MITSUBISHI MATERIALS

VFFDRB

DUPLEX CORNER RADIUS IMPACT MIRACLE END MILL

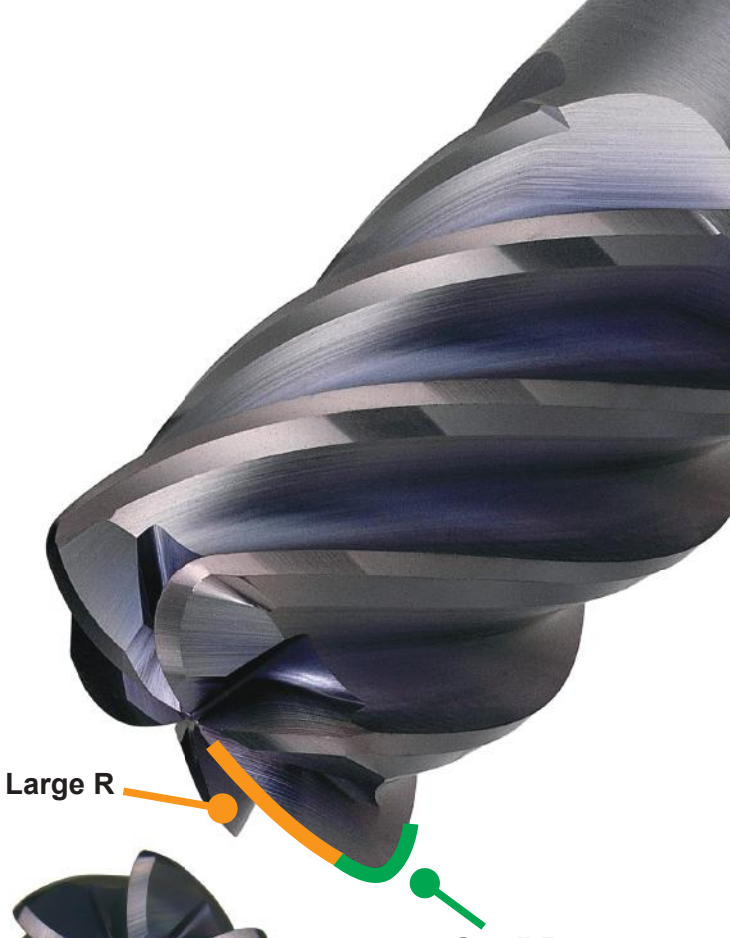




TOOL NEWS **B075A-F**

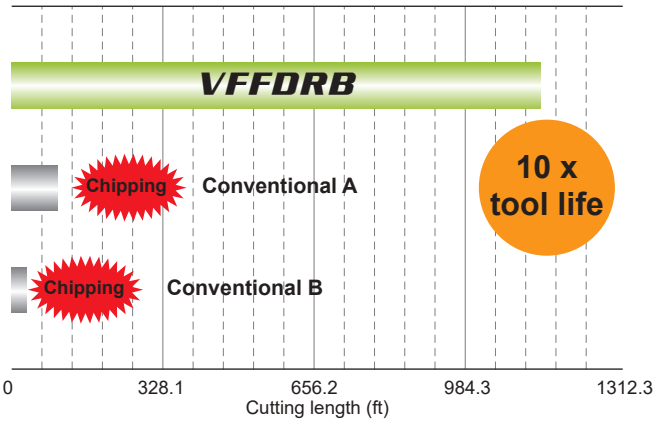
VFFDRB

New duplex corner radius and multi-flute geometry for high feed, stable machining of hardened steels.



Cutting Performance

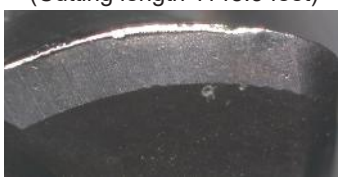
Tool life comparison in AISI D2 (ø6)



<Cutting conditions>

Work piece	: AISI D2 (60HRC)
Tool	: VFFDRBD0600
Revolution	: 3700 RPM (230 SFM)
Feed rate	: 233 IPM (.016 IPT)
Depth of cut	: ap=.012 inch, ae=.059 inch
Overhang	: .709 inch (3D)
Machining center	: Vertical M/C (HSK63)
Coolant	: Air blow

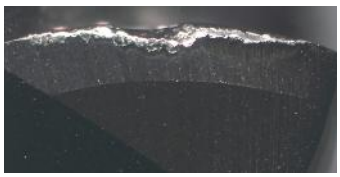
VFFDRB
(Cutting length 1148.3 feet)

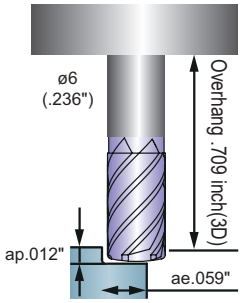


Conventional A
(Cutting length 98.4 feet)



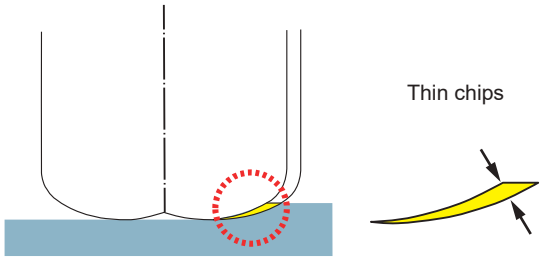
Conventional B
(Cutting length 16.4 feet)





Features

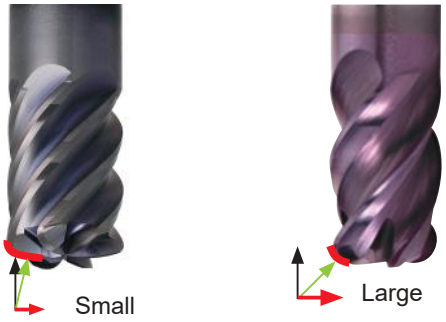
High efficiency machining geometry



Thin chips and a long cutting edge combine to provide both high performance and long tool life.

Vibration control geometry

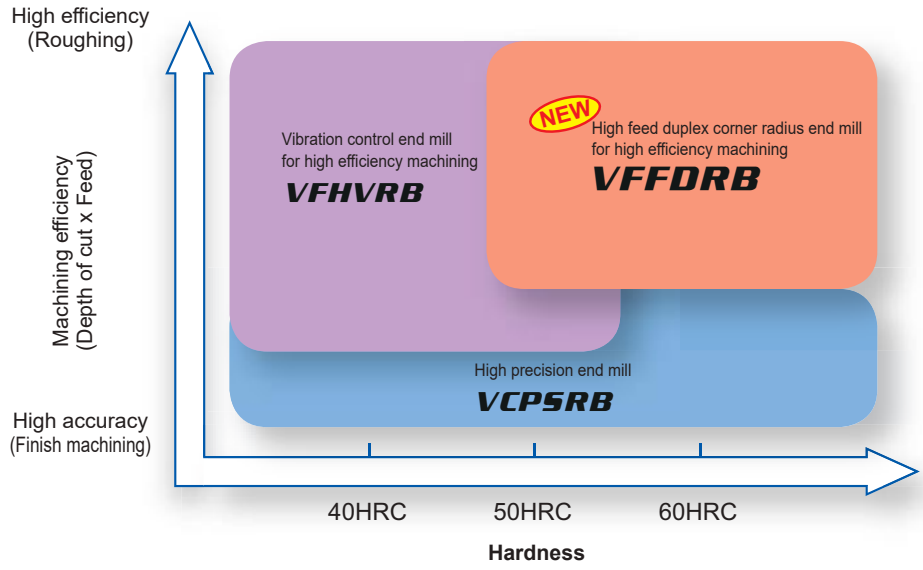
VFFDRB Conventional radius



Reduced cutting resistance in the radial direction suppresses tool vibration and reduces deflection.

Performance and Application Range

High efficiency machining of high hardened steels over 60 HRC can be achieved.



Application / Tool - Selection Chart

Content of processing	Hardened materials (Over 50 HRC)	Long overhangs (Over 5D)	High feed	Large ap (Over 0.05D)
				
High feed duplex corner radius end mill **VFFDRB**	◎	◎	◎	×
Vibration control end mill for high efficiency machining **VFHVRB**	○	○	○	◎

◎...First recommendation
○...Second recommendation
×...Not recommended

VFFDRB

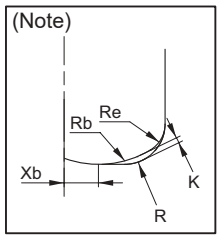
NEW

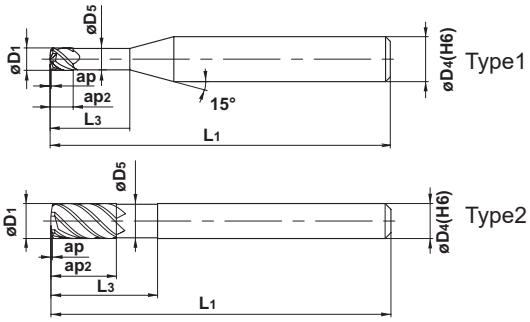
Duplex corner radius end mill, Short cut length, 4-6 flute, For high feed

UWC VF 40° D_1≤6 D_1≥8

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○	◎	◎				







D_1≤12				
0 -0.020				
D_4=6	8≤D_4≤10	D_4=12		
0 -0.008	0 -0.009	0 -0.011		

h6

- High feed rate possible due to the duplex corner radius geometry.
- Multi-flutes enable high feed machining.

Unit : mm

Order Number	D_1	R*	ap	ap_2	L_3	D_5	L_1	D_4	N	Duplex corner radius K	Xb	Re	Rb	α	Stock	Type
VFFDRBD0300	3	0.64	0.18	3	10	2.8	60	6	4	0.08	0.375	0.5	2	2.1	★	1
VFFDRBD**0400**	4	0.71	0.25	4	12	3.8	60	6	4	0.13	0.5	0.5	3	1.9	★	1
VFFDRBD**0600**	6	0.92	0.36	9	18	5.6	80	6	4	0.21	0.75	0.6	5	1.7	★	2
VFFDRBD**0800**	8	1.16	0.44	12	24	7.6	90	8	6	0.22	1.6	0.8	4.5	1.7	★	2
VFFDRBD**1000**	10	1.47	0.57	15	30	9.4	100	10	6	0.28	2	1	5.5	1.7	★	2
VFFDRBD**1200**	12	1.77	0.7	18	36	11.4	110	12	6	0.34	2.4	1.2	6.5	1.8	★	2

R* = Approx.R **N** = Number of Flutes α = Max.Ramping Angle

(Note) When machining in the approx.R as radius end mill, the uncut portions(K) is generated.

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Alloy steel (180—280HB), Alloy tool steel (≤350HB), Mild steel (≤180HB)					Pre hardened steel (35—45HRC)				
Dia. (mm)	n (min^{-1})	vf (mm/min)	vf (IPM)	ap (mm)	ae (mm)	n (min^{-1})	vf (mm/min)	vf (IPM)	ap (mm)	ae (mm)
3	16000	9600	378.0	0.12	1.5	14000	8400	330.7	0.12	1.5
4	12000	9600	378.0	0.16	2.0	11000	8800	346.5	0.16	2.0
6	8000	11000	433.1	0.24	3.0	7200	10000	393.7	0.24	3.0
8	6000	13000	511.8	0.32	4.8	5400	11000	433.1	0.32	4.8
10	4800	12000	472.4	0.40	6.0	4300	10000	393.7	0.40	6.0
12	4000	11000	433.1	0.48	7.2	3600	9700	381.9	0.48	7.2

Work material	Hardened steel (40—55HRC), Ferritic and martensitic stainless steel (>200HB), Precipitation hardening stainless steel (<450HB)					Hardened steel (55—62HRC)				
Dia. (mm)	n (min^{-1})	vf (mm/min)	vf (IPM)	ap (mm)	ae (mm)	n (min^{-1})	vf (mm/min)	vf (IPM)	ap (mm)	ae (mm)
3	13000	7800	307.1	0.12	1.5	8500	3400	133.9	0.12	1.5
4	9500	8000	315.0	0.16	2.0	6400	3800	149.6	0.16	2.0
6	6400	9000	354.3	0.24	3.0	4200	5000	196.9	0.24	3.0
8	4800	10000	393.7	0.32	4.8	3200	5800	228.3	0.32	4.8
10	3800	9100	358.3	0.40	6.0	2500	5300	208.7	0.40	6.0
12	3200	8600	388.6	0.48	7.2	2100	5000	196.9	0.48	7.2

1) When ramping, it is recommended to reduce the feed rate by 50%. The recommended ramping angle is 1 deg.

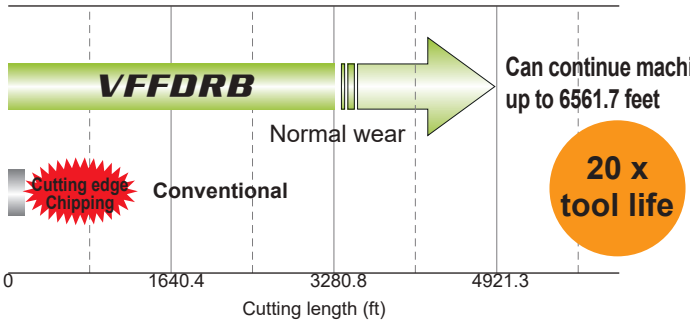
2) When the overhang is longer than 5D, reduce the spindle speed by 30% and the feed rate by 50%.

★ : Inventory maintained in Japan.

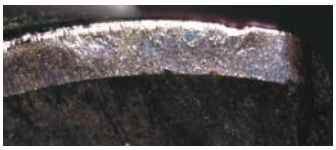
Cutting Performance

Tool life comparison when machining AISI H13 (ø6 - 7D overhang)

VFFDRB achieves more than 20 times longer tool life compared to conventional for extreme overhang applications (7D)



VFFDRB
(Cutting length 3280.8 feet)



VFFDRB
(Cutting length 1640.4 feet)





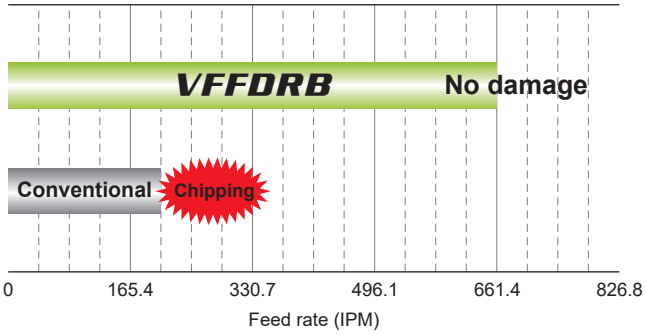
Conventional
(Cutting length 164.0 feet)

<Cutting conditions>

Work piece	: AISI H13 (52HRC)	Depth of cut	: ap=.012 inch, ae=.059 inch
Tool	: VFFDRBD0600	Overhang	: 1.66 inch (7D)
Revolution	: 6400 RPM (395 SFM)	Machining center	: Vertical M/C (HSK63)
Feed rate	: 252 IPM (.01 IPT)	Coolant	: Air blow

Machining efficiency comparison when machining AISI H13 ø10 - 3D overhang)

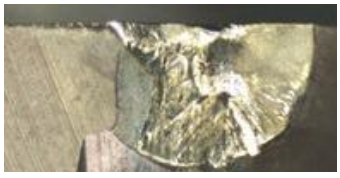
Feed rate increase x 3 compared to conventional radius end mills.



VFFDRB
6 flutes
Feed rate
(661 IPM)



Conventional
Feed rate
(207 IPM)



<Cutting conditions>

Work peice	: AISI H13 (52HRC)	Depth of cut	: ap=.012 inch, ae=.217 inch
Tool	: VFFDRBD1000	Overhang	: 1.18 inch
Revolution	: 3500 RPM (360 SFM)	Machining center	: Horizontal M/C (BT40)
Feed rate	: 207-661 IPM	Coolant	: Down cut, Air blow

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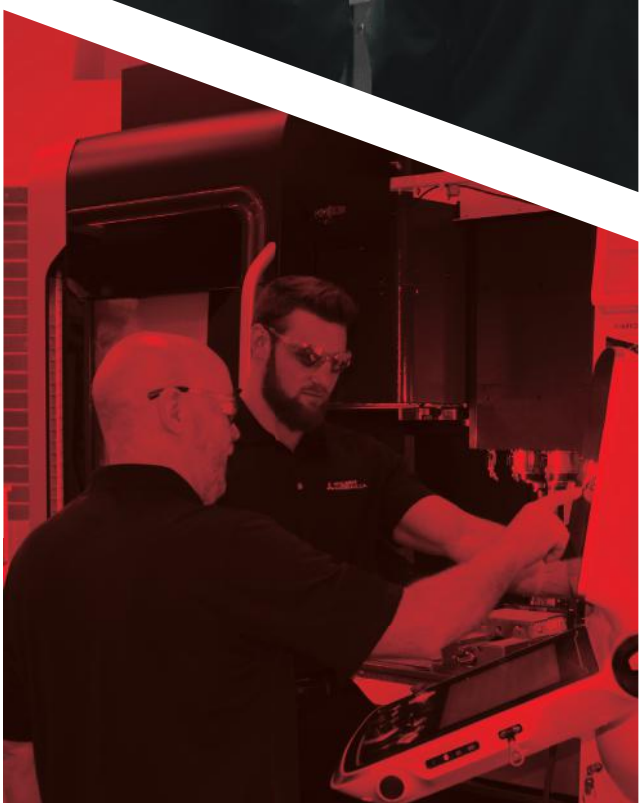
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- Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage.
- Please use safety covers and wear safety glasses.
- When using compounded cutting oils, please take fire precautions.
- When attaching inserts or spare parts, please use only the correct wrench or driver.
- 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.

B075A-F-US-2014.12