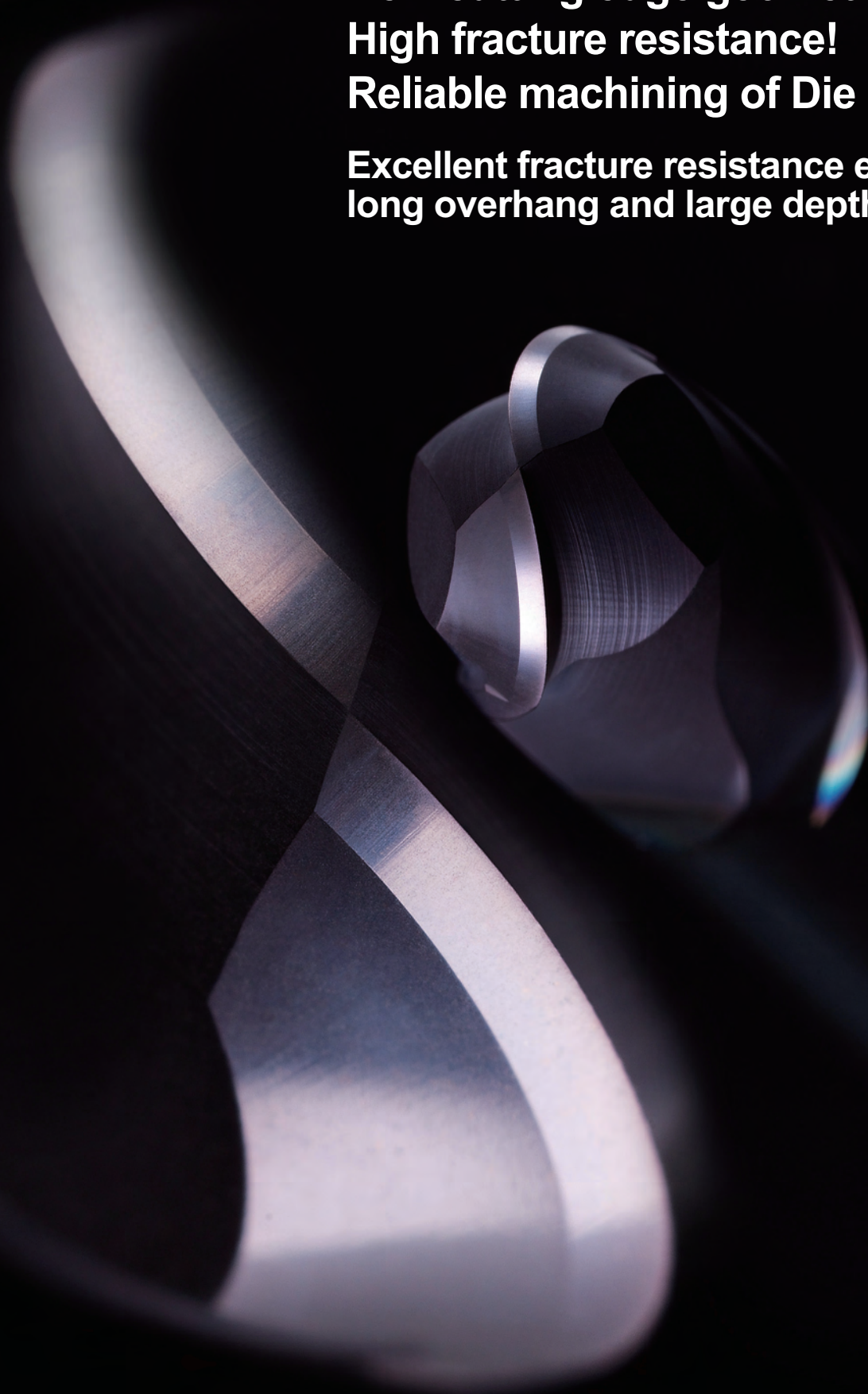


**IMPACT MIRACLE** strong geometry end mill series

***VF-25DB VF-25DBL***

**New cutting edge geometry,  
High fracture resistance!  
Reliable machining of Die and Moulds!**

**Excellent fracture resistance even with  
long overhang and large depths of cut.**



# IMPACT MIRACLE

**VF-2SDB** NEW

Ball nose, 2 flute, Strong geometry,  
For hardened materials

**VF-2SDBL** NEW

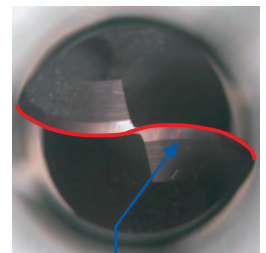
Ball nose, 2 flute, Strong geometry, Long shank,  
For hardened materials.

**New cutting edge geometry, High fracture resistance!**  
**Reliable machining of Die and Moulds!**

Excellent fracture resistance even with long overhang and large depths of cut.

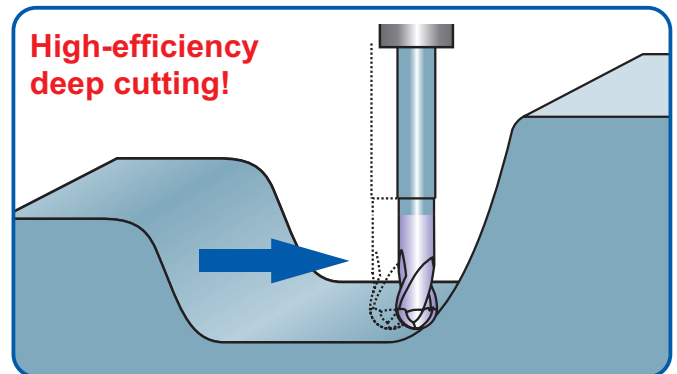
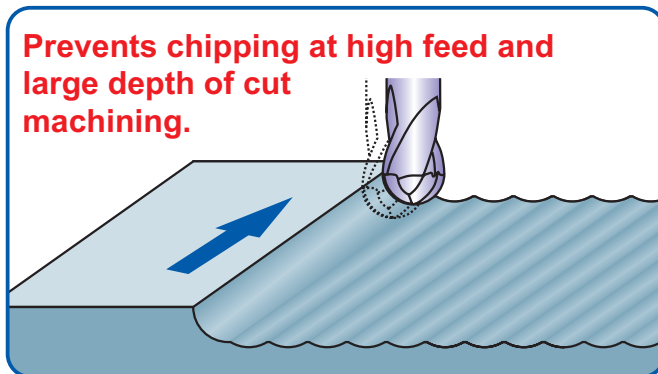
## Features

- Geometry** Adopted new cutting edge geometry which has excellent fracture resistance.
- Substrate** Cemented carbide that has high toughness and excellent fracture resistance.
- Coating** Newly developed "Impact Miracle Coating".



New cutting edge geometry

- Make the most of coating's ability!
- Realized high efficiency machining!



## Machining Example 1

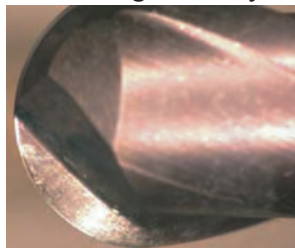
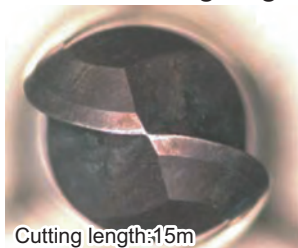
**Fracture resistance comparison**

**New cutting edge geometry achieves excellent fracture resistance. Compared with conventional end mill, VF-2SDB shows excellent chipping resistance.**

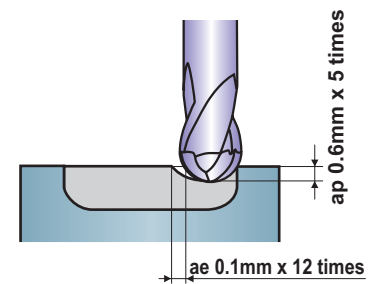
Bottom cutting edge

Gash geometry

**VF-2SDB**



Competitor

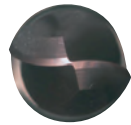


End mill	VF-2SDB R3
Work material	SKD61(52HRC)
Revolution	12,000min <sup>-1</sup> (226m/min)
Feed rate	4,500mm/min (0.18mm/t)
Cutting method	Air blow

# IMPACT MIRACLE END MILL

## VF-2SDB

Ball nose, 2 flute, Strong geometry, For hardened materials

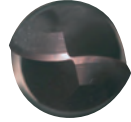


**R0.5-R10mm**

14 different sizes available.

## VF-2SDBL

Ball nose, 2 flute, Strong geometry, Long shank, For hardened materials.



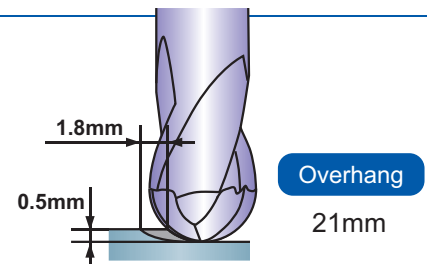
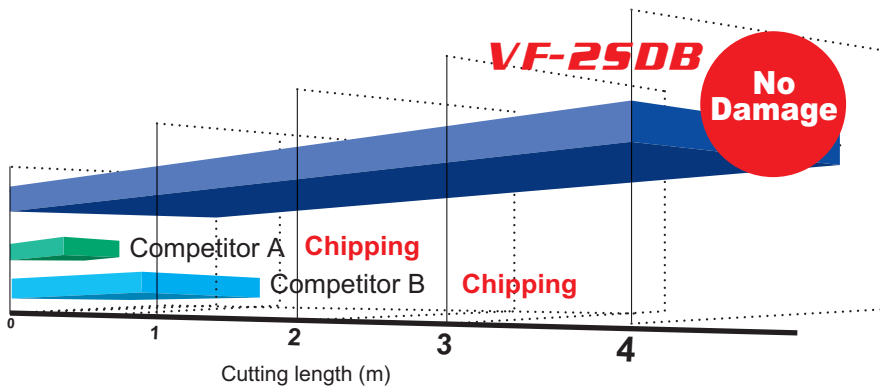
**R0.5-R10mm**

11 different sizes available.

## Machining Example 2

### High feed milling comparison

Compared with conventional end mill, VF-2SDB achieved 4 times longer tool life.



End mill	VF-2SDB R3
Work material	SKD61(52HRC)
Revolution	16,000min <sup>-1</sup>
Feed rate	9,600mm/min (0.3mm/t)
Cutting method	Air blow

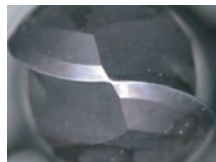
## Machining Example 3

### Deep and high feed machining comparison

Even for difficult machining such as, high feed, large depth of cuts, high efficiency machining can be achieved.

Bottom cutting edge Gash geometry

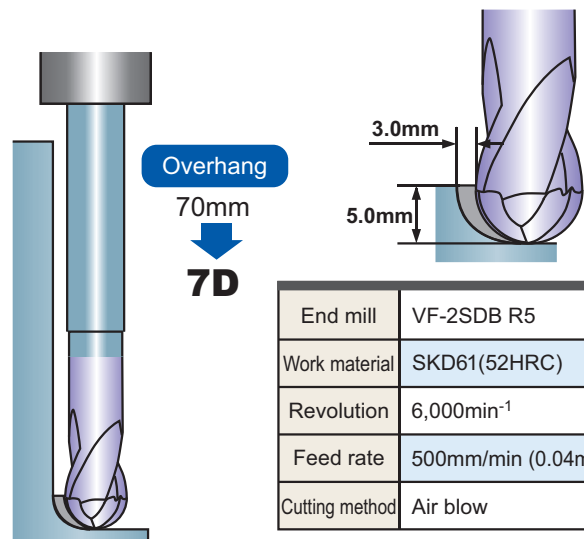
**VF-2SDB**



Conventional A



Conventional B



End mill	VF-2SDB R5
Work material	SKD61(52HRC)
Revolution	6,000min <sup>-1</sup>
Feed rate	500mm/min (0.04mm/t)
Cutting method	Air blow

# IMPACT MIRACLE END MILL

## VF-25DB NEW

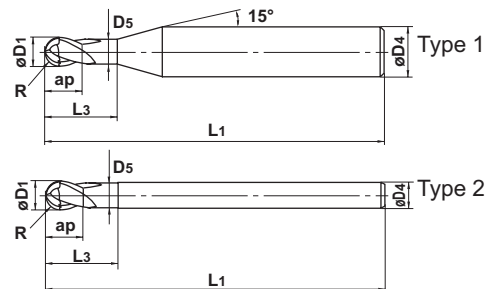
Ball nose, 2 flute, Strong geometry, For hardened materials



$R \leq 6.5$   $\pm 0.01$   
 $6.5 < R$   $\pm 0.02$



$D_1 \leq 12$   $0 - -0.02$   
 $12 < D_1$   $0 - -0.03$



- 2 flute ball nose end mills with Impact Miracle coating for high hardness materials and achieves excellent fracture resistance.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2SDBR0050	0.5	1	1	2	0.94	45	4	2	●	1
R0100S04	1	2	2	4	1.9	50	4	2	●	1
R0100	1	2	2	4	1.9	60	6	2	●	1
R0150S03	1.5	3	3	6	2.9	60	3	2	●	2
R0150	1.5	3	3	6	2.9	70	6	2	●	1
R0200S04	2	4	4	8	3.9	60	4	2	●	2
R0200	2	4	4	8	3.9	70	6	2	●	1
R0250	2.5	5	5	10	4.9	80	6	2	●	1
R0300	3	6	12	22	5.85	80	6	2	●	2
R0400	4	8	14	27	7.85	90	8	2	●	2
R0500	5	10	18	31	9.7	100	10	2	●	2
R0600	6	12	22	35	11.7	110	12	2	●	2
R0800	8	16	30	50	15.5	140	16	2	●	2
R1000	10	20	38	58	19.5	160	20	2	●	2

# VF-2SDBL NEW

Ball nose, 2 flute, Strong geometry, Long shank, For hardened materials



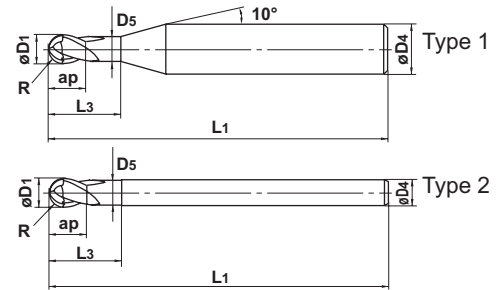
$R \leq 6.5 \pm 0.01$   
 $6.5 < R \pm 0.02$



$D1 \leq 12 \quad 0 - -0.02$   
 $12 < D1 \quad 0 - -0.03$



● VF-2SDB with long shank.



Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
<b>VF2SDBLR0050</b>	0.5	1	1	2	0.94	60	6	2	●	1
<b>R0100</b>	1	2	2	4	1.9	80	6	2	●	1
<b>R0150</b>	1.5	3	3	6	2.9	90	6	2	●	1
<b>R0200</b>	2	4	4	8	3.9	90	6	2	●	1
<b>R0250</b>	2.5	5	5	10	4.9	110	8	2	●	1
<b>R0300</b>	3	6	12	22	5.85	120	6	2	●	2
<b>R0400</b>	4	8	14	27	7.85	130	8	2	●	2
<b>R0500</b>	5	10	18	31	9.7	140	10	2	●	2
<b>R0600</b>	6	12	22	35	11.7	140	12	2	●	2
<b>R0800</b>	8	16	30	50	15.5	200	16	2	●	2
<b>R1000</b>	10	20	38	58	19.5	200	20	2	●	2

# IMPACT MIRACLE END MILL

## VF-25DB

Ball nose, 2 flute, Strong geometry, For hardened materials

## VF-25DBL

Ball nose, 2 flute, Strong geometry, Long shank, For hardened materials

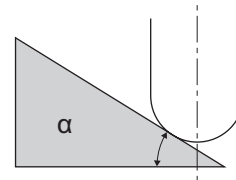
### Overhang below 5D (D is end mill diameter)

Work material	Thermal refining steel, Pre-hardened steel (-45HRC) NAK, HPM						Hardened steel, Thermal refining steel (45-55HRC) HPM, AISI H13, AISI 420						Hardened steel (55-62HRC) AISI D2					
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (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)			Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)		
<b>R 0.5</b>	40,000	5,200	36,000	2,300	0.10	0.25	40,000	5,200	36,000	2,300	0.10	0.25	40,000	5,000	40,000	2,400	0.05	0.10
<b>R 1</b>	40,000	6,000	36,000	3,500	0.20	0.50	40,000	6,000	36,000	3,500	0.20	0.50	36,000	5,000	24,000	2,400	0.10	0.20
<b>R 1.5x3</b>	29,000	4,600	19,000	2,400	0.20	0.50	25,000	4,000	16,000	2,000	0.20	0.50	17,000	2,400	11,000	1,000	0.12	0.30
<b>R 1.5</b>	37,000	7,000	24,000	3,000	0.30	0.75	37,000	7,000	24,000	3,000	0.30	0.75	25,000	6,000	16,000	2,200	0.12	0.30
<b>R 2x4</b>	24,000	4,300	15,000	2,200	0.25	0.70	19,000	3,400	13,000	1,700	0.25	0.70	12,000	1,900	8,200	900	0.13	0.40
<b>R 2</b>	30,000	6,500	19,000	2,800	0.40	1.00	28,000	6,000	19,000	2,600	0.40	1.00	18,000	4,800	12,000	2,000	0.13	0.40
<b>R 2.5</b>	25,000	6,000	16,000	2,600	0.50	1.30	22,000	5,000	16,000	2,300	0.50	1.25	15,000	4,200	9,500	1,700	0.15	0.50
<b>R 3</b>	22,000	6,000	14,000	2,400	0.60	1.80	18,000	4,500	12,000	1,900	0.60	1.50	12,000	3,500	8,000	1,600	0.20	0.60
<b>R 4</b>	19,000	5,200	12,000	2,200	0.80	2.40	15,000	3,800	9,500	1,700	0.80	2.00	9,800	3,000	6,500	1,300	0.20	0.80
<b>R 5</b>	15,000	4,300	9,500	2,000	1.00	3.00	11,000	3,000	7,000	1,500	1.00	2.50	7,500	2,400	5,000	1,000	0.20	1.00
<b>R 6</b>	12,000	3,400	8,000	1,800	1.20	3.60	9,000	2,400	6,000	1,400	1.20	3.00	6,000	1,900	4,000	800	0.30	1.20
<b>R 8</b>	9,000	2,600	6,000	1,500	1.60	4.80	7,000	1,900	4,500	1,100	1.60	4.00	4,500	1,500	3,000	600	0.30	1.60
<b>R10</b>	7,500	2,200	4,800	1,200	2.00	6.00	5,500	1,500	3,600	900	2.00	5.00	3,600	1,200	2,500	500	0.30	2.00

Depth of cut

Pick feed rates should be chosen according to the surface finish required. The table above should be used as a reference start point.

- 1) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased. If accuracy is important, please reduce the feed rate.
- 3)  $\alpha$  is the inclination angle of the machined surface.

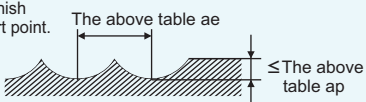


## Overhang 7D (D is end mill diameter)

Work material	Thermal refining steel, Pre-hardened steel (-45HRC) NAK, HPM				Hardened steel, Thermal refining steel, (45-55HRC) HPM, AISI H13, AISI 420			
	R (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)
<b>R 1.5x3</b>	16,000	2,000	0.10	0.30	13,000	1,500	0.10	0.30
<b>R 2x4</b>	13,000	2,000	0.15	0.50	10,000	1,500	0.15	0.50
<b>R 3</b>	10,000	2,000	0.20	1.00	8,000	1,600	0.20	0.80
<b>R 4</b>	8,000	1,800	0.30	1.50	6,400	1,400	0.40	1.20
<b>R 5</b>	6,000	1,600	0.40	2.00	4,800	1,200	0.40	1.60
<b>R 6</b>	5,000	1,300	0.45	2.40	4,000	1,000	0.45	2.00
<b>R 8</b>	3,800	1,000	0.60	3.00	3,100	800	0.60	2.50
<b>R10</b>	3,000	800	0.80	4.00	2,500	650	0.80	3.00

Depth of cut

Pick feed rates should be chosen according to the surface finish required. The table above should be used as a reference start point.



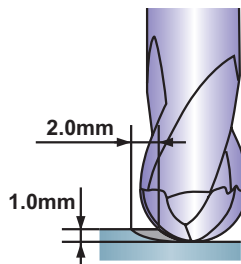
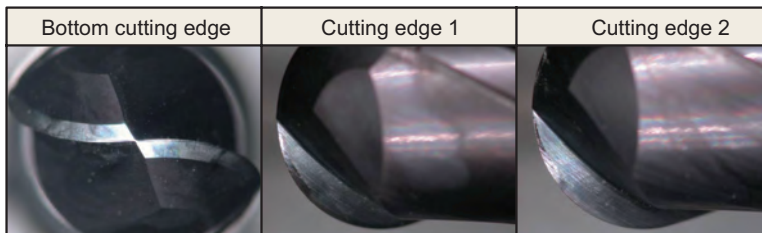
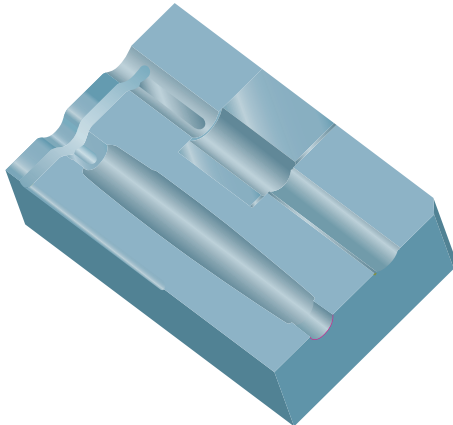
- 1) The cutting conditions above are guide only end mills which outer diameter as same as shank diameter.
- 2) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.  
If the depth of cut is shallow, the revolution and feed rate can be increased. If accuracy is important, please reduce the feed rate.
- 3) The above table should not be applied to hardened steels (over 55 HRC hardness)

## Performance Report 1

### User assessment

#### Roughing on mould

- 1) No chipping after the 2 hour's machining.
- 2) Minute tool wear. Can continue use.



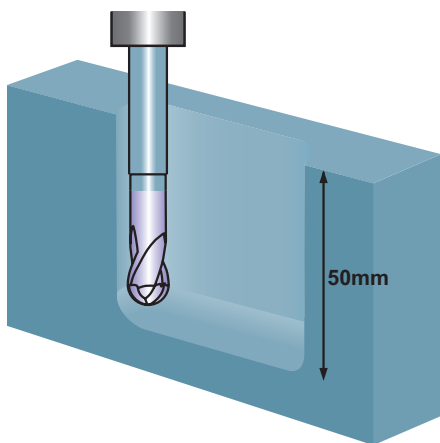
End mill	VF-2SDB R5
Work material	PX5
Revolution	5,000min <sup>-1</sup> (157m/min)
Feed rate	2,000mm/min (0.2mm/t)
Cutting method	Non water soluble cutting fluid

## Performance Report 2

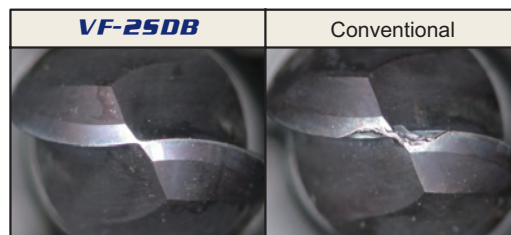
### User assessment

#### Roughing on mould

- 1) No chipping at long overhang machining (7D).
- 2) Conventional end mill had chipping.



Overhang  
70mm  
↓  
**7D**



End mill	VF-2SDB R5
Work material	SKD61 (52HRC)
Revolution	8,000min <sup>-1</sup> (251m/min)
Feed rate	4,800mm/min (0.3mm/t)
Cutting method	Climb cut, Air blow

# MITSUBISHI MATERIALS KOBE TOOLS



ISO 9001  
ISO 14001  
JQA-2522  
JQA-EM0941

#### MITSUBISHI MATERIALS CORPORATION MARKETING DEPT.

KFC bldg., 8F, 1-6-1, Yokoami, Sumida-ku, Tokyo 130-0015, Japan  
TEL 81-3-5819-8772 FAX 81-3-5819-8774

#### MMC HARTMETALL GmbH

Comeniusstr.2, 40670, Meerbusch GERMANY  
TEL 49-2159-9189-0 FAX 49-2159-50462

#### MITSUBISHI MATERIALS U.S.A. CORPORATION Headquarters

17401, Eastman Street, Irvine, California, 92614, USA  
TEL 1-949-862-5100 FAX 1-949-862-5180

#### MMC METAL SINGAPORE PTE LTD.

10, Arumugam Road, #04-00 Lion Industrial Bldg., 409957, SINGAPORE  
TEL 65-6743-9370 FAX 65-6749-1469