

MIRACLE 3 FLUTES BALL NOSE END MILLS

***VC-3MB VC-3LB***

## High precision, high efficient milling



# MIRACLE BALL NOSE END MILL SERIES

# VC-3MB VC-3LB

## Feature ..... 1

**Highly efficient milling is achieved by unique 3-flute shape.**

Excellent chip disposal and sharp cutting edge have been achieved by use of unique 3-flute shap. Peerless efficiency milling is possible.



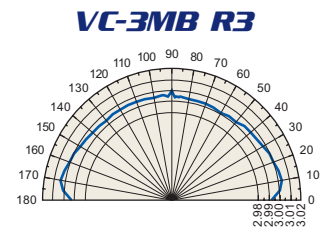
## Feature ..... 2

**High precision shape realizes milling from roughing to finishing.**

High efficiency, high precision milling is achieved by close R tolerance.

## High accuracy

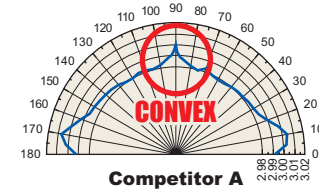
Superior good R accuracy in all cutting edge is achieved by original top-center design (PAT.pending).



## Feature ..... 3

**Long shank type for deep milling.**

Long shank type is available in addition to the medium-cutting-length type. High precision machining is possible in deep milling.

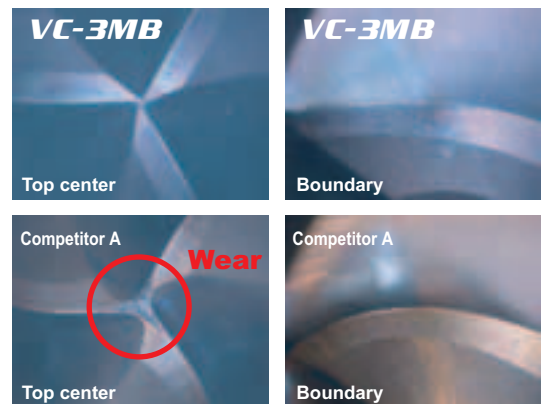
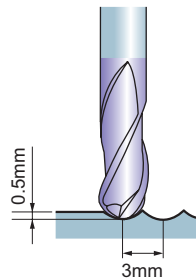


## Machining example

### Example 1

**High efficient milling with long tool life.**

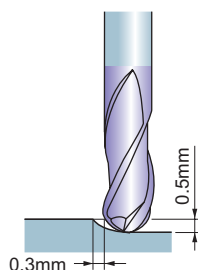
End mill	VC-3MB R3
Work material	SKD61(50HRC)
Revolution	10,000min <sup>-1</sup>
Cutting speed	104m/min
Feed rate	4,000mm/min (0.13mm/tooth)
Cutting method	Climb cut, Air blow



### Example 2

**Fine finish with highly accurat and efficient milling.**

End mill	VC-3MB R3
Work material	PX5
Revolution	20,000min <sup>-1</sup>
Cutting speed	135m/min
Feed rate	6,000mm/min (0.1mm/tooth)
Cutting method	Climb cut, Air blow



Rz : Maximum height of roughness

	VC-3MB	Competitor B	Competitor A
Surface			
Roughness			
	Rz=1.82mm	Rz=4.20mm	Rz=6.18mm
Top center			

After cutting 700m



## VC-3MB

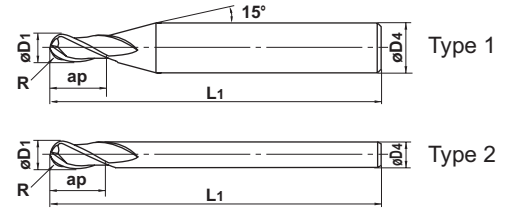
Ball Nose, Medium, 3 flute



$R \leq 6 \pm 0.01$   
 $8 \leq R \pm 0.02$



$D1 < 4 \quad 0 - -0.02$   
 $4 \leq D1 < 6 \quad 0 - -0.038$   
 $6 \leq D1 \quad 0 - -0.038$



● High efficient milling is achieved by original 3 fluted shapes.

Unit : mm

Order Number	Radius of ball nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VC3MBR0100	1	2	6	60	6	3	●	1
R0150	1.5	3	8	70	6	3	●	1
R0200	2	4	8	70	6	3	●	1
R0250	2.5	5	12	80	6	3	●	1
R0300	3	6	12	80	6	3	●	2
R0400	4	8	14	90	8	3	●	2
R0500	5	10	18	100	10	3	●	2
R0600	6	12	22	110	12	3	●	2
R0800	8	16	30	140	16	3	●	2
R1000	10	20	38	160	20	3	●	2

## VC-3LB

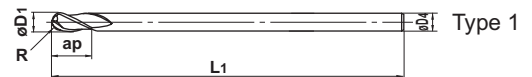
Ball Nose, Long, 3 flute



$R \leq 6 \pm 0.01$   
 $8 \leq R \pm 0.02$



$D1 < 6 \quad 0 - -0.028$   
 $6 \leq D1 \quad 0 - -0.038$



● It is a long shank type of VC-3MB.

Unit : mm

Order Number	Radius of ball nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VC3LBR0200	2	4	8	120	4	3	●	1
R0300	3	6	12	140	6	3	●	1
R0400	4	8	14	150	8	3	●	1
R0500	5	10	18	180	10	3	●	1
R0600	6	12	22	200	12	3	●	1
R0800	8	16	30	230	16	3	●	1
R1000	10	20	38	250	20	3	●	1

● : Inventory maintained.

## VC-3MB

Ball Nose, Medium, 3 flute

### Roughing

Work material	Alloy steel, Tool steel, Pre-hardened steel (-45HRC) SCM, AISI H13, AISI D2 etc.				Hardened steel (45-55HRC) AISI H13 etc.			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
R (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
<b>R1</b>	32,000	3,000	25,000	1,170	18,000	1,440	16,000	640
<b>R2</b>	18,500	3,700	14,500	1,460	11,000	1,760	9,200	740
<b>R3</b>	13,000	4,000	10,000	1,500	7,700	1,920	6,400	800
<b>R4</b>	10,000	5,000	8,000	2,000	6,000	2,300	4,800	920
<b>R5</b>	8,000	5,000	6,500	2,000	4,800	2,200	3,800	870
<b>R6</b>	6,600	4,600	5,300	1,800	4,000	2,100	3,200	840
<b>R8</b>	5,000	4,000	4,000	1,600	3,000	1,700	2,400	680
<b>R10</b>	4,000	3,600	3,200	1,440	2,400	1,400	1,900	550

Depth of cut

### Finishing

Work material	Alloy steel, Tool steel, Pre-hardened steel (-45HRC) SCM, AISI H13, AISI D2 etc.				Hardened steel (45-55HRC) AISI H13 etc.			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
R (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
<b>R1</b>	32,000	3,200	32,000	1,500	25,000	2,000	20,000	800
<b>R2</b>	25,500	5,000	20,000	2,000	17,000	2,700	13,000	1,000
<b>R3</b>	20,000	6,100	15,000	2,200	13,000	3,200	10,000	1,200
<b>R4</b>	15,000	7,500	11,000	2,700	10,000	3,800	7,500	1,400
<b>R5</b>	12,000	7,500	9,000	2,700	8,000	3,700	6,000	1,400
<b>R6</b>	10,000	7,000	7,500	2,500	6,600	3,500	5,000	1,300
<b>R8</b>	7,500	6,000	5,600	2,200	5,000	2,800	3,700	1,000
<b>R10</b>	6,000	5,400	4,500	2,000	4,000	2,300	3,000	900

Depth of cut

- 1)  $\alpha$  is the inclination of machining surface.
- 2) Please use VC-2SB or VC-4MB for work materials of 55 HRC or above.
- 3) If the rigidity of the machine or the work material installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.  
When high machining accuracy is especially needed, we recommend lowering feed rate.
- 4) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools.  
Please see the above table as a standard.
- 5) VC-2MDB is recommended when using an end mill with a long overhang, in deep slotting with low rigidity or high hardness material milling.
- 6) If the depth of cut is shallow, the revolution and feed rate can be increased.

## MITSUBISHI MATERIALS KOBE TOOLS



JQA-2522  
JQA-EM0941

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