THE NEW VALUE FRONTIER

KYOCERA

Milling MRW

High-Efficiency Radius Cutter with Multiple Edges

MRW

High-Efficiency Radius Cutter with Multiple Edges

- Economical **8-edge insert**
- Low Cutting Force due to our **helical cutting edge design**
- Higher Stability with **flat lock structure**

NEW Applicable to a wide range of applications from steel to difficult-to-cut materials

For difficult-to-cut materials
PR1535 / CA6535

ADVANCING PRODUCTIVITY

- KYOCERA. Contributing To Advancing Productivity -

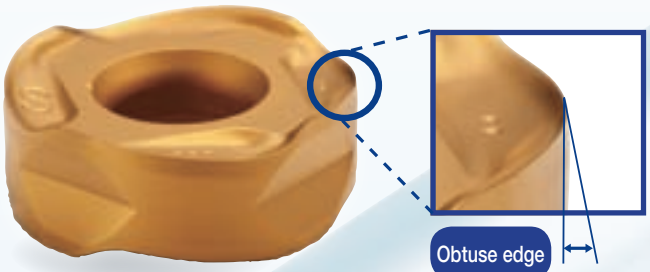
MRW

The MRW Radius Cutter lowers cutting costs and increases efficiency! Double-faced inserts improve the milling of a wide variety of materials

POINT 1 Economical 8-edge insert

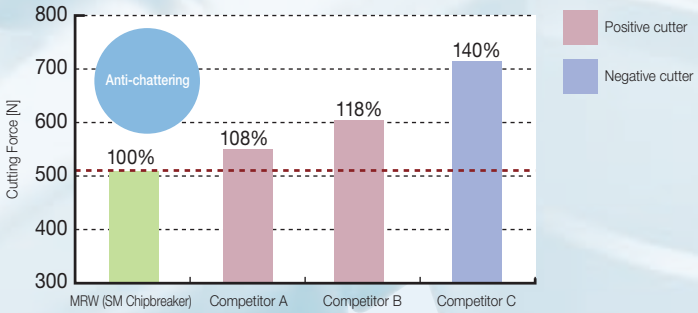
POINT 2 The perfect combination of sharpness & cutting-edge strength

Improved edge strength due to obtuse edge



Low cutting force Chipbreaker

POINT 3 Helical cutting edge design with maximum axial rake angle of 12° reduces cutting force as equivalent as positive inserts



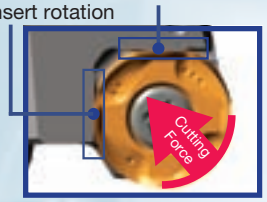
< Cutting Conditions >
Vc=120m/min, ap×ae=1×40mm, fz=0.2mm/t
SUS304, Cutter φ 50

POINT 4 Flat Lock Structure holds insert firmly Prevents insert rotation during machining to provide stable cutting

2 wide flat binding faces

Flat Lock Structure

Wide flat binding face
- Receives even cutting forces
- Prevents insert rotation



The MRW's wide lineup includes 4 grades and 3 Chipbreakers which enables extend tool life of your cutters! Applicable to steel, stainless steel, and heat-resistant alloys machining.

Workpiece		Applicable Insert Grade	Applicable Chipbreaker
P Carbon Steel / Alloy Steel / Die Steel		PR1525	GM/SM/GH Chipbreaker
K Gray Cast Iron / Nodular Cast Iron		PR1510	GH/GM Chipbreaker
S Ni-based Heat-resistant Alloys	M Martensitic Stainless Steel	CA6535	SM/GM Chipbreaker
S Ni-based Heat-resistant Alloys S Titanium Alloys	M Austenitic Stainless Steel M Precipitation-hardened Stainless Steel	PR1535	SM/GM Chipbreaker

For Chipbreaker Selection and Recommended Cutting Conditions ➡ P6

POINT 5 New grade for difficult-to-cut materials

Stable cutting prevents insert fracturing
Good for high-efficiency machining

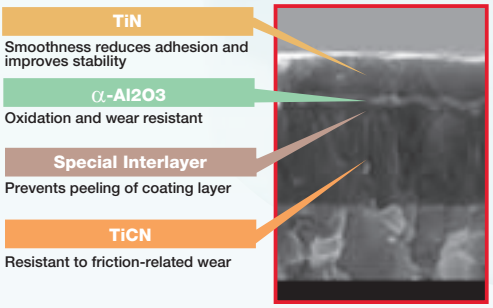
CA6535

For martensitic stainless steel and Ni-based heat-resistant alloys

High heat resistance and wear resistance with CVD coating

Improved stability due to thin-film coating technology

Newly-Developed Tougher Substrate



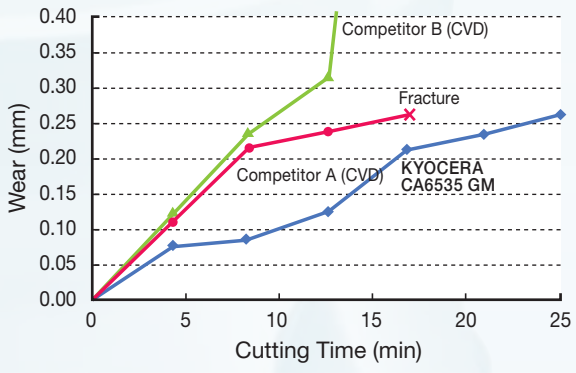
PR1535

For Ni-based heat-resistant alloys, titanium alloys, and precipitation hardened stainless steel

Kyocera's MEGACOAT NANO coating technology provides stabilized milling and long tool life!

Tool Life Comparison

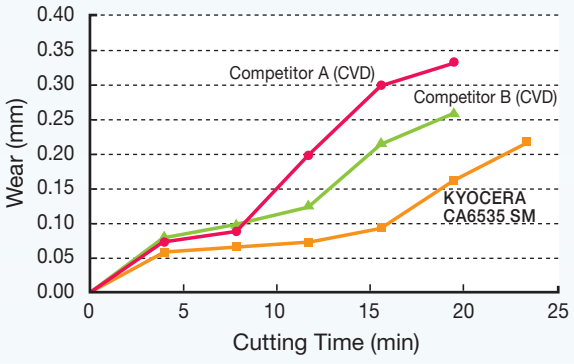
• Ni-based Heat-resistant Alloys



<Cutting Conditions> Vc=50m/min, ap=1.0mm, fz=0.15mm/t, WET

1st recommendation GM Chipbreaker

• Martensitic Stainless Steel



<Cutting Conditions> Vc=300m/min, ap=2.0mm, fz=0.2mm/t, WET

1st recommendation SM Chipbreaker

MRW Face Mill (with coolant hole)

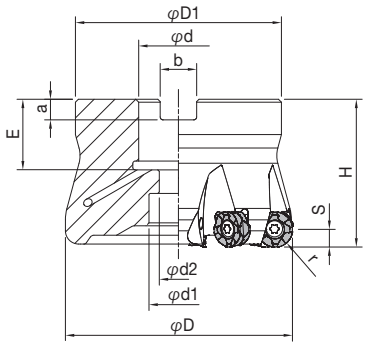


Fig. 1

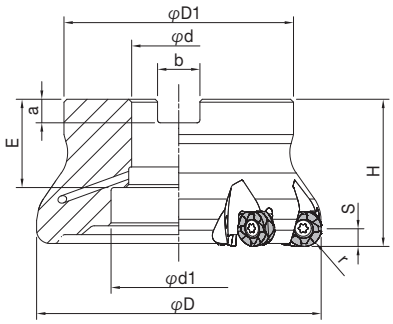


Fig. 2

Toolholder Dimensions

	Description	Stock	No. of inserts	Dimension (mm)											Rake Angle (°)		Coolant Hole	Drawing	Weight (kg)	Max. Revolution (min^{-1})
				r	φD	φD1	φd	φd1	φd2	H	E	a	b	S	A.R.	R.R.				
Bore Dia. Inch Specs	MRW 080R-12-6T	●	6	6	80	70	25.4	20	13	50	27	6	9.5	6.0	+12°	-15.5°	Yes	Fig. 1	1.2	12,000
	080R-12-8T	●	8																1.1	
	100R-12-7T	●	7		100	78	31.75	46	-		34	8	12.7					Fig. 2	1.5	10,600
	100R-12-9T	●	9																1.4	
	MRW 080R-16-6T	●	6	8	80	70	25.4	20	13	50	27	6	9.5	8.0	+11°	-16.5°		Fig. 1	1.1	11,000
	080R-16-7T	●	7																1.1	
	100R-16-6T	●	6		100	78	31.75	46	-		34	8	12.7					Fig. 2	1.4	9,600
	100R-16-8T	●	8																1.4	
	125R-16-8T	●	8		125	89	38.1	55		63	38	10	15.9						2.6	8,560
	125R-16-10T	●	10																2.6	
Metric Specs	MRW 050R-12-5T-M	●	5	6	50	48	22	18	11	40	21	6.3	10.4	6.0	+12°	-15.5°		Fig. 1	0.3	16,000
	050R-12-6T-M	●	6																0.3	
	063R-12-6T-M	●	6		63	60		19											0.6	14,000
	063R-12-7T-M	●	7																0.6	
	080R-12-6T-M	●	6		80	70	27	20	13	50	24	7	12.4						1.1	12,000
	080R-12-8T-M	●	8																1.1	
	100R-12-7T-M	●	7		100	78	32	46	-		30	8	14.4					Fig. 2	1.5	10,600
	100R-12-9T-M	●	9																1.4	
	MRW 063R-16-5T-M	●	5	8	63	60	22	19	11	40	21	6.3	10.4	8.0	+11°	-16.5°		Fig. 1	0.5	12,800
	063R-16-6T-M	●	6																0.5	
	080R-16-6T-M	●	6		80	70	27	20	13	50	24	7	12.4						1.1	11,000
	080R-16-7T-M	●	7																1.0	
	100R-16-6T-M	●	6		100	78	32	46	-		30	8	14.4					Fig. 2	1.4	9,600
	100R-16-8T-M	●	8																1.3	
	125R-16-8T-M	●	8		125	89	40	55		63	33	9	16.4						2.6	8,560
	125R-16-10T-M	●	10																2.5	

●: Std. Item

Spare Parts and Applicable Inserts

Description	Clamp Screw	Wrench		Anti-seize Compound	Mounting Bolt	Applicable Inserts
		DTPM-15	TTP-20			
MRW 050R-12...	SB-4085TRP	DTPM-15		MP-1	HH10x30	ROMU12...
063R-12...		Recommended Torque for Insert Clamp 3.5N·m			HH12x35	
080R-12...					-	
100R-12...						
MRW 063R-16...	SB-50140TRP	TTP-20		MP-1	HH10x30	ROMU16...
080R-16...		Recommended Torque for Insert Clamp 4.5N·m			HH12x35	
100R-16...					-	
125R-16...						

Recommended Cutting Conditions ➡ P6

- **Caution with Max. Revolution**
  When running an endmill or a cutter at the maximum revolution, the insert or cutter may be damaged by centrifugal force.
- Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.
- S is Maximum ap. For more details, see page 6.

MRW End Mill (with coolant hole)

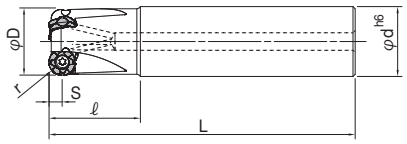


Fig. 1

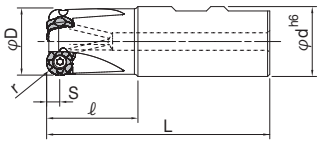


Fig. 3

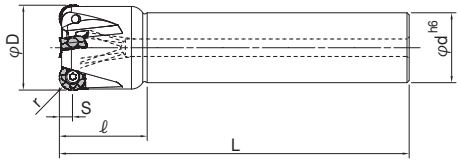


Fig. 2

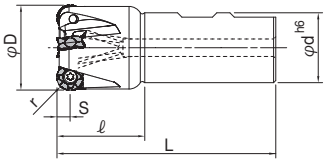


Fig. 4

Toolholder Dimensions

Description		Stock	No. of inserts	Dimension (mm)						Rake Angle (°)		Coolant Hole	Drawing	Max. Revolution (min^{-1})
				r	ϕD	ϕd	L	ℓ	S	A.R. (MAX.)	R.R.			
Standard (Straight)	MRW 32-S32-12-3T	●	3	6	32	32	140	40	6.0	+12°	-20°	Yes	Fig. 1	22,000
	40-S32-12-4T	●	4		40		160				-16.5°		Fig. 2	18,800
	50-S42-12-5T	●	5		50	42	170				-15.5°			16,000
	MRW 40-S32-16-3T	●	3	8	40	32	160	40	8.0	+11°	-18°	Yes	Fig. 2	17,200
	50-S42-16-4T	●	4		50	42	170				-16.5°			14,800
	63-S42-16-5T	●	5		63			50						12,800
Long Shank (Straight)	MRW 32-S32-12-2T-200	●	2	6	32	32	200	40	6.0	+12°	-20°	Yes	Fig. 1	22,000
	40-S32-12-3T-200	●	3		40						-16.5°		Fig. 2	18,800
	50-S42-12-4T-300	●	4		50	42	300				-15.5°			16,000
	MRW 40-S32-16-2T-200	●	2	8	40	32	200	40	8.0	+11°	-18°	Yes	Fig. 2	17,200
	50-S42-16-3T-300	●	3		50	42	300				-16.5°			14,800
	63-S42-16-4T-300	●	4		63			50						12,800
Standard (Weldon)	MRW 32-W32-12-3T	●	3	6	32	32	102	40	6.0	+12°	-20°	Yes	Fig. 3	22,000
	40-W32-12-4T	●	4		40		100				-16.5°		Fig. 4	18,800
	50-W40-12-5T	●	5		50	40	110				-15.5°			16,000
	MRW 40-W32-16-3T	●	3	8	40	32	100	40	8.0	+11°	-18°	Yes	Fig. 4	17,200
	50-W40-16-4T	●	4		50	40	110				-16.5°			14,800
	63-W40-16-5T	●	5		63		120	50						12,800

●: Std. Item

Spare Parts and Applicable Inserts

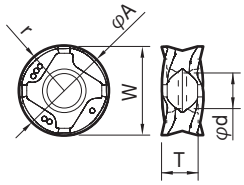
Description	Clamp Screw	Wrench		Anti-seize Compound	Applicable Inserts
		DTPM-15 	TTP-20 		
MRW ...-12...	SB-4085TRP	DTPM-15		MP-1	ROMU12...
	Recommended Torque for Insert Clamp 3.5N·m				
MRW ...-16...	SB-50140TRP	TTP-20		MP-1	ROMU16...
	Recommended Torque for Insert Clamp 4.5N·m				

Recommended Cutting Conditions ➡ P6

- **Caution with Max. Revolution**
  When running an endmill or a cutter at the maximum revolution, the insert or cutter may be damaged by centrifugal force.
- Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.
- S is Maximum ap. For more details, see page 6.

Milling Inserts (with hole)

Classification of Usage										Applicable Holder Reference Page
★: Roughing / 1st Choice ☆: Roughing / 2nd Choice ■: Finishing / 1st Choice □: Finishing / 2nd Choice (In case hardness is under 45 HRC)	P	Carbon Steel / Alloy Steel		★						
		Die Steel		★						
	M	Austenitic Stainless Steel (SUS304)	★	☆						
		Martensitic Stainless Steel (SUS403)	☆			★				
		Precipitation-hardened Stainless Steel	★							
	K	Gray Cast Iron			★					
		Nodular Cast Iron			★					
	S	Heat-resistant Alloys (Ni-based Heat-resistant Alloys)	★			☆				
		Titanium Alloys	★		☆					
	H	Hard Materials		☆						

Insert		Description	Dimension (mm)					MEGACOAT NANO			CVD Coated Carbide			
			ϕA	T	ϕd	W	r	PR1535	PR1525	PR1510	CA6535			
General Purpose		ROMU 1204M0ER-GM	12	4.75	4.6	11.8	6	●	●	●	●			P3 P4
		1605M0ER-GM	16	5.48	6.2	15.8	8	●	●	●	●			
Low Cutting Force		ROMU 1204M0ER-SM	12	4.75	4.6	11.8	6	●	●		●			
		1605M0ER-SM	16	5.48	6.2	15.8	8	●	●		●			
Tough Edge (Heavy Milling)		ROMU 1204M0ER-GH	12	4.75	4.6	11.8	6	●	●	●	●			
		1605M0ER-GH	16	5.48	6.2	15.8	8	●	●	●	●			

●: Std. Item

How to mount an insert

1.Be sure to remove dust and chips from the insert mounting pocket.

2.①Apply anti-seize compound on portion of taper and thread of clamp screw.
②Attach the screw to the front end of the wrench. While lightly pressing the insert against the constraint surfaces, put the screw into the hole of the insert and tighten.
(See Fig. 1)

3.Wrenches and clamp screws are "Torx Plus".
①**Fig. 2** wrench is for MRW-12. (Straight grip)
②**Fig. 3** wrench is for MRW-16. (T-shaped grip)
Use a "Torx Plus" Wrench for tightening the clamp screw.
*If a "Torx" Wrench **(Fig. 4)** is used to tighten, the screw head might become damaged and then the screw cannot be removed.

4.When tightening the screw, make sure that the wrench is parallel to the screw.
For recommended torque, **see page 3 and 4.**

5.After tightening the screw, make sure that there is no clearance between the insert seat surface and the bearing surface of the holder or between the insert side surfaces and the constraint surface of the holder.
If there is any clearance, remove the insert and mount it again according to the above steps.

Fig. 1

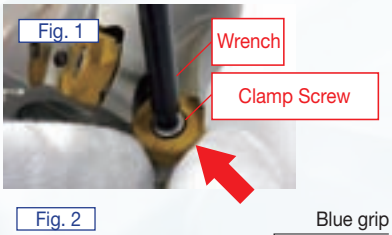
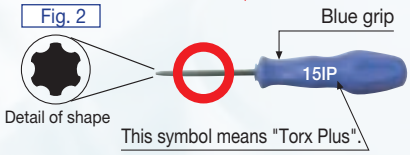
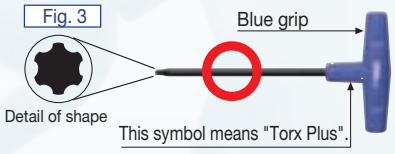


Fig. 2



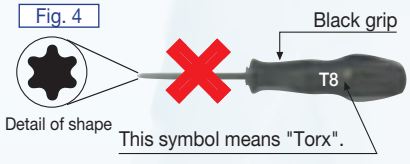
Straight grip wrench for MRW-12

Fig. 3



T-shaped grip wrench for MRW-16

Fig. 4



Torx Wrench (Do NOT use for MRW!)

Recommended Cutting Conditions

Workpiece Material	Recommended Chipbreaker (fz mm/t) *ROMU12···ap=3mm ROMU16···ap=4mm Recommended feed rate (standard value) for ROMU12 type: ap=3mm, ROMU16 type: ap=4mm			Recommended Insert Grade (Vc:m/min)			
				MEGACOAT NANO			CVD Coated Carbide
	GM	SM	GH	PR1535	PR1525	PR1510	CA6535
Carbon Steel (SxxC)	★ 0.1~**0.2**~0.3	☆ 0.06~**0.15**~0.2	☆ 0.15~**0.3**~0.35	-	★ 120~**180**~250	-	-
Alloy Steel (SCM)	★ 0.1~**0.2**~0.3	☆ 0.06~**0.15**~0.2	☆ 0.15~**0.3**~0.35	-	★ 100~**160**~220	-	-
Die Steel (SKD/NAK)	★ 0.1~**0.15**~0.25	☆ 0.06~**0.12**~0.2	☆ 0.15~**0.2**~0.3	-	★ 80~**140**~180	-	-
Austenitic Stainless Steel (SUS304)	☆ 0.1~**0.15**~0.2	★ 0.06~**0.12**~0.2	-	★ 100~**160**~200	★ 100~**160**~200	-	-
Martensitic Stainless Steel (SUS403)	☆ 0.1~**0.15**~0.2	★ 0.06~**0.12**~0.2	-	★ 150~**200**~250	-	-	★ 180~**240**~300
Precipitation-hardened Stainless Steel (SUS630)	★ 0.1~**0.15**~0.2	☆ 0.06~**0.12**~0.2	-	★ 90~**120**~150	-	-	-
Gray Cast Iron (FC)	★ 0.1~**0.2**~0.3	-	☆ 0.15~**0.3**~0.35	-	-	★ 120~**180**~250	-
Nodular Cast Iron (FCD)	★ 0.1~**0.15**~0.25	-	☆ 0.15~**0.2**~0.3	-	-	★ 100~**150**~200	-
Ni-based Heat-resistant Alloys	★ 0.1~**0.12**~0.15	☆ 0.06~**0.1**~0.15	-	★ 20~**30**~50	-	-	☆ 20~**40**~50
Titanium Alloys (Ti-6Al-4V)	☆ 0.1~**0.12**~0.15	★ 0.06~**0.1**~0.15	-	★ 40~**60**~80	-	☆ 30~**50**~70	-

★: 1st recommendation ☆: 2nd recommendation

*Machining with coolant is recommended for Ni-based heat-resistant alloys and titanium alloys.

*The figure in **bold font** is the **median value of the recommended cutting conditions**. Adjust the cutting speed and the feed rate within the above values according to the actual machining conditions.

*Recommended feed rate is the reference value when ap is rε/2 (3mm for ROMU12, 4mm for ROMU16). For lower ap than the above conditions, the conversion factor in the following table is recommended.

Conversion factor for feed per tooth by depth of cut (ap)

Insert	ap (recommended)	ap (max)	Conversion factor for feed per tooth				
			ap=0.5mm	ap=1mm	ap=2mm	ap=3mm	ap=4mm
ROMU12 type	3mm or less	6mm	2.1	1.5	1.1	1.0 (Standard)	—
ROMU16 type	4mm or less	8mm	2.4	1.7	1.3	1.1	1.0 (Standard)

• Example (ROMU12 type, Carbon Steel, GM Chipbreaker, ap=1mm)

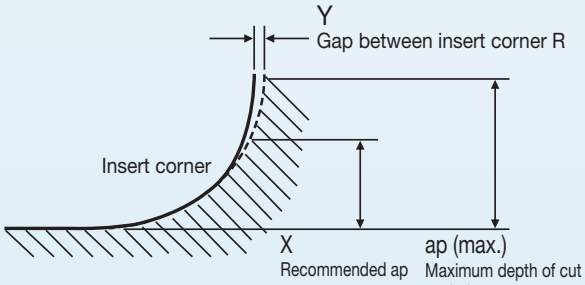
fz=0.2mm/t (Standard value for Carbon Steel / GM Chipbreaker)	×	1.5 (Conversion factor for ROMU12 / ap = 1mm)	=	fz=0.3mm/t (Recommended feed per tooth)

* Recommended ap: 3mm or less for ROMU12, 4mm or less for ROMU16
Except the case that ap temporally surpass the recommended ap, machining under the recommended ap is recommended.

Corner R shape during machining

Corner R shape during machining with MRW (See figure to the right.)

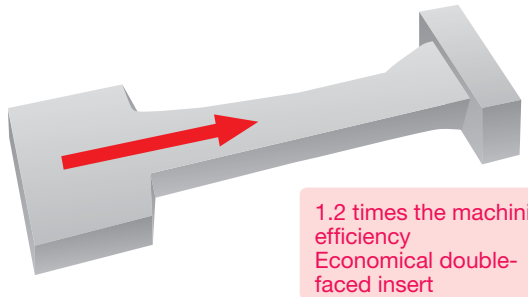
Insert	ap (max.)	X	Y
ROMU12 type	6mm	3mm	0.1mm
ROMU16 type	8mm	4mm	0.1mm



* When machining with larger ap than the recommended ap (X), there is a gap (Y) between the workpiece corner and insert corner R (rε).
* The above figure is estimation. There is a ±0.2mm variation depending on the cutting conditions.

Case Studies

12Cr Steel



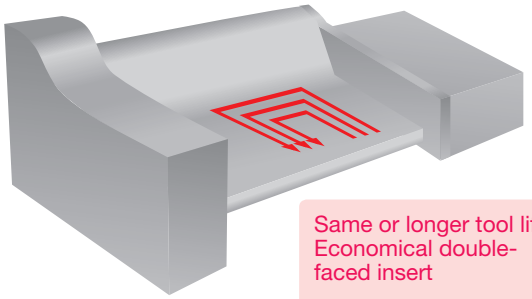
1.2 times the machining efficiency
Economical double-faced insert

•Turbine Blade •Vc=270m/min •fz=0.278mm/t
•ap=0.5~1.0mm ae=max.35mm •Dry
•MRW050R-12-6T-M (6 inserts) •ROMU1204M0ER-SM (CA6535)

CA6535	Stable Machining
Competitor A (Positive cutter)	Unstable machining with loud noise

The MRW improved machining efficiency by 1.2 times with the same tool life compared with Competitor A.
The MRW has a cost advantage due to its double-sided inserts.

12Cr Steel



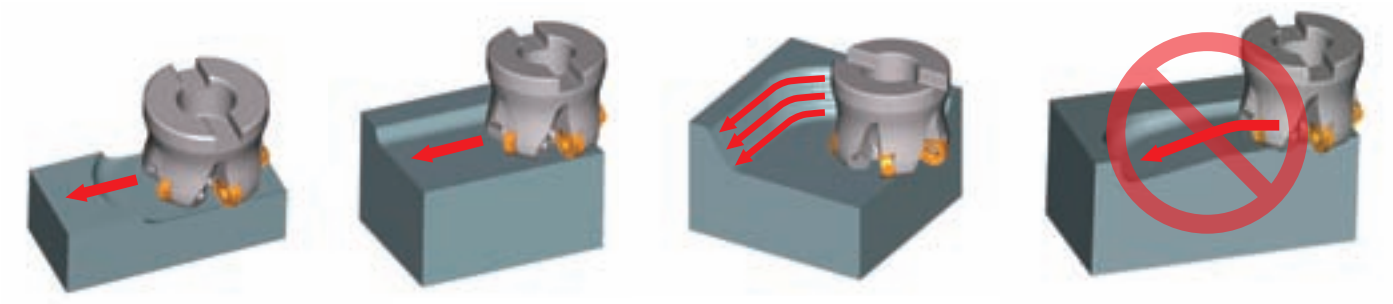
Same or longer tool life
Economical double-faced insert

•Turbine Blade •Vc=250m/min •fz=0.16mm/t
•ap=2.0mm ae=5~30mm •Wet
•MRW050R-12-5T-M (5 inserts) •ROMU1204M0ER-SM (CA6535)

CA6535	Stable, available for further machining
Competitor B (Positive cutter)	Unstable machining with loud noise

The MRW showed less damage on the cutting edge and reduced cutting noise.
The MRW has equal or longer tool life and a cost advantage due to its double-sided inserts.

Applications



Facing | Shouldering | Contouring | Ramping / Profiling

*The MRW is not applicable to 3D machining, such as Ramping and Profiling.

Search "KYOCERA Tools" on App Store & Google play

Available on the App Store

ANDROID APP ON Google play

- Downloadable high resolution cutting tools catalogues
- Product usage videos
- Turning, milling and drilling calculation tools
- KYOCERA instant contact

KYOCERA

ADVANCING PRODUCTIVITY