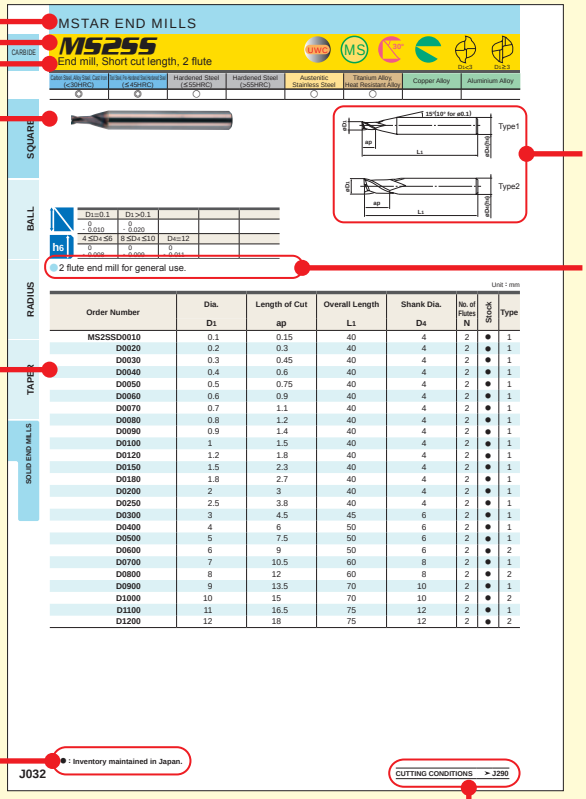
HOW TO READ THE STANDARD OF SOLID END MILLS

●How this section page is organized

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

PHOTO OF PRODUCT
PRODUCT TITLE
ITEM NUMBER
PRODUCT BLOCK



GEOMETRY

PRODUCT FEATURES

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

PAGE REFERENCE
• CUTTING CONDITIONS
indicates the reference pages, including the above, on the right hand page of each double-spread page.

PRODUCT STANDARDS
indicates order numbers, dimensions, and stock status.

●To Order:
For solid-carbide drill or brazed drill, please specify ①order number.

MILLING TOOLS

SOLID END MILLS

*Arranged by Alphabetical order

IDENTIFICATION

ORDER NUMBER OF END MILLS

End mill names

VQ	: SMART MIRACLE End Mills
VF	: Impact Miracle end mills
MP	: MS Plus End Mills
MS	: Mstar end mills
VC	: Miracle end mills
CRN	: CRN coated end mills
DLC	: DLC coated end mills
DFC	: CVD diamond coated end mills
DF	: Diamond coated end mills
CBN	: CBN end mills
C	: Carbide end mills
VA	: Violet end mills
G	: TiN coated end mills
S	: KHAS end mills (High-grade powder high-speed steel)
K	: KHA end mills (Powder metallurgy HSS)
None	: Cobalt high-speed steel

Number of flutes

1	: 1flute
2	: 2flute
3	: 3flute
4	: 4flute
• • •	

Flute length

ES	: Extra short
S	: Short
M	: Medium
J	: Semi long
L	: Long
XL	: Long neck
X	: Taper neck
SX	: Extra long
MX	: Extra long

Features

S	: General-use
U	: For stainless steel
K	: For keyway
A	: For light alloy
C	: Center cut
D	: For deep cut
V	: Irregular spiral helix angle
B	: Ball nose
R	: Roughing
FPR	: Fine roughing
H	: High helix
T	: Taper
TB	: Taper ball nose
RB	: Corner radius
CH	: Coolant hole
3	: 3mm shank
6	: 6mm shank

Dimensions

D✱✱✱✱ : Diameter

ex.

D0050 →ϕ0.5

D0500 →ϕ5

R✱✱✱✱ : Radius of ball nose

ex.

R0050 → R0.5

R0500 → R5

Others

S✱✱	: Shank diameter
N✱✱✱	: Neck length
T✱✱✱✱	: Taper angle one side
L✱✱	: Flute length
A✱✱✱	: Overall Length

✱Other types are available by special order.

End mill names

SZ	: Super square
BZ	: Super ball
SE	: Square end mill

Helix angle

D	: 30°
E	: 45°
G	: Irregular spiral helix angle (38°/41°)

Number of flutes

2	: 2flute
4	: 4flute

Diameter

ex.

010 →ϕ1

050 →ϕ5

Shape

S	: Short
M	: Standard
L	: Long
KP	: For key way (+)
KM	: For key way (-)

Coating

G : (Al, Ti)N Coating

✱Other types are available by special order.

SYMBOL DESCRIPTIONS

Tool material

Ultra micro grain carbide
Ultra micro grain carbide is used as the substrate material.

Cubic boron nitride
Mitsubishi's original CBN is used.

High hardness powder metallurgy HSS
High hardness powder metallurgy HSS is used as the substrate material.

Powder metallurgy HSS
Powder metallurgy HSS is used as the substrate material.

Ultra micro grain carbide
Cobalt high speed steel is used as the substrate material.

High speed steel
High speed steel is used as the substrate material.

Tolerances

Outside diameter tolerance
Indicates diameter tolerance of end mill.

R tolerance
Indicates the radial 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.

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

Shank diameter tolerance
Indicates the shank diameter tolerance of end mill.

Coating

SMART MIRACLE Coating
(Al, Cr)N coaitng optimum for difficult-to-cut materials

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

(Al,Ti,Cr)N multilayer coating
Offers higher versatility for carbon steel, alloy steel and hardened steel.

(Al,Ti)N Coating
(Al,Ti)N offers higher versatility.

MIRACLE Coating
The original Miracle (Al,Ti)N coating.
Also suitable for dry cutting.

CRN Coating
Newly developed CrN coating for Copper Electrodes machining.

DLC Coating
Hardness similar to that of CVD diamond coating achieved with high adhesion strength.
(Jointly developed with NAGATA SEIKI CO.,LTD.)

CVD diamond coated end mills
Suitable for CFRP

Diamond Coating
Suitable for graphite machining.

VIOLET Coating
Increased tool life of 2–3 times that of TiN coated products.

TiN Coating
Increased tool life of 2–3 times that of non coated products.

Angle, sharp corner edge and gash land

Helix angle
Indicates the helix angle of the end mill.

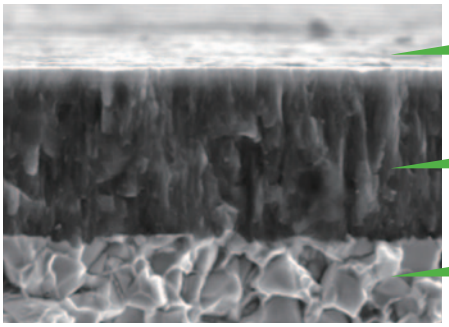
Sharp corner edge
Indicates the end mill has a sharp corner edge.

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

COATING TECHNOLOGY

SMART MIRACLE® Coating VQ

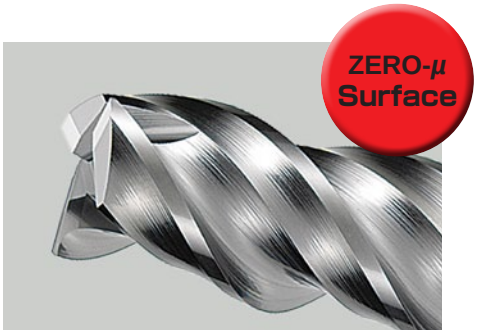
Newly-developed (Al,Cr)N coating with improved wear resistance.
The smoothig treatment of the coating layer reduces the cutting resistance and improves chip discharge significantly. This next-generation coating offers longer tool life and higher efficiency in machining difficult-to-cut materials.



Smoothed surface"Zero-μ Surface"

Newly developed(Al,Cr)N coating

Super fine grade substrate



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.

İMPACT MIRACLE Coating VF

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 friction of coefficient and as such prevents abnormal damage such as chipping.

FEATURES OF IMPACT MIRACLE COATING

	İMPACT MIRACLE Shingle phase nano coating (Al,Ti,Si)N	(Al,Ti,Si)N	(Al,Ti)N
Hardness (HV)	**3700**	3200	2800
Oxidation Temperature (℃)	**1300**	1100	840
Adhesion (N)[1)]	**100**	80	80
Wear Coefficient[2)] (800℃)	**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)

MIRACLE Coating (Al,Ti)N VC

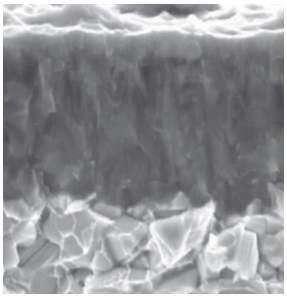
MIRACLE coating for high speed milling.

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.
It has succeeded in improving the heat resistance during cutting and coating hardness, 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.

(Al,Ti,Cr)N multilayer coating (MS Plus) MS+

Suitable coating for a broad range of workpiece materials such as carbon steel, alloy steel and hardened steel of approx. 50HRC.

Our original coating technology enables a multilayer of (Al,Ti)N and (Al,Cr)N. It allows machining of a wide range of workpiece materials.



Properties of (Al,Ti,Cr)N multilayer coating (MS Plus)

	(Al,Ti,Cr)N multilayer	(Al,Ti)N	(Al,Cr)N
Hardness (HV)	**3200**	2800	3100
Oxidation Temperature (℃)	**1100**	800	1100
Adhesion (N)	**100**	80	80

CRN Coating CRN

Specially designed for milling of copper electrode and copper alloy.

CRN coating has been developed for copper alloy milling. It has superior wear resistance and excellent adhesion strength by using Miracle coating technology. The excellent anti adhesion properties needed for copper machining has been achieved due to its low friction coefficient at high temperatures.

DLC Coating DLC

Newly developed DLC coating.
Hardness similar to that of CVD diamond coating achieved with high adhesion strength.

Mitsubishi Materials and NAGATA SEIKI have jointly developed a unique DLC coating that has substantially increased "adhesion strength" compared to previous DLC coatings.

Diamond Coating DFC

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.

Diamond Coating DF

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

Owing to Mitsubishi's unique plasma chemical vapor deposition (CVD) coating technology, great combination of coating hardness similar to that of natural diamond has been combined with a good adhesion to carbide substrates.
DF end mill series suitable for graphite machining.

VIOLET Coating V

(Al,Ti)N coating, excellent adhesion strength for HSS tools.

Violet coating is the name of the technology of successfully applying a Miracle type coating to HSS substrate tools. The newly developed technology of applying (Al,Ti)N coating at the low temperatures required for HSS substrates, means that Violet coating has the same level of adhesion strength as Miracle coating. Additionally high film hardness and excellent oxidation resistance properties have also been realised.

END MILLS SELECTION CHART CARBIDE (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
MS PLUS END MILL SERIES																
General Use	BALL	2	MS+	MP2SSB NEW	Ball nose, Short cut length, 2 flute, Short shank	R0.1 –R6	◎	◎	◎		○	○	◎		J124	J286
			MS+	MP2SB NEW	Ball nose, Short cut length, 2 flute	R0.1 –R6	◎	◎	○		○	○			J125	J286
			MS+	MP2MB NEW	Ball nose, Medium cutting length, 2 flute	R0.25 –R6	◎	◎	○		○	○			J126	J286
	LONG NECK BALL		MS+	MP2XLB NEW	End mill, Short cut length, 2 flute, Long neck	R0.05 –R3	◎	◎	○		○	○			J127	J287
MSTAR END MILL SERIES																
General Use	SQUARE	2	MS	MS2SS	End mill, Short cut length, 2 flute	ϕ0.1 –ϕ12	◎	◎	○		○	○			J032	J290
			MS	MS2MS	End mill, Medium cut length, 2 flute	ϕ0.2 –ϕ20	◎	◎	○		○	○			J033	J290
			MS	MS2MD	End mill, Medium cut length, 2 flute, Strong geometry type	ϕ1 –ϕ12	◎	◎	○		○	○			J035	J291
			MS	MS2JS	End mill, Semi long cut length, 2 flute	ϕ0.1 –ϕ12	◎	◎	○		○	○			J036	J292
			MS	MS2LS	End mill, Long cut length, 2 flute	ϕ0.2 –ϕ12	◎	◎	○		○	○			J037	J293
		4	MS	MS4SC	End mill, Short cut length, 4 flute	ϕ1 –ϕ12	◎	◎	○		○	○			J082	J299
			MS	MS4MC	End mill, Medium cut length, 4 flute	ϕ1 –ϕ20	◎	◎	○		○	○			J083	J299
			MS	MS4JC	End mill, Semi long cut length, 4 flute	ϕ1 –ϕ12	◎	◎	○		○	○			J084	J300
General Use, For Key Way Slotting		3	MS	MSMHZD	Slotting, Medium cut length, 3 flute	ϕ1 –ϕ20	◎	◎	○		◎	○			J070	J296
For high feed cutting		4	MS	MSSHD	High power, Short cut length, 4 flute	ϕ3 –ϕ20	◎	◎	○		◎	◎			J078	J297
			MS	MSMHD	High power, Medium cut length, 4 flute	ϕ2 –ϕ25	◎	◎	○		◎	◎			J079	J297
			MS	MSJHD	High power, Semi long cut length, 4 flute	ϕ2 –ϕ20	◎	◎	○		◎	◎			J081	J298
	RADIUS		MS	MSMHDRB	High power, Corner radius, Medium cut length, 4 flute	ϕ2 –ϕ20	◎	◎	○		◎	◎			J197	J308

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material								Page Number	
							P		H		M	S	N		Dimensions	Cutting Conditions
							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	Aluminium Alloy		
For Profiling	BALL	2	MS	MS2SB	Ball nose end mill, Short cut length, 2 flute	R0.1 –R6	◎	◎	○		○	○			J132	J303
			MS	MS2MB	Ball nose end mill, Medium cut length, 2 flute	R0.25 –R6	◎	◎	○		○	○			J134	J303
For Deep Slotting	LONG NECK SQUARE	2	MS	MS2XL	End mill, Short cut length, 2 flute, Long neck	ϕ0.2 –ϕ6	◎	◎	○		○	○			J038	J294
			MS	MS2XL6	End mill, Short cut length, 2 flute, 6mm shank	ϕ0.3 –ϕ2.5	◎	◎	○		○	○			J041	J295
		4	MS	MS4XL	End mill, Short cut length, 4 flute, Long neck	ϕ1 –ϕ10	◎	◎	○		○	○			J085	J301
	LONG NECK BALL	2	MS	MS2XLB	Ball nose end mill, Short cut length, 2 flute, Long neck	R0.1 –R3	◎	◎	○		○	○			J135	J304
	TAPER NECK BALL		MS	MS2XB	Ball nose end mill, 2 flute, Taper neck	R0.1 –R2	◎	◎	○		○	○			J140	J305
	LONG NECK CORNER RADIUS		MS	MS2XLRB	Corner radius end mill, Short cut length, 2 flute, Long neck	ϕ1 –ϕ6	◎	◎	○		○	○			J184	J306
For Rib Milling	TAPER	4	MS	MS4LT	Taper end mill, Long cut length, 4 flute	ϕ0.2 –ϕ3	◎	◎	○		○				J227	J310
	TAPER BALL		MS	MS4LTB	Ball nose, 4 flute, Taper, For rib milling	R0.3 –R1	◎	◎	○		○	○			J235	J311
For Corner Radius	RADIUS	2	MS	MS2MRB	Corner radius end mill, Medium cut length, 2 flute	ϕ1 –ϕ12	◎	◎	○		○	○			J182	J290
		4	MS	MS4MRB	Corner radius end mill, Medium cut length, 4 flute	ϕ3 –ϕ20	◎	◎	○		○	○			J195	J307
For Angled Face Machining	TAPER	2	MS	MS2MT	Taper end mill, Medium cut length, 2 flute	ϕ0.2 –ϕ10	◎	◎	○		○	○			J222	J309
	TAPER BALL		MS	MS2MTB	Ball nose taper end mill, Medium cut length, 2 flute	R0.2 –R1.5	◎	◎	○		○	○			J233	J303
For Small Automatic Lathes	SQUARE		MS	MS2ES	End mill, 2 flute, For small automatic lathes	ϕ3 –ϕ12	◎	◎	○		○	○			J043	J302
		3	MS	MS3ES	End mill, 3 flute, For small automatic lathes	ϕ3 –ϕ12	◎	◎	○		○	○			J071	J302
		4	MS	MS4EC	End mill, 4 flute, For small automatic lathes	ϕ3 –ϕ14	◎	◎	○		○	○			J088	J302

END MILLS SELECTION CHART CARBIDE (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
SMART MIRACLE END MILL SERIES																
For Difficult-to-cut Materials	SQUARE	3	VQ	VQ-MHZV (NEW)	End mill, Medium cutting length, 3 flute for drilling and slotting	ϕ1 –ϕ20	◎	○			◎	◎	○		J072	J341
			VQ	VQ-MHZV-OH (NEW)	End mill, Medium cutting length, 3 flute for drilling and slotting with internal through coolant holes	ϕ6 –ϕ16	◎	○			◎	◎	○		J074	J343
		4	VQ	VQ-MHV (NEW)	End mill, Medium cutting length, 4 flute, Irregular helix flutes	ϕ2 –ϕ25	◎	○			◎	◎	○		J094	J345
	BALL		VQ	VQ-4SVB (NEW)	Ball nose, Medium cutting length, 4 flute	R1 –R6	○	○			◎	◎	○		J180	J344
	RADIUS		VQ	VQ-MHVRB (NEW)	Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes	ϕ2 –ϕ20	◎	○			◎	◎	○		J205	J345
			VQ	VQ-MHVRB-F (NEW)	Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes (for finishing)	ϕ6 –ϕ16	○	○			○	◎			J207	J346
IMPACT MIRACLE END MILL SERIES																
For Machining of Hardened Steels	For Profiling of Special Geometry WIDE BALL	2	VF	VF-2WB	Wide ball nose, Medium cut length, 2 flute	R1 –R3	○	◎	○		◎	◎			J143	J323
	SQUARE		VF	VF-2MD	End mill, Medium cut length, 2 flute, For hardened materials	ϕ0.5 –ϕ6	○	◎	◎	◎					J044	J312
			VF	VF-2MV	End mill, Medium cut length, 2 flute, Irregular helix flutes	ϕ0.5 –ϕ6	○	◎	◎	◎					J045	J313
		4	VF	VF-4MD	End mill, Medium cut length, 4 flute, For hardened materials	ϕ1 –ϕ20	○	◎	◎	◎					J089	J315
			VF	VF-4MV	End mill, Medium cut length, 4 flute, Irregular helix flutes	ϕ6 –ϕ20	○	◎	◎	◎					J090	J316
		4 6	VF	VF-SD	End mill, Short cut length, For hardened materials	ϕ1 –ϕ12	○	◎	◎	◎					J109	J320
			VF	VF-MD	End mill, Medium cut length, For hardened materials	ϕ1 –ϕ25	○	◎	◎	◎					J110	J320
	BALL	2	VF	VF-2SSB	Ball nose, Short cut length, 2 flute, Short shank	R0.5 –R6	○	◎	◎	◎	○	○			J144	J326
			VF	VF-2SB	Ball nose, Short cut length, 2 flute, For hardened materials	R0.1 –R10	○	◎	◎	◎	○	○			J145	J326
		4	VF	VF-4MB	Ball nose, Medium cut length, 4 flute	R0.5 –R6		◎	◎	◎	○	○			J179	J331

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
For Machining of Hardened Steels	RADIUS	6	VF	VF-SDRB	IMPACT MIRACLE Corner radius end mill, 6 flute (S)	ϕ3 –ϕ12	○	◎	◎	◎					J217	J320
			VF	VF-MDRB	Corner radius, Medium cut length, 6 flute, For hardened materials	ϕ3 –ϕ20	○	◎	◎	◎					J218	J320
	ROUGHING	3 4	VF	VF-SFPR	Roughing end mill, Short cut length, 3—4 flute	ϕ3 –ϕ20	◎	◎	○		◎	◎			J119	J321
		4	VF	VF-MFPR	Roughing end mill, Medium cut length, 4 flute	ϕ5 –ϕ20	◎	◎	○		◎	◎			J120	J322
For Deep Slotting of Hardened Steels	LONG NECK SQUARE	2	VF	VF-2XL	End mill, 2 flute, Long neck	ϕ0.1 –ϕ3	○	◎	◎	◎					J046	J314
	LONG NECK BALL		VF	VF-2XLBS	Ball nose, Medium cut length, 2 flute, Short shank	R0.2 –R1	○	◎	◎	◎		○			J149	J327
			VF	VF-2XLB	IMPACT MIRACLE, Ball nose, 2 flute, Long neck	R0.1 –R3	○	◎	◎	◎		○			J150	J327
For Machining of Hardened Steels	TAPER NECK BALL	3	VF	VF-3XB	Ball nose, Medium cut length, 3 flute, Taper neck	R0.4 –R2.5	○	◎	◎	◎	○	○			J173	J328
IMPACT MIRACLE BALL NOSE HIGH POWER END MILL SERIES																
For high feed cutting	BALL	2	VF	VF-2SDB	Ball nose, Short cut length, 2 flute, Strong geometry type	R0.5 –R10	○	◎	◎	○					J147	J324
			VF	VF-2SDBL	Ball nose, Short cut length, 2 flute, Strong geometry type, Long shank	R0.5 –R10	○	◎	◎	○					J148	J324
IMPACT MIRACLE CORNER RADIUS END MILL SERIES FOR HIGH EFFICIENCY MACHINIG, IRREGULAR HELIX																
For High Efficiency Machining	RADIUS	4	VF	VF-HVRB	4 flute, Corner radius, Short cut length,Irregular helix flutes	ϕ1 –ϕ16	◎	◎	◎	◎	○	○			J199	J332
IMPACT MIRACLE END MILL SERIES FOR DIFFICULT TO CUT MATERIALS, IRREGULAR HELIX																
For Difficult-to-cut Materials	SQUARE	4	VF	VF-MHV	End mill, Medium cut length, Irregular helix flutes	ϕ2 –ϕ20	○	○	○		◎	◎			J091	J317
			VF	VF-JHV	End mill, Semi long cut length, Irregular helix flutes	ϕ2 –ϕ20	○	○	○		◎	◎			J092	J318
		6	VF	VF-6MHV	End mill, Medium cut length, 6 flute, Irregular helix flutes	ϕ6 –ϕ20					◎	◎			J108	J319
	BALL	4	VF	VF-4SVB	Ball nose, Short cut length, 4 flute,Variable curve	R1 –R10	○	○			◎	◎			J178	J330
	RADIUS		VF	VF-MHVRB	Corner radius, Medium cut length, Irregular helix flutes	ϕ6 –ϕ20	◎	○	○		◎	◎			J203	J317
		6	VF	VF-6MHVRB	Corner radius, Medium cut length, 6 flute, Irregular helix flutes	ϕ6 –ϕ20	○	○	○		◎	◎			J216	J319

END MILLS SELECTION CHART CARBIDE (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
COOL STAR END MILL SERIES																
For Difficult-to-cut Materials	SQUARE	4	VF	VF-MHV-CH	End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J093	J338
		6	VF	VF-6MHV-CH	End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ10,ϕ12 ϕ16,ϕ20					◎	◎			J111	J338
		8	VF	VF-8MHV-CH	End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J114	J339
	RADIUS	4	VF	VF-MHVRB-CH	Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16 –ϕ20					◎	◎			J204	J338
		6	VF	VF-6MHVRB-CH	Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ10,ϕ12 ϕ16,ϕ20					◎	◎			J219	J338
		8	VF	VF-8MHVRB-CH	Corner radius end mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J220	J339
	ROUGHING	4	VF	VF-SFPR-CH	Roughing end mill, Short cut length, 4 flute, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J121	J339
		6	VF	VF-6SVR-CH	Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J123	J340
MIRACLE END MILL SERIES																
General Use	SQUARE	2	VC	VC-2SS	End mill, Extra short cut length, 2 flute	ϕ0.3 –ϕ16	○	◎	◎		○	○			J048	J347
			VC	VC-2MS	End mill, Medium cut length, 2 flute	ϕ0.3 –ϕ25	○	◎	◎		○	○			J050	J348
			VC	VC-2JS	End mill, Semi long cut length, 2 flute	ϕ1 –ϕ25	○	◎	◎		○	○			J052	J349
		4	VC	VC-4MC	End mill, Medium cut length, 4 flute	ϕ2 –ϕ25	○	◎	◎	○	○	○			J095	J350
			VC	VC-4JC	End mill, Semi long cut length, 4 flute	ϕ3 –ϕ25	○	◎	◎	○	○	○			J096	J351
For high feed cutting	BALL	2	VC	VC-2MDB	MIRACLE ball nose high power end mill (M), 2 flute	R1.5 –R12.5	○	◎	◎	○	○	○			J159	J357
For Profiling			VC	VC-2ESB	Ball nose, Extra short cut length, 2 flute, Short shank	R0.15 –R6	○	◎	◎	○	○	○			J155	J357
			VC	VC-2MB	Ball nose end mill, Medium cut length, 2 flute	R0.2 –R12.5	○	◎	◎	○	○	○			J158	J357
For High Efficiency Machining		3	VC	VC-3MB	Ball nose end mill, Medium cut length, 3 flute	R1 –R10	○	◎	◎	○	○	○			J176	J360

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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 – Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
For Deep Slotting	BALL	2	VC	VC-2LB	Ball nose end mill, Medium cut length, 2 flute, Long shank	R1 –R12.5	○	◎	◎	○	○	○			J160	—
For Deep Slotting	TAPER NECK BALL	2	VC	VC-XB	Ball nose taper end mill, Medium cut length, Taper neck	R0.5 –R6	○	◎	◎	○	○	○			J161	J359
For Corner Radius	RADIUS	4	VC	VC-4SRB	Corner radius end mill, Short cut length, 4 flute	ϕ4 –ϕ12	○	◎	◎	○	○	○			J208	J350
For Corner Radius	RADIUS	4	VC	VC-4JRB	Corner radius end mill, Semi long cut length, 4 flute	ϕ3 –ϕ20	○	◎	○	○	○	○			J209	J351
For Roughing	ROUGHING	3 4	VC	VC-SFPR	Roughing end mill, Short cut length, 3–4 flute	ϕ3 –ϕ20	◎	◎	○		◎	◎			J122	J356
For Angled Face Machining	TAPER	2	VC	VC-2MT	Taper end mill, Medium cut length, 2 flute	ϕ1 –ϕ10	○	◎	◎	○	○	○			J226	J366
For Chamfering	CHAMFERING	2	VC	VC-2C	Chamfer cutter, 2 flute	ϕ2 –ϕ12	◎	◎	◎	○	◎	◎	○	○	J240	J369
MIRACLE NOVA END MILL SERIES																
For High-Precision Machining	BALL	2	VC	VC-2PSB	Ball nose end mill, Short cut length, 2 flute, High precision	R0.05 –R6	◎	◎	◎		○	○			J156	J358
For Ultra high-precision Machining	BALL	2	VC	VC-2PSB-P	MIRACLE ball nose ultra high-precision end mill(S), 2 flute	R0.02 –R6	◎	◎	◎		○	○			J157	J358
MIRACLE ORBIT END MILL SERIES																
For High-Precision Machining	RADIUS	2 4	VC	VC-PSRB	Corner radius end mill, Short cut length, 2–4 flute, High precision	ϕ0.6 –ϕ12	◎	◎	◎	◎	○	○			J185	J362
MIRACLE CORNER RADIUS END MILL SERIES FOR HIGH FEED MACHINING																
For High Feed Machining	RADIUS	4	VC	VC-HFRB	Corner radius, Short flute length, 4 flute, High feed machining	ϕ2 –ϕ16	◎	◎	◎	○		○			J210	J364
MIRACLE END MILL SERIES FOR HIGH HARDNESS STEEL																
For Machining of Hardened Steels	SQUARE	4 6	VC	VC-MD-SC	End mill, Medium cut length, 4–6 flute	ϕ0.5 –ϕ3	○	◎	◎	◎					J097	J352
For Machining of Hardened Steels	SQUARE	6	VC	VC-LD	End mill, Long cut length, 6 flute	ϕ6 –ϕ25	○	◎	◎	◎					J112	J353
For Machining of Hardened Steels	BALL	4	VC	VC-4MB	Ball nose end mill, Medium cut length, 4 flute	R0.5 –R10	○	◎	◎	◎	○	○			J181	J361
For Angled Face Machining	TAPER BALL	4	VC	VC-4STB	Ball nose taper end mill, Short cut length, 4 flute	R0.3 –R4	○	◎	◎	◎	○	○			J238	J367

END MILLS SELECTION CHART CARBIDE (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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 – Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
MIRACLE END MILL SERIES FOR DIFFICULT TO CUT MATERIALS																
For Difficult-to-cut Materials	SQUARE	3 4	VC	VC-MH	 End mill, Medium cut length, 3–4 flute, High helix angle	ϕ3 –ϕ25	○	◎	○		◎	◎			J075	J354
		6	VC	VC-6MH	 End mill, Medium cut length, 6 flute, High helix angle	ϕ6 –ϕ25	◎	◎	○		◎	◎			J113	J355
		8	VC	VC-8MH	 End mill, Medium cut length, 8 flute, High helix angle	ϕ20 –ϕ25	◎	◎	○		◎	◎			J115	J355
	RADIUS	4	VC	VC-MHDRB	 Corner radius end mill, Medium cut length, 4 flute, High helix angle	ϕ2 –ϕ25	○	◎	◎	○	◎	◎			J212	J365
END MILL SERIES FOR SLOTTING																
For Key Way Slotting	SQUARE	2	MS	SED2KPG	 End mill, Medium cut length, 2 flute, + Tolerance	ϕ2 –ϕ16	◎	◎			○	○			J057	J387
			MS	SED2KMG	 End mill, Medium cut length, 2 flute, + Tolerance	ϕ2 –ϕ16	◎	◎			○	○			J058	J387
CRN END MILL SERIES																
For Copper Electrodes	SQUARE	2	CRN	CRN-2MS	 End mill, Medium cut length, 2 flute, For copper electrodes	ϕ0.2 –ϕ12							◎	○	J053	J371
	LONG NECK SQUARE		CRN	CRN-2XL	 End mill, Medium cut length, 2 flute, Long neck, For copper electrodes	ϕ0.2 –ϕ6							◎	○	J054	J372
	SQUARE	4	CRN	CRN-4JC	 End mill, Semi long cut length, 4 flute, For copper electrodes	ϕ3 –ϕ12							◎	○	J098	J371
	BALL	2	CRN	CRN-2MB	 Ball nose, Medium cut length, 2 flute, For copper electrodes	R0.2 –R6							◎	○	J163	J373
	LONG NECK BALL		CRN	CRN-2XLB	 Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes	R0.1 –R3							◎	○	J164	J374
	RADIUS		CRN	CRN-2MRB	 Corner radius, Medium cut length, 2 flute, For copper electrodes	ϕ6 –ϕ12							◎	○	J189	J375
	LONG NECK CORNER RADIUS		CRN	CRN-2XLRB	 Corner radius, Medium cut length, 2 flute, For copper electrodes	ϕ0.5 –ϕ6							◎	○	J190	J376

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
DFC END MILL SERIES																
For CFRP machining	SQUARE	4	DFC	DFC-4JC NEW	Diamond coating endmill, 4 flute	φ6 –φ12	CFRP : ○								J101	J385
For CFRP machining	SQUARE WITH CROSS-NICK	–	DFC	DFC-JRT NEW	Diamond coating endmill with cross-nick	φ6 –φ12	CFRP : ○								J102	J385
DF END MILL SERIES																
For Graphite	SQUARE	4	DF	DF-4JC	End mill, Semi long cut length, 4 flute, For graphite	φ3 –φ12	Graphite : ◎ GFRP : ○ CFRP : ○							○	J099	J377
For Graphite	LONG NECK SQUARE	4	DF	DF-4XL	End mill, Long neck, 4 flute, For graphite	φ1 –φ12								○	J100	J378
For Graphite	BALL	2	DF	DF-2MB	Ball nose, Medium cut length, 2 flute, For graphite	R3 –R6								○	J167	J379
For Graphite	LONG NECK BALL	2	DF	DF-2XLB	Ball nose, Medium cut length, 2 flute, Long neck, For graphite	R0.2 –R2								○	J168	J380
For Graphite	TAPER NECK BALL	3	DF	DF-3XB	Ball nose, Medium cut length, 3 flute, Taper neck, For graphite	R0.5 –R2								○	J177	J381
For Graphite	RADIUS	2 4	DF	DF-PSRB	Corner radius end mill, Short cut length, 2–4 flute, High precision, For graphite	φ0.5 –φ12								○	J214	J382
DLC END MILL SERIES																
For Machining of Aluminium Alloys	SQUARE	2	DLC	DLC-2MA	Slot drill, Medium cut length, 2 flute	φ1 –φ20	GFRP : ○ CFRP : ○						○	◎	J056	J383
For Machining of Aluminium Alloys	BALL	2	DLC	DLC-2MB	Ball nose, Medium cut length, 2 flute	R0.1 –R10							○	◎	J170	J384
ALIMASTER END MILL SERIES																
For Machining of Aluminium Alloys	SQUARE	2	–	C-2SA	End mill, Short cut length, 2 flute, For aluminium alloy	φ3 –φ20							○	◎	J067	J389
For Machining of Aluminium Alloys	SQUARE	2	–	C-2MA	End mill, Medium cut length, 2 flute, For aluminium alloy	φ1 –φ20								◎	J065	J388
For Machining of Aluminium Alloys	SQUARE	2	–	C-2LA	End mill, Long cut length, 2 flute, For aluminium alloy	φ1 –φ20								◎	J066	J388
For Machining of Aluminium Alloys	SQUARE	2	–	C-2MHA	End mill, Medium cut length, 2 flute, For aluminium alloy	φ3 –φ25								◎	J068	J389
For Machining of Aluminium Alloys	SQUARE	3	–	C-3SA	End mill, Short cut length, 3 flute, For aluminium alloy	φ10 –φ26							○	◎	J077	J390
For Machining of Aluminium Alloys	RADIUS	3	–	C-3SARB	Corner radius, Short cut length, 3 flute, For aluminium alloy	φ12 –φ25							○	◎	J193	J390

END MILLS SELECTION CHART CARBIDE (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
ALIMASTER END MILL SERIES																
For Machining of Aluminium Alloys	ROUGHING	3	—	C-SRA	Roughing end mill, Short cut length, 3 flute, For aluminium alloy	ϕ10 –ϕ25								◎	J117	J393
			—	C-MRA	Roughing end mill, Medium cut length, 3 flute, For aluminium alloy	ϕ3 –ϕ25								◎	J118	J394
	ROUGHING RADIUS		—	C-SRARB	Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy	ϕ10 –ϕ25								◎	J194	J393
CARBIDE END MILL SERIES																
General Use	SQUARE	2	—	C-2SS	End mill, Short cut length, 2 flute	ϕ0.4 –ϕ6	○	○			○	○	○	○	J059	J391
			—	C-2MS	End mill, Medium cut length, 2 flute	ϕ1 –ϕ20	○	○			○	○	○	○	J060	J391
			—	C-2JS	End mill, Semi long cut length, 2 flute	ϕ1 –ϕ25	○	○			○	○	○	○	J063	J391
			—	C-2LS	End mill, Long cut length, 2 flute	ϕ1 –ϕ20	○	○			○	○	○	○	J064	J391
		4	—	C-4MC	End mill, Medium cut length, 4 flute, Center cutting	ϕ3 –ϕ20	○	○			○	○	○	○	J103	J392
			—	C-4JC	End mill, Semi long cut length, 4 flute, Center cutting	ϕ3 –ϕ25	○	○			○	○	○	○	J104	J392
			—	C-4LC	End mill, Long cut length, 4 flute, Center cutting	ϕ3 –ϕ20	○	○			○	○	○	○	J105	J392
For Profiling	BALL	2	—	C-2MB	Ball nose end mill, Medium cut length, 2 flute	R0.5 –R10	◎	○			○	○	○	○	J172	J396
High Helix	SQUARE		—	SEE2L	End mill, Long cut length, 2 flute	ϕ3 –ϕ20	◎	○			○	○	○	○	J069	J397
		4	—	SEE4L	End mill, Long cut length, 4 flute	ϕ3 –ϕ25	◎	○			○	○		○	J106	J398
For Machining of Aluminium Alloys		4	—	SEG4SA	End mill, Medium cut length, 4 flute, Irregular spiral helix angle, For aluminium alloy	ϕ6 –ϕ25							○	◎	J107	J395
For Difficult-to-cut Materials		3	—	C-MH	End mill, Medium cut length, 3 flute	ϕ6 –ϕ16	○	◎			○	○		○	J076	—
CBN END MILL SERIES																
For Machining of Hardened Steels	SQUARE	1	—	GBE	End mill, 1 flute, Brazed type (CBN)	ϕ6 –ϕ12		○	◎	◎					J116	J116

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material								Page Number	
							P		H		M	S	N		Dimensions	Cutting Conditions
							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	Aluminium Alloy		
For Machining of Hardened Steels	LONG NECK BALL	2	—	CBN-2XLB	 Ball nose, Short cut length, 2 flute, Long neck	R0.2 –R1	○	◎	◎	◎					J171	J386
	LONG NECK CORNER RADIUS		—	CBN-2XLRB	 Corner radius end mill, Medium cut length, 2 flute, Long neck	φ0.5 –φ2	○	◎	◎	◎					J192	J386

END MILLS SELECTION CHART CARBIDE(By Shape)

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
SQUARE																
	1	For Machining of Hardened Steels	—	GBE	End mill, 1 flute, Brazed type (CBN)	φ6 –φ12		○	◎	◎					J116	J116
	2	General Use	MS	MS2SS	End mill, Short cut length, 2 flute	φ0.1 –φ12	◎	◎	○		○	○			J032	J290
			MS	MS2MS	End mill, Medium cut length, 2 flute	φ0.2 –φ20	◎	◎	○		○	○			J033	J290
			MS	MS2MD	End mill, Medium cut length, 2 flute, Strong geometry type	φ1 –φ12	◎	◎	○		○	○			J035	J291
			MS	MS2JS	End mill, Semi long cut length, 2 flute	φ0.1 –φ12	◎	◎	○		○	○			J036	J292
			MS	MS2LS	End mill, Long cut length, 2 flute	φ0.2 –φ12	◎	◎	○		○	○			J037	J293
			VC	VC-2SS	End mill, Extra short cut length, 2 flute	φ0.3 –φ16	○	◎	◎		○	○			J048	J347
			VC	VC-2MS	End mill, Medium cut length, 2 flute	φ0.3 –φ25	○	◎	◎		○	○			J050	J348
			VC	VC-2JS	End mill, Semi long cut length, 2 flute	φ1 –φ25	○	◎	◎		○	○			J052	J349
			—	C-2SS	End mill, Short cut length, 2 flute	φ0.4 –φ6	○	○			○	○	○	○	J059	J391
			—	C-2MS	End mill, Medium cut length, 2 flute	φ1 –φ20	○	○			○	○	○	○	J060	J391
			—	C-2JS	End mill, Semi long cut length, 2 flute	φ1 –φ25	○	○			○	○	○	○	J063	J391
			—	C-2LS	End mill, Long cut length, 2 flute	φ1 –φ20	○	○			○	○	○	○	J064	J391
		For Key Way Slotting	MS	SED2KPG	End mill, Medium cut length, 2 flute, + Tolerance	φ2 –φ16	◎	◎			○	○			J057	J387
			MS	SED2KMG	End mill, Medium cut length, 2 flute, + Tolerance	φ2 –φ16	◎	◎			○	○			J058	J387
		High helix	—	SEE2L	End mill, Long cut length, 2 flute	φ3 –φ20	◎	○			○	○	○	○	J069	J397
		For Small Automatic Lathes	MS	MS2ES	End mill, 2 flute, For small automatic lathes	φ3 –φ12	◎	◎	○		○	○			J043	J302

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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 – Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
	2	For Machining of Hardened Steels	VF	VF-2MD	End mill, Medium cut length, 2 flute, For hardened materials	ϕ0.5 –ϕ6	○	◎	◎	◎					J044	J312
			VF	VF-2MV	End mill, Medium cut length, 2 flute, Irregular helix flutes	ϕ0.5 –ϕ6	○	◎	◎	◎					J045	J313
		For Copper Electrodes	CRN	CRN-2MS	End mill, Medium cut length, 2 flute, For copper electrodes	ϕ0.2 –ϕ12							◎	○	J053	J371
		For Machining of Aluminium Alloys	DLC	DLC-2MA	Slot drill, Medium cut length, 2 flute	ϕ1 –ϕ20	GFRP : ○ CFRP : ○						○	◎	J056	J383
			—	C-2SA	End mill, Short cut length, 2 flute, For aluminium alloy	ϕ3 –ϕ20							○	◎	J067	J389
			—	C-2MA	End mill, Medium cut length, 2 flute, For aluminium alloy	ϕ1 –ϕ20								◎	J065	J388
			—	C-2LA	End mill, Long cut length, 2 flute, For aluminium alloy	ϕ1 –ϕ20								◎	J066	J388
			—	C-2MHA	End mill, Medium cut length, 2 flute, For aluminium alloy	ϕ3 –ϕ25								◎	J068	J389
	3	General Use; For Keyway Slotting	MS	MSMHZD	Slotting, Medium cut length, 3 flute	ϕ1 –ϕ20	◎	◎	○		◎	○			J070	J296
		For Small Automatic Lathes	MS	MS3ES	End mill, 3 flute, For small automatic lathes	ϕ3 –ϕ12	◎	◎	○		○	○			J071	J302
		For Difficult-to-cut Materials	VQ	VQ-MHZV (NEW)	End mill, Medium cutting length, 3 flute for drilling and slotting	ϕ1 –ϕ20	◎	○			◎	◎	○		J072	J341
			VQ	VQ-MHZV-OH (NEW)	End mill, Medium cutting length, 3 flute for drilling and slotting with internal through coolant holes	ϕ6 –ϕ16	◎	○			◎	◎	○		J074	J343
			—	C-MH	End mill, Medium cut length, 3 flute	ϕ6 –ϕ16	○	◎			○	○		○	J076	—
		For Machining of Aluminium Alloys	—	C-3SA	End mill, Short cut length, 3 flute, For aluminium alloy	ϕ10 –ϕ26							○	◎	J077	J390
	3 4	For Difficult-to-cut Materials	VC	VC-MH	End mill, Medium cut length, 3–4 flute, High helix angle	ϕ3 –ϕ25	○	◎	○		◎	◎			J075	J354
	4	General Use	MS	MS4SC	End mill, Short cut length, 4 flute	ϕ1 –ϕ12	◎	◎	○		○	○			J082	J299
			MS	MS4MC	End mill, Medium cut length, 4 flute	ϕ1 –ϕ20	◎	◎	○		○	○			J083	J299
			MS	MS4JC	End mill, Semi long cut length, 4 flute	ϕ1 –ϕ12	◎	◎	○		○	○			J084	J300

END MILLS SELECTION CHART CARBIDE(By Shape)

SQUARE

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
4	General Use		VC	VC-4MC	End mill, Medium cut length, 4 flute	ϕ2 –ϕ25	○	◎	◎	○	○	○			J095	J350
			VC	VC-4JC	End mill, Semi long cut length, 4 flute	ϕ3 –ϕ25	○	◎	◎	○	○	○			J096	J351
			—	C-4MC	End mill, Medium cut length, 4 flute, Center cutting	ϕ3 –ϕ20	○	○			○	○	○	○	J103	J392
			—	C-4JC	End mill, Semi long cut length, 4 flute, Center cutting	ϕ3 –ϕ25	○	○			○	○	○	○	J104	J392
			—	C-4LC	End mill, Long cut length, 4 flute, Center cutting	ϕ3 –ϕ20	○	○			○	○	○	○	J105	J392
	For high feed cutting		MS	MSSHD	High power, Short cut length, 4 flute	ϕ3 –ϕ20	◎	◎	○		◎	◎			J078	J297
			MS	MSMHD	High power, Medium cut length, 4 flute	ϕ2 –ϕ25	◎	◎	○		◎	◎			J079	J297
			MS	MSJHD	High power, Semi long cut length, 4 flute	ϕ2 –ϕ20	◎	◎	○		◎	◎			J081	J298
	High helix		—	SEE4L	End mill, Long cut length, 4 flute	ϕ3 –ϕ25	◎	○			○	○		○	J106	J398
	For Small Automatic Lathes		MS	MS4EC	End mill, 4 flute, For small automatic lathes	ϕ3 –ϕ14	◎	◎	○		○	○			J088	J302
	For Machining of Hardened Steels		VF	VF-4MD	End mill, Medium cut length, 4 flute, For hardened materials	ϕ1 –ϕ20	○	◎	◎	◎					J089	J315
			VF	VF-4MV	End mill, Medium cut length, 4 flute, Irregular helix flutes	ϕ6 –ϕ20	○	◎	◎	◎					J090	J316
	For Difficult-to-cut Materials		VQ	VQ-MHV NEW	End mill, Medium cutting length, 4 flute, Irregular helix flutes	ϕ2 –ϕ25	◎	○			◎	◎	○		J094	J345
			VF	VF-MHV	End mill, Medium cut length, Irregular helix flutes	ϕ2 –ϕ20	○	○	○		◎	◎			J091	J317
			VF	VF-JHV	End mill, Semi long cut length, Irregular helix flutes	ϕ2 –ϕ20	○	○	○		◎	◎			J092	J318
			VF	VF-MHV-CH	End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J093	J338
	For Copper Electrodes		CRN	CRN-4JC	End mill, Semi long cut length, 4 flute, For copper electrodes	ϕ3 –ϕ12							◎	○	J098	J371

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
	4	For CFRP machining	DFC	DFC-4JC (NEW)	Diamond coating endmill, 4 flute	ϕ6 –ϕ12	CFRP : ○								J101	J385
	4	For Graphite	DF	DF-4JC	End mill, Semi long cut length, 4 flute, For graphite	ϕ3 –ϕ12	Graphite : ◎ GFRP : ○ CFRP : ○							○	J099	J377
	4	For Machining of Aluminium Alloys	—	SEG4SA	End mill, Medium cut length, 4 flute, Irregular spiral helix angle, For aluminium alloy	ϕ6 –ϕ25							○	◎	J107	J395
	4 6	For Machining of Hardened Steels	VF	VF-SD	End mill, Short cut length, For hardened materials	ϕ1 –ϕ12	○	◎	◎	◎					J109	J320
	4 6	For Machining of Hardened Steels	VF	VF-MD	End mill, Medium cut length, For hardened materials	ϕ1 –ϕ25	○	◎	◎	◎					J110	J320
	4 6	For Machining of Hardened Steels	VC	VC-MD-SC	End mill, Medium cut length, 4–6 flute	ϕ0.5 –ϕ3	○	◎	◎	◎					J097	J352
	6	For Machining of Hardened Steels	VC	VC-LD	End mill, Long cut length, 6 flute	ϕ6 –ϕ25	○	◎	◎	◎					J112	J353
	6	For Difficult-to-cut Materials	VF	VF-6MHV	End mill, Medium cut length, 6 flute, Irregular helix flutes	ϕ6 –ϕ20					◎	◎			J108	J319
	6	For Difficult-to-cut Materials	VF	VF-6MHV-CH	End mill, Medium cut length, Irregular helix flutes, with multiple internal through coolant holes	ϕ10,ϕ12 ϕ16,ϕ20					◎	◎			J111	J338
	6	For Difficult-to-cut Materials	VC	VC-6MH	End mill, Medium cut length, 6 flute, High helix angle	ϕ6 –ϕ25	◎	◎	○		◎	◎			J113	J355
	8	For Difficult-to-cut Materials	VF	VF-8MHV-CH	End mill, Medium cut length, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J114	J339
	8	For Difficult-to-cut Materials	VC	VC-8MH	End mill, Medium cut length, 8 flute, High helix angle	ϕ20 –ϕ25	◎	◎	○		◎	◎			J115	J355
LONG NECK SQUARE																
	2	For Deep Slotting	MS	MS2XL	End mill, Short cut length, 2 flute, Long neck	ϕ0.2 –ϕ6	◎	◎	○		○	○			J038	J294
	2	For Deep Slotting	MS	MS2XL6	End mill, Short cut length, 2 flute, 6mm shank	ϕ0.3 –ϕ2.5	◎	◎	○		○	○			J041	J295
	2	For Deep Slotting of Hardened Steels	VF	VF-2XL	End mill, 2 flute, Long neck	ϕ0.1 –ϕ3	○	◎	◎	◎					J046	J314
	2	For copper electrodes	CRN	CRN-2XL	End mill, Medium cut length, 2 flute, Long neck, For copper electrodes	ϕ0.2 –ϕ6							◎	○	J054	J372
	2	For Deep Slotting	MS	MS4XL	End mill, Short cut length, 4 flute, Long neck	ϕ1 –ϕ10	◎	◎	○		○	○			J085	J301

END MILLS SELECTION CHART CARBIDE(By Shape)

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
LONG NECK SQUARE																
	4	For Graphite	DF	DF-4XL	End mill, Long neck, 4 flute, For graphite	φ1 –φ12	Graphite : ◎ GFRP : ○ CFRP : ○							○	J100	J378
SQUARE WITH CROSS-NICK																
	—	For CFRP machining	DFC	DFC-JRT NEW	Diamond coating endmill with cross-nick	φ6 –φ12	CFRP : ○								J102	J385
TAPER																
	2	For Angled Face Machining	MS	MS2MT	Taper end mill, Medium cut length, 2 flute	φ0.2 –φ10	◎	◎	○		○	○			J222	J309
			VC	VC-2MT	Taper end mill, Medium cut length, 2 flute	φ1 –φ10	○	◎	◎	○	○	○			J226	J366
	4	For Rib Milling	MS	MS4LT	Taper end mill, Long cut length, 4 flute	φ0.2 –φ3	◎	◎	○		○				J227	J310
BALL																
	2	General Use	MS+	MP2SSB NEW	Ball nose, Short cut length, 2 flute, Short shank	R0.1 –R6	◎	◎	◎		○	○	◎		J124	J286
			MS+	MP2SB NEW	Ball nose, Short cut length, 2 flute	R0.1 –R6	◎	◎	○		○	○			J125	J286
			MS+	MP2MB NEW	Ball nose, Medium cutting length, 2 flute	R0.25 –R6	◎	◎	○		○	○			J126	J286
		For high feed cutting	VF	VF-2SDB	Ball nose, Short cut length, 2 flute, Strong geometry type	R0.5 –R10	○	◎	◎	○					J147	J324
			VF	VF-2SDBL	Ball nose, Short cut length, 2 flute, Strong geometry type, Long shank	R0.5 –R10	○	◎	◎	○					J148	J324
			VC	VC-2MDB	MIRACLE ball nose high power end mill (M), 2 flute	R1.5 –R12.5	○	◎	◎	○	○	○			J159	J357
		For Profiling	MS	MS2SB	Ball nose end mill, Short cut length, 2 flute	R0.1 –R6	◎	◎	○		○	○			J132	J303
			MS	MS2MB	Ball nose end mill, Medium cut length, 2 flute	R0.25 –R6	◎	◎	○		○	○			J134	J303
			VC	VC-2ESB	Ball nose, Extra short cut length, 2 flute, Short shank	R0.15 –R6	○	◎	◎	○	○	○			J155	J357

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
	2	For Profiling	VC	VC-2MB	Ball nose end mill, Medium cut length, 2 flute	R0.2 –R12.5	○	◎	◎	○	○	○			J158	J357
		For Profiling	—	C-2MB	Ball nose end mill, Medium cut length, 2 flute	R0.5 –R10	◎	○			○	○	○	○	J172	J396
		For Deep Slotting	VC	VC-2LB	Ball nose end mill, Medium cut length, 2 flute, Long shank	R1 –R12.5	○	◎	◎	○	○	○			J160	—
		For High-Precision Machining	VC	VC-2PSB	Ball nose end mill, Short cut length, 2 flute, High precision	R0.05 –R6	◎	◎	◎		○	○			J156	J358
		For Ultra high-precision Machining	VC	VC-2PSB-P	MIRACLE ball nose ultra high-precision end mill(S), 2 flute	R0.02 –R6	◎	◎	◎		○	○			J157	J358
		For Machining of Hardened Steels	VF	VF-2SSB	Ball nose, Short cut length, 2 flute, Short shank	R0.5 –R6	○	◎	◎	◎	○	○			J144	J326
		For Machining of Hardened Steels	VF	VF-2SB	Ball nose, Short cut length, 2 flute, For hardened materials	R0.1 –R10	○	◎	◎	◎	○	○			J145	J326
		For Copper Electrodes	CRN	CRN-2MB	Ball nose, Medium cut length, 2 flute, For copper electrodes	R0.2 –R6							◎	○	J163	J373
		For Graphite	DF	DF-2MB	Ball nose, Medium cut length, 2 flute, For graphite	R3 –R6	Graphite : ◎ GFRP : ○ CFRP : ○							○	J167	J379
		For Machining of Aluminium Alloys	DLC	DLC-2MB	Ball nose, Medium cut length, 2 flute	R0.1 –R10	GFRP : ○ CFRP : ○						○	◎	J170	J384
	3	For High Efficiency Machining	VC	VC-3MB	Ball nose end mill, Medium cut length, 3 flute	R1 –R10	○	◎	◎	○	○	○			J176	J360
	4	For Machining of Hardened Steels	VF	VF-4MB	Ball nose, Medium cut length, 4 flute	R0.5 –R6		◎	◎	◎	○	○			J179	J331
	4	For Machining of Hardened Steels	VC	VC-4MB	Ball nose end mill, Medium cut length, 4 flute	R0.5 –R10	○	◎	◎	◎	○	○			J181	J361
	4	For Difficult-to-cut Materials	VQ	VQ-4SVB (NEW)	Ball nose, Medium cutting length, 4 flute	R1 –R6	○	○			◎	◎	○		J180	J344
	4	For Difficult-to-cut Materials	VF	VF-4SVB	Ball nose, Short cut length, 4 flute,Variable curve	R1 –R10	○	○			◎	◎			J178	J330
LONG NECK BALL																
	2	General Use	MS+	MP2XLB (NEW)	End mill, Short cut length, 2 flute, Long neck	R0.05 –R3	◎	◎	○		○	○			J127	J287
	2	For Deep Slotting	MS	MS2XLB	Ball nose end mill, Short cut length, 2 flute, Long neck	R0.1 –R3	◎	◎	○		○	○			J135	J304

END MILLS SELECTION CHART CARBIDE(By Shape)

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
LONG NECK BALL																
	2	For Machining of Hardened Steels	—	CBN-2XLB	Ball nose, Short cut length, 2 flute, Long neck	R0.2 –R1	○	◎	◎	◎					J171	J386
		For Deep Slotting of Hardened Steels	VF	VF-2XLBS	Ball nose, Medium cut length, 2 flute, Short shank	R0.2 –R1	○	◎	◎	◎		○			J149	J327
			VF	VF-2XLB	IMPACT MIRACLE, Ball nose, 2 flute, Long neck	R0.1 –R3	○	◎	◎	◎		○			J150	J327
		For Copper Electrodes	CRN	CRN-2XLB	Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes	R0.1 –R3							◎	○	J164	J374
		For Graphite	DF	DF-2XLB	Ball nose, Medium cut length, 2 flute, Long neck, For graphite	R0.2 –R2	Graphite : ◎ GFRP : ○ CFRP : ○							○	J168	J380
TAPER NECK BALL																
	2	For Deep Slotting	MS	MS2XB	Ball nose end mill, 2 flute, Taper neck	R0.1 –R2	◎	◎	○		○	○			J140	J305
			VC	VC-XB	Ball nose taper end mill, Medium cut length, Taper neck	R0.5 –R6	○	◎	◎	○	○	○			J161	J359
	3	For Deep Slotting of Hardened Steels	VF	VF-3XB	Ball nose, Medium cut length, 3 flute, Taper neck	R0.4 –R2.5	○	◎	◎	◎	○	○			J173	J328
		For Graphite	DF	DF-3XB	Ball nose, Medium cut length, 3 flute, Taper neck, For graphite	R0.5 –R2	Graphite : ◎ GFRP : ○ CFRP : ○							○	J177	J381
WIDE BALL																
	2	For Profiling of Special Geometry	VF	VF-2WB	Wide ball nose, Medium cut length, 2 flute	R1 –R3	○	◎	○		◎	◎			J143	J323
TAPER BALL																
	2	For Angled Face Machining	MS	MS2MTB	Ball nose taper end mill, Medium cut length, 2 flute	R0.2 –R1.5	◎	◎	○		○	○			J233	J303
	4	For Rib Milling	MS	MS4LTB	Ball nose, 4 flute, Taper, For rib milling	R0.3 –R1	◎	◎	○		○	○			J235	J311
		For Machining of Hardened Steels	VC	VC-4STB	Ball nose taper end mill, Short cut length, 4 flute	R0.3 –R4	○	◎	◎	◎	○	○			J238	J367

RADIUS

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
	2	For Corner Radius	MS	MS2MRB	Corner radius end mill, Medium cut length, 2 flute	φ1 –φ12	◎	◎	○		○	○			J182	J290
	2	For Copper Electrodes	CRN	CRN-2MRB	Corner radius, Medium cut length, 2 flute, For copper electrodes	φ6 –φ12							◎	○	J189	J375
	3	For Machining of Aluminium Alloys	—	C-3SARB	Corner radius, Short cut length, 3 flute, For aluminium alloy	φ12 –φ25							○	◎	J193	J390
	2 4	For High-Precision Machining	VC	VC-PSRB	Corner radius end mill, Short cut length, 2–4 flute, High precision	φ0.6 –φ12	◎	◎	◎	◎	○	○			J185	J362
	2 4	For Graphite	DF	DF-PSRB	Corner radius end mill, Short cut length, 2–4 flute, High precision, For graphite	φ0.5 –φ12	Graphite : ◎ GFRP : ○ CFRP : ○							○	J214	J382
	4	For high feed cutting	MS	MSMHDRB	High power, Corner radius, Medium cut length, 4 flute	φ2 –φ20	◎	◎	○		◎	◎			J197	J308
	4	For High Efficiency Machining	VF	VF-HVRB	4 flute, Corner radius, Short cut length,Irregular helix flutes	φ1 –φ16	◎	◎	◎	◎	○	○			J199	J332
	4	For High Feed Machining	VC	VC-HFRB	Corner radius, Short flute length, 4 flute, High feed machining	φ2 –φ16	◎	◎	◎	○		○			J210	J364
	4	For Corner Radius	MS	MS4MRB	Corner radius end mill, Medium cut length, 4 flute	φ3 –φ20	◎	◎	○		○	○			J195	J307
	4	For Corner Radius	VC	VC-4SRB	Corner radius end mill, Short cut length, 4 flute	φ4 –φ12	○	◎	◎	○	○	○			J208	J350
	4	For Corner Radius	VC	VC-4JRB	Corner radius end mill, Semi long cut length, 4 flute	φ3 –φ20	○	◎	○	○	○	○			J209	J351
	4	For Difficult-to-cut Materials	VQ	VQ-MHVRB NEW	Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes	φ2 –φ20	◎	○			◎	◎	○		J205	J345
	4	For Difficult-to-cut Materials	VQ	VQ-MHVRB-F NEW	Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes (for finishing)	φ6 –φ16	○	○			○	◎			J207	J346
	4	For Difficult-to-cut Materials	VF	VF-MHVRB	Corner radius, Medium cut length, Irregular helix flutes	φ6 –φ20	◎	○	○		◎	◎			J203	J317
	4	For Difficult-to-cut Materials	VF	VF-MHVRB-CH	Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes	φ16 –φ20					◎	◎			J204	J338
	4	For Difficult-to-cut Materials	VC	VC-MHDRB	Corner radius end mill, Medium cut length, 4 flute, High helix angle	φ2 –φ25	○	◎	◎	○	◎	◎			J212	J365

END MILLS SELECTION CHART CARBIDE(By Shape)

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
RADIUS																
	6	For Machining of Hardened Steels	VF	VF-SDRB	IMPACT MIRACLE Corner radius end mill, 6 flute (S)	ϕ3 –ϕ12	○	◎	◎	◎					J217	J320
	6	For Machining of Hardened Steels	VF	VF-MDRB	Corner radius, Medium cut length, 6 flute, For hardened materials	ϕ3 –ϕ20	○	◎	◎	◎					J218	J320
	6	For Difficult-to-cut Materials	VF	VF-6MHVRB	Corner radius, Medium cut length, 6 flute, Irregular helix flutes	ϕ6 –ϕ20	○	○	○		◎	◎			J216	J319
	6	For Difficult-to-cut Materials	VF	VF-6MHVRB-CH	Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ10,ϕ12 ϕ16,ϕ20					◎	◎			J219	J338
	8	For Difficult-to-cut Materials	VF	VF-8MHVRB-CH	Corner radius end mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J220	J339
LONG NECK CORNER RADIUS																
	2	For Deep Slotting	MS	MS2XLRB	Corner radius end mill, Short cut length, 2 flute, Long neck	ϕ1 –ϕ6	◎	◎	○		○	○			J184	J306
	2	For Machining of Hardened Steels	—	CBN-2XLRB	Corner radius end mill, Medium cut length, 2 flute, Long neck	ϕ0.5 –ϕ2	○	◎	◎	◎					J192	J386
	2	For Copper Electrodes	CRN	CRN-2XLRB	Corner radius, Medium cut length, 2 flute, For copper electrodes	ϕ0.5 –ϕ6							◎	○	J190	J376
ROUGHING																
	3	For Machining of Aluminium Alloys	—	C-SRA	Roughing end mill, Short cut length, 3 flute, For aluminium alloy	ϕ10 –ϕ25								◎	J117	J393
	3	For Machining of Aluminium Alloys	—	C-MRA	Roughing end mill, Medium cut length, 3 flute, For aluminium alloy	ϕ3 –ϕ25								◎	J118	J394
	3 4	For Roughing	VC	VC-SFPR	Roughing end mill, Short cut length, 3—4 flute	ϕ3 –ϕ20	◎	◎	○		◎	◎			J122	J356
	4	For Machining of Hardened Steels	VF	VF-SFPR	Roughing end mill, Short cut length, 3—4 flute	ϕ3 –ϕ20	◎	◎	○		◎	◎			J119	J321
	4	For Machining of Hardened Steels	VF	VF-MFPR	Roughing end mill, Medium cut length, 4 flute	ϕ5 –ϕ20	◎	◎	○		◎	◎			J120	J322
	4	For Difficult-to-cut Materials	VF	VF-SFPR-CH	Roughing end mill, Short cut length, 4 flute, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J121	J339
	6	For Difficult-to-cut Materials	VF	VF-6SVR-CH	Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes	ϕ16, ϕ20					◎	◎			J123	J340

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size Range	Work Material								Page Number	
							P		H		M	S	N		Dimensions	Cutting Conditions
							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	Aluminium Alloy		
CORNER RADIUS, ROUGHING																
	3	For Machining of Aluminium Alloys	—	C-SRARB	Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy	ϕ10 –ϕ25								◎	J194	J393
CHAMFER CUTTER																
	2	For Chamfering	VC	VC-2C	Chamfer cutter, 2 flute	ϕ2 –ϕ12	◎	◎	◎	○	◎	◎	○	○	J240	J369

END MILLS SELECTION CHART HSS (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
VIOLET END MILLS																
General Use	SQUARE	2	V	VA-2SS	End mill, Short cut length, 2 flute	ϕ3 –ϕ20	◎	○			○	○			J244	J399
			V	VA-2MS	End mill, Medium cut length, 2 flute	ϕ3 –ϕ40	◎	○			○	○			J245	J399
		4	V	VA-4MC	End mill, Medium cut length, 4 flute	ϕ3 –ϕ30	◎	○			○	○			J261	J401
For Difficult-to-cut Materials		2 3 4	V	VA-MH	End mill, Medium cut length, 2–4 flute	ϕ5 –ϕ30	◎	○			◎	○			J259	J400
For Roughing	ROUGHING	4 5 6	V	VA-SFPR	Roughing end mill, Short cut length, 4–6 flute, Fine pitch form	ϕ5 –ϕ50	◎	○			◎	○			J272	J402
			V	VA-MFPR	Roughing end mill, Medium cut length, 4–6 flute, Fine pitch form	ϕ5 –ϕ50	◎	○			◎	○			J273	J403
			V	VA-MR	Roughing end mill, Medium cut length, 4–6 flute	ϕ5 –ϕ50	◎	○			◎	○			J274	J404
			V	VA-JR	Roughing end mill, Semi long cut length, 4–6 flute	ϕ10 –ϕ50	◎	○			◎	○			J275	J405
			V	VA-LR	Roughing end mill, Long cut length, 4–6 flute	ϕ10 –ϕ50	◎	○			◎	○			J276	J405
TIN COATED END MILLS																
General Use	SQUARE	2	G	G-2MS	End mill, Medium cut length, 2 flute	ϕ1 –ϕ40	◎	○			○	○		○	J250	J408
		4	G	G-4MC	End mill, Medium cut length, 4 flute	ϕ3 –ϕ30	◎	○			○	○		○	J263	J411
			G	G-4LC	End mill, Long cut length, 4 flute, Center cutting	ϕ3 –ϕ40	◎	○			○	○		○	J267	J411
For Roughing	ROUGHING	3 4 6	G	G-SFPR	Roughing end mill, Short cut length, 3–6 flute, Fine pitch form	ϕ5 –ϕ50	◎	○			○	○		○	J271	J415
		4 5 6	G	G-MR	Roughing end mill, Medium cut length, 4–6 flute	ϕ5 –ϕ50	◎	○			○	○		○	J278	J415
TWO-FLUTE END MILLS																
General Use	SQUARE	2	—	2SS	End mill, Short cut length, 2 flute	ϕ0.5 –ϕ20	◎	○			○	○		○	J246	J406
			—	S-2MD	End mill, Short cut length, 2 flute, KHA Super	ϕ0.4 –ϕ20	◎	○			○	○		○	J248	J407

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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 – Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
General Use	SQUARE	2	—	2MS	 End mill, Medium cut length, 2 flute	ϕ1 –ϕ60	◎	○			○	○		○	J252	J409
General Use	SQUARE	2	—	2LS	 End mill, Long cut length, 2 flute	ϕ1 –ϕ40	◎	○			○	○		○	J254	J409
For Key Way Slotting	SQUARE	2	—	2MK	 End mill, Short cut length, 2 flute, For key ways	ϕ3 –ϕ20	◎	○			○			○	J256	—
FOUR-FLUTE END MILLS																
General Use	SQUARE	4	—	S-4MD	 End mill, Medium cut length, 4 flute	ϕ2.5 –ϕ20	◎	○			○	○		○	J262	J410
General Use	SQUARE	4	—	4MC	 End mill, Medium cut length, 4 flute, Center cutting	ϕ2.5 –ϕ40	◎	○			○	○		○	J264	J412
General Use	SQUARE	4	—	S-4JC	 End mill, Semi long cut length, 4 flute	ϕ3 –ϕ40	◎	○			○	○		○	J266	J410
General Use	SQUARE	4	—	4LC	 End mill, Long cut length, 4 flute, Center cutting	ϕ3 –ϕ40	◎	○			○	○		○	J269	J412
BALL NOSE END MILLS																
For Profiling	BALL	2	—	S-2MB	 Ball nose end mill, Medium cut length, 2 flute	R0.5 –R25	◎	○			○	○		○	J282	J413
ROUGHING END MILLS																
For Roughing	ROUGHING	4 5 6	—	SR	 Roughing end mill, Short cut length, 4—6 flute	ϕ10 –ϕ40	◎	○			○	○		○	J277	J414
For Roughing	ROUGHING	4 5 6	—	MR	 Roughing end mill, Medium cut length, 4—6 flute	ϕ5 –ϕ50	◎	○			○	○		○	J279	J414
For Roughing	ROUGHING	4 5 6	—	JR	 Roughing end mill, Semi long cut length, 4—6 flute	ϕ10 –ϕ50	◎	○			○	○		○	J280	J414
For Roughing	ROUGHING	4 5 6	—	LR	 Roughing end mill, Long cut length, 4—6 flute	ϕ10 –ϕ50	◎	○			○	○		○	J281	J414
For Roughing	ROUGHING BALL NOSE	4	—	MRB	 Ball nose roughing end mill, Medium cut length, 4 flute	R4 –R25	◎	○			○	○		○	J284	—
HIGH HELIX END MILLS																
For Difficult-to-cut Materials	SQUARE	2 3 4	—	K-MH	 End mill, Medium cut length, 2—4 flute, High helix angle	ϕ5 –ϕ20	◎	○			○	○	○	○	J260	J416

END MILLS SELECTION CHART HSS (By Series)

Applications, Features	Type	No. of Flutes	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
LIGHT ALLOY STEEL END MILLS																
For Machining of Aluminium Sashes	SQUARE	1	—	1MA	 End mill, Medium cut length, 1 flute	φ3 –φ8								◎	J242	—
			—	1LA	 End mill, Long cut length, 1 flute	φ4 –φ12								◎	J243	—
For Machining of Aluminium Alloys		2	—	S-2SDA	 End mill, Short cut length, 2 flute, For aluminium alloy	φ3 –φ20							○	◎	J258	J416

END MILLS SELECTION CHART HSS (By Shape)

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
SQUARE																
	1	For Machining of Aluminium Sashes	—	1MA	 End mill, Medium cut length, 1 flute	φ3 –φ8								◎	J242	—
			—	1LA	 End mill, Long cut length, 1 flute	φ4 –φ12								◎	J243	—
	2	General Use	V	VA-2SS	 End mill, Short cut length, 2 flute	φ3 –φ20	◎	○			○	○			J244	J399
			V	VA-2MS	 End mill, Medium cut length, 2 flute	φ3 –φ40	◎	○			○	○			J245	J399
			G	G-2MS	 End mill, Medium cut length, 2 flute	φ1 –φ40	◎	○			○	○		○	J250	J408
			—	2SS	 End mill, Short cut length, 2 flute	φ0.5 –φ20	◎	○			○	○		○	J246	J406
			—	S-2MD	 End mill, Short cut length, 2 flute, KHA Super	φ0.4 –φ20	◎	○			○	○		○	J248	J407
			—	2MS	 End mill, Medium cut length, 2 flute	φ1 –φ60	◎	○			○	○		○	J252	J409
			—	2LS	 End mill, Long cut length, 2 flute	φ1 –φ40	◎	○			○	○		○	J254	J409
		For Key Way Slotting	—	2MK	 End mill, Short cut length, 2 flute, For key ways	φ3 –φ20	◎	○			○			○	J256	—
		For Machining of Aluminium Alloys	—	S-2SDA	 End mill, Short cut length, 2 flute, For aluminium alloy	φ3 –φ20							○	◎	J258	J416
	2 3 4	For Difficult-to-cut Materials	V	VA-MH	 End mill, Medium cut length, 2–4 flute	φ5 –φ30	◎	○			◎	○			J259	J400
			—	K-MH	 End mill, Medium cut length, 2–4 flute, High helix angle	φ5 –φ20	◎	○			○	○	○	○	J260	J416
	4	General Use	V	VA-4MC	 End mill, Medium cut length, 4 flute	φ3 –φ30	◎	○			○	○			J261	J401
			G	G-4MC	 End mill, Medium cut length, 4 flute	φ3 –φ30	◎	○			○	○		○	J263	J411
			G	G-4LC	 End mill, Long cut length, 4 flute, Center cutting	φ3 –φ40	◎	○			○	○		○	J267	J411
			—	S-4MD	 End mill, Medium cut length, 4 flute	φ2.5 –φ20	◎	○			○	○		○	J262	J410

END MILLS SELECTION CHART HSS (By Shape)

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
SQUARE																
	4	General Use	—	4MC	 End mill, Medium cut length, 4 flute, Center cutting	ϕ2.5 –ϕ40	◎	○			○	○		○	J264	J412
	4	General Use	—	S-4JC	 End mill, Semi long cut length, 4 flute	ϕ3 –ϕ40	◎	○			○	○		○	J266	J410
	4	General Use	—	4LC	 End mill, Long cut length, 4 flute, Center cutting	ϕ3 –ϕ40	◎	○			○	○		○	J269	J412
ROUGHING																
	3 4 6	For Roughing	G	G-SFPR	 Roughing end mill, Short cut length, 3–6 flute, Fine pitch form	ϕ5 –ϕ50	◎	○			○	○		○	J271	J415
	4 5 6	For Roughing	V	VA-SFPR	 Roughing end mill, Short cut length, 4–6 flute, Fine pitch form	ϕ5 –ϕ50	◎	○			◎	○			J272	J402
	4 5 6	For Roughing	V	VA-MFPR	 Roughing end mill, Medium cut length, 4–6 flute, Fine pitch form	ϕ5 –ϕ50	◎	○			◎	○			J273	J403
	4 5 6	For Roughing	V	VA-MR	 Roughing end mill, Medium cut length, 4–6 flute	ϕ5 –ϕ50	◎	○			◎	○			J274	J404
	4 5 6	For Roughing	V	VA-JR	 Roughing end mill, Semi long cut length, 4–6 flute	ϕ10 –ϕ50	◎	○			◎	○			J275	J405
	4 5 6	For Roughing	V	VA-LR	 Roughing end mill, Long cut length, 4–6 flute	ϕ10 –ϕ50	◎	○			◎	○			J276	J405
	4 5 6	For Roughing	G	G-MR	 Roughing end mill, Medium cut length, 4–6 flute	ϕ5 –ϕ50	◎	○			○	○		○	J278	J415
	4 5 6	For Roughing	—	SR	 Roughing end mill, Short cut length, 4–6 flute	ϕ10 –ϕ40	◎	○			○	○		○	J277	J414
	4 5 6	For Roughing	—	MR	 Roughing end mill, Medium cut length, 4–6 flute	ϕ5 –ϕ50	◎	○			○	○		○	J279	J414
	4 5 6	For Roughing	—	JR	 Roughing end mill, Semi long cut length, 4–6 flute	ϕ10 –ϕ50	◎	○			○	○		○	J280	J414
	4 5 6	For Roughing	—	LR	 Roughing end mill, Long cut length, 4–6 flute	ϕ10 –ϕ50	◎	○			○	○		○	J281	J414
BALL																
	2	For Profiling	—	S-2MB	 Ball nose end mill, Medium cut length, 2 flute	R0.5 –R25	◎	○			○	○		○	J282	J413

Type	No. of Flutes	Applications, Features	Coating	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
ROUGHING BALL NOSE																
	4	For Roughing	—	MRB	 Ball nose roughing end mill, Medium cut length, 4 flute	R4 –R25	◎	○			○	○		○	J284	—

Indexable head end mills

iMX End Mill Series

Head

Type	Applications, Features	No. of Flutes	Coating grade	Product Code	Shape	Size 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: Aluminium Alloy	Page Number: Dimensions	Page Number: Cutting Conditions
SQUARE																
	For Difficult-to-cut Materials	3	EP7020	iMX-S3HV	Square head, 3 flute, For aluminium alloy 	ϕ10–ϕ25	◎	○			◎	◎	○		J419	J433
		4	EP7020	iMX-S4HV		ϕ10–ϕ25	◎	○			◎	◎	○		J420	J436
		4	EP7020	iMX-S4HV-S		ϕ10–ϕ25	◎	○			◎	◎	○		J421	J436
	For Machining of Aluminium Alloys	3	ET2020	iMX-S3A		ϕ10–ϕ25								◎	J422	J441
ROUGHING																
	For Difficult-to-cut Materials	4	EP7020	iMX-R4F	Roughing head, 4 flute 	ϕ10–ϕ25	◎	○			◎	◎	○		J423	J438
BALL																
	For Difficult-to-cut Materials	4	EP7020	iMX-B4HV	Ball nose head, 4 flute, Irregular helix 	ϕ10–ϕ25	◎	○			◎	◎	○		J424	J443
		4	EP7020	iMX-B4HV-E		ϕ10–ϕ25	◎	○			◎	◎	○		J425	J443
		6	EP7020	iMX-B6HV		ϕ10–ϕ25	◎	○			◎	◎			J426	J443
RADIUS																
	For Difficult-to-cut Materials	4	EP7020	iMX-C4HV	Corner radius head, 4 flute, Irregular helix 	ϕ10–ϕ25	◎	○			◎	◎	○		J427	J436
		4	EP7020	iMX-C4HV-S		ϕ10–ϕ25	◎	○			◎	◎	○		J428	J436
		6	EP7020	iMX-C6HV		ϕ10–ϕ25	◎	○			◎	◎			J429	J442
		10	EP7020	iMX-C10HV		ϕ10–ϕ25	◎	○			◎	◎			J429	J442
		12	EP7020	iMX-C12HV	Corner radius head, 3 flute, For aluminium alloy	ϕ10–ϕ25	◎	○			◎	◎			J429	J442
	For High Efficiency Machining	4	EP6120	iMX-C4FV		ϕ10–ϕ25	◎	◎	◎						J430	J440
	For Machining of Aluminium Alloys	3	ET2020	iMX-C3A		ϕ10–ϕ25								◎	J431	J441

Carbide Holder


Undercut

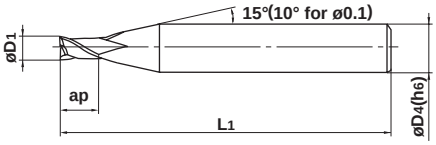

Taper neck type

*Please refer to J432 for details.

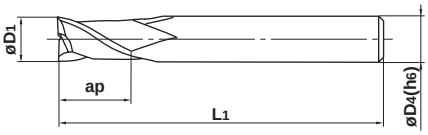
MS2SS

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

D1=0.1	D1 >0.1			
0 - 0.010	0 - 0.020			
4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 2 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2SSD0010	0.1	0.15	40	4	2	●	1
D0020	0.2	0.3	40	4	2	●	1
D0030	0.3	0.45	40	4	2	●	1
D0040	0.4	0.6	40	4	2	●	1
D0050	0.5	0.75	40	4	2	●	1
D0060	0.6	0.9	40	4	2	●	1
D0070	0.7	1.1	40	4	2	●	1
D0080	0.8	1.2	40	4	2	●	1
D0090	0.9	1.4	40	4	2	●	1
D0100	1	1.5	40	4	2	●	1
D0120	1.2	1.8	40	4	2	●	1
D0150	1.5	2.3	40	4	2	●	1
D0180	1.8	2.7	40	4	2	●	1
D0200	2	3	40	4	2	●	1
D0250	2.5	3.8	40	4	2	●	1
D0300	3	4.5	45	6	2	●	1
D0400	4	6	50	6	2	●	1
D0500	5	7.5	50	6	2	●	1
D0600	6	9	50	6	2	●	2
D0700	7	10.5	60	8	2	●	1
D0800	8	12	60	8	2	●	2
D0900	9	13.5	70	10	2	●	1
D1000	10	15	70	10	2	●	2
D1100	11	16.5	75	12	2	●	1
D1200	12	18	75	12	2	●	2

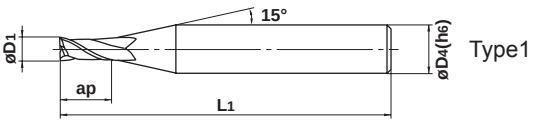
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J290

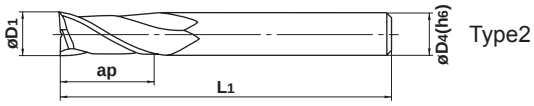
MS2MS

End mill, Medium cut length, 2 flute

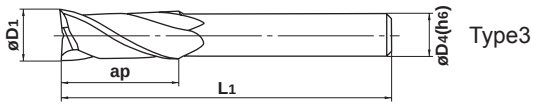
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2



Type3

D1 ≤12	D1 >12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 2 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MSD0020	0.2	0.4	40	4	2	●	1
D0030	0.3	0.6	40	4	2	●	1
D0040	0.4	0.8	40	4	2	●	1
D0050	0.5	1	40	4	2	●	1
D0060	0.6	1.2	40	4	2	●	1
D0070	0.7	1.4	40	4	2	●	1
D0080	0.8	1.6	40	4	2	●	1
D0090	0.9	1.8	40	4	2	●	1
D0100	1	2	40	4	2	●	1
D0110	1.1	2.2	40	4	2	●	1
D0120	1.2	2.4	40	4	2	●	1
D0130	1.3	2.6	40	4	2	●	1
D0140	1.4	2.8	40	4	2	●	1
D0150	1.5	3	40	4	2	●	1
D0160	1.6	3.2	40	4	2	●	1
D0170	1.7	3.4	40	4	2	●	1
D0180	1.8	3.6	40	4	2	●	1
D0190	1.9	3.8	40	4	2	●	1
D0200	2	4	40	4	2	●	1
D0210	2.1	4.2	40	4	2	●	1
D0220	2.2	4.4	40	4	2	●	1
D0230	2.3	4.6	40	4	2	●	1
D0240	2.4	4.8	40	4	2	●	1
D0250	2.5	5	40	4	2	●	1
D0260	2.6	5.2	40	4	2	●	1
D0270	2.7	5.4	40	4	2	●	1
D0280	2.8	5.6	40	4	2	●	1
D0290	2.9	5.8	40	4	2	●	1
D0300	3	6	45	6	2	●	1
D0310	3.1	6.2	45	6	2	●	1
D0320	3.2	6.4	45	6	2	●	1
D0330	3.3	6.6	45	6	2	●	1
D0340	3.4	6.8	45	6	2	●	1
D0350	3.5	7	45	6	2	●	1

CUTTING CONDITIONS ➤ J290

MS2MS

End mill, Medium cut length, 2 flute

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2MSD0360	3.6	7.2	45	6	2	●	1
D0370	3.7	7.4	45	6	2	●	1
D0380	3.8	7.6	45	6	2	●	1
D0390	3.9	7.8	45	6	2	●	1
D0400	4	8	50	6	2	●	1
D0410	4.1	8.2	50	6	2	●	1
D0420	4.2	8.4	50	6	2	●	1
D0430	4.3	8.6	50	6	2	●	1
D0440	4.4	8.8	50	6	2	●	1
D0450	4.5	9	50	6	2	●	1
D0460	4.6	9.2	50	6	2	●	1
D0470	4.7	9.4	50	6	2	●	1
D0480	4.8	9.6	50	6	2	●	1
D0490	4.9	9.8	50	6	2	●	1
D0500	5	10	50	6	2	●	1
D0510	5.1	10.2	50	6	2	●	1
D0520	5.2	10.4	50	6	2	●	1
D0530	5.3	10.6	50	6	2	●	1
D0540	5.4	10.8	50	6	2	●	1
D0550	5.5	11	50	6	2	●	1
D0560	5.6	11.2	50	6	2	●	1
D0570	5.7	11.4	50	6	2	●	1
D0580	5.8	11.6	50	6	2	●	1
D0590	5.9	11.8	50	6	2	●	1
D0600	6	12	50	6	2	●	2
D0650	6.5	13	60	8	2	●	1
D0700	7	14	60	8	2	●	1
D0750	7.5	15	60	8	2	●	1
D0800	8	16	60	8	2	●	2
D0850	8.5	17	70	10	2	●	1
D0900	9	18	70	10	2	●	1
D0950	9.5	19	70	10	2	●	1
D1000	10	20	70	10	2	●	2
D1100	11	22	75	12	2	●	1
D1200	12	24	75	12	2	●	2
D1600	16	32	90	16	2	●	2
D1800	18	36	90	16	2	●	3
D2000	20	40	100	20	2	●	2

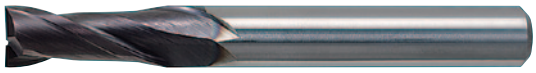
● : Inventory maintained in Japan.

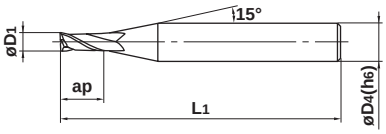
CUTTING CONDITIONS ➤ J290

MS2MD

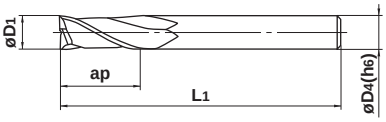
End mill, Medium cut length, 2 flute

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	Aluminium Alloy
◎	◎	○		○	○		





Type1



Type2

h6	1 ≤D1 ≤12				
	0 - 0.020				
	4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

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

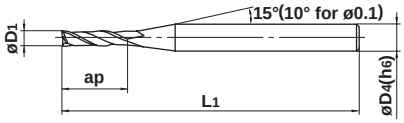
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MDD0100	1	2.5	40	4	2	●	1
D0150	1.5	3.8	40	4	2	●	1
D0200	2	5	40	4	2	●	1
D0250	2.5	6.3	40	4	2	●	1
D0300	3	7.5	50	6	2	●	1
D0400	4	10	50	6	2	●	1
D0500	5	12.5	50	6	2	●	1
D0600	6	15	50	6	2	●	2
D0800	8	20	60	8	2	●	2
D1000	10	25	70	10	2	●	2
D1200	12	30	90	12	2	●	2

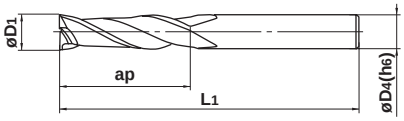
MS2JS

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

D1=0.1	D1 >0.1			
0 - 0.010	0 - 0.020			
4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 2 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2JSD0010	0.1	0.3	40	4	2	●	1
D0020	0.2	0.6	40	4	2	●	1
D0030	0.3	0.9	40	4	2	●	1
D0040	0.4	1.2	40	4	2	●	1
D0050	0.5	1.5	40	4	2	●	1
D0060	0.6	1.8	40	4	2	●	1
D0070	0.7	2.1	40	4	2	●	1
D0080	0.8	2.4	40	4	2	●	1
D0090	0.9	2.7	40	4	2	●	1
D0100	1	3	40	4	2	●	1
D0120	1.2	3.6	40	4	2	●	1
D0150	1.5	4.5	40	4	2	●	1
D0180	1.8	5.4	40	4	2	●	1
D0200	2	6	40	4	2	●	1
D0250	2.5	7.5	40	4	2	●	1
D0300	3	9	45	6	2	●	1
D0400	4	12	50	6	2	●	1
D0500	5	15	50	6	2	●	1
D0600	6	18	50	6	2	●	2
D0800	8	24	70	8	2	●	2
D1000	10	30	90	10	2	●	2
D1200	12	36	90	12	2	●	2

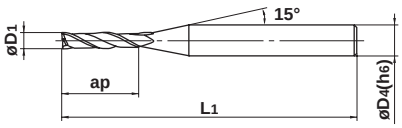
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J292

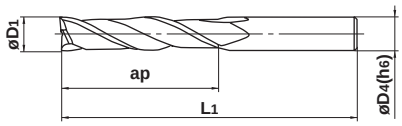
MS2LS

End mill, 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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

0.2 ≤D1 ≤12				
0 - 0.020				
4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

2 flute end mill for general use.

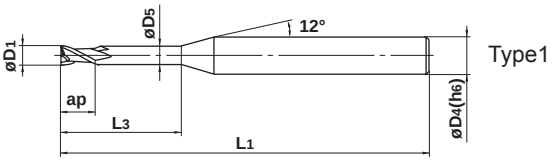
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2LSD0020	0.2	0.8	40	4	2	●	1
D0030	0.3	1.2	40	4	2	●	1
D0040	0.4	1.6	40	4	2	●	1
D0050	0.5	2	40	4	2	●	1
D0060	0.6	2.4	40	4	2	●	1
D0070	0.7	2.8	40	4	2	●	1
D0080	0.8	3.2	40	4	2	●	1
D0090	0.9	3.6	40	4	2	●	1
D0100	1	4	40	4	2	●	1
D0150	1.5	6	40	4	2	●	1
D0200	2	8	40	4	2	●	1
D0250	2.5	10	50	4	2	●	1
D0300	3	12	50	6	2	●	1
D0400	4	16	50	6	2	●	1
D0500	5	20	60	6	2	●	1
D0600	6	24	60	6	2	●	2
D0800	8	32	70	8	2	●	2
D1000	10	40	90	10	2	●	2
D1200	12	48	110	12	2	●	2

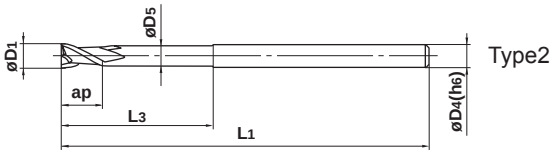
MS2XL

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

D1 <0.5	D1 ≥0.5			
0 - 0.010	0 - 0.020			
4 ≤D4 ≤6				
0 - 0.008				

h6

● 2 flute long neck end mill.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2XLD0020N005	0.2	0.3	0.5	0.17	45	4	2	●	1
D0020N010	0.2	0.3	1	0.17	45	4	2	●	1
D0020N015	0.2	0.3	1.5	0.17	45	4	2	●	1
D0030N010	0.3	0.4	1	0.27	45	4	2	●	1
D0030N020	0.3	0.4	2	0.27	45	4	2	●	1
D0030N030	0.3	0.4	3	0.27	45	4	2	●	1
D0030N060	0.3	0.4	6	0.27	45	4	2	●	1
D0030N090	0.3	0.4	9	0.27	45	4	2	●	1
D0040N020	0.4	0.6	2	0.36	45	4	2	●	1
D0040N030	0.4	0.6	3	0.36	45	4	2	●	1
D0040N040	0.4	0.6	4	0.36	45	4	2	●	1
D0040N080	0.4	0.6	8	0.36	45	4	2	●	1
D0040N120	0.4	0.6	12	0.36	45	4	2	●	1
D0050N020	0.5	0.7	2	0.46	45	4	2	●	1
D0050N040	0.5	0.7	4	0.46	45	4	2	●	1
D0050N060	0.5	0.7	6	0.46	45	4	2	●	1
D0050N080	0.5	0.7	8	0.46	50	4	2	●	1
D0050N100	0.5	0.7	10	0.46	50	4	2	●	1
D0050N150	0.5	0.7	15	0.46	50	4	2	●	1
D0060N020	0.6	0.9	2	0.56	45	4	2	●	1
D0060N040	0.6	0.9	4	0.56	45	4	2	●	1
D0060N060	0.6	0.9	6	0.56	45	4	2	●	1
D0060N080	0.6	0.9	8	0.56	50	4	2	●	1
D0060N100	0.6	0.9	10	0.56	50	4	2	●	1
D0060N120	0.6	0.9	12	0.56	50	4	2	●	1
D0060N180	0.6	0.9	18	0.56	50	4	2	●	1
D0070N020	0.7	1	2	0.66	45	4	2	●	1
D0070N040	0.7	1	4	0.66	45	4	2	●	1
D0070N060	0.7	1	6	0.66	45	4	2	●	1
D0070N080	0.7	1	8	0.66	50	4	2	●	1
D0070N100	0.7	1	10	0.66	50	4	2	●	1
D0080N040	0.8	1.2	4	0.76	45	4	2	●	1
D0080N060	0.8	1.2	6	0.76	45	4	2	●	1
D0080N080	0.8	1.2	8	0.76	50	4	2	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2XLD0080N100	0.8	1.2	10	0.76	50	4	2	●	1
D0080N120	0.8	1.2	12	0.76	50	4	2	●	1
D0080N160	0.8	1.2	16	0.76	50	4	2	●	1
D0080N240	0.8	1.2	24	0.76	60	4	2	●	1
D0090N060	0.9	1.4	6	0.86	45	4	2	●	1
D0090N080	0.9	1.4	8	0.86	50	4	2	●	1
D0090N100	0.9	1.4	10	0.86	50	4	2	●	1
D0090N150	0.9	1.4	15	0.86	60	4	2	●	1
D0100N040	1	1.5	4	0.94	50	4	2	●	1
D0100N060	1	1.5	6	0.94	50	4	2	●	1
D0100N080	1	1.5	8	0.94	50	4	2	●	1
D0100N100	1	1.5	10	0.94	50	4	2	●	1
D0100N120	1	1.5	12	0.94	50	4	2	●	1
D0100N160	1	1.5	16	0.94	60	4	2	●	1
D0100N200	1	1.5	20	0.94	60	4	2	●	1
D0100N250	1	1.5	25	0.94	70	4	2	●	1
D0100N300	1	1.5	30	0.94	70	4	2	●	1
D0120N060	1.2	1.8	6	1.14	50	4	2	●	1
D0120N080	1.2	1.8	8	1.14	50	4	2	●	1
D0120N100	1.2	1.8	10	1.14	50	4	2	●	1
D0120N120	1.2	1.8	12	1.14	50	4	2	●	1
D0120N160	1.2	1.8	16	1.14	60	4	2	●	1
D0120N200	1.2	1.8	20	1.14	60	4	2	●	1
D0150N060	1.5	2.3	6	1.44	50	4	2	●	1
D0150N080	1.5	2.3	8	1.44	50	4	2	●	1
D0150N100	1.5	2.3	10	1.44	50	4	2	●	1
D0150N120	1.5	2.3	12	1.44	50	4	2	●	1
D0150N140	1.5	2.3	14	1.44	60	4	2	●	1
D0150N160	1.5	2.3	16	1.44	60	4	2	●	1
D0150N180	1.5	2.3	18	1.44	60	4	2	●	1
D0150N200	1.5	2.3	20	1.44	60	4	2	●	1
D0150N250	1.5	2.3	25	1.44	70	4	2	●	1
D0150N300	1.5	2.3	30	1.44	70	4	2	●	1
D0150N380	1.5	2.3	38	1.44	80	4	2	●	1
D0150N450	1.5	2.3	45	1.44	80	4	2	●	1
D0200N060	2	3	6	1.9	50	4	2	●	1
D0200N080	2	3	8	1.9	50	4	2	●	1
D0200N100	2	3	10	1.9	50	4	2	●	1
D0200N120	2	3	12	1.9	50	4	2	●	1
D0200N140	2	3	14	1.9	60	4	2	●	1
D0200N160	2	3	16	1.9	60	4	2	●	1
D0200N180	2	3	18	1.9	60	4	2	●	1
D0200N200	2	3	20	1.9	60	4	2	●	1
D0200N250	2	3	25	1.9	70	4	2	●	1
D0200N300	2	3	30	1.9	70	4	2	●	1
D0200N350	2	3	35	1.9	80	4	2	●	1
D0200N400	2	3	40	1.9	90	4	2	●	1
D0200N500	2	3	50	1.9	100	4	2	●	1
D0200N600	2	3	60	1.9	110	4	2	●	1
D0250N080	2.5	3.7	8	2.4	50	4	2	●	1
D0250N120	2.5	3.7	12	2.4	50	4	2	●	1
D0250N160	2.5	3.7	16	2.4	60	4	2	●	1

CUTTING CONDITIONS ➤ J294

MS2XL

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

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2XLD0250N200	2.5	3.7	20	2.4	60	4	2	●	1
D0250N250	2.5	3.7	25	2.4	70	4	2	●	1
D0250N300	2.5	3.7	30	2.4	70	4	2	●	1
D0250N400	2.5	3.7	40	2.4	90	4	2	●	1
D0250N500	2.5	3.7	50	2.4	100	4	2	●	1
D0300N080	3	4.5	8	2.8	50	6	2	●	1
D0300N120	3	4.5	12	2.8	50	6	2	●	1
D0300N160	3	4.5	16	2.8	60	6	2	●	1
D0300N200	3	4.5	20	2.8	60	6	2	●	1
D0300N250	3	4.5	25	2.8	70	6	2	●	1
D0300N300	3	4.5	30	2.8	70	6	2	●	1
D0300N400	3	4.5	40	2.8	90	6	2	●	1
D0300N500	3	4.5	50	2.8	100	6	2	●	1
D0400N120	4	6	12	3.8	50	6	2	●	1
D0400N160	4	6	16	3.8	60	6	2	●	1
D0400N200	4	6	20	3.8	60	6	2	●	1
D0400N250	4	6	25	3.8	70	6	2	●	1
D0400N300	4	6	30	3.8	70	6	2	●	1
D0400N350	4	6	35	3.8	80	6	2	●	1
D0400N400	4	6	40	3.8	90	6	2	●	1
D0400N450	4	6	45	3.8	90	6	2	●	1
D0400N500	4	6	50	3.8	100	6	2	●	1
D0400N600	4	6	60	3.8	110	6	2	●	1
D0500N160	5	7.5	16	4.8	60	6	2	●	1
D0500N250	5	7.5	25	4.8	70	6	2	●	1
D0500N350	5	7.5	35	4.8	80	6	2	●	1
D0500N500	5	7.5	50	4.8	110	6	2	●	1
D0500N600	5	7.5	60	4.8	120	6	2	●	1
D0600N200	6	9	20	5.8	80	6	2	●	2
D0600N300	6	9	30	5.8	90	6	2	●	2
D0600N400	6	9	40	5.8	100	6	2	●	2
D0600N500	6	9	50	5.8	110	6	2	●	2
D0600N600	6	9	60	5.8	120	6	2	●	2

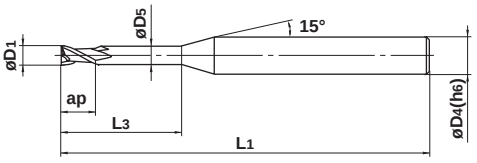
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J294

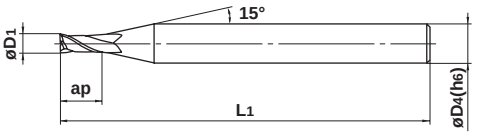
MS2XL6

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

h6	0.3 ≤D1 ≤2.5				
	0 - 0.020				
	D4=6				
	0 - 0.008				

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

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2XL6D0030N008	0.3	0.8	—	—	50	6	2	●	2
D0030N015	0.3	0.5	1.5	0.27	50	6	2	●	1
D0040N010	0.4	0.6	1	0.36	50	6	2	●	1
D0040N020	0.4	0.6	2	0.36	50	6	2	●	1
D0050N013	0.5	0.8	1.3	0.46	50	6	2	●	1
D0050N025	0.5	0.8	2.5	0.46	50	6	2	●	1
D0060N015	0.6	0.9	1.5	0.56	50	6	2	●	1
D0060N030	0.6	0.9	3	0.56	50	6	2	●	1
D0070N018	0.7	1.1	1.8	0.66	50	6	2	●	1
D0070N035	0.7	1.1	3.5	0.66	50	6	2	●	1
D0080N020	0.8	1.2	2	0.76	50	6	2	●	1
D0080N040	0.8	1.2	4	0.76	50	6	2	●	1
D0090N023	0.9	1.4	2.3	0.86	50	6	2	●	1
D0090N045	0.9	1.4	4.5	0.86	50	6	2	●	1
D0100N025	1	1.5	2.5	0.94	50	6	2	●	1
D0100N050	1	1.5	5	0.94	50	6	2	●	1
D0110N028	1.1	1.7	2.8	1.04	50	6	2	●	1
D0110N055	1.1	1.7	5.5	1.04	50	6	2	●	1
D0120N030	1.2	1.8	3	1.14	50	6	2	●	1
D0120N060	1.2	1.8	6	1.14	50	6	2	●	1
D0130N033	1.3	2	3.3	1.24	50	6	2	●	1
D0130N065	1.3	2	6.5	1.24	50	6	2	●	1
D0140N035	1.4	2.1	3.5	1.34	50	6	2	●	1
D0140N070	1.4	2.1	7	1.34	50	6	2	●	1
D0150N038	1.5	2.3	3.8	1.44	50	6	2	●	1
D0150N075	1.5	2.3	7.5	1.44	50	6	2	●	1
D0160N040	1.6	2.4	4	1.54	50	6	2	●	1
D0160N080	1.6	2.4	8	1.54	50	6	2	●	1
D0170N043	1.7	2.6	4.3	1.64	50	6	2	●	1
D0170N085	1.7	2.6	8.5	1.64	50	6	2	●	1
D0180N045	1.8	2.7	4.5	1.74	50	6	2	●	1
D0180N090	1.8	2.7	9	1.74	50	6	2	●	1
D0190N048	1.9	2.9	4.8	1.84	50	6	2	●	1
D0190N095	1.9	2.9	9.5	1.84	50	6	2	●	1

MS2XL6

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

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2XL6D0200N050	2	3	5	1.90	50	6	2	●	1
D0200N100	2	3	10	1.90	50	6	2	●	1
D0210N053	2.1	3.2	5.3	2.00	50	6	2	●	1
D0210N105	2.1	3.2	10.5	2.00	60	6	2	●	1
D0220N055	2.2	3.3	5.5	2.10	50	6	2	●	1
D0220N110	2.2	3.3	11	2.10	60	6	2	●	1
D0230N058	2.3	3.5	5.8	2.20	50	6	2	●	1
D0230N115	2.3	3.5	11.5	2.20	60	6	2	●	1
D0240N060	2.4	3.6	6	2.30	50	6	2	●	1
D0240N120	2.4	3.6	12	2.30	60	6	2	●	1
D0250N063	2.5	3.8	6.3	2.40	50	6	2	●	1
D0250N125	2.5	3.8	12.5	2.40	60	6	2	●	1

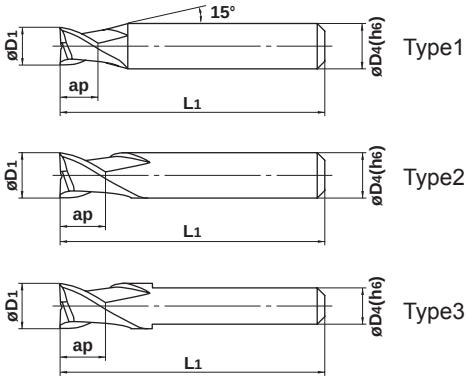
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J295

MS2ES

End mill, 2 flute, For small automatic 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	Aluminium Alloy
◎	◎	○		○	○		



h6	3 ≤D1 ≤12				
	0 - 0.020				
	4 ≤D4 ≤6	7 ≤D4 ≤10			
	0 - 0.008	0 - 0.009			

2 flute end mill.

Overall length 35mm

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2ESD0300L35S04	3	3	35	4	2	●	1
D0350L35S04	3.5	3.5	35	4	2	●	1
D0400L35S04	4	4	35	4	2	●	2
D0500L35S05	5	5	35	5	2	●	2
D0500L35S06	5	5	35	6	2	●	1
D0600L35S05	6	6	35	5	2	●	3
D0600L35S06	6	6	35	6	2	●	2
D0700L35S07	7	6	35	7	2	●	2
D0800L35S07	8	6	35	7	2	●	3
D0800L35S08	8	6	35	8	2	●	2
D1000L35S07	10	6	35	7	2	●	3
D1000L35S10	10	6	35	10	2	●	2
D1200L35S10	12	6	35	10	2	●	3

Overall length 45mm

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2ESD0300L45S04	3	3	45	4	2	●	1
D0350L45S04	3.5	3.5	45	4	2	●	1
D0400L45S04	4	4	45	4	2	●	2
D0500L45S06	5	5	45	6	2	●	1
D0600L45S06	6	6	45	6	2	●	2
D0700L45S07	7	7	45	7	2	●	2
D0800L45S07	8	8	45	7	2	●	3
D0800L45S08	8	8	45	8	2	●	2
D1000L45S07	10	10	45	7	2	●	3
D1000L45S10	10	10	45	10	2	●	2
D1200L45S10	12	12	45	10	2	●	3

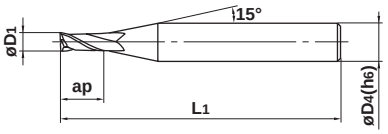
IMPACT MIRACLE END MILLS

VF-2MD

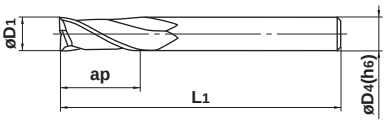
End mill, Medium cut length, 2 flute, For hardened materials

UWC VF 35° D1<3 D1≥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	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2

h6

0.5 ≤D1 ≤6				
0 - 0.020				
4 ≤D4 ≤6				
0 - 0.008				

2 flute end mill suitable for high-speed machining of hardened steel.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2MDD0050	0.5	1.3	40	4	2	●	1
D0100	1	2.5	40	4	2	●	1
D0150	1.5	3.8	40	4	2	●	1
D0200	2	5	40	4	2	●	1
D0250	2.5	6.3	40	4	2	●	1
D0300	3	7.5	50	6	2	●	1
D0400	4	10	50	6	2	●	1
D0500	5	12.5	50	6	2	●	1
D0600	6	15	50	6	2	●	2

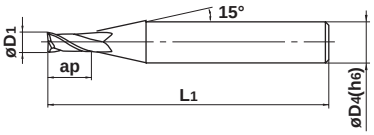
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J312

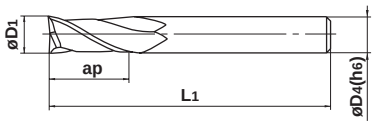
VF-2MV

End mill, Medium cut length, 2 flute, Irregular helix flutes

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	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2

h6	0.5 ≤D1 ≤6				
	0 - 0.020				
	4 ≤D4 ≤6				
	0 - 0.008				

An irregular helix 2 flute square end mill suitable for high-speed machining of hardened steel.

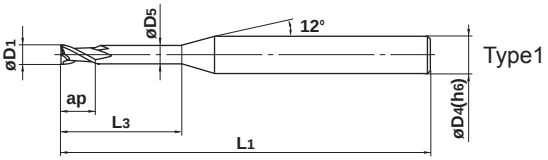
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2MVD0050	0.5	1.3	40	4	2	●	1
D0100	1	2.5	40	4	2	●	1
D0150	1.5	3.8	40	4	2	●	1
D0200	2	5	40	4	2	●	1
D0250	2.5	6.3	40	4	2	●	1
D0300	3	7.5	50	6	2	●	1
D0400	4	10	50	6	2	●	1
D0500	5	12.5	50	6	2	●	1
D0600	6	15	50	6	2	●	2

VF-2XL

End mill, 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	Aluminium Alloy
○	◎	◎	◎				



Type1

0.1 ≤D1 ≤3				
0 - 0.020				
4 ≤D4 ≤6				
0 - 0.008				

h6

● 2 flute long neck end mill for high-speed machining of hardened steels.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2XLD0010N005	0.1	0.15	0.5	0.085	45	4	2	●	1
D0020N006	0.2	0.3	0.6	0.17	45	4	2	●	1
D0020N010	0.2	0.3	1	0.17	45	4	2	●	1
D0020N015	0.2	0.3	1.5	0.17	45	4	2	●	1
D0030N010	0.3	0.5	1	0.27	45	4	2	●	1
D0030N020	0.3	0.5	2	0.27	45	4	2	●	1
D0030N030	0.3	0.5	3	0.27	45	4	2	●	1
D0040N010	0.4	0.6	1	0.36	45	4	2	●	1
D0040N020	0.4	0.6	2	0.36	45	4	2	●	1
D0040N040	0.4	0.6	4	0.36	45	4	2	●	1
D0050N020	0.5	0.8	2	0.46	45	4	2	●	1
D0050N040	0.5	0.8	4	0.46	45	4	2	●	1
D0050N060	0.5	0.8	6	0.46	45	4	2	●	1
D0060N020	0.6	0.9	2	0.56	45	4	2	●	1
D0060N040	0.6	0.9	4	0.56	45	4	2	●	1
D0060N060	0.6	0.9	6	0.56	45	4	2	●	1
D0080N040	0.8	1.2	4	0.76	45	4	2	●	1
D0080N060	0.8	1.2	6	0.76	45	4	2	●	1
D0080N080	0.8	1.2	8	0.76	50	4	2	●	1
D0080N100	0.8	1.2	10	0.76	50	4	2	●	1
D0100N040	1	1.5	4	0.94	50	4	2	●	1
D0100N060	1	1.5	6	0.94	50	4	2	●	1
D0100N080	1	1.5	8	0.94	50	4	2	●	1
D0100N100	1	1.5	10	0.94	50	4	2	●	1
D0100N120	1	1.5	12	0.94	50	4	2	●	1
D0150N060	1.5	2.3	6	1.44	50	4	2	●	1
D0150N080	1.5	2.3	8	1.44	50	4	2	●	1
D0150N100	1.5	2.3	10	1.44	50	4	2	●	1
D0150N120	1.5	2.3	12	1.44	50	4	2	●	1
D0150N160	1.5	2.3	16	1.44	60	4	2	●	1
D0200N060	2	3	6	1.9	50	4	2	●	1
D0200N080	2	3	8	1.9	50	4	2	●	1
D0200N100	2	3	10	1.9	50	4	2	●	1
D0200N120	2	3	12	1.9	50	4	2	●	1

● : Inventory maintained in Japan.

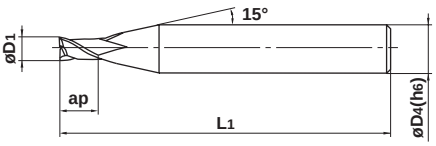
Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
VF2XLD0200N160	2	3	16	1.9	60	4	2	●	1
D0200N200	2	3	20	1.9	60	4	2	●	1
D0300N120	3	4.5	12	2.9	50	6	2	●	1
D0300N160	3	4.5	16	2.9	60	6	2	●	1
D0300N200	3	4.5	20	2.9	60	6	2	●	1

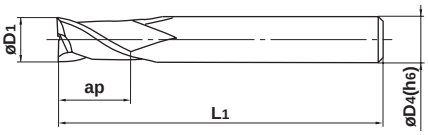
VC-2SS

End mill, Extra 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	Aluminium Alloy
○	◎	◎		○	○		



Type1



Type2

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 2 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2SSD0030	0.3	0.6	50	6	2	●	1
D0040	0.4	0.8	50	6	2	●	1
D0050	0.5	0.8	50	6	2	●	1
D0060	0.6	1	50	6	2	●	1
D0070	0.7	1	50	6	2	●	1
D0080	0.8	1.3	50	6	2	●	1
D0090	0.9	1.3	50	6	2	●	1
D0100	1	1.5	50	6	2	●	1
D0110	1.1	1.5	50	6	2	●	1
D0120	1.2	2	50	6	2	●	1
D0130	1.3	2	50	6	2	●	1
D0140	1.4	2	50	6	2	●	1
D0150	1.5	2.5	50	6	2	●	1
D0160	1.6	2.5	50	6	2	●	1
D0170	1.7	2.5	50	6	2	●	1
D0180	1.8	3	50	6	2	●	1
D0190	1.9	3	50	6	2	●	1
D0200	2	3	50	6	2	●	1
D0210	2.1	3	50	6	2	●	1
D0220	2.2	3.5	50	6	2	●	1
D0230	2.3	3.5	50	6	2	●	1
D0240	2.4	3.5	50	6	2	●	1
D0250	2.5	4	50	6	2	●	1
D0260	2.6	4	50	6	2	●	1
D0270	2.7	4	50	6	2	●	1
D0280	2.8	4	50	6	2	●	1
D0290	2.9	4.5	50	6	2	●	1
D0300	3	4.5	50	6	2	●	1
D0350	3.5	5.5	50	6	2	●	1
D0400	4	6	50	6	2	●	1
D0450	4.5	7	50	6	2	●	1
D0500	5	7.5	50	6	2	●	1
D0550	5.5	8.5	50	6	2	●	1
D0600	6	9	50	6	2	●	2

● : Inventory maintained in Japan.

Unit : mm

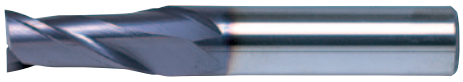
Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
VC2SSD0800	8	12	60	8	2	●	2
D1000	10	15	70	10	2	●	2
D1200	12	18	75	12	2	●	2
D1400	14	21	75	16	2	●	1
D1500	15	23	80	16	2	●	1
D1600	16	24	90	16	2	●	2

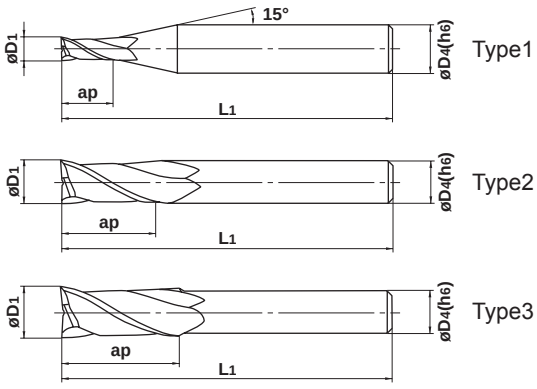
MIRACLE END MILLS

VC-2MS

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	Aluminium Alloy
○	◎	◎		○	○		





D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=3	4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25
0 - 0.006	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

h6

● 2 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2MSD0030	0.3	0.6	38	3	2	●	1
D0040	0.4	0.8	38	3	2	●	1
D0050	0.5	1	38	3	2	●	1
D0060	0.6	1.2	38	3	2	●	1
D0070	0.7	1.4	38	3	2	●	1
D0080	0.8	1.6	38	3	2	●	1
D0090	0.9	2	38	3	2	●	1
D0100	1	2.5	40	4	2	●	1
D0110	1.1	2.5	40	4	2	●	1
D0120	1.2	3	40	4	2	●	1
D0130	1.3	3	40	4	2	●	1
D0140	1.4	3	40	4	2	●	1
D0150	1.5	4	40	4	2	●	1
D0160	1.6	4	40	4	2	●	1
D0170	1.7	4	40	4	2	●	1
D0180	1.8	5	40	4	2	●	1
D0190	1.9	5	40	4	2	●	1
D0200	2	6	40	4	2	●	1
D0210	2.1	6	40	4	2	●	1
D0220	2.2	6	40	4	2	●	1
D0230	2.3	6	40	4	2	●	1
D0240	2.4	8	40	4	2	●	1
D0250	2.5	8	40	4	2	●	1
D0260	2.6	8	40	4	2	●	1
D0270	2.7	8	40	4	2	●	1
D0280	2.8	8	40	4	2	●	1
D0290	2.9	8	40	4	2	●	1
D0300	3	8	45	6	2	●	1
D0350	3.5	10	45	6	2	●	1
D0400	4	11	45	6	2	●	1
D0450	4.5	11	45	6	2	●	1
D0500	5	13	50	6	2	●	1
D0550	5.5	13	50	6	2	●	1
D0600	6	13	50	6	2	●	2

● : Inventory maintained in Japan.

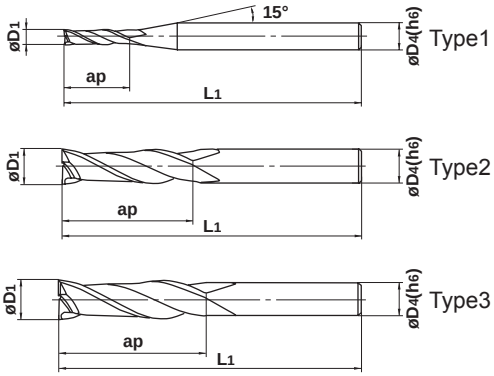
Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
VC2MSD0650	6.5	16	60	8	2	●	1
D0700	7	16	60	8	2	●	1
D0750	7.5	16	60	8	2	●	1
D0800	8	19	60	8	2	●	2
D0850	8.5	19	70	10	2	●	1
D0900	9	19	70	10	2	●	1
D0950	9.5	19	70	10	2	●	1
D1000	10	22	70	10	2	●	2
D1050	10.5	22	75	12	2	●	1
D1100	11	22	75	12	2	●	1
D1150	11.5	22	75	12	2	●	1
D1200	12	26	75	12	2	●	2
D1250	12.5	26	75	12	2	●	3
D1300	13	26	75	12	2	●	3
D1400	14	26	75	12	2	●	3
D1500	15	30	80	16	2	●	1
D1600	16	32	90	16	2	●	2
D1700	17	32	90	16	2	●	3
D1800	18	32	90	16	2	●	3
D1900	19	32	100	20	2	●	1
D2000	20	38	100	20	2	●	2
D2200	22	38	100	20	2	●	3
D2400	24	45	120	25	2	●	1
D2500	25	45	120	25	2	●	2

VC-2JS

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	Aluminium Alloy
○	◎	◎		○	○		



D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 2 flute end mill with longer cut length than standard.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2JSD0100	1	3.5	40	4	2	●	1
D0150	1.5	5	40	4	2	●	1
D0200	2	8	40	4	2	●	1
D0250	2.5	10	40	4	2	●	1
D0300	3	12	50	6	2	●	1
D0350	3.5	15	50	6	2	●	1
D0400	4	15	50	6	2	●	1
D0450	4.5	15	50	6	2	●	1
D0500	5	20	60	6	2	●	1
D0550	5.5	20	60	6	2	●	1
D0600	6	20	60	6	2	●	2
D0650	6.5	25	70	8	2	●	1
D0700	7	25	70	8	2	●	1
D0750	7.5	25	70	8	2	●	1
D0800	8	25	70	8	2	●	2
D0850	8.5	25	90	10	2	●	1
D0900	9	25	90	10	2	●	1
D0950	9.5	25	90	10	2	●	1
D1000	10	30	90	10	2	●	2
D1050	10.5	30	90	12	2	●	1
D1100	11	30	90	12	2	●	1
D1150	11.5	30	90	12	2	●	1
D1200	12	30	90	12	2	●	2
D1300	13	35	90	12	2	●	3
D1400	14	40	110	16	2	●	1
D1500	15	40	110	16	2	●	1
D1600	16	50	110	16	2	●	2
D1700	17	50	110	20	2	●	1
D1800	18	50	110	20	2	●	1
D1900	19	55	110	20	2	●	1
D2000	20	55	110	20	2	●	2
D2200	22	65	140	25	2	●	1
D2400	24	75	140	25	2	●	1
D2500	25	75	140	25	2	●	2

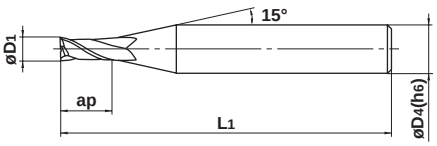
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J349

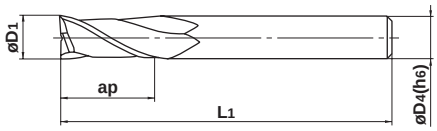
CRN-2MS

End mill, Medium cut length, 2 flute, For copper electrodes

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	Aluminium Alloy
						◎	○



Type1



Type2

h6				
0.2 ≤D1 ≤12				
0 -0.02				
4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
0 -0.008	0 -0.009	0 -0.011		

● 2 flute end mill with CRN coating for copper electrode machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CRN2MSD0020S04	0.2	0.4	40	4	2	●	1
D0020S06	0.2	0.4	45	6	2	●	1
D0030S04	0.3	0.6	40	4	2	●	1
D0030S06	0.3	0.6	45	6	2	●	1
D0040S04	0.4	0.8	40	4	2	●	1
D0040S06	0.4	0.8	45	6	2	●	1
D0050S04	0.5	1	40	4	2	●	1
D0050S06	0.5	1	45	6	2	●	1
D0060S04	0.6	1.2	40	4	2	●	1
D0070S04	0.7	1.4	40	4	2	●	1
D0080S04	0.8	1.6	40	4	2	●	1
D0080S06	0.8	1.6	45	6	2	●	1
D0090S04	0.9	2	40	4	2	●	1
D0100S04	1	2.5	40	4	2	●	1
D0100S06	1	2.5	45	6	2	●	1
D0110S04	1.1	2.5	40	4	2	●	1
D0120S04	1.2	3	40	4	2	●	1
D0120S06	1.2	3	45	6	2	●	1
D0130S04	1.3	3	40	4	2	●	1
D0140S04	1.4	3	40	4	2	●	1
D0150S04	1.5	4	40	4	2	●	1
D0150S06	1.5	4	45	6	2	●	1
D0160S04	1.6	4	40	4	2	●	1
D0170S04	1.7	4	40	4	2	●	1
D0180S04	1.8	5	40	4	2	●	1
D0190S04	1.9	5	40	4	2	●	1
D0200S06	2	6	45	6	2	●	1
D0250S06	2.5	8	45	6	2	●	1
D0300S06	3	8	45	6	2	●	1
D0400S06	4	11	45	6	2	●	1
D0500S06	5	13	50	6	2	●	1
D0600S06	6	13	50	6	2	●	2
D0800S08	8	19	60	8	2	●	2
D1000S10	10	22	70	10	2	●	2
D1200S12	12	26	75	12	2	●	2

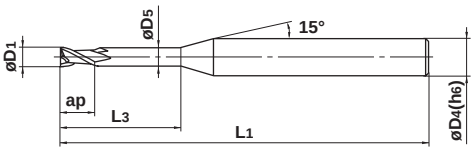
MIRACLE END CRN

CRN-2XL

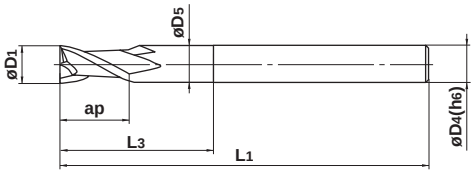
End mill, Medium cut length, 2 flute, Long neck, For copper electrodes

UWC CRN 30° D1<3 D1≥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	Aluminium Alloy
						◎	○



Type1



Type2

0.2 ≤D1 ≤6				
0 - 0.02				
4 ≤D4 ≤6				
0 - 0.008				

h6

● 2 flute long neck end mill with CRN coating for copper electrode machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CRN2XLD0020N005S04	0.2	0.3	0.5	0.17	50	4	2	●	1
D0020N005S06	0.2	0.3	0.5	0.17	50	6	2	●	1
D0020N010S04	0.2	0.3	1	0.17	50	4	2	●	1
D0020N010S06	0.2	0.3	1	0.17	50	6	2	●	1
D0020N015S04	0.2	0.3	1.5	0.17	50	4	2	●	1
D0020N015S06	0.2	0.3	1.5	0.17	50	6	2	●	1
D0030N010S04	0.3	0.5	1	0.27	50	4	2	●	1
D0030N010S06	0.3	0.5	1	0.27	50	6	2	●	1
D0030N030S04	0.3	0.5	3	0.27	50	4	2	●	1
D0030N030S06	0.3	0.5	3	0.27	50	6	2	●	1
D0040N020S04	0.4	0.6	2	0.36	50	4	2	●	1
D0040N020S06	0.4	0.6	2	0.36	50	6	2	●	1
D0040N040S04	0.4	0.6	4	0.36	50	4	2	●	1
D0040N040S06	0.4	0.6	4	0.36	50	6	2	●	1
D0040N060S04	0.4	0.6	6	0.36	50	4	2	●	1
D0040N060S06	0.4	0.6	6	0.36	50	6	2	●	1
D0050N020S04	0.5	0.8	2	0.46	50	4	2	●	1
D0050N020S06	0.5	0.8	2	0.46	50	6	2	●	1
D0050N040S04	0.5	0.8	4	0.46	50	4	2	●	1
D0050N040S06	0.5	0.8	4	0.46	50	6	2	●	1
D0050N060S04	0.5	0.8	6	0.46	50	4	2	●	1
D0050N060S06	0.5	0.8	6	0.46	50	6	2	●	1
D0050N080S04	0.5	0.8	8	0.46	50	4	2	●	1
D0050N080S06	0.5	0.8	8	0.46	50	6	2	●	1
D0080N040S04	0.8	1.2	4	0.76	50	4	2	●	1
D0080N040S06	0.8	1.2	4	0.76	50	6	2	●	1
D0080N060S04	0.8	1.2	6	0.76	50	4	2	●	1
D0080N060S06	0.8	1.2	6	0.76	50	6	2	●	1
D0080N080S04	0.8	1.2	8	0.76	50	4	2	●	1
D0080N080S06	0.8	1.2	8	0.76	50	6	2	●	1
D0080N100S04	0.8	1.2	10	0.76	50	4	2	●	1
D0080N100S06	0.8	1.2	10	0.76	50	6	2	●	1
D0100N060S04	1	1.5	6	0.94	50	4	2	●	1
D0100N060S06	1	1.5	6	0.94	50	6	2	●	1

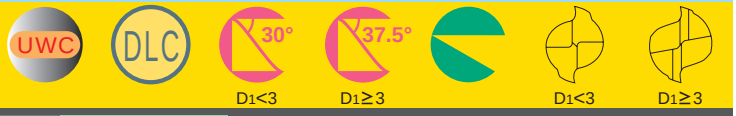
● : Inventory maintained in Japan.

Unit : mm

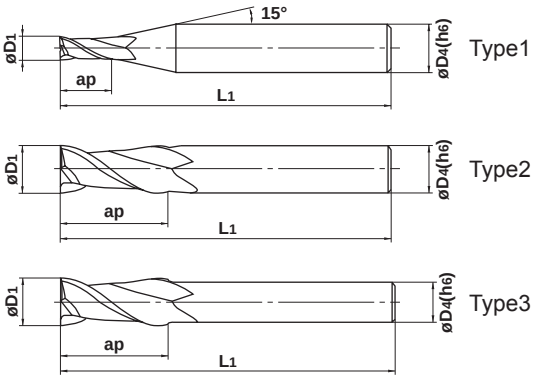
Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
CRN2XLD0100N080S04	1	1.5	8	0.94	50	4	2	●	1
D0100N080S06	1	1.5	8	0.94	50	6	2	●	1
D0100N100S04	1	1.5	10	0.94	50	4	2	●	1
D0100N100S06	1	1.5	10	0.94	50	6	2	●	1
D0100N120S04	1	1.5	12	0.94	50	4	2	●	1
D0100N120S06	1	1.5	12	0.94	50	6	2	●	1
D0100N160S04	1	1.5	16	0.94	55	4	2	●	1
D0100N160S06	1	1.5	16	0.94	55	6	2	●	1
D0150N060S04	1.5	2.3	6	1.44	50	4	2	●	1
D0150N060S06	1.5	2.3	6	1.44	50	6	2	●	1
D0150N080S04	1.5	2.3	8	1.44	50	4	2	●	1
D0150N080S06	1.5	2.3	8	1.44	50	6	2	●	1
D0150N100S04	1.5	2.3	10	1.44	50	4	2	●	1
D0150N100S06	1.5	2.3	10	1.44	50	6	2	●	1
D0150N120S04	1.5	2.3	12	1.44	50	4	2	●	1
D0150N120S06	1.5	2.3	12	1.44	50	6	2	●	1
D0150N160S04	1.5	2.3	16	1.44	55	4	2	●	1
D0150N160S06	1.5	2.3	16	1.44	55	6	2	●	1
D0150N200S04	1.5	2.3	20	1.44	60	4	2	●	1
D0150N200S06	1.5	2.3	20	1.44	60	6	2	●	1
D0200N060S06	2	3.0	6	1.90	50	6	2	●	1
D0200N080S06	2	3.0	8	1.90	50	6	2	●	1
D0200N100S06	2	3.0	10	1.90	50	6	2	●	1
D0200N120S06	2	3.0	12	1.90	50	6	2	●	1
D0200N160S06	2	3.0	16	1.90	55	6	2	●	1
D0200N200S06	2	3.0	20	1.90	60	6	2	●	1
D0250N080S06	2.5	3.8	8	2.40	50	6	2	●	1
D0250N120S06	2.5	3.8	12	2.40	55	6	2	●	1
D0250N160S06	2.5	3.8	16	2.40	60	6	2	●	1
D0250N200S06	2.5	3.8	20	2.40	65	6	2	●	1
D0300N200S06	3	4.5	20	2.90	65	6	2	●	1
D0400N200S06	4	6.0	20	3.90	65	6	2	●	1
D0500N250S06	5	7.5	25	4.90	70	6	2	●	1
D0600N300S06	6	9.0	30	5.85	70	6	2	●	2

DLC-2MA

Slot drill, Medium cut length, 2 flute



Copper Alloy	Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○	



D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 2 flute end mill with new high welding resistance DLC coating, ideal for machining non-ferrous materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DLC2MAD0100	1	2.5	40	4	2	●	1
D0150	1.5	4	40	4	2	●	1
D0200	2	6	40	4	2	●	1
D0250	2.5	8	40	4	2	●	1
D0300	3	8	45	6	2	●	1
D0350	3.5	10	45	6	2	●	1
D0400	4	11	45	6	2	●	1
D0450	4.5	11	45	6	2	●	1
D0500	5	13	50	6	2	●	1
D0600	6	13	50	6	2	●	2
D0800	8	19	60	8	2	●	2
D1000	10	22	70	10	2	●	2
D1200	12	26	75	12	2	●	2
D1400	14	26	75	12	2	●	3
D1500	15	30	80	16	2	●	1
D1600	16	32	90	16	2	●	2
D1800	18	32	90	16	2	●	3
D2000	20	38	100	20	2	●	2

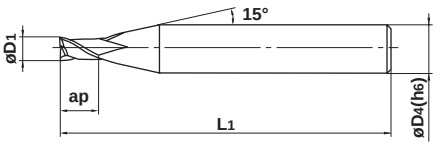
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J383

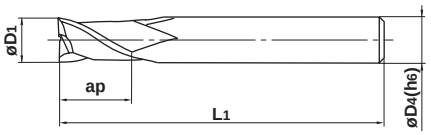
SED2KPG

End mill, Medium cut length, 2 flute, + Tolerance

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	Aluminium Alloy
◎	◎			○	○		



Type1



Type2

h6					
2 ≤D1 ≤16					
0 + 0.02					
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16			
0 - 0.008	0 - 0.009	0 - 0.011			

- 2 flute end mill for key way slotting with plus tolerance
- cutting diameter.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SED2020KPG	2	3	45	4	2	●	1
2030KPG	3	5	45	6	2	●	1
2040KPG	4	6	45	6	2	●	1
2050KPG	5	8	50	6	2	●	1
2060KPG	6	9	50	6	2	●	2
2070KPG	7	10	60	8	2	●	1
2080KPG	8	12	60	8	2	●	2
2100KPG	10	15	65	10	2	●	2
2120KPG	12	15	65	12	2	●	2
2140KPG	14	15	70	16	2	●	1
2150KPG	15	15	70	16	2	●	1
2160KPG	16	15	70	16	2	●	2

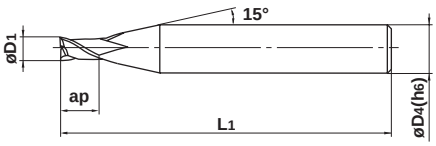
END MILL FOR SLOTTING

SED2KMG

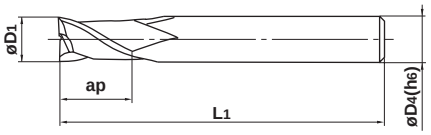
End mill, Medium cut length, 2 flute, - Tolerance

UWC MS 30° D1≤10 D1>10 D1<3 3≤D1≤10 D1≥11

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	Aluminium Alloy
◎	◎			○	○		



Type1



Type2

h6

2 ≤D1 ≤16				
0 - 0.02				
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16		
0 - 0.008	0 - 0.009	0 - 0.011		

- 2 flute end mill for key way slotting with minus tolerance
- cutting diameter.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SED2020KMG	2	3	45	4	2	●	1
2030KMG	3	5	45	6	2	●	1
2040KMG	4	6	45	6	2	●	1
2050KMG	5	8	50	6	2	●	1
2060KMG	6	9	50	6	2	●	2
2070KMG	7	10	60	8	2	●	1
2080KMG	8	12	60	8	2	●	2
2100KMG	10	15	65	10	2	●	2
2120KMG	12	15	65	12	2	●	2
2140KMG	14	15	70	16	2	●	1
2150KMG	15	15	70	16	2	●	1
2160KMG	16	15	70	16	2	●	2

● : Inventory maintained in Japan.

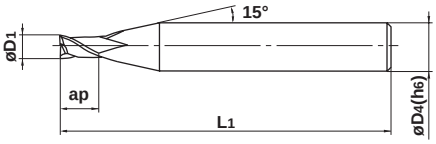
CUTTING CONDITIONS ➤ J387

C-2SS

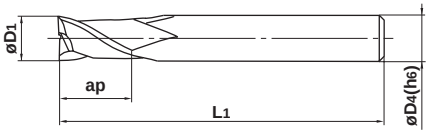
End mill, Short cut length, 2 flute

UWC 30° D1<3 D1≥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	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2

0.4 ≤D1 ≤6				
0 -0.020				
4 ≤D4 ≤6				
0 -0.008				

h6

● 2 flute end mill with short rigid geometry.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2SSD0040	0.4	0.8	40	4	2	●	1
D0050	0.5	0.8	40	4	2	●	1
D0060	0.6	1	40	4	2	●	1
D0070	0.7	1	40	4	2	●	1
D0080	0.8	1.3	40	4	2	●	1
D0090	0.9	1.3	40	4	2	●	1
D0100	1	1.5	40	4	2	●	1
D0110	1.1	1.5	40	4	2	●	1
D0120	1.2	2	40	4	2	●	1
D0130	1.3	2	40	4	2	●	1
D0140	1.4	2	40	4	2	●	1
D0150	1.5	2.5	40	4	2	●	1
D0160	1.6	2.5	40	4	2	●	1
D0170	1.7	2.5	40	4	2	●	1
D0180	1.8	3	40	4	2	●	1
D0190	1.9	3	40	4	2	●	1
D0200	2	3	40	4	2	●	1
D0210	2.1	3	40	4	2	●	1
D0220	2.2	3.5	40	4	2	●	1
D0230	2.3	3.5	40	4	2	●	1
D0240	2.4	3.5	40	4	2	●	1
D0250	2.5	4	40	4	2	●	1
D0260	2.6	4	40	4	2	●	1
D0270	2.7	4	40	4	2	●	1
D0280	2.8	4	40	4	2	●	1
D0290	2.9	4.5	40	4	2	●	1
D0300	3	4.5	45	6	2	●	1
D0350	3.5	5.5	45	6	2	●	1
D0400	4	6	45	6	2	●	1
D0450	4.5	7	45	6	2	●	1
D0500	5	7.5	50	6	2	●	1
D0550	5.5	8.5	50	6	2	●	1
D0600	6	9	50	6	2	●	2

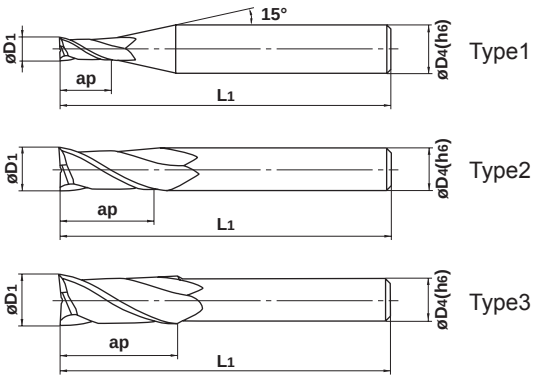
CARBIDE END MILLS

C-2MS

End mill, Medium cut length, 2 flute

UWC 30° D1<3 D1≥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	Aluminium Alloy
○	○			○	○	○	○



h6

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 2 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2MSD0100	1	2.5	40	4	2	●	1
D0110	1.1	2.5	40	4	2	●	1
D0120	1.2	3	40	4	2	●	1
D0130	1.3	3	40	4	2	●	1
D0140	1.4	3	40	4	2	●	1
D0150	1.5	4	40	4	2	●	1
D0160	1.6	4	40	4	2	●	1
D0170	1.7	4	40	4	2	●	1
D0180	1.8	5	40	4	2	●	1
D0190	1.9	5	40	4	2	●	1
D0200	2	6	40	4	2	●	1
D0210	2.1	6	40	4	2	●	1
D0220	2.2	6	40	4	2	●	1
D0230	2.3	6	40	4	2	●	1
D0240	2.4	8	40	4	2	●	1
D0250	2.5	8	40	4	2	●	1
D0260	2.6	8	40	4	2	●	1
D0270	2.7	8	40	4	2	●	1
D0280	2.8	8	40	4	2	●	1
D0290	2.9	8	40	4	2	●	1
D0300	3	8	45	6	2	●	1
D0310	3.1	8	45	6	2	●	1
D0320	3.2	8	45	6	2	●	1
D0330	3.3	8	45	6	2	●	1
D0340	3.4	10	45	6	2	●	1
D0350	3.5	10	45	6	2	●	1
D0360	3.6	10	45	6	2	●	1
D0370	3.7	10	45	6	2	●	1
D0380	3.8	11	45	6	2	●	1
D0390	3.9	11	45	6	2	●	1
D0400	4	11	45	6	2	●	1
D0410	4.1	11	45	6	2	●	1
D0420	4.2	11	45	6	2	●	1
D0430	4.3	11	45	6	2	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
C2MSD0440	4.4	11	45	6	2	●	1
D0450	4.5	11	45	6	2	●	1
D0460	4.6	11	45	6	2	●	1
D0470	4.7	11	45	6	2	●	1
D0480	4.8	13	50	6	2	●	1
D0490	4.9	13	50	6	2	●	1
D0500	5	13	50	6	2	●	1
D0510	5.1	13	50	6	2	●	1
D0520	5.2	13	50	6	2	●	1
D0530	5.3	13	50	6	2	●	1
D0540	5.4	13	50	6	2	●	1
D0550	5.5	13	50	6	2	●	1
D0560	5.6	13	50	6	2	●	1
D0570	5.7	13	50	6	2	●	1
D0580	5.8	13	50	6	2	●	1
D0590	5.9	13	50	6	2	●	1
D0600	6	13	50	6	2	●	2
D0610	6.1	16	60	8	2	●	1
D0620	6.2	16	60	8	2	●	1
D0630	6.3	16	60	8	2	●	1
D0640	6.4	16	60	8	2	●	1
D0650	6.5	16	60	8	2	●	1
D0660	6.6	16	60	8	2	●	1
D0670	6.7	16	60	8	2	●	1
D0680	6.8	16	60	8	2	●	1
D0690	6.9	16	60	8	2	●	1
D0700	7	16	60	8	2	●	1
D0710	7.1	16	60	8	2	●	1
D0720	7.2	16	60	8	2	●	1
D0730	7.3	16	60	8	2	●	1
D0740	7.4	16	60	8	2	●	1
D0750	7.5	16	60	8	2	●	1
D0760	7.6	19	60	8	2	●	1
D0770	7.7	19	60	8	2	●	1
D0780	7.8	19	60	8	2	●	1
D0790	7.9	19	60	8	2	●	1
D0800	8	19	60	8	2	●	2
D0810	8.1	19	70	10	2	●	1
D0820	8.2	19	70	10	2	●	1
D0830	8.3	19	70	10	2	●	1
D0840	8.4	19	70	10	2	●	1
D0850	8.5	19	70	10	2	●	1
D0860	8.6	19	70	10	2	●	1
D0870	8.7	19	70	10	2	●	1
D0880	8.8	19	70	10	2	●	1
D0890	8.9	19	70	10	2	●	1
D0900	9	19	70	10	2	●	1
D0910	9.1	19	70	10	2	●	1
D0920	9.2	19	70	10	2	●	1
D0930	9.3	19	70	10	2	●	1
D0940	9.4	19	70	10	2	●	1
D0950	9.5	19	70	10	2	●	1

CUTTING CONDITIONS ➤ J391

C-2MS

End mill, Medium cut length, 2 flute

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
C2MSD0960	9.6	22	70	10	2	●	1
D0970	9.7	22	70	10	2	●	1
D0980	9.8	22	70	10	2	●	1
D0990	9.9	22	70	10	2	●	1
D1000	10	22	70	10	2	●	2
D1100	11	22	75	12	2	●	1
D1200	12	26	75	12	2	●	2
D1300	13	26	75	12	2	●	3
D1400	14	26	75	12	2	●	3
D1500	15	30	80	16	2	●	1
D1600	16	32	90	16	2	●	2
D1700	17	32	90	16	2	●	3
D1800	18	32	90	16	2	●	3
D1900	19	32	100	20	2	●	1
D2000	20	38	100	20	2	●	2

● : Inventory maintained in Japan.

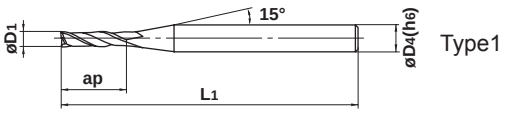
CUTTING CONDITIONS ➤ J391

C-2JS

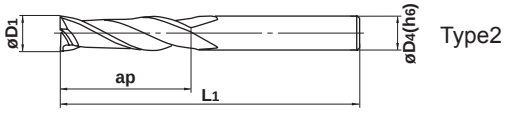
End mill, Semi long cut length, 2 flute

UWC | 30° | D1<3 | D1≥3 | D1<3 | D1≥3

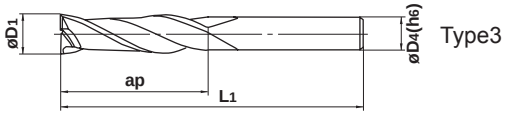
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2



Type3

h6

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

2 flute uncoated end mill for general use.

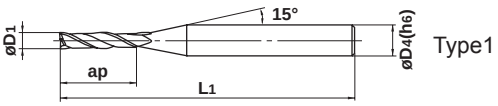
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2JSD0100	1	3.5	40	4	2	●	1
D0150	1.5	5	40	4	2	●	1
D0200	2	8	40	4	2	●	1
D0250	2.5	10	40	4	2	●	1
D0300	3	12	50	6	2	●	1
D0350	3.5	15	50	6	2	●	1
D0400	4	15	50	6	2	●	1
D0450	4.5	15	50	6	2	●	1
D0500	5	20	60	6	2	●	1
D0550	5.5	20	60	6	2	●	1
D0600	6	20	60	6	2	●	2
D0650	6.5	25	70	8	2	●	1
D0700	7	25	70	8	2	●	1
D0750	7.5	25	70	8	2	●	1
D0800	8	25	70	8	2	●	2
D0850	8.5	25	90	10	2	●	1
D0900	9	25	90	10	2	●	1
D0950	9.5	25	90	10	2	●	1
D1000	10	30	90	10	2	●	2
D1050	10.5	30	90	12	2	●	1
D1100	11	30	90	12	2	●	1
D1150	11.5	30	90	12	2	●	1
D1200	12	30	90	12	2	●	2
D1300	13	35	90	12	2	●	3
D1400	14	40	110	16	2	●	1
D1500	15	40	110	16	2	●	1
D1600	16	50	110	16	2	●	2
D1700	17	50	110	20	2	●	1
D1800	18	50	110	20	2	●	1
D1900	19	55	110	20	2	●	1
D2000	20	55	110	20	2	●	2
D2200	22	65	140	25	2	●	1
D2400	24	75	140	25	2	●	1
D2500	25	75	140	25	2	●	2

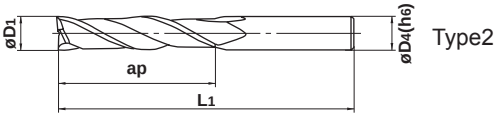
C-2LS

End mill, Long cut length, 2 flute

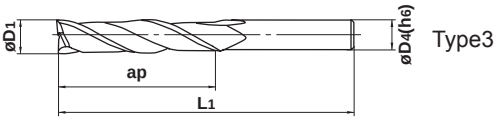
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2



Type3

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 2 flute end mill with longer cut length than standard.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2LSD0100	1	4	40	4	2	●	1
D0150	1.5	6	40	4	2	●	1
D0200	2	9	40	4	2	●	1
D0250	2.5	12	40	4	2	●	1
D0300	3	20	60	6	2	●	1
D0350	3.5	22	60	6	2	●	1
D0400	4	25	60	6	2	●	1
D0450	4.5	25	60	6	2	●	1
D0500	5	30	70	6	2	●	1
D0550	5.5	30	70	6	2	●	1
D0600	6	30	70	6	2	●	2
D0650	6.5	30	90	8	2	●	1
D0700	7	40	90	8	2	●	1
D0750	7.5	40	90	8	2	●	1
D0800	8	40	90	8	2	●	2
D0850	8.5	40	100	10	2	●	1
D0900	9	40	100	10	2	●	1
D0950	9.5	40	100	10	2	●	1
D1000	10	50	100	10	2	●	2
D1050	10.5	50	110	12	2	●	1
D1100	11	50	110	12	2	●	1
D1150	11.5	50	110	12	2	●	1
D1200	12	50	110	12	2	●	2
D1250	12.5	50	120	12	2	●	3
D1300	13	50	120	12	2	●	3
D1400	14	70	130	16	2	●	1
D1500	15	70	130	16	2	●	1
D1600	16	70	130	16	2	●	2
D1700	17	70	140	20	2	●	1
D1800	18	70	140	20	2	●	1
D1900	19	70	140	20	2	●	1
D2000	20	70	140	20	2	●	2

● : Inventory maintained in Japan.

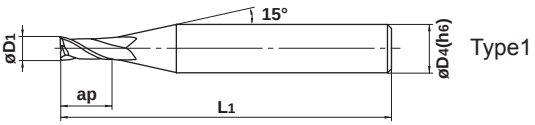
CUTTING CONDITIONS ➤ J391

C-2MA

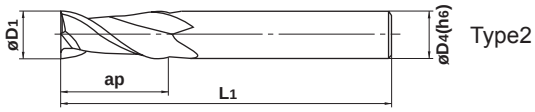
End mill, Medium cut length, 2 flute, For aluminium alloy

UWC | 30° D1<3 | 37.5° D1≥3 | D1<3 | D1≥3

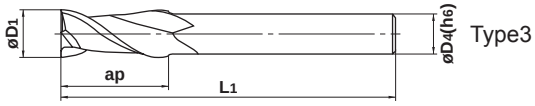
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



Type1



Type2



Type3

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

2 flute uncoated end mill designed especially for aluminium alloys.

Unit : mm

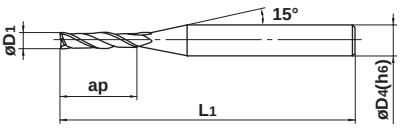
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2MAD0100	1	2.5	40	4	2	●	1
D0150	1.5	4	40	4	2	●	1
D0200	2	6	40	4	2	●	1
D0250	2.5	8	40	4	2	●	1
D0300	3	8	45	6	2	●	1
D0400	4	11	45	6	2	●	1
D0500	5	13	50	6	2	●	1
D0600	6	13	50	6	2	●	2
D0800	8	19	60	8	2	●	2
D1000	10	22	70	10	2	●	2
D1200	12	26	75	12	2	●	2
D1400	14	26	75	12	2	●	3
D1500	15	30	80	16	2	●	1
D1600	16	32	90	16	2	●	2
D1800	18	32	90	16	2	●	3
D2000	20	38	100	20	2	●	2

MIRACLE END ALIMASTER

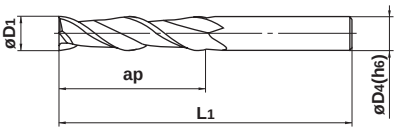
C-2LA

End mill, Long cut length, 2 flute, For aluminium 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	Aluminium Alloy
							◎



Type1



Type2

h6

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

2 flute uncoated end mill designed especially for aluminium alloys.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2LAD0100	1	4	40	4	2	●	1
D0150	1.5	6	40	4	2	●	1
D0200	2	9	40	4	2	●	1
D0250	2.5	12	40	4	2	●	1
D0300	3	20	60	6	2	●	1
D0400	4	25	60	6	2	●	1
D0500	5	30	70	6	2	●	1
D0600	6	30	70	6	2	●	2
D0800	8	40	90	8	2	●	2
D1000	10	50	100	10	2	●	2
D1200	12	50	110	12	2	●	2
D1400	14	70	130	16	2	●	1
D1500	15	70	130	16	2	●	1
D1600	16	70	130	16	2	●	2
D1800	18	70	140	20	2	●	1
D2000	20	70	140	20	2	●	2

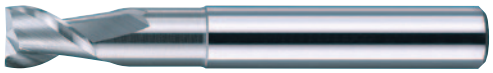
● : Inventory maintained in Japan.

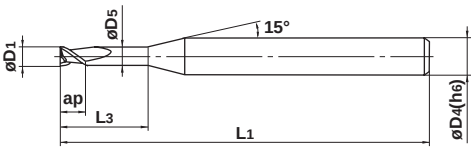
CUTTING CONDITIONS ➤ J388

C-2SA

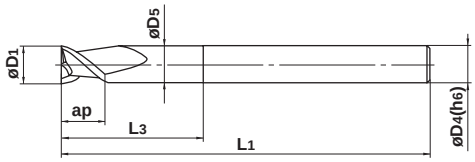
End mill, Short cut length, 2 flute, For aluminium alloy

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	Aluminium Alloy
						○	◎





Type1



Type2

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● High efficiency machining for aluminium alloys.

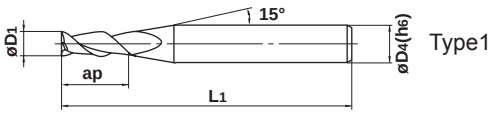
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2SAD0300N120	3	6	12	2.7	60	6	2	●	1
D0400N120	4	6	12	3.7	60	6	2	●	1
D0500N150	5	8	15	4.7	60	6	2	●	1
D0600N160	6	8	16	5.7	75	6	2	●	2
D0800N200	8	10	20	7.4	75	8	2	●	2
D1000N300	10	12	30	9.4	75	10	2	●	2
D1000N350	10	12	35	9.4	100	10	2	●	2
D1200N300	12	15	30	11.4	75	12	2	●	2
D1200N350	12	15	35	11.4	100	12	2	●	2
D1200N400	12	15	40	11.4	125	12	2	●	2
D1600N300	16	15	30	15.4	75	16	2	●	2
D1600N400	16	15	40	15.4	100	16	2	●	2
D1600N450	16	15	45	15.4	125	16	2	●	2
D2000N400	20	20	40	19	100	20	2	●	2
D2000N500	20	20	50	19	125	20	2	●	2

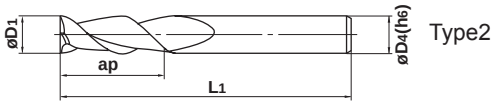
C-2MHA

End mill, Medium cut length, 2 flute, For aluminium alloy

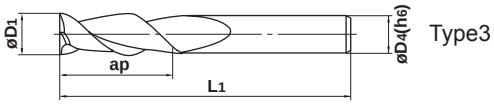
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



Type1



Type2



Type3

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● High efficiency machining for aluminium alloys.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2MHAD0300	3	9	60	6	2	●	1
D0400	4	12	60	6	2	●	1
D0500	5	15	60	6	2	●	1
D0600	6	18	60	6	2	●	2
D0800	8	20	75	8	2	●	2
D1000	10	25	75	10	2	●	2
D1200	12	25	75	12	2	●	2
D1400	14	32	75	12	2	●	3
D1600	16	32	100	16	2	●	2
D2000	20	38	125	20	2	●	2
D2500	25	38	125	25	2	●	2

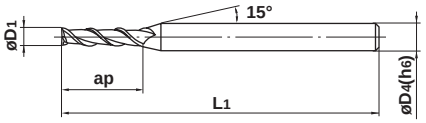
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J389

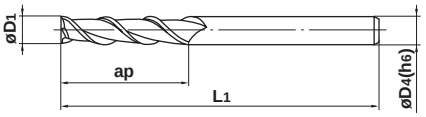
SEE2L

End mill, 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	Aluminium Alloy
◎	○			○	○	○	○



Type1



Type2

h6

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

2 flute uncoated high helix end mill.

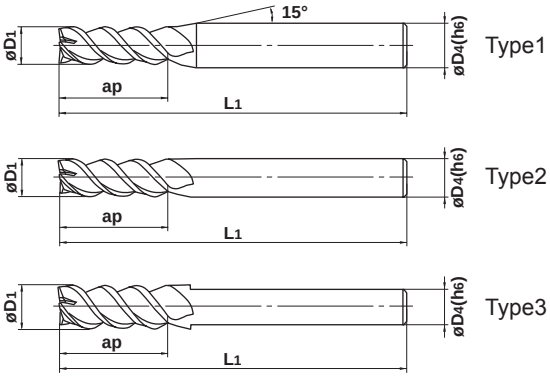
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SEE2030L	3	15	55	6	2	●	1
2040L	4	20	60	6	2	●	1
2050L	5	25	65	6	2	●	1
2060L	6	25	65	6	2	●	2
2070L	7	35	80	8	2	●	1
2080L	8	35	80	8	2	●	2
2090L	9	45	90	10	2	●	1
2100L	10	45	95	10	2	●	2
2110L	11	55	105	12	2	●	1
2120L	12	55	105	12	2	●	2
2150L	15	70	125	16	2	●	1
2160L	16	70	125	16	2	●	2
2200L	20	75	140	20	2	●	2

MSMHZD

Slotting, 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	Aluminium Alloy
◎	◎	○		◎	○		



D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● A single end mill for both plunging and slotting.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MSMHZDD0100	1	2	45	4	3	●	1
D0150	1.5	3	45	4	3	●	1
D0200	2	4	50	6	3	●	1
D0250	2.5	5	50	6	3	●	1
D0300	3	6	50	6	3	●	1
D0350	3.5	8	50	6	3	●	1
D0400	4	8	50	6	3	●	1
D0450	4.5	10	50	6	3	●	1
D0500	5	10	50	6	3	●	1
D0550	5.5	13	50	6	3	●	1
D0600	6	13	60	6	3	●	2
D0650	6.5	16	60	8	3	●	1
D0700	7	16	60	8	3	●	1
D0750	7.5	16	60	8	3	●	1
D0800	8	19	70	8	3	●	2
D0850	8.5	19	70	10	3	●	1
D0900	9	19	70	10	3	●	1
D0950	9.5	19	70	10	3	●	1
D1000	10	22	80	10	3	●	2
D1100	11	22	80	12	3	●	1
D1200	12	26	90	12	3	●	2
D1300	13	26	90	12	3	●	3
D1400	14	26	90	12	3	●	3
D1500	15	26	110	16	3	●	1
D1600	16	30	110	16	3	●	2
D2000	20	32	140	20	3	●	2

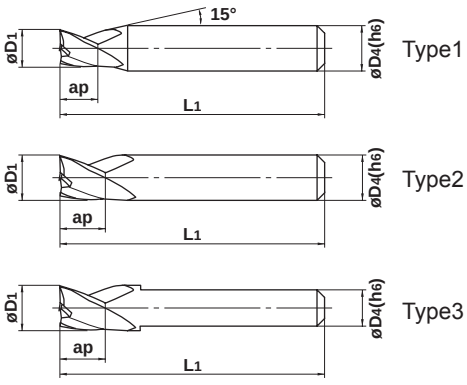
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J296

MS3ES

End mill, 3 flute, For small automatic 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	Aluminium Alloy
◎	◎	○		○	○		



3 ≤D1 ≤12				
0 - 0.020				
4 ≤D4 ≤6	7 ≤D4 ≤10			
0 - 0.008	0 - 0.009			

h6

● 3 flute end mill.

Overall length 35mm

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS3ESD0300L35S04	3	3	35	4	3	●	1
D0350L35S04	3.5	3.5	35	4	3	●	1
D0400L35S04	4	4	35	4	3	●	2
D0500L35S05	5	5	35	5	3	●	2
D0500L35S06	5	5	35	6	3	●	1
D0600L35S05	6	6	35	5	3	●	3
D0600L35S06	6	6	35	6	3	●	2
D0700L35S07	7	6	35	7	3	●	2
D0800L35S07	8	6	35	7	3	●	3
D0800L35S08	8	6	35	8	3	●	2
D1000L35S07	10	6	35	7	3	●	3
D1000L35S10	10	6	35	10	3	●	2
D1200L35S10	12	6	35	10	3	●	3

Overall length 45mm

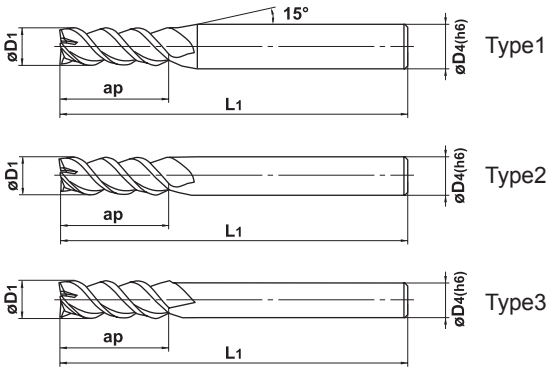
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS3ESD0300L45S04	3	3	45	4	3	●	1
D0350L45S04	3.5	3.5	45	4	3	●	1
D0400L45S04	4	4	45	4	3	●	2
D0500L45S06	5	5	45	6	3	●	1
D0600L45S06	6	6	45	6	3	●	2
D0700L45S07	7	7	45	7	3	●	2
D0800L45S07	8	8	45	7	3	●	3
D0800L45S08	8	8	45	8	3	●	2
D1000L45S07	10	10	45	7	3	●	3
D1000L45S10	10	10	45	10	3	●	2
D1200L45S10	12	12	45	10	3	●	3

VQ-MHZV NEW

End mill, Medium cutting 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	Aluminium Alloy
◎	○			◎	◎	○	



D1 ≤12	D1>12			
0 - 0.02	0 - 0.03			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- A single end mill for both plunging and slotting.
- Irregular helical geometry controls the vibration.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VQMHZVD0100	1	2	45	4	3	●	1
D0110	1.1	2.2	45	4	3	●	1
D0120	1.2	2.4	45	4	3	●	1
D0130	1.3	2.6	45	4	3	●	1
D0140	1.4	2.8	45	4	3	●	1
D0150	1.5	3	45	4	3	●	1
D0160	1.6	3.2	45	4	3	●	1
D0170	1.7	3.4	45	4	3	●	1
D0180	1.8	3.6	45	4	3	●	1
D0190	1.9	3.8	45	4	3	●	1
D0200	2	4	50	6	3	●	1
D0210	2.1	4.2	50	6	3	●	1
D0220	2.2	4.4	50	6	3	●	1
D0230	2.3	4.6	50	6	3	●	1
D0240	2.4	4.8	50	6	3	●	1
D0250	2.5	5	50	6	3	●	1
D0260	2.6	5.2	50	6	3	●	1
D0270	2.7	5.4	50	6	3	●	1
D0280	2.8	5.6	50	6	3	●	1
D0290	2.9	5.8	50	6	3	●	1
D0300	3	6	50	6	3	●	1
D0310	3.1	7	50	6	3	●	1
D0320	3.2	7	50	6	3	●	1
D0330	3.3	7	50	6	3	●	1
D0340	3.4	7	50	6	3	●	1
D0350	3.5	8	50	6	3	●	1
D0360	3.6	8	50	6	3	●	1
D0370	3.7	8	50	6	3	●	1
D0380	3.8	8	50	6	3	●	1
D0390	3.9	8	50	6	3	●	1
D0400	4	8	50	6	3	●	1
D0450	4.5	10	50	6	3	●	1
D0500	5	10	50	6	3	●	1
D0550	5.5	13	50	6	3	●	1

● : Inventory maintained in Japan.

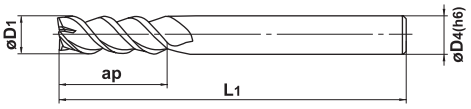
Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
VQMHZVD0600	6	13	60	6	3	●	2
D0650	6.5	16	60	8	3	●	1
D0700	7	16	60	8	3	●	1
D0750	7.5	16	60	8	3	●	1
D0800	8	19	70	8	3	●	2
D0850	8.5	19	70	10	3	●	1
D0900	9	19	70	10	3	●	1
D0950	9.5	19	70	10	3	●	1
D1000	10	22	80	10	3	●	2
D1100	11	22	80	12	3	●	1
D1200	12	26	90	12	3	●	2
D1300	13	26	90	12	3	●	3
D1400	14	26	90	12	3	●	3
D1500	15	26	110	16	3	●	1
D1600	16	30	110	16	3	●	2
D2000	20	32	140	20	3	●	2

VQ-MHZV-OH NEW

End mill, Medium cutting length, 3 flute for drilling and slotting with internal through 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	Aluminium Alloy
○	○			◎	◎	○	



Type1

D1≦12	D1=16			
0 - 0.02	0 - 0.03			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

- A single end mill for both plunging and slotting.
- Excellent peformance in slotting and pocketing with oil supply from the end cutting edge.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VQMHZVOHD0600	6	13	60	6	3	●	1
D0800	8	19	70	8	3	●	1
D1000	10	22	80	10	3	●	1
D1200	12	26	90	12	3	●	1
D1600	16	30	110	16	3	●	1

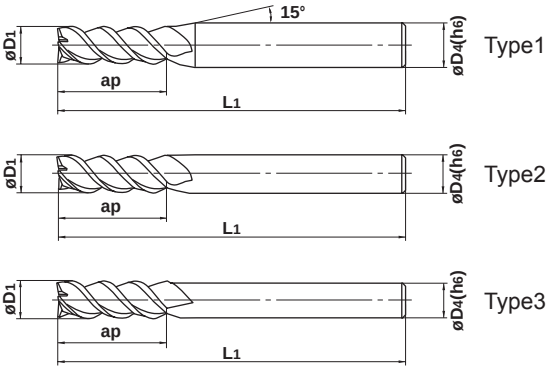
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J343

VC-MH

End mill, Medium cut length, 3—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	Aluminium Alloy
○	◎	○		◎	◎		



D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤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.

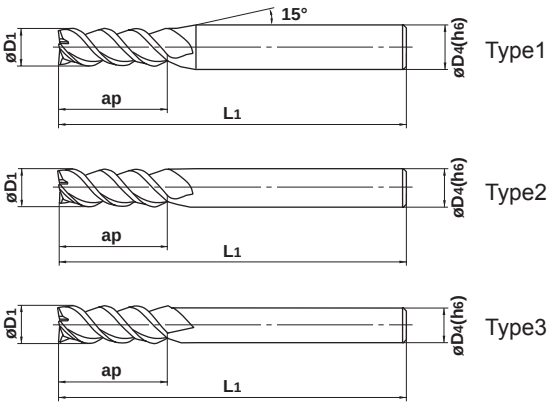
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCMH D0300	3	8	45	6	3	●	1
D0400	4	11	45	6	3	●	1
D0500	5	13	50	6	3	●	1
D0600	6	13	50	6	3	●	2
D0700	7	16	60	8	3	●	1
D0800	8	19	60	8	3	●	2
D0900	9	19	70	10	3	●	1
D1000	10	22	70	10	3	●	2
D1100	11	22	75	12	3	●	1
D1200	12	26	75	12	3	●	2
D1300	13	26	75	12	3	●	3
D1400	14	26	75	12	3	●	3
D1500	15	30	80	16	3	●	1
D1600	16	32	90	16	3	●	2
D1800	18	32	90	16	3	●	3
D2000	20	38	100	20	4	●	2
D2500	25	45	120	25	4	●	2

C-MH

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	Aluminium Alloy
○	◎			○	○		○



D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 3 flute ultra micro-grain uncoated carbide end mill for general use and cast iron milling.

Unit : mm

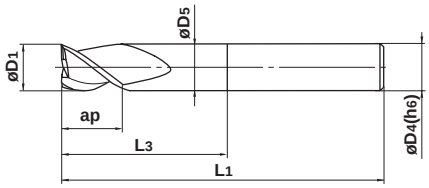
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CMHD0600	6	13	50	6	3	●	2
D0700	7	16	60	8	3	●	1
D0800	8	19	60	8	3	●	2
D0900	9	19	70	10	3	●	1
D1000	10	22	70	10	3	●	2
D1100	11	22	75	12	3	●	1
D1200	12	26	75	12	3	●	2
D1300	13	26	75	12	3	●	3
D1400	14	26	75	12	3	●	3
D1500	15	30	80	16	3	●	1
D1600	16	32	90	16	3	●	2

● : Inventory maintained in Japan.

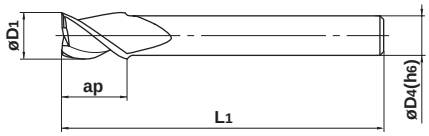
C-3SA

End mill, Short cut length, 3 flute, For aluminium 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	Aluminium Alloy
						○	◎



Type1



Type2

h6

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

● High efficiency machining for aluminium alloys.

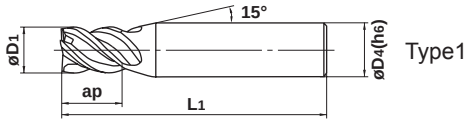
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C3SAD1000A100S08	10	12	—	—	100	8	3	●	2
D1000N300	10	12	30	9.4	75	10	3	●	1
D1000N350	10	12	35	9.4	100	10	3	●	1
D1200A150S10	12	15	—	—	150	10	3	●	2
D1200N300	12	15	30	11.4	75	12	3	●	1
D1200N350	12	15	35	11.4	100	12	3	●	1
D1200N400	12	15	40	11.4	125	12	3	●	1
D1600A200S14	16	15	—	—	200	14	3	●	2
D1600N300	16	15	30	15.4	75	16	3	●	1
D1600N400	16	15	40	15.4	100	16	3	●	1
D1600N450	16	15	45	15.4	125	16	3	●	1
D1700A150S16	17	18	—	—	150	16	3	●	2
D1800A200S16	18	18	—	—	200	16	3	●	2
D2000A200S18	20	20	—	—	200	18	3	●	2
D2000N400	20	20	40	19	100	20	3	●	1
D2000N600	20	20	60	19	125	20	3	●	1
D2000N850	20	20	85	19	150	20	3	●	1
D2500N500	25	20	50	24	100	25	3	●	1
D2500N650	25	20	65	24	125	25	3	●	1
D2500N900	25	20	90	24	150	25	3	●	1
D2600A200S25	26	20	—	—	200	25	3	●	2

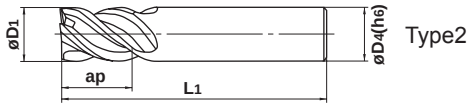
MSSHD

High power, Short cut length, 4 flute

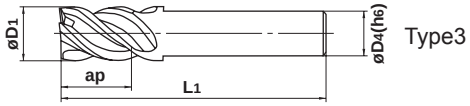
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2



Type3

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute high power end mill.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MSSHDD0300	3	4.5	45	6	4	●	1
D0350	3.5	5.3	45	6	4	●	1
D0400	4	6	45	6	4	●	1
D0450	4.5	6.8	45	6	4	●	1
D0500	5	7.5	50	6	4	●	1
D0550	5.5	8.3	50	6	4	●	1
D0600	6	9	50	6	4	●	2
D0650	6.5	9.8	60	8	4	●	1
D0700	7	10.5	60	8	4	●	1
D0750	7.5	11.3	60	8	4	●	1
D0800	8	12	60	8	4	●	2
D0850	8.5	12.8	70	10	4	●	1
D0900	9	13.5	70	10	4	●	1
D0950	9.5	14.3	70	10	4	●	1
D1000	10	15	70	10	4	●	2
D1100	11	16.5	75	12	4	●	1
D1200	12	18	75	12	4	●	2
D1300	13	19.5	75	12	4	●	3
D1400	14	21	90	16	4	●	1
D1500	15	22.5	90	16	4	●	1
D1600	16	24	90	16	4	●	2
D1700	17	25.5	100	16	4	●	3
D1800	18	27	100	16	4	●	3
D1900	19	28.5	110	20	4	●	1
D2000	20	30	110	20	4	●	2

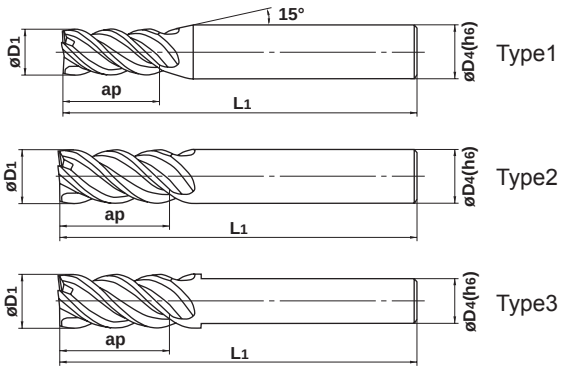
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J297

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	Aluminium Alloy
◎	◎	○		◎	◎		



D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- 4 flute high power end mill.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MSMHDD0200	2	4	45	4	4	●	1
D0210	2.1	5	45	4	4	●	1
D0220	2.2	5	45	4	4	●	1
D0230	2.3	5	45	4	4	●	1
D0240	2.4	5	45	4	4	●	1
D0250	2.5	5	45	4	4	●	1
D0260	2.6	6	45	4	4	●	1
D0270	2.7	6	45	4	4	●	1
D0280	2.8	6	45	4	4	●	1
D0290	2.9	6	45	4	4	●	1
D0300	3	8	45	6	4	●	1
D0310	3.1	8	45	6	4	●	1
D0320	3.2	8	45	6	4	●	1
D0330	3.3	8	45	6	4	●	1
D0340	3.4	8	45	6	4	●	1
D0350	3.5	8	45	6	4	●	1
D0360	3.6	11	45	6	4	●	1
D0370	3.7	11	45	6	4	●	1
D0380	3.8	11	45	6	4	●	1
D0390	3.9	11	45	6	4	●	1
D0400	4	11	45	6	4	●	1
D0410	4.1	12	45	6	4	●	1
D0420	4.2	12	45	6	4	●	1
D0430	4.3	12	45	6	4	●	1
D0440	4.4	12	45	6	4	●	1
D0450	4.5	12	45	6	4	●	1
D0460	4.6	13	50	6	4	●	1
D0470	4.7	13	50	6	4	●	1
D0480	4.8	13	50	6	4	●	1
D0490	4.9	13	50	6	4	●	1
D0500	5	13	50	6	4	●	1
D0510	5.1	13	50	6	4	●	1
D0520	5.2	13	50	6	4	●	1
D0530	5.3	13	50	6	4	●	1

MSMHD

High power, Medium cut length, 4 flute

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MSMHDD0540	5.4	13	50	6	4	●	1
D0550	5.5	13	50	6	4	●	1
D0560	5.6	13	50	6	4	●	1
D0570	5.7	13	50	6	4	●	1
D0580	5.8	13	50	6	4	●	1
D0590	5.9	13	50	6	4	●	1
D0600	6	13	50	6	4	●	2
D0650	6.5	16	60	8	4	●	1
D0700	7	19	60	8	4	●	1
D0750	7.5	19	60	8	4	●	1
D0800	8	19	60	8	4	●	2
D0850	8.5	19	70	10	4	●	1
D0900	9	22	70	10	4	●	1
D0950	9.5	22	70	10	4	●	1
D1000	10	22	70	10	4	●	2
D1100	11	26	75	12	4	●	1
D1200S10	12	26	75	10	4	●	3
D1200	12	26	75	12	4	●	2
D1300	13	26	75	12	4	●	3
D1400	14	30	90	16	4	●	1
D1500	15	35	90	16	4	●	1
D1600	16	35	90	16	4	●	2
D1700	17	35	100	16	4	●	3
D1800	18	40	100	16	4	●	3
D1900	19	40	110	20	4	●	1
D2000	20	45	110	20	4	●	2
D2200	22	50	125	20	4	●	3
D2500	25	55	125	25	4	●	2

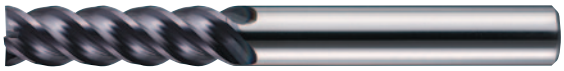
● : Inventory maintained in Japan.

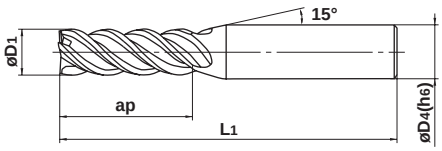
CUTTING CONDITIONS ➤ J297

MSJHD

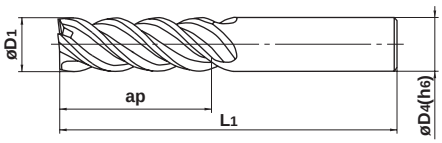
High power, Semi long cut length, 4 flute

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	Aluminium Alloy
◎	◎	○		◎	◎		





Type1



Type2

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute high power end mill.

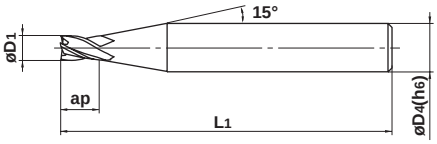
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MSJHDD0200	2	8	60	6	4	●	1
D0250	2.5	10	60	6	4	●	1
D0300	3	12	60	6	4	●	1
D0350	3.5	14	60	6	4	●	1
D0400	4	16	60	6	4	●	1
D0450	4.5	18	60	6	4	●	1
D0500	5	20	60	6	4	●	1
D0600	6	24	60	6	4	●	2
D0700	7	25	80	8	4	●	1
D0800	8	28	80	8	4	●	2
D0900	9	32	90	10	4	●	1
D1000	10	35	90	10	4	●	2
D1100	11	35	100	12	4	●	1
D1200	12	36	100	12	4	●	2
D1400	14	42	110	16	4	●	1
D1500	15	45	110	16	4	●	1
D1600	16	48	125	16	4	●	2
D2000	20	55	140	20	4	●	2

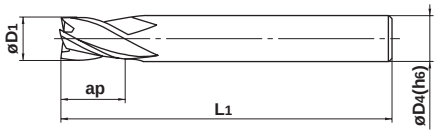
MS4SC

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

1 ≤D1 ≤12				
0 - 0.020				
4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 4 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4SCD0100	1	1.5	40	4	4	●	1
D0150	1.5	2.3	40	4	4	●	1
D0200	2	3	40	4	4	●	1
D0250	2.5	3.8	40	4	4	●	1
D0300	3	4.5	50	6	4	●	1
D0400	4	6	50	6	4	●	1
D0500	5	7.5	50	6	4	●	1
D0600	6	9	50	6	4	●	2
D0800	8	12	60	8	4	●	2
D1000	10	15	70	10	4	●	2
D1200	12	18	75	12	4	●	2

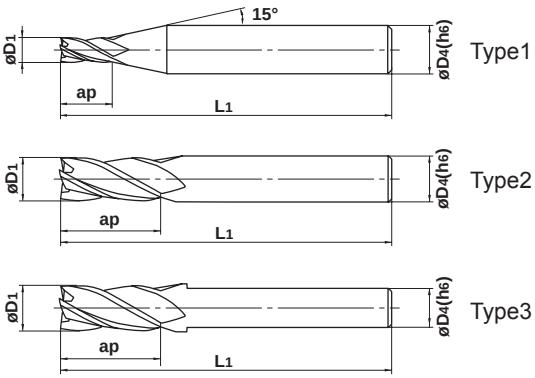
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J299

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	Aluminium Alloy
◎	◎	○		○	○		



h6	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			
	4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

4 flute end mill for general use.

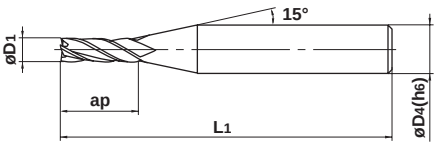
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4MCD0100	1	2.5	40	4	4	●	1
D0150	1.5	3.8	40	4	4	●	1
D0200	2	5	40	4	4	●	1
D0250	2.5	6.3	40	4	4	●	1
D0300	3	7.5	50	6	4	●	1
D0350	3.5	9	50	6	4	●	1
D0400	4	10	50	6	4	●	1
D0450	4.5	11.5	50	6	4	●	1
D0500	5	12.5	50	6	4	●	1
D0550	5.5	14	50	6	4	●	1
D0600	6	15	50	6	4	●	2
D0650	6.5	16.5	60	8	4	●	1
D0700	7	17.5	60	8	4	●	1
D0750	7.5	19	60	8	4	●	1
D0800	8	20	60	8	4	●	2
D0850	8.5	21.5	70	10	4	●	1
D0900	9	22.5	70	10	4	●	1
D0950	9.5	24	70	10	4	●	1
D1000	10	25	70	10	4	●	2
D1100	11	27.5	75	12	4	●	1
D1200	12	30	90	12	4	●	2
D1400	14	35	90	12	4	●	3
D1600	16	40	100	16	4	●	2
D1800	18	45	100	16	4	●	3
D2000	20	50	110	20	4	●	2

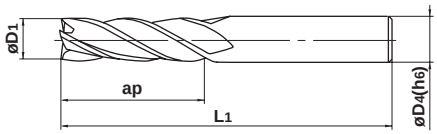
MS4JC

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

1≤D1≤12				
0 - 0.020				
4≤D4≤6	8≤D4≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 4 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4JCD0100	1	4	40	4	4	●	1
D0150	1.5	6	40	4	4	●	1
D0200	2	8	40	4	4	●	1
D0250	2.5	10	50	4	4	●	1
D0300	3	12	50	6	4	●	1
D0400	4	16	50	6	4	●	1
D0500	5	20	60	6	4	●	1
D0600	6	24	60	6	4	●	2
D0800	8	32	70	8	4	●	2
D1000	10	40	90	10	4	●	2
D1200	12	48	110	12	4	●	2

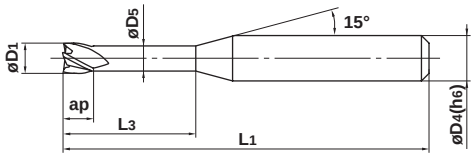
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J300

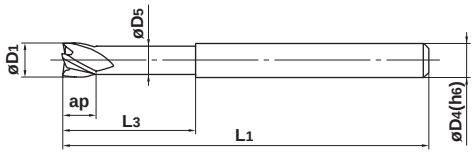
MS4XL

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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

1≤D1≤10				
0 - 0.020				
4≤D4≤6	8≤D4≤10			
0 - 0.008	0 - 0.009			

h6

4 flute long neck end mill.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4XLD0100N040	1	1	4	0.94	50	4	4	●	1
D0100N060	1	1	6	0.94	50	4	4	●	1
D0100N080	1	1	8	0.94	50	4	4	●	1
D0100N100	1	1	10	0.94	50	4	4	●	1
D0100N120	1	1	12	0.94	50	4	4	●	1
D0100N160	1	1	16	0.94	60	4	4	●	1
D0110N060	1.1	1.1	6	1.04	50	4	4	●	1
D0110N100	1.1	1.1	10	1.04	50	4	4	●	1
D0110N160	1.1	1.1	16	1.04	60	4	4	●	1
D0120N060	1.2	1.2	6	1.14	50	4	4	●	1
D0120N080	1.2	1.2	8	1.14	50	4	4	●	1
D0120N100	1.2	1.2	10	1.14	50	4	4	●	1
D0120N120	1.2	1.2	12	1.14	50	4	4	●	1
D0120N160	1.2	1.2	16	1.14	60	4	4	●	1
D0130N060	1.3	1.3	6	1.24	50	4	4	●	1
D0130N120	1.3	1.3	12	1.24	50	4	4	●	1
D0130N180	1.3	1.3	18	1.24	60	4	4	●	1
D0140N060	1.4	1.4	6	1.34	50	4	4	●	1
D0140N080	1.4	1.4	8	1.34	50	4	4	●	1
D0140N100	1.4	1.4	10	1.34	50	4	4	●	1
D0140N120	1.4	1.4	12	1.34	50	4	4	●	1
D0140N140	1.4	1.4	14	1.34	60	4	4	●	1
D0140N160	1.4	1.4	16	1.34	60	4	4	●	1
D0140N220	1.4	1.4	22	1.34	60	4	4	●	1
D0150N060	1.5	1.5	6	1.44	50	4	4	●	1
D0150N080	1.5	1.5	8	1.44	50	4	4	●	1
D0150N100	1.5	1.5	10	1.44	50	4	4	●	1
D0150N120	1.5	1.5	12	1.44	50	4	4	●	1
D0150N140	1.5	1.5	14	1.44	60	4	4	●	1
D0150N160	1.5	1.5	16	1.44	60	4	4	●	1
D0150N180	1.5	1.5	18	1.44	60	4	4	●	1
D0150N200	1.5	1.5	20	1.44	60	4	4	●	1
D0160N060	1.6	1.6	6	1.54	50	4	4	●	1
D0160N080	1.6	1.6	8	1.54	50	4	4	●	1

MS4XL

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

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4XLD0160N100	1.6	1.6	10	1.54	50	4	4	●	1
D0160N120	1.6	1.6	12	1.54	50	4	4	●	1
D0160N140	1.6	1.6	14	1.54	60	4	4	●	1
D0160N160	1.6	1.6	16	1.54	60	4	4	●	1
D0160N180	1.6	1.6	18	1.54	60	4	4	●	1
D0160N200	1.6	1.6	20	1.54	60	4	4	●	1
D0160N260	1.6	1.6	26	1.54	70	4	4	●	1
D0170N060	1.7	1.7	6	1.64	50	4	4	●	1
D0170N140	1.7	1.7	14	1.64	60	4	4	●	1
D0170N240	1.7	1.7	24	1.64	70	4	4	●	1
D0180N060	1.8	1.8	6	1.74	50	4	4	●	1
D0180N080	1.8	1.8	8	1.74	50	4	4	●	1
D0180N100	1.8	1.8	10	1.74	50	4	4	●	1
D0180N120	1.8	1.8	12	1.74	50	4	4	●	1
D0180N140	1.8	1.8	14	1.74	60	4	4	●	1
D0180N160	1.8	1.8	16	1.74	60	4	4	●	1
D0180N180	1.8	1.8	18	1.74	60	4	4	●	1
D0180N200	1.8	1.8	20	1.74	60	4	4	●	1
D0180N250	1.8	1.8	25	1.74	70	4	4	●	1
D0190N060	1.9	1.9	6	1.84	50	4	4	●	1
D0190N160	1.9	1.9	16	1.84	60	4	4	●	1
D0190N280	1.9	1.9	28	1.84	70	4	4	●	1
D0200N060	2	2	6	1.9	50	4	4	●	1
D0200N080	2	2	8	1.9	50	4	4	●	1
D0200N100	2	2	10	1.9	50	4	4	●	1
D0200N120	2	2	12	1.9	50	4	4	●	1
D0200N140	2	2	14	1.9	60	4	4	●	1
D0200N160	2	2	16	1.9	60	4	4	●	1
D0200N180	2	2	18	1.9	60	4	4	●	1
D0200N200	2	2	20	1.9	60	4	4	●	1
D0200N250	2	2	25	1.9	70	4	4	●	1
D0200N300	2	2	30	1.9	70	4	4	●	1
D0250N080	2.5	2.5	8	2.4	50	4	4	●	1
D0250N120	2.5	2.5	12	2.4	50	4	4	●	1
D0250N160	2.5	2.5	16	2.4	60	4	4	●	1
D0250N200	2.5	2.5	20	2.4	60	4	4	●	1
D0250N250	2.5	2.5	25	2.4	70	4	4	●	1
D0300N080	3	3	8	2.9	50	6	4	●	1
D0300N120	3	3	12	2.9	50	6	4	●	1
D0300N160	3	3	16	2.9	60	6	4	●	1
D0300N200	3	3	20	2.9	60	6	4	●	1
D0300N250	3	3	25	2.9	70	6	4	●	1
D0300N300	3	3	30	2.9	70	6	4	●	1
D0350N150	3.5	3.5	15	3.4	60	6	4	●	1
D0350N250	3.5	3.5	25	3.4	70	6	4	●	1
D0350N350	3.5	3.5	35	3.4	80	6	4	●	1
D0400N120	4	4	12	3.9	50	6	4	●	1
D0400N160	4	4	16	3.9	60	6	4	●	1
D0400N200	4	4	20	3.9	60	6	4	●	1
D0400N250	4	4	25	3.9	70	6	4	●	1
D0400N300	4	4	30	3.9	70	6	4	●	1
D0400N350	4	4	35	3.9	80	6	4	●	1

● : Inventory maintained in Japan.

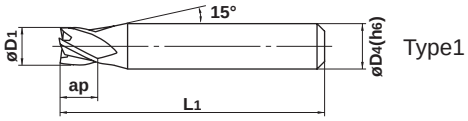
Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4XLD0400N400	4	4	40	3.9	90	6	4	●	1
D0400N450	4	4	45	3.9	90	6	4	●	1
D0400N500	4	4	50	3.9	100	6	4	●	1
D0500N160	5	5	16	4.9	60	6	4	●	1
D0500N250	5	5	25	4.9	70	6	4	●	1
D0500N350	5	5	35	4.9	80	6	4	●	1
D0500N500	5	5	50	4.9	110	6	4	●	1
D0600N200	6	6	20	5.85	80	6	4	●	2
D0600N300	6	6	30	5.85	90	6	4	●	2
D0600N400	6	6	40	5.85	100	6	4	●	2
D0600N500	6	6	50	5.85	110	6	4	●	2
D0800N300	8	8	30	7.85	90	8	4	●	2
D0800N500	8	8	50	7.85	110	8	4	●	2
D0800N700	8	8	70	7.85	130	8	4	●	2
D1000N400	10	10	40	9.7	100	10	4	●	2
D1000N600	10	10	60	9.7	120	10	4	●	2
D1000N800	10	10	80	9.7	140	10	4	●	2

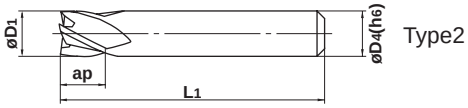
MS4EC

End mill, 4 flute, For small automatic lathes

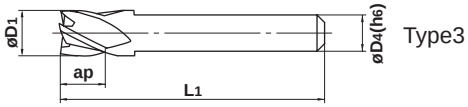
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2



Type3

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
4≤D4≤6	7≤D4≤10			
0 - 0.008	0 - 0.009			

h6

● 4 flute end mill.

Overall length 35mm

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4ECD0300L35S04	3	3	35	4	4	●	1
D0350L35S04	3.5	3.5	35	4	4	●	1
D0400L35S04	4	4	35	4	4	●	2
D0500L35S05	5	5	35	5	4	●	2
D0500L35S06	5	5	35	6	4	●	1
D0600L35S05	6	6	35	5	4	●	3
D0600L35S06	6	6	35	6	4	●	2
D0700L35S07	7	6	35	7	4	●	2
D0800L35S07	8	6	35	7	4	●	3
D0800L35S08	8	6	35	8	4	●	2
D1000L35S07	10	6	35	7	4	●	3
D1000L35S10	10	6	35	10	4	●	2
D1200L35S10	12	6	35	10	4	●	3

Overall length 45mm

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4ECD0300L45S04	3	3	45	4	4	●	1
D0350L45S04	3.5	3.5	45	4	4	●	1
D0400L45S04	4	4	45	4	4	●	2
D0500L45S06	5	5	45	6	4	●	1
D0600L45S06	6	6	45	6	4	●	2
D0700L45S07	7	7	45	7	4	●	2
D0800L45S07	8	8	45	7	4	●	3
D0800L45S08	8	8	45	8	4	●	2
D1000L45S07	10	10	45	7	4	●	3
D1000L45S10	10	10	45	10	4	●	2
D1200L45S10	12	12	45	10	4	●	3
D1400L45S10	14	14	45	10	4	●	3

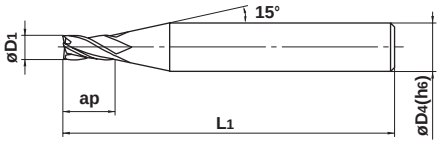
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J302

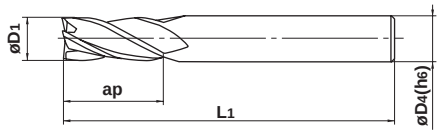
VF-4MD

End mill, Medium cut length, 4 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	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
4≤D4≤6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

4 flute end mill suitable for high-speed machining of hardened steel.

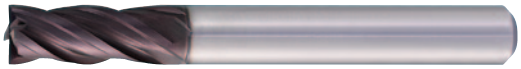
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF4MDD0100	1	2.5	40	4	4	●	1
D0150	1.5	3.8	40	4	4	●	1
D0200	2	5	40	4	4	●	1
D0250	2.5	6.3	40	4	4	●	1
D0300	3	7.5	50	6	4	●	1
D0400	4	10	50	6	4	●	1
D0500	5	12.5	50	6	4	●	1
D0600	6	15	50	6	4	●	2
D0800	8	20	60	8	4	●	2
D1000	10	25	70	10	4	●	2
D1200	12	30	90	12	4	●	2
D1600	16	40	100	16	4	●	2
D2000	20	50	110	20	4	●	2

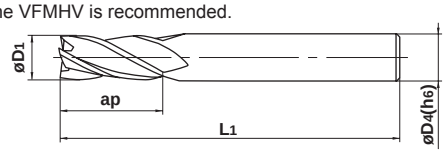
VF-4MV

End mill, Medium cut length, 4 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	Aluminium Alloy
○	◎	◎	◎				



∗ For austenitic stainless steels, titanium and heat-resistant alloys, the VFMHV is recommended.



Type1

h6

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

An irregular helix 4 flute square end mill suitable for high-speed machining of hardened steel.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF4MVD0600	6	15	50	6	4	●	1
D0800	8	20	60	8	4	●	1
D1000	10	25	70	10	4	●	1
D1200	12	30	90	12	4	●	1
D1600	16	40	100	16	4	●	1
D2000	20	50	110	20	4	●	1

● : Inventory maintained in Japan.

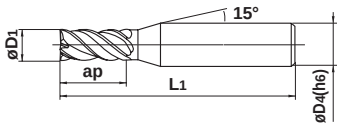
CUTTING CONDITIONS ➤ J316

VF-MHV

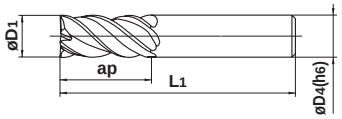
End mill, Medium cut length, Irregular helix flutes

UWC VF 43° 45° D1<6 42° 45° D1≥6

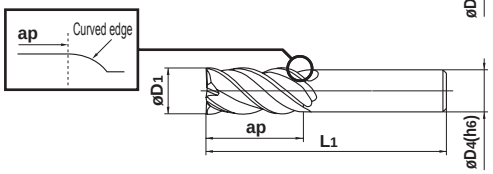
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○	○		◎	◎		



Type1



Type2



Type3

h6

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
4≤D4≤6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

Vibration control end mill achieving stable machining of difficult-to-cut materials and for long overhang applications.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFMHVD0200	2	4	45	4	4	●	1
D0250	2.5	5	45	4	4	●	1
D0300	3	8	45	6	4	●	1
D0350	3.5	8	45	6	4	●	1
D0400	4	11	45	6	4	●	1
D0500	5	13	50	6	4	●	1
D0600	6	13	50	6	4	●	2
D0600A070	6	13	70	6	4	●	2
D0700	7	19	60	8	4	●	1
D0800	8	19	60	8	4	●	2
D0800A080	8	19	80	8	4	●	2
D0900	9	22	70	10	4	●	1
D1000A100S08	10	22	100	8	4	●	3
D1000	10	22	70	10	4	●	2
D1000A100	10	22	100	10	4	●	2
D1100	11	26	100	10	4	●	3
D1200A110S10	12	26	110	10	4	●	3
D1200	12	26	75	12	4	●	2
D1200A110	12	26	110	12	4	●	2
D1300	13	26	110	12	4	●	3
D1400A130S12	14	32	130	12	4	●	3
D1600	16	35	90	16	4	●	2
D1800A150S16	18	42	150	16	4	●	3
D2000	20	45	110	20	4	●	2

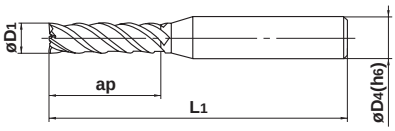
IMPACT MIRACLE END MILL FOR DIFFICULT TO CUT MATERIALS, IRREGULAR HELIX

VF-JHV

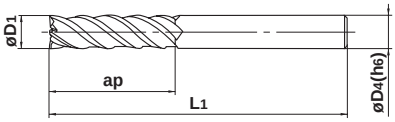
End mill, Semi long cut length, Irregular helix flutes

UWC VF 43.5° 45° D1≤6 43° 45° D1>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	Aluminium Alloy
○	○	○		◎	◎		



Type1



Type2

h6

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	D4=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.
Suitable for deep machining with long axial depth of cut.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFJHVD0200	2	8	60	6	4	●	1
D0300	3	12	60	6	4	●	1
D0400	4	16	60	6	4	●	1
D0500	5	20	60	6	4	●	1
D0600	6	24	60	6	4	●	2
D0800	8	28	80	8	4	●	2
D1000	10	35	90	10	4	●	2
D1200	12	40	100	12	4	●	2
D1600	16	55	125	16	4	●	2
D2000	20	60	140	20	4	●	2

● : Inventory maintained in Japan.

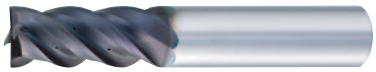
CUTTING CONDITIONS ➤ J318

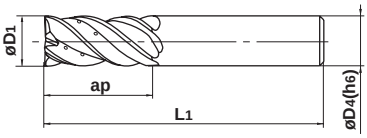
VF-MHV-CH

End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS





Type1

h6	16≤D1≤20				
	0 - 0.03				
	D4=16	D4=20			
	0 - 0.011	0 - 0.013			

● Vibration control end mill with multiple internal through coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

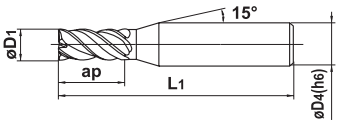
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFMHVCHD1600	16	35	90	16	4	●	1
D2000	20	45	110	20	4	●	1

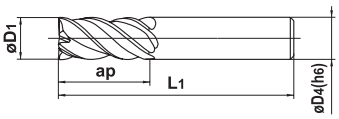
VQ-MHV NEW

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

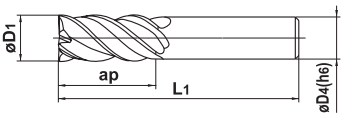
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			◎	◎	○	



Type1



Type2



Type3

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
4≤D4≤6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

Smart Miracle vibration control end mill achieving stable machining of difficult-to-cut materials and for long overhang applications.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VQMHVD0200	2	4	45	4	4	●	1
D0250	2.5	5	45	4	4	●	1
D0300	3	8	45	6	4	●	1
D0350	3.5	8	45	6	4	●	1
D0400	4	11	45	6	4	●	1
D0500	5	13	50	6	4	●	1
D0600	6	13	50	6	4	●	2
D0700	7	19	60	8	4	●	1
D0800	8	19	60	8	4	●	2
D0900	9	22	70	10	4	●	1
D1000	10	22	70	10	4	●	2
D1100	11	26	75	12	4	●	1
D1200	12	26	75	12	4	●	2
D1300	13	26	75	12	4	●	3
D1400	14	30	90	16	4	●	1
D1600	16	35	90	16	4	●	2
D1800	18	40	100	16	4	●	3
D2000	20	45	110	20	4	●	2
D2500	25	55	125	25	4	●	2

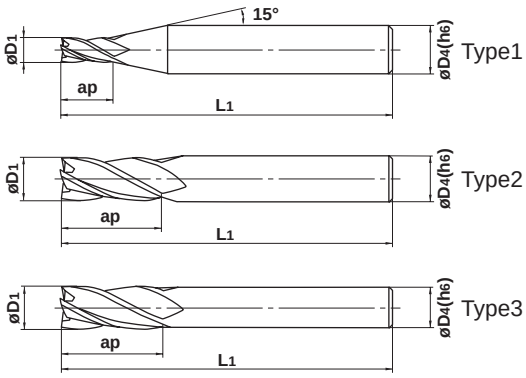
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J345

VC-4MC

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	Aluminium Alloy
○	◎	◎	○	○	○		



h6				
D1≤12	D1>12			
0 - 0.020	0 - 0.030			
4≤D4≤6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 4 flute end mill for general use.

Unit : mm

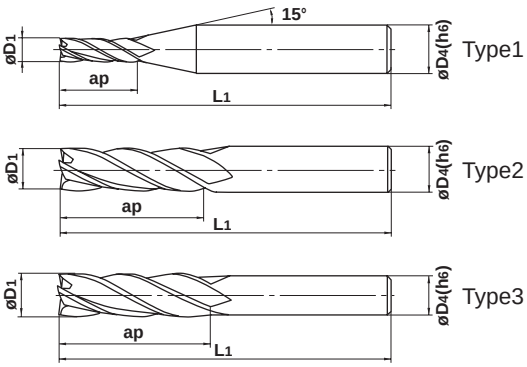
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4MCD0200	2	6	40	4	4	●	1
D0250	2.5	8	40	4	4	●	1
D0300	3	8	45	6	4	●	1
D0350	3.5	10	45	6	4	●	1
D0400	4	11	45	6	4	●	1
D0450	4.5	11	45	6	4	●	1
D0500	5	13	50	6	4	●	1
D0550	5.5	13	50	6	4	●	1
D0600	6	13	50	6	4	●	2
D0650	6.5	16	60	8	4	●	1
D0700	7	16	60	8	4	●	1
D0750	7.5	16	60	8	4	●	1
D0800	8	19	60	8	4	●	2
D0850	8.5	19	70	10	4	●	1
D0900	9	19	70	10	4	●	1
D0950	9.5	19	70	10	4	●	1
D1000	10	22	70	10	4	●	2
D1050	10.5	22	75	12	4	●	1
D1100	11	22	75	12	4	●	1
D1150	11.5	22	75	12	4	●	1
D1200	12	26	75	12	4	●	2
D1250	12.5	26	75	12	4	●	3
D1300	13	26	75	12	4	●	3
D1400	14	26	75	12	4	●	3
D1500	15	30	80	16	4	●	1
D1600	16	32	90	16	4	●	2
D1700	17	32	90	16	4	●	3
D1800	18	32	90	16	4	●	3
D1900	19	32	100	20	4	●	1
D2000	20	38	100	20	4	●	2
D2200	22	38	100	20	4	●	3
D2400	24	45	120	25	4	●	1
D2500	25	45	120	25	4	●	2

CUTTING CONDITIONS ➤ J350

VC-4JC

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	Aluminium Alloy
○	◎	◎	○	○	○		



D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4JCD0300	3	12	50	6	4	●	1
D0350	3.5	15	50	6	4	●	1
D0400	4	15	50	6	4	●	1
D0450	4.5	15	50	6	4	●	1
D0500	5	20	60	6	4	●	1
D0550	5.5	20	60	6	4	●	1
D0600	6	20	60	6	4	●	2
D0650	6.5	25	70	8	4	●	1
D0700	7	25	70	8	4	●	1
D0750	7.5	25	70	8	4	●	1
D0800	8	25	70	8	4	●	2
D0850	8.5	25	90	10	4	●	1
D0900	9	25	90	10	4	●	1
D0950	9.5	25	90	10	4	●	1
D1000	10	30	90	10	4	●	2
D1050	10.5	30	90	12	4	●	1
D1100	11	30	90	12	4	●	1
D1150	11.5	30	90	12	4	●	1
D1200	12	30	90	12	4	●	2
D1300	13	35	90	12	4	●	3
D1400	14	40	110	16	4	●	1
D1500	15	40	110	16	4	●	1
D1600	16	50	110	16	4	●	2
D1700	17	50	110	20	4	●	1
D1800	18	50	110	20	4	●	1
D1900	19	55	110	20	4	●	1
D2000	20	55	110	20	4	●	2
D2200	22	65	140	25	4	●	1
D2400	24	75	140	25	4	●	1
D2500	25	75	140	25	4	●	2

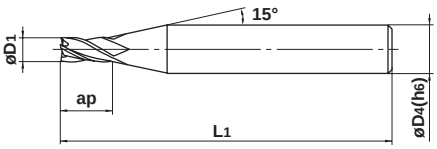
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J351

VC-MD-SC

End mill, Medium cut length, 4—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	Aluminium Alloy
○	◎	◎	◎				



Type1

h6	0.5≤D1≤3				
	0 - 0.020				
	D4=6				
	0 - 0.008				

● Ideal for tool steel and hardened materials machining

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCMDSCD0050	0.5	1	45	6	4	●	1
D0100	1	2.5	45	6	4	●	1
D0150	1.5	4	45	6	4	●	1
D0200	2	6	45	6	4	●	1
D0250	2.5	8	45	6	4	●	1
D0300	3	8	45	6	6	●	1

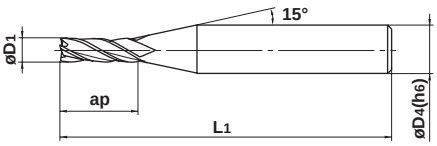
CUTTING CONDITIONS ➤ J352

MIRACLE END CRN

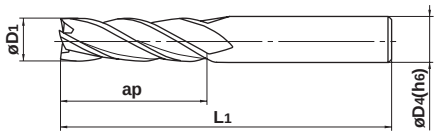
CRN-4JC

End mill, Semi long cut length, 4 flute, For copper electrodes

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	Aluminium Alloy
						◎	○



Type1



Type2

3≤D1≤12				
0 - 0.02				
D4=6	8≤D4≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 4 flute end mill with CRN coating for copper electrode machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CRN4JCD0300	3	12	50	6	4	●	1
D0400	4	15	50	6	4	●	1
D0500	5	20	60	6	4	●	1
D0600	6	20	60	6	4	●	2
D0800	8	25	70	8	4	●	2
D1000	10	30	90	10	4	●	2
D1200	12	30	90	12	4	●	2

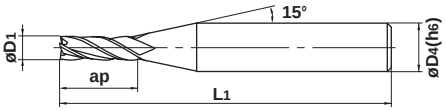
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J371

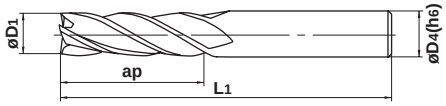
DF-4JC

End mill, Semi long cut length, 4 flute, For graphite

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○



Type1



Type2

h6	3≤D1≤12				
	0 - 0.02				
	D4=6	8≤D4≤10	D4=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

4 flute end mill with original diamond coating for graphite machining.

Unit : mm

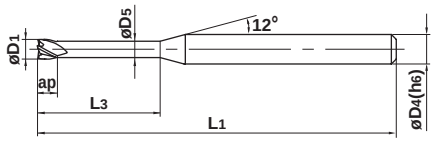
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DF4JCD0300	3	12	60	6	4	●	1
D0400	4	16	60	6	4	●	1
D0600	6	24	60	6	4	●	2
D0800	8	28	70	8	4	●	2
D1000	10	35	90	10	4	●	2
D1200	12	36	110	12	4	●	2

DF-4XL

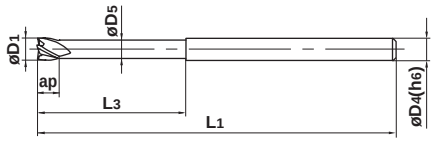
End mill, Long neck, 4 flute, For graphite

UWC DF 30° D1<3 D1=3

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○



Type1



Type2

1≤D1≤12				
0 - 0.02				
4≤D4≤6	8≤D4≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 4 flute long neck end mill with original diamond coating for graphite machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DF4XLD0100N060	1	1.5	6	0.94	50	4	4	●	1
D0100N080	1	1.5	8	0.94	50	4	4	●	1
D0100N100	1	1.5	10	0.94	50	4	4	●	1
D0150N100	1.5	2.3	10	1.44	60	4	4	●	1
D0150N160	1.5	2.3	16	1.44	60	4	4	●	1
D0200N100	2	3	10	1.9	60	4	4	●	1
D0200N160	2	3	16	1.9	60	4	4	●	1
D0200N200	2	3	20	1.9	60	4	4	●	1
D0300N160	3	4.5	16	2.9	70	4	4	●	1
D0300N200	3	4.5	20	2.9	70	4	4	●	1
D0300N300	3	4.5	30	2.9	70	4	4	●	1
D0400N200	4	6	20	3.9	80	4	4	●	2
D0400N400	4	6	40	3.9	80	4	4	●	2
D0600N300	6	9	30	5.85	70	6	4	●	2
D0800N300	8	12	30	7.85	90	8	4	●	2
D1000N300	10	15	30	9.7	90	10	4	●	2
D1200N300	12	18	30	11.7	110	12	4	●	2

● : Inventory maintained in Japan.

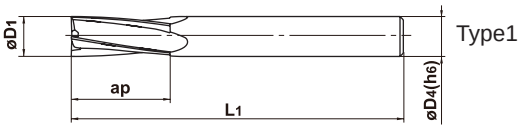
CUTTING CONDITIONS ➤ J378

DFC-4JC NEW

Diamond coating endmill, 4 flute

CFRP

◎



Type1

h6	6≤D1≤12				
	0 - 0.03				
	D4=6	8≤D4≤10	D4=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	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DFC4JCD0600	6	20	70	6	4	●	1
D0800	8	30	80	8	4	●	1
D1000	10	30	90	10	4	●	1
D1200	12	30	100	12	4	●	1

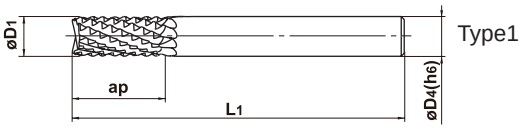
Note) Please contact Mitsubishi Materials for geometries and through coolant types that are non-standard.

DFC-JRT NEW

Diamond coating endmill with cross-nick

CFRP

◎



h6	D4=6	8≤D4≤10	D4=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	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DFCJRTD0600	6	20	70	6	10	●	1
D0800	8	30	80	8	10	●	1
D1000	10	30	90	10	12	●	1
D1200	12	30	100	12	12	●	1

Note) Please contact Mitsubishi Materials for geometries and through coolant types that are non-standard.

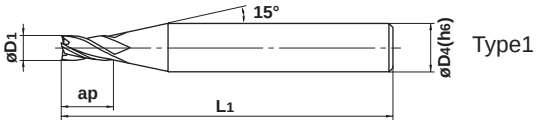
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J385

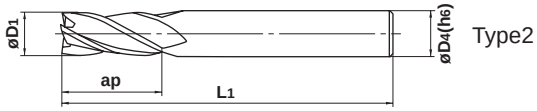
C-4MC

End mill, Medium cut length, 4 flute, Center cutting

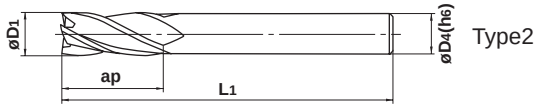
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2



Type2

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- 4 flute uncoated center cutting end mill for general use.

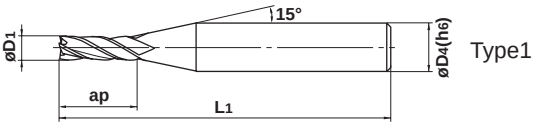
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C4MCD0300	3	8	45	6	4	●	1
D0350	3.5	10	45	6	4	●	1
D0400	4	11	45	6	4	●	1
D0450	4.5	11	45	6	4	●	1
D0500	5	13	50	6	4	●	1
D0550	5.5	13	50	6	4	●	1
D0600	6	13	50	6	4	●	2
D0650	6.5	16	60	8	4	●	1
D0700	7	16	60	8	4	●	1
D0750	7.5	16	60	8	4	●	1
D0800	8	19	60	8	4	●	2
D0850	8.5	19	70	10	4	●	1
D0900	9	19	70	10	4	●	1
D0950	9.5	19	70	10	4	●	1
D1000	10	22	70	10	4	●	2
D1050	10.5	22	75	12	4	●	1
D1100	11	22	75	12	4	●	1
D1150	11.5	22	75	12	4	●	1
D1200	12	26	75	12	4	●	2
D1250	12.5	26	75	12	4	●	3
D1300	13	26	75	12	4	●	3
D1400	14	26	75	12	4	●	3
D1500	15	30	80	16	4	●	1
D1600	16	32	90	16	4	●	2
D1700	17	32	90	16	4	●	3
D1800	18	32	90	16	4	●	3
D1900	19	32	100	20	4	●	1
D2000	20	38	100	20	4	●	2

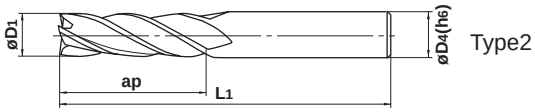
C-4JC

End mill, Semi long cut length, 4 flute, Center cutting

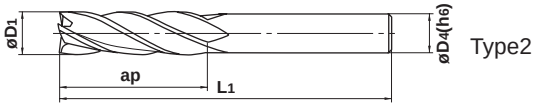
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2



Type2

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute uncoated end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C4JCD0300	3	12	50	6	4	●	1
D0350	3.5	15	50	6	4	●	1
D0400	4	15	50	6	4	●	1
D0450	4.5	15	50	6	4	●	1
D0500	5	20	60	6	4	●	1
D0550	5.5	20	60	6	4	●	1
D0600	6	20	60	6	4	●	2
D0650	6.5	25	70	8	4	●	1
D0700	7	25	70	8	4	●	1
D0750	7.5	25	70	8	4	●	1
D0800	8	25	70	8	4	●	2
D0850	8.5	25	90	10	4	●	1
D0900	9	25	90	10	4	●	1
D0950	9.5	25	90	10	4	●	1
D1000	10	30	90	10	4	●	2
D1050	10.5	30	90	12	4	●	1
D1100	11	30	90	12	4	●	1
D1150	11.5	30	90	12	4	●	1
D1200	12	30	90	12	4	●	2
D1300	13	35	90	12	4	●	3
D1400	14	40	110	16	4	●	1
D1500	15	40	110	16	4	●	1
D1600	16	50	110	16	4	●	2
D1700	17	50	110	20	4	●	1
D1800	18	50	110	20	4	●	1
D1900	19	55	110	20	4	●	1
D2000	20	55	110	20	4	●	2
D2200	22	65	140	25	4	●	1
D2400	24	75	140	25	4	●	1
D2500	25	75	140	25	4	●	2

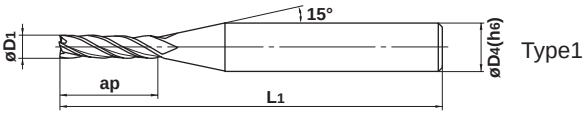
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J392

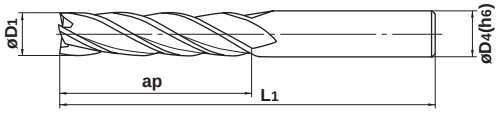
C-4LC

End mill, Long cut length, 4 flute, Center cutting

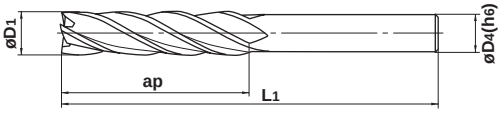
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2



Type2

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute end mill with longer cut length than standard.

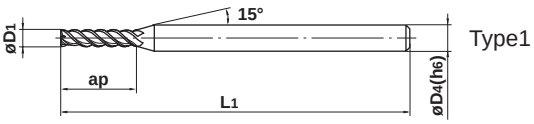
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C4LCD0300	3	20	60	6	4	●	1
D0350	3.5	22	60	6	4	●	1
D0400	4	25	60	6	4	●	1
D0450	4.5	25	60	6	4	●	1
D0500	5	30	70	6	4	●	1
D0550	5.5	30	70	6	4	●	1
D0600	6	30	70	6	4	●	2
D0650	6.5	30	90	8	4	●	1
D0700	7	40	90	8	4	●	1
D0750	7.5	40	90	8	4	●	1
D0800	8	40	90	8	4	●	2
D0850	8.5	40	100	10	4	●	1
D0900	9	40	100	10	4	●	1
D0950	9.5	40	100	10	4	●	1
D1000	10	50	100	10	4	●	2
D1050	10.5	50	110	12	4	●	1
D1100	11	50	110	12	4	●	1
D1150	11.5	50	110	12	4	●	1
D1200	12	50	110	12	4	●	2
D1250	12.5	50	120	12	4	●	3
D1300	13	50	120	12	4	●	3
D1400	14	70	130	16	4	●	1
D1500	15	70	130	16	4	●	1
D1600	16	70	130	16	4	●	2
D1700	17	70	140	20	4	●	1
D1800	18	70	140	20	4	●	1
D1900	19	70	140	20	4	●	1
D2000	20	70	140	20	4	●	2

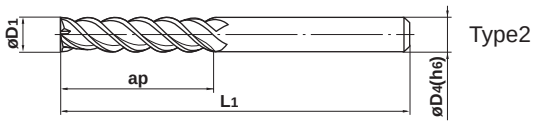
SEE4L

End mill, 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	Aluminium Alloy
◎	○			○	○		○



Type1



Type2

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 4 flute high helix end mill.

Unit : mm

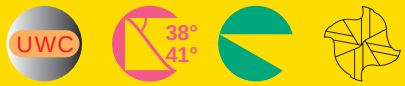
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SEE4030L	3	15	55	6	4	●	1
4040L	4	20	60	6	4	●	1
4050L	5	25	65	6	4	●	1
4060L	6	25	65	6	4	●	2
4070L	7	35	80	8	4	●	1
4080L	8	35	80	8	4	●	2
4090L	9	45	90	10	4	●	1
4100L	10	45	95	10	4	●	2
4110L	11	55	105	12	4	●	1
4120L	12	55	105	12	4	●	2
4140L	14	70	125	16	4	●	1
4150L	15	70	125	16	4	●	1
4160L	16	70	125	16	4	●	2
4180L	18	70	125	20	4	●	1
4200L	20	75	140	20	4	●	2
4250L	25	85	160	25	4	●	2

● : Inventory maintained in Japan.

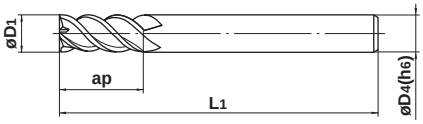
CUTTING CONDITIONS ➤ J398

SEG4SA

End mill, Medium cut length, 4 flute, Irregular spiral helix angle, For aluminium 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	Aluminium Alloy
						○	◎



Type1

h6

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 4 flute end mill with irregular helix angle for aluminium alloy.

Unit : mm

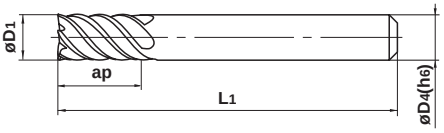
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SEG4060SA	6	14	50	6	4	●	1
4080SA	8	19	60	8	4	●	1
4100SA	10	24	70	10	4	●	1
4120SA	12	29	75	12	4	●	1
4160SA	16	38	90	16	4	●	1
4200SA	20	48	110	20	4	●	1
4250SA	25	59	125	25	4	●	1

IMPACT MIRACLE END MILL FOR DIFFICULT TO CUT MATERIALS, IRREGULAR HELIX

VF-6MHV

End mill, Medium cut length, 6 flute, Irregular helix flutes

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	Aluminium Alloy
○	○	○		◎	◎		



Type1

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- 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	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF6MHVD0600	6	13	50	6	6	●	1
D0800	8	19	60	8	6	●	1
D1000	10	22	70	10	6	●	1
D1200	12	26	75	12	6	●	1
D1600	16	32	90	16	6	●	1
D2000	20	38	100	20	6	●	1

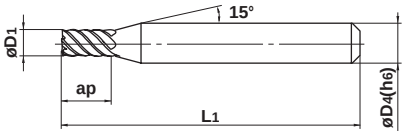
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J319

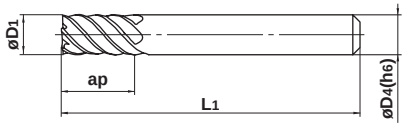
VF-SD

End mill, Short cut length, 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	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2

1≤D1≤12				
0 - 0.02				
D4=6	8≤D4≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

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

Unit : mm

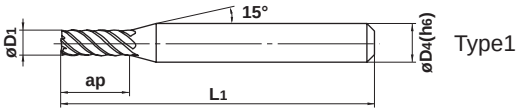
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFSDD0100	1	2	45	6	4	●	1
D0150	1.5	3	45	6	4	●	1
D0200	2	4	45	6	4	●	1
D0250	2.5	5	45	6	4	●	1
D0300	3	6	45	6	6	●	1
D0350	3.5	7	45	6	6	●	1
D0400	4	8	45	6	6	●	1
D0500	5	10	50	6	6	●	1
D0600	6	12	50	6	6	●	2
D0800	8	16	60	8	6	●	2
D1000	10	20	70	10	6	●	2
D1200	12	24	75	12	6	●	2

VF-MD

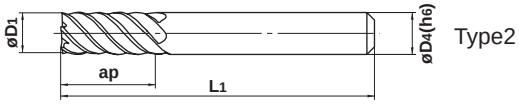
End mill, Medium cut length, For hardened materials

UWC VF 30° 45° D1<3 D1≥3 D1<3 D1≥3

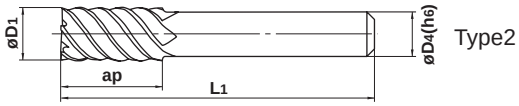
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2



Type2

h6

D1≤12	D1>12			
0 - 0.02	0 - 0.03			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

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

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFMDD0100	1	3.5	60	6	4	●	1
D0150	1.5	5	60	6	4	●	1
D0200	2	7	60	6	4	●	1
D0250	2.5	8	60	6	4	●	1
D0300	3	10	60	6	6	●	1
D0400	4	12	60	6	6	●	1
D0500	5	15	60	6	6	●	1
D0600	6	15	60	6	6	●	2
D0800	8	20	75	8	6	●	2
D1000	10	25	80	10	6	●	2
D1200	12	30	100	12	6	●	2
D1400	14	35	105	12	6	●	3
D1500	15	40	110	16	6	●	1
D1600	16	40	110	16	6	●	2
D1800	18	40	120	16	6	●	3
D2000	20	45	125	20	6	●	2
D2200	22	45	135	20	6	●	3
D2500	25	60	160	25	6	●	2

● : Inventory maintained in Japan.

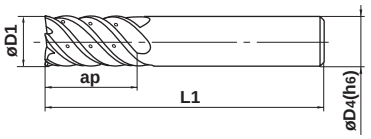
CUTTING CONDITIONS ➤ J320

VF-6MHV-CH

End mill, Medium cut length, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS



Type1

h6

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=10	D4=12	D4=16	D4=20	
0 - 0.009	0 - 0.011	0 - 0.011	0 - 0.013	

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

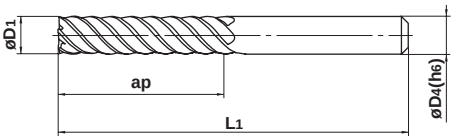
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
NEW VF6MHVCHD1000	10	22	70	10	6	●	1
NEW D1200	12	26	75	12	6	●	1
D1600	16	32	90	16	6	●	1
D2000	20	38	100	20	6	●	1

MIRACLE END MILL FOR HIGH HARDNESS STEEL

VC-LD

End mill, Long cut length, 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	Aluminium Alloy
○	◎	◎	◎				



Type1

D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● Ideal for tool steel and hardened materials machining

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCLDD0600	6	26	70	6	6	●	1
D0800	8	36	90	8	6	●	1
D1000	10	46	100	10	6	●	1
D1200	12	56	110	12	6	●	1
D1600	16	66	130	16	6	●	1
D2000	20	76	140	20	6	●	1
D2500	25	92	180	25	6	●	1

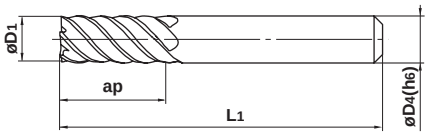
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J353

VC-6MH

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	Aluminium Alloy
◎	◎	○		◎	◎		



Type1

D1≤12	D1>12			
0 - 0.02	0 - 0.03			
D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

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

Unit : mm

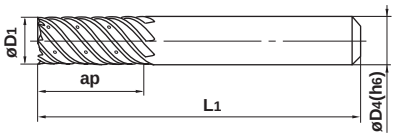
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC6MHD0600	6	13	50	6	6	●	1
D0800	8	19	60	8	6	●	1
D1000	10	22	70	10	6	●	1
D1200	12	26	75	12	6	●	1
D1600	16	32	90	16	6	●	1
D2000	20	38	100	20	6	●	1
D2500	25	45	120	25	6	●	1

VF-8MHV-CH

End mill, Medium cut length, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS



Type1

16≤D1≤20				
0 - 0.03				
D4=16	D4=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	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF8MHVCHD1600	16	32	90	16	8	●	1
D2000	20	38	100	20	8	●	1

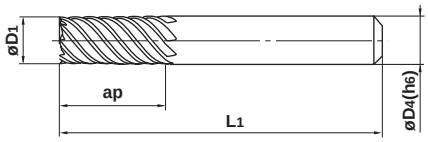
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J339

VC-8MH

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	Aluminium Alloy
◎	◎	○		◎	◎		



Type1

h6	20≤D1≤25				
	0 - 0.03				
	20≤D4≤25				
	0 - 0.013				

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

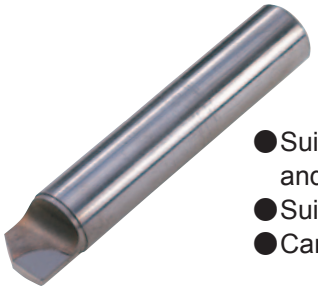
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC8MHD2000	20	38	100	20	8	●	1
D2500	25	45	120	25	8	●	1

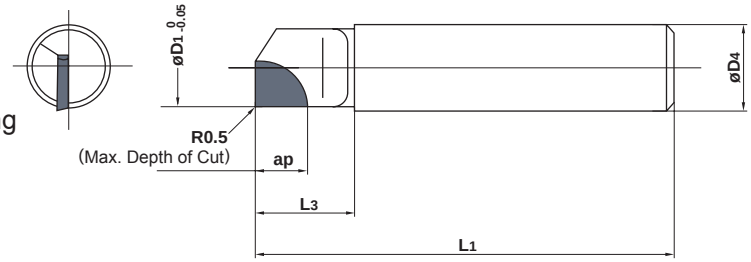
GBE

CBN end mill, Single flute

Light Alloy	Cast Iron	Carbon Steel • Alloy Steel	Stainless Steel	Hardened Steel
				◎



- Suitable for shoulder milling and die machining.
- Suitable for re-grinding.
- Carbon shank.



Right hand tool holder only.

Order Number	Number of Flutes	Stock	Dimensions (mm)				
		MB730	D1	L1	D4	L3	ap
GBE06S0640	1	●	6	40	6	8	3.5
08S0845	1	●	8	45	8	13	6
10S1050	1	●	10	50	10	13	6
12S1255	1	●	12	55	12	13	6

RECOMMENDED CUTTING CONDITIONS FOR GBE TYPE

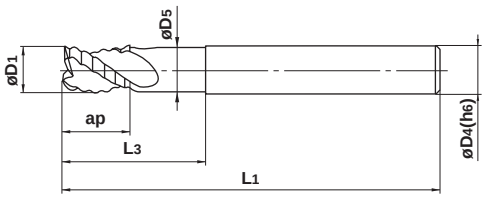
	Work Material	Hardness	Grade	Cutting Speed (m/min)	Feed (mm/rev)	Depth of Cut (mm)
H	Hardened Steel	45–68HRC	MB730	140 (80–200)	0.08 (0.02–0.15)	≤0.5
	Hardened Steel	45–68HRC	MB730	100 (60–150)	0.06 (0.02–0.10)	≤0.5

● : Inventory maintained in Japan.

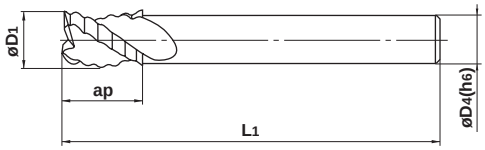
C-SRA

Roughing end mill, Short cut length, 3 flute, For aluminium 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	Aluminium Alloy
							◎



Type1



Type2

h6

D4=10	12≤D4≤16	20≤D4≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

● 3 flute uncoated end mill for roughing aluminium alloy.

Unit : mm

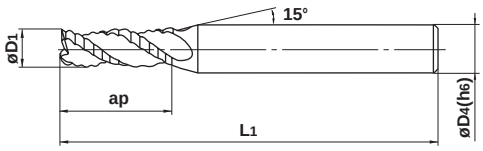
Order Number	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CSRAD1000	10	12	25	9.4	75	10	3	●	1
D1200	12	15	30	11.4	75	12	3	●	1
D1600	16	18	35	15.4	100	16	3	●	1
D1800	18	22	—	—	100	16	3	●	2
D2000	20	25	50	18.0	125	20	3	●	1
D2200	22	25	—	—	125	20	3	●	2
D2500	25	30	60	23.0	125	25	3	●	1

MIRACLE END ALIMASTER

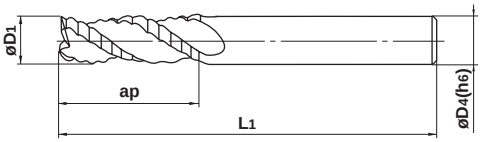
C-MRA

Roughing end mill, Medium cut length, 3 flute, For aluminium 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	Aluminium Alloy
							◎



Type1



Type2

h6

D4=6	8≤D4≤10	12≤D4≤16	20≤D4≤25
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

3 flute uncoated end mill for roughing aluminium alloy.

Unit : mm

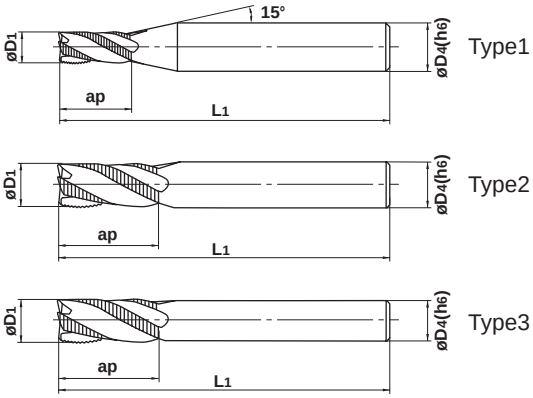
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CMRAD0300	3	8	50	6	3	●	1
D0400	4	11	50	6	3	●	1
D0500	5	13	50	6	3	●	1
D0600	6	13	50	6	3	●	2
D0800	8	19	60	8	3	●	2
D1000	10	22	75	10	3	●	2
D1200	12	26	75	12	3	●	2
D1600	16	32	100	16	3	●	2
D2000	20	38	125	20	3	●	2
D2500	25	45	125	25	3	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J394

VF-SFPR

Roughing end mill, Short cut length, 3—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	Aluminium Alloy
◎	◎	○		◎	◎		

h6

D4=6	8≤D4≤10	12≤D4≤16	D4=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 through to hardened steel and difficult-to-cut materials.

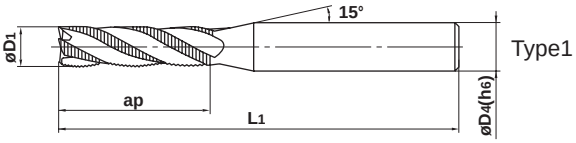
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFSFPRD0300	3	6	50	6	3	●	1
D0400	4	8	50	6	3	●	1
D0500	5	10	50	6	3	●	1
D0600	6	12	50	6	3	●	2
D0700	7	17	60	8	3	●	1
D0800	8	17	60	8	4	●	2
D0900	9	22	70	10	4	●	1
D1000S08	10	22	90	8	4	●	3
D1000	10	22	70	10	4	●	2
D1200S10	12	27	100	10	4	●	3
D1200	12	27	75	12	4	●	2
D1400	14	27	75	12	4	●	3
D1600	16	33	90	16	4	●	2
D1800	18	33	90	16	4	●	3
D2000	20	38	100	20	4	●	2

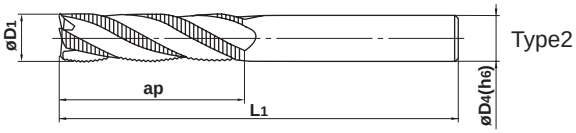
VF-MFPR

Roughing 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	Aluminium Alloy
◎	◎	○		◎	◎		



Type1



Type2

h6

D4=6	8≤D4≤10	12≤D4≤16	D4=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	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFMFPRD0500	5	15	60	6	4	●	1
D0600	6	17	60	6	4	●	2
D0700	7	22	75	8	4	●	1
D0800	8	28	75	8	4	●	2
D0900	9	28	100	10	4	●	1
D1000	10	34	100	10	4	●	2
D1200	12	40	110	12	4	●	2
D1600	16	48	125	16	4	●	2
D2000	20	57	140	20	4	●	2

● : Inventory maintained in Japan.

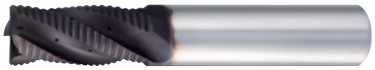
CUTTING CONDITIONS ➤ J322

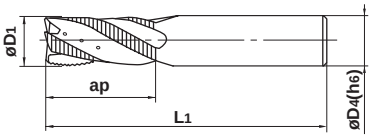
VF-SFPR-CH

Roughing end mill, Short cut length, 4 flute, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS





Type1

h6

D4=16	D4=20			
0 - 0.011	0 - 0.013			

● Roughing end mill with multiple internal through coolant holes suitable for difficult-to-cut materials.

Unit : mm

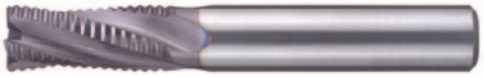
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFSFPRCHD1600	16	33	90	16	4	●	1
D2000	20	38	100	20	4	●	1

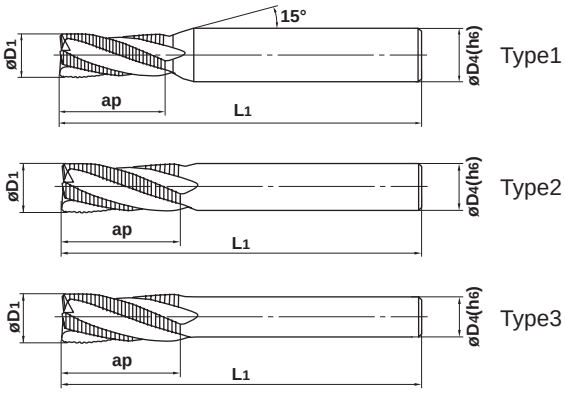
VC-SFPR

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

UWC VC 20° D1<8 D1≥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	Aluminium Alloy
◎	◎	○		◎	◎		





h6

D4=6	8≤D4≤10	12≤D4≤16	D4=20
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

3—4 flute roughing end mill for carbon and alloy steel through to difficult-to-cut and hardened materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCSFPRD0300	3	6	50	6	3	●	1
D0400	4	8	50	6	3	●	1
D0500	5	10	50	6	3	●	1
D0600	6	12	50	6	3	●	2
D0700	7	17	60	8	3	●	1
D0800	8	17	60	8	4	●	2
D0900	9	22	70	10	4	●	1
D1000S08	10	22	90	8	4	●	3
D1000	10	22	70	10	4	●	2
D1200S10	12	27	100	10	4	●	3
D1200	12	27	75	12	4	●	2
D1400	14	27	75	12	4	●	3
D1600	16	33	90	16	4	●	2
D1800	18	33	90	16	4	●	3
D2000	20	38	100	20	4	●	2

● : Inventory maintained in Japan.

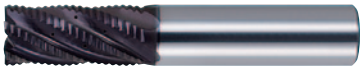
CUTTING CONDITIONS ➤ J356

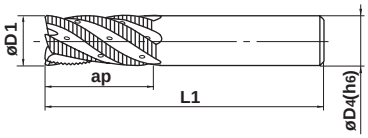
VF-6SVR-CH

Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS





Type1

h6

D4=16	D4=20			
0 - 0.011	0 - 0.013			

Roughing end mill with multiple internal through coolant holes suitable for difficult-to-cut materials.

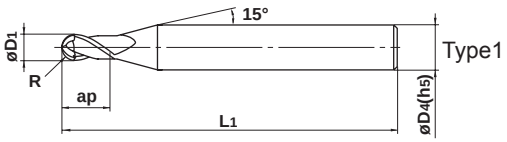
Unit : mm

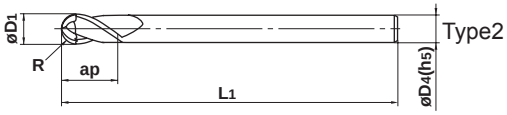
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF6SVRCHD1600	16	33	90	16	6	●	1
D2000	20	38	100	20	6	●	1

MP2SSB NEW

Ball nose, Short cut length, 2 flute, Short 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	Aluminium Alloy
◎	◎	○		○	○	◎	





R					
	0.1≤R≤6				
	±0.005				
h5	4≤D4≤6	8≤D4≤10	D4=12		
	0 - 0.005	0 - 0.006	0 - 0.008		

2-flute ball nose end mills with short cutting edge length for general purpose. Excellent performance for a wide range of workpiece materials such as carbon steel, alloy steel and hardened steel.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MP2SSBR0010	0.1	0.2	0.2	40	4	2	●	1
R0020	0.2	0.4	0.4	40	4	2	●	1
R0030	0.3	0.6	0.6	40	4	2	●	1
R0040	0.4	0.8	0.8	40	4	2	●	1
R0050	0.5	1	1	40	4	2	●	1
R0050S06	0.5	1	1	40	6	2	●	1
R0075	0.75	1.5	1.5	40	4	2	●	1
R0075S06	0.75	1.5	1.5	40	6	2	●	1
R0100	1	2	2	45	6	2	●	1
R0150	1.5	3	3	45	6	2	●	1
R0200	2	4	4	45	6	2	●	1
R0250	2.5	5	5	50	6	2	●	1
R0300	3	6	6	50	6	2	●	2
R0400	4	8	8	60	8	2	●	2
R0500	5	10	10	70	10	2	●	2
R0600	6	12	12	75	12	2	●	2

● : Inventory maintained in Japan.

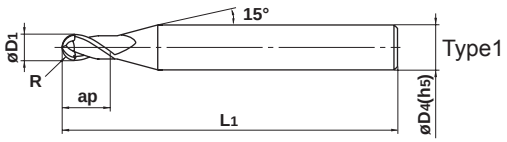
CUTTING CONDITIONS ➤ J286

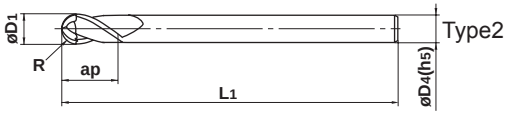
MP2SB NEW

Ball nose, Short 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)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		○	○		





R					
	0.1≤R≤6				
	±0.005				
h5	4≤D4≤6	8≤D4≤10	D4=12		
	0 - 0.005	0 - 0.006	0 - 0.008		

2-flute ball nose end mills with short cutting edge length for general purpose. Excellent performance for a wide range of workpiece materials such as carbon steel, alloy steel and hardened steel.

Unit : mm

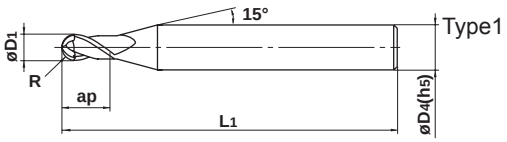
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MP2SBR0010	0.1	0.2	0.3	45	4	2	●	1
R0015	0.15	0.3	0.5	45	4	2	●	1
R0020	0.2	0.4	0.6	45	4	2	●	1
R0025	0.25	0.5	0.8	45	4	2	●	1
R0030	0.3	0.6	0.9	45	4	2	●	1
R0035	0.35	0.7	1.1	45	4	2	●	1
R0040	0.4	0.8	1.2	45	4	2	●	1
R0045	0.45	0.9	1.4	45	4	2	●	1
R0050	0.5	1	1.5	45	4	2	●	1
R0060	0.6	1.2	1.8	45	4	2	●	1
R0070	0.7	1.4	2.1	45	4	2	●	1
R0075	0.75	1.5	2.3	45	4	2	●	1
R0080	0.8	1.6	2.4	45	4	2	●	1
R0090	0.9	1.8	2.7	45	4	2	●	1
R0100	1	2	3	50	4	2	●	1
R0125	1.25	2.5	3.8	50	4	2	●	1
R0150	1.5	3	4.5	70	6	2	●	1
R0200	2	4	6	70	6	2	●	1
R0250	2.5	5	7.5	80	6	2	●	1
R0300	3	6	9	80	6	2	●	2
R0400	4	8	12	90	8	2	●	2
R0500	5	10	15	100	10	2	●	2
R0600	6	12	18	110	12	2	●	2

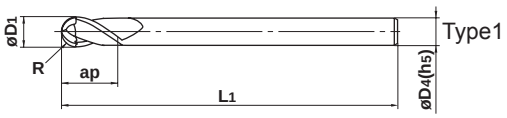
MS PLUS END MILLS

MP2MB NEW

Ball nose, Medium cutting 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	Aluminium Alloy
◎	◎	○		○	○		





R					
	0.25≤R≤6				
	±0.005				
h5	4≤D4≤6	8≤D4≤10	D4=12		
	0 - 0.005	0 - 0.006	0 - 0.008		

2-flute ball nose end mills with medium cutting edge length for general purpose. Excellent performance for a wide range of workpiece materials such as carbon steel, alloy steel and hardened steel.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MP2MBR0025	0.25	0.5	1	45	4	2	●	1
R0030	0.3	0.6	1.2	45	4	2	●	1
R0040	0.4	0.8	1.6	45	4	2	●	1
R0050	0.5	1	2.5	45	4	2	●	1
R0060	0.6	1.2	2.5	45	4	2	●	1
R0070	0.7	1.4	3	45	4	2	●	1
R0075	0.75	1.5	4	45	4	2	●	1
R0080	0.8	1.6	4	45	4	2	●	1
R0090	0.9	1.8	5	45	4	2	●	1
R0100	1	2	6	50	4	2	●	1
R0125	1.25	2.5	6	50	4	2	●	1
R0150S03	1.5	3	8	70	3	2	●	2
R0150	1.5	3	8	70	6	2	●	1
R0175	1.75	3.5	8	70	6	2	●	1
R0200S04	2	4	8	70	4	2	●	2
R0200	2	4	8	70	6	2	●	1
R0250	2.5	5	12	80	6	2	●	1
R0300	3	6	12	80	6	2	●	2
R0400	4	8	14	90	8	2	●	2
R0500	5	10	18	100	10	2	●	2
R0600	6	12	22	110	12	2	●	2

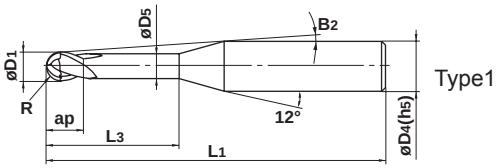
● : Inventory maintained in Japan.

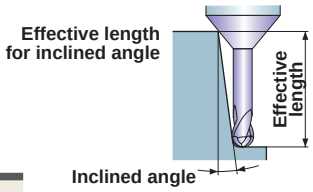
CUTTING CONDITIONS ➤ J286

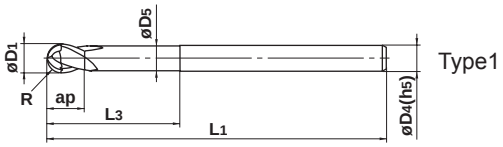
MP2XLB NEW

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	Aluminium Alloy
◎	◎	○		○	○		







R	0.05≤R≤3			
	±0.005			
h5	4≤D4≤6			
	0 / -0.005			

2-flute long neck ball nose end mills. Excellent performance for a wide range of workpiece materials such as carbon steel, alloy steel and hardened steel.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MP2XLBR0005N003	0.05	0.1	0.08	0.3	0.085	11.6°	50	4	2	●	1	0.3	0.3	0.4	0.4
R0005N005	0.05	0.1	0.08	0.5	0.085	11.4°	50	4	2	●	1	0.5	0.5	0.6	0.7
R0010N005	0.1	0.2	0.15	0.5	0.18	11.5°	50	4	2	●	1	0.5	0.5	0.6	0.7
R0010N008	0.1	0.2	0.15	0.75	0.18	11.2°	50	4	2	●	1	0.8	0.8	0.9	1
R0010N010	0.1	0.2	0.15	1	0.18	10.9°	50	4	2	●	1	1	1.1	1.2	1.3
R0010N013	0.1	0.2	0.15	1.25	0.18	10.6°	50	4	2	●	1	1.3	1.4	1.5	1.7
R0010N015	0.1	0.2	0.15	1.5	0.18	10.4°	50	4	2	●	1	1.6	1.6	1.8	2
R0010N018	0.1	0.2	0.15	1.75	0.18	10.2°	50	4	2	●	1	1.8	1.9	2.1	2.3
R0010N020	0.1	0.2	0.15	2	0.18	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0010N025	0.1	0.2	0.15	2.5	0.18	9.5°	50	4	2	●	1	2.6	2.7	3	3.3
R0015N005	0.15	0.3	0.24	0.5	0.28	11.5°	50	4	2	●	1	0.5	0.5	0.6	0.6
R0015N008	0.15	0.3	0.24	0.75	0.28	11.2°	50	4	2	●	1	0.8	0.8	0.9	1
R0015N010	0.15	0.3	0.24	1	0.28	10.9°	50	4	2	●	1	1	1.1	1.2	1.3
R0015N010S06	0.15	0.3	0.24	1	0.28	11.3°	50	6	2	●	1	1	1.1	1.2	1.3
R0015N013	0.15	0.3	0.24	1.25	0.28	10.7°	50	4	2	●	1	1.3	1.4	1.5	1.6
R0015N013S06	0.15	0.3	0.24	1.25	0.28	11.1°	50	6	2	●	1	1.3	1.4	1.5	1.6
R0015N015	0.15	0.3	0.24	1.5	0.28	10.4°	50	4	2	●	1	1.6	1.6	1.8	2
R0015N015S06	0.15	0.3	0.24	1.5	0.28	10.9°	50	6	2	●	1	1.6	1.6	1.8	2
R0015N018	0.15	0.3	0.24	1.75	0.28	10.2°	50	4	2	●	1	1.8	1.9	2.1	2.3
R0015N020	0.15	0.3	0.24	2	0.28	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0015N025	0.15	0.3	0.24	2.5	0.28	9.5°	50	4	2	●	1	2.6	2.7	3	3.3
R0015N030	0.15	0.3	0.24	3	0.28	9.1°	50	4	2	●	1	3.1	3.3	3.6	4
R0015N035	0.15	0.3	0.24	3.5	0.28	8.7°	50	4	2	●	1	3.7	3.8	4.2	4.6
R0015N040	0.15	0.3	0.24	4	0.28	8.4°	50	4	2	●	1	4.2	4.4	4.8	5.3
R0020N005	0.2	0.4	0.3	0.5	0.37	11.6°	50	4	2	●	1	0.5	0.5	0.5	0.6
R0020N008	0.2	0.4	0.3	0.75	0.37	11.3°	50	4	2	●	1	0.7	0.8	0.9	0.9
R0020N010	0.2	0.4	0.3	1	0.37	11°	50	4	2	●	1	1	1.1	1.2	1.3
R0020N010S06	0.2	0.4	0.3	1	0.37	11.3°	50	6	2	●	1	1	1.1	1.2	1.3
R0020N015	0.2	0.4	0.3	1.5	0.37	10.4°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0020N020	0.2	0.4	0.3	2	0.37	9.9°	50	4	2	●	1	2.1	2.2	2.3	2.6
R0020N020S06	0.2	0.4	0.3	2	0.37	10.6°	50	6	2	●	1	2.1	2.2	2.3	2.6
R0020N025	0.2	0.4	0.3	2.5	0.37	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.3
R0020N030	0.2	0.4	0.3	3	0.37	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9
R0020N035	0.2	0.4	0.3	3.5	0.37	8.7°	50	4	2	●	1	3.6	3.8	4.1	4.6

CUTTING CONDITIONS ➤ J287

MP2XLB NEW

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MP2XLBR0020N040	0.2	0.4	0.3	4	0.37	8.4°	50	4	2	●	1	4.2	4.3	4.7	5.2
R0020N045	0.2	0.4	0.3	4.5	0.37	8°	50	4	2	●	1	4.7	4.9	5.3	5.9
R0020N050	0.2	0.4	0.3	5	0.37	7.7°	50	4	2	●	1	5.2	5.4	5.9	6.6
R0020N055	0.2	0.4	0.3	5.5	0.37	7.5°	50	4	2	●	1	5.7	6	6.5	7.2
R0020N060	0.2	0.4	0.3	6	0.37	7.2°	50	4	2	●	1	6.2	6.5	7.1	7.9
R0025N010	0.25	0.5	0.37	1	0.47	11°	50	4	2	●	1	1	1	1.1	1.2
R0025N015	0.25	0.5	0.37	1.5	0.47	10.4°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0025N015S06	0.25	0.5	0.37	1.5	0.47	11°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0025N020	0.25	0.5	0.37	2	0.47	9.9°	50	4	2	●	1	2.1	2.1	2.3	2.6
R0025N020S06	0.25	0.5	0.37	2	0.47	10.6°	50	6	2	●	1	2.1	2.1	2.3	2.6
R0025N025	0.25	0.5	0.37	2.5	0.47	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.2
R0025N025S06	0.25	0.5	0.37	2.5	0.47	10.3°	50	6	2	●	1	2.6	2.7	2.9	3.2
R0025N030	0.25	0.5	0.37	3	0.47	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9
R0025N030S06	0.25	0.5	0.37	3	0.47	10°	50	6	2	●	1	3.1	3.2	3.5	3.9
R0025N035	0.25	0.5	0.37	3.5	0.47	8.7°	50	4	2	●	1	3.6	3.8	4.1	4.6
R0025N040	0.25	0.5	0.37	4	0.47	8.3°	50	4	2	●	1	4.1	4.3	4.7	5.2
R0025N045	0.25	0.5	0.37	4.5	0.47	8°	50	4	2	●	1	4.7	4.9	5.3	5.9
R0025N050	0.25	0.5	0.37	5	0.47	7.7°	50	4	2	●	1	5.2	5.4	5.9	6.6
R0025N055	0.25	0.5	0.37	5.5	0.47	7.4°	50	4	2	●	1	5.7	6	6.5	7.2
R0025N060	0.25	0.5	0.37	6	0.47	7.2°	50	4	2	●	1	6.2	6.5	7.1	7.9
R0025N070	0.25	0.5	0.37	7	0.47	6.7°	50	4	2	●	1	7.3	7.6	8.3	9.2
R0025N080	0.25	0.5	0.37	8	0.47	6.3°	50	4	2	●	1	8.3	8.7	9.5	10.5
R0025N090	0.25	0.5	0.37	9	0.47	5.9°	50	4	2	●	1	9.4	9.8	10.7	11.9
R0025N100	0.25	0.5	0.37	10	0.47	5.6°	50	4	2	●	1	10.4	10.9	11.9	13.2
R0030N015	0.3	0.6	0.45	1.5	0.57	10.4°	50	4	2	●	1	1.5	1.6	1.8	2
R0030N015S06	0.3	0.6	0.45	1.5	0.57	11°	50	6	2	●	1	1.5	1.6	1.8	2
R0030N020	0.3	0.6	0.45	2	0.57	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0030N020S06	0.3	0.6	0.45	2	0.57	10.6°	50	6	2	●	1	2.1	2.2	2.4	2.6
R0030N025	0.3	0.6	0.45	2.5	0.57	9.4°	50	4	2	●	1	2.6	2.7	3	3.3
R0030N030	0.3	0.6	0.45	3	0.57	9°	50	4	2	●	1	3.1	3.3	3.6	4
R0030N030S06	0.3	0.6	0.45	3	0.57	9.9°	50	6	2	●	1	3.1	3.3	3.6	4
R0030N035	0.3	0.6	0.45	3.5	0.57	8.6°	50	4	2	●	1	3.7	3.8	4.2	4.6
R0030N040	0.3	0.6	0.45	4	0.57	8.2°	50	4	2	●	1	4.2	4.4	4.8	5.3
R0030N040S06	0.3	0.6	0.45	4	0.57	9.3°	50	6	2	●	1	4.2	4.4	4.8	5.3
R0030N045	0.3	0.6	0.45	4.5	0.57	7.9°	50	4	2	●	1	4.7	4.9	5.4	5.9
R0030N050	0.3	0.6	0.45	5	0.57	7.6°	50	4	2	●	1	5.2	5.5	6	6.6
R0030N050S06	0.3	0.6	0.45	5	0.57	8.8°	50	6	2	●	1	5.2	5.5	6	6.6
R0030N055	0.3	0.6	0.45	5.5	0.57	7.3°	50	4	2	●	1	5.8	6	6.6	7.3
R0030N060	0.3	0.6	0.45	6	0.57	7.1°	50	4	2	●	1	6.3	6.6	7.2	7.9
R0030N060S06	0.3	0.6	0.45	6	0.57	8.3°	50	6	2	●	1	6.3	6.6	7.2	7.9
R0030N065	0.3	0.6	0.45	6.5	0.57	6.8°	50	4	2	●	1	6.8	7.1	7.8	8.6
R0030N070	0.3	0.6	0.45	7	0.57	6.6°	50	4	2	●	1	7.3	7.6	8.4	9.3
R0030N080	0.3	0.6	0.45	8	0.57	6.2°	50	4	2	●	1	8.4	8.7	9.6	10.6
R0030N080S06	0.3	0.6	0.45	8	0.57	7.6°	50	6	2	●	1	8.4	8.7	9.6	10.6
R0030N085	0.3	0.6	0.45	8.5	0.57	6°	50	4	2	●	1	8.9	9.3	10.2	11.3
R0030N090	0.3	0.6	0.45	9	0.57	5.8°	50	4	2	●	1	9.4	9.8	10.8	11.9
R0030N095	0.3	0.6	0.45	9.5	0.57	5.7°	50	4	2	●	1	9.9	10.4	11.4	12.6
R0030N100	0.3	0.6	0.45	10	0.57	5.5°	50	4	2	●	1	10.5	10.9	12	13.2
R0030N110	0.3	0.6	0.45	11	0.57	5.2°	50	4	2	●	1	11.5	12	13.2	14.6
R0030N120	0.3	0.6	0.45	12	0.57	5°	50	4	2	●	1	12.5	13.1	14.4	15.9
R0040N020	0.4	0.8	0.6	2	0.77	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0040N020S06	0.4	0.8	0.6	2	0.77	10.6°	50	6	2	●	1	2.1	2.2	2.4	2.6

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MP2XLBR0040N024S06	0.4	0.8	0.6	2.4	0.77	10.3°	50	6	2	●	1	2.5	2.6	2.8	3.1
R0040N030	0.4	0.8	0.6	3	0.77	8.9°	50	4	2	●	1	3.1	3.3	3.6	3.9
R0040N030S06	0.4	0.8	0.6	3	0.77	9.9°	50	6	2	●	1	3.1	3.3	3.6	3.9
R0040N040	0.4	0.8	0.6	4	0.77	8.2°	50	4	2	●	1	4.2	4.4	4.8	5.2
R0040N040S06	0.4	0.8	0.6	4	0.77	9.3°	50	6	2	●	1	4.2	4.4	4.8	5.2
R0040N050	0.4	0.8	0.6	5	0.77	7.5°	50	4	2	●	1	5.2	5.5	6	6.6
R0040N060	0.4	0.8	0.6	6	0.77	6.9°	50	4	2	●	1	6.3	6.5	7.2	7.9
R0040N070	0.4	0.8	0.6	7	0.77	6.5°	50	4	2	●	1	7.3	7.6	8.4	9.2
R0040N080	0.4	0.8	0.6	8	0.77	6°	50	4	2	●	1	8.4	8.7	9.5	10.6
R0040N090	0.4	0.8	0.6	9	0.77	5.7°	50	4	2	●	1	9.4	9.8	10.7	11.9
R0040N100	0.4	0.8	0.6	10	0.77	5.4°	50	4	2	●	1	10.5	10.9	11.9	13.2
R0040N120	0.4	0.8	0.6	12	0.77	4.8°	50	4	2	●	1	12.5	13.1	14.3	15.9
R0050N030	0.5	1	0.75	3	0.96	8.7°	50	4	2	●	1	3.2	3.4	3.7	4.1
R0050N030S06	0.5	1	0.75	3	0.96	9.8°	50	6	2	●	1	3.2	3.4	3.7	4.1
R0050N040	0.5	1	0.75	4	0.96	7.9°	50	4	2	●	1	4.3	4.5	4.9	5.4
R0050N040S06	0.5	1	0.75	4	0.96	9.2°	50	6	2	●	1	4.3	4.5	4.9	5.4
R0050N050	0.5	1	0.75	5	0.96	7.3°	50	4	2	●	1	5.3	5.6	6.1	6.7
R0050N050S06	0.5	1	0.75	5	0.96	8.6°	50	6	2	●	1	5.3	5.6	6.1	6.7
R0050N060	0.5	1	0.75	6	0.96	6.7°	50	4	2	●	1	6.4	6.7	7.3	8.1
R0050N060S06	0.5	1	0.75	6	0.96	8.2°	50	6	2	●	1	6.4	6.7	7.3	8.1
R0050N070	0.5	1	0.75	7	0.96	6.2°	50	4	2	●	1	7.4	7.8	8.5	9.4
R0050N080	0.5	1	0.75	8	0.96	5.8°	50	4	2	●	1	8.5	8.9	9.7	10.7
R0050N080S06	0.5	1	0.75	8	0.96	7.3°	50	6	2	●	1	8.5	8.9	9.7	10.7
R0050N090	0.5	1	0.75	9	0.96	5.5°	50	4	2	●	1	9.5	10	10.9	12
R0050N100	0.5	1	0.75	10	0.96	5.1°	50	4	2	●	1	10.6	11.1	12.1	13.4
R0050N100S06	0.5	1	0.75	10	0.96	6.7°	60	6	2	●	1	10.6	11.1	12.1	13.4
R0050N120	0.5	1	0.75	12	0.96	4.6°	50	4	2	●	1	12.7	13.2	14.5	16
R0050N120S06	0.5	1	0.75	12	0.96	6.1°	60	6	2	●	1	12.7	13.2	14.5	16
R0050N140	0.5	1	0.75	14	0.96	4.2°	55	4	2	●	1	14.8	15.4	16.9	18.7
R0050N160	0.5	1	0.75	16	0.96	3.8°	55	4	2	●	1	16.9	17.6	19.3	21.3
R0050N160S06	0.5	1	0.75	16	0.96	5.2°	65	6	2	●	1	16.9	17.6	19.3	21.3
R0050N180	0.5	1	0.75	18	0.96	3.5°	55	4	2	●	1	18.9	19.8	21.7	24
R0050N200	0.5	1	0.75	20	0.96	3.3°	55	4	2	●	1	21	22	24.1	26.6
R0050N200S06	0.5	1	0.75	20	0.96	4.6°	65	6	2	●	1	21	22	24.1	26.6
R0060N060	0.6	1.2	0.9	6	1.16	6.6°	50	4	2	●	1	6.4	6.7	7.3	8
R0060N060S06	0.6	1.2	0.9	6	1.16	8.1°	55	6	2	●	1	6.4	6.7	7.3	8
R0060N080	0.6	1.2	0.9	8	1.16	5.7°	50	4	2	●	1	8.5	8.9	9.7	10.7
R0060N080S06	0.6	1.2	0.9	8	1.16	7.3°	55	6	2	●	1	8.5	8.9	9.7	10.7
R0060N100	0.6	1.2	0.9	10	1.16	5°	50	4	2	●	1	10.6	11	12.1	13.3
R0060N100S06	0.6	1.2	0.9	10	1.16	6.6°	55	6	2	●	1	10.6	11	12.1	13.3
R0060N120	0.6	1.2	0.9	12	1.16	4.4°	50	4	2	●	1	12.7	13.2	14.5	16
R0060N120S06	0.6	1.2	0.9	12	1.16	6°	65	6	2	●	1	12.7	13.2	14.5	16
R0060N140	0.6	1.2	0.9	14	1.16	4°	55	4	2	●	1	14.8	15.4	16.9	18.7
R0060N160	0.6	1.2	0.9	16	1.16	3.7°	55	4	2	●	1	16.9	17.6	19.3	21.3
R0060N160S06	0.6	1.2	0.9	16	1.16	5.1°	65	6	2	●	1	16.9	17.6	19.3	21.3
R0060N180	0.6	1.2	0.9	18	1.16	3.4°	60	4	2	●	1	18.9	19.8	21.7	24
R0060N200	0.6	1.2	0.9	20	1.16	3.1°	60	4	2	●	1	21	21.9	24	26.6
R0060N240	0.6	1.2	0.9	24	1.16	2.7°	60	4	2	●	1	25.2	26.3	28.8	No interference
R0070N080	0.7	1.4	1.05	8	1.34	5.5°	50	4	2	●	1	8.4	8.8	9.6	10.6
R0070N120	0.7	1.4	1.05	12	1.34	4.3°	50	4	2	●	1	12.6	13.1	14.4	15.9
R0070N160	0.7	1.4	1.05	16	1.34	3.5°	50	4	2	●	1	16.8	17.5	19.2	21.2
R0075N030	0.75	1.5	1.1	3	1.44	8.6°	50	4	2	●	1	3.1	3.3	3.6	3.9

MP2XLB NEW

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MP2XLBR0075N040	0.75	1.5	1.1	4	1.44	7.7°	50	4	2	●	1	4.2	4.4	4.8	5.2
R0075N060	0.75	1.5	1.1	6	1.44	6.3°	50	4	2	●	1	6.3	6.6	7.2	7.9
R0075N060S06	0.75	1.5	1.1	6	1.44	8°	50	6	2	●	1	6.3	6.6	7.2	7.9
R0075N080	0.75	1.5	1.1	8	1.44	5.4°	50	4	2	●	1	8.4	8.8	9.6	10.6
R0075N080S06	0.75	1.5	1.1	8	1.44	7.2°	60	6	2	●	1	8.4	8.8	9.6	10.6
R0075N100	0.75	1.5	1.1	10	1.44	4.7°	50	4	2	●	1	10.5	11	12	13.2
R0075N100S06	0.75	1.5	1.1	10	1.44	6.5°	60	6	2	●	1	10.5	11	12	13.2
R0075N120	0.75	1.5	1.1	12	1.44	4.2°	50	4	2	●	1	12.6	13.1	14.4	15.9
R0075N120S06	0.75	1.5	1.1	12	1.44	5.9°	60	6	2	●	1	12.6	13.1	14.4	15.9
R0075N140	0.75	1.5	1.1	14	1.44	3.8°	55	4	2	●	1	14.7	15.3	16.8	18.5
R0075N160	0.75	1.5	1.1	16	1.44	3.4°	55	4	2	●	1	16.8	17.5	19.2	21.2
R0075N160S06	0.75	1.5	1.1	16	1.44	5°	60	6	2	●	1	16.8	17.5	19.2	21.2
R0075N180	0.75	1.5	1.1	18	1.44	3.1°	60	4	2	●	1	18.9	19.7	21.6	23.8
R0075N200	0.75	1.5	1.1	20	1.44	2.9°	60	4	2	●	1	21	21.9	23.9	No interference
R0075N220	0.75	1.5	1.1	22	1.44	2.7°	60	4	2	●	1	23	24	26.3	No interference
R0080N080	0.8	1.6	1.2	8	1.54	5.3°	55	4	2	●	1	8.4	8.8	9.6	10.5
R0080N120	0.8	1.6	1.2	12	1.54	4.1°	55	4	2	●	1	12.6	13.1	14.4	15.9
R0080N160	0.8	1.6	1.2	16	1.54	3.3°	55	4	2	●	1	16.8	17.5	19.1	21.2
R0080N200	0.8	1.6	1.2	20	1.54	2.8°	55	4	2	●	1	21	21.9	23.9	No interference
R0090N080	0.9	1.8	1.4	8	1.74	5.1°	55	4	2	●	1	8.4	8.8	9.6	10.5
R0090N120	0.9	1.8	1.4	12	1.74	3.9°	55	4	2	●	1	12.6	13.1	14.3	15.8
R0090N160	0.9	1.8	1.4	16	1.74	3.1°	55	4	2	●	1	16.8	17.5	19.1	21.1
R0090N200	0.9	1.8	1.4	20	1.74	2.6°	55	4	2	●	1	20.9	21.8	23.9	No interference
R0100N040	1	2	1.5	4	1.94	7.2°	50	4	2	●	1	4.2	4.4	4.7	5.2
R0100N040S06	1	2	1.5	4	1.94	9°	50	6	2	●	1	4.2	4.4	4.7	5.2
R0100N060	1	2	1.5	6	1.94	5.8°	50	4	2	●	1	6.3	6.6	7.1	7.8
R0100N060S06	1	2	1.5	6	1.94	7.8°	50	6	2	●	1	6.3	6.6	7.1	7.8
R0100N080	1	2	1.5	8	1.94	4.8°	50	4	2	●	1	8.4	8.8	9.5	10.5
R0100N080S06	1	2	1.5	8	1.94	6.9°	50	6	2	●	1	8.4	8.8	9.5	10.5
R0100N100	1	2	1.5	10	1.94	4.2°	50	4	2	●	1	10.5	10.9	11.9	13.1
R0100N100S06	1	2	1.5	10	1.94	6.2°	50	6	2	●	1	10.5	10.9	11.9	13.1
R0100N120	1	2	1.5	12	1.94	3.6°	50	4	2	●	1	12.6	13.1	14.3	15.8
R0100N120S06	1	2	1.5	12	1.94	5.6°	60	6	2	●	1	12.6	13.1	14.3	15.8
R0100N140	1	2	1.5	14	1.94	3.2°	55	4	2	●	1	14.7	15.3	16.7	18.4
R0100N140S06	1	2	1.5	14	1.94	5.1°	60	6	2	●	1	14.7	15.3	16.7	18.4
R0100N160	1	2	1.5	16	1.94	2.9°	55	4	2	●	1	16.8	17.5	19.1	No interference
R0100N160S06	1	2	1.5	16	1.94	4.7°	65	6	2	●	1	16.8	17.5	19.1	21.1
R0100N180	1	2	1.5	18	1.94	2.7°	55	4	2	●	1	18.9	19.7	21.5	No interference
R0100N180S06	1	2	1.5	18	1.94	4.3°	65	6	2	●	1	18.9	19.7	21.5	23.8
R0100N200	1	2	1.5	20	1.94	2.4°	65	4	2	●	1	20.9	21.8	23.9	No interference
R0100N200S06	1	2	1.5	20	1.94	4°	65	6	2	●	1	20.9	21.8	23.9	26.4
R0100N220	1	2	1.5	22	1.94	2.3°	65	4	2	●	1	23	24	26.3	No interference
R0100N250	1	2	1.5	25	1.94	2°	65	4	2	●	1	26.2	27.3	No interference	No interference
R0100N250S06	1	2	1.5	25	1.94	3.5°	90	6	2	●	1	26.2	27.3	29.9	33
R0100N300	1	2	1.5	30	1.94	1.7°	80	4	2	●	1	31.4	32.7	No interference	No interference
R0100N300S06	1	2	1.5	30	1.94	3°	90	6	2	●	1	31.4	32.7	35.9	No interference
R0100N350	1	2	1.5	35	1.94	1.5°	80	4	2	●	1	36.6	38.2	No interference	No interference
R0100N350S06	1	2	1.5	35	1.94	2.7°	90	6	2	●	1	36.6	38.2	41.8	No interference
R0100N400	1	2	1.5	40	1.94	1.4°	80	4	2	●	1	41.8	43.6	No interference	No interference
R0100N400S06	1	2	1.5	40	1.94	2.4°	90	6	2	●	1	41.8	43.6	47.8	No interference
R0125N100	1.25	2.5	1.9	10	2.4	3.5°	55	4	2	●	1	10.4	10.8	11.8	12.9
R0125N150	1.25	2.5	1.9	15	2.4	2.5°	55	4	2	●	1	15.6	16.3	17.8	No interference

● : Inventory maintained in Japan.

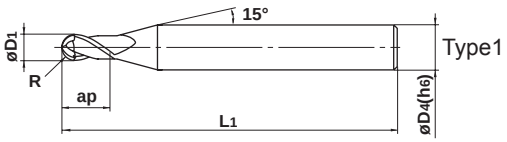
Unit : mm

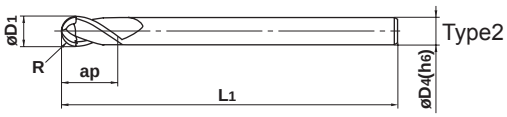
Order Number	Radius of Ball Nose R	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MP2XLBR0125N200	1.25	2.5	1.9	20	2.4	2°	55	4	2	●	1	20.8	21.7	No interference	No interference
R0125N250	1.25	2.5	1.9	25	2.4	1.6°	70	4	2	●	1	26.1	27.2	No interference	No interference
R0125N300	1.25	2.5	1.9	30	2.4	1.4°	70	4	2	●	1	31.3	32.6	No interference	No interference
R0125N350	1.25	2.5	1.9	35	2.4	1.2°	70	4	2	●	1	36.5	38.1	No interference	No interference
R0150N060S03	1.5	3	2.3	6	2.9	—	60	3	2	●	1	No interference	No interference	No interference	No interference
R0150N080	1.5	3	2.3	8	2.9	6.3°	60	6	2	●	1	8.3	8.6	9.3	10.2
R0150N100	1.5	3	2.3	10	2.9	5.5°	60	6	2	●	1	10.4	10.8	11.7	12.9
R0150N120	1.5	3	2.3	12	2.9	4.9°	60	6	2	●	1	12.5	13	14.1	15.5
R0150N140	1.5	3	2.3	14	2.9	4.4°	60	6	2	●	1	14.6	15.2	16.5	18.2
R0150N160	1.5	3	2.3	16	2.9	4°	70	6	2	●	1	16.7	17.3	18.9	20.8
R0150N200	1.5	3	2.3	20	2.9	3.4°	70	6	2	●	1	20.8	21.7	23.7	26.1
R0150N250	1.5	3	2.3	25	2.9	2.8°	70	6	2	●	1	26.1	27.2	29.7	No interference
R0150N300	1.5	3	2.3	30	2.9	2.5°	70	6	2	●	1	31.3	32.6	35.7	No interference
R0150N350	1.5	3	2.3	35	2.9	2.2°	90	6	2	●	1	36.5	38	41.7	No interference
R0150N400	1.5	3	2.3	40	2.9	1.9°	90	6	2	●	1	41.7	43.5	No interference	No interference
R0175N150	1.75	3.5	2.6	15	3.4	3.8°	65	6	2	●	1	15.6	16.2	17.7	19.4
R0175N250	1.75	3.5	2.6	25	3.4	2.5°	65	6	2	●	1	26	27.1	29.6	No interference
R0175N350	1.75	3.5	2.6	35	3.4	1.9°	90	6	2	●	1	36.5	38	No interference	No interference
R0175N450	1.75	3.5	2.6	45	3.4	1.5°	90	6	2	●	1	46.9	48.9	No interference	No interference
R0200N080S04	2	4	3	8	3.9	—	65	4	2	●	1	No interference	No interference	No interference	No interference
R0200N100	2	4	3	10	3.9	4.5°	65	6	2	●	1	10.4	10.8	11.6	12.7
R0200N120	2	4	3	12	3.9	3.9°	65	6	2	●	1	12.5	12.9	14	15.4
R0200N140	2	4	3	14	3.9	3.4°	65	6	2	●	1	14.6	15.1	16.4	18
R0200N160	2	4	3	16	3.9	3.1°	70	6	2	●	1	16.6	17.3	18.8	20.7
R0200N200	2	4	3	20	3.9	2.6°	70	6	2	●	1	20.8	21.7	23.6	No interference
R0200N250	2	4	3	25	3.9	2.1°	70	6	2	●	1	26	27.1	29.6	No interference
R0200N300	2	4	3	30	3.9	1.8°	80	6	2	●	1	31.2	32.6	No interference	No interference
R0200N350	2	4	3	35	3.9	1.6°	80	6	2	●	1	36.5	38	No interference	No interference
R0200N400	2	4	3	40	3.9	1.4°	90	6	2	●	1	41.7	43.5	No interference	No interference
R0200N450	2	4	3	45	3.9	1.2°	90	6	2	●	1	46.9	48.9	No interference	No interference
R0200N500	2	4	3	50	3.9	1.1°	100	6	2	●	1	52.1	54.3	No interference	No interference
R0250N150	2.5	5	3.8	15	4.9	2°	70	6	2	●	1	15.6	16.2	No interference	No interference
R0250N200	2.5	5	3.8	20	4.9	1.5°	70	6	2	●	1	20.8	21.6	No interference	No interference
R0250N250	2.5	5	3.8	25	4.9	1.2°	70	6	2	●	1	26	27.1	No interference	No interference
R0250N300	2.5	5	3.8	30	4.9	1°	80	6	2	●	1	31.2	No interference	No interference	No interference
R0250N350	2.5	5	3.8	35	4.9	0.9°	80	6	2	●	1	36.4	No interference	No interference	No interference
R0250N400	2.5	5	3.8	40	4.9	0.8°	90	6	2	●	1	41.7	No interference	No interference	No interference
R0300N200	3	6	6	20	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference
R0300N250	3	6	6	25	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference
R0300N300	3	6	6	30	5.85	—	80	6	2	●	2	No interference	No interference	No interference	No interference
R0300N400	3	6	6	40	5.85	—	90	6	2	●	2	No interference	No interference	No interference	No interference
R0300N500	3	6	6	50	5.85	—	100	6	2	●	2	No interference	No interference	No interference	No interference

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	Aluminium Alloy
◎	◎	○		○	○		





R					
	0.1≤R≤3				
	±0.01				
	0.2≤D1≤6				
	0 - 0.020				
h6	4≤D4≤6	8≤D4≤10	D4=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

2 flute ball nose end mill for general use.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2SBR0010S04	0.1	0.2	0.3	45	4	2	●	1
R0010S06	0.1	0.2	0.3	50	6	2	●	1
R0015S04	0.15	0.3	0.5	45	4	2	●	1
R0015S06	0.15	0.3	0.5	50	6	2	●	1
R0020S04	0.2	0.4	0.6	45	4	2	●	1
R0020S06	0.2	0.4	0.6	50	6	2	●	1
R0025S04	0.25	0.5	0.8	45	4	2	●	1
R0025S06	0.25	0.5	0.8	50	6	2	●	1
R0030S04	0.3	0.6	0.9	45	4	2	●	1
R0030S06	0.3	0.6	0.9	50	6	2	●	1
R0035S04	0.35	0.7	1.1	45	4	2	●	1
R0040S04	0.4	0.8	1.2	45	4	2	●	1
R0040S06	0.4	0.8	1.2	50	6	2	●	1
R0045S04	0.45	0.9	1.4	45	4	2	●	1
R0050S04	0.5	1	1.5	45	4	2	●	1
R0050S06	0.5	1	1.5	50	6	2	●	1
R0060S04	0.6	1.2	1.8	45	4	2	●	1
R0060S06	0.6	1.2	1.8	50	6	2	●	1
R0070S04	0.7	1.4	2.1	45	4	2	●	1
R0070S06	0.7	1.4	2.1	50	6	2	●	1
R0075S04	0.75	1.5	2.3	45	4	2	●	1
R0075S06	0.75	1.5	2.3	50	6	2	●	1
R0080S04	0.8	1.6	2.4	45	4	2	●	1
R0080S06	0.8	1.6	2.4	50	6	2	●	1
R0090S04	0.9	1.8	2.7	45	4	2	●	1
R0090S06	0.9	1.8	2.7	50	6	2	●	1
R0100S04	1	2	3	50	4	2	●	1
R0100S06	1	2	3	50	6	2	●	1
R0125S04	1.25	2.5	3.8	50	4	2	●	1
R0125S06	1.25	2.5	3.8	50	6	2	●	1
R0150S06	1.5	3	4.5	70	6	2	●	1
R0200S06	2	4	6	70	6	2	●	1
R0250S06	2.5	5	7.5	80	6	2	●	1
R0300S06	3	6	9	80	6	2	●	2

● : Inventory maintained in Japan.

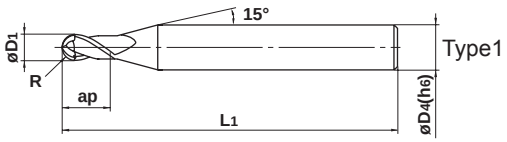
Unit : mm

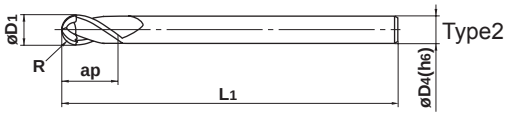
Order Number	Radius of Ball Nose R	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2SBR0400S08	4	8	12	90	8	2	●	2
R0500S10	5	10	15	100	10	2	●	2
R0600S12	6	12	18	110	12	2	●	2

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	Aluminium Alloy
◎	◎	○		○	○		





R				
0.25≤R≤6				
±0.01				
0.5≤D1≤6				
0 - 0.020				
h6	D4=3	4≤D4≤6	8≤D4≤10	D4=12
	0 - 0.006	0 - 0.008	0 - 0.009	0 - 0.011

2 flute ball nose end mill for general use.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MBR0025	0.25	0.5	1	45	4	2	●	1
R0030	0.3	0.6	1.2	45	4	2	●	1
R0040	0.4	0.8	1.6	45	4	2	●	1
R0050	0.5	1	2.5	45	4	2	●	1
R0060	0.6	1.2	2.5	45	4	2	●	1
R0070	0.7	1.4	3	45	4	2	●	1
R0075	0.75	1.5	4	45	4	2	●	1
R0080	0.8	1.6	4	45	4	2	●	1
R0090	0.9	1.8	5	45	4	2	●	1
R0100	1	2	6	50	4	2	●	1
R0125	1.25	2.5	6	50	4	2	●	1
R0150S03	1.5	3	8	70	3	2	●	2
R0150	1.5	3	8	70	6	2	●	1
R0175	1.75	3.5	8	70	6	2	●	1
R0200S04	2	4	8	70	4	2	●	2
R0200	2	4	8	70	6	2	●	1
R0250	2.5	5	12	80	6	2	●	1
R0300	3	6	12	80	6	2	●	2
R0400	4	8	14	90	8	2	●	2
R0500	5	10	18	100	10	2	●	2
R0600	6	12	22	110	12	2	●	2

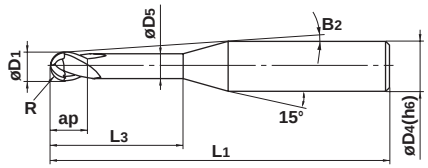
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J303

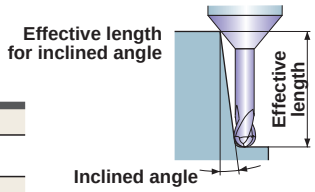
MS2XLB

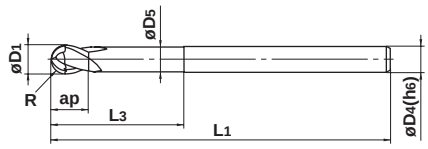
Ball nose end mill, Short cut length, 2 flute, Long neck

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	Aluminium Alloy
◎	◎	○		○	○		



Type1





Type2

R			
0.1≤R≤3			
±0.01			
0.2≤D1≤6			
0 / - 0.020			
4≤D4≤6			
0 / - 0.008			

h6

● 2 flute long neck ball nose end mill.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
R0010N005S06	0.1	0.2	0.2	0.5	0.17	14.4°	50	6	2	●	1	0.5	0.5	0.6	0.6
R0010N008S06	0.1	0.2	0.2	0.8	0.17	14.1°	50	6	2	●	1	0.8	0.8	0.9	1
R0010N010	0.1	0.2	0.2	1	0.17	13.3°	50	4	2	●	1	1	1.1	1.2	1.3
R0010N010S06	0.1	0.2	0.2	1	0.17	13.8°	50	6	2	●	1	1	1.1	1.2	1.3
R0010N013	0.1	0.2	0.2	1.25	0.17	12.9°	50	4	2	●	1	1.3	1.3	1.5	1.6
R0010N013S06	0.1	0.2	0.2	1.25	0.17	13.6°	50	6	2	●	1	1.3	1.3	1.5	1.6
R0010N015	0.1	0.2	0.2	1.5	0.17	12.5°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0010N015S06	0.1	0.2	0.2	1.5	0.17	13.3°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0010N018	0.1	0.2	0.2	1.75	0.17	12.2°	50	4	2	●	1	1.8	1.9	2	2.2
R0010N018S06	0.1	0.2	0.2	1.75	0.17	13.1°	50	6	2	●	1	1.8	1.9	2	2.2
R0010N020	0.1	0.2	0.2	2	0.17	11.9°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0010N020S06	0.1	0.2	0.2	2	0.17	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0010N025	0.1	0.2	0.2	2.5	0.17	11.3°	50	4	2	●	1	2.6	2.7	2.9	3.1
R0010N030	0.1	0.2	0.2	3	0.17	10.7°	50	4	2	●	1	3.1	3.2	3.5	3.7
R0015N008S06	0.15	0.3	0.3	0.8	0.27	14.1°	50	6	2	●	1	0.8	0.8	0.9	1
R0015N010	0.15	0.3	0.3	1	0.27	13.3°	50	4	2	●	1	1	1.1	1.2	1.3
R0015N010S06	0.15	0.3	0.3	1	0.27	13.9°	50	6	2	●	1	1	1.1	1.2	1.3
R0015N012S06	0.15	0.3	0.3	1.2	0.27	13.7°	50	6	2	●	1	1.2	1.3	1.4	1.5
R0015N015	0.15	0.3	0.3	1.5	0.27	12.5°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0015N015S06	0.15	0.3	0.3	1.5	0.27	13.3°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0015N020	0.15	0.3	0.3	2	0.27	11.9°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0015N020S06	0.15	0.3	0.3	2	0.27	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0015N025	0.15	0.3	0.3	2.5	0.27	11.2°	50	4	2	●	1	2.6	2.7	2.9	3.1
R0015N030	0.15	0.3	0.3	3	0.27	10.7°	50	4	2	●	1	3.1	3.2	3.5	3.7
R0015N040	0.15	0.3	0.3	4	0.27	9.7°	50	4	2	●	1	4.2	4.3	4.6	5
R0020N010	0.2	0.4	0.4	1	0.36	13.4°	50	4	2	●	1	1	1	1.1	1.2
R0020N010S06	0.2	0.4	0.4	1	0.36	13.9°	50	6	2	●	1	1	1	1.1	1.2
R0020N012S06	0.2	0.4	0.4	1.2	0.36	13.7°	50	6	2	●	1	1.2	1.3	1.4	1.5
R0020N015	0.2	0.4	0.4	1.5	0.36	12.6°	50	4	2	●	1	1.5	1.6	1.7	1.8
R0020N015S06	0.2	0.4	0.4	1.5	0.36	13.4°	50	6	2	●	1	1.5	1.6	1.7	1.8
R0020N020	0.2	0.4	0.4	2	0.36	11.9°	50	4	2	●	1	2	2.1	2.3	2.5
R0020N020S06	0.2	0.4	0.4	2	0.36	12.8°	50	6	2	●	1	2	2.1	2.3	2.5
R0020N025	0.2	0.4	0.4	2.5	0.36	11.2°	50	4	2	●	1	2.6	2.7	2.9	3.1

MS2XLB

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
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
R0020N030	0.2	0.4	0.4	3	0.36	10.7°	50	4	2	●	1	3.1	3.2	3.4	3.7
R0020N030S06	0.2	0.4	0.4	3	0.36	11.9°	50	6	2	●	1	3.1	3.2	3.4	3.7
R0020N035	0.2	0.4	0.4	3.5	0.36	10.2°	50	4	2	●	1	3.6	3.7	4	4.3
R0020N040	0.2	0.4	0.4	4	0.36	9.7°	50	4	2	●	1	4.1	4.3	4.6	4.9
R0020N045	0.2	0.4	0.4	4.5	0.36	9.3°	50	4	2	●	1	4.7	4.8	5.2	5.6
R0020N050	0.2	0.4	0.4	5	0.36	8.9°	50	4	2	●	1	5.2	5.3	5.7	6.2
R0020N055	0.2	0.4	0.4	5.5	0.36	8.5°	50	4	2	●	1	5.7	5.9	6.3	6.8
R0020N060	0.2	0.4	0.4	6	0.36	8.2°	50	4	2	●	1	6.2	6.4	6.9	7.4
R0025N015	0.25	0.5	0.5	1.5	0.46	12.6°	50	4	2	●	1	1.5	1.6	1.7	1.8
R0025N015S06	0.25	0.5	0.5	1.5	0.46	13.4°	50	6	2	●	1	1.5	1.6	1.7	1.8
R0025N020	0.25	0.5	0.5	2	0.46	11.9°	50	4	2	●	1	2	2.1	2.3	2.4
R0025N020S06	0.25	0.5	0.5	2	0.46	12.9°	50	6	2	●	1	2	2.1	2.3	2.4
R0025N025	0.25	0.5	0.5	2.5	0.46	11.2°	50	4	2	●	1	2.6	2.7	2.9	3.1
R0025N025S06	0.25	0.5	0.5	2.5	0.46	12.4°	50	6	2	●	1	2.6	2.7	2.9	3.1
R0025N030	0.25	0.5	0.5	3	0.46	10.6°	50	4	2	●	1	3.1	3.2	3.4	3.7
R0025N030S06	0.25	0.5	0.5	3	0.46	11.9°	50	6	2	●	1	3.1	3.2	3.4	3.7
R0025N035	0.25	0.5	0.5	3.5	0.46	10.1°	50	4	2	●	1	3.6	3.7	4	4.3
R0025N035S06	0.25	0.5	0.5	3.5	0.46	11.5°	50	6	2	●	1	3.6	3.7	4	4.3
R0025N040	0.25	0.5	0.5	4	0.46	9.6°	50	4	2	●	1	4.1	4.3	4.6	4.9
R0025N040S06	0.25	0.5	0.5	4	0.46	11.1°	50	6	2	●	1	4.1	4.3	4.6	4.9
R0025N045	0.25	0.5	0.5	4.5	0.46	9.2°	50	4	2	●	1	4.6	4.8	5.2	5.6
R0025N045S06	0.25	0.5	0.5	4.5	0.46	10.7°	50	6	2	●	1	4.6	4.8	5.2	5.6
R0025N050	0.25	0.5	0.5	5	0.46	8.8°	50	4	2	●	1	5.2	5.3	5.7	6.2
R0025N050S06	0.25	0.5	0.5	5	0.46	10.4°	50	6	2	●	1	5.2	5.3	5.7	6.2
R0025N055	0.25	0.5	0.5	5.5	0.46	8.4°	50	4	2	●	1	5.7	5.9	6.3	6.8
R0025N055S06	0.25	0.5	0.5	5.5	0.46	10.1°	50	6	2	●	1	5.7	5.9	6.3	6.8
R0025N060	0.25	0.5	0.5	6	0.46	8.1°	50	4	2	●	1	6.2	6.4	6.9	7.4
R0025N060S06	0.25	0.5	0.5	6	0.46	9.7°	50	6	2	●	1	6.2	6.4	6.9	7.4
R0025N070	0.25	0.5	0.5	7	0.46	7.5°	50	4	2	●	1	7.2	7.5	8	8.7
R0025N070S06	0.25	0.5	0.5	7	0.46	9.2°	50	6	2	●	1	7.2	7.5	8	8.7
R0025N080	0.25	0.5	0.5	8	0.46	7°	50	4	2	●	1	8.3	8.5	9.2	9.9
R0025N080S06	0.25	0.5	0.5	8	0.46	8.7°	50	6	2	●	1	8.3	8.5	9.2	9.9
R0025N100	0.25	0.5	0.5	10	0.46	6.2°	50	4	2	●	1	10.3	10.7	11.5	12.4
R0025N100S06	0.25	0.5	0.5	10	0.46	7.8°	50	6	2	●	1	10.3	10.7	11.5	12.4
R0030N018S06	0.3	0.6	0.6	1.8	0.56	13°	50	6	2	●	1	1.9	1.9	2.1	2.3
R0030N020	0.3	0.6	0.6	2	0.56	11.8°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0030N020S06	0.3	0.6	0.6	2	0.56	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0030N025	0.3	0.6	0.6	2.5	0.56	11.1°	50	4	2	●	1	2.6	2.7	2.9	3.1
R0030N025S06	0.3	0.6	0.6	2.5	0.56	12.3°	50	6	2	●	1	2.6	2.7	2.9	3.1
R0030N030	0.3	0.6	0.6	3	0.56	10.5°	50	4	2	●	1	3.1	3.3	3.5	3.8
R0030N030S06	0.3	0.6	0.6	3	0.56	11.8°	50	6	2	●	1	3.1	3.3	3.5	3.8
R0030N035	0.3	0.6	0.6	3.5	0.56	10°	50	4	2	●	1	3.6	3.8	4.1	4.4
R0030N035S06	0.3	0.6	0.6	3.5	0.56	11.4°	50	6	2	●	1	3.6	3.8	4.1	4.4
R0030N040	0.3	0.6	0.6	4	0.56	9.5°	50	4	2	●	1	4.2	4.3	4.6	5
R0030N040S06	0.3	0.6	0.6	4	0.56	11°	50	6	2	●	1	4.2	4.3	4.6	5
R0030N045	0.3	0.6	0.6	4.5	0.56	9.1°	50	4	2	●	1	4.7	4.9	5.2	5.6
R0030N045S06	0.3	0.6	0.6	4.5	0.56	10.6°	50	6	2	●	1	4.7	4.9	5.2	5.6
R0030N050	0.3	0.6	0.6	5	0.56	8.7°	50	4	2	●	1	5.2	5.4	5.8	6.2
R0030N050S06	0.3	0.6	0.6	5	0.56	10.3°	50	6	2	●	1	5.2	5.4	5.8	6.2
R0030N060	0.3	0.6	0.6	6	0.56	8°	50	4	2	●	1	6.3	6.5	6.9	7.5
R0030N060S06	0.3	0.6	0.6	6	0.56	9.7°	50	6	2	●	1	6.3	6.5	6.9	7.5

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XLBR0030N070	0.3	0.6	0.6	7	0.56	7.4°	50	4	2	●	1	7.3	7.5	8.1	8.7
R0030N080	0.3	0.6	0.6	8	0.56	6.9°	50	4	2	●	1	8.3	8.6	9.2	10
R0030N080S06	0.3	0.6	0.6	8	0.56	8.6°	50	6	2	●	1	8.3	8.6	9.2	10
R0030N090	0.3	0.6	0.6	9	0.56	6.4°	50	4	2	●	1	9.4	9.7	10.4	11.2
R0030N100	0.3	0.6	0.6	10	0.56	6°	50	4	2	●	1	10.4	10.8	11.5	12.5
R0030N100S06	0.3	0.6	0.6	10	0.56	7.8°	50	6	2	●	1	10.4	10.8	11.5	12.5
R0030N110	0.3	0.6	0.6	11	0.56	5.7°	50	4	2	●	1	11.4	11.8	12.7	13.7
R0030N120	0.3	0.6	0.6	12	0.56	5.4°	50	4	2	●	1	12.5	12.9	13.8	15
R0040N020	0.4	0.8	0.8	2	0.76	11.7°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0040N020S06	0.4	0.8	0.8	2	0.76	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0040N024S06	0.4	0.8	0.8	2.4	0.76	12.4°	50	6	2	●	1	2.5	2.6	2.8	3
R0040N030	0.4	0.8	0.8	3	0.76	10.4°	50	4	2	●	1	3.1	3.3	3.5	3.7
R0040N030S06	0.4	0.8	0.8	3	0.76	11.8°	50	6	2	●	1	3.1	3.3	3.5	3.7
R0040N040	0.4	0.8	0.8	4	0.76	9.4°	50	4	2	●	1	4.2	4.3	4.6	5
R0040N040S06	0.4	0.8	0.8	4	0.76	11°	50	6	2	●	1	4.2	4.3	4.6	5
R0040N050	0.4	0.8	0.8	5	0.76	8.5°	50	4	2	●	1	5.2	5.4	5.8	6.2
R0040N060	0.4	0.8	0.8	6	0.76	7.8°	50	4	2	●	1	6.3	6.5	6.9	7.5
R0040N060S06	0.4	0.8	0.8	6	0.76	9.6°	50	6	2	●	1	6.3	6.5	6.9	7.5
R0040N070	0.4	0.8	0.8	7	0.76	7.2°	50	4	2	●	1	7.3	7.5	8.1	8.7
R0040N080	0.4	0.8	0.8	8	0.76	6.7°	50	4	2	●	1	8.3	8.6	9.2	10
R0040N080S06	0.4	0.8	0.8	8	0.76	8.5°	50	6	2	●	1	8.3	8.6	9.2	10
R0040N100	0.4	0.8	0.8	10	0.76	5.9°	50	4	2	●	1	10.4	10.8	11.5	12.4
R0040N100S06	0.4	0.8	0.8	10	0.76	7.7°	50	6	2	●	1	10.4	10.8	11.5	12.4
R0040N120	0.4	0.8	0.8	12	0.76	5.2°	50	4	2	●	1	12.5	12.9	13.8	14.9
R0050N030	0.5	1	1	3	0.94	10.1°	50	4	2	●	1	3.2	3.3	3.6	3.9
R0050N030S06	0.5	1	1	3	0.94	11.6°	50	6	2	●	1	3.2	3.3	3.6	3.9
R0050N040	0.5	1	1	4	0.94	9.1°	50	4	2	●	1	4.2	4.4	4.8	5.2
R0050N040S06	0.5	1	1	4	0.94	10.8°	50	6	2	●	1	4.2	4.4	4.8	5.2
R0050N050	0.5	1	1	5	0.94	8.2°	50	4	2	●	1	5.3	5.5	6	6.4
R0050N050S06	0.5	1	1	5	0.94	10.1°	50	6	2	●	1	5.3	5.5	6	6.4
R0050N060	0.5	1	1	6	0.94	7.5°	50	4	2	●	1	6.3	6.6	7.1	7.7
R0050N060S06	0.5	1	1	6	0.94	9.4°	50	6	2	●	1	6.3	6.6	7.1	7.7
R0050N070	0.5	1	1	7	0.94	6.9°	50	4	2	●	1	7.4	7.7	8.3	8.9
R0050N080	0.5	1	1	8	0.94	6.4°	50	4	2	●	1	8.4	8.8	9.4	10.2
R0050N080S06	0.5	1	1	8	0.94	8.3°	50	6	2	●	1	8.4	8.8	9.4	10.2
R0050N090	0.5	1	1	9	0.94	6°	50	4	2	●	1	9.5	9.9	10.6	11.4
R0050N100	0.5	1	1	10	0.94	5.6°	50	4	2	●	1	10.5	10.9	11.7	12.6
R0050N100S06	0.5	1	1	10	0.94	7.5°	50	6	2	●	1	10.5	10.9	11.7	12.6
R0050N120	0.5	1	1	12	0.94	5°	50	4	2	●	1	12.6	13.1	14	15.1
R0050N120S06	0.5	1	1	12	0.94	6.8°	55	6	2	●	1	12.6	13.1	14	15.1
R0050N140	0.5	1	1	14	0.94	4.5°	50	4	2	●	1	14.7	15.2	16.3	17.6
R0050N160	0.5	1	1	16	0.94	4.1°	55	4	2	●	1	16.8	17.4	18.6	20.1
R0050N160S06	0.5	1	1	16	0.94	5.7°	60	6	2	●	1	16.8	17.4	18.6	20.1
R0050N180	0.5	1	1	18	0.94	3.7°	55	4	2	●	1	18.9	19.5	20.9	22.6
R0050N200	0.5	1	1	20	0.94	3.4°	55	4	2	●	1	20.9	21.6	23.2	25.1
R0050N200S06	0.5	1	1	20	0.94	5°	60	6	2	●	1	20.9	21.6	23.2	25.1
R0060N036S06	0.6	1.2	1.2	3.6	1.14	11.1°	50	6	2	●	1	3.8	4	4.3	4.7
R0060N060	0.6	1.2	1.2	6	1.14	7.3°	50	4	2	●	1	6.3	6.6	7.1	7.6
R0060N060S06	0.6	1.2	1.2	6	1.14	9.3°	50	6	2	●	1	6.3	6.6	7.1	7.6
R0060N080	0.6	1.2	1.2	8	1.14	6.2°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0060N080S06	0.6	1.2	1.2	8	1.14	8.2°	50	6	2	●	1	8.4	8.8	9.4	10.1
R0060N100	0.6	1.2	1.2	10	1.14	5.4°	50	4	2	●	1	10.5	10.9	11.7	12.6

CUTTING CONDITIONS ➤ J304

MS2XLB

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XLBR0060N100S06	0.6	1.2	1.2	10	1.14	7.4°	50	6	2	●	1	10.5	10.9	11.7	12.6
R0060N120	0.6	1.2	1.2	12	1.14	4.8°	50	4	2	●	1	12.6	13.1	14	15.1
R0060N120S06	0.6	1.2	1.2	12	1.14	6.7°	55	6	2	●	1	12.6	13.1	14	15.1
R0060N140	0.6	1.2	1.2	14	1.14	4.3°	50	4	2	●	1	14.7	15.2	16.3	17.6
R0060N160	0.6	1.2	1.2	16	1.14	3.9°	55	4	2	●	1	16.8	17.3	18.6	20.1
R0060N160S06	0.6	1.2	1.2	16	1.14	5.6°	60	6	2	●	1	16.8	17.3	18.6	20.1
R0060N180	0.6	1.2	1.2	18	1.14	3.5°	55	4	2	●	1	18.8	19.5	20.9	22.6
R0060N240	0.6	1.2	1.2	24	1.14	2.8°	65	4	2	●	1	25.1	25.9	27.8	⁎
R0070N080	0.7	1.4	1.4	8	1.34	6°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0070N120	0.7	1.4	1.4	12	1.34	4.6°	50	4	2	●	1	12.6	13.1	14	15.1
R0070N160	0.7	1.4	1.4	16	1.34	3.7°	55	4	2	●	1	16.8	17.3	18.6	20.1
R0075N045S06	0.75	1.5	1.5	4.5	1.44	10.2°	50	6	2	●	1	4.7	5	5.4	5.7
R0075N060	0.75	1.5	1.5	6	1.44	7°	50	4	2	●	1	6.3	6.6	7.1	7.6
R0075N060S06	0.75	1.5	1.5	6	1.44	9.2°	50	6	2	●	1	6.3	6.6	7.1	7.6
R0075N075S06	0.75	1.5	1.5	7.5	1.44	8.3°	50	6	2	●	1	7.9	8.2	8.8	9.5
R0075N080	0.75	1.5	1.5	8	1.44	5.9°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0075N080S06	0.75	1.5	1.5	8	1.44	8.1°	50	6	2	●	1	8.4	8.8	9.4	10.1
R0075N100	0.75	1.5	1.5	10	1.44	5.1°	50	4	2	●	1	10.5	10.9	11.7	12.6
R0075N100S06	0.75	1.5	1.5	10	1.44	7.2°	50	6	2	●	1	10.5	10.9	11.7	12.6
R0075N120	0.75	1.5	1.5	12	1.44	4.4°	50	4	2	●	1	12.6	13.1	14	15.1
R0075N120S06	0.75	1.5	1.5	12	1.44	6.5°	55	6	2	●	1	12.6	13.1	14	15.1
R0075N140	0.75	1.5	1.5	14	1.44	4°	50	4	2	●	1	14.7	15.2	16.3	17.6
R0075N140S06	0.75	1.5	1.5	14	1.44	5.9°	55	6	2	●	1	14.7	15.2	16.3	17.6
R0075N160	0.75	1.5	1.5	16	1.44	3.6°	55	4	2	●	1	16.8	17.3	18.6	20
R0075N160S06	0.75	1.5	1.5	16	1.44	5.4°	60	6	2	●	1	16.8	17.3	18.6	20
R0075N180	0.75	1.5	1.5	18	1.44	3.3°	55	4	2	●	1	18.8	19.5	20.9	22.5
R0075N200	0.75	1.5	1.5	20	1.44	3°	55	4	2	●	1	20.9	21.6	23.2	⁎
R0075N200S06	0.75	1.5	1.5	20	1.44	4.6°	60	6	2	●	1	20.9	21.6	23.2	25
R0075N220	0.75	1.5	1.5	22	1.44	2.8°	60	4	2	●	1	23	23.8	25.5	⁎
R0075N300	0.75	1.5	1.5	30	1.44	2.1°	70	4	2	●	1	31.2	32.3	34.7	⁎
R0080N080	0.8	1.6	1.6	8	1.54	5.8°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0080N120	0.8	1.6	1.6	12	1.54	4.3°	50	4	2	●	1	12.6	13.1	14	15.1
R0080N160	0.8	1.6	1.6	16	1.54	3.5°	55	4	2	●	1	16.8	17.3	18.6	20
R0080N200	0.8	1.6	1.6	20	1.54	2.9°	55	4	2	●	1	20.9	21.6	23.2	⁎
R0090N080	0.9	1.8	1.8	8	1.74	5.5°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0090N120	0.9	1.8	1.8	12	1.74	4.1°	50	4	2	●	1	12.6	13	14	15
R0090N160	0.9	1.8	1.8	16	1.74	3.3°	55	4	2	●	1	16.8	17.3	18.6	20
R0090N200	0.9	1.8	1.8	20	1.74	2.7°	55	4	2	●	1	20.9	21.6	23.2	⁎
R0100N040	1	2	2	4	1.9	8.2°	50	4	2	●	1	4.1	4.3	4.6	4.9
R0100N040S06	1	2	2	4	1.9	10.6°	50	6	2	●	1	4.1	4.3	4.6	4.9
R0100N060	1	2	2	6	1.9	6.4°	50	4	2	●	1	6.2	6.5	6.9	7.4
R0100N060S06	1	2	2	6	1.9	9°	50	6	2	●	1	6.2	6.5	6.9	7.4
R0100N080	1	2	2	8	1.9	5.3°	50	4	2	●	1	8.3	8.7	9.2	9.9
R0100N080S06	1	2	2	8	1.9	7.8°	50	6	2	●	1	8.3	8.7	9.2	9.9
R0100N100	1	2	2	10	1.9	4.5°	50	4	2	●	1	10.4	10.8	11.5	12.4
R0100N100S06	1	2	2	10	1.9	6.9°	50	6	2	●	1	10.4	10.8	11.5	12.4
R0100N120	1	2	2	12	1.9	3.9°	50	4	2	●	1	12.5	12.9	13.8	14.9
R0100N120S06	1	2	2	12	1.9	6.1°	55	6	2	●	1	12.5	12.9	13.8	14.9
R0100N140	1	2	2	14	1.9	3.4°	50	4	2	●	1	14.6	15.1	16.1	17.4
R0100N140S06	1	2	2	14	1.9	5.6°	55	6	2	●	1	14.6	15.1	16.1	17.4
R0100N160	1	2	2	16	1.9	3.1°	55	4	2	●	1	16.7	17.2	18.4	19.9
R0100N160S06	1	2	2	16	1.9	5.1°	60	6	2	●	1	16.7	17.2	18.4	19.9

⁎ No interference

● : Inventory maintained in Japan.

Unit : mm

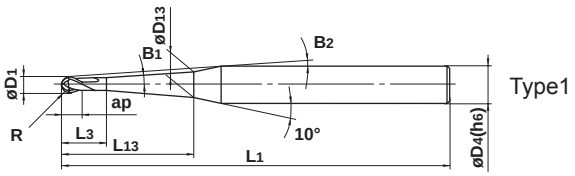
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XLBR0100N180	1	2	2	18	1.9	2.8°	55	4	2	●	1	18.7	19.4	20.7	*
R0100N180S06	1	2	2	18	1.9	4.7°	60	6	2	●	1	18.7	19.4	20.7	22.3
R0100N200	1	2	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23	*
R0100N200S06	1	2	2	20	1.9	4.3°	60	6	2	●	1	20.8	21.5	23	24.8
R0100N220	1	2	2	22	1.9	2.3°	60	4	2	●	1	22.9	23.6	25.3	*
R0100N250	1	2	2	25	1.9	2.1°	65	4	2	●	1	26	26.8	28.8	*
R0100N250S06	1	2	2	25	1.9	3.7°	65	6	2	●	1	26	26.8	28.8	31
R0100N300	1	2	2	30	1.9	1.8°	70	4	2	●	1	31.1	32.2	*	*
R0100N300S06	1	2	2	30	1.9	3.2°	70	6	2	●	1	31.1	32.2	34.5	37.3
R0100N350	1	2	2	35	1.9	1.6°	70	4	2	●	1	36.3	37.5	*	*
R0100N350S06	1	2	2	35	1.9	2.8°	80	6	2	●	1	36.3	37.5	40.3	*
R0125N060S06	1.25	2.5	2.5	6	2.4	8.6°	50	6	2	●	1	6.2	6.5	6.9	7.4
R0125N075S06	1.25	2.5	2.5	7.5	2.4	7.7°	50	6	2	●	1	7.8	8.1	8.6	9.2
R0125N100S06	1.25	2.5	2.5	10	2.4	6.5°	50	6	2	●	1	10.4	10.8	11.5	12.3
R0125N125S06	1.25	2.5	2.5	12.5	2.4	5.6°	50	6	2	●	1	13	13.5	14.4	15.4
R0125N160S06	1.25	2.5	2.5	16	2.4	4.7°	60	6	2	●	1	16.7	17.2	18.4	19.8
R0125N200S06	1.25	2.5	2.5	20	2.4	4°	60	6	2	●	1	20.8	21.5	23	24.8
R0125N250S06	1.25	2.5	2.5	25	2.4	3.3°	65	6	2	●	1	26	26.8	28.7	31
R0125N300S06	1.25	2.5	2.5	30	2.4	2.9°	70	6	2	●	1	31.1	32.2	34.5	*
R0125N350S06	1.25	2.5	2.5	35	2.4	2.5°	80	6	2	●	1	36.3	37.5	40.2	*
R0150N080	1.5	3	3	8	2.9	7°	60	6	2	●	1	8.3	8.6	9.2	9.8
R0150N100	1.5	3	3	10	2.9	6°	60	6	2	●	1	10.4	10.8	11.5	12.3
R0150N120	1.5	3	3	12	2.9	5.3°	60	6	2	●	1	12.5	12.9	13.8	14.8
R0150N140	1.5	3	3	14	2.9	4.7°	60	6	2	●	1	14.6	15	16.1	17.3
R0150N160	1.5	3	3	16	2.9	4.3°	60	6	2	●	1	16.6	17.2	18.4	19.7
R0150N200	1.5	3	3	20	2.9	3.6°	70	6	2	●	1	20.8	21.5	23	24.7
R0150N250	1.5	3	3	25	2.9	3°	70	6	2	●	1	26	26.8	28.7	*
R0150N300	1.5	3	3	30	2.9	2.6°	70	6	2	●	1	31.1	32.2	34.5	*
R0150N350	1.5	3	3	35	2.9	2.2°	80	6	2	●	1	36.3	37.5	40.2	*
R0150N400	1.5	3	3	40	2.9	2°	90	6	2	●	1	41.5	42.9	*	*
R0200N100	2	4	4	10	3.9	4.8°	70	6	2	●	1	10.4	10.7	11.4	12.2
R0200N120	2	4	4	12	3.9	4.1°	70	6	2	●	1	12.5	12.9	13.7	14.6
R0200N140	2	4	4	14	3.9	3.6°	70	6	2	●	1	14.6	15	16	17.1
R0200N160	2	4	4	16	3.9	3.2°	70	6	2	●	1	16.6	17.1	18.3	19.6
R0200N200	2	4	4	20	3.9	2.7°	70	6	2	●	1	20.8	21.4	22.9	*
R0200N250	2	4	4	25	3.9	2.2°	70	6	2	●	1	25.9	26.8	28.6	*
R0200N300	2	4	4	30	3.9	1.8°	70	6	2	●	1	31.1	32.1	*	*
R0200N350	2	4	4	35	3.9	1.6°	80	6	2	●	1	36.3	37.5	*	*
R0200N400	2	4	4	40	3.9	1.4°	90	6	2	●	1	41.4	42.8	*	*
R0200N450	2	4	4	45	3.9	1.3°	90	6	2	●	1	46.6	48.2	*	*
R0200N500	2	4	4	50	3.9	1.2°	100	6	2	●	1	51.8	53.5	*	*
R0250N200	2.5	5	5	20	4.9	1.5°	70	6	2	●	1	20.7	21.4	*	*
R0250N250	2.5	5	5	25	4.9	1.2°	70	6	2	●	1	25.9	26.7	*	*
R0250N300	2.5	5	5	30	4.9	1°	80	6	2	●	1	31.1	*	*	*
R0250N350	2.5	5	5	35	4.9	0.9°	80	6	2	●	1	36.3	*	*	*
R0300N300	3	6	6	30	5.85	—	80	6	2	●	2	*	*	*	*
R0300N500	3	6	6	50	5.85	—	120	6	2	●	2	*	*	*	*

* No interference

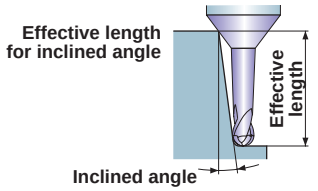
MS2XB

Ball nose end mill, 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	Aluminium Alloy
◎	◎	○		○	○		



R					
	0.1≤R≤2				
	±0.01				
	0.2≤D1≤4				
	0 - 0.020				
h6	4≤D4≤6	D4=8			
	0 - 0.008	0 - 0.009			



● 2 flute taper neck ball nose end mill.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Taper Angle One Side B1	Length of Cut ap	Neck Length L13	Length of Straight Neck L3	Cutting Edge to Shank Angle B2	Neck Dia. D13	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XBR0010T0030L015	0.1	0.2	30'	0.2	1.5	0.6	8.8°	0.19	50	4	2	●	1	1.7	1.8	2.0	2.3
R0010T0030L020	0.1	0.2	30'	0.2	2	0.6	8.5°	0.20	50	4	2	●	1	2.2	2.4	2.6	3.0
R0010T0100L015	0.1	0.2	1°	0.2	1.5	0.6	8.8°	0.21	50	4	2	●	1	—	1.8	2.0	2.2
R0010T0100L020	0.1	0.2	1°	0.2	2	0.6	8.5°	0.22	50	4	2	●	1	—	2.3	2.5	2.9
R0010T0130L015	0.1	0.2	1°30'	0.2	1.5	0.6	8.9°	0.22	50	4	2	●	1	—	—	1.9	2.2
R0010T0130L020	0.1	0.2	1°30'	0.2	2	0.6	8.6°	0.25	50	4	2	●	1	—	—	2.4	2.8
R0010T0200L015	0.1	0.2	2°	0.2	1.5	0.6	8.9°	0.24	50	4	2	●	1	—	—	1.8	2.1
R0010T0200L020	0.1	0.2	2°	0.2	2	0.6	8.6°	0.27	50	4	2	●	1	—	—	2.3	2.6
R0010T0300L015	0.1	0.2	3°	0.2	1.5	0.6	9.0°	0.27	50	4	2	●	1	—	—	—	1.9
R0010T0300L020	0.1	0.2	3°	0.2	2	0.6	8.7°	0.32	50	4	2	●	1	—	—	—	2.4
R0010T0500L020	0.1	0.2	5°	0.2	2	0.6	9.0°	0.42	50	4	2	●	1	—	—	—	—
R0015T0030L030	0.15	0.3	30'	0.3	3	0.7	7.9°	0.32	50	4	2	●	1	3.2	3.4	3.8	4.3
R0015T0100L030	0.15	0.3	1°	0.3	3	0.7	7.9°	0.36	50	4	2	●	1	—	3.3	3.7	4.2
R0015T0130L030	0.15	0.3	1°30'	0.3	3	0.7	8.0°	0.40	50	4	2	●	1	—	—	3.5	4.0
R0015T0200L030	0.15	0.3	2°	0.3	3	0.7	8.1°	0.44	50	4	2	●	1	—	—	3.3	3.8
R0015T0300L030	0.15	0.3	3°	0.3	3	0.7	8.2°	0.52	50	4	2	●	1	—	—	—	3.4
R0015T0500L030	0.15	0.3	5°	0.3	3	0.7	8.6°	0.68	50	4	2	●	1	—	—	—	—
R0020T0030L020	0.2	0.4	30'	0.4	2	1.2	8.4°	0.38	50	4	2	●	1	2.3	2.4	2.7	3.0
R0020T0030L030	0.2	0.4	30'	0.4	3	1.2	7.8°	0.40	50	4	2	●	1	3.3	3.5	3.9	4.4
R0020T0030L040	0.2	0.4	30'	0.4	4	1.2	7.3°	0.41	50	4	2	●	1	4.3	4.5	5.1	5.7
R0020T0030L050	0.2	0.4	30'	0.4	5	1.2	6.8°	0.43	50	4	2	●	1	5.3	5.6	6.2	7.1
R0020T0100L020	0.2	0.4	1°	0.4	2	1.2	8.4°	0.39	50	4	2	●	1	—	2.3	2.6	3.0
R0020T0100L030	0.2	0.4	1°	0.4	3	1.2	7.9°	0.43	50	4	2	●	1	—	3.3	3.7	4.2
R0020T0100L040	0.2	0.4	1°	0.4	4	1.2	7.4°	0.46	50	4	2	●	1	—	4.3	4.9	5.5
R0020T0100L050	0.2	0.4	1°	0.4	5	1.2	6.9°	0.50	50	4	2	●	1	—	5.3	6.0	6.8
R0020T0130L020	0.2	0.4	1°30'	0.4	2	1.2	8.5°	0.41	50	4	2	●	1	—	—	2.5	2.9
R0020T0130L030	0.2	0.4	1°30'	0.4	3	1.2	7.9°	0.46	50	4	2	●	1	—	—	3.6	4.1
R0020T0130L040	0.2	0.4	1°30'	0.4	4	1.2	7.5°	0.51	50	4	2	●	1	—	—	4.7	5.3
R0020T0130L050	0.2	0.4	1°30'	0.4	5	1.2	7.0°	0.56	50	4	2	●	1	—	—	5.7	6.5
R0020T0200L020	0.2	0.4	2°	0.4	2	1.2	8.5°	0.42	50	4	2	●	1	—	—	2.5	2.8
R0020T0200L030	0.2	0.4	2°	0.4	3	1.2	8.0°	0.49	50	4	2	●	1	—	—	3.5	4.0
R0020T0200L040	0.2	0.4	2°	0.4	4	1.2	7.5°	0.56	50	4	2	●	1	—	—	4.5	5.1
R0020T0200L050	0.2	0.4	2°	0.4	5	1.2	7.1°	0.63	50	4	2	●	1	—	—	5.5	6.2
R0025T0030L030	0.25	0.5	30'	0.5	3	1.5	7.8°	0.49	50	4	2	●	1	3.3	3.5	3.9	4.4

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Taper Angle One Side	Length of Cut	Neck Length	Length of Straight Neck	Cutting Edge to Shank Angle	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle			
	R	D_1	B_1	ap	L_{13}	L_3	B_2	D_{13}	L_1	D_4	N			30'	1°	2°	3°
MS2XBR0025T0030L050	0.25	0.5	30'	0.5	5	1.5	6.8°	0.53	50	4	2	●	1	5.3	5.6	6.2	7.1
R0025T0100L030	0.25	0.5	1°	0.5	3	1.5	7.8°	0.52	50	4	2	●	1	—	3.4	3.8	4.3
R0025T0100L050	0.25	0.5	1°	0.5	5	1.5	6.9°	0.59	50	4	2	●	1	—	5.4	6.0	6.8
R0025T0130L030	0.25	0.5	1°30'	0.5	3	1.5	7.9°	0.54	50	4	2	●	1	—	—	3.7	4.1
R0025T0130L050	0.25	0.5	1°30'	0.5	5	1.5	7.0°	0.65	50	4	2	●	1	—	—	5.8	6.6
R0025T0200L030	0.25	0.5	2°	0.5	3	1.5	7.9°	0.57	50	4	2	●	1	—	—	3.5	4.0
R0025T0200L050	0.25	0.5	2°	0.5	5	1.5	7.1°	0.71	50	4	2	●	1	—	—	5.5	6.3
R0030T0030L050	0.3	0.6	30'	0.6	5	1.6	6.8°	0.62	50	4	2	●	1	5.3	5.6	6.2	7.1
R0030T0030L080	0.3	0.6	30'	0.6	8	1.6	5.7°	0.68	50	4	2	●	1	8.3	8.7	9.8	11.1
R0030T0100L050	0.3	0.6	1°	0.6	5	1.6	6.8°	0.68	50	4	2	●	1	—	5.4	6.0	6.8
R0030T0100L080	0.3	0.6	1°	0.6	8	1.6	5.8°	0.79	50	4	2	●	1	—	8.4	9.4	10.7
R0030T0100L100	0.3	0.6	1°	0.6	10	1.6	5.2°	0.86	50	4	2	●	1	—	10.4	11.6	13.2
R0030T0100L120	0.3	0.6	1°	0.6	12	1.6	4.8°	0.93	50	4	2	●	1	—	12.4	13.9	15.8
R0030T0100L150	0.3	0.6	1°	0.6	15	1.6	4.2°	1.03	50	4	2	●	1	—	15.4	17.2	19.6
R0030T0130L050	0.3	0.6	1°30'	0.6	5	1.6	6.9°	0.74	50	4	2	●	1	—	—	5.8	6.6
R0030T0130L080	0.3	0.6	1°30'	0.6	8	1.6	5.9°	0.90	50	4	2	●	1	—	—	9.0	10.2
R0030T0200L060	0.3	0.6	2°	0.6	6	1.6	6.6°	0.87	50	4	2	●	1	—	—	6.6	7.4
R0030T0200L080	0.3	0.6	2°	0.6	8	1.6	6.0°	1.01	50	4	2	●	1	—	—	8.6	9.7
R0040T0030L080	0.4	0.8	30'	0.8	8	1.8	5.5°	0.87	50	4	2	●	1	8.3	8.7	9.8	11.1
R0040T0030L120	0.4	0.8	30'	0.8	12	1.8	4.5°	0.94	60	4	2	●	1	12.3	13.0	14.5	16.5
R0040T0100L080	0.4	0.8	1°	0.8	8	1.8	5.6°	0.98	50	4	2	●	1	—	8.4	9.4	10.7
R0040T0100L120	0.4	0.8	1°	0.8	12	1.8	4.6°	1.12	60	4	2	●	1	—	12.4	13.9	15.8
R0040T0130L080	0.4	0.8	1°30'	0.8	8	1.8	5.8°	1.09	50	4	2	●	1	—	—	9.0	10.2
R0040T0130L120	0.4	0.8	1°30'	0.8	12	1.8	4.8°	1.30	60	4	2	●	1	—	—	13.2	15.0
R0040T0200L080	0.4	0.8	2°	0.8	8	1.8	5.9°	1.20	60	4	2	●	1	—	—	8.6	9.7
R0040T0300L120	0.4	0.8	3°	0.8	12	1.8	5.2°	1.83	60	4	2	●	1	—	—	—	12.8
R0050T0030L100	0.5	1	30'	1	10	2.5	6.1°	1.08	60	6	2	●	1	10.4	10.9	12.2	13.9
R0050T0030L150	0.5	1	30'	1	15	2.5	5.1°	1.16	60	6	2	●	1	15.4	16.2	18.2	20.7
R0050T0030L200	0.5	1	30'	1	20	2.5	4.4°	1.25	70	6	2	●	1	20.4	21.5	24.1	27.4
R0050T0030L250	0.5	1	30'	1	25	2.5	3.8°	1.34	70	6	2	●	1	25.4	26.8	30.0	34.2
R0050T0030L300	0.5	1	30'	1	30	2.5	3.4°	1.42	70	6	2	●	1	30.4	32.0	35.9	41.0
R0050T0100L100	0.5	1	1°	1	10	2.5	6.2°	1.21	60	6	2	●	1	—	10.5	11.8	13.4
R0050T0100L150	0.5	1	1°	1	15	2.5	5.2°	1.38	60	6	2	●	1	—	15.5	17.4	19.8
R0050T0100L200	0.5	1	1°	1	20	2.5	4.5°	1.56	70	6	2	●	1	—	20.5	23.0	26.2
R0050T0100L250	0.5	1	1°	1	25	2.5	3.9°	1.73	70	6	2	●	1	—	25.5	28.6	32.6
R0050T0100L300	0.5	1	1°	1	30	2.5	3.5°	1.91	70	6	2	●	1	—	30.5	34.2	39.0
R0050T0100L350	0.5	1	1°	1	35	2.5	3.2°	2.08	80	6	2	●	1	—	35.5	39.8	45.4
R0050T0130L100	0.5	1	1°30'	1	10	2.5	6.3°	1.34	60	6	2	●	1	—	—	11.3	12.8
R0050T0130L150	0.5	1	1°30'	1	15	2.5	5.3°	1.60	60	6	2	●	1	—	—	16.6	18.9
R0050T0130L200	0.5	1	1°30'	1	20	2.5	4.6°	1.86	70	6	2	●	1	—	—	21.9	24.9
R0050T0200L150	0.5	1	2°	1	15	2.5	5.4°	1.82	60	6	2	●	1	—	—	15.8	18.0
R0050T0200L200	0.5	1	2°	1	20	2.5	4.7°	2.17	70	6	2	●	1	—	—	20.8	23.7
R0050T0300L200	0.5	1	3°	1	20	2.5	5.0°	2.78	70	6	2	●	1	—	—	—	21.2
R0050T0300L400	0.5	1	3°	1	40	2.5	3.4°	4.88	80	6	2	●	1	—	—	—	41.2
R0050T0500L200	0.5	1	5°	1	20	2.5	5.7°	4.01	70	6	2	●	1	—	—	—	—
R0060T0030L120	0.6	1.2	30'	1.2	12	2.7	5.6°	1.31	60	6	2	●	1	12.4	13.1	14.6	16.6
R0060T0030L240	0.6	1.2	30'	1.2	24	2.7	3.8°	1.52	70	6	2	●	1	24.4	25.7	28.8	32.8
R0060T0100L120	0.6	1.2	1°	1.2	12	2.7	5.7°	1.47	60	6	2	●	1	—	12.5	14.0	15.9
R0060T0100L240	0.6	1.2	1°	1.2	24	2.7	3.9°	1.89	70	6	2	●	1	—	24.5	27.5	31.3
R0060T0130L120	0.6	1.2	1°30'	1.2	12	2.7	5.8°	1.63	60	6	2	●	1	—	—	13.4	15.2
R0060T0130L240	0.6	1.2	1°30'	1.2	24	2.7	4.1°	2.26	70	6	2	●	1	—	—	26.2	29.8
R0060T0200L120	0.6	1.2	2°	1.2	12	2.7	5.9°	1.79	60	6	2	●	1	—	—	12.8	14.6

MS2XB

Ball nose end mill, 2 flute, Taper neck

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Taper Angle One Side B1	Length of Cut ap	Neck Length L13	Length of Straight Neck L3	Cutting Edge to Shank Angle B2	Neck Dia. D13	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
MS2XBR0060T0200L240	0.6	1.2	2°	1.2	24	2.7	4.2°	2.63	70	6	2	●	1	—	—	24.8	28.3
R0075T0030L100	0.75	1.5	30'	1.5	10	3	5.9°	1.57	60	6	2	●	1	10.4	10.9	12.2	13.8
R0075T0030L150	0.75	1.5	30'	1.5	15	3	4.9°	1.65	60	6	2	●	1	15.4	16.2	18.1	20.6
R0075T0030L300	0.75	1.5	30'	1.5	30	3	3.2°	1.92	70	6	2	●	1	30.4	32.0	35.9	40.9
R0075T0100L100	0.75	1.5	1°	1.5	10	3	6.0°	1.69	60	6	2	●	1	—	10.5	11.8	13.3
R0075T0100L150	0.75	1.5	1°	1.5	15	3	5.0°	1.86	60	6	2	●	1	—	15.5	17.4	19.7
R0075T0100L200	0.75	1.5	1°	1.5	20	3	4.2°	2.04	70	6	2	●	1	—	20.5	23.0	26.1
R0075T0100L300	0.75	1.5	1°	1.5	30	3	3.3°	2.39	70	6	2	●	1	—	30.5	34.2	39.0
R0075T0130L100	0.75	1.5	1°30'	1.5	10	3	6.1°	1.81	60	6	2	●	1	—	—	11.3	12.8
R0075T0130L150	0.75	1.5	1°30'	1.5	15	3	5.1°	2.07	60	6	2	●	1	—	—	16.6	18.9
R0075T0130L300	0.75	1.5	1°30'	1.5	30	3	3.4°	2.86	70	6	2	●	1	—	—	32.5	37.0
R0075T0200L100	0.75	1.5	2°	1.5	10	3	6.2°	1.93	60	6	2	●	1	—	—	10.9	12.3
R0075T0200L150	0.75	1.5	2°	1.5	15	3	5.2°	2.28	60	6	2	●	1	—	—	15.9	18.0
R0075T0200L300	0.75	1.5	2°	1.5	30	3	3.5°	3.33	70	6	2	●	1	—	—	30.9	35.1
R0100T0030L200	1	2	30'	2	20	4	3.9°	2.18	60	6	2	●	1	20.7	21.7	24.3	27.6
R0100T0030L300	1	2	30'	2	30	4	2.9°	2.36	70	6	2	●	1	30.7	32.3	36.2	*
R0100T0030L400	1	2	30'	2	40	4	2.4°	2.53	80	6	2	●	1	40.7	42.8	48.0	*
R0100T0100L200	1	2	1°	2	20	4	4.0°	2.46	60	6	2	●	1	—	20.8	23.3	26.4
R0100T0100L250	1	2	1°	2	25	4	3.4°	2.64	60	6	2	●	1	—	25.8	28.9	32.9
R0100T0100L300	1	2	1°	2	30	4	3.0°	2.81	70	6	2	●	1	—	30.8	34.5	39.3
R0100T0100L350	1	2	1°	2	35	4	2.7°	2.99	80	6	2	●	1	—	35.8	40.1	*
R0100T0100L400	1	2	1°	2	40	4	2.5°	3.16	80	6	2	●	1	—	40.8	45.8	*
R0100T0100L500	1	2	1°	2	50	4	2.1°	3.51	90	6	2	●	1	—	50.8	57.0	*
R0100T0130L200	1	2	1°30'	2	20	4	4.1°	2.74	60	6	2	●	1	—	—	22.3	25.3
R0100T0130L300	1	2	1°30'	2	30	4	3.1°	3.27	70	6	2	●	1	—	—	32.9	37.4
R0100T0130L400	1	2	1°30'	2	40	4	2.6°	3.79	80	6	2	●	1	—	—	43.5	*
R0100T0200L300	1	2	2°	2	30	4	3.3°	3.72	70	6	2	●	1	—	—	31.3	35.5
R0100T0200L400	1	2	2°	2	40	4	2.7°	4.42	80	6	2	●	1	—	—	41.3	*
R0100T0300L300	1	2	3°	2	30	4	3.5°	4.63	70	6	2	●	1	—	—	—	31.8
R0100T0300L400	1	2	3°	2	40	4	2.9°	5.68	80	6	2	●	1	—	—	—	*
R0100T0500L200	1	2	5°	2	20	4	5.1°	4.70	60	6	2	●	1	—	—	—	—
R0100T0500L380	1	2	5°	2	38	4	4.6°	7.85	80	8	2	●	1	—	—	—	—
R0150T0030L300	1.5	3	30'	3	30	6	2.4°	3.32	70	6	2	●	1	30.7	32.3	36.2	*
R0150T0030L400	1.5	3	30'	3	40	6	1.9°	3.50	80	6	2	●	1	40.7	42.9	*	*
R0150T0030L500	1.5	3	30'	3	50	6	1.6°	3.67	90	6	2	●	1	50.7	53.4	*	*
R0150T0100L300	1.5	3	1°	3	30	6	2.5°	3.74	70	6	2	●	1	—	31.0	34.7	*
R0150T0100L400	1.5	3	1°	3	40	6	2.0°	4.09	80	6	2	●	1	—	41.0	45.9	*
R0150T0100L500	1.5	3	1°	3	50	6	1.7°	4.44	90	6	2	●	1	—	51.0	*	*
R0150T0130L300	1.5	3	1°30'	3	30	6	2.6°	4.16	70	6	2	●	1	—	—	33.1	*
R0150T0130L400	1.5	3	1°30'	3	40	6	2.1°	4.69	80	6	2	●	1	—	—	43.8	*
R0150T0130L500	1.5	3	1°30'	3	50	6	1.7°	5.21	90	6	2	●	1	—	—	*	*
R0150T0200L300	1.5	3	2°	3	30	6	2.7°	4.58	70	6	2	●	1	—	—	31.6	*
R0150T0200L480	1.5	3	2°	3	48	6	1.9°	5.84	90	6	2	●	1	—	—	*	*
R0150T0300L300	1.5	3	3°	3	30	6	2.9°	5.42	70	6	2	●	1	—	—	—	*
R0150T0300L500	1.5	3	3°	3	50	6	2.9°	7.52	90	8	2	●	1	—	—	—	*
R0200T0030L600	2	4	30'	4	60	7	1.0°	4.83	110	6	2	●	1	60.8	64.0	*	*
R0200T0100L600	2	4	1°	4	60	7	1.0°	5.76	110	6	2	●	1	—	61.1	*	*

* No interference

● : Inventory maintained in Japan.

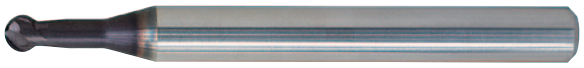
CUTTING CONDITIONS ➤ J305

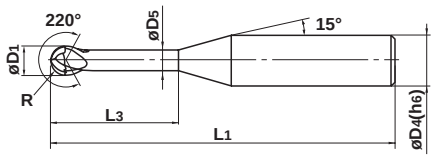
VF-2WB

Wide ball nose, Medium cut length, 2 flute

UWC VF

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	Aluminium Alloy
○	◎	○		◎	◎		





Type1

R	1≤R≤3				
	±0.01				
h6	D4=6				
	0 - 0.008				

● Ball nose end mill suitable for machining of undercut geometries and complex geometries using a 5-axis machine.

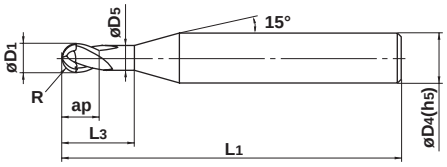
Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2WBR0100N060	1	2	6	1.6	60	6	2	●	1
R0150N080	1.5	3	8	2.4	60	6	2	●	1
R0200N100	2	4	10	3.2	60	6	2	●	1
R0300N120	3	6	12	4.8	80	6	2	●	1

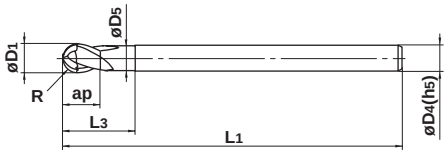
VF-2SSB

Ball nose, Short cut length, 2 flute, Short 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	Aluminium Alloy
○	◎	◎	◎	○	○		



Type1



Type2

R				
0.5≤R≤6				
±0.005				
1≤D1≤12				
0 - 0.01				
4≤D4≤6	8≤D4≤10	D4=12		
0 - 0.005	0 - 0.006	0 - 0.008		

h5

● 2 flute ball nose end mill with Impact Miracle coating for high hardened materials.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2SSBR0050S04	0.5	1	1	2	0.94	40	4	2	●	1
R0050	0.5	1	1	2	0.94	40	6	2	●	1
R0075S04	0.75	1.5	1.5	3	1.44	40	4	2	●	1
R0075	0.75	1.5	1.5	3	1.44	40	6	2	●	1
R0100	1	2	2	4	1.9	45	6	2	●	1
R0150	1.5	3	3	6	2.9	45	6	2	●	1
R0200	2	4	4	8	3.9	45	6	2	●	1
R0250	2.5	5	5	10	4.9	50	6	2	●	1
R0300	3	6	6	12	5.85	50	6	2	●	2
R0400	4	8	8	14	7.85	60	8	2	●	2
R0500	5	10	10	18	9.7	70	10	2	●	2
R0600	6	12	12	22	11.7	75	12	2	●	2

● : Inventory maintained in Japan.

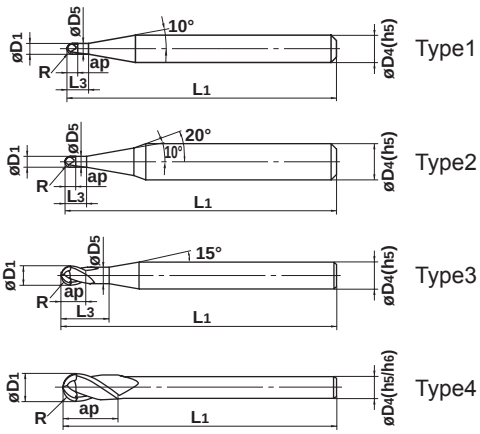
CUTTING CONDITIONS ➤ J326

VF-2SB

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

UWC | VF | 0° R<0.3 | 30° R≥0.3 | R<0.3 | R≥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	Aluminium Alloy
○	◎	◎	◎	○	○		



R	R≤6	R<6			
	±0.005	±0.010			
	D1≤12	D1>12			
	0 - 0.01	0 - 0.02			
h5 D4≤12	D4=3	4≤D4≤6	8≤D4≤10		
	0 - 0.004	0 - 0.005	0 - 0.006		
h6 D4>12	D4=12	D4=16	D4=20		
	0 - 0.008	0 - 0.011	0 - 0.013		

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2SBR0010S04	0.1	0.2	0.2	0.4	0.17	45	4	2	●	1
R0010S06	0.1	0.2	0.2	0.4	0.17	50	6	2	●	2
R0015S04	0.15	0.3	0.3	0.6	0.27	45	4	2	●	1
R0015S06	0.15	0.3	0.3	0.6	0.27	50	6	2	●	2
R0020S04	0.2	0.4	0.4	0.8	0.36	45	4	2	●	1
R0020S06	0.2	0.4	0.4	0.8	0.36	50	6	2	●	2
R0030S04	0.3	0.6	0.6	1.2	0.56	45	4	2	●	3
R0030S06	0.3	0.6	0.6	1.2	0.56	50	6	2	●	3
R0040S04	0.4	0.8	0.8	1.6	0.76	45	4	2	●	3
R0040S06	0.4	0.8	0.8	1.6	0.76	50	6	2	●	3
R0050S04	0.5	1	1	2	0.94	45	4	2	●	3
R0050S06	0.5	1	1	2	0.94	50	6	2	●	3
R0060S04	0.6	1.2	1.2	2.4	1.14	45	4	2	●	3
R0060S06	0.6	1.2	1.2	2.4	1.14	50	6	2	●	3
R0070S04	0.7	1.4	1.4	2.8	1.34	45	4	2	●	3
R0070S06	0.7	1.4	1.4	2.8	1.34	50	6	2	●	3
R0075S04	0.75	1.5	1.5	3	1.44	45	4	2	●	3
R0075S06	0.75	1.5	1.5	3	1.44	50	6	2	●	3
R0080S04	0.8	1.6	1.6	3.2	1.54	45	4	2	●	3
R0080S06	0.8	1.6	1.6	3.2	1.54	50	6	2	●	3
R0090S04	0.9	1.8	1.8	3.6	1.74	45	4	2	●	3
R0090S06	0.9	1.8	1.8	3.6	1.74	50	6	2	●	3
R0100S04	1	2	2	4	1.9	50	4	2	●	3
R0100S06	1	2	2	4	1.9	60	6	2	●	3
R0125S06	1.25	2.5	2.5	5	2.4	60	6	2	●	3
R0150S03	1.5	3	3	—	—	60	3	2	●	4
R0150S06	1.5	3	3	6	2.9	70	6	2	●	3
R0200S04	2	4	4	—	—	60	4	2	●	4
R0200S06	2	4	4	8	3.9	70	6	2	●	3
R0250S06	2.5	5	5	10	4.9	80	6	2	●	3
R0300S06	3	6	12	—	—	80	6	2	●	4
R0400S08	4	8	14	—	—	90	8	2	●	4
R0500S10	5	10	18	—	—	100	10	2	●	4
R0600S12	6	12	22	—	—	110	12	2	●	4

VF-2SB

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2SBR0800S16	8	16	30	—	—	140	16	2	●	4
R1000S20	10	20	38	—	—	160	20	2	●	4

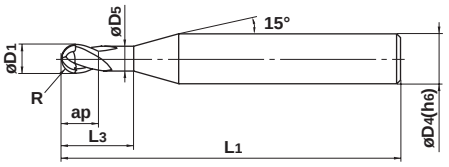
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J326

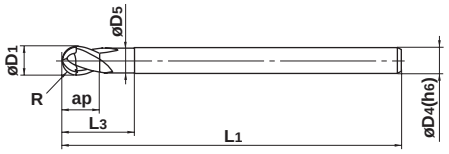
VF-2SDB

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

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	Aluminium Alloy
○	◎	◎	○				



Type1



Type2

R					
R≤6.5	R<6.5				
±0.01	±0.02				
D1≤12	D1>12				
0 - 0.02	0 - 0.03				
D4=3	4≤D4≤6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.006	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

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

Unit : mm

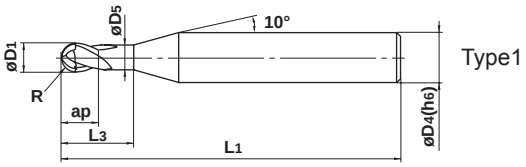
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF2SDBR0050	0.5	1	1	2	0.94	45	4	2	●	1
R0100S04	1	2	2	4	1.9	50	4	2	●	1
R0100	1	2	2	4	1.9	60	6	2	●	1
R0150S03	1.5	3	3	6	2.9	60	3	2	●	2
R0150	1.5	3	3	6	2.9	70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

IMPACT MIRACLE BALL NOSE HIGH POWER END MILL

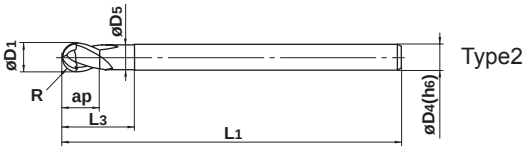
VF-2SDBL

Ball nose, Short cut length, 2 flute, Strong geometry type, 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	Aluminium Alloy
○	◎	◎	○				



Type1



Type2

R	R≤6.5	R>6.5			
	±0.01	±0.02			
	D1≤12	D1>12			
	0 - 0.02	0 - 0.03			
h6	D4=6	8≤D4≤10	12≤D4≤16	D4=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 2 flute end mill with long shank for general use.

Unit : mm

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

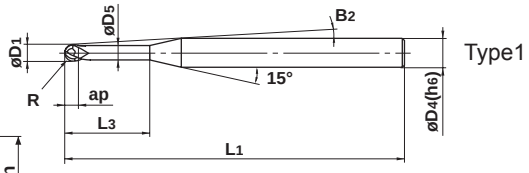
● : Inventory maintained in Japan.

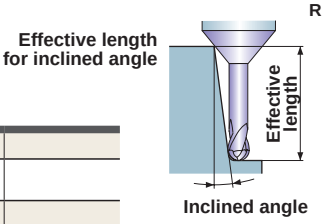
CUTTING CONDITIONS ➤ J324

VF-2XLBS

IMPACT MIRACLE, Ball nose, 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	Aluminium Alloy
○	◎	◎	◎		○		





0.2≤R≤1					
±0.007					
0.4≤D1≤2					
0 - 0.02					
D4=4					
0 - 0.008					

- 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.

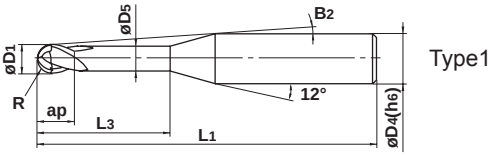
Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
R0020N020	0.2	0.4	0.32	2	0.36	11.9°	40	4	2	●	1	2.0	2.1	2.3	2.5
R0020N030	0.2	0.4	0.32	3	0.36	10.7°	40	4	2	●	1	3.1	3.2	3.4	3.7
R0020N040	0.2	0.4	0.32	4	0.36	9.7°	40	4	2	●	1	4.1	4.3	4.6	4.9
R0025N040	0.25	0.5	0.4	4	0.46	9.6°	40	4	2	●	1	4.1	4.3	4.6	4.9
R0025N060	0.25	0.5	0.4	6	0.46	8.1°	40	4	2	●	1	6.2	6.4	6.9	7.4
R0030N020	0.3	0.6	0.48	2	0.56	11.8°	40	4	2	●	1	2.1	2.2	2.3	2.5
R0030N030	0.3	0.6	0.48	3	0.56	10.5°	40	4	2	●	1	3.1	3.3	3.5	3.8
R0030N040	0.3	0.6	0.48	4	0.56	9.5°	40	4	2	●	1	4.2	4.3	4.6	5.0
R0030N060	0.3	0.6	0.48	6	0.56	8.0°	40	4	2	●	1	6.3	6.5	6.9	7.5
R0040N040	0.4	0.8	0.64	4	0.76	9.4°	40	4	2	●	1	4.2	4.3	4.6	5.0
R0040N060	0.4	0.8	0.64	6	0.76	7.8°	40	4	2	●	1	6.3	6.5	6.9	7.5
R0050N030	0.5	1	0.8	3	0.94	10.1°	40	4	2	●	1	3.2	3.3	3.6	3.9
R0050N040	0.5	1	0.8	4	0.94	9.1°	40	4	2	●	1	4.2	4.4	4.8	5.2
R0050N060	0.5	1	0.8	6	0.94	7.5°	40	4	2	●	1	6.3	6.6	7.1	7.7
R0050N080	0.5	1	0.8	8	0.94	6.4°	40	4	2	●	1	8.4	8.8	9.4	10.2
R0100N060	1	2	1.6	6	1.9	6.4°	40	4	2	●	1	6.2	6.5	6.9	7.4
R0100N080	1	2	1.6	8	1.9	5.3°	40	4	2	●	1	8.3	8.7	9.2	9.9
R0100N100	1	2	1.6	10	1.9	4.5°	40	4	2	●	1	10.4	10.8	11.5	12.4

VF-2XLB

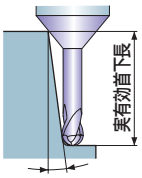
IMPACT MIRACLE, Ball nose, 2 flute, Long neck

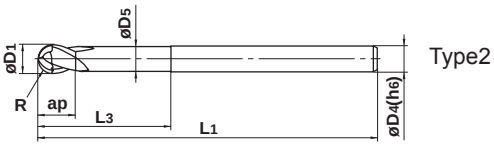
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎		○		



Type1

Effective length for inclined angle





Type2

R	R≤1	R>1			
	±0.007	±0.010			
	0.2≤D1≤6				
	0 -0.02				
h6	4≤D4≤6				
	0 -0.008				

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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF2XLBR0010N005S04	0.1	0.2	0.16	0.5	0.17	11.5°	50	4	2	●	1	0.5	0.5	0.6	0.6
R0010N005S06	0.1	0.2	0.16	0.5	0.17	11.7°	50	6	2	●	1	0.5	0.5	0.6	0.6
R0010N008S04	0.1	0.2	0.16	0.75	0.17	11.2°	50	4	2	●	1	0.7	0.8	0.9	1.0
R0010N010S04	0.1	0.2	0.16	1	0.17	10.9°	50	4	2	●	1	1.0	1.1	1.2	1.3
R0010N010S06	0.1	0.2	0.16	1	0.17	11.3°	50	6	2	●	1	1.0	1.1	1.2	1.3
R0010N013S04	0.1	0.2	0.16	1.25	0.17	10.7°	50	4	2	●	1	1.3	1.3	1.5	1.6
R0010N015S04	0.1	0.2	0.16	1.5	0.17	10.4°	50	4	2	●	1	1.5	1.6	1.8	2.0
R0010N015S06	0.1	0.2	0.16	1.5	0.17	10.9°	50	6	2	●	1	1.5	1.6	1.8	2.0
R0010N018S04	0.1	0.2	0.16	1.75	0.17	10.2°	50	4	2	●	1	1.8	1.9	2.1	2.3
R0010N020S04	0.1	0.2	0.16	2	0.17	10°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0010N025S04	0.1	0.2	0.16	2.5	0.17	9.5°	50	4	2	●	1	2.6	2.7	3.0	3.3
R0015N010S04	0.15	0.3	0.24	1	0.27	11°	50	4	2	●	1	1.0	1.1	1.2	1.3
R0015N010S06	0.15	0.3	0.24	1	0.27	11.3°	50	6	2	●	1	1.0	1.1	1.2	1.3
R0015N013S04	0.15	0.3	0.24	1.25	0.27	10.7°	50	4	2	●	1	1.3	1.3	1.5	1.6
R0015N015S04	0.15	0.3	0.24	1.5	0.27	10.4°	50	4	2	●	1	1.5	1.6	1.8	1.9
R0015N015S06	0.15	0.3	0.24	1.5	0.27	10.9°	50	6	2	●	1	1.5	1.6	1.8	1.9
R0015N018S04	0.15	0.3	0.24	1.75	0.27	10.2°	50	4	2	●	1	1.8	1.9	2.1	2.3
R0015N020S04	0.15	0.3	0.24	2	0.27	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0015N020S06	0.15	0.3	0.24	2	0.27	10.6°	50	6	2	●	1	2.1	2.2	2.4	2.6
R0015N025S04	0.15	0.3	0.24	2.5	0.27	9.5°	50	4	2	●	1	2.6	2.7	3.0	3.3
R0015N030S04	0.15	0.3	0.24	3	0.27	9.1°	50	4	2	●	1	3.1	3.2	3.6	3.9
R0015N040S04	0.15	0.3	0.24	4	0.27	8.4°	50	4	2	●	1	4.2	4.3	4.8	5.3
R0020N010S04	0.2	0.4	0.32	1	0.36	11°	50	4	2	●	1	1.0	1.0	1.1	1.2
R0020N010S06	0.2	0.4	0.32	1	0.36	11.3°	50	6	2	●	1	1.0	1.0	1.1	1.2
R0020N015S04	0.2	0.4	0.32	1.5	0.36	10.4°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0020N015S06	0.2	0.4	0.32	1.5	0.36	11°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0020N020S04	0.2	0.4	0.32	2	0.36	10°	50	4	2	●	1	2.0	2.1	2.3	2.6
R0020N020S06	0.2	0.4	0.32	2	0.36	10.6°	50	6	2	●	1	2.0	2.1	2.3	2.6
R0020N025S04	0.2	0.4	0.32	2.5	0.36	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.2
R0020N025S06	0.2	0.4	0.32	2.5	0.36	10.3°	50	6	2	●	1	2.6	2.7	2.9	3.2
R0020N030S04	0.2	0.4	0.32	3	0.36	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9
R0020N030S06	0.2	0.4	0.32	3	0.36	10°	50	6	2	●	1	3.1	3.2	3.5	3.9
R0020N040S04	0.2	0.4	0.32	4	0.36	8.4°	50	4	2	●	1	4.1	4.3	4.7	5.2
R0020N050S04	0.2	0.4	0.32	5	0.36	7.8°	50	4	2	●	1	5.2	5.4	5.9	6.6

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
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
R0025N015S06	0.25	0.5	0.4	1.5	0.46	11°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0025N020S04	0.25	0.5	0.4	2	0.46	10°	50	4	2	●	1	2.0	2.1	2.3	2.6
R0025N020S06	0.25	0.5	0.4	2	0.46	10.6°	50	6	2	●	1	2.0	2.1	2.3	2.6
R0025N025S04	0.25	0.5	0.4	2.5	0.46	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.2
R0025N030S04	0.25	0.5	0.4	3	0.46	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9
R0025N030S06	0.25	0.5	0.4	3	0.46	10°	50	6	2	●	1	3.1	3.2	3.5	3.9
R0025N035S04	0.25	0.5	0.4	3.5	0.46	8.7°	50	4	2	●	1	3.6	3.8	4.1	4.5
R0025N040S04	0.25	0.5	0.4	4	0.46	8.3°	50	4	2	●	1	4.1	4.3	4.7	5.2
R0025N040S06	0.25	0.5	0.4	4	0.46	9.4°	50	6	2	●	1	4.1	4.3	4.7	5.2
R0025N050S04	0.25	0.5	0.4	5	0.46	7.7°	50	4	2	●	1	5.2	5.4	5.9	6.5
R0025N050S06	0.25	0.5	0.4	5	0.46	8.9°	50	6	2	●	1	5.2	5.4	5.9	6.5
R0025N060S04	0.25	0.5	0.4	6	0.46	7.2°	50	4	2	●	1	6.2	6.5	7.1	7.9
R0025N060S06	0.25	0.5	0.4	6	0.46	8.4°	60	6	2	●	1	6.2	6.5	7.1	7.9
R0030N020S04	0.3	0.6	0.48	2	0.56	9.9°	50	4	2	●	1	2.1	2.2	2.4	2.6
R0030N020S06	0.3	0.6	0.48	2	0.56	10.6°	50	6	2	●	1	2.1	2.2	2.4	2.6
R0030N025S04	0.3	0.6	0.48	2.5	0.56	9.4°	50	4	2	●	1	2.6	2.7	3.0	3.3
R0030N030S04	0.3	0.6	0.48	3	0.56	9°	50	4	2	●	1	3.1	3.3	3.6	3.9
R0030N030S06	0.3	0.6	0.48	3	0.56	9.9°	50	6	2	●	1	3.1	3.3	3.6	3.9
R0030N035S04	0.3	0.6	0.48	3.5	0.56	8.6°	50	4	2	●	1	3.6	3.8	4.2	4.6
R0030N040S04	0.3	0.6	0.48	4	0.56	8.3°	50	4	2	●	1	4.2	4.4	4.8	5.2
R0030N040S06	0.3	0.6	0.48	4	0.56	9.3°	50	6	2	●	1	4.2	4.4	4.8	5.2
R0030N050S04	0.3	0.6	0.48	5	0.56	7.6°	50	4	2	●	1	5.2	5.4	6.0	6.6
R0030N050S06	0.3	0.6	0.48	5	0.56	8.8°	50	6	2	●	1	5.2	5.4	6.0	6.6
R0030N060S04	0.3	0.6	0.48	6	0.56	7.1°	50	4	2	●	1	6.3	6.5	7.1	7.9
R0030N060S06	0.3	0.6	0.48	6	0.56	8.4°	50	6	2	●	1	6.3	6.5	7.1	7.9
R0030N070S04	0.3	0.6	0.48	7	0.56	6.6°	50	4	2	●	1	7.3	7.6	8.3	9.2
R0030N080S04	0.3	0.6	0.48	8	0.56	6.2°	50	4	2	●	1	8.3	8.7	9.5	10.6
R0030N080S06	0.3	0.6	0.48	8	0.56	7.6°	60	6	2	●	1	8.3	8.7	9.5	10.6
R0040N020S04	0.4	0.8	0.64	2	0.76	9.9°	50	4	2	●	1	2.1	2.2	2.3	2.6
R0040N020S06	0.4	0.8	0.64	2	0.76	10.6°	50	6	2	●	1	2.1	2.2	2.3	2.6
R0040N030S04	0.4	0.8	0.64	3	0.76	8.9°	50	4	2	●	1	3.1	3.3	3.5	3.9
R0040N030S06	0.4	0.8	0.64	3	0.76	9.9°	50	6	2	●	1	3.1	3.3	3.5	3.9
R0040N040S04	0.4	0.8	0.64	4	0.76	8.2°	50	4	2	●	1	4.2	4.3	4.7	5.2
R0040N040S06	0.4	0.8	0.64	4	0.76	9.3°	50	6	2	●	1	4.2	4.3	4.7	5.2
R0040N050S04	0.4	0.8	0.64	5	0.76	7.5°	50	4	2	●	1	5.2	5.4	5.9	6.5
R0040N060S04	0.4	0.8	0.64	6	0.76	7°	50	4	2	●	1	6.3	6.5	7.1	7.9
R0040N060S06	0.4	0.8	0.64	6	0.76	8.3°	50	6	2	●	1	6.3	6.5	7.1	7.9
R0040N070S04	0.4	0.8	0.64	7	0.76	6.5°	50	4	2	●	1	7.3	7.6	8.3	9.2
R0040N080S04	0.4	0.8	0.64	8	0.76	6.1°	50	4	2	●	1	8.3	8.7	9.5	10.5
R0040N080S06	0.4	0.8	0.64	8	0.76	7.5°	50	6	2	●	1	8.3	8.7	9.5	10.5
R0040N100S04	0.4	0.8	0.64	10	0.76	5.4°	50	4	2	●	1	10.4	10.9	11.9	13.2
R0040N100S06	0.4	0.8	0.64	10	0.76	6.8°	60	6	2	●	1	10.4	10.9	11.9	13.2
R0050N030S04	0.5	1	0.8	3	0.94	8.8°	50	4	2	●	1	3.2	3.3	3.6	4.0
R0050N030S06	0.5	1	0.8	3	0.94	9.8°	50	6	2	●	1	3.2	3.3	3.6	4.0
R0050N040S04	0.5	1	0.8	4	0.94	8°	50	4	2	●	1	4.2	4.4	4.8	5.3
R0050N040S06	0.5	1	0.8	4	0.94	9.2°	50	6	2	●	1	4.2	4.4	4.8	5.3
R0050N050S04	0.5	1	0.8	5	0.94	7.3°	50	4	2	●	1	5.3	5.5	6.0	6.7
R0050N050S06	0.5	1	0.8	5	0.94	8.7°	50	6	2	●	1	5.3	5.5	6.0	6.7
R0050N060S04	0.5	1	0.8	6	0.94	6.8°	50	4	2	●	1	6.3	6.6	7.2	8.0
R0050N060S06	0.5	1	0.8	6	0.94	8.2°	50	6	2	●	1	6.3	6.6	7.2	8.0
R0050N070S04	0.5	1	0.8	7	0.94	6.3°	50	4	2	●	1	7.4	7.7	8.4	9.3

VF-2XLB

IMPACT MIRACLE, Ball nose, 2 flute, Long neck

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF2XLBR0050N080S04	0.5	1	0.8	8	0.94	5.9°	50	4	2	●	1	8.4	8.8	9.6	10.6
R0050N080S06	0.5	1	0.8	8	0.94	7.4°	50	6	2	●	1	8.4	8.8	9.6	10.6
R0050N090S04	0.5	1	0.8	9	0.94	5.5°	50	4	2	●	1	9.5	9.9	10.8	12.0
R0050N100S04	0.5	1	0.8	10	0.94	5.2°	50	4	2	●	1	10.5	11.0	12.0	13.3
R0050N100S06	0.5	1	0.8	10	0.94	6.7°	50	6	2	●	1	10.5	11.0	12.0	13.3
R0050N120S04	0.5	1	0.8	12	0.94	4.6°	50	4	2	●	1	12.6	13.2	14.4	15.9
R0050N120S06	0.5	1	0.8	12	0.94	6.1°	60	6	2	●	1	12.6	13.2	14.4	15.9
R0050N140S04	0.5	1	0.8	14	0.94	4.2°	60	4	2	●	1	14.7	15.3	16.8	18.6
R0050N160S04	0.5	1	0.8	16	0.94	3.8°	60	4	2	●	1	16.8	17.5	19.2	21.3
R0050N160S06	0.5	1	0.8	16	0.94	5.3°	70	6	2	●	1	16.8	17.5	19.2	21.3
R0050N180S04	0.5	1	0.8	18	0.94	3.5°	60	4	2	●	1	18.9	19.7	21.6	23.9
R0050N200S04	0.5	1	0.8	20	0.94	3.3°	60	4	2	●	1	21.0	21.9	24.0	26.6
R0050N200S06	0.5	1	0.8	20	0.94	4.6°	70	6	2	●	1	21.0	21.9	24.0	26.6
R0060N060S04	0.6	1.2	0.96	6	1.14	6.6°	50	4	2	●	1	6.3	6.6	7.2	8.0
R0060N060S06	0.6	1.2	0.96	6	1.14	8.1°	50	6	2	●	1	6.3	6.6	7.2	8.0
R0060N080S04	0.6	1.2	0.96	8	1.14	5.7°	50	4	2	●	1	8.4	8.8	9.6	10.6
R0060N080S06	0.6	1.2	0.96	8	1.14	7.3°	50	6	2	●	1	8.4	8.8	9.6	10.6
R0060N100S04	0.6	1.2	0.96	10	1.14	5°	50	4	2	●	1	10.5	11.0	12.0	13.3
R0060N100S06	0.6	1.2	0.96	10	1.14	6.6°	50	6	2	●	1	10.5	11.0	12.0	13.3
R0060N120S04	0.6	1.2	0.96	12	1.14	4.5°	50	4	2	●	1	12.6	13.2	14.4	15.9
R0060N120S06	0.6	1.2	0.96	12	1.14	6°	50	6	2	●	1	12.6	13.2	14.4	15.9
R0060N140S04	0.6	1.2	0.96	14	1.14	4°	60	4	2	●	1	14.7	15.3	16.8	18.6
R0060N160S04	0.6	1.2	0.96	16	1.14	3.7°	60	4	2	●	1	16.8	17.5	19.2	21.2
R0060N160S06	0.6	1.2	0.96	16	1.14	5.2°	70	6	2	●	1	16.8	17.5	19.2	21.2
R0070N080S04	0.7	1.4	1.12	8	1.34	5.5°	50	4	2	●	1	8.4	8.8	9.6	10.6
R0070N120S04	0.7	1.4	1.12	12	1.34	4.3°	50	4	2	●	1	12.6	13.1	14.4	15.9
R0070N160S04	0.7	1.4	1.12	16	1.34	3.5°	60	4	2	●	1	16.8	17.5	19.2	21.2
R0075N060S04	0.75	1.5	1.2	6	1.44	6.3°	50	4	2	●	1	6.3	6.6	7.2	7.9
R0075N060S06	0.75	1.5	1.2	6	1.44	8°	50	6	2	●	1	6.3	6.6	7.2	7.9
R0075N080S04	0.75	1.5	1.2	8	1.44	5.4°	50	4	2	●	1	8.4	8.8	9.6	10.6
R0075N080S06	0.75	1.5	1.2	8	1.44	7.2°	50	6	2	●	1	8.4	8.8	9.6	10.6
R0075N100S04	0.75	1.5	1.2	10	1.44	4.7°	50	4	2	●	1	10.5	11.0	12.0	13.2
R0075N100S06	0.75	1.5	1.2	10	1.44	6.5°	50	6	2	●	1	10.5	11.0	12.0	13.2
R0075N120S04	0.75	1.5	1.2	12	1.44	4.2°	50	4	2	●	1	12.6	13.1	14.4	15.9
R0075N120S06	0.75	1.5	1.2	12	1.44	5.9°	50	6	2	●	1	12.6	13.1	14.4	15.9
R0075N140S04	0.75	1.5	1.2	14	1.44	3.8°	50	4	2	●	1	14.7	15.3	16.8	18.5
R0075N140S06	0.75	1.5	1.2	14	1.44	5.4°	50	6	2	●	1	14.7	15.3	16.8	18.5
R0075N160S04	0.75	1.5	1.2	16	1.44	3.4°	60	4	2	●	1	16.8	17.5	19.2	21.2
R0075N160S06	0.75	1.5	1.2	16	1.44	5°	60	6	2	●	1	16.8	17.5	19.2	21.2
R0075N180S04	0.75	1.5	1.2	18	1.44	3.1°	60	4	2	●	1	18.9	19.7	21.6	23.8
R0075N200S04	0.75	1.5	1.2	20	1.44	2.9°	60	4	2	●	1	21.0	21.9	23.9	*
R0075N200S06	0.75	1.5	1.2	20	1.44	4.3°	70	6	2	●	1	21.0	21.9	23.9	26.5
R0080N080S04	0.8	1.6	1.28	8	1.54	5.3°	50	4	2	●	1	8.4	8.8	9.6	10.5
R0080N120S04	0.8	1.6	1.28	12	1.54	4.1°	50	4	2	●	1	12.6	13.1	14.4	15.9
R0080N160S04	0.8	1.6	1.28	16	1.54	3.3°	60	4	2	●	1	16.8	17.5	19.1	21.2
R0080N200S04	0.8	1.6	1.28	20	1.54	2.8°	60	4	2	●	1	21.0	21.9	23.9	*
R0090N080S04	0.9	1.8	1.44	8	1.74	5.1°	50	4	2	●	1	8.4	8.8	9.6	10.5
R0090N120S04	0.9	1.8	1.44	12	1.74	3.9°	50	4	2	●	1	12.6	13.1	14.3	15.8
R0090N160S04	0.9	1.8	1.44	16	1.74	3.1°	60	4	2	●	1	16.8	17.5	19.1	21.1
R0090N200S04	0.9	1.8	1.44	20	1.74	2.6°	60	4	2	●	1	20.9	21.8	23.9	*
R0100N060S04	1	2	1.6	6	1.9	5.8°	50	4	2	●	1	6.2	6.5	7.0	7.7
R0100N060S06	1	2	1.6	6	1.9	7.9°	50	6	2	●	1	6.2	6.5	7.0	7.7

* No interference

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF2XLBR0100N080S04	1	2	1.6	8	1.9	4.9°	50	4	2	●	1	8.3	8.7	9.4	10.4
R0100N080S06	1	2	1.6	8	1.9	6.9°	50	6	2	●	1	8.3	8.7	9.4	10.4
R0100N100S04	1	2	1.6	10	1.9	4.2°	50	4	2	●	1	10.4	10.9	11.8	13.0
R0100N100S06	1	2	1.6	10	1.9	6.2°	50	6	2	●	1	10.4	10.9	11.8	13.0
R0100N120S04	1	2	1.6	12	1.9	3.7°	50	4	2	●	1	12.5	13.0	14.2	15.7
R0100N120S06	1	2	1.6	12	1.9	5.6°	50	6	2	●	1	12.5	13.0	14.2	15.7
R0100N140S04	1	2	1.6	14	1.9	3.3°	50	4	2	●	1	14.6	15.2	16.6	18.3
R0100N140S06	1	2	1.6	14	1.9	5.1°	50	6	2	●	1	14.6	15.2	16.6	18.3
R0100N160S04	1	2	1.6	16	1.9	2.9°	60	4	2	●	1	16.7	17.4	19.0	*
R0100N160S06	1	2	1.6	16	1.9	4.7°	60	6	2	●	1	16.7	17.4	19.0	21.0
R0100N180S04	1	2	1.6	18	1.9	2.7°	60	4	2	●	1	18.8	19.6	21.4	*
R0100N180S06	1	2	1.6	18	1.9	4.4°	60	6	2	●	1	18.8	19.6	21.4	23.6
R0100N200S04	1	2	1.6	20	1.9	2.5°	60	4	2	●	1	20.9	21.8	23.8	*
R0100N200S06	1	2	1.6	20	1.9	4.1°	60	6	2	●	1	20.9	21.8	23.8	26.3
R0100N220S04	1	2	1.6	22	1.9	2.3°	60	4	2	●	1	22.9	23.9	26.2	*
R0100N250S04	1	2	1.6	25	1.9	2°	70	4	2	●	1	26.1	27.2	*	*
R0100N250S06	1	2	1.6	25	1.9	3.5°	70	6	2	●	1	26.1	27.2	29.8	32.9
R0100N300S04	1	2	1.6	30	1.9	1.7°	70	4	2	●	1	31.3	32.6	*	*
R0100N300S06	1	2	1.6	30	1.9	3°	80	6	2	●	1	31.3	32.6	35.8	*
R0100N350S04	1	2	1.6	35	1.9	1.5°	80	4	2	●	1	36.5	38.1	*	*
R0125N100S06	1.25	2.5	2	10	2.4	5.9°	60	6	2	●	1	10.4	10.8	11.8	12.9
R0125N150S06	1.25	2.5	2	15	2.4	4.6°	60	6	2	●	1	15.6	16.3	17.8	19.6
R0125N200S06	1.25	2.5	2	20	2.4	3.7°	70	6	2	●	1	20.8	21.7	23.8	26.2
R0125N250S06	1.25	2.5	2	25	2.4	3.2°	70	6	2	●	1	26.1	27.2	29.7	32.9
R0125N300S06	1.25	2.5	2	30	2.4	2.8°	80	6	2	●	1	31.3	32.6	35.7	*
R0125N350S06	1.25	2.5	2	35	2.4	2.4°	80	6	2	●	1	36.5	38.1	41.7	*
R0150N080S06	1.5	3	2.4	8	2.9	6.3°	60	6	2	●	1	8.3	8.6	9.3	10.2
R0150N100S06	1.5	3	2.4	10	2.9	5.5°	60	6	2	●	1	10.4	10.8	11.7	12.9
R0150N120S06	1.5	3	2.4	12	2.9	4.9°	60	6	2	●	1	12.5	13.0	14.1	15.5
R0150N140S06	1.5	3	2.4	14	2.9	4.4°	60	6	2	●	1	14.6	15.2	16.5	18.2
R0150N160S06	1.5	3	2.4	16	2.9	4°	60	6	2	●	1	16.7	17.3	18.9	20.8
R0150N200S06	1.5	3	2.4	20	2.9	3.4°	70	6	2	●	1	20.8	21.7	23.7	26.1
R0150N250S06	1.5	3	2.4	25	2.9	2.8°	70	6	2	●	1	26.1	27.2	29.7	*
R0150N300S06	1.5	3	2.4	30	2.9	2.5°	70	6	2	●	1	31.3	32.6	35.7	*
R0150N350S06	1.5	3	2.4	35	2.9	2.2°	80	6	2	●	1	36.5	38.0	41.7	*
R0150N400S06	1.5	3	2.4	40	2.9	1.9°	90	6	2	●	1	41.7	43.5	*	*
R0175N160S06	1.75	3.5	2.8	16	3.4	3.6°	60	6	2	●	1	16.7	17.3	18.9	20.8
R0175N200S06	1.75	3.5	2.8	20	3.4	3°	70	6	2	●	1	20.8	21.7	23.7	*
R0175N250S06	1.75	3.5	2.8	25	3.4	2.5°	70	6	2	●	1	26.0	27.1	29.6	*
R0175N300S06	1.75	3.5	2.8	30	3.4	2.1°	80	6	2	●	1	31.3	32.6	35.6	*
R0175N350S06	1.75	3.5	2.8	35	3.4	1.9°	80	6	2	●	1	36.5	38.0	*	*
R0175N400S06	1.75	3.5	2.8	40	3.4	1.7°	90	6	2	●	1	41.7	43.5	*	*
R0200N100S06	2	4	3.2	10	3.9	4.5°	70	6	2	●	1	10.4	10.8	11.6	12.7
R0200N120S06	2	4	3.2	12	3.9	3.9°	70	6	2	●	1	12.5	12.9	14.0	15.4
R0200N140S06	2	4	3.2	14	3.9	3.4°	70	6	2	●	1	14.6	15.1	16.4	18.0
R0200N160S06	2	4	3.2	16	3.9	3.1°	70	6	2	●	1	16.6	17.3	18.8	20.7
R0200N200S06	2	4	3.2	20	3.9	2.6°	70	6	2	●	1	20.8	21.7	23.6	*
R0200N250S06	2	4	3.2	25	3.9	2.1°	70	6	2	●	1	26.0	27.1	29.6	*
R0200N300S06	2	4	3.2	30	3.9	1.8°	70	6	2	●	1	31.2	32.6	*	*
R0200N350S06	2	4	3.2	35	3.9	1.6°	80	6	2	●	1	36.5	38.0	*	*
R0200N400S06	2	4	3.2	40	3.9	1.4°	90	6	2	●	1	41.7	43.5	*	*
R0200N450S06	2	4	3.2	45	3.9	1.2°	90	6	2	●	1	46.9	48.9	*	*

* No interference

CUTTING CONDITIONS ➤ J327

VF-2XLB

IMPACT MIRACLE, Ball nose, 2 flute, Long neck

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF2XLBR0200N500S06	2	4	3.2	50	3.9	1.1°	100	6	2	●	1	52.1	54.3	*	*
R0250N200S06	2.5	5	4	20	4.9	1.5°	70	6	2	●	1	20.8	21.6	*	*
R0250N250S06	2.5	5	4	25	4.9	1.2°	70	6	2	●	1	26.0	27.1	*	*
R0250N300S06	2.5	5	4	30	4.9	1°	80	6	2	●	1	31.2	*	*	*
R0250N350S06	2.5	5	4	35	4.9	0.9°	80	6	2	●	1	36.4	*	*	*
R0300N300S06	3	6	4.8	30	5.85	—	80	6	2	●	2	*	*	*	*
R0300N400S06	3	6	4.8	40	5.85	—	90	6	2	●	2	*	*	*	*
R0300N500S06	3	6	4.8	50	5.85	—	100	6	2	●	2	*	*	*	*

* No interference

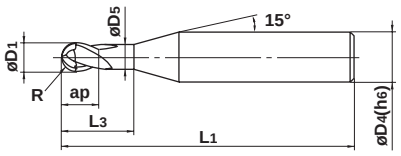
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J327

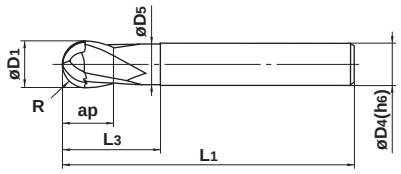
VC-2ESB

Ball nose, Extra short cut length, 2 flute, Short 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	Aluminium Alloy
○	◎	◎	○	○	○		



Type2



Type2

R				
0.15≤R≤6				
±0.01				
0.3≤D1≤12				
0 - 0.020				
h6	4≤D4≤6	8≤D4≤10	D4=12	
	0 - 0.008	0 - 0.009	0 - 0.011	

- 2 flute ball nose end mill for high rigidity.

Unit : mm

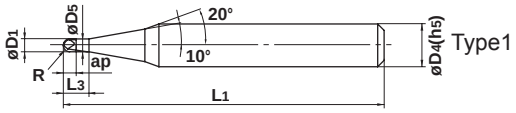
Order Number	Order Number R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2ESBR0015N006	0.15	0.3	0.3	0.6	0.27	30	4	2	●	1
R0020N008	0.2	0.4	0.4	0.8	0.36	30	4	2	●	1
R0030N012	0.3	0.6	0.6	1.2	0.56	30	4	2	●	1
R0040N016	0.4	0.8	0.8	1.6	0.76	30	4	2	●	1
R0050	0.5	1	1	—	—	30	4	2	●	1
R0050N025	0.5	1	1	2.5	0.94	30	4	2	●	1
R0075	0.75	1.5	1.5	—	—	30	4	2	●	1
R0075N040	0.75	1.5	1.5	4	1.44	30	4	2	●	1
R0100	1	2	2	—	—	40	6	2	●	1
R0100N060	1	2	2	6	1.9	40	6	2	●	1
R0150	1.5	3	3	—	—	40	6	2	●	1
R0150N080	1.5	3	3	8	2.9	40	6	2	●	1
R0200	2	4	4	—	—	40	6	2	●	1
R0200N080	2	4	4	8	3.9	40	6	2	●	1
R0250	2.5	5	5	—	—	40	6	2	●	1
R0250N120	2.5	5	5	12	4.9	40	6	2	●	1
R0300	3	6	6	—	—	40	6	2	●	2
R0300N130	3	6	6	13	5.85	40	6	2	●	2
R0350	3.5	7	7	—	—	50	8	2	●	1
R0400	4	8	8	—	—	50	8	2	●	2
R0500	5	10	10	—	—	60	10	2	●	2
R0600	6	12	12	—	—	65	12	2	●	2

VC-2PSB MIRACLE NOVA

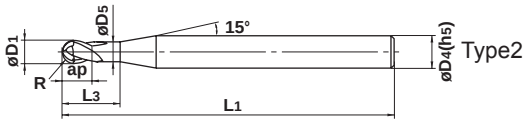
Ball nose end mill, Short cut length, 2 flute, High precision

UWC VC 0° R<0.5 30° R≥0.5 R<0.5 R≥0.5

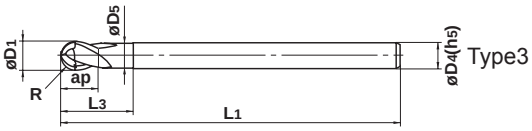
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	◎		○	○		



Type1



Type2



Type3

R				
0.5≤R≤6				
±0.005				
0.1≤D1≤12				
0 - 0.01				
h5	D4=6	8≤D4≤10	D4=12	
	0 - 0.005	0 - 0.006	0 - 0.008	

2 flute ball nose end mill with high precision radial tolerance ±0.005mm.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2PSBR0005	0.05	0.1	0.2	—	—	50	6	2	●	1
R0010	0.1	0.2	0.2	0.5	0.17	50	6	2	●	1
R0015	0.15	0.3	0.3	0.8	0.27	50	6	2	●	1
R0020	0.2	0.4	0.4	1	0.36	50	6	2	●	1
R0025	0.25	0.5	0.5	1.3	0.46	50	6	2	●	1
R0030	0.3	0.6	0.6	1.5	0.56	50	6	2	●	1
R0035	0.35	0.7	0.7	1.8	0.66	50	6	2	●	1
R0040	0.4	0.8	0.8	2	0.76	50	6	2	●	1
R0045	0.45	0.9	0.9	2.3	0.86	50	6	2	●	1
R0050	0.5	1	1.5	2.5	0.94	50	6	2	●	2
R0060	0.6	1.2	1.8	3	1.14	50	6	2	●	2
R0070	0.7	1.4	2.1	3.5	1.34	50	6	2	●	2
R0075	0.75	1.5	2.3	3.8	1.44	50	6	2	●	2
R0080	0.8	1.6	2.4	4	1.54	50	6	2	●	2
R0090	0.9	1.8	2.7	4.5	1.74	50	6	2	●	2
R0100	1	2	3	5	1.90	50	6	2	●	2
R0150	1.5	3	4.5	7.5	2.90	70	6	2	●	2
R0200	2	4	6	10	3.90	70	6	2	●	2
R0250	2.5	5	7.5	12.5	4.90	80	6	2	●	2
R0300	3	6	9	15	5.85	80	6	2	●	3
R0400	4	8	12	20	7.85	90	8	2	●	3
R0500	5	10	15	25	9.70	100	10	2	●	3
R0600	6	12	18	30	11.70	110	12	2	●	3

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

CUTTING CONDITIONS ➤ J358

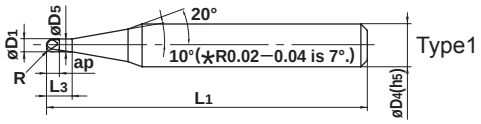
VC-2PSB-P MIRACLE NOVA

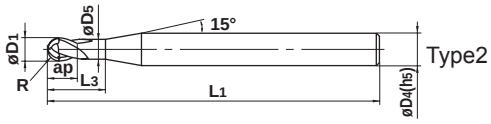
Ball nose end mill, Short cut length, 2 flute, Ultra high precision

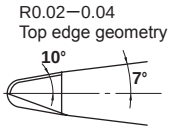
UWC VC 0° R<0.5 30° R≥0.5 R<0.5 R≥0.5

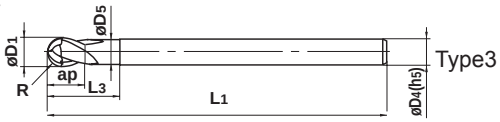
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	◎		○	○		

Inspection reports regarding the R accuracy of the VC-2PSB-P are supplied with the tool.









R					
0.02≤R≤6					
±0.002					
0.1≤D1≤12					
0 - 0.01					
h5	D4=6	8≤D4≤10	D4=12		
	0 - 0.005	0 - 0.006	0 - 0.008		

2 flute ball nose end mill with ultra high precision radial tolerance ±0.002mm.

Unit : mm

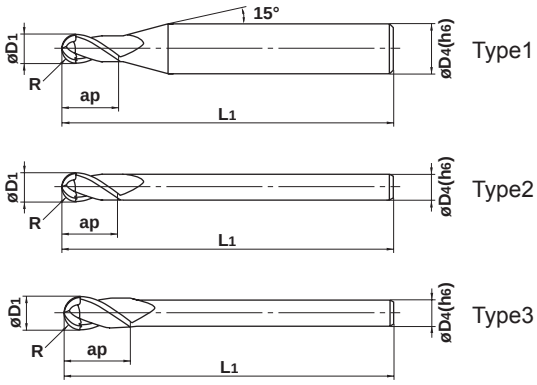
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2PSBPR0002	0.02	—	0.06	—	—	50	6	2	□	1
R0003	0.03	—	0.09	—	—	50	6	2	□	1
R0004	0.04	—	0.12	—	—	50	6	2	□	1
R0005	0.05	0.1	0.2	—	—	50	6	2	●	1
R0010	0.1	0.2	0.2	0.5	0.17	50	6	2	●	1
R0015	0.15	0.3	0.3	0.8	0.27	50	6	2	●	1
R0020	0.2	0.4	0.4	1	0.36	50	6	2	●	1
R0025	0.25	0.5	0.5	1.3	0.46	50	6	2	●	1
R0030	0.3	0.6	0.6	1.5	0.56	50	6	2	●	1
R0035	0.35	0.7	0.7	1.8	0.66	50	6	2	●	1
R0040	0.4	0.8	0.8	2	0.76	50	6	2	●	1
R0045	0.45	0.9	0.9	2.3	0.86	50	6	2	●	1
R0050	0.5	1	1.5	2.5	0.94	50	6	2	●	2
R0060	0.6	1.2	1.8	3	1.14	50	6	2	●	2
R0070	0.7	1.4	2.1	3.5	1.34	50	6	2	●	2
R0075	0.75	1.5	2.3	3.8	1.44	50	6	2	●	2
R0080	0.8	1.6	2.4	4	1.54	50	6	2	●	2
R0090	0.9	1.8	2.7	4.5	1.74	50	6	2	●	2
R0100	1	2	3	5	1.9	50	6	2	●	2
R0150	1.5	3	4.5	7.5	2.9	70	6	2	●	2
R0200	2	4	6	10	3.9	70	6	2	●	2
R0250	2.5	5	7.5	12.5	4.9	80	6	2	●	2
R0300	3	6	9	15	5.85	80	6	2	●	3
R0400	4	8	12	20	7.85	90	8	2	●	3
R0500	5	10	15	25	9.7	100	10	2	●	3
R0600	6	12	18	30	11.7	110	12	2	●	3

ULTRA HIGH PRECISION [±0.002mm]

VC-2MB

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	Aluminium Alloy
○	◎	◎	○	○	○		



R	R≤6.5	R>6.5			
	±0.01	±0.02			
	D1≤12	D1>12			
	0 - 0.020	0 - 0.030			
h6	D4=3	4≤D4≤6	8≤D4≤10	12≤D4≤16	20≤D4≤25
	0 - 0.006	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

● 2 flute end mill for general use.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2MBR0020	0.2	0.4	0.8	38	3	2	●	1
R0025	0.25	0.5	1	38	3	2	●	1
R0030	0.3	0.6	1.2	38	3	2	●	1
R0040	0.4	0.8	1.6	38	3	2	●	1
R0050	0.5	1	2.5	40	4	2	●	1
R0060	0.6	1.2	3	40	4	2	●	1
R0070	0.7	1.4	3	40	4	2	●	1
R0075	0.75	1.5	4	40	4	2	●	1
R0080	0.8	1.6	4	40	4	2	●	1
R0090	0.9	1.8	5	40	4	2	●	1
R0100	1	2	6	60	6	2	●	1
R0150	1.5	3	8	70	6	2	●	1
R0200	2	4	8	70	6	2	●	1
R0250	2.5	5	12	80	6	2	●	1
R0300	3	6	12	80	6	2	●	2
R0350	3.5	7	14	90	8	2	●	1
R0400	4	8	14	90	8	2	●	2
R0450	4.5	9	18	100	10	2	●	1
R0500	5	10	18	100	10	2	●	2
R0600	6	12	22	110	12	2	●	2
R0700	7	14	26	120	12	2	●	3
R0750	7.5	15	30	140	16	2	●	1
R0800	8	16	30	140	16	2	●	2
R0900	9	18	34	140	16	2	●	3
R1000	10	20	38	160	20	2	●	2
R1250	12.5	25	55	180	25	2	●	2

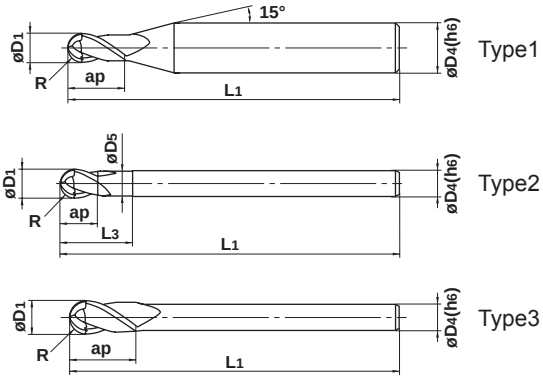
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J357

VC-2MDB

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

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	Aluminium Alloy
○	◎	◎	○	○	○		



R					
R≤6.5	R>6.5				
±0.01	±0.02				
D1≤12	D1>12				
0 - 0.020	0 - 0.030				
D4=3	4≤D4≤6	8≤D4≤10	12≤D4≤16	20≤D4≤25	
0 - 0.006	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

● 2 flute ball nose end mill with high edge strength resistant to chipping.

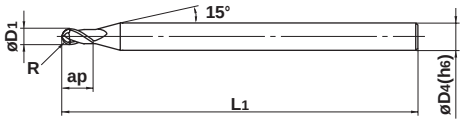
Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2MDBR0150S03	1.5	3	8	14	2.9	70	3	2	●	2
R0150	1.5	3	8	—	—	70	6	2	●	1
R0200S04	2	4	8	14	3.9	70	4	2	●	2
R0200	2	4	8	—	—	70	6	2	●	1
R0250	2.5	5	12	—	—	80	6	2	●	1
R0300	3	6	12	22	5.85	80	6	2	●	2
R0350	3.5	7	14	—	—	90	8	2	●	1
R0400	4	8	14	27	7.85	90	8	2	●	2
R0500	5	10	18	31	9.7	100	10	2	●	2
R0600	6	12	22	35	11.7	110	12	2	●	2
R0700	7	14	26	—	—	120	12	2	●	3
R0800	8	16	30	50	15.5	140	16	2	●	2
R0900	9	18	34	—	—	140	16	2	●	3
R1000	10	20	38	58	19.5	160	20	2	●	2
R1250	12.5	25	55	75	24.5	180	25	2	●	2

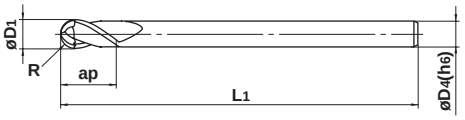
VC-2LB

Ball nose end mill, Medium cut length, 2 flute, 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	Aluminium Alloy
○	◎	◎	○	○	○		



Type1



Type2

R≤6	R≥8			
±0.01	±0.02			
D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=3	4≤D4≤6	8≤D4≤10	12≤D4≤16	20≤D4≤25
0 - 0.006	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

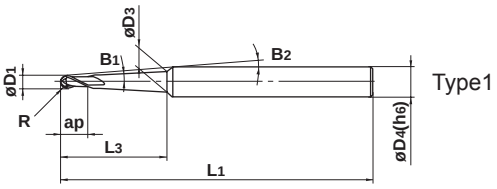
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2LBR0800	8	16	30	200	16	2	●	2
R1000	10	20	38	200	20	2	●	2
R1250	12.5	25	55	220	25	2	●	2

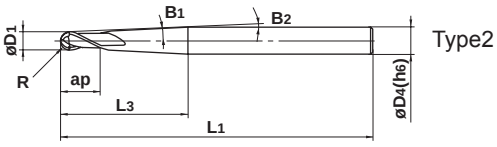
● : Inventory maintained in Japan.

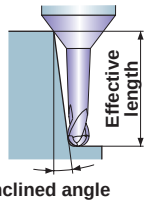
VC-XB

Ball nose taper end mill, Medium cut length, 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	Aluminium Alloy
○	◎	◎	○	○	○		







R					
0.5≤R≤6					
±0.01					
1≤D1≤12					
0 - 0.020					
h6	D4=6	8≤D4≤10	12≤D4≤16		
	0 - 0.008	0 - 0.009	0 - 0.011		

● 2 flute taper end mill with taper neck.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Cutting Edge to Shank Angle B2	Neck Dia. D3	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCXBR0050T0100L016	0.5	1	1°	2	16	6.6°	1.38	50	6	2	●	1	16.2	17	18
R0050T0100L021	0.5	1	1°	2	21	5.4°	1.56	60	6	2	●	1	21.2	22.3	23.5
R0050T0100L026	0.5	1	1°	2	26	4.6°	1.73	70	6	2	●	1	26.2	27.6	29.1
R0050T0130	0.5	1	1°30'	2	23	5.1°	1.97	60	6	2	●	1	—	23.9	25.2
R0050T0300	0.5	1	3°	2	42	3.4°	5.08	80	6	2	●	1	—	—	42.4
R0050T0500	0.5	1	5°	2	23	5.8°	4.46	60	6	2	●	1	—	—	—
R0100T0100L021	1	2	1°	4	21	4.6°	2.43	50	6	2	●	1	21.3	22.4	23.6
R0100T0100L031	1	2	1°	4	31	3.4°	2.78	60	6	2	●	1	31.3	33	34.8
R0100T0100L041	1	2	1°	4	41	2.7°	3.13	70	6	2	●	1	41.3	43.5	*
R0100T0130	1	2	1°30'	4	23	4.4°	2.8	60	6	2	●	1	—	24.1	25.4
R0100T0300	1	2	3°	4	41	2.9°	5.71	80	6	2	●	1	—	—	*
R0100T0500	1	2	5°	4	23	4.9°	5.02	60	6	2	●	1	—	—	—
R0150T0100L031	1.5	3	1°	6	31	2.7°	3.71	60	6	2	●	1	31.4	33	*
R0150T0100L041	1.5	3	1°	6	41	2.1°	4.06	70	6	2	●	1	41.4	43.5	*
R0150T0100L051	1.5	3	1°	6	51	1.7°	4.41	80	6	2	●	1	51.4	*	*
R0150T0130	1.5	3	1°30'	6	52	1.7°	5.21	90	6	2	●	1	—	*	*
R0150T0300	1.5	3	3°	6	32	2.8°	5.56	70	6	2	●	1	—	—	*
R0200T0100L036	2	4	1°	8	36	1.7°	4.81	70	6	2	●	1	36.5	*	*
R0200T0100L046	2	4	1°	8	46	1.3°	5.16	80	6	2	●	1	46.5	*	*
R0200T0100L060	2	4	1°	8	60	1°	5.65	90	6	2	●	1	60.5	*	*
R0200T0130	2	4	1°30'	8	49	1.3°	5.95	90	6	2	●	1	—	*	*
R0200T0300	2	4	3°	8	28	2.2°	—	70	6	2	●	2	—	—	*
R0250T0100L036	2.5	5	1°	10	36	0.9°	5.71	80	6	2	●	1	*	*	*
R0250T0100L065	2.5	5	1°	10	65	1.4°	6.72	110	8	2	●	1	65.6	*	*
R0250T0130	2.5	5	1°30'	10	61	1.5°	7.42	110	8	2	●	1	—	*	*
R0250T0300	2.5	5	3°	10	41	2.3°	—	90	8	2	●	2	—	—	*
R0300T0100L051	3	6	1°	12	51	1.2°	7.11	90	8	2	●	1	51.8	*	*
R0300T0100L065	3	6	1°	12	65	1°	7.6	110	8	2	●	1	65.8	*	*
R0300T0100L092	3	6	1°	12	92	1.3°	8.54	140	10	2	●	1	92.8	*	*
R0300T0130	3	6	1°30'	12	53	1.2°	7.85	110	8	2	●	1	—	*	*
R0300T0300	3	6	3°	12	34	1.9°	—	90	8	2	●	2	—	—	*
R0400T0100L068	4	8	1°	14	68	0.9°	9.64	110	10	2	●	1	*	*	*
R0400T0100L092	4	8	1°	14	92	1.3°	10.47	140	12	2	●	1	92.8	*	*
R0400T0130	4	8	1°30'	14	55	1.2°	9.85	120	10	2	●	1	—	*	*

* No interference

CUTTING CONDITIONS ➤ J359

VC-XB

Ball nose taper end mill, Medium cut length, Taper neck

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D_1	Taper Angle One Side B_1	Length of Cut ap	Neck Length L_3	Cutting Edge to Shank Angle B_2	Neck Dia. D_3	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCXBR0400T0300	4	8	3°	14	36	1.8°	—	100	10	2	●	2	—	—	⁎
R0500T0100L070	5	10	1°	18	70	0.9°	11.76	130	12	2	●	1	⁎	⁎	⁎
R0500T0100L100	5	10	1°	18	100	1.8°	12.8	160	16	2	●	1	100.7	⁎	⁎
R0500T0130	5	10	1°30'	18	59	1.1°	—	130	12	2	●	2	—	⁎	⁎
R0500T0300	5	10	3°	18	40	1.7°	—	110	12	2	●	2	—	—	⁎
R0600T0100L070	6	12	1°	22	70	1.8°	13.62	140	16	2	●	1	70.9	⁎	⁎
R0600T0100L100	6	12	1°	22	100	1.2°	14.66	160	16	2	●	1	100.9	⁎	⁎
R0600T0130	6	12	1°30'	22	83	1.5°	15.08	160	16	2	●	1	—	⁎	⁎
R0600T0300	6	12	3°	22	63	2.1°	—	140	16	2	●	2	—	—	⁎

⁎ No interference

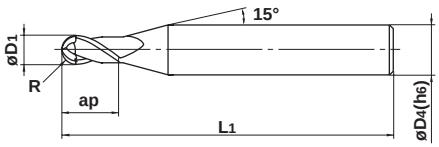
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J359

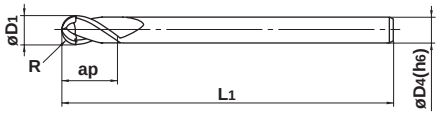
CRN-2MB

Ball nose, Medium cut length, 2 flute, For copper electrodes

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	Aluminium Alloy
						◎	○



Type1



Type2

R

0.2≤R≤6				
±0.01				

h6

0.4≤D1≤12				
0 - 0.02				
D4=3	4≤D4≤6	8≤D4≤10	D4=12	
0 - 0.006	0 - 0.008	0 - 0.009	0 - 0.011	

● 2 flute ball nose end mill with CRN coating for copper electrode machining.

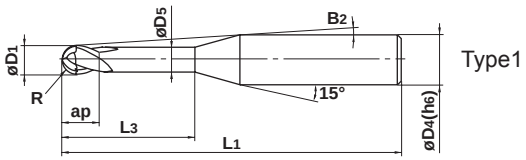
Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CRN2MBR0020S04	0.2	0.4	0.8	45	4	2	●	1
R0020S06	0.2	0.4	0.8	50	6	2	●	1
R0030S04	0.3	0.6	1.2	45	4	2	●	1
R0030S06	0.3	0.6	1.2	50	6	2	●	1
R0040S04	0.4	0.8	1.6	45	4	2	●	1
R0040S06	0.4	0.8	1.6	50	6	2	●	1
R0050S04	0.5	1	2.5	45	4	2	●	1
R0050S06	0.5	1	2.5	50	6	2	●	1
R0075S04	0.75	1.5	4	45	4	2	●	1
R0075S06	0.75	1.5	4	50	6	2	●	1
R0100S06	1	2	6	50	6	2	●	1
R0125S06	1.25	2.5	6	50	6	2	●	1
R0150S03	1.5	3	8	70	3	2	●	2
R0150S06	1.5	3	8	70	6	2	●	1
R0175S06	1.75	3.5	8	70	6	2	●	1
R0200S04	2	4	8	70	4	2	●	2
R0200S06	2	4	8	70	6	2	●	1
R0250S06	2.5	5	12	80	6	2	●	1
R0300S06	3	6	12	80	6	2	●	2
R0400S08	4	8	14	90	8	2	●	2
R0500S10	5	10	18	100	10	2	●	2
R0600S12	6	12	22	110	12	2	●	2

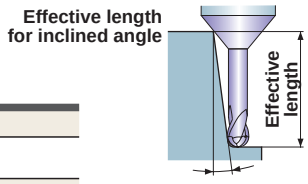
CRN-2XLB

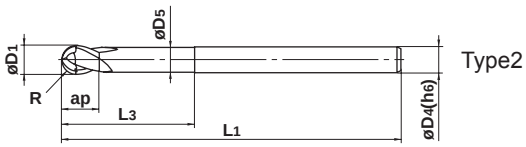
Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes

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	Aluminium Alloy
						◎	○



Type1





Type2

R	
0.1≤R≤3	±0.01
0.2≤D1≤6	0 - 0.02
4≤D4≤6	0 - 0.008

● 2 flute long neck ball nose end mill with CRN coating for copper electrode machining.

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Length of Cut	Neck Length	Neck Dia.	Cutting Edge to Shank Angle	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle			
	R	D1	ap	L3	D5	B2	L1	D4	N			30'	1°	2°	3°
CRN2XLBR0010N005S04	0.1	0.2	0.2	0.5	0.17	14.1°	50	4	2	●	1	0.5	0.5	0.6	0.6
R0010N005S06	0.1	0.2	0.2	0.5	0.17	14.4°	50	6	2	●	1	0.5	0.5	0.6	0.6
R0010N010S04	0.1	0.2	0.2	1	0.17	13.3°	50	4	2	●	1	1	1.1	1.2	1.3
R0010N010S06	0.1	0.2	0.2	1	0.17	13.8°	50	6	2	●	1	1	1.1	1.2	1.3
R0010N015S04	0.1	0.2	0.2	1.5	0.17	12.5°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0010N015S06	0.1	0.2	0.2	1.5	0.17	13.3°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0015N010S04	0.15	0.3	0.3	1	0.27	13.3°	50	4	2	●	1	1	1.1	1.2	1.3
R0015N010S06	0.15	0.3	0.3	1	0.27	13.9°	50	6	2	●	1	1	1.1	1.2	1.3
R0015N015S04	0.15	0.3	0.3	1.5	0.27	12.5°	50	4	2	●	1	1.5	1.6	1.7	1.9
R0015N015S06	0.15	0.3	0.3	1.5	0.27	13.3°	50	6	2	●	1	1.5	1.6	1.7	1.9
R0015N020S04	0.15	0.3	0.3	2	0.27	11.9°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0015N020S06	0.15	0.3	0.3	2	0.27	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0020N010S04	0.2	0.4	0.4	1	0.36	13.4°	50	4	2	●	1	1	1	1.1	1.2
R0020N010S06	0.2	0.4	0.4	1	0.36	13.9°	50	6	2	●	1	1	1	1.1	1.2
R0020N015S04	0.2	0.4	0.4	1.5	0.36	12.6°	50	4	2	●	1	1.5	1.6	1.7	1.8
R0020N015S06	0.2	0.4	0.4	1.5	0.36	13.4°	50	6	2	●	1	1.5	1.6	1.7	1.8
R0020N020S04	0.2	0.4	0.4	2	0.36	11.9°	50	4	2	●	1	2	2.1	2.3	2.5
R0020N020S06	0.2	0.4	0.4	2	0.36	12.8°	50	6	2	●	1	2	2.1	2.3	2.5
R0020N030S04	0.2	0.4	0.4	3	0.36	10.7°	50	4	2	●	1	3.1	3.2	3.4	3.7
R0020N030S06	0.2	0.4	0.4	3	0.36	11.9°	50	6	2	●	1	3.1	3.2	3.4	3.7
R0025N015S04	0.25	0.5	0.5	1.5	0.46	12.6°	50	4	2	●	1	1.5	1.6	1.7	1.8
R0025N015S06	0.25	0.5	0.5	1.5	0.46	13.4°	50	6	2	●	1	1.5	1.6	1.7	1.8
R0025N020S04	0.25	0.5	0.5	2	0.46	11.9°	50	4	2	●	1	2	2.1	2.3	2.4
R0025N020S06	0.25	0.5	0.5	2	0.46	12.9°	50	6	2	●	1	2	2.1	2.3	2.4
R0025N030S04	0.25	0.5	0.5	3	0.46	10.6°	50	4	2	●	1	3.1	3.2	3.4	3.7
R0025N030S06	0.25	0.5	0.5	3	0.46	11.9°	50	6	2	●	1	3.1	3.2	3.4	3.7
R0025N040S04	0.25	0.5	0.5	4	0.46	9.6°	50	4	2	●	1	4.1	4.3	4.6	4.9
R0025N040S06	0.25	0.5	0.5	4	0.46	11.1°	50	6	2	●	1	4.1	4.3	4.6	4.9
R0025N060S04	0.25	0.5	0.5	6	0.46	8.1°	50	4	2	●	1	6.2	6.4	6.9	7.4
R0025N060S06	0.25	0.5	0.5	6	0.46	9.7°	50	6	2	●	1	6.2	6.4	6.9	7.4
R0025N080S04	0.25	0.5	0.5	8	0.46	7°	50	4	2	●	1	8.3	8.5	9.2	9.9
R0025N080S06	0.25	0.5	0.5	8	0.46	8.7°	50	6	2	●	1	8.3	8.5	9.2	9.9
R0025N100S04	0.25	0.5	0.5	10	0.46	6.2°	50	4	2	●	1	10.3	10.7	11.5	12.4
R0025N100S06	0.25	0.5	0.5	10	0.46	7.8°	50	6	2	●	1	10.3	10.7	11.5	12.4

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CRN2XLBR0030N020S04	0.3	0.6	0.6	2	0.56	11.8°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0030N020S06	0.3	0.6	0.6	2	0.56	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0030N040S04	0.3	0.6	0.6	4	0.56	9.5°	50	4	2	●	1	4.2	4.3	4.6	5
R0030N040S06	0.3	0.6	0.6	4	0.56	11°	50	6	2	●	1	4.2	4.3	4.6	5
R0030N060S04	0.3	0.6	0.6	6	0.56	8°	50	4	2	●	1	6.3	6.5	6.9	7.5
R0030N060S06	0.3	0.6	0.6	6	0.56	9.7°	50	6	2	●	1	6.3	6.5	6.9	7.5
R0030N080S04	0.3	0.6	0.6	8	0.56	6.9°	50	4	2	●	1	8.3	8.6	9.2	10
R0030N080S06	0.3	0.6	0.6	8	0.56	8.6°	50	6	2	●	1	8.3	8.6	9.2	10
R0030N100S04	0.3	0.6	0.6	10	0.56	6°	50	4	2	●	1	10.4	10.8	11.5	12.5
R0030N100S06	0.3	0.6	0.6	10	0.56	7.8°	50	6	2	●	1	10.4	10.8	11.5	12.5
R0040N020S04	0.4	0.8	0.8	2	0.76	11.7°	50	4	2	●	1	2.1	2.2	2.3	2.5
R0040N020S06	0.4	0.8	0.8	2	0.76	12.8°	50	6	2	●	1	2.1	2.2	2.3	2.5
R0040N040S04	0.4	0.8	0.8	4	0.76	9.4°	50	4	2	●	1	4.2	4.3	4.6	5
R0040N040S06	0.4	0.8	0.8	4	0.76	11°	50	6	2	●	1	4.2	4.3	4.6	5
R0040N060S04	0.4	0.8	0.8	6	0.76	7.8°	50	4	2	●	1	6.3	6.5	6.9	7.5
R0040N060S06	0.4	0.8	0.8	6	0.76	9.6°	50	6	2	●	1	6.3	6.5	6.9	7.5
R0040N080S04	0.4	0.8	0.8	8	0.76	6.7°	50	4	2	●	1	8.3	8.6	9.2	10
R0040N080S06	0.4	0.8	0.8	8	0.76	8.5°	50	6	2	●	1	8.3	8.6	9.2	10
R0040N100S04	0.4	0.8	0.8	10	0.76	5.9°	50	4	2	●	1	10.4	10.8	11.5	12.4
R0040N100S06	0.4	0.8	0.8	10	0.76	7.7°	50	6	2	●	1	10.4	10.8	11.5	12.4
R0050N030S04	0.5	1	1	3	0.94	10.1°	50	4	2	●	1	3.2	3.3	3.6	3.9
R0050N030S06	0.5	1	1	3	0.94	11.6°	50	6	2	●	1	3.2	3.3	3.6	3.9
R0050N040S04	0.5	1	1	4	0.94	9.1°	50	4	2	●	1	4.2	4.4	4.8	5.2
R0050N040S06	0.5	1	1	4	0.94	10.8°	50	6	2	●	1	4.2	4.4	4.8	5.2
R0050N050S04	0.5	1	1	5	0.94	8.2°	50	4	2	●	1	5.3	5.5	6	6.4
R0050N050S06	0.5	1	1	5	0.94	10.1°	50	6	2	●	1	5.3	5.5	6	6.4
R0050N060S04	0.5	1	1	6	0.94	7.5°	50	4	2	●	1	6.3	6.6	7.1	7.7
R0050N060S06	0.5	1	1	6	0.94	9.4°	50	6	2	●	1	6.3	6.6	7.1	7.7
R0050N070S04	0.5	1	1	7	0.94	6.9°	50	4	2	●	1	7.4	7.7	8.3	8.9
R0050N070S06	0.5	1	1	7	0.94	8.8°	50	6	2	●	1	7.4	7.7	8.3	8.9
R0050N080S04	0.5	1	1	8	0.94	6.4°	50	4	2	●	1	8.4	8.8	9.4	10.2
R0050N080S06	0.5	1	1	8	0.94	8.3°	50	6	2	●	1	8.4	8.8	9.4	10.2
R0050N100S04	0.5	1	1	10	0.94	5.6°	50	4	2	●	1	10.5	10.9	11.7	12.6
R0050N100S06	0.5	1	1	10	0.94	7.5°	50	6	2	●	1	10.5	10.9	11.7	12.6
R0050N120S04	0.5	1	1	12	0.94	5°	50	4	2	●	1	12.6	13.1	14	15.1
R0050N120S06	0.5	1	1	12	0.94	6.8°	50	6	2	●	1	12.6	13.1	14	15.1
R0050N140S04	0.5	1	1	14	0.94	4.5°	50	4	2	●	1	14.7	15.2	16.3	17.6
R0050N140S06	0.5	1	1	14	0.94	6.2°	55	6	2	●	1	14.7	15.2	16.3	17.6
R0050N160S04	0.5	1	1	16	0.94	4.1°	55	4	2	●	1	16.8	17.4	18.6	20.1
R0050N160S06	0.5	1	1	16	0.94	5.7°	55	6	2	●	1	16.8	17.4	18.6	20.1
R0050N180S04	0.5	1	1	18	0.94	3.7°	55	4	2	●	1	18.9	19.5	20.9	22.6
R0050N180S06	0.5	1	1	18	0.94	5.3°	60	6	2	●	1	18.9	19.5	20.9	22.6
R0050N200S04	0.5	1	1	20	0.94	3.4°	55	4	2	●	1	20.9	21.6	23.2	25.1
R0050N200S06	0.5	1	1	20	0.94	5°	60	6	2	●	1	20.9	21.6	23.2	25.1
R0075N080S04	0.75	1.5	1.5	8	1.44	5.9°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0075N080S06	0.75	1.5	1.5	8	1.44	8.1°	50	6	2	●	1	8.4	8.8	9.4	10.1
R0075N100S04	0.75	1.5	1.5	10	1.44	5.1°	50	4	2	●	1	10.5	10.9	11.7	12.6
R0075N100S06	0.75	1.5	1.5	10	1.44	7.2°	50	6	2	●	1	10.5	10.9	11.7	12.6
R0075N120S04	0.75	1.5	1.5	12	1.44	4.4°	50	4	2	●	1	12.6	13.1	14	15.1
R0075N120S06	0.75	1.5	1.5	12	1.44	6.5°	50	6	2	●	1	12.6	13.1	14	15.1
R0075N140S04	0.75	1.5	1.5	14	1.44	4°	50	4	2	●	1	14.7	15.2	16.3	17.6
R0075N140S06	0.75	1.5	1.5	14	1.44	5.9°	55	6	2	●	1	14.7	15.2	16.3	17.6

CUTTING CONDITIONS ➤ J374

CRN-2XLB

Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CRN2XLBR0075N160S04	0.75	1.5	1.5	16	1.44	3.6°	55	4	2	●	1	16.8	17.3	18.6	20
R0075N160S06	0.75	1.5	1.5	16	1.44	5.4°	55	6	2	●	1	16.8	17.3	18.6	20
R0075N180S04	0.75	1.5	1.5	18	1.44	3.3°	55	4	2	●	1	18.8	19.5	20.9	22.5
R0075N180S06	0.75	1.5	1.5	18	1.44	5°	60	6	2	●	1	18.8	19.5	20.9	22.5
R0075N200S04	0.75	1.5	1.5	20	1.44	3°	55	4	2	●	1	20.9	21.6	23.2	*
R0075N200S06	0.75	1.5	1.5	20	1.44	4.6°	60	6	2	●	1	20.9	21.6	23.2	25
R0100N080S04	1	2	2	8	1.90	5.3°	50	4	2	●	1	8.3	8.7	9.2	9.9
R0100N080S06	1	2	2	8	1.90	7.8°	50	6	2	●	1	8.3	8.7	9.2	9.9
R0100N100S04	1	2	2	10	1.90	4.5°	50	4	2	●	1	10.4	10.8	11.5	12.4
R0100N100S06	1	2	2	10	1.90	6.9°	50	6	2	●	1	10.4	10.8	11.5	12.4
R0100N120S04	1	2	2	12	1.90	3.9°	50	4	2	●	1	12.5	12.9	13.8	14.9
R0100N120S06	1	2	2	12	1.90	6.1°	50	6	2	●	1	12.5	12.9	13.8	14.9
R0100N140S04	1	2	2	14	1.90	3.4°	50	4	2	●	1	14.6	15.1	16.1	17.4
R0100N140S06	1	2	2	14	1.90	5.6°	55	6	2	●	1	14.6	15.1	16.1	17.4
R0100N160S04	1	2	2	16	1.90	3.1°	55	4	2	●	1	16.7	17.2	18.4	19.9
R0100N160S06	1	2	2	16	1.90	5.1°	55	6	2	●	1	16.7	17.2	18.4	19.9
R0100N200S04	1	2	2	20	1.90	2.5°	60	4	2	●	1	20.8	21.5	23	*
R0100N200S06	1	2	2	20	1.90	4.3°	60	6	2	●	1	20.8	21.5	23	24.8
R0100N250S06	1	2	2	25	1.90	3.7°	65	6	2	●	1	26	26.8	28.8	31
R0100N300S06	1	2	2	30	1.90	3.2°	70	6	2	●	1	31.1	32.2	34.5	37.3
R0150N160S06	1.5	3	3	16	2.90	4.3°	60	6	2	●	1	16.6	17.2	18.4	19.7
R0150N250S06	1.5	3	3	25	2.90	3°	70	6	2	●	1	26	26.8	28.7	*
R0150N350S06	1.5	3	3	35	2.90	2.2°	80	6	2	●	1	36.3	37.5	40.2	*
R0200N160S06	2	4	4	16	3.90	3.2°	70	6	2	●	1	16.6	17.1	18.3	19.6
R0200N200S06	2	4	4	20	3.90	2.7°	70	6	2	●	1	20.8	21.4	22.9	*
R0200N300S06	2	4	4	30	3.90	1.8°	70	6	2	●	1	31.1	32.1	*	*
R0200N400S06	2	4	4	40	3.90	1.4°	90	6	2	●	1	41.4	42.8	*	*
R0200N500S06	2	4	4	50	3.90	1.2°	100	6	2	●	1	51.8	53.5	*	*
R0250N200S06	2.5	5	5	20	4.90	1.5°	70	6	2	●	1	20.7	21.4	*	*
R0250N300S06	2.5	5	5	30	4.90	1°	80	6	2	●	1	31.1	*	*	*
R0300N300S06	3	6	6	30	5.85	—	80	6	2	●	1	*	*	*	*
R0300N500S06	3	6	6	50	5.85	—	100	6	2	●	1	*	*	*	*

* No interference

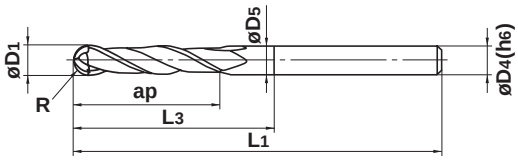
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J374

DF-2MB

Ball nose, Medium cut length, 2 flute, For graphite

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○



Type1

R					
	3≤R≤6				
	±0.01				
h6	D4=6	8≤D4≤10	D4=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	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DF2MBR0300A100	3	6	30	50	5.85	100	6	2	●	1
R0300A150	3	6	30	50	5.85	150	6	2	●	1
R0400A110	4	8	40	60	7.85	110	8	2	●	1
R0400A150	4	8	40	60	7.85	150	8	2	●	1
R0500A120	5	10	50	70	9.7	120	10	2	●	1
R0500A180	5	10	50	70	9.7	180	10	2	●	1
R0600A130	6	12	55	75	11.7	130	12	2	●	1
R0600A200	6	12	55	75	11.7	200	12	2	●	1

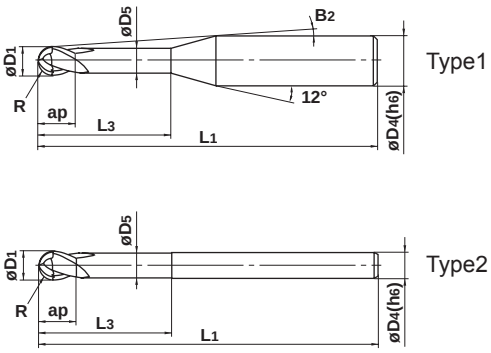
(Effective Coating Length : 1-1.5D1)

DF-2XLB

Ball nose, Medium cut length, 2 flute, Long neck, For graphite

UWC DF 30°

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○



R	0.2≤R≤2				
	±0.01				
h6	D4=4				
	0 -0.008				

2 flute long neck ball nose end mill with Mitsubishi's unique diamond coating for graphite machining.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
DF2XLBR0020N010	0.2	0.4	0.6	1	0.36	11°	50	4	2	●	1	1	1	1.1	1.2
R0020N020	0.2	0.4	0.6	2	0.36	10°	50	4	2	●	1	2	2.1	2.3	2.6
R0020N030	0.2	0.4	0.6	3	0.36	9.1°	50	4	2	●	1	3.1	3.2	3.5	3.9
R0020N040	0.2	0.4	0.6	4	0.36	8.4°	60	4	2	●	1	4.1	4.3	4.7	5.2
R0020N080	0.2	0.4	0.6	8	0.36	6.4°	60	4	2	●	1	8.3	8.7	9.5	10.5
R0020N120	0.2	0.4	0.6	12	0.36	5.1°	60	4	2	●	1	12.5	13	14.3	15.8
R0025N040	0.25	0.5	0.6	4	0.46	8.3°	60	4	2	●	1	4.1	4.3	4.7	5.2
R0030N020	0.3	0.6	0.9	2	0.56	9.9°	60	4	2	●	1	2.1	2.2	2.4	2.6
R0030N040	0.3	0.6	0.9	4	0.56	8.3°	60	4	2	●	1	4.2	4.4	4.8	5.2
R0030N060	0.3	0.6	0.9	6	0.56	7.1°	60	4	2	●	1	6.3	6.5	7.1	7.9
R0030N100	0.3	0.6	0.9	10	0.56	5.5°	60	4	2	●	1	10.4	10.9	11.9	13.2
R0030N160	0.3	0.6	0.9	16	0.56	4.1°	60	4	2	●	1	16.7	17.4	19.1	21.2
R0040N060	0.4	0.8	1.2	6	0.76	7°	60	4	2	●	1	6.3	6.5	7.1	7.9
R0040N080	0.4	0.8	1.2	8	0.76	6.1°	60	4	2	●	1	8.3	8.7	9.5	10.5
R0050N040	0.5	1	1.5	4	0.94	8°	60	4	2	●	1	4.2	4.4	4.8	5.3
R0050N060	0.5	1	1.5	6	0.94	6.8°	60	4	2	●	1	6.3	6.6	7.2	8
R0050N080	0.5	1	1.5	8	0.94	5.9°	60	4	2	●	1	8.4	8.8	9.6	10.6
R0050N100	0.5	1	1.5	10	0.94	5.2°	60	4	2	●	1	10.5	11	12	13.3
R0050N120	0.5	1	1.5	12	0.94	4.6°	60	4	2	●	1	12.6	13.2	14.4	15.9
R0050N200	0.5	1	1.5	20	0.94	3.3°	80	4	2	●	1	21	21.9	24	26.6
R0050N300	0.5	1	1.5	30	0.94	2.4°	80	4	2	●	1	31.4	32.8	36	*
R0050N400	0.5	1	1.5	40	0.94	1.9°	80	4	2	●	1	41.8	43.7	*	*
R0075N080	0.75	1.5	2.3	8	1.44	5.4°	60	4	2	●	1	8.4	8.8	9.6	10.6
R0075N100	0.75	1.5	2.3	10	1.44	4.7°	60	4	2	●	1	10.5	11	12	13.2
R0075N160	0.75	1.5	2.3	16	1.44	3.4°	80	4	2	●	1	16.8	17.5	19.2	21.2
R0075N300	0.75	1.5	2.3	30	1.44	2.1°	80	4	2	●	1	31.4	32.8	35.9	*
R0100N080	1	2	3	8	1.9	4.9°	60	4	2	●	1	8.3	8.7	9.4	10.4
R0100N100	1	2	3	10	1.9	4.2°	60	4	2	●	1	10.4	10.9	11.8	13
R0100N120	1	2	3	12	1.9	3.7°	60	4	2	●	1	12.5	13	14.2	15.7
R0100N160	1	2	3	16	1.9	2.9°	80	4	2	●	1	16.7	17.4	19	*
R0100N200	1	2	3	20	1.9	2.5°	80	4	2	●	1	20.9	21.8	23.8	*
R0100N250	1	2	3	25	1.9	2°	80	4	2	●	1	26	27.2	*	*
R0100N400	1	2	3	40	1.9	1.4°	100	4	2	●	1	41.5	43.5	*	*
R0100N600	1	2	3	60	1.9	0.9°	100	4	2	●	1	62.6	*	*	*

* No interference

● : Inventory maintained in Japan.

Unit : mm

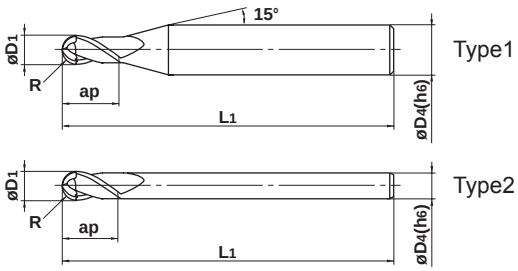
Order Number	Radius of Ball Nose R	Dia. D_1	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
DF2XLBR0150N160	1.5	3	4.5	16	2.9	1.7°	80	4	2	●	1	16.7	17.3	⋆	⋆
R0150N250	1.5	3	4.5	25	2.9	1.2°	80	4	2	●	1	26.1	27.2	⋆	⋆
R0150N400	1.5	3	4.5	40	2.9	0.7°	100	4	2	●	1	41.7	⋆	⋆	⋆
R0150N600	1.5	3	4.5	60	2.9	0.5°	100	4	2	●	1	⋆	⋆	⋆	⋆
R0200N200	2	4	6	20	3.9	—	80	4	2	●	2	⋆	⋆	⋆	⋆
R0200N300	2	4	6	30	3.9	—	80	4	2	●	2	⋆	⋆	⋆	⋆
R0200N400	2	4	6	40	3.9	—	100	4	2	●	2	⋆	⋆	⋆	⋆
R0200N600	2	4	6	60	3.9	—	100	4	2	●	2	⋆	⋆	⋆	⋆

⋆ No interference

DLC-2MB

Ball nose, Medium cut length, 2 flute

Copper Alloy	Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○	



R	R≤6	R>6			
	±0.01	±0.02			
D1	D1≤12	D1>12			
	0 -0.020	0 -0.030			
h6	4≤D4≤6	8≤D4≤10	12≤D4≤16	D4=20	
	0 -0.008	0 -0.009	0 -0.011	0 -0.013	

2 flute ball nose end mill with new high welding resistance DLC coating, ideal for machining non-ferrous materials.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DLC2MBR0010	0.1	0.2	0.4	40	4	2	●	1
R0015	0.15	0.3	0.6	40	4	2	●	1
R0020	0.2	0.4	0.8	40	4	2	●	1
R0025	0.25	0.5	1	40	4	2	●	1
R0030	0.3	0.6	1.2	40	4	2	●	1
R0040	0.4	0.8	1.6	40	4	2	●	1
R0050	0.5	1	2.5	40	4	2	●	1
R0075	0.75	1.5	4	40	4	2	●	1
R0100	1	2	6	60	6	2	●	1
R0125	1.25	2.5	6	60	6	2	●	1
R0150	1.5	3	8	70	6	2	●	1
R0200	2	4	8	70	6	2	●	1
R0250	2.5	5	12	80	6	2	●	1
R0300	3	6	12	80	6	2	●	2
R0400	4	8	14	90	8	2	●	2
R0500	5	10	18	100	10	2	●	2
R0600	6	12	22	110	12	2	●	2
R0800	8	16	30	140	16	2	●	2
R1000	10	20	38	160	20	2	●	2

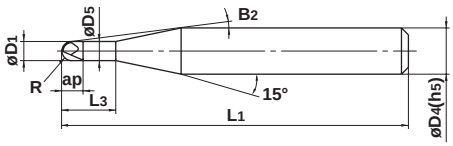
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J384

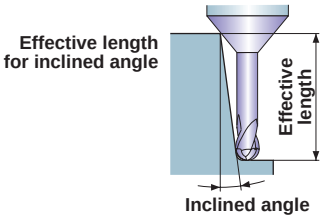
CBN-2XLB

Ball nose, 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	Aluminium Alloy
○	◎	◎	◎				



Type1



R	0.2 ≤R ≤1				
	±0.005				
h5	4 ≤D4 ≤6				
	0 - 0.005				

● Solid CBN ball nose. A wide variation of neck lengths available.

Unit : mm

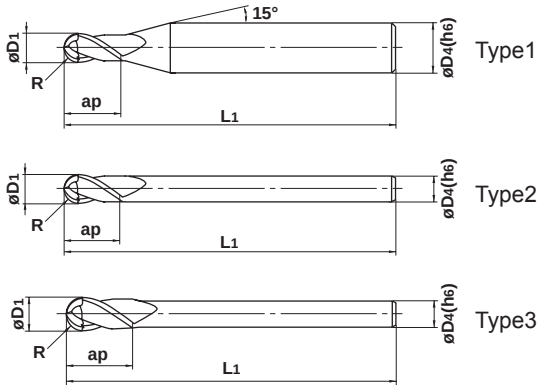
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CBN2XLBR0020N010S04	0.2	0.4	0.3	1	0.36	13.4°	51	4	2	●	1	1	1	1.1	1.2
R0020N010S06	0.2	0.4	0.3	1	0.36	13.9°	51	6	2	●	1	1	1	1.1	1.2
R0020N016S04	0.2	0.4	0.3	1.6	0.36	12.4°	51	4	2	●	1	1.6	1.7	1.8	2
R0020N016S06	0.2	0.4	0.3	1.6	0.36	13.3°	51	6	2	●	1	1.6	1.7	1.8	2
* R0030N009S06	0.3	0.6	0.4	0.9	0.56	14.1°	62	6	2	●	1	0.9	0.9	1	1.1
R0030N015S04	0.3	0.6	0.5	1.5	0.56	12.6°	51	4	2	●	1	1.5	1.6	1.7	1.8
R0030N015S06	0.3	0.6	0.5	1.5	0.56	13.4°	51	6	2	●	1	1.5	1.6	1.7	1.8
R0030N024S04	0.3	0.6	0.5	2.4	0.56	11.3°	51	4	2	●	1	2.5	2.6	2.7	2.9
R0030N024S06	0.3	0.6	0.5	2.4	0.56	12.5°	51	6	2	●	1	2.5	2.6	2.7	2.9
* R0040N010S06	0.4	0.8	0.5	1	0.76	14.1°	62	6	2	●	1	1	1	1.1	1.2
R0040N020S04	0.4	0.8	0.6	2	0.76	11.8°	51	4	2	●	1	2	2.1	2.3	2.4
R0040N020S06	0.4	0.8	0.6	2	0.76	12.9°	51	6	2	●	1	2	2.1	2.3	2.4
R0040N032S04	0.4	0.8	0.6	3.2	0.76	10.3°	51	4	2	●	1	3.3	3.4	3.6	3.9
R0040N032S06	0.4	0.8	0.6	3.2	0.76	11.7°	51	6	2	●	1	3.3	3.4	3.6	3.9
* R0050N011S06	0.5	1	0.6	1.1	0.94	14.1°	62	6	2	●	1	1.1	1.1	1.2	1.2
R0050N025S04	0.5	1	0.8	2.5	0.94	11°	51	4	2	●	1	2.6	2.7	2.8	3
R0050N025S06	0.5	1	0.8	2.5	0.94	12.3°	51	6	2	●	1	2.6	2.7	2.8	3
R0050N040S04	0.5	1	0.8	4	0.94	9.3°	51	4	2	●	1	4.1	4.3	4.6	4.9
R0050N040S06	0.5	1	0.8	4	0.94	11°	51	6	2	●	1	4.1	4.3	4.6	4.9
R0075N038S04	0.75	1.5	1.1	3.8	1.44	9.1°	52	4	2	●	1	3.9	4.1	4.3	4.6
R0075N038S06	0.75	1.5	1.1	3.8	1.44	11°	52	6	2	●	1	3.9	4.1	4.3	4.6
R0075N060S04	0.75	1.5	1.1	6	1.44	7.1°	52	4	2	●	1	6.2	6.4	6.8	7.3
R0075N060S06	0.75	1.5	1.1	6	1.44	9.3°	52	6	2	●	1	6.2	6.4	6.8	7.3
* R0100N017S06	1	2	1.2	1.7	1.9	13.6°	62	6	2	●	1	1.7	1.7	1.8	1.9
R0100N050S04	1	2	1.5	5	1.9	7.3°	52	4	2	●	1	5.1	5.3	5.6	6
R0100N050S06	1	2	1.5	5	1.9	9.8°	52	6	2	●	1	5.1	5.3	5.6	6
R0100N080S04	1	2	1.5	8	1.9	5.3°	52	4	2	●	1	8.2	8.5	9	9.7
R0100N080S06	1	2	1.5	8	1.9	7.9°	52	6	2	●	1	8.2	8.5	9	9.7

* Designed with short cutting edge and neck lengths for high rigidity.

C-2MB

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	Aluminium Alloy
◎	○			○	○	○	○



R	R ≤6.5	R>6.5			
	±0.01	±0.02			
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			
h6	4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

2 flute ultra micro-grain carbide end mill for contour milling of alloy and hardened steels.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2MBR0050	0.5	1	2.5	40	4	2	●	1
R0060	0.6	1.2	3	40	4	2	●	1
R0070	0.7	1.4	3	40	4	2	●	1
R0075	0.75	1.5	4	40	4	2	●	1
R0080	0.8	1.6	4	40	4	2	●	1
R0090	0.9	1.8	5	40	4	2	●	1
R0100	1	2	6	60	6	2	●	1
R0125	1.25	2.5	6	60	6	2	●	1
R0150	1.5	3	8	70	6	2	●	1
R0175	1.75	3.5	8	70	6	2	●	1
R0200	2	4	8	70	6	2	●	1
R0225	2.25	4.5	10	70	6	2	●	1
R0250	2.5	5	12	80	6	2	●	1
R0275	2.75	5.5	12	80	6	2	●	1
R0300	3	6	12	80	6	2	●	2
R0325	3.25	6.5	14	90	8	2	●	1
R0350	3.5	7	14	90	8	2	●	1
R0375	3.75	7.5	14	90	8	2	●	1
R0400	4	8	14	90	8	2	●	2
R0425	4.25	8.5	18	100	10	2	●	1
R0450	4.5	9	18	100	10	2	●	1
R0475	4.75	9.5	18	100	10	2	●	1
R0500	5	10	18	100	10	2	●	2
R0550	5.5	11	22	110	12	2	●	1
R0600	6	12	22	110	12	2	●	2
R0650	6.5	13	26	120	12	2	●	3
R0700	7	14	26	120	12	2	●	3
R0750	7.5	15	30	140	16	2	●	1
R0800	8	16	30	140	16	2	●	2
R0900	9	18	34	140	16	2	●	3
R1000	10	20	38	160	20	2	●	2

● : Inventory maintained in Japan.

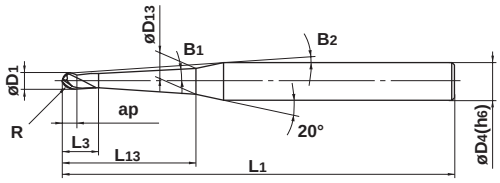
CUTTING CONDITIONS ➤ J396

VF-3XB

Ball nose, Medium cut length, 3 flute, Taper neck

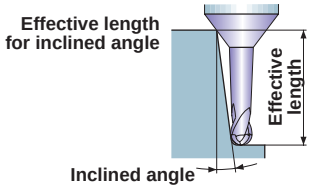
UWC VF 30°

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	Aluminium Alloy
○	◎	◎	◎	○	○		



Type1

R				
0.4 ≤R ≤2.5				
±0.01				
0.8 ≤D1 ≤5				
0 - 0.02				
4 ≤D4 ≤6	D4=8			
h6	0 - 0.008	0 - 0.009		



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

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Taper Angle One Side B1	Length of Cut ap	Neck Length L13	Length of Straight Neck L3	Cutting Edge to Shank Angle B2	Neck Dia. D13	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF3XBR0040T0024L006	0.4	0.8	0.4°	0.5	6	1.5	8.9°	0.82	60	4	3	●	1	6.3	6.6	6.9	7.3
R0040T0024L008	0.4	0.8	0.4°	0.5	8	1.5	7.5°	0.85	60	4	3	●	1	8.4	8.6	9.1	9.5
R0040T0024L012	0.4	0.8	0.4°	0.5	12	1.5	5.7°	0.91	60	4	3	●	1	12.4	12.7	13.4	14.1
R0040T0054L008	0.4	0.8	0.9°	0.5	8	1.5	7.6°	0.96	60	4	3	●	1	—	8.4	8.9	9.3
R0040T0054L012	0.4	0.8	0.9°	0.5	12	1.5	5.8°	1.09	60	4	3	●	1	—	12.4	13.1	13.8
R0040T0054L016	0.4	0.8	0.9°	0.5	16	1.5	4.7°	1.22	60	4	3	●	1	—	16.5	17.3	18.3
R0050T0024L008	0.5	1	0.4°	0.8	8	2.3	9.6°	1.02	60	6	3	●	1	8.5	8.8	9.3	9.8
R0050T0024L010	0.5	1	0.4°	0.8	10	2.3	8.5°	1.05	60	6	3	●	1	10.5	10.9	11.4	12.1
R0050T0024L012	0.5	1	0.4°	0.8	12	2.3	7.6°	1.08	60	6	3	●	1	12.6	13.0	13.6	14.4
R0050T0024L016	0.5	1	0.4°	0.8	16	2.3	6.3°	1.13	70	6	3	●	1	16.6	17.1	18.0	18.9
R0050T0024L020	0.5	1	0.4°	0.8	20	2.3	5.4°	1.19	70	6	3	●	1	20.6	21.2	22.3	23.5
R0050T0024L025	0.5	1	0.4°	0.8	25	2.3	4.6°	1.26	70	6	3	●	1	25.7	26.3	27.7	29.3
R0050T0024L030	0.5	1	0.4°	0.8	30	2.3	4.0°	1.33	80	6	3	●	1	30.7	31.5	33.1	35.0
R0050T0024L035	0.5	1	0.4°	0.8	35	2.3	3.5°	1.40	80	6	3	●	1	35.7	36.6	38.6	40.7
R0050T0054L008	0.5	1	0.9°	0.8	8	2.3	9.7°	1.12	60	6	3	●	1	—	8.6	9.1	9.6
R0050T0054L012	0.5	1	0.9°	0.8	12	2.3	7.7°	1.24	60	6	3	●	1	—	12.6	13.3	14.1
R0050T0054L016	0.5	1	0.9°	0.8	16	2.3	6.4°	1.37	70	6	3	●	1	—	16.7	17.6	18.5
R0050T0054L020	0.5	1	0.9°	0.8	20	2.3	5.5°	1.50	70	6	3	●	1	—	20.7	21.8	23.0
R0050T0054L025	0.5	1	0.9°	0.8	25	2.3	4.7°	1.65	70	6	3	●	1	—	25.7	27.1	28.6
R0050T0054L030	0.5	1	0.9°	0.8	30	2.3	4.0°	1.81	80	6	3	●	1	—	30.8	32.4	34.2
R0050T0054L035	0.5	1	0.9°	0.8	35	2.3	3.6°	1.97	80	6	3	●	1	—	35.8	37.7	39.8
R0050T0054L040	0.5	1	0.9°	0.8	40	2.3	3.2°	2.12	80	6	3	●	1	—	40.8	43.0	45.4
R0050T0054L050	0.5	1	0.9°	0.8	50	2.3	2.7°	2.44	110	6	3	●	1	—	50.9	53.6	*
R0050T0054L060	0.5	1	0.9°	0.8	60	2.3	2.3°	2.75	110	6	3	●	1	—	60.9	64.1	*
R0050T0054L070	0.5	1	0.9°	0.8	70	2.3	2.0°	3.07	110	6	3	●	1	—	71.0	74.7	*
R0050T0130L012	0.5	1	1.5°	0.8	12	2.3	7.9°	1.45	60	6	3	●	1	—	—	13.0	13.7
R0050T0130L016	0.5	1	1.5°	0.8	16	2.3	6.5°	1.66	70	6	3	●	1	—	—	17.1	18.0
R0050T0130L020	0.5	1	1.5°	0.8	20	2.3	5.6°	1.87	70	6	3	●	1	—	—	21.2	22.4
R0050T0130L025	0.5	1	1.5°	0.8	25	2.3	4.8°	2.13	70	6	3	●	1	—	—	26.3	27.8
R0050T0130L030	0.5	1	1.5°	0.8	30	2.3	4.1°	2.39	80	6	3	●	1	—	—	31.5	33.2
R0050T0130L035	0.5	1	1.5°	0.8	35	2.3	3.7°	2.65	80	6	3	●	1	—	—	36.6	38.6
R0075T0024L010	0.75	1.5	0.4°	1.3	10	2.8	8.1°	1.54	60	6	3	●	1	10.6	10.9	11.4	12.0
R0075T0024L015	0.75	1.5	0.4°	1.3	15	2.8	6.2°	1.61	60	6	3	●	1	15.6	16.0	16.9	17.8
R0075T0024L020	0.75	1.5	0.4°	1.3	20	2.8	5.0°	1.68	70	6	3	●	1	20.6	21.2	22.3	23.5

* No interference

CUTTING CONDITIONS ➤ J328

VF-3XB

Ball nose, Medium cut length, 3 flute, Taper neck

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Taper Angle One Side B1	Length of Cut ap	Neck Length L13	Length of Straight Neck L3	Cutting Edge to Shank Angle B2	Neck Dia. D13	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
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
R0075T0054L015	0.75	1.5	0.9°	1.3	15	2.8	6.3°	1.82	60	6	3	●	1	—	15.7	16.5	17.4
R0075T0054L020	0.75	1.5	0.9°	1.3	20	2.8	5.1°	1.98	70	6	3	●	1	—	20.7	21.8	23.0
R0075T0054L030	0.75	1.5	0.9°	1.3	30	2.8	3.7°	2.29	80	6	3	●	1	—	30.8	32.4	34.2
R0075T0054L040	0.75	1.5	0.9°	1.3	40	2.8	3.0°	2.61	80	6	3	●	1	—	40.8	43.0	45.3
R0075T0130L015	0.75	1.5	1.5°	1.3	15	2.8	6.4°	2.08	60	6	3	●	1	—	—	16.1	17.0
R0075T0130L020	0.75	1.5	1.5°	1.3	20	2.8	5.2°	2.34	70	6	3	●	1	—	—	21.2	22.4
R0075T0130L030	0.75	1.5	1.5°	1.3	30	2.8	3.8°	2.86	80	6	3	●	1	—	—	31.5	33.2
R0100T0024L016	1	2	0.4°	1.6	16	3.6	5.5°	2.07	70	6	3	●	1	16.7	17.1	18.0	19.0
R0100T0024L020	1	2	0.4°	1.6	20	3.6	4.6°	2.13	70	6	3	●	1	20.7	21.3	22.3	23.5
R0100T0024L025	1	2	0.4°	1.6	25	3.6	3.9°	2.20	70	6	3	●	1	25.8	26.4	27.8	29.3
R0100T0024L030	1	2	0.4°	1.6	30	3.6	3.4°	2.27	80	6	3	●	1	30.8	31.6	33.2	35.0
R0100T0024L035	1	2	0.4°	1.6	35	3.6	2.9°	2.34	80	6	3	●	1	35.8	36.7	38.6	*
R0100T0024L040	1	2	0.4°	1.6	40	3.6	2.6°	2.41	80	6	3	●	1	40.8	41.9	44.0	*
R0100T0054L020	1	2	0.9°	1.6	20	3.6	4.7°	2.42	70	6	3	●	1	—	20.8	21.9	23.0
R0100T0054L025	1	2	0.9°	1.6	25	3.6	4.0°	2.57	70	6	3	●	1	—	25.8	27.2	28.6
R0100T0054L030	1	2	0.9°	1.6	30	3.6	3.4°	2.73	80	6	3	●	1	—	30.9	32.5	34.2
R0100T0054L035	1	2	0.9°	1.6	35	3.6	3.0°	2.89	80	6	3	●	1	—	35.9	37.7	39.8
R0100T0054L040	1	2	0.9°	1.6	40	3.6	2.7°	3.04	80	6	3	●	1	—	40.9	43.0	*
R0100T0054L050	1	2	0.9°	1.6	50	3.6	2.2°	3.36	110	6	3	●	1	—	51.0	53.6	*
R0100T0054L060	1	2	0.9°	1.6	60	3.6	1.9°	3.67	110	6	3	●	1	—	61.0	*	*
R0100T0054L070	1	2	0.9°	1.6	70	3.6	1.6°	3.99	110	6	3	●	1	—	71.1	*	*
R0100T0130L025	1	2	1.5°	1.6	25	3.6	4.1°	3.02	70	6	3	●	1	—	—	26.4	27.9
R0100T0130L030	1	2	1.5°	1.6	30	3.6	3.5°	3.28	80	6	3	●	1	—	—	31.6	33.3
R0100T0130L035	1	2	1.5°	1.6	35	3.6	3.1°	3.54	80	6	3	●	1	—	—	36.7	38.7
R0100T0130L040	1	2	1.5°	1.6	40	3.6	2.7°	3.81	80	6	3	●	1	—	—	41.8	*
R0125T0054L020	1.25	2.5	0.9°	2	20	4.5	4.3°	2.89	60	6	3	●	1	—	20.8	21.9	23.1
R0125T0054L030	1.25	2.5	0.9°	2	30	4.5	3.1°	3.20	80	6	3	●	1	—	30.9	32.5	34.2
R0125T0054L040	1.25	2.5	0.9°	2	40	4.5	2.4°	3.52	80	6	3	●	1	—	40.9	43.1	*
R0125T0130L020	1.25	2.5	1.5°	2	20	4.5	4.4°	3.21	60	6	3	●	1	—	—	21.4	22.5
R0125T0130L030	1.25	2.5	1.5°	2	30	4.5	3.1°	3.74	80	6	3	●	1	—	—	31.6	33.3
R0125T0130L040	1.25	2.5	1.5°	2	40	4.5	2.5°	4.26	80	6	3	●	1	—	—	41.9	*
R0150T0024L020	1.5	3	0.4°	2	20	5	3.8°	3.11	60	6	3	●	1	20.7	21.3	22.3	23.5
R0150T0024L025	1.5	3	0.4°	2	25	5	3.1°	3.18	80	6	3	●	1	25.8	26.4	27.7	29.2
R0150T0024L030	1.5	3	0.4°	2	30	5	2.7°	3.25	80	6	3	●	1	30.8	31.6	33.2	*
R0150T0024L040	1.5	3	0.4°	2	40	5	2.1°	3.39	80	6	3	●	1	40.9	41.9	44.0	*
R0150T0024L050	1.5	3	0.4°	2	50	5	1.7°	3.53	100	6	3	●	1	50.9	52.2	*	*
R0150T0054L020	1.5	3	0.9°	2	20	5	3.8°	3.37	60	6	3	●	1	—	20.9	21.9	23.0
R0150T0054L030	1.5	3	0.9°	2	30	5	2.7°	3.69	80	6	3	●	1	—	30.9	32.5	*
R0150T0054L040	1.5	3	0.9°	2	40	5	2.1°	4.00	80	6	3	●	1	—	41.0	43.1	*
R0150T0054L050	1.5	3	0.9°	2	50	5	1.7°	4.31	100	6	3	●	1	—	51.0	*	*
R0150T0054L060	1.5	3	0.9°	2	60	5	2.3°	4.63	110	8	3	●	1	—	61.1	64.2	*
R0150T0054L070	1.5	3	0.9°	2	70	5	2.0°	4.94	120	8	3	●	1	—	71.1	74.8	*
R0150T0130L040	1.5	3	1.5°	2	40	5	2.2°	4.73	80	6	3	●	1	—	—	41.9	*
R0150T0130L050	1.5	3	1.5°	2	50	5	2.8°	5.26	110	8	3	●	1	—	—	52.2	*
R0150T0130L060	1.5	3	1.5°	2	60	5	2.4°	5.78	110	8	3	●	1	—	—	62.4	*
R0150T0130L070	1.5	3	1.5°	2	70	5	2.1°	6.30	120	8	3	●	1	—	—	72.7	*
R0200T0054L030	2	4	0.9°	3	30	6	3.5°	4.65	90	8	3	●	1	—	30.9	32.5	34.2
R0200T0054L040	2	4	0.9°	3	40	6	2.7°	4.97	90	8	3	●	1	—	41.0	43.0	*
R0200T0054L050	2	4	0.9°	3	50	6	2.2°	5.28	110	8	3	●	1	—	51.0	53.6	*
R0200T0054L060	2	4	0.9°	3	60	6	1.9°	5.60	110	8	3	●	1	—	61.1	*	*
R0250T0054L035	2.5	5	0.9°	3.5	35	6.5	2.4°	5.80	90	8	3	●	1	—	35.9	37.7	*

* No interference

● : Inventory maintained in Japan.

Unit : mm

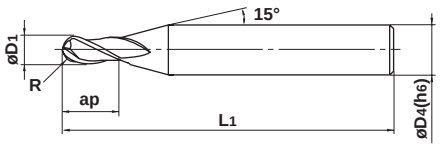
Order Number	Radius of Ball Nose R	Dia. D_1	Taper Angle One Side B_1	Length of Cut ap	Neck Length L_{13}	Length of Straight Neck L_3	Cutting Edge to Shank Angle B_2	Neck Dia. D_{13}	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VF3XBR0250T0054L040	2.5	5	0.9°	3.5	40	6.5	2.2°	5.95	90	8	3	●	1	—	41.0	43.0	*
R0250T0054L050	2.5	5	0.9°	3.5	50	6.5	1.8°	6.27	110	8	3	●	1	—	51.0	*	*
R0250T0054L060	2.5	5	0.9°	3.5	60	6.5	1.5°	6.58	110	8	3	●	1	—	61.1	*	*

* No interference

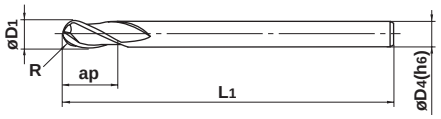
VC-3MB

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	Aluminium Alloy
○	◎	◎	○	○	○		



Type1



Type2

R ≤6	R ≥8			
±0.01	±0.02			
D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=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	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC3MB R0100	1	2	6	60	6	3	●	1
R0150	1.5	3	8	70	6	3	●	1
R0200	2	4	8	70	6	3	●	1
R0250	2.5	5	12	80	6	3	●	1
R0300	3	6	12	80	6	3	●	2
R0400	4	8	14	90	8	3	●	2
R0500	5	10	18	100	10	3	●	2
R0600	6	12	22	110	12	3	●	2
R0800	8	16	30	140	16	3	●	2
R1000	10	20	38	160	20	3	●	2

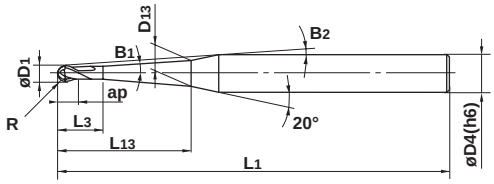
● : Inventory maintained in Japan.

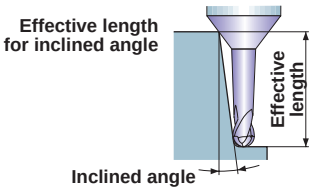
CUTTING CONDITIONS ➤ J360

DF-3XB

Ball nose, Medium cut length, 3 flute, Taper neck, For graphite

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○





R	0.5≤R≤2				
	±0.01				
h6	D4=6				
	0 -0.008				

Ball nose taper end mill with Mitsubishi's unique diamond coating for graphite machining.

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Taper Angle One Side	Length of Cut	Neck Length	Length of Straight Neck	Cutting Edge to Shank Angle	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle			
	R	D1	B1	ap	L13	L3	B2	D13	L1	D4	N			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
R0050L040	0.5	1	0.5°	1.5	40	3	3.2°	1.60	100	6	3	●	1	40.4	41.4	43.6	46
R0050L050	0.5	1	0.5°	1.5	50	3	2.6°	1.77	100	6	3	●	1	50.4	51.7	54.4	*
R0100L040	1	2	0.5°	3	40	5	2.6°	2.52	100	6	3	●	1	40.7	41.7	43.9	*
R0100L060	1	2	0.5°	3	60	5	1.8°	2.86	130	6	3	●	1	60.7	62.2	*	*
R0100L080	1	2	0.5°	3	80	5	1.4°	3.21	130	6	3	●	1	80.7	82.7	*	*
R0150L060	1.5	3	0.5°	4.5	60	7.5	1.4°	3.82	130	6	3	●	1	60.8	62.2	*	*
R0150L080	1.5	3	0.5°	4.5	80	7.5	1.1°	4.17	130	6	3	●	1	80.8	82.8	*	*
R0200L100	2	4	0.5°	6	100	9	0.6°	5.49	160	6	3	●	1	100.8	*	*	*

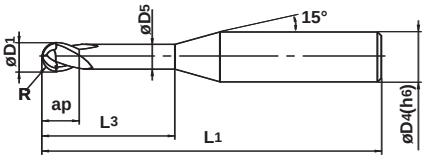
* No interference

IMPACT MIRACLE END MILL FOR DIFFICULT TO CUT MATERIALS, IRREGULAR HELIX

VF-4SVB

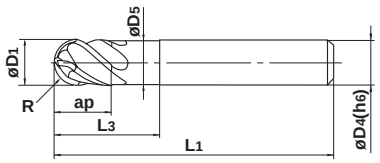
Ball nose, Short cut length, 4 flute,Variable curve

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	Aluminium Alloy
○	○			◎	◎		



Type1

R	R≤6	R>6			
	±0.01	±0.02			
	D1≤12	D1>12			
	0 - 0.02	0 - 0.03			
h6	D4=6	8≤D4≤10	12≤D4≤16	D4=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	



Type2

● Impact Miracle ball nose end mill with variable curve ensures stable machining of difficult-to-cut materials.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
NEW VF4SVBR0100	1	2	3	5	1.9	50	6	4	●	1
NEW R0150	1.5	3	4.5	7.5	2.9	50	6	4	●	1
NEW R0200	2	4	6	10	3.9	50	6	4	●	1
NEW R0250	2.5	5	7.5	12.5	4.9	50	6	4	●	1
R0300	3	6	9	15	5.85	50	6	4	●	2
R0400	4	8	12	20	7.85	60	8	4	●	2
R0500	5	10	15	25	9.7	70	10	4	●	2
R0600	6	12	18	30	11.7	75	12	4	●	2
R0800	8	16	24	40	15.5	90	16	4	●	2
R1000	10	20	30	50	19.5	100	20	4	●	2

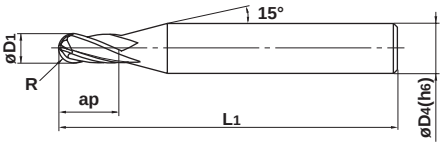
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J330

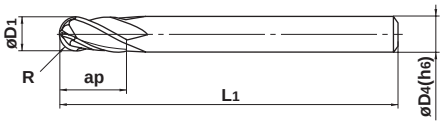
VF-4MB

Ball nose, 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	Aluminium Alloy
	◎	◎	◎	○	○		



Type1



Type2

R					
	±0.01				
	0 - 0.020				
h6	D4=6	8≤D4≤10	D4=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

4 flute ball nose end mill for high-speed machining of hardened steel.

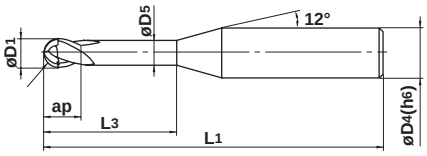
Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF4MBR0050	0.5	1	2.5	50	6	4	●	1
R0100	1	2	6	60	6	4	●	1
R0150	1.5	3	8	70	6	4	●	1
R0200	2	4	8	70	6	4	●	1
R0250	2.5	5	12	80	6	4	●	1
R0300	3	6	12	80	6	4	●	2
R0400	4	8	14	90	8	4	●	2
R0500	5	10	18	100	10	4	●	2
R0600	6	12	22	110	12	4	●	2

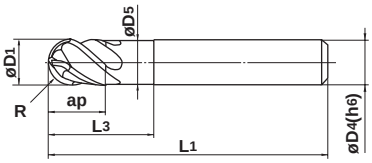
VQ-4SVB NEW

Ball nose, Medium cutting 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	Aluminium Alloy
○	○			◎	◎	○	



Type1



Type2

R					
1≤R≤6					
±0.01					
D1≤12					
0 - 0.02					
h6	D4=6	8≤D4≤10	D4=20		
	0 - 0.008	0 - 0.009	0 - 0.011		

- 4 flute ball nose end mill
- With the special substrate, suitable for finishing of heat resistance alloy, etc.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VQ4SVBR0100	1	2	3	5	1.9	50	6	4	●	1
R0150	1.5	3	4.5	7.5	2.9	50	6	4	●	1
R0200	2	4	6	10	3.9	50	6	4	●	1
R0250	2.5	5	7.5	12.5	4.9	50	6	4	●	1
R0300	3	6	9	15	5.85	50	6	4	●	2
R0400	4	8	12	20	7.85	60	8	4	●	2
R0500	5	10	15	25	9.7	70	10	4	●	2
R0600	6	12	18	30	11.7	75	12	4	●	2

● : Inventory maintained in Japan.

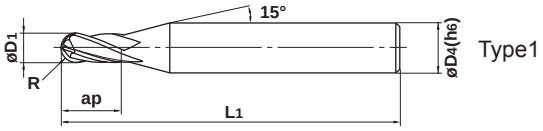
CUTTING CONDITIONS ➤ J344

VC-4MB

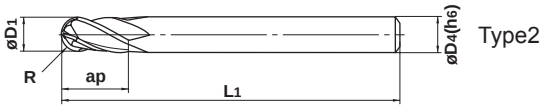
Ball nose end mill, Medium cut length, 4 flute

UWC VC 20° R<3 30° R≥3

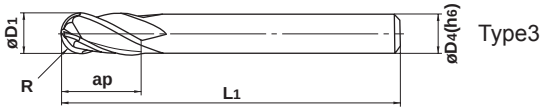
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎	○	○		



Type1



Type2



Type3

R

h6

R≤6	R≥7			
±0.01	±0.02			
D1≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8≤D4≤10	12≤D4≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● 4 flute ball nose end mill with high durability for hardened steels.

Unit : mm

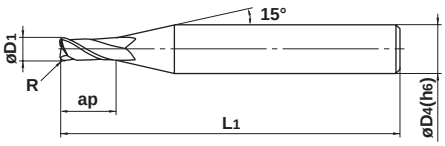
Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4MBR0050	0.5	1	2.5	50	6	4	●	1
R0075	0.75	1.5	4	50	6	4	●	1
R0100	1	2	6	60	6	4	●	1
R0150	1.5	3	8	70	6	4	●	1
R0200	2	4	8	70	6	4	●	1
R0250	2.5	5	12	80	6	4	●	1
R0300	3	6	12	80	6	4	●	2
R0400	4	8	14	90	8	4	●	2
R0500	5	10	18	100	10	4	●	2
R0600	6	12	22	110	12	4	●	2
R0700	7	14	26	120	12	4	●	3
R0800	8	16	30	140	16	4	●	2
R0900	9	18	34	140	16	4	●	3
R1000	10	20	38	160	20	4	●	2

MS2MRB

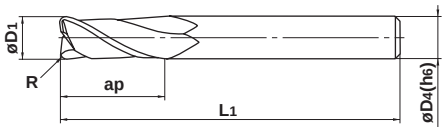
Corner radius end mill, Medium cut length, 2 flute

UWC MS 30° D1<3 D1≥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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

1 ≤D1 ≤12				
0 - 0.020				
4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

2 flute corner radius end mill for general use.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MRBD0100R010	1	0.1	2	40	4	2	●	1
D0100R020	1	0.2	2	40	4	2	●	1
D0100R030	1	0.3	2	40	4	2	●	1
D0150R010	1.5	0.1	3	40	4	2	●	1
D0150R020	1.5	0.2	3	40	4	2	●	1
D0150R030	1.5	0.3	3	40	4	2	●	1
D0150R050	1.5	0.5	3	40	4	2	●	1
D0200R010	2	0.1	4	40	4	2	●	1
D0200R020	2	0.2	4	40	4	2	●	1
D0200R030	2	0.3	4	40	4	2	●	1
D0200R050	2	0.5	4	40	4	2	●	1
D0250R010	2.5	0.1	5	40	4	2	●	1
D0250R020	2.5	0.2	5	40	4	2	●	1
D0250R030	2.5	0.3	5	40	4	2	●	1
D0250R050	2.5	0.5	5	40	4	2	●	1
D0300R010	3	0.1	6	50	6	2	●	1
D0300R020	3	0.2	6	50	6	2	●	1
D0300R030	3	0.3	6	50	6	2	●	1
D0300R050	3	0.5	6	50	6	2	●	1
D0300R100	3	1	6	50	6	2	●	1
D0400R010	4	0.1	8	50	6	2	●	1
D0400R020	4	0.2	8	50	6	2	●	1
D0400R030	4	0.3	8	50	6	2	●	1
D0400R050	4	0.5	8	50	6	2	●	1
D0400R100	4	1	8	50	6	2	●	1
D0500R010	5	0.1	10	50	6	2	●	1
D0500R020	5	0.2	10	50	6	2	●	1
D0500R030	5	0.3	10	50	6	2	●	1
D0500R050	5	0.5	10	50	6	2	●	1
D0500R100	5	1	10	50	6	2	●	1
D0600R010	6	0.1	12	50	6	2	●	2
D0600R020	6	0.2	12	50	6	2	●	2
D0600R030	6	0.3	12	50	6	2	●	2
D0600R050	6	0.5	12	50	6	2	●	2

● : Inventory maintained in Japan.

Unit : mm

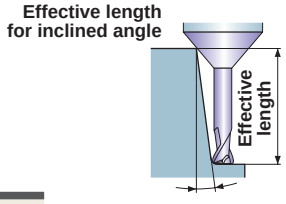
Order Number	Dia D_1	Corner R R	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2MRBD0600R100	6	1	12	50	6	2	●	2
D0600R150	6	1.5	12	50	6	2	●	2
D0600R200	6	2	12	50	6	2	●	2
D0800R020	8	0.2	16	60	8	2	●	2
D0800R030	8	0.3	16	60	8	2	●	2
D0800R050	8	0.5	16	60	8	2	●	2
D0800R100	8	1	16	60	8	2	●	2
D0800R150	8	1.5	16	60	8	2	●	2
D0800R200	8	2	16	60	8	2	●	2
D0800R250	8	2.5	16	60	8	2	●	2
D0800R300	8	3	16	60	8	2	●	2
D1000R020	10	0.2	20	70	10	2	●	2
D1000R030	10	0.3	20	70	10	2	●	2
D1000R050	10	0.5	20	70	10	2	●	2
D1000R100	10	1	20	70	10	2	●	2
D1000R150	10	1.5	20	70	10	2	●	2
D1000R200	10	2	20	70	10	2	●	2
D1000R250	10	2.5	20	70	10	2	●	2
D1000R300	10	3	20	70	10	2	●	2
D1200R020	12	0.2	24	75	12	2	●	2
D1200R030	12	0.3	24	75	12	2	●	2
D1200R050	12	0.5	24	75	12	2	●	2
D1200R100	12	1	24	75	12	2	●	2
D1200R150	12	1.5	24	75	12	2	●	2
D1200R200	12	2	24	75	12	2	●	2
D1200R250	12	2.5	24	75	12	2	●	2
D1200R300	12	3	24	75	12	2	●	2

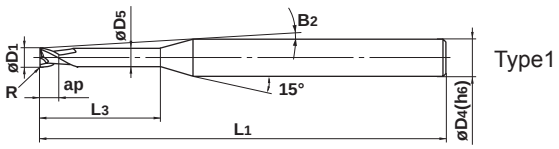
MS2XLRB

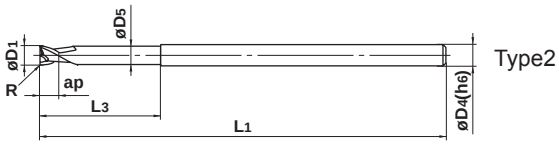
Corner radius end mill, Short cut length, 2 flute, Long neck

UWC MS 30° D1<3 D1≥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	Aluminium Alloy
◎	◎	○		○	○		







1 ≤D1 ≤6			
0 - 0.020			
D4=6			
0 - 0.008			

h6

● 2 flute long neck corner radius end mill.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D0100R010N050	1	0.1	1	5	0.94	9.8°	60	6	2	●	1	5.3	5.6	6.0	6.5
D0200R010N040	2	0.1	2	4	1.90	9.9°	60	6	2	●	1	4.2	4.4	4.8	5.2
D0200R010N100	2	0.1	2	10	1.90	6.5°	60	6	2	●	1	10.5	10.9	11.7	12.6
D0200R030N040	2	0.3	2	4	1.90	10°	60	6	2	●	1	4.2	4.4	4.7	5.1
D0200R030N100	2	0.3	2	10	1.90	6.6°	60	6	2	●	1	10.5	10.8	11.6	12.6
D0300R010N060	3	0.1	3	6	2.90	7.4°	50	6	2	●	1	6.3	6.6	7.1	7.6
D0300R010N150	3	0.1	3	15	2.90	4.2°	60	6	2	●	1	15.7	16.2	17.4	18.8
D0300R030N060	3	0.3	3	6	2.90	7.5°	50	6	2	●	1	6.3	6.6	7.0	7.6
D0300R030N150	3	0.3	3	15	2.90	4.2°	60	6	2	●	1	15.7	16.2	17.4	18.8
D0400R010N080	4	0.1	4	8	3.90	4.9°	50	6	2	●	1	8.4	8.7	9.4	10.1
D0400R010N200	4	0.1	4	20	3.90	2.5°	60	6	2	●	1	20.8	21.6	23.2	*
D0400R030N080	4	0.3	4	8	3.90	5°	50	6	2	●	1	8.4	8.7	9.3	10.1
D0400R030N200	4	0.3	4	20	3.90	2.5°	60	6	2	●	1	20.8	21.5	23.1	*
D0400R050N080	4	0.5	4	8	3.90	5°	50	6	2	●	1	8.4	8.7	9.3	10.0
D0400R050N200	4	0.5	4	20	3.90	2.5°	60	6	2	●	1	20.8	21.5	23.1	*
D0600R010N120	6	0.1	6	12	5.85	—	50	6	2	●	1	*	*	*	*
D0600R010N300	6	0.1	6	30	5.85	—	70	6	2	●	1	*	*	*	*
D0600R030N120	6	0.3	6	12	5.85	—	50	6	2	●	1	*	*	*	*
D0600R030N300	6	0.3	6	30	5.85	—	70	6	2	●	1	*	*	*	*
D0600R050N120	6	0.5	6	12	5.85	—	50	6	2	●	2	*	*	*	*
D0600R050N300	6	0.5	6	30	5.85	—	70	6	2	●	2	*	*	*	*

* No interference

● : Inventory maintained in Japan.

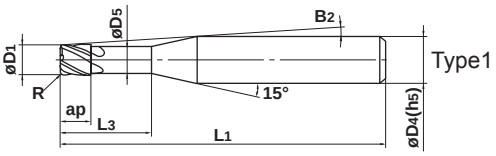
CUTTING CONDITIONS ➤ J306

VC-PSRB MIRACLE ORBIT

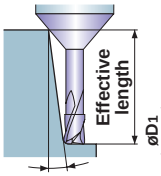
Corner radius end mill, Short cut length, 2—4 flute, High precision

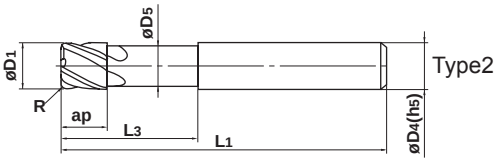
UWC VC 30° D1≤1.5 D1≥2

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	Aluminium Alloy
◎	◎	◎	◎	○	○		



Effective length for inclined angle





R				
0.05 ≤R ≤5				
±0.01				
0.6 ≤D1 ≤12				
0 - 0.01				
h5 D4=6	8 ≤D4 ≤10	D4=12		
0 - 0.005	0 - 0.006	0 - 0.008		

●±0.01mm corner radius tolerance, 0—-0.01mm outer diameter tolerance.
End mill with corner radius for precise and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D0060N02R01	0.6	0.1	0.6	2	0.56	12.6°	50	6	2	●	1	2.1	2.2	2.3	2.6
D0060N02R02	0.6	0.2	0.6	2	0.56	12.7°	50	6	2	●	1	2.1	2.2	2.2	2.5
D0060N04R01	0.6	0.1	0.6	4	0.56	10.9°	50	6	2	●	1	4.2	4.4	4.7	5.1
D0060N04R02	0.6	0.2	0.6	4	0.56	11°	50	6	2	●	1	4.2	4.3	4.7	5
D0080N04R005	0.8	0.05	0.8	4	0.76	10.7°	50	6	2	●	1	4.2	4.4	4.7	5.1
D0080N04R01	0.8	0.1	0.8	4	0.76	10.8°	50	6	2	●	1	4.2	4.4	4.7	5.1
D0080N04R02	0.8	0.2	0.8	4	0.76	10.8°	50	6	2	●	1	4.2	4.3	4.7	5
D0080N04R03	0.8	0.3	0.8	4	0.76	10.9°	50	6	2	●	1	4.2	4.3	4.6	5
D0080N06R01	0.8	0.1	0.8	6	0.76	9.4°	50	6	2	●	1	6.3	6.5	7	7.5
D0080N06R02	0.8	0.2	0.8	6	0.76	9.5°	50	6	2	●	1	6.3	6.5	7	7.5
D0080N06R03	0.8	0.3	0.8	6	0.76	9.5°	50	6	2	●	1	6.3	6.5	6.9	7.5
D0080N08R03	0.8	0.3	0.8	8	0.76	8.5°	50	6	2	●	1	8.3	8.6	9.2	10
D0100N04R005	1	0.05	1	4	0.94	10.5°	50	6	2	●	1	4.2	4.5	4.8	5.3
D0100N04R01	1	0.1	1	4	0.94	10.5°	50	6	2	●	1	4.2	4.5	4.8	5.3
D0100N04R02	1	0.2	1	4	0.94	10.6°	50	6	2	●	1	4.2	4.5	4.7	5.3
D0100N04R03	1	0.3	1	4	0.94	10.6°	50	6	2	●	1	4.2	4.5	4.6	5.2
D0100N04R04	1	0.4	1	4	0.94	10.7°	50	6	2	●	1	4.2	4.5	4.4	5.2
D0100N06R01	1	0.1	1	6	0.94	9.2°	50	6	2	●	1	6.4	6.7	7.2	7.8
D0100N06R02	1	0.2	1	6	0.94	9.2°	50	6	2	●	1	6.4	6.7	7.2	7.7
D0100N06R03	1	0.3	1	6	0.94	9.3°	50	6	2	●	1	6.3	6.6	7.2	7.7
D0100N06R04	1	0.4	1	6	0.94	9.4°	50	6	2	●	1	6.3	6.6	7.1	7.7
D0100N10R03	1	0.3	1	10	0.94	7.4°	50	6	2	●	1	10.5	10.9	11.8	12.7
D0100N10R04	1	0.4	1	10	0.94	7.4°	50	6	2	●	1	10.5	10.9	11.7	12.7
D0120N06R05	1.2	0.5	1.2	6	1.14	9.3°	50	6	2	●	1	6.3	6.6	7.1	7.7
D0120N10R05	1.2	0.5	1.2	10	1.14	7.3°	50	6	2	●	1	10.5	10.9	11.7	12.6
D0120N15R05	1.2	0.5	1.2	15	1.14	5.8°	50	6	2	●	1	15.7	16.3	17.5	18.9
D0150N04R01	1.5	0.1	1.5	4	1.44	10.2°	50	6	2	●	1	4.2	4.5	4.8	5.3
D0150N04R02	1.5	0.2	1.5	4	1.44	10.2°	50	6	2	●	1	4.2	4.5	4.7	5.3
D0150N04R03	1.5	0.3	1.5	4	1.44	10.3°	50	6	2	●	1	4.2	4.5	4.6	5.2
D0150N04R05	1.5	0.5	1.5	4	1.44	10.5°	50	6	2	●	1	4.2	4.4	4.3	5.2
D0150N06R01	1.5	0.1	1.5	6	1.44	8.8°	50	6	2	●	1	6.4	6.7	7.2	7.8
D0150N06R02	1.5	0.2	1.5	6	1.44	8.9°	50	6	2	●	1	6.4	6.7	7.2	7.7
D0150N06R03	1.5	0.3	1.5	6	1.44	8.9°	50	6	2	●	1	6.3	6.6	7.2	7.7

CUTTING CONDITIONS ➤ J362

VC-PSRB MIRACLE ORBIT

Corner radius end mill, Short cut length, 2—4 flute, High precision

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VCPSRBD0150N06R05	1.5	0.5	1.5	6	1.44	9°	50	6	2	●	1	6.3	6.6	7.1	7.7
D0150N10R01	1.5	0.1	1.5	10	1.44	6.9°	50	6	2	●	1	10.6	11	11.8	12.7
D0150N10R02	1.5	0.2	1.5	10	1.44	7°	50	6	2	●	1	10.5	11	11.8	12.7
D0150N10R03	1.5	0.3	1.5	10	1.44	7°	50	6	2	●	1	10.5	10.9	11.8	12.7
D0150N10R05	1.5	0.5	1.5	10	1.44	7.1°	50	6	2	●	1	10.5	10.9	11.7	12.6
D0150N15R01	1.5	0.1	1.5	15	1.44	5.5°	50	6	2	●	1	15.8	16.3	17.5	18.9
D0150N15R02	1.5	0.2	1.5	15	1.44	5.5°	50	6	2	●	1	15.8	16.3	17.5	18.9
D0150N15R03	1.5	0.3	1.5	15	1.44	5.5°	50	6	2	●	1	15.7	16.3	17.5	18.9
D0150N15R05	1.5	0.5	1.5	15	1.44	5.7°	50	6	2	●	1	15.7	16.3	17.4	18.6
D0150N20R03	1.5	0.3	1.5	20	1.44	4.7°	60	6	2	●	1	20.9	21.6	22.9	24.5
D0150N20R05	1.5	0.5	1.5	20	1.44	4.8°	60	6	2	●	1	20.9	21.5	22.8	24.2
D0200N06R01	2	0.1	2	6	1.9	9.4°	50	6	4	●	1	6.3	6.6	6.9	7.5
D0200N06R02	2	0.2	2	6	1.9	9.7°	50	6	4	●	1	6.3	6.6	6.8	7.4
D0200N06R03	2	0.3	2	6	1.9	10°	50	6	4	●	1	6.3	6.6	6.7	7.4
D0200N06R05	2	0.5	2	6	1.9	10.3°	50	6	4	●	1	6.3	6.5	6.5	7.4
D0200N10R01	2	0.1	2	10	1.9	7.6°	50	6	4	●	1	10.5	10.9	11.4	12
D0200N10R02	2	0.2	2	10	1.9	7.7°	50	6	4	●	1	10.5	10.8	11.2	12
D0200N10R03	2	0.3	2	10	1.9	7.8°	50	6	4	●	1	10.5	10.8	11.1	11.9
D0200N10R05	2	0.5	2	10	1.9	8°	50	6	4	●	1	10.5	10.8	10.9	11.9
D0200N15R01	2	0.1	2	15	1.9	5.9°	50	6	4	●	1	15.7	16.1	16.8	17.5
D0200N15R02	2	0.2	2	15	1.9	5.9°	50	6	4	●	1	15.7	16.1	16.7	17.5
D0200N15R03	2	0.3	2	15	1.9	6°	50	6	4	●	1	15.7	16.1	16.6	17.4
D0200N15R05	2	0.5	2	15	1.9	6.1°	50	6	4	●	1	15.6	16.1	16.3	17.4
D0200N20R03	2	0.3	2	20	1.9	4.8°	60	6	4	●	1	20.8	21.4	21.9	22.9
D0200N20R05	2	0.5	2	20	1.9	4.9°	60	6	4	●	1	20.8	21.4	21.7	22.9
D0200N25R03	2	0.3	2	25	1.9	4°	60	6	4	●	1	26	26.6	27.5	28.3
D0200N25R05	2	0.5	2	25	1.9	4°	60	6	4	●	1	26	26.6	27	28.2
D0250N08R01	2.5	0.1	2.5	8	2.4	8.6°	50	6	4	●	1	8.4	8.7	9.2	9.9
D0250N08R02	2.5	0.2	2.5	8	2.4	8.7°	50	6	4	●	1	8.4	8.7	9	9.9
D0250N08R03	2.5	0.3	2.5	8	2.4	8.8°	50	6	4	●	1	8.4	8.7	8.9	9.9
D0250N08R05	2.5	0.5	2.5	8	2.4	9°	50	6	4	●	1	8.4	8.7	8.7	9.9
D0250N08R10	2.5	1	2.5	8	2.4	9.4°	50	6	4	●	1	8.3	8.7	8.2	9.9
D0250N15R03	2.5	0.3	2.5	15	2.4	5.5°	50	6	4	●	1	15.7	16.1	16.6	17.5
D0250N15R05	2.5	0.5	2.5	15	2.4	5.6°	50	6	4	●	1	15.6	16.1	16.3	17.5
D0250N15R10	2.5	1	2.5	15	2.4	5.7°	50	6	4	●	1	15.6	16.1	15.8	17.5
D0300N10R01	3	0.1	3	10	2.9	6.6°	60	6	4	●	1	10.5	10.9	11.4	12.3
D0300N10R02	3	0.2	3	10	2.9	6.6°	60	6	4	●	1	10.5	10.8	11.2	12.3
D0300N10R03	3	0.3	3	10	2.9	6.6°	60	6	4	●	1	10.5	10.8	11.1	12.3
D0300N10R05	3	0.5	3	10	2.9	6.7°	60	6	4	●	1	10.5	10.8	10.9	12.4
D0300N10R10	3	1	3	10	2.9	7°	60	6	4	●	1	10.4	10.8	10.4	12.4
D0300N15R01	3	0.1	3	15	2.9	4.8°	60	6	4	●	1	15.7	16.1	16.8	17.7
D0300N15R02	3	0.2	3	15	2.9	4.8°	60	6	4	●	1	15.7	16.1	16.7	17.8
D0300N15R03	3	0.3	3	15	2.9	4.8°	60	6	4	●	1	15.7	16.1	16.6	17.8
D0300N15R05	3	0.5	3	15	2.9	4.8°	60	6	4	●	1	15.6	16.1	16.3	17.8
D0300N15R10	3	1	3	15	2.9	5°	60	6	4	●	1	15.6	16.1	15.8	17.8
D0300N20R01	3	0.1	3	20	2.9	3.7°	60	6	4	●	1	20.8	21.4	22.1	23.1
D0300N20R02	3	0.2	3	20	2.9	3.7°	60	6	4	●	1	20.8	21.4	22	23.1
D0300N20R03	3	0.3	3	20	2.9	3.8°	60	6	4	●	1	20.8	21.4	21.9	23.2
D0300N20R05	3	0.5	3	20	2.9	3.8°	60	6	4	●	1	20.8	21.4	21.7	23.2
D0300N20R10	3	1	3	20	2.9	3.9°	60	6	4	●	1	20.8	21.3	21.2	23.2
D0300N30R03	3	0.3	3	30	2.9	2.6°	70	6	4	●	1	31.1	31.8	32.5	*
D0300N30R05	3	0.5	3	30	2.9	2.6°	70	6	4	●	1	31.1	31.8	32.2	*

* No interference

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VCPSRBD0400N12R01	4	0.1	4	12	3.9	3.8°	60	6	4	●	1	12.5	13	13.5	15.1
D0400N12R02	4	0.2	4	12	3.9	3.8°	60	6	4	●	1	12.5	13	13.4	15.2
D0400N12R03	4	0.3	4	12	3.9	3.8°	60	6	4	●	1	12.5	13	13.3	15.2
D0400N12R05	4	0.5	4	12	3.9	3.9°	60	6	4	●	1	12.5	13	13.1	15.3
D0400N12R10	4	1	4	12	3.9	4°	60	6	4	●	1	12.5	12.9	12.6	15.3
D0400N20R01	4	0.1	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	22.1	*
D0400N20R02	4	0.2	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	22	*
D0400N20R03	4	0.3	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	21.9	*
D0400N20R05	4	0.5	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	21.7	*
D0400N20R10	4	1	4	20	3.9	2.6°	60	6	4	●	1	20.8	21.3	21.2	*
D0400N30R03	4	0.3	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	*	*
D0400N30R05	4	0.5	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	*	*
D0400N30R10	4	1	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	*	*
D0500N15R05	5	0.5	5	15	4.9	1.6°	60	6	4	●	1	15.6	16.1	*	*
D0500N15R10	5	1	5	15	4.9	1.6°	60	6	4	●	1	15.6	16.1	*	*
D0500N30R05	5	0.5	5	30	4.9	0.9°	70	6	4	●	1	31.1	*	*	*
D0500N30R10	5	1	5	30	4.9	0.9°	70	6	4	●	1	31.1	*	*	*
D0600N18R01	6	0.1	6	18	5.85	–	70	6	4	●	2	*	*	*	*
D0600N18R02	6	0.2	6	18	5.85	–	70	6	4	●	2	*	*	*	*
D0600N18R03	6	0.3	6	18	5.85	–	70	6	4	●	2	*	*	*	*
D0600N18R05	6	0.5	6	18	5.85	–	70	6	4	●	2	*	*	*	*
D0600N18R10	6	1	6	18	5.85	–	70	6	4	●	2	*	*	*	*
D0600N18R20	6	2	6	18	5.85	–	70	6	4	●	2	*	*	*	*
D0600N41R05	6	0.5	6	41	5.85	–	90	6	4	●	2	*	*	*	*
D0600N50R10	6	1	6	50	5.85	–	90	6	4	●	2	*	*	*	*
D0800N24R01	8	0.1	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N24R02	8	0.2	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N24R03	8	0.3	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N24R05	8	0.5	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N24R10	8	1	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N24R20	8	2	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N24R30	8	3	8	24	7.85	–	90	8	4	●	2	*	*	*	*
D0800N50R10	8	1	8	50	7.85	–	90	8	4	●	2	*	*	*	*
D0800N50R30	8	3	8	50	7.85	–	90	8	4	●	2	*	*	*	*
D1000N30R03	10	0.3	10	30	9.7	–	100	10	4	●	2	*	*	*	*
D1000N30R05	10	0.5	10	30	9.7	–	100	10	4	●	2	*	*	*	*
D1000N30R10	10	1	10	30	9.7	–	100	10	4	●	2	*	*	*	*
D1000N30R20	10	2	10	30	9.7	–	100	10	4	●	2	*	*	*	*
D1000N30R30	10	3	10	30	9.7	–	100	10	4	●	2	*	*	*	*
D1000N30R40	10	4	10	30	9.7	–	100	10	4	●	2	*	*	*	*
D1000N50R10	10	1	10	50	9.7	–	100	10	4	●	2	*	*	*	*
D1000N50R30	10	3	10	50	9.7	–	100	10	4	●	2	*	*	*	*
D1200N36R03	12	0.3	12	36	11.7	–	110	12	4	●	2	*	*	*	*
D1200N36R05	12	0.5	12	36	11.7	–	110	12	4	●	2	*	*	*	*
D1200N36R10	12	1	12	36	11.7	–	110	12	4	●	2	*	*	*	*
D1200N36R20	12	2	12	36	11.7	–	110	12	4	●	2	*	*	*	*
D1200N36R30	12	3	12	36	11.7	–	110	12	4	●	2	*	*	*	*
D1200N36R40	12	4	12	36	11.7	–	110	12	4	●	2	*	*	*	*
D1200N36R50	12	5	12	36	11.7	–	110	12	4	●	2	*	*	*	*

* No interference

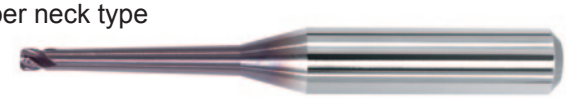
VC-PSRB MIRACLE ORBIT

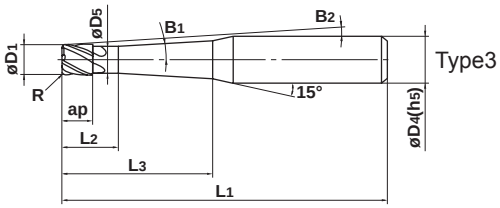
Corner radius end mill, Short cut length, 2−4 flute, High precision

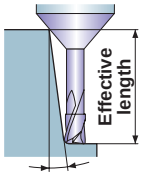
UWC VC 30° D1≤1.5 D1≥2

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	Aluminium Alloy
◎	◎	◎	◎	○	○		

Taper neck type







R					
	0.5 ≤R ≤3				
	±0.01				
	1.5 ≤D1 ≤12				
	0 - 0.01				
h5	D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16		
	0 - 0.005	0 - 0.006	0 - 0.008		

●±0.01mm corner radius tolerance, 0−-0.01mm outer diameter tolerance.
End mill with corner radius for precise and efficient machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Length of Straight Neck L2	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D0150N03L10R05	1.5	0.5	1° 30'	1.5	10	3	1.44	7.2°	50	6	2	●	3	—	11.3	12.2
D0200N04L10R05	2	0.5	1° 30'	2	10	4	1.9	6.7°	60	6	4	●	3	—	11.5	12.4
D0200N04L15R05	2	0.5	1° 30'	2	15	4	1.9	5.3°	60	6	4	●	3	—	16.7	18
D0250N05L12R10	2.5	1	1° 30'	2.5	12	5	2.4	5.6°	60	6	4	●	3	—	14.2	15.3
D0250N05L20R10	2.5	1	1° 30'	2.5	20	5	2.4	4°	60	6	4	●	3	—	22.5	24.2
D0300N06L15R05	3	0.5	1° 30'	3	15	6	2.9	4.4°	60	6	4	●	3	—	16.9	18.2
D0300N06L20R05	3	0.5	1° 30'	3	20	6	2.9	3.6°	60	6	4	●	3	—	22.1	23.8
D0300N06L15R10	3	1	1° 30'	3	15	6	2.9	4.4°	60	6	4	●	3	—	17.4	18.7
D0300N06L20R10	3	1	1° 30'	3	20	6	2.9	3.6°	60	6	4	●	3	—	22.6	24.4
D0400N08L20R10	4	1	1° 30'	4	20	8	3.9	2.6°	60	6	4	●	3	—	22.8	⁎
D0400N08L30R10	4	1	1° 30'	4	30	8	3.9	1.9°	70	6	4	●	3	—	⁎	⁎
D0500N08L40R05	5	0.5	1°	5	40	8	4.9	2°	90	8	4	●	3	41.2	⁎	⁎
D0500N08L60R05	5	0.5	1°	5	60	8	4.9	1.4°	110	8	4	●	3	61.2	⁎	⁎
D0500N08L40R10	5	1	1°	5	40	8	4.9	2°	90	8	4	●	3	41.7	⁎	⁎
D0500N08L60R10	5	1	1°	5	60	8	4.9	1.4°	110	8	4	●	3	61.7	⁎	⁎
D0600N08L40R20	6	2	1°	6	40	8	5.85	1.4°	70	8	4	●	3	42.8	⁎	⁎
D0600N08L60R20	6	2	1°	6	60	8	5.85	1°	100	8	4	●	3	⁎	⁎	⁎
D0800N10L53R20	8	2	1°	8	53	10	7.85	1.1°	90	10	4	●	3	55.9	⁎	⁎
D0800N10L70R20	8	2	1°	8	70	10	7.85	1.6°	130	12	4	●	3	72.9	⁎	⁎
D1000N12L55R30	10	3	1°	10	55	12	9.7	1.1°	100	12	4	●	3	59.4	⁎	⁎
D1000N12L70R30	10	3	1°	10	70	12	9.7	0.9°	130	12	4	●	3	⁎	⁎	⁎
D1200N24L70R30	12	3	1°	12	70	24	11.7	1.6°	130	16	4	●	3	75.2	⁎	⁎

⁎ No interference

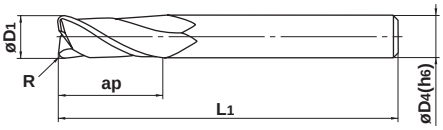
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J362

CRN-2MRB

Corner radius, Medium cut length, 2 flute, For copper electrodes

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	Aluminium Alloy
						◎	○



Type1

h6				
6≦D1≦12				
0 - 0.02				
D4=6	8≦D4≦10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

2 flute corner radius end mill with CRN coating for copper electrode machining.

Unit : mm

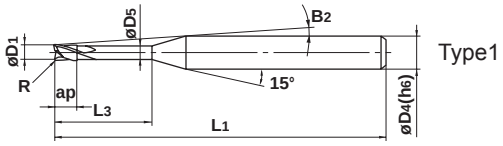
Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CRN2MRBD0600R020	6	0.2	13	50	6	2	●	1
D0600R030	6	0.3	13	50	6	2	●	1
D0600R050	6	0.5	13	50	6	2	●	1
D0600R100	6	1	13	50	6	2	●	1
D0800R030	8	0.3	19	60	8	2	●	1
D0800R050	8	0.5	19	60	8	2	●	1
D0800R100	8	1	19	60	8	2	●	1
D1000R030	10	0.3	22	70	10	2	●	1
D1000R050	10	0.5	22	70	10	2	●	1
D1000R100	10	1	22	70	10	2	●	1
D1200R030	12	0.3	26	75	12	2	●	1
D1200R050	12	0.5	26	75	12	2	●	1
D1200R100	12	1	26	75	12	2	●	1

CRN-2XLRB

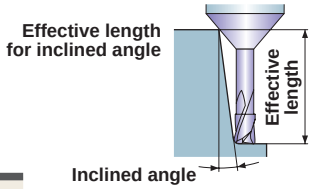
Corner radius, Medium cut length, 2 flute, For copper electrodes

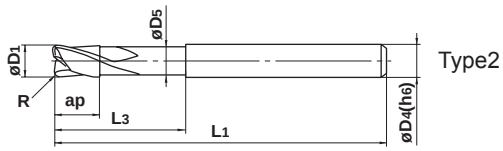
UWC CRN 30° D1<3 D1≥3

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	Aluminium Alloy
						◎	○



Type1





Type2

h6	0.5 ≤D1 ≤6			
	0 - 0.02			
	4 ≤D4 ≤6			
	0 - 0.008			

2 flute long neck corner radius end mill with CRN coating for copper electrode machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CRN2XLRBD0050R005N04	0.5	0.05	0.5	4	0.46	9.5°	50	4	2	●	1	4.1	4.3	4.6	5
D0050R010N04	0.5	0.1	0.5	4	0.46	9.5°	50	4	2	●	1	4.1	4.3	4.6	5
D0050R005N06	0.5	0.05	0.5	6	0.46	8°	50	4	2	●	1	6.2	6.4	6.9	7.5
D0050R010N06	0.5	0.1	0.5	6	0.46	8°	50	4	2	●	1	6.2	6.4	6.9	7.5
D0080R005N06	0.8	0.05	0.8	6	0.76	7.6°	50	4	2	●	1	6.3	6.5	7	7.6
D0080R010N06	0.8	0.1	0.8	6	0.76	7.6°	50	4	2	●	1	6.3	6.5	7	7.5
D0080R005N08	0.8	0.05	0.8	8	0.76	6.5°	50	4	2	●	1	8.3	8.6	9.3	10
D0080R010N08	0.8	0.1	0.8	8	0.76	6.6°	50	4	2	●	1	8.3	8.6	9.3	10
D0100R010N08	1	0.1	1	8	0.94	6.3°	50	4	2	●	1	8.5	8.8	9.5	10.2
D0100R030N08	1	0.3	1	8	0.94	6.3°	50	4	2	●	1	8.5	8.8	9.5	10.2
D0100R010N10	1	0.1	1	10	0.94	5.5°	55	4	2	●	1	10.6	11	11.8	12.7
D0100R030N10	1	0.3	1	10	0.94	5.5°	55	4	2	●	1	10.5	10.9	11.8	12.7
D0100R010N12	1	0.1	1	12	0.94	4.9°	55	4	2	●	1	12.6	13.1	14.1	15.2
D0100R030N12	1	0.3	1	12	0.94	4.9°	55	4	2	●	1	12.6	13.1	14.1	15.2
D0150R010N12	1.5	0.1	1.5	12	1.44	4.3°	55	4	2	●	1	12.6	13.1	14.1	15.2
D0150R020N12	1.5	0.2	1.5	12	1.44	4.3°	55	4	2	●	1	12.6	13.1	14.1	15.2
D0150R030N12	1.5	0.3	1.5	12	1.44	4.3°	55	4	2	●	1	12.6	13.1	14.1	15.2
D0150R010N20	1.5	0.1	1.5	20	1.44	2.9°	60	4	2	●	1	20.9	21.7	23.3	⁎
D0150R020N20	1.5	0.2	1.5	20	1.44	2.9°	60	4	2	●	1	20.9	21.7	23.3	⁎
D0150R030N20	1.5	0.3	1.5	20	1.44	3°	60	4	2	●	1	20.9	21.6	23.3	⁎
D0200R010N12	2	0.1	2	12	1.9	3.7°	55	4	2	●	1	12.5	13	14	15.1
D0200R020N12	2	0.2	2	12	1.9	3.7°	55	4	2	●	1	12.5	13	14	15.1
D0200R030N12	2	0.3	2	12	1.9	3.7°	55	4	2	●	1	12.5	13	13.9	15
D0200R050N12	2	0.5	2	12	1.9	3.8°	55	4	2	●	1	12.5	13	13.9	15
D0200R010N16	2	0.1	2	16	1.9	2.9°	55	4	2	●	1	16.7	17.3	18.6	⁎
D0200R020N16	2	0.2	2	16	1.9	2.9°	55	4	2	●	1	16.7	17.3	18.6	⁎
D0200R030N16	2	0.3	2	16	1.9	3°	55	4	2	●	1	16.7	17.3	18.5	⁎
D0200R050N16	2	0.5	2	16	1.9	3°	55	4	2	●	1	16.7	17.2	18.5	⁎
D0200R010N20	2	0.1	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.6	23.2	⁎
D0200R020N20	2	0.2	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23.2	⁎
D0200R030N20	2	0.3	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23.1	⁎
D0200R050N20	2	0.5	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23.1	⁎
D0300R020N20	3	0.2	3	20	2.9	3.4°	65	6	2	●	1	20.8	21.5	23.2	25
D0300R030N20	3	0.3	3	20	2.9	3.4°	65	6	2	●	1	20.8	21.5	23.1	25

⁎ No interference

● : Inventory maintained in Japan.

Unit : mm

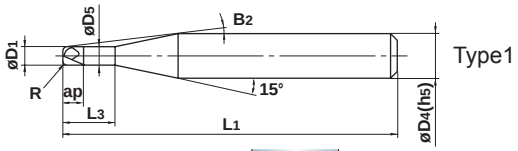
Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
CRN2XLRBD0300R050N20	3	0.5	3	20	2.9	3.4°	65	6	2	●	1	20.8	21.5	23.1	24.9
D0400R020N20	4	0.2	4	20	3.9	2.5°	65	6	2	●	1	20.8	21.5	23.2	*
D0400R030N20	4	0.3	4	20	3.9	2.5°	65	6	2	●	1	20.8	21.5	23.1	*
D0400R050N20	4	0.5	4	20	3.9	2.5°	65	6	2	●	1	20.8	21.5	23.1	*
D0500R020N25	5	0.2	5	25	4.9	1.1°	65	6	2	●	1	26	26.9	*	*
D0500R030N25	5	0.3	5	25	4.9	1.1°	65	6	2	●	1	26	26.9	*	*
D0500R050N25	5	0.5	5	25	4.9	1.1°	65	6	2	●	1	26	26.9	*	*
D0600R020N30	6	0.2	6	30	5.85	—	70	6	2	●	2	*	*	*	*
D0600R030N30	6	0.3	6	30	5.85	—	70	6	2	●	2	*	*	*	*
D0600R050N30	6	0.5	6	30	5.85	—	70	6	2	●	2	*	*	*	*
D0600R100N30	6	1	6	30	5.85	—	70	6	2	●	2	*	*	*	*

* No interference

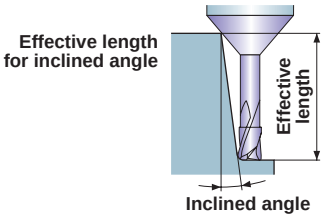
CBN-2XLRB

Corner radius end mill, Medium 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	Aluminium Alloy
○	◎	◎	◎				



Type1



R	
0.05 ≤R ≤0.5	
±0.005	
0.5 ≤D1 ≤2	
0 - 0.010	
D4=4	
0 - 0.005	

CBN long neck radius end mill. A wide variation of neck lengths available.

Unit : mm

Order Number	Corner R	Dia.	Length of Cut	Neck Length	Neck Dia.	Cutting Edge to Shank Angle	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle			
	R	D1	ap	L3	D5	B2	L1	D4	N			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
D0050R005N03	0.05	0.5	0.3	3	0.46	10.4°	51	4	2	●	1	3.1	3.2	3.5	3.7
D0050R010N02	0.1	0.5	0.3	2	0.46	11.7°	51	4	2	●	1	2.1	2.1	2.3	2.5
D0050R010N03	0.1	0.5	0.3	3	0.46	10.5°	51	4	2	●	1	3.1	3.2	3.4	3.7
D0100R005N03	0.05	1	0.6	3	0.94	9.7°	51	4	2	●	1	3.2	3.4	3.7	4
D0100R005N05	0.05	1	0.6	5	0.94	7.9°	51	4	2	●	1	5.3	5.6	6	6.5
D0100R010N03	0.1	1	0.6	3	0.94	9.7°	51	4	2	●	1	3.2	3.4	3.6	4
D0100R010N05	0.1	1	0.6	5	0.94	8°	51	4	2	●	1	5.3	5.6	6	6.5
D0100R020N03	0.2	1	0.6	3	0.94	9.8°	51	4	2	●	1	3.2	3.4	3.5	4
D0100R020N05	0.2	1	0.6	5	0.94	8°	51	4	2	●	1	5.3	5.6	6	6.5
D0100R030N03	0.3	1	0.6	3	0.94	9.9°	51	4	2	●	1	3.2	3.4	3.4	4
D0100R030N05	0.3	1	0.6	5	0.94	8.1°	51	4	2	●	1	5.3	5.6	6	6.5
D0150R010N05	0.1	1.5	0.9	5	1.44	7.3°	52	4	2	●	1	5.3	5.6	6	6.5
D0150R010N08	0.1	1.5	0.9	8	1.44	5.6°	52	4	2	●	1	8.5	8.8	9.5	10.2
D0150R020N05	0.2	1.5	0.9	5	1.44	7.3°	52	4	2	●	1	5.3	5.6	6	6.5
D0150R020N08	0.2	1.5	0.9	8	1.44	5.6°	52	4	2	●	1	8.5	8.8	9.5	10.2
D0150R030N05	0.3	1.5	0.9	5	1.44	7.4°	52	4	2	●	1	5.3	5.6	6	6.5
D0150R030N08	0.3	1.5	0.9	8	1.44	5.7°	52	4	2	●	1	8.5	8.8	9.5	10.2
D0200R010N06	0.1	2	1.2	6	1.9	5.9°	52	4	2	●	1	6.3	6.6	7.1	7.6
D0200R010N10	0.1	2	1.2	10	1.9	4.2°	52	4	2	●	1	10.5	10.9	11.7	12.6
D0200R020N06	0.2	2	1.2	6	1.9	5.9°	52	4	2	●	1	6.3	6.6	7.1	7.6
D0200R020N10	0.2	2	1.2	10	1.9	4.2°	52	4	2	●	1	10.5	10.9	11.7	12.6
D0200R030N06	0.3	2	1.2	6	1.9	6°	52	4	2	●	1	6.3	6.6	7	7.6
D0200R030N10	0.3	2	1.2	10	1.9	4.2°	52	4	2	●	1	10.5	10.8	11.6	12.6
D0200R050N06	0.5	2	1.2	6	1.9	6.1°	52	4	2	●	1	6.3	6.5	7	7.5
D0200R050N10	0.5	2	1.2	10	1.9	4.3°	52	4	2	●	1	10.5	10.8	11.6	12.5

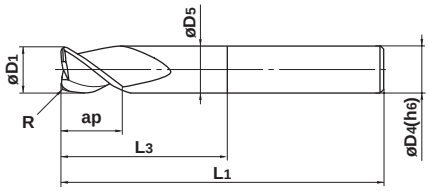
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J386

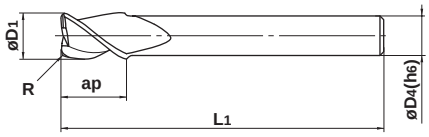
C-3SARB

Corner radius, Short cut length, 3 flute, For aluminium 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	Aluminium Alloy
						○	◎



Type1



Type2

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
12 ≤D4 ≤16	20 ≤D4 ≤25			
0 - 0.011	0 - 0.013			

h6

● High efficiency machining for aluminium alloys.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C3SARBD1200N0300R100	12	1	15	30	11.4	75	12	3	●	1
D1200N0300R320	12	3.2	15	30	11.4	75	12	3	●	1
D1200N0400R100	12	1	15	40	11.4	125	12	3	●	1
D1200N0400R320	12	3.2	15	40	11.4	125	12	3	●	1
D1600N0450R100	16	1	15	45	15.4	125	16	3	●	1
D1600N0450R320	16	3.2	15	45	15.4	125	16	3	●	1
D1600N0700R100	16	1	15	70	15.4	150	16	3	●	1
D1600N0700R320	16	3.2	15	70	15.4	150	16	3	●	1
D1800R100	18	1	18	—	—	150	16	3	●	2
D1800R320	18	3.2	18	—	—	150	16	3	●	2
D2000N0600R100	20	1	20	60	18.0	125	20	3	●	1
D2000N0600R320	20	3.2	20	60	18.0	125	20	3	●	1
D2000N0600R400	20	4	20	60	18.0	125	20	3	●	1
D2000N0850R100	20	1	20	85	18.0	150	20	3	●	1
D2000N0850R320	20	3.2	20	85	18.0	150	20	3	●	1
D2000N0850R400	20	4	20	85	18.0	150	20	3	●	1
D2500N0650R320	25	3.2	20	65	23.0	125	25	3	●	1
D2500N0650R400	25	4	20	65	23.0	125	25	3	●	1
D2500N0650R500	25	5	20	65	23.0	125	25	3	●	1
D2500N0900R320	25	3.2	20	90	23.0	150	25	3	●	1
D2500N0900R400	25	4	20	90	23.0	150	25	3	●	1
D2500N0900R500	25	5	20	90	23.0	150	25	3	●	1

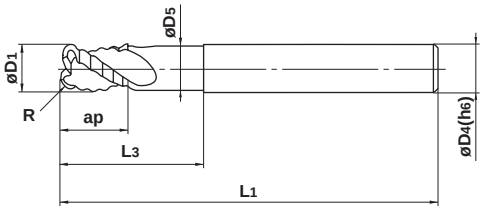
CRN END ALIMASTER

C-SRARB

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	Aluminium Alloy
							◎



Type1

h6

D4=10	12 ≤D4 ≤16	20 ≤D4 ≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

3 flute uncoated end mill for roughing aluminium alloy.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
CSRARBD1000R100	10	1	12	25	9.4	75	10	3	●	1
D1000R200	10	2	12	25	9.4	75	10	3	●	1
D1200R100	12	1	15	30	11.4	75	12	3	●	1
D1200R200	12	2	15	30	11.4	75	12	3	●	1
D1600R200	16	2	18	35	15.4	100	16	3	●	1
D1600R300	16	3	18	35	15.4	100	16	3	●	1
D2000R200	20	2	25	50	18.0	125	20	3	●	1
D2000R300	20	3	25	50	18.0	125	20	3	●	1
D2500R300	25	3	30	60	23.0	125	25	3	●	1
D2500R400	25	4	30	60	23.0	125	25	3	●	1
D2500R500	25	5	30	60	23.0	125	25	3	●	1

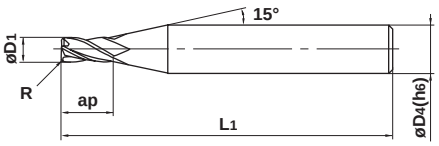
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J194

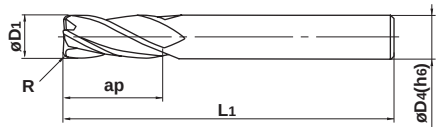
MS4MRB

Corner radius 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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

4 flute corner radius end mill for general use.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4MRBD0300R010	3	0.1	8	45	6	4	●	1
D0300R020	3	0.2	8	45	6	4	●	1
D0300R030	3	0.3	8	45	6	4	●	1
D0300R050	3	0.5	8	45	6	4	●	1
D0300R100	3	1	8	45	6	4	●	1
D0400R010	4	0.1	11	45	6	4	●	1
D0400R020	4	0.2	11	45	6	4	●	1
D0400R030	4	0.3	11	45	6	4	●	1
D0400R050	4	0.5	11	45	6	4	●	1
D0400R100	4	1	11	45	6	4	●	1
D0500R010	5	0.1	13	50	6	4	●	1
D0500R020	5	0.2	13	50	6	4	●	1
D0500R030	5	0.3	13	50	6	4	●	1
D0500R050	5	0.5	13	50	6	4	●	1
D0500R100	5	1	13	50	6	4	●	1
D0600R010	6	0.1	13	50	6	4	●	2
D0600R020	6	0.2	13	50	6	4	●	2
D0600R030	6	0.3	13	50	6	4	●	2
D0600R050	6	0.5	13	50	6	4	●	2
D0600R100	6	1	13	50	6	4	●	2
D0600R150	6	1.5	13	50	6	4	●	2
D0600R200	6	2	13	50	6	4	●	2
D0800R020	8	0.2	19	60	8	4	●	2
D0800R030	8	0.3	19	60	8	4	●	2
D0800R050	8	0.5	19	60	8	4	●	2
D0800R100	8	1	19	60	8	4	●	2
D0800R150	8	1.5	19	60	8	4	●	2
D0800R200	8	2	19	60	8	4	●	2
D0800R250	8	2.5	19	60	8	4	●	2
D0800R300	8	3	19	60	8	4	●	2
D1000R020	10	0.2	22	70	10	4	●	2
D1000R030	10	0.3	22	70	10	4	●	2
D1000R050	10	0.5	22	70	10	4	●	2
D1000R100	10	1	22	70	10	4	●	2

MS4MRB

Corner radius end mill, Medium cut length, 4 flute

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4MRBD1000R150	10	1.5	22	70	10	4	●	2
D1000R200	10	2	22	70	10	4	●	2
D1000R250	10	2.5	22	70	10	4	●	2
D1000R300	10	3	22	70	10	4	●	2
D1200R020	12	0.2	26	75	12	4	●	2
D1200R030	12	0.3	26	75	12	4	●	2
D1200R050	12	0.5	26	75	12	4	●	2
D1200R100	12	1	26	75	12	4	●	2
D1200R150	12	1.5	26	75	12	4	●	2
D1200R200	12	2	26	75	12	4	●	2
D1200R250	12	2.5	26	75	12	4	●	2
D1200R300	12	3	26	75	12	4	●	2
D1600R050	16	0.5	32	90	16	4	●	2
D1600R100	16	1	32	90	16	4	●	2
D1600R150	16	1.5	32	90	16	4	●	2
D1600R200	16	2	32	90	16	4	●	2
D1600R250	16	2.5	32	90	16	4	●	2
D1600R300	16	3	32	90	16	4	●	2
D2000R050	20	0.5	38	100	20	4	●	2
D2000R100	20	1	38	100	20	4	●	2
D2000R150	20	1.5	38	100	20	4	●	2
D2000R200	20	2	38	100	20	4	●	2
D2000R250	20	2.5	38	100	20	4	●	2
D2000R300	20	3	38	100	20	4	●	2

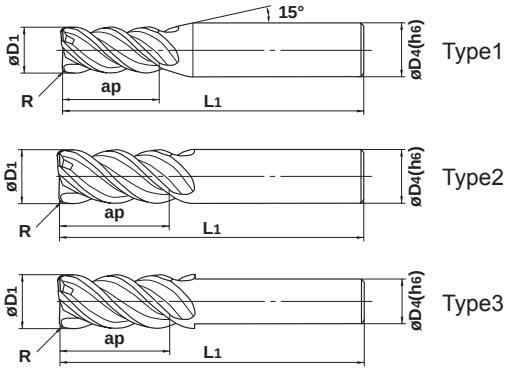
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J307

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	Aluminium Alloy
◎	◎	○		◎	◎		



R				
0.2 ≤R ≤6.35				
±0.020				
D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
h6	4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≦16	D4=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	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MSMHDRBD0200R020	2	0.2	4	45	4	4	●	1
D0200R030	2	0.3	4	45	4	4	●	1
D0300R020	3	0.2	8	45	6	4	●	1
D0300R030	3	0.3	8	45	6	4	●	1
D0300R050	3	0.5	8	45	6	4	●	1
D0400R020	4	0.2	11	45	6	4	●	1
D0400R030	4	0.3	11	45	6	4	●	1
D0400R050	4	0.5	11	45	6	4	●	1
D0500R020	5	0.2	13	50	6	4	●	1
D0500R030	5	0.3	13	50	6	4	●	1
D0500R050	5	0.5	13	50	6	4	●	1
D0500R100	5	1	13	50	6	4	●	1
D0600R030	6	0.3	13	50	6	4	●	2
D0600R050	6	0.5	13	50	6	4	●	2
D0600R100	6	1	13	50	6	4	●	2
D0800R030	8	0.3	19	60	8	4	●	2
D0800R050	8	0.5	19	60	8	4	●	2
D0800R100	8	1	19	60	8	4	●	2
D0800R150	8	1.5	19	60	8	4	●	2
D1000R030	10	0.3	22	70	10	4	●	2
D1000R050	10	0.5	22	70	10	4	●	2
D1000R100	10	1	22	70	10	4	●	2
D1000R150	10	1.5	22	70	10	4	●	2
D1000R200	10	2	22	70	10	4	●	2
D1200R050S10	12	0.5	26	75	10	4	●	3
D1200R100S10	12	1	26	75	10	4	●	3
D1200R150S10	12	1.5	26	75	10	4	●	3
D1200R200S10	12	2	26	75	10	4	●	3
D1200R300S10	12	3	26	75	10	4	●	3
D1200R050	12	0.5	26	75	12	4	●	2
D1200R100	12	1	26	75	12	4	●	2
D1200R150	12	1.5	26	75	12	4	●	2
D1200R200	12	2	26	75	12	4	●	2
D1200R300	12	3	26	75	12	4	●	2

MSMHDRB

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

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MSMHDRBD1600R100	16	1	35	90	16	4	●	2
D1600R150	16	1.5	35	90	16	4	●	2
D1600R200	16	2	35	90	16	4	●	2
D1600R300	16	3	35	90	16	4	●	2
NEW D1600R500	16	5	35	90	16	4	●	2
D1800R100	18	1	40	100	16	4	●	3
D1800R150	18	1.5	40	100	16	4	●	3
D1800R200	18	2	40	100	16	4	●	3
D1800R300	18	3	40	100	16	4	●	3
D2000R100	20	1	45	110	20	4	●	2
D2000R150	20	1.5	45	110	20	4	●	2
D2000R200	20	2	45	110	20	4	●	2
D2000R300	20	3	45	110	20	4	●	2
NEW D2000R500	20	5	45	110	20	4	●	2
NEW D2000R635	20	6.35	45	110	20	4	●	2

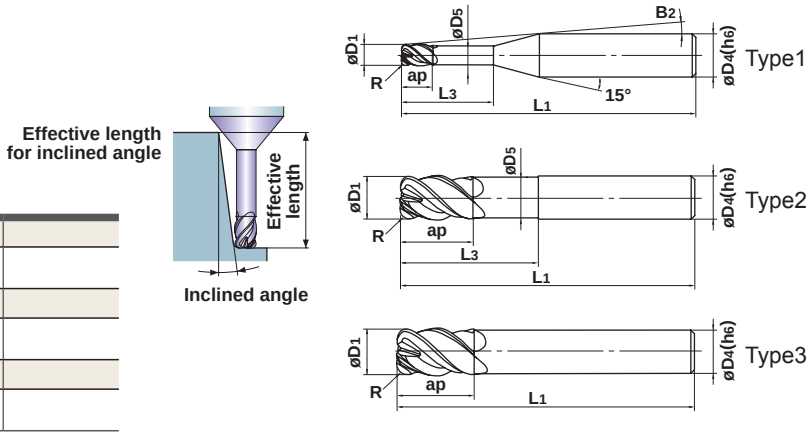
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J308

VF-HVRB

4 flute, Corner radius, Short cut length,Irregular helix flutes

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	Aluminium Alloy
◎	◎	◎	◎	○	○		



R	D1 ≤10	D1>10			
	±0.007	±0.01			
	D1 ≤12	D1>12			
	0 - 0.02	0 - 0.03			
h6	D4=6	8 ≤D4 ≤10	12 ≤D4 ≤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	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D0100R02N006	1	0.2	1	6	0.94	9.2°	60	6	4	●	1	6.4	6.7	7.2	7.7
D0100R02N008	1	0.2	1	8	0.94	8.2°	60	6	4	●	1	8.5	8.8	9.5	10.2
D0100R02N010	1	0.2	1	10	0.94	7.4°	60	6	4	●	1	10.5	11	11.8	12.7
D0100R02N015	1	0.2	1	15	0.94	5.9°	60	6	4	●	1	15.8	16.3	17.5	18.9
D0100R02N020	1	0.2	1	20	0.94	4.9°	80	6	4	●	1	20.9	21.7	23.3	25.1
D0150R03N004	1.5	0.3	1.5	4	1.44	10.3°	60	6	4	●	1	4.2	4.5	4.6	5.2
D0150R03N006	1.5	0.3	1.5	6	1.44	8.9°	60	6	4	●	1	6.3	6.6	7.2	7.7
D0150R03N010	1.5	0.3	1.5	10	1.44	7°	60	6	4	●	1	10.5	10.9	11.8	12.7
D0150R03N015	1.5	0.3	1.5	15	1.44	5.5°	60	6	4	●	1	15.7	16.3	17.5	18.9
D0150R03N020	1.5	0.3	1.5	20	1.44	4.6°	80	6	4	●	1	20.9	21.6	23.3	25.1
D0150R03N025	1.5	0.3	1.5	25	1.44	3.9°	80	6	4	●	1	26.1	27	29	31.3
D0150R03N030	1.5	0.3	1.5	30	1.44	3.4°	80	6	4	●	1	31.3	32.3	34.7	37.5
D0200R05N006	2	0.5	2	6	1.9	8.7°	60	6	4	●	1	6.3	6.5	7	7.5
D0200R05N010	2	0.5	2	10	1.9	6.7°	60	6	4	●	1	10.5	10.8	11.6	12.5
D0200R05N015	2	0.5	2	15	1.9	5.2°	60	6	4	●	1	15.6	16.2	17.4	18.7
D0200R05N020	2	0.5	2	20	1.9	4.3°	80	6	4	●	1	20.8	21.5	23.1	24.9
D0200R05N025	2	0.5	2	25	1.9	3.6°	80	6	4	●	1	26	26.9	28.9	31.2
D0200R05N030	2	0.5	2	30	1.9	3.1°	80	6	4	●	1	31.2	32.2	34.6	37.4
D0200R05N035	2	0.5	2	35	1.9	2.8°	90	6	4	●	1	36.3	37.6	40.4	*
D0200R05N040	2	0.5	2	40	1.9	2.5°	90	6	4	●	1	41.5	42.9	46.1	*
D0300R05N010	3	0.5	3	10	2.9	5.6°	60	6	4	●	1	10.5	10.8	11.6	12.5
D0300R05N015	3	0.5	3	15	2.9	4.3°	60	6	4	●	1	15.6	16.2	17.4	18.7
D0300R05N020	3	0.5	3	20	2.9	3.4°	80	6	4	●	1	20.8	21.5	23.1	24.9
D0300R05N030	3	0.5	3	30	2.9	2.5°	80	6	4	●	1	31.2	32.2	34.6	*
D0300R08N010	3	0.8	3	10	2.9	5.7°	60	6	4	●	1	10.4	10.8	11.6	12.4
D0300R08N015	3	0.8	3	15	2.9	4.3°	60	6	4	●	1	15.6	16.2	17.3	18.7
D0300R08N020	3	0.8	3	20	2.9	3.5°	80	6	4	●	1	20.8	21.5	23.1	24.9
D0300R08N030	3	0.8	3	30	2.9	2.5°	80	6	4	●	1	31.1	32.2	34.6	*
D0300R08N040	3	0.8	3	40	2.9	2°	90	6	4	●	1	41.5	42.9	*	*
D0300R08N050	3	0.8	3	50	2.9	1.6°	90	6	4	●	1	51.8	53.6	*	*
D0400R05N012	4	0.5	4	12	3.9	3.8°	60	6	4	●	1	12.5	13	13.9	15
D0400R05N020	4	0.5	4	20	3.9	2.5°	80	6	4	●	1	20.8	21.5	23.1	*
D0400R05N030	4	0.5	4	30	3.9	1.8°	80	6	4	●	1	31.2	32.2	*	*

* No interference

CUTTING CONDITIONS ➤ J332

4 FLUTE, CORNER RADIUS, SHORT CUT LENGTH,IRREGULAR HELIX FLUTES

VF-HVRB

4 flute, Corner radius, Short cut length,Irregular helix flutes

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
VFHVRBD0400R05N048	4	0.5	4	48	3.9	1.2°	90	6	4	●	1	49.8	51.5	⁎	⁎
D0400R10N012	4	1	4	12	3.9	3.9°	60	6	4	●	1	12.5	12.9	13.8	14.9
D0400R10N020	4	1	4	20	3.9	2.5°	80	6	4	●	1	20.8	21.5	23	⁎
D0400R10N030	4	1	4	30	3.9	1.8°	80	6	4	●	1	31.1	32.2	⁎	⁎
D0600R05N018	6	0.5	9	18	5.85	—	60	6	4	●	2	⁎	⁎	⁎	⁎
D0600R05N030	6	0.5	9	30	5.85	—	80	6	4	●	2	⁎	⁎	⁎	⁎
D0600R10N018	6	1	9	18	5.85	—	60	6	4	●	2	⁎	⁎	⁎	⁎
D0600R10N030	6	1	9	30	5.85	—	80	6	4	●	2	⁎	⁎	⁎	⁎
D0600R10N054	6	1	9	54	5.85	—	90	6	4	●	2	⁎	⁎	⁎	⁎
D0600R15N018	6	1.5	9	18	5.85	—	60	6	4	●	2	⁎	⁎	⁎	⁎
D0600R15N030	6	1.5	9	30	5.85	—	80	6	4	●	2	⁎	⁎	⁎	⁎
D0600R15N042	6	1.5	9	42	5.85	—	90	6	4	●	2	⁎	⁎	⁎	⁎
D0600R15N054	6	1.5	9	54	5.85	—	90	6	4	●	2	⁎	⁎	⁎	⁎
D0600R20N018	6	2	9	18	5.85	—	60	6	4	●	2	⁎	⁎	⁎	⁎
D0600R20N030	6	2	9	30	5.85	—	80	6	4	●	2	⁎	⁎	⁎	⁎
D0700R15	7	1.5	11	—	—	—	80	6	4	●	3	⁎	⁎	⁎	⁎
D0800R05N024	8	0.5	12	24	7.85	—	60	8	4	●	2	⁎	⁎	⁎	⁎
D0800R05N040	8	0.5	12	40	7.85	—	100	8	4	●	2	⁎	⁎	⁎	⁎
D0800R10N024	8	1	12	24	7.85	—	60	8	4	●	2	⁎	⁎	⁎	⁎
D0800R10N040	8	1	12	40	7.85	—	100	8	4	●	2	⁎	⁎	⁎	⁎
D0800R20N024	8	2	12	24	7.85	—	60	8	4	●	2	⁎	⁎	⁎	⁎
D0800R20N040	8	2	12	40	7.85	—	100	8	4	●	2	⁎	⁎	⁎	⁎
D0800R20N056	8	2	12	56	7.85	—	120	8	4	●	2	⁎	⁎	⁎	⁎
D0800R20N072	8	2	12	72	7.85	—	120	8	4	●	2	⁎	⁎	⁎	⁎
D0900R20	9	2	13.5	—	—	—	100	8	4	●	3	⁎	⁎	⁎	⁎
D1000R05N030	10	0.5	15	30	9.7	—	70	10	4	●	2	⁎	⁎	⁎	⁎
D1000R05N050	10	0.5	15	50	9.7	—	110	10	4	●	2	⁎	⁎	⁎	⁎
D1000R10N030	10	1	15	30	9.7	—	70	10	4	●	2	⁎	⁎	⁎	⁎
D1000R10N050	10	1	15	50	9.7	—	110	10	4	●	2	⁎	⁎	⁎	⁎
D1000R20N030	10	2	15	30	9.7	—	70	10	4	●	2	⁎	⁎	⁎	⁎
D1000R20N050	10	2	15	50	9.7	—	110	10	4	●	2	⁎	⁎	⁎	⁎
D1000R20N070	10	2	15	70	9.7	—	150	10	4	●	2	⁎	⁎	⁎	⁎
D1000R20N090	10	2	15	90	9.7	—	150	10	4	●	2	⁎	⁎	⁎	⁎
D1100R20	11	2	16.5	—	—	—	110	10	4	●	3	⁎	⁎	⁎	⁎
D1200R05N036	12	0.5	18	36	11.7	—	80	12	4	●	2	⁎	⁎	⁎	⁎
D1200R05N060	12	0.5	18	60	11.7	—	120	12	4	●	2	⁎	⁎	⁎	⁎
D1200R10N036	12	1	18	36	11.7	—	80	12	4	●	2	⁎	⁎	⁎	⁎
D1200R10N060	12	1	18	60	11.7	—	120	12	4	●	2	⁎	⁎	⁎	⁎
D1200R20N036	12	2	18	36	11.7	—	80	12	4	●	2	⁎	⁎	⁎	⁎
D1200R20N060	12	2	18	60	11.7	—	120	12	4	●	2	⁎	⁎	⁎	⁎
D1200R20N084	12	2	18	84	11.7	—	160	12	4	●	2	⁎	⁎	⁎	⁎
D1200R20N108	12	2	18	108	11.7	—	160	12	4	●	2	⁎	⁎	⁎	⁎
D1200R30N036	12	3	18	36	11.7	—	80	12	4	●	2	⁎	⁎	⁎	⁎
D1200R30N060	12	3	18	60	11.7	—	120	12	4	●	2	⁎	⁎	⁎	⁎
D1300R30	13	3	19.5	—	—	—	120	12	4	●	3	⁎	⁎	⁎	⁎
D1600R05N042	16	0.5	24	42	15.5	—	100	16	4	●	2	⁎	⁎	⁎	⁎
D1600R20N042	16	2	24	42	15.5	—	100	16	4	●	2	⁎	⁎	⁎	⁎
D1600R30N042	16	3	24	42	15.5	—	100	16	4	●	2	⁎	⁎	⁎	⁎
D1600R30N080	16	3	24	80	15.5	—	140	16	4	●	2	⁎	⁎	⁎	⁎
D1600R30N120	16	3	24	120	15.5	—	175	16	4	●	2	⁎	⁎	⁎	⁎

⁎ No interference

● : Inventory maintained in Japan.

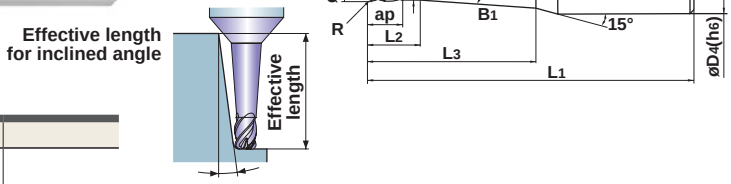
CUTTING CONDITIONS ➢ J332

VF-HVRB NEW

4 flute, Corner radius, Short cut length,Irregular helix flutes

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	Aluminium Alloy
◎	◎	◎	◎	○	○		

Taper neck type



R	D1 ≤10	D1>10			
	±0.007	±0.01			
	D1 ≤12				
	0 - 0.02				
h6	D4=6	8 ≤D4 ≤10	12 ≤D4 ≤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	Dia. D1	Corner R R	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Length of Straight Neck L2	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D010R02N010T09	1	0.2	0.9°	1	10	2.5	0.94	7.5°	60	6	4	●	—	10.6	11.4	12.3
D010R02N015T09	1	0.2	0.9°	1	15	2.5	0.94	6.1°	60	6	4	●	—	15.6	16.8	18.1
D010R02N020T09	1	0.2	0.9°	1	20	2.5	0.94	5.1°	80	6	4	●	—	20.6	22.1	23.9
D010R02N025T09	1	0.2	0.9°	1	25	2.5	0.94	4.4°	80	6	4	●	—	25.6	27.5	29.7
D010R02N030T09	1	0.2	0.9°	1	30	2.5	0.94	3.8°	80	6	4	●	—	30.6	32.9	35.5
D010R02N035T09	1	0.2	0.9°	1	35	2.5	0.94	3.4°	90	6	4	●	—	35.6	38.3	41.3
D010R02N040T09	1	0.2	0.9°	1	40	2.5	0.94	3.1°	90	6	4	●	—	40.6	43.6	47.2
D010R02N045T09	1	0.2	0.9°	1	45	2.5	0.94	2.8°	90	6	4	●	—	45.6	49	*
D010R02N050T09	1	0.2	0.9°	1	50	2.5	0.94	2.6°	90	6	4	●	—	50.6	54.4	*
D015R03N010T09	1.5	0.3	0.9°	1.5	10	3	1.44	7.1°	60	6	4	●	—	10.6	11.4	12.3
D015R03N015T09	1.5	0.3	0.9°	1.5	15	3	1.44	5.7°	60	6	4	●	—	15.6	16.8	18.1
D015R03N020T09	1.5	0.3	0.9°	1.5	20	3	1.44	4.7°	80	6	4	●	—	20.6	22.2	23.9
D015R03N030T09	1.5	0.3	0.9°	1.5	30	3	1.44	3.5°	80	6	4	●	—	30.6	32.9	35.6
D015R03N040T09	1.5	0.3	0.9°	1.5	40	3	1.44	2.8°	90	6	4	●	—	40.6	43.7	*
D015R03N050T09	1.5	0.3	0.9°	1.5	50	3	1.44	2.4°	90	6	4	●	—	50.6	54.4	*
D020R05N015T04	2	0.5	0.4°	2	15	4	1.9	5.2°	60	6	4	●	15.6	16.2	17.4	18.7
D020R05N020T04	2	0.5	0.4°	2	20	4	1.9	4.3°	80	6	4	●	20.6	21.3	22.9	24.7
D020R05N025T04	2	0.5	0.4°	2	25	4	1.9	3.6°	80	6	4	●	25.6	26.5	28.5	30.8
D020R05N030T04	2	0.5	0.4°	2	30	4	1.9	3.2°	80	6	4	●	30.6	31.7	34	36.8
D020R05N035T04	2	0.5	0.4°	2	35	4	1.9	2.8°	80	6	4	●	35.6	36.9	39.6	*
D020R05N040T04	2	0.5	0.4°	2	40	4	1.9	2.5°	80	6	4	●	40.6	42	45.2	*
D020R05N020T09	2	0.5	0.9°	2	20	4	1.9	4.4°	80	6	4	●	—	20.8	22.3	24.1
D020R05N025T09	2	0.5	0.9°	2	25	4	1.9	3.7°	90	6	4	●	—	25.8	27.7	29.9
D020R05N030T09	2	0.5	0.9°	2	30	4	1.9	3.2°	90	6	4	●	—	30.8	33	35.7
D020R05N035T09	2	0.5	0.9°	2	35	4	1.9	2.9°	90	6	4	●	—	35.8	38.4	*
D020R05N040T09	2	0.5	0.9°	2	40	4	1.9	2.6°	90	6	4	●	—	40.8	43.8	*
D020R05N045T09	2	0.5	0.9°	2	45	4	1.9	2.3°	90	6	4	●	—	45.8	49.2	*
D020R05N050T09	2	0.5	0.9°	2	50	4	1.9	2.2°	100	6	4	●	—	50.8	54.5	*
D020R05N055T09	2	0.5	0.9°	2	55	4	1.9	2°	100	6	4	●	—	55.8	59.9	*
D020R05N060T09	2	0.5	0.9°	2	60	4	1.9	1.8°	100	6	4	●	—	60.8	*	*
D030R08N020T09	3	0.8	0.9°	3	20	6	2.9	3.6°	80	6	4	●	—	20.9	22.4	24.1
D030R08N025T09	3	0.8	0.9°	3	25	6	2.9	3°	80	6	4	●	—	25.9	27.8	30
D030R08N030T09	3	0.8	0.9°	3	30	6	2.9	2.6°	80	6	4	●	—	30.9	33.1	*

* No interference

CUTTING CONDITIONS ➤ J332

4 FLUTE, CORNER RADIUS, SHORT CUT LENGTH,IRREGULAR HELIX FLUTES

VF-HVRB NEW

4 flute, Corner radius, Short cut length,Irregular helix flutes

Unit : mm

Order Number	Dia. D_1	Corner R R	Taper Angle One Side B_1	Length of Cut ap	Neck Length L_3	Length of Straight Neck L_2	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Effective length for inclined angle 30'	1°	2°	3°
VFHVRBD030R08N040T09	3	0.8	0.9°	3	40	6	2.9	2°	90	6	4	●	—	40.9	43.9	*
D030R08N050T09	3	0.8	0.9°	3	50	6	2.9	1.7°	90	6	4	●	—	50.9	*	*
D030R08N060T09	3	0.8	0.9°	3	60	6	2.9	1.4°	100	6	4	●	—	60.9	*	*
D040R10N025T04	4	1	0.4°	4	25	7	3.9	2.1°	80	6	4	●	25.7	26.6	28.5	*
D040R10N030T04	4	1	0.4°	4	30	7	3.9	1.8°	80	6	4	●	30.7	31.8	*	*
D040R10N035T04	4	1	0.4°	4	35	7	3.9	1.6°	80	6	4	●	35.7	36.9	*	*
D040R10N040T04	4	1	0.4°	4	40	7	3.9	1.4°	80	6	4	●	40.7	42.1	*	*
D040R10N045T04	4	1	0.4°	4	45	7	3.9	1.3°	90	6	4	●	45.7	47.3	*	*
D040R10N050T04	4	1	0.4°	4	50	7	3.9	1.2°	90	6	4	●	50.7	52.5	*	*
D040R10N025T09	4	1	0.9°	4	25	7	3.9	2.2°	90	6	4	●	—	25.9	27.8	*
D040R10N030T09	4	1	0.9°	4	30	7	3.9	1.9°	90	6	4	●	—	30.9	*	*
D040R10N040T09	4	1	0.9°	4	40	7	3.9	1.4°	100	6	4	●	—	40.9	*	*
D040R10N050T09	4	1	0.9°	4	50	7	3.9	1.2°	100	6	4	●	—	50.9	*	*
D040R10N060T09	4	1	0.9°	4	60	7	3.9	1°	100	6	4	●	—	60.9	*	*
D060R15N040T09	6	1.5	0.9°	9	40	12	5.85	1.4°	110	8	4	●	—	41.4	*	*
D060R15N050T09	6	1.5	0.9°	9	50	12	5.85	1.2°	110	8	4	●	—	51.4	*	*
D060R15N060T09	6	1.5	0.9°	9	60	12	5.85	1°	110	8	4	●	—	61.4	*	*
D060R15N070T09	6	1.5	0.9°	9	70	12	5.85	0.9°	110	8	4	●	—	*	*	*
D080R20N060T09	8	2	0.9°	12	60	15	7.85	1°	150	10	4	●	—	61.5	*	*
D080R20N080T09	8	2	0.9°	12	80	15	7.85	0.8°	150	10	4	●	—	*	*	*
D100R20N080T09	10	2	0.9°	15	80	18	9.7	2°	130	16	4	●	—	82	88	*
D100R20N120T09	10	2	0.9°	15	120	18	9.7	1.4°	180	16	4	●	—	122	*	*
D120R20N080T09	12	2	0.9°	18	80	21	11.7	1.4°	130	16	4	●	—	82.2	*	*
D120R20N120T09	12	2	0.9°	18	120	21	11.7	1°	180	16	4	●	—	122.2	*	*

* No interference

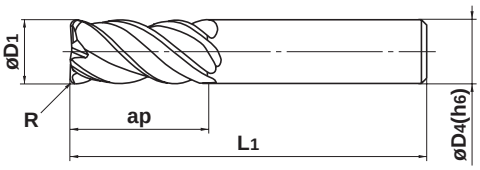
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J332

VF-MHVRB

Corner radius, Medium cut length, Irregular helix flutes

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	Aluminium Alloy
○	○	○		◎	◎		



Type1

R					
	0.5 ≤R ≤6.35				
	±0.015				
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			
h6	D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

● Vibration control end mill achieving stable machining of difficult-to-cut materials and for long overhang applications.

Unit : mm

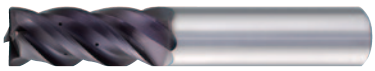
Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFMHVRBD0600R050	6	0.5	13	50	6	4	●	1
D0600R100	6	1	13	50	6	4	●	1
D0800R050	8	0.5	19	60	8	4	●	1
D0800R100	8	1	19	60	8	4	●	1
D1000R050	10	0.5	22	70	10	4	●	1
D1000R100	10	1	22	70	10	4	●	1
D1000R200	10	2	22	70	10	4	●	1
D1200R050	12	0.5	26	75	12	4	●	1
D1200R100	12	1	26	75	12	4	●	1
D1200R200	12	2	26	75	12	4	●	1
D1600R100	16	1	35	90	16	4	●	1
D1600R200	16	2	35	90	16	4	●	1
D1600R300	16	3	35	90	16	4	●	1
NEW D1600R500	16	5	35	90	16	4	●	1
D2000R100	20	1	45	110	20	4	●	1
D2000R200	20	2	45	110	20	4	●	1
D2000R300	20	3	45	110	20	4	●	1
D2000R400	20	4	45	110	20	4	●	1
NEW D2000R500	20	5	45	110	20	4	●	1
NEW D2000R635	20	6.35	45	110	20	4	●	1

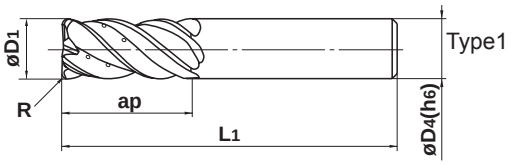
VF-MHVRB-CH

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS





R					
	1 ≤R ≤3				
	±0.015				
	16 ≤D1 ≤20				
	0 - 0.03				
h6	D4=16	D4=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	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VFMHVRBCHD1600R100	16	1	35	90	16	4	●	1
D1600R300	16	3	35	90	16	4	●	1
D2000R100	20	1	45	110	20	4	●	1
D2000R300	20	3	45	110	20	4	●	1

● : Inventory maintained in Japan.

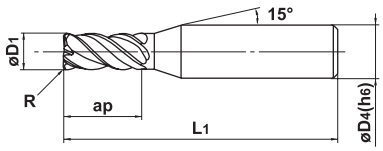
CUTTING CONDITIONS ➤ J338

VQ-MHVRB NEW

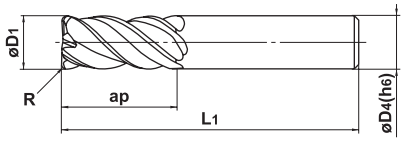
Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes

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	Aluminium Alloy
◎	○			◎	◎	○	



Type1



Type2

R				
0.2 ≤R ≤6.35				
±0.015				
h6	D1 ≤12	D1>12		
	0 - 0.02	0 - 0.03		
	4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=12
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

Smart Miracle vibration control end mill achieving stable machining of difficult-to-cut materials and for long overhang applications.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VQMHVRBD0200R020	2	0.2	4	45	4	4	●	1
D0200R030	2	0.3	4	45	4	4	●	1
D0300R020	3	0.2	8	45	6	4	●	1
D0300R030	3	0.3	8	45	6	4	●	1
D0300R050	3	0.5	8	45	6	4	●	1
D0400R020	4	0.2	11	45	6	4	●	1
D0400R030	4	0.3	11	45	6	4	●	1
D0400R050	4	0.5	11	45	6	4	●	1
D0500R020	5	0.2	13	50	6	4	●	1
D0500R030	5	0.3	13	50	6	4	●	1
D0500R050	5	0.5	13	50	6	4	●	1
D0500R100	5	1	13	50	6	4	●	1
D0600R030	6	0.3	13	50	6	4	●	2
D0600R050	6	0.5	13	50	6	4	●	2
D0600R100	6	1	13	50	6	4	●	2
D0800R030	8	0.3	19	60	8	4	●	2
D0800R050	8	0.5	19	60	8	4	●	2
D0800R100	8	1	19	60	8	4	●	2
D0800R150	8	1.5	19	60	8	4	●	2
D1000R030	10	0.3	22	70	10	4	●	2
D1000R050	10	0.5	22	70	10	4	●	2
D1000R100	10	1	22	70	10	4	●	2
D1000R150	10	1.5	22	70	10	4	●	2
D1000R200	10	2	22	70	10	4	●	2
D1200R050	12	0.5	26	75	12	4	●	2
D1200R100	12	1	26	75	12	4	●	2
D1200R150	12	1.5	26	75	12	4	●	2
D1200R200	12	2	26	75	12	4	●	2
D1200R250	12	2.5	26	75	12	4	●	2
D1200R300	12	3	26	75	12	4	●	2
D1600R100	16	1	35	90	16	4	●	2
D1600R150	16	1.5	35	90	16	4	●	2
D1600R200	16	2	35	90	16	4	●	2
D1600R250	16	2.5	35	90	16	4	●	2

CUTTING CONDITIONS ➤ J345

VQ-MHVRB

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

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
VQMHVRBD1600R300	16	3	35	90	16	4	●	2
D1600R400	16	4	35	90	16	4	●	2
D1600R500	16	5	35	90	16	4	●	2
D2000R100	20	1	45	110	20	4	●	2
D2000R150	20	1.5	45	110	20	4	●	2
D2000R200	20	2	45	110	20	4	●	2
D2000R250	20	2.5	45	110	20	4	●	2
D2000R300	20	3	45	110	20	4	●	2
D2000R400	20	4	45	110	20	4	●	2
D2000R500	20	5	45	110	20	4	●	2
D2000R635	20	6.35	45	110	20	4	●	2

● : Inventory maintained in Japan.

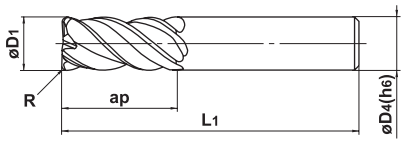
CUTTING CONDITIONS ➤ J345

VQ-MHVRB-F NEW

Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes (for finishing)

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	Aluminium Alloy
○	○			◎	◎	○	



Type1

R					
0.3 ≤R ≤2					
±0.015					
D1 ≤12	D1>12				
0 - 0.02	0 - 0.03				
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16			
0 - 0.008	0 - 0.009	0 - 0.011			

- Smart Miracle vibration control end mill achieving stable machining of difficult-to-cut materials.
- With the special substrate, suitable for finishing of heat resistance alloy, etc.

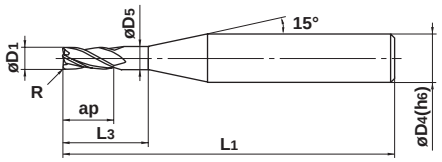
Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VQMHVRBFD0600R030	6	0.3	13	50	6	4	●	1
D0600R050	6	0.5	13	50	6	4	●	1
D0600R100	6	1	13	50	6	4	●	1
D0800R050	8	0.5	19	60	8	4	●	1
D0800R100	8	1	19	60	8	4	●	1
D1000R030	10	0.3	22	70	10	4	●	1
D1000R050	10	0.5	22	70	10	4	●	1
D1000R100	10	1	22	70	10	4	●	1
D1000R200	10	2	22	70	10	4	●	1
D1200R100	12	1	26	75	12	4	●	1
D1200R200	12	2	26	75	12	4	●	1
D1200R300	12	3	26	75	12	4	●	1
D1600R100	16	1	35	90	16	4	●	1
D1600R200	16	2	35	90	16	4	●	1

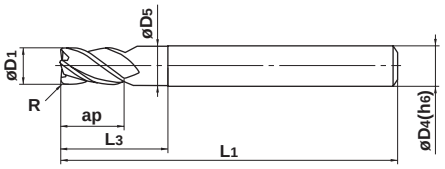
VC-4SRB

Corner radius 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	Aluminium Alloy
○	◎	◎	○	○	○		



Type1



Type2

4 ≤D1 ≤12				
0 - 0.020				
D4=6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

● 4 flute corner radius end mill with relieved neck for 3×D length of reach.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4SRBD0400R0050	4	0.5	4	12	3.8	45	6	4	●	1
D0600R0050	6	0.5	6	18	5.8	50	6	4	●	2
D0600R0100	6	1	6	18	5.8	50	6	4	●	2
D0800R0050	8	0.5	8	24	7.8	60	8	4	●	2
D0800R0100	8	1	8	24	7.8	60	8	4	●	2
D1000R0100	10	1	10	30	9.7	70	10	4	●	2
D1000R0200	10	2	10	30	9.7	70	10	4	●	2
D1200R0100	12	1	12	36	11.7	75	12	4	●	2
D1200R0200	12	2	12	36	11.7	75	12	4	●	2

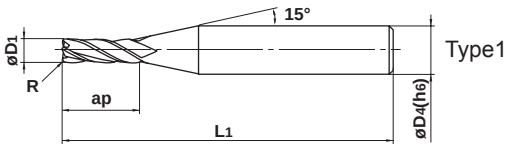
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J350

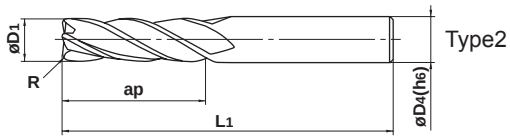
VC-4JRB

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	Aluminium Alloy
○	◎	◎	○	○	○		



Type1



Type2

h6

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

- 4 flute corner radius end mill for general use.
- 4 flute corner radius end mill for longer reach applications.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4JRBD0300R0030	3	0.3	12	50	6	4	●	1
D0400R0030	4	0.3	15	50	6	4	●	1
D0400R0050	4	0.5	15	50	6	4	●	1
D0500R0030	5	0.3	20	60	6	4	●	1
D0500R0050	5	0.5	20	60	6	4	●	1
D0600R0030	6	0.3	20	60	6	4	●	2
D0600R0050	6	0.5	20	60	6	4	●	2
D0600R0100	6	1	20	60	6	4	●	2
D0800R0030	8	0.3	25	70	8	4	●	2
D0800R0050	8	0.5	25	70	8	4	●	2
D0800R0100	8	1	25	70	8	4	●	2
D0800R0150	8	1.5	25	70	8	4	●	2
D0800R0200	8	2	25	70	8	4	●	2
D1000R0030	10	0.3	30	90	10	4	●	2
D1000R0050	10	0.5	30	90	10	4	●	2
D1000R0100	10	1	30	90	10	4	●	2
D1000R0150	10	1.5	30	90	10	4	●	2
D1000R0200	10	2	30	90	10	4	●	2
D1200R0050	12	0.5	30	90	12	4	●	2
D1200R0100	12	1	30	90	12	4	●	2
D1200R0150	12	1.5	30	90	12	4	●	2
D1200R0200	12	2	30	90	12	4	●	2
D1600R0050	16	0.5	50	110	16	4	●	2
D1600R0100	16	1	50	110	16	4	●	2
D1600R0150	16	1.5	50	110	16	4	●	2
D1600R0200	16	2	50	110	16	4	●	2
D2000R0050	20	0.5	55	110	20	4	●	2
D2000R0100	20	1	55	110	20	4	●	2
D2000R0150	20	1.5	55	110	20	4	●	2
D2000R0200	20	2	55	110	20	4	●	2

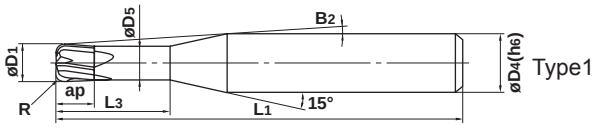
MIRACLE CORNER RADIUS END MILL FOR HIGH FEED MACHINING

VC-HFRB

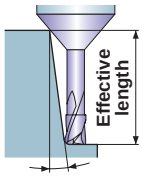
Corner radius, Short flute length, 4 flute, High feed machining

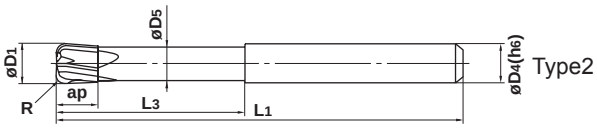
UWC | VC | 20° D1≤5 | 10° D1≥6

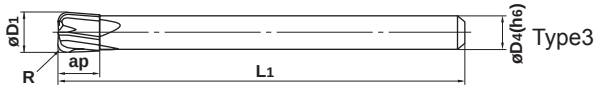
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	◎	○		○		



Effective length for inclined angle







R			
0.5 ≤R ≤3			
±0.015			
D1 ≤12	D1>12		
0 - 0.02	0 - 0.03		
h6	D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16
	0 - 0.008	0 - 0.009	0 - 0.011

Suitable for high feed and efficient machining of die & mould.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D0200R050N10	2	0.5	2	10	1.9	6.7°	70	6	4	●	1	10.4	10.8	11.5	12.4
D0300R075N09	3	0.75	3	9	2.9	6.2°	50	6	4	●	1	9.4	9.7	10.4	11.1
D0300R075N15	3	0.75	3	15	2.9	4.3°	70	6	4	●	1	15.6	16.1	17.3	18.6
D0400R100N12	4	1	4	12	3.9	3.9°	50	6	4	●	1	12.4	12.8	13.7	14.7
D0400R100N20	4	1	4	20	3.9	2.6°	70	6	4	●	1	20.7	21.4	22.9	*
D0500R120N15	5	1.2	5	15	4.9	1.9°	70	6	4	●	1	15.5	16	*	*
D0600R150N18	6	1.5	6	18	5.85	—	50	6	4	●	2	*	*	*	*
D0600R150N30	6	1.5	6	30	5.85	—	90	6	4	●	2	*	*	*	*
D0700R150A050	7	1.5	7	—	—	—	50	6	4	●	3	*	*	*	*
D0700R150A080	7	1.5	7	—	—	—	80	6	4	●	3	*	*	*	*
D0800R200N24	8	2	8	24	7.85	—	60	8	4	●	2	*	*	*	*
D0800R200N40	8	2	8	40	7.85	—	90	8	4	●	2	*	*	*	*
D0900R200A065	9	2	9	—	—	—	65	8	4	●	3	*	*	*	*
D0900R200A100	9	2	9	—	—	—	100	8	4	●	3	*	*	*	*
D1000R200N30	10	2	10	30	9.7	—	70	10	4	●	2	*	*	*	*
D1000R200N50	10	2	10	50	9.7	—	100	10	4	●	2	*	*	*	*
D1100R200A070	11	2	11	—	—	—	70	10	4	●	3	*	*	*	*
D1100R200A110	11	2	11	—	—	—	110	10	4	●	3	*	*	*	*
D1200R300N36	12	3	12	36	11.7	—	75	12	4	●	2	*	*	*	*
D1200R300N60	12	3	12	60	11.7	—	110	12	4	●	2	*	*	*	*
D1300R300A075	13	3	13	—	—	—	75	12	4	●	3	*	*	*	*
D1300R300A120	13	3	13	—	—	—	120	12	4	●	3	*	*	*	*
D1600R300N80	16	3	16	80	15.5	—	140	16	4	●	2	*	*	*	*

* No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J364

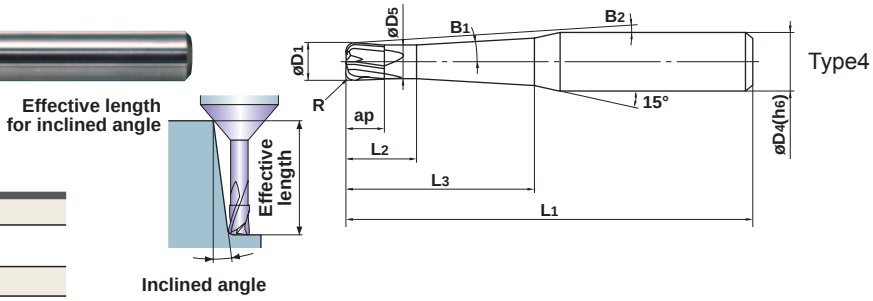
VC-HFRB

Corner radius, Short flute length, 4 flute, High feed machining

UWC VC 20° D1≤5 10° D1≥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	Aluminium Alloy
◎	◎	◎	○		○		

Taper neck type



R	0.5 ≤R ≤3			
	±0.015			
	D1 ≤12	D1>12		
	0 - 0.02	0 - 0.03		
h6	D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	
	0 - 0.008	0 - 0.009	0 - 0.011	

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

Unit : mm

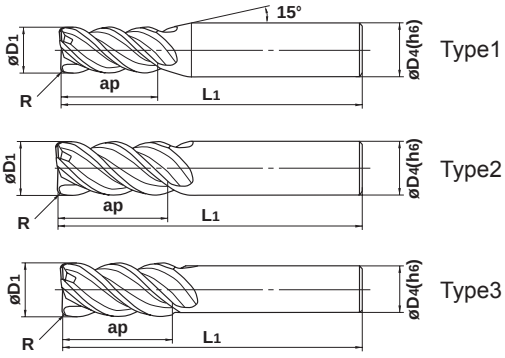
Order Number	Dia. D1	Corner R R	Taper Angle One Side B1	Length of Cut ap	Neck Length L3	Length of Straight Neck L2	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type	Effective length for inclined angle 1°	2°	3°
VCHFRBD0200R050N12	2	0.5	1°	2	12	4	1.9	6°	70	6	4	●	4	12.9	13.9	15
D0200R050N16	2	0.5	1°	2	16	4	1.9	5°	70	6	4	●	4	16.9	18.2	19.6
D0200R050N20	2	0.5	1°	2	20	4	1.9	4.3°	70	6	4	●	4	20.9	22.5	24.3
D0300R075N18	3	0.75	1°	3	18	6	2.9	3.8°	80	6	4	●	4	19.3	20.7	22.3
D0300R075N24	3	0.75	1°	3	24	6	2.9	3°	80	6	4	●	4	25.3	27.2	*
D0300R075N30	3	0.75	1°	3	30	6	2.9	2.6°	80	6	4	●	4	31.3	33.6	*
D0400R100N24	4	1	1°	4	24	8	3.9	2.2°	90	6	4	●	4	25.7	27.6	*
D0400R100N32	4	1	1°	4	32	8	3.9	1.7°	90	6	4	●	4	33.7	*	*
D0400R100N40	4	1	1°	4	40	8	3.9	1.4°	90	6	4	●	4	41.7	*	*
D0500R120N30	5	1.2	1°	5	30	8	4.9	1°	90	6	4	●	4	*	*	*
D0500R120N40	5	1.2	1°	5	40	8	4.9	2°	90	8	4	●	4	41.9	*	*
D0500R120N50	5	1.2	1°	5	50	8	4.9	1.7°	110	8	4	●	4	51.9	*	*
D0600R150N50	6	1.5	1°	6	50	16	5.85	1.2°	110	8	4	●	4	52.9	*	*
D0600R150N67	6	1.5	1°	6	67	16	5.85	0.9°	130	8	4	●	4	*	*	*
D0800R200N70	8	2	1°	8	70	18	7.85	0.9°	120	10	4	●	4	*	*	*
D0800R200N90	8	2	1°	8	90	18	7.85	1.3°	150	12	4	●	4	93.5	*	*
D1000R200N80	10	2	1°	10	80	20	9.7	2°	140	16	4	●	4	83.9	*	*
D1000R200N110	10	2	1°	10	110	20	9.7	1.5°	160	16	4	●	4	113.9	*	*
D1200R300N110	12	3	1°	12	110	24	11.7	1.1°	160	16	4	●	4	115.2	*	*

* No interference

VC-MHDRB

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	Aluminium Alloy
○	◎	◎	○	◎	◎		



D1≦12	D1>12			
0 - 0.02	0 - 0.03			
4≦D4≦6	8≦D4≦10	12≦D4≦16	20≦D4≦25	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

- 4 flute corner radius end mill with high helix angle and newly designed corner radius, for milling difficult-to-cut materials.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCMHDRBD0200R020S04	2	0.2	6	40	4	4	●	1
D0200R030S04	2	0.3	6	40	4	4	●	1
D0300R020S06	3	0.2	8	50	6	4	●	1
D0300R030S06	3	0.3	8	50	6	4	●	1
D0300R050S06	3	0.5	8	50	6	4	●	1
D0400R020S06	4	0.2	11	50	6	4	●	1
D0400R030S06	4	0.3	11	50	6	4	●	1
D0400R050S06	4	0.5	11	50	6	4	●	1
D0500R020S06	5	0.2	13	60	6	4	●	1
D0500R030S06	5	0.3	13	60	6	4	●	1
D0500R050S06	5	0.5	13	60	6	4	●	1
D0500R100S06	5	1	13	60	6	4	●	1
D0600R030S06	6	0.3	13	60	6	4	●	2
D0600R050S06	6	0.5	13	60	6	4	●	2
D0600R100S06	6	1	13	60	6	4	●	2
D0800R030S08	8	0.3	19	70	8	4	●	2
D0800R050S08	8	0.5	19	70	8	4	●	2
D0800R100S08	8	1	19	70	8	4	●	2
D0800R150S08	8	1.5	19	70	8	4	●	2
D1000R030S08	10	0.3	22	90	8	4	●	3
D1000R050S08	10	0.5	22	90	8	4	●	3
D1000R100S08	10	1	22	90	8	4	●	3
D1000R150S08	10	1.5	22	90	8	4	●	3
D1000R200S08	10	2	22	90	8	4	●	3
D1000R030S10	10	0.3	22	90	10	4	●	2
D1000R050S10	10	0.5	22	90	10	4	●	2
D1000R100S10	10	1	22	90	10	4	●	2
D1000R150S10	10	1.5	22	90	10	4	●	2
D1000R200S10	10	2	22	90	10	4	●	2
D1200R050S10	12	0.5	26	90	10	4	●	3
D1200R100S10	12	1	26	90	10	4	●	3
D1200R150S10	12	1.5	26	90	10	4	●	3
D1200R200S10	12	2	26	90	10	4	●	3
D1200R300S10	12	3	26	90	10	4	●	3

● : Inventory maintained in Japan.

Unit : mm

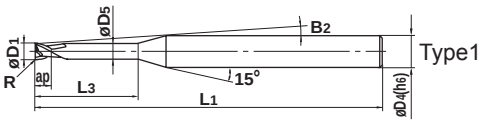
Order Number	Dia. D_1	Corner R R	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
VCMHDRBD1200R050S12	12	0.5	26	90	12	4	●	2
D1200R100S12	12	1	26	90	12	4	●	2
D1200R150S12	12	1.5	26	90	12	4	●	2
D1200R200S12	12	2	26	90	12	4	●	2
D1200R300S12	12	3	26	90	12	4	●	2
D1600R100S16	16	1	32	110	16	4	●	2
D1600R150S16	16	1.5	32	110	16	4	●	2
D1600R200S16	16	2	32	110	16	4	●	2
D1600R300S16	16	3	32	110	16	4	●	2
D1800R100S16	18	1	32	110	16	4	●	3
D1800R150S16	18	1.5	32	110	16	4	●	3
D1800R200S16	18	2	32	110	16	4	●	3
D1800R300S16	18	3	32	110	16	4	●	3
D2000R100S20	20	1	38	110	20	4	●	2
D2000R150S20	20	1.5	38	110	20	4	●	2
D2000R200S20	20	2	38	110	20	4	●	2
D2000R300S20	20	3	38	110	20	4	●	2
D2200R100S20	22	1	38	140	20	4	●	3
D2200R150S20	22	1.5	38	140	20	4	●	3
D2200R200S20	22	2	38	140	20	4	●	3
D2200R300S20	22	3	38	140	20	4	●	3
D2500R100S25	25	1	45	140	25	4	●	2
D2500R150S25	25	1.5	45	140	25	4	●	2
D2500R200S25	25	2	45	140	25	4	●	2
D2500R300S25	25	3	45	140	25	4	●	2

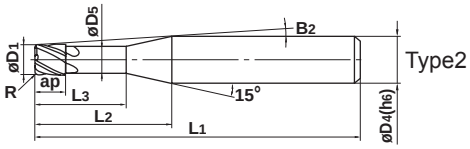
DF-PSRB

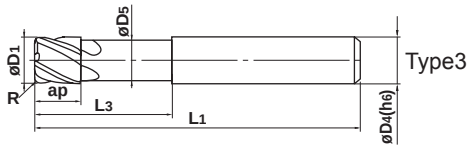
Corner radius end mill, Short cut length, 2−4 flute, High precision, For graphite

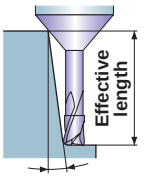
UWC DF 30° D1≤1.5 D1≥2

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	○	○









R					
0.1 ≤R≦1					
±0.01					
0.5 ≤D1 ≤12					
0 - 0.02					
h6	4 ≤D4 ≤6	8 ≤D4 ≤10	D4=12		
	0 - 0.008	0 - 0.009	0 - 0.011		

●±0.01mm corner radius tolerance, 0−-0.02mm outer diameter tolerance.
Corner radius end mill with original diamond coating for precise and efficient graphite machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Neck Length L3	Neck Dia. D5	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	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
D0050R010N05	0.5	0.1	0.75	5	0.46	8.7°	60	4	2	●	1	5.2	5.4	5.7	6.2
D0050R010N06	0.5	0.1	0.75	6	0.46	8°	60	4	2	●	1	6.2	6.4	6.9	7.5
D0050R010N10	0.5	0.1	0.75	10	0.46	6.1°	60	4	2	●	1	10.3	10.7	11.5	12.4
D0050R010N15	0.5	0.1	0.75	15	0.46	4.7°	60	4	2	●	1	15.5	16	17.2	18.6
D0080R010N06	0.8	0.1	1	6	0.76	7.7°	60	4	2	●	1	6.2	6.4	6.9	7.5
D0080R010N08	0.8	0.1	1	8	0.76	6.6°	60	4	2	●	1	8.3	8.6	9.2	9.9
D0100R010N08	1	0.1	1.5	8	0.94	6.3°	60	4	2	●	1	8.5	8.8	9.5	10.2
D0100R010N12	1	0.1	1.5	12	0.94	4.9°	60	4	2	●	1	12.6	13.1	14.1	15.2
D0100R020N08	1	0.2	1.5	8	0.94	6.3°	60	4	2	●	1	8.5	8.8	9.5	10.2
D0100R020N12	1	0.2	1.5	12	0.94	4.9°	60	4	2	●	1	12.6	13.1	14.1	15.2
D0100R020N16	1	0.2	1.5	16	0.94	4°	70	4	2	●	1	16.8	17.4	18.7	20.2
D0100R020N20	1	0.2	1.5	20	0.94	3.4°	70	4	2	●	1	20.9	21.7	23.3	25.1
D0100R020N30	1	0.2	1.5	30	0.94	2.5°	70	4	2	●	1	31.3	32.4	34.8	*
D0150R020N10	1.5	0.2	2.3	10	1.44	4.9°	70	4	2	●	1	10.5	11	11.8	12.7
D0150R020N20	1.5	0.2	2.3	20	1.44	2.9°	70	4	2	●	1	20.9	21.7	23.3	*
D0200R020N12	2	0.2	3	12	1.9	3.7°	70	4	4	●	2	12.5	13	14	15.1
D0200R020N16	2	0.2	3	16	1.9	2.9°	70	4	4	●	2	16.7	17.3	18.6	*
D0200R020N20	2	0.2	3	20	1.9	2.5°	80	4	4	●	2	20.8	21.5	23.2	*
D0200R020N30	2	0.2	3	30	1.9	1.7°	80	4	4	●	2	31.2	32.2	*	*
D0200R020N40	2	0.2	3	40	1.9	1.4°	80	4	4	●	2	41.5	42.9	*	*
D0300R020N20	3	0.2	4.5	20	2.9	1.4°	80	4	4	●	2	20.8	21.5	*	*
D0300R020N40	3	0.2	4.5	40	2.9	0.7°	80	4	4	●	2	41.5	*	*	*
D0300R050N20	3	0.5	4.5	20	2.9	1.4°	80	4	4	●	2	20.8	21.5	*	*
D0400R020N20	4	0.2	6	20	3.9	—	80	4	4	●	3	*	*	*	*
D0400R020N40	4	0.2	6	40	3.9	—	80	4	4	●	3	*	*	*	*
D0400R050N20	4	0.5	6	20	3.9	—	80	4	4	●	3	*	*	*	*
D0400R050N40	4	0.5	6	40	3.9	—	80	4	4	●	3	*	*	*	*
D0600R050N30	6	0.5	9	30	5.85	—	90	6	4	●	3	*	*	*	*
D0600R100N30	6	1	9	30	5.85	—	90	6	4	●	3	*	*	*	*
D0800R050N30	8	0.5	12	30	7.85	—	90	8	4	●	3	*	*	*	*
D0800R100N30	8	1	12	30	7.85	—	90	8	4	●	3	*	*	*	*
D1000R050N40	10	0.5	15	40	9.7	—	130	10	4	●	3	*	*	*	*

* No interference

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut ap	Neck Length L_3	Neck Dia. D_5	Cutting Edge to Shank Angle B_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type	Effective length for inclined angle 30'	1°	2°	3°
DFPSRBD1000R100N40	10	1	15	40	9.7	—	130	10	4	●	3	⁎	⁎	⁎	⁎
D1200R050N40	12	0.5	18	40	11.7	—	130	12	4	●	3	⁎	⁎	⁎	⁎

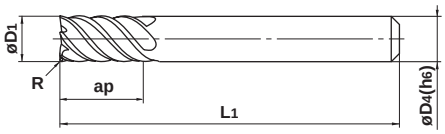
⁎ No interference

IMPACT MIRACLE END MILL FOR DIFFICULT TO CUT MATERIALS, IRREGULAR HELIX

VF-6MHVRB

Corner radius, Medium cut length, 6 flute, Irregular helix flutes

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	Aluminium Alloy
○	○	○		◎	◎		



Type1

R				
0.5 ≤R ≤2				
±0.015				
D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=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	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF6MHVRBD0600R050	6	0.5	13	50	6	6	●	1
D0600R100	6	1	13	50	6	6	●	1
D0800R050	8	0.5	19	60	8	6	●	1
D0800R100	8	1	19	60	8	6	●	1
D1000R050	10	0.5	22	70	10	6	●	1
D1000R100	10	1	22	70	10	6	●	1
D1200R050	12	0.5	26	75	12	6	●	1
D1200R100	12	1	26	75	12	6	●	1
D1600R100	16	1	32	90	16	6	●	1
D1600R200	16	2	32	90	16	6	●	1
D2000R100	20	1	38	100	20	6	●	1
D2000R200	20	2	38	100	20	6	●	1

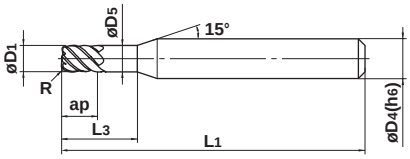
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J319

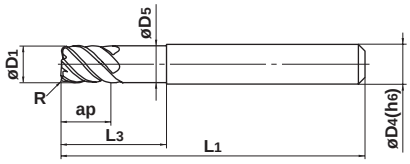
VF-SDRB

IMPACT MIRACLE Corner radius end mill, 6 flute (S)

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	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2

3 ≤D1 ≤12				
0 - 0.02				
D4=6	8 ≤D4 ≤10	D4=12		
0 - 0.008	0 - 0.009	0 - 0.011		

h6

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

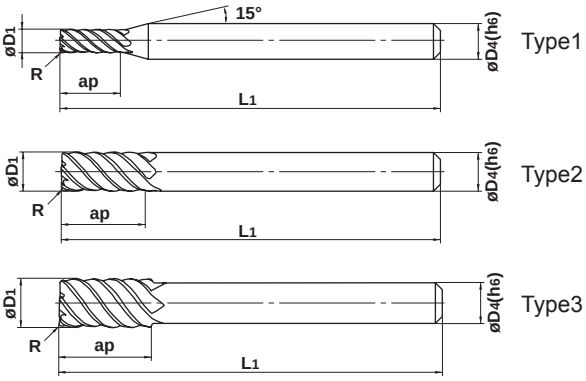
Unit : mm

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

VF-MDRB

Corner radius, Medium cut length, 6 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	Aluminium Alloy
○	◎	◎	◎				



D1 ≤12	D1>12			
0 - 0.02	0 - 0.03			
D4=6	8 ≤D4 ≤10	12 ≤D4 ≤16	D4=20	
0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013	

h6

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

Unit : mm

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

● : Inventory maintained in Japan.

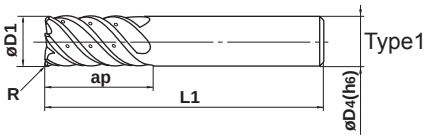
CUTTING CONDITIONS ➤ J320

VF-6MHVRB-CH

Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS



R					
	0.5 ≤R ≤3				
	±0.015				
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			
h6	D4=10	D4=12	D4=16	D4=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

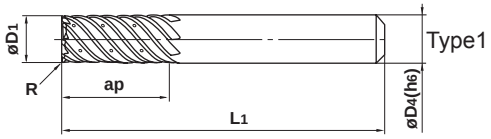
Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
NEW VF6MHVRBCHD1000R050	10	0.5	22	70	10	6	●	1
NEW D1000R100	10	1	22	70	10	6	●	1
NEW D1200R050	12	0.5	26	75	12	6	●	1
NEW D1200R100	12	1	26	75	12	6	●	1
D1600R100	16	1	32	90	16	6	●	1
D1600R300	16	3	32	90	16	6	●	1
D2000R100	20	1	38	100	20	6	●	1
D2000R300	20	3	38	100	20	6	●	1

VF-8MHVRB-CH

Corner radius end mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through 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	Aluminium Alloy
				◎	◎		

CoolStar
END MILLS



R					
	1≤R≤3				
	±0.015				
h6					
	0 - 0.03				
	D4=16	D4=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	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VF8MHVRBCHD1600R100	16	1	32	90	16	8	●	1
D1600R300	16	3	32	90	16	8	●	1
D2000R100	20	1	38	100	20	8	●	1
D2000R300	20	3	38	100	20	8	●	1

● : Inventory maintained in Japan.

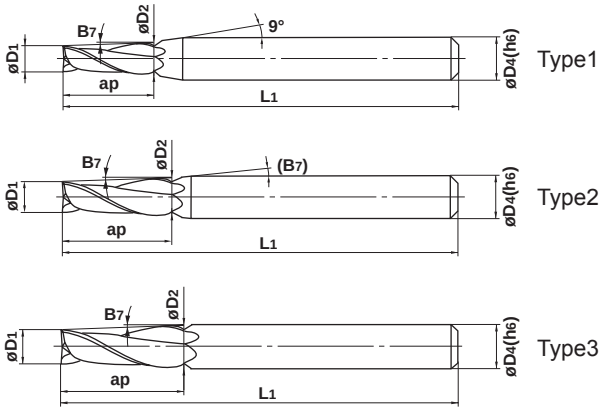
CUTTING CONDITIONS ➤ J339

Memo

MS2MT

Taper 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	Aluminium Alloy
◎	◎	○		○	○		



D1<0.5	D1≥0.5			
0 - 0.020	0 - 0.030			
±5'				
4≤D4≤6	8≤D4≤10	12≤D4≤16		
0 - 0.008	0 - 0.009	0 - 0.011		

2 flute taper end mill for general use.

Unit : mm

Order Number	Small Mill Dia. D1	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MTD0020T0030	0.2	30'	0.8	0.21	45	4	2	●	1
D0020T0100	0.2	1°	0.8	0.23	45	4	2	●	1
D0020T0130	0.2	1° 30'	0.8	0.24	45	4	2	●	1
D0020T0200	0.2	2°	0.8	0.26	45	4	2	●	1
D0020T0300	0.2	3°	0.8	0.28	45	4	2	●	1
D0020T0400	0.2	4°	0.8	0.31	45	4	2	●	1
D0020T0500	0.2	5°	0.8	0.34	45	4	2	●	1
D0020T0700	0.2	7°	0.8	0.4	45	4	2	●	1
D0020T1000	0.2	10°	0.8	0.48	45	4	2	●	2
D0030T0030	0.3	30'	1.2	0.32	45	4	2	●	1
D0030T0100	0.3	1°	1.2	0.34	45	4	2	●	1
D0030T0130	0.3	1° 30'	1.2	0.36	45	4	2	●	1
D0030T0200	0.3	2°	1.2	0.38	45	4	2	●	1
D0030T0300	0.3	3°	1.2	0.43	45	4	2	●	1
D0030T0400	0.3	4°	1.2	0.47	45	4	2	●	1
D0030T0500	0.3	5°	1.2	0.51	45	4	2	●	1
D0030T0700	0.3	7°	1.2	0.59	45	4	2	●	1
D0030T1000	0.3	10°	1.2	0.72	45	4	2	●	2
D0040T0030	0.4	30'	1.6	0.43	45	4	2	●	1
D0040T0100	0.4	1°	1.6	0.46	45	4	2	●	1
D0040T0130	0.4	1° 30'	1.6	0.48	45	4	2	●	1
D0040T0200	0.4	2°	1.6	0.51	45	4	2	●	1
D0040T0300	0.4	3°	1.6	0.57	45	4	2	●	1
D0040T0400	0.4	4°	1.6	0.62	45	4	2	●	1
D0040T0500	0.4	5°	1.6	0.68	45	4	2	●	1
D0040T0700	0.4	7°	1.6	0.79	45	4	2	●	1
D0040T1000	0.4	10°	1.6	0.96	45	4	2	●	2
D0050T0030	0.5	30'	2	0.53	45	4	2	●	1
D0050T0100	0.5	1°	2	0.57	45	4	2	●	1
D0050T0130	0.5	1° 30'	2	0.6	45	4	2	●	1
D0050T0200	0.5	2°	2	0.64	45	4	2	●	1
D0050T0300	0.5	3°	2	0.71	45	4	2	●	1
D0050T0400	0.5	4°	2	0.78	45	4	2	●	1
D0050T0500	0.5	5°	2	0.85	45	4	2	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2MTD0050T0700	0.5	7°	2	0.99	45	4	2	●	1
D0050T1000	0.5	10°	2	1.21	45	4	2	●	2
D0060T0030	0.6	30'	2	0.63	45	4	2	●	1
D0060T0100	0.6	1°	2	0.67	45	4	2	●	1
D0060T0130	0.6	1° 30'	2	0.7	45	4	2	●	1
D0060T0200	0.6	2°	2	0.74	45	4	2	●	1
D0060T0230	0.6	2° 30'	2	0.77	45	4	2	●	1
D0060T0300	0.6	3°	2	0.81	45	4	2	●	1
D0060T0400	0.6	4°	2	0.88	45	4	2	●	1
D0060T0500	0.6	5°	2	0.95	45	4	2	●	1
D0060T0700	0.6	7°	2	1.09	45	4	2	●	1
D0060T1000	0.6	10°	2	1.31	45	4	2	●	2
D0070T0030	0.7	30'	2	0.73	45	4	2	●	1
D0070T0100	0.7	1°	2	0.77	45	4	2	●	1
D0070T0130	0.7	1° 30'	2	0.8	45	4	2	●	1
D0070T0200	0.7	2°	2	0.84	45	4	2	●	1
D0070T0300	0.7	3°	2	0.91	45	4	2	●	1
D0070T0400	0.7	4°	2	0.98	45	4	2	●	1
D0070T0500	0.7	5°	2	1.05	45	4	2	●	1
D0070T0700	0.7	7°	2	1.19	45	4	2	●	1
D0070T1000	0.7	10°	2	1.41	45	4	2	●	2
D0080T0030	0.8	30'	3	0.85	45	4	2	●	1
D0080T0100	0.8	1°	3	0.9	45	4	2	●	1
D0080T0130	0.8	1° 30'	3	0.96	45	4	2	●	1
D0080T0200	0.8	2°	3	1.01	45	4	2	●	1
D0080T0230	0.8	2° 30'	3	1.06	45	4	2	●	1
D0080T0300	0.8	3°	3	1.11	45	4	2	●	1
D0080T0400	0.8	4°	3	1.22	45	4	2	●	1
D0080T0500	0.8	5°	3	1.32	45	4	2	●	1
D0080T0700	0.8	7°	3	1.54	45	4	2	●	1
D0080T1000	0.8	10°	3	1.86	45	4	2	●	2
D0090T0030	0.9	30'	3	0.95	45	4	2	●	1
D0090T0100	0.9	1°	3	1	45	4	2	●	1
D0090T0130	0.9	1° 30'	3	1.06	45	4	2	●	1
D0090T0200	0.9	2°	3	1.11	45	4	2	●	1
D0090T0300	0.9	3°	3	1.21	45	4	2	●	1
D0090T0400	0.9	4°	3	1.32	45	4	2	●	1
D0090T0500	0.9	5°	3	1.42	45	4	2	●	1
D0090T0700	0.9	7°	3	1.64	45	4	2	●	1
D0090T1000	0.9	10°	3	1.96	45	4	2	●	2
D0100T0030	1	30'	4	1.07	45	4	2	●	1
D0100T0100	1	1°	4	1.14	45	4	2	●	1
D0100T0130	1	1° 30'	4	1.21	45	4	2	●	1
D0100T0200	1	2°	4	1.28	45	4	2	●	1
D0100T0230	1	2° 30'	4	1.35	45	4	2	●	1
D0100T0300	1	3°	4	1.42	45	4	2	●	1
D0100T0400	1	4°	4	1.56	45	4	2	●	1
D0100T0500	1	5°	4	1.7	45	4	2	●	1
D0100T0700	1	7°	4	1.98	45	4	2	●	1
D0100T1000	1	10°	4	2.41	45	4	2	●	2
D0150T0030	1.5	30'	5	1.59	45	4	2	●	1
D0150T0100	1.5	1°	5	1.67	45	4	2	●	1

MS2MT

Taper end mill, Medium cut length, 2 flute

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2MTD0150T0130	1.5	1° 30'	5	1.76	45	4	2	●	1
D0150T0200	1.5	2°	5	1.85	45	4	2	●	1
D0150T0230	1.5	2° 30'	5	1.94	45	4	2	●	1
D0150T0300	1.5	3°	5	2.02	45	4	2	●	1
D0150T0400	1.5	4°	5	2.2	45	4	2	●	1
D0150T0500	1.5	5°	5	2.37	45	4	2	●	1
D0150T0700	1.5	7°	5	2.73	45	4	2	●	1
D0150T1000	1.5	10°	5	3.26	45	4	2	●	2
D0200T0030	2	30'	6	2.1	45	4	2	●	1
D0200T0100	2	1°	6	2.21	45	4	2	●	1
D0200T0130	2	1° 30'	6	2.31	45	4	2	●	1
D0200T0200	2	2°	6	2.42	45	4	2	●	1
D0200T0230	2	2° 30'	6	2.52	45	4	2	●	1
D0200T0300	2	3°	6	2.63	45	4	2	●	1
D0200T0400	2	4°	6	2.84	45	4	2	●	1
D0200T0500	2	5°	6	3.05	45	4	2	●	1
D0200T0700	2	7°	6	3.47	45	4	2	●	2
D0200T1000	2	10°	6	4.12	50	6	2	●	2
D0250T0030	2.5	30'	8	2.64	45	4	2	●	1
D0250T0100	2.5	1°	8	2.78	45	4	2	●	1
D0250T0130	2.5	1° 30'	8	2.92	45	4	2	●	1
D0250T0200	2.5	2°	8	3.06	45	4	2	●	1
D0250T0230	2.5	2° 30'	8	3.2	45	4	2	●	1
D0250T0300	2.5	3°	8	3.34	45	4	2	●	1
D0250T0400	2.5	4°	8	3.62	45	4	2	●	2
D0250T0500	2.5	5°	8	3.9	45	4	2	●	2
D0250T0700	2.5	7°	8	4.46	50	4	2	●	3
D0250T1000	2.5	10°	8	5.32	50	6	2	●	2
D0300T0030	3	30'	10	3.17	50	6	2	●	1
D0300T0100	3	1°	10	3.35	50	6	2	●	1
D0300T0130	3	1° 30'	10	3.52	50	6	2	●	1
D0300T0200	3	2°	10	3.7	50	6	2	●	1
D0300T0300	3	3°	10	4.05	50	6	2	●	1
D0300T0400	3	4°	10	4.4	50	6	2	●	1
D0300T0500	3	5°	10	4.75	50	6	2	●	1
D0300T0700	3	7°	10	5.46	50	6	2	●	2
D0300T1000	3	10°	10	6.53	50	6	2	●	3
D0400T0030	4	30'	15	4.26	50	6	2	●	1
D0400T0100	4	1°	15	4.52	50	6	2	●	1
D0400T0130	4	1° 30'	15	4.79	50	6	2	●	1
D0400T0200	4	2°	15	5.05	50	6	2	●	1
D0400T0300	4	3°	15	5.57	50	6	2	●	1
D0400T0400	4	4°	15	6.1	55	6	2	●	3
D0400T0500	4	5°	15	6.62	55	6	2	●	3
D0400T0700	4	7°	15	7.68	55	6	2	●	3
D0400T1000	4	10°	15	9.29	60	8	2	●	3
D0500T0030	5	30'	20	5.35	55	6	2	●	1
D0500T0100	5	1°	20	5.7	55	6	2	●	1
D0500T0130	5	1° 30'	20	6.05	55	6	2	●	3
D0500T0200	5	2°	20	6.4	55	6	2	●	3
D0500T0300	5	3°	20	7.1	55	6	2	●	3
D0500T0400	5	4°	20	7.8	60	6	2	●	3

● : Inventory maintained in Japan.

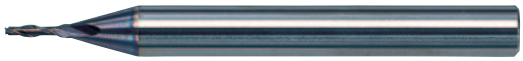
Unit : mm

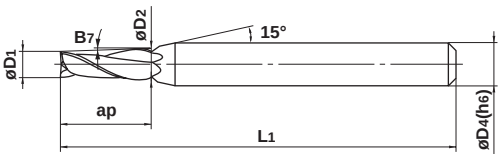
Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS2MTD0500T0500	5	5°	20	8.5	60	8	2	●	3
D0500T0700	5	7°	20	9.91	70	10	2	●	2
D0500T1000	5	10°	20	12.05	80	12	2	●	3
D0600T0030	6	30'	20	6.35	60	6	2	●	3
D0600T0100	6	1°	20	6.7	60	6	2	●	3
D0600T0130	6	1° 30'	20	7.05	60	6	2	●	3
D0600T0200	6	2°	20	7.4	60	6	2	●	3
D0600T0300	6	3°	20	8.1	65	8	2	●	3
D0600T0500	6	5°	20	9.5	70	8	2	●	3
D0800T0030	8	30'	25	8.44	70	8	2	●	3
D0800T0100	8	1°	25	8.87	70	8	2	●	3
D0800T0130	8	1° 30'	25	9.31	70	8	2	●	3
D0800T0200	8	2°	25	9.75	70	8	2	●	3
D0800T0300	8	3°	25	10.62	75	10	2	●	3
D0800T0500	8	5°	25	12.37	95	12	2	●	3
D1000T0030	10	30'	35	10.61	90	10	2	●	3
D1000T0100	10	1°	35	11.22	90	10	2	●	3
D1000T0130	10	1° 30'	35	11.83	90	10	2	●	3
D1000T0200	10	2°	35	12.44	95	12	2	●	3
D1000T0300	10	3°	35	13.67	95	12	2	●	3
D1000T0500	10	5°	35	16.12	95	16	2	●	3

VC-2MT

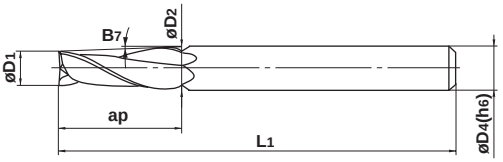
Taper end mill, Medium cut length, 2 flute

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	Aluminium Alloy
○	◎	◎	○	○	○		





Type1



Type2

1 ≤D1 ≤2.5				
0 - 0.03				
±5'				
4 ≤D4 ≤6	8 ≤D4 ≤10	12 ≤D4 ≤16		
h6 0 - 0.008	0 - 0.009	0 - 0.011		

● Suitable for machining of non-heat-treated steel through to hardened steel.

Unit : mm

Order Number	Small Mill Dia. D1	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2MTD0100T0030	1	30'	4	1.07	45	4	2	●	1
D0100T0100	1	1°	4	1.14	45	4	2	●	1
D0100T0130	1	1° 30'	4	1.21	45	4	2	●	1
D0100T0200	1	2°	4	1.28	45	4	2	●	1
D0100T0300	1	3°	4	1.42	45	4	2	●	1
D0100T0500	1	5°	4	1.7	45	4	2	●	1
D0150T0030	1.5	30'	5	1.59	45	4	2	●	1
D0150T0100	1.5	1°	5	1.67	45	4	2	●	1
D0150T0130	1.5	1° 30'	5	1.76	45	4	2	●	1
D0150T0200	1.5	2°	5	1.85	45	4	2	●	1
D0150T0300	1.5	3°	5	2.02	45	4	2	●	1
D0150T0500	1.5	5°	5	2.37	45	4	2	●	1
D0200T0030	2	30'	6	2.1	45	4	2	●	1
D0200T0100	2	1°	6	2.21	45	4	2	●	1
D0200T0130	2	1° 30'	6	2.31	45	4	2	●	1
D0200T0200	2	2°	6	2.42	45	4	2	●	1
D0200T0300	2	3°	6	2.63	45	4	2	●	1
D0200T0500	2	5°	6	3.05	45	4	2	●	1
D0200T1000	2	10°	6	4.12	50	6	2	●	1
D0250T0030	2.5	30'	8	2.64	45	4	2	●	1
D0250T0100	2.5	1°	8	2.78	45	4	2	●	1
D0250T0130	2.5	1° 30'	8	2.92	45	4	2	●	1
D0250T0200	2.5	2°	8	3.06	45	4	2	●	1
D0250T0300	2.5	3°	8	3.34	45	4	2	●	1
D0250T0500	2.5	5°	8	3.9	45	4	2	●	1
D0250T1000	2.5	10°	8	5.32	50	6	2	●	1

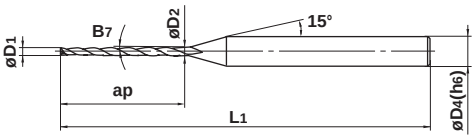
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J366

MS4LT

Taper end mill, 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	Aluminium Alloy
◎	◎	○		○			



Type1

D1<0.5	D1≥0.5			
0 - 0.020	0 - 0.040			
±5'				
D4=3	4≤D4≤6			
0 - 0.006	0 - 0.008			

h6

4 flute taper end mill for rib milling.

Unit : mm

Order Number	Small Mill Dia. D1	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4LTD0020T0030L02	0.2	30'	2	0.23	40	3	4	●	1
D0020T0100L02	0.2	1°	2	0.27	40	3	4	●	1
D0020T0130L02	0.2	1° 30'	2	0.3	40	3	4	●	1
D0020T0200L02	0.2	2°	2	0.34	40	3	4	●	1
D0030T0030L03	0.3	30'	3	0.35	40	3	4	●	1
D0030T0100L03	0.3	1°	3	0.4	40	3	4	●	1
D0030T0130L03	0.3	1° 30'	3	0.46	40	3	4	●	1
D0030T0200L03	0.3	2°	3	0.51	40	3	4	●	1
D0040T0030L04	0.4	30'	4	0.47	40	3	4	●	1
D0040T0100L04	0.4	1°	4	0.54	40	3	4	●	1
D0040T0130L04	0.4	1° 30'	4	0.61	40	3	4	●	1
D0040T0200L04	0.4	2°	4	0.68	40	3	4	●	1
D0050T0030L04	0.5	30'	4	0.57	40	3	4	●	1
D0050T0030L06	0.5	30'	6	0.6	40	3	4	●	1
D0050T0100L04	0.5	1°	4	0.64	40	3	4	●	1
D0050T0100L06	0.5	1°	6	0.71	40	3	4	●	1
D0050T0130L04	0.5	1° 30'	4	0.71	40	3	4	●	1
D0050T0130L06	0.5	1° 30'	6	0.81	40	3	4	●	1
D0050T0200L04	0.5	2°	4	0.78	40	3	4	●	1
D0050T0200L06	0.5	2°	6	0.92	40	3	4	●	1
D0060T0030L04	0.6	30'	4	0.67	40	3	4	●	1
D0060T0030L06	0.6	30'	6	0.7	40	3	4	●	1
D0060T0100L04	0.6	1°	4	0.74	40	3	4	●	1
D0060T0100L06	0.6	1°	6	0.81	40	3	4	●	1
D0060T0130L04	0.6	1° 30'	4	0.81	40	3	4	●	1
D0060T0130L06	0.6	1° 30'	6	0.91	40	3	4	●	1
D0060T0200L04	0.6	2°	4	0.88	40	3	4	●	1
D0060T0200L06	0.6	2°	6	1.02	40	3	4	●	1
D0070T0030L06	0.7	30'	6	0.8	40	3	4	●	1
D0070T0030L08	0.7	30'	8	0.84	45	3	4	●	1
D0070T0100L06	0.7	1°	6	0.91	40	3	4	●	1
D0070T0100L08	0.7	1°	8	0.98	45	3	4	●	1
D0070T0130L06	0.7	1° 30'	6	1.01	40	3	4	●	1
D0070T0130L08	0.7	1° 30'	8	1.12	45	3	4	●	1

MS4LT

Taper end mill, Long cut length, 4 flute

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4LTD0070T0200L06	0.7	2°	6	1.12	40	3	4	●	1
D0070T0200L08	0.7	2°	8	1.26	45	3	4	●	1
D0080T0015L04	0.8	15'	4	0.83	45	4	4	●	1
D0080T0015L06	0.8	15'	6	0.85	45	4	4	●	1
D0080T0015L08	0.8	15'	8	0.87	45	4	4	●	1
D0080T0015L10	0.8	15'	10	0.89	45	4	4	●	1
D0080T0030L04	0.8	30'	4	0.87	45	4	4	●	1
D0080T0030L06	0.8	30'	6	0.9	45	4	4	●	1
D0080T0030L08	0.8	30'	8	0.94	45	4	4	●	1
D0080T0030L10	0.8	30'	10	0.97	45	4	4	●	1
D0080T0030L12	0.8	30'	12	1.01	50	4	4	●	1
D0080T0100L04	0.8	1°	4	0.94	45	4	4	●	1
D0080T0100L06	0.8	1°	6	1.01	45	4	4	●	1
D0080T0100L08	0.8	1°	8	1.08	45	4	4	●	1
D0080T0100L10	0.8	1°	10	1.15	45	4	4	●	1
D0080T0100L12	0.8	1°	12	1.22	50	4	4	●	1
D0080T0130L04	0.8	1° 30'	4	1.01	45	4	4	●	1
D0080T0130L06	0.8	1° 30'	6	1.11	45	4	4	●	1
D0080T0130L08	0.8	1° 30'	8	1.22	45	4	4	●	1
D0080T0130L10	0.8	1° 30'	10	1.32	45	4	4	●	1
D0080T0130L12	0.8	1° 30'	12	1.43	50	4	4	●	1
D0080T0200L04	0.8	2°	4	1.08	45	4	4	●	1
D0080T0200L06	0.8	2°	6	1.22	45	4	4	●	1
D0080T0200L08	0.8	2°	8	1.36	45	4	4	●	1
D0080T0200L10	0.8	2°	10	1.5	45	4	4	●	1
D0080T0200L12	0.8	2°	12	1.64	50	4	4	●	1
D0100T0015L06	1	15'	6	1.05	45	4	4	●	1
D0100T0015L08	1	15'	8	1.07	45	4	4	●	1
D0100T0015L10	1	15'	10	1.09	45	4	4	●	1
D0100T0015L12	1	15'	12	1.1	50	4	4	●	1
D0100T0030L06	1	30'	6	1.1	45	4	4	●	1
D0100T0030L08	1	30'	8	1.14	45	4	4	●	1
D0100T0030L10	1	30'	10	1.17	45	4	4	●	1
D0100T0030L12	1	30'	12	1.21	50	4	4	●	1
D0100T0100L06	1	1°	6	1.21	45	4	4	●	1
D0100T0100L08	1	1°	8	1.28	45	4	4	●	1
D0100T0100L10	1	1°	10	1.35	45	4	4	●	1
D0100T0100L12	1	1°	12	1.42	50	4	4	●	1
D0100T0100L16	1	1°	16	1.56	55	4	4	●	1
D0100T0130L06	1	1° 30'	6	1.31	45	4	4	●	1
D0100T0130L08	1	1° 30'	8	1.42	45	4	4	●	1
D0100T0130L10	1	1° 30'	10	1.52	45	4	4	●	1
D0100T0130L12	1	1° 30'	12	1.63	50	4	4	●	1
D0100T0130L16	1	1° 30'	16	1.84	55	4	4	●	1
D0100T0200L06	1	2°	6	1.42	45	4	4	●	1
D0100T0200L08	1	2°	8	1.56	45	4	4	●	1
D0100T0200L10	1	2°	10	1.7	45	4	4	●	1
D0100T0200L12	1	2°	12	1.84	50	4	4	●	1
D0100T0200L16	1	2°	16	2.12	55	4	4	●	1
D0120T0015L06	1.2	15'	6	1.25	45	4	4	●	1
D0120T0015L10	1.2	15'	10	1.29	45	4	4	●	1
D0120T0015L12	1.2	15'	12	1.3	50	4	4	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4LTD0120T0015L16	1.2	15'	16	1.34	55	4	4	●	1
D0120T0030L06	1.2	30'	6	1.3	45	4	4	●	1
D0120T0030L10	1.2	30'	10	1.37	45	4	4	●	1
D0120T0030L12	1.2	30'	12	1.41	50	4	4	●	1
D0120T0030L16	1.2	30'	16	1.48	55	4	4	●	1
D0120T0100L06	1.2	1°	6	1.41	45	4	4	●	1
D0120T0100L10	1.2	1°	10	1.55	45	4	4	●	1
D0120T0100L12	1.2	1°	12	1.62	50	4	4	●	1
D0120T0100L16	1.2	1°	16	1.76	55	4	4	●	1
D0120T0100L20	1.2	1°	20	1.9	55	4	4	●	1
D0120T0130L06	1.2	1° 30'	6	1.51	45	4	4	●	1
D0120T0130L10	1.2	1° 30'	10	1.72	45	4	4	●	1
D0120T0130L12	1.2	1° 30'	12	1.83	50	4	4	●	1
D0120T0130L16	1.2	1° 30'	16	2.04	55	4	4	●	1
D0120T0130L20	1.2	1° 30'	20	2.25	55	4	4	●	1
D0120T0200L06	1.2	2°	6	1.62	45	4	4	●	1
D0120T0200L10	1.2	2°	10	1.9	45	4	4	●	1
D0120T0200L12	1.2	2°	12	2.04	50	4	4	●	1
D0120T0200L16	1.2	2°	16	2.32	55	4	4	●	1
D0120T0200L20	1.2	2°	20	2.6	55	4	4	●	1
D0130T0030L12	1.3	30'	12	1.51	50	4	4	●	1
D0130T0100L12	1.3	1°	12	1.72	50	4	4	●	1
D0130T0130L12	1.3	1° 30'	12	1.93	50	4	4	●	1
D0130T0200L12	1.3	2°	12	2.14	50	4	4	●	1
D0140T0030L12	1.4	30'	12	1.61	50	4	4	●	1
D0140T0100L12	1.4	1°	12	1.82	50	4	4	●	1
D0140T0130L12	1.4	1° 30'	12	2.03	50	4	4	●	1
D0140T0200L12	1.4	2°	12	2.24	50	4	4	●	1
D0150T0015L06	1.5	15'	6	1.55	45	4	4	●	1
D0150T0015L08	1.5	15'	8	1.57	45	4	4	●	1
D0150T0015L10	1.5	15'	10	1.59	45	4	4	●	1
D0150T0015L12	1.5	15'	12	1.6	50	4	4	●	1
D0150T0015L16	1.5	15'	16	1.64	55	4	4	●	1
D0150T0015L20	1.5	15'	20	1.67	55	4	4	●	1
D0150T0030L06	1.5	30'	6	1.6	45	4	4	●	1
D0150T0030L08	1.5	30'	8	1.64	45	4	4	●	1
D0150T0030L10	1.5	30'	10	1.67	45	4	4	●	1
D0150T0030L12	1.5	30'	12	1.71	50	4	4	●	1
D0150T0030L16	1.5	30'	16	1.78	55	4	4	●	1
D0150T0030L20	1.5	30'	20	1.85	55	4	4	●	1
D0150T0100L06	1.5	1°	6	1.71	45	4	4	●	1
D0150T0100L08	1.5	1°	8	1.78	45	4	4	●	1
D0150T0100L10	1.5	1°	10	1.85	45	4	4	●	1
D0150T0100L12	1.5	1°	12	1.92	50	4	4	●	1
D0150T0100L16	1.5	1°	16	2.06	55	4	4	●	1
D0150T0100L20	1.5	1°	20	2.2	55	4	4	●	1
D0150T0100L25	1.5	1°	25	2.37	60	4	4	●	1
D0150T0130L06	1.5	1° 30'	6	1.81	45	4	4	●	1
D0150T0130L08	1.5	1° 30'	8	1.92	45	4	4	●	1
D0150T0130L10	1.5	1° 30'	10	2.02	45	4	4	●	1
D0150T0130L12	1.5	1° 30'	12	2.13	50	4	4	●	1
D0150T0130L16	1.5	1° 30'	16	2.34	55	4	4	●	1

MS4LT

Taper end mill, Long cut length, 4 flute

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4LTD0150T0130L20	1.5	1° 30'	20	2.55	55	4	4	●	1
D0150T0130L25	1.5	1° 30'	25	2.81	60	4	4	●	1
D0150T0200L06	1.5	2°	6	1.92	45	4	4	●	1
D0150T0200L08	1.5	2°	8	2.06	45	4	4	●	1
D0150T0200L10	1.5	2°	10	2.2	45	4	4	●	1
D0150T0200L12	1.5	2°	12	2.34	50	4	4	●	1
D0150T0200L16	1.5	2°	16	2.62	55	4	4	●	1
D0150T0200L20	1.5	2°	20	2.9	55	4	4	●	1
D0150T0200L25	1.5	2°	25	3.25	60	4	4	●	1
D0160T0030L08	1.6	30'	8	1.74	45	4	4	●	1
D0160T0030L12	1.6	30'	12	1.81	50	4	4	●	1
D0160T0030L16	1.6	30'	16	1.88	55	4	4	●	1
D0160T0030L20	1.6	30'	20	1.95	55	4	4	●	1
D0160T0100L08	1.6	1°	8	1.88	45	4	4	●	1
D0160T0100L12	1.6	1°	12	2.02	50	4	4	●	1
D0160T0100L16	1.6	1°	16	2.16	55	4	4	●	1
D0160T0100L20	1.6	1°	20	2.3	55	4	4	●	1
D0160T0130L08	1.6	1° 30'	8	2.02	45	4	4	●	1
D0160T0130L12	1.6	1° 30'	12	2.23	50	4	4	●	1
D0160T0130L16	1.6	1° 30'	16	2.44	55	4	4	●	1
D0160T0130L20	1.6	1° 30'	20	2.65	55	4	4	●	1
D0160T0200L08	1.6	2°	8	2.16	45	4	4	●	1
D0160T0200L12	1.6	2°	12	2.44	50	4	4	●	1
D0160T0200L16	1.6	2°	16	2.72	55	4	4	●	1
D0160T0200L20	1.6	2°	20	3	55	4	4	●	1
D0180T0015L08	1.8	15'	8	1.87	45	4	4	●	1
D0180T0015L16	1.8	15'	16	1.94	55	4	4	●	1
D0180T0015L24	1.8	15'	24	2.01	60	4	4	●	1
D0180T0030L08	1.8	30'	8	1.94	45	4	4	●	1
D0180T0030L16	1.8	30'	16	2.08	55	4	4	●	1
D0180T0030L24	1.8	30'	24	2.22	60	4	4	●	1
D0180T0100L08	1.8	1°	8	2.08	45	4	4	●	1
D0180T0100L16	1.8	1°	16	2.36	55	4	4	●	1
D0180T0100L24	1.8	1°	24	2.64	60	4	4	●	1
D0180T0130L08	1.8	1° 30'	8	2.22	45	4	4	●	1
D0180T0130L16	1.8	1° 30'	16	2.64	55	4	4	●	1
D0180T0130L24	1.8	1° 30'	24	3.06	60	4	4	●	1
D0180T0200L08	1.8	2°	8	2.36	45	4	4	●	1
D0180T0200L16	1.8	2°	16	2.92	55	4	4	●	1
D0180T0200L24	1.8	2°	24	3.48	60	4	4	●	1
D0200T0015L08	2	15'	8	2.07	45	4	4	●	1
D0200T0015L10	2	15'	10	2.09	45	4	4	●	1
D0200T0015L12	2	15'	12	2.1	50	4	4	●	1
D0200T0015L16	2	15'	16	2.14	55	4	4	●	1
D0200T0015L20	2	15'	20	2.17	55	4	4	●	1
D0200T0015L25	2	15'	25	2.22	60	4	4	●	1
D0200T0030L08	2	30'	8	2.14	45	4	4	●	1
D0200T0030L10	2	30'	10	2.17	45	4	4	●	1
D0200T0030L12	2	30'	12	2.21	50	4	4	●	1
D0200T0030L16	2	30'	16	2.28	55	4	4	●	1
D0200T0030L20	2	30'	20	2.35	55	4	4	●	1
D0200T0030L25	2	30'	25	2.44	60	4	4	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4LTD0200T0030L30	2	30'	30	2.52	65	4	4	●	1
D0200T0100L08	2	1°	8	2.28	45	4	4	●	1
D0200T0100L10	2	1°	10	2.35	45	4	4	●	1
D0200T0100L12	2	1°	12	2.42	50	4	4	●	1
D0200T0100L16	2	1°	16	2.56	55	4	4	●	1
D0200T0100L20	2	1°	20	2.7	55	4	4	●	1
D0200T0100L25	2	1°	25	2.87	60	4	4	●	1
D0200T0100L30	2	1°	30	3.05	65	4	4	●	1
D0200T0130L08	2	1° 30'	8	2.42	45	4	4	●	1
D0200T0130L10	2	1° 30'	10	2.52	45	4	4	●	1
D0200T0130L12	2	1° 30'	12	2.63	50	4	4	●	1
D0200T0130L16	2	1° 30'	16	2.84	55	4	4	●	1
D0200T0130L20	2	1° 30'	20	3.05	55	4	4	●	1
D0200T0130L25	2	1° 30'	25	3.31	60	4	4	●	1
D0200T0130L30	2	1° 30'	30	3.57	65	4	4	●	1
D0200T0200L08	2	2°	8	2.56	45	4	4	●	1
D0200T0200L10	2	2°	10	2.7	45	4	4	●	1
D0200T0200L12	2	2°	12	2.84	50	4	4	●	1
D0200T0200L16	2	2°	16	3.12	55	4	4	●	1
D0200T0200L20	2	2°	20	3.4	55	4	4	●	1
D0200T0200L25	2	2°	25	3.75	60	4	4	●	1
D0200T0200L30	2	2°	30	4.1	65	6	4	●	1
D0200T0300L12	2	3°	12	3.26	50	4	4	●	1
D0200T0300L16	2	3°	16	3.68	55	4	4	●	1
D0200T0300L20	2	3°	20	4.1	55	6	4	●	1
D0200T0300L25	2	3°	25	4.62	60	6	4	●	1
D0200T0300L30	2	3°	30	5.14	65	6	4	●	1
D0250T0030L10	2.5	30'	10	2.67	45	4	4	●	1
D0250T0030L16	2.5	30'	16	2.78	50	4	4	●	1
D0250T0030L20	2.5	30'	20	2.85	55	4	4	●	1
D0250T0030L25	2.5	30'	25	2.94	60	4	4	●	1
D0250T0030L30	2.5	30'	30	3.02	65	4	4	●	1
D0250T0100L10	2.5	1°	10	2.85	45	4	4	●	1
D0250T0100L16	2.5	1°	16	3.06	50	4	4	●	1
D0250T0100L20	2.5	1°	20	3.2	55	4	4	●	1
D0250T0100L25	2.5	1°	25	3.37	60	4	4	●	1
D0250T0100L30	2.5	1°	30	3.55	65	4	4	●	1
D0250T0130L10	2.5	1° 30'	10	3.02	45	4	4	●	1
D0250T0130L16	2.5	1° 30'	16	3.34	50	4	4	●	1
D0250T0130L20	2.5	1° 30'	20	3.55	55	4	4	●	1
D0250T0130L25	2.5	1° 30'	25	3.81	60	4	4	●	1
D0250T0130L30	2.5	1° 30'	30	4.07	65	6	4	●	1
D0250T0200L10	2.5	2°	10	3.2	45	4	4	●	1
D0250T0200L16	2.5	2°	16	3.62	50	4	4	●	1
D0250T0200L20	2.5	2°	20	3.9	55	4	4	●	1
D0250T0200L25	2.5	2°	25	4.25	60	6	4	●	1
D0250T0200L30	2.5	2°	30	4.6	65	6	4	●	1
D0300T0030L25	3	30'	25	3.44	65	6	4	●	1
D0300T0030L40	3	30'	40	3.7	80	6	4	●	1
D0300T0100L25	3	1°	25	3.87	65	6	4	●	1
D0300T0100L40	3	1°	40	4.4	80	6	4	●	1
D0300T0130L25	3	1° 30'	25	4.31	65	6	4	●	1

MS4LT

Taper end mill, Long cut length, 4 flute

Unit : mm

Order Number	Small Mill Dia. D_1	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4LTD0300T0130L40	3	1° 30'	40	5.09	80	6	4	●	1
D0300T0200L25	3	2°	25	4.75	65	6	4	●	1
D0300T0200L40	3	2°	40	5.79	80	6	4	●	1

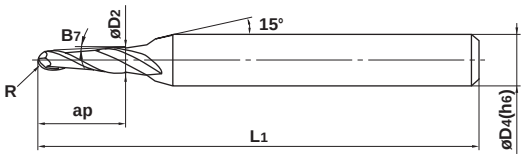
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J310

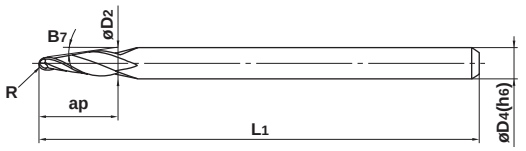
MS2MTB

Ball nose taper 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	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2

R	0.2 ≤R ≤1.5				
	±0.01				
	±5'				
h6	4 ≤D4 ≤6				
	0 - 0.008				

2 flute taper ball nose end mill.

Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MTBR0020T0300	0.2	3°	3	0.69	40	4	2	●	1
R0020T0500	0.2	5°	3	0.89	40	4	2	●	1
R0020T0700	0.2	7°	3	1.09	40	4	2	●	1
R0020T1000	0.2	10°	3	1.39	40	4	2	●	1
R0030T0300	0.3	3°	3	0.88	40	4	2	●	1
R0030T0500	0.3	5°	3	1.07	40	4	2	●	1
R0030T0700	0.3	7°	3	1.27	40	4	2	●	1
R0030T1000	0.3	10°	3	1.56	40	4	2	●	1
R0050T0030	0.5	30'	3	1.04	40	4	2	●	1
R0050T0100	0.5	1°	3	1.09	40	4	2	●	1
R0050T0130	0.5	1° 30'	3	1.13	40	4	2	●	1
R0050T0200	0.5	2°	3	1.18	40	4	2	●	1
R0050T0300	0.5	3°	3	1.26	40	4	2	●	1
R0050T0500	0.5	5°	3	1.44	40	4	2	●	1
R0050T0700	0.5	7°	6	2.36	45	4	2	●	1
R0075T0030	0.75	30'	6	1.59	40	4	2	●	1
R0075T0100	0.75	1°	6	1.68	40	4	2	●	1
R0075T0130	0.75	1° 30'	6	1.78	40	4	2	●	1
R0075T0200	0.75	2°	6	1.87	40	4	2	●	1
R0075T0300	0.75	3°	6	2.05	40	4	2	●	1
R0075T0700	0.75	7°	6	2.8	40	4	2	●	1
R0100T0030	1	30'	8	2.12	45	4	2	●	1
R0100T0100	1	1°	8	2.24	45	4	2	●	1
R0100T0130	1	1° 30'	8	2.37	45	4	2	●	1
R0100T0200	1	2°	8	2.49	45	4	2	●	1
R0100T0300	1	3°	8	2.74	45	4	2	●	1
R0100T0400	1	4°	8	2.98	45	4	2	●	1
R0100T0500	1	5°	8	3.23	45	4	2	●	1
R0100T0700	1	7°	8	3.73	50	6	2	●	1
R0125T0030	1.25	30'	10	2.65	45	4	2	●	1
R0125T0100	1.25	1°	10	2.81	45	4	2	●	1
R0125T0130	1.25	1° 30'	10	2.96	45	4	2	●	1
R0125T0200	1.25	2°	10	3.11	45	4	2	●	1
R0125T0300	1.25	3°	10	3.42	45	4	2	●	1

MS2MTB

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

Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MTBR0125T0400	1.25	4°	10	3.73	50	6	2	●	1
R0125T0500	1.25	5°	10	4.04	50	6	2	●	1
R0125T0700	1.25	7°	14.5	5.77	60	6	2	●	2
R0150T0700	1.5	7°	12.5	5.72	60	6	2	●	2

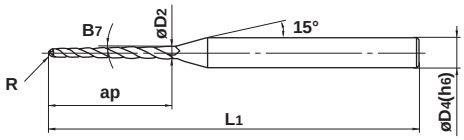
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J303

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	Aluminium Alloy
◎	◎	○		○	○		



Type1

R	0.3 ≤R ≤1				
	±0.03				
	±5'				
h6	4 ≤D4 ≤6				
	0 - 0.008				

4 flute taper ball nose end mill for rib milling.

Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4LTBR0030T0030L04	0.3	30'	4	0.66	45	4	4	●	1
R0030T0030L06	0.3	30'	6	0.70	45	4	4	●	1
R0030T0100L04	0.3	1°	4	0.73	45	4	4	●	1
R0030T0100L06	0.3	1°	6	0.80	45	4	4	●	1
R0030T0130L04	0.3	1° 30'	4	0.79	45	4	4	●	1
R0030T0130L06	0.3	1° 30'	6	0.90	45	4	4	●	1
R0030T0200L04	0.3	2°	4	0.86	45	4	4	●	1
R0030T0200L06	0.3	2°	6	1.00	45	4	4	●	1
R0040T0030L06	0.4	30'	6	0.90	50	4	4	●	1
R0040T0030L08	0.4	30'	8	0.93	50	4	4	●	1
R0040T0030L10	0.4	30'	10	0.97	50	4	4	●	1
R0040T0100L06	0.4	1°	6	1.00	50	4	4	●	1
R0040T0100L08	0.4	1°	8	1.07	50	4	4	●	1
R0040T0100L10	0.4	1°	10	1.14	50	4	4	●	1
R0040T0130L06	0.4	1° 30'	6	1.09	50	4	4	●	1
R0040T0130L08	0.4	1° 30'	8	1.20	50	4	4	●	1
R0040T0130L10	0.4	1° 30'	10	1.30	50	4	4	●	1
R0040T0200L06	0.4	2°	6	1.19	50	4	4	●	1
R0040T0200L08	0.4	2°	8	1.33	50	4	4	●	1
R0040T0200L10	0.4	2°	10	1.47	50	4	4	●	1
R0050T0030L08	0.5	30'	8	1.13	50	4	4	●	1
R0050T0030L10	0.5	30'	10	1.17	50	4	4	●	1
R0050T0030L12	0.5	30'	12	1.20	50	4	4	●	1
R0050T0030L16	0.5	30'	16	1.27	55	4	4	●	1
R0050T0100L08	0.5	1°	8	1.26	50	4	4	●	1
R0050T0100L10	0.5	1°	10	1.33	50	4	4	●	1
R0050T0100L12	0.5	1°	12	1.40	50	4	4	●	1
R0050T0100L16	0.5	1°	16	1.54	55	4	4	●	1
R0050T0130L08	0.5	1° 30'	8	1.39	50	4	4	●	1
R0050T0130L10	0.5	1° 30'	10	1.50	50	4	4	●	1
R0050T0130L12	0.5	1° 30'	12	1.60	50	4	4	●	1
R0050T0130L16	0.5	1° 30'	16	1.81	55	4	4	●	1
R0050T0200L08	0.5	2°	8	1.52	50	4	4	●	1
R0050T0200L10	0.5	2°	10	1.66	50	4	4	●	1

MS4LTB

Ball nose, 4 flute, Taper, For rib milling

Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B7	Length of Cut ap	Large Mill Dia. D2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS4LTBR0050T0200L12	0.5	2°	12	1.80	50	4	4	●	1
R0050T0200L16	0.5	2°	16	2.08	55	4	4	●	1
R0060T0030L08	0.6	30'	8	1.33	50	4	4	●	1
R0060T0030L10	0.6	30'	10	1.36	50	4	4	●	1
R0060T0030L12	0.6	30'	12	1.40	50	4	4	●	1
R0060T0030L16	0.6	30'	16	1.47	55	4	4	●	1
R0060T0100L08	0.6	1°	8	1.46	50	4	4	●	1
R0060T0100L10	0.6	1°	10	1.53	50	4	4	●	1
R0060T0100L12	0.6	1°	12	1.60	50	4	4	●	1
R0060T0100L16	0.6	1°	16	1.74	55	4	4	●	1
R0060T0130L08	0.6	1° 30'	8	1.59	50	4	4	●	1
R0060T0130L10	0.6	1° 30'	10	1.69	50	4	4	●	1
R0060T0130L12	0.6	1° 30'	12	1.80	50	4	4	●	1
R0060T0130L16	0.6	1° 30'	16	2.01	55	4	4	●	1
R0060T0200L08	0.6	2°	8	1.72	50	4	4	●	1
R0060T0200L10	0.6	2°	10	1.86	50	4	4	●	1
R0060T0200L12	0.6	2°	12	2.00	50	4	4	●	1
R0060T0200L16	0.6	2°	16	2.28	55	4	4	●	1
R0075T0030L08	0.75	30'	8	1.63	50	4	4	●	1
R0075T0030L10	0.75	30'	10	1.66	50	4	4	●	1
R0075T0030L12	0.75	30'	12	1.70	50	4	4	●	1
R0075T0030L16	0.75	30'	16	1.77	55	4	4	●	1
R0075T0030L20	0.75	30'	20	1.84	60	4	4	●	1
R0075T0100L08	0.75	1°	8	1.75	50	4	4	●	1
R0075T0100L10	0.75	1°	10	1.82	50	4	4	●	1
R0075T0100L12	0.75	1°	12	1.89	50	4	4	●	1
R0075T0100L16	0.75	1°	16	2.03	55	4	4	●	1
R0075T0100L20	0.75	1°	20	2.17	60	4	4	●	1
R0075T0130L08	0.75	1° 30'	8	1.88	50	4	4	●	1
R0075T0130L10	0.75	1° 30'	10	1.98	50	4	4	●	1
R0075T0130L12	0.75	1° 30'	12	2.09	50	4	4	●	1
R0075T0130L16	0.75	1° 30'	16	2.30	55	4	4	●	1
R0075T0130L20	0.75	1° 30'	20	2.51	60	4	4	●	1
R0075T0200L08	0.75	2°	8	2.01	50	4	4	●	1
R0075T0200L10	0.75	2°	10	2.15	50	4	4	●	1
R0075T0200L12	0.75	2°	12	2.29	50	4	4	●	1
R0075T0200L16	0.75	2°	16	2.57	55	4	4	●	1
R0075T0200L20	0.75	2°	20	2.84	60	4	4	●	1
R0090T0030L08	0.9	30'	8	1.92	50	4	4	●	1
R0090T0030L10	0.9	30'	10	1.96	50	4	4	●	1
R0090T0030L12	0.9	30'	12	1.99	50	4	4	●	1
R0090T0030L16	0.9	30'	16	2.06	55	4	4	●	1
R0090T0030L20	0.9	30'	20	2.13	60	4	4	●	1
R0090T0100L08	0.9	1°	8	2.05	50	4	4	●	1
R0090T0100L10	0.9	1°	10	2.12	50	4	4	●	1
R0090T0100L12	0.9	1°	12	2.19	50	4	4	●	1
R0090T0100L16	0.9	1°	16	2.33	55	4	4	●	1
R0090T0100L20	0.9	1°	20	2.47	60	4	4	●	1
R0090T0130L08	0.9	1° 30'	8	2.17	50	4	4	●	1
R0090T0130L10	0.9	1° 30'	10	2.28	50	4	4	●	1
R0090T0130L12	0.9	1° 30'	12	2.38	50	4	4	●	1
R0090T0130L16	0.9	1° 30'	16	2.59	55	4	4	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B_7	Length of Cut ap	Large Mill Dia. D_2	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
MS4LTBR0090T0130L20	0.9	1° 30'	20	2.80	60	4	4	●	1
R0090T0200L08	0.9	2°	8	2.30	50	4	4	●	1
R0090T0200L10	0.9	2°	10	2.44	50	4	4	●	1
R0090T0200L12	0.9	2°	12	2.58	50	4	4	●	1
R0090T0200L16	0.9	2°	16	2.86	55	4	4	●	1
R0090T0200L20	0.9	2°	20	3.13	60	4	4	●	1
R0100T0030L10	1	30'	10	2.16	50	4	4	●	1
R0100T0030L12	1	30'	12	2.19	50	4	4	●	1
R0100T0030L16	1	30'	16	2.26	55	4	4	●	1
R0100T0030L20	1	30'	20	2.33	60	4	4	●	1
R0100T0030L25	1	30'	25	2.42	65	4	4	●	1
R0100T0030L30	1	30'	30	2.51	65	4	4	●	1
R0100T0100L10	1	1°	10	2.31	50	4	4	●	1
R0100T0100L12	1	1°	12	2.38	50	4	4	●	1
R0100T0100L16	1	1°	16	2.52	55	4	4	●	1
R0100T0100L20	1	1°	20	2.66	60	4	4	●	1
R0100T0100L25	1	1°	25	2.84	65	4	4	●	1
R0100T0100L30	1	1°	30	3.01	65	4	4	●	1
R0100T0130L10	1	1° 30'	10	2.47	50	4	4	●	1
R0100T0130L12	1	1° 30'	12	2.58	50	4	4	●	1
R0100T0130L16	1	1° 30'	16	2.79	55	4	4	●	1
R0100T0130L20	1	1° 30'	20	3.00	60	4	4	●	1
R0100T0130L25	1	1° 30'	25	3.26	65	6	4	●	1
R0100T0130L30	1	1° 30'	30	3.52	65	6	4	●	1
R0100T0200L10	1	2°	10	2.63	50	4	4	●	1
R0100T0200L12	1	2°	12	2.77	50	4	4	●	1
R0100T0200L16	1	2°	16	3.05	55	4	4	●	1
R0100T0200L20	1	2°	20	3.33	60	4	4	●	1
R0100T0200L25	1	2°	25	3.68	65	6	4	●	1
R0100T0200L30	1	2°	30	4.03	65	6	4	●	1

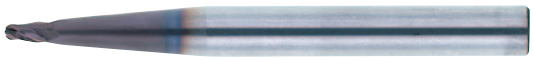
MIRACLE END MILL FOR HIGH HARDNESS STEEL

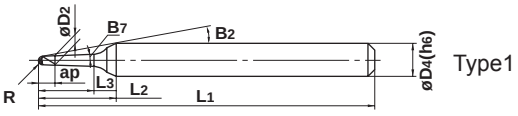
VC-4STB

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

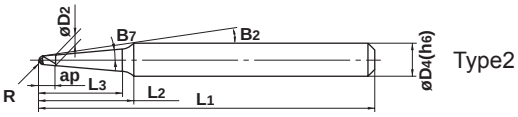
UWC VC 30° R<0.5 R≥0.5

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	Aluminium Alloy
○	◎	◎	◎	○	○		

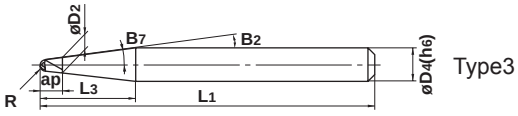




Type1



Type2



Type3

*Relief Neck type.

R	0.3 ≤R ≤4				
	±0.01				
h6	D4=6	8 ≤D4 ≤10			
	0 - 0.008	0 - 0.009			

● 4 flute taper end mill with taper neck for maximum rigidity and high performance.

Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B7	Length of Cut ap	Neck Length L3	Under Shank Length L2	Large Mill Dia. D2	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4STBR0030T0130N05	0.3	1° 30'	1	5	9.0	0.64	17.2°	60	6	4	●	1
R0030T0200N05	0.3	2°	1	5	9.0	0.65	17.2°	60	6	4	●	1
R0030T0500N05	0.3	5°	1	5	8.8	0.72	17.6°	60	6	4	●	1
R0030T1000N15	0.3	10°	1	15	—	0.86	10.4°	60	6	4	●	3
R0040T0130N10	0.4	1° 30'	2	10	14.0	0.88	10.8°	60	6	4	●	1
R0040T0130N15	0.4	1° 30'	2	15	19.0	0.88	8.0°	60	6	4	●	1
R0040T0200N10	0.4	2°	2	10	14.0	0.91	10.8°	60	6	4	●	1
R0040T0500N10	0.4	5°	2	10	13.5	1.08	11.2°	60	6	4	●	1
R0040T0700N10	0.4	7°	7	10	12.2	2.43	12.4°	60	6	4	●	2
R0040T1000N15	0.4	10°	3	15	—	1.73	10.1°	60	6	4	●	3
R0050T0130N10	0.5	1° 30'	2	10	14.0	1.08	10.5°	60	6	4	●	1
R0050T0130N15	0.5	1° 30'	2	15	19.0	1.08	7.7°	60	6	4	●	1
R0050T0130N20	0.5	1° 30'	2	20	24.0	1.08	6.1°	60	6	4	●	1
R0050T0200N10	0.5	2°	2	10	14.0	1.11	10.5°	60	6	4	●	1
R0050T0200N15	0.5	2°	2	15	18.9	1.11	7.8°	60	6	4	●	1
R0050T0200N20	0.5	2°	3	20	24.0	1.11	6.1°	60	6	4	●	1
R0050T0500N10	0.5	5°	3	10	13.6	1.44	10.8°	60	6	4	●	1
R0050T0500N15	0.5	5°	3	15	17.2	1.44	8.5°	60	6	4	●	2
R0050T0500N20	0.5	5°	3	20	21.8	1.44	6.7°	60	6	4	●	2
R0050T0700N10	0.5	7°	7	10	12.1	2.60	12.2°	60	6	4	●	2
R0050T0700N15	0.5	7°	7	15	16.6	2.60	8.9°	60	6	4	●	2
R0050T0700N20	0.5	7°	7	20	—	2.60	7.3°	60	6	4	●	3
R0050T1000N14	0.5	10°	3	14	—	1.90	10.5°	60	6	4	●	3
R0075T0200N10	0.75	2°	3	10	14.0	1.66	9.6°	60	6	4	●	1
R0075T0500N15	0.75	5°	3	15	17.0	1.90	7.9°	60	6	4	●	2
R0100T0130N10	1	1° 30'	4	10	13.5	2.16	9.1°	60	6	4	●	1
R0100T0130N15	1	1° 30'	4	15	18.5	2.16	6.5°	60	6	4	●	1
R0100T0130N20	1	1° 30'	4	20	23.5	2.16	5.1°	60	6	4	●	1
R0100T0200N06	1	2°	4	6	8.7	2.21	14.4°	60	6	4	●	2
R0100T0200N10	1	2°	4	10	13.8	2.21	8.9°	60	6	4	●	1
R0100T0200N15	1	2°	4	15	17.5	2.21	6.9°	60	6	4	●	2
R0100T0500N10	1	5°	4	10	12.2	2.53	10.1°	60	6	4	●	2
R0100T0500N15	1	5°	4	15	16.8	2.53	7.2°	60	6	4	●	2
R0100T0500N23	1	5°	4	23	—	2.53	5.2°	60	6	4	●	3

● : Inventory maintained in Japan.

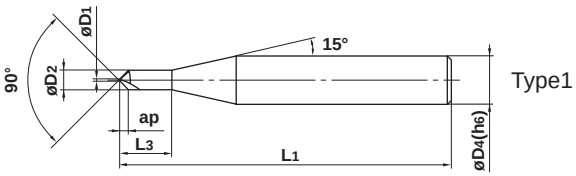
Unit : mm

Order Number	Radius of Ball Nose R	Taper Angle One Side B7	Length of Cut ap	Neck Length L3	Under Shank Length L2	Large Mill Dia. D2	Cutting Edge to Shank Angle B2	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4STBR0100T0700N17	1	7°	7	17	—	3.49	7.1°	60	6	4	●	3
R0100T1000N12	1	10°	4	12	—	3.09	10.3°	60	6	4	●	3
R0125T0500N15	1.25	5°	4	15	16.5	2.99	6.6°	60	6	4	●	2
R0150T0130N15	1.5	1° 30'	4	15	17.3	3.13	5.4°	60	6	4	●	2
R0150T0130N20	1.5	1° 30'	4	20	22.2	3.13	4.2°	60	6	4	●	2
R0150T0300N15	1.5	3°	4	15	16.9	3.27	5.6°	60	6	4	●	2
R0150T0500N10	1.5	5°	4	10	11.7	3.45	8.3°	60	6	4	●	2
R0150T0500N18	1.5	5°	4	18	—	3.45	5.2°	60	6	4	●	3
R0175T0500N15	1.75	5°	4	15	—	3.91	5.4°	60	6	4	●	3
R0200T0130N15	2	1° 30'	5	15	16.8	4.16	3.9°	60	6	4	●	2
R0200T0130N20	2	1° 30'	5	20	21.6	4.16	3.0°	60	6	4	●	2
R0200T0300N21	2	3°	4	21	—	4.22	3.1°	60	6	4	●	3
R0200T0500N13	2	5°	4	13	—	4.37	5.2°	60	6	4	●	3
R0200T0700N18	2	7°	7	18	—	5.26	7.1°	60	8	4	●	3
R0300T0130N15	3	1° 30'	6	15	16.8	6.16	4.2°	90	8	4	●	2
R0300T0130N20	3	1° 30'	6	20	21.7	6.16	3.1°	90	8	4	●	2
R0300T0300N22	3	3°	6	22	—	6.32	3.1°	90	8	4	●	3
R0400T0130N15	4	1° 30'	8	15	16.9	8.21	4.4°	90	10	4	●	2
R0400T0300N22	4	3°	8	22	—	8.43	3.2°	90	10	4	●	3

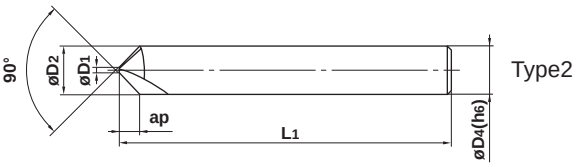
VC-2C

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	Aluminium Alloy
◎	◎	◎	○	◎	◎	○	○



Type1



Type2

±0.02				
D4=6	8 ≤D4 ≤10	D4=12		
h6 0 - 0.008	0 - 0.009	0 - 0.011		

● Chamfering cutters for machining of hardened steel and difficult-to-cut materials.

Unit : mm

Order Number	Dia. D2	Small Mill Dia. D1	Length of Cut ap	Neck Length L3	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2CD0200	2	0.3	0.85	6	50	6	2	●	1
D0400	4	0.3	1.85	12	50	6	2	●	1
D0600	6	0.3	2.85	—	50	6	2	●	2
D0800	8	0.4	3.8	—	60	8	2	●	2
D1000	10	0.5	4.75	—	70	10	2	●	2
D1200	12	0.5	5.75	—	75	12	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J369

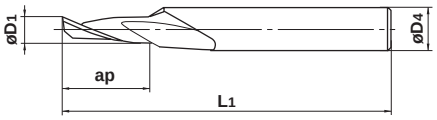
Memo

LIGHT ALLOY STEEL END MILLS

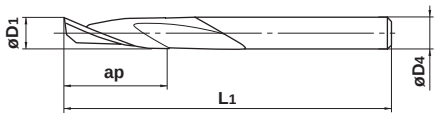
1MA

End mill, Medium cut length, 1 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	Aluminium Alloy
							◎



Type1



Type2

3≤D1≤8				
0 - 0.050				

● Single flute end mill for aluminium channel and wood working.

Unit : mm

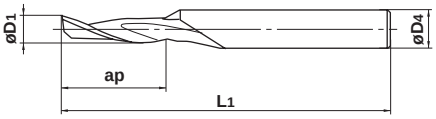
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
1MAD0300	3	10	60	8	1	●	1
D0400	4	12	60	8	1	●	1
D0500	5	15	65	8	1	●	1
D0600	6	15	65	8	1	●	1
D0800	8	20	75	8	1	●	2

● : Inventory maintained in Japan.

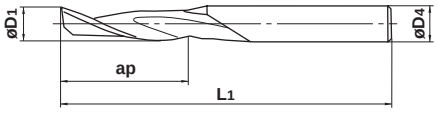
1LA

End mill, Long cut length, 1 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	Aluminium Alloy
							◎



Type1



Type2

4≤D1≤12					
0 - 0.050					

● Single flute end mill with longer cut length and overall length than standard for deeper machining.

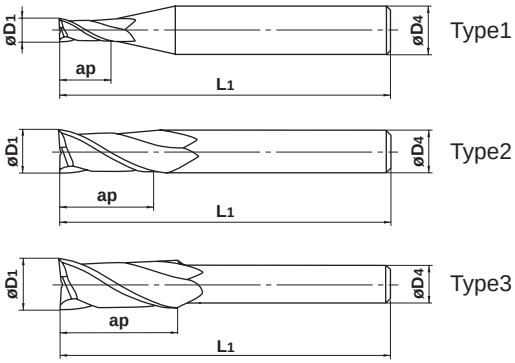
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
1LAD0400	4	18	70	8	1	●	1
D0500	5	20	70	8	1	●	1
D0600	6	20	70	8	1	●	1
D0800	8	30	80	8	1	●	2
D1000	10	35	90	10	1	●	2
D1200	12	45	100	12	1	●	2

VA-2SS

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	Aluminium Alloy
◎	○			○	○		



3≤D1≤20				
0 - 0.030				

● 2 flute end mill with high grade HSS substrate and Violet coating for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VA2SSD0300	3	8	50	6	2	●	1
D0400	4	8	60	8	2	●	1
D0500	5	10	60	8	2	●	1
D0600	6	12	60	8	2	●	1
D0700	7	15	65	10	2	●	1
D0800	8	15	65	10	2	●	1
D0900	9	20	75	10	2	●	1
D1000	10	20	75	12	2	●	1
D1100	11	22	85	12	2	●	1
D1200	12	22	85	12	2	●	2
D1300	13	26	90	12	2	●	3
D1400	14	26	95	16	2	●	1
D1500	15	30	100	16	2	●	1
D1600	16	32	100	16	2	●	2
D1700	17	34	100	16	2	●	3
D1800	18	34	100	16	2	●	3
D1900	19	38	120	20	2	●	1
D2000	20	38	120	20	2	●	2

● : Inventory maintained in Japan.

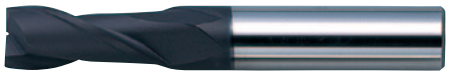
CUTTING CONDITIONS ➤ J399

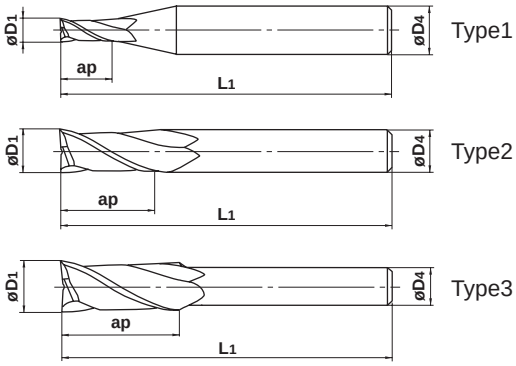
VA-2MS

End mill, Medium cut length, 2 flute

D1<3 D1≥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	Aluminium Alloy
◎	○			○	○		





D1 ≤20	D1>20			
0 - 0.030	0 - 0.040			

2 flute end mill with high grade HSS substrate and Violet coating for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VA2MSD0300	3	10	50	6	2	●	1
D0400	4	12	60	8	2	●	1
D0500	5	15	60	8	2	●	1
D0600	6	15	60	8	2	●	1
D0700	7	20	65	10	2	●	1
D0800	8	20	65	10	2	●	1
D0900	9	25	75	10	2	●	1
D1000	10	25	75	10	2	●	2
D1100	11	30	85	12	2	●	1
D1200	12	30	85	12	2	●	2
D1300	13	35	90	12	2	●	3
D1400	14	35	95	16	2	●	1
D1500	15	40	100	16	2	●	1
D1600	16	40	100	16	2	●	2
D1700	17	40	100	16	2	●	3
D1800	18	40	100	16	2	●	3
D1900	19	45	120	20	2	●	1
D2000	20	45	120	20	2	●	2
D2200	22	45	120	20	2	●	3
D2400	24	50	140	25	2	●	1
D2500	25	50	140	25	2	●	2
D2600	26	50	140	25	2	●	3
D2800	28	55	145	25	2	●	3
D3000	30	55	145	25	2	●	3
D3200	32	60	160	32	2	●	2
D3500	35	60	160	32	2	●	3
D4000	40	65	165	32	2	●	3

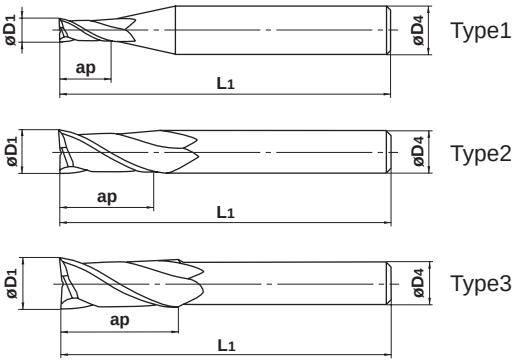
TWO-FLUTE END MILLS

2SS

End mill, Short cut length, 2 flute

CO HSS | 30° | D1<3 | D1≥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	Aluminium Alloy
◎	○			○	○		○



D1 ≤3	D1>3			
0 - 0.020	0 - 0.030			

● 2 flute HSS end mill with rigid design.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2SSD0050	0.5	0.8	50	6	2	●	1
D0100	1	2	50	6	2	●	1
D0150	1.5	3.5	50	6	2	●	1
D0200	2	5	50	6	2	●	1
D0250	2.5	6	50	6	2	●	1
D0300	3	8	50	6	2	●	1
D0350	3.5	8	60	8	2	●	1
D0400	4	8	60	8	2	●	1
D0450	4.5	10	60	8	2	●	1
D0500	5	10	60	8	2	●	1
D0550	5.5	12	60	8	2	●	1
D0600	6	12	60	8	2	●	1
D0650	6.5	15	65	10	2	●	1
D0700	7	15	65	10	2	●	1
D0750	7.5	15	65	10	2	●	1
D0800	8	15	65	10	2	●	1
D0850	8.5	20	75	10	2	●	1
D0900	9	20	75	10	2	●	1
D0950S10	9.5	20	75	10	2	●	1
D0950S12	9.5	20	75	12	2	●	1
D1000S10	10	20	75	10	2	●	2
D1000S12	10	20	75	12	2	●	1
D1050	10.5	22	85	12	2	●	1
D1100	11	22	85	12	2	●	1
D1150	11.5	22	85	12	2	●	1
D1200	12	22	85	12	2	●	2
D1250	12.5	26	90	12	2	●	3
D1300	13	26	90	12	2	●	3
D1350	13.5	26	90	16	2	●	1
D1400	14	26	90	16	2	●	1
D1450	14.5	26	100	16	2	●	1
D1500	15	30	100	16	2	●	1
D1550	15.5	32	100	16	2	●	1
D1600	16	32	100	16	2	●	2

● : **Inventory maintained in Japan.**

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
2SSD1650	16.5	32	100	16	2	●	3
D1700	17	34	100	16	2	●	3
D1750	17.5	34	100	16	2	●	3
D1800	18	34	100	16	2	●	3
D1850	18.5	38	115	20	2	●	1
D1900	19	38	115	20	2	●	1
D1950	19.5	38	115	20	2	●	1
D2000	20	38	115	20	2	●	2

CUTTING CONDITIONS ➤ J406

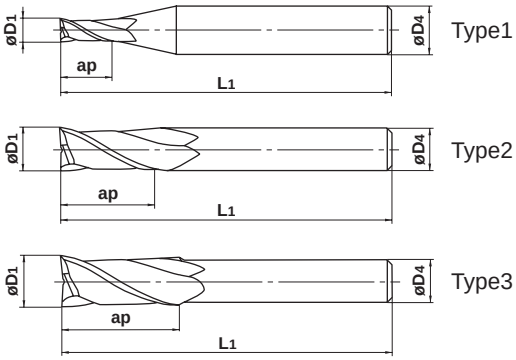
TWO-FLUTE END MILLS

S-2MD

End mill, Short cut length, 2 flute, KHA Super

KHA S | 30° | D1<3 | D1≥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	Aluminium Alloy
◎	○			○	○		○



D1≤3	3<D1≤20	D1>20		
0 - 0.020	0 - 0.030	0 - 0.040		

● 2 flute end mill with KHA Super substrate for high speed milling of difficult-to-cut and hard materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S2MDD0050	0.5	0.8	50	6	2	●	1
D0100	1	2	50	6	2	●	1
D0150	1.5	3.5	50	6	2	●	1
D0200	2	5	50	6	2	●	1
D0250	2.5	6	50	6	2	●	1
D0300	3	8	50	6	2	●	1
D0350	3.5	8	60	8	2	●	1
D0400	4	8	60	8	2	●	1
D0450	4.5	10	60	8	2	●	1
D0500	5	10	60	8	2	●	1
D0550	5.5	12	60	8	2	●	1
D0600	6	12	60	8	2	●	1
D0650	6.5	15	65	10	2	●	1
D0700	7	15	65	10	2	●	1
D0750	7.5	15	65	10	2	●	1
D0800S08	8	15	65	8	2	●	2
D0800S10	8	15	65	10	2	●	1
D0850	8.5	20	75	10	2	●	1
D0900	9	20	75	10	2	●	1
D0950	9.5	20	75	12	2	●	1
D1000S10	10	20	75	10	2	●	2
D1000S12	10	20	75	12	2	●	1
D1050	10.5	22	85	12	2	●	1
D1100	11	22	85	12	2	●	1
D1150	11.5	22	85	12	2	●	1
D1200	12	22	85	12	2	●	2
D1250	12.5	26	90	12	2	●	3
D1300	13	26	90	12	2	●	3
D1350	13.5	26	95	16	2	●	1
D1400	14	26	95	16	2	●	1
D1450	14.5	26	100	16	2	●	1
D1500	15	30	100	16	2	●	1
D1550	15.5	32	100	16	2	●	1
D1600	16	32	100	16	2	●	2

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
S2MDD1650	16.5	32	100	16	2	●	3
D1700	17	34	100	16	2	●	3
D1750	17.5	34	100	16	2	●	3
D1800	18	34	100	16	2	●	3
D1850	18.5	38	120	20	2	●	1
D1900	19	38	120	20	2	●	1
D1950	19.5	38	120	20	2	●	1
D2000	20	38	120	20	2	●	2

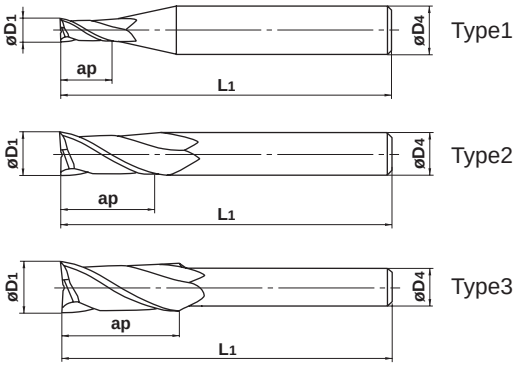
TWO-FLUTE END MILLS

G-2MS

End mill, Medium cut length, 2 flute

CO HSS | G | 30° | D1<3 | D1≥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	Aluminium Alloy
◎	○			○	○		○



D1≤20	D1>20			
0 - 0.030	0 - 0.040			

2 flute end mill with high grade HSS substrate and TiN coating for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
G2MSD0100	1	3	50	6	2	●	1
D0150	1.5	4.5	50	6	2	●	1
D0200	2	6	50	6	2	●	1
D0250	2.5	7.5	50	6	2	●	1
D0300	3	10	50	6	2	●	1
D0350	3.5	12	50	6	2	●	1
D0400	4	12	50	6	2	●	1
D0450	4.5	15	55	6	2	●	1
D0500	5	15	55	6	2	●	1
D0550	5.5	15	55	6	2	●	1
D0600	6	15	55	6	2	●	2
D0650	6.5	20	65	8	2	●	1
D0700	7	20	65	8	2	●	1
D0750	7.5	20	65	8	2	●	1
D0800	8	20	65	8	2	●	2
D0850	8.5	25	75	10	2	●	1
D0900	9	25	75	10	2	●	1
D0950	9.5	25	75	10	2	●	1
D1000	10	25	75	10	2	●	2
D1100	11	30	85	12	2	●	1
D1200	12	30	85	12	2	●	2
D1300	13	35	90	12	2	●	3
D1400	14	35	95	16	2	●	1
D1500	15	40	100	16	2	●	1
D1600	16	40	100	16	2	●	2
D1700	17	40	100	16	2	●	3
D1800	18	40	100	16	2	●	3
D1900	19	45	115	20	2	●	1
D2000	20	45	115	20	2	●	2
D2100	21	45	115	20	2	●	3
D2200	22	45	115	20	2	●	3
D2300	23	50	120	25	2	●	1
D2400	24	50	120	25	2	●	1
D2500	25	50	120	25	2	●	2

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
G2MSD2600	26	50	120	25	2	●	3
D2700	27	55	125	25	2	●	3
D2800	28	55	125	25	2	●	3
D2900	29	55	125	25	2	●	3
D3000	30	55	125	25	2	●	3
D3100	31	60	145	25	2	●	3
D3200	32	60	145	32	2	●	2
D3300	33	60	145	32	2	●	3
D3400	34	60	145	32	2	●	3
D3500	35	60	145	32	2	●	3
D3600	36	65	150	32	2	●	3
D3700	37	65	150	32	2	●	3
D3800	38	65	150	32	2	●	3
D3900	39	65	150	32	2	●	3
D4000	40	65	150	32	2	●	3

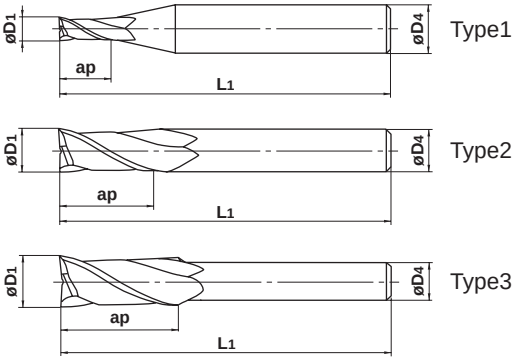
TWO-FLUTE END MILLS

2MS

End mill, Medium cut length, 2 flute

CO HSS | 30° | D1<3 | D1≥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	Aluminium Alloy
◎	○			○	○		○



D1≤3	3<D1≤20	D1>20		
0 - 0.020	0 - 0.030	0 - 0.040		

● 2 flute end mill with high grade HSS substrate for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2MSD0100	1	3	50	6	2	●	1
D0150	1.5	4.5	50	6	2	●	1
D0200	2	6	50	6	2	●	1
D0250	2.5	7.5	50	6	2	●	1
D0300	3	10	50	6	2	●	1
D0350	3.5	12	50	6	2	●	1
D0400	4	12	50	6	2	●	1
D0450	4.5	15	55	6	2	●	1
D0500	5	15	55	6	2	●	1
D0550	5.5	15	55	6	2	●	1
D0600	6	15	55	6	2	●	2
D0650	6.5	20	65	8	2	●	1
D0700	7	20	65	8	2	●	1
D0750	7.5	20	65	8	2	●	1
D0800	8	20	65	8	2	●	2
D0850	8.5	25	75	10	2	●	1
D0900	9	25	75	10	2	●	1
D0950	9.5	25	75	10	2	●	1
D1000	10	25	75	10	2	●	2
D1100	11	30	85	12	2	●	1
D1200	12	30	85	12	2	●	2
D1300	13	35	90	12	2	●	3
D1400	14	35	95	16	2	●	1
D1500	15	40	100	16	2	●	1
D1600	16	40	100	16	2	●	2
D1700	17	40	100	16	2	●	3
D1800	18	40	100	16	2	●	3
D1900	19	45	115	20	2	●	1
D2000	20	45	115	20	2	●	2
D2100	21	45	115	20	2	●	3
D2200	22	45	115	20	2	●	3
D2300	23	50	120	25	2	●	1
D2400	24	50	120	25	2	●	1
D2500	25	50	120	25	2	●	2

● : **Inventory maintained in Japan.**

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
2MSD2600	26	50	120	25	2	●	3
D2700	27	55	125	25	2	●	3
D2800	28	55	125	25	2	●	3
D2900	29	55	125	25	2	●	3
D3000	30	55	125	25	2	●	3
D3100	31	60	145	25	2	●	3
D3200	32	60	145	32	2	●	2
D3300	33	60	145	32	2	●	3
D3400	34	60	145	32	2	●	3
D3500	35	60	145	32	2	●	3
D3600	36	65	150	32	2	●	3
D3700	37	65	150	32	2	●	3
D3800	38	65	150	32	2	●	3
D3900	39	65	150	32	2	●	3
D4000	40	65	150	32	2	●	3
D4100	41	70	155	32	2	●	3
D4200S32	42	70	155	32	2	●	3
D4200S42	42	70	155	42	2	●	2
D4500S32	45	70	155	32	2	●	3
D4500S42	45	70	155	42	2	●	3
D4600S32	46	70	155	32	2	●	3
D4600S42	46	70	155	42	2	●	3
D5000S32	50	70	155	32	2	●	3
D5000S42	50	70	155	42	2	●	3
D5500	55	80	175	42	2	●	3
D6000	60	85	185	42	2	●	3

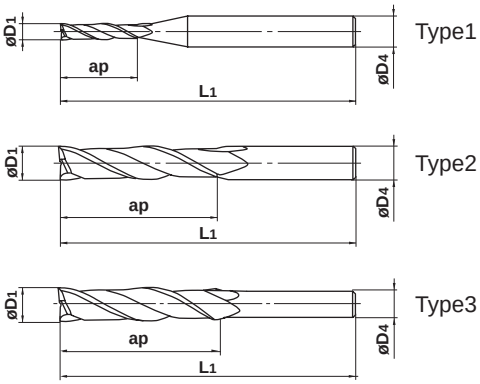
TWO-FLUTE END MILLS

2LS

End mill, Long cut length, 2 flute

CO HSS | 30° | D1<3 | D1≥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	Aluminium Alloy
◎	○			○	○		○



D1≤3	3<D1≤20	D1>20		
0 - 0.020	0 - 0.030	0 - 0.040		

● 2 flute end mill with high grade HSS substrate for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2LSD0100	1	6	50	6	2	●	1
D0150	1.5	7.5	50	6	2	●	1
D0200	2	10	55	6	2	●	1
D0250	2.5	15	55	6	2	●	1
D0300	3	15	55	6	2	●	1
D0350	3.5	15	55	6	2	●	1
D0400	4	20	55	6	2	●	1
D0450	4.5	20	55	6	2	●	1
D0500	5	25	60	6	2	●	1
D0550	5.5	25	60	6	2	●	1
D0600	6	25	60	6	2	●	2
D0650	6.5	35	75	8	2	●	1
D0700	7	35	75	8	2	●	1
D0750	7.5	35	75	8	2	●	1
D0800	8	35	75	8	2	●	2
D0850	8.5	35	75	10	2	●	1
D0900	9	45	90	10	2	●	1
D0950	9.5	45	90	10	2	●	1
D1000	10	45	90	10	2	●	2
D1050	10.5	55	105	12	2	●	1
D1100	11	55	105	12	2	●	1
D1150	11.5	55	105	12	2	●	1
D1200	12	55	105	12	2	●	2
D1250	12.5	55	105	12	2	●	3
D1300	13	55	105	12	2	●	3
D1350	13.5	55	110	16	2	●	1
D1400	14	55	110	16	2	●	1
D1450	14.5	65	120	16	2	●	1
D1500	15	65	120	16	2	●	1
D1550	15.5	65	120	16	2	●	1
D1600	16	65	120	16	2	●	2
D1650	16.5	65	120	16	2	●	3
D1700	17	65	120	16	2	●	3
D1750	17.5	65	120	16	2	●	3

● : **Inventory maintained in Japan.**

Unit : mm

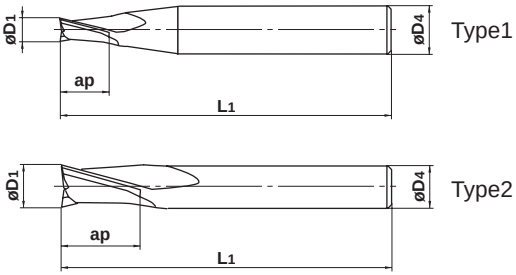
Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
2LSD1800	18	65	120	16	2	●	3
D1850	18.5	75	140	20	2	●	1
D1900	19	75	140	20	2	●	1
D1950	19.5	75	140	20	2	●	1
D2000	20	75	140	20	2	●	2
D2100	21	75	140	20	2	●	3
D2200	22	75	140	20	2	●	3
D2300	23	90	160	25	2	●	1
D2400	24	90	160	25	2	●	1
D2500	25	90	160	25	2	●	2
D2600	26	90	160	25	2	●	3
D2700	27	90	160	25	2	●	3
D2800	28	90	160	25	2	●	3
D2900	29	90	160	25	2	●	3
D3000	30	90	160	25	2	●	3
D3100	31	95	180	25	2	●	3
D3200	32	95	180	32	2	●	2
D3300	33	95	180	32	2	●	3
D3400	34	100	185	32	2	●	3
D3500	35	100	185	32	2	●	3
D3600	36	105	190	32	2	●	3
D3700	37	105	190	32	2	●	3
D3800	38	105	190	32	2	●	3
D3900	39	110	195	32	2	●	3
D4000	40	110	195	32	2	●	3

TWO-FLUTE END MILLS

2MK

End mill, Short cut length, 2 flute, For key ways

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	Aluminium Alloy
◎	○			○			○



● 2 flute end mill for NN (JIS) standards and plus or minus tolerance diameters.

2MK-P($D_1{}^{+0.02}_{0}$)

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
2MKPD0300	3	5	50	6	2	●	1
D0400	4	6	60	8	2	●	1
D0500	5	8	60	8	2	●	1
D0600	6	8	60	8	2	●	1
D0700	7	10	65	10	2	●	1
D0800	8	10	65	10	2	●	1
D1000	10	15	75	12	2	●	1
D1200	12	18	75	12	2	●	2
D1500	15	22	75	16	2	●	1
D1800	18	22	80	20	2	●	1
D2000	20	22	85	20	2	●	2

2MK-N($D_1{}^{0}_{-0.02}$)

Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
2MKND0300	3	5	50	6	2	●	1
D0400	4	6	60	8	2	●	1
D0500	5	8	60	8	2	●	1
D0600	6	8	60	8	2	●	1
D0700	7	10	65	10	2	●	1
D0800	8	10	65	10	2	●	1
D1000	10	15	75	12	2	●	1
D1200	12	18	75	12	2	●	2
D1500	15	22	75	16	2	●	1

● : Inventory maintained in Japan.

2MK-NN($D_1{}^{-0.02}_{-0.04}$)

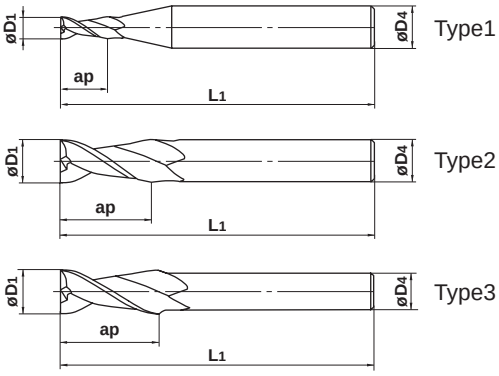
Unit : mm

Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
2MKNND0300	3	5	50	6	2	●	1
D0400	4	6	60	8	2	●	1
D0500	5	8	60	8	2	●	1
D0600	6	8	60	8	2	●	1
D0700	7	10	65	10	2	●	1
D0800	8	10	65	10	2	●	1
D1000	10	15	75	12	2	●	1
D1200	12	18	75	12	2	●	2
D1500	15	22	75	16	2	●	1
D1800	18	22	80	20	2	●	1
D2000	20	22	85	20	2	●	2

S-2SDA

End mill, Short cut length, 2 flute, For aluminium 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	Aluminium Alloy
						○	◎



D1=3	D1>3			
0 - 0.020	0 - 0.030			

● 2 flute end mill for aluminium alloy and soft materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S2SDAD0300	3	8	50	6	2	●	1
D0400	4	8	60	8	2	●	1
D0500	5	10	60	8	2	●	1
D0600	6	12	60	8	2	●	1
D0800	8	15	65	10	2	●	1
D1000	10	20	75	10	2	●	2
D1200	12	22	85	12	2	●	2
D1400	14	26	90	16	2	●	1
D1600	16	32	100	16	2	●	2
D1800	18	34	100	16	2	●	3
D2000	20	38	115	20	2	●	2

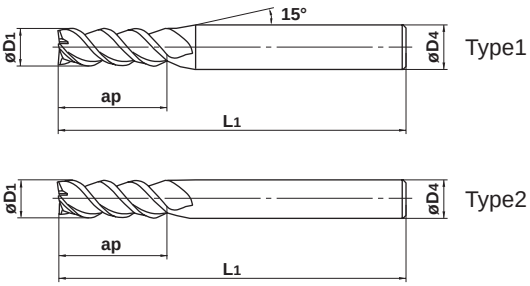
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J416

VA-MH

End mill, Medium cut length, 2—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	Aluminium Alloy
◎	○			◎	○		



5≤D1≤30				
0 - 0.040				

2—4 flute end mill with high grade HSS substrate and Violet coating for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VAMHD0500	5	12	65	8	2	●	1
D0600	6	15	65	8	3	●	1
D0700	7	20	75	10	3	●	1
D0800	8	20	75	10	3	●	1
D0900	9	25	90	10	3	●	1
D1000	10	25	90	12	3	●	1
D1100	11	30	95	12	3	●	1
D1200	12	30	95	12	3	●	2
D1300	13	35	105	16	3	●	1
D1400	14	35	105	16	3	●	1
D1500	15	40	115	16	3	●	1
D1600	16	40	115	16	3	●	2
D1800	18	40	125	20	3	●	1
D2000	20	45	130	20	3	●	2
D2100	21	45	135	25	4	●	1
D2200	22	45	135	25	4	●	1
D2300	23	50	140	25	4	●	1
D2400	24	50	140	25	4	●	1
D2500	25	50	140	25	4	●	2
D2800	28	55	150	32	4	●	1
D3000	30	55	150	32	4	●	1

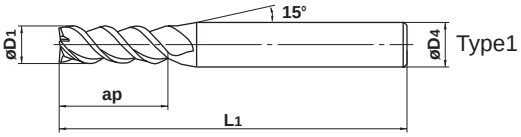
HIGH HELIX END MILLS

K-MH

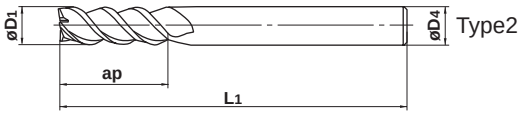
End mill, Medium cut length, 2—4 flute, High helix angle

KHA | 45° | 50° | D1=5 | D1≥6 | D1=5 | D1≤20 | D1≥21

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	Aluminium Alloy
◎	○			○	○	○	○



Type1



Type2

5≤D1≤20				
0 - 0.040				

● 2—4 flute end mill for general use on mild steel through to difficult-to-cut materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
KMHD0500	5	12	65	8	2	●	1
D0600	6	15	65	8	3	●	1
D0700	7	20	75	10	3	●	1
D0800	8	20	75	10	3	●	1
D0900	9	25	90	10	3	●	1
D1000	10	25	90	12	3	●	1
D1200	12	30	95	12	3	●	2
D1400	14	35	105	16	3	●	1
D1600	16	40	115	16	3	●	2
D2000	20	45	130	20	3	●	2

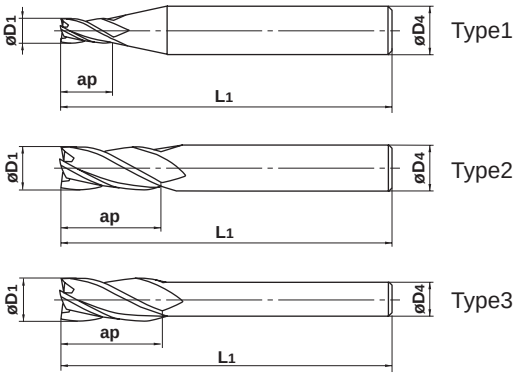
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J416

VA-4MC

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	Aluminium Alloy
◎	○			○	○		



D1 ≤20	D1>20			
0 + 0.030	0 + 0.040			

4 flute end mill with high grade HSS substrate and Violet coating for general use.

Unit : mm

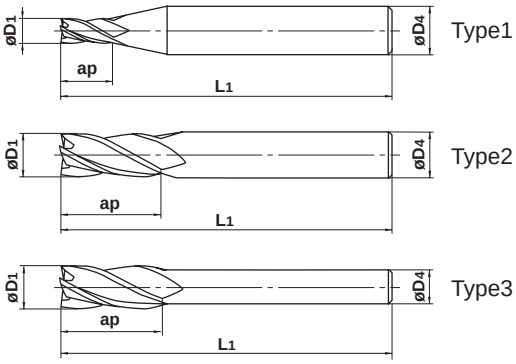
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VA4MCD0300	3	10	50	6	4	●	1
D0400	4	12	60	8	4	●	1
D0500	5	15	60	8	4	●	1
D0600	6	15	60	8	4	●	1
D0700	7	20	65	10	4	●	1
D0800	8	20	65	10	4	●	1
D0900	9	25	75	10	4	●	1
D1000	10	25	75	10	4	●	2
D1100	11	30	85	12	4	●	1
D1200	12	30	85	12	4	●	2
D1300	13	35	90	12	4	●	3
D1400	14	35	95	16	4	●	1
D1500	15	40	100	16	4	●	1
D1600	16	40	100	16	4	●	2
D1700	17	40	100	16	4	●	3
D1800	18	40	100	16	4	●	3
D1900	19	45	115	20	4	●	1
D2000	20	45	115	20	4	●	2
D2200	22	45	115	20	4	●	3
D2400	24	50	120	25	4	●	1
D2500	25	50	120	25	4	●	2
D2800	28	55	125	25	4	●	3
D3000	30	55	125	25	4	●	3

FOUR-FLUTE END MILLS

S-4MD

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	Aluminium Alloy
◎	○			○	○		○



D1 ≤20	D1>20			
0 +0.020	0 +0.030			

● 4 flute end mill with high grade powder metallurgy HSS (KHA Super) substrate for high speed milling and cutting of high hardness difficult-to-cut materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S4MDD0250	2.5	10	50	6	4	●	1
D0300	3	10	50	6	4	●	1
D0350	3.5	12	60	8	4	●	1
D0400	4	12	60	8	4	●	1
D0450	4.5	15	60	8	4	●	1
D0500	5	15	60	8	4	●	1
D0550	5.5	15	60	8	4	●	1
D0600	6	15	60	8	4	●	1
D0650	6.5	20	65	10	4	●	1
D0700	7	20	65	10	4	●	1
D0750	7.5	20	65	10	4	●	1
D0800	8	20	65	10	4	●	1
D0850	8.5	25	75	10	4	●	1
D0900	9	25	75	10	4	●	1
D0950	9.5	25	75	10	4	●	1
D1000S10	10	25	75	10	4	●	2
D1000S12	10	25	75	12	4	●	1
D1100	11	30	85	12	4	●	1
D1200	12	30	85	12	4	●	2
D1300	13	35	90	12	4	●	3
D1400	14	35	95	16	4	●	1
D1500	15	40	100	16	4	●	1
D1600	16	40	100	16	4	●	2
D1700	17	40	100	16	4	●	3
D1800	18	40	100	16	4	●	3
D1900	19	45	115	20	4	●	1
D2000	20	45	115	20	4	●	2

● : Inventory maintained in Japan.

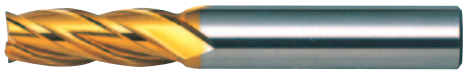
CUTTING CONDITIONS ➤ J410

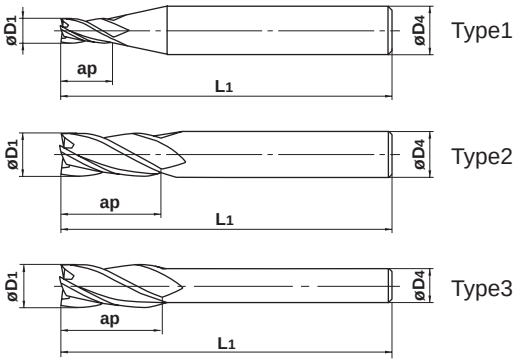
G-4MC

End mill, Medium cut length, 4 flute

CO HSS | G | 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	Aluminium Alloy
◎	○			○	○		○





D1 ≤20	D1>20			
0 + 0.030	0 + 0.040			

4 flute end mill for high speed continuous cutting.

Unit : mm

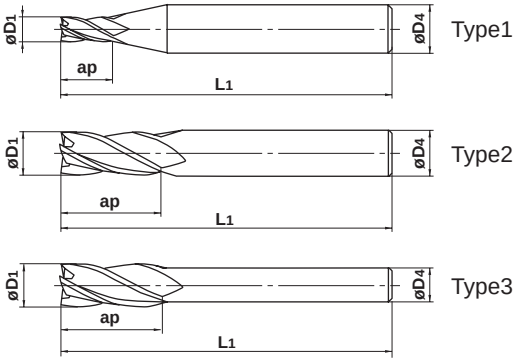
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
G4MCD0300	3	10	50	6	4	●	1
D0350	3.5	12	60	8	4	●	1
D0400	4	12	60	8	4	●	1
D0450	4.5	15	60	8	4	●	1
D0500	5	15	60	8	4	●	1
D0550	5.5	15	60	8	4	●	1
D0600	6	15	60	8	4	●	1
D0650	6.5	20	65	10	4	●	1
D0700	7	20	65	10	4	●	1
D0750	7.5	20	65	10	4	●	1
D0800	8	20	65	10	4	●	1
D0850	8.5	25	75	10	4	●	1
D0900	9	25	75	10	4	●	1
D0950	9.5	25	75	10	4	●	1
D1000	10	25	75	10	4	●	2
D1100	11	30	85	12	4	●	1
D1200	12	30	85	12	4	●	2
D1300	13	35	90	12	4	●	3
D1400	14	35	95	16	4	●	1
D1500	15	40	100	16	4	●	1
D1600	16	40	100	16	4	●	2
D1700	17	40	100	16	4	●	3
D1800	18	40	100	16	4	●	3
D1900	19	45	115	20	4	●	1
D2000	20	45	115	20	4	●	2
D2100	21	45	115	20	4	●	3
D2200	22	45	115	20	4	●	3
D2300	23	50	120	25	4	●	1
D2400	24	50	120	25	4	●	1
D2500	25	50	120	25	4	●	2
D2600	26	50	120	25	4	●	3
D2700	27	55	125	25	4	●	3
D2800	28	55	125	25	4	●	3
D2900	29	55	125	25	4	●	3
D3000	30	55	125	25	4	●	3

FOUR-FLUTE END MILLS

4MC

End mill, Medium cut length, 4 flute, Center cutting

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	Aluminium Alloy
◎	○			○	○		○



D1 ≤20	D1>20			
0 + 0.020	0 + 0.030			

● 4 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
4MCD0250	2.5	10	50	6	4	●	1
D0300	3	10	50	6	4	●	1
D0350	3.5	12	60	8	4	●	1
D0400	4	12	60	8	4	●	1
D0450	4.5	15	60	8	4	●	1
D0500	5	15	60	8	4	●	1
D0550	5.5	15	60	8	4	●	1
D0600	6	15	60	8	4	●	1
D0650	6.5	20	65	10	4	●	1
D0700	7	20	65	10	4	●	1
D0750	7.5	20	65	10	4	●	1
D0800	8	20	65	10	4	●	1
D0850	8.5	25	75	10	4	●	1
D0900	9	25	75	10	4	●	1
D0950	9.5	25	75	10	4	●	1
D1000	10	25	75	10	4	●	2
D1100	11	30	85	12	4	●	1
D1200	12	30	85	12	4	●	2
D1300	13	35	90	12	4	●	3
D1400	14	35	95	16	4	●	1
D1500	15	40	100	16	4	●	1
D1600	16	40	100	16	4	●	2
D1700	17	40	100	16	4	●	3
D1800	18	40	100	16	4	●	3
D1900	19	45	115	20	4	●	1
D2000	20	45	115	20	4	●	2
D2100	21	45	115	20	4	●	3
D2200	22	45	115	20	4	●	3
D2300	23	50	120	25	4	●	1
D2400	24	50	120	25	4	●	1
D2500	25	50	120	25	4	●	2
D2600	26	50	120	25	4	●	3
D2700	27	55	125	25	4	●	3
D2800	28	55	125	25	4	●	3

● : Inventory maintained in Japan.

Unit : mm

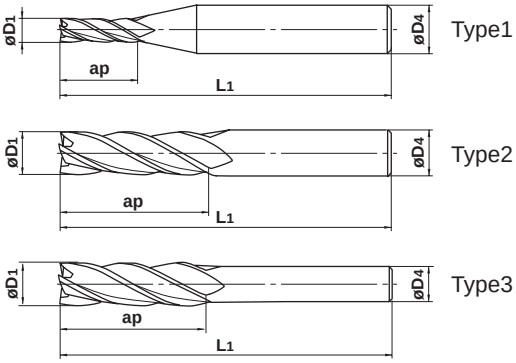
Order Number	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
4MCD2900	29	55	125	25	4	●	3
D3000	30	55	125	25	4	●	3
D3100	31	60	145	25	4	●	3
D3200	32	60	145	32	4	●	2
D3300	33	60	145	32	4	●	3
D3400	34	60	145	32	4	●	3
D3500	35	60	145	32	4	●	3
D3600	36	65	150	32	4	●	3
D3700	37	65	150	32	4	●	3
D3800	38	65	150	32	4	●	3
D3900	39	65	150	32	4	●	3
D4000	40	65	150	32	4	●	3

FOUR-FLUTE END MILLS

S-4JC

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	Aluminium Alloy
◎	○			○	○		○



D1≤20	D1>20			
0 + 0.020	0 + 0.030			

● 4 flute end mill for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S4JCD0300	3	12	60	6	4	●	1
D0400	4	15	65	8	4	●	1
D0500	5	20	75	8	4	●	1
D0600	6	20	75	8	4	●	1
D0700	7	25	80	10	4	●	1
D0800	8	25	80	10	4	●	1
D0900	9	35	90	10	4	●	1
D1000	10	35	90	10	4	●	2
D1100	11	45	110	12	4	●	1
D1200	12	45	110	12	4	●	2
D1300	13	45	110	12	4	●	3
D1400	14	55	125	16	4	●	1
D1500	15	55	125	16	4	●	1
D1600	16	55	125	16	4	●	2
D1700	17	55	125	16	4	●	3
D1800	18	55	125	16	4	●	3
D1900	19	65	145	20	4	●	1
D2000	20	65	145	20	4	●	2
D2500	25	75	165	25	4	●	2
D3000	30	75	165	25	4	●	3
D3500	35	85	190	32	4	●	3
D4000	40	95	200	32	4	●	3

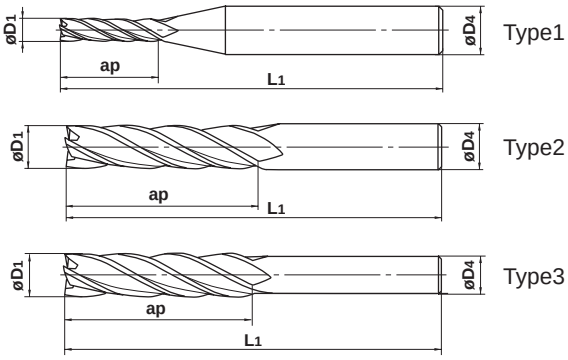
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J410

G-4LC

End mill, Long cut length, 4 flute, Center cutting

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	Aluminium Alloy
◎	○			○	○		○



D1≤20	D1>20			
0 + 0.030	0 + 0.040			

4 flute end mill with long flute for deep cutting applications.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
G4LCD0300	3	15	55	6	4	●	1
D0400	4	20	55	8	4	●	1
D0500	5	25	60	8	4	●	1
D0600	6	25	60	8	4	●	1
D0700	7	35	75	10	4	●	1
D0800	8	35	75	10	4	●	1
D0900	9	45	90	10	4	●	1
D1000	10	45	90	10	4	●	2
D1100	11	55	105	12	4	●	1
D1200	12	55	105	12	4	●	2
D1300	13	55	105	12	4	●	3
D1400	14	55	110	16	4	●	1
D1500	15	65	120	16	4	●	1
D1600	16	65	120	16	4	●	2
D1700	17	65	120	16	4	●	3
D1800	18	65	120	16	4	●	3
D1900	19	75	140	20	4	●	1
D2000	20	75	140	20	4	●	2
D2100	21	75	140	20	4	●	3
D2200	22	75	140	20	4	●	3
D2300	23	90	160	25	4	●	1
D2400	24	90	160	25	4	●	1
D2500	25	90	160	25	4	●	2
D2600	26	90	160	25	4	●	3
D2700	27	90	160	25	4	●	3
D2800	28	90	160	25	4	●	3
D2900	29	90	160	25	4	●	3
D3000	30	90	160	25	4	●	3
D3100	31	95	180	25	4	●	3
D3200	32	95	180	32	4	●	2
D3300	33	95	180	32	4	●	3
D3400	34	100	185	32	4	●	3
D3500	35	100	185	32	4	●	3
D3600	36	105	190	32	4	●	3

CUTTING CONDITIONS ➤ J411

FOUR-FLUTE END MILLS

G-4LC

End mill, Long cut length, 4 flute, Center cutting

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
G4LCD3700	37	105	190	32	4	●	3
D3800	38	105	190	32	4	●	3
D3900	39	110	195	32	4	●	3
D4000	40	110	195	32	4	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J411

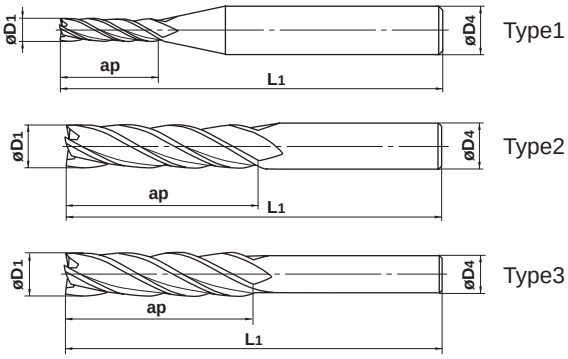
4LC

End mill, Long cut length, 4 flute, Center cutting

CO HSS

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	Aluminium Alloy
◎	○			○	○		○



D1 ≤20	D1>20			
0 + 0.020	0 + 0.030			

4 flute end mill with long flute for deep cutting applications.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
4LCD0300	3	15	55	6	4	●	1
D0400	4	20	55	8	4	●	1
D0500	5	25	60	8	4	●	1
D0600	6	25	60	8	4	●	1
D0700	7	35	75	10	4	●	1
D0800	8	35	75	10	4	●	1
D0900	9	45	90	10	4	●	1
D1000	10	45	90	10	4	●	2
D1100	11	55	105	12	4	●	1
D1200	12	55	105	12	4	●	2
D1300	13	55	105	12	4	●	3
D1400	14	55	110	16	4	●	1
D1500	15	65	120	16	4	●	1
D1600	16	65	120	16	4	●	2
D1700	17	65	120	16	4	●	3
D1800	18	65	120	16	4	●	3
D1900	19	75	140	20	4	●	1
D2000	20	75	140	20	4	●	2
D2100	21	75	140	20	4	●	3
D2200	22	75	140	20	4	●	3
D2300	23	90	160	25	4	●	1
D2400	24	90	160	25	4	●	1
D2500	25	90	160	25	4	●	2
D2600	26	90	160	25	4	●	3
D2700	27	90	160	25	4	●	3
D2800	28	90	160	25	4	●	3
D2900	29	90	160	25	4	●	3
D3000	30	90	160	25	4	●	3
D3100	31	95	180	25	4	●	3
D3200	32	95	180	32	4	●	2
D3300	33	95	180	32	4	●	3
D3400	34	100	185	32	4	●	3
D3500	35	100	185	32	4	●	3
D3600	36	105	190	32	4	●	3

CUTTING CONDITIONS ➤ J412

FOUR-FLUTE END MILLS

4LC

End mill, Long cut length, 4 flute, Center cutting

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
4LCD3700	37	105	190	32	4	●	3
D3800	38	105	190	32	4	●	3
D3900	39	110	195	32	4	●	3
D4000	40	110	195	32	4	●	3

● : Inventory maintained in Japan.

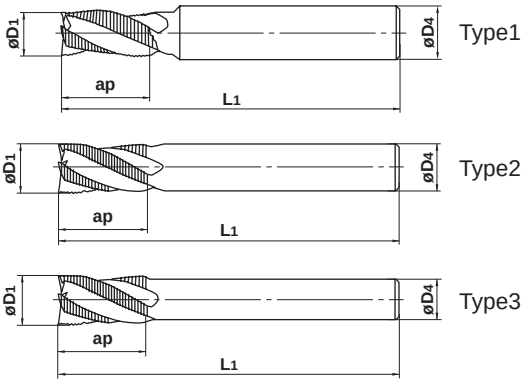
CUTTING CONDITIONS ➤ J412

G-SFPR

Roughing end mill, Short cut length, 3—6 flute, Fine pitch form

CO HSS | G | 30° | D1≤22 | 24≤D1≤32 | D1≥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	Aluminium Alloy
◎	○			○	○		○



● 3—6 flute roughing end mill with good chip disposal properties for high feed milling.

Unit : mm

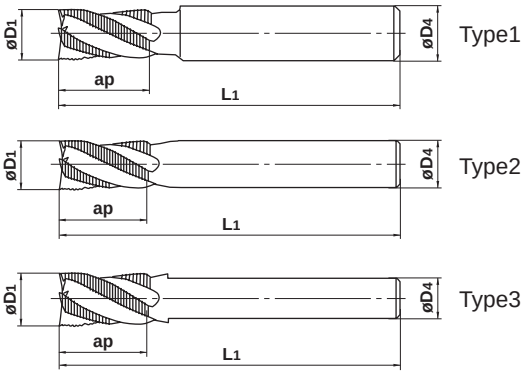
Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
GSFPRD0500	5	10	80	6	3	●	1
D0600	6	12	80	6	3	●	2
D0700	7	17	80	8	3	●	1
D0800	8	17	85	8	3	●	2
D0900	9	22	100	10	3	●	1
D1000	10	22	100	10	3	●	2
D1200	12	27	110	12	3	●	2
D1300	13	27	110	12	3	●	3
D1400	14	27	135	12	3	●	3
D1500	15	27	140	16	3	●	1
D1600	16	33	140	16	3	●	2
D1800	18	33	140	16	3	●	3
D1900	19	38	145	20	3	●	1
D2000	20	38	145	20	3	●	2
D2200	22	38	145	20	3	●	3
D2400	24	43	150	25	4	●	1
D2500	25	43	150	25	4	●	2
D2800	28	43	160	25	4	●	3
D3000	30	48	165	25	4	●	3
D3200	32	55	175	25	4	●	3
D3500	35	55	175	32	6	●	3
D4000	40	65	185	32	6	●	3
D4500	45	65	200	42	6	●	3
D5000	50	75	200	42	6	●	3

VA-SFPR

Roughing end mill, Short cut length, 4—6 flute, Fine pitch form

KHA S | V | 30° | D1≤24 | 25≤D1≤32 | D1≥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	Aluminium Alloy
◎	○			◎	○		



Roughing 4—6 flute end mill with high grade HSS substrate and Violet coating for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VASFPRD0500	5	10	80	6	4	●	1
D0600	6	12	80	6	4	●	2
D0700	7	17	80	8	4	●	1
D0800	8	17	85	8	4	●	2
D0900	9	22	100	10	4	●	1
D1000	10	22	100	10	4	●	2
D1200	12	27	110	12	4	●	2
D1400	14	27	110	12	4	●	3
D1500	15	27	125	16	4	●	1
D1600	16	33	125	16	4	●	2
D1800	18	33	125	16	4	●	3
D2000	20	38	145	20	4	●	2
D2200	22	38	145	20	4	●	3
D2400	24	43	150	25	4	●	1
D2500	25	43	150	25	5	●	2
D2800	28	43	160	25	5	●	3
D3000	30	48	165	25	5	●	3
D3200	32	55	175	25	5	●	3
D3500	35	55	175	32	6	●	3
D4000	40	65	185	32	6	●	3
D4500	45	65	200	42	6	●	3
D5000	50	75	200	42	6	●	3

● : Inventory maintained in Japan.

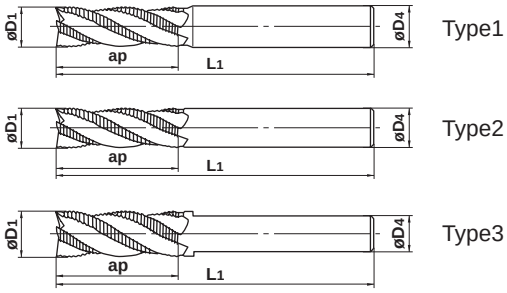
CUTTING CONDITIONS ➤ J402

VA-MFPR

Roughing end mill, Medium cut length, 4—6 flute, Fine pitch form

KHA S | V | 30° | D1≤20 | 22≤D1≤28 | D1≥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	Aluminium Alloy
◎	○			◎	○		



Type1 Type2 Type3

● 4—6 flute end mill with medium cut length.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VAMFPRD0500	5	15	80	6	4	●	1
D0600	6	17	80	6	4	●	2
D0700	7	22	80	8	4	●	1
D0800	8	28	85	8	4	●	2
D0900	9	28	95	10	4	●	1
D1000	10	34	100	10	4	●	2
D1200	12	40	110	12	4	●	2
D1400	14	40	110	12	4	●	3
D1500	15	40	120	16	4	●	1
D1600	16	48	125	16	4	●	2
D1800	18	48	125	16	4	●	3
D2000	20	57	145	20	4	●	2
D2200	22	57	145	20	5	●	3
D2400	24	68	150	25	5	●	1
D2500	25	68	150	25	5	●	2
D2800	28	68	160	25	5	●	3
D3000	30	68	165	25	6	●	3
D3200	32	80	175	32	6	●	2
D3500	35	80	175	32	6	●	3
D4000	40	94	185	32	6	●	3
D4500	45	94	200	42	6	●	3
D5000	50	113	200	42	6	●	3

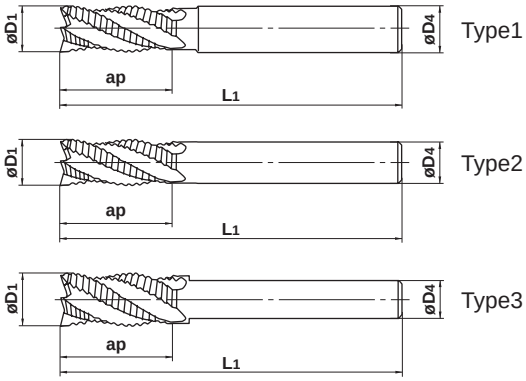
VIOLET END MILLS

VA-MR

Roughing end mill, Medium cut length, 4—6 flute

KHA S | V | 30° | D1≤15 | 16≤D1≤26 | 28≤D1≤32 | D1≥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	Aluminium Alloy
◎	○			◎	○		



Roughing 4—6 flute end mill with high grade HSS substrate and Violet coating for general use.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VAMRD0500	5	15	60	6	4	●	1
D0600	6	15	60	6	4	●	2
D0700	7	20	70	8	4	●	1
D0800	8	20	70	8	4	●	2
D0900	9	25	80	10	4	●	1
D1000	10	25	80	10	4	●	2
D1100	11	30	110	12	4	●	1
D1200	12	30	110	12	4	●	2
D1300	13	35	115	12	4	●	3
D1400	14	35	135	16	4	●	1
D1500	15	40	140	16	4	●	1
D1600	16	40	140	16	4	●	2
D1700	17	40	140	16	4	●	3
D1800	18	40	140	16	4	●	3
D1900	19	45	145	20	4	●	1
D2000	20	45	145	20	4	●	2
D2200	22	45	145	20	4	●	3
D2400	24	50	150	25	4	●	1
D2500	25	50	150	25	4	●	2
D2600	26	50	150	25	4	●	3
D2800	28	55	160	25	5	●	3
D3000	30	55	165	25	5	●	3
D3200	32	60	175	32	5	●	2
D3500	35	60	175	32	6	●	3
D4000	40	65	185	32	6	●	3
D4500	45	70	200	42	6	●	3
D5000	50	70	200	42	6	●	3

● : Inventory maintained in Japan.

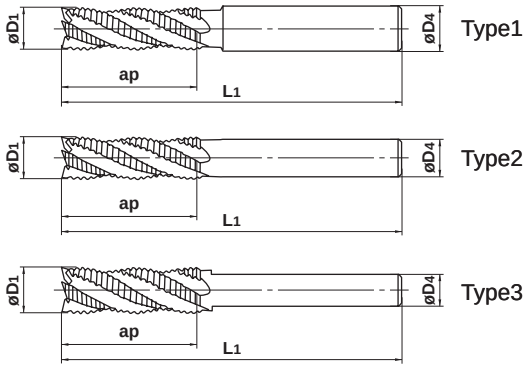
CUTTING CONDITIONS ➤ J404

VA-JR

Roughing end mill, Semi long cut length, 4—6 flute

KHA S | V | 30° | D1≤15 | 16≤D1≤25 | D1=30 | D1≥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	Aluminium Alloy
◎	○			◎	○		



● 4—6 flute end mill with longer cut length than standard.

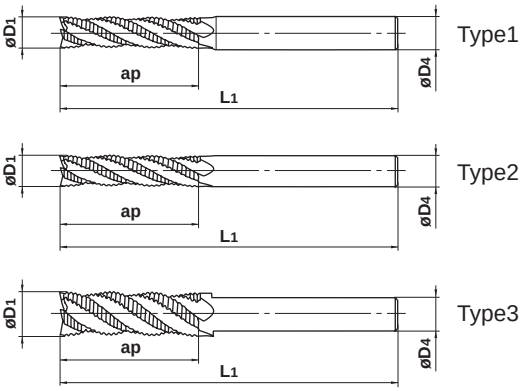
Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VAJRD1000	10	35	90	10	4	●	2
D1200	12	45	125	12	4	●	2
D1400	14	45	145	16	4	●	1
D1500	15	55	155	16	4	●	1
D1600	16	55	155	16	4	●	2
D1800	18	55	155	16	4	●	3
D2000	20	65	165	20	4	●	2
D2500	25	75	175	25	4	●	2
D3000S25	30	75	185	25	5	●	3
D3000S32	30	75	185	32	5	●	1
D3500	35	85	200	32	6	●	3
D4000	40	85	205	42	6	●	1
D4500	45	105	235	42	6	●	3
D5000	50	105	235	42	6	●	3

VA-LR

Roughing end mill, Long cut length, 4—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	Aluminium Alloy
◎	○			◎	○		



● 4—6 flute end mill with long cut length.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VALRD1000	10	45	110	10	4	●	2
D1200	12	50	130	12	4	●	2
D1400	14	55	155	16	4	●	1
D1500	15	65	165	16	4	●	1
D1600	16	65	165	16	4	●	2
D1800	18	65	165	16	4	●	3
D2000	20	75	175	20	4	●	2
D2200	22	75	175	20	4	●	3
D2400	24	85	185	25	4	●	1
D2500	25	90	190	25	4	●	2
D2800	28	90	190	25	5	●	3
D3000	30	90	200	25	5	●	3
D3200	32	95	210	32	5	●	2
D3500	35	100	215	32	6	●	3
D4000	40	110	230	32	6	●	3
D4500	45	120	250	42	6	●	3
D5000	50	120	250	42	6	●	3

● : Inventory maintained in Japan.

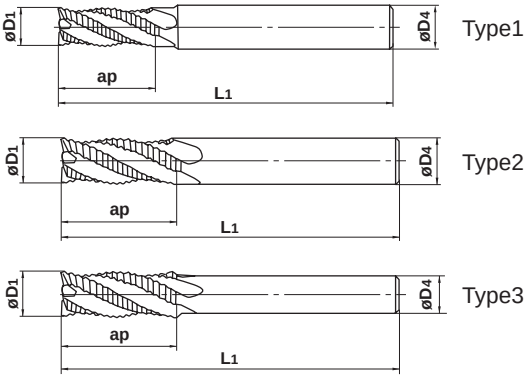
CUTTING CONDITIONS ➤ J405

SR

Roughing end mill, Short cut length, 4—6 flute

CO HSS | 30° | D1≤25 | 28≤D1≤32 | D1≥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	Aluminium Alloy
◎	○			○	○		○



● 4—6 flute roughing end mill with full radius cutting edge profile for heavy cutting.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SRD1000	10	22	75	10	4	●	2
D1200	12	27	85	12	4	●	2
D1300	13	27	85	12	4	●	3
D1400	14	27	90	16	4	●	1
D1500	15	27	95	16	4	●	1
D1600	16	33	100	16	4	●	2
D1800	18	33	100	16	4	●	3
D1900	19	38	110	20	4	●	1
D2000	20	38	110	20	4	●	2
D2200	22	38	110	20	4	●	3
D2500	25	43	125	25	4	●	2
D2800	28	43	125	25	5	●	3
D3000	30	48	130	25	5	●	3
D3200	32	55	145	32	5	●	2
D3500	35	55	145	32	6	●	3
D4000	40	65	165	32	6	●	3

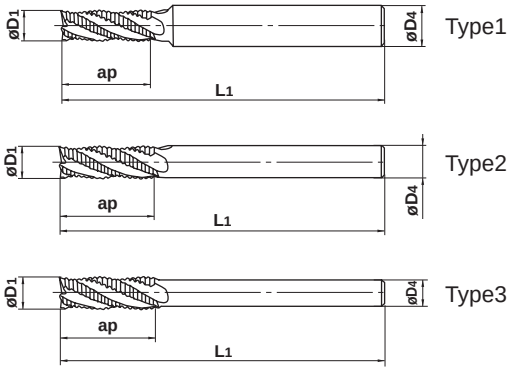
ROUGHING END MILLS

G-MR

Roughing end mill, Medium cut length, 4—6 flute

CO HSS | G | 30° | D1≤15 | 16≤D1≤26 | 28≤D1≤32 | D1≥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	Aluminium Alloy
◎	○			○	○		○



● 4—6 flute roughing end mill with TiN coating for general rough milling of steels through to difficult-to-cut materials.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
GMRD0500	5	15	60	6	4	●	1
D0600	6	15	60	6	4	●	2
D0700	7	20	70	8	4	●	1
D0800	8	20	70	8	4	●	2
D0900	9	25	80	10	4	●	1
D1000	10	25	80	10	4	●	2
D1100	11	30	110	12	4	●	1
D1200	12	30	110	12	4	●	2
D1300	13	35	115	12	4	●	3
D1400	14	35	135	16	4	●	1
D1500	15	40	140	16	4	●	1
D1600	16	40	140	16	4	●	2
D1700	17	40	140	16	4	●	3
D1800	18	40	140	16	4	●	3
D1900	19	45	145	20	4	●	1
D2000	20	45	145	20	4	●	2
D2200	22	45	145	20	4	●	3
D2400	24	50	150	25	4	●	1
D2500	25	50	150	25	4	●	2
D2600	26	50	150	25	4	●	3
D2800	28	55	160	25	5	●	3
D3000	30	55	165	25	5	●	3
D3200	32	60	175	32	5	●	2
D3500	35	60	175	32	6	●	3
D4000	40	65	185	32	6	●	3
D4500	45	70	200	42	6	●	3
D5000	50	70	200	42	6	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J415

MR

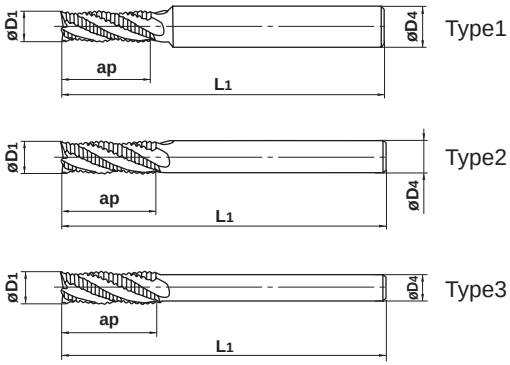
Roughing end mill, Medium cut length, 4—6 flute

CO HSS

30°

D1≤15 16≤D1≤26 28≤D1≤32 D1≥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	Aluminium Alloy
◎	○			○	○		○



● 4—6 flute roughing end mill with full radius cutting edge profile for heavy cutting.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MRD0500	5	15	60	6	4	●	1
D0600	6	15	60	6	4	●	2
D0700	7	20	70	8	4	●	1
D0800	8	20	70	8	4	●	2
D0900	9	25	80	10	4	●	1
D1000	10	25	80	10	4	●	2
D1100	11	30	110	12	4	●	1
D1200	12	30	110	12	4	●	2
D1300	13	35	115	12	4	●	3
D1400	14	35	135	16	4	●	1
D1500	15	40	140	16	4	●	1
D1600	16	40	140	16	4	●	2
D1700	17	40	140	16	4	●	3
D1800	18	40	140	16	4	●	3
D1900	19	45	145	20	4	●	1
D2000	20	45	145	20	4	●	2
D2200	22	45	145	20	4	●	3
D2400	24	50	150	25	4	●	1
D2500	25	50	150	25	4	●	2
D2600	26	50	150	25	4	●	3
D2800	28	55	160	25	5	●	3
D3000S25	30	55	165	25	5	●	3
D3000S32	30	55	165	32	5	●	1
D3200	32	60	175	32	5	●	2
D3500	35	60	175	32	6	●	3
D4000S32	40	65	185	32	6	●	3
D4000S42	40	65	185	42	6	●	1
D4500	45	70	200	42	6	●	3
D5000	50	70	200	42	6	●	3

CUTTING CONDITIONS ➤ J414

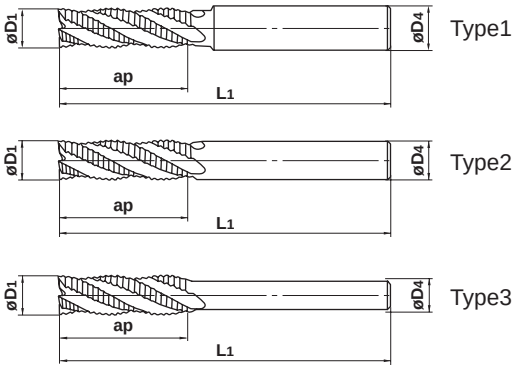
ROUGHING END MILLS

JR

Roughing end mill, Semi long cut length, 4—6 flute

CO HSS | 30° | D1≤15 | 16≤D1≤25 | 28≤D1≤32 | D1≥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	Aluminium Alloy
◎	○			○	○		○



● 4—6 flute roughing end mill with full radius cutting edge profile for heavy cutting.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
JRD1000	10	35	90	10	4	●	2
D1200	12	45	125	12	4	●	2
D1400	14	45	145	16	4	●	1
D1500	15	55	155	16	4	●	1
D1600	16	55	155	16	4	●	2
D1800	18	55	155	16	4	●	3
D2000	20	65	165	20	4	●	2
D2200	22	65	165	20	4	●	3
D2400	24	65	165	25	4	●	1
D2500	25	75	175	25	4	●	2
D2800	28	75	180	25	5	●	3
D3000S25	30	75	185	25	5	●	3
D3000S32	30	75	185	32	5	●	1
D3200	32	75	190	32	5	●	2
D3500	35	85	200	32	6	●	3
D4000S32	40	85	205	32	6	●	3
D4000S42	40	85	205	42	6	●	1
D4500	45	105	235	42	6	●	3
D5000	50	105	235	42	6	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J414

LR

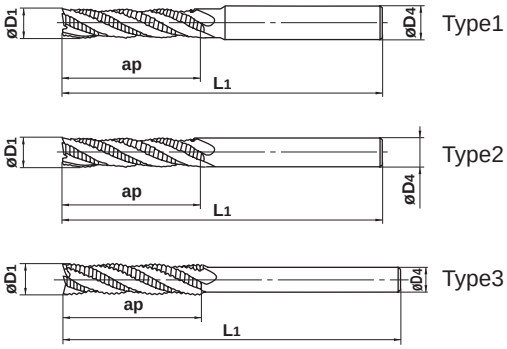
Roughing end mill, Long cut length, 4—6 flute

CO HSS

30°

D1≤25 28≤D1≤32 D1≥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	Aluminium Alloy
◎	○			○	○		○



● 4—6 flute end mill with longer cut length and overall length than standard.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
LRD1000	10	45	110	10	4	●	2
D1200	12	50	130	12	4	●	2
D1400	14	55	155	16	4	●	1
D1500	15	65	165	16	4	●	1
D1600	16	65	165	16	4	●	2
D1800	18	65	165	16	4	●	3
D2000	20	75	175	20	4	●	2
D2200	22	75	175	20	4	●	3
D2400	24	85	185	25	4	●	1
D2500	25	90	190	25	4	●	2
D2800	28	90	190	25	5	●	3
D3000S25	30	90	200	25	5	●	3
D3000S32	30	90	200	32	5	●	1
D3200	32	95	210	32	5	●	2
D3500	35	100	215	32	6	●	3
D4000S32	40	110	230	32	6	●	3
D4000S42	40	110	230	42	6	●	1
D4500	45	120	250	42	6	●	3
D5000	50	120	250	42	6	●	3

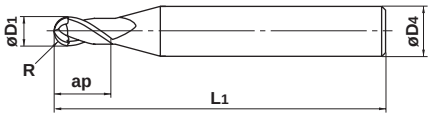
S-2MB

Ball nose end mill, Medium cut length, 2 flute

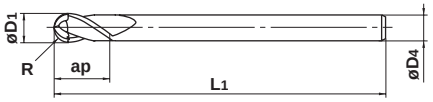
KHA S

30°

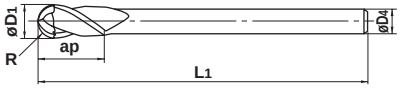
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel,Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



Type1



Type2



Type3

R	R ≤6.5	R>6.5			
	±0.01	±0.02			
	D1 ≤3	3<D1 ≤13	D1>13		
	0 - 0.02	0 - 0.03	0 - 0.04		

2 flute end mill with KHA Super substrate for general use.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S2MBR0050	0.5	1	2	50	6	2	●	1
R0060	0.6	1.2	2	50	6	2	●	1
R0070	0.7	1.4	2	50	6	2	●	1
R0075	0.75	1.5	3.5	50	6	2	●	1
R0080	0.8	1.6	3.5	50	6	2	●	1
R0090	0.9	1.8	3.5	50	6	2	●	1
R0100	1	2	5	50	6	2	●	1
R0125	1.25	2.5	6	50	6	2	●	1
R0150	1.5	3	8	60	6	2	●	1
R0175	1.75	3.5	8	70	6	2	●	1
R0200	2	4	8	70	6	2	●	1
R0225	2.25	4.5	10	90	6	2	●	1
R0250	2.5	5	10	90	6	2	●	1
R0275	2.75	5.5	12	100	6	2	●	1
R0300	3	6	12	100	6	2	●	2
R0325	3.25	6.5	14	100	6	2	●	3
R0350	3.5	7	14	100	6	2	●	3
R0375	3.75	7.5	14	100	8	2	●	1
R0400	4	8	14	100	8	2	●	2
R0425	4.25	8.5	18	120	8	2	●	3
R0450	4.5	9	18	120	8	2	●	3
R0475	4.75	9.5	18	120	10	2	●	1
R0500	5	10	18	120	10	2	●	2
R0550	5.5	11	20	120	10	2	●	3
R0600	6	12	22	120	12	2	●	2
R0650	6.5	13	24	120	12	2	●	3
R0700	7	14	26	120	12	2	●	3
R0750	7.5	15	28	120	16	2	●	1
R0800	8	16	30	160	16	2	●	2
R0900	9	18	34	160	16	2	●	3
R1000	10	20	38	180	20	2	●	2
R1250	12.5	25	50	200	25	2	●	2
R1500	15	30	55	200	25	2	●	3
R1600	16	32	55	200	32	2	●	2

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D_1	Length of Cut ap	Overall Length L_1	Shank Dia. D_4	No. of Flutes N	Stock	Type
S2MBR1750	17.5	35	65	220	32	2	●	3
R2000	20	40	65	220	32	2	●	3
R2500	25	50	75	240	42	2	●	3

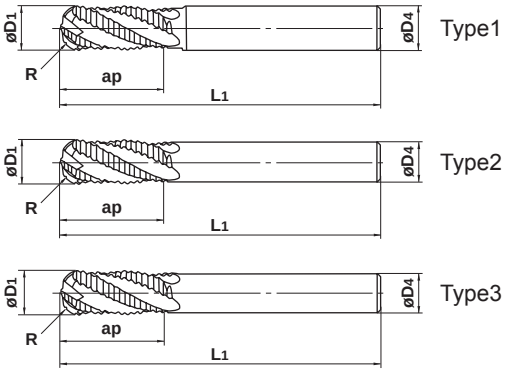
MRB

Ball nose roughing end mill, Medium cut length, 4 flute

CO HSS

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	Aluminium Alloy
◎	○			○	○		○



● 4 flute ball nose roughing end mill for general use.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MRBR0400	4	8	20	70	8	4	●	2
R0500	5	10	25	80	10	4	●	2
R0600	6	12	30	110	12	4	●	2
R0700	7	14	35	135	16	4	●	1
R0800	8	16	40	140	16	4	●	2
R0900	9	18	40	140	16	4	●	3
R1000	10	20	45	145	20	4	●	2
R1250	12.5	25	50	150	25	4	●	2
R1500	15	30	55	165	25	4	●	3
R1600	16	32	60	175	32	4	●	2
R1750	17.5	35	60	175	32	4	●	3
R2000	20	40	65	185	32	4	●	3
R2250	22.5	45	70	200	42	4	●	3
R2500	25	50	70	200	42	4	●	3

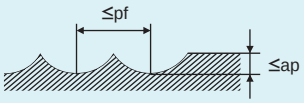
● : Inventory maintained in Japan.

Memo

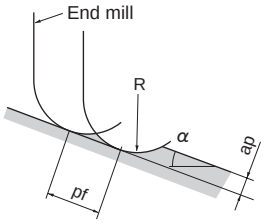
RECOMMENDED CUTTING CONDITIONS FOR MS Plus END MILLS

Ball nose, Short cut length, 2 flute, Short shank MP2SSB

Ball nose, Short cut length, 2 flute MP2SB Ball nose, Medium cutting length, 2 flute MP2MB

Work material	Carbon steel,Alloy steel,Pre-hardened steel, Hardened steel (−45HRC) AISI 1050, AISI P21, AISI H13						Hardened steel (45−55HRC) AISI 420, AISI H13						Copper, Copper alloys					
R (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick feed pf (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R0.1	40000	300	40000	250	0.003	0.02	40000	300	40000	250	0.003	0.02	40000	300	40000	250	0.003	0.02
R0.15	40000	500	40000	350	0.007	0.03	40000	500	40000	350	0.007	0.03	40000	500	40000	350	0.007	0.03
R0.2	40000	1600	40000	1200	0.02	0.04	40000	1300	40000	950	0.015	0.04	40000	1300	40000	950	0.015	0.04
R0.25	40000	2400	40000	1400	0.025	0.05	40000	1900	40000	1100	0.02	0.05	40000	1900	40000	1100	0.02	0.05
R0.3	40000	3200	40000	1600	0.03	0.06	40000	2500	40000	1300	0.025	0.06	40000	2500	40000	1300	0.025	0.06
R0.4	40000	4800	40000	2400	0.05	0.08	40000	4000	40000	1900	0.04	0.08	40000	4000	40000	1900	0.04	0.08
R0.5	40000	5600	40000	3200	0.06	0.1	40000	5600	40000	3000	0.05	0.1	40000	5600	40000	3000	0.05	0.1
R0.75	40000	6500	40000	4000	0.09	0.15	40000	6500	32000	3200	0.08	0.15	40000	6500	32000	3200	0.08	0.15
R1	40000	6500	39000	4700	0.11	0.2	40000	6500	31000	3500	0.11	0.2	40000	6500	31000	3500	0.11	0.2
R1.25	40000	7000	33000	4500	0.12	0.25	36000	6500	26000	3500	0.12	0.25	36000	6500	26000	3500	0.12	0.25
R1.5	40000	7500	27000	4300	0.13	0.3	32000	6000	22000	3400	0.13	0.3	32000	6000	22000	3400	0.13	0.3
R2	32000	7500	20000	3600	0.15	0.4	25000	6000	16000	2700	0.15	0.4	25000	6000	16000	2700	0.15	0.6
R2.5	25000	6000	16000	2900	0.2	0.5	20000	5400	13000	2300	0.2	0.5	20000	5400	13000	2300	0.2	0.75
R3	21000	5800	13000	2600	0.25	0.6	17000	4700	10000	2000	0.25	0.6	17000	4700	10000	2000	0.25	0.9
R4	16000	4500	10000	2000	0.3	0.8	13000	3600	8000	1500	0.3	0.8	13000	3600	8000	1500	0.3	1.6
R5	13000	3600	8000	1700	0.5	1	10000	2900	6400	1200	0.5	1	10000	2900	6400	1200	0.5	2
R6	9000	2500	6000	1300	0.5	1.2	7200	2000	4800	1000	0.5	1.2	8500	2300	5300	1100	0.5	2.4
Depth of cut																		

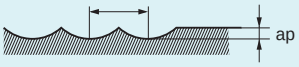
1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.



MP2SSB ➤ J124
MP2SB ➤ J125
MP2MB ➤ J126

MP2XLB

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

Work material		Carbon steel,Alloy steel,Pre-hardened steel, Hardened steel (—45HRC) AISI 1055, AISI P21			Hardened steell (—52HRC) AISI H13, AISI 420			Copper, Copper alloys		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R0.05	0.3	50000	200	0.002	50000	200	0.002	50000	200	0.004
	0.5	50000	200	0.001	50000	200	0.002	50000	200	0.002
R0.1	0.5	50000	400	0.003	50000	320	0.003	50000	320	0.006
	1	50000	400	0.002	50000	320	0.002	50000	320	0.004
	1.5	40000	300	0.001	40000	240	0.001	40000	240	0.002
	2	40000	200	0.001	40000	160	0.001	40000	160	0.002
	2.5	40000	100	0.001	40000	80	0.001	40000	80	0.002
R0.15	1	50000	600	0.007	50000	480	0.007	50000	480	0.014
	1.5	50000	600	0.005	50000	480	0.005	50000	480	0.01
	2	50000	600	0.003	50000	480	0.003	50000	480	0.006
	2.5	40000	400	0.003	40000	320	0.003	40000	320	0.006
	3	40000	300	0.002	40000	240	0.002	40000	240	0.004
	3.5	30000	250	0.002	30000	200	0.002	30000	200	0.004
	4	30000	200	0.002	30000	160	0.002	30000	160	0.004
R0.2	1	50000	1800	0.015	50000	1400	0.015	50000	1400	0.03
	2	50000	1300	0.01	50000	1000	0.01	50000	1000	0.02
	3	50000	900	0.005	50000	700	0.005	50000	700	0.01
	4	40000	600	0.004	40000	480	0.004	40000	480	0.008
	5	40000	400	0.003	40000	320	0.003	40000	320	0.006
	6	30000	200	0.002	30000	160	0.002	30000	160	0.004
R0.25	2	50000	2500	0.02	50000	2000	0.02	50000	2000	0.04
	3	50000	1500	0.015	50000	1200	0.015	50000	1200	0.03
	4	45000	1200	0.01	45000	950	0.01	45000	950	0.02
	5	45000	900	0.007	45000	700	0.007	45000	700	0.014
	6	36000	600	0.006	36000	480	0.006	36000	480	0.012
	7	32000	400	0.005	32000	320	0.005	32000	320	0.01
	8	32000	300	0.003	32000	240	0.003	32000	240	0.006
	10	26000	200	0.002	26000	160	0.002	26000	160	0.004
R0.3	2	50000	3500	0.03	50000	2800	0.03	50000	2800	0.06
	3	50000	3500	0.03	50000	2800	0.03	50000	2800	0.06
	4	44000	2500	0.02	44000	2000	0.02	44000	2000	0.04
	5	37000	1200	0.01	37000	950	0.01	37000	950	0.02
	6	37000	1000	0.008	37000	800	0.008	37000	800	0.016
	7	35000	750	0.008	35000	600	0.008	35000	600	0.016
	8	35000	600	0.006	35000	480	0.006	35000	480	0.012
	9	30000	500	0.004	30000	400	0.004	30000	400	0.008
	10	30000	500	0.003	30000	400	0.003	30000	400	0.006
	11	22000	300	0.002	22000	240	0.002	22000	240	0.004
	12	22000	200	0.002	22000	160	0.002	22000	160	0.004
R0.4	2	50000	4400	0.04	50000	3500	0.04	50000	3500	0.08
	3	50000	4000	0.04	50000	3200	0.04	50000	3200	0.08
	4	50000	4000	0.02	50000	3200	0.02	50000	3200	0.04
	5	35000	2400	0.02	35000	1900	0.02	35000	1900	0.04
	6	35000	2400	0.02	35000	1900	0.02	35000	1900	0.04
	7	30000	1500	0.015	30000	1200	0.015	30000	1200	0.03
	8	30000	1500	0.01	30000	1200	0.01	30000	1200	0.02
	10	30000	700	0.008	30000	560	0.008	30000	560	0.016
	12	22000	500	0.006	22000	400	0.006	22000	400	0.012
Depth ofcut		≤0.1R (R ≤1) ≤0.2R (R >1)  								

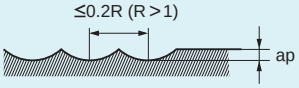
R:Radius

1) When the inclination angle of machined surface is large, or machining with large cutting load such as corner area, reduce the revolution and feed rate.
2) The use of oil mist is recommended when machining with small diameter.
3) The revolution and feed rate can increase for the small depth of cut (ap).
4) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.
5) For hardened steel over 55HRC, use VF-2XLB.

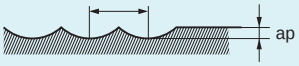
RECOMMENDED CUTTING CONDITIONS FOR MS Plus END MILLS

MP2XLB

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

Work material		Carbon steel,Alloy steel,Pre-hardened steel, Hardened steel (—45HRC) AISI 1055, AISI P21			Hardened steell (—52HRC) AISI H13, AISI 420			Copper, Copper alloys		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R0.5	3	40000	4000	0.05	40000	3200	0.05	40000	3200	0.1
	4	40000	4000	0.05	40000	3200	0.05	40000	3200	0.1
	6	35000	3000	0.03	35000	2400	0.03	35000	2400	0.06
	8	30000	2000	0.02	30000	1600	0.02	30000	1600	0.04
	10	20000	1000	0.01	20000	800	0.01	20000	800	0.02
	12	20000	1000	0.01	20000	800	0.01	20000	800	0.02
	14	18000	600	0.008	18000	480	0.008	18000	480	0.016
	16	18000	500	0.008	18000	400	0.008	18000	400	0.016
	18	13000	300	0.005	13000	240	0.005	13000	240	0.01
	20	13000	250	0.005	13000	200	0.005	13000	200	0.01
R0.6	6	40000	4400	0.04	40000	3500	0.04	40000	3500	0.08
	8	40000	4000	0.04	40000	3200	0.04	40000	3200	0.08
	10	27000	1900	0.02	27000	1500	0.02	27000	1500	0.04
	12	16000	1400	0.02	16000	1100	0.02	16000	1100	0.04
	18	15000	700	0.008	15000	560	0.008	15000	560	0.016
	24	11000	300	0.006	11000	240	0.006	11000	240	0.012
R0.7	8	40000	4000	0.05	40000	3200	0.05	40000	2560	0.1
	12	26000	2000	0.04	26000	1600	0.04	26000	1280	0.08
	16	17000	1400	0.03	17000	1120	0.03	17000	896	0.06
R0.75	6	40000	6000	0.07	36000	4300	0.07	36000	4300	0.14
	8	40000	6000	0.07	36000	4300	0.07	36000	4300	0.14
	10	40000	5000	0.06	36000	3600	0.06	36000	3600	0.12
	12	32000	3400	0.04	29000	2400	0.04	29000	2400	0.08
	16	15000	1400	0.03	15000	1100	0.03	15000	1100	0.06
	20	12000	900	0.02	12000	720	0.02	12000	720	0.04
	22	9000	400	0.01	9000	320	0.01	9000	320	0.02
R0.8	8	40000	6000	0.08	32000	3800	0.08	32000	3800	0.16
	12	36000	4500	0.06	29000	2800	0.06	29000	2800	0.12
	16	14000	1400	0.04	14000	1100	0.04	14000	1100	0.08
	20	12000	1000	0.03	12000	800	0.03	12000	800	0.06
R0.9	8	40000	6600	0.09	32000	4200	0.09	32000	4200	0.18
	12	40000	5000	0.07	32000	3200	0.07	32000	3200	0.14
	16	28000	2800	0.04	22000	1800	0.04	22000	1800	0.08
	20	10000	800	0.03	10000	640	0.03	10000	640	0.06
R1	4	40000	8000	0.1	32000	5000	0.1	32000	5000	0.2
	6	40000	8000	0.1	32000	5000	0.1	32000	5000	0.2
	8	40000	6000	0.1	32000	3800	0.1	32000	3800	0.2
	10	40000	5000	0.08	32000	3200	0.08	32000	3200	0.16
	12	40000	5000	0.08	32000	3200	0.08	32000	3200	0.16
	16	32000	3500	0.05	26000	2200	0.05	26000	2200	0.1
	20	10000	1000	0.04	10000	800	0.04	10000	800	0.08
	25	10000	1000	0.04	10000	800	0.04	10000	800	0.08
	30	10000	800	0.02	10000	640	0.02	10000	640	0.04
	35	10000	600	0.02	10000	480	0.02	10000	480	0.04
	40	8000	400	0.01	8000	320	0.01	8000	320	0.02
Depth ofcut		≤0.1R (R ≤1) ≤0.2R (R >1)  								R:Radius

1) When the inclination angle of machined surface is large, or machining with large cutting load such as corner area, reduce the revolution and feed rate.
2) The use of oil mist is recommended when machining with small diameter.
3) The revolution and feed rate can increase for the small depth of cut (ap).
4) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.
5) For hardened steel over 55HRC, use VF-2XLB.

Work material		Carbon steel,Alloy steel,Pre-hardened steel, Hardened steel (—45HRC) AISI 1055, AISI P21			Hardened steell (—52HRC) AISI H13, AISI 420			Copper, Copper alloys		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R1.25	10	36000	6000	0.12	29000	3800	0.12	29000	3800	0.24
	15	32000	4500	0.1	26000	2900	0.1	26000	2900	0.2
	20	26000	3200	0.07	21000	2000	0.07	21000	2000	0.14
	25	12000	1400	0.06	8000	720	0.06	8000	720	0.12
	30	8000	900	0.04	8000	700	0.04	8000	700	0.08
	35	8000	800	0.02	8000	640	0.02	8000	510	0.04
R1.5	6	32000	7000	0.15	26000	4500	0.15	22000	3800	0.3
	10	32000	7000	0.15	26000	4500	0.15	22000	3800	0.3
	16	32000	5000	0.1	26000	3200	0.1	22000	2700	0.2
	20	27000	3800	0.1	22000	2400	0.1	22000	2400	0.2
	25	21000	2700	0.08	17000	1700	0.08	17000	1700	0.16
	30	10000	700	0.08	6000	560	0.08	6000	560	0.16
	35	6000	700	0.06	6000	560	0.06	6000	560	0.12
	40	6000	600	0.04	6000	480	0.04	6000	480	0.08
R1.75	15	27500	4400	0.13	22000	2800	0.13	18000	2300	0.26
	25	23000	3600	0.1	18000	2200	0.1	18000	2200	0.2
	35	10000	1400	0.08	10000	1100	0.08	10000	1100	0.16
	45	7500	900	0.04	7500	720	0.04	7500	720	0.08
R2	10	24000	6000	0.2	19000	3800	0.2	16000	3200	0.4
	20	24000	3800	0.15	19000	2400	0.15	16000	2000	0.3
	30	20000	3000	0.1	16000	1900	0.1	16000	1900	0.2
	40	12000	1700	0.1	12000	1400	0.1	12000	1400	0.2
	50	8000	1000	0.05	8000	800	0.05	8000	800	0.1
R2.5	20	22000	6000	0.2	18000	3800	0.2	13000	2800	0.4
	25	22000	4400	0.2	18000	2800	0.2	13000	2000	0.4
	30	22000	3800	0.15	18000	2400	0.15	13000	1700	0.3
	40	22000	3600	0.1	18000	2300	0.1	13000	1600	0.2
R3	20	20000	6000	0.2	16000	3800	0.2	11000	2600	0.4
	30	20000	6000	0.2	16000	3800	0.2	11000	2600	0.4
	40	20000	4500	0.15	16000	2800	0.15	11000	2000	0.3
	50	20000	3000	0.15	16000	1900	0.15	11000	1300	0.3
Depth ofcut		≤0.1R (R ≤1) ≤0.2R (R >1)  R:Radius								

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

End mill, Short cut length, 2 flute **MS2SS**

End mill, Medium cut length, 2 flute **MS2MS** Corner radius end mill, Medium cut length, 2 flute **MS2MRB**

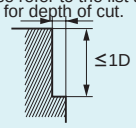
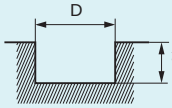
Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45—55HRC) AISI H13		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.1	40000	40	0.001	40000	40	0.001
0.2	40000	100	0.002	40000	100	0.002
0.3	40000	200	0.005	40000	200	0.005
0.4	40000	600	0.01	40000	600	0.01
0.5	40000	1000	0.015	40000	960	0.015
0.6	40000	1200	0.02	40000	1200	0.02
0.7	40000	1400	0.02	40000	1400	0.02
0.8	40000	1600	0.03	40000	1600	0.03
0.9	40000	1800	0.04	40000	1600	0.04
1	40000	2000	0.06	32000	1600	0.06
1.5	40000	3000	0.12	32000	1900	0.08
2	30000	3000	0.18	24000	1900	0.10
2.5	24000	2600	0.25	19000	1600	0.13
3	20000	2300	0.30	16000	1400	0.15
4	15000	2000	0.40	12000	1200	0.20
5	12000	1600	0.50	9000	900	0.25
6	10000	1400	0.60	7000	700	0.30
8	8000	1000	0.80	5600	550	0.40
10	6400	900	1.00	4500	500	0.50
12	5400	820	1.00	3800	450	0.50
16	2400	380	3.00	1200	100	0.80
20	1900	320	4.00	1000	80	1.00
Depth of cut	≤Please refer to the list above for depth of cut. ≤1D D ≤Please refer to the list above for depth of cut. D:Dia.					

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When slotting with end mills with ϕ3 or larger, reduce the revolution to 50—70% and the feed rate to 40—60%.
3) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS2SS ➤ J032
MS2MS ➤ J033
MS2MRB ➤ J182

MS2MD

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

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45－55HRC) AISI H13		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
1	40000	2000	0.06	32000	1600	0.06
1.5	40000	3000	0.12	32000	1900	0.08
2	30000	3000	0.18	24000	1900	0.10
2.5	24000	2600	0.25	19000	1600	0.13
3	20000	2300	0.30	16000	1400	0.15
4	15000	2000	0.40	12000	1200	0.20
5	12000	1600	0.50	9000	900	0.25
6	10000	1400	0.60	7000	700	0.30
8	8000	1000	0.80	5600	550	0.40
10	6400	900	1.00	4500	500	0.50
12	5400	820	1.00	3800	450	0.50
Depth of cut	≤Please refer to the list above for depth of cut.  			 ≤Please refer to the list above for depth of cut. D:Dia.		

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

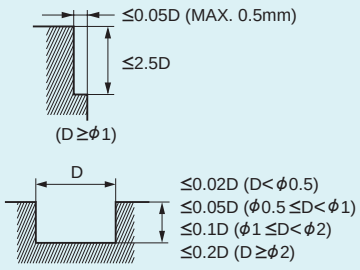
RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

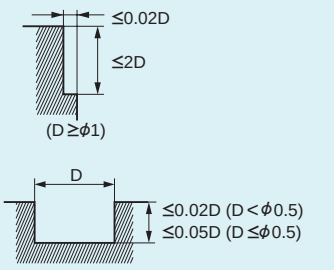
MS2JS

End mill, Semi long cut length, 2 flute

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.1	40000	— (40)	40000	— (40)	40000	— (35)	40000	— (25)
0.2	40000	— (45)	40000	— (45)	40000	— (35)	32000	— (25)
0.3	40000	— (55)	32000	— (45)	27000	— (35)	21000	— (25)
0.4	32000	— (60)	24000	— (45)	20000	— (35)	16000	— (25)
0.5	25000	— (60)	19000	— (45)	16000	— (35)	13000	— (25)
0.6	21000	— (60)	16000	— (45)	13000	— (35)	11000	— (25)
0.7	18000	— (60)	14000	— (45)	11000	— (35)	9100	— (25)
0.8	16000	— (60)	12000	— (45)	9900	— (35)	8000	— (25)
0.9	14000	— (60)	11000	— (45)	8800	— (35)	7100	— (25)
1	13000	60 (60)	9500	45 (45)	8000	35 (35)	6400	25 (25)
1.5	8500	60 (60)	6400	45 (45)	5300	35 (35)	4200	25 (25)
2	6400	60 (60)	4800	45 (45)	4000	35 (35)	3200	25 (25)
2.5	5100	60 (60)	3800	45 (45)	3200	40 (40)	2500	25 (25)
3	4200	65 (60)	3400	55 (45)	2600	40 (40)	2100	25 (25)
4	3400	80 (60)	2700	65 (45)	2100 (1600)	50 (30)	1700	35 (25)
5	2900	100 (60)	2300	80 (45)	1800 (1350)	60 (30)	1500	40 (25)
6	2500	120 (60)	2000	100 (50)	1500 (1100)	75 (30)	1300	50 (25)
8	1900	130 (60)	1500	100 (50)	1200 (900)	80 (30)	1000	50 (25)
10	1600	130 (60)	1300	100 (50)	950 (710)	75 (30)	800	50 (25)
12	1300	120 (60)	1100	100 (50)	800 (600)	75 (30)	670	50 (25)

Depth of cut





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

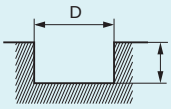
D:Dia.

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) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

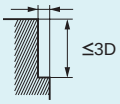
MS2JS ➤ J036

MS2LS
End mill, Long cut length, 2 flute

Slotting

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		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.2	40000	400	0.001	30000	250	0.001
0.3	40000	600	0.005	35000	420	0.005
0.4	40000	700	0.007	30000	420	0.007
0.5	40000	800	0.01	24000	380	0.01
0.6	33000	800	0.015	21000	480	0.01
0.7	28000	800	0.015	18000	480	0.015
0.8	25000	800	0.02	16000	480	0.02
0.9	22000	800	0.03	15000	500	0.03
1	20000	800	0.04	13000	500	0.04
1.5	13000	800	0.10	9000	500	0.10
2	10000	800	0.15	6700	500	0.15
2.5	9000	800	0.20	6000	500	0.20
3	8000	800	0.20	5200	460	0.20
4	6000	600	0.20	4000	340	0.20
5	4800	480	0.30	3200	280	0.20
6	4000	400	0.30	2600	210	0.20
8	3000	300	0.30	2000	170	0.30
10	2400	240	0.30	1600	140	0.30
12	2000	200	0.30	1300	110	0.30
Depth of cut	 ≤Please refer to the list above for depth of cut. D:Dia.					

Side milling

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		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
3	3500	370	0.05	2600	250	0.03
4	2800	370	0.06	2100	200	0.03
5	2200	330	0.06	1700	160	0.03
6	1800	300	0.06	1500	140	0.03
8	1600	270	0.08	1100	140	0.04
10	1400	240	0.10	900	140	0.05
12	1200	200	0.10	750	120	0.06
Depth of cut	≤Please refer to the list above for depth of cut.  D:Dia.					

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS2XL

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

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
0.2	0.5	40000	600	0.004
	1	40000	400	0.001
0.3	1	40000	650	0.007
	3	40000	500	0.002
	9	22000	150	0.001
0.4	2	40000	800	0.007
	4	40000	800	0.003
	12	17000	150	0.001
0.5	2	40000	950	0.01
	6	40000	700	0.003
	10	25000	400	0.002
	15	14000	150	0.001
0.6	2	40000	950	0.01
	6	40000	800	0.005
	10	25000	450	0.003
	18	12000	150	0.001
0.7	2	40000	1000	0.02
	6	40000	900	0.01
	8	30000	700	0.005
	10	11000	300	0.005
0.8	4	40000	1200	0.02
	8	40000	1000	0.01
	12	25000	400	0.003
	24	10000	150	0.001
0.9	6	40000	1300	0.02
	10	35000	1000	0.01
	15	9000	400	0.003
1	6	40000	1600	0.04
	8	40000	1600	0.03
	12	30000	1000	0.02
	20	15000	400	0.005
	30	8000	150	0.001
1.2	6	40000	1900	0.06
	8	40000	1900	0.04
	12	25000	1000	0.03
	20	6500	150	0.01

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
1.5	6	40000	2400	0.10
	10	30000	1800	0.05
	20	15000	600	0.02
	30	7500	300	0.005
	45	5000	150	0.001
1.6	6	40000	2400	0.12
	10	30000	1800	0.07
	16	20000	1000	0.04
2	6	40000	2400	0.18
	10	30000	1800	0.10
	16	20000	1000	0.06
	30	8000	500	0.04
	40	6000	250	0.01
	60	4200	150	0.003
2.5	8	25000	2500	0.20
	16	18000	1700	0.10
	20	12000	1000	0.08
	40	8000	400	0.03
	50	4000	150	0.015
3	8	20000	2000	0.30
	16	15000	1400	0.15
	20	10000	800	0.10
	40	5000	250	0.02
	50	3700	150	0.010
4	12	15000	3000	0.30
	20	11000	2200	0.22
	30	6400	1200	0.12
	40	4500	400	0.05
	50	2800	150	0.018
5	16	12000	2500	0.35
	35	5100	750	0.15
	60	2200	150	0.02
6	20	10000	2000	0.40
	40	4200	800	0.20
	60	1900	150	0.10

ap:Depth of Cut in the Axial Direction

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

MS2XL ➤ J038

MS2XL6

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

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		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
0.3	—	40000	500−1000	0.01	30000	300−800	0.01
	1.5			0.007			0.007
0.4	1	40000	500−1000	0.015	30000	300−800	0.015
	2			0.01			0.01
0.5	1.3	40000	500−1000	0.02	30000	300−800	0.02
	2.5			0.013			0.013
0.6	1.5	33000	500−1000	0.03	25000	300−800	0.03
	3			0.018			0.018
0.7	1.8	29000	500−1000	0.04	22000	300−800	0.04
	3.5			0.025			0.025
0.8	2	25000	500−1000	0.06	20000	300−800	0.06
	4			0.03			0.03
0.9	2.3	22000	500−1000	0.08	18000	300−800	0.08
	4.5			0.05			0.05
1	2.5	20000	500−1000	0.1	16000	300−800	0.1
	5			0.07			0.07
1.1	2.8	18000	500−1000	0.12	14000	300−800	0.12
	5.5			0.08			0.08
1.2	3	16000	500−1000	0.12	13000	300−800	0.12
	6			0.08			0.08
1.3	3.3	15000	500−1000	0.12	12000	300−800	0.12
	6.5			0.08			0.08
1.4	3.5	14000	500−1000	0.12	11000	300−800	0.12
	7			0.08			0.08
1.5	3.8	13000	500−1000	0.15	10000	300−800	0.15
	7.5			0.1			0.1
1.6	4	12000	500−1000	0.15	10000	300−800	0.15
	8			0.1			0.1
1.7	4.3	12000	500−1000	0.17	9500	300−800	0.17
	8.5			0.12			0.12
1.8	4.5	11000	500−1000	0.17	9000	300−800	0.17
	9			0.12			0.12
1.9	4.8	10000	500−1000	0.17	9000	300−800	0.17
	9.5			0.12			0.12
2	5	10000	500−1000	0.2	9000	300−800	0.2
	10			0.15			0.15
2.1	5.3	9800	500−1000	0.2	9000	300−800	0.2
	10.5			0.15			0.15
2.2	5.5	9600	500−1000	0.2	9000	300−800	0.2
	11			0.15			0.15
2.3	5.8	9400	500−1000	0.2	8800	300−800	0.2
	11.5			0.15			0.15
2.4	6	9200	500−1000	0.25	8700	300−800	0.25
	12			0.2			0.2
2.5	6.3	9000	500−1000	0.25	8500	300−800	0.25
	12.5			0.2			0.2

ap:Depth of Cut in the Axial Direction

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MSMHZD

Slotting, Medium cut length, 3 flute

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	19000	600	13000	310	10000	200	9500	65
1.5	14000	600	9000	310	7500	210	6400	75
2	11000	600	7200	310	6000	210	4800	75
3	8500	770	5300	380	4400	220	3200	100
4	7200	850	4400	480	3700	250	2400	130
6	5300	940	3200	490	2700	270	1600	130
8	4000	1010	2400	560	2000	280	1200	120
10	3200	1000	1900	480	1600	300	950	110
12	2700	950	1600	440	1300	300	800	90
16	2000	720	1200	350	1000	260	600	70
20	1600	600	1000	290	800	240	480	60
Depth of cut	≤0.2D (D>ϕ3) ≤0.1D (D ≤ϕ3) ≤1.5D		≤0.2D (D>ϕ3) ≤0.1D (D ≤ϕ3) ≤1.5D				0.05D 1.5D	

D:Dia.

Plunging

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	13000	80	10000	50	6000	10
1.5	12000	120	8000	80	6000	20
2	11000	200	7200	140	6000	30
3	8500	250	5300	180	4200	50
4	7200	300	4400	210	3300	60
6	5300	300	3200	210	2200	70
8	4000	320	2400	220	1600	80
10	3200	340	1900	240	1300	70
12	2700	320	1600	220	1100	70
16	2000	250	1200	180	800	55
20	1600	200	1000	140	640	55
Depth of cut	≤1D (D ≥ϕ2) ≤0.5D (D<ϕ2)		≤0.5D (D ≥ϕ2) ≤0.2D (D<ϕ2)			

D:Dia.

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	13000	130	10000	80	6000	30	5700	25
1.5	12000	250	8000	150	6000	60	3800	30
2	11000	500	7200	260	6000	130	2800	35
3	8500	640	5300	320	4200	130	1900	50
4	7200	650	4400	370	3300	140	1400	70
6	5300	720	3200	380	2200	140	950	70
8	4000	780	2400	430	1600	140	720	60
10	3200	770	1900	370	1300	150	570	50
12	2700	730	1600	340	1100	150	480	40
16	2000	600	1200	290	800	130	360	30
20	1600	500	1000	240	640	120	290	25
Depth of cut	D ≤1D (D ≥ϕ2) ≤0.5D (D<ϕ2)		D ≤0.5D (D ≥ϕ2) ≤0.2D (D<ϕ2)		D 0.2D			

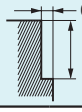
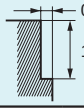
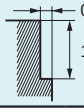
D:Dia.

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MSSHD
High power, Short cut length, 4 flute

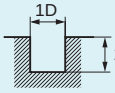
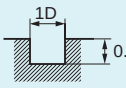
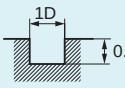
MSMHD
High power, Medium cut length, 4 flute

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	15000	550	10000	340	10000	320	6400	160	4800	100
3	11000	800	7400	500	7400	480	4800	250	4000	170
4	8000	900	5600	540	5600	520	3600	270	3200	240
5	6400	1000	4500	600	4500	580	2900	300	2600	240
6	5800	1100	3700	640	3700	600	2400	320	2100	230
8	4400	1100	2800	660	2800	600	1800	330	1600	220
10	3500	1000	2200	640	2200	560	1400	320	1300	200
12	2900	1000	1900	640	1900	530	1200	320	1100	170
16	2200	800	1400	500	1400	450	900	250	800	130
20	1800	750	1100	460	1100	440	720	230	640	100
25	1400	600	900	400	900	380	570	200	510	80
Depth of cut										

D:Dia.

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	12000	400	7000	200	7000	100	4200	80	2300	40
3	9000	600	5300	300	5300	150	3200	130	1900	70
4	7200	720	4000	360	4000	180	2400	140	1400	95
5	5800	720	3200	360	3200	180	1900	150	1100	95
6	5000	800	2700	400	2700	200	1600	160	950	95
8	3700	800	2000	400	2000	200	1200	170	720	90
10	3000	720	1600	360	1600	180	960	160	570	80
12	2500	720	1300	360	1300	180	800	160	480	70
16	2000	600	1000	280	1000	150	600	130	360	50
20	1600	540	800	250	800	130	480	120	290	40
25	1300	480	640	220	640	120	380	100	230	35
Depth of cut										

D:Dia.

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

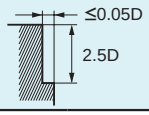
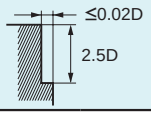
MSSHD ➤ J078
MSMHD ➤ J079

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MSJHD

High power, Semi long cut length, 4 flute

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	11000	370	7000	230	7000	210	5000	100	3800	55
3	8000	550	5100	320	5100	300	3800	190	2500	80
4	6200	620	4000	350	4000	340	3000	210	1900	110
5	5000	670	3200	370	3200	360	2400	220	1500	110
6	4200	750	2600	400	2600	390	2000	220	1300	110
8	3200	780	2000	420	2000	400	1500	230	960	100
10	2500	690	1600	410	1600	380	1200	210	760	100
12	2100	670	1300	380	1300	340	1000	190	640	80
16	1600	570	1000	320	1000	280	750	170	480	65
20	1200	470	800	290	800	260	600	150	380	50
Depth of cut										

D:Dia.

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS4SC
End mill, Short cut length, 4 flute

MS4MC
End mill, Medium cut length, 4 flute

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45—55HRC) AISI H13		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
1	40000	3000	0.06	32000	2400	0.06
1.5	40000	4500	0.12	32000	3600	0.08
2	30000	4500	0.18	24000	3600	0.10
2.5	24000	3900	0.25	19000	3000	0.13
3	20000	3500	0.30	16000	2700	0.15
4	15000	3000	0.40	12000	2400	0.20
5	12000	2400	0.50	9000	1800	0.25
6	10000	2100	0.60	7000	1500	0.30
8	8000	1500	0.80	5600	1100	0.40
10	6400	1400	1.00	4500	950	0.50
12	5400	1200	1.00	3800	860	0.50
16	2400	550	3.00	1200	120	0.80
20	1900	480	4.00	1000	100	1.00
Depth of cut	≤Please refer to the list above for depth of cut. ≤1D D ≤Please refer to the list above for depth of cut. D:Dia.					

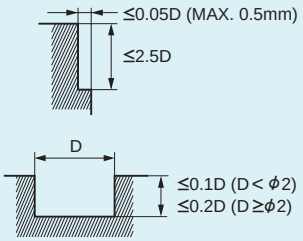
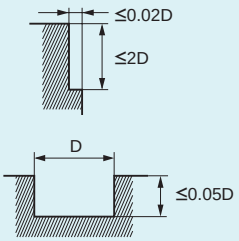
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When slotting with end mills with ϕ3 or larger, reduce the revolution to 50—70% and the feed rate to 40—60%.
3) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS4SC ➤ J082
MS4MC ➤ J083

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS4JC

End mill, Semi long cut length, 4 flute

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	11100	85	9500	65	8000	50	6400	35
1.5	7400	85	6400	90	5300	50	4200	35
2	5600	85	4800	90	4000	50	3200	35
2.5	4500	85	3800	90	3200	55	2500	35
3	3700	90	3400	90	2600	60	2100	35
4	3000	110	2700	90	2100	70	1700	50
5	2600	140	2300	110	1800	85	1500	55
6	2300	170	2000	140	1500	110	1300	70
8	1700	180	1500	140	1200	110	1000	70
10	1400	180	1300	140	950	110	800	70
12	1200	170	1100	140	800	110	670	70
Depth of cut								

D:Dia.

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) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS4JC ➤ J084

MS4XL
End mill, Short cut length, 4 flute, Long neck

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
1	4	40000	3000	0.04
	8	36000	2400	0.03
	12	20000	1000	0.02
	16	10000	500	0.005
1.2	6	40000	3000	0.05
	10	36000	2400	0.04
	12	20000	1200	0.03
	16	12000	600	0.01
1.5	6	40000	3200	0.06
	12	32000	2400	0.05
	16	16000	1100	0.03
	20	10000	600	0.01
1.8	6	40000	3600	0.08
	12	32000	2800	0.06
	20	12000	1000	0.02
	25	7000	600	0.01
2	6	40000	4000	0.1
	12	32000	3200	0.07
	16	24000	2400	0.05
	20	12000	1200	0.03
	30	5000	500	0.01
2.5	8	32000	4000	0.2
	25	9000	1100	0.04
	50	2500	300	0.005
3	8	25000	3600	0.4
	16	18000	2500	0.2
	25	12000	1700	0.1
	30	7000	800	0.05

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
3.5	15	20000	3000	0.6
	25	11000	1600	0.15
	35	5500	800	0.06
4	12	18000	3000	1
	20	12000	2000	0.5
	30	8000	1300	0.2
	40	4200	700	0.08
	50	2400	400	0.03
5	16	14000	2700	1
	25	9500	1800	0.5
	35	6400	1200	0.2
	50	3200	600	0.05
6	20	11000	2200	1.2
	30	8000	1600	0.6
	40	5400	1100	0.25
	50	3200	640	0.15
8	30	8000	1600	1.6
	50	4000	800	0.5
	70	2000	400	0.2
10	40	6400	1300	2
	60	3200	640	0.6
	80	1600	320	0.3

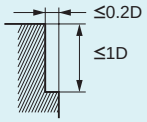
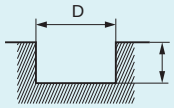
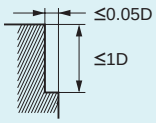
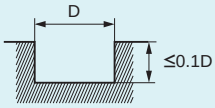
ap:Depth of Cut in the Axial Direction

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS2ES
End mill, 2 flute, For small automatic lathes

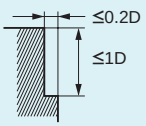
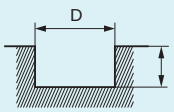
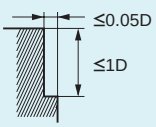
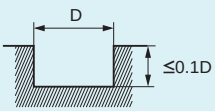
MS3ES
End mill, 3 flute, For small automatic lathes

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	10000	600	7000	400	6000	300	5000	120
4	7500	600	5200	400	4500	300	4000	120
5	6000	600	4200	400	3600	300	3200	120
6	5000	600	3500	400	3000	300	2700	120
7	4500	560	3000	360	2700	280	2300	110
8	4000	520	2800	350	2400	260	2000	110
10	3200	450	2200	300	1900	230	1600	100
12	2700	410	1900	270	1600	210	1300	100
Depth of cut	 				 			

D:Dia.

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) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS4EC
End mill, 4 flute, For small automatic lathes

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	10000	900	7000	600	6000	450	5000	180
4	7500	900	5200	600	4500	450	4000	180
5	6000	900	4200	600	3600	450	3200	180
6	5000	900	3500	600	3000	450	2700	180
7	4500	840	3000	540	2700	420	2300	160
8	4000	780	2800	520	2400	390	2000	160
10	3200	680	2200	450	1900	340	1600	140
12	2700	620	1900	410	1600	310	1300	120
14	2300	550	1600	350	1400	280	1200	120
Depth of cut	 				 			

D:Dia.

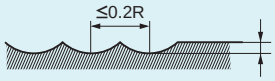
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS2ES ➤ J043
MS3ES ➤ J071
MS4EC ➤ J088

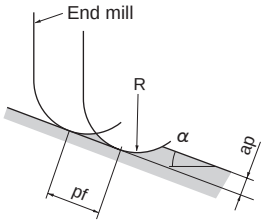
Ball nose end mill, Short cut length, 2 flute **MS2SB**

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

Ball nose end mill, Medium cut length, 2 flute **MS2MTB**

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21					Hardened steel (45−55HRC) AISI H13				
R (mm)	α≤15°		α>15°		Depth of cut (mm)	α≤15°		α>15°		Depth of cut (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	
R 0.1	40000	300	40000	250	0.003	40000	300	40000	250	0.003
R 0.15	40000	500	40000	350	0.007	40000	500	40000	350	0.007
R 0.2	40000	1600	40000	1200	0.02	40000	1300	40000	950	0.015
R 0.25	40000	2400	40000	1400	0.025	40000	1900	40000	1100	0.020
R 0.3	40000	3200	40000	1600	0.03	40000	2500	40000	1300	0.025
R 0.4	40000	4800	40000	2400	0.05	40000	4000	40000	1900	0.04
R 0.5	40000	5600	40000	3200	0.06	40000	5600	40000	3000	0.05
R 0.75	40000	6500	40000	4000	0.09	40000	6500	32000	3200	0.08
R 1	40000	6500	39000	4700	0.11	40000	6500	31000	3500	0.11
R 1.25	40000	7000	33000	4500	0.12	36000	6500	26000	3500	0.12
R 1.5	40000	7500	27000	4300	0.13	32000	6000	22000	3400	0.13
R 2	32000	7500	20000	3600	0.15	25000	6000	16000	2700	0.15
R 2.5	25000	6000	16000	2900	0.20	20000	5400	13000	2300	0.20
R 3	21000	5800	13000	2600	0.25	17000	4700	10000	2000	0.25
R 4	16000	4500	10000	2000	0.30	13000	3600	8000	1500	0.30
R 5	13000	3600	8000	1700	0.50	10000	2900	6400	1200	0.50
R 6	9000	2500	6000	1300	0.50	7200	2000	4800	1000	0.50
Depth of cut	 ≤Please refer to the list above for depth of cut. R:Radius									

1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.



MS2SB ➤ J132
MS2MB ➤ J134
MS2MTB ➤ J233

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

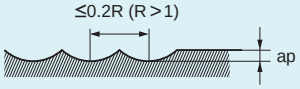
MS2XLB

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

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45−55HRC) AISI H13		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R 0.1	0.5	50000	400	0.003	50000	320	0.003
	1	50000	400	0.002	50000	320	0.002
	1.5	40000	300	0.001	40000	240	0.001
	2	40000	200	0.001	40000	160	0.001
	2.5	40000	100	0.001	40000	80	0.001
	3	30000	50	0.001	30000	40	0.001
R 0.15	1	50000	600	0.007	50000	480	0.007
	1.5	50000	600	0.005	50000	480	0.005
	2	50000	600	0.003	50000	480	0.003
	2.5	40000	400	0.003	40000	320	0.003
	3	40000	300	0.002	40000	240	0.002
	4	30000	200	0.002	30000	160	0.002
R 0.2	1	50000	1800	0.015	50000	1400	0.015
	2	50000	1300	0.01	50000	1000	0.01
	3	50000	900	0.005	50000	700	0.005
	4	40000	600	0.004	40000	480	0.004
	5	40000	400	0.003	40000	320	0.003
	6	30000	200	0.002	30000	160	0.002
R 0.25	2	50000	2500	0.02	50000	2000	0.02
	3	50000	1500	0.015	50000	1200	0.015
	4	45000	1200	0.01	45000	950	0.01
	5	45000	900	0.007	45000	700	0.007
	6	36000	600	0.006	36000	480	0.006
	7	32000	400	0.005	32000	320	0.005
	8	32000	300	0.003	32000	240	0.003
	10	26000	200	0.002	26000	160	0.002
R 0.3	2	50000	3500	0.03	50000	2800	0.03
	3	50000	3500	0.03	50000	2800	0.03
	4	44000	2500	0.02	44000	2000	0.02
	5	37000	1200	0.01	37000	950	0.01
	6	37000	1000	0.008	37000	800	0.008
	7	35000	750	0.008	35000	600	0.008
	8	35000	600	0.006	35000	480	0.006
	9	30000	500	0.004	30000	400	0.004
	10	30000	500	0.003	30000	400	0.003
	11	22000	300	0.002	22000	240	0.002
	12	22000	200	0.002	22000	160	0.002
R 0.4	2	50000	4400	0.04	50000	3500	0.04
	3	50000	4000	0.04	50000	3200	0.04
	4	50000	4000	0.02	50000	3200	0.02
	5	35000	2400	0.02	35000	1900	0.02
	6	35000	2400	0.02	35000	1900	0.02
	7	30000	1500	0.015	30000	1200	0.015
	8	30000	1500	0.01	30000	1200	0.01
	10	30000	700	0.008	30000	560	0.008
	12	22000	500	0.006	22000	400	0.006
R 0.5	3	40000	4000	0.05	40000	3200	0.05
	4	40000	4000	0.05	40000	3200	0.05
	6	35000	3000	0.03	35000	2400	0.03
	8	30000	2000	0.02	30000	1600	0.02

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45−55HRC) AISI H13		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R 0.5	10	20000	1000	0.01	20000	800	0.01
	12	20000	1000	0.01	20000	800	0.01
	14	18000	600	0.008	18000	480	0.008
	16	18000	500	0.008	18000	400	0.008
	18	13000	300	0.005	13000	240	0.005
	20	13000	250	0.005	13000	200	0.005
R 0.6	3.6	40000	4400	0.06	40000	3500	0.06
	6	40000	4400	0.04	40000	3500	0.04
	8	40000	4000	0.04	40000	3200	0.04
	10	27000	1900	0.02	27000	1500	0.02
	12	16000	1400	0.02	16000	1100	0.02
	18	15000	700	0.008	15000	560	0.008
	24	11000	300	0.006	11000	240	0.006
R 0.75	6	40000	6000	0.07	36000	4300	0.07
	8	40000	6000	0.07	36000	4300	0.07
	10	40000	5000	0.06	36000	3600	0.06
	12	32000	3400	0.04	29000	2400	0.04
	16	15000	1400	0.03	15000	1100	0.03
	20	12000	900	0.02	12000	720	0.02
	30	9000	400	0.01	9000	320	0.01
R 1	4	40000	8000	0.1	32000	5000	0.1
	6	40000	8000	0.1	32000	5000	0.1
	8	40000	6000	0.1	32000	3800	0.1
	10	40000	5000	0.08	32000	3200	0.08
	12	40000	5000	0.08	32000	3200	0.08
	16	32000	3500	0.05	26000	2200	0.05
	20	10000	1000	0.04	10000	800	0.04
	25	10000	1000	0.04	10000	800	0.04
	30	10000	800	0.02	10000	640	0.02
	35	10000	600	0.02	10000	480	0.02
R 1.5	8	32000	7000	0.15	26000	4500	0.15
	10	32000	7000	0.15	26000	4500	0.15
	16	32000	5000	0.1	26000	3200	0.1
	20	27000	3800	0.1	22000	2400	0.1
	25	21000	2700	0.08	17000	1700	0.08
	30	6000	700	0.08	6000	560	0.08
	35	6000	700	0.06	6000	560	0.06
	40	6000	600	0.04	6000	480	0.04
R 2	10	24000	6000	0.2	19000	3800	0.2
	20	24000	3800	0.15	19000	2400	0.15
	30	20000	3000	0.1	16000	1900	0.1
	40	12000	1700	0.1	12000	1400	0.1
	50	8000	1000	0.05	8000	800	0.05
R 2.5	20	22000	6000	0.2	18000	3800	0.2
	25	22000	4400	0.2	18000	2800	0.2
	30	22000	3800	0.15	18000	2400	0.15
	35	22000	3600	0.1	18000	2300	0.1
R 3	30	20000	6000	0.2	16000	3800	0.2
	50	20000	3000	0.15	16000	1900	0.15

Depth of cut



R:Radius

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

MS2XLB ➤ J135

MS2XB

Ball nose end mill, 2 flute, Taper neck

Work material				Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21	
R (mm)	Taper angle one side	Neck length (mm)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)
R0.1	30'	1.5	0.005	30000	300
	30'	2	0.005		
	1°	1.5	0.005		
	1°	2	0.005		
	2°	1.5	0.01		
	2°	2	0.01		
	3°	1.5	0.01		
	3°	2	0.01		
	5°	2	0.01		
R0.15	30'	3	0.005	30000	300
	1°	3	0.005		
	2°	3	0.01		
	3°	3	0.01		
	5°	3	0.01		
R0.2	30'	2	0.02	30000	300
	30'	5	0.01		
	1°	2	0.02		
	1°	5	0.01		
	2°	2	0.02		
	2°	5	0.01		
R0.25	30'	3	0.03	30000	300
	30'	5	0.02		
	1°	3	0.03		
	1°	5	0.02		
	2°	3	0.03		
	2°	5	0.02		
R0.3	30'	5	0.03	30000	400
	30'	8	0.02		
	1°	5	0.03		
	1°	10	0.02		
	1°	15	0.01		
	2°	6	0.03		
	2°	8	0.02		
R0.4	30'	8	0.05	30000	500
	30'	12	0.04		
	1°	8	0.05		
	1°	12	0.04		
	2°	8	0.08		
	3°	12	0.06		

Work material				Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21	
R (mm)	Taper angle one side	Neck length (mm)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)
R0.5	30'	10	0.05	22000	530
	30'	20	0.02		
	30'	30	0.005		
	1°	10	0.05		
	1°	20	0.02		
	1°	35	0.005		
	2°	20	0.03		
	3°	40	0.05		
	5°	20	0.05		
R0.6	30'	12	0.05	22000	600
	30'	24	0.02		
	1°	12	0.05		
	1°	24	0.02		
	2°	12	0.06		
	2°	24	0.03		
R0.75	30'	10	0.1	20000	700
	30'	30	0.02		
	1°	10	0.1		
	1°	30	0.05		
	2°	30	0.1		
R1	30'	20	0.05	18000	1000
	30'	30	0.03		
	30'	40	0.02		
	1°	20	0.05		
	1°	40	0.03		
	1°	50	0.02		
	2°	40	0.1		
	3°	40	0.1		
	5°	38.2	0.1		
R1.5	30'	30	0.1	16000	1300
	30'	50	0.03		
	1°	30	0.1		
	1°	50	0.03		
	2°	48.9	0.1		
	3°	50	0.1		
R2	30'	60	0.1	14000	1100
	1°	60	0.1		

Depth of cut	
	≤0.1R (R < 0.5) ≤0.2R (R ≥ 0.5) ap R:Radius

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

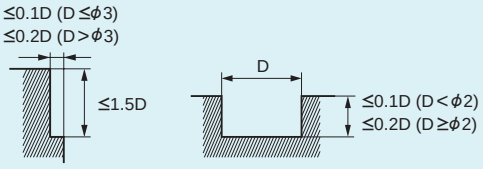
MS2XLRB

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

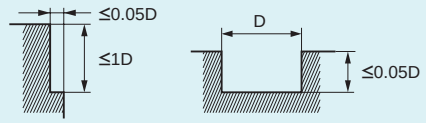
Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20		Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Neck length (mm)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	2	(2D)	30000	600	20000	400	18000	300	15000	120
2	4		15000	600	10000	400	9100	300	8000	120
3	6		10000	600	7000	400	6000	300	5000	120
4	8		7500	600	5200	400	4500	300	4000	120
6	12		5000	600	3500	400	3000	300	2700	120
1	5	(5D)	22000	350	17000	280	14000	200	12000	100
2	10		11000	350	8800	280	7200	200	6400	100
3	15		7400	350	5800	280	4800	200	4200	100
4	20		5600	350	4400	280	3600	200	3200	100
6	30		3700	350	2900	280	2400	200	2100	100

Depth of cut

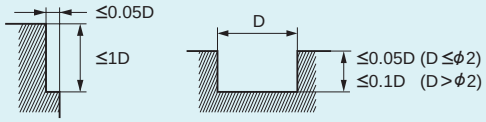
(Neck length=2D)



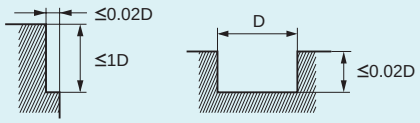
(Neck length=5D)



(Neck length=2D)



(Neck length=5D)



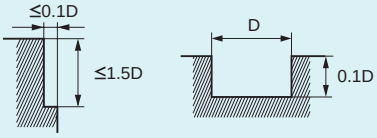
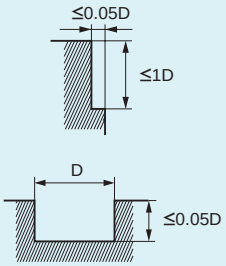
D:Dia.

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.

MS2XLRB ➤ J184

MS4MRB

Corner radius end mill, Medium cut length, 4 flute

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40000	1500	30000	800	22000	480	24000	240
1.5	32000	1500	20000	800	15000	480	16000	240
2	24000	1500	15000	800	11000	480	12000	240
2.5	19000	1500	12000	800	8800	480	9600	240
3	16000	1500	10000	800	7400	480	8000	240
4	12000	1800	8000	1000	5600	600	6000	240
5	9600	1800	6400	1000	4400	600	4800	240
6	8000	1800	5300	1000	3700	600	4000	240
8	6000	1600	4000	900	2800	560	3000	240
10	4800	1400	3200	800	2200	500	2400	240
12	4000	1200	2700	700	1800	430	2000	230
16	3000	960	2000	560	1400	360	1500	190
20	2400	800	1600	480	1100	300	1200	170
Depth of cut								

D:Dia.

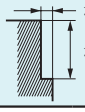
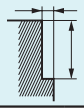
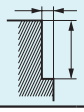
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MSMHDRB

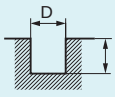
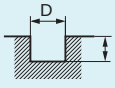
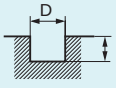
High power, Corner radius, Medium cut length, 4 flute

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	15000	550	10000	340	10000	320	6400	160	4800	100
3	11000	800	7400	500	7400	480	4800	250	4000	170
4	8000	900	5600	540	5600	520	3600	270	3200	240
5	6400	1000	4500	600	4500	580	2900	300	2600	240
6	5900	1100	3700	640	3700	600	2400	320	2100	230
8	4400	1100	2800	660	2800	600	1800	330	1600	220
10	3500	1000	2300	640	2300	560	1400	320	1300	200
12	2900	1000	1900	640	1900	530	1200	320	1100	170
16	2200	800	1400	500	1400	450	900	250	800	130
18	2000	800	1250	480	1250	450	800	240	710	110
20	1800	750	1100	460	1100	440	720	230	650	100
Depth of cut	 ≤0.2D ≤1.5D				 ≤0.1D ≤1.5D				 ≤0.05D ≤1.5D	

D:Dia.

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	12000	400	7000	200	7000	100	4200	80	2300	40
3	9000	600	5300	300	5300	150	3200	130	1900	70
4	7200	720	4000	360	4000	180	2400	140	1400	95
5	5800	720	3200	360	3200	180	1900	150	1100	95
6	5000	800	2700	400	2700	200	1600	160	950	95
8	3700	800	2000	400	2000	200	1200	170	720	90
10	3000	720	1600	360	1600	180	960	160	570	80
12	2500	600	1300	290	1300	150	800	140	480	70
16	2000	480	1000	230	1000	120	600	110	360	50
18	1800	460	900	210	900	110	550	110	320	45
20	1600	430	800	200	800	100	480	100	290	40
Depth of cut	 ≤1D (MAX. 12mm)				 ≤0.5D				 ≤0.2D	

D:Dia.

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

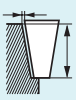
MSMHDRB ➤ J197

MS2MT
Taper end mill, Medium cut length, 2 flute

Slotting

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		
Small Mill Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.2	40000	320	0.005	40000	180	0.004	40000	100	0.002
0.3	40000	400	0.006	40000	220	0.005	35000	130	0.003
0.4	40000	450	0.008	40000	270	0.006	31000	150	0.004
0.5	37000	500	0.010	32000	320	0.008	25000	160	0.005
0.6	32000	530	0.013	26000	340	0.010	21000	170	0.006
0.7	27000	560	0.015	23000	380	0.011	18000	180	0.007
0.8	24000	610	0.018	20000	410	0.013	16000	210	0.008
0.9	21000	610	0.020	18000	450	0.015	14000	210	0.009
1	19000	610	0.025	16000	450	0.020	13000	210	0.010
1.5	13000	720	0.040	11000	540	0.030	8500	270	0.015
Depth of cut	 Please refer to the list above for depth of cut.								

Side milling

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	
Small Mill Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	9500	720	8000	540	6400	300
2.5	7800	800	6300	540	5000	300
3	6400	800	5300	540	4200	300
4	4800	800	4000	540	3200	300
5	3800	800	3200	540	2500	300
6	3200	800	2600	540	2100	300
8	2400	700	2000	480	1600	270
10	1900	600	1600	410	1300	240
Depth of cut	≤0.05D  ≤2.5D				≤0.03D  ≤2.5D	

D:End point diameter

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS4LT

Taper end mill, Long cut length, 4 flute

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

ap:Depth of Cut in the Axial Direction

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

MS4LT ➤ J227

MS4LTB

Ball nose, 4 flute, Taper, For rib milling

Work material		Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45－55HRC) AISI H13		
R (mm)	Length of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R0.3	4	18000－32000	250－600	0.01	13000－24000	200－400	0.005
	6			0.007			0.004
R0.4	6	14000－24000	250－600	0.025	10000－18000	200－400	0.013
	8			0.02			0.01
	10			0.015			0.008
R0.5	8	11000－19000	300－800	0.025	8000－14000	200－500	0.013
	10			0.02			0.01
	12			0.018			0.009
	16			0.015			0.008
R0.6	8	9200－16000	300－800	0.035	6600－12000	200－500	0.018
	10			0.03			0.015
	12			0.027			0.013
	16			0.02			0.01
R0.75	8	7500－13000	300－800	0.05	5300－9500	200－500	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	0.08	4400－8000	200－500	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	0.08	4000－7200	200－500	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

ap:Depth of Cut in the Axial Direction

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-2MD

End mill, Medium cut length, 2 flute, For hardened materials

Work material	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		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.5	40000	1000	0.015	40000	960	0.015	30000	600	0.01
1	40000	2000	0.06	32000	1600	0.06	16000	550	0.05
1.5	40000	3000	0.12	32000	1900	0.08	10600	500	0.08
2	30000	3000	0.18	24000	1900	0.10	8100	400	0.1
2.5	24000	2600	0.25	19000	1600	0.13	6400	350	0.13
3	20000	2300	0.30	16000	1400	0.15	5400	300	0.15
4	15000	2000	0.40	12000	1200	0.20	4000	240	0.2
5	12000	1600	0.50	9000	900	0.25	3200	190	0.2
6	10000	1400	0.60	7000	700	0.30	2700	160	0.2
Depth of cut	≤Please refer to the list above for depth of cut. ≤1D D ≤Please refer to the list above for depth of cut. D:Dia.								

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VF-2MD ➤ J044

VF-2MV

End mill, Medium cut length, 2 flute, Irregular helix flutes

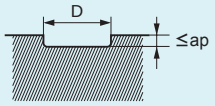
Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21			Hardened steel (45－55HRC) AISI H13			Hardened steel (55－62HRC) AISI D2		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.5	40000	1000	0.015	40000	960	0.015	30000	600	0.01
1	40000	2000	0.06	32000	1600	0.06	16000	550	0.05
1.5	40000	3000	0.12	32000	1900	0.08	10600	500	0.08
2	30000	3000	0.18	24000	1900	0.10	8100	400	0.1
2.5	24000	2600	0.25	19000	1600	0.13	6400	350	0.13
3	20000	2300	0.30	16000	1400	0.15	5400	300	0.15
4	15000	2000	0.40	12000	1200	0.20	4000	240	0.2
5	12000	1600	0.50	9000	900	0.25	3200	190	0.2
6	10000	1400	0.60	7000	700	0.30	2700	160	0.2
Depth of cut	≤Please refer to the list above for depth of cut. ≤1D D ≤Please refer to the list above for depth of cut. D:Dia.								

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, the VFMHV is recommended.
3) 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 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.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-2XL

End mill, 2 flute, Long neck

Work material		Hardened steel (45−55HRC) AISI H13			Hardened steel (55−62HRC) AISI D2		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut per pass ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut per pass ap (mm)
0.1	0.5	40000	100	0.002	40000	80	0.001
0.2	0.6	40000	400	0.004	40000	360	0.004
	1	40000	300	0.003	40000	250	0.002
	1.5	40000	200	0.002	40000	150	0.001
0.3	1	40000	500	0.006	40000	450	0.004
	2	40000	400	0.003	38000	350	0.002
	3	38000	250	0.002	36000	200	0.001
0.4	1	40000	800	0.008	36000	500	0.006
	2	40000	500	0.007	30000	350	0.005
	4	36000	300	0.004	27000	200	0.003
0.5	2	40000	800	0.01	30000	600	0.009
	4	36000	600	0.008	27000	450	0.007
	6	30000	400	0.005	22000	300	0.004
0.6	2	40000	1000	0.015	30000	700	0.012
	4	36000	800	0.01	27000	500	0.01
	6	30000	600	0.006	22000	350	0.006
0.8	4	36000	1200	0.03	27000	900	0.02
	6	30000	900	0.02	22000	650	0.015
	8	24000	600	0.01	18000	450	0.008
	10	20000	400	0.008	15000	300	0.005
1	4	32000	1600	0.05	24000	1100	0.04
	6	32000	1400	0.04	24000	1000	0.03
	8	28000	1000	0.03	21000	750	0.02
	10	28000	800	0.02	21000	600	0.015
	12	24000	500	0.02	18000	370	0.01
1.5	6	22000	1200	0.08	16000	900	0.06
	8	22000	1100	0.07	16000	800	0.05
	10	22000	1000	0.06	16000	750	0.04
	12	20000	800	0.05	15000	600	0.03
	16	18000	500	0.03	13000	350	0.02
2	6	16000	1000	0.15	12000	750	0.15
	8	16000	1000	0.15	12000	750	0.1
	10	16000	800	0.1	12000	600	0.08
	12	16000	800	0.08	12000	600	0.06
	16	15000	600	0.06	11000	450	0.05
	20	14000	500	0.05	10000	350	0.04
3	12	11000	800	0.2	8200	600	0.15
	16	11000	600	0.15	8200	450	0.15
	20	11000	500	0.1	8200	350	0.1
Depth of cut		 D:Dia.					

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

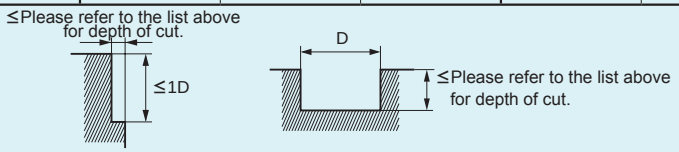
VF-2XL ➤ J046

VF-4MD

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

Work material	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		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
1	40000	3000	0.06	32000	2400	0.06	16000	710	0.05
1.5	40000	4500	0.12	32000	3600	0.08	10600	650	0.08
2	30000	4500	0.18	24000	3600	0.10	8100	520	0.10
2.5	24000	3900	0.25	19000	3000	0.13	6400	450	0.13
3	20000	3500	0.30	16000	2700	0.15	5400	390	0.15
4	15000	3000	0.40	12000	2400	0.20	4000	450	0.20
5	12000	2400	0.50	9000	1800	0.25	3200	380	0.20
6	10000	2100	0.60	7000	1400	0.30	2700	320	0.20
8	8000	1500	0.80	5600	1100	0.40	2000	240	0.20
10	6400	1400	1.00	4500	950	0.50	1600	210	0.30
12	5400	1200	1.00	3800	860	0.50	1300	160	0.30
16	2400	550	3.00	1200	280	0.80	1000	130	0.30
20	1900	480	4.00	1000	240	1.00	800	100	0.30

Depth of cut



D:Dia.

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-4MV

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

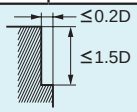
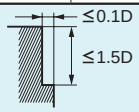
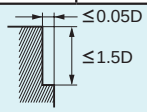
Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21			Hardened steel (45－55HRC) AISI H13			Hardened steel (55－62HRC) AISI D2		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
6	10000	2100	0.60	7000	1400	0.30	2700	320	0.20
8	8000	1500	0.80	5600	1100	0.40	2000	240	0.20
10	6400	1400	1.00	4500	950	0.50	1600	210	0.30
12	5400	1200	1.00	3800	860	0.50	1300	160	0.30
16	2400	550	3.00	1200	280	0.80	1000	130	0.30
20	1900	480	4.00	1000	240	1.00	800	100	0.30
Depth of cut	≤Please refer to the list above for depth of cut. ≤1D D ≤Please refer to the list above for depth of cut. D:Dia.								

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, the VFMHV is recommended.
3) 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 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.

VF-MHV
End mill, Medium cut length, Irregular helix flutes

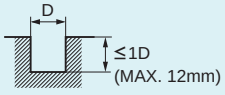
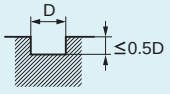
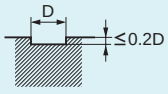
VF-MHVRB
Corner radius, Medium cut length, Irregular helix flutes

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	21000	1100	21000	1100	14000	560	9600	310	4800	130
3	15000	1250	15000	1250	10600	850	7400	380	4200	200
4	11000	1400	11000	1400	8000	960	5600	400	3200	220
5	9600	1920	9600	1920	6400	1020	4500	430	2500	250
6	8000	2240	8000	2240	5300	1060	3700	440	2100	250
7	6800	1900	6800	1900	4500	1010	3200	450	1800	260
8	6000	1680	6000	1680	4000	960	2800	450	1600	260
9	5300	1480	5300	1480	3500	840	2500	450	1400	220
10	4800	1440	4800	1440	3200	770	2200	440	1300	210
11	4400	1350	4400	1350	2900	760	2000	400	1200	190
12	4000	1250	4000	1250	2700	760	1900	380	1100	180
13	3700	1180	3700	1180	2500	700	1700	360	1000	160
14	3400	1160	3400	1160	2300	640	1600	350	900	140
16	3000	1140	3000	1140	2000	560	1400	340	800	130
18	2700	970	2700	970	1800	550	1200	340	700	110
20	2400	860	2400	860	1600	510	1100	330	600	100
Depth of cut										

D:Dia.

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	17000	680	10000	400	9600	310	4800	130	3200	80
3	12000	720	6900	410	7400	380	3200	140	2700	110
4	9200	810	5600	490	5600	400	2400	150	2000	120
5	7600	1060	4500	630	4500	410	1900	170	1600	130
6	6400	1280	3700	740	3700	440	1600	190	1300	160
7	5500	1210	3200	700	3200	410	1400	190	1100	140
8	4800	1150	2800	670	2800	390	1200	190	1000	130
9	4200	1010	2500	600	2500	350	1100	180	900	130
10	3800	910	2200	530	2200	350	1000	160	800	130
11	3500	900	2000	530	2000	320	900	160	720	120
12	3200	900	1900	530	1900	300	800	160	660	110
13	2900	810	1700	480	1700	290	730	150	610	100
14	2700	760	1600	450	1600	290	680	140	570	90
16	2400	670	1400	390	1400	280	600	120	500	80
18	2100	670	1200	380	1200	270	530	120	440	70
20	1900	610	1100	350	1100	260	480	120	400	60
Depth of cut										

D:Dia.

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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

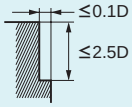
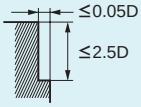
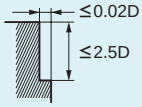
VF-MHV ➤ J091
VF-MHVRB ➤ J203

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-JHV

End mill, Semi long cut length, Irregular helix flutes

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	16000	530	10000	320	10000	300	7400	140	3800	55
3	12000	820	7600	470	7600	440	5600	280	2500	80
4	9500	950	6000	520	6000	510	4500	310	1900	110
5	7600	1000	4800	550	4800	540	3600	330	1500	110
6	6300	1100	4000	610	4000	600	3000	330	1300	110
8	4700	1100	3000	630	3000	600	2200	330	960	100
10	3800	1000	2400	610	2400	570	1800	310	760	100
12	3100	980	2000	580	2000	520	1500	280	640	80
16	2300	810	1500	480	1500	420	1100	240	480	65
20	1900	740	1200	430	1200	390	900	220	380	50
Depth of cut										

D:Dia.

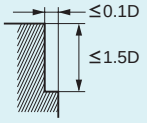
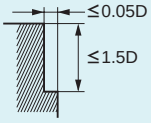
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-JHV ➤ J092

VF-6MHV
End mill, Medium cut length, 6 flute, Irregular helix flutes

VF-6MHVRB
Corner radius, Medium cut length, 6 flute, Irregular helix flutes

Side milling

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
6	10600	2900	8000	2000	2100	320
8	8000	2900	6000	2000	1600	300
10	6400	2700	4800	2000	1300	260
12	5300	2700	4000	2000	1100	230
16	4000	2200	3000	1600	800	180
20	3200	1900	2400	1400	640	150
Depth of cut						

D:Dia.

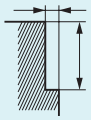
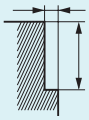
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-6MHV ➤ J108
VF-6MHVRB ➤ J216

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

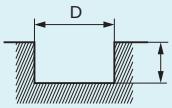
End mill, Short cut length, For hardened materials
Corner radius, Extra short cut length, For hardened materials
VF-SD
VF-SDRB

End mill, Medium cut length, For hardened materials
Corner radius, Medium cut length, 6 flute, For hardened materials
VF-MD
VF-MDRB

Work material	Hardened steel (45−55HRC) AISI H13			Hardened steel (55−62HRC) AISI D2			Hardened steel (62−70HRC) AISI W1, AISI M2		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
1	40000	1200	0.05	40000	800	0.03	32000	500	0.02
2	40000	2000	0.1	24000	1000	0.05	16000	600	0.05
3	32000	3800	0.2	16000	1900	0.1	11000	1200	0.05
4	24000	4400	0.2	12000	2200	0.1	8000	1300	0.05
6	16000	5800	0.3	8000	2900	0.2	5300	1800	0.1
8	12000	5800	0.4	6000	2900	0.2	4000	1800	0.1
10	9600	5800	0.5	4800	2900	0.3	3200	1800	0.2
12	8000	4800	0.6	4000	2400	0.3	2700	1500	0.2
16	6000	3600	0.8	3000	1800	0.5	2000	1100	0.3
20	4800	2900	1.0	2400	1400	0.5	1600	880	0.3
25	3800	2300	1.0	1900	1100	0.5	1300	720	0.3
Depth of cut	 Please refer to the list above for depth of cut. ≤1.5D			 Please refer to the list above for depth of cut. ≤1.0D					

D:Dia.

Slot milling with small diameter tools

Work material	Hardened steel (45−55HRC) AISI H13			Hardened steel (55−62HRC) AISI D2		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
1	15000	300	0.1	9500	110	0.05
2	8000	320	0.2	4800	190	0.1
Depth of cut	 D Please refer to the list above for depth of cut. D:Dia.					

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

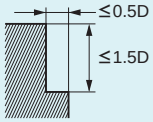
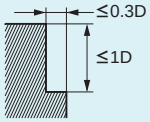
SOLID END MILLS

VF-SD ➤ J109
VF-MD ➤ J110
VF-SDRB ➤ J217
VF-MDRB ➤ J218

VF-SFPR

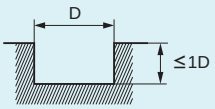
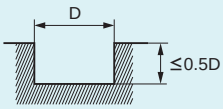
Roughing end mill, Short cut length, 3—4 flute

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45—55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	16000	960	13000	640	6400	260	5300	320	4200	70
4	12000	960	9500	640	4800	260	4000	320	3200	70
5	9500	960	7600	640	3800	260	3200	320	2500	70
6	8000	960	6400	680	3200	290	2700	340	2100	75
8	6000	1050	4800	760	2400	340	2000	400	1600	95
10	4800	1050	3800	760	1900	340	1600	400	1300	105
12	4000	960	3200	700	1600	320	1300	400	1100	110
16	3000	840	2400	620	1200	300	1000	360	800	110
20	2400	760	1900	560	1000	300	800	320	600	100
Depth of cut										

D:Dia.

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45—55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	13000	720	11000	480	4800	190	3200	190	2100	25
4	9500	720	8000	480	3600	190	2400	190	1600	25
5	7600	720	6400	480	3200	190	1900	190	1300	25
6	6400	720	5300	480	2700	200	1600	200	1100	30
8	4800	800	4000	520	2000	220	1200	220	800	35
10	3800	800	3200	520	1600	220	1000	220	600	35
12	3200	750	2700	520	1300	210	800	210	500	40
16	2400	620	2000	450	1000	180	600	180	400	45
20	1900	540	1600	400	800	160	500	160	300	40
Depth of cut										

D:Dia.

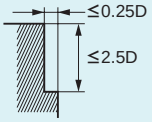
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-MFPR

Roughing end mill, Medium cut length, 4 flute

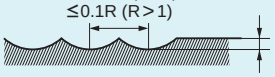
Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	3800	360	3200	290	2500	150	2500	150	1900	50
6	3200	360	2700	290	2100	160	2100	160	1600	60
8	2400	450	2000	360	1600	160	1600	160	1200	70
10	1900	450	1600	360	1300	180	1300	180	1000	75
12	1600	400	1300	320	1100	180	1100	180	800	80
16	1200	360	1000	290	800	160	800	160	600	80
20	1000	340	800	270	600	150	600	150	500	80
Depth of cut	 D:Dia.									

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VF-2WB

Wide ball nose, Medium cut length, 2 flute

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			Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			Hardened steel (45−55HRC) AISI H13		
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
R1	40000	5000	0.07	40000	5000	0.06	32000	2500	0.05	32000	3000	0.03
R1.5	32000	5000	0.12	32000	5000	0.11	26000	2500	0.10	26000	3000	0.07
R2	24000	3800	0.15	24000	3800	0.13	20000	2000	0.12	20000	2800	0.10
R3	16000	2800	0.20	16000	2800	0.18	13000	1500	0.15	13000	2100	0.12
Depth of cut	≤0.05R (R=1) ≤0.1R (R>1)  ≤Please refer to the list above for depth of cut. R:Radius											

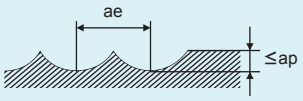
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

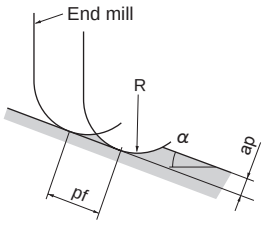
VF-2SDB
Ball nose, Short cut length, 2 flute, Strong geometry type

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

Overhang below 5D (D:Dia.)

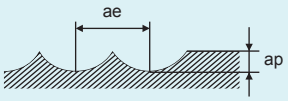
Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21						Hardened steel (45－55HRC) AISI H13						Hardened steel (55－62HRC) AISI D2					
R (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Depth of cut ae (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Depth of cut ae (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Depth of cut ae (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R 0.5	40000	5200	36000	2300	0.10	0.25	40000	5200	36000	2300	0.10	0.25	40000	5000	40000	2400	0.05	0.10
R 1	40000	6000	36000	3500	0.20	0.50	40000	6000	36000	3500	0.20	0.50	36000	5000	24000	2400	0.10	0.20
R 1.5x3	29000	4600	19000	2400	0.20	0.50	25000	4000	16000	2000	0.20	0.50	17000	2400	11000	1000	0.12	0.30
R 1.5	37000	7000	24000	3000	0.30	0.75	37000	7000	24000	3000	0.30	0.75	25000	6000	16000	2200	0.12	0.30
R 2x4	24000	4300	15000	2200	0.25	0.70	19000	3400	13000	1700	0.25	0.70	12000	1900	8200	900	0.13	0.40
R 2	30000	6500	19000	2800	0.40	1.00	28000	6000	19000	2600	0.40	1.00	18000	4800	12000	2000	0.13	0.40
R 2.5	25000	6000	16000	2600	0.50	1.30	22000	5000	16000	2300	0.50	1.25	15000	4200	9500	1700	0.15	0.50
R 3	22000	6000	14000	2400	0.60	1.80	18000	4500	12000	1900	0.60	1.50	12000	3500	8000	1600	0.20	0.60
R 4	19000	5200	12000	2200	0.80	2.40	15000	3800	9500	1700	0.80	2.00	9800	3000	6500	1300	0.20	0.80
R 5	15000	4300	9500	2000	1.00	3.00	11000	3000	7000	1500	1.00	2.50	7500	2400	5000	1000	0.20	1.00
R 6	12000	3400	8000	1800	1.20	3.60	9000	2400	6000	1400	1.20	3.00	6000	1900	4000	800	0.30	1.20
R 8	9000	2600	6000	1500	1.60	4.80	7000	1900	4500	1100	1.60	4.00	4500	1500	3000	600	0.30	1.60
R10	7500	2200	4800	1200	2.00	6.00	5500	1500	3600	900	2.00	5.00	3600	1200	2500	500	0.30	2.00
Depth of cut																		

1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.



VF-2SDB ➤ J147
VF-2SDBL ➤ J148

Overhang 7D (D:Dia.)

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Hardened steel (45—55HRC) AISI H13			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R 1.5x3	16000	2000	0.10	0.30	13000	1500	0.10	0.30
R 2x4	13000	2000	0.15	0.50	10000	1500	0.15	0.50
R 3	10000	2000	0.20	1.00	8000	1600	0.20	0.80
R 4	8000	1800	0.30	1.50	6400	1400	0.40	1.20
R 5	6000	1600	0.40	2.00	4800	1200	0.40	1.60
R 6	5000	1300	0.45	2.40	4000	1000	0.45	2.00
R 8	3800	1000	0.60	3.00	3100	800	0.60	2.50
R10	3000	800	0.80	4.00	2500	650	0.80	3.00
Depth of cut								

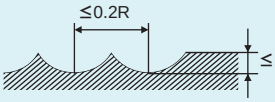
1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VF-2SDB ➤ J147
VF-2SDBL ➤ J148

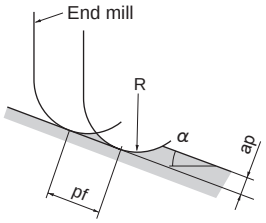
RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-2SSB
Ball nose, Short cut length, 2 flute, Short shank

VF-2SB
Ball nose, Short cut length, 2 flute, For hardened materials

Work material	Hardened steel (45−55HRC) AISI H13					Hardened steel (55−62HRC) AISI D2					Hardened steel (62−70HRC) AISI W1, AISI M2				
R (mm)	α≤15°		α>15°		Depth of cut ap(mm)	α≤15°		α>15°		Depth of cut ap(mm)	α≤15°		α>15°		Depth of cut ap(mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	
R 0.1	40000	320	40000	240	0.003	40000	320	40000	160	0.003	40000	320	40000	160	0.002
R 0.15	40000	640	40000	560	0.01	40000	640	40000	400	0.007	40000	640	40000	400	0.005
R 0.2	40000	1600	40000	1200	0.02	40000	1400	40000	1000	0.015	40000	1200	40000	1000	0.01
R 0.3	40000	3200	40000	1600	0.03	40000	2800	40000	1200	0.025	40000	2000	40000	1200	0.02
R 0.4	40000	6400	40000	2400	0.05	40000	4000	40000	1600	0.04	40000	2800	40000	1600	0.03
R 0.5	40000	8000	40000	3200	0.06	40000	5600	40000	2400	0.05	40000	3600	32000	1300	0.04
R 0.75	40000	9600	40000	4000	0.09	40000	7200	32000	2500	0.075	32000	4500	21000	1200	0.05
R 1	40000	9600	39000	4700	0.11	40000	8000	24000	2400	0.1	24000	3800	16000	1000	0.07
R 1.25	40000	10400	32000	4500	0.12	37000	8100	19000	2300	0.11	19000	3400	13000	1000	0.08
R 1.5	40000	12000	27000	4300	0.13	32000	7700	16000	2200	0.12	16000	3200	11000	880	0.09
R 2	32000	10880	20000	3600	0.15	24000	6200	12000	1900	0.13	12000	2400	8000	800	0.1
R 2.5	25000	9000	16000	2900	0.2	19000	5300	9600	1700	0.15	9600	2100	6000	600	0.1
R 3	21000	8400	13000	2600	0.25	16000	4800	8000	1600	0.2	8000	1700	5000	600	0.11
R 4	16000	6400	10000	2000	0.3	12000	3600	6000	1200	0.2	6000	1400	4000	480	0.11
R 5	13000	5200	8000	1700	0.5	10000	3200	4800	960	0.2	4800	1100	3000	420	0.12
R 6	9000	3600	6000	1300	0.5	7000	2200	3600	720	0.3	3600	860	2200	310	0.12
R 8	6000	2400	4000	1000	0.5	5000	1600	2500	500	0.3	2500	650	1500	240	0.15
R10	4500	1800	3000	780	0.5	4000	1300	1800	360	0.3	1800	470	1000	160	0.15
Depth of cut	 ≤0.2R ≤Please refer to the list above for depth of cut. R:Radius														

1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.



VF-2SSB ➤ J144
VF-2SB ➤ J145

VF-2XLBS

Ball nose, Medium cut length, 2 flute, Short shank

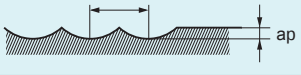
Work material		Hardened steel (45−55HRC) AISI H13			Hardened steel (55−62HRC) AISI D2		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R 0.1	0.5	40000	300	0.003	40000	300	0.002
	1	40000	300	0.002	40000	300	0.002
	1.5	40000	300	0.001	40000	200	0.001
	2	40000	200	0.001	40000	100	0.001
	2.5	40000	100	0.001	40000	60	0.001
R 0.15	1	40000	500	0.007	40000	500	0.005
	1.5	40000	500	0.005	40000	500	0.003
	2	40000	500	0.003	40000	500	0.002
	2.5	40000	400	0.003	40000	400	0.002
	3	40000	300	0.002	40000	300	0.001
	4	30000	200	0.002	30000	200	0.001
R 0.2	1	40000	1400	0.015	40000	1400	0.01
	1.5	40000	1000	0.01	40000	1000	0.006
	2	40000	1000	0.01	40000	1000	0.006
	2.5	40000	700	0.005	40000	700	0.003
	3	40000	700	0.005	40000	700	0.003
	4	40000	600	0.004	40000	500	0.003
	5	40000	400	0.003	40000	300	0.002
R 0.25	1.5	40000	2000	0.02	40000	2000	0.015
	2	40000	2000	0.02	40000	2000	0.015
	3	40000	1200	0.015	40000	1200	0.01
	4	36000	900	0.01	36000	900	0.007
	5	36000	700	0.007	36000	600	0.005
	6	36000	600	0.006	36000	500	0.004
R 0.3	2	40000	2800	0.03	40000	2800	0.02
	3	40000	2800	0.03	40000	2800	0.02
	4	35000	2000	0.02	35000	2000	0.015
	5	30000	1000	0.01	30000	1000	0.007
	6	30000	800	0.008	30000	800	0.005
	7	30000	600	0.008	30000	600	0.005
	8	25000	400	0.006	25000	400	0.004
R 0.4	2	40000	3500	0.04	40000	3500	0.03
	3	40000	3000	0.04	40000	3000	0.03
	4	40000	3000	0.02	40000	3000	0.015
	6	30000	1600	0.02	30000	1600	0.01
	8	25000	1000	0.01	25000	1000	0.007
	10	25000	600	0.008	25000	600	0.005
R 0.5	3	40000	4000	0.05	40000	4000	0.04
	4	40000	4000	0.05	40000	4000	0.04
	5	40000	3000	0.03	40000	3000	0.02
	6	35000	2000	0.03	35000	2000	0.02
	8	30000	1600	0.02	30000	1600	0.01
	10	20000	1000	0.01	20000	1000	0.01
	12	20000	1000	0.01	18000	800	0.008
	14	18000	600	0.008	18000	480	0.008
	16	18000	500	0.008	18000	400	0.006
	18	13000	300	0.005	13000	240	0.004
	20	13000	250	0.005	13000	200	0.004
R 0.6	6	40000	4000	0.05	35000	3500	0.04
	8	40000	3000	0.05	27000	2000	0.04
	10	27000	1900	0.03	24000	1700	0.02
	12	16000	1100	0.02	16000	1000	0.01
	14	16000	850	0.01	16000	780	0.01
	16	15000	500	0.01	14000	400	0.006
R 0.7	8	40000	4500	0.06	28000	3200	0.05
	12	32000	3000	0.03	19000	1800	0.02
	16	15000	1000	0.02	14000	800	0.01
R 0.75	6	40000	5000	0.07	32000	4000	0.06
	8	40000	5000	0.07	28000	3500	0.06
	10	40000	4500	0.06	21000	2400	0.04
	12	32000	3400	0.04	19000	2000	0.03
	14	16000	1500	0.04	13000	1200	0.03
	16	13000	1200	0.03	13000	1200	0.02

VF-2XLB

IMPACT MIRACLE, Ball nose, 2 flute, Long neck

Work material		Hardened steel (45−55HRC) AISI H13			Hardened steel (55−62HRC) AISI D2		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R 0.75	18	13000	1100	0.02	10000	800	0.02
	20	12000	900	0.02	9000	700	0.01
R 0.8	8	40000	5000	0.08	26000	3200	0.07
	12	35000	3800	0.05	20000	2100	0.03
	16	13000	1200	0.04	12000	1100	0.02
	20	10000	750	0.02	8000	600	0.01
R 0.9	8	40000	5000	0.09	25000	3100	0.08
	12	36000	3800	0.06	18000	1900	0.04
	16	25000	2500	0.04	14000	1300	0.025
	20	10000	1000	0.03	8000	800	0.02
R 1	6	40000	6000	0.1	24000	3400	0.1
	8	40000	5000	0.1	24000	3000	0.1
	10	40000	5000	0.08	24000	3000	0.07
	12	40000	5000	0.08	24000	2600	0.05
	14	40000	5000	0.06	21000	2300	0.05
	16	32000	3500	0.05	16000	1700	0.03
	18	24000	2400	0.04	13000	1300	0.03
	20	10000	1000	0.04	10000	1000	0.03
	22	10000	1000	0.04	10000	1000	0.02
	25	10000	1000	0.04	8000	800	0.02
	30	10000	800	0.02	8000	800	0.015
	35	10000	500	0.02	8000	400	0.01
R 1.25	10	36000	5000	0.12	20000	2600	0.11
	15	36000	4600	0.08	18000	2000	0.075
	20	26000	3000	0.07	13000	1400	0.05
	25	10000	1100	0.06	8000	800	0.04
	30	8000	800	0.05	7000	700	0.03
	35	8000	500	0.03	5000	400	0.03
R 1.5	8	32000	6400	0.15	16000	3000	0.15
	10	32000	5100	0.15	16000	2200	0.15
	12	32000	5100	0.13	16000	2200	0.13
	14	32000	4500	0.13	16000	2200	0.1
	16	32000	4500	0.1	16000	1800	0.1
	20	27000	3800	0.1	14000	1600	0.06
	25	21000	2700	0.08	11000	1200	0.06
	30	9000	1000	0.08	7000	700	0.05
	35	6000	700	0.06	6000	600	0.04
	40	6000	600	0.04	5000	400	0.03
R 1.75	16	28000	4200	0.13	14000	1600	0.13
	20	26000	3800	0.13	13000	1600	0.11
	25	23000	3300	0.12	11000	1200	0.08
	30	13000	1900	0.09	9000	1000	0.07
	35	9000	1200	0.08	6000	600	0.06
	40	8500	1100	0.07	5500	500	0.04
R 2	10	24000	4800	0.2	12000	2200	0.2
	12	24000	4800	0.2	12000	2200	0.2
	14	24000	3800	0.15	12000	1500	0.15
	16	24000	3800	0.15	12000	1500	0.15
	20	24000	3800	0.15	12000	1500	0.15
	25	24000	3800	0.15	10000	1100	0.1
	30	20000	3000	0.1	10000	1100	0.08
	35	12000	1700	0.1	8000	900	0.08
	40	11000	1500	0.1	5000	500	0.06
	45	10000	1300	0.08	5000	500	0.05
	50	8000	1000	0.05	4000	400	0.04
R 2.5	20	19000	3400	0.2	10000	1400	0.2
	25	19000	3400	0.2	10000	1400	0.2
	30	19000	3200	0.15	8000	1000	0.15
	35	16000	2700	0.1	8000	900	0.1
R 3	30	16000	3500	0.2	8000	1000	0.2
	40	16000	3000	0.15	8000	800	0.15
	50	16000	2700	0.15	6000	500	0.15

Depth of cut



R:Radius

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

VF-2XLBS ➤ J149
VF-2XLB ➤ J150

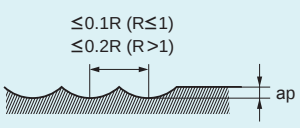
RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-3XB

Ball nose, Medium cut length, 3 flute, Taper neck

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		
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R0.4	0.4°	6	34000	2700	0.03	31000	2200	0.025	24000	1700	0.02	19000	1400	0.015
		8	31000	2100	0.02	29000	1700	0.02	22000	1300	0.015	18000	1000	0.01
		12	28000	2000	0.015	26000	1600	0.01	20000	1200	0.01	16000	960	0.007
	0.9°	8	31000	2200	0.02	29000	1800	0.02	22000	1400	0.015	18000	1100	0.01
		12	28000	2100	0.015	26000	1700	0.01	20000	1300	0.01	16000	1000	0.007
		16	25000	1100	0.01	23000	910	0.01	18000	700	0.008	14000	560	0.006
R0.5	0.4°	8	27000	2700	0.04	25000	2200	0.04	19000	1700	0.03	15000	1400	0.02
		10	24000	2200	0.03	22000	1800	0.025	17000	1400	0.02	14000	1100	0.015
		12	24000	2200	0.03	22000	1800	0.025	17000	1400	0.02	14000	1100	0.015
		16	22000	2100	0.03	21000	1700	0.025	16000	1300	0.02	13000	1000	0.015
		20	20000	1400	0.015	18000	1200	0.01	14000	900	0.01	11000	720	0.007
		25	18000	1300	0.015	17000	1000	0.01	13000	800	0.009	10000	640	0.006
		30	15000	960	0.01	14000	780	0.01	11000	600	0.008	8800	480	0.006
		35	14000	800	0.008	13000	650	0.007	10000	500	0.006	8000	400	0.004
	0.9°	8	27000	2900	0.04	25000	2300	0.04	19000	1800	0.03	15000	1400	0.02
		12	24000	2400	0.03	22000	2000	0.025	17000	1500	0.02	14000	1200	0.015
		16	22000	2200	0.03	21000	1800	0.025	16000	1400	0.02	13000	1100	0.015
		20	20000	1600	0.015	18000	1300	0.01	14000	1000	0.01	11000	800	0.007
		25	18000	1400	0.015	17000	1200	0.01	13000	900	0.009	10000	720	0.006
		30	15000	1100	0.01	14000	910	0.009	11000	700	0.008	8800	560	0.006
		35	14000	960	0.008	13000	780	0.007	10000	600	0.006	8000	480	0.004
		40	11000	800	0.007	11000	650	0.006	8000	500	0.005	6400	400	0.003
		50	8400	610	0.006	7800	490	0.005	6000	380	0.004	4800	300	0.003
		60	7000	510	0.004	6500	400	0.004	5000	320	0.003	4000	260	0.002
		70	7000	480	0.003	6500	390	0.002	5000	300	0.002	4000	240	0.001
	1.5°	12	24000	2600	0.03	22000	2100	0.025	17000	1600	0.02	14000	1300	0.015
		16	22000	2400	0.03	21000	2000	0.025	16000	1500	0.02	13000	1200	0.015
		20	20000	1800	0.015	18000	1400	0.01	14000	1100	0.01	11000	880	0.007
		25	18000	1600	0.015	17000	1300	0.01	13000	1000	0.009	11000	800	0.006
		30	15000	1300	0.01	14000	1000	0.01	11000	800	0.008	8800	640	0.006
		35	14000	1100	0.008	13000	910	0.007	10000	700	0.006	8000	560	0.004
R0.75	0.4°	10	18000	2700	0.06	17000	2200	0.05	13000	1700	0.04	10000	1400	0.03
		15	17000	2200	0.04	16000	1800	0.04	12000	1400	0.03	9600	1100	0.02
		20	17000	2100	0.03	16000	1700	0.025	12000	1300	0.02	9600	1000	0.015
		30	14000	1600	0.015	13000	1300	0.01	10000	1000	0.01	8000	800	0.007
	0.9°	15	17000	2400	0.04	16000	2000	0.04	12000	1500	0.03	9600	1200	0.02
		20	17000	2200	0.03	16000	1800	0.025	12000	1400	0.02	9600	1100	0.015
		30	14000	1800	0.015	13000	1400	0.01	10000	1100	0.01	8000	880	0.007
		40	13000	1300	0.01	12000	1000	0.01	9000	800	0.008	7200	640	0.006
	1.5°	15	17000	2600	0.04	16000	2100	0.04	12000	1600	0.03	9600	1300	0.02
		20	17000	2400	0.03	16000	2000	0.025	12000	1500	0.02	9600	1200	0.015
		30	14000	2000	0.015	13000	1600	0.01	10000	1200	0.01	8000	960	0.007

Depth of cut



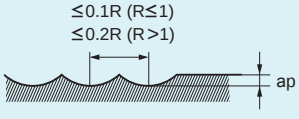
R:Radius

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VF-3XB ➤ J173

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		
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
R1	0.4°	16	15000	3200	0.07	14000	2600	0.06	11000	2000	0.05	8800	1600	0.03
		20	14000	2400	0.06	13000	2000	0.05	10000	1500	0.04	8000	1200	0.03
		25	14000	2100	0.04	13000	1700	0.04	10000	1300	0.03	8000	1000	0.02
		30	13000	1800	0.03	12000	1400	0.03	9000	1100	0.025	7200	880	0.02
		35	13000	1600	0.03	12000	1300	0.025	9000	1000	0.02	7200	800	0.015
		40	12000	1400	0.015	11000	1200	0.01	8500	900	0.01	6800	720	0.007
	0.9°	20	14000	2600	0.06	13000	2100	0.05	10000	1600	0.04	8000	1300	0.03
		25	14000	2200	0.05	13000	1800	0.04	10000	1400	0.03	8000	1100	0.025
		30	13000	1900	0.04	12000	1600	0.04	9000	1200	0.03	7200	960	0.02
		35	13000	1800	0.04	12000	1400	0.03	9000	1100	0.025	7200	880	0.02
		40	12000	1600	0.03	11000	1300	0.025	8500	1000	0.02	6800	800	0.015
		50	11000	1400	0.015	10000	1200	0.01	8000	900	0.01	6400	720	0.007
		60	9800	1100	0.007	9100	910	0.006	7000	700	0.005	5600	560	0.003
		70	8400	960	0.004	7800	780	0.004	6000	600	0.003	4800	480	0.002
	1.5°	25	14000	2400	0.05	13000	2000	0.04	10000	1500	0.03	8000	1200	0.025
		30	12600	2100	0.04	12000	1700	0.04	9000	1300	0.03	7200	1000	0.02
		35	13000	1900	0.04	12000	1600	0.03	9000	1200	0.025	7200	960	0.02
		40	12000	1800	0.03	11000	1400	0.025	8500	1100	0.02	6800	880	0.015
R1.25	0.9°	20	13000	2900	0.06	12000	2300	0.05	9000	1800	0.04	7200	1400	0.03
		30	12000	2600	0.05	11000	2100	0.04	8500	1600	0.03	6800	1300	0.025
		40	11000	2200	0.04	9800	1800	0.04	7500	1400	0.03	6000	1100	0.02
	1.5°	20	13000	3000	0.06	12000	2500	0.05	9000	1900	0.04	7200	1500	0.03
		30	12000	2700	0.05	11050	2200	0.04	8500	1700	0.03	6800	1400	0.025
		40	11000	2400	0.04	9800	2000	0.04	7500	1500	0.03	6000	1200	0.02
R1.5	0.4°	20	12000	3700	0.13	11000	3000	0.1	8500	2300	0.09	6800	1800	0.06
		30	11000	2900	0.07	10000	2300	0.06	8000	1800	0.05	6400	1400	0.03
		40	11000	2400	0.06	10000	2000	0.05	8000	1500	0.04	6400	1200	0.03
		50	11000	2000	0.04	9800	1600	0.04	7500	1200	0.03	6000	960	0.02
	0.9°	20	12000	3800	0.13	11000	3100	0.1	8500	2400	0.09	6800	1900	0.06
		30	11000	3000	0.07	10000	2500	0.06	8000	1900	0.05	6400	1500	0.03
		40	11000	2600	0.06	10000	2100	0.05	8000	1600	0.04	6400	1300	0.03
		50	11000	2100	0.04	9800	1700	0.04	7500	1300	0.03	6000	1000	0.02
		60	9800	2000	0.03	9100	1600	0.025	7000	1200	0.02	5600	960	0.015
		70	9800	1800	0.015	9100	1400	0.01	7000	1100	0.01	5600	880	0.007
	1.5°	50	11000	2200	0.04	9800	1800	0.04	7500	1400	0.03	6000	1100	0.02
		60	9800	2100	0.03	9100	1700	0.025	7000	1300	0.02	5600	1000	0.015
		70	9800	2000	0.015	9100	1600	0.01	7000	1200	0.01	5600	960	0.007
R2	0.9°	30	10000	3200	0.3	9400	2600	0.25	7200	2000	0.2	5800	1600	0.15
		40	9500	2400	0.15	8800	2000	0.12	6800	1500	0.1	5400	1200	0.07
		50	9500	2100	0.1	8800	1700	0.1	6800	1300	0.08	5400	1000	0.06
		60	9000	1900	0.07	8300	1600	0.06	6400	1200	0.05	5100	960	0.03
R2.5	0.9°	35	8000	3500	0.3	7400	2900	0.25	5700	2200	0.2	4600	1800	0.15
		40	8000	3200	0.2	7400	2600	0.18	5700	2000	0.15	4600	1600	0.1
		60	7600	2400	0.15	7000	2000	0.12	5400	1500	0.1	4300	1200	0.07

Depth of cut



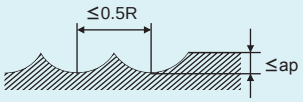
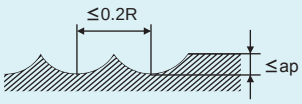
R:Radius

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

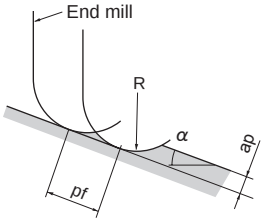
VF-4SVB

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

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21						Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V						Heat resistant alloys Inconel718					
R (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick feed pf (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R 1	40000	8000	32000	3800	0.17	≤0.5	36000	6500	24000	2900	0.17	≤0.5	9600	960	6400	510	0.08	≤0.2
R 1.5	32000	7700	21000	3200	0.25	≤0.75	24000	4800	16000	1900	0.25	≤0.75	6400	640	4200	340	0.13	≤0.3
R 2	24000	5800	16000	2800	0.33	≤1	18000	4000	12000	1700	0.33	≤1	4800	580	3200	260	0.17	≤0.4
R 2.5	19000	5300	12700	2600	0.42	≤1.25	14400	3500	9600	1500	0.42	≤1.25	3800	530	2500	250	0.21	≤0.5
R 3	16000	4800	10600	2100	0.5	≤1.5	12000	3200	8000	1400	0.5	≤1.5	3200	500	2100	210	0.25	≤0.6
R 4	12000	4300	8000	1900	0.8	≤2	9000	3200	6000	1400	0.8	≤2	2400	430	1600	190	0.4	≤0.8
R 5	9600	4100	6400	1800	1	≤2.5	7200	3000	4800	1300	1	≤2.5	2000	420	1300	180	0.5	≤1
R 6	8000	4000	5300	1800	1.2	≤3	6000	3000	4000	1300	1.2	≤3	1700	350	1100	150	0.6	≤1.2
R 8	6000	3200	4000	1400	1.6	≤4	4500	2500	3000	1100	1.6	≤4	1200	300	800	130	0.8	≤1.6
R10	4800	3000	3200	1300	2	≤5	3600	2300	2400	1000	2	≤5	1000	250	640	100	1	≤2
Depth of cut																		

R:Radius

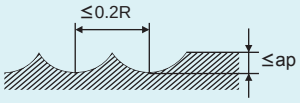
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.
4) α is the inclination angle of the machined surface.



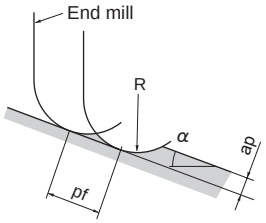
VF-4SVB ➤ J178

VF-4MB

Ball nose, Medium cut length, 4 flute

Work material	Hardened steel (45－55HRC) AISI H13					Hardened steel (55－62HRC) AISI D2					Hardened steel (62－70HRC) AISI W1, AISI M2				
R (mm)	α≤15°		α>15°		Depth of cut ap(mm)	α≤15°		α>15°		Depth of cut ap(mm)	α≤15°		α>15°		Depth of cut ap(mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	
R0.5	40000	8000	40000	3800	0.06	40000	5600	40000	3100	0.05	40000	4700	32000	1700	0.03
R1	40000	9600	40000	5600	0.11	40000	8000	28000	3100	0.10	24000	5000	16000	1200	0.06
R1.5	40000	12000	32000	5600	0.13	32000	7700	19000	2900	0.12	16000	4200	11000	1100	0.07
R2	32000	11000	24000	4700	0.15	24000	6200	14000	2500	0.13	12000	3100	8000	1000	0.08
R2.5	25000	9000	19000	3800	0.20	19000	5300	12000	2200	0.15	9600	2700	6000	780	0.08
R3	21000	8400	15000	3400	0.25	16000	4800	9600	2000	0.20	8000	2300	5000	780	0.09
R4	16000	6400	12000	2600	0.30	12000	3600	7200	1600	0.20	6000	1900	4000	620	0.09
R5	13000	5200	9600	2200	0.50	10000	3200	5800	1300	0.20	4800	1500	3000	550	0.10
R6	9000	3600	7200	1700	0.50	7000	2200	4300	940	0.30	3600	1100	2200	400	0.10
Depth of cut	 R:Radius														

1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

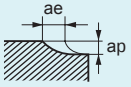


RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-HVRB

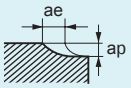
4 flute, Corner radius, Short cut length,Irregular helix flutes

High speed milling

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			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	0.2	4	40000	7200	0.04	0.45	33000	5100	0.03	0.45	27000	4100	0.025	0.45	20000	1800	0.013	0.45
1	0.2	6	40000	6500	0.03	0.45	33000	4600	0.022	0.45	27000	3700	0.018	0.45	20000	1600	0.01	0.45
1	0.2	8	32000	4500	0.022	0.45	27000	3200	0.018	0.45	21000	2600	0.012	0.45	16000	1100	0.008	0.45
1	0.2	10	24000	2700	0.015	0.45	20000	1900	0.01	0.45	16000	1500	0.008	0.45	12000	700	0.006	0.45
1	0.2	15	16000	1200	0.008	0.45	14000	700	0.005	0.45	12000	500	0.003	0.45	10000	400	0.003	0.45
1	0.2	20	14000	1000	0.005	0.45	12000	600	0.004	0.45	10000	400	0.002	0.45	9000	300	0.002	0.45
1.5	0.3	4	32000	10000	0.1	0.65	27000	7100	0.08	0.65	21000	5700	0.06	0.65	16000	2500	0.03	0.65
1.5	0.3	6	32000	7800	0.08	0.65	27000	5500	0.06	0.65	21000	4200	0.05	0.65	16000	2000	0.025	0.65
1.5	0.3	10	27000	5700	0.05	0.65	22000	4000	0.035	0.65	18000	3000	0.03	0.65	14000	1400	0.014	0.65
1.5	0.3	15	22000	3200	0.03	0.65	18000	2300	0.025	0.65	15000	1700	0.018	0.65	11000	1000	0.009	0.65
1.5	0.3	20	16000	1400	0.02	0.65	14000	1200	0.016	0.65	13000	1000	0.012	0.65	9000	700	0.007	0.65
1.5	0.3	25	13000	1000	0.015	0.65	11000	800	0.012	0.65	10000	700	0.009	0.65	7500	500	0.005	0.65
1.5	0.3	30	13000	900	0.01	0.65	11000	700	0.008	0.65	10000	600	0.006	0.65	7500	400	0.004	0.65
2	0.5	6	24000	10000	0.1	0.75	20000	7100	0.08	0.75	16000	5700	0.06	0.75	12000	2500	0.03	0.75
2	0.5	10	24000	10000	0.08	0.75	20000	7100	0.06	0.75	16000	5700	0.05	0.75	12000	2500	0.025	0.75
2	0.5	15	20000	7000	0.05	0.75	17000	5000	0.04	0.75	13000	3200	0.03	0.75	10000	1800	0.016	0.75
2	0.5	20	20000	3600	0.04	0.75	17000	2600	0.03	0.75	13000	1800	0.025	0.75	10000	900	0.012	0.75
2	0.5	25	16000	1800	0.03	0.75	14000	1400	0.025	0.75	12000	1100	0.02	0.75	9000	720	0.01	0.75
2	0.5	30	16000	1400	0.025	0.75	14000	1200	0.02	0.75	12000	900	0.016	0.75	9000	650	0.008	0.75
2	0.5	35	13000	1100	0.02	0.75	11000	800	0.018	0.75	10000	700	0.014	0.75	7000	500	0.007	0.75
2	0.5	40	13000	1000	0.02	0.75	11000	700	0.015	0.75	10000	600	0.012	0.75	7000	400	0.006	0.75
3	0.5	10	16000	11000	0.12	1.5	13000	7800	0.09	1.5	11000	6300	0.07	1.5	8000	2800	0.04	1.5
3	0.5	15	16000	9000	0.11	1.5	13000	6400	0.08	1.5	11000	5100	0.06	1.5	8000	2300	0.04	1.5
3	0.5	20	13000	7200	0.09	1.5	11000	5100	0.07	1.5	8700	4000	0.05	1.5	6500	1800	0.03	1.5
3	0.5	30	13000	5700	0.06	1.5	11000	4000	0.05	1.5	8700	3000	0.04	1.5	6500	1400	0.02	1.5
3	0.8	10	16000	11000	0.24	1	13000	7800	0.19	1	11000	6300	0.14	1	8000	2800	0.07	1
3	0.8	15	16000	9000	0.22	1	13000	6400	0.17	1	11000	5100	0.13	1	8000	2300	0.07	1
3	0.8	20	13000	7200	0.19	1	11000	5100	0.15	1	8700	4000	0.11	1	6500	1800	0.06	1
3	0.8	30	13000	5700	0.12	1	11000	4000	0.09	1	8700	3000	0.07	1	6500	1400	0.04	1
3	0.8	40	11000	3600	0.08	1	9100	2600	0.06	1	7400	2000	0.05	1	5500	1000	0.025	1
3	0.8	50	8000	2600	0.07	1	6600	1800	0.05	1	5800	1500	0.04	1	4600	800	0.02	1
4	0.5	12	8400	6000	0.15	2	7000	4300	0.12	2	5600	3400	0.09	2	4200	1500	0.05	2
4	0.5	20	8400	6000	0.14	2	7000	4300	0.11	2	5600	3400	0.08	2	4200	1500	0.04	2
4	0.5	30	6900	4900	0.12	2	5700	3500	0.09	2	4600	2800	0.07	2	3500	1200	0.03	2
4	0.5	48	5600	2000	0.07	2	4600	1400	0.05	2	3800	1100	0.04	2	2800	500	0.02	2
4	1	12	12000	12000	0.3	1.5	10000	8500	0.23	1.5	8000	6800	0.18	1.5	6000	3000	0.1	1.5
4	1	20	12000	12000	0.27	1.5	10000	8500	0.21	1.5	8000	6800	0.16	1.5	6000	3000	0.08	1.5
4	1	30	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
6	0.5	18	4000	3900	0.15	3.5	3300	2800	0.12	3.5	2700	2200	0.09	3.5	2000	1000	0.05	3.5
6	0.5	30	4000	3900	0.14	3.5	3300	2800	0.11	3.5	2700	2200	0.08	3.5	2000	1000	0.04	3.5
6	1	18	8000	13000	0.5	3	6600	9200	0.4	3	5400	7400	0.3	3	4000	3300	0.15	3
6	1	30	8000	13000	0.45	3	6600	9200	0.35	3	5400	7400	0.27	3	4000	3300	0.14	3
6	1	54	6600	11000	0.25	3	5500	7800	0.2	3	4400	6300	0.15	3	3300	2800	0.08	3
6	1.5	18	8000	13000	0.5	2	6600	9200	0.4	2	5400	7400	0.3	2	4000	3300	0.15	2
6	1.5	30	8000	13000	0.45	2	6600	9200	0.35	2	5400	7400	0.27	2	4000	3300	0.14	2
6	1.5	42	6600	11000	0.4	2	5500	7800	0.3	2	4400	6300	0.24	2	3300	2800	0.12	2
6	1.5	54	6600	11000	0.25	2	5500	7800	0.2	2	4400	6300	0.15	2	3300	2800	0.08	2
6	2	18	8000	13000	0.5	1.5	6600	9200	0.4	1.5	5400	7400	0.3	1.5	4000	3300	0.15	1.5
6	2	30	8000	13000	0.45	1.5	6600	9200	0.35	1.5	5400	7400	0.27	1.5	4000	3300	0.14	1.5
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 moulds, 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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-HVRB ➤ J199

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			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
7	1.5	—	6800	13000	0.5	3	5600	9200	0.4	3	4600	7400	0.3	3	3400	3300	0.15	3
8	0.5	24	3000	3900	0.18	5	2500	2800	0.14	5	2000	2200	0.11	5	1500	1000	0.05	5
8	0.5	40	3000	3900	0.16	5	2500	2800	0.12	5	2000	2200	0.1	5	1500	1000	0.05	5
8	1	24	4200	6500	0.3	4.5	3500	4600	0.23	4.5	2800	3700	0.18	4.5	2100	1600	0.09	4.5
8	1	40	4200	6500	0.27	4.5	3500	4600	0.21	4.5	2800	3700	0.16	4.5	2100	1600	0.08	4.5
8	2	24	6000	13000	0.6	3	5000	9200	0.46	3	4000	7400	0.36	3	3000	3300	0.18	3
8	2	40	6000	13000	0.54	3	5000	9200	0.42	3	4000	7400	0.32	3	3000	3300	0.16	3
8	2	56	5000	11000	0.48	3	4200	7800	0.37	3	3400	6300	0.3	3	2500	2800	0.14	3
8	2	72	5000	11000	0.3	3	4200	7800	0.23	3	3400	6300	0.2	3	2500	2800	0.09	3
9	2	—	5300	13000	0.6	3.5	4400	9200	0.46	3.5	3600	7400	0.36	3.5	2700	3300	0.18	3.5
10	0.5	30	2400	3900	0.18	6.5	2000	2800	0.14	6.5	1600	2200	0.11	6.5	1200	1000	0.05	6.5
10	0.5	50	2400	3900	0.16	6.5	2000	2800	0.12	6.5	1600	2200	0.1	6.5	1200	1000	0.05	6.5
10	1	30	3300	6500	0.3	6	2700	4600	0.23	6	2200	3700	0.18	6	1700	1600	0.09	6
10	1	50	3300	6500	0.27	6	2700	4600	0.21	6	2200	3700	0.16	6	1700	1600	0.08	6
10	2	30	4800	13000	0.6	4.5	4000	9200	0.46	4.5	3200	7400	0.36	4.5	2400	3300	0.18	4.5
10	2	50	4800	13000	0.54	4.5	4000	9200	0.42	4.5	3200	7400	0.32	4.5	2400	3300	0.16	4.5
10	2	70	4000	11000	0.48	4.5	3300	7800	0.37	4.5	2700	6300	0.3	4.5	2000	2800	0.14	4.5
10	2	90	4000	11000	0.48	4.5	3300	7800	0.37	4.5	2700	6300	0.3	4.5	2000	2800	0.14	4.5
11	2	—	4300	12000	0.6	5	3600	8500	0.46	5	2900	6800	0.36	5	2200	3000	0.18	5
12	0.5	36	2000	3600	0.27	8	1700	2600	0.21	8	1300	2100	0.14	8	1000	900	0.07	8
12	0.5	60	2000	3600	0.24	8	1700	2600	0.18	8	1300	2100	0.12	8	1000	900	0.06	8
12	1	36	2400	4800	0.36	7.5	2000	3400	0.28	7.5	1600	2700	0.18	7.5	1200	1200	0.09	7.5
12	1	60	2400	4800	0.32	7.5	2000	3400	0.25	7.5	1600	2700	0.16	7.5	1200	1200	0.08	7.5
12	2	36	4000	12000	0.9	6	3300	8500	0.7	6	2700	6800	0.45	6	2000	3000	0.23	6
12	2	60	4000	12000	0.8	6	3300	8500	0.6	6	2700	6800	0.4	6	2000	3000	0.2	6
12	2	84	3300	9900	0.7	6	2700	7000	0.55	6	2200	5600	0.36	6	1700	2500	0.18	6
12	2	108	3300	9900	0.45	6	2700	7000	0.35	6	2200	5600	0.23	6	1700	2500	0.11	6
12	3	36	4000	12000	0.9	4.5	3300	8500	0.7	4.5	2700	6800	0.45	4.5	2000	3000	0.23	4.5
12	3	60	4000	12000	0.8	4.5	3300	8500	0.6	4.5	2700	6800	0.4	4.5	2000	3000	0.2	4.5
13	3	—	3700	12000	0.9	5	3100	8500	0.7	5	2500	6800	0.45	5	1900	3000	0.23	5
16	0.5	42	1500	3000	0.27	11	1200	2100	0.21	11	1000	1700	0.12	11	750	750	0.05	11
16	2	42	2100	5000	0.45	9	1700	3600	0.35	9	1400	2900	0.2	9	1100	1300	0.08	9
16	3	42	3000	10000	0.9	7.5	2500	7100	0.7	7.5	2000	5700	0.4	7.5	1500	2500	0.15	7.5
16	3	80	3000	10000	0.8	7.5	2500	7100	0.6	7.5	2000	5700	0.37	7.5	1500	2500	0.14	7.5
16	3	120	2500	8300	0.7	7.5	2100	5900	0.55	7.5	1700	4700	0.32	7.5	1300	2100	0.12	7.5
Depth of cut																		

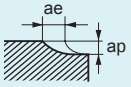
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Air blow or oil mist is recommended for good chip evacuation.
3) For profile machining such as moulds, machining conditions may differ considerably depending on the workpiece geometry, machining methods and depth of cut. Reduce the feed rate especially when machining the corner sections of a workpiece.
4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-HVRB

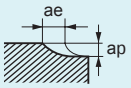
4 flute, Corner radius, Short cut length,Irregular helix flutes

High depth of cut conditions

Work material			Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI 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			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	0.2	4	24000	2200	0.08	0.45	20000	1500	0.07	0.45	16000	1200	0.05	0.45	12000	550	0.025	0.45
1	0.2	6	24000	2000	0.07	0.45	20000	1400	0.05	0.45	16000	1100	0.04	0.45	12000	500	0.02	0.45
1	0.2	8	19000	1400	0.05	0.45	16000	1000	0.04	0.45	13000	800	0.03	0.45	9500	350	0.016	0.45
1	0.2	10	14000	800	0.04	0.45	12000	600	0.03	0.45	9000	400	0.025	0.45	7000	200	0.012	0.45
1	0.2	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1	0.2	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5	0.3	4	19000	3000	0.2	0.65	16000	2100	0.16	0.65	13000	1700	0.12	0.65	9500	750	0.06	0.65
1.5	0.3	6	19000	2300	0.16	0.65	16000	1600	0.13	0.65	13000	1300	0.1	0.65	9500	580	0.05	0.65
1.5	0.3	10	16000	1700	0.1	0.65	13000	1200	0.07	0.65	11000	1000	0.05	0.65	8000	430	0.03	0.65
1.5	0.3	15	13000	1000	0.06	0.65	11000	700	0.05	0.65	9000	600	0.04	0.65	6500	250	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	0.2	0.75	12000	2100	0.16	0.75	9400	1700	0.12	0.75	7000	750	0.06	0.75
2	0.5	10	14000	3000	0.16	0.75	12000	2100	0.13	0.75	9400	1700	0.1	0.75	7000	750	0.05	0.75
2	0.5	15	12000	2100	0.1	0.75	10000	1500	0.08	0.75	8000	1200	0.06	0.75	6000	530	0.03	0.75
2	0.5	20	12000	1100	0.08	0.75	10000	800	0.06	0.75	8000	600	0.05	0.75	6000	280	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	0.24	1.5	8000	2300	0.2	1.5	6400	1800	0.14	1.5	4800	830	0.07	1.5
3	0.5	15	9600	2700	0.22	1.5	8000	1900	0.17	1.5	6400	1500	0.13	1.5	4800	680	0.06	1.5
3	0.5	20	7800	2200	0.18	1.5	6500	1500	0.14	1.5	5200	1200	0.11	1.5	3900	550	0.05	1.5
3	0.5	30	7800	1700	0.12	1.5	6500	1200	0.1	1.5	5200	1000	0.07	1.5	3900	430	0.04	1.5
3	0.8	10	9600	3300	0.5	1	8000	2300	0.4	1	6400	1800	0.3	1	4800	830	0.14	1
3	0.8	15	9600	2700	0.5	1	8000	1900	0.35	1	6400	1500	0.25	1	4800	680	0.13	1
3	0.8	20	7800	2200	0.4	1	6500	1500	0.3	1	5200	1200	0.23	1	3900	550	0.11	1
3	0.8	30	7800	1700	0.24	1	6500	1200	0.2	1	5200	1000	0.14	1	3900	430	0.05	1
3	0.8	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.8	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	0.5	12	5000	1800	0.3	2	4200	1300	0.24	2	3400	1000	0.18	2	2500	450	0.06	2
4	0.5	20	5000	1800	0.3	2	4200	1300	0.22	2	3400	1000	0.17	2	2500	450	0.06	2
4	0.5	30	4100	1500	0.24	2	3400	1100	0.19	2	2700	840	0.14	2	2100	380	0.05	2
4	0.5	48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	1	12	7200	3600	0.6	1.5	6000	2500	0.5	1.5	4800	2000	0.36	1.5	3600	900	0.12	1.5
4	1	20	7200	3600	0.6	1.5	6000	2500	0.4	1.5	4800	2000	0.32	1.5	3600	900	0.11	1.5
4	1	30	6000	3000	0.5	1.5	5000	2100	0.4	1.5	4000	1700	0.3	1.5	3000	750	0.1	1.5
6	0.5	18	2400	1200	0.3	3.5	2000	840	0.24	3.5	1600	670	0.18	3.5	1200	300	0.06	3.5
6	0.5	30	2400	1200	0.3	3.5	2000	840	0.22	3.5	1600	670	0.17	3.5	1200	300	0.06	3.5
6	1	18	4800	3900	1	3	4000	2700	0.8	3	3200	2200	0.6	3	2400	980	0.2	3
6	1	30	4800	3900	0.9	3	4000	2700	0.7	3	3200	2200	0.5	3	2400	980	0.18	3
6	1	54	4000	3300	0.5	3	3300	2300	0.4	3	2700	1800	0.3	3	2000	830	0.1	3
6	1.5	18	4800	3900	1	2	4000	2700	0.8	2	3200	2200	0.6	2	2400	980	0.2	2
6	1.5	30	4800	3900	0.9	2	4000	2700	0.7	2	3200	2200	0.5	2	2400	980	0.18	2
6	1.5	42	4000	3300	0.8	2	3300	2300	0.6	2	2700	1800	0.5	2	2000	830	0.16	2
6	1.5	54	4000	3300	0.5	2	3300	2300	0.4	2	2700	1800	0.3	2	2000	830	0.1	2
6	2	18	4800	3900	1	1.5	4000	2700	0.8	1.5	3200	2200	0.6	1.5	2400	980	0.2	1.5
6	2	30	4800	3900	0.9	1.5	4000	2700	0.7	1.5	3200	2200	0.5	1.5	2400	980	0.18	1.5
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 moulds, 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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-HVRB ➤ J199

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			
Dia. (mm)	Corner R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
7	1.5	—	4100	3900	1	3	3400	2700	0.8	3	2700	2200	0.6	3	2100	980	0.2	3
8	0.5	24	1800	1200	0.35	5	1500	840	0.3	5	1200	670	0.2	5	900	300	0.07	5
8	0.5	40	1800	1200	0.3	5	1500	840	0.25	5	1200	670	0.2	5	900	300	0.06	5
8	1	24	2500	2000	0.6	4.5	2100	1400	0.5	4.5	1700	1100	0.4	4.5	1300	500	0.12	4.5
8	1	40	2500	2000	0.5	4.5	2100	1400	0.4	4.5	1700	1100	0.3	4.5	1300	500	0.11	4.5
8	2	24	3600	3900	1.2	3	3000	2700	1	3	2400	2200	0.7	3	1800	980	0.24	3
8	2	40	3600	3900	1.1	3	3000	2700	0.9	3	2400	2200	0.7	3	1800	980	0.22	3
8	2	56	3000	3300	1	3	2500	2300	0.8	3	2000	1800	0.6	3	1500	830	0.2	3
8	2	72	3000	3300	0.6	3	2500	2300	0.5	3	2000	1800	0.4	3	1500	830	0.12	3
9	2	—	3200	3900	1.2	3.5	2700	2700	1	3.5	2100	2200	0.7	3.5	1600	980	0.24	3.5
10	0.5	30	1400	1200	0.35	6.5	1200	840	0.3	6.5	940	670	0.2	6.5	700	300	0.07	6.5
10	0.5	50	1400	1200	0.3	6.5	1200	840	0.25	6.5	940	670	0.2	6.5	700	300	0.06	6.5
10	1	30	2000	2000	0.6	6	1700	1400	0.5	6	1300	1100	0.4	6	1000	500	0.12	6
10	1	50	2000	2000	0.5	6	1700	1400	0.4	6	1300	1100	0.3	6	1000	500	0.11	6
10	2	30	2900	3900	1.2	4.5	2400	2700	1	4.5	1900	2200	0.7	4.5	1500	980	0.24	4.5
10	2	50	2900	3900	1.1	4.5	2400	2700	0.9	4.5	1900	2200	0.7	4.5	1500	980	0.22	4.5
10	2	70	2400	3300	1	4.5	2000	2300	0.8	4.5	1600	1800	0.6	4.5	1200	830	0.2	4.5
10	2	90	2400	3300	1	4.5	2000	2300	0.8	4.5	1600	1800	0.6	4.5	1200	830	0.2	4.5
11	2	—	2600	3600	1.2	5	2200	2500	1	5	1700	2000	0.7	5	1300	900	0.24	5
12	0.5	36	1200	1100	0.5	8	1000	770	0.4	8	800	620	0.3	8	600	280	0.11	8
12	0.5	60	1200	1100	0.5	8	1000	770	0.4	8	800	620	0.3	8	600	280	0.1	8
12	1	36	1400	1400	0.7	7.5	1200	1000	0.6	7.5	940	780	0.4	7.5	700	350	0.14	7.5
12	1	60	1400	1400	0.6	7.5	1200	1000	0.5	7.5	940	780	0.4	7.5	700	350	0.13	7.5
12	2	36	2400	3600	1.8	6	2000	2500	1.4	6	1600	2000	1.1	6	1200	900	0.4	6
12	2	60	2400	3600	1.6	6	2000	2500	1.3	6	1600	2000	1	6	1200	900	0.3	6
12	2	84	2000	3000	1.4	6	1700	2100	1.1	6	1300	1700	0.8	6	1000	750	0.3	6
12	2	108	2000	3000	0.9	6	1700	2100	0.7	6	1300	1700	0.5	6	1000	750	0.2	6
12	3	36	2400	3600	1.8	4.5	2000	2500	1.4	4.5	1600	2000	1.1	4.5	1200	900	0.4	4.5
12	3	60	2400	3600	1.6	4.5	2000	2500	1.3	4.5	1600	2000	1	4.5	1200	900	0.3	4.5
13	3	—	2200	3600	1.8	5	1800	2500	1.4	5	1500	2000	1.1	5	1100	900	0.4	5
16	0.5	42	900	900	0.5	11	750	630	0.4	11	600	500	0.3	11	450	230	0.1	11
16	2	42	1300	1500	0.9	9	1100	1100	0.7	9	870	840	0.5	9	650	380	0.2	9
16	3	42	1800	3000	1.8	7.5	1500	2100	1.4	7.5	1200	1700	0.9	7.5	900	750	0.4	7.5
16	3	80	1800	3000	1.6	7.5	1500	2100	1.3	7.5	1200	1700	0.8	7.5	900	750	0.3	7.5
16	3	120	1500	2500	1.4	7.5	1200	1800	1.1	7.5	1000	1400	0.7	7.5	750	630	0.3	7.5
Depth of cut																		

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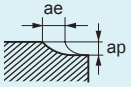
RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-HVRB (Taper neck type)

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 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			
Dia. (mm)	Corner R (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	0.2	0.9°	6	40000	6500	0.03	0.45	33000	4600	0.022	0.45	27000	3700	0.018	0.45	20000	1600	0.01	0.45
1	0.2	0.9°	10	24000	2700	0.015	0.45	20000	1900	0.01	0.45	16000	1500	0.008	0.45	12000	700	0.006	0.45
1	0.2	0.9°	15	16000	1200	0.013	0.45	14000	700	0.008	0.45	12000	500	0.007	0.45	10000	400	0.003	0.45
1	0.2	0.9°	20	14000	1000	0.01	0.45	12000	600	0.006	0.45	10000	400	0.005	0.45	9000	300	0.002	0.45
1	0.2	0.9°	25	9500	610	0.008	0.45	8000	440	0.005	0.45	6000	320	0.004	0.45	4800	160	0.002	0.45
1	0.2	0.9°	30	4900	320	0.007	0.45	4100	220	0.004	0.45	3000	160	0.003	0.45	2500	80	0.002	0.45
1	0.2	0.9°	35	4000	260	0.006	0.45	3400	190	0.003	0.45	3000	160	0.003	0.45	2000	70	0.001	0.45
1	0.2	0.9°	40	3500	180	0.005	0.45	2900	130	0.003	0.45	2000	90	0.003	0.45	1700	50	0.001	0.45
1	0.2	0.9°	45	2900	150	0.004	0.45	2400	100	0.002	0.45	2000	90	0.002	0.45	1400	40	0.001	0.45
1	0.2	0.9°	50	2900	110	0.003	0.45	2400	80	0.002	0.45	2000	60	0.002	0.45	1400	30	0.001	0.45
1.5	0.3	0.9°	10	27000	5700	0.05	0.65	22000	4000	0.035	0.65	18000	3000	0.03	0.65	14000	1400	0.014	0.65
1.5	0.3	0.9°	15	22000	3200	0.03	0.65	18000	2300	0.025	0.65	15000	1700	0.018	0.65	11000	1000	0.009	0.65
1.5	0.3	0.9°	20	16000	1400	0.02	0.65	14000	1200	0.016	0.65	13000	1000	0.012	0.65	9000	700	0.007	0.65
1.5	0.3	0.9°	30	13000	900	0.01	0.65	11000	700	0.008	0.65	10000	600	0.006	0.65	7500	400	0.004	0.65
1.5	0.3	0.9°	40	4500	230	0.008	0.65	3700	160	0.007	0.65	3000	120	0.005	0.65	2300	70	0.003	0.65
1.5	0.3	0.9°	50	3700	190	0.007	0.65	3000	130	0.006	0.65	3000	120	0.004	0.65	1900	60	0.002	0.65
2	0.5	0.4°	15	20000	7000	0.05	0.75	17000	5000	0.04	0.75	13000	3200	0.03	0.75	10000	1800	0.016	0.75
2	0.5	0.4°	20	20000	3600	0.04	0.75	17000	2600	0.03	0.75	13000	1800	0.025	0.75	10000	900	0.012	0.75
2	0.5	0.4°	25	16000	1800	0.03	0.75	14000	1400	0.025	0.75	12000	1100	0.02	0.75	9000	720	0.01	0.75
2	0.5	0.4°	30	16000	1400	0.025	0.75	14000	1200	0.02	0.75	12000	900	0.016	0.75	9000	650	0.008	0.75
2	0.5	0.4°	35	13000	1100	0.02	0.75	11000	800	0.018	0.75	10000	700	0.014	0.75	7000	500	0.007	0.75
2	0.5	0.4°	40	13000	1000	0.02	0.75	11000	700	0.015	0.75	10000	600	0.012	0.75	7000	400	0.006	0.75
2	0.5	0.9°	20	20000	3600	0.04	0.75	17000	2600	0.03	0.75	13000	1800	0.025	0.75	10000	900	0.012	0.75
2	0.5	0.9°	25	16000	1800	0.03	0.75	14000	1400	0.025	0.75	12000	1100	0.02	0.75	9000	720	0.01	0.75
2	0.5	0.9°	30	16000	1400	0.025	0.75	14000	1200	0.02	0.75	12000	900	0.016	0.75	9000	650	0.008	0.75
2	0.5	0.9°	35	13000	1100	0.02	0.75	11000	800	0.018	0.75	10000	700	0.014	0.75	7000	500	0.007	0.75
2	0.5	0.9°	40	13000	1000	0.02	0.75	11000	700	0.015	0.75	10000	600	0.012	0.75	7000	400	0.006	0.75
2	0.5	0.9°	45	8000	500	0.016	0.75	6800	360	0.012	0.75	5200	250	0.01	0.75	4000	120	0.005	0.75
2	0.5	0.9°	50	8000	500	0.016	0.75	6800	360	0.012	0.75	5200	250	0.01	0.75	4000	120	0.005	0.75
2	0.5	0.9°	55	4100	230	0.012	0.75	3500	170	0.009	0.75	2700	120	0.008	0.75	2000	60	0.004	0.75
2	0.5	0.9°	60	4100	230	0.012	0.75	3500	170	0.009	0.75	2700	120	0.008	0.75	2000	60	0.004	0.75
3	0.8	0.9°	20	13000	7200	0.19	1	11000	5100	0.15	1	8700	4000	0.11	1	6500	1800	0.06	1
3	0.8	0.9°	25	13000	7200	0.19	1	11000	5100	0.15	1	8700	4000	0.11	1	6500	1800	0.06	1
3	0.8	0.9°	30	13000	5700	0.12	1	11000	4000	0.09	1	8700	3000	0.07	1	6500	1400	0.04	1
3	0.8	0.9°	40	11000	3600	0.08	1	9100	2600	0.06	1	7400	2000	0.05	1	5500	1000	0.025	1
3	0.8	0.9°	50	8000	2600	0.07	1	6600	1800	0.05	1	5800	1500	0.04	1	4600	800	0.02	1
3	0.8	0.9°	60	7800	2480	0.06	1	6600	1740	0.05	1	5000	1250	0.04	1	3900	610	0.02	1
Depth of cut																			

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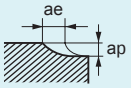
Work material				Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20				Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Hardened steel (45−55HRC) AISI H13				Hardened steel (55−62HRC) AISI D2			
Dia. (mm)	Corner R (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
4	1	0.4°	25	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
4	1	0.4°	30	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
4	1	0.4°	35	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.4°	40	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.4°	45	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.4°	50	8100	6300	0.14	1.5	6700	4420	0.11	1.5	5400	3500	0.08	1.5	4000	1600	0.04	1.5
4	1	0.9°	25	10000	9900	0.24	1.5	8300	7000	0.19	1.5	6700	5600	0.14	1.5	5000	2500	0.07	1.5
4	1	0.9°	30	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.9°	40	10000	9900	0.15	1.5	8300	7000	0.12	1.5	6700	5600	0.09	1.5	5000	2500	0.04	1.5
4	1	0.9°	50	8100	6300	0.14	1.5	6700	4420	0.11	1.5	5400	3500	0.08	1.5	4000	1600	0.04	1.5
4	1	0.9°	60	8100	6300	0.11	1.5	6700	4420	0.08	1.5	5400	3500	0.06	1.5	4000	1600	0.03	1.5
6	1.5	0.9°	40	6600	11000	0.4	2	5500	7600	0.32	2	4500	6100	0.24	2	3300	2700	0.12	2
6	1.5	0.9°	50	6600	11000	0.4	2	5500	7600	0.32	2	4500	6100	0.24	2	3300	2700	0.12	2
6	1.5	0.9°	60	6600	11000	0.25	2	5500	7600	0.2	2	4500	6100	0.15	2	3300	2700	0.08	2
6	1.5	0.9°	70	5400	8700	0.23	2	4400	6200	0.18	2	3600	5000	0.14	2	2700	2200	0.07	2
8	2	0.9°	60	5000	11000	0.48	3	4200	7600	0.37	3	3300	6100	0.29	3	2500	2700	0.14	3
8	2	0.9°	80	5000	11000	0.3	3	4200	7600	0.23	3	3300	6100	0.18	3	2500	2700	0.09	3
10	2	0.9°	80	4000	11000	0.48	4.5	3300	7600	0.37	4.5	2700	6100	0.29	4.5	2000	2700	0.14	4.5
10	2	0.9°	120	3200	8700	0.27	4.5	2700	6200	0.21	4.5	2100	5000	0.16	4.5	1600	2200	0.08	4.5
12	2	0.9°	80	3300	10000	0.72	6	2700	7100	0.56	6	2200	5600	0.36	6	1700	2500	0.18	6
12	2	0.9°	120	3300	10000	0.45	6	2700	7100	0.35	6	2200	5600	0.23	6	1700	2500	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 moulds, 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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-MHV-CH

End mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes

VF-MHVRB-CH

Corner radius end mill, Medium cut length, 4 flute, Irregular helix flutes, with multiple internal through coolant holes

Side milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
16	2000	560	800	110
20	1600	510	600	100
Depth of cut	≤0.1D 0.5D—1.5D		≤0.05D 0.5D—1.5D	

D:Dia.

Slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
16	1400	170
20	1100	130
Depth of cut	D 0.5D—1.5D	

D:Dia.

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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-6MHV-CH

End mill, Medium cut length, 6 flute, Irregular helix flutes with multiple internal through coolant holes

VF-6MHVRB-CH

Corner radius end mill, Medium cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes

Side milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	4800	2000	1300	260
12	4000	2000	1100	230
16	3000	1600	800	180
20	2400	1400	640	150
Depth of cut	≤0.1D 0.5D—1.5D		≤0.05D 0.5D—1.5D	

D:Dia.

Trochoidal slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
10	4800	1400
12	4000	1200
16	3000	1100
20	2400	900
Depth of cut	1.5D≤ ≤0.1D 0.5D—1.5D	

D:Dia.

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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-MHV-CH	➤ J093
VF-MHVRB-CH	➤ J204
VF-6MHV-CH	➤ J111
VF-6MHVRB-CH	➤ J219

VF-8MHV-CH

End mill, Medium cut length, 8 flute, Irregular helix flutes with multiple internal through coolant holes

VF-8MHVRB-CH

Corner radius end mill, Medium cut length, 8 flute, Irregular helix flutes, with multiple internal through coolant holes

Side milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
16	3000	2100	800	240
20	2400	1900	640	200
Depth of cut	≤0.08D 0.5D—1.5D		≤0.05D 0.5D—1.5D	

D:Dia.

Trochoidal slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
16	3000	1400
20	2400	1200
Depth of cut	1.5D≤ ≤0.08D 0.5D—1.5D	

D:Dia.

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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

VF-SFPR-CH

Roughing end mill, Short cut length, 4 flute, with multiple internal through coolant holes

Side milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
16	1200	300	800	110
20	1000	300	600	100
Depth of cut	≤0.5D 0.5D—1.5D		≤0.3D 0.5D—1.0D	

D:Dia.

Slotting

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
16	800	100
20	600	80
Depth of cut	D 0.5D—1.0D	

D:Dia.

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VF-8MHV-CH ➤ J114
VF-8MHVRB-CH ➤ J220
VF-SFPR-CH ➤ J121

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-6SVR-CH

Roughing end mill, Short cut length, 6 flute, Irregular helix flutes, with multiple internal through coolant holes

Side milling

Work material	Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
16	2400	1200	800	160
20	2000	1000	640	140
Depth of cut	≤0.3D 0.5D—1.5D		≤0.2D 0.5D—1.5D	

D : Dia.

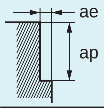
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is poor, vibration or abonrmal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

VF-6SVR-CH ➤ J123

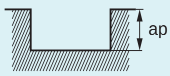
VQ-MHZV

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

Side milling

Work material	Carbon steel, Alloy steel, Mild Steel				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V				Precipitation hardeningstainless steel, Cobalt chromium alloy				Copper, Copper alloys				Heat Resistant Alloy Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
1	32000	720	1.5	0.2	25000	530	1.5	0.2	19000	430	1.5	0.2	16000	340	1.5	0.1	38000	860	1.5	0.2	13000	160	1.5	0.05
1.5	28000	1300	2.25	0.3	21000	630	2.25	0.3	18000	540	2.25	0.3	14000	420	2.25	0.15	32000	1400	2.25	0.3	8500	170	2.25	0.08
2	24000	1800	3	0.6	19000	860	3	0.6	16000	620	3	0.6	12000	540	3	0.4	29000	2200	3	0.6	6400	170	3	0.2
3	16000	1900	4.5	0.9	13000	940	4.5	0.9	11000	660	4.5	0.9	8000	580	4.5	0.6	19000	2300	4.5	0.9	4200	180	4.5	0.3
4	12000	2000	6	1.2	9500	940	6	1.2	8000	670	6	1.2	6000	590	6	0.8	14000	2300	6	1.2	3200	180	6	0.4
5	9500	1900	7.5	1.5	7600	960	7.5	1.5	6400	670	7.5	1.5	4800	600	7.5	1	11000	2100	7.5	1.5	2500	180	7.5	0.5
6	8000	1900	9	1.8	6400	960	9	1.8	5300	830	9	1.8	4000	600	9	1.2	9500	2300	9	1.8	2100	190	9	0.6
8	6000	1900	12	2.4	4800	1000	12	2.4	4000	900	12	2.4	3000	630	12	1.6	7200	2300	12	2.4	1600	190	12	0.8
10	4800	1700	15	3	3800	910	15	3	3200	960	15	3	2400	580	15	2	5700	2100	15	3	1300	220	15	1
12	4000	1400	18	3.6	3200	860	18	3.6	2700	890	18	3.6	2000	540	18	2.4	4800	1700	18	3.6	1100	210	18	1.2
16	3000	1200	24	4.8	2400	720	24	4.8	2000	720	24	4.8	1500	450	24	3.2	3600	1500	24	4.8	800	150	24	1.6
20	2400	970	30	6	1900	570	30	6	1600	580	30	6	1200	360	30	4	2900	1200	30	6	640	120	30	2
Depth of cut																								

Slotting

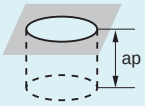
Work material	Carbon steel, Alloy steel, Mild Steel			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			Precipitation hardeningstainless steel, Cobalt chromium alloy			Copper, Copper alloys			Heat Resistant Alloy Inconel718		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
1	32000	380	0.5	25000	150	0.5	19000	100	0.5	14000	80	0.3	38000	460	0.5	9500	60	0.2
1.5	28000	590	0.75	21000	250	0.75	18000	220	0.75	12000	140	0.45	32000	670	0.75	6400	80	0.3
2	24000	940	2	19000	460	2	16000	480	2	9500	230	1	29000	1100	2	4800	100	0.6
3	16000	1100	3	13000	550	3	11000	500	3	6400	270	1.5	19000	1300	3	3200	120	0.9
4	12000	1400	4	9500	680	4	8000	530	4	4800	350	2	14000	1700	4	2400	130	1.2
5	9500	1400	5	7600	680	5	6400	540	5	3800	340	2.5	11000	1700	5	1900	130	1.5
6	8000	1400	6	6400	770	6	5300	560	6	3200	380	3	9500	1700	6	1600	130	1.8
8	6000	1300	8	4800	720	8	4000	600	8	2400	360	4	7200	1500	8	1200	140	2.4
10	4800	1200	10	3800	630	10	3200	670	10	1900	310	5	5700	1400	10	950	160	3
12	4000	960	12	3200	580	12	2700	650	12	1600	290	6	4800	1200	12	800	150	3.6
16	3000	810	12	2400	500	12	2000	480	12	1200	250	8	3600	970	12	600	120	4.8
20	2400	650	12	1900	400	12	1600	380	12	950	200	10	2900	780	12	480	90	6
Depth of cut																		

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) When the depth of cut is small, the revolution and feed rate can be increased in side milling. In slotting, the feed rate can be increased.
3) 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 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.

VQ-MHZV

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

Plunging

Work material	Carbon steel, Alloy steel, Mild Steel				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V				Precipitation hardeningstainless steel, Cobalt chromium alloy				Copper, Copper alloys			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)
1	20000	160	0.5	0.1	16000	100	0.5	0.1	16000	50	0.5	0.05	9500	30	0.5	0.05	24000	190	0.5	0.1
1.5	18000	270	0.75	0.3	13000	120	0.75	0.3	13000	80	0.75	0.1	7400	40	0.75	0.1	21000	320	0.75	0.3
2	16000	480	2	0.5	11000	200	2	0.4	9500	90	1	0.1	6400	60	1	0.1	19000	570	2	0.5
3	11000	660	3	1	7400	270	3	0.6	6400	100	1.5	0.2	4200	60	1.5	0.2	13000	780	3	0.99
4	8000	800	4	2	5600	340	4	0.8	4800	100	2	0.4	3200	60	2	0.4	9500	950	4	2
5	6400	960	5	2.5	4500	410	5	1	3800	100	2.5	0.5	2500	60	2.5	0.5	7600	1100	5	2.5
6	5300	950	6	3	3700	440	6	1.2	3200	100	3	0.6	2100	60	3	0.6	6400	1200	6	3
8	4000	720	8	4	2800	340	8	1.6	2400	70	4	0.6	1600	50	4	0.6	4800	860	8	4
10	3200	580	10	5	2200	260	10	2.5	1900	60	5	0.6	1300	40	5	0.6	3800	680	10	5
12	2700	490	12	5	1900	230	12	3	1600	50	6	0.6	1100	30	6	0.6	3200	580	12	5
16	2000	360	16	5	1400	170	16	4	1200	40	8	0.6	800	20	8	0.6	2400	430	16	5
20	1600	290	20	5	1100	130	20	5	950	30	10	0.6	640	20	10	0.6	1900	340	20	5
Depth of cut																				

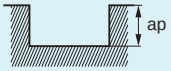
1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation 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.

VQ-MHZV ➤ J072

VQ-MHZV-OH

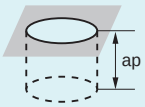
End mill, Medium cutting length, 3 flute for drilling and slotting with internal through coolant holes

Slotting

Work material	Carbon steel, Alloy steel, Mild Steel			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			Precipitation hardeningstainless steel, Cobalt chromium alloy			Copper, Copper alloys			Heat Resistant Alloy Inconel718		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
6	8000	1400	6	6400	770	6	5300	560	6	3200	380	3	9500	1700	6	1600	130	1.8
8	6000	1300	8	4800	720	8	4000	600	8	2400	360	4	7200	1500	8	1200	140	2.4
10	4800	1200	10	3800	630	10	3200	670	10	1900	310	5	5700	1400	10	950	160	3
12	4000	960	12	3200	580	12	2700	650	12	1600	290	6	4800	1200	12	800	150	3.6
16	3000	810	12	2400	500	12	2000	480	12	1200	250	8	3600	970	12	600	120	4.8
Depth of cut																		

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) When the depth of cut is small, the feed rate can be increased.
3) 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 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.

Plunging

Work material	Carbon steel, Alloy steel, Mild Steel				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V				Precipitation hardeningstainless steel, Cobalt chromium alloy				Copper, Copper alloys			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)
6	5300	950	9	3	3700	440	9	1.2	3200	100	6	0.6	2100	60	6	0.6	6400	1200	9	3
8	4000	720	12	4	2800	340	12	1.6	2400	70	8	0.6	1600	50	8	0.6	4800	860	12	4
10	3200	580	15	5	2200	260	15	2.5	1900	60	10	0.6	1300	40	10	0.6	3800	680	15	5
12	2700	490	18	5	1900	230	18	3	1600	50	12	0.6	1100	30	12	0.6	3200	580	18	5
16	2000	360	24	5	1400	170	24	4	1200	40	16	0.6	800	20	16	0.6	2400	430	24	5
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 workpiece 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.

RECOMMENDED CUTTING CONDITIONS FOR SMART MIRACLE END MILLS

VQ-4SVB

Ball nose, Medium cutting length, 4 flute

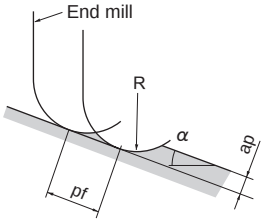
Shoulder milling (Slotting)

Work material	Carbon steel, Alloy steel, Mild Steel, Pre-hardened steel						Austenitic stainless steel, Titanium alloy, Precipitation hardeningstainless steel, Cobalt chromium alloy, Ferritic, Precipitation hardeningstainless steel						Copper, Copper alloys					
R (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R 1	40000	8000	32000	3800	0.17	0.5	36000	6500	24000	2900	0.17	0.5	40000	8000	38000	4500	0.17	0.5
R 1.5	32000	7700	21000	3200	0.25	0.75	24000	4800	16000	1900	0.25	0.75	38000	9100	25000	3800	0.25	0.75
R 2	24000	5800	16000	2800	0.33	1	18000	4000	12000	1700	0.33	1	29000	7000	19000	3300	0.33	1
R 2.5	19000	5300	12700	2600	0.42	1.25	14400	3500	9600	1500	0.42	1.25	23000	6400	15000	3100	0.42	1.25
R 3	16000	4800	10600	2100	0.5	1.5	12000	3200	8000	1400	0.5	1.5	19000	5700	13000	2600	0.5	1.5
R 4	12000	4300	8000	1900	0.8	2	9000	3200	6000	1400	0.8	2	14000	5000	9600	2300	0.8	2
R 5	9600	4100	6400	1800	1	2.5	7200	3000	4800	1300	1	2.5	12000	5100	7700	2200	1	2.5
R 6	8000	4000	5300	1800	1.2	3	6000	3000	4000	1300	1.2	3	9600	4800	6400	2200	1.2	3
Depth of cut	≤pf ≤ap												≤pf ≤ap					

Work material	Heat Resistant Alloy Inconel718					
R (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
R 1	9600	960	6400	510	0.08	0.2
R 1.5	6400	640	4200	340	0.13	0.3
R 2	4800	580	3200	260	0.17	0.4
R 2.5	3800	530	2500	250	0.21	0.5
R 3	3200	500	2100	210	0.25	0.6
R 4	2400	430	1600	190	0.4	0.8
R 5	2000	420	1300	180	0.5	1
R 6	1700	350	1100	150	0.6	1.2
Depth of cut	≤pf ≤ap					

R:Radius

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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.
4) α is the inclination angle of the machined surface.



VQ-4SVB ➤ J180

VQ-MHV

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

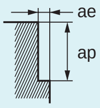
VQ-MHVRB

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

Side milling

Work material	Carbon steel, Alloy steel, Mild Steel				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V				Precipitation hardeningstainless steel, Cobalt chromium alloy				Copper, Copper alloys				Heat Resistant Alloy Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	24000	2400	3	0.6	19000	1100	3	0.6	16000	830	3	0.6	12000	720	3	0.4	29000	2900	3	0.6	6400	230	3	0.2
3	16000	2600	4.5	0.9	13000	1200	4.5	0.9	11000	880	4.5	0.9	8000	770	4.5	0.6	19000	3000	4.5	0.9	4200	240	4.5	0.3
4	12000	2600	6	1.2	9500	1300	6	1.2	8000	900	6	1.2	6000	790	6	0.8	14000	3100	6	1.2	3200	240	6	0.4
5	9500	2500	7.5	1.5	7600	1300	7.5	1.5	6400	900	7.5	1.5	4800	810	7.5	1	11000	2900	7.5	1.5	2500	240	7.5	0.5
6	8000	2600	9	1.8	6400	1300	9	1.8	5300	1100	9	1.8	4000	800	9	1.2	9500	3000	9	1.8	2100	250	9	0.6
8	6000	2500	12	2.4	4800	1300	12	2.4	4000	1200	12	2.4	3000	840	12	1.6	7200	3000	12	2.4	1600	260	12	0.8
10	4800	2300	15	3	3800	1200	15	3	3200	1300	15	3	2400	770	15	2	5700	2700	15	3	1300	290	15	1
12	4000	1900	18	3.6	3200	1200	18	3.6	2700	1200	18	3.6	2000	720	18	2.4	4800	2300	18	3.6	1100	280	18	1.2
16	3000	1600	24	4.8	2400	960	24	4.8	2000	960	24	4.8	1500	600	24	3.2	3600	1900	24	4.8	800	200	24	1.6
20	2400	1300	30	6	1900	760	30	6	1600	770	30	6	1200	480	30	4	2900	1600	30	6	640	160	30	2
25	1900	1100	37.5	7.5	1500	600	37.5	7.5	1300	620	37.5	7.5	950	380	37.5	5	2300	1300	37.5	7.5	510	130	37.5	2.5

Depth of cut

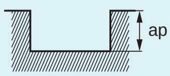


1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

Slotting

Work material	Carbon steel, Alloy steel, Mild Steel			Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel			Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V			Precipitation hardeningstainless steel, Cobalt chromium alloy			Copper, Copper alloys			Heat Resistant Alloy Inconel718		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
2	24000	1200	2	19000	610	2	16000	640	2	9500	300	1	29000	1500	2	4800	130	0.6
3	16000	1500	3	13000	730	3	11000	660	3	6400	360	1.5	19000	1700	3	3200	150	0.9
4	12000	1900	4	9500	910	4	8000	700	4	4800	460	2	14000	2200	4	2400	170	1.2
5	9500	1900	5	7600	910	5	6400	720	5	3800	460	2.5	11000	2200	5	1900	170	1.5
6	8000	1900	6	6400	1000	6	5300	740	6	3200	510	3	9500	2300	6	1600	180	1.8
8	6000	1700	8	4800	960	8	4000	800	8	2400	480	4	7200	2000	8	1200	190	2.4
10	4800	1500	10	3800	840	10	3200	900	10	1900	420	5	5700	1800	10	950	210	3
12	4000	1300	12	3200	770	12	2700	860	12	1600	380	6	4800	1500	12	800	200	3.6
16	3000	1100	12	2400	670	12	2000	640	12	1200	340	8	3600	1300	12	600	150	4.8
20	2400	860	12	1900	530	12	1600	510	12	950	270	10	2900	1000	12	480	120	6
25	1900	760	12	1500	420	12	1300	420	12	760	210	12	2300	920	12	380	100	7.5

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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

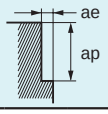
VQ-MHV ➢ J094
VQ-MHVRB ➢ J205

RECOMMENDED CUTTING CONDITIONS FOR SMART MIRACLE END MILLS

VQ-MHVRB-F

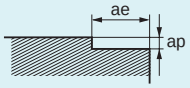
Corner radius end mill, Medium cutting length, 4 flute, Irregular helix flutes (for finishing)

Side milling

Work material	Carbon steel, Alloy steel, Mild Steel				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Precipitation hardeningstainless steel, Cobalt chromium alloy				Copper, Copper alloys				Heat Resistant Alloy Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
6	8000	2600	9	0.3	6400	1300	9	0.3	4000	800	9	0.3	9500	3000	9	0.3	2100	250	9	0.18
8	6000	2500	12	0.4	4800	1300	12	0.4	3000	840	12	0.4	7200	3000	12	0.4	1600	260	12	0.24
10	4800	2300	15	0.5	3800	1200	15	0.5	2400	770	15	0.5	5700	2700	15	0.5	1300	290	15	0.3
12	4000	1900	18	0.6	3200	1200	18	0.6	2000	720	18	0.6	4800	2300	18	0.6	1100	280	18	0.36
16	3000	1600	24	0.8	2400	960	24	0.8	1500	600	24	0.8	3600	1900	24	0.8	800	200	24	0.48
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 larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

Bottom face milling

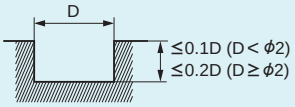
Work material	Carbon steel, Alloy steel, Mild Steel				Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Precipitation hardeningstainless steel, Cobalt chromium alloy				Copper, Copper alloys				Heat Resistant Alloy Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
6	5800	1400	0.3	4.8	4800	770	0.3	4.8	2900	460	0.3	4.8	6900	1700	0.3	4.8	1600	180	0.18	4.8
8	4400	1200	0.4	6.4	3600	720	0.4	6.4	2200	440	0.4	6.4	5200	1500	0.4	6.4	1200	190	0.24	6.4
10	3500	1100	0.5	8	2900	640	0.5	8	1800	400	0.5	8	4100	1300	0.5	8	950	210	0.3	8
12	2900	930	0.6	9.6	2400	580	0.6	9.6	1500	360	0.6	9.6	3400	1100	0.6	9.6	800	200	0.36	9.6
16	2200	790	0.8	12.8	1800	500	0.8	12.8	1100	310	0.8	12.8	2600	940	0.8	12.8	600	150	0.48	12.8
Depth of cut																				

1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) When the depth of cut is small, the feed rate can be increased.
3) 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 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.

VC-2SS

End mill, Extra short cut length, 2 flute

Slotting

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	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.3	40000	190	40000	190	40000	100
0.5	40000	380	40000	380	30000	140
1	30000	720	20000	480	15000	180
1.5	20000	960	14000	670	10000	190
2	15000	1100	10000	720	8000	200
3	10000	1150	7000	800	5000	210
4	7500	900	5200	620	4000	200
5	6000	720	4200	500	3200	160
6	5000	600	3500	420	2700	140
8	4000	520	2800	350	2000	120
10	3200	450	2200	290	1600	110
12	2700	410	1900	260	1300	100
16	2000	340	1400	210	1000	90
Depth of cut	 D:Dia.					

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

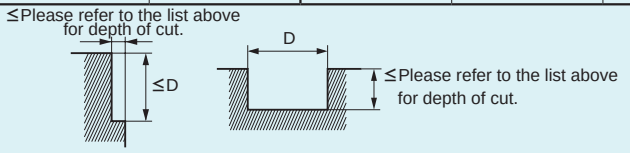
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2MS

End mill, Medium cut length, 2 flute

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45—55HRC) AISI H13		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.3	40000	200	0.005	40000	200	0.005
0.5	40000	950	0.015	40000	950	0.015
1	40000	2000	0.06	32000	1600	0.06
1.5	40000	3000	0.12	32000	1900	0.08
2	30000	3000	0.18	24000	1900	0.10
2.5	24000	2600	0.25	19000	1600	0.13
3	20000	2300	0.30	16000	1400	0.15
4	15000	2000	0.40	12000	1200	0.20
5	12000	1600	0.50	9000	900	0.25
6	10000	1400	0.60	7000	700	0.30
8	8000	1000	0.80	5600	550	0.40
10	6400	900	1.00	4500	500	0.50
12	5400	820	1.00	3800	450	0.50
16	2400	380	3.00	1200	100	0.80
20	1900	320	4.00	1000	80	1.00

Depth of cut



D:Dia.

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When slotting with end mills with ϕ3 or larger, reduce the revolution to 50—70% and the feed rate to 40—60%.
3) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-2JS

End mill, Semi long cut length, 2 flute

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	13000	60 (60)	9000	35 (35)	6500 (6500)	20 (20)	5700	20 (15)
2	6400	60 (60)	4800	45 (45)	3500 (3500)	30 (30)	3000	25 (15)
3	4200	65 (60)	3400	55 (55)	2600 (2600)	40 (40)	2100	30 (20)
4	3400	80 (60)	2700	65 (30)	2100 (1600)	50 (20)	1700	35 (20)
5	2900	100 (60)	2300	80 (40)	1800 (1350)	60 (25)	1500	40 (20)
6	2500	120 (60)	2000	100 (50)	1500 (1100)	75 (30)	1300	50 (25)
8	1900	130 (60)	1500	100 (50)	1200 (900)	85 (35)	1000	50 (25)
10	1600	130 (60)	1300	100 (50)	950 (710)	75 (30)	800	50 (25)
12	1300	120 (60)	1100	90 (45)	800 (600)	60 (25)	670	40 (20)
16	1000	80 (40)	820	65 (30)	600 (450)	45 (20)	500	30 (15)
20	800	65 (30)	650	50 (25)	480 (360)	40 (15)	400	25 (13)
25	650	50 (25)	520	40 (20)	380 (280)	30 (12)	320	20 (10)
Depth of cut			≤0.05D (MAX. 0.5mm) ≤2.5D D ≤0.05D (D=φ1) ≤0.1D (φ1< D≤ φ2) ≤0.15D (φ2< D≤ φ3) ≤0.3D (D>φ3) (MAX. 3mm)				≤0.02D (MAX. 0.3mm) ≤2D D ≤0.05D (MAX. 0.5mm)	

D:Dia.

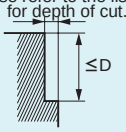
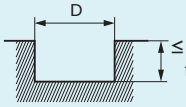
( ) : Indicates standard revolution and feed rates for slotting.

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) When drilling, please set the feed rate at 1/3 or below the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-4MC
End mill, Medium cut length, 4 flute

VC-4SRB
Corner radius end mill, Short cut length, 4 flute

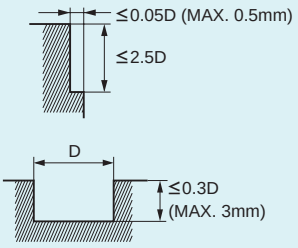
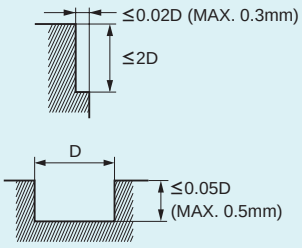
Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21			Hardened steel (45－55HRC) AISI H13		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
2	30000	4500	0.18	24000	3600	0.10
2.5	24000	3900	0.25	19000	3000	0.13
3	20000	3500	0.30	16000	2700	0.15
4	15000	3000	0.40	12000	2400	0.20
5	12000	2400	0.50	9000	1800	0.25
6	10000	2100	0.60	7000	1470	0.30
8	8000	1500	0.80	5600	1050	0.40
10	6400	1400	1.00	4500	950	0.50
12	5400	1200	1.00	3800	860	0.50
16	2400	550	2.00	1200	120	0.80
20	1900	480	3.00	1000	100	1.00
Depth of cut	≤Please refer to the list above for depth of cut. 			 ≤Please refer to the list above for depth of cut.		D:Dia.

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) When drilling, please set the feed rate at 1/3 or below the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-4MC ➤ J095
VC-4SRB ➤ J208

VC-4JC
End mill, Semi long cut length, 4 flute

VC-4JRB
Corner radius end mill, Semi long cut length, 4 flute

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	4200	110	3400	95	2600	70	2100	50
4	3400	140	2700	110	2100	85	1700	60
5	2900	170	2300	140	1800	100	1500	70
6	2500	200	2000	170	1500	130	1300	85
8	1900	220	1500	170	1200	150	1000	85
10	1600	220	1300	170	950	130	800	85
12	1300	170	1100	150	800	100	670	70
16	1000	140	820	110	600	80	500	50
20	800	110	650	85	480	70	400	40
25	650	85	520	70	380	50	320	35
Depth of cut								

D:Dia.

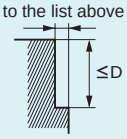
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The above table shows cutting conditions for standard side milling. For slotting, please reduce the feed rate only to 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 the values above.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-4JC ➤ J096
VC-4JRB ➤ J209

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

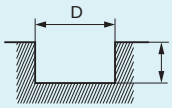
VC-MD-SC

End mill, Medium cut length, 4—6 flute

Work material	Hardened steel (45—55HRC) AISI H13			Hardened steel (55—62HRC) AISI D2		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.5	40000	2000	0.03	30000	600	0.02
1	40000	3000	0.05	20000	900	0.03
1.5	40000	5000	0.08	18000	1100	0.05
2	40000	5600	0.10	16000	1300	0.06
3	34000	5600	0.15	13000	1600	0.09
Depth of cut	≤Please refer to the list above for depth of cut.  D:Dia.					

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The above condition are for shoulder milling. For slotting ϕ3 or larger diameters, set the revolution, feed rate and depth of cut at 20—40% of the table figures.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

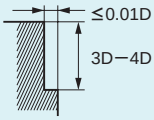
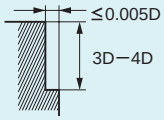
Slot milling with small diameter tools

Work material	Hardened steel (45—55HRC) AISI H13			Hardened steel (55—62HRC) AISI D2		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.5	20000	200	0.05	15000	90	0.03
1	15000	300	0.1	11000	110	0.05
1.5	10000	280	0.15	7500	150	0.07
2	8000	320	0.2	6000	190	0.1
Depth of cut	 Please refer to the list above for depth of cut. D:Dia.					

1) Air blow or oil mist is recommended for good chip evacuation.

VC-LD

End mill, Long cut length, 6 flute

Work material	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		Hardened steel (62−70HRC) AISI W1, AISI M2	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
6	2100	450	1600	330	1300	240	1100	190
8	1600	430	1200	310	1000	230	800	170
10	1300	420	960	290	800	220	640	150
12	1100	380	800	260	660	200	530	140
16	800	310	600	220	500	160	400	120
20	640	270	480	190	400	140	320	110
25	510	230	380	160	320	120	260	90
Depth of cut								

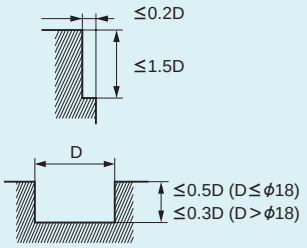
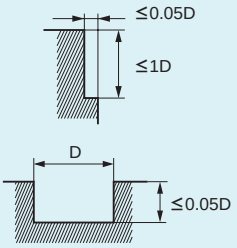
D:Dia.

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-MH

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

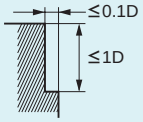
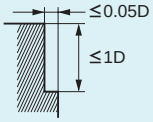
Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45—55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	5300	130	4400	100	2400	50	1500	25
4	4400	220	3700	160	2000	80	1300	40
5	3600	260	3000	190	1700	100	1100	50
6	3200	280	2700	200	1500	100	1000	50
8	2400	300	2000	210	1200	110	800	45
10	1900	290	1600	210	960	115	640	45
12	1600	250	1300	170	800	95	530	40
16	1200	180	1000	130	600	70	400	30
18	1100	170	900	120	530	65	350	25
20	960	190	800	140	480	75	320	25
25	760	150	640	110	380	60	260	20
Depth of cut								

D:Dia.

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) The above table shows cutting conditions for side 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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-6MH
End mill, Medium cut length, 6 flute, High helix angle

VC-8MH
End mill, Medium cut length, 8 flute, High helix angle

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
6	10600	2900	8000	2000	4200	900	2100	320
8	8000	2900	6000	2000	3200	900	1600	300
10	6400	2700	4800	2000	2500	870	1300	260
12	5300	2700	4000	2000	2100	830	1100	230
16	4000	2200	3000	1600	1600	740	800	180
20	3200	1900	2400	1400	1300	710	640	150
25	2500	1600	1900	1200	1000	560	510	120
Depth of cut								

D:Dia.

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

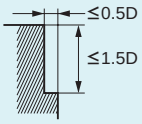
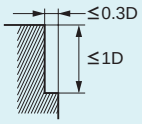
VC-6MH ➤ J113
VC-8MH ➤ J115

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

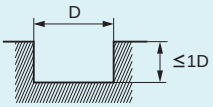
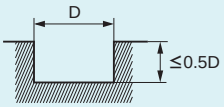
VC-SFPR

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

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45—55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	16000	960	13000	640	6400	260	5300	100	4200	70
4	12000	960	9500	640	4800	260	4000	100	3200	70
5	9500	960	7600	640	3800	260	3200	100	2500	70
6	8000	960	6400	680	3200	290	2700	110	2100	75
8	6000	1050	4800	760	2400	340	2000	140	1600	95
10	4800	1050	3800	760	1900	340	1600	150	1300	105
12	4000	960	3200	700	1600	320	1300	150	1100	110
16	3000	840	2400	620	1200	300	1000	150	800	110
20	2400	760	1900	560	1000	300	800	140	600	100
Depth of cut										

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45—55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	13000	720	11000	480	4800	190	3200	50	2100	25
4	9500	720	8000	480	3600	190	2400	50	1600	25
5	7600	720	6400	480	3200	190	1900	50	1300	25
6	6400	720	5300	480	2700	200	1600	55	1100	30
8	4800	800	4000	520	2000	220	1200	70	800	35
10	3800	800	3200	520	1600	220	1000	70	600	35
12	3200	750	2700	520	1300	210	800	75	500	40
16	2400	620	2000	450	1000	180	600	75	400	45
20	1900	540	1600	400	800	160	500	70	300	40
Depth of cut										

D:Dia.

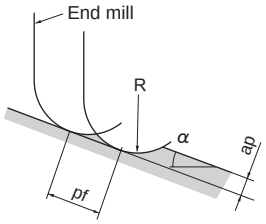
1) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

Ball nose end mill, Medium cut length, 2 flute **VC-2MB** Ball nose, Medium cut length, 2 flute, Strong geometry type **VC-2MDB**

Ball nose, Extra short cut length, 2 flute, Short shank **VC-2ESB**

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21					Hardened steel (45－55HRC) AISI H13				
R (mm)	α≤15°		α>15°		Depth of cut (mm)	α≤15°		α>15°		Depth of cut (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	
R 0.5	40000	5600	40000	3200	0.06	40000	5600	40000	3000	0.06
R 0.75	40000	6500	40000	3200	0.09	40000	6500	32000	3200	0.09
R 1	40000	6500	39000	3800	0.11	40000	6500	31000	3500	0.11
R 1.5	40000	7500	27000	4300	0.13	32000	6000	22000	3400	0.13
R 2	32000	7500	20000	3600	0.15	25000	6000	16000	2700	0.15
R 2.5	25000	6000	16000	2900	0.20	20000	5400	13000	2300	0.20
R 3	21000	5800	13000	2600	0.25	17000	4700	10000	2000	0.25
R 4	16000	4500	10000	2000	0.30	13000	3600	8000	1500	0.30
R 5	13000	3600	8000	1700	0.50	10000	2900	6400	1200	0.50
R 6	9000	2500	6000	1300	0.50	7200	2000	4800	1000	0.50
Depth of cut	≤0.2R ≤Please refer to the list above for depth of cut. R:Radius									

1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.



Using general machining center or NC milling machine.

	Roughing (Depth of cut ≤ 0.8R)			
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	
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 0.5	—	—	—	—
R 1	8800	150	7000	110
R 2	5800	280	4400	230
R 3	4200	340	3100	240
R 4	3200	360	2400	280
R 5	2500	340	1900	260
R 6	2100	300	1600	220
R 8	1500	210	1200	170
R10	1200	170	960	130
R12.5	950	130	770	110

SOLID END MILLS

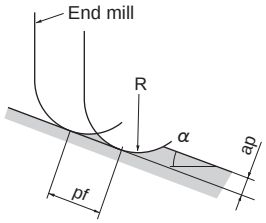
VC-2MB ➤ J158
VC-2MDB ➤ J159
VC-2ESB ➤ J155

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2PSB-P MIRACLE NOVA
Ball nose end mill, Short cut length, 2 flute, Ultra high precision

VC-2PSB MIRACLE NOVA
Ball nose end mill, Short cut length, 2 flute, High precision

Work material	Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Hardened steel (45—55HRC) AISI H13			
R (mm)	α≤15°		α>15°		α≤15°		α>15°	
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R0.05	40000	200	—	—	40000	170	—	—
R0.1	40000	600	40000	400	40000	600	40000	400
R0.15	40000	900	40000	600	40000	900	40000	600
R0.2	40000	1000	40000	700	40000	1000	40000	700
R0.25	40000	1500	40000	1000	40000	1500	40000	1000
R0.3	40000	2000	40000	1500	40000	2000	40000	1500
R0.35	40000	2800	40000	2100	40000	2800	37000	1800
R0.4	40000	2800	40000	2100	40000	2800	35000	1800
R0.45	40000	3200	38000	2200	38000	3000	32000	1800
R0.5	40000	3200	35000	2200	35000	3000	30000	1800
R0.75	40000	3600	30000	2300	32000	3000	25000	1800
R1	35000	3500	25000	2200	28000	2800	20000	1700
R1.5	30000	3400	23000	2200	24000	2600	16000	1500
R2	25000	3400	20000	2200	20000	2600	14000	1500
R2.5	23000	3400	17000	2200	18000	2600	12000	1500
R3	20000	3400	15000	2200	16000	2600	10000	1400
R4	15000	3000	12500	2000	10000	2000	7500	1200
R5	12000	3000	10000	2000	8000	2000	6000	1200
R6	10000	2600	8300	1800	6600	1700	5000	1100
Depth of cut	≤0.1R, ≤0.06R R:Radius							

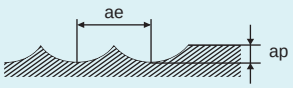


1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-2PSB-P ➤ J157
VC-2PSB ➤ J156

VC-XB

Ball nose taper end mill, Medium cut length, Taper neck

Work material					Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21		Hardened steel (45－55HRC) AISI H13	
R (mm)	Taper angle one side	Neck length (mm)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R0.5	1°	16	0.02	0.1	22000	530	12000	230
	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	10000	260
	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	6000	200
	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	5000	220
	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	4000	270
	3°	36	0.4					
R5	1°	70	0.4	2	6000	840	3000	310
	1°	100	0.3					
	1°30'	59	0.5					
	3°	40	0.5					
R6	1°	70	0.6	2.4	5000	900	2500	340
	1°	100	0.4					
	1°30'	83	0.6					
	3°	63	0.6					
Depth of cut								

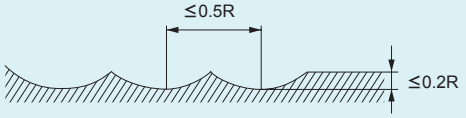
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

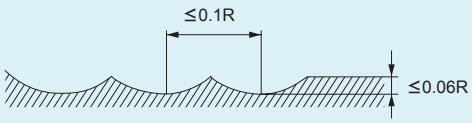
VC-3MB

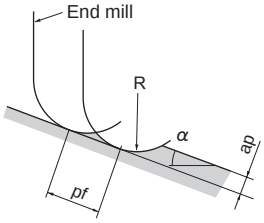
Ball nose end mill, Medium cut length, 3 flute

Roughing

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21				Hardened steel (45－55HRC) AISI H13			
R (mm)	α≤15°		α>15°		α≤15°		α>15°	
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 1	32000	3000	25000	1170	18000	1440	16000	640
R 2	18500	3700	14500	1460	11000	1760	9200	740
R 3	13000	4000	10000	1500	7700	1920	6400	800
R 4	10000	5000	8000	2000	6000	2300	4800	920
R 5	8000	5000	6500	2000	4800	2200	3800	870
R 6	6600	4600	5300	1800	4000	2100	3200	840
R 8	5000	4000	4000	1600	3000	1700	2400	680
R10	4000	3600	3200	1440	2400	1400	1900	550
Depth of cut	 R:Radius							

Finishing

Work material	Carbon steel, Cast iron, Alloy steel, Pre-hardened steel AISI 1050, AISI No 35 B, AISI P20, AISI P21				Hardened steel (45－55HRC) AISI H13			
R (mm)	α≤15°		α>15°		α≤15°		α>15°	
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 1	32000	3200	32000	1500	25000	2000	20000	800
R 2	25500	5000	20000	2000	17000	2700	13000	1000
R 3	20000	6100	15000	2200	13000	3200	10000	1200
R 4	15000	7500	11000	2700	10000	3800	7500	1400
R 5	12000	7500	9000	2700	8000	3700	6000	1400
R 6	10000	7000	7500	2500	6600	3500	5000	1300
R 8	7500	6000	5600	2200	5000	2800	3700	1000
R10	6000	5400	4500	2000	4000	2300	3000	900
Depth of cut	 R:Radius							

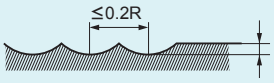


1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-3MB ➤ J176

VC-4MB

Ball nose end mill, Medium cut length, 4 flute

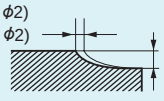
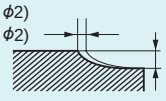
Work material	Alloy steel, Tool steel, Pre-hardened steel, Hardened steel (−55HRC) AISI H13, AISI W1-10, AISI P21					Hardened steel (55−62HRC) AISI D2				
R (mm)	α≤15°		α>15°		Depth of cut (mm)	α≤15°		α>15°		Depth of cut (mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	
R 0.5	40000	8000	40000	3800	0.06	40000	5600	40000	3100	0.05
R 0.75	40000	9600	40000	4800	0.09	40000	7200	38000	4200	0.08
R 1	40000	9600	40000	5600	0.11	40000	8000	28000	3100	0.10
R 1.5	40000	12000	32000	5600	0.13	32000	7700	19000	2900	0.12
R 2	32000	11000	24000	4700	0.15	24000	6200	14000	2500	0.13
R 2.5	25000	9000	19000	3800	0.20	19000	5300	12000	2200	0.15
R 3	21000	8400	15000	3400	0.25	16000	4800	9600	2000	0.20
R 4	16000	6400	12000	2600	0.30	12000	3600	7200	1600	0.20
R 5	13000	5200	9600	2200	0.50	10000	3200	5800	1300	0.20
R 6	9000	3600	7200	1700	0.50	7000	2200	4300	940	0.30
Depth of cut	 ≤Please refer to the list above for depth of cut. R:Radius									

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-PSRB MIRACLE ORBIT

Corner radius end mill, Short cut length, 2—4 flute, High precision

Work material		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	
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.6	2	48000	200— 600	40000	160— 500	22000	80— 250
	4	48000	160— 500	40000	100— 300	22000	50— 150
0.8	4	48000	240— 750	32000	160— 500	19000	80— 250
	6	38000	190— 600	26000	130— 400	16000	70— 200
	8	29000	150— 450	19000	100— 300	12000	50— 150
1	4	48000	270— 900	32000	180— 600	19000	90— 300
	6	38000	220— 720	26000	150— 480	16000	70— 240
	10	29000	160— 540	19000	110— 360	12000	60— 180
1.2	6	48000	300— 900	32000	200— 600	19000	100— 300
	10	38000	240— 720	26000	160— 480	15000	80— 240
	15	29000	180— 540	19000	120— 360	12000	60— 180
1.5	4	41000	300— 900	27000	200— 600	16000	100— 300
	6	32000	240— 720	22000	160— 480	13000	80— 240
	10	24000	180— 540	16000	120— 360	10000	60— 180
2	6	36000	600—2000	24000	400—1300	14000	200— 650
	10	29000	480—1600	19000	320—1000	12000	160— 520
	15	22000	360—1200	14000	240— 780	9000	120— 390
2.5	8	33000	750—2400	22000	500—1600	13000	250— 800
	15	20000	450—1400	13000	300— 960	8000	150— 480
3	10	30000	900—3000	20000	600—2000	12000	300—1000
	15	24000	720—2400	16000	480—1600	10000	240— 800
	20	18000	540—1800	12000	360—1200	7000	180— 600
4	12	26000	1200—4500	17000	800—3000	10000	400—1500
	20	20000	960—2000	14000	640—2000	8000	320—2000
	30	15000	720—1000	10000	480—1000	6000	240—1000
5	15	20000	1200—4800	13000	780—3120	10000	520—2000
	30	12000	720—1900	8000	480—1600	7000	360—1120
6	18	20000	1600—7500	13000	1100—5000	8000	550—2500
	41	15000	900—2400	12000	720—1600	10000	600—1200
	50	10000	600—1200	8000	480— 800	6000	360— 530
8	24	15000	1900—7500	10000	1300—5000	6000	650—2500
	50	10000	1300—2400	8000	1000—2200	3000	320— 600
10	30	12000	1600—7500	8000	1100—5000	5000	550—2500
	50	10000	1300—3200	7000	950—2200	2500	280— 600
12	36	10000	1500—7500	7000	1000—5000	4000	500—2500
Depth of cut		≤0.2R (D≤ϕ2) ≤0.4R (D＞ϕ2)  ≤0.1mm (D≤ϕ1.5) ≤0.2mm (D≤ϕ4) ≤0.5mm (D≤ϕ6)				≤0.1R (D≤ϕ2) ≤0.2R (D＞ϕ2)  ≤0.05mm (D≤ϕ1.5) ≤0.1mm (D≤ϕ4) ≤0.3mm (D≤ϕ6)	

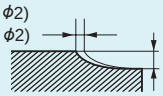
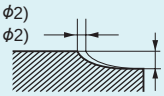
D:Dia.

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 shallow, the revolution and feed rate can be increased.
3) For profile machining such as moulds, 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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-PSRB ➤ J185

VC-PSRB (Taper neck type) MIRACLE ORBIT

Corner radius end mill, Short cut length, 2—4 flute, High precision

Work material			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	
Dia. (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1.5	1°30'	6	36000	270— 810	24000	180— 540	15000	90— 270
	1°30'	10	28000	210— 630	19000	140— 420	11000	70— 210
2	1°30'	10	32000	540—1800	22000	360—1200	13000	180— 590
	1°30'	15	25000	420—1400	17000	280— 910	10000	140— 460
2.5	1°30'	12	26000	600—1900	18000	400—1300	11000	200— 640
	1°30'	20	20000	450— 140	13000	300— 960	8000	150— 480
3	1°30'	15	27000	810—2700	18000	540—1800	11000	270— 900
	1°30'	20	21000	630—2100	14000	420—1400	8000	210— 700
4	1°30'	20	23000	1080—3000	15000	720—3000	9000	360—3000
	1°30'	30	18000	840—1500	12000	560—1500	7000	280—1500
5	1°	40	10000	520—1400	7000	420— 840	5000	260— 600
	1°	60	7000	360— 840	5000	300— 500	4000	210— 400
6	1°	40	20000	1650—4500	13000	1100—3000	8000	550—1500
8	1°	53	15000	1950—4500	10000	1300—3000	6000	650—1500
10	1°	55	12000	1650—4500	8000	1100—3000	5000	550—1500
Depth of cut			≤0.2R (D≤ϕ2) ≤0.4R (D> ϕ2)  ≤0.1mm (D≤ϕ1.5) ≤0.2mm (D≤ϕ4) ≤0.5mm (D≤ϕ6)		≤0.1R (D≤ϕ2) ≤0.2R (D>ϕ2)  ≤0.05mm (D≤ϕ1.5) ≤0.1mm (D≤ϕ4) ≤0.3mm (D≤ϕ6)		

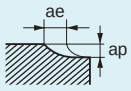
D:Dia.

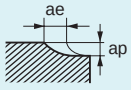
1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) For profile machining such as moulds, 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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-HFRB

Corner radius, Short flute length, 4 flute, High feed machining

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			
Dia. (mm)	Corner radius (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	R 0.5	33000	10000	0.08	0.8	27000	8400	0.05	0.8
3	R 0.75	22000	11000	0.12	1.2	18000	9000	0.08	1.2
4	R 1	17000	12000	0.15	1.5	14000	9500	0.12	1.5
5	R 1.2	13000	13000	0.20	2.0	11000	11000	0.15	2.0
6	R 1.5	11000	13000	0.25	2.5	9000	11000	0.15	2.5
7	R 1.5	9400	13000	0.25	3.0	7800	11000	0.15	3.0
8	R 2	8200	13000	0.30	3.0	7000	11000	0.20	3.0
9	R 2	7300	13000	0.30	4.0	6000	11000	0.20	4.0
10	R 2	6500	13000	0.30	4.5	5500	11000	0.20	4.5
11	R 2	6000	12000	0.30	5.5	5000	10000	0.20	5.5
12	R 3	5500	12000	0.45	4.5	4600	10000	0.30	4.5
13	R 3	5000	12000	0.45	5.5	4200	10000	0.30	5.5
16	R 3	4100	10000	0.45	7.5	3400	8800	0.30	7.5
Depth of cut									

Work material		Hardened steel (45−55HRC) AISI H13				Hardened steel (55−62HRC) AISI D2			
Dia. (mm)	Corner radius (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
2	R 0.5	24000	7500	0.04	0.8	16000	3000	0.03	0.8
3	R 0.75	16000	8500	0.06	1.2	11000	3300	0.05	1.2
4	R 1	12000	8800	0.08	1.5	8000	3500	0.07	1.5
5	R 1.2	9600	9500	0.10	2.0	6400	3800	0.08	2.0
6	R 1.5	8000	9600	0.10	2.5	5300	3800	0.10	2.5
7	R 1.5	6900	9600	0.10	3.0	4600	3800	0.10	3.0
8	R 2	6000	9600	0.15	3.0	4000	3800	0.13	3.0
9	R 2	5300	9500	0.15	4.0	3800	3800	0.13	4.0
10	R 2	4800	9500	0.15	4.5	3200	3800	0.13	4.5
11	R 2	4500	9000	0.15	5.5	2900	3500	0.13	5.5
12	R 3	4100	9000	0.25	4.5	2700	3500	0.20	4.5
13	R 3	3700	8900	0.25	5.5	2500	3500	0.20	5.5
16	R 3	3000	7800	0.25	7.5	2000	3200	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%

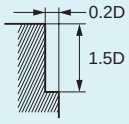
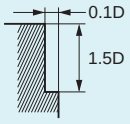
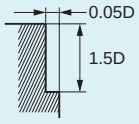
1) The above table shows cutting conditions when machining with the corner radius cutting edge.
2) This table shows the cutting conditions with less than 5D overhang length. In the case of longer overhangs, the revolution and the feed rate should be reduced proportionately.
3) If the depth of cut is shallow, the revolution and feed rate can be increased.
4) Air blow or oil mist is recommended for good chip evacuation.
5) For profile machining such as moulds, 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.
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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-HFRB ➤ J210

VC-MHDRB

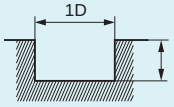
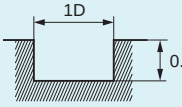
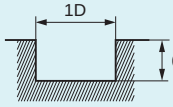
Corner radius end mill, Medium cut length, 4 flute, High helix angle

Side milling

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	15000	550	10000	340	10000	320	6400	160	4800	100
3	11000	800	7400	500	7400	480	4800	250	4000	170
4	8000	900	5600	540	5600	520	3600	270	3200	240
5	6400	1000	4500	600	4500	580	2900	300	2600	240
6	5900	1100	3700	640	3700	600	2400	320	2100	230
8	4400	1100	2800	660	2800	600	1800	330	1600	220
10	3500	1000	2300	640	2300	560	1400	320	1300	200
12	2900	1000	1900	640	1900	530	1200	320	1100	170
16	2200	800	1400	500	1400	450	900	250	800	130
20	1800	750	1100	460	1100	440	720	230	640	100
25	1400	600	900	400	900	380	570	200	510	80
Depth of cut										

D:Dia.

Slotting

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		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13		Heat resistant alloys Inconel718	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	12000	400	7000	200	7000	100	4200	80	2300	40
3	9000	600	5300	300	5300	150	3200	130	1900	70
4	7200	720	4000	360	4000	180	2400	140	1400	95
5	5800	720	3200	360	3200	180	1900	150	1100	95
6	5000	800	2700	400	2700	200	1600	160	950	95
8	3700	800	2000	400	2000	200	1200	170	720	90
10	3000	720	1600	360	1600	180	960	160	570	80
12	2500	720	1300	360	1300	180	800	160	480	70
16	2000	600	1000	280	1000	150	600	130	360	50
20	1600	540	800	250	800	130	480	120	290	40
25	1300	480	640	220	640	120	380	100	230	35
Depth of cut										

D:Dia.

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2MT

Taper end mill, Medium cut length, 2 flute

Slotting

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		
Small Mill Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
1	16000	400	0.03	12000	300	0.03	10000	100	0.02
1.5	10000	400	0.06	7500	300	0.06	6500	100	0.04
2	8000	400	0.08	6000	300	0.08	5000	100	0.06
2.5	6500	400	0.12	5000	300	0.12	4000	100	0.10

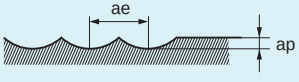
ap:Depth of Cut in the Axial Direction

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-2MT ➤ J226

VC-4STB

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

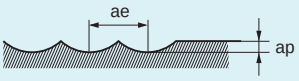
Work material			Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21				Hardened steel (45−55HRC) AISI H13				Hardened steel (55−62HRC) AISI D2			
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R 0.3	1°30'	5	40000	1600	0.08	0.12	40000	1200	0.06	0.10	40000	700	0.04	0.06
	2°	5	40000	1600	0.08	0.12	40000	1200	0.06	0.10	40000	700	0.04	0.06
	5°	5	40000	1600	0.08	0.12	40000	1200	0.06	0.10	40000	700	0.04	0.06
	10°	15	40000	1600	0.05	0.08	40000	1200	0.04	0.06	40000	700	0.03	0.04
R 0.4	1°30'	10	40000	2000	0.07	0.11	40000	1500	0.06	0.08	30000	700	0.04	0.05
	1°30'	15	40000	2000	0.05	0.08	40000	1500	0.04	0.06	30000	800	0.03	0.04
	2°	10	40000	2000	0.07	0.11	40000	1500	0.06	0.08	30000	800	0.04	0.05
	5°	10	40000	2000	0.07	0.11	40000	1500	0.06	0.08	30000	800	0.04	0.05
	7°	10	40000	2000	0.07	0.11	40000	1500	0.06	0.08	30000	800	0.04	0.05
	10°	15	40000	2000	0.06	0.09	40000	1500	0.05	0.07	30000	800	0.03	0.05
R 0.5	1°30	10	38000	2500	0.11	0.16	35000	1600	0.08	0.13	25000	800	0.05	0.08
	1°30'	15	38000	2500	0.09	0.14	35000	1600	0.07	0.11	25000	800	0.05	0.07
	1°30'	20	38000	2500	0.06	0.09	35000	1600	0.05	0.07	25000	800	0.03	0.05
	2°	10	38000	2500	0.11	0.16	35000	1600	0.08	0.13	25000	800	0.05	0.08
	2°	15	38000	2500	0.09	0.14	35000	1600	0.07	0.11	25000	800	0.05	0.07
	2°	20	38000	2500	0.06	0.09	35000	1600	0.05	0.07	25000	800	0.03	0.05
	5°	10	38000	2500	0.12	0.18	35000	1600	0.10	0.14	25000	800	0.06	0.09
	5°	15	38000	2500	0.09	0.14	35000	1600	0.07	0.11	25000	800	0.05	0.07
	5°	20	38000	2500	0.08	0.11	35000	1600	0.06	0.09	25000	800	0.04	0.06
	7°	10	38000	2500	0.12	0.18	35000	1600	0.10	0.14	25000	800	0.06	0.09
	7°	15	38000	2500	0.11	0.16	35000	1600	0.08	0.13	25000	800	0.05	0.08
	7°	20	38000	2500	0.08	0.11	35000	1600	0.06	0.09	25000	800	0.04	0.06
	10°	14	38000	2500	0.11	0.16	35000	1600	0.08	0.13	25000	800	0.05	0.08
R 0.75	2°	10	38000	2500	0.18	0.27	35000	1600	0.14	0.22	18000	800	0.09	0.14
	5°	15	38000	2500	0.16	0.24	35000	1600	0.13	0.19	18000	800	0.08	0.12
R 1	1°30'	10	35000	2800	0.18	0.27	30000	1800	0.14	0.22	15000	1000	0.09	0.14
	1°30'	15	35000	2800	0.16	0.24	30000	1800	0.13	0.19	15000	1000	0.08	0.12
	1°30'	20	35000	2800	0.14	0.21	30000	1800	0.11	0.17	15000	1000	0.07	0.11
	2°	6	35000	2800	0.20	0.30	30000	1800	0.16	0.24	15000	1000	0.10	0.15
	2°	10	35000	2800	0.18	0.27	30000	1800	0.14	0.22	15000	1000	0.09	0.14
	2°	15	35000	2800	0.16	0.24	30000	1800	0.13	0.19	15000	1000	0.08	0.12
	5°	10	35000	2800	0.18	0.27	30000	1800	0.14	0.22	15000	1000	0.09	0.14
	5°	15	35000	2800	0.18	0.27	30000	1800	0.14	0.22	15000	1000	0.09	0.14
	5°	23	35000	2800	0.14	0.21	30000	1800	0.11	0.17	15000	1000	0.07	0.11
	7°	17	35000	2800	0.16	0.24	30000	1800	0.13	0.19	15000	1000	0.08	0.12
	10°	12	35000	2800	0.18	0.27	30000	1800	0.14	0.22	15000	1000	0.09	0.14
R 1.25	5°	15	35000	2800	0.23	0.34	30000	1800	0.18	0.27	15000	1000	0.11	0.17
R 1.5	1°30'	15	32000	3000	0.23	0.34	27000	2000	0.18	0.27	16000	1200	0.11	0.17
	1°30'	20	32000	3000	0.23	0.34	27000	2000	0.18	0.27	16000	1200	0.11	0.17
	3°	15	32000	3000	0.23	0.34	27000	2000	0.18	0.27	16000	1200	0.11	0.17
	5°	10	32000	3000	0.25	0.38	27000	2000	0.20	0.30	16000	1200	0.13	0.19
	5°	18	32000	3000	0.23	0.34	27000	2000	0.18	0.27	16000	1200	0.11	0.17
R 1.75	5°	15	27500	3500	0.23	0.34	23000	2500	0.18	0.27	14000	1500	0.11	0.17
Depth of cut														

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-4STB

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				Hardened steel (45－55HRC) AISI H13				Hardened steel (55－62HRC) AISI D2			
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R 2	1°30'	15	24000	3500	0.23	0.34	20000	2500	0.18	0.27	12000	1500	0.11	0.17
	1°30'	20	24000	3500	0.23	0.34	20000	2500	0.18	0.27	12000	1500	0.11	0.17
	3°	21	24000	3500	0.23	0.34	20000	2500	0.18	0.27	12000	1500	0.11	0.17
	5°	13	24000	3500	0.25	0.38	20000	2500	0.20	0.30	12000	1500	0.13	0.19
	7°	18	24000	3500	0.23	0.34	20000	2500	0.18	0.27	12000	1500	0.11	0.17
R 3	1°30'	15	16000	3500	0.30	0.45	13500	2500	0.24	0.36	8000	1500	0.15	0.23
	1°30'	20	16000	3500	0.30	0.45	13500	2500	0.24	0.36	8000	1500	0.15	0.23
	3°	22	16000	3500	0.30	0.45	13500	2500	0.24	0.36	8000	1500	0.15	0.23
R 4	1°30'	15	12000	3500	0.30	0.45	10000	2500	0.24	0.36	6000	1500	0.15	0.23
	3°	22	12000	3500	0.30	0.45	10000	2500	0.24	0.36	6000	1500	0.15	0.23
Depth of cut														

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 work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VC-4STB ➤ J238

VC-2C
Chamfer cutter, 2 flute

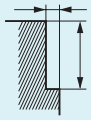
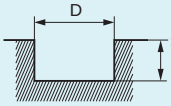
Work material	Carbon steel, Cast iron, Alloy steel (−30HRC) AISI 1050, AISI No 35 B, AISI P20		Alloy steel, Tool steel, Pre-hardened steel AISI H13, AISI W1-10, AISI P21		Austenitic stainless steel, Titanium alloy AISI 304, AISI 306, Ti-6Al-4V		Hardened steel (45−55HRC) AISI H13	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	16000	960	11000	590	9500	460	8000	320
4	8000	480	5600	300	4800	230	4000	160
6	5300	320	3700	200	3200	150	2700	110
8	4000	240	2800	150	2400	120	2000	80
10	3200	190	2200	120	1900	90	1600	60
12	2700	160	1900	100	1600	80	1300	50
Depth of cut	Chamfering ≤0.3D (MAX. 2.5mm) Chamfering of hole ≤0.2D D:Dia.							

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) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

Memo

CRN-2MS

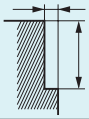
End mill, Medium cut length, 2 flute, For copper electrodes

Work material	Copper, Copper alloys		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut (mm)
0.2	40000	600	0.01
0.3	40000	600	0.01
0.4	40000	800	0.01
0.5	40000	960	0.015
0.6	40000	1200	0.02
0.7	40000	1400	0.02
0.8	40000	1600	0.03
0.9	40000	1800	0.04
1	40000	2000	0.06
1.5	40000	3000	0.12
2	30000	3000	0.18
2.5	24000	2600	0.25
3	20000	2300	0.30
4	15000	2000	0.40
5	12000	1600	0.50
6	10000	1400	0.60
8	8000	1000	0.80
10	6400	900	1.00
12	5400	820	1.00
Depth of cut	≤Please refer to the list above for depth of cut. ≤D  D  ≤Please refer to the list above for depth of cut. D:Dia.		

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) When drilling, please set the feed rate at 1/3 or below of the table value.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

CRN-4JC

End mill, Semi long cut length, 4 flute, For copper electrodes

Work material	Copper, Copper alloys	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	10600	280
4	8000	330
5	6400	380
6	5300	420
8	4000	460
10	3200	460
12	2700	460
Depth of cut	≤0.05D (MAX. 0.5mm) ≤2.5D  D:Dia.	

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) When drilling, please set the feed rate at 1/3 or below of the table value.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

CRN-2MS ➤ J053
CRN-4JC ➤ J098

RECOMMENDED CUTTING CONDITIONS FOR CRN END MILLS

CRN-2XL

End mill, Medium cut length, 2 flute, Long neck, For copper electrodes

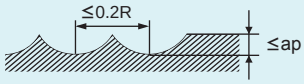
Work material		Copper, Copper alloys		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut per pass (mm)
0.2	0.5	40000	800	0.004
	1.0	40000	700	0.003
	1.5	40000	600	0.002
0.3	1	40000	800	0.007
	3	40000	600	0.002
0.4	2	40000	950	0.007
	4	40000	800	0.003
	6	40000	600	0.001
0.5	2	40000	950	0.01
	4	40000	800	0.005
	6	40000	700	0.002
0.8	4	40000	1200	0.02
	6	40000	1200	0.015
	8	40000	1000	0.01
1	6	40000	2000	0.04
	8	40000	2000	0.03
	10	30000	1200	0.02
	12	30000	1000	0.015
1.5	6	40000	2400	0.10
	8	40000	2200	0.09
	10	40000	2000	0.08
	12	30000	1800	0.05
	16	20000	1200	0.03
	20	15000	800	0.02
2	6	40000	2400	0.18
	8	40000	2200	0.15
	10	40000	2000	0.12
	12	30000	1500	0.10
	16	30000	1000	0.06
	20	15000	600	0.03
2.5	8	40000	3000	0.20
	12	40000	2800	0.15
	16	30000	2100	0.10
	20	20000	1000	0.08
3	20	20000	2000	0.12
4	20	15000	2000	0.30
5	25	12000	1500	0.35
6	30	10000	1200	0.40

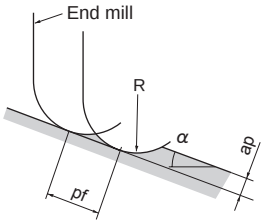
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

CRN-2XL ➤ J054

CRN-2MB

Ball nose, Medium cut length, 2 flute, For copper electrodes

Work material	Copper, Copper alloys				
R (mm)	α≤15°		α>15°		Depth of cut ap(mm)
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	
R0.2	40000	1600	40000	1200	0.02
R0.3	40000	3200	40000	1600	0.03
R0.4	40000	6400	40000	2400	0.05
R0.5	40000	8000	40000	3200	0.06
R0.75	40000	9600	40000	4000	0.09
R1	40000	9600	39000	4700	0.11
R1.25	40000	12000	30000	4500	0.12
R1.5	40000	12000	27000	4300	0.13
R2	32000	11000	20000	3600	0.15
R2.5	25000	9000	16000	2900	0.20
R3	21000	8400	13000	2600	0.25
R4	16000	6400	10000	2000	0.30
R5	13000	5200	8000	1700	0.50
R6	9000	3600	6000	1300	0.50
Depth of cut	 R:Radius				



1) α is the inclination angle of the machined surface.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Water-soluble cutting fluid is recommended.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR CRN END MILLS

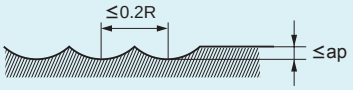
CRN-2XLB

Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes

Work material		Copper, Copper alloys		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap(mm)
R0.1	0.5	40000	800	0.003
	1.0	40000	600	0.002
	1.5	40000	400	0.001
R0.15	1	40000	1200	0.007
	2	40000	800	0.003
R0.2	1	40000	2000	0.015
	2	40000	1300	0.01
	3	40000	800	0.005
R0.25	2	40000	2000	0.02
	4	40000	1200	0.01
	6	36000	600	0.006
	10	26000	200	0.002
R0.3	2	40000	3200	0.03
	6	40000	1200	0.008
	10	30000	500	0.003
R0.4	4	40000	4000	0.02
	6	40000	2500	0.02
	10	30000	700	0.008
R0.5	4	40000	6400	0.05
	6	40000	4800	0.03
	8	40000	3000	0.02
	10	33000	2000	0.01
	16	18000	500	0.008
	20	13000	250	0.005

Work material		Copper, Copper alloys		
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap(mm)
R0.75	8	40000	8000	0.07
	12	35000	4500	0.04
	16	20000	2000	0.03
	20	12000	900	0.02
R1	8	40000	9600	0.10
	10	40000	6400	0.08
	12	40000	6000	0.08
	16	30000	3000	0.05
	20	20000	2000	0.04
	30	10000	800	0.02
R1.5	16	40000	12000	0.10
	25	25000	6000	0.08
	35	6000	700	0.06
R2	16	32000	11000	0.15
	20	32000	9000	0.15
	30	20000	4500	0.10
	40	15000	3000	0.08
	50	8000	1000	0.05
R2.5	20	25000	9500	0.20
	30	20000	3300	0.15
R3	30	21000	8400	0.20
	50	20000	3000	0.15

Depth of cut

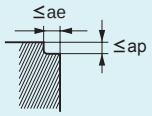


R:Radius

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

CRN-2MRB

Corner radius, Medium cut length, 2 flute, For copper electrodes

Work material		Copper, Copper alloys			
Dia. (mm)	Corner radius (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
6	R0.2, R0.3, R0.5	10000	1400	6	0.6
	R1	10000	1700	6	0.6
8	R0.3, R0.5	8000	1000	8	0.8
	R1	8000	1200	8	0.8
10	R0.3, R0.5	6400	900	10	1.0
	R1	6400	1100	10	1.0
12	R0.3, R0.5	5400	800	12	1.0
	R1	5400	1000	12	1.0
Depth of cut					

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

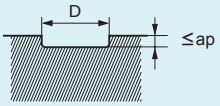
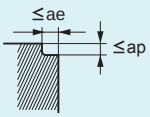
RECOMMENDED CUTTING CONDITIONS FOR CRN END MILLS

CRN-2XLRB

Corner radius, Medium cut length, 2 flute, For copper electrodes

Slotting

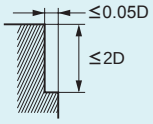
Contour Cutting

Work material			Copper, Copper alloys			Copper, Copper alloys			
Dia. (mm)	Corner radius (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
0.5	R0.05, R0.1	4	40000	800	0.005	40000	1500	0.01	0.1
		6	40000	700	0.003	40000	1000	0.005	0.1
0.8	R0.05, R0.1	6	40000	1200	0.02	40000	2500	0.02	0.15
		8	40000	1200	0.015	40000	1600	0.01	0.15
1	R0.1, R0.3	8	40000	2000	0.03	40000	3000	0.03	0.2
		10	35000	1600	0.025	35000	2000	0.025	0.2
		12	30000	1200	0.02	30000	1800	0.02	0.2
1.5	R0.1, R0.2, R0.3	12	30000	1500	0.05	40000	4500	0.04	0.3
		20	20000	1000	0.02	20000	2000	0.02	0.3
2	R0.1, R0.2 R0.3, R0.5	12	30000	1500	0.1	40000	4500	0.08	0.4
		16	30000	1000	0.06	30000	3000	0.05	0.4
		20	20000	600	0.04	20000	2000	0.04	0.4
3	R0.2, R0.3	20	20000	2000	0.12	35000	6000	0.1	0.6
	R0.5	20	20000	2200	0.12	35000	8000	0.1	0.6
4	R0.2, R0.3	20	15000	2000	0.25	32000	5000	0.15	0.8
	R0.5	20	15000	2200	0.25	32000	7000	0.15	0.8
5	R0.2, R0.3	25	12000	1500	0.3	22000	5000	0.2	1.0
	R0.5	25	12000	1700	0.3	22000	7000	0.2	1.0
6	R0.2, R0.3, R0.5	30	10000	1200	0.4	20000	5000	0.25	1.2
	R1	30	10000	1500	0.4	20000	7000	0.25	1.2
Depth of cut			 D:Dia.						

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

DF-4JC

End mill, Semi long cut length, 4 flute, For graphite

Work material	Graphite	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	22000	2500
4	18000	2900
6	14000	3200
8	10500	2900
10	8700	2600
12	7200	2200
Depth of cut	 D:Dia.	

1) When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
2) Use a milling machine dedicated for graphite.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR DF END MILLS

DF-4XL

End mill, Long neck, 4 flute, For graphite

Side milling

Work material		Graphite	
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)
1	6	30000	1300
	8	25000	1000
	10	22000	700
1.5	10	25000	1200
	16	18000	800
2	10	22000	1500
	16	19000	1100
	20	16000	800
3	16	21000	1900
	20	18000	1500
	30	14000	1000
4	20	18000	2400
	40	13000	1500
6	30	14000	3200
8	30	10500	2900
10	30	8700	2600
12	30	7200	2200
Depth of cut		≤0.05D (D<ϕ4) ≤0.1D (ϕ4≤D) ≤D D:Dia.	

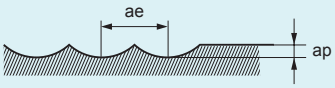
Slotting

Work material		Graphite		
Dia. (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
1	6	30000	1000	0.1
	8	25000	700	0.08
	10	22000	500	0.06
1.5	10	25000	1100	0.14
	16	18000	600	0.1
2	10	22000	1200	0.2
	16	19000	800	0.16
	20	16000	600	0.12
3	16	21000	1400	0.3
	20	18000	1100	0.25
	30	14000	700	0.2
4	20	18000	1800	0.5
	40	13000	900	0.4
6	30	14000	2300	1.2
8	30	10500	2000	2
10	30	8700	1900	3
12	30	7200	1700	4
Depth of cut		D ap D:Dia.		

1) When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
2) Use a milling machine dedicated for graphite.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DF-2MB

Ball nose, Medium cut length, 2 flute, For graphite

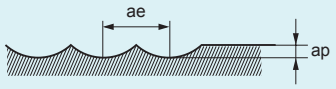
Work material		Graphite			
R (mm)	Overall Length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R3	100	10000－16000	1200－2100	0.6	1.5
	150	6000－10000	600－1200	0.4	1.2
R4	110	9000－12000	1500－2200	0.8	2
	150	5000－ 9000	700－1500	0.6	1.6
R5	120	7500－10000	1700－2400	1	2.5
	180	5000－ 7500	1000－1700	0.8	2
R6	130	6000－ 8000	1300－1900	1.2	3
	200	4000－ 6000	800－1300	1	2.5
Depth of cut					

1) When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
2) Use a milling machine dedicated for graphite.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR DF END MILLS

DF-2XLB

Ball nose, Medium cut length, 2 flute, Long neck, For graphite

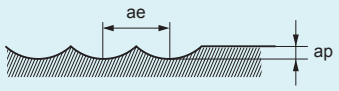
Work material		Graphite			
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R0.2	1	40000	1500	0.05	0.15
	2	40000	1500	0.05	0.12
	3	40000	1300	0.04	0.12
	4	40000	1300	0.04	0.1
	8	30000	800	0.03	0.1
	12	20000	450	0.03	0.08
R0.25	4	40000	1500	0.05	0.15
R0.3	2	40000	1800	0.07	0.2
	4	40000	1500	0.06	0.18
	6	40000	1500	0.06	0.15
	10	35000	1000	0.05	0.15
	16	22000	530	0.04	0.12
R0.4	6	40000	1700	0.08	0.2
	8	40000	1700	0.08	0.15
R0.5	4	40000	2500	0.12	0.3
	6	40000	2500	0.1	0.3
	8	40000	2000	0.1	0.25
	10	40000	2000	0.1	0.2
	12	40000	2000	0.1	0.2
	20	30000	1100	0.08	0.2
	30	20000	600	0.06	0.15
	40	15000	400	0.04	0.12
R0.75	8	40000	2800	0.15	0.45
	10	40000	2800	0.15	0.45
	16	35000	2000	0.15	0.3
	30	27000	1000	0.1	0.3
R1	8	40000	3000	0.23	0.7
	10	40000	3000	0.2	0.6
	12	35000	2500	0.2	0.6
	16	30000	2000	0.2	0.5
	20	30000	2000	0.2	0.5
	25	25000	1500	0.18	0.45
	40	20000	1000	0.15	0.4
	60	15000	500	0.1	0.3
R1.5	16	28000	3000	0.3	0.9
	25	20000	2000	0.25	0.75
	40	16000	1500	0.2	0.6
	60	14000	1000	0.17	0.45
R2	20	21000	3300	0.5	1.5
	30	15000	2000	0.4	1.2
	40	13000	1600	0.35	1
	60	12000	1400	0.3	0.9
Depth of cut					

1) When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
2) Use a milling machine dedicated for graphite.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DF-2XLB ➤ J168

DF-3XB

Ball nose, Medium cut length, 3 flute, Taper neck, For graphite

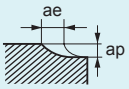
Work material		Graphite			
R (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R0.5	30	20000	1100	0.05	0.13
	40	15000	750	0.04	0.11
	50	12000	500	0.03	0.1
R1	40	20000	1800	0.13	0.4
	60	15000	900	0.09	0.27
	80	12000	600	0.07	0.2
R1.5	60	14000	1700	0.15	0.45
	80	12000	1200	0.12	0.35
R2	100	10000	1100	0.2	0.5
Depth of cut					

1) When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
2) Use a milling machine dedicated for graphite.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR DF END MILLS

DF-PSRB

Corner radius end mill, Short cut length, 2—4 flute, High precision, For graphite

Work material			Graphite			
Dia. (mm)	Corner radius (mm)	Neck length (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
0.5	0.1	4	30000	1100	0.05	0.23
	0.1	5	28000	960	0.05	0.23
	0.1	6	25000	850	0.05	0.23
	0.1	10	22000	600	0.04	0.21
	0.1	15	20000	500	0.03	0.18
0.8	0.1	6	28000	1300	0.08	0.45
	0.1	8	22000	900	0.08	0.45
1	0.1	8	25000	1500	0.1	0.6
	0.1	12	22000	1300	0.1	0.6
	0.2	8	25000	1500	0.1	0.45
	0.2	12	22000	1300	0.1	0.45
	0.2	16	18000	1000	0.08	0.4
	0.2	20	15000	800	0.08	0.4
	0.2	30	12000	600	0.07	0.35
1.5	0.2	10	25000	2100	0.15	0.8
	0.2	20	18000	1400	0.15	0.8
2	0.2	12	22000	3000	0.2	1.2
	0.2	16	19000	2500	0.2	1.2
	0.2	20	16000	2000	0.2	1.2
	0.2	30	13000	1600	0.16	1
	0.2	40	11000	1200	0.14	0.8
3	0.2	20	18000	3000	0.3	2
	0.2	40	12000	1800	0.25	1.7
	0.5	20	18000	3000	0.3	1.5
4	0.2	20	18000	4200	0.4	2.7
	0.2	40	13000	2800	0.4	2.7
	0.5	20	18000	4200	0.4	2.3
	0.5	40	13000	2800	0.4	2.3
6	0.5	30	14000	4600	0.6	3.8
	1	30	14000	4600	0.6	3
8	0.5	30	10500	4000	0.8	5.3
	1	30	10500	4000	0.8	4.5
10	0.5	40	8700	3500	1	6.8
	1	40	8700	3500	1	6
12	0.5	40	7200	3000	1.2	8
Depth of cut						

1) When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
2) Use a milling machine dedicated for graphite.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DF-PSRB ➤ J214

DLC-2MA

Slot drill, Medium cut length, 2 flute

Side milling

Work material	Aluminium alloy		Aluminium cast, Copper, Copper alloys	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40000	600	40000	460
2	40000	1100	38000	850
3	32000	1400	25000	950
4	24000	1500	19000	1000
5	19000	1600	15000	1000
6	16000	1900	13000	1100
8	12000	1900	9500	1200
10	9500	1900	7600	1200
12	8000	1900	6400	1200
16	6000	1900	4800	1200
20	4800	1500	3800	1000
Depth of cut	≤0.2D (D < ϕ3) ≤0.5D (D ≥ ϕ3) ≤1D D:Dia.			

Slotting

Work material	Aluminium alloy		Aluminium cast, Copper, Copper alloys	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40000	460	40000	350
2	38000	850	32000	550
3	25000	950	21000	600
4	19000	1000	16000	650
5	15000	1000	13000	700
6	13000	1100	11000	750
8	9500	1200	8000	800
10	7600	1200	6400	800
12	6400	1200	5300	800
16	4800	1000	4000	720
20	3800	970	3200	660
Depth of cut	D ≤1D (MAX. 12mm) D:Dia.			

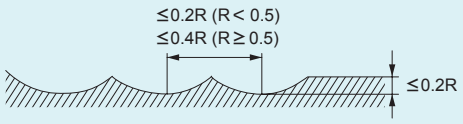
1) When cutting a very hard workpiece, reduce the feed rate.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

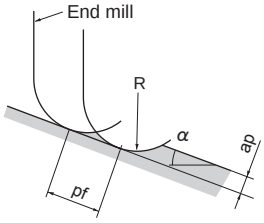
RECOMMENDED CUTTING CONDITIONS FOR DLC END MILLS

DLC-2MB

Ball nose, Medium cut length, 2 flute

Work material	Aluminium alloy				Aluminium cast, Copper, Copper alloys			
R (mm)	α≤15°		α>15°		α≤15°		α>15°	
	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 0.1	40000	350	40000	260	40000	280	40000	210
R 0.15	40000	480	40000	360	40000	380	40000	290
R 0.2	40000	600	40000	450	40000	480	40000	360
R 0.25	40000	800	40000	600	40000	640	40000	480
R 0.3	40000	1000	40000	750	40000	800	40000	600
R 0.4	40000	1500	40000	1100	40000	1200	40000	880
R 0.5	40000	2000	40000	1500	40000	1600	40000	1200
R 0.75	40000	2200	40000	1600	40000	1800	40000	1300
R 1	40000	2800	40000	2200	40000	2200	32000	1400
R 1.25	40000	3200	38000	2200	32000	2000	30000	1400
R 1.5	40000	4000	32000	2600	32000	2600	26000	1700
R 2	30000	4200	24000	2800	24000	2700	19000	1800
R 2.5	24000	4400	19000	2800	19000	2800	15000	1800
R 3	20000	4000	16000	2800	16000	2600	13000	1800
R 4	15000	3600	12000	2400	12000	2300	9600	1500
R 5	12000	3600	9500	2000	9600	2300	7600	1300
R 6	10000	3200	8000	2200	8000	2000	6400	1400
R 8	7500	2800	6000	1800	6000	1800	4800	1200
R10	6000	2500	4800	1600	4800	1600	3800	1000
Depth of cut	≤0.2R (R< 0.5) ≤0.4R (R≥ 0.5) ≤0.2R R:Radius							





1) α is the inclination angle of the machined surface.
2) When cutting a very hard workpiece, reduce the feed rate.
3) If the depth of cut is shallow, the revolution and feed rate can be increased.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DLC-2MB ➤ J170

DFC-4JC

End mill, Semi long cutting length, 4 flute, For CFRP

Work material	CFRP	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
6	11000	950
8	8000	780
10	6400	700
12	5300	650

DFC-JRT

Cross-nick type end mill , Semi long cutting length, For CFRP

Work material	CFRP	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
6	11000	1200
8	8000	1000
10	6400	900
12	5300	850

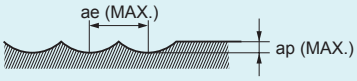
1) Cutting conditions may differ considerably due to the kind of CFRP, the rigidity of the machine, or the clamping and geometry of the workpiece. Please use the above table as a guideline.
2) When high machining accuracy is needed or if large burrs or delamination occur, we recommend reducing the feed rate.
3) When the depth of cut is greater than 0.8D1, we recommend reducing the feed rate.
4) Please take precautions against dust.

DFC-4JC ➤ J101
DFC-JRT ➤ J102

RECOMMENDED CUTTING CONDITIONS FOR CBN END MILLS

CBN-2XLB

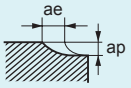
Ball nose, Short cut length, 2 flute, Long neck

Work material	Hardened steel (45−55HRC) AISI H13				Hardened steel (55−62HRC) AISI D2				Hardened steel (62−70HRC) AISI W1, AISI M2			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R0.2	50000	1500	0.006	0.01	50000	1200	0.006	0.01	50000	1200	0.004	0.008
R0.3	50000	2000	0.01	0.02	50000	1500	0.01	0.02	50000	1500	0.008	0.015
R0.4	50000	3000	0.02	0.05	50000	2000	0.02	0.04	50000	2000	0.015	0.03
R0.5	50000	3000	0.03	0.06	50000	2000	0.03	0.05	50000	2000	0.02	0.03
R0.75	50000	3500	0.04	0.08	50000	2500	0.03	0.06	50000	2500	0.02	0.04
R1	50000	4000	0.05	0.1	50000	3000	0.04	0.07	50000	3000	0.03	0.05
Depth of cut												

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Oil mist coolant is recommended.
3) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

CBN-2XLRB

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

Work material	Hardened steel (45−55HRC) AISI H13				Hardened steel (55−62HRC) AISI D2				Hardened steel (62−70HRC) AISI W1, AISI M2			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
0.5	50000	750	0.01	0.2	50000	600	0.01	0.1	40000	400	0.005	0.06
1	38000	1100	0.02	0.3	38000	760	0.01	0.2	25000	400	0.01	0.1
1.5	25000	900	0.03	0.5	25000	700	0.02	0.4	17000	340	0.02	0.2
2	20000	800	0.04	0.7	20000	600	0.03	0.6	12000	300	0.02	0.3
Depth of cut												

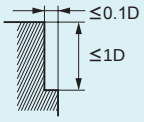
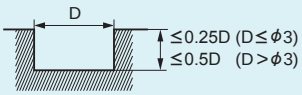
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Oil mist coolant is recommended.
3) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.

CBN-2XLB ➤ J171
CBN-2XLRB ➤ J192

CUTTING CONDITION OF END MILL FOR SLOTTING

SED2KPG
End mill, Short cut length, 2 flute, For key ways

SED2KMG
End mill, Short cut length, 2 flute, For key ways

Work material	Carbon steel, Alloy steel (180−280HB) AISI 1045, AISI P20		Carbon steel, Alloy steel (280−380HB) AISI 1045, AISI P20		Pre-hardened steel (35−45HRC)		Stainless steel (270HB≥) AISI 420		Cast iron (Tensile Strength 350MPa≥) AISI No 35 B	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
2	13000	260 (260)	10300	200 (200)	8800	110 (110)	9800	170 (170)	21500	830 (830)
3	8500	340 (340)	6900	200 (200)	6400	110 (110)	6400	170 (170)	14300	850 (850)
4	6500	380 (380)	5200	250 (200)	4400	140 (110)	4800	200 (160)	10700	860 (860)
5	5100	400 (400)	4100	290 (230)	3500	140 (110)	3800	190 (150)	8600	850 (850)
6	4300	410 (410)	3400	290 (230)	2900	150 (120)	3200	180 (140)	7200	870 (870)
8	3200	410 (410)	2600	250 (200)	2200	140 (110)	2400	150 (120)	5400	880 (880)
10	2600	400 (400)	2070	240 (190)	1800	140 (110)	1900	140 (110)	4300	860 (860)
12	2200	360 (360)	1700	210 (170)	1500	130 (100)	1600	130 (105)	3600	860 (860)
14	1900	340 (340)	1500	200 (160)	1250	130 (100)	1400	130 (100)	3100	860 (860)
16	1600	320 (320)	1300	200 (160)	1100	130 (100)	1200	120 (95)	2700	870 (870)
Depth of cut									D:Dia.	

( ) : Indicates standard feed rate for slotting.

1) The cutting conditions above are a guide only to milling within the standard depth of cut.
2) Ductile cast iron milling has the same cutting conditions as carbon steel and alloy steel. (180−280HB)
3) When drilling, please set the feed rate at 1/3 or below of the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

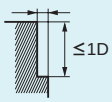
SED2KPG ➤ J057
SED2KMG ➤ J058

RECOMMENDED CUTTING CONDITIONS FOR ALIMASTER END MILLS

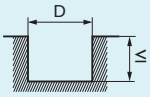
C-2MA

End mill, Medium cut length, 2 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40000	600	40000	460
2	40000	1100	38000	850
3	32000	1400	25000	950
4	24000	1500	19000	1000
5	19000	1600	15000	1000
6	16000	1900	13000	1100
8	12000	1900	9500	1200
10	9500	1900	7600	1200
12	8000	1900	6400	1200
16	6000	1900	4800	1200
20	4800	1500	3800	1000
Depth of cut	≤0.2D (D < ϕ3) ≤0.5D (D ≥ ϕ3)  ≤1D D:Dia.			

Slotting

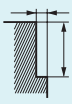
Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40000	460	40000	350
2	38000	850	32000	550
3	25000	950	21000	600
4	19000	1000	16000	650
5	15000	1000	13000	700
6	13000	1100	11000	750
8	9500	1200	8000	800
10	7600	1200	6400	800
12	6400	1200	5300	800
16	4800	1000	4000	720
20	3800	970	3200	660
Depth of cut	 ≤1D (MAX. 12mm) D:Dia.			

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) Climb cutting is recommended for side milling.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

C-2LA

End mill, Long cut length, 2 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy		Aluminium cast	
Cutting speed	150m/min		120m/min	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	40000	320	38000	240
2	24000	380	19000	240
3	16000	510	13000	330
4	12000	580	9500	380
5	9500	640	7600	400
6	8000	640	6400	400
8	6000	770	4800	480
10	4800	770	3800	480
12	4000	770	3200	480
16	3000	670	2400	430
20	2400	610	1900	390
Depth of cut	≤0.05D (D < ϕ3) ≤0.1D (D ≥ ϕ3)  ≦≤2.5D D:Dia.			

1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Water-soluble cutting fluid is recommended.
3) Climb cutting is recommended for side milling.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

C-2MA ➤ J065
C-2LA ➤ J066

C-2MHA

End mill, Medium cut length, 2 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	40000	2400
4	36000	2600
5	30000	4000
6	27000	4000
8	20000	4000
10	16000	4500
12	13000	4500
16	10000	4500
20	8000	4300
25	6000	3600
Depth of cut	≤0.2D, ≤1.5D D:Dia.	

Slotting

Work material	Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	40000	1500
4	36000	1800
5	30000	2800
6	27000	2800
8	20000	2800
10	16000	3200
12	13000	3200
16	10000	3200
20	8000	3000
25	6000	2500
Depth of cut	D, ≤1D (MAX. 20mm) D:Dia.	

1) Water-soluble cutting fluid is recommended.
2) Climb cutting is recommended for side milling.
3) If tool clamping is poor, the tool can be pulled out of the holder. Ensure that the tool is sufficiently clamped.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

C-2SA

End mill, Short cut length, 2 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	40000	1800
4	36000	2400
5	30000	3000
6	27000	3200
8	20000	3400
10	16000	3600
12	13000	3600
16	10000	3600
20	8000	3300
Depth of cut	≦≤0.5D, ≤0.8D D:Dia.	

Slotting

Work material	Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	40000	1600
4	36000	2100
5	30000	2700
6	27000	2800
8	20000	3000
10	16000	3200
12	13000	3200
16	10000	3200
20	8000	3000
Depth of cut	D, ≤0.8D D:Dia.	

1) Water-soluble cutting fluid is recommended.
2) Climb cutting is recommended for side milling.
3) If tool clamping is poor, the tool can be pulled out of the holder. Ensure that the tool is sufficiently clamped.
4) This table shows the cutting condition with less than 4D overhang length. If more than 4D, spindle speed, feed rate and depth of cut should be reduced.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

SOLID END MILLS

C-2MHA ➤ J068
C-2SA ➤ J067

RECOMMENDED CUTTING CONDITIONS FOR ALIMASTER END MILLS

C-3SA
End mill, Short cut length, 3 flute, For aluminium alloy

C-3SARB
Corner radius, Short cut length, 3 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
12	13000	5400
16	10000	5400
18	9000	5000
20	8000	5000
25	6000	4500
Depth of cut	≤0.3D, ≤0.8D, D:Dia.	

Slotting

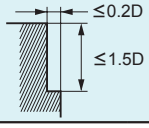
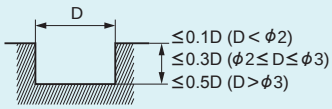
Work material	Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
12	13000	3200
16	10000	3200
18	9000	3000
20	8000	3000
25	6000	2800
Depth of cut	D, ≤0.5D, D:Dia.	

1) Water-soluble cutting fluid is recommended.
2) Climb cutting is recommended for side milling.
3) This table shows the cutting condition with less than 4D overhang length. If more than 4D, spindle speed, feed rate and depth of cut should be reduced.
4) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.

C-3SA ➤ J077
C-3SARB ➤ J193

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

End mill, Short cut length, 2 flute **C-2SS**
End mill, Medium cut length, 2 flute **C-2MS**
End mill, Semi long cut length, 2 flute **C-2JS** 1)
End mill, Long cut length, 2 flute **C-2LS** 2)

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1050, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel, Titanium alloy AISI 304	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.5	17000	50 (50)	14000	45 (45)	11000	30 (30)	9000	30 (30)
1	10000	65 (65)	8500	55 (55)	6400	40 (40)	5200	35 (35)
2	5500	90 (90)	4800	80 (80)	3800	55 (55)	3100	50 (50)
3	4100	100 (100)	3500	85 (85)	2800	65 (65)	2300	60 (60)
4	3400	170 (135)	2900	140 (110)	2200	90 (70)	1900	80 (60)
5	2900	190 (150)	2400	150 (120)	1800	100 (80)	1500	90 (60)
6	2500	200 (160)	2100	170 (135)	1600	110 (90)	1300	95 (65)
8	1900	200 (160)	1600	170 (135)	1200	105 (85)	1000	100 (70)
10	1500	180 (145)	1250	150 (120)	950	95 (75)	800	90 (65)
12	1250	150 (120)	1050	130 (100)	800	80 (65)	660	75 (50)
16	940	110 (90)	800	95 (75)	600	60 (50)	500	55 (40)
20	750	90 (70)	640	80 (65)	480	50 (40)	400	45 (30)
Depth of cut	(C-2SS, C-2MS)   D:Dia.							

( ) : Indicates standard feed rate for slotting.

1) Decrease the feed rate by 20—30% for C-2JS.
2) Decrease the revolution by 20—30% and the feed rate by 40—50% for C-2LS.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

C-2SS ➤ J059
C-2MS ➤ J060
C-2JS ➤ J063
C-2LS ➤ J064

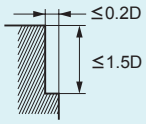
RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

End mill, Medium cut length, 4 flute, Center cutting **C-4MC**

End mill, Semi long cut length, 4 flute, Center cutting **C-4JC** 1)

End mill, Long cut length, 4 flute, Center cutting **C-4LC** 2)

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1050, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—45HRC) AISI P20, AISI H13, AISI P21		Austenitic stainless steel, Titanium alloy AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	4100	150	3500	130	2800	100	2300	90
4	3400	260	2900	210	2200	140	1900	120
5	2900	290	2400	230	1800	150	1500	135
6	2500	300	2100	260	1600	170	1300	140
8	1900	300	1600	260	1200	160	1000	150
10	1500	270	1250	230	950	140	800	135
12	1250	230	1050	200	800	120	660	110
16	940	170	800	140	600	90	500	80
20	750	140	640	120	480	75	400	70
Depth of cut	(C-4MC)  D:Dia.							

1) Decrease the feed rate by 20—30% for C-4JC.
2) Decrease the revolution by 20—30% and the feed rate by 40—50% for C-4LC.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

C-4MC ➤ J103
C-4JC ➤ J104
C-4LC ➤ J105

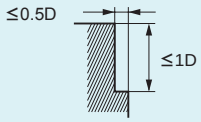
C-SRA

Roughing end mill, Short cut length, 3 flute, For aluminium alloy

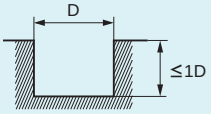
C-SRARB

Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	19000	8600	9500	3400
12	16000	8200	8000	3200
16	12000	7600	6000	3100
18	10500	7200	5300	2900
20	9500	7100	4800	2900
22	8500	6900	4300	2800
25	7500	6800	3800	2700
Depth of cut	 D:Dia.			

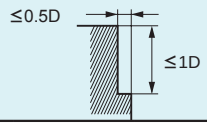
Slotting

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	19000	6800	9500	2700
12	16000	6500	8000	2600
16	12000	6100	6000	2400
18	10500	5800	5300	2400
20	9500	5700	4800	2300
22	8500	5500	4300	2200
25	7500	5400	3800	2200
Depth of cut	 D:Dia.			

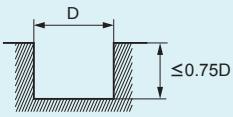
1) Water-soluble cutting fluid is recommended.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Climb cutting is recommended for side milling.
4) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.

Using a high-speed and high-rigidity machining center

Side milling

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	30000	11000	19000	5400
12	30000	12000	16000	5300
16	24000	12000	12000	4900
18	21000	12000	10500	4700
20	19000	11000	9500	4600
22	17000	11000	8500	4300
25	15000	11000	7500	4300
Depth of cut	 D:Dia.			

Slotting

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	30000	8600	19000	4300
12	30000	9900	16000	4300
16	24000	9700	12000	4000
18	21000	9500	10500	3800
20	19000	9100	9500	3700
22	17000	8700	8500	3400
25	15000	8600	7500	3400
Depth of cut	 D:Dia.			

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 side milling.
4) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.

C-SRA ➤ J117
C-SRARB ➤ J194

RECOMMENDED CUTTING CONDITIONS FOR ALIMASTER END MILLS

C-MRA

Roughing end mill, Medium cut length, 3 flute, For aluminium alloy

Side milling

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	40000	2700	25000	1100
4	36000	2700	20000	1100
5	30000	5400	16000	2200
6	27000	6100	13000	2300
8	20000	6000	10000	2400
10	16000	5800	8000	2300
12	13000	5300	6500	2100
16	10000	5100	5000	2000
20	8000	4800	4000	1900
25	6400	4600	3200	1800
Depth of cut	≤0.25D, ≤1.5D, D:Dia.			

Slotting

Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	30000	1800	16000	700
4	24000	2200	12000	900
5	19000	2300	10000	900
6	16000	2400	8000	1000
8	12000	2500	6000	1000
10	9500	2600	5000	1100
12	8000	2300	4000	900
16	6000	2100	3000	800
20	4800	2000	2400	800
25	3800	2000	1900	700
Depth of cut	D, ≤1D, D:Dia.			

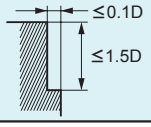
1) Water-soluble cutting fluid is recommended.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Climb cutting is recommended for side milling.
4) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.

C-MRA ➤ J118

SEG4SA

End mill, Medium cut length, 4 flute, Irregular spiral helix angle, For aluminium alloy

Side milling

Work material	Aluminium alloy Plastics		Pure copper	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
6	9600	1700	4800	840
8	7200	1800	3600	900
10	5800	1800	2900	910
12	4800	2000	2400	980
16	3600	2000	1800	980
20	2900	2400	1400	1100
25	2300	2400	1100	1100
Depth of cut	 ≤0.1D ≤1.5D D:Dia.			

1) The cutting conditions above are a guide only to milling within the standard depth of cut.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

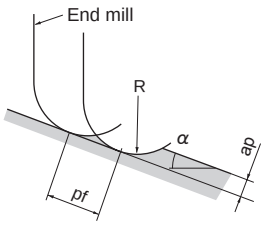
RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

C-2MB

Ball nose end mill, Medium cut length, 2 flute

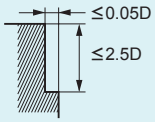
	Roughing (Large depth of cut ≤0.8R)				Finishing (Depth of cut 0.05R)							
Work material	Carbon steel, Alloy steel (−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30−45HRC) AISI H13, AISI P21		Carbon steel, Alloy steel (−30HRC) AISI 1055, AISI P20				Alloy steel, Tool steel, Pre-hardened steel (30−45HRC) AISI H13, AISI D2, AISI P21			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	α≤15°		α>15°		α≤15°		α>15°	
					Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 0.5	—	—	—	—	14000	180	10000	120	12000	150	7000	80
R 1	4100	70	2800	40	10500	350	7300	210	8400	220	5500	130
R 2	2600	120	1650	85	7200	500	5100	300	5900	360	4300	210
R 3	1900	150	1200	95	5200	560	3600	350	4200	410	2900	240
R 4	1400	160	900	105	4000	640	2700	380	3100	440	2200	240
R 5	1100	140	710	95	3200	700	2200	380	2500	460	1750	250
R 6	940	130	600	85	2600	640	1750	350	2100	430	1450	250
R 8	700	100	450	60	1900	620	1300	330	1550	430	1100	250
R10	560	80	360	50	1500	590	1000	310	1250	410	860	250

1) α is the inclination angle of the machined surface.
2) Cutting conditions may differ considerably due to the overhang (milling depth and neck length), depth of cut, and machine tool conditions. Please see the above table as a standard starting point.
3) If the depth of cut is shallow, the revolution and feed rate can be increased.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately. Please reduce the feed rate when the surface finish is important.



C-2MB ➤ J172

SEE2L
End mill, Long cut length, 2 flute

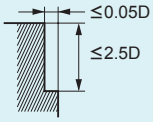
Work material	Carbon steel, Alloy steel (180−280HB) AISI 1045, AISI P20		Carbon steel, Alloy steel (280−380HB) AISI 1045, AISI P20		Pre-hardened steel (35−45HRC)		Stainless steel (270HB≥) AISI 420		Cast iron (Tensile Strength 350MPa≥) AISI No 35 B	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	3400	100	3000	40	2100	20	2600	40	5500	160
4	2400	110	2200	60	1600	30	1900	50	4200	180
5	2000	120	1800	60	1300	40	1500	50	3300	200
6	1600	120	1500	60	1000	40	1300	50	2800	210
8	1200	110	1100	60	800	40	960	50	2100	210
10	1000	100	880	60	640	40	760	50	1600	210
12	800	100	760	70	520	40	640	60	1400	210
16	600	90	560	70	400	40	480	70	1000	220
20	480	80	440	80	320	40	400	70	840	230
Depth of cut	 D:Dia.									

1) The cutting conditions above are a guide only to milling within the standard depth of cut.
2) Ductile cast iron milling has the same cutting conditions as carbon steel and alloy steel. (180−280HB)
3) When drilling, please set the feed rate at 1/3 or below of the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

SEE4L

End mill, Long cut length, 4 flute

Work material	Carbon steel, Alloy steel (180—280HB) AISI 1045, AISI P20		Carbon steel, Alloy steel (280—380HB) AISI 1045, AISI P20		Pre-hardened steel (35—45HRC)		Stainless steel (270HB≥) AISI 420		Cast iron (Tensile Strength 350MPa≥) AISI No 35 B	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	3400	150	3000	60	2100	30	2600	60	5500	240
4	2400	170	2200	90	1600	50	1900	80	4200	270
5	2000	180	1800	90	1300	60	1500	80	3300	300
6	1600	180	1500	90	1000	60	1300	80	2800	320
8	1200	170	1100	90	800	60	960	80	2100	320
10	1000	150	880	90	640	60	760	80	1600	320
12	800	150	760	110	520	60	640	90	1400	320
14	720	150	640	110	480	60	560	110	1200	320
16	600	140	560	110	400	60	480	110	1000	330
18	560	140	480	120	360	60	440	110	960	330
20	480	120	440	120	320	60	400	110	840	350
25	400	120	360	110	240	50	320	90	680	330
Depth of cut	 D:Dia.									

1) The cutting conditions above are a guide only to milling within the standard depth of cut.
2) Ductile cast iron milling has the same cutting conditions as carbon steel and alloy steel. (180—280HB)
3) When drilling, please set the feed rate at 1/3 or below of the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

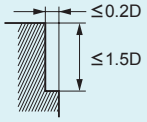
SEE4L ➤ J106

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

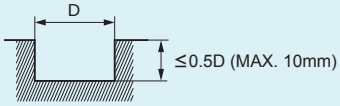
VA-2SS
End mill, Short cut length, 2 flute

VA-2MS
End mill, Medium cut length, 2 flute

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	5400	170	4000	125	2700	85	2200	65
4	4300	200	3200	150	2100	100	1800	75
5	3600	210	2700	160	1800	105	1500	80
6	3200	220	2400	165	1600	110	1300	85
8	2400	240	1800	180	1200	120	1000	90
10	1900	260	1400	190	950	130	800	100
12	1600	240	1200	180	800	120	660	90
16	1200	210	900	160	600	105	500	80
20	950	180	720	135	480	90	400	70
25	760	150	570	115	380	75	320	60
30	640	130	480	100	320	65	270	50
40	470	100	350	75	240	50	200	40
Depth of cut	 D:Dia.							

Slotting

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	3700	110	3000	95	2100	65	1600	50
4	3200	140	2800	130	1800	75	1400	60
5	2900	160	2400	145	1500	80	1200	60
6	2600	170	2100	150	1300	85	1000	70
8	2000	190	1600	160	1000	90	800	70
10	1600	210	1300	180	800	100	640	80
12	1300	190	1100	165	660	90	530	70
16	1000	170	800	140	500	80	400	65
20	720	130	640	120	400	70	320	55
25	570	110	450	90	320	60	230	40
30	480	90	370	75	270	50	190	35
40	360	70	280	60	200	40	140	25
Depth of cut	 D:Dia.							

1) Supply cutting fluid sufficiently during slotting. When dry cut, slotting decrease the revolution and feed rate by 20—30% proportionately.
2) When drilling, please set the feed rate at 1/3 or below of the values above.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

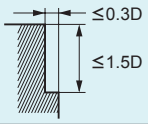
VA-2SS ➤ J244
VA-2MS ➤ J245

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

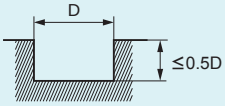
VA-MH

End mill, Medium cut length, 2—4 flute

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	3600	140	2700	100	1800	70	1500	60
6	3200	200	2400	150	1600	100	1300	80
8	2400	220	1800	160	1200	110	1000	90
10	1900	230	1400	170	960	120	800	100
12	1600	240	1200	180	800	120	660	100
16	1200	220	900	160	600	110	500	90
20	950	200	720	150	480	100	400	85
25	760	220	570	170	380	110	320	95
30	640	200	480	150	320	100	270	85
Depth of cut	 D:Dia.							

Slotting

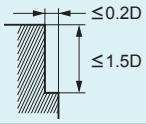
Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	2900	105	2400	75	1500	50	1200	45
6	2600	150	2100	110	1300	75	1000	60
8	2000	165	1600	120	1000	80	800	70
10	1600	170	1300	130	800	90	640	75
12	1300	180	1100	135	660	90	530	75
16	1000	165	800	120	500	80	400	70
20	720	150	640	110	400	75	320	65
25	570	165	450	130	320	80	230	70
30	480	150	370	110	270	75	190	65
Depth of cut	 D:Dia.							

1) Supply cutting fluid sufficiently during slotting. When slotting with dry cut, decrease the revolution and feed rate proportionately by 20—30%.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VA-MH ➤ J259

VA-4MC
End mill, Medium cut length, 4 flute

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	5400	270	4000	200	2700	140	2200	100
4	4300	320	3200	240	2100	160	1800	120
5	3600	340	2700	250	1800	170	1500	130
6	3200	350	2400	260	1600	180	1300	140
8	2400	380	1800	290	1200	190	1000	145
10	1900	420	1400	300	950	210	800	160
12	1600	380	1200	290	800	190	660	145
16	1200	340	900	260	600	170	500	130
20	950	290	720	220	480	140	400	110
25	760	240	570	180	380	120	320	100
30	640	210	480	160	320	100	270	80
Depth of cut	 D:Dia.							

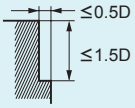
1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

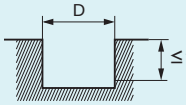
VA-SFPR

Roughing end mill, Short cut length, 4—6 flute, Fine pitch form

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	2800	140	2200	120	1500	80	1300	70
6	2600	180	2000	140	1400	90	1200	80
8	2200	230	1700	180	1200	130	990	100
10	1750	330	1350	250	950	160	800	130
12	1450	330	1100	260	800	180	660	140
16	1100	330	850	260	600	180	500	140
20	880	340	680	260	480	180	400	140
25	700	330	540	250	380	170	320	140
30	580	300	450	230	320	170	270	140
40	350	210	270	170	190	120	160	100
50	250	170	190	130	130	90	110	75
Depth of cut	 D:Dia.							

Slotting

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	2100	100	1650	80	1150	50	960	35
6	2000	130	1550	100	1050	60	900	45
8	1600	160	1300	130	920	90	760	60
10	1300	220	1000	175	730	110	610	80
12	1050	230	850	190	610	130	500	85
16	800	230	640	190	460	130	380	85
20	640	230	510	180	370	130	300	85
25	510	200	410	160	290	110	240	80
30	420	190	320	140	210	90	180	75
40	280	140	210	110	140	70	120	60
50	190	110	150	90	95	55	85	45
Depth of cut	 D:Dia.							

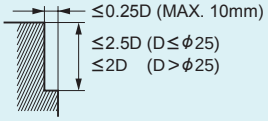
1) Supply cutting fluid sufficiently during cutting. For dry-cutting, decrease the revolution and feed rate proportionately by 20—50%.
2) For smaller depths and widths of cut, the revolution may be increased by 10—20% and the feed rate by 10—40%.
3) When drilling, please set the feed rate at 1/3 or below of the values above.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VA-SFPR ➤ J272

VA-MFPR

Roughing end mill, Medium cut length, 4—6 flute, Fine pitch form

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	2600	90	2000	70	1400	50	1200	40
6	2500	100	1900	90	1300	50	1100	50
8	2000	170	1600	130	1100	90	930	80
10	1650	220	1300	170	900	100	750	90
12	1400	260	1000	210	750	140	620	120
16	1000	290	800	230	560	160	470	130
20	830	300	640	230	450	160	380	130
25	660	290	510	220	360	160	300	130
30	550	270	420	210	300	140	250	130
40	330	180	250	140	180	100	150	90
50	240	160	180	120	120	80	100	70
Depth of cut	 D:Dia.							

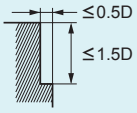
1) Supply cutting fluid sufficiently during cutting. For dry-cutting, decrease the revolution and feed rate proportionately by 20—50%.
2) When the diameter exceeds 30 and the metal removal is less than the quantity shown in the table, the revolution and feed rate may be increased proportionately by 10—40%.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

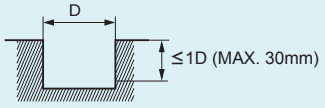
VA-MR

Roughing end mill, Medium cut length, 4—6 flute

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	2400	120	1800	90	1200	60	1000	50
6	2200	155	1700	120	1100	70	930	65
8	1800	200	1400	140	950	100	780	85
10	1500	250	1100	200	810	125	680	100
12	1250	270	960	220	680	160	560	120
16	930	270	720	220	510	160	430	120
20	750	290	580	220	410	160	340	120
25	600	270	460	210	320	140	270	120
30	490	250	380	200	270	140	230	120
40	300	180	230	140	160	105	140	90
50	210	140	160	110	110	80	90	65
Depth of cut	 D:Dia.							

Slotting

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	1800	85	1350	60	920	40	740	25
6	1700	110	1300	85	830	45	700	35
8	1300	140	1050	100	730	70	600	50
10	1100	170	810	140	620	85	520	60
12	900	190	740	160	520	115	420	75
16	680	190	540	160	390	115	330	75
20	550	195	440	150	320	115	260	75
25	440	170	350	135	240	90	200	70
30	350	160	270	120	180	75	155	65
40	240	120	180	90	120	60	105	55
50	260	90	125	75	80	50	70	40
Depth of cut	 D:Dia.							

1) Supply cutting fluid sufficiently during cutting. For dry-cutting, decrease the revolution and feed rate proportionately by 20—50%.
2) When the diameter exceeds 30 and the metal removal is less than the quantity shown in the table, the revolution and feed rate may be increased proportionately by 10—40%.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VA-MR ➤ J274

VA-JR
Roughing end mill, Semi long cut length, 4—6 flute

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1050, AISI 1055		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) SCM, AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	1400	170	1100	130	760	80	640	65
12	1200	170	900	130	640	90	530	80
16	870	170	680	130	480	90	400	80
20	700	170	540	130	380	90	320	80
25	560	170	430	120	300	90	260	80
30	460	155	360	120	260	80	220	65
40	280	105	220	90	150	65	130	65
50	200	90	150	65	100	50	90	40
Depth of cut	≤0.25D (MAX. 10mm) ≤2.5D (D≤ϕ30) ≤2D (D>ϕ30) D:Dia.							

VA-LR
Roughing end mill, Long cut length, 4—6 flute

Side milling

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
10	1000	75	700	55	480	40	400	30
12	850	90	630	70	440	50	370	40
16	700	100	540	80	380	55	320	45
20	560	100	430	80	300	55	260	50
25	450	100	340	75	240	55	210	50
30	370	100	290	75	200	50	170	45
40	260	80	200	60	135	45	120	40
50	180	65	140	50	90	35	80	30
Depth of cut	≤0.1D ≤3D (D≤ϕ30) ≤2.5D (D>ϕ30) (MAX. 100mm) D:Dia.							

1) Supply cutting fluid sufficiently during cutting. For dry-cutting, decrease the revolution and feed rate proportionately by 20—50%.
2) When the diameter exceeds 30 and the metal removal is less than the quantity shown in the table, the revolution and feed rate may be increased proportionately by 10—40%.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

VA-JR ➤ J275
VA-LR ➤ J276

RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

2SS
End mill, Short cut length, 2 flute

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30−35HRC) AISI H13		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.5	8000	60 (50)	7000	40 (35)	4500	30 (25)	3500	25 (20)	7500	65 (55)	16000	120 (100)
1	5300	80 (65)	4200	50 (40)	3000	35 (30)	2400	27 (22)	4500	85 (70)	11000	170 (140)
2	3100	85 (70)	2600	60 (50)	1800	50 (40)	1400	30 (25)	2700	90 (75)	6800	190 (150)
3	2300	90 (75)	1800	65 (55)	1400	55 (45)	1100	35 (30)	2000	95 (80)	4800	240 (190)
4	1800	100 (85)	1400	70 (60)	1100	55 (45)	850	35 (30)	1600	110 (90)	3800	310 (250)
5	1600	110 (95)	1200	90 (75)	900	60 (50)	710	40 (35)	1300	120 (100)	3200	360 (290)
6	1400	120 (100)	1000	90 (75)	780	65 (55)	610	50 (40)	1100	130 (110)	2800	400 (320)
8	1100	130 (110)	800	95 (80)	580	65 (55)	470	50 (40)	850	140 (120)	2200	460 (370)
10	860	140 (120)	640	100 (80)	470	65 (55)	380	55 (45)	700	160 (130)	1800	440 (350)
12	720	130 (110)	530	95 (80)	390	60 (50)	310	50 (40)	580	140 (120)	1600	420 (340)
16	540	110 (95)	400	85 (70)	300	55 (45)	230	40 (35)	440	120 (100)	1200	350 (280)
20	430	100 (80)	320	70 (60)	240	45 (38)	190	35 (30)	350	100 (85)	960	300 (240)
Depth of cut	≤0.1D (D≤ϕ3) ≤0.2D (D>ϕ3) ≤1.5D						D ≤0.1D (D<ϕ2) ≤0.3D (ϕ2≤D≤ϕ3) ≤0.5D (D>ϕ3)				D:Dia.	

( ) : Indicates standard feed rate for slotting.

1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

2SS ➤ J246

RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

S-2MD

End mill, Short cut length, 2 flute, KHA Super

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30−35HRC) AISI H13		Austenitic stainless steel, Alloy steel, Tool steel (35−40HRC) AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
0.5	14000	100 (80)	12000	70 (55)	7700	50 (40)	6000	40 (30)	13000	110 (90)	20000	160 (130)
1	9000	140 (110)	7100	85 (70)	5100	60 (50)	4100	45 (35)	7700	145 (115)	19000	290 (230)
2	5300	145 (115)	4400	100 (80)	3100	85 (70)	2400	50 (40)	4600	150 (120)	12000	320 (260)
3	3900	150 (120)	3100	110 (90)	2400	95 (75)	1900	60 (50)	3400	160 (130)	8200	410 (330)
4	3100	170 (135)	2400	120 (95)	1850	95 (75)	1450	60 (50)	2700	190 (150)	6500	530 (420)
5	2700	190 (150)	2000	150 (120)	1500	100 (80)	1200	70 (55)	2200	200 (160)	5400	610 (490)
6	2400	200 (160)	1700	150 (120)	1300	110 (90)	1000	85 (70)	1900	220 (175)	4800	680 (540)
8	1900	220 (175)	1300	160 (130)	990	110 (90)	800	85 (70)	1450	240 (190)	3800	780 (620)
10	1500	240 (190)	1100	180 (145)	800	110 (90)	650	90 (70)	1200	270 (220)	3200	750 (600)
12	1250	220 (175)	900	160 (130)	670	100 (80)	540	85 (70)	990	240 (190)	2700	710 (570)
16	940	190 (150)	680	145 (115)	500	85 (70)	400	70 (55)	760	200 (160)	2000	600 (480)
20	750	170 (135)	540	120 (95)	400	75 (60)	320	60 (50)	600	170 (135)	1600	510 (410)
Depth of cut	≤0.1D (D≤ϕ3) ≤0.2D (D>ϕ3) ≤1.5D						D ≤0.1D (D<ϕ2) ≤0.3D (ϕ2≤D≤ϕ3) ≤0.5D (D>ϕ3)				D:Dia.	

( ) : Indicates standard feed rate for slotting.

1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

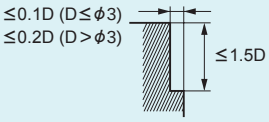
RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

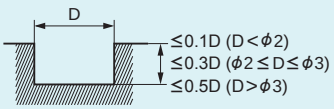
G-2MS

End mill, Medium cut length, 2 flute

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30−35HRC) AISI P20, AISI H13 AISI D2		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	6400	80 (65)	5000	50 (40)	3600	35 (30)	2900	25 (20)	5400	85 (70)	13000	170 (135)
2	3700	85 (70)	3100	60 (50)	2200	50 (40)	1700	30 (25)	3200	90 (70)	8200	190 (150)
3	2800	90 (70)	2200	65 (50)	1700	55 (45)	1300	35 (30)	2400	95 (75)	5800	240 (190)
4	2150	100 (80)	1700	70 (55)	1300	55 (45)	1000	35 (30)	1900	110 (90)	4600	310 (250)
5	1900	115 (90)	1450	90 (70)	1100	60 (50)	850	40 (30)	1600	120 (95)	3800	360 (290)
6	1700	120 (95)	1200	90 (70)	940	65 (50)	730	50 (40)	1300	130 (105)	3400	400 (320)
8	1300	130 (105)	960	95 (75)	700	65 (50)	560	50 (40)	1000	140 (110)	2600	460 (370)
10	1000	145 (115)	770	110 (90)	560	65 (50)	460	55 (45)	840	160 (130)	2200	430 (350)
12	860	130 (105)	640	95 (75)	470	60 (50)	370	50 (40)	700	140 (110)	1900	420 (340)
16	650	115 (90)	480	90 (70)	360	55 (45)	280	40 (30)	530	120 (95)	1450	350 (280)
20	520	95 (75)	380	70 (55)	290	45 (35)	230	35 (30)	420	100 (80)	1150	300 (240)
25	420	85 (70)	300	60 (50)	230	40 (30)	180	30 (25)	340	90 (70)	910	260 (210)
30	350	80 (65)	250	55 (45)	190	35 (30)	145	25 (20)	290	85 (70)	770	240 (190)
40	250	60 (50)	180	35 (30)	140	25 (20)	110	22 (18)	220	65 (50)	580	190 (150)

Depth of cut





D:Dia.

( ) : Indicates standard feed rate for slotting.

1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

2MS
End mill, Medium cut length, 2 flute

2LS 1)
End mill, Long cut length, 2 flute

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
1	5300	65 (50)	4200	40 (30)	3000	30 (25)	2400	22 (18)	4500	70 (55)	11000	140 (110)
2	3100	70 (55)	2600	50 (40)	1800	40 (30)	1400	25 (20)	2700	75 (60)	6800	160 (130)
3	2300	75 (60)	1800	55 (45)	1400	45 (35)	1100	30 (25)	2000	80 (65)	4800	200 (160)
4	1800	85 (70)	1400	60 (50)	1100	45 (35)	850	30 (25)	1600	90 (70)	3800	260 (210)
5	1600	95 (75)	1200	75 (60)	900	50 (40)	710	35 (25)	1300	100 (80)	3200	300 (240)
6	1400	100 (80)	1000	75 (60)	780	55 (45)	610	40 (30)	1100	110 (90)	2800	330 (260)
8	1100	110 (90)	800	80 (65)	580	55 (45)	470	40 (30)	850	115 (90)	2200	380 (300)
10	860	120 (95)	640	85 (70)	470	55 (45)	380	45 (35)	700	130 (105)	1800	360 (290)
12	720	110 (90)	530	80 (65)	390	50 (40)	310	40 (30)	580	115 (90)	1600	350 (280)
16	540	95 (75)	400	75 (60)	300	45 (35)	230	35 (28)	440	100 (80)	1200	290 (230)
20	430	80 (65)	320	60 (50)	240	38 (30)	190	30 (25)	350	85 (70)	960	250 (200)
25	350	70 (55)	250	50 (40)	190	32 (25)	150	25 (20)	285	75 (60)	760	220 (180)
30	290	65 (50)	210	45 (35)	160	28 (22)	120	22 (18)	240	70 (55)	640	200 (160)
40	210	50 (40)	150	30 (25)	120	22 (18)	90	18 (15)	180	55 (45)	480	160 (130)
50	160	40 (30)	115	28 (22)	90	20 (15)	70	15 (12)	140	45 (35)	380	130 (105)
60	130	35 (28)	95	25 (20)	75	18 (15)	55	12 (10)	115	40 (30)	310	110 (90)
Depth of cut	(2MS) ≤0.1D (D≤φ3) ≤0.2D (D>φ3) ≤1.5D D ≤0.1D (D<φ2) ≤0.3D (φ2≤D≤φ3) ≤0.5D (D>φ3) D:Dia.											

( ) : Indicates standard feed rate for slotting.

1) Decrease the revolution by 20—30% and the feed rate by 40—50% for 2LS.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

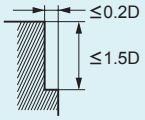
2MS ➤ J252
2LS ➤ J254

RECOMMENDED CUTTING CONDITIONS FOR FOUR-FLUTE END MILLS

S-4MD
End mill, Medium cut length, 4 flute

S-4JC 1)
End mill, Semi long cut length, 4 flute

Side milling

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13		Austenitic stainless steel, Alloy steel, Tool steel (35—40HRC) AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	3900	240	3100	175	2400	150	1900	95	3400	260	8200	660
4	3100	270	2400	190	1850	150	1450	95	2700	300	6500	850
5	2700	300	2000	240	1500	160	1200	110	2200	320	5400	980
6	2400	320	1700	240	1300	175	1000	135	1900	350	4800	1100
8	1900	350	1300	260	990	175	800	135	1450	380	3800	1250
10	1500	380	1100	290	800	175	650	145	1200	430	3200	1200
12	1250	350	900	260	670	160	540	135	990	380	2700	1100
16	940	300	680	230	500	135	400	110	760	320	2000	960
Depth of cut	(S-4MD)  D:Dia.											

1) Decrease the feed rate by 20—30% for S-4JC.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

S-4MD ➤ J262
S-4JC ➤ J266

RECOMMENDED CUTTING CONDITIONS FOR FOUR-FLUTE END MILLS

G-4MC
End mill, Medium cut length, 4 flute

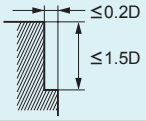
G-4LC 1)
End mill, Long cut length, 4 flute, Center cutting

Side milling

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	2800	145	2200	105	1700	90	1300	55	2400	150	5800	380
4	2150	160	1700	110	1300	90	1000	55	1900	175	4600	500
5	1900	185	1450	145	1100	95	850	65	1600	190	3800	580
6	1700	190	1200	145	940	105	730	80	1300	210	3400	640
8	1300	210	960	150	700	105	560	80	1000	220	2600	740
10	1000	230	770	175	560	105	460	90	840	260	2200	690
12	860	210	640	150	470	95	370	80	700	220	1900	670
16	650	180	480	145	360	90	280	65	530	190	1450	560
20	520	150	380	110	290	70	230	55	420	160	1150	480
25	420	135	300	95	230	65	180	50	340	145	910	420
30	350	130	250	90	190	55	145	40	290	135	770	380
40	250	95	180	55	140	40	110	35	220	105	580	300
50	190	80	140	55	110	40	85	30	170	90	460	260

Depth of cut

(G-4MC)



D:Dia.

1) Decrease the revolution by 20—30% and the feed rate by 40—50% for G-4LC.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

G-4MC ➤ J263
G-4LC ➤ J267

RECOMMENDED CUTTING CONDITIONS FOR FOUR-FLUTE END MILLS

4MC
End mill, Medium cut length, 4 flute, Center cutting

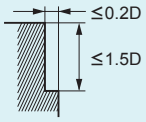
4LC 1)
End mill, Long cut length, 4 flute, Center cutting

Side milling

Work material	Structural steel, Carbon steel AISI 1045, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI No 35 B		Aluminium alloy	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
3	2300	105	1800	80	1400	65	1100	45	2000	110	4800	280
4	1800	120	1400	85	1100	65	850	45	1600	125	3800	370
5	1600	135	1200	105	900	70	710	50	1300	140	3200	420
6	1400	140	1000	105	780	80	610	55	1100	155	2800	460
8	1100	155	800	110	580	80	470	55	850	160	2200	530
10	860	170	640	120	470	80	380	65	700	180	1800	500
12	720	155	530	110	390	70	310	55	580	160	1600	490
16	540	135	400	105	300	65	230	50	440	140	1200	410
20	430	110	320	85	240	55	190	45	350	120	960	350
25	350	100	250	70	190	45	150	35	285	105	760	310
30	290	90	210	65	160	40	120	30	240	100	640	280
40	210	70	150	40	120	30	90	25	180	80	480	220

Depth of cut

(4MC)



D:Dia.

1) Decrease the revolution by 20—30% and the feed rate by 40—50% for 4LC.
2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

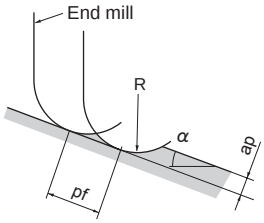
4MC ➤ J264
4LC ➤ J269

S-2MB

Ball nose end mill, Medium cut length, 2 flute

	Roughing (Large depth of cut ≤0.8R)				Finishing (Depth of cut 0.05R)							
Work material	Carbon steel, Alloy steel (−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30−40HRC) AISI H13, AISI P21		Carbon steel, Alloy steel (−30HRC) AISI 1055, AISI P20				Alloy steel, Tool steel, Pre-hardened steel (30−40HRC) AISI H13, AISI D2, AISI P21			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	α≤15°		α>15°		α≤15°		α>15°	
					Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
R 0.5	—	—	—	—	8000	260	6000	140	6800	160	4800	100
R 1	3400	55	2900	50	5700	340	4600	190	4900	210	3600	150
R 2	2300	75	1900	65	3800	420	3000	230	3200	250	2500	190
R 3	1800	115	1400	95	3000	440	2300	270	2500	300	1900	230
R 4	1400	135	1150	105	2300	460	1700	290	2000	380	1500	250
R 5	1100	140	910	115	1900	490	1400	300	1600	420	1200	270
R 6	950	135	760	105	1600	530	1100	300	1400	460	990	270
R 8	700	105	570	85	1200	570	860	340	1000	490	760	300
R10	570	95	460	75	950	570	680	320	800	460	610	290
R12.5	460	85	360	65	760	490	530	300	650	420	480	250
R15	380	75	300	60	640	470	450	280	530	380	400	230
R20	280	60	220	50	480	400	330	240	400	330	300	190

1) α is the inclination angle of the machined surface.
2) Cutting conditions may differ considerably due to the overhang (milling depth and neck length), depth of cut, and machine tool conditions. Please see the above table as a standard starting point.
3) If the depth of cut is shallow, the revolution and feed rate can be increased.
4) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately. Please reduce the feed rate when the surface finish is important.



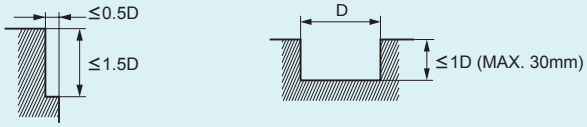
RECOMMENDED CUTTING CONDITIONS FOR ROUGHING END MILLS

Roughing end mill, Short cut length, 4—6 flute **SR**
Roughing end mill, Medium cut length, 4—6 flute **MR**
Roughing end mill, Medium cut length, 4—6 flute **JR** 1)
Roughing end mill, Long cut length, 4—6 flute **LR** 2)

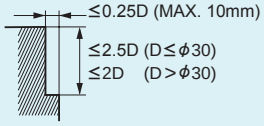
Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	1000 (750)	40 (30)	760 (570)	30 (25)	610 (460)	25 (20)	510 (380)	20 (15)
6	960 (720)	50 (40)	720 (540)	40 (30)	570 (430)	30 (25)	480 (360)	25 (20)
8	800 (600)	65 (50)	600 (450)	50 (40)	500 (380)	40 (30)	400 (300)	30 (25)
10	640 (480)	90 (70)	480 (360)	70 (55)	380 (290)	50 (40)	320 (240)	40 (30)
12	530 (400)	90 (70)	400 (300)	70 (55)	320 (240)	55 (40)	270 (200)	45 (35)
16	400 (300)	90 (70)	300 (230)	70 (55)	240 (180)	55 (40)	200 (150)	45 (35)
20	320 (240)	95 (70)	240 (180)	70 (55)	190 (140)	55 (40)	160 (120)	45 (35)
25	250 (190)	90 (70)	190 (140)	65 (50)	150 (110)	50 (40)	130 (100)	45 (35)
30	210 (160)	85 (65)	160 (120)	65 (50)	130 (100)	50 (40)	110 (85)	45 (35)
40	135 (100)	60 (45)	100 (75)	45 (40)	80 (60)	35 (26)	70 (55)	30 (25)
50	100 (75)	50 (40)	75 (55)	40 (30)	60 (45)	30 (23)	50 (40)	25 (20)

Depth of cut

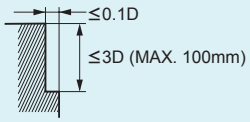
(SR, MR)



(JR)



(LR)



( ) : Indicates standard revolution and feed rate for slotting with SR and MR.

D:Dia.

1) Decrease the revolution shown above by 10—20% and the feed rate by 20—30% for JR.
2) Decrease the revolution shown above by 20—30% and the feed rate by 30—50% for LR.
3) Supply cutting fluid sufficiently during cutting.
4) When the diameter exceeds 30 and the metal removal is less than the quantity shown in the table, the revolution and feed rate may be increased by 10—40%.
5) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

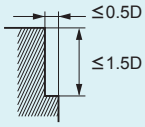
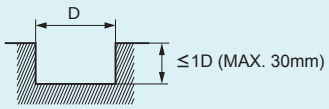
SOLID END MILLS

SR ➤ J277
MR ➤ J279
JR ➤ J280
LR ➤ J281

RECOMMENDED CUTTING CONDITIONS FOR ROUGHING END MILLS

G-SFPR
Roughing end mill, Short cut length, 3—6 flute, Fine pitch form

G-MR
Roughing end mill, Medium cut length, 4—6 flute

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	1200 (900)	50 (40)	900 (680)	35 (25)	730 (550)	30 (23)	610 (460)	25 (20)
6	1150 (860)	60 (45)	860 (650)	50 (40)	680 (510)	35 (26)	580 (440)	30 (23)
8	960 (720)	80 (60)	720 (540)	60 (45)	600 (450)	50 (40)	480 (360)	35 (26)
10	770 (580)	110 (85)	580 (440)	85 (65)	460 (350)	60 (45)	380 (290)	50 (40)
12	640 (480)	110 (85)	480 (360)	85 (65)	380 (290)	65 (50)	320 (240)	55 (40)
16	480 (360)	110 (85)	360 (270)	85 (65)	290 (220)	65 (50)	240 (180)	55 (40)
20	380 (290)	115 (85)	290 (220)	85 (65)	230 (170)	65 (50)	190 (145)	55 (40)
25	300 (230)	110 (85)	230 (170)	80 (60)	180 (135)	60 (45)	160 (120)	55 (40)
30	250 (190)	100 (75)	190 (145)	80 (60)	160 (120)	60 (45)	130 (100)	55 (40)
40	160 (120)	70 (55)	120 (90)	55 (40)	95 (70)	40 (30)	85 (65)	35 (26)
50	120 (90)	60 (45)	90 (70)	50 (40)	70 (55)	35 (25)	60 (45)	30 (23)
Depth of cut	(G-SFPR, G-MR)   D:Dia.							

( ) : Indicates standard revolution and feed rate for slotting with G-SFPR and G-MR.

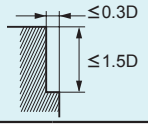
1) Supply cutting fluid sufficiently during cutting.
2) When the diameter exceeds 30 and the metal removal is less than the quantity shown in the table, the revolution and feed rate may be increased by 10—40%.
3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

G-SFPR ➤ J271
G-MR ➤ J278

RECOMMENDED CUTTING CONDITIONS FOR HIGH HELIX/LIGHT ALLOY STEEL END MILLS

K-MH

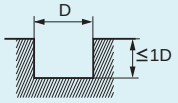
End mill, Medium cut length, 2—4 flute, High helix angle

Work material	Structural steel, Cast iron, Carbon steel AISI 1045, AISI No 35 B, AISI 1050		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel, Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel AISI 304, AISI 316	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)
5	1600	65	1200	50	900	30	710	25
6	1400	90	1000	65	780	45	610	35
8	1100	100	800	75	580	50	470	40
10	860	105	640	80	470	55	380	45
12	720	110	530	80	390	55	310	45
16	540	100	400	75	300	50	230	40
20	430	90	320	65	240	50	190	35
Depth of cut	 D:Dia.							

1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

S-2SDA

End mill, Short cut length, 2 flute, For aluminium alloy

Work material	Cast aluminium, Rolled aluminium, Magnesium alloy resin AC, ADC, A5052, A7075	
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)
3	8200	410
4	6500	530
6	4800	680
8	3800	780
10	3200	750
12	2700	710
16	2000	600
20	1600	510
Depth of cut	 D:Dia.	

1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

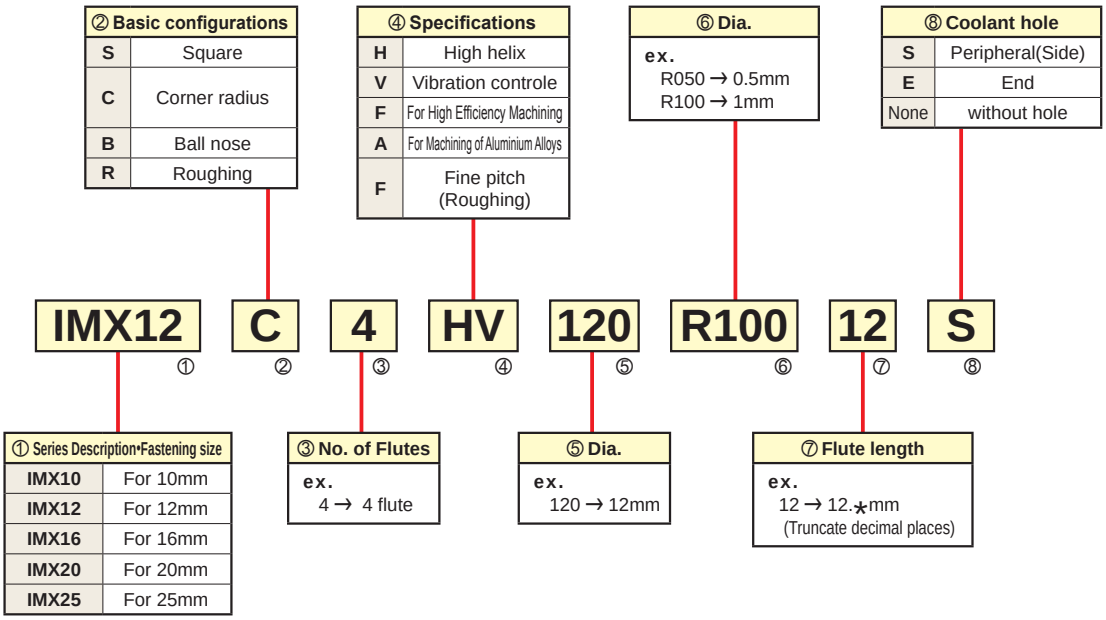
K-MH ➤ J260
S-2SDA ➤ J258

Memo

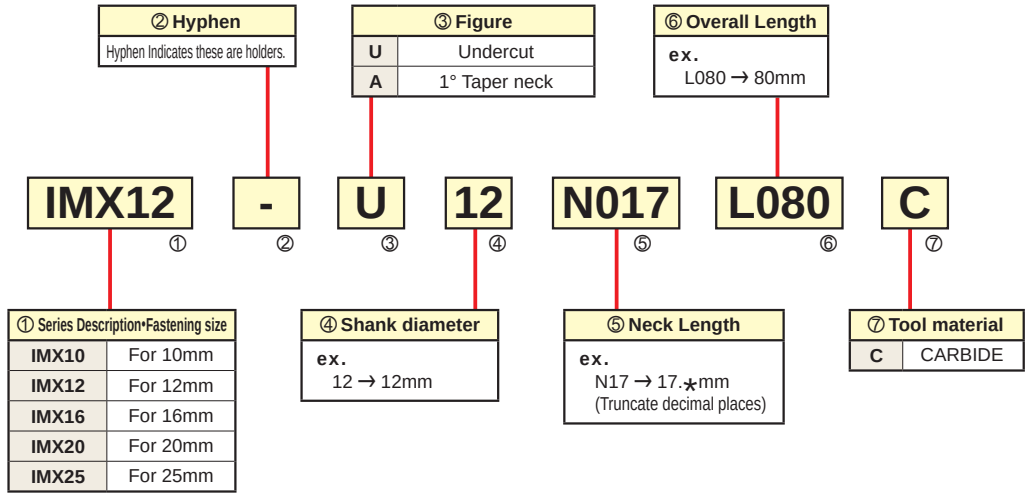
IDENTIFICATION

iMX END MILL SERIES

HEAD



CARBIDE HOLDER



RUN-OUT ACCURACY AND HEAD EXCHANGE ACCURACY

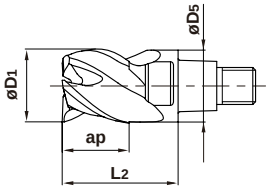
Unit : mm

Run-out accuracy for the peripheral cutting edge	Head exchange accuracy (Axial)
0.015 (ø10~20)	±0.02
0.020 (ø25)	

iMX-S3HV NEW

Square head, 3 flute, Illegular 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	Aluminium Alloy
◎	○			◎	◎	○	



Type1

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			

- 3-flute end mills that cover side milling, slotting and plunging.
- Irregular lead controls vibration and achieves stable machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10S3HV10008	10	8.5	16	9.7	3	●	1
12S3HV12010	12	10.1	19	11.7	3	●	1
16S3HV16013	16	13.3	24	15.5	3	●	1
20S3HV20017	20	17	30	19.5	3	●	1
25S3HV25021	25	21	37.5	24.5	3	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

● : Inventory maintained in Japan.

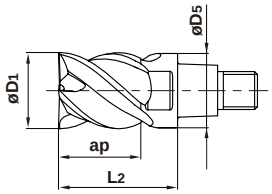
INDEXABLE HEAD END MILLS

iMX-S4HV NEW

Square head, 4 flute, Illegular 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	Aluminium Alloy
◎	○			◎	◎	○	



Type1

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			

Irregular lead controls vibration and achieves stable machining even when machining of difficult-to-cut materials and long overhang.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10S4HV10010	10	10.5	16	9.7	4	●	1
12S4HV12012	12	12.5	19	11.7	4	●	1
16S4HV16016	16	16.5	24	15.5	4	●	1
20S4HV20021	20	21	30	19.5	4	●	1
25S4HV25026	25	26	37.5	24.5	4	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

● : Inventory maintained in Japan.

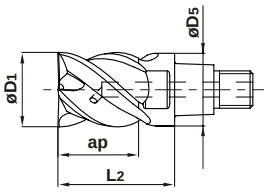
CUTTING CONDITIONS ➤ J436

iMX-S4HV-S NEW

Square head with coolant hole, 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	Aluminium Alloy
◎	○			◎	◎	○	

Peripheral cutting edge with coolant hole



Type1

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			

- Coolant holes for each cutting edge enable stable coolant supply.
- Irregular lead controls vibration and achieves stable machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10S4HV10010S	10	10.5	16	9.7	4	●	1
12S4HV12012S	12	12.5	19	11.7	4	●	1
16S4HV16016S	16	16.5	24	15.5	4	●	1
20S4HV20021S	20	21	30	19.5	4	●	1
25S4HV25026S	25	26	37.5	24.5	4	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

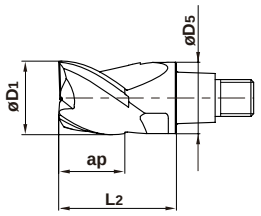
CUTTING CONDITIONS ➤ J436

INDEXABLE HEAD END MILLS

iMX-S3A NEW

Square head, 3 flute, For aluminium 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	Aluminium Alloy
							◎



Type1

D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			

- High efficiency machining due to the sharp cutting edge suitable for aluminium alloy machining and polished rake face.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade ET2020	Type
IMX10S3A10008	10	8.5	16	9.7	3	●	1
12S3A12010	12	10.1	19	11.7	3	●	1
16S3A16013	16	13.3	24	15.5	3	●	1
20S3A20017	20	17	30	19.5	3	●	1
25S3A25021	25	21	37.5	24.5	3	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

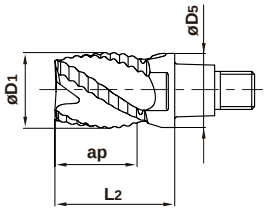
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J441

iMX-R4F NEW

Roughing head, 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	Aluminium Alloy
◎	○			◎	◎	○	



Type1

● Roughing cutting edge reduces the cutting resistance. Effective when the rigidity of the machine or workpiece is low.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10R4F10010	10	10.5	16	9.7	4	●	1
12R4F12012	12	12.5	19	11.7	4	●	1
16R4F16016	16	16.5	24	15.5	4	●	1
20R4F20021	20	21	30	19.5	4	●	1
25R4F25026	25	26	37.5	24.5	4	●	1

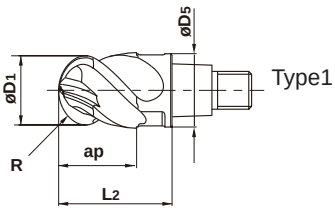
* The fastening size of the holder and head should be the same. (refer to J418)

INDEXABLE HEAD END MILLS

iMX-B4HV NEW

Ball nose 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	Aluminium Alloy
◎	○			◎	◎	○	



R	D1 ≤12	D1>12			
	±0.010	±0.020			
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			

● The variable curve cutting edge controls vibraion and achieves stable machining of difficult-to-cut materilas and for long overhang applications.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10B4HV10010	5	10	10.5	16	9.7	4	●	1
12B4HV12012	6	12	12.5	19	11.7	4	●	1
16B4HV16016	8	16	16.5	24	15.5	4	●	1
20B4HV20021	10	20	21	30	19.5	4	●	1
25B4HV25026	12.5	25	26	37.5	24.5	4	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

● : Inventory maintained in Japan.

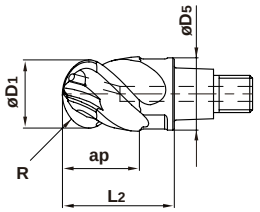
CUTTING CONDITIONS ➤ J443

iMX-B4HV-E NEW

Ball nose head with coolant hole, 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	Aluminium Alloy
◎	○			◎	◎	○	

End cutting edge with coolant hole



Type1

R	D1 ≤12	D1>12			
	±0.010	±0.020			
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			

- Coolant holes for each cutting edge enable stable coolant supply.
- The variable curve cutting edge controls vibraion and achieves stable machining of difficult-to-cut materilas and for long overhang applications.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10B4HV10010E	5	10	10.5	16	9.7	4	●	1
12B4HV12012E	6	12	12.5	19	11.7	4	●	1
16B4HV16016E	8	16	16.5	24	15.5	4	●	1
20B4HV20021E	10	20	21	30	19.5	4	●	1
25B4HV25026E	12.5	25	26	37.5	24.5	4	●	1

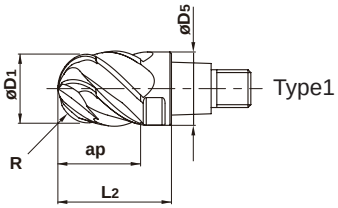
* The fastening size of the holder and head should be the same. (refer to J418)

INDEXABLE HEAD END MILLS

iMX-B6HV NEW

Ball nose head, 6 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	Aluminium Alloy
◎	○			◎	◎		



R	D1 ≤12	D1>12			
	±0.010	±0.020			
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			

- The variable curve cutting edge controls vibraion and achieves stable machining of difficult-to-cut materilas and for long overhang applications.
- 6 flutes enable high machining efficiency.

Unit : mm

Order Number	Radius of Ball Nose R	Dia. D1	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10B6HV10010	5	10	10.5	16	9.7	6	●	1
12B6HV12012	6	12	12.5	19	11.7	6	●	1
16B6HV16016	8	16	16.5	24	15.5	6	●	1
20B6HV20021	10	20	21	30	19.5	6	●	1
25B6HV25026	12.5	25	26	37.5	24.5	6	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

● : Inventory maintained in Japan.

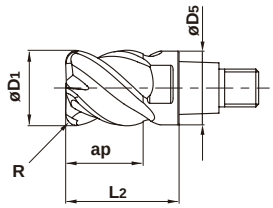
CUTTING CONDITIONS ➤ J443

iMX-C4HV 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	Aluminium Alloy
◎	○			◎	◎	○	



Type1

R					
	±0.020				
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			

● Vibration control corner radius type achieving the stable machining of difficult-to-cut materials and for long overhang applications due to the irregular helix.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10C4HV100R05010	10	0.5	10.5	16	9.7	4	●	1
10C4HV100R10010	10	1	10.5	16	9.7	4	●	1
10C4HV100R15010	10	1.5	10.5	16	9.7	4	●	1
10C4HV100R20010	10	2	10.5	16	9.7	4	●	1
10C4HV100R25010	10	2.5	10.5	16	9.7	4	●	1
10C4HV100R30010	10	3	10.5	16	9.7	4	●	1
12C4HV120R05012	12	0.5	12.5	19	11.7	4	●	1
12C4HV120R10012	12	1	12.5	19	11.7	4	●	1
12C4HV120R15012	12	1.5	12.5	19	11.7	4	●	1
12C4HV120R20012	12	2	12.5	19	11.7	4	●	1
12C4HV120R25012	12	2.5	12.5	19	11.7	4	●	1
12C4HV120R30012	12	3	12.5	19	11.7	4	●	1
16C4HV160R05016	16	0.5	16.5	24	15.5	4	●	1
16C4HV160R10016	16	1	16.5	24	15.5	4	●	1
16C4HV160R15016	16	1.5	16.5	24	15.5	4	●	1
16C4HV160R20016	16	2	16.5	24	15.5	4	●	1
16C4HV160R25016	16	2.5	16.5	24	15.5	4	●	1
16C4HV160R30016	16	3	16.5	24	15.5	4	●	1
16C4HV160R40016	16	4	16.5	24	15.5	4	●	1
16C4HV160R50016	16	5	16.5	24	15.5	4	●	1
20C4HV200R05021	20	0.5	21	30	19.5	4	●	1
20C4HV200R10021	20	1	21	30	19.5	4	●	1
20C4HV200R15021	20	1.5	21	30	19.5	4	●	1
20C4HV200R20021	20	2	21	30	19.5	4	●	1
20C4HV200R25021	20	2.5	21	30	19.5	4	●	1
20C4HV200R30021	20	3	21	30	19.5	4	●	1
20C4HV200R40021	20	4	21	30	19.5	4	●	1
20C4HV200R50021	20	5	21	30	19.5	4	●	1
20C4HV200R63521	20	6.35	21	30	19.5	4	●	1
25C4HV250R10026	25	1	26	37.5	24.5	4	●	1
25C4HV250R20026	25	2	26	37.5	24.5	4	●	1
25C4HV250R30026	25	3	26	37.5	24.5	4	●	1
25C4HV250R40026	25	4	26	37.5	24.5	4	●	1
25C4HV250R50026	25	5	26	37.5	24.5	4	●	1
25C4HV250R63526	25	6.35	26	37.5	24.5	4	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

CUTTING CONDITIONS ➤ J436

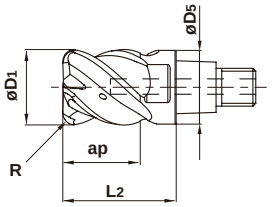
INDEXABLE HEAD END MILLS

iMX-C4HV-S NEW

Corner radius 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	Aluminium Alloy
◎	○			◎	◎	○	

Peripheral cutting edge with coolant hole



Type1

R					
	±0.020				
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			

- Coolant holes for each cutting edge enable stable coolant supply.
- Vibration control corner radius type achieving the stable machining of difficult-to-cut materials and for long overhang applications due to the irregular helix.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10C4HV100R10010S	10	1	10.5	16	9.7	4	●	1
12C4HV120R10012S	12	1	12.5	19	11.7	4	●	1
16C4HV160R10016S	16	1	16.5	24	15.5	4	●	1
20C4HV200R10021S	20	1	21	30	19.5	4	●	1
25C4HV250R10026S	25	1	26	37.5	24.5	4	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

● : Inventory maintained in Japan.

CUTTING CONDITIONS ➢ J436

iMX-C6HV/C10HV/C12HV NEW

Corner radius head, Multi-flute, Irregular helix

UWC

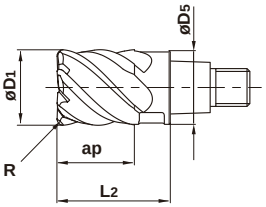
D1 ≤12

D1>12

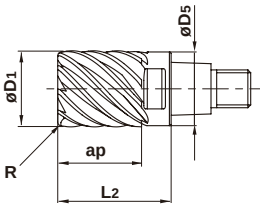

D1 ≤12


D1>12

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	Aluminium Alloy
◎	○			◎	◎		



Type1



Type2

R

±0.020				
D1 ≤12	D1>12			
0 - 0.020	0 - 0.030			

- High machining efficiency due to the multi-flute design.
- Irregular lead controls vibration and achieves stable machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP7020	Type
IMX10C6HV100R10010	10	1	10.5	16	9.7	6	●	1
12C6HV120R10012	12	1	12.5	19	11.7	6	●	1
16C10HV160R10016	16	1	16.5	24	15.5	10	●	2
20C12HV200R10021	20	1	21	30	19.5	12	●	2
25C12HV250R10026	25	1	26	37.5	24.5	12	●	2

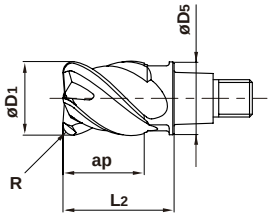
* The fastening size of the holder and head should be the same. (refer to J418)

INDEXABLE HEAD END MILLS

iMX-C4FV NEW

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	Aluminium Alloy
◎	◎	◎					



Type1

R					
	D>20				
±0.010	±0.020				
D1 ≤12	D1>12				
0 - 0.020	0 - 0.030				

- Corner radius end mill for high efficiency machining
- Irregular lead controls vibration and achieves stable machining.

Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade EP6120	Type
IMX10C4FV100R20010	10	2	10.5	16	9.7	4	●	1
12C4FV120R20012	12	2	12.5	19	11.7	4	●	1
16C4FV160R30016	16	3	16.5	24	15.5	4	●	1
20C4FV200R30021	20	3	21	30	19.5	4	●	1
25C4FV250R40026	25	4	26	37.5	24.5	4	●	1

* The fastening size of the holder and head should be the same. (refer to J418)

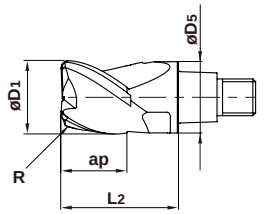
● : Inventory maintained in Japan.

CUTTING CONDITIONS ➤ J440

iMX-C3A NEW

Corner radius head, 3 flute, For aluminium 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	Aluminium Alloy
							◎



Type1

R					
	±0.020				
	D1 ≤12	D1>12			
	0 - 0.020	0 - 0.030			

● High efficiency machining due to the sharp cutting edge suitable for aluminium alloy machining and polished rake face.

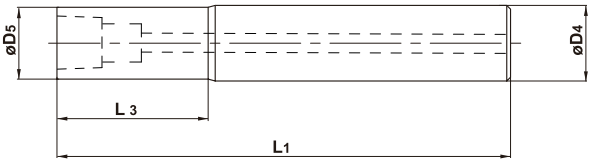
Unit : mm

Order Number	Dia. D1	Corner R R	Length of Cut ap	Head length L2	Neck Dia. D5	No. of Flutes N	Grade ET2020	Type
IMX10C3A100R10008	10	1	8.5	16	9.7	3	●	1
10C3A100R25008	10	2.5	8.5	16	9.7	3	●	1
12C3A120R10010	12	1	10.1	19	11.7	3	●	1
12C3A120R32010	12	3.2	10.1	19	11.7	3	●	1
16C3A160R10013	16	1	13.3	24	15.5	3	●	1
16C3A160R32013	16	3.2	13.3	24	15.5	3	●	1
20C3A200R10017	20	1	17	30	19.5	3	●	1
20C3A200R32017	20	3.2	17	30	19.5	3	●	1
25C3A250R32021	25	3.2	21	37.5	24.5	3	●	1
25C3A250R50021	25	5	21	37.5	24.5	3	●	1

∗ The fastening size of the holder and head should be the same. (refer to J418)

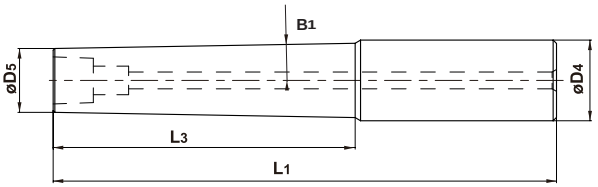
iMX NEW
Carbide Holder

Undercut



Type1

Taper neck type



Type2

h6

8 ≤D4 ≤10	12 ≤D4 ≤16	20 ≤D4 ≤25		
0 - 0.009	0 - 0.011	0 - 0.013		

Carbide Holder

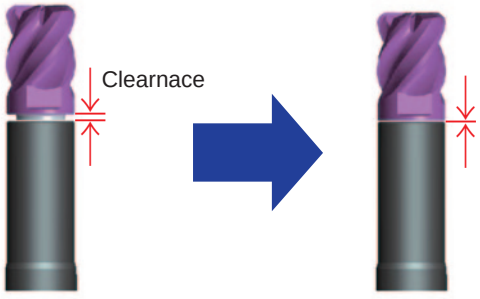
Unit : mm

Order Number	Taper Angle One Side B1	Neck Length L3	Neck Dia. D5	Overall Length L1	Shank Dia. D4	Stock	Type	Suitable Head	Wrench
IMX10-U10N014L070C	—	14	9.7	70	10	●	1	IMX10	IMX10-WR
10-U10N034L090C	—	34	9.7	90	10	●	1	IMX10	IMX10-WR
10-U10N054L110C	—	54	9.7	110	10	●	1	IMX10	IMX10-WR
10-A12N054L110C	1	54	9.7	110	12	●	2	IMX10	IMX10-WR
12-U12N017L080C	—	17	11.7	80	12	●	1	IMX12	IMX12-WR
12-U12N041L100C	—	41	11.7	100	12	●	1	IMX12	IMX12-WR
12-U12N065L130C	—	65	11.7	130	12	●	1	IMX12	IMX12-WR
12-A16N065L130C	1	65	11.7	130	16	●	2	IMX12	IMX12-WR
16-U16N024L080C	—	24	15.5	80	16	●	1	IMX16	IMX16-WR
16-U16N056L110C	—	56	15.5	110	16	●	1	IMX16	IMX16-WR
16-U16N088L150C	—	88	15.5	150	16	●	1	IMX16	IMX16-WR
16-A20N088L150C	1	88	15.5	150	20	●	2	IMX16	IMX16-WR
20-U20N030L090C	—	30	19.5	90	20	●	1	IMX20	IMX20-WR
20-U20N070L130C	—	70	19.5	130	20	●	1	IMX20	IMX20-WR
20-U20N110L180C	—	110	19.5	180	20	●	1	IMX20	IMX20-WR
20-A25N110L180C	1	110	19.5	180	25	●	2	IMX20	IMX20-WR
25-U25N037L110C	—	37.5	24.5	110	25	●	1	IMX25	IMX25-WR
25-U25N087L160C	—	87.5	24.5	160	25	●	1	IMX25	IMX25-WR

*The fastening size of the holder and head should be the same. (refer to J418)

HOW TO INSTALL THE HEAD

- Before installing the head, remove all the dirt and oil etc. around the holder, taper face and end face of the head by cleaning with a waste cloth, air blow or wash spray etc. It is recommended to apply anti-seize compounds to the screw part. (Be aware not to attach to the taper face.)
- Use the provided wrench to tighten until there is no clearance between the head and holder end face.
- If regulating more strictly, use the torque wrench to tighten by the recommended torque below.



Fastening size	Recommended clamp torque (Nm)
IMX10	10
IMX12	15
IMX16	30
IMX20	50
IMX25	75

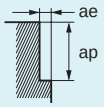
Note 1) Please do not touch the cutting edge with bare hands.
Note 2) Please use the provided wrench. (Thickness is different from the general wrench.)

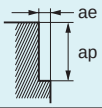
● : **Inventory maintained in Japan.**

iMX-S3HV
Square head, 3 flute, Illegular 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 hardeningstainless steel, Titanium alloy			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	4800	1300	8	2	3800	680	8	2	3200	720	8	2
12	4000	1100	9.6	2.4	3200	620	9.6	2.4	2700	650	9.6	2.4
16	3000	900	12.8	3.2	2400	540	12.8	3.2	2000	540	12.8	3.2
20	2400	720	16	4	1900	430	16	4	1600	430	16	4
25	1900	680	20	5	1500	340	20	5	1300	350	20	5
Depth of cut												

Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	2400	430	8	2	1300	160	8	1
12	2000	390	9.6	2.4	1100	150	9.6	1.2
16	1500	340	12.8	3.2	800	120	12.8	1.6
20	1200	270	16	4	640	96	16	2
25	950	210	20	5	510	77	20	2.5
Depth of cut								

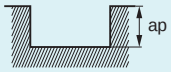
1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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.

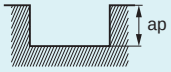
iMX-S3HV

Square head, 3 flute, Illegular 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 hardeningstainless steel, Titanium alloy		
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	4800	860	5	3800	460	5	3200	480	5
12	4000	720	6	3200	430	6	2700	450	6
16	3000	630	8	2400	360	8	2000	360	8
20	2400	500	10	1900	290	10	1600	290	10
25	1900	460	12	1500	230	12	1300	230	12
Depth of cut									

Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy			Heat resistant alloys Inconel718		
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	1900	230	5	950	110	2
12	1600	220	6	800	110	2.4
16	1200	180	8	600	90	3.2
20	950	140	10	480	72	4
25	760	110	12	380	57	5
Depth of cut						

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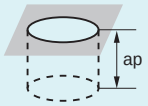
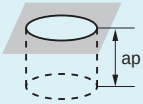
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) The irregular helix flute end mill has a large effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece installation is poor, vibration or abnormal 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, Illegular helix

RECOMMENDED CUTTING CONDITIONS

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 hardeningstainless steel, Titanium alloy			
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)
10	3200	450	5	2.5	2200	200	5	2	1900	57	5	0.6
12	2700	380	6	2.5	1900	170	6	2	1600	48	6	0.6
16	2000	280	8	2.5	1400	130	8	2	1200	36	8	0.6
20	1600	220	10	2.5	1100	100	10	2	950	29	10	0.6
25	1300	180	12.5	2.5	890	80	12.5	2	760	23	12.5	0.6
Depth of cut												

Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy			
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Drilled Depth ap (mm)	Step (mm)
10	1300	39	5	0.6
12	1100	33	6	0.6
16	800	24	8	0.6
20	640	19	10	0.6
25	510	15	12.5	0.6
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 workpiece 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.

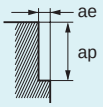
INDEXABLE HEAD END MILLS

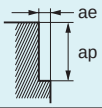
iMX-S4HV/iMX-S4HV-S/iMX-C4HV/iMX-C4HV-S

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 hardeningstainless steel, Titanium alloy			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	4800	1700	10	2	3800	910	10	2	3200	960	10	2
12	4000	1400	12	2.4	3200	830	12	2.4	2700	860	12	2.4
16	3000	1200	16	3.2	2400	720	16	3.2	2000	720	16	3.2
20	2400	960	20	4	1900	570	20	4	1600	580	20	4
25	1900	910	25	5	1500	450	25	5	1300	470	25	5
Depth of cut												

Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	2400	580	10	2	1300	210	10	1
12	2000	520	12	2.4	1100	200	12	1.2
16	1500	450	16	3.2	800	160	16	1.6
20	1200	360	20	4	640	130	20	2
25	950	290	25	5	510	100	25	2.5
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 workpiece 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.

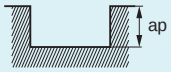
iMX-S4HV	➤ J420
iMX-S4HV-S	➤ J421
iMX-C4HV	➤ J427
iMX-C4HV-S	➤ J428

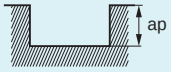
iMX-S4HV/iMX-S4HV-S/iMX-C4HV/iMX-C4HV-S

Square/Corner radius, 4 flute, Irregular helix (With/Without coolant hole)

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 hardeningstainless steel, Titanium alloy		
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	4800	1200	5	3800	610	5	3200	640	5
12	4000	960	6	3200	580	6	2700	590	6
16	3000	840	8	2400	480	8	2000	480	8
20	2400	670	10	1900	380	10	1600	380	10
25	1900	610	12	1500	300	12	1300	310	12
Depth of cut									

Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy			Heat resistant alloys Inconel718		
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	1900	300	5	950	150	2
12	1600	290	6	800	140	2.4
16	1200	240	8	600	120	3.2
20	950	190	10	480	96	4
25	760	150	12	380	76	5
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 workpiece 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.

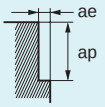
iMX-S4HV	➢ J420
iMX-S4HV-S	➢ J421
iMX-C4HV	➢ J427
iMX-C4HV-S	➢ J428

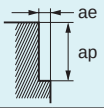
iMX-R4F

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 hardeningstainless steel, Titanium alloy			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	4800	860	8	4	3800	460	8	4	3200	480	8	4
12	4000	720	9.6	4.8	3200	420	9.6	4.8	2700	430	9.6	4.8
16	3000	600	12.8	6.4	2400	360	12.8	6.4	2000	360	12.8	6.4
20	2400	480	16	8	1900	290	16	8	1600	290	16	8
25	1900	460	20	10	1500	230	20	10	1300	230	20	10
Depth of cut												

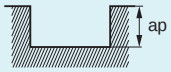
Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy				Heat resistant alloys Inconel718			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	2400	290	8	4	1300	210	8	1
12	2000	260	9.6	4.8	1100	200	9.6	1.2
16	1500	230	12.8	6.4	800	160	12.8	1.6
20	1200	180	16	8	640	130	16	2
25	950	140	20	10	510	100	20	2.5
Depth of cut								

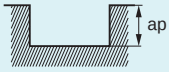
1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Vibration may occur if the rigidity of machine or workpiece is low.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

iMX-R4F
Roughing head, 4 flute

RECOMMENDED CUTTING CONDITIONS

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 hardeningstainless steel, Titanium alloy		
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	3800	680	5	3200	380	5	1900	150	4
12	3200	580	6	2700	350	6	1600	160	4.8
16	2400	480	8	2000	300	8	1200	140	6.4
20	1900	380	10	1600	240	10	950	130	8
25	1500	360	12	1300	200	12	760	100	10
Depth of cut									

Work material	Precipitation hardeningstainless steel, Cobalt chromium alloy		
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	1300	83	4
12	1100	88	4.8
16	800	77	6.4
20	640	70	8
25	510	55	10
Depth of cut			

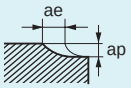
1) For stainless steel, titanium alloy and heat resistant alloy, the use of water-soluble coolant is effective.
2) If the depth of cut is shallow, the revolution and feed rate can be increased.
3) Vibration may occur if the rigidity of machine or workpiece is low.In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

iMX-C4FV

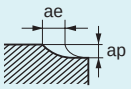
Corner radius head for high efficiency machining, 4 flute, Irregular helix

RECOMMENDED CUTTING CONDITIONS

High depth of cut conditions

Work material		Carbon steel, Alloy steel, Gray Cast Iron				Pre-hardened steel, Alloy tool steel				Hardened steel (45−55HRC)			
Dia. (mm)	CornerR (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	2	2900	2900	1.2	4.5	2400	2000	1	4.5	1900	1700	0.7	4.5
12	2	2400	2400	1.8	6	2000	1700	1.4	6	1600	1400	0.9	6
16	3	1800	1800	1.8	7.5	1500	1200	1.4	7.5	1200	1100	0.9	7.5
20	3	1400	1400	1.8	9	1200	1000	1.4	9	950	850	0.9	9
25	4	1100	1100	2.4	11.5	950	750	1.8	11.5	750	650	1.2	11.5
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)			
Dia. (mm)	CornerR (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	2	4800	9800	0.6	4.5	4000	6900	0.46	4.5	3200	5500	0.36	4.5
12	2	4000	9000	0.9	6	3300	6400	0.7	6	2700	5100	0.45	6
16	3	3000	7200	0.9	7.5	2500	5300	0.7	7.5	2000	4300	0.45	7.5
20	3	2400	5800	0.9	9	2000	3000	0.7	9	1600	2500	0.45	9
25	4	1900	4500	1.2	11.5	1600	2500	0.9	11.5	1300	2000	0.6	11.5
Depth of cut													

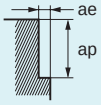
1) If the depth of cut is shallow, the revolution and feed rate can be increased.
2) Air blow or oil mist is recommended for good chip evacuation.
3) For profile machining such as moulds, machining conditions may differ considerably depending on the workpiece geometry, machining methods and depth of cut. Reduce the feed rate especially when machining the corner sections of a workpiece.
4) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the workpiece 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-S3A/iMX-C3A

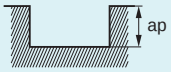
Square/Corner radius head, 3 flute, For aluminium alloy

RECOMMENDED CUTTING CONDITIONS

Side milling

Work material	Aluminium alloy			
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	16000	5600	8	3
12	13000	4600	9.6	3.6
16	10000	4600	12.8	4.8
20	8000	4200	16	6
25	6000	3800	20	7.5
Depth of cut				

Slotting

Work material	Aluminium alloy		
Dia. (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)
10	16000	3300	5
12	13000	2800	6
16	10000	2800	8
20	8000	2600	10
25	6000	2300	12.5
Depth of cut			

1) The use of water-soluble coolant is recommended.
2) Vibration may occur if the rigidity of machine or workpiece is low.
In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.

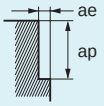
iMX-S3A ➤ J422
iMX-C3A ➤ J431

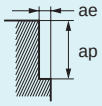
INDEXABLE HEAD END MILLS

iMX-C6HV/C10HV/C12HV

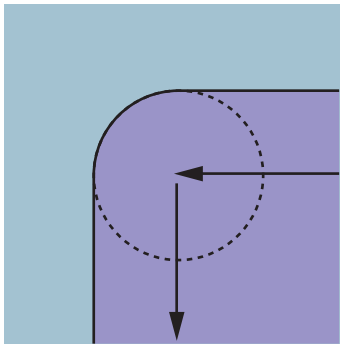
Corner radius head, Multi-flute, Irregular helix

Side milling

Work material	Pre-hardened steel, Carbon steel, Alloy steel, Alloy tool steel				Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Titanium alloy				Precipitation hardeningstainless steel, Cobalt chromium alloy			
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	6400	2700	10	1	4800	2000	10	1	3200	1300	10	1
12	5300	2700	12	1.2	4000	2000	12	1.2	2700	1400	12	1.2
16	4000	2800	16	0.64	3000	2600	16	0.64	2000	1400	16	0.64
20	3200	3100	20	0.8	2400	2900	20	0.8	1600	1500	20	0.8
25	2500	2400	25	1	1900	2300	25	1	1300	1200	25	1
Depth of cut												

Work material	Heat resistant alloys Inconel718			
Dia (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
10	1300	260	10	0.5
12	1100	230	12	0.6
16	800	300	16	0.64
20	640	310	20	0.8
25	510	240	25	1
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 workpiece 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 the head with more than 10 flutes, please set the depth of cut and feed rate to half of the above.



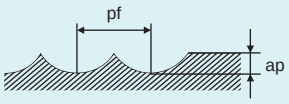
iMX-C6HV	➤ J429
iMX-C10HV	➤ J429
iMX-C12HV	➤ J429

iMX-B4HV/iMX-B4HV-E

Ball nose head, 4 flute, Irregular helix (With/Without coolant hole)

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

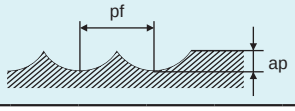
Work material		Carbon steel, Alloy steel, Mild Steel, Pre-hardened steel, Copper, Copper alloys						Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Precipitation hardeningstainless steel, Cobalt chromium alloy, Titanium alloy						Heat resistant alloys Inconel718					
Inclination angle		α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)
Dia (mm)	Radius of Ball Nose (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
10	5	9600	4100	6400	1800	1	2.5	7200	3000	4800	1300	1	2.5	1900	420	1300	180	0.5	1
12	6	8000	4000	5300	1800	1.2	3	6000	3000	4000	1300	1.2	3	1600	350	1100	150	0.6	1.2
16	8	6000	3200	4000	1400	1.6	4	4500	2500	3000	1100	1.6	4	1200	300	800	130	0.8	1.6
20	10	4800	3000	3200	1300	2	5	3600	2300	2400	1000	2	5	1000	250	640	100	1	2
25	12.5	3800	2400	2500	1000	2.5	6	2900	1900	1900	800	2.5	6	760	190	510	80	1.2	2.5
Depth of cut																			

iMX-B6HV

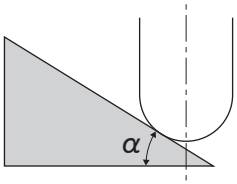
Ball nose head, 6 flute, Irregular helix

RECOMMENDED CUTTING CONDITIONS

Shoulder milling

Work material		Carbon steel, Alloy steel, Mild Steel, Pre-hardened steel						Austenitic stainless steel, Ferritic, Precipitation hardeningstainless steel, Precipitation hardeningstainless steel, Cobalt chromium alloy, Titanium alloy						Heat resistant alloys Inconel718					
Inclination angle		α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)	α≤15°		α>15°		Depth of cut ap (mm)	Pick Feed pf (mm)
Dia (mm)	Radius of Ball Nose (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)			Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)		
10	5	9600	6100	6400	2700	0.5	2	7200	4500	4800	1900	0.5	2	1900	630	1300	270	0.5	1
12	6	8000	6000	5300	2700	0.6	2.4	6000	4500	4000	1900	0.6	2.4	1600	520	1100	220	0.6	1.2
16	8	6000	4800	4000	2100	0.8	3.2	4500	3700	3000	1600	0.8	3.2	1200	450	800	190	0.8	1.6
20	10	4800	4500	3200	1900	1	4	3600	3400	2400	1500	1	4	1000	370	640	150	1	2
25	12.5	3800	3600	2500	1500	1.2	5	2900	2800	1900	1200	1.2	5	760	300	510	120	1.2	2.5
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 workpiece 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	➤ J424
iMX-B4HV-E	➤ J425
iMX-B6HV	➤ J426