

IMPACT MIRACLE

End Mill Series

Newly developed "Impact Miracle Coating".

Single phase nano crystal coating technology for higher film hardness and heat resistance.



IMPACT

IMPACT MIRACLE

Miracle end mills for increased cutting speeds, efficiency and tool life when milling high hardness materials.

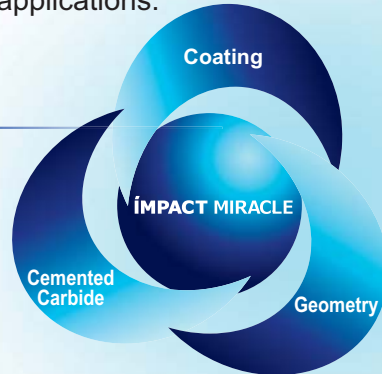
Solid carbide end mills using a combination of Impact Miracle coating, new micro-grain cemented carbide and optimized geometry.

- For hardened steels over 60HRC, pre-hardened steels through to general steels.
- For high-speed & high efficiency machining.
- For unstable applications with long overhang machining through to precision machining.

New end mill series covering a wide range of machining applications.

Features

- All Impact Miracle end mills are coated using the latest Single phase nano crystal coating technology for higher film hardness and heat resistance.



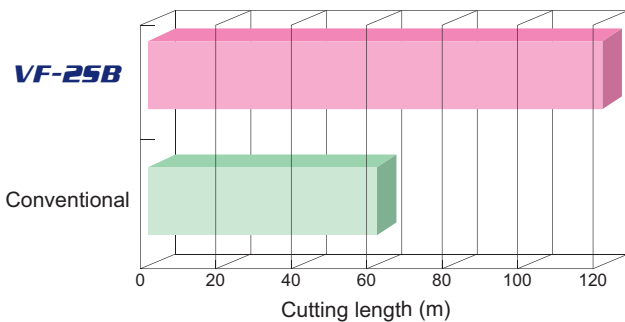
New coating, cemented carbide and geometry. New generation of IMPACT MIRACLE end mills!

Characteristics of Impact Miracle coating

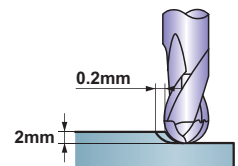
	IMPACT MIRACLE	(Al,Ti,Si)N	(Al,Ti)N
Hardness	3700HV	3200HV	2800HV
Adhesion	100N	80N	80N
Oxidation temperature	1300°C	1100°C	840°C
Friction coefficient	0.48	0.53	0.58

- Improved cutting edge geometry. The superior chipping resistance allows higher speeds for reliable milling of high hardness materials.
- For reduced friction resistance and high quality surface finishes!

When machining die casting mould steel tool life was doubled when compared to the conventional product.



End mill	VF-25B R3
Workpiece	DH31S (52HRC)
Revolution	16,000min ⁻¹ (284m/min)
Feed rate	1,600mm/min (0.05mm/t)
Machining method	Climb cut, Air blow

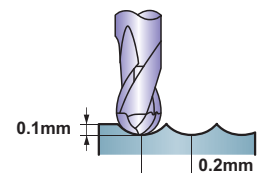


Excellent cutting performance even when machining pre-hardened steels!

Cutting length: 1200m



End mill	VF-2XLB R1.5x8
Workpiece	NAK80 (43HRC)
Revolution	20,000min ⁻¹ (68m/min)
Feed rate	2,000mm/min (0.05mm/t)
Machining method	Water soluble coolant



Competitor



IMPACT MIRACLE END MILL

VF-255B

Ball nose, Short cut length, 2 flute, For hardened materials



R0.5-R6mm

12 different sizes available.

VF-25B

Ball nose, Short cut length, 2 flute, For hardened materials



R0.1-R10mm

36 different sizes available.

VF-2XLB

Ball nose, Long cut length, 2 flute, For hardened materials



R0.1-R3mm

198 different sizes available.

VF-25DB

Ball nose, Short cut length, 2 flute, Strong geometry type

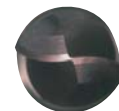


R0.5-R10mm

14 different sizes available.

VF-25DBL

Ball nose, Short cut length, 2 flute, Strong geometry type, Long shank



R0.5-R10mm

11 different sizes available.

VF-3XB

Ball nose, 3 flute, Taper neck, For hardened materials



R0.4-R2.5mm

89 different sizes available.

VF-5D

End mill, Short cut length, 4/6 flute, For hardened materials



ø1-ø12mm

12 different sizes available.

VF-MD

End mill, Medium cut length, 4/6 flute, For hardened materials



ø1-ø25mm

18 different sizes available.

VF-5DRB

Corner radius, Short cut length, 6 flute, For hardened materials



ø3-ø12mm

13 different sizes available.

VF-MDRB

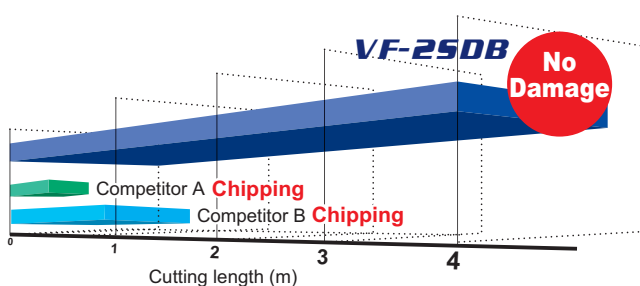
Corner Radius, Medium cut length, 6 flute, For hardened materials



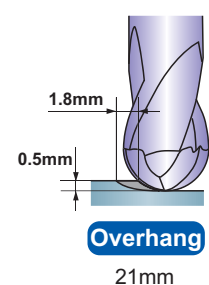
ø3-ø20mm

21 different sizes available.

Higher feed rates and 4 times longer tool life compared to competitor end mills !




End mill	VF-25DB R3
Workpiece	SKD61(52HRC)
Revolution	16,000min ⁻¹
Feed rate	9,600mm/min (0.3mm/t)
Machining method	Air blow



Powder high speed steel machining

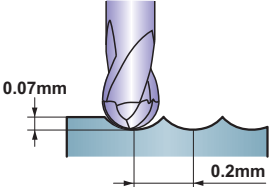
Tool life doubled compared to competitors end mills when machining hardened steels over 65 HRC.

<Geometry>

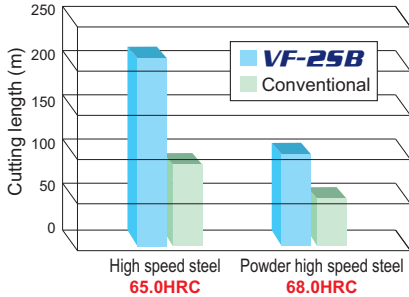


VF-25B

<Depth of cut>




<Result>



High speed steel 65.0HRC Powder high speed steel 68.0HRC

Cutting length (m)

VF-25B Conventional




End mill	VF-2SB R1
Workpiece	Powder high speed steel
Revolution	8,000min ⁻¹ (18m/min)
Feed rate	1,260mm/min (0.08mm/t)
Machining method	Climb cut, Air blow

High speed steel machining

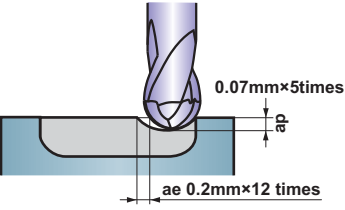
Triple tool life compared to competitors end mills when pocket machining hardened steels !

<Geometry>



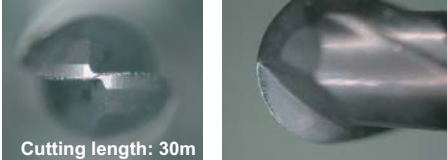
VF-25B

<Depth of cut>




<Result>

VF-25B



Cutting length: 30m

Competitor



Chipping


Cutting length: 10m

End mill	VF-2SB R1
Workpiece	SKH51 (65HRC)
Revolution	20,000min ⁻¹ (126m/min)
Feed rate	6,000mm/min (0.15mm/t)
Machining method	Up and down cut milling, Air blow

Machining of hardened steels

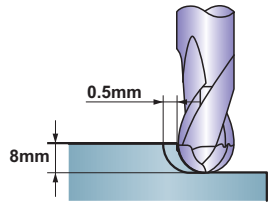
Triple tool life compared to competitors end mills when machining at large depths of cut.

<Geometry>



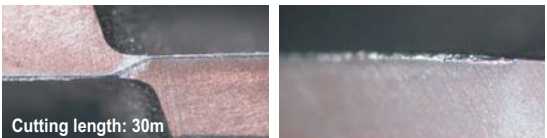
VF-25B

<Depth of cut>



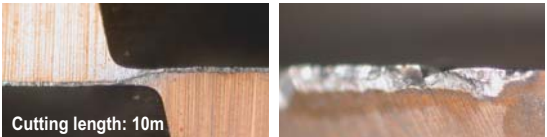
<Result>

VF-25B



Cutting length: 30m

Competitor




Cutting length: 10m

End mill	VF-2SB R10
Workpiece	SKD11 (60HRC)
Revolution	1,200min ⁻¹ (74m/min)
Feed rate	240mm/min (0.1mm/t)
Machining method	Climb cut, Air blow

High load machining of pre-hardened steels

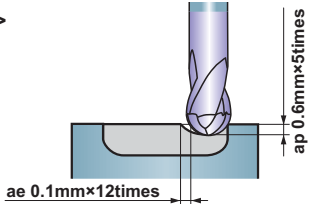
Excellent chipping resistance compared to competitors end mills !

<Geometry>

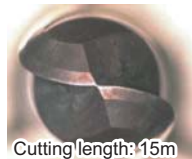





VF-2SDB

<Depth of cut>



<Result>


	Bottom cutting edge	Gash geometry
VF-2SDB	 Cutting length: 15m	
Competitor	 Cutting length: 15m	

End mill	VF-2SDB R3
Workpiece	SKD61 (52HRC)
Revolution	12,000min ⁻¹ (226m/min)
Feed rate	4,500mm/min (0.18mm/t)
Machining method	Air blow

Deep and high feed machining comparison

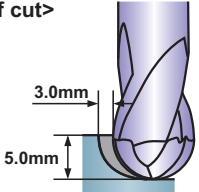
Excellent fracture resistance even with long overhang (7D) and large depths of cut !

<Geometry>









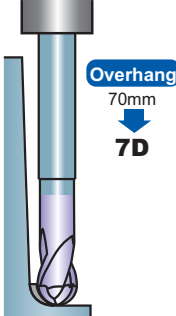
VF-2SDB

<Depth of cut>



<Result>

	Bottom cutting edge	Gash geometry
VF-2SDB		
Conventional A		
Conventional B		




End mill	VF-2SDB R5
Workpiece	SKD61(52HRC)
Revolution	6,000min ⁻¹ (188m/min)
Feed rate	500mm/min (0.04mm/t)
Machining method	Air blow

Pre-hardened steel machining

Roughing on mould

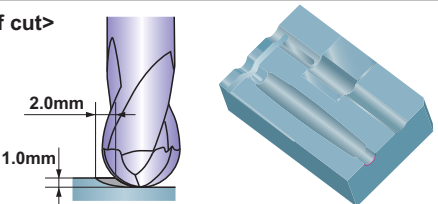
- 1) No chipping after the 2 hour's machining.
- 2) Minimum tool wear, further machining possible.

<Geometry>



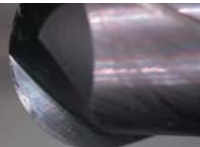


VF-2SDB

<Depth of cut>



<Result>

	Bottom cutting edge	Cutting edge 1	Cutting edge 2
VF-2SDB			


End mill	VF-2SDB R5
Workpiece	PX5 (40HRC)
Revolution	5,000min ⁻¹ (157m/min)
Feed rate	2,000mm/min (0.2mm/t)
Machining method	Non water soluble coolant

Alloy tool steel for hot moulding

Roughing on mould

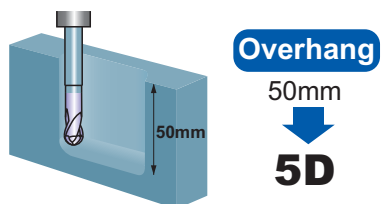
- 1) No chipping at long overhang machining (5D).
- 2) Conventional end mill had chipping.

<Geometry>




VF-2SDB

<Depth of cut>



Overhang
50mm
↓
5D

<Result>




End mill	VF-2SDB R5
Workpiece	SKD61 (52HRC)
Revolution	8,000min ⁻¹ (251m/min)
Feed rate	4,800mm/min (0.3mm/t)
Machining method	Climb cut, Air blow

Pocket machining of hardened steels

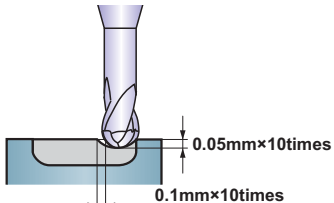
Longer tool life without chipping compared to competitors end mills !

<Geometry>



VF-2XLB

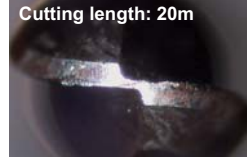

<Depth of cut>



<Result>



VF-2XLB
2×component

Cutting length: 20m

Competitor
1×component

Cutting length: 10m





End mill	VF-2XLB R1x20
Workpiece	SKD11 (60HRC)
Revolution	10,000min ⁻¹ (63m/min)
Feed rate	1,000mm/min (0.05mm/t)
Machining method	Up and down cut milling, Air blow

Pre-hardened steel machining

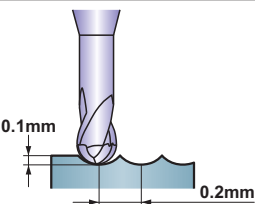
Long tool life compared to competitors end mills when pocket machining hardened steels !

<Geometry>



VF-2XLB

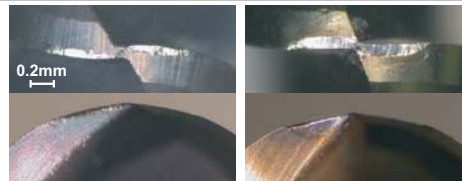
<Depth of cut>



<Result>

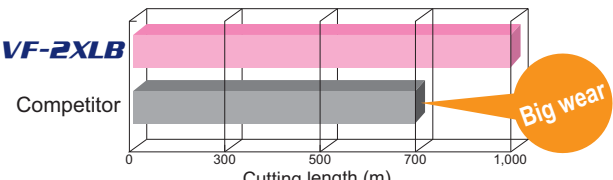
VF-2XLB Cutting length 1,000m

Competitor Cutting length 700m



VF-2XLB

Competitor




End mill	VF-2XLB R1.5x8
Workpiece	STAVAX (52HRC)
Revolution	20,000min ⁻¹ (68m/min)
Feed rate	4,000mm/min (0.1mm/t)
Machining method	Climb cut, Water soluble coolant

Hardened steel machining

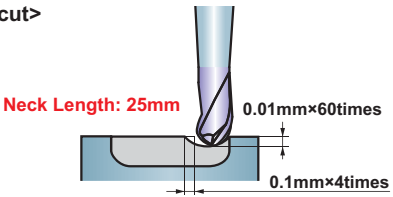
Comparison with conventional 2 flute end mill, VF-3XB shows high fracture resistance.

<Geometry>

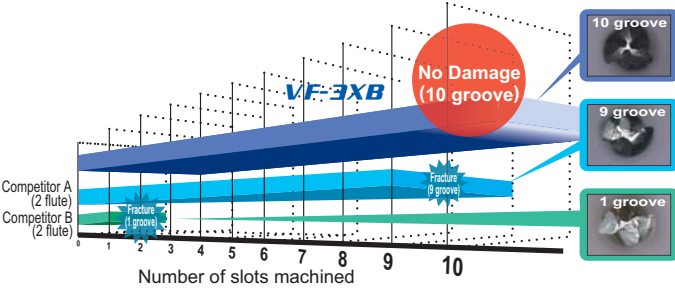


VF-3XB

<Depth of cut>



<Result>




End mill	VF-3XB R0.5 x 1.5° x 25
Workpiece	SKD61 (52HRC)
Revolution	13,000min ⁻¹ (40.8m/min)
Feed rate	1,500mm/min (0.038mm/t)
Machining method	Air blow

Hardened steel machining

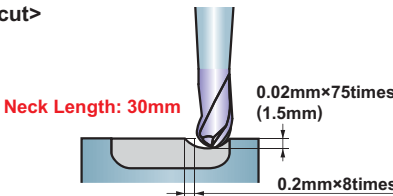
Feed rate increased by 60%.

<Geometry>



VF-3XB

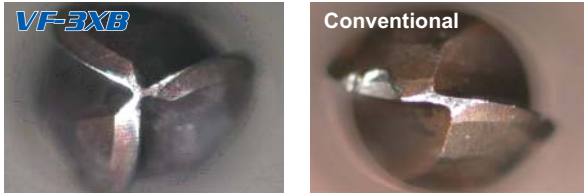
<Depth of cut>



<Result>

Previous feed rate: 1600mm/min

VF-3XB: 2,600mm/min




End mill	VF-3XB R1 x 0.9° x 30
Workpiece	SKD61 (52HRC)
Revolution	16,000min ⁻¹ (100m/min)
Feed rate	2,600mm/min (0.054mm/t)
Machining method	Coolant mist

Hardened steel machining

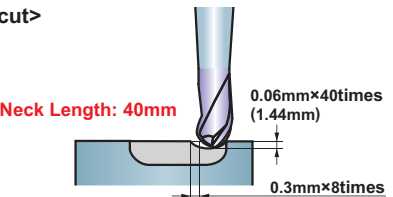
Feed rate increased by 50%.

<Geometry>



VF-3XB

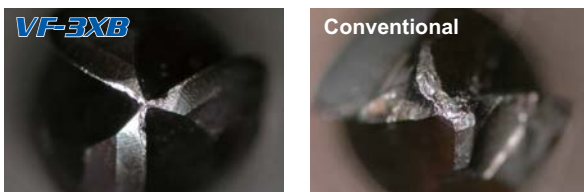
<Depth of cut>



<Result>

Previous feed rate: 2500mm/min

VF-3XB: 3,400mm/min




End mill	VF-3XB 1.5R x 0.9° x 40
Workpiece	SKD61(52HRC)
Revolution	14,000min ⁻¹ (131m/min)
Feed rate	3,400mm/min (0.08mm/t)
Machining method	Coolant mist

STAVAX (Copy turning)

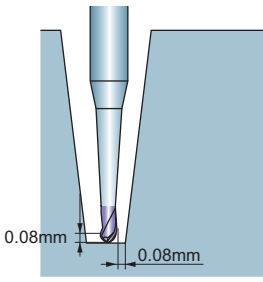
1) 30% increase in efficiency!
2) Surface finish improved and longer tool life.

<Geometry>



VF-3XB


<Depth of cut>
Machining the bottom of the slot.



0.08mm

0.08mm

<Result>




End mill	VF-3XB R1 x 1.5° x 25
Workpiece	STAVAX (40HRC)
Revolution	12,000min ⁻¹ (75m/min)
Feed rate	850mm/min (0.024mm/t)
Machining method	Climb cut, Non water soluble coolant

SKD61 (Rib processing)

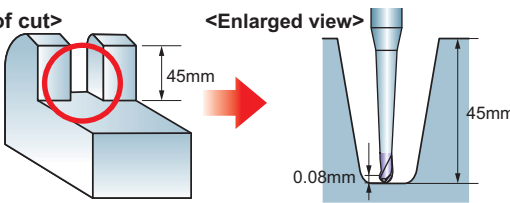
Conventional end mill: damage at the cutting edge
VF3XB : damage was reduced

<Geometry>



VF-3XB

<Depth of cut>




45mm

0.08mm

45mm

<Result>




End mill	VF-3XB R2 x 0.9° x 40
Workpiece	SKD61 (45HRC)
Revolution	10,000min ⁻¹ (MAX 125m/min)
Feed rate	Roughing: 2,000mm/min (0.067mm/t), Finishing: 720mm/min (0.024mm/t)
Machining method	Water soluble coolant

Side machining of hardened mould steels

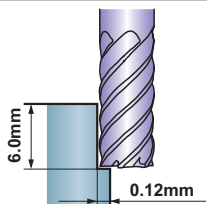
Excellent wear resistance without fracturing at the end cutting edge !

<Geometry>



VF-MD

<Depth of cut>




6.0mm

0.12mm


<Result>

VF-MD




Cutting length: 100m

Competitor A



Cutting length: 100m

Competitor B




Cutting length: 62m

End mill	VF-MD ø6
Workpiece	SKD11 (60HRC)
Revolution	8,000min ⁻¹ (151m/min)
Feed rate	2,160mm/min (0.045mm/t)
Machining method	Climb cut, Air blow

Machining of hardened mould steels

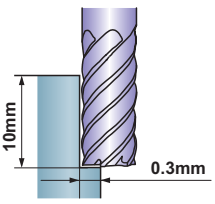
VF-MD : Stable cutting conditions and superior surface finish.
 Competitor: Not suitable for finishing due to excessive waviness of the machined surface. Chips were burnt.

<Geometry>

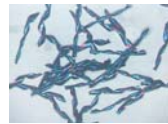
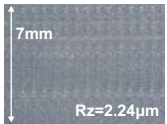

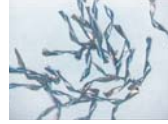

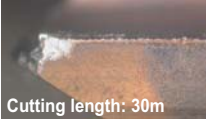


VF-MD

<Depth of cut>



<Result>

	Chips	Surface	Cutting edge
VF-MD		 7mm Rz=2.24µm	 Cutting length: 30m
Competitor		 Rz=4.76µm	 Cutting length: 30m

Rz=Maximum height of roughness

End mill	VF-MD ø10
Workpiece	SKD11 (60HRC)
Revolution	4,800min ⁻¹ (151m/min)
Feed rate	2,900mm/min (0.1mm/t)
Machining method	Climb cut, Air blow

Side machining of hardened mould steels

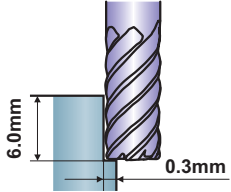
Excellent fracture and wear resistance.

<Geometry>

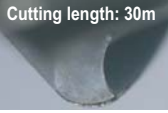


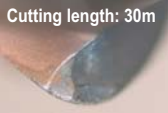




VF-MDRB

<Depth of cut>



<Result>


VF-MDRB	 Cutting length: 30m		
Competitor A	 Cutting length: 30m		
Competitor B	 Cutting length: 30m		

End mill	VF-MDRB ø6xR0.5
Workpiece	SKD11 (60HRC)
Revolution	8,000min ⁻¹ (151m/min)
Feed rate	2,400mm/min (0.05mm/t)
Machining method	Climb cut, Air blow

End face machining of hardened mould steels

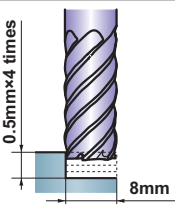
Stable machining with minimum tool wear and no corner breakage.

<Geometry>



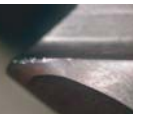
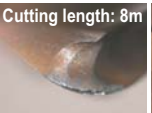







VF-MDRB

<Depth of cut>



<Result>

VF-MDRB	 Cutting length: 8m		
Competitor A	 Cutting length: 8m		
Competitor B	 Cutting length: 8m		

End mill	VF-MDRB ø10xR1
Workpiece	SKD11(60HRC)
Revolution	1,600min ⁻¹ (50m/min)
Feed rate	480mm/min (0.05mm/t)
Machining method	Climb cut, Air blow

From rough milling to finishing ! IMPACT MIRACLE end mill series for a wide range of workpiece materials !

Square Series

VF-5D
VF-MD

- Short and medium cutting lengths.
- 30 sizes available.
- Chip-resistant cutting edge and flute geometry.



Corner Radius Series

VF-5DRB
VF-MDRB

- Short and medium cutting lengths.
- 34 sizes available.
- Corner radius type for high efficiency machining.



Ball Nose Series

L = Neck length
D = End mill diameter

3 **5** **7** **10**

VF-255B (L/D ≤ 3) **VF-25B** (L/D = 2-5)

- Standard and short shank types available.
- Short shank type is suitable for shrink fit chucks.
- 48 sizes available for standard and short shank types.

VF-25DBL (L/D = 2-7)

- VF-25DB with long shank.

VF-25DB (L/D = 2-5)

- Improved chipping resistance.
- Excellent fracture resistance even with long overhang, high feeds and large depths of cut.
- High efficiency roughing and semi-roughing.

VF-2XLB (L/D = 3-10)

- Long neck type suitable for deep slotting.
- 198 sizes available.

VF-3XB (L/D ≥ 8)

- Taper neck type for stable deep slotting.
- Suitable for machining for depths over 2D.
- 89 different sizes covering R0.4-R2.5.

IMPACT MIRACLE Tooling Example

Workpiece: SKD61(HRC52) 80x80x70

- **Machining efficiency has been greatly improved even for hardened steels over 50HRC !**
- **Wide selection to cover a wide range of applications from rough to finish milling !**



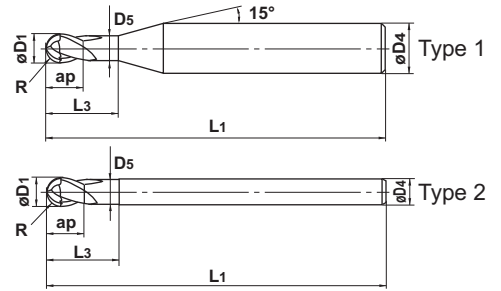
- 1 VF-MD**
Heavy roughing
- 2 VF-25DB**
Roughing
- 3 VF-25B**
Finishing
- 4 VF-3XB**
Deep slot
- 5 VF-MDRB**
Finishing

VF-2SSB

Ball nose, Short cut length, 2 flute, For hardened materials



● Suitable for shrink fit chucks.



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 Flute N	Stock	Type
VF2SSBR0050S04	0.5	1	1	2	0.94	40	4	2	●	1
R0050	0.5	1	1	2	0.94	40	6	2	●	1
R0075S04	0.75	1.5	1.5	3	1.44	40	4	2	●	1
R0075	0.75	1.5	1.5	3	1.44	40	6	2	●	1
R0100	1	2	2	4	1.9	45	6	2	●	1
R0150	1.5	3	3	6	2.9	45	6	2	●	1
R0200	2	4	4	8	3.9	45	6	2	●	1
R0250	2.5	5	5	10	4.9	50	6	2	●	1
R0300	3	6	6	12	5.85	50	6	2	●	2
R0400	4	8	8	14	7.85	60	8	2	●	2
R0500	5	10	10	18	9.7	70	10	2	●	2
R0600	6	12	12	22	11.7	75	12	2	●	2

● : Inventory maintained.

IMPACT MIRACLE END MILL

VF-25B

Ball nose, Short cut length, 2 flute, For hardened materials



$R \leq 6$ ± 0.005
 $6 < R$ ± 0.010



$D_1 \leq 12$ $0 - -0.01$
 $12 < D_1$ $0 - -0.02$



$R < 0.3$



$0.3 \leq R$

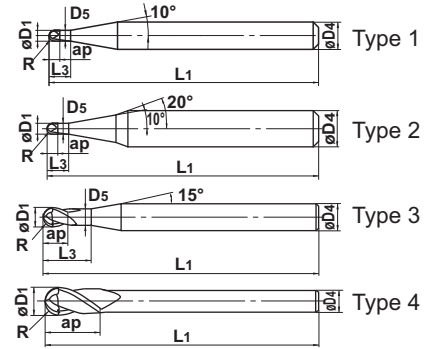


$R < 0.3$



$0.3 \leq R$

● 2 flute ball nose end mills with Impact Miracle coating for high hardness materials.



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 Flute N	Stock	Type
VF2SBR0010S04	0.1	0.2	0.2	0.4	0.17	45	4	2	●	1
R0010S06	0.1	0.2	0.2	0.4	0.17	50	6	2	●	2
R0015S04	0.15	0.3	0.3	0.6	0.27	45	4	2	●	1
R0015S06	0.15	0.3	0.3	0.6	0.27	50	6	2	●	2
R0020S04	0.2	0.4	0.4	0.8	0.36	45	4	2	●	1
R0020S06	0.2	0.4	0.4	0.8	0.36	50	6	2	●	2
R0030S04	0.3	0.6	0.6	1.2	0.56	45	4	2	●	3
R0030S06	0.3	0.6	0.6	1.2	0.56	50	6	2	●	3
R0040S04	0.4	0.8	0.8	1.6	0.76	45	4	2	●	3
R0040S06	0.4	0.8	0.8	1.6	0.76	50	6	2	●	3
R0050S04	0.5	1	1	2	0.94	45	4	2	●	3
R0050S06	0.5	1	1	2	0.94	50	6	2	●	3
R0060S04	0.6	1.2	1.2	2.4	1.14	45	4	2	●	3
R0060S06	0.6	1.2	1.2	2.4	1.14	50	6	2	●	3
R0070S04	0.7	1.4	1.4	2.8	1.34	45	4	2	●	3
R0070S06	0.7	1.4	1.4	2.8	1.34	50	6	2	●	3
R0075S04	0.75	1.5	1.5	3	1.44	45	4	2	●	3
R0075S06	0.75	1.5	1.5	3	1.44	50	6	2	●	3
R0080S04	0.8	1.6	1.6	3.2	1.54	45	4	2	●	3
R0080S06	0.8	1.6	1.6	3.2	1.54	50	6	2	●	3
R0090S04	0.9	1.8	1.8	3.6	1.74	45	4	2	●	3
R0090S06	0.9	1.8	1.8	3.6	1.74	50	6	2	●	3
R0100S04	1	2	2	4	1.9	50	4	2	●	3
R0100S06	1	2	2	4	1.9	60	6	2	●	3
R0125S06	1.25	2.5	2.5	5	2.4	60	6	2	●	3
R0150S03	1.5	3	3	—	—	60	3	2	●	4
R0150S06	1.5	3	3	6	2.9	70	6	2	●	3
R0200S04	2	4	4	—	—	60	4	2	●	4
R0200S06	2	4	4	8	3.9	70	6	2	●	3
R0250S06	2.5	5	5	10	4.9	80	6	2	●	3
R0300S06	3	6	12	—	—	80	6	2	●	4
R0400S08	4	8	14	—	—	90	8	2	●	4
R0500S10	5	10	18	—	—	100	10	2	●	4
R0600S12	6	12	22	—	—	110	12	2	●	4
R0800S16	8	16	30	—	—	140	16	2	●	4
R1000S20	10	20	38	—	—	160	20	2	●	4

VF-2XLB

Ball nose, Long cut length, 2 flute, For hardened materials



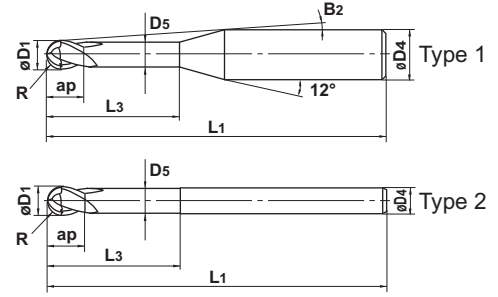
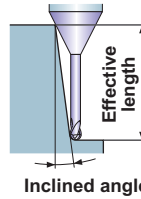
$R \leq 1$ ± 0.007
 $1 < R$ ± 0.010



$0 - 0.02$



Effective length
for inclined angle



- 2 flute long neck ball nose end mill with Impact Miracle coating for high hardened materials.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Cutting Edge to Shank Angle B2	Neck Dia D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective Length for Inclined Angle			
												30°	1°	2°	3°
VF2XLBR0010N005S04	0.1	0.2	0.16	0.5	11.2°	0.17	50	4	2	●	1	0.7	0.8	0.9	1.0
R0010N005S06	0.1	0.2	0.16	0.5	11.5°	0.17	50	6	2	●	1	0.7	0.8	0.9	1.0
R0010N008S04	0.1	0.2	0.16	0.75	10.9°	0.17	50	4	2	●	1	1.0	1.1	1.2	1.3
R0010N010S04	0.1	0.2	0.16	1	10.7°	0.17	50	4	2	●	1	1.3	1.3	1.5	1.6
R0010N010S06	0.1	0.2	0.16	1	11.1°	0.17	50	6	2	●	1	1.3	1.3	1.5	1.6
R0010N013S04	0.1	0.2	0.16	1.25	10.4°	0.17	50	4	2	●	1	1.5	1.6	1.8	1.9
R0010N015S04	0.1	0.2	0.16	1.5	10.2°	0.17	50	4	2	●	1	1.8	1.9	2.1	2.3
R0010N015S06	0.1	0.2	0.16	1.5	10.8°	0.17	50	6	2	●	1	1.8	1.9	2.1	2.3
R0010N018S04	0.1	0.2	0.16	1.75	10.0°	0.17	50	4	2	●	1	2.1	2.2	2.4	2.6
R0010N020S04	0.1	0.2	0.16	2	9.7°	0.17	50	4	2	●	1	2.3	2.4	2.7	2.9
R0010N025S04	0.1	0.2	0.16	2.5	9.3°	0.17	50	4	2	●	1	2.8	3.0	3.3	3.6
R0015N010S04	0.15	0.3	0.24	1	10.7°	0.27	50	4	2	●	1	1.3	1.3	1.5	1.6
R0015N010S06	0.15	0.3	0.24	1	11.1°	0.27	50	6	2	●	1	1.3	1.3	1.5	1.6
R0015N013S04	0.15	0.3	0.24	1.25	10.4°	0.27	50	4	2	●	1	1.5	1.6	1.8	1.9
R0015N015S04	0.15	0.3	0.24	1.5	10.2°	0.27	50	4	2	●	1	1.8	1.9	2.1	2.3
R0015N015S06	0.15	0.3	0.24	1.5	10.8°	0.27	50	6	2	●	1	1.8	1.9	2.1	2.3
R0015N018S04	0.15	0.3	0.24	1.75	10.0°	0.27	50	4	2	●	1	2.1	2.1	2.4	2.6
R0015N020S04	0.15	0.3	0.24	2	9.7°	0.27	50	4	2	●	1	2.3	2.4	2.7	2.9
R0015N020S06	0.15	0.3	0.24	2	10.4°	0.27	50	6	2	●	1	2.3	2.4	2.7	2.9
R0015N025S04	0.15	0.3	0.24	2.5	9.3°	0.27	50	4	2	●	1	2.8	3.0	3.2	3.6
R0015N030S04	0.15	0.3	0.24	3	8.9°	0.27	50	4	2	●	1	3.4	3.5	3.8	4.3
R0015N040S04	0.15	0.3	0.24	4	8.2°	0.27	50	4	2	●	1	4.4	4.6	5.0	5.6
R0020N010S04	0.2	0.4	0.32	1	10.7°	0.36	50	4	2	●	1	1.3	1.4	1.5	1.6
R0020N010S06	0.2	0.4	0.32	1	11.1°	0.36	50	6	2	●	1	1.3	1.4	1.5	1.6
R0020N015S04	0.2	0.4	0.32	1.5	10.2°	0.36	50	4	2	●	1	1.8	1.9	2.1	2.3
R0020N015S06	0.2	0.4	0.32	1.5	10.8°	0.36	50	6	2	●	1	1.8	1.9	2.1	2.3
R0020N020S04	0.2	0.4	0.32	2	9.7°	0.36	50	4	2	●	1	2.3	2.4	2.7	2.9
R0020N020S06	0.2	0.4	0.32	2	10.4°	0.36	50	6	2	●	1	2.3	2.4	2.7	2.9
R0020N025S04	0.2	0.4	0.32	2.5	9.3°	0.36	50	4	2	●	1	2.9	3.0	3.3	3.6
R0020N025S06	0.2	0.4	0.32	2.5	10.1°	0.36	50	6	2	●	1	2.9	3.0	3.3	3.6
R0020N030S04	0.2	0.4	0.32	3	8.9°	0.36	50	4	2	●	1	3.4	3.5	3.9	4.3
R0020N030S06	0.2	0.4	0.32	3	9.8°	0.36	50	6	2	●	1	3.4	3.5	3.9	4.3
R0020N040S04	0.2	0.4	0.32	4	8.2°	0.36	50	4	2	●	1	4.4	4.6	5.1	5.6
R0020N050S04	0.2	0.4	0.32	5	7.6°	0.36	50	4	2	●	1	5.5	5.7	6.3	6.9
R0025N015S04	0.25	0.5	0.4	1.5	10.2°	0.46	50	4	2	●	1	1.8	1.9	2.1	2.3
R0025N015S06	0.25	0.5	0.4	1.5	10.8°	0.46	50	6	2	●	1	1.8	1.9	2.1	2.3
R0025N020S04	0.25	0.5	0.4	2	9.7°	0.46	50	4	2	●	1	2.3	2.4	2.7	2.9
R0025N020S06	0.25	0.5	0.4	2	10.4°	0.46	50	6	2	●	1	2.3	2.4	2.7	2.9

IMPACT MIRACLE END MILL

VF-2XLB

Ball nose, Long cut length, 2 flute, For hardened materials



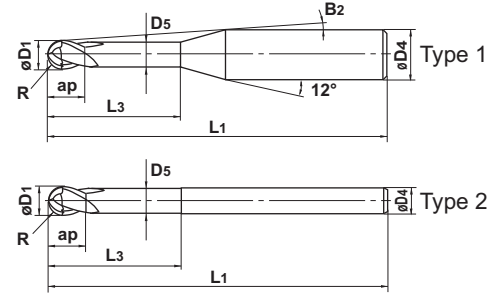
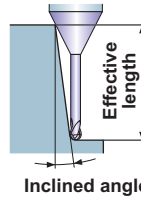
R ≤ 1 ±0.007
1 < R ±0.010



0 - -0.02



Effective length for inclined angle



- 2 flute long neck ball nose end mill with Impact Miracle coating for high hardened materials.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Cutting Edge to Shank Angle B2	Neck Dia D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective Length for Inclined Angle			
												30°	1°	2°	3°
VF2XLBR0025N025S04	0.25	0.5	0.4	2.5	9.2°	0.46	50	4	2	●	1	2.9	3.0	3.3	3.6
R0025N030S04	0.25	0.5	0.4	3	8.8°	0.46	50	4	2	●	1	3.4	3.5	3.9	4.3
R0025N030S06	0.25	0.5	0.4	3	9.8°	0.46	50	6	2	●	1	3.4	3.5	3.9	4.3
R0025N035S04	0.25	0.5	0.4	3.5	8.5°	0.46	50	4	2	●	1	3.9	4.1	4.5	4.9
R0025N040S04	0.25	0.5	0.4	4	8.1°	0.46	50	4	2	●	1	4.4	4.6	5.1	5.6
R0025N040S06	0.25	0.5	0.4	4	9.2°	0.46	50	6	2	●	1	4.4	4.6	5.1	5.6
R0025N050S04	0.25	0.5	0.4	5	7.5°	0.46	50	4	2	●	1	5.5	5.7	6.2	6.9
R0025N050S06	0.25	0.5	0.4	5	8.7°	0.46	50	6	2	●	1	5.5	5.7	6.2	6.9
R0025N060S04	0.25	0.5	0.4	6	7.0°	0.46	50	4	2	●	1	6.5	6.8	7.4	8.2
R0025N060S06	0.25	0.5	0.4	6	8.3°	0.46	60	6	2	●	1	6.5	6.8	7.4	8.2
R0030N020S04	0.3	0.6	0.48	2	9.6°	0.56	50	4	2	●	1	2.4	2.5	2.8	3.1
R0030N020S06	0.3	0.6	0.48	2	10.4°	0.56	50	6	2	●	1	2.4	2.5	2.8	3.1
R0030N025S04	0.3	0.6	0.48	2.5	9.1°	0.56	50	4	2	●	1	3.0	3.1	3.4	3.7
R0030N030S04	0.3	0.6	0.48	3	8.7°	0.56	50	4	2	●	1	3.5	3.6	4.0	4.4
R0030N030S06	0.3	0.6	0.48	3	9.7°	0.56	50	6	2	●	1	3.5	3.6	4.0	4.4
R0030N035S04	0.3	0.6	0.48	3.5	8.4°	0.56	50	4	2	●	1	4.0	4.2	4.6	5.0
R0030N040S04	0.3	0.6	0.48	4	8.0°	0.56	50	4	2	●	1	4.5	4.7	5.2	5.7
R0030N040S06	0.3	0.6	0.48	4	9.2°	0.56	50	6	2	●	1	4.5	4.7	5.2	5.7
R0030N050S04	0.3	0.6	0.48	5	7.4°	0.56	50	4	2	●	1	5.6	5.8	6.4	7.0
R0030N050S06	0.3	0.6	0.48	5	8.7°	0.56	50	6	2	●	1	5.6	5.8	6.4	7.0
R0030N060S04	0.3	0.6	0.48	6	6.9°	0.56	50	4	2	●	1	6.6	6.9	7.6	8.4
R0030N060S06	0.3	0.6	0.48	6	8.2°	0.56	50	6	2	●	1	6.6	6.9	7.6	8.4
R0030N070S04	0.3	0.6	0.48	7	6.5°	0.56	50	4	2	●	1	7.7	8.0	8.8	9.7
R0030N080S04	0.3	0.6	0.48	8	6.1°	0.56	50	4	2	●	1	8.7	9.1	10.0	11.0
R0030N080S06	0.3	0.6	0.48	8	7.4°	0.56	60	6	2	●	1	8.7	9.1	10.0	11.0
R0040N020S04	0.4	0.8	0.64	2	9.5°	0.76	50	4	2	●	1	2.4	2.5	2.8	3.0
R0040N020S06	0.4	0.8	0.64	2	10.4°	0.76	50	6	2	●	1	2.4	2.5	2.8	3.0
R0040N030S04	0.4	0.8	0.64	3	8.7°	0.76	50	4	2	●	1	3.5	3.6	4.0	4.3
R0040N030S06	0.4	0.8	0.64	3	9.7°	0.76	50	6	2	●	1	3.5	3.6	4.0	4.3
R0040N040S04	0.4	0.8	0.64	4	7.9°	0.76	50	4	2	●	1	4.5	4.7	5.1	5.7
R0040N040S06	0.4	0.8	0.64	4	9.1°	0.76	50	6	2	●	1	4.5	4.7	5.1	5.7
R0040N050S04	0.4	0.8	0.64	5	7.3°	0.76	50	4	2	●	1	5.6	5.8	6.3	7.0
R0040N060S04	0.4	0.8	0.64	6	6.8°	0.76	50	4	2	●	1	6.6	6.9	7.5	8.3
R0040N060S06	0.4	0.8	0.64	6	8.1°	0.76	50	6	2	●	1	6.6	6.9	7.5	8.3
R0040N070S04	0.4	0.8	0.64	7	6.3°	0.76	50	4	2	●	1	7.7	8.0	8.7	9.7
R0040N080S04	0.4	0.8	0.64	8	5.9°	0.76	50	4	2	●	1	8.7	9.1	9.9	11.0
R0040N080S06	0.4	0.8	0.64	8	7.4°	0.76	50	6	2	●	1	8.7	9.1	9.9	11.0
R0040N100S04	0.4	0.8	0.64	10	5.3°	0.76	50	4	2	●	1	10.8	11.3	12.3	13.6

● : Inventory maintained.

Order Number	Radius of Ball Nose	Dia.	Length of Cut	Neck Length	Cutting Edge to Shank Angle	Neck Dia	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective Length for Inclined Angle			
	R	D1	ap	L3	B2	D5	L1	D4	N			30°	1°	2°	3°
VF2XLBR0040N100S06	0.4	0.8	0.64	10	6.7°	0.76	60	6	2	●	1	10.8	11.3	12.3	13.6
R0050N030S04	0.5	1	0.8	3	8.3°	0.94	50	4	2	●	1	3.8	4.0	4.4	4.8
R0050N030S06	0.5	1	0.8	3	9.5°	0.94	50	6	2	●	1	3.8	4.0	4.4	4.8
R0050N040S04	0.5	1	0.8	4	7.6°	0.94	50	4	2	●	1	4.9	5.1	5.6	6.1
R0050N040S06	0.5	1	0.8	4	8.9°	0.94	50	6	2	●	1	4.9	5.1	5.6	6.1
R0050N050S04	0.5	1	0.8	5	7.0°	0.94	50	4	2	●	1	5.9	6.2	6.8	7.5
R0050N050S06	0.5	1	0.8	5	8.4°	0.94	50	6	2	●	1	5.9	6.2	6.8	7.5
R0050N060S04	0.5	1	0.8	6	6.5°	0.94	50	4	2	●	1	7.0	7.3	8.0	8.8
R0050N060S06	0.5	1	0.8	6	7.9°	0.94	50	6	2	●	1	7.0	7.3	8.0	8.8
R0050N070S04	0.5	1	0.8	7	6.0°	0.94	50	4	2	●	1	8.0	8.4	9.2	10.1
R0050N080S04	0.5	1	0.8	8	5.6°	0.94	50	4	2	●	1	9.1	9.5	10.3	11.4
R0050N080S06	0.5	1	0.8	8	7.2°	0.94	50	6	2	●	1	9.1	9.5	10.3	11.4
R0050N090S04	0.5	1	0.8	9	5.3°	0.94	50	4	2	●	1	10.1	10.6	11.5	12.8
R0050N100S04	0.5	1	0.8	10	5.0°	0.94	50	4	2	●	1	11.2	11.6	12.7	14.1
R0050N100S06	0.5	1	0.8	10	6.5°	0.94	50	6	2	●	1	11.2	11.6	12.7	14.1
R0050N120S04	0.5	1	0.8	12	4.5°	0.94	50	4	2	●	1	13.2	13.8	15.1	16.7
R0050N120S06	0.5	1	0.8	12	6.0°	0.94	60	6	2	●	1	13.2	13.8	15.1	16.7
R0050N140S04	0.5	1	0.8	14	4.1°	0.94	60	4	2	●	1	15.3	16.0	17.5	19.4
R0050N160S04	0.5	1	0.8	16	3.7°	0.94	60	4	2	●	1	17.4	18.2	19.9	22.1
R0050N160S06	0.5	1	0.8	16	5.1°	0.94	70	6	2	●	1	17.4	18.2	19.9	22.1
R0050N180S04	0.5	1	0.8	18	3.4°	0.94	60	4	2	●	1	19.5	20.4	22.3	24.7
R0050N200S04	0.5	1	0.8	20	3.2°	0.94	60	4	2	●	1	21.6	22.5	24.7	27.4
R0050N200S06	0.5	1	0.8	20	4.5°	0.94	70	6	2	●	1	21.6	22.5	24.7	27.4
R0060N060S04	0.6	1.2	0.96	6	6.3°	1.14	50	4	2	●	1	7.0	7.3	7.9	8.7
R0060N060S06	0.6	1.2	0.96	6	7.9°	1.14	50	6	2	●	1	7.0	7.3	7.9	8.7
R0060N080S04	0.6	1.2	0.96	8	5.5°	1.14	50	4	2	●	1	9.1	9.5	10.3	11.4
R0060N080S06	0.6	1.2	0.96	8	7.1°	1.14	50	6	2	●	1	9.1	9.5	10.3	11.4
R0060N100S04	0.6	1.2	0.96	10	4.8°	1.14	50	4	2	●	1	11.2	11.6	12.7	14.1
R0060N100S06	0.6	1.2	0.96	10	6.4°	1.14	50	6	2	●	1	11.2	11.6	12.7	14.1
R0060N120S04	0.6	1.2	0.96	12	4.3°	1.14	50	4	2	●	1	13.2	13.8	15.1	16.7
R0060N120S06	0.6	1.2	0.96	12	5.9°	1.14	50	6	2	●	1	13.2	13.8	15.1	16.7
R0060N140S04	0.6	1.2	0.96	14	3.9°	1.14	60	4	2	●	1	15.3	16.0	17.5	19.4
R0060N160S04	0.6	1.2	0.96	16	3.6°	1.14	60	4	2	●	1	17.4	18.2	19.9	22.0
R0060N160S06	0.6	1.2	0.96	16	5.0°	1.14	70	6	2	●	1	17.4	18.2	19.9	22.0
R0070N080S04	0.7	1.4	1.12	8	5.3°	1.34	50	4	2	●	1	9.1	9.4	10.3	11.4
R0070N120S04	0.7	1.4	1.12	12	4.1°	1.34	50	4	2	●	1	13.2	13.8	15.1	16.7
R0070N160S04	0.7	1.4	1.12	16	3.4°	1.34	60	4	2	●	1	17.4	18.2	19.9	22.0
R0075N060S04	0.75	1.5	1.2	6	6.0°	1.44	50	4	2	●	1	7.0	7.3	7.9	8.7
R0075N060S06	0.75	1.5	1.2	6	7.7°	1.44	50	6	2	●	1	7.0	7.3	7.9	8.7
R0075N080S04	0.75	1.5	1.2	8	5.2°	1.44	50	4	2	●	1	9.1	9.4	10.3	11.4
R0075N080S06	0.75	1.5	1.2	8	6.9°	1.44	50	6	2	●	1	9.1	9.4	10.3	11.4
R0075N100S04	0.75	1.5	1.2	10	4.5°	1.44	50	4	2	●	1	11.1	11.6	12.7	14.0
R0075N100S06	0.75	1.5	1.2	10	6.3°	1.44	50	6	2	●	1	11.1	11.6	12.7	14.0
R0075N120S04	0.75	1.5	1.2	12	4.0°	1.44	50	4	2	●	1	13.2	13.8	15.1	16.7
R0075N120S06	0.75	1.5	1.2	12	5.7°	1.44	50	6	2	●	1	13.2	13.8	15.1	16.7
R0075N140S04	0.75	1.5	1.2	14	3.6°	1.44	50	4	2	●	1	15.3	16.0	17.5	19.3
R0075N140S06	0.75	1.5	1.2	14	5.3°	1.44	50	6	2	●	1	15.3	16.0	17.5	19.3
R0075N160S04	0.75	1.5	1.2	16	3.3°	1.44	60	4	2	●	1	17.4	18.2	19.9	22.0

IMPACT MIRACLE END MILL

VF-2XLB

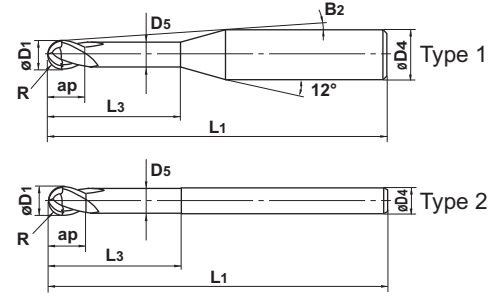
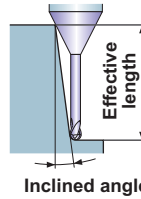
Ball nose, Long cut length, 2 flute, For hardened materials

$R \leq 1$ ± 0.007
 $1 < R$ ± 0.010

$0 - -0.02$



Effective length for inclined angle



- 2 flute long neck ball nose end mill with Impact Miracle coating for high hardened materials.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Cutting Edge to Shank Angle B2	Neck Dia D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective Length for Inclined Angle			
												30°	1°	2°	3°
VF2XLBR0075N160S06	0.75	1.5	1.2	16	4.9°	1.44	60	6	2	●	1	17.4	18.2	19.9	22.0
R0075N180S04	0.75	1.5	1.2	18	3.0°	1.44	60	4	2	●	1	19.5	20.3	22.3	24.6
R0075N200S04	0.75	1.5	1.2	20	2.8°	1.44	60	4	2	●	1	21.6	22.5	24.7	No interference
R0075N200S06	0.75	1.5	1.2	20	4.3°	1.44	70	6	2	●	1	21.6	22.5	24.7	27.3
R0080N080S04	0.8	1.6	1.28	8	5.1°	1.54	50	4	2	●	1	9.1	9.4	10.3	11.3
R0080N120S04	0.8	1.6	1.28	12	3.9°	1.54	50	4	2	●	1	13.2	13.8	15.1	16.6
R0080N160S04	0.8	1.6	1.28	16	3.2°	1.54	60	4	2	●	1	17.4	18.2	19.9	22.0
R0080N200S04	0.8	1.6	1.28	20	2.7°	1.54	60	4	2	●	1	21.6	22.5	24.7	No interference
R0090N080S04	0.9	1.8	1.44	8	4.9°	1.74	50	4	2	●	1	9.0	9.4	10.3	11.3
R0090N120S04	0.9	1.8	1.44	12	3.7°	1.74	50	4	2	●	1	13.2	13.8	15.1	16.6
R0090N160S04	0.9	1.8	1.44	16	3.0°	1.74	60	4	2	●	1	17.4	18.1	19.8	No interference
R0090N200S04	0.9	1.8	1.44	20	2.6°	1.74	60	4	2	●	1	21.6	22.5	24.6	No interference
R0100N060S04	1	2	1.6	6	5.4°	1.9	50	4	2	●	1	7.1	7.3	8.0	8.7
R0100N060S06	1	2	1.6	6	7.5°	1.9	50	6	2	●	1	7.1	7.3	8.0	8.7
R0100N080S04	1	2	1.6	8	4.6°	1.9	50	4	2	●	1	9.2	9.5	10.4	11.4
R0100N080S06	1	2	1.6	8	6.6°	1.9	50	6	2	●	1	9.2	9.5	10.4	11.4
R0100N100S04	1	2	1.6	10	4.0°	1.9	50	4	2	●	1	11.2	11.7	12.8	14.1
R0100N100S06	1	2	1.6	10	6.0°	1.9	50	6	2	●	1	11.2	11.7	12.8	14.1
R0100N120S04	1	2	1.6	12	3.5°	1.9	50	4	2	●	1	13.3	13.9	15.2	16.7
R0100N120S06	1	2	1.6	12	5.4°	1.9	50	6	2	●	1	13.3	13.9	15.2	16.7
R0100N140S04	1	2	1.6	14	3.1°	1.9	50	4	2	●	1	15.4	16.1	17.5	19.4
R0100N140S06	1	2	1.6	14	5.0°	1.9	50	6	2	●	1	15.4	16.1	17.5	19.4
R0100N160S04	1	2	1.6	16	2.8°	1.9	60	4	2	●	1	17.5	18.2	19.9	No interference
R0100N160S06	1	2	1.6	16	4.6°	1.9	60	6	2	●	1	17.5	18.2	19.9	22.0
R0100N180S04	1	2	1.6	18	2.6°	1.9	60	4	2	●	1	19.6	20.4	22.3	No interference
R0100N180S06	1	2	1.6	18	4.2°	1.9	60	6	2	●	1	19.6	20.4	22.3	24.7
R0100N200S04	1	2	1.6	20	2.4°	1.9	60	4	2	●	1	21.7	22.6	24.7	No interference
R0100N200S06	1	2	1.6	20	4.0°	1.9	60	6	2	●	1	21.7	22.6	24.7	27.3
R0100N220S04	1	2	1.6	22	2.2°	1.9	60	4	2	●	1	23.8	24.8	27.1	No interference
R0100N250S04	1	2	1.6	25	2.0°	1.9	70	4	2	●	1	26.9	28.0	No interference	No interference
R0100N250S06	1	2	1.6	25	3.4°	1.9	70	6	2	●	1	26.9	28.0	30.7	34.0
R0100N300S04	1	2	1.6	30	1.7°	1.9	70	4	2	●	1	32.1	33.5	No interference	No interference
R0100N300S06	1	2	1.6	30	3.0°	1.9	80	6	2	●	1	32.1	33.5	36.7	No interference
R0100N350S04	1	2	1.6	35	1.5°	1.9	80	4	2	●	1	37.3	38.9	No interference	No interference
R0125N100S06	1.25	2.5	2	10	5.6°	2.4	60	6	2	●	1	11.2	11.7	12.7	14.0
R0125N150S06	1.25	2.5	2	15	4.4°	2.4	60	6	2	●	1	16.4	17.1	18.7	20.6
R0125N200S06	1.25	2.5	2	20	3.6°	2.4	70	6	2	●	1	21.7	22.6	24.7	27.2
R0125N250S06	1.25	2.5	2	25	3.1°	2.4	70	6	2	●	1	26.9	28.0	30.7	33.9

● : Inventory maintained.

Order Number	Radius of Ball Nose	Dia.	Length of Cut	Neck Length	Cutting Edge to Shank Angle	Neck Dia	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective Length for Inclined Angle			
	R	D1	ap	L3	B2	D5	L1	D4	N			30°	1°	2°	3°
VF2XLBR0125N300S06	1.25	2.5	2	30	2.7°	2.4	80	6	2	●	1	32.1	33.5	36.6	No interference
R0125N350S06	1.25	2.5	2	35	2.4°	2.4	80	6	2	●	1	37.3	38.9	42.6	No interference
R0150N080S06	1.5	3	2.4	8	6.0°	2.9	60	6	2	●	1	9.1	9.5	10.3	11.2
R0150N100S06	1.5	3	2.4	10	5.2°	2.9	60	6	2	●	1	11.2	11.7	12.7	13.9
R0150N120S06	1.5	3	2.4	12	4.7°	2.9	60	6	2	●	1	13.3	13.8	15.1	16.5
R0150N140S06	1.5	3	2.4	14	4.2°	2.9	60	6	2	●	1	15.4	16.0	17.4	19.2
R0150N160S06	1.5	3	2.4	16	3.9°	2.9	60	6	2	●	1	17.5	18.2	19.8	21.9
R0150N200S06	1.5	3	2.4	20	3.3°	2.9	70	6	2	●	1	21.6	22.5	24.6	27.2
R0150N250S06	1.5	3	2.4	25	2.8°	2.9	70	6	2	●	1	26.9	28.0	30.6	No interference
R0150N300S06	1.5	3	2.4	30	2.4°	2.9	70	6	2	●	1	32.1	33.4	36.6	No interference
R0150N350S06	1.5	3	2.4	35	2.1°	2.9	80	6	2	●	1	37.3	38.9	42.6	No interference
R0150N400S06	1.5	3	2.4	40	1.9°	2.9	90	6	2	●	1	42.5	44.3		No interference
R0175N160S06	1.75	3.5	2.8	16	3.4°	3.4	60	6	2	●	1	17.5	18.2	19.8	21.8
R0175N200S06	1.75	3.5	2.8	20	2.9°	3.4	70	6	2	●	1	21.6	22.5	24.6	No interference
R0175N250S06	1.75	3.5	2.8	25	2.4°	3.4	70	6	2	●	1	26.8	28.0	30.6	No interference
R0175N300S06	1.75	3.5	2.8	30	2.1°	3.4	80	6	2	●	1	32.1	33.4	36.5	No interference
R0175N350S06	1.75	3.5	2.8	35	1.8°	3.4	80	6	2	●	1	37.3	38.9		No interference
R0175N400S06	1.75	3.5	2.8	40	1.6°	3.4	90	6	2	●	1	42.5	44.3		No interference
R0200N100S06	2	4	3.2	10	4.2°	3.9	70	6	2	●	1	11.2	11.6	12.6	13.7
R0200N120S06	2	4	3.2	12	3.7°	3.9	70	6	2	●	1	13.3	13.8	15.0	16.4
R0200N140S06	2	4	3.2	14	3.3°	3.9	70	6	2	●	1	15.4	16.0	17.4	19.0
R0200N160S06	2	4	3.2	16	3.0°	3.9	70	6	2	●	1	17.5	18.1	19.7	No interference
R0200N200S06	2	4	3.2	20	2.5°	3.9	70	6	2	●	1	21.6	22.5	24.5	No interference
R0200N250S06	2	4	3.2	25	2.1°	3.9	70	6	2	●	1	26.8	28.0	30.5	No interference
R0200N300S06	2	4	3.2	30	1.8°	3.9	70	6	2	●	1	32.1	33.4	No interference	No interference
R0200N350S06	2	4	3.2	35	1.5°	3.9	80	6	2	●	1	37.3	38.8	No interference	No interference
R0200N400S06	2	4	3.2	40	1.4°	3.9	90	6	2	●	1	42.5	44.3	No interference	No interference
R0200N450S06	2	4	3.2	45	1.2°	3.9	90	6	2	●	1	47.7	49.7	No interference	No interference
R0200N500S06	2	4	3.2	50	1.1°	3.9	100	6	2	●	1	52.9	55.2	No interference	No interference
R0250N200S06	2.5	5	4	20	1.4°	4.9	70	6	2	●	1	21.6	22.5	No interference	No interference
R0250N250S06	2.5	5	4	25	1.2°	4.9	70	6	2	●	1	26.8	27.9	No interference	No interference
R0250N300S06	2.5	5	4	30	1.0°	4.9	80	6	2	●	1	32.0	No interference	No interference	No interference
R0250N350S06	2.5	5	4	35	0.9°	4.9	80	6	2	●	1	37.2	No interference	No interference	No interference
R0300N300S06	3	6	4.8	30	0.0°	5.85	80	6	2	●	2	No interference	No interference	No interference	No interference
R0300N400S06	3	6	4.8	40	0.0°	5.85	90	6	2	●	2	No interference	No interference	No interference	No interference
R0300N500S06	3	6	4.8	50	0.0°	5.85	100	6	2	●	2	No interference	No interference	No interference	No interference

IMPACT MIRACLE END MILL

VF-25DB

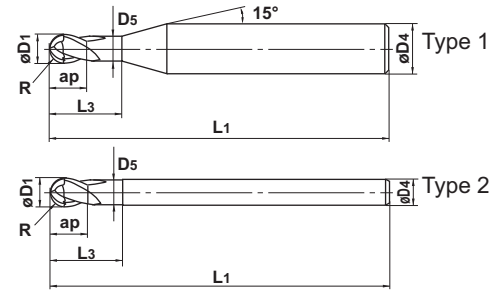
Ball nose, Short cut length, 2 flute, Strong geometry type



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



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



- 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 Flute 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

Ball nose, Short cut length, 2 flute, Strong geometry type, Long shank



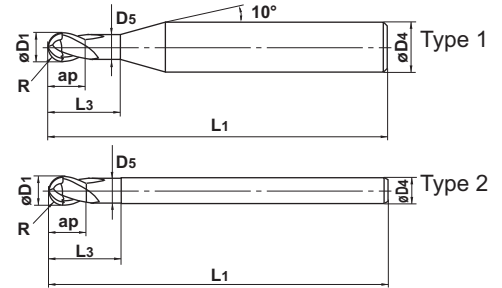
$R \leq 6.5$ ± 0.01
 $6.5 < R$ ± 0.02



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



● VF-2SDB with long shank.



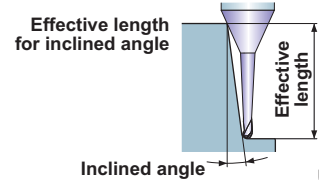
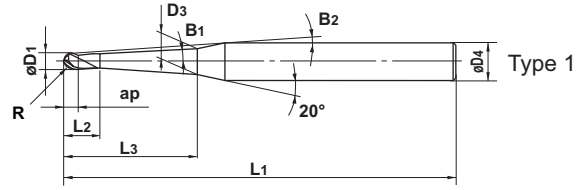
Unit : mm

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 Flute N	Stock	Type
VF2SDBLR0050	0.5	1	1	2	0.94	60	6	2	●	1
R0100	1	2	2	4	1.9	80	6	2	●	1
R0150	1.5	3	3	6	2.9	90	6	2	●	1
R0200	2	4	4	8	3.9	90	6	2	●	1
R0250	2.5	5	5	10	4.9	110	8	2	●	1
R0300	3	6	12	22	5.85	120	6	2	●	2
R0400	4	8	14	27	7.85	130	8	2	●	2
R0500	5	10	18	31	9.7	140	10	2	●	2
R0600	6	12	22	35	11.7	140	12	2	●	2
R0800	8	16	30	50	15.5	200	16	2	●	2
R1000	10	20	38	58	19.5	200	20	2	●	2

IMPACT MIRACLE END MILL

VF-3XB

Ball nose, 3 flute, Taper neck, For hardened materials



Inclined angle Unit : mm

● 3 flute ball end mill, high rigidity taper neck type.

Order Number	Radius of Ball Nose R	Dia. D1	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Length of Straight Neck L2	Cutting Edge to Shank Angle B2	Neck Dia. D3	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective Length for Inclined Angle			
														30°	1°	2°	3°
VF3XBR0040T0024L006	0.4	0.8	0.4°	0.5	6	1.5	8.9°	0.82	60	4	3	●	1	6.3	6.6	6.9	7.3
R0040T0024L008	0.4	0.8	0.4°	0.5	8	1.5	7.5°	0.85	60	4	3	●	1	8.4	8.6	9.1	9.5
R0040T0024L012	0.4	0.8	0.4°	0.5	12	1.5	5.7°	0.91	60	4	3	●	1	12.4	12.7	13.4	14.1
R0040T0054L008	0.4	0.8	0.9°	0.5	8	1.5	7.6°	0.96	60	4	3	●	1	—	8.4	8.9	9.3
R0040T0054L012	0.4	0.8	0.9°	0.5	12	1.5	5.8°	1.09	60	4	3	●	1	—	12.4	13.1	13.8
R0040T0054L016	0.4	0.8	0.9°	0.5	16	1.5	4.7°	1.22	60	4	3	●	1	—	16.5	17.3	18.3
R0050T0024L008	0.5	1	0.4°	0.8	8	2.3	9.6°	1.02	60	6	3	●	1	8.5	8.8	9.3	9.8
R0050T0024L010	0.5	1	0.4°	0.8	10	2.3	8.5°	1.05	60	6	3	●	1	10.5	10.9	11.4	12.1
R0050T0024L012	0.5	1	0.4°	0.8	12	2.3	7.6°	1.08	60	6	3	●	1	12.6	13.0	13.6	14.4
R0050T0024L016	0.5	1	0.4°	0.8	16	2.3	6.3°	1.13	70	6	3	●	1	16.6	17.1	18.0	18.9
R0050T0024L020	0.5	1	0.4°	0.8	20	2.3	5.4°	1.19	70	6	3	●	1	20.6	21.2	22.3	23.5
R0050T0024L025	0.5	1	0.4°	0.8	25	2.3	4.6°	1.26	70	6	3	●	1	25.7	26.3	27.7	29.3
R0050T0024L030	0.5	1	0.4°	0.8	30	2.3	4.0°	1.33	80	6	3	●	1	30.7	31.5	33.1	35.0
R0050T0024L035	0.5	1	0.4°	0.8	35	2.3	3.5°	1.40	80	6	3	●	1	35.7	36.6	38.6	40.7
R0050T0054L008	0.5	1	0.9°	0.8	8	2.3	9.7°	1.12	60	6	3	●	1	—	8.6	9.1	9.6
R0050T0054L012	0.5	1	0.9°	0.8	12	2.3	7.7°	1.24	60	6	3	●	1	—	12.6	13.3	14.1
R0050T0054L016	0.5	1	0.9°	0.8	16	2.3	6.4°	1.37	70	6	3	●	1	—	16.7	17.6	18.5
R0050T0054L020	0.5	1	0.9°	0.8	20	2.3	5.5°	1.50	70	6	3	●	1	—	20.7	21.8	23.0
R0050T0054L025	0.5	1	0.9°	0.8	25	2.3	4.7°	1.65	70	6	3	●	1	—	25.7	27.1	28.6
R0050T0054L030	0.5	1	0.9°	0.8	30	2.3	4.0°	1.81	80	6	3	●	1	—	30.8	32.4	34.2
R0050T0054L035	0.5	1	0.9°	0.8	35	2.3	3.6°	1.97	80	6	3	●	1	—	35.8	37.7	39.8
R0050T0054L040	0.5	1	0.9°	0.8	40	2.3	3.2°	2.12	80	6	3	●	1	—	40.8	43.0	45.4
R0050T0054L050	0.5	1	0.9°	0.8	50	2.3	2.7°	2.44	110	6	3	●	1	—	50.9	53.6	No interference
R0050T0054L060	0.5	1	0.9°	0.8	60	2.3	2.3°	2.75	110	6	3	●	1	—	60.9	64.1	No interference
R0050T0054L070	0.5	1	0.9°	0.8	70	2.3	2.0°	3.07	110	6	3	●	1	—	71.0	74.7	No interference
R0050T0130L012	0.5	1	1.5°	0.8	12	2.3	7.9°	1.45	60	6	3	●	1	—	—	13.0	13.7
R0050T0130L016	0.5	1	1.5°	0.8	16	2.3	6.5°	1.66	70	6	3	●	1	—	—	17.1	18.0
R0050T0130L020	0.5	1	1.5°	0.8	20	2.3	5.6°	1.87	70	6	3	●	1	—	—	21.2	22.4
R0050T0130L025	0.5	1	1.5°	0.8	25	2.3	4.8°	2.13	70	6	3	●	1	—	—	26.3	27.8
R0050T0130L030	0.5	1	1.5°	0.8	30	2.3	4.1°	2.39	80	6	3	●	1	—	—	31.5	33.2
R0050T0130L035	0.5	1	1.5°	0.8	35	2.3	3.7°	2.65	80	6	3	●	1	—	—	36.6	38.6
R0075T0024L010	0.75	1.5	0.4°	1.3	10	2.8	8.1°	1.54	60	6	3	●	1	10.6	10.9	11.4	12.0
R0075T0024L015	0.75	1.5	0.4°	1.3	15	2.8	6.2°	1.61	60	6	3	●	1	15.6	16.0	16.9	17.8
R0075T0024L020	0.75	1.5	0.4°	1.3	20	2.8	5.0°	1.68	70	6	3	●	1	20.6	21.2	22.3	23.5
R0075T0024L030	0.75	1.5	0.4°	1.3	30	2.8	3.7°	1.82	80	6	3	●	1	30.7	31.5	33.1	35.0
R0075T0054L015	0.75	1.5	0.9°	1.3	15	2.8	6.3°	1.82	60	6	3	●	1	—	15.7	16.5	17.4
R0075T0054L020	0.75	1.5	0.9°	1.3	20	2.8	5.1°	1.98	70	6	3	●	1	—	20.7	21.8	23.0
R0075T0054L030	0.75	1.5	0.9°	1.3	30	2.8	3.7°	2.29	80	6	3	●	1	—	30.8	32.4	34.2

● : Inventory maintained.

Order Number	Radius of Ball Nose	Dia.	Taper Angle One Side	Length of Cut	Neck Length	Length of Straight Neck	Cutting Edge to Shank Angle	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective Length for Inclined Angle			
	R	D1	B1	ap	L3	L2	B2	D3	L1	D4	N			30°	1°	2°	3°
VF3XBR0075T0054L040	0.75	1.5	0.9°	1.3	40	2.8	3.0°	2.61	80	6	3	●	1	—	40.8	43.0	45.3
R0075T0130L015	0.75	1.5	1.5°	1.3	15	2.8	6.4°	2.08	60	6	3	●	1	—	—	16.1	17.0
R0075T0130L020	0.75	1.5	1.5°	1.3	20	2.8	5.2°	2.34	70	6	3	●	1	—	—	21.2	22.4
R0075T0130L030	0.75	1.5	1.5°	1.3	30	2.8	3.8°	2.86	80	6	3	●	1	—	—	31.5	33.2
R0100T0024L016	1	2	0.4°	1.6	16	3.6	5.5°	2.07	70	6	3	●	1	16.7	17.1	18.0	19.0
R0100T0024L020	1	2	0.4°	1.6	20	3.6	4.6°	2.13	70	6	3	●	1	20.7	21.3	22.3	23.5
R0100T0024L025	1	2	0.4°	1.6	25	3.6	3.9°	2.20	70	6	3	●	1	25.8	26.4	27.8	29.3
R0100T0024L030	1	2	0.4°	1.6	30	3.6	3.4°	2.27	80	6	3	●	1	30.8	31.6	33.2	35.0
R0100T0024L035	1	2	0.4°	1.6	35	3.6	2.9°	2.34	80	6	3	●	1	35.8	36.7	38.6	No interference
R0100T0024L040	1	2	0.4°	1.6	40	3.6	2.6°	2.41	80	6	3	●	1	40.8	41.9	44.0	No interference
R0100T0054L020	1	2	0.9°	1.6	20	3.6	4.7°	2.42	70	6	3	●	1	—	20.8	21.9	23.0
R0100T0054L025	1	2	0.9°	1.6	25	3.6	4.0°	2.57	70	6	3	●	1	—	25.8	27.2	28.6
R0100T0054L030	1	2	0.9°	1.6	30	3.6	3.4°	2.73	80	6	3	●	1	—	30.9	32.5	34.2
R0100T0054L035	1	2	0.9°	1.6	35	3.6	3.0°	2.89	80	6	3	●	1	—	35.9	37.7	39.8
R0100T0054L040	1	2	0.9°	1.6	40	3.6	2.7°	3.04	80	6	3	●	1	—	40.9	43.0	No interference
R0100T0054L050	1	2	0.9°	1.6	50	3.6	2.2°	3.36	110	6	3	●	1	—	51.0	53.6	No interference
R0100T0054L060	1	2	0.9°	1.6	60	3.6	1.9°	3.67	110	6	3	●	1	—	61.0	No interference	No interference
R0100T0054L070	1	2	0.9°	1.6	70	3.6	1.6°	3.99	110	6	3	●	1	—	71.1	No interference	No interference
R0100T0130L025	1	2	1.5°	1.6	25	3.6	4.1°	3.02	70	6	3	●	1	—	—	26.4	27.9
R0100T0130L030	1	2	1.5°	1.6	30	3.6	3.5°	3.28	80	6	3	●	1	—	—	31.6	33.3
R0100T0130L035	1	2	1.5°	1.6	35	3.6	3.1°	3.54	80	6	3	●	1	—	—	36.7	38.7
R0100T0130L040	1	2	1.5°	1.6	40	3.6	2.7°	3.81	80	6	3	●	1	—	—	41.8	No interference
R0125T0054L020	1.25	2.5	0.9°	2	20	4.5	4.3°	2.89	60	6	3	●	1	—	20.8	21.9	23.1
R0125T0054L030	1.25	2.5	0.9°	2	30	4.5	3.1°	3.20	80	6	3	●	1	—	30.9	32.5	34.2
R0125T0054L040	1.25	2.5	0.9°	2	40	4.5	2.4°	3.52	80	6	3	●	1	—	40.9	43.1	No interference
R0125T0130L020	1.25	2.5	1.5°	2	20	4.5	4.4°	3.21	60	6	3	●	1	—	—	21.4	22.5
R0125T0130L030	1.25	2.5	1.5°	2	30	4.5	3.1°	3.74	80	6	3	●	1	—	—	31.6	33.3
R0125T0130L040	1.25	2.5	1.5°	2	40	4.5	2.5°	4.26	80	6	3	●	1	—	—	41.9	No interference
R0150T0024L020	1.5	3	0.4°	2	20	5	3.8°	3.11	60	6	3	●	1	20.7	21.3	22.3	23.5
R0150T0024L025	1.5	3	0.4°	2	25	5	3.1°	3.18	80	6	3	●	1	25.8	26.4	27.7	29.2
R0150T0024L030	1.5	3	0.4°	2	30	5	2.7°	3.25	80	6	3	●	1	30.8	31.6	33.2	No interference
R0150T0024L040	1.5	3	0.4°	2	40	5	2.1°	3.39	80	6	3	●	1	40.9	41.9	44.0	No interference
R0150T0024L050	1.5	3	0.4°	2	50	5	1.7°	3.53	100	6	3	●	1	50.9	52.2	No interference	No interference
R0150T0054L020	1.5	3	0.9°	2	20	5	3.8°	3.37	60	6	3	●	1	—	20.9	21.9	23.0
R0150T0054L030	1.5	3	0.9°	2	30	5	2.7°	3.69	80	6	3	●	1	—	30.9	32.5	No interference
R0150T0054L040	1.5	3	0.9°	2	40	5	2.1°	4.00	80	6	3	●	1	—	41.0	43.1	No interference
R0150T0054L050	1.5	3	0.9°	2	50	5	1.7°	4.31	100	6	3	●	1	—	51.0	No interference	No interference
R0150T0054L060	1.5	3	0.9°	2	60	5	2.3°	4.63	110	8	3	●	1	—	61.1	64.2	No interference
R0150T0054L070	1.5	3	0.9°	2	70	5	2.0°	4.94	120	8	3	●	1	—	71.1	74.8	No interference
R0150T0130L040	1.5	3	1.5°	2	40	5	2.2°	4.73	80	6	3	●	1	—	—	41.9	No interference
R0150T0130L050	1.5	3	1.5°	2	50	5	2.8°	5.26	110	8	3	●	1	—	—	52.2	No interference
R0150T0130L060	1.5	3	1.5°	2	60	5	2.4°	5.78	110	8	3	●	1	—	—	62.4	No interference
R0150T0130L070	1.5	3	1.5°	2	70	5	2.1°	6.30	120	8	3	●	1	—	—	72.7	No interference
R0200T0054L030	2	4	0.9°	3	30	6	3.5°	4.65	90	8	3	●	1	—	30.9	32.5	34.2
R0200T0054L040	2	4	0.9°	3	40	6	2.7°	4.97	90	8	3	●	1	—	41.0	43.0	No interference
R0200T0054L050	2	4	0.9°	3	50	6	2.2°	5.28	110	8	3	●	1	—	51.0	53.6	No interference
R0200T0054L060	2	4	0.9°	3	60	6	1.9°	5.60	110	8	3	●	1	—	61.1	No interference	No interference
R0250T0054L035	2.5	5	0.9°	3.5	35	6.5	2.4°	5.80	90	8	3	●	1	—	35.9	37.7	No interference
R0250T0054L040	2.5	5	0.9°	3.5	40	6.5	2.2°	5.95	90	8	3	●	1	—	41.0	43.0	No interference
R0250T0054L050	2.5	5	0.9°	3.5	50	6.5	1.8°	6.27	110	8	3	●	1	—	51.0	No interference	No interference
R0250T0054L060	2.5	5	0.9°	3.5	60	6.5	1.5°	6.58	110	8	3	●	1	—	61.1	No interference	No interference

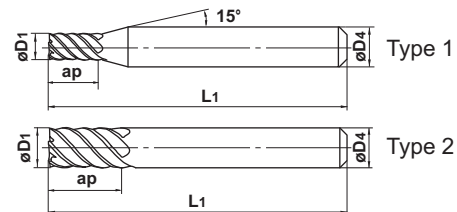
IMPACT MIRACLE END MILL

VF-SD

End mill, Short cut length, 4/6 flute, For hardened materials



0 - -0.02



$D1 < 3$



$3 \leq D1$



$D1 < 3$



$3 \leq D1$

● End mill with Impact Miracle coating for high hardened materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VFSD0100	1	2	45	6	4	●	1
D0150	1.5	3	45	6	4	●	1
D0200	2	4	45	6	4	●	1
D0250	2.5	5	45	6	4	●	1
D0300	3	6	45	6	6	●	1
D0350	3.5	7	45	6	6	●	1
D0400	4	8	45	6	6	●	1
D0500	5	10	50	6	6	●	1
D0600	6	12	50	6	6	●	2
D0800	8	16	60	8	6	●	2
D1000	10	20	70	10	6	●	2
D1200	12	24	75	12	6	●	2

VF-MD

End mill, Medium cut length, 4/6 flute, For hardened materials



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



$D_1 < 3$



$3 \leq D_1$

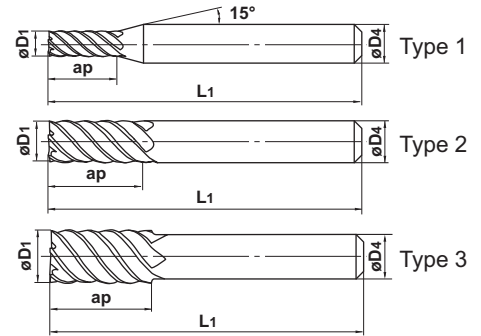


$D_1 < 3$



$3 \leq D_1$

● End mill with Impact Miracle coating for high hardened materials.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flute N	Stock	Type
VFMD0100	1	3.5	60	6	4	●	1
D0150	1.5	5	60	6	4	●	1
D0200	2	7	60	6	4	●	1
D0250	2.5	8	60	6	4	●	1
D0300	3	10	60	6	6	●	1
D0400	4	12	60	6	6	●	1
D0500	5	15	60	6	6	●	1
D0600	6	15	60	6	6	●	2
D0800	8	20	75	8	6	●	2
D1000	10	25	80	10	6	●	2
D1200	12	30	100	12	6	●	2
D1400	14	35	105	12	6	●	3
D1500	15	40	110	16	6	●	1
D1600	16	40	110	16	6	●	2
D1800	18	40	120	16	6	●	3
D2000	20	45	125	20	6	●	2
D2200	22	45	135	20	6	●	3
D2500	25	60	160	25	6	●	2

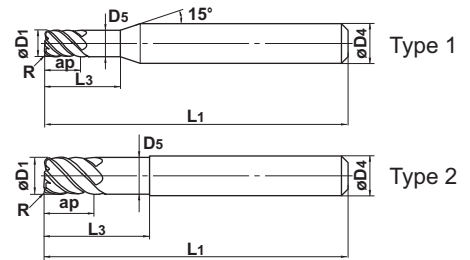
IMPACT MIRACLE END MILL

VF-SDRB

Corner radius, Short cut length, 6 flute, For hardened materials



0 - -0.02



- 6 flute end mill with Impact Miracle coating for high hardened materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia D5	Overall Length L1	Shank Dia. D4	Corner R R	No. of Flute N	Stock	Type
VFSDRBD0300R030	3	3	9	2.9	45	6	0.3	6	●	1
D0400R030	4	4	12	3.9	45	6	0.3	6	●	1
D0500R030	5	5	15	4.9	50	6	0.3	6	●	1
D0600R030	6	6	18	5.85	50	6	0.3	6	●	2
D0600R050	6	6	18	5.85	50	6	0.5	6	●	2
D0600R100	6	6	18	5.85	50	6	1	6	●	2
D0800R030	8	8	24	7.85	60	8	0.3	6	●	2
D0800R050	8	8	24	7.85	60	8	0.5	6	●	2
D0800R100	8	8	24	7.85	60	8	1	6	●	2
D1000R050	10	10	30	9.7	70	10	0.5	6	●	2
D1000R100	10	10	30	9.7	70	10	1	6	●	2
D1200R050	12	12	36	11.7	75	12	0.5	6	●	2
D1200R100	12	12	36	11.7	75	12	1	6	●	2

VF-MDRB

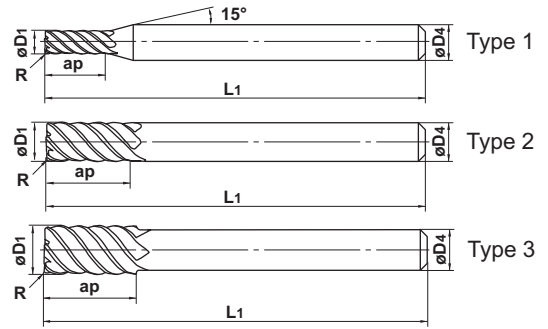
Corner radius, Medium cut length, 6 flute, For hardened materials



D1 ≤ 12 0 - -0.02
12 < D1 0 - -0.03



● 6 flute corner radius end mill with Impact Miracle coating for high hardened materials.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	Corner R R	No. of Flute N	Stock	Type
VFMDRBD0300R030	3	10	60	6	0.3	6	●	1
D0400R030	4	12	60	6	0.3	6	●	1
D0500R030	5	15	60	6	0.3	6	●	1
D0600R030	6	15	60	6	0.3	6	●	2
D0600R050	6	15	60	6	0.5	6	●	2
D0600R100	6	15	60	6	1	6	●	2
D0800R030	8	20	75	8	0.3	6	●	2
D0800R050	8	20	75	8	0.5	6	●	2
D0800R100	8	20	75	8	1	6	●	2
D1000R030	10	25	80	10	0.3	6	●	2
D1000R050	10	25	80	10	0.5	6	●	2
D1000R100	10	25	80	10	1	6	●	2
D1200R050	12	30	100	12	0.5	6	●	2
D1200R100	12	30	100	12	1	6	●	2
D1600R100	16	40	110	16	1	6	●	2
D1600R150	16	40	110	16	1.5	6	●	2
D1800R100	18	40	120	16	1	6	●	3
D1800R150	18	40	120	16	1.5	6	●	3
D2000R100	20	45	125	20	1	6	●	2
D2000R150	20	45	125	20	1.5	6	●	2
D2000R200	20	45	125	20	2	6	●	2

IMPACT MIRACLE END MILL

VF-255B

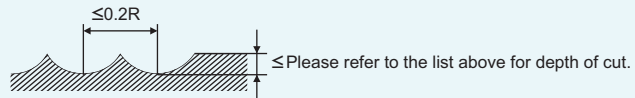
Ball nose, Short cut length, 2 flute, For hardened materials

VF-25B

Ball nose, Short cut length, 2 flute, For hardened materials

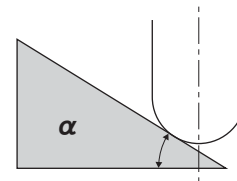
Work material	Hardened steel (-55HRC) NAK, JIS SKD61, JIS SUS420					Hardened steel (55-62HRC) JIS SKD11					Hardened steel (62-70HRC) JIS SKS, JIS SKH				
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
R 0.1	40,000	320	40,000	240	0.003	40,000	320	40,000	160	0.003	40,000	320	40,000	160	0.002
R 0.15	40,000	640	40,000	560	0.01	40,000	640	40,000	400	0.007	40,000	640	40,000	400	0.005
R 0.2	40,000	1,600	40,000	1,200	0.02	40,000	1,400	40,000	1,000	0.015	40,000	1,200	40,000	1,000	0.01
R 0.3	40,000	3,200	40,000	1,600	0.03	40,000	2,800	40,000	1,200	0.025	40,000	2,000	40,000	1,200	0.02
R 0.4	40,000	6,400	40,000	2,400	0.05	40,000	4,000	40,000	1,600	0.04	40,000	2,800	40,000	1,600	0.03
R 0.5	40,000	8,000	40,000	3,200	0.06	40,000	5,600	40,000	2,400	0.05	40,000	3,600	32,000	1,300	0.04
R 0.75	40,000	9,600	40,000	4,000	0.09	40,000	7,200	32,000	2,500	0.075	32,000	4,500	21,000	1,200	0.05
R 1	40,000	9,600	39,000	4,700	0.11	40,000	8,000	24,000	2,400	0.1	24,000	3,800	16,000	1,000	0.07
R 1.25	40,000	10,400	32,000	4,500	0.12	37,000	8,100	19,000	2,300	0.11	19,000	3,400	13,000	1,000	0.08
R 1.5	40,000	12,000	27,000	4,300	0.13	32,000	7,700	16,000	2,200	0.12	16,000	3,200	11,000	880	0.09
R 2	32,000	10,880	20,000	3,600	0.15	24,000	6,200	12,000	1,900	0.13	12,000	2,400	8,000	800	0.1
R 2.5	25,000	9,000	16,000	2,900	0.2	19,000	5,300	9,600	1,700	0.15	9,600	2,100	6,000	600	0.1
R 3	21,000	8,400	13,000	2,600	0.25	16,000	4,800	8,000	1,600	0.2	8,000	1,700	5,000	600	0.11
R 4	16,000	6,400	10,000	2,000	0.3	12,000	3,600	6,000	1,200	0.2	6,000	1,400	4,000	480	0.11
R 5	13,000	5,200	8,000	1,700	0.5	10,000	3,200	4,800	960	0.2	4,800	1,100	3,000	420	0.12
R 6	9,000	3,600	6,000	1,300	0.5	7,000	2,200	3,600	720	0.3	3,600	860	2,200	310	0.12
R 8	6,000	2,400	4,000	1,000	0.5	5,000	1,600	2,500	500	0.3	2,500	650	1,500	240	0.15
R10	4,500	1,800	3,000	780	0.5	4,000	1,300	1,800	360	0.3	1,800	470	1,000	160	0.15

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



R:Radius

- 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) α is the inclination angle of the machined surface.

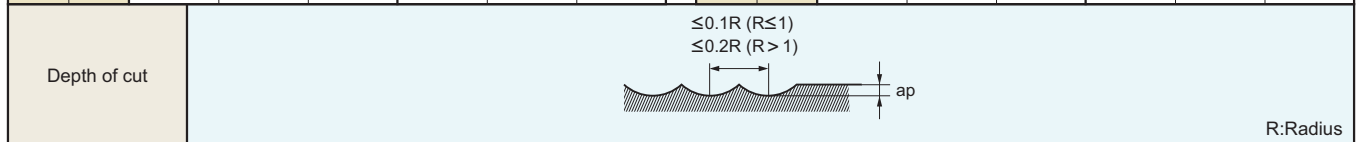


VF-2XLB

Ball nose, Long cut length, 2 flute, For hardened materials

Work material	Hardened steel (40—55HRC) NAK, JIS SKD61, STAVAX				Hardened steel (55—62HRC) JIS SKD11, HSS		
	R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
R 0.1	0.5	40,000	300	0.003	40,000	300	0.002
	1	40,000	300	0.002	40,000	300	0.002
	1.5	40,000	300	0.001	40,000	200	0.001
R 0.15	1	40,000	500	0.007	40,000	500	0.005
	1.5	40,000	500	0.005	40,000	500	0.003
	2	40,000	500	0.003	40,000	500	0.002
R 0.2	1	40,000	1,400	0.015	40,000	1,400	0.01
	1.5	40,000	1,000	0.01	40,000	1,000	0.006
	2	40,000	1,000	0.01	40,000	1,000	0.006
	2.5	40,000	700	0.005	40,000	700	0.003
	3	40,000	700	0.005	40,000	700	0.003
R 0.25	1.5	40,000	2,000	0.02	40,000	2,000	0.015
	2	40,000	2,000	0.02	40,000	2,000	0.015
	3	40,000	1,200	0.015	40,000	1,200	0.01
	4	36,000	900	0.01	36,000	900	0.007
R 0.3	5	36,000	700	0.007	36,000	700	0.005
	2	40,000	2,800	0.03	40,000	2,800	0.02
	3	40,000	2,800	0.03	40,000	2,800	0.02
	4	35,000	2,000	0.02	35,000	2,000	0.015
	5	30,000	1,000	0.01	30,000	1,000	0.007
R 0.4	6	30,000	800	0.008	30,000	800	0.005
	2	40,000	3,500	0.04	40,000	3,500	0.03
	3	40,000	3,000	0.04	40,000	3,000	0.03
	4	40,000	3,000	0.02	40,000	3,000	0.015
	6	30,000	1,600	0.02	30,000	1,600	0.01
	8	25,000	1,000	0.01	25,000	1,000	0.007
R 0.5	3	40,000	4,000	0.05	40,000	4,000	0.04
	4	40,000	4,000	0.05	40,000	4,000	0.04
	5	40,000	3,000	0.03	40,000	3,000	0.02
	6	35,000	2,000	0.03	35,000	2,000	0.02
	8	30,000	1,600	0.02	30,000	1,600	0.01
R 0.6	10	20,000	1,000	0.01	20,000	1,000	0.01
	6	40,000	4,000	0.05	40,000	4,000	0.04
	8	40,000	3,000	0.05	27,000	2,000	0.04
	10	27,000	1,900	0.03	24,000	1,700	0.02
	12	16,000	1,000	0.03	16,000	1,000	0.02

Work material	Hardened steel (40—55HRC) NAK, JIS SKD61, STAVAX				Hardened steel (55—62HRC) JIS SKD11, HSS			
	R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)
R 0.75	6	40,000	5,000	0.07	32,000	4,000	0.06	
	8	40,000	5,000	0.07	28,000	3,500	0.06	
	10	40,000	4,500	0.06	21,000	2,400	0.04	
	12	32,000	3,400	0.04	19,000	2,000	0.03	
R 1	14	15,000	1,400	0.04	13,000	1,200	0.03	
	6	40,000	6,000	0.1	24,000	3,400	0.1	
	8	40,000	5,000	0.1	24,000	3,000	0.1	
	10	40,000	5,000	0.08	24,000	3,000	0.07	
	12	40,000	5,000	0.08	24,000	2,600	0.05	
	14	40,000	5,000	0.06	21,000	2,300	0.05	
	16	32,000	3,500	0.05	16,000	1,700	0.03	
	18	24,000	2,400	0.04	13,000	1,300	0.03	
	20	10,000	1,000	0.04	10,000	1,000	0.03	
	R 1.5	8	32,000	6,400	0.15	16,000	3,000	0.15
10		32,000	5,100	0.15	16,000	2,200	0.15	
12		32,000	5,100	0.13	16,000	2,200	0.13	
14		32,000	4,500	0.13	16,000	2,200	0.1	
16		32,000	4,500	0.1	14,000	1,600	0.1	
20		27,000	3,800	0.1	14,000	1,600	0.06	
25		21,000	2,700	0.08	11,000	1,200	0.06	
30		6,000	700	0.08	6,000	600	0.05	
R 2		10	24,000	4,800	0.2	12,000	2,200	0.2
		12	24,000	4,800	0.2	12,000	2,200	0.2
	14	24,000	3,800	0.15	12,000	1,500	0.15	
	16	24,000	3,800	0.15	12,000	1,500	0.15	
	20	24,000	3,800	0.15	12,000	1,500	0.15	
	25	24,000	3,800	0.15	8,000	900	0.1	
	30	20,000	3,000	0.1	7,000	800	0.1	
	35	12,000	1,700	0.1	6,000	700	0.08	
R 2.5	20	19,000	3,400	0.2	10,000	1,400	0.2	
	25	19,000	3,400	0.2	10,000	1,400	0.2	
	30	19,000	3,200	0.15	8,000	1,000	0.15	
	35	16,000	2,700	0.1	6,000	700	0.1	
R 3	30	16,000	3,500	0.2	8,000	1,000	0.2	



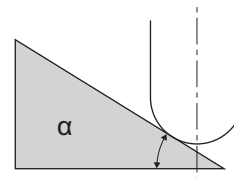
- 1) If the inclination of machining surface is very big, or cutting load is big, please reduce the revolution and the feed rate proportionately.
- 2) If using the small size, we recommend coolant mist.
- 3) If the depth of cut is shallow, the feed rate can be increased.

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, JIS SKD61, JIS SUS420						Hardened steel (55-62HRC) JIS SKD11					
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$				$\alpha \leq 15^\circ$		$\alpha > 15^\circ$				$\alpha \leq 15^\circ$		$\alpha > 15^\circ$			
R 0.5	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
R 1	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
R 1.5x3	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
R 1.5	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
R 2x4	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
R 2	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
R 2.5	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
R 3	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
R 4	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
R 5	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
R 6	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
R 8	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
R10	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) α 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, JIS SKD61, JIS SUS420			
	R 1.5x3	16,000	2,000	0.10	0.30	13,000	1,500	0.10
R 2x4	13,000	2,000	0.15	0.50	10,000	1,500	0.15	0.50
R 3	10,000	2,000	0.20	1.00	8,000	1,600	0.20	0.80
R 4	8,000	1,800	0.30	1.50	6,400	1,400	0.40	1.20
R 5	6,000	1,600	0.40	2.00	4,800	1,200	0.40	1.60
R 6	5,000	1,300	0.45	2.40	4,000	1,000	0.45	2.00
R 8	3,800	1,000	0.60	3.00	3,100	800	0.60	2.50
R10	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)

End mill, Short cut length, 4/6 flute, For hardened materials **VF-SD**

End mill, Medium cut length, 4/6 flute, For hardened materials **VF-MD**

Corner radius, Short cut length, 6 flute, For hardened materials **VF-SDRB**

Corner radius, Medium cut length, 6 flute, For hardened materials **VF-MDRB**

Work material	Alloy steel, Hardened steel (-55HRC) NAK, JIS SKD61, JIS SUS420			Hardened steel (55-62HRC) JIS SKD11			Hardened steel (62-70HRC) JIS SKS, JIS SKH		
	Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
1	40,000	1,200	0.05	40,000	800	0.03	32,000	500	0.02
2	40,000	2,000	0.1	24,000	1,000	0.05	16,000	600	0.05
3	32,000	3,800	0.2	16,000	1,900	0.1	11,000	1,200	0.05
4	24,000	4,400	0.2	12,000	2,200	0.1	8,000	1,300	0.05
6	16,000	5,800	0.3	8,000	2,900	0.2	5,300	1,800	0.1
8	12,000	5,800	0.4	6,000	2,900	0.2	4,000	1,800	0.1
10	9,600	5,800	0.5	4,800	2,900	0.3	3,200	1,800	0.2
12	8,000	4,800	0.6	4,000	2,400	0.3	2,700	1,500	0.2
16	6,000	3,600	0.8	3,000	1,800	0.5	2,000	1,100	0.3
20	4,800	2,900	1.0	2,400	1,400	0.5	1,600	880	0.3
25	3,800	2,300	1.0	1,900	1,100	0.5	1,300	720	0.3
Depth of cut	<p>Please refer to the list above for depth of cut. ≤1.5D</p>			<p>Please refer to the list above for depth of cut. ≤1.0D</p>					

D:Dia.

Slot milling with small diameter tools

Work material	Alloy steel, Hardened steel (-55HRC) NAK, JIS SKD61			Hardened steel (55-65HRC) JIS SKD11, JIS SKH		
	Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
1	15,000	300	0.1	9,500	110	0.05
2	8,000	320	0.2	4,800	190	0.1
Depth of cut	<p>Please refer to the list above for depth of cut.</p>					

D:Dia.

- 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) Climb cutting is recommended for side milling.
- 3) Air blow recommended to disperse chips effectively.

IMPACT MIRACLE END MILL

VF-3XB

Ball nose, 3 flute, Taper neck, For hardened materials

Work material			Carbon steel, Alloy steel (-30HRC) JIS S55C			Alloy steel, Pre-hardened steel (30-45HRC) PX5, NAK			Hardened steel (45-55HRC) JIS SKD61, STAVAX			Hardened steel (55-62HRC) JIS SKD11			
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	
R0.4	0.4°	6	34,000	2,700	0.03	31,000	2,200	0.025	24,000	1,700	0.02	19,000	1,400	0.015	
		8	31,000	2,100	0.02	29,000	1,700	0.02	22,000	1,300	0.015	18,000	1,000	0.01	
		12	28,000	2,000	0.015	26,000	1,600	0.01	20,000	1,200	0.01	16,000	960	0.007	
	0.9°	8	31,000	2,200	0.02	29,000	1,800	0.02	22,000	1,400	0.015	18,000	1,100	0.01	
		12	28,000	2,100	0.015	26,000	1,700	0.01	20,000	1,300	0.01	16,000	1,000	0.007	
		16	25,000	1,100	0.01	23,000	910	0.01	18,000	700	0.008	14,000	560	0.006	
R0.5	0.4°	8	27,000	2,700	0.04	25,000	2,200	0.04	19,000	1,700	0.03	15,000	1,400	0.02	
		10	24,000	2,200	0.03	22,000	1,800	0.025	17,000	1,400	0.02	14,000	1,100	0.015	
		12	24,000	2,200	0.03	22,000	1,800	0.025	17,000	1,400	0.02	14,000	1,100	0.015	
		16	22,000	2,100	0.03	21,000	1,700	0.025	16,000	1,300	0.02	13,000	1,000	0.015	
		20	20,000	1,400	0.015	18,000	1,200	0.01	14,000	900	0.01	11,000	720	0.007	
		25	18,000	1,300	0.015	17,000	1,000	0.01	13,000	800	0.009	10,000	640	0.006	
		30	15,000	960	0.01	14,000	780	0.01	11,000	600	0.008	8,800	480	0.006	
		35	14,000	800	0.008	13,000	650	0.007	10,000	500	0.006	8,000	400	0.004	
	0.9°	8	27,000	2,900	0.04	25,000	2,300	0.04	19,000	1,800	0.03	15,000	1,400	0.02	
		12	24,000	2,400	0.03	22,000	2,000	0.025	17,000	1,500	0.02	14,000	1,200	0.015	
		16	22,000	2,200	0.03	21,000	1,800	0.025	16,000	1,400	0.02	13,000	1,100	0.015	
		20	20,000	1,600	0.015	18,000	1,300	0.01	14,000	1,000	0.01	11,000	800	0.007	
		25	18,000	1,400	0.015	17,000	1,200	0.01	13,000	900	0.009	10,000	720	0.006	
		30	15,000	1,100	0.01	14,000	910	0.009	11,000	700	0.008	8,800	560	0.006	
		35	14,000	960	0.008	13,000	780	0.007	10,000	600	0.006	8,000	480	0.004	
		40	11,000	800	0.007	11,000	650	0.006	8,000	500	0.005	6,400	400	0.003	
	1.5°	12	24,000	2,600	0.03	22,000	2,100	0.025	17,000	1,600	0.02	14,000	1,300	0.015	
		16	22,000	2,400	0.03	21,000	2,000	0.025	16,000	1,500	0.02	13,000	1,200	0.015	
		20	20,000	1,800	0.015	18,000	1,400	0.01	14,000	1,100	0.01	11,000	880	0.007	
		25	18,000	1,600	0.015	17,000	1,300	0.01	13,000	1,000	0.009	11,000	800	0.006	
		30	15,000	1,300	0.01	14,000	1,000	0.01	11,000	800	0.008	8,800	640	0.006	
		35	14,000	1,100	0.008	13,000	910	0.007	10,000	700	0.006	8,000	560	0.004	
	R0.75	0.4°	10	18,000	2,700	0.06	17,000	2,200	0.05	13,000	1,700	0.04	10,000	1,400	0.03
			15	17,000	2,200	0.04	16,000	1,800	0.04	12,000	1,400	0.03	9,600	1,100	0.02
20			17,000	2,100	0.03	16,000	1,700	0.025	12,000	1,300	0.02	9,600	1,000	0.015	
30			14,000	1,600	0.015	13,000	1,300	0.01	10,000	1,000	0.01	8,000	800	0.007	
15			17,000	2,400	0.04	16,000	2,000	0.04	12,000	1,500	0.03	9,600	1,200	0.02	
0.9°		20	17,000	2,200	0.03	16,000	1,800	0.025	12,000	1,400	0.02	9,600	1,100	0.015	
		30	14,000	1,800	0.015	13,000	1,400	0.01	10,000	1,100	0.01	8,000	880	0.007	
		40	13,000	1,300	0.01	12,000	1,000	0.01	9,000	800	0.008	7,200	640	0.006	
		15	17,000	2,600	0.04	16,000	2,100	0.04	12,000	1,600	0.03	9,600	1,300	0.02	
1.5°		20	17,000	2,400	0.03	16,000	2,000	0.025	12,000	1,500	0.02	9,600	1,200	0.015	
		30	14,000	2,000	0.015	13,000	1,600	0.01	10,000	1,200	0.01	8,000	960	0.007	

Work material			Carbon steel, Alloy steel (-30HRC) JIS S55C			Alloy steel, Pre-hardened steel (30-45HRC) PX5, NAK			Hardened steel (45-55HRC) JIS SKD61, STAVAX			Hardened steel (55-62HRC) JIS SKD11			
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	
R1	0.4°	16	15,000	3,200	0.07	14,000	2,600	0.06	11,000	2,000	0.05	8,800	1,600	0.03	
		20	14,000	2,400	0.06	13,000	2,000	0.05	10,000	1,500	0.04	8,000	1,200	0.03	
		25	14,000	2,100	0.04	13,000	1,700	0.04	10,000	1,300	0.03	8,000	1,000	0.02	
		30	13,000	1,800	0.03	12,000	1,400	0.03	9,000	1,100	0.025	7,200	880	0.02	
		35	13,000	1,600	0.03	12,000	1,300	0.025	9,000	1,000	0.02	7,200	800	0.015	
		40	12,000	1,400	0.015	11,000	1,200	0.01	8,500	900	0.01	6,800	720	0.007	
	0.9°	20	14,000	2,600	0.06	13,000	2,100	0.05	10,000	1,600	0.04	8,000	1,300	0.03	
		25	14,000	2,200	0.05	13,000	1,800	0.04	10,000	1,400	0.03	8,000	1,100	0.025	
		30	13,000	1,900	0.04	12,000	1,600	0.04	9,000	1,200	0.03	7,200	960	0.02	
		35	13,000	1,800	0.04	12,000	1,400	0.03	9,000	1,100	0.025	7,200	880	0.02	
		40	12,000	1,600	0.03	11,000	1,300	0.025	8,500	1,000	0.02	6,800	800	0.015	
		50	11,000	1,400	0.015	10,000	1,200	0.01	8,000	900	0.01	6,400	720	0.007	
	1.5°	60	9,800	1,100	0.007	9,100	910	0.006	7,000	700	0.005	5,600	560	0.003	
		70	8,400	960	0.004	7,800	780	0.004	6,000	600	0.003	4,800	480	0.002	
		25	14,000	2,400	0.05	13,000	2,000	0.04	10,000	1,500	0.03	8,000	1,200	0.025	
		30	12,600	2,100	0.04	12,000	1,700	0.04	9,000	1,300	0.03	7,200	1,000	0.02	
	R1.25	0.9°	35	13,000	1,900	0.04	12,000	1,600	0.03	9,000	1,200	0.025	7,200	960	0.02
			40	12,000	1,800	0.03	11,000	1,400	0.025	8,500	1,100	0.02	6,800	880	0.015
20			13,000	2,900	0.06	12,000	2,300	0.05	9,000	1,800	0.04	7,200	1,400	0.03	
1.5°	30	12,000	2,600	0.05	11,000	2,100	0.04	8,500	1,600	0.03	6,800	1,300	0.025		
	40	11,000	2,200	0.04	9,800	1,800	0.04	7,500	1,400	0.03	6,000	1,100	0.02		
	20	13,000	3,000	0.06	12,000	2,500	0.05	9,000	1,900	0.04	7,200	1,500	0.03		
R1.5	0.4°	30	12,000	2,700	0.05	11,050	2,200	0.04	8,500	1,700	0.03	6,800	1,400	0.025	
		40	11,000	2,400	0.04	9,800	2,000	0.04	7,500	1,500	0.03	6,000	1,200	0.02	
		20	12,000	3,700	0.13	11,000	3,000	0.1	8,500	2,300	0.09	6,800	1,800	0.06	
		30	11,000	2,900	0.07	10,000	2,300	0.06	8,000	1,800	0.05	6,400	1,400	0.03	
	0.9°	40	11,000	2,400	0.06	10,000	2,000	0.05	8,000	1,500	0.04	6,400	1,200	0.03	
		50	11,000	2,000	0.04	9,800	1,600	0.04	7,500	1,200	0.03	6,000	960	0.02	
		20	12,000	3,800	0.13	11,000	3,100	0.1	8,500	2,400	0.09	6,800	1,900	0.06	
		30	11,000	3,000	0.07	10,000	2,500	0.06	8,000	1,900	0.05	6,400	1,500	0.03	
		40	11,000	2,600	0.06	10,000	2,100	0.05	8,000	1,600	0.04	6,400	1,300	0.03	
		50	11,000	2,100	0.04	9,800	1,700	0.04	7,500	1,300	0.03	6,000	1,000	0.02	
		60	9,800	2,000	0.03	9,100	1,600	0.025	7,000	1,200	0.02	5,600	960	0.015	
	1.5°	70	9,800	1,800	0.015	9,100	1,400	0.01	7,000	1,100	0.01	5,600	880	0.007	
		50	11,000	2,200	0.04	9,800	1,800	0.04	7,500	1,400	0.03	6,000	1,100	0.02	
		60	9,800	2,100	0.03	9,100	1,700	0.025	7,000	1,300	0.02	5,600	1,000	0.015	
		70	9,800	2,000	0.015	9,100	1,600	0.01	7,000	1,200	0.01	5,600	960	0.007	
R2	0.9°	30	10,000	3,200	0.3	9,400	2,600	0.25	7,200	2,000	0.2	5,800	1,600	0.15	
		40	9,500	2,400	0.15	8,800	2,000	0.12	6,800	1,500	0.1	5,400	1,200	0.07	
		50	9,500	2,100	0.1	8,800	1,700	0.1	6,800	1,300	0.08	5,400	1,000	0.06	
		60	9,000	1,900	0.07	8,300	1,600	0.06	6,400	1,200	0.05	5,100	960	0.03	
R2.5	0.9°	35	8,000	3,500	0.3	7,400	2,900	0.25	5,700	2,200	0.2	4,600	1,800	0.15	
		40	8,000	3,200	0.2	7,400	2,600	0.18	5,700	2,000	0.15	4,600	1,600	0.1	
		60	7,600	2,400	0.15	7,000	2,000	0.12	5,400	1,500	0.1	4,300	1,200	0.07	

- 1) The above table shows depth of cut. Please control the pick feed (ae) according to machining conditions, up to a maximum of R x 1.5.
- 2) It is recommend to use high accuracy type machines and holders wherever possible.
- 3) Please reduce the depth of cut if chattering and noise are generated and reduce the feed rate proportionately.

For Your Safety

●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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(Tools specifications subject to change without notice.)