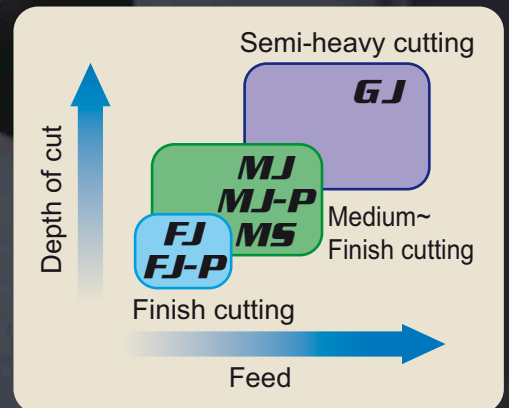
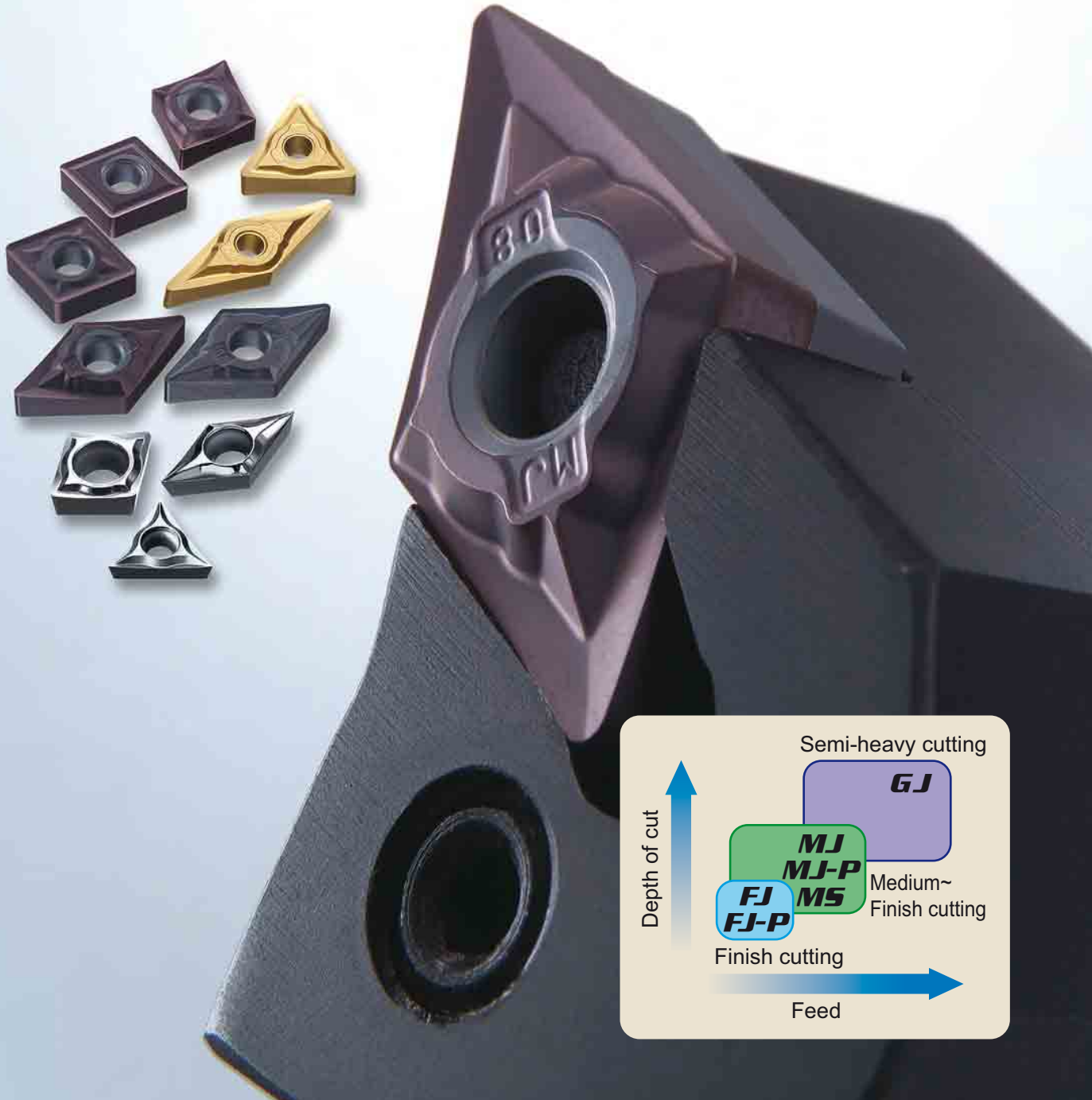


Special breakers for difficult-to-cut materials

FJ/MJ/GJ/MS breaker

FJ-P/MJ-P (P denotes polished, uncoated inserts)

Excellent for highly accurate machining of heat-resistant and titanium alloy.



Special breakers for difficult-to-cut materials

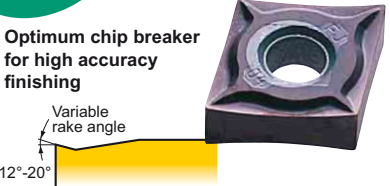
FJ/MJ/GJ/MS

FJ-P/MJ-P breaker

Features

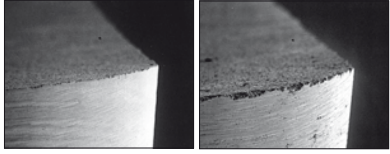
FJ breaker Finish cutting
G Class

Optimum chip breaker for high accuracy finishing



Variable rake angle
12°-20°

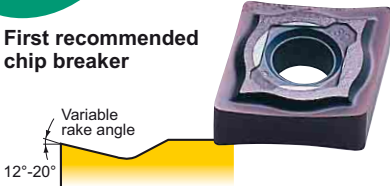
- Reduced heat generation with the use of a sharp cutting edge.
- Superior chip control at very small depths of cut with a special dot type chip breaker.



Cutting edge of **FJ breaker** (Extremely sharp cutting edge) Cutting edge of a competitors breaker for difficult-to-cut materials.

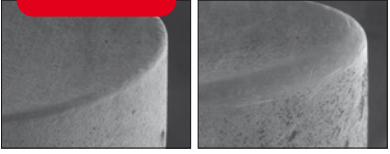
MJ breaker Medium-Finish cutting
M Class

First recommended chip breaker



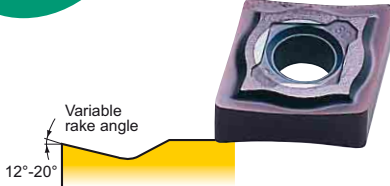
Variable rake angle
12°-20°

- M-class economy with a smooth micro honing for highest sharpness.
- A curved edge design suitable for copy turning.
- A wide variety of corner radii, .016—.063 available as standard.



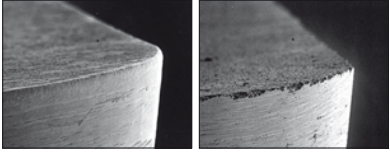
Cutting edge of **MJ breaker** for class M (Extremely sharp cutting edge) Cutting edge of a competitors breaker for class M

MJ breaker Medium-Finish cutting
G Class



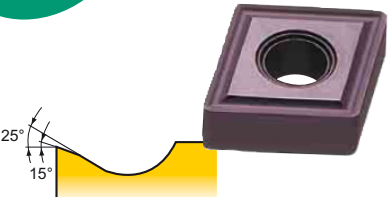
Variable rake angle
12°-20°

- G-class precision with a smooth micro honing for the highest sharpness.
- A curved edge design suitable for copy turning.
- When high accuracy and precise insert positioning are needed, we recommend the use of G-class inserts.



Cutting edge of **MJ breaker** for class G (Extremely sharp cutting edge) Cutting edge of a competitors breaker for difficult-to-cut materials.

MS breaker Medium cutting
M Class

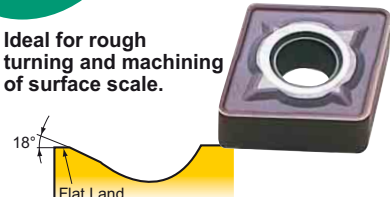


25°
15°

- The high rake angle reduces cutting temperatures.
- Reduced contact area on the rake face.
- Suppresses heat generation.

GJ breaker Semi-heavy cutting
M Class

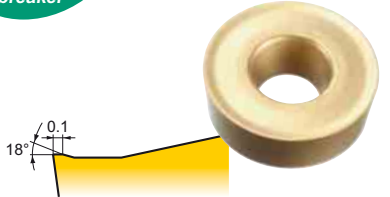
Ideal for rough turning and machining of surface scale.



18°
Flat Land

- Sharpness and high cutting edge strength with an optimum rake angle and flat land.
- Cutting edge geometry optimized for resistance to face wear when cutting titanium alloy.

RCMX Standard breaker Medium cutting
M Class




18°
0.1

- A smaller rake angle prevents notching.

FJ-P breaker Finish cutting
G Class

Finishing titanium alloy. Also available to aluminum and copper.



Variable rake angle
12°-20°

- The sharp edge produces good surface finish.
- The curved edge allows smooth chip discharge.
- A mirror finish insert surface offers high welding resistance.

MJ-P breaker Medium-Finish cutting
G Class

Medium cutting of titanium alloy. Also available to aluminum and copper.



Variable rake angle
12°-20°

- The sharp edge produces good surface finish.
- The curved edge allows smooth chip discharge.
- A mirror finish insert surface offers high welding resistance.

Grade Features

Application range for heat resistant alloy machining

Properties	Heat-resistant alloy	
		<ul style="list-style-type: none"> ● CVD coated <i>US905</i> Unequalled wear resistance enables machining at high speeds when compared to conventional products. ● Miracle Coated grade <i>VP05RT</i> The combination of MIRACLE coating and a high-strength cemented carbide substrate increases wear resistance and exhibits high continuous cut performance. ● Miracle Coated grade <i>VP10RT</i> A good balance of wear and fracture resistance. First recommendation for turning heat-resistant alloys. Also suitable for stainless steels. ● Miracle Coated grade <i>VP15TF</i> High-strength micro-grain cemented carbide substrate. Ideal for interrupted cutting that requires high fracture resistance.

Features of *US905*

CVD Coated *US905*

Coating

A CVD coating layer with a close micro structure to prevent flank and face wear of edges that are subject to very high temperatures.

Substrate

The highest hardness cemented carbide substrate suitable for CVD coating. For reduced plastic deformation and improved dimensional accuracy of components.

Features of MIRACLE Coating

MIRACLE coating features

MIRACLE coating

Increased heat resistance

Increased adhesion strength

Competitor's Ti coating grade

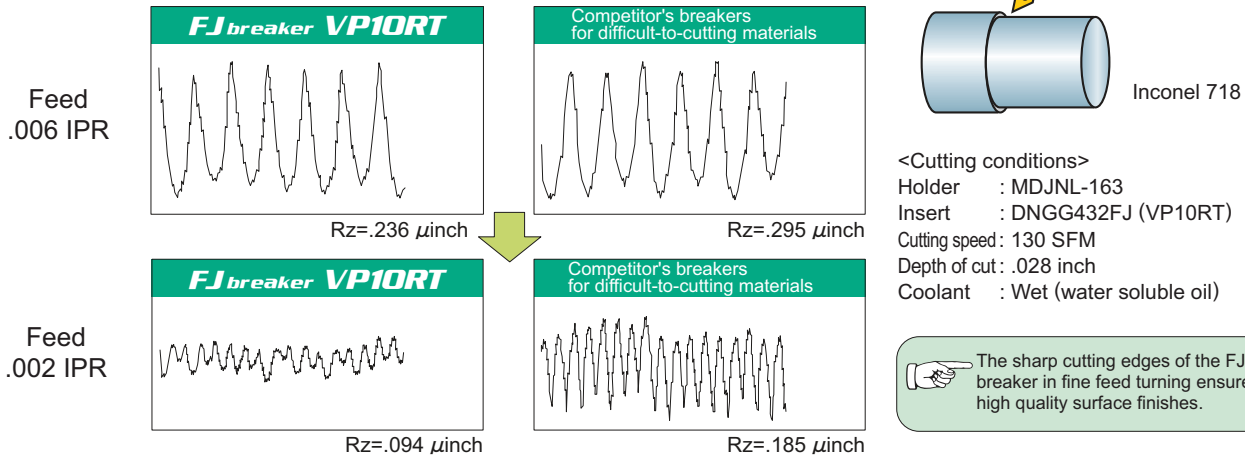
Application range for titanium alloys machining

Properties	Titanium Alloys	
		<ul style="list-style-type: none"> ● Cemented carbide grade <i>RT9005</i> Unmatched resistance to heat and plastic deformation. Ideal for wear resistant high-speed machining. ● Cemented carbide grade <i>RT9010</i> Good balance of wear and fracture resistance. First choice for turning of titanium alloys. ● Cemented carbide grade <i>TF15</i> High-strength micro-grain cemented carbide grade. Ideal for interrupted cutting that requires high fracture resistance.

FJ/MJ/GJ/MS
FJ-P/MJ-P breaker

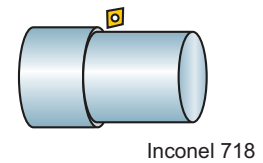
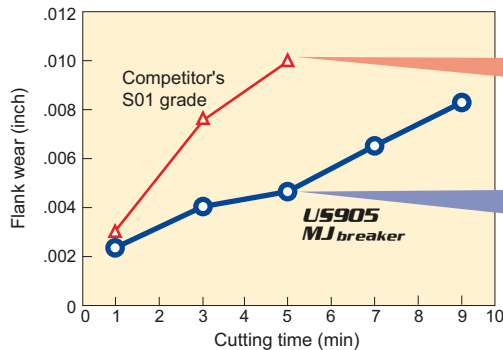
Cutting performance of *FJ breaker*

● Finished surface comparison on Inconel 718



Cutting performance of *MJ breaker*

● High speed turning of Inconel 718 **US905** with unmatched wear resistance.

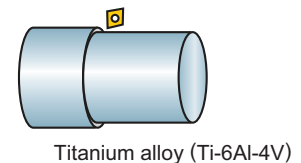
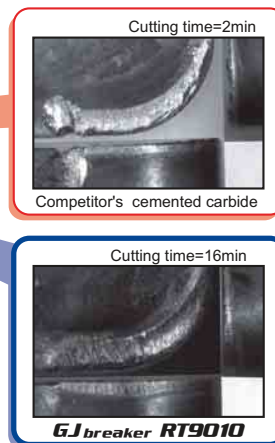
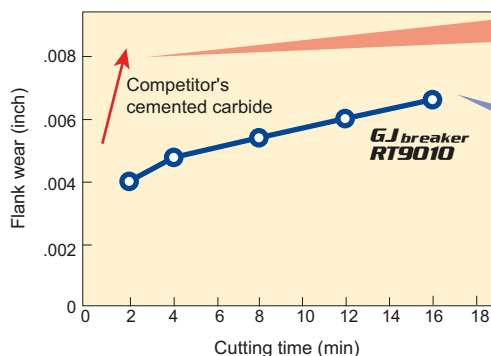


<Cutting conditions>
Insert : CNMG432MJ
Holder : MCLNL-163
Cutting speed : 295 SFM
Feed : .006 IPR
Depth of cut : .020 inch
Coolant : Wet (water soluble oil)

- Unequaled cutting edge sharpness for M class inserts. Provides excellent wear resistance due to a combination of M class accuracy and the coated carbide grade US905.
- Excellent for workpieces and machines lacking rigidity.
- Ideal for stainless steel turning with the combination of M class accuracy and the coated carbide grade VP10RT.

Cutting performance of *GJ breaker*




● Titanium alloy (Ti-6Al-4V)
GJ breaker for excellent wear & fracture resistance.



<Cutting conditions>
Insert : CNMG432GJ
Holder : MCLNL-163
Cutting speed : 165 SFM
Feed : .010 IPR
Depth of cut : .079 inch
Coolant : Wet (water soluble oil)

Recommended cutting conditions

Cutting conditions

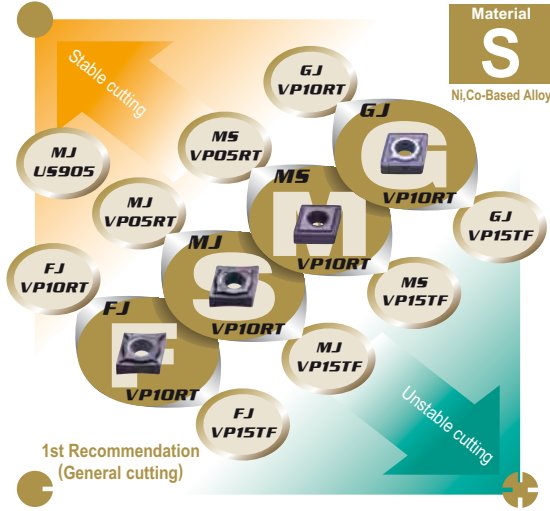
-  Stable cutting
-  General cutting
-  Unstable cutting

Continuous cutting
Constant depth of cut machining
Pre-machined
Securely clamped component machining

Heavy interrupted cutting
Irregular depth of cut machining
Low clamping rigidity machining

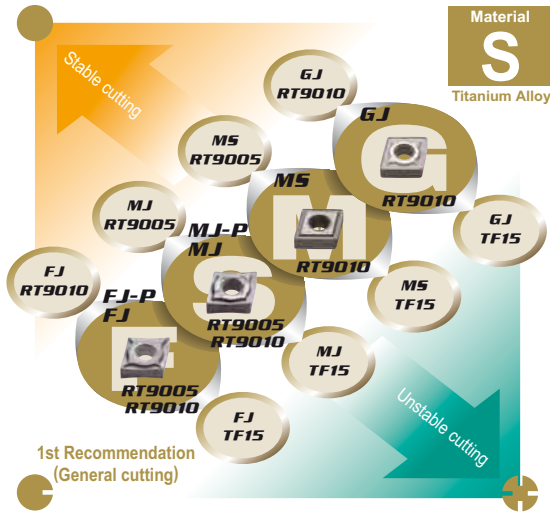
Cutting area

-  Finish cutting
-  Medium cutting
-  Light cutting
-  Semi-heavy cutting



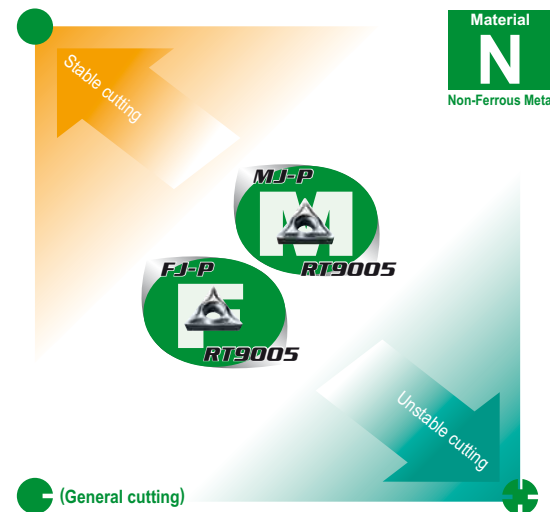
INSERTS FOR HEAT-RESISTANT ALLOY

Cutting area	Breaker	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)
Finish cutting	FJ	65—250	— .008	— .032
Finish cutting Medium cutting	MJ	65—200	— .008	.020—.070
Medium cutting	MS	65—200	.004—.010	.020—.100
Semi-heavy cutting	GJ	65—170	.006—.012	.040—.125



INSERTS FOR TITANIUM ALLOY

Cutting area	Breaker	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)
Finish cutting	FJ-P FJ	65—250	— .008	— .032
Finish cutting Medium cutting	MJ-P MJ	65—200	— .008	.020—.070
Medium cutting	MS	65—200	.004—.010	.020—.100
Semi-heavy cutting	GJ	65—170	.006—.012	.040—.125



INSERTS FOR ALUMINUM ALLOY

Cutting area	Breaker	Cutting speed (SFM)	Feed (IPR)	Depth of cut (inch)
Finish cutting	FJ-P	200—3300	— .006	— .032
Finish cutting Medium cutting	MJ-P	650—2000	— .012	.010—.175

Special breakers for difficult-to-cut materials

Type	Geometry	Order Number	(ISO) Number	Class	Coating				Carbide				Dimensions (inch)		
					US905	VP05RT	VP10RT	VP15TF	RT9005	RT9010	TF15	HT10	D1	S1	Re
FJ (Finish Cutting / G Class)		CNGG43V5FJ	CNGG1204V5-FJ	G		●				□			.500	.188	.002
		430.2FJ	120401-FJ	G		●				□			.500	.188	.004
		430.5FJ	120402-FJ	G		●				□			.500	.188	.008
		431FJ	120404-FJ	G		●	★			★	★	□	.500	.188	.016
		432FJ	120408-FJ	G		●	●			●	★	□	.500	.188	.031
		DNGG431FJ	DNGG150404-FJ	G		★	★			★	★	□	.500	.188	.016
		432FJ	150408-FJ	G		●	●			●	★	□	.500	.188	.031
		VNGG33V5FJ	VNGG1604V5-FJ	G		●				●			.375	.188	.002
		330.2FJ	160401-FJ	G		●				●			.375	.188	.004
		330.5FJ	160402-FJ	G		●				●			.375	.188	.008
		VBGT33V5FJ	VBGT1604V5-FJ	G		●							.375	.188	.002
		330.2FJ	160401-FJ	G		●							.375	.188	.004
		330.5FJ	160402-FJ	G		●							.375	.188	.008
		CCGT21.5V5FJ	CCGT0602V5-FJ	G		●							.250	.094	.002
		21.50.2FJ	060201-FJ	G		●							.250	.094	.004
		21.50.5FJ	060202-FJ	G		●							.250	.094	.008
		32.5V5FJ	09T3V5-FJ	G		●							.375	.156	.002
		32.50.2FJ	09T301-FJ	G		●					□		.375	.156	.004
		32.50.5FJ	09T302-FJ	G		●					□		.375	.156	.008
		32.51FJ	09T304-FJ	G		●					□		.375	.156	.016
		DCGT21.5V5FJ	DCGT0702V5-FJ	G		●							.250	.094	.002
		21.50.2FJ	070201-FJ	G		●							.250	.094	.004
		21.50.5FJ	070202-FJ	G		●							.250	.094	.008
		32.5V5FJ	11T3V5-FJ	G		●							.375	.156	.002
		32.50.2FJ	11T301-FJ	G		●							.375	.156	.004
		32.50.5FJ	11T302-FJ	G		●							.375	.156	.008
		TCGT21.5V5FJ	TCGT1102V5-FJ	G		●							.250	.094	.002
		21.50.2FJ	110201-FJ	G		●							.250	.094	.004
		21.50.5FJ	110202-FJ	G		●							.250	.094	.008
		32.5V5FJ	16T3V5-FJ	G		●							.375	.156	.002
32.50.2FJ		16T301-FJ	G		●							.375	.156	.004	
	WCGT21.5V5FJ	WCGT0402V5-FJ	G		●							.250	.094	.002	
	21.50.2FJ	040201-FJ	G		●							.250	.094	.004	
	21.50.5FJ	040202-FJ	G		●							.250	.094	.008	
	32.5V5FJ	06T3V5-FJ	G		●							.375	.156	.002	
	32.50.2FJ	06T301-FJ	G		●							.375	.156	.004	
32.50.5FJ	06T302-FJ	G		●							.375	.156	.008		

● : Inventory maintained. ★ : Inventory maintained in Japan.

□ : Non stock, produced to order only.

Type	Geometry	Order Number	(ISO) Number	Class	Coating				Carbide			Dimensions (inch)		
					US905	VP05RT	VP10RT	VP15TF	RT9005	RT9010	TF15	HTT10	D1	S1
FJ-P (Finish Cutting / G Class)		CNGG43V5FJ-P	CNGG1204V5-FJ-P	G					●			.500	.188	.002
		430.2FJ-P	120401-FJ-P	G					●			.500	.188	.004
		430.5FJ-P	120402-FJ-P	G					●			.500	.188	.008
		VBGT33V5-FJ-P	VBGT1604V5-FJ-P	G					●			.375	.188	.002
		330.2FJ-P	160401-FJ-P	G					●			.375	.188	.004
		330.5FJ-P	160402-FJ-P	G					●			.375	.188	.008
		CCGT21.5V5FJ-P	CCGT0602V5-FJ-P	G					●			.250	.094	.002
		21.50.2FJ-P	060201-FJ-P	G					●			.250	.094	.004
		21.50.5FJ-P	060202-FJ-P	G					●			.250	.094	.008
		32.5V5FJ-P	09T3V5-FJ-P	G					●			.375	.156	.002
		32.50.2FJ-P	09T301-FJ-P	G					●			.375	.156	.004
		32.50.5FJ-P	09T302-FJ-P	G					●			.375	.156	.008
		32.51FJ-P	09T304-FJ-P	G					●			.375	.156	.016
		DCGT21.5V5FJ-P	DCGT0702V5-FJ-P	G					●			.250	.094	.002
		21.50.2FJ-P	070201-FJ-P	G					●			.250	.094	.004
		21.50.5FJ-P	070202-FJ-P	G					●			.250	.094	.008
		32.5V5FJ-P	11T3V5-FJ-P	G					●			.375	.156	.002
		32.50.2FJ-P	11T301-FJ-P	G					●			.375	.156	.004
		TCGT21.5V5FJ-P	TCGT1102V5-FJ-P	G					●			.250	.094	.002
		21.50.2FJ-P	110201-FJ-P	G					●			.250	.094	.004
		21.50.5FJ-P	110202-FJ-P	G					●			.250	.094	.008
		32.5V5FJ-P	16T3V5-FJ-P	G					●			.375	.156	.002
		32.50.2FJ-P	16T301-FJ-P	G					●			.375	.156	.004
		WCGT21.5V5FJ-P	WCGT0402V5-FJ-P	G					●			.250	.094	.002
		21.50.2FJ-P	040201-FJ-P	G					●			.250	.094	.004
		21.50.5FJ-P	040202-FJ-P	G					●			.250	.094	.008
		32.5V5FJ-P	06T3V5-FJ-P	G					●			.375	.156	.002
32.50.2FJ-P		06T301-FJ-P	G					●			.375	.156	.004	
32.50.5FJ-P	06T302-FJ-P	G					●			.375	.156	.008		

Special breakers for difficult-to-cut materials

Type	Geometry	Order Number	(ISO) Number	Class	Coating				Carbide			Dimensions (inch)			
					US905	VP05RT	VP10RT	VP15TF	RT9005	RT9010	TF15	HTT10	D1	S1	Re
MJ (Finish - Medium Cutting / G Class)		CNGG431MJ	CNGG120404-MJ	G		●	●		●	★	●	.500	.188	.016	
		432MJ	120408-FJ	G		●	●		●	★	●	.500	.188	.031	
		DNGM431MJ	DNGM150404-MJ	G			●	★		●	★	●	.500	.188	.016
		432MJ	150408-MJ	G			●	★		●	★	●	.500	.188	.031
		VNGM331MJ	VNGM160404-MJ	G			●			●			.375	.188	.016
		332MJ	160408-MJ	G			●			●			.375	.188	.031
		431MJ	220404-MJ	G			●			●			.500	.188	.016
		432MJ	220408-MJ	G			●			●			.500	.188	.031
		VBGT331MJ	VBGT160404-MJ	G			●						.375	.188	.016
		332MJ	160408-MJ	G			●						.375	.188	.031
		CCGT21.51MJ	CCGT060204-MJ	G			●						.250	.094	.016
		32.52MJ	09T308-MJ	G			●						.375	.156	.031
		DCGT21.51MJ	DCGT070204-MJ	G			●						.250	.094	.016
		32.51MJ	11T304-MJ	G			●						.375	.156	.016
		32.52MJ	11T308-MJ	G			●						.375	.156	.031
		TCGT21.51MJ	TCGT110204-MJ	G			●						.250	.094	.016
		32.51MJ	16T304-MJ	G			●						.375	.156	.016
		32.52MJ	16T308-MJ	G			●						.375	.156	.031
		WCGT21.51MJ	WCGT040204-MJ	G			●						.250	.094	.016
		32.51MJ	06T304-MJ	G			●						.375	.156	.016
32.52MJ		06T308-MJ	G			●						.375	.156	.031	

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

Type	Geometry	Order Number	(ISO) Number	Class	Coating				Carbide			Dimensions (inch)			
					US905	VP05RT	VP10RT	VP15TF	RT9005	RT9010	TF15	HT110	D1	S1	Re
MJ (Finish - Medium Cutting / M Class)		CNMG431MJ	CNMG120404-MJ	M	★	●	●		□	●			.500	.188	.016
		432MJ	120408-MJ	M	★	●	●		□	●			.500	.188	.031
		433MJ	120412-MJ	M	★	★	★						.500	.188	.047
		434MJ	120416-MJ	M	★	★	★						.500	.188	.063
		DNMG431MJ	DNMG150404-MJ	M	★	●	●		□	●			.500	.188	.016
		432MJ	150408-MJ	M	★	●	●		□	●			.500	.188	.031
		433MJ	150412-MJ	M	★	★	★						.500	.188	.047
		434MJ	150416-MJ	M	★	★	★						.500	.188	.063
		441MJ	150604-MJ	M	★	★	★						.500	.250	.016
		442MJ	150608-MJ	M	★	★	★						.500	.250	.031
		443MJ	150612-MJ	M	★	★	★						.500	.250	.047
		444MJ	150616-MJ	M	★	★	★						.500	.250	.063
		TNMG331MJ	TNMG160404-MJ	M	★	●	●		□	●			.375	.188	.016
		332MJ	160408-MJ	M	★	●	●		●	●			.375	.188	.031
		333MJ	160412-MJ	M	★	★	★						.375	.188	.047
		VNMG331MJ	VNMG160404-MJ	M	★	●	●		□	●			.375	.188	.016
		332MJ	160408-MJ	M	★	●	●		□	●			.375	.188	.031
		333MJ	160412-MJ	M	★	★	★						.375	.188	.047
		WNMG432MJ	WNMG080408-MJ	M	★	★	★						.500	.188	.031
		433MJ	080412-MJ	M	★	★	★						.500	.188	.047
434MJ		080416-MJ	M	★	★	★						.500	.188	.063	
MJ-P (Finish - Medium Cutting / G Class)		VBGT331MJ-P	VBGT160404-MJ-P	G					●			.375	.188	.016	
		332MJ-P	160408-MJ-P	G					●			.375	.188	.031	
		CCGT21.51MJ-P	CCGT060204-MJ-P	G					●			.250	.094	.016	
		32.52MJ-P	09T308-MJ-P	G					●			.375	.156	.031	
		DCGT21.51MJ-P	DCGT070204-MJ-P	G					●			.250	.094	.016	
		32.51MJ-P	11T304-MJ-P	G					●			.375	.156	.016	
		32.52MJ-P	11T308-MJ-P	G					●			.375	.156	.031	

Special breakers for difficult-to-cut materials

Type	Geometry	Order Number	(ISO) Number	Class	Coating				Carbide			Dimensions (inch)		
					US905	VP05RT	VP10RT	VP15TF	RT9005	RT9010	TF15	HT110	D1	S1
MJ-P (Finish - Medium Cutting / G Class)		TCGT21.51MJ-P	TCGT110204-MJ-P	G					●			.250	.094	.016
		32.51MJ-P	16T304-MJ-P	G					●			.375	.156	.016
		32.52MJ-P	16T308-MJ-P	G					●			.375	.156	.031
		WCGT21.51MJ-P	WCGT040204-MJ-P	G					●			.250	.094	.016
		32.51MJ-P	06T304-MJ-P	G					●			.375	.156	.016
		32.52MJ-P	06T308-MJ-P	G					●			.375	.156	.031
MS (Medium Cutting / M Class)		CNMG431MS	CNMG120404-MS	M	●	●	●	□	●	★	★	.500	.188	.016
		432MS	120408-MS	M	●	●	●	□	●	★	★	.500	.188	.031
		433MS	120412-MS	M	★	●	●	□	★	★		.500	.188	.047
		DNMG431MS	DNMG150404-MS	M	●	●	●	□	●	★		.500	.188	.016
		432MS	150408-MS	M	●	●	●	□	●	★		.500	.188	.031
		433MS	150412-MS	M	★	★	★	□	★	★		.500	.188	.047
		SNMG431MS	SNMG150404-MS	M					●			.500	.188	.016
		432MS	150408-MS	M	★	★	★	□	●	□	□	.500	.188	.031
		433MS	150412-MS	M	★	★	★	□	★	□		.500	.188	.047
		TNMG331MS	TNMG160404-MS	M	●	●	★	□	★	□		.375	.188	.016
		332MS	160408-MS	M	●	●	★	□	●	□	★	.375	.188	.031
		432MS	220408-MS	M	●	●	□	□	●	□		.500	.188	.031
		VNMG331MS	VNMG160404-MS	M	●	●		□	●			.375	.188	.016
		332MS	160408-MS	M	★	●		□	●			.375	.188	.031
		WNMG431MS	WNMG080404-MS	M	●	●	●		●		□	.500	.188	.016
		432MS	080408-MS	M	●	●	●		□	●	□	.500	.188	.031

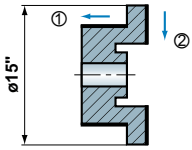

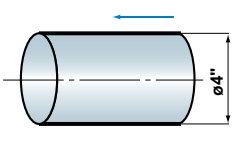




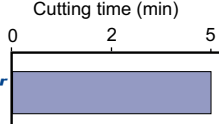
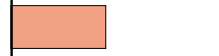
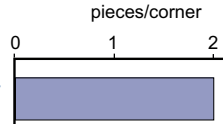

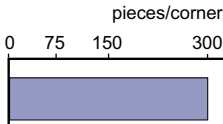

● : Inventory maintained. ★ : Inventory maintained in Japan.

□ : Non stock, produced to order only.

Type	Geometry	Order Number	(ISO) Number	Class	Coating			Carbide			Dimensions (inch)				
					US905	VP05RT	VP10RT	VP15TF	RT9005	RT9010	TF15	HTT10	D1	S1	Re
GJ (Semi-heavy Cutting / M Class)		CNMG432GJ	CNMG120408-GJ	M			●	●		●	★		.500	.188	.031
		433GJ	120412-GJ	M			●	●		●	★		.500	.188	.047
		434GJ	120416-GJ	M			★	★		★	★		.500	.188	.063
		543GJ	160612-GJ	M			●			●			.625	.250	.047
		643GJ	190612-GJ	M			●			●			.750	.250	.047
		644GJ	190616-GJ	M			●			●			.750	.250	.063
		DNMG432GJ	DNMG150408-GJ	M			●	●		●	★		.500	.188	.031
		433GJ	150412-GJ	M			●	●		●	★		.500	.188	.047
		434GJ	150416-GJ	M			★	★		★	★		.500	.188	.063
		WNMG432GJ	WNMG080408-GJ	M			●			●			.500	.188	.031
		433GJ	080412-GJ	M			●			●			.500	.188	.047
		434GJ	080416-GJ	M			●			●			.500	.188	.063
		543GJ	100612-GJ	M			●			●			.625	.250	.047
	RCMX-Standard (Medium Cutting / M Class)		RCMM1003	RCMX1003M0	M	★	★	★					.394	.125	—
1204			1204M0	M	★	★	★					.472	.188	—	
1606			1606M0	M	★	★	★					.630	.250	—	

Special breakers for difficult-to-cut materials

Application Examples

Insert (Grade)	CNGG432MJ(VP15TF)	CNMG432MJ(US905)	DCGT32.52MJ-P(RT9005)
Work Material	Ring (Inconel 718) 	Inconel 718 	Titanium alloy 
Cutting Conditions	Cutting Speed (SFM)	①160(Continuous) ②100(Interrupted)	295
	Feed (IPR)	.004	.010
	Depth of Cut (inch)	.012	.012
	Coolant	Wet	WSO
Result	<p>pieces/corner</p> <p>Class G MJbreaker (VP15TF)</p>  <p>Competitor's K20 carbide</p>  <p>MJ breaker did not suffer from fracture. Stable machining was possible with the MJ breaker.</p>	<p>M Class MJbreaker (US905)</p> <p>Cutting length :39.4 inch</p>  <p>Competitor's S01 coating (G Class)</p> <p>Cutting length :26.8inch</p> 	<p>Cutting time (min)</p> <p>M Class MJ-Pbreaker (RT9005)</p>  <p>Competitor's K10 carbide (G Class)</p>  <p>MJ-P breaker displayed double the tool life.</p>
	Result	<p>pieces/corner</p> <p>GJbreaker (VP10RT)</p>  <p>Competitor's coated carbide</p>  <p>GJ breaker achieved four times longer tool life. GJ breaker also exhibited excellent chip disposal properties.</p>	<p>pieces/corner</p> <p>M Class MJbreaker (VP05RT)</p>  <p>Competitor's K10 carbide (G Class)</p>  <p>MJ breaker achieved four times longer tool life.</p>

For Your Safety

- Don't handle inserts and chips without gloves. ● Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ● Please use safety covers and wear safety glasses. ● When using compounded cutting oils, please take fire precautions. ● When attaching inserts or spare parts, please use only the correct wrench or driver.

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(Tools specifications subject to change without notice.)