MITSUBISHI
MITSUBISHI MATERIALS

MITSUBISHI CARBIDE

CBN Turning Insert Series

2009.3 Update B077E

NEW PETIT CUT

High speed, accuracy and efficiency

- Optimum edge geometries in combination with Mitsubishi's CBN sintering technology for higher performance.
- MBC020, the new CBN grade using MIRACLE coating technology for a wider application range.
- MBC020, new breaker inserts (BF series) for superior chip control now available.
- New wiper inserts now available.
- MB4020, new CBN grade for sintered alloy now available.

MBC020

MB8025

MBC010

MB4020

CBN Turning Insert Series

NEW PETIT CUT

Overview

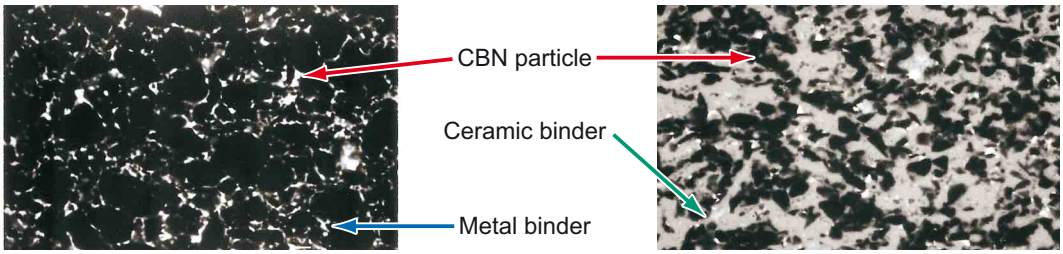
Mitsubishi CBN inserts

Mitsubishi CBN inserts were launched in 1982.
Mitsubishi Materials is one of the few tool manufacturers producing it's own sintered CBN for use in CBN tools. The combination of material, honing, brazing and other various technologies means that CBN inserts are especially effective for efficient, high speed and accurate machining of hardened steel and cast iron.

Features

Features of sintered CBN

- CBN tool material is produced by mixing the main component CBN (cubic boron nitride), which has a hardness second only to diamond, with a special ceramic or metal binder. It is then sintered at a pressure of over 5GPa and at a temperature of 1200°C or higher.
- CBN has lower affinity to iron than diamond. The low affinity and high hardness properties means that sintered CBN delivers a superior cutting performance especially during high speed machining of materials such as hardened steel, cast iron and sintered alloys.

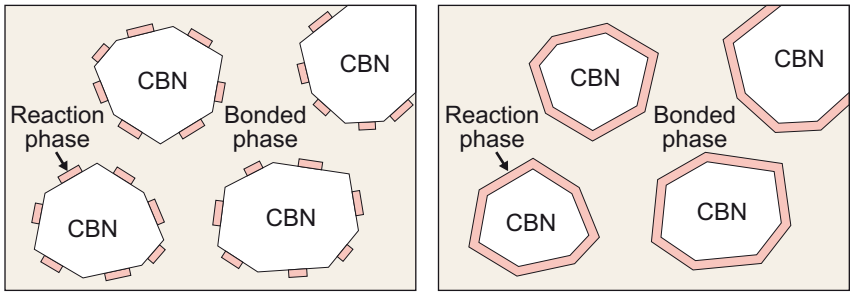


Sintered CBN using a metal binder
MB730

Sintered CBN using a ceramic binder
MB8025

Particle-activated Sintering Method

The Particle-activated Sintering Method is an innovative sintered CBN manufacturing process developed by Mitsubishi Materials in 2001.



Previous technology
Reaction phases partially segregated

New technology
Reaction phases formed evenly

1. Impurities that inhibit CBN sintering were eliminated.
2. Reaction phases with the binder can now be formed evenly on the surface of the CBN particles. Simultaneously, this method is the best way to control the amount of reaction phases that are formed.

Feature of Coated CBN

MBC020 for General Cutting

●Wider application

MBC020 is a general purpose coated CBN grade suitable for continuous turning to light interrupted machining of hardened steel. The combination of high cutting edge rigidity and a coating for higher wear resistance allows MBC020 to cover a wider range of machining applications than conventional CBN grades.

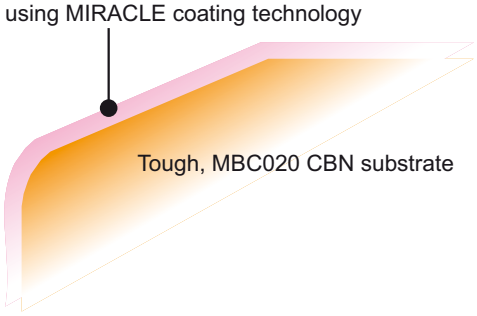
●MIRACLE coating technology on a CBN substrate

MBC020 is a new coated type CBN to compliment the exisiting MBC010 grade. By applying a coating to the substrate, MBC020 provides a higher wear resistance.

Why does a coating on a high hardness CBN grade increase wear resistance?

CBN has a hardness value second only to diamond. Mitsubishi's Particle -activated sintering method combines with CBN's hardness to withstand high temperatures developed when machining hardened steels.

However, for MBC020, MIRACLE coating technology has been used and covers the CBN with a highly heat-resistant TiAlN base coating layer that maximizes the hardness properties. As a result, MBC020 displays a higher wear resistance than uncoated CBN inserts of the same grade.



MBC010 for High Speed Cutting

●Ultra high-speed cutting

MBC010 is a coated CBN grade for hardened steels. High wear resistance enables high-speed cutting.

●Excellent surface finish

Micrograin CBN makes MBC010 a suitable grade for excellent surface finishes.

●High wear resistance properties and high-speed cutting performance

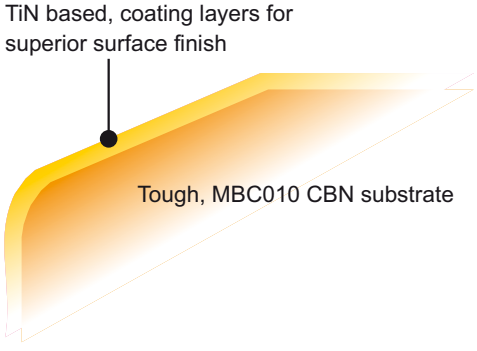
MBC010 makes the best use of the special ceramic binder structure, actualizing high wear resistance. High wear resistance enables continuous machining at high speeds over 300m/min.

●Superior surface finish

MBC010 employs the first micrograin CBN for cutting tools. Micrograin CBN, special ceramic binder and TiN based coating combine to provide the finest surface finishes.

●Tougher cutting edges

Mitsubishi Materials' newly developed "particle-activated sintering method" provides both high wear resistance and high toughness. Because of high resistance to fracture, which high-grade CBN is liable to, MBC010 increases tool life and is less costly.



NEW PETIT CUT

Wide Selection of Grades

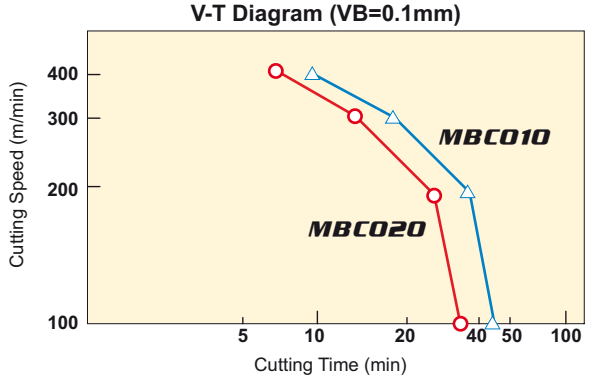
Hardened Steel Machining

Coated CBN Grade

Grade	Grade Features and Application	CBN Substrat	Grade	Grade Features and Application	CBN Substrat
MBC010	**Coated CBN for High Speed Continuous Cutting** MBC010 makes the best use of a special ceramic binder structure, actualizing high wear resistance. High wear resistance enables continuous machining at high speeds over 300m/min.	CBN(Micro Grain) TiN Al_2O_3	MBC020	**Coated CBN for general cutting (First recommendation)** Uses a CBN substrate that has high cutting edge rigidity. The TiAlN based coating delivers superb wear resistance. CBN grade first recommendation.	CBN(Micro Grain) TiN Al_2O_3

Continuous Cutting

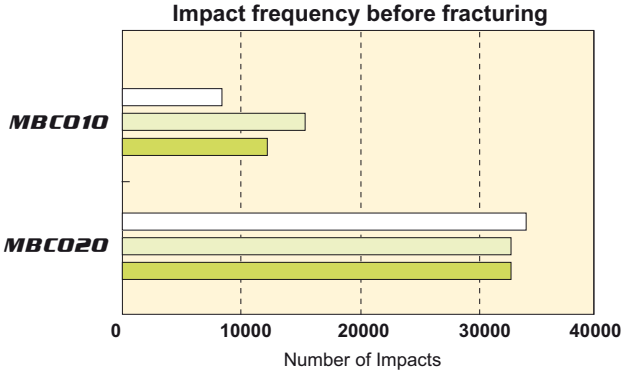
V-T Diagram (VB=0.1mm)



<Cutting Condition>
Workpiece : Hardened steel (60HRC)
Feed : 0.1mm/rev
Depth of Cut : 0.1mm
Wet Cutting

Interrupted Cutting

Impact frequency before fracturing



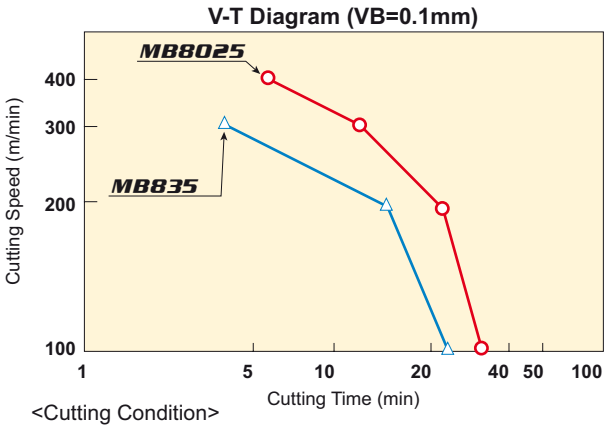
<Cutting Condition>
Workpiece : Hardened steel (60HRC)
External Interrupted Cutting. 8 Grooves
Cutting Speed : 150m/min
Feed : 0.15mm/rev
Depth of Cut : 0.2mm
Dry Cutting

Non Coated CBN Grade

Grade	Grade Features and Application	CBN Substrat	Grade	Grade Features and Application	CBN Substrat
MB8025	**Grade for General Purpose Turning** By employing a "Particle-activated Sintering Method", the new sintered CBN technology is recommended for continuous cutting at medium to high speeds.	CBN(Micro Grain) TiN Al_2O_3	MB835	**For Heavy Interrupted Cutting** Improved grade employing micro-grain CBN particles. Excellent fracture resistance for use in heavy interrupted cutting.	CBN(Micro Grain) TiN Al_2O_3

Continuous Cutting

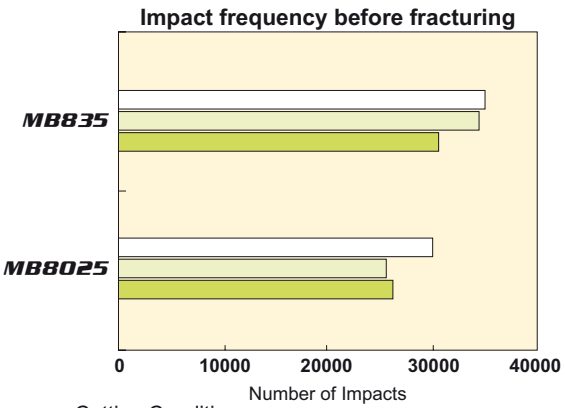
V-T Diagram (VB=0.1mm)



<Cutting Condition>
Workpiece : Hardened steel (60HRC)
Feed : 0.1mm/rev
Depth of Cut : 0.1mm
Wet Cutting

Interrupted Cutting

Impact frequency before fracturing



<Cutting Condition>
Workpiece : Hardened steel (60HRC)
External Interrupted Cutting. 8 Grooves
Cutting Speed : 150m/min
Feed : 0.15mm/rev
Depth of Cut : 0.2mm
Dry Cutting

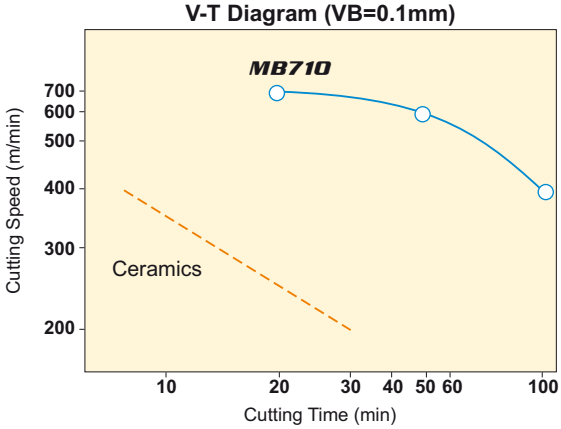
Cast Iron Machining

Non Coated CBN Grade

Grade	Grade Features and Application	CBN Substrat	Grade	Grade Features and Application	CBN Substrat
MB710	**For General Cutting** General purpose grade with well balanced wear and fracture resistance.	CBN TiC Al_2O_3	**MB730**	**For High Speed Cutting** Has a larger CBN content and therefore displays good thermal conductivity. It is suitable for the high temperatures that are generated in high speed cutting.	CBN(High Content) Co Base Alloy

Continuous Cutting

V-T Diagram (VB=0.1mm)



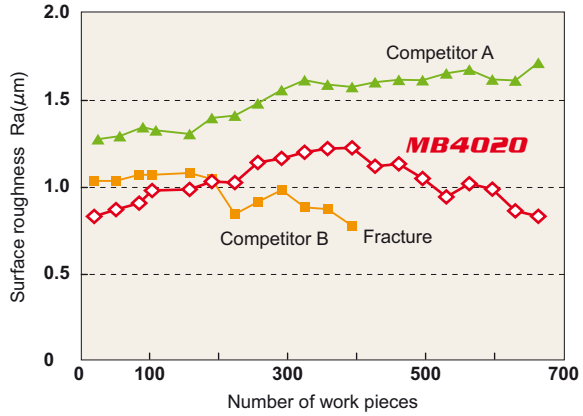
<Cutting Condition of **MB710**>
Workpiece : DIN GG25
Insert : NP-TNGA160408GS3
Feed : 0.1mm/rev
Depth of Cut : 0.15mm
Wet Cutting

<Cutting Condition of Ceramics>
Workpiece : DIN GG25
Insert : TNGA160408
Feed : 0.1mm/rev
Depth of Cut : 0.15mm
Dry Cutting

Sintred Alloy Machining

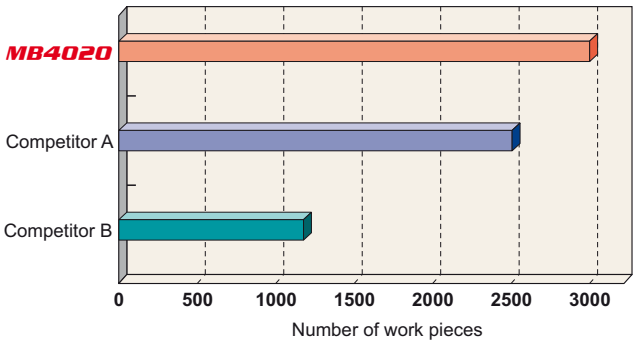
Grade	Grade Features and Application	CBN Substrat
NEW **MB4020**	**For General Cutting** General purpose grade suitable for continuous turning through to light interrupted machining of sintered alloy.	CBN Co Base Alloy

Continuous machining of high strength sintered alloy



<Cutting conditions>
Workpiece : High strength sintered alloy (75HRB)
Insert : NP-CNGA120408FS2
Cutting speed : 190m/min
Feed : 0.15mm/rev
Depth of cut : 0.1mm
Dry cutting

Interrupted machining of general sintered alloy



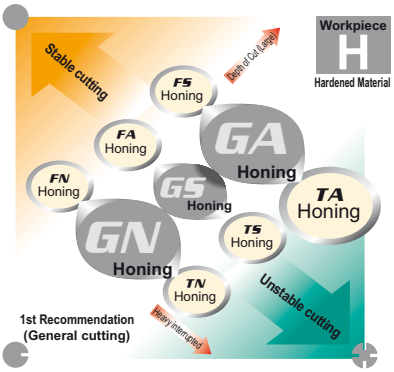
<Cutting conditions>
Workpiece : General sintered alloy (45HRB)
Insert : NP-CNGA120408FS2
Cutting speed : 270m/min
Feed : 0.15mm/rev
Depth of cut : 0.1mm
Wet cutting

NEW PETIT CUT

Feature of Insert

New Honing Types

For the CBN **MBC010** and **MBC020** coated grades, a wide range of edge honing styles are offered to cover a large range of applications and to represent Mitsubishi Materials' unique cutting tool technology.



● **General cutting**
GA honing is the first recommendation.
GS honing if the depth of cut is 0.1mm or less.
GN honing if the crater wear is large.

● **Continuous cutting, stable cutting**
FS honing is the first recommendation.
FA honing to improve the initial machining performance.
FN honing if the crater wear is large.

● **Medium and heavy interrupted cutting, unstable cutting**
TA honing is the first recommendation.
TS honing if the depth of cut is 0.1mm or less.
TN honing if the crater wear is large.

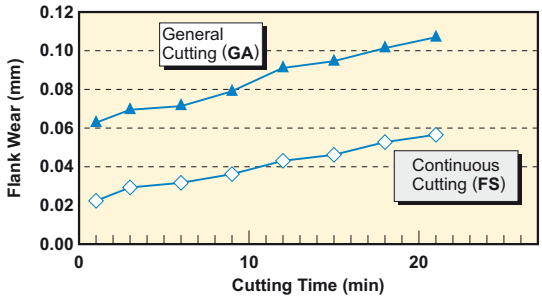
NP-CNGA120404-GAW2
Main Application — Edge Honing Type

MAIN APPLICATION \ EDGE HONING TYPE	**A** For General Purpose Machining (1st recommendation)	**S** For Very Small Depths of Cut (Sharp anti-burr type)	**N** For High Load Machining (Crater wear resistant)
F For Continuous Machining	FA Honing 0.1 / 15° / R0	FS Honing 0.13 / 15° / R0.015	FN Honing 0.05 / 15° / R0.015
G For Continuous – Light Interrupted Machining	GA Honing 0.13 / 25° / R0.03	GS Honing 0.13 / 25° / R0.015	GN Honing 0.05 / 25° / R0.015
T For Interrupted Machining	TA Honing 0.13 / 35° / R0.03	TS Honing 0.13 / 35° / R0.015	TN Honing 0.05 / 35° / R0.015

(Note 1) First, select the insert edge type from the main application area (F,G,T) then choose a honing type (A,S,N) that compliments the machining requirement.
(Note 2) The depth of cut varies according to workpiece and machine used.

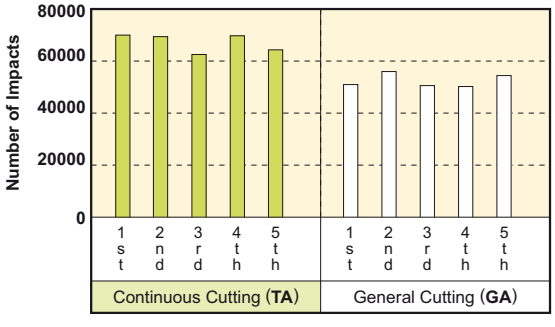
Cutting Performance

For Continuous Cutting *FS* HONING



<Cutting Condition>
Workpiece : Hardened steel (60HRC)
Insert : NP-CNGA120408FS2/GA2 (MBC010)
Cutting Speed : 150m/min
Feed : 0.1mm/rev
Depth of Cut : 0.1mm
Dry Cutting

For Interrupted Cutting *TA* HONING



<Cutting Condition>
Workpiece : Hardened steel (60HRC)
External Interrupted Cutting. 8 Grooves
Insert : NP-TNGA160408TA3/GA3 (MB8025)
Cutting Speed : 100m/min
Feed : 0.1mm/rev
Depth of Cut : 0.1mm
Wet Cutting

Provide the optimum insert for the material and cutting mode required (TOOL NAVI system).

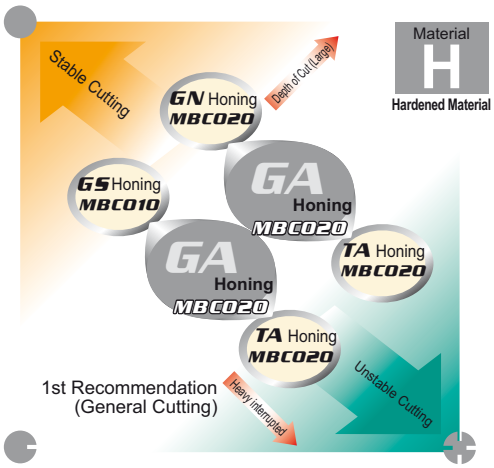
CBN Inserts for Hardened Steel

Coated CBN Grade (1st recommendation)

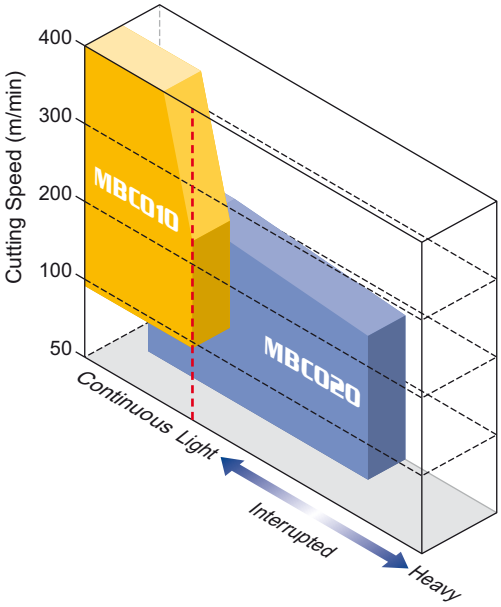
MBC010 Coated CBN for High Speed Continuous Cutting
Hard grade with the use of micro-grain CBN.
For good surface finishes.

MBC020 Coated CBN for General Purpose Cutting
1st recommendation for hardened steel.

●Selecting the insert grade and honing type



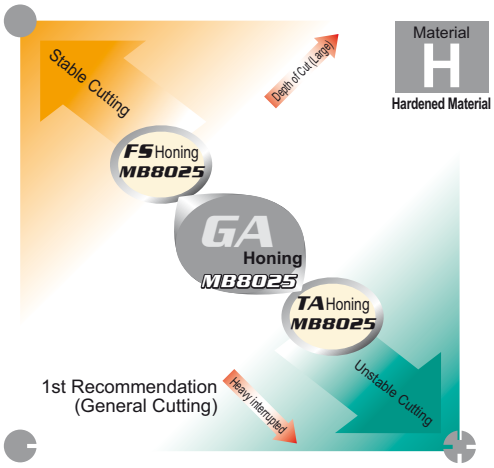
●Grade application area



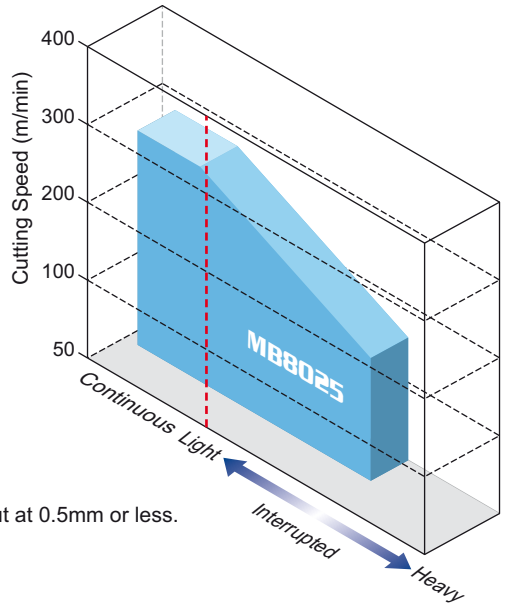
Non Coated CBN Grade

MB8025 For General Purpose Cutting

●Selecting the insert grade and honing type



●Grade application area



(Note 1) Please refer to page 5 for honing details.
(Note 2) For NEW PETIT CUT inserts, please set the depth of cut at 0.5mm or less.

NEW PETIT CUT

CBN Inserts for Cast Iron

MB730 **For High Speed Continuous to Interrupted Cutting**

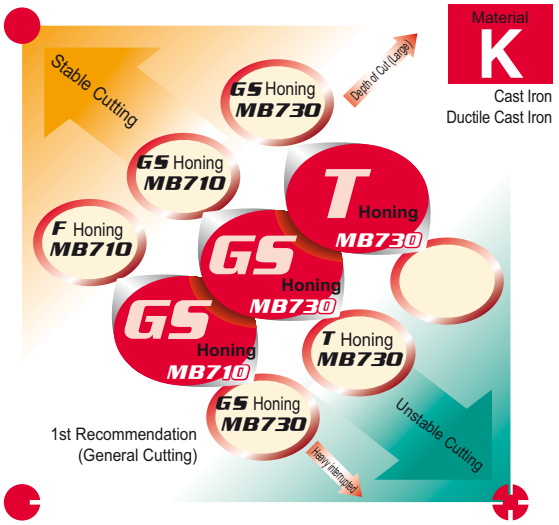
High fracture-resistant grade with a high CBN brazing strength due to the use of a metal binder.

MB710 **For General Cutting**

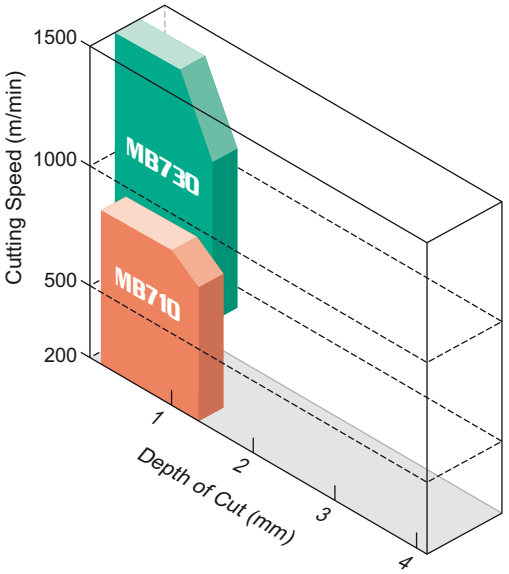
General purpose grade with well balanced wear and fracture resistance.

General Cast Iron Machining

●Selecting the insert grade and honing type

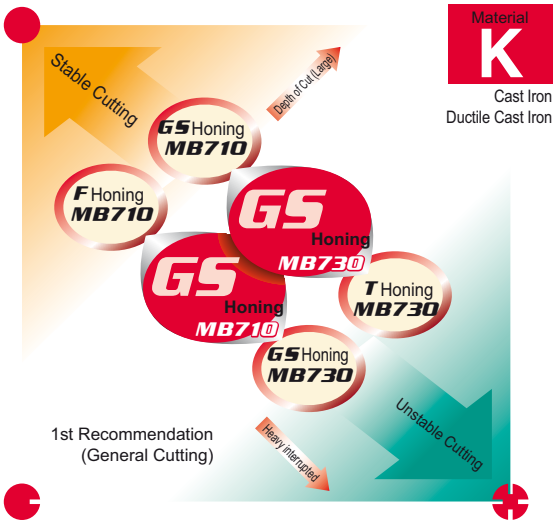


●Grade application area

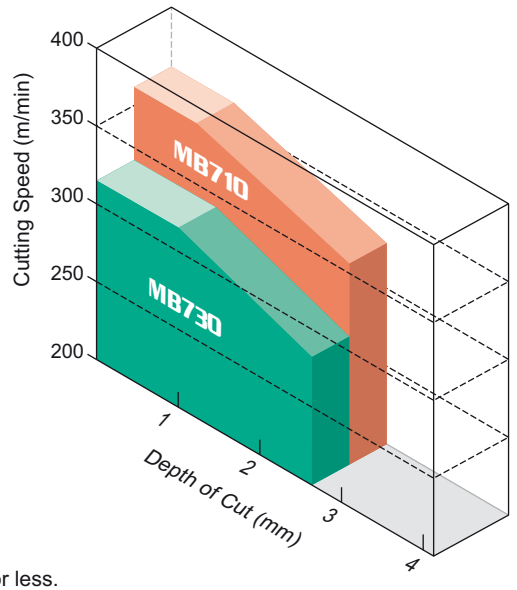


Ductile Cast Iron Machining

●Selecting the insert grade and honing type



●Grade application area



(Note 1) Please refer to page 5 for honing details.
(Note 2) For NEW PETIT CUT inserts, please set the depth of cut at 0.5mm or less.

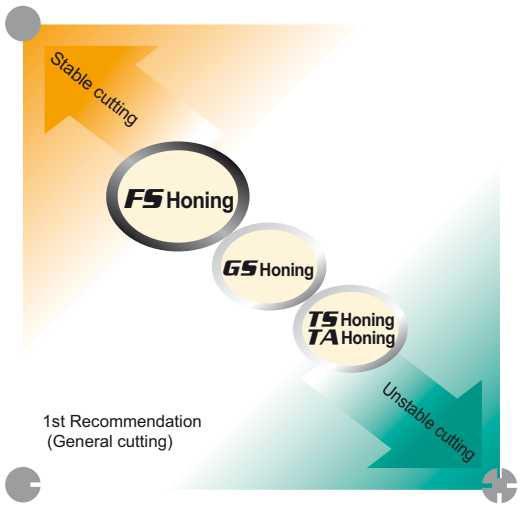
CBN Inserts for Sintered Parts

MB4020 For General Cutting

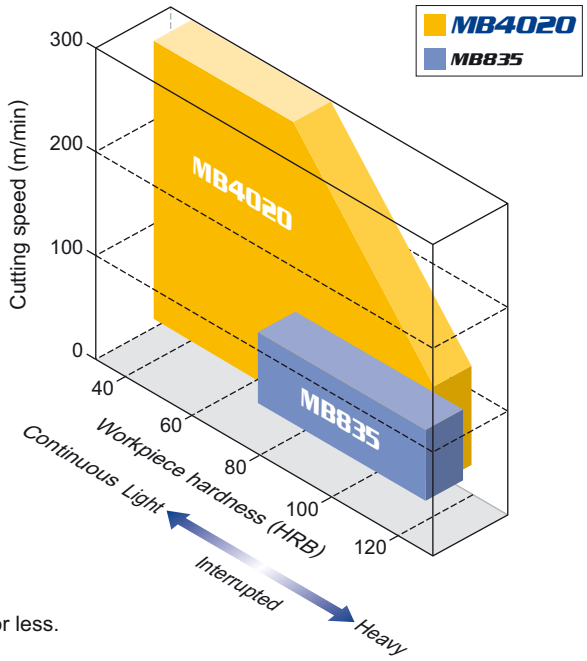
MB835 For Interrupted Cutting

Sintered Parts Machining

Selecting the insert grade and honing type



Grade application area



(Note 1) Please refer to page 5 for honing details.
(Note 2) For NEW PETIT CUT inserts, please set the depth of cut at 0.5mm or less.

Valve Seat

Amount of hard particles	None or small ← → Large			
Hardness of workpiece (HV)	150	250	300	350
Plunge Cut	MB4020		MB835	
Traverse Cut	MB4020	MB710	MB835	

NEW PETIT CUT

Recommended Cutting Conditions

Selection Standard

● Heat Treated Steel

Work Material		Type	Cutting Mode	Recommended Grade	Recommended Cutting Condition		
					Cutting Speed (m/min)	Feed (mm/rev)	Depth of Cut (mm)
Structural Steel High Alloy Steel	35—65 HRC	Coated	High speed finish cutting	MBC010	250 (150—400)	—0.2	—0.2
			Continuous cutting for general purpose	MBC020	200 (80—250)	—0.5	—0.5
			Interrupted cutting for general purpose		150 (60—200)	—0.2	—0.3
		Non-coated	Continuous cutting	MB8025	180 (80—250)	—0.3	—0.5
			Light interrupted cutting		120 (60—150)	—0.2	—0.3
			Continuous to medium interrupted cutting		120 (60—150)	—0.2	—0.3
			Heavy interrupted cutting	MB835	100 (50—120)	—0.3	—0.5

● Cast Iron

Work Material	Workpiece Structure	Cutting Speed (m/min) 250 500 750 1000 1250	Feed (mm/rev)	Depth of Cut (mm)	Coolant
Gray Cast Iron	—	MB710 MB730	—0.5	—1.0	Dry,Wet
Alloy Cast Iron	Pearlitic		—0.4	—0.5	Dry,Wet
Ductile Cast Iron	Ferritic	MB710	—0.4	—0.5	Dry,Wet
	Ferritic + Pearlitic Pearlitic	MB730			

● Sintered Alloy

Work Material	Recommended Grade	Recommended Cutting Condition		
		Cutting Speed (m/min)	Feed (mm/rev)	Depth of Cut (mm)
High Hardness Iron and Sintered Metal	MB4020	200 (150—250)	—0.1	0.15 (0.1—0.2)
Sintered Forged Products	MB8025	150 (100—200)	—0.1	0.15 (0.1—0.2)
Wear Resistant Parts		120 (100—150)	—0.1	0.15 (0.1—0.2)

●Roll

Work Material	Grade	Recommended Cutting Conditions		
		Cutting Speed (m/min)	Feed (mm/rev)	Depth of Cut (mm)
Cast Steel Adamite Cast Steel	MB8025	80 (30 – 130)	0.3 (0.1 – 0.5)	0.2 – 3.0
Ductile Cast Iron Granular Cast Iron Chilled Cast Iron	MB710	80 (30 – 130)	0.3 (0.1 – 0.5)	0.2 – 3.0
High Chromium Steel High Alloy Steel	MB8025	80 (30 – 130)	0.3 (0.1 – 0.5)	0.2 – 3.0
High Speed Steel	MB730	50 (20 – 70)	0.25 (0.1 – 0.4)	0.1 – 3.0
Tungsten Carbide	MB730	20 (10 – 30)	– 0.2	– 0.2

●Heat Resistant Alloy

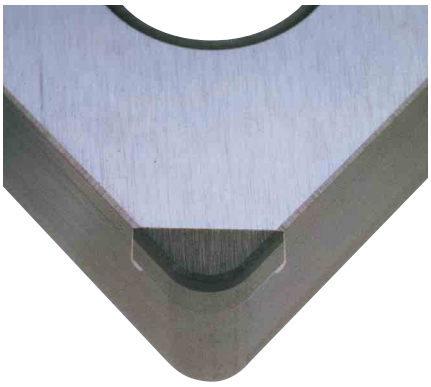
Work Material	Grade	Recommended Cutting Conditions		
		Cutting Speed (m/min)	Feed (mm/rev)	Depth of Cut (mm)
Ni Base Heat Resistant Alloy	MB730	120 (100 – 150)	– 0.2	– 0.5
Co Base Heat Resistant Alloy	MB730	70 (50 – 100)	– 0.2	– 0.5

Features of New Petit Cut

POWERFUL

- **Excellent Brazing Strength**
  With the introduction of our new brazing technology, NEW PETIT CUT is now twice as strong as previous PETIT CUT.
- **Improved Performance**
  Two types of honing are available. One is suitable for increasing performance during continuous cutting and the other for improvements on interrupted cutting.
- **Wider Application Range**
  These two technical improvements result in increased PETIT CUT stability and widen the application range to high speed and interrupted machining.

PETIT



VALUE

- **Economical**
  A small CBN segment with prolonged life is one of the main contributing factors towards reducing tool costs.
- **Disposable Type**
  The cost of the NEW PETIT CUT insert is comparable to the cost of regrinding conventional style CBN inserts.
  Eliminating the loss of geometric integrity associated with regrinding.

Double-sided, Multi-corner Type Inserts

Double-sided, multi-corner type inserts are available for the MBC020 coated CBN range.
The stamp on the cemented carbide portion of the insert allows easy recognition of the cutting edges.

NP-TNGA160412-GA6

No. of the Cutting Edge Corners

For MB8025 non-coated, general purpose CBN and MBC010, MBC020 coated CBN grades, single-sided, multi-corner type inserts are available. As in the double-sided, multi-corner types, the stamp on the cemented carbide portion of the insert makes it easy to recognize the cutting edges.

NP-TNGA160412-GS3

No. of the Cutting Edge Corners

CBN Breaker Insert

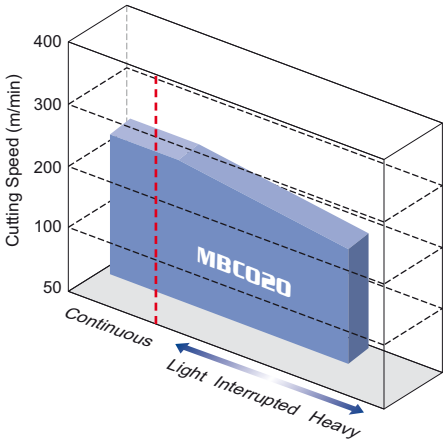
Features

Chip breaker geometry designed for excellent chip control

R-shaped chip breaker ensures optimization of the cutting point and the chip breaker position. Enables effective chip discharge even when copy machining and prevents the chips from wrapping around the holder under finish cutting conditions.

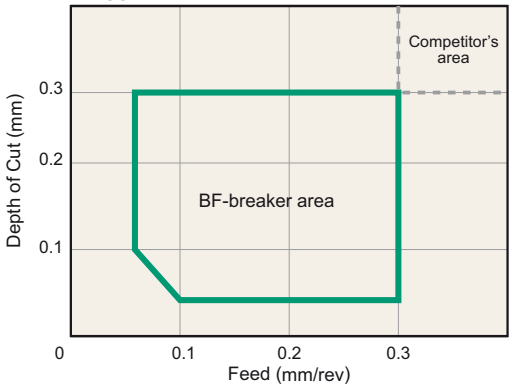
Long life coated CBN grade

The coated grade MBC020 made with MIRACLE coating technology exhibits high cutting performance over a wider range of machining applications from continuous to medium interrupted cutting and enables long tool life.



BF-Breaker Application Area and Recommended Cutting Conditions

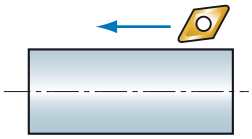
●Application Area



	Cutting Speed (m/min)			Coolant
	100	200	300	
MBC020				Dry Wet

Cutting Performance

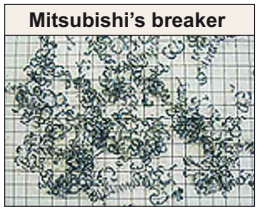
●External Cutting



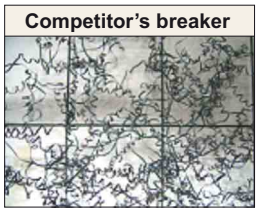
<Cutting Conditions>

Workpiece : Hardened steel (HRC55)
Insert : BF-CNGM432-TA2
Cutting Speed : 100m/min
Feed : 0.2mm/rev
Depth of Cut : 0.1mm
Dry

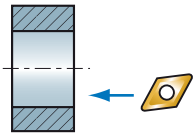
Mitsubishi's breaker



Competitor's breaker



●Internal Cutting

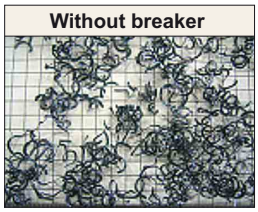


<Cutting Conditions>

Workpiece : Hardened steel (HRC60)
Insert : BF-CCGT32.52-TA2
Cutting Speed : 120m/min
Feed : 0.2mm/rev
Depth of Cut : 0.3mm
Dry

Mitsubishi's breaker

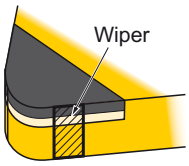
Without breaker



Wiper Insert

What is a Wiper Insert?

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



NP-CNGA120408-GAW2

Wiper Symbol

Improving Surface Finish

Under the same machining conditions as conventional inserts, but with the feed rate increased, the surface finish of the workpiece can be improved.

Improving Efficiency

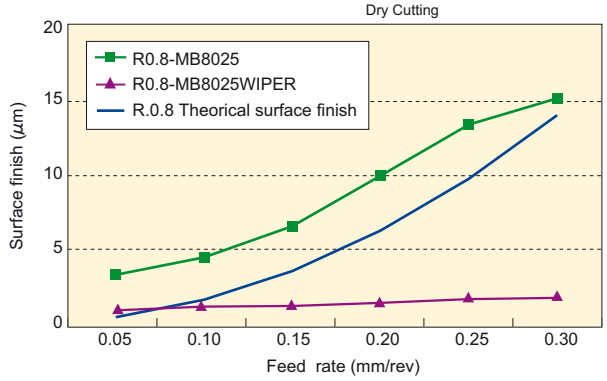
High feed rates not only shorten machining times but also make it possible to combine roughing and finishing operations.

Increased Tool Life

When changing to high feed conditions, the time required 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.

Cutting Performance

<Cutting Conditions>
Workpiece : Hardened steel (HRC60)
Insert : NP-CNGA432-○○○
Cutting Speed : 120m/min
Depth of Cut : 0.1mm
Dry Cutting



A wiper insert + machining at high feed rate

- Reduced machining time (per workpieces)
- Increased number of workpieces (per definitive time period)
- Improved chip control

A wiper insert + machining at conventional feed rate

- Eliminating the finishing step by roughing and finishing together (Separate roughing and finishing steps → Single-step machining)

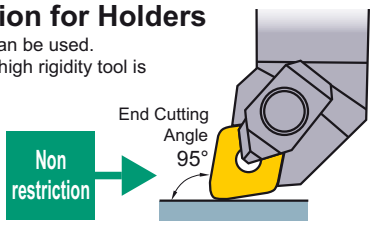
Reducing cycle times
Increased productivity
Avoiding Line-Stoppage

The realization of Reduced Costs!!

Special attention is not necessary when using C-style and W-style inserts

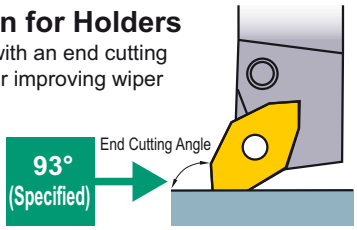
No Restriction for Holders

Standard holders can be used.
(*A double clamp, high rigidity tool is recommended.)

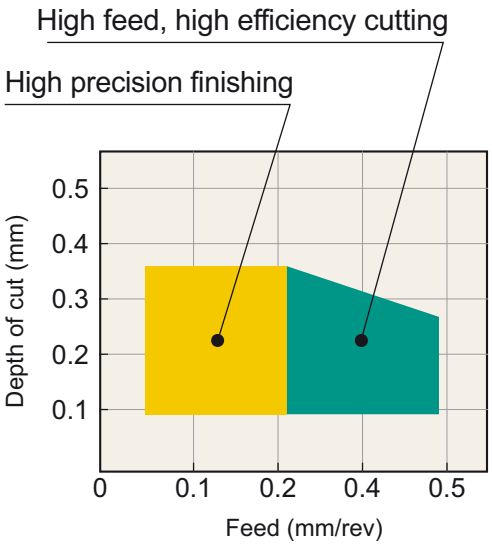


Restriction for Holders

Use a holder with an end cutting angle of 93° for improving wiper efficiency.

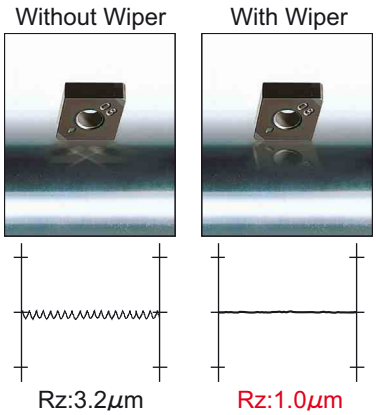


Cutting Conditions and Performance



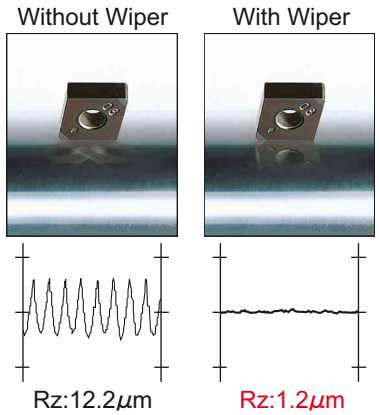
High precision finishing

Cutting speed : 100m/min Feed : 0.1mm/rev
Depth of cut : 0.1mm Dry cutting



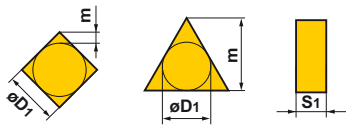
High feed, highly efficient cutting

Cutting speed : 100m/min Feed : 0.3mm/rev
Depth of cut : 0.1mm Dry cutting



NEW PETIT CUT

IDENTIFICATION



Symbol	Tolerance of Nose Height **m** (mm)	Tolerance of Inscribed Circle **ϕD1** (mm)	Tolerance of Thickness **S1** (mm)
G	±0.025	±0.025	±0.13
M*	±0.08–±0.18	±0.05–±0.15	±0.13

Inserts marked with * are sintered.

Detail of M Class Insert Tolerance

● Tolerance of Nose Height **m** (mm)

D.I.C.	Triangular	Square	Rhombic 80°	Rhombic 55°	Rhombic 35°	Round
6.35	±0.08	±0.08	±0.08	±0.11	±0.16	–
9.525	±0.08	±0.08	±0.08	±0.11	±0.16	–
12.70	±0.13	±0.13	±0.13	±0.15	–	–

● Tolerance of Inscribed Circle **ϕD1** (mm)

D.I.C.	Triangular	Square	Rhombic 80°	Rhombic 55°	Rhombic 35°	Round
6.35	±0.05	±0.05	±0.05	±0.05	±0.05	–
9.525	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
12.70	±0.08	±0.08	±0.08	±0.08	–	±0.08

④ Tolerance Class

BF	With Breaker
NP	New Petit Cut
No mark	Standard Type

① Insert Geometry

① ④

NP - D N G A

② **③** **⑤**

② Insert Shape

Symbol	Insert Shape
C	Rhombic80°
D	Rhombic55°
R	Round
S	Square
T	Triangular
V	Rhombic35°
W	Trigon

③ Normal Clearance

Symbol	Normal Clearance
B	5°
C	7°
D	15°
E	20°
N	0°
P	11°

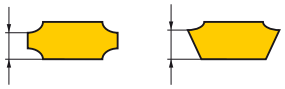
⑤ Clamping and/or for Chip Breaker

Metric

Symbol	Hole	Hole Configuration	Chip Breaker	Figure
W	With Hole	Cylindrical Hole + One Countersink (40–60°)	No	
T	With Hole		One Sided	
B	With Hole	Cylindrical Hole + One Countersink (70–90°)	No	
H	With Hole		One Sided	
A	With Hole	Cylindrical Hole	No	
M	With Hole	Cylindrical Hole	One Sided	
N	Without Hole	–	No	
X	–	–	–	Special Design

Diameter of Inscribed Circle (mm)	Symbol						
	R	W	V	D	C	S	T
3.97		02		04	03	03	06
4.76		L3	08	05	04	04	08
5.56		03	09	06	05	05	09
6.35		04	11	07	06	06	11
7.94		05	13	09	08	07	13
9.525	09	06	16	11	09	09	16
12.70	12	08	22	15	12	12	22

⑥ Insert Size



*Thickness is from the bottom of the insert to the top of the cutting edge.

Symbol	Thickness (mm)
S1	1.39
01	1.59
T0	1.79
02	2.38
T2	2.78
03	3.18
T3	3.97
04	4.76

⑦ Insert Thickness

Symbol	Corner Radius (mm)
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6

⑧ Insert Corner Configuration

⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬
15	04	04	GA	W	2	J	R

⑨ Application (Honing)

Symbol	Honing
GA GS GN	Continuous Cutting – Medium Interrupted Cutting
FA FS FN	Continuous Cutting
TA TS TN	Interrupted Cutting

Please refer to page 3 for further information.

⑩ Wiper

W	Stable Cutting
WC	Stable Cutting (less cutting force)
WS	General Cutting
No mark	Without Wiper

⑪ Number of Teeth

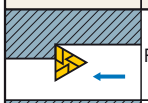
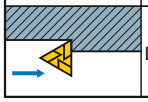
2	2
3	3
4	4
6	6
No mark	1

⑫ Cutting Edge Angle

J	93°
No mark	Non Restriction

Please pay special attention when using wiper inserts. Please refer to page 18 for further information.

⑬ Cutting Direction

Figure	Hand	Symbol
	Right	R
	Left	L

NEW PETIT CUT

Inserts

●Negative Inserts (With hole)

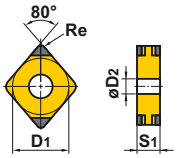
Work Material		
H	Hardened Materials	● ◐ ◐ ✥ ● ◐ ◐ ◐
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

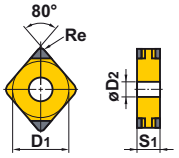
Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✥: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

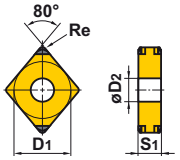
Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NP-CNGA120404GA4		●						12.7	4.76	0.4	5.16	
	120408GA4		●						12.7	4.76	0.8	5.16	
	120412GA4		●						12.7	4.76	1.2	5.16	
	120404GN4		★						12.7	4.76	0.4	5.16	
	120408GN4		★						12.7	4.76	0.8	5.16	
	120412GN4		★						12.7	4.76	1.2	5.16	
	120408FS4		●						12.7	4.76	0.8	5.16	
	120412FS4		●						12.7	4.76	1.2	5.16	
	120404TA4		●						12.7	4.76	0.4	5.16	
	120408TA4		●						12.7	4.76	0.8	5.16	
	120412TA4		●						12.7	4.76	1.2	5.16	
	120404TN4		□						12.7	4.76	0.4	5.16	
	120408TN4		●						12.7	4.76	0.8	5.16	
	120412TN4		●						12.7	4.76	1.2	5.16	
NEW PETIT CUT (With Wiper) *	NP-CNGA120404GAW4		●						12.7	4.76	0.4	5.16	
	120408GAW4		●						12.7	4.76	0.8	5.16	
	120412GAW4		●						12.7	4.76	1.2	5.16	
	120408GAWC4		●						12.7	4.76	0.8	5.16	
	120412GAWC4		●						12.7	4.76	1.2	5.16	
	120408GSWC4		●						12.7	4.76	0.8	5.16	
	120412GSWC4		●						12.7	4.76	1.2	5.16	
NEW PETIT CUT (With Breaker)	BF-CNGG120404TA4		★						12.7	4.76	0.4	5.16	
	120408TA4		★						12.7	4.76	0.8	5.16	
	120412TA4		★						12.7	4.76	1.2	5.16	
NEW PETIT CUT (With Breaker)	BF-CNGM120404TA2		●						12.7	4.76	0.4	5.16	
	120408TA2		●						12.7	4.76	0.8	5.16	
	120412TA2		●						12.7	4.76	1.2	5.16	

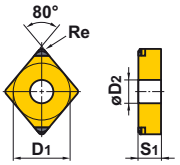












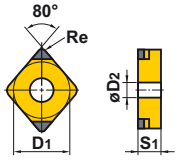
* Please refer to P.12 before using wiper inserts.

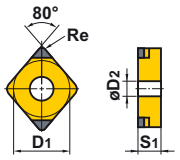
● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

Work Material		
	H	Hardened Materials
	K	Cast Iron
	S	Heat-resistant Alloy, Titanium Alloy
		Sintred Alloy

Cutting Conditions (Guide) :
● : Stable Cutting ◐ : General Cutting ✲ : Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020	D1	S1	Re	D2	
NEW PETIT CUT	NP-CNGA120404GA2		□	●		●	●		12.7	4.76	0.4	5.16	
	120408GA2		□	●					12.7	4.76	0.8	5.16	
	120412GA2		□	●					12.7	4.76	1.2	5.16	
	120404GS2	●				NEW ●	NEW ●	●	12.7	4.76	0.4	5.16	
	120408GS2	●		●		NEW ●	NEW ●	●	12.7	4.76	0.8	5.16	
	120412GS2	●		●		NEW ●	NEW ●	●	12.7	4.76	1.2	5.16	
	NEW 120404FS2					●		●	12.7	4.76	0.4	5.16	
	120408FS2	●	□	●		NEW ●		●	12.7	4.76	0.8	5.16	
	120412FS2	●	□	●		NEW ●		●	12.7	4.76	1.2	5.16	
	120404TA2		□	●	●	NEW ★			12.7	4.76	0.4	5.16	
	120408TA2		□	●	●		●		12.7	4.76	0.8	5.16	
	120412TA2		□	●	●		●		12.7	4.76	1.2	5.16	
	120404TN2		□	●					12.7	4.76	0.4	5.16	
	120408TN2		□	●					12.7	4.76	0.8	5.16	
	120412TN2		□	●					12.7	4.76	1.2	5.16	
	120404TS2							★	12.7	4.76	0.4	5.16	
	120408TS2							★	12.7	4.76	0.8	5.16	
	120412TS2							★	12.7	4.76	1.2	5.16	
NEW PETIT CUT (With Wiper) *	NEW NP-CNGA120404GAWS2		●	★					12.7	4.76	0.4	5.16	
	NEW 120408GAWS2		●	★					12.7	4.76	0.8	5.16	
	NEW 120412GAWS2		●	★					12.7	4.76	1.2	5.16	
	NEW 120404GSWS2	●	●						12.7	4.76	0.4	5.16	
	NEW 120408GSWS2	●	●						12.7	4.76	0.8	5.16	
	NEW 120412GSWS2	●	●						12.7	4.76	1.2	5.16	
	120404GAW2		□	●					12.7	4.76	0.4	5.16	
	120408GAW2		□	●					12.7	4.76	0.8	5.16	
	120412GAW2		□	●					12.7	4.76	1.2	5.16	
	120408GSW2	●							12.7	4.76	0.8	5.16	
	120412GSW2	●							12.7	4.76	1.2	5.16	
	120408GAWC2		□	●					12.7	4.76	0.8	5.16	
	120404GSWC2	●							12.7	4.76	0.4	5.16	
	120408GSWC2	●		●					12.7	4.76	0.8	5.16	
	120412GSWC2			●					12.7	4.76	1.2	5.16	
	120408FAW2					●			12.7	4.76	0.8	5.16	
	120412FAW2					●			12.7	4.76	1.2	5.16	
	120408FSW2	●							12.7	4.76	0.8	5.16	





* Please refer to P.12 before using wiper inserts.

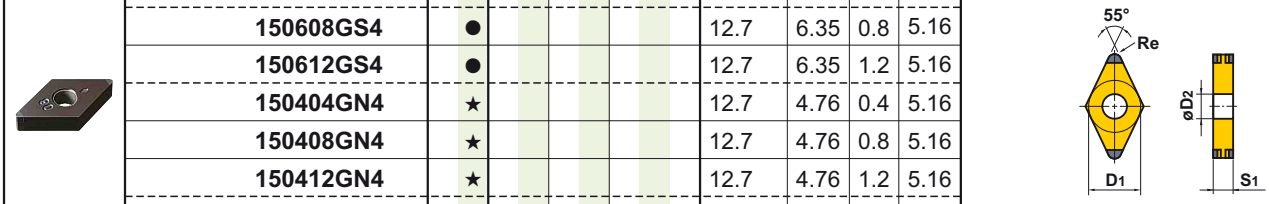
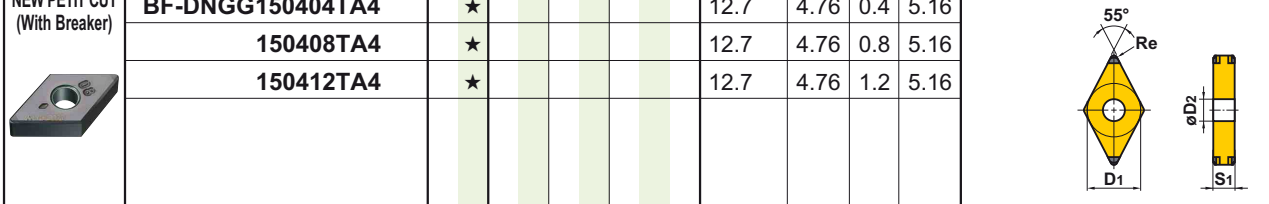
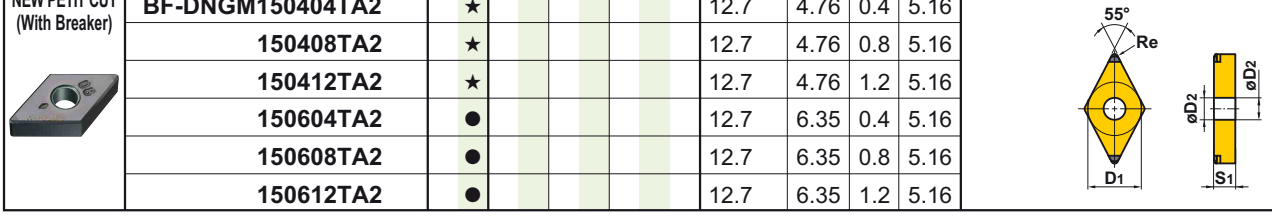
NEW PETIT CUT

Inserts

●Negative Inserts (With hole)

Work Material		
H	Hardened Materials	
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

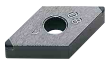
Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✥: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

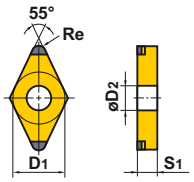
Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 NEW	D1	S1	Re	D2	
NEW PETIT CUT	NP-DNGA110408GA4		●						9.525	4.76	0.8	3.81	
	110412GA4		●						9.525	4.76	1.2	3.81	
	150404GA4		★						12.7	4.76	0.4	5.16	
	150408GA4		●						12.7	4.76	0.8	5.16	
	150412GA4		★						12.7	4.76	1.2	5.16	
	150604GA4		●						12.7	6.35	0.4	5.16	
	150608GA4		●						12.7	6.35	0.8	5.16	
	150612GA4		●						12.7	6.35	1.2	5.16	
	150608GS4		●						12.7	6.35	0.8	5.16	
	150612GS4		●						12.7	6.35	1.2	5.16	
	150404GN4		★						12.7	4.76	0.4	5.16	
	150408GN4		★						12.7	4.76	0.8	5.16	
	150412GN4		★						12.7	4.76	1.2	5.16	
	150404TA4		★						12.7	4.76	0.4	5.16	
	150408TA4		●						12.7	4.76	0.8	5.16	
	150412TA4		★						12.7	4.76	1.2	5.16	
	150604TA4		□						12.7	6.35	0.4	5.16	
	150608TA4		●						12.7	6.35	0.8	5.16	
	150612TA4		●						12.7	6.35	1.2	5.16	
	150604TN4		□						12.7	6.35	0.4	5.16	
	150608TN4		□						12.7	6.35	0.8	5.16	
NEW PETIT CUT (With Breaker)	BF-DNGG150404TA4		★						12.7	4.76	0.4	5.16	
	150408TA4		★						12.7	4.76	0.8	5.16	
	150412TA4		★						12.7	4.76	1.2	5.16	
NEW PETIT CUT (With Breaker)	BF-DNGM150404TA2		★						12.7	4.76	0.4	5.16	
	150408TA2		★						12.7	4.76	0.8	5.16	
	150412TA2		★						12.7	4.76	1.2	5.16	
	150604TA2		●						12.7	6.35	0.4	5.16	
	150608TA2		●						12.7	6.35	0.8	5.16	
	150612TA2		●						12.7	6.35	1.2	5.16	

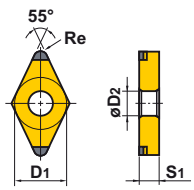
● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

Work Material		
	H	Hardened Materials
	K	Cast Iron
	S	Heat-resistant Alloy, Titanium Alloy
		Sintred Alloy

Cutting Conditions (Guide) :
● : Stable Cutting ◐ : General Cutting ✣ : Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D_1	S_1	Re	D_2	
NEW PETIT CUT (With Wiper) *	NEW NP-DNGA150404GAWS2JR		★	★					12.7	4.76	0.4	5.16	
	NEW 150404GAWS2JL		★	★					12.7	4.76	0.4	5.16	
	NEW 150408GAWS2JR		★	★					12.7	4.76	0.8	5.16	
	NEW 150408GAWS2JL		★	★					12.7	4.76	0.8	5.16	
	NEW 150604GAWS2JR		●						12.7	6.35	0.4	5.16	
	NEW 150604GAWS2JL		●						12.7	6.35	0.4	5.16	
	NEW 150608GAWS2JR		●						12.7	6.35	0.8	5.16	
	NEW 150608GAWS2JL		●						12.7	6.35	0.8	5.16	
	NEW 150404GSWS2JR	★							12.7	4.76	0.4	5.16	
	NEW 150404GSWS2JL	★							12.7	4.76	0.4	5.16	
	NEW 150408GSWS2JR	★							12.7	4.76	0.8	5.16	
	NEW 150408GSWS2JL	★							12.7	4.76	0.8	5.16	
	NEW 150604GSWS2JR	●	●						12.7	6.35	0.4	5.16	
	NEW 150604GSWS2JL	●	●						12.7	6.35	0.4	5.16	
	NEW 150608GSWS2JR	●	●						12.7	6.35	0.8	5.16	
	NEW 150608GSWS2JL	●	●						12.7	6.35	0.8	5.16	
	150404GAW2JR		★						12.7	4.76	0.4	5.16	
	150404GAW2JL		★						12.7	4.76	0.4	5.16	
	150604GAWS2JR		★	●					12.7	4.76	0.8	5.16	
	150604GAWS2JL		★	●					12.7	4.76	0.8	5.16	
	150608GAWS2JR		●	●					12.7	6.35	1.2	5.16	
	150608GAWS2JL		●	●					12.7	6.35	1.2	5.16	
	150608GSW2JR	●							12.7	6.35	0.8	5.16	
	150608GSW2JL	●							12.7	6.35	0.8	5.16	
	150612GSW2JR	●							12.7	6.35	1.2	5.16	
	150612GSW2JL	●							12.7	6.35	1.2	5.16	
	150608FSW2JR	●							12.7	6.35	0.8	5.16	
	150608FSW2JL	●							12.7	6.35	0.8	5.16	Right hand insert shown.
NEW PETIT CUT	NP-DNGA150404GA2		□	●					12.7	4.76	0.4	5.16	
	150408GA2		□	●					12.7	4.76	0.8	5.16	
	150412GA2		□	●					12.7	4.76	1.2	5.16	
	150604GA2		□	●					12.7	6.35	0.4	5.16	
	150608GA2		□	●					12.7	6.35	0.8	5.16	
	150612GA2		□	●					12.7	6.35	1.2	5.16	
	150404GS2	●				●	●		12.7	4.76	0.4	5.16	
	150408GS2	●				●	●		12.7	4.76	0.8	5.16	
	150412GS2	●				●	●		12.7	4.76	1.2	5.16	
	150604GS2	●				●	●	●	12.7	6.35	0.4	5.16	
	150608GS2	●		●		●	●	●	12.7	6.35	0.8	5.16	
	150612GS2	●		●		●	●	●	12.7	6.35	1.2	5.16	
	150404FS2							★	12.7	4.76	0.4	5.16	
	150408FS2							★	12.7	4.76	0.8	5.16	
	150412FS2							★	12.7	4.76	1.2	5.16	





* Please refer to P.12 before using wiper inserts.

NEW PETIT CUT

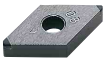
Inserts

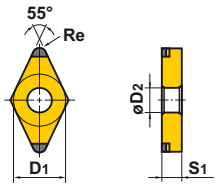
●Negative Inserts (With hole)

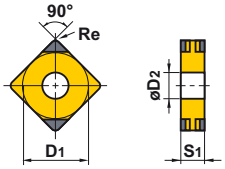
Work Material		
H	Hardened Materials	● ◐ ◐ ✣ ● ◐ ◐ ◐
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

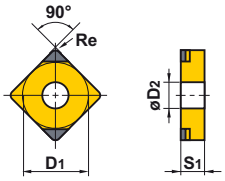
Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✣: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NP-DNGA150604FS2	●						●	12.7	6.35	0.4	5.16	
	150608FS2	●						●	12.7	6.35	0.8	5.16	
	150612FS2	●						●	12.7	6.35	1.2	5.16	
	150404TA2				●				12.7	4.76	0.4	5.16	
	150408TA2				●				12.7	4.76	0.8	5.16	
	150604TA2		□	●	●				12.7	6.35	0.4	5.16	
	150608TA2		□	●	●				12.7	6.35	0.8	5.16	
	150612TA2		□	●					12.7	6.35	1.2	5.16	
	150604TN2		□	●					12.7	6.35	0.4	5.16	
	150608TN2		□	●					12.7	6.35	0.8	5.16	
	150404TS2							★	12.7	4.76	0.4	5.16	
	150408TS2							★	12.7	4.76	0.8	5.16	
	150412TS2							★	12.7	4.76	1.2	5.16	
NEW PETIT CUT	NP-SNGA120404GA4		★						12.7	4.76	0.4	5.16	
	120408GA4		★						12.7	4.76	0.8	5.16	
	120412GA4		★						12.7	4.76	1.2	5.16	
NEW PETIT CUT	NP-SNGA120404GA2		□	●					12.7	4.76	0.4	5.16	
	120408GA2		□	●					12.7	4.76	0.8	5.16	
	120412GA2		□	●					12.7	4.76	1.2	5.16	
	120404GS2	●						●	12.7	4.76	0.4	5.16	
	120408GS2	●				●	●	●	12.7	4.76	0.8	5.16	
	120412GS2	●				●	●	●	12.7	4.76	1.2	5.16	
	120404FS2							●	12.7	4.76	0.4	5.16	
	120408FS2							●	12.7	4.76	0.8	5.16	
	120412FS2							●	12.7	4.76	1.2	5.16	
	120404TS2							★	12.7	4.76	0.4	5.16	
	120408TS2							★	12.7	4.76	0.8	5.16	
	120412TS2							★	12.7	4.76	1.2	5.16	





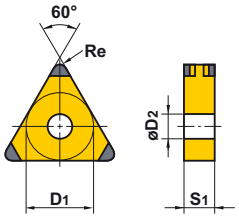
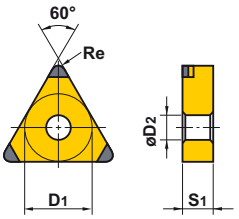
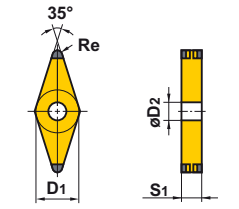




● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

Work Material														
	H	Hardened Materials	●	◕	◕	✣	●	◕						
	K	Cast Iron						◕						
	S	Heat-resistant Alloy, Titanium Alloy												
		Sintred Alloy							◕					

Cutting Conditions (Guide) :
●: Stable Cutting ◕: General Cutting ✣: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NP-TNGA160404GA6		★						9.525	4.76	0.4	3.81	
	160408GA6		●						9.525	4.76	0.8	3.81	
	160412GA6		●						9.525	4.76	1.2	3.81	
	160404GN6		★						9.525	4.76	0.4	3.81	
	160408GN6		★						9.525	4.76	0.8	3.81	
	160412GN6		★						9.525	4.76	1.2	3.81	
	160404TA6		★						9.525	4.76	0.4	3.81	
	160408TA6		●						9.525	4.76	0.8	3.81	
	160412TA6		★						9.525	4.76	1.2	3.81	
	160408TN6		●						9.525	4.76	0.8	3.81	
	160412TN6		□						9.525	4.76	1.2	3.81	
NEW PETIT CUT	NEW NP-TNGA160402GA3		★						9.525	4.76	0.2	3.81	
	160404GA3		□	●					9.525	4.76	0.4	3.81	
	160408GA3		□	●					9.525	4.76	0.8	3.81	
	160412GA3		□	●					9.525	4.76	1.2	3.81	
	NEW 160402GN3		★						9.525	4.76	0.2	3.81	
	160404GS3	●						●	9.525	4.76	0.4	3.81	
	160408GS3	●				●	●	●	9.525	4.76	0.8	3.81	
	160412GS3	●				●	●	●	9.525	4.76	1.2	3.81	
	160404FS3							●	9.525	4.76	0.4	3.81	
	160408FS3							●	9.525	4.76	0.8	3.81	
	160412FS3							●	9.525	4.76	1.2	3.81	
	160408TA3		□	●	●				9.525	4.76	0.8	3.81	
	160412TA3		□	●					9.525	4.76	1.2	3.81	
	160408TN3		□	●					9.525	4.76	0.8	3.81	
	160412TN3		□	●					9.525	4.76	1.2	3.81	
	160404TS3							★	9.525	4.76	0.4	3.81	
	160408TS3							★	9.525	4.76	0.8	3.81	
	160412TS3							★	9.525	4.76	1.2	3.81	
NEW PETIT CUT	NP-VNGA160404GA4		●						9.525	4.76	0.4	3.81	
	160408GA4		●						9.525	4.76	0.8	3.81	

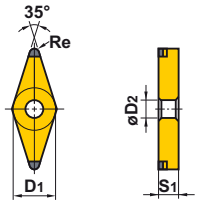
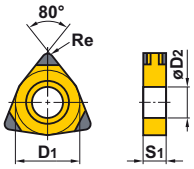
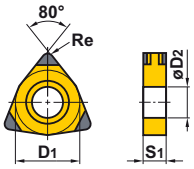
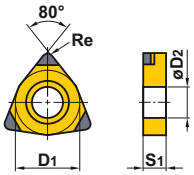
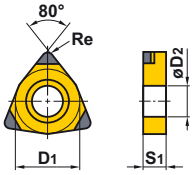
NEW PETIT CUT

Inserts

●Negative Inserts (With hole)

Work Material		
H	Hardened Materials	● ◐ ◐ ✣ ● ◐ ◐ ◐
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✣: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN MBC010	Coated CBN MBC020	CBN MB8025	CBN MB835	CBN MB710	CBN MB730	CBN NEW MB4020	Dimensions (mm) D1	S1	Re	D2	Geometry
NEW PETIT CUT	NEW NP-VNGA160402GA2		★						9.525	4.76	0.2	3.81	
	160404GA2		□	●					9.525	4.76	0.4	3.81	
	160408GA2		□	●					9.525	4.76	0.8	3.81	
	NEW 160402GN2		★						9.525	4.76	0.2	3.81	
	160404GS2	●						●	9.525	4.76	0.4	3.81	
	160408GS2	●						●	9.525	4.76	0.8	3.81	
	160404FS2							●	9.525	4.76	0.4	3.81	
	160408FS2							●	9.525	4.76	0.8	3.81	
	160404TS2							★	9.525	4.76	0.4	3.81	
	160408TS2							★	9.525	4.76	0.8	3.81	
NEW PETIT CUT	NP-WNGA080408GA6		●						12.7	4.76	0.8	5.16	
NEW PETIT CUT (With Wiper) *	NP-WNGA080408GAW6		●						12.7	4.76	0.8	5.16	
NEW PETIT CUT	NP-WNGA080408GA3		□	●					12.7	4.76	0.8	5.16	
	080408FS3							★	12.7	4.76	0.8	5.16	
	080408TS3							★	12.7	4.76	0.8	5.16	
NEW PETIT CUT (With Wiper)	NP-WNGA080408GAW3		□	●					12.7	4.76	0.8	5.16	
	NEW 080408GAWS3		★	★					12.7	4.76	0.8	5.16	
	NEW 080408GSWS3	★							12.7	4.76	0.8	5.16	

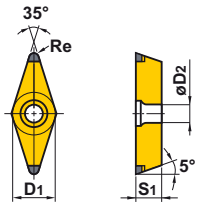
* Please refer to P.12 before using wiper inserts.

● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

●5° Positive Inserts (With hole)

Work Material		
H	Hardened Materials	
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

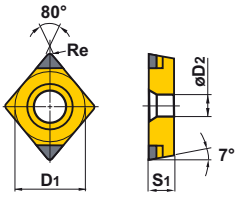
Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✠: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NEW NP-VBGW110304GS2					★	★		6.35	3.18	0.4	4.43	
	NEW 110308GS2					★	★		6.35	3.18	0.8	4.43	
	160404GA2		●	●					9.525	4.76	0.4	4.43	
	160408GA2		●	●					9.525	4.76	0.8	4.43	
	160404GS2	●	●	●		NEW ●	NEW ●	●	9.525	4.76	0.4	4.43	
	160408GS2	●	●	●		NEW ●	NEW ●	●	9.525	4.76	0.8	4.43	
	110304FS2							★	6.35	3.18	0.4	2.85	
	110308FS2							★	6.35	3.18	0.8	2.85	
	160404FS2							●	9.525	4.76	0.4	4.43	
	160408FS2							●	9.525	4.76	0.8	4.43	
	160404TA2				●				9.525	4.76	0.4	4.43	
	160408TA2				●				9.525	4.76	0.8	4.43	
	110304TS2							★	6.35	3.18	0.4	2.85	
	110308TS2							★	6.35	3.18	0.8	2.85	
	160404TS2							★	9.525	4.76	0.4	4.43	
	160408TS2							★	9.525	4.76	0.8	4.43	

●7° Positive Inserts (With hole)

Work Material		
H	Hardened Materials	
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✠: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NP-CCGB060204GA2		★	●					6.35	2.38	0.4	2.8	
	060204GS2	●							6.35	2.38	0.4	2.8	
	060204FS2	●		●					6.35	2.38	0.4	2.8	

NEW PETIT CUT

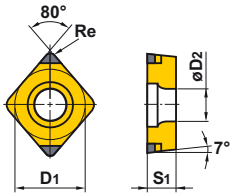
Inserts

●7° Positive Inserts (With hole)

Work Material		
H	Hardened Materials	
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

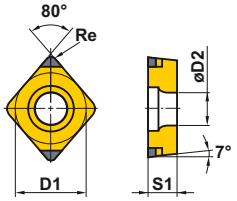
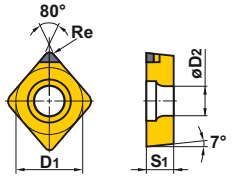
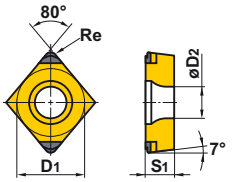
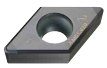
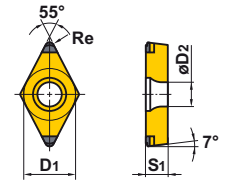
Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✣: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 NEW	D1	S1	Re	D2	
NEW PETIT CUT	NP-CCGW060202GA2		●	●					6.35	2.38	0.2	2.8	
	060204GA2		●	●			●		6.35	2.38	0.4	2.8	
	060208GA2		●	●					6.35	2.38	0.8	2.8	
	09T302GA2		●	●					9.525	3.97	0.2	4.4	
	09T304GA2		●	●			●		9.525	3.97	0.4	4.4	
	09T308GA2		●	●					9.525	3.97	0.8	4.4	
	09T312GA2		●	●					9.525	3.97	1.2	4.4	
	120404GA2		●	●					12.7	4.76	0.4	5.5	
	120408GA2		●	●					12.7	4.76	0.8	5.5	
	060202GS2	●				NEW ●	NEW ●		6.35	2.38	0.2	2.8	
	060204GS2	●				NEW ●	NEW ●	●	6.35	2.38	0.4	2.8	
NEW	060208GS2					NEW ●	NEW ●	●	6.35	2.38	0.8	2.8	
	09T304GS2	●	●	●		NEW ●	NEW ●	●	9.525	3.97	0.4	4.4	
	09T308GS2	●	●	●		NEW ●	NEW ●	●	9.525	3.97	0.8	4.4	
	09T312GS2		●	●					9.525	3.97	1.2	4.4	
	09T302GN2		★						9.525	3.97	0.2	4.4	
	09T304GN2		★						9.525	3.97	0.4	4.4	
	09T308GN2		★						9.525	3.97	0.8	4.4	
	060202FA2	●	●	●			●		6.35	2.38	0.2	2.8	
	060204FA2						●		6.35	2.38	0.4	2.8	
NEW	060208FA2						●		6.35	2.38	0.8	2.8	
NEW	060202FS2					●		★	6.35	2.38	0.2	2.8	
	060204FS2	●	●	●		NEW ●		●	6.35	2.38	0.4	2.8	
	060208FS2	●				NEW ●		●	6.35	2.38	0.8	2.8	
	09T302FS2	●	●	●				★	9.525	3.97	0.2	4.4	
	09T304FS2	●	●	●			NEW ●	●	9.525	3.97	0.4	4.4	
	09T308FS2	●	●	●		NEW ●	NEW ●	●	9.525	3.97	0.8	4.4	
	060202TA2		●	●	●				6.35	2.38	0.2	2.8	
	060204TA2		●	●	●				6.35	2.38	0.4	2.8	
	060208TA2		●	●					6.35	2.38	0.8	2.8	
	09T304TA2		●	●	●				9.525	3.97	0.4	4.4	
	09T308TA2		●	●	●				9.525	3.97	0.8	4.4	
	09T312TA2		●	●					9.525	3.97	1.2	4.4	
	09T304TN2		●	●					9.525	3.97	0.4	4.4	
	09T308TN2		●	●					9.525	3.97	0.8	4.4	
	060202TS2							★	6.35	2.38	0.2	2.8	
	060204TS2							★	6.35	2.38	0.4	2.8	
	060208TS2							★	6.35	2.38	0.8	2.8	
	09T302TS2							★	9.525	3.97	0.4	4.4	
	09T304TS2							★	9.525	3.97	0.8	4.4	
	09T308TS2							★	9.525	3.97	1.2	4.4	



● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

Work Material			Cutting Conditions (Guide) : ● : Stable Cutting ◕ : General Cutting ✥ : Unstable Cutting Honing (Last letter of order number) : Please refer to P.5
	H	Hardened Materials	
	K	Cast Iron	
	S	Heat-resistant Alloy, Titanium Alloy	
		Sintred Alloy	

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT (With Wiper) * 	NP-CCGW09T308GAW2		●						9.525	3.97	0.8	4.4	
	120404GAW2		●	●					12.7	4.76	0.4	5.5	
	120408GAW2		●	●					12.7	4.76	0.8	5.5	
	NEW 09T304GAWS2		●						9.525	3.97	0.4	4.4	
	09T308GAWC2		●	●					9.525	3.97	0.8	4.4	
	NEW 09T308GAWS2		●	★					9.525	3.97	0.8	4.4	
	09T304GSW2	●							9.525	3.97	0.4	4.4	
	09T304GSWC2	●	●	●					9.525	3.97	0.4	4.4	
	NEW 09T304GSWS2	●	●						9.525	3.97	0.4	4.4	
	09T308GSWC2	●	●	●					9.525	3.97	0.8	4.4	
	NEW 09T308GSWS2	●	●						9.525	3.97	0.8	4.4	
	09T304FSWC2	●							9.525	3.97	0.4	4.4	
	09T308FSWC2	●							9.525	3.97	0.8	4.4	
	09T308TAWC2		●	●					9.525	3.97	0.8	4.4	
NEW PETIT CUT 	NP-CCGW03S102FA	●	●	●					3.57	1.39	0.2	2.0	
	04T002FA	●	●	●					4.37	1.79	0.2	2.4	
	03S104FS	●	●	●					3.57	1.39	0.4	2.0	
	04T004FS	●	●	●					4.37	1.79	0.4	2.4	
NEW PETIT CUT (With Breaker) 	BF-CCGT09T304TA2		●						9.525	3.97	0.4	4.4	
	09T308TA2		●						9.525	3.97	0.8	4.4	
NEW PETIT CUT (With Wiper) 	BF-DCGT11T304TA2		●						9.525	3.97	0.4	4.4	
	11T308TA2		●						9.525	3.97	0.8	4.4	

* Please refer to P.12 before using wiper inserts.

NEW PETIT CUT

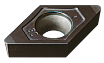
Inserts

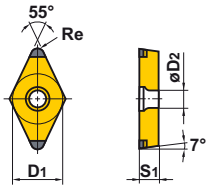
●7° Positive Inserts (With hole)

Work Material		
H	Hardened Materials	● ◐ ◐ ✣ ● ◐ ◐ ◐
K	Cast Iron	
S	Heat-resistant Alloy, Titanium Alloy	
	Sintred Alloy	

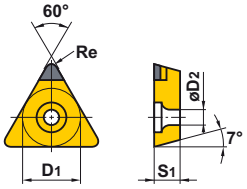
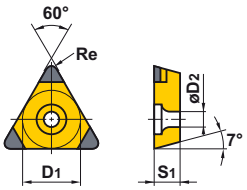
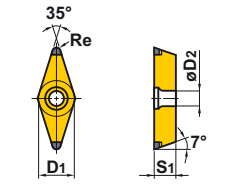
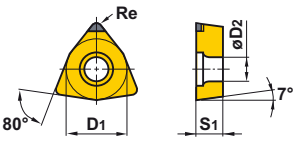
Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✣: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NP-DCGW070202GA2		●	●					6.35	2.38	0.2	2.8	
	070204GA2		●	●					6.35	2.38	0.4	2.8	
	070208GA2		●	●					6.35	2.38	0.8	2.8	
	11T302GA2		●	●					9.525	3.97	0.2	4.4	
	11T304GA2		●	●					9.525	3.97	0.4	4.4	
	11T308GA2		●	●					9.525	3.97	0.8	4.4	
	11T312GA2		●	●					9.525	3.97	1.2	4.4	
	070204GS2	●	●	●				●	6.35	2.38	0.4	2.8	
	070208GS2	●	●	●				●	6.35	2.38	0.8	2.8	
	11T302GS2	●							9.525	3.97	0.2	4.4	
	11T304GS2	●	●	●		●	●	●	9.525	3.97	0.4	4.4	
	11T308GS2	●	●	●		(NEW) ●	(NEW) ●	●	9.525	3.97	0.8	4.4	
	070202GN2		★						6.35	2.38	0.2	2.8	
	070204GN2		●						6.35	2.38	0.4	2.8	
	070208GN2		●						6.35	2.38	0.8	2.8	
	11T302GN2		★						9.525	3.97	0.2	4.4	
	11T304GN2		★						9.525	3.97	0.4	4.4	
	11T308GN2		★						9.525	3.97	0.8	4.4	
	11T304FA2					●	●		9.525	3.97	0.4	4.4	
	11T308FA2					●	●		9.525	3.97	0.8	4.4	
	070202FS2	●							6.35	2.38	0.2	2.8	
	070204FS2	●				●		●	6.35	2.38	0.4	2.8	
	070208FS2	●						●	6.35	2.38	0.8	2.8	
	11T302FS2	●						●	9.525	3.97	0.2	4.4	
	11T304FS2	●						●	9.525	3.97	0.4	4.4	
	11T308FS2	●						●	9.525	3.97	0.8	4.4	
	070204TA2		●	●	●				6.35	2.38	0.4	2.8	
	11T302TA2		□	●	●				9.525	3.97	0.2	4.4	
	11T304TA2		●	●	●				9.525	3.97	0.4	4.4	
	11T308TA2				●				9.525	3.97	0.8	4.4	
	11T308TN2		●	●					9.525	3.97	0.8	4.4	
	070204TS2							★	6.35	2.38	0.4	2.8	
	070208TS2							★	6.35	2.38	0.8	2.8	
	11T302TS2							★	9.525	3.97	0.2	4.4	
	11T304TS2							★	9.525	3.97	0.4	4.4	
	11T308TS2							★	9.525	3.97	0.8	4.4	





● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

Work Material			Coated CBN		CBN					Dimensions (mm)				Geometry
	H	Hardened Materials	●	☾	☾	✣	●	☾						
	K	Cast Iron						☾						
	S	Heat-resistant Alloy, Titanium Alloy												
		Sintred Alloy							☾					
Shape		Order Number	MBC010	MBC020	MB8025	MB835	MB710	MB730 (NEW)	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT		NP-TCGW090204GS					●	●		5.56	2.38	0.4	2.5	
NEW		090208GS					●	●		5.56	2.38	0.8	2.5	
		110204GS					●	●		6.35	2.38	0.4	2.8	
		110208GS					●	●		6.35	2.38	0.8	2.8	
		090204FS					●	●		5.56	2.38	0.4	2.5	
		090208FS					●	●		5.56	2.38	0.8	2.5	
		110204FS					●	●		6.35	2.38	0.4	2.8	
		110208FS					●	●		6.35	2.38	0.8	2.8	
NEW PETIT CUT		NP-TCGW090202GA3	★							5.56	2.38	0.2	2.5	
		090204GA3	★							5.56	2.38	0.4	2.5	
		090208GA3	★							5.56	2.38	0.8	2.5	
		110202GA3	★							6.35	2.38	0.2	2.8	
		110204GA3	★							6.35	2.38	0.4	2.8	
		110208GA3	★							6.35	2.38	0.8	2.8	
		130304GA3	★							7.94	3.18	0.4	3.4	
		130308GA3	★							7.94	3.18	0.8	3.4	
		16T304GA3	★							9.525	3.97	0.4	4.4	
		16T308GA3	★							9.525	3.97	0.8	4.4	
	NEW	16T304GS3					●	●		9.525	3.97	0.4	4.4	
	NEW	16T308GS3					●	●		9.525	3.97	0.8	4.4	
		110204FS3							★	6.35	2.38	0.4	2.8	
		110208FS3							★	6.35	2.38	0.8	2.8	
	NEW	16T304FS3					●	●		9.525	3.97	0.4	4.4	
	NEW	16T308FS3					●	●		9.525	3.97	0.8	4.4	
		110204TS3							★	6.35	2.38	0.4	2.8	
		110208TS3							★	6.35	2.38	0.8	2.8	
NEW PETIT CUT		NP-VCGW160404GA2	★		□					9.525	4.76	0.4	4.4	
		160408GA2	★		□					9.525	4.76	0.8	4.4	
		160404GS2	□							9.525	4.76	0.4	4.4	
		160408GS2	□							9.525	4.76	0.8	4.4	
NEW PETIT CUT		NP-WCMWL30204FA						★		4.76	2.38	0.4	2.3	
NEW		L30208FA						★		4.76	2.38	0.8	2.3	

Cutting Conditions (Guide) :
●: Stable Cutting ☾: General Cutting ✣: Unstable Cutting

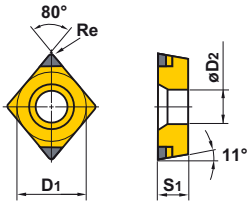
Honing (Last letter of order number) :
Please refer to P.5

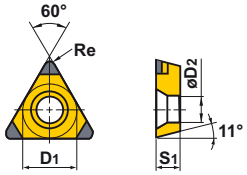
●11° Positive Inserts (With hole)

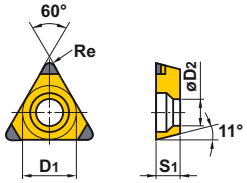
Work Material		
	H	Hardened Materials
	K	Cast Iron
	S	Heat-resistant Alloy, Titanium Alloy
		Sintred Alloy

Cutting Conditions (Guide) :
●: Stable Cutting ◐: General Cutting ✠: Unstable Cutting
Honing (Last letter of order number) :
Please refer to P.5

Shape	Order Number	Coated CBN		CBN					Dimensions (mm)				Geometry
		MBC010	MBC020	MB8025	MB835	MB710	MB730	MB4020 (NEW)	D1	S1	Re	D2	
NEW PETIT CUT	NP-CPGB080204GA2		●	●					7.94	2.38	0.4	3.5	
	080208GA2		●	●					7.94	2.38	0.8	3.5	
	090304GA2		●	●					9.525	3.18	0.4	4.5	
	090308GA2		●	●					9.525	3.18	0.8	4.5	
	080204GS2	●							7.94	2.38	0.4	3.5	
	080208GS2	●							7.94	2.38	0.8	3.5	
	090304GS2	●							9.525	3.18	0.4	4.5	
	090308GS2	●							9.525	3.18	0.8	4.5	
	080202FS2							★	7.94	2.38	0.2	3.5	
	080204FS2	●	□	●				★	7.94	2.38	0.4	3.5	
	080208FS2	●	□	●					7.94	2.38	0.8	3.5	
	090302FS2							★	9.525	3.18	0.2	4.5	
	090304FS2	●	□	●				★	9.525	3.18	0.4	4.5	
	090308FS2	●	□	●				★	9.525	3.18	0.8	4.5	
NEW PETIT CUT	NP-TPGB080204GA3		●	●					4.76	2.38	0.4	2.4	
	080208GA3		★	●					4.76	2.38	0.8	2.4	
	090204GA3		★	●					5.56	2.38	0.4	2.9	
	090208GA3		★	●					5.56	2.38	0.8	2.9	
	110304GA3		★	●					6.35	3.18	0.4	3.4	
	110308GA3		●	●					6.35	3.18	0.8	3.4	
	160304GA3		★	●					9.525	3.18	0.4	4.4	
	160308GA3		●	●					9.525	3.18	0.8	4.4	
	090202FS3							★	5.56	2.38	0.2	2.9	
	090204FS3							★	5.56	2.38	0.4	2.9	
	110302FS3							★	6.35	3.18	0.2	3.4	
	110304FS3							★	6.35	3.18	0.4	3.4	
	110308FS3							★	6.35	3.18	0.8	3.4	
NEW PETIT CUT	NP-TPGX080202GS3	●							4.76	2.38	0.2	2.5	
	080204GS3	●							4.76	2.38	0.4	2.5	
	090202GS3	●							5.56	2.38	0.2	3	
	090204GS3	●							5.56	2.38	0.4	3	
	110304GS3	●							6.35	3.18	0.4	3.5	
	110308GS3	●							6.35	3.18	0.8	3.5	
	080204TA3				●				4.76	2.38	0.4	2.5	
	090204TA3				●				5.56	2.38	0.4	3	
	110304TA3				●				6.35	3.18	0.4	3.5	







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