

RD16B type

Radius Mill RD16B

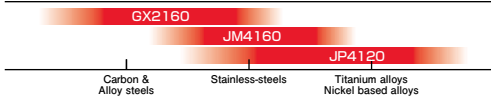


MOLDINO Tool Engineering, Ltd.

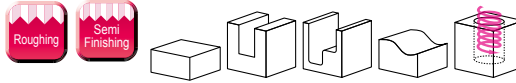
New Product News | No.1704E-7 | 2022-8

Cost-effective machining with low cutting force and multi-functionality is realized for difficult-to-cut material.

Insert has 16 corners which realized by latest manufacturing technology.



Applications



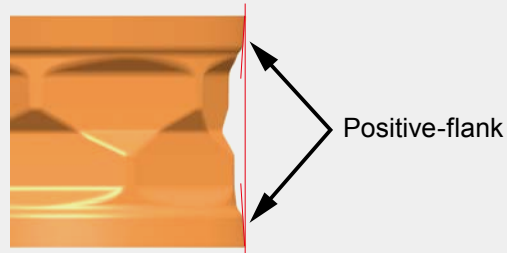
Features **01** Double-sided insert with 16 corners and positive-flank



a_p for using 16 corners (mm)

R6	$a_p \leq 1.5$
R8	$a_p \leq 2$

[Note] For a using 16 corners, there is a limit in axial depth of cut.

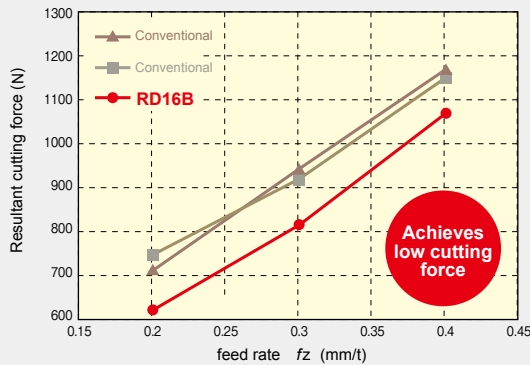


Positive-flank

- Since maximum 16 corners can be used on both sides, it realized **high cost performance**. It is particularly effective **for difficult-to-cut material machining** with short tool life.

Although it is a double-sided specification, the flank is formed into a positive shape by the latest manufacturing technology and it achieves **low cutting force**.

○ Cutting force comparison

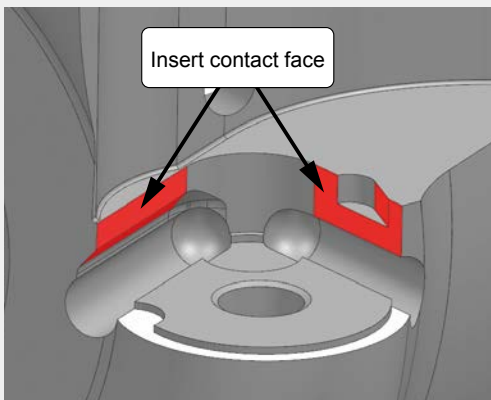


Achieves low cutting force

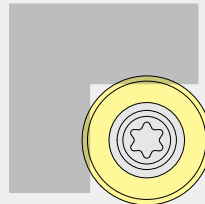
Cutting conditions

Work material : S50C (220HB)
 Tool : RD16B4050RM-5 (Tool dia. D=50mm)
 Insert : RNMG1205MOEN-B16
 Overhang : 60mm
 Cutting speed : $V_c=160\text{m/min}$
 Feed rate : $f_z=0.2, 0.3, 0.4\text{mm/t}$ (*Single-tip cutting)
 Depth of cut : $a_p \times a_e=1 \times 15\text{mm}$
 Machine : BT50 M/C

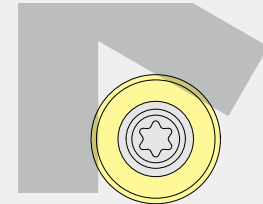
Features **02** Solid insert clamp



Conventional



RD16B



The constraint face of the insert and the holder are flat, and each constraint face supports the insert with an acute angle, so **reliable rotation prevention** and operability to change insert are improved.

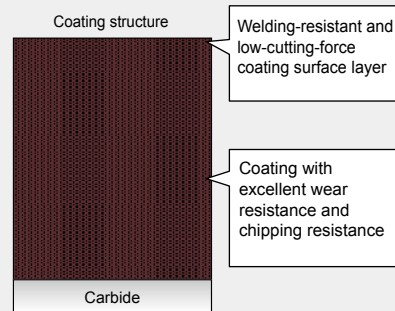
Features of AJ Coating series

- Adopt an AlTiN layer with a new composition created by increasing the Al content of conventional layers.
- Excellent wear resistance, chipping resistance, and heat resistance!

New technology!!

- The new layer with high Al content employs a new composition and optimizes the structure to improve wear resistance and chipping resistance!
- Adopt a low-friction-effect coating with excellent welding resistance as the top-most surface layer. This reduces welding to the work and decreases cutting force!

Layer structure AJ Coating



PVD Technology

Grade for machining pre-hardened or hardened materials JP4120

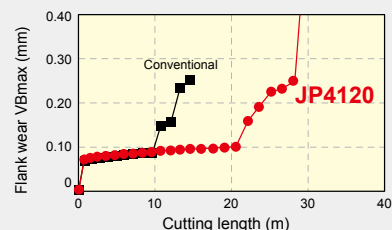
Features

- Adopt a fine carbide substrate with an excellent balance between wear resistance and toughness and the new "AJ Coating" to provide improved wear resistance and chipping resistance.
- Highly versatile with excellent wear resistance and chipping resistance when machining steel materials with hardnesses of 30 to 50 HRC.

Strong fields

- Exhibits excellent cutting performance when machining pre-hardened or hardened steel with hardnesses of 30 to 50 HRC.
- Exhibits excellent wear resistance even on difficult-to-cut diecast tool steel or precipitation-hardened stainless steels, or for finishing.

Cutting performance



Work material : SKD61(40HRC)
 Tool : AHU1532R-3
 Insert : JDMT150508R
 Cutting conditions :
 $v_c=120\text{m/min}$ $f_z=0.15\text{mm/t}$ $a_p \times a_e=3 \times 10\text{mm}$
 Dry ※Single-flute cutting

PVD Technology

Grade for machining stainless-steel materials JM4160

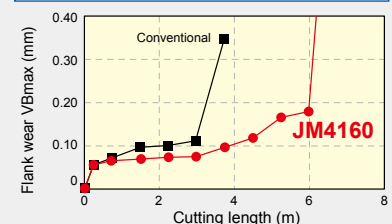
Features

- Adopt a carbide substrate with high toughness and the new "AJ Coating" to improve wear resistance and chipping resistance when machining stainless-steel materials.
- Adopt AJ Coating with excellent welding resistance to reduce the welding to work material that occurs when machining stainless steel materials.

Strong fields

- Provides long tool life for general processing of stainless-steel materials

Cutting performance



Work material : SUS630 (35HRC)
 Tool : AHU1532R-3
 Insert : JDMT150508R
 Cutting conditions :
 $v_c=120\text{m/min}$ $f_z=0.12\text{mm/t}$ $a_p \times a_e=3 \times 5\text{mm}$
 Wet ※Single-flute cutting

CVD Technology

Grade for machining stainless-steel materials GX2160

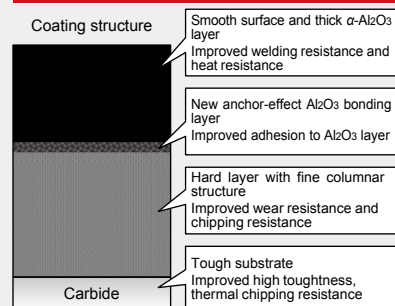
Features

- Increasing the fineness of the layer's columnar structure improves wear resistance.

Strong fields

- Adopt CVD coating with excellent heat resistance improves wear resistance and provides long life when dry-cutting stainless steel materials.

Layer structure GX Coating

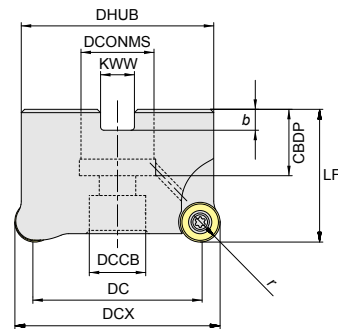


Line Up

Bore type

RD16B $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$ R- $\bigcirc\bigcirc$ /RD16B $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$ RM- $\bigcirc\bigcirc$

Numeric figure comes in a circle \bigcirc .



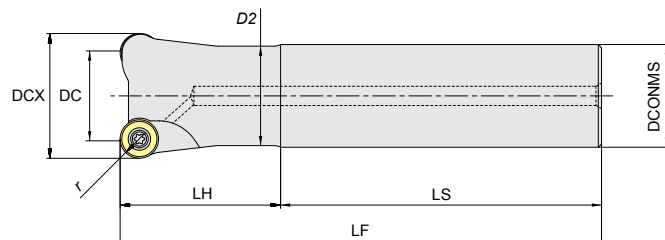
With coolant hole

Item code	Stock	No. of flutes	Size (mm)										Insert		
			r	DCX	DC	DHUB	LF	DCONMS	DCCB	KWW	b	CBDP			
Internal diameter inch size	RD16B4050R-5	●	5	6	50	38	45	40	22.225	17	8.4	5	19	RNMG1205M0EN-B16	
	RD16B4063R-6	●	6		63	51	58	40	22.225	17	8.4	5	19		
	RD16B4080R-7	●	7		80	68	75	63	31.75	26	12.7	8	32		
	Internal diameter mm size	RD16B5063R-4	●	4	8	63	47	58	40	22.225	17	8.4	5	19	RNMG1606M0EN-B16
		RD16B5080R-5	●	5		80	64	75	63	31.75	26	12.7	8	32	
		RD16B5100R-6	●	6		100	84	96	63	31.75	26	12.7	8	32	
Internal diameter mm size	RD16B4040RM-4	●	4	6	40	28	35	40	16	11.2	8.4	5.6	19	RNMG1205M0EN-B16	
	RD16B4050RM-5	●	5		50	38	45	40	22	17	10.4	6.3	20		
	RD16B4063RM-6	●	6		63	51	58	40	22	17	10.4	6.3	20		
	Internal diameter mm size	RD16B4080RM-7	●	7	8	80	68	75	50	27	20	12.4	7	22	RNMG1606M0EN-B16
		RD16B5063RM-4	●	4		63	47	58	40	22	17	10.4	6.3	20	
		RD16B5080RM-5	●	5		80	64	75	50	27	20	12.4	7	22	
		RD16B5100RM-6	●	6		100	84	96	63	32	26	14.4	8	32	

Shank type

RD16B40 $\bigcirc\bigcirc$ S32R- $\bigcirc\bigcirc$

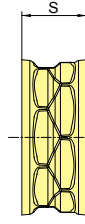
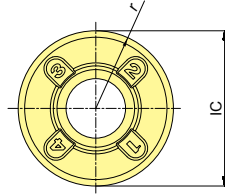
Numeric figure comes in a circle \bigcirc .



With coolant hole

Item code	Stock	No. of flutes	Size (mm)									Insert
			r	DCX	DC	LF	DCONMS	LH	LS	D2		
Shank type	RD16B4032S32R-3	●	3	6	32	20	150	32	70	80	28	RNMG1205M0EN-B16
	RD16B4040S32R-4	●	4	6	40	28	150	32	50	100	31	

Inserts



P	Mild steels (SC · SS)									
K	FC · FCD Cast irons									
M	Stainless steels									
S	Titanium alloys, Nickel based alloys									
										: General cutting, First recommendation : General cutting, Second recommendation
Item code	Tolerance class	AJ Coating			GX Coating	Size (mm)				
		JP4120	JM4160	GX2160	r	IC	S			
RNMG1205M0EN-B16	M	●	●	●	6	12	4.9			
RNMG1606M0EN-B16		●	●	●	8	16	5.9			

[Note] Please note that the GX2160 does not cause a reaction in conductive touch sensors.

Parts

Parts		Clamp screw	Arbor screw							Screw driver / Wrench	Screw anti-seizure agent						
Cutter body	Shape																
	Fastening torque (N · m)		Item code	a	ϕb	c	d	f	Type								
Shank	RD16B4032S32R-3	412-142	2.9	—	—	—	—	—	104-T15	A							
	RD16B4040S32R-4			—	—	—	—	—									
Bore Inch size	RD16B4050R-5	412-142	2.9	100-178	M10×1.5	16	35	25	104-T15	A							
	RD16B4063R-6			100-180 ※ 2	M16×2.0	24	51	35			14						
	RD16B4080R-7																
	RD16B5063R-4	412-144	4.9	100-178	M10×1.5	16	35	25	105-T20	B							
	RD16B5080R-5			100-180 ※ 2	M16×2.0	24	51	35			14						
	RD16B5100R-6																
Bore mm size	RD16B4040RM-4	412-142	2.9	100-184 ※ 1	M8×1.25	11	33	25	104-T15	A							
	RD16B4050RM-5			100-178	M10×1.5	16	35	25			8						
	RD16B4063RM-6																
	RD16B4080RM-7	412-144	4.9	100-179 ※ 2	M12×1.75	18	42	30	105-T20	B							
	RD16B5063RM-4			100-178	M10×1.5	16	35	25			8						
	RD16B5080RM-5											100-179 ※ 2	M12×1.75	18	42	30	10
	RD16B5100RM-6																

[Note]

The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

※ 1.The arbor screw 100-184 is included with the cutter themselves.

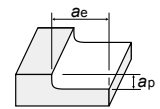
※ 2.Part size for arbor screw for $\phi 80$ is different due to inlay size.

Recommended Cutting Conditions

※ Red indicates primary recommended insert grade.

Work material	Cutting method	Recommended inserts grade	Cutting speed Vc(m/min)	Depth of cut ap(mm)	Feed rate fz(mm/t)	Shank type (r6)				Bore type (r6)															
						φ32-3 flutes		φ40-4 flutes		φ40-4 flutes		φ50-5 flutes		φ63-6 flutes		φ80-7 flutes									
						Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min								
Austenite, ferrite Stainless steels SUS304 SUS316 SUS430 etc	Dry cutting	GX2160	180 ~ 220	2 ~	0.1 ~ 0.2	1,989	1,492	1,592	1,592	1,592	1,592	1,273	1,592	1,011	1,516	796	1,393								
				1 ~ 2	0.2 ~ 0.3													Vc = 200m/min, fz = 0.25mm/t							
				~ 1	0.3 ~ 0.4													Vc = 200m/min, fz = 0.25mm/t							
	Wet cutting	JM4160	90 ~ 110	2 ~	0.1 ~ 0.2	995	746	796	796	796	796	637	796	505	758	398	696								
				1 ~ 2	0.2 ~ 0.3	Vc = 100m/min, fz = 0.25mm/t																			
				~ 1	0.3 ~ 0.4	Vc = 100m/min, fz = 0.25mm/t																			
Martensite Stainless steels SUS410 SUS420J2 etc	Dry cutting	GX2160	200 ~ 240	2 ~	0.1 ~ 0.2	2,188	1,641	1,751	1,751	1,751	1,751	1,401	1,751	1,112	1,667	875	1,532								
				1 ~ 2	0.2 ~ 0.3	Vc = 220m/min, fz = 0.25mm/t																			
				~ 1	0.3 ~ 0.4	Vc = 220m/min, fz = 0.25mm/t																			
	Wet cutting	JM4160	120 ~ 200	2 ~	0.1 ~ 0.2	1,592	1,194	1,273	1,273	1,273	1,273	1,019	1,273	808	1,213	637	1,114								
				1 ~ 2	0.2 ~ 0.3	Vc = 160m/min, fz = 0.25mm/t																			
				~ 1	0.3 ~ 0.4	Vc = 160m/min, fz = 0.25mm/t																			
Precipitation-hardened Stainless steels SUS630 SUS631 etc	Dry cutting	GX2160	160 ~ 200	2 ~	0.1 ~ 0.2	1,790	1,343	1,432	1,432	1,432	1,432	1,146	1,432	909	1,364	716	1,253								
				1 ~ 2	0.2 ~ 0.3	Vc = 180m/min, fz = 0.25mm/t																			
				~ 1	0.3 ~ 0.4	Vc = 180m/min, fz = 0.25mm/t																			
	Wet cutting	JM4160 JP4120	100 ~ 180	2 ~	0.1 ~ 0.2	1,194	895	955	955	955	955	764	955	606	909	477	836								
				1 ~ 2	0.2 ~ 0.3	Vc = 120m/min, fz = 0.25mm/t																			
				~ 1	0.3 ~ 0.4	Vc = 120m/min, fz = 0.25mm/t																			
Titanium alloys Ti-6AL-4V etc	Wet cutting	JP4120	30 ~ 50	~ 2	0.07 ~ 0.13	398	119	318	127	318	127	255	127	202	121	159	111								
						Vc = 40m/min, fz = 0.1mm/t																			
Ni based alloys	Wet cutting	JP4120	30 ~ 40	~ 2	0.06 ~ 0.1	348	84	279	89	279	89	223	89	177	85	139	78								
						Vc = 35m/min, fz = 0.08mm/t																			
Mild steels, Carbon steels SS,S45C etc	Dry cutting	GX2160 JP4120	150 ~ 200	2 ~	0.1 ~ 0.2	1,592	1,194	1,273	1,273	1,273	1,273	1,019	1,273	808	1,213	637	1,114								
				1 ~ 2	0.2 ~ 0.3	Vc = 160m/min, fz = 0.25mm/t																			
				~ 1	0.3 ~ 0.4	Vc = 160m/min, fz = 0.25mm/t																			

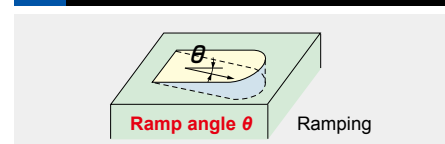
Work material	Cutting method	Recommended inserts grade	Cutting speed Vc(m/min)	Depth of cut ap(mm)	Feed rate fz(mm/t)	Bore type (r8)											
						φ63-4 flutes		φ80-5 flutes		φ100-6 flutes							
						Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min	Revolution min ⁻¹	Feed speed mm/min						
Austenite, ferrite Stainless steels SUS304 SUS316 SUS430 etc	Dry cutting	GX2160	180 ~ 220	2 ~	0.1 ~ 0.2	1,010	1,010	796	995	637	956						
				1 ~ 2	0.2 ~ 0.3							Vc = 200m/min, fz = 0.25mm/t					
				~ 1	0.3 ~ 0.4							Vc = 200m/min, fz = 0.25mm/t					
	Wet cutting	JM4160	90 ~ 110	2 ~	0.1 ~ 0.2	505	505	397	496	318	477						
				1 ~ 2	0.2 ~ 0.3	Vc = 100m/min, fz = 0.25mm/t											
				~ 1	0.3 ~ 0.4	Vc = 100m/min, fz = 0.25mm/t											
Martensite Stainless steels SUS410 SUS420J2 etc	Dry cutting	GX2160	200 ~ 240	2 ~	0.1 ~ 0.2	1,112	1,112	875	1,094	700	1,050						
				1 ~ 2	0.2 ~ 0.3	Vc = 220m/min, fz = 0.25mm/t											
				~ 1	0.3 ~ 0.4	Vc = 220m/min, fz = 0.25mm/t											
	Wet cutting	JM4160	120 ~ 200	2 ~	0.1 ~ 0.2	808	808	637	796	509	764						
				1 ~ 2	0.2 ~ 0.3	Vc = 160m/min, fz = 0.25mm/t											
				~ 1	0.3 ~ 0.4	Vc = 160m/min, fz = 0.25mm/t											
Precipitation-hardened Stainless steels SUS630 SUS631 etc	Dry cutting	GX2160	160 ~ 200	2 ~	0.1 ~ 0.2	909	909	716	895	572	858						
				1 ~ 2	0.2 ~ 0.3	Vc = 180m/min, fz = 0.25mm/t											
				~ 1	0.3 ~ 0.4	Vc = 180m/min, fz = 0.25mm/t											
	Wet cutting	JM4160 JP4120	100 ~ 180	2 ~	0.1 ~ 0.2	606	606	477	596	382	573						
				1 ~ 2	0.2 ~ 0.3	Vc = 120m/min, fz = 0.25mm/t											
				~ 1	0.3 ~ 0.4	Vc = 120m/min, fz = 0.25mm/t											
Titanium alloys Ti-6AL-4V etc	Wet cutting	JP4120	30 ~ 50	~ 2	0.07 ~ 0.13	202	202	159	95	127	76						
						Vc = 40m/min, fz = 0.1mm/t											
Ni based alloys	Wet cutting	JP4120	30 ~ 40	~ 2	0.06 ~ 0.1	177	57	139	56	111	53						
						Vc = 35m/min, fz = 0.08mm/t											
Mild steels, Carbon steels SS,S45C etc	Dry cutting	GX2160 JP4120	150 ~ 200	2 ~	0.1 ~ 0.2	808	808	637	796	509	764						
				1 ~ 2	0.2 ~ 0.3	Vc = 160m/min, fz = 0.25mm/t											
				~ 1	0.3 ~ 0.4	Vc = 160m/min, fz = 0.25mm/t											



[Note]

- ① These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
- ② Please note that the GX2160 does not cause a reaction in conductive touch sensors.
- ③ In order to avoid of insert breakage, please change insert earlier.
- ④ Use the appropriate coolant for the work material and machining shape.

Regarding ramping



Maximum ramp angle θ

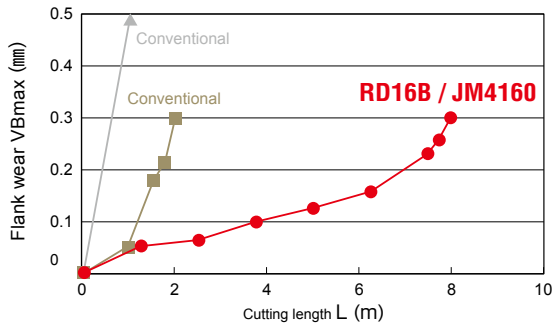
	Tool dia. D (mm)					
	φ32	φ40	φ50	φ63	φ80	φ100
RD16B4000 type	0.6°	1°	1.3°	1°	0.5°	
RD16B5000 type				1°	1°	0.7°

[Note] It is recommended that the tool be used while performing sufficient chip removal and checking that there are no abnormal vibrations.

※ It is recommended that ae be set between 0.3DC and 0.6DC.
 ※ See Page 7 for adjustment of cutting conditions.

Cutting performance

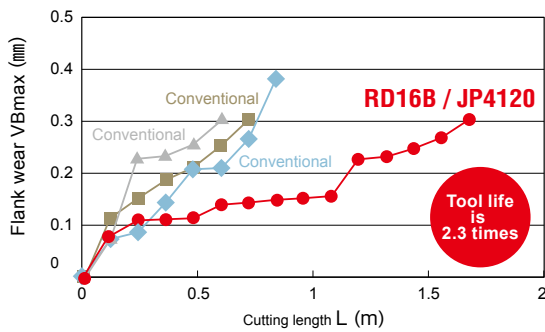
01 Tool life evaluation for SUS630(36.6HRC)



Cutting conditions

Work material : SUS630(36.6HRC)
 Tool : RD16B4050RM-5(Tool dia. D=50mm)
 Insert : RNMG1205M0EN-B16
 Overhang : 60mm
 Cutting speed : $v_c=220\text{m/min}$
 Feed rate : $f_z=0.167\text{mm/t}$ (*Single-flute cutting)
 Depth of cut : $a_p \times a_e=1 \times 25\text{mm}$
 Machine : BT50M/C
 Wet (Water base)

02 Tool life evaluation for ALLOY718 (Ni based alloys) age hardening material

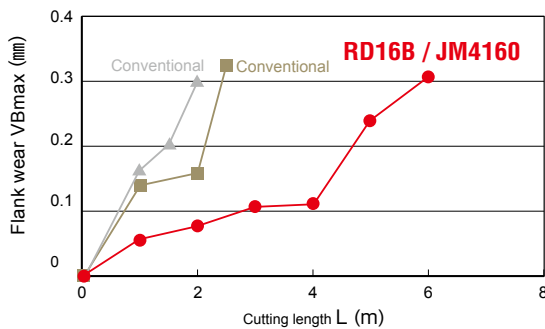


Cutting conditions

Work material : ALLOY718 age hardening material
 Tool : RD16B4050RM-5(Tool dia. D=50mm)
 Insert : RNMG1205M0EN-B16
 Overhang : 60mm
 Cutting speed : $v_c=30\text{m/min}$
 Feed rate : $f_z=0.1\text{mm/t}$ (*Single-flute cutting)
 Depth of cut : $a_p \times a_e=2 \times 15\text{mm}$
 Machine : BT50M/C
 Wet (Water base)

*Ni based alloys is a registered trademark of Special Metals Corporation.

03 Tool life evaluation for SUS304



Cutting conditions

Work material : SUS304
 Tool : RD16B4050RM-5(Tool dia. D=50mm)
 Insert : RNMG1205M0EN-B16
 Overhang : 60mm
 Cutting speed : $v_c=100\text{m/min}$
 Feed rate : $f_z=0.25\text{mm/t}$ (*Single-flute cutting)
 Depth of cut : $a_p \times a_e=2 \times 25\text{mm}$
 Machine : BT50M/C
 Wet (Water base)

Adjustment of cutting conditions

- Feed rate and spindle revolution must be adjusted to correspond to tool overhang and machining conditions.
- Please consider the standard cutting conditions as 100% and adjust the machining conditions by referring to the table right.

		Overhang		
		<3D	3D~5D	5D<
Surfacing	Rotation speed	100%	70%	50%
	Shoulder cutting	Feed rate	100%	70%
Slotting	Rotation speed	100%	70%	50%
	Feed rate	70%	50%	35%
Ramping	Rotation speed	100%	70%	50%
	Feed rate	80%	55%	40%

Field data

Product items	Work materials	Item code	Cutting conditions	Cutting time	Result
Turbine blade	Stainless steels	RD16B/JM4160	$v_c = 200\text{m/min}$ $v_f = 1,000\text{mm/min}$ Wet cutting	70min	2× the tool life of conventional products.



The diagrams and table data are examples of test results, and are not guaranteed values.
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Attentions on Safety

1. Attentions regarding handling

- (1) When removing the tool from the case (package), be careful not to drop it on your foot or drop it onto the tips of your bare fingers.
- (2) When actually setting the inserts, be careful not to touch the cutting flute directly with your bare hands.

2. Attentions regarding mounting

- (1) When preparing for use, be sure that the inserts are firmly mounted in place and that they are firmly mounted on the arbor, etc.
- (2) If abnormal chattering occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Attentions during use

- (1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
- (2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
- (3) The inserts are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be installed and safety equipment such as safety glasses should be worn to create a safe environment for work.
 - Do not use where there is a risk of fire or explosion.
 - Do not use non-water-soluble cutting oils. Such oils may result in fire.
- (4) Do not use the tool for any purpose other than that for which it is intended, and do not modify it.

MOLDINO Tool Engineering, Ltd.

Head Office
 Hulic Ryogoku Bldg. 8F, 4-31-11, Ryogoku, Sumida-ku, Tokyo, Japan 130-0026
 International Sales Dept. : TEL +81-3-6890-5103 FAX +81-3-6890-5128

Official Web Site

<http://www.moldino.com/en/>

Database for selection Cutting Tool Products [TOOL SEARCH]

Europe MOLDINO Tool Engineering Europe GmbH

Itterpark 12, 40724 Hilden, Germany
 Tel +49-(0)2103-24820 Fax +49-(0)2103-248230

China MOLDINO Tool Engineering (Shanghai), Ltd.

Room 2804-2805, Metro Plaza, 555 Loushanguan Road, Changning District, Shanghai, 200051, China
 Tel +86-(0)21-3366-3058 Fax +86-(0)21-3366-3050

America MITSUBISHI MATERIALS U.S.A. CORPORATION

DETROIT OFFICE Customer service
 41700 Gardenbrook Road, Suite 120, Novi, MI 48375-1320 U.S.A.
 Tel +1(248) 308-2620 Fax +1(248) 308-2627

Mexico MMC METAL DE MEXICO, S.A. DE C.V.

Av. La Cañada No.16, Parque Industrial Bernardo Quintana, El Marques, Querétaro, CP 76246, México
 Tel +52-442-1928600

Brazil MMC METAL DO BRASIL LTDA.

Rua Cincinato Braga, 340 13° andar, Bela Vista – CEP 01333-010 São Paulo – SP., Brasil
 Tel +55(11)3506-5600 Fax +55(11)3506-5677

Thailand MMC Hardmetal (Thailand) Co.,Ltd. MOLDINO Division

622 Emporium Tower, Floor 22/1-4, Sukhumvit Road, Klong Tan, Klong Toei,
 Bangkok 10110, Thailand
 Tel +66-(0)2-661-8175 Fax +66-(0)2-661-8176

India MMC Hardmetal India Pvt Ltd.

H.O.: Prasad Enclave, #118/119, 1st Floor, 2nd Stage, 5th main, BBMP Ward #11, (New #38),
 Industrial Suburb, Yeshwanthpura, Bengaluru, 560 022, Karnataka, India.
 Tel +91-80-2204-3600

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