MITSUBISHI
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TOOLS NEWS

2006.12 Update B049G

High Precision Radius Endmill

MIRACLE ORBIT

Expand

New solution for machining die & mold

(New method to machining die & mold instead of ball nose endmill)

MIRACLE ORBIT can achieve highly precise and highly efficient machining die & mold.

98 SIZE ▶ 158 SIZE

High Precision Radius Endmill

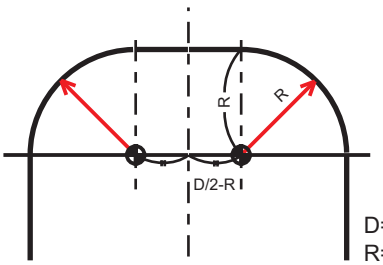
VC-PSRB

MIRACLE ORBIT

Available 158 sizes

Precision of corner radius

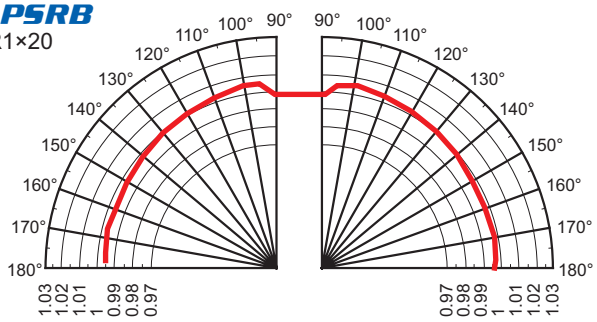
Radius tolerance : R±0.01mm
Diameter tolerance : 0—-0.01mm



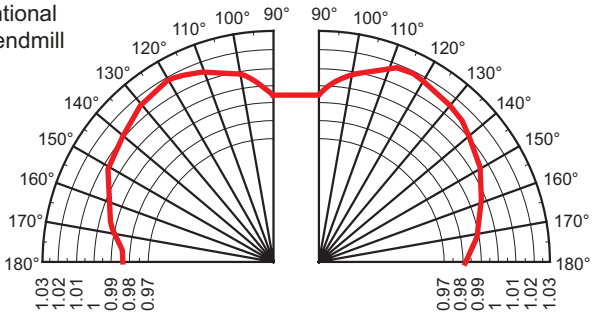
D=Dia.
R=Corner R

There is no standard to measure radius accuracy of conventional radius endmill.
BUT, radius accuracy of MIRACLE ORBIT is measured with fixed center position as shown above figure. Therefore, MIRACLE ORBIT can be used for finishing die & mold with CAD/CAM system.

VC-PSRB
ϕ4×R1×20



Conventional radius endmill
ϕ4×R1



Geometry of corner radius

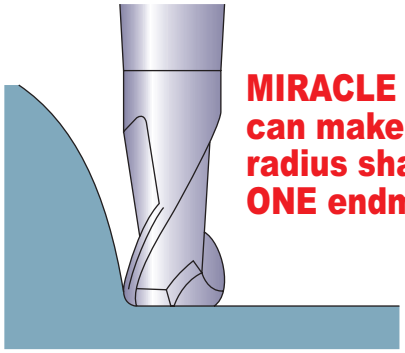
The radius geometry (PAT. P) of MIRACLE ORBIT is simultaneous pursuit of cutting edge strength and low cutting force.
Seamless relief face between corner radius cutting edge and peripheral cutting edge makes good surface finish.
Due to neck relieved, MIRACLE ORBIT can make vertical wall.

High precision in cutting vertical wall

VC-PSRB

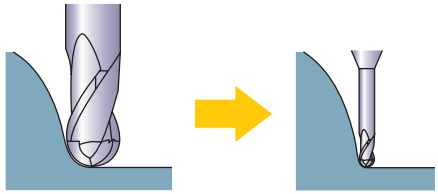
Conventional radius endmill

Suitable for making corner radius shape



MIRACLE ORBIT can make corner radius shape with ONE endmill.

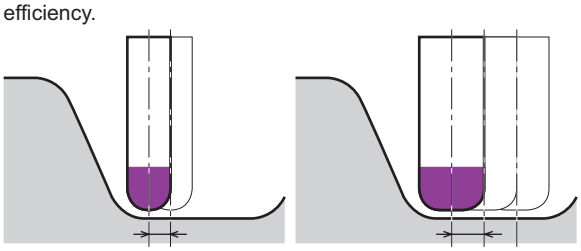
①Reduction of number of endmill
②Erasing step by changing endmill
③Increase of machining accuracy and efficiency due to bigger diameter



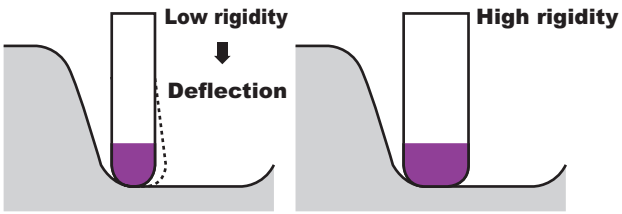
In conventional method by ball nose endmill, small diameter is necessary to make corner radius shape.

High Precision and High Efficiency

Bigger pick feed than ball nose end mill makes high efficiency.



Bigger diameter makes less deflection.



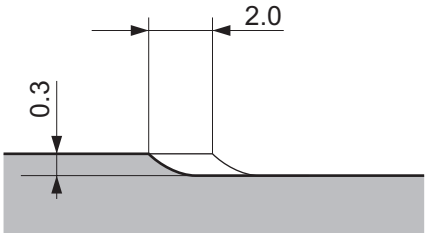
Machining example

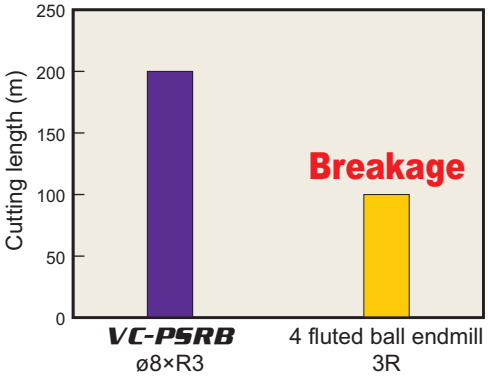
Case 1

In machining flat surface, due to high rigidity compared with ball nose endmill, high feed rate machining is possible.

■Cutting condition

End mill	VC-PSRB ø8×R3
Work material	SKD61 (52HRC)
Revolution	13,000min^{-1} (327m/min)
Feed rate	10,400mm/min (0.2mm/t)
Cutting method	Climb cut, Air blow

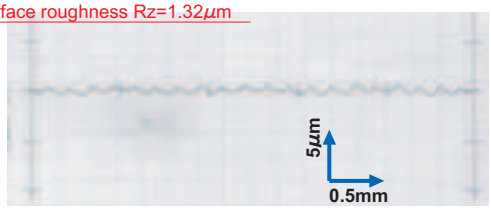
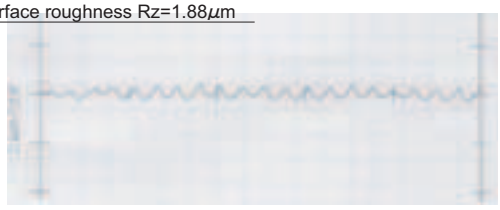
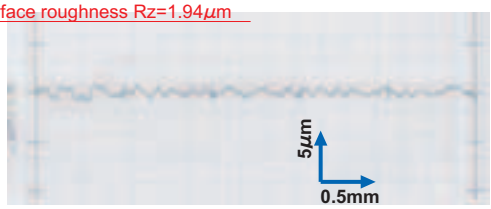
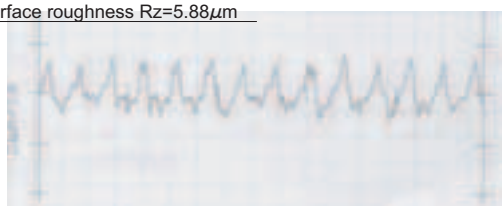




In the machining at high feed rate at 10,000mm/min, breakage happened to ball nose endmill. But MIACLE ORBIT could cat 200m cutting length and flank wear was still small.

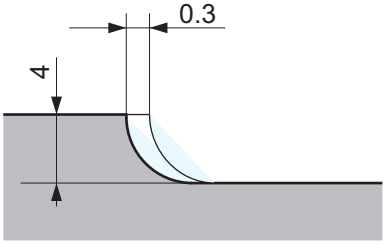
Case 2

The surface roughness by MIRACLE ORBIT is 1/3 compared with ball nose endmill in flat surface.

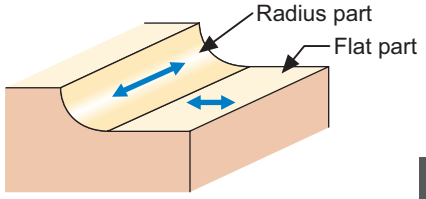
Measuring point	VC-PSRB ø8×R3	4 fluted ball endmill R3
Radius part	Surface roughness Rz=1.32μm 	Surface roughness Rz=1.88μm 
Flat part	Surface roughness Rz=1.94μm 	Surface roughness Rz=5.88μm 

■Cutting condition

End mill	VC-PSRB ø8×R3
Work material	SKD61 (52HRC)
Revolution	13,000min^{-1} (327m/min)
Feed rate	2,600mm/min (0.05mm/t)
Cutting length	20m
Cutting method	Climb cut, Air blow



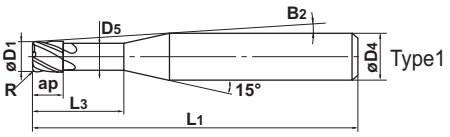
Measuring point and direction of surface roughness

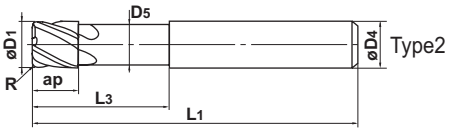


VC-PSRB MIRACLE ORBIT Expand

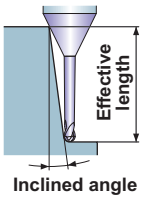
Corner radius end mill, Short cut length, 2–4 flute, High precision

R ±0.01 0 – -0.01





UWC VC 30°



● ±0.01mm corner radius tolerance, 0–-0.01mm outer diameter tolerance. End mill with corner radius for precise and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
* VCPSRBD0060N02R005	0.6	0.05	0.6	2	0.56	12.4°	50	6	2	●	1	2.4	2.4	2.6	2.8
* D0060N02R01	0.6	0.1	0.6	2	0.56	12.4°	50	6	2	●	1	2.3	2.4	2.6	2.8
* D0060N02R02	0.6	0.2	0.6	2	0.56	12.5°	50	6	2	●	1	2.3	2.4	2.6	2.8
* D0060N04R01	0.6	0.1	0.6	4	0.56	10.7°	50	6	2	●	1	4.4	4.6	4.9	5.3
* D0060N04R02	0.6	0.2	0.6	4	0.56	10.8°	50	6	2	●	1	4.4	4.6	4.9	5.3
* D0080N04R005	0.8	0.05	0.8	4	0.76	10.6°	50	6	2	●	1	4.4	4.6	4.9	5.3
* D0080N04R01	0.8	0.1	0.8	4	0.76	10.6°	50	6	2	●	1	4.4	4.6	4.9	5.3
* D0080N04R02	0.8	0.2	0.8	4	0.76	10.7°	50	6	2	●	1	4.4	4.6	4.9	5.3
D0080N04R03	0.8	0.3	0.8	4	0.76	10.7°	50	6	2	●	1	4.4	4.6	4.9	5.3
* D0080N06R01	0.8	0.1	0.8	6	0.76	9.3°	50	6	2	●	1	6.5	6.7	7.2	7.8
* D0080N06R02	0.8	0.2	0.8	6	0.76	9.4°	50	6	2	●	1	6.5	6.7	7.2	7.8
D0080N06R03	0.8	0.3	0.8	6	0.76	9.4°	50	6	2	●	1	6.5	6.7	7.2	7.8
D0080N08R03	0.8	0.3	0.8	8	0.76	8.4°	50	6	2	●	1	8.6	8.8	9.5	10.2
* D0100N04R005	1	0.05	1	4	0.94	10.3°	50	6	2	●	1	4.6	4.8	5.1	5.5
* D0100N04R01	1	0.1	1	4	0.94	10.4°	50	6	2	●	1	4.6	4.8	5.1	5.5
* D0100N04R02	1	0.2	1	4	0.94	10.4°	50	6	2	●	1	4.6	4.8	5.1	5.5
D0100N04R03	1	0.3	1	4	0.94	10.5°	50	6	2	●	1	4.6	4.8	5.1	5.5
D0100N04R04	1	0.4	1	4	0.94	10.6°	50	6	2	●	1	4.6	4.7	5.1	5.5
* D0100N06R01	1	0.1	1	6	0.94	9.1°	50	6	2	●	1	6.7	6.9	7.4	8
* D0100N06R02	1	0.2	1	6	0.94	9.1°	50	6	2	●	1	6.7	6.9	7.4	8
D0100N06R03	1	0.3	1	6	0.94	9.2°	50	6	2	●	1	6.7	6.9	7.4	8
D0100N06R04	1	0.4	1	6	0.94	9.2°	50	6	2	●	1	6.7	6.9	7.4	7.9
D0100N10R03	1	0.3	1	10	0.94	7.3°	50	6	2	●	1	10.8	11.2	12	12.9
D0100N10R04	1	0.4	1	10	0.94	7.4°	50	6	2	●	1	10.8	11.2	12	12.9
D0120N06R05	1.2	0.5	1.2	6	1.14	9.1°	50	6	2	●	1	6.7	6.9	7.4	7.9
D0120N10R05	1.2	0.5	1.2	10	1.14	7.3°	50	6	2	●	1	10.8	11.2	12	12.9
D0120N15R05	1.2	0.5	1.2	15	1.14	5.8°	50	6	2	●	1	16	16.5	17.7	19.1
* D0150N04R01	1.5	0.1	1.5	4	1.44	10°	50	6	2	●	1	4.6	4.8	5.1	5.5
* D0150N04R02	1.5	0.2	1.5	4	1.44	10.1°	50	6	2	●	1	4.6	4.8	5.1	5.5
D0150N04R03	1.5	0.3	1.5	4	1.44	10.2°	50	6	2	●	1	4.6	4.8	5.1	5.5
D0150N04R05	1.5	0.5	1.5	4	1.44	10.3°	50	6	2	●	1	4.6	4.7	5.1	5.4
* D0150N06R01	1.5	0.1	1.5	6	1.44	8.7°	50	6	2	●	1	6.7	6.9	7.4	8
* D0150N06R02	1.5	0.2	1.5	6	1.44	8.7°	50	6	2	●	1	6.7	6.9	7.4	8
D0150N06R03	1.5	0.3	1.5	6	1.44	8.8°	50	6	2	●	1	6.7	6.9	7.4	8
D0150N06R05	1.5	0.5	1.5	6	1.44	8.9°	50	6	2	●	1	6.7	6.9	7.4	7.9
* D0150N10R01	1.5	0.1	1.5	10	1.44	6.9°	50	6	2	●	1	10.8	11.2	12	13
* D0150N10R02	1.5	0.2	1.5	10	1.44	6.9°	50	6	2	●	1	10.8	11.2	12	13
D0150N10R03	1.5	0.3	1.5	10	1.44	6.9°	50	6	2	●	1	10.8	11.2	12	12.9

* Expand

● : Inventory maintained.

Unit : mm

	Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
	VCPSRBD0150N10R05	1.5	0.5	1.5	10	1.44	7°	50	6	2	●	1	10.8	11.2	12	12.9
*	D0150N15R01	1.5	0.1	1.5	15	1.44	5.4°	50	6	2	●	1	16	16.5	17.8	19.2
*	D0150N15R02	1.5	0.2	1.5	15	1.44	5.5°	50	6	2	●	1	16	16.5	17.8	19.2
	D0150N15R03	1.5	0.3	1.5	15	1.44	5.5°	50	6	2	●	1	16	16.5	17.7	19.2
	D0150N15R05	1.5	0.5	1.5	15	1.44	5.5°	50	6	2	●	1	16	16.5	17.7	19.1
	D0150N20R03	1.5	0.3	1.5	20	1.44	4.5°	60	6	2	●	1	21.1	21.9	23.5	25.4
	D0150N20R05	1.5	0.5	1.5	20	1.44	4.6°	60	6	2	●	1	21.1	21.9	23.5	25.3
*	D0200N06R01	2	0.1	2	6	1.9	8.2°	50	6	4	●	1	6.7	7	7.5	8.1
*	D0200N06R02	2	0.2	2	6	1.9	8.3°	50	6	4	●	1	6.7	7	7.5	8.1
	D0200N06R03	2	0.3	2	6	1.9	8.3°	50	6	4	●	1	6.7	7	7.5	8.1
	D0200N06R05	2	0.5	2	6	1.9	8.4°	50	6	4	●	1	6.7	7	7.4	8
*	D0200N10R01	2	0.1	2	10	1.9	6.4°	50	6	4	●	1	10.9	11.3	12.1	13.1
*	D0200N10R02	2	0.2	2	10	1.9	6.4°	50	6	4	●	1	10.9	11.3	12.1	13.1
	D0200N10R03	2	0.3	2	10	1.9	6.5°	50	6	4	●	1	10.9	11.2	12.1	13
	D0200N10R05	2	0.5	2	10	1.9	6.5°	50	6	4	●	1	10.9	11.2	12	13
*	D0200N15R01	2	0.1	2	15	1.9	5°	50	6	4	●	1	16.1	16.6	17.9	19.3
*	D0200N15R02	2	0.2	2	15	1.9	5.1°	50	6	4	●	1	16	16.6	17.8	19.3
	D0200N15R03	2	0.3	2	15	1.9	5.1°	50	6	4	●	1	16	16.6	17.8	19.2
	D0200N15R05	2	0.5	2	15	1.9	5.1°	50	6	4	●	1	16	16.6	17.8	19.2
	D0200N20R03	2	0.3	2	20	1.9	4.2°	60	6	4	●	1	21.2	21.9	23.6	25.5
	D0200N20R05	2	0.5	2	20	1.9	4.2°	60	6	4	●	1	21.2	21.9	23.5	25.4
	D0200N25R03	2	0.3	2	25	1.9	3.5°	60	6	4	●	1	26.4	27.3	29.3	31.7
	D0200N25R05	2	0.5	2	25	1.9	3.6°	60	6	4	●	1	26.4	27.3	29.3	31.6
*	D0250N08R01	2.5	0.1	2.5	8	2.4	6.7°	50	6	4	●	1	8.8	9.1	9.8	10.6
*	D0250N08R02	2.5	0.2	2.5	8	2.4	6.7°	50	6	4	●	1	8.8	9.1	9.8	10.6
	D0250N08R03	2.5	0.3	2.5	8	2.4	6.8°	50	6	4	●	1	8.8	9.1	9.8	10.5
	D0250N08R05	2.5	0.5	2.5	8	2.4	6.9°	50	6	4	●	1	8.8	9.1	9.7	10.5
	D0250N08R10	2.5	1	2.5	8	2.4	7.1°	50	6	4	●	1	8.8	9.1	9.7	10.4
	D0250N15R03	2.5	0.3	2.5	15	2.4	4.6°	50	6	4	●	1	16	16.6	17.8	19.2
	D0250N15R05	2.5	0.5	2.5	15	2.4	4.7°	50	6	4	●	1	16	16.6	17.8	19.2
	D0250N15R10	2.5	1	2.5	15	2.4	4.8°	50	6	4	●	1	16	16.5	17.7	19.1
*	D0300N10R01	3	0.1	3	10	2.9	5.4°	60	6	4	●	1	10.9	11.3	12.1	13.1
*	D0300N10R02	3	0.2	3	10	2.9	5.4°	60	6	4	●	1	10.9	11.3	12.1	13.1
	D0300N10R03	3	0.3	3	10	2.9	5.4°	60	6	4	●	1	10.9	11.2	12.1	13
	D0300N10R05	3	0.5	3	10	2.9	5.5°	60	6	4	●	1	10.9	11.2	12	13
	D0300N10R10	3	1	3	10	2.9	5.7°	60	6	4	●	1	10.9	11.2	12	12.9
*	D0300N15R01	3	0.1	3	15	2.9	4.1°	60	6	4	●	1	16.1	16.6	17.9	19.3
*	D0300N15R02	3	0.2	3	15	2.9	4.1°	60	6	4	●	1	16	16.6	17.8	19.3
	D0300N15R03	3	0.3	3	15	2.9	4.2°	60	6	4	●	1	16	16.6	17.8	19.2
	D0300N15R05	3	0.5	3	15	2.9	4.2°	60	6	4	●	1	16	16.6	17.8	19.2
	D0300N15R10	3	1	3	15	2.9	4.3°	60	6	4	●	1	16	16.5	17.7	19.1
*	D0300N20R01	3	0.1	3	20	2.9	3.3°	60	6	4	●	1	21.2	22	23.6	25.5
*	D0300N20R02	3	0.2	3	20	2.9	3.4°	60	6	4	●	1	21.2	22	23.6	25.5
	D0300N20R03	3	0.3	3	20	2.9	3.4°	60	6	4	●	1	21.2	21.9	23.6	25.5
	D0300N20R05	3	0.5	3	20	2.9	3.4°	60	6	4	●	1	21.2	21.9	23.5	25.4
	D0300N20R10	3	1	3	20	2.9	3.5°	60	6	4	●	1	21.2	21.9	23.5	25.3
*	D0300N30R03	3	0.3	3	30	2.9	2.4°	70	6	4	●	1	31.6	32.6	35.1	No interference
	D0300N30R05	3	0.5	3	30	2.9	2.5°	70	6	4	●	1	31.5	32.6	35	No interference

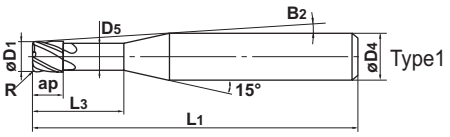
* Expand

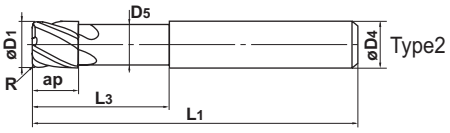
MIRACLE END MILLS

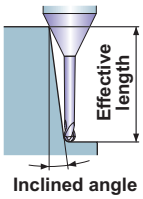
VC-PSRB MIRACLE ORBIT Expand

Corner radius end mill, Short cut length, 2–4 flute, High precision

R ±0.01 0 – -0.01







- ±0.01mm corner radius tolerance, 0–-0.01mm outer diameter tolerance. End mill with corner radius for precise and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
* VCPSRBD0400N12R01	4	0.1	4	12	3.9	3.6°	60	6	4	●	1	13	13.4	14.4	15.6
* D0400N12R02	4	0.2	4	12	3.9	3.6°	60	6	4	●	1	12.9	13.4	14.4	15.5
D0400N12R03	4	0.3	4	12	3.9	3.6°	60	6	4	●	1	12.9	13.4	14.4	15.5
D0400N12R05	4	0.5	4	12	3.9	3.7°	60	6	4	●	1	12.9	13.4	14.3	15.5
D0400N12R10	4	1	4	12	3.9	3.8°	60	6	4	●	1	12.9	13.3	14.3	15.4
* D0400N20R01	4	0.1	4	20	3.9	2.4°	60	6	4	●	1	21.2	22	23.6	No interference
* D0400N20R02	4	0.2	4	20	3.9	2.4°	60	6	4	●	1	21.2	22	23.6	No interference
D0400N20R03	4	0.3	4	20	3.9	2.4°	60	6	4	●	1	21.2	21.9	23.6	No interference
D0400N20R05	4	0.5	4	20	3.9	2.5°	60	6	4	●	1	21.2	21.9	23.5	No interference
D0400N20R10	4	1	4	20	3.9	2.5°	60	6	4	●	1	21.2	21.9	23.5	No interference
D0400N30R03	4	0.3	4	30	3.9	1.7°	70	6	4	●	1	31.6	32.6	No interference	No interference
D0400N30R05	4	0.5	4	30	3.9	1.7°	70	6	4	●	1	31.5	32.6	No interference	No interference
D0400N30R10	4	1	4	30	3.9	1.8°	70	6	4	●	1	31.5	32.6	No interference	No interference
* D0500N15R05	5	0.5	5	15	4.9	1.7°	60	6	4	●	1	16	16.6	No interference	No interference
* D0500N15R10	5	1	5	15	4.9	1.8°	60	6	4	●	1	16	16.5	No interference	No interference
* D0500N30R05	5	0.5	5	30	4.9	0.9°	70	6	4	●	1	31.5	No interference	No interference	No interference
* D0500N30R10	5	1	5	30	4.9	1°	70	6	4	●	1	31.5	No interference	No interference	No interference
* D0600N18R01	6	0.1	6	18	5.85	–	70	6	4	●	2	No interference	No interference	No interference	No interference
* D0600N18R02	6	0.2	6	18	5.85	–	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R03	6	0.3	6	18	5.85	–	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R05	6	0.5	6	18	5.85	–	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R10	6	1	6	18	5.85	–	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R20	6	2	6	18	5.85	–	70	6	4	●	2	No interference	No interference	No interference	No interference
* D0600N41R05	6	0.5	6	41	5.85	–	90	6	4	●	2	No interference	No interference	No interference	No interference
* D0600N50R10	6	1	6	50	5.85	–	90	6	4	●	2	No interference	No interference	No interference	No interference
* D0800N24R01	8	0.1	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
* D0800N24R02	8	0.2	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R03	8	0.3	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R05	8	0.5	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R10	8	1	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R20	8	2	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R30	8	3	8	24	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
* D0800N50R10	8	1	8	50	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
* D0800N50R30	8	3	8	50	7.85	–	90	8	4	●	2	No interference	No interference	No interference	No interference
D1000N30R03	10	0.3	10	30	9.7	–	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R05	10	0.5	10	30	9.7	–	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R10	10	1	10	30	9.7	–	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R20	10	2	10	30	9.7	–	100	10	4	●	2	No interference	No interference	No interference	No interference

* Expand

● : Inventory maintained.

Unit : mm

	Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
	VCPSRBD1000N30R30	10	3	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
	D1000N30R40	10	4	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
*	**D1000N50R10**	10	1	10	50	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
*	**D1000N50R30**	10	3	10	50	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R03	12	0.3	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R05	12	0.5	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R10	12	1	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R20	12	2	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R30	12	3	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R40	12	4	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
	D1200N36R50	12	5	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference

* Expand

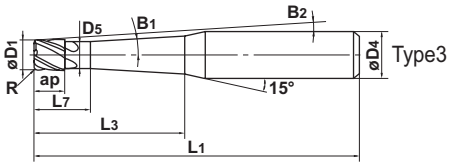
MIRACLE END MILLS

VC-PSRB MIRACLE ORBIT Expand

Corner radius end mill, Short cut length, 2–4 flute, High precision

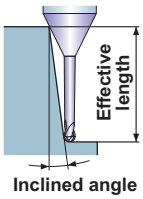
R ±0.01 0 – 0.01

(Taper neck type)



UWC VC 30°

Effective length for inclined angle



- ±0.01mm corner radius tolerance, 0–-0.01mm outer diameter tolerance. End mill with corner radius for precise and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Taper Angle One Side B1	L7	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCPSRBD0150N03L06R05	1.5	0.5	1.5	1° 30'	3	6	1.44	9°	50	6	2	●	3	–	7.1	7.7
D0150N03L10R05	1.5	0.5	1.5	1° 30'	3	10	1.44	7.2°	50	6	2	●	3	–	11.3	12.2
D0200N04L10R05	2	0.5	2	1° 30'	4	10	1.9	6.7°	60	6	4	●	3	–	11.5	12.4
D0200N04L15R05	2	0.5	2	1° 30'	4	15	1.9	5.3°	60	6	4	●	3	–	16.7	18
D0250N05L12R10	2.5	1	2.5	1° 30'	5	12	2.4	5.6°	60	6	4	●	3	–	14.2	15.3
D0250N05L20R10	2.5	1	2.5	1° 30'	5	20	2.4	4°	60	6	4	●	3	–	22.5	24.2
D0300N06L15R05	3	0.5	3	1° 30'	6	15	2.9	4.4°	60	6	4	●	3	–	16.9	18.2
D0300N06L20R05	3	0.5	3	1° 30'	6	20	2.9	3.6°	60	6	4	●	3	–	22.1	23.8
D0300N06L15R10	3	1	3	1° 30'	6	15	2.9	4.4°	60	6	4	●	3	–	17.4	18.7
D0300N06L20R10	3	1	3	1° 30'	6	20	2.9	3.6°	60	6	4	●	3	–	22.6	24.4
D0400N08L20R10	4	1	4	1° 30'	8	20	3.9	2.6°	60	6	4	●	3	–	22.8	No interference
D0400N08L30R10	4	1	4	1° 30'	8	30	3.9	1.9°	70	6	4	●	3	–	No interference	No interference
* D0500N08L40R05	5	0.5	5	1°	8	40	4.9	2°	90	8	4	●	3	41.2	No interference	No interference
* D0500N08L60R05	5	0.5	5	1°	8	60	4.9	1.4°	110	8	4	●	3	61.2	No interference	No interference
* D0500N08L40R10	5	1	5	1°	8	40	4.9	2°	90	8	4	●	3	41.7	No interference	No interference
* D0500N08L60R10	5	1	5	1°	8	60	4.9	1.4°	110	8	4	●	3	61.7	No interference	No interference
D0600N08L40R20	6	2	6	1°	8	40	5.85	1.4°	70	8	4	●	3	42.8	No interference	No interference
D0600N08L60R20	6	2	6	1°	8	60	5.85	1°	100	8	4	●	3	No interference	No interference	No interference
D0800N10L53R20	8	2	8	1°	10	53	7.85	1.1°	90	10	4	●	3	55.9	No interference	No interference
D0800N10L70R20	8	2	8	1°	10	70	7.85	1.6°	130	12	4	●	3	72.9	No interference	No interference
D1000N12L55R30	10	3	10	1°	12	55	9.7	1.1°	100	12	4	●	3	59.4	No interference	No interference
D1000N12L70R30	10	3	10	1°	12	70	9.7	0.9°	130	12	4	●	3	No interference	No interference	No interference
D1200N24L70R30	12	3	12	1°	24	70	11.7	1.6°	130	16	4	●	3	75.2	No interference	No interference

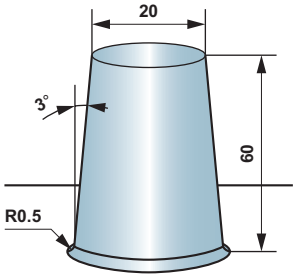
* Expand

● : Inventory maintained.

Performance report 1

Customer recognition

Compared with conventional cutting method by ball nose endmill
1. Higher efficiency (Doubled feed rate)
2. Seamless surface between taper face and radius face.
3. Higher accuracy



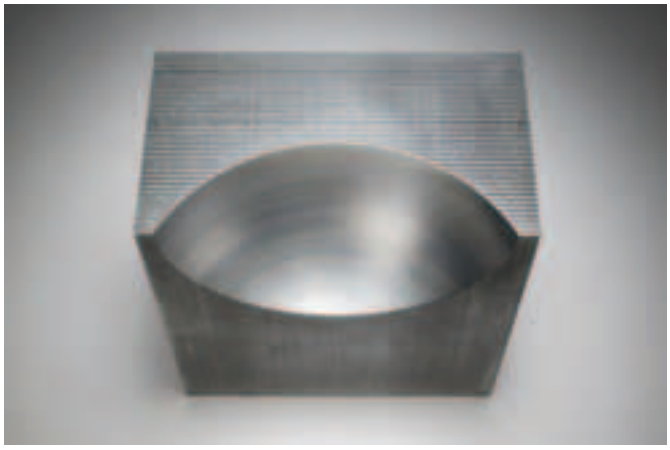
■Cutting condition

	Mould
End mill	VC-PSRB ø8×R0.5
Work material	DAC (55HRC)
Revolution	4,000min^{-1} (100m/min)
Feed rate	2,300mm/min (0.14mm/t)
Cutting method	Climb cut, Air blow

Performance report 2

Customer recognition

Compared with conventional cutting method by ball nose endmill
1. 3times or more efficiency
   (Feed rate 7,000mm/min in machining flat surface)
2. Good surface roughness and accuracy
3. Small flank wear



■Cutting condition

	Mould
End mill	VC-PSRB ø8×R3
Work material	PX-5
Revolution	15,000min^{-1} (377m/min)
Feed rate	7,000mm/min (0.12mm/t)
Depth of cut	0.1mm
Cutting method	Up and down cut milling, Air blow

VC-PSRB MIRACLE ORBIT

Corner radius end mill, Short cut length, 2—4 flute, High precision

Work material		Alloy steel, Tool steel, Pre-hardened steel (—45HRC) SCM, AISI H13, AISI D2, NAK		Hardened steel (45—55HRC) AISI H13, AISI D2, AISI 420		Hardened steel (55—62HRC) AISI D2, SKH, SKS	
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.6	2	48,000	200 — 600	40,000	160 — 500	22,000	80 — 250
	4	48,000	160 — 500	40,000	100 — 300	22,000	50 — 150
0.8	4	48,000	240 — 750	32,000	160 — 500	19,000	80 — 250
	6	38,000	190 — 600	26,000	130 — 400	16,000	70 — 200
	8	29,000	150 — 450	19,000	100 — 300	12,000	50 — 150
1	4	48,000	270 — 900	32,000	180 — 600	19,000	90 — 300
	6	38,000	220 — 720	26,000	150 — 480	16,000	70 — 240
	10	29,000	160 — 540	19,000	110 — 360	12,000	60 — 180
1.2	6	48,000	300 — 900	32,000	200 — 600	19,000	100 — 300
	10	38,000	240 — 720	26,000	160 — 480	15,000	80 — 240
	15	29,000	180 — 540	19,000	120 — 360	12,000	60 — 180
1.5	4	41,000	300 — 900	27,000	200 — 600	16,000	100 — 300
	6	32,000	240 — 720	22,000	160 — 480	13,000	80 — 240
	10	24,000	180 — 540	16,000	120 — 360	10,000	60 — 180
2	6	36,000	600 — 2,000	24,000	400 — 1,300	14,000	200 — 650
	10	29,000	480 — 1,600	19,000	320 — 1,000	12,000	160 — 520
	15	22,000	360 — 1,200	14,000	240 — 780	9,000	120 — 390
2.5	8	33,000	750 — 2,400	22,000	500 — 1,600	13,000	250 — 800
	15	20,000	450 — 1,400	13,000	300 — 960	8,000	150 — 480
3	10	30,000	900 — 3,000	20,000	600 — 2,000	12,000	300 — 1,000
	15	24,000	720 — 2,400	16,000	480 — 1,600	10,000	240 — 800
	20	18,000	540 — 1,800	12,000	360 — 1,200	7,000	180 — 600
4	12	26,000	1,200 — 4,500	17,000	800 — 3,000	10,000	400 — 1,500
	20	20,000	960 — 2,000	14,000	640 — 2,000	8,000	320 — 2,000
	30	15,000	720 — 1,000	10,000	480 — 1,000	6,000	240 — 1,000
5	15	20,000	1,200 — 4,800	13,000	780 — 3,120	10,000	520 — 2,000
	30	12,000	720 — 1,900	8,000	480 — 1,600	7,000	360 — 1,120
6	18	20,000	1,600 — 7,500	13,000	1,100 — 5,000	8,000	550 — 2,500
	41	15,000	900 — 2,400	12,000	720 — 1,600	10,000	600 — 1,200
	50	10,000	600 — 1,200	8,000	480 — 800	6,000	360 — 530
8	24	15,000	1,900 — 7,500	10,000	1,300 — 5,000	6,000	650 — 2,500
	50	10,000	1,300 — 2,400	8,000	1,000 — 2,200	3,000	320 — 600
10	30	12,000	1,600 — 7,500	8,000	1,100 — 5,000	5,000	550 — 2,500
	50	10,000	1,300 — 3,200	7,000	950 — 2,200	2,500	280 — 600
12	36	10,000	1,500 — 7,500	7,000	1,000 — 5,000	4,000	500 — 2,500
Depth of cut		≤0.2R (D≤ϕ2) ≤0.4R (D>ϕ2) ≤0.1mm (D≤ϕ1.5) ≤0.2mm (D≤ϕ4) ≤0.5mm (D≥ϕ6)				≤0.1R (D≤ϕ2) ≤0.2R (D>ϕ2) ≤0.05mm (D≤ϕ1.5) ≤0.1mm (D≤ϕ4) ≤0.3mm (D≥ϕ6)	

D:Dia.

1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
2) Use a high rigidity machine.
3) When machining moulds, the cutting conditions change considerably according to the machined shape, milling method and the depth of cut.
4) Vibration is liable to occur when using a long tool overhang. Reduce cutting speeds and feed rates proportionately.
5) Using air blow or mist is recommended.

Taper neck type

Work material			Alloy steel, Tool steel, Pre-hardened steel (—45HRC) SCM, AISI H13, AISI D2, NAK		Hardened steel (45—55HRC) AISI H13, AISI D2, AISI 420		Hardened steel (55—62HRC) AISI D2, SKH, SKS	
Dia. (mm)	Taper angle one side (°)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1.5	1.5	6	36,000	270 — 810	24,000	180 — 540	15,000	90 — 270
	1.5	10	28,000	210 — 630	19,000	140 — 420	11,000	70 — 210
2	1.5	10	32,000	540 — 1,800	22,000	360 — 1,200	13,000	180 — 590
	1.5	15	25,000	420 — 1,400	17,000	280 — 910	10,000	140 — 460
2.5	1.5	12	26,000	600 — 1,900	18,000	400 — 1,300	11,000	200 — 640
	1.5	20	20,000	450 — 140	13,000	300 — 960	8,000	150 — 480
3	1.5	15	27,000	810 — 2,700	18,000	540 — 1,800	11,000	270 — 900
	1.5	20	21,000	630 — 2,100	14,000	420 — 1,400	8,000	210 — 700
4	1.5	20	23,000	1,080 — 3,000	15,000	720 — 3,000	9,000	360 — 3,000
	1.5	30	18,000	840 — 1,500	12,000	560 — 1,500	7,000	280 — 1,500
5	1	40	10,000	520 — 1,400	7,000	420 — 840	5,000	260 — 600
	1	60	7,000	360 — 840	5,000	300 — 500	4,000	210 — 400
6	1	40	20,000	1,650 — 4,500	13,000	1,100 — 3,000	8,000	550 — 1,500
8	1	53	15,000	1,950 — 4,500	10,000	1,300 — 3,000	6,000	650 — 1,500
10	1	55	12,000	1,650 — 4,500	8,000	1,100 — 3,000	5,000	550 — 1,500
12	1	70	10,000	1,400 — 4,500	6,500	900 — 3,000	4,000	450 — 1,500
Depth of cut			≤0.2R (D≤ϕ2) ≤0.4R (D>ϕ2) ≤0.1mm (D≤ϕ1.5) ≤0.2mm (D≤ϕ4) ≤0.5mm (D≥ϕ6)		≤0.1R (D≤ϕ2) ≤0.2R (D>ϕ2) ≤0.05mm (D≤ϕ1.5) ≤0.1mm (D≤ϕ4) ≤0.3mm (D≥ϕ6)			

D:Dia.

1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
2) Use a high rigidity machine.
3) When machining moulds, the cutting conditions change considerably according to the machined shape, milling method and the depth of cut.
4) Vibration is liable to occur when using a long tool overhang. Reduce cutting speeds and feed rates proportionately.
5) Using air blow or mist is recommended.

JQA-2522
JQA-EM0941

MITSUBISHI MATERIALS KOBE TOOLS

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