

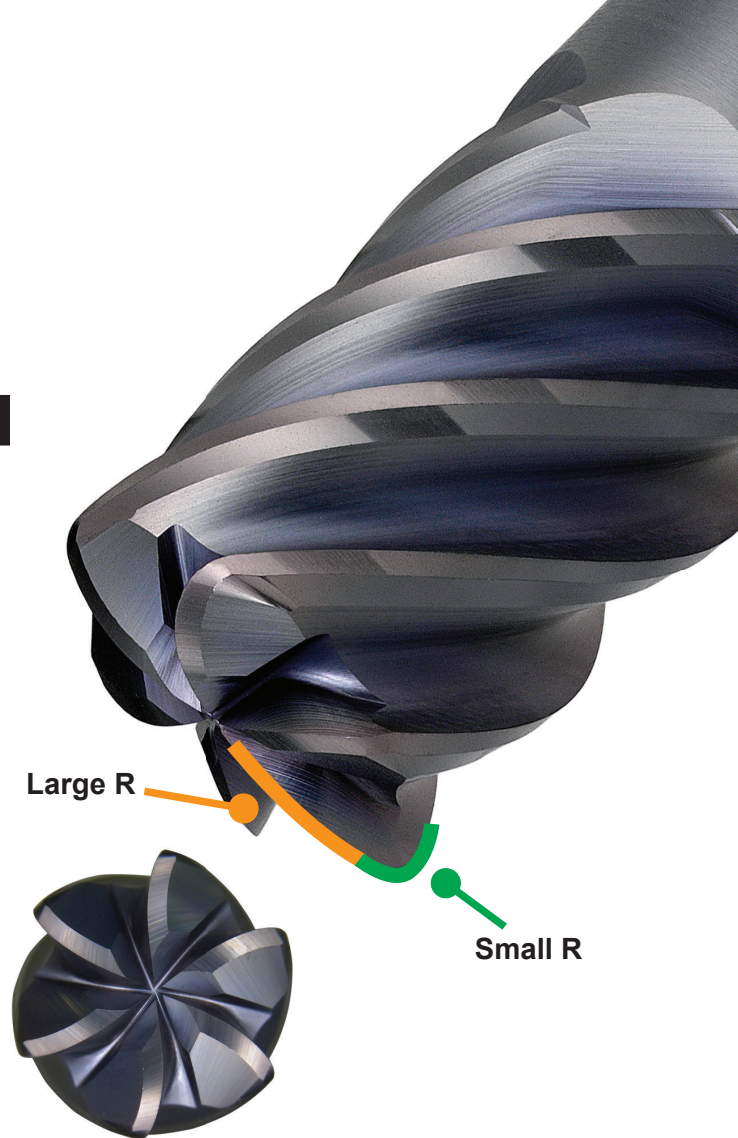
VFFDRB

DUPLEX CORNER RADIUS
IMPACT MIRACLE END MILL



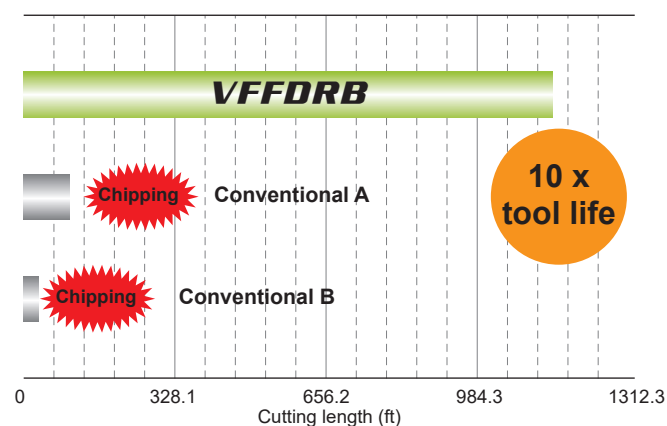
VFFDRB

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

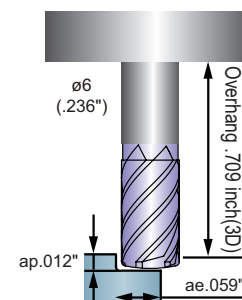
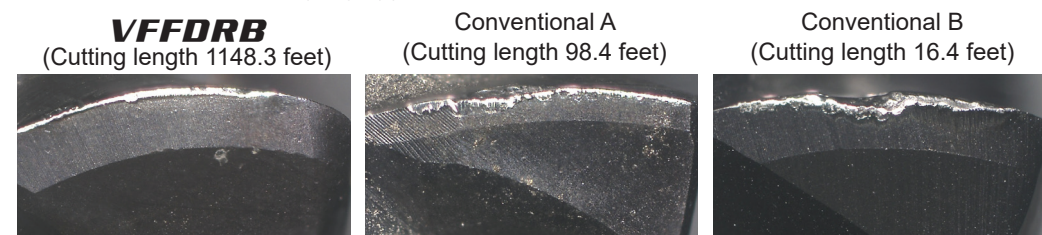


Cutting Performance

Tool life comparison in AISI D2 (ø6)

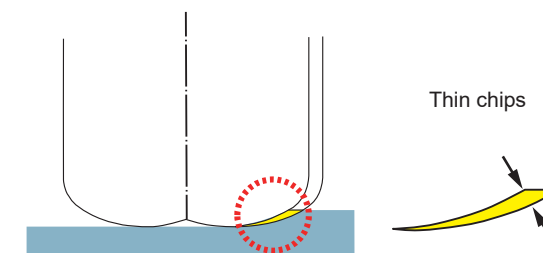


<Cutting conditions>
 Work piece : AISI D2 (60HRC)
 Tool : VFFDRBD0600
 Revolution : 3700 RPM (230 SFM)
 Feed rate : 233 IPM (.016 IPT)
 Depth of cut : $a_p = .012$ inch, $a_e = .059$ inch
 Overhang : .709 inch (3D)
 Machining center : Vertical M/C (HSK63)
 Coolant : Air blow



Features

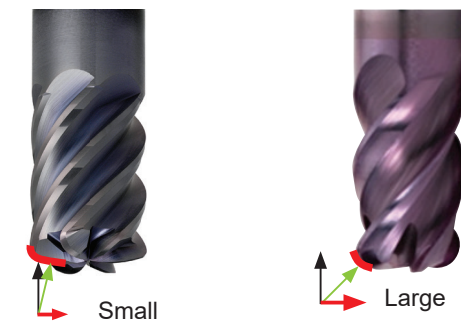
High efficiency machining geometry



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

Vibration control geometry

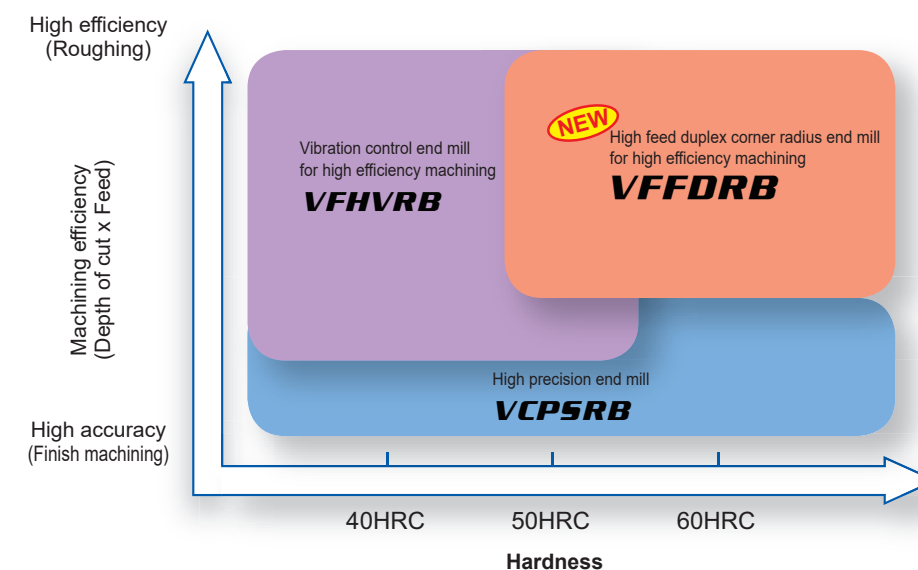
VFFDRB Conventional radius



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 a_p (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

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)

Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)

Hardened Steel (≤55HRC)


Hardened Steel (>55HRC)

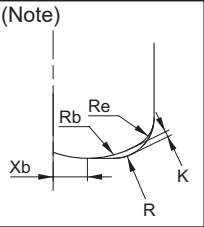
Austenitic Stainless Steel

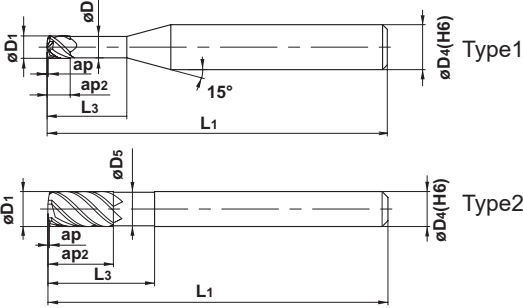
Titanium Alloy, Heat Resistant Alloy

Copper Alloy

Aluminum Alloy



(Note)




D₁ ≤ 12

0
- 0.020

D₄ = 6

8 ≤ D₄ ≤ 10

D₄ = 12

0
- 0.008

0
- 0.009

0
- 0.011

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

Order Number	D ₁	R*	ap	ap ₂	L ₃	D ₅	L ₁	D ₄	N	Duplex corner radius				α	Stock	Type
										K	Xb	Re	Rb			
VFFDRBD0300	3	0.64	0.18	3	10	2.8	60	6	4	0.08	0.375	0.5	2	2.1	★	1
VFFDRBD0400	4	0.71	0.25	4	12	3.8	60	6	4	0.13	0.5	0.5	3	1.9	★	1
VFFDRBD0600	6	0.92	0.36	9	18	5.6	80	6	4	0.21	0.75	0.6	5	1.7	★	2
VFFDRBD0800	8	1.16	0.44	12	24	7.6	90	8	6	0.22	1.6	0.8	4.5	1.7	★	2
VFFDRBD1000	10	1.47	0.57	15	30	9.4	100	10	6	0.28	2	1	5.5	1.7	★	2
VFFDRBD1200	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

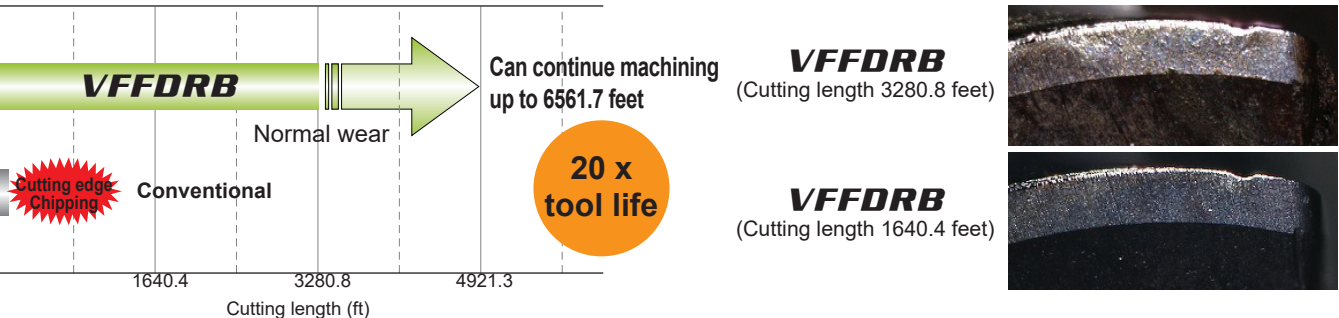
Work material	Carbon steel, Alloy steel (180—280HB), Alloy tool steel (≤350HB), Mild steel (≤180HB)					Pre hardened steel (35—45HRC)				
	Dia. (mm)	n (min ⁻¹)	vf		ap (mm)	ae (mm)	n (min ⁻¹)	vf		ap (mm)
(mm/min)			(IPM)	(mm/min)				(IPM)		
3	16000	9600	378.0	0.12	1.5	14000	8400	330.7	0.12	1.5
4	12000	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

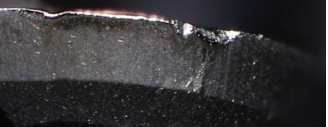
Work material	Hardened steel (40—55HRC), Ferritic and martensitic stainless steel (>200HB), Precipitation hardening stainless steel (<450HB)					Hardened steel (55—62HRC)				
	Dia. (mm)	n (min ⁻¹)	vf		ap (mm)	ae (mm)	n (min ⁻¹)	vf		ap (mm)
(mm/min)			(IPM)	(mm/min)				(IPM)		
3	13000	7800	307.1	0.12	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)



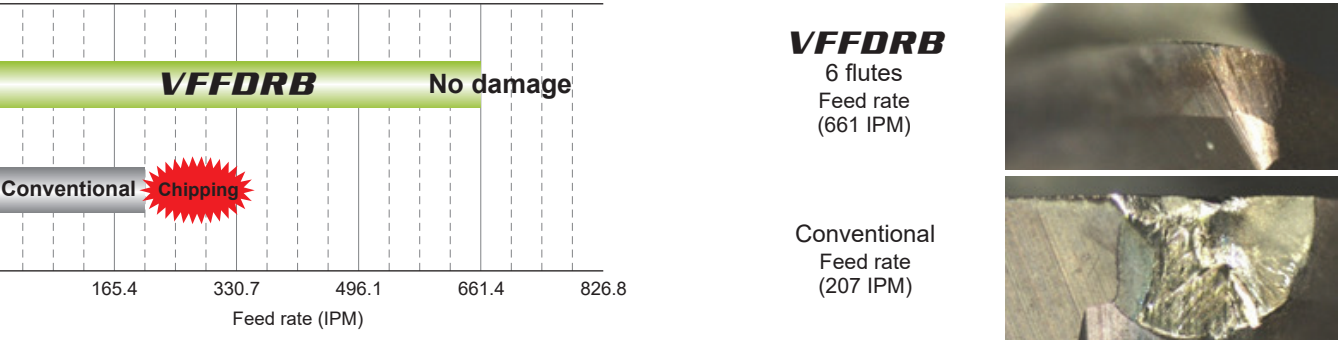


Conventional
(Cutting length 164.0 feet)

<Cutting conditions>
Work piece : AISI H13 (52HRC)
Tool : VFFDRBD0600
Revolution : 6400 RPM (395 SFM)
Feed rate : 252 IPM (.01 IPT)

Depth of cut : ap=.012 inch, ae=.059 inch
Overhang : 1.66 inch (7D)
Machining center : Vertical M/C (HSK63)
Coolant : Air blow

Machining efficiency comparison when machining AISI H13 ø10 - 3D overhang)
Feed rate increase x 3 compared to conventional radius end mills.



<Cutting conditions>
Work peice : AISI H13 (52HRC)
Tool : VFFDRBD1000
Revolution : 3500 RPM (360 SFM)
Feed rate : 207-661 IPM

Depth of cut : ap=.012 inch, ae=.217 inch
Overhang : 1.18 inch
Machining center : Horizontal M/C (BT40)
Coolant : Down cut, Air blow



MACHINING TECHNOLOGY
AND EDUCATION CENTER

Welcome to our new world-class
Machining Technology and Education
Center (MTEC) in Mooresville, NC
providing year round support and
services to North America.



ABOUT MTEC

TOOLING PROPOSALS & EVALUATION

We will review your current processes or outline a new process. From this review, we will improve productivity, analyze programming methods and output a solution with programming, tooling and time savings.

MACHINING SIMULATION

Using the latest CAD/CAM software and our cutting tool experience, we will outline a new process using proper machining techniques to maximize tool life and productivity.

TECHNICAL SUPPORT

Dedicated local professionals to answer any of your order, product or technical questions.

TRAINING

We are excited to offer several levels of training with goals to reach our highest level--Craftsman Machining Technology. At MTEC NC, we will train using a combination of classroom and hands-on machine time to develop skills and real-world understanding of materials, tools and applications. In addition to multi-day courses, we will have Machining Technology skills seminars, as well as seminars from our partners to complement our apprentice level courses, our journeyman courses, and up to our craftsman level courses.

PROCESS IMPROVEMENTS

Review of the complete part processing and recommend changes of speed, feed, new tooling, reduction of passes, modifying programming and other solutions to reduce cycle time, save money and be proactive.



WEBINARS

Our FREE online webinar series is available anytime on-demand. Narrated by the MTEC training staff, you will receive in-depth knowledge of the topic. Simply register online at the link below for access. You will receive a certificate upon completion of each course.

mmusnewsstand.com/register

ONLINE TRAINING

Our FREE e-learning program offers 11 courses in drilling, milling, turning, threading, tool grades and workpiece materials. Once each course is completed, you will be given the opportunity to print a certificate.

- Basic Drilling
- Basic Milling
- Basic Turning
- Advanced Drilling
- Advanced End Milling
- Advanced Turning
- Basic Threading
- Advanced Face Milling
- Basic Workpiece Materials
- Tool Grades
- Advanced Workpiece Materials

TRAINING COURSES

Programs are designed for several levels of skill development – from basic understanding to advance manufacturing with digital solutions, complementing to your valued experience in CNC machining environment. Participate in machining demonstrations with Mitsubishi Materials' skilled engineers. Discover methods to reduce setup and cycle time, optimize programs and enhance your knowledge base.

Information on course schedule,
course description, and accommodations

MTECTRaining.INFO

Follow the QR Code for a virtual facility tour





MITSUBISHI MATERIALS U.S.A. CORPORATION

California Office (Headquarters)

3535 Hyland Avenue, Suite 200
Costa Mesa, CA 92626
Customer Service: 800.523.0800
Technical Service: 800.486.2341

Chicago Office (Engineering)

300 N. Martingale Road, Suite 500
Schaumburg, IL 60173
Main: 847.252.6300
Fax: 847.519.1732

MMC Metal de Mexico, S.A. DE C.V.

Av. La Cañada No.16,
Parque Industrial Bernardo
Quintana, El Marques,
Queretaro C.P. 76246 MEXICO
Main: +52.442.221.61.36
Fax: +52.442.221.61.34

North Carolina-MTEC (Marketing & Technical Center)

105 Corporate Center Drive, Suite A
Mooresville, NC 28117
Main: 980.312.3100
Fax: 704.746.9292

Toronto Office (Canada Branch)

600 Matheson Blvd. Unit 5 (Office)
Mississauga, ON L5R 4C1
Main: 905.814.0240
Fax: 905.814.0245

Detroit Office (Moldino CS)

41700 Gardenbrook Road, Suite 120
Novi, MI 48375
Main: 248.308.2620
Fax: 248.308.2627

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 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.

www.mmc-carbide.com/us

Tools specifications subject to change without notice.

B075A-F-US-2014.12