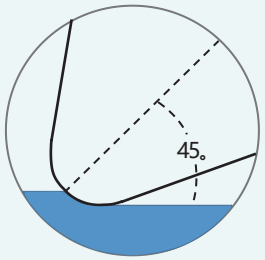
Depth of Cut Recommendation based on Insert Corner Radius

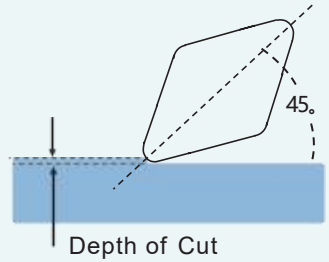
To maximize tool life when using straight-edged inserts (C, D, or S) with corner radii, as opposed to a round insert, the allowable depths of cut are related to the radius and not the insert size. To minimize notching and allow a cut from both directions, the effective machining procedure is to take more material off during the roughing operation, with a round insert. Then the material removal amount for the finishing operation, with a straight edge insert, should be suitable for the nose radius of the insert.

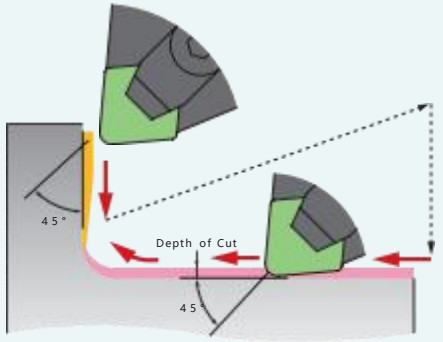
It is important to choose the insert with the appropriate corner radius to complete the finishing operation's depth of cut. If the part has a required radius feature called out, then do not leave more than the amount of material called out for the required insert radius to finish the part and feature. A large corner radius may deflect a part with thin walls because of radial forces generated between the workpiece and insert.

Insert Corner Radius (mm)	Ideal Depth of Cut (mm)	Corner Radius Designation (mm)
0.38	0.12	04
0.8	0.23	08
1.21	0.35	12
1.59	0.47	16
2.	0.70	24
3.18	0.93	32

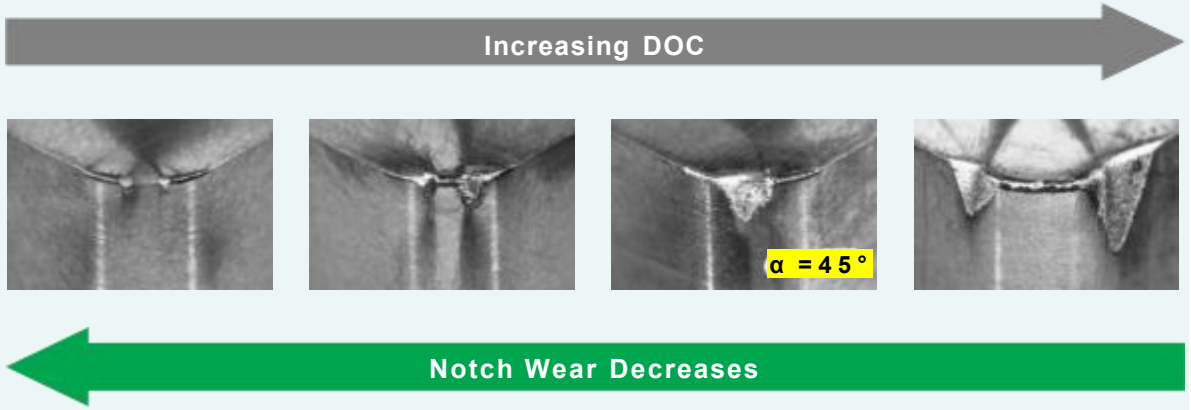
Optimum DOC is 5-15% of insert diameter (based on 0 deg. Lead angle)







As seen in these photos, by removing the appropriate amount of stock for the nose radius of the insert and staying below the 45° mark of the corner radius notching is minimized allowing a cutting operation to be programmed from both directions on the insert.



Guidelines for Turning with CBN

Turning with CBN Inserts

CBN's should not be used for machining easy to cut materials. Applications should include hardened steels, cast irons and tough super alloys

Tool Overhang

Use a rigid machine that is capable of obtaining the optimal conditions for CBN inserts and minimize the tool overhang. Too much overhang causes the holder to deflect resulting in vibration and chatter which can lead to insert breakage. When working with turret style machines, straight edged inserts should be used to eliminate radial tool forces and chatter issues. Stop the cut immediately if chatter is heard. It is an indication that the tool edge is dull or the setup isn't rigid enough.

Toolholder angles and positioning

Angles are built into the holders and include inclination angle, rake angles, and entry angle. Centerline height of the holder is important in hard turning. The position is more critical as the part diameter to machine becomes smaller. The tool should be on-center to slightly below center. For boring applications it is best to set the tool on center or slightly above, because cutting deflection will lower the effective centerline. Chamfer the edge of the workpiece to minimize burr formations on the part and to reduce the potential of the insert chipping or breaking upon entry or exit point of work material.

Coolant:

For Continuous cut operations coolant does not have a significant effect on the rate at which the tool wears. The only exceptions are machining tungsten carbide and Inconel with CBN, coolant is recommended. Even though coolant does not influence flank wear, it can be beneficial for controlling temperature and removing chips during the cutting process. Coolant can be a benefit when crater wear is an issue.

Inserts:

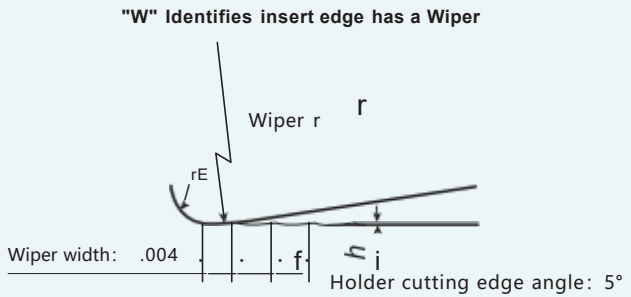
As a general rule there is no need to select a larger insert than necessary. This is especially true when using solid inserts, since they have more edges and are often more cost effective than tipped styles. The insert shape should be selected based on the entry angle required verses requirements of accessibility and versatility. The largest possible insert geometry should be selected for improved strength and economy.

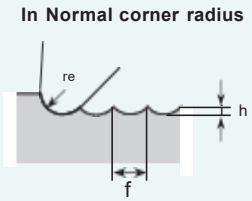
Radius:

The size of the corner radius is an important aspect and impacts the strength of the edge. One step up in size of the radius is equivalent to one step of an increase in grade toughness. This should be considered when determining insert material hardness and wear resistance.

Wiper style inserts:

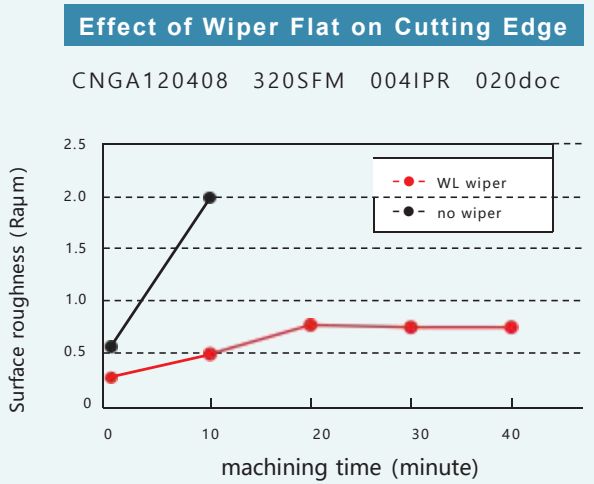
These inserts are designed with a flat feature that is situated where the straight edge meets the corner radius.Applying an insert with a wiper achieves superior surface finishes when maintaining machining conditions run with a conventional insert. If the feed rates are increased, then a consistent surface finish can be maintained, while lowering machine time. The high feed rate also prevents rubbing, delaying the progression of wear and increasing tool life





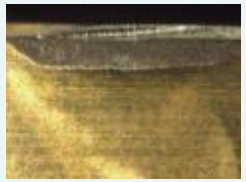
$$h_{(\mu m)} = \frac{f2}{8\,r_\varepsilon} \times 1000$$

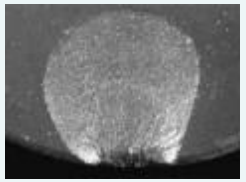
h : Theoretical surface roughness (μm)
f : Feed (mm/rev)
re : Corner radius (mm)



Troubleshooting Recommendations

CBN Application		
Problem	**Cause**	**Suggested Action**
Poor Surface Quality	Vibration	Check rigidity of tool & set-up
	Too High Feed	Lower feed rate, increase nose radius or change to wiper
	Too Sharp Insert	Increase chamfer angle
	Wrong Grade	Choose finer grain size
Premature Wear	Wrong Speed	Increase speed
	Too sharp of Insert	Increase chamfer angle
	Wrong Grade	Choose finer grain size
Vibration	Poor set-up	Check rigidity of tool & set-up
	Too Light Feed	Increase feed / of DOC
	Too much Pressure	Choose more positive insert geometry / cutting edge angle
	Improper Edge Prep	Reduce chamfer angle
	Too much Pressure	Reduce nose radius

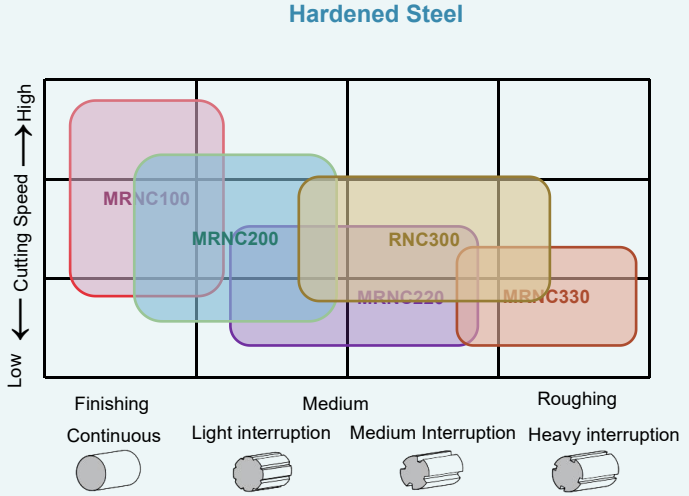
Flank Wear 	• Increase cutting speed • Increase feed rate • Increase DOC • Check tool centerline height • Check material' s iron content

Catastrophic edge breakage 	• Reduce DOC (reduce insert load) • Reduce cutting speed • Increase nose radius (if possible use round insert) • Use insert with chamfer + hone • Check centerline height • Check condition of holder
Notch Wear 	• Increase cutting speed • Reduce feed rate • Increase insert approach angle (with a round insert) • Vary the DOC • Use insert with chamfered edge
Rake Face flaking 	• Reduce feed and speed • Consider coolant as factor • Use insert with larger edge prep: chamfer + hone edge • Increase cutting edge • Check tool centerline height • Reduce insert approach angle
Edge Chipping 	• Use insert with chamfer and hone • Increase tool rigidity • Interrupted cuts– chamfer the tool entry and exit path of slots and holes • Vary cutting speed to eliminate vibration • Check tool rigidity and centerline height
Crater Wear 	• Reduce cutting speed • Reduce feed rate • Reduce insert chamfer angle • Use sharp edge condition • Use coated insert • Use coolant (continuous cuts only)

Hardened Steel Machining

MRNC100	High speed continuous machining of hardened steel. Good thermal stability and creater wear resistance.
MRNC200	General use in continuous and light interrupted machining of hardened steel. Combination of wear resistance and thermal stability.
MRNC220	General use in continuous and light interrupted machining of hardened steel. Combination of wear resistance and impact strength.
MRNC300	High speed and medium interrupted to interrupted machining of hardened steel. Combination of wear resistance and thermal stability.
MRNC330	Heavy interrupted machining of hardened steel. High degree of toughness due to fine CBN and ceramic matrix.
MRN350 Solid CBN	Heavy interrupted machining of hardened steel. High degree of toughness due to fine CBN and ceramic matrix.
MRN380 Solid CBN	High speed continuous machining of hardened steel. Good thermal stability and creater wear resistance.

Application Map



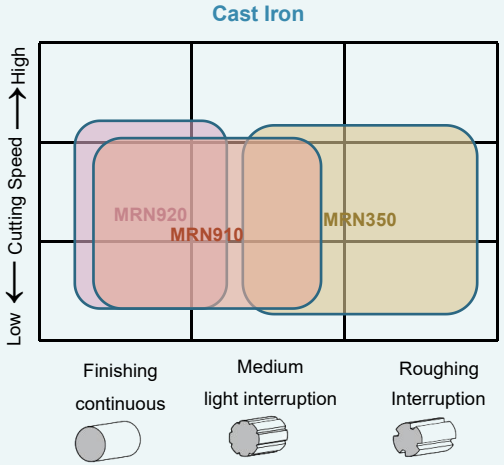
Recommended Cutting Parameter

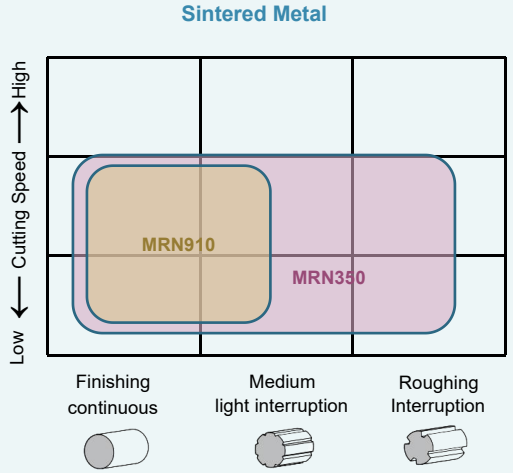
Wokpiece Material	Hardness	Cutting Condition	Grade	Cutting Parameter		
				Vc (m/min)	f (mm/rev)	ap (mm)
Hardened Steel	≥HRC50	continuous~light interruption	MRNC100	100~200	0.05~0.1	0.05~0.5
		light interruption~interruption	MRNC200	80~160	0.05~0.1	0.05~0.5
		interruption	MRNC300	60~150	0.05~0.1	0.05~0.4
		heavy interruption	MRN330	70~110	0.05~0.2	0.5~2.0
		High Precision Rz=1.6~3.2	MRNC100	110~220	0.03~0.2	0.03~0.3
		continuous~light interruption	MRN220	80~120	0.03~0.2	0.03~0.3
HSS Steel	≥HRC50	continuous~light interruption	MRN200	150~200	0.03~0.15	0.03~0.2
		interruption	MRNC300	80~150	0.03~0.2	0.03~0.3
		heavy interruption	MRN330	80-150	0.03-0.2	0.03~0.3

Cast Iron Machining

MRN910	Machining most kinds of cast iron and powder metal alloy Extreme wear resistance and high chipping resistance due to high content CBN and fine CBN size.
MRN920	Machining most kinds of cast iron. Extreme wear resistance due to high content of CBN and metal binder.
MRN950	Machining non- homogeneous cast iron and ductile cast iron. Combination of wear resistance and thermal properties.
MRN350 **Solid CBN**	Ideal for machining mill roll. High degree of toughness due to fine CBN and ceramic matrix.
MRN400 **Solid CBN**	Ideal for machining brake disc and brake drum. Combination of wear resistance and thermal stability.

Application Map





Recommended Cutting Parameter

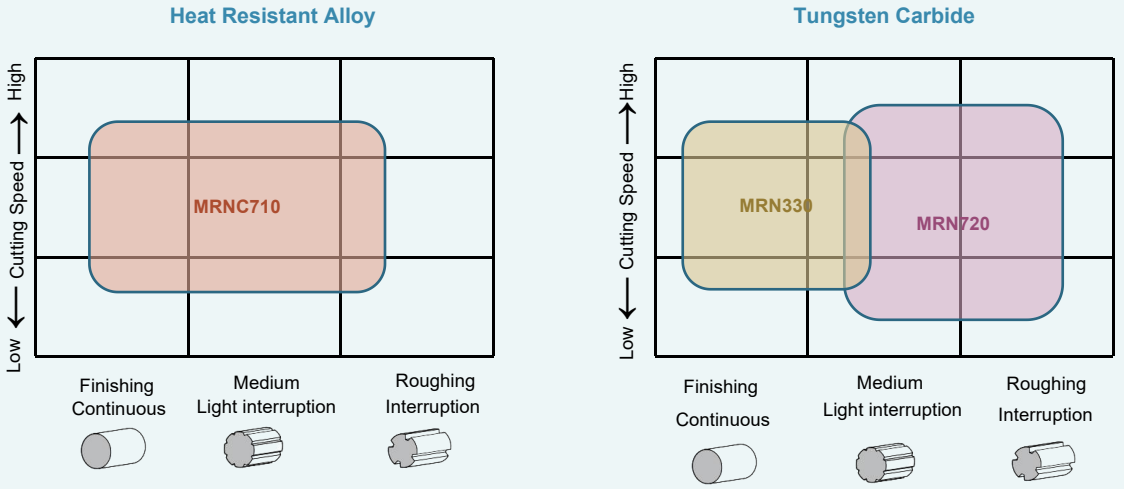
Wokpiece Material	Hardness	Cutting Condition	Grade	Cutting Parameter		
				Vc (m/min)	f (mm/rev)	ap (mm)
Gray Cast Iron	HB≤250	continuous~light interruption	MRN910	400~1200	0.1~0.3	0.05~0.5
		continuous~light interruption	MRN920	500~1200	0.05~0.2	0.1~1.0
		interruption	MRN350	500~900	0.1~0.5	0.5~3.0
Alloy Cast Iron	HB≥200	continuous~light interruption	MRN910	200~800	0.1~0.4	0.1~0.5
		interruption	MRN350	200~1000	0.1~0.4	0.5~3.0
Ductile Cast Iron	-	continuous~interruption	MRN950	150~500	0.1~0.4	0.1~0.5
Vermicular Graphite Cast Iron (CGI)	-	continuous~interruption	MRN950	200~500	0.1~0.4	0.1~0.4
Sintered Metal	-	continuous~interruption	MRN910	100~250	0.05~0.25	0.05~0.3
VSR		continuous	MRN910	50~125	0.03~0.2	0.05~0.5
Chilled Cast Iron Roll	HRC≥55	continuous~interruption	MRN920	70~110	0.05~0.15	0.3-1.0

Exotic Alloy Machining

MRNC710 Coated CBN for nickel based alloy, titanium alloy and other high temperature alloy. The higher hardness and improved thermal conductivity compared to conventional CBN grades

MRNC720 Coated CBN for tungsten carbide roll.
High wear capabilities and fracture resistance.
Suit for interrupted cutting.

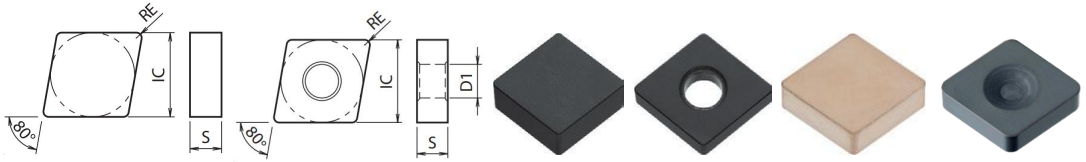
Application Map

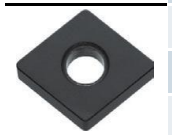
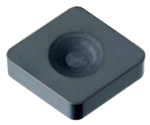


Recommended Cutting Parameter

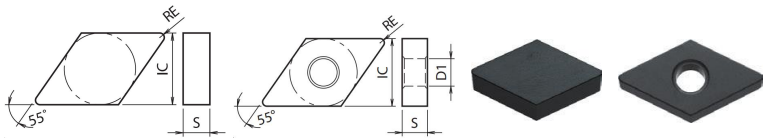
Wokpiece Material	Hardness	Cutting Condition	Grade	Cutting Parameter		
				Vc (m/min)	f (mm/rev)	ap (mm)
Ni Based Alloy	-	continuous~interruption	MRNC710	100~200	0.05~0.2	0.1~1.0
Co Based Alloy	-	continuous~interruption	MRNC710	50~100	0.05~0.2	0.1~1.0
Tungsten Carbide	-	continuous~interruption	MRNC720	50~100	0.1~0.4	0.1~1.0

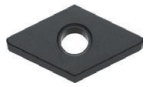
80° Rhombic/Solid CBN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	CNGN120404	12.7	4.76	-	0.4														
	CNGN120408	12.7	4.76	-	0.8														
	CNGN120412	12.7	4.76	-	1.2														
	CNGA120404	12.7	4.76	5.16	0.4														
	CNGA120408	12.7	4.76	5.16	0.8														
	CNGA120412	12.7	4.76	5.16	1.2														
	CNGN120404	12.7	4.76	-	0.4														
	CNGN120408	12.7	4.76	-	0.8														
	CNGN120412	12.7	4.76	-	1.2														
	CNGX120404	12.7	4.76	-	0.4														
	CNGX120408	12.7	4.76	-	0.8														
	CNGX120412	12.7	4.76	-	1.2														

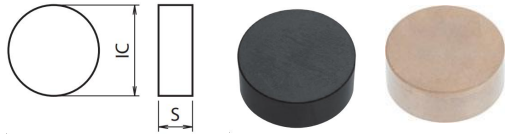
55° Rhombic/Solid CBN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	DNMN110404	9.525	4.76	-	0.4														
	DNMN110408	9.525	4.76	-	0.8														
	DNMN110412	9.525	4.76	-	1.2														
	DNMN150604	12.7	6.35	-	0.4														
	DNMN150608	12.7	6.35	-	0.8														
	DNMN150612	12.7	6.35	-	1.2														
	DNMA110404	9.525	4.76	3.81	0.4														
	DNMA110408	9.525	4.76	3.81	0.8														
	DNMA110412	9.525	4.76	3.81	1.2														
	DNMA150604	12.7	6.35	5.16	0.4														
	DNMA150608	12.7	6.35	5.16	0.8														
	DNMA150612	12.7	6.35	5.16	1.2														

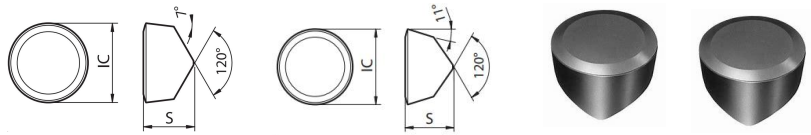
W Stand for wiper
H starnd for chipbreak

Round/Solid CBN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	RNGN090300	9.525	4.76	-	-														
	RNGN090400	9.525	4.76	-	-														
	RNGN120400	12.7	4.76	-	-														
	RNGN120700	12.7	7.94	-	-														
	RNMN150700	15.875	7.94	-	-														
	RNMN201000	20.0	10.0	-	-														
	RNGN090300	9.525	3.97	-	-														
	RNGN090400	9.525	4.76	-	-														
	RNGN120400	12.7	4.76	-	-														
	RNGN120700	12.7	7.94	-	-														
	RNMN150700	15.875	7.94	-	-														
	RNMN201000	20.0	10.0	-	-														

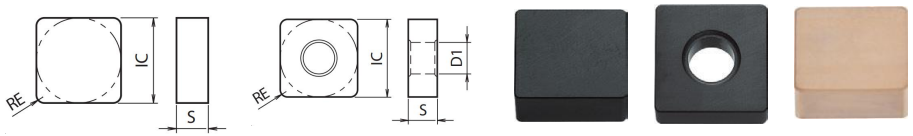
Round/Solid CBN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	RCGX060500	6.35	5.0	-	-														
	RCGX090700	9.525	7.94	-	-														
	RCGX120700	12.7	7.94	-	-														
	RCGX151000	15.875	10.0	-	-														
	RCGX191000	19.05	10.0	-	-														
	RCGX251200	25	12.0	-	-														
	RPGX060500	6.35	5.0	-	-														
	RPGX090700	9.525	7.94	-	-														
	RPGX120700	12.7	7.94	-	-														
	RPGX151000	15.875	10.0	-	-														
	RCGX191000	19.05	10.0																
	RCGX251200	25	12.0																

FT Stand for full CBN
H starnd for chipbreak

90° Square/Solid CBN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	SNMN090304	9.525	3.18	-	0.4														
	SNMN090408	9.525	4.76	-	0.8														
	SNMN120404	12.7	4.76	-	0.4														
	SNMN120408	12.7	4.76	-	0.8														
	SNMN120412	12.7	4.76	-	1.2														
	SNMN150716	15.875	7.93	-	1.6														
	SNMA120404	12.7	4.76	5.16	0.4														
	SNMA120408	12.7	4.76	5.16	0.8														
	SNMA120412	12.7	4.76	5.16	1.2														
	SNGN090304	9.525	3.18	-	0.4														
	SNGN090408	9.525	4.76	-	0.8														
	SNGN120404	12.7	4.76	-	0.4														
	SNGN120408	12.7	4.76	-	0.8														
	SNGN120412	12.7	4.76	-	0.12														
	SNGN150716	15.875	7.94	-	0.16														

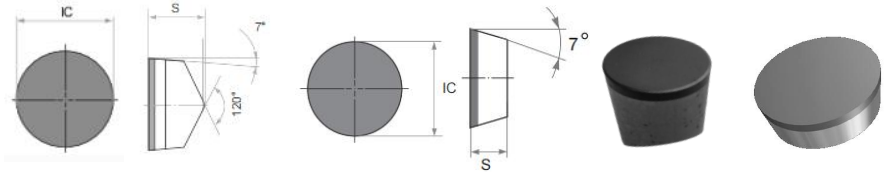
60° Triangle/Solid CBN

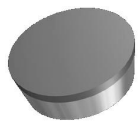


Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	TNMN110304	6.35	3.18	-	0.4														
	TNMN110308	6.35	3.18	-	0.8														
	TNMN110312	6.35	3.18	-	1.2														
	TNMN160404	9.525	4.76	-	0.4														
	TNMN160408	9.525	4.76	-	0.8														
	TNMN160412	9.525	4.76	-	1.2														
	TNMA160404	9.525	4.76	3.81	0.4														
	TNMA160408	9.525	4.76	3.81	0.8														
	TNMA160412	9.525	4.76	3.81	1.2														
	TNGN110304	6.35	3.18	-	0.4														
	TNGN110308	6.35	3.18	-	0.8														
	TNGN110312	6.35	3.18	-	1.2														
	TNGN160404	9.525	4.76	-	0.4														
	TNGN160408	9.525	4.76	-	0.8														
	TNGN160412	9.525	7.93	-	1.2														

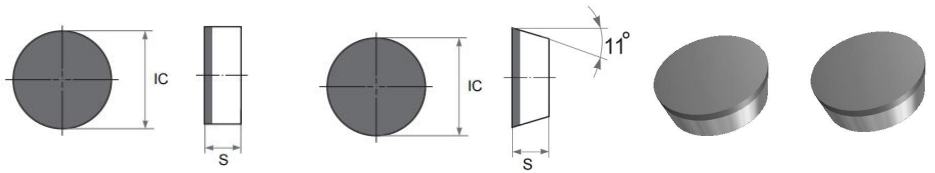
W Stand for wiper
H starnd for chipbreak

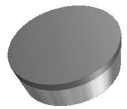
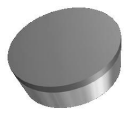
Round/Full Top CBN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	RCGX050400-FT	5.0	4.0	-	-														
	RCGX060500-FT	6.35	5.0	-	-														
	RCGX090700-FT	9.525	7.94	-	-														
	RCGX120700-FT	12.7	7.94	-	-														
	RCGX150700-FT	15.875	7.94	-	-														
	RCGX151000-FT	15.875	10.0	-	-														
	RCGN060300-FT	6.35	3.18	-	-														
	RCGN090400-FT	9.525	1.59	-	-														
	RCGN120400-FT	12.7	1.59	-	-														

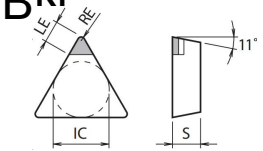
Round/Full Top CBN

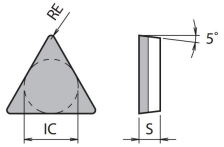


Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	RNGN060300-FT	6.35	3.18	-	-														
	RNGN090300-FT	6.35	3.18	-	-														
	RNGN090400-FT	6.35	3.18	-	-														
	RNGN120300-FT	9.525	4.76	-	-														
	RNGN120400-FT	9.525	4.76	-	-														
	RNGN120700-FT	9.525	4.76	-	-														
	RPGN090300-FT	9.525	3.18	-	-														
	RPGN120300-FT	12.7	3.18	-	-														
	RPGN120400-FT	12.7	4.76	-	-														

W Stand for wiper
H starnd for chipbreak

60° Triangle/Full Top CBN









Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	TPGN110302	9.525	3.18	-	-														
	TPGN110304	9.525	3.18	-	-														
	TPGN16T302	6.35	3.18	-	-														
	TPGN16T304	6.35	3.18	-	-														
	TPGN16T308	6.35	3.18	-	-														
	TBGN060102-FT	3.97	1.59	-	-														
	TBGN060104-FT	3.97	1.59	-	-														
	TBGN060108-FT	3.97	1.59	-	-														

Hexagon/Full Top CBN

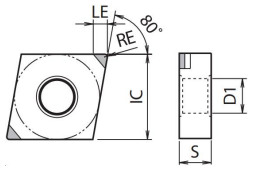


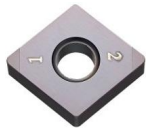
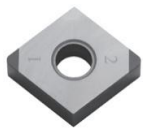
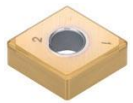


Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	HX06-G	6.35	3.18	-	-														
	HX08-G	6.35	3.18	-	-														
	HX10-G	6.35	3.18	-	-														
				-	-														
				-	-														
				-	-														
	HX06	9.525	3.18	-	-														
	HX08	12.7	3.18	-	-														
	HX10	12.7	4.76	-	-														

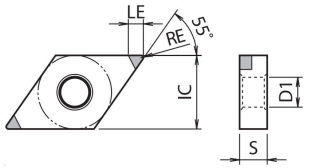
W Stand for wiper
H starnd for chipbreak

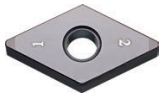
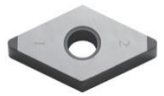
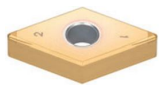
80° Rhombic / CNGA



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	CNGA120404-2N	12.7	4.76	5.16	0.4														
	CNGA120408-2N	12.7	4.76	5.16	0.8														
	CNGA120412-2N	12.7	4.76	5.16	1.2														
	CNGA120404-4N	12.7	4.76	5.16	0.4														
	CNGA120408-4N	12.7	4.76	5.16	0.8														
	CNGA120412-4N	12.7	4.76	5.16	1.2														
	CNGA120404-2N	12.7	4.76	5.16	0.4														
	CNGA120408-2N	12.7	4.76	5.16	0.8														
	CNGA120412-2N	12.7	4.76	5.16	1.2														
	CNGA120404-4N	12.7	4.76	5.16	0.4														
	CNGA120408-4N	12.7	4.76	5.16	0.8														
	CNGA120412-4N	12.7	4.76	5.16	0.4														
	CNGA120404H-2N	12.7	4.76	5.16	0.8														
	CNGA120408H-2N	12.7	4.76	5.16	0.12														
	CNGA120412H-2N	12.7	7.94	5.16	0.16														

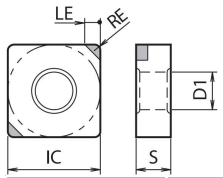
55° Rhombic / DNGA



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	DNGA150404-2N	12.7	4.76	5.16	0.4														
	DNGA150408-2N	12.7	4.76	5.16	0.8														
	DNGA150412-2N	12.7	4.76	5.16	1.2														
	DNGA150604-2N	12.7	6.35	5.16	0.4														
	DNGA150608-2N	12.7	6.35	5.16	0.8														
	DNGA150612-2N	12.7	6.35	5.16	1.2														
	DNGA150404-2N	12.7	4.76	5.16	0.4														
	DNGA150408-2N	12.7	4.76	5.16	0.8														
	DNGA150412-2N	12.7	4.76	5.16	1.2														
	DNGA150604-2N	12.7	6.35	5.16	0.4														
	DNGA150608-2N	12.7	6.35	5.16	0.8														
	DNGA150612-2N	12.7	6.35	5.16	1.2														
	DNGA150404H-2N	12.7	4.76	5.16	0.4														
	DNGA150408H-2N	12.7	4.76	5.16	0.8														
	DNGA150412H-2N	12.7	4.76	5.16	1.2														

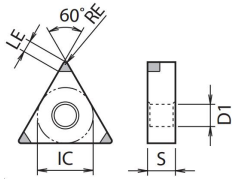
W Stand for wiper
H starnd for chipbreak

90° Square / SNGA



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC300	MRN330	MRN350	MRN380	MRN910	MRN930	MRN850	MRN980	MRN990	MRN900C	MRN710	MRN720
	SNGA120404-2N	12.7	4.76	5.16	0.4														
	SNGA120408-2N	12.7	4.76	5.16	0.8														
	SNGA120412-2N	12.7	4.76	5.16	1.2														
	SNGA120404-4N	12.7	4.76	5.16	0.4														
	SNGA120408-4N	12.7	4.76	5.16	0.8														
	SNGA120412-4N	12.7	4.76	5.16	1.2														
	SNGA120404-2N	12.7	4.76	5.16	0.4														
	SNGA120408-2N	12.7	4.76	5.16	0.8														
	SNGA120412-2N	12.7	4.76	5.16	1.2														
	SNGA120404-4N	12.7	4.76	5.16	0.4														
	SNGA120408-4N	12.7	4.76	5.16	0.8														
	SNGA120412-4N	12.7	4.76	5.16	0.4														
	SNGN090308-2N	9.525	3.18	-	0.8														
	SNGN090312-2N	9.525	3.18	-	0.12														
	SNGN120412-2N	12.7	4.76	-	0.12														

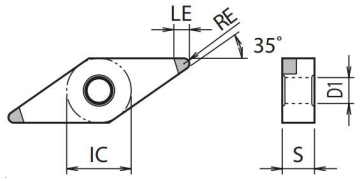
60° Triangle / TNGA

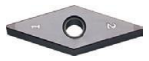
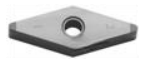


Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC300	MRN330	MRN350	MRN380	MRN910	MRN930	MRN850	MRN980	MRN990	MRN900C	MRN710	MRN720
	TNGA160404-3N	9.525	4.76	3.81	0.4														
	TNGA160408-3N	9.525	4.76	3.81	0.8														
	TNGA160412-3N	9.525	4.76	3.81	1.2														
	TNGA160404-3N W	9.525	4.76	3.81	0.4														
	TNGA160408-3N W	9.525	4.76	3.81	0.8														
	TNGA160412-3N W	9.525	4.76	3.81	1.2														
	TNGA160404-3N	9.525	4.76	3.81	0.4														
	TNGA160408-3N	9.525	4.76	3.81	0.8														
	TNGA160412-3N	9.525	4.76	3.81	1.2														
	TNGA160404-3N W	9.525	4.76	3.81	0.4														
	TNGA160408-3N W	9.525	4.76	3.81	0.8														
	TNGA160412-3N W	9.525	4.76	3.81	1.2														
	TNGA160404H-3N	9.525	4.76	3.81	0.4														
	TNGA160408H-3N	9.525	4.76	3.81	0.8														
	TNGA160412H-3N	9.525	4.76	3.81	1.2														

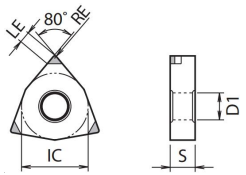
W Stand for wiper
H starnd for chipbreak

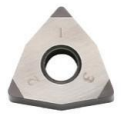
35° Rhombic / VNGA



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	VNGA160404-2N	9.525	4.76	3.81	0.4														
	VNGA160408-2N	9.525	4.76	3.81	0.8														
	VNGA160412-2N	9.525	4.76	3.81	1.2														
	VNGA160404-4N	9.525	4.76	3.81	0.4														
	VNGA160408-4N	9.525	4.76	3.81	0.8														
	VNGA160412-4N	9.525	4.76	3.81	1.2														
	VNGA160404-2N	9.525	4.76	3.81	0.4														
	VNGA160408-2N	9.525	4.76	3.81	0.8														
	VNGA160412-2N	9.525	4.76	3.81	1.2														
	VNGA160404-4N	9.525	4.76	3.81	0.4														
	VNGA160408-4N	9.525	4.76	3.81	0.8														
	VNGA160412-4N	9.525	4.76	3.81	1.2														
	VNGA160404H-2N	9.525	4.76	3.81	0.4														
	VNGA160408H-2N	9.525	4.76	3.81	0.8														
	VNGA160412H-2N	9.525	4.76	3.81	1.2														

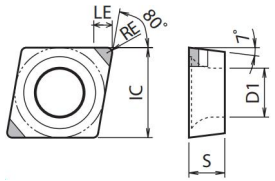
80° Trigon / WNGA

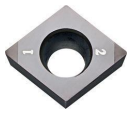
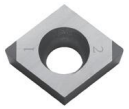


Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	WNGA080404-3N	12.7	4.76	5.16	0.4														
	WNGA080408-3N	12.7	4.76	5.16	0.8														
	WNGA080412-3N	12.7	4.76	5.16	1.2														
	WNGA080404-6N	12.7	4.76	5.16	0.4														
	WNGA080408-6N	12.7	4.76	5.16	0.8														
	WNGA080412-6N	12.7	4.76	5.16	1.2														
	WNGA080404-3N	12.7	4.76	5.16	0.4														
	WNGA080408-3N	12.7	4.76	5.16	0.8														
	WNGA080412-3N	12.7	4.76	5.16	1.2														
	WNGA080404-6N	12.7	4.76	5.16	0.4														
	WNGA080408-6N	12.7	4.76	5.16	0.8														
	WNGA080412-6N	12.7	4.76	5.16	1.2														

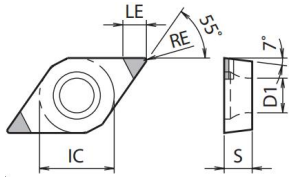
W Stand for wiper
H starnd for chipbreak

80° Rhombic / CCGW



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	CCGW060204-2N	6.35	2.38	2.8	0.2														
	CCGW060204-2N	6.35	2.38	2.8	0.4														
	CCGW060208-2N	6.35	2.38	2.8	0.8														
	CCGW09T304-2N	9.525	3.97	4.4	0.4														
	CCGW09T308-2N	9.525	3.97	4.4	0.8														
	CCGW09T312-N	9.525	3.97	4.4	1.2														
	CCGW060204-2N	6.35	2.38	2.8	0.2														
	CCGW060204-2N	6.35	2.38	2.8	0.4														
	CCGW060208-2N	6.35	2.38	2.8	0.8														
	CCGW09T304-2N	9.525	3.97	4.4	0.4														
	CCGW09T308-2N	9.525	3.97	4.4	0.8														
	CCGW09T312-N	9.525	3.97	4.4	1.2														
	CCMW040102	4.3	1.8	2.3	0.2														
	CCMW040104	4.3	1.8	2.3	0.4														
	CCMW060204	6.35	2.38	2.8	0.4														

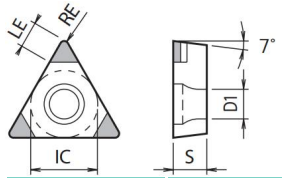
55° Rhombic / DCGW



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	DCGW070202-2N	6.35	2.38	2.8	0.2														
	DCGW070204-2N	6.35	2.38	2.8	0.4														
	DCGW070208-2N	6.35	2.38	2.8	0.8														
	DCGW11T304-2N	9.525	3.97	4.4	0.4														
	DCGW11T308-2N	9.525	3.97	4.4	0.8														
	DCGW11T312-2N	9.525	3.97	4.4	1.2														
	DCGW070202-2N	6.35	2.38	2.8	0.2														
	DCGW070204-2N	6.35	2.38	2.8	0.4														
	DCGW070208-2N	6.35	2.38	2.8	0.8														
	DCGW11T304-2N	9.525	3.97	4.4	0.4														
	DCGW11T308-2N	9.525	3.97	4.4	0.8														
	DCGW11T312-2N	9.525	3.97	4.4	1.2														
	DCGW070202	6.35	2.38	2.8	0.4														
	DCGW070204	6.35	2.38	2.8	0.8														
	DCGW11T304	9.525	3.97	4.4	1.2														

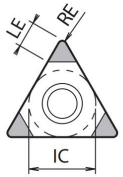
W Stand for wiper
H starnd for chipbreak

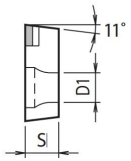
60° Triangle / TCGW

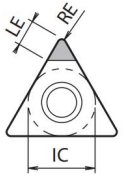


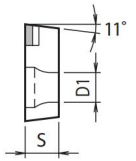
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	TCGW160402-3N	9.525	4.76	4.4	0.2														
	TCGW160404-3N	9.525	4.76	4.4	0.4														
	TCGW160408-3N	9.525	4.76	4.4	0.8														
	TCGW160402-3N	9.525	4.76	4.4	0.2														
	TPGW160404-3N	9.525	4.76	4.4	0.4														
	TCGW160408-3N	9.525	4.76	4.4	0.8														
	TCGW160402-3N	9.525	4.76	4.4	0.2														
	TCGW160404-3N	9.525	4.76	4.4	0.4														
	TCGW160408-3N	9.525	4.76	4.4	0.8														
	TCGW160402-3N	9.525	4.76	4.4	0.2														
	TCGW160404-3N	9.525	4.76	4.4	0.4														
	TCGW160408-3N	9.525	3.97	4.4	0.8														
	TCGW160402-1N	9.525	4.76	4.4	0.2														
	TCGW160404-1N	9.525	4.76	4.4	0.4														
	TCGW160408-1N	9.525	4.76	4.4	0.8														

60° Triangle / TPGW





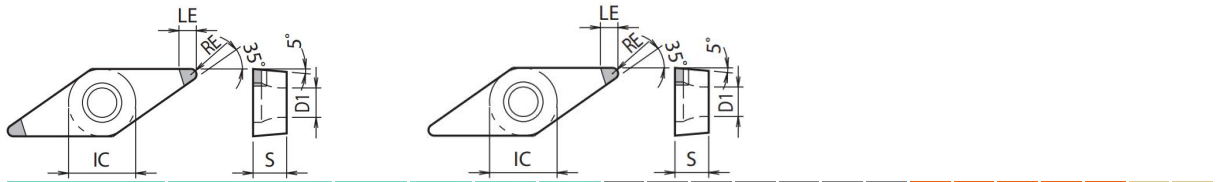


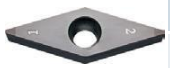
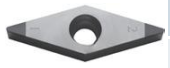


Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	TPGW160402-3N	9.525	4.76	4.4	0.2														
	TPGW160404-3N	9.525	4.76	4.4	0.4														
	TPGW160408-3N	9.525	4.76	4.4	0.8														
	TPGW160402-3N	9.525	4.76	4.4	0.2														
	TPGW160404-3N	9.525	4.76	4.4	0.4														
	TPGW160408-3N	9.525	4.76	4.4	0.8														
	TPGW160402-3N	9.525	4.76	4.4	0.2														
	TPGW160404-3N	9.525	4.76	4.4	0.4														
	TPGW160408-3N	9.525	4.76	4.4	0.8														
	TPGW160402-3N	9.525	4.76	4.4	0.2														
	TPGW160404-3N	9.525	4.76	4.4	0.4														
	TPGW160408-3N	9.525	3.97	4.4	0.8														
	TPGW160402-1N	9.525	4.76	4.4	0.2														
	TPGW160404-1N	9.525	4.76	4.4	0.4														
	TPGW160408-1N	9.525	4.76	4.4	0.8														

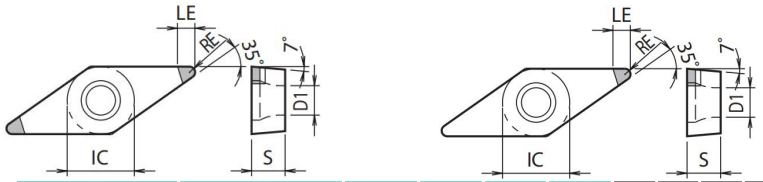
W Stand for wiper
H starnd for chipbreak

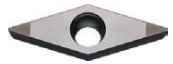
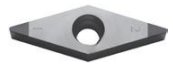
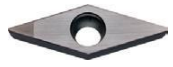
35° Rhombic / VBGW



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	VBGW110302-2N	6.35	3.18	2.8	0.2														
	VBGW110304-2N	6.35	3.18	2.8	0.4														
	VBGW110308-2N	6.35	3.18	2.8	0.8														
	VBGW160402-2N	9.525	4.76	4.4	0.2														
	VBGW160404-2N	9.525	4.76	4.4	0.4														
	VBGW160408-2N	9.525	4.76	4.4	0.8														
	VBGW110302-2N	6.35	3.18	2.8	0.2														
	VBGW110304-2N	6.35	3.18	2.8	0.4														
	VBGW110308-2N	6.35	3.18	2.8	0.8														
	VBGW160402-2N	9.525	4.76	4.4	0.2														
	VBGW160404-2N	9.525	4.76	4.4	0.4														
	VBGW160408-2N	9.525	4.76	4.4	0.8														
	VBGW110304-1N	6.35	3.18	2.8	0.4														
	VBGW160404-1N	9.525	4.76	4.4	0.4														
	VBGW160408-1N	9.525	4.76	4.4	0.8														

35° Rhombic / VCGW



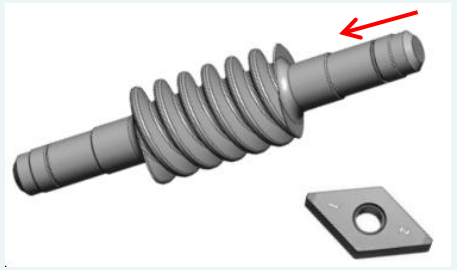
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350	MRN380	MRN910	MRN920	MRN950	MRN400	MRN900	MRN710	MRN720
	VCGW110302-2N	6.35	3.18	2.8	0.2														
	VCGW110304-2N	6.35	3.18	2.8	0.4														
	VCGW110308-2N	6.35	3.18	2.8	0.8														
	VCGW160402-2N	9.525	4.76	4.4	0.2														
	VCGW160404-2N	9.525	4.76	4.4	0.4														
	VCGW160408-2N	9.525	4.76	4.4	0.8														
	VCGW110302-2N	6.35	3.18	2.8	0.2														
	VCGW110304-2N	6.35	3.18	2.8	0.4														
	VCGW110308-2N	6.35	3.18	2.8	0.8														
	VCGW160402-2N	9.525	4.76	4.4	0.2														
	VCGW160404-2N	9.525	4.76	4.4	0.4														
	VCGW160408-2N	9.525	4.76	4.4	0.8														
	VCGW110304-1N	6.35	3.18	2.8	0.4														
	VCGW160404-1N	9.525	4.76	4.4	0.4														
	VCGW160408-1N	9.525	4.76	4.4	0.8														

W Stand for wiper
H starnd for chipbreak

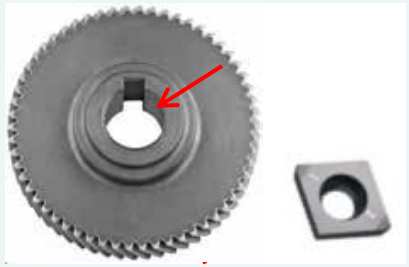
Solution for Automotive Parts



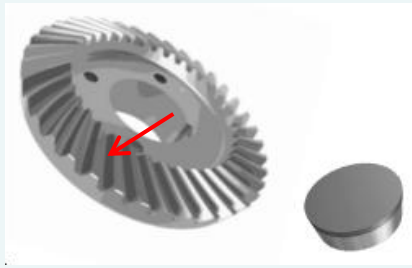
- Workpiece:CVT Shaft
- Material: SCr420H(HRC61-65)
- CBN Insert: DNGA150404S01225
- Application:External fnishing
- Vc: 150m/min
- ap: 0.15mm
- f: 0.12mm
- Wet



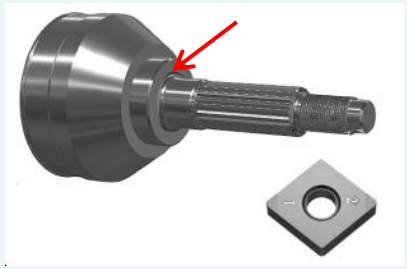
- Workpiece:Drive Shaft
- Material: 16MnCr5(HRC58-62)
- CBN Insert: DNGA150608S01535
- Application:External fnishing
- Vc: 180m/min
- ap: 0.15mm
- f: 0.07mm
- Dry



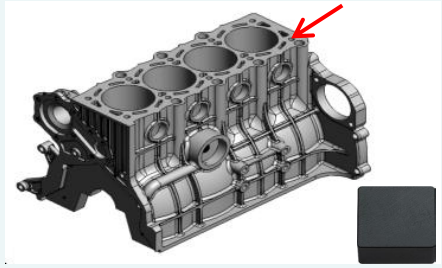
- Workpiece:Drivetrain
- Material: 16MnCr5(HRC58-62)
- CBN Insert: CCGW060204S02035
- Application:External fnishing
- Vc: 150m/min
- ap: 0.1mm
- f: 0.1mm
- Dry



- Crown Wheel（20MnCr5)
- RNGN090300S03035
- Application: Face turning (Interruption)
- Vc:150m/min
- ap:0.15mm
- f:0.28mm
- Dry



- Workpiece:CVJ Part
- Material: S55C（HRC62)
- CBN Insert: CNGA120412S01015
- Application:End face
- Vc: 150m/min
- ap: 0.2mm
- f: 0.2mm
- Dry



- Workpiece:Cylinder Block
- Material: FC250
- CBN Insert: SNGN120412S02020
- Application:Face
- Vc: 1000m/min
- ap: 1.0 mm
- f: 0.1mm
- Dry

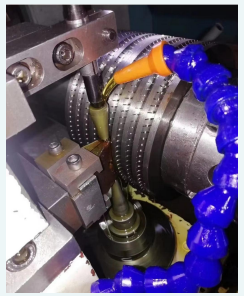


- Workpiece:Brade Drum
- Material: FC250
- CBN Insert: CNGN120712S02020
- Application:Face
- Vc: 1000m/min
- ap: 1.0 mm
- f: 0.1mm
- Wet

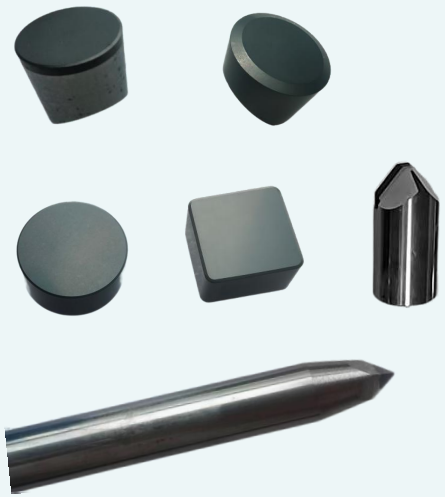


- Workpiece:Brade Drum
- Material: FC250
- CBN Insert: SNGN120416S02020
- Application:Face
- Vc: 800m/min
- ap: 2.5 mm
- f: 0.4mm
- Wet

Solution for Mill Rolls







U.S Rebar Size Chart			
Imperial bar size	Metric size	Nominal diameter	
		(inch)	(mm)
#2	#6	0.25	6.35
#3	#10	0.375	9.525
#4	#13	0.500	12.7
#5	#16	0.625	15.875
#6	#19	0.750	19.05
#8	#25	1.000	25.4

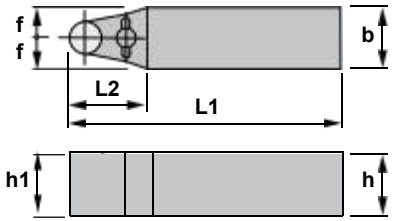
Types, Applications and Features of Rolls

Mill Rolls	Applications	Features
Forged rolls • Cr-Mo based • High speed steel based • Carbide based	Bloom-milling ar heavy rolling load. Work rolls for rough cold rolling and rolls reinforcement	Strong and relatively high in heat resistance.
Cast iron rolls • Carbide based	Semi-rolling or finishing that requires a very heavy load	More wear-resistant and high-heat-resistant than steel in between ordinary steel and cast-iron-based steel.
Cast Steel rolls • Adamite roll for deep profile • Chilled roll for boards and wire steel process • Grain roll for steel finishing process boards(Resistant to thermal crack • Ductile roll for boards, profile steel, and bar wire steel process(Roll for roughing and finishing use • Special cast iron roll	Wide range of applications from bloom-milling and semi-rolling to finishing	Suitable for the applications that require hear resistance and strength. Suitable for the application that require wear resistance
• Carbide Roll	• Pinch mills • Wire rod • Wire flatering or forming • ERW tube mills • Tuks heads • Hot & Cold rolls • Work reducing rolls	Preferred in abrasive operations. High wear capabilities.

Key Points for Machining Mill Rolls

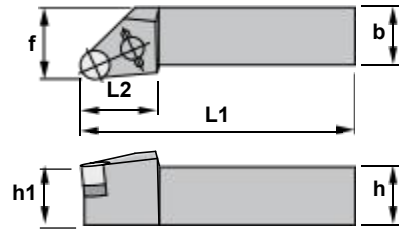
- Hardness of the roll is an important factor. As the roll gets harder the SFM should be reduced.
- RCGX style inserts are the preferred insert for rigidity and cost savings.
- If making multiple passes with one edge, vary your DOC to move the wear on the insert edge and reduce notch wear.
- If you encounter chatter, increase your feed rate. Variable RPM controllers are helpful to reduce harmonics.
- Heavy chatter is often a sign of tooling being above centerline.
- Chilled and ductile iron rolls are typically softer and short chipping materials. Even after running in the mill, these rolls rarely exceed a 67 Shore hardness.
- Tool steel and CPM rolls run quite similar and are normally over 100 Shore hardness. These rolls have a higher Chrome and Cobalt content and are considered a longer chipping material. The combination of the material type and hardness require a slower speed to run successfully.

CRDCN



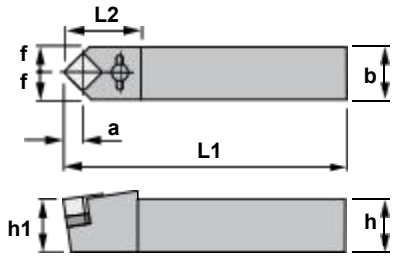
Type	HF=H	B	LF	LU	WF	Insert
CRDCN3232 P06	32	32	170	29	17.2	RCGX060500
CRDCN3232 P12	32	32	170	33	18.8	RCGX090700
CRDCN4040 S15	40	40	250	38	27.9	RCGX120700
CRDCN5040 T19	50	40	300	45	29.5	RCGX151000
CRDCN5040 T20	50	40	300	45	30	RCGX191000
CRDCN5040 T25	50	40	300	45	30	RCGX251200

CRGN



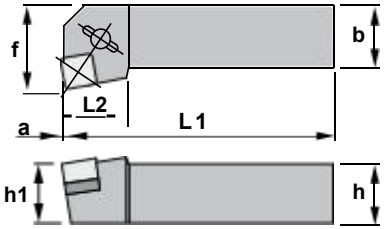
Type	h=h1	b	L1	L2	f	Insert
CRGNR/L3232 P12	32	32	170	40	37	RNMN120400
CRGNR/L3232 P15	32	32	170	40	37	RNMN150700
CRGNR/L4040 S20	40	40	250	42	45	RNMN200700
CRGNR/L5050T20	50	50	300	42	55	RNMN201000
CRGNR/L5050T25	50	40	300	42	55	RNMN251200

CSDNN 45°



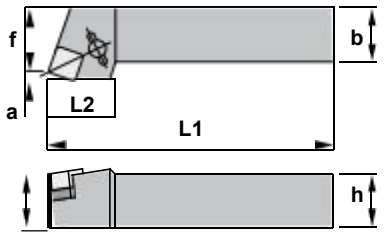
Type	h=h1	b	L1	L2	f	Insert
CSDNN3232 P12	32	32	170	48	16	SNMN1207
CSDNN4040 S15	40	40	250	52	20	SNMN1507
CSDNN5050 T20	50	50	300	56	25	SNMN2010

CSKN 75°



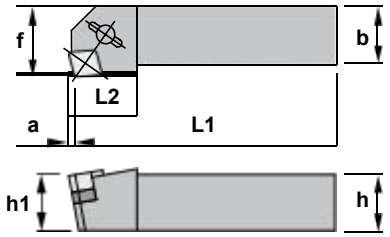
Type	h=h1	b	L1	L2	f	Insert
CSKNR/L3232 P12	32	32	170	40	39	SNMN1207
CSKNR/L3232 P15	40	40	170	45	40	SNMN1507
CSKNR/L4040 S15	50	50	250	46	49	SNMN1507
CSKNR/L4040 S20	40	40	250	50	50	SNMN2010
CSKNR/L5050 T15	50	50	300	46	60	SNMN1507
CSKNR/L5050 T20	50	50	300	50	60	SNMN2010

CSRN 75°



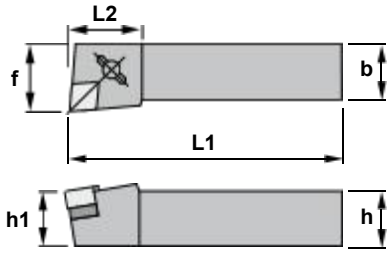
Type	h=h1	b	L1	L2	f	Insert
CSRNR/L3232 P12	32	32	170	36	36	SNMN1207
CSRNR/L4040 S15	40	40	250	45	45	SNMN1507
CSRNR/L5050 T20	50	50	300	45	56	SNMN1507

CCKN 75°



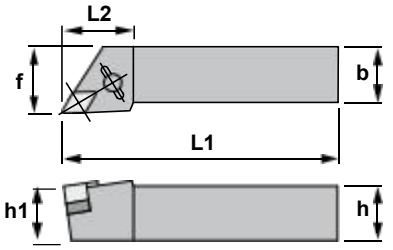
Type	h=h1	b	L1	L2	f	Insert
CCKNR/L3232 P12	25	25	170	40	39	CNMN1207
CCKNR/L3232 P15	32	32	170	45	40	CNMN1507
CCKNR/L4040 S15	40	40	250	45	49	CNMN1507
CCKNR/L4040S20	40	40	250	50	50	CNMN2010
CCKNR/L5050 T15	50	50	300	46	60	CNMN1507
CCKNR/L5050 T20	50	50	300	50	60	CNMN2010

CCLN 90°



Type	h=h1	b	L1	L2	f	Insert
CCLNR/L3232 P12	32	32	170	34	36	CNMN1207
CCLNR/L4040 S12	40	40	200	40	45	CNMN1207

CDJN 93°



Type	h=h1	b	L1	L2	f	Insert
CDJNR/L3232 M15	25	25	170	38	32	DNMN1507
CDJNR/L3232 M15	32	32	170	38	39	DNMN1507



Cotent

1. PCD Grade·····67

2. PCD Insert·····69

3. Application·····83

ADVANTAGES

Extremely hard and effective

On the usage of modern structural materials, whether in vehicle manufacture, in aerospace or also increasingly in mechanical engineering, the focus is on an improved energy balance. The energy consumption is to be lowered with the same or even better dynamic performance. For this reason the portion of non-ferrous metals, fibre-reinforced plastics (GFRP, CFRP) and sandwich materials is increasing continuously.

PCD is ideal as a cutting material for machining these workpiece materials. Due to its hardness and wear resistance even with extremely abrasive materials, high cutting values and tool lives can be achieved. The cost-effectiveness of the machining is ensured in this manner. We started to rely on PCD during the design of high-performance tools at an early stage and has obtained broad know how and many years of experience. Different machining tasks with varying requirements in relation to abrasiveness, part geometry and machines are realised with PCD.

To achieve optimal technology figures for the various requirement profiles and to fully exploit the performance of the PCD cutting material and of the machines, an optimal cutting edge geometry must be manufactured with high accuracy and reproducible quality. Here We uses the latest machine technology for grinding and eroding the inserts. New technologies such as the laser machining of PCD are also used. Positive chip geometries and different chip breaker geometries are machined using lasers on the PCD indexable inserts that are used, for example, for long chipping types of aluminium. Short, easily removed chips are produced, which significantly increases the process reliability.

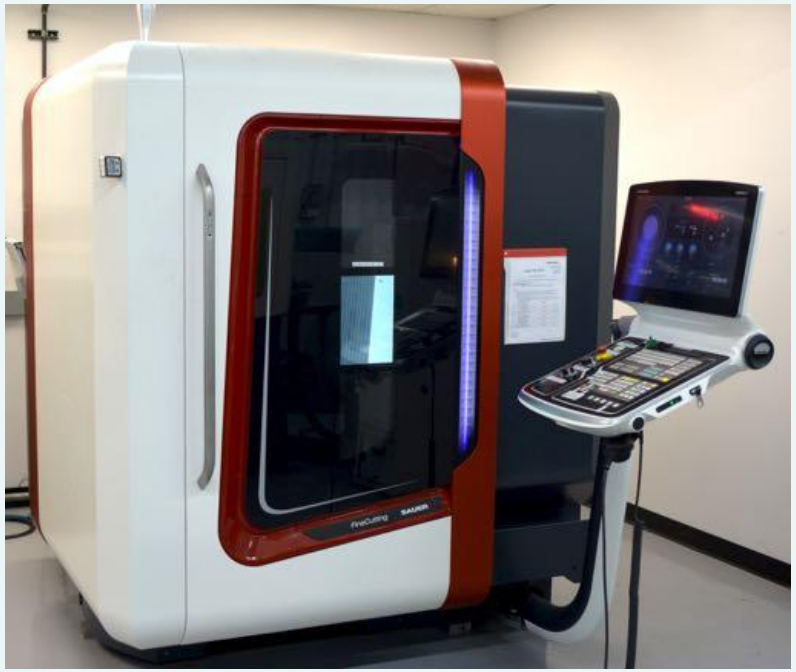
Work material characteristics and to a lesser extent, cutting parameters, determine the demands placed on the cutting tool and hence, the optimum balance of tool material properties. Knowledge of the application, including workpiece composition, facilitates selection of the optimum grade and selection of the correct tool geometry. Often, work material composition and machining parameters (vc, f, ap) go hand in hand. It is possible, therefore, only to provide a typical range of values for each parameter.

PCD Application Guide

For high speed machining of nonferrous metals

Features

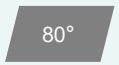
- Elevated cutting speed when compared to carbide.
- Recommended for cutting of aluminum and copper alloys with excellent deposition resistance.
- Incorporates a very sharp cutting edge condition.
- Pre-grinding and cutting-off types added in addition to the current milling cutter types.



IDENTIFICATION SYSTEM

ISO C C G W 06 02 04 CB
1 2 3 4 5 6 7 8

ANSI C C G W 4 3 2 CB
1 2 3 4 5 6 7 8

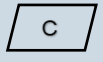
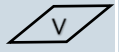
1 Shape	
	C
	D
	E
	H
	L
	R
	S
	T
	V
	W

2 Clearance Angle	
A	3°
C	5°
D	7°
E	15°
F	20°
G	25°
N	0°
P	11°

3 Tolerance			
Symbol	m	s	i.c
A	±0.005	±0.025	±0.025
C	±0.013	±0.025	±0.025
E	±0.025	±0.025	±0.025
F	±0.005	±0.025	±0.013
G	±0.025	±0.013	±0.025
H	±0.013	±0.025	±0.013
J	±0.005	±0.025	
K	±0.013	±0.025	
L	±0.025	±0.025	
M		±0.127	
N		±0.127	
U		±0.025	

4 Type	
A	With hole
B	With hole and one 70°-90° countersink
C	With hole and one 70°-90° countersink
F	Chipbreaker both sides
G	With hole, chipbreaker on both sides
H	With hole one 70°-90° countersink and chipbreak on one side
J	With hole two 70°-90° countersink and chipbreak on both side
M	With hole, chipbreaker on one sides
N	No hole, No chipbreaker
Q	With hole, one 40°-60° countersink
R	chipbreaker on one sides
T	With hole, one 40°-60° countersink, chipbreaker on one sides.
W	With hole, one 40°-60° countersink.
X	Special design

IDENTIFICATION SYSTEM

5 Cutting Edging Length (ISO)									
							I.C(mm)	I.C(inch)	ANSI
03	04	03	03	06		02	3.97	5/32	12
04	05	04	04	08		03	4.76	3/16	15
05	06	05	05	09	09	03	5.56	7/32	18
06	07	06	06	11	11	04	6.35	1/4	2
08	09	07	07	13	13	05	7.94	5/16	25
09	11	09	09	16	16	06	9.525	3/8	3
12	15	12	12	22	22	08	12.7	1/2	4
16	19	15	15	27	27	10	15.875	5/8	5
19	23	19	19	33	33	13	19.050	3/4	6
22	27	22	22	38	38		22.225	7/8	7
25	31	25	25	44	44		25.4	1	8
32	38	31	31	55	54		31.75	1-1/4	10

6 Thickness (ISO)			
mm	ISO	inch	ANSI
1.59	01	1/16	1
1.98	T1	5/64	12
2.38	02	3/32	15
3.18	03	1/8	2
3.97	T3	5/32	25
4.76	04	3/14	3
5.56	05	7/32	35
6.35	06	1/4	4
7.94	07	5/16	5
9.525	09	3/8	6
12.7	12	1/2	8

7 Nose-Radius			
mm	ISO	inch	ANSI
Sharp	00	0.000	0.0
0.2	02	0.008	05
0.4	04	1/64	1
0.8	08	1/32	2
1.2	12	3/64	3
1.6	16	1/16	4
2.0	20	5/64	5
2.4	24	3/32	6
2.8	28	7/64	7
3.2	32	1/8	8
00	Round Insert	0	Round Insert

8 Chip Breaker

3D - lasered Micro Chip Breaker

PCD tools are the first choice for the machining of aluminum (<Si1) and magnesium alloys, lead-free brass, and a wide variety of plastic composites. However, these long-chipping materials are often plagued by chip problems.
Our laser technology allows us to introduce 3D micro chip grooves into a wide variety of PCD, CVD-D and CBN tools. This special laser ablation process allows more complex chipbreaker shapes and achieve excellent chip control.

A lasered 3D micro chip breaker enables controlled chip breakage in most long-chipping materials. In addition, the chipbreaker minimizes cutting pressure, allowing for the machining of thin-walled components.
For controlled chip breaking, we offer you two different 3D-Micro chip grooves:

- **CB-1:**The chip breaker structure C1 was specially developed for machining tasks with low cutting depths and therefore thin chips. The chips are also reliably broken at high cutting speeds and can be transported away without problems.
- **CB-2** :For machining tasks with high cutting depth, the structure C2 is available. Short, easy to control chips are also produced with this chip breaker structure.

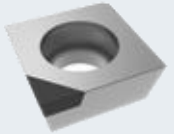
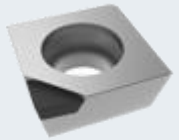


CB-1



CB-2

Rake Angle Geometry

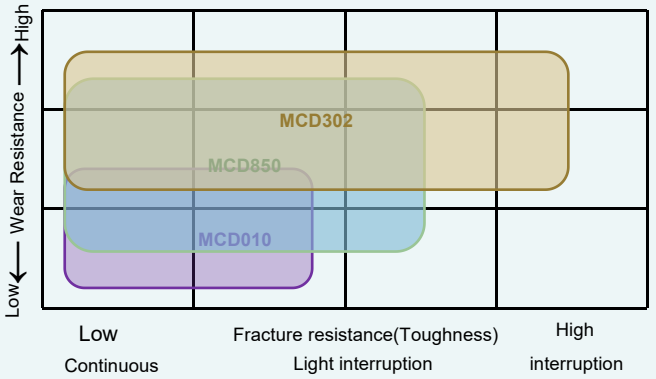
Example	Geometry	Application description
	0° rake angle	**Medium cutting pressure** – Solid or particularly stable parts – Tight tolerances – High quality surface finish
	Positive rake angle	**Low cutting pressure** – Thin-walled or unstable parts – Very tight tolerances – Medium quality surface finish



PCD Grade

MCD850 0.85~1 um	Ideal for milling and rough cutting of aluminium alloys where extreme chip resistance is required, also for machining titanium and composites.
MCD002 2 um	Ideal for profile routers and thread cutting tools, can also be used in wear part applications.
MCD004 4 um	Ideal for cutting of aluminium alloys where high surface finish is required alongside higher wear resitance.
MCD010 10 um	The ideal grade where roughing and finishing are performed with a single tool. Highly recommended for low to medium content aluminium alloy.
MCD025 25 um	Successful in machining of high silicon aluminium alloys, metal matrix composites (MMC),tungsten carbides and ceramics.
MCD302 2~30 um	Application areas include MMC, high silicon aluminium alloys, high strength cast irons and bi-metal applications. Excellent abrasion resistance and good thermal stability.

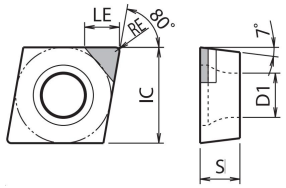
Application Map

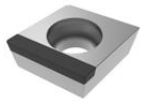
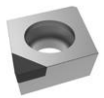


Recommended Cutting Parameter

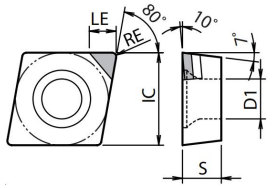
Workpiece material	Grade	Cutting Parameter			
		Vc (m/min)	f (mm/rev)	ap (mm)	
				Positive Insert	Negative Insert
Aluminum alloys, Znic alloys	**MCD850** MCD010	300~1500	0.03~0.5	~1.0	~2.0
Copper，Brass, Brozen	**MCD850** MCD010	300~1000	0.03~0.5	~1.0	~2.0
Magnesium alloys	**MCD850** MCD010	400~1200	0.03~0.5	~1.0	~2.0
Carbide	**MCD850** MCD010	10~30	0.03~0.1	~0.3	~0.3
Titanium alloy	**MCD850** MCD010	100~200	0.05~0.2	~1.0	~2.0
Glass fiber reinforced plastics, Carbon fiber	**MCD850** MCD010	100~600	0.05~0.5	~1.0	~2.0
Silica filling plastic, Particle borad	**MCD850** MCD010	400~800	0.05~0.5	~1.0	~2.0

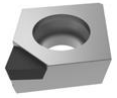
80° Rhombic / CCGW



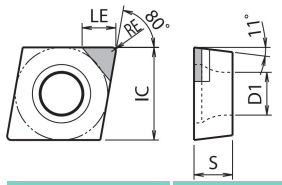
Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	CCGW060201	6.35	2.38	2.8	0.1						
	CCGW060202	6.35	2.38	2.8	0.2						
	CCGW060204	6.35	2.38	2.8	0.4						
	CCGW09T302	9.525	3.97	4.4	0.2						
	CCGW09T304	9.525	3.97	4.4	0.4						
	CCGW09T308	9.525	3.97	4.4	0.8						
	CCGW060202-L	6.35	2.38	2.8	0.2						
	CCGW060204-L	6.35	2.38	2.8	0.4						
	CCGW060208-L	6.35	2.38	2.8	0.8						
	CCGW09T302-L	9.525	3.97	4.4	0.2						
	CCGW09T304-L	9.525	3.97	4.4	0.4						
	CCGW09T308-L	9.525	3.97	4.4	0.8						
	CCGW040101	4.3	1.8	2.3	0.1						
	CCGW040102	4.3	1.8	2.3	0.2						
	CCGW040104	4.3	1.8	2.3	0.4						

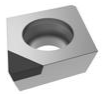
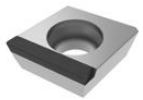
80° Rhombic / CCGT



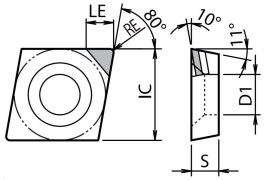
Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	CCGT060201	6.35	2.38	2.8	0.1						
	CCGT060202	6.35	2.38	2.8	0.2						
	CCGT060204	6.35	2.38	2.8	0.4						
	CCGT09T302	9.525	3.97	4.4	0.2						
	CCGT09T304	9.525	3.97	4.4	0.4						
	CCGT09T308	9.525	3.97	4.4	0.8						
	CCGT060202-CB1	6.35	2.38	2.8	0.2						
	CCGT060204-CB1	6.35	2.38	2.8	0.4						
	CCGT060208-CB1	6.35	2.38	2.8	0.8						
	CCGT09T302-CB1	9.525	3.97	4.4	0.2						
	CCGT09T304-CB1	9.525	3.97	4.4	0.4						
	CCGT09T308-CB1	9.525	3.97	4.4	0.8						
	CCGT040101	4.3	1.8	2.3	0.1						
	CCGT040102	4.3	1.8	2.3	0.2						
	CCGT040104	4.3	1.8	2.3	0.4						

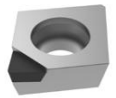
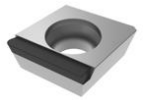
80° Rhombic / CPGW



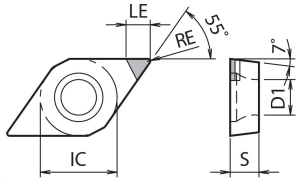
Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	CPGW060201	6.35	2.38	2.8	0.1						
	CPGW060202	6.35	2.38	2.8	0.2						
	CPGW060204	6.35	2.38	2.8	0.4						
	CPGW09T302	9.525	3.97	4.4	0.2						
	CPGW09T304	9.525	3.97	4.4	0.4						
	CPGW09T308	9.525	3.97	4.4	0.8						
	CPGW060202-L	6.35	2.38	2.8	0.2						
	CPGW060204-L	6.35	2.38	2.8	0.4						
	CPGW060208-L	6.35	2.38	2.8	0.8						
	CPGW09T302-L	9.525	3.97	4.4	0.2						
	CPGW09T304-L	9.525	3.97	4.4	0.4						
	CPGW09T308-L	9.525	3.97	4.4	0.8						

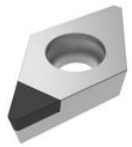
80° Rhombic / CPGT



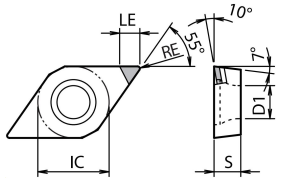
Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	CPGT060201	6.35	2.38	2.8	0.1						
	CPGT060202	6.35	2.38	2.8	0.2						
	CPGW060204	6.35	2.38	2.8	0.4						
	CPGT09T302	9.525	3.97	4.4	0.2						
	CPGT09T304	9.525	3.97	4.4	0.4						
	CPGT09T308	9.525	3.97	4.4	0.8						
	CPGT060202-L	6.35	2.38	2.8	0.2						
	CPGT060204-L	6.35	2.38	2.8	0.4						
	CPGT060208-L	6.35	2.38	2.8	0.8						
	CPGT09T302-L	9.525	3.97	4.4	0.2						
	CPGT09T304-L	9.525	3.97	4.4	0.4						
	CPGT09T308-L	9.525	3.97	4.4	0.8						

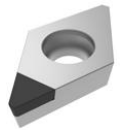
55° Rhombic / DCGW



Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	DCGW070202	6.35	2.38	2.8	0.2						
	DCGW070204	6.35	2.38	2.8	0.4						
	DCGW070208	6.35	2.38	2.8	0.8						
	DCGW11T304	9.525	3.97	4.4	0.4						
	DCGW11T308	9.525	3.97	4.4	0.8						
	DCGW11T312	9.525	3.97	4.4	1.2						

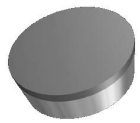
55° Rhombic / DCGT



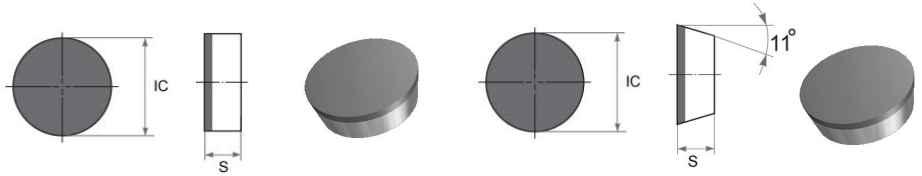
Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	DCGT070202-2N	6.35	2.38	2.8	0.2						
	DCGT070204-2N	6.35	2.38	2.8	0.4						
	DCGT070208-2N	6.35	2.38	2.8	0.8						
	DCGT11T304-2N	9.525	3.97	4.4	0.4						
	DCGT11T308-2N	9.525	3.97	4.4	0.8						
	DCGT11T312-2N	9.525	3.97	4.4	1.2						
	DCGT070202-CB1	6.35	2.38	2.8	0.2						
	DCGT070204-CB1	6.35	2.38	2.8	0.4						
	DCGT070208-CB1	6.35	2.38	2.8	0.8						
	DCGT11T304-CB1	9.525	3.97	4.4	0.4						
	DCGT11T308-CB1	9.525	3.97	4.4	0.8						
	DCGT11T312-CB1	9.525	3.97	4.4	1.2						

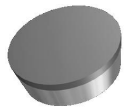
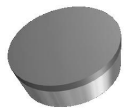
Round/Full Top PCD



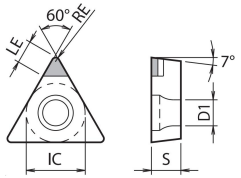
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330
	RCGX050400-FT	5.0	4.0	-	-					
	RCGX060500-FT	6.35	5.0	-	-					
	RCGX090700-FT	9.525	7.94	-	-					
	RCGX120700-FT	12.7	7.94	-	-					
	RCGX150700-FT	15.875	7.94	-	-					
	RCGX151000-FT	15.875	10.0	-	-					
	RCGN060300-FT	6.35	3.18	-	-					
	RCGN090400-FT	9.525	1.59	-	-					
	RCGN120400-FT	12.7	1.59	-	-					

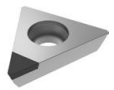
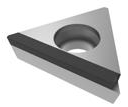
Round/Full Top PCD



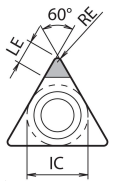
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330
	RNGN060300-FT	6.35	3.18	-	-					
	RNGN090300-FT	6.35	3.18	-	-					
	RNGN090400-FT	6.35	3.18	-	-					
	RNGN120300-FT	9.525	4.76	-	-					
	RNGN120400-FT	9.525	4.76	-	-					
	RNGN120700-FT	9.525	4.76	-	-					
	RPGN090300-FT	9.525	3.18	-	-					
	RPGN120300-FT	12.7	3.18	-	-					
	RPGN120400-FT	12.7	4.76	-	-					

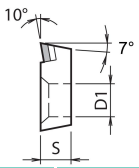
60° Triangle / TCGW

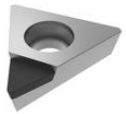
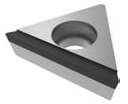


Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	TCGW090204	5.56	2.38	2.5	0.2						
	TCGW090208	5.56	2.38	2.5	0.4						
	TCGW110204	6.35	2.38	2.8	0.4						
	TCGW110208	6.35	2.38	2.8	0.4						
	TCGW16T304	9.525	3.97	4.4	0.4						
	TCGW16T308	9.525	3.97	4.4	0.8						
	TCGW090204-L	5.56	2.38	2.5	0.2						
	TCGW090208-L	5.56	2.38	2.5	0.4						
	TCGW110204-L	6.35	2.38	2.8	0.4						
	TCGW110208-L	6.35	2.38	2.8	0.4						
	TCGW16T304-L	9.525	3.97	4.4	0.4						
	TCGW16T304-L	9.525	3.97	4.4	0.8						

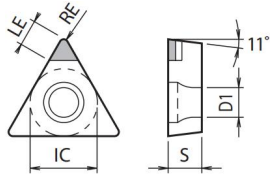
60° Triangle / TCGT

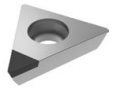
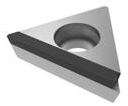




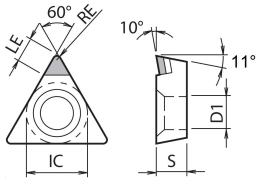
Insert	ISO	I.C	S	D1	RE	MCD850	MCD002	MCD004	MCD010	MCD025	MCD302
	TCGT090204	5.56	2.38	2.5	0.2						
	TCGT090208	5.56	2.38	2.5	0.4						
	TCGT110204	6.35	2.38	2.8	0.4						
	TCGT110208	6.35	2.38	2.8	0.4						
	TCGT16T304	9.525	3.97	4.4	0.4						
	TCGT16T308	9.525	3.97	4.4	0.8						
	TCGT090204-L	5.56	2.38	2.5	0.2						
	TCGT090208-L	5.56	2.38	2.5	0.4						
	TCGT110204-L	6.35	2.38	2.8	0.4						
	TCGT110208-L	6.35	2.38	2.8	0.4						
	TCGT16T304-L	9.525	3.97	4.4	0.4						
	TCGT16T304-L	9.525	3.97	4.4	0.8						

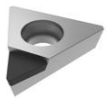
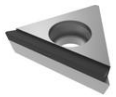
60° Triangle / TPGW



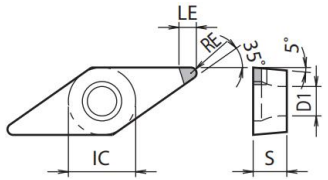
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350
	TPGW090204	5.56	2.38	2.5	0.2						
	TPGW090208	5.56	2.38	2.5	0.4						
	TPGW110204	6.35	2.38	2.8	0.4						
	TPGW110208	6.35	2.38	2.8	0.4						
	TPGW16T304	9.525	3.97	4.4	0.4						
	TPGW16T308	9.525	3.97	4.4	0.8						
	TPGW090204-L	5.56	2.38	2.5	0.2						
	TPGW090208-L	5.56	2.38	2.5	0.4						
	TPGW110204-L	6.35	2.38	2.8	0.4						
	TPGW110208-L	6.35	2.38	2.8	0.4						
	TPGW16T304-L	9.525	3.97	4.4	0.4						
	TPGW16T304-L	9.525	3.97	4.4	0.8						

60° Triangle / TPGT



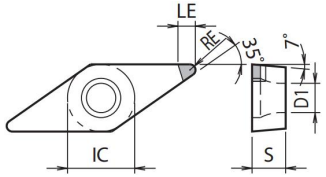
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350
	TPGT090204	5.56	2.38	2.5	0.2						
	TPGT090208	5.56	2.38	2.5	0.4						
	TPGT110204	6.35	2.38	2.8	0.4						
	TPGT110208	6.35	2.38	2.8	0.4						
	TPGT16T304	9.525	3.97	4.4	0.4						
	TPGT16T308	9.525	3.97	4.4	0.8						
	TPGT090204-L	5.56	2.38	2.5	0.2						
	TPGT090208-L	5.56	2.38	2.5	0.4						
	TPGT110204-L	6.35	2.38	2.8	0.4						
	TPGT110208-L	6.35	2.38	2.8	0.4						
	TPGT16T304-L	9.525	3.97	4.4	0.4						
	TPGT16T304-L	9.525	3.97	4.4	0.8						
	TPGT160402-1N	9.525	4.76	4.4	0.2						
	TPGT160404-1N	9.525	4.76	4.4	0.4						
	TPGT160408-1N	9.525	4.76	4.4	0.8						

35° Rhombic / VBGW



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350
	VBGW110302	6.35	3.18	2.8	0.2						
	VBGW110304	6.35	3.18	2.8	0.4						
	VBGW110308	6.35	3.18	2.8	0.8						
	VBGW160402	9.525	4.76	4.4	0.2						
	VBGW160404	9.525	4.76	4.4	0.4						
	VBGW160408	9.525	4.76	4.4	0.8						

35° Rhombic / VCGW



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330	MRN350
	VCGW110302	6.35	3.18	2.8	0.2						
	VCGW110304	6.35	3.18	2.8	0.4						
	VCGW110308	6.35	3.18	2.8	0.8						
	VCGW160402	9.525	4.76	4.4	0.2						
	VCGW160404	9.525	4.76	4.4	0.4						
	VCGW160408	9.525	4.76	4.4	0.8						

Application Examples



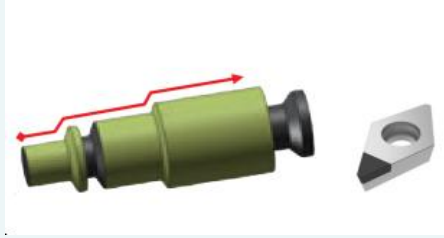
- Workpiece: Alloy Wheel
- Material: AlSi7
- PCD Insert: VCGW220518
- Application:Surface
- Vc: 1500m/min
- ap: 0.2mm
- f: 0.16mm
- Wet



- Workpiece: Piston
- Material: Alu B2+
- PCD Insert: DCGT11T308-CB1
- Application:External fnishing
- Vc: 3700m/min
- ap: 0.m
- f: 0.12mm
- Wet



- Workpiece: Shaft
- Material: AlMgSi0.5
- CBN Insert: DCGT11T304-CB1
- Application:External fnishing
- Vc: 800m/min
- ap: 0.3mm
- f: 0.09mm
- Wet



- Workpiece: Spool
- Material: C1100
- CBN Insert: DCGT11T302
- Application::External fnishing
- Vc: 107m/min
- ap: 0.2 mm
- f: 0.03mm
- Wet

MEMO



Cotent

1. Ceramic Grade·····91

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For Ceramic Insert

Ceramic Insert is an inorganic material, die-pressed and sintered using very fine and pure raw materials with fine microstructure. Since the MeRui ceramic inserts are prepared by HIP process to condense completely, it has high thermal shock resistance, excellent fracture toughness and distinguished wear resistance through HIP.



Ceramic Edge Preparations

The application of T-lands (edge chamfers), hones, or both is generally required to increase the strength of ceramic cutting edges. Negative T-lands redirect the cutting forces into the body of the insert, thereby reducing the tensile stresses on the cutting edge. Honing or edge rounding eliminates the sharp edges at which chipping can occur in the early stages of use.

Selecting the proper edge preparation is often the most important factor affecting the performance of ceramic inserts. The size and type of the edge preparation required are related primarily to the feed rate and the severity of the operation. Light feed rates demand small T-lands and/or hones; heavy feed rates require larger T-lands and hones.

The ideal edge preparation is the smallest which consistently provides adequate edge strength and resistance to chipping in a given operation. As a general rule, the feed rate (in inches/revolution) should be 1 - 1.5 times the width of the T-land.

IDENTIFICATION SYSTEM

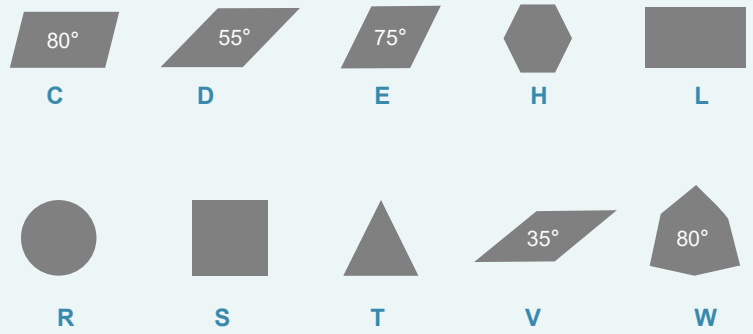
ISO

S	N	G	A	12	04	12	T	010	20
1	2	3	4	5	6	7	8	9	10

ANSI

S	N	G	A	4	3	3	T	010	20
1	2	3	4	5	6	7	8	9	10

1 Shape



2 Clearance Angle	
A	3°
C	5°
D	7°
E	15°
F	20°
G	25°
N	0°
P	11°

3 Tolerance

Symbol	m	s	i.c
A	±0.005	±0.025	±0.025
C	±0.013	±0.025	±0.025
E	±0.025	±0.025	±0.025
F	±0.005	±0.025	±0.013
G	±0.025	±0.013	±0.025
H	±0.013	±0.025	±0.013
J	±0.005	±0.025	
K	±0.013	±0.025	
L	±0.025	±0.025	
M		±0.127	
N		±0.127	
U		±0.025	

4 Type	
A	With hole
B	With hole and one 70°-90° countersink
C	With hole and one 70°-90° countersink
F	Chipbreaker both sides
G	With hole, chipbreaker on both sides
H	With hole one 70°-90° countersink and chipbreak on one side
J	With hole two 70°-90° countersink and chipbreak on both side
M	With hole, chipbreaker on one sides
N	No hole, No chipbreaker
Q	With hole, one 40°-60° countersink
R	chipbreaker on one sides
T	With hole, one 40°-60° countersink, chipbreaker on one sides.
W	With hole, one 40°-60° countersink.
X	Special design

IDENTIFICATION SYSTEM

5 Cutting Edging Length (ISO)

C	D	R	S	T	V	W	I.C(mm)	I.C(inch)	ANSI
03	04	03	03	06		02	3.97	5/32	12
04	05	04	04	08		03	4.76	3/16	15
05	06	05	05	09	09	03	5.56	7/32	18
06	07	06	06	11	11	04	6.35	1/4	2
08	09	07	07	13	13	05	7.94	5/16	25
09	11	09	09	16	16	06	9.525	3/8	3
12	15	12	12	22	22	08	12.7	1/2	4
16	19	15	15	27	27	10	15.875	5/8	5
19	23	19	19	33	33	13	19.050	3/4	6
22	27	22	22	38	38		22.225	7/8	7
25	31	25	25	44	44		25.4	1	8
32	38	31	31	55	54		31.75	1-1/4	10

6 Thickness (ISO)

mm	ISO	inch	ANSI
1.59	01	1/16	1
1.98	T1	5/64	12
2.38	02	3/32	15
3.18	03	1/8	2
3.97	T3	5/32	25
4.76	04	3/14	3
5.56	05	7/32	35
6.35	06	1/4	4
7.94	07	5/16	5
9.525	09	3/8	6
12.7	12	1/2	8

7 Nose-Radius

mm	ISO	inch	ANSI
Sharp	00	0.000	0.0
0.2	02	0.008	05
0.4	04	1/64	1
0.8	08	1/32	2
1.2	12	3/64	3
1.6	16	1/16	4
2.0	20	5/64	5
2.4	24	3/32	6
2.8	28	7/64	7
3.2	32	1/8	8
00	Round Insert	0	Round Insert

8 Type of Cutting Edge

Code	Edge	Diagram
F	Sharp	
E	Honing	
T	Chamfering	
S	Chamfering + Honing	

9 Chamfer Width



010	0.10	045	0.45
015	0.15	050	0.50
020	0.20	100	1.00
025	0.25	200	2.00

10 Chamfer Angle



05	5°	20	20°
10	10°	25	25°
15	15°	30	30°

GRADE INFORMATION

Ceramic Series

MCC100
High thermal shock resistance Al2O3+TiC.
Universal grade for machining cast iron and hardened steel

MCC300
Excellent wear resistance Al2O3+TiCN.
A basic choice for machining hardened steel and alloy steel

MCC500
Fine microstructure Al2O3+TiCN.
Fine finishing for hardened steel and cast iron.

MCN500
Excellent wear resistance in high speed cutting.
First choice for roughing of cast iron.
High speed machining with interrupted cuts.

MCW800
Al2O3+SiC Whisker
Nickel Base Alloy, Cobalt Base Alloy in high speed cutting
Roughing and finishing with continuous or light interruption

.

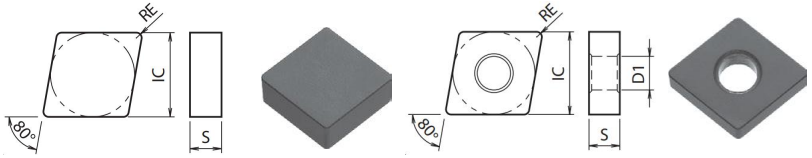
Physical Properties

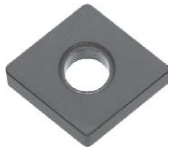
Grade	Composition	Color	Density(g/cm3)	Hardness(HV)	Toughness(Mpa·$m^{1/2}$)
MCC10	Al_2O_3+TiC	Black	4.2	2100	4.0
MCC300	Al_2O_3+TiCN	Black	4.4	2150	4.5
MCC500	Al_2O_3+TiCN	Black	4.3	2200	4.5
MCN500	Si_3N_4	Black	3.2	1700	6.0
MCW800	Al_2O_3+SiC	Grey	3.8	2100	7.0

Recommended Cutting Parameter

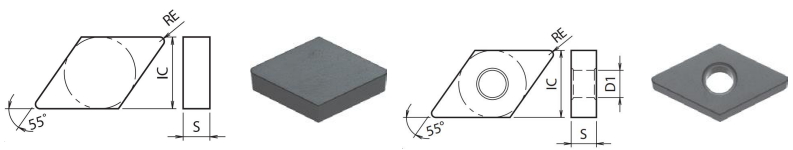
Cutting Condition	Grade	Cutting Condition	Cutting Parameter		
			Vc (m/min)	f (mm/rev)	ap (mm)
Gray Cast Iron (FC) Malleable (FCMB)	MCC100 MCC300 MCC500	Roughing Finishing	150~800 200~1200	0.2~0.5 0.3~0.5	3~6 0.1~0.5
	MCN500	Roughing Finishing	150~1100 250~1200	0.3~0.8 0.15~0.4	< 5 < 1
Chilled Cast Iron	MCC100 MCC300 MCC500	Roughing Finishing	30~100 50~200	0.1~0.2 0.05~0.15	0.5~1.5 0.1~0.5
	MCN500	Roughing Finishing	20~100 60~200	1.0~2.0 0.1~0.5	< 5 < 1
Ductile Cast Iron Nodular Cast Iron	MCC100	Roughing Finishing	100~400 200~800	0.1~0.2 0.05~0.25	1~2 0.1~0.5
Carbon Steel Alloy Steel Bearing Steel	MCC100 MCC300 MCC500	Roughing Finishing	150~400 200~800	0.2~0.5 0.05~0.2	2~5 0.1~0.5
Hard Steel (HRC 45≥)	MCC100 MCC300 MCC500	Roughing Finishing	20~100 40~200	0.1~0.2 0.05~0.5	0.5~1.5 0.1~0.5
High temperature alloys Inconel Stellite	MCW800	Roughing Finishing	180~360 180~450	0.03~0.15	0.03~0.2

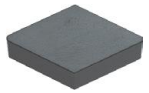
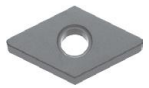
80° Rhombic/CN



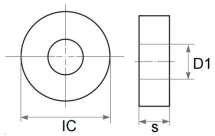
Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	CNGN120404	12.7	4.76	-	0.4					
	CNGN120408	12.7	4.76	-	0.8					
	CNGN120412	12.7	4.76	-	1.2					
	CNGN120704	12.7	7.94	-	0.4					
	CNGN120708	12.7	7.94	-	0.8					
	CNGN120712	12.7	7.94	-	1.2					
	CNGN160712	15.875	7.94	-	1.2					
	CNGN190716	19.05	7.94	-	1.6					
	CNGA120404	12.7	4.76	5.16	0.4					
	CNGA120408	12.7	4.76	5.16	0.8					
	CNGA120412	12.7	4.76	5.16	1.2					
	CNGA120704	12.7	7.94	5.16	0.4					
	CNGA120708	12.7	7.94	5.16	0.8					
	CNGA120712	12.7	7.94	5.16	1.2					
	CNGA160712	15.875	7.94	6.35	1.2					
	CNGA190716	19.05	7.94	7.93	1.6					

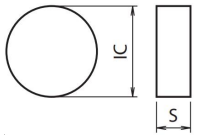
55° Rhombic/DN



Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330
	DNGN150404	12.7	4.76	-	0.4					
	DNGN150408	12.7	4.76	-	0.8					
	DNGN150412	12.7	4.76	-	1.2					
	DNGN150604	12.7	6.35	-	0.4					
	DNGN150608	12.7	6.35	-	0.8					
	DNGN150612	12.7	6.35		1.2					
	DNGN150712	12.7	7.94		1.2					
	DNGN150716	12.7	7.94	-	1.6					
	DNGA150404	12.7	4.76	5.16	0.4					
	DNGA150408	12.7	4.76	5.16	0.8					
	DNGA150412	12.7	4.76	5.16	1.2					
	DNGA150604	12.7	6.35	5.16	0.4					
	DNGA150608	12.7	6.35	5.16	0.8					
	DNGA150612	12.7	6.35	5.16	1.2					
	DNGA150712	12.7	7.94	5.16	1.2					
	DNGA150716	12.7	7.94	5.16	1.6					

Round/RN

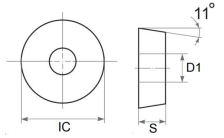


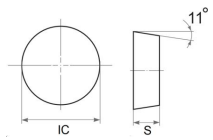





Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	RNGA120400	12.7	4.76	5.16	-					
	RNGA120700	12.7	4.76	5.16	-					
					-					
	RNGN120400	12.7	7.94	-	-					
	RNGN120700	12.7	7.94	-	-					
	RNGN150700	15.875	7.94	-	-					
	RNGN190600	19.05	6.35	-	-					
	RNGN190700	19.05	7.94	-	-					
	RNGN250700	25.4	7.94	-	-					
	RNGN250900	25.4	9.525	-	-					

Round/RP

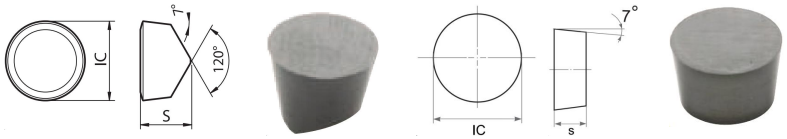




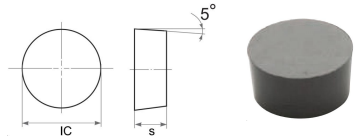
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330
	RPGA120400	12.7	4.76	5.16	-					
	RPGA120700	12.7	4.76	5.16	-					
					-					
	RPGN120400	12.7	7.94	-	-					
	RPGN120700	12.7	7.94	-	-					
	RPGN150700	15.875	7.94	-	-					
	RPGN190600	19.05	6.35	-	-					
	RPGN190700	19.05	7.94	-	-					
	RPGN250700	25.4	7.94	-	-					
	RPGN250900	25.4	9.525	-	-					

Round/RC



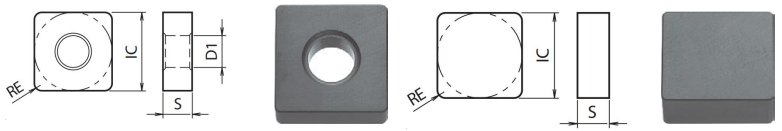
Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	RCGN060500	6.35	5.0	-	-					
	RCGN060600	6.35	6.35	-	-					
	RCGN090700	9.525	7.94	-	-					
	RCGN120700	12.7	7.94	-	-					
	RCGN151000	15.875	7.94	-	-					
	RCGN191000	19.05	10.00							
	RCGN251200	25.4	12.0							
	RCGX060500	6.35	5.0	-	-					
	RCGX060600	6.35	6.35	-	-					
	RCGX090700	9.525	7.94	-	-					
	RCGX120700	12.7	7.94	-	-					
	RCGX151000	15.875	7.94	-	-					
	RCGX191000	19.05	10.00							
	RCGX251200	25.4	12.0	-	-					

Round/RB



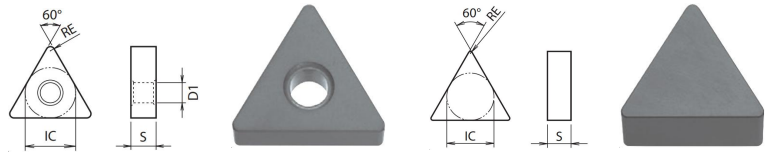
Insert	ISO	I.C	S	D1	RE	MRNC100	MRNC200	MRNC220	MRNC300	MRNC330
	RBGN090300	9.525	3.18	-	-					
	RBGN090400	9.525	4.76	-	-					
	RBGN120300	12.7	3.18	-	-					
	RBGN120400	12.7	4.76	-	-					
	RBGN120700	12.7	7.94	-	-					
	RBGN150700	15.875	7.94							
	RBGN190700	19.05	7.94	-	-					

90° Square/SN



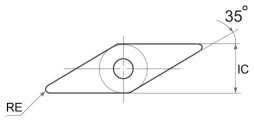
Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	SNGA090304	9.525	3.18	3.81	0.4					
	SNGA090408	9.525	4.76	3.81	0.8					
	SNGA120404	12.7	4.76	5.16	0.4					
	SNGA120408	12.7	4.76	5.16	0.8					
	SNGA120412	12.7	4.76	5.16	1.2					
	SNGA150608	15.875	7.93	6.35	0.8					
	SNGA190612	19.05	6.35	7.94	1.2					
	SNGA190616	19.05	6.35	7.94	1.6					
	SNGN090304	9.525	3.18	-	0.4					
	SNGN090408	9.525	4.76	-	0.8					
	SNGN120404	12.7	4.76	-	0.4					
	SNGN120408	12.7	4.76	-	0.8					
	SNGN120412	12.7	4.76	-	1.2					
	SNGN150608	15.875	7.93	-	0.8					
	SNGN190612	19.05	6.35	-	1.2					
	SNGN190616	19.05	6.35	-	1.6					

60° Triangle/TN

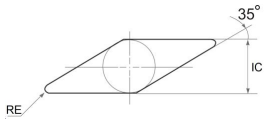


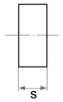
Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	TNGA110304	6.35	3.18	2.26	0.4					
	TNGA110308	6.35	3.18	2.26	0.8					
	TNGA110312	6.35	3.18	2.26	1.2					
	TNGA160404	9.525	4.76	3.81	0.4					
	TNGA160408	9.525	4.76	3.81	0.8					
	TNGA16412	9.525	4.76	3.81	1.2					
	TNGA220408	12.7	4.76	5.16	0.8					
	TNGA220712	12.7	7.94	5.16	1.2					
	TNGN110304	6.35	3.18	-	0.4					
	TNGN110308	6.35	3.18	-	0.8					
	TNGN110312	6.35	3.18	-	1.2					
	TNGN160404	9.525	4.76	-	0.4					
	TNGN160408	9.525	4.76	-	0.8					
	TNGN16412	9.525	4.76	-	1.2					
	TNGN220408	12.7	4.76	-	0.8					
	TNGN220712	12.7	7.94	-	1.2					

35° Rhombic/VN





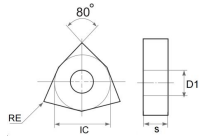



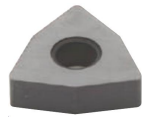


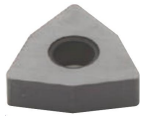


Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	VNGA160404	9.525	4.76	3.81	0.4					
	VNGA160408	9.525	4.76	3.81	0.8					
	VNGA160412	9.525	4.76	3.81	1.2					
	VNGA160604	9.525	6.35	3.81	0.4					
	VNGA160608	9.525	6.35	3.81	0.8					
	VNGA160612	9.525	6.35	3.81	1.2					
	VNGA220408	12.7	4.76	5.16	0.8					
	VNGA220412	12.7	4.76	5.16	1.2					
	VNGN160404	9.525	4.76	-	0.4					
	VNGN160408	9.525	4.76	-	0.8					
	VNGN160412	9.525	4.76	-	1.2					
	VNGN160604	9.525	6.35	-	0.4					
	VNGN160608	9.525	6.35	-	0.8					
	VNGN160612	9.525	6.35	-	1.2					
	VNGN220408	12.7	4.76	-	0.8					
	VNGN220412	12.7	4.76	-	1.2					

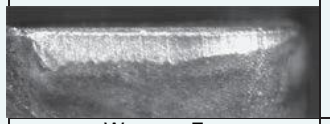
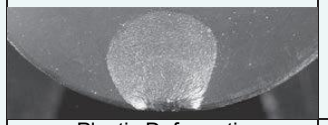
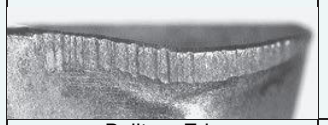
80° Triangle/Solid CBN





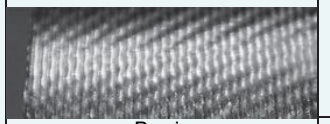
Insert	ISO	I.C	S	D1	RE	MCC100	MCC300	MCC500	MCN500	MCW800
	WNGA080404	12.7	4.76	5.16	0.4					
	WNGA080408	12.7	4.76	5.16	0.8					
	WNGA080412	12.7	4.76	5.16	1.2					

Troubleshooting Case Studies: Turning Insert

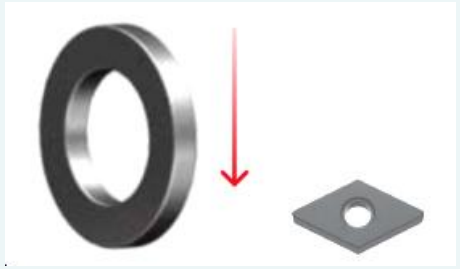
Case/Symptom-Insert	Possible Causes	Corrective Measures
VB Wear 	•The material / grade is too soft •Cutting speed is too high •Cutting speed is too high	•Use a coated grade •Choose a material/grade highly resistant to wear •Decrease the cutting speed
Wear on Face 	•High temperature causes chemical •reactions between the insert material and chips	•Use a coated grade •Decrease both of the cutting speed and feed rate •Widen the rake angle
Notching Wear 	•The work surface is too hard •Boundary area has been oxidized Burrs, caused by chips in the sheared form, have been cut	•Widen the side cutting edge angle •Make the nose radius larger so that cutting is performed within the radius •Use a round insert
Chipping/ Fracture 	•Feed rate is too high •Chips have become trapped •Chatter resulting in vibration	•Enlarge the honed edge •Make the nose radius larger •Narrow the rake angle to secure the cutting edge strength
Flaking 	•This is due to compressive forces being applied to the cutting edge from elastic deformation in the area being cut •This occurs when deposited/adhered	•Change the cutting conditions by checking the cutting edge •Choose a material/grade highly resistant to fracture •Increase the coolant rate and pressure
Plastic Deformation 	•High cutting force and excessive heat is applied to the cutting edge	•Choose a material/grade highly resistant to wear •Decrease both of the cutting speed and feed rate •Make the nose radius larger •Use coolant
Built-up Edge 	•This occurs because the cutting temperature is lower than the recrystallization temperature of the work material	•Increase the cutting speed •Use coolant with excellent lubrication performance •Change to a grade with less affinity to the work material

Case/Symptom	Possible Causes	Corrective Measures
Deposition 	•The deposition is caused to the face by a chemical reactions of the work material due to heat generation	•Increase the cutting speed •Widen the relief angle •Hone the face with a mirror-like-surface finish •Change to a grade with less affinity to the work material
Clamping Crack 	•The insert was clamped under improper seating conditions	•Clean the clamping areas and install the insert in the recommended way •Tighten to the specified torque

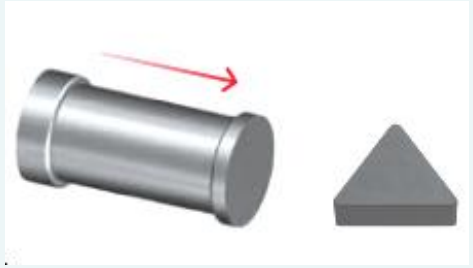
Troubleshooting Case Studies: Workpiece

Case/Symptom-Workpiece	Possible Causes	Corrective Measures
Deposition 	•The feed rate is too high •An unsuitable insert was selected	•Decrease the feed rate •Use a smaller edge preparation •Change to a grade highly resistant to boundary wear •Change the cutting edge angle of the holder
Clamping Crack 	•The feed rate is incorrect •The shape of insert is not suitable	•Decrease the feed rate •Use a smaller edge preparation •Decrease the feed rate •Use a smaller edge preparation
Chipping 	•The cutting force is too great •The rigidity of the work piece and cutting tool is insufficient	•Decrease the feed rate •Use a smaller edge preparation •Ensure tool overhang is minimised •Change the cutting edge angle of the holder
Burring 	•ration of the cutting edge due to deposition/built-up edge 07	•Use cutting oil excellent in lubrication performance •Change to a grade with less affinity to the work material

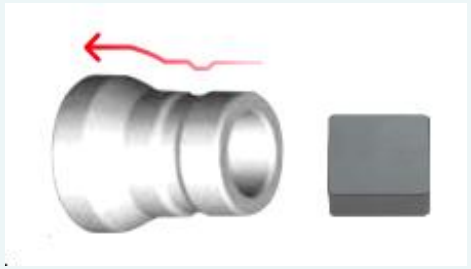
Solution for Automotive Parts



- Workpiece:Wheel Bearing
- Material: 100Cr6(HRC60-62)
- Ceramic Insert: DNGA150612 E040
- Application:External fnishing
- Vc: 244m/min
- ap: 0.01~0.02mm
- f: 0.05~0.1mm
- Wet



- Workpiece:Cylinder Liner
- Material: GG25(HB220-280)
- Ceramic Insert: TNGN160412 E010
- Application:External fnishing
- Vc: 660m/min
- ap: 0.1mm
- f: 0.2mm
- Wet



- Workpiece:Cylinder Sleeve
- Material: GG25(HB220-280)
- Ceramic Insert: SNGN120716 E040
- Application:End face
- Vc: 450m/min
- ap: 1.5mm
- f: 0.3mm
- Dry



- Workpiece:Brake Disc
- Material: GG25(HB170-280)
- Ceramic Insert: CNGN120716 E040
- Application:Face
- Vc: 800m/min
- ap: 2.0~3.0
- f: 0.4~0.5mm
- Dry

MEMO