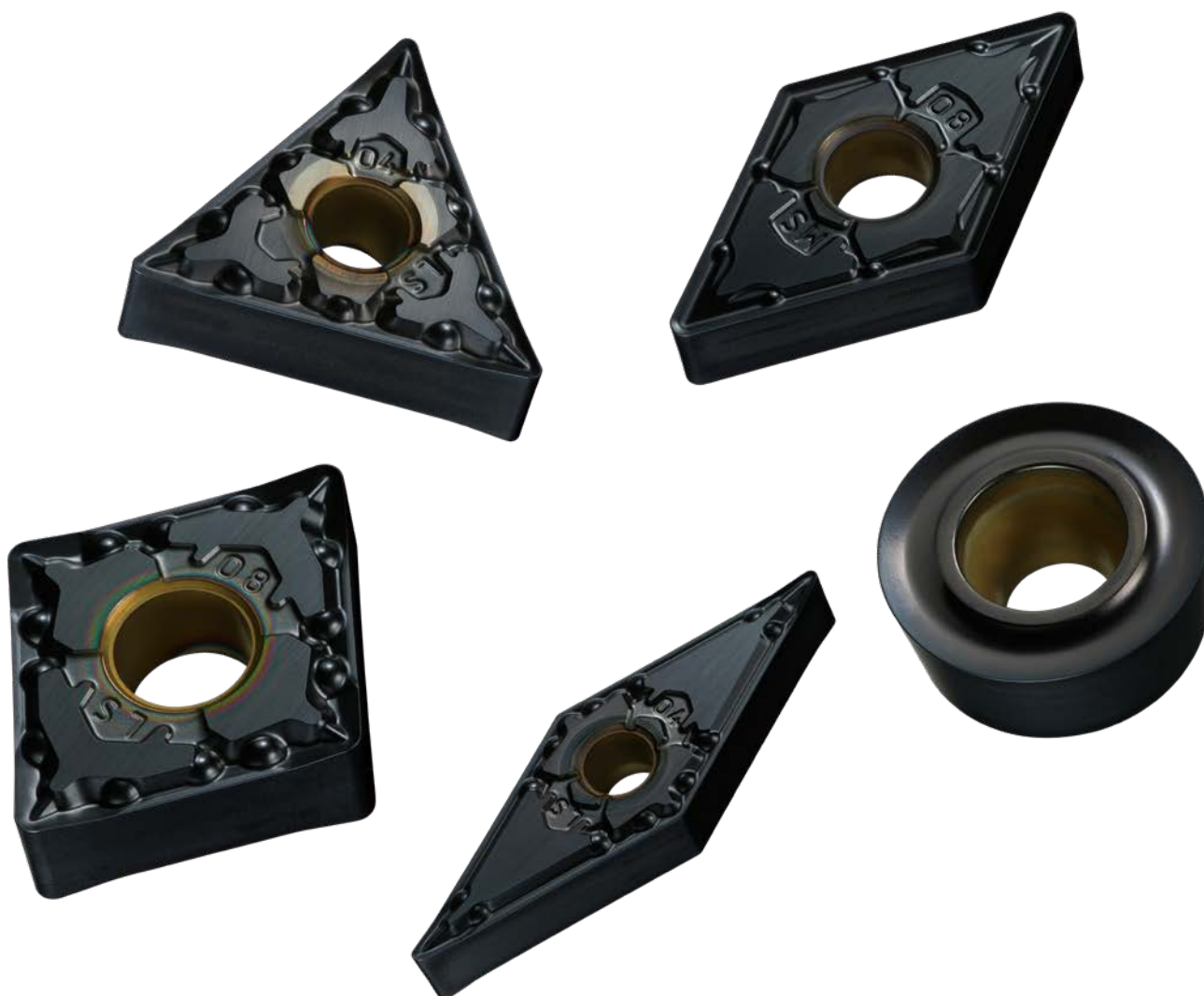


MV9005

CVD-COATED GRADES EXCEED ALL CURRENT
STANDARDS WHEN MACHINING HEAT RESISTANT
SUPER ALLOYS

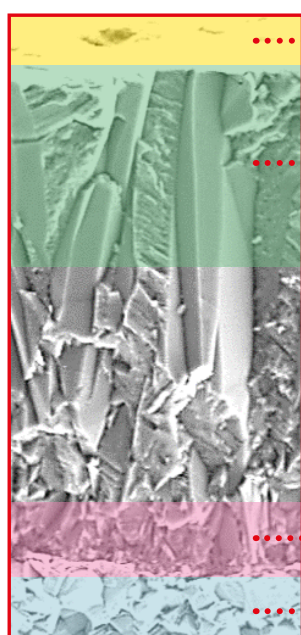


MV9005

CVD-COATED GRADES EXCEED ALL CURRENT STANDARDS WHEN MACHINING HEAT RESISTANT SUPER ALLOYS

ADVANCED WEAR RESISTANCE

By adopting a newly developed Al-Rich coating technology, an (Al,Ti)N coating with a high Al content ratio for extreme hardness means that oxidation resistance is greatly improved, resulting in excellent wear resistance.



EXCELLENT WELDING RESISTANCE

Smooth surface

OUTSTANDING WEAR RESISTANCE

Newly developed Al-Rich coating

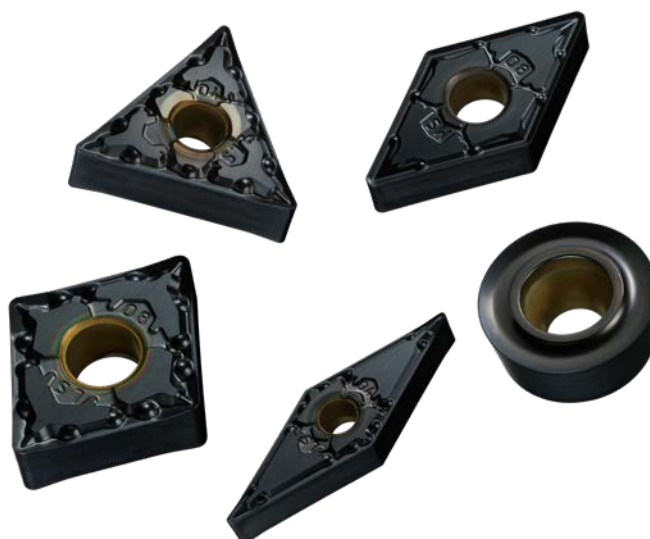
EXCELLENT CHIPPING RESISTANCE FOR STABLE MACHINING

Newly developed bonding layer

EXCELLENT RESISTANCE TO PLASTIC DEFORMATION

Extremely hard dedicated cemented carbide substrate

Graphical representation



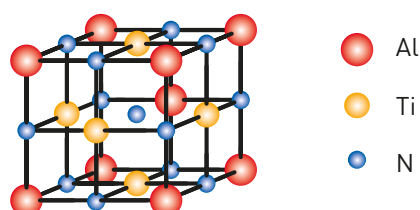
MV9005

CVD-COATED GRADES EXCEED ALL CURRENT STANDARDS WHEN MACHINING HEAT RESISTANT SUPER ALLOYS

COMPLETE COATING TECHNOLOGY THAT TOPPLES CURRENT TOOL LIFE STANDARDS

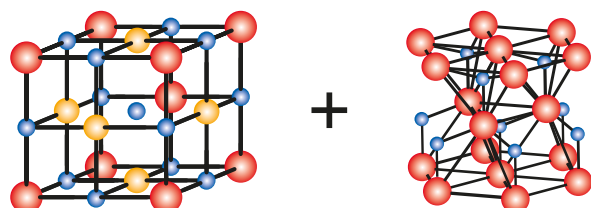
Due to the newly developed Al-Rich coating.

Aluminium titanium nitride [Al,Ti]N is a compound of aluminium and titanium that is widely used as a coating for cutting tools due to its extremely hard and heat-resistant properties.



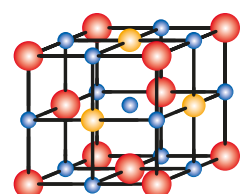
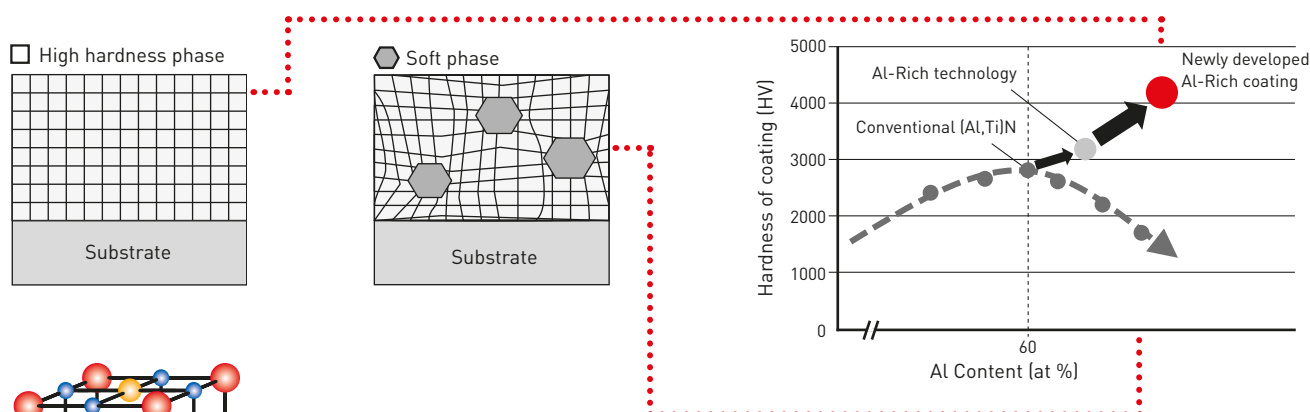
The combination of atoms with different sizes creates an exceptionally hard crystal structure.

The hardness of [Al,Ti]N increases as the Al content ratio increases, but with conventional technology, when the Al content ratio exceeds 60 %, the crystal structure changes and the hardness of [Al,Ti]N decreases.



When the Al ratio is over 60 %, a softer crystal phase is formed.

Using a new coating process based on Mitsubishi Materials' own original technology, a way in which an Al-Rich coating does not change its crystal structure even when the Al content is increased was developed. This also achieves a higher Al content and a higher hardness of [Al,Ti]N.

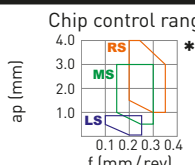
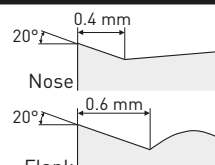
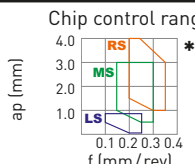
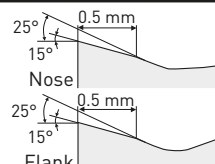
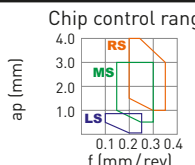
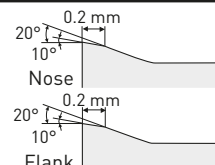
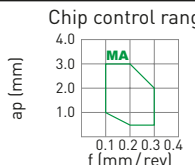
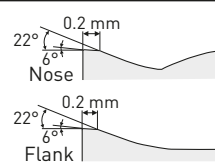


Crystal image of MV9005

MV9005

CHIPBREAKER SYSTEM

NEGATIVE INSERTS

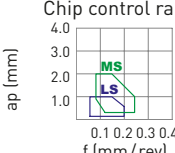
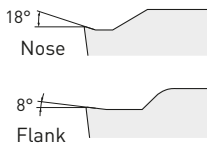
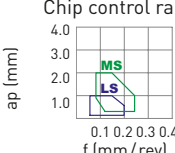
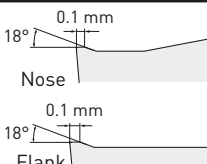
Tolerance		Features	Cross section geometry		
M	LIGHT CUTTING				
		Enhanced chip disposal for depths of cut smaller than the corner R.			
	LS				
	MEDIUM CUTTING				
		The large 2-step rake angle generates chips smoothly and without tangling during low feed cutting.			
	MS				
	ROUGH CUTTING				
		During low speed cutting the positive land controls chip welding and abrasion at the depth of cut line.			
	RS				
	MULTI-ASSIST CHIPBREAKER				
		Suitable for a medium cutting range.			
	MA				

* The chipbreaker control range was tested for optimum chip evacuation when cutting Inconel®718 with a CNMG120408 insert.

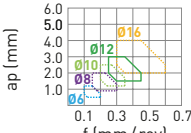
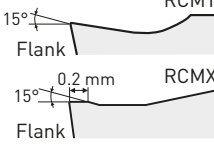
MV9005

CHIPBREAKER SYSTEM

POSITIVE INSERTS

Tolerance		Features	Cross section geometry	
M	LIGHT CUTTING			
		Prevents insert welding and reduces the cloudiness of the finished surface.	 Chip control range ap (mm) f (mm/rev)	 18° Nose 8° Flank
M	MEDIUM CUTTING			
		Reduces cutting resistance, chatter, vibration and chip clogging.	 Chip control range ap (mm) f (mm/rev)	 0.1 mm 18° Nose 0.1 mm 18° Flank

POSITIVE INSERTS

Tolerance		Features	Cross section geometry
M	MEDIUM CUTTING		
	Balance of strength and sharpness due to a combination of a flat land and rake angle.	Chip Control Range  ap (mm) f (mm/rev)	 15° Flank RCMT 0.2 mm RCMX 15° Flank

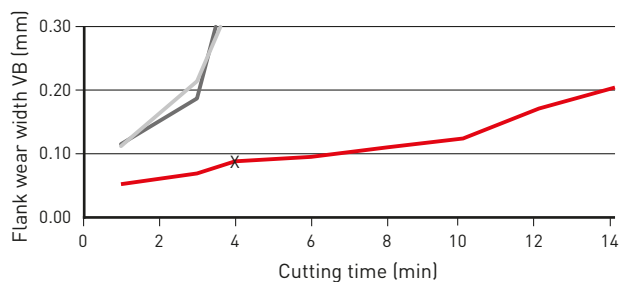
MV9005

CUTTING PERFORMANCE

COMPARISON OF WEAR RESISTANCE WHEN MACHINING INCONEL®718

Exhibits excellent wear resistance and extended tool life.

Material	Inconel®718
Insert	CNMG120412-00
Vc (m/min)	100
f (mm/rev)	0.3
ap (mm)	0.75
Cutting mode	Wet cutting



TAKEN AFTER MACHINING 4 MINUTES



MV9005
MS Breaker

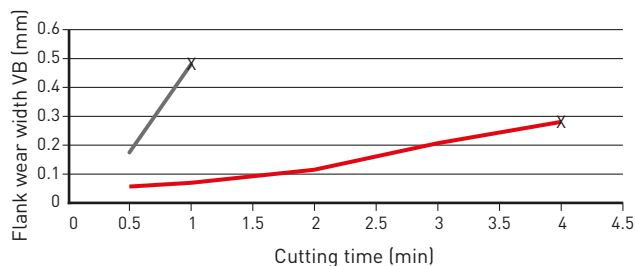


Conventional A

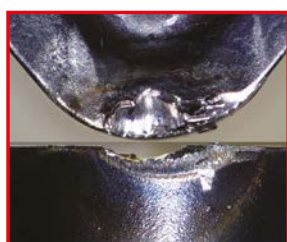
COMPARISON OF WEAR RESISTANCE WHEN MACHINING INCONEL®718

Demonstrates excellent wear resistance even during high-speed cutting of heat resistant alloys, thus improving machining efficiency.

Material	Inconel®718
Insert	CNMG120412-00
Vc (m/min)	150
f (mm/rev)	0.3
ap (mm)	0.75
Cutting mode	Wet cutting



4 MIN. MACHINING



MV9005
MS Breaker

1 MIN. MACHINING



Conventional A

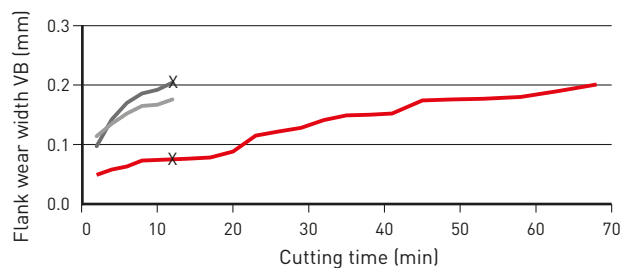
MV9005

CUTTING PERFORMANCE

COMPARISON OF WEAR RESISTANCE WHEN MACHINING RENE 41

Exhibits excellent wear resistance even when machining heat resistant alloy components that are used in high temperature environments of 800 °C or higher.

Material	Rene 41 (Ni based heat resistant alloys)
Insert	CNMG120412- 
Vc (m/min)	30
f (mm/rev)	0.1
ap (mm)	0.5
Cutting mode	Wet cutting

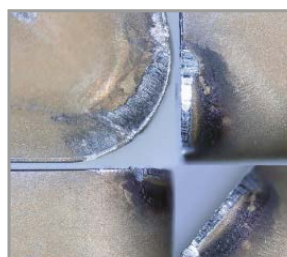


TAKEN AFTER 12 MINUTES MACHINING



MV9005

MS Breaker

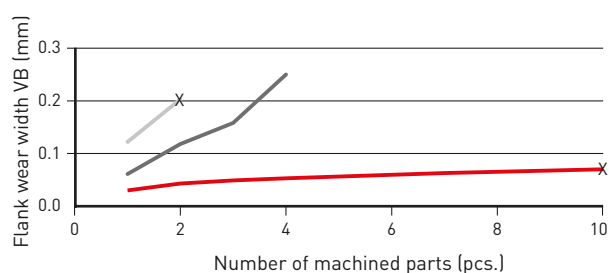


Conventional A

COMPARISON WHEN MACHINING A NICKEL-BASED SUPER ALLOY CONTAINING COBALT

Exhibits excellent wear resistance across a wide range of nickel-based heat resistant alloys.

Material	Nickel-base super alloy containing cobalt
Insert	CNMG120412- 
Vc (m/min)	40
f (mm/rev)	0.15
ap (mm)	1.5
Cutting mode	Wet cutting



10 PARTS



MV9005

MS Breaker

1 PART



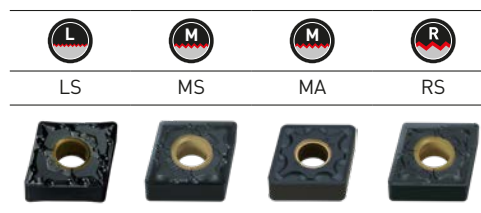
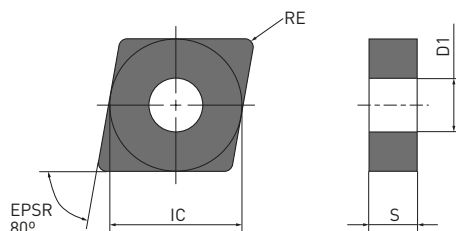
Conventional B

CNMG

NEGATIVE INSERTS (WITH HOLE)

M Class

CNMG



Order number	  	MV9005	IC	S	RE	D1
CNMG120402-LS	L	●	12.7	4.76	0.2	5.16
CNMG120404-LS	L	●	12.7	4.76	0.4	5.16
CNMG120408-LS	L	●	12.7	4.76	0.8	5.16
CNMG120404-MS	M	●	12.7	4.76	0.4	5.16
CNMG120408-MS	M	●	12.7	4.76	0.8	5.16
CNMG120412-MS	M	●	12.7	4.76	1.2	5.16
CNMG120408-MA	M	●	12.7	4.76	0.8	5.16
CNMG120412-MA	M	●	12.7	4.76	1.2	5.16
CNMG120416-MA	M	●	12.7	4.76	1.6	5.16
CNMG120408-RS	R	●	12.7	4.76	0.8	5.16
CNMG120412-RS	R	●	12.7	4.76	1.2	5.16
CNMG120416-RS	R	●	12.7	4.76	1.6	5.16
CNMG190616-RS	R	●	19.05	6.35	1.6	7.93

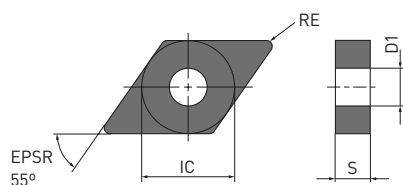
1/1

DNMG

NEGATIVE INSERTS (WITH HOLE)

M Class

DNMG



Order number	  	MV9005	IC	S	RE	D1
DNMG150402-LS	L	●	12.7	4.76	0.2	5.16
DNMG150404-LS	L	●	12.7	4.76	0.4	5.16
DNMG150408-LS	L	●	12.7	4.76	0.8	5.16
NEW DNMG150604-LS	L	●	12.7	6.35	0.4	5.16
NEW DNMG150608-LS	L	●	12.7	6.35	0.8	5.16
NEW DNMG150612-LS	L	●	12.7	6.35	1.2	5.16
DNMG150404-MS	M	●	12.7	4.76	0.4	5.16
DNMG150408-MS	M	●	12.7	4.76	0.8	5.16
DNMG150412-MS	M	●	12.7	4.76	1.2	5.16
NEW DNMG150604-MS	M	●	12.7	6.35	0.4	5.16
NEW DNMG150608-MS	M	●	12.7	6.35	0.8	5.16
NEW DNMG150612-MS	M	●	12.7	6.35	1.2	5.16
DNMG150404-MA	M	●	12.7	4.76	0.4	5.16
DNMG150408-MA	M	●	12.7	4.76	0.8	5.16
DNMG150412-MA	M	●	12.7	4.76	1.2	5.16
NEW DNMG150604-MA	M	●	12.7	6.35	0.4	5.16
NEW DNMG150608-MA	M	●	12.7	6.35	0.8	5.16
NEW DNMG150612-MA	M	●	12.7	6.35	1.2	5.16

1/1

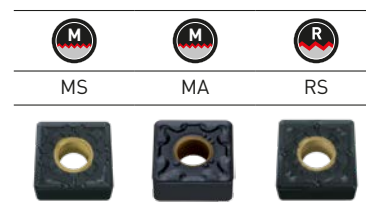
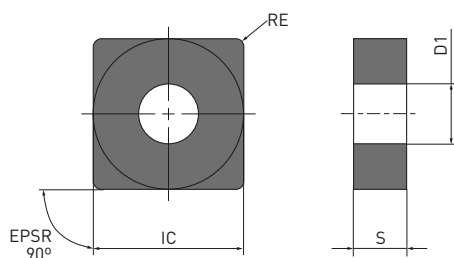


SNMG

NEGATIVE INSERTS (WITH HOLE)

M Class

SNMG



Order number	  	MV9005	IC	S	RE	D1
SNMG120404-MS	M	●	12.7	4.76	0.4	5.16
SNMG120408-MS	M	●	12.7	4.76	0.8	5.16
SNMG120412-MS	M	●	12.7	4.76	1.2	5.16
SNMG120404-MA	M	●	12.7	4.76	0.4	5.16
SNMG120408-MA	M	●	12.7	4.76	0.8	5.16
SNMG120412-MA	M	●	12.7	4.76	1.2	5.16
SNMG120408-RS	R	●	12.7	4.76	0.8	5.16
SNMG120412-RS	R	●	12.7	4.76	1.2	5.16
SNMG120416-RS	R	●	12.7	4.76	1.6	5.16

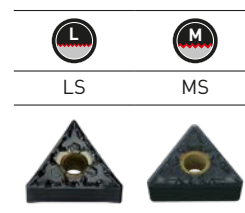
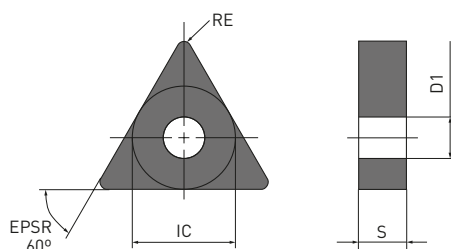
1/1

TNMG

NEGATIVE INSERTS (WITH HOLE)

M Class

TNMG



Order number	  	MV9005	IC	S	RE	D1
TNMG160402-LS	L	●	9.525	4.76	0.2	3.81
TNMG160404-LS	L	●	9.525	4.76	0.4	3.81
TNMG160408-LS	L	●	9.525	4.76	0.8	3.81
TNMG160404-MS	M	●	9.525	4.76	0.4	3.81
TNMG160408-MS	M	●	9.525	4.76	0.8	3.81
TNMG160412-MS	M	●	9.525	4.76	1.2	3.81

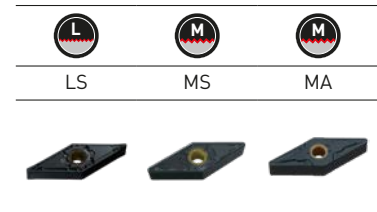
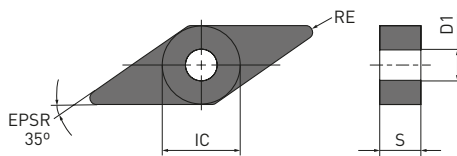
1/1

VNMG

NEGATIVE INSERTS (WITH HOLE)

M Class

VNMG



Order number	  	MV9005	IC	S	RE	D1
VNMG160402-LS	L	●	9.525	4.76	0.2	3.81
VNMG160404-LS	L	●	9.525	4.76	0.4	3.81
VNMG160408-LS	L	●	9.525	4.76	0.8	3.81
VNMG160404-MS	M	●	9.525	4.76	0.4	3.81
VNMG160408-MS	M	●	9.525	4.76	0.8	3.81
VNMG160404-MA	M	●	9.525	4.76	0.4	3.81
VNMG160408-MA	M	●	9.525	4.76	0.8	3.81

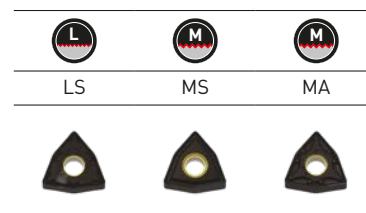
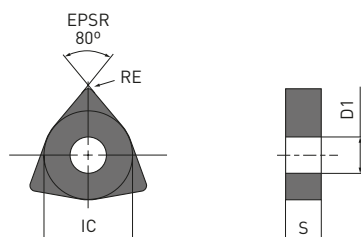
1/1

WNMG

NEGATIVE INSERTS (WITH HOLE)

M Class

WNMG



Order number	  	MV9005	IC	S	RE	D1
WNMG080404-LS	L	●	12.7	4.76	0.4	5.16
WNMG080408-LS	L	●	12.7	4.76	0.8	5.16
WNMG080404-MS	M	●	12.7	4.76	0.4	5.16
WNMG080408-MS	M	●	12.7	4.76	0.8	5.16
WNMG080404-MA	M	●	12.7	4.76	0.4	5.16
WNMG080408-MA	M	●	12.7	4.76	0.8	5.16

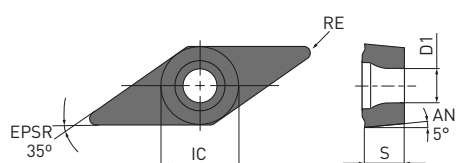
1/1

VBMT

5° POSITIVE INSERTS (WITH HOLE)

M Class

VBMT



LS



MS



Order number	 	MV9005	IC	S	RE	D1
VBMT110304-LS	L	●	6.35	3.18	0.4	2.9
VBMT160404-LS	L	●	9.525	4.76	0.4	4.4
VBMT160408-LS	L	●	9.525	4.76	0.8	4.4
VBMT160412-LS	L	●	9.525	4.76	1.2	4.4
VBMT110304-MS	M	●	6.35	3.18	0.4	2.9
VBMT160404-MS	M	●	9.525	4.76	0.4	4.4
VBMT160408-MS	M	●	9.525	4.76	0.8	4.4
VBMT160412-MS	M	●	9.525	4.76	1.2	4.4

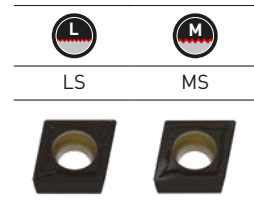
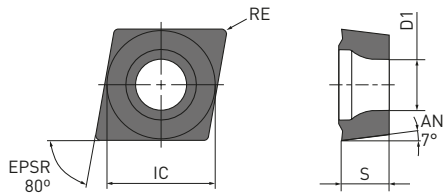
1/1

CCMT

7° POSITIVE INSERTS (WITH HOLE)

M Class

CCMT



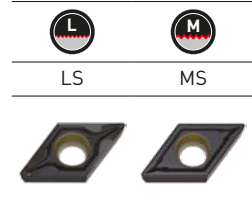
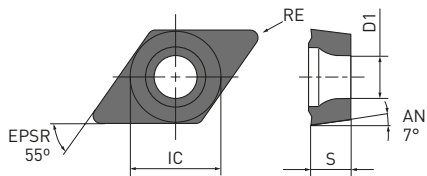
Order number	 	MV9005	IC	S	RE	D1
CCMT09T308-LS	L	●	9.525	3.97	0.8	4.4
CCMT09T304-MS	M	●	9.525	3.97	0.4	4.4
CCMT09T308-MS	M	●	9.525	3.97	0.8	4.4
						1/1

DCMT

7° POSITIVE INSERTS (WITH HOLE)

M Class

DCMT



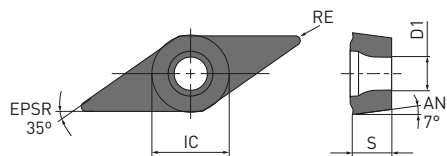
Order number	 	MV9005	IC	S	RE	D1
DCMT11T308-LS	L	●	9.525	3.97	0.8	4.4
DCMT11T304-MS	M	●	9.525	3.97	0.4	4.4
DCMT11T308-MS	M	●	9.525	3.97	0.8	4.4
						1/1

VCMT

7° POSITIVE INSERTS (WITH HOLE)

M Class

VCMT



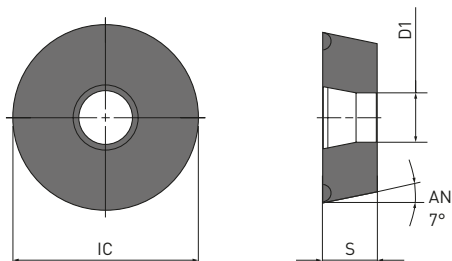
Order number	 	MV9005	IC	S	RE	D1
VCMT110304-LS	L	●	6.35	3.18	0.4	2.8
VCMT160404-LS	L	●	9.525	4.76	0.4	4.4
VCMT160408-LS	L	●	9.525	4.76	0.8	4.4
VCMT110304-MS	M	●	6.35	3.18	0.4	2.8
VCMT160404-MS	M	●	9.525	4.76	0.4	4.4
VCMT160408-MS	M	●	9.525	4.76	0.8	4.4
VCMT160412-MS	M	●	9.525	4.76	1.2	4.4
						1/1

RCMT / RCMX

7° POSITIVE INSERTS (WITH HOLE)

M Class

RCMT / RCMX



Standard



Standard



Order number		MV9005	IC	S	RE	D1
RCMT0602M0	M	●	6.0	2.38	—	2.8
RCMT0803M0	M	●	8.0	3.18	—	3.4
RCMT10T3M0	M	●	10.0	3.97	—	4.4
RCMT1204M0	M	●	12.0	4.76	—	4.4
RCMT1606M0	M	●	16.0	6.35	—	5.5
RCMX1003M0	M	●	10.0	3.18	—	3.6
RCMX1204M0	M	●	12.0	4.76	—	4.2
RCMX1606M0	M	●	16.0	6.35	—	5.2

1/1

MV9005

RECOMMENDED CUTTING CONDITIONS

NEGATIVE INSERTS

CNMG/DNMG/SNMG/TNMG/VNMG/WNMG

Material	Conditions			Grade		Vc	f	ap
S Ni based heat resistant alloys (Inconel®718, Hastelloy®, Waspaloy®)		L		MV9005	LS	75 – 140	0.10 – 0.25	0.2 – 0.8
		M		MV9005	MS	70 – 130	0.15 – 0.30	0.5 – 3.0

1/1

1. Verify the recommended conditions for each boring bar as cutting conditions for internal machining can differ.

POSITIVE INSERTS

CCMT/DCMT/VBMT/VCMT

Material	Conditions			Grade		Vc	f	ap
S Ni based heat resistant alloys (Inconel®718, Hastelloy®, Waspaloy®)		L		MV9005	LS	65 – 120	0.10 – 0.25	0.2 – 0.8
		M		MV9005	MS	55 – 100	0.15 – 0.30	0.5 – 3.0

1/1

1. Verify the recommended conditions for each boring bar as cutting conditions for internal machining can differ.

POSITIVE INSERTS

RCMT/RCMX

Material	Conditions		Grade	Vc	f	ap
S Ni based heat resistant alloys (Inconel®718, Hastelloy®, Waspaloy®)		M	MV9005	55 – 100	0.25 – 0.45	1.5 – 3.0

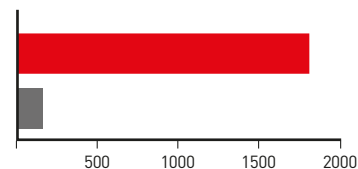
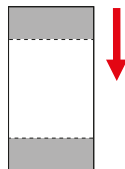
1/1

1. Verify the recommended conditions for each boring bar as cutting conditions for internal machining can differ.

MV9005

EXAMPLE OF USAGE

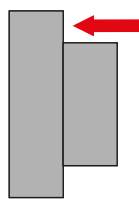
Insert	CNMG120412-MS
Material	Nickel-base super alloy containing cobalt
Component	Aerospace component
Application	Face
Vc (m/min)	40
f (mm/rev)	0.15
ap (mm)	1.5
Cutting mode	Wet cutting



Results

Notch wear is suppressed, and it is possible to significantly extend the tool life.

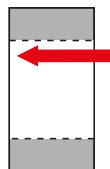
Insert	CNMG120412-MS
Material	Inconel®718
Component	Aerospace component
Application	Turning
Vc (m/min)	MV9005 = 100 Conventional = 80
f (mm/rev)	MV9005 = 0.30 Conventional = 0.25
ap (mm)	0.15 – 0.35
Cutting mode	Wet cutting



Results

Cutting conditions improve machining efficiency by 50 % compared to conventional products. Premature wear is also suppressed and stable machining is achieved.

Insert	CNMG120412-MS
Material	Inconel®718
Component	Aerospace component
Application	Internal
Vc (m/min)	MV9005 = 100 Conventional = 80
f (mm/rev)	MV9005 = 0.18 Conventional = 0.15
ap (mm)	0.15 – 0.35
Cutting mode	Wet cutting



Results

Machining efficiency is 50 % higher than conventional products. Premature wear is suppressed even under increased cutting conditions, enabling stable machining.

The examples shown are customer's applications, therefore can differ from the recommended conditions.

SYMBOLS

 Recommended cutting conditions	MACHINING TYPE
NEW Completely new products or expansions released in the current Spring or Autumn product launch and are not included in the latest version of the General Catalogue.	 Roughing
NEW Products or expansions that have already been introduced in one of the previous Spring or Autumn product launches but are not included in the latest General Catalogue.	 Medium cutting
APPLICATION	 Light cutting
 Face milling	 Pre-finishing
 Chamfer milling	 Finishing
 Shoulder milling with R	 Fine-finishing
 Face milling close to a wall	TOOL MATERIAL
 Shoulder milling	 Ultra micro grain carbide Ultra micro grain carbide substrate material.
 Side milling	 Cubic boron nitride Mitsubishi Materials' original CBN material.
 Slot milling	 Ceramic For high speed efficient machining of super alloys due to the excellent high temperature strength property.
 Ramping	 High hardness powder metallurgy HSS High hardness powder metallurgy HSS substrate material.
 Pocket milling	 High grade high alloy HSS High grade high alloy HSS substrate material.
 Slot milling with R	 Cobalt high speed steel Cobalt high speed steel substrate material.
 Copy milling	 High speed steel High speed steel substrate material.
 T-Slot milling	

SYMBOLS

COATING



SMART MIRACLE coating

New smooth and dense coating technology for high efficiency milling of difficult to cut materials.



CRN coating

Newly developed CrN coating for Copper Electrodes machining.



Violet coating

Increased tool life of 2-3 times more than TiN coated products.



DP coating

New generation coating suitable for a wide range of materials.



MIRACLE coating

The original Miracle (Al,Ti)N coating. Also suitable for dry cutting.



[Al, Ti]N coating

[Al,Ti]N highly versatile application range.



[Al,Ti,Cr]N multi-layer coating

For carbon, alloy and hardened steels.



IMPACT MIRACLE coating

Single phase nano crystal coating technology has higher film hardness and heat resistance.



MIRACLE coating

The original MIRACLE (Al,Ti)N coating. Also suitable for dry cutting.



VFR coating

The [AlCrSi]N/[AlTiSi]N PVD multilayer coating is ideal for machining of extremely hard materials up to 70 HRC.



DLC coating

Hardness similar to CVD diamond coating achieved with high adhesion strength.



Diamond coating

Suitable for CFRP and CFRP-aluminium materials.



Diamond coating

Suitable for graphite machining.



Diamond coating

The original CVD diamond coating.



CVD Diamond coating

Unique multi-layer micro-grain diamond crystal control technology drastically improves wear resistance and smoothness.

CUTTING EDGE PROPERTIES



Sharp corner edge

Indicates the end mill has a sharp corner edge.



Gash land

Indicates the end mill cutting edge has a protective chamfer.



Rake angle



Helix angle

Indicates the helix angle of the end mill.



Point angle

Indicates the drill point angle.



Roughing flute geometry



Variable helix



Rounded gash



Corner angle

WEB THINNING



X type point geometry

X web thinning used at the drill point.



XR type point geometry

XR web thinning used at the drill point.



S type point geometry

Easy cutting geometry.



N type point geometry

Effective when the point web is thick.



Chipbreaker

SYMBOLS

TOLERANCES



Tolerance of taper angle
Indicates the tolerance of the taper angle.



R tolerance
Indicates the radial tolerance of a ball nose end mill.



R tolerance
Indicates the radial tolerance of the corner radius.



R tolerance
Indicates the radial tolerance of a cutter with a corner radius.



Outside diameter tolerance
Indicates the diameter tolerance of the end mill.



Peak tolerance
Indicates the tolerance for the end diameter.



Shank diameter tolerance



Shank diameter tolerance



Drill tolerance / diameter

COOLANT HOLES



External coolant



Internal coolant



Internal coolant



Centered, internal coolant hole



Radial, internal coolant holes



Internal coolant holes



Internal coolant holes

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