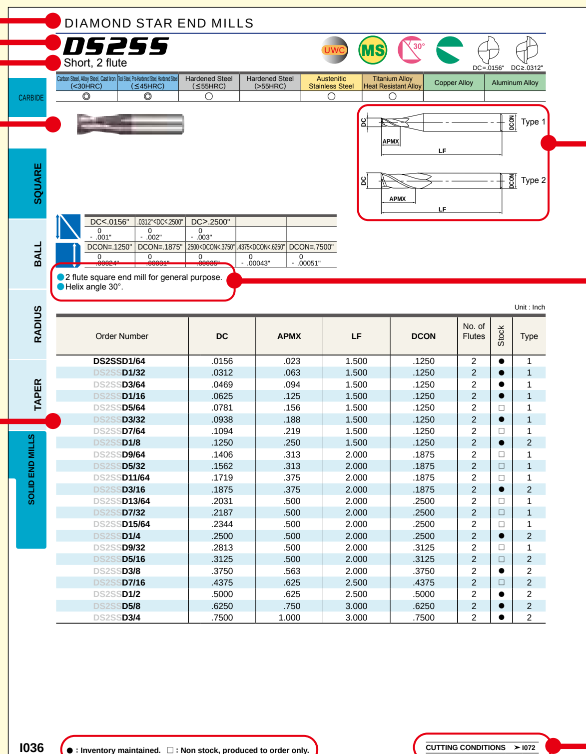
●Section organization

①Organized according to cutting mode for milling. (Refer to END MILL LIST.)

PHOTO OF PRODUCT
PRODUCT TITLE
ITEM NUMBER
PRODUCT BLOCK



DIAMOND STAR END MILLS

DS2SS
Short, 2 flute

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
◎	◎	○		○	○		

DC<.0156"	.0312"<DC<.2500"	DC>.2500"		
0 - .001"	0 - .002"	0 - .003"		
DCON=.1250"	DCON=.1875"	.2500<DCON<.3750"	.4375<DCON<.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

● 2 flute square end mill for general purpose.
● Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2SSD1/64	.0156	.023	1.500	.1250	2	●	1
DS2SSD1/32	.0312	.063	1.500	.1250	2	●	1
DS2SSD3/64	.0469	.094	1.500	.1250	2	●	1
DS2SSD1/16	.0625	.125	1.500	.1250	2	●	1
DS2SSD5/64	.0781	.156	1.500	.1250	2	□	1
DS2SSD3/32	.0938	.188	1.500	.1250	2	●	1
DS2SSD7/64	.1094	.219	1.500	.1250	2	□	1
DS2SSD1/8	.1250	.250	1.500	.1250	2	●	2
DS2SSD9/64	.1406	.313	2.000	.1875	2	□	1
DS2SSD5/32	.1562	.313	2.000	.1875	2	□	1
DS2SSD11/64	.1719	.375	2.000	.1875	2	□	1
DS2SSD3/16	.1875	.375	2.000	.1875	2	●	2
DS2SSD13/64	.2031	.500	2.000	.2500	2	□	1
DS2SSD7/32	.2187	.500	2.000	.2500	2	□	1
DS2SSD15/64	.2344	.500	2.000	.2500	2	□	1
DS2SSD1/4	.2500	.500	2.000	.2500	2	●	2
DS2SSD9/32	.2813	.500	2.000	.3125	2	□	1
DS2SSD5/16	.3125	.500	2.000	.3125	2	□	2
DS2SSD3/8	.3750	.563	2.000	.3750	2	●	2
DS2SSD7/16	.4375	.625	2.500	.4375	2	□	2
DS2SSD1/2	.5000	.625	2.500	.5000	2	●	2
DS2SSD5/8	.6250	.750	3.000	.6250	2	●	2
DS2SSD3/4	.7500	1.000	3.000	.7500	2	●	2

I036

● : Inventory maintained. □ : Non stock, produced to order only.

CUTTING CONDITIONS ➤ I072

GEOMETRY

PRODUCT FEATURES

PAGE REFERENCE
· CUTTING CONDITIONS

LEGEND FOR STOCK STATUS MARK
is shown on the left hand page of
each double-page spread.

PRODUCT STANDARDS
indicates diameters, order numbers,
stock status, dimensions,
and for the title product.

●To Order: Please specify product title and order number.

MILLING

SOLID CARBIDE END MILLS

*Arranged by Alphabetical order

PRODUCT CODE CORRESPONDENCES

PRODUCT CODE OF END MILLS

MS 2 M S D0020 *

End mill names	Number of flutes	Flute length	Features	Dimensions	Others
VQ : Smart Miracle end mills	**2** : 2 flute	**ES** : Extra short	**S** : General use	**D***** : Diameter	**S**** : Shank diameter
VF : Impact Miracle end mills	**3** : 3 flute	**S** : Short	**C** : Center cut	**ex.**	**N**** : Neck length
MS : Mstar end mills	**4** : 4 flute	**M** : Medium	**B** : Ball nose	D0050 →ϕ0.5 mm	**T**** : Taper angle one side
VC : Miracle end mills	**5** : 5 flute	**J** : Semi long	**A** : For light alloy	D0500 →ϕ5 mm	**L**** : Length of cut
CBN : CBN end mills	**6** : 6 flute	**L** : Long	**D** : For heavy duty		**A**** : Overall length
C : Carbide end mills	**8** : 8 flute	**X** : Taper neck	**V** : Irregular helix flutes	**R***** : Radius of ball nose	
DFC : Diamond coated end mills		**XL** : Long neck	**RB** : Corner radius		
DF : Diamond coated end mills			**H** : High helix 45°	**ex.**	
DS : Diamond star end mills			**HH** : High helix 60°	R0050 → R0.5	
			R : Roughing	R0500 → R5	
			FPR : Fine roughing		
			T : Taper		
			TB : Taper ball nose		
			CH : Coolant hole		

SYMBOL DESCRIPTIONS

Tool material

UWC — Ultra micro grain carbide

CBN — Cubic boron nitride

Tolerances

Outside diameter tolerance
Indicates the diameter tolerance of the end mill.

R tolerance
Indicates the radius tolerance of a ball nose end mill.

R tolerance
Indicates the radial tolerance of an end mill with a corner radius.

Tolerance of Taper angle
Indicates the tolerance of the taper angle.

Tolerance of Point angle
Indicates the tolerance of the point angle.

h6 — **Tolerance of Shank**
Indicates the tolerance of the end mill shank.

Coating

VQ — **SMART MIRACLE Coating**
New smooth and dense coating technology for high efficiency milling of difficult to cut materials.

VF — **IMPACT MIRACLE Coating**
Single phase nano crystal coating technology for higher film hardness and heat resistance.

VC — MIRACLE Coating

MS — Original developed (Al, Ti)N coating

DFC — Diamond Coating

DF — Diamond Coating

Angle, sharp corner edge and gash land

30° — **Helix angle**
Indicates the helix angle of the end mill.

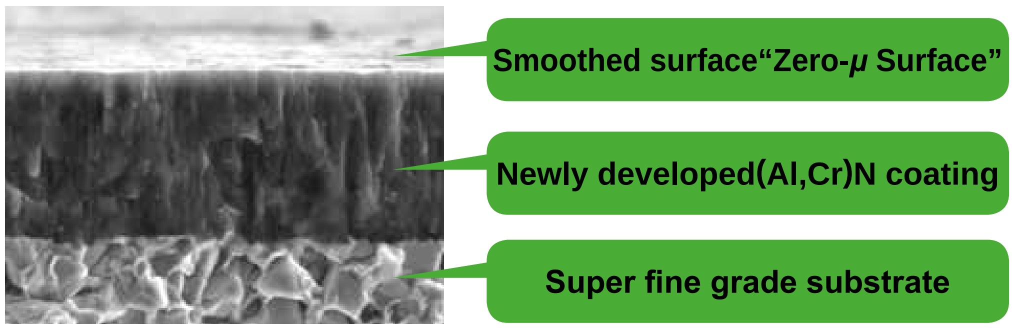
Sharp corner edge
Indicates that the end mill has a sharp corner edge.

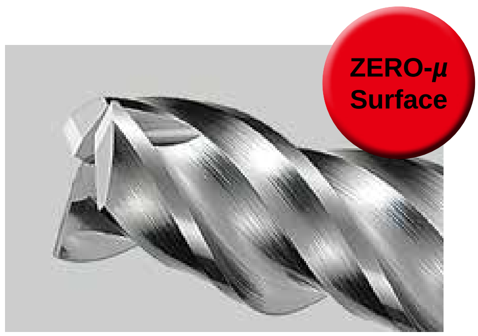
Gash land
Indicates that the end mill cutting edge has a gash land.

COATING TECHNOLOGY

VQ SMART MIRACLE® Coating

Newly-developed (Al,Cr)N coating with improved wear resistance.
The smoothig treatment of the coating layer reduces the cutting resistance and improves chip discharge significantly. This next-generation coating offers longer tool life and higher efficiency in machining difficult-to-cut materials.





SMART MIRACLE Coating

ZERO- μ Surface

The original surface treatment technology offers smooth coatng layer. A good balance of smooth surface and sharpe edge allows smooth chip discharge and reduces the cutting resistance. Machining efficiency and tool life is improved.

MIRACLE SIGMA

VF IMPACT MIRACLE Coating

For higher hardness, higher speed and longer tool life!

In comparison with the conventional coating single-phase, nano crystal coating technology offers higher coating hardness and heat resistance.
When machining hardened steels, it can be seen that the IMPACT MIRACLE coating offers a lower coefficient of friction and prevents abnormal damage such as chipping.

FEATURES OF IMPACT MIRACLE COATING

	IMPACT MIRACLE	(Al,Ti,Si)N	(Al,Ti)N
Hardness	3700HV	3200HV	2800HV
Adhesion	100N	80N	80N
Oxidation temperature	2370F	2010F	1540F
Coefficient of friction	0.48	0.53	0.58

1) Adhesion : Measured by critical load scratch test.
2) Coefficient of friction : Measured by ball-on-disk method.
(Counter gear : AISI D2 60HRC)

VC MIRACLE Coating (Al,Ti)N

MIRACLE coating for high speed milling.

Miracle coating is produced by adding Al to the existing TiN coating.
This coating layer consists of a compound solid solution of (Al,Ti)N.
This results in improving the heat resistance during cutting, and thus delivers high performance in high hardness material machining and high speed dry cutting. It also has the high adhesion strength for the cemented carbide substrate, and extends the tool life significantly compared to conventional products.

SOLID END MILLS

ENDMILL SERIES (FOR FERROUS MATERIAL)

APPLICATION RANGE

Work material		High performance	General
P	Carbon Steel Alloy Steel		
M	Austenitic Stainless Steel	SMART MIRACLE	MS
S	Titanium Alloy Heat Resistant Alloy		
H	Hardened steel	IMPACT MIRACLE	

DFC Diamond Coating

Proprietary CVD diamond coating produces excellent wear resistance and smooth hole surface.

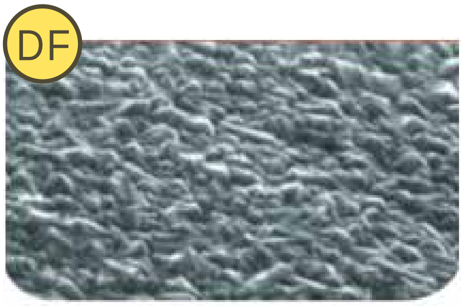
The newly developed CVD diamond coated carbide material achieves outstanding abrasion resistance and smoothness due to a proprietary fine multilayer diamond crystal control technology.

DF Diamond Coating

Diamond coating for non-ferrous and new non-metal materials.

Due to Mitsubishi's unique plasma chemical vapor deposition (CVD) coating technology, the coating hardness, which is similar to diamond, has been combined with excellent adhesion strength to the carbide substrate(s) to provide long tool life.
DF end mill series are suitable for graphite machining.

DF



Large crystal coating provide excellent wear resistance against graphite

DFC

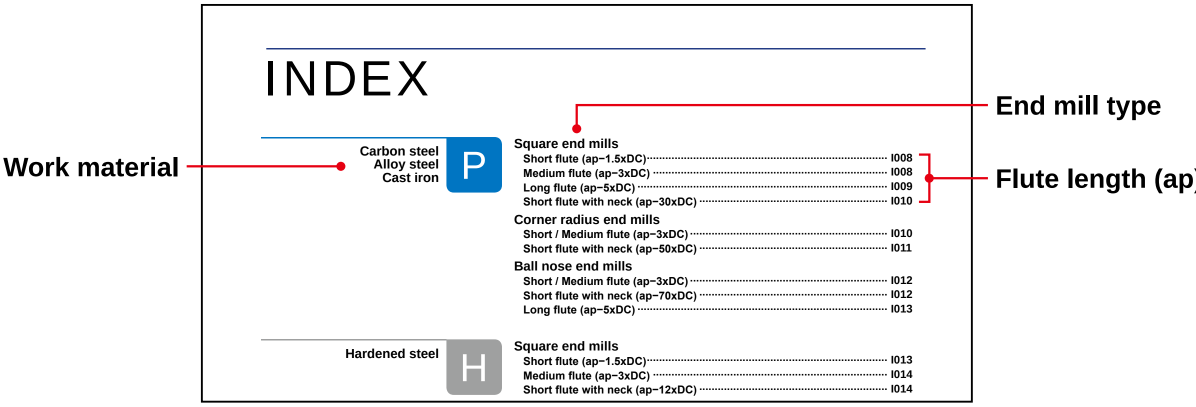
Fine crystal coating provide smooth surface and sharp cutting edge. DFC is suitable for machining FRP materials.

TOOL NAVI

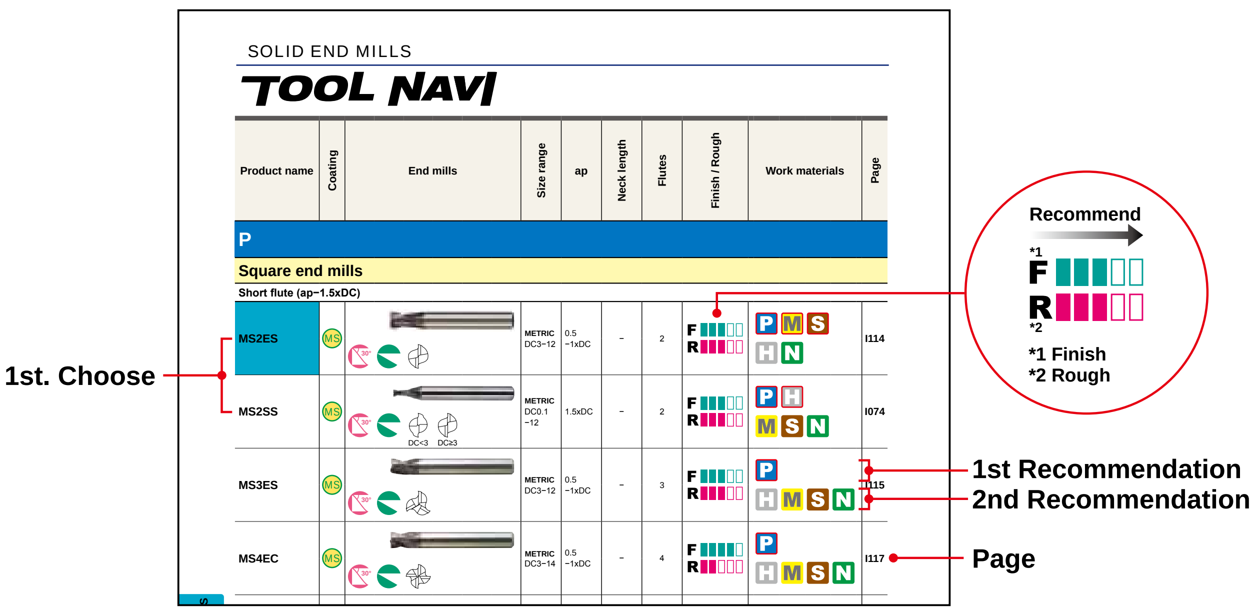
HOW TO USE TOOL NAVI

3 steps to find the correct tool and cutting data.

STEP1 Choose work material, end mill type and cutting length

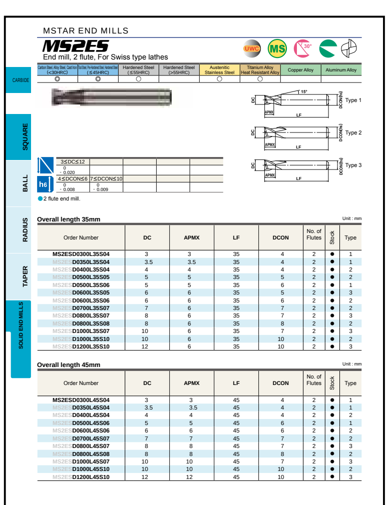


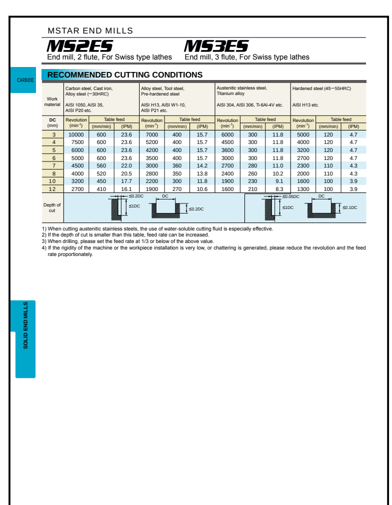
STEP2 Choose end mill



STEP3 Choose size and cutting condition

End mill size





Cutting conditions

SOLID END MILLS

INDEX

P — Carbon steel / Alloy steel / Cast iron

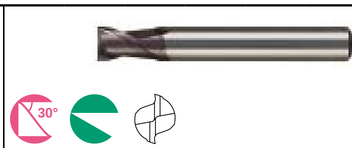
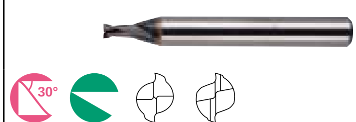
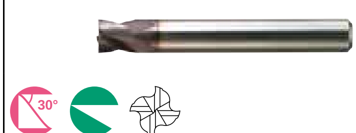
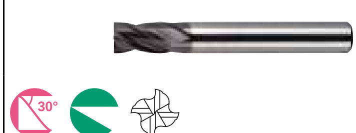
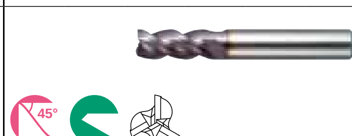
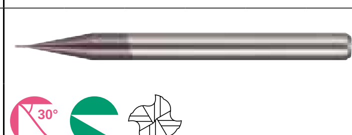
H — Hardened steel

M — Austenitic Stainless steel
S — Ti alloy / Ni-base alloy

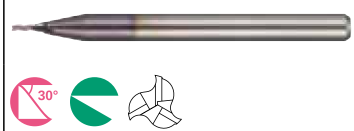
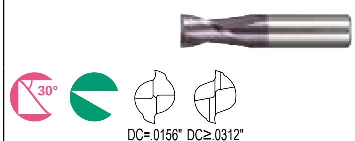
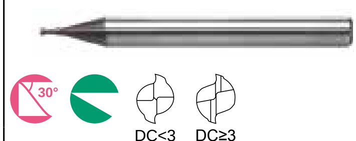
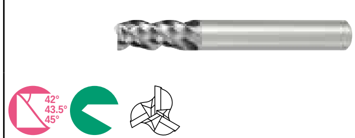
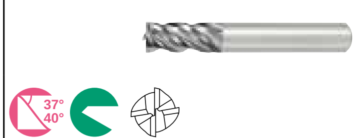
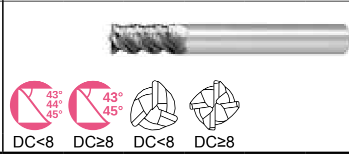
N — Copper alloy / Aluminum alloy

G — Graphite / FRP

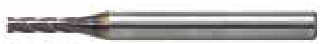
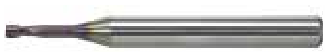
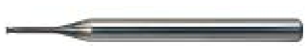
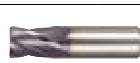
TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
P									
Square end mills									
Short flute (ap−1.5xDC)									
MS2ES	MS		METRIC DC3−12	0.5 −1xDC	−	2	F ■■■□□ R ■■■□□	P M S H N	I114
MS2SS	MS	 DC<3 DC≥3	METRIC DC0.1 −12	1.5xDC	−	2	F ■■■□□ R ■■■□□	P H M S N	I074
MS3ES	MS		METRIC DC3−12	0.5 −1xDC	−	3	F ■■■□□ R ■■■□□	P H M S N	I115
MS4EC	MS		METRIC DC3−14	0.5 −1xDC	−	4	F ■■■■□ R ■■□□□	P H M S N	I117
MS4SC	MS		METRIC DC1−12	1.5xDC	−	4	F ■■■■□ R ■■□□□	P H M S N	I103
MSSHD	MS		METRIC DC3−20	1.5xDC	−	4	F ■■■■□ R ■■■□□	P M S H	I093
Medium flute (ap−3xDC)									
MSMHD	MS		METRIC DC2−25	2 −3.1xDC	−	4	F ■■■■□ R ■■■□□	P M S H	I094
MSMHZD	MS		METRIC DC1−20 INCH DC.0625 −.7500	1.6 −2.5xDC	−	3	F ■■■□□ R ■■■□□	P M S H N	METRIC I099 INCH I101
DS4MC	MS		INCH DC.0156 −1.2500	1.3 −3.6xDC	−	4	F ■■■■□ R ■■□□□	P H M S N	I042

* ap : Depth of cut
* DC : Dia.

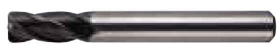
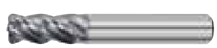
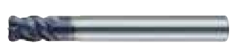
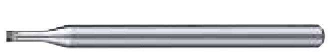
Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
DS3MC	MS	 30°	INCH DC.0156 −1.2500	2 −3.6xDC	–	3	F R	P H M S N	I040
DS2SS	MS	 30° DC=.0156" DC≥.0312"	INCH DC.0156 −.7500	1.2 −2.5xDC	–	2	F R	P H M S N	I036
MS2MS	MS	 30° DC<3 DC≥3	METRIC DC0.2 −20	2xDC	–	2	F R	P H M S N	I075
MS2JS	MS	 30° DC<3 DC≥3 DC<3 DC≥3	METRIC DC0.1 −12	3xDC	–	2	F R	P H M S N	I080
VQMHZV MIRACLE SIGMA	VQ	 42° 43.5° 45°	METRIC DC1−20 INCH DC.0625 −.5000	1.6 −2.5xDC	–	3	F R	P M S N	METRIC I202 INCH I208
VQMHV MIRACLE SIGMA	VQ	 37° 40°	METRIC DC2−25 INCH DC.1250 −.5000	2 −2.8xDC	–	4	F R	P M S N	METRIC I218 INCH I222
NEW VQSVR MIRACLE SIGMA	VQ	 43° 44° 45° 43° 45° DC<8 DC≥8 DC<8 DC≥8	METRIC DC3−20	1.8 −2.2xDC	–	4	F R	P M S N	I232
Long flute (ap−5xDC)									
MSJHD	MS	 45°	METRIC DC2−20	2.8 −4xDC	–	4	F R	P M S H	I097
DS4LC	MS	 30°	INCH DC.1250 −1.0000	3 −8xDC	–	4	F R	P H M S N	I043
MS2LS	MS	 30°	METRIC DC0.2 −12	4xDC	–	2	F R	P H M S N	I082

TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
P									
Square end mills									
Long flute (ap−5xDC)									
MS4JC	MS	 30° DC<3 DC≥3 DC<3 DC≥3	METRIC DC1−12	4xDC	−	4	F R	P H M S N	I106
NEW VQJHV MIRACLE SIGMA	VQ	 38° 40° 37.5° 40° DC≤6 DC>6	METRIC DC2−20 INCH DC.1250 −.5000	3.3 −4xDC	−	4	F R	P M S N	METRIC I225 INCH I227
Short flute with neck (ap−30xDC)									
MS2XL	MS	 30° DC<0.4 DC≥0.4	METRIC DC0.2 −6 INCH DC.0156 −.2500	1.3 −1.6xDC	2.5 −30xDC	2	F R	P H M S N	METRIC I084 INCH I091
MS2XL6	MS	 30°	METRIC DC0.3 −2.5	1.5 −2.7xDC	2.5 −5xDC	2	F R	P H M S N	I088
MS4XL	MS	 30°	METRIC DC1−10 INCH DC.0625 −.2500	1xDC	2.6 −16.2xDC	4	F R	P H M S	METRIC I108 INCH I112
VF2XL	VF	 30° DC<3 DC=3	METRIC DC0.1 −3	1.5 −1.7xDC	2.5 −12.5xDC	2	F R	P H	I252
Corner radius end mills									
Short / Medium flute (ap−3xDC)									
MSMHDRB	MS	 45°	METRIC DC2−20	2 −2.8xDC	−	4	F R	P M S H	I140
DS4SRB	MS	 30°	INCH DC.1250 −.7500	1.2 −2xDC	−	4	F R	P H M S N	I055

* ap : Depth of cut
* DC : Dia.

SOLID END MILLS

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
MS2MRB	MS	 30° DC<3 DC≥3	METRIC DC1−12	2xDC	−	2	F ■■■□□ R ■■■□□	P H M S	I132
DS4MRB	MS	 30°	INCH DC.1250 −.7500	2 −3xDC	−	4	F ■■■■□ R ■■□□□	P H M S N	I056
MS4MRB	MS	 30°	METRIC DC3−20	1.9 −2.8xDC	−	4	F ■■■■□ R ■■□□□	P H M S	I137
VQMHVRB MIRACLE SIGMA	VQ	 37° 40°	METRIC DC2−20 INCH DC.1250 −.5000	2 −2.8xDC	−	4	F ■■■■□ R ■■■■□	P M S N	METRIC I239 INCH I244
Short flute with neck (ap−50xDC)									
VFHVRB	VF	 43° 45°	METRIC DC1−16 INCH DC.1250 −.5000	1 −1.6xDC	2.6 −50xDC	4	F ■■■■□ R ■■■■■	P H M S	METRIC I307 INCH I313
VCPSRB [High Precision]	VC	 30° DC≤1.5 DC≥2	METRIC DC0.6 −12	1xDC	2.6 −13.3xDC	2 4	F ■■■■■ R ■■■□□	P H M S	I181
MS2XLRB	MS	 30° DC<3 DC≥3	METRIC DC1−6	1xDC	2−50xDC	2	F ■■■□□ R ■□□□□	P H M S N	I135
CBN2XLRB	CBN	 0°	METRIC DC0.5 −2	0.6xDC	3−6xDC	2	F ■■■■■ R □□□□□	P H	I349

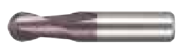
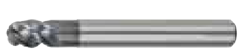
TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page

P

Ball nose end mills

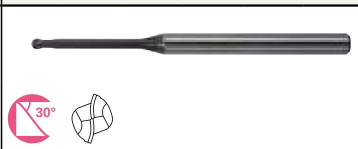
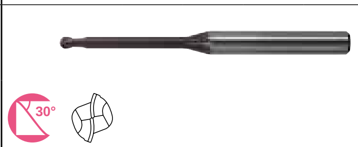
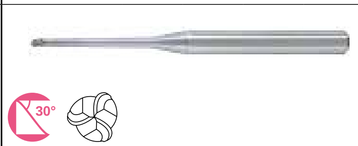
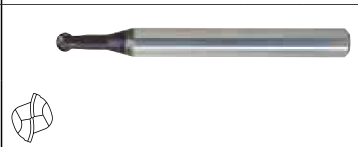
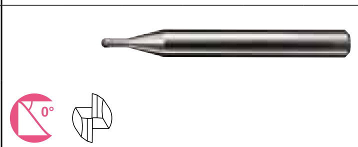
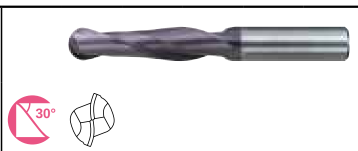
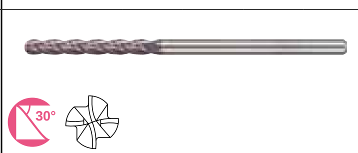
Short / Medium flute (ap−3xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
MS2SB	MS	 30°	**METRIC** PRFRAD 0.1−6	1.5 −1.7xDC	−	2	F ■■■□□ R ■■■□□	P H M S	**I119**
DS2SB	MS	 30°	**INCH** DC.0156 −.7500	1.2 −2.5xDC	−	2	F ■■■□□ R ■■■□□	P H M S	**I044**
MS2MB	MS	 30°	**METRIC** PRFRAD 0.25−6	1.8 −3xDC	−	2	F ■■■□□ R ■■■□□	P H M S	**I121**
VF2SDB	VF	 30°	**METRIC** PRFRAD 0.5−10	1−2xDC	−	2	F ■■■□□ R ■■■■■	P H	**I284**
VF2SDBL	VF	 30°	**METRIC** PRFRAD 0.5−10	1−2xDC	−	2	F ■■■□□ R ■■■■□	P H	**I285**
VQ4SVB MIRACLE SIGMA	VQ	 45°	**METRIC** PRFRAD 1−6 **INCH** PRFRAD .0625− .2500	1.5xDC	−	4	F ■■■■■ R ■■□□□	P M S N	METRIC **I235** INCH **I237**
VC2PSBP [High Precision]	VC	 0° 30° PRFRAD<0.5 PRFRAD≥0.5 PRFRAD<0.5 PRFRAD≥0.5	**METRIC** PRFRAD 0.02−6	1−2xDC	−	2	F ■■■■■ R ■■■□□	P H M S	**I172**

Short flute with neck (ap−70xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
MS2XLB	MS	 30°	**METRIC** PRFRAD 0.1−3 **INCH** PRFRAD .0078− .1250	1xDC	2 −20xDC	2	F ■■■□□ R ■■□□□	P H M S N	METRIC **I123** INCH **I129**
MS4XLB	MS	 20° 30° DC<3/16 DC=1/4	**INCH** PRFRAD .0313− .1250	1xDC	6 −12xDC	4	F ■■■□□ R ■□□□□	P H M S	**I131**

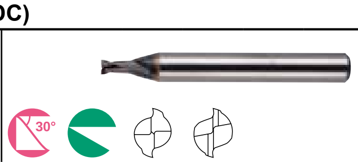
* ap : Depth of cut
* DC : Dia.
* PRFRAD : Radius of ball nose

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
VF2XLB	VF		**METRIC** PRFRAD 0.1−3 **INCH** PRFRAD .0156−.1250	0.8xDC	2.5 −20xDC	2	F R	P H S	METRIC **I289** INCH **I295**
VF2XLBS	VF		**METRIC** PRFRAD 0.2−1	0.8xDC	2.5 −12xDC	2	F R	P H S	**I288**
VF3XB	VF		**METRIC** PRFRAD 0.4−2.5	0.6 −0.9xDC	6.6 −70xDC	3	F R	P H S	**I297**
VF2WB	VF		**METRIC** PRFRAD 1−3	220°	2−3xDC	2	F R	P M S H	**I277**
CBN2XLB	CBN		**METRIC** PRFRAD 0.2−1	0.6 −0.8xDC	0.85 −4xDC	2	F R	P H	**I347**
Long flute (ap−5xDC)									
DS2LB	MS		**INCH** DC.1250 −1.0000	3 −8xDC	−	2	F R	P H M S	**I045**
DS4LB	MS		**INCH** DC.1250 −1.0000	3 −8xDC	−	4	F R	P H M S	**I048**

H

Square end mills

Short flute (ap−1.5xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
MS2SS	MS	 DC<3 DC≥3	**METRIC** DC0.1 −12	1.5xDC	−	2	F R	P H M S N	**I074**

TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
H									
Square end mills									
Medium flute (ap−3xDC)									
VFSD	VF	30° DC<3, 45° DC≥3, DC<3, DC≥3	METRIC DC1−12	2xDC	−	4 6	F R	P H	I266
VFMD	VF	30° DC<3, 45° DC≥3, DC<3, DC≥3	METRIC DC1−25 INCH DC.0313 −.5000	2 −3.5xDC	−	4 6	F R	P H	METRIC I267 INCH I269
VF2MV	VF	32.5° 37.5°	METRIC DC0.5 −6	2.5xDC	−	2	F R	P H	I255
VF4MV	VF	35° 38°	METRIC DC6−20	2.5xDC	−	4	F R	P H	I257
Short flute with neck (ap−12xDC)									
VF2XL	VF	30°, DC<3, DC=3	METRIC DC0.1 −3	1.5 −1.7xDC	2.5 −12.5xDC	2	F R	P H	I252
Corner radius end mills									
Short / Medium flute (ap−3xDC)									
NEW VFSDRB	VF	45°	METRIC DC3−12	1xDC	−	6	F R	P H	I321
NEW VFMDRB	VF	45°	METRIC DC3−20	2.2 −3.3xDC	−	6	F R	P H	I322
Short flute with neck (ap−50xDC)									
VFHVRB	VF	43° 45°	METRIC DC1−16 INCH DC.1250 −.5000	1 −1.6xDC	2.6 −50xDC	4	F R	P H M S	METRIC I307 INCH I313

⁎ ap : Depth of cut
⁎ DC : Dia.
⁎ PRFRAD : Radius of ball nose

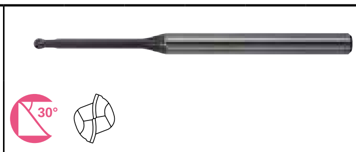
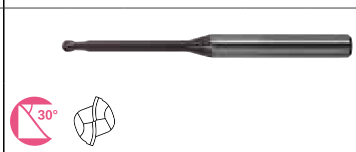
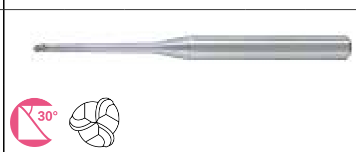
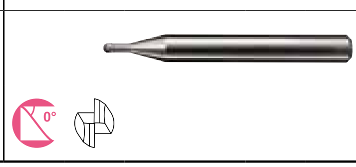
Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
VCPSRB [High Precision]	VC	30° DC≤1.5 DC≥2	METRIC DC0.6 −12	1xDC	2.6 −13.3xDC	2 4	F R	P H M S	I181
NEW **VFFDRB**	VF	40° DC≤6 DC≥8	METRIC DC3−12	0.06DC	3DC	4 6	F R	H P M	I306
CBN2XLRB	CBN	0°	METRIC DC0.5 −2	0.6xDC	3−6xDC	2	F R	P H	I349

Ball nose end mills

Short / Medium flute (ap−3xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
VF2SB	VF	0° 30° PRFRAD<0.3 PRFRAD≥0.3 PRFRAD<0.3 PRFRAD≥0.3	METRIC PRFRAD 0.1−10 INCH PRFRAD .0156− .2500	1−2xDC	−	2	F R	P H M S	METRIC I279 INCH I282
VF2SSB	VF	30°	METRIC PRFRAD 0.5−6	1xDC	−	2	F R	P H M S	I278
VF2SDB	VF	30°	METRIC PRFRAD 0.5−10	1−2xDC	−	2	F R	P H	I284
VF2SDBL	VF	30°	METRIC PRFRAD 0.5−10	1−2xDC	−	2	F R	P H	I285
VF4MB	VF	30°	METRIC PRFRAD 0.5−6	1.8 −3xDC	−	4	F R	P H M S	I302
VC2PSBP [High Precision]	VC	0° 30° PRFRAD<0.5 PRFRAD≥0.5 PRFRAD<0.5 PRFRAD≥0.5	METRIC PRFRAD 0.02−6	1−2xDC	−	2	F R	P H M S	I172

TOOL NAVI

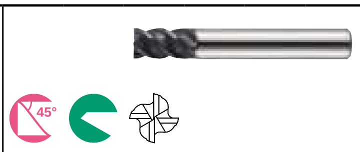
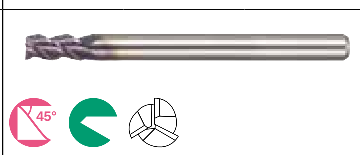
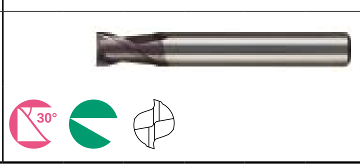
Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
H									
Ball nose end mills									
Short flute with neck (ap−70xDC)									
VF2XLB	VF	 30°	**METRIC** PRFRAD 0.1−3 **INCH** PRFRAD .0156−.1250	0.8xDC	2.5 −20xDC	2	F ■■■□□ R ■■□□□	P H S	METRIC I289 INCH I295
VF2XLBS	VF	 30°	**METRIC** PRFRAD 0.2−1	0.8xDC	2.5 −12xDC	2	F ■■■□□ R ■■□□□	P H S	I288
VF3XB	VF	 30°	**METRIC** PRFRAD 0.4 −2.5	0.6 −0.9xDC	6.6 −70xDC	3	F ■■■□□ R ■□□□□	P H S	I297
CBN2XLB	CBN	 0°	**METRIC** PRFRAD 0.2−1	0.6 −0.8xDC	0.85 −4xDC	2	F ■■■■■ R □□□□□	P H	I347

* ap : Depth of cut
* DC : Dia.
* PRFRAD : Radius of ball nose

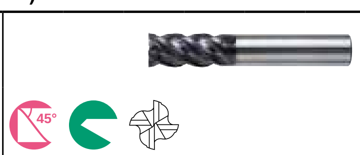
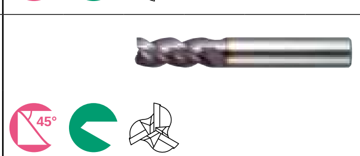
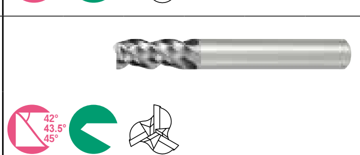
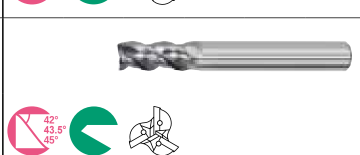
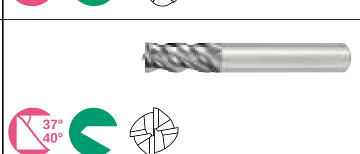
Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
M									
S									

Square end mills

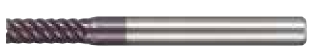
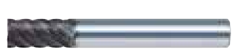
Short flute (ap−1.5xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
MSSHD	MS		METRIC DC3−20	1.5xDC	−	4	F ■■■■□ R ■■■□□	P M S H	I093
DS3SH-SS	MS		INCH DC.1250 −.7500	1.2 −2xDC	−	3	F ■■■□□ R ■■■□□	M S P H	I060
MS2ES	MS		METRIC DC3−12	0.5 −1xDC	−	2	F ■■■□□ R ■■■□□	P M S H N	I114

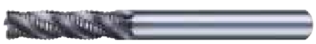
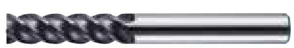
Medium flute (ap−3xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
MSMHD	MS		METRIC DC2−25	2 −3.1xDC	−	4	F ■■■■□ R ■■■□□	P M S H	I094
MSMHZD	MS		METRIC DC1−20 INCH DC.0625 −.7500	1.6 −2.5xDC	−	3	F ■■■□□ R ■■■□□	P M S H N	METRIC I099 INCH I101
VQMHZV MIRACLE SIGMA	VQ		METRIC DC1−20 INCH DC.0625 −.5000	1.6 −2.5xDC	−	3	F ■■■□□ R ■■■□□	P M S N	METRIC I202 INCH I208
VQMHZVOH MIRACLE SIGMA	VQ		METRIC DC6−16 INCH DC.2500 −.5000	1.9 −2.4xDC	−	3	F ■■■□□ R ■■■□□	P M S N	METRIC I212 INCH I215
VQMHV MIRACLE SIGMA	VQ		METRIC DC2−25 INCH DC.1250 −.5000	2 −2.8xDC	−	4	F ■■■■□ R ■■■■□	P M S N	METRIC I218 INCH I222

TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
M									
S									
Square end mills									
Medium flute (ap−3xDC)									
DS3MHH60	MS	 60°	INCH DC.1250 −1.0000	1.5 −3.2xDC	–	3	F ■■■□□ R ■■■□□	M S P H	I049
NEW VQSVR MIRACLE SIGMA	VQ	 43° 44° 45° DC<8; 43° 45° DC≥8; DC<8; DC≥8	METRIC DC3−20	1.8 −2.2xDC	–	4	F □□□□□ R ■■■■■	P M S N	I232
VFMHVCH	VF	 42° 45°	METRIC DC16, DC20	2.2xDC	–	4	F ■■■■□ R ■■■■□	M S P H	I260
DS5MH-SS	MS	 45°	INCH DC.2500 −.7500	2.2 −3xDC	–	5	F ■■■■□ R ■□□□□	M S P H	I062
DS6MHH60	MS	 60°	INCH DC.1250 −1.0000	1.5 −3.2xDC	–	6	F ■■■■■ R ■□□□□	M S P H	I050
VF6MHV	VF	 43.5° 45°	METRIC DC6−20	1.9 −2.4xDC	–	6	F ■■■■■ R ■□□□□	M S P H	I263
VF6MHVCH	VF	 43.5° 45°	METRIC DC10 −20	1.9 −2.2xDC	–	6	F ■■■■■ R ■□□□□	M S P H	I264
VF8MHVCH	VF	 44° 45°	METRIC DC16, DC20	1.9 −2xDC	–	8	F ■■■■■ R ■□□□□	M S P H	I265

* ap : Depth of cut
* DC : Dia.

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
VFSFPRCH	VF	 30°	METRIC DC16, DC20	1.9 −2.1xDC	–	4	F □□□□□ R ■■■■■	P M S H	I273
VF6SVRCH	VF	 28.5° 30°	METRIC DC16, DC20	1.9 −2.1xDC	–	6	F □□□□□ R ■■■■■	P M S H	I274
VFMFPR	VF	 30°	METRIC DC5−20	2.8 −3.5xDC	–	4	F □□□□□ R ■■■■■	P M S H	I275
Long flute (ap−5xDC)									
VQJHV MIRACLE SIGMA	VQ	 38° 40° DC≤6 37.5° 40° DC>6	METRIC DC2−20 INCH DC.1250 −.5000	3.3 −4xDC	–	4	F ■■■■□ R ■■□□□	P M S N	METRIC I225 INCH I227
MSJHD	MS	 45°	METRIC DC2−20	2.8 −4xDC	–	4	F ■■■■□ R ■■□□□	P M S H	I097
DS5LH-SS	MS	 45°	INCH DC.2500 −.7500	4 −5xDC	–	5	F ■■■■■ R □□□□□	M S P H	I063
Short flute with neck (ap−30xDC)									
VQXL MIRACLE SIGMA	VQ	 35° DC<0.3 DC≥0.4	METRIC DC0.2 −1	1.5 −1.67xDC	2.5 −6xDC	3 4	F ■■■■□ R ■■□□□	P M S H N	I229
MS2XL	MS	 30° DC<0.4 DC≥0.4	METRIC DC0.2 −6 INCH DC.0156 −.2500	1.3 −1.6xDC	2.5 −30xDC	2	F ■■■□□ R ■□□□□	P H M S N	METRIC I084 INCH I091
MS2XL6	MS	 30°	METRIC DC0.3 −2.5	1.5 −2.7xDC	2.5 −5xDC	2	F ■■■□□ R ■□□□□	P H M S N	I088

SOLID END MILLS

TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page

M

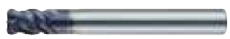
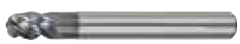
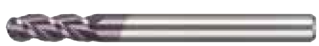
S

Corner radius end mills

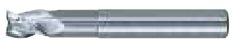
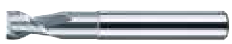
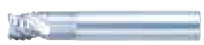
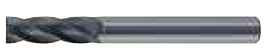
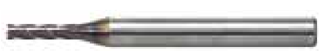
Short / Medium flute (ap−3xDC)

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
VQMHVRB MIRACLE SIGMA	VQ	37° 40°	METRIC DC2−20 INCH DC.1250 −.5000	2 −2.8xDC	−	4	F ■■■■□ R ■■■■□	P M S N	METRIC I239 INCH I244
MSMHDRB	MS	45°	METRIC DC2−20	2 −2.8xDC	−	4	F ■■■■□ R ■■■□□	P M S H	I140
DS3MHRB-SS	MS	45°	INCH DC.1250 −.7500	2.2 −3xDC	−	3	F ■■■□□ R ■■■□□	M S P H	I067
VQMHVRBF MIRACLE SIGMA	VQ	37° 40°	METRIC DC6−16 INCH DC.2500 −.5000	2.2 −2.4xDC	−	4	F ■■■■□ R ■■□□□	P S M	METRIC I247 INCH I249
VFMHVRBCH	VF	42° 45°	METRIC DC16 −20	2.2 −2.3xDC	−	4	F ■■■■□ R ■■■■□	P M S H	I324
DS5SHRB-SS	MS	45°	INCH DC.2500 −.7500	1.2 −1.5xDC	−	5	F ■■■■□ R ■□□□□	M S P H	I068
VF6MHVRB	VF	43.5° 45°	METRIC DC6−20	1.9 −2.4xDC	−	6	F ■■■■■ R ■□□□□	M S P H	I325
VF6MHVRBCH	VF	43.5° 45°	METRIC DC10 −20	1.9 −2.2xDC	−	6	F ■■■■■ R ■□□□□	M S P H	I327

* ap : Depth of cut
* DC : Dia.
* PRFRAD : Radius of ball nose

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
VF8MHVRBCH	VF	 44° 45°	**METRIC** DC16, DC20	1.9 −2xDC	−	8	F ■■■■■ R ■□□□□	M S P H	I329
Short flute with neck (ap−50xDC)									
VFHVRB	VF	 43° 45°	**METRIC** DC1−16 **INCH** DC.1250 −.5000	1 −1.6xDC	2.6 −50xDC	4	F ■■■■□ R ■■■■■	P H M S	METRIC I307 INCH I313
Ball nose end mills									
Short / Medium flute (ap−3xDC)									
VQ4SVB MIRACLE SIGMA	VQ	 45°	**METRIC** PRFRAD 1−6 **INCH** PRFRAD .0625− .2500	1.5xDC	−	4	F ■■■■■ R ■■□□□	P M S N	METRIC I235 INCH I237
DS3MHB-SS	MS	 45°	**INCH** DC.1250 −.7500	2.2 −3xDC	−	3	F ■■■□□ R ■■■□□	M S P H	I065
Short flute with neck (ap−20xDC)									
VF2WB	VF		**METRIC** PRFRAD 1−3	220°	2−3xDC	2	F ■■■□□ R ■□□□□	P M S H	I277
MS2XLB	MS	 30°	**METRIC** PRFRAD 0.1−3 **INCH** PRFRAD .0078− .1250	1xDC	2 −20xDC	2	F ■■■□□ R ■□□□□	P H M S	METRIC I123 INCH I129

TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
N									
Square end mills									
Short flute (ap−1.5xDC)									
C3SA	–	 37.5°	METRIC DC10 −26	0.8 −1.3xDC	-	3	F ■■■□□ R ■■■□□	N	I353
C2SA	–	 37.5°	METRIC DC3−20	0.9 −2xDC	-	2	F ■■■□□ R ■■■□□	N	I351
CSRA	–	 37.5°	METRIC DC10 −25	1.1 −1.3xDC	-	3	F □□□□□ R ■■■■■	N	I359
Medium flute (ap−3xDC)									
C2MHA	–	 55°	METRIC DC3−25	1.5 −3xDC	-	2	F ■■■□□ R ■■■□□	N	I355
Long flute (ap−5xDC)									
DF4JC	DF	 30°	METRIC DC3−12	3−4xDC	-	4	F ■■■■□ R ■■■□□	N G	I330
MS4JC	MS	 30° DC<3 DC≥3 DC<3 DC≥3	METRIC DC1−12	4xDC	-	4	F ■■■■□ R ■□□□□	P H M S N	I106

⁎ ap : Depth of cut
⁎ DC : Dia.

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
Short flute with neck (ap−30xDC)									
DF4XL	DF	30° DC<3 DC≥3	METRIC DC1−12	1.5xDC	2.5 −10.6xDC	4	F R	N G	I333
MS2XL	MS	30° DC<0.4 DC≥0.4	METRIC DC0.2 −6 INCH DC.0156 −.2500	1.3 −1.6xDC	2.5 −30xDC	2	F R	P H M S N	METRIC I084 INCH I091

Corner radius end mills

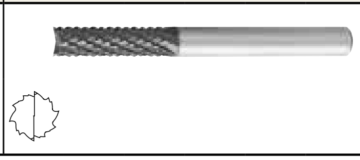
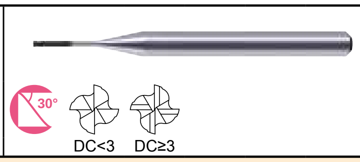
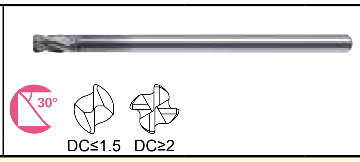
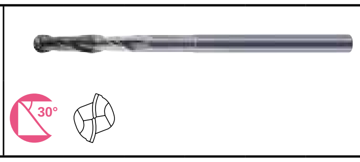
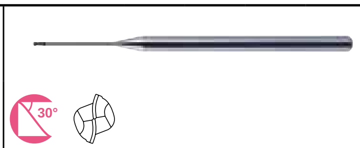
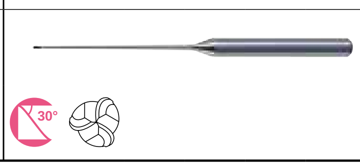
Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
Short / Medium flute (ap−3xDC)									
C3SARB	–	37.5°	METRIC DC12 −25	0.8 −1.3xDC	–	3	F R	N	I357
NEW **CSRARB**	–	37.5°	METRIC DC10 −25	1.1 −1.3xDC	–	3	F R	N	I361
Short flute with neck (ap−50xDC)									
DFPSRB	DF	30° DC≤1.5 DC≥2	METRIC DC0.5 −12	1.3 −1.5xDC	3.3 −30xDC	2 4	F R	N G	I344
MS2XLRB	MS	30° DC<3 DC≥3	METRIC DC1−6	1xDC	2 −50xDC	2	F R	P H M S N	I135

TOOL NAVI

Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
N									
Ball nose end mills									
Short / Medium flute (ap−3xDC)									
DF2MB	DF	30°	**METRIC** PRFRAD 3−6	4.6 −5xDC	−	2	F ■■■□□ R ■■■□□	N G	I336
VQ4SVB MIRACLE SIGMA	VQ	45°	**METRIC** PRFRAD 1−6 **INCH** PRFRAD .0625− .2500	1.5xDC	−	4	F ■■■■■ R ■■□□□	P M S N	METRIC I235 INCH I237
Short flute with neck (ap−50xDC)									
DF2XLB	DF	30°	**METRIC** PRFRAD 0.2−2	1.2 −1.5xDC	2.5 −40xDC	2	F ■■■□□ R ■■■□□	N G	I338
DF3XB	DF	30°	**METRIC** PRFRAD 0.5−2	1.5xDC	20 −50xDC	3	F ■■■□□ R ■■□□□	N G	I342
MS2XLB	MS	30°	**METRIC** PRFRAD 0.1−3 **INCH** PRFRAD .0078− .1250	1xDC	2 −20xDC	2	F ■■■□□ R ■■□□□	P H M S N	METRIC I123 INCH I129
G									
Square end mills									
Long flute (ap−5xDC)									
DF4JC	DF	30°	**METRIC** DC3−12	3−4xDC	−	4	F ■■■■□ R ■■■□□	N G	I332
DFC4JC	DFC	10°	**METRIC** DC6−12	2.5 −3.8xDC	−	4	F ■■■■□ R ■■■■□	G	I330

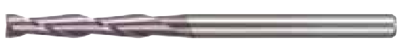
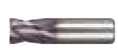
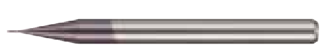
⁎ ap : Depth of cut
⁎ DC : Dia.
⁎ PRFRAD : Radius of ball nose

SOLID END MILLS

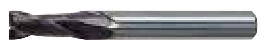
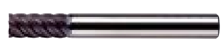
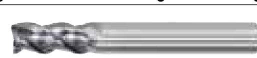
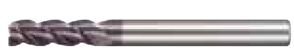
Product name	Coating	End mills	Size range	ap	Neck length	Flutes	Finish / Rough	Work materials	Page
DFCJRT	DFC		METRIC DC6−12	2.5 −3.8xDC	−	10 12	F □□□□□ R ■■■■□	G	I331
Short flute with neck (ap−10xDC)									
DF4XL	DF		METRIC DC1−12	1.5xDC	2.5 −10.6xDC	4	F ■■■■□ R ■■□□□	N G	I333
Corner radius end mills									
Short flute with neck (ap−30xDC)									
DFPSRB	DF		METRIC DC0.5 −12	1.3 −1.5xDC	3.3 −30xDC	2 4	F ■■■■■ R ■■■□□	N G	I344
Ball nose end mills									
Short / Medium flute (ap−3xDC)									
DF2MB	DF		METRIC PRFRAD 3−6	4.6 −5xDC	−	2	F ■■■□□ R ■■■□□	N G	I336
Short flute with neck (ap−50xDC)									
DF2XLB	DF		METRIC PRFRAD 0.2−2	1.2 −1.5xDC	2.5 −40xDC	2	F ■■■□□ R ■■■□□	N G	I338
DF3XB	DF		METRIC PRFRAD 0.5−2	1.5xDC	20 −50xDC	3	F ■■■□□ R ■■□□□	N G	I342

SOLID END MILLS

END MILLS SELECTION CHART CARBIDE

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (−55HRC)	H: Hardened Steel (55HRC−)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
SQUARE	General	2	MS	MS2SS	 Short cut length, 2 flute	METRIC DC 0.1−12	◎	◎	○		○	○			I074	I077
			MS	DS2SS	 Short, 2 flute	INCH DC .0156−.7500	◎	◎	○		○	○			I036	I072
			MS	MS2MS	 Medium cut length, 2 flute	METRIC DC 0.2−20	◎	◎	○		○	○			I075	I077
			MS	DS2MS	 Medium, 2 flute	INCH DC .0156−1.2500	◎	◎	○		○	○			I037	I072
			MS	MS2JS	 Semi long cut length, 2 flute	METRIC DC 0.1−12	◎	◎	○		○	○			I080	I081
			MS	MS2LS	 long cut length, 2 flute	METRIC DC 0.2−12	◎	◎	○		○	○			I082	I083
			MS	DS2LS	 Long, 2 flute	INCH DC .1250−1.0000	◎	◎	○		○	○			I038	I072
		3	MS	DS3SC	 Short, 3 flute	INCH DC .0156−.7500	◎	◎	○		○	○			I039	I072
			MS	DS3MC	 Medium, 3 flute	INCH DC .0156−1.2500	◎	◎	○		○	○			I040	I072
		4	MS	MS4SC	 Short cut length, 4 flute	METRIC DC 1−12	◎	◎	○		○	○			I103	I105
			MS	DS4SC	 Short, 4 flute	INCH DC .0156−.7500	◎	◎	○		○	○			I041	I072
			MS	MS4MC	 Medium cut length, 4 flute	METRIC DC 1−20	◎	◎	○		○	○			I104	I105
			MS	DS4MC	 Medium, 4 flute	INCH DC .0156−1.2500	◎	◎	○		○	○			I042	I072
			MS	MS4JC	 Semi long cut length, 4 flute	METRIC DC 1−12	◎	◎	○		○	○			I106	I107
			MS	DS4LC	 Long, 4 flute	INCH DC .1250−1.0000	◎	◎	○		○	○			I043	I072

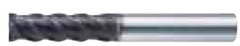
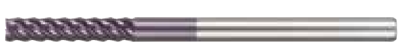
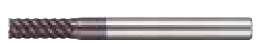
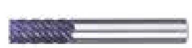
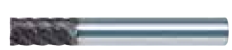
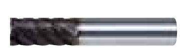
◎ : Excellent ○ : Good None : Not Recommended

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material: P Carbon Steel, Alloy Steel, Cast Iron	P Tool Steel, Pre-Hardened Steel, Hardened Steel	H Hardened Steel (—55HRC)	H Hardened Steel (55HRC—)	M Austenitic Stainless Steel	S Titanium Alloy, Heat Resistant Alloy	N Copper Alloy	N Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
SQUARE	High Helix	3	MS	MSMHZD	 Medium cut length, 3 flute for drilling and slotting	METRIC DC 1—20 INCH DC .0625—.7500	◎	◎	○		◎	○			METRIC I099 INCH I101	METRIC I100 INCH I102
		4	MS	MSSHD	 High power, Short cut length, 4 flute	METRIC DC 3—20	◎	◎	○		◎	◎			I093	I096
			MS	MSMHD	 High power, Medium cut length, 4 flute	METRIC DC 2—25	◎	◎	○		◎	◎			I094	I096
			MS	MSJHD	 High power, Semi long cut length, 4 flute	METRIC DC 2—20	◎	◎	○		◎	◎			I097	I098
	For Hardened Steel	2	MS	MS2MD	 Medium cut length, 2 flute, Strong geometry type	METRIC DC 1—12	◎	◎	○		○	○			I078	I079
			VF	VF2MV	 Medium cut length, 2 flute, Irregular helix flutes	METRIC DC 0.5—6	○	◎	◎	◎					I255	I256
		4	VF	VF4MV	 Medium cut length, 4 flute, Irregular helix flutes	METRIC DC 6—20	○	◎	◎	◎					I257	I257
		4 6	VF	VFSD	 Short cut length, For hardened materials	METRIC DC 1—12	○	◎	◎	◎					I266	I268
			VF	VFMD	 Medium cut length, For hardened materials	METRIC DC 1—25 INCH DC .0313—.5000	○	◎	◎	◎					METRIC I267 INCH I269	METRIC I268 INCH I270
			VC	VCMDSC	 Medium cut length, 4—6 flute	METRIC DC 0.5—3	○	◎	◎	◎					I161	I161
		6	VC	VCLD	 Long cut length, 6 flute	METRIC DC 6—25	○	◎	◎	◎					I162	I162
	For Difficult-to-cut Material	3	VQ	VQMHZV	 Medium cut length, 3 flute, for drilling and slotting	METRIC DC 1—20 INCH DC .0625—.5000	◎	○			◎	◎	○		METRIC I202 INCH I208	METRIC I204 INCH I209
			VQ	VQMHZVOH	 Anti-vibration Smart miracle 3 flute for drilling and slotting with coolant holes	METRIC DC 6—16 INCH DC .2500—.5000	◎	○			◎	◎	○		METRIC I212 INCH I215	METRIC I213 INCH I216
			MS	DS3SH-SS	 Short, 3 flute, For stainless steel	INCH DC .1250—.7500	○	○			◎	◎			I060	I072
			MS	DS3MH-SS	 Medium, 3 flute, For stainless steel	INCH DC .1250—.7500	○	○			◎	◎			I061	I072

◎ : Excellent ○ : Good None : Not Recommended

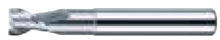
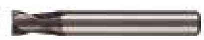
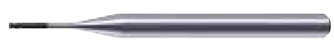
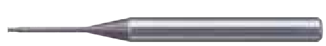
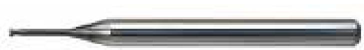
CARBIDE

END MILLS SELECTION CHART CARBIDE

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (−55HRC)	H: Hardened Steel (55HRC−)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
SQUARE	For Difficult-to-cut Material	3	MS	DS3MHH60	 High helix, Medium, 3 flute	INCH DC .1250−1.0000	○	○	○		◎	◎			I049	I072
		3 4	VQ	VQSVR NEW MIRACLE SIGMA	 Roughing, Short cut length, 4 flute, Irregular helix flutes	METRIC DC 3−20	◎	○			◎	◎	○		I232	I233
			VC	VCMH	 Medium cut length, 3−4 flute, High helix angle	METRIC DC 3−25	○	◎	○		◎	◎			I163	I164
		4	VQ	VQMHV MIRACLE SIGMA	 Medium cut length, 4 flute, Irregular helix flutes	METRIC DC 2−25 INCH DC .1250−.5000	◎	○			◎	◎	○		METRIC I218 INCH I222	METRIC I219 INCH I223
			VQ	VQJHV NEW MIRACLE SIGMA	 Semi long cut length, 4 flute, Irregular helix flutes	METRIC DC 2−20 INCH DC .1250−.5000	◎	○			◎	◎	○		METRIC I225 INCH I227	METRIC I226 INCH I228
			VF	VFMHV	 Medium cut length, Irregular helix flutes	METRIC DC 2−20	○	○	○		◎	◎			I258	I259
			VF	VFMHVCH	 Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	METRIC DC 16, 20					◎	◎			I260	I260
			VF	VFJHV	 Semi long cut length, 4 flute, Irregular helix flutes	METRIC DC 2−20	○	○	○		◎	◎			I261	I262
		5	MS	DS5MH-SS	 Medium, 5 flute, For stainless steel	INCH DC .2500−.7500	○	○			◎	◎			I062	I072
			MS	DS5LH-SS	 Long, 5 flute, For stainless steel	INCH DC .2500−.7500	○	○			◎	◎			I063	I072
		6	MS	DS6MHH60	 High helix, Medium, 6 flute	INCH DC .1250−1.0000	○	○	○		◎	◎			I050	I072
			VC	VC6MH	 Medium cut length, 6 flute, High helix angle	METRIC DC 6−25	◎	◎	○		◎	◎			I165	I166
			VF	VF6MHV	 Medium cut length, 6 flute, Irregular helix flutes	METRIC DC 6−20	○	○	○		◎	◎			I263	I263
			VF	VF6MHVCH	 Medium cut length, 6 flute, Irregular helix flutes with multiple internal through coolant holes	METRIC DC 10−20					◎	◎			I264	I264
		8	VF	VF8MHVCH	 Medium cut length, 8 flute, Irregular helix flutes with multiple internal through coolant holes	METRIC DC 16, 20					◎	◎			I265	I265
			VC	VC8MH	 Medium cut length, 8 flute, High helix angle	METRIC DC 20−25	◎	◎	○		◎	◎			I166	I166

◎ : Excellent ○ : Good None : Not Recommended

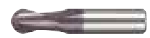
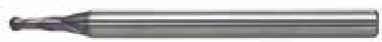
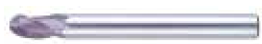
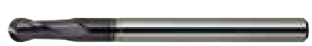
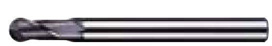
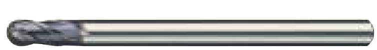
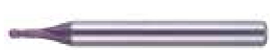
SOLID END MILLS

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (−55HRC)	H: Hardened Steel (55HRC−)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
SQUARE	For Aluminum Alloy	2	–	C2MHA	 2 flute, Medium cut length, Relieved neck	METRIC DC 3−25								◎	I355	I356
			–	C2SA	 2 flute, Short cut length, Relieved neck	METRIC DC 3−20							○	◎	I351	I352
		3	–	C3SA	 3 flute, Short cut length, Relieved neck	METRIC DC 10−26							○	◎	I353	I354
	For Swiss Type Lathes	2	MS	MS2ES	 2 flute, For Swiss type lathes	METRIC DC 3−12	◎	◎	○		○	○			I114	I116
		3	MS	MS3ES	 3 flute, For Swiss type lathes	METRIC DC 3−12	◎	◎	○		○	○			I115	I116
		4	MS	MS4EC	 4 flute, For Swiss type lathes	METRIC DC 3−14	◎	◎	○		○	○			I117	I118
	For CFRP		DFC	DFC4JC	 End mill, Semi long cutting length, 4 flute, For CFRP	METRIC DC 6−12	CFRP : ◎								I330	I330
	For Graphite		DF	DF4JC	 Semi long cut length, 4 flute, For graphite	METRIC DC 3−12	Graphite : ◎ GFPR,CFPR : ○							○	I332	I332
			DF	DF4XL	 Long neck, 4 flute, For graphite	METRIC DC 1−12								○	I333	I334
LONG NECK SQUARE	Rib Processing	2	MS	MS2XL	 Short cut length, 2 flute, Long neck	METRIC DC 0.2−6 INCH DC .0156−.2500	◎	◎	○		○	○			METRIC I084 INCH I091	METRIC I087 INCH I092
			MS	MS2XL6	 Short cut length, 2 flute, 6mm shank	METRIC DC 0.3−2.5	◎	◎	○		○	○			I088	I090
		4	MS	MS4XL	 Short cut length, 4 flute, Long neck	METRIC DC 1−10 INCH DC .0625−.2500	◎	◎	○		○	○			METRIC I108 INCH I112	METRIC I111 INCH I113
	For Hardened Steel	2	VF	VF2XL	 2 flute, Long neck	METRIC DC 0.1−3	○	◎	◎	◎					I252	I254
	For Small Parts	3 4	VQ	VQXL NEW MIRACLE SIGMA	 4 flute, Long neck	METRIC DC 0.2−1	◎	○			◎	◎	○		I229	I230
SQUARE WITH CROSS-NECK	For CFRP	–	DFC	DFCJRT	 Cross-nick type end mill, Semi long cutting length, For CFRP	METRIC DC 6−12	CFRP : ◎								I331	I331

◎ : Excellent ○ : Good None : Not Recommended

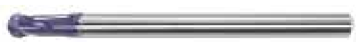
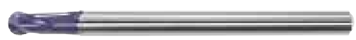
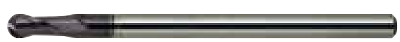
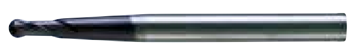
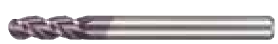
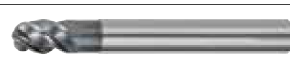
CARBIDE

END MILLS SELECTION CHART CARBIDE

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (−55HRC)	H: Hardened Steel (55HRC−)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
BALL	Curved Surface Machining	2	MS	MS2SB	 Ball nose, Short, 2 flute	METRIC PRFRAD 0.1−6	◎	◎	○		○	○			I119	I122
			MS	DS2SB	 Ball nose, Short, 2 flute	INCH DC .0156−.7500	◎	◎	○		○	○			I044	I073
			MS	MS2MB	 Ball nose, Medium cut length, 2 flute	METRIC PRFRAD 0.25−6	◎	◎	○		○	○			I121	I122
			MS	DS2LB	 Ball nose, Long, 2 flute	INCH DC .1250−1.0000	◎	◎	○		○	○			I045	I073
			VC	VC2ESB	 Ball nose, Extra short cut length, 2 flute	METRIC PRFRAD 0.15−6	○	◎	◎	○	○	○			I169	I170
		3	MS	DS3SB	 Ball nose, Short, 3 flute	INCH DC .1250−.7500	◎	◎	○		○	○			I046	I073
			VC	VC3MB	 Ball nose, Medium cut length, 3 flute	METRIC PRFRAD 1−10	○	◎	◎	○	○	○			I177	I178
		4	MS	DS4SB	 Ball nose, Short, 4 flute	INCH DC .0312−.7500	◎	◎	○		○	○			I047	I073
			MS	DS4LB	 Ball nose, Long, 4 flute	INCH DC .1250−1.0000	◎	◎	○		○	○			I048	I073
	For Complex Geometry	2	VF	VF2WB	 Wide ball nose, Medium neck, 2 flute	METRIC PRFRAD 1−3	◎	◎	○		◎	◎			I277	I277
	Strong		VF	VF2SDB	 Ball nose, Short cut length, 2 flute, Strong geometry	METRIC PRFRAD 0.5−10	○	◎	◎	○					I284	I286
	For Hardened Steel		VF	VF2SSB	 Ball nose, Short cut length, 2 flute, For hardened materials	METRIC PRFRAD 0.5−6	○	◎	◎	◎	○	○			I278	I281
			VF	VF2SB	 Ball nose, Short cut length, 2 flute, For hardened materials	METRIC PRFRAD 0.1−10 INCH PRFRAD .0156−.2500	○	◎	◎	◎	○	○			METRIC I279 INCH I282	METRIC I281 INCH I283
		4	VF	VF4MB	 Ball nose, Medium cut length, 4 flute	METRIC PRFRAD 0.5−6		◎	◎	◎	○	○			I302	I303
			VC	VC4MB	 Ball nose, Medium cut length, 4 flute	METRIC PRFRAD 0.5−10	○	◎	◎	◎	○	○			I179	I180

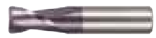
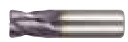
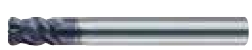
◎ : Excellent ○ : Good None : Not Recommended

SOLID END MILLS

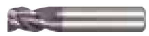
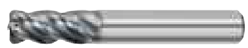
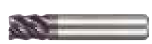
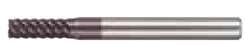
Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material								Page	
							P	P	H	H	M	S	N	N		
							Carbon Steel, Alloy Steel, Cast Iron	Tool Steel, Pre-Hardened Steel, Hardened Steel	Hardened Steel (–55HRC)	Hardened Steel (55HRC–)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy	Dimensions	Cutting Conditions
BALL	High Precision	2	VC	VC2PSB	 Ball nose, Short cut length, 2 flute, High precision	METRIC PRFRAD 0.05–6	◎	◎	◎		○	○			I171	I173
BALL	High Precision	2	VC	VC2PSBP	 Ball nose, Short cut length, 2 flute, Ultra high precision	METRIC PRFRAD 0.02–6	◎	◎	◎		○	○			I172	I173
BALL	Long Shank	2	VF	VF2SDBL	 Ball nose, Short cut length, 2 flute, Strong geometry, Long shank	METRIC PRFRAD 0.5–10	○	◎	◎	○					I285	I286
BALL	Taper neck	3	VF	VF3XB	 Ball nose, 3 flute, Taper neck	METRIC PRFRAD 0.4–2.5	○	◎	◎	◎	○	○			I297	I300
BALL	Taper neck	2	VC	VCXB	 Ball nose, 2 flute, Taper neck	METRIC PRFRAD 0.5–6	○	◎	◎	○	○	○			I174	I176
BALL	For Difficult-to-cut Material	3	MS	DS3SHB-SS	 Ball nose, Short, 3 flute, For stainless steel	INCH DC .1250–.7500	○	○			◎	◎			I064	I073
BALL	For Difficult-to-cut Material	3	MS	DS3MHB-SS	 Ball nose, Medium, 3 flute, For stainless steel	INCH DC .1250–.7500	○	○			◎	◎			I065	I073
BALL	For Difficult-to-cut Material	4	VQ	VQ4SVB MIRACLE SIGMA	 Ball nose, Short cut length, 4 flute, Variable curve	METRIC PRFRAD 1–6 INCH PRFRAD .0625–.2500	○	○			◎	◎	○		METRIC I235 INCH I237	METRIC I236 INCH I238
BALL	For Difficult-to-cut Material	4	VF	VF4SVB	 Ball nose, Short cut length, 4 flute, Variable curve	METRIC PRFRAD 1–10	○	○			◎	◎			I304	I305
BALL	For Graphite	2	DF	DF2MB	 Ball nose, Medium cut length, 2 flute, For graphite	METRIC PRFRAD 3–6	Graphite : ◎ GFPR,CFPR : ○							○	I336	I337
BALL	For Graphite	2	DF	DF2XLB	 Ball nose, 2 flute, Long neck, For graphite	METRIC PRFRAD 0.1–3	Graphite : ◎ GFPR,CFPR : ○							○	I338	I340
BALL	For Graphite	3	DF	DF3XB	 Ball nose, 3 flute, Taper neck, For graphite	METRIC PRFRAD 0.5–2	Graphite : ◎ GFPR,CFPR : ○							○	I342	I343
LONG NECK BALL	Deep Slotting	2	VF	VF2XLB	 Ball nose, Long neck, 2 flute, For hardened materials	METRIC PRFRAD 0.1–3 INCH PRFRAD .0156–.1250	○	◎	◎	◎		○			METRIC I289 INCH I295	METRIC I294 INCH I296
LONG NECK BALL	Deep Slotting	2	VF	VF2XLBS	 Ball nose, Long neck, 2 flute, Short shank	METRIC PRFRAD 0.2–1	○	◎	◎	◎					I288	I294
LONG NECK BALL	Deep Slotting	2	MS	MS2XLB	 Ball nose, Short cut length, 2 flute, Long neck	METRIC PRFRAD 0.1–3 INCH PRFRAD .0078–.1250	◎	◎	○		○	○			METRIC I123 INCH I129	METRIC I128 INCH I130
LONG NECK BALL	Deep Slotting	4	MS	MS4XLB	 Ball nose, 4 flute, Long neck	INCH PRFRAD .0313–.1250	◎	◎	○		○	○			I131	I131

◎ : Excellent ○ : Good None : Not Recommended

END MILLS SELECTION CHART CARBIDE

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (–55HRC)	H: Hardened Steel (55HRC–)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
RADIUS	Corner Radius	2	MS	DS2SRB	 Corner radius, Short, 2 flute	INCH DC .1250–.7500	◎	◎	○		○	○			I053	I072
			MS	MS2MRB	 Corner radius, Medium cut length, 2 flute	METRIC DC 1–12	◎	◎	○		○	○			I132	I134
			MS	DS2MRB	 Corner radius, Medium, 2 flute	INCH DC .1250–.7500	◎	◎	○		○	○			I054	I072
		4	MS	DS4SRB	 Corner radius, Short, 4 flute	INCH DC .1250–.7500	◎	◎	○		○	○			I055	I072
			MS	MS4MRB	 Corner radius, Medium cut length, 4 flute	METRIC DC 3–20	◎	◎	○		○	○			I137	I139
			MS	DS4MRB	 Corner radius, Medium, 4 flute	INCH DC .1250–.7500	◎	◎	○		○	○			I056	I072
			VC	VC4JRB	 Corner radius, Semi long cut length, 4 flute	METRIC DC 3–20	○	◎	◎	○	○	○			I187	I188
			MS	MSMHDRB	 High power, Corner radius, Medium cut length, 4 flute	METRIC DC 2–20	◎	◎	◎		◎	◎			I140	I142
			VC	VCMHDRB	 Corner radius, Medium cut length, 4 flute, High helix angle	METRIC DC 2–25	○	◎	◎	○	◎	◎			I194	I196
	For Difficult-to-cut Material	4 6	VF	VFFDRB NEW	 Multi-task corner radius end mill for impact miracle high speed cutting	METRIC DC 3–12	○	○	◎	◎					I306	I306
		6	VF	VFSDRB NEW	 IMPACT MIRACLE Corner radius end mill, 6 flute (S)	METRIC DC 3–12	○	◎	◎	◎					I321	I323
		6	VF	VFMDRB NEW	 Corner radius, Medium cut length, 6 flute, For hardened materials	METRIC DC 3–20	○	◎	◎	◎					I322	I323
	For Hardened Steel	4	VF	VFHVRB	 4 flute, Corner radius, Short cut length, Irregular helix flutes	METRIC DC 1–16 INCH DC .1250–.5000	◎	◎	◎	◎	○	○			METRIC I307 INCH I313	METRIC I309 INCH I314
	High Precision	2 4	VC	VCPSRB	 Corner radius, Short cut length, 2-4 flute, High precision type	METRIC DC 0.6–12	◎	◎	◎	◎	○	○			I181	I184
	High Feed	4	VC	VCHFRB	 High feed corner radius, 4 flute	METRIC DC 2–16 INCH DC .1250–.5000	◎	◎	◎	○		○			METRIC I189 INCH I192	METRIC I191 INCH I193

◎ : Excellent ○ : Good None : Not Recommended

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	Work Material P: Tool Steel, Pre-Hardened Steel, Hardened Steel	Work Material H: Hardened Steel (−55HRC)	Work Material H: Hardened Steel (55HRC−)	Work Material M: Austenitic Stainless Steel	Work Material S: Titanium Alloy, Heat Resistant Alloy	Work Material N: Copper Alloy	Work Material N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
RADIUS	For Difficult-to-cut Material	3	MS	DS3SHRB-SS	 Corner radius, Short, 3 flute, For stainless steel	INCH DC .1250−.7500	○	○			◎	◎			I066	I072
		3	MS	DS3MHRB-SS	 Corner radius, Medium, 3 flute, For stainless steel	INCH DC .1250−.7500	○	○			◎	◎			I067	I072
		3	MS	DS3MHHRB	 Corner radius, High helix, Medium, 3 flute	INCH DC .1250−.6250	○	○	○		◎	◎			I070	I072
		4	VQ	VQMHVRB	 Corner radius, Medium cut length, 4 flute, Irregular helix flutes	METRIC DC 2−20 INCH DC .1250−.5000	◎	○			○	◎	○		METRIC I239 INCH I244	METRIC I241 INCH I245
		4	VQ	VQMHVRBF	 Corner radius, Medium cut length, 4 flute, Irregular helix flutes ,for finishing	METRIC DC 6−16 INCH DC .2500−.5000	○	○			○	◎			METRIC I247 INCH I249	METRIC I248 INCH I250
		4	VF	VFMHVRB	 Corner radius, Medium cut length, 4 flute, Irregular helix flutes	METRIC DC 6−20	○	○	○		◎	◎			I319	I320
		4	VF	VFMHVRBCH	 Corner radius, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	METRIC DC 16−20					◎	◎			I324	I324
		5	MS	DS5SHRB-SS	 Corner radius, Short, 5 flute, For stainless steel	INCH DC .2500−.7500	○	○			◎	◎			I068	I072
		5	MS	DS5MHRB-SS	 Corner radius, Medium, 5 flute, For stainless steel	INCH DC .2500−.7500	○	○			◎	◎			I069	I072
		6	MS	DS6MHHRB	 Corner radius, High helix, Medium, 6 flute	INCH DC .1250−.6250	○	○	○		◎	◎			I071	I072
		6	VF	VF6MHVRB	 Corner radius, Medium cut length, 6 flute, Irregular helix flutes	METRIC DC 6−20	○	○	○		◎	◎			I325	I326
		6	VF	VF6MHVRBCH	 Corner radius, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes	METRIC DC 10−20					◎	◎			I327	I328
		8	VF	VF8MHVRBCH	 Corner radius, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant holes	METRIC DC 16−20					◎	◎			I329	I329

◎ : Excellent ○ : Good None : Not Recommended

CARBIDE

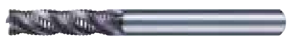
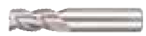
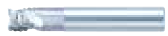
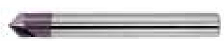
END MILLS SELECTION CHART CARBIDE

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (–55HRC)	H: Hardened Steel (55HRC–)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
RADIUS	For Aluminum Alloy	2	–	DS2SRB-A○	Corner radius, Short, 2 flute, For aluminum alloys	INCH DC .1875–1.0000							○	◎	I057	I072
RADIUS	For Aluminum Alloy	2	–	DS2SRB-NA○	Corner radius, Short, 2 flute, Neck relief	INCH DC .1875–1.0000							○	◎	I058	I072
RADIUS	For Aluminum Alloy	3	–	C3SARB	Corner radius, Short cut length, 3 flute, For aluminum alloy	METRIC DC 12–25							○	◎	I357	I358
RADIUS	For Graphite	2 4	DF	DFPSRB	Corner radius, Short cut length, 2-4 flute, High precision, For graphite	METRIC DC 0.5–12	Graphite : ◎ GFPR,CFPR : ○							○	I344	I346
LONG NECK RADIUS	General	2	MS	MS2XLRB	Corner radius, Short cut length, 2 flute, Long neck	METRIC DC 1–6	◎	◎	○		○	○			I135	I136
TAPER	Rib Processing	4	MS	MS4LT	Taper, Long cut length, 4 flute	METRIC DC 0.2–3	◎	◎	○		○				I148	I154
TAPER BALL	Rib Processing	4	MS	MS4LTB	Ball nose, 4 flute, Taper, For rib milling	METRIC PRFRAD 0.3–1	◎	◎	○		○	○			I157	I160
TAPER	Slope Machining	2	MS	MS2MT	Taper, Medium cut length, 2 flute	METRIC DC 0.2–10	◎	◎	○		○	○			I143	I147
TAPER BALL	Slope Machining	2	MS	MS2MTB	Ball nose taper, Medium cut length, 2 flute	METRIC PRFRAD 0.2–1.5	◎	◎	○		○	○			I155	I156
TAPER BALL	Slope Machining	4	VC	VC4STB	Ball nose taper, Short cut length, 4 flute	METRIC PRFRAD 0.3–4	○	◎	◎	◎	○	○			I197	I199
ROUGHING	Roughing	4	MS	DS4MC-CB	Chipbreaker, Medium, 4 flute	INCH DC .1250–1.0000	◎	◎	○		○	○			I051	I072
ROUGHING	Roughing	4	MS	DS4LC-CB	Chipbreaker, Long, 4 flute	INCH DC .1250–1.0000	◎	◎	○		○	○			I052	I072
ROUGHING	Roughing	3 4	VC	VCSFPR	Roughing, Short cut length, 3–4 flute	METRIC DC 3–20	◎	◎	○		◎	◎			I167	I168
ROUGHING	For Difficult-to-cut Material	3 4	VF	VFSFPR	Roughing, Short cut length, 3–4 flute	METRIC DC 3–20	◎	◎	○		◎	◎			I271	I272
ROUGHING	For Difficult-to-cut Material	4	VF	VFSFPRCH	Roughing, Short cut length, 4 flute, with multiple internal through coolant holes	METRIC DC 16, 20					◎	◎			I273	I273

◎ : Excellent ○ : Good None : Not Recommended

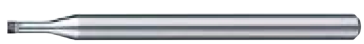
SOLID END MILLS

END MILLS SELECTION CHART CARBIDE

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (–55HRC)	H: Hardened Steel (55HRC–)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
ROUGHING	For Difficult-to-cut Material	6	VF	VF6SVRCH	 Roughing, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes	METRIC DC 16, 20					◎	◎			I274	I274
ROUGHING	For Difficult-to-cut Material	4	VF	VFMFPR	 Roughing, Medium cut length, 4 flute	METRIC DC 5–20	◎	◎	○		◎	◎			I275	I276
ROUGHING	Roughing Aluminum Alloy	3	–	DS3MHR-A	 Roughing, Medium, 3 flute, For aluminum alloys	INCH DC .2500–1.0000								◎	I059	I072
ROUGHING	Roughing Aluminum Alloy	3	–	CSRA NEW	 Roughing end mill, Short cut length, 3 flute, For aluminium alloy	METRIC DC 10–25								◎	I359	I360
ROUGHING RADIUS	Roughing Aluminum Alloy	3	–	CSRARB NEW	 Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy	METRIC DC 10–25								◎	I361	I362
CHAMFERING	Chamfering	2	VC	VC2C	 Chamfer cutter, 2 flute	METRIC DC 2–12	◎	◎	◎	○	◎	◎	○	○	I201	I201

◎ : Excellent ○ : Good None : Not Recommended

END MILLS SELECTION CHART CBN

Shape	Type	Number of Flutes	Coating	Order Number	Shape	Cutting Diameter Range	Work Material P: Carbon Steel, Alloy Steel, Cast Iron	P: Tool Steel, Pre-Hardened Steel, Hardened Steel	H: Hardened Steel (–55HRC)	H: Hardened Steel (55HRC–)	M: Austenitic Stainless Steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Page: Dimensions	Page: Cutting Conditions
LONG NECK BALL	High Precision	2	–	CBN2XLB	 Ball nose, Short cut length, 2 flute, Long neck	METRIC PRFRAD 0.2–1	○	◎	◎	◎					I347	I348
LONG NECK RADIUS	High Precision	2	–	CBN2XLRB	 Corner radius, Short cut length, 2 flute, Long neck	METRIC DC 0.5–2	○	◎	◎	◎					I349	I350

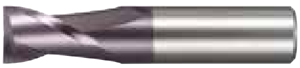
◎ : Excellent ○ : Good None : Not Recommended

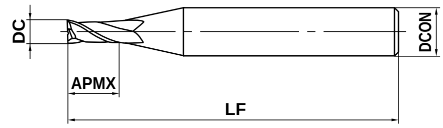
DS2SS

Short, 2 flute

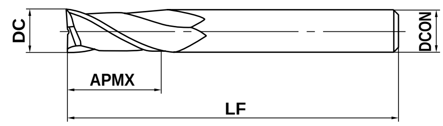
DC=.0156" DC≥.0312"

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
◎	◎	○		○	○		





Type 1



Type 2

DC<.0156"	.0312"<DC<.2500"	DC>.2500"		
0 / - .001"	0 / - .002"	0 / - .003"		
DCON=.1250"	DCON=.1875"	.2500<DCON<.3750"	.4375<DCON<.6250"	DCON=.7500"
0 / - .00024"	0 / - .00031"	0 / - .00035"	0 / - .00043"	0 / - .00051"

- 2 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2SSD1/64	.0156	.023	1.500	.1250	2	●	1
DS2SSD1/32	.0312	.063	1.500	.1250	2	●	1
DS2SSD3/64	.0469	.094	1.500	.1250	2	●	1
DS2SSD1/16	.0625	.125	1.500	.1250	2	●	1
DS2SSD5/64	.0781	.156	1.500	.1250	2	□	1
DS2SSD3/32	.0938	.188	1.500	.1250	2	●	1
DS2SSD7/64	.1094	.219	1.500	.1250	2	□	1
DS2SSD1/8	.1250	.250	1.500	.1250	2	●	2
DS2SSD9/64	.1406	.313	2.000	.1875	2	□	1
DS2SSD5/32	.1562	.313	2.000	.1875	2	□	1
DS2SSD11/64	.1719	.375	2.000	.1875	2	□	1
DS2SSD3/16	.1875	.375	2.000	.1875	2	●	2
DS2SSD13/64	.2031	.500	2.000	.2500	2	□	1
DS2SSD7/32	.2187	.500	2.000	.2500	2	□	1
DS2SSD15/64	.2344	.500	2.000	.2500	2	□	1
DS2SSD1/4	.2500	.500	2.000	.2500	2	●	2
DS2SSD9/32	.2813	.500	2.000	.3125	2	□	1
DS2SSD5/16	.3125	.500	2.000	.3125	2	□	2
DS2SSD3/8	.3750	.563	2.000	.3750	2	●	2
DS2SSD7/16	.4375	.625	2.500	.4375	2	□	2
DS2SSD1/2	.5000	.625	2.500	.5000	2	●	2
DS2SSD5/8	.6250	.750	3.000	.6250	2	●	2
DS2SSD3/4	.7500	1.000	3.000	.7500	2	●	2

● : Inventory maintained. □ : Non stock, produced to order only.

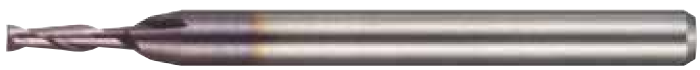
CUTTING CONDITIONS ➤ I072

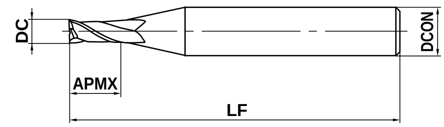
DS2MS

Medium, 2 flute

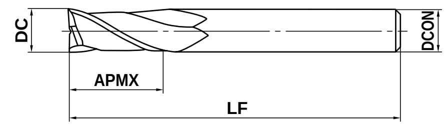
DC=.0156" DC≥.0312"

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
◎	◎	○		○	○		





Type 1



Type 2

DC≤.0156"	.0312"≤DC≤.2500"	DC>.2500"			
0 - .001"	0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"	DCON=1.2500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"	0 - .00063"

- 2 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2MSD1/64	.0156	.040	1.500	.1250	2	●	1
DS2MSD1/32	.0312	.078	1.500	.1250	2	●	1
DS2MSD3/64	.0469	.109	1.500	.1250	2	●	1
DS2MSD1/16	.0625	.188	1.500	.1250	2	●	1
DS2MSD5/64	.0781	.234	1.500	.1250	2	□	1
DS2MSD3/32	.0938	.281	1.500	.1250	2	●	1
DS2MSD7/64	.1094	.328	1.500	.1250	2	□	1
DS2MSD1/8	.1250	.375	1.500	.1250	2	●	2
DS2MSD9/64	.1406	.500	2.000	.1875	2	□	1
DS2MSD5/32	.1562	.500	2.000	.1875	2	□	1
DS2MSD11/64	.1719	.563	2.000	.1875	2	□	1
DS2MSD3/16	.1875	.563	2.000	.1875	2	●	2
DS2MSD13/64	.2031	.625	2.500	.2500	2	□	1
DS2MSD7/32	.2187	.625	2.500	.2500	2	□	1
DS2MSD15/64	.2344	.750	2.500	.2500	2	□	1
DS2MSD1/4	.2500	.750	2.500	.2500	2	●	2
DS2MSD9/32	.2813	.750	2.500	.3125	2	□	1
DS2MSD5/16	.3125	.813	2.500	.3125	2	□	2
DS2MSD3/8	.3750	.875	2.500	.3750	2	●	2
DS2MSD7/16	.4375	1.000	2.750	.4375	2	□	2
DS2MSD1/2	.5000	1.000	3.000	.5000	2	●	2
DS2MSD9/16	.5625	1.125	3.500	.5625	2	●	2
DS2MSD5/8	.6250	1.250	3.500	.6250	2	●	2
DS2MSD3/4	.7500	1.500	4.000	.7500	2	●	2
DS2MSD7/8	.8750	1.500	4.000	.8750	2	●	2
DS2MSD1	1.0000	1.500	4.000	1.0000	2	□	2
DS2MSD1-1/4	1.2500	1.563	4.375	1.2500	2	□	2

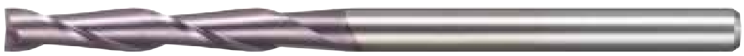
CUTTING CONDITIONS ➤ I072

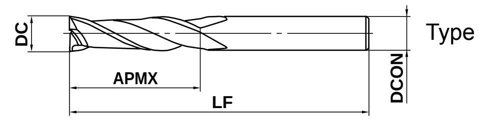
DS2LS

Long, 2 flute

UWC MS 30° DC≥3

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
◎	◎			○	○		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 2 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

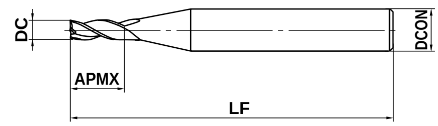
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2LSD1/8	.1250	1.000	2.500	.1250	2	●	1
DS2LS**D3/16**	.1875	1.125	3.000	.1875	2	●	1
DS2LS**D1/4**	.2500	1.250	3.000	.2500	2	●	1
DS2LS**D5/16**	.3125	1.375	3.250	.3125	2	□	1
DS2LS**D3/8**	.3750	1.500	3.500	.3750	2	●	1
DS2LS**D7/16**	.4375	1.750	4.000	.4375	2	□	1
DS2LS**D1/2**	.5000	2.000	4.000	.5000	2	●	1
DS2LS**D5/8**	.6250	2.500	4.625	.6250	2	●	1
DS2LS**D3/4**	.7500	3.000	5.250	.7500	2	●	1
DS2LS**D1**	1.0000	3.000	6.000	1.0000	2	□	1

● : Inventory maintained. □ : Non stock, produced to order only.

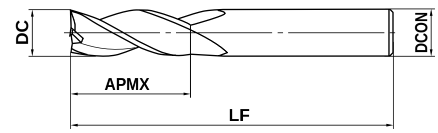
CUTTING CONDITIONS ➤ I072

DS3SC
Short, 3 flute

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
◎	◎			○	○		



Type 1



Type 2

DC≤.0156"	.0312"≤DC≤.2500"	DC>.2500"		
0 - .001"	0 - .002"	0 - .003"		
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

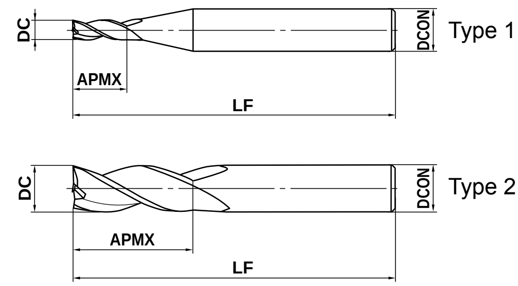
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3SCD1/64	.0156	.023	1.500	.1250	3	●	1
DS3SC**D1/32**	.0312	.063	1.500	.1250	3	●	1
DS3SC**D3/64**	.0469	.094	1.500	.1250	3	●	1
DS3SC**D1/16**	.0625	.125	1.500	.1250	3	●	1
DS3SC**D5/64**	.0781	.156	1.500	.1250	3	□	1
DS3SC**D3/32**	.0938	.188	1.500	.1250	3	●	1
DS3SC**D7/64**	.1094	.219	1.500	.1250	3	□	1
DS3SC**D1/8**	.1250	.250	1.500	.1250	3	●	2
DS3SC**D9/64**	.1406	.313	2.000	.1875	3	□	1
DS3SC**D5/32**	.1562	.313	2.000	.1875	3	□	1
DS3SC**D11/64**	.1719	.375	2.000	.1875	3	□	1
DS3SC**D3/16**	.1875	.375	2.000	.1875	3	●	2
DS3SC**D13/64**	.2031	.500	2.000	.2500	3	□	1
DS3SC**D7/32**	.2187	.500	2.000	.2500	3	□	1
DS3SC**D15/64**	.2344	.500	2.000	.2500	3	□	1
DS3SC**D1/4**	.2500	.500	2.000	.2500	3	●	2
DS3SC**D9/32**	.2813	.500	2.000	.3125	3	□	1
DS3SC**D5/16**	.3125	.500	2.000	.3125	3	□	2
DS3SC**D3/8**	.3750	.563	2.000	.3750	3	●	2
DS3SC**D7/16**	.4375	.625	2.500	.4375	3	□	2
DS3SC**D1/2**	.5000	.625	2.500	.5000	3	●	2
DS3SC**D5/8**	.6250	.750	3.000	.6250	3	●	2
DS3SC**D3/4**	.7500	1.000	3.000	.7500	3	□	2

CUTTING CONDITIONS ➤ I072

DS3MC

Medium, 3 flute

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
◎	◎			○	○		



DC≤.0156"	.0312"≤DC≤.2500"	DC>.2500"			
0 - .001"	0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"	DCON=1.2500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"	0 - .00063"

- 3 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MCD1/64	.0156	.040	1.500	.1250	3	●	1
DS3MCD1/32	.0312	.078	1.500	.1250	3	●	1
DS3MCD3/64	.0469	.109	1.500	.1250	3	□	1
DS3MCD1/16	.0625	.188	1.500	.1250	3	●	1
DS3MCD5/64	.0781	.234	1.500	.1250	3	●	1
DS3MCD3/32	.0938	.281	1.500	.1250	3	●	1
DS3MCD7/64	.1094	.328	1.500	.1250	3	●	1
DS3MCD1/8	.1250	.375	1.500	.1250	3	●	2
DS3MCD9/64	.1406	.500	2.000	.1875	3	□	1
DS3MCD5/32	.1562	.500	2.000	.1875	3	□	1
DS3MCD11/64	.1719	.563	2.000	.1875	3	□	1
DS3MCD3/16	.1875	.563	2.000	.1875	3	●	2
DS3MCD13/64	.2031	.625	2.500	.2500	3	□	1
DS3MCD7/32	.2187	.625	2.500	.2500	3	□	1
DS3MCD15/64	.2344	.750	2.500	.2500	3	□	1
DS3MCD1/4	.2500	.750	2.500	.2500	3	●	2
DS3MCD9/32	.2813	.750	2.500	.3125	3	□	1
DS3MCD5/16	.3125	.813	2.500	.3125	3	●	2
DS3MCD3/8	.3750	.875	2.500	.3750	3	●	2
DS3MCD7/16	.4375	1.000	2.750	.4375	3	□	2
DS3MCD1/2	.5000	1.000	3.000	.5000	3	●	2
DS3MCD9/16	.5625	1.125	3.500	.5625	3	●	2
DS3MCD5/8	.6250	1.250	3.500	.6250	3	●	2
DS3MCD3/4	.7500	1.500	4.000	.7500	3	●	2
DS3MCD7/8	.8750	1.500	4.000	.8750	3	□	2
DS3MCD1	1.0000	1.500	4.000	1.0000	3	□	2
DS3MCD1-1/4	1.2500	1.563	4.375	1.2500	3	□	2

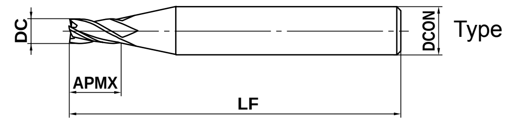
● : Inventory maintained. □ : Non stock, produced to order only.

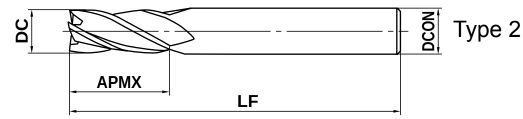
CUTTING CONDITIONS ➤ I072

DS4SC

Short, 4 flute

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
◎	◎			○	○		





DC≤.0156"	.0312"≤DC≤.2500"	DC>.2500"		
0 - .001"	0 - .002"	0 - .003"		
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

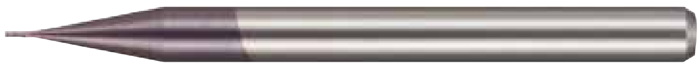
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4SCD1/64	.0156	.023	1.500	.1250	4	●	1
DS4SCD1/32	.0312	.063	1.500	.1250	4	●	1
DS4SCD3/64	.0469	.094	1.500	.1250	4	●	1
DS4SCD1/16	.0625	.125	1.500	.1250	4	●	1
DS4SCD5/64	.0781	.156	1.500	.1250	4	□	1
DS4SCD3/32	.0938	.188	1.500	.1250	4	●	1
DS4SCD7/64	.1094	.219	1.500	.1250	4	□	1
DS4SCD1/8	.1250	.250	1.500	.1250	4	●	2
DS4SCD9/64	.1406	.313	2.000	.1875	4	□	1
DS4SCD5/32	.1562	.313	2.000	.1875	4	□	1
DS4SCD11/64	.1719	.375	2.000	.1875	4	□	1
DS4SCD3/16	.1875	.375	2.000	.1875	4	●	2
DS4SCD13/64	.2031	.500	2.000	.2500	4	□	1
DS4SCD7/32	.2187	.500	2.000	.2500	4	□	1
DS4SCD15/64	.2344	.500	2.000	.2500	4	□	1
DS4SCD1/4	.2500	.500	2.000	.2500	4	●	2
DS4SCD9/32	.2813	.500	2.000	.3125	4	□	1
DS4SCD5/16	.3125	.500	2.000	.3125	4	□	2
DS4SCD3/8	.3750	.563	2.000	.3750	4	●	2
DS4SCD7/16	.4375	.625	2.500	.4375	4	□	2
DS4SCD1/2	.5000	.625	2.500	.5000	4	●	2
DS4SCD5/8	.6250	.750	3.000	.6250	4	●	2
DS4SCD3/4	.7500	1.000	3.000	.7500	4	●	2

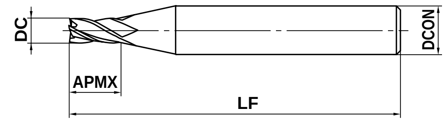
CUTTING CONDITIONS ➤ I072

DS4MC

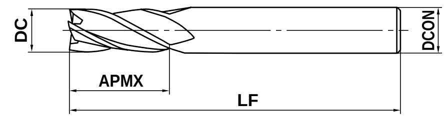
Medium, 4 flute

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
◎	◎			○	○		





Type 1



Type 2

DC≤.0156"	.0312"≤DC≤.2500"	DC>.2500"			
0 - .001"	0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"	DCON=1.2500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"	0 - .00063"

- 4 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4MCD1/64	.0156	.040	1.500	.1250	4	●	1
DS4MCD1/32	.0312	.078	1.500	.1250	4	●	1
DS4MCD3/64	.0469	.109	1.500	.1250	4	●	1
DS4MCD1/16	.0625	.188	1.500	.1250	4	●	1
DS4MCD5/64	.0781	.234	1.500	.1250	4	□	1
DS4MCD3/32	.0938	.281	1.500	.1250	4	●	1
DS4MCD7/64	.1094	.328	1.500	.1250	4	□	1
DS4MCD1/8	.1250	.375	1.500	.1250	4	□	2
DS4MCD9/64	.1406	.500	2.000	.1875	4	□	1
DS4MCD5/32	.1562	.500	2.000	.1875	4	●	1
DS4MCD11/64	.1719	.563	2.000	.1875	4	□	1
DS4MCD3/16	.1875	.563	2.000	.1875	4	●	2
DS4MCD13/64	.2031	.625	2.500	.2500	4	□	1
DS4MCD7/32	.2187	.625	2.500	.2500	4	□	1
DS4MCD15/64	.2344	.750	2.500	.2500	4	□	1
DS4MCD1/4	.2500	.750	2.500	.2500	4	●	2
DS4MCD9/32	.2813	.750	2.500	.3125	4	□	1
DS4MCD5/16	.3125	.813	2.500	.3125	4	●	2
DS4MCD3/8	.3750	.875	2.500	.3750	4	●	2
DS4MCD7/16	.4375	1.000	2.750	.4375	4	●	2
DS4MCD1/2	.5000	1.000	3.000	.5000	4	●	2
DS4MCD9/16	.5625	1.125	3.500	.5625	4	●	2
DS4MCD5/8	.6250	1.250	3.500	.6250	4	●	2
DS4MCD3/4	.7500	1.500	4.000	.7500	4	●	2
DS4MCD7/8	.8750	1.500	4.000	.8750	4	●	2
DS4MCD1	1.0000	1.500	4.000	1.0000	4	□	2
DS4MCD1-1/4	1.2500	1.563	4.375	1.2500	4	□	2

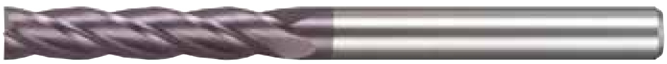
● : Inventory maintained. □ : Non stock, produced to order only.

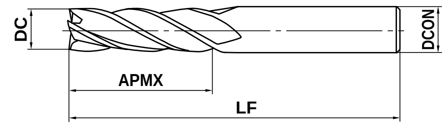
CUTTING CONDITIONS ➤ I072

DS4LC

Long, 4 flute

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
◎	◎			○	○		





DC	DC≤.2500"	DC>.2500"			
	0 - .002"	0 - .003"			
DCON	DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
	0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute square end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4LCD1/8	.1250	1.000	2.500	.1250	4	●	1
DS4LC**D3/16**	.1875	1.125	3.000	.1875	4	●	1
DS4LC**D1/4**	.2500	1.250	3.000	.2500	4	●	1
DS4LC**D5/16**	.3125	1.375	3.250	.3125	4	□	1
DS4LC**D3/8**	.3750	1.500	3.500	.3750	4	●	1
DS4LC**D7/16**	.4375	1.750	4.000	.4375	4	□	1
DS4LC**D1/2**	.5000	2.000	4.000	.5000	4	●	1
DS4LC**D5/8**	.6250	2.500	4.625	.6250	4	●	1
DS4LC**D3/4**	.7500	3.000	5.250	.7500	4	●	1
DS4LC**D1**	1.0000	3.000	6.000	1.0000	4	□	1

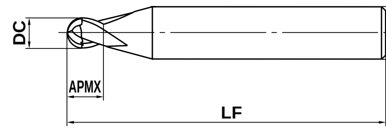
CUTTING CONDITIONS ➤ I072

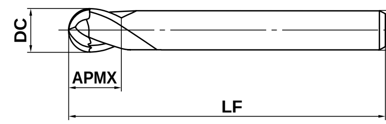
DS2SB

Ball nose, Short, 2 flute

UWC MS 30°

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
◎	◎			○	○		





DC≤.0156"	.0312"≤DC≤.2500"	DC>.2500"		
0 / - .001"	0 / - .002"	0 / - .003"		
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 / - .00024"	0 / - .00031"	0 / - .00035"	0 / - .00043"	0 / - .00051"

- 2 flute ball nose end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2SBD1/64	.0156	.023	1.500	.1250	2	●	1
DS2SBD1/32	.0312	.063	1.500	.1250	2	●	1
DS2SBD3/64	.0469	.094	1.500	.1250	2	●	1
DS2SBD1/16	.0625	.125	1.500	.1250	2	●	1
DS2SBD3/32	.0938	.188	1.500	.1250	2	●	1
DS2SBD1/8	.1250	.250	1.500	.1250	2	●	2
DS2SBD9/64	.1406	.313	2.000	.1875	2	□	1
DS2SBD5/32	.1562	.313	2.000	.1875	2	□	1
DS2SBD11/64	.1719	.375	2.000	.1875	2	□	1
DS2SBD3/16	.1875	.375	2.000	.1875	2	●	2
DS2SBD13/64	.2031	.500	2.000	.2500	2	□	1
DS2SBD7/32	.2187	.500	2.000	.2500	2	□	1
DS2SBD15/64	.2344	.500	2.000	.2500	2	□	1
DS2SBD1/4	.2500	.500	2.000	.2500	2	●	2
DS2SBD5/16	.3125	.500	2.000	.3125	2	□	2
DS2SBD3/8	.3750	.563	2.000	.3750	2	●	2
DS2SBD7/16	.4375	.625	2.500	.4375	2	□	2
DS2SBD1/2	.5000	.625	2.500	.5000	2	●	2
DS2SBD5/8	.6250	.750	3.000	.6250	2	●	2
DS2SBD3/4	.7500	1.000	3.000	.7500	2	●	2

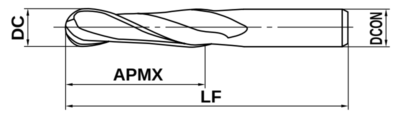
● : Inventory maintained. □ : Non stock, produced to order only.

CUTTING CONDITIONS ➤ I073

DS2LB

Ball nose, Long, 2 flute

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
◎	◎			○	○		



Type 1

DC≤.2500"	DC>.2500"			
0 / - .002"	0 / - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 / - .00024"	0 / - .00031"	0 / - .00035"	0 / - .00043"	0 / - .00051"

- 2 flute ball nose end mill for general purpose.
- Helix angle 30°.

Unit : Inch

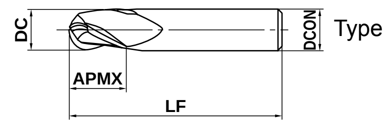
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2LBD1/8	.1250	1.000	2.500	.1250	2	●	1
DS2LBD3/16	.1875	1.125	3.000	.1875	2	●	1
DS2LBD1/4	.2500	1.250	3.000	.2500	2	●	1
DS2LBD5/16	.3125	1.375	3.250	.3125	2	□	1
DS2LBD3/8	.3750	1.500	3.500	.3750	2	●	1
DS2LBD7/16	.4375	1.750	4.000	.4375	2	□	1
DS2LBD1/2	.5000	2.000	4.000	.5000	2	●	1
DS2LBD5/8	.6250	2.500	4.625	.6250	2	●	1
DS2LBD3/4	.7500	3.000	5.250	.7500	2	●	1
DS2LBD1	1.0000	3.000	6.000	1.0000	2	□	1

CUTTING CONDITIONS ➤ I073

DS3SB

Ball nose, Short, 3 flute

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
◎	◎			○	○		



DC≤.2500"	DC>.2500"			
0 / - .002"	0 / - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 / - .00024"	0 / - .00031"	0 / - .00035"	0 / - .00043"	0 / - .00051"

- 3 flute ball nose end mill for general purpose.
- Helix angle 30°.

Unit : Inch

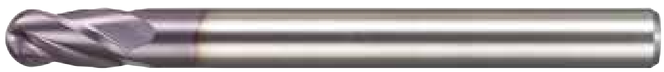
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3SBD1/8	.1250	.250	1.500	.1250	3	●	1
DS3SBD3/16	.1875	.375	2.000	.1875	3	●	1
DS3SBD1/4	.2500	.500	2.000	.2500	3	●	1
DS3SBD5/16	.3125	.500	2.000	.3125	3	□	1
DS3SBD3/8	.3750	.563	2.000	.3750	3	●	1
DS3SBD7/16	.4375	.625	2.500	.4375	3	□	1
DS3SBD1/2	.5000	.625	2.500	.5000	3	●	1
DS3SBD5/8	.6250	.750	3.000	.6250	3	●	1
DS3SBD3/4	.7500	1.000	3.000	.7500	3	●	1

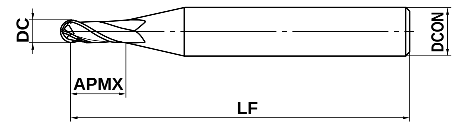
● : Inventory maintained. □ : Non stock, produced to order only.

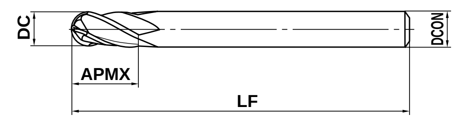
CUTTING CONDITIONS ➤ I073

DS4SB
Ball nose, Short, 4 flute

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
◎	◎			○	○		







.0312"≤DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute ball nose end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4SBD1/32	.0312	.063	1.500	.1250	4	●	1
DS4SB**D3/64**	.0469	.094	1.500	.1250	4	●	1
DS4SB**D1/16**	.0625	.125	1.500	.1250	4	●	1
DS4SB**D3/32**	.0938	.188	1.500	.1250	4	●	1
DS4SB**D1/8**	.1250	.250	1.500	.1250	4	●	2
DS4SB**D9/64**	.1406	.313	2.000	.1875	4	□	1
DS4SB**D5/32**	.1562	.313	2.000	.1875	4	□	1
DS4SB**D11/64**	.1719	.375	2.000	.1875	4	□	1
DS4SB**D3/16**	.1875	.375	2.000	.1875	4	●	2
DS4SB**D13/64**	.2031	.500	2.000	.2500	4	□	1
DS4SB**D7/32**	.2187	.500	2.000	.2500	4	□	1
DS4SB**D15/64**	.2344	.500	2.000	.2500	4	□	1
DS4SB**D1/4**	.2500	.500	2.000	.2500	4	●	2
DS4SB**D5/16**	.3125	.500	2.000	.3125	4	□	2
DS4SB**D3/8**	.3750	.563	2.000	.3750	4	●	2
DS4SB**D7/16**	.4375	.625	2.500	.4375	4	□	2
DS4SB**D1/2**	.5000	.625	2.500	.5000	4	●	2
DS4SB**D5/8**	.6250	.750	3.000	.6250	4	●	2
DS4SB**D3/4**	.7500	1.000	3.000	.7500	4	●	2

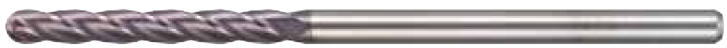
CUTTING CONDITIONS ➤ I073

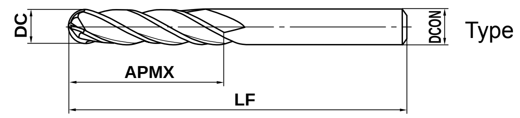
CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

DS4LB

Ball nose, Long, 4 flute

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
◎	◎			○	○		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute ball nose end mill for general purpose.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4LBD1/8	.1250	1.000	2.500	.1250	4	●	1
DS4LB**D3/16**	.1875	1.125	3.000	.1875	4	●	1
DS4LB**D1/4**	.2500	1.250	3.000	.2500	4	●	1
DS4LB**D5/16**	.3125	1.375	3.250	.8333	4	□	1
DS4LB**D3/8**	.3750	1.500	3.500	.3750	4	●	1
DS4LB**D7/16**	.4375	1.750	4.000	.4375	4	□	1
DS4LB**D1/2**	.5000	2.000	4.000	.5000	4	●	1
DS4LB**D5/8**	.6250	2.500	4.625	.6250	4	●	1
DS4LB**D3/4**	.7500	3.000	5.250	.7500	4	●	1
DS4LB**D1**	1.0000	3.000	6.000	1.0000	4	□	1

● : Inventory maintained. □ : Non stock, produced to order only.

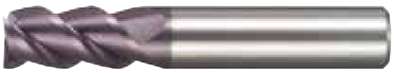
CUTTING CONDITIONS ➤ I073

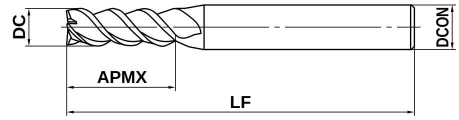
DS3MHH60

High helix, Medium, 3 flute

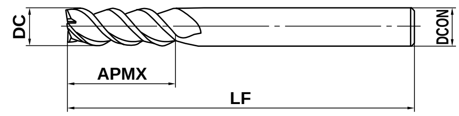
UWC MS 60°

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
○	○			◎	◎		





Type 1



Type 2

DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute high helix square end mill for difficult to cut materials.
- Helix angle 60°.

Unit : Inch

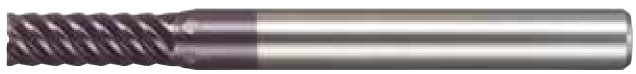
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MHH60D1/8	.1250	.375	1.500	.1250	3	●	2
DS3MHH60D5/32	.1562	.500	2.000	.1875	3	□	1
DS3MHH60D3/16	.1875	.563	2.000	.1875	3	●	2
DS3MHH60D7/32	.2187	.625	2.500	.2500	3	□	1
DS3MHH60D1/4	.2500	.750	2.500	.2500	3	●	2
DS3MHH60D9/32	.2813	.750	2.500	.3125	3	□	1
DS3MHH60D5/16	.3125	.813	2.500	.3125	3	□	2
DS3MHH60D3/8	.3750	.875	2.500	.3750	3	●	2
DS3MHH60D7/16	.4375	1.000	2.750	.4375	3	□	2
DS3MHH60D1/2	.5000	1.000	3.000	.5000	3	●	2
DS3MHH60D9/16	.5625	1.125	3.500	.5625	3	□	2
DS3MHH60D5/8	.6250	1.250	3.500	.6250	3	●	2
DS3MHH60D3/4	.7500	1.500	4.000	.7500	3	●	2
DS3MHH60D7/8	.8750	1.500	4.000	.8750	3	□	2
DS3MHH60D1	1.0000	1.500	4.000	1.0000	3	□	2

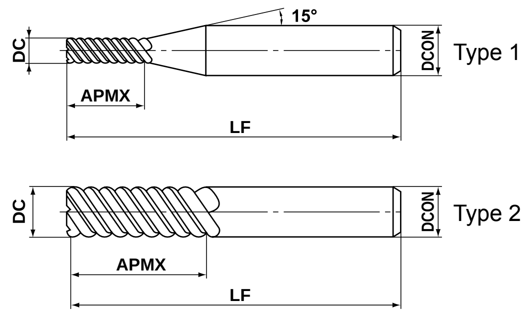
CUTTING CONDITIONS ➤ I072

DS6MHH60

High helix, Medium, 6 flute

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 6 flute high helix square end mill for difficult to cut materials.
- Helix angle 60°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS6MHH60D1/8	.1250	.375	1.500	.1250	6	●	2
DS6MHH60D5/32	.1562	.500	2.000	.1875	6	□	1
DS6MHH60D3/16	.1875	.563	2.000	.1875	6	●	2
DS6MHH60D7/32	.2187	.625	2.500	.2500	6	●	1
DS6MHH60D1/4	.2500	.750	2.500	.2500	6	●	2
DS6MHH60D9/32	.2813	.750	2.500	.3125	6	□	1
DS6MHH60D5/16	.3125	.813	2.500	.3125	6	□	2
DS6MHH60D3/8	.3750	.875	2.500	.3750	6	●	1
DS6MHH60D7/16	.4375	1.000	2.750	.4375	6	□	2
DS6MHH60D1/2	.5000	1.000	3.000	.5000	6	●	1
DS6MHH60D9/16	.5625	1.125	3.500	.5625	6	□	2
DS6MHH60D5/8	.6250	1.250	3.500	.6250	6	●	1
DS6MHH60D3/4	.7500	1.500	4.000	.7500	6	□	2
DS6MHH60D7/8	.8750	1.500	4.000	.8750	6	□	1
DS6MHH60D1	1.0000	1.500	4.000	1.0000	6	□	2

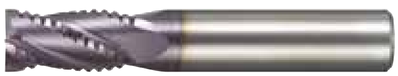
● : Inventory maintained. □ : Non stock, produced to order only.

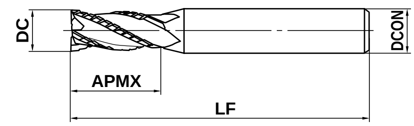
CUTTING CONDITIONS ➤ I072

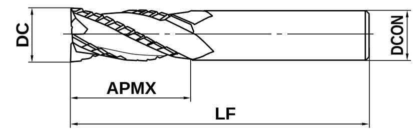
DS4MC...CB

Chipbreaker, Medium, 4 flute

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
◎	◎			○	○		







DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute chipbreaker end mill.
- Helix angle 30°.

Unit : Inch

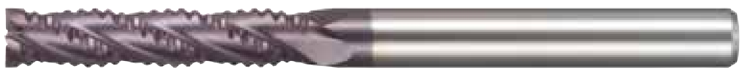
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4MCD1/8CB	.1250	.375	1.500	.1250	4	□	2
DS4MC**D5/32CB**	.1562	.500	2.000	.1875	4	□	1
DS4MC**D3/16CB**	.1875	.563	2.000	.1875	4	□	2
DS4MC**D7/32CB**	.2187	.625	2.500	.2500	4	□	1
DS4MC**D1/4CB**	.2500	.750	2.500	.2500	4	●	2
DS4MC**D9/32CB**	.2813	.750	2.500	.3125	4	□	1
DS4MC**D5/16CB**	.3125	.813	2.500	.3125	4	□	2
DS4MC**D3/8CB**	.3750	.875	2.500	.3750	4	●	2
DS4MC**D7/16CB**	.4375	1.000	2.750	.4375	4	□	2
DS4MC**D1/2CB**	.5000	1.000	3.000	.5000	4	●	2
DS4MC**D9/16CB**	.5625	1.125	3.500	.5625	4	□	2
DS4MC**D5/8CB**	.6250	1.250	3.500	.6250	4	●	2
DS4MC**D3/4CB**	.7500	1.500	4.000	.7500	4	□	2
DS4MC**D7/8CB**	.8750	1.500	4.000	.8750	4	□	2
DS4MC**D1CB**	1.0000	1.500	4.000	1.0000	4	□	2

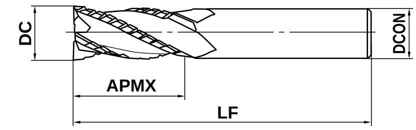
CUTTING CONDITIONS ➢ I072

DS4LC...CB

Chipbreaker, Long, 4 flute

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
◎	◎			○	○		





Type 1

DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	.7500≤DCON≤1.0000"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute chipbreaker end mill.
- Helix angle 30°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4LCD1/8CB	.1250	1.000	2.500	.1250	4	□	1
DS4LCD3/16CB	.1875	1.125	3.000	.1875	4	□	1
DS4LCD1/4CB	.2500	1.250	3.000	.2500	4	●	1
DS4LCD5/16CB	.3125	1.375	3.250	.3125	4	□	1
DS4LCD3/8CB	.3750	1.500	3.500	.3750	4	●	1
DS4LCD7/16CB	.4375	1.750	4.000	.4375	4	□	1
DS4LCD1/2CB	.5000	2.000	4.000	.5000	4	●	1
DS4LCD5/8CB	.6250	2.500	4.625	.6250	4	●	1
DS4LCD3/4CB	.7500	3.000	5.250	.7500	4	□	1
DS4LCD1CB	1.0000	3.000	6.000	1.0000	4	□	1

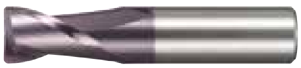
● : Inventory maintained. □ : Non stock, produced to order only.

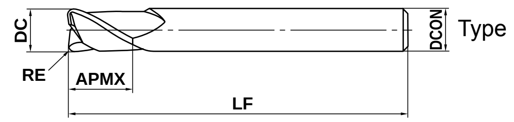
CUTTING CONDITIONS ➤ I072

DS2SRB

Corner radius, Short, 2 flute

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
◎	◎			○	○		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.5000≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 2 flute radius end mill.
- General purpose.

Unit : Inch

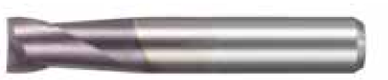
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2SRBD1/8R0.008	.1250	.008	.250	1.500	.1250	2	●	1
DS2SRBD3/16R0.015	.1875	.015	.375	2.000	.1875	2	●	1
DS2SRBD1/4R0.008	.2500	.008	.500	2.000	.2500	2	●	1
DS2SRBD1/4R0.020	.2500	.020	.500	2.000	.2500	2	●	1
DS2SRBD3/8R0.020	.3750	.020	.563	2.000	.3750	2	●	1
DS2SRBD3/8R0.040	.3750	.040	.563	2.000	.3750	2	●	1
DS2SRBD1/2R0.015	.5000	.015	.625	2.500	.5000	2	●	1
DS2SRBD1/2R0.030	.5000	.030	.625	2.500	.5000	2	●	1
DS2SRBD1/2R0.060	.5000	.060	.625	2.500	.5000	2	●	1
DS2SRBD5/8R0.020	.6250	.020	.750	3.000	.6250	2	●	1
DS2SRBD5/8R0.040	.6250	.040	.750	3.000	.6250	2	●	1
DS2SRBD3/4R0.030	.7500	.030	1.000	3.000	.7500	2	□	1
DS2SRBD3/4R0.060	.7500	.060	1.000	3.000	.7500	2	□	1

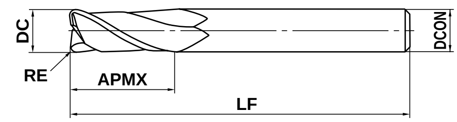
CUTTING CONDITIONS ➤ I072

DS2MRB

Corner radius, Medium, 2 flute

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
◎	◎			○	○		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.5000≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 2 flute radius end mill.
- General purpose.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2MRBD1/8R0.008	.1250	.008	.375	1.500	.1250	2	●	1
DS2MRBD3/16R0.015	.1875	.015	.563	2.000	.1875	2	●	1
DS2MRBD1/4R0.008	.2500	.008	.750	2.500	.2500	2	●	1
DS2MRBD1/4R0.020	.2500	.020	.750	2.500	.2500	2	●	1
DS2MRBD3/8R0.020	.3750	.020	.875	2.500	.3750	2	●	1
DS2MRBD3/8R0.040	.3750	.040	.875	2.500	.3750	2	●	1
DS2MRBD1/2R0.015	.5000	.015	1.000	3.000	.5000	2	●	1
DS2MRBD1/2R0.030	.5000	.030	1.000	3.000	.5000	2	●	1
DS2MRBD1/2R0.060	.5000	.060	1.000	3.000	.5000	2	●	1
DS2MRBD5/8R0.020	.6250	.020	1.250	3.500	.6250	2	●	1
DS2MRBD5/8R0.040	.6250	.040	1.250	3.500	.6250	2	●	1
DS2MRBD3/4R0.030	.7500	.030	1.500	4.000	.7500	2	□	1
DS2MRBD3/4R0.060	.7500	.060	1.500	4.000	.7500	2	□	1

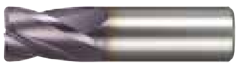
● : Inventory maintained. □ : Non stock, produced to order only.

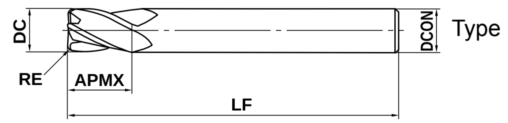
CUTTING CONDITIONS ➤ I072

DS4SRB

Corner radius, Short, 4 flute

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
◎	◎			○	○		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.5000≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 4 flute radius end mill.
- General purpose.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4SRBD1/8R0.008	.1250	.008	.250	1.500	.1250	4	●	1
DS4SRBD3/16R0.015	.1875	.015	.375	2.000	.1875	4	●	1
DS4SRBD1/4R0.008	.2500	.008	.500	2.000	.2500	4	●	1
DS4SRBD1/4R0.020	.2500	.020	.500	2.000	.2500	4	●	1
DS4SRBD3/8R0.020	.3750	.020	.563	2.000	.3750	4	●	1
DS4SRBD3/8R0.040	.3750	.040	.563	2.000	.3750	4	●	1
DS4SRBD1/2R0.015	.5000	.015	.625	2.500	.5000	4	●	1
DS4SRBD1/2R0.030	.5000	.030	.625	2.500	.5000	4	●	1
DS4SRBD1/2R0.060	.5000	.060	.625	2.500	.5000	4	●	1
DS4SRBD5/8R0.020	.6250	.020	.750	3.000	.6250	4	●	1
DS4SRBD5/8R0.040	.6250	.040	.750	3.000	.6250	4	●	1
DS4SRBD3/4R0.030	.7500	.030	1.000	3.000	.7500	4	□	1
DS4SRBD3/4R0.060	.7500	.060	1.000	3.000	.7500	4	□	1

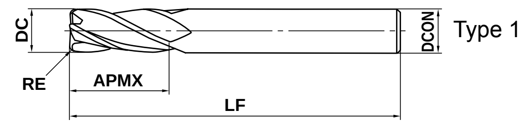
CUTTING CONDITIONS ➤ I072

DS4MRB

Corner radius, Medium, 4 flute

UWC MS 30°

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
◎	◎			○	○		



DC≤.2500"	DC>.2500"			
0 / - .002"	0 / - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.5000≤DCON≤.6250"	DCON=.7500"
0 / - .00024"	0 / - .00031"	0 / - .00035"	0 / - .00043"	0 / - .00051"

- 4 flute radius end mill.
- General purpose.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS4MRBD1/8R0.008	.1250	.008	.375	1.500	.1250	4	●	1
DS4MRBD3/16R0.015	.1875	.015	.563	2.000	.1875	4	●	1
DS4MRBD1/4R0.008	.2500	.008	.750	2.500	.2500	4	●	1
DS4MRBD1/4R0.020	.2500	.020	.750	2.500	.2500	4	●	1
DS4MRBD3/8R0.020	.3750	.020	.875	2.500	.3750	4	●	1
DS4MRBD3/8R0.040	.3750	.040	.875	2.500	.3750	4	●	1
DS4MRBD1/2R0.015	.5000	.015	1.000	3.000	.5000	4	●	1
DS4MRBD1/2R0.030	.5000	.030	1.000	3.000	.5000	4	●	1
DS4MRBD1/2R0.060	.5000	.060	1.000	3.000	.5000	4	●	1
DS4MRBD5/8R0.020	.6250	.020	1.250	3.500	.6250	4	●	1
DS4MRBD5/8R0.040	.6250	.040	1.250	3.500	.6250	4	●	1
DS4MRBD3/4R0.030	.7500	.030	1.500	4.000	.7500	4	□	1
DS4MRBD3/4R0.060	.7500	.060	1.500	4.000	.7500	4	□	1

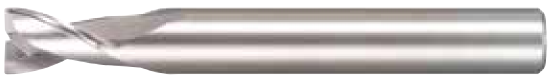
● : Inventory maintained. □ : Non stock, produced to order only.

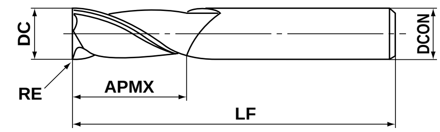
CUTTING CONDITIONS ➤ I072

DS2SRB...A○

Corner radius, Short, 2 flute, For aluminum alloys

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
						○	◎





Type 1

.1875≤DC≤1.0000"				
0 - .003"				
DCON=.1875"	.2500≤DCON≤.3750"	DCON=.5000"	.7500≤DCON≤1.0000"	
0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"	

- 2 flute radius end mill for aluminum alloys.
- Helix angle 30°.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS2SRBD3/16R0.008A2	.1875	.008	.250	2.000	.1875	2	●	1
DS2SRBD1/4R0.011A2.5	.2500	.011	.313	2.500	.2500	2	●	1
DS2SRBD3/8R0.015A2.5	.3750	.015	.500	2.500	.3750	2	●	1
DS2SRBD3/8R0.015A3	.3750	.015	.500	3.000	.3750	2	●	1
DS2SRBD3/8R0.015A4	.3750	.015	.500	4.000	.3750	2	□	1
DS2SRBD1/2R0.020A3	.5000	.020	.625	3.000	.5000	2	●	1
DS2SRBD1/2R0.020A4	.5000	.020	.625	4.000	.5000	2	●	1
DS2SRBD1/2R0.020A5	.5000	.020	.625	5.000	.5000	2	□	1
DS2SRBD3/4R0.030A4	.7500	.030	1.000	4.000	.7500	2	●	1
DS2SRBD3/4R0.030A5	.7500	.030	1.000	5.000	.7500	2	□	1
DS2SRBD3/4R0.030A6	.7500	.030	1.000	6.000	.7500	2	□	1
DS2SRBD1R0.045A4	1.0000	.045	1.250	4.000	1.0000	2	□	1
DS2SRBD1R0.045A5	1.0000	.045	1.250	5.000	1.0000	2	□	1
DS2SRBD1R0.045A6	1.0000	.045	1.250	6.000	1.0000	2	□	1

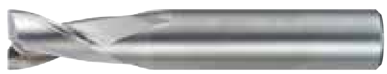
CUTTING CONDITIONS ➤ I072

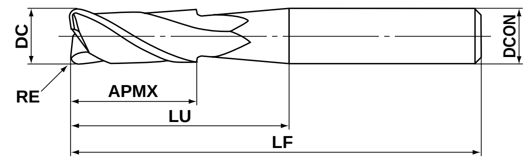
DS2SRB…NA◌

Corner radius, Short, 2 flute, Neck relief

UWC 30°

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
						○	◎





.1875≤DC≤1.0000"				
0 - .003"				
DCON=.1875"	.2500≤DCON≤.3750"	DCON=.5000"	.7500≤DCON≤1.0000"	
0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"	

- 2 flute radius end mill with neck relief for aluminum alloys.
- Helix angle 30°.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	LU	No. of Flutes	Stock	Type
DS2SRBD3/16R0.008NA2	.1875	.008	.250	2.000	.1875	.563	2	●	1
DS2SRB**D1/4R0.011NA2.5**	.2500	.011	.313	2.500	.2500	.750	2	●	1
DS2SRB**D3/8R0.015NA2.5**	.3750	.015	.500	2.500	.3750	.875	2	●	1
DS2SRB**D3/8R0.015NA3**	.3750	.015	.500	3.000	.3750	1.375	2	●	1
DS2SRB**D3/8R0.015NA4**	.3750	.015	.500	4.000	.3750	2.375	2	□	1
DS2SRB**D1/2R0.020NA3**	.5000	.020	.625	3.000	.5000	1.125	2	●	1
DS2SRB**D1/2R0.020NA4**	.5000	.020	.625	4.000	.5000	2.125	2	●	1
DS2SRB**D1/2R0.020NA5**	.5000	.020	.625	5.000	.5000	3.125	2	●	1
DS2SRB**D3/4R0.030NA4**	.7500	.030	1.000	4.000	.7500	1.875	2	●	1
DS2SRB**D3/4R0.030NA5**	.7500	.030	1.000	5.000	.7500	2.875	2	□	1
DS2SRB**D3/4R0.030NA6**	.7500	.030	1.000	6.000	.7500	3.875	2	□	1
DS2SRB**D1R0.045NA4**	1.0000	.045	1.250	4.000	1.0000	1.625	2	□	1
DS2SRB**D1R0.045NA5**	1.0000	.045	1.250	5.000	1.0000	2.625	2	□	1
DS2SRB**D1R0.045NA6**	1.0000	.045	1.250	6.000	1.0000	3.625	2	□	1

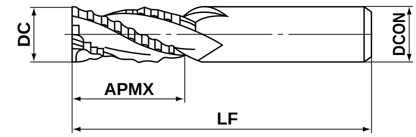
● : Inventory maintained. □ : Non stock, produced to order only.

CUTTING CONDITIONS ➤ I072

DS3MHR...A

Roughing, Medium, 3 flute, For aluminum alloys

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
							◎



Type 1

.2500≦DC≦1.0000"				
0 - .005"				
.2500≦DCON≦.3750"	DCON=.5000"	.7500≦DCON≦1.0000"		
0 - .00035"	0 - .00043"	0 - .00051"		

- 3 flute rougher end mill for aluminum alloys.
- Helix angle 45°.

Unit : Inch

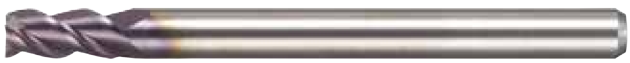
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MHRD1/4A	.2500	.750	2.500	.2500	3	●	1
DS3MHR**D3/8A**	.3750	.875	2.500	.3750	3	●	1
DS3MHR**D1/2A**	.5000	1.000	3.000	.5000	3	●	1
DS3MHR**D3/4A**	.7500	1.500	4.000	.7500	3	●	1
DS3MHR**D1A**	1.0000	2.000	4.000	1.0000	3	□	1

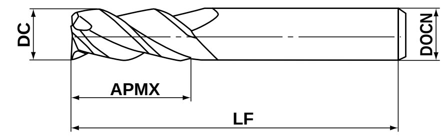
CUTTING CONDITIONS ➤ I072

DS3SH...SS

Short, 3 flute, For stainless steel

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
○	○			◎	◎		





Type 1

DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute square end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3SHD1/8SS	.1250	.250	1.500	.1250	3	●	1
DS3SHD3/16SS	.1875	.313	2.000	.1875	3	●	1
DS3SHD1/4SS	.2500	.375	2.000	.2500	3	●	1
DS3SHD5/16SS	.3125	.438	2.000	.3125	3	□	1
DS3SHD3/8SS	.3750	.500	2.000	.3750	3	●	1
DS3SHD7/16SS	.4375	.563	2.500	.4375	3	□	1
DS3SHD1/2SS	.5000	.625	2.500	.5000	3	●	1
DS3SHD5/8SS	.6250	.750	3.000	.6250	3	●	1
DS3SHD3/4SS	.7500	1.000	3.000	.7500	3	□	1

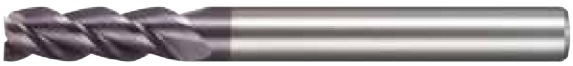
● : Inventory maintained. □ : Non stock, produced to order only.

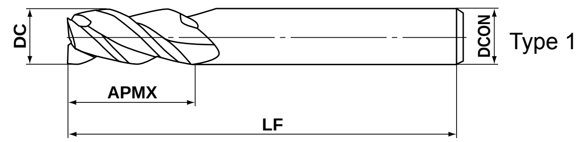
CUTTING CONDITIONS ➤ I072

DS3MH•••SS

Medium, 3 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute square end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

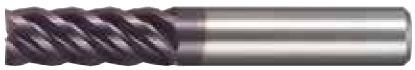
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MHD1/8SS	.1250	.375	1.500	.1250	3	●	1
DS3MH**D3/16SS**	.1875	.563	2.000	.1875	3	●	1
DS3MH**D1/4SS**	.2500	.750	2.500	.2500	3	●	1
DS3MH**D5/16SS**	.3125	.813	2.500	.3125	3	□	1
DS3MH**D3/8SS**	.3750	1.000	2.500	.3750	3	●	1
DS3MH**D7/16SS**	.4375	1.000	2.750	.4375	3	□	1
DS3MH**D1/2SS**	.5000	1.250	3.000	.5000	3	●	1
DS3MH**D5/8SS**	.6250	1.625	3.500	.6250	3	●	1
DS3MH**D3/4SS**	.7500	1.625	4.000	.7500	3	□	1

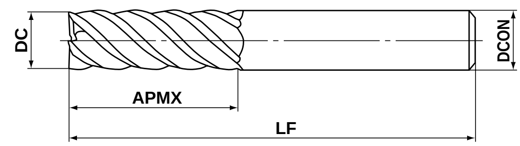
CUTTING CONDITIONS ➢ I072

DS5MH•••SS

Medium, 5 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"		
0 - .00035"	0 - .00043"	0 - .00051"		

- 5 flute square end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS5MHD1/4SS	.2500	.750	2.500	.2500	5	●	1
DS5MHD5/16SS	.3125	.813	2.500	.3125	5	□	1
DS5MHD3/8SS	.3750	1.000	2.500	.3750	5	●	1
DS5MHD7/16SS	.4375	1.000	2.750	.4375	5	□	1
DS5MHD1/2SS	.5000	1.250	3.000	.5000	5	●	1
DS5MHD5/8SS	.6250	1.625	3.500	.6250	5	●	1
DS5MHD3/4SS	.7500	1.625	4.000	.7500	5	□	1

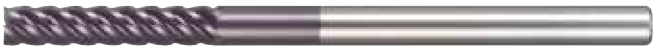
● : Inventory maintained. □ : Non stock, produced to order only.

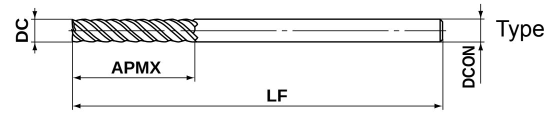
CUTTING CONDITIONS ➤ I072

DS5LH●●●SS

Long, 5 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"		
0 - .00035"	0 - .00043"	0 - .00051"		

- 5 flute square end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

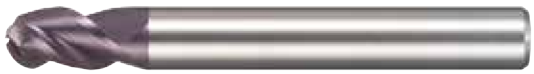
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS5LHD1/4SS	.2500	1.250	4.000	.2500	5	●	1
DS5LHD5/16SS	.3125	1.250	4.000	.3125	5	●	1
DS5LHD3/8SS	.3750	1.500	4.000	.3750	5	●	1
DS5LHD7/16SS	.4375	2.000	4.000	.4375	5	□	1
DS5LHD1/2SS	.5000	2.000	4.000	.5000	5	●	1
DS5LHD5/8SS	.6250	2.500	5.000	.6250	5	●	1
DS5LHD3/4SS	.7500	3.250	6.000	.7500	5	□	1

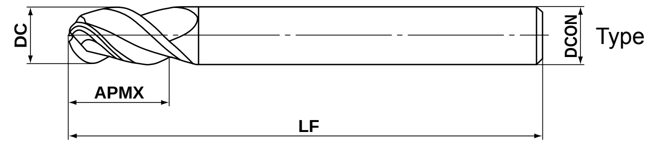
CUTTING CONDITIONS ➤ I072

DS3SHB…SS

Ball nose, Short, 3 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 / -.002"	0 / -.003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 / -.00024"	0 / -.00031"	0 / -.00035"	0 / -.00043"	0 / -.00051"

- 3 flute ball nose end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3SHBD1/8SS	.1250	.250	1.500	.1250	3	●	1
DS3SHBD3/16SS	.1875	.313	2.000	.1875	3	●	1
DS3SHBD1/4SS	.2500	.375	2.000	.2500	3	●	1
DS3SHBD5/16SS	.3125	.438	2.000	.3125	3	□	1
DS3SHBD3/8SS	.3750	.500	2.000	.3750	3	●	1
DS3SHBD7/16SS	.4375	.563	2.500	.4375	3	□	1
DS3SHBD1/2SS	.5000	.625	2.500	.5000	3	●	1
DS3SHBD5/8SS	.6250	.750	3.000	.6250	3	●	1
DS3SHBD3/4SS	.7500	1.000	3.000	.7500	3	●	1

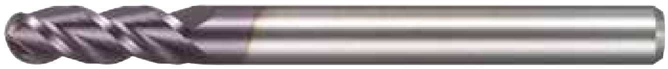
● : Inventory maintained. □ : Non stock, produced to order only.

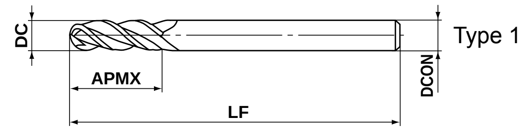
CUTTING CONDITIONS ➤ I073

DS3MHB•••SS

Ball nose, Medium, 3 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute ball nose end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

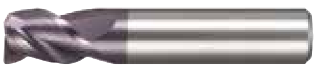
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MHBD1/8SS	.1250	.375	2.500	.1250	3	●	1
DS3MHB**D3/16SS**	.1875	.563	2.000	.1875	3	●	1
DS3MHB**D1/4SS**	.2500	.750	2.500	.2500	3	●	1
DS3MHB**D5/16SS**	.3125	.813	2.500	.3125	3	□	1
DS3MHB**D3/8SS**	.3750	1.000	2.500	.3750	3	●	1
DS3MHB**D7/16SS**	.4375	1.000	2.750	.4375	3	□	1
DS3MHB**D1/2SS**	.5000	1.250	3.000	.5000	3	●	1
DS3MHB**D5/8SS**	.6250	1.625	3.500	.6250	3	●	1
DS3MHB**D3/4SS**	.7500	1.625	4.000	.7500	3	●	1

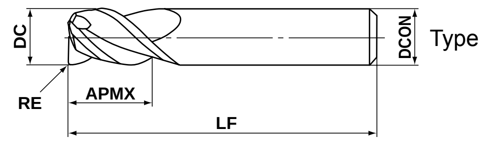
CUTTING CONDITIONS ➤ I073

DS3SHRB...SS

Corner radius, Short, 3 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute radius end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3SHRBD1/8R0.008SS	.1250	.008	.250	1.500	.1250	3	●	1
DS3SHRB**D3/16R0.008SS**	.1875	.008	.313	2.000	.1875	3	●	1
DS3SHRB**D1/4R0.015SS**	.2500	.015	.375	2.000	.2500	3	●	1
DS3SHRB**D5/16R0.015SS**	.3125	.015	.438	2.000	.3125	3	□	1
DS3SHRB**D3/8R0.020SS**	.3750	.020	.500	2.000	.3750	3	●	1
DS3SHRB**D7/16R0.020SS**	.4375	.020	.563	2.500	.4375	3	□	1
DS3SHRB**D1/2R0.030SS**	.5000	.030	.625	2.500	.5000	3	●	1
DS3SHRB**D5/8R0.030SS**	.6250	.030	.750	3.000	.6250	3	●	1
DS3SHRB**D3/4R0.035SS**	.7500	.035	1.000	3.000	.7500	3	●	1

● : Inventory maintained. □ : Non stock, produced to order only.

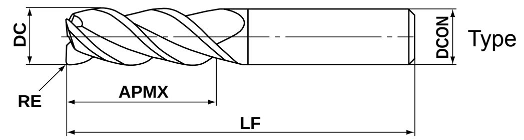
CUTTING CONDITIONS ➢ I072

DS3MHRB...SS

Corner radius, Medium, 3 flute, For stainless steel

UWC MS 45°

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
○	○			◎	◎		



DC	DC≤.2500"	DC>.2500"			
	0 - .002"	0 - .003"			
DCON	DCON=.1250"	DCON=.1875"	.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"
	0 - .00024"	0 - .00031"	0 - .00035"	0 - .00043"	0 - .00051"

- 3 flute radius end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

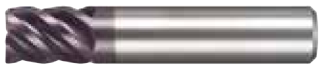
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MHRBD1/8R0.008SS	.1250	.008	.375	1.500	.1250	3	●	1
DS3MHRB**D3/16R0.008SS**	.1875	.008	.563	2.000	.1875	3	●	1
DS3MHRB**D1/4R0.015SS**	.2500	.015	.750	2.500	.2500	3	●	1
DS3MHRB**D5/16R0.015SS**	.3125	.015	.813	2.500	.3125	3	□	1
DS3MHRB**D3/8R0.020SS**	.3750	.020	1.000	2.500	.3750	3	●	1
DS3MHRB**D7/16R0.020SS**	.4375	.020	1.000	2.750	.4375	3	□	1
DS3MHRB**D1/2R0.030SS**	.5000	.030	1.250	3.000	.5000	3	●	1
DS3MHRB**D5/8R0.030SS**	.6250	.030	1.625	3.500	.6250	3	●	1
DS3MHRB**D3/4R0.035SS**	.7500	.035	1.625	4.000	.7500	3	□	1

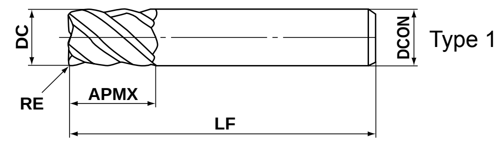
CUTTING CONDITIONS ➤ I072

DS5SHRB...SS

Corner radius, Short, 5 flute, For stainless steel

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"		
0 - .00035"	0 - .00043"	0 - .00051"		

- 5 flute radius end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS5SHRBD1/4R0.015SS	.2500	.015	.375	2.000	.2500	5	●	1
DS5SHRB**D5/16R0.015SS**	.3125	.015	.438	2.000	.3125	5	□	1
DS5SHRB**D3/8R0.020SS**	.3750	.020	.500	2.000	.3750	5	●	1
DS5SHRB**D7/16R0.020SS**	.4375	.020	.563	2.500	.4375	5	□	1
DS5SHRB**D1/2R0.030SS**	.5000	.030	.625	2.500	.5000	5	●	1
DS5SHRB**D5/8R0.030SS**	.6250	.030	.750	3.000	.6250	5	●	1
DS5SHRB**D3/4R0.035SS**	.7500	.035	1.000	3.000	.7500	5	□	1

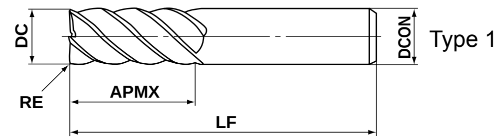
● : Inventory maintained. □ : Non stock, produced to order only.

CUTTING CONDITIONS ➤ I072

DS5MHRB…SS

Corner radius, Medium, 5 flute, For stainless steel

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
○	○			◎	◎		



DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
.2500≤DCON≤.3750"	.4375≤DCON≤.6250"	DCON=.7500"		
0 - .00035"	0 - .00043"	0 - .00051"		

- 5 flute radius end mill for stainless steel.
- Helix angle 45°.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS5MHRBD1/4R0.015SS	.2500	.015	.750	2.500	.2500	5	●	1
DS5MHRBD5/16R0.015SS	.3125	.015	.813	2.500	.3125	5	●	1
DS5MHRBD3/8R0.020SS	.3750	.020	1.000	2.500	.3750	5	●	1
DS5MHRBD7/16R0.020SS	.4375	.020	1.000	2.750	.4375	5	□	1
DS5MHRBD1/2R0.030SS	.5000	.030	1.250	3.000	.5000	5	●	1
DS5MHRBD5/8R0.030SS	.6250	.030	1.625	3.500	.6250	5	●	1
DS5MHRBD3/4R0.035SS	.7500	.035	1.625	4.000	.7500	5	●	1

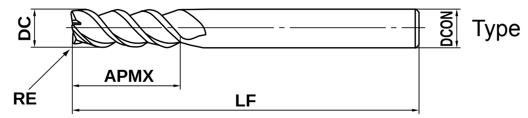
CUTTING CONDITIONS ➤ I072

DS3MHHRB

Corner radius, High helix, Medium, 3 flute

UWC MS 60°

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
○	○			◎	◎		



DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	.2500≤DCON≤.3750"	.5000≤DCON≤.6250"		
0 - .00024"	0 - .00035"	0 - .00043"		

- 3 flute high helix radius end mill.
- Suitable for difficult-to-cut material.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS3MHHRBD1/8R0.008	.1250	.008	.375	1.500	.1250	3	●	1
DS3MHHRB**D1/4R0.015**	.2500	.015	.750	2.500	.2500	3	●	1
DS3MHHRB**D1/4R0.030**	.2500	.030	.750	2.500	.2500	3	●	1
DS3MHHRB**D3/8R0.020**	.3750	.020	.875	2.500	.3750	3	●	1
DS3MHHRB**D3/8R0.040**	.3750	.040	.875	2.500	.3750	3	●	1
DS3MHHRB**D1/2R0.015**	.5000	.015	1.000	3.000	.5000	3	●	1
DS3MHHRB**D1/2R0.030**	.5000	.030	1.000	3.000	.5000	3	●	1
DS3MHHRB**D1/2R0.060**	.5000	.060	1.000	3.000	.5000	3	●	1
DS3MHHRB**D5/8R0.030**	.6250	.030	1.250	3.500	.6250	3	●	1
DS3MHHRB**D5/8R0.060**	.6250	.060	1.250	3.500	.6250	3	●	1

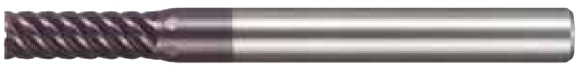
● : Inventory maintained.

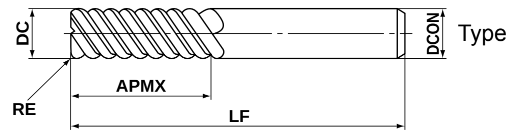
CUTTING CONDITIONS ➤ I072

DS6MHHRB

Corner radius, High helix, Medium, 6 flute

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
○	○			◎	◎		





DC≤.2500"	DC>.2500"			
0 - .002"	0 - .003"			
DCON=.1250"	.2500≤DCON≤.3750"	.5000≤DCON≤.6250"		
0 - .00024"	0 - .00035"	0 - .00043"		

- 6 flute high helix radius end mill.
- Suitable for difficult-to-cut material.

Unit : Inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
DS6MHHRBD1/8R0.008	.1250	.008	.375	1.500	.1250	6	●	1
DS6MHHRB**D1/4R0.015**	.2500	.015	.750	2.500	.2500	6	●	1
DS6MHHRB**D1/4R0.030**	.2500	.030	.750	2.500	.2500	6	●	1
DS6MHHRB**D3/8R0.020**	.3750	.020	.875	2.500	.3750	6	●	1
DS6MHHRB**D3/8R0.040**	.3750	.040	.875	2.500	.3750	6	●	1
DS6MHHRB**D1/2R0.015**	.5000	.015	1.000	3.000	.5000	6	●	1
DS6MHHRB**D1/2R0.030**	.5000	.030	1.000	3.000	.5000	6	●	1
DS6MHHRB**D1/2R0.060**	.5000	.060	1.000	3.000	.5000	6	●	1
DS6MHHRB**D5/8R0.030**	.6250	.030	1.250	3.500	.6250	6	●	1
DS6MHHRB**D5/8R0.060**	.6250	.060	1.250	3.500	.6250	6	●	1

CUTTING CONDITIONS ➤ I072

APPLICATION CHART

Square End Mill, Corner Radius End Mill

DS2SS (➲I036), DS2MS (➲I037), DS2LS (➲I038), DS3SC (➲I039), DS3MC (➲I040), DS4SC (➲I041), DS4MC (➲I042), DS4LC (➲I043), DS4MC...CB (➲I051), DS4LC...CB (➲I052), DS2SRB (➲I053), DS2MRB (➲I054), DS4SRB (➲I055), DS4MRB (➲I056)

				.016"—.125"	.141"—.250"	.281"—.500"	.563"—.750"	.750"—1.250"	Slotting-max D.O.C.
	MATERIAL	HRC / BHN	SFM *	IPT	IPT	IPT	IPT	IPT	
STEELS	Carbon Steel	150—250 BHN	160—500	.0002—.0005	.0008—.0015	.0015—.003	.002—.003	.003—.005	.3—.5DC
STEELS	Steel Alloys	—45 HRC	130—350	.0002—.0005	.0008—.0015	.0015—.003	.002—.003	.003	.3—.5DC
STEELS	Steel Alloys	45—55 HRC	100—160	.0001—.0004	.0005—.001	.001—.002	.002	.003	.05—.2DC
STAINLESS STEELS	300	140—185 BHN	100—300	.0001—.0005	.0008—.0015	.0015—.003	.002—.003	.003—.004	.3—.5DC
STAINLESS STEELS	400	180—200 BHN	125—350	.0001—.0005	.0008—.0015	.0015—.003	.002—.003	.003—.004	.3—.5DC
STAINLESS STEELS	Heat Resistant	32—43 HRC	100—300	.0001—.0004	.0005—.001	.001—.002	.002	.002	.05—.2DC
CAST IRON	Gray Cast Iron	180—260 BHN	150—550	.0002—.0005	.0008—.0015	.0015—.003	.002—.003	.003—.005	.3—.5DC
CAST IRON	Ductile Cast Iron	220—260 BHN	150—550	.0002—.0005	.0008—.0015	.0015—.003	.002—.003	.003—.005	.3—.5DC
NON-FERROUS	Aluminum Alloys	180—220 BHN	300—1000	.0002—.0005	.001—.002	.002—.003	.003—.004	.004—.005	.5—1DC
NON-FERROUS	Copper Alloys	60—120 BHN	200—500	.0002—.0005	.0008—.0015	.0015—.003	.002—.003	.003—.005	.3—.5DC
NON-FERROUS	Plastics	—	300—1500	.0002—.0005	.001—.002	.002—.003	.003—.004	.004—.005	.5—1DC
Ti	Titanium	300—350 BHN	70—300	.0003—.0006	.0006—.001	.001—.003	.003—.004	.004—.007	.3—.5DC

STAINLESS STEEL Square End Mill, Corner Radius End Mill

DS3MHH60 (➲I049), DS6MHH60 (➲I050), DS3SH...SS (➲I060), DS3MH...SS (➲I061), DS5MH...SS (➲I062), DS5LH...SS (➲I063), DS3SHRB...SS (➲I066), DS3MHRB...SS (➲I067), DS5SHRB...SS (➲I068), DS5MHRB...SS (➲I069), DS3MHHRB (➲I070), DS6MHHRB (➲I071)

				.125"	.141"—.250"	.281"—.500"	.563"—.750"	.750"	Slotting-max D.O.C.
	MATERIAL	HRC / BHN	SFM *	IPT	IPT	IPT	IPT	IPT	
STAINLESS STEELS	304 316	130—190 BHN	150—300	.0005	.0008—.0015	.0015—.003	.002—.003	.003	.3—.5DC
STAINLESS STEELS	405 410 430	180—200 BHN	200—500	.0005	.0008—.0015	.0015—.003	.002—.003	.003	.3—.5DC
STAINLESS STEELS	405 410 430	30—37 HRC	130—500	.0005	.0008—.0015	.0015—.003	.002—.003	.003	.3—.5DC
STAINLESS STEELS	PH	35—42 HRC	150—200	.0004	.0005—.001	.001—.002	.002	.002	.05—.2DC

ALUMINUM Square End Mill, Corner Radius End Mill

DS2SRB...A (➲I057), DS2SRB...NA (➲I058), DS3MHR...A (➲I059)

				.141"—.250"	.281"—.500"	.563"—.750"	.750"—1"	Slotting-max D.O.C.
	MATERIAL	HRC / BHN	SFM *	IPT	IPT	IPT	IPT	
ALUMINUM	Aluminum Cast	40—100 BHN	700—1500	.001—.002	.002—.003	.003—.004	.004—.006	.5—1DC
ALUMINUM	Aluminum Alloys <5% silicon	40—100 BHN	700—1500	.001—.002	.002—.003	.003—.004	.004—.006	.5—1DC
ALUMINUM	Aluminum Alloys >5% silicon	60—120 BHN	450—1000	.001—.002	.002—.003	.003—.004	.004—.006	.5—1DC

* Please decrease speed by 25% when using extra length end mills.
* Speed may be increased by 25% when using stub length end mills.
* When slotting, please decrease speed by 20%.

APPLICATION CHART

Ball Nose End Mill

DS2SB (➲I044), DS2LB (➲I045), DS3SB (➲I046), DS4SB (➲I047), DS4LB (➲I048)

	MATERIAL	HRC / BHN	SFM *	.016"—.125" IPT	.141"—.250" IPT	.281"—.500" IPT	.563"—.750" IPT	.750"—1" IPT	Slotting-max D.O.C.
STEELS	Carbon Steel	150—250 BHN	160—900	.0001—.0005	.001—.0015	.0015—.003	.003—.005	.005—.006	.1—.25DC
STEELS	Steel Alloys	—45 HRC	160—750	.0001—.0004	.001—.0012	.0012—.003	.003—.005	.005—.006	.1—.25DC
STEELS	Steel Alloys	45—55 HRC	160—600	.0001—.0004	.0008—.0012	.0012—.003	.003—.004	.004—.005	.1—.25DC
STAINLESS STEELS	400	180—200 BHN	160—750	.0001—.0004	.001—.0012	.0012—.003	.003—.005	.005—.006	.1—.25DC
STAINLESS STEELS	Heat Resistant	32—43 HRC	150—400	.0001—.0004	.0008—.0012	.0012—.003	.003—.004	.004—.005	.1—.25DC
CAST IRON	Gray Cast Iron	180—260 BHN	160—900	.0001—.0005	.001—.0015	.0015—.003	.003—.005	.005—.006	.1—.25DC
CAST IRON	Ductile Cast Iron	220—260 BHN	160—900	.0001—.0005	.001—.0015	.0015—.003	.003—.005	.005—.006	.1—.25DC
NON-FERROUS	Aluminum Alloys	180—220 BHN	300—1500	.0001—.0008	.001—.002	.0015—.004	.004—.006	.006—.008	.2—.5DC
NON-FERROUS	Copper Alloys	60—120 BHN	160—900	.0001—.0005	.001—.0015	.0015—.003	.003—.005	.005—.006	.1—.25DC
NON-FERROUS	Plastics	—	300—1500	.0001—.0008	.001—.002	.0015—.004	.004—.006	.006—.008	.2—.5DC
Ti	Titanium	300—350 BHN	100—300	.0001—.0004	.0008—.0012	.0012—.003	.003—.004	.004—.005	.1—.25DC

STAINLESS STEEL Ball Nose End Mill

DS3SHB...SS (➲I064), DS3MHB...SS (➲I065)

	MATERIAL	HRC / BHN	SFM *	.125" IPT	.141"—.250" IPT	.281"—.500" IPT	.563"—.750" IPT	.750" IPT	Slotting-max D.O.C.
STAINLESS STEELS	304 316	130—190 BHN	250—500	.0003—.0004	.001—.0012	.0012—.003	.003—.005	.004—.005	.1—.25DC
STAINLESS STEELS	405 410 430	180—200 BHN	200—600	.0003—.0004	.001—.0012	.0012—.003	.003—.005	.005—.006	.1—.25DC
STAINLESS STEELS	405 410 430	30—37 HRC	130—500	.0003—.0004	.001—.0012	.0012—.003	.003—.005	.005—.006	.1—.25DC
STAINLESS STEELS	PH	35—42 HRC	150—350	.0003—.0004	.0008—.0012	.0012—.003	.003—.004	.004—.005	.1—.25DC

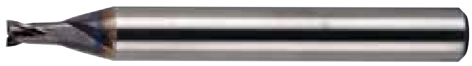
* Please decrease speed by 25% when using extra length end mills.
* Speed may be increased by 25% when using stub length end mills.
* When slotting, please decrease speed by 20%.

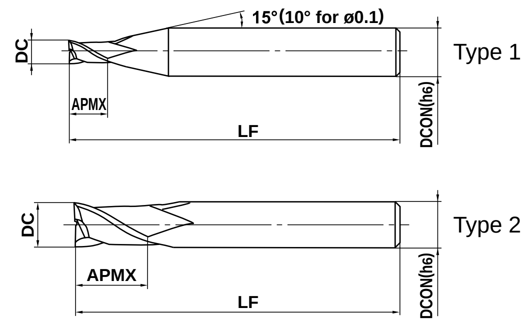
MS2SS

End mill, Short cut length, 2 flute

DC<3　DC≥3

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
◎	◎	○		○	○		





	DC=0.1	DC>0.1		
DC tolerance	0 - 0.010	0 - 0.020		
h6	4≤DCON≤6	8≤DCON≤10	DCON=12	
	0 - 0.008	0 - 0.009	0 - 0.011	

● 2 flute end mill for general use.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2SSD0010	0.1	0.15	40	4	2	★	1
MS2SSD0020	0.2	0.3	40	4	2	★	1
MS2SSD0030	0.3	0.45	40	4	2	★	1
MS2SSD0040	0.4	0.6	40	4	2	★	1
MS2SSD0050	0.5	0.75	40	4	2	★	1
MS2SSD0060	0.6	0.9	40	4	2	★	1
MS2SSD0070	0.7	1.1	40	4	2	★	1
MS2SSD0080	0.8	1.2	40	4	2	★	1
MS2SSD0090	0.9	1.4	40	4	2	★	1
MS2SSD0100	1	1.5	40	4	2	★	1
MS2SSD0120	1.2	1.8	40	4	2	★	1
MS2SSD0150	1.5	2.3	40	4	2	★	1
MS2SSD0180	1.8	2.7	40	4	2	★	1
MS2SSD0200	2	3	40	4	2	★	1
MS2SSD0250	2.5	3.8	40	4	2	★	1
MS2SSD0300	3	4.5	45	6	2	★	1
MS2SSD0400	4	6	50	6	2	★	1
MS2SSD0500	5	7.5	50	6	2	★	1
MS2SSD0600	6	9	50	6	2	★	2
MS2SSD0700	7	10.5	60	8	2	★	1
MS2SSD0800	8	12	60	8	2	★	2
MS2SSD0900	9	13.5	70	10	2	★	1
MS2SSD1000	10	15	70	10	2	★	2
MS2SSD1100	11	16.5	75	12	2	★	1
MS2SSD1200	12	18	75	12	2	★	2

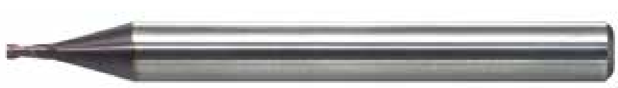
● : Inventory maintained.　★ : Inventory maintained in Japan.

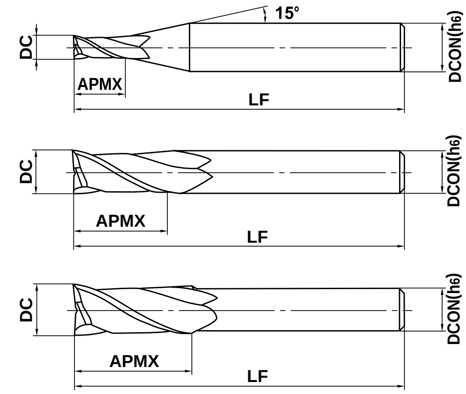
MS2MS

End mill, Medium cut length, 2 flute

UWC MS 30° DC<3 DC≥3

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
◎	◎	○		○	○		





	DC≤12	DC>12			
	0 / - 0.020	0 / - 0.030			
h6	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 / - 0.008	0 / - 0.009	0 / - 0.011	0 / - 0.013	

● 2 flute end mill for general use.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2MSD0020	0.2	0.4	40	4	2	●	1
MS2MSD0030	0.3	0.6	40	4	2	●	1
MS2MSD0040	0.4	0.8	40	4	2	●	1
MS2MSD0050	0.5	1	40	4	2	●	1
MS2MSD0060	0.6	1.2	40	4	2	●	1
MS2MSD0070	0.7	1.4	40	4	2	●	1
MS2MSD0080	0.8	1.6	40	4	2	●	1
MS2MSD0090	0.9	1.8	40	4	2	●	1
MS2MSD0100	1	2	40	4	2	●	1
MS2MSD0110	1.1	2.2	40	4	2	●	1
MS2MSD0120	1.2	2.4	40	4	2	●	1
MS2MSD0130	1.3	2.6	40	4	2	●	1
MS2MSD0140	1.4	2.8	40	4	2	●	1
MS2MSD0150	1.5	3	40	4	2	●	1
MS2MSD0160	1.6	3.2	40	4	2	●	1
MS2MSD0170	1.7	3.4	40	4	2	●	1
MS2MSD0180	1.8	3.6	40	4	2	●	1
MS2MSD0190	1.9	3.8	40	4	2	●	1
MS2MSD0200	2	4	40	4	2	●	1
MS2MSD0210	2.1	4.2	40	4	2	●	1
MS2MSD0220	2.2	4.4	40	4	2	●	1
MS2MSD0230	2.3	4.6	40	4	2	●	1
MS2MSD0240	2.4	4.8	40	4	2	●	1
MS2MSD0250	2.5	5	40	4	2	●	1
MS2MSD0260	2.6	5.2	40	4	2	●	1
MS2MSD0270	2.7	5.4	40	4	2	●	1
MS2MSD0280	2.8	5.6	40	4	2	●	1
MS2MSD0290	2.9	5.8	40	4	2	●	1
MS2MSD0300	3	6	45	6	2	●	1
MS2MSD0310	3.1	6.2	45	6	2	★	1
MS2MSD0320	3.2	6.4	45	6	2	★	1

MS2MS

End mill, Medium cut length, 2 flute

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2MSD0330	3.3	6.6	45	6	2	★	1
MS2MSD0340	3.4	6.8	45	6	2	★	1
MS2MSD0350	3.5	7	45	6	2	★	1
MS2MSD0360	3.6	7.2	45	6	2	★	1
MS2MSD0370	3.7	7.4	45	6	2	★	1
MS2MSD0380	3.8	7.6	45	6	2	★	1
MS2MSD0390	3.9	7.8	45	6	2	★	1
MS2MSD0400	4	8	50	6	2	●	1
MS2MSD0410	4.1	8.2	50	6	2	★	1
MS2MSD0420	4.2	8.4	50	6	2	★	1
MS2MSD0430	4.3	8.6	50	6	2	★	1
MS2MSD0440	4.4	8.8	50	6	2	★	1
MS2MSD0450	4.5	9	50	6	2	★	1
MS2MSD0460	4.6	9.2	50	6	2	★	1
MS2MSD0470	4.7	9.4	50	6	2	★	1
MS2MSD0480	4.8	9.6	50	6	2	★	1
MS2MSD0490	4.9	9.8	50	6	2	★	1
MS2MSD0500	5	10	50	6	2	●	1
MS2MSD0510	5.1	10.2	50	6	2	★	1
MS2MSD0520	5.2	10.4	50	6	2	★	1
MS2MSD0530	5.3	10.6	50	6	2	★	1
MS2MSD0540	5.4	10.8	50	6	2	★	1
MS2MSD0550	5.5	11	50	6	2	★	1
MS2MSD0560	5.6	11.2	50	6	2	★	1
MS2MSD0570	5.7	11.4	50	6	2	★	1
MS2MSD0580	5.8	11.6	50	6	2	★	1
MS2MSD0590	5.9	11.8	50	6	2	★	1
MS2MSD0600	6	12	50	6	2	●	2
MS2MSD0650	6.5	13	60	8	2	★	1
MS2MSD0700	7	14	60	8	2	★	1
MS2MSD0750	7.5	15	60	8	2	★	1
MS2MSD0800	8	16	60	8	2	●	2
MS2MSD0850	8.5	17	70	10	2	★	1
MS2MSD0900	9	18	70	10	2	★	1
MS2MSD0950	9.5	19	70	10	2	★	1
MS2MSD1000	10	20	70	10	2	●	2
MS2MSD1100	11	22	75	12	2	★	1
MS2MSD1200	12	24	75	12	2	●	2
MS2MSD1600	16	32	90	16	2	★	2
MS2MSD1800	18	36	90	16	2	★	3
MS2MSD2000	20	40	100	20	2	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

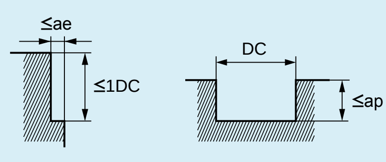
MS2SS
End mill, Short cut length, 2 flute

MS2MS
End mill, Medium cut length, 2 flute

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)
0.1	40000	40	1.6	0.001	40000	40	1.6	0.001
0.2	40000	100	3.9	0.002	40000	100	3.9	0.002
0.3	40000	200	7.9	0.005	40000	200	7.9	0.005
0.4	40000	600	23.6	0.01	40000	600	23.6	0.01
0.5	40000	1000	39.4	0.015	40000	960	37.8	0.015
0.6	40000	1200	47.2	0.02	40000	1200	47.2	0.02
0.7	40000	1400	55.1	0.02	40000	1400	55.1	0.02
0.8	40000	1600	63.0	0.03	40000	1600	63.0	0.03
0.9	40000	1800	70.9	0.04	40000	1600	63.0	0.04
1	40000	2000	78.7	0.06	32000	1600	63.0	0.06
1.5	40000	3000	118.1	0.12	32000	1900	74.8	0.08
2	30000	3000	118.1	0.18	24000	1900	74.8	0.10
2.5	24000	2600	102.4	0.25	19000	1600	63.0	0.13
3	20000	2300	90.6	0.30	16000	1400	55.1	0.15
4	15000	2000	78.7	0.40	12000	1200	47.2	0.20
5	12000	1600	63.0	0.50	9000	900	35.4	0.25
6	10000	1400	55.1	0.60	7000	700	27.6	0.30
8	8000	1000	39.4	0.80	5600	550	21.7	0.40
10	6400	900	35.4	1.00	4500	500	19.7	0.50
12	5400	820	32.3	1.00	3800	450	17.7	0.50
16	2400	380	15.0	≦3	1200	100	3.9	≦0.8
20	1900	320	12.6	≦4	1000	80	3.1	≦1

Depth of cut



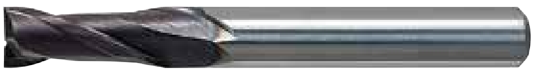
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) In case of slotting with over 3 mm endmill, please reduce revolution to 50−70% of above value, and reduce feed rate to 40−60% of above value.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

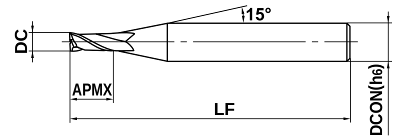
MS2MD

End mill, Medium cut length, 2 flute, Strong geometry type

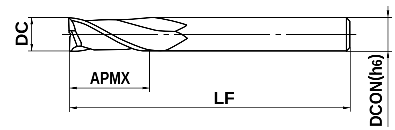
DC<3 DC≥3

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
◎	◎	○		○	○		





Type 1



Type 2

1≤DC≤12				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

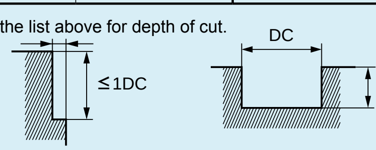
- Strong edge type, 2 flute end mill with high resistance to corner fracturing.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2MDD0100	1	2.5	40	4	2	★	1
MS2MDD0150	1.5	3.8	40	4	2	★	1
MS2MDD0200	2	5	40	4	2	★	1
MS2MDD0250	2.5	6.3	40	4	2	★	1
MS2MDD0300	3	7.5	50	6	2	★	1
MS2MDD0400	4	10	50	6	2	★	1
MS2MDD0500	5	12.5	50	6	2	★	1
MS2MDD0600	6	15	50	6	2	★	2
MS2MDD0800	8	20	60	8	2	★	2
MS2MDD1000	10	25	70	10	2	★	2
MS2MDD1200	12	30	90	12	2	★	2

★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

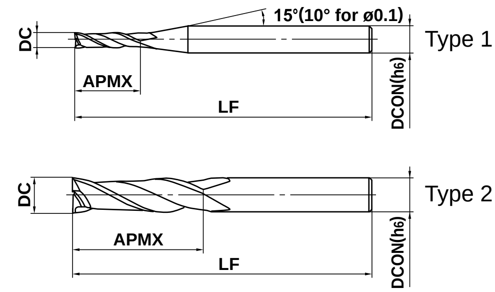
Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45-55HRC) AISI H13 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)	
1	40000	2000	78.7	0.06	32000	1600	63.0	0.06
1.5	40000	3000	118.1	0.12	32000	1900	74.8	0.08
2	30000	3000	118.1	0.18	24000	1900	74.8	0.10
2.5	24000	2600	102.4	0.25	19000	1600	63.0	0.13
3	20000	2300	90.6	0.30	16000	1400	55.1	0.15
4	15000	2000	78.7	0.40	12000	1200	47.2	0.20
5	12000	1600	63.0	0.50	9000	900	35.4	0.25
6	10000	1400	55.1	0.60	7000	700	27.6	0.30
8	8000	1000	39.4	0.80	5600	550	21.7	0.40
10	6400	900	35.4	1.00	4500	500	19.7	0.50
12	5400	820	32.3	1.00	3800	450	17.7	0.50
Depth of cut								

1) If the depth of cut is smaller than this table, feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below of the above value.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

MS2JS

End mill, Semi long cut length, 2 flute

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
◎	◎	○		○	○		



DC	DC=0.1	DC>0.1			
	0 - 0.010	0 - 0.020			
h6	4≤DCON≤6	8≤DCON≤10	DCON=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

- 2 flute end mill for general use.

Unit : mm

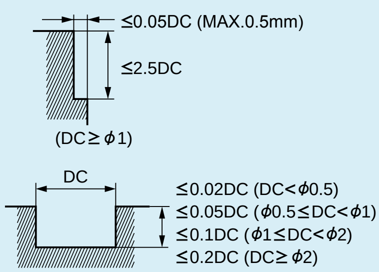
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2JSD0010	0.1	0.3	40	4	2	●	1
MS2JSD0020	0.2	0.6	40	4	2	●	1
MS2JSD0030	0.3	0.9	40	4	2	●	1
MS2JSD0040	0.4	1.2	40	4	2	●	1
MS2JSD0050	0.5	1.5	40	4	2	●	1
MS2JSD0060	0.6	1.8	40	4	2	●	1
MS2JSD0070	0.7	2.1	40	4	2	●	1
MS2JSD0080	0.8	2.4	40	4	2	●	1
MS2JSD0090	0.9	2.7	40	4	2	●	1
MS2JSD0100	1	3	40	4	2	●	1
MS2JSD0120	1.2	3.6	40	4	2	●	1
MS2JSD0150	1.5	4.5	40	4	2	●	1
MS2JSD0180	1.8	5.4	40	4	2	●	1
MS2JSD0200	2	6	40	4	2	●	1
MS2JSD0250	2.5	7.5	40	4	2	●	1
MS2JSD0300	3	9	45	6	2	●	1
MS2JSD0400	4	12	50	6	2	●	1
MS2JSD0500	5	15	50	6	2	●	1
MS2JSD0600	6	18	50	6	2	●	2
MS2JSD0800	8	24	70	8	2	●	2
MS2JSD1000	10	30	90	10	2	●	2
MS2JSD1200	12	36	90	12	2	●	2

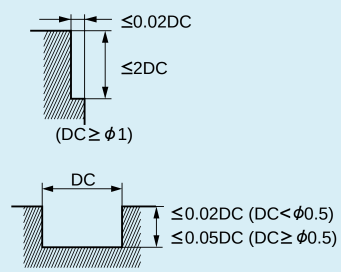
● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
0.1	40000	— (40)	— (1.6)	40000	— (40)	— (1.6)	40000	— (35)	— (1.4)	40000	— (25)	— (1.0)
0.2	40000	— (45)	— (1.8)	40000	— (45)	— (1.8)	40000	— (35)	— (1.4)	32000	— (25)	— (1.0)
0.3	40000	— (55)	— (2.2)	32000	— (45)	— (1.8)	27000	— (35)	— (1.4)	21000	— (25)	— (1.0)
0.4	32000	— (60)	— (2.4)	24000	— (45)	— (1.8)	20000	— (35)	— (1.4)	16000	— (25)	— (1.0)
0.5	25000	— (60)	— (2.4)	19000	— (45)	— (1.8)	16000	— (35)	— (1.4)	13000	— (25)	— (1.0)
0.6	21000	— (60)	— (2.4)	16000	— (45)	— (1.8)	13000	— (35)	— (1.4)	11000	— (25)	— (1.0)
0.7	18000	— (60)	— (2.4)	14000	— (45)	— (1.8)	11000	— (35)	— (1.4)	9100	— (25)	— (1.0)
0.8	16000	— (60)	— (2.4)	12000	— (45)	— (1.8)	9900	— (35)	— (1.4)	8000	— (25)	— (1.0)
0.9	14000	— (60)	— (2.4)	11000	— (45)	— (1.8)	8800	— (35)	— (1.4)	7100	— (25)	— (1.0)
1	13000	60 (60)	2.4 (2.4)	9500	45 (45)	1.8 (1.8)	8000	35 (35)	1.4 (1.4)	6400	25 (25)	1.0 (1.0)
1.5	8500	60 (60)	2.4 (2.4)	6400	45 (45)	1.8 (1.8)	5300	35 (35)	1.4 (1.4)	4200	25 (25)	1.0 (1.0)
2	6400	60 (60)	2.4 (2.4)	4800	45 (45)	1.8 (1.8)	4000	35 (35)	1.4 (1.4)	3200	25 (25)	1.0 (1.0)
2.5	5100	60 (60)	2.4 (2.4)	3800	45 (45)	1.8 (1.8)	3200	40 (40)	1.6 (1.6)	2500	25 (25)	1.0 (1.0)
3	4200	65 (60)	2.6 (2.4)	3400	55 (45)	2.2 (1.8)	2600	40 (40)	1.6 (1.6)	2100	25 (25)	1.0 (1.0)
4	3400	80 (60)	3.1 (2.4)	2700	65 (45)	2.6 (1.8)	2100 (1600)	50 (30)	2.0 (1.2)	1700	35 (25)	1.4 (1.0)
5	2900	100 (60)	3.9 (2.4)	2300	80 (45)	3.1 (1.8)	1800 (1350)	60 (30)	2.4 (1.2)	1500	40 (25)	1.6 (1.0)
6	2500	120 (60)	4.7 (2.4)	2000	100 (50)	3.9 (2.0)	1500 (1100)	75 (30)	3.0 (1.2)	1300	50 (25)	2.0 (1.0)
8	1900	130 (60)	5.1 (2.4)	1500	100 (50)	3.9 (2.0)	1200 (900)	80 (30)	3.1 (1.2)	1000	50 (25)	2.0 (1.0)
10	1600	130 (60)	5.1 (2.4)	1300	100 (50)	3.9 (2.0)	950 (710)	75 (30)	3.0 (1.2)	800	50 (25)	2.0 (1.0)
12	1300	120 (60)	4.7 (2.4)	1100	100 (50)	3.9 (2.0)	800 (600)	75 (30)	3.0 (1.2)	670	50 (25)	2.0 (1.0)

Depth of cut





( ) : Indicates standard revolution and feed rate in slotting.

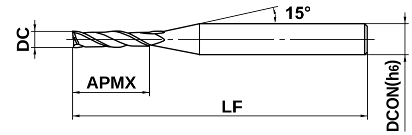
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

MS2LS

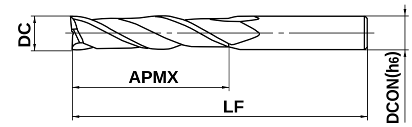
End mill, long cut length, 2 flute

UWC MS 30° DC<3 DC≥3 DC<3 DC≥3

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
◎	◎	○		○	○		



Type 1



Type 2

0.2≤DC≤12				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 2 flute end mill for general use.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2LSD0020	0.2	0.8	40	4	2	★	1
MS2LSD0030	0.3	1.2	40	4	2	★	1
MS2LSD0040	0.4	1.6	40	4	2	★	1
MS2LSD0050	0.5	2	40	4	2	★	1
MS2LSD0060	0.6	2.4	40	4	2	★	1
MS2LSD0070	0.7	2.8	40	4	2	★	1
MS2LSD0080	0.8	3.2	40	4	2	★	1
MS2LSD0090	0.9	3.6	40	4	2	★	1
MS2LSD0100	1	4	40	4	2	★	1
MS2LSD0150	1.5	6	40	4	2	★	1
MS2LSD0200	2	8	40	4	2	★	1
MS2LSD0250	2.5	10	50	4	2	★	1
MS2LSD0300	3	12	50	6	2	★	1
MS2LSD0400	4	16	50	6	2	★	1
MS2LSD0500	5	20	60	6	2	★	1
MS2LSD0600	6	24	60	6	2	★	2
MS2LSD0800	8	32	70	8	2	★	2
MS2LSD1000	10	40	90	10	2	★	2
MS2LSD1200	12	48	110	12	2	★	2

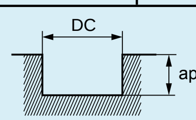
★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)	
0.2	40000	400	15.7	0.001	30000	250	9.8	0.001
0.3	40000	600	23.6	0.005	35000	420	16.5	0.005
0.4	40000	700	27.6	0.007	30000	420	16.5	0.007
0.5	40000	800	31.5	0.01	24000	380	15.0	0.01
0.6	33000	800	31.5	0.015	21000	480	18.9	0.01
0.7	28000	800	31.5	0.015	18000	480	18.9	0.015
0.8	25000	800	31.5	0.02	16000	480	18.9	0.02
0.9	22000	800	31.5	0.03	15000	500	19.7	0.03
1	20000	800	31.5	0.04	13000	500	19.7	0.04
1.5	13000	800	31.5	0.10	9000	500	19.7	0.10
2	10000	800	31.5	0.15	6700	500	19.7	0.15
2.5	9000	800	31.5	0.20	6000	500	19.7	0.20
3	8000	800	31.5	0.20	5200	460	18.1	0.20
4	6000	600	23.6	0.20	4000	340	13.4	0.20
5	4800	480	18.9	0.30	3200	280	11.0	0.20
6	4000	400	15.7	0.30	2600	210	8.3	0.20
8	3000	300	11.8	0.30	2000	170	6.7	0.30
10	2400	240	9.4	0.30	1600	140	5.5	0.30
12	2000	200	7.9	0.30	1300	110	4.3	0.30

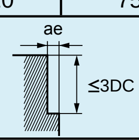
Depth of cut



Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Width of cut ae (mm)	Revolution (min^{-1})	Table feed		Width of cut ae (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)	
3	3500	370	14.6	0.05	2600	250	9.8	0.03
4	2800	370	14.6	0.06	2100	200	7.9	0.03
5	2200	330	13.0	0.06	1700	160	6.3	0.03
6	1800	300	11.8	0.06	1500	140	5.5	0.03
8	1600	270	10.6	0.08	1100	140	5.5	0.04
10	1400	240	9.4	0.10	900	140	5.5	0.05
12	1200	200	7.9	0.10	750	120	4.7	0.06

Depth of cut



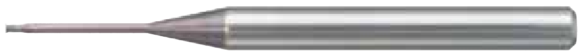
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below of the above value.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

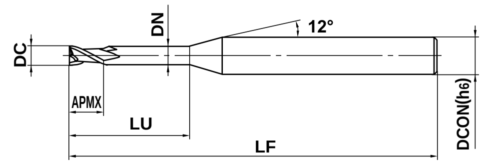
MS2XL

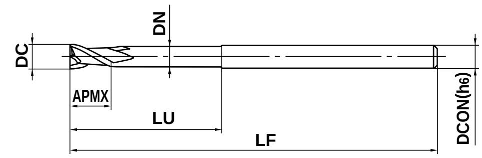
End mill, Short cut length, 2 flute, Long neck

UWC MS 30° DC<0.4 DC≥0.4

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
◎	◎	○		○	○		







	DC<0.5	DC≥0.5		
DC	0 - 0.010	0 - 0.020		
h6	4≤DCON≤6			
	0 - 0.008			

● 2 flute long neck end mill.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XLD0020N005	0.2	0.3	0.5	0.17	45	4	2	★	1
MS2XLD0020N010	0.2	0.3	1	0.17	45	4	2	★	1
MS2XLD0020N015	0.2	0.3	1.5	0.17	45	4	2	★	1
MS2XLD0030N010	0.3	0.4	1	0.27	45	4	2	★	1
MS2XLD0030N020	0.3	0.4	2	0.27	45	4	2	★	1
MS2XLD0030N030	0.3	0.4	3	0.27	45	4	2	★	1
MS2XLD0030N060	0.3	0.4	6	0.27	45	4	2	★	1
MS2XLD0030N090	0.3	0.4	9	0.27	45	4	2	★	1
MS2XLD0040N020	0.4	0.6	2	0.36	45	4	2	★	1
MS2XLD0040N030	0.4	0.6	3	0.36	45	4	2	★	1
MS2XLD0040N040	0.4	0.6	4	0.36	45	4	2	★	1
MS2XLD0040N080	0.4	0.6	8	0.36	45	4	2	★	1
MS2XLD0040N120	0.4	0.6	12	0.36	45	4	2	★	1
MS2XLD0050N020	0.5	0.7	2	0.46	45	4	2	★	1
MS2XLD0050N040	0.5	0.7	4	0.46	45	4	2	●	1
MS2XLD0050N060	0.5	0.7	6	0.46	45	4	2	●	1
MS2XLD0050N080	0.5	0.7	8	0.46	50	4	2	●	1
MS2XLD0050N100	0.5	0.7	10	0.46	50	4	2	●	1
MS2XLD0050N150	0.5	0.7	15	0.46	50	4	2	●	1
MS2XLD0060N020	0.6	0.9	2	0.56	45	4	2	★	1
MS2XLD0060N040	0.6	0.9	4	0.56	45	4	2	★	1
MS2XLD0060N060	0.6	0.9	6	0.56	45	4	2	★	1
MS2XLD0060N080	0.6	0.9	8	0.56	50	4	2	★	1
MS2XLD0060N100	0.6	0.9	10	0.56	50	4	2	★	1
MS2XLD0060N120	0.6	0.9	12	0.56	50	4	2	★	1
MS2XLD0060N180	0.6	0.9	18	0.56	50	4	2	★	1
MS2XLD0070N020	0.7	1	2	0.66	45	4	2	★	1
MS2XLD0070N040	0.7	1	4	0.66	45	4	2	★	1
MS2XLD0070N060	0.7	1	6	0.66	45	4	2	★	1
MS2XLD0070N080	0.7	1	8	0.66	50	4	2	★	1
MS2XLD0070N100	0.7	1	10	0.66	50	4	2	★	1

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XLD0080N040	0.8	1.2	4	0.76	45	4	2	★	1
MS2XL**D0080N060**	0.8	1.2	6	0.76	45	4	2	★	1
MS2XL**D0080N080**	0.8	1.2	8	0.76	50	4	2	★	1
MS2XL**D0080N100**	0.8	1.2	10	0.76	50	4	2	★	1
MS2XL**D0080N120**	0.8	1.2	12	0.76	50	4	2	★	1
MS2XL**D0080N160**	0.8	1.2	16	0.76	50	4	2	★	1
MS2XL**D0080N240**	0.8	1.2	24	0.76	60	4	2	★	1
MS2XL**D0090N060**	0.9	1.4	6	0.86	45	4	2	★	1
MS2XL**D0090N080**	0.9	1.4	8	0.86	50	4	2	★	1
MS2XL**D0090N100**	0.9	1.4	10	0.86	50	4	2	★	1
MS2XL**D0090N150**	0.9	1.4	15	0.86	60	4	2	★	1
MS2XL**D0100N040**	1	1.5	4	0.94	50	4	2	●	1
MS2XL**D0100N060**	1	1.5	6	0.94	50	4	2	●	1
MS2XL**D0100N080**	1	1.5	8	0.94	50	4	2	●	1
MS2XL**D0100N100**	1	1.5	10	0.94	50	4	2	●	1
MS2XL**D0100N120**	1	1.5	12	0.94	50	4	2	●	1
MS2XL**D0100N160**	1	1.5	16	0.94	60	4	2	●	1
MS2XL**D0100N200**	1	1.5	20	0.94	60	4	2	●	1
MS2XL**D0100N250**	1	1.5	25	0.94	70	4	2	★	1
MS2XL**D0100N300**	1	1.5	30	0.94	70	4	2	★	1
MS2XL**D0120N060**	1.2	1.8	6	1.14	50	4	2	★	1
MS2XL**D0120N080**	1.2	1.8	8	1.14	50	4	2	★	1
MS2XL**D0120N100**	1.2	1.8	10	1.14	50	4	2	★	1
MS2XL**D0120N120**	1.2	1.8	12	1.14	50	4	2	★	1
MS2XL**D0120N160**	1.2	1.8	16	1.14	60	4	2	★	1
MS2XL**D0120N200**	1.2	1.8	20	1.14	60	4	2	★	1
MS2XL**D0150N060**	1.5	2.3	6	1.44	50	4	2	★	1
MS2XL**D0150N080**	1.5	2.3	8	1.44	50	4	2	★	1
MS2XL**D0150N100**	1.5	2.3	10	1.44	50	4	2	★	1
MS2XL**D0150N120**	1.5	2.3	12	1.44	50	4	2	★	1
MS2XL**D0150N140**	1.5	2.3	14	1.44	60	4	2	★	1
MS2XL**D0150N160**	1.5	2.3	16	1.44	60	4	2	★	1
MS2XL**D0150N180**	1.5	2.3	18	1.44	60	4	2	★	1
MS2XL**D0150N200**	1.5	2.3	20	1.44	60	4	2	★	1
MS2XL**D0150N250**	1.5	2.3	25	1.44	70	4	2	★	1
MS2XL**D0150N300**	1.5	2.3	30	1.44	70	4	2	★	1
MS2XL**D0150N380**	1.5	2.3	38	1.44	80	4	2	★	1
MS2XL**D0150N450**	1.5	2.3	45	1.44	80	4	2	★	1
MS2XL**D0200N060**	2	3	6	1.9	50	4	2	★	1
MS2XL**D0200N080**	2	3	8	1.9	50	4	2	★	1
MS2XL**D0200N100**	2	3	10	1.9	50	4	2	●	1
MS2XL**D0200N120**	2	3	12	1.9	50	4	2	★	1
MS2XL**D0200N140**	2	3	14	1.9	60	4	2	●	1
MS2XL**D0200N160**	2	3	16	1.9	60	4	2	●	1
MS2XL**D0200N180**	2	3	18	1.9	60	4	2	★	1
MS2XL**D0200N200**	2	3	20	1.9	60	4	2	●	1
MS2XL**D0200N250**	2	3	25	1.9	70	4	2	●	1
MS2XL**D0200N300**	2	3	30	1.9	70	4	2	●	1
MS2XL**D0200N350**	2	3	35	1.9	80	4	2	★	1
MS2XL**D0200N400**	2	3	40	1.9	90	4	2	★	1
MS2XL**D0200N500**	2	3	50	1.9	100	4	2	★	1

MS2XL

End mill, Short cut length, 2 flute, Long neck

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XLD0200N600	2	3	60	1.9	110	4	2	★	1
MS2XLD0250N080	2.5	3.7	8	2.4	50	4	2	★	1
MS2XLD0250N120	2.5	3.7	12	2.4	50	4	2	●	1
MS2XLD0250N160	2.5	3.7	16	2.4	60	4	2	●	1
MS2XLD0250N200	2.5	3.7	20	2.4	60	4	2	●	1
MS2XLD0250N250	2.5	3.7	25	2.4	70	4	2	●	1
MS2XLD0250N300	2.5	3.7	30	2.4	70	4	2	●	1
MS2XLD0250N400	2.5	3.7	40	2.4	90	4	2	★	1
MS2XLD0250N500	2.5	3.7	50	2.4	100	4	2	★	1
MS2XLD0300N080	3	4.5	8	2.8	50	6	2	★	1
MS2XLD0300N120	3	4.5	12	2.8	50	6	2	★	1
MS2XLD0300N160	3	4.5	16	2.8	60	6	2	●	1
MS2XLD0300N200	3	4.5	20	2.8	60	6	2	●	1
MS2XLD0300N250	3	4.5	25	2.8	70	6	2	●	1
MS2XLD0300N300	3	4.5	30	2.8	70	6	2	●	1
MS2XLD0300N400	3	4.5	40	2.8	90	6	2	●	1
MS2XLD0300N500	3	4.5	50	2.8	100	6	2	★	1
MS2XLD0400N120	4	6	12	3.8	50	6	2	★	1
MS2XLD0400N160	4	6	16	3.8	60	6	2	★	1
MS2XLD0400N200	4	6	20	3.8	60	6	2	★	1
MS2XLD0400N250	4	6	25	3.8	70	6	2	★	1
MS2XLD0400N300	4	6	30	3.8	70	6	2	★	1
MS2XLD0400N350	4	6	35	3.8	80	6	2	★	1
MS2XLD0400N400	4	6	40	3.8	90	6	2	★	1
MS2XLD0400N450	4	6	45	3.8	90	6	2	★	1
MS2XLD0400N500	4	6	50	3.8	100	6	2	★	1
MS2XLD0400N600	4	6	60	3.8	110	6	2	★	1
MS2XLD0500N160	5	7.5	16	4.8	60	6	2	●	1
MS2XLD0500N250	5	7.5	25	4.8	70	6	2	●	1
MS2XLD0500N350	5	7.5	35	4.8	80	6	2	●	1
MS2XLD0500N500	5	7.5	50	4.8	110	6	2	●	1
MS2XLD0500N600	5	7.5	60	4.8	120	6	2	★	1
MS2XLD0600N200	6	9	20	5.8	80	6	2	★	2
MS2XLD0600N300	6	9	30	5.8	90	6	2	★	2
MS2XLD0600N400	6	9	40	5.8	100	6	2	★	2
MS2XLD0600N500	6	9	50	5.8	110	6	2	★	2
MS2XLD0600N600	6	9	60	5.8	120	6	2	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.			
DC (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
0.2	0.5	40000	600	23.6	0.004
	1	40000	400	15.7	0.001
0.3	1	40000	650	25.6	0.007
	3	40000	500	19.7	0.002
	9	22000	150	5.9	0.001
0.4	2	40000	800	31.5	0.007
	4	40000	800	31.5	0.003
	12	17000	150	5.9	0.001
0.5	2	40000	950	37.4	0.01
	6	40000	700	27.6	0.003
	10	25000	400	15.7	0.002
	15	14000	150	5.9	0.001
0.6	2	40000	950	37.4	0.01
	6	40000	800	31.5	0.005
	10	25000	450	17.7	0.003
	18	12000	150	5.9	0.001
0.7	2	40000	1000	39.4	0.02
	6	40000	900	35.4	0.01
	8	30000	700	27.6	0.005
	10	11000	300	11.8	0.005
0.8	4	40000	1200	47.2	0.02
	8	40000	1000	39.4	0.01
	12	25000	400	15.7	0.003
	24	10000	150	5.9	0.001
0.9	6	40000	1300	51.2	0.02
	10	35000	1000	39.4	0.01
	15	9000	400	15.7	0.003
1	6	40000	1600	63.0	0.04
	8	40000	1600	63.0	0.03
	12	30000	1000	39.4	0.02
	20	15000	400	15.7	0.005
	30	8000	150	5.9	0.001
1.2	6	40000	1900	74.8	0.06
	8	40000	1900	74.8	0.04
	12	25000	1000	39.4	0.03
	20	6500	150	5.9	0.01

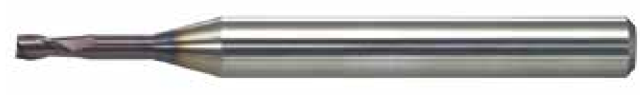
Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.			
DC (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
1.5	6	40000	2400	94.5	0.10
	10	30000	1800	70.9	0.05
	20	15000	600	23.6	0.02
	30	7500	300	11.8	0.005
	45	5000	150	5.9	0.001
1.6	6	40000	2400	94.5	0.12
	10	30000	1800	70.9	0.07
	16	20000	1000	39.4	0.04
2	6	40000	2400	94.5	0.18
	10	30000	1800	70.9	0.10
	16	20000	1000	39.4	0.06
	30	8000	500	19.7	0.04
	40	6000	250	9.8	0.01
	60	4200	150	5.9	0.003
2.5	8	25000	2500	98.4	0.20
	16	18000	1700	66.9	0.10
	20	12000	1000	39.4	0.08
	40	8000	400	15.7	0.03
	50	4000	150	5.9	0.015
3	8	20000	2000	78.7	0.30
	16	15000	1400	55.1	0.15
	20	10000	800	31.5	0.10
	40	5000	250	9.8	0.02
	50	3700	150	5.9	0.01
4	12	15000	3000	118.1	0.30
	20	11000	2200	86.6	0.22
	30	6400	1200	47.2	0.12
	40	4500	400	15.7	0.05
	50	2800	150	5.9	0.018
	60	1800	60	2.6	0.005
5	16	12000	2500	98.4	0.35
	35	5100	750	29.5	0.15
	60	2200	150	5.9	0.02
6	20	10000	2000	78.7	0.40
	40	4200	800	31.5	0.20
	60	1900	150	5.9	0.10

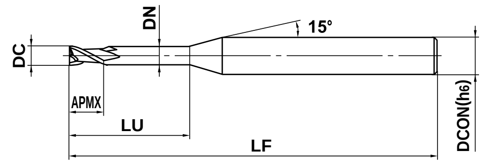
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

MS2XL6

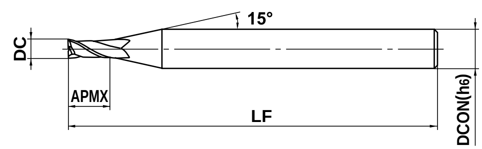
End mill, Short cut length, 2 flute, 6mm shank

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
◎	◎	○		○	○		





Type 1



Type 2

0.3≤DC≤2.5				
0 - 0.020				
DCON=6				
0 - 0.008				

- 2 flute long neck end mill.
- ϕ6 shank type.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XL6D0030N008	0.3	0.8	—	—	50	6	2	●	2
MS2XL6**D0030N015**	0.3	0.5	1.5	0.27	50	6	2	●	1
MS2XL6**D0040N010**	0.4	0.6	1	0.36	50	6	2	●	1
MS2XL6**D0040N020**	0.4	0.6	2	0.36	50	6	2	●	1
MS2XL6**D0050N013**	0.5	0.8	1.3	0.46	50	6	2	●	1
MS2XL6**D0050N025**	0.5	0.8	2.5	0.46	50	6	2	●	1
MS2XL6**D0060N015**	0.6	0.9	1.5	0.56	50	6	2	●	1
MS2XL6**D0060N030**	0.6	0.9	3	0.56	50	6	2	●	1
MS2XL6**D0070N018**	0.7	1.1	1.8	0.66	50	6	2	●	1
MS2XL6**D0070N035**	0.7	1.1	3.5	0.66	50	6	2	●	1
MS2XL6**D0080N020**	0.8	1.2	2	0.76	50	6	2	●	1
MS2XL6**D0080N040**	0.8	1.2	4	0.76	50	6	2	●	1
MS2XL6**D0090N023**	0.9	1.4	2.3	0.86	50	6	2	●	1
MS2XL6**D0090N045**	0.9	1.4	4.5	0.86	50	6	2	●	1
MS2XL6**D0100N025**	1	1.5	2.5	0.94	50	6	2	●	1
MS2XL6**D0100N050**	1	1.5	5	0.94	50	6	2	●	1
MS2XL6**D0110N028**	1.1	1.7	2.8	1.04	50	6	2	●	1
MS2XL6**D0110N055**	1.1	1.7	5.5	1.04	50	6	2	●	1
MS2XL6**D0120N030**	1.2	1.8	3	1.14	50	6	2	●	1
MS2XL6**D0120N060**	1.2	1.8	6	1.14	50	6	2	●	1
MS2XL6**D0130N033**	1.3	2	3.3	1.24	50	6	2	●	1
MS2XL6**D0130N065**	1.3	2	6.5	1.24	50	6	2	●	1
MS2XL6**D0140N035**	1.4	2.1	3.5	1.34	50	6	2	●	1
MS2XL6**D0140N070**	1.4	2.1	7	1.34	50	6	2	●	1
MS2XL6**D0150N038**	1.5	2.3	3.8	1.44	50	6	2	●	1
MS2XL6**D0150N075**	1.5	2.3	7.5	1.44	50	6	2	●	1
MS2XL6**D0160N040**	1.6	2.4	4	1.54	50	6	2	●	1
MS2XL6**D0160N080**	1.6	2.4	8	1.54	50	6	2	●	1
MS2XL6**D0170N043**	1.7	2.6	4.3	1.64	50	6	2	●	1
MS2XL6**D0170N085**	1.7	2.6	8.5	1.64	50	6	2	●	1
MS2XL6**D0180N045**	1.8	2.7	4.5	1.74	50	6	2	●	1

● : Inventory maintained.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XL6D0180N090	1.8	2.7	9	1.74	50	6	2	●	1
MS2XL6**D0190N048**	1.9	2.9	4.8	1.84	50	6	2	●	1
MS2XL6**D0190N095**	1.9	2.9	9.5	1.84	50	6	2	●	1
MS2XL6**D0200N050**	2	3	5	1.90	50	6	2	●	1
MS2XL6**D0200N100**	2	3	10	1.90	50	6	2	●	1
MS2XL6**D0210N053**	2.1	3.2	5.3	2.00	50	6	2	●	1
MS2XL6**D0210N105**	2.1	3.2	10.5	2.00	60	6	2	●	1
MS2XL6**D0220N055**	2.2	3.3	5.5	2.10	50	6	2	●	1
MS2XL6**D0220N110**	2.2	3.3	11	2.10	60	6	2	●	1
MS2XL6**D0230N058**	2.3	3.5	5.8	2.20	50	6	2	●	1
MS2XL6**D0230N115**	2.3	3.5	11.5	2.20	60	6	2	●	1
MS2XL6**D0240N060**	2.4	3.6	6	2.30	50	6	2	●	1
MS2XL6**D0240N120**	2.4	3.6	12	2.30	60	6	2	●	1
MS2XL6**D0250N063**	2.5	3.8	6.3	2.40	50	6	2	●	1
MS2XL6**D0250N125**	2.5	3.8	12.5	2.40	60	6	2	●	1

MS2XL6

End mill, Short cut length, 2 flute, 6mm shank

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material		Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			
DC (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut per pass (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut per pass (mm)
0.3	0.8	40000	500—1000	19.7—39.4	0.01	30000	300—800	11.8—31.5	0.01
	1.5				0.007				0.007
0.4	1	40000	500—1000	19.7—39.4	0.015	30000	300—800	11.8—31.5	0.015
	2				0.01				0.01
0.5	1.3	40000	500—1000	19.7—39.4	0.02	30000	300—800	11.8—31.5	0.02
	2.5				0.013				0.013
0.6	1.5	33000	500—1000	19.7—39.4	0.03	25000	300—800	11.8—31.5	0.03
	3				0.018				0.018
0.7	1.8	29000	500—1000	19.7—39.4	0.04	22000	300—800	11.8—31.5	0.04
	3.5				0.025				0.025
0.8	2	25000	500—1000	19.7—39.4	0.06	20000	300—800	11.8—31.5	0.06
	4				0.03				0.03
0.9	2.3	22000	500—1000	19.7—39.4	0.08	18000	300—800	11.8—31.5	0.08
	4.5				0.05				0.05
1	2.5	20000	500—1000	19.7—39.4	0.1	16000	300—800	11.8—31.5	0.1
	5				0.07				0.07
1.1	2.8	18000	500—1000	19.7—39.4	0.12	14000	300—800	11.8—31.5	0.12
	5.5				0.08				0.08
1.2	3	16000	500—1000	19.7—39.4	0.12	13000	300—800	11.8—31.5	0.12
	6				0.08				0.08
1.3	3.3	15000	500—1000	19.7—39.4	0.12	12000	300—800	11.8—31.5	0.12
	6.5				0.08				0.08
1.4	3.5	14000	500—1000	19.7—39.4	0.12	11000	300—800	11.8—31.5	0.12
	7				0.08				0.08
1.5	3.8	13000	500—1000	19.7—39.4	0.15	10000	300—800	11.8—31.5	0.15
	7.5				0.1				0.1
1.6	4	12000	500—1000	19.7—39.4	0.15	10000	300—800	11.8—31.5	0.15
	8				0.1				0.1
1.7	4.3	12000	500—1000	19.7—39.4	0.17	9500	300—800	11.8—31.5	0.17
	8.5				0.12				0.12
1.8	4.5	11000	500—1000	19.7—39.4	0.17	9000	300—800	11.8—31.5	0.17
	9				0.12				0.12
1.9	4.8	10000	500—1000	19.7—39.4	0.17	9000	300—800	11.8—31.5	0.17
	9.5				0.12				0.12
2	5	10000	500—1000	19.7—39.4	0.2	9000	300—800	11.8—31.5	0.2
	10				0.15				0.15
2.1	5.3	9800	500—1000	19.7—39.4	0.2	9000	300—800	11.8—31.5	0.2
	10.5				0.15				0.15
2.2	5.5	9600	500—1000	19.7—39.4	0.2	9000	300—800	11.8—31.5	0.2
	11				0.15				0.15
2.3	5.8	9400	500—1000	19.7—39.4	0.2	8800	300—800	11.8—31.5	0.2
	11.5				0.15				0.15
2.4	6	9200	500—1000	19.7—39.4	0.25	8700	300—800	11.8—31.5	0.25
	12				0.2				0.2
2.5	6.3	9000	500—1000	19.7—39.4	0.25	8500	300—800	11.8—31.5	0.25
	12.5				0.2				0.2

1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

SOLID END MILLS

MS2XL – Inch sizes

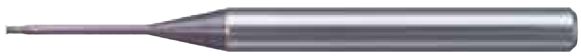
Square, 2 flute, Long neck

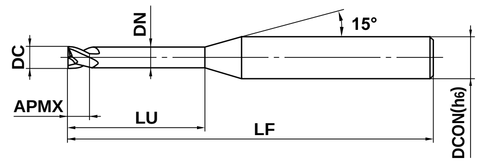
UWC MS 30°

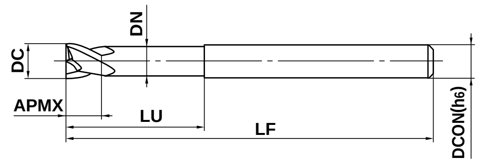
DC＜1/8 DC≥1/8

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
◎	◎	○		○	○		

CARBIDE







0 - .0008"				
DCON=.1250"	DCON=.1875"	DCON=.2500"		
0 - .00024"	0 - .00031"	0 - .00035"		

h6

● 2 flute, long neck, square end mill for general purpose.

Unit : inch

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XLD1/64N0094	.0156	.0156	.0938	.0144	2.0	.1250	2	●	1
MS2XLD1/64N0125	.0156	.0156	.1250	.0144	2.0	.1250	2	●	1
MS2XLD1/64N0187	.0156	.0156	.1875	.0144	2.0	.1250	2	●	1
MS2XLD1/32N0187	.0313	.0313	.1875	.0301	2.0	.1250	2	●	1
MS2XLD1/32N0250	.0313	.0313	.2500	.0301	2.0	.1250	2	●	1
MS2XLD1/32N0375	.0313	.0313	.3750	.0301	2.0	.1250	2	●	1
MS2XLD1/16N0375	.0625	.0625	.3750	.0601	2.0	.1250	2	●	1
MS2XLD1/16N0500	.0625	.0625	.5000	.0601	2.0	.1250	2	●	1
MS2XLD1/16N0750	.0625	.0625	.7500	.0601	2.0	.1250	2	●	1
MS2XLD3/32N0562	.0938	.0938	.5625	.0898	2.0	.1250	2	●	1
MS2XLD3/32N0750	.0938	.0938	.7500	.0898	2.0	.1250	2	●	1
MS2XLD3/32N1125	.0938	.0938	1.1250	.0898	2.5	.1250	2	●	1
MS2XLD1/8N0750	.1250	.1250	.7500	.1211	2.0	.1250	2	●	2
MS2XLD3/16N1125	.1875	.1875	1.1250	.1836	2.5	.1875	2	●	2
MS2XLD1/4N1500	.2500	.2500	1.5000	.2441	3.0	.2500	2	●	2

● : Inventory maintained.

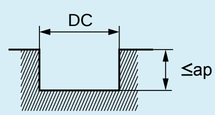
MS2XL – Inch sizes

Square, 2 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.		
DC (inch)	**LU** (inch)	Revolution (min^{-1})	Table feed (IPM)	Depth of cut ap (inch)
.0156	.0938	40000	17.0	.0002
	.1250	30000	10.6	.0002
	.1875	20000	5.6	.0001
.0313	.1875	40000	56.7	.0008
	.2500	25000	26.6	.0008
	.3750	15000	10.6	.0004
.0625	.3750	40000	90.7	.0028
	.5000	30000	51.0	.0016
	.7500	10000	10.6	.0008
.0938	.5625	33000	81.8	.003
	.7500	20000	42.5	.002
	1.1250	10000	14.1	.001
.1250	.7500	25000	72.4	.004
.1875	1.1250	17000	54.2	.006
.2500	1.5000	13000	55.3	.008

Depth of cut

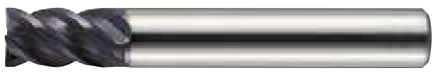


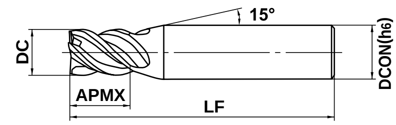
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

MSSHD

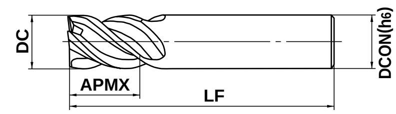
High power, Short cut length, 4 flute

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
◎	◎	○		◎	◎		

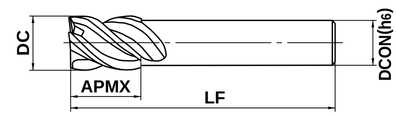




Type 1



Type 2



Type 3

	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 4 flute high power end mill.

Unit : mm

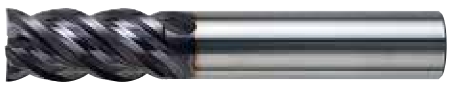
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MSSHDD0300	3	4.5	45	6	4	★	1
MSSHDD0350	3.5	5.3	45	6	4	★	1
MSSHDD0400	4	6	45	6	4	★	1
MSSHDD0450	4.5	6.8	45	6	4	★	1
MSSHDD0500	5	7.5	50	6	4	★	1
MSSHDD0550	5.5	8.3	50	6	4	★	1
MSSHDD0600	6	9	50	6	4	★	2
MSSHDD0650	6.5	9.8	60	8	4	★	1
MSSHDD0700	7	10.5	60	8	4	★	1
MSSHDD0750	7.5	11.3	60	8	4	★	1
MSSHDD0800	8	12	60	8	4	★	2
MSSHDD0850	8.5	12.8	70	10	4	★	1
MSSHDD0900	9	13.5	70	10	4	★	1
MSSHDD0950	9.5	14.3	70	10	4	★	1
MSSHDD1000	10	15	70	10	4	★	2
MSSHDD1100	11	16.5	75	12	4	★	1
MSSHDD1200	12	18	75	12	4	★	2
MSSHDD1300	13	19.5	75	12	4	★	3
MSSHDD1400	14	21	90	16	4	★	1
MSSHDD1500	15	22.5	90	16	4	★	1
MSSHDD1600	16	24	90	16	4	★	2
MSSHDD1700	17	25.5	100	16	4	★	3
MSSHDD1800	18	27	100	16	4	★	3
MSSHDD1900	19	28.5	110	20	4	★	1
MSSHDD2000	20	30	110	20	4	★	2

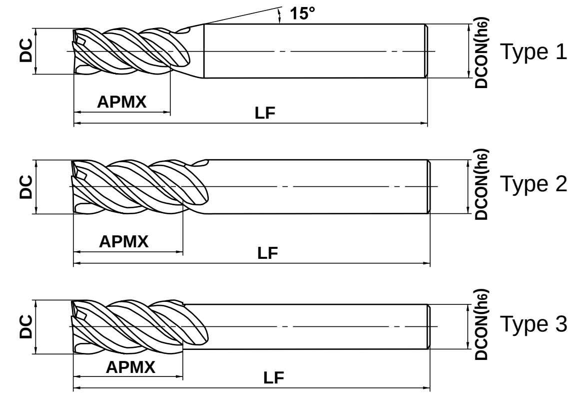
★ : Inventory maintained in Japan.

MSMHD

High power, Medium cut length, 4 flute

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
◎	◎	○		◎	◎		





	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- 4 flute high power end mill.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MSMHDD0200	2	4	45	4	4	★	1
MSMHDD0210	2.1	5	45	4	4	★	1
MSMHDD0220	2.2	5	45	4	4	★	1
MSMHDD0230	2.3	5	45	4	4	★	1
MSMHDD0240	2.4	5	45	4	4	★	1
MSMHDD0250	2.5	5	45	4	4	★	1
MSMHDD0260	2.6	6	45	4	4	★	1
MSMHDD0270	2.7	6	45	4	4	★	1
MSMHDD0280	2.8	6	45	4	4	★	1
MSMHDD0290	2.9	6	45	4	4	★	1
MSMHDD0300	3	8	45	6	4	★	1
MSMHDD0310	3.1	8	45	6	4	★	1
MSMHDD0320	3.2	8	45	6	4	★	1
MSMHDD0330	3.3	8	45	6	4	★	1
MSMHDD0340	3.4	8	45	6	4	★	1
MSMHDD0350	3.5	8	45	6	4	★	1
MSMHDD0360	3.6	11	45	6	4	★	1
MSMHDD0370	3.7	11	45	6	4	★	1
MSMHDD0380	3.8	11	45	6	4	★	1
MSMHDD0390	3.9	11	45	6	4	★	1
MSMHDD0400	4	11	45	6	4	★	1
MSMHDD0410	4.1	12	45	6	4	★	1
MSMHDD0420	4.2	12	45	6	4	★	1
MSMHDD0430	4.3	12	45	6	4	★	1
MSMHDD0440	4.4	12	45	6	4	★	1
MSMHDD0450	4.5	12	45	6	4	★	1
MSMHDD0460	4.6	13	50	6	4	★	1
MSMHDD0470	4.7	13	50	6	4	★	1
MSMHDD0480	4.8	13	50	6	4	★	1
MSMHDD0490	4.9	13	50	6	4	★	1
MSMHDD0500	5	13	50	6	4	★	1

★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MSMHDD0510	5.1	13	50	6	4	★	1
MSMHDD0520	5.2	13	50	6	4	★	1
MSMHDD0530	5.3	13	50	6	4	★	1
MSMHDD0540	5.4	13	50	6	4	★	1
MSMHDD0550	5.5	13	50	6	4	★	1
MSMHDD0560	5.6	13	50	6	4	★	1
MSMHDD0570	5.7	13	50	6	4	★	1
MSMHDD0580	5.8	13	50	6	4	★	1
MSMHDD0590	5.9	13	50	6	4	★	1
MSMHDD0600	6	13	50	6	4	★	2
MSMHDD0650	6.5	16	60	8	4	★	1
MSMHDD0700	7	19	60	8	4	★	1
MSMHDD0750	7.5	19	60	8	4	★	1
MSMHDD0800	8	19	60	8	4	★	2
MSMHDD0850	8.5	19	70	10	4	★	1
MSMHDD0900	9	22	70	10	4	★	1
MSMHDD0950	9.5	22	70	10	4	★	1
MSMHDD1000	10	22	70	10	4	★	2
MSMHDD1100	11	26	75	12	4	★	1
MSMHDD1200S10	12	26	75	10	4	★	3
MSMHDD1200	12	26	75	12	4	★	2
MSMHDD1300	13	26	75	12	4	★	3
MSMHDD1400	14	30	90	16	4	★	1
MSMHDD1500	15	35	90	16	4	★	1
MSMHDD1600	16	35	90	16	4	★	2
MSMHDD1700	17	35	100	16	4	★	3
MSMHDD1800	18	40	100	16	4	★	3
MSMHDD1900	19	40	110	20	4	★	1
MSMHDD2000	20	45	110	20	4	★	2
MSMHDD2200	22	50	125	20	4	★	3
MSMHDD2500	25	55	125	25	4	★	2

MSSHD
High power, Short cut length, 4 flute

MSMHD
High power, Medium cut length, 4 flute

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Shoulder Milling

Work material	Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45—55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	15000	550	21.7	10000	340	13.4	10000	320	12.6	6400	160	6.3	4800	100	3.9
3	11000	800	31.5	7400	500	19.7	7400	480	18.9	4800	250	9.8	4000	170	6.7
4	8000	900	35.4	5600	540	21.3	5600	520	20.5	3600	270	10.6	3200	240	9.4
5	6400	1000	39.4	4500	600	23.6	4500	580	22.8	2900	300	11.8	2600	240	9.4
6	5800	1100	43.3	3700	640	25.2	3700	600	23.6	2400	320	12.6	2100	230	9.1
8	4400	1100	43.3	2800	660	26.0	2800	600	23.6	1800	330	13.0	1600	220	8.7
10	3500	1000	39.4	2200	640	25.2	2200	560	22.0	1400	320	12.6	1300	200	7.9
12	2900	1000	39.4	1900	640	25.2	1900	530	20.9	1200	320	12.6	1100	170	6.7
16	2200	800	31.5	1400	500	19.7	1400	450	17.7	900	250	9.8	800	130	5.1
20	1800	750	29.5	1100	460	18.1	1100	440	17.3	720	230	9.1	640	100	3.9
25	1400	600	23.6	900	400	15.7	900	380	15.0	570	200	7.9	510	80	3.1
Depth of cut	0.2DC, 1.5DC						0.1DC, 1.5DC			0.05DC, 1.5DC					

Slotting

Work material	Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45—55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	12000	400	15.7	7000	200	7.9	7000	100	3.9	4200	80	3.1	2300	40	1.6
3	9000	600	23.6	5300	300	11.8	5300	150	5.9	3200	130	5.1	1900	70	2.8
4	7200	720	28.3	4000	360	14.2	4000	180	7.1	2400	140	5.5	1400	95	3.7
5	5800	720	28.3	3200	360	14.2	3200	180	7.1	1900	150	5.9	1100	95	3.7
6	5000	800	31.5	2700	400	15.7	2700	200	7.9	1600	160	6.3	950	95	3.7
8	3700	800	31.5	2000	400	15.7	2000	200	7.9	1200	170	6.7	720	90	3.5
10	3000	720	28.3	1600	360	14.2	1600	180	7.1	960	160	6.3	570	80	3.1
12	2500	720	28.3	1300	360	14.2	1300	180	7.1	800	160	6.3	480	70	2.8
16	2000	600	23.6	1000	280	11.0	1000	150	5.9	600	130	5.1	360	50	2.0
20	1600	540	21.3	800	250	9.8	800	130	5.1	480	120	4.7	290	40	1.6
25	1300	480	18.9	640	220	8.7	640	120	4.7	380	100	3.9	230	35	1.4
Depth of cut	DC, 1DC (MAX.12mm)						DC, 0.5DC			DC, 0.2DC					

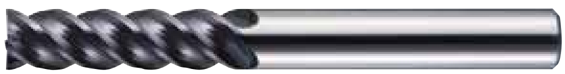
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

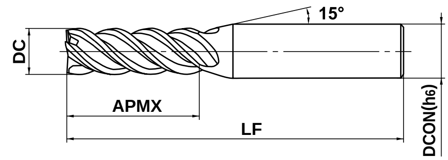
SOLID END MILLS

MSJHD

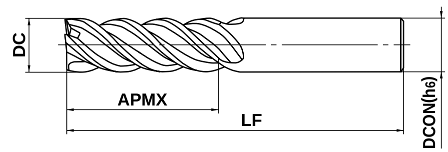
High power, Semi long cut length, 4 flute

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
◎	◎	○		◎	◎		





Type 1



Type 2

DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- 4 flute high power end mill.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MSJHDD0200	2	8	60	6	4	★	1
MSJHD**D0250**	2.5	10	60	6	4	★	1
MSJHD**D0300**	3	12	60	6	4	★	1
MSJHD**D0350**	3.5	14	60	6	4	★	1
MSJHD**D0400**	4	16	60	6	4	★	1
MSJHD**D0450**	4.5	18	60	6	4	★	1
MSJHD**D0500**	5	20	60	6	4	★	1
MSJHD**D0600**	6	24	60	6	4	★	2
MSJHD**D0700**	7	25	80	8	4	★	1
MSJHD**D0800**	8	28	80	8	4	★	2
MSJHD**D0900**	9	32	90	10	4	★	1
MSJHD**D1000**	10	35	90	10	4	★	2
MSJHD**D1100**	11	35	100	12	4	★	1
MSJHD**D1200**	12	36	100	12	4	★	2
MSJHD**D1400**	14	42	110	16	4	★	1
MSJHD**D1500**	15	45	110	16	4	★	1
MSJHD**D1600**	16	48	125	16	4	★	2
MSJHD**D2000**	20	55	140	20	4	★	2

★ : Inventory maintained in Japan.

MSJHD

High power, Semi long cut length, 4 flute

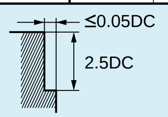
CARBIDE

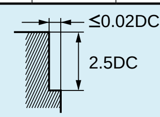
RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	11000	370	14.6	7000	230	9.1	7000	210	8.3	5000	100	3.9	3800	55	2.2
3	8000	550	21.7	5100	320	12.6	5100	300	11.8	3800	190	7.5	2500	80	3.1
4	6200	620	24.4	4000	350	13.8	4000	340	13.4	3000	210	8.3	1900	110	4.3
5	5000	670	26.4	3200	370	14.6	3200	360	14.2	2400	220	8.7	1500	110	4.3
6	4200	750	29.5	2600	400	15.7	2600	390	15.4	2000	220	8.7	1300	110	4.3
8	3200	780	30.7	2000	420	16.5	2000	400	15.7	1500	230	9.1	960	100	3.9
10	2500	690	27.2	1600	410	16.1	1600	380	15.0	1200	210	8.3	760	100	3.9
12	2100	670	26.4	1300	380	15.0	1300	340	13.4	1000	190	7.5	640	80	3.1
16	1600	570	22.4	1000	320	12.6	1000	280	11.0	750	170	6.7	480	65	2.6
20	1200	470	18.5	800	290	11.4	800	260	10.2	600	150	5.9	380	50	2.0

Depth of cut





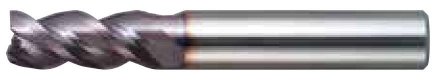
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

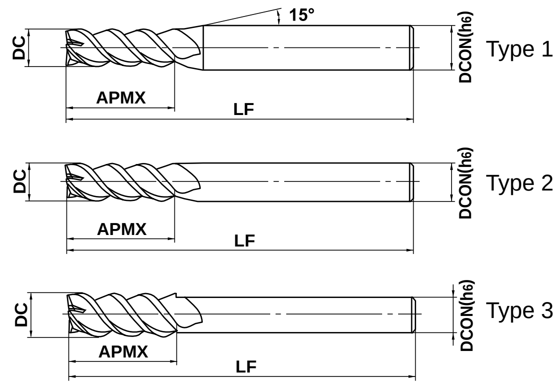
SOLID END MILLS

MSMHZD

End mill, Medium cut length, 3 flute for drilling and slotting

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
◎	◎	○		◎	○		





DC≤12	DC>12			
0 - 0.020	0 - 0.030			
4≤DCON≤6	8≤CON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 3 flute end mill for both drilling and slotting.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MSMHZDD0100	1	2	45	4	3	★	1
MSMHZD**D0150**	1.5	3	45	4	3	★	1
MSMHZD**D0200**	2	4	50	6	3	●	1
MSMHZD**D0250**	2.5	5	50	6	3	●	1
MSMHZD**D0300**	3	6	50	6	3	●	1
MSMHZD**D0350**	3.5	8	50	6	3	●	1
MSMHZD**D0400**	4	8	50	6	3	●	1
MSMHZD**D0450**	4.5	10	50	6	3	●	1
MSMHZD**D0500**	5	10	50	6	3	●	1
MSMHZD**D0550**	5.5	13	50	6	3	●	1
MSMHZD**D0600**	6	13	60	6	3	●	2
MSMHZD**D0650**	6.5	16	60	8	3	●	1
MSMHZD**D0700**	7	16	60	8	3	●	1
MSMHZD**D0750**	7.5	16	60	8	3	●	1
MSMHZD**D0800**	8	19	70	8	3	●	2
MSMHZD**D0850**	8.5	19	70	10	3	●	1
MSMHZD**D0900**	9	19	70	10	3	●	1
MSMHZD**D0950**	9.5	19	70	10	3	●	1
MSMHZD**D1000**	10	22	80	10	3	●	2
MSMHZD**D1100**	11	22	80	12	3	●	1
MSMHZD**D1200**	12	26	90	12	3	●	2
MSMHZD**D1300**	13	26	90	12	3	●	3
MSMHZD**D1400**	14	26	90	12	3	●	3
MSMHZD**D1500**	15	26	110	16	3	●	1
MSMHZD**D1600**	16	30	110	16	3	●	2
MSMHZD**D2000**	20	32	140	20	3	●	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

MSMHZD

End mill, Medium cut length, 3 flute for drilling and slotting

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)
1	19000	600	23.6	13000	310	12.2	10000	200	7.9	9500	65	2.6
1.5	14000	600	23.6	9000	310	12.2	7500	210	8.3	6400	75	3.0
2	11000	600	23.6	7200	310	12.2	6000	210	8.3	4800	75	3.0
3	8500	770	30.3	5300	380	15.0	4400	220	8.7	3200	100	3.9
4	7200	850	33.5	4400	480	18.9	3700	250	9.8	2400	130	5.1
6	5300	940	37.0	3200	490	19.3	2700	270	10.6	1600	130	5.1
8	4000	1010	39.8	2400	560	22.0	2000	280	11.0	1200	120	4.7
10	3200	1000	39.4	1900	480	18.9	1600	300	11.8	950	110	4.3
12	2700	950	37.4	1600	440	17.3	1300	300	11.8	800	90	3.5
16	2000	720	28.3	1200	350	13.8	1000	260	10.2	600	70	2.8
20	1600	600	23.6	1000	290	11.4	800	240	9.4	480	60	2.4
Depth of cut	≤0.2DC (DC>ϕ3) ≤0.1DC (DC≤ϕ3) ≤1.5DC			≤0.2DC (DC>ϕ3) ≤0.1DC (DC≤ϕ3) ≤1.5DC						0.05DC 1.5DC		

Drilling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)
1	13000	80	3.1	10000	50	2.0	6000	10	0.4
1.5	12000	120	4.7	8000	80	3.1	6000	20	0.8
2	11000	200	7.9	7200	140	5.5	6000	30	1.2
3	8500	250	9.8	5300	180	7.1	4200	50	2.0
4	7200	300	11.8	4400	210	8.3	3300	60	2.4
6	5300	300	11.8	3200	210	8.3	2200	70	2.8
8	4000	320	12.6	2400	220	8.7	1600	80	3.1
10	3200	340	13.4	1900	240	9.4	1300	70	2.8
12	2700	320	12.6	1600	220	8.7	1100	70	2.8
16	2000	250	9.8	1200	180	7.1	800	55	2.2
20	1600	200	7.9	1000	140	5.5	640	55	2.2
Depth of cut	≤1DC (DC≥ϕ2) ≤0.5DC (DC<ϕ2)						≤0.5DC (DC≥ϕ2) ≤0.2DC (DC<ϕ2)		

Slotting

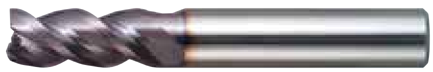
Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)
1	13000	130	5.1	10000	80	3.1	6000	30	1.2	5700	25	1.0
1.5	12000	250	9.8	8000	150	5.9	6000	60	2.4	3800	30	1.2
2	11000	500	19.7	7200	260	10.2	6000	130	5.1	2800	35	1.4
3	8500	640	25.2	5300	320	12.6	4200	130	5.1	1900	50	2.0
4	7200	650	25.6	4400	370	14.6	3300	140	5.5	1400	70	2.8
6	5300	720	28.3	3200	380	15.0	2200	140	5.5	950	70	2.8
8	4000	780	30.7	2400	430	16.9	1600	140	5.5	720	60	2.4
10	3200	770	30.3	1900	370	14.6	1300	150	5.9	570	50	2.0
12	2700	730	28.7	1600	340	13.4	1100	150	5.9	480	40	1.6
16	2000	600	23.6	1200	290	11.4	800	130	5.1	360	30	1.2
20	1600	500	19.7	1000	240	9.4	640	120	4.7	290	25	1.0
Depth of cut	DC ≤1DC (DC≥ϕ2) ≤0.5DC (DC<ϕ2)				DC ≤0.5DC (DC≥ϕ2) ≤0.2DC (DC<ϕ2)					DC 0.2DC		

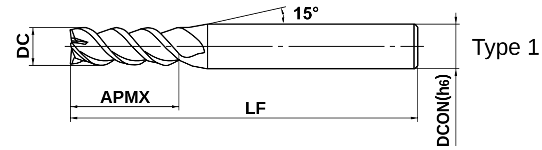
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

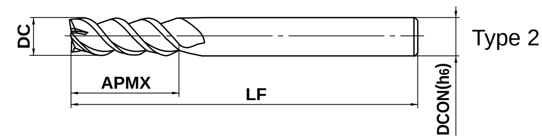
MSMHZD – Inch sizes

End mill, Medium cut length, 3 flute for drilling and slotting

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
◎	◎	○		◎	○		







DC<.5000"	DC≥.5000"			
0 - .0008"	0 - .0012"			
.2500"≤DCON≤.3750"	.5000"≤DCON≤.6250"	DCON=.7500"		
0 - .00035"	0 - .00043"	0 - .00051"		

h6

- 3 flute end mill for both drilling and slotting.

Unit : inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MSMHZDD1/16	.0625	.125	2.000	.2500	3	●	1
MSMHZD**D5/64**	.0781	.156	2.000	.2500	3	●	1
MSMHZD**D3/32**	.0938	.188	2.000	.2500	3	●	1
MSMHZD**D7/64**	.1094	.250	2.000	.2500	3	●	1
MSMHZD**D1/8**	.1250	.313	2.000	.2500	3	●	2
MSMHZD**D5/32**	.1563	.313	2.000	.2500	3	●	1
MSMHZD**D3/16**	.1875	.406	2.000	.2500	3	●	1
MSMHZD**D7/32**	.2188	.406	2.000	.2500	3	●	1
MSMHZD**D1/4**	.2500	.625	2.500	.2500	3	●	2
MSMHZD**D9/32**	.2813	.625	2.500	.3750	3	●	1
MSMHZD**D5/16**	.3125	.750	2.750	.3750	3	●	1
MSMHZD**D11/32**	.3438	.750	2.750	.3750	3	●	2
MSMHZD**D3/8**	.3750	.750	3.000	.3750	3	●	2
MSMHZD**D13/32**	.4060	.875	3.000	.5000	3	●	1
MSMHZD**D7/16**	.4380	.875	3.000	.5000	3	●	1
MSMHZD**D15/32**	.4690	1.000	3.500	.5000	3	●	2
MSMHZD**D1/2**	.5000	1.000	3.500	.5000	3	●	2
MSMHZD**D9/16**	.5630	1.000	3.500	.6250	3	●	1
MSMHZD**D5/8**	.6250	1.125	4.250	.6250	3	●	2
MSMHZD**D3/4**	.7500	1.250	5.500	.7500	3	●	1

● : Inventory maintained.

MSMHZD – Inch sizes

End mill, Medium cut length, 3 flute for drilling and slotting

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
.0625	13000	550	21.7	8500	310	12.2	7100	200	7.9
.1250	8000	770	30.3	5100	380	15.0	4200	220	8.7
.1875	6300	880	34.6	3800	490	19.3	3200	250	9.8
.2500	5000	950	37.4	3000	500	19.7	2500	270	10.6
.3125	4000	1000	39.4	2400	560	22.0	2000	280	11.0
.3750	3300	1000	39.4	2000	490	19.3	1700	290	11.4
.4380	2900	970	38.2	1700	450	17.7	1400	300	11.8
.5000	2500	860	33.9	1500	420	16.5	1300	300	11.8
.5630	2200	790	31.1	1300	370	14.6	1100	280	11.0
.6250	2000	720	28.3	1200	350	13.8	1000	260	10.2
.7500	1700	610	24.0	1000	290	11.4	800	240	9.4
Depth of cut	≤0.2DC (DC>ϕ.1094) ≤0.1DC (DC≤ϕ.1250) ≤1.5DC						≤0.2DC (DC>ϕ.1094) ≤0.1DC (DC≤ϕ.1250) ≤1.5DC		

Drilling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
.0625	11000	120	4.7	7600	80	3.1	6000	20	0.8
.1250	8000	260	10.2	5000	180	7.1	4000	50	2.0
.1875	6300	300	11.8	3800	210	8.3	2700	60	2.4
.2500	5000	310	12.2	3000	210	8.3	2000	70	2.8
.3125	4000	320	12.6	2400	220	8.7	1600	80	3.1
.3750	3300	330	13.0	2000	240	9.4	1300	70	2.8
.4380	2900	330	13.0	1700	220	8.7	1100	70	2.8
.5000	2500	310	12.2	1500	210	8.3	1000	70	2.8
.5630	2200	270	10.6	1300	180	7.1	900	60	2.4
.6250	2000	250	9.8	1200	180	7.1	800	55	2.2
.7500	1700	200	7.9	1000	140	5.5	700	55	2.2
Depth of cut	≤1DC (DC≥ϕ.0781) ≤0.5DC (DC<ϕ.0938)						≤0.5DC (DC≥ϕ.0781) ≤0.2DC (DC<ϕ.0938)		

Slotting

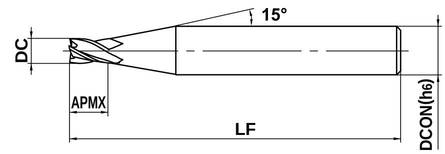
Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
.0625	11000	230	9.1	7600	150	5.9	6000	60	2.4
.1250	8000	600	23.6	5000	320	12.6	4000	130	5.1
.1875	6300	660	26.0	3800	360	14.2	2700	140	5.5
.2500	5000	720	28.3	3000	390	15.4	2000	140	5.5
.3125	4000	780	30.7	2400	430	16.9	1600	140	5.5
.3750	3300	740	29.1	2000	380	15.0	1300	150	5.9
.4380	2900	730	28.7	1700	340	13.4	1100	150	5.9
.5000	2500	700	27.6	1500	330	13.0	1000	140	5.5
.5630	2200	630	24.8	1300	300	11.8	900	140	5.5
.6250	2000	600	23.6	1200	290	11.4	800	130	5.1
.7500	1700	510	20.1	1000	240	9.4	700	120	4.7
Depth of cut	DC ≤1DC(DC≥ϕ.0781) ≤0.5DC(DC<ϕ.0938)						DC ≤0.5DC(DC≥ϕ.0781) ≤0.2DC(DC<ϕ.0938)		

1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

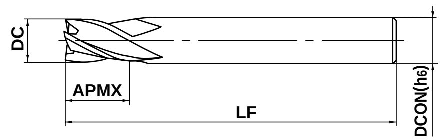
MS4SC

End mill, Short cut length, 4 flute

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
◎	◎	○		○	○		



Type 1



Type 2

1≤DC≤12				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● 4 flute end mill for general use.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4SCD0100	1	1.5	40	4	4	★	1
MS4SC**D0150**	1.5	2.3	40	4	4	★	1
MS4SC**D0200**	2	3	40	4	4	★	1
MS4SC**D0250**	2.5	3.8	40	4	4	★	1
MS4SC**D0300**	3	4.5	50	6	4	★	1
MS4SC**D0400**	4	6	50	6	4	★	1
MS4SC**D0500**	5	7.5	50	6	4	★	1
MS4SC**D0600**	6	9	50	6	4	★	2
MS4SC**D0800**	8	12	60	8	4	★	2
MS4SC**D1000**	10	15	70	10	4	★	2
MS4SC**D1200**	12	18	75	12	4	★	2

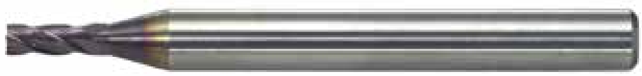
★ : Inventory maintained in Japan.

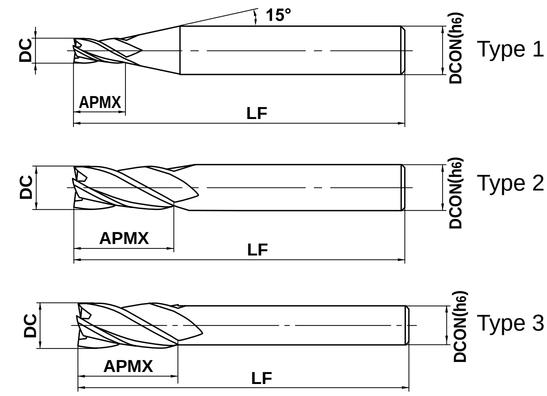
MS4MC

End mill, Medium cut length, 4 flute

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
◎	◎	○		○	○		

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS





DC≤12	DC>12			
0 - 0.020	0 - 0.030			
4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute end mill for general use.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4MCD0100	1	2.5	40	4	4	●	1
MS4MCD0150	1.5	3.8	40	4	4	●	1
MS4MCD0200	2	5	40	4	4	●	1
MS4MCD0250	2.5	6.3	40	4	4	●	1
MS4MCD0300	3	7.5	50	6	4	●	1
MS4MCD0350	3.5	9	50	6	4	★	1
MS4MCD0400	4	10	50	6	4	●	1
MS4MCD0450	4.5	11.5	50	6	4	★	1
MS4MCD0500	5	12.5	50	6	4	●	1
MS4MCD0550	5.5	14	50	6	4	★	1
MS4MCD0600	6	15	50	6	4	●	2
MS4MCD0650	6.5	16.5	60	8	4	★	1
MS4MCD0700	7	17.5	60	8	4	★	1
MS4MCD0750	7.5	19	60	8	4	★	1
MS4MCD0800	8	20	60	8	4	●	2
MS4MCD0850	8.5	21.5	70	10	4	★	1
MS4MCD0900	9	22.5	70	10	4	★	1
MS4MCD0950	9.5	24	70	10	4	★	1
MS4MCD1000	10	25	70	10	4	●	2
MS4MCD1100	11	27.5	75	12	4	★	1
MS4MCD1200	12	30	90	12	4	●	2
MS4MCD1400	14	35	90	12	4	★	3
MS4MCD1600	16	40	100	16	4	★	2
MS4MCD1800	18	45	100	16	4	★	3
MS4MCD2000	20	50	110	20	4	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

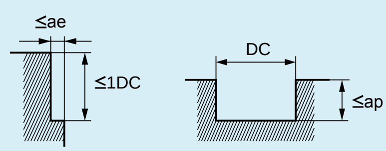
MS4SC
End mill, Short cut length, 4 flute

MS4MC
End mill, Medium cut length, 4 flute

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45—55HRC) AISI H13 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)
1	40000	3000	118.1	0.06	32000	2400	94.5	0.06
1.5	40000	4500	177.2	0.12	32000	3600	141.7	0.08
2	30000	4500	177.2	0.18	24000	3600	141.7	0.10
2.5	24000	3900	153.5	0.25	19000	3000	118.1	0.13
3	20000	3500	137.8	0.30	16000	2700	106.3	0.15
4	15000	3000	118.1	0.40	12000	2400	94.5	0.20
5	12000	2400	94.5	0.50	9000	1800	70.9	0.25
6	10000	2100	82.7	0.60	7000	1500	59.1	0.30
8	8000	1500	59.1	0.80	5600	1100	43.3	0.40
10	6400	1400	55.1	1.00	4500	950	37.4	0.50
12	5400	1200	47.2	1.00	3800	860	33.9	0.50
16	2400	550	21.7	≤3	1200	120	4.7	≤0.8
20	1900	480	18.9	≤4	1000	100	3.9	≤1

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) In case of slotting with over 3 mm endmill, please reduce revolution to 50—70% of above value, and reduce feed rate to 40—60% of above value.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

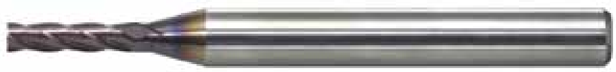
MS4JC

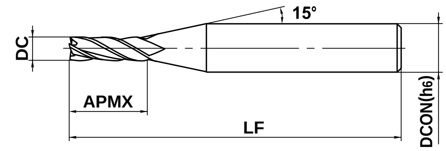
End mill, Semi long cut length, 4 flute

UWC MS 30°

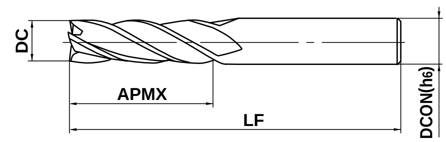
DC<3 DC≥3 DC≥3 DC<3

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
◎	◎	○		○	○		





Type 1



Type 2

1≤DC≤12				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 4 flute end mill for general use.

Unit : mm

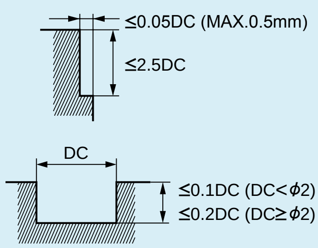
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4JCD0100	1	4	40	4	4	●	1
MS4JC**D0150**	1.5	6	40	4	4	●	1
MS4JC**D0200**	2	8	40	4	4	●	1
MS4JC**D0250**	2.5	10	50	4	4	●	1
MS4JC**D0300**	3	12	50	6	4	●	1
MS4JC**D0400**	4	16	50	6	4	●	1
MS4JC**D0500**	5	20	60	6	4	●	1
MS4JC**D0600**	6	24	60	6	4	●	2
MS4JC**D0800**	8	32	70	8	4	●	2
MS4JC**D1000**	10	40	90	10	4	●	2
MS4JC**D1200**	12	48	110	12	4	●	2

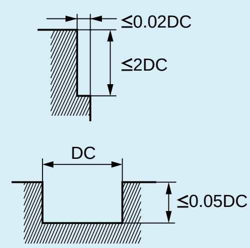
● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45—55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
1	11100	85	3.3	9500	65	2.6	8000	50	2.0	6400	35	1.4
1.5	7400	85	3.3	6400	90	3.5	5300	50	2.0	4200	35	1.4
2	5600	85	3.3	4800	90	3.5	4000	50	2.0	3200	35	1.4
2.5	4500	85	3.3	3800	90	3.5	3200	55	2.2	2500	35	1.4
3	3700	90	3.5	3400	90	3.5	2600	60	2.4	2100	35	1.4
4	3000	110	4.3	2700	90	3.5	2100	70	2.8	1700	50	2.0
5	2600	140	5.5	2300	110	4.3	1800	85	3.3	1500	55	2.2
6	2300	170	6.7	2000	140	5.5	1500	110	4.3	1300	70	2.8
8	1700	180	7.1	1500	140	5.5	1200	110	4.3	1000	70	2.8
10	1400	180	7.1	1300	140	5.5	950	110	4.3	800	70	2.8
12	1200	170	6.7	1100	140	5.5	800	110	4.3	670	70	2.8

Depth of cut



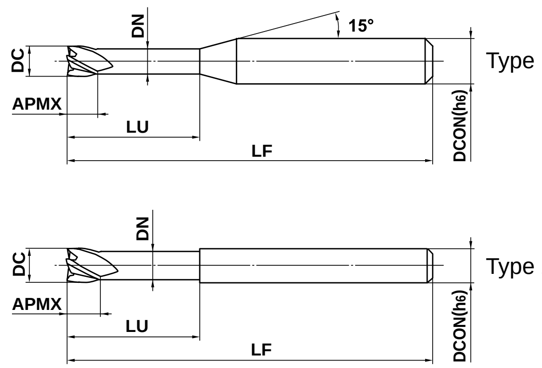


1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

MS4XL

End mill, Short cut length, 4 flute, Long neck

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
◎	◎	○		○	○		



1≤DC≤10				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10			
0 - 0.008	0 - 0.009			

● 4 flute long neck end mill.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS4XLD0100N040	1	1	4	0.94	50	4	4	★	1
MS4XLD0100N060	1	1	6	0.94	50	4	4	★	1
MS4XLD0100N080	1	1	8	0.94	50	4	4	★	1
MS4XLD0100N100	1	1	10	0.94	50	4	4	★	1
MS4XLD0100N120	1	1	12	0.94	50	4	4	★	1
MS4XLD0100N160	1	1	16	0.94	60	4	4	★	1
MS4XLD0110N060	1.1	1.1	6	1.04	50	4	4	★	1
MS4XLD0110N100	1.1	1.1	10	1.04	50	4	4	★	1
MS4XLD0110N160	1.1	1.1	16	1.04	60	4	4	★	1
MS4XLD0120N060	1.2	1.2	6	1.14	50	4	4	★	1
MS4XLD0120N080	1.2	1.2	8	1.14	50	4	4	★	1
MS4XLD0120N100	1.2	1.2	10	1.14	50	4	4	★	1
MS4XLD0120N120	1.2	1.2	12	1.14	50	4	4	★	1
MS4XLD0120N160	1.2	1.2	16	1.14	60	4	4	★	1
MS4XLD0130N060	1.3	1.3	6	1.24	50	4	4	★	1
MS4XLD0130N120	1.3	1.3	12	1.24	50	4	4	★	1
MS4XLD0130N180	1.3	1.3	18	1.24	60	4	4	★	1
MS4XLD0140N060	1.4	1.4	6	1.34	50	4	4	★	1
MS4XLD0140N080	1.4	1.4	8	1.34	50	4	4	★	1
MS4XLD0140N100	1.4	1.4	10	1.34	50	4	4	★	1
MS4XLD0140N120	1.4	1.4	12	1.34	50	4	4	★	1
MS4XLD0140N140	1.4	1.4	14	1.34	60	4	4	★	1
MS4XLD0140N160	1.4	1.4	16	1.34	60	4	4	★	1
MS4XLD0140N220	1.4	1.4	22	1.34	60	4	4	★	1
MS4XLD0150N060	1.5	1.5	6	1.44	50	4	4	★	1
MS4XLD0150N080	1.5	1.5	8	1.44	50	4	4	★	1
MS4XLD0150N100	1.5	1.5	10	1.44	50	4	4	★	1
MS4XLD0150N120	1.5	1.5	12	1.44	50	4	4	★	1
MS4XLD0150N140	1.5	1.5	14	1.44	60	4	4	★	1
MS4XLD0150N160	1.5	1.5	16	1.44	60	4	4	★	1
MS4XLD0150N180	1.5	1.5	18	1.44	60	4	4	★	1

★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS4XLD0150N200	1.5	1.5	20	1.44	60	4	4	★	1
MS4XLD0160N060	1.6	1.6	6	1.54	50	4	4	★	1
MS4XLD0160N080	1.6	1.6	8	1.54	50	4	4	★	1
MS4XLD0160N100	1.6	1.6	10	1.54	50	4	4	★	1
MS4XLD0160N120	1.6	1.6	12	1.54	50	4	4	★	1
MS4XLD0160N140	1.6	1.6	14	1.54	60	4	4	★	1
MS4XLD0160N160	1.6	1.6	16	1.54	60	4	4	★	1
MS4XLD0160N180	1.6	1.6	18	1.54	60	4	4	★	1
MS4XLD0160N200	1.6	1.6	20	1.54	60	4	4	★	1
MS4XLD0160N260	1.6	1.6	26	1.54	70	4	4	★	1
MS4XLD0170N060	1.7	1.7	6	1.64	50	4	4	★	1
MS4XLD0170N140	1.7	1.7	14	1.64	60	4	4	★	1
MS4XLD0170N240	1.7	1.7	24	1.64	70	4	4	★	1
MS4XLD0180N060	1.8	1.8	6	1.74	50	4	4	★	1
MS4XLD0180N080	1.8	1.8	8	1.74	50	4	4	★	1
MS4XLD0180N100	1.8	1.8	10	1.74	50	4	4	★	1
MS4XLD0180N120	1.8	1.8	12	1.74	50	4	4	★	1
MS4XLD0180N140	1.8	1.8	14	1.74	60	4	4	★	1
MS4XLD0180N160	1.8	1.8	16	1.74	60	4	4	★	1
MS4XLD0180N180	1.8	1.8	18	1.74	60	4	4	★	1
MS4XLD0180N200	1.8	1.8	20	1.74	60	4	4	★	1
MS4XLD0180N250	1.8	1.8	25	1.74	70	4	4	★	1
MS4XLD0190N060	1.9	1.9	6	1.84	50	4	4	★	1
MS4XLD0190N160	1.9	1.9	16	1.84	60	4	4	★	1
MS4XLD0190N280	1.9	1.9	28	1.84	70	4	4	★	1
MS4XLD0200N060	2	2	6	1.9	50	4	4	★	1
MS4XLD0200N080	2	2	8	1.9	50	4	4	★	1
MS4XLD0200N100	2	2	10	1.9	50	4	4	★	1
MS4XLD0200N120	2	2	12	1.9	50	4	4	★	1
MS4XLD0200N140	2	2	14	1.9	60	4	4	★	1
MS4XLD0200N160	2	2	16	1.9	60	4	4	★	1
MS4XLD0200N180	2	2	18	1.9	60	4	4	★	1
MS4XLD0200N200	2	2	20	1.9	60	4	4	★	1
MS4XLD0200N250	2	2	25	1.9	70	4	4	★	1
MS4XLD0200N300	2	2	30	1.9	70	4	4	★	1
MS4XLD0250N080	2.5	2.5	8	2.4	50	4	4	★	1
MS4XLD0250N120	2.5	2.5	12	2.4	50	4	4	★	1
MS4XLD0250N160	2.5	2.5	16	2.4	60	4	4	★	1
MS4XLD0250N200	2.5	2.5	20	2.4	60	4	4	★	1
MS4XLD0250N250	2.5	2.5	25	2.4	70	4	4	★	1
MS4XLD0300N080	3	3	8	2.9	50	6	4	★	1
MS4XLD0300N120	3	3	12	2.9	50	6	4	★	1
MS4XLD0300N160	3	3	16	2.9	60	6	4	★	1
MS4XLD0300N200	3	3	20	2.9	60	6	4	★	1
MS4XLD0300N250	3	3	25	2.9	70	6	4	★	1
MS4XLD0300N300	3	3	30	2.9	70	6	4	★	1
MS4XLD0350N150	3.5	3.5	15	3.4	60	6	4	★	1
MS4XLD0350N250	3.5	3.5	25	3.4	70	6	4	★	1
MS4XLD0350N350	3.5	3.5	35	3.4	80	6	4	★	1
MS4XLD0400N120	4	4	12	3.9	50	6	4	★	1
MS4XLD0400N160	4	4	16	3.9	60	6	4	★	1

MS4XL

End mill, Short cut length, 4 flute, Long neck

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID END MILLS

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS4XLD0400N200	4	4	20	3.9	60	6	4	★	1
MS4XLD0400N250	4	4	25	3.9	70	6	4	★	1
MS4XLD0400N300	4	4	30	3.9	70	6	4	★	1
MS4XLD0400N350	4	4	35	3.9	80	6	4	★	1
MS4XLD0400N400	4	4	40	3.9	90	6	4	★	1
MS4XLD0400N450	4	4	45	3.9	90	6	4	★	1
MS4XLD0400N500	4	4	50	3.9	100	6	4	★	1
MS4XLD0500N160	5	5	16	4.9	60	6	4	★	1
MS4XLD0500N250	5	5	25	4.9	70	6	4	★	1
MS4XLD0500N350	5	5	35	4.9	80	6	4	★	1
MS4XLD0500N500	5	5	50	4.9	110	6	4	★	1
MS4XLD0600N200	6	6	20	5.85	80	6	4	★	2
MS4XLD0600N300	6	6	30	5.85	90	6	4	★	2
MS4XLD0600N400	6	6	40	5.85	100	6	4	★	2
MS4XLD0600N500	6	6	50	5.85	110	6	4	★	2
MS4XLD0800N300	8	8	30	7.85	90	8	4	★	2
MS4XLD0800N500	8	8	50	7.85	110	8	4	★	2
MS4XLD0800N700	8	8	70	7.85	130	8	4	★	2
MS4XLD1000N400	10	10	40	9.7	100	10	4	★	2
MS4XLD1000N600	10	10	60	9.7	120	10	4	★	2
MS4XLD1000N800	10	10	80	9.7	140	10	4	★	2

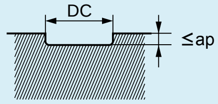
★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.			
DC (mm)	Neck length (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
1	4	40000	3000	118.1	0.04
	8	36000	2400	94.5	0.03
	12	20000	1000	39.4	0.02
	16	10000	500	19.7	0.005
1.2	6	40000	3000	118.1	0.05
	10	36000	2400	94.5	0.04
	12	20000	1200	47.2	0.03
	16	12000	600	23.6	0.01
1.5	6	40000	3200	126.0	0.06
	12	32000	2400	94.5	0.05
	16	16000	1100	43.3	0.03
	20	10000	600	23.6	0.01
1.8	6	40000	3600	141.7	0.08
	12	32000	2800	110.2	0.06
	20	12000	1000	39.4	0.02
	25	7000	600	23.6	0.01
2	6	40000	4000	157.5	0.1
	12	32000	3200	126.0	0.07
	16	24000	2400	94.5	0.05
	20	12000	1200	47.2	0.03
	30	5000	500	19.7	0.01
2.5	8	32000	4000	157.5	0.2
	25	9000	1100	43.3	0.04
	50	2500	300	11.8	0.005
3	8	25000	3600	141.7	0.4
	16	18000	2500	98.4	0.2
	25	12000	1700	66.9	0.1
	30	7000	800	31.5	0.05

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.			
DC (mm)	Neck length (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
3.5	15	20000	3000	118.1	0.6
	25	11000	1600	63.0	0.15
	35	5500	800	31.5	0.06
4	12	18000	3000	118.1	1
	20	12000	2000	78.7	0.5
	30	8000	1300	51.2	0.2
	40	4200	700	27.6	0.08
	50	2400	400	15.7	0.03
5	16	14000	2700	106.3	1
	25	9500	1800	70.9	0.5
	35	6400	1200	47.2	0.2
	50	3200	600	23.6	0.05
6	20	11000	2200	86.6	1.2
	30	8000	1600	63.0	0.6
	40	5400	1100	43.3	0.25
	50	3200	640	25.2	0.15
8	30	8000	1600	63.0	1.6
	50	4000	800	31.5	0.5
	70	2000	400	15.7	0.2
10	40	6400	1300	51.2	2
	60	3200	640	25.2	0.6
	80	1600	320	12.6	0.3

Depth of cut



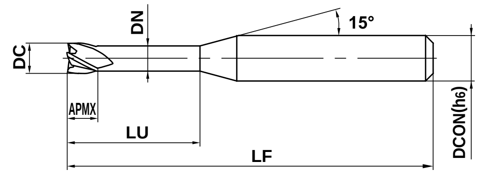
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

MS4XL – Inch sizes

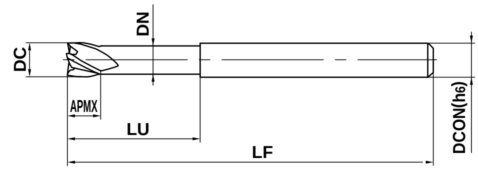
Square, 4 flute, Long neck

DC＜1/8 DC≥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
◎	◎	○		○	○		



Type 1



Type 2

0 - .0008"				
DCON=.1250"	DCON=.1875"	DCON=.2500"		
0 - .00024"	0 - .00031"	0 - .00035"		

h6

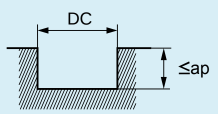
● 4 flute, long neck, square end mill for general purpose.

Unit : inch

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS4XLD1/16N0375	.0625	.0625	.3750	.0601	2.0	.1250	4	●	1
MS4XLD1/16N0500	.0625	.0625	.5000	.0601	2.0	.1250	4	●	1
MS4XLD1/16N0750	.0625	.0625	.7500	.0601	2.0	.1250	4	●	1
MS4XLD3/32N0562	.0938	.0938	.5625	.0898	2.0	.1250	4	●	1
MS4XLD3/32N0750	.0938	.0938	.7500	.0898	2.0	.1250	4	●	1
MS4XLD3/32N1125	.0938	.0938	1.1250	.0898	2.5	.1250	4	●	1
MS4XLD1/8N0750	.1250	.1250	.7500	.1211	2.0	.1250	4	●	2
MS4XLD3/16N1125	.1875	.1875	1.1250	.1836	2.5	.1875	4	●	2
MS4XLD1/4N1500	.2500	.2500	1.5000	.2441	3.0	.2500	4	●	2

● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

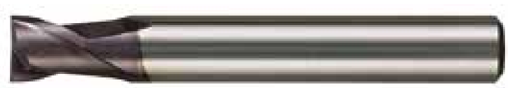
Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.		
DC (inch)	Neck length (inch)	Revolution (min^{-1})	Table feed (IPM)	Depth of cut ap (inch)
.0156	.3750	40000	121.0	.0028
	.5000	30000	68.0	.0016
	.7500	10000	14.2	.0008
.0313	.5625	33000	109.1	.003
	.7500	20000	56.6	.002
	1.1250	10000	18.8	.001
.1250	.7500	25000	96.5	.004
.1875	1.1250	17000	72.2	.006
.2500	1.5000	13000	73.7	.008
Depth of cut				

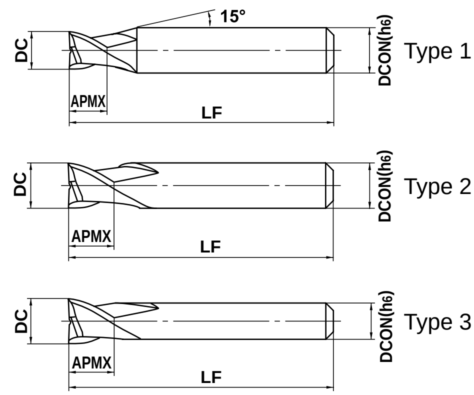
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

MS2ES

End mill, 2 flute, For Swiss type lathes

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
◎	◎	○		○	○		





3≤DC≤12				
0 - 0.020				
h6 4≤DCON≤6	7≤DCON≤10			
0 - 0.008	0 - 0.009			

- 2 flute end mill.

Overall length 35mm

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2ESD0300L35S04	3	3	35	4	2	●	1
MS2ESD0350L35S04	3.5	3.5	35	4	2	●	1
MS2ESD0400L35S04	4	4	35	4	2	●	2
MS2ESD0500L35S05	5	5	35	5	2	●	2
MS2ESD0500L35S06	5	5	35	6	2	●	1
MS2ESD0600L35S05	6	6	35	5	2	●	3
MS2ESD0600L35S06	6	6	35	6	2	●	2
MS2ESD0700L35S07	7	6	35	7	2	●	2
MS2ESD0800L35S07	8	6	35	7	2	●	3
MS2ESD0800L35S08	8	6	35	8	2	●	2
MS2ESD1000L35S07	10	6	35	7	2	●	3
MS2ESD1000L35S10	10	6	35	10	2	●	2
MS2ESD1200L35S10	12	6	35	10	2	●	3

Overall length 45mm

Unit : mm

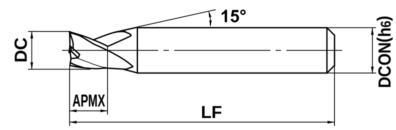
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2ESD0300L45S04	3	3	45	4	2	●	1
MS2ESD0350L45S04	3.5	3.5	45	4	2	●	1
MS2ESD0400L45S04	4	4	45	4	2	●	2
MS2ESD0500L45S06	5	5	45	6	2	●	1
MS2ESD0600L45S06	6	6	45	6	2	●	2
MS2ESD0700L45S07	7	7	45	7	2	●	2
MS2ESD0800L45S07	8	8	45	7	2	●	3
MS2ESD0800L45S08	8	8	45	8	2	●	2
MS2ESD1000L45S07	10	10	45	7	2	●	3
MS2ESD1000L45S10	10	10	45	10	2	●	2
MS2ESD1200L45S10	12	12	45	10	2	●	3

● : Inventory maintained.

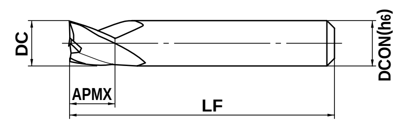
MS3ES

End mill, 3 flute, For Swiss type lathes

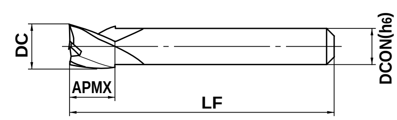
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
◎	◎	○		○	○		



Type 1



Type 2



Type 3

	3≤DC≤12				
	0 - 0.020				
h6	4≤DCON≤6	7≤DCON≤10			
	0 - 0.008	0 - 0.009			

● 3 flute end mill.

Overall length 35mm

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS3ESD0300L35S04	3	3	35	4	3	●	1
MS3ESD0350L35S04	3.5	3.5	35	4	3	●	1
MS3ESD0400L35S04	4	4	35	4	3	●	2
MS3ESD0500L35S05	5	5	35	5	3	●	2
MS3ESD0500L35S06	5	5	35	6	3	●	1
MS3ESD0600L35S05	6	6	35	5	3	●	3
MS3ESD0600L35S06	6	6	35	6	3	●	2
MS3ESD0700L35S07	7	6	35	7	3	●	2
MS3ESD0800L35S07	8	6	35	7	3	●	3
MS3ESD0800L35S08	8	6	35	8	3	●	2
MS3ESD1000L35S07	10	6	35	7	3	●	3
MS3ESD1000L35S10	10	6	35	10	3	●	2
MS3ESD1200L35S10	12	6	35	10	3	●	3

Overall length 45mm

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS3ESD0300L45S04	3	3	45	4	3	●	1
MS3ESD0350L45S04	3.5	3.5	45	4	3	●	1
MS3ESD0400L45S04	4	4	45	4	3	●	2
MS3ESD0500L45S06	5	5	45	6	3	●	1
MS3ESD0600L45S06	6	6	45	6	3	●	2
MS3ESD0700L45S07	7	7	45	7	3	●	2
MS3ESD0800L45S07	8	8	45	7	3	●	3
MS3ESD0800L45S08	8	8	45	8	3	●	2
MS3ESD1000L45S07	10	10	45	7	3	●	3
MS3ESD1000L45S10	10	10	45	10	3	●	2
MS3ESD1200L45S10	12	12	45	10	3	●	3

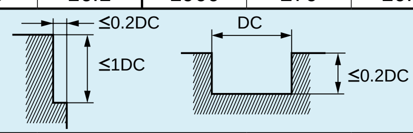
MS2ES
End mill, 2 flute, For Swiss type lathes

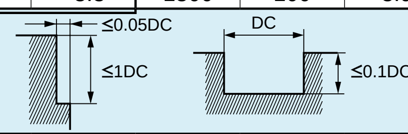
MS3ES
End mill, 3 flute, For Swiss type lathes

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	10000	600	23.6	7000	400	15.7	6000	300	11.8	5000	120	4.7
4	7500	600	23.6	5200	400	15.7	4500	300	11.8	4000	120	4.7
5	6000	600	23.6	4200	400	15.7	3600	300	11.8	3200	120	4.7
6	5000	600	23.6	3500	400	15.7	3000	300	11.8	2700	120	4.7
7	4500	560	22.0	3000	360	14.2	2700	280	11.0	2300	110	4.3
8	4000	520	20.5	2800	350	13.8	2400	260	10.2	2000	110	4.3
10	3200	450	17.7	2200	300	11.8	1900	230	9.1	1600	100	3.9
12	2700	410	16.1	1900	270	10.6	1600	210	8.3	1300	100	3.9

Depth of cut



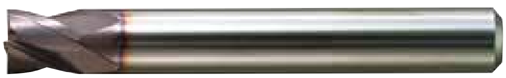


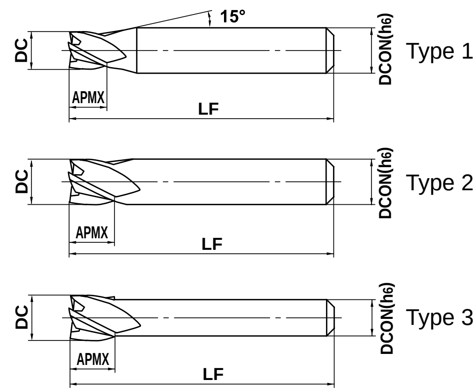
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

MS4EC

End mill, 4 flute, For Swiss type lathes

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
◎	◎	○		○	○		





	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	4≤DCON≤6	7≤DCON≤10			
	0 - 0.008	0 - 0.009			

● 4 flute end mill.

Overall length 35mm

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4ECD0300L35S04	3	3	35	4	4	●	1
MS4EC**D0350L35S04**	3.5	3.5	35	4	4	●	1
MS4EC**D0400L35S04**	4	4	35	4	4	●	2
MS4EC**D0500L35S05**	5	5	35	5	4	●	2
MS4EC**D0500L35S06**	5	5	35	6	4	●	1
MS4EC**D0600L35S05**	6	6	35	5	4	●	3
MS4EC**D0600L35S06**	6	6	35	6	4	●	2
MS4EC**D0700L35S07**	7	6	35	7	4	●	2
MS4EC**D0800L35S07**	8	6	35	7	4	●	3
MS4EC**D0800L35S08**	8	6	35	8	4	●	2
MS4EC**D1000L35S07**	10	6	35	7	4	●	3
MS4EC**D1000L35S10**	10	6	35	10	4	●	2
MS4EC**D1200L35S10**	12	6	35	10	4	●	3

Overall length 45mm

Unit : mm

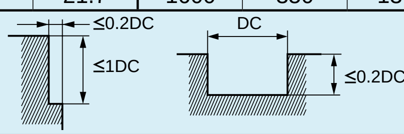
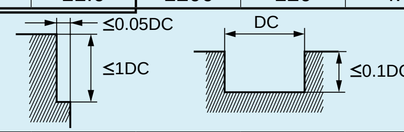
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4ECD0300L45S04	3	3	45	4	4	●	1
MS4EC**D0350L45S04**	3.5	3.5	45	4	4	●	1
MS4EC**D0400L45S04**	4	4	45	4	4	●	2
MS4EC**D0500L45S06**	5	5	45	6	4	●	1
MS4EC**D0600L45S06**	6	6	45	6	4	●	2
MS4EC**D0700L45S07**	7	7	45	7	4	●	2
MS4EC**D0800L45S07**	8	8	45	7	4	●	3
MS4EC**D0800L45S08**	8	8	45	8	4	●	2
MS4EC**D1000L45S07**	10	10	45	7	4	●	3
MS4EC**D1000L45S10**	10	10	45	10	4	●	2
MS4EC**D1200L45S10**	12	12	45	10	4	●	3
MS4EC**D1400L45S10**	14	14	45	10	4	●	3

● : Inventory maintained.

MS4EC

End mill, 4 flute, For Swiss type lathes

RECOMMENDED CUTTING CONDITIONS

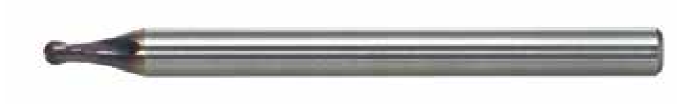
Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)		(mm/min)	(IPM)		(mm/min)	(IPM)		(mm/min)	(IPM)
3	10000	900	35.4	7000	600	23.6	6000	450	17.7	5000	180	7.1
4	7500	900	35.4	5200	600	23.6	4500	450	17.7	4000	180	7.1
5	6000	900	35.4	4200	600	23.6	3600	450	17.7	3200	180	7.1
6	5000	900	35.4	3500	600	23.6	3000	450	17.7	2700	180	7.1
7	4500	840	33.1	3000	540	21.3	2700	420	16.5	2300	160	6.3
8	4000	780	30.7	2800	520	20.5	2400	390	15.4	2000	160	6.3
10	3200	680	26.8	2200	450	17.7	1900	340	13.4	1600	140	5.5
12	2700	620	24.4	1900	410	16.1	1600	310	12.2	1300	120	4.7
14	2300	550	21.7	1600	350	13.8	1400	280	11.0	1200	120	4.7
Depth of cut												

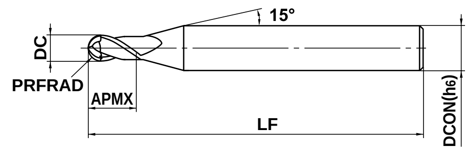
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

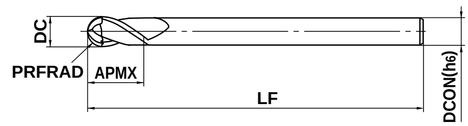
MS2SB

Ball nose end mill, Short cut length, 2 flute

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
◎	◎	○		○	○		







R	0.1≤PRFRAD≤3	4≤PRFRAD≤6			
	±0.005	±0.007			
DC	0.2≤DC≤12				
	0 / -0.020				
h6	4≤DCON≤6	8≤DCON≤10	DCON=12		
	0 / -0.005	0 / -0.006	0 / -0.008		

- 2 flute ball nose end mill for general use.

Unit : mm

Order Number	PRFRAD	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2SBR0010S04	0.1	0.2	0.3	45	4	2	●	1
MS2SBR0010S06	0.1	0.2	0.3	50	6	2	●	1
MS2SBR0015S04	0.15	0.3	0.5	45	4	2	●	1
MS2SBR0015S06	0.15	0.3	0.5	50	6	2	●	1
MS2SBR0020S04	0.2	0.4	0.6	45	4	2	●	1
MS2SBR0020S06	0.2	0.4	0.6	50	6	2	●	1
MS2SBR0025S04	0.25	0.5	0.8	45	4	2	●	1
MS2SBR0025S06	0.25	0.5	0.8	50	6	2	●	1
MS2SBR0030S04	0.3	0.6	0.9	45	4	2	●	1
MS2SBR0030S06	0.3	0.6	0.9	50	6	2	●	1
MS2SBR0035S04	0.35	0.7	1.1	45	4	2	●	1
MS2SBR0040S04	0.4	0.8	1.2	45	4	2	●	1
MS2SBR0040S06	0.4	0.8	1.2	50	6	2	●	1
MS2SBR0045S04	0.45	0.9	1.4	45	4	2	●	1
MS2SBR0050S04	0.5	1	1.5	45	4	2	●	1
MS2SBR0050S06	0.5	1	1.5	50	6	2	●	1
MS2SBR0060S04	0.6	1.2	1.8	45	4	2	●	1
MS2SBR0060S06	0.6	1.2	1.8	50	6	2	●	1
MS2SBR0070S04	0.7	1.4	2.1	45	4	2	●	1
MS2SBR0070S06	0.7	1.4	2.1	50	6	2	●	1
MS2SBR0075S04	0.75	1.5	2.3	45	4	2	●	1
MS2SBR0075S06	0.75	1.5	2.3	50	6	2	●	1
MS2SBR0080S04	0.8	1.6	2.4	45	4	2	●	1
MS2SBR0080S06	0.8	1.6	2.4	50	6	2	●	1
MS2SBR0090S04	0.9	1.8	2.7	45	4	2	●	1
MS2SBR0090S06	0.9	1.8	2.7	50	6	2	●	1
MS2SBR0100S04	1	2	3	50	4	2	●	1
MS2SBR0100S06	1	2	3	50	6	2	●	1
MS2SBR0125S04	1.25	2.5	3.8	50	4	2	●	1
MS2SBR0125S06	1.25	2.5	3.8	50	6	2	●	1
MS2SBR0150S06	1.5	3	4.5	70	6	2	●	1

● : Inventory maintained.

CARBIDE

MS2SB

Ball nose end mill, Short cut length, 2 flute

Order Number	PRFRAD	DC	APMXMX	LF	DCON	No. of Flutes	Stock	Type
MS2SBR0200S06	2	4	6	70	6	2	●	1
MS2SBR0250S06	2.5	5	7.5	80	6	2	●	1
MS2SBR0300S06	3	6	9	80	6	2	●	2
MS2SBR0400S08	4	8	12	90	8	2	●	2
MS2SBR0500S10	5	10	15	100	10	2	●	2
MS2SBR0600S12	6	12	18	110	12	2	●	2

SQUARE

BALL

RADIUS

TAPER

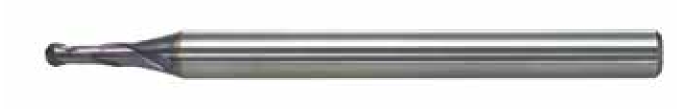
SOLID END MILLS

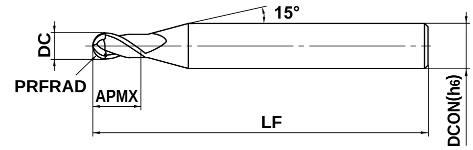
● : Inventory maintained. ★ : Inventory maintained in Japan.

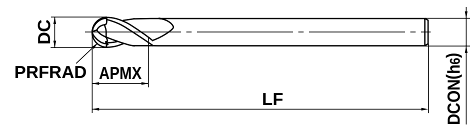
MS2MB

Ball nose end mill, Medium cut length, 2 flute

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
◎	◎	○		○	○		







0.25≤PRFRAD≤3	4≤PRFRAD≤6			
±0.005	±0.007			
0.5≤DC≤12				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.005	0 - 0.006	0 - 0.008		

● 2 flute ball nose end mill for general use.

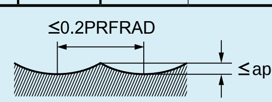
Unit : mm

Order Number	PRFRAD	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2MBR0025	0.25	0.5	1	45	4	2	●	1
MS2MB**R0030**	0.3	0.6	1.2	45	4	2	●	1
MS2MB**R0040**	0.4	0.8	1.6	45	4	2	●	1
MS2MB**R0050**	0.5	1	2.5	45	4	2	●	1
MS2MB**R0060**	0.6	1.2	2.5	45	4	2	●	1
MS2MB**R0070**	0.7	1.4	3	45	4	2	●	1
MS2MB**R0075**	0.75	1.5	4	45	4	2	●	1
MS2MB**R0080**	0.8	1.6	4	45	4	2	●	1
MS2MB**R0090**	0.9	1.8	5	45	4	2	●	1
MS2MB**R0100**	1	2	6	50	4	2	●	1
MS2MB**R0125**	1.25	2.5	6	50	4	2	●	1
MS2MB**R0150S03**	1.5	3	8	70	3	2	★	2
MS2MB**R0150**	1.5	3	8	70	6	2	●	1
MS2MB**R0175**	1.75	3.5	8	70	6	2	●	1
MS2MB**R0200S04**	2	4	8	70	4	2	★	2
MS2MB**R0200**	2	4	8	70	6	2	●	1
MS2MB**R0250**	2.5	5	12	80	6	2	●	1
MS2MB**R0300**	3	6	12	80	6	2	●	2
MS2MB**R0400**	4	8	14	90	8	2	●	2
MS2MB**R0500**	5	10	18	100	10	2	●	2
MS2MB**R0600**	6	12	22	110	12	2	●	2

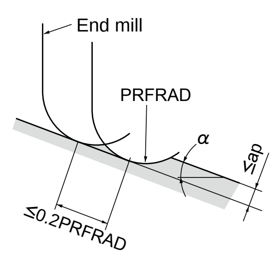
MS2SB
Ball nose end mill, Short cut length, 2 flute

MS2MB
Ball nose end mill, Medium cut length, 2 flute

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.							Hardened steel (45−55HRC) AISI H13 etc.						
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	α≤15°			α>15°			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R 0.1	40000	300	11.8	40000	250	9.8	0.003	40000	300	11.8	40000	250	9.8	0.003
R 0.15	40000	500	19.7	40000	350	13.8	0.007	40000	500	19.7	40000	350	13.8	0.007
R 0.2	40000	1600	63.0	40000	1200	47.2	0.02	40000	1300	51.2	40000	950	37.4	0.015
R 0.25	40000	2400	94.5	40000	1400	55.1	0.025	40000	1900	74.8	40000	1100	43.3	0.020
R 0.3	40000	3200	126.0	40000	1600	63.0	0.03	40000	2500	98.4	40000	1300	51.2	0.025
R 0.4	40000	4800	189.0	40000	2400	94.5	0.05	40000	4000	157.5	40000	1900	74.8	0.04
R 0.5	40000	5600	220.5	40000	3200	126.0	0.06	40000	5600	220.5	40000	3000	118.1	0.05
R 0.75	40000	6500	255.9	40000	4000	157.5	0.09	40000	6500	255.9	32000	3200	126.0	0.08
R 1	40000	6500	255.9	39000	4700	185.0	0.11	40000	6500	255.9	31000	3500	137.8	0.11
R 1.25	40000	7000	275.6	33000	4500	177.2	0.12	36000	6500	255.9	26000	3500	137.8	0.12
R 1.5	40000	7500	295.3	27000	4300	169.3	0.13	32000	6000	236.2	22000	3400	133.9	0.13
R 2	32000	7500	295.3	20000	3600	141.7	0.15	25000	6000	236.2	16000	2700	106.3	0.15
R 2.5	25000	6000	236.2	16000	2900	114.2	0.20	20000	5400	212.6	13000	2300	90.6	0.20
R 3	21000	5800	228.3	13000	2600	102.4	0.25	17000	4700	185.0	10000	2000	78.7	0.25
R 4	16000	4500	177.2	10000	2000	78.7	0.30	13000	3600	141.7	8000	1500	59.1	0.30
R 5	13000	3600	141.7	8000	1700	66.9	0.50	10000	2900	114.2	6400	1200	47.2	0.50
R 6	9000	2500	98.4	6000	1300	51.2	0.50	7200	2000	78.7	4800	1000	39.4	0.50
Depth of cut														

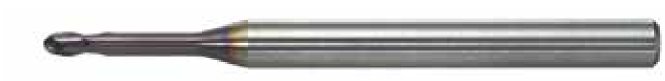
1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.



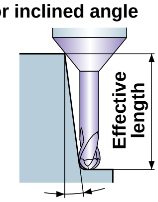
MS2XLB

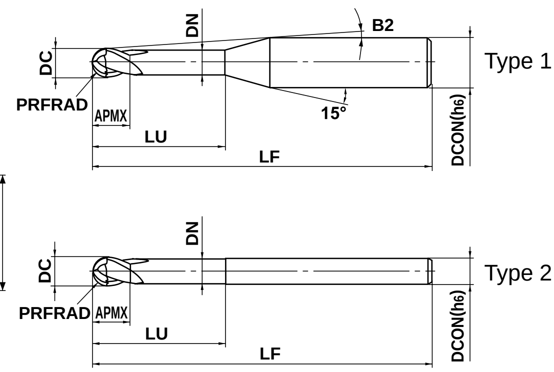
Ball nose end mill, Short cut length, 2 flute, Long neck

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
◎	◎	○		○	○		



Effective length for inclined angle





0.1≤PRFRAD≤3			
±0.005			
0.2≤DC≤6			
0 - 0.020			
4≤DCON≤6			
0 - 0.005			

h6

● 2 flute long neck ball nose end mill.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XLBR0010N005	0.1	0.2	0.2	0.5	0.17	14.1°	50	4	2	●	1	0.5	0.5	0.6	0.6
MS2XLBR0010N005S06	0.1	0.2	0.2	0.5	0.17	14.4°	50	6	2	●	1	0.5	0.5	0.6	0.6
MS2XLBR0010N008S06	0.1	0.2	0.2	0.8	0.17	14.1°	50	6	2	●	1	0.8	0.8	0.9	1
MS2XLBR0010N010	0.1	0.2	0.2	1	0.17	13.3°	50	4	2	●	1	1	1.1	1.2	1.3
MS2XLBR0010N010S06	0.1	0.2	0.2	1	0.17	13.8°	50	6	2	★	1	1	1.1	1.2	1.3
MS2XLBR0010N013	0.1	0.2	0.2	1.25	0.17	12.9°	50	4	2	★	1	1.3	1.3	1.5	1.6
MS2XLBR0010N013S06	0.1	0.2	0.2	1.25	0.17	13.6°	50	6	2	★	1	1.3	1.3	1.5	1.6
MS2XLBR0010N015	0.1	0.2	0.2	1.5	0.17	12.5°	50	4	2	●	1	1.5	1.6	1.7	1.9
MS2XLBR0010N015S06	0.1	0.2	0.2	1.5	0.17	13.3°	50	6	2	★	1	1.5	1.6	1.7	1.9
MS2XLBR0010N018	0.1	0.2	0.2	1.75	0.17	12.2°	50	4	2	★	1	1.8	1.9	2	2.2
MS2XLBR0010N018S06	0.1	0.2	0.2	1.75	0.17	13.1°	50	6	2	★	1	1.8	1.9	2	2.2
MS2XLBR0010N020	0.1	0.2	0.2	2	0.17	11.9°	50	4	2	★	1	2.1	2.2	2.3	2.5
MS2XLBR0010N020S06	0.1	0.2	0.2	2	0.17	12.8°	50	6	2	★	1	2.1	2.2	2.3	2.5
MS2XLBR0010N025	0.1	0.2	0.2	2.5	0.17	11.3°	50	4	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0010N030	0.1	0.2	0.2	3	0.17	10.7°	50	4	2	★	1	3.1	3.2	3.5	3.7
MS2XLBR0015N008S06	0.15	0.3	0.3	0.8	0.27	14.1°	50	6	2	●	1	0.8	0.8	0.9	1
MS2XLBR0015N010	0.15	0.3	0.3	1	0.27	13.3°	50	4	2	●	1	1	1.1	1.2	1.3
MS2XLBR0015N010S06	0.15	0.3	0.3	1	0.27	13.9°	50	6	2	★	1	1	1.1	1.2	1.3
MS2XLBR0015N012S06	0.15	0.3	0.3	1.2	0.27	13.7°	50	6	2	●	1	1.2	1.3	1.4	1.5
MS2XLBR0015N015	0.15	0.3	0.3	1.5	0.27	12.5°	50	4	2	★	1	1.5	1.6	1.7	1.9
MS2XLBR0015N015S06	0.15	0.3	0.3	1.5	0.27	13.3°	50	6	2	★	1	1.5	1.6	1.7	1.9
MS2XLBR0015N020	0.15	0.3	0.3	2	0.27	11.9°	50	4	2	●	1	2.1	2.2	2.3	2.5
MS2XLBR0015N020S06	0.15	0.3	0.3	2	0.27	12.8°	50	6	2	★	1	2.1	2.2	2.3	2.5
MS2XLBR0015N025	0.15	0.3	0.3	2.5	0.27	11.2°	50	4	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0015N030	0.15	0.3	0.3	3	0.27	10.7°	50	4	2	★	1	3.1	3.2	3.5	3.7
MS2XLBR0015N040	0.15	0.3	0.3	4	0.27	9.7°	50	4	2	★	1	4.2	4.3	4.6	5
MS2XLBR0020N010	0.2	0.4	0.4	1	0.36	13.4°	50	4	2	●	1	1	1	1.1	1.2
MS2XLBR0020N010S06	0.2	0.4	0.4	1	0.36	13.9°	50	6	2	★	1	1	1	1.1	1.2
MS2XLBR0020N012S06	0.2	0.4	0.4	1.2	0.36	13.7°	50	6	2	●	1	1.2	1.3	1.4	1.5
MS2XLBR0020N015	0.2	0.4	0.4	1.5	0.36	12.6°	50	4	2	★	1	1.5	1.6	1.7	1.8
MS2XLBR0020N015S06	0.2	0.4	0.4	1.5	0.36	13.4°	50	6	2	★	1	1.5	1.6	1.7	1.8

● : Inventory maintained. ★ : Inventory maintained in Japan.

MS2XLB

Ball nose end mill, Short cut length, 2 flute, Long neck

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
MS2XLBR0020N020	0.2	0.4	0.4	2	0.36	11.9°	50	4	2	●	1	2	2.1	2.3	2.5
MS2XLBR0020N020S06	0.2	0.4	0.4	2	0.36	12.8°	50	6	2	●	1	2	2.1	2.3	2.5
MS2XLBR0020N025	0.2	0.4	0.4	2.5	0.36	11.2°	50	4	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0020N025S06	0.2	0.4	0.4	2.5	0.36	12.4°	50	6	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0020N030	0.2	0.4	0.4	3	0.36	10.7°	50	4	2	●	1	3.1	3.2	3.4	3.7
MS2XLBR0020N030S06	0.2	0.4	0.4	3	0.36	11.9°	50	6	2	★	1	3.1	3.2	3.4	3.7
MS2XLBR0020N035	0.2	0.4	0.4	3.5	0.36	10.2°	50	4	2	★	1	3.6	3.7	4	4.3
MS2XLBR0020N040	0.2	0.4	0.4	4	0.36	9.7°	50	4	2	★	1	4.1	4.3	4.6	4.9
MS2XLBR0020N045	0.2	0.4	0.4	4.5	0.36	9.3°	50	4	2	★	1	4.7	4.8	5.2	5.6
MS2XLBR0020N050	0.2	0.4	0.4	5	0.36	8.9°	50	4	2	★	1	5.2	5.3	5.7	6.2
MS2XLBR0020N055	0.2	0.4	0.4	5.5	0.36	8.5°	50	4	2	★	1	5.7	5.9	6.3	6.8
MS2XLBR0020N060	0.2	0.4	0.4	6	0.36	8.2°	50	4	2	★	1	6.2	6.4	6.9	7.4
MS2XLBR0025N015	0.25	0.5	0.5	1.5	0.46	12.6°	50	4	2	★	1	1.5	1.6	1.7	1.8
MS2XLBR0025N015S06	0.25	0.5	0.5	1.5	0.46	13.4°	50	6	2	●	1	1.5	1.6	1.7	1.8
MS2XLBR0025N020	0.25	0.5	0.5	2	0.46	11.9°	50	4	2	●	1	2	2.1	2.3	2.4
MS2XLBR0025N020S06	0.25	0.5	0.5	2	0.46	12.9°	50	6	2	★	1	2	2.1	2.3	2.4
MS2XLBR0025N025	0.25	0.5	0.5	2.5	0.46	11.2°	50	4	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0025N025S06	0.25	0.5	0.5	2.5	0.46	12.4°	50	6	2	●	1	2.6	2.7	2.9	3.1
MS2XLBR0025N030	0.25	0.5	0.5	3	0.46	10.6°	50	4	2	★	1	3.1	3.2	3.4	3.7
MS2XLBR0025N030S06	0.25	0.5	0.5	3	0.46	11.9°	50	6	2	★	1	3.1	3.2	3.4	3.7
MS2XLBR0025N035	0.25	0.5	0.5	3.5	0.46	10.1°	50	4	2	★	1	3.6	3.7	4	4.3
MS2XLBR0025N035S06	0.25	0.5	0.5	3.5	0.46	11.5°	50	6	2	★	1	3.6	3.7	4	4.3
MS2XLBR0025N040	0.25	0.5	0.5	4	0.46	9.6°	50	4	2	●	1	4.1	4.3	4.6	4.9
MS2XLBR0025N040S06	0.25	0.5	0.5	4	0.46	11.1°	50	6	2	★	1	4.1	4.3	4.6	4.9
MS2XLBR0025N045	0.25	0.5	0.5	4.5	0.46	9.2°	50	4	2	★	1	4.6	4.8	5.2	5.6
MS2XLBR0025N045S06	0.25	0.5	0.5	4.5	0.46	10.7°	50	6	2	★	1	4.6	4.8	5.2	5.6
MS2XLBR0025N050	0.25	0.5	0.5	5	0.46	8.8°	50	4	2	★	1	5.2	5.3	5.7	6.2
MS2XLBR0025N050S06	0.25	0.5	0.5	5	0.46	10.4°	50	6	2	★	1	5.2	5.3	5.7	6.2
MS2XLBR0025N055	0.25	0.5	0.5	5.5	0.46	8.4°	50	4	2	★	1	5.7	5.9	6.3	6.8
MS2XLBR0025N055S06	0.25	0.5	0.5	5.5	0.46	10.1°	50	6	2	★	1	5.7	5.9	6.3	6.8
MS2XLBR0025N060	0.25	0.5	0.5	6	0.46	8.1°	50	4	2	●	1	6.2	6.4	6.9	7.4
MS2XLBR0025N060S06	0.25	0.5	0.5	6	0.46	9.7°	50	6	2	★	1	6.2	6.4	6.9	7.4
MS2XLBR0025N070	0.25	0.5	0.5	7	0.46	7.5°	50	4	2	★	1	7.2	7.5	8	8.7
MS2XLBR0025N070S06	0.25	0.5	0.5	7	0.46	9.2°	50	6	2	★	1	7.2	7.5	8	8.7
MS2XLBR0025N080	0.25	0.5	0.5	8	0.46	7°	50	4	2	●	1	8.3	8.5	9.2	9.9
MS2XLBR0025N080S06	0.25	0.5	0.5	8	0.46	8.7°	50	6	2	★	1	8.3	8.5	9.2	9.9
MS2XLBR0025N100	0.25	0.5	0.5	10	0.46	6.2°	50	4	2	●	1	10.3	10.7	11.5	12.4
MS2XLBR0025N100S06	0.25	0.5	0.5	10	0.46	7.8°	50	6	2	★	1	10.3	10.7	11.5	12.4
MS2XLBR0030N018S06	0.3	0.6	0.6	1.8	0.56	13°	50	6	2	●	1	1.9	1.9	2.1	2.3
MS2XLBR0030N020	0.3	0.6	0.6	2	0.56	11.8°	50	4	2	●	1	2.1	2.2	2.3	2.5
MS2XLBR0030N020S06	0.3	0.6	0.6	2	0.56	12.8°	50	6	2	★	1	2.1	2.2	2.3	2.5
MS2XLBR0030N025	0.3	0.6	0.6	2.5	0.56	11.1°	50	4	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0030N025S06	0.3	0.6	0.6	2.5	0.56	12.3°	50	6	2	★	1	2.6	2.7	2.9	3.1
MS2XLBR0030N030	0.3	0.6	0.6	3	0.56	10.5°	50	4	2	★	1	3.1	3.3	3.5	3.8
MS2XLBR0030N030S06	0.3	0.6	0.6	3	0.56	11.8°	50	6	2	●	1	3.1	3.3	3.5	3.8
MS2XLBR0030N035	0.3	0.6	0.6	3.5	0.56	10°	50	4	2	★	1	3.6	3.8	4.1	4.4
MS2XLBR0030N035S06	0.3	0.6	0.6	3.5	0.56	11.4°	50	6	2	★	1	3.6	3.8	4.1	4.4
MS2XLBR0030N040	0.3	0.6	0.6	4	0.56	9.5°	50	4	2	●	1	4.2	4.3	4.6	5
MS2XLBR0030N040S06	0.3	0.6	0.6	4	0.56	11°	50	6	2	★	1	4.2	4.3	4.6	5
MS2XLBR0030N045	0.3	0.6	0.6	4.5	0.56	9.1°	50	4	2	★	1	4.7	4.9	5.2	5.6
MS2XLBR0030N045S06	0.3	0.6	0.6	4.5	0.56	10.6°	50	6	2	★	1	4.7	4.9	5.2	5.6
MS2XLBR0030N050	0.3	0.6	0.6	5	0.56	8.7°	50	4	2	★	1	5.2	5.4	5.8	6.2

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
MS2XLBR0030N050S06	0.3	0.6	0.6	5	0.56	10.3°	50	6	2	★	1	5.2	5.4	5.8	6.2
MS2XLBR0030N060	0.3	0.6	0.6	6	0.56	8°	50	4	2	●	1	6.3	6.5	6.9	7.5
MS2XLBR0030N060S06	0.3	0.6	0.6	6	0.56	9.7°	50	6	2	★	1	6.3	6.5	6.9	7.5
MS2XLBR0030N070	0.3	0.6	0.6	7	0.56	7.4°	50	4	2	★	1	7.3	7.5	8.1	8.7
MS2XLBR0030N080	0.3	0.6	0.6	8	0.56	6.9°	50	4	2	●	1	8.3	8.6	9.2	10
MS2XLBR0030N080S06	0.3	0.6	0.6	8	0.56	8.6°	50	6	2	★	1	8.3	8.6	9.2	10
MS2XLBR0030N090	0.3	0.6	0.6	9	0.56	6.4°	50	4	2	★	1	9.4	9.7	10.4	11.2
MS2XLBR0030N100	0.3	0.6	0.6	10	0.56	6°	50	4	2	●	1	10.4	10.8	11.5	12.5
MS2XLBR0030N100S06	0.3	0.6	0.6	10	0.56	7.8°	50	6	2	★	1	10.4	10.8	11.5	12.5
MS2XLBR0030N110	0.3	0.6	0.6	11	0.56	5.7°	50	4	2	★	1	11.4	11.8	12.7	13.7
MS2XLBR0030N120	0.3	0.6	0.6	12	0.56	5.4°	50	4	2	★	1	12.5	12.9	13.8	15
MS2XLBR0040N020	0.4	0.8	0.8	2	0.76	11.7°	50	4	2	●	1	2.1	2.2	2.3	2.5
MS2XLBR0040N020S06	0.4	0.8	0.8	2	0.76	12.8°	50	6	2	★	1	2.1	2.2	2.3	2.5
MS2XLBR0040N024S06	0.4	0.8	0.8	2.4	0.76	12.4°	50	6	2	●	1	2.5	2.6	2.8	3
MS2XLBR0040N030	0.4	0.8	0.8	3	0.76	10.4°	50	4	2	★	1	3.1	3.3	3.5	3.7
MS2XLBR0040N030S06	0.4	0.8	0.8	3	0.76	11.8°	50	6	2	★	1	3.1	3.3	3.5	3.7
MS2XLBR0040N040	0.4	0.8	0.8	4	0.76	9.4°	50	4	2	●	1	4.2	4.3	4.6	5
MS2XLBR0040N040S06	0.4	0.8	0.8	4	0.76	11°	50	6	2	●	1	4.2	4.3	4.6	5
MS2XLBR0040N050	0.4	0.8	0.8	5	0.76	8.5°	50	4	2	★	1	5.2	5.4	5.8	6.2
MS2XLBR0040N060	0.4	0.8	0.8	6	0.76	7.8°	50	4	2	●	1	6.3	6.5	6.9	7.5
MS2XLBR0040N060S06	0.4	0.8	0.8	6	0.76	9.6°	50	6	2	★	1	6.3	6.5	6.9	7.5
MS2XLBR0040N070	0.4	0.8	0.8	7	0.76	7.2°	50	4	2	★	1	7.3	7.5	8.1	8.7
MS2XLBR0040N080	0.4	0.8	0.8	8	0.76	6.7°	50	4	2	●	1	8.3	8.6	9.2	10
MS2XLBR0040N080S06	0.4	0.8	0.8	8	0.76	8.5°	50	6	2	★	1	8.3	8.6	9.2	10
MS2XLBR0040N100	0.4	0.8	0.8	10	0.76	5.9°	50	4	2	●	1	10.4	10.8	11.5	12.4
MS2XLBR0040N100S06	0.4	0.8	0.8	10	0.76	7.7°	50	6	2	★	1	10.4	10.8	11.5	12.4
MS2XLBR0040N120	0.4	0.8	0.8	12	0.76	5.2°	50	4	2	★	1	12.5	12.9	13.8	14.9
MS2XLBR0050N030	0.5	1	1	3	0.94	10.1°	50	4	2	●	1	3.2	3.3	3.6	3.9
MS2XLBR0050N030S06	0.5	1	1	3	0.94	11.6°	50	6	2	●	1	3.2	3.3	3.6	3.9
MS2XLBR0050N040	0.5	1	1	4	0.94	9.1°	50	4	2	●	1	4.2	4.4	4.8	5.2
MS2XLBR0050N040S06	0.5	1	1	4	0.94	10.8°	50	6	2	★	1	4.2	4.4	4.8	5.2
MS2XLBR0050N050	0.5	1	1	5	0.94	8.2°	50	4	2	★	1	5.3	5.5	6	6.4
MS2XLBR0050N050S06	0.5	1	1	5	0.94	10.1°	50	6	2	●	1	5.3	5.5	6	6.4
MS2XLBR0050N060	0.5	1	1	6	0.94	7.5°	50	4	2	●	1	6.3	6.6	7.1	7.7
MS2XLBR0050N060S06	0.5	1	1	6	0.94	9.4°	50	6	2	★	1	6.3	6.6	7.1	7.7
MS2XLBR0050N070	0.5	1	1	7	0.94	6.9°	50	4	2	★	1	7.4	7.7	8.3	8.9
MS2XLBR0050N080	0.5	1	1	8	0.94	6.4°	50	4	2	●	1	8.4	8.8	9.4	10.2
MS2XLBR0050N080S06	0.5	1	1	8	0.94	8.3°	50	6	2	★	1	8.4	8.8	9.4	10.2
MS2XLBR0050N090	0.5	1	1	9	0.94	6°	50	4	2	★	1	9.5	9.9	10.6	11.4
MS2XLBR0050N100	0.5	1	1	10	0.94	5.6°	50	4	2	●	1	10.5	10.9	11.7	12.6
MS2XLBR0050N100S06	0.5	1	1	10	0.94	7.5°	50	6	2	★	1	10.5	10.9	11.7	12.6
MS2XLBR0050N120	0.5	1	1	12	0.94	5°	50	4	2	●	1	12.6	13.1	14	15.1
MS2XLBR0050N120S06	0.5	1	1	12	0.94	6.8°	55	6	2	★	1	12.6	13.1	14	15.1
MS2XLBR0050N140	0.5	1	1	14	0.94	4.5°	50	4	2	●	1	14.7	15.2	16.3	17.6
MS2XLBR0050N160	0.5	1	1	16	0.94	4.1°	55	4	2	●	1	16.8	17.4	18.6	20.1
MS2XLBR0050N160S06	0.5	1	1	16	0.94	5.7°	60	6	2	★	1	16.8	17.4	18.6	20.1
MS2XLBR0050N180	0.5	1	1	18	0.94	3.7°	55	4	2	●	1	18.9	19.5	20.9	22.6
MS2XLBR0050N200	0.5	1	1	20	0.94	3.4°	55	4	2	●	1	20.9	21.6	23.2	25.1
MS2XLBR0050N200S06	0.5	1	1	20	0.94	5°	60	6	2	★	1	20.9	21.6	23.2	25.1
MS2XLBR0060N036S06	0.6	1.2	1.2	3.6	1.14	11.1°	50	6	2	●	1	3.8	4	4.3	4.7
MS2XLBR0060N060	0.6	1.2	1.2	6	1.14	7.3°	50	4	2	★	1	6.3	6.6	7.1	7.6
MS2XLBR0060N060S06	0.6	1.2	1.2	6	1.14	9.3°	50	6	2	●	1	6.3	6.6	7.1	7.6

MS2XLB

Ball nose end mill, Short cut length, 2 flute, Long neck

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
MS2XLBR0060N080	0.6	1.2	1.2	8	1.14	6.2°	50	4	2	●	1	8.4	8.8	9.4	10.1
MS2XLBR0060N080S06	0.6	1.2	1.2	8	1.14	8.2°	50	6	2	★	1	8.4	8.8	9.4	10.1
MS2XLBR0060N100	0.6	1.2	1.2	10	1.14	5.4°	50	4	2	★	1	10.5	10.9	11.7	12.6
MS2XLBR0060N100S06	0.6	1.2	1.2	10	1.14	7.4°	50	6	2	★	1	10.5	10.9	11.7	12.6
MS2XLBR0060N120	0.6	1.2	1.2	12	1.14	4.8°	50	4	2	●	1	12.6	13.1	14	15.1
MS2XLBR0060N120S06	0.6	1.2	1.2	12	1.14	6.7°	55	6	2	★	1	12.6	13.1	14	15.1
MS2XLBR0060N140	0.6	1.2	1.2	14	1.14	4.3°	50	4	2	★	1	14.7	15.2	16.3	17.6
MS2XLBR0060N160	0.6	1.2	1.2	16	1.14	3.9°	55	4	2	★	1	16.8	17.3	18.6	20.1
MS2XLBR0060N160S06	0.6	1.2	1.2	16	1.14	5.6°	60	6	2	★	1	16.8	17.3	18.6	20.1
MS2XLBR0060N180	0.6	1.2	1.2	18	1.14	3.5°	55	4	2	★	1	18.8	19.5	20.9	22.6
MS2XLBR0060N240	0.6	1.2	1.2	24	1.14	2.8°	65	4	2	★	1	25.1	25.9	27.8	⋆
MS2XLBR0070N080	0.7	1.4	1.4	8	1.34	6°	50	4	2	●	1	8.4	8.8	9.4	10.1
MS2XLBR0070N120	0.7	1.4	1.4	12	1.34	4.6°	50	4	2	●	1	12.6	13.1	14	15.1
MS2XLBR0070N160	0.7	1.4	1.4	16	1.34	3.7°	55	4	2	●	1	16.8	17.3	18.6	20.1
MS2XLBR0075N045S06	0.75	1.5	1.5	4.5	1.44	10.2°	50	6	2	●	1	4.7	5	5.4	5.7
MS2XLBR0075N060	0.75	1.5	1.5	6	1.44	7°	50	4	2	●	1	6.3	6.6	7.1	7.6
MS2XLBR0075N060S06	0.75	1.5	1.5	6	1.44	9.2°	50	6	2	★	1	6.3	6.6	7.1	7.6
MS2XLBR0075N075S06	0.75	1.5	1.5	7.5	1.44	8.3°	50	6	2	●	1	7.9	8.2	8.8	9.5
MS2XLBR0075N080	0.75	1.5	1.5	8	1.44	5.9°	50	4	2	●	1	8.4	8.8	9.4	10.1
MS2XLBR0075N080S06	0.75	1.5	1.5	8	1.44	8.1°	50	6	2	★	1	8.4	8.8	9.4	10.1
MS2XLBR0075N100	0.75	1.5	1.5	10	1.44	5.1°	50	4	2	●	1	10.5	10.9	11.7	12.6
MS2XLBR0075N100S06	0.75	1.5	1.5	10	1.44	7.2°	50	6	2	★	1	10.5	10.9	11.7	12.6
MS2XLBR0075N120	0.75	1.5	1.5	12	1.44	4.4°	50	4	2	●	1	12.6	13.1	14	15.1
MS2XLBR0075N120S06	0.75	1.5	1.5	12	1.44	6.5°	55	6	2	★	1	12.6	13.1	14	15.1
MS2XLBR0075N140	0.75	1.5	1.5	14	1.44	4°	50	4	2	●	1	14.7	15.2	16.3	17.6
MS2XLBR0075N140S06	0.75	1.5	1.5	14	1.44	5.9°	55	6	2	★	1	14.7	15.2	16.3	17.6
MS2XLBR0075N160	0.75	1.5	1.5	16	1.44	3.6°	55	4	2	●	1	16.8	17.3	18.6	20
MS2XLBR0075N160S06	0.75	1.5	1.5	16	1.44	5.4°	60	6	2	★	1	16.8	17.3	18.6	20
MS2XLBR0075N180	0.75	1.5	1.5	18	1.44	3.3°	55	4	2	●	1	18.8	19.5	20.9	22.5
MS2XLBR0075N200	0.75	1.5	1.5	20	1.44	3°	55	4	2	●	1	20.9	21.6	23.2	⋆
MS2XLBR0075N200S06	0.75	1.5	1.5	20	1.44	4.6°	60	6	2	★	1	20.9	21.6	23.2	25
MS2XLBR0075N220	0.75	1.5	1.5	22	1.44	2.8°	60	4	2	★	1	23	23.8	25.5	⋆
MS2XLBR0075N300	0.75	1.5	1.5	30	1.44	2.1°	70	4	2	★	1	31.2	32.3	34.7	⋆
MS2XLBR0080N080	0.8	1.6	1.6	8	1.54	5.8°	50	4	2	●	1	8.4	8.8	9.4	10.1
MS2XLBR0080N120	0.8	1.6	1.6	12	1.54	4.3°	50	4	2	●	1	12.6	13.1	14	15.1
MS2XLBR0080N160	0.8	1.6	1.6	16	1.54	3.5°	55	4	2	●	1	16.8	17.3	18.6	20
MS2XLBR0080N200	0.8	1.6	1.6	20	1.54	2.9°	55	4	2	●	1	20.9	21.6	23.2	⋆
MS2XLBR0090N080	0.9	1.8	1.8	8	1.74	5.5°	50	4	2	●	1	8.4	8.8	9.4	10.1
MS2XLBR0090N120	0.9	1.8	1.8	12	1.74	4.1°	50	4	2	●	1	12.6	13	14	15
MS2XLBR0090N160	0.9	1.8	1.8	16	1.74	3.3°	55	4	2	●	1	16.8	17.3	18.6	20
MS2XLBR0090N200	0.9	1.8	1.8	20	1.74	2.7°	55	4	2	●	1	20.9	21.6	23.2	⋆
MS2XLBR0100N040	1	2	2	4	1.9	8.2°	50	4	2	●	1	4.1	4.3	4.6	4.9
MS2XLBR0100N040S06	1	2	2	4	1.9	10.6°	50	6	2	★	1	4.1	4.3	4.6	4.9
MS2XLBR0100N060	1	2	2	6	1.9	6.4°	50	4	2	●	1	6.2	6.5	6.9	7.4
MS2XLBR0100N060S06	1	2	2	6	1.9	9°	50	6	2	●	1	6.2	6.5	6.9	7.4
MS2XLBR0100N080	1	2	2	8	1.9	5.3°	50	4	2	●	1	8.3	8.7	9.2	9.9
MS2XLBR0100N080S06	1	2	2	8	1.9	7.8°	50	6	2	★	1	8.3	8.7	9.2	9.9
MS2XLBR0100N100	1	2	2	10	1.9	4.5°	50	4	2	●	1	10.4	10.8	11.5	12.4
MS2XLBR0100N100S06	1	2	2	10	1.9	6.9°	50	6	2	●	1	10.4	10.8	11.5	12.4
MS2XLBR0100N120	1	2	2	12	1.9	3.9°	50	4	2	●	1	12.5	12.9	13.8	14.9
MS2XLBR0100N120S06	1	2	2	12	1.9	6.1°	55	6	2	★	1	12.5	12.9	13.8	14.9
MS2XLBR0100N140	1	2	2	14	1.9	3.4°	50	4	2	●	1	14.6	15.1	16.1	17.4

⋆ No interference

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
MS2XLBR0100N140S06	1	2	2	14	1.9	5.6°	55	6	2	★	1	14.6	15.1	16.1	17.4
MS2XLBR0100N160	1	2	2	16	1.9	3.1°	55	4	2	●	1	16.7	17.2	18.4	19.9
MS2XLBR0100N160S06	1	2	2	16	1.9	5.1°	60	6	2	★	1	16.7	17.2	18.4	19.9
MS2XLBR0100N180	1	2	2	18	1.9	2.8°	55	4	2	●	1	18.7	19.4	20.7	*
MS2XLBR0100N180S06	1	2	2	18	1.9	4.7°	60	6	2	★	1	18.7	19.4	20.7	22.3
MS2XLBR0100N200	1	2	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23	*
MS2XLBR0100N200S06	1	2	2	20	1.9	4.3°	60	6	2	★	1	20.8	21.5	23	24.8
MS2XLBR0100N220	1	2	2	22	1.9	2.3°	60	4	2	●	1	22.9	23.6	25.3	*
MS2XLBR0100N250	1	2	2	25	1.9	2.1°	65	4	2	●	1	26	26.8	28.8	*
MS2XLBR0100N250S06	1	2	2	25	1.9	3.7°	65	6	2	★	1	26	26.8	28.8	31
MS2XLBR0100N300	1	2	2	30	1.9	1.8°	70	4	2	●	1	31.1	32.2	*	*
MS2XLBR0100N300S06	1	2	2	30	1.9	3.2°	70	6	2	★	1	31.1	32.2	34.5	37.3
MS2XLBR0100N350	1	2	2	35	1.9	1.6°	70	4	2	★	1	36.3	37.5	*	*
MS2XLBR0100N350S06	1	2	2	35	1.9	2.8°	80	6	2	★	1	36.3	37.5	40.3	*
MS2XLBR0125N060S06	1.25	2.5	2.5	6	2.4	8.6°	50	6	2	★	1	6.2	6.5	6.9	7.4
MS2XLBR0125N075S06	1.25	2.5	2.5	7.5	2.4	7.7°	50	6	2	●	1	7.8	8.1	8.6	9.2
MS2XLBR0125N100S06	1.25	2.5	2.5	10	2.4	6.5°	50	6	2	★	1	10.4	10.8	11.5	12.3
MS2XLBR0125N125S06	1.25	2.5	2.5	12.5	2.4	5.6°	50	6	2	●	1	13	13.5	14.4	15.4
MS2XLBR0125N160S06	1.25	2.5	2.5	16	2.4	4.7°	60	6	2	★	1	16.7	17.2	18.4	19.8
MS2XLBR0125N200S06	1.25	2.5	2.5	20	2.4	4°	60	6	2	★	1	20.8	21.5	23	24.8
MS2XLBR0125N250S06	1.25	2.5	2.5	25	2.4	3.3°	65	6	2	★	1	26	26.8	28.7	31
MS2XLBR0125N300S06	1.25	2.5	2.5	30	2.4	2.9°	70	6	2	★	1	31.1	32.2	34.5	*
MS2XLBR0125N350S06	1.25	2.5	2.5	35	2.4	2.5°	80	6	2	★	1	36.3	37.5	40.2	*
MS2XLBR0150N080	1.5	3	3	8	2.9	7°	60	6	2	●	1	8.3	8.6	9.2	9.8
MS2XLBR0150N100	1.5	3	3	10	2.9	6°	60	6	2	●	1	10.4	10.8	11.5	12.3
MS2XLBR0150N120	1.5	3	3	12	2.9	5.3°	60	6	2	●	1	12.5	12.9	13.8	14.8
MS2XLBR0150N140	1.5	3	3	14	2.9	4.7°	60	6	2	★	1	14.6	15	16.1	17.3
MS2XLBR0150N160	1.5	3	3	16	2.9	4.3°	60	6	2	●	1	16.6	17.2	18.4	19.7
MS2XLBR0150N200	1.5	3	3	20	2.9	3.6°	70	6	2	●	1	20.8	21.5	23	24.7
MS2XLBR0150N250	1.5	3	3	25	2.9	3°	70	6	2	●	1	26	26.8	28.7	*
MS2XLBR0150N300	1.5	3	3	30	2.9	2.6°	70	6	2	●	1	31.1	32.2	34.5	*
MS2XLBR0150N350	1.5	3	3	35	2.9	2.2°	80	6	2	●	1	36.3	37.5	40.2	*
MS2XLBR0150N400	1.5	3	3	40	2.9	2°	90	6	2	★	1	41.5	42.9	*	*
MS2XLBR0200N100	2	4	4	10	3.9	4.8°	70	6	2	●	1	10.4	10.7	11.4	12.2
MS2XLBR0200N120	2	4	4	12	3.9	4.1°	70	6	2	●	1	12.5	12.9	13.7	14.6
MS2XLBR0200N140	2	4	4	14	3.9	3.6°	70	6	2	★	1	14.6	15	16	17.1
MS2XLBR0200N160	2	4	4	16	3.9	3.2°	70	6	2	●	1	16.6	17.1	18.3	19.6
MS2XLBR0200N200	2	4	4	20	3.9	2.7°	70	6	2	●	1	20.8	21.4	22.9	*
MS2XLBR0200N250	2	4	4	25	3.9	2.2°	70	6	2	●	1	25.9	26.8	28.6	*
MS2XLBR0200N300	2	4	4	30	3.9	1.8°	70	6	2	●	1	31.1	32.1	*	*
MS2XLBR0200N350	2	4	4	35	3.9	1.6°	80	6	2	●	1	36.3	37.5	*	*
MS2XLBR0200N400	2	4	4	40	3.9	1.4°	90	6	2	●	1	41.4	42.8	*	*
MS2XLBR0200N450	2	4	4	45	3.9	1.3°	90	6	2	●	1	46.6	48.2	*	*
MS2XLBR0200N500	2	4	4	50	3.9	1.2°	100	6	2	●	1	51.8	53.5	*	*
MS2XLBR0250N200	2.5	5	5	20	4.9	1.5°	70	6	2	●	1	20.7	21.4	*	*
MS2XLBR0250N250	2.5	5	5	25	4.9	1.2°	70	6	2	●	1	25.9	26.7	*	*
MS2XLBR0250N300	2.5	5	5	30	4.9	1°	80	6	2	●	1	31.1	*	*	*
MS2XLBR0250N350	2.5	5	5	35	4.9	0.9°	80	6	2	●	1	36.3	*	*	*
MS2XLBR0300N300	3	6	6	30	5.85	—	80	6	2	●	2	*	*	*	*
MS2XLBR0300N500	3	6	6	50	5.85	—	120	6	2	●	2	*	*	*	*

* No interference

MS2XLB

Ball nose end mill, Short cut length, 2 flute, Long neck

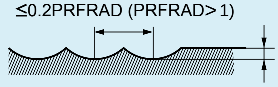
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45—55HRC) AISI H13 etc.			
PRFRAD (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)
R 0.1	0.5	50000	400	15.7	0.003	50000	320	12.6	0.003
	1	50000	400	15.7	0.002	50000	320	12.6	0.002
	1.5	40000	300	11.8	0.001	40000	240	9.4	0.001
	2	40000	200	7.9	0.001	40000	160	6.3	0.001
	2.5	40000	100	3.9	0.001	40000	80	3.1	0.001
	3	30000	50	2.0	0.001	30000	40	1.6	0.001
R 0.15	1	50000	600	23.6	0.007	50000	480	18.9	0.007
	1.5	50000	600	23.6	0.005	50000	480	18.9	0.005
	2	50000	600	23.6	0.003	50000	480	18.9	0.003
	2.5	40000	400	15.7	0.003	40000	320	12.6	0.003
	3	40000	300	11.8	0.002	40000	240	9.4	0.002
	4	30000	200	7.9	0.002	30000	160	6.3	0.002
R 0.2	1	50000	1800	70.9	0.015	50000	1400	55.1	0.015
	2	50000	1300	51.2	0.01	50000	1000	39.4	0.01
	3	50000	900	35.4	0.005	50000	700	27.6	0.005
	4	40000	600	23.6	0.004	40000	480	18.9	0.004
	5	40000	400	15.7	0.003	40000	320	12.6	0.003
	6	30000	200	7.9	0.002	30000	160	6.3	0.002
R 0.25	2	50000	2500	98.4	0.02	50000	2000	78.7	0.02
	3	50000	1500	59.1	0.015	50000	1200	47.2	0.015
	4	45000	1200	47.2	0.01	45000	950	37.4	0.01
	5	45000	900	35.4	0.007	45000	700	27.6	0.007
	6	36000	600	23.6	0.006	36000	480	18.9	0.006
	7	32000	400	15.7	0.005	32000	320	12.6	0.005
	8	32000	300	11.8	0.003	32000	240	9.4	0.003
	10	26000	200	7.9	0.002	26000	160	6.3	0.002
R 0.3	2	50000	3500	137.8	0.03	50000	2800	110.2	0.03
	3	50000	3500	137.8	0.03	50000	2800	110.2	0.03
	4	44000	2500	98.4	0.02	44000	2000	78.7	0.02
	5	37000	1200	47.2	0.01	37000	950	37.4	0.01
	6	37000	1000	39.4	0.008	37000	800	31.5	0.008
	7	35000	750	29.5	0.008	35000	600	23.6	0.008
	8	35000	600	23.6	0.006	35000	480	18.9	0.006
	9	30000	500	19.7	0.004	30000	400	15.7	0.004
	10	30000	500	19.7	0.003	30000	400	15.7	0.003
	11	22000	300	11.8	0.002	22000	240	9.4	0.002
	12	22000	200	7.9	0.002	22000	160	6.3	0.002
R 0.4	2	50000	4400	173.2	0.04	50000	3500	137.8	0.04
	3	50000	4000	157.5	0.04	50000	3200	126.0	0.04
	4	50000	4000	157.5	0.02	50000	3200	126.0	0.02
	5	35000	2400	94.5	0.02	35000	1900	74.8	0.02
	6	35000	2400	94.5	0.02	35000	1900	74.8	0.02
	7	30000	1500	59.1	0.015	30000	1200	47.2	0.015
	8	30000	1500	59.1	0.01	30000	1200	47.2	0.01
	10	30000	700	27.6	0.008	30000	560	22.0	0.008
	12	22000	500	19.7	0.006	22000	400	15.7	0.006
R 0.5	3	40000	4000	157.5	0.05	44000	3200	126.0	0.05
	4	40000	4000	157.5	0.05	44000	3200	126.0	0.05
	6	35000	3000	118.1	0.03	35000	2400	94.5	0.03
	8	30000	2000	78.7	0.02	30000	1600	63.0	0.02

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45—55HRC) AISI H13 etc.			
PRFRAD (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)
R 0.5	10	20000	1000	39.4	0.01	20000	800	31.5	0.01
	12	20000	1000	39.4	0.01	20000	800	31.5	0.01
	14	18000	600	23.6	0.008	18000	480	18.9	0.008
	16	18000	500	19.7	0.008	18000	400	15.7	0.008
	18	13000	300	11.8	0.005	13000	240	9.4	0.005
	20	13000	250	9.8	0.005	13000	200	7.9	0.005
R 0.6	3.6	40000	4400	173.2	0.06	40000	3500	137.8	0.06
	6	40000	4400	173.2	0.04	40000	3500	137.8	0.04
	8	40000	4000	157.5	0.04	40000	3200	126.0	0.04
	10	27000	1900	74.8	0.02	27000	1500	59.1	0.02
	12	16000	1400	55.1	0.02	16000	1100	43.3	0.02
	18	15000	700	27.6	0.008	15000	560	22.0	0.008
	24	11000	300	11.8	0.006	11000	240	9.4	0.006
R 0.75	6	40000	6000	236.2	0.07	36000	4300	169.3	0.07
	8	40000	6000	236.2	0.07	36000	4300	169.3	0.07
	10	40000	5000	196.9	0.06	36000	3600	141.7	0.06
	12	32000	3400	133.9	0.04	29000	2400	94.5	0.04
	16	15000	1400	55.1	0.03	15000	1100	43.3	0.03
	20	12000	900	35.4	0.02	12000	720	28.3	0.02
	30	9000	400	15.7	0.01	9000	320	12.6	0.01
R 1	4	40000	8000	315.0	0.1	32000	5000	196.9	0.1
	6	40000	8000	315.0	0.1	32000	5000	196.9	0.1
	8	40000	6000	236.2	0.1	32000	3800	149.6	0.1
	10	40000	5000	196.9	0.08	32000	3200	126.0	0.08
	12	40000	5000	196.9	0.08	32000	3200	126.0	0.08
	16	32000	3500	137.8	0.05	26000	2200	86.6	0.05
	20	10000	1000	39.4	0.04	10000	800	31.5	0.04
	25	10000	1000	39.4	0.04	10000	800	31.5	0.04
	30	10000	800	31.5	0.02	10000	640	25.2	0.02
	35	10000	600	23.6	0.02	10000	480	18.9	0.02
R 1.5	8	32000	7000	275.6	0.15	26000	4500	177.2	0.15
	10	32000	7000	275.6	0.15	26000	4500	177.2	0.15
	16	32000	5000	196.9	0.1	26000	3200	126.0	0.1
	20	27000	3800	149.6	0.1	22000	2400	94.5	0.1
	25	21000	2700	106.3	0.08	17000	1700	66.9	0.08
	30	6000	700	27.6	0.08	6000	560	22.0	0.08
	35	6000	700	27.6	0.06	6000	560	22.0	0.06
	40	6000	600	23.6	0.04	6000	480	18.9	0.04
R 2	10	24000	6000	236.2	0.2	19000	3800	149.6	0.2
	20	24000	3800	149.6	0.15	19000	2400	94.5	0.15
	30	20000	3000	118.1	0.1	16000	1900	74.8	0.1
	40	12000	1700	66.9	0.1	12000	1400	55.1	0.1
	50	8000	1000	39.4	0.05	8000	800	31.5	0.05
R 2.5	20	22000	6000	236.2	0.2	18000	3800	149.6	0.2
	25	22000	4400	173.2	0.2	18000	2800	110.2	0.2
	30	22000	3800	149.6	0.15	18000	2400	94.5	0.15
	35	22000	3600	141.7	0.1	18000	2300	90.6	0.1
R 3	30	20000	6000	236.2	0.2	16000	3800	149.6	0.2
	50	20000	3000	118.1	0.15	16000	1900	74.8	0.15

Depth of cut	≤0.1PRFRAD (PRFRAD≤1) ≤0.2PRFRAD (PRFRAD>1)



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

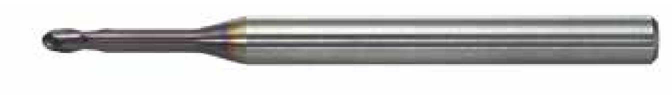
SOLID END MILLS

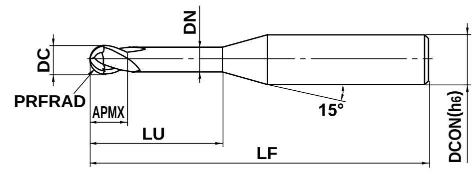
MS2XLB – Inch sizes

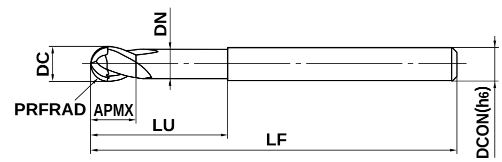
Ball nose, 2 flute, Long neck

UWC MS 30°

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







.0078"≤PRFRAD≤.1250"				
±.0004"				
.0156"≤DC≤.2500"				
0 - .0008"				
DCON=.1250"	DCON=.1875"	DCON=.2500"		
0 - .00024"	0 - .00031"	0 - .00035"		

● 2 flute, long neck, ball nose end mill for general purpose.

Unit : inch

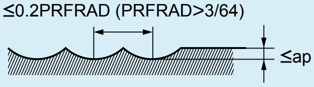
Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS2XLBD1/64N0094	.00781	.0156	.01563	.0938	.0144	2.0	.1250	2	●	1
MS2XLB**D1/64N0125**	.00781	.0156	.01563	.1250	.0144	2.0	.1250	2	●	1
MS2XLB**D1/64N0187**	.00781	.0156	.01563	.1875	.0144	2.0	.1250	2	●	1
MS2XLB**D1/32N0187**	.01563	.0313	.03125	.1875	.0301	2.0	.1250	2	●	1
MS2XLB**D1/32N0250**	.01563	.0313	.03125	.2500	.0301	2.0	.1250	2	●	1
MS2XLB**D1/32N0375**	.01563	.0313	.03125	.3750	.0301	2.0	.1250	2	●	1
MS2XLB**D1/16N0375**	.03125	.0625	.0625	.3750	.0601	2.0	.1250	2	●	1
MS2XLB**D1/16N0500**	.03125	.0625	.0625	.5000	.0601	2.0	.1250	2	●	1
MS2XLB**D1/16N0750**	.03125	.0625	.0625	.7500	.0601	2.0	.1250	2	●	1
MS2XLB**D3/32N0562**	.04688	.0938	.09375	.5625	.0898	2.0	.1250	2	●	1
MS2XLB**D3/32N0750**	.04688	.0938	.09375	.7500	.0898	2.0	.1250	2	●	1
MS2XLB**D3/32N1125**	.04688	.0938	.09375	1.1250	.0898	2.5	.1250	2	●	1
MS2XLB**D1/8N0750**	.06250	.1250	.1250	.7500	.1211	2.0	.1250	2	●	2
MS2XLB**D3/16N1125**	.09375	.1875	.1875	1.1250	.1836	2.5	.1875	2	●	2
MS2XLB**D1/4N1500**	.12500	.2500	.2500	1.5000	.2441	3.0	.2500	2	●	2

● : Inventory maintained.

MS2XLB – Inch sizes

Ball nose, 2 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

Work material		Hardened steel (45—55HRC) AISI H13 etc.		
PRFRAD (inch)	**LU** (inch)	Revolution (min^{-1})	Table feed (IPM)	Depth of cut ap (inch)
.0078	.0938	40000	21.2	.0002
	.1290	30000	17.7	.0002
	.1875	20000	10.6	.0001
.0156	.1875	40000	70.8	.0008
	.2500	25000	44.3	.0008
	.3750	15000	26.6	.0004
.0313	.3750	40000	113.4	.0028
	.5000	30000	85.1	.0016
	.7500	10000	28.4	.0008
.0469	.5625	40000	141.8	.003
	.7500	20000	70.8	.002
	1.1250	10000	35.5	.001
.0625	.7500	30000	124.0	.004
.0938	1.1250	20000	106.3	.006
.1250	1.5000	15000	106.3	.008
Depth of cut		≤0.1PRFRAD (PRFRAD≤3/64) ≤0.2PRFRAD (PRFRAD>3/64) 		

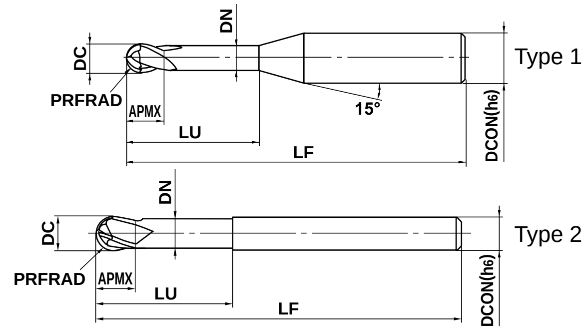
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

MS4XLB – Inch sizes

Ball nose, 4 flute, Long neck

UWC MS 20° DC<3/16 30° DC=1/4

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
◎	◎	○		○	○		



R					
	±.0004"				
	0 - .0008"				
	DCON=.1250"	DCON=.1875"	DCON=.2500"		
h6	0 - .00024"	0 - .00031"	0 - .00035"		

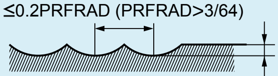
● 4 flute, long neck, ball nose end mill for general purpose.

Unit : inch

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
MS4XLBD1/16N0375	.03125	.0625	.0625	.3750	.0601	2.0	.1250	4	●	1
MS4XLBD1/16N0500	.03125	.0625	.0625	.5000	.0601	2.0	.1250	4	●	1
MS4XLBD1/16N0750	.03125	.0625	.0625	.7500	.0601	2.0	.1250	4	●	1
MS4XLBD3/32N0562	.04688	.0938	.0938	.5625	.0898	2.0	.1250	4	●	1
MS4XLBD3/32N0750	.04688	.0938	.0938	.7500	.0898	2.0	.1250	4	●	1
MS4XLBD3/32N1125	.04688	.0938	.0938	1.1250	.0898	2.5	.1250	4	●	1
MS4XLBD1/8N0750	.06250	.1250	.1250	.7500	.1211	2.0	.1250	4	●	2
MS4XLBD3/16N1125	.09375	.1875	.1875	1.1250	.1836	2.5	.1875	4	●	2
MS4XLBD1/4N1500	.1250	.2500	.2500	1.5000	.2441	3.0	.2500	4	●	2

RECOMMENDED CUTTING CONDITIONS

Work material		Hardened steel (45−55HRC) AISI H13 etc.		
PRFRAD (inch)	LU (inch)	Revolution (min^{-1})	Table feed (IPM)	Depth of cut ap (inch)
.0313	.3750	40000	151.2	.0028
	.5000	30000	113.4	.0016
	.7500	10000	37.8	.0008
.0156	.5625	40000	189.0	.003
	.7500	20000	94.4	.002
	1.1250	10000	47.3	.001
.0625	.7500	30000	165.4	.004
.0938	1.1250	20000	141.7	.006
.1250	1.5000	15000	141.7	.008
Depth of cut		≤0.1PRFRAD (PRFRAD≤3/64) ≤0.2PRFRAD (PRFRAD>3/64)		



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

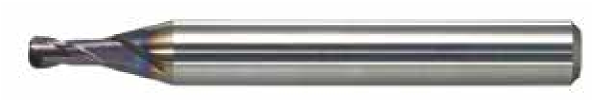
● : Inventory maintained.

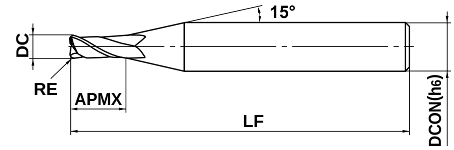
MS2MRB

Corner radius end mill, Medium cut length, 2 flute

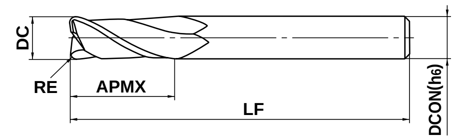
UWC MS 30° DC<3 DC≥3

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
◎	◎	○		○	○		





Type 1



Type 2

1≦DC≦12				
0 - 0.020				

h6

4≦DCON≦6	8≦DCON≦10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

- 2 flute corner radius end mill for general use.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2MRBD0100R010	1	0.1	2	40	4	2	★	1
MS2MRBD0100R020	1	0.2	2	40	4	2	●	1
MS2MRBD0100R030	1	0.3	2	40	4	2	●	1
MS2MRBD0150R010	1.5	0.1	3	40	4	2	★	1
MS2MRBD0150R020	1.5	0.2	3	40	4	2	●	1
MS2MRBD0150R030	1.5	0.3	3	40	4	2	●	1
MS2MRBD0150R050	1.5	0.5	3	40	4	2	●	1
MS2MRBD0200R010	2	0.1	4	40	4	2	★	1
MS2MRBD0200R020	2	0.2	4	40	4	2	●	1
MS2MRBD0200R030	2	0.3	4	40	4	2	●	1
MS2MRBD0200R050	2	0.5	4	40	4	2	●	1
MS2MRBD0250R010	2.5	0.1	5	40	4	2	★	1
MS2MRBD0250R020	2.5	0.2	5	40	4	2	●	1
MS2MRBD0250R030	2.5	0.3	5	40	4	2	●	1
MS2MRBD0250R050	2.5	0.5	5	40	4	2	●	1
MS2MRBD0300R010	3	0.1	6	50	6	2	★	1
MS2MRBD0300R020	3	0.2	6	50	6	2	●	1
MS2MRBD0300R030	3	0.3	6	50	6	2	●	1
MS2MRBD0300R050	3	0.5	6	50	6	2	●	1
MS2MRBD0300R100	3	1	6	50	6	2	●	1
MS2MRBD0400R010	4	0.1	8	50	6	2	★	1
MS2MRBD0400R020	4	0.2	8	50	6	2	●	1
MS2MRBD0400R030	4	0.3	8	50	6	2	●	1
MS2MRBD0400R050	4	0.5	8	50	6	2	●	1
MS2MRBD0400R100	4	1	8	50	6	2	●	1
MS2MRBD0500R010	5	0.1	10	50	6	2	★	1
MS2MRBD0500R020	5	0.2	10	50	6	2	●	1
MS2MRBD0500R030	5	0.3	10	50	6	2	●	1
MS2MRBD0500R050	5	0.5	10	50	6	2	●	1
MS2MRBD0500R100	5	1	10	50	6	2	●	1
MS2MRBD0600R010	6	0.1	12	50	6	2	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
MS2MRBD0600R020	6	0.2	12	50	6	2	●	2
MS2MRBD0600R030	6	0.3	12	50	6	2	●	2
MS2MRBD0600R050	6	0.5	12	50	6	2	●	2
MS2MRBD0600R100	6	1	12	50	6	2	●	2
MS2MRBD0600R150	6	1.5	12	50	6	2	●	2
MS2MRBD0600R200	6	2	12	50	6	2	●	2
MS2MRBD0800R020	8	0.2	16	60	8	2	★	2
MS2MRBD0800R030	8	0.3	16	60	8	2	★	2
MS2MRBD0800R050	8	0.5	16	60	8	2	★	2
MS2MRBD0800R100	8	1	16	60	8	2	★	2
MS2MRBD0800R150	8	1.5	16	60	8	2	★	2
MS2MRBD0800R200	8	2	16	60	8	2	★	2
MS2MRBD0800R250	8	2.5	16	60	8	2	★	2
MS2MRBD0800R300	8	3	16	60	8	2	★	2
MS2MRBD1000R020	10	0.2	20	70	10	2	★	2
MS2MRBD1000R030	10	0.3	20	70	10	2	★	2
MS2MRBD1000R050	10	0.5	20	70	10	2	★	2
MS2MRBD1000R100	10	1	20	70	10	2	★	2
MS2MRBD1000R150	10	1.5	20	70	10	2	★	2
MS2MRBD1000R200	10	2	20	70	10	2	★	2
MS2MRBD1000R250	10	2.5	20	70	10	2	★	2
MS2MRBD1000R300	10	3	20	70	10	2	★	2
MS2MRBD1200R020	12	0.2	24	75	12	2	★	2
MS2MRBD1200R030	12	0.3	24	75	12	2	★	2
MS2MRBD1200R050	12	0.5	24	75	12	2	★	2
MS2MRBD1200R100	12	1	24	75	12	2	★	2
MS2MRBD1200R150	12	1.5	24	75	12	2	★	2
MS2MRBD1200R200	12	2	24	75	12	2	★	2
MS2MRBD1200R250	12	2.5	24	75	12	2	★	2
MS2MRBD1200R300	12	3	24	75	12	2	★	2

MS2MRB

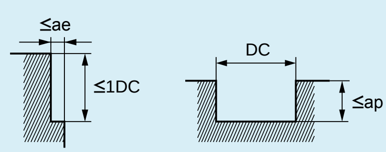
Corner radius end mill, Medium cut length, 2 flute

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)
0.1	40000	40	1.6	0.001	40000	40	1.6	0.001
0.2	40000	100	3.9	0.002	40000	100	3.9	0.002
0.3	40000	200	7.9	0.005	40000	200	7.9	0.005
0.4	40000	600	23.6	0.01	40000	600	23.6	0.01
0.5	40000	1000	39.4	0.015	40000	960	37.8	0.015
0.6	40000	1200	47.2	0.02	40000	1200	47.2	0.02
0.7	40000	1400	55.1	0.02	40000	1400	55.1	0.02
0.8	40000	1600	63.0	0.03	40000	1600	63.0	0.03
0.9	40000	1800	70.9	0.04	40000	1600	63.0	0.04
1	40000	2000	78.7	0.06	32000	1600	63.0	0.06
1.5	40000	3000	118.1	0.12	32000	1900	74.8	0.08
2	30000	3000	118.1	0.18	24000	1900	74.8	0.10
2.5	24000	2600	102.4	0.25	19000	1600	63.0	0.13
3	20000	2300	90.6	0.30	16000	1400	55.1	0.15
4	15000	2000	78.7	0.40	12000	1200	47.2	0.20
5	12000	1600	63.0	0.50	9000	900	35.4	0.25
6	10000	1400	55.1	0.60	7000	700	27.6	0.30
8	8000	1000	39.4	0.80	5600	550	21.7	0.40
10	6400	900	35.4	1.00	4500	500	19.7	0.50
12	5400	820	32.3	1.00	3800	450	17.7	0.50
16	2400	380	15.0	≤3	1200	100	3.9	≤0.8
20	1900	320	12.6	≤4	1000	80	3.1	≤1

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) In case of slotting with over 3 mm endmill, please reduce revolution to 50−70% of above value, and reduce feed rate to 40−60% of above value.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

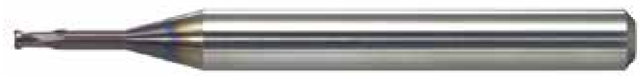
SOLID END MILLS

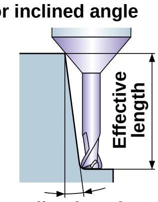
MS2XLRB

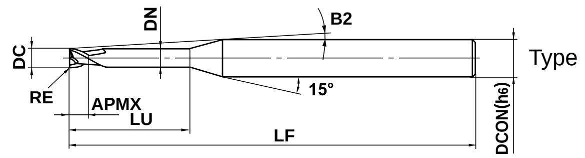
Corner radius end mill, Short cut length, 2 flute, Long neck

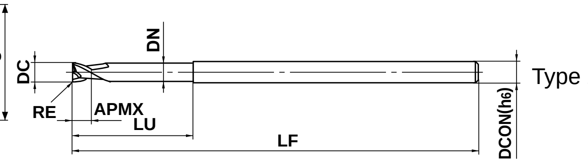
DC<3 DC≥3

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
◎	◎	○		○	○		









1≤DC≤6			
0 - 0.020			
DCON=6			
0 - 0.008			

h6

● 2 flute long neck corner radius end mill.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XLRBD0100R010N020	1	0.1	1	2	0.94	12.3°	60	6	2	●	1	2.1	2.3	2.4	2.8
MS2XLRBD0100R010N050	1	0.1	1	5	0.94	9.8°	60	6	2	●	1	5.3	5.6	6.0	6.5
MS2XLRBD0200R010N040	2	0.1	2	4	1.90	9.9°	60	6	2	●	1	4.2	4.4	4.8	5.2
MS2XLRBD0200R010N100	2	0.1	2	10	1.90	6.5°	60	6	2	●	1	10.5	10.9	11.7	12.6
MS2XLRBD0200R030N040	2	0.3	2	4	1.90	10°	60	6	2	●	1	4.2	4.4	4.7	5.1
MS2XLRBD0200R030N100	2	0.3	2	10	1.90	6.6°	60	6	2	●	1	10.5	10.8	11.6	12.6
MS2XLRBD0300R010N060	3	0.1	3	6	2.90	7.4°	50	6	2	●	1	6.3	6.6	7.1	7.6
MS2XLRBD0300R010N150	3	0.1	3	15	2.90	4.2°	60	6	2	●	1	15.7	16.2	17.4	18.8
MS2XLRBD0300R030N060	3	0.3	3	6	2.90	7.5°	50	6	2	●	1	6.3	6.6	7.0	7.6
MS2XLRBD0300R030N150	3	0.3	3	15	2.90	4.2°	60	6	2	●	1	15.7	16.2	17.4	18.8
MS2XLRBD0400R010N080	4	0.1	4	8	3.90	4.9°	50	6	2	●	1	8.4	8.7	9.4	10.1
MS2XLRBD0400R010N200	4	0.1	4	20	3.90	2.5°	60	6	2	●	1	20.8	21.6	23.2	⋆
MS2XLRBD0400R030N080	4	0.3	4	8	3.90	5°	50	6	2	●	1	8.4	8.7	9.3	10.1
MS2XLRBD0400R030N200	4	0.3	4	20	3.90	2.5°	60	6	2	●	1	20.8	21.5	23.1	⋆
MS2XLRBD0400R050N080	4	0.5	4	8	3.90	5°	50	6	2	●	1	8.4	8.7	9.3	10.0
MS2XLRBD0400R050N200	4	0.5	4	20	3.90	2.5°	60	6	2	●	1	20.8	21.5	23.1	⋆
MS2XLRBD0600R010N120	6	0.1	6	12	5.85	—	50	6	2	●	1	⋆	⋆	⋆	⋆
MS2XLRBD0600R010N300	6	0.1	6	30	5.85	—	70	6	2	●	1	⋆	⋆	⋆	⋆
MS2XLRBD0600R030N120	6	0.3	6	12	5.85	—	50	6	2	●	1	⋆	⋆	⋆	⋆
MS2XLRBD0600R030N300	6	0.3	6	30	5.85	—	70	6	2	●	1	⋆	⋆	⋆	⋆
MS2XLRBD0600R050N120	6	0.5	6	12	5.85	—	50	6	2	●	2	⋆	⋆	⋆	⋆
MS2XLRBD0600R050N300	6	0.5	6	30	5.85	—	70	6	2	●	2	⋆	⋆	⋆	⋆

⋆ No interference

● : Inventory maintained.

MS2XLRB

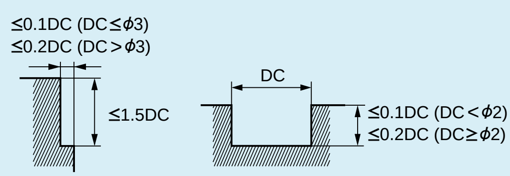
Corner radius end mill, Short cut length, 2 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

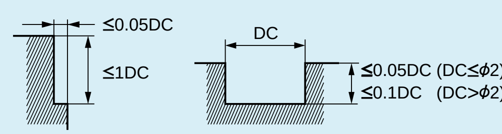
Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	**LU** (mm)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
1	2	(2DC)	30000	600	23.6	20000	400	15.7	18000	300	11.8	15000	120	4.7
2	4	(2DC)	15000	600	23.6	10000	400	15.7	9100	300	11.8	8000	120	4.7
3	6	(2DC)	10000	600	23.6	7000	400	15.7	6000	300	11.8	5000	120	4.7
4	8	(2DC)	7500	600	23.6	5200	400	15.7	4500	300	11.8	4000	120	4.7
6	12	(2DC)	5000	600	23.6	3500	400	15.7	3000	300	11.8	2700	120	4.7
1	5	(5DC)	22000	350	13.8	17000	280	11.0	14000	200	7.9	12000	100	3.9
2	10	(5DC)	11000	350	13.8	8800	280	11.0	7200	200	7.9	6400	100	3.9
3	15	(5DC)	7400	350	13.8	5800	280	11.0	4800	200	7.9	4200	100	3.9
4	20	(5DC)	5600	350	13.8	4400	280	11.0	3600	200	7.9	3200	100	3.9
6	30	(5DC)	3700	350	13.8	2900	280	11.0	2400	200	7.9	2100	100	3.9

Depth of cut

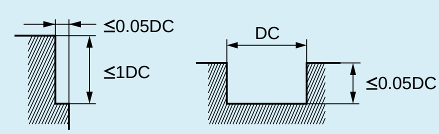
(LU=2DC)



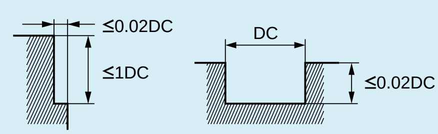
(LU=2DC)



(LU=5DC)



(LU=5DC)



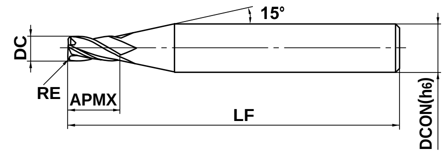
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.

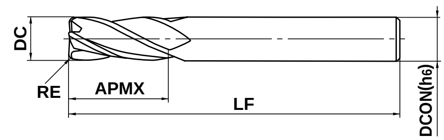
MS4MRB

Corner radius end mill, Medium cut length, 4 flute

UWC MS 30°

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
◎	◎	○		○	○		





	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 4 flute corner radius end mill for general use.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4MRBD0300R010	3	0.1	8	45	6	4	★	1
MS4MRBD0300R020	3	0.2	8	45	6	4	★	1
MS4MRBD0300R030	3	0.3	8	45	6	4	★	1
MS4MRBD0300R050	3	0.5	8	45	6	4	★	1
MS4MRBD0300R100	3	1	8	45	6	4	★	1
MS4MRBD0400R010	4	0.1	11	45	6	4	★	1
MS4MRBD0400R020	4	0.2	11	45	6	4	★	1
MS4MRBD0400R030	4	0.3	11	45	6	4	★	1
MS4MRBD0400R050	4	0.5	11	45	6	4	★	1
MS4MRBD0400R100	4	1	11	45	6	4	★	1
MS4MRBD0500R010	5	0.1	13	50	6	4	★	1
MS4MRBD0500R020	5	0.2	13	50	6	4	★	1
MS4MRBD0500R030	5	0.3	13	50	6	4	★	1
MS4MRBD0500R050	5	0.5	13	50	6	4	★	1
MS4MRBD0500R100	5	1	13	50	6	4	★	1
MS4MRBD0600R010	6	0.1	13	50	6	4	★	2
MS4MRBD0600R020	6	0.2	13	50	6	4	★	2
MS4MRBD0600R030	6	0.3	13	50	6	4	★	2
MS4MRBD0600R050	6	0.5	13	50	6	4	★	2
MS4MRBD0600R100	6	1	13	50	6	4	★	2
MS4MRBD0600R150	6	1.5	13	50	6	4	★	2
MS4MRBD0600R200	6	2	13	50	6	4	★	2
MS4MRBD0800R020	8	0.2	19	60	8	4	★	2
MS4MRBD0800R030	8	0.3	19	60	8	4	★	2
MS4MRBD0800R050	8	0.5	19	60	8	4	★	2
MS4MRBD0800R100	8	1	19	60	8	4	★	2
MS4MRBD0800R150	8	1.5	19	60	8	4	★	2
MS4MRBD0800R200	8	2	19	60	8	4	★	2
MS4MRBD0800R250	8	2.5	19	60	8	4	★	2
MS4MRBD0800R300	8	3	19	60	8	4	★	2
MS4MRBD1000R020	10	0.2	22	70	10	4	★	2

★ : Inventory maintained in Japan.

MS4MRB

Corner radius end mill, Medium cut length, 4 flute

Unit : mm

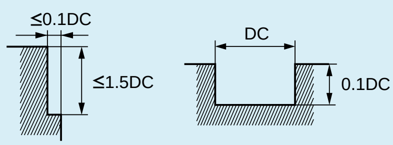
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
MS4MRBD1000R030	10	0.3	22	70	10	4	★	2
MS4MRBD1000R050	10	0.5	22	70	10	4	★	2
MS4MRBD1000R100	10	1	22	70	10	4	★	2
MS4MRBD1000R150	10	1.5	22	70	10	4	★	2
MS4MRBD1000R200	10	2	22	70	10	4	★	2
MS4MRBD1000R250	10	2.5	22	70	10	4	★	2
MS4MRBD1000R300	10	3	22	70	10	4	★	2
MS4MRBD1200R020	12	0.2	26	75	12	4	★	2
MS4MRBD1200R030	12	0.3	26	75	12	4	★	2
MS4MRBD1200R050	12	0.5	26	75	12	4	★	2
MS4MRBD1200R100	12	1	26	75	12	4	★	2
MS4MRBD1200R150	12	1.5	26	75	12	4	★	2
MS4MRBD1200R200	12	2	26	75	12	4	★	2
MS4MRBD1200R250	12	2.5	26	75	12	4	★	2
MS4MRBD1200R300	12	3	26	75	12	4	★	2
MS4MRBD1600R050	16	0.5	32	90	16	4	★	2
MS4MRBD1600R100	16	1	32	90	16	4	★	2
MS4MRBD1600R150	16	1.5	32	90	16	4	★	2
MS4MRBD1600R200	16	2	32	90	16	4	★	2
MS4MRBD1600R250	16	2.5	32	90	16	4	★	2
MS4MRBD1600R300	16	3	32	90	16	4	★	2
MS4MRBD2000R050	20	0.5	38	100	20	4	★	2
MS4MRBD2000R100	20	1	38	100	20	4	★	2
MS4MRBD2000R150	20	1.5	38	100	20	4	★	2
MS4MRBD2000R200	20	2	38	100	20	4	★	2
MS4MRBD2000R250	20	2.5	38	100	20	4	★	2
MS4MRBD2000R300	20	3	38	100	20	4	★	2

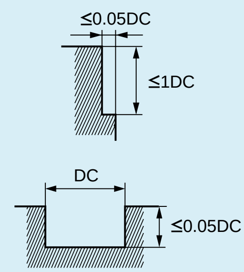
★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)		(mm/min)	(IPM)		(mm/min)	(IPM)		(mm/min)	(IPM)
3	16000	1500	59.1	10000	800	31.5	7400	480	18.9	8000	240	9.4
4	12000	1800	70.9	8000	1000	39.4	5600	600	23.6	6000	240	9.4
5	9600	1800	70.9	6400	1000	39.4	4400	600	23.6	4800	240	9.4
6	8000	1800	70.9	5300	1000	39.4	3700	600	23.6	4000	240	9.4
8	6000	1600	63.0	4000	900	35.4	2800	560	22.0	3000	240	9.4
10	4800	1400	55.1	3200	800	31.5	2200	500	19.7	2400	240	9.4
12	4000	1200	47.2	2700	700	27.6	1800	430	16.9	2000	230	9.1
16	3000	960	37.8	2000	560	22.0	1400	360	14.2	1500	190	7.5
20	2400	800	31.5	1600	480	18.9	1100	300	11.8	1200	170	6.7

Depth of cut





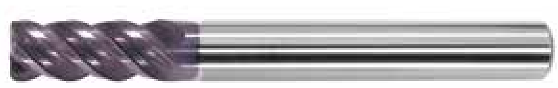
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below of the above value.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

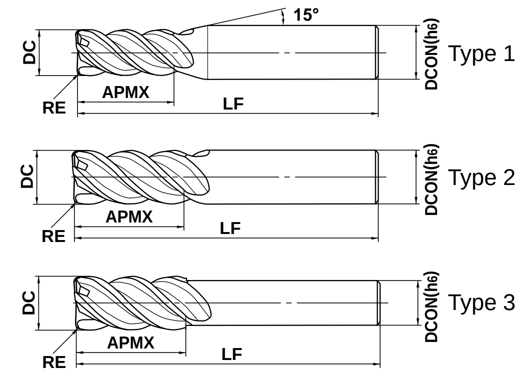
MSMHDRB

High power, Corner radius, Medium cut length, 4 flute

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
◎	◎	◎		◎	◎		

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS





R				
0.2≤RE≤6.35				
±0.020				
DC≤12	DC>12			
0 - 0.020	0 - 0.030			
4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- 4 flute high power corner radius end mill.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
MSMHDRBD0200R020	2	0.2	4	45	4	4	★	1
MSMHDRB**D0200R030**	2	0.3	4	45	4	4	★	1
MSMHDRB**D0300R020**	3	0.2	8	45	6	4	★	1
MSMHDRB**D0300R030**	3	0.3	8	45	6	4	★	1
MSMHDRB**D0300R050**	3	0.5	8	45	6	4	★	1
MSMHDRB**D0400R020**	4	0.2	11	45	6	4	★	1
MSMHDRB**D0400R030**	4	0.3	11	45	6	4	★	1
MSMHDRB**D0400R050**	4	0.5	11	45	6	4	★	1
MSMHDRB**D0500R020**	5	0.2	13	50	6	4	★	1
MSMHDRB**D0500R030**	5	0.3	13	50	6	4	★	1
MSMHDRB**D0500R050**	5	0.5	13	50	6	4	★	1
MSMHDRB**D0500R100**	5	1	13	50	6	4	★	1
MSMHDRB**D0600R030**	6	0.3	13	50	6	4	★	2
MSMHDRB**D0600R050**	6	0.5	13	50	6	4	★	2
MSMHDRB**D0600R100**	6	1	13	50	6	4	★	2
MSMHDRB**D0800R030**	8	0.3	19	60	8	4	★	2
MSMHDRB**D0800R050**	8	0.5	19	60	8	4	★	2
MSMHDRB**D0800R100**	8	1	19	60	8	4	★	2
MSMHDRB**D0800R150**	8	1.5	19	60	8	4	★	2
MSMHDRB**D1000R030**	10	0.3	22	70	10	4	★	2
MSMHDRB**D1000R050**	10	0.5	22	70	10	4	★	2
MSMHDRB**D1000R100**	10	1	22	70	10	4	★	2
MSMHDRB**D1000R150**	10	1.5	22	70	10	4	★	2
MSMHDRB**D1000R200**	10	2	22	70	10	4	★	2
MSMHDRB**D1200R050S10**	12	0.5	26	75	10	4	★	3
MSMHDRB**D1200R100S10**	12	1	26	75	10	4	★	3
MSMHDRB**D1200R150S10**	12	1.5	26	75	10	4	★	3
MSMHDRB**D1200R200S10**	12	2	26	75	10	4	★	3
MSMHDRB**D1200R300S10**	12	3	26	75	10	4	★	3
MSMHDRB**D1200R050**	12	0.5	26	75	12	4	★	2
MSMHDRB**D1200R100**	12	1	26	75	12	4	★	2

★ : Inventory maintained in Japan.

Unit : mm

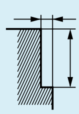
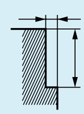
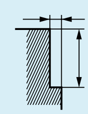
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
MSMHDRBD1200R150	12	1.5	26	75	12	4	★	2
MSMHDRBD1200R200	12	2	26	75	12	4	★	2
MSMHDRBD1200R300	12	3	26	75	12	4	★	2
MSMHDRBD1600R100	16	1	35	90	16	4	★	2
MSMHDRBD1600R150	16	1.5	35	90	16	4	★	2
MSMHDRBD1600R200	16	2	35	90	16	4	★	2
MSMHDRBD1600R300	16	3	35	90	16	4	★	2
MSMHDRBD1600R500	16	5	35	90	16	4	★	2
MSMHDRBD1800R100	18	1	40	100	16	4	★	3
MSMHDRBD1800R150	18	1.5	40	100	16	4	★	3
MSMHDRBD1800R200	18	2	40	100	16	4	★	3
MSMHDRBD1800R300	18	3	40	100	16	4	★	3
MSMHDRBD2000R100	20	1	45	110	20	4	★	2
MSMHDRBD2000R150	20	1.5	45	110	20	4	★	2
MSMHDRBD2000R200	20	2	45	110	20	4	★	2
MSMHDRBD2000R300	20	3	45	110	20	4	★	2
MSMHDRBD2000R500	20	5	45	110	20	4	★	2
MSMHDRBD2000R635	20	6.35	45	110	20	4	★	2

MSMHDRB

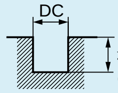
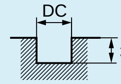
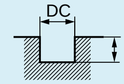
High power, Corner radius, Medium cut length, 4 flute

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	15000	550	21.7	10000	340	13.4	10000	320	12.6	6400	160	6.3	4800	100	3.9
3	11000	800	31.5	7400	500	19.7	7400	480	18.9	4800	250	9.8	4000	170	6.7
4	8000	900	35.4	5600	540	21.3	5600	520	20.5	3600	270	10.6	3200	240	9.4
5	6400	1000	39.4	4500	600	23.6	4500	580	22.8	2900	300	11.8	2600	240	9.4
6	5900	1100	43.3	3700	640	25.2	3700	600	23.6	2400	320	12.6	2100	230	9.1
8	4400	1100	43.3	2800	660	26.0	2800	600	23.6	1800	330	13.0	1600	220	8.7
10	3500	1000	39.4	2300	640	25.2	2300	560	22.0	1400	320	12.6	1300	200	7.9
12	2900	1000	39.4	1900	640	25.2	1900	530	20.9	1200	320	12.6	1100	170	6.7
16	2200	800	31.5	1400	500	19.7	1400	450	17.7	900	250	9.8	800	130	5.1
18	2000	800	31.5	1250	480	18.9	1250	450	17.7	800	240	9.4	640	100	3.9
20	1800	750	29.5	1100	460	18.1	1100	440	17.3	720	230	9.1	510	80	3.1
Depth of cut	 ≤0.2DC ≤1.5DC						 ≤0.1DC ≤1.5DC			 ≤0.05DC ≤1.5DC					

Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	12000	400	15.7	7000	200	7.9	7000	100	3.9	4200	80	3.1	2300	40	1.6
3	9000	600	23.6	5300	300	11.8	5300	150	5.9	3200	130	5.1	1900	70	2.8
4	7200	720	28.3	4000	360	14.2	4000	180	7.1	2400	140	5.5	1400	95	3.7
5	5800	720	28.3	3200	360	14.2	3200	180	7.1	1900	150	5.9	1100	95	3.7
6	5000	800	31.5	2700	400	15.7	2700	200	7.9	1600	160	6.3	950	95	3.7
8	3700	800	31.5	2000	400	15.7	2000	200	7.9	1200	170	6.7	720	90	3.5
10	3000	720	28.3	1600	360	14.2	1600	180	7.1	960	160	6.3	570	80	3.1
12	2500	600	23.6	1300	290	11.4	1300	150	5.9	800	140	5.5	480	70	2.8
16	2000	480	18.9	1000	230	9.1	1000	120	4.7	600	110	4.3	360	50	2.0
18	1800	460	18.1	900	210	8.3	900	110	4.3	550	110	4.3	290	40	1.6
20	1600	430	16.9	800	200	7.9	800	100	3.9	480	100	3.9	230	35	1.4
Depth of cut	DC  ≤1DC (MAX. 12mm)						DC  ≤0.5DC			DC  ≤0.2DC					

1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

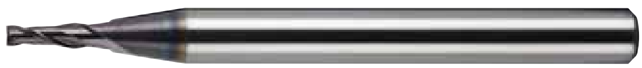
MS2MT

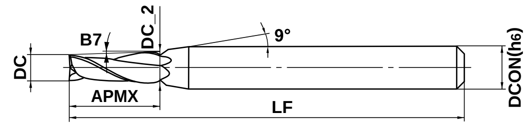
Taper end mill, Medium cut length, 2 flute

UWC MS 30°

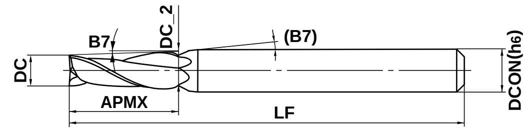
DC<0.4 DC≥0.4

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
◎	◎	○		○	○		

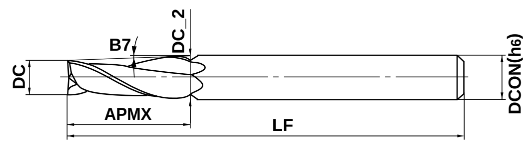




Type 1



Type 2



Type 3

DC tolerance	DC<0.5	DC≥0.5			
	0 - 0.020	0 - 0.030			
Angle tolerance					
	±5'				
h6	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16		
	0 - 0.008	0 - 0.009	0 - 0.011		

● 2 flute taper end mill for general use.

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS2MTD0020T0030	0.2	30'	0.8	0.21	45	4	2	★	1
MS2MTD0020T0100	0.2	1°	0.8	0.23	45	4	2	★	1
MS2MTD0020T0130	0.2	1° 30'	0.8	0.24	45	4	2	★	1
MS2MTD0020T0200	0.2	2°	0.8	0.26	45	4	2	★	1
MS2MTD0020T0300	0.2	3°	0.8	0.28	45	4	2	★	1
MS2MTD0020T0400	0.2	4°	0.8	0.31	45	4	2	★	1
MS2MTD0020T0500	0.2	5°	0.8	0.34	45	4	2	★	1
MS2MTD0020T0700	0.2	7°	0.8	0.4	45	4	2	★	1
MS2MTD0020T1000	0.2	10°	0.8	0.48	45	4	2	★	2
MS2MTD0030T0030	0.3	30'	1.2	0.32	45	4	2	★	1
MS2MTD0030T0100	0.3	1°	1.2	0.34	45	4	2	★	1
MS2MTD0030T0130	0.3	1° 30'	1.2	0.36	45	4	2	★	1
MS2MTD0030T0200	0.3	2°	1.2	0.38	45	4	2	★	1
MS2MTD0030T0300	0.3	3°	1.2	0.43	45	4	2	★	1
MS2MTD0030T0400	0.3	4°	1.2	0.47	45	4	2	★	1
MS2MTD0030T0500	0.3	5°	1.2	0.51	45	4	2	★	1
MS2MTD0030T0700	0.3	7°	1.2	0.59	45	4	2	★	1
MS2MTD0030T1000	0.3	10°	1.2	0.72	45	4	2	★	2
MS2MTD0040T0030	0.4	30'	1.6	0.43	45	4	2	★	1
MS2MTD0040T0100	0.4	1°	1.6	0.46	45	4	2	★	1
MS2MTD0040T0130	0.4	1° 30'	1.6	0.48	45	4	2	★	1
MS2MTD0040T0200	0.4	2°	1.6	0.51	45	4	2	★	1
MS2MTD0040T0300	0.4	3°	1.6	0.57	45	4	2	★	1
MS2MTD0040T0400	0.4	4°	1.6	0.62	45	4	2	★	1
MS2MTD0040T0500	0.4	5°	1.6	0.68	45	4	2	★	1
MS2MTD0040T0700	0.4	7°	1.6	0.79	45	4	2	★	1
MS2MTD0040T1000	0.4	10°	1.6	0.96	45	4	2	★	2
MS2MTD0050T0030	0.5	30'	2	0.53	45	4	2	★	1
MS2MTD0050T0100	0.5	1°	2	0.57	45	4	2	★	1
MS2MTD0050T0130	0.5	1° 30'	2	0.6	45	4	2	★	1
MS2MTD0050T0200	0.5	2°	2	0.64	45	4	2	★	1

★ : Inventory maintained in Japan.

MS2MT

Taper end mill, Medium cut length, 2 flute

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS2MTD0050T0300	0.5	3°	2	0.71	45	4	2	★	1
MS2MTD0050T0400	0.5	4°	2	0.78	45	4	2	★	1
MS2MTD0050T0500	0.5	5°	2	0.85	45	4	2	★	1
MS2MTD0050T0700	0.5	7°	2	0.99	45	4	2	★	1
MS2MTD0050T1000	0.5	10°	2	1.21	45	4	2	★	2
MS2MTD0060T0030	0.6	30'	2	0.63	45	4	2	★	1
MS2MTD0060T0100	0.6	1°	2	0.67	45	4	2	★	1
MS2MTD0060T0130	0.6	1° 30'	2	0.7	45	4	2	★	1
MS2MTD0060T0200	0.6	2°	2	0.74	45	4	2	★	1
MS2MTD0060T0230	0.6	2° 30'	2	0.77	45	4	2	★	1
MS2MTD0060T0300	0.6	3°	2	0.81	45	4	2	★	1
MS2MTD0060T0400	0.6	4°	2	0.88	45	4	2	★	1
MS2MTD0060T0500	0.6	5°	2	0.95	45	4	2	★	1
MS2MTD0060T0700	0.6	7°	2	1.09	45	4	2	★	1
MS2MTD0060T1000	0.6	10°	2	1.31	45	4	2	★	2
MS2MTD0070T0030	0.7	30'	2	0.73	45	4	2	★	1
MS2MTD0070T0100	0.7	1°	2	0.77	45	4	2	★	1
MS2MTD0070T0130	0.7	1° 30'	2	0.8	45	4	2	★	1
MS2MTD0070T0200	0.7	2°	2	0.84	45	4	2	★	1
MS2MTD0070T0300	0.7	3°	2	0.91	45	4	2	★	1
MS2MTD0070T0400	0.7	4°	2	0.98	45	4	2	★	1
MS2MTD0070T0500	0.7	5°	2	1.05	45	4	2	★	1
MS2MTD0070T0700	0.7	7°	2	1.19	45	4	2	★	1
MS2MTD0070T1000	0.7	10°	2	1.41	45	4	2	★	2
MS2MTD0080T0030	0.8	30'	3	0.85	45	4	2	★	1
MS2MTD0080T0100	0.8	1°	3	0.9	45	4	2	★	1
MS2MTD0080T0130	0.8	1° 30'	3	0.96	45	4	2	★	1
MS2MTD0080T0200	0.8	2°	3	1.01	45	4	2	★	1
MS2MTD0080T0230	0.8	2° 30'	3	1.06	45	4	2	★	1
MS2MTD0080T0300	0.8	3°	3	1.11	45	4	2	★	1
MS2MTD0080T0400	0.8	4°	3	1.22	45	4	2	★	1
MS2MTD0080T0500	0.8	5°	3	1.32	45	4	2	★	1
MS2MTD0080T0700	0.8	7°	3	1.54	45	4	2	★	1
MS2MTD0080T1000	0.8	10°	3	1.86	45	4	2	★	2
MS2MTD0090T0030	0.9	30'	3	0.95	45	4	2	★	1
MS2MTD0090T0100	0.9	1°	3	1	45	4	2	★	1
MS2MTD0090T0130	0.9	1° 30'	3	1.06	45	4	2	★	1
MS2MTD0090T0200	0.9	2°	3	1.11	45	4	2	★	1
MS2MTD0090T0300	0.9	3°	3	1.21	45	4	2	★	1
MS2MTD0090T0400	0.9	4°	3	1.32	45	4	2	★	1
MS2MTD0090T0500	0.9	5°	3	1.42	45	4	2	★	1
MS2MTD0090T0700	0.9	7°	3	1.64	45	4	2	★	1
MS2MTD0090T1000	0.9	10°	3	1.96	45	4	2	★	2
MS2MTD0100T0030	1	30'	4	1.07	45	4	2	★	1
MS2MTD0100T0100	1	1°	4	1.14	45	4	2	★	1
MS2MTD0100T0130	1	1° 30'	4	1.21	45	4	2	★	1
MS2MTD0100T0200	1	2°	4	1.28	45	4	2	★	1
MS2MTD0100T0230	1	2° 30'	4	1.35	45	4	2	★	1
MS2MTD0100T0300	1	3°	4	1.42	45	4	2	★	1
MS2MTD0100T0400	1	4°	4	1.56	45	4	2	★	1
MS2MTD0100T0500	1	5°	4	1.7	45	4	2	★	1

★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS2MTD0100T0700	1	7°	4	1.98	45	4	2	★	1
MS2MTD0100T1000	1	10°	4	2.41	45	4	2	★	2
MS2MTD0150T0030	1.5	30'	5	1.59	45	4	2	★	1
MS2MTD0150T0100	1.5	1°	5	1.67	45	4	2	★	1
MS2MTD0150T0130	1.5	1° 30'	5	1.76	45	4	2	★	1
MS2MTD0150T0200	1.5	2°	5	1.85	45	4	2	★	1
MS2MTD0150T0230	1.5	2° 30'	5	1.94	45	4	2	★	1
MS2MTD0150T0300	1.5	3°	5	2.02	45	4	2	★	1
MS2MTD0150T0400	1.5	4°	5	2.2	45	4	2	★	1
MS2MTD0150T0500	1.5	5°	5	2.37	45	4	2	★	1
MS2MTD0150T0700	1.5	7°	5	2.73	45	4	2	★	1
MS2MTD0150T1000	1.5	10°	5	3.26	45	4	2	★	2
MS2MTD0200T0030	2	30'	6	2.1	45	4	2	★	1
MS2MTD0200T0100	2	1°	6	2.21	45	4	2	★	1
MS2MTD0200T0130	2	1° 30'	6	2.31	45	4	2	★	1
MS2MTD0200T0200	2	2°	6	2.42	45	4	2	★	1
MS2MTD0200T0230	2	2° 30'	6	2.52	45	4	2	★	1
MS2MTD0200T0300	2	3°	6	2.63	45	4	2	★	1
MS2MTD0200T0400	2	4°	6	2.84	45	4	2	★	1
MS2MTD0200T0500	2	5°	6	3.05	45	4	2	★	1
MS2MTD0200T0700	2	7°	6	3.47	45	4	2	★	2
MS2MTD0200T1000	2	10°	6	4.12	50	6	2	★	2
MS2MTD0250T0030	2.5	30'	8	2.64	45	4	2	★	1
MS2MTD0250T0100	2.5	1°	8	2.78	45	4	2	★	1
MS2MTD0250T0130	2.5	1° 30'	8	2.92	45	4	2	★	1
MS2MTD0250T0200	2.5	2°	8	3.06	45	4	2	★	1
MS2MTD0250T0230	2.5	2° 30'	8	3.2	45	4	2	★	1
MS2MTD0250T0300	2.5	3°	8	3.34	45	4	2	★	1
MS2MTD0250T0400	2.5	4°	8	3.62	45	4	2	★	2
MS2MTD0250T0500	2.5	5°	8	3.9	45	4	2	★	2
MS2MTD0250T0700	2.5	7°	8	4.46	50	4	2	★	3
MS2MTD0250T1000	2.5	10°	8	5.32	50	6	2	★	2
MS2MTD0300T0030	3	30'	10	3.17	50	6	2	★	1
MS2MTD0300T0100	3	1°	10	3.35	50	6	2	★	1
MS2MTD0300T0130	3	1° 30'	10	3.52	50	6	2	★	1
MS2MTD0300T0200	3	2°	10	3.7	50	6	2	★	1
MS2MTD0300T0300	3	3°	10	4.05	50	6	2	★	1
MS2MTD0300T0400	3	4°	10	4.4	50	6	2	★	1
MS2MTD0300T0500	3	5°	10	4.75	50	6	2	★	1
MS2MTD0300T0700	3	7°	10	5.46	50	6	2	★	2
MS2MTD0300T1000	3	10°	10	6.53	50	6	2	★	3
MS2MTD0400T0030	4	30'	15	4.26	50	6	2	★	1
MS2MTD0400T0100	4	1°	15	4.52	50	6	2	★	1
MS2MTD0400T0130	4	1° 30'	15	4.79	50	6	2	★	1
MS2MTD0400T0200	4	2°	15	5.05	50	6	2	★	1
MS2MTD0400T0300	4	3°	15	5.57	50	6	2	★	1
MS2MTD0400T0400	4	4°	15	6.1	55	6	2	★	3
MS2MTD0400T0500	4	5°	15	6.62	55	6	2	★	3
MS2MTD0400T0700	4	7°	15	7.68	55	6	2	★	3
MS2MTD0400T1000	4	10°	15	9.29	60	8	2	★	3
MS2MTD0500T0030	5	30'	20	5.35	55	6	2	★	1

MS2MT

Taper end mill, Medium cut length, 2 flute

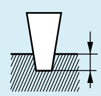
Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS2MTD0500T0100	5	1°	20	5.7	55	6	2	★	1
MS2MT**D0500T0130**	5	1° 30'	20	6.05	55	6	2	★	3
MS2MT**D0500T0200**	5	2°	20	6.4	55	6	2	★	3
MS2MT**D0500T0300**	5	3°	20	7.1	55	6	2	★	3
MS2MT**D0500T0400**	5	4°	20	7.8	60	6	2	★	3
MS2MT**D0500T0500**	5	5°	20	8.5	60	8	2	★	3
MS2MT**D0500T0700**	5	7°	20	9.91	70	10	2	★	2
MS2MT**D0500T1000**	5	10°	20	12.05	80	12	2	★	3
MS2MT**D0600T0030**	6	30'	20	6.35	60	6	2	★	3
MS2MT**D0600T0100**	6	1°	20	6.7	60	6	2	★	3
MS2MT**D0600T0130**	6	1° 30'	20	7.05	60	6	2	★	3
MS2MT**D0600T0200**	6	2°	20	7.4	60	6	2	★	3
MS2MT**D0600T0300**	6	3°	20	8.1	65	8	2	★	3
MS2MT**D0600T0500**	6	5°	20	9.5	70	8	2	★	3
MS2MT**D0800T0030**	8	30'	25	8.44	70	8	2	★	3
MS2MT**D0800T0100**	8	1°	25	8.87	70	8	2	★	3
MS2MT**D0800T0130**	8	1° 30'	25	9.31	70	8	2	★	3
MS2MT**D0800T0200**	8	2°	25	9.75	70	8	2	★	3
MS2MT**D0800T0300**	8	3°	25	10.62	75	10	2	★	3
MS2MT**D0800T0500**	8	5°	25	12.37	95	12	2	★	3
MS2MT**D1000T0030**	10	30'	35	10.61	90	10	2	★	3
MS2MT**D1000T0100**	10	1°	35	11.22	90	10	2	★	3
MS2MT**D1000T0130**	10	1° 30'	35	11.83	90	10	2	★	3
MS2MT**D1000T0200**	10	2°	35	12.44	95	12	2	★	3
MS2MT**D1000T0300**	10	3°	35	13.67	95	12	2	★	3
MS2MT**D1000T0500**	10	5°	35	16.12	95	16	2	★	3

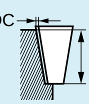
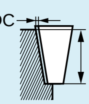
★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)			(mm/min)	(IPM)	
0.2	40000	320	12.6	0.005	40000	180	7.1	0.004	40000	100	3.9	0.002
0.3	40000	400	15.7	0.006	40000	220	8.7	0.005	35000	130	5.1	0.003
0.4	40000	450	17.7	0.008	40000	270	10.6	0.006	31000	150	5.9	0.004
0.5	37000	500	19.7	0.010	32000	320	12.6	0.008	25000	160	6.3	0.005
0.6	32000	530	20.9	0.013	26000	340	13.4	0.010	21000	170	6.7	0.006
0.7	27000	560	22.0	0.015	23000	380	15.0	0.011	18000	180	7.1	0.007
0.8	24000	610	24.0	0.018	20000	410	16.1	0.013	16000	210	8.3	0.008
0.9	21000	610	24.0	0.020	18000	450	17.7	0.015	14000	210	8.3	0.009
1	19000	610	24.0	0.025	16000	450	17.7	0.020	13000	210	8.3	0.010
1.5	13000	720	28.3	0.040	11000	540	21.3	0.030	8500	270	10.6	0.015
Depth of cut	 Please refer to the list.											

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)		(mm/min)	(IPM)		(mm/min)	(IPM)
2	9500	720	28.3	8000	540	21.3	6400	300	11.8
2.5	7800	800	31.5	6300	540	21.3	5000	300	11.8
3	6400	800	31.5	5300	540	21.3	4200	300	11.8
4	4800	800	31.5	4000	540	21.3	3200	300	11.8
5	3800	800	31.5	3200	540	21.3	2500	300	11.8
6	3200	800	31.5	2600	540	21.3	2100	300	11.8
8	2400	700	27.6	2000	480	18.9	1600	270	10.6
10	1900	600	23.6	1600	410	16.1	1300	240	9.4
Depth of cut	 ≦0.05DC ≦2.5DC						 ≦0.03DC ≦2.5DC		

DC:End point diameter

1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

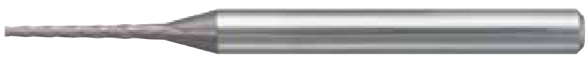
MS4LT

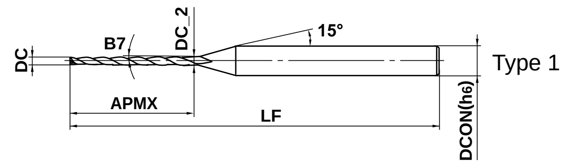
Taper end mill, Long cut length, 4 flute

UWC MS 25° DC<3 DC≥3

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
◎	◎	○		○			

CARBIDE





SQUARE BALL RADIUS TAPER SOLID END MILLS

	DC<0.5	DC≥0.5			
	0 - 0.020	0 - 0.040			
	±5'				
h6	DCON=3	4≦DCON≦6			
	0 - 0.006	0 - 0.008			

● 4 flute taper end mill for rib milling.

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTD0020T0030L02	0.2	30'	2	0.23	40	3	4	★	1
MS4LTD0020T0100L02	0.2	1°	2	0.27	40	3	4	★	1
MS4LTD0020T0130L02	0.2	1° 30'	2	0.3	40	3	4	★	1
MS4LTD0020T0200L02	0.2	2°	2	0.34	40	3	4	★	1
MS4LTD0030T0030L03	0.3	30'	3	0.35	40	3	4	★	1
MS4LTD0030T0100L03	0.3	1°	3	0.4	40	3	4	★	1
MS4LTD0030T0130L03	0.3	1° 30'	3	0.46	40	3	4	★	1
MS4LTD0030T0200L03	0.3	2°	3	0.51	40	3	4	★	1
MS4LTD0040T0030L04	0.4	30'	4	0.47	40	3	4	★	1
MS4LTD0040T0100L04	0.4	1°	4	0.54	40	3	4	★	1
MS4LTD0040T0130L04	0.4	1° 30'	4	0.61	40	3	4	★	1
MS4LTD0040T0200L04	0.4	2°	4	0.68	40	3	4	★	1
MS4LTD0050T0030L04	0.5	30'	4	0.57	40	3	4	●	1
MS4LTD0050T0030L06	0.5	30'	6	0.6	40	3	4	●	1
MS4LTD0050T0100L04	0.5	1°	4	0.64	40	3	4	●	1
MS4LTD0050T0100L06	0.5	1°	6	0.71	40	3	4	●	1
MS4LTD0050T0130L04	0.5	1° 30'	4	0.71	40	3	4	●	1
MS4LTD0050T0130L06	0.5	1° 30'	6	0.81	40	3	4	●	1
MS4LTD0050T0200L04	0.5	2°	4	0.78	40	3	4	★	1
MS4LTD0050T0200L06	0.5	2°	6	0.92	40	3	4	★	1
MS4LTD0060T0030L04	0.6	30'	4	0.67	40	3	4	★	1
MS4LTD0060T0030L06	0.6	30'	6	0.7	40	3	4	★	1
MS4LTD0060T0100L04	0.6	1°	4	0.74	40	3	4	★	1
MS4LTD0060T0100L06	0.6	1°	6	0.81	40	3	4	★	1
MS4LTD0060T0130L04	0.6	1° 30'	4	0.81	40	3	4	★	1
MS4LTD0060T0130L06	0.6	1° 30'	6	0.91	40	3	4	★	1
MS4LTD0060T0200L04	0.6	2°	4	0.88	40	3	4	★	1
MS4LTD0060T0200L06	0.6	2°	6	1.02	40	3	4	★	1
MS4LTD0070T0030L06	0.7	30'	6	0.8	40	3	4	★	1
MS4LTD0070T0030L08	0.7	30'	8	0.84	45	3	4	★	1
MS4LTD0070T0100L06	0.7	1°	6	0.91	40	3	4	★	1

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTD0070T0100L08	0.7	1°	8	0.98	45	3	4	★	1
MS4LTD0070T0130L06	0.7	1° 30'	6	1.01	40	3	4	★	1
MS4LTD0070T0130L08	0.7	1° 30'	8	1.12	45	3	4	★	1
MS4LTD0070T0200L06	0.7	2°	6	1.12	40	3	4	★	1
MS4LTD0070T0200L08	0.7	2°	8	1.26	45	3	4	★	1
MS4LTD0080T0015L04	0.8	15'	4	0.83	45	4	4	★	1
MS4LTD0080T0015L06	0.8	15'	6	0.85	45	4	4	★	1
MS4LTD0080T0015L08	0.8	15'	8	0.87	45	4	4	★	1
MS4LTD0080T0015L10	0.8	15'	10	0.89	45	4	4	★	1
MS4LTD0080T0030L04	0.8	30'	4	0.87	45	4	4	★	1
MS4LTD0080T0030L06	0.8	30'	6	0.9	45	4	4	●	1
MS4LTD0080T0030L08	0.8	30'	8	0.94	45	4	4	●	1
MS4LTD0080T0030L10	0.8	30'	10	0.97	45	4	4	●	1
MS4LTD0080T0030L12	0.8	30'	12	1.01	50	4	4	●	1
MS4LTD0080T0100L04	0.8	1°	4	0.94	45	4	4	★	1
MS4LTD0080T0100L06	0.8	1°	6	1.01	45	4	4	●	1
MS4LTD0080T0100L08	0.8	1°	8	1.08	45	4	4	●	1
MS4LTD0080T0100L10	0.8	1°	10	1.15	45	4	4	●	1
MS4LTD0080T0100L12	0.8	1°	12	1.22	50	4	4	●	1
MS4LTD0080T0130L04	0.8	1° 30'	4	1.01	45	4	4	★	1
MS4LTD0080T0130L06	0.8	1° 30'	6	1.11	45	4	4	★	1
MS4LTD0080T0130L08	0.8	1° 30'	8	1.22	45	4	4	★	1
MS4LTD0080T0130L10	0.8	1° 30'	10	1.32	45	4	4	★	1
MS4LTD0080T0130L12	0.8	1° 30'	12	1.43	50	4	4	★	1
MS4LTD0080T0200L04	0.8	2°	4	1.08	45	4	4	★	1
MS4LTD0080T0200L06	0.8	2°	6	1.22	45	4	4	★	1
MS4LTD0080T0200L08	0.8	2°	8	1.36	45	4	4	★	1
MS4LTD0080T0200L10	0.8	2°	10	1.5	45	4	4	★	1
MS4LTD0080T0200L12	0.8	2°	12	1.64	50	4	4	★	1
MS4LTD0100T0015L06	1	15'	6	1.05	45	4	4	★	1
MS4LTD0100T0015L08	1	15'	8	1.07	45	4	4	★	1
MS4LTD0100T0015L10	1	15'	10	1.09	45	4	4	★	1
MS4LTD0100T0015L12	1	15'	12	1.1	50	4	4	★	1
MS4LTD0100T0030L06	1	30'	6	1.1	45	4	4	●	1
MS4LTD0100T0030L08	1	30'	8	1.14	45	4	4	●	1
MS4LTD0100T0030L10	1	30'	10	1.17	45	4	4	●	1
MS4LTD0100T0030L12	1	30'	12	1.21	50	4	4	●	1
MS4LTD0100T0100L06	1	1°	6	1.21	45	4	4	●	1
MS4LTD0100T0100L08	1	1°	8	1.28	45	4	4	●	1
MS4LTD0100T0100L10	1	1°	10	1.35	45	4	4	●	1
MS4LTD0100T0100L12	1	1°	12	1.42	50	4	4	●	1
MS4LTD0100T0100L16	1	1°	16	1.56	55	4	4	●	1
MS4LTD0100T0130L06	1	1° 30'	6	1.31	45	4	4	●	1
MS4LTD0100T0130L08	1	1° 30'	8	1.42	45	4	4	●	1
MS4LTD0100T0130L10	1	1° 30'	10	1.52	45	4	4	●	1
MS4LTD0100T0130L12	1	1° 30'	12	1.63	50	4	4	●	1
MS4LTD0100T0130L16	1	1° 30'	16	1.84	55	4	4	●	1
MS4LTD0100T0200L06	1	2°	6	1.42	45	4	4	★	1
MS4LTD0100T0200L08	1	2°	8	1.56	45	4	4	★	1
MS4LTD0100T0200L10	1	2°	10	1.7	45	4	4	★	1
MS4LTD0100T0200L12	1	2°	12	1.84	50	4	4	★	1

MS4LT

Taper end mill, Long cut length, 4 flute

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTD0100T0200L16	1	2°	16	2.12	55	4	4	★	1
MS4LTD0120T0015L06	1.2	15'	6	1.25	45	4	4	★	1
MS4LTD0120T0015L10	1.2	15'	10	1.29	45	4	4	★	1
MS4LTD0120T0015L12	1.2	15'	12	1.3	50	4	4	★	1
MS4LTD0120T0015L16	1.2	15'	16	1.34	55	4	4	★	1
MS4LTD0120T0030L06	1.2	30'	6	1.3	45	4	4	★	1
MS4LTD0120T0030L10	1.2	30'	10	1.37	45	4	4	★	1
MS4LTD0120T0030L12	1.2	30'	12	1.41	50	4	4	★	1
MS4LTD0120T0030L16	1.2	30'	16	1.48	55	4	4	★	1
MS4LTD0120T0100L06	1.2	1°	6	1.41	45	4	4	★	1
MS4LTD0120T0100L10	1.2	1°	10	1.55	45	4	4	★	1
MS4LTD0120T0100L12	1.2	1°	12	1.62	50	4	4	★	1
MS4LTD0120T0100L16	1.2	1°	16	1.76	55	4	4	★	1
MS4LTD0120T0100L20	1.2	1°	20	1.9	55	4	4	★	1
MS4LTD0120T0130L06	1.2	1° 30'	6	1.51	45	4	4	★	1
MS4LTD0120T0130L10	1.2	1° 30'	10	1.72	45	4	4	★	1
MS4LTD0120T0130L12	1.2	1° 30'	12	1.83	50	4	4	★	1
MS4LTD0120T0130L16	1.2	1° 30'	16	2.04	55	4	4	★	1
MS4LTD0120T0130L20	1.2	1° 30'	20	2.25	55	4	4	★	1
MS4LTD0120T0200L06	1.2	2°	6	1.62	45	4	4	★	1
MS4LTD0120T0200L10	1.2	2°	10	1.9	45	4	4	★	1
MS4LTD0120T0200L12	1.2	2°	12	2.04	50	4	4	★	1
MS4LTD0120T0200L16	1.2	2°	16	2.32	55	4	4	★	1
MS4LTD0120T0200L20	1.2	2°	20	2.6	55	4	4	★	1
MS4LTD0130T0030L12	1.3	30'	12	1.51	50	4	4	★	1
MS4LTD0130T0100L12	1.3	1°	12	1.72	50	4	4	★	1
MS4LTD0130T0130L12	1.3	1° 30'	12	1.93	50	4	4	★	1
MS4LTD0130T0200L12	1.3	2°	12	2.14	50	4	4	★	1
MS4LTD0140T0030L12	1.4	30'	12	1.61	50	4	4	★	1
MS4LTD0140T0100L12	1.4	1°	12	1.82	50	4	4	★	1
MS4LTD0140T0130L12	1.4	1° 30'	12	2.03	50	4	4	★	1
MS4LTD0140T0200L12	1.4	2°	12	2.24	50	4	4	★	1
MS4LTD0150T0015L06	1.5	15'	6	1.55	45	4	4	★	1
MS4LTD0150T0015L08	1.5	15'	8	1.57	45	4	4	★	1
MS4LTD0150T0015L10	1.5	15'	10	1.59	45	4	4	★	1
MS4LTD0150T0015L12	1.5	15'	12	1.6	50	4	4	★	1
MS4LTD0150T0015L16	1.5	15'	16	1.64	55	4	4	★	1
MS4LTD0150T0015L20	1.5	15'	20	1.67	55	4	4	★	1
MS4LTD0150T0030L06	1.5	30'	6	1.6	45	4	4	★	1
MS4LTD0150T0030L08	1.5	30'	8	1.64	45	4	4	★	1
MS4LTD0150T0030L10	1.5	30'	10	1.67	45	4	4	●	1
MS4LTD0150T0030L12	1.5	30'	12	1.71	50	4	4	★	1
MS4LTD0150T0030L16	1.5	30'	16	1.78	55	4	4	●	1
MS4LTD0150T0030L20	1.5	30'	20	1.85	55	4	4	★	1
MS4LTD0150T0100L06	1.5	1°	6	1.71	45	4	4	★	1
MS4LTD0150T0100L08	1.5	1°	8	1.78	45	4	4	★	1
MS4LTD0150T0100L10	1.5	1°	10	1.85	45	4	4	●	1
MS4LTD0150T0100L12	1.5	1°	12	1.92	50	4	4	★	1
MS4LTD0150T0100L16	1.5	1°	16	2.06	55	4	4	●	1
MS4LTD0150T0100L20	1.5	1°	20	2.2	55	4	4	★	1
MS4LTD0150T0100L25	1.5	1°	25	2.37	60	4	4	★	1

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTD0150T0130L06	1.5	1° 30'	6	1.81	45	4	4	★	1
MS4LTD0150T0130L08	1.5	1° 30'	8	1.92	45	4	4	★	1
MS4LTD0150T0130L10	1.5	1° 30'	10	2.02	45	4	4	★	1
MS4LTD0150T0130L12	1.5	1° 30'	12	2.13	50	4	4	★	1
MS4LTD0150T0130L16	1.5	1° 30'	16	2.34	55	4	4	★	1
MS4LTD0150T0130L20	1.5	1° 30'	20	2.55	55	4	4	★	1
MS4LTD0150T0130L25	1.5	1° 30'	25	2.81	60	4	4	★	1
MS4LTD0150T0200L06	1.5	2°	6	1.92	45	4	4	★	1
MS4LTD0150T0200L08	1.5	2°	8	2.06	45	4	4	★	1
MS4LTD0150T0200L10	1.5	2°	10	2.2	45	4	4	★	1
MS4LTD0150T0200L12	1.5	2°	12	2.34	50	4	4	★	1
MS4LTD0150T0200L16	1.5	2°	16	2.62	55	4	4	★	1
MS4LTD0150T0200L20	1.5	2°	20	2.9	55	4	4	★	1
MS4LTD0150T0200L25	1.5	2°	25	3.25	60	4	4	★	1
MS4LTD0160T0030L08	1.6	30'	8	1.74	45	4	4	★	1
MS4LTD0160T0030L12	1.6	30'	12	1.81	50	4	4	★	1
MS4LTD0160T0030L16	1.6	30'	16	1.88	55	4	4	★	1
MS4LTD0160T0030L20	1.6	30'	20	1.95	55	4	4	★	1
MS4LTD0160T0100L08	1.6	1°	8	1.88	45	4	4	★	1
MS4LTD0160T0100L12	1.6	1°	12	2.02	50	4	4	★	1
MS4LTD0160T0100L16	1.6	1°	16	2.16	55	4	4	★	1
MS4LTD0160T0100L20	1.6	1°	20	2.3	55	4	4	★	1
MS4LTD0160T0130L08	1.6	1° 30'	8	2.02	45	4	4	★	1
MS4LTD0160T0130L12	1.6	1° 30'	12	2.23	50	4	4	★	1
MS4LTD0160T0130L16	1.6	1° 30'	16	2.44	55	4	4	★	1
MS4LTD0160T0130L20	1.6	1° 30'	20	2.65	55	4	4	★	1
MS4LTD0160T0200L08	1.6	2°	8	2.16	45	4	4	★	1
MS4LTD0160T0200L12	1.6	2°	12	2.44	50	4	4	★	1
MS4LTD0160T0200L16	1.6	2°	16	2.72	55	4	4	★	1
MS4LTD0160T0200L20	1.6	2°	20	3	55	4	4	★	1
MS4LTD0180T0015L08	1.8	15'	8	1.87	45	4	4	★	1
MS4LTD0180T0015L16	1.8	15'	16	1.94	55	4	4	★	1
MS4LTD0180T0015L24	1.8	15'	24	2.01	60	4	4	★	1
MS4LTD0180T0030L08	1.8	30'	8	1.94	45	4	4	★	1
MS4LTD0180T0030L16	1.8	30'	16	2.08	55	4	4	★	1
MS4LTD0180T0030L24	1.8	30'	24	2.22	60	4	4	★	1
MS4LTD0180T0100L08	1.8	1°	8	2.08	45	4	4	★	1
MS4LTD0180T0100L16	1.8	1°	16	2.36	55	4	4	★	1
MS4LTD0180T0100L24	1.8	1°	24	2.64	60	4	4	★	1
MS4LTD0180T0130L08	1.8	1° 30'	8	2.22	45	4	4	★	1
MS4LTD0180T0130L16	1.8	1° 30'	16	2.64	55	4	4	★	1
MS4LTD0180T0130L24	1.8	1° 30'	24	3.06	60	4	4	★	1
MS4LTD0180T0200L08	1.8	2°	8	2.36	45	4	4	★	1
MS4LTD0180T0200L16	1.8	2°	16	2.92	55	4	4	★	1
MS4LTD0180T0200L24	2	2°	24	3.48	60	4	4	★	1
MS4LTD0200T0015L08	2	15'	8	2.07	45	4	4	★	1
MS4LTD0200T0015L10	2	15'	10	2.09	45	4	4	★	1
MS4LTD0200T0015L12	2	15'	12	2.1	50	4	4	★	1
MS4LTD0200T0015L16	2	15'	16	2.14	55	4	4	★	1
MS4LTD0200T0015L20	2	15'	20	2.17	55	4	4	★	1
MS4LTD0200T0015L25	2	15'	25	2.22	60	4	4	★	1

MS4LT

Taper end mill, Long cut length, 4 flute

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTD0200T0030L08	2	30'	8	2.14	45	4	4	★	1
MS4LTD0200T0030L10	2	30'	10	2.17	45	4	4	●	1
MS4LTD0200T0030L12	2	30'	12	2.21	50	4	4	★	1
MS4LTD0200T0030L16	2	30'	16	2.28	55	4	4	★	1
MS4LTD0200T0030L20	2	30'	20	2.35	55	4	4	●	1
MS4LTD0200T0030L25	2	30'	25	2.44	60	4	4	★	1
MS4LTD0200T0030L30	2	30'	30	2.52	65	4	4	★	1
MS4LTD0200T0100L08	2	1°	8	2.28	45	4	4	★	1
MS4LTD0200T0100L10	2	1°	10	2.35	45	4	4	●	1
MS4LTD0200T0100L12	2	1°	12	2.42	50	4	4	★	1
MS4LTD0200T0100L16	2	1°	16	2.56	55	4	4	●	1
MS4LTD0200T0100L20	2	1°	20	2.7	55	4	4	●	1
MS4LTD0200T0100L25	2	1°	25	2.87	60	4	4	★	1
MS4LTD0200T0100L30	2	1°	30	3.05	65	4	4	★	1
MS4LTD0200T0130L08	2	1° 30'	8	2.42	45	4	4	★	1
MS4LTD0200T0130L10	2	1° 30'	10	2.52	45	4	4	●	1
MS4LTD0200T0130L12	2	1° 30'	12	2.63	50	4	4	★	1
MS4LTD0200T0130L16	2	1° 30'	16	2.84	55	4	4	●	1
MS4LTD0200T0130L20	2	1° 30'	20	3.05	55	4	4	●	1
MS4LTD0200T0130L25	2	1° 30'	25	3.31	60	4	4	★	1
MS4LTD0200T0130L30	2	1° 30'	30	3.57	65	4	4	★	1
MS4LTD0200T0200L08	2	2°	8	2.56	45	4	4	★	1
MS4LTD0200T0200L10	2	2°	10	2.7	45	4	4	★	1
MS4LTD0200T0200L12	2	2°	12	2.84	50	4	4	★	1
MS4LTD0200T0200L16	2	2°	16	3.12	55	4	4	★	1
MS4LTD0200T0200L20	2	2°	20	3.4	55	4	4	★	1
MS4LTD0200T0200L25	2	2°	25	3.75	60	4	4	★	1
MS4LTD0200T0200L30	2	2°	30	4.1	65	6	4	★	1
MS4LTD0200T0300L12	2	3°	12	3.26	50	4	4	★	1
MS4LTD0200T0300L16	2	3°	16	3.68	55	4	4	★	1
MS4LTD0200T0300L20	2	3°	20	4.1	55	6	4	★	1
MS4LTD0200T0300L25	2	3°	25	4.62	60	6	4	★	1
MS4LTD0200T0300L30	2	3°	30	5.14	65	6	4	★	1
MS4LTD0250T0030L10	2.5	30'	10	2.67	45	4	4	★	1
MS4LTD0250T0030L16	2.5	30'	16	2.78	50	4	4	★	1
MS4LTD0250T0030L20	2.5	30'	20	2.85	55	4	4	★	1
MS4LTD0250T0030L25	2.5	30'	25	2.94	60	4	4	★	1
MS4LTD0250T0030L30	2.5	30'	30	3.02	65	4	4	★	1
MS4LTD0250T0100L10	2.5	1°	10	2.85	45	4	4	★	1
MS4LTD0250T0100L16	2.5	1°	16	3.06	50	4	4	★	1
MS4LTD0250T0100L20	2.5	1°	20	3.2	55	4	4	★	1
MS4LTD0250T0100L25	2.5	1°	25	3.37	60	4	4	★	1
MS4LTD0250T0100L30	2.5	1°	30	3.55	65	4	4	★	1
MS4LTD0250T0130L10	2.5	1° 30'	10	3.02	45	4	4	★	1
MS4LTD0250T0130L16	2.5	1° 30'	16	3.34	50	4	4	★	1
MS4LTD0250T0130L20	2.5	1° 30'	20	3.55	55	4	4	★	1
MS4LTD0250T0130L25	2.5	1° 30'	25	3.81	60	4	4	★	1
MS4LTD0250T0130L30	2.5	1° 30'	30	4.07	65	6	4	★	1
MS4LTD0250T0200L10	2.5	2°	10	3.2	45	4	4	★	1
MS4LTD0250T0200L16	2.5	2°	16	3.62	50	4	4	★	1
MS4LTD0250T0200L20	2.5	2°	20	3.9	55	4	4	★	1

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTD0250T0200L25	2.5	2°	25	4.25	60	6	4	★	1
MS4LT**D0250T0200L30**	2.5	2°	30	4.6	65	6	4	★	1
MS4LT**D0300T0030L25**	3	30'	25	3.44	65	6	4	★	1
MS4LT**D0300T0030L40**	3	30'	40	3.7	80	6	4	★	1
MS4LT**D0300T0100L25**	3	1°	25	3.87	65	6	4	★	1
MS4LT**D0300T0100L40**	3	1°	40	4.4	80	6	4	★	1
MS4LT**D0300T0130L25**	3	1° 30'	25	4.31	65	6	4	★	1
MS4LT**D0300T0130L40**	3	1° 30'	40	5.09	80	6	4	★	1
MS4LT**D0300T0200L25**	3	2°	25	4.75	65	6	4	★	1
MS4LT**D0300T0200L40**	3	2°	40	5.79	80	6	4	★	1

MS4LT

Taper end mill, Long cut length, 4 flute

RECOMMENDED CUTTING CONDITIONS

Work material			Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.			
DC (mm)	PRFRAD (mm)	APMX (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
0.2	−	2	20000−40000	200−500	7.9−19.7	0.001	20000−40000	150−300	5.9−11.8	0.001
0.3	−	3	20000−40000	200−500	7.9−19.7	0.002	20000−40000	150−300	5.9−11.8	0.001
0.4	−	4	20000−40000	200−500	7.9−19.7	0.003	20000−36000	150−300	5.9−11.8	0.002
0.5	−	4	20000−38000	200−500	7.9−19.7	0.01	16000−29000	200−400	7.9−15.8	0.005
		6				0.005				0.003
0.6	R 0.3	4	18000−32000	250−600	9.9−23.6	0.01	13000−24000	200−400	7.9−15.8	0.005
		6				0.007				0.004
0.7	−	6	16000−27000	250−600	9.9−23.6	0.015	11000−20000	200−400	7.9−15.8	0.008
		8				0.01				0.005
0.8	R 0.4	4	14000−24000	250−600	9.9−23.6	0.03	10000−18000	200−400	7.9−15.8	0.015
		8				0.02				0.01
		12				0.013				0.007
1.0	R 0.5	6	11000−19000	300−800	11.8−31.5	0.03	8000−14000	200−500	7.9−19.7	0.015
		10				0.02				0.01
		16				0.015				0.008
1.2	R 0.6	6	9200−16000	300−800	11.8−31.5	0.04	6600−12000	200−500	7.9−19.7	0.02
		10				0.03				0.015
		16				0.02				0.01
1.3	−	12	8500−15000	300−800	11.8−31.5	0.03	6100−11000	200−500	7.9−19.7	0.015
1.4	−	12	8000−14000	300−800	11.8−31.5	0.035	5700−10000	200−500	7.9−19.7	0.018
1.5	R 0.75	6	7500−13000	300−800	11.8−31.5	0.06	5300−9500	200−500	7.9−19.7	0.03
		10				0.04				0.02
		16				0.03				0.015
		25				0.015				0.008
1.6	−	8	7000−12000	300−800	11.8−31.5	0.06	5000−9000	200−500	7.9−19.7	0.03
		12				0.045				0.025
		16				0.035				0.02
		20				0.025				0.015
1.8	R 0.9	8	6200−11000	300−800	11.8−31.5	0.08	4400−8000	200−500	7.9−19.7	0.04
		16				0.05				0.03
		24				0.03				0.015
2.0	R 1	8	5500−9500	300−800	11.8−31.5	0.1	4000−7200	200−500	7.9−19.7	0.05
		12				0.07				0.04
		20				0.04				0.02
		30				0.02				0.01
2.5	−	10	4400−7600	300−800	11.8−31.5	0.1	3200−5700	200−500	7.9−19.7	0.05
		20				0.06				0.03
		30				0.03				0.015
3.0	−	25	3700−6400	300−800	11.8−31.5	0.08	2700−4800	200−500	7.9−19.7	0.04
		40				0.04				0.02

1) If the depth of cut is smaller than this table, feed rate can be increased.

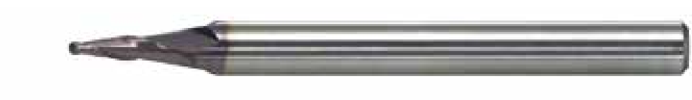
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

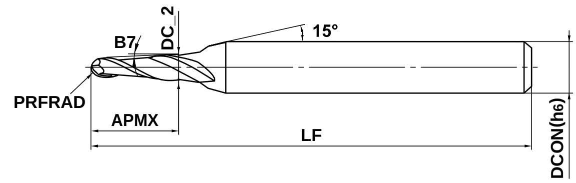
MS2MTB

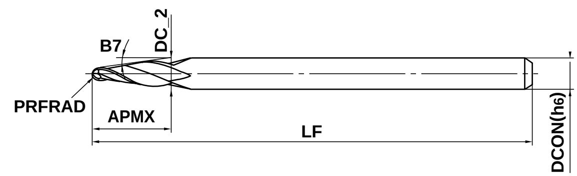
Ball nose taper end mill, Medium cut length, 2 flute

UWC MS 30°

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







0.2≤PRFRAD≤1.5				
±0.01				
±5'				
4≤DCON≤6				
0 - 0.008				

● 2 flute taper ball nose end mill.

Unit : mm

Order Number	PRFRAD	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS2MTBR0020T0300	0.2	3°	3	0.69	40	4	2	●	1
MS2MTBR0020T0500	0.2	5°	3	0.89	40	4	2	●	1
MS2MTBR0020T0700	0.2	7°	3	1.09	40	4	2	●	1
MS2MTBR0020T1000	0.2	10°	3	1.39	40	4	2	●	1
MS2MTBR0030T0300	0.3	3°	3	0.88	40	4	2	●	1
MS2MTBR0030T0500	0.3	5°	3	1.07	40	4	2	●	1
MS2MTBR0030T0700	0.3	7°	3	1.27	40	4	2	●	1
MS2MTBR0030T1000	0.3	10°	3	1.56	40	4	2	●	1
MS2MTBR0050T0030	0.5	30'	3	1.04	40	4	2	●	1
MS2MTBR0050T0100	0.5	1°	3	1.09	40	4	2	●	1
MS2MTBR0050T0130	0.5	1° 30'	3	1.13	40	4	2	●	1
MS2MTBR0050T0200	0.5	2°	3	1.18	40	4	2	●	1
MS2MTBR0050T0300	0.5	3°	3	1.26	40	4	2	●	1
MS2MTBR0050T0500	0.5	5°	3	1.44	40	4	2	●	1
MS2MTBR0050T0700	0.5	7°	6	2.36	45	4	2	●	1
MS2MTBR0075T0030	0.75	30'	6	1.59	40	4	2	●	1
MS2MTBR0075T0100	0.75	1°	6	1.68	40	4	2	●	1
MS2MTBR0075T0130	0.75	1° 30'	6	1.78	40	4	2	●	1
MS2MTBR0075T0200	0.75	2°	6	1.87	40	4	2	●	1
MS2MTBR0075T0300	0.75	3°	6	2.05	40	4	2	●	1
MS2MTBR0075T0700	0.75	7°	6	2.8	40	4	2	●	1
MS2MTBR0100T0030	1	30'	8	2.12	45	4	2	●	1
MS2MTBR0100T0100	1	1°	8	2.24	45	4	2	●	1
MS2MTBR0100T0130	1	1° 30'	8	2.37	45	4	2	●	1
MS2MTBR0100T0200	1	2°	8	2.49	45	4	2	●	1
MS2MTBR0100T0300	1	3°	8	2.74	45	4	2	●	1
MS2MTBR0100T0400	1	4°	8	2.98	45	4	2	●	1
MS2MTBR0100T0500	1	5°	8	3.23	45	4	2	●	1
MS2MTBR0100T0700	1	7°	8	3.73	50	6	2	●	1
MS2MTBR0125T0030	1.25	30'	10	2.65	45	4	2	●	1
MS2MTBR0125T0100	1.25	1°	10	2.81	45	4	2	●	1

● : Inventory maintained.

MS2MTB

Ball nose taper end mill, Medium cut length, 2 flute

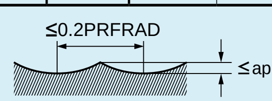
Unit : mm

Order Number	PRFRAD	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS2MTBR0125T0130	1.25	1° 30'	10	2.96	45	4	2	●	1
MS2MTB**R0125T0200**	1.25	2°	10	3.11	45	4	2	●	1
MS2MTB**R0125T0300**	1.25	3°	10	3.42	45	4	2	●	1
MS2MTB**R0125T0400**	1.25	4°	10	3.73	50	6	2	●	1
MS2MTB**R0125T0500**	1.25	5°	10	4.04	50	6	2	●	1
MS2MTB**R0125T0700**	1.25	7°	14.5	5.77	60	6	2	●	2
MS2MTB**R0150T0700**	1.5	7°	12.5	5.72	60	6	2	●	2

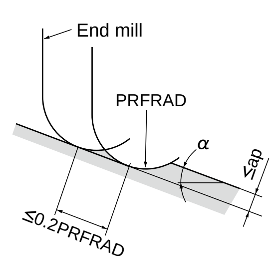
RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.							Hardened steel (45−55HRC) AISI H13 etc.						
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	α≤15°			α>15°			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R 0.1	40000	300	11.8	40000	250	9.8	0.003	40000	300	11.8	40000	250	9.8	0.003
R 0.15	40000	500	19.7	40000	350	13.8	0.007	40000	500	19.7	40000	350	13.8	0.007
R 0.2	40000	1600	63.0	40000	1200	47.2	0.02	40000	1300	51.2	40000	950	37.4	0.015
R 0.25	40000	2400	94.5	40000	1400	55.1	0.025	40000	1900	74.8	40000	1100	43.3	0.020
R 0.3	40000	3200	126.0	40000	1600	63.0	0.03	40000	2500	98.4	40000	1300	51.2	0.025
R 0.4	40000	4800	189.0	40000	2400	94.5	0.05	40000	4000	157.5	40000	1900	74.8	0.04
R 0.5	40000	5600	220.5	40000	3200	126.0	0.06	40000	5600	220.5	40000	3000	118.1	0.05
R 0.75	40000	6500	255.9	40000	4000	157.5	0.09	40000	6500	255.9	32000	3200	126.0	0.08
R 1	40000	6500	255.9	39000	4700	185.0	0.11	40000	6500	255.9	31000	3500	137.8	0.11
R 1.25	40000	7000	275.6	33000	4500	177.2	0.12	36000	6500	255.9	26000	3500	137.8	0.12
R 1.5	40000	7500	295.3	27000	4300	169.3	0.13	32000	6000	236.2	22000	3400	133.9	0.13
R 2	32000	7500	295.3	20000	3600	141.7	0.15	25000	6000	236.2	16000	2700	106.3	0.15
R 2.5	25000	6000	236.2	16000	2900	114.2	0.20	20000	5400	212.6	13000	2300	90.6	0.20
R 3	21000	5800	228.3	13000	2600	102.4	0.25	17000	4700	185.0	10000	2000	78.7	0.25
R 4	16000	4500	177.2	10000	2000	78.7	0.30	13000	3600	141.7	8000	1500	59.1	0.30
R 5	13000	3600	141.7	8000	1700	66.9	0.50	10000	2900	114.2	6400	1200	47.2	0.50
R 6	9000	2500	98.4	6000	1300	51.2	0.50	7200	2000	78.7	4800	1000	39.4	0.50

Depth of cut



1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

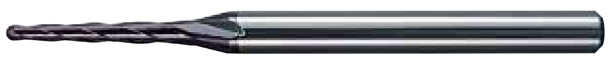


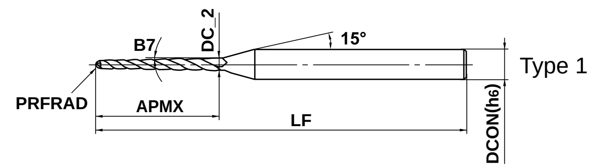
● : Inventory maintained. ★ : Inventory maintained in Japan.

MS4LTB

Ball nose, 4 flute, Taper, For rib milling

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
◎	◎	○		○	○		





0.3≤PRFRAD≤1				
±0.03				
±5'				
4≤DCON≤6				
0 - 0.008				

● 4 flute taper ball nose end mill for rib milling.

Unit : mm

Order Number	PRFRAD	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTBR0030T0030L04	0.3	30'	4	0.66	45	4	4	★	1
MS4LTBR0030T0030L06	0.3	30'	6	0.70	45	4	4	★	1
MS4LTBR0030T0100L04	0.3	1°	4	0.73	45	4	4	★	1
MS4LTBR0030T0100L06	0.3	1°	6	0.80	45	4	4	★	1
MS4LTBR0030T0130L04	0.3	1° 30'	4	0.79	45	4	4	★	1
MS4LTBR0030T0130L06	0.3	1° 30'	6	0.90	45	4	4	★	1
MS4LTBR0030T0200L04	0.3	2°	4	0.86	45	4	4	★	1
MS4LTBR0030T0200L06	0.3	2°	6	1.00	45	4	4	★	1
MS4LTBR0040T0030L06	0.4	30'	6	0.90	50	4	4	★	1
MS4LTBR0040T0030L08	0.4	30'	8	0.93	50	4	4	★	1
MS4LTBR0040T0030L10	0.4	30'	10	0.97	50	4	4	★	1
MS4LTBR0040T0100L06	0.4	1°	6	1.00	50	4	4	★	1
MS4LTBR0040T0100L08	0.4	1°	8	1.07	50	4	4	★	1
MS4LTBR0040T0100L10	0.4	1°	10	1.14	50	4	4	★	1
MS4LTBR0040T0130L06	0.4	1° 30'	6	1.09	50	4	4	★	1
MS4LTBR0040T0130L08	0.4	1° 30'	8	1.20	50	4	4	★	1
MS4LTBR0040T0130L10	0.4	1° 30'	10	1.30	50	4	4	★	1
MS4LTBR0040T0200L06	0.4	2°	6	1.19	50	4	4	★	1
MS4LTBR0040T0200L08	0.4	2°	8	1.33	50	4	4	★	1
MS4LTBR0040T0200L10	0.4	2°	10	1.47	50	4	4	★	1
MS4LTBR0050T0030L08	0.5	30'	8	1.13	50	4	4	★	1
MS4LTBR0050T0030L10	0.5	30'	10	1.17	50	4	4	★	1
MS4LTBR0050T0030L12	0.5	30'	12	1.20	50	4	4	★	1
MS4LTBR0050T0030L16	0.5	30'	16	1.27	55	4	4	★	1
MS4LTBR0050T0100L08	0.5	1°	8	1.26	50	4	4	★	1
MS4LTBR0050T0100L10	0.5	1°	10	1.33	50	4	4	★	1
MS4LTBR0050T0100L12	0.5	1°	12	1.40	50	4	4	★	1
MS4LTBR0050T0100L16	0.5	1°	16	1.54	55	4	4	★	1
MS4LTBR0050T0130L08	0.5	1° 30'	8	1.39	50	4	4	★	1
MS4LTBR0050T0130L10	0.5	1° 30'	10	1.50	50	4	4	★	1
MS4LTBR0050T0130L12	0.5	1° 30'	12	1.60	50	4	4	★	1

MS4LTB

Ball nose, 4 flute, Taper, For rib milling

Unit : mm

Order Number	PRFRAD	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTBR0050T0130L16	0.5	1° 30'	16	1.81	55	4	4	★	1
MS4LTBR0050T0200L08	0.5	2°	8	1.52	50	4	4	★	1
MS4LTBR0050T0200L10	0.5	2°	10	1.66	50	4	4	★	1
MS4LTBR0050T0200L12	0.5	2°	12	1.80	50	4	4	★	1
MS4LTBR0050T0200L16	0.5	2°	16	2.08	55	4	4	★	1
MS4LTBR0060T0030L08	0.6	30'	8	1.33	50	4	4	★	1
MS4LTBR0060T0030L10	0.6	30'	10	1.36	50	4	4	★	1
MS4LTBR0060T0030L12	0.6	30'	12	1.40	50	4	4	★	1
MS4LTBR0060T0030L16	0.6	30'	16	1.47	55	4	4	★	1
MS4LTBR0060T0100L08	0.6	1°	8	1.46	50	4	4	★	1
MS4LTBR0060T0100L10	0.6	1°	10	1.53	50	4	4	★	1
MS4LTBR0060T0100L12	0.6	1°	12	1.60	50	4	4	★	1
MS4LTBR0060T0100L16	0.6	1°	16	1.74	55	4	4	★	1
MS4LTBR0060T0130L08	0.6	1° 30'	8	1.59	50	4	4	★	1
MS4LTBR0060T0130L10	0.6	1° 30'	10	1.69	50	4	4	★	1
MS4LTBR0060T0130L12	0.6	1° 30'	12	1.80	50	4	4	★	1
MS4LTBR0060T0130L16	0.6	1° 30'	16	2.01	55	4	4	★	1
MS4LTBR0060T0200L08	0.6	2°	8	1.72	50	4	4	★	1
MS4LTBR0060T0200L10	0.6	2°	10	1.86	50	4	4	★	1
MS4LTBR0060T0200L12	0.6	2°	12	2.00	50	4	4	★	1
MS4LTBR0060T0200L16	0.6	2°	16	2.28	55	4	4	★	1
MS4LTBR0075T0030L08	0.75	30'	8	1.63	50	4	4	★	1
MS4LTBR0075T0030L10	0.75	30'	10	1.66	50	4	4	★	1
MS4LTBR0075T0030L12	0.75	30'	12	1.70	50	4	4	★	1
MS4LTBR0075T0030L16	0.75	30'	16	1.77	55	4	4	★	1
MS4LTBR0075T0030L20	0.75	30'	20	1.84	60	4	4	★	1
MS4LTBR0075T0100L08	0.75	1°	8	1.75	50	4	4	★	1
MS4LTBR0075T0100L10	0.75	1°	10	1.82	50	4	4	★	1
MS4LTBR0075T0100L12	0.75	1°	12	1.89	50	4	4	★	1
MS4LTBR0075T0100L16	0.75	1°	16	2.03	55	4	4	★	1
MS4LTBR0075T0100L20	0.75	1°	20	2.17	60	4	4	★	1
MS4LTBR0075T0130L08	0.75	1° 30'	8	1.88	50	4	4	★	1
MS4LTBR0075T0130L10	0.75	1° 30'	10	1.98	50	4	4	★	1
MS4LTBR0075T0130L12	0.75	1° 30'	12	2.09	50	4	4	★	1
MS4LTBR0075T0130L16	0.75	1° 30'	16	2.30	55	4	4	★	1
MS4LTBR0075T0130L20	0.75	1° 30'	20	2.51	60	4	4	★	1
MS4LTBR0075T0200L08	0.75	2°	8	2.01	50	4	4	★	1
MS4LTBR0075T0200L10	0.75	2°	10	2.15	50	4	4	★	1
MS4LTBR0075T0200L12	0.75	2°	12	2.29	50	4	4	★	1
MS4LTBR0075T0200L16	0.75	2°	16	2.57	55	4	4	★	1
MS4LTBR0075T0200L20	0.75	2°	20	2.84	60	4	4	★	1
MS4LTBR0090T0030L08	0.9	30'	8	1.92	50	4	4	★	1
MS4LTBR0090T0030L10	0.9	30'	10	1.96	50	4	4	★	1
MS4LTBR0090T0030L12	0.9	30'	12	1.99	50	4	4	★	1
MS4LTBR0090T0030L16	0.9	30'	16	2.06	55	4	4	★	1
MS4LTBR0090T0030L20	0.9	30'	20	2.13	60	4	4	★	1
MS4LTBR0090T0100L08	0.9	1°	8	2.05	50	4	4	★	1
MS4LTBR0090T0100L10	0.9	1°	10	2.12	50	4	4	★	1
MS4LTBR0090T0100L12	0.9	1°	12	2.19	50	4	4	★	1
MS4LTBR0090T0100L16	0.9	1°	16	2.33	55	4	4	★	1
MS4LTBR0090T0100L20	0.9	1°	20	2.47	60	4	4	★	1

★ : Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	B7	APMX	DC_2	LF	DCON	No. of Flutes	Stock	Type
MS4LTBR0090T0130L08	0.9	1° 30'	8	2.17	50	4	4	★	1
MS4LTB**R0090T0130L10**	0.9	1° 30'	10	2.28	50	4	4	★	1
MS4LTB**R0090T0130L12**	0.9	1° 30'	12	2.38	50	4	4	★	1
MS4LTB**R0090T0130L16**	0.9	1° 30'	16	2.59	55	4	4	★	1
MS4LTB**R0090T0130L20**	0.9	1° 30'	20	2.80	60	4	4	★	1
MS4LTB**R0090T0200L08**	0.9	2°	8	2.30	50	4	4	★	1
MS4LTB**R0090T0200L10**	0.9	2°	10	2.44	50	4	4	★	1
MS4LTB**R0090T0200L12**	0.9	2°	12	2.58	50	4	4	★	1
MS4LTB**R0090T0200L16**	0.9	2°	16	2.86	55	4	4	★	1
MS4LTB**R0090T0200L20**	0.9	2°	20	3.13	60	4	4	★	1
MS4LTB**R0100T0030L10**	1	30'	10	2.16	50	4	4	★	1
MS4LTB**R0100T0030L12**	1	30'	12	2.19	50	4	4	★	1
MS4LTB**R0100T0030L16**	1	30'	16	2.26	55	4	4	★	1
MS4LTB**R0100T0030L20**	1	30'	20	2.33	60	4	4	★	1
MS4LTB**R0100T0030L25**	1	30'	25	2.42	65	4	4	★	1
MS4LTB**R0100T0030L30**	1	30'	30	2.51	65	4	4	★	1
MS4LTB**R0100T0100L10**	1	1°	10	2.31	50	4	4	★	1
MS4LTB**R0100T0100L12**	1	1°	12	2.38	50	4	4	★	1
MS4LTB**R0100T0100L16**	1	1°	16	2.52	55	4	4	★	1
MS4LTB**R0100T0100L20**	1	1°	20	2.66	60	4	4	★	1
MS4LTB**R0100T0100L25**	1	1°	25	2.84	65	4	4	★	1
MS4LTB**R0100T0100L30**	1	1°	30	3.01	65	4	4	★	1
MS4LTB**R0100T0130L10**	1	1° 30'	10	2.47	50	4	4	★	1
MS4LTB**R0100T0130L12**	1	1° 30'	12	2.58	50	4	4	★	1
MS4LTB**R0100T0130L16**	1	1° 30'	16	2.79	55	4	4	★	1
MS4LTB**R0100T0130L20**	1	1° 30'	20	3.00	60	4	4	★	1
MS4LTB**R0100T0130L25**	1	1° 30'	25	3.26	65	6	4	★	1
MS4LTB**R0100T0130L30**	1	1° 30'	30	3.52	65	6	4	★	1
MS4LTB**R0100T0200L10**	1	2°	10	2.63	50	4	4	★	1
MS4LTB**R0100T0200L12**	1	2°	12	2.77	50	4	4	★	1
MS4LTB**R0100T0200L16**	1	2°	16	3.05	55	4	4	★	1
MS4LTB**R0100T0200L20**	1	2°	20	3.33	60	4	4	★	1
MS4LTB**R0100T0200L25**	1	2°	25	3.68	65	6	4	★	1
MS4LTB**R0100T0200L30**	1	2°	30	4.03	65	6	4	★	1

MS4LTB

Ball nose, 4 flute, Taper, For rib milling

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.			
PRFRAD (mm)	APMX (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)
			(mm/min)	(IPM)			(mm/min)	(IPM)	
R0.3	4	18000−32000	250−600	9.8−23.6	0.01	13000−24000	200−400	7.9−15.7	0.005
	6				0.007				0.004
R0.4	6	14000−24000	250−600	9.8−23.6	0.025	10000−18000	200−400	7.9−15.7	0.013
	8				0.02				0.01
	10				0.015				0.008
R0.5	8	11000−19000	300−800	11.8−31.5	0.025	8000−14000	200−500	7.9−19.7	0.013
	10				0.02				0.01
	12				0.018				0.009
	16				0.015				0.008
R0.6	8	9200−16000	300−800	11.8−31.5	0.035	6600−12000	200−500	7.9−19.7	0.018
	10				0.03				0.015
	12				0.027				0.013
	16				0.02				0.01
R0.75	8	7500−13000	300−800	11.8−31.5	0.05	5300−9500	200−500	7.9−19.7	0.025
	10				0.04				0.02
	12				0.035				0.018
	16				0.03				0.015
	20				0.02				0.01
R0.9	8	6200−11000	300−800	11.8−31.5	0.08	4400−8000	200−500	7.9−19.7	0.04
	10				0.07				0.035
	12				0.06				0.035
	16				0.05				0.03
	20				0.04				0.02
R1	10	5500−9500	300−800	11.8−31.5	0.08	4000−7200	200−500	7.9−19.7	0.045
	12				0.07				0.04
	16				0.05				0.03
	20				0.04				0.02
	25				0.03				0.015
	30				0.02				0.01

1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

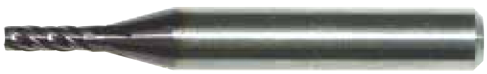
SOLID END MILLS

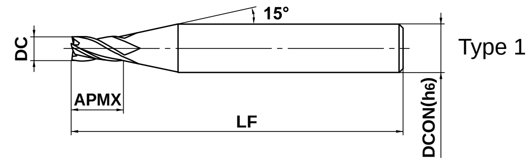
VCMDSC

End mill, Medium cut length, 4—6 flute

DC<3 DC=3

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
○	◎	◎	◎				





0.5≤DC≤3				
0 - 0.020				
DCON=6				
0 - 0.008				

- 4—6 flute end mill with sharp corner geometry for hardened steel milling.

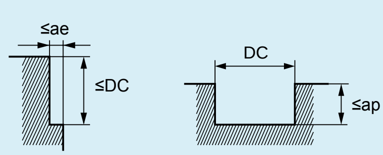
Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VCMDSCD0050	0.5	1	45	6	4	★	1
VCMDSCD0100	1	2.5	45	6	4	★	1
VCMDSCD0150	1.5	4	45	6	4	★	1
VCMDSCD0200	2	6	45	6	4	★	1
VCMDSCD0250	2.5	8	45	6	4	★	1
VCMDSCD0300	3	8	45	6	6	★	1

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (45—55HRC) AISI H13 etc.				Hardened steel (55—62HRC) AISI D2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ae, ap (mm)
0.5	40000	2000	78.7	0.03	30000	600	23.6	0.02
1	40000	3000	118.1	0.05	20000	900	35.4	0.03
1.5	40000	5000	196.9	0.08	18000	1100	43.3	0.05
2	40000	5600	220.5	0.10	16000	1300	51.2	0.06
3	34000	5600	220.5	0.15	13000	1600	63.0	0.09

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) The above condition are for shoulder milling. In slotting with over ϕ3, please set the revolution, feed rate and depth of cut at 20—40% of above value.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

★ : Inventory maintained in Japan.

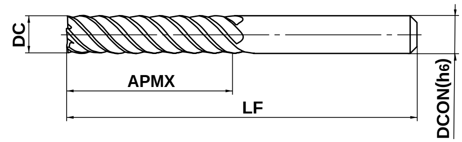
CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

VCLD

End mill, Long cut length, 6 flute

UWC VC 45°

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
○	◎	◎	◎				



Type 1

SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

DC≤12	DC>12			
0 - 0.020	0 - 0.030			
h6 DCON=6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

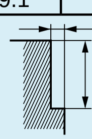
- 6 flute end mill with long cutting length for hardened steel milling.

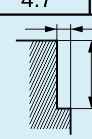
Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VCLDD0600	6	26	70	6	6	★	1
VCLD**D0800**	8	36	90	8	6	★	1
VCLD**D1000**	10	46	100	10	6	★	1
VCLD**D1200**	12	56	110	12	6	★	1
VCLD**D1600**	16	66	130	16	6	★	1
VCLD**D2000**	20	76	140	20	6	★	1
VCLD**D2500**	25	92	180	25	6	★	1

RECOMMENDED CUTTING CONDITIONS

Material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Hardened steel (45−55HRC) AISI H13 etc.			Hardened steel (55−62HRC) AISI D2 etc.			Hardened steel (62−70HRC) AISI W1, AISI M2 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
6	2100	450	17.7	1600	330	13.0	1300	240	9.4	1100	190	7.5
8	1600	430	16.9	1200	310	12.2	1000	230	9.1	800	170	6.7
10	1300	420	16.5	960	290	11.4	800	220	8.7	640	150	5.9
12	1100	380	15.0	800	260	10.2	660	200	7.9	530	140	5.5
16	800	310	12.2	600	220	8.7	500	160	6.3	400	120	4.7
20	640	270	10.6	480	190	7.5	400	140	5.5	320	110	4.3
25	510	230	9.1	380	160	6.3	320	120	4.7	260	90	3.5
Depth of cut	≤0.01DC 3DC−4DC						≤0.005DC 3DC−4DC					





1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

★ : Inventory maintained in Japan.

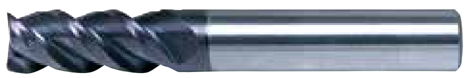
VCMH

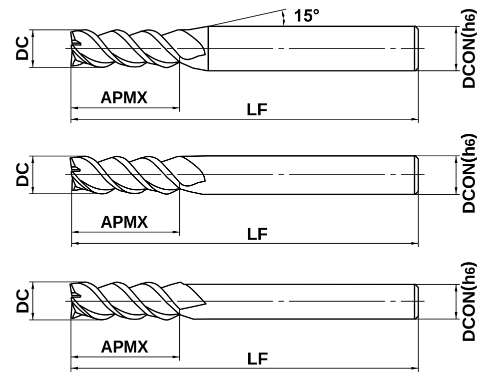
End mill, Medium cut length, 3—4 flute, High helix angle

UWC VC 50°

DC≤18 DC≥20

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
○	◎	○		◎	◎		





Type 1

Type 2

Type 3

DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 3—4 flute end mill for milling difficult-to-cut and soft materials.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VCMHD0300	3	8	45	6	3	★	1
VCMH**D0400**	4	11	45	6	3	★	1
VCMH**D0500**	5	13	50	6	3	★	1
VCMH**D0600**	6	13	50	6	3	★	2
VCMH**D0700**	7	16	60	8	3	★	1
VCMH**D0800**	8	19	60	8	3	★	2
VCMH**D0900**	9	19	70	10	3	★	1
VCMH**D1000**	10	22	70	10	3	★	2
VCMH**D1100**	11	22	75	12	3	★	1
VCMH**D1200**	12	26	75	12	3	★	2
VCMH**D1300**	13	26	75	12	3	★	3
VCMH**D1400**	14	26	75	12	3	★	3
VCMH**D1500**	15	30	80	16	3	★	1
VCMH**D1600**	16	32	90	16	3	★	2
VCMH**D1800**	18	32	90	16	3	★	3
VCMH**D2000**	20	38	100	20	4	★	2
VCMH**D2500**	25	45	120	25	4	★	2

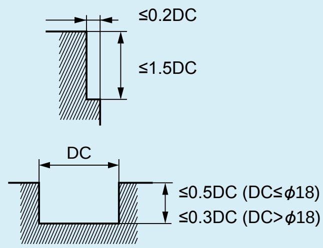
VCMH

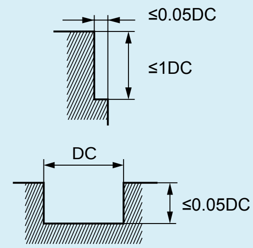
End mill, Medium cut length, 3−4 flute, High helix angle

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	5300	130	5.1	4400	100	3.9	2400	50	2.0	1500	25	1.0
4	4400	220	8.7	3700	160	6.3	2000	80	3.1	1300	40	1.6
5	3600	260	10.2	3000	190	7.5	1700	100	3.9	1100	50	2.0
6	3200	280	11.0	2700	200	7.9	1500	100	3.9	1000	50	2.0
8	2400	300	11.8	2000	210	8.3	1200	110	4.3	800	45	1.8
10	1900	290	11.4	1600	210	8.3	960	115	4.5	640	45	1.8
12	1600	250	9.8	1300	170	6.7	800	95	3.7	530	40	1.6
16	1200	180	7.1	1000	130	5.1	600	70	2.8	400	30	1.2
18	1100	170	6.7	900	120	4.7	530	65	2.6	350	25	1.0
20	960	190	7.5	800	140	5.5	480	75	3.0	320	25	1.0
25	760	150	5.9	640	110	4.3	380	60	2.4	260	20	0.8

Depth of cut



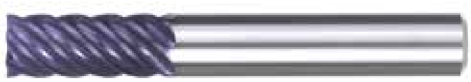


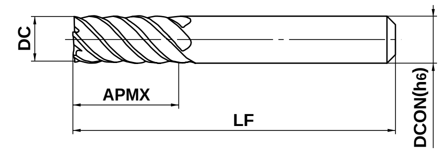
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) The above table shows cutting conditions for shoulder milling. For slotting, please set the revolution at 80 − 100% and the feed rate at 60−80% of the table figure. Please set the revolution rate at 60% and the feed rate at 40% when slotting austenitic stainless steels.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VC6MH

End mill, Medium cut length, 6 flute, High helix angle

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
◎	◎	○		◎	◎		





DC≤12	DC>12			
0 - 0.02	0 - 0.03			
h6 DCON=6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 6 flute end mill for milling difficult-to-cut and soft materials.

Unit : mm

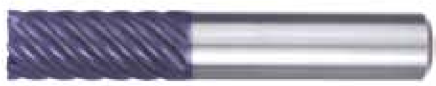
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VC6MHD0600	6	13	50	6	6	★	1
VC6MH**D0800**	8	19	60	8	6	★	1
VC6MH**D1000**	10	22	70	10	6	★	1
VC6MH**D1200**	12	26	75	12	6	★	1
VC6MH**D1600**	16	32	90	16	6	★	1
VC6MH**D2000**	20	38	100	20	6	★	1
VC6MH**D2500**	25	45	120	25	6	★	1

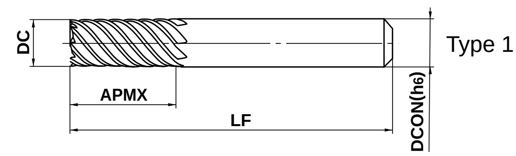
★ : Inventory maintained in Japan.

VC8MH

End mill, Medium cut length, 8 flute, High helix angle

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
◎	◎	○		◎	◎		





20≦DC≦25				
0 - 0.03				
20≦DCON≦25				
0 - 0.013				

● 8 flute end mill for milling difficult-to-cut and soft materials.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VC8MHD2000	20	38	100	20	8	★	1
VC8MH**D2500**	25	45	120	25	8	★	1

VC6MH

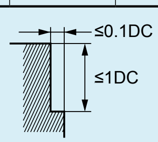
End mill, Medium cut length, 6 flute, High helix angle

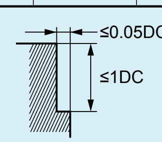
VC8MH

End mill, Medium cut length, 8 flute, High helix angle

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
6	10600	2900	114.2	8000	2000	78.7	4200	900	35.4	2100	320	12.6
8	8000	2900	114.2	6000	2000	78.7	3200	900	35.4	1600	300	11.8
10	6400	2700	106.3	4800	2000	78.7	2500	870	34.3	1300	260	10.2
12	5300	2700	106.3	4000	2000	78.7	2100	830	32.7	1100	230	9.1
16	4000	2200	86.6	3000	1600	63.0	1600	740	29.1	800	180	7.1
20	3200	1900	74.8	2400	1400	55.1	1300	710	28.0	640	150	5.9
25	2500	1600	63.0	1900	1200	47.2	1000	560	22.0	510	120	4.7
Depth of cut	≤0.1DC, ≤1DC			≤0.05DC, ≤1DC								





1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

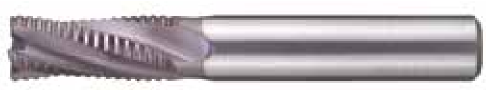
● : Inventory maintained. ★ : Inventory maintained in Japan.

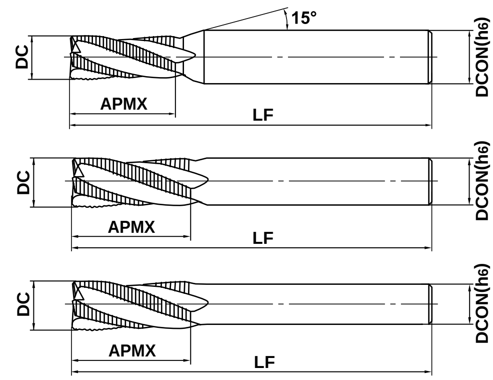
VCSFPR

Roughing end mill, Short cut length, 3−4 flute

UWC VC 20° DC<8 DC≥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
◎	◎	○		◎	◎		





h6

DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- 3−4 flute roughing end mill for general steel, difficult-to-cut and hardened materials.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VCSFPRD0300	3	6	50	6	3	★	1
VCSFPR**D0400**	4	8	50	6	3	★	1
VCSFPR**D0500**	5	10	50	6	3	●	1
VCSFPR**D0600**	6	12	50	6	3	●	2
VCSFPR**D0700**	7	17	60	8	3	●	1
VCSFPR**D0800**	8	17	60	8	4	●	2
VCSFPR**D0900**	9	22	70	10	4	●	1
VCSFPR**D1000S08**	10	22	90	8	4	★	3
VCSFPR**D1000**	10	22	70	10	4	●	2
VCSFPR**D1200S10**	12	27	100	10	4	★	3
VCSFPR**D1200**	12	27	75	12	4	●	2
VCSFPR**D1400**	14	27	75	12	4	●	3
VCSFPR**D1600**	16	33	90	16	4	●	2
VCSFPR**D1800**	18	33	90	16	4	●	3
VCSFPR**D2000**	20	38	100	20	4	●	2

VCSFPR

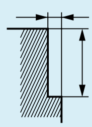
Roughing end mill, Short cut length, 3−4 flute

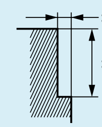
RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC	Revolution	Table feed		Revolution	Table feed		Revolution	Table feed		Revolution	Table feed		Revolution	Table feed	
(mm)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)
3	16000	960	37.8	13000	640	25.2	6400	260	10.2	5300	100	3.9	4200	70	2.8
4	12000	960	37.8	9500	640	25.2	4800	260	10.2	4000	100	3.9	3200	70	2.8
5	9500	960	37.8	7600	640	25.2	3800	260	10.2	3200	100	3.9	2500	70	2.8
6	8000	960	37.8	6400	680	26.8	3200	290	11.4	2700	110	4.3	2100	75	3.0
8	6000	1050	41.3	4800	760	29.9	2400	340	13.4	2000	140	5.5	1600	95	3.7
10	4800	1050	41.3	3800	760	29.9	1900	340	13.4	1600	150	5.9	1300	105	4.1
12	4000	960	37.8	3200	700	27.6	1600	320	12.6	1300	150	5.9	1100	110	4.3
16	3000	840	33.1	2400	620	24.4	1200	300	11.8	1000	150	5.9	800	110	4.3
20	2400	760	29.9	1900	560	22.0	1000	300	11.8	800	140	5.5	600	100	3.9

Depth of cut

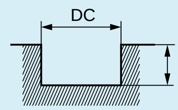


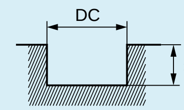


Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC	Revolution	Table feed		Revolution	Table feed		Revolution	Table feed		Revolution	Table feed		Revolution	Table feed	
(mm)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)	(min^{-1})	(mm/min)	(IPM)
3	13000	720	28.3	11000	480	18.9	4800	190	7.5	3200	50	2.0	2100	25	1.0
4	9500	720	28.3	8000	480	18.9	3600	190	7.5	2400	50	2.0	1600	25	1.0
5	7600	720	28.3	6400	480	18.9	3200	190	7.5	1900	50	2.0	1300	25	1.0
6	6400	720	28.3	5300	480	18.9	2700	200	7.9	1600	55	2.2	1100	30	1.2
8	4800	800	31.5	4000	520	20.5	2000	220	8.7	1200	70	2.8	800	35	1.4
10	3800	800	31.5	3200	520	20.5	1600	220	8.7	1000	70	2.8	600	35	1.4
12	3200	750	29.5	2700	520	20.5	1300	210	8.3	800	75	3.0	500	40	1.6
16	2400	620	24.4	2000	450	17.7	1000	180	7.1	600	75	3.0	400	45	1.8
20	1900	540	21.3	1600	400	15.7	800	160	6.3	500	70	2.8	300	40	1.6

Depth of cut





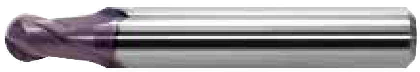
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

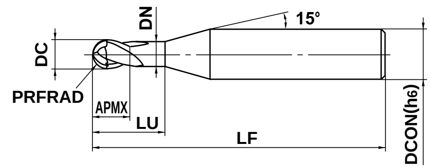
VC2ESB

Ball nose, Extra short cut length, 2 flute

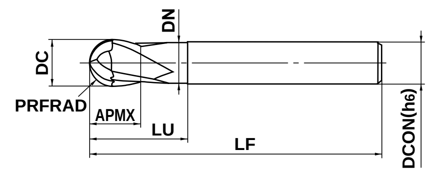
UWC VC 30°

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
○	◎	◎	○	○	○		





Type 1



Type 2

0.15≤PRFRAD≤6				
±0.01				
0.3≤DC≤12				
0 - 0.020				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● The optimal series for milling in compact machining center.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VC2ESBR0015N006	0.15	0.3	0.3	0.6	0.27	30	4	2	●	1
VC2ESB**R0020N008**	0.2	0.4	0.4	0.8	0.36	30	4	2	●	1
VC2ESB**R0030N012**	0.3	0.6	0.6	1.2	0.56	30	4	2	●	1
VC2ESB**R0040N016**	0.4	0.8	0.8	1.6	0.76	30	4	2	●	1
VC2ESB**R0050**	0.5	1	1	—	—	30	4	2	●	1
VC2ESB**R0050N025**	0.5	1	1	2.5	0.94	30	4	2	●	1
VC2ESB**R0075**	0.75	1.5	1.5	—	—	30	4	2	●	1
VC2ESB**R0075N040**	0.75	1.5	1.5	4	1.44	30	4	2	●	1
VC2ESB**R0100**	1	2	2	—	—	40	6	2	●	1
VC2ESB**R0100N060**	1	2	2	6	1.9	40	6	2	●	1
VC2ESB**R0150**	1.5	3	3	—	—	40	6	2	●	1
VC2ESB**R0150N080**	1.5	3	3	8	2.9	40	6	2	●	1
VC2ESB**R0200**	2	4	4	—	—	40	6	2	●	1
VC2ESB**R0200N080**	2	4	4	8	3.9	40	6	2	●	1
VC2ESB**R0250**	2.5	5	5	—	—	40	6	2	●	1
VC2ESB**R0250N120**	2.5	5	5	12	4.9	40	6	2	●	1
VC2ESB**R0300**	3	6	6	—	—	40	6	2	●	2
VC2ESB**R0300N130**	3	6	6	13	5.85	40	6	2	●	2
VC2ESB**R0350**	3.5	7	7	—	—	50	6	2	●	1
VC2ESB**R0400**	4	8	8	—	—	50	6	2	●	2
VC2ESB**R0500**	5	10	10	—	—	60	10	2	●	2
VC2ESB**R0600**	6	12	12	—	—	65	12	2	●	2

● : Inventory maintained.

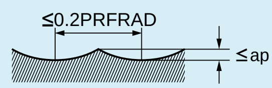
VC2ESB

Ball nose, Extra short cut length, 2 flute

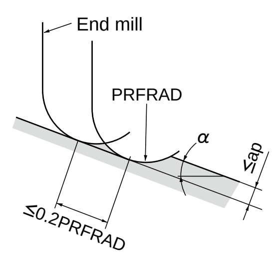
RECOMMENDED CUTTING CONDITIONS

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.							Hardened steel (45–55HRC) AISI H13 etc.						
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	α≤15°			α>15°			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R 0.5	40000	5600	220.5	40000	3200	126.0	0.06	40000	5600	220.5	40000	3000	118.1	0.06
R 0.75	40000	6500	256.0	40000	3200	126.0	0.09	40000	6500	256.0	32000	3200	126.0	0.09
R 1	40000	6500	256.0	39000	3800	149.6	0.11	40000	6500	256.0	31000	3500	137.8	0.11
R 1.5	40000	7500	295.3	27000	4300	169.3	0.13	32000	6000	236.2	22000	3400	133.9	0.13
R 2	32000	7500	295.3	20000	3600	141.7	0.15	25000	6000	236.2	16000	2700	106.3	0.15
R 2.5	25000	6000	236.2	16000	2900	114.2	0.20	20000	5400	212.6	13000	2300	90.6	0.20
R 3	21000	5800	228.3	13000	2600	102.4	0.25	17000	4700	185.0	10000	2000	78.7	0.25
R 4	16000	4500	177.2	10000	2000	78.7	0.30	13000	3600	141.7	8000	1500	59.1	0.30
R 5	13000	3600	141.7	8000	1700	66.9	0.50	10000	2900	114.2	6400	1200	47.2	0.50
R 6	9000	2500	98.5	6000	1300	51.2	0.50	7200	2000	78.7	4800	1000	39.4	0.50

Depth of cut



1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.



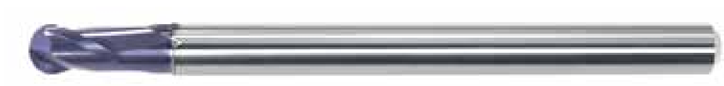
VC2PSB MIRACLE NOVA

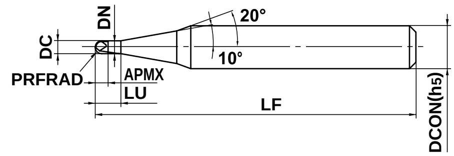
Ball nose, Short cut length, 2 flute, High precision

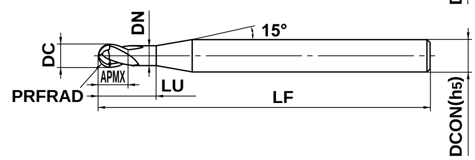
UWC VC

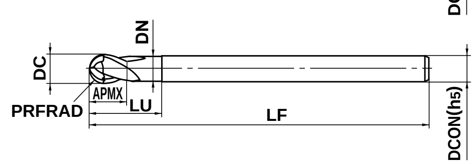
PRFRAD<0.5 PRFRAD≥0.5 PRFRAD<0.5 PRFRAD≥0.5

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
◎	◎	◎		○	○		









R				
0.05≤PRFRAD≤6				
±0.005				
0.1≤DC≤12				
0 - 0.01				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.005	0 - 0.006	0 - 0.008		

● MIRACLE NOVA, radial tolerance of ±0.005mm, diameter tolerance 0– -0.01mm and a shank tolerance of h5.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VC2PSBR0005	0.05	0.1	0.2	—	—	50	6	2	●	1
VC2PSBR0010	0.1	0.2	0.2	0.5	0.17	50	6	2	●	1
VC2PSBR0015	0.15	0.3	0.3	0.8	0.27	50	6	2	●	1
VC2PSBR0020	0.2	0.4	0.4	1	0.36	50	6	2	●	1
VC2PSBR0025	0.25	0.5	0.5	1.3	0.46	50	6	2	●	1
VC2PSBR0030	0.3	0.6	0.6	1.5	0.56	50	6	2	●	1
VC2PSBR0035	0.35	0.7	0.7	1.8	0.66	50	6	2	●	1
VC2PSBR0040	0.4	0.8	0.8	2	0.76	50	6	2	●	1
VC2PSBR0045	0.45	0.9	0.9	2.3	0.86	50	6	2	●	1
VC2PSBR0050	0.5	1	1.5	2.5	0.94	50	6	2	●	2
VC2PSBR0060	0.6	1.2	1.8	3	1.14	50	6	2	★	2
VC2PSBR0070	0.7	1.4	2.1	3.5	1.34	50	6	2	★	2
VC2PSBR0075	0.75	1.5	2.3	3.8	1.44	50	6	2	●	2
VC2PSBR0080	0.8	1.6	2.4	4	1.54	50	6	2	★	2
VC2PSBR0090	0.9	1.8	2.7	4.5	1.74	50	6	2	★	2
VC2PSBR0100	1	2	3	5	1.90	50	6	2	●	2
VC2PSBR0150	1.5	3	4.5	7.5	2.90	70	6	2	●	2
VC2PSBR0200	2	4	6	10	3.90	70	6	2	●	2
VC2PSBR0250	2.5	5	7.5	12.5	4.90	80	6	2	●	2
VC2PSBR0300	3	6	9	15	5.85	80	6	2	●	3
VC2PSBR0400	4	8	12	20	7.85	90	8	2	●	3
VC2PSBR0500	5	10	15	25	9.70	100	10	2	●	3
VC2PSBR0600	6	12	18	30	11.70	110	12	2	●	3

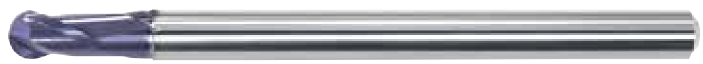
● : Inventory maintained. ★ : Inventory maintained in Japan.

VC2PSBP MIRACLE NOVA

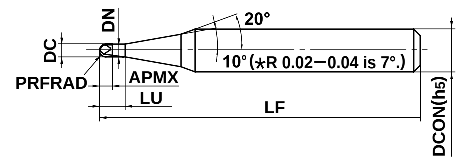
Ball nose, Short cut length, 2 flute, Ultra high precision

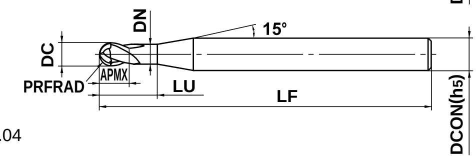
UWC VC PRFRAD<0.5 PRFRAD≥0.5 PRFRAD<0.5 PRFRAD≥0.5

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
◎	◎	◎		○	○		



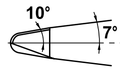
Inspection reports regarding the R accuracy of the VC2PSBP are supplied with the tool.

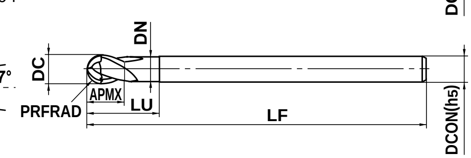




R	0.02≤PRFRAD≤6			
	±0.002			
	0.1≤DC≤12			
	0 - 0.01			
h5	DCON=6	8≤DCON≤10	DCON=12	
	0 - 0.005	0 - 0.006	0 - 0.008	

R0.02−0.04
Top edge geometry





● MIRACLE NOVA, radial tolerance of ±0.002mm, diameter tolerance 0− -0.01mm and a shank tolerance of h5.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VC2PSBPR0002	0.02	—	0.06	—	—	50	6	2	□	1
VC2PSBPR0003	0.03	—	0.09	—	—	50	6	2	□	1
VC2PSBPR0004	0.04	—	0.12	—	—	50	6	2	□	1
VC2PSBPR0005	0.05	0.1	0.2	—	—	50	6	2	★	1
VC2PSBPR0010	0.1	0.2	0.2	0.5	0.17	50	6	2	★	1
VC2PSBPR0015	0.15	0.3	0.3	0.8	0.27	50	6	2	★	1
VC2PSBPR0020	0.2	0.4	0.4	1	0.36	50	6	2	★	1
VC2PSBPR0025	0.25	0.5	0.5	1.3	0.46	50	6	2	★	1
VC2PSBPR0030	0.3	0.6	0.6	1.5	0.56	50	6	2	★	1
VC2PSBPR0035	0.35	0.7	0.7	1.8	0.66	50	6	2	★	1
VC2PSBPR0040	0.4	0.8	0.8	2	0.76	50	6	2	★	1
VC2PSBPR0045	0.45	0.9	0.9	2.3	0.86	50	6	2	★	1
VC2PSBPR0050	0.5	1	1.5	2.5	0.94	50	6	2	★	2
VC2PSBPR0060	0.6	1.2	1.8	3	1.14	50	6	2	★	2
VC2PSBPR0070	0.7	1.4	2.1	3.5	1.34	50	6	2	★	2
VC2PSBPR0075	0.75	1.5	2.3	3.8	1.44	50	6	2	★	2
VC2PSBPR0080	0.8	1.6	2.4	4	1.54	50	6	2	★	2
VC2PSBPR0090	0.9	1.8	2.7	4.5	1.74	50	6	2	★	2
VC2PSBPR0100	1	2	3	5	1.9	50	6	2	★	2
VC2PSBPR0150	1.5	3	4.5	7.5	2.9	70	6	2	★	2
VC2PSBPR0200	2	4	6	10	3.9	70	6	2	★	2
VC2PSBPR0250	2.5	5	7.5	12.5	4.9	80	6	2	★	2
VC2PSBPR0300	3	6	9	15	5.85	80	6	2	★	3
VC2PSBPR0400	4	8	12	20	7.85	90	8	2	★	3
VC2PSBPR0500	5	10	15	25	9.7	100	10	2	★	3
VC2PSBPR0600	6	12	18	30	11.7	110	12	2	★	3

(Inspection reports with VC2PSBP.)

ULTRA HIGH PRECISION
[±0.002mm]

★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

VC2PSBP MIRACLE NOVA

Ball nose, Short cut length, Ultra high precision

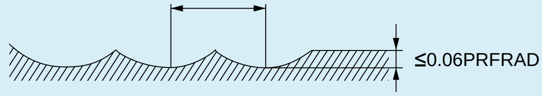
VC2PSB MIRACLE NOVA

Ball nose, Short cut length, 2 flute, High precision

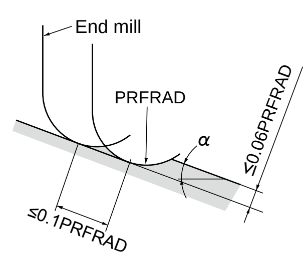
RECOMMENDED CUTTING CONDITIONS

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.						Hardened steel (45−55HRC) AISI H13 etc.					
PRFRAD (mm)	α≤15°			α>15°			α≤15°			α>15°		
	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)
R0.05	40000	200	7.9	—	—	—	40000	170	6.7	—	—	—
R0.1	40000	600	23.6	40000	400	15.7	40000	600	23.6	40000	400	15.7
R0.15	40000	900	35.4	40000	600	23.6	40000	900	35.4	40000	600	23.6
R0.2	40000	1000	39.4	40000	700	27.6	40000	1000	39.4	40000	700	27.6
R0.25	40000	1500	59.1	40000	1000	39.4	40000	1500	59.1	40000	1000	39.4
R0.3	40000	2000	78.7	40000	1500	59.1	40000	2000	78.7	40000	1500	59.1
R0.35	40000	2800	110.2	40000	2100	82.7	40000	2800	110.2	37000	1800	70.9
R0.4	40000	2800	110.2	40000	2100	82.7	40000	2800	110.2	35000	1800	70.9
R0.45	40000	3200	126.0	38000	2200	86.6	38000	3000	118.1	32000	1800	70.9
R0.5	40000	3200	126.0	35000	2200	86.6	35000	3000	118.1	30000	1800	70.9
R0.75	40000	3600	141.7	30000	2300	90.6	32000	3000	118.1	25000	1800	70.9
R1	35000	3500	137.8	25000	2200	86.6	28000	2800	110.2	20000	1700	66.9
R1.5	30000	3400	133.9	23000	2200	86.6	24000	2600	102.4	16000	1500	59.1
R2	25000	3400	133.9	20000	2200	86.6	20000	2600	102.4	14000	1500	59.1
R2.5	23000	3400	133.9	17000	2200	86.6	18000	2600	102.4	12000	1500	59.1
R3	20000	3400	133.9	15000	2200	86.6	16000	2600	102.4	10000	1400	55.1
R4	15000	3000	118.1	12500	2000	78.7	10000	2000	78.7	7500	1200	47.2
R5	12000	3000	118.1	10000	2000	78.7	8000	2000	78.7	6000	1200	47.2
R6	10000	2600	102.4	8300	1800	70.9	6600	1700	66.9	5000	1100	43.3

Depth of cut



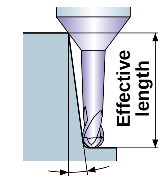
1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

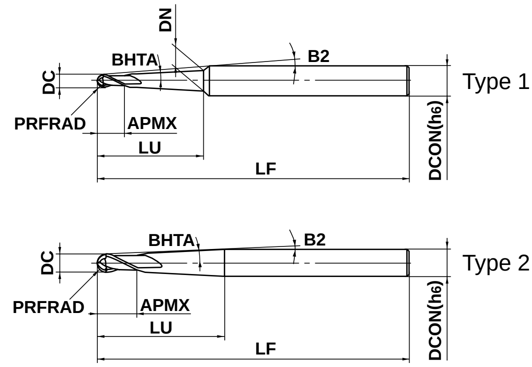


VCXB

Ball nose, 2 flute, Taper neck

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
○	◎	◎	○	○	○		





R	0.5≤PRFRAD≤6		
	±0.01		
DC	1≤DC≤12		
	0 / - 0.020		
h6	DCON=6	8≤DCON≤10	12≤DCON≤16
	0 / - 0.008	0 / - 0.009	0 / - 0.011

● Ball nose end mill with taper neck.

Unit : mm

Order Number	PRFRAD	DC	BHTA	APMX	LU	B2	DN	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCXBR0050T0100L016	0.5	1	1°	2	16	6.6°	1.38	50	6	2	●	1	16.2	17	18
VCXBR0050T0100L021	0.5	1	1°	2	21	5.4°	1.56	60	6	2	●	1	21.2	22.3	23.5
VCXBR0050T0100L026	0.5	1	1°	2	26	4.6°	1.73	70	6	2	●	1	26.2	27.6	29.1
VCXBR0050T0130	0.5	1	1° 30'	2	23	5.1°	1.97	60	6	2	●	1	—	23.9	25.2
VCXBR0050T0300	0.5	1	3°	2	42	3.4°	5.08	80	6	2	●	1	—	—	42.4
VCXBR0050T0500	0.5	1	5°	2	23	5.8°	4.46	60	6	2	●	1	—	—	—
VCXBR0100T0100L021	1	2	1°	4	21	4.6°	2.43	50	6	2	●	1	21.3	22.4	23.6
VCXBR0100T0100L031	1	2	1°	4	31	3.4°	2.78	60	6	2	●	1	31.3	33	34.8
VCXBR0100T0100L041	1	2	1°	4	41	2.7°	3.13	70	6	2	●	1	41.3	43.5	⋆
VCXBR0100T0130	1	2	1° 30'	4	23	4.4°	2.8	60	6	2	●	1	—	24.1	25.4
VCXBR0100T0300	1	2	3°	4	41	2.9°	5.71	80	6	2	●	1	—	—	⋆
VCXBR0100T0500	1	2	5°	4	23	4.9°	5.02	60	6	2	●	1	—	—	—
VCXBR0150T0100L031	1.5	3	1°	6	31	2.7°	3.71	60	6	2	●	1	31.4	33	⋆
VCXBR0150T0100L041	1.5	3	1°	6	41	2.1°	4.06	70	6	2	●	1	41.4	43.5	⋆
VCXBR0150T0100L051	1.5	3	1°	6	51	1.7°	4.41	80	6	2	●	1	51.4	⋆	⋆
VCXBR0150T0130	1.5	3	1° 30'	6	52	1.7°	5.21	90	6	2	●	1	—	⋆	⋆
VCXBR0150T0300	1.5	3	3°	6	32	2.8°	5.56	70	6	2	●	1	—	—	⋆
VCXBR0200T0100L036	2	4	1°	8	36	1.7°	4.81	70	6	2	●	1	36.5	⋆	⋆
VCXBR0200T0100L046	2	4	1°	8	46	1.3°	5.16	80	6	2	●	1	46.5	⋆	⋆
VCXBR0200T0100L060	2	4	1°	8	60	1°	5.65	90	6	2	●	1	60.5	⋆	⋆
VCXBR0200T0130	2	4	1° 30'	8	49	1.3°	5.95	90	6	2	●	1	—	⋆	⋆
VCXBR0200T0300	2	4	3°	8	28	2.2°	—	70	6	2	●	2	—	—	⋆
VCXBR0250T0100L036	2.5	5	1°	10	36	0.9°	5.71	80	6	2	●	1	⋆	⋆	⋆
VCXBR0250T0100L065	2.5	5	1°	10	65	1.4°	6.72	110	8	2	●	1	65.6	⋆	⋆
VCXBR0250T0130	2.5	5	1° 30'	10	61	1.5°	7.42	110	8	2	★	1	—	⋆	⋆
VCXBR0250T0300	2.5	5	3°	10	41	2.3°	—	90	8	2	★	2	—	—	⋆
VCXBR0300T0100L051	3	6	1°	12	51	1.2°	7.11	90	8	2	●	1	51.8	⋆	⋆
VCXBR0300T0100L065	3	6	1°	12	65	1°	7.6	110	8	2	●	1	65.8	⋆	⋆
VCXBR0300T0100L092	3	6	1°	12	92	1.3°	8.54	140	10	2	●	1	92.8	⋆	⋆
VCXBR0300T0130	3	6	1° 30'	12	53	1.2°	7.85	110	8	2	●	1	—	⋆	⋆
VCXBR0300T0300	3	6	3°	12	34	1.9°	—	90	8	2	●	2	—	—	⋆

⋆ No interference

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	BHTA	APMX	LU	B2	DN	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle		
													1°	2°	3°
VCXBR0400T0100L068	4	8	1°	14	68	0.9°	9.64	110	10	2	★	1	⁎	⁎	⁎
VCXB**R0400T0100L092**	4	8	1°	14	92	1.3°	10.47	140	12	2	★	1	92.8	⁎	⁎
VCXB**R0400T0130**	4	8	1° 30'	14	55	1.2°	9.85	120	10	2	★	1	—	⁎	⁎
VCXB**R0400T0300**	4	8	3°	14	36	1.8°	—	100	10	2	★	2	—	—	⁎
VCXB**R0500T0100L070**	5	10	1°	18	70	0.9°	11.76	130	12	2	★	1	⁎	⁎	⁎
VCXB**R0500T0100L100**	5	10	1°	18	100	1.8°	12.8	160	16	2	★	1	100.7	⁎	⁎
VCXB**R0500T0130**	5	10	1° 30'	18	59	1.1°	—	130	12	2	★	2	—	⁎	⁎
VCXB**R0500T0300**	5	10	3°	18	40	1.7°	—	110	12	2	★	2	—	—	⁎
VCXB**R0600T0100L070**	6	12	1°	22	70	1.8°	13.62	140	16	2	★	1	70.9	⁎	⁎
VCXB**R0600T0100L100**	6	12	1°	22	100	1.2°	14.66	160	16	2	★	1	100.9	⁎	⁎
VCXB**R0600T0130**	6	12	1° 30'	22	83	1.5°	15.08	160	16	2	★	1	—	⁎	⁎
VCXB**R0600T0300**	6	12	3°	22	63	2.1°	—	140	16	2	★	2	—	—	⁎

⁎ No interference

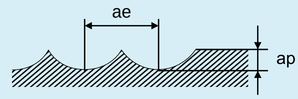
VCXB

Ball nose, 2 flute, Taper neck

RECOMMENDED CUTTING CONDITIONS

Work material					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Hardened steel (45−55HRC) AISI H13 etc.		
PRFRAD (mm)	**DN**	**LU** (mm)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
R0.5	1°	16	0.02	0.1	22000	530	20.9	12000	230	9.1
	1°	21	0.01							
	1°	26	0.01							
	1° 30'	23	0.02							
	3°	42	0.05							
	5°	23	0.05							
R1	1°	21	0.05	0.2	18000	570	22.4	10000	260	10.2
	1°	31	0.04							
	1°	41	0.03							
	1° 30'	23	0.1							
	3°	41	0.1							
	5°	23	0.1							
R2	1°	36	0.2	0.8	14000	670	26.4	6000	200	7.9
	1°	46	0.15							
	1°	60	0.1							
	1° 30'	49	0.2							
	3°	28	0.2							
R3	1°	51	0.3	1.2	10000	840	33.1	5000	220	8.7
	1°	65	0.2							
	1°	92	0.1							
	1° 30'	53	0.3							
	3°	34	0.3							
R4	1° 30'	55	0.4	1.6	8000	840	33.1	4000	270	10.6
	3°	36	0.4							
R5	1°	70	0.4	2	6000	840	33.1	3000	310	12.2
	1°	100	0.3							
	1° 30'	59	0.5							
	3°	40	0.5							
R6	1°	70	0.6	2.4	5000	900	35.4	2500	340	13.4
	1°	100	0.4							
	1° 30'	83	0.6							
	3°	63	0.6							

Depth of cut

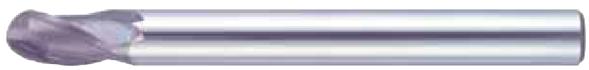


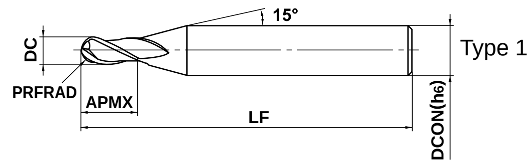
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

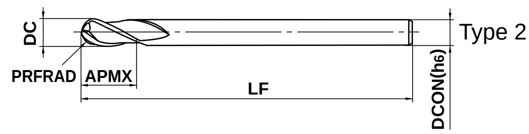
VC3MB

Ball nose end mill, Medium cut length, 3 flute

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
○	◎	◎	○	○	○		







R	PRFRAD≤6	PRFRAD≥8			
	±0.01	±0.02			
DC	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 3 flute ball nose end mill for efficient machining.

Unit : mm

Order Number	PRFRAD	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VC3MBR0100	1	2	6	60	6	3	●	1
VC3MB**R0150**	1.5	3	8	70	6	3	●	1
VC3MB**R0200**	2	4	8	70	6	3	●	1
VC3MB**R0250**	2.5	5	12	80	6	3	●	1
VC3MB**R0300**	3	6	12	80	6	3	●	2
VC3MB**R0400**	4	8	14	90	8	3	●	2
VC3MB**R0500**	5	10	18	100	10	3	●	2
VC3MB**R0600**	6	12	22	110	12	3	●	2
VC3MB**R0800**	8	16	30	140	16	3	●	2
VC3MB**R1000**	10	20	38	160	20	3	●	2

● : Inventory maintained.

VC3MB

Ball nose end mill, Medium cut length, 3 flute

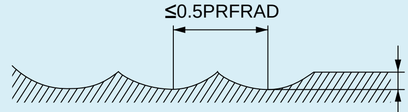
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Roughing

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.						Hardened steel (45−55HRC) AISI H13 etc.					
PRFRAD (mm)	α≦15°			α>15°			α≦15°			α>15°		
	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)
R1	32000	3000	118.1	25000	1170	46.1	18000	1440	56.7	16000	640	25.2
R2	18500	3700	145.7	14500	1460	57.5	11000	1760	69.3	9200	740	29.1
R3	13000	4000	157.5	10000	1500	59.1	7700	1920	75.6	6400	800	31.5
R4	10000	5000	196.9	8000	2000	78.7	6000	2300	90.6	4800	920	36.2
R5	8000	5000	196.9	6500	2000	78.7	4800	2200	86.6	3800	870	34.3
R6	6600	4600	181.1	5300	1800	70.9	4000	2100	82.7	3200	840	33.1
R8	5000	4000	157.5	4000	1600	63.0	3000	1700	66.9	2400	680	26.8
R10	4000	3600	141.7	3200	1440	56.7	2400	1400	55.1	1900	550	21.7

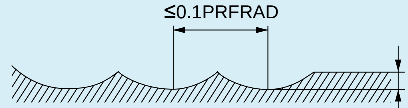
Depth of cut



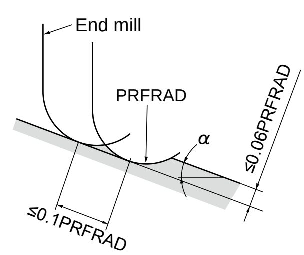
Finishing

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21 etc.						Hardened steel (45−55HRC) AISI H13 etc.					
PRFRAD (mm)	α≦15°			α>15°			α≦15°			α>15°		
	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)
R1	32000	3200	126.0	32000	1500	59.1	25000	2000	78.7	20000	800	31.5
R2	25500	5000	196.9	20000	2000	78.7	17000	2700	106.3	13000	1000	39.4
R3	20000	6100	240.2	15000	2200	86.6	13000	3200	126.0	10000	1200	47.2
R4	15000	7500	295.3	11000	2700	106.3	10000	3800	149.6	7500	1400	55.1
R5	12000	7500	295.3	9000	2700	106.3	8000	3700	145.7	6000	1400	55.1
R6	10000	7000	275.6	7500	2500	98.4	6600	3500	137.8	5000	1300	51.2
R8	7500	6000	236.2	5600	2200	86.6	5000	2800	110.2	3700	1000	39.4
R10	6000	5400	212.6	4500	2000	78.7	4000	2300	90.6	3000	900	35.4

Depth of cut



1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.



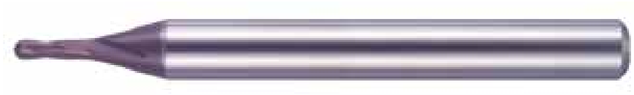
SOLID END MILLS

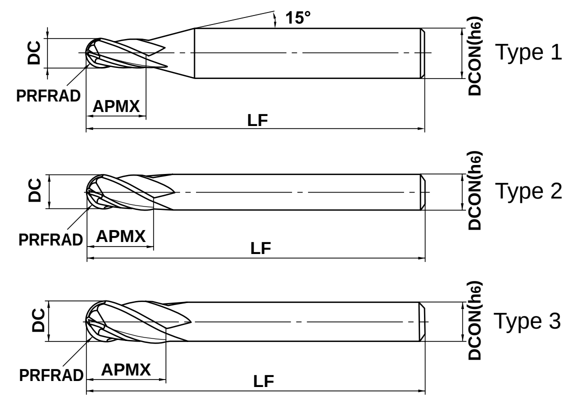
VC4MB

Ball nose, Medium cut length, 4 flute

UWC VC PRFRAD<3 20° PRFRAD≥3 30°

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
○	◎	◎	◎	○	○		





R	PRFRAD≤6	PRFRAD≥7			
	±0.01	±0.02			
	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- Best for high efficiency milling of hardened steels and milling in high-speed machining centers.

Unit : mm

Order Number	PRFRAD	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VC4MBR0050	0.5	1	2.5	50	6	4	●	1
VC4MB**R0075**	0.75	1.5	4	50	6	4	●	1
VC4MB**R0100**	1	2	6	60	6	4	●	1
VC4MB**R0150**	1.5	3	8	70	6	4	●	1
VC4MB**R0200**	2	4	8	70	6	4	●	1
VC4MB**R0250**	2.5	5	12	80	6	4	●	1
VC4MB**R0300**	3	6	12	80	6	4	●	2
VC4MB**R0400**	4	8	14	90	8	4	●	2
VC4MB**R0500**	5	10	18	100	10	4	●	2
VC4MB**R0600**	6	12	22	110	12	4	●	2
VC4MB**R0700**	7	14	26	120	12	4	★	3
VC4MB**R0800**	8	16	30	140	16	4	●	2
VC4MB**R0900**	9	18	34	140	16	4	★	3
VC4MB**R1000**	10	20	38	160	20	4	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

VC4MB

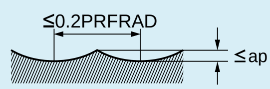
Ball nose, Medium cut length, 4 flute

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material	Alloy steel, Tool steel, Pre-hardened steel, Hardened steel (−55HRC) AISI H13, AISI W1-10, AISI P21 etc.							Hardened steel (55−62HRC) AISI D2 etc.						
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	α≤15°			α>15°			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R 0.5	40000	8000	315.0	40000	3800	149.6	0.06	40000	5600	220.5	40000	3100	122.0	0.05
R 0.75	40000	9600	378.0	40000	4800	189.0	0.09	40000	7200	283.5	38000	4200	165.4	0.08
R 1	40000	9600	378.0	40000	5600	220.5	0.11	40000	8000	315.0	28000	3100	122.0	0.10
R 1.5	40000	12000	472.4	32000	5600	220.5	0.13	32000	7700	303.1	19000	2900	114.2	0.12
R 2	32000	11000	433.1	24000	4700	185.0	0.15	24000	6200	244.1	14000	2500	98.4	0.13
R 2.5	25000	9000	354.3	19000	3800	149.6	0.20	19000	5300	208.7	12000	2200	86.6	0.15
R 3	21000	8400	330.7	15000	3400	133.9	0.25	16000	4800	189.0	9600	2000	78.7	0.20
R 4	16000	6400	252.0	12000	2600	102.4	0.30	12000	3600	141.7	7200	1600	63.0	0.20
R 5	13000	5200	204.7	9600	2200	86.6	0.50	10000	3200	126.0	5800	1300	51.2	0.20
R 6	9000	3600	141.7	7200	1700	66.9	0.50	7000	2200	86.6	4300	940	37.0	0.30
R 8	7500	2400	94.5	5000	1500	59.1	0.50	5000	1100	43.3	3100	600	23.6	0.30
R 10	6000	2000	78.7	4000	1300	51.2	0.50	4000	900	35.4	2500	500	19.7	0.30

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

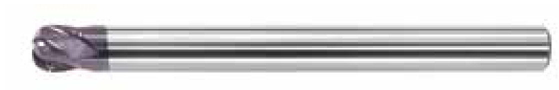
SOLID END MILLS

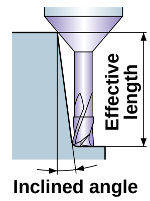
VCPSRB MIRACLE ORBIT

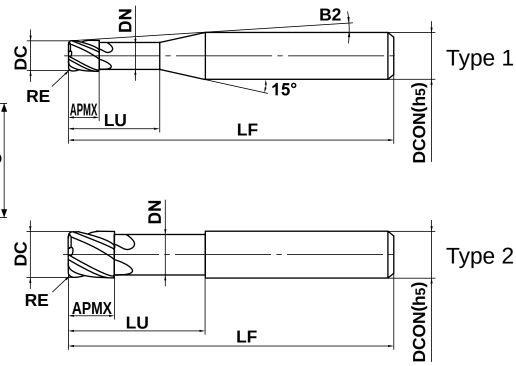
Corner radius, Short cut length, 2-4 flute, High precision type

UWC VC 30° DC≤1.5 DC≥2

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
◎	◎	◎	◎	○	○		







R

h5

0.05≤RE≤5		
±0.01		
0.6≤DC≤12		
0 - 0.01		
DCON=6	8≤DCON≤10	DCON=12
0 - 0.005	0 - 0.006	0 - 0.008

● Radius tolerance : R ±0.01mm, Diameter tolerance : 0–-0.01mm Suitable for high precision and high efficient machining of die & mold.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VCPSRBD0060N02R005	0.6	0.05	0.6	2	0.56	12.6°	50	6	2	★	1	2.1	2.2	2.4	2.6
VCPSRBD0060N02R01	0.6	0.1	0.6	2	0.56	12.6°	50	6	2	★	1	2.1	2.2	2.3	2.6
VCPSRBD0060N02R02	0.6	0.2	0.6	2	0.56	12.7°	50	6	2	★	1	2.1	2.2	2.2	2.5
VCPSRBD0060N04R01	0.6	0.1	0.6	4	0.56	10.9°	50	6	2	★	1	4.2	4.4	4.7	5.1
VCPSRBD0060N04R02	0.6	0.2	0.6	4	0.56	11°	50	6	2	★	1	4.2	4.3	4.7	5
VCPSRBD0080N04R005	0.8	0.05	0.8	4	0.76	10.7°	50	6	2	★	1	4.2	4.4	4.7	5.1
VCPSRBD0080N04R01	0.8	0.1	0.8	4	0.76	10.8°	50	6	2	★	1	4.2	4.4	4.7	5.1
VCPSRBD0080N04R02	0.8	0.2	0.8	4	0.76	10.8°	50	6	2	★	1	4.2	4.3	4.7	5
VCPSRBD0080N04R03	0.8	0.3	0.8	4	0.76	10.9°	50	6	2	★	1	4.2	4.3	4.6	5
VCPSRBD0080N06R01	0.8	0.1	0.8	6	0.76	9.4°	50	6	2	★	1	6.3	6.5	7	7.5
VCPSRBD0080N06R02	0.8	0.2	0.8	6	0.76	9.5°	50	6	2	★	1	6.3	6.5	7	7.5
VCPSRBD0080N06R03	0.8	0.3	0.8	6	0.76	9.5°	50	6	2	★	1	6.3	6.5	6.9	7.5
VCPSRBD0080N08R03	0.8	0.3	0.8	8	0.76	8.5°	50	6	2	★	1	8.3	8.6	9.2	10
VCPSRBD0100N04R005	1	0.05	1	4	0.94	10.5°	50	6	2	★	1	4.2	4.5	4.8	5.3
VCPSRBD0100N04R01	1	0.1	1	4	0.94	10.5°	50	6	2	★	1	4.2	4.5	4.8	5.3
VCPSRBD0100N04R02	1	0.2	1	4	0.94	10.6°	50	6	2	★	1	4.2	4.5	4.7	5.3
VCPSRBD0100N04R03	1	0.3	1	4	0.94	10.6°	50	6	2	★	1	4.2	4.5	4.6	5.2
VCPSRBD0100N04R04	1	0.4	1	4	0.94	10.7°	50	6	2	★	1	4.2	4.5	4.4	5.2
VCPSRBD0100N06R01	1	0.1	1	6	0.94	9.2°	50	6	2	★	1	6.4	6.7	7.2	7.8
VCPSRBD0100N06R02	1	0.2	1	6	0.94	9.2°	50	6	2	★	1	6.4	6.7	7.2	7.7
VCPSRBD0100N06R03	1	0.3	1	6	0.94	9.3°	50	6	2	★	1	6.3	6.6	7.2	7.7
VCPSRBD0100N06R04	1	0.4	1	6	0.94	9.4°	50	6	2	★	1	6.3	6.6	7.1	7.7
VCPSRBD0100N10R03	1	0.3	1	10	0.94	7.4°	50	6	2	★	1	10.5	10.9	11.8	12.7
VCPSRBD0100N10R04	1	0.4	1	10	0.94	7.4°	50	6	2	★	1	10.5	10.9	11.7	12.7
VCPSRBD0120N06R05	1.2	0.5	1.2	6	1.14	9.3°	50	6	2	★	1	6.3	6.6	7.1	7.7
VCPSRBD0120N10R05	1.2	0.5	1.2	10	1.14	7.3°	50	6	2	★	1	10.5	10.9	11.7	12.6
VCPSRBD0120N15R05	1.2	0.5	1.2	15	1.14	5.8°	50	6	2	★	1	15.7	16.3	17.5	18.9
VCPSRBD0150N04R01	1.5	0.1	1.5	4	1.44	10.2°	50	6	2	★	1	4.2	4.5	4.8	5.3
VCPSRBD0150N04R02	1.5	0.2	1.5	4	1.44	10.2°	50	6	2	★	1	4.2	4.5	4.7	5.3
VCPSRBD0150N04R03	1.5	0.3	1.5	4	1.44	10.3°	50	6	2	★	1	4.2	4.5	4.6	5.2
VCPSRBD0150N04R05	1.5	0.5	1.5	4	1.44	10.5°	50	6	2	●	1	4.2	4.4	4.3	5.2

● : Inventory maintained. ★ : Inventory maintained in Japan.

VCPSRB MIRACLE ORBIT

Corner radius, Short cut length, 2-4 flute, High precision type

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VCPSRBD0150N06R01	1.5	0.1	1.5	6	1.44	8.8°	50	6	2	★	1	6.4	6.7	7.2	7.8
VCPSRBD0150N06R02	1.5	0.2	1.5	6	1.44	8.9°	50	6	2	★	1	6.4	6.7	7.2	7.7
VCPSRBD0150N06R03	1.5	0.3	1.5	6	1.44	8.9°	50	6	2	★	1	6.3	6.6	7.2	7.7
VCPSRBD0150N06R05	1.5	0.5	1.5	6	1.44	9°	50	6	2	●	1	6.3	6.6	7.1	7.7
VCPSRBD0150N10R01	1.5	0.1	1.5	10	1.44	6.9°	50	6	2	★	1	10.6	11	11.8	12.7
VCPSRBD0150N10R02	1.5	0.2	1.5	10	1.44	7°	50	6	2	★	1	10.5	11	11.8	12.7
VCPSRBD0150N10R03	1.5	0.3	1.5	10	1.44	7°	50	6	2	★	1	10.5	10.9	11.8	12.7
VCPSRBD0150N10R05	1.5	0.5	1.5	10	1.44	7.1°	50	6	2	●	1	10.5	10.9	11.7	12.6
VCPSRBD0150N15R01	1.5	0.1	1.5	15	1.44	5.5°	50	6	2	★	1	15.8	16.3	17.5	18.9
VCPSRBD0150N15R02	1.5	0.2	1.5	15	1.44	5.5°	50	6	2	★	1	15.8	16.3	17.5	18.9
VCPSRBD0150N15R03	1.5	0.3	1.5	15	1.44	5.5°	50	6	2	★	1	15.7	16.3	17.5	18.9
VCPSRBD0150N15R05	1.5	0.5	1.5	15	1.44	5.7°	50	6	2	★	1	15.7	16.3	17.4	18.6
VCPSRBD0150N20R03	1.5	0.3	1.5	20	1.44	4.7°	60	6	2	★	1	20.9	21.6	22.9	24.5
VCPSRBD0150N20R05	1.5	0.5	1.5	20	1.44	4.8°	60	6	2	★	1	20.9	21.5	22.8	24.2
VCPSRBD0200N06R01	2	0.1	2	6	1.9	9.4°	50	6	4	★	1	6.3	6.6	6.9	7.5
VCPSRBD0200N06R02	2	0.2	2	6	1.9	9.7°	50	6	4	★	1	6.3	6.6	6.8	7.4
VCPSRBD0200N06R03	2	0.3	2	6	1.9	10°	50	6	4	★	1	6.3	6.6	6.7	7.4
VCPSRBD0200N06R05	2	0.5	2	6	1.9	10.3°	50	6	4	●	1	6.3	6.5	6.5	7.4
VCPSRBD0200N10R01	2	0.1	2	10	1.9	7.6°	50	6	4	★	1	10.5	10.9	11.4	12
VCPSRBD0200N10R02	2	0.2	2	10	1.9	7.7°	50	6	4	★	1	10.5	10.8	11.2	12
VCPSRBD0200N10R03	2	0.3	2	10	1.9	7.8°	50	6	4	★	1	10.5	10.8	11.1	11.9
VCPSRBD0200N10R05	2	0.5	2	10	1.9	8°	50	6	4	●	1	10.5	10.8	10.9	11.9
VCPSRBD0200N15R01	2	0.1	2	15	1.9	5.9°	50	6	4	★	1	15.7	16.1	16.8	17.5
VCPSRBD0200N15R02	2	0.2	2	15	1.9	5.9°	50	6	4	★	1	15.7	16.1	16.7	17.5
VCPSRBD0200N15R03	2	0.3	2	15	1.9	6°	50	6	4	★	1	15.7	16.1	16.6	17.4
VCPSRBD0200N15R05	2	0.5	2	15	1.9	6.1°	50	6	4	●	1	15.6	16.1	16.3	17.4
VCPSRBD0200N20R03	2	0.3	2	20	1.9	4.8°	60	6	4	★	1	20.8	21.4	21.9	22.9
VCPSRBD0200N20R05	2	0.5	2	20	1.9	4.9°	60	6	4	★	1	20.8	21.4	21.7	22.9
VCPSRBD0200N25R03	2	0.3	2	25	1.9	4°	60	6	4	★	1	26	26.6	27.5	28.3
VCPSRBD0200N25R05	2	0.5	2	25	1.9	4°	60	6	4	★	1	26	26.6	27	28.2
VCPSRBD0250N08R01	2.5	0.1	2.5	8	2.4	8.6°	50	6	4	★	1	8.4	8.7	9.2	9.9
VCPSRBD0250N08R02	2.5	0.2	2.5	8	2.4	8.7°	50	6	4	★	1	8.4	8.7	9	9.9
VCPSRBD0250N08R03	2.5	0.3	2.5	8	2.4	8.8°	50	6	4	★	1	8.4	8.7	8.9	9.9
VCPSRBD0250N08R05	2.5	0.5	2.5	8	2.4	9°	50	6	4	★	1	8.4	8.7	8.7	9.9
VCPSRBD0250N08R10	2.5	1	2.5	8	2.4	9.4°	50	6	4	●	1	8.3	8.7	8.2	9.9
VCPSRBD0250N15R03	2.5	0.3	2.5	15	2.4	5.5°	50	6	4	★	1	15.7	16.1	16.6	17.5
VCPSRBD0250N15R05	2.5	0.5	2.5	15	2.4	5.6°	50	6	4	★	1	15.6	16.1	16.3	17.5
VCPSRBD0250N15R10	2.5	1	2.5	15	2.4	5.7°	50	6	4	●	1	15.6	16.1	15.8	17.5
VCPSRBD0300N10R01	3	0.1	3	10	2.9	6.6°	60	6	4	★	1	10.5	10.9	11.4	12.3
VCPSRBD0300N10R02	3	0.2	3	10	2.9	6.6°	60	6	4	★	1	10.5	10.8	11.2	12.3
VCPSRBD0300N10R03	3	0.3	3	10	2.9	6.6°	60	6	4	★	1	10.5	10.8	11.1	12.3
VCPSRBD0300N10R05	3	0.5	3	10	2.9	6.7°	60	6	4	●	1	10.5	10.8	10.9	12.4
VCPSRBD0300N10R10	3	1	3	10	2.9	7°	60	6	4	●	1	10.4	10.8	10.4	12.4
VCPSRBD0300N15R01	3	0.1	3	15	2.9	4.8°	60	6	4	★	1	15.7	16.1	16.8	17.7
VCPSRBD0300N15R02	3	0.2	3	15	2.9	4.8°	60	6	4	★	1	15.7	16.1	16.7	17.8
VCPSRBD0300N15R03	3	0.3	3	15	2.9	4.8°	60	6	4	★	1	15.7	16.1	16.6	17.8
VCPSRBD0300N15R05	3	0.5	3	15	2.9	4.8°	60	6	4	●	1	15.6	16.1	16.3	17.8
VCPSRBD0300N15R10	3	1	3	15	2.9	5°	60	6	4	●	1	15.6	16.1	15.8	17.8
VCPSRBD0300N20R01	3	0.1	3	20	2.9	3.7°	60	6	4	★	1	20.8	21.4	22.1	23.1
VCPSRBD0300N20R02	3	0.2	3	20	2.9	3.7°	60	6	4	★	1	20.8	21.4	22	23.1
VCPSRBD0300N20R03	3	0.3	3	20	2.9	3.8°	60	6	4	★	1	20.8	21.4	21.9	23.2
VCPSRBD0300N20R05	3	0.5	3	20	2.9	3.8°	60	6	4	●	1	20.8	21.4	21.7	23.2

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

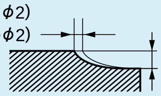
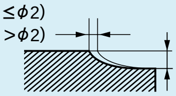
Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VCPSRBD0300N20R10	3	1	3	20	2.9	3.9°	60	6	4	●	1	20.8	21.3	21.2	23.2
VCPSRBD0300N30R03	3	0.3	3	30	2.9	2.6°	70	6	4	★	1	31.1	31.8	32.5	⋆
VCPSRBD0300N30R05	3	0.5	3	30	2.9	2.6°	70	6	4	★	1	31.1	31.8	32.2	⋆
VCPSRBD0400N12R01	4	0.1	4	12	3.9	3.8°	60	6	4	★	1	12.5	13	13.5	15.1
VCPSRBD0400N12R02	4	0.2	4	12	3.9	3.8°	60	6	4	★	1	12.5	13	13.4	15.2
VCPSRBD0400N12R03	4	0.3	4	12	3.9	3.8°	60	6	4	★	1	12.5	13	13.3	15.2
VCPSRBD0400N12R05	4	0.5	4	12	3.9	3.9°	60	6	4	●	1	12.5	13	13.1	15.3
VCPSRBD0400N12R10	4	1	4	12	3.9	4°	60	6	4	●	1	12.5	12.9	12.6	15.3
VCPSRBD0400N20R01	4	0.1	4	20	3.9	2.5°	60	6	4	★	1	20.8	21.4	22.1	⋆
VCPSRBD0400N20R02	4	0.2	4	20	3.9	2.5°	60	6	4	★	1	20.8	21.4	22	⋆
VCPSRBD0400N20R03	4	0.3	4	20	3.9	2.5°	60	6	4	★	1	20.8	21.4	21.9	⋆
VCPSRBD0400N20R05	4	0.5	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	21.7	⋆
VCPSRBD0400N20R10	4	1	4	20	3.9	2.6°	60	6	4	●	1	20.8	21.3	21.2	⋆
VCPSRBD0400N30R03	4	0.3	4	30	3.9	1.8°	70	6	4	★	1	31.1	31.8	⋆	⋆
VCPSRBD0400N30R05	4	0.5	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	⋆	⋆
VCPSRBD0400N30R10	4	1	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	⋆	⋆
VCPSRBD0500N15R05	5	0.5	5	15	4.9	1.6°	60	6	4	★	1	15.6	16.1	⋆	⋆
VCPSRBD0500N15R10	5	1	5	15	4.9	1.6°	60	6	4	★	1	15.6	16.1	⋆	⋆
VCPSRBD0500N30R05	5	0.5	5	30	4.9	0.9°	70	6	4	★	1	31.1	⋆	⋆	⋆
VCPSRBD0500N30R10	5	1	5	30	4.9	0.9°	70	6	4	★	1	31.1	⋆	⋆	⋆
VCPSRBD0600N18R01	6	0.1	6	18	5.85	—	70	6	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0600N18R02	6	0.2	6	18	5.85	—	70	6	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0600N18R03	6	0.3	6	18	5.85	—	70	6	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0600N18R05	6	0.5	6	18	5.85	—	70	6	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0600N18R10	6	1	6	18	5.85	—	70	6	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0600N18R20	6	2	6	18	5.85	—	70	6	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0600N41R05	6	0.5	6	41	5.85	—	90	6	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0600N50R10	6	1	6	50	5.85	—	90	6	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R01	8	0.1	8	24	7.85	—	90	8	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R02	8	0.2	8	24	7.85	—	90	8	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R03	8	0.3	8	24	7.85	—	90	8	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R05	8	0.5	8	24	7.85	—	90	8	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R10	8	1	8	24	7.85	—	90	8	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R20	8	2	8	24	7.85	—	90	8	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0800N24R30	8	3	8	24	7.85	—	90	8	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD0800N50R10	8	1	8	50	7.85	—	90	8	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD0800N50R30	8	3	8	50	7.85	—	90	8	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD1000N30R03	10	0.3	10	30	9.7	—	100	10	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD1000N30R05	10	0.5	10	30	9.7	—	100	10	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1000N30R10	10	1	10	30	9.7	—	100	10	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1000N30R20	10	2	10	30	9.7	—	100	10	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1000N30R30	10	3	10	30	9.7	—	100	10	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1000N30R40	10	4	10	30	9.7	—	100	10	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1000N50R10	10	1	10	50	9.7	—	100	10	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD1000N50R30	10	3	10	50	9.7	—	100	10	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R03	12	0.3	12	36	11.7	—	110	12	4	★	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R05	12	0.5	12	36	11.7	—	110	12	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R10	12	1	12	36	11.7	—	110	12	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R20	12	2	12	36	11.7	—	110	12	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R30	12	3	12	36	11.7	—	110	12	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R40	12	4	12	36	11.7	—	110	12	4	●	2	⋆	⋆	⋆	⋆
VCPSRBD1200N36R50	12	5	12	36	11.7	—	110	12	4	●	2	⋆	⋆	⋆	⋆

⋆ No interference

VCPSRB MIRACLE ORBIT

Corner radius, Short cut length, 2-4 flute, High precision type

RECOMMENDED CUTTING CONDITIONS

Work material		Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Hardened steel (45−55HRC) AISI H13 etc.			Hardened steel (55−62HRC) AISI D2 etc.		
DC (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
0.6	2	48000	200−600	7.9− 23.6	40000	160−500	6.3− 19.7	22000	80−250	3.1− 9.8
	4	48000	160−500	6.3− 19.7	40000	100−300	3.9− 11.8	22000	50−150	2.0− 5.9
0.8	4	48000	240−750	9.4− 29.5	32000	160−500	6.3− 19.7	19000	80−250	3.1− 9.8
	6	38000	190−600	7.5− 23.6	26000	130−400	5.1− 15.7	16000	70−200	2.8− 7.9
	8	29000	150−450	5.9− 17.7	19000	100−300	3.9− 11.8	12000	50−150	2.0− 5.9
1	4	48000	270−900	10.6− 35.4	32000	180−600	7.1− 23.6	19000	90−300	3.5−11.8
	6	38000	220−720	8.7− 28.3	26000	150−480	5.9− 18.9	16000	70−240	2.8− 9.4
	10	29000	160−540	6.3− 21.3	19000	110−360	4.3− 14.2	12000	60−180	2.4− 7.1
1.2	6	48000	300−900	11.8− 35.4	32000	200−600	7.9− 23.6	19000	100−300	3.9−11.8
	10	38000	240−720	9.4− 28.3	26000	160−480	6.3− 18.9	15000	80−240	3.1− 9.4
	15	29000	180−540	7.1− 21.3	19000	120−360	4.7− 14.2	12000	60−180	2.4− 7.1
1.5	4	41000	300−900	11.8− 35.4	27000	200−600	7.9− 23.6	16000	100−300	3.9−11.8
	6	32000	240−720	9.4− 28.3	22000	160−480	6.3− 18.9	13000	80−240	3.1− 9.4
	10	24000	180−540	7.1− 21.3	16000	120−360	4.7− 14.2	10000	60−180	2.4− 7.1
2	6	36000	600−2000	23.6− 78.7	24000	400−1300	15.7− 51.2	14000	200−650	7.9−25.6
	10	29000	480−1600	18.9− 63.0	19000	320−1000	12.6− 39.4	12000	160−520	6.3−20.5
	15	22000	360−1200	14.2− 47.2	14000	240−780	9.4− 30.7	9000	120−390	4.7−15.4
2.5	8	33000	750−2400	29.5− 94.5	22000	500−1600	19.7− 63.0	13000	250−800	9.8−31.5
	15	20000	450−1400	17.7− 55.1	13000	300−960	11.8− 37.8	8000	150−480	5.9−18.9
3	10	30000	900−3000	35.4−118.1	20000	600−2000	23.6− 78.7	12000	300−1000	11.8−39.4
	15	24000	720−2400	28.3− 94.5	16000	480−1600	18.9− 63.0	10000	240−800	9.4−31.5
	20	18000	540−1800	21.3− 70.9	12000	360−1200	14.2− 47.2	7000	180−600	7.1−23.6
4	12	26000	1200−4500	47.2−177.2	17000	800−3000	31.5−118.1	10000	400−1500	15.7−59.1
	20	20000	960−2000	37.8− 78.7	14000	640−2000	25.2− 78.7	8000	320−2000	12.6−78.7
	30	15000	720−1000	28.3− 39.4	10000	480−1000	18.9− 39.4	6000	240−1000	9.4−39.4
5	15	20000	1200−4800	47.2−189.0	13000	780−3120	30.7−122.8	10000	520−2000	20.5−78.7
	30	12000	720−1900	28.3− 74.8	8000	480−1600	18.9− 63.0	7000	360−1120	14.2−44.1
6	18	20000	1600−7500	63.0−295.3	13000	1100−5000	43.3−196.9	8000	550−2500	21.7−98.4
	41	15000	900−2400	35.4− 94.5	12000	720−1600	28.3− 63.0	10000	600−1200	23.6−47.2
	50	10000	600−1200	23.6− 47.2	8000	480−800	18.9− 31.5	6000	360−530	14.2−20.9
8	24	15000	1900−7500	74.8−295.3	10000	1300−5000	51.2−196.9	6000	650−2500	25.6−98.4
	50	10000	1300−2400	51.2− 94.5	8000	1000−2200	39.4− 86.6	3000	320−600	12.6−23.6
10	30	12000	1600−7500	63.0−295.3	8000	1100−5000	43.3−196.9	5000	550−2500	21.7−98.4
	50	10000	1300−3200	51.2−126.0	7000	950−2200	37.4− 86.6	2500	280−600	11.0−23.6
12	36	10000	1500−7500	59.1−295.3	7000	1000−5000	39.4−196.9	4000	500−2500	19.7−98.4
Depth of cut		≤0.2RE (DC≤ϕ2) ≤0.4RE (DC>ϕ2)  ≤0.1mm (DC≤ϕ1.5) ≤0.2mm (DC=ϕ2 to ϕ5) ≤0.5mm (DC≥ϕ6)						≤0.1RE (DC≤ϕ2) ≤0.2RE (DC>ϕ2)  ≤0.05mm (DC≤ϕ1.5) ≤0.1mm (DC=ϕ2 to ϕ5) ≤0.3mm (DC≥ϕ6)		

1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VCPSRB MIRACLE ORBIT

Corner radius, Short cut length, 2-4 flute, Taper neck, High precision

UWC VC 30° DC=1.5 DC≥2

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
◎	◎	◎	◎	○	○		

CARBIDE

SQUARE

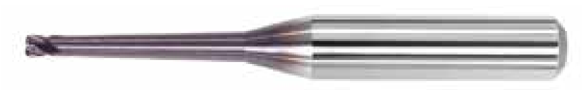
BALL

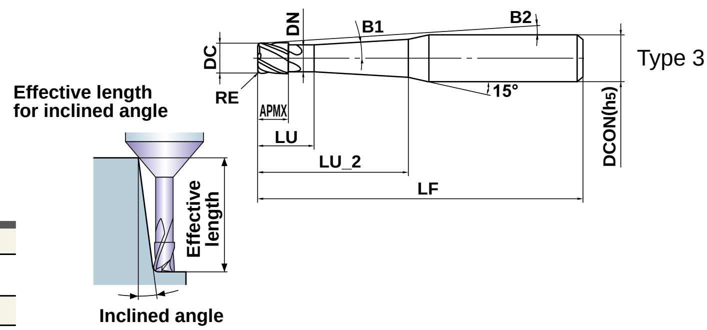
RADIUS

TAPER

SOLID END MILLS

Taper neck type





R 0.5≤RE≤3				
±0.01				
1.5≤DC≤12				
0 - 0.01				
h5 DCON=6	8≤DCON≤10	12≤DCON≤16		
0 - 0.005	0 - 0.006	0 - 0.008		

● Radius tolerance : R ±0.01mm, Diameter tolerance : 0—-0.01mm Suitable for high precision and high efficient machining of die & mold.

Unit : mm

Order Number	DC	RE	BHTA	APMX	LU_2	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCPSRBD0150N03L06R05	1.5	0.5	1°30'	1.5	6	3	1.44	9°	50	6	2	●	3	—	7.1	7.7
VCPSRBD0150N03L10R05	1.5	0.5	1°30'	1.5	10	3	1.44	7.2°	50	6	2	●	3	—	11.3	12.2
VCPSRBD0200N04L10R05	2	0.5	1°30'	2	10	4	1.9	6.7°	60	6	4	●	3	—	11.5	12.4
VCPSRBD0200N04L15R05	2	0.5	1°30'	2	15	4	1.9	5.3°	60	6	4	●	3	—	16.7	18
VCPSRBD0250N05L12R10	2.5	1	1°30'	2.5	12	5	2.4	5.6°	60	6	4	●	3	—	14.2	15.3
VCPSRBD0250N05L20R10	2.5	1	1°30'	2.5	20	5	2.4	4°	60	6	4	●	3	—	22.5	24.2
VCPSRBD0300N06L15R05	3	0.5	1°30'	3	15	6	2.9	4.4°	60	6	4	●	3	—	16.9	18.2
VCPSRBD0300N06L20R05	3	0.5	1°30'	3	20	6	2.9	3.6°	60	6	4	●	3	—	22.1	23.8
VCPSRBD0300N06L15R10	3	1	1°30'	3	15	6	2.9	4.4°	60	6	4	●	3	—	17.4	18.7
VCPSRBD0300N06L20R10	3	1	1°30'	3	20	6	2.9	3.6°	60	6	4	●	3	—	22.6	24.4
VCPSRBD0400N08L20R10	4	1	1°30'	4	20	8	3.9	2.6°	60	6	4	●	3	—	22.8	⁎
VCPSRBD0400N08L30R10	4	1	1°30'	4	30	8	3.9	1.9°	70	6	4	●	3	—	⁎	⁎
VCPSRBD0500N08L40R05	5	0.5	1°	5	40	8	4.9	2°	90	8	4	★	3	41.2	⁎	⁎
VCPSRBD0500N08L60R05	5	0.5	1°	5	60	8	4.9	1.4°	110	8	4	★	3	61.2	⁎	⁎
VCPSRBD0500N08L40R10	5	1	1°	5	40	8	4.9	2°	90	8	4	★	3	41.7	⁎	⁎
VCPSRBD0500N08L60R10	5	1	1°	5	60	8	4.9	1.4°	110	8	4	★	3	61.7	⁎	⁎
VCPSRBD0600N08L40R20	6	2	1°	6	40	8	5.85	1.4°	70	8	4	●	3	42.8	⁎	⁎
VCPSRBD0600N08L60R20	6	2	1°	6	60	8	5.85	1°	100	8	4	★	3	⁎	⁎	⁎
VCPSRBD0800N10L53R20	8	2	1°	8	53	10	7.85	1.1°	90	10	4	●	3	55.9	⁎	⁎
VCPSRBD0800N10L70R20	8	2	1°	8	70	10	7.85	1.6°	130	12	4	★	3	72.9	⁎	⁎
VCPSRBD1000N12L55R30	10	3	1°	10	55	12	9.7	1.1°	100	12	4	●	3	59.4	⁎	⁎
VCPSRBD1000N12L70R30	10	3	1°	10	70	12	9.7	0.9°	130	12	4	★	3	⁎	⁎	⁎
VCPSRBD1200N24L70R30	12	3	1°	12	70	24	11.7	1.6°	130	16	4	★	3	75.2	⁎	⁎

⁎ No interference

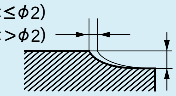
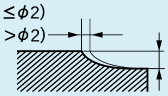
● : Inventory maintained. ★ : Inventory maintained in Japan.

VCPSRB MIRACLE ORBIT

Corner radius, Short cut length, 2-4 flute, High precision type

RECOMMENDED CUTTING CONDITIONS

Taper neck type

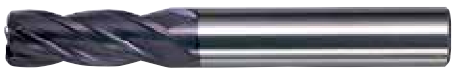
Work material			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Hardened steel (45–55HRC) AISI H13 etc.			Hardened steel (55–62HRC) AISI D2 etc.		
DC (mm)	**BHTA**	**LU_2** (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
1.5	1° 30'	6	36000	270–810	10.6– 31.9	24000	180–540	7.1– 21.3	15000	90–270	3.5– 10.6
1.5	1° 30'	10	28000	210–630	8.3– 24.8	19000	140–420	5.5– 16.5	11000	70–210	2.8– 8.3
2	1° 30'	10	32000	540–1800	21.3– 70.9	22000	360–1200	14.2– 47.2	13000	180–590	7.1– 23.2
2	1° 30'	15	25000	420–1400	16.5– 55.1	17000	280–910	11.0– 35.8	10000	140–460	5.5– 18.1
2.5	1° 30'	12	26000	600–1900	23.6– 74.8	18000	400–1300	15.7– 51.2	11000	200–640	7.9– 25.2
2.5	1° 30'	20	20000	450–140	17.7– 5.5	13000	300–960	11.8– 37.8	8000	150–480	5.9– 18.9
3	1° 30'	15	27000	810–2700	31.9–106.3	18000	540–1800	21.3– 70.9	11000	270–900	10.6– 35.4
3	1° 30'	20	21000	630–2100	24.8– 82.7	14000	420–1400	16.5– 55.1	8000	210–700	8.3– 27.6
4	1° 30'	20	23000	1080–3000	42.5–118.1	15000	720–3000	28.3–118.1	9000	360–3000	14.2–118.1
4	1° 30'	30	18000	840–1500	33.1– 59.1	12000	560–1500	22.0– 59.1	7000	280–1500	11.0– 59.1
5	1°	40	10000	520–1400	20.5– 55.1	7000	420–840	16.5– 33.1	5000	260–600	10.2– 23.6
5	1°	60	7000	360–840	14.2– 33.1	5000	300–500	11.8– 19.7	4000	210–400	8.3– 15.7
6	1°	40	20000	1650–4500	65.0–177.2	13000	1100–3000	43.3–118.1	8000	550–1500	21.7– 59.1
8	1°	53	15000	1950–4500	76.8–177.2	10000	1300–3000	51.2–118.1	6000	650–1500	25.6– 59.1
10	1°	55	12000	1650–4500	65.0–177.2	8000	1100–3000	43.3–118.1	5000	550–1500	21.7– 59.1
Depth of cut			≤0.2RE (DC≤ϕ2) ≤0.4RE (DC>ϕ2)  ≤0.1mm (DC≤ϕ1.5) ≤0.2mm (DC=ϕ2 to ϕ5) ≤0.5mm (DC≥ϕ6)						≤0.1RE (DC≤ϕ2) ≤0.2RE (DC>ϕ2)  ≤0.05mm (DC≤ϕ1.5) ≤0.1mm (DC=ϕ2 toϕ5) ≤0.3mm (DC≥ϕ6)		

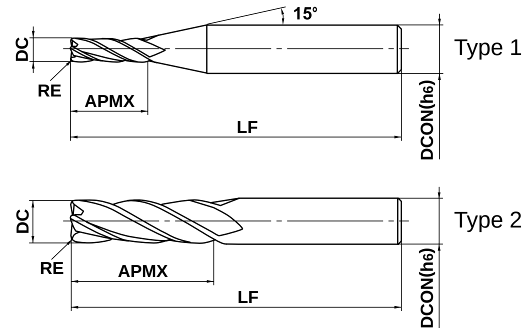
1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VC4JRB

Corner radius end mill, Semi long cut length, 4 flute

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
○	◎	◎	○	○	○		





DC≤12	DC>12			
0 / -0.020	0 / -0.030			
DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 / -0.008	0 / -0.009	0 / -0.011	0 / -0.013	

● 4 flute corner radius end mill for longer reach applications.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VC4JRBD0300R0030	3	0.3	12	50	6	4	★	1
VC4JRBD0400R0030	4	0.3	15	50	6	4	★	1
VC4JRBD0400R0050	4	0.5	15	50	6	4	★	1
VC4JRBD0500R0030	5	0.3	20	60	6	4	★	1
VC4JRBD0500R0050	5	0.5	20	60	6	4	★	1
VC4JRBD0600R0030	6	0.3	20	60	6	4	★	2
VC4JRBD0600R0050	6	0.5	20	60	6	4	★	2
VC4JRBD0600R0100	6	1	20	60	6	4	★	2
VC4JRBD0800R0030	8	0.3	25	70	8	4	★	2
VC4JRBD0800R0050	8	0.5	25	70	8	4	★	2
VC4JRBD0800R0100	8	1	25	70	8	4	★	2
VC4JRBD0800R0150	8	1.5	25	70	8	4	★	2
VC4JRBD0800R0200	8	2	25	70	8	4	★	2
VC4JRBD1000R0030	10	0.3	30	90	10	4	★	2
VC4JRBD1000R0050	10	0.5	30	90	10	4	★	2
VC4JRBD1000R0100	10	1	30	90	10	4	★	2
VC4JRBD1000R0150	10	1.5	30	90	10	4	★	2
VC4JRBD1000R0200	10	2	30	90	10	4	★	2
VC4JRBD1200R0050	12	0.5	30	90	12	4	★	2
VC4JRBD1200R0100	12	1	30	90	12	4	★	2
VC4JRBD1200R0150	12	1.5	30	90	12	4	★	2
VC4JRBD1200R0200	12	2	30	90	12	4	★	2
VC4JRBD1600R0050	16	0.5	50	110	16	4	★	2
VC4JRBD1600R0100	16	1	50	110	16	4	★	2
VC4JRBD1600R0150	16	1.5	50	110	16	4	★	2
VC4JRBD1600R0200	16	2	50	110	16	4	★	2
VC4JRBD2000R0050	20	0.5	55	110	20	4	★	2
VC4JRBD2000R0100	20	1	55	110	20	4	★	2
VC4JRBD2000R0150	20	1.5	55	110	20	4	★	2
VC4JRBD2000R0200	20	2	55	110	20	4	★	2

★ : Inventory maintained in Japan.

VC4JRB

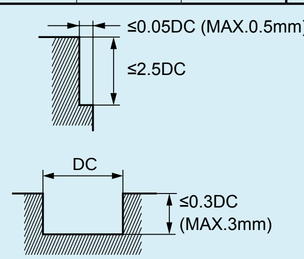
Corner radius end mill, Semi long cut length, 4 flute

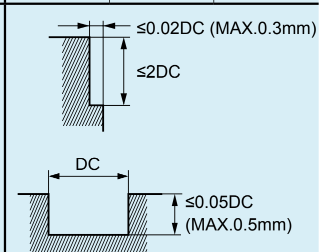
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	4200	110	4.3	3400	95	3.7	2600	70	2.8	2100	50	2.0
4	3400	140	5.5	2700	110	4.3	2100	85	3.3	1700	60	2.4
5	2900	170	6.7	2300	140	5.5	1800	100	3.9	1500	70	2.8
6	2500	200	7.9	2000	170	6.7	1500	130	5.1	1300	85	3.3
8	1900	220	8.7	1500	170	6.7	1200	150	5.9	1000	85	3.3
10	1600	220	8.7	1300	170	6.7	950	130	5.1	800	85	3.3
12	1300	170	6.7	1100	150	5.9	800	100	3.9	670	70	2.8
16	1000	140	5.5	820	110	4.3	600	80	3.1	500	50	2.0
20	800	110	4.3	650	85	3.3	480	70	2.8	400	40	1.6

Depth of cut





1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) The above table shows cutting conditions for shoulder milling. For slotting, please reduce the feed rate only to 50% of the table figure. Please set the revolution rate at 60% and the feed rate at 40% when slotting austenitic stainless steels.
4) When drilling, please set the feed rate at 1/3 or below of the above value.
5) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

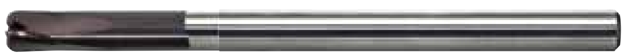
SOLID END MILLS

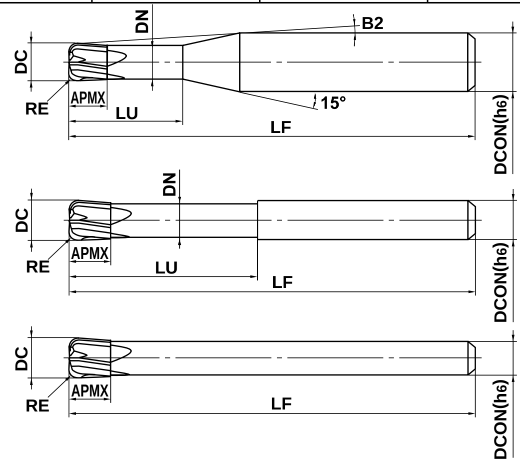
VCHFRB

High feed corner radius, 4 flute

UWC VC 20° DC≤5 10° DC≥6

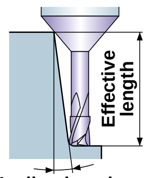
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
◎	◎	◎	○		○		





R	0.5≤RE≤3		
	±0.015		
DC	DC≤12	DC>12	
	0 / -0.02	0 / -0.03	
h6	DCON=6	8≤DCON≤10	12≤DCON≤16
	0 / -0.008	0 / -0.009	0 / -0.011

Effective length for inclined angle



Inclined angle

● Suitable for high feed and efficient machining of die & mold.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VCHFRBD0200R050N06	2	0.5	2	6	1.9	8.7°	50	6	4	★	1	6.2	6.5	6.9	7.5
VCHFRBD0200R050N10	2	0.5	2	10	1.9	6.7°	70	6	4	★	1	10.4	10.8	11.5	12.4
VCHFRBD0300R075N09	3	0.75	3	9	2.9	6.2°	50	6	4	★	1	9.4	9.7	10.4	11.1
VCHFRBD0300R075N15	3	0.75	3	15	2.9	4.3°	70	6	4	★	1	15.6	16.1	17.3	18.6
VCHFRBD0400R100N12	4	1	4	12	3.9	3.9°	50	6	4	★	1	12.4	12.8	13.7	14.7
VCHFRBD0400R100N20	4	1	4	20	3.9	2.6°	70	6	4	★	1	20.7	21.4	22.9	*
VCHFRBD0500R120N15	5	1.2	5	15	4.9	1.9°	70	6	4	★	1	15.5	16	*	*
VCHFRBD0600R150N18	6	1.5	6	18	5.85	—	50	6	4	★	2	*	*	*	*
VCHFRBD0600R150N30	6	1.5	6	30	5.85	—	90	6	4	★	2	*	*	*	*
VCHFRBD0700R150A050	7	1.5	7	—	—	—	50	6	4	★	3	*	*	*	*
VCHFRBD0700R150A080	7	1.5	7	—	—	—	80	6	4	★	3	*	*	*	*
VCHFRBD0800R200N24	8	2	8	24	7.85	—	60	8	4	★	2	*	*	*	*
VCHFRBD0800R200N40	8	2	8	40	7.85	—	90	8	4	★	2	*	*	*	*
VCHFRBD0900R200A065	9	2	9	—	—	—	65	8	4	★	3	*	*	*	*
VCHFRBD0900R200A100	9	2	9	—	—	—	100	8	4	★	3	*	*	*	*
VCHFRBD1000R200N30	10	2	10	30	9.7	—	70	10	4	★	2	*	*	*	*
VCHFRBD1000R200N50	10	2	10	50	9.7	—	100	10	4	★	2	*	*	*	*
VCHFRBD1100R200A070	11	2	11	—	—	—	70	10	4	★	3	*	*	*	*
VCHFRBD1100R200A110	11	2	11	—	—	—	110	10	4	★	3	*	*	*	*
VCHFRBD1200R300N36	12	3	12	36	11.7	—	75	12	4	★	2	*	*	*	*
VCHFRBD1200R300N60	12	3	12	60	11.7	—	110	12	4	★	2	*	*	*	*
VCHFRBD1300R300A075	13	3	13	—	—	—	75	12	4	★	3	*	*	*	*
VCHFRBD1300R300A120	13	3	13	—	—	—	120	12	4	★	3	*	*	*	*
VCHFRBD1600R300N80	16	3	16	80	15.5	—	140	16	4	★	2	*	*	*	*

* No interference

★ : Inventory maintained in Japan.

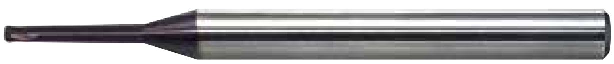
VCHFRB

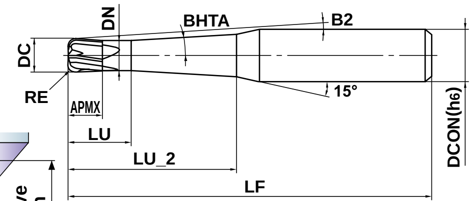
High feed corner radius, taper neck, 4 flute

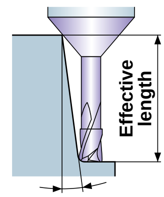
DC≤5 DC≥6

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
◎	◎	◎	○	○	○		

Taper neck type







R	0.5≤RE≤3		
	±0.015		
DC	DC≤12	DC>12	
	0 - 0.02	0 - 0.03	
h6	DCON=6	8≤DCON≤10	12≤DCON≤16
	0 - 0.008	0 - 0.009	0 - 0.011

- Suitable for high feed and efficient machining of die & mold.

Unit : mm

Order Number	DC	RE	BHTA	APMX	LU_2	LU	DN	B2	LF	DCON	No. ofFlutes	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCHFRBD0200R050N12	2	0.5	1°	2	12	4	1.9	6°	70	6	4	★	4	12.9	13.9	15
VCHFRB**D0200R050N16**	2	0.5	1°	2	16	4	1.9	5°	70	6	4	★	4	16.9	18.2	19.6
VCHFRB**D0200R050N20**	2	0.5	1°	2	20	4	1.9	4.3°	70	6	4	★	4	20.9	22.5	24.3
VCHFRB**D0300R075N18**	3	0.75	1°	3	18	6	2.9	3.8°	80	6	4	★	4	19.3	20.7	22.3
VCHFRB**D0300R075N24**	3	0.75	1°	3	24	6	2.9	3°	80	6	4	★	4	25.3	27.2	⋆
VCHFRB**D0300R075N30**	3	0.75	1°	3	30	6	2.9	2.6°	80	6	4	★	4	31.3	33.6	⋆
VCHFRB**D0400R100N24**	4	1	1°	4	24	8	3.9	2.2°	90	6	4	★	4	25.7	27.6	⋆
VCHFRB**D0400R100N32**	4	1	1°	4	32	8	3.9	1.7°	90	6	4	★	4	33.7	⋆	⋆
VCHFRB**D0400R100N40**	4	1	1°	4	40	8	3.9	1.4°	90	6	4	★	4	41.7	⋆	⋆
VCHFRB**D0500R120N30**	5	1.2	1°	5	30	8	4.9	1°	90	6	4	★	4	⋆	⋆	⋆
VCHFRB**D0500R120N40**	5	1.2	1°	5	40	8	4.9	2°	90	8	4	★	4	41.9	⋆	⋆
VCHFRB**D0500R120N50**	5	1.2	1°	5	50	8	4.9	1.7°	110	8	4	★	4	51.9	⋆	⋆
VCHFRB**D0600R150N50**	6	1.5	1°	6	50	16	5.85	1.2°	110	8	4	★	4	52.9	⋆	⋆
VCHFRB**D0600R150N67**	6	1.5	1°	6	67	16	5.85	0.9°	130	8	4	★	4	⋆	⋆	⋆
VCHFRB**D0800R200N70**	8	2	1°	8	70	18	7.85	0.9°	120	10	4	★	4	⋆	⋆	⋆
VCHFRB**D0800R200N90**	8	2	1°	8	90	18	7.85	1.3°	150	12	4	★	4	93.5	⋆	⋆
VCHFRB**D1000R200N80**	10	2	1°	10	80	20	9.7	2°	140	16	4	★	4	83.9	⋆	⋆
VCHFRB**D1000R200N110**	10	2	1°	10	110	20	9.7	1.5°	160	16	4	★	4	113.9	⋆	⋆
VCHFRB**D1200R300N110**	12	3	1°	12	110	24	11.7	1.1°	160	16	4	★	4	115.2	⋆	⋆

⋆ No interference

★ : Inventory maintained in Japan.

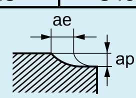
VCHFRB

High feed corner radius, 4 flute

RECOMMENDED CUTTING CONDITIONS

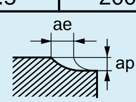
Work material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.				
DC (mm)	RE (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
2	R 0.5	33000	10000	393.7	0.08	0.8	27000	8400	330.7	0.05	0.8
3	R 0.75	22000	11000	433.1	0.12	1.2	18000	9000	354.3	0.08	1.2
4	R 1	17000	12000	472.4	0.15	1.5	14000	9500	374.0	0.12	1.5
5	R 1.2	13000	13000	511.8	0.20	2.0	11000	11000	433.1	0.15	2.0
6	R 1.5	11000	13000	511.8	0.25	2.5	9000	11000	433.1	0.15	2.5
7	R 1.5	9400	13000	511.8	0.25	3.0	7800	11000	433.1	0.15	3.0
8	R 2	8200	13000	511.8	0.30	3.0	7000	11000	433.1	0.20	3.0
9	R 2	7300	13000	511.8	0.30	4.0	6000	11000	433.1	0.20	4.0
10	R 2	6500	13000	511.8	0.30	4.5	5500	11000	433.1	0.20	4.5
11	R 2	6000	12000	472.4	0.30	5.5	5000	10000	393.7	0.20	5.5
12	R 3	5500	12000	472.4	0.45	4.5	4600	10000	393.7	0.30	4.5
13	R 3	5000	12000	472.4	0.45	5.5	4200	10000	393.7	0.30	5.5
16	R 3	4100	10000	393.7	0.45	7.5	3400	8800	346.5	0.30	7.5

Depth of cut



Work material		Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
DC (mm)	RE (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
2	R 0.5	24000	7500	295.3	0.04	0.8	16000	3000	118.1	0.03	0.8
3	R 0.75	16000	8500	334.6	0.06	1.2	11000	3300	129.9	0.05	1.2
4	R 1	12000	8800	346.5	0.08	1.5	8000	3500	137.8	0.07	1.5
5	R 1.2	9600	9500	374.0	0.10	2.0	6400	3800	149.6	0.08	2.0
6	R 1.5	8000	9600	378.0	0.10	2.5	5300	3800	149.6	0.10	2.5
7	R 1.5	6900	9600	378.0	0.10	3.0	4600	3800	149.6	0.10	3.0
8	R 2	6000	9600	378.0	0.15	3.0	4000	3800	149.6	0.13	3.0
9	R 2	5300	9500	374.0	0.15	4.0	3800	3800	149.6	0.13	4.0
10	R 2	4800	9500	374.0	0.15	4.5	3200	3800	149.6	0.13	4.5
11	R 2	4500	9000	354.3	0.15	5.5	2900	3500	137.8	0.13	5.5
12	R 3	4100	9000	354.3	0.25	4.5	2700	3500	137.8	0.20	4.5
13	R 3	3700	8900	350.4	0.25	5.5	2500	3500	137.8	0.20	5.5
16	R 3	3000	7800	307.1	0.25	7.5	2000	3200	126.0	0.20	7.5

Depth of cut



Coefficients respective of tool overhang

Type	Overhang	Revolution	Feed rate	Depth of cut ap
Straight	L/D≦5	100%	100%	100%
	L/D=6	90%	80%	80%
	L/D=7	80%	70%	70%
Taper neck	L/D=6	100%	100%	100%
	L/D=8	90%	80%	80%
	L/D≧10	80%	70%	70%

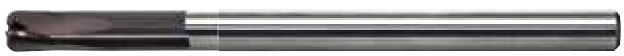
1) The above table shows cutting conditions when machining with the corner radius cutting edge.
2) This table shows the cutting conditions with less than 5D overhang length. In the case of longer overhangs, the revolution and the feed rate should be reduced proportionately.
3) If the depth of cut is smaller than this table, feed rate can be increased.
4) Using air blow or mist is recommended.
5) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
6) When machining inclinations in the Z direction, set the inclination angle at 2° and reduce the feed rate by 50%.
7) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

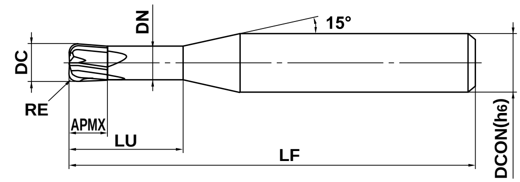
VCHFRB – Inch sizes

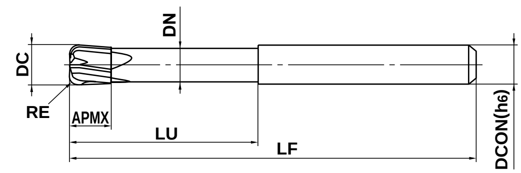
High feed corner radius, 4 flute

UWC VC 20° DC≦3/16 10° DC≧1/4

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
◎	◎	◎	○		○		







R	.030"≦RE≦.120"				
	±.0006"				
DC	DC>.5000"				
	0 -.0008"				
h6	.2500"≦DCON≦.3750"	DCON=.5000"			
	0 -.00035"	0 -.00043"			

● Suitable for high feed and efficient machining of die & mold.

Unit : inch

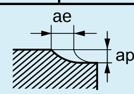
Order Number	DC	RE	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VCHFRBD1/8N3DR0.03	.1250	.030	.125	.375	.1191	2.250	.2500	4	●	1
VCHFRB**D1/8N5DR0.03**	.1250	.030	.125	.625	.1191	2.250	.2500	4	●	1
VCHFRB**D3/16N3DR0.05**	.1875	.050	.188	.563	.1796	2.250	.2500	4	●	1
VCHFRB**D3/16N5DR0.05**	.1875	.050	.188	.938	.1796	2.250	.2500	4	●	1
VCHFRB**D1/4N3DR0.06**	.2500	.060	.250	.750	.2421	3.000	.2500	4	●	2
VCHFRB**D1/4N5DR0.06**	.2500	.060	.250	1.250	.2421	3.000	.2500	4	●	2
VCHFRB**D3/8N3DR0.08**	.3750	.080	.375	1.125	.3612	4.000	.3750	4	●	2
VCHFRB**D3/8N5DR0.08**	.3750	.080	.375	1.875	.3612	4.000	.3750	4	●	2
VCHFRB**D1/2N3DR0.12**	.5000	.120	.500	1.500	.4843	5.000	.5000	4	●	2

● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

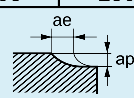
DC (inch)	RE (inch)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
Work material		Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.				
.1250	R .030	21000	11000	433	.0045	.049	17000	9000	354	.0032	.049
.1875	R .050	14000	13000	512	.0075	.066	12000	11000	433	.0053	.066
.2500	R .060	10000	13000	512	.0090	.098	8600	11000	433	.0063	.098
.3750	R .080	6800	13000	512	.0120	.161	5700	11000	433	.0084	.161
.5000	R .120	5100	12000	472	.0180	.195	4300	10000	394	.0126	.195

Depth of cut



DC (inch)	RE (inch)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
Work material		Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
.1250	R .030	15000	8500	335	.0025	.049	10000	3200	126	.0020	.049
.1875	R .050	10000	9300	366	.0042	.066	6700	3700	146	.0034	.066
.2500	R .060	7600	9600	378	.0050	.098	5000	3800	150	.0040	.098
.3750	R .080	5000	9500	374	.0067	.161	3300	3600	142	.0054	.161
.5000	R .120	3800	8900	350	.0101	.195	2500	3400	134	.0081	.195

Depth of cut



Coefficients respective of tool overhang

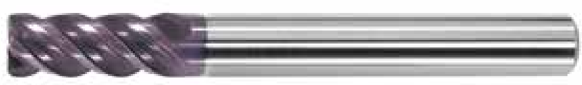
Type	Overhang	Revolution	Feed rate	Depth of cut ap
Straight	L/D≦5	100%	100%	100%
	L/D=6	90%	80%	80%
	L/D=7	80%	70%	70%
Taper neck	L/D=6	100%	100%	100%
	L/D=8	90%	80%	80%
	L/D≧10	80%	70%	70%

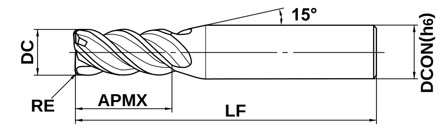
1) The above table shows cutting conditions when machining with the corner radius cutting edge.
2) This table shows the cutting conditions with less than 5D overhang length. In the case of longer overhangs, the revolution and the feed rate should be reduced proportionately.
3) If the depth of cut is smaller than this table, feed rate can be increased.
4) Using air blow or mist is recommended.
5) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
6) When machining inclinations in the Z direction, set the inclination angle at 2° and reduce the feed rate by 50%.
7) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VCMHDRB

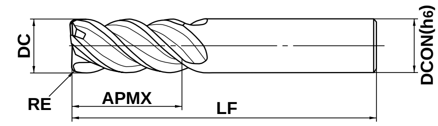
Corner radius end mill, Medium cut length, 4 flute, High helix angle

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
○	◎	◎	○	◎	◎		

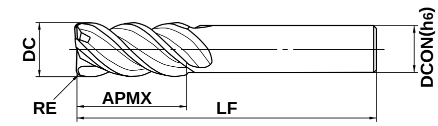




Type 1



Type 2



Type 3

DC≤12	DC>12			
0 - 0.02	0 - 0.03			
4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 4 flute corner radius end mill with high helix angle for milling difficult-to-cut materials.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VCMHDRBD0200R020S04	2	0.2	6	40	4	4	★	1
VCMHDRBD0200R030S04	2	0.3	6	40	4	4	★	1
VCMHDRBD0300R020S06	3	0.2	8	50	6	4	★	1
VCMHDRBD0300R030S06	3	0.3	8	50	6	4	★	1
VCMHDRBD0300R050S06	3	0.5	8	50	6	4	★	1
VCMHDRBD0400R020S06	4	0.2	11	50	6	4	★	1
VCMHDRBD0400R030S06	4	0.3	11	50	6	4	★	1
VCMHDRBD0400R050S06	4	0.5	11	50	6	4	★	1
VCMHDRBD0500R020S06	5	0.2	13	60	6	4	★	1
VCMHDRBD0500R030S06	5	0.3	13	60	6	4	★	1
VCMHDRBD0500R050S06	5	0.5	13	60	6	4	★	1
VCMHDRBD0500R100S06	5	1	13	60	6	4	★	1
VCMHDRBD0600R030S06	6	0.3	13	60	6	4	★	2
VCMHDRBD0600R050S06	6	0.5	13	60	6	4	★	2
VCMHDRBD0600R100S06	6	1	13	60	6	4	★	2
VCMHDRBD0800R030S08	8	0.3	19	70	8	4	★	2
VCMHDRBD0800R050S08	8	0.5	19	70	8	4	★	2
VCMHDRBD0800R100S08	8	1	19	70	8	4	★	2
VCMHDRBD0800R150S08	8	1.5	19	70	8	4	★	2
VCMHDRBD1000R030S08	10	0.3	22	90	8	4	★	3
VCMHDRBD1000R050S08	10	0.5	22	90	8	4	★	3
VCMHDRBD1000R100S08	10	1	22	90	8	4	★	3
VCMHDRBD1000R150S08	10	1.5	22	90	8	4	★	3
VCMHDRBD1000R200S08	10	2	22	90	8	4	★	3
VCMHDRBD1000R030S10	10	0.3	22	90	10	4	★	2
VCMHDRBD1000R050S10	10	0.5	22	90	10	4	★	2
VCMHDRBD1000R100S10	10	1	22	90	10	4	★	2
VCMHDRBD1000R150S10	10	1.5	22	90	10	4	★	2
VCMHDRBD1000R200S10	10	2	22	90	10	4	★	2
VCMHDRBD1200R050S10	12	0.5	26	90	10	4	★	3
VCMHDRBD1200R100S10	12	1	26	90	10	4	★	3

★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VCMHDRBD1200R150S10	12	1.5	26	90	10	4	★	3
VCMHDRB**D1200R200S10**	12	2	26	90	10	4	★	3
VCMHDRB**D1200R300S10**	12	3	26	90	10	4	★	3
VCMHDRB**D1200R050S12**	12	0.5	26	90	12	4	★	2
VCMHDRB**D1200R100S12**	12	1	26	90	12	4	★	2
VCMHDRB**D1200R150S12**	12	1.5	26	90	12	4	★	2
VCMHDRB**D1200R200S12**	12	2	26	90	12	4	★	2
VCMHDRB**D1200R300S12**	12	3	26	90	12	4	★	2
VCMHDRB**D1600R100S16**	16	1	32	110	16	4	★	2
VCMHDRB**D1600R150S16**	16	1.5	32	110	16	4	★	2
VCMHDRB**D1600R200S16**	16	2	32	110	16	4	★	2
VCMHDRB**D1600R300S16**	16	3	32	110	16	4	★	2
VCMHDRB**D1800R100S16**	18	1	32	110	16	4	★	3
VCMHDRB**D1800R150S16**	18	1.5	32	110	16	4	★	3
VCMHDRB**D1800R200S16**	18	2	32	110	16	4	★	3
VCMHDRB**D1800R300S16**	18	3	32	110	16	4	★	3
VCMHDRB**D2000R100S20**	20	1	38	110	20	4	★	2
VCMHDRB**D2000R150S20**	20	1.5	38	110	20	4	★	2
VCMHDRB**D2000R200S20**	20	2	38	110	20	4	★	2
VCMHDRB**D2000R300S20**	20	3	38	110	20	4	★	2
VCMHDRB**D2200R100S20**	22	1	38	140	20	4	★	3
VCMHDRB**D2200R150S20**	22	1.5	38	140	20	4	★	3
VCMHDRB**D2200R200S20**	22	2	38	140	20	4	★	3
VCMHDRB**D2200R300S20**	22	3	38	140	20	4	★	3
VCMHDRB**D2500R100S25**	25	1	45	140	25	4	★	2
VCMHDRB**D2500R150S25**	25	1.5	45	140	25	4	★	2
VCMHDRB**D2500R200S25**	25	2	45	140	25	4	★	2
VCMHDRB**D2500R300S25**	25	3	45	140	25	4	★	2

VCMHDRB

Corner radius end mill, Medium cut length, 4 flute, High helix angle

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45—55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	15000	550	21.7	10000	340	13.4	10000	320	12.6	6400	160	6.3	4800	100	3.9
3	11000	800	31.5	7400	500	19.7	7400	480	18.9	4800	250	9.8	4000	170	6.7
4	8000	900	35.4	5600	540	21.3	5600	520	20.5	3600	270	10.6	3200	240	9.4
5	6400	1000	39.4	4500	600	23.6	4500	580	22.8	2900	300	11.8	2600	240	9.4
6	5900	1100	43.3	3700	640	25.2	3700	600	23.6	2400	320	12.6	2100	230	9.1
8	4400	1100	43.3	2800	660	26.0	2800	600	23.6	1800	330	13.0	1600	220	8.7
10	3500	1000	39.4	2300	640	25.2	2300	560	22.0	1400	320	12.6	1300	200	7.9
12	2900	1000	39.4	1900	640	25.2	1900	530	20.9	1200	320	12.6	1100	170	6.7
16	2200	800	31.5	1400	500	19.7	1400	450	17.7	900	250	9.8	800	130	5.1
20	1800	750	29.5	1100	460	18.1	1100	440	17.3	720	230	9.1	640	100	3.9
25	1400	600	23.6	900	400	15.7	900	380	15.0	570	200	7.9	510	80	3.1
Depth of cut	0.2DC, 1.5DC						0.1DC, 1.5DC			0.05DC, 1.5DC					

Slotting

Work material	Carbon steel, Cast iron, Alloy steel (—30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45—55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	12000	400	15.7	7000	200	7.9	7000	100	3.9	4200	80	3.1	2300	40	1.6
3	9000	600	23.6	5300	300	11.8	5300	150	5.9	3200	130	5.1	1900	70	2.8
4	7200	720	28.3	4000	360	14.2	4000	180	7.1	2400	140	5.5	1400	95	3.7
5	5800	720	28.3	3200	360	14.2	3200	180	7.1	1900	150	5.9	1100	95	3.7
6	5000	800	31.5	2700	400	15.7	2700	200	7.9	1600	160	6.3	950	95	3.7
8	3700	800	31.5	2000	400	15.7	2000	200	7.9	1200	170	6.7	720	90	3.5
10	3000	720	28.3	1600	360	14.2	1600	180	7.1	960	160	6.3	570	80	3.1
12	2500	720	28.3	1300	360	14.2	1300	180	7.1	800	160	6.3	480	70	2.8
16	2000	600	23.6	1000	280	11.0	1000	150	5.9	600	130	5.1	360	50	2.0
20	1600	540	21.3	800	250	9.8	800	130	5.1	480	120	4.7	290	40	1.6
25	1300	480	18.9	640	220	8.7	640	120	4.7	380	100	3.9	230	35	1.4
Depth of cut	1DC, 1DC (MAX. 12mm)						1DC, 0.5DC			1DC, 0.2DC					

1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

SOLID END MILLS

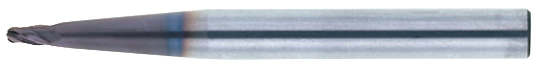
VC4STB

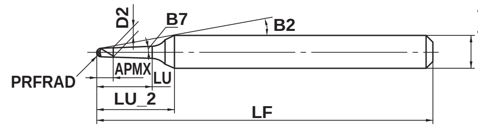
Ball nose taper end mill, Short cut length, 4 flute

UWC VC 30°

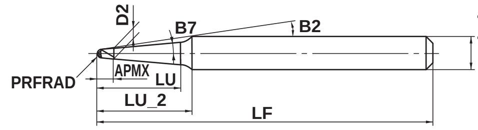
PRFRAD<0.5 PRFRAD≥0.5

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
○	◎	◎	◎	○	○		

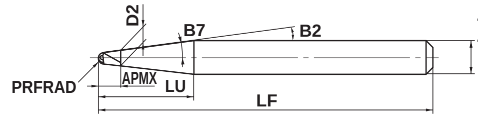




Type 1



Type 2



Type 3

★Relief Neck type.

R	0.3≦PRFRAD≦4				
	±0.01				
h6	DCON=6	8≦DCON≦10			
	0 - 0.008	0 - 0.009			

● The taper neck and short length of cut are adopted in order to increase the rigidity to the fullest extent, ensuring the maximum performance when machining any kind of work material.

Unit : mm

Order Number	PRFRAD	B7	APMX	LU	LU_2	D2	B2	LF	DCON	No. of Flutes	Stock	Type
VC4STBR0030T0130N05	0.3	1° 30'	1	5	9.0	0.64	17.2°	60	6	4	●	1
VC4STBR0030T0200N05	0.3	2°	1	5	9.0	0.65	17.2°	60	6	4	★	1
VC4STBR0030T0500N05	0.3	5°	1	5	8.8	0.70	17.6°	60	6	4	●	1
VC4STBR0030T1000N15	0.3	10°	1	15	—	0.90	10.4°	60	6	4	●	3
VC4STBR0040T0130N10	0.4	1° 30'	2	10	14.0	0.88	10.8°	60	6	4	★	1
VC4STBR0040T0130N15	0.4	1° 30'	2	15	19.0	0.88	8.0°	60	6	4	★	1
VC4STBR0040T0200N10	0.4	2°	2	10	14.0	0.91	10.8°	60	6	4	★	1
VC4STBR0040T0500N10	0.4	5°	2	10	13.5	1.08	11.2°	60	6	4	★	1
VC4STBR0040T0700N10	0.4	7°	7	10	12.2	2.43	12.4°	60	6	4	★	2
VC4STBR0040T1000N15	0.4	10°	3	15	—	1.73	10.1°	60	6	4	★	3
VC4STBR0050T0130N10	0.5	1° 30'	2	10	14.0	1.08	10.5°	60	6	4	●	1
VC4STBR0050T0130N15	0.5	1° 30'	2	15	19.0	1.08	7.7°	60	6	4	★	1
VC4STBR0050T0130N20	0.5	1° 30'	2	20	24.0	1.08	6.1°	60	6	4	★	1
VC4STBR0050T0200N10	0.5	2°	2	10	14.0	1.11	10.5°	60	6	4	●	1
VC4STBR0050T0200N15	0.5	2°	2	15	18.9	1.11	7.8°	60	6	4	●	1
VC4STBR0050T0200N20	0.5	2°	3	20	24.0	1.11	6.1°	60	6	4	★	1
VC4STBR0050T0500N10	0.5	5°	3	10	13.6	1.44	10.8°	60	6	4	●	1
VC4STBR0050T0500N15	0.5	5°	3	15	17.2	1.44	8.5°	60	6	4	●	2
VC4STBR0050T0500N20	0.5	5°	3	20	21.8	1.44	6.7°	60	6	4	●	2
VC4STBR0050T0700N10	0.5	7°	7	10	12.1	2.60	12.2°	60	6	4	●	2
VC4STBR0050T0700N15	0.5	7°	7	15	16.6	2.60	8.9°	60	6	4	●	2
VC4STBR0050T0700N20	0.5	7°	7	20	—	2.60	7.3°	60	6	4	●	3
VC4STBR0050T1000N14	0.5	10°	3	14	—	1.90	10.5°	60	6	4	●	3
VC4STBR0075T0200N10	0.75	2°	3	10	14.0	1.66	9.6°	60	6	4	●	1
VC4STBR0075T0500N15	0.75	5°	3	15	17.0	1.90	7.9°	60	6	4	●	2
VC4STBR0100T0130N10	1	1° 30'	4	10	13.5	2.16	9.1°	60	6	4	●	1
VC4STBR0100T0130N15	1	1° 30'	4	15	18.5	2.16	6.5°	60	6	4	●	1
VC4STBR0100T0130N20	1	1° 30'	4	20	23.5	2.16	5.1°	60	6	4	●	1
VC4STBR0100T0200N06	1	2°	4	6	8.7	2.20	14.4°	60	6	4	●	2
VC4STBR0100T0200N10	1	2°	4	10	13.8	2.20	8.9°	60	6	4	●	1
VC4STBR0100T0200N15	1	2°	4	15	17.5	2.20	6.9°	60	6	4	●	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

VC4STB

Ball nose taper end mill, Short cut length, 4 flute

Unit : mm

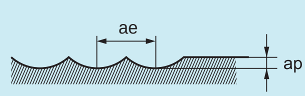
Order Number	PRFRAD	B7	APMX	LU	LU_2	D2	B2	LF	DCON	No. of Flutes	Stock	Type
VC4STBR0100T0500N10	1	5°	4	10	12.2	2.50	10.1°	60	6	4	●	2
VC4STBR0100T0500N15	1	5°	4	15	16.8	2.50	7.2°	60	6	4	●	2
VC4STBR0100T0500N23	1	5°	4	23	—	2.50	5.2°	60	6	4	●	3
VC4STBR0100T0700N17	1	7°	7	17	—	3.49	7.1°	60	6	4	●	3
VC4STBR0100T1000N12	1	10°	4	12	—	3.10	10.3°	60	6	4	●	3
VC4STBR0125T0500N15	1.25	5°	4	15	16.5	2.99	6.6°	60	6	4	●	2
VC4STBR0150T0130N15	1.5	1° 30'	4	15	17.3	3.13	5.4°	60	6	4	●	2
VC4STBR0150T0130N20	1.5	1° 30'	4	20	22.2	3.13	4.2°	60	6	4	●	2
VC4STBR0150T0300N15	1.5	3°	4	15	16.9	3.27	5.6°	60	6	4	●	2
VC4STBR0150T0500N10	1.5	5°	4	10	11.7	3.50	8.3°	60	6	4	●	2
VC4STBR0150T0500N18	1.5	5°	4	18	—	3.50	5.2°	60	6	4	●	3
VC4STBR0175T0500N15	1.75	5°	4	15	—	3.91	5.4°	60	6	4	●	3
VC4STBR0200T0130N15	2	1° 30'	5	15	16.8	4.16	3.9°	60	6	4	●	2
VC4STBR0200T0130N20	2	1° 30'	5	20	21.6	4.16	3.0°	60	6	4	●	2
VC4STBR0200T0300N21	2	3°	4	21	—	4.22	3.1°	60	6	4	●	3
VC4STBR0200T0500N13	2	5°	4	13	—	4.40	5.2°	60	6	4	●	3
VC4STBR0200T0700N18	2	7°	7	18	—	5.26	7.1°	60	8	4	●	3
VC4STBR0300T0130N15	3	1° 30'	6	15	16.8	6.16	4.2°	90	8	4	●	2
VC4STBR0300T0130N20	3	1° 30'	6	20	21.7	6.16	3.1°	90	8	4	●	2
VC4STBR0300T0300N22	3	3°	6	22	—	6.32	3.1°	90	8	4	●	3
VC4STBR0400T0130N15	4	1° 30'	8	15	16.9	8.21	4.4°	90	10	4	★	2
VC4STBR0400T0300N22	4	3°	8	22	—	8.43	3.2°	90	10	4	★	3

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Work material			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.					Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
PRFRAD (mm)	B7 (°)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
R 0.3	1.5	5	40000	1600	63.0	0.08	0.12	40000	1200	47.2	0.06	0.10	40000	700	27.6	0.04	0.06
	2	5	40000	1600	63.0	0.08	0.12	40000	1200	47.2	0.06	0.10	40000	700	27.6	0.04	0.06
	5	5	40000	1600	63.0	0.08	0.12	40000	1200	47.2	0.06	0.10	40000	700	27.6	0.04	0.06
	10	15	40000	1600	63.0	0.05	0.08	40000	1200	47.2	0.04	0.06	40000	700	27.6	0.03	0.04
R 0.4	1.5	10	40000	2000	78.7	0.07	0.11	40000	1500	59.1	0.06	0.08	30000	700	31.5	0.04	0.05
	1.5	15	40000	2000	78.7	0.05	0.08	40000	1500	59.1	0.04	0.06	30000	800	31.5	0.03	0.04
	2	10	40000	2000	78.7	0.07	0.11	40000	1500	59.1	0.06	0.08	30000	800	31.5	0.04	0.05
	5	10	40000	2000	78.7	0.07	0.11	40000	1500	59.1	0.06	0.08	30000	800	31.5	0.04	0.05
	7	10	40000	2000	78.7	0.07	0.11	40000	1500	59.1	0.06	0.08	30000	800	31.5	0.04	0.05
	10	15	40000	2000	78.7	0.06	0.09	40000	1500	59.1	0.05	0.07	30000	800	31.5	0.03	0.05
R 0.5	1.5	10	38000	2500	98.4	0.11	0.16	35000	1600	63.0	0.08	0.13	25000	800	31.5	0.05	0.08
	1.5	15	38000	2500	98.4	0.09	0.14	35000	1600	63.0	0.07	0.11	25000	800	31.5	0.05	0.07
	1.5	20	38000	2500	98.4	0.06	0.09	35000	1600	63.0	0.05	0.07	25000	800	31.5	0.03	0.05
	2	10	38000	2500	98.4	0.11	0.16	35000	1600	63.0	0.08	0.13	25000	800	31.5	0.05	0.08
	2	15	38000	2500	98.4	0.09	0.14	35000	1600	63.0	0.07	0.11	25000	800	31.5	0.05	0.07
	2	20	38000	2500	98.4	0.06	0.09	35000	1600	63.0	0.05	0.07	25000	800	31.5	0.03	0.05
	5	10	38000	2500	98.4	0.12	0.18	35000	1600	63.0	0.10	0.14	25000	800	31.5	0.06	0.09
	5	15	38000	2500	98.4	0.09	0.14	35000	1600	63.0	0.07	0.11	25000	800	31.5	0.05	0.07
	5	20	38000	2500	98.4	0.08	0.11	35000	1600	63.0	0.06	0.09	25000	800	31.5	0.04	0.06
	7	10	38000	2500	98.4	0.12	0.18	35000	1600	63.0	0.10	0.14	25000	800	31.5	0.06	0.09
	7	15	38000	2500	98.4	0.11	0.16	35000	1600	63.0	0.08	0.13	25000	800	31.5	0.05	0.08
	7	20	38000	2500	98.4	0.08	0.11	35000	1600	63.0	0.06	0.09	25000	800	31.5	0.04	0.06
	10	14	38000	2500	98.4	0.11	0.16	35000	1600	63.0	0.08	0.13	25000	800	31.5	0.05	0.08
R 0.75	2	10	38000	2500	98.4	0.18	0.27	35000	1600	63.0	0.14	0.22	18000	800	31.5	0.09	0.14
	5	15	38000	2500	98.4	0.16	0.24	35000	1600	63.0	0.13	0.19	18000	800	31.5	0.08	0.12
R 1	1.5	10	35000	2800	110.2	0.18	0.27	30000	1800	70.9	0.14	0.22	15000	1000	39.4	0.09	0.14
	1.5	15	35000	2800	110.2	0.16	0.24	30000	1800	70.9	0.13	0.19	15000	1000	39.4	0.08	0.12
	1.5	20	35000	2800	110.2	0.14	0.21	30000	1800	70.9	0.11	0.17	15000	1000	39.4	0.07	0.11
	2	6	35000	2800	110.2	0.20	0.30	30000	1800	70.9	0.16	0.24	15000	1000	39.4	0.10	0.15
	2	10	35000	2800	110.2	0.18	0.27	30000	1800	70.9	0.14	0.22	15000	1000	39.4	0.09	0.14
	2	15	35000	2800	110.2	0.16	0.24	30000	1800	70.9	0.13	0.19	15000	1000	39.4	0.08	0.12
	5	10	35000	2800	110.2	0.18	0.27	30000	1800	70.9	0.14	0.22	15000	1000	39.4	0.09	0.14
	5	15	35000	2800	110.2	0.18	0.27	30000	1800	70.9	0.14	0.22	15000	1000	39.4	0.09	0.14
	5	23	35000	2800	110.2	0.14	0.21	30000	1800	70.9	0.11	0.17	15000	1000	39.4	0.07	0.11
	7	17	35000	2800	110.2	0.16	0.24	30000	1800	70.9	0.13	0.19	15000	1000	39.4	0.08	0.12
	10	12	35000	2800	110.2	0.18	0.27	30000	1800	70.9	0.14	0.22	15000	1000	39.4	0.09	0.14
R 1.25	5	15	35000	2800	110.2	0.23	0.34	30000	1800	70.9	0.18	0.27	15000	1000	39.4	0.11	0.17
R 1.5	1.5	15	32000	3000	118.1	0.23	0.34	27000	2000	78.7	0.18	0.27	16000	1200	47.2	0.11	0.17
	1.5	20	32000	3000	118.1	0.23	0.34	27000	2000	78.7	0.18	0.27	16000	1200	47.2	0.11	0.17
	3	15	32000	3000	118.1	0.23	0.34	27000	2000	78.7	0.18	0.27	16000	1200	47.2	0.11	0.17
	5	10	32000	3000	118.1	0.25	0.38	27000	2000	78.7	0.20	0.30	16000	1200	47.2	0.13	0.19
	5	18	32000	3000	118.1	0.23	0.34	27000	2000	78.7	0.18	0.27	16000	1200	47.2	0.11	0.17
R 1.75	5	15	27500	3500	137.8	0.23	0.34	23000	2500	98.4	0.18	0.27	14000	1500	59.1	0.11	0.17

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

CARBIDE

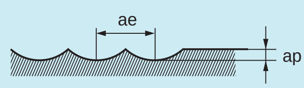
SOLID END MILLS

VC4STB

Ball nose taper end mill, Short cut length, 4 flute

Work material			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.					Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
PRFRAD (mm)	**B7** (°)	**LU** (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
R 2	1.5	15	24000	3500	137.8	0.23	0.34	20000	2500	98.4	0.18	0.27	12000	1500	59.1	0.11	0.17
	1.5	20	24000	3500	137.8	0.23	0.34	20000	2500	98.4	0.18	0.27	12000	1500	59.1	0.11	0.17
	3	21	24000	3500	137.8	0.23	0.34	20000	2500	98.4	0.18	0.27	12000	1500	59.1	0.11	0.17
	5	13	24000	3500	137.8	0.25	0.38	20000	2500	98.4	0.20	0.30	12000	1500	59.1	0.13	0.19
	7	18	24000	3500	137.8	0.23	0.34	20000	2500	98.4	0.18	0.27	12000	1500	59.1	0.11	0.17
R 3	1.5	15	16000	3500	137.8	0.30	0.45	13500	2500	98.4	0.24	0.36	8000	1500	59.1	0.15	0.23
	1.5	20	16000	3500	137.8	0.30	0.45	13500	2500	98.4	0.24	0.36	8000	1500	59.1	0.15	0.23
	3	22	16000	3500	137.8	0.30	0.45	13500	2500	98.4	0.24	0.36	8000	1500	59.1	0.15	0.23
R 4	1.5	15	12000	3500	137.8	0.30	0.45	10000	2500	98.4	0.24	0.36	6000	1500	59.1	0.15	0.23
	3	22	12000	3500	137.8	0.30	0.45	10000	2500	98.4	0.24	0.36	6000	1500	59.1	0.15	0.23

Depth of cut

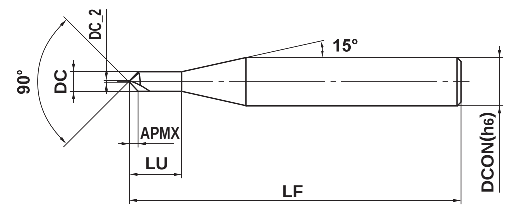


1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

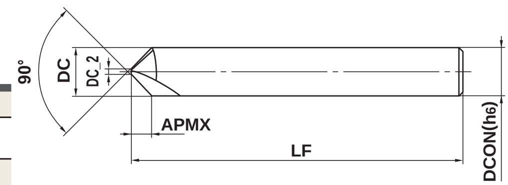
VC2C

Chamfer cutter, 2 flute

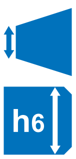
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
◎	◎	◎	○	◎	◎	○	○



Type 1



Type 2



±0.02				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● Chamfer cutter for machining hardened steels and difficult-to-cut materials.

Unit : mm

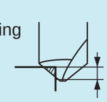
Order Number	DC	DC_2	APMX	LU	LF	DCON	No. of Flutes	Stock	Type
VC2CD0200	2	0.3	0.85	6	50	6	2	★	1
VC2C**D0400**	4	0.3	1.85	12	50	6	2	★	1
VC2C**D0600**	6	0.3	2.85	—	50	6	2	★	2
VC2C**D0800**	8	0.4	3.8	—	60	8	2	★	2
VC2C**D1000**	10	0.5	4.75	—	70	10	2	★	2
VC2C**D1200**	12	0.5	5.75	—	75	12	2	★	2

RECOMMENDED CUTTING CONDITIONS

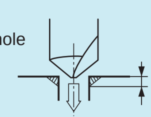
Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	16000	960	37.8	11000	590	23.2	9500	460	18.1	8000	320	12.6
4	8000	480	18.9	5600	300	11.8	4800	230	9.1	4000	160	6.3
6	5300	320	12.6	3700	200	7.9	3200	150	5.9	2700	110	4.3
8	4000	240	9.4	2800	150	5.9	2400	120	4.7	2000	80	3.1
10	3200	190	7.5	2200	120	4.7	1900	90	3.5	1600	60	2.4
12	2700	160	6.3	1900	100	3.9	1600	80	3.1	1300	50	2.0

Depth of cut

Chamfering



Chamfering of hole



1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

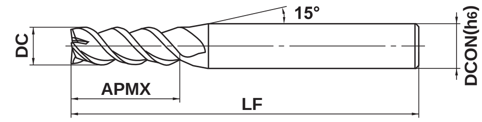
★ : Inventory maintained in Japan.

VQMHZV

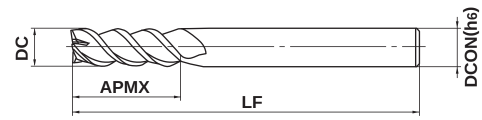
End mill, Medium cut length, 3 flute for drilling and slotting

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

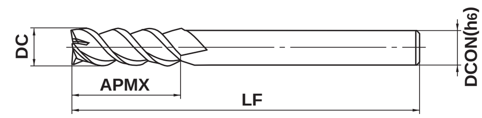
CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS



Type1



Type2



Type3

	DC≤12	DC>12			
DC	0 - 0.02	0 - 0.03			
h6	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- 3 flute end mill for drilling and slotting.
- Featuring irregular helical geometry for reducing vibration.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHZVD0100	1	2	45	4	3	●	1
VQMHZVD0110	1.1	2.2	45	4	3	●	1
VQMHZVD0120	1.2	2.4	45	4	3	●	1
VQMHZVD0130	1.3	2.6	45	4	3	●	1
VQMHZVD0140	1.4	2.8	45	4	3	●	1
VQMHZVD0150	1.5	3	45	4	3	●	1
VQMHZVD0160	1.6	3.2	45	4	3	●	1
VQMHZVD0170	1.7	3.4	45	4	3	●	1
VQMHZVD0180	1.8	3.6	45	4	3	●	1
VQMHZVD0190	1.9	3.8	45	4	3	●	1
VQMHZVD0200	2	4	50	6	3	●	1
VQMHZVD0210	2.1	4.2	50	6	3	●	1
VQMHZVD0220	2.2	4.4	50	6	3	●	1
VQMHZVD0230	2.3	4.6	50	6	3	●	1
VQMHZVD0240	2.4	4.8	50	6	3	●	1
VQMHZVD0250	2.5	5	50	6	3	●	1
VQMHZVD0260	2.6	5.2	50	6	3	●	1
VQMHZVD0270	2.7	5.4	50	6	3	●	1
VQMHZVD0280	2.8	5.6	50	6	3	●	1
VQMHZVD0290	2.9	5.8	50	6	3	●	1
VQMHZVD0300	3	6	50	6	3	●	1
VQMHZVD0310	3.1	7	50	6	3	●	1
VQMHZVD0320	3.2	7	50	6	3	●	1
VQMHZVD0330	3.3	7	50	6	3	●	1
VQMHZVD0340	3.4	7	50	6	3	●	1
VQMHZVD0350	3.5	8	50	6	3	●	1
VQMHZVD0360	3.6	8	50	6	3	●	1
VQMHZVD0370	3.7	8	50	6	3	●	1
VQMHZVD0380	3.8	8	50	6	3	●	1
VQMHZVD0390	3.9	8	50	6	3	●	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHZVD0400	4	8	50	6	3	●	1
VQMHZV**D0450**	4.5	10	50	6	3	●	1
VQMHZV**D0500**	5	10	50	6	3	●	1
VQMHZV**D0550**	5.5	13	50	6	3	●	1
VQMHZV**D0600**	6	13	60	6	3	●	2
VQMHZV**D0650**	6.5	16	60	8	3	●	1
VQMHZV**D0700**	7	16	60	8	3	●	1
VQMHZV**D0750**	7.5	16	60	8	3	●	1
VQMHZV**D0800**	8	19	70	8	3	●	2
VQMHZV**D0850**	8.5	19	70	10	3	●	1
VQMHZV**D0900**	9	19	70	10	3	●	1
VQMHZV**D0950**	9.5	19	70	10	3	●	1
VQMHZV**D1000**	10	22	80	10	3	●	2
VQMHZV**D1100**	11	22	80	12	3	●	1
VQMHZV**D1200**	12	26	90	12	3	●	2
VQMHZV**D1300**	13	26	90	12	3	★	3
VQMHZV**D1400**	14	26	90	12	3	★	3
VQMHZV**D1500**	15	26	110	16	3	★	1
VQMHZV**D1600**	16	30	110	16	3	★	2
VQMHZV**D2000**	20	32	140	20	3	★	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

VQMHZV

End mill, Medium cut length, 3 flute for drilling and slotting

RECOMMENDED CUTTING CONDITIONS

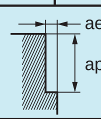
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	100	32000	720	1.5	0.2	80	25000	530	1.5	0.2	60	19000	430	1.5	0.2	50	16000	340	1.5	0.1
1.5	130	28000	1300	2.25	0.3	100	21000	630	2.25	0.3	85	18000	540	2.25	0.3	65	14000	420	2.25	0.15
2	150	24000	1800	3	0.6	120	19000	860	3	0.6	100	16000	620	3	0.6	75	12000	540	3	0.4
3	150	16000	1900	4.5	0.9	120	13000	940	4.5	0.9	100	11000	660	4.5	0.9	75	8000	580	4.5	0.6
4	150	12000	2000	6	1.2	120	9500	940	6	1.2	100	8000	670	6	1.2	75	6000	590	6	0.8
5	150	9500	1900	7.5	1.5	120	7600	960	7.5	1.5	100	6400	670	7.5	1.5	75	4800	600	7.5	1
6	150	8000	1900	9	1.8	120	6400	960	9	1.8	100	5300	830	9	1.8	75	4000	600	9	1.2
8	150	6000	1900	12	2.4	120	4800	1000	12	2.4	100	4000	900	12	2.4	75	3000	630	12	1.6
10	150	4800	1700	15	3	120	3800	910	15	3	100	3200	960	15	3	75	2400	580	15	2
12	150	4000	1400	18	3.6	120	3200	860	18	3.6	100	2700	890	18	3.6	75	2000	540	18	2.4
16	150	3000	1200	24	4.8	120	2400	720	24	4.8	100	2000	720	24	4.8	75	1500	450	24	3.2
20	150	2400	970	30	6	120	1900	570	30	6	100	1600	580	30	6	75	1200	360	30	4

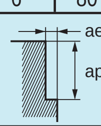
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	100	32000	480	1.5	0.2	80	25000	350	1.5	0.2	60	19000	280	1.5	0.2	50	16000	220	1.5	0.1
1.5	120	25000	740	2.25	0.3	100	21000	420	2.25	0.3	80	17000	340	2.25	0.3	65	14000	280	2.25	0.15
2	120	19000	940	3	0.6	100	16000	480	3	0.6	80	13000	340	3	0.6	70	11000	330	3	0.4
3	120	13000	1000	4.5	0.9	100	11000	520	4.5	0.9	80	8500	340	4.5	0.9	70	7400	350	4.5	0.6
4	120	9500	1000	6	1.2	100	8000	520	6	1.2	80	6400	350	6	1.2	70	5600	370	6	0.8
5	120	7600	980	7.5	1.5	100	6400	530	7.5	1.5	80	5100	350	7.5	1.5	70	4500	370	7.5	1
6	120	6400	1000	9	1.8	100	5300	540	9	1.8	80	4200	400	9	1.8	70	3700	370	9	1.2
8	120	4800	1000	12	2.4	100	4000	550	12	2.4	80	3200	430	12	2.4	70	2800	390	12	1.6
10	120	3800	900	15	3	100	3200	510	15	3	80	2500	450	15	3	70	2200	350	15	2
12	120	3200	760	18	3.6	100	2700	480	18	3.6	80	2100	420	18	3.6	70	1900	340	18	2.4
16	120	2400	640	24	4.8	100	2000	400	24	4.8	80	1600	340	24	4.8	70	1400	280	24	3.2
20	120	1900	510	30	6	100	1600	320	30	6	80	1300	270	30	6	70	1100	220	30	4

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the feed rate can be increased.

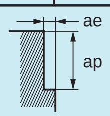
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	120	38000	860	1.5	0.2	40	13000	160	1.5	0.05
1.5	150	32000	1400	2.25	0.3	40	8500	170	2.25	0.08
2	180	29000	2200	3	0.6	40	6400	170	3	0.2
3	180	19000	2300	4.5	0.9	40	4200	180	4.5	0.3
4	180	14000	2300	6	1.2	40	3200	180	6	0.4
5	180	11000	2300	7.5	1.5	40	2500	180	7.5	0.5
6	180	9500	2300	9	1.8	40	2100	190	9	0.6
8	180	7200	2300	12	2.4	40	1600	190	12	0.8
10	180	5700	2100	15	3	40	1300	220	15	1
12	180	4800	1700	18	3.6	40	1100	210	18	1.2
16	180	3600	1500	24	4.8	40	800	150	24	1.6
20	180	2900	1200	30	6	40	640	120	30	2

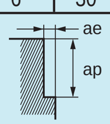
Depth of cut



General purpose cutting conditions

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	120	38000	560	1.5	0.2	30	9500	75	1.5	0.05
1.5	140	30000	890	2.25	0.3	30	6400	82	2.25	0.07
2	140	22000	1100	3	0.6	30	4800	86	3	0.2
3	140	15000	1200	4.5	0.9	30	3200	89	4.5	0.3
4	140	11000	1200	6	1.2	30	2400	90	6	0.4
5	140	8900	1200	7.5	1.5	30	1900	90	7.5	0.5
6	140	7400	1200	9	1.8	30	1600	95	9	0.6
8	140	5600	1200	12	2.4	30	1200	95	12	0.8
10	140	4500	1100	15	3	30	950	110	15	1
12	140	3700	880	18	3.6	30	800	100	18	1.2
16	140	2800	750	24	4.8	30	600	76	24	1.6
20	140	2200	590	30	6	30	480	61	30	2

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
   When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
   In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

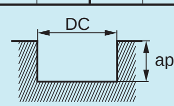
VQMHZV

End mill, Medium cut length, 3 flute for drilling and slotting

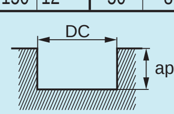
Slotting

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
1	100	32000	380	0.5	80	25000	150	0.5	60	19000	100	0.5	45	14000	80	0.3	120	38000	460	0.5	30	9500	60	0.2
1.5	130	28000	590	0.75	100	21000	250	0.75	85	18000	220	0.75	60	12000	140	0.4	150	32000	670	0.75	30	6400	80	0.3
2	150	24000	940	2	120	19000	460	2	100	16000	480	2	60	9500	230	1	180	29000	1100	2	30	4800	100	0.6
3	150	16000	1100	3	120	13000	550	3	100	11000	500	3	60	6400	270	1.5	180	19000	1300	3	30	3200	120	0.9
4	150	12000	1400	4	120	9500	680	4	100	8000	530	4	60	4800	350	2	180	14000	1700	4	30	2400	130	1.2
5	150	9500	1400	5	120	7600	680	5	100	6400	540	5	60	3800	350	2.5	180	11000	1700	5	30	1900	130	1.5
6	150	8000	1400	6	120	6400	770	6	100	5300	560	6	60	3200	380	3	180	9500	1700	6	30	1600	130	1.8
8	150	6000	1300	8	120	4800	720	8	100	4000	600	8	60	2400	360	4	180	7200	1500	8	30	1200	140	2.4
10	150	4800	1200	10	120	3800	630	10	100	3200	670	10	60	1900	310	5	180	5700	1400	10	30	950	160	3
12	150	4000	960	12	120	3200	580	12	100	2700	650	12	60	1600	290	6	180	4800	1200	12	30	800	150	3.6
16	150	3000	810	12	120	2400	500	12	100	2000	480	12	60	1200	250	8	180	3600	970	12	30	600	120	4.8
20	150	2400	650	12	120	1900	400	12	100	1600	380	12	60	950	200	10	180	2900	780	12	30	480	90	6
Depth of cut																								

General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
1	100	32000	250	0.5	80	25000	99	0.5	60	19000	80	0.5	45	14000	60	0.3	120	38000	300	0.5	25	8000	30	0.2
1.5	100	21000	290	0.75	80	17000	130	0.75	60	13000	100	0.75	50	11000	87	0.4	120	25000	350	0.75	25	5300	40	0.3
2	100	16000	410	2	80	13000	210	2	60	9500	190	2	50	8000	130	1	120	19000	490	2	25	4000	55	0.6
3	100	11000	500	3	80	8500	240	3	60	6400	190	3	50	5300	150	1.5	120	13000	590	3	25	2700	64	0.9
4	100	8000	630	4	80	6400	300	4	60	4800	210	4	50	4000	190	2	120	9500	750	4	25	2000	70	1.2
5	100	6400	630	5	80	5100	300	5	60	3800	210	5	50	3200	190	2.5	120	7600	750	5	25	1600	71	1.5
6	100	5300	630	6	80	4200	330	6	60	3200	220	6	50	2700	210	3	120	6400	760	6	25	1300	72	1.8
8	100	4000	550	8	80	3200	320	8	60	2400	240	8	50	2000	200	4	120	4800	670	8	25	990	78	2.4
10	100	3200	510	10	80	2500	270	10	60	1900	260	10	50	1600	170	5	120	3800	600	10	25	800	89	3
12	100	2700	430	12	80	2100	250	12	60	1600	250	12	50	1300	150	6	120	3200	510	12	25	660	84	3.6
16	100	2000	360	12	80	1600	220	12	60	1200	190	12	50	990	140	8	120	2400	430	12	25	500	63	4.8
20	100	1600	290	12	80	1300	180	12	60	950	150	12	50	800	110	10	120	1900	340	12	25	400	50	6
Depth of cut																								

1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the feed rate can be increased.

Plunging

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material: Carbon steel, Alloy steel, Mild steel — S45C, SCM440, SS400, S10C

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	65	20000	160	0.5	0.1
1.5	85	18000	270	0.75	0.3
2	100	16000	480	2	0.5
3	100	11000	660	3	1
4	100	8000	800	4	2
5	100	6400	960	5	2.5
6	100	5300	950	6	3
8	100	4000	720	8	4
10	100	3200	580	10	5
12	100	2700	490	12	5
16	100	2000	360	16	5
20	100	1600	290	20	5

Work material: Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel — NAK, PX5, SNCM439, SKD, SKT

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	50	16000	100	0.5	0.1
1.5	60	13000	120	0.75	0.3
2	70	11000	200	2	0.4
3	70	7400	270	3	0.6
4	70	5600	340	4	0.8
5	70	4500	410	5	1
6	70	3700	440	6	1.2
8	70	2800	340	8	1.6
10	70	2200	260	10	2.5
12	70	1900	230	12	3
16	70	1400	170	16	4
20	70	1100	130	20	5

Work material: Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys — SUS304, SUS316, Ti-6Al-4V

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	50	16000	50	0.5	0.05
1.5	60	13000	80	0.75	0.1
2	60	9500	90	1	0.15
3	60	6400	100	1.5	0.2
4	60	4800	100	2	0.4
5	60	3800	100	2.5	0.5
6	60	3200	100	3	0.6
8	60	2400	70	4	0.6
10	60	1900	60	5	0.6
12	60	1600	50	6	0.6
16	60	1200	40	8	0.6
20	60	950	30	10	0.6

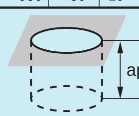
Work material: Hardened stainless steels, Cobaly chromium alloy — SUS630, SUS631

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	30	9500	30	0.5	0.05
1.5	35	7400	40	0.75	0.1
2	40	6400	60	1	0.1
3	40	4200	60	1.5	0.2
4	40	3200	60	2	0.4
5	40	2500	60	2.5	0.5
6	40	2100	60	3	0.6
8	40	1600	50	4	0.6
10	40	1300	40	5	0.6
12	40	1100	30	6	0.6
16	40	800	20	8	0.6
20	40	640	20	10	0.6

Work material: Copper, Copper alloy

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	75	24000	190	0.5	0.1
1.5	100	21000	320	0.75	0.3
2	120	19000	570	2	0.5
3	120	13000	780	3	1.0
4	120	9500	950	4	2
5	120	7600	1100	5	2.5
6	120	6400	1200	6	3
8	120	4800	860	8	4
10	120	3800	680	10	5
12	120	3200	580	12	5
16	120	2400	430	16	5
20	120	1900	340	20	5

Depth of cut



General purpose cutting conditions

Work material: Carbon steel, Alloy steel, Mild steel — S45C, SCM440, SS400, S10C

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	65	20000	160	0.5	0.05
1.5	85	18000	270	0.75	0.15
2	100	16000	480	2	0.25
3	100	11000	660	3	0.3
4	100	8000	800	4	0.4
5	100	6400	960	5	0.5
6	100	5300	950	6	0.6
8	100	4000	720	8	0.7
10	100	3200	580	10	0.75
12	100	2700	490	12	0.75
16	100	2000	360	16	0.75
20	100	1600	290	20	0.75

Work material: Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel — NAK, PX5, SNCM439, SKD, SKT

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	50	16000	100	0.5	0.05
1.5	60	13000	120	0.75	0.1
2	70	11000	200	2	0.2
3	70	7400	270	3	0.3
4	70	5600	340	4	0.4
5	70	4500	410	5	0.5
6	70	3700	440	6	0.6
8	70	2800	340	8	0.7
10	70	2200	260	10	0.75
12	70	1900	230	12	0.75
16	70	1400	170	16	0.75
20	70	1100	130	20	0.75

Work material: Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys — SUS304, SUS316, Ti-6Al-4V

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	50	16000	50	0.5	0.05
1.5	60	13000	80	0.75	0.05
2	60	9500	90	1	0.05
3	60	6400	100	1.5	0.1
4	60	4800	100	2	0.2
5	60	3800	100	2.5	0.25
6	60	3200	100	3	0.3
8	60	2400	70	4	0.3
10	60	1900	60	5	0.3
12	60	1600	50	6	0.3
16	60	1200	40	8	0.3
20	60	950	30	10	0.3

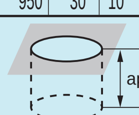
Work material: Hardened stainless steels, Cobaly chromium alloy — SUS630, SUS631

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	30	9500	30	0.5	0.05
1.5	35	7400	40	0.75	0.05
2	40	6400	60	1	0.05
3	40	4200	60	1.5	0.1
4	40	3200	60	2	0.2
5	40	2500	60	2.5	0.25
6	40	2100	60	3	0.3
8	40	1600	50	4	0.3
10	40	1300	40	5	0.3
12	40	1100	30	6	0.3
16	40	800	20	8	0.3
20	40	640	20	10	0.3

Work material: Copper, Copper alloy

DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
1	75	24000	190	0.5	0.05
1.5	100	21000	320	0.75	0.15
2	120	19000	570	2	0.25
3	120	13000	780	3	0.3
4	120	9500	950	4	0.4
5	120	7600	1100	5	0.5
6	120	6400	1200	6	0.6
8	120	4800	860	8	0.7
10	120	3800	680	10	0.75
12	120	3200	580	12	0.75
16	120	2400	430	16	0.75
20	120	1900	340	20	0.75

Depth of cut



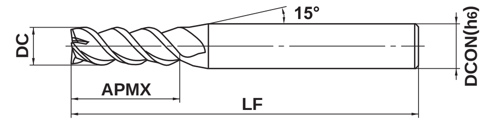
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.

VQMHZV - Inch sizes

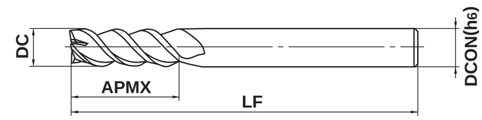
End mill, Medium cut length, 3 flute for drilling and slotting

UWC VQ 42° 43.5° 45°

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



Type1



Type2

	DC<.5000"	DC=.5000"			
	0 - .0008"	0 - .0012"			
h6	.2500"≤DCON≤.3750"	DCON=.5000"			
	0 - .00035"	0 - .00043"			

- 3 flute end mill for drilling and slotting.
- Featuring irregular helical geometry for reducing vibration.

Unit : inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHZVD1/16	.0625	.1250	2.0	.2500	3	●	1
VQMHZV**D5/64**	.0781	.1560	2.0	.2500	3	●	1
VQMHZV**D3/32**	.0938	.1880	2.0	.2500	3	●	1
VQMHZV**D7/64**	.1094	.2500	2.0	.2500	3	●	1
VQMHZV**D1/8**	.1250	.3130	2.0	.2500	3	●	1
VQMHZV**D5/32**	.1563	.3750	2.0	.2500	3	●	1
VQMHZV**D3/16**	.1875	.4375	2.0	.2500	3	●	1
VQMHZV**D1/4**	.2500	.6250	2.5	.2500	3	●	2
VQMHZV**D5/16**	.3125	.7500	2.75	.3125	3	●	2
VQMHZV**D11/32**	.3438	.7500	3.0	.3750	3	●	1
VQMHZV**D3/8**	.3750	.8750	3.0	.3750	3	●	2
VQMHZV**D1/2**	.5000	1.1250	3.5	.5000	3	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

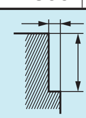
● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

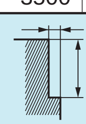
Work material	Carbon steel (–30HRC) AISI 1035, AISI 1050, ASTM 283						Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21						Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.					
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)			Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)			Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		
1/16	26000	55.3	24000	33.9	.094	.013	20000	26.0	20000	17.3	.094	.013	18000	23.4	16000	13.8	.094	.013
5/64	24000	70.9	19000	37.0	.12	.023	19000	33.7	16000	18.9	.12	.023	16000	24.6	13000	13.0	.12	.023
3/32	20000	70.9	16000	37.4	.14	.028	16000	34.0	13000	18.1	.14	.028	13000	24.6	11000	13.8	.14	.028
7/64	17000	72.3	14000	39.4	.16	.033	14000	34.7	11000	18.1	.16	.033	11000	24.7	9200	13.8	.16	.033
1/8	15000	76.2	12000	39.4	.19	.038	12000	36.9	10000	20.1	.19	.038	10000	26.0	8000	13.8	.19	.038
5/32	12000	78.0	9600	39.4	.23	.047	9600	37.4	8000	20.5	.23	.047	8000	26.5	6400	13.8	.23	.047
3/16	10000	74.4	8000	39.4	.28	.056	8000	37.8	6700	20.9	.28	.056	6700	26.5	5300	13.8	.28	.056
1/4	7500	74.4	6000	39.4	.38	.075	6000	39.0	5000	21.3	.38	.075	5000	35.4	4000	18.9	.38	.075
5/16	6000	74.4	4800	39.4	.47	.094	4800	39.7	4000	21.7	.47	.094	4000	35.4	3200	18.9	.47	.094
11/32	5500	71.5	4400	37.8	.52	.10	4400	37.9	3600	20.5	.52	.10	3600	36.1	2900	19.3	.52	.10
3/8	5000	67.9	4000	35.8	.56	.11	4000	36.9	3300	20.1	.56	.11	3300	37.0	2700	20.1	.56	.11
1/2	3800	56.1	3000	29.1	.75	.15	3000	32.6	2500	18.1	.75	.15	2500	32.5	2000	17.3	.75	.15

Depth of cut



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.						Copper, Copper alloy						Heat resistant alloy Inconel718 etc.					
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)			Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)			Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		
1/16	13000	16.9	13000	11.0	.094	.0063	30000	63.8	28000	39.4	.094	.013	8000	3.3	6000	13.8	.094	.0031
5/64	12000	21.3	11000	13.0	.12	.016	29000	85.6	22000	43.3	.12	.023	6400	3.4	4800	13.0	.12	.0078
3/32	10000	21.3	9400	13.4	.14	.019	24000	85.0	19000	43.3	.14	.028	5300	3.4	4000	13.8	.14	.0094
7/64	8600	21.3	8000	13.0	.16	.022	21000	89.3	16000	43.3	.16	.033	4600	3.5	3400	13.8	.16	.011
1/8	7500	23.0	7000	14.2	.19	.025	18000	91.4	14000	47.2	.19	.038	4000	3.5	3000	13.8	.19	.013
5/32	6000	23.4	5600	14.6	.23	.031	14000	90.9	11000	47.2	.23	.047	3200	3.5	2400	13.8	.23	.016
3/16	5000	23.6	4700	14.6	.28	.038	12000	89.3	9400	47.2	.28	.056	2700	3.6	2000	13.8	.28	.019
1/4	3800	24.7	3500	15.0	.38	.050	9000	89.3	7000	47.2	.38	.075	2000	3.7	1500	18.9	.38	.025
5/16	3000	24.8	2800	15.4	.47	.063	7200	89.3	5600	47.2	.47	.094	1600	3.7	1200	18.9	.47	.031
11/32	2700	23.3	2600	15.0	.52	.069	6600	85.7	5100	43.3	.52	.10	1500	3.9	1100	19.3	.52	.034
3/8	2500	23.0	2300	14.2	.56	.075	6000	81.5	4700	43.3	.56	.11	1300	3.9	1000	20.1	.56	.038
1/2	1900	20.6	1800	13.0	.75	.10	4500	66.4	3500	34.3	.75	.15	1000	3.7	750	17.3	.75	.050

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, and titanium alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

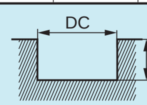
VQMHZV - Inch sizes

End mill, Medium cut length, 3 flute for drilling and slotting

Slotting

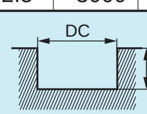
Work material	Carbon steel (−30HRC) AISI 1035, AISI 1050, ASTM 283					Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21					Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/16	26000	27.6	20000	14.2	.031	20000	11.8	16000	6.3	.031	18000	10.6	12000	4.7	.031
5/64	24000	36.9	16000	16.1	.078	19000	18.0	13000	8.3	.078	16000	18.9	9600	7.5	.078
3/32	20000	37.8	13000	16.1	.094	16000	18.9	11000	8.7	.094	13000	19.2	8000	7.9	.094
7/64	17000	40.2	11000	17.3	.11	14000	19.8	9200	8.7	.11	11000	19.5	6900	7.9	.11
1/8	15000	44.3	10000	19.7	.13	12000	22.7	8000	9.8	.13	10000	20.1	6000	7.9	.13
5/32	12000	56.7	8000	24.8	.16	9600	26.1	6400	11.4	.16	8000	20.8	4800	8.3	.16
3/16	10000	56.7	6700	25.2	.19	8000	26.9	5300	11.8	.19	6700	21.4	4000	8.3	.19
1/4	7500	55.8	5000	24.4	.25	6000	29.8	4000	13.0	.25	5000	21.9	3000	8.7	.25
5/16	6000	49.6	4000	21.7	.31	4800	28.3	3200	12.6	.31	4000	23.6	2400	9.4	.31
11/32	5500	48.7	3600	20.9	.34	4400	27.0	2900	11.8	.34	3600	24.2	2200	9.8	.34
3/8	5000	46.1	3300	20.1	.38	4000	25.5	2700	11.4	.38	3300	25.3	2000	10.2	.38
1/2	3800	35.9	2500	15.7	.50	3000	22.3	2000	9.8	.50	2500	23.6	1500	9.4	.50

Depth of cut



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.					Copper, Copper alloy					Heat resistant alloy Inconel718 etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/16	11000	6.5	10000	3.9	.019	30000	31.9	24000	16.9	.031	6000	3.5	5000	2.0	.013
5/64	9600	9.1	8000	5.1	.039	29000	44.5	19000	19.3	.078	4800	4.0	4000	2.2	.023
3/32	8000	9.5	6700	5.1	.047	24000	45.4	16000	20.1	.094	4000	4.3	3300	2.3	.028
7/64	6900	9.8	5700	5.5	.055	21000	49.6	14000	21.7	.11	3400	4.4	2900	2.5	.033
1/8	6000	11.3	5000	6.3	.063	18000	53.1	12000	23.2	.13	3000	4.6	2500	2.5	.038
5/32	4800	13.0	4000	7.1	.078	14000	66.1	9600	29.9	.16	2400	5.0	2000	2.8	.047
3/16	4000	13.7	3300	7.5	.094	12000	68.0	8000	29.9	.19	2000	5.1	1700	2.9	.056
1/4	3000	14.9	2500	8.3	.13	9000	67.0	6000	29.5	.25	1500	5.3	1300	3.0	.075
5/16	2400	14.2	2000	7.9	.16	7200	59.5	4800	26.4	.31	1200	5.7	1000	3.1	.094
11/32	2200	13.5	1800	7.5	.17	6600	58.5	4400	25.6	.34	1100	5.9	910	3.2	.10
3/8	2000	12.8	1700	7.1	.19	6000	55.3	4000	24.4	.38	1000	6.1	840	3.4	.11
1/2	1500	11.2	1300	6.3	.25	4500	42.5	3000	18.9	.50	750	5.7	630	3.1	.15

Depth of cut



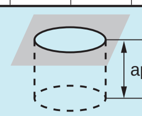
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy, and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

CARBIDE

Drilling

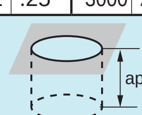
Work material	Carbon steel (—30HRC) AISI 1035, AISI 1050, ASTM 283							Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21							Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)		Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)		Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	
1/16	18000	12.8	.013	18000	12.6	.006	.031	12000	5.2	.013	12000	5.2	.006	.031	12000	3.3	.004	12000	3.3	.002	.031
5/64	16000	18.9	.020	16000	18.9	.006	.078	11000	7.8	.016	11000	7.8	.006	.078	9600	3.5	.004	9600	3.5	.002	.039
3/32	13000	20.5	.023	13000	20.5	.010	.094	9400	8.8	.019	9400	8.8	.010	.094	8000	3.5	.006	8000	3.5	.002	.047
7/64	11000	21.7	.033	11000	21.7	.010	.11	8000	9.4	.022	8000	9.4	.010	.11	6900	3.5	.008	6900	3.5	.002	.055
1/8	10000	27.6	.044	10000	27.6	.012	.13	7000	11.0	.025	7000	11.0	.012	.13	6000	4.0	.008	6000	4.0	.004	.063
5/32	8000	31.5	.078	8000	31.5	.012	.16	5600	13.2	.031	5600	13.2	.012	.16	4800	3.8	.016	4800	3.8	.004	.078
3/16	6700	34.3	.094	6700	34.3	.016	.19	4700	15.0	.038	4700	15.0	.016	.19	4000	3.8	.020	4000	3.8	.008	.094
1/4	5000	35.4	.13	5000	35.4	.024	.25	3500	16.5	.050	3500	16.5	.024	.25	3000	3.5	.024	3000	3.5	.012	.13
5/16	4000	28.3	.16	4000	28.3	.028	.31	2800	13.2	.063	2800	13.2	.028	.31	2400	2.8	.024	2400	2.8	.012	.16
11/32	3600	25.5	.17	3600	25.5	.028	.34	2600	12.3	.069	2600	12.3	.028	.34	2200	2.6	.024	2200	2.6	.012	.17
3/8	3300	23.4	.19	3300	23.4	.030	.38	2300	11.0	.094	2300	11.0	.030	.38	2000	2.3	.024	2000	2.3	.012	.19
1/2	2500	17.7	.20	2500	17.7	.030	.50	1800	8.5	.13	1800	8.5	.030	.50	1500	2.0	.024	1500	2.0	.012	.25

Hole depth



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.							Copper, Copper alloy						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)		Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	Revolution (min^{-1})	Feed rate (IPM)	Step (inch)	
1/16	7000	2.0	.004	7000	2.0	.002	.031	22000	15.6	.013	22000	15.6	.006	.031
5/64	6400	2.4	.004	6400	2.4	.002	.039	19000	22.4	.020	19000	22.4	.006	.039
3/32	5300	2.4	.006	5300	2.4	.002	.047	16000	25.2	.023	16000	25.2	.010	.047
7/64	4600	2.4	.008	4600	2.4	.002	.055	14000	27.6	.033	14000	27.6	.010	.055
1/8	4000	2.8	.008	4000	2.8	.004	.063	12000	33.1	.044	12000	33.1	.012	.063
5/32	3200	2.4	.016	3200	2.4	.004	.078	9600	37.8	.078	9600	37.8	.012	.078
3/16	2700	2.4	.020	2700	2.4	.008	.094	8000	39.4	.094	8000	39.4	.016	.094
1/4	2000	2.4	.024	2000	2.4	.012	.13	6000	43.3	.130	6000	43.3	.024	.13
5/16	1600	2.0	.024	1600	2.0	.012	.16	4800	33.9	.160	4800	33.9	.028	.16
11/32	1500	1.8	.024	1500	1.8	.012	.17	4400	31.1	.17	4400	31.1	.028	.17
3/8	1300	1.5	.024	1300	1.5	.012	.19	4000	28.3	.19	4000	28.3	.030	.19
1/2	1000	1.2	.024	1000	1.2	.012	.25	3000	21.3	.20	3000	21.3	.030	.25

Hole depth



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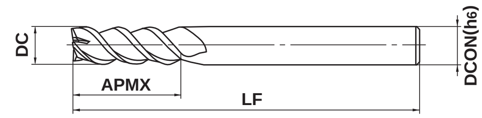
2) Effective cutting of stainless steel, and titanium alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

SOLID END MILLS

VQMHZVOH

End mill, Medium cut length, 3 flute for drilling and slotting with coolant holes

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
◎	○			◎	◎	○	



Type1

DC≤12	DC=16			
0 - 0.02	0 - 0.03			
DCON=6	8≤DCON≤10	12≤DCON≤16		
0 - 0.008	0 - 0.009	0 - 0.011		

- 3 flute end mill for drilling and slotting.
- The through coolant holes add stability to drilling and pocket machining.
- Featuring irregular helical geometry for reducing vibration.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHZVOHD0600	6	13	60	6	3	●	1
VQMHZVOHD0800	8	19	70	8	3	●	1
VQMHZVOHD1000	10	22	80	10	3	●	1
VQMHZVOHD1200	12	26	90	12	3	●	1
VQMHZVOHD1600	16	30	110	16	3	★	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

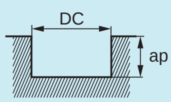
Slotting

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
6	150	8000	1400	6	120	6400	770	6	100	5300	560	6	60	3200	380	3	180	9500	1700	6	30	1600	130	1.8
8	150	6000	1300	8	120	4800	720	8	100	4000	600	8	60	2400	360	4	180	7200	1500	8	30	1200	140	2.4
10	150	4800	1200	10	120	3800	630	10	100	3200	670	10	60	1900	310	5	180	5700	1400	10	30	950	160	3
12	150	4000	960	12	120	3200	580	12	100	2700	650	12	60	1600	290	6	180	4800	1200	12	30	800	150	3.6
16	150	3000	810	12	120	2400	500	12	100	2000	480	12	60	1200	250	8	180	3600	970	12	30	600	120	4.8

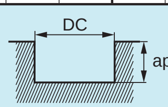
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
6	100	5300	630	6	80	4200	330	6	60	3200	220	6	50	2700	210	3	120	6400	760	6	25	1300	72	1.8
8	100	4000	550	8	80	3200	320	8	60	2400	240	8	50	2000	200	4	120	4800	670	8	25	990	78	2.4
10	100	3200	510	10	80	2500	270	10	60	1900	260	10	50	1600	170	5	120	3800	600	10	25	800	89	3
12	100	2700	430	12	80	2100	250	12	60	1600	250	12	50	1300	150	6	120	3200	510	12	25	660	84	3.6
16	100	2000	360	12	80	1600	220	12	60	1200	190	12	50	990	140	8	120	2400	430	12	25	500	63	4.8

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
   When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
   In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the feed rate can be increased.

VQMHZVOH

End mill, Medium cut length, 3 flute for drilling and slotting with coolant holes

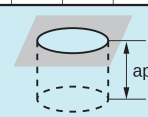
Plunging

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631					Copper, Copper alloy				
DC (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
6	100	5300	950	9	3	70	3700	440	9	1.2	60	3200	100	6	0.6	40	2100	60	6	0.6	120	6400	1200	9	3
8	100	4000	720	12	4	70	2800	340	12	1.6	60	2400	70	8	0.6	40	1600	50	8	0.6	120	4800	860	12	4
10	100	3200	580	15	5	70	2200	260	15	2.5	60	1900	60	10	0.6	40	1300	40	10	0.6	120	3800	680	15	5
12	100	2700	490	18	5	70	1900	230	18	3	60	1600	50	12	0.6	40	1100	30	12	0.6	120	3200	580	18	5
16	100	2000	360	24	5	70	1400	170	24	4	60	1200	40	16	0.6	40	800	20	16	0.6	120	2400	430	24	5

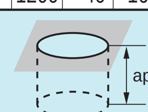
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631					Copper, Copper alloy				
DC (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Hole Depth ap (mm)	Step (mm)
6	100	5300	950	9	0.6	70	3700	440	9	0.6	60	3200	100	6	0.3	40	2100	60	6	0.3	120	6400	1200	9	0.6
8	100	4000	720	12	0.7	70	2800	340	12	0.7	60	2400	70	8	0.3	40	1600	50	8	0.3	120	4800	860	12	0.7
10	100	3200	580	15	0.75	70	2200	260	15	0.75	60	1900	60	10	0.3	40	1300	40	10	0.3	120	3800	680	15	0.75
12	100	2700	490	18	0.75	70	1900	230	18	0.75	60	1600	50	12	0.3	40	1100	30	12	0.3	120	3200	580	18	0.75
16	100	2000	360	24	0.75	70	1400	170	24	0.75	60	1200	40	16	0.3	40	800	20	16	0.3	120	2400	430	24	0.75

Depth of cut



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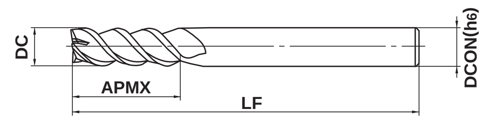
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

VQMHZVOH - Inch sizes NEW

UWC VQ 42° 43.5° 45°

End mill, Medium cut length, 3 flute for drilling and slotting with coolant holes

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



Type1

DC<.5000"	DC=.5000"				
0 - .0008"	0 - .0012"				
.250"≤DCON≤.375"	DCON=.500"				
0 - .00035"	0 - .00043"				

h6

- 3 flute end mill for drilling and slotting.
- The through coolant holes add stability to drilling and pocket machining.
- Featuring irregular helical geometry for reducing vibration.

Unit : inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHZVOHD1/4	.2500	.6252	2.5	.2500	3	●	1
VQMHZVOHD5/16	.3125	.7500	2.75	.3125	3	●	1
VQMHZVOHD3/8	.3750	.8752	3.0	.3750	3	●	1
VQMHZVOHD1/2	.5000	1.1252	3.5	.5000	3	●	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained.

VQMHZVOH - Inch sizes NEW

End mill, Medium cut length, 3 flute for drilling and slotting with coolant holes

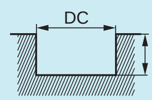
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Slotting

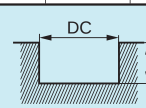
Work material	Carbon steel (—30HRC) AISI 1035, AISI 1050, ASTM 283					Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21					Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/4	7500	55.8	5000	24.4	.25	6000	29.8	5000	16.5	.25	5000	21.9	3000	8.7	.25
5/16	6000	49.6	4000	21.7	.31	4800	28.3	4000	15.7	.31	4000	23.6	2400	9.4	.31
3/8	5000	46.1	3300	20.1	.38	4000	25.5	3300	13.8	.38	3300	25.3	2000	10.2	.38
1/2	3800	35.9	2500	15.7	.50	3000	22.3	2500	12.2	.50	2500	23.6	1500	9.4	.50

Depth of cut



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.					Copper, Copper alloy					Heat resistant alloy Inconel718 etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/4	3000	14.9	2500	8.3	.25	9000	67.0	6000	29.5	.25	1500	5.3	1300	3.0	.075
5/16	2400	14.2	2000	7.9	.31	7200	59.5	4800	26.4	.31	1200	5.7	1000	3.1	.094
3/8	2000	12.8	1700	7.1	.38	6000	55.3	4000	24.4	.38	1000	6.1	840	3.4	.11
1/2	1500	11.2	1300	6.3	.50	4500	42.5	3000	18.9	.50	750	5.7	630	3.1	.15

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy, and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

SOLID END MILLS

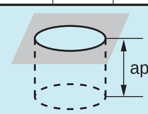
Plunging

Work material	Carbon steel (–30HRC) AISI 1035, AISI 1050, ASTM 283						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	
1/4	5000	35.4	.13	5000	35.4	.024	.38
5/16	4000	28.3	.16	4000	28.3	.028	.47
3/8	3300	23.4	.19	3300	23.4	.030	.56
1/2	2500	17.7	.20	2500	17.7	.030	.75

Work material	Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	
1/4	3500	16.5	.050	3500	16.5	.024	.38
5/16	2800	13.2	.063	2800	13.2	.028	.47
3/8	2300	11.0	.094	2300	11.0	.030	.56
1/2	1800	8.5	.13	1800	8.5	.030	.75

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	
1/4	3000	3.5	.024	3000	3.5	.012	.38
5/16	2400	2.8	.024	2400	2.8	.012	.47
3/8	2000	2.3	.024	2000	2.3	.012	.56
1/2	1500	2.0	.024	1500	2.0	.012	.75

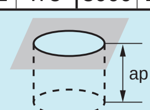
Hole depth



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	
1/4	2000	2.3	.024	2000	2.3	.012	.38
5/16	1600	2.0	.024	1600	2.0	.012	.47
3/8	1300	1.5	.024	1300	1.5	.012	.56
1/2	1000	1.2	.024	1000	1.2	.012	.75

Work material	Copper, Copper alloy						
DC (inch)	High speed cutting			General purpose cutting			Hole Depth ap (inch)
	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	Revolution (min⁻¹)	Feed rate (IPM)	Step (inch)	
1/4	6000	42.5	.13	6000	42.5	.0024	.38
5/16	4800	34.0	.16	4800	34.0	.0028	.47
3/8	4000	28.3	.19	4000	28.3	.003	.56
1/2	3000	21.3	.20	3000	21.3	.003	.75

Hole depth



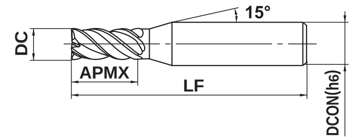
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy, and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

VQMHV

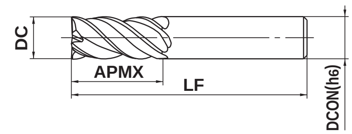
End mill, Medium cut length, 4 flute, Irregular helix flutes

UWC VQ 37° 40°

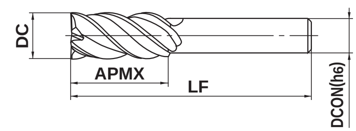
Carbon Steel, Alloy Steel (<30HRC)	Pre-Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
◎	○			◎	◎	○	



Type1



Type2



Type3

	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- SMART MIRACLE vibration control end mills for reduced chattering and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Unit : mm

	Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
	VQMHVD0200	2	4	45	4	4	●	1
	VQMHVD0250	2.5	5	45	4	4	●	1
	VQMHVD0300	3	8	45	6	4	●	1
	VQMHVD0350	3.5	8	45	6	4	●	1
	VQMHVD0400	4	11	45	6	4	●	1
	VQMHVD0500	5	13	50	6	4	●	1
	VQMHVD0600	6	13	50	6	4	●	2
	VQMHVD0700	7	19	60	8	4	●	1
	VQMHVD0800	8	19	60	8	4	●	2
	VQMHVD0900	9	22	70	10	4	●	1
NEW	VQMHVD0900S08	9	22	75	8	4	●	3
	VQMHVD1000	10	22	70	10	4	●	2
NEW	VQMHVD1000S08	10	22	100	8	4	●	3
	VQMHVD1100	11	26	75	12	4	●	1
NEW	VQMHVD1100S10	11	26	100	10	4	●	3
	VQMHVD1200	12	26	75	12	4	●	2
NEW	VQMHVD1200S10	12	26	110	10	4	●	3
	VQMHVD1300	13	26	75	12	4	★	3
NEW	VQMHVD1300S12	13	26	110	12	4	★	3
	VQMHVD1400	14	30	90	16	4	★	1
NEW	VQMHVD1400S12	14	32	130	12	4	★	3
	VQMHVD1600	16	35	90	16	4	★	2
	VQMHVD1800	18	40	100	16	4	★	3
NEW	VQMHVD1800S16	18	42	150	16	4	★	3
	VQMHVD2000	20	45	110	20	4	★	2
	VQMHVD2500	25	55	125	25	4	★	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

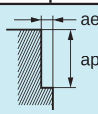
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	150	24000	2400	3	0.6	120	19000	1100	3	0.6	100	16000	830	3	0.6	75	12000	720	3	0.4
3	150	16000	2600	4.5	0.9	120	13000	1200	4.5	0.9	100	11000	880	4.5	0.9	75	8000	770	4.5	0.6
4	150	12000	2600	6	1.2	120	9500	1300	6	1.2	100	8000	900	6	1.2	75	6000	790	6	0.8
5	150	9500	2600	7.5	1.5	120	7600	1300	7.5	1.5	100	6400	900	7.5	1.5	75	4800	810	7.5	1
6	150	8000	2600	9	1.8	120	6400	1300	9	1.8	100	5300	1100	9	1.8	75	4000	810	9	1.2
8	150	6000	2500	12	2.4	120	4800	1300	12	2.4	100	4000	1200	12	2.4	75	3000	840	12	1.6
10	150	4800	2300	15	3	120	3800	1200	15	3	100	3200	1300	15	3	75	2400	770	15	2
12	150	4000	1900	18	3.6	120	3200	1200	18	3.6	100	2700	1200	18	3.6	75	2000	720	18	2.4
16	150	3000	1600	24	4.8	120	2400	960	24	4.8	100	2000	960	24	4.8	75	1500	600	24	3.2
20	150	2400	1300	30	6	120	1900	760	30	6	100	1600	770	30	6	75	1200	480	30	4
25	150	1900	1100	37.5	7.5	120	1500	600	37.5	7.5	100	1300	620	37.5	7.5	75	950	380	37.5	5

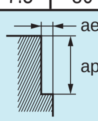
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	120	19000	1300	3	0.6	100	16000	630	3	0.6	80	13000	450	1.5	0.2	70	11000	440	3	0.4
3	120	13000	1400	4.5	0.9	100	11000	700	4.5	0.9	80	8500	450	2.2	0.3	70	7400	470	4.5	0.6
4	120	9500	1400	6	1.2	100	8000	700	6	1.2	80	6400	470	3	0.6	70	5600	490	6	0.8
5	120	7600	1400	7.5	1.5	100	6400	710	7.5	1.5	80	5100	470	4.5	0.9	70	4500	500	7.5	1
6	120	6400	1400	9	1.8	100	5300	710	9	1.8	80	4200	580	6	1.2	70	3700	500	9	1.2
8	120	4800	1300	12	2.4	100	4000	740	12	2.4	80	3200	630	7.5	1.5	70	2800	520	12	1.6
10	120	3800	1200	15	3	100	3200	680	15	3	80	2500	660	9	1.8	70	2200	460	15	2
12	120	3200	1000	18	3.6	100	2700	640	18	3.6	80	2100	610	12	2.4	70	1900	450	18	2.4
16	120	2400	860	24	4.8	100	2000	530	24	4.8	80	1600	510	15	3	70	1400	370	24	3.2
20	120	1900	680	30	6	100	1600	420	30	6	80	1300	410	18	3.6	70	1100	290	30	4
25	120	1500	390	37.5	7.5	100	1300	340	37.5	7.5	80	1000	210	24	4.8	70	890	230	37.5	5

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
   When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
   In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

VQMHV

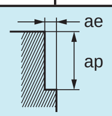
End mill, Medium cut length, 4 flute, Irregular helix flutes

CARBIDE

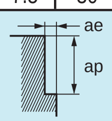
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	180	29000	2900	3	0.6	40	6400	230	3	0.2
3	180	19000	3000	4.5	0.9	40	4200	240	4.5	0.3
4	180	14000	3000	6	1.2	40	3200	240	6	0.4
5	180	11000	3000	7.5	1.5	40	2500	240	7.5	0.5
6	180	9500	3000	9	1.8	40	2100	250	9	0.6
8	180	7200	3000	12	2.4	40	1600	260	12	0.8
10	180	5700	2700	15	3	40	1300	290	15	1
12	180	4800	2300	18	3.6	40	1100	280	18	1.2
16	180	3600	1900	24	4.8	40	800	200	24	1.6
20	180	2900	1600	30	6	40	640	160	30	2
25	180	2300	1300	37	7.5	40	510	130	37.5	2.5
Depth of cut										

General purpose cutting conditions

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min-1)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	140	22000	1500	3	0.6	30	4800	110	3	0.2
3	140	15000	1600	4.5	0.9	30	3200	120	4.5	0.3
4	140	11000	1600	6	1.2	30	2400	120	6	0.4
5	140	8900	1600	7.5	1.5	30	1900	120	7.5	0.5
6	140	7400	1600	9	1.8	30	1600	130	9	0.6
8	140	5600	1600	12	2.4	30	1200	130	12	0.8
10	140	4500	1400	15	3	30	950	140	15	1
12	140	3700	1200	18	3.6	30	800	140	18	1.2
16	140	2800	1000	24	4.8	30	600	100	24	1.6
20	140	2200	780	30	6	30	480	81	30	2
25	140	1800	670	37.5	7.5	30	380	64	37.5	2.5
Depth of cut										

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   When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
   In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

SOLID END MILLS

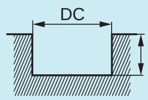
Slotting

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
2	150	24000	1200	2	120	19000	610	2	100	16000	640	2	60	9500	300	1	180	29000	1500	2	30	4800	130	0.6
3	150	16000	1500	3	120	13000	730	3	100	11000	660	3	60	6400	360	1.5	180	19000	1700	3	30	3200	150	0.9
4	150	12000	1900	4	120	9500	910	4	100	8000	700	4	60	4800	460	2	180	14000	2200	4	30	2400	170	1.2
5	150	9500	1900	5	120	7600	910	5	100	6400	720	5	60	3800	460	2.5	180	11000	2200	5	30	1900	170	1.5
6	150	8000	1900	6	120	6400	1000	6	100	5300	740	6	60	3200	510	3	180	9500	2300	6	30	1600	180	1.8
8	150	6000	1700	8	120	4800	960	8	100	4000	800	8	60	2400	480	4	180	7200	2000	8	30	1200	190	2.4
10	150	4800	1500	10	120	3800	840	10	100	3200	900	10	60	1900	420	5	180	5700	1800	10	30	950	210	3
12	150	4000	1300	12	120	3200	770	12	100	2700	860	12	60	1600	380	6	180	4800	1500	12	30	800	200	3.6
16	150	3000	1100	12	120	2400	670	12	100	2000	640	12	60	1200	340	8	180	3600	1300	12	30	600	150	4.8
20	150	2400	860	12	120	1900	530	12	100	1600	510	12	60	950	270	10	180	2900	1000	12	30	480	120	6
25	150	1900	760	12	120	1500	420	12	100	1300	420	12	60	760	210	12	180	2300	920	12	30	380	100	7.5

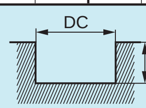
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
2	100	16000	550	2	80	13000	270	2	60	9500	250	2	50	8000	170	1	120	19000	650	2	25	4000	74	0.6
3	100	11000	670	3	80	8500	310	3	60	6400	250	3	50	5300	200	1.5	120	13000	790	3	25	2700	86	0.9
4	100	8000	840	4	80	6400	410	4	60	4800	280	4	50	4000	250	2	120	9500	1000	4	25	2000	93	1.2
5	100	6400	840	5	80	5100	410	5	60	3800	280	5	50	3200	250	2.5	120	7600	1000	5	25	1600	95	1.5
6	100	5300	840	6	80	4200	440	6	60	3200	300	6	50	2700	290	3	120	6400	1000	6	25	1300	96	1.8
8	100	4000	740	8	80	3200	420	8	60	2400	320	8	50	2000	260	4	120	4800	890	8	25	990	100	2.4
10	100	3200	680	10	80	2500	360	10	60	1900	350	10	50	1600	230	5	120	3800	800	10	25	800	120	3
12	100	2700	570	12	80	2100	330	12	60	1600	340	12	50	1300	210	6	120	3200	680	12	25	660	110	3.6
16	100	2000	480	12	80	1600	300	12	60	1200	250	12	50	990	180	8	120	2400	570	12	25	500	84	4.8
20	100	1600	380	12	80	1300	240	12	60	950	200	12	50	800	150	10	120	1900	450	12	25	400	68	6
25	100	1300	340	12	80	1000	180	12	60	760	160	12	50	640	120	12	120	1500	400	12	25	320	50	7.5

Depth of cut

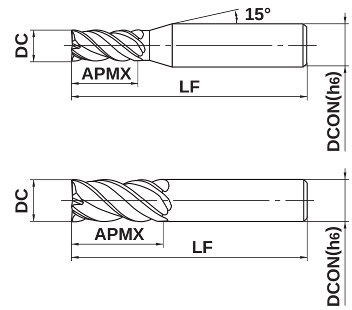


1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the feed rate can be increased.

VQMHV – Inch sizes

End mill, Medium cut length, 4 flute, Irregular helix flutes

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



DC<.5000"	DC=.5000"			
0 - .0008"	0 - .0012"			
.2500"≤DCON≤.3750"	DCON=.5000"			
0 - .00035"	0 - .00043"			

- SMART MIRACLE irregular helix end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Unit : inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHVD1/8	.1250	.3130	2.0	.2500	4	●	1
VQMHV**D3/16**	.1875	.4375	2.0	.2500	4	●	1
VQMHV**D1/4**	.2500	.6250	2.5	.2500	4	●	2
VQMHV**D5/16**	.3125	.7500	2.75	.3125	4	●	2
VQMHV**D3/8**	.3750	.8750	3.0	.3750	4	●	2
VQMHV**D1/2**	.5000	1.1250	3.5	.5000	4	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

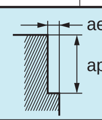
● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

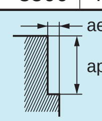
Work material	Carbon steel (−30HRC) AISI 1035, AISI 1050, ASTM 283						Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21						Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.					
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)
	Revolution (min-1)	Feed rate (IPM)	Revolution (min-1)	Feed rate (IPM)			Revolution (min-1)	Feed rate (IPM)	Revolution (min-1)	Feed rate (IPM)			Revolution (min-1)	Feed rate (IPM)	Revolution (min-1)	Feed rate (IPM)		
1/8	15000	102.0	12000	55.1	.19	.038	12000	49.1	10000	27.2	.19	.038	10000	34.6	8000	18.1	.19	.038
3/16	10000	99.2	8000	51.2	.28	.056	8000	50.4	6700	28.0	.28	.056	6700	35.3	5300	18.5	.28	.056
1/4	7500	99.2	6000	51.2	.38	.075	6000	52.0	5000	28.7	.38	.075	5000	47.2	4000	24.8	.38	.075
5/16	6000	99.2	4800	51.2	.47	.094	4800	52.9	4000	29.1	.47	.094	4000	47.2	3200	24.8	.47	.094
3/8	5000	90.6	4000	47.2	.56	.11	4000	49.1	3300	26.8	.56	.11	3300	49.4	2700	26.8	.56	.11
1/2	3800	74.8	3000	39.0	.75	.15	3000	43.5	2500	24.0	.75	.15	2500	43.3	2000	22.8	.75	.15

Depth of cut



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.						Copper, Copper alloy						Heat resistant alloy Inconel718 etc.					
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	Width of cut ae (inch)
	Revolution (min-1)	Feed rate (IPM)	Revolution (min-1)	Feed rate (IPM)			Revolution (min-1)	Feed rate (IPM)	Revolution (min-1)	Feed rate (IPM)			Revolution (min-1)	Feed rate (IPM)	Revolution (min-1)	Feed rate (IPM)		
1/8	7500	30.7	7000	18.9	.19	.025	18000	122.0	14000	63.0	.19	.038	4000	9.5	3000	4.7	.19	.013
3/16	5000	31.5	4700	19.7	.28	.038	12000	119.0	9400	63.0	.28	.056	2700	9.8	2000	4.7	.28	.019
1/4	3800	32.9	3500	20.1	.38	.050	9000	119.0	7000	63.0	.38	.075	2000	10.1	1500	5.1	.38	.025
5/16	3000	33.1	2800	20.5	.47	.063	7200	119.0	5600	63.0	.47	.094	1600	10.1	1200	5.1	.47	.031
3/8	2500	30.7	2300	18.5	.56	.075	6000	109.0	4700	55.1	.56	.11	1300	10.6	1000	5.5	.56	.038
1/2	1900	27.5	1800	17.3	.75	.10	4500	88.6	3500	47.2	.75	.15	1000	10.1	750	5.1	.75	.050

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

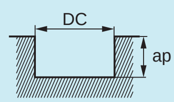
VQMHV – Inch sizes

End mill, Medium cut length, 4 flute, Irregular helix flutes

Slotting

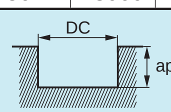
Work material	Carbon steel (−30HRC) AISI 1035, AISI 1050, ASTM 283					Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21					Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/8	15000	59.1	10000	26.0	.13	12000	30.2	8000	13.4	.13	10000	26.8	6000	10.6	.13
3/16	10000	75.6	6700	33.5	.19	8000	35.9	5300	15.7	.19	6700	28.5	4000	11.4	.19
1/4	7500	74.4	5000	32.7	.25	6000	39.7	4000	17.3	.25	5000	29.1	3000	11.4	.25
5/16	6000	66.1	4000	29.1	.31	4800	37.8	3200	16.5	.31	4000	31.5	2400	12.6	.31
3/8	5000	61.4	3300	26.8	.38	4000	34.0	2700	15.0	.38	3300	33.8	2000	13.4	.38
1/2	3800	47.9	2500	20.9	.50	3000	29.8	2000	13.0	.50	2500	31.5	1500	12.6	.50

Depth of cut



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.					Copper, Copper alloy					Heat resistant alloy Inconel718 etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/8	6000	15.1	5000	8.3	.063	18000	70.9	12000	31.1	.13	3000	6.14	2500	3.4	.038
3/16	4000	18.3	3300	9.8	.094	12000	90.7	8000	39.4	.19	2000	6.80	1700	3.8	.056
1/4	3000	19.8	2500	11.0	.13	9000	89.3	6000	39.4	.25	1500	7.09	1300	3.9	.075
5/16	2400	18.9	2000	10.2	.16	7200	79.4	4800	35.0	.31	1200	7.56	1000	4.3	.094
3/8	2000	17.0	1700	9.4	.19	6000	73.7	4000	32.3	.38	1000	8.19	840	4.7	.11
1/2	1500	14.9	1300	8.7	.25	4500	56.7	3000	24.8	.50	750	7.56	630	4.3	.15

Depth of cut



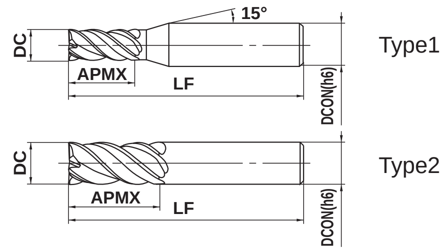
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

VQJHV NEW

End mill, Semi long cut length, 4 flute, Irregular helix flutes

UWC VQ 38° 40° DC≤6 37.5° 40° DC>6

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



	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- SMART MIRACLE vibration control end mills for reduced chattering and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQJHVD0200	2	8	60	6	4	●	1
VQJHV**D0250**	2.5	10	60	6	4	●	1
VQJHV**D0300**	3	12	60	6	4	●	1
VQJHV**D0350**	3.5	14	60	6	4	●	1
VQJHV**D0400**	4	16	60	6	4	●	1
VQJHV**D0450**	4.5	18	60	6	4	●	1
VQJHV**D0500**	5	20	60	6	4	●	1
VQJHV**D0600**	6	24	60	6	4	●	2
VQJHV**D0700**	7	25	80	8	4	●	1
VQJHV**D0800**	8	28	80	8	4	●	2
VQJHV**D0900**	9	32	90	10	4	●	1
VQJHV**D1000**	10	35	90	10	4	●	2
VQJHV**D1200**	12	40	100	12	4	●	2
VQJHV**D1600**	16	55	125	16	4	★	2
VQJHV**D2000**	20	70	140	20	4	★	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

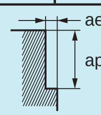
● : Inventory maintained. ★ : Inventory maintained in Japan.

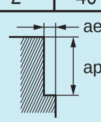
VQJHV NEW

End mill, Semi long cut length, 4 flute, Irregular helix flutes

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	130	21000	700	5	0.2	100	16000	510	5	0.2	80	13000	390	5	0.1	75	12000	360	5	0.1
3	130	14000	960	7.5	0.3	100	11000	680	7.5	0.3	80	8500	490	7.5	0.15	75	8000	460	7.5	0.15
4	130	10000	1000	10	0.4	100	8000	690	10	0.4	80	6400	540	10	0.2	75	6000	510	10	0.2
5	130	8300	1100	12.5	0.5	100	6400	730	12.5	0.5	80	5100	570	12.5	0.25	75	4800	540	12.5	0.25
6	130	6900	1200	15	0.6	100	5300	810	15	0.6	80	4200	630	15	0.3	75	4000	600	15	0.3
8	130	5200	1200	20	0.8	100	4000	840	20	0.8	80	3200	640	20	0.4	75	3000	600	20	0.4
10	130	4100	1100	25	1	100	3200	810	25	1	80	2500	590	25	0.5	75	2400	570	25	0.5
12	130	3400	1100	30	1.2	100	2700	780	30	1.2	80	2100	550	30	0.6	75	2000	520	30	0.6
16	130	2600	920	40	1.6	100	2000	640	40	1.6	80	1600	450	40	0.8	75	1500	420	40	0.8
20	130	2100	820	50	2	100	1600	570	50	2	80	1300	420	50	1	75	1200	390	50	1
Depth of cut																				

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	160	25000	830	5	0.2	40	6400	90	5	0.04
3	160	17000	1200	7.5	0.3	40	4200	130	7.5	0.06
4	160	13000	1300	10	0.4	40	3200	190	10	0.08
5	160	10000	1300	12.5	0.5	40	2500	180	12.5	0.1
6	160	8500	1500	15	0.6	40	2100	180	15	0.12
8	160	6400	1500	20	0.8	40	1600	170	20	0.16
10	160	5100	1300	25	1	40	1300	170	25	0.2
12	160	4200	1300	30	1.2	40	1100	140	30	0.24
16	160	3200	1100	40	1.6	40	800	110	40	0.32
20	160	2500	970	50	2	40	640	80	50	0.4
Depth of cut										

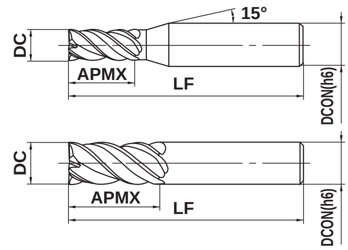
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

VQJHV - Inch sizes NEW

End mill, Semi long cut length, 4 flute, Irregular helix flutes

UWC VQ 38° 40° DC≤1/4 37.5° 40° DC>1/4

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



DC<.5000"	DC=.5000"			
0 - .0008"	0 - .0012"			
.2500"≤DCON≤.3750"	DCON=.5000"			
0 - .00035"	0 - .00043"			

h6

● SMART MIRACLE vibration control end mills for reduced chattering and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Unit : inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VQJHVD1/8	.1250	.5000	2.5	.2500	4	●	1
VQJHV**D3/16**	.1875	.7500	2.5	.2500	4	●	1
VQJHV**D1/4**	.2500	1.0000	2.5	.2500	4	●	2
VQJHV**D5/16**	.3125	1.0900	3.25	.3125	4	●	2
VQJHV**D3/8**	.3750	1.3100	3.5	.3750	4	●	2
VQJHV**D1/2**	.5000	1.6500	4.0	.5000	4	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained.

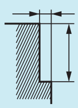
CARBIDE SQUARE BALL RADIUS TAPER SOLID END MILLS

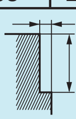
VQJHV- Inch sizes NEW

End mill, Semi long cut length, 4 flute, Irregular helix flutes

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Alloy steel, Mild steel AISI 1035, AISI 1050, ASTM 283				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel AISI H13, AISI 4140, AISI P21				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.				Hardened stainless steels, Cobaly chromium alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.			
DC (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
1/8	13000	39	.313	.013	10000	26.8	.313	.013	8000	2.1	.313	.006	7500	18.9	.313	.006
3/16	8700	39.4	.469	.019	6700	27.6	.469	.019	5300	21.7	.469	.009	5000	20.5	.469	.009
1/4	6500	47.2	.625	.025	5000	32.3	.625	.025	4000	25.2	.625	.013	3800	24	.625	.013
5/16	5200	47.2	.781	.031	4000	33.5	.781	.031	3200	25.2	.781	.016	3000	23.6	.781	.016
3/8	4300	43.3	.938	.038	3300	31.9	.938	.038	2700	23.2	.938	.019	2500	22.4	.938	.019
1/2	3300	43.3	1.25	.05	2500	29.1	1.25	.05	2000	2.9	1.25	.025	1900	20.1	1.25	.025
Depth of cut																

Work material	Copper, Copper alloy				Heat resistant alloys Inconel718 etc.			
DC (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
1/8	16000	48	.013	.013	4000	5.1	.313	.003
3/16	11000	51.9	.019	.019	2700	7.1	.469	.004
1/4	8000	57.9	.025	.025	2000	6.7	.625	.005
5/16	6400	59.4	.031	.031	1600	6.7	.781	.006
3/8	5300	51.7	.038	.038	1300	6.7	.938	.008
1/2	4000	50.4	.05	.05	1000	5.1	1.25	.01
Depth of cut								

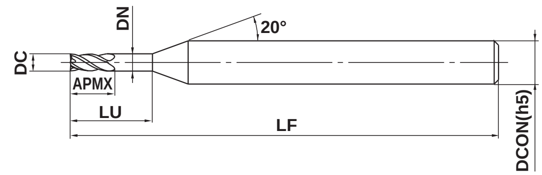
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

VQXL NEW

End mill, Short cut length, 4 flute, Long neck

UWC VQ 35° DC≤0.3 DC≥0.4

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



Type1

DC≤1				
0 - 0.010				
DCON=4				
0 - 0.005				

- SMART MIRACLE coating enhances efficiency due to an improved chip disposal.
- Providing a high efficiency and a long tool life by increasing the number of flutes.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VQXLD0020N006	0.2	0.3	0.6	0.18	40	4	3	●	1
VQXLD0030N009	0.3	0.5	0.9	0.28	40	4	3	●	1
VQXLD0030N015	0.3	0.5	1.5	0.28	40	4	3	●	1
VQXLD0040N010	0.4	0.6	1	0.37	40	4	4	●	1
VQXLD0040N018	0.4	0.6	1.8	0.37	40	4	4	●	1
VQXLD0050N015	0.5	0.7	1.5	0.46	40	4	4	●	1
VQXLD0050N025	0.5	0.7	2.5	0.46	40	4	4	●	1
VQXLD0050N030	0.5	0.7	3	0.46	40	4	4	●	1
VQXLD0060N030	0.6	0.9	3	0.57	40	4	4	●	1
VQXLD0070N035	0.7	1	3.5	0.67	40	4	4	●	1
VQXLD0080N024	0.8	1.2	2.4	0.77	40	4	4	●	1
VQXLD0080N030	0.8	1.2	3	0.77	40	4	4	●	1
VQXLD0080N040	0.8	1.2	4	0.77	40	4	4	●	1
VQXLD0100N050	1	1.5	5	0.96	40	4	4	●	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

TORX Chart

Order Number	ISO 10664 TORX Type
VQXLD0020N006	T4
VQXLD0030N009	T6
VQXLD0030N015	
VQXLD0040N010	T8
VQXLD0040N018	
VQXLD0050N015	T15
VQXLD0050N025	
VQXLD0050N030	
VQXLD0080N024	T25
VQXLD0080N040	
VQXLD0100N050	T40

● : Inventory maintained.

VQXL NEW

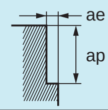
End mill, Short cut length, 4 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material		Carbon steel, Alloy steel, Mild steel, Alloy tool steel, Austenitic stainless steels, Titanium alloys, Cobaly chromium alloy, Copper, Copper alloy S45C, SCM440, SNCM439, SUS304, SUS316, SUS304LN, SUS316LN, Ti-6Al-4V					Heat resistant alloys, Pre-hardened steel, Hardened steel Inconel718, NAK, PX5, SKD61, SKT4, SUS431, SUS420J2				
DC (mm)	**LU** (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
0.2	0.6	25	40000	360	0.03	0.01	20	32000	290	0.03	0.01
0.3	0.9	40	40000	480	0.045	0.015	20	21000	250	0.045	0.015
0.3	1.5	40	40000	360	0.045	0.015	20	21000	190	0.045	0.015
0.4	1.2	50	40000	800	0.06	0.02	20	16000	320	0.06	0.02
0.4	2	50	40000	560	0.06	0.02	20	16000	220	0.06	0.025
0.5	1.5	60	38000	910	0.075	0.025	20	13000	310	0.075	0.025
0.5	2.5	60	38000	610	0.075	0.025	20	13000	210	0.075	0.025
0.5	3	60	38000	550	0.075	0.025	20	13000	180	0.075	0.025
0.6	3	60	32000	640	0.09	0.03	20	10500	210	0.09	0.03
0.7	3.5	60	27000	650	0.11	0.035	20	9100	200	0.11	0.035
0.8	2.4	60	24000	960	0.12	0.04	20	8000	260	0.12	0.04
0.8	3	60	24000	860	0.12	0.04	20	8000	230	0.12	0.04
0.8	4	60	24000	670	0.12	0.04	20	8000	190	0.12	0.04
1	5	60	20000	800	0.15	0.05	20	6500	210	0.15	0.05

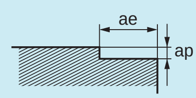
Depth of cut



Face milling

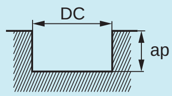
Work material		Carbon steel, Alloy steel, Mild steel, Alloy tool steel, Austenitic stainless steels, Titanium alloys, Cobaly chromium alloy, Copper, Copper alloy S45C, SCM440, SNCM439, SUS304, SUS316, SUS304LN, SUS316LN, Ti-6Al-4V					Heat resistant alloys, Pre-hardened steel, Hardened steel Inconel718, NAK, PX5, SKD61, SKT4, SUS431, SUS420J2				
DC (mm)	**LU** (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
0.2	0.6	25	40000	360	0.015	≤0.2	20	32000	290	0.015	≤0.1
0.3	0.9	40	40000	480	0.025	≤0.3	20	21000	250	0.025	≤0.15
0.3	1.5	40	40000	360	0.02	≤0.3	20	21000	190	0.02	≤0.15
0.4	1.2	50	40000	800	0.03	≤0.4	20	16000	320	0.03	≤0.2
0.4	2	50	40000	560	0.02	≤0.4	20	16000	220	0.02	≤0.2
0.5	1.5	60	38000	910	0.04	≤0.5	20	13000	310	0.04	≤0.25
0.5	2.5	60	38000	610	0.03	≤0.5	20	13000	210	0.03	≤0.25
0.5	3	60	38000	550	0.03	≤0.5	20	13000	180	0.03	≤0.25
0.6	3	60	32000	640	0.035	≤0.6	20	10500	210	0.035	≤0.3
0.7	3.5	60	27000	640	0.035	≤0.7	20	9100	190	0.035	≤0.35
0.8	2.4	60	24000	960	0.06	≤0.8	20	8000	260	0.06	≤0.4
0.8	3	60	24000	840	0.05	≤0.8	20	8000	230	0.05	≤0.4
0.8	4	60	24000	670	0.04	≤0.8	20	8000	190	0.04	≤0.4
1	5	60	20000	800	0.05	≤1	20	6500	210	0.05	≤0.5

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

Slotting

Work material		Carbon steel, Alloy steel, Mild steel, Alloy tool steel, Austenitic stainless steels, Titanium alloys Cobaly chromium alloy, Copper, Copper alloy S45C, SCM440, SNCM439, SUS304, SUS316, SUS304LN, SUS316LN, Ti-6Al-4V				Heat resistant alloys, Pre-hardened steel, Hardened steel Inconel718, NAK, PX5, SKD61, SKT4, SUS431, SUS420J2			
DC (mm)	**LU** (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
0.2	0.6	20	30000	270	0.03	15	24000	220	0.03
0.3	0.9	30	30000	360	0.045	14	15000	180	0.045
0.3	1.5	30	30000	270	0.045	14	15000	140	0.045
0.4	1.2	40	30000	600	0.06	15	12000	240	0.06
0.4	2	40	30000	420	0.06	15	12000	170	0.06
0.5	1.5	45	28000	670	0.075	15	9500	230	0.075
0.5	2.5	45	28000	450	0.075	15	9500	150	0.075
0.5	3	45	28000	390	0.075	15	9500	130	0.075
0.6	3	45	24000	480	0.09	15	7800	160	0.09
0.7	3.5	45	20000	480	0.11	15	6800	140	0.11
0.8	2.4	45	18000	720	0.12	15	6000	190	0.12
0.8	3	45	18000	650	0.12	15	6000	170	0.12
0.8	4	45	18000	500	0.12	15	6000	140	0.12
1	5	45	15000	600	0.15	15	4800	150	0.15
Depth of cut									

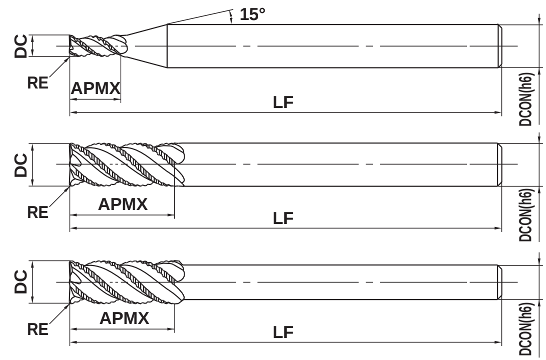
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) When the depth of cut is smaller than shown the feed rate can be increased.

VQSVR NEW

Roughing end mill, Short cut length, 4 flute, Irregular helix flutes

UWC VQ 43° 44° 45° DC<8 | 43° 45° DC≥8 | DC<8 | DC≥8

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



h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

- Achieving excellent vibration resistance due to the adoption of irregular helix.
- Offering greater fracture resistance than conventional roughing by adopting an asymmetrical nick.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VQSVRD0300	3	0.2	6	60	6	3	●	1
VQSVR**D0400**	4	0.2	8	60	6	3	●	1
VQSVR**D0500**	5	0.3	10	60	6	3	●	1
VQSVR**D0600**	6	0.3	12	70	6	3	●	2
VQSVR**D0700**	7	0.3	17	80	8	3	●	1
VQSVR**D0800**	8	0.5	17	80	8	4	●	2
VQSVR**D0900**	9	0.5	22	90	10	4	●	1
VQSVR**D1000S08**	10	0.5	22	90	8	4	●	3
VQSVR**D1000**	10	0.5	22	90	10	4	●	2
VQSVR**D1200S10**	12	0.5	27	100	10	4	●	3
VQSVR**D1200**	12	0.5	27	100	12	4	●	2
VQSVR**D1400**	14	0.5	27	130	12	4	★	3
VQSVR**D1600**	16	0.5	33	125	16	4	★	2
VQSVR**D1800**	18	0.5	33	150	16	4	★	3
VQSVR**D2000**	20	0.5	38	140	20	4	★	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained. ★ : Inventory maintained in Japan.

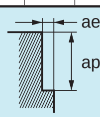
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631					Copper, Copper alloy				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)
3	150	16000	960	4.5	1.5	120	13000	640	4.5	1.5	100	11000	450	4.5	1.5	75	8000	330	4.5	0.9	180	19000	1100	4.5	1.5
4	150	12000	960	6	2	120	9500	640	6	2	100	8000	430	6	2	75	6000	330	6	1.2	180	14000	1100	6	2
5	150	9500	960	7.5	2.5	120	7600	640	7.5	2.5	100	6400	440	7.5	2.5	75	4800	330	7.5	1.5	180	11000	1100	7.5	2.5
6	150	8000	960	9	3	120	6400	680	9	3	100	5300	480	9	3	75	4000	360	9	1.8	180	9500	1100	9	3
7	150	6800	950	10.5	3.5	120	5500	700	10.5	3.5	100	4500	500	10.5	3.5	75	3400	380	10.5	2.1	180	8200	1100	10.5	3.5
8	150	6000	1100	12	4	120	4800	800	12	4	100	4000	570	12	4	75	3000	430	12	2.4	180	7200	1300	12	4
9	150	5300	1100	13.5	4.5	120	4200	760	13.5	4.5	100	3500	570	13.5	4.5	75	2700	430	13.5	2.7	180	6400	1300	13.5	4.5
10	150	4800	1100	15	5	120	3800	760	15	5	100	3200	570	15	5	75	2400	430	15	3	180	5700	1200	15	5
12	150	4000	960	18	6	120	3200	700	18	6	100	2700	540	18	6	75	2000	400	18	3.6	180	4800	1200	18	6
14	150	3400	880	21	7	120	2700	650	21	7	100	2300	510	21	7	75	1700	380	21	4.2	180	4100	1100	21	7
16	150	3000	840	24	8	120	2400	620	24	8	100	2000	500	24	8	75	1500	380	24	4.8	180	3600	1000	24	8
18	150	2700	810	27	9	120	2100	590	27	9	100	1800	500	27	9	75	1300	360	27	5.4	180	3200	960	27	9
20	150	2400	760	30	10	120	1900	560	30	10	100	1600	500	30	10	75	1200	360	30	6	180	2900	920	30	10

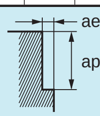
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631					Copper, Copper alloy				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Hole Depth ap (mm)	Hole Depth ae (mm)
3	120	13000	610	4.5	1.5	100	11000	430	4.5	1.5	80	8500	280	4.5	1.5	70	7400	240	4.5	0.9	140	15000	700	4.5	1.5
4	120	9500	610	6	2	100	8000	430	6	2	80	6400	280	6	2	70	5600	240	6	1.2	140	11000	700	6	2
5	120	7600	610	7.5	2.5	100	6400	430	7.5	2.5	80	5100	280	7.5	2.5	70	4500	250	7.5	1.5	140	8900	720	7.5	2.5
6	120	6400	610	9	3	100	5300	450	9	3	80	4200	300	9	3	70	3700	270	9	1.8	140	7400	720	9	3
7	120	5500	620	10.5	3.5	100	4500	480	10.5	3.5	80	3600	320	10.5	3.5	70	3200	290	10.5	2.1	140	6400	720	10.5	3.5
8	120	4800	720	12	4	100	4000	570	12	4	80	3200	380	12	4	70	2800	340	12	2.4	140	5600	840	12	4
9	120	4200	670	13.5	4.5	100	3500	510	13.5	4.5	80	2800	360	13.5	4.5	70	2500	320	13.5	2.7	140	5000	800	13.5	4.5
10	120	3800	670	15	5	100	3200	510	15	5	80	2500	360	15	5	70	2200	310	15	3	140	4500	790	15	5
12	120	3200	610	18	6	100	2700	470	18	6	80	2100	340	18	6	70	1900	300	18	3.6	140	3700	710	18	6
14	120	2700	560	21	7	100	2300	440	21	7	80	1800	320	21	7	70	1600	280	21	4.2	140	3200	670	21	7
16	120	2400	540	24	8	100	2000	410	24	8	80	1600	320	24	8	70	1400	280	24	4.8	140	2800	630	24	8
18	120	2100	500	27	9	100	1800	400	27	9	80	1400	310	27	9	70	1200	270	27	5.4	140	2500	600	27	9
20	120	1900	480	30	10	100	1600	380	30	10	80	1300	310	30	10	70	1100	270	30	6	140	2200	560	30	10

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

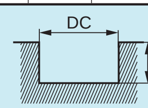
VQSVR NEW

Roughing end mill, Short cut length, 4 flute, Irregular helix flutes

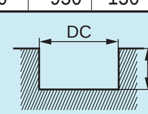
Slotting

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
3	120	13000	720	3	100	11000	440	3	80	8500	340	3	60	6400	250	1.5	150	16000	890	3
4	120	9500	720	4	100	8000	450	4	80	6400	340	4	60	4800	250	2	150	12000	900	4
5	120	7600	720	5	100	6400	460	5	80	5100	300	5	60	3800	230	2.5	150	9500	900	5
6	120	6400	720	6	100	5300	460	6	80	4200	310	6	60	3200	240	3	150	8000	900	6
7	120	5500	730	7	100	4500	470	7	80	3600	330	7	60	2700	250	3.5	150	6800	950	7
8	120	4800	840	8	100	4000	560	8	80	3200	400	8	60	2400	300	4	150	6000	1100	8
9	120	4200	810	9	100	3500	540	9	80	2800	350	9	60	2100	260	4.5	150	5300	1000	9
10	120	3800	800	10	100	3200	520	10	80	2500	340	10	60	1900	260	5	150	4800	1000	10
12	120	3200	750	12	100	2700	480	12	80	2100	340	12	60	1600	260	6	150	4000	940	12
14	120	2700	670	14	100	2300	420	14	80	1800	300	14	60	1400	240	7	150	3400	840	14
16	120	2400	620	16	100	2000	380	16	80	1600	290	16	60	1200	220	8	150	3000	780	16
18	120	2100	570	18	100	1800	380	18	80	1400	260	18	60	1100	210	9	150	2700	730	18
20	120	1900	540	20	100	1600	350	20	80	1300	260	20	60	950	190	10	150	2400	680	20
Depth of cut																				

General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
3	100	11000	490	3	80	8500	300	3	60	6400	200	3	50	5300	170	1.5	120	13000	580	3
4	100	8000	490	4	80	6400	310	4	60	4800	200	4	50	4000	170	2	120	9500	580	4
5	100	6400	490	5	80	5100	310	5	60	3800	200	5	50	3200	170	2.5	120	7600	580	5
6	100	5300	490	6	80	4200	310	6	60	3200	200	6	50	2700	170	3	120	6400	580	6
7	100	4500	500	7	80	3600	320	7	60	2700	200	7	50	2300	170	3.5	120	5500	620	7
8	100	4000	600	8	80	3200	380	8	60	2400	240	8	50	2000	200	4	120	4800	720	8
9	100	3500	540	9	80	2800	330	9	60	2100	210	9	50	1800	180	4.5	120	4200	650	9
10	100	3200	540	10	80	2500	330	10	60	1900	210	10	50	1600	180	5	120	3800	640	10
12	100	2700	510	12	80	2100	320	12	60	1600	210	12	50	1300	170	6	120	3200	600	12
14	100	2300	460	14	80	1800	300	14	60	1400	190	14	50	1100	150	7	120	2700	540	14
16	100	2000	410	16	80	1600	290	16	60	1200	170	16	50	990	140	8	120	2400	500	16
18	100	1800	390	18	80	1400	260	18	60	1100	170	18	50	880	130	9	120	2100	460	18
20	100	1600	360	20	80	1300	260	20	60	950	150	20	50	800	130	10	120	1900	430	20
Depth of cut																				

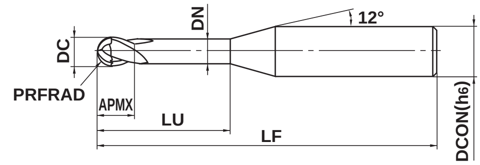
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the feed rate can be increased.

VQ4SVB

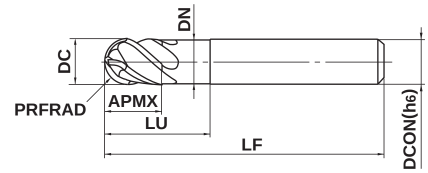
Ball nose, Short cut length, 4 flute, Variable curve

UWC VQ 45°

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
○	○			◎	◎	○	



Type1



Type2

1≤PRFRAD≤6				
±0.01				
DC≤12				
0 - 0.02				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

- SMART MIRACLE irregular helix ball nose end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials such as inconel.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VQ4SVBR0100	1	2	3	5	1.9	50	6	4	●	1
VQ4SVB**R0150**	1.5	3	4.5	7.5	2.9	50	6	4	●	1
VQ4SVB**R0200**	2	4	6	10	3.9	50	6	4	●	1
VQ4SVB**R0250**	2.5	5	7.5	12.5	4.9	50	6	4	●	1
VQ4SVB**R0300**	3	6	9	15	5.85	50	6	4	●	2
VQ4SVB**R0400**	4	8	12	20	7.85	60	8	4	●	2
VQ4SVB**R0500**	5	10	15	25	9.7	70	10	4	●	2
VQ4SVB**R0600**	6	12	18	30	11.7	75	12	4	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained.

VQ4SVB

Ball nose, Short cut length, 4 flute, Variable curve

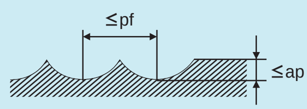
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Shoulder milling (grooving)

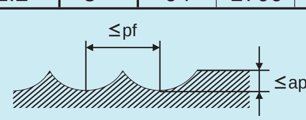
Work material	Carbon steel, Alloy steel, Mild steel, Pre-hardened steel S45C, SCM440, SS400, S10C, NAK, PX5, SNCM439								Austenitic stainless steel, Titanium alloy, Hardened stainless steels, Cobaly chromium alloy, Ferritic and Martensitic stainless steels SUS304, SUS316, Ti-6Al-4V, SUS630, SUS631, SUS431, SUS420J2							
PRFRAD (mm)	$\alpha \leq 15°$			$\alpha > 15°$			Depth of cut ap (mm)	Pick feed pf (mm)	$\alpha \leq 15°$			$\alpha > 15°$			Depth of cut ap (mm)	Pick feed pf (mm)
	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)			Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R 1	250	40000	8000	200	32000	3800	0.17	0.5	230	36000	6500	150	24000	2900	0.17	0.5
R 1.5	300	32000	7700	200	21000	3200	0.25	0.75	230	24000	4800	150	16000	1900	0.25	0.75
R 2	300	24000	5800	200	16000	2800	0.33	1	230	18000	4000	150	12000	1700	0.33	1
R 2.5	300	19000	5300	200	12700	2600	0.42	1.25	230	14400	3500	150	9600	1500	0.42	1.25
R 3	300	16000	4800	200	10600	2100	0.5	1.5	230	12000	3200	150	8000	1400	0.5	1.5
R 4	300	12000	4300	200	8000	1900	0.8	2	230	9000	3200	150	6000	1400	0.8	2
R 5	300	9600	4100	200	6400	1800	1	2.5	230	7200	3000	150	4800	1300	1	2.5
R 6	300	8000	4000	200	5300	1800	1.2	3	230	6000	3000	150	4000	1300	1.2	3

Depth of cut



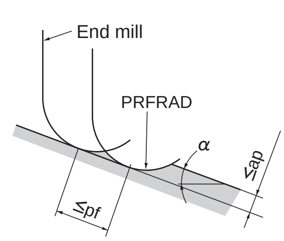
Work material	Copper, Copper alloy								Heat resistant alloys Inconel etc.							
PRFRAD (mm)	$\alpha \leq 15°$			$\alpha > 15°$			Depth of cut ap (mm)	Pick feed pf (mm)	$\alpha \leq 15°$			$\alpha > 15°$			Depth of cut ap (mm)	Pick feed pf (mm)
	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)			Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R 1	250	40000	8000	240	38000	4500	0.17	0.5	60	9600	960	40	6400	510	0.08	0.2
R 1.5	360	38000	9100	240	25000	3800	0.25	0.7	60	6400	640	40	4200	340	0.13	0.3
R 2	360	29000	7000	240	19000	3300	0.33	1	60	4800	580	40	3200	260	0.17	0.4
R 2.5	360	23000	6400	240	15000	3100	0.42	1.2	60	3800	530	39	2500	250	0.21	0.5
R 3	360	19000	5700	240	13000	2600	0.5	1.5	60	3200	500	40	2100	210	0.25	0.6
R 4	360	14000	5000	240	9600	2300	0.8	2	60	2400	430	40	1600	190	0.4	0.8
R 5	360	12000	5100	240	7700	2200	1	2.5	63	2000	420	41	1300	180	0.5	1
R 6	360	9600	4800	240	6400	2200	1.2	3	64	1700	350	41	1100	150	0.6	1.2

Depth of cut



SOLID END MILLS

1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.
5) α is the inclination angle of the machined surface.

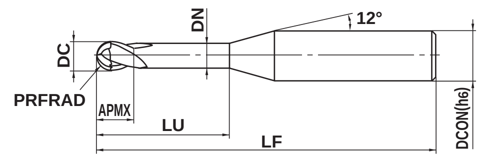


VQ4SVB - Inch sizes NEW

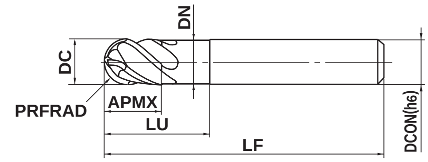
UWC VQ 45°

Ball nose, Short cut length, 4 flute, Variable curve

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



Type 1



Type 2

R					
±.0004"					
DC<.5000"	DC=.5000"				
0 - .0008"	0 - .0012"				
h6 .250"≤DCON≤.375"	DCON=.500"				
0 - .00035"	0 - .00043"				

● SMART MIRACLE irregular helix ball nose end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials such as inconel.

Unit : inch

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VQ4SVBD1/8	.0625	.1250	.188	.3126	.1213	2.0	.2500	4	●	1
VQ4SVB**D3/16**	.0938	.1875	.281	.4689	.1835	2.0	.2500	4	●	1
VQ4SVB**D1/4**	.1250	.2500	.375	.6252	.2441	2.0	.2500	4	●	2
VQ4SVB**D5/16**	.1563	.3125	.469	.7811	.3067	2.5	.3126	4	●	2
VQ4SVB**D3/8**	.1875	.3750	.563	.9374	.3693	2.75	.3752	4	●	2
VQ4SVB**D1/2**	.2500	.5000	.750	1.2500	.4882	3.0	.5000	4	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained.

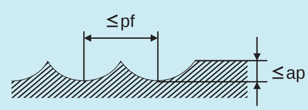
VQ4SVB - Inch sizes NEW

Ball nose, Short cut length, 4 flute, Variable curve

Shoulder milling (Slotting)

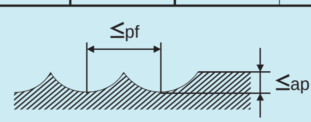
Work material	Carbon steel, Alloy steel, Mild Steel, Pre-hardened steel AISI 1010, AISI 1035, AISI 1050, ASTM 283, AISI H13, AISI 4140, AISI P21						Austenitic steinless steel, Titanium alloy, Hardened stainless steel, Cobaly chomium alloy, Ferritic and Martensitic stainless steels AISI 304, AISI 316, AISI S17400, AISI S17700, AISI 430, AISI 420					
PRFRAD (inch)	$\alpha \le 15°$		$\alpha > 15°$		Depth of cut ap (inch)	Pick feed pf (inch)	$\alpha \le 15°$		$\alpha > 15°$		Depth of cut ap (inch)	Pick feed pf (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)			Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		
.0625	30000	283.5	20000	118.1	.0098	.0313	22500	189.0	15000	74.8	.0098	.0313
.0938	20000	220.5	13400	102.4	.0165	.0469	15000	137.8	10000	59.1	.0165	.0469
.1250	15000	177.2	10000	82.7	.0197	.0626	11200	126.0	7500	55.1	.0197	.0626
.1563	12000	169.3	8000	74.8	.0315	.0781	9000	126.0	6000	55.1	.0315	.0781
.1875	10000	161.4	6700	70.9	.0394	.0937	7500	118.1	5000	51.2	.0394	.0937
.2500	7600	149.6	5000	70.9	.0472	.125	5600	118.1	3800	51.2	.0472	.125

Depth of cut

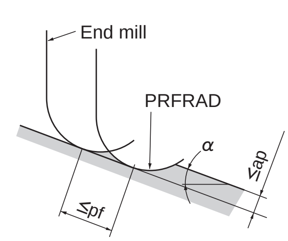


Work material	Copper, Copper alloys						Heat resistant alloy Inconel718 etc.					
PRFRAD (inch)	$\alpha \le 15°$		$\alpha > 15°$		Depth of cut ap (inch)	Pick feed pf (inch)	$\alpha \le 15°$		$\alpha > 15°$		Depth of cut ap (inch)	Pick feed pf (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)			Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		
.0625	36000	338.6	24000	141.7	.0098	.0313	6000	25.2	4000	13.4	.0051	.0313
.0938	24000	263.8	16000	122.0	.0165	.0469	4000	20.9	2700	9.8	.0083	.0469
.1250	18000	212.6	12000	98.4	.0197	.0626	3000	19.7	2000	8.3	.0098	.0626
.1563	14000	196.9	9600	90.6	.0315	.0781	2400	16.9	1600	7.5	.0157	.0781
.1875	12000	192.9	8000	82.7	.0394	.0937	2000	16.5	1300	7.1	.0197	.0937
.2500	9100	181.1	6000	86.6	.0472	.125	1500	13.8	1000	5.9	.0236	.0125

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
3) If the depth of cut is smaller than this table, feed rate can be increased.
4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
5) α is the inclination of the machined surface.

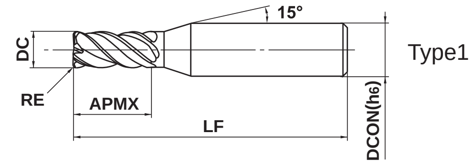


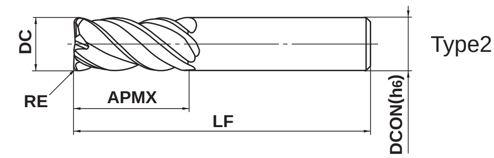
VQMHVRB

Corner radius, End mill, Medium cut length, 4 flute, Irregular helix flutes

UWC VQ 37° 40°

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





R	0.2≤RE≤6.35				
	±0.015				
DC	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● SMART MIRACLE corner radius, irregular helix end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHVRBD0200R020	2	0.2	4	45	4	4	●	1
VQMHVRBD0200R030	2	0.3	4	45	4	4	●	1
VQMHVRBD0300R020	3	0.2	8	45	6	4	●	1
VQMHVRBD0300R030	3	0.3	8	45	6	4	●	1
VQMHVRBD0300R050	3	0.5	8	45	6	4	●	1
VQMHVRBD0400R020	4	0.2	11	45	6	4	●	1
VQMHVRBD0400R030	4	0.3	11	45	6	4	●	1
VQMHVRBD0400R050	4	0.5	11	45	6	4	●	1
VQMHVRBD0500R020	5	0.2	13	50	6	4	●	1
VQMHVRBD0500R030	5	0.3	13	50	6	4	●	1
VQMHVRBD0500R050	5	0.5	13	50	6	4	●	1
VQMHVRBD0500R100	5	1	13	50	6	4	●	1
VQMHVRBD0600R030	6	0.3	13	50	6	4	●	2
VQMHVRBD0600R050	6	0.5	13	50	6	4	●	2
VQMHVRBD0600R100	6	1	13	50	6	4	●	2
VQMHVRBD0800R030	8	0.3	19	60	8	4	●	2
VQMHVRBD0800R050	8	0.5	19	60	8	4	●	2
VQMHVRBD0800R100	8	1	19	60	8	4	●	2
VQMHVRBD0800R150	8	1.5	19	60	8	4	●	2
VQMHVRBD1000R030	10	0.3	22	70	10	4	●	2
VQMHVRBD1000R050	10	0.5	22	70	10	4	●	2
VQMHVRBD1000R100	10	1	22	70	10	4	●	2
VQMHVRBD1000R150	10	1.5	22	70	10	4	●	2
VQMHVRBD1000R200	10	2	22	70	10	4	●	2
VQMHVRBD1200R050	12	0.5	26	75	12	4	●	2
VQMHVRBD1200R100	12	1	26	75	12	4	●	2
VQMHVRBD1200R150	12	1.5	26	75	12	4	●	2
VQMHVRBD1200R200	12	2	26	75	12	4	●	2
VQMHVRBD1200R250	12	2.5	26	75	12	4	●	2
VQMHVRBD1200R300	12	3	26	75	12	4	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained.

VQMHVRB

Corner radius, End mill, Medium cut length, 4 flute, Irregular helix flutes

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHVRBD1600R100	16	1	35	90	16	4	★	2
VQMHVRBD1600R150	16	1.5	35	90	16	4	★	2
VQMHVRBD1600R200	16	2	35	90	16	4	★	2
VQMHVRBD1600R250	16	2.5	35	90	16	4	★	2
VQMHVRBD1600R300	16	3	35	90	16	4	★	2
VQMHVRBD1600R400	16	4	35	90	16	4	★	2
VQMHVRBD1600R500	16	5	35	90	16	4	★	2
VQMHVRBD2000R100	20	1	45	110	20	4	★	2
VQMHVRBD2000R150	20	1.5	45	110	20	4	★	2
VQMHVRBD2000R200	20	2	45	110	20	4	★	2
VQMHVRBD2000R250	20	2.5	45	110	20	4	★	2
VQMHVRBD2000R300	20	3	45	110	20	4	★	2
VQMHVRBD2000R400	20	4	45	110	20	4	★	2
VQMHVRBD2000R500	20	5	45	110	20	4	★	2
VQMHVRBD2000R635	20	6.35	45	110	20	4	★	2

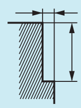
Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

★ : Inventory maintained in Japan.

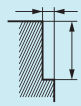
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	150	24000	2400	3	0.6	120	19000	1100	3	0.6	100	16000	830	3	0.6	75	12000	720	3	0.4
3	150	16000	2600	4.5	0.9	120	13000	1200	4.5	0.9	100	11000	880	4.5	0.9	75	8000	770	4.5	0.6
4	150	12000	2600	6	1.2	120	9500	1300	6	1.2	100	8000	900	6	1.2	75	6000	790	6	0.8
5	150	9500	2600	7.5	1.5	120	7600	1300	7.5	1.5	100	6400	900	7.5	1.5	75	4800	810	7.5	1
6	150	8000	2600	9	1.8	120	6400	1300	9	1.8	100	5300	1100	9	1.8	75	4000	810	9	1.2
8	150	6000	2500	12	2.4	120	4800	1300	12	2.4	100	4000	1200	12	2.4	75	3000	840	12	1.6
10	150	4800	2300	15	3	120	3800	1200	15	3	100	3200	1300	15	3	75	2400	770	15	2
12	150	4000	1900	18	3.6	120	3200	1200	18	3.6	100	2700	1200	18	3.6	75	2000	720	18	2.4
16	150	3000	1600	24	4.8	120	2400	960	24	4.8	100	2000	960	24	4.8	75	1500	600	24	3.2
20	150	2400	1300	30	6	120	1900	760	30	6	100	1600	770	30	6	75	1200	480	30	4
25	150	1900	1100	37.5	7.5	120	1500	600	37.5	7.5	100	1300	620	37.5	7.5	75	950	380	37.5	5
Depth of cut																				

General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT					Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V					Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	120	19000	1300	3	0.6	100	16000	630	3	0.6	80	13000	450	1.5	0.2	70	11000	440	3	0.4
3	120	13000	1400	4.5	0.9	100	11000	700	4.5	0.9	80	8500	450	2.2	0.3	70	7400	470	4.5	0.6
4	120	9500	1400	6	1.2	100	8000	700	6	1.2	80	6400	470	3	0.6	70	5600	490	6	0.8
5	120	7600	1400	7.5	1.5	100	6400	710	7.5	1.5	80	5100	470	4.5	0.9	70	4500	500	7.5	1
6	120	6400	1400	9	1.8	100	5300	710	9	1.8	80	4200	580	6	1.2	70	3700	500	9	1.2
8	120	4800	1300	12	2.4	100	4000	740	12	2.4	80	3200	630	7.5	1.5	70	2800	520	12	1.6
10	120	3800	1200	15	3	100	3200	680	15	3	80	2500	660	9	1.8	70	2200	460	15	2
12	120	3200	1000	18	3.6	100	2700	640	18	3.6	80	2100	610	12	2.4	70	1900	450	18	2.4
16	120	2400	860	24	4.8	100	2000	530	24	4.8	80	1600	510	15	3	70	1400	370	24	3.2
20	120	1900	680	30	6	100	1600	420	30	6	80	1300	410	18	3.6	70	1100	290	30	4
25	120	1500	390	37.5	7.5	100	1300	340	37.5	7.5	80	1000	210	24	4.8	70	890	230	37.5	5
Depth of cut																				

1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

VQMHVRB

Corner radius, End mill, Medium cut length, 4 flute, Irregular helix flutes

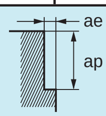
Shoulder milling

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	180	29000	2900	3	0.6	40	6400	230	3	0.2
3	180	19000	3000	4.5	0.9	40	4200	240	4.5	0.3
4	180	14000	3000	6	1.2	40	3200	240	6	0.4
5	180	11000	3000	7.5	1.5	40	2500	240	7.5	0.5
6	180	9500	3000	9	1.8	40	2100	250	9	0.6
8	180	7200	3000	12	2.4	40	1600	260	12	0.8
10	180	5700	2700	15	3	40	1300	290	15	1
12	180	4800	2300	18	3.6	40	1100	280	18	1.2
16	180	3600	1900	24	4.8	40	800	200	24	1.6
20	180	2900	1600	30	6	40	640	160	30	2
25	180	2300	1300	37	7.5	40	510	130	37.5	2.5

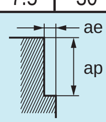
Depth of cut



General purpose cutting conditions

Work material	Copper, Copper alloy					Heat resistant alloys Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	140	22000	1500	3	0.6	30	4800	110	3	0.2
3	140	15000	1600	4.5	0.9	30	3200	120	4.5	0.3
4	140	11000	1600	6	1.2	30	2400	120	6	0.4
5	140	8900	1600	7.5	1.5	30	1900	120	7.5	0.5
6	140	7400	1600	9	1.8	30	1600	130	9	0.6
8	140	5600	1600	12	2.4	30	1200	130	12	0.8
10	140	4500	1400	15	3	30	950	140	15	1
12	140	3700	1200	18	3.6	30	800	140	18	1.2
16	140	2800	1000	24	4.8	30	600	100	24	1.6
20	140	2200	780	30	6	30	480	81	30	2
25	140	1800	670	37.5	7.5	30	380	64	37.5	2.5

Depth of cut



1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

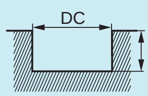
Slotting

When machine rigidity, work material rigidity and chip discharge are enough, please select the high efficiency cutting conditions.
When either machine rigidity, work material rigidity or chip discharge are not enough, please select the general-purpose cutting conditions.

High efficiency cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
2	150	24000	1200	2	120	19000	610	2	100	16000	640	2	60	9500	300	1	180	29000	1500	2	30	4800	130	0.6
3	150	16000	1500	3	120	13000	730	3	100	11000	660	3	60	6400	360	1.5	180	19000	1700	3	30	3200	150	0.9
4	150	12000	1900	4	120	9500	910	4	100	8000	700	4	60	4800	460	2	180	14000	2200	4	30	2400	170	1.2
5	150	9500	1900	5	120	7600	910	5	100	6400	720	5	60	3800	460	2.5	180	11000	2200	5	30	1900	170	1.5
6	150	8000	1900	6	120	6400	1000	6	100	5300	740	6	60	3200	510	3	180	9500	2300	6	30	1600	180	1.8
8	150	6000	1700	8	120	4800	960	8	100	4000	800	8	60	2400	480	4	180	7200	2000	8	30	1200	190	2.4
10	150	4800	1500	10	120	3800	840	10	100	3200	900	10	60	1900	420	5	180	5700	1800	10	30	950	210	3
12	150	4000	1300	12	120	3200	770	12	100	2700	860	12	60	1600	380	6	180	4800	1500	12	30	800	200	3.6
16	150	3000	1100	12	120	2400	670	12	100	2000	640	12	60	1200	340	8	180	3600	1300	12	30	600	150	4.8
20	150	2400	860	12	120	1900	530	12	100	1600	510	12	60	950	270	10	180	2900	1000	12	30	480	120	6
25	150	1900	760	12	120	1500	420	12	100	1300	420	12	60	760	210	12	180	2300	920	12	30	380	100	7.5

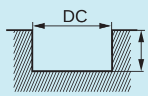
Depth of cut



General purpose cutting conditions

Work material	Carbon steel, Alloy steel, Mild steel S45C, SCM440, SS400, S10C				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel NAK, PX5, SNCM439, SKD, SKT				Austenitic, Ferritic and Martensitic stainless steels, Titanium alloys SUS304, SUS316, Ti-6Al-4V				Hardened stainless steels, Cobaly chromium alloy SUS630, SUS631				Copper, Copper alloy				Heat resistant alloys Inconel718			
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
2	100	16000	550	2	80	13000	270	2	60	9500	250	2	50	8000	170	1	120	19000	650	2	25	4000	74	0.6
3	100	11000	670	3	80	8500	310	3	60	6400	250	3	50	5300	200	1.5	120	13000	790	3	25	2700	86	0.9
4	100	8000	840	4	80	6400	410	4	60	4800	280	4	50	4000	250	2	120	9500	1000	4	25	2000	93	1.2
5	100	6400	840	5	80	5100	410	5	60	3800	280	5	50	3200	250	2.5	120	7600	1000	5	25	1600	95	1.5
6	100	5300	840	6	80	4200	440	6	60	3200	300	6	50	2700	290	3	120	6400	1000	6	25	1300	96	1.8
8	100	4000	740	8	80	3200	420	8	60	2400	320	8	50	2000	260	4	120	4800	890	8	25	990	100	2.4
10	100	3200	680	10	80	2500	360	10	60	1900	350	10	50	1600	230	5	120	3800	800	10	25	800	120	3
12	100	2700	570	12	80	2100	330	12	60	1600	340	12	50	1300	210	6	120	3200	680	12	25	660	110	3.6
16	100	2000	480	12	80	1600	300	12	60	1200	250	12	50	990	180	8	120	2400	570	12	25	500	84	4.8
20	100	1600	380	12	80	1300	240	12	60	950	200	12	50	800	150	10	120	1900	450	12	25	400	68	6
25	100	1300	340	12	80	1000	180	12	60	760	160	12	50	640	120	12	120	1500	400	12	25	320	50	7.5

Depth of cut

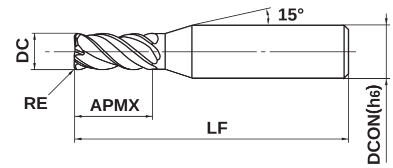


1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient.
In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the feed rate can be increased.

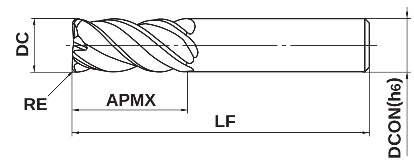
VQMHVRB- Inch sizes

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes

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



Type1



Type2

R	.0080"≤RE≤.1200"				
	±.0006"				
DC	DC<.5000"	DC=.5000"			
	0 / - .0008"	0 / - .0012"			
h6	.2500"≤DCON≤.3750"	DCON=.5000"			
	0 / - .00035"	0 / - .00043"			

- SMART MIRACLE corner radius, irregular helix end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Unit : inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHVRBD1/8R008	.1250	.0080	.3130	2.0	.2500	4	●	1
VQMHVRBD1/8R010	.1250	.0100	.3130	2.0	.2500	4	●	1
VQMHVRBD3/16R010	.1875	.0100	.4375	2.0	.2500	4	●	1
VQMHVRBD3/16R015	.1875	.0150	.4375	2.0	.2500	4	●	1
VQMHVRBD3/16R020	.1875	.0200	.4375	2.0	.2500	4	●	1
VQMHVRBD3/16R030	.1875	.0300	.4375	2.0	.2500	4	●	1
VQMHVRBD1/4R008	.2500	.0080	.6250	2.5	.2500	4	●	2
VQMHVRBD1/4R010	.2500	.0100	.6250	2.5	.2500	4	●	2
VQMHVRBD1/4R015	.2500	.0150	.6250	2.5	.2500	4	●	2
VQMHVRBD1/4R020	.2500	.0200	.6250	2.5	.2500	4	●	2
VQMHVRBD1/4R030	.2500	.0300	.6250	2.5	.2500	4	●	2
VQMHVRBD5/16R010	.3125	.0100	.7500	2.75	.3125	4	●	2
VQMHVRBD5/16R015	.3125	.0150	.7500	2.75	.3125	4	●	2
VQMHVRBD5/16R020	.3125	.0200	.7500	2.75	.3125	4	●	2
VQMHVRBD5/16R030	.3125	.0300	.7500	2.75	.3125	4	●	2
VQMHVRBD5/16R060	.3125	.0600	.7500	2.75	.3125	4	●	2
VQMHVRBD3/8R010	.3750	.0100	.8750	3.0	.3750	4	●	2
VQMHVRBD3/8R015	.3750	.0150	.8750	3.0	.3750	4	●	2
VQMHVRBD3/8R020	.3750	.0200	.8750	3.0	.3750	4	●	2
VQMHVRBD3/8R030	.3750	.0300	.8750	3.0	.3750	4	●	2
VQMHVRBD3/8R040	.3750	.0400	.8750	3.0	.3750	4	●	2
VQMHVRBD3/8R060	.3750	.0600	.8750	3.0	.3750	4	●	2
VQMHVRBD3/8R090	.3750	.0900	.8750	3.0	.3750	4	●	2
VQMHVRBD1/2R010	.5000	.0100	1.1250	3.5	.5000	4	●	2
VQMHVRBD1/2R015	.5000	.0150	1.1250	3.5	.5000	4	●	2
VQMHVRBD1/2R020	.5000	.0200	1.1250	3.5	.5000	4	●	2
VQMHVRBD1/2R030	.5000	.0300	1.1250	3.5	.5000	4	●	2
VQMHVRBD1/2R060	.5000	.0600	1.1250	3.5	.5000	4	●	2
VQMHVRBD1/2R090	.5000	.0900	1.1250	3.5	.5000	4	●	2
VQMHVRBD1/2R120	.5000	.1200	1.1250	3.5	.5000	4	●	2

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

● : Inventory maintained.

CARBIDE

RECOMMENDED CUTTING CONDITIONS

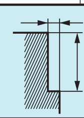
Shoulder milling

Work material	Carbon steel (−30HRC) AISI 1035, AISI 1050, ASTM 283					
DC (inch)	High speed cutting Revolution (min^{-1})	High speed cutting Feed rate (IPM)	General purpose cutting Revolution (min^{-1})	General purpose cutting Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/8	15000	102.0	12000	55.1	.19	.038
3/16	10000	99.2	8000	51.2	.28	.056
1/4	7500	99.2	6000	51.2	.38	.075
5/16	6000	99.2	4800	51.2	.47	.094
3/8	5000	90.6	4000	47.2	.56	.11
1/2	3800	74.8	3000	39.0	.75	.15

Work material	Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21					
DC (inch)	High speed cutting Revolution (min^{-1})	High speed cutting Feed rate (IPM)	General purpose cutting Revolution (min^{-1})	General purpose cutting Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/8	12000	49.1	10000	27.2	.19	.038
3/16	8000	50.4	6700	28.0	.28	.056
1/4	6000	52.0	5000	28.7	.38	.075
5/16	4800	52.9	4000	29.1	.47	.094
3/8	4000	49.1	3300	26.8	.56	.11
1/2	3000	43.5	2500	24.0	.75	.15

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.					
DC (inch)	High speed cutting Revolution (min^{-1})	High speed cutting Feed rate (IPM)	General purpose cutting Revolution (min^{-1})	General purpose cutting Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/8	10000	34.6	8000	18.1	.19	.038
3/16	6700	35.3	5300	18.5	.28	.056
1/4	5000	47.2	4000	24.8	.38	.075
5/16	4000	47.2	3200	24.8	.47	.094
3/8	3300	49.4	2700	26.8	.56	.11
1/2	2500	43.3	2000	22.8	.75	.15

Depth of cut

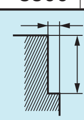


Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.					
DC (inch)	High speed cutting Revolution (min^{-1})	High speed cutting Feed rate (IPM)	General purpose cutting Revolution (min^{-1})	General purpose cutting Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/8	7500	30.7	7000	18.9	.19	.025
3/16	5000	31.5	4700	19.7	.28	.038
1/4	3800	32.9	3500	20.1	.38	.050
5/16	3000	33.1	2800	20.5	.47	.063
3/8	2500	30.7	2300	18.5	.56	.075
1/2	1900	27.5	1800	17.3	.75	.10

Work material	Copper, Copper alloy					
DC (inch)	High speed cutting Revolution (min^{-1})	High speed cutting Feed rate (IPM)	General purpose cutting Revolution (min^{-1})	General purpose cutting Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/8	18000	122.0	14000	63.0	.19	.038
3/16	12000	119.0	9400	63.0	.28	.056
1/4	9000	119.0	7000	63.0	.38	.075
5/16	7200	119.0	5600	63.0	.47	.094
3/8	6000	109.0	4700	55.1	.56	.11
1/2	4500	88.6	3500	47.2	.75	.15

Work material	Heat resistant alloy Inconel718 etc.					
DC (inch)	High speed cutting Revolution (min^{-1})	High speed cutting Feed rate (IPM)	General purpose cutting Revolution (min^{-1})	General purpose cutting Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/8	4000	9.5	3000	4.7	.19	.013
3/16	2700	9.8	2000	4.7	.28	.019
1/4	2000	10.1	1500	5.1	.38	.025
5/16	1600	10.1	1200	5.1	.47	.031
3/8	1300	10.6	1000	5.5	.56	.038
1/2	1000	10.1	750	5.1	.75	.050

Depth of cut



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2) Effective cutting of stainless steel, titanium alloy and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

SOLID END MILLS

VQMHVRB– Inch sizes

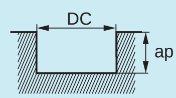
Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes

CARBIDE

Slotting

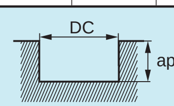
Work material	Carbon steel (—30HRC) AISI 1035, AISI 1050, ASTM 283					Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21					Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, AISI 316L, Ti-6Al-4V etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/8	15000	59.1	10000	26.0	.13	12000	30.2	8000	13.4	.13	10000	26.8	6000	10.6	.13
3/16	10000	75.6	6700	33.5	.19	8000	35.9	5300	15.7	.19	6700	28.5	4000	11.4	.19
1/4	7500	74.4	5000	32.7	.25	6000	39.7	4000	17.3	.25	5000	29.1	3000	11.4	.25
5/16	6000	66.1	4000	29.1	.31	4800	37.8	3200	16.5	.31	4000	31.5	2400	12.6	.31
3/8	5000	61.4	3300	26.8	.38	4000	34.0	2700	15.0	.38	3300	33.8	2000	13.4	.38
1/2	3800	47.9	2500	20.9	.50	3000	29.8	2000	13.0	.50	2500	31.5	1500	12.6	.50

Depth of cut



Work material	Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.					Copper, Copper alloy					Heat resistant alloy Inconel718 etc.				
DC (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)	High speed cutting		General purpose cutting		Depth of cut ap (inch)
	Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)		Revolution (min^{-1})	Feed rate (IPM)	Revolution (min^{-1})	Feed rate (IPM)	
1/8	6000	15.1	5000	8.3	.063	18000	70.9	12000	31.1	.13	3000	6.14	2500	3.4	.038
3/16	4000	18.3	3300	9.8	.094	12000	90.7	8000	39.4	.19	2000	6.80	1700	3.8	.056
1/4	3000	19.8	2500	11.0	.13	9000	89.3	6000	39.4	.25	1500	7.09	1300	3.9	.075
5/16	2400	18.9	2000	10.2	.16	7200	79.4	4800	35.0	.31	1200	7.56	1000	4.3	.094
3/8	2000	17.0	1700	9.4	.19	6000	73.7	4000	32.3	.38	1000	8.19	840	4.7	.11
1/2	1500	14.9	1300	8.7	.25	4500	56.7	3000	24.8	.50	750	7.56	630	4.3	.15

Depth of cut



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2) Effective cutting of stainless steel, titanium alloy and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) Vibration can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.

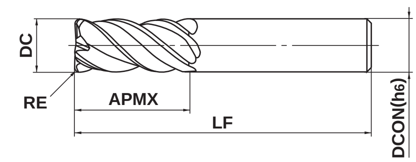
SOLID END MILLS

VQMHVRBF

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes

UWC VQ 37° 40°

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
○	○			○	◎		



Type1

R	0.3≤RE≤2				
	±0.015				
DC	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16		
	0 - 0.008	0 - 0.009	0 - 0.011		

- SMART MIRACLE corner radius, irregular helix end mills for reduced vibration and delivering a stable performance on finish cutting for difficult-to-cut materials such as inconel.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHVRBFD0600R030	6	0.3	13	50	6	4	●	1
VQMHVRBF**D0600R050**	6	0.5	13	50	6	4	●	1
VQMHVRBF**D0600R100**	6	1	13	50	6	4	●	1
VQMHVRBF**D0800R050**	8	0.5	19	60	8	4	●	1
VQMHVRBF**D0800R100**	8	1	19	60	8	4	●	1
VQMHVRBF**D1000R030**	10	0.3	22	70	10	4	●	1
VQMHVRBF**D1000R050**	10	0.5	22	70	10	4	●	1
VQMHVRBF**D1000R100**	10	1	22	70	10	4	●	1
VQMHVRBF**D1000R200**	10	2	22	70	10	4	●	1
VQMHVRBF**D1200R100**	12	1	26	75	12	4	●	1
VQMHVRBF**D1200R200**	12	2	26	75	12	4	●	1
VQMHVRBF**D1200R300**	12	3	26	75	12	4	●	1
VQMHVRBF**D1600R100**	16	1	35	90	16	4	★	1
VQMHVRBF**D1600R200**	16	2	35	90	16	4	★	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

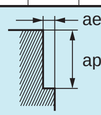
● : Inventory maintained. ★ : Inventory maintained in Japan.

VQMHVRBF

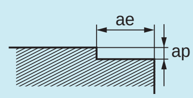
Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes (for finish cutting)

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Alloy steel, Mild steel					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel					Hardened stainless steels, Cobaly chromium alloy					Copper, Copper alloy					Heat resistant alloys				
	S45C, SCM440, SS400, S10C					NAK, PX5, SNCM439, SKD, SKT					SUS630, SUS631										Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
6	150	8000	2600	9	0.3	120	6400	1300	9	0.3	75	4000	800	9	0.3	180	9500	3000	9	0.3	40	2100	250	9	0.18
8	150	6000	2500	12	0.4	120	4800	1300	12	0.4	75	3000	840	12	0.4	180	7200	3000	12	0.4	40	1600	260	12	0.24
10	150	4800	2300	15	0.5	120	3800	1200	15	0.5	75	2400	770	15	0.5	180	5700	2700	15	0.5	41	1300	290	15	0.3
12	150	4000	1900	18	0.6	120	3200	1200	18	0.6	75	2000	720	18	0.6	180	4800	2300	18	0.6	41	1100	280	18	0.36
16	150	3000	1600	24	0.8	120	2400	960	24	0.8	75	1500	600	24	0.8	180	3600	1900	24	0.8	40	800	200	24	0.48
Depth of cut																									

Face milling

Work material	Carbon steel, Alloy steel, Mild steel					Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel					Hardened stainless steels, Cobaly chromium alloy					Copper, Copper alloy					Heat resistant alloys				
	S45C, SCM440, SS400, S10C					NAK, PX5, SNCM439, SKD, SKT					SUS630, SUS631										Inconel718				
DC (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Cutting speed (m/min)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
6	110	5800	1400	0.3	4.8	90	4800	770	0.3	4.8	55	2900	460	0.3	4.8	130	6900	1700	0.3	4.8	30	1600	180	0.18	4.8
8	110	4400	1200	0.4	6.4	90	3600	720	0.4	6.4	55	2200	440	0.4	6.4	130	5200	1500	0.4	6.4	30	1200	190	0.24	6.4
10	110	3500	1100	0.5	8	90	2900	640	0.5	8	55	1800	400	0.5	8	130	4100	1300	0.5	8	30	950	210	0.3	8
12	110	2900	930	0.6	9.6	90	2400	580	0.6	9.6	55	1500	360	0.6	9.6	130	3400	1100	0.6	9.6	30	800	200	0.36	9.6
16	110	2200	790	0.8	12.8	90	1800	500	0.8	12.8	55	1100	310	0.8	12.8	130	2600	940	0.8	12.8	30	600	150	0.48	12.8
Depth of cut																									

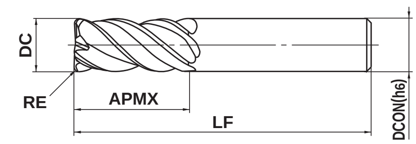
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
3) Chattering can still occur if the machine rigidity and clamping method are insufficient. In these cases the feed and speed should be reduced proportionately.
4) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

VQMHVRBF - Inch sizes NEW

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes

UWC VQ 37° 40°

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



R						
	±.0006"					
	DC<.5000"	DC=.5000"				
	0 - .0008"	0 - .0012"				
h6	.250"≤DCON≤.375"	DCON=.500"				
	0 - .00035"	0 - .00043"				

- SMART MIRACLE corner radius, irregular helix end mills for reducing vibration and delivering stable performance on finish cutting for difficult-to-cut materials such as inconel.

Unit : inch

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VQMHVRBFD1/4R015	.2500	.0150	.6252	2.5	.2500	4	●	1
VQMHVRBF**D1/4R030**	.2500	.0299	.6252	2.5	.2500	4	●	1
VQMHVRBF**D5/16R015**	.3125	.0150	.7500	2.75	.3126	4	●	1
VQMHVRBF**D5/16R030**	.3125	.0299	.7500	2.75	.3126	4	●	1
VQMHVRBF**D5/16R060**	.3125	.0598	.7500	2.75	.3126	4	●	1
VQMHVRBF**D3/8R015**	.3750	.0150	.8748	3.0	.3752	4	●	1
VQMHVRBF**D3/8R030**	.3750	.0299	.8748	3.0	.3752	4	●	1
VQMHVRBF**D3/8R060**	.3750	.0598	.8748	3.0	.3752	4	●	1
VQMHVRBF**D3/8R090**	.3750	.0902	.8748	3.0	.3752	4	●	1
VQMHVRBF**D1/2R030**	.5000	.0299	1.1252	3.5	.5000	4	●	1
VQMHVRBF**D1/2R060**	.5000	.0598	1.1252	3.5	.5000	4	●	1
VQMHVRBF**D1/2R090**	.5000	.0902	1.1252	3.5	.5000	4	●	1
VQMHVRBF**D1/2R120**	.5000	.1201	1.1252	3.5	.5000	4	●	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

● : Inventory maintained.

VQMHVRBF - Inch sizes NEW

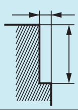
Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes

CARBIDE

Shoulder milling

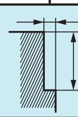
Work material	Carbon steel (–30HRC) AISI 1035, AISI 1050, ASTM 283				Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21				Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.			
DC (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/4	7500	94.5	.38	.013	6000	47.2	.38	.013	3800	29.9	.38	.013
5/16	6000	99.2	.47	.016	4800	52.9	.47	.016	3000	33.1	.47	.016
3/8	5000	94.5	.56	.019	4000	50.4	.56	.019	2500	31.5	.56	.019
1/2	3800	71.8	.75	.025	3000	42.5	.75	.025	1900	26.9	.75	.025

Depth of cut



Work material	Copper, Copper alloy				Heat resistant alloy Inconel718 etc.			
DC (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/4	9000	113	.38	.013	2000	9.5	.38	.008
5/16	7200	119	.47	.016	1600	10.1	.47	.009
3/8	6000	113	.56	.019	1300	11.5	.56	.011
1/2	4500	85.0	.75	.025	1000	10.1	.75	.015

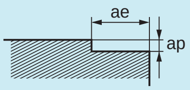
Depth of cut

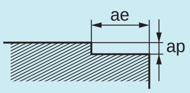


1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy, and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) If the depth of cut is smaller than this table, feed rate can be increased.
4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

SOLID END MILLS

Face milling

Work material	Carbon steel (−30HRC) AISI 1035, AISI 1050, ASTM 283				Alloy steel, Pre-hardened steel AISI H13, AISI 4140, AISI P21				Precipitation hardening martensitic stainless steel, Co-Cr-Mo alloy ASTM S 17400, ASTM S 17700, 17-4PH, 15-5PH etc.			
DC (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/4	5500	52.0	.013	.2	4500	28.3	.013	.2	2800	17.6	.013	.2
5/16	4400	48.5	.016	.25	3600	28.3	.016	.25	2200	17.3	.016	.25
3/8	3700	46.6	.019	.3	3000	26.0	.019	.3	1800	15.6	.019	.3
1/2	2800	35.3	.025	.4	2300	21.7	.025	.4	1400	13.2	.025	.4
Depth of cut												

Work material	Copper, Copper alloy				Heat resistant alloy Inconel718 etc.			
DC (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
1/4	6500	61.4	.013	.2	1500	6.6	.008	.2
5/16	5200	57.3	.016	.25	1200	7.6	.009	.25
3/8	4300	54.2	.019	.3	1000	8.8	.011	.3
1/2	3300	41.6	.025	.4	750	7.6	.015	.4
Depth of cut								

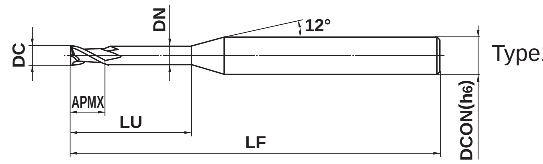
1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
2) Effective cutting of stainless steel, titanium alloy, and heat-resistant alloy can be achieved with the use of water-soluble cutting fluid.
3) Higher feeds and speeds can be used for smaller depth of cut.
4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VF2XL

End mill, 2 flute, Long neck

UWC VF 30° DC<3 DC=3

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



0.1≤DC≤3				
0 - 0.020				
h6 4≤DCON≤6				
0 - 0.008				

● 2 flute long neck end mill for high-speed machining of hardened steels.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2XLD0010N005	0.1	0.15	0.5	0.085	45	4	2	★	1
VF2XLD0020N006	0.2	0.3	0.6	0.17	45	4	2	★	1
VF2XLD0020N010	0.2	0.3	1	0.17	45	4	2	★	1
VF2XLD0020N015	0.2	0.3	1.5	0.17	45	4	2	★	1
VF2XLD0030N010	0.3	0.5	1	0.27	45	4	2	★	1
VF2XLD0030N020	0.3	0.5	2	0.27	45	4	2	★	1
VF2XLD0030N030	0.3	0.5	3	0.27	45	4	2	★	1
VF2XLD0040N010	0.4	0.6	1	0.36	45	4	2	★	1
VF2XLD0040N020	0.4	0.6	2	0.36	45	4	2	★	1
VF2XLD0040N040	0.4	0.6	4	0.36	45	4	2	★	1
VF2XLD0050N020	0.5	0.8	2	0.46	45	4	2	★	1
VF2XLD0050N040	0.5	0.8	4	0.46	45	4	2	★	1
VF2XLD0050N060	0.5	0.8	6	0.46	45	4	2	★	1
VF2XLD0060N020	0.6	0.9	2	0.56	45	4	2	★	1
VF2XLD0060N040	0.6	0.9	4	0.56	45	4	2	★	1
VF2XLD0060N060	0.6	0.9	6	0.56	45	4	2	★	1
VF2XLD0080N040	0.8	1.2	4	0.76	45	4	2	★	1
VF2XLD0080N060	0.8	1.2	6	0.76	45	4	2	★	1
VF2XLD0080N080	0.8	1.2	8	0.76	50	4	2	★	1
VF2XLD0080N100	0.8	1.2	10	0.76	50	4	2	★	1
VF2XLD0100N040	1	1.5	4	0.94	50	4	2	★	1
VF2XLD0100N060	1	1.5	6	0.94	50	4	2	★	1
VF2XLD0100N080	1	1.5	8	0.94	50	4	2	★	1
VF2XLD0100N100	1	1.5	10	0.94	50	4	2	★	1
VF2XLD0100N120	1	1.5	12	0.94	50	4	2	★	1
VF2XLD0150N060	1.5	2.3	6	1.44	50	4	2	★	1
VF2XLD0150N080	1.5	2.3	8	1.44	50	4	2	★	1
VF2XLD0150N100	1.5	2.3	10	1.44	50	4	2	★	1
VF2XLD0150N120	1.5	2.3	12	1.44	50	4	2	★	1
VF2XLD0150N160	1.5	2.3	16	1.44	60	4	2	★	1
VF2XLD0200N060	2	3	6	1.9	50	4	2	★	1

★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2XLD0200N080	2	3	8	1.9	50	4	2	★	1
VF2XL**D0200N100**	2	3	10	1.9	50	4	2	★	1
VF2XL**D0200N120**	2	3	12	1.9	50	4	2	★	1
VF2XL**D0200N160**	2	3	16	1.9	60	4	2	★	1
VF2XL**D0200N200**	2	3	20	1.9	60	4	2	★	1
VF2XL**D0300N120**	3	4.5	12	2.9	50	6	2	★	1
VF2XL**D0300N160**	3	4.5	16	2.9	60	6	2	★	1
VF2XL**D0300N200**	3	4.5	20	2.9	60	6	2	★	1

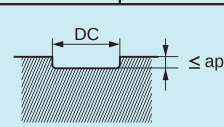
VF2XL

End mill, 2 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

Work material		Hardened steel (45—55HRC) AISI H13 etc.				Hardened steel (55—62HRC) AISI D2 etc.			
DC (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut per pass ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut per pass ap (mm)
0.1	0.5	40000	100	3.9	0.002	40000	80	3.1	0.001
0.2	0.6	40000	400	15.7	0.004	40000	360	14.2	0.004
	1	40000	300	11.8	0.003	40000	250	9.8	0.002
	1.5	40000	200	7.9	0.002	40000	150	5.9	0.001
0.3	1	40000	500	19.7	0.006	40000	450	17.7	0.004
	2	40000	400	15.7	0.003	38000	350	13.8	0.002
	3	38000	250	9.8	0.002	36000	200	7.9	0.001
0.4	1	40000	800	31.5	0.008	36000	500	19.7	0.006
	2	40000	500	19.7	0.007	30000	350	13.8	0.005
	4	36000	300	11.8	0.004	27000	200	7.9	0.003
0.5	2	40000	800	31.5	0.01	30000	600	23.6	0.009
	4	36000	600	23.6	0.008	27000	450	17.7	0.007
	6	30000	400	15.7	0.005	22000	300	11.8	0.004
0.6	2	40000	1000	39.4	0.015	30000	700	27.6	0.012
	4	36000	800	31.5	0.01	27000	500	19.7	0.01
	6	30000	600	23.6	0.006	22000	350	13.8	0.006
0.8	4	36000	1200	47.2	0.03	27000	900	35.4	0.02
	6	30000	900	35.4	0.02	22000	650	25.6	0.015
	8	24000	600	23.6	0.01	18000	450	17.7	0.008
	10	20000	400	15.7	0.008	15000	300	11.8	0.005
1	4	32000	1600	63.0	0.05	24000	1100	43.3	0.04
	6	32000	1400	55.1	0.04	24000	1000	39.4	0.03
	8	28000	1000	39.4	0.03	21000	750	29.5	0.02
	10	28000	800	31.5	0.02	21000	600	23.6	0.015
	12	24000	500	19.7	0.02	18000	370	14.6	0.01
1.5	6	22000	1200	47.2	0.08	16000	900	35.4	0.06
	8	22000	1100	43.3	0.07	16000	800	31.5	0.05
	10	22000	1000	39.4	0.06	16000	750	29.5	0.04
	12	20000	800	31.5	0.05	15000	600	23.6	0.03
	16	18000	500	19.7	0.03	13000	350	13.8	0.02
2	6	16000	1000	39.4	0.15	12000	750	29.5	0.15
	8	16000	1000	39.4	0.15	12000	750	29.5	0.1
	10	16000	800	31.5	0.1	12000	600	23.6	0.08
	12	16000	800	31.5	0.08	12000	600	23.6	0.06
	16	15000	600	23.6	0.06	11000	450	17.7	0.05
	20	14000	500	19.7	0.05	10000	350	13.8	0.04
3	12	11000	800	31.5	0.2	8200	600	23.6	0.15
	16	11000	600	23.6	0.15	8200	450	17.7	0.15
	20	11000	500	19.7	0.1	8200	350	13.8	0.1

Depth of cut

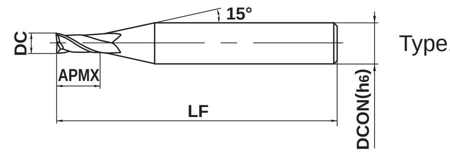


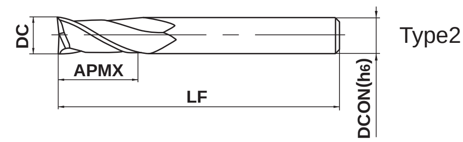
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

VF2MV

End mill, Medium cut length, 2 flute, Irregular helix flutes

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





0.5≤DC≤6				
0 - 0.020				
4≤DCON≤6				
0 - 0.008				

● An irregular helix 2 flute square end mill suitable for high-speed machining of hardened steel.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF2MVD0050	0.5	1.3	40	4	2	●	1
VF2MV**D0100**	1	2.5	40	4	2	●	1
VF2MV**D0150**	1.5	3.8	40	4	2	●	1
VF2MV**D0200**	2	5	40	4	2	●	1
VF2MV**D0250**	2.5	6.3	40	4	2	●	1
VF2MV**D0300**	3	7.5	50	6	2	●	1
VF2MV**D0400**	4	10	50	6	2	●	1
VF2MV**D0500**	5	12.5	50	6	2	●	1
VF2MV**D0600**	6	15	50	6	2	●	2

● : Inventory maintained.

VF2MV

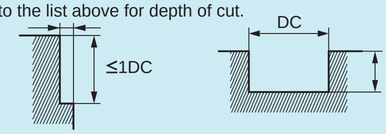
End mill, Medium cut length, 2 flute, Irregular helix flutes

RECOMMENDED CUTTING CONDITIONS

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)			(mm/min)	(IPM)	
0.5	40000	1000	39.4	0.015	40000	960	37.8	0.015	30000	600	23.6	0.01
1	40000	2000	78.7	0.06	32000	1600	63.0	0.06	16000	550	21.7	0.05
1.5	40000	3000	118.1	0.12	32000	1900	74.8	0.08	10600	500	19.7	0.08
2	30000	3000	118.1	0.18	24000	1900	74.8	0.10	8100	400	15.7	0.1
2.5	24000	2600	102.4	0.25	19000	1600	63.0	0.13	6400	350	13.8	0.13
3	20000	2300	90.6	0.30	16000	1400	55.1	0.15	5400	300	11.8	0.15
4	15000	2000	78.7	0.40	12000	1200	47.2	0.20	4000	240	9.4	0.2
5	12000	1600	63.0	0.50	9000	900	35.4	0.25	3200	190	7.5	0.2
6	10000	1400	55.1	0.60	7000	700	27.6	0.30	2700	160	6.3	0.2

Depth of cut

Please refer to the list above for depth of cut.



Please refer to the list above for depth of cut.

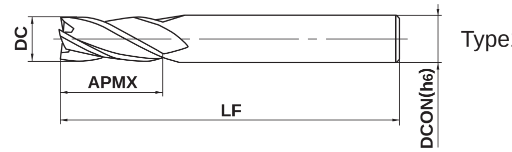
1) When slotting, reduce the revolutions by 50 - 70% and the feed rate by 40 - 60%.
2) For austenitic stainless steels, titanium and heat-resistant alloys, VFMHV is recommended.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VF4MV

End mill, Medium cut length, 4 flute, Irregular helix flutes

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

*For austenitic stainless steels, titanium and heat-resistant alloys, the VFMHV is recommended.



DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● An irregular helix 4 flute square end mill suitable for high-speed machining of hardened steel.

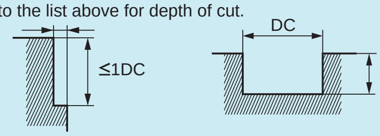
Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF4MVD0600	6	15	50	6	4	●	1
VF4MV**D0800**	8	20	60	8	4	●	1
VF4MV**D1000**	10	25	70	10	4	●	1
VF4MV**D1200**	12	30	90	12	4	●	1
VF4MV**D1600**	16	40	100	16	4	★	1
VF4MV**D2000**	20	50	110	20	4	★	1

RECOMMENDED CUTTING CONDITIONS

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
6	10000	2100	82.7	0.60	7000	1400	55.1	0.30	2700	320	12.6	0.20
8	8000	1500	59.1	0.80	5600	1100	43.3	0.40	2000	240	9.4	0.20
10	6400	1400	55.1	1.00	4500	950	37.4	0.50	1600	210	8.3	0.30
12	5400	1200	47.2	1.00	3800	860	33.9	0.50	1300	160	6.3	0.30
16	2400	550	21.7	3.00	1200	280	11.0	0.80	1000	130	5.1	0.30
20	1900	480	18.9	4.00	1000	240	9.4	1.00	800	100	3.9	0.30

Depth of cut



1) When slotting, reduce the revolutions by 50 - 70% and the feed rate by 40 - 60%.
2) For austenitic stainless steels, titanium and heat-resistant alloys, VFMHV is recommended.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

● : Inventory maintained. ★ : Inventory maintained in Japan.

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

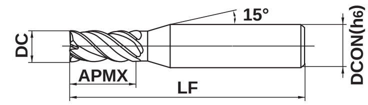
VFMHV

End mill, Medium cut length, 4 flute, Irregular helix flutes

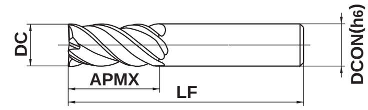
UWC VF 43° 45° DC<6 42° 45° DC≥6

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

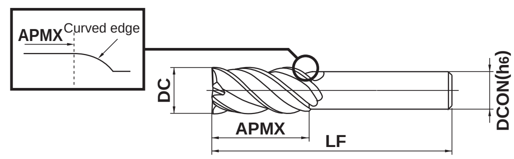
Carbon Steel, Alloy Steel (<30HRC)	Pre-Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○	○		◎	◎		



Type1



Type2



Type3

DC≤12	DC>12		
0 - 0.02	0 - 0.03		
4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

h6

● Impact Miracle end mill with irregular helix flutes ensures stable machining of difficult-to-cut materials and with long overhangs.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMHVD0200	2	4	45	4	4	★	1
VFMHVD0250	2.5	5	45	4	4	★	1
VFMHVD0300	3	8	45	6	4	●	1
VFMHVD0350	3.5	8	45	6	4	●	1
VFMHVD0400	4	11	45	6	4	●	1
VFMHVD0500	5	13	50	6	4	★	1
VFMHVD0600	6	13	50	6	4	★	2
VFMHVD0600A070	6	13	70	6	4	★	2
VFMHVD0700	7	19	60	8	4	★	1
VFMHVD0800	8	19	60	8	4	★	2
VFMHVD0800A080	8	19	80	8	4	★	2
VFMHVD0900	9	22	70	10	4	★	1
VFMHVD1000A100S08	10	22	100	8	4	★	3
VFMHVD1000	10	22	70	10	4	★	2
VFMHVD1000A100	10	22	100	10	4	★	2
VFMHVD1100	11	26	100	10	4	★	3
VFMHVD1200A110S10	12	26	110	10	4	★	3
VFMHVD1200	12	26	75	12	4	★	2
VFMHVD1200A110	12	26	110	12	4	★	2
VFMHVD1300	13	26	110	12	4	★	3
VFMHVD1400A130S12	14	32	130	12	4	★	3
VFMHVD1600	16	35	90	16	4	★	2
VFMHVD1800A150S16	18	42	150	16	4	★	3
VFMHVD2000	20	45	110	20	4	★	2

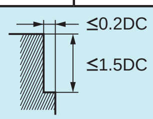
● : Inventory maintained. ★ : Inventory maintained in Japan.

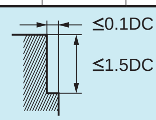
RECOMMENDED CUTTING CONDITIONS

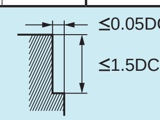
Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	21000	1100	43.3	21000	1100	43.3	14000	560	22.0	9600	310	12.2	4800	130	5.1
3	15000	1250	49.2	15000	1250	49.2	10600	850	33.5	7400	380	15.0	4200	200	7.9
4	11000	1400	55.1	11000	1400	55.1	8000	960	37.8	5600	400	15.7	3200	220	8.7
5	9600	1920	75.6	9600	1920	75.6	6400	1020	40.2	4500	430	16.9	2500	250	9.8
6	8000	2240	88.2	8000	2240	88.2	5300	1060	41.7	3700	440	17.3	2100	250	9.8
7	6800	1900	74.8	6800	1900	74.8	4500	1010	39.8	3200	450	17.7	1800	260	10.2
8	6000	1680	66.1	6000	1680	66.1	4000	960	37.8	2800	450	17.7	1600	260	10.2
9	5300	1480	58.3	5300	1480	58.3	3500	840	33.1	2500	450	17.7	1400	220	8.7
10	4800	1440	56.7	4800	1440	56.7	3200	770	30.3	2200	440	17.3	1300	210	8.3
11	4400	1350	53.1	4400	1350	53.1	2900	760	29.9	2000	400	15.7	1200	190	7.5
12	4000	1250	49.2	4000	1250	49.2	2700	760	29.9	1900	380	15.0	1100	180	7.1
13	3700	1180	46.5	3700	1180	46.5	2500	700	27.6	1700	360	14.2	1000	160	6.3
14	3400	1160	45.7	3400	1160	45.7	2300	640	25.2	1600	350	13.8	900	140	5.5
16	3000	1140	44.9	3000	1140	44.9	2000	560	22.0	1400	340	13.4	800	130	5.1
18	2700	970	38.2	2700	970	38.2	1800	550	21.7	1200	340	13.4	700	110	4.3
20	2400	860	33.9	2400	860	33.9	1600	510	20.1	1100	330	13.0	600	100	3.9

Depth of cut



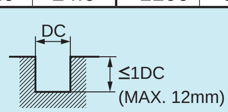


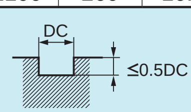


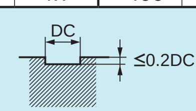
Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	17000	680	26.8	10000	400	15.7	9600	310	12.2	4800	130	5.1	3200	80	3.1
3	12000	720	28.3	6900	410	16.1	7400	380	15.0	3200	140	5.5	2700	110	4.3
4	9200	810	31.9	5600	490	19.3	5600	400	15.7	2400	150	5.9	2000	120	4.7
5	7600	1060	41.7	4500	630	24.8	4500	410	16.1	1900	170	6.7	1600	130	5.1
6	6400	1280	50.4	3700	740	29.1	3700	440	17.3	1600	190	7.5	1300	160	6.3
7	5500	1210	47.6	3200	700	27.6	3200	410	16.1	1400	190	7.5	1100	140	5.5
8	4800	1150	45.3	2800	670	26.4	2800	390	15.4	1200	190	7.5	1000	130	5.1
9	4200	1010	39.8	2500	600	23.6	2500	350	13.8	1100	180	7.1	900	130	5.1
10	3800	910	35.8	2200	530	20.9	2200	350	13.8	1000	160	6.3	800	130	5.1
11	3500	900	35.4	2000	530	20.9	2000	320	12.6	900	160	6.3	720	120	4.7
12	3200	900	35.4	1900	530	20.9	1900	300	11.8	800	160	6.3	660	110	4.3
13	2900	810	31.9	1700	480	18.9	1700	290	11.4	730	150	5.9	610	100	3.9
14	2700	760	29.9	1600	450	17.7	1600	290	11.4	680	140	5.5	570	90	3.5
16	2400	670	26.4	1400	390	15.4	1400	280	11.0	600	120	4.7	500	80	3.1
18	2100	670	26.4	1200	380	15.0	1200	270	10.6	530	120	4.7	440	70	2.8
20	1900	610	24.0	1100	350	13.8	1100	260	10.2	480	120	4.7	400	60	2.4

Depth of cut







1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

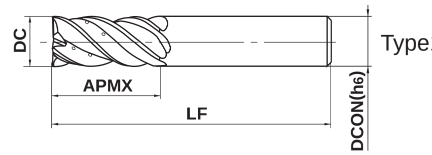
VFMHVCH

End mill, Medium cut length, 4 flute, Irregular helix flutes,
with multiple internal through coolant holes

UWC VF 42° 45°

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

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS



16≤DC≤20				
0 - 0.03				
DCON=16	DCON=20			
0 - 0.011	0 - 0.013			

h6

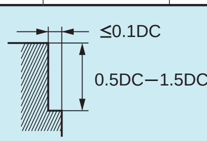
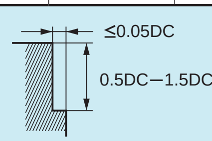
- Vibration control end mill with multiple internal through coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

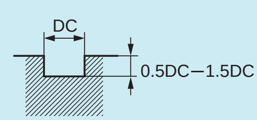
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMHVCHD1600	16	35	90	16	4	★	1
VFMHVCH**D2000**	20	45	110	20	4	★	1

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)
16	2000	560	22.0	800	110	4.3
20	1600	510	20.1	600	100	3.9
Depth of cut						

Slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (mm)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)
16	1400	170	6.7
20	1100	130	5.1
Depth of cut			

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
3) For shoulder milling, climb cutting is recommended.

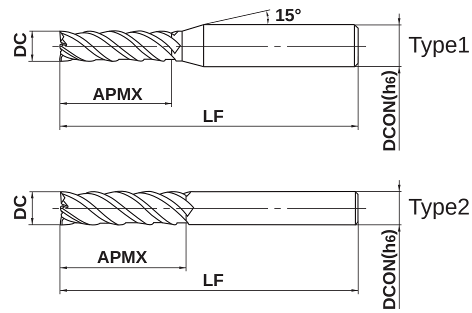
● : Inventory maintained. ★ : Inventory maintained in Japan.

VFJHV

End mill, Semi long cut length, 4 flute, Irregular helix flutes

43.5° 45° DC≤6 | 43° 45° DC>6

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



DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- Impact Miracle end mill with irregular helix flutes ensures stable machining of difficult-to-cut materials.
- Suitable for deep machining with long axial depth of cut.

Unit : mm

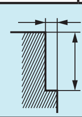
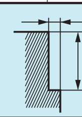
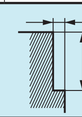
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFJHVD0200	2	8	60	6	4	●	1
VFJHV**D0300**	3	12	60	6	4	●	1
VFJHV**D0400**	4	16	60	6	4	●	1
VFJHV**D0500**	5	20	60	6	4	★	1
VFJHV**D0600**	6	24	60	6	4	★	2
VFJHV**D0800**	8	28	80	8	4	★	2
VFJHV**D1000**	10	35	90	10	4	★	2
VFJHV**D1200**	12	40	100	12	4	★	2
VFJHV**D1600**	16	55	125	16	4	★	2
VFJHV**D2000**	20	60	140	20	4	★	2

VFJHV

End mill, Semi long cut length, 4 flute, Irregular helix flutes

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

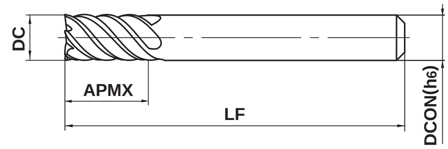
Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (55−62HRC) AISI D2 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	16000	530	20.9	10000	320	12.6	10000	300	11.8	7400	140	5.5	3800	55	2.2
3	12000	820	32.3	7600	470	18.5	7600	440	17.3	5600	280	11.0	2500	80	3.1
4	9500	950	37.4	6000	520	20.5	6000	510	20.1	4500	310	12.2	1900	110	4.3
5	7600	1000	39.4	4800	550	21.7	4800	540	21.3	3600	330	13.0	1500	110	4.3
6	6300	1100	43.3	4000	610	24.0	4000	600	23.6	3000	330	13.0	1300	110	4.3
8	4700	1100	43.3	3000	630	24.8	3000	600	23.6	2200	330	13.0	960	100	3.9
10	3800	1000	39.4	2400	610	24.0	2400	570	22.4	1800	310	12.2	760	100	3.9
12	3100	980	38.6	2000	580	22.8	2000	520	20.5	1500	280	11.0	640	80	3.1
16	2300	810	31.9	1500	480	18.9	1500	420	16.5	1100	240	9.4	480	65	2.6
20	1900	740	29.1	1200	430	16.9	1200	390	15.4	900	220	8.7	380	50	2.0
Depth of cut	 ≤0.1DC ≤2.5DC						 ≤0.05DC ≤2.5DC			 ≤0.02DC ≤2.5DC					

1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VF6MHV

End mill, Medium cut length, 6 flute, Irregular helix flutes

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



DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=6	**8≤DCON≤10**	**12≤DCON≤16**	**DCON=20**	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

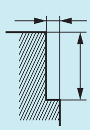
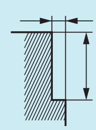
- Newly developed irregular helix 6 flute geometry reduces vibrations and achieves high efficiency machining.
- Suitable for machining of difficult-to-cut materials such as stainless steel, titanium alloy and inconel.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF6MHVD0600	6	13	50	6	6	★	1
VF6MHV**D0800**	8	19	60	8	6	★	1
VF6MHV**D1000**	10	22	70	10	6	★	1
VF6MHV**D1200**	12	26	75	12	6	★	1
VF6MHV**D1600**	16	32	90	16	6	★	1
VF6MHV**D2000**	20	38	100	20	6	★	1

RECOMMENDED CUTTING CONDITIONS

Side milling

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
6	10600	2900	114.2	8000	2000	78.7	2100	320	12.6
8	8000	2900	114.2	6000	2000	78.7	1600	300	11.8
10	6400	2700	106.3	4800	2000	78.7	1300	260	10.2
12	5300	2700	106.3	4000	2000	78.7	1100	230	9.1
16	4000	2200	86.6	3000	1600	63.0	800	180	7.1
20	3200	1900	74.8	2400	1400	55.1	640	150	5.9
Depth of cut									

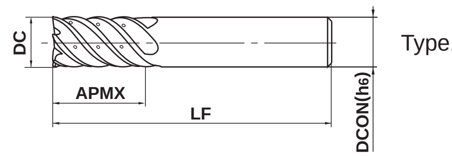
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

★ : **Inventory maintained in Japan.**

VF6MHVCH

End mill, Medium cut length, 6 flute,
Irregular helix flutes with multiple internal through coolant holes

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



DC≤12	DC>12			
0 / - 0.020	0 / - 0.030			
DCON=10	DCON=12	DCON=16	DCON=20	
0 / - 0.009	0 / - 0.011	0 / - 0.011	0 / - 0.013	

h6

- Vibration control end mill with multiple internal through coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

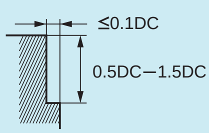
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF6MHVCHD1000	10	22	70	10	6	●	1
VF6MHVCH**D1200**	12	26	75	12	6	●	1
VF6MHVCH**D1600**	16	32	90	16	6	★	1
VF6MHVCH**D2000**	20	38	100	20	6	★	1

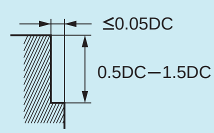
RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	4800	2000	78.7	1300	260	10.2
12	4000	2000	78.7	1100	230	9.1
16	3000	1600	63.0	800	180	7.1
20	2400	1400	55.1	640	150	5.9

Depth of cut

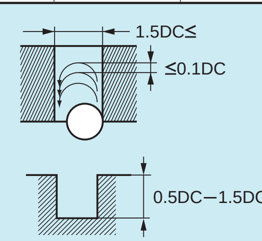




Trochoidal milling

Work material	Austenitic Stainless Steel Titanium alloy AISI 304, AISI 316, Ti-6Al-4V etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	4800	1400	55.1
12	4000	1200	47.2
16	3000	1100	43.3
20	2400	900	35.4

Depth of cut



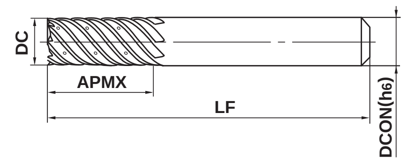
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately.
3) Climb cutting is recommended.

● : Inventory maintained. ★ : Inventory maintained in Japan.

VF8MHVCH

End mill, Medium cut length, 8 flute,
Irregular helix flutes with multiple internal through coolant holes

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



Type1

16≤DC≤20				
0 - 0.03				
DCON=16	DCON=20			
0 - 0.011	0 - 0.013			

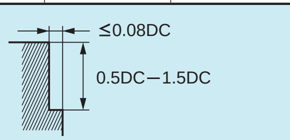
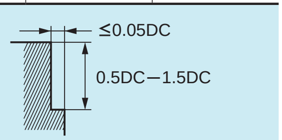
- Vibration control 8 flute end mill with multiple internal through coolant holes ensures efficient side finishing of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

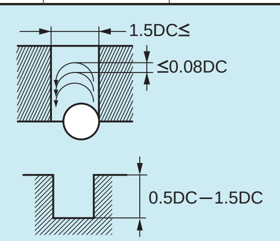
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF8MHVCHD1600	16	32	90	16	8	★	1
VF8MHVCHD2000	20	38	100	20	8	★	1

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	3000	2100	82.7	800	240	9.4
20	2400	1900	74.8	640	200	7.9
Depth of cut	 ≤0.08DC 0.5DC−1.5DC			 ≤0.05DC 0.5DC−1.5DC		

Trochoidal milling

Work material	Austenitic Stainless Steel Titanium alloy AISI 304, AISI 316, Ti-6Al-4V etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	3000	1400	55.1
20	2400	1200	47.2
Depth of cut	 1.5DC≤ ≤0.08DC 0.5DC−1.5DC		

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately.
3) For shoulder milling, climb cutting is recommended.

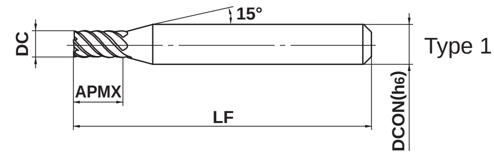
★ : Inventory maintained in Japan.

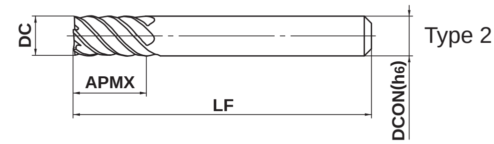
VFSD

End mill, Short cut length, For hardened materials

UWC VF 30° DC<3 45° DC≥3 DC<3 DC≥3

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
○	◎	◎	◎				





1≤DC≤12				
0 - 0.02				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● End mills with Impact Miracle coating for high hardness materials.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFSDD0100	1	2	45	6	4	●	1
VFSD**D0150**	1.5	3	45	6	4	●	1
VFSD**D0200**	2	4	45	6	4	●	1
VFSD**D0250**	2.5	5	45	6	4	●	1
VFSD**D0300**	3	6	45	6	6	●	1
VFSD**D0350**	3.5	7	45	6	6	●	1
VFSD**D0400**	4	8	45	6	6	●	1
VFSD**D0500**	5	10	50	6	6	●	1
VFSD**D0600**	6	12	50	6	6	●	2
VFSD**D0800**	8	16	60	8	6	●	2
VFSD**D1000**	10	20	70	10	6	●	2
VFSD**D1200**	12	24	75	12	6	●	2

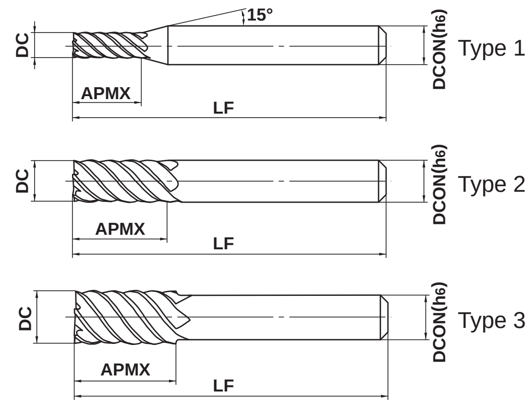
● : Inventory maintained. ★ : Inventory maintained in Japan.

VFMD

End mill, Medium cut length, For hardened materials

UWC VF 30° DC<3 45° DC≥3 DC<3 DC≥3

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
○	◎	◎	◎				



	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● End mills with Impact Miracle coating for high hardness materials.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMDD0100	1	3.5	60	6	4	●	1
VFMD**D0150**	1.5	5	60	6	4	●	1
VFMD**D0200**	2	7	60	6	4	●	1
VFMD**D0250**	2.5	8	60	6	4	●	1
VFMD**D0300**	3	10	60	6	6	●	1
VFMD**D0400**	4	12	60	6	6	●	1
VFMD**D0500**	5	15	60	6	6	●	1
VFMD**D0600**	6	15	60	6	6	●	2
VFMD**D0800**	8	20	75	8	6	●	2
VFMD**D1000**	10	25	80	10	6	●	2
VFMD**D1200**	12	30	100	12	6	●	2
VFMD**D1400**	14	35	105	12	6	★	3
VFMD**D1500**	15	40	110	16	6	★	1
VFMD**D1600**	16	40	110	16	6	★	2
VFMD**D1800**	18	40	120	16	6	★	3
VFMD**D2000**	20	45	125	20	6	★	2
VFMD**D2200**	22	45	135	20	6	★	3
VFMD**D2500**	25	60	160	25	6	★	2

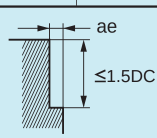
VFSD
End mill, Short cut length, For hardened materials

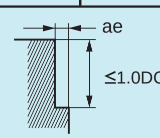
VFMD
End mill, Medium cut length, For hardened materials

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.				Hardened steel (62−70HRC) AISI W1, AISI M2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Width of cut ae (mm)
1	40000	1200	47.2	0.05	40000	800	31.5	0.03	32000	500	19.7	0.02
2	40000	2000	78.7	0.1	24000	1000	39.4	0.05	16000	600	23.6	0.05
3	32000	3800	149.6	0.2	16000	1900	74.8	0.1	11000	1200	47.2	0.05
4	24000	4400	173.2	0.2	12000	2200	86.6	0.1	8000	1300	51.2	0.05
6	16000	5800	228.3	0.3	8000	2900	114.2	0.2	5300	1800	70.9	0.1
8	12000	5800	228.3	0.4	6000	2900	114.2	0.2	4000	1800	70.9	0.1
10	9600	5800	228.3	0.5	4800	2900	114.2	0.3	3200	1800	70.9	0.2
12	8000	4800	189.0	0.6	4000	2400	94.5	0.3	2700	1500	59.1	0.2
16	6000	3600	141.7	0.8	3000	1800	70.9	0.5	2000	1100	43.3	0.3
20	4800	2900	114.2	1.0	2400	1400	55.1	0.5	1600	880	34.6	0.3
25	3800	2300	90.6	1.0	1900	1100	43.3	0.5	1300	720	28.3	0.3

Depth of cut

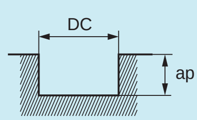




Slot milling with small diameter tools

Work material	Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)
1	15000	300	11.8	0.1	9500	110	4.3	0.05
2	8000	320	12.6	0.2	4800	190	7.5	0.1

Depth of cut



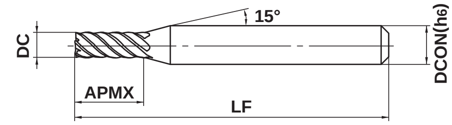
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VFMD- Inch sizes

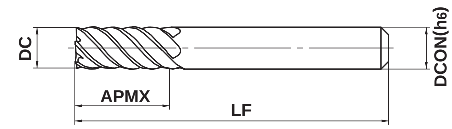
End mill, Medium cut length, For hardened materials

UWC VF 30° DC＜1/8 45° 1/8≦DC DC＜1/8 DC≦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
○	◎	◎	◎				



Type 1



Type 2

DC＜.5000"	DC=.5000"			
0 - .0008"	0 - .0012"			
.2500"≦DCON≦.3750"	DCON=.5000"			
0 - .00035"	0 - .00043"			

h6

● End mills with Impact Miracle coating for high hardness materials.

Unit : inch

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMDD1/32	.0313	.0938	2.5	.2500	4	●	1
VFMDD1/16	.0625	.1875	2.5	.2500	4	●	1
VFMDD3/32	.0938	.2813	2.5	.2500	4	●	1
VFMDD1/8	.1250	.3750	2.5	.2500	6	●	1
VFMDD5/32	.1563	.5000	2.5	.2500	6	●	1
VFMDD3/16	.1875	.5630	2.5	.2500	6	●	1
VFMDD1/4	.2500	.5630	3.5	.2500	6	●	2
VFMDD5/16	.3125	.6875	4.0	.3125	6	●	2
VFMDD3/8	.3750	.8125	4.0	.3750	6	●	2
VFMDD1/2	.5000	1.0938	4.5	.5000	6	●	2

● : Inventory maintained.

VFMD – Inch sizes

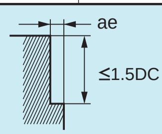
End mill, Medium cut length, For hardened materials

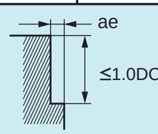
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (45–55HRC) AISI H13 etc.				Hardened steel (55–62HRC) AISI D2 etc.				Hardened steel (62–70HRC) AISI W1, AISI M2 etc.			
DC (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Width of cut ae (inch)
.0313	40000	1100	43.3	.0016	40000	800	31.5	.00094	36000	500	19.6	.00063
.0625	40000	1800	70.8	.0031	30000	960	37.8	.0019	20000	560	22	.0013
.0938	40000	2600	102	.0047	20000	1100	43	.0028	13000	680	26.6	.0019
.1250	30000	4100	161	.0063	15000	2100	82	.0038	10000	1300	49.6	.0025
.1563	24000	4300	170	.0078	12000	2200	86	.0047	8000	1300	51	.0031
.1875	20000	4800	189	.0094	10000	2400	94.5	.0056	6700	1400	55	.0038
.2500	15000	5800	228	.013	7500	2900	114	.0075	5000	1800	70.8	.005
.3125	12000	5800	228	.016	6000	2900	114	.0094	4000	1800	70.8	.0063
.3750	10000	5800	228	.019	5000	2900	114	.011	3300	1800	70.8	.0075
.5000	7500	4500	177	.025	3800	2300	90.5	.015	2500	1400	55	.01

Depth of cut





1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

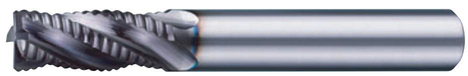
SOLID END MILLS

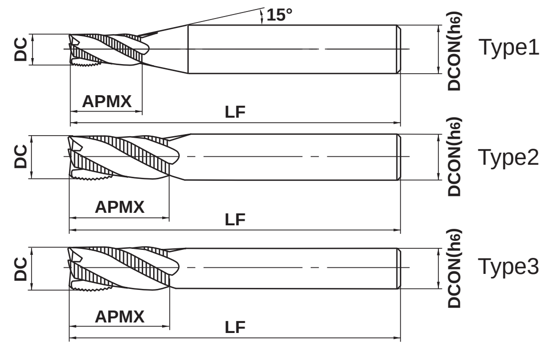
VFSFPR

Roughing end mill, Short cut length, 3–4 flute

UWC VF 30° DC<8 DC≥8

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





h6

DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- Impact Miracle roughing end mills for a wide range of work materials from carbon and alloy steel, hardened steel and difficult-to-cut materials.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFSFPRD0300	3	6	50	6	3	★	1
VFSFPR**D0400**	4	8	50	6	3	★	1
VFSFPR**D0500**	5	10	50	6	3	★	1
VFSFPR**D0600**	6	12	50	6	3	★	2
VFSFPR**D0700**	7	17	60	8	3	★	1
VFSFPR**D0800**	8	17	60	8	4	★	2
VFSFPR**D0900**	9	22	70	10	4	★	1
VFSFPR**D1000S08**	10	22	90	8	4	★	3
VFSFPR**D1000**	10	22	70	10	4	★	2
VFSFPR**D1200S10**	12	27	100	10	4	★	3
VFSFPR**D1200**	12	27	75	12	4	★	2
VFSFPR**D1400**	14	27	75	12	4	★	3
VFSFPR**D1600**	16	33	90	16	4	★	2
VFSFPR**D1800**	18	33	90	16	4	★	3
VFSFPR**D2000**	20	38	100	20	4	★	2

★ : Inventory maintained in Japan.

VFSFPR

Roughing end mill, Short cut length, 3−4 flute

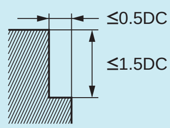
CARBIDE

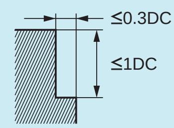
RECOMMENDED CUTTING CONDITIONS

Side milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti−6Al−4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	16000	960	37.8	13000	640	25.2	6400	260	10.2	5300	320	12.6	4200	70	2.8
4	12000	960	37.8	9500	640	25.2	4800	260	10.2	4000	320	12.6	3200	70	2.8
5	9500	960	37.8	7600	640	25.2	3800	260	10.2	3200	320	12.6	2500	70	2.8
6	8000	960	37.8	6400	680	26.8	3200	290	11.4	2700	340	13.4	2100	75	3.0
8	6000	1050	41.3	4800	760	29.9	2400	340	13.4	2000	400	15.7	1600	95	3.7
10	4800	1050	41.3	3800	760	29.9	1900	340	13.4	1600	400	15.7	1300	105	4.1
12	4000	960	37.8	3200	700	27.6	1600	320	12.6	1300	400	15.7	1100	110	4.3
16	3000	840	33.1	2400	620	24.4	1200	300	11.8	1000	360	14.2	800	110	4.3
20	2400	760	29.9	1900	560	22.0	1000	300	11.8	800	320	12.6	600	100	3.9

Depth of cut

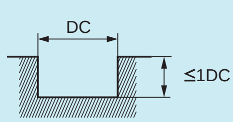


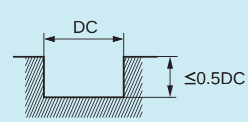


Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti−6Al−4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	13000	720	28.3	11000	480	18.9	4800	190	7.5	3200	190	7.5	2100	25	1.0
4	9500	720	28.3	8000	480	18.9	3600	190	7.5	2400	190	7.5	1600	25	1.0
5	7600	720	28.3	6400	480	18.9	3200	190	7.5	1900	190	7.5	1300	25	1.0
6	6400	720	28.3	5300	480	18.9	2700	200	7.9	1600	200	7.9	1100	30	1.2
8	4800	800	31.5	4000	520	20.5	2000	220	8.7	1200	220	8.7	800	35	1.4
10	3800	800	31.5	3200	520	20.5	1600	220	8.7	1000	220	8.7	600	35	1.4
12	3200	750	29.5	2700	520	20.5	1300	210	8.3	800	210	8.3	500	40	1.6
16	2400	620	24.4	2000	450	17.7	1000	180	7.1	600	180	7.1	400	45	1.8
20	1900	540	21.3	1600	400	15.7	800	160	6.3	500	160	6.3	300	40	1.6

Depth of cut





1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

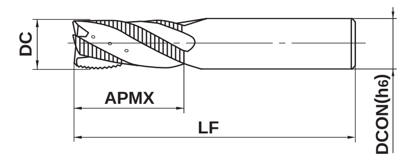
SOLID END MILLS

VFSFPRCH

Roughing end mill, Short cut length, 4 flute, with multiple internal through coolant holes

UWC VF 30°

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



Type1

h6

DCON=16	DCON=20			
0 - 0.011	0 - 0.013			

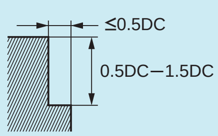
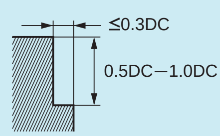
● Roughing end mill with multiple internal through coolant holes suitable for difficult-to-cut materials.

Unit : mm

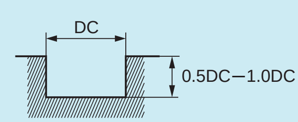
Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFSFPRCHD1600	16	33	90	16	4	★	1
VFSFPRCH**D2000**	20	38	100	20	4	★	1

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	1200	300	11.8	800	110	4.3
20	1000	300	11.8	600	100	3.9
Depth of cut	 ≤0.5DC, 0.5DC−1.5DC			 ≤0.3DC, 0.5DC−1.0DC		

Slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	800	100	3.9
20	600	80	3.1
Depth of cut	 DC, 0.5DC−1.0DC		

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
3) For shoulder milling, climb cutting is recommended.

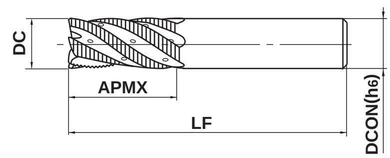
★ : Inventory maintained in Japan.

VF6SVRCH

Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes

UWC VF 28.5° 30°

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



Type1

h6	DCON=16	DCON=20			
	0 - 0.011	0 - 0.013			

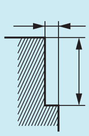
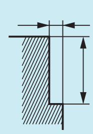
- 6 flute roughing end mill with multiple internal through coolant holes ensures efficient side finishing of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF6SVRCHD1600	16	33	90	16	6	★	1
VF6SVRCH**D2000**	20	38	100	20	6	★	1

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	2400	1200	47.2	800	160	6.3
20	2000	1000	39.4	640	140	5.5
Depth of cut	 ≤0.3DC 0.5DC−1.5DC			 ≤0.2DC 0.5DC−1.5DC		

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately.
3) Climb cutting is recommended.

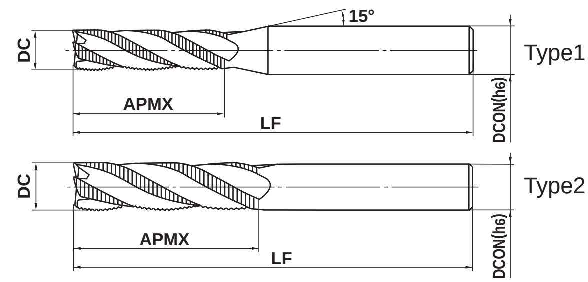
★ : Inventory maintained in Japan.

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

VFMFPR

Roughing end mill, Medium cut length, 4 flute

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



h6

DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- Impact Miracle roughing end mills suitable for the machining of deep walled components.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMFPRD0500	5	15	60	6	4	★	1
VFMFPR**D0600**	6	17	60	6	4	★	2
VFMFPR**D0700**	7	22	75	8	4	★	1
VFMFPR**D0800**	8	28	75	8	4	★	2
VFMFPR**D0900**	9	28	100	10	4	★	1
VFMFPR**D1000**	10	34	100	10	4	★	2
VFMFPR**D1200**	12	40	110	12	4	★	2
VFMFPR**D1600**	16	48	125	16	4	★	2
VFMFPR**D2000**	20	57	140	20	4	★	2

VFMFPR

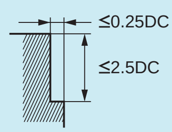
Roughing end mill, Medium cut length, 4 flute

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Side milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti−6Al−4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
5	3800	360	14.2	3200	290	11.4	2500	150	5.9	2500	150	5.9	1900	50	2.0
6	3200	360	14.2	2700	290	11.4	2100	160	6.3	2100	160	6.3	1600	60	2.4
8	2400	450	17.7	2000	360	14.2	1600	160	6.3	1600	160	6.3	1200	70	2.8
10	1900	450	17.7	1600	360	14.2	1300	180	7.1	1300	180	7.1	1000	75	3.0
12	1600	400	15.7	1300	320	12.6	1100	180	7.1	1100	180	7.1	800	80	3.1
16	1200	360	14.2	1000	290	11.4	800	160	6.3	800	160	6.3	600	80	3.1
20	1000	340	13.4	800	270	10.6	600	150	5.9	600	150	5.9	500	80	3.1
Depth of cut	(see diagram below)														



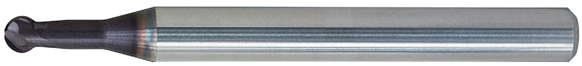
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

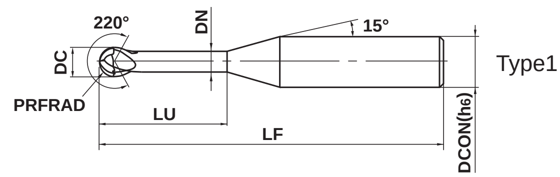
SOLID END MILLS

VF2WB

Wide ball nose, Medium neck, 2 flute

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





I≤PRFRAD≤3				
±0.01				
DCON=6				
0 - 0.008				

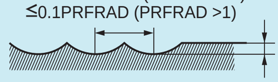
- Ball nose end mill suitable for machining of undercut geometries and complex geometries using a 5-axis machine.

Unit : mm

Order Number	PRFRAD	DC	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2WBR0100N060	1	2	6	1.6	60	6	2	★	1
VF2WB**R0150N080**	1.5	3	8	2.4	60	6	2	★	1
VF2WB**R0200N100**	2	4	10	3.2	60	6	2	★	1
VF2WB**R0300N120**	3	6	12	4.8	80	6	2	★	1

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.				Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti−6Al−4V etc.				Hardened steel (45−55HRC) AISI H13 etc.			
PRFRAD (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
R1	40000	5000	196.9	0.07	40000	5000	196.9	0.06	32000	2500	98.4	0.05	32000	3000	118.1	0.03
R1.5	32000	5000	196.9	0.12	32000	5000	196.9	0.11	26000	2500	98.4	0.10	26000	3000	118.1	0.07
R2	24000	3800	149.6	0.15	24000	3800	149.6	0.13	20000	2000	98.4	0.12	20000	2800	110.2	0.10
R3	16000	2800	110.2	0.20	16000	2800	110.2	0.18	13000	1500	59.1	0.15	13000	2100	82.7	0.12
Depth of cut	≤0.05PRFRAD (PRFRAD =1) ≤0.1PRFRAD (PRFRAD >1) ≤Please refer to the list above for depth of cut.															



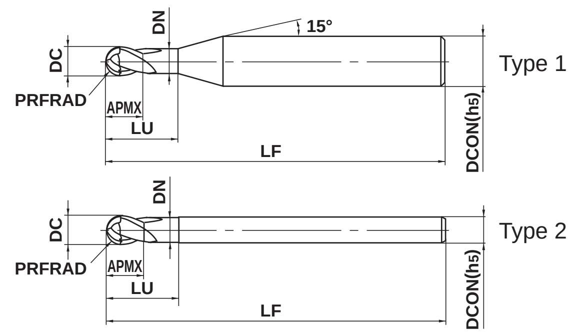
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.

★ : Inventory maintained in Japan.

VF2SSB

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

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
○	◎	◎	◎	○	○		



0.5≤PRFRAD≤6			
±0.005			
1≤DC≤12			
0 / - 0.01			
DCON=6	8≤DCON≤10	DCON=12	
0 / - 0.005	0 / - 0.006	0 / - 0.008	

- 2 flute ball nose end mills with Impact Miracle coating for high hardness materials.
- Short shank type suitable for use with a shrink fit type holder.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2SSBR0050	0.5	1	1	2	0.94	40	6	2	●	1
VF2SSBR0075	0.75	1.5	1.5	3	1.44	40	6	2	●	1
VF2SSBR0100	1	2	2	4	1.9	45	6	2	●	1
VF2SSBR0150	1.5	3	3	6	2.9	45	6	2	●	1
VF2SSBR0200	2	4	4	8	3.9	45	6	2	●	1
VF2SSBR0250	2.5	5	5	10	4.9	50	6	2	●	1
VF2SSBR0300	3	6	6	12	5.85	50	6	2	●	2
VF2SSBR0400	4	8	8	14	7.85	60	8	2	●	2
VF2SSBR0500	5	10	10	18	9.7	70	10	2	●	2
VF2SSBR0600	6	12	12	22	11.7	75	12	2	●	2

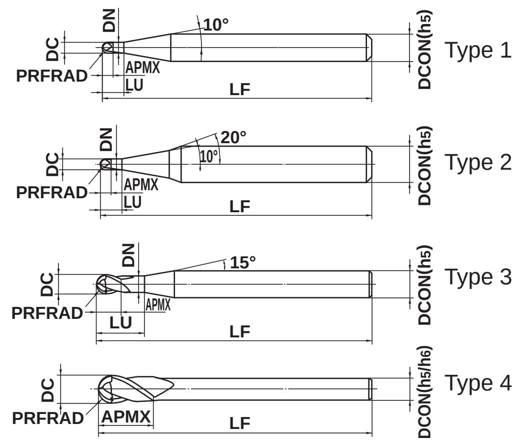
● : Inventory maintained.

VF2SB

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

UWC VF PRFRAD<0.3 PRFRAD≥0.3 PRFRAD<0.3 PRFRAD≥0.3

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
○	◎	◎	◎	○	○		



R	PRFRAD≤6	PRFRAD>6		
	±0.005	±0.010		
	DC≤12	DC>12		
	0 - 0.01	0 - 0.02		
h5 DCON≤12	DCON=3	4≤DCON≤6	8≤DCON≤10	
	0 - 0.004	0 - 0.005	0 - 0.006	
h6 DCON>12	DCON=12	DCON=16	DCON=20	
	0 - 0.008	0 - 0.011	0 - 0.013	

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

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2SBR0010S04	0.1	0.2	0.2	0.4	0.17	45	4	2	●	1
VF2SB**R0010S06**	0.1	0.2	0.2	0.4	0.17	50	6	2	●	2
VF2SB**R0015S04**	0.15	0.3	0.3	0.6	0.27	45	4	2	●	1
VF2SB**R0015S06**	0.15	0.3	0.3	0.6	0.27	50	6	2	●	2
VF2SB**R0020S04**	0.2	0.4	0.4	0.8	0.36	45	4	2	●	1
VF2SB**R0020S06**	0.2	0.4	0.4	0.8	0.36	50	6	2	●	2
VF2SB**R0030S04**	0.3	0.6	0.6	1.2	0.56	45	4	2	●	3
VF2SB**R0030S06**	0.3	0.6	0.6	1.2	0.56	50	6	2	●	3
VF2SB**R0040S04**	0.4	0.8	0.8	1.6	0.76	45	4	2	●	3
VF2SB**R0040S06**	0.4	0.8	0.8	1.6	0.76	50	6	2	●	3
VF2SB**R0050S04**	0.5	1	1	2	0.94	45	4	2	●	3
VF2SB**R0050S06**	0.5	1	1	2	0.94	50	6	2	●	3
VF2SB**R0060S04**	0.6	1.2	1.2	2.4	1.14	45	4	2	●	3
VF2SB**R0060S06**	0.6	1.2	1.2	2.4	1.14	50	6	2	●	3
VF2SB**R0070S04**	0.7	1.4	1.4	2.8	1.34	45	4	2	●	3
VF2SB**R0070S06**	0.7	1.4	1.4	2.8	1.34	50	6	2	●	3
VF2SB**R0075S04**	0.75	1.5	1.5	3	1.44	45	4	2	●	3
VF2SB**R0075S06**	0.75	1.5	1.5	3	1.44	50	6	2	●	3
VF2SB**R0080S04**	0.8	1.6	1.6	3.2	1.54	45	4	2	●	3
VF2SB**R0080S06**	0.8	1.6	1.6	3.2	1.54	50	6	2	●	3
VF2SB**R0090S04**	0.9	1.8	1.8	3.6	1.74	45	4	2	●	3
VF2SB**R0090S06**	0.9	1.8	1.8	3.6	1.74	50	6	2	●	3
VF2SB**R0100S04**	1	2	2	4	1.9	50	4	2	●	3
VF2SB**R0100S06**	1	2	2	4	1.9	60	6	2	●	3
VF2SB**R0125S06**	1.25	2.5	2.5	5	2.4	60	6	2	●	3
VF2SB**R0150S03**	1.5	3	3	—	—	60	3	2	●	4
VF2SB**R0150S06**	1.5	3	3	6	2.9	70	6	2	●	3
VF2SB**R0200S04**	2	4	4	—	—	60	4	2	●	4
VF2SB**R0200S06**	2	4	4	8	3.9	70	6	2	●	3
VF2SB**R0250S06**	2.5	5	5	10	4.9	80	6	2	●	3
VF2SB**R0300S06**	3	6	12	—	—	80	6	2	●	4

VF2SB

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

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2SBR0400S08	4	8	14	—	—	90	8	2	●	4
VF2SB**R0500S10**	5	10	18	—	—	100	10	2	●	4
VF2SB**R0600S12**	6	12	22	—	—	110	12	2	●	4
VF2SB**R0800S16**	8	16	30	—	—	140	16	2	★	4
VF2SB**R1000S20**	10	20	38	—	—	160	20	2	★	4

● : Inventory maintained. **★ : Inventory maintained in Japan.**

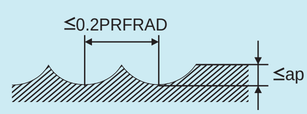
VF2SSB
Ball nose, Short cut length, 2 flute, For hardened materials

VF2SB
Ball nose, Short cut length, 2 flute, For hardened materials

RECOMMENDED CUTTING CONDITIONS

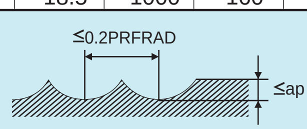
Work material	Hardened steel (45−55HRC) AISI H13 etc.							Hardened steel (55−62HRC) AISI D2 etc.						
PRFRAD (mm)	$\alpha\leq15°$			$\alpha>15°$			Depth of cut ap (mm)	$\alpha\leq15°$			$\alpha>15°$			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R 0.1	40000	320	12.6	40000	240	9.4	0.003	40000	320	12.6	40000	160	6.3	0.003
R 0.15	40000	640	25.2	40000	560	22.0	0.01	40000	640	25.2	40000	400	15.7	0.007
R 0.2	40000	1600	63.0	40000	1200	47.2	0.02	40000	1400	55.1	40000	1000	39.4	0.015
R 0.3	40000	3200	126.0	40000	1600	63.0	0.03	40000	2800	110.2	40000	1200	47.2	0.025
R 0.4	40000	6400	252.0	40000	2400	94.5	0.05	40000	4000	157.5	40000	1600	63.0	0.04
R 0.5	40000	8000	315.0	40000	3200	126.0	0.06	40000	5600	220.5	40000	2400	94.5	0.05
R 0.75	40000	9600	378.0	40000	4000	157.5	0.09	40000	7200	283.5	32000	2500	98.4	0.075
R 1	40000	9600	378.0	39000	4700	185.0	0.11	40000	8000	315.0	24000	2400	94.5	0.1
R 1.25	40000	10400	409.4	32000	4500	177.2	0.12	37000	8100	318.9	19000	2300	90.6	0.11
R 1.5	40000	12000	472.4	27000	4300	169.3	0.13	32000	7700	303.1	16000	2200	86.6	0.12
R 2	32000	10880	428.3	20000	3600	141.7	0.15	24000	6200	244.1	12000	1900	74.8	0.13
R 2.5	25000	9000	354.3	16000	2900	114.2	0.2	19000	5300	208.7	9600	1700	66.9	0.15
R 3	21000	8400	330.7	13000	2600	102.4	0.25	16000	4800	189.0	8000	1600	63.0	0.2
R 4	16000	6400	252.0	10000	2000	78.7	0.3	12000	3600	141.7	6000	1200	47.2	0.2
R 5	13000	5200	204.7	8000	1700	66.9	0.5	10000	3200	126.0	4800	960	37.8	0.2
R 6	9000	3600	141.7	6000	1300	51.2	0.5	7000	2200	86.6	3600	720	28.3	0.3
R 8	6000	2400	94.5	4000	1000	39.4	0.5	5000	1600	63.0	2500	500	19.7	0.3
R10	4500	1800	70.9	3000	780	30.7	0.5	4000	1300	51.2	1800	360	14.2	0.3

Depth of cut

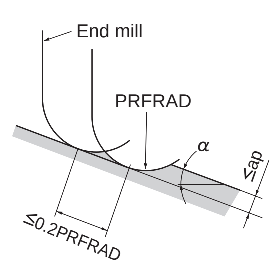


Work material	Hardened steel (62−70HRC) AISI W1, AISI M2 etc.						
PRFRAD (mm)	$\alpha\leq15°$			$\alpha>15°$			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R 0.1	40000	320	12.6	40000	160	6.3	0.002
R 0.15	40000	640	25.2	40000	400	15.7	0.005
R 0.2	40000	1200	47.2	40000	1000	39.4	0.01
R 0.3	40000	2000	78.7	40000	1200	47.2	0.02
R 0.4	40000	2800	110.2	40000	1600	63.0	0.03
R 0.5	40000	3600	141.7	32000	1300	51.2	0.04
R 0.75	32000	4500	177.2	21000	1200	47.2	0.05
R 1	24000	3800	149.6	16000	1000	39.4	0.07
R 1.25	19000	3400	133.9	13000	1000	39.4	0.08
R 1.5	16000	3200	126.0	11000	880	34.6	0.09
R 2	12000	2400	94.5	8000	800	31.5	0.1
R 2.5	9600	2100	82.7	6000	600	23.6	0.1
R 3	8000	1700	66.9	5000	600	23.6	0.11
R 4	6000	1400	55.1	4000	480	18.9	0.11
R 5	4800	1100	43.3	3000	420	16.5	0.12
R 6	3600	860	33.9	2200	310	12.2	0.12
R 8	2500	650	25.6	1500	240	9.4	0.15
R10	1800	470	18.5	1000	160	6.3	0.15

Depth of cut



1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

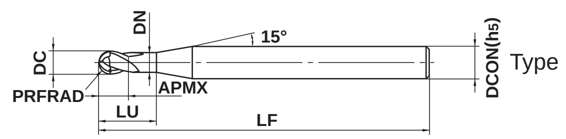


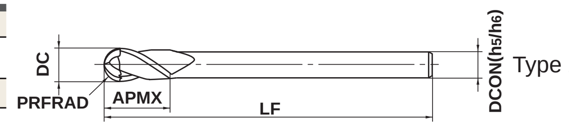
CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

VF2SB- Inch sizes

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

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
○	◎	◎	◎	○	○		





.0156"≤PRFRAD≤.2500"				
±.0002"				
DC<.5000"	DC=.5000"			
0 - 0.0004"	0 - 0.0008"			
.2500"≤DCON≤.3750"				
0 - .00024"				
DCON=.5000"				
0 - 0.00043"				

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

Unit : inch

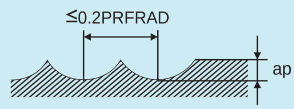
Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2SB D1/32	.0156	.0313	.0313	.0625	.0296	2.5	.2500	2	●	1
VF2SB **D1/16**	.0313	.0625	.0625	.1250	.0601	2.5	.2500	2	●	1
VF2SB **D3/32**	.0469	.0938	.0938	.1875	.0898	2.5	.2500	2	●	1
VF2SB **D1/8**	.0625	.1250	.1250	.2500	.1211	3.0	.2500	2	●	1
VF2SB **D3/16**	.0938	.1875	.1875	.3750	.1835	3.0	.2500	2	●	1
VF2SB **D1/4**	.1250	.2500	.5000	–	–	3.5	.2500	2	●	2
VF2SB **D5/16**	.1563	.3125	.6250	–	–	4.0	.3125	2	●	2
VF2SB **D3/8**	.1875	.3750	.7500	–	–	4.0	.3750	2	●	2
VF2SB **D1/2**	.2500	.5000	1.0000	–	–	4.5	.5000	2	●	2

● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

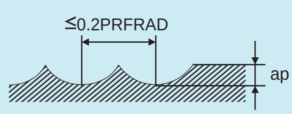
Work material	Hardened steel(45−55HRC) AISI H13 etc.							Hardened steel (55−62HRC) AISI D2 etc.						
PRFRAD (inch)	α≤15°			α>15°			Depth of cut ap (inch)	α≤15°			α>15°			Depth of cut ap (inch)
	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)		Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	
R .0156	40000	6400	252	40000	2400	94.5	.0020	40000	4000	157	40000	1600	63	.0016
R .0313	40000	9600	378	40000	4000	157	.0039	40000	8000	315	30000	2400	94.5	.0031
R .0469	40000	10000	394	33000	4600	182	.0047	36000	7900	312	20000	2400	94.5	.0043
R .0625	38000	11000	433	25000	4000	157	.0051	30000	7200	283	15000	2100	82.7	.0047
R .0938	27000	9700	383	17000	3100	122	.0067	20000	5600	220	10000	1800	70.9	.0055
R .1250	20000	8000	315	13000	2600	102	.0098	15000	4500	177	7500	1500	59.1	.0079
R .1563	16000	6400	252	10000	2000	78.7	.0118	12000	3600	142	6000	1200	47.2	.0079
R .1875	13000	5200	205	8400	1700	66.9	.0197	10000	3000	118	5000	1000	39.4	.0079
R .2500	8500	3400	134	5700	1100	43.3	.0197	6500	2100	82.7	3400	680	26.8	.0118

Depth of cut

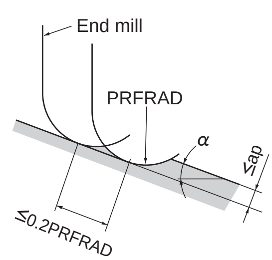


Work material	Hardened steel (62−70HRC) AISI W1, AISI M2 etc.						
PRFRAD (inch)	α≤15°			α>15°			Depth of cut ap (inch)
	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	Revolution (min-1)	Table feed (mm/min)	Table feed (IPM)	
R .0156	40000	2800	110	40000	1600	63	.0012
R .0313	30000	4200	165	20000	1200	47.2	.0024
R .0469	20000	3600	142	13000	900	35.4	.0031
R .0625	15000	3000	118	10000	800	31.5	.0035
R .0938	10000	2200	86.6	6300	630	24.8	.0039
R .1250	7500	1700	66.9	4800	580	22.7	.0043
R .1563	6000	1400	55.1	4000	480	18.9	.0043
R .1875	5000	1100	43.3	3200	450	17.6	.0047
R .2500	3400	750	29.4	2000	280	11	.0047

Depth of cut



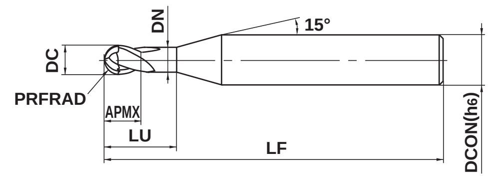
1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

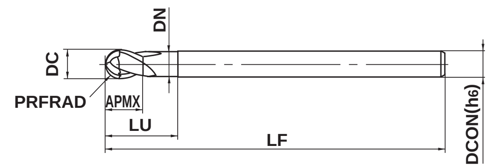


VF2SDB

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

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
○	◎	◎	○				





R	PRFRAD≤6.5	PRFRAD>6.5			
	±0.01	±0.02			
	DC≤12	DC>12			
	0 / -0.02	0 / -0.03			
h6	DCON=3	4≤DCON≤6	8≤DCON≤10	12≤DCON≤16	DCON=20
	0 / -0.006	0 / -0.008	0 / -0.009	0 / -0.011	0 / -0.013

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

Unit : mm

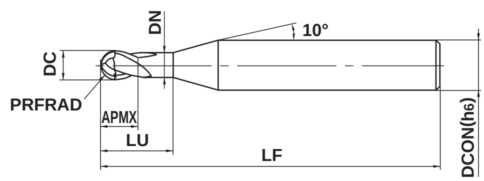
Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2SDBR0050	0.5	1	1	2	0.94	45	4	2	●	1
VF2SDB**R0100S04**	1	2	2	4	1.9	50	4	2	●	1
VF2SDB**R0100**	1	2	2	4	1.9	60	6	2	●	1
VF2SDB**R0150S03**	1.5	3	3	6	2.9	60	3	2	●	2
VF2SDB**R0150**	1.5	3	3	6	2.9	70	6	2	●	1
VF2SDB**R0200S04**	2	4	4	8	3.9	60	4	2	●	2
VF2SDB**R0200**	2	4	4	8	3.9	70	6	2	●	1
VF2SDB**R0250**	2.5	5	5	10	4.9	80	6	2	●	1
VF2SDB**R0300**	3	6	12	22	5.85	80	6	2	●	2
VF2SDB**R0400**	4	8	14	27	7.85	90	8	2	●	2
VF2SDB**R0500**	5	10	18	31	9.7	100	10	2	●	2
VF2SDB**R0600**	6	12	22	35	11.7	110	12	2	●	2
VF2SDB**R0800**	8	16	30	50	15.5	140	16	2	★	2
VF2SDB**R1000**	10	20	38	58	19.5	160	20	2	★	2

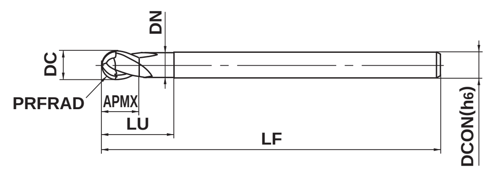
● : Inventory maintained.　★ : Inventory maintained in Japan.

VF2SDBL

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

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
○	◎	◎	○				





R	PRFRAD≤6.5	PRFRAD>6.5			
	±0.01	±0.02			
	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 2 flute ball nose end mill with long shank for general use.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF2SDBLR0050	0.5	1	1	2	0.94	60	6	2	●	1
VF2SDBL**R0100**	1	2	2	4	1.9	80	6	2	●	1
VF2SDBL**R0150**	1.5	3	3	6	2.9	90	6	2	●	1
VF2SDBL**R0200**	2	4	4	8	3.9	90	6	2	●	1
VF2SDBL**R0250**	2.5	5	5	10	4.9	110	8	2	●	1
VF2SDBL**R0300**	3	6	12	22	5.85	120	6	2	●	2
VF2SDBL**R0400**	4	8	14	27	7.85	130	8	2	●	2
VF2SDBL**R0500**	5	10	18	31	9.7	140	10	2	●	2
VF2SDBL**R0600**	6	12	22	35	11.7	140	12	2	●	2
VF2SDBL**R0800**	8	16	30	50	15.5	200	16	2	★	2
VF2SDBL**R1000**	10	20	38	58	19.5	200	20	2	★	2

VF2SDB

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

VF2SDBL

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

CARBIDE

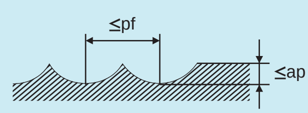
RECOMMENDED CUTTING CONDITIONS

Overhang below 5D (D is end mill diameter)

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.							
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	Pick feed pf (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		
R 0.5	40000	5200	204.7	36000	2300	90.6	0.10	0.25
R 1	40000	6000	236.2	36000	3500	137.8	0.20	0.50
R 1.5	29000	4600	181.1	19000	2400	94.5	0.20	0.50
R 1.5	37000	7000	275.6	24000	3000	118.1	0.30	0.75
R 2	24000	4300	169.3	15000	2200	86.6	0.25	0.70
R 2	30000	6500	255.9	19000	2800	110.2	0.40	1.00
R 2.5	25000	6000	236.2	16000	2600	102.4	0.50	1.30
R 3	22000	6000	236.2	14000	2400	94.5	0.60	1.80
R 4	19000	5200	204.7	12000	2200	86.6	0.80	2.40
R 5	15000	4300	169.3	9500	2000	78.7	1.00	3.00
R 6	12000	3400	133.9	8000	1800	70.9	1.20	3.60
R 8	9000	2600	102.4	6000	1500	59.1	1.60	4.80
R10	7500	2200	86.6	4800	1200	47.2	2.00	6.00

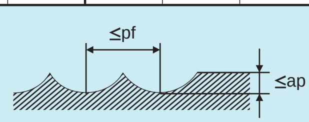
Work material	Hardened steel (45−55HRC) AISI H13 etc.							
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	Pick feed pf (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		
R 0.5	40000	5200	204.7	36000	2300	90.6	0.10	0.25
R 1	40000	6000	236.2	36000	3500	137.8	0.20	0.50
R 1.5	25000	4000	157.5	16000	2000	78.7	0.20	0.50
R 1.5	37000	7000	275.6	24000	3000	118.1	0.30	0.75
R 2	19000	3400	133.9	13000	1700	66.9	0.25	0.70
R 2	28000	6000	236.2	19000	2600	102.4	0.40	1.00
R 2.5	22000	5000	196.9	16000	2300	90.6	0.50	1.25
R 3	18000	4500	177.2	12000	1900	74.8	0.60	1.50
R 4	15000	3800	149.6	9500	1700	66.9	0.80	2.00
R 5	11000	3000	118.1	7000	1500	59.1	1.00	2.50
R 6	9000	2400	94.5	6000	1400	55.1	1.20	3.00
R 8	7000	1900	74.8	4500	1100	43.3	1.60	4.00
R10	5500	1500	59.1	3600	900	35.4	2.00	5.00

Depth of cut

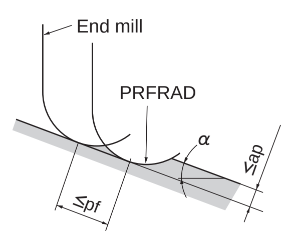


Work material	Hardened steel (55−62HRC) AISI D2 etc.							
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	Pick feed pf (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		
R 0.5	40000	5000	196.9	40000	2400	94.5	0.05	0.10
R 1	36000	5000	196.9	24000	2400	94.5	0.10	0.20
R 1.5	17000	2400	94.5	11000	1000	39.4	0.12	0.30
R 1.5	25000	6000	236.2	16000	2200	86.6	0.12	0.30
R 2	12000	1900	74.8	8200	900	35.4	0.13	0.40
R 2	18000	4800	189.0	12000	2000	78.7	0.13	0.40
R 2.5	15000	4200	165.4	9500	1700	66.9	0.15	0.50
R 3	12000	3500	137.8	8000	1600	63.0	0.20	0.60
R 4	9800	3000	118.1	6500	1300	51.2	0.20	0.80
R 5	7500	2400	94.5	5000	1000	39.4	0.20	1.00
R 6	6000	1900	74.8	4000	800	31.5	0.30	1.20
R 8	4500	1500	59.1	3000	600	23.6	0.30	1.60
R10	3600	1200	47.2	2500	500	19.7	0.30	2.00

Depth of cut



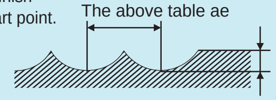
1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.



SOLID END MILLS

Overhang 7D (D is end mill diameter)

Work material	Alloy steel, Pre-hardened steel (–45HRC) AISI P20, AISI 420					Hardened steel (45–55HRC) AISI H13, AISI 420				
PRFRAD (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
R 1.5x3	16000	2000	78.7	0.10	0.30	13000	1500	59.1	0.10	0.30
R 2x4	13000	2000	78.7	0.15	0.50	10000	1500	59.1	0.15	0.50
R 3	10000	2000	78.7	0.20	1.00	8000	1600	63.0	0.20	0.80
R 4	8000	1800	70.9	0.30	1.50	6400	1400	55.1	0.30	1.20
R 5	6000	1600	63.0	0.40	2.00	4800	1200	47.2	0.40	1.60
R 6	5000	1300	51.2	0.45	2.40	4000	1000	39.4	0.45	2.00
R 8	3800	1000	39.4	0.60	3.00	3100	800	31.5	0.60	2.50
R10	3000	800	31.5	0.80	4.00	2500	650	25.6	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.									



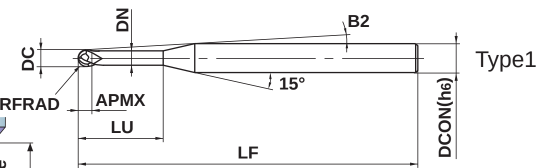
1) The cutting conditions above are a starting reference point only for end mills which outer diameter is the same as the shank diameter.
2) If the rigidity of the machine or the work piece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate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

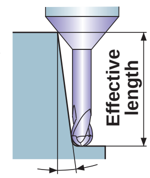
VF2XLBS

Ball nose, Long neck, 2 flute, Short shank

UWC VF 30°

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





0.2≤PRFRAD≤1				
±0.007				
0.4≤DC≤2				
0 - 0.02				
DCON=4				
0 - 0.005				

- 2 flute long neck ball nose end mill for high-speed machining of hardened steel.
- Short shank type suitable for use with a shrink fit holder.

Unit : mm

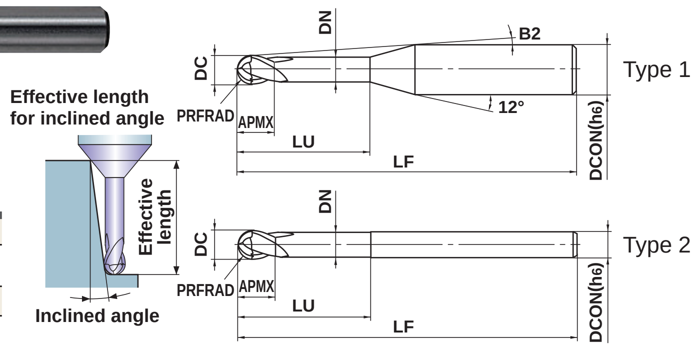
Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF2XLBSR0020N010	0.2	0.4	0.32	1	0.36	13.4°	40	4	2	●	1	1.0	1.0	1.1	1.2
VF2XLBSR0020N020	0.2	0.4	0.32	2	0.36	11.9°	40	4	2	●	1	2.0	2.1	2.3	2.5
VF2XLBSR0020N030	0.2	0.4	0.32	3	0.36	10.7°	40	4	2	●	1	3.1	3.2	3.4	3.7
VF2XLBSR0020N040	0.2	0.4	0.32	4	0.36	9.7°	40	4	2	●	1	4.1	4.3	4.6	4.9
VF2XLBSR0025N040	0.25	0.5	0.4	4	0.46	9.6°	40	4	2	●	1	4.1	4.3	4.6	4.9
VF2XLBSR0025N060	0.25	0.5	0.4	6	0.46	8.1°	40	4	2	●	1	6.2	6.4	6.9	7.4
VF2XLBSR0030N020	0.3	0.6	0.48	2	0.56	11.8°	40	4	2	●	1	2.1	2.2	2.3	2.5
VF2XLBSR0030N030	0.3	0.6	0.48	3	0.56	10.5°	40	4	2	●	1	3.1	3.3	3.5	3.8
VF2XLBSR0030N040	0.3	0.6	0.48	4	0.56	9.5°	40	4	2	●	1	4.2	4.3	4.6	5.0
VF2XLBSR0030N060	0.3	0.6	0.48	6	0.56	8.0°	40	4	2	●	1	6.3	6.5	6.9	7.5
VF2XLBSR0040N040	0.4	0.8	0.64	4	0.76	9.4°	40	4	2	●	1	4.2	4.3	4.6	5.0
VF2XLBSR0040N060	0.4	0.8	0.64	6	0.76	7.8°	40	4	2	●	1	6.3	6.5	6.9	7.5
VF2XLBSR0050N030	0.5	1	0.8	3	0.94	10.1°	40	4	2	●	1	3.2	3.3	3.6	3.9
VF2XLBSR0050N040	0.5	1	0.8	4	0.94	9.1°	40	4	2	●	1	4.2	4.4	4.8	5.2
VF2XLBSR0050N060	0.5	1	0.8	6	0.94	7.5°	40	4	2	●	1	6.3	6.6	7.1	7.7
VF2XLBSR0050N080	0.5	1	0.8	8	0.94	6.4°	40	4	2	●	1	8.4	8.8	9.4	10.2
VF2XLBSR0100N060	1	2	1.6	6	1.9	6.4°	40	4	2	●	1	6.2	6.5	6.9	7.4
VF2XLBSR0100N080	1	2	1.6	8	1.9	5.3°	40	4	2	●	1	8.3	8.7	9.2	9.9
VF2XLBSR0100N100	1	2	1.6	10	1.9	4.5°	40	4	2	●	1	10.4	10.8	11.5	12.4

●: Inventory maintained.

VF2XLB

Ball nose, Long neck, 2 flute, For hardened materials

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
○	◎	◎	◎		○		



R	PRFRAD≤1	PRFRAD>1		
	±0.007	±0.010		
	0.2≤DC≤6			
	0 - 0.02			
h5	4≤DCON≤6			
	0 - 0.005			

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

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF2XLBR0010N005S04	0.1	0.2	0.16	0.5	0.17	11.5°	50	4	2	●	1	0.5	0.5	0.6	0.6
VF2XLBR0010N005S06	0.1	0.2	0.16	0.5	0.17	11.7°	50	6	2	●	1	0.5	0.5	0.6	0.6
VF2XLBR0010N008S04	0.1	0.2	0.16	0.75	0.17	11.2°	50	4	2	●	1	0.7	0.8	0.9	1.0
VF2XLBR0010N010S04	0.1	0.2	0.16	1	0.17	10.9°	50	4	2	●	1	1.0	1.1	1.2	1.3
VF2XLBR0010N010S06	0.1	0.2	0.16	1	0.17	11.3°	50	6	2	●	1	1.0	1.1	1.2	1.3
VF2XLBR0010N013S04	0.1	0.2	0.16	1.25	0.17	10.7°	50	4	2	●	1	1.3	1.3	1.5	1.6
VF2XLBR0010N015S04	0.1	0.2	0.16	1.5	0.17	10.4°	50	4	2	●	1	1.5	1.6	1.8	2.0
VF2XLBR0010N015S06	0.1	0.2	0.16	1.5	0.17	10.9°	50	6	2	●	1	1.5	1.6	1.8	2.0
VF2XLBR0010N018S04	0.1	0.2	0.16	1.75	0.17	10.2°	50	4	2	●	1	1.8	1.9	2.1	2.3
VF2XLBR0010N020S04	0.1	0.2	0.16	2	0.17	10°	50	4	2	●	1	2.1	2.2	2.4	2.6
VF2XLBR0010N025S04	0.1	0.2	0.16	2.5	0.17	9.5°	50	4	2	●	1	2.6	2.7	3.0	3.3
VF2XLBR0015N010S04	0.15	0.3	0.24	1	0.27	11°	50	4	2	●	1	1.0	1.1	1.2	1.3
VF2XLBR0015N010S06	0.15	0.3	0.24	1	0.27	11.3°	50	6	2	●	1	1.0	1.1	1.2	1.3
VF2XLBR0015N013S04	0.15	0.3	0.24	1.25	0.27	10.7°	50	4	2	●	1	1.3	1.3	1.5	1.6
VF2XLBR0015N015S04	0.15	0.3	0.24	1.5	0.27	10.4°	50	4	2	●	1	1.5	1.6	1.8	1.9
VF2XLBR0015N015S06	0.15	0.3	0.24	1.5	0.27	10.9°	50	6	2	●	1	1.5	1.6	1.8	1.9
VF2XLBR0015N018S04	0.15	0.3	0.24	1.75	0.27	10.2°	50	4	2	●	1	1.8	1.9	2.1	2.3
VF2XLBR0015N020S04	0.15	0.3	0.24	2	0.27	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
VF2XLBR0015N020S06	0.15	0.3	0.24	2	0.27	10.6°	50	6	2	●	1	2.1	2.2	2.4	2.6
VF2XLBR0015N025S04	0.15	0.3	0.24	2.5	0.27	9.5°	50	4	2	●	1	2.6	2.7	3.0	3.3
VF2XLBR0015N030S04	0.15	0.3	0.24	3	0.27	9.1°	50	4	2	●	1	3.1	3.2	3.6	3.9
VF2XLBR0015N040S04	0.15	0.3	0.24	4	0.27	8.4°	50	4	2	●	1	4.2	4.3	4.8	5.3
VF2XLBR0020N010S04	0.2	0.4	0.32	1	0.36	11°	50	4	2	●	1	1.0	1.0	1.1	1.2
VF2XLBR0020N010S06	0.2	0.4	0.32	1	0.36	11.3°	50	6	2	●	1	1.0	1.0	1.1	1.2
VF2XLBR0020N015S04	0.2	0.4	0.32	1.5	0.36	10.4°	50	4	2	●	1	1.5	1.6	1.7	1.9
VF2XLBR0020N015S06	0.2	0.4	0.32	1.5	0.36	11°	50	6	2	●	1	1.5	1.6	1.7	1.9
VF2XLBR0020N020S04	0.2	0.4	0.32	2	0.36	10°	50	4	2	●	1	2.0	2.1	2.3	2.6
VF2XLBR0020N020S06	0.2	0.4	0.32	2	0.36	10.6°	50	6	2	●	1	2.0	2.1	2.3	2.6
VF2XLBR0020N025S04	0.2	0.4	0.32	2.5	0.36	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.2
VF2XLBR0020N025S06	0.2	0.4	0.32	2.5	0.36	10.3°	50	6	2	●	1	2.6	2.7	2.9	3.2
VF2XLBR0020N030S04	0.2	0.4	0.32	3	0.36	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9

VF2XLB

Ball nose, Long neck, 2 flute, For hardened materials

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VF2XLBR0020N030S06	0.2	0.4	0.32	3	0.36	10°	50	6	2	●	1	3.1	3.2	3.5	3.9
VF2XLBR0020N040S04	0.2	0.4	0.32	4	0.36	8.4°	50	4	2	●	1	4.1	4.3	4.7	5.2
VF2XLBR0020N050S04	0.2	0.4	0.32	5	0.36	7.8°	50	4	2	●	1	5.2	5.4	5.9	6.6
VF2XLBR0025N015S04	0.25	0.5	0.4	1.5	0.46	10.5°	50	4	2	●	1	1.5	1.6	1.7	1.9
VF2XLBR0025N015S06	0.25	0.5	0.4	1.5	0.46	11°	50	6	2	●	1	1.5	1.6	1.7	1.9
VF2XLBR0025N020S04	0.25	0.5	0.4	2	0.46	10°	50	4	2	●	1	2.0	2.1	2.3	2.6
VF2XLBR0025N020S06	0.25	0.5	0.4	2	0.46	10.6°	50	6	2	●	1	2.0	2.1	2.3	2.6
VF2XLBR0025N025S04	0.25	0.5	0.4	2.5	0.46	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.2
VF2XLBR0025N030S04	0.25	0.5	0.4	3	0.46	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9
VF2XLBR0025N030S06	0.25	0.5	0.4	3	0.46	10°	50	6	2	●	1	3.1	3.2	3.5	3.9
VF2XLBR0025N035S04	0.25	0.5	0.4	3.5	0.46	8.7°	50	4	2	●	1	3.6	3.8	4.1	4.5
VF2XLBR0025N040S04	0.25	0.5	0.4	4	0.46	8.3°	50	4	2	●	1	4.1	4.3	4.7	5.2
VF2XLBR0025N040S06	0.25	0.5	0.4	4	0.46	9.4°	50	6	2	●	1	4.1	4.3	4.7	5.2
VF2XLBR0025N050S04	0.25	0.5	0.4	5	0.46	7.7°	50	4	2	●	1	5.2	5.4	5.9	6.5
VF2XLBR0025N050S06	0.25	0.5	0.4	5	0.46	8.9°	50	6	2	●	1	5.2	5.4	5.9	6.5
VF2XLBR0025N060S04	0.25	0.5	0.4	6	0.46	7.2°	50	4	2	●	1	6.2	6.5	7.1	7.9
VF2XLBR0025N060S06	0.25	0.5	0.4	6	0.46	8.4°	60	6	2	●	1	6.2	6.5	7.1	7.9
VF2XLBR0030N020S04	0.3	0.6	0.48	2	0.56	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
VF2XLBR0030N020S06	0.3	0.6	0.48	2	0.56	10.6°	50	6	2	●	1	2.1	2.2	2.4	2.6
VF2XLBR0030N025S04	0.3	0.6	0.48	2.5	0.56	9.4°	50	4	2	●	1	2.6	2.7	3.0	3.3
VF2XLBR0030N030S04	0.3	0.6	0.48	3	0.56	9°	50	4	2	●	1	3.1	3.3	3.6	3.9
VF2XLBR0030N030S06	0.3	0.6	0.48	3	0.56	9.9°	50	6	2	●	1	3.1	3.3	3.6	3.9
VF2XLBR0030N035S04	0.3	0.6	0.48	3.5	0.56	8.6°	50	4	2	●	1	3.6	3.8	4.2	4.6
VF2XLBR0030N040S04	0.3	0.6	0.48	4	0.56	8.3°	50	4	2	●	1	4.2	4.4	4.8	5.2
VF2XLBR0030N040S06	0.3	0.6	0.48	4	0.56	9.3°	50	6	2	●	1	4.2	4.4	4.8	5.2
VF2XLBR0030N050S04	0.3	0.6	0.48	5	0.56	7.6°	50	4	2	●	1	5.2	5.4	6.0	6.6
VF2XLBR0030N050S06	0.3	0.6	0.48	5	0.56	8.8°	50	6	2	●	1	5.2	5.4	6.0	6.6
VF2XLBR0030N060S04	0.3	0.6	0.48	6	0.56	7.1°	50	4	2	●	1	6.3	6.5	7.1	7.9
VF2XLBR0030N060S06	0.3	0.6	0.48	6	0.56	8.4°	50	6	2	●	1	6.3	6.5	7.1	7.9
VF2XLBR0030N070S04	0.3	0.6	0.48	7	0.56	6.6°	50	4	2	●	1	7.3	7.6	8.3	9.2
VF2XLBR0030N080S04	0.3	0.6	0.48	8	0.56	6.2°	50	4	2	●	1	8.3	8.7	9.5	10.6
VF2XLBR0030N080S06	0.3	0.6	0.48	8	0.56	7.6°	60	6	2	●	1	8.3	8.7	9.5	10.6
VF2XLBR0040N020S04	0.4	0.8	0.64	2	0.76	9.9°	50	4	2	●	1	2.1	2.2	2.3	2.6
VF2XLBR0040N020S06	0.4	0.8	0.64	2	0.76	10.6°	50	6	2	●	1	2.1	2.2	2.3	2.6
VF2XLBR0040N030S04	0.4	0.8	0.64	3	0.76	8.9°	50	4	2	●	1	3.1	3.3	3.5	3.9
VF2XLBR0040N030S06	0.4	0.8	0.64	3	0.76	9.9°	50	6	2	●	1	3.1	3.3	3.5	3.9
VF2XLBR0040N040S04	0.4	0.8	0.64	4	0.76	8.2°	50	4	2	●	1	4.2	4.3	4.7	5.2
VF2XLBR0040N040S06	0.4	0.8	0.64	4	0.76	9.3°	50	6	2	●	1	4.2	4.3	4.7	5.2
VF2XLBR0040N050S04	0.4	0.8	0.64	5	0.76	7.5°	50	4	2	●	1	5.2	5.4	5.9	6.5
VF2XLBR0040N060S04	0.4	0.8	0.64	6	0.76	7°	50	4	2	●	1	6.3	6.5	7.1	7.9
VF2XLBR0040N060S06	0.4	0.8	0.64	6	0.76	8.3°	50	6	2	●	1	6.3	6.5	7.1	7.9
VF2XLBR0040N070S04	0.4	0.8	0.64	7	0.76	6.5°	50	4	2	●	1	7.3	7.6	8.3	9.2
VF2XLBR0040N080S04	0.4	0.8	0.64	8	0.76	6.1°	50	4	2	●	1	8.3	8.7	9.5	10.5
VF2XLBR0040N080S06	0.4	0.8	0.64	8	0.76	7.5°	50	6	2	●	1	8.3	8.7	9.5	10.5
VF2XLBR0040N100S04	0.4	0.8	0.64	10	0.76	5.4°	50	4	2	●	1	10.4	10.9	11.9	13.2
VF2XLBR0040N100S06	0.4	0.8	0.64	10	0.76	6.8°	60	6	2	●	1	10.4	10.9	11.9	13.2
VF2XLBR0050N030S04	0.5	1	0.8	3	0.94	8.8°	50	4	2	●	1	3.2	3.3	3.6	4.0
VF2XLBR0050N030S06	0.5	1	0.8	3	0.94	9.8°	50	6	2	●	1	3.2	3.3	3.6	4.0
VF2XLBR0050N040S04	0.5	1	0.8	4	0.94	8°	50	4	2	●	1	4.2	4.4	4.8	5.3
VF2XLBR0050N040S06	0.5	1	0.8	4	0.94	9.2°	50	6	2	●	1	4.2	4.4	4.8	5.3
VF2XLBR0050N050S04	0.5	1	0.8	5	0.94	7.3°	50	4	2	●	1	5.3	5.5	6.0	6.7

●: Inventory maintained. ★: Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VF2XLBR0050N050S06	0.5	1	0.8	5	0.94	8.7°	50	6	2	●	1	5.3	5.5	6.0	6.7
VF2XLBR0050N060S04	0.5	1	0.8	6	0.94	6.8°	50	4	2	●	1	6.3	6.6	7.2	8.0
VF2XLBR0050N060S06	0.5	1	0.8	6	0.94	8.2°	50	6	2	●	1	6.3	6.6	7.2	8.0
VF2XLBR0050N070S04	0.5	1	0.8	7	0.94	6.3°	50	4	2	●	1	7.4	7.7	8.4	9.3
VF2XLBR0050N080S04	0.5	1	0.8	8	0.94	5.9°	50	4	2	●	1	8.4	8.8	9.6	10.6
VF2XLBR0050N080S06	0.5	1	0.8	8	0.94	7.4°	50	6	2	●	1	8.4	8.8	9.6	10.6
VF2XLBR0050N090S04	0.5	1	0.8	9	0.94	5.5°	50	4	2	●	1	9.5	9.9	10.8	12.0
VF2XLBR0050N100S04	0.5	1	0.8	10	0.94	5.2°	50	4	2	●	1	10.5	11.0	12.0	13.3
VF2XLBR0050N100S06	0.5	1	0.8	10	0.94	6.7°	50	6	2	●	1	10.5	11.0	12.0	13.3
VF2XLBR0050N120S04	0.5	1	0.8	12	0.94	4.6°	50	4	2	●	1	12.6	13.2	14.4	15.9
VF2XLBR0050N120S06	0.5	1	0.8	12	0.94	6.1°	60	6	2	●	1	12.6	13.2	14.4	15.9
VF2XLBR0050N140S04	0.5	1	0.8	14	0.94	4.2°	60	4	2	●	1	14.7	15.3	16.8	18.6
VF2XLBR0050N160S04	0.5	1	0.8	16	0.94	3.8°	60	4	2	●	1	16.8	17.5	19.2	21.3
VF2XLBR0050N160S06	0.5	1	0.8	16	0.94	5.3°	70	6	2	●	1	16.8	17.5	19.2	21.3
VF2XLBR0050N180S04	0.5	1	0.8	18	0.94	3.5°	60	4	2	●	1	18.9	19.7	21.6	23.9
VF2XLBR0050N200S04	0.5	1	0.8	20	0.94	3.3°	60	4	2	●	1	21.0	21.9	24.0	26.6
VF2XLBR0050N200S06	0.5	1	0.8	20	0.94	4.6°	70	6	2	●	1	21.0	21.9	24.0	26.6
VF2XLBR0060N060S04	0.6	1.2	0.96	6	1.14	6.6°	50	4	2	★	1	6.3	6.6	7.2	8.0
VF2XLBR0060N060S06	0.6	1.2	0.96	6	1.14	8.1°	50	6	2	★	1	6.3	6.6	7.2	8.0
VF2XLBR0060N080S04	0.6	1.2	0.96	8	1.14	5.7°	50	4	2	★	1	8.4	8.8	9.6	10.6
VF2XLBR0060N080S06	0.6	1.2	0.96	8	1.14	7.3°	50	6	2	★	1	8.4	8.8	9.6	10.6
VF2XLBR0060N100S04	0.6	1.2	0.96	10	1.14	5°	50	4	2	★	1	10.5	11.0	12.0	13.3
VF2XLBR0060N100S06	0.6	1.2	0.96	10	1.14	6.6°	50	6	2	★	1	10.5	11.0	12.0	13.3
VF2XLBR0060N120S04	0.6	1.2	0.96	12	1.14	4.5°	50	4	2	★	1	12.6	13.2	14.4	15.9
VF2XLBR0060N120S06	0.6	1.2	0.96	12	1.14	6°	50	6	2	★	1	12.6	13.2	14.4	15.9
VF2XLBR0060N140S04	0.6	1.2	0.96	14	1.14	4°	60	4	2	★	1	14.7	15.3	16.8	18.6
VF2XLBR0060N160S04	0.6	1.2	0.96	16	1.14	3.7°	60	4	2	★	1	16.8	17.5	19.2	21.2
VF2XLBR0060N160S06	0.6	1.2	0.96	16	1.14	5.2°	70	6	2	★	1	16.8	17.5	19.2	21.2
VF2XLBR0070N080S04	0.7	1.4	1.12	8	1.34	5.5°	50	4	2	★	1	8.4	8.8	9.6	10.6
VF2XLBR0070N120S04	0.7	1.4	1.12	12	1.34	4.3°	50	4	2	★	1	12.6	13.1	14.4	15.9
VF2XLBR0070N160S04	0.7	1.4	1.12	16	1.34	3.5°	60	4	2	★	1	16.8	17.5	19.2	21.2
VF2XLBR0075N060S04	0.75	1.5	1.2	6	1.44	6.3°	50	4	2	●	1	6.3	6.6	7.2	7.9
VF2XLBR0075N060S06	0.75	1.5	1.2	6	1.44	8°	50	6	2	●	1	6.3	6.6	7.2	7.9
VF2XLBR0075N080S04	0.75	1.5	1.2	8	1.44	5.4°	50	4	2	●	1	8.4	8.8	9.6	10.6
VF2XLBR0075N080S06	0.75	1.5	1.2	8	1.44	7.2°	50	6	2	●	1	8.4	8.8	9.6	10.6
VF2XLBR0075N100S04	0.75	1.5	1.2	10	1.44	4.7°	50	4	2	●	1	10.5	11.0	12.0	13.2
VF2XLBR0075N100S06	0.75	1.5	1.2	10	1.44	6.5°	50	6	2	●	1	10.5	11.0	12.0	13.2
VF2XLBR0075N120S04	0.75	1.5	1.2	12	1.44	4.2°	50	4	2	●	1	12.6	13.1	14.4	15.9
VF2XLBR0075N120S06	0.75	1.5	1.2	12	1.44	5.9°	50	6	2	●	1	12.6	13.1	14.4	15.9
VF2XLBR0075N140S04	0.75	1.5	1.2	14	1.44	3.8°	50	4	2	●	1	14.7	15.3	16.8	18.5
VF2XLBR0075N140S06	0.75	1.5	1.2	14	1.44	5.4°	50	6	2	●	1	14.7	15.3	16.8	18.5
VF2XLBR0075N160S04	0.75	1.5	1.2	16	1.44	3.4°	60	4	2	●	1	16.8	17.5	19.2	21.2
VF2XLBR0075N160S06	0.75	1.5	1.2	16	1.44	5°	60	6	2	●	1	16.8	17.5	19.2	21.2
VF2XLBR0075N180S04	0.75	1.5	1.2	18	1.44	3.1°	60	4	2	●	1	18.9	19.7	21.6	23.8
VF2XLBR0075N200S04	0.75	1.5	1.2	20	1.44	2.9°	60	4	2	●	1	21.0	21.9	23.9	*
VF2XLBR0075N200S06	0.75	1.5	1.2	20	1.44	4.3°	70	6	2	●	1	21.0	21.9	23.9	26.5
VF2XLBR0080N080S04	0.8	1.6	1.28	8	1.54	5.3°	50	4	2	★	1	8.4	8.8	9.6	10.5
VF2XLBR0080N120S04	0.8	1.6	1.28	12	1.54	4.1°	50	4	2	★	1	12.6	13.1	14.4	15.9
VF2XLBR0080N160S04	0.8	1.6	1.28	16	1.54	3.3°	60	4	2	★	1	16.8	17.5	19.1	21.2
VF2XLBR0080N200S04	0.8	1.6	1.28	20	1.54	2.8°	60	4	2	★	1	21.0	21.9	23.9	*
VF2XLBR0090N080S04	0.9	1.8	1.44	8	1.74	5.1°	50	4	2	★	1	8.4	8.8	9.6	10.5

* No interference

VF2XLB

Ball nose, Long neck, 2 flute, For hardened materials

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VF2XLBR0090N120S04	0.9	1.8	1.44	12	1.74	3.9°	50	4	2	★	1	12.6	13.1	14.3	15.8
VF2XLBR0090N160S04	0.9	1.8	1.44	16	1.74	3.1°	60	4	2	★	1	16.8	17.5	19.1	21.1
VF2XLBR0090N200S04	0.9	1.8	1.44	20	1.74	2.6°	60	4	2	★	1	20.9	21.8	23.9	⋆
VF2XLBR0100N060S04	1	2	1.6	6	1.9	5.8°	50	4	2	●	1	6.2	6.5	7.0	7.7
VF2XLBR0100N060S06	1	2	1.6	6	1.9	7.9°	50	6	2	●	1	6.2	6.5	7.0	7.7
VF2XLBR0100N080S04	1	2	1.6	8	1.9	4.9°	50	4	2	●	1	8.3	8.7	9.4	10.4
VF2XLBR0100N080S06	1	2	1.6	8	1.9	6.9°	50	6	2	●	1	8.3	8.7	9.4	10.4
VF2XLBR0100N100S04	1	2	1.6	10	1.9	4.2°	50	4	2	●	1	10.4	10.9	11.8	13.0
VF2XLBR0100N100S06	1	2	1.6	10	1.9	6.2°	50	6	2	●	1	10.4	10.9	11.8	13.0
VF2XLBR0100N120S04	1	2	1.6	12	1.9	3.7°	50	4	2	●	1	12.5	13.0	14.2	15.7
VF2XLBR0100N120S06	1	2	1.6	12	1.9	5.6°	50	6	2	●	1	12.5	13.0	14.2	15.7
VF2XLBR0100N140S04	1	2	1.6	14	1.9	3.3°	50	4	2	●	1	14.6	15.2	16.6	18.3
VF2XLBR0100N140S06	1	2	1.6	14	1.9	5.1°	50	6	2	●	1	14.6	15.2	16.6	18.3
VF2XLBR0100N160S04	1	2	1.6	16	1.9	2.9°	60	4	2	●	1	16.7	17.4	19.0	⋆
VF2XLBR0100N160S06	1	2	1.6	16	1.9	4.7°	60	6	2	●	1	16.7	17.4	19.0	21.0
VF2XLBR0100N180S04	1	2	1.6	18	1.9	2.7°	60	4	2	●	1	18.8	19.6	21.4	⋆
VF2XLBR0100N180S06	1	2	1.6	18	1.9	4.4°	60	6	2	●	1	18.8	19.6	21.4	23.6
VF2XLBR0100N200S04	1	2	1.6	20	1.9	2.5°	60	4	2	●	1	20.9	21.8	23.8	⋆
VF2XLBR0100N200S06	1	2	1.6	20	1.9	4.1°	60	6	2	●	1	20.9	21.8	23.8	26.3
VF2XLBR0100N220S04	1	2	1.6	22	1.9	2.3°	60	4	2	●	1	22.9	23.9	26.2	⋆
VF2XLBR0100N250S04	1	2	1.6	25	1.9	2°	70	4	2	★	1	26.1	27.2	⋆	⋆
VF2XLBR0100N250S06	1	2	1.6	25	1.9	3.5°	70	6	2	★	1	26.1	27.2	29.8	32.9
VF2XLBR0100N300S04	1	2	1.6	30	1.9	1.7°	70	4	2	★	1	31.3	32.6	⋆	⋆
VF2XLBR0100N300S06	1	2	1.6	30	1.9	3°	80	6	2	★	1	31.3	32.6	35.8	⋆
VF2XLBR0100N350S04	1	2	1.6	35	1.9	1.5°	80	4	2	★	1	36.5	38.1	⋆	⋆
VF2XLBR0125N100S06	1.25	2.5	2	10	2.4	5.9°	60	6	2	★	1	10.4	10.8	11.8	12.9
VF2XLBR0125N150S06	1.25	2.5	2	15	2.4	4.6°	60	6	2	★	1	15.6	16.3	17.8	19.6
VF2XLBR0125N200S06	1.25	2.5	2	20	2.4	3.7°	70	6	2	★	1	20.8	21.7	23.8	26.2
VF2XLBR0125N250S06	1.25	2.5	2	25	2.4	3.2°	70	6	2	★	1	26.1	27.2	29.7	32.9
VF2XLBR0125N300S06	1.25	2.5	2	30	2.4	2.8°	80	6	2	★	1	31.3	32.6	35.7	⋆
VF2XLBR0125N350S06	1.25	2.5	2	35	2.4	2.4°	80	6	2	★	1	36.5	38.1	41.7	⋆
VF2XLBR0150N080S06	1.5	3	2.4	8	2.9	6.3°	60	6	2	●	1	8.3	8.6	9.3	10.2
VF2XLBR0150N100S06	1.5	3	2.4	10	2.9	5.5°	60	6	2	●	1	10.4	10.8	11.7	12.9
VF2XLBR0150N120S06	1.5	3	2.4	12	2.9	4.9°	60	6	2	●	1	12.5	13.0	14.1	15.5
VF2XLBR0150N140S06	1.5	3	2.4	14	2.9	4.4°	60	6	2	●	1	14.6	15.2	16.5	18.2
VF2XLBR0150N160S06	1.5	3	2.4	16	2.9	4°	60	6	2	●	1	16.7	17.3	18.9	20.8
VF2XLBR0150N200S06	1.5	3	2.4	20	2.9	3.4°	70	6	2	●	1	20.8	21.7	23.7	26.1
VF2XLBR0150N250S06	1.5	3	2.4	25	2.9	2.8°	70	6	2	●	1	26.1	27.2	29.7	⋆
VF2XLBR0150N300S06	1.5	3	2.4	30	2.9	2.5°	70	6	2	●	1	31.3	32.6	35.7	⋆
VF2XLBR0150N350S06	1.5	3	2.4	35	2.9	2.2°	80	6	2	●	1	36.5	38.0	41.7	⋆
VF2XLBR0150N400S06	1.5	3	2.4	40	2.9	1.9°	90	6	2	●	1	41.7	43.5	⋆	⋆
VF2XLBR0175N160S06	1.75	3.5	2.8	16	3.4	3.6°	60	6	2	★	1	16.7	17.3	18.9	20.8
VF2XLBR0175N200S06	1.75	3.5	2.8	20	3.4	3°	70	6	2	★	1	20.8	21.7	23.7	⋆
VF2XLBR0175N250S06	1.75	3.5	2.8	25	3.4	2.5°	70	6	2	★	1	26.0	27.1	29.6	⋆
VF2XLBR0175N300S06	1.75	3.5	2.8	30	3.4	2.1°	80	6	2	★	1	31.3	32.6	35.6	⋆
VF2XLBR0175N350S06	1.75	3.5	2.8	35	3.4	1.9°	80	6	2	★	1	36.5	38.0	⋆	⋆
VF2XLBR0175N400S06	1.75	3.5	2.8	40	3.4	1.7°	90	6	2	★	1	41.7	43.5	⋆	⋆
VF2XLBR0200N100S06	2	4	3.2	10	3.9	4.5°	70	6	2	●	1	10.4	10.8	11.6	12.7
VF2XLBR0200N120S06	2	4	3.2	12	3.9	3.9°	70	6	2	●	1	12.5	12.9	14.0	15.4
VF2XLBR0200N140S06	2	4	3.2	14	3.9	3.4°	70	6	2	●	1	14.6	15.1	16.4	18.0
VF2XLBR0200N160S06	2	4	3.2	16	3.9	3.1°	70	6	2	●	1	16.6	17.3	18.8	20.7

⋆ No interference

●: Inventory maintained. ★: Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VF2XLBR0200N200S06	2	4	3.2	20	3.9	2.6°	70	6	2	●	1	20.8	21.7	23.6	⁎
VF2XLB**R0200N250S06**	2	4	3.2	25	3.9	2.1°	70	6	2	●	1	26.0	27.1	29.6	⁎
VF2XLB**R0200N300S06**	2	4	3.2	30	3.9	1.8°	70	6	2	●	1	31.2	32.6	⁎	⁎
VF2XLB**R0200N350S06**	2	4	3.2	35	3.9	1.6°	80	6	2	●	1	36.5	38.0	⁎	⁎
VF2XLB**R0200N400S06**	2	4	3.2	40	3.9	1.4°	90	6	2	★	1	41.7	43.5	⁎	⁎
VF2XLB**R0200N450S06**	2	4	3.2	45	3.9	1.2°	90	6	2	★	1	46.9	48.9	⁎	⁎
VF2XLB**R0200N500S06**	2	4	3.2	50	3.9	1.1°	100	6	2	★	1	52.1	54.3	⁎	⁎
VF2XLB**R0250N200S06**	2.5	5	4	20	4.9	1.5°	70	6	2	●	1	20.8	21.6	⁎	⁎
VF2XLB**R0250N250S06**	2.5	5	4	25	4.9	1.2°	70	6	2	●	1	26.0	27.1	⁎	⁎
VF2XLB**R0250N300S06**	2.5	5	4	30	4.9	1°	80	6	2	●	1	31.2	⁎	⁎	⁎
VF2XLB**R0250N350S06**	2.5	5	4	35	4.9	0.9°	80	6	2	★	1	36.4	⁎	⁎	⁎
VF2XLB**R0300N300S06**	3	6	4.8	30	5.85	—	80	6	2	●	2	⁎	⁎	⁎	⁎
VF2XLB**R0300N400S06**	3	6	4.8	40	5.85	—	90	6	2	●	2	⁎	⁎	⁎	⁎
VF2XLB**R0300N500S06**	3	6	4.8	50	5.85	—	100	6	2	●	2	⁎	⁎	⁎	⁎

⁎ No interference

VF2XLBS
Ball nose, Long neck, 2 flute, Short shank

VF2XLB
Ball nose, Long neck, 2 flute, For hardened materials

CARBIDE

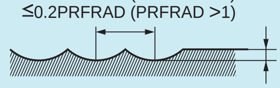
RECOMMENDED CUTTING CONDITIONS

Work material		Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
PRFRAD (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)
R 0.1	0.5	40000	300	11.8	0.003	40000	300	11.8	0.002
	1	40000	300	11.8	0.002	40000	300	11.8	0.002
	1.5	40000	300	11.8	0.001	40000	200	7.9	0.001
	2	40000	200	7.9	0.001	40000	100	3.9	0.001
	2.5	40000	100	3.9	0.001	40000	60	2.4	0.001
R 0.15	1	40000	500	19.7	0.007	40000	500	19.7	0.005
	1.5	40000	500	19.7	0.005	40000	500	19.7	0.003
	2	40000	500	19.7	0.003	40000	500	19.7	0.002
	2.5	40000	400	15.7	0.003	40000	400	15.7	0.002
	3	40000	300	11.8	0.002	40000	300	11.8	0.001
	4	30000	200	7.9	0.002	30000	200	7.9	0.001
R 0.2	1	40000	1400	55.1	0.015	40000	1400	55.1	0.01
	1.5	40000	1000	39.4	0.01	40000	1000	39.4	0.006
	2	40000	1000	39.4	0.01	40000	1000	39.4	0.006
	2.5	40000	700	27.6	0.005	40000	700	27.6	0.003
	3	40000	700	27.6	0.005	40000	700	27.6	0.003
	4	40000	600	23.6	0.004	40000	500	19.7	0.003
	5	40000	400	15.7	0.003	40000	300	11.8	0.002
R 0.25	1.5	40000	2000	78.7	0.02	40000	2000	78.7	0.015
	2	40000	2000	78.7	0.02	40000	2000	78.7	0.015
	3	40000	1200	47.2	0.015	40000	1200	47.2	0.01
	4	36000	900	35.4	0.01	36000	900	35.4	0.007
	5	36000	700	27.6	0.007	36000	600	23.6	0.005
	6	36000	600	23.6	0.006	36000	500	19.7	0.004
R 0.3	2	40000	2800	110.2	0.03	40000	2800	110.2	0.02
	3	40000	2800	110.2	0.03	40000	2800	110.2	0.02
	4	35000	2000	78.7	0.02	35000	2000	78.7	0.015
	5	30000	1000	39.4	0.01	30000	1000	39.4	0.007
	6	30000	800	31.5	0.008	30000	800	31.5	0.005
	7	30000	600	23.6	0.008	30000	600	23.6	0.005
	8	25000	400	15.7	0.006	25000	400	15.7	0.004
R 0.4	2	40000	3500	137.8	0.04	40000	3500	137.8	0.03
	3	40000	3000	118.1	0.04	40000	3000	118.1	0.03
	4	40000	3000	118.1	0.02	40000	3000	118.1	0.015
	6	30000	1600	63.0	0.02	30000	1600	63.0	0.01
	8	25000	1000	39.4	0.01	25000	1000	39.4	0.007
	10	25000	600	23.6	0.008	25000	600	23.6	0.005
R 0.5	3	40000	4000	157.5	0.05	40000	4000	157.5	0.04
	4	40000	4000	157.5	0.05	40000	4000	157.5	0.04
	5	40000	3000	118.1	0.03	40000	3000	118.1	0.02
	6	35000	2000	78.7	0.03	35000	2000	78.7	0.02
	8	30000	1600	63.0	0.02	30000	1600	63.0	0.01
	10	20000	1000	39.4	0.01	20000	1000	39.4	0.01
	12	20000	1000	39.4	0.01	18000	800	31.5	0.008
	14	18000	600	23.6	0.008	18000	480	18.9	0.008
	16	18000	500	19.7	0.008	18000	400	15.7	0.006
	18	13000	300	11.8	0.005	13000	240	9.4	0.004
	20	13000	250	9.8	0.005	13000	200	7.9	0.004
R 0.6	6	40000	4000	157.5	0.05	35000	3500	137.8	0.04
	8	40000	3000	118.1	0.05	27000	2000	78.7	0.04
	10	27000	1900	74.8	0.03	24000	1700	66.9	0.02
	12	16000	1100	43.3	0.02	16000	1000	39.4	0.01
	14	16000	850	33.5	0.01	16000	780	30.7	0.01
	16	15000	500	19.7	0.01	14000	400	15.7	0.006
R 0.7	8	40000	4500	177.2	0.06	28000	3200	126.0	0.05
	12	32000	3000	118.1	0.03	19000	1800	70.9	0.02
	16	15000	1000	39.4	0.02	14000	800	31.5	0.01
R 0.75	6	40000	5000	196.9	0.07	32000	4000	157.5	0.06
	8	40000	5000	196.9	0.07	28000	3500	137.8	0.06
	10	40000	4500	117.2	0.06	21000	2400	94.5	0.04
	12	32000	3400	133.9	0.04	19000	2000	78.7	0.03
	14	16000	1500	59.1	0.04	13000	1200	47.2	0.03
	16	13000	1200	47.2	0.03	13000	1200	47.2	0.02

Work material		Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
PRFRAD (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)
R 0.75	18	13000	1100	43.3	0.02	10000	800	31.5	0.02
	20	12000	900	35.4	0.02	9000	700	27.6	0.01
R 0.8	8	40000	5000	196.9	0.08	26000	3200	126.0	0.07
	12	35000	3800	149.6	0.05	20000	2100	82.7	0.03
	16	13000	1200	47.2	0.04	12000	1100	43.3	0.02
	20	10000	750	29.5	0.02	8000	600	23.6	0.01
R 0.9	8	40000	5000	196.9	0.09	25000	3100	122.0	0.08
	12	36000	3800	149.6	0.06	18000	1900	74.8	0.04
	16	25000	2500	98.4	0.04	14000	1300	51.2	0.025
	20	10000	1000	39.4	0.03	8000	800	31.5	0.02
R 1	6	40000	6000	236.2	0.1	24000	3400	133.9	0.1
	8	40000	5000	196.9	0.1	24000	3000	118.1	0.1
	10	40000	5000	196.9	0.08	24000	3000	118.1	0.07
	12	40000	5000	196.9	0.07	24000	2600	102.4	0.05
	14	40000	5000	196.9	0.06	21000	2300	90.6	0.05
	16	32000	3500	137.8	0.05	16000	1700	66.9	0.03
	18	24000	2400	94.5	0.04	13000	1300	51.2	0.03
	20	10000	1000	39.4	0.04	10000	1000	39.4	0.03
	22	10000	1000	39.4	0.04	10000	1000	39.4	0.02
	25	10000	1000	39.4	0.04	8000	800	31.5	0.02
	30	10000	800	31.5	0.02	8000	800	31.5	0.015
	35	10000	500	19.7	0.02	8000	400	15.7	0.01
R 1.25	10	36000	5000	196.9	0.12	20000	2600	102.4	0.11
	15	36000	4600	181.1	0.08	18000	2000	78.7	0.075
	20	26000	3000	118.1	0.07	13000	1400	55.1	0.05
	25	10000	1100	43.3	0.06	8000	800	31.5	0.04
	30	8000	800	31.5	0.05	7000	700	27.6	0.03
	35	8000	500	19.7	0.03	5000	400	15.7	0.03
R 1.5	8	32000	6400	252.0	0.15	16000	3000	118.1	0.15
	10	32000	5100	200.8	0.15	16000	2200	86.6	0.15
	12	32000	5100	200.8	0.13	16000	2200	86.6	0.13
	14	32000	4500	177.2	0.13	16000	2200	86.6	0.1
	16	32000	4500	177.2	0.1	16000	1800	70.9	0.1
	20	27000	3800	149.6	0.1	14000	1600	63.0	0.06
	25	21000	2700	106.3	0.08	11000	1200	47.2	0.06
	30	9000	1000	39.4	0.08	7000	700	27.6	0.05
	35	6000	700	27.6	0.06	6000	600	23.6	0.04
	40	6000	600	23.6	0.04	5000	400	15.7	0.03
R 1.75	16	28000	4200	165.4	0.13	14000	1600	63.0	0.13
	20	26000	3800	149.6	0.13	13000	1600	63.0	0.11
	25	23000	3300	129.9	0.12	11000	1200	47.2	0.08
	30	13000	1900	74.8	0.09	9000	1000	39.4	0.07
	35	9000	1200	47.2	0.08	6000	600	23.6	0.06
	40	8500	1100	43.3	0.07	5500	500	19.7	0.04
R 2	10	24000	4800	189.0	0.2	12000	2200	86.6	0.2
	12	24000	4800	189.0	0.2	12000	2200	86.6	0.2
	14	24000	3800	149.6	0.15	12000	1500	59.1	0.15
	16	24000	3800	149.6	0.15	12000	1500	59.1	0.15
	20	24000	3800	149.6	0.15	12000	1500	59.1	0.15
	25	24000	3800	149.6	0.15	10000	1100	43.3	0.1
	30	20000	3000	118.1	0.1	10000	1100	43.3	0.08
	35	12000	1700	66.9	0.1	8000	900	35.4	0.08
	40	11000	1500	59.1	0.1	5000	500	19.7	0.06
	45	10000	1300	51.2	0.08	5000	500	19.7	0.05
	50	8000	1000	39.4	0.05	4000	400	15.7	0.04
R 2.5	20	19000	3400	133.9	0.2	10000	1400	55.1	0.2
	25	19000	3400	133.9	0.2	10000	1400	55.1	0.2
	30	19000	3200	126.0	0.15	8000	1000	39.4	0.15
	35	16000	2700	106.3	0.1	8000	900	35.4	0.1
R 3	30	16000	3500	137.8	0.2	8000	1000	39.4	0.2
	40	16000	3000	118.1	0.15	8000	800	31.5	0.15
	50	16000	2700	106.3	0.15	6000	500	19.7	0.15

Depth of cut

≦0.1PRFRAD (PRFRAD ≦1)
≦0.2PRFRAD (PRFRAD >1)



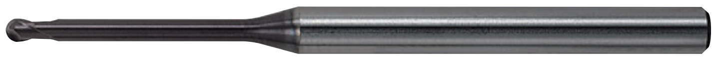
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

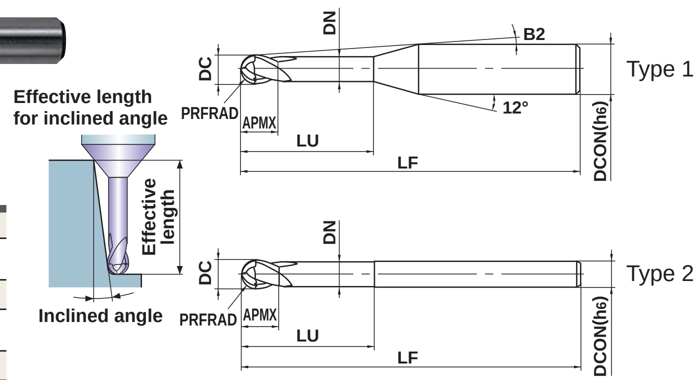
SOLID END MILLS

VF2XLB- Inch sizes

Ball nose, Long neck, 2 flute, For hardened materials

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
○	◎	◎	◎		○		





R				
.0156"≤PRFRAD≤.1250"				
±0.002"				
.0313"≤DC≤.2500"				
0 - 0.0008"				
DCON=.2500"				
0 - 0.00024"				

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

Unit : inch

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VF2XLB D1/32N4D	.0156	.0313	.0313	.1250	.0296	9.9°	2.5	.2500	2	●	1	.130	.134	.146	.161
VF2XLB D1/32N6D	.0156	.0313	.0313	.1875	.0296	9.1°	2.5	.2500	2	●	1	.197	.205	.221	.244
VF2XLB D1/16N4D	.0313	.0625	.0625	.2500	.0601	8.0°	2.5	.2500	2	●	1	.264	.276	.299	.331
VF2XLB D1/16N6D	.0313	.0625	.0625	.3750	.0601	6.8°	2.5	.2500	2	●	1	.394	.409	.449	.496
VF2XLB D3/32N4D	.0469	.0938	.0938	.3750	.0898	6.4°	2.5	.2500	2	●	1	.390	.406	.441	.484
VF2XLB D3/32N6D	.0469	.0938	.0938	.5625	.0898	5.1°	2.5	.2500	2	●	1	.587	.610	.665	.736
VF2XLB D1/8N4D	.0625	.1250	.1250	.5000	.1211	4.9°	3.0	.2500	2	●	1	.520	.539	.591	.646
VF2XLB D1/8N6D	.0625	.1250	.1250	.7500	.1211	3.7°	3.0	.2500	2	●	1	.780	.815	.886	.980
VF2XLB D3/16N4D	.0938	.1875	.1875	.7500	.1835	2.3°	3.0	.2500	2	●	1	.780	.811	.882	*
VF2XLB D3/16N6D	.0938	.1875	.1875	1.1250	.1835	1.6°	3.0	.2500	2	●	1	1.169	1.221	*	*
VF2XLB D1/4N4D	.1250	.2500	.2500	1.0000	.2441	–	3.5	.2500	2	●	2	*	*	*	*
VF2XLB D1/4N6D	.1250	.2500	.2500	1.5000	.2441	–	3.5	.2500	2	●	2	*	*	*	*

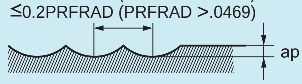
* No interference

● : Inventory maintained.

VF2XLB – Inch sizes

Ball nose, Long neck, 2 flute, For hardened materials

RECOMMENDED CUTTING CONDITIONS

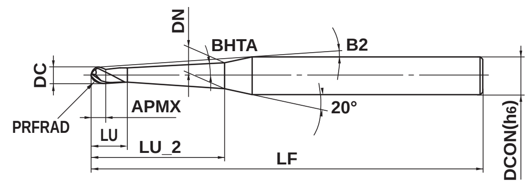
Work material		Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
PRFRAD (inch)	**LU** (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)
R .0156	.1250	40000	3000	118	.0016	40000	3000	118	.0012
R .0156	.1875	32000	1700	67	.0012	32000	1700	67	.0004
R .0313	.2500	40000	5000	197	.0031	26000	3300	129	.0028
R .0313	.3750	36000	3900	153	.0024	20000	2200	86	.0012
R .0469	.3750	37000	5200	204	.0047	20000	2600	102	.0043
R .0469	.5625	37000	4800	189	.0031	20000	2200	86.6	.0030
R .0625	.5000	30000	4800	189	.0051	15000	2100	82.6	.0051
R .0625	.7500	30000	4200	165	.0039	13000	1500	59	.0024
R .0938	.7500	20000	3600	142	.0079	10000	1400	55.1	.0071
R .0938	1.1250	20000	3400	134	.0059	8400	1100	43.3	.0055
R .1250	1.0000	15000	3300	130	.0079	7500	950	37.2	.0079
R .1250	1.5000	15000	3000	118	.0059	7500	750	29.5	.0059
Depth of cut		≤0.1PRFRAD (PRFRAD ≤.0469) ≤0.2PRFRAD (PRFRAD >.0469) 							

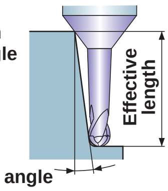
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

VF3XB

Ball nose, 3 flute, Taper neck

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
○	◎	◎	◎	○	○		





R	0.4≤PRFRAD≤2.5	
	±0.01	
DC	0.8≤DC≤5	
	0 - 0.02	
h6	4≤DCON≤6	DCON=8
	0 - 0.008	0 - 0.009

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

Unit : mm

Order Number	PRFRAD	DC	BHTA	APMX	LU_2	LU	B2	DN	LF	DCON	No. of Flutes	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
VF3XBR0040T0024L008	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
VF3XBR0040T0024L012	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
VF3XBR0040T0054L008	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
VF3XBR0040T0054L012	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
VF3XBR0040T0054L016	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
VF3XBR0050T0024L008	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
VF3XBR0050T0024L010	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
VF3XBR0050T0024L012	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
VF3XBR0050T0024L016	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
VF3XBR0050T0024L020	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
VF3XBR0050T0024L025	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
VF3XBR0050T0024L030	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
VF3XBR0050T0024L035	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
VF3XBR0050T0054L008	0.5	1	0.9°	0.8	8	2.3	9.7°	1.12	60	6	3	●	1	—	8.6	9.1	9.6
VF3XBR0050T0054L012	0.5	1	0.9°	0.8	12	2.3	7.7°	1.24	60	6	3	●	1	—	12.6	13.3	14.1
VF3XBR0050T0054L016	0.5	1	0.9°	0.8	16	2.3	6.4°	1.37	70	6	3	●	1	—	16.7	17.6	18.5
VF3XBR0050T0054L020	0.5	1	0.9°	0.8	20	2.3	5.5°	1.50	70	6	3	●	1	—	20.7	21.8	23.0
VF3XBR0050T0054L025	0.5	1	0.9°	0.8	25	2.3	4.7°	1.65	70	6	3	★	1	—	25.7	27.1	28.6
VF3XBR0050T0054L030	0.5	1	0.9°	0.8	30	2.3	4.0°	1.81	80	6	3	★	1	—	30.8	32.4	34.2
VF3XBR0050T0054L035	0.5	1	0.9°	0.8	35	2.3	3.6°	1.97	80	6	3	★	1	—	35.8	37.7	39.8
VF3XBR0050T0054L040	0.5	1	0.9°	0.8	40	2.3	3.2°	2.12	80	6	3	★	1	—	40.8	43.0	45.4
VF3XBR0050T0054L050	0.5	1	0.9°	0.8	50	2.3	2.7°	2.44	110	6	3	★	1	—	50.9	53.6	*
VF3XBR0050T0054L060	0.5	1	0.9°	0.8	60	2.3	2.3°	2.75	110	6	3	★	1	—	60.9	64.1	*
VF3XBR0050T0054L070	0.5	1	0.9°	0.8	70	2.3	2.0°	3.07	110	6	3	★	1	—	71.0	74.7	*
VF3XBR0050T0130L012	0.5	1	1.5°	0.8	12	2.3	7.9°	1.45	60	6	3	★	1	—	—	13.0	13.7
VF3XBR0050T0130L016	0.5	1	1.5°	0.8	16	2.3	6.5°	1.66	70	6	3	★	1	—	—	17.1	18.0
VF3XBR0050T0130L020	0.5	1	1.5°	0.8	20	2.3	5.6°	1.87	70	6	3	★	1	—	—	21.2	22.4
VF3XBR0050T0130L025	0.5	1	1.5°	0.8	25	2.3	4.8°	2.13	70	6	3	★	1	—	—	26.3	27.8
VF3XBR0050T0130L030	0.5	1	1.5°	0.8	30	2.3	4.1°	2.39	80	6	3	★	1	—	—	31.5	33.2
VF3XBR0050T0130L035	0.5	1	1.5°	0.8	35	2.3	3.7°	2.65	80	6	3	★	1	—	—	36.6	38.6

* No interference

● : Inventory maintained. **★ : Inventory maintained in Japan.**

VF3XB

Ball nose, 3 flute, Taper neck

Unit : mm

Order Number	PRFRAD	DC	BHTA	APMX	LU_2	LU	B2	DN	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
														30'	1°	2°	3°
VF3XBR0075T0024L010	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
VF3XBR0075T0024L015	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
VF3XBR0075T0024L020	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
VF3XBR0075T0024L030	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
VF3XBR0075T0054L015	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
VF3XBR0075T0054L020	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
VF3XBR0075T0054L030	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
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
VF3XBR0075T0130L015	0.75	1.5	1.5°	1.3	15	2.8	6.4°	2.08	60	6	3	★	1	–	–	16.1	17.0
VF3XBR0075T0130L020	0.75	1.5	1.5°	1.3	20	2.8	5.2°	2.34	70	6	3	★	1	–	–	21.2	22.4
VF3XBR0075T0130L030	0.75	1.5	1.5°	1.3	30	2.8	3.8°	2.86	80	6	3	★	1	–	–	31.5	33.2
VF3XBR0100T0024L016	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
VF3XBR0100T0024L020	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
VF3XBR0100T0024L025	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
VF3XBR0100T0024L030	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
VF3XBR0100T0024L035	1	2	0.4°	1.6	35	3.6	2.9°	2.34	80	6	3	●	1	35.8	36.7	38.6	⋆
VF3XBR0100T0024L040	1	2	0.4°	1.6	40	3.6	2.6°	2.41	80	6	3	●	1	40.8	41.9	44.0	⋆
VF3XBR0100T0054L020	1	2	0.9°	1.6	20	3.6	4.7°	2.42	70	6	3	●	1	–	20.8	21.9	23.0
VF3XBR0100T0054L025	1	2	0.9°	1.6	25	3.6	4.0°	2.57	70	6	3	●	1	–	25.8	27.2	28.6
VF3XBR0100T0054L030	1	2	0.9°	1.6	30	3.6	3.4°	2.73	80	6	3	●	1	–	30.9	32.5	34.2
VF3XBR0100T0054L035	1	2	0.9°	1.6	35	3.6	3.0°	2.89	80	6	3	●	1	–	35.9	37.7	39.8
VF3XBR0100T0054L040	1	2	0.9°	1.6	40	3.6	2.7°	3.04	80	6	3	●	1	–	40.9	43.0	⋆
VF3XBR0100T0054L050	1	2	0.9°	1.6	50	3.6	2.2°	3.36	110	6	3	★	1	–	51.0	53.6	⋆
VF3XBR0100T0054L060	1	2	0.9°	1.6	60	3.6	1.9°	3.67	110	6	3	★	1	–	61.0	⋆	⋆
VF3XBR0100T0054L070	1	2	0.9°	1.6	70	3.6	1.6°	3.99	110	6	3	★	1	–	71.1	⋆	⋆
VF3XBR0100T0130L025	1	2	1.5°	1.6	25	3.6	4.1°	3.02	70	6	3	★	1	–	–	26.4	27.9
VF3XBR0100T0130L030	1	2	1.5°	1.6	30	3.6	3.5°	3.28	80	6	3	★	1	–	–	31.6	33.3
VF3XBR0100T0130L035	1	2	1.5°	1.6	35	3.6	3.1°	3.54	80	6	3	★	1	–	–	36.7	38.7
VF3XBR0100T0130L040	1	2	1.5°	1.6	40	3.6	2.7°	3.81	80	6	3	★	1	–	–	41.8	⋆
VF3XBR0125T0054L020	1.25	2.5	0.9°	2	20	4.5	4.3°	2.89	60	6	3	★	1	–	20.8	21.9	23.1
VF3XBR0125T0054L030	1.25	2.5	0.9°	2	30	4.5	3.1°	3.20	80	6	3	★	1	–	30.9	32.5	34.2
VF3XBR0125T0054L040	1.25	2.5	0.9°	2	40	4.5	2.4°	3.52	80	6	3	★	1	–	40.9	43.1	⋆
VF3XBR0125T0130L020	1.25	2.5	1.5°	2	20	4.5	4.4°	3.21	60	6	3	★	1	–	–	21.4	22.5
VF3XBR0125T0130L030	1.25	2.5	1.5°	2	30	4.5	3.1°	3.74	80	6	3	★	1	–	–	31.6	33.3
VF3XBR0125T0130L040	1.25	2.5	1.5°	2	40	4.5	2.5°	4.26	80	6	3	★	1	–	–	41.9	⋆
VF3XBR0150T0024L020	1.5	3	0.4°	2	20	5	3.8°	3.11	60	6	3	●	1	20.7	21.3	22.3	23.5
VF3XBR0150T0024L025	1.5	3	0.4°	2	25	5	3.1°	3.18	80	6	3	●	1	25.8	26.4	27.7	29.2
VF3XBR0150T0024L030	1.5	3	0.4°	2	30	5	2.7°	3.25	80	6	3	●	1	30.8	31.6	33.2	⋆
VF3XBR0150T0024L040	1.5	3	0.4°	2	40	5	2.1°	3.39	80	6	3	●	1	40.9	41.9	44.0	⋆
VF3XBR0150T0024L050	1.5	3	0.4°	2	50	5	1.7°	3.53	100	6	3	●	1	50.9	52.2	⋆	⋆
VF3XBR0150T0054L020	1.5	3	0.9°	2	20	5	3.8°	3.37	60	6	3	●	1	–	20.9	21.9	23.0
VF3XBR0150T0054L030	1.5	3	0.9°	2	30	5	2.7°	3.69	80	6	3	●	1	–	30.9	32.5	⋆
VF3XBR0150T0054L040	1.5	3	0.9°	2	40	5	2.1°	4.00	80	6	3	●	1	–	41.0	43.1	⋆
VF3XBR0150T0054L050	1.5	3	0.9°	2	50	5	1.7°	4.31	100	6	3	●	1	–	51.0	⋆	⋆
VF3XBR0150T0054L060	1.5	3	0.9°	2	60	5	2.3°	4.63	110	8	3	●	1	–	61.1	64.2	⋆
VF3XBR0150T0054L070	1.5	3	0.9°	2	70	5	2.0°	4.94	120	8	3	●	1	–	71.1	74.8	⋆
VF3XBR0150T0130L040	1.5	3	1.5°	2	40	5	2.2°	4.73	80	6	3	★	1	–	–	41.9	⋆
VF3XBR0150T0130L050	1.5	3	1.5°	2	50	5	2.8°	5.26	110	8	3	★	1	–	–	52.2	⋆
VF3XBR0150T0130L060	1.5	3	1.5°	2	60	5	2.4°	5.78	110	8	3	★	1	–	–	62.4	⋆
VF3XBR0150T0130L070	1.5	3	1.5°	2	70	5	2.1°	6.30	120	8	3	★	1	–	–	72.7	⋆
VF3XBR0200T0054L030	2	4	0.9°	3	30	6	3.5°	4.65	90	8	3	●	1	–	30.9	32.5	34.2

⋆ No interference

● : Inventory maintained. ★ : Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	BHTA	APMX	LU_2	LU	B2	DN	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF3XBR0200T0054L040	2	4	0.9°	3	40	6	2.7°	4.97	90	8	3	●	1	—	41.0	43.0	*
VF3XB**R0200T0054L050**	2	4	0.9°	3	50	6	2.2°	5.28	110	8	3	●	1	—	51.0	53.6	*
VF3XB**R0200T0054L060**	2	4	0.9°	3	60	6	1.9°	5.60	110	8	3	●	1	—	61.1	*	*
VF3XB**R0250T0054L035**	2.5	5	0.9°	3.5	35	6.5	2.4°	5.80	90	8	3	●	1	—	35.9	37.7	*
VF3XB**R0250T0054L040**	2.5	5	0.9°	3.5	40	6.5	2.2°	5.95	90	8	3	●	1	—	41.0	43.0	*
VF3XB**R0250T0054L050**	2.5	5	0.9°	3.5	50	6.5	1.8°	6.27	110	8	3	●	1	—	51.0	*	*
VF3XB**R0250T0054L060**	2.5	5	0.9°	3.5	60	6.5	1.5°	6.58	110	8	3	●	1	—	61.1	*	*

* No interference

VF3XB

Ball nose, 3 flute, Taper neck

RECOMMENDED CUTTING CONDITIONS

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
PRFRAD (mm)	BHTA	LU_2 (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
R0.4	0.4°	6	34000	2700	106.3	0.03	31000	2200	86.6	0.025	24000	1700	66.9	0.02	19000	1400	55.1	0.015
		8	31000	2100	82.7	0.02	29000	1700	66.9	0.02	22000	1300	51.2	0.015	18000	1000	39.4	0.01
		12	28000	2000	78.7	0.015	26000	1600	63.0	0.01	20000	1200	47.2	0.01	16000	960	37.8	0.007
	0.9°	8	31000	2200	86.6	0.02	29000	1800	70.9	0.02	22000	1400	55.1	0.015	18000	1100	43.3	0.01
		12	28000	2100	82.7	0.015	26000	1700	66.9	0.01	20000	1300	51.2	0.01	16000	1000	39.4	0.007
		16	25000	1100	43.3	0.01	23000	910	35.8	0.01	18000	700	27.6	0.008	14000	560	22.0	0.006
R0.5	0.4°	8	27000	2700	106.3	0.04	25000	2200	86.6	0.04	19000	1700	66.9	0.03	15000	1400	55.1	0.02
		10	24000	2200	86.6	0.03	22000	1800	70.9	0.025	17000	1400	55.1	0.02	14000	1100	43.3	0.015
		12	24000	2200	86.6	0.03	22000	1800	70.9	0.025	17000	1400	55.1	0.02	14000	1100	43.3	0.015
		16	22000	2100	82.7	0.03	21000	1700	66.9	0.025	16000	1300	51.2	0.02	13000	1000	39.4	0.015
		20	20000	1400	55.1	0.015	18000	1200	47.2	0.01	14000	900	35.4	0.01	11000	720	28.3	0.007
		25	18000	1300	51.2	0.015	17000	1000	39.4	0.01	13000	800	31.5	0.009	10000	640	25.2	0.006
		30	15000	960	37.8	0.01	14000	780	30.7	0.01	11000	600	23.6	0.008	8800	480	18.9	0.006
		35	14000	800	31.5	0.008	13000	650	25.6	0.007	10000	500	19.7	0.006	8000	400	15.7	0.004
	0.9°	8	27000	2900	114.2	0.04	25000	2300	90.6	0.04	19000	1800	70.9	0.03	15000	1400	55.1	0.02
		12	24000	2400	94.5	0.03	22000	2000	78.7	0.025	17000	1500	59.1	0.02	14000	1200	47.2	0.015
		16	22000	2200	86.6	0.03	21000	1800	70.9	0.025	16000	1400	55.1	0.02	13000	1100	43.3	0.015
		20	20000	1600	63.0	0.015	18000	1300	51.2	0.01	14000	1000	39.4	0.01	11000	800	31.5	0.007
		25	18000	1400	55.1	0.015	17000	1200	47.2	0.01	13000	900	35.4	0.009	10000	720	28.3	0.006
		30	15000	1100	43.3	0.01	14000	910	35.8	0.009	11000	700	27.6	0.008	8800	560	22.0	0.006
		35	14000	960	37.8	0.008	13000	780	30.7	0.007	10000	600	23.6	0.006	8000	480	18.9	0.004
		40	11000	800	31.5	0.007	11000	650	25.6	0.006	8000	500	19.7	0.005	6400	400	15.7	0.003
		50	8400	610	24.0	0.006	7800	490	19.3	0.005	6000	380	15.0	0.004	4800	300	11.8	0.003
		60	7000	510	20.1	0.004	6500	400	15.7	0.004	5000	320	12.6	0.003	4000	260	10.2	0.002
		70	7000	480	18.9	0.003	6500	390	15.4	0.002	5000	300	11.8	0.002	4000	240	9.4	0.001
	1.5°	12	24000	2600	102.4	0.03	22000	2100	82.7	0.025	17000	1600	63.0	0.02	14000	1300	51.2	0.015
		16	22000	2400	94.5	0.03	21000	2000	78.7	0.025	16000	1500	59.1	0.02	13000	1200	47.2	0.015
		20	20000	1800	70.9	0.015	18000	1400	55.1	0.01	14000	1100	43.3	0.01	11000	880	34.6	0.007
		25	18000	1600	63.0	0.015	17000	1300	51.2	0.01	13000	1000	39.4	0.009	11000	800	31.5	0.006
		30	15000	1300	51.2	0.01	14000	1000	39.4	0.01	11000	800	31.5	0.008	8800	640	25.2	0.006
		35	14000	1100	43.3	0.008	13000	910	35.8	0.007	10000	700	27.6	0.006	8000	560	22.0	0.004
R0.75	0.4°	10	18000	2700	106.3	0.06	17000	2200	86.6	0.05	13000	1700	66.9	0.04	10000	1400	55.1	0.03
		15	17000	2200	86.6	0.04	16000	1800	70.9	0.04	12000	1400	55.1	0.03	9600	1100	43.3	0.02
		20	17000	2100	82.7	0.03	16000	1700	66.9	0.025	12000	1300	51.2	0.02	9600	1000	39.4	0.015
		30	14000	1600	63.0	0.015	13000	1300	51.2	0.01	10000	1000	39.4	0.01	8000	800	31.5	0.007
	0.9°	15	17000	2400	94.5	0.04	16000	2000	78.7	0.04	12000	1500	59.1	0.03	9600	1200	47.2	0.02
		20	17000	2200	86.6	0.03	16000	1800	70.9	0.025	12000	1400	55.1	0.02	9600	1100	43.3	0.015
		30	14000	1800	70.9	0.015	13000	1400	55.1	0.01	10000	1100	43.3	0.01	8000	880	34.6	0.007
		40	13000	1300	51.2	0.01	12000	1000	39.4	0.01	9000	800	31.5	0.008	7200	640	25.2	0.006
	1.5°	15	17000	2600	102.4	0.04	16000	2100	82.7	0.04	12000	1600	63.0	0.03	9600	1300	51.2	0.02
		20	17000	2400	94.5	0.03	16000	2000	78.7	0.025	12000	1500	59.1	0.02	9600	1200	47.2	0.015
		30	14000	2000	78.7	0.015	13000	1600	63.0	0.01	10000	1200	47.2	0.01	8000	960	37.8	0.007

1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.				Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
PRFRAD (mm)	BHTA	LU_2 (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
R1	0.4°	16	15000	3200	126.0	0.07	14000	2600	102.4	0.06	11000	2000	78.7	0.05	8800	1600	63.0	0.03
		20	14000	2400	94.5	0.06	13000	2000	78.7	0.05	10000	1500	59.1	0.04	8000	1200	47.2	0.03
		25	14000	2100	82.7	0.04	13000	1700	66.9	0.04	10000	1300	51.2	0.03	8000	1000	39.4	0.02
		30	13000	1800	70.9	0.03	12000	1400	55.1	0.03	9000	1100	43.3	0.025	7200	880	34.6	0.02
		35	13000	1600	63.0	0.03	12000	1300	51.2	0.025	9000	1000	39.4	0.02	7200	800	31.5	0.015
		40	12000	1400	55.1	0.015	11000	1200	47.2	0.01	8500	900	35.4	0.01	6800	720	28.3	0.007
	0.9°	20	14000	2600	102.4	0.06	13000	2100	82.7	0.05	10000	1600	63.0	0.04	8000	1300	51.2	0.03
		25	14000	2200	86.6	0.05	13000	1800	70.9	0.04	10000	1400	55.1	0.03	8000	1100	43.3	0.025
		30	13000	1900	74.8	0.04	12000	1600	63.0	0.04	9000	1200	47.2	0.03	7200	960	37.8	0.02
		35	13000	1800	70.9	0.04	12000	1400	55.1	0.03	9000	1100	43.3	0.025	7200	880	34.6	0.02
		40	12000	1600	63.0	0.03	11000	1300	51.2	0.025	8500	1000	39.4	0.02	6800	800	31.5	0.015
		50	11000	1400	55.1	0.015	10000	1200	47.2	0.01	8000	900	35.4	0.01	6400	720	28.3	0.007
		60	9800	1100	43.3	0.007	9100	910	35.8	0.006	7000	700	27.6	0.005	5600	560	22.0	0.003
		70	8400	960	37.8	0.004	7800	780	30.7	0.004	6000	600	23.6	0.003	4800	480	18.9	0.002
	1.5°	25	14000	2400	94.5	0.05	13000	2000	78.7	0.04	10000	1500	59.1	0.03	8000	1200	47.2	0.025
		30	12600	2100	82.7	0.04	12000	1700	66.9	0.04	9000	1300	51.2	0.03	7200	1000	39.4	0.02
		35	13000	1900	74.8	0.04	12000	1600	63.0	0.03	9000	1200	47.2	0.025	7200	960	37.8	0.02
		40	12000	1800	70.9	0.03	11000	1400	55.1	0.025	8500	1100	43.3	0.02	6800	880	34.6	0.015
R1.25	0.9°	20	13000	2900	114.2	0.06	12000	2300	90.6	0.05	9000	1800	70.9	0.04	7200	1400	55.1	0.03
		30	12000	2600	102.4	0.05	11000	2100	82.7	0.04	8500	1600	63.0	0.03	6800	1300	51.2	0.025
		40	11000	2200	86.6	0.04	9800	1800	70.9	0.04	7500	1400	55.1	0.03	6000	1100	43.3	0.02
	1.5°	20	13000	3000	118.1	0.06	12000	2500	98.4	0.05	9000	1900	74.8	0.04	7200	1500	59.1	0.03
		30	12000	2700	106.3	0.05	11050	2200	86.6	0.04	8500	1700	66.9	0.03	6800	1400	55.1	0.025
		40	11000	2400	94.5	0.04	9800	2000	78.7	0.04	7500	1500	59.1	0.03	6000	1200	47.2	0.02
R1.5	0.4°	20	12000	3700	145.7	0.13	11000	3000	118.1	0.1	8500	2300	90.6	0.09	6800	1800	70.9	0.06
		30	11000	2900	114.2	0.07	10000	2300	90.6	0.06	8000	1800	70.9	0.05	6400	1400	55.1	0.03
		40	11000	2400	94.5	0.06	10000	2000	78.7	0.05	8000	1500	59.1	0.04	6400	1200	47.2	0.03
		50	11000	2000	78.7	0.04	9800	1600	63.0	0.04	7500	1200	47.2	0.03	6000	960	37.8	0.02
	0.9°	20	12000	3800	149.6	0.13	11000	3100	122.0	0.1	8500	2400	94.5	0.09	6800	1900	74.8	0.06
		30	11000	3000	118.1	0.07	10000	2500	98.4	0.06	8000	1900	74.8	0.05	6400	1500	59.1	0.03
		40	11000	2600	102.4	0.06	10000	2100	82.7	0.05	8000	1600	63.0	0.04	6400	1300	51.2	0.03
		50	11000	2100	82.7	0.04	9800	1700	66.9	0.04	7500	1300	51.2	0.03	6000	1000	39.4	0.02
		60	9800	2000	78.7	0.03	9100	1600	63.0	0.025	7000	1200	47.2	0.02	5600	960	37.8	0.015
		70	9800	1800	70.9	0.015	9100	1400	55.1	0.01	7000	1100	43.3	0.01	5600	880	34.6	0.007
	1.5°	50	11000	2200	86.6	0.04	9800	1800	70.9	0.04	7500	1400	55.1	0.03	6000	1100	43.3	0.02
		60	9800	2100	82.7	0.03	9100	1700	66.9	0.025	7000	1300	51.2	0.02	5600	1000	39.4	0.015
		70	9800	2000	78.7	0.015	9100	1600	63.0	0.01	7000	1200	47.2	0.01	5600	960	37.8	0.007
R2	0.9°	30	10000	3200	126.0	0.3	9400	2600	102.4	0.25	7200	2000	78.7	0.2	5800	1600	63.0	0.15
		40	9500	2400	94.5	0.15	8800	2000	78.7	0.12	6800	1500	59.1	0.1	5400	1200	47.2	0.07
		50	9500	2100	82.7	0.1	8800	1700	66.9	0.1	6800	1300	51.2	0.08	5400	1000	39.4	0.06
		60	9000	1900	74.8	0.07	8300	1600	63.0	0.06	6400	1200	47.2	0.05	5100	960	37.8	0.03
R2.5	0.9°	35	8000	3500	137.8	0.3	7400	2900	114.2	0.25	5700	2200	86.6	0.2	4600	1800	70.9	0.15
		40	8000	3200	126.0	0.2	7400	2600	102.4	0.18	5700	2000	78.7	0.15	4600	1600	63.0	0.1
		60	7600	2400	94.5	0.15	7000	2000	78.7	0.12	5400	1500	59.1	0.1	4300	1200	47.2	0.07

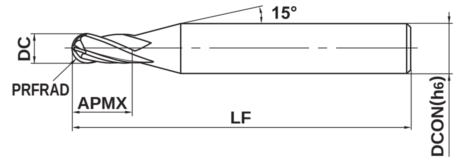
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VF4MB

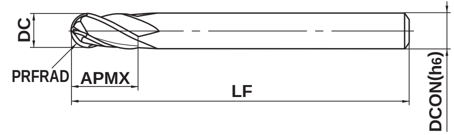
Ball nose, Medium cut length, 4 flute

UWC VF 30°

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



Type1



Type2

0.5≤PRFRAD≤6				
±0.01				
1≤DC≤12				
0 - 0.020				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

4 flute ball nose end mill for high-speed machining of hardened steel.

Unit : mm

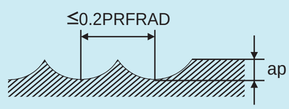
Order Number	PRFRAD	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
VF4MBR0050	0.5	1	2.5	50	6	4	●	1
VF4MB**R0100**	1	2	6	60	6	4	●	1
VF4MB**R0150**	1.5	3	8	70	6	4	●	1
VF4MB**R0200**	2	4	8	70	6	4	●	1
VF4MB**R0250**	2.5	5	12	80	6	4	●	1
VF4MB**R0300**	3	6	12	80	6	4	●	2
VF4MB**R0400**	4	8	14	90	8	4	●	2
VF4MB**R0500**	5	10	18	100	10	4	●	2
VF4MB**R0600**	6	12	22	110	12	4	●	2

● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

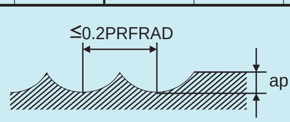
Work material	Hardened steel (45−55HRC) AISI H13 etc.							Hardened steel (55−62HRC) AISI D2 etc.						
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)	α≤15°			α>15°			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)		Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R0.5	40000	8000	315.0	40000	3800	149.6	0.06	40000	5600	220.5	40000	3100	122.0	0.05
R1	40000	9600	378.0	40000	5600	220.5	0.11	40000	8000	315.0	28000	3100	122.0	0.10
R1.5	40000	12000	472.4	32000	5600	220.5	0.13	32000	7700	303.1	19000	2900	114.2	0.12
R2	32000	11000	433.1	24000	4700	185.0	0.15	24000	6200	244.1	14000	2500	98.4	0.13
R2.5	25000	9000	354.3	19000	3800	149.6	0.20	19000	5300	208.7	12000	2200	86.6	0.15
R3	21000	8400	330.7	15000	3400	133.9	0.25	16000	4800	189.0	9600	2000	78.7	0.20
R4	16000	6400	252.0	12000	2600	102.4	0.30	12000	3600	141.7	7200	1600	63.0	0.20
R5	13000	5200	204.7	9600	2200	86.6	0.50	10000	3200	126.0	5800	1300	51.2	0.20
R6	9000	3600	141.7	7200	1700	66.9	0.50	7000	2200	86.6	4300	940	37.0	0.30

Depth of cut

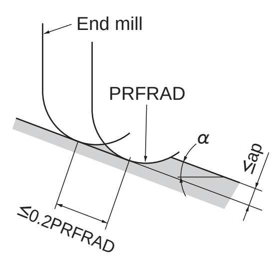


Work material	Hardened steel (62−70HRC) AISI W1, AISI M2 etc.						
PRFRAD (mm)	α≤15°			α>15°			Depth of cut ap (mm)
	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	
R0.5	40000	4700	185.0	32000	1700	66.9	0.03
R1	24000	5000	196.9	16000	1200	47.2	0.06
R1.5	16000	4200	165.4	11000	1100	43.3	0.07
R2	12000	3100	122.0	8000	1000	39.4	0.08
R2.5	9600	2700	106.3	6000	780	30.7	0.08
R3	8000	2300	90.6	5000	780	30.7	0.09
R4	6000	1900	74.8	4000	620	24.4	0.09
R5	4800	1500	59.1	3000	550	21.7	0.10
R6	3600	1100	43.3	2200	400	15.7	0.10

Depth of cut



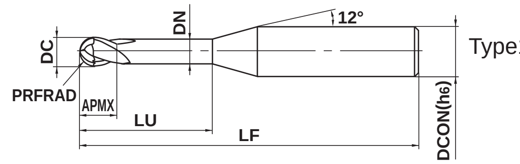
1) α is the inclination of the machined surface.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

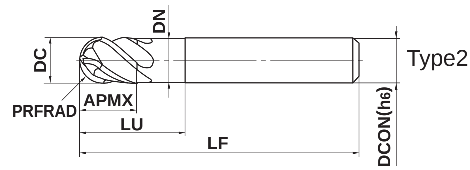


VF4SVB

Ball nose, Short cut length, 4 flute, Variable curve

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





PRFRAD≤6	PRFRAD>6			
±0.01	±0.02			
DC≤12	DC>12			
0 - 0.02	0 - 0.03			
DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- Impact Miracle ball nose end mill with variable curve ensures stable machining of difficult-to-cut materials.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VF4SVBR0100	1	2	3	5	1.9	50	6	4	●	1
VF4SVBR0150	1.5	3	4.5	7.5	2.9	50	6	4	●	1
VF4SVBR0200	2	4	6	10	3.9	50	6	4	●	1
VF4SVBR0250	2.5	5	7.5	12.5	4.9	50	6	4	●	1
VF4SVBR0300	3	6	9	15	5.85	50	6	4	●	2
VF4SVBR0400	4	8	12	20	7.85	60	8	4	★	2
VF4SVBR0500	5	10	15	25	9.7	70	10	4	★	2
VF4SVBR0600	6	12	18	30	11.7	75	12	4	★	2
VF4SVBR0800	8	16	24	40	15.5	90	16	4	★	2
VF4SVBR1000	10	20	30	50	19.5	100	20	4	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

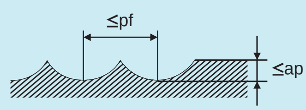
Work material: Alloy steel, Tool steel, Pre-hardened steel — AISI H13, AISI W1–10, AISI P21 etc.

PRFRAD (mm)	α≤15° Revolution (min^{-1})	α≤15° Table feed (mm/min)	α≤15° Table feed (IPM)	α>15° Revolution (min^{-1})	α>15° Table feed (mm/min)	α>15° Table feed (IPM)	Depth of cut ap (mm)	Pick feed pf (mm)
R 1	40000	8000	315.0	32000	3800	149.6	0.17	0.5
R 1.5	32000	7700	303.1	21000	3200	126.0	0.25	0.75
R 2	24000	5800	228.3	16000	2800	110.2	0.33	1
R 2.5	19000	5300	208.7	12700	2600	102.4	0.42	1.25
R 3	16000	4800	189.0	10600	2100	82.7	0.5	1.5
R 4	12000	4300	169.3	8000	1900	74.8	0.8	2
R 5	9600	4100	161.4	6400	1800	70.9	1	2.5
R 6	8000	4000	157.5	5300	1800	70.9	1.2	3
R 8	6000	3200	126.0	4000	1400	55.1	1.6	4
R10	4800	3000	118.1	3200	1300	51.2	2	5

Work material: Austenitic stainless steel, Titanium alloy — AISI 304, AISI 306, Ti–6Al–4V etc.

PRFRAD (mm)	α≤15° Revolution (min^{-1})	α≤15° Table feed (mm/min)	α≤15° Table feed (IPM)	α>15° Revolution (min^{-1})	α>15° Table feed (mm/min)	α>15° Table feed (IPM)	Depth of cut ap (mm)	Pick feed pf (mm)
R 1	36000	6500	255.9	24000	2900	114.2	0.17	0.5
R 1.5	24000	4800	189.0	16000	1900	74.8	0.25	0.75
R 2	18000	4000	157.5	12000	1700	66.9	0.33	1
R 2.5	14400	3500	137.8	9600	1500	59.1	0.42	1.25
R 3	12000	3200	126.0	8000	1400	55.1	0.5	1.5
R 4	9000	3200	126.0	6000	1400	55.1	0.8	2
R 5	7200	3000	118.1	4800	1300	51.2	1	2.5
R 6	6000	3000	118.1	4000	1300	51.2	1.2	3
R 8	4500	2500	98.4	3000	1100	43.3	1.6	4
R10	3600	2300	90.6	2400	1000	39.4	2	5

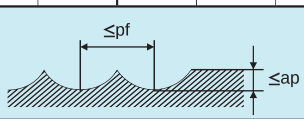
Depth of cut



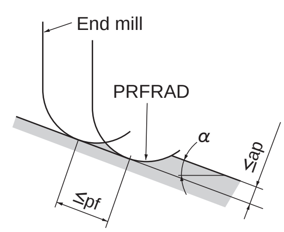
Work material: Heat resistant alloy — Inconel718 etc.

PRFRAD (mm)	α≤15° Revolution (min^{-1})	α≤15° Table feed (mm/min)	α≤15° Table feed (IPM)	α>15° Revolution (min^{-1})	α>15° Table feed (mm/min)	α>15° Table feed (IPM)	Depth of cut ap (mm)	Pick feed pf (mm)
R 1	9600	960	37.8	6400	510	20.1	0.17	0.2
R 1.5	6400	640	25.2	4200	340	13.4	0.25	0.3
R 2	4800	580	22.8	3200	260	10.2	0.33	0.4
R 2.5	3800	530	20.9	2500	250	9.8	0.42	0.5
R 3	3200	500	19.7	2100	210	8.3	0.25	0.6
R 4	2400	430	16.9	1600	190	7.5	0.4	0.8
R 5	2000	420	16.5	1300	180	7.1	0.5	1
R 6	1700	350	13.8	1100	150	5.9	0.6	1.2
R 8	1200	300	11.8	800	130	5.1	0.8	1.6
R10	1000	250	9.8	640	100	3.9	1	2

Depth of cut



1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is poor, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
4) α is the inclination angle of the machined surface.

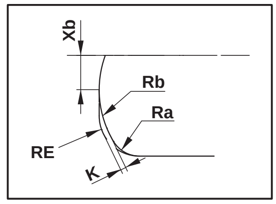


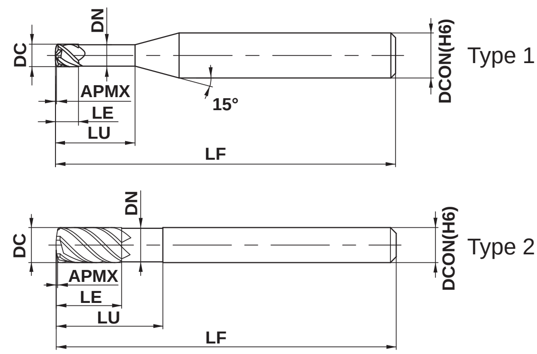
VFFDRB NEW

Multi-task corner radius end mill for impact miracle high speed cutting

UWC VF 40° DC≤6 DC≤8

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





DC≤12				
0 - 0.020				

h6

DMM=6	8≤DMM≤10	DMM=12		
0 - 0.008	0 - 0.009	0 - 0.011		

- Multi-task corner radius type allows more efficient high feed.
- Adoption of multiple cuttings realized high feed cutting.

Unit : mm

Order Number	DC	RE	APMX	LE	LU	DN	LF	DCON	No. of Flutes	Multi-task radius part K	Xb	Ra	Rb	RMPX	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
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

RECOMMENDED CUTTING CONDITIONS

Work material	Carbon steel, Alloy steel (180–280HB), Tool steel (≤350HB) Mild steel (≤180HB) S45C, SCM440, SS400, S10C etc.							Pre-hardened steel (35–45HRC) NAK, PX5, SNCM439, SKD, SKT etc.						
DC (mm)	Cutting Speed (m/min)	Main spindle speed (min⁻¹)	Feed per Tooth (mm/tooth)	Table Feed (mm/min)	Table Feed (IPM)	Depth of Cut ap (mm)	Width of Cut ae (mm)	Cutting Speed (m/min)	Main spindle speed (min⁻¹)	Feed per Tooth (mm/tooth)	Table Feed (mm/min)	Table Feed (IPM)	Depth of Cut ap (mm)	Width of Cut ae (mm)
3	150	16000	0.15	9600	378	0.12	1.5	135	14000	0.15	8400	330	0.12	1.5
4	150	12000	0.20	9600	378	0.16	2.0	135	11000	0.20	8800	346	0.16	2.0
6	150	8000	0.35	11000	433	0.24	3.0	135	7200	0.35	10000	394	0.24	3.0
8	150	6000	0.35	13000	512	0.32	4.8	135	5400	0.35	11000	433	0.32	4.8
10	150	4800	0.40	12000	472	0.40	6.0	135	4300	0.40	10000	393	0.40	6.0
12	150	4000	0.45	11000	433	0.48	7.2	135	3600	0.45	9700	382	0.48	7.2

Work material	Hardened steel (40–55HRC), Ferritic and martensitic stainless steel (>200HB), Precipitation hardening stainless steel (<450HB) SKD61, SKT4, SUS431, SUS420J2, STAVAX, SUS630, SUS631, 15-5PH, 17-4PH etc.							Hardened steel (55–62HRC) SKD11 etc.						
DC (mm)	Cutting Speed (m/min)	Main spindle speed (min⁻¹)	Feed per Tooth (mm/tooth)	Table Feed (mm/min)	Table Feed (IPM)	Depth of Cut ap (mm)	Width of Cut ae (mm)	Cutting Speed (m/min)	Main spindle speed (min⁻¹)	Feed per Tooth (mm/tooth)	Table Feed (mm/min)	Table Feed (IPM)	Depth of Cut ap (mm)	Width of Cut ae (mm)
3	120	13000	0.15	7800	308	0.12	1.5	80	8500	0.10	3400	134	0.12	1.5
4	120	9500	0.21	8000	315	0.16	2.0	80	6400	0.15	3800	150	0.16	2.0
6	120	6400	0.35	9000	354	0.24	3.0	80	4200	0.30	5000	197	0.24	3.0
8	120	4800	0.35	10000	394	0.32	4.8	80	3200	0.30	5800	228	0.32	4.8
10	120	3800	0.40	9100	358	0.40	6.0	80	2500	0.35	5300	209	0.40	6.0
12	120	3200	0.45	8600	339	0.48	7.2	80	2100	0.40	5000	197	0.48	7.2

1) When ramping process set the feedrate at 50%. A ramping angle of 1° is recommended.
2) Use at a revolution of 70% and feedrate of 50% when the tool overhang exceeds 5D.

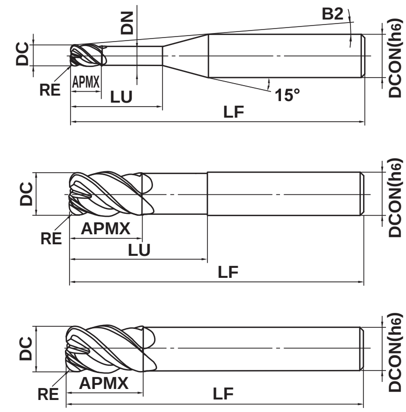
● : Inventory maintained.

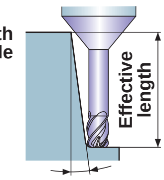
VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

UWC VF 43° 45°

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





R	DC≤10	DC>10			
	±0.007	±0.01			
	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16		
	0 - 0.008	0 - 0.009	0 - 0.011		

● Impact Miracle corner radius end mill for high feed and efficient machining.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VFHVRBD0100R02N004	1	0.2	1	4	0.94	10.6°	60	6	4	●	1	4.2	4.5	4.7	5.3
VFHVRBD0100R02N006	1	0.2	1	6	0.94	9.2°	60	6	4	●	1	6.4	6.7	7.2	7.7
VFHVRBD0100R02N008	1	0.2	1	8	0.94	8.2°	60	6	4	●	1	8.5	8.8	9.5	10.2
VFHVRBD0100R02N010	1	0.2	1	10	0.94	7.4°	60	6	4	●	1	10.5	11	11.8	12.7
VFHVRBD0100R02N015	1	0.2	1	15	0.94	5.9°	60	6	4	●	1	15.8	16.3	17.5	18.9
VFHVRBD0100R02N020	1	0.2	1	20	0.94	4.9°	80	6	4	●	1	20.9	21.7	23.3	25.1
VFHVRBD0150R03N004	1.5	0.3	1.5	4	1.44	10.3°	60	6	4	●	1	4.2	4.5	4.6	5.2
VFHVRBD0150R03N006	1.5	0.3	1.5	6	1.44	8.9°	60	6	4	●	1	6.3	6.6	7.2	7.7
VFHVRBD0150R03N010	1.5	0.3	1.5	10	1.44	7°	60	6	4	●	1	10.5	10.9	11.8	12.7
VFHVRBD0150R03N015	1.5	0.3	1.5	15	1.44	5.5°	60	6	4	●	1	15.7	16.3	17.5	18.9
VFHVRBD0150R03N020	1.5	0.3	1.5	20	1.44	4.6°	80	6	4	●	1	20.9	21.6	23.3	25.1
VFHVRBD0150R03N025	1.5	0.3	1.5	25	1.44	3.9°	80	6	4	●	1	26.1	27	29	31.3
VFHVRBD0150R03N030	1.5	0.3	1.5	30	1.44	3.4°	80	6	4	●	1	31.3	32.3	34.7	37.5
VFHVRBD0200R05N006	2	0.5	2	6	1.9	8.7°	60	6	4	●	1	6.3	6.5	7	7.5
VFHVRBD0200R05N010	2	0.5	2	10	1.9	6.7°	60	6	4	●	1	10.5	10.8	11.6	12.5
VFHVRBD0200R05N015	2	0.5	2	15	1.9	5.2°	60	6	4	●	1	15.6	16.2	17.4	18.7
VFHVRBD0200R05N020	2	0.5	2	20	1.9	4.3°	80	6	4	●	1	20.8	21.5	23.1	24.9
VFHVRBD0200R05N025	2	0.5	2	25	1.9	3.6°	80	6	4	●	1	26	26.9	28.9	31.2
VFHVRBD0200R05N030	2	0.5	2	30	1.9	3.1°	80	6	4	●	1	31.2	32.2	34.6	37.4
VFHVRBD0200R05N035	2	0.5	2	35	1.9	2.8°	90	6	4	●	1	36.3	37.6	40.4	*
VFHVRBD0200R05N040	2	0.5	2	40	1.9	2.5°	90	6	4	●	1	41.5	42.9	46.1	*
VFHVRBD0300R05N010	3	0.5	3	10	2.9	5.6°	60	6	4	●	1	10.5	10.8	11.6	12.5
VFHVRBD0300R05N015	3	0.5	3	15	2.9	4.3°	60	6	4	●	1	15.6	16.2	17.4	18.7
VFHVRBD0300R05N020	3	0.5	3	20	2.9	3.4°	80	6	4	●	1	20.8	21.5	23.1	24.9
VFHVRBD0300R05N030	3	0.5	3	30	2.9	2.5°	80	6	4	●	1	31.2	32.2	34.6	*
VFHVRBD0300R08N010	3	0.8	3	10	2.9	5.7°	60	6	4	●	1	10.4	10.8	11.6	12.4
VFHVRBD0300R08N015	3	0.8	3	15	2.9	4.3°	60	6	4	●	1	15.6	16.2	17.3	18.7
VFHVRBD0300R08N020	3	0.8	3	20	2.9	3.5°	80	6	4	●	1	20.8	21.5	23.1	24.9
VFHVRBD0300R08N030	3	0.8	3	30	2.9	2.5°	80	6	4	●	1	31.1	32.2	34.6	*
VFHVRBD0300R08N040	3	0.8	3	40	2.9	2°	90	6	4	●	1	41.5	42.9	*	*
VFHVRBD0300R08N050	3	0.8	3	50	2.9	1.6°	90	6	4	●	1	51.8	53.6	*	*
VFHVRBD0400R05N012	4	0.5	4	12	3.9	3.8°	60	6	4	●	1	12.5	13	13.9	15

* No interference

VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
VFHVRBD0400R05N020	4	0.5	4	20	3.9	2.5°	80	6	4	●	1	20.8	21.5	23.1	*
VFHVRBD0400R05N030	4	0.5	4	30	3.9	1.8°	80	6	4	●	1	31.2	32.2	*	*
VFHVRBD0400R05N048	4	0.5	4	48	3.9	1.2°	90	6	4	●	1	49.8	51.5	*	*
VFHVRBD0400R10N012	4	1	4	12	3.9	3.9°	60	6	4	●	1	12.5	12.9	13.8	14.9
VFHVRBD0400R10N020	4	1	4	20	3.9	2.5°	80	6	4	●	1	20.8	21.5	23	*
VFHVRBD0400R10N030	4	1	4	30	3.9	1.8°	80	6	4	●	1	31.1	32.2	*	*
VFHVRBD0600R05N018	6	0.5	9	18	5.85	—	60	6	4	●	2	*	*	*	*
VFHVRBD0600R05N030	6	0.5	9	30	5.85	—	80	6	4	●	2	*	*	*	*
VFHVRBD0600R10N018	6	1	9	18	5.85	—	60	6	4	●	2	*	*	*	*
VFHVRBD0600R10N030	6	1	9	30	5.85	—	80	6	4	●	2	*	*	*	*
VFHVRBD0600R10N054	6	1	9	54	5.85	—	90	6	4	●	2	*	*	*	*
VFHVRBD0600R15N018	6	1.5	9	18	5.85	—	60	6	4	●	2	*	*	*	*
VFHVRBD0600R15N030	6	1.5	9	30	5.85	—	80	6	4	●	2	*	*	*	*
VFHVRBD0600R15N042	6	1.5	9	42	5.85	—	90	6	4	●	2	*	*	*	*
VFHVRBD0600R15N054	6	1.5	9	54	5.85	—	90	6	4	●	2	*	*	*	*
VFHVRBD0600R20N018	6	2	9	18	5.85	—	60	6	4	●	2	*	*	*	*
VFHVRBD0600R20N030	6	2	9	30	5.85	—	80	6	4	●	2	*	*	*	*
VFHVRBD0700R15	7	1.5	11	—	—	—	80	6	4	●	3	*	*	*	*
VFHVRBD0800R05N024	8	0.5	12	24	7.85	—	60	8	4	●	2	*	*	*	*
VFHVRBD0800R05N040	8	0.5	12	40	7.85	—	100	8	4	●	2	*	*	*	*
VFHVRBD0800R10N024	8	1	12	24	7.85	—	60	8	4	●	2	*	*	*	*
VFHVRBD0800R10N040	8	1	12	40	7.85	—	100	8	4	●	2	*	*	*	*
VFHVRBD0800R20N024	8	2	12	24	7.85	—	60	8	4	●	2	*	*	*	*
VFHVRBD0800R20N040	8	2	12	40	7.85	—	100	8	4	●	2	*	*	*	*
VFHVRBD0800R20N056	8	2	12	56	7.85	—	120	8	4	●	2	*	*	*	*
VFHVRBD0800R20N072	8	2	12	72	7.85	—	120	8	4	●	2	*	*	*	*
VFHVRBD0900R20	9	2	13.5	—	—	—	100	8	4	●	3	*	*	*	*
VFHVRBD1000R05N030	10	0.5	15	30	9.7	—	70	10	4	●	2	*	*	*	*
VFHVRBD1000R05N050	10	0.5	15	50	9.7	—	110	10	4	●	2	*	*	*	*
VFHVRBD1000R10N030	10	1	15	30	9.7	—	70	10	4	●	2	*	*	*	*
VFHVRBD1000R10N050	10	1	15	50	9.7	—	110	10	4	●	2	*	*	*	*
VFHVRBD1000R20N030	10	2	15	30	9.7	—	70	10	4	●	2	*	*	*	*
VFHVRBD1000R20N050	10	2	15	50	9.7	—	110	10	4	●	2	*	*	*	*
VFHVRBD1000R20N070	10	2	15	70	9.7	—	150	10	4	●	2	*	*	*	*
VFHVRBD1000R20N090	10	2	15	90	9.7	—	150	10	4	●	2	*	*	*	*
VFHVRBD1100R20	11	2	16.5	—	—	—	110	10	4	●	3	*	*	*	*
VFHVRBD1200R05N036	12	0.5	18	36	11.7	—	80	12	4	●	2	*	*	*	*
VFHVRBD1200R05N060	12	0.5	18	60	11.7	—	120	12	4	●	2	*	*	*	*
VFHVRBD1200R10N036	12	1	18	36	11.7	—	80	12	4	●	2	*	*	*	*
VFHVRBD1200R10N060	12	1	18	60	11.7	—	120	12	4	●	2	*	*	*	*
VFHVRBD1200R20N036	12	2	18	36	11.7	—	80	12	4	●	2	*	*	*	*
VFHVRBD1200R20N060	12	2	18	60	11.7	—	120	12	4	●	2	*	*	*	*
VFHVRBD1200R20N084	12	2	18	84	11.7	—	160	12	4	●	2	*	*	*	*
VFHVRBD1200R20N108	12	2	18	108	11.7	—	160	12	4	●	2	*	*	*	*
VFHVRBD1200R30N036	12	3	18	36	11.7	—	80	12	4	●	2	*	*	*	*
VFHVRBD1200R30N060	12	3	18	60	11.7	—	120	12	4	●	2	*	*	*	*
VFHVRBD1300R30	13	3	19.5	—	—	—	120	12	4	★	3	*	*	*	*
VFHVRBD1600R05N042	16	0.5	24	42	15.5	—	100	16	4	★	2	*	*	*	*
VFHVRBD1600R20N042	16	2	24	42	15.5	—	100	16	4	★	2	*	*	*	*
VFHVRBD1600R30N042	16	3	24	42	15.5	—	100	16	4	★	2	*	*	*	*
VFHVRBD1600R30N080	16	3	24	80	15.5	—	140	16	4	★	2	*	*	*	*
VFHVRBD1600R30N120	16	3	24	120	15.5	—	175	16	4	★	2	*	*	*	*

* No interference

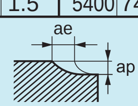
● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

High feed conditions

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.					Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
DC (mm)	RE (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
1	0.2	4	40000	7200	283.5	0.04	0.45	33000	5100	200.8	0.03	0.45	27000	4100	161.4	0.025	0.45	20000	1800	70.9	0.013	0.45
1	0.2	6	40000	6500	255.9	0.03	0.45	33000	4600	181.1	0.022	0.45	27000	3700	145.7	0.018	0.45	20000	1600	63.0	0.01	0.45
1	0.2	8	32000	4500	177.2	0.022	0.45	27000	3200	126.0	0.018	0.45	21000	2600	102.4	0.012	0.45	16000	1100	43.3	0.008	0.45
1	0.2	10	24000	2700	106.3	0.015	0.45	20000	1900	74.8	0.01	0.45	16000	1500	59.1	0.008	0.45	12000	700	27.6	0.006	0.45
1	0.2	15	16000	1200	47.2	0.008	0.45	14000	700	27.6	0.005	0.45	12000	500	19.7	0.003	0.45	10000	400	15.7	0.003	0.45
1	0.2	20	14000	1000	39.4	0.005	0.45	12000	600	23.6	0.004	0.45	10000	400	15.7	0.002	0.45	9000	300	11.8	0.002	0.45
1.5	0.3	4	32000	10000	393.7	0.1	0.65	27000	7100	279.5	0.08	0.65	21000	5700	224.4	0.06	0.65	16000	2500	98.4	0.03	0.65
1.5	0.3	6	32000	7800	307.1	0.08	0.65	27000	5500	216.5	0.06	0.65	21000	4200	165.4	0.05	0.65	16000	2000	78.7	0.025	0.65
1.5	0.3	10	27000	5700	224.4	0.05	0.65	22000	4000	157.5	0.035	0.65	18000	3000	118.1	0.03	0.65	14000	1400	55.1	0.014	0.65
1.5	0.3	15	22000	3200	126.0	0.03	0.65	18000	2300	90.6	0.025	0.65	15000	1700	66.9	0.018	0.65	11000	1000	39.4	0.009	0.65
1.5	0.3	20	16000	1400	55.1	0.02	0.65	14000	1200	47.2	0.016	0.65	13000	1000	39.4	0.012	0.65	9000	700	27.6	0.007	0.65
1.5	0.3	25	13000	1000	39.4	0.015	0.65	11000	800	31.5	0.012	0.65	10000	700	27.6	0.009	0.65	7500	500	19.7	0.005	0.65
1.5	0.3	30	13000	900	35.4	0.01	0.65	11000	700	27.6	0.008	0.65	10000	600	23.6	0.006	0.65	7500	400	15.7	0.004	0.65
2	0.5	6	24000	10000	393.7	0.1	0.75	20000	7100	279.5	0.08	0.75	16000	5700	224.4	0.06	0.75	12000	2500	98.4	0.03	0.75
2	0.5	10	24000	10000	393.7	0.08	0.75	20000	7100	279.5	0.06	0.75	16000	5700	224.4	0.05	0.75	12000	2500	98.4	0.025	0.75
2	0.5	15	20000	7000	275.6	0.05	0.75	17000	5000	196.9	0.04	0.75	13000	3200	126.0	0.03	0.75	10000	1800	70.9	0.016	0.75
2	0.5	20	20000	3600	141.7	0.04	0.75	17000	2600	102.4	0.03	0.75	13000	1800	70.9	0.025	0.75	10000	900	35.4	0.012	0.75
2	0.5	25	16000	1800	70.9	0.03	0.75	14000	1400	55.1	0.025	0.75	12000	1100	43.3	0.02	0.75	9000	720	28.3	0.01	0.75
2	0.5	30	16000	1400	55.1	0.025	0.75	14000	1200	47.2	0.02	0.75	12000	900	35.4	0.016	0.75	9000	650	25.6	0.008	0.75
2	0.5	35	13000	1100	43.3	0.02	0.75	11000	800	31.5	0.018	0.75	10000	700	27.6	0.014	0.75	7000	500	19.7	0.007	0.75
2	0.5	40	13000	1000	39.4	0.02	0.75	11000	700	27.6	0.015	0.75	10000	600	23.6	0.012	0.75	7000	400	15.7	0.006	0.75
3	0.5	10	16000	11000	433.1	0.12	1.5	13000	7800	307.1	0.09	1.5	11000	6300	248.0	0.07	1.5	8000	2800	110.2	0.04	1.5
3	0.5	15	16000	9000	354.3	0.11	1.5	13000	6400	252.0	0.08	1.5	11000	5100	200.8	0.06	1.5	8000	2300	90.6	0.04	1.5
3	0.5	20	13000	7200	283.5	0.09	1.5	11000	5100	200.8	0.07	1.5	8700	4000	157.5	0.05	1.5	6500	1800	70.9	0.03	1.5
3	0.5	30	13000	5700	224.4	0.06	1.5	11000	4000	157.5	0.05	1.5	8700	3000	118.1	0.04	1.5	6500	1400	55.1	0.02	1.5
3	0.8	10	16000	11000	433.1	0.24	1	13000	7800	307.1	0.19	1	11000	6300	248.0	0.14	1	8000	2800	110.2	0.07	1
3	0.8	15	16000	9000	354.3	0.22	1	13000	6400	252.0	0.17	1	11000	5100	200.8	0.13	1	8000	2300	90.6	0.07	1
3	0.8	20	13000	7200	283.5	0.19	1	11000	5100	200.8	0.15	1	8700	4000	157.5	0.11	1	6500	1800	70.9	0.06	1
3	0.8	30	13000	5700	224.4	0.12	1	11000	4000	157.5	0.09	1	8700	3000	118.1	0.07	1	6500	1400	55.1	0.04	1
3	0.8	40	11000	3600	141.7	0.08	1	9100	2600	102.4	0.06	1	7400	2000	78.7	0.05	1	5500	1000	39.4	0.025	1
3	0.8	50	8000	2600	102.4	0.07	1	6600	1800	70.9	0.05	1	5800	1500	59.1	0.04	1	4600	800	31.5	0.02	1
4	0.5	12	8400	6000	236.2	0.15	2	7000	4300	169.3	0.12	2	5600	3400	133.9	0.09	2	4200	1500	59.1	0.05	2
4	0.5	20	8400	6000	236.2	0.14	2	7000	4300	169.3	0.11	2	5600	3400	133.9	0.08	2	4200	1500	59.1	0.04	2
4	0.5	30	6900	4900	192.9	0.12	2	5700	3500	137.8	0.09	2	4600	2800	110.2	0.07	2	3500	1200	47.2	0.03	2
4	0.5	48	5600	2000	78.7	0.07	2	4600	1400	55.1	0.05	2	3800	1100	43.3	0.04	2	2800	500	19.7	0.02	2
4	1	12	12000	12000	472.4	0.3	1.5	10000	8500	334.6	0.23	1.5	8000	6800	267.7	0.18	1.5	6000	3000	118.1	0.1	1.5
4	1	20	12000	12000	472.4	0.27	1.5	10000	8500	334.6	0.21	1.5	8000	6800	267.7	0.16	1.5	6000	3000	118.1	0.08	1.5
4	1	30	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
6	0.5	18	4000	3900	153.5	0.15	3.5	3300	2800	110.2	0.12	3.5	2700	2200	86.6	0.09	3.5	2000	1000	39.4	0.05	3.5
6	0.5	30	4000	3900	153.5	0.14	3.5	3300	2800	110.2	0.11	3.5	2700	2200	86.6	0.08	3.5	2000	1000	39.4	0.04	3.5
6	1	18	8000	13000	511.8	0.5	3	6600	9200	362.2	0.4	3	5400	7400	291.3	0.3	3	4000	3300	129.9	0.15	3
6	1	30	8000	13000	511.8	0.45	3	6600	9200	362.2	0.35	3	5400	7400	291.3	0.27	3	4000	3300	129.9	0.14	3
6	1	54	6600	11000	433.1	0.25	3	5500	7800	307.1	0.2	3	4400	6300	248.0	0.15	3	3300	2800	110.2	0.08	3
6	1.5	18	8000	13000	511.8	0.5	2	6600	9200	362.2	0.4	2	5400	7400	291.3	0.3	2	4000	3300	129.9	0.15	2
6	1.5	30	8000	13000	511.8	0.45	2	6600	9200	362.2	0.35	2	5400	7400	291.3	0.27	2	4000	3300	129.9	0.14	2
6	1.5	42	6600	11000	433.1	0.4	2	5500	7800	307.1	0.3	2	4400	6300	248.0	0.24	2	3300	2800	110.2	0.12	2
6	1.5	54	6600	11000	433.1	0.25	2	5500	7800	307.1	0.2	2	4400	6300	248.0	0.15	2	3300	2800	110.2	0.08	2
6	2	18	8000	13000	511.8	0.5	1.5	6600	9200	362.2	0.4	1.5	5400	7400	291.3	0.3	1.5	4000	3300	129.9	0.15	1.5
6	2	30	8000	13000	511.8	0.45	1.5	6600	9200	362.2	0.35	1.5	5400	7400	291.3	0.27	1.5	4000	3300	129.9	0.14	1.5

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Using air blow or mist is recommended.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VFHVRB

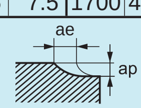
4 flute, Corner radius, Short cut length, Irregular helix flutes

CARBIDE

High feed conditions

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.					Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
DC (mm)	RE (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
7	1.5	—	6800	13000	511.8	0.5	3	5600	9200	362.2	0.4	3	4600	7400	291.3	0.3	3	3400	3300	129.9	0.15	3
8	0.5	24	3000	3900	153.5	0.18	5	2500	2800	110.2	0.14	5	2000	2200	86.6	0.11	5	1500	1000	39.4	0.05	5
8	0.5	40	3000	3900	153.5	0.16	5	2500	2800	110.2	0.12	5	2000	2200	86.6	0.1	5	1500	1000	39.4	0.05	5
8	1	24	4200	6500	255.9	0.3	4.5	3500	4600	181.1	0.23	4.5	2800	3700	145.7	0.18	4.5	2100	1600	63.0	0.09	4.5
8	1	40	4200	6500	255.9	0.27	4.5	3500	4600	181.1	0.21	4.5	2800	3700	145.7	0.16	4.5	2100	1600	63.0	0.08	4.5
8	2	24	6000	13000	511.8	0.6	3	5000	9200	362.2	0.46	3	4000	7400	291.3	0.36	3	3000	3300	129.9	0.18	3
8	2	40	6000	13000	511.8	0.54	3	5000	9200	362.2	0.42	3	4000	7400	291.3	0.32	3	3000	3300	129.9	0.16	3
8	2	56	5000	11000	433.1	0.48	3	4200	7800	307.1	0.37	3	3400	6300	248.0	0.3	3	2500	2800	110.2	0.14	3
8	2	72	5000	11000	433.1	0.3	3	4200	7800	307.1	0.23	3	3400	6300	248.0	0.2	3	2500	2800	110.2	0.09	3
9	2	—	5300	13000	511.8	0.6	3.5	4400	9200	362.2	0.46	3.5	3600	7400	291.3	0.36	3.5	2700	3300	129.9	0.18	3.5
10	0.5	30	2400	3900	153.5	0.18	6.5	2000	2800	110.2	0.14	6.5	1600	2200	86.6	0.11	6.5	1200	1000	39.4	0.05	6.5
10	0.5	50	2400	3900	153.5	0.16	6.5	2000	2800	110.2	0.12	6.5	1600	2200	86.6	0.1	6.5	1200	1000	39.4	0.05	6.5
10	1	30	3300	6500	255.9	0.3	6	2700	4600	181.1	0.23	6	2200	3700	145.7	0.18	6	1700	1600	63.0	0.09	6
10	1	50	3300	6500	255.9	0.27	6	2700	4600	181.1	0.21	6	2200	3700	145.7	0.16	6	1700	1600	63.0	0.08	6
10	2	30	4800	13000	511.8	0.6	4.5	4000	9200	362.2	0.46	4.5	3200	7400	291.3	0.36	4.5	2400	3300	129.9	0.18	4.5
10	2	50	4800	13000	511.8	0.54	4.5	4000	9200	362.2	0.42	4.5	3200	7400	291.3	0.32	4.5	2400	3300	129.9	0.16	4.5
10	2	70	4000	11000	433.1	0.48	4.5	3300	7800	307.1	0.37	4.5	2700	6300	248.0	0.3	4.5	2000	2800	110.2	0.14	4.5
10	2	90	4000	11000	433.1	0.48	4.5	3300	7800	307.1	0.37	4.5	2700	6300	248.0	0.3	4.5	2000	2800	110.2	0.14	4.5
11	2	—	4300	12000	472.4	0.6	5	3600	8500	334.6	0.46	5	2900	6800	267.7	0.36	5	2200	3000	118.1	0.18	5
12	0.5	36	2000	3600	141.7	0.27	8	1700	2600	102.4	0.21	8	1300	2100	82.7	0.14	8	1000	900	35.4	0.07	8
12	0.5	60	2000	3600	141.7	0.24	8	1700	2600	102.4	0.18	8	1300	2100	82.7	0.12	8	1000	900	35.4	0.06	8
12	1	36	2400	4800	189.0	0.36	7.5	2000	3400	133.9	0.28	7.5	1600	2700	106.3	0.18	7.5	1200	1200	47.2	0.09	7.5
12	1	60	2400	4800	189.0	0.32	7.5	2000	3400	133.9	0.25	7.5	1600	2700	106.3	0.16	7.5	1200	1200	47.2	0.08	7.5
12	2	36	4000	12000	472.4	0.9	6	3300	8500	334.6	0.7	6	2700	6800	267.7	0.45	6	2000	3000	118.1	0.23	6
12	2	60	4000	12000	472.4	0.8	6	3300	8500	334.6	0.6	6	2700	6800	267.7	0.4	6	2000	3000	118.1	0.2	6
12	2	84	3300	9900	389.8	0.7	6	2700	7000	275.6	0.55	6	2200	5600	220.5	0.36	6	1700	2500	98.4	0.18	6
12	2	108	3300	9900	389.8	0.45	6	2700	7000	275.6	0.35	6	2200	5600	220.5	0.23	6	1700	2500	98.4	0.11	6
12	3	36	4000	12000	472.4	0.9	4.5	3300	8500	334.6	0.7	4.5	2700	6800	267.7	0.45	4.5	2000	3000	118.1	0.23	4.5
12	3	60	4000	12000	472.4	0.8	4.5	3300	8500	334.6	0.6	4.5	2700	6800	267.7	0.4	4.5	2000	3000	118.1	0.2	4.5
13	3	—	3700	12000	472.4	0.9	5	3100	8500	334.6	0.7	5	2500	6800	267.7	0.45	5	1900	3000	118.1	0.23	5
16	0.5	42	1500	3000	118.1	0.27	11	1200	2100	82.7	0.21	11	1000	1700	66.9	0.12	11	750	750	29.5	0.05	11
16	2	42	2100	5000	196.9	0.45	9	1700	3600	141.7	0.35	9	1400	2900	114.2	0.2	9	1100	1300	51.2	0.08	9
16	3	42	3000	10000	393.7	0.9	7.5	2500	7100	279.5	0.7	7.5	2000	5700	224.4	0.4	7.5	1500	2500	98.4	0.15	7.5
16	3	80	3000	10000	393.7	0.8	7.5	2500	7100	279.5	0.6	7.5	2000	5700	224.4	0.37	7.5	1500	2500	98.4	0.14	7.5
16	3	120	2500	8300	326.8	0.7	7.5	2100	5900	232.3	0.55	7.5	1700	4700	185.0	0.32	7.5	1300	2100	82.7	0.12	7.5

Depth of cut



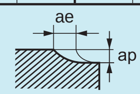
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Using air blow or mist is recommended.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

SOLID END MILLS

High depth of cut conditions

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.					Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
DC (mm)	RE (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
1	0.2	4	24000	2200	86.6	0.08	0.45	20000	1500	59.1	0.07	0.45	16000	1200	47.2	0.05	0.45	12000	550	21.7	0.025	0.45
1	0.2	6	24000	2000	78.7	0.07	0.45	20000	1400	55.1	0.05	0.45	16000	1100	43.3	0.04	0.45	12000	500	19.7	0.02	0.45
1	0.2	8	19000	1400	55.1	0.05	0.45	16000	1000	39.4	0.04	0.45	13000	800	31.5	0.03	0.45	9500	350	13.8	0.016	0.45
1	0.2	10	14000	800	31.5	0.04	0.45	12000	600	23.6	0.03	0.45	9000	400	15.7	0.025	0.45	7000	200	7.9	0.012	0.45
1	0.2	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1	0.2	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.3	4	19000	3000	118.1	0.2	0.65	16000	2100	82.7	0.16	0.65	13000	1700	66.9	0.12	0.65	9500	750	29.5	0.06	0.65
1.5	0.3	6	19000	2300	90.6	0.16	0.65	16000	1600	63.0	0.13	0.65	13000	1300	51.2	0.1	0.65	9500	580	22.8	0.05	0.65
1.5	0.3	10	16000	1700	66.9	0.1	0.65	13000	1200	47.2	0.07	0.65	11000	1000	39.4	0.05	0.65	8000	430	16.9	0.03	0.65
1.5	0.3	15	13000	1000	39.4	0.06	0.65	11000	700	27.6	0.05	0.65	9000	600	23.6	0.04	0.65	6500	250	9.8	0.018	0.65
1.5	0.3	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.3	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.3	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	0.5	6	14000	3000	118.1	0.2	0.75	12000	2100	82.7	0.16	0.75	9400	1700	66.9	0.12	0.75	7000	750	29.5	0.06	0.75
2	0.5	10	14000	3000	118.1	0.16	0.75	12000	2100	82.7	0.13	0.75	9400	1700	66.9	0.1	0.75	7000	750	29.5	0.05	0.75
2	0.5	15	12000	2100	82.7	0.1	0.75	10000	1500	59.1	0.08	0.75	8000	1200	47.2	0.06	0.75	6000	530	20.9	0.03	0.75
2	0.5	20	12000	1100	43.3	0.08	0.75	10000	800	31.5	0.06	0.75	8000	600	23.6	0.05	0.75	6000	280	11.0	0.025	0.75
2	0.5	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	0.5	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	0.5	35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	0.5	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.5	10	9600	3300	129.9	0.24	1.5	8000	2300	90.6	0.2	1.5	6400	1800	70.9	0.14	1.5	4800	830	32.7	0.07	1.5
3	0.5	15	9600	2700	106.3	0.22	1.5	8000	1900	74.8	0.17	1.5	6400	1500	59.1	0.13	1.5	4800	680	26.8	0.06	1.5
3	0.5	20	7800	2200	86.6	0.18	1.5	6500	1500	59.1	0.14	1.5	5200	1200	47.2	0.11	1.5	3900	550	21.7	0.05	1.5
3	0.5	30	7800	1700	66.9	0.12	1.5	6500	1200	47.2	0.1	1.5	5200	1000	39.4	0.07	1.5	3900	430	16.9	0.04	1.5
3	0.8	10	9600	3300	129.9	0.5	1	8000	2300	90.6	0.4	1	6400	1800	70.9	0.3	1	4800	830	32.7	0.14	1
3	0.8	15	9600	2700	106.3	0.5	1	8000	1900	74.8	0.35	1	6400	1500	59.1	0.25	1	4800	680	26.8	0.13	1
3	0.8	20	7800	2200	86.6	0.4	1	6500	1500	59.1	0.3	1	5200	1200	47.2	0.23	1	3900	550	21.7	0.11	1
3	0.8	30	7800	1700	66.9	0.24	1	6500	1200	47.2	0.2	1	5200	1000	39.4	0.14	1	3900	430	16.9	0.05	1
3	0.8	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.8	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	0.5	12	5000	1800	70.9	0.3	2	4200	1300	51.2	0.24	2	3400	1000	39.4	0.18	2	2500	450	17.7	0.06	2
4	0.5	20	5000	1800	70.9	0.3	2	4200	1300	51.2	0.22	2	3400	1000	39.4	0.17	2	2500	450	17.7	0.06	2
4	0.5	30	4100	1500	59.1	0.24	2	3400	1100	43.3	0.19	2	2700	840	33.1	0.14	2	2100	380	15.0	0.05	2
4	0.5	48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	1	12	7200	3600	141.7	0.6	1.5	6000	2500	98.4	0.5	1.5	4800	2000	78.7	0.36	1.5	3600	900	35.4	0.12	1.5
4	1	20	7200	3600	141.7	0.6	1.5	6000	2500	98.4	0.4	1.5	4800	2000	78.7	0.32	1.5	3600	900	35.4	0.11	1.5
4	1	30	6000	3000	118.1	0.5	1.5	5000	2100	82.7	0.4	1.5	4000	1700	66.9	0.3	1.5	3000	750	29.5	0.1	1.5
6	0.5	18	2400	1200	47.2	0.3	3.5	2000	840	33.1	0.24	3.5	1600	670	26.4	0.18	3.5	1200	300	11.8	0.06	3.5
6	0.5	30	2400	1200	47.2	0.3	3.5	2000	840	33.1	0.22	3.5	1600	670	26.4	0.17	3.5	1200	300	11.8	0.06	3.5
6	1	18	4800	3900	153.5	1	3	4000	2700	106.3	0.8	3	3200	2200	86.6	0.6	3	2400	980	38.6	0.2	3
6	1	30	4800	3900	153.5	0.9	3	4000	2700	106.3	0.7	3	3200	2200	86.6	0.5	3	2400	980	38.6	0.18	3
6	1	54	4000	3300	129.9	0.5	3	3300	2300	90.6	0.4	3	2700	1800	70.9	0.3	3	2000	830	32.7	0.1	3
6	1.5	18	4800	3900	153.5	1	2	4000	2700	106.3	0.8	2	3200	2200	86.6	0.6	2	2400	980	38.6	0.2	2
6	1.5	30	4800	3900	153.5	0.9	2	4000	2700	106.3	0.7	2	3200	2200	86.6	0.5	2	2400	980	38.6	0.18	2
6	1.5	42	4000	3300	129.9	0.8	2	3300	2300	90.6	0.6	2	2700	1800	70.9	0.5	2	2000	830	32.7	0.16	2
6	1.5	54	4000	3300	129.9	0.5	2	3300	2300	90.6	0.4	2	2700	1800	70.9	0.3	2	2000	830	32.7	0.1	2
6	2	18	4800	3900	153.5	1	1.5	4000	2700	106.3	0.8	1.5	3200	2200	86.6	0.6	1.5	2400	980	38.6	0.2	1.5
6	2	30	4800	3900	153.5	0.9	1.5	4000	2700	106.3	0.7	1.5	3200	2200	86.6	0.5	1.5	2400	980	38.6	0.18	1.5

Depth of cut



1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Using air blow or mist is recommended.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

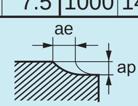
VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

High depth of cut conditions

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1−10, AISI P21 etc.					Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.				
DC (mm)	RE (mm)	LU (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
7	1.5	—	4100	3900	153.5	1	3	3400	2700	106.3	0.8	3	2700	2200	86.6	0.6	3	2100	980	38.6	0.2	3
8	0.5	24	1800	1200	47.2	0.35	5	1500	840	33.1	0.3	5	1200	670	26.4	0.2	5	900	300	11.8	0.07	5
8	0.5	40	1800	1200	47.2	0.3	5	1500	840	33.1	0.25	5	1200	670	26.4	0.2	5	900	300	11.8	0.06	5
8	1	24	2500	2000	78.7	0.6	4.5	2100	1400	55.1	0.5	4.5	1700	1100	43.3	0.4	4.5	1300	500	19.7	0.12	4.5
8	1	40	2500	2000	78.7	0.5	4.5	2100	1400	55.1	0.4	4.5	1700	1100	43.3	0.3	4.5	1300	500	19.7	0.11	4.5
8	2	24	3600	3900	153.5	1.2	3	3000	2700	106.3	1	3	2400	2200	86.6	0.7	3	1800	980	38.6	0.24	3
8	2	40	3600	3900	153.5	1.1	3	3000	2700	106.3	0.9	3	2400	2200	86.6	0.7	3	1800	980	38.6	0.22	3
8	2	56	3000	3300	129.9	1	3	2500	2300	90.6	0.8	3	2000	1800	70.9	0.6	3	1500	830	32.7	0.2	3
8	2	72	3000	3300	129.9	0.6	3	2500	2300	90.6	0.5	3	2000	1800	70.9	0.4	3	1500	830	32.7	0.12	3
9	2	—	3200	3900	153.5	1.2	3.5	2700	2700	106.3	1	3.5	2100	2200	86.6	0.7	3.5	1600	980	38.6	0.24	3.5
10	0.5	30	1400	1200	47.2	0.35	6.5	1200	840	33.1	0.3	6.5	940	670	26.4	0.2	6.5	700	300	11.8	0.07	6.5
10	0.5	50	1400	1200	47.2	0.3	6.5	1200	840	33.1	0.25	6.5	940	670	26.4	0.2	6.5	700	300	11.8	0.06	6.5
10	1	30	2000	2000	78.7	0.6	6	1700	1400	55.1	0.5	6	1300	1100	43.3	0.4	6	1000	500	19.7	0.12	6
10	1	50	2000	2000	78.7	0.5	6	1700	1400	55.1	0.4	6	1300	1100	43.3	0.3	6	1000	500	19.7	0.11	6
10	2	30	2900	3900	153.5	1.2	4.5	2400	2700	106.3	1	4.5	1900	2200	86.6	0.7	4.5	1500	980	38.6	0.24	4.5
10	2	50	2900	3900	153.5	1.1	4.5	2400	2700	106.3	0.9	4.5	1900	2200	86.6	0.7	4.5	1500	980	38.6	0.22	4.5
10	2	70	2400	3300	129.9	1	4.5	2000	2300	90.6	0.8	4.5	1600	1800	70.9	0.6	4.5	1200	830	32.7	0.2	4.5
10	2	90	2400	3300	129.9	1	4.5	2000	2300	90.6	0.8	4.5	1600	1800	70.9	0.6	4.5	1200	830	32.7	0.2	4.5
11	2	—	2600	3600	141.7	1.2	5	2200	2500	98.4	1	5	1700	2000	78.7	0.7	5	1300	900	35.4	0.24	5
12	0.5	36	1200	1100	43.3	0.5	8	1000	770	30.3	0.4	8	800	620	24.4	0.3	8	600	280	11.0	0.11	8
12	0.5	60	1200	1100	43.3	0.5	8	1000	770	30.3	0.4	8	800	620	24.4	0.3	8	600	280	11.0	0.1	8
12	1	36	1400	1400	55.1	0.7	7.5	1200	1000	39.4	0.6	7.5	940	780	30.7	0.4	7.5	700	350	13.8	0.14	7.5
12	1	60	1400	1400	55.1	0.6	7.5	1200	1000	39.4	0.5	7.5	940	780	30.7	0.4	7.5	700	350	13.8	0.13	7.5
12	2	36	2400	3600	141.7	1.8	6	2000	2500	98.4	1.4	6	1600	2000	78.7	1.1	6	1200	900	35.4	0.4	6
12	2	60	2400	3600	141.7	1.6	6	2000	2500	98.4	1.3	6	1600	2000	78.7	1	6	1200	900	35.4	0.3	6
12	2	84	2000	3000	118.1	1.4	6	1700	2100	82.7	1.1	6	1300	1700	66.9	0.8	6	1000	750	29.5	0.3	6
12	2	108	2000	3000	118.1	0.9	6	1700	2100	82.7	0.7	6	1300	1700	66.9	0.5	6	1000	750	29.5	0.2	6
12	3	36	2400	3600	141.7	1.8	4.5	2000	2500	98.4	1.4	4.5	1600	2000	78.7	1.1	4.5	1200	900	35.4	0.4	4.5
12	3	60	2400	3600	141.7	1.6	4.5	2000	2500	98.4	1.3	4.5	1600	2000	78.7	1	4.5	1200	900	35.4	0.3	4.5
13	3	—	2200	3600	141.7	1.8	5	1800	2500	98.4	1.4	5	1500	2000	78.7	1.1	5	1100	900	35.4	0.4	5
16	0.5	42	900	900	35.4	0.5	11	750	630	24.8	0.4	11	600	500	19.7	0.3	11	450	230	9.1	0.1	11
16	2	42	1300	1500	59.1	0.9	9	1100	1100	43.3	0.7	9	870	840	33.1	0.5	9	650	380	15.0	0.2	9
16	3	42	1800	3000	118.1	1.8	7.5	1500	2100	82.7	1.4	7.5	1200	1700	66.9	0.9	7.5	900	750	29.5	0.4	7.5
16	3	80	1800	3000	118.1	1.6	7.5	1500	2100	82.7	1.3	7.5	1200	1700	66.9	0.8	7.5	900	750	29.5	0.3	7.5
16	3	120	1500	2500	98.4	1.4	7.5	1200	1800	70.9	1.1	7.5	1000	1400	55.1	0.7	7.5	750	630	24.8	0.3	7.5

Depth of cut



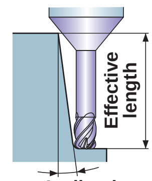
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Using air blow or mist is recommended.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

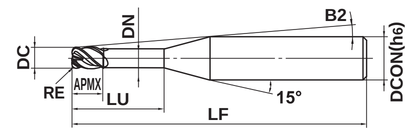
VFHVRB – Inch sizes

4 flute, Corner radius, Short cut length, Irregular helix flutes

UWC VF 43° 45°

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
◎	◎	◎	◎	○	○		





R	±.0004"				
	0 - .0008"				
h6	.2500"≤DMM≤.3750"	DMM=.5000"			
	0 - .00035	0 - .00043			

● Impact Miracle corner radius end mill for high feed and efficient machining.

Unit : inch

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Effective length for inclined angle 30'	1°	2°	3°
VFHVRBD1/8N3DR0.03	.1250	.030	.125	.375	.1211	6.1°	2.25	.2500	4	●	9.9	10.3	11	11.9
VFHVRB**D1/8N5DR0.03**	.1250	.030	.125	.625	.1211	4.3°	2.25	.2500	4	●	16.5	17.1	18.3	19.8
VFHVRB**D3/16N3DR0.05**	.1875	.050	.188	.563	.1835	2.9°	2.25	.2500	4	●	14.9	15.4	16.4	⋆
VFHVRB**D3/16N5DR0.05**	.1875	.050	.188	.938	.1835	1.8°	2.25	.2500	4	●	24.7	25.6	⋆	⋆
VFHVRB**D1/4N3DR0.06**	.2500	.060	.375	.750	.2441	–	2.25	.2500	4	●	⋆	⋆	⋆	⋆
VFHVRB**D1/4N5DR0.06**	.2500	.060	.375	1.250	.2441	–	3.00	.2500	4	●	⋆	⋆	⋆	⋆
VFHVRB**D5/16N3DR0.08**	.3125	.080	.469	.938	.3066	–	3.00	.3125	4	●	⋆	⋆	⋆	⋆
VFHVRB**D5/16N5DR0.08**	.3125	.080	.469	1.563	.3066	–	4.00	.3125	4	●	⋆	⋆	⋆	⋆
VFHVRB**D3/8N3DR0.08**	.3750	.080	.563	1.125	.3691	–	3.00	.3750	4	●	⋆	⋆	⋆	⋆
VFHVRB**D3/8N5DR0.08**	.3750	.080	.563	1.875	.3691	–	4.00	.3750	4	●	⋆	⋆	⋆	⋆
VFHVRB**D1/2N3DR0.12**	.5000	.120	.750	1.500	.4882	–	4.00	.5000	4	●	⋆	⋆	⋆	⋆
VFHVRB**D1/2N5DR0.12**	.5000	.120	.750	2.500	.4882	–	5.00	.5000	4	●	⋆	⋆	⋆	⋆

⋆ No interference

● : Inventory maintained.

VFHVRB – Inch sizes

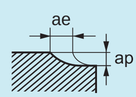
4 flute, Corner radius, Short cut length, Irregular helix flutes

RECOMMENDED CUTTING CONDITIONS

High feed conditions

Work material			Carbon Steel, Cast Iron, Alloy Steel (—30HRC) AISI 1049, AISI 30, AISI P20					Alloy steel, Tool steel, Pre-haedened steel AIAI H13, AISI W1-10, AISI P21					Hardened Steel (45—55HRC) AISI H13					Hardened Steel (55—62HRC) AISI D2				
DC (inch)	RE (inch)	LU (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
0.1250	0.03	0.375	16000	11000	433.1	.009	.039	13000	7800	307.1	.007	.039	11000	6300	248	.006	.039	8000	2800	110.2	.003	.039
0.1250	0.03	0.625	16000	9000	354.3	.009	.039	13000	6400	252	.007	.039	11000	5100	200.8	.006	.039	8000	2300	90.6	.003	.039
0.1875	0.05	0.563	12000	12000	472.4	.012	.059	10000	8500	334.6	.009	.059	8000	6800	267.7	.007	.059	6000	3000	118.1	.004	.059
0.1875	0.05	0.938	12000	12000	472.4	.011	.059	10000	8500	334.6	.008	.059	8000	6800	267.7	.006	.059	6000	3000	118.1	.003	.059
0.2500	0.06	0.750	8000	13000	511.8	.020	.078	6600	9200	362.2	.016	.078	5400	7400	291.3	.012	.078	4000	3300	129.9	.006	.078
0.2500	0.06	1.250	8000	13000	511.8	.018	.078	6600	9200	362.2	.014	.078	5400	7400	291.3	.011	.078	4000	3300	129.9	.006	.078
0.3125	0.08	0.938	6000	13000	511.8	.024	.118	5000	9200	362.2	.018	.118	4000	7400	291.3	.014	.118	3000	3300	129.9	.007	.118
0.3125	0.08	1.563	6000	13000	511.8	.021	.118	5000	9200	362.2	.017	.118	4000	7400	291.3	.013	.118	3000	3300	129.9	.006	.118
0.3750	0.08	1.125	4800	13000	511.8	.024	.177	4000	9200	362.2	.018	.177	3200	7400	291.3	.014	.177	2400	3300	129.9	.007	.177
0.3750	0.08	1.875	4800	13000	511.8	.021	.177	4000	9200	362.2	.017	.177	3200	7400	291.3	.013	.177	2400	3300	129.9	.006	.177
0.5000	0.12	1.500	4000	12000	472.4	.035	.177	3300	8500	334.6	.028	.177	2700	6800	267.7	.018	.177	2000	3000	118.1	.009	.177
0.5000	0.12	2.500	4000	12000	472.4	.031	.177	3300	8500	334.6	.024	.177	2700	6800	267.7	.016	.177	2000	3000	118.1	.008	.177

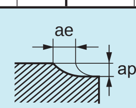
Depth of cut



High depth of cut conditions

Work material			Carbon Steel, Cast Iron, Alloy Steel (—30HRC) AISI 1049, AISI 30, AISI P20					Alloy steel, Tool steel, Pre-haedened steel AIAI H13, AISI W1-10, AISI P21					Hardened Steel (45—55HRC) AISI H13					Hardened Steel (55—62HRC) AISI D2				
DC (inch)	RE (inch)	LU (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (inch)	Width of cut ae (inch)
0.1250	0.03	0.375	9600	3300	129.9	.020	.039	8000	2300	90.6	.016	.039	6400	1800	70.9	.012	.039	4800	830	32.7	.006	.039
0.1250	0.03	0.625	9600	2700	106.3	.020	.039	8000	1900	74.8	.014	.039	6400	1500	59.1	.010	.039	4800	680	26.8	.005	.039
0.1875	0.05	0.563	7200	3600	141.7	.024	.059	6000	2500	98.4	.020	.059	4800	2000	78.7	.014	.059	3600	900	35.4	.005	.059
0.1875	0.05	0.938	7200	3600	141.7	.024	.059	6000	2500	98.4	.016	.059	4800	2000	78.7	.013	.059	3600	900	35.4	.004	.059
0.2500	0.06	0.750	4000	3300	129.9	.020	.118	3300	2300	90.6	.016	.118	2700	1800	70.9	.012	.118	2000	830	32.7	.004	.118
0.2500	0.06	1.250	4800	3900	153.5	.040	.079	4000	2700	106.3	.031	.079	3200	2200	86.6	.024	.079	2400	980	38.6	.008	.079
0.3125	0.08	0.938	3600	3900	153.5	.047	.118	3000	2700	106.3	.040	.118	2400	2200	86.6	.028	.118	1800	980	38.6	.009	.118
0.3125	0.08	1.563	3600	3900	153.5	.043	.118	3000	2700	106.3	.035	.118	2400	2200	86.6	.028	.118	1800	980	38.6	.009	.118
0.3750	0.08	1.125	2900	3900	153.5	.047	.177	2400	2700	106.3	.040	.177	1900	2200	86.6	.028	.177	1500	980	38.6	.009	.177
0.3750	0.08	1.875	2900	3900	153.5	.043	.177	2400	2700	106.3	.035	.177	1900	2200	86.6	.028	.177	1500	980	38.6	.009	.177
0.5000	0.12	1.500	2400	3600	141.7	.071	.177	2000	2500	98.4	.055	.177	1600	2000	78.7	.043	.177	1200	900	35.4	.016	.177
0.5000	0.12	2.500	2400	3600	141.7	.063	.177	2000	2500	98.4	.051	.177	1600	2000	78.7	.040	.177	1200	900	35.4	.012	.177

Depth of cut



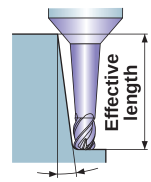
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Using air blow or mist is recommended.
3) When contour milling, cutting conditions can vary greatly due to the geometry of the workpiece and depth of cut.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

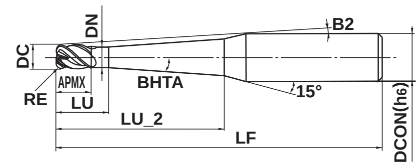
VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

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

Taper neck type





R	DC≤10	DC>10			
	±0.007	±0.01			
	DC≤12				
	0 - 0.02				
h6	DCON=6	8≤DCON≤10	12≤DCON≤16		
	0 - 0.008	0 - 0.009	0 - 0.011		

● Impact Miracle corner radius end mill for high feed and efficient machining.

Unit : mm

Order Number	DC	RE	BHTA	APMX	LU_2	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Effective length for inclined angle 30'	1°	2°	3°
VFHVRBD010R02N006T09	1	0.2	0.9°	1	6	2.5	0.94	9.3°	60	6	4	●	–	6.6	7.1	7.6
VFHVRBD010R02N010T09	1	0.2	0.9°	1	10	2.5	0.94	7.5°	60	6	4	●	–	10.6	11.4	12.3
VFHVRBD010R02N015T09	1	0.2	0.9°	1	15	2.5	0.94	6.1°	60	6	4	●	–	15.6	16.8	18.1
VFHVRBD010R02N020T09	1	0.2	0.9°	1	20	2.5	0.94	5.1°	80	6	4	●	–	20.6	22.1	23.9
VFHVRBD010R02N025T09	1	0.2	0.9°	1	25	2.5	0.94	4.4°	80	6	4	●	–	25.6	27.5	29.7
VFHVRBD010R02N030T09	1	0.2	0.9°	1	30	2.5	0.94	3.8°	80	6	4	●	–	30.6	32.9	35.5
VFHVRBD010R02N035T09	1	0.2	0.9°	1	35	2.5	0.94	3.4°	90	6	4	●	–	35.6	38.3	41.3
VFHVRBD010R02N040T09	1	0.2	0.9°	1	40	2.5	0.94	3.1°	90	6	4	●	–	40.6	43.6	47.2
VFHVRBD010R02N045T09	1	0.2	0.9°	1	45	2.5	0.94	2.8°	90	6	4	●	–	45.6	49	*
VFHVRBD010R02N050T09	1	0.2	0.9°	1	50	2.5	0.94	2.6°	90	6	4	●	–	50.6	54.4	*
VFHVRBD015R03N010T09	1.5	0.3	0.9°	1.5	10	3	1.44	7.1°	60	6	4	●	–	10.6	11.4	12.3
VFHVRBD015R03N015T09	1.5	0.3	0.9°	1.5	15	3	1.44	5.7°	60	6	4	●	–	15.6	16.8	18.1
VFHVRBD015R03N020T09	1.5	0.3	0.9°	1.5	20	3	1.44	4.7°	80	6	4	●	–	20.6	22.2	23.9
VFHVRBD015R03N030T09	1.5	0.3	0.9°	1.5	30	3	1.44	3.5°	80	6	4	●	–	30.6	32.9	35.6
VFHVRBD015R03N040T09	1.5	0.3	0.9°	1.5	40	3	1.44	2.8°	90	6	4	●	–	40.6	43.7	*
VFHVRBD015R03N050T09	1.5	0.3	0.9°	1.5	50	3	1.44	2.4°	90	6	4	●	–	50.6	54.4	*
VFHVRBD020R05N015T04	2	0.5	0.4°	2	15	4	1.9	5.2°	60	6	4	●	15.6	16.2	17.4	18.7
VFHVRBD020R05N020T04	2	0.5	0.4°	2	20	4	1.9	4.3°	80	6	4	●	20.6	21.3	22.9	24.7
VFHVRBD020R05N025T04	2	0.5	0.4°	2	25	4	1.9	3.6°	80	6	4	●	25.6	26.5	28.5	30.8
VFHVRBD020R05N030T04	2	0.5	0.4°	2	30	4	1.9	3.2°	80	6	4	●	30.6	31.7	34	36.8
VFHVRBD020R05N035T04	2	0.5	0.4°	2	35	4	1.9	2.8°	80	6	4	●	35.6	36.9	39.6	*
VFHVRBD020R05N040T04	2	0.5	0.4°	2	40	4	1.9	2.5°	80	6	4	●	40.6	42	45.2	*
VFHVRBD020R05N020T09	2	0.5	0.9°	2	20	4	1.9	4.4°	80	6	4	●	–	20.8	22.3	24.1
VFHVRBD020R05N025T09	2	0.5	0.9°	2	25	4	1.9	3.7°	90	6	4	●	–	25.8	27.7	29.9
VFHVRBD020R05N030T09	2	0.5	0.9°	2	30	4	1.9	3.2°	90	6	4	●	–	30.8	33	35.7
VFHVRBD020R05N035T09	2	0.5	0.9°	2	35	4	1.9	2.9°	90	6	4	●	–	35.8	38.4	*
VFHVRBD020R05N040T09	2	0.5	0.9°	2	40	4	1.9	2.6°	90	6	4	●	–	40.8	43.8	*
VFHVRBD020R05N045T09	2	0.5	0.9°	2	45	4	1.9	2.3°	90	6	4	●	–	45.8	49.2	*
VFHVRBD020R05N050T09	2	0.5	0.9°	2	50	4	1.9	2.2°	100	6	4	●	–	50.8	54.5	*
VFHVRBD020R05N055T09	2	0.5	0.9°	2	55	4	1.9	2°	100	6	4	●	–	55.8	59.9	*
VFHVRBD020R05N060T09	2	0.5	0.9°	2	60	4	1.9	1.8°	100	6	4	●	–	60.8	*	*

* No interference

● : Inventory maintained.

VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

Unit : mm

Order Number	DC	RE	BHTA	APMX	LU_2	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Effective length for inclined angle 30'	1°	2°	3°
VFHVRBD030R08N020T09	3	0.8	0.9°	3	20	6	2.9	3.6°	80	6	4	●	—	20.9	22.4	24.1
VFHVRBD030R08N025T09	3	0.8	0.9°	3	25	6	2.9	3°	80	6	4	●	—	25.9	27.8	30
VFHVRBD030R08N030T09	3	0.8	0.9°	3	30	6	2.9	2.6°	80	6	4	●	—	30.9	33.1	*
VFHVRBD030R08N040T09	3	0.8	0.9°	3	40	6	2.9	2°	90	6	4	●	—	40.9	43.9	*
VFHVRBD030R08N050T09	3	0.8	0.9°	3	50	6	2.9	1.7°	90	6	4	●	—	50.9	*	*
VFHVRBD030R08N060T09	3	0.8	0.9°	3	60	6	2.9	1.4°	100	6	4	●	—	60.9	*	*
VFHVRBD040R10N025T04	4	1	0.4°	4	25	7	3.9	2.1°	80	6	4	●	25.7	26.6	28.5	*
VFHVRBD040R10N030T04	4	1	0.4°	4	30	7	3.9	1.8°	80	6	4	●	30.7	31.8	*	*
VFHVRBD040R10N035T04	4	1	0.4°	4	35	7	3.9	1.6°	80	6	4	●	35.7	36.9	*	*
VFHVRBD040R10N040T04	4	1	0.4°	4	40	7	3.9	1.4°	80	6	4	●	40.7	42.1	*	*
VFHVRBD040R10N045T04	4	1	0.4°	4	45	7	3.9	1.3°	90	6	4	●	45.7	47.3	*	*
VFHVRBD040R10N050T04	4	1	0.4°	4	50	7	3.9	1.2°	90	6	4	●	50.7	52.5	*	*
VFHVRBD040R10N025T09	4	1	0.9°	4	25	7	3.9	2.2°	90	6	4	●	—	25.9	27.8	*
VFHVRBD040R10N030T09	4	1	0.9°	4	30	7	3.9	1.9°	90	6	4	●	—	30.9	*	*
VFHVRBD040R10N040T09	4	1	0.9°	4	40	7	3.9	1.4°	100	6	4	●	—	40.9	*	*
VFHVRBD040R10N050T09	4	1	0.9°	4	50	7	3.9	1.2°	100	6	4	●	—	50.9	*	*
VFHVRBD040R10N060T09	4	1	0.9°	4	60	7	3.9	1°	100	6	4	●	—	60.9	*	*
VFHVRBD060R15N040T09	6	1.5	0.9°	9	40	12	5.85	1.4°	110	8	4	●	—	41.4	*	*
VFHVRBD060R15N050T09	6	1.5	0.9°	9	50	12	5.85	1.2°	110	8	4	●	—	51.4	*	*
VFHVRBD060R15N060T09	6	1.5	0.9°	9	60	12	5.85	1°	110	8	4	●	—	61.4	*	*
VFHVRBD060R15N070T09	6	1.5	0.9°	9	70	12	5.85	0.9°	110	8	4	●	—	*	*	*
VFHVRBD080R20N060T09	8	2	0.9°	12	60	15	7.85	1°	150	10	4	●	—	61.5	*	*
VFHVRBD080R20N080T09	8	2	0.9°	12	80	15	7.85	0.8°	150	10	4	●	—	*	*	*
VFHVRBD100R20N080T09	10	2	0.9°	15	80	18	9.7	2°	130	16	4	●	—	82	88	*
VFHVRBD100R20N120T09	10	2	0.9°	15	120	18	9.7	1.4°	180	16	4	●	—	122	*	*
VFHVRBD120R20N080T09	12	2	0.9°	18	80	21	11.7	1.4°	130	16	4	●	—	82.2	*	*
VFHVRBD120R20N120T09	12	2	0.9°	18	120	21	11.7	1°	180	16	4	●	—	122.2	*	*

* No interference

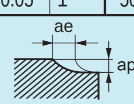
● : Inventory maintained.

RECOMMENDED CUTTING CONDITIONS

Taper neck type

Work material				Carbon Steel, Cast Iron, Alloy Steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21					Hardened Steel (45−55HRC) AISI H13					Hardened Steel (55−62HRC) AISI D2				
DC (mm)	RE (mm)	BHTA	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)
1	0.2	0.9°	6	40000	6500	255.9	0.03	0.45	33000	4600	181.1	0.022	0.45	27000	3700	145.7	0.018	0.45	20000	1600	63.0	0.01	0.45
1	0.2	0.9°	10	24000	2700	106.3	0.015	0.45	20000	1900	74.8	0.01	0.45	16000	1500	59.1	0.008	0.45	12000	700	27.6	0.006	0.45
1	0.2	0.9°	15	16000	1200	47.2	0.013	0.45	14000	700	27.6	0.008	0.45	12000	500	19.7	0.007	0.45	10000	400	15.7	0.003	0.45
1	0.2	0.9°	20	14000	1000	39.4	0.01	0.45	12000	600	23.6	0.006	0.45	10000	400	15.7	0.005	0.45	9000	300	11.8	0.002	0.45
1	0.2	0.9°	25	9500	610	24.0	0.008	0.45	8000	440	17.3	0.005	0.45	6000	320	12.6	0.004	0.45	4800	160	6.3	0.002	0.45
1	0.2	0.9°	30	4900	320	12.6	0.007	0.45	4100	220	8.7	0.004	0.45	3000	160	6.3	0.003	0.45	2500	80	3.1	0.002	0.45
1	0.2	0.9°	35	4000	260	10.2	0.006	0.45	3400	190	7.5	0.003	0.45	3000	160	6.3	0.003	0.45	2000	70	2.8	0.001	0.45
1	0.2	0.9°	40	3500	180	7.1	0.005	0.45	2900	130	5.1	0.003	0.45	2000	90	3.5	0.003	0.45	1700	50	2.0	0.001	0.45
1	0.2	0.9°	45	2900	150	5.9	0.004	0.45	2400	100	3.9	0.002	0.45	2000	90	3.5	0.002	0.45	1400	40	1.6	0.001	0.45
1	0.2	0.9°	50	2900	110	4.3	0.003	0.45	2400	80	3.1	0.002	0.45	2000	60	2.4	0.002	0.45	1400	30	1.2	0.001	0.45
1.5	0.3	0.9°	10	27000	5700	224.4	0.05	0.65	22000	4000	157.5	0.035	0.65	18000	3000	118.1	0.03	0.65	14000	1400	55.1	0.014	0.65
1.5	0.3	0.9°	15	22000	3200	126.0	0.03	0.65	18000	2300	90.6	0.025	0.65	15000	1700	66.9	0.018	0.65	11000	1000	39.4	0.009	0.65
1.5	0.3	0.9°	20	16000	1400	55.1	0.02	0.65	14000	1200	47.2	0.016	0.65	13000	1000	39.4	0.012	0.65	9000	700	27.6	0.007	0.65
1.5	0.3	0.9°	30	13000	900	35.4	0.01	0.65	11000	700	27.6	0.008	0.65	10000	600	23.6	0.006	0.65	7500	400	15.7	0.004	0.65
1.5	0.3	0.9°	40	4500	230	9.1	0.008	0.65	3700	160	6.3	0.007	0.65	3000	120	4.7	0.005	0.65	2300	70	2.8	0.003	0.65
1.5	0.3	0.9°	50	3700	190	7.5	0.007	0.65	3000	130	5.1	0.006	0.65	3000	120	4.7	0.004	0.65	1900	60	2.4	0.002	0.65
2	0.5	0.4°	15	20000	7000	275.6	0.05	0.75	17000	5000	196.9	0.04	0.75	13000	3200	126.0	0.03	0.75	10000	1800	70.9	0.016	0.75
2	0.5	0.4°	20	20000	3600	141.7	0.04	0.75	17000	2600	102.4	0.03	0.75	13000	1800	70.9	0.025	0.75	10000	900	35.4	0.012	0.75
2	0.5	0.4°	25	16000	1800	70.9	0.03	0.75	14000	1400	55.1	0.025	0.75	12000	1100	43.3	0.02	0.75	9000	720	28.3	0.01	0.75
2	0.5	0.4°	30	16000	1400	55.1	0.025	0.75	14000	1200	47.2	0.02	0.75	12000	900	35.4	0.016	0.75	9000	650	25.6	0.008	0.75
2	0.5	0.4°	35	13000	1100	43.3	0.02	0.75	11000	800	31.5	0.018	0.75	10000	700	27.6	0.014	0.75	7000	500	19.7	0.007	0.75
2	0.5	0.4°	40	13000	1000	39.4	0.02	0.75	11000	700	27.6	0.015	0.75	10000	600	23.6	0.012	0.75	7000	400	15.7	0.006	0.75
2	0.5	0.9°	20	20000	3600	141.7	0.04	0.75	17000	2600	102.4	0.03	0.75	13000	1800	70.9	0.025	0.75	10000	900	35.4	0.012	0.75
2	0.5	0.9°	25	16000	1800	70.9	0.03	0.75	14000	1400	55.1	0.025	0.75	12000	1100	43.3	0.02	0.75	9000	720	28.3	0.01	0.75
2	0.5	0.9°	30	16000	1400	55.1	0.025	0.75	14000	1200	47.2	0.02	0.75	12000	900	35.4	0.016	0.75	9000	650	25.6	0.008	0.75
2	0.5	0.9°	35	13000	1100	43.3	0.02	0.75	11000	800	31.5	0.018	0.75	10000	700	27.6	0.014	0.75	7000	500	19.7	0.007	0.75
2	0.5	0.9°	40	13000	1000	39.4	0.02	0.75	11000	700	27.6	0.015	0.75	10000	600	23.6	0.012	0.75	7000	400	15.7	0.006	0.75
2	0.5	0.9°	45	8000	500	19.7	0.016	0.75	6800	360	14.2	0.012	0.75	5200	250	9.8	0.01	0.75	4000	120	4.7	0.005	0.75
2	0.5	0.9°	50	8000	500	19.7	0.016	0.75	6800	360	14.2	0.012	0.75	5200	250	9.8	0.01	0.75	4000	120	4.7	0.005	0.75
2	0.5	0.9°	55	4100	230	9.1	0.012	0.75	3500	170	6.7	0.009	0.75	2700	120	4.7	0.008	0.75	2000	60	2.4	0.004	0.75
2	0.5	0.9°	60	4100	230	9.1	0.012	0.75	3500	170	6.7	0.009	0.75	2700	120	4.7	0.008	0.75	2000	60	2.4	0.004	0.75
3	0.8	0.9°	20	13000	7200	283.5	0.19	1	11000	5100	200.8	0.15	1	8700	4000	157.5	0.11	1	6500	1800	70.9	0.06	1
3	0.8	0.9°	25	13000	7200	283.5	0.19	1	11000	5100	200.8	0.15	1	8700	4000	157.5	0.11	1	6500	1800	70.9	0.06	1
3	0.8	0.9°	30	13000	5700	224.4	0.12	1	11000	4000	157.5	0.09	1	8700	3000	118.1	0.07	1	6500	1400	55.1	0.04	1
3	0.8	0.9°	40	11000	3600	141.7	0.08	1	9100	2600	102.4	0.06	1	7400	2000	78.7	0.05	1	5500	1000	39.4	0.025	1
3	0.8	0.9°	50	8000	2600	102.4	0.07	1	6600	1800	70.9	0.05	1	5800	1500	59.1	0.04	1	4600	800	31.5	0.02	1
3	0.8	0.9°	60	7800	2480	97.6	0.06	1	6600	1740	68.5	0.05	1	5000	1250	49.2	0.04	1	3900	610	24.0	0.02	1

Depth of cut



1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Air blow or oil mist is recommended for good chip evacuation.
3) For profile machining such as molds, machining conditions may differ considerably depending on the workpiece geometry, machining methods and depth of cut. Reduce the feed rate especially when machining the corner sections of a workpiece.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is poor, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

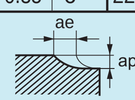
VFHVRB

4 flute, Corner radius, Short cut length, Irregular helix flutes

Taper neck type

Work material				Carbon Steel, Cast Iron, Alloy Steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21					Hardened Steel (45−55HRC) AISI H13					Hardened Steel (55−62HRC) AISI D2				
DC (mm)	RE (mm)	BHTA	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap(mm)	Width of cut ae(mm)
4	1	0.4°	25	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
4	1	0.4°	30	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
4	1	0.4°	35	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.4°	40	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.4°	45	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.4°	50	8100	6300	248.0	0.14	1.5	6700	4420	174.0	0.11	1.5	5400	3500	137.8	0.08	1.5	4000	1600	63.0	0.04	1.5
4	1	0.9°	25	10000	9900	389.8	0.24	1.5	8300	7000	275.6	0.19	1.5	6700	5600	220.5	0.14	1.5	5000	2500	98.4	0.07	1.5
4	1	0.9°	30	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.9°	40	10000	9900	389.8	0.15	1.5	8300	7000	275.6	0.12	1.5	6700	5600	220.5	0.09	1.5	5000	2500	98.4	0.04	1.5
4	1	0.9°	50	8100	6300	248.0	0.14	1.5	6700	4420	174.0	0.11	1.5	5400	3500	137.8	0.08	1.5	4000	1600	63.0	0.04	1.5
4	1	0.9°	60	8100	6300	248.0	0.11	1.5	6700	4420	174.0	0.08	1.5	5400	3500	137.8	0.06	1.5	4000	1600	63.0	0.03	1.5
6	1.5	0.9°	40	6600	11000	433.1	0.4	2	5500	7600	299.2	0.32	2	4500	6100	240.2	0.24	2	3300	2700	106.3	0.12	2
6	1.5	0.9°	50	6600	11000	433.1	0.4	2	5500	7600	299.2	0.32	2	4500	6100	240.2	0.24	2	3300	2700	106.3	0.12	2
6	1.5	0.9°	60	6600	11000	433.1	0.25	2	5500	7600	299.2	0.2	2	4500	6100	240.2	0.15	2	3300	2700	106.3	0.08	2
6	1.5	0.9°	70	5400	8700	342.5	0.23	2	4400	6200	244.1	0.18	2	3600	5000	196.9	0.14	2	2700	2200	86.6	0.07	2
8	2	0.9°	60	5000	11000	433.1	0.48	3	4200	7600	299.2	0.37	3	3300	6100	240.2	0.29	3	2500	2700	106.3	0.14	3
8	2	0.9°	80	5000	11000	433.1	0.3	3	4200	7600	299.2	0.23	3	3300	6100	240.2	0.18	3	2500	2700	106.3	0.09	3
10	2	0.9°	80	4000	11000	433.1	0.48	4.5	3300	7600	299.2	0.37	4.5	2700	6100	240.2	0.29	4.5	2000	2700	106.3	0.14	4.5
10	2	0.9°	120	3200	8700	342.5	0.27	4.5	2700	6200	244.1	0.21	4.5	2100	5000	196.9	0.16	4.5	1600	2200	86.6	0.08	4.5
12	2	0.9°	80	3300	10000	393.7	0.72	6	2700	7100	279.5	0.56	6	2200	5600	220.5	0.36	6	1700	2500	98.4	0.18	6
12	2	0.9°	120	3300	10000	393.7	0.45	6	2700	7100	279.5	0.35	6	2200	5600	220.5	0.23	6	1700	2500	98.4	0.12	6

Depth of cut



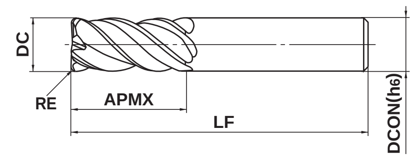
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Air blow or oil mist is recommended for good chip evacuation.
3) For profile machining such as molds, machining conditions may differ considerably depending on the workpiece geometry, machining methods and depth of cut. Reduce the feed rate especially when machining the corner sections of a workpiece.
4) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is poor, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VFMHVRB

Corner radius end mill, Medium cut length, 4 flute,
Irregular helix flutes

UWC VF 42° 45°

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



R	0.5≤RE≤6.35				
	±0.015				
DC	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- Impact Miracle end mill with irregular helix flutes ensures stable machining of difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMHVRBD0600R050	6	0.5	13	50	6	4	★	1
VFMHVRBD0600R100	6	1	13	50	6	4	★	1
VFMHVRBD0800R050	8	0.5	19	60	8	4	★	1
VFMHVRBD0800R100	8	1	19	60	8	4	★	1
VFMHVRBD1000R050	10	0.5	22	70	10	4	★	1
VFMHVRBD1000R100	10	1	22	70	10	4	★	1
VFMHVRBD1000R200	10	2	22	70	10	4	★	1
VFMHVRBD1200R050	12	0.5	26	75	12	4	★	1
VFMHVRBD1200R100	12	1	26	75	12	4	★	1
VFMHVRBD1200R200	12	2	26	75	12	4	★	1
VFMHVRBD1600R100	16	1	35	90	16	4	★	1
VFMHVRBD1600R200	16	2	35	90	16	4	★	1
VFMHVRBD1600R300	16	3	35	90	16	4	★	1
VFMHVRBD1600R500	16	5	35	90	16	4	★	1
VFMHVRBD2000R100	20	1	45	110	20	4	★	1
VFMHVRBD2000R200	20	2	45	110	20	4	★	1
VFMHVRBD2000R300	20	3	45	110	20	4	★	1
VFMHVRBD2000R400	20	4	45	110	20	4	★	1
VFMHVRBD2000R500	20	5	45	110	20	4	★	1
VFMHVRBD2000R635	20	6.35	45	110	20	4	★	1

★ : Inventory maintained in Japan.

VFMHVRB

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes

CARBIDE

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	21000	1100	43.3	21000	1100	43.3	14000	560	22.0	9600	310	12.2	4800	130	5.1
3	15000	1250	49.2	15000	1250	49.2	10600	850	33.5	7400	380	15.0	4200	200	7.9
4	11000	1400	55.1	11000	1400	55.1	8000	960	37.8	5600	400	15.7	3200	220	8.7
5	9600	1920	75.6	9600	1920	75.6	6400	1020	40.2	4500	430	16.9	2500	250	9.8
6	8000	2240	88.2	8000	2240	88.2	5300	1060	41.7	3700	440	17.3	2100	250	9.8
7	6800	1900	74.8	6800	1900	74.8	4500	1010	39.8	3200	450	17.7	1800	260	10.2
8	6000	1680	66.1	6000	1680	66.1	4000	960	37.8	2800	450	17.7	1600	260	10.2
9	5300	1480	58.3	5300	1480	58.3	3500	840	33.1	2500	450	17.7	1400	220	8.7
10	4800	1440	56.7	4800	1440	56.7	3200	770	30.3	2200	440	17.3	1300	210	8.3
11	4400	1350	53.1	4400	1350	53.1	2900	760	29.9	2000	400	15.7	1200	190	7.5
12	4000	1250	49.2	4000	1250	49.2	2700	760	29.9	1900	380	15.0	1100	180	7.1
13	3700	1180	46.5	3700	1180	46.5	2500	700	27.6	1700	360	14.2	1000	160	6.3
14	3400	1160	45.7	3400	1160	45.7	2300	640	25.2	1600	350	13.8	900	140	5.5
16	3000	1140	44.9	3000	1140	44.9	2000	560	22.0	1400	340	13.4	800	130	5.1
18	2700	970	38.2	2700	970	38.2	1800	550	21.7	1200	340	13.4	700	110	4.3
20	2400	860	33.9	2400	860	33.9	1600	510	20.1	1100	330	13.0	600	100	3.9
Depth of cut	≤0.2DC ≤1.5DC						≤0.1DC ≤1.5DC			≤0.05DC ≤1.5DC					

Slotting

Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 35, AISI P20 etc.			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Hardened steel (45−55HRC) AISI H13 etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
2	17000	680	26.8	10000	400	15.7	9600	310	12.2	4800	130	5.1	3200	80	3.1
3	12000	720	28.3	6900	410	16.1	7400	380	15.0	3200	140	5.5	2700	110	4.3
4	9200	810	31.9	5600	490	19.3	5600	400	15.7	2400	150	5.9	2000	120	4.7
5	7600	1060	41.7	4500	630	24.8	4500	410	16.1	1900	170	6.7	1600	130	5.1
6	6400	1280	50.4	3700	740	29.1	3700	440	17.3	1600	190	7.5	1300	160	6.3
7	5500	1210	47.6	3200	700	27.6	3200	410	16.1	1400	190	7.5	1100	140	5.5
8	4800	1150	45.3	2800	670	26.4	2800	390	15.4	1200	190	7.5	1000	130	5.1
9	4200	1010	39.8	2500	600	23.6	2500	350	13.8	1100	180	7.1	900	130	5.1
10	3800	910	35.8	2200	530	20.9	2200	350	13.8	1000	160	6.3	800	130	5.1
11	3500	900	35.4	2000	530	20.9	2000	320	12.6	900	160	6.3	720	120	4.7
12	3200	900	35.4	1900	530	20.9	1900	300	11.8	800	160	6.3	660	110	4.3
13	2900	810	31.9	1700	480	18.9	1700	290	11.4	730	150	5.9	610	100	3.9
14	2700	760	29.9	1600	450	17.7	1600	290	11.4	680	140	5.5	570	90	3.5
16	2400	670	26.4	1400	390	15.4	1400	280	11.0	600	120	4.7	500	80	3.1
18	2100	670	26.4	1200	380	15.0	1200	270	10.6	530	120	4.7	440	70	2.8
20	1900	610	24.0	1100	350	13.8	1100	260	10.2	480	120	4.7	400	60	2.4
Depth of cut	DC ≤1DC (MAX.12mm)						DC ≤0.5DC			DC ≤0.2DC					

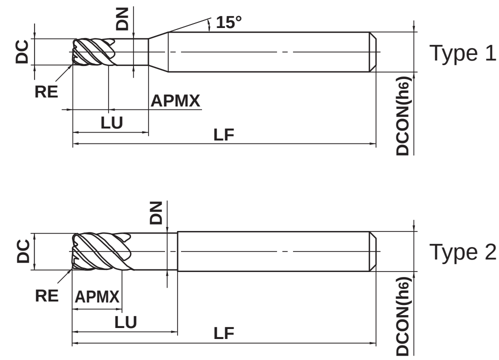
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

SOLID END MILLS

VFSDRB NEW

IMPACT MIRACLE Corner radius end mill, 6 flute (S)

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



3≤DC≤12				
0 - 0.02				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

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

Unit : mm

Order Number	DC	RE	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
VFSDRBD0300R030	3	0.3	3	9	2.9	45	6	6	●	1
VFSDRBD0400R030	4	0.3	4	12	3.9	45	6	6	●	1
VFSDRBD0500R030	5	0.3	5	15	4.9	50	6	6	●	1
VFSDRBD0600R030	6	0.3	6	18	5.85	50	6	6	●	2
VFSDRBD0600R050	6	0.5	6	18	5.85	50	6	6	●	2
VFSDRBD0600R100	6	1	6	18	5.85	50	6	6	●	2
VFSDRBD0800R030	8	0.3	8	24	7.85	60	8	6	●	2
VFSDRBD0800R050	8	0.5	8	24	7.85	60	8	6	●	2
VFSDRBD0800R100	8	1	8	24	7.85	60	8	6	●	2
VFSDRBD1000R050	10	0.5	10	30	9.7	70	10	6	●	2
VFSDRBD1000R100	10	1	10	30	9.7	70	10	6	●	2
VFSDRBD1200R050	12	0.5	12	36	11.7	75	12	6	●	2
VFSDRBD1200R100	12	1	12	36	11.7	75	12	6	●	2

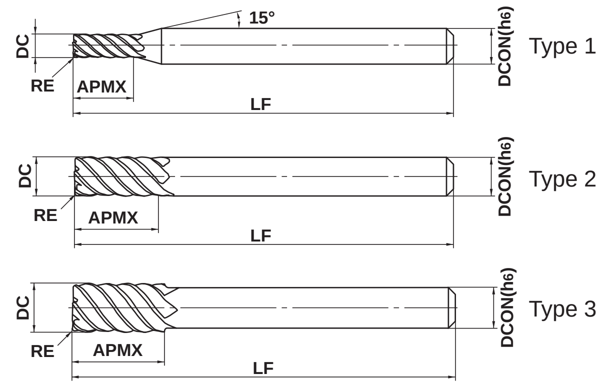
●: Inventory maintained.

VFMDRB NEW

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

UWC VF 45°

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



	DC≤12	DC>12		
	0 - 0.02	0 - 0.03		
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

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

Unit : mm

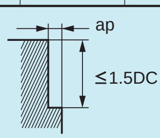
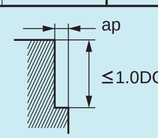
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMDRBD0300R030	3	0.3	10	60	6	6	●	1
VFMDRBD0400R030	4	0.3	12	60	6	6	●	1
VFMDRBD0500R030	5	0.3	15	60	6	6	●	1
VFMDRBD0600R030	6	0.3	15	60	6	6	●	2
VFMDRBD0600R050	6	0.5	15	60	6	6	●	2
VFMDRBD0600R100	6	1	15	60	6	6	●	2
VFMDRBD0800R030	8	0.3	20	75	8	6	●	2
VFMDRBD0800R050	8	0.5	20	75	8	6	●	2
VFMDRBD0800R100	8	1	20	75	8	6	●	2
VFMDRBD1000R030	10	0.3	25	80	10	6	●	2
VFMDRBD1000R050	10	0.5	25	80	10	6	●	2
VFMDRBD1000R100	10	1	25	80	10	6	●	2
VFMDRBD1200R050	12	0.5	30	100	12	6	●	2
VFMDRBD1200R100	12	1	30	100	12	6	●	2
VFMDRBD1600R100	16	1	40	110	16	6	★	2
VFMDRBD1600R150	16	1.5	40	110	16	6	★	2
VFMDRBD1800R100	18	1	40	120	16	6	★	3
VFMDRBD1800R150	18	1.5	40	120	16	6	★	3
VFMDRBD2000R100	20	1	45	125	20	6	★	2
VFMDRBD2000R150	20	1.5	45	125	20	6	★	2
VFMDRBD2000R200	20	2	45	125	20	6	★	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

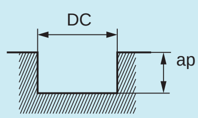
VFSDRB
IMPACT MIRACLE Corner radius end mill, 6 flute (S)

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

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.				Hardened steel (62−70HRC) AISI W1, AISI M2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)			(mm/min)	(IPM)	
1	40000	1200	47.2	0.05	40000	800	31.5	0.03	32000	500	19.7	0.02
2	40000	2000	78.7	0.1	24000	1000	39.4	0.05	16000	600	23.6	0.05
3	32000	3800	149.6	0.2	16000	1900	74.8	0.1	11000	1200	47.2	0.05
4	24000	4400	173.2	0.2	12000	2200	86.6	0.1	8000	1300	51.2	0.05
6	16000	5800	228.3	0.3	8000	2900	114.2	0.2	5300	1800	70.9	0.1
8	12000	5800	228.3	0.4	6000	2900	114.2	0.2	4000	1800	70.9	0.1
10	9600	5800	228.3	0.5	4800	2900	114.2	0.3	3200	1800	70.9	0.2
12	8000	4800	189.0	0.6	4000	2400	94.5	0.3	2700	1500	59.1	0.2
16	6000	3600	141.7	0.8	3000	1800	70.9	0.5	2000	1100	43.3	0.3
20	4800	2900	114.2	1.0	2400	1400	55.1	0.5	1600	880	34.6	0.3
25	3800	2300	90.6	1.0	1900	1100	43.3	0.5	1300	720	28.3	0.3
Depth of cut												

Slot milling with small diameter tools

Work material	Hardened steel (45−55HRC) AISI H13 etc.				Hardened steel (55−62HRC) AISI D2 etc.			
DC (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)	Revolution (min^{-1})	Table feed		Depth of cut ap (mm)
		(mm/min)	(IPM)			(mm/min)	(IPM)	
1	15000	300	11.8	0.1	9500	110	4.3	0.05
2	8000	320	12.6	0.2	4800	190	7.5	0.1
Depth of cut								

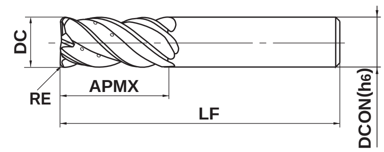
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

VFMHVRBCH

Corner radius end mill, Medium cut length, 4 flute,
Irregular helix flutes, with multiple internal through coolant holes

UWC VF 42° 45°

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



1<RE<3				
±0.015				
16≤DC≤20				
0 - 0.03				
DCON=16	DCON=20			
0 - 0.011	0 - 0.013			

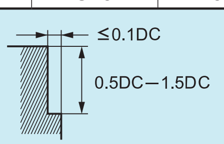
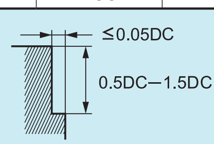
● Vibration control corner radius end mill with multiple internal through coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

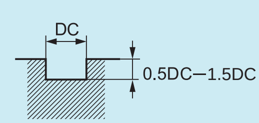
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VFMHVRBCHD1600R100	16	1	35	90	16	4	★	1
VFMHVRBCHD1600R300	16	3	35	90	16	4	★	1
VFMHVRBCHD2000R100	20	1	45	110	20	4	★	1
VFMHVRBCHD2000R300	20	3	45	110	20	4	★	1

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)
16	2000	560	22.0	800	110	4.3
20	1600	510	20.1	600	100	3.9
Depth of cut						

Slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.		
DC (mm)	Revolution (min⁻¹)	Table feed (mm/min)	Table feed (IPM)
16	1400	170	6.7
20	1100	130	5.1
Depth of cut			

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
3) For shoulder milling, climb cutting is recommended.

★ : Inventory maintained in Japan.

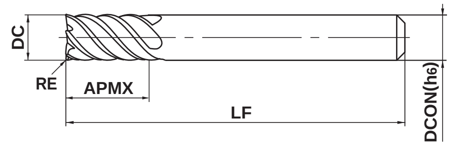
CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

VF6MHVRB

Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes

UWC VF 43.5° 45°

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



Type1

R	0.5≤RE≤2				
	±0.015				
DC	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- Irregular helix 6 flute geometry reduces vibrations and achieves high efficiency machining.
- Suitable for machining of difficult-to-cut materials such as stainless steel, titanium alloy and inconel.

Unit : mm

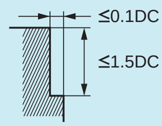
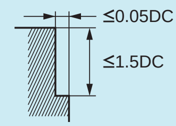
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VF6MHVRBD0600R050	6	0.5	13	50	6	6	★	1
VF6MHVRBD0600R100	6	1	13	50	6	6	★	1
VF6MHVRBD0800R050	8	0.5	19	60	8	6	★	1
VF6MHVRBD0800R100	8	1	19	60	8	6	★	1
VF6MHVRBD1000R050	10	0.5	22	70	10	6	★	1
VF6MHVRBD1000R100	10	1	22	70	10	6	★	1
VF6MHVRBD1200R050	12	0.5	26	75	12	6	★	1
VF6MHVRBD1200R100	12	1	26	75	12	6	★	1
VF6MHVRBD1600R100	16	1	32	90	16	6	★	1
VF6MHVRBD1600R200	16	2	32	90	16	6	★	1
VF6MHVRBD2000R100	20	1	38	100	20	6	★	1
VF6MHVRBD2000R200	20	2	38	100	20	6	★	1

VF6MHVRB

Corner radius, Medium cut length, 6 flute, Irregular helix flutes

RECOMMENDED CUTTING CONDITIONS

Side milling

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21 etc.			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
6	10600	2900	114.2	8000	2000	78.7	2100	320	12.6
8	8000	2900	114.2	6000	2000	78.7	1600	300	11.8
10	6400	2700	106.3	4800	2000	78.7	1300	260	10.2
12	5300	2700	106.3	4000	2000	78.7	1100	230	9.1
16	4000	2200	86.6	3000	1600	63.0	800	180	7.1
20	3200	1900	74.8	2400	1400	55.1	640	150	5.9
Depth of cut									

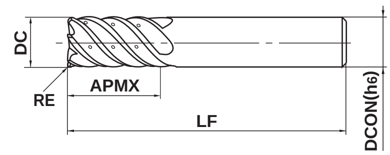
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is especially effective.
2) If the depth of cut is smaller than this table, feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VF6MHVRBCH

Corner radius end mill, Medium cut length, 6 flute,
Irregular helix flutes, with multiple internal through coolant holes

UWC VF 43.5° 45°

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



Type 1

R	0.5≤RE≤3				
	±0.015				
DC	DC≤12	DC>12			
	0 - 0.02	0 - 0.03			
h6	DCON=10	DCON=12	DCON=16	DCON=20	
	0 - 0.009	0 - 0.011	0 - 0.011	0 - 0.013	

● Vibration control corner radius end mill with multiple internal through coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

Unit : mm

Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VF6MHVRBCHD1000R050	10	0.5	22	70	10	6	●	1
VF6MHVRBCH**D1000R100**	10	1	22	70	10	6	●	1
VF6MHVRBCH**D1200R050**	12	0.5	26	75	12	6	●	1
VF6MHVRBCH**D1200R100**	12	1	26	75	12	6	●	1
VF6MHVRBCH**D1600R100**	16	1	32	90	16	6	★	1
VF6MHVRBCH**D1600R300**	16	3	32	90	16	6	★	1
VF6MHVRBCH**D2000R100**	20	1	38	100	20	6	★	1
VF6MHVRBCH**D2000R300**	20	3	38	100	20	6	★	1

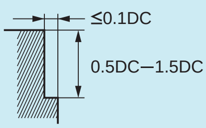
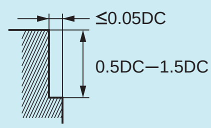
● : Inventory maintained. ★ : Inventory maintained in Japan.

VF6MHVRBCH

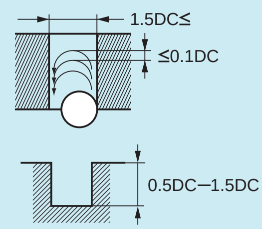
Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed		Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)		(mm/min)	(IPM)
10	4800	2000	78.7	1300	260	10.2
12	4000	2000	78.7	1100	230	9.1
16	3000	1600	63.0	800	180	7.1
20	2400	1400	55.1	640	150	5.9
Depth of cut						

Trochoidal milling

Work material	Austenitic Stainless Steel Titanium alloy AISI 304, AISI 316, Ti-6Al-4V etc.		
DC (mm)	Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)
10	4800	1400	55.1
12	4000	1200	47.2
16	3000	1100	43.3
20	2400	900	35.4
Depth of cut			

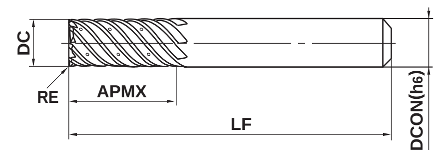
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately.
3) Climb cutting is recommended.

VF8MHVRBCH

Corner radius end mill, Medium cut length, 8 flute,
Irregular helix flutes, with multiple internal through coolant holes

UWC VF 44° 45°

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



R				
1≤RE≤3				
±0.015				
0 - 0.03				
DCON=16	DCON=20			
0 - 0.011	0 - 0.013			

h6

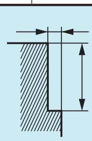
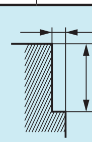
- Vibration control 8 flute corner radius end mill with multiple internal through coolant holes ensures efficient side finishing of difficult-to-cut materials such as stainless steels, titanium and inconel alloys.

Unit : mm

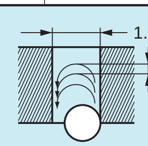
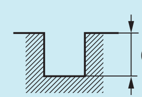
Order Number	DC	RE	APMX	LF	DCON	No. of Flutes	Stock	Type
VF8MHVRBCHD1600R100	16	1	32	90	16	8	★	1
VF8MHVRBCH**D1600R300**	16	3	32	90	16	8	★	1
VF8MHVRBCH**D2000R100**	20	1	38	100	20	8	★	1
VF8MHVRBCH**D2000R300**	20	3	38	100	20	8	★	1

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V etc.			Heat resistant alloy Inconel718 etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	3000	2100	82.7	800	240	9.4
20	2400	1900	74.8	640	200	7.9
Depth of cut	 ≤0.08DC 0.5DC–1.5DC			 ≤0.05DC 0.5DC–1.5DC		

Trochoidal milling

Work material	Austenitic Stainless Steel Titanium alloy AISI 304, AISI 316, Ti-6Al-4V etc.		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
16	3000	1400	55.1
20	2400	1200	47.2
Depth of cut	 1.5DC≤ ≤0.08DC  0.5DC–1.5DC		

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is very low, then vibration can occur. In this case, please reduce the revolution and feed rate proportionately.
3) For shoulder milling, climb cutting is recommended.

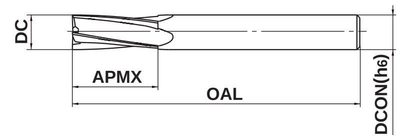
★ : Inventory maintained in Japan.

DFC4JC

End mill, Semi long cutting length, 4 flute, For CFRP

CARBIDE
SQUARE
BALL
RADIUS
TAPER
SOLID END MILLS

CFRP
◎



	6≦DC≦12				
	0 - 0.03				
h6	DCON=6	8≦DCON≦10	DCON=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

● 4 flute end mill with original CVD diamond coating for CFRP machining.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DFC4JCD0600	6	20	70	6	4	●	1
DFC4JC**D0800**	8	30	80	8	4	●	1
DFC4JC**D1000**	10	30	90	10	4	●	1
DFC4JC**D1200**	12	30	100	12	4	●	1

Note) Please contact Mitsubishi Materials for geometries and through coolant types that are non-standard.

RECOMMENDED CUTTING CONDITIONS

Work material	CFRP		
DC (mm)	Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)
6	11000	950	37.4
8	8000	780	30.7
10	6400	700	27.6
12	5300	650	25.6

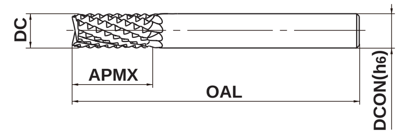
1) Cutting conditions may differ considerably due to the kind of CFRP, the rigidity of the machine, or the clamping and geometry of the workpiece. Please use the above table as a guideline.
2) When high machining accuracy is needed or if large burrs or delamination occur, we recommend reducing the feed rate.
3) When the depth of cut is greater than 0.8DC, we recommend reducing the feed rate.
4) Please take precautions against dust.

● : Inventory maintained.

DFCJRT

Cross-nick type end mill , Semi long cutting length, For CFRP

CFRP
◎



Type1

h6

DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● Cross-nick type end mill with original CVD diamond coating for CFRP machining.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DFCJRTD0600	6	20	70	6	10	●	1
DFCJRT**D0800**	8	30	80	8	10	●	1
DFCJRT**D1000**	10	30	90	10	12	●	1
DFCJRT**D1200**	12	30	100	12	12	●	1

Note) Please contact Mitsubishi Materials for geometries and through coolant types that are non-standard.

RECOMMENDED CUTTING CONDITIONS

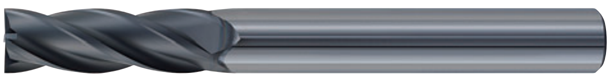
Work material	CFRP		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
6	11000	1200	47.2
8	8000	1000	39.4
10	6400	900	35.4
12	5300	850	33.4

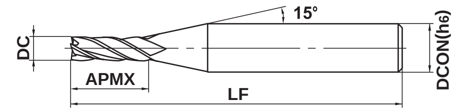
1) Cutting conditions may differ considerably due to the kind of CFRP, the rigidity of the machine, or the clamping and geometry of the workpiece. Please use the above table as a guideline.
2) When high machining accuracy is needed or if large burrs or delamination occur, we recommend reducing the feed rate.
3) When the depth of cut is greater than 0.8DC, we recommend reducing the feed rate.
4) Please take precautions against dust.

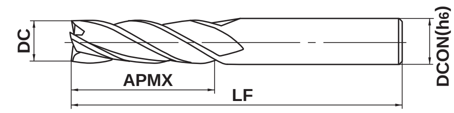
DF4JC

End mill, Semi long cut length, 4 flute, For graphite

Aluminum Alloy	Copper	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○	○







3≦DC≦12				
0 - 0.02				
DCON=6	8≦DCON≦10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● 4 flute end mill with original diamond coating for graphite machining.

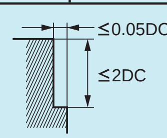
Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
DF4JCD0300	3	12	60	6	4	★	1
DF4JC**D0400**	4	16	60	6	4	★	1
DF4JC**D0600**	6	24	60	6	4	★	2
DF4JC**D0800**	8	28	70	8	4	★	2
DF4JC**D1000**	10	35	90	10	4	★	2
DF4JC**D1200**	12	36	110	12	4	★	2

RECOMMENDED CUTTING CONDITIONS

Work material	Graphite					Copper, Copper alloys				
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)
3	22000	2500	98.4	6	0.15	10600	280	11.0	6	0.15
4	18000	2900	114.2	8	0.2	8000	330	13.0	8	0.2
6	14000	3200	126.0	12	0.3	6400	380	15.0	12	0.3
8	10500	2900	114.2	16	0.4	4000	420	16.5	16	0.4
10	8700	2600	102.4	20	0.5	3200	460	18.1	20	0.5
12	7200	2200	86.6	24	0.6	2700	460	18.1	24	0.6

Depth of cut

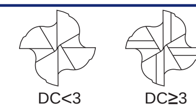


1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

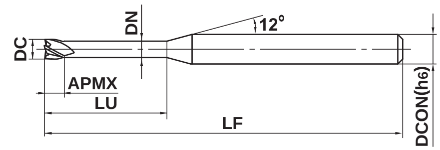
★ : Inventory maintained in Japan.

DF4XL

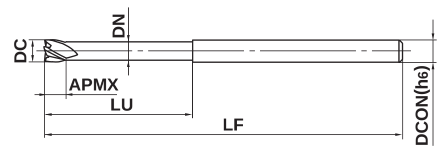
End mill, Long neck, 4 flute, For graphite



Aluminum Alloy	Copper	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○	○



Type1



Type2

1≤DC≤12				
0 - 0.02				

h6				
4≤DCON≤6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● 4 flute long neck end mill with original diamond coating for graphite machining.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
DF4XLD0100N060	1	1.5	6	0.94	50	4	4	★	1
DF4XLD0100N080	1	1.5	8	0.94	50	4	4	★	1
DF4XLD0100N100	1	1.5	10	0.94	50	4	4	★	1
DF4XLD0150N100	1.5	2.3	10	1.44	60	4	4	★	1
DF4XLD0150N160	1.5	2.3	16	1.44	60	4	4	★	1
DF4XLD0200N100	2	3	10	1.9	60	4	4	★	1
DF4XLD0200N160	2	3	16	1.9	60	4	4	★	1
DF4XLD0200N200	2	3	20	1.9	60	4	4	★	1
DF4XLD0300N160	3	4.5	16	2.9	70	4	4	★	1
DF4XLD0300N200	3	4.5	20	2.9	70	4	4	★	1
DF4XLD0300N300	3	4.5	30	2.9	70	4	4	★	1
DF4XLD0400N200	4	6	20	3.9	80	4	4	★	2
DF4XLD0400N400	4	6	40	3.9	80	4	4	★	2
DF4XLD0600N300	6	9	30	5.85	70	6	4	★	2
DF4XLD0800N300	8	12	30	7.85	90	8	4	★	2
DF4XLD1000N300	10	15	30	9.7	90	10	4	★	2
DF4XLD1200N300	12	18	30	11.7	110	12	4	★	2

DF4XL

End mill, Long neck, 4 flute, For graphite

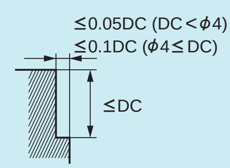
CARBIDE

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material		Graphite					Copper, Copper alloys				
DC (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)
1	6	30000	1300	51.2	1	0.05	30000	1300	51.2	1	0.05
	8	25000	1000	39.4	1	0.05	25000	1000	39.4	1	0.05
	10	22000	700	27.6	1	0.05	22000	700	27.6	1	0.05
1.5	10	25000	1200	47.2	2	0.075	21000	1000	39.4	1.5	0.075
	16	18000	800	31.5	1.5	0.075	18000	800	31.5	1.5	0.075
2	10	22000	1500	59.1	2	0.1	16000	1100	43.3	2	0.1
	16	19000	1100	43.3	2	0.1	16000	930	36.6	2	0.1
	20	16000	800	31.5	2	0.1	16000	800	31.5	2	0.1
3	16	21000	1900	74.8	3	0.15	10600	960	37.8	3	0.15
	20	18000	1500	59.1	3	0.15	10600	890	35.0	3	0.15
	30	14000	1000	39.4	3	0.15	10600	760	29.9	3	0.15
4	20	18000	2400	94.5	4	0.4	8000	1100	43.3	4	0.4
	40	13000	1500	59.1	4	0.4	8000	920	36.2	4	0.4
6	30	14000	3200	126.0	6	0.6	5300	1200	47.2	6	0.6
8	30	10500	2900	114.2	8	0.8	4000	1100	43.3	8	0.8
10	30	8700	2600	102.4	10	1.0	3200	960	37.8	10	1.0
12	30	7200	2200	86.6	12	1.2	2650	800	31.5	12	1.2

Depth of cut



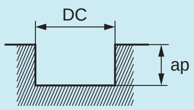
1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

SOLID END MILLS

Slotting

Work material		Graphite				Copper, Copper alloys			
DC (mm)	**LU** (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)
1	6	30000	1000	39.4	0.1	30000	980	38.6	0.1
	8	25000	700	27.6	0.08	25000	700	27.6	0.08
	10	22000	500	19.7	0.06	22000	500	19.7	0.06
1.5	10	25000	1100	43.3	0.14	21000	750	29.5	0.14
	16	18000	600	23.6	0.1	18000	600	23.6	0.1
2	10	22000	1200	47.2	0.2	16000	820	32.3	0.2
	16	19000	800	31.5	0.16	16000	700	27.6	0.16
	20	16000	600	23.6	0.12	16000	600	23.6	0.12
3	16	21000	1400	55.1	0.3	10600	720	28.3	0.3
	20	18000	1100	43.3	0.25	10600	670	26.4	0.25
	30	14000	700	27.6	0.2	10600	570	22.4	0.2
4	20	18000	1800	70.9	0.5	8000	820	32.3	0.5
	40	13000	900	35.4	0.4	8000	690	27.2	0.4
6	30	14000	2300	90.6	1.2	5300	900	35.4	1.2
8	30	10500	2000	78.7	2.0	4000	820	32.3	2.0
10	30	8700	1900	74.8	3.0	3200	720	28.3	3.0
12	30	7200	1700	66.9	4.0	2650	600	23.6	4.0

Depth of cut

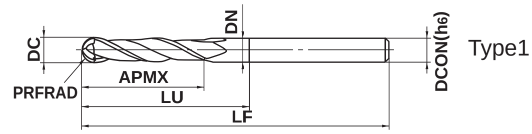


1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

DF2MB

Ball nose, Medium cut length, 2 flute, For graphite

Aluminum Alloy	Copper	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○	○



R				
3≤PRFRAD≤6				
±0.01				

h6				
DCON=6	8≤DCON≤10	DCON=12		
0 - 0.008	0 - 0.009	0 - 0.011		

● 2 flute ball nose end mill with original diamond coating for graphite machining.

Unit : mm

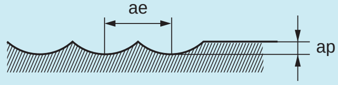
Order Number	PRFRAD	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
DF2MBR0300A100	3	6	30	50	5.85	100	6	2	★	1
DF2MB**R0300A150**	3	6	30	50	5.85	150	6	2	★	1
DF2MB**R0400A110**	4	8	40	60	7.85	110	8	2	★	1
DF2MB**R0400A150**	4	8	40	60	7.85	150	8	2	★	1
DF2MB**R0500A120**	5	10	50	70	9.7	120	10	2	★	1
DF2MB**R0500A180**	5	10	50	70	9.7	180	10	2	★	1
DF2MB**R0600A130**	6	12	55	75	11.7	130	12	2	★	1
DF2MB**R0600A200**	6	12	55	75	11.7	200	12	2	★	1

★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Work material		Graphite					Copper, Copper alloys				
PRFRAD (mm)	**LF** (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)
R3	100	16000	1900	74.8	0.6	1.5	16000	1500	59.1	0.6	1.5
	150	12000	1200	47.2	0.4	1.2	12000	960	37.8	0.4	1.2
R4	110	12000	2000	78.7	0.8	2.0	12000	1600	63	0.8	2.0
	150	9200	1400	55.1	0.6	1.6	9200	1100	43.3	0.6	1.6
R5	120	9500	2200	86.6	1.0	2.5	9500	1800	70.9	1.0	2.5
	180	7300	1500	59.1	0.8	2.0	7300	1200	47.2	0.8	2.0
R6	130	8000	1800	70.9	1.2	3.0	8000	1400	55.1	1.2	3.0
	200	6100	1200	47.2	1.0	2.5	6100	960	37.8	1.0	2.5

Depth of cut



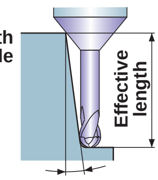
1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

DF2XLB

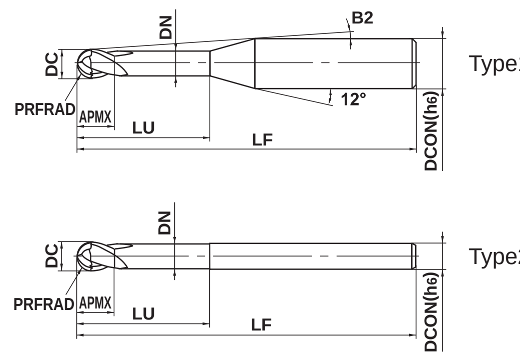
Ball nose, Medium cut length, 2 flute, Long neck, For graphite

Aluminum Alloy	Copper	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○	○

Effective length for inclined angle



Inclined angle



R	
0.1≤PRFRAD≤3	
±0.01	

h6	
DCON=4,6	
0 / - 0.008	

● 2 flute long neck ball nose end mill with original diamond coating for graphite machining.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
DF2XLBR0010N005	0.1	0.2	0.2	0.5	0.18	11.5°	50	4	2	★	1	0.5	0.5	0.6	0.7
DF2XLBR0015N020	0.15	0.3	0.3	2	0.27	9.9°	50	4	2	★	1	2.1	2.2	2.4	2.6
DF2XLBR0015N030	0.15	0.3	0.3	3	0.27	9.1°	50	4	2	★	1	3.1	3.2	3.6	3.9
DF2XLBR0020N010	0.2	0.4	0.6	1	0.36	11.0°	50	4	2	★	1	1.0	1.0	1.1	1.2
DF2XLBR0020N020	0.2	0.4	0.6	2	0.36	10.0°	50	4	2	★	1	2.0	2.1	2.3	2.6
DF2XLBR0020N030	0.2	0.4	0.6	3	0.36	9.1°	50	4	2	★	1	3.1	3.2	3.5	3.9
DF2XLBR0020N040	0.2	0.4	0.6	4	0.36	8.4°	60	4	2	★	1	4.1	4.3	4.7	5.2
DF2XLBR0020N080	0.2	0.4	0.6	8	0.36	6.4°	60	4	2	★	1	8.3	8.7	9.5	10.5
DF2XLBR0020N120	0.2	0.4	0.6	12	0.36	5.1°	60	4	2	★	1	12.5	13.0	14.3	15.8
DF2XLBR0025N040	0.25	0.5	0.6	4	0.46	8.3°	60	4	2	★	1	4.1	4.3	4.7	5.2
DF2XLBR0025N050	0.25	0.5	0.6	5	0.46	7.7°	60	4	2	★	1	5.2	5.4	5.9	6.5
DF2XLBR0025N080	0.25	0.5	0.6	8	0.46	6.3°	60	4	2	★	1	8.3	8.7	9.5	10.5
DF2XLBR0030N020	0.3	0.6	0.9	2	0.56	9.9°	60	4	2	★	1	2.1	2.2	2.4	2.6
DF2XLBR0030N040	0.3	0.6	0.9	4	0.56	8.3°	60	4	2	★	1	4.2	4.4	4.8	5.2
DF2XLBR0030N050	0.3	0.6	0.9	5	0.56	7.6°	60	4	2	★	1	5.2	5.4	6.0	6.6
DF2XLBR0030N060	0.3	0.6	0.9	6	0.56	7.1°	60	4	2	★	1	6.3	6.5	7.1	7.9
DF2XLBR0030N080	0.3	0.6	0.9	8	0.56	6.2°	60	4	2	★	1	8.3	8.7	9.5	10.6
DF2XLBR0030N100	0.3	0.6	0.9	10	0.56	5.5°	60	4	2	★	1	10.4	10.9	11.9	13.2
DF2XLBR0030N160	0.3	0.6	0.9	16	0.56	4.1°	60	4	2	★	1	16.7	17.4	19.1	21.2
DF2XLBR0040N060	0.4	0.8	1.2	6	0.76	7.0°	60	4	2	★	1	6.3	6.5	7.1	7.9
DF2XLBR0040N080	0.4	0.8	1.2	8	0.76	6.1°	60	4	2	★	1	8.3	8.7	9.5	10.5
DF2XLBR0050N040	0.5	1	1.5	4	0.94	8.0°	60	4	2	★	1	4.2	4.4	4.8	5.3
DF2XLBR0050N060	0.5	1	1.5	6	0.94	6.8°	60	4	2	★	1	6.3	6.6	7.2	8.0
DF2XLBR0050N080	0.5	1	1.5	8	0.94	5.9°	60	4	2	★	1	8.4	8.8	9.6	10.6
DF2XLBR0050N100	0.5	1	1.5	10	0.94	5.2°	60	4	2	★	1	10.5	11.0	12.0	13.3
DF2XLBR0050N120	0.5	1	1.5	12	0.94	4.6°	60	4	2	★	1	12.6	13.2	14.4	15.9
DF2XLBR0050N200	0.5	1	1.5	20	0.94	3.3°	80	4	2	★	1	21.0	21.9	24.0	26.6
DF2XLBR0050N300	0.5	1	1.5	30	0.94	2.4°	80	4	2	★	1	31.4	32.8	36.0	⋆
DF2XLBR0050N400	0.5	1	1.5	40	0.94	1.9°	80	4	2	★	1	41.8	43.7	⋆	⋆
DF2XLBR0075N080	0.75	1.5	2.3	8	1.44	5.4°	60	4	2	★	1	8.4	8.8	9.6	10.6
DF2XLBR0075N100	0.75	1.5	2.3	10	1.44	4.7°	60	4	2	★	1	10.5	11.0	12.0	13.2

⋆ No interference

★ : Inventory maintained in Japan.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
												30'	1°	2°	3°
DF2XLBR0075N160	0.75	1.5	2.3	16	1.44	3.4°	80	4	2	★	1	16.8	17.5	19.2	21.2
DF2XLBR0075N300	0.75	1.5	2.3	30	1.44	2.1°	80	4	2	★	1	31.4	32.8	35.9	*
DF2XLBR0100N080	1	2	3	8	1.9	4.9°	60	4	2	★	1	8.3	8.7	9.4	10.4
DF2XLBR0100N100	1	2	3	10	1.9	4.2°	60	4	2	★	1	10.4	10.9	11.8	13.0
DF2XLBR0100N120	1	2	3	12	1.9	3.7°	60	4	2	★	1	12.5	13.0	14.2	15.7
DF2XLBR0100N160	1	2	3	16	1.9	2.9°	80	4	2	★	1	16.7	17.4	19.0	*
DF2XLBR0100N200	1	2	3	20	1.9	2.5°	80	4	2	★	1	20.9	21.8	23.8	*
DF2XLBR0100N250	1	2	3	25	1.9	2.0°	80	4	2	★	1	26.1	27.2	*	*
DF2XLBR0100N400	1	2	3	40	1.9	1.4°	100	4	2	★	1	41.7	43.5	*	*
DF2XLBR0100N600	1	2	3	60	1.9	0.9°	100	4	2	★	1	62.6	*	*	*
DF2XLBR0150N160	1.5	3	4.5	16	2.9	1.7°	80	4	2	★	1	16.7	17.3	*	*
DF2XLBR0150N250	1.5	3	4.5	25	2.9	1.2°	80	4	2	★	1	26.1	27.2	*	*
DF2XLBR0150N400	1.5	3	4.5	40	2.9	0.7°	100	4	2	★	1	41.7	*	*	*
DF2XLBR0150N600	1.5	3	4.5	60	2.9	0.5°	100	4	2	★	1	*	*	*	*
DF2XLBR0200N080	2	4	6	8	3.9	—	80	4	2	★	2	*	*	*	*
DF2XLBR0200N200	2	4	6	20	3.9	—	80	4	2	★	2	*	*	*	*
DF2XLBR0200N300	2	4	6	30	3.9	—	80	4	2	★	2	*	*	*	*
DF2XLBR0200N400	2	4	6	40	3.9	—	100	4	2	★	2	*	*	*	*
DF2XLBR0200N600	2	4	6	60	3.9	—	100	4	2	★	2	*	*	*	*
DF2XLBR0300N120	3	6	9	12	5.85	—	100	6	2	★	2	*	*	*	*

* No interference

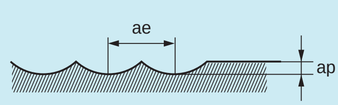
DF2XLB

Ball nose, Medium cut length, 2 flute, Long neck, For graphite

RECOMMENDED CUTTING CONDITIONS

Work material		Graphite					Copper, Copper alloys				
PRFRAD (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)
R0.1	0.5	40000	800	31.5	0.01	0.03	40000	800	31.5	0.003	0.02
R0.15	2	40000	1200	47.2	0.03	0.08	40000	800	31.5	0.003	0.03
	3	40000	1200	47.2	0.03	0.08	40000	600	23.6	0.002	0.03
R0.2	1	40000	1500	59.1	0.05	0.15	40000	2000	78.7	0.015	0.04
	2	40000	1500	59.1	0.05	0.12	40000	1300	51.2	0.01	0.04
	3	40000	1300	51.2	0.04	0.12	40000	800	31.5	0.005	0.04
	4	40000	1300	51.2	0.04	0.1	32000	600	23.6	0.004	0.04
	8	30000	800	31.5	0.03	0.1	—	—	—	—	—
	12	20000	450	17.7	0.03	0.08	—	—	—	—	—
R0.25	4	40000	1500	59.1	0.05	0.15	40000	800	31.5	0.01	0.05
	5	38000	1300	51.2	0.05	0.15	36000	700	27.6	0.008	0.05
	8	30000	1000	39.4	0.04	0.12	28000	500	19.7	0.002	0.05
R0.3	2	40000	1800	70.9	0.07	0.2	40000	1500	59.1	0.03	0.06
	4	40000	1500	59.1	0.06	0.18	40000	1200	47.2	0.02	0.06
	5	40000	1500	59.1	0.06	0.17	40000	1100	43.3	0.015	0.06
	6	40000	1500	59.1	0.06	0.15	40000	1000	39.4	0.008	0.06
	8	37000	1200	47.2	0.05	0.15	35000	800	31.5	0.005	0.06
	10	35000	1000	39.4	0.05	0.15	—	—	—	—	—
	16	22000	530	20.9	0.04	0.12	—	—	—	—	—
R0.4	6	40000	1700	66.9	0.08	0.2	40000	1500	59.1	0.02	0.08
	8	40000	1700	66.9	0.08	0.15	30000	1200	47.2	0.008	0.08
R0.5	4	40000	2500	98.4	0.12	0.3	40000	2000	78.7	0.05	0.1
	6	40000	2500	98.4	0.1	0.3	40000	2000	78.7	0.03	0.1
	8	40000	2000	78.7	0.1	0.25	40000	1800	70.9	0.02	0.1
	10	40000	2000	78.7	0.1	0.2	33000	1400	55.1	0.01	0.1
	12	40000	2000	78.7	0.1	0.2	30000	1000	39.4	0.007	0.1
	20	30000	1100	43.3	0.08	0.2	—	—	—	—	—
	30	20000	600	23.6	0.06	0.15	—	—	—	—	—
	40	15000	400	15.7	0.04	0.12	—	—	—	—	—

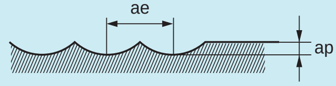
Depth of cut



1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

Work material		Graphite					Copper, Copper alloys				
PRFRAD (mm)	**LU** (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)
R0.75	8	40000	2800	110.2	0.15	0.45	40000	2400	94.5	0.07	0.15
	10	40000	2800	110.2	0.15	0.45	32000	1800	70.9	0.05	0.15
	16	35000	2000	78.7	0.15	0.3	20000	900	35.4	0.03	0.15
	30	27000	1000	39.4	0.1	0.3	—	—	—	—	—
R1	8	40000	3000	118.1	0.23	0.7	40000	3000	118.1	0.1	0.2
	10	40000	3000	118.1	0.2	0.6	40000	2800	110.2	0.08	0.2
	12	35000	2500	98.4	0.2	0.6	35000	2300	90.6	0.08	0.2
	16	30000	2000	78.7	0.2	0.5	30000	1800	70.9	0.05	0.2
	20	30000	2000	78.7	0.2	0.5	20000	1200	47.2	0.04	0.2
	25	25000	1500	59.1	0.18	0.45	20000	1000	39.4	0.03	0.2
	40	20000	1000	39.4	0.15	0.4	—	—	—	—	—
	60	15000	500	19.7	0.1	0.3	—	—	—	—	—
R1.5	16	28000	3000	118.1	0.3	0.9	28000	3000	118.1	0.3	0.3
	25	20000	2000	78.7	0.25	0.75	20000	2000	78.7	0.25	0.3
	40	16000	1500	59.1	0.2	0.6	16000	1500	59.1	0.2	0.3
	60	14000	1000	39.4	0.17	0.45	—	—	—	—	—
R2	8	24000	3800	149.6	0.5	1.5	24000	3800	149.6	0.5	0.4
	20	21000	3300	129.9	0.5	1.5	21000	3300	129.9	0.4	0.4
	30	15000	2000	78.7	0.4	1.2	15000	2000	78.7	0.3	0.4
	40	13000	1600	63.0	0.35	1.0	13000	1600	63.0	0.25	0.4
	60	12000	1400	55.1	0.3	0.9	12000	1400	55.1	0.2	0.4
R3	12	17000	2800	110.2	0.6	2.0	17000	2800	110.2	0.6	0.6

Depth of cut



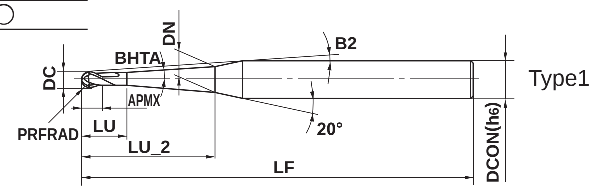
1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

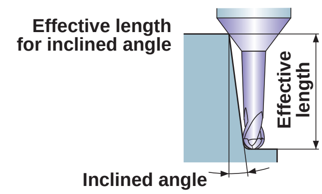
DF3XB

Ball nose, Medium cut length, 3 flute, Taper neck, For graphite

UWC DF 30°

Aluminum Alloy	Copper	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○	○





R				
0.5≦PRFRAD≦2				
±0.01				
h6 DCON=6				
0 - 0.008				

● 3 flute taper neck ball nose end mill with original diamond coating for graphite machining.

Unit : mm

Order Number	PRFRAD	DC	BHTA	APMX	LU_2	LU	B2	DN	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle			
														30'	1°	2°	3°
DF3XBR0050L030	0.5	1	0.5°	1.5	30	3	4°	1.42	100	6	3	★	1	30.4	32.1	32.8	34.6
DF3XBR0050L040	0.5	1	0.5°	1.5	40	3	3.2°	1.60	100	6	3	★	1	40.4	41.4	43.6	46.0
DF3XBR0050L050	0.5	1	0.5°	1.5	50	3	2.6°	1.77	100	6	3	★	1	50.4	51.7	54.4	⋆
DF3XBR0100L040	1	2	0.5°	3	40	5	2.6°	2.52	100	6	3	★	1	40.7	41.7	43.9	⋆
DF3XBR0100L060	1	2	0.5°	3	60	5	1.8°	2.86	130	6	3	★	1	60.7	62.2	⋆	⋆
DF3XBR0100L080	1	2	0.5°	3	80	5	1.4°	3.21	130	6	3	★	1	80.7	82.7	⋆	⋆
DF3XBR0150L060	1.5	3	0.5°	4.5	60	7.5	1.4°	3.82	130	6	3	★	1	60.8	62.2	⋆	⋆
DF3XBR0150L080	1.5	3	0.5°	4.5	80	7.5	1.1°	4.17	130	6	3	★	1	80.8	82.8	⋆	⋆
DF3XBR0200L100	2	4	0.5°	6	100	9	0.6°	5.49	160	6	3	★	1	100.8	⋆	⋆	⋆

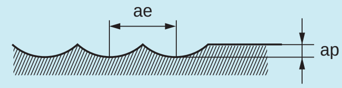
⋆ No interference

★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

Work material		Graphite					Copper, Copper alloys				
PRFRAD (mm)	**LU_2** (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed		Depth of cut (mm)	Width of cut (mm)
			(mm/min)	(IPM)				(mm/min)	(IPM)		
R0.5	30	20000	1100	43.3	0.05	0.13	16000	700	27.6	0.04	0.13
	40	15000	750	29.5	0.04	0.11	12000	480	18.9	0.03	0.11
	50	12000	500	19.7	0.03	0.10	9600	320	12.6	0.02	0.10
R1	40	20000	1800	70.9	0.13	0.40	16000	1100	43.3	0.10	0.40
	60	15000	900	35.4	0.09	0.27	12000	580	22.8	0.07	0.27
	80	12000	600	23.6	0.07	0.20	9600	380	15	0.06	0.20
R1.5	60	14000	1700	66.9	0.15	0.45	11000	1100	43.3	0.12	0.45
	80	12000	1200	47.2	0.12	0.35	9600	770	30.3	0.10	0.35
R2	100	10000	1100	43.3	0.20	0.50	8000	700	27.6	0.16	0.50

Depth of cut



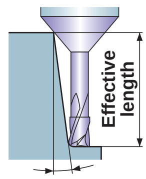
1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

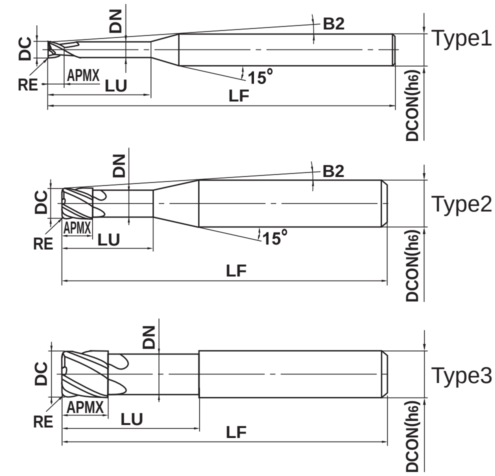
DFPSRB

Corner radius end mill, Short cut length, 2-4 flute, High precision, For graphite

UWC DF 30° DC≦1.5 DC≧2

Aluminum Alloy	Copper	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○	○





0.1≦RE≦1			
±0.01			
0.5≦DC≦12			
0 - 0.02			
4≦DCON≦6	8≦DCON≦10	DCON=12	
0 - 0.008	0 - 0.009	0 - 0.011	

● ±0.01mm corner radius tolerance, 0ー-0.02mm outer diameter tolerance. Corner radius end mill with original diamond coating for precise and efficient graphite machining.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
DFPSRBD0050R010N04	0.5	0.1	0.75	4	0.46	9.5°	60	4	2	★	1	4.1	4.3	4.6	5.0
DFPSRBD0050R010N05	0.5	0.1	0.75	5	0.46	8.7°	60	4	2	★	1	5.2	5.4	5.7	6.2
DFPSRBD0050R010N06	0.5	0.1	0.75	6	0.46	8.0°	60	4	2	★	1	6.2	6.4	6.9	7.5
DFPSRBD0050R010N10	0.5	0.1	0.75	10	0.46	6.1°	60	4	2	★	1	10.3	10.7	11.5	12.4
DFPSRBD0050R010N15	0.5	0.1	0.75	15	0.46	4.7°	60	4	2	★	1	15.5	16.0	17.2	18.6
DFPSRBD0080R010N06	0.8	0.1	1	6	0.76	7.7°	60	4	2	★	1	6.2	6.4	6.9	7.5
DFPSRBD0080R010N08	0.8	0.1	1	8	0.76	6.6°	60	4	2	★	1	8.3	8.6	9.2	9.9
DFPSRBD0100R010N08	1	0.1	1.5	8	0.94	6.3°	60	4	2	★	1	8.5	8.8	9.5	10.2
DFPSRBD0100R010N12	1	0.1	1.5	12	0.94	4.9°	60	4	2	★	1	12.6	13.1	14.1	15.2
DFPSRBD0100R020N08	1	0.2	1.5	8	0.94	6.3°	60	4	2	★	1	8.5	8.8	9.5	10.2
DFPSRBD0100R020N12	1	0.2	1.5	12	0.94	4.9°	60	4	2	★	1	12.6	13.1	14.1	15.2
DFPSRBD0100R020N16	1	0.2	1.5	16	0.94	4.0°	70	4	2	★	1	16.8	17.4	18.7	20.2
DFPSRBD0100R020N20	1	0.2	1.5	20	0.94	3.4°	70	4	2	★	1	20.9	21.7	23.3	25.1
DFPSRBD0100R020N30	1	0.2	1.5	30	0.94	2.5°	70	4	2	★	1	31.3	32.4	34.8	⋆
DFPSRBD0150R020N10	1.5	0.2	2.3	10	1.44	4.9°	70	4	2	★	1	10.5	11.0	11.8	12.7
DFPSRBD0150R020N20	1.5	0.2	2.3	20	1.44	2.9°	70	4	2	★	1	20.9	21.7	23.3	⋆
DFPSRBD0200R010N08	2	0.1	3	8	1.9	4.9°	70	4	4	★	2	8.4	8.7	9.4	10.1
DFPSRBD0200R020N12	2	0.2	3	12	1.9	3.7°	70	4	4	★	2	12.5	13.0	14.0	15.1
DFPSRBD0200R020N16	2	0.2	3	16	1.9	2.9°	70	4	4	★	2	16.7	17.3	18.6	⋆
DFPSRBD0200R020N20	2	0.2	3	20	1.9	2.5°	80	4	4	★	2	20.8	21.5	23.2	⋆
DFPSRBD0200R020N30	2	0.2	3	30	1.9	1.7°	80	4	4	★	2	31.2	32.2	⋆	⋆
DFPSRBD0200R020N40	2	0.2	3	40	1.9	1.4°	80	4	4	★	2	41.5	42.9	⋆	⋆
DFPSRBD0200R030N08	2	0.3	3	8	1.9	5.0°	70	4	4	★	2	8.4	8.7	9.3	10.1
DFPSRBD0300R020N20	3	0.2	4.5	20	2.9	1.4°	80	4	4	★	2	20.8	21.5	⋆	⋆
DFPSRBD0300R020N40	3	0.2	4.5	40	2.9	0.7°	80	4	4	★	2	41.5	⋆	⋆	⋆
DFPSRBD0300R030N12	3	0.3	4.5	12	2.9	2.1°	80	4	4	★	2	12.5	13.0	13.9	⋆
DFPSRBD0300R050N20	3	0.5	4.5	20	2.9	1.4°	80	4	4	★	2	20.8	21.5	⋆	⋆
DFPSRBD0400R020N20	4	0.2	6	20	3.9	—	80	4	4	★	3	⋆	⋆	⋆	⋆
DFPSRBD0400R020N40	4	0.2	6	40	3.9	—	80	4	4	★	3	⋆	⋆	⋆	⋆
DFPSRBD0400R050N20	4	0.5	6	20	3.9	—	80	4	4	★	3	⋆	⋆	⋆	⋆
DFPSRBD0400R050N40	4	0.5	6	40	3.9	—	80	4	4	★	3	⋆	⋆	⋆	⋆

⋆ No interference

★ : Inventory maintained in Japan.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
DFPSRBD0600R010N24	6	0.1	9	24	5.85	—	90	6	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD0600R030N24	6	0.3	9	24	5.85	—	90	6	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD0600R050N24	6	0.5	9	24	5.85	—	90	6	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD0600R050N30	6	0.5	9	30	5.85	—	90	6	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD0600R100N30	6	1	9	30	5.85	—	90	6	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD0800R050N30	8	0.5	12	30	7.85	—	90	8	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD0800R100N30	8	1	12	30	7.85	—	90	8	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD1000R050N40	10	0.5	15	40	9.7	—	130	10	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD1000R100N40	10	1	15	40	9.7	—	130	10	4	★	3	⁎	⁎	⁎	⁎
DFPSRBD1200R050N40	12	0.5	18	40	11.7	—	130	12	4	★	3	⁎	⁎	⁎	⁎

⁎ No interference

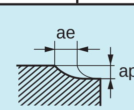
DFPSRB

Corner radius end mill, Short cut length, 2-4 flute, High precision, For graphite

RECOMMENDED CUTTING CONDITIONS

Work material			Graphite					Copper, Copper alloys				
DC (mm)	RE (mm)	LU (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut (mm)	Width of cut (mm)
0.5	0.1	4	30000	1100	43.3	0.05	0.23	24000	700	27.6	0.04	0.23
	0.1	5	28000	960	37.8	0.05	0.23	22000	600	23.6	0.04	0.23
	0.1	6	25000	850	33.5	0.05	0.23	20000	540	21.3	0.04	0.23
	0.1	10	22000	600	23.6	0.04	0.21	–	–	–	–	–
	0.1	15	20000	500	19.7	0.03	0.18	–	–	–	–	–
0.8	0.1	6	28000	1300	51.2	0.08	0.45	22000	830	32.7	0.06	0.45
	0.1	8	22000	900	35.4	0.08	0.45	18000	580	22.8	0.06	0.45
1	0.1	8	25000	1500	59.1	0.1	0.6	20000	960	37.8	0.08	0.6
	0.1	12	22000	1300	51.2	0.1	0.6	18000	830	32.7	0.08	0.6
	0.2	8	25000	1500	59.1	0.1	0.45	20000	960	37.8	0.08	0.45
	0.2	12	22000	1300	51.2	0.1	0.45	18000	830	32.7	0.08	0.45
	0.2	16	18000	1000	39.4	0.08	0.4	14000	640	25.2	0.06	0.4
	0.2	20	15000	800	31.5	0.08	0.4	–	–	–	–	–
	0.2	30	12000	600	23.6	0.07	0.35	–	–	–	–	–
1.5	0.2	10	18000	1400	55.1	0.15	0.8	14000	900	35.4	0.12	0.8
	0.2	20	12000	900	35.4	0.12	0.65	9600	580	22.8	0.1	0.65
2	0.1	8	24000	3300	129.9	0.2	1.2	19000	2100	82.7	0.16	1.2
	0.2	12	22000	3000	118.1	0.2	1.2	18000	1900	74.8	0.16	1.2
	0.2	16	19000	2500	98.4	0.2	1.2	15000	1600	63.0	0.16	1.2
	0.2	20	16000	2000	78.7	0.2	1.2	13000	1300	51.2	0.16	1.2
	0.2	30	13000	1600	63.0	0.16	1.0	–	–	–	–	–
	0.2	40	11000	1200	47.2	0.14	0.8	–	–	–	–	–
	0.3	8	24000	3300	129.9	0.3	1.2	19000	2100	82.7	0.24	1.2
3	0.2	20	18000	3000	118.1	0.3	2.0	14000	1900	74.8	0.24	2.0
	0.2	40	12000	1800	70.9	0.25	1.7	9600	1100	43.3	0.2	1.7
	0.5	20	18000	3000	118.1	0.3	1.5	14000	1900	74.8	0.24	1.5
	0.3	12	20000	4500	177.2	0.3	1.5	16000	2900	114.2	0.24	1.5
4	0.2	20	18000	4200	165.4	0.4	2.7	14000	2700	106.3	0.3	2.7
	0.2	40	13000	2800	110.2	0.4	2.7	10000	1800	70.9	0.3	2.7
	0.5	20	18000	4200	165.4	0.4	2.3	14000	2700	106.3	0.3	2.3
	0.5	40	13000	2800	110.2	0.4	2.3	10000	1800	70.9	0.3	2.3
6	0.1	24	14000	4600	181.1	0.6	3.8	11000	2900	114.2	0.5	3.8
	0.3	24	14000	4600	181.1	0.6	3.8	11000	2900	114.2	0.5	3.8
	0.5	24	14000	4600	181.1	0.6	3.8	11000	2900	114.2	0.5	3.8
	0.5	30	14000	4600	181.1	0.6	3.8	11000	2900	114.2	0.5	3.8
	1	30	14000	4600	181.1	0.6	3.0	11000	2900	114.2	0.5	3.0
8	0.5	30	10500	4000	157.5	0.8	5.3	8400	2600	102.4	0.6	5.3
	1	30	10500	4000	157.5	0.8	4.5	8400	2600	102.4	0.6	4.5
10	0.5	40	8700	3500	137.8	1.0	6.8	7000	2200	86.6	0.8	6.8
	1	40	8700	3500	137.8	1.0	6.0	7000	2200	86.6	0.8	6.0
12	0.5	40	7200	3000	118.1	1.2	8.0	5800	1900	74.8	1.0	8.0

Depth of cut



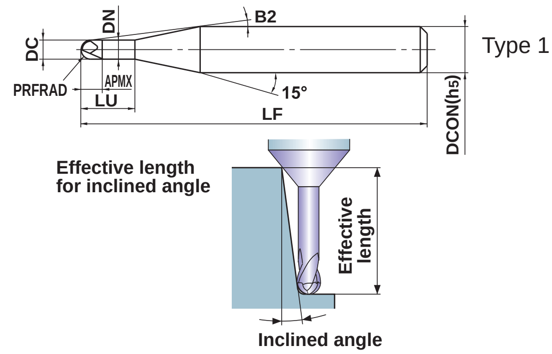
1) When high machining accuracy is needed, or work piece becomes chipped, we recommend lowering feed rate.
2) Use a milling machine dedicated for graphite.
3) If rigidity of machine or work materials installation is very low, or chattering and noise are generated, reduce revolution and feed rate proportionately.

CBN2XLB

Ball nose, Short cut length, 2 flute, Long neck

CBN 0°

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
○	◎	◎	◎				



R	0.2≤PRFRAD≤1			
	±0.005			
h5	4≤DCON≤6			
	0 - 0.005			

● Solid CBN ball nose. A wide variation of neck lengths available.

Unit : mm

Order Number	PRFRAD	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CBN2XLBR0020N010S04	0.2	0.4	0.3	1	0.36	13.4°	51	4	2	★	1	1	1	1.1	1.2
CBN2XLBR0020N010S06	0.2	0.4	0.3	1	0.36	13.9°	51	6	2	★	1	1	1	1.1	1.2
CBN2XLBR0020N016S04	0.2	0.4	0.3	1.6	0.36	12.4°	51	4	2	★	1	1.6	1.7	1.8	2
CBN2XLBR0020N016S06	0.2	0.4	0.3	1.6	0.36	13.3°	51	6	2	★	1	1.6	1.7	1.8	2
⁎ CBN2XLBR0030N009S06	0.3	0.6	0.4	0.9	0.56	14.1°	62	6	2	★	1	0.9	0.9	1.0	1.1
CBN2XLBR0030N015S04	0.3	0.6	0.5	1.5	0.56	12.6°	51	4	2	★	1	1.5	1.6	1.7	1.8
CBN2XLBR0030N015S06	0.3	0.6	0.5	1.5	0.56	13.4°	51	6	2	★	1	1.5	1.6	1.7	1.8
CBN2XLBR0030N024S04	0.3	0.6	0.5	2.4	0.56	11.3°	51	4	2	★	1	2.5	2.6	2.7	2.9
CBN2XLBR0030N024S06	0.3	0.6	0.5	2.4	0.56	12.5°	51	6	2	★	1	2.5	2.6	2.7	2.9
⁎ CBN2XLBR0040N010S06	0.4	0.8	0.5	1	0.76	14.1°	62	6	2	★	1	1	1	1.1	1.2
CBN2XLBR0040N020S04	0.4	0.8	0.6	2	0.76	11.8°	51	4	2	★	1	2	2.1	2.3	2.4
CBN2XLBR0040N020S06	0.4	0.8	0.6	2	0.76	12.9°	51	6	2	★	1	2	2.1	2.3	2.4
CBN2XLBR0040N032S04	0.4	0.8	0.6	3.2	0.76	10.3°	51	4	2	★	1	3.3	3.4	3.6	3.9
CBN2XLBR0040N032S06	0.4	0.8	0.6	3.2	0.76	11.7°	51	6	2	★	1	3.3	3.4	3.6	3.9
⁎ CBN2XLBR0050N011S06	0.5	1	0.6	1.1	0.94	14.1°	62	6	2	★	1	1.1	1.1	1.2	1.2
CBN2XLBR0050N025S04	0.5	1	0.8	2.5	0.94	11°	51	4	2	★	1	2.6	2.7	2.8	3
CBN2XLBR0050N025S06	0.5	1	0.8	2.5	0.94	12.3°	51	6	2	●	1	2.6	2.7	2.8	3
CBN2XLBR0050N040S04	0.5	1	0.8	4	0.94	9.3°	51	4	2	★	1	4.1	4.3	4.6	4.9
CBN2XLBR0050N040S06	0.5	1	0.8	4	0.94	11°	51	6	2	●	1	4.1	4.3	4.6	4.9
CBN2XLBR0075N038S04	0.75	1.5	1.1	3.8	1.44	9.1°	52	4	2	★	1	3.9	4.1	4.3	4.6
CBN2XLBR0075N038S06	0.75	1.5	1.1	3.8	1.44	11°	52	6	2	★	1	3.9	4.1	4.3	4.6
CBN2XLBR0075N060S04	0.75	1.5	1.1	6	1.44	7.1°	52	4	2	★	1	6.2	6.4	6.8	7.3
CBN2XLBR0075N060S06	0.75	1.5	1.1	6	1.44	9.3°	52	6	2	★	1	6.2	6.4	6.8	7.3
⁎ CBN2XLBR0100N017S06	1	2	1.2	1.7	1.9	13.6°	62	6	2	★	1	1.7	1.7	1.8	1.9
CBN2XLBR0100N050S04	1	2	1.5	5	1.9	7.3°	52	4	2	★	1	5.1	5.3	5.6	6
CBN2XLBR0100N050S06	1	2	1.5	5	1.9	9.8°	52	6	2	★	1	5.1	5.3	5.6	6
CBN2XLBR0100N080S04	1	2	1.5	8	1.9	5.3°	52	4	2	★	1	8.2	8.5	9	9.7
CBN2XLBR0100N080S06	1	2	1.5	8	1.9	7.9°	52	6	2	★	1	8.2	8.5	9	9.7

⁎ Short edge and neck lengths for high rigidity.

● : Inventory maintained. ★ : Inventory maintained in Japan.

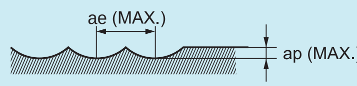
CBN2XLB

Ball nose, Short cut length, 2 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (45–55HRC) AISI H13 etc.					Hardened steel (55–62HRC) AISI D2 etc.					Hardened steel (62–70HRC) AISI W1, AISI M2 etc.				
PRFRAD (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
R0.2	50000	1500	59.1	0.006	0.01	50000	1200	47.2	0.006	0.01	50000	1200	47.2	0.004	0.008
R0.3	50000	2000	78.7	0.01	0.02	50000	1500	59.1	0.01	0.02	50000	1500	59.1	0.008	0.015
R0.4	50000	3000	118.1	0.02	0.05	50000	2000	78.7	0.02	0.04	50000	2000	78.7	0.015	0.03
R0.5	50000	3000	118.1	0.03	0.06	50000	2000	78.7	0.03	0.05	50000	2000	78.7	0.02	0.03
R0.75	50000	3500	137.8	0.04	0.08	50000	2500	98.4	0.03	0.06	50000	2500	98.4	0.02	0.04
R1	50000	4000	157.5	0.05	0.1	50000	3000	118.1	0.04	0.07	50000	3000	118.1	0.03	0.05

Depth of cut



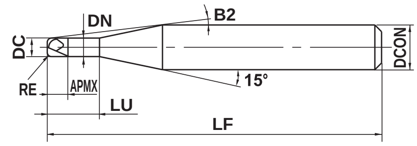
1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Oil mist coolant is recommended.
3) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

CBN2XLRB

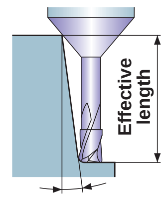
Corner radius end mill, Short cut length, 2 flute, Long neck

CBN 0°

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
○	◎	◎	◎				



Type 1



Effective length for inclined angle

R	0.05≤RE≤0.5			
	±0.005			
DC	0.5<DC≤2			
	0 / - 0.010			
h5	DCON=4			
	0 / - 0.005			

● CBN long neck radius end mill. A wide variation of neck lengths available.

Unit : mm

Order Number	RE	DC	APMX	LU	DN	B2	LF	DCON	No. of Flutes	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CBN2XLRBD0050R005N02	0.05	0.5	0.3	2	0.46	11.6°	51	4	2	★	1	2.1	2.1	2.3	2.5
CBN2XLRBD0050R005N03	0.05	0.5	0.3	3	0.46	10.4°	51	4	2	★	1	3.1	3.2	3.5	3.7
CBN2XLRBD0050R010N02	0.1	0.5	0.3	2	0.46	11.7°	51	4	2	★	1	2.1	2.1	2.3	2.5
CBN2XLRBD0050R010N03	0.1	0.5	0.3	3	0.46	10.5°	51	4	2	★	1	3.1	3.2	3.4	3.7
CBN2XLRBD0100R005N03	0.05	1	0.6	3	0.94	9.7°	51	4	2	★	1	3.2	3.4	3.7	4
CBN2XLRBD0100R005N05	0.05	1	0.6	5	0.94	7.9°	51	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0100R010N03	0.1	1	0.6	3	0.94	9.7°	51	4	2	★	1	3.2	3.4	3.6	4
CBN2XLRBD0100R010N05	0.1	1	0.6	5	0.94	8°	51	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0100R020N03	0.2	1	0.6	3	0.94	9.8°	51	4	2	★	1	3.2	3.4	3.5	4
CBN2XLRBD0100R020N05	0.2	1	0.6	5	0.94	8°	51	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0100R030N03	0.3	1	0.6	3	0.94	9.9°	51	4	2	★	1	3.2	3.4	3.4	4
CBN2XLRBD0100R030N05	0.3	1	0.6	5	0.94	8.1°	51	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0150R010N05	0.1	1.5	0.9	5	1.44	7.3°	52	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0150R010N08	0.1	1.5	0.9	8	1.44	5.6°	52	4	2	★	1	8.5	8.8	9.5	10.2
CBN2XLRBD0150R020N05	0.2	1.5	0.9	5	1.44	7.3°	52	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0150R020N08	0.2	1.5	0.9	8	1.44	5.6°	52	4	2	★	1	8.5	8.8	9.5	10.2
CBN2XLRBD0150R030N05	0.3	1.5	0.9	5	1.44	7.4°	52	4	2	★	1	5.3	5.6	6	6.5
CBN2XLRBD0150R030N08	0.3	1.5	0.9	8	1.44	5.7°	52	4	2	★	1	8.5	8.8	9.5	10.2
CBN2XLRBD0200R010N06	0.1	2	1.2	6	1.9	5.9°	52	4	2	★	1	6.3	6.6	7.1	7.6
CBN2XLRBD0200R010N10	0.1	2	1.2	10	1.9	4.2°	52	4	2	★	1	10.5	10.9	11.7	12.6
CBN2XLRBD0200R020N06	0.2	2	1.2	6	1.9	5.9°	52	4	2	★	1	6.3	6.6	7.1	7.6
CBN2XLRBD0200R020N10	0.2	2	1.2	10	1.9	4.2°	52	4	2	★	1	10.5	10.9	11.7	12.6
CBN2XLRBD0200R030N06	0.3	2	1.2	6	1.9	6°	52	4	2	★	1	6.3	6.6	7	7.6
CBN2XLRBD0200R030N10	0.3	2	1.2	10	1.9	4.2°	52	4	2	★	1	10.5	10.8	11.6	12.6
CBN2XLRBD0200R050N06	0.5	2	1.2	6	1.9	6.1°	52	4	2	★	1	6.3	6.5	7	7.5
CBN2XLRBD0200R050N10	0.5	2	1.2	10	1.9	4.3°	52	4	2	★	1	10.5	10.8	11.6	12.5

★ : Inventory maintained in Japan.

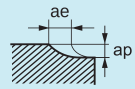
CBN2XLRB

Corner radius end mill, Short cut length, 2 flute, Long neck

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (45−55HRC) AISI H13 etc.					Hardened steel (55−62HRC) AISI D2 etc.					Hardened steel (62−70HRC) AISI W1, AISI M2 etc.				
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Depth of cut ap (mm)	Width of cut ae (mm)
0.5	50000	750	29.5	0.01	0.2	50000	600	23.6	0.01	0.1	40000	400	15.7	0.005	0.06
1	38000	1100	43.3	0.02	0.3	38000	760	29.9	0.01	0.2	25000	400	15.7	0.01	0.1
1.5	25000	900	35.4	0.03	0.5	25000	700	27.6	0.02	0.4	17000	340	13.4	0.02	0.2
2	20000	800	31.5	0.04	0.7	20000	600	23.6	0.03	0.6	12000	300	11.8	0.02	0.3

Depth of cut

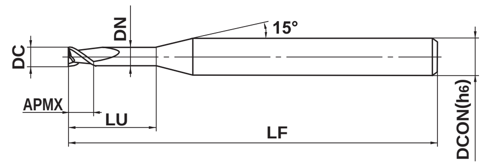


1) If the depth of cut is smaller than this table, feed rate can be increased.
2) Oil mist coolant is recommended.
3) Cutting conditions may differ considerably due to the overhang, depth of cut, and machine tool conditions. Please use the above table as a start reference point.

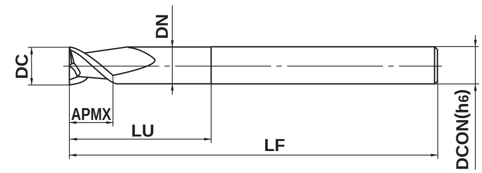
C2SA

2 flute, Short cut length, Relieved neck

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
						○	◎



Type 1



Type 2

	DC≦12	DC>12			
	0 - 0.020	0 - 0.030			
h6	DCON=6	8≦DCON≦10	12≦DCON≦16	DCON=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● High efficiency machining for aluminum alloys.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
C2SAD0300N120	3	6	12	2.7	60	6	2	★	1
C2SAD0400N120	4	6	12	3.7	60	6	2	★	1
C2SAD0500N150	5	8	15	4.7	60	6	2	★	1
C2SAD0600N160	6	8	16	5.7	75	6	2	★	2
C2SAD0800N200	8	10	20	7.4	75	8	2	★	2
C2SAD1000N300	10	12	30	9.4	75	10	2	★	2
C2SAD1000N350	10	12	35	9.4	100	10	2	★	2
C2SAD1200N300	12	15	30	11.4	75	12	2	★	2
C2SAD1200N350	12	15	35	11.4	100	12	2	★	2
C2SAD1200N400	12	15	40	11.4	125	12	2	★	2
C2SAD1600N300	16	15	30	15.4	75	16	2	★	2
C2SAD1600N400	16	15	40	15.4	100	16	2	★	2
C2SAD1600N450	16	15	45	15.4	125	16	2	★	2
C2SAD2000N400	20	20	40	18	100	20	2	★	2
C2SAD2000N500	20	20	50	18	125	20	2	★	2

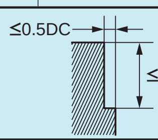
★ : Inventory maintained in Japan.

C2SA

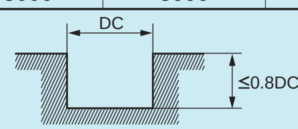
2 flute, Short cut length, Relieved neck, For aluminum alloy

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	40000	1800	70.9
4	36000	2400	94.5
5	30000	3000	118.1
6	27000	3200	126.0
8	20000	3400	133.9
10	16000	3600	141.7
12	13000	3600	141.7
16	10000	3600	141.7
20	8000	3300	129.9
Depth of cut			

Slotting

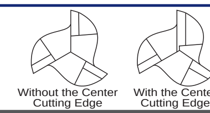
Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
3	40000	1600	63.0
4	36000	2100	82.7
5	30000	2700	106.3
6	27000	2800	110.2
8	20000	3000	118.1
10	16000	3200	126.0
12	13000	3200	126.0
16	10000	3200	126.0
20	8000	3000	118.1
Depth of cut			

1) Water-soluble cutting fluid is recommended.
2) Climb cutting is recommended for shoulder milling.
3) If the tooling clamping is insufficient, the tool can be pulled out of the holder therefore ensure that it is securely located.
4) The above are for L/D of up to 4. If exceeding L/D of 4 reduce the speed, feed and depth of cut proportionately.
5) 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.

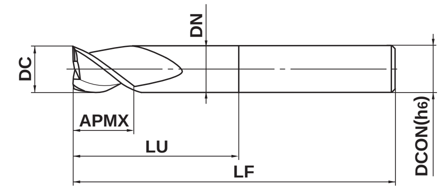
C3SA

3 flute, Short cut length, Relieved neck

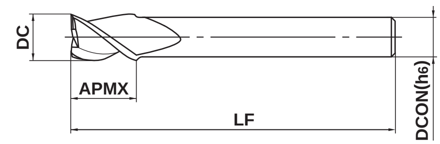
UWC 37.5°



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
						○	◎



Type 1



Type 2

DC≤12	DC>12			
0 - 0.020	0 - 0.030			

h6

8≤DCON≤10	12≤DCON≤18	20≤DCON≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

● High efficiency machining for aluminum alloys.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type	The Center Cutting Edge
C3SAD1000A100S08	10	12	—	—	100	8	3	★	2	○
C3SA**D1000N300**	10	12	30	9.4	75	10	3	★	1	—
C3SA**D1000N350**	10	12	35	9.4	100	10	3	★	1	—
C3SA**D1200A150S10**	12	15	—	—	150	10	3	★	2	○
C3SA**D1200N300**	12	15	30	11.4	75	12	3	★	1	—
C3SA**D1200N350**	12	15	35	11.4	100	12	3	★	1	—
C3SA**D1200N400**	12	15	40	11.4	125	12	3	★	1	—
C3SA**D1600A200S14**	16	15	—	—	200	14	3	★	2	○
C3SA**D1600N300**	16	15	30	15.4	75	16	3	★	1	—
C3SA**D1600N400**	16	15	40	15.4	100	16	3	★	1	—
C3SA**D1600N450**	16	15	45	15.4	125	16	3	★	1	—
C3SA**D1700A150S16**	17	18	—	—	150	16	3	★	2	○
C3SA**D1800A200S16**	18	18	—	—	200	16	3	★	2	○
C3SA**D2000A200S18**	20	20	—	—	200	18	3	★	2	○
C3SA**D2000N400**	20	20	40	18	100	20	3	★	1	—
C3SA**D2000N600**	20	20	60	18	125	20	3	★	1	—
C3SA**D2000N850**	20	20	85	18	150	20	3	★	1	—
C3SA**D2500N500**	25	20	50	23	100	25	3	★	1	—
C3SA**D2500N650**	25	20	65	23	125	25	3	★	1	—
C3SA**D2500N900**	25	20	90	23	150	25	3	★	1	—
C3SA**D2600A200S25**	26	20	—	—	200	25	3	★	2	○

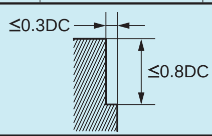
★ : Inventory maintained in Japan.

C3SA

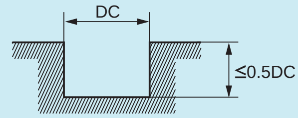
3 flute, Short cut length, Relieved neck, For aluminum alloy

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
12	13000	5400	212.6
16	10000	5400	212.6
18	9000	5000	196.9
20	8000	5000	196.9
25	6000	4500	177.2
Depth of cut			

Slotting

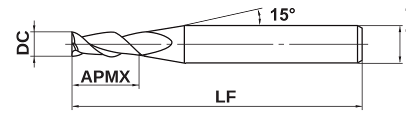
Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
12	13000	3200	126.0
16	10000	3200	126.0
18	9000	3000	118.1
20	8000	3000	118.1
25	6000	2800	110.2
Depth of cut			

1) Water-soluble cutting fluid is recommended.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and feed rate proportionately, or set the depth of cut smaller.
3) Climb cutting is recommended for shoulder milling.
4) The above are for L/D of up to 4. If exceeding L/D of 4 reduce the speed, feed and depth of cut proportionately.
5) Not center cutting edge therefore vertical feed can not be carried at. If vertical feed is necessary please use ramping.

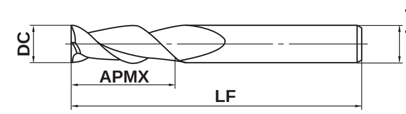
C2MHA

2 flute, Medium cut length, Relieved neck

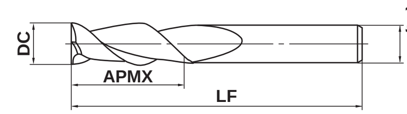
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
							◎



Type 1



Type 2



Type 3

DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=6	8≤DCON≤10	12≤DCON≤16	20≤DCON≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- High efficiency machining for aluminum alloys.

Unit : mm

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock	Type
C2MHAD0300	3	9	60	6	2	★	1
C2MHAD0400	4	12	60	6	2	★	1
C2MHAD0500	5	15	60	6	2	★	1
C2MHAD0600	6	18	60	6	2	★	2
C2MHAD0800	8	20	75	8	2	★	2
C2MHAD1000	10	25	75	10	2	★	2
C2MHAD1200	12	25	75	12	2	★	2
C2MHAD1400	14	32	75	12	2	★	3
C2MHAD1600	16	32	100	16	2	★	2
C2MHAD2000	20	38	125	20	2	★	2
C2MHAD2500	25	38	125	25	2	★	2

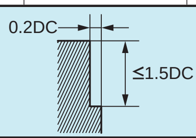
★ : Inventory maintained in Japan.

C2MHA

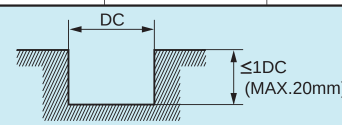
2 flute, Medium cut length, Relieved neck, For aluminum alloy

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)
3	40000	2400	94.5
4	36000	2600	102.4
5	30000	4000	157.5
6	27000	4000	157.5
8	20000	4000	157.5
10	16000	4500	177.2
12	13000	4500	177.2
16	10000	4500	177.2
20	8000	4300	169.3
25	6000	3600	141.7
Depth of cut			

Slotting

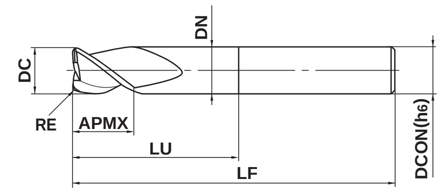
Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed	
		(mm/min)	(IPM)
3	40000	1500	59.1
4	36000	1800	70.9
5	30000	2800	110.2
6	27000	2800	110.2
8	20000	2800	110.2
10	16000	3200	126.0
12	13000	3200	126.0
16	10000	3200	126.0
20	8000	3000	118.1
25	6000	2500	98.4
Depth of cut			

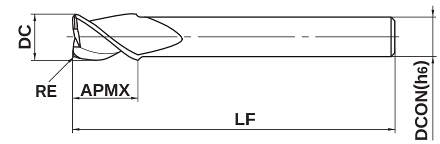
1) Water-soluble cutting fluid is recommended.
2) Climb cutting is recommended for shoulder milling.
3) If the tooling clamping is insufficient, the tool can be pulled out of the holder therefore ensure that it is securely located.
4) If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.

C3SARB

Corner radius, Short cut length, 3 flute, For aluminum alloy

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
						○	◎





DC≤12	DC>12			
0 - 0.020	0 - 0.030			
12≤DCON≤16	20≤DCON≤25			
0 - 0.011	0 - 0.013			

h6

- High efficiency machining for aluminium alloys.

Unit : mm

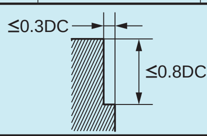
Order Number	DC	RE	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
C3SARBD1200N0300R100	12	1	15	30	11.4	75	12	3	★	1
C3SARBD1200N0300R320	12	3.2	15	30	11.4	75	12	3	★	1
C3SARBD1200N0400R100	12	1	15	40	11.4	125	12	3	★	1
C3SARBD1200N0400R320	12	3.2	15	40	11.4	125	12	3	★	1
C3SARBD1600N0450R100	16	1	15	45	15.4	125	16	3	★	1
C3SARBD1600N0450R320	16	3.2	15	45	15.4	125	16	3	★	1
C3SARBD1600N0700R100	16	1	15	70	15.4	150	16	3	★	1
C3SARBD1600N0700R320	16	3.2	15	70	15.4	150	16	3	★	1
C3SARBD1800R100	18	1	18	—	—	150	16	3	★	2
C3SARBD1800R320	18	3.2	18	—	—	150	16	3	★	2
C3SARBD2000N0600R100	20	1	20	60	18.0	125	20	3	★	1
C3SARBD2000N0600R320	20	3.2	20	60	18.0	125	20	3	★	1
C3SARBD2000N0600R400	20	4	20	60	18.0	125	20	3	★	1
C3SARBD2000N0850R100	20	1	20	85	18.0	150	20	3	★	1
C3SARBD2000N0850R320	20	3.2	20	85	18.0	150	20	3	★	1
C3SARBD2000N0850R400	20	4	20	85	18.0	150	20	3	★	1
C3SARBD2500N0650R320	25	3.2	20	65	23.0	125	25	3	★	1
C3SARBD2500N0650R400	25	4	20	65	23.0	125	25	3	★	1
C3SARBD2500N0650R500	25	5	20	65	23.0	125	25	3	★	1
C3SARBD2500N0900R320	25	3.2	20	90	23.0	150	25	3	★	1
C3SARBD2500N0900R400	25	4	20	90	23.0	150	25	3	★	1
C3SARBD2500N0900R500	25	5	20	90	23.0	150	25	3	★	1

★ : Inventory maintained in Japan.

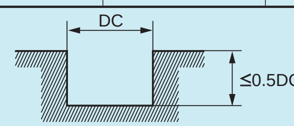
C3SARB

Corner radius, Short cut length, 3 flute, For aluminum alloy

Shoulder milling

Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
12	13000	5400	212.6
16	10000	5400	212.6
18	9000	5000	196.9
20	8000	5000	196.9
25	6000	4500	177.2
Depth of cut			

Slotting

Work material	Aluminum alloy		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
12	13000	3200	126.0
16	10000	3200	126.0
18	9000	3000	118.1
20	8000	3000	118.1
25	6000	2800	110.2
Depth of cut			

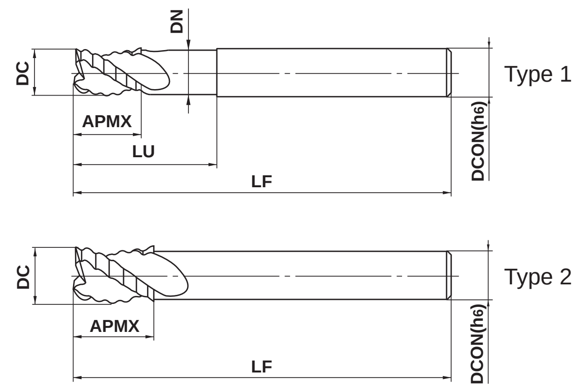
1) Water-soluble cutting fluid is recommended.
2) If the rigidity of the machine or the workpiece installation is very low, or chattering is generated, please reduce the revolution and feed rate proportionately, or set the depth of cut smaller.
3) Climb cutting is recommended for shoulder milling.
4) The above are for L/D of up to 4. If exceeding L/D of 4 reduce the speed, feed and depth of cut proportionately.
5) Not center cutting edge therefore vertical feed can not be carried at. If vertical feed is necessary please use ramping.

CSRA NEW

Roughing end mill, Short cut length, 3 flute, For aluminium alloy

UWC 37.5°

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
							◎



h6	DCON=10	12≤DCON≤16	20≤DCON≤25		
	0 - 0.009	0 - 0.011	0 - 0.013		

- 3 flute uncoated end mill for roughing aluminium alloy.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
CSRAD1000	10	12	25	9.4	75	10	3	★	1
CSRAD1200	12	15	30	11.4	75	12	3	★	1
CSRAD1600	16	18	35	15.4	100	16	3	★	1
CSRAD1800	18	22	—	—	100	16	3	★	2
CSRAD2000	20	25	50	18.0	125	20	3	★	1
CSRAD2200	22	25	—	—	125	20	3	★	2
CSRAD2500	25	30	60	23.0	125	25	3	★	1

★ : Inventory maintained in Japan.

CSRA

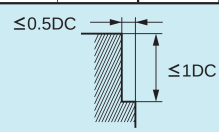
Roughing end mill, Short cut length, 3 flute, For aluminium alloy

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	19000	8600	339	9500	3400	134
12	16000	8200	323	8000	3200	126
16	12000	7600	299	6000	3100	122
18	10500	7200	283	5300	2900	114
20	9500	7100	280	4800	2900	114
22	8500	6900	272	4300	2800	110
25	7500	6800	268	3800	2700	106

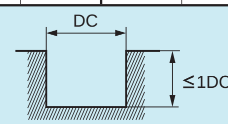
Depth of cut



Slotting

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	19000	6800	268	9500	2700	106
12	16000	6500	256	8000	2600	102
16	12000	6100	240	6000	2400	94
18	10500	5800	228	5300	2400	94
20	9500	5700	224	4800	2300	90
22	8500	5500	217	4300	2200	87
25	7500	5400	213	3800	2200	87

Depth of cut



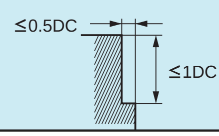
1) Water-soluble cutting fluid is recommended.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Climb cutting is recommended for shoulder milling.
4) Not center cutting edge therefore vertical feed can not be carried at. If vertical feed is necessary please use ramping.
5) 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.

Using a high-speed and high-rigidity machining center

Shoulder milling

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	30000	11000	433	19000	5400	213
12	30000	12000	472	16000	5300	209
16	24000	12000	472	12000	4900	193
18	21000	12000	472	10500	4700	185
20	19000	11000	433	9500	4600	181
22	17000	11000	433	8500	4300	169
25	15000	11000	433	7500	4300	169

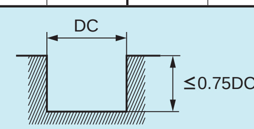
Depth of cut



Slotting

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	30000	8600	339	19000	4300	169
12	30000	9900	390	16000	4300	169
16	24000	9700	382	12000	4000	157
18	21000	9500	374	10500	3800	150
20	19000	9100	358	9500	3700	146
22	17000	8700	343	8500	3400	134
25	15000	8600	339	7500	3400	134

Depth of cut



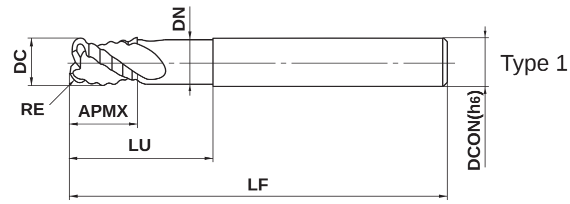
1) Water-soluble cutting fluid is recommended.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Climb cutting is recommended for shoulder milling.
4) Not center cutting edge therefore vertical feed can not be carried at. If vertical feed is necessary please use ramping.
5) 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.

CSRARB NEW

Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy

UWC 37.5°

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
							◎



h6

DCON=10	12≤DCON≤16	20≤DCON≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

● 3 flute uncoated end mill for roughing aluminium alloy.

Unit : mm

Order Number	DC	RE	APMX	LU	DN	LF	DCON	No. of Flutes	Stock	Type
CSRARBD1000R100	10	1	12	25	9.4	75	10	3	★	1
CSRARB**D1000R200**	10	2	12	25	9.4	75	10	3	★	1
CSRARB**D1200R100**	12	1	15	30	11.4	75	12	3	★	1
CSRARB**D1200R200**	12	2	15	30	11.4	75	12	3	★	1
CSRARB**D1600R200**	16	2	18	35	15.4	100	16	3	★	1
CSRARB**D1600R300**	16	3	18	35	15.4	100	16	3	★	1
CSRARB**D2000R200**	20	2	25	50	18.0	125	20	3	★	1
CSRARB**D2000R300**	20	3	25	50	18.0	125	20	3	★	1
CSRARB**D2500R300**	25	3	30	60	23.0	125	25	3	★	1
CSRARB**D2500R400**	25	4	30	60	23.0	125	25	3	★	1
CSRARB**D2500R500**	25	5	30	60	23.0	125	25	3	★	1

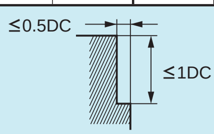
★ : Inventory maintained in Japan.

CSRARB

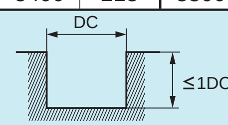
Roughing end mill, Short cut length, 3 flute, For aluminium alloy

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	19000	8600	339	9500	3400	134
12	16000	8200	323	8000	3200	126
16	12000	7600	299	6000	3100	122
18	10500	7200	283	5300	2900	114
20	9500	7100	279	4800	2900	114
22	8500	6900	272	4300	2800	110
25	7500	6800	268	3800	2700	106
Depth of cut						

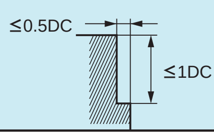
Slotting

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	19000	6800	268	9500	2700	106
12	16000	6500	256	8000	2600	102
16	12000	6100	240	6000	2400	94
18	10500	5800	228	5300	2400	94
20	9500	5700	224	4800	2300	91
22	8500	5500	216	4300	2200	87
25	7500	5400	213	3800	2200	87
Depth of cut						

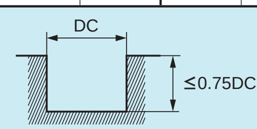
1) Water-soluble cutting fluid is recommended.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Climb cutting is recommended for shoulder milling.
4) Not center cutting edge therefore vertical feed can not be carried at. If vertical feed is necessary please use ramping.
5) 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.

Using a high-speed and high-rigidity machining center

Shoulder milling

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	30000	11000	433	19000	5400	213
12	30000	12000	472	16000	5300	209
16	24000	12000	472	12000	4900	193
18	21000	12000	472	10500	4700	185
20	19000	11000	433	9500	4600	181
22	17000	11000	433	8500	4300	169
25	15000	11000	433	7500	4300	169
Depth of cut						

Slotting

Work material	Aluminum alloy			Aluminium cast		
DC (mm)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)	Revolution (min^{-1})	Table feed (mm/min)	Table feed (IPM)
10	30000	8600	339	19000	4300	169
12	30000	9900	389	16000	4300	169
16	24000	9700	381	12000	4000	169
18	21000	9500	374	10500	3800	149
20	19000	9100	358	9500	3700	146
22	17000	8700	342	8500	3400	134
25	15000	8600	338	7500	3400	134
Depth of cut						

1) Water-soluble cutting fluid is recommended.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Climb cutting is recommended for shoulder milling.
4) Not center cutting edge therefore vertical feed can not be carried at. If vertical feed is necessary please use ramping.
5) 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.

Memo

Four geometries now available with through coolant.

HEAD

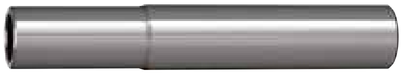
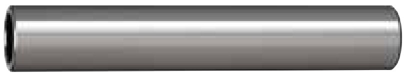
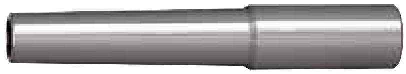
Type	Applications, Features	No. of Flutes	Product Code	Shape	Size Range	Coolant	Long cutting edge	Work Material P Carbon Steel	Work Material P Tool steel	Work Material H -55HRC	Work Material H 55HRC-	Work Material M Stainless steel	Work Material S Titanium Alloy, Heat Resistant Alloy	Work Material N Copper Alloy	Work Material N Aluminum Alloy	Dimensions	Cutting Conditions
SQUARE																	
	For Difficult-to-cut Materials	3	iMX-S3HV	Square head, 3 flute, Irregular helix 	ϕ.375"–ϕ1.000" ϕ10–ϕ25			◎	○			◎	◎	○		I368 I369	I401 I402 I403
		4	iMX-S4HV	Square head, 4 flute, Irregular helix 	ϕ.375"–ϕ1.000" ϕ10–ϕ32			◎	○			◎	◎	○		I370 I371	I404 I405 I406 I407
				Square head, 4 flute, Irregular helix, Long cutting edge type 	— ϕ16, ϕ20		●									I371	I406
		4	iMX-S4HV-S	Square head, 4 flute, Irregular helix, with coolant hole 	ϕ.375"–ϕ1.000" ϕ10–ϕ25	●		◎	○			◎	◎	○		I372 I373	I404 I405
	For Aluminum Alloys	3	iMX-S3A	Square head, 3 flute, For aluminum alloy 	ϕ.375"–ϕ1.000" ϕ10–ϕ28										◎	I374 I375	I408
RADIUS																	
	For Difficult-to-cut Materials	4	iMX-C4HV	Corner radius head, 4 flute, Irregular helix 	ϕ.375"–ϕ1.000" ϕ10–ϕ28			◎	○			◎	◎	○		I376 I377 I378	I404 I405 I406 I407
				Corner radius head, 4 flute, Irregular helix, Long cutting edge type 	— ϕ16, ϕ20		●									I378	I406
		4	iMX-C4HV-S	Corner radius head, 4 flute, Irregular helix, with coolant hole 	ϕ.375"–ϕ1.000" ϕ10–ϕ25	●		◎	○			◎	◎	○		I380 I381	I404 I405
		6	iMX-C6HV	Corner radius head, Multi-flute, Irregular helix	ϕ.375"–ϕ.500" ϕ10, ϕ12			◎	○			◎	◎			I382	I409
		10	iMX-C10HV		ϕ.625" ϕ16			◎	○			◎	◎			I382	I409
		12	iMX-C12HV		ϕ.750"–ϕ1.000" ϕ20, ϕ25			◎	○			◎	◎			I382	I409
	For High Feed	4	iMX-C4FD-C	Duplex corner radius head, 4 flute, For high feed, with coolant hole 	— ϕ10–ϕ25	●		◎	◎	◎		◎	◎	○		I383	I410
	For High Efficiency Machining	4	iMX-C4FV	Corner radius head for high efficiency machining, 4 flute, Irregular helix 	ϕ.375"–ϕ1.000" ϕ10–ϕ25			◎	◎	◎						I384 I385	I411
	For Aluminum Alloys	3	iMX-C3A	Corner radius head, 3 flute, For aluminum alloy 	ϕ.375"–ϕ1.000" ϕ10–ϕ28										◎	I386 I387	I408

EXCHANGEABLE HEAD END MILLS

Type	Applications, Features	No. of Flutes	Product Code	Shape	Size Range	Coolant	Long cutting edge	Work Material P: Carbon Steel	P: Tool steel	H: -55HRC	H: 55HRC-	M: Stainless steel	S: Titanium Alloy, Heat Resistant Alloy	N: Copper Alloy	N: Aluminum Alloy	Dimensions	Cutting Conditions
ROUGHING																	
	For Difficult-to-cut Materials	**4**	**iMX-R4F**	Roughing head, 4 flute 	ϕ.375"–ϕ1.000" ϕ10–ϕ25			◎	○			◎	◎	○		I388 I389	I412 I413
BALL																	
	For Difficult-to-cut Materials	**4**	**iMX-B4HV**	Ball nose head, 4 flute, Irregular curve 	ϕ.375"–ϕ1.000" ϕ10–ϕ25			◎	○			◎	◎	○		I390 I391	I414
		4	**iMX-B4HV-E**	Ball nose head, 4 flute, Irregular curve, with coolant hole 	ϕ.375"–ϕ1.000" ϕ10–ϕ25	●		◎	○			◎	◎	○		I392 I393	I414
		6	**iMX-B6HV**	Ball nose head, 6 flute, Irregular curve 	ϕ.375"–ϕ1.000" ϕ10–ϕ25			◎	○			◎	◎			I394 I395	I415

HOLDER

The undercut type holders are available in medium, semi-long, and long lengths.

Type		Length	Taper Angle	Material	Dimensions
Under cut (Inch, Metric)		Medium Semi-long Long	—	Carbide	I396 I397
Straight (Metric)		Semi-long Long	—	Carbide	I397
Taper neck (Inch, Metric)		Long	1°	Carbide	I396 I397

MIRACLE SIGMA

IDENTIFICATION

CARBIDE

iMX END MILL SERIES

HEAD

IMX12 C 4 HV 120 R100 12 S

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Series Description Head & Holder Combination	
Head Series Description	Holder Series Description
iMX 10	iMX 10 -
iMX 12	iMX 12 -
iMX 16	iMX 16 -
iMX 20	iMX 20 -
iMX 25	iMX 25 -

Head & holder combination should be the same.

② Basic configurations	
S	Square
C	Corner radius
B	Ball nose
R	Roughing

③ No. of Flutes
ex.
4 → 4 flute

④ Specifications	
H	High helix
V	Vibration control
F	For High Efficiency Machining
A	For Aluminum Alloys
D	Duplex corner radius
F	Fine pitch (Roughing)

⑤ Dia. (mm)
ex.
120 → 12mm

⑤ Dia. (inch)
ex.
0500 → .5inch

⑥ Corner R. (mm)
ex.
R050 → 0.5mm
R100 → 1mm

⑥ Corner R. (inch)
ex.
R030 → .030inch

⑦ Flute length (mm)
ex.
12 → 12.*mm
(Truncate decimal places)

⑦ Flute length (inch)
ex.
M → Medium = 1DC
P → 0.8DC
(DC=external diameter)

⑧ Coolant hole	
S	Peripheral(Side)
E	End
C	End face, Center
None	without hole

CARBIDE HOLDER

IMX12 - U 12 N017 L080 C

① ② ③ ④ ⑤ ⑥ ⑦

① Series Description Holder & Head Combination	
Holder Series Description	Head Series Description
iMX 10 -	iMX 10
iMX 12 -	iMX 12
iMX 16 -	iMX 16
iMX 20 -	iMX 20
iMX 25 -	iMX 25

Holder & head combination should be the same.
For holder details, refer to pages I396 and I397.

② Hyphen
Hyphen Indicates these are holders.

③ Figure	
U	Undercut
S	Straight
A	1° Taper neck

④ Shank diameter (mm)
ex.
12 → 12mm

④ Shank diameter (inch)
ex.
0500 → .5inch

⑤ Neck Length (mm)
ex.
N17 → 17.*mm
(Truncate decimal places)

⑤ Neck Length (inch)
ex.
N071 → .71*inch
(Three digits decimal place truncate)

⑥ Overall Length (mm)
ex.
L080 → 80mm

⑥ Overall Length (inch)
ex.
L31 → 3.1*inch
(Two digits decimal place truncate)

⑦ Tool material	
C	CARBIDE

* For holder details, refer to pages I396 and I397

RUN-OUT ACCURACY AND HEAD EXCHANGE ACCURACY

Unit : inch

Run-out accuracy for the peripheral cutting edge	Head exchange accuracy (Axial)
.0006 (ø10~20)	±.0008
.0008 (ø25)	

Note: Dimension symbols conforming to ISO13399.
See pages PR3-PR6 for details.

Memo

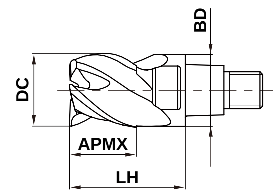
iMX-S3HV- Inch sizes NEW

Square head, 3 flute, Irregular helix

UWC

42°
43.5°
45°

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
◎	○			◎	◎	○	



DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

- 3-flute end mills suitable for side milling, slotting and plunging.
- Irregular helix controls vibration and achieves stable machining.

Unit : inch

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10S3HV0375P	.375	.320	.630	.363	3	●	1
IMX12S3HV0500P	.500	.420	.789	.488	3	●	1
IMX16S3HV0625P	.625	.520	.945	.605	3	●	1
IMX20S3HV0750P	.750	.650	1.181	.730	3	●	1
IMX25S3HV1000P	1.000	.850	1.500	.980	3	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

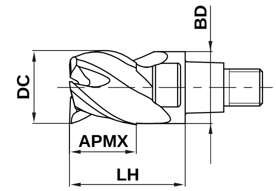
CUTTING CONDITIONS ➤ I401—I403

iMX-S3HV – Metric sizes NEW

Square head, 3 flute, Irregular helix

UWC 42° 43.5° 45°

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
◎	○			◎	◎	○	



Type1

DC≤12	DC>12			
0 - 0.020	0 - 0.030			

●3-flute end mills suitable for side milling, slotting and plunging.
●Irregular helix controls vibration and achieves stable machining.

Unit : mm

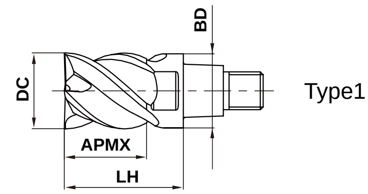
Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10S3HV10008	10	8.5	16	9.7	3	●	1
IMX12S3HV12010	12	10.1	19	11.7	3	●	1
IMX16S3HV16013	16	13.3	24	15.5	3	●	1
IMX20S3HV20017	20	17	30	19.5	3	●	1
IMX25S3HV25021	25	21	37.5	24.5	3	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

iMX-S4HV- Inch sizes NEW

Square head, 4 flute, Irregular helix

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
◎	○			◎	◎	○	



DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

● Irregular helix controls vibration and achieves stable machining even when machining of difficult-to-cut materials and for applications with a long overhang.

Unit : inch

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10S4HV0375M	.375	.395	.630	.363	4	●	1
IMX12S4HV0500M	.500	.520	.789	.488	4	●	1
IMX16S4HV0625M	.625	.645	.945	.605	4	●	1
IMX20S4HV0750M	.750	.800	1.181	.730	4	●	1
IMX25S4HV1000M	1.000	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

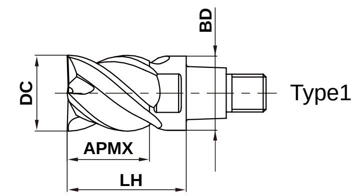
● : Inventory maintained.

CUTTING CONDITIONS ➤ I404–I407

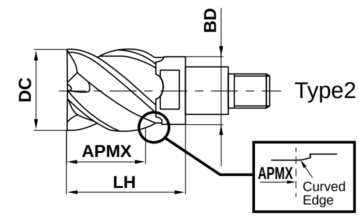
iMX-S4HV- Metric sizes NEW

Square head, 4 flute, Irregular helix

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
◎	○			◎	◎	○	



Oversize Type



*See note 1

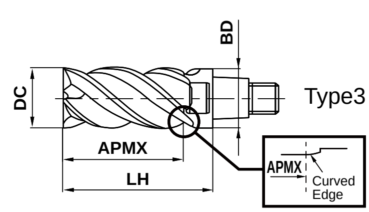
DC≤12	DC>12			
0 - 0.020	0 - 0.030			

● Irregular helix controls vibration and achieves stable machining even when machining of difficult-to-cut materials and for applications with a long overhang.

Unit : mm

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10S4HV10010	10	10.5	16	9.7	4	●	1
IMX**10S4HV12012**	12	12.5	19	9.7	4	●	2
IMX**12S4HV12012**	12	12.5	19	11.7	4	●	1
IMX**12S4HV14014**	14	14.5	22.5	11.7	4	●	2
IMX**16S4HV16016**	16	16.5	24	15.5	4	●	1
IMX**16S4HV18018**	18	18.5	27	15.5	4	●	2
IMX**20S4HV20021**	20	21	30	19.5	4	●	1
IMX**20S4HV22023**	22	23	33	19.5	4	●	2
IMX**25S4HV25026**	25	26	37.5	24.5	4	●	1
IMX**25S4HV28029**	28	29	41.5	24.5	4	●	2
IMX**25S4HV30031**	30	31	43.5	24.5	4	●	2
IMX**25S4HV32033**	32	33	45.5	24.5	4	●	2

CUTTING CONDITIONS ➤ I404–I407



Long cutting edge type

Unit : mm

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX16S4HV16032	16	32	40	15.5	4	●	3
IMX**20S4HV20040**	20	40	50	19.5	4	●	3

1) A curved edge at the shank side of the flute is used in some of our new iMX heads. This feature allows deep faces to be finished in steps, minimizes the blend mark between steps, and provides a good surface finish.

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

CUTTING CONDITIONS ➤ I406

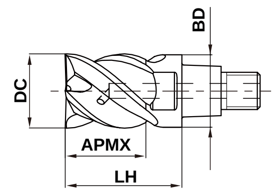
iMX-S4HV-S - Inch sizes NEW

Square head, 4 flute, Irregular helix, with coolant hole

UWC 42° 45°

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
◎	○			◎	◎	○	

(Peripheral cutting edge with coolant hole)



Type1

(Peripheral cutting edge with coolant hole)

DC≦.500"	DC>.500"			
0 - .0008"	0 - .0012"			

- Coolant thru design allows for effective chip evacuation.
- Irregular helix controls vibration and achieves stable machining.

Unit : inch

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10S4HV0375MS	.375	.395	.630	.363	4	●	1
IMX12S4HV0500MS	.500	.520	.789	.488	4	●	1
IMX16S4HV0625MS	.625	.645	.945	.605	4	●	1
IMX20S4HV0750MS	.750	.800	1.181	.730	4	●	1
IMX25S4HV1000MS	1.000	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

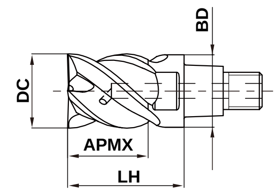
CUTTING CONDITIONS ➤ I404, I405

iMX-S4HV-S - Metric sizes NEW

Square head, 4 flute, Irregular helix, with coolant hole

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
◎	○			◎	◎	○	

(Peripheral cutting edge with coolant hole)



(Peripheral cutting edge with coolant hole)

DC≤12	DC>12			
0 - 0.020	0 - 0.030			

- Coolant thru design allows for effective chip evacuation.
- Irregular helix controls vibration and achieves stable machining.

Unit : mm

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10S4HV10010S	10	10.5	16	9.7	4	●	1
IMX12S4HV12012S	12	12.5	19	11.7	4	●	1
IMX16S4HV16016S	16	16.5	24	15.5	4	●	1
IMX20S4HV20021S	20	21	30	19.5	4	●	1
IMX25S4HV25026S	25	26	37.5	24.5	4	●	1

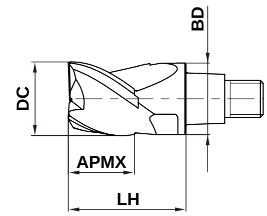
* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

iMX-S3A - Inch sizes NEW

Square head, 3 flute, For aluminum alloy

UWC 37.5°

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
							◎



DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

● High efficiency machining is possible due to the polished rake face and sharp cutting edge.

Unit : inch

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade ET2020	Type
IMX10S3A0375P	.375	.320	.630	.363	3	●	1
IMX12S3A0500P	.500	.420	.789	.488	3	●	1
IMX16S3A0625P	.625	.520	.945	.605	3	●	1
IMX20S3A0750P	.750	.650	1.181	.730	3	●	1
IMX25S3A1000P	1.000	.850	1.500	.980	3	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

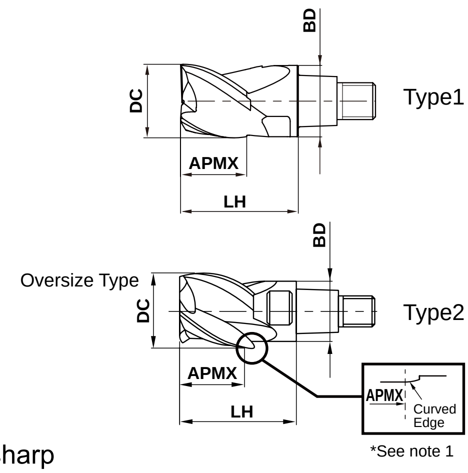
CUTTING CONDITIONS ➤ I408

iMX-S3A – Metric sizes NEW

Square head, 3 flute, For aluminum alloy

UWC 37.5°

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
							◎



DC≤12	DC>12			
0 - 0.020	0 - 0.030			

● High efficiency machining is possible due to the polished rake face and sharp cutting edge.

Unit : mm

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade ET2020	Type
IMX10S3A10008	10	8.5	16	9.7	3	●	1
IMX10S3A12010	12	10.1	19	9.7	3	●	2
IMX12S3A12010	12	10.1	19	11.7	3	●	1
IMX12S3A14011	14	11.7	22.5	11.7	3	●	2
IMX16S3A16013	16	13.3	24	15.5	3	●	1
IMX16S3A18014	18	14.9	27	15.5	3	●	2
IMX20S3A20017	20	17	30	19.5	3	●	1
IMX20S3A22018	22	18.6	33	19.5	3	●	2
IMX25S3A25021	25	21	37.5	24.5	3	●	1
IMX25S3A28023	28	23.4	41.5	24.5	3	●	2

1) A curved edge at the shank side of the flute is used in some of our new iMX heads. This feature allows deep faces to be finished in steps, minimizes the blend mark between steps, and provides a good surface finish.

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

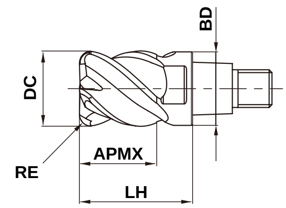
CUTTING CONDITIONS ➤ I408

iMX-C4HV- Inch sizes NEW

Corner radius head, 4 flute, Irregular helix

UWC 42° 45°

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
◎	○			◎	◎	○	



±.0008"				
DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

● Vibration control corner radius type achieves stable machining of difficult-to-cut materials and is suitable for long overhang applications due to the irregular helix.

Unit : inch

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10C4HV0375R015M	.375	.015	.395	.630	.363	4	●	1
IMX10C4HV0375R030M	.375	.030	.395	.630	.363	4	●	1
IMX10C4HV0375R060M	.375	.060	.395	.630	.363	4	●	1
IMX12C4HV0500R015M	.500	.015	.520	.789	.488	4	●	1
IMX12C4HV0500R030M	.500	.030	.520	.789	.488	4	●	1
IMX12C4HV0500R060M	.500	.060	.520	.789	.488	4	●	1
IMX16C4HV0625R015M	.625	.015	.645	.945	.605	4	●	1
IMX16C4HV0625R030M	.625	.030	.645	.945	.605	4	●	1
IMX16C4HV0625R060M	.625	.060	.645	.945	.605	4	●	1
IMX20C4HV0750R030M	.750	.030	.800	1.181	.730	4	●	1
IMX20C4HV0750R060M	.750	.060	.800	1.181	.730	4	●	1
IMX20C4HV0750R125M	.750	.125	.800	1.181	.730	4	●	1
IMX20C4HV0750R190M	.750	.190	.800	1.181	.730	4	●	1
IMX20C4HV0750R250M	.750	.250	.800	1.181	.730	4	●	1
IMX25C4HV1000R030M	1.000	.030	1.050	1.500	.980	4	●	1
IMX25C4HV1000R060M	1.000	.060	1.050	1.500	.980	4	●	1
IMX25C4HV1000R125M	1.000	.125	1.050	1.500	.980	4	●	1
IMX25C4HV1000R190M	1.000	.190	1.050	1.500	.980	4	●	1
IMX25C4HV1000R250M	1.000	.250	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

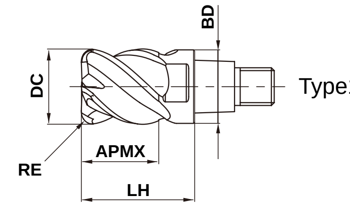
CUTTING CONDITIONS ➤ I404–I407

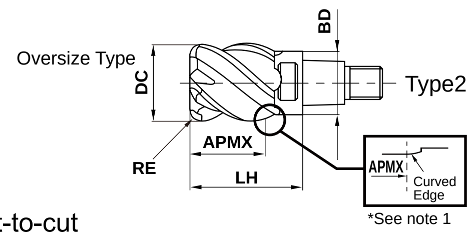
iMX-C4HV - Metric sizes NEW

Corner radius head, 4 flute, Irregular helix

UWC 42° 45°

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
◎	○			◎	◎	○	





R: ±0.020				
DC ≤12	DC>12			
0 - 0.020	0 - 0.030			

● Vibration control corner radius type achieves stable machining of difficult-to-cut materials and is suitable for long overhang applications due to the irregular helix.

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10C4HV100R05010	10	0.5	10.5	16	9.7	4	●	1
IMX10C4HV100R10010	10	1	10.5	16	9.7	4	●	1
IMX10C4HV100R15010	10	1.5	10.5	16	9.7	4	●	1
IMX10C4HV100R20010	10	2	10.5	16	9.7	4	●	1
IMX10C4HV100R25010	10	2.5	10.5	16	9.7	4	●	1
IMX10C4HV100R30010	10	3	10.5	16	9.7	4	●	1
IMX10C4HV120R10012	12	1	12.5	19	9.7	4	●	2
IMX10C4HV120R20012	12	2	12.5	19	9.7	4	●	2
IMX12C4HV120R05012	12	0.5	12.5	19	11.7	4	●	1
IMX12C4HV120R10012	12	1	12.5	19	11.7	4	●	1
IMX12C4HV120R15012	12	1.5	12.5	19	11.7	4	●	1
IMX12C4HV120R20012	12	2	12.5	19	11.7	4	●	1
IMX12C4HV120R25012	12	2.5	12.5	19	11.7	4	●	1
IMX12C4HV120R30012	12	3	12.5	19	11.7	4	●	1
IMX12C4HV120R40012	12	4	12	19	11.7	4	●	1
IMX12C4HV140R10014	14	1	14.5	22.5	11.7	4	●	2
IMX12C4HV140R20014	14	2	14.5	22.5	11.7	4	●	2
IMX16C4HV160R05016	16	0.5	16.5	24	15.5	4	●	1
IMX16C4HV160R10016	16	1	16.5	24	15.5	4	●	1
IMX16C4HV160R15016	16	1.5	16.5	24	15.5	4	●	1
IMX16C4HV160R20016	16	2	16.5	24	15.5	4	●	1
IMX16C4HV160R25016	16	2.5	16.5	24	15.5	4	●	1
IMX16C4HV160R30016	16	3	16.5	24	15.5	4	●	1
IMX16C4HV160R40016	16	4	16.5	24	15.5	4	●	1
IMX16C4HV160R50016	16	5	16.5	24	15.5	4	●	1
IMX16C4HV180R10018	18	1	18.5	27	15.5	4	●	2
IMX16C4HV180R30018	18	3	18.5	27	15.5	4	●	2
IMX20C4HV200R05021	20	0.5	21	30	19.5	4	●	1
IMX20C4HV200R10021	20	1	21	30	19.5	4	●	1
IMX20C4HV200R15021	20	1.5	21	30	19.5	4	●	1

CARBIDE

SQUARE

BALL

RADIUS

EXCHANGEABLE HEAD END MILLS

iMX-C4HV- Metric sizes NEW

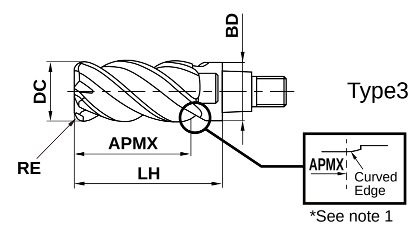
Corner radius head, 4 flute, Irregular helix

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX20C4HV200R20021	20	2	21	30	19.5	4	●	1
IMX20C4HV200R25021	20	2.5	21	30	19.5	4	●	1
IMX20C4HV200R30021	20	3	21	30	19.5	4	●	1
IMX20C4HV200R40021	20	4	21	30	19.5	4	●	1
IMX20C4HV200R50021	20	5	21	30	19.5	4	●	1
IMX20C4HV200R63521	20	6.35	21	30	19.5	4	●	1
IMX20C4HV220R10023	22	1	23	33	19.5	4	●	2
IMX20C4HV220R30023	22	3	23	33	19.5	4	●	2
IMX25C4HV250R10026	25	1	26	37.5	24.5	4	●	1
IMX25C4HV250R20026	25	2	26	37.5	24.5	4	●	1
IMX25C4HV250R30026	25	3	26	37.5	24.5	4	●	1
IMX25C4HV250R40026	25	4	26	37.5	24.5	4	●	1
IMX25C4HV250R50026	25	5	26	37.5	24.5	4	●	1
IMX25C4HV250R63526	25	6.35	26	37.5	24.5	4	●	1
IMX25C4HV280R10029	28	1	29	41.5	24.5	4	●	2
IMX25C4HV280R30029	28	3	29	41.5	24.5	4	●	2

1) A curved edge at the shank side of the flute is used in some of our new iMX heads. This feature allows deep faces to be finished in steps, minimizes the blend mark between steps, and provides a good surface finish.

CUTTING CONDITIONS ➤ I404–I407



Long cutting edge type

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX16C4HV160R10032	16	1	32	40	15.5	4	●	3
IMX16C4HV160R30032	16	3	32	40	15.5	4	●	3
IMX20C4HV200R10040	20	1	40	50	19.5	4	●	3
IMX20C4HV200R30040	20	3	40	50	19.5	4	●	3

1) A curved edge at the shank side of the flute is used in some of our new iMX heads. This feature allows deep faces to be finished in steps, minimizes the blend mark between steps, and provides a good surface finish.

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

CUTTING CONDITIONS ➤ I406

Memo

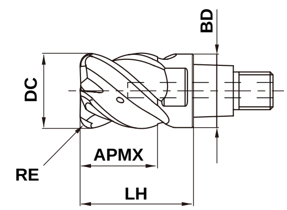
iMX-C4HV-S – Inch sizes NEW

Corner radius head, 4 flute, Irregular helix, with coolant hole

UWC 42° 45°

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
◎	○			◎	◎	○	

(Peripheral cutting edge with coolant hole)



(Peripheral cutting edge with coolant hole)

±.0008"				
DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

- Coolant thru design allows for effective chip evacuation.
- Vibration control corner radius type for stable machining of difficult-to-cut materials and long overhang applications due to the irregular helix.

Unit : inch

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10C4HV0375R030MS	.375	.030	.395	.630	.363	4	●	1
IMX12C4HV0500R030MS	.500	.030	.520	.789	.488	4	●	1
IMX16C4HV0625R030MS	.625	.030	.645	.945	.605	4	●	1
IMX20C4HV0750R030MS	.750	.030	.800	1.181	.730	4	●	1
IMX25C4HV1000R030MS	1.000	.030	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

CUTTING CONDITIONS ➤ I404, I405

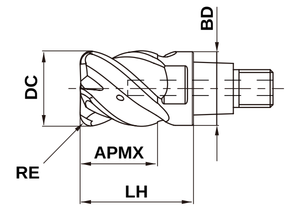
iMX-C4HV-S – Metric sizes NEW

Corner radius head, 4 flute, Irregular helix, with coolant hole

UWC 42° 45°

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
◎	○			◎	◎	○	

(Peripheral cutting edge with coolant hole)



(Peripheral cutting edge with coolant hole)

R

±0.020				
DC≤12	DC>12			
0 - 0.020	0 - 0.030			

- Coolant thru design allows for effective chip evacuation.
- Vibration control corner radius type for stable machining of difficult-to-cut materials and long overhang applications due to the irregular helix.

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10C4HV100R10010S	10	1	10.5	16	9.7	4	●	1
IMX**12C4HV120R10012S**	12	1	12.5	19	11.7	4	●	1
IMX**16C4HV160R10016S**	16	1	16.5	24	15.5	4	●	1
IMX**20C4HV200R10021S**	20	1	21	30	19.5	4	●	1
IMX**25C4HV250R10026S**	25	1	26	37.5	24.5	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

iMX-C6HV/C10HV/C12HV – Inch sizes NEW

UWC

Corner radius head, Multi-flute, Irregular helix

43.5° 45° DC≤.500" | 44.5° 45° DC>.500" | DC≤.500" | DC>.500"

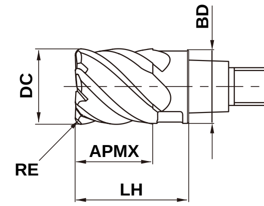
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
◎	○			◎	◎		

CARBIDE

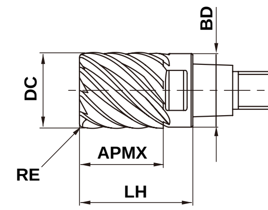
SQUARE

BALL

RADIUS



Type1



Type2

R

±.0008"				
DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

- High machining efficiency due to multi-flute design.
- Irregular helix controls vibration and achieves stable machining.

Unit : inch

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10C6HV0375R030M	.375	.030	.395	.630	.363	6	●	1
IMX12C6HV0500R030M	.500	.030	.520	.789	.488	6	●	1
IMX16C10HV0625R030M	.625	.030	.645	.945	.605	10	●	2
IMX20C12HV0750R030M	.750	.030	.800	1.181	.730	12	●	2
IMX25C12HV1000R030M	1.000	.030	1.050	1.500	.980	12	●	2

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

CUTTING CONDITIONS ➤ I409

iMX-C6HV/C10HV/C12HV – Metric sizes NEW

UWC

Corner radius head, Multi-flute, Irregular helix

43.5° 45° DC≤12 | 44.5° 45° DC>12 | DC≤12 | DC>12

EXCHANGEABLE HEAD END MILLS

R

±0.020				
DC≤12	DC>12			
0 - 0.020	0 - 0.030			

- High machining efficiency due to multi-flute design.
- Irregular helix controls vibration and achieves stable machining.

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10C6HV100R05010	10	0.5	10.5	16	9.7	6	●	1
IMX10C6HV100R10010	10	1	10.5	16	9.7	6	●	1
IMX12C6HV120R10012	12	1	12.5	19	11.7	6	●	1
IMX16C10HV160R10016	16	1	16.5	24	15.5	10	●	2
IMX20C12HV200R10021	20	1	21	30	19.5	12	●	2
IMX25C12HV250R10026	25	1	26	37.5	24.5	12	●	2

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

CUTTING CONDITIONS ➤ I409

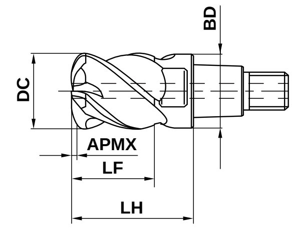
iMX-C4FD-C - Metric sizes NEW

UWC 45°

Duplex corner radius head, 4 flute, For high feed, with coolant hole

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
◎	◎	◎		◎	◎	○	

(End mill with end face center coolant hole)



(End mill with end face center coolant hole)

DC≤12	DC>12			
0 / - 0.020	0 / - 0.030			

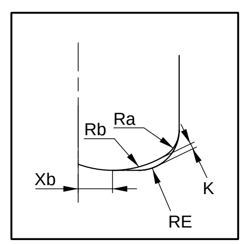
- The duplex corner radius and 4 flute geometry enables efficient machining at higher feed rates.
- End face center coolant hole provides a stable supply of coolant.

Unit : mm

Order Number	DC	RE *1	APMX	LF	LH	BD	No. of Flutes	RMPX *2	Grade EP7020	Type
IMX10C4FD10010C	10	1.99	0.7	10.5	16	9.7	4	2.1	●	1
IMX12C4FD12012C	12	2.1	0.8	12.5	19	11.7	4	2.8	●	1
IMX16C4FD16016C	16	2.75	1	16.5	24	15.5	4	3	●	1
IMX20C4FD20021C	20	3.07	1.3	21	30	19.5	4	3.3	●	1
IMX25C4FD25026C	25	4.21	1.6	26	37.5	24.5	4	4.5	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)
* Duplex corner radius end mill is not suitable for corner radius machining due to the possibility of leaving unmachined areas.
*1 RE : Approximate Radius
*2 RMPX : Max. Ramping Angle

Order Number	RE *1	Duplex corner radius			
		K	Xb	Ra	Rb
IMX10C4FD10010C	1.99	0.27	1.7	1.5	5
IMX12C4FD12012C	2.1	0.33	2.25	1.5	6
IMX16C4FD16016C	2.75	0.42	3.1	2	8
IMX20C4FD20021C	3.07	0.59	4	2	10
IMX25C4FD25026C	4.21	0.67	5	3	12



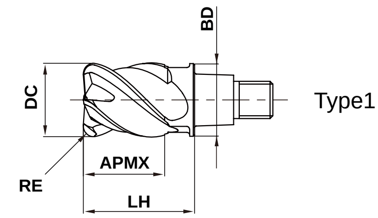
*Note for programing
Approximate Radius = RE
Uncut portion =K

iMX-C4FV- Inch sizes NEW

UWC 43° 45°

Corner radius head for high efficiency machining, 4 flute, Irregular helix

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
◎	◎	◎					



R	DC≤.750"	DC>.750"			
	±.0004"	±.0008"			
	DC≤.500"	DC>.500"			
	0 - .0008"	0 - .0012"			

- Corner radius end mill for high efficiency machining
- Irregular helix controls vibration and achieves stable machining.

Unit : inch

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP6120	Type
IMX10C4FV0375R090M	.375	.090	.395	.630	.363	4	●	1
IMX12C4FV0500R090M	.500	.090	.520	.789	.488	4	●	1
IMX16C4FV0625R125M	.625	.125	.645	.945	.605	4	●	1
IMX20C4FV0750R125M	.750	.125	.800	1.181	.730	4	●	1
IMX25C4FV1000R190M	1.000	.190	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

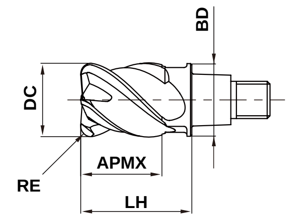
CUTTING CONDITIONS ➢ I411

iMX-C4FV - Metric sizes NEW

Corner radius head for high efficiency machining, 4 flute, Irregular helix

UWC 43° 45°

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
◎	◎	◎					



R	DC≤20	DC>20			
	±0.010	±0.020			
DC	DC≤12	DC>12			
	$^{0}_{-0.020}$	$^{0}_{-0.030}$			

- Corner radius end mill for high efficiency machining
- Irregular helix controls vibration and achieves stable machining.

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade EP6120	Type
IMX10C4FV100R20010	10	2	10.5	16	9.7	4	●	1
IMX12C4FV120R20012	12	2	12.5	19	11.7	4	●	1
IMX16C4FV160R30016	16	3	16.5	24	15.5	4	●	1
IMX20C4FV200R30021	20	3	21	30	19.5	4	●	1
IMX25C4FV250R40026	25	4	26	37.5	24.5	4	●	1

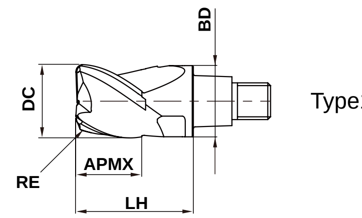
* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

iMX-C3A – Inch sizes NEW

Corner radius head, 3 flute, For aluminum alloy

UWC 37.5°

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
							◎



±.0008"				
DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

● High efficiency machining is possible due to polished rake face and sharp cutting edge.

Unit : inch

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade ET2020	Type
IMX10C3A0375R015P	.375	.015	.320	.630	.363	3	●	1
IMX10C3A0375R030P	.375	.030	.320	.630	.363	3	●	1
IMX12C3A0500R015P	.500	.015	.420	.789	.488	3	●	1
IMX12C3A0500R030P	.500	.030	.420	.789	.488	3	●	1
IMX16C3A0625R030P	.625	.030	.520	.945	.605	3	●	1
IMX16C3A0625R060P	.625	.060	.520	.945	.605	3	●	1
IMX20C3A0750R030P	.750	.030	.650	1.181	.730	3	●	1
IMX20C3A0750R060P	.750	.060	.650	1.181	.730	3	●	1
IMX25C3A1000R060P	1.000	.060	.850	1.500	.980	3	●	1
IMX25C3A1000R125P	1.000	.125	.850	1.500	.980	3	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

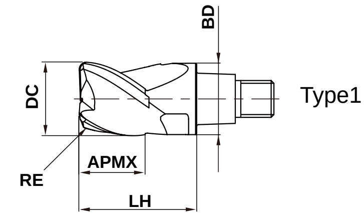
CUTTING CONDITIONS ➢ I408

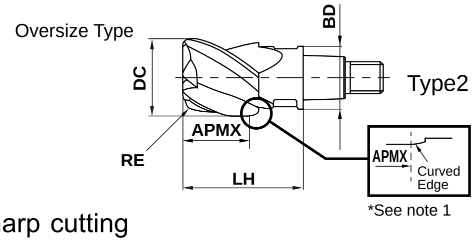
iMX-C3A- Metric sizes NEW

Corner radius head, 3 flute, For aluminum alloy

UWC 37.5°

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
							◎





R	±0.020			
DC	DC ≤12	DC>12		
	0 - 0.020	0 - 0.030		

● High efficiency machining is possible due to polished rake face and sharp cutting edge.

Unit : mm

Order Number	DC	RE	APMX	LH	BD	No. of Flutes	Grade ET2020	Type
IMX10C3A100R10008	10	1	8.5	16	9.7	3	●	1
IMX10C3A100R25008	10	2.5	8.5	16	9.7	3	●	1
IMX10C3A120R10010	12	1	10.1	19	9.7	3	●	2
IMX12C3A120R10010	12	1	10.1	19	11.7	3	●	1
IMX12C3A120R32010	12	3.2	10.1	19	11.7	3	●	1
IMX12C3A140R10011	14	1	11.7	22.5	11.7	3	●	2
IMX16C3A160R10013	16	1	13.3	24	15.5	3	●	1
IMX16C3A160R32013	16	3.2	13.3	24	15.5	3	●	1
IMX16C3A180R32014	18	3.2	14.9	27	15.5	3	●	2
IMX20C3A200R10017	20	1	17	30	19.5	3	●	1
IMX20C3A200R32017	20	3.2	17	30	19.5	3	●	1
IMX20C3A220R32018	22	3.2	18.6	33	19.5	3	●	2
IMX25C3A250R10020	25	1	20	37.5	24.5	3	●	2
IMX25C3A250R32021	25	3.2	21	37.5	24.5	3	●	1
IMX25C3A250R50021	25	5	21	37.5	24.5	3	●	1
IMX25C3A280R32023	28	3.2	23.4	41.5	24.5	3	●	2

1) A curved edge at the shank side of the flute is used in some of our new iMX heads. This feature allows deep faces to be finished in steps, minimizes the blend mark between steps, and provides a good surface finish.

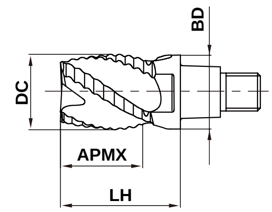
* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

iMX-R4F - Inch sizes NEW

Roughing head, 4 flute

UWC 35°

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
◎	○			◎	◎	○	



● The roughing edge geometry reduces cutting resistance. Effective when rigidity of the machine or work piece is low.

Unit : inch

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10R4F0375M	.375	.395	.630	.363	4	●	1
IMX12R4F0500M	.500	.520	.789	.488	4	●	1
IMX16R4F0625M	.625	.645	.945	.605	4	●	1
IMX20R4F0750M	.750	.800	1.181	.730	4	●	1
IMX25R4F1000M	1.000	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

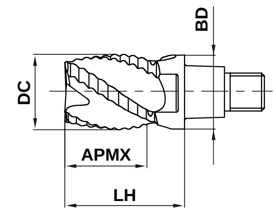
CUTTING CONDITIONS ➤ I412, I413

iMX-R4F - Metric sizes NEW

Roughing head, 4 flute

UWC 35°

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
◎	○			◎	◎	○	



- The roughing edge geometry reduces cutting resistance.
  Effective when rigidity of the machine or work piece is low.

Unit : mm

Order Number	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10R4F10010	10	10.5	16	9.7	4	●	1
IMX12R4F12012	12	12.5	19	11.7	4	●	1
IMX16R4F16016	16	16.5	24	15.5	4	●	1
IMX20R4F20021	20	21	30	19.5	4	●	1
IMX25R4F25026	25	26	37.5	24.5	4	●	1

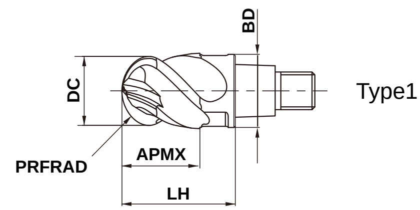
* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

CARBIDE
SQUARE
BALL
RADIUS
EXCHANGEABLE HEAD END MILLS

iMX-B4HV- Inch sizes NEW

Ball nose head, 4 flute, Irregular curve

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
◎	○			◎	◎	○	



DC≤.500"	DC>.500"			
±.0004"	±.0008"			
DC≤.500"	DC>.500"			
0 - .0008"	0 - .0012"			

● Irregular curve cutting edge controls vibration and achieves stable machining of difficult-to-cut materials and is suitable for long overhang applications.

Unit : inch

Order Number	PRFRAD	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10B4HV0375M	.1875	.375	.395	.630	.363	4	●	1
IMX12B4HV0500M	.2500	.500	.520	.789	.488	4	●	1
IMX16B4HV0625M	.3125	.625	.645	.945	.605	4	●	1
IMX20B4HV0750M	.3750	.750	.800	1.181	.730	4	●	1
IMX25B4HV1000M	.5000	1.000	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

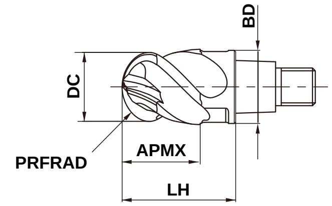
CUTTING CONDITIONS ➤ I414

iMX-B4HV - Metric sizes NEW

Ball nose head, 4 flute, Irregular curve

UWC 45°

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
◎	○			◎	◎	○	



Type1

R	DC≤12	DC>12			
	±0.010	±0.020			
	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			

● Irregular curve cutting edge controls vibration and achieves stable machining of difficult-to-cut materials and is suitable for long overhang applications.

Unit : mm

Order Number	PRFRAD	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10B4HV10010	5	10	10.5	16	9.7	4	●	1
IMX**12B4HV12012**	6	12	12.5	19	11.7	4	●	1
IMX**16B4HV16016**	8	16	16.5	24	15.5	4	●	1
IMX**20B4HV20021**	10	20	21	30	19.5	4	●	1
IMX**25B4HV25026**	12.5	25	26	37.5	24.5	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

CARBIDE
SQUARE
BALL
RADIUS
EXCHANGEABLE HEAD END MILLS

CUTTING CONDITIONS ➤ I414

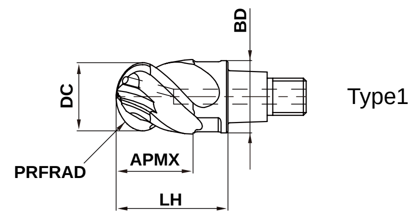
iMX-B4HV-E - Inch sizes NEW

Ball nose head, 4 flute, Irregular curve, with coolant hole

UWC 45°

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
◎	○			◎	◎	○	

(End cutting edge with coolant hole)



(End cutting edge with coolant hole)

R	DC≤.500"	DC>.500"			
	±.0004"	±.0008"			
DC tolerance	DC≤.500"	DC>.500"			
	0 - .0008"	0 - .0012"			

- Coolant thru design allows for effective chip evacuation.
- Irregular curve cutting edge controls vibration and achieves stable machining of difficult-to-cut materials and is suitable for long overhang applications.

Unit : inch

Order Number	PRFRAD	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10B4HV0375ME	.1875	.375	.395	.630	.363	4	●	1
IMX12B4HV0500ME	.2500	.500	.520	.789	.488	4	●	1
IMX16B4HV0625ME	.3125	.625	.645	.945	.605	4	●	1
IMX20B4HV0750ME	.3750	.750	.800	1.181	.730	4	●	1
IMX25B4HV1000ME	.5000	1.000	1.050	1.500	.980	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

CUTTING CONDITIONS ➤ I414

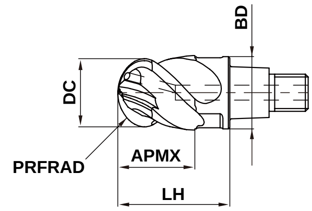
iMX-B4HV-E - Metric sizes NEW

Ball nose head, 4 flute, Irregular curve, with coolant hole

UWC 45°

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
◎	○			◎	◎	○	

(End cutting edge with coolant hole)



(End cutting edge with coolant hole)

R	DC≤12	DC>12			
	±0.010	±0.020			
DC	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			

- Coolant thru design allows for effective chip evacuation.
- Irregular curve cutting edge controls vibration and achieves stable machining of difficult-to-cut materials and is suitable for long overhang applications.

Unit : mm

Order Number	PRFRAD	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10B4HV10010E	5	10	10.5	16	9.7	4	●	1
IMX12B4HV12012E	6	12	12.5	19	11.7	4	●	1
IMX16B4HV16016E	8	16	16.5	24	15.5	4	●	1
IMX20B4HV20021E	10	20	21	30	19.5	4	●	1
IMX25B4HV25026E	12.5	25	26	37.5	24.5	4	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

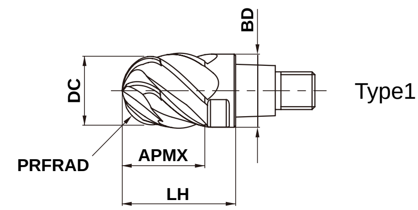
CUTTING CONDITIONS ➤ I414

iMX-B6HV - Inch sizes NEW

Ball nose head, 6 flute, Irregular curve

UWC 45°

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
◎	○			◎	◎		



R	DC≦.500"	DC>.500"			
	±.0004"	±.0008"			
DC	DC≦.500"	DC>.500"			
	0 - .0008"	0 - .0012"			

- Irregular curve cutting edge for vibration control and stable machining of difficult-to-cut materials.
- 6 flutes enables high machining efficiency.

Unit : inch

Order Number	PRFRAD	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10B6HV0375M	.1875	.375	.395	.630	.363	6	●	1
IMX12B6HV0500M	.2500	.500	.520	.789	.488	6	●	1
IMX16B6HV0625M	.3125	.625	.645	.945	.605	6	●	1
IMX20B6HV0750M	.3750	.750	.800	1.181	.730	6	●	1
IMX25B6HV1000M	.5000	1.000	1.050	1.500	.980	6	●	1

* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

● : Inventory maintained.

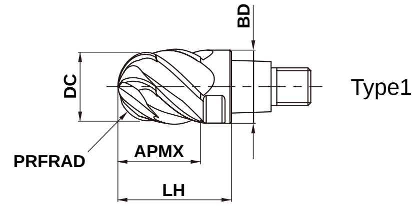
CUTTING CONDITIONS ➤ I415

iMX-B6HV - Metric sizes NEW

Ball nose head, 6 flute, Irregular curve

UWC 45°

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
◎	○			◎	◎		



R	DC≤12	DC>12			
	±0.010	±0.020			
	DC≤12	DC>12			
	0 - 0.020	0 - 0.030			

- Irregular curve cutting edge for vibration control and stable machining of difficult-to-cut materials.
- 6 flutes enables high machining efficiency.

Unit : mm

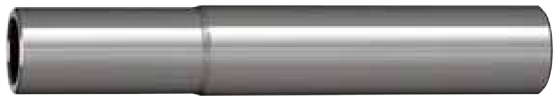
Order Number	PRFRAD	DC	APMX	LH	BD	No. of Flutes	Grade EP7020	Type
IMX10B6HV10010	5	10	10.5	16	9.7	6	●	1
IMX**12B6HV12012**	6	12	12.5	19	11.7	6	●	1
IMX**16B6HV16016**	8	16	16.5	24	15.5	6	●	1
IMX**20B6HV20021**	10	20	21	30	19.5	6	●	1
IMX**25B6HV25026**	12.5	25	26	37.5	24.5	6	●	1

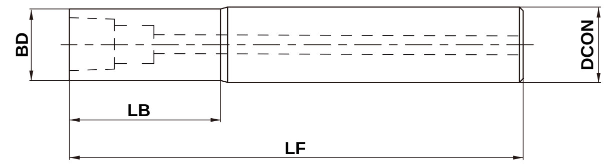
* The series of the head and holder should be the same. (refer to page I366, I396 or I397)

CUTTING CONDITIONS ➤ I415

iMX- Inch sizes NEW
Carbide Holder

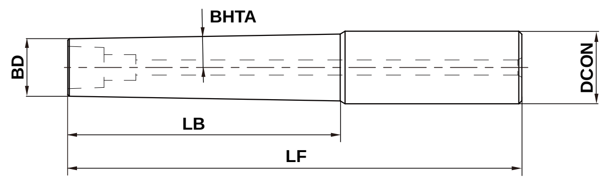
Undercut





Type1

Taper neck type



Type2

h6	DCON=.375	.500 ≤DCON≤.625	.750 ≤DCON≤1.000		
	0 - .00035"	0 - .00043"	0 - .00051"		

Carbide Holder

Unit : inch

Order Number	BHTA	LB	BD	LF	DCON	Stock	Type	Suitable Head	Wrench	Anti-seize Lubricant
IMX10-U0375N049L27C	—	.495	.363	2.755	.375	●	1	IMX10	IMX10-WR	MK1KS
IMX10-U0375N124L35C	—	1.245	.363	3.543	.375	●	1	IMX10	IMX10-WR	MK1KS
IMX10-U0375N199L43C	—	1.995	.363	4.330	.375	●	1	IMX10	IMX10-WR	MK1KS
IMX10-A0500N199L43C	1	1.995	.363	4.330	.500	●	2	IMX10	IMX10-WR	MK1KS
IMX12-U0500N071L31C	—	.711	.488	3.149	.500	●	1	IMX12	IMX12-WR	MK1KS
IMX12-U0500N171L39C	—	1.711	.488	3.937	.500	●	1	IMX12	IMX12-WR	MK1KS
IMX12-U0500N271L51C	—	2.711	.488	5.118	.500	●	1	IMX12	IMX12-WR	MK1KS
IMX12-A0625N271L51C	1	2.711	.488	5.118	.625	●	2	IMX12	IMX12-WR	MK1KS
IMX16-U0625N093L31C	—	.930	.605	3.149	.625	●	1	IMX16	IMX16-WR	MK1KS
IMX16-U0625N218L43C	—	2.180	.605	4.330	.625	●	1	IMX16	IMX16-WR	MK1KS
IMX16-U0625N343L59C	—	3.43	.605	5.905	.625	●	1	IMX16	IMX16-WR	MK1KS
IMX16-A0750N343L59C	1	3.430	.605	5.905	.750	●	2	IMX16	IMX16-WR	MK1KS
IMX20-U0750N106L35C	—	1.069	.730	3.543	.750	●	1	IMX20	IMX20-WR	MK1KS
IMX20-U0750N256L51C	—	2.569	.730	5.118	.750	●	1	IMX20	IMX20-WR	MK1KS
IMX20-U0750N406L70C	—	4.069	.730	7.086	.750	●	1	IMX20	IMX20-WR	MK1KS
IMX20-A1000N406L70C	1	4.069	.730	7.086	1.000	●	2	IMX20	IMX20-WR	MK1KS
IMX25-U1000N150L43C	—	1.500	.980	4.330	1.000	●	1	IMX25	IMX25-WR	MK1KS
IMX25-U1000N350L62C	—	3.500	.980	6.299	1.000	●	1	IMX25	IMX25-WR	MK1KS

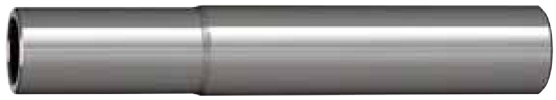
* The series of the head and holder should be the same. (refer to page I366, I396 or I397)
* See page I398 regarding how to install the head

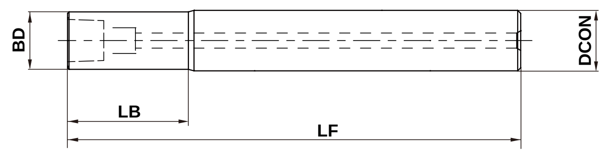
● : Inventory maintained.

iMX – Metric sizes NEW
Carbide Holder

CARBIDE

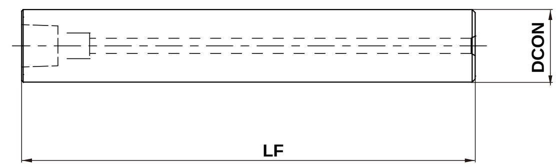
Undercut





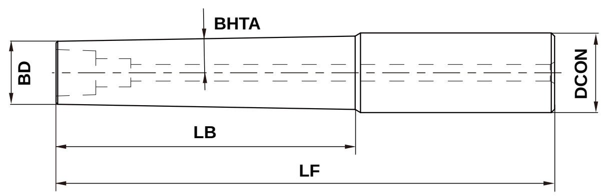
Type1

Straight



Type2

Taper neck type



Type3

h6

DCON=10	12≤DCON≤16	20≤DCON≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

Carbide Holder

Unit : mm

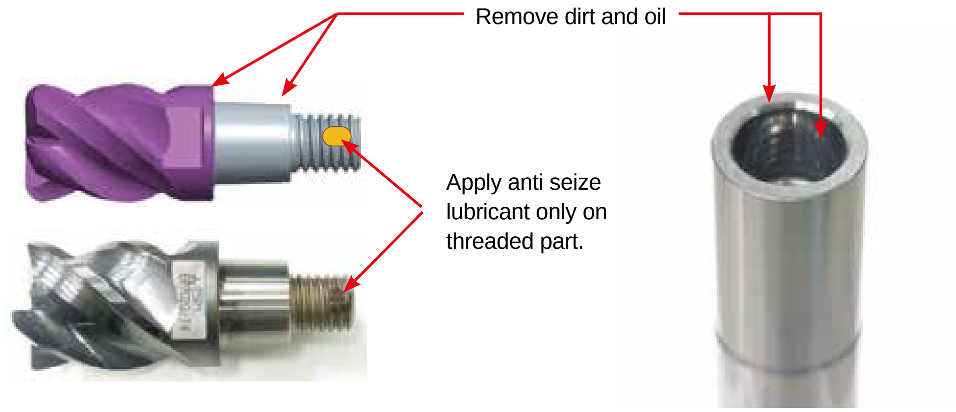
Order Number	BHTA	LB	BD	LF	DCON	Stock	Type	Suitable Head	Wrench	Anti-seize Lubricant
IMX10-U10N014L070C	–	14	9.7	70	10	●	1	IMX10	IMX10-WR	MK1KS
IMX10-S10L090C	–	–	–	90	10	●	2	IMX10	IMX10-WR	MK1KS
IMX10-U10N034L090C	–	34	9.7	90	10	●	1	IMX10	IMX10-WR	MK1KS
IMX10-S10L110C	–	–	–	110	10	●	2	IMX10	IMX10-WR	MK1KS
IMX10-U10N054L110C	–	54	9.7	110	10	●	1	IMX10	IMX10-WR	MK1KS
IMX10-A12N054L110C	1	54	9.7	110	12	●	3	IMX10	IMX10-WR	MK1KS
IMX12-U12N017L080C	–	17	11.7	80	12	●	1	IMX12	IMX12-WR	MK1KS
IMX12-S12L100C	–	–	–	100	12	●	2	IMX12	IMX12-WR	MK1KS
IMX12-U12N041L100C	–	41	11.7	100	12	●	1	IMX12	IMX12-WR	MK1KS
IMX12-S12L130C	–	–	–	130	12	●	2	IMX12	IMX12-WR	MK1KS
IMX12-U12N065L130C	–	65	11.7	130	12	●	1	IMX12	IMX12-WR	MK1KS
IMX12-A16N065L130C	1	65	11.7	130	16	●	3	IMX12	IMX12-WR	MK1KS
IMX16-U16N024L080C	–	24	15.5	80	16	●	1	IMX16	IMX16-WR	MK1KS
IMX16-S16L110C	–	–	–	110	16	●	2	IMX16	IMX16-WR	MK1KS
IMX16-U16N056L110C	–	56	15.5	110	16	●	1	IMX16	IMX16-WR	MK1KS
IMX16-S16L150C	–	–	–	150	16	●	2	IMX16	IMX16-WR	MK1KS
IMX16-U16N088L150C	–	88	15.5	150	16	●	1	IMX16	IMX16-WR	MK1KS
IMX16-A20N088L150C	1	88	15.5	150	20	●	3	IMX16	IMX16-WR	MK1KS
IMX20-U20N030L090C	–	30	19.5	90	20	●	1	IMX20	IMX20-WR	MK1KS
IMX20-S20L130C	–	–	–	130	20	●	2	IMX20	IMX20-WR	MK1KS
IMX20-U20N070L130C	–	70	19.5	130	20	●	1	IMX20	IMX20-WR	MK1KS
IMX20-S20L180C	–	–	–	180	20	●	2	IMX20	IMX20-WR	MK1KS
IMX20-U20N110L180C	–	110	19.5	180	20	●	1	IMX20	IMX20-WR	MK1KS
IMX20-A25N110L180C	1	110	19.5	180	25	●	3	IMX20	IMX20-WR	MK1KS
IMX25-U25N037L110C	–	37.5	24.5	110	25	●	1	IMX25	IMX25-WR	MK1KS
IMX25-S25L160C	–	–	–	160	25	●	2	IMX25	IMX25-WR	MK1KS
IMX25-U25N087L160C	–	87.5	24.5	160	25	●	1	IMX25	IMX25-WR	MK1KS
IMX25-S25L210C	–	–	–	210	25	●	2	IMX25	IMX25-WR	MK1KS

⋆ The series of the head and holder should be the same. (refer to page I366, I396 or I397)
⋆ See page I398 regarding how to install the head

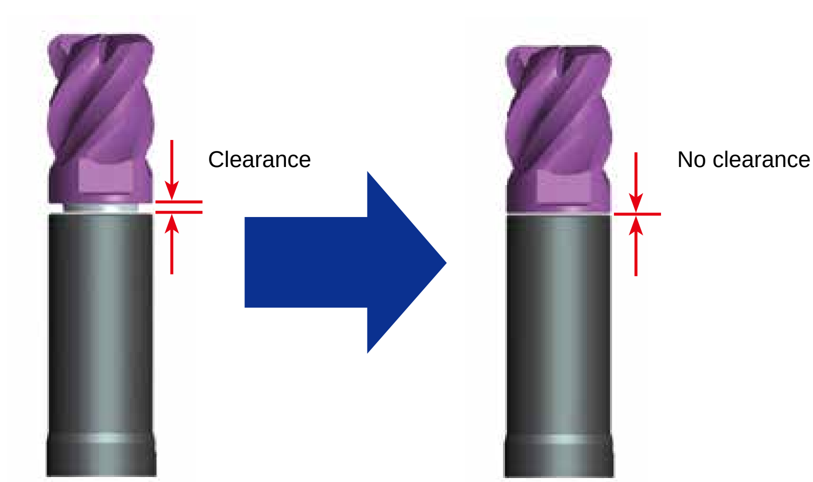
EXCHANGEABLE HEAD END MILLS

HOW TO INSTALL THE HEAD

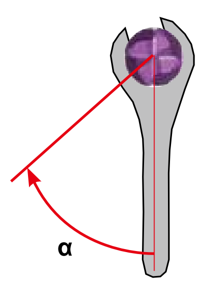
- Before assembly, remove the rust preventative oil and clean the taper and end faces.
  Apply anti seize lubricant to the thread and ensure none comes in contact with the taper faces of the head or holder.



- Lightly screw in the head by hand then tighten using the wrench provided.
- Refer to the table below for the recommended clamping torque.



iMX Series	Reference tightening angle α	Recommended clamping torque (lbf-in)
iMX10	50°	88
iMX12	50°	132
iMX16	50°	265
iMX20	40°	440
iMX25	35°	660

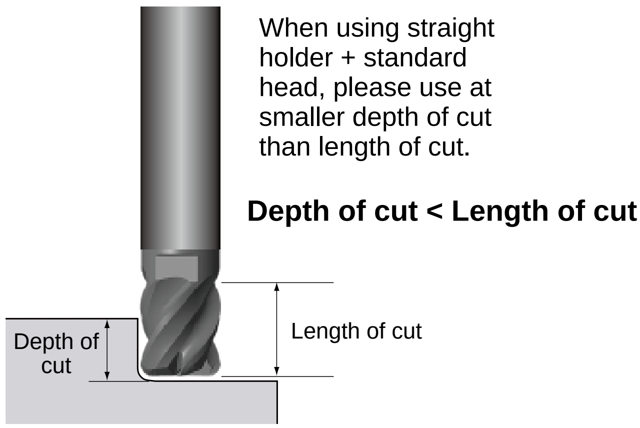


Note 1) Do not handle cutting edges with bare hands.
Note 2) Please use the wrench provided. It is thinner than a standard wrench to prevent damage to the flutes when tightening.

HOW TO SELECT iMX HOLDERS

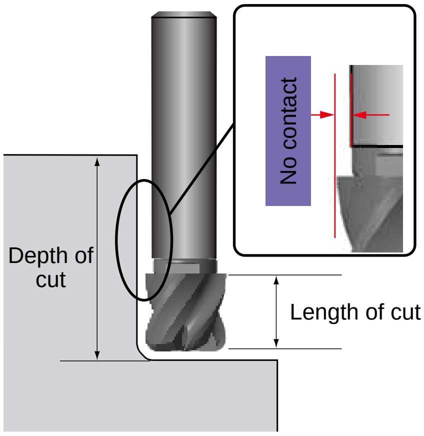
- When using straight holder + standard head, interference will occur in cases where the depth of cut is larger than the length of cut of the head.
- When using straight holder + oversize type head, larger depths of cut are possible because the diameter of the head is larger than the holder.

Straight + Standard head



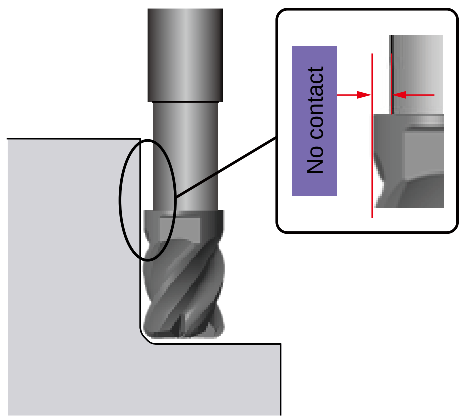
Less than 3D overhang is recommended when depth of cut < length of cut.

Straight + Oversize type

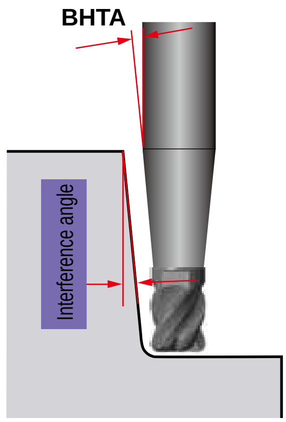


- Undercut type with relieved neck is suitable for vertical wall machining.
- The large diameter of the taper neck holder provides stability in long overhang applications.
- Undercut and taper neck types are now also available. (Please refer to diameter BD of each type for minimum diameter.)

Undercut + Standard head



Taper neck + Standard head



IDENTIFICATION

Reduce the cutting parameters by the coefficient values shown according to the length of overhang.
For long edge and Oversize types heads refer to their specific recommended conditions.

Work material	Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy		
L/D	Revolution (RPM)	Feed (IPT)	Depth of cut ae (inch)	Revolution (RPM)	Feed (IPT)	Depth of cut ae (inch)	Revolution (RPM)	Feed (IPT)	Depth of cut ae (inch)
2	100%	100%	100%	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%	100%	100%	100%
4	80%	90%	70%	80%	90%	70%	80%	90%	70%
5	60%	80%	40%	60%	80%	40%	60%	80%	40%
6	50%	70%	30%	50%	70%	30%	50%	70%	30%
7	40%	70%	20%	40%	70%	20%	30%	60%	20%
8	40%	60%	10%	40%	60%	10%	30%	50%	10%
9	30%	60%	10%	30%	60%	10%	20%	50%	10%

Work material	Precipitation hardening stainless steel, Cobalt chromium alloy			Heat resistant alloys Inconel718		
L/D	Revolution (RPM)	Feed (IPT)	Depth of cut ae (inch)	Revolution (RPM)	Feed (IPT)	Depth of cut ae (inch)
2	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%
4	80%	90%	70%	80%	90%	70%
5	60%	80%	40%	60%	80%	40%
6	50%	70%	30%	50%	70%	30%
7	30%	60%	20%	30%	60%	20%
8	30%	50%	10%	30%	50%	10%
9	20%	50%	10%	20%	50%	10%

iMX-S3HV

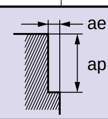
Square head, 3 flute, Irregular helix

RECOMMENDED CUTTING CONDITIONS

Side milling

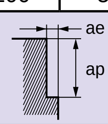
Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	5000	52.5	.300	.075	4000	28.8	.300	.075	3400	30.6	.300	.075
10	.3937	4800	50.4	.315	.079	3800	27.4	.315	.079	3200	28.8	.315	.079
12	.4724	4000	42.0	.378	.094	3200	25.0	.378	.094	2700	25.1	.378	.094
	.5000	3700	38.9	.400	.100	3000	23.4	.400	.100	2500	23.3	.400	.100
	.6250	3000	35.1	.500	.125	2400	21.6	.500	.125	2000	21.0	.500	.125
16	.6299	3000	35.1	.504	.126	2400	21.6	.504	.126	2000	21.0	.504	.126
	.7500	2500	29.3	.600	.150	2000	18.0	.600	.150	1700	17.9	.600	.150
20	.7874	2400	28.1	.630	.157	1900	17.1	.630	.157	1600	16.8	.630	.157
25	.9843	1900	26.8	.787	.197	1500	13.5	.787	.197	1300	13.7	.787	.197
	1.0000	1900	26.8	.800	.200	1500	13.5	.800	.200	1300	13.7	.800	.200

Depth of cut



Work material		Precipitation hardening stainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	2500	18.0	.300	.075	1300	6.2	.300	.038
10	.3937	2400	17.3	.315	.079	1300	6.2	.315	.039
12	.4724	2000	15.6	.378	.094	1100	5.9	.378	.047
	.5000	1900	14.8	.400	.100	990	5.3	.400	.050
	.6250	1500	13.5	.500	.125	790	4.7	.500	.063
16	.6299	1500	13.5	.504	.126	790	4.7	.504	.063
	.7500	1200	10.8	.600	.150	660	4.0	.600	.075
20	.7874	1200	10.8	.630	.157	630	3.8	.630	.079
25	.9843	950	8.6	.787	.197	500	3.0	.787	.098
	1.0000	940	8.5	.800	.200	500	3.0	.800	.100

Depth of cut



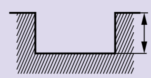
1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills.
   However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur.
   In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

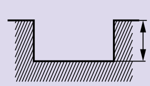
iMX-S3HV

Square head, 3 flute, Irregular helix

RECOMMENDED CUTTING CONDITIONS

Slotting

Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy		
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	3400	16.1	.188	2600	9.4	.188	2500	9.0	.188
10	.3937	3200	15.4	.197	2500	9.0	.197	2400	8.6	.197
12	.4724	2700	16.2	.236	2100	10.1	.236	2000	9.6	.236
	.5000	2500	15.0	.250	2000	9.6	.250	1900	9.1	.250
	.6250	2000	16.8	.313	1600	9.6	.313	1500	10.8	.313
16	.6299	2000	16.8	.315	1600	9.6	.315	1500	10.8	.315
	.7500	1700	14.3	.375	1300	7.8	.375	1200	8.6	.375
20	.7874	1600	13.4	.394	1300	7.8	.394	1200	8.6	.394
25	.9843	1300	12.1	.472	1000	6.0	.472	950	6.8	.472
	1.0000	1300	12.1	.480	990	5.9	.480	940	6.8	.480
Depth of cut		 ap								

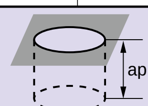
Work material		Precipitation hardening stainless steel, Cobalt chromium alloy			Heat resistant alloys Inconel718		
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	2000	6.0	.188	1000	2.4	.075
10	.3937	1900	5.7	.197	970	2.3	.079
12	.4724	1600	6.7	.236	810	2.9	.094
	.5000	1500	6.3	.250	760	2.7	.100
	.6250	1200	7.2	.313	610	3.7	.125
16	.6299	1200	7.2	.315	610	3.7	.126
	.7500	990	5.9	.375	510	3.1	.150
20	.7874	950	5.7	.394	490	2.9	.157
25	.9843	760	4.6	.472	390	2.3	.197
	1.0000	740	4.4	.480	380	2.3	.200
Depth of cut		 ap					

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills.
However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

Plunging

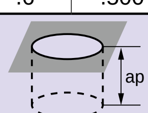
Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Peck ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Peck ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Peck ap (inch)
	.3750	3400	18.7	.188	.100	2300	8.1	.188	.080	2000	2.4	.188	.023
10	.3937	3200	17.6	.197	.100	2200	7.7	.197	.080	1900	2.3	.197	.023
12	.4724	2700	14.9	.236	.100	1900	6.7	.236	.080	1600	1.9	.236	.023
	.5000	2500	13.8	.250	.100	1800	6.3	.250	.080	1500	1.8	.250	.023
	.6250	2000	11.0	.313	.100	1400	4.9	.313	.080	1200	1.4	.313	.023
16	.6299	2000	11.0	.315	.100	1400	4.9	.315	.080	1200	1.4	.315	.023
	.7500	1700	9.4	.375	.100	1200	4.2	.375	.080	990	1.2	.375	.023
20	.7874	1600	8.8	.394	.100	1100	3.9	.394	.080	950	1.1	.394	.023
25	.9843	1300	7.2	.492	.100	880	3.1	.492	.080	760	.9	.492	.023
	1.0000	1300	7.2	.500	.100	880	3.1	.500	.080	740	.9	.500	.023

Depth of cut



Work material		Precipitation hardening stainless steel, Cobalt chromium alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Peck ap (inch)
	.3750	1300	1.6	.188	.023
10	.3937	1300	1.6	.197	.023
12	.4724	1100	1.3	.236	.023
	.5000	990	1.2	.250	.023
	.6250	790	.9	.313	.023
16	.6299	790	.9	.315	.023
	.7500	660	.8	.375	.023
20	.7874	630	.8	.394	.023
25	.9843	500	.6	.492	.023
	1.0000	500	.6	.500	.023

Depth of cut



1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills.
However, if the rigidity of the machine or the work piece installation is poor, vibration or abonrmal sound can occur.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

iMX-S4HV/iMX-S4HV-S/iMX-C4HV/iMX-C4HV-S

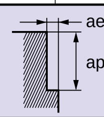
Square/Corner radius, 4 flute, Irregular helix (With/Without coolant hole)

RECOMMENDED CUTTING CONDITIONS

Side milling

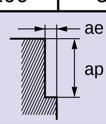
Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	5000	70.0	.375	.075	4000	38.4	.375	.075	3400	40.8	.375	.075
10	.3937	4800	67.2	.394	.079	3800	36.5	.394	.079	3200	38.4	.394	.079
12	.4724	4000	56.0	.472	.094	3200	33.3	.472	.094	2700	33.5	.472	.094
	.5000	3700	51.8	.500	.100	3000	31.2	.500	.100	2500	31.0	.500	.100
	.6250	3000	46.8	.625	.125	2400	28.8	.625	.125	2000	28.0	.625	.125
16	.6299	3000	46.8	.630	.126	2400	28.8	.630	.126	2000	28.0	.630	.126
	.7500	2500	39.0	.750	.150	2000	24.0	.750	.150	1700	23.8	.750	.150
20	.7874	2400	37.4	.787	.157	1900	22.8	.787	.157	1600	22.4	.787	.157
25	.9843	1900	35.7	.984	.197	1500	18.0	.984	.197	1300	18.2	.984	.197
	1.0000	1900	35.7	1.000	.200	1500	18.0	1.000	.200	1300	18.2	1.000	.200

Depth of cut



Work material		Precipitation hardening stainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	2500	24.0	.375	.075	1300	8.3	.375	.038
10	.3937	2400	23.0	.394	.079	1300	8.3	.394	.039
12	.4724	2000	20.8	.472	.094	1100	7.9	.472	.047
	.5000	1900	19.8	.500	.100	990	7.1	.500	.050
	.6250	1500	18.0	.625	.125	790	6.3	.625	.063
16	.6299	1500	18.0	.630	.126	790	6.3	.630	.063
	.7500	1200	14.4	.750	.150	660	5.3	.750	.075
20	.7874	1200	14.4	.787	.157	630	5.0	.787	.079
25	.9843	950	11.4	.984	.197	500	4.1	.984	.098
	1.0000	940	11.3	1.000	.200	500	4.0	1.000	.100

Depth of cut

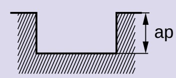


1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

Slotting

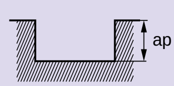
Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy		
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	3400	21.4	.188	2600	12.5	.188	2500	12.0	.188
10	.3937	3200	20.5	.197	2500	12.0	.197	2400	11.5	.197
12	.4724	2700	21.6	.236	2100	13.4	.236	2000	12.8	.236
	.5000	2500	20.0	.250	2000	12.8	.250	1900	12.2	.250
	.6250	2000	22.4	.313	1600	12.8	.313	1500	14.4	.313
16	.6299	2000	22.4	.315	1600	12.8	.315	1500	14.4	.315
	.7500	1700	19.0	.375	1300	10.4	.375	1200	11.5	.375
20	.7874	1600	17.9	.394	1300	10.4	.394	1200	11.5	.394
25	.9843	1300	16.1	.472	1000	8.0	.472	950	9.1	.472
	1.0000	1300	16.1	.480	990	7.9	.480	940	9.0	.480

Depth of cut



Work material		Precipitation hardening stainless steel, Cobalt chromium alloy			Heat resistant alloys Inconel718		
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	2000	8.0	.188	1000	3.2	.075
10	.3937	1900	7.6	.197	970	3.1	.079
12	.4724	1600	9.0	.236	810	3.9	.094
	.5000	1500	8.4	.250	760	3.6	.100
	.6250	1200	9.6	.313	610	4.9	.125
16	.6299	1200	9.6	.315	610	4.9	.126
	.7500	1000	7.9	.375	510	4.1	.150
20	.7874	950	7.6	.394	490	3.9	.157
25	.9843	760	6.1	.472	390	3.1	.197
	1.0000	740	5.9	.480	380	3.0	.200

Depth of cut



1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills.
However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

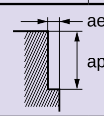
iMX-S4HV ➤ I370, I371
iMX-S4HV-S ➤ I372, I373
iMX-C4HV ➤ I376–I378
iMX-C4HV-S ➤ I380, I381

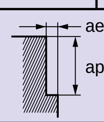
iMX-S4HV/iMX-C4HV

Square/Corner radius head, 4 flute, Irregular helix, Long cutting edge type

RECOMMENDED CUTTING CONDITIONS

Side milling

Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy			
L/D	DC (mm)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
4	16	2000	28.0	1.260	.031	1600	17.9	1.260	.031	1200	14.9	1.260	.031
	20	1600	22.4	1.575	.039	1300	14.6	1.575	.039	950	11.8	1.575	.039
6	16	1200	13.4	1.260	.031	990	8.0	1.260	.031	790	7.6	1.260	.031
	20	950	10.6	1.575	.039	800	6.4	1.575	.039	630	6.0	1.575	.039
Depth of cut													

Work material		Precipitation hardening stainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
L/D	DC (mm)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
4	16	1000	11.2	1.260	.031	610	4.9	1.260	.016
	20	800	9.0	1.575	.039	490	3.9	1.575	.020
6	16	610	4.9	1.260	.031	390	2.5	1.260	.016
	20	490	3.9	1.575	.039	320	2.0	1.575	.020
Depth of cut									

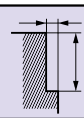
1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
4) L/D will be +1 when using a long cutting edge type head.

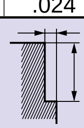
iMX-S4HV ➤ I370, I371
iMX-C4HV ➤ I376–I378

iMX-S4HV/iMX-C4HV

Square/Corner radius head, 4 flute, Irregular helix, Oversize type head

Side milling

Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy			
L/D	DC (mm)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
≤3	12	4000	56.0	.472	.047	3200	30.7	.472	.047	2700	32.4	.472	.047
	14	3400	47.6	.551	.055	2700	28.1	.551	.055	2300	28.5	.551	.055
	18	2600	40.6	.709	.071	2100	25.2	.709	.071	1800	25.2	.709	.071
	22	2200	34.3	.866	.087	1700	20.4	.866	.087	1500	21.0	.866	.087
	28	1700	32.0	1.102	.110	1400	16.8	1.102	.110	1100	15.4	1.102	.110
	30	1600	30.1	1.181	.118	1300	15.6	1.181	.118	1100	15.4	1.181	.118
	32	1500	28.2	1.260	.126	1200	14.4	1.260	.126	1000	14.0	1.260	.126
5	12	2400	26.9	.472	.020	1900	15.2	.472	.020	1600	15.4	.472	.020
	14	2000	22.4	.551	.024	1600	12.8	.551	.024	1400	13.4	.551	.024
	18	1600	19.8	.709	.028	1200	11.5	.709	.028	1100	12.3	.709	.028
	22	1300	16.1	.866	.035	1000	9.6	.866	.035	860	9.6	.866	.035
	28	1000	15.6	1.102	.043	800	7.7	1.102	.043	680	7.6	1.102	.043
	30	950	14.8	1.181	.047	740	7.1	1.181	.047	630	7.1	1.181	.047
	32	890	13.9	1.260	.051	700	6.7	1.260	.051	590	6.6	1.260	.051
7	12	1600	15.4	.472	.008	1300	8.3	.472	.008	850	6.8	.472	.008
	14	1400	13.4	.551	.012	1100	8.8	.551	.012	730	7.0	.551	.012
	18	1100	12.3	.709	.016	890	7.1	.709	.016	570	5.5	.709	.016
	22	860	9.6	.866	.016	730	5.8	.866	.016	460	4.4	.866	.016
	28	680	8.4	1.102	.024	570	4.6	1.102	.024	360	3.5	1.102	.024
	30	630	7.8	1.181	.024	530	4.2	1.181	.024	340	3.3	1.181	.024
	32	590	7.3	1.260	.024	500	4.0	1.260	.024	320	3.1	1.260	.024
Depth of cut													

Work material		Precipitation hardening stainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
L/D	DC (mm)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
≤3	12	2000	19.2	.472	.047	810	5.2	.472	.035
	14	1700	17.7	.551	.055	690	5.0	.551	.043
	18	1300	15.6	.709	.071	700	5.6	.709	.055
	22	1100	13.2	.866	.087	570	4.6	.866	.067
	28	900	10.2	1.102	.110	450	3.6	1.102	.083
	30	790	9.5	1.181	.118	420	3.4	1.181	.091
	32	740	8.9	1.260	.126	390	3.1	1.260	.094
5	12	1300	10.4	.472	.020	280	1.3	.472	.016
	14	1100	8.8	.551	.024	240	1.5	.551	.016
	18	890	8.5	.709	.028	320	2.0	.709	.024
	22	730	7.0	.866	.035	260	1.7	.866	.028
	28	570	5.5	1.102	.043	210	1.3	1.102	.031
	30	530	5.1	1.181	.047	190	1.2	1.181	.035
	32	500	4.8	1.260	.051	180	1.2	1.260	.039
7	12	650	4.2	.472	.008	–	–	–	–
	14	550	4.4	.551	.012	–	–	–	–
	18	430	3.4	.709	.016	–	–	–	–
	22	350	2.8	.866	.016	–	–	–	–
	28	280	2.2	1.102	.024	–	–	–	–
	30	260	2.1	1.181	.024	–	–	–	–
	32	240	1.9	1.260	.024	–	–	–	–
Depth of cut									

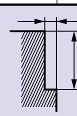
iMX-S4HV ➤ I370, I371
iMX-C4HV ➤ I376–I378

iMX-S3A/iMX-C3A

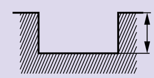
Square/Corner radius head, 3 flute, For aluminum alloy

RECOMMENDED CUTTING CONDITIONS

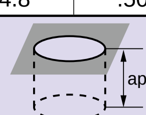
Side milling

Work material		Aluminum alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	17000	234.6	.300	.113
10	.3937	16000	220.8	.315	.118
12	.4724	13000	179.4	.378	.142
	.5000	13000	179.4	.400	.150
	.6250	10000	180.0	.500	.188
16	.6299	9900	178.2	.504	.189
	.7500	8400	173.9	.600	.225
20	.7874	8000	165.6	.630	.236
25	.9843	6400	159.4	.787	.295
	1.0000	6300	156.9	.800	.300
Depth of cut					

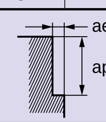
Slotting

Work material		Aluminum alloy		
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	17000	137.7	.188
10	.3937	16000	129.6	.197
12	.4724	13000	109.2	.236
	.5000	13000	109.2	.250
	.6250	10000	111.0	.313
16	.6299	9900	109.9	.315
	.7500	8400	108.4	.375
20	.7874	8000	103.2	.394
25	.9843	6400	96.0	.492
	1.0000	6300	94.5	.500
Depth of cut				

Plunging

Work material		Aluminum alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Peck ap (inch)
	.3750	10000	39.0	.188	.10
10	.3937	9600	37.4	.197	.10
12	.4724	8000	31.2	.236	.10
	.5000	7500	29.3	.250	.10
	.6250	6000	23.4	.313	.10
16	.6299	6000	23.4	.315	.10
	.7500	5000	19.5	.375	.10
20	.7874	4800	18.7	.394	.10
25	.9843	3800	14.8	.492	.10
	1.0000	3800	14.8	.500	.10
Depth of cut					

Oversize type head Side milling

Work material		Aluminum alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
12	.472	13000	179.4	.378	.094
14	.551	11000	151.8	.441	.110
18	.709	8800	158.4	.567	.142
22	.866	7200	149.0	.693	.173
28	1.102	5700	141.9	.882	.220
Depth of cut					

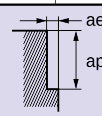
1) The use of water-soluble coolant is recommended.
2) Vibration may occur if the rigidity of machine or work piece is low.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

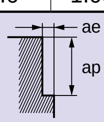
iMX-S3A ➤ I374, I375
iMX-C3A ➤ I386, I387

iMX-C6HV/C10HV/C12HV

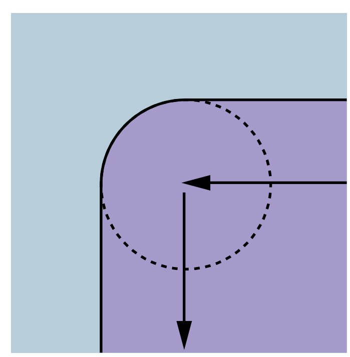
Corner radius head, Multi-flute, Irregular helix

Side milling

Work material		Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy				Precipitation hardening stainless steel, Cobalt chromium alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	6700	112.6	.375	.038	5000	84.0	.375	.038	3400	57.1	.375	.038
10	.3937	6400	107.5	.394	.039	4800	80.6	.394	.039	3200	53.8	.394	.039
12	.4724	5300	104.9	.472	.047	4000	79.2	.472	.047	2700	53.5	.472	.047
	.5000	5000	99.0	.500	.050	3700	73.3	.500	.050	2500	49.5	.500	.050
	.6250	4000	140.0	.625	.025	3000	105.0	.625	.025	2000	70.0	.625	.025
16	.6299	4000	140.0	.630	.025	3000	105.0	.630	.025	2000	70.0	.630	.025
	.7500	3300	154.4	.750	.030	2500	117.0	.750	.030	1700	79.6	.750	.030
20	.7874	3200	149.8	.787	.031	2400	112.3	.787	.031	1600	74.9	.787	.031
25	.9843	2500	117.0	.984	.039	1900	88.9	.984	.039	1300	60.8	.984	.039
	1.0000	2500	117.0	1.000	.040	1900	88.9	1.000	.040	1300	60.8	1.000	.040
Depth of cut													

Work material		Heat resistant alloys Inconel718			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	1300	10.1	.375	.019
10	.3937	1300	10.1	.394	.020
12	.4724	1100	9.2	.472	.024
	.5000	990	8.3	.500	.025
	.6250	790	11.9	.625	.025
16	.6299	790	11.9	.630	.025
	.7500	660	12.7	.750	.030
20	.7874	630	12.1	.787	.031
25	.9843	500	9.6	.984	.039
	1.0000	500	9.6	1.000	.040
Depth of cut					

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
4) If the machining radius at the corner is the same as the tool radius when using a head with more than 10 flutes, please set the depth of cut and feed rate to half of the above.



iMX-C4FD-C

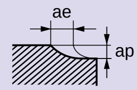
Duplex corner radius head, 4 flute, For high feed, with coolant hole

RECOMMENDED CUTTING CONDITIONS

Side milling

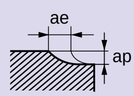
Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Hardened steel, Precipitation hardening stainless steel, Ferritic, Precipitation hardening stainless steel,			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
10	.3937	4800	301.4	.02	.236	4300	270.0	.02	.236	3800	179.4	.020	.236
12	.4724	4000	283.2	.024	.283	3600	254.9	.24	.283	3200	151.0	.024	.283
16	.6299	3000	236.4	.031	.378	2700	212.8	.31	.378	2400	150.7	.031	.378
20	.7874	2400	189.1	.039	.472	2100	173.4	.39	.472	1900	119.3	.039	.472
25	.9843	1900	149.7	.049	.591	1700	134.0	.49	.591	1500	94.2	.049	.591

Depth of cut



Work material		Austenitic stainless steel, Titanium alloy, Cobalt chromium alloy				Heat resistant alloys Inconel718			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
10	.3937	1300	41.1	.02	.236	780	12.2	.02	.236
12	.4724	1100	34.8	.024	.283	650	10.1	.24	.283
16	.6299	790	37.3	.031	.378	490	11.6	.31	.378
20	.7874	630	29.7	.039	.472	390	9.2	.39	.472
25	.9843	500	23.6	.049	.591	310	7.3	.49	.591

Depth of cut



1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
4) Please reduce the feed rate by 50% when ramping.

iMX-C4FD-C ➤ I383

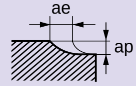
iMX-C4FV

Corner radius head for high efficiency machining, 4 flute, Irregular helix

High depth of cut conditions

Work material		Carbon steel, Alloy steel, Gray Cast Iron				Pre-hardened steel, Alloy tool steel				Hardened steel (45−55HRC)			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	3000	117.6	.045	.169	2500	91.0	.038	.169	2000	69.6	.026	.169
10	.3937	2900	113.7	.047	.177	2400	87.4	.039	.177	1900	66.1	.028	.177
12	.4724	2400	94.1	.071	.236	2000	72.8	.055	.236	1600	55.7	.035	.236
	.5000	2300	90.2	.075	.250	1900	69.2	.058	.250	1500	52.2	.038	.250
	.6250	1800	70.6	.070	.293	1500	54.6	.055	.293	1200	41.8	.035	.293
16	.6299	1800	70.6	.071	.295	1500	54.6	.055	.295	1200	41.8	.035	.295
	.7500	1500	58.8	.068	.338	1300	43.7	.053	.338	990	34.5	.034	.338
20	.7874	1400	54.9	.071	.354	1200	43.7	.055	.354	950	33.1	.035	.354
25	.9843	1100	43.1	.094	.453	950	34.6	.071	.453	760	26.4	.047	.453
	1.0000	1100	43.1	.096	.460	940	34.2	.072	.460	740	25.8	.048	.460

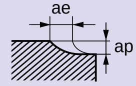
Depth of cut



High speed milling

Work material		Carbon steel, Alloy steel, Gray Cast Iron				Pre-hardened steel, Alloy tool steel				Hardened steel (45−55HRC)			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	5000	314.0	.023	.169	4200	231.8	.017	.169	3400	160.5	.014	.169
10	.3937	4800	301.4	.024	.177	4000	220.8	.018	.177	3200	151.0	.014	.177
12	.4724	4000	283.2	.035	.236	3300	207.2	.028	.236	2700	127.4	.018	.236
	.5000	3700	262.0	.038	.250	3100	194.7	.029	.250	2500	118.0	.019	.250
	.6250	3000	236.4	.035	.293	2500	177.0	.027	.293	2000	94.4	.018	.293
16	.6299	3000	236.4	.035	.295	2500	177.0	.028	.295	2000	94.4	.018	.295
	.7500	2500	197.0	.034	.338	2100	148.7	.026	.338	1700	93.8	.017	.338
20	.7874	2400	189.1	.035	.354	2000	141.6	.028	.354	1600	88.3	.018	.354
25	.9843	1900	149.7	.047	.453	1600	113.3	.035	.453	1300	71.8	.024	.453
	1.0000	1900	149.7	.048	.460	1600	113.3	.036	.460	1300	71.8	.024	.460

Depth of cut



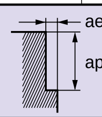
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Air blow or oil mist is recommended for good chip evacuation.
3) For profile machining such as molds, machining conditions may differ considerably depending on the work piece geometry, machining methods and depth of cut.
   Reduce the feed rate especially when machining the corner sections of a work piece.
4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills.
   However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur.
   In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

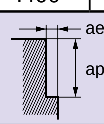
iMX-R4F

Roughing head, 4 flute

RECOMMENDED CUTTING CONDITIONS

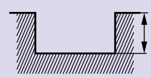
Side milling

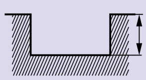
Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	5000	36.0	.300	.015	4000	19.2	.300	.150	3400	20.4	.300	.150
10	.3937	4800	34.6	.320	.160	3800	18.2	.320	.160	3200	19.2	.320	.160
12	.4724	4000	28.8	.380	.190	3200	16.6	.380	.190	2700	17.3	.380	.190
	.5000	3700	26.6	.400	.200	3000	15.6	.400	.200	2500	16.0	.400	.200
	.6250	3000	24.0	.500	.250	2400	14.4	.500	.250	2000	14.4	.500	.250
16	.6299	3000	24.0	.500	.250	2400	14.4	.500	.250	2000	14.4	.500	.250
	.7500	2500	20.0	.600	.300	2000	12.0	.600	.300	1700	12.2	.600	.300
20	.7874	2400	19.2	.630	.320	1900	11.4	.630	.320	1600	11.5	.630	.320
25	.9843	1900	18.2	.790	.390	1500	9.0	.790	.390	1300	9.4	.790	.390
	1.0000	1900	18.2	.800	.400	1500	9.0	.800	.400	1300	9.4	.800	.400
Depth of cut													

Work material		Precipitation hardening stainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
DC (mm)	DC (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Depth of cut ae (inch)
	.3750	2500	12.0	.300	.150	1300	8.3	.300	.038
10	.3937	2400	11.5	.320	.160	1300	8.3	.320	.039
12	.4724	2000	10.4	.380	.190	1100	7.9	.380	.047
	.5000	1900	9.9	.400	.200	990	7.1	.400	.050
	.6250	1500	9.0	.500	.250	790	6.3	.500	.063
16	.6299	1500	9.0	.500	.250	790	6.3	.500	.063
	.7500	1200	7.2	.600	.300	660	5.3	.600	.075
20	.7874	1200	7.2	.630	.320	630	5.0	.630	.079
25	.9843	950	5.7	.790	.390	500	4.0	.790	.098
	1.0000	940	5.6	.800	.400	500	4.0	.800	.100
Depth of cut									

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Vibration may occur if the rigidity of machine or work piece is low.
   In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

Slotting

Work material		Carbon steel, Alloy steel, Mild Steel, Copper, Copper alloys			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Titanium alloy		
DC										
(mm)	(inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	3400	21.4	.190	2600	12.5	.190	2000	6.4	.150
10	.3937	3200	20.5	.200	2500	12.0	.200	1900	6.1	.160
12	.4724	2700	19.4	.240	2100	10.9	.240	1600	6.4	.190
	.5000	2500	18.0	.250	2000	10.4	.250	1500	6.0	.200
	.6250	2000	16.0	.310	1600	9.6	.310	1200	5.8	.250
16	.6299	2000	16.0	.320	1600	9.6	.320	1200	5.8	.250
	.7500	1700	13.6	.380	1300	7.8	.380	990	5.1	.300
20	.7874	1600	12.8	.390	1300	7.8	.390	950	4.9	.320
25	.9843	1300	12.5	.470	1000	6.0	.470	760	4.0	.390
	1.0000	1300	12.5	.480	990	5.9	.480	740	3.8	.400
Depth of cut										

Work material		Precipitation hardening stainless steel, Cobalt chromium alloy		
DC				
(mm)	(inch)	Revolution (RPM)	Feed rate (IPM)	Depth of cut ap (inch)
	.3750	1300	3.1	.150
10	.3937	1300	3.1	.160
12	.4724	1100	3.5	.190
	.5000	990	3.2	.200
	.6250	790	2.8	.250
16	.6299	790	2.8	.250
	.7500	660	2.9	.300
20	.7874	630	2.8	.320
25	.9843	500	2.2	.390
	1.0000	500	2.2	.400
Depth of cut				

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills.
However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

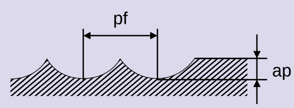
iMX-B4HV/iMX-B4HV-E

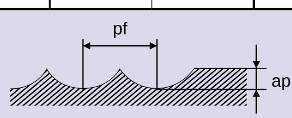
Ball nose head, 4 flute, Irregular curve (With/Without coolant hole)

CARBIDE
SQUARE
BALL
RADIUS
EXCHANGEABLE HEAD END MILLS

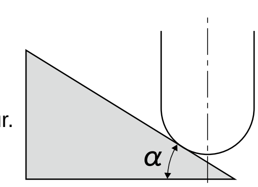
RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material		Carbon steel, Alloy steel, Mild Steel, Pre-hardened steel, Copper, Copper alloys						Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Cobalt chromium alloy, Titanium alloy					
Inclination angle		α ≤15°		α>15°		Depth of cut ap (inch)	Pick feed (inch)	α ≤15°		α>15°		Depth of cut ap (inch)	Pick feed (inch)
PRFRAD (mm)	PRFRAD (inch)	Revolution (RPM)	Feed rate (IPM)	Revolution (RPM)	Feed rate (IPM)			Revolution (RPM)	Feed rate (IPM)	Revolution (RPM)	Feed rate (IPM)		
	.1875	10000	168.0	6700	75.0	.038	.100	7500	123.0	5000	52.0	.038	.100
5	.1969	9600	161.3	6400	71.7	.039	.100	7200	118.1	4800	49.9	.039	.100
6	.2362	8000	156.8	5300	70.0	.047	.120	6000	117.6	4000	49.6	.047	.120
	.2500	7500	147.0	5000	66.0	.050	.120	5700	111.7	3700	45.9	.050	.120
	.3125	6000	127.2	4000	56.0	.063	.160	4500	99.0	3000	42.0	.063	.160
8	.3150	6000	127.2	4000	56.0	.063	.160	4500	99.0	3000	42.0	.063	.160
	.3750	5000	122.0	3300	51.5	.075	.190	3800	95.8	2500	41.0	.075	.190
10	.3937	4800	117.1	3200	49.9	.079	.200	3600	90.7	2400	39.4	.079	.200
12.5	.4921	3800	95.8	2500	39.0	.098	.240	2900	73.1	1900	31.2	.098	.240
	.5000	3800	95.8	2500	39.0	.100	.240	2800	70.6	1900	31.2	.100	.240
Depth of cut													

Work material		Heat resistant alloys Inconel718					
Inclination angle		α ≤15°		α>15°		Depth of cut ap (inch)	Pick feed (inch)
PRFRAD (mm)	PRFRAD (inch)	Revolution (RPM)	Feed rate (IPM)	Revolution (RPM)	Feed rate (IPM)		
	.1875	2000	17.6	1300	7.3	.019	.038
5	.1969	1900	16.7	1300	7.3	.020	.039
6	.2362	1600	14.1	1100	6.2	.024	.047
	.2500	1500	13.2	990	5.5	.025	.050
	.3125	1200	11.5	790	5.1	.031	.063
8	.3150	1200	11.5	790	5.1	.031	.063
	.3750	990	9.5	660	4.2	.038	.075
10	.3937	950	9.1	630	4.0	.039	.079
12.5	.4921	760	7.3	500	3.2	.047	.100
	.5000	740	7.1	500	3.2	.048	.100
Depth of cut							

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
4) α is the inclination angle of the machined surface.

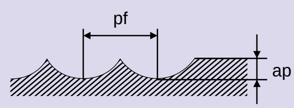


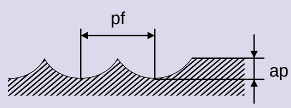
iMX-B4HV ➤ I390, I391
iMX-B4HV-E ➤ I392, I393

iMX-B6HV

Ball nose head, 6 flute, Irregular curve

Shoulder milling

Work material		Carbon steel, Alloy steel, Mild Steel, Pre-hardened steel								Austenitic stainless steel, Ferritic, Precipitation hardening stainless steel, Cobalt chromium alloy, Titanium alloy							
Inclination angle		α≤15°		α>15°		Depth of cut ap (inch)	Pick feed (inch)	α≤15°		α>15°		Depth of cut ap (inch)	Pick feed (inch)
PRFRAD (mm)	(inch)	Revolution (RPM)	Feed rate (IPM)	Revolution (RPM)	Feed rate (IPM)			Revolution (RPM)	Feed rate (IPM)	Revolution (RPM)	Feed rate (IPM)		
	.1875	10000	252.0	6700	112.6	.019	.075	7500	184.5	5000	78.0	.019	.075
5	.1969	9600	241.9	6400	107.5	.020	.079	7200	177.1	4800	74.9	.020	.079
6	.2362	8000	235.2	5300	104.9	.024	.094	6000	176.4	4000	74.4	.024	.094
	.2500	7500	220.5	5000	99.0	.025	.100	5700	167.6	3700	68.8	.025	.100
	.3125	6000	190.8	4000	84.0	.031	.125	4500	148.5	3000	63.0	.031	.125
8	.3150	6000	190.8	4000	84.0	.031	.126	4500	148.5	3000	63.0	.031	.126
	.3750	5000	183.0	3300	77.2	.038	.150	3800	143.6	2500	61.5	.038	.150
10	.3937	4800	175.7	3200	74.9	.039	.157	3600	136.1	2400	59.0	.039	.157
12.5	.4921	3800	143.6	2500	58.5	.047	.197	2900	109.6	1900	46.7	.047	.197
	.5000	3800	143.6	2500	58.5	.048	.200	2800	105.8	1900	46.7	.048	.200
Depth of cut													

Work material		Heat resistant alloys Inconel718					
Inclination angle		α≤15°		α>15°		Depth of cut ap (inch)	Pick feed (inch)
PRFRAD (mm)	(inch)	Revolution (RPM)	Feed rate (IPM)	Revolution (RPM)	Feed rate (IPM)		
	.1875	2000	26.4	1300	10.9	.019	.038
5	.1969	1900	25.1	1300	10.9	.020	.039
6	.2362	1600	21.1	1100	9.2	.024	.047
	.2500	1500	19.8	990	8.3	.025	.050
	.3125	1200	17.3	790	7.6	.031	.063
8	.3150	1200	17.3	790	7.6	.031	.063
	.3750	990	14.3	660	6.3	.038	.075
10	.3937	950	13.7	630	6.0	.039	.079
12.5	.4921	760	10.9	500	4.8	.047	.098
	.5000	740	10.7	500	4.8	.048	.100
Depth of cut							

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work piece installation is poor, vibration or abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
4) α is the inclination angle of the machined surface.