

MIRACLE high feed corner radius end mills

**VC-HFRB**

# Ultra Rapid

The new standard for high feed end milling



# MIRACLE END MILL SERIES

# VC-HFRB

MIRACLE high feed corner radius end mills

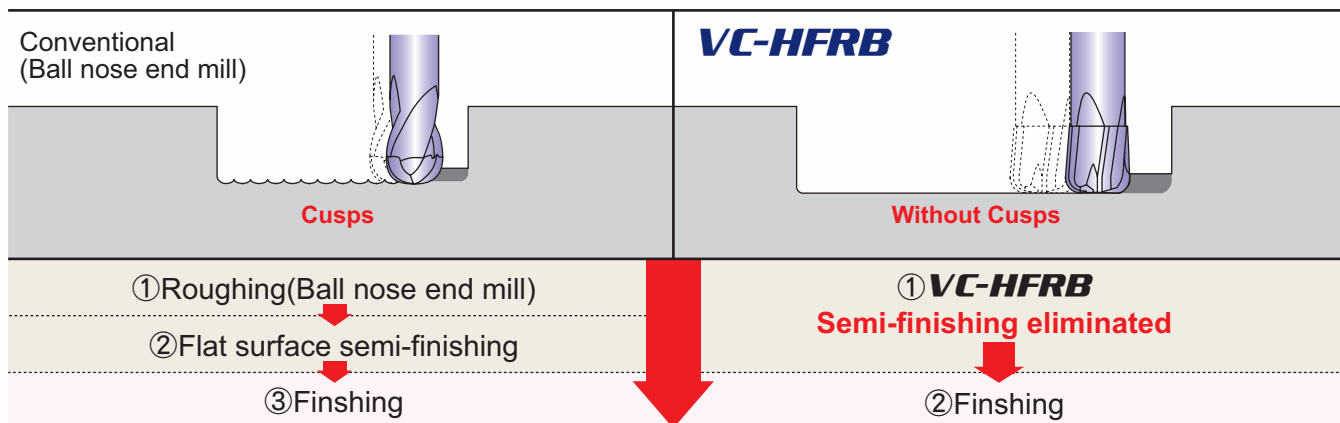
**Ultra Rapid ! The new standard for high feed, long overhang end milling.**

## Features

- Newly developed cutting edge with excellent chipping resistance. Possible to cut at over 10,000 mm/min feed rate.
- High efficiency cutting is possible even in the corners of pockets or with an overhang of  $L/D = 7$ .
- Wide range of end mills, short type, long neck type, taper neck type, and long shank type, 43 sizes available in total.

### 1. High Efficiency

- VC-HFRB is able to machine a flat surface and therefore eliminate the semi-finishing process.
- A much larger pick feed than conventional ball nose end mills leads to higher efficiency.



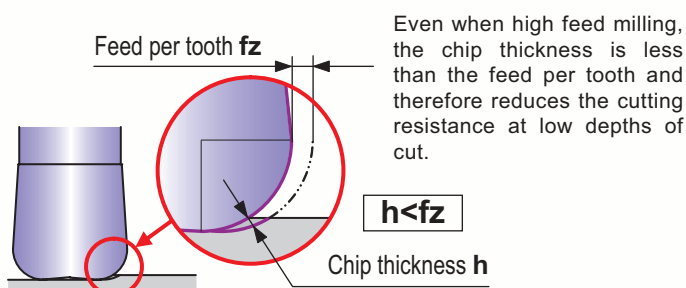
### 2. High feed milling

**VC-HFRB** ( $\varnothing 10$ )

High feed - **0.3~0.7mm/tooth**

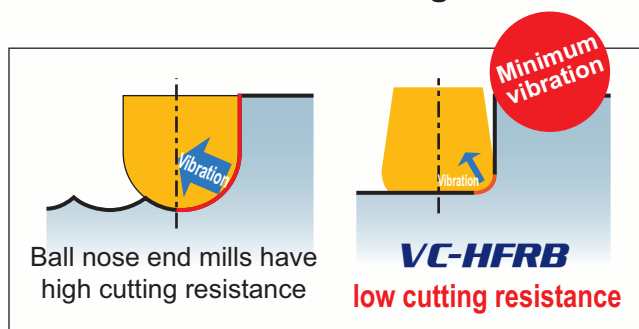
Conventional : ( $\varnothing 10$ )

Ball nose end mill **0.05mm/tooth**



### 3. Cutting resistance

Compared to ball nose end mills, **VC-HFRB** has low cutting resistance.



# MIRACLE END MILLS

## VC-HFRB

Corner radius, Short flute length, 4 flute, High feed machining



±0.015



D1 ≤ 12 0 - -0.02  
13 ≤ D1 0 - -0.03



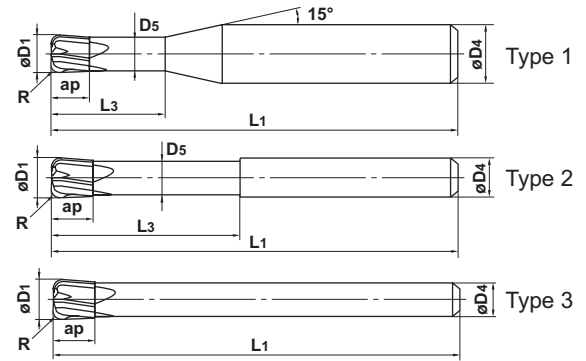
D1 ≤ 5



6 ≤ D1



- Suitable for high feed and efficient machining of moulds and dies.

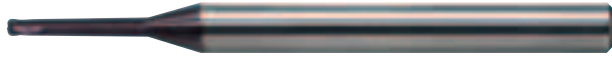
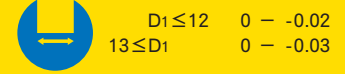


Unit : mm

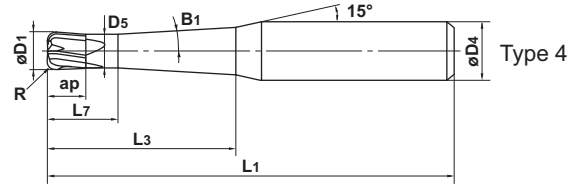
Order Number	Dia. D1	Radius of Ball Nose R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCHFRBD0200R050N06	2	0.5	2	6	1.9	50	6	4	●	1
D0200R050N10	2	0.5	2	10	1.9	70	6	4	●	1
D0300R075N09	3	0.75	3	9	2.9	50	6	4	●	1
D0300R075N15	3	0.75	3	15	2.9	70	6	4	●	1
D0400R100N12	4	1	4	12	3.9	50	6	4	●	1
D0400R100N20	4	1	4	20	3.9	70	6	4	●	1
D0500R120N15	5	1.2	5	15	4.9	70	6	4	●	1
D0600R150N18	6	1.5	6	18	5.85	50	6	4	●	2
D0600R150N30	6	1.5	6	30	5.85	90	6	4	●	2
D0700R150A050	7	1.5	7	—	—	50	6	4	●	3
D0700R150A080	7	1.5	7	—	—	80	6	4	●	3
D0800R200N24	8	2	8	24	7.85	60	8	4	●	2
D0800R200N40	8	2	8	40	7.85	90	8	4	●	2
D0900R200A065	9	2	9	—	—	65	8	4	●	3
D0900R200A100	9	2	9	—	—	100	8	4	●	3
D1000R200N30	10	2	10	30	9.7	70	10	4	●	2
D1000R200N50	10	2	10	50	9.7	100	10	4	●	2
D1100R200A070	11	2	11	—	—	70	10	4	●	3
D1100R200A110	11	2	11	—	—	110	10	4	●	3
D1200R300N36	12	3	12	36	11.7	75	12	4	●	2
D1200R300N60	12	3	12	60	11.7	110	12	4	●	2
D1300R300A075	13	3	13	—	—	75	12	4	●	3
D1300R300A120	13	3	13	—	—	120	12	4	●	3
D1600R300N80	16	3	16	80	15.5	140	16	4	●	2

# VC-HFRB

Corner radius, Short flute length, 4 flute, High feed machining



(Taper neck type)



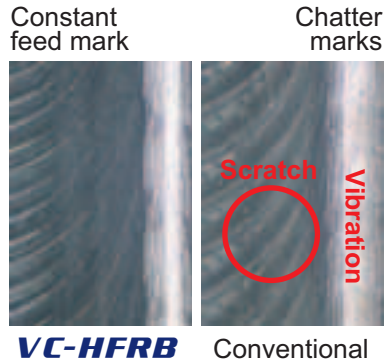
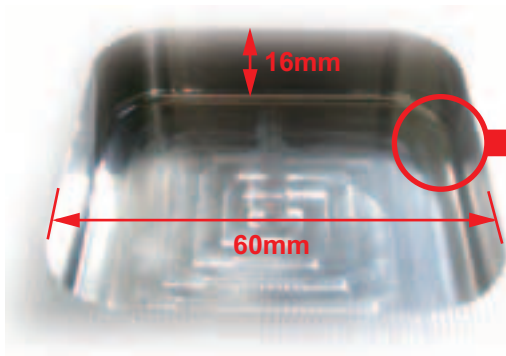
- Suitable for high feed and efficient machining of moulds and dies.

Unit : mm

Order Number	Dia.	Radius of Ball Nose	Length of Cut	Taper Angle One Side	L7	Neck Length	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	R	ap	B1		L3	D5	L1	D4			
VCHFBD0200R050N12	2	0.5	2	1°	4	12	1.9	70	6	4	●	4
D0200R050N16	2	0.5	2	1°	4	16	1.9	70	6	4	●	4
D0200R050N20	2	0.5	2	1°	4	20	1.9	70	6	4	●	4
D0300R075N18	3	0.75	3	1°	6	18	2.9	80	6	4	●	4
D0300R075N24	3	0.75	3	1°	6	24	2.9	80	6	4	●	4
D0300R075N30	3	0.75	3	1°	6	30	2.9	80	6	4	●	4
D0400R100N24	4	1	4	1°	8	24	3.9	90	6	4	●	4
D0400R100N32	4	1	4	1°	8	32	3.9	90	6	4	●	4
D0400R100N40	4	1	4	1°	8	40	3.9	90	6	4	●	4
D0500R120N30	5	1.2	5	1°	8	30	4.9	90	6	4	●	4
D0500R120N40	5	1.2	5	1°	8	40	4.9	90	8	4	●	4
D0500R120N50	5	1.2	5	1°	8	50	4.9	110	8	4	●	4
D0600R150N50	6	1.5	6	1°	16	50	5.85	110	8	4	●	4
D0600R150N67	6	1.5	6	1°	16	67	5.85	130	8	4	●	4
D0800R200N70	8	2	8	1°	18	70	7.85	120	10	4	●	4
D0800R200N90	8	2	8	1°	18	90	7.85	150	12	4	●	4
D1000R200N80	10	2	10	1°	20	80	9.7	140	16	4	●	4
D1000R200N110	10	2	10	1°	20	110	9.7	160	16	4	●	4
D1200R300N110	12	3	12	1°	24	110	11.7	160	16	4	●	4

Cutting Example 1

Superior surface finish without chatter or vibration

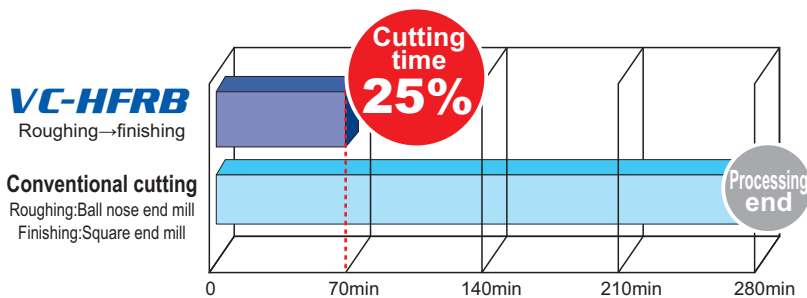


End mill	VC-HFRB $\phi 10 \times R2$
Work material	SKD61 (52HRC)
Overhang	50mm
Revolution	5,000min <sup>-1</sup> (157m/min)
Feed rate	10,000mm/min (0.5mm/tooth)
Depth of cut	ap:0.3mm, ae:4mm
Cutting method	Air blowing

Cutting Example 2

75% reduction in machining time with high feed cutting!

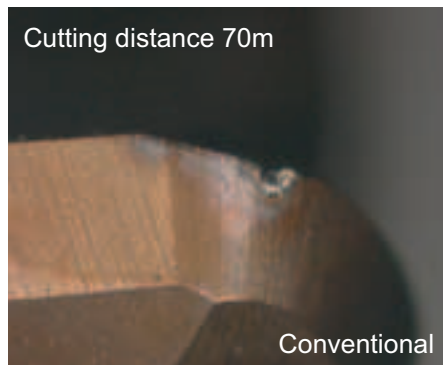
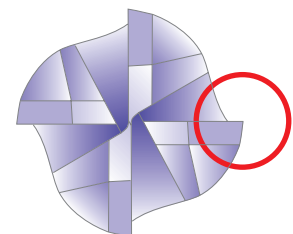
(Cutting time 280min → 70min)



End mill	VC-HFRB $\phi 2 \times R0.5$
Work material	SKD61 (50HRC)
Mold	For plastics
Revolution	24,000min <sup>-1</sup> (150m/min)
Feed rate	6,700mm/min (0.07mm/tooth)
Depth of cut	ap:0.04mm, ae:0.5mm
Cutting method	Air blowing
Machining time	70 min

Cutting Example 3

Superior chipping resistance! High feed cutting and long tool life

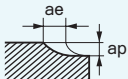


End mill	VC-HFRB $\phi 10 \times R2$
Work material	SKD61 (50HRC)
Revolution	6,000min <sup>-1</sup> (157m/min)
Feed rate	10,000mm/min (0.3mm/tooth)
Depth of cut	ap:0.3mm, ae:4mm
Cutting method	Air blowing

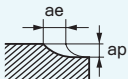
**VC-HFRB**

Corner radius, Short flute length, 4 flute, High feed machining

Work material		Carbon steel, Alloy steel, Cast iron (-30HRC) Ck55, 41CrMo				Alloy steel, Tool steel, Pre-hardened steel (30-45HRC) W.Nr. 1.2344(H13), X210Cr12			
Dia. (mm)	R (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
2	R 0.5	33,000	10,000	0.8	0.08	27,000	8,400	0.8	0.05
3	R 0.75	22,000	11,000	1.2	0.12	18,000	9,000	1.2	0.08
4	R 1	17,000	12,000	1.5	0.15	14,000	9,500	1.5	0.12
5	R 1.2	13,000	13,000	2.0	0.20	11,000	11,000	2.0	0.15
6	R 1.5	11,000	13,000	2.5	0.25	9,000	11,000	2.5	0.15
7	R 1.5	9,400	13,000	3.0	0.25	7,800	11,000	3.0	0.15
8	R 2	8,200	13,000	3.0	0.30	7,000	11,000	3.0	0.20
9	R 2	7,300	13,000	4.0	0.30	6,000	11,000	4.0	0.20
10	R 2	6,500	13,000	4.5	0.30	5,500	11,000	4.5	0.20
11	R 2	6,000	12,000	5.5	0.30	5,000	10,000	5.5	0.20
12	R 3	5,500	12,000	4.5	0.45	4,600	10,000	4.5	0.30
13	R 3	5,000	12,000	5.5	0.45	4,200	10,000	5.5	0.30
16	R 3	4,100	10,000	7.5	0.45	3,400	8,800	7.5	0.30

Depth of cut 

Work material		Hardened steel (45-55HRC) W.Nr. 1.2344(H13)				Hardened steel (55-60HRC) X210Cr12, S6-5-2 etc.			
Dia. (mm)	R (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
2	R 0.5	24,000	7,500	0.8	0.04	16,000	3,000	0.8	0.03
3	R 0.75	16,000	8,500	1.2	0.06	11,000	3,300	1.2	0.05
4	R 1	12,000	8,800	1.5	0.08	8,000	3,500	1.5	0.07
5	R 1.2	9,600	9,500	2.0	0.10	6,400	3,800	2.0	0.08
6	R 1.5	8,000	9,600	2.5	0.10	5,300	3,800	2.5	0.10
7	R 1.5	6,900	9,600	3.0	0.10	4,600	3,800	3.0	0.10
8	R 2	6,000	9,600	3.0	0.15	4,000	3,800	3.0	0.13
9	R 2	5,300	9,500	4.0	0.15	3,800	3,800	4.0	0.13
10	R 2	4,800	9,500	4.5	0.15	3,200	3,800	4.5	0.13
11	R 2	4,500	9,000	5.5	0.15	2,900	3,500	5.5	0.13
12	R 3	4,100	9,000	4.5	0.25	2,700	3,500	4.5	0.20
13	R 3	3,700	8,900	5.5	0.25	2,500	3,500	5.5	0.20
16	R 3	3,000	7,800	7.5	0.25	2,000	3,200	7.5	0.20

Depth of cut 

- 1) The above table shows cutting conditions when machining with the corner radius cutting edge.
- 2) This table shows the cutting conditions with less than 5D overhang length.  
In the case of longer overhangs, the revolution and the feed rate should be reduced proportionately.
- 3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
- 4) Air blow or oil mist is recommended for good chip evacuation.



JQA-2522  
JQA-EM0941

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