

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.

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

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

MSTAR END MILLS
MS255
 End mill, Short cut length, 2 flute

Material: Hardened Steel (P20/P18), Hardened Steel (P20/P18), Austenitic Stainless Steel, Titanium Alloy (Ti-6Al-4V), Copper Alloy, Aluminum Alloy

Unit: mm

Order Number	Di	Length of Cut ap	Overall Length L1	Shank Dia. Da	No. of Flutes N	Type
MS2550010	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

●To Order:

For solid-carbide drill or brazed drill, please specify ①order number.

MILLING TOOLS

SOLID END MILLS

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SOLID END MILLS STANDARD

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*Arranged by Alphabetical order

B185 BEM	B271 K-LH	B215 SEG2SA	B143 VC-MDL
B188 BZD2SG	B270 K-MH	B216 SEG4SA	B146 VC-MDRB
B195 C-2JS	B265 LR	B260 SR	B142 VC-MD-SC
B198 C-2LA	B263 MR	B214 SZE4S	B149 VC-MH
B196 C-2LS	B266 MRB	B220 VA-2MB	B147 VC-MHDB
B197 C-2MA	B040 MS2ES	B218 VA-2MS	B131 VC-PSRB
B202 C-2MB	B022 MS2JS	B217 VA-2SS	B159 VC-RC
B206 C-2MHA	B023 MS2LS	B219 VA-4MC	B145 VC-SDRB
B192 C-2MS	B044 MS2MB	B224 VA-JR	B152 VC-SFPR
B204 C-2SA	B021 MS2MD	B227 VA-LH	B126 VC-XB
B191 C-2SS	B055 MS2MRB	B225 VA-LR	B076 VF-2MD
B205 C-3SA	B019 MS2MS	B222 VA-MFPR	B086 VF-2SB
B209 C-3SARB	B062 MS2MT	B226 VA-MH	B087 VF-2SDB
B200 C-4JC	B075 MS2MTB	B223 VA-MR	B088 VF-2SDBL
B201 C-4LC	B043 MS2SB	B221 VA-SFPR	B085 VF-2SSB
B199 C-4MC	B018 MS2SS	B158 VC-2C	B084 VF-2WB
B182 CBN-2XLB	B051 MS2XB	B114 VC-2ESB	B077 VF-2XL
B183 CBN-2XLRB	B024 MS2XL	B136 VC-2JRB	B090 VF-2XLB
B203 C-MH	B027 MS2XL6	B109 VC-2JS	B089 VF-2XLBS
B208 C-MRA	B045 MS2XLB	B123 VC-2LB	B095 VF-3XB
B166 CRN-2MB	B057 MS2XLRB	B119 VC-2MB	B098 VF-4MB
B170 CRN-2MRB	B041 MS3ES	B121 VC-2MB-OH	B078 VF-4MD
B162 CRN-2MS	B042 MS4EC	B120 VC-2MB-SS	B100 VF-6MHVRB
B163 CRN-2XL	B036 MS4JC	B122 VC-2MDB	B081 VF-MD
B167 CRN-2XLB	B066 MS4LT	B106 VC-2MS	B102 VF-MDRB
B171 CRN-2XLRB	B072 MS4LTB	B108 VC-2MS-SS	B083 VF-MFPR
B165 CRN-4JC	B035 MS4MC	B153 VC-2MT	B079 VF-MHV
B207 C-SRA	B058 MS4MRB	B117 VC-2PSB	B099 VF-MHVRB
B210 C-SRARB	B034 MS4SC	B118 VC-2PSB-P	B080 VF-SD
B179 DC-2LB	B037 MS4XL	B116 VC-2SB	B101 VF-SDRB
B178 DC-2MB	B269 MSF	B104 VC-2SS	B082 VF-SFPR
B177 DC-2MB-NF	B032 MSJHD	B115 VC-2SSB	B160 VJ-2MS
B176 DC-2MS-3	B030 MSMHD	B110 VC-2XL	B161 VJ-4MS
B180 DC-2XLB	B060 MSMHDB	B124 VC-2XLB	B273 1LA
B181 DC-XB	B033 MSMHZD	B125 VC-2XLB-6	B272 1MA
B174 DLC-2MA	B029 MSSHD	B129 VC-3LB	B258 2FB
B175 DLC-2MB	B281 RB	B128 VC-3MB	B243 2LS
B238 G-2MS	B282 RC	B113 VC-4JC	B275 2MA
B228 G-2SS	B242 S-2JS	B138 VC-4JRB	B245 2MK
B255 G-4LC	B257 S-2MB	B130 VC-4MB	B277 2ML
B251 G-4MC	B234 S-2MD	B111 VC-4MC	B240 2MS
B184 GBE	B274 S-2SDA	B112 VC-4MC-SS	B229 2SS
B184 GDE	B254 S-4JC	B154 VC-4MT	B248 3MS
B262 G-MR	B249 S-4MD	B137 VC-4SRB	B256 4LC
B267 G-MSF	B187 SED2KMG	B156 VC-4STB	B252 4MC
B261 G-SFPR	B186 SED2KPG	B150 VC-6MH	B278 4ML
B264 JR	B212 SEE2L	B151 VC-8MH	B280 4MX
B247 K-2SL	B211 SEE2S	B139 VC-HFRB	B279 4SX
B276 K-2XL	B189 SEE2SG	B144 VC-LD	
B259 K-4MB	B213 SEE4L	B141 VC-MD	

IDENTIFICATION

ORDER NUMBER OF END MILLS

MS	2	M	S	D0100	* * *
End mill names	Number of flutes	Flute length	Features	Dimensions	Others
MS : Mstar end mills	1 : 1flute	ES : Extra short	S : General-use	D * * * * : Diameter	S * * : Shank diameter
VF : Impact Miracle end mills	2 : 2flute	S : Short	U : For stainless steel	ex.	N * * * : Neck length
VC : Miracle end mills	3 : 3flute	M : Medium	K : For keyway	D0050 → $\phi 0.5$	T * * * * : Taper angle one side
VJ : Miracle jumbo end mills	4 : 4flute	J : Semi long	A : For light alloy	D0500 → $\phi 5$	L * * : Flute length
CRN : CRN coated end mills	...	L : Long	C : Center cut	R * * * * : Radius of ball nose	A * * * : Overall Length
DLC : DLC coated end mills		XL : Long neck	D : For deep cut	ex.	
DC : Diamond coated end mills		X : Taper neck	V : Irregular spiral helix angle	R0050 → R0.5	
CBN : CBN end mills		SX : Extra long	B : Ball nose	R0500 → R5	
C : Carbide end mills		MX : Extra long	R : Roughing		
VA : Violet end mills			FPR : Fine roughing		
G : TiN coated end mills			H : High helix		
S : KHAS end mills (High-grade powder high-speed steel)			T : Taper		
K : KHA end mills (Powder metallurgy HSS)			TB : Taper ball nose		
None : Cobalt high-speed steel			RB : Corner radius		
			3 : 3mm shank		
			6 : 6mm shank		

*Other types are available by special order.

SE	E	2	040	S	G
End mill names	Helix angle	Number of flutes	Diameter	Shape	Coating
SZ : Super square	D : 30°	2 : 2flute	ex.	S : Short	G : (Al, Ti)N Coating
BZ : Super ball	E : 45°	4 : 4flute	010 → $\phi 1$	M : Standard	
SE : Square end mill	G : Irregular spiral helix angle (38°/41°)		050 → $\phi 5$	L : Long	
				KP : For key way (+)	
				KM : For key way (-)	

*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



(Al,Ti)N Coating

(Al,Ti)N offers higher versatility.



IMPACT MIRACLE Coating

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



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.)



Diamond Coating

Pure Diamond high performance coating excelling in film adhesion to the substrate.



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

IMPACT MIRACLE Coating

For higher hardness, higher speed and longer tool life!

In comparison with the conventional coating single-phase nano crystal coating technology offers higher coating hardness and heat resistance.

When machining hardened steels it can be seen that the IMPACT MIRACLE coating offers a lower friction of coefficient and as such prevents abnormal damage such as chipping.



FEATURES OF IMPACT MIRACLE COATING

	IMPACT MIRACLE Single phase nano coating (Al,Ti,Si)N	(Al,Ti,Si)N	(Al,Ti)N
Hardness (HV)	3700	3200	2800
Oxidation Temperature (°C)	1300	1100	840
Adhesion (N) ¹⁾	100	80	80
Wear Coefficient ²⁾ (800°C)	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

MIRACLE coating for high speed milling.

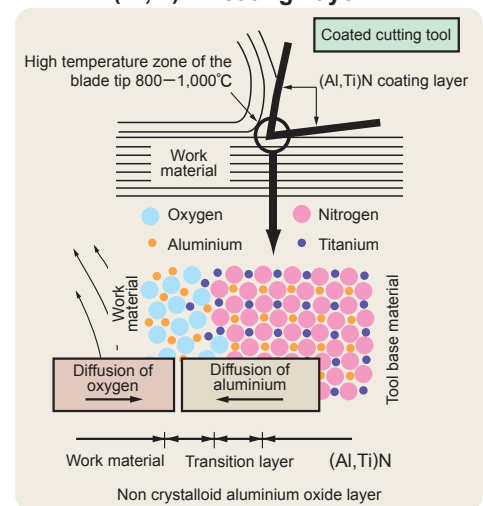
Miracle coating is produced by adding Al to an existing TiN coating.

This coating layer consists of a compound solid solution of (AlTi)N.

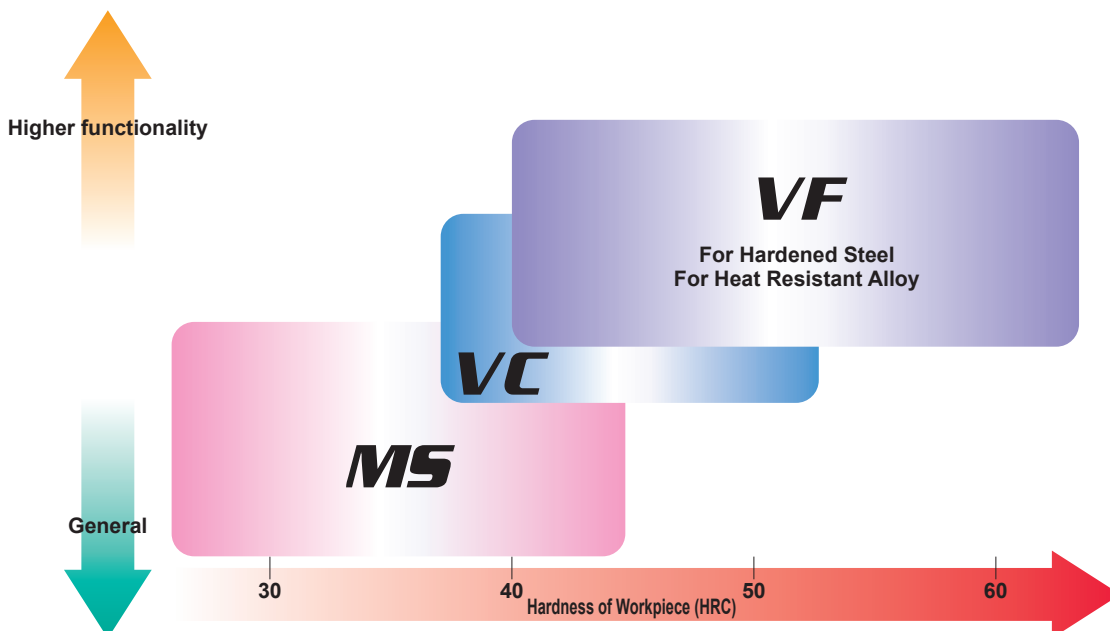
This coating has succeeded in improving heat resistance during cutting in addition to adding high hardness properties to the tool.

The result is improved performance for dry, high speed cutting of hardened materials.

Oxidation Behavior Concept Chart of (Al,Ti)N Coating Layer



Coating application range



CRN Coating

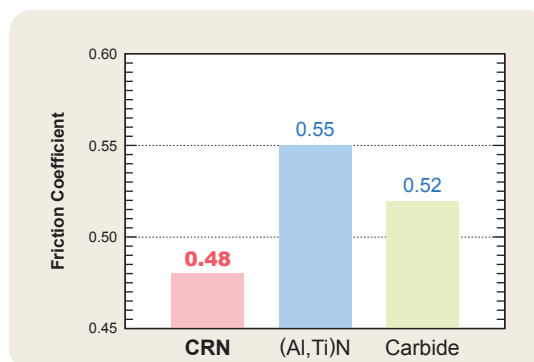
Specially designed for milling of copper electrode and copper alloy.

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.

FEATURES OF CRN COATING

	CRN	(Al,Ti)N	Carbide
Hardness (HV)	2000	2800	1600
Adhesion (N)	80	80	—

Friction Coefficient against copper at the high temperature of 600°C



DLC Coating

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.

FEATURES OF DLC COATING

	Mitsubishi's DLC	Competitor's DLC	Diamond	TiN
Hardness (HV)	6000—7000	1000—7000	7000—10000	2000
Friction Coefficient	0.1	0.1	0.4	0.4

Diamond Coating

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.

VIOLET Coating

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

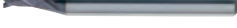
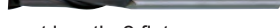
Violet coating is the name of the technology of successfully applying a Miracle type coating to HSS substrate tools. The newly developed technology of applying (Al,Ti)N coating at the low temperatures required for HSS substrates, means that Violet coating has the same level of adhesion strength as Miracle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

FEATURES OF VIOLET COATING

	Violet Coating	TiN
Hardness (HV)	2800	1900
Adhesion (N)	80	60
Oxidation Temperature (°C)	840	620

END MILLS SELECTION CHART

CEMENTED CARBIDE

Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material						Page Number		
							P Carbon Steel, Alloy Steel, Cast Iron	H Tool Steel, Pre-Hardened Steel, Hardened Steel	M Hardened Steel (≤55HRC)	S Hardened Steel (55HRC-)	N Austenitic Stainless Steel	T Titanium Alloy, Heat Resistant Alloy	C Copper Alloy	A Aluminium Alloy	Dimensions
SQUARE	General Use	2		MS2SS	 End mill, Short cut length, 2 flute	φ0.1 —φ12								B018	B284
				MS2MS	 End mill, Medium cut length, 2 flute	φ0.2 —φ20								B019	B284
				MS2MD ^{NEW}	 End mill, Medium cut length, 2 flute, Strong geometry type	φ1 —φ12								B021	B285
				MS2JS	 End mill, Semi long cut length, 2 flute	φ0.1 —φ12								B022	B286
				MS2LS	 End mill, Long cut length, 2 flute	φ0.2 —φ12								B023	B287
				VC-2SS	 End mill, Extra short cut length, 2 flute	φ0.3 —φ16								B104	B323
				VC-2MS	 End mill, Medium cut length, 2 flute	φ0.3 —φ25								B106	B324
				VC-2JS	 End mill, Semi long cut length, 2 flute	φ1 —φ25								B109	B325
			—	C-2SS	 End mill, Short cut length, 2 flute	φ0.4 —φ6								B191	B365
			—	C-2MS	 End mill, Medium cut length, 2 flute	φ1 —φ20								B192	B365
			—	C-2JS	 End mill, Semi long cut length, 2 flute	φ1 —φ25								B195	B365
			—	C-2LS	 End mill, Long cut length, 2 flute	φ1 —φ20								B196	B365
		4		MS4SC	 End mill, Short cut length, 4 flute	φ1 —φ12								B034	B293
				MS4MC	 End mill, Medium cut length, 4 flute	φ1 —φ20								B035	B293
				MS4JC	 End mill, Semi long cut length, 4 flute	φ1 —φ12								B036	B294
				VC-4MC	 End mill, Medium cut length, 4 flute	φ2 —φ25								B111	B327
				VC-4JC	 End mill, Semi long cut length, 4 flute	φ3 —φ25								B113	B328
			—	C-4MC	 End mill, Medium cut length, 4 flute, Center cutting	φ3 —φ20								B199	B367

Type	Applications, Features	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
SQUARE	General Use	4	—	C-4JC	 End mill, Semi long cut length, 4 flute, Center cutting	φ3 —φ25	○	○			○	○	○	○	B200	B367
			—	C-4LC	 End mill, Long cut length, 4 flute, Center cutting	φ3 —φ20	○	○			○	○	○	○	B201	B367
	General Use Slim Shank	2		VC-2MS-55	 End mill, Medium cut length, 2 flute, Slim shank	φ6 —φ12	○	◎			○	○			B108	—
		4		VC-4MC-55	 End mill, Medium cut length, 4 flute, Slim shank	φ6 —φ12	○	◎	○		○	○			B112	—
	General Use High Helix	2		SEE2SG	 End mill, Short cut length, 2 flute, High helix	φ3 —φ25	◎	○			○	○	○	○	B189	B363
			—	SEE2S	 End mill, Short cut length, 2 flute	φ3 —φ20	◎	○			○	○	○	○	B211	B373
			—	SEE2L	 End mill, Long cut length, 2 flute	φ3 —φ20	◎	○			○	○	○	○	B212	B373
		3		MSMHZD	 Slotting, Medium cut length, 3 flute	φ1 —φ20	◎	◎	○		◎	○			B033	B292
		4		MSSHHD	 High power, Short cut length, 4 flute	φ3 —φ20	◎	◎	○		◎	◎			B029	B290
				MSMHD	 High power, Medium cut length, 4 flute	φ2 —φ25	◎	◎	○		◎	◎			B030	B290
				MSJHD	 High power, Semi long cut length, 4 flute	φ2 —φ20	◎	◎	○		◎	◎			B032	B291
			—	SIZE4S	 End mill, Medium cut length, 4 flute, Super Square geometry	φ3 —φ25	◎	○			○	○		○	B214	—
			—	SEE4L	 End mill, Long cut length, 4 flute	φ3 —φ25	◎	○			○	○		○	B213	B374
	For Machining of Hardened Steels	2		VF-2MD NEW	 End mill, Medium cut length, 2 flute, For hardened materials	φ0.5 —φ6	○	◎	◎	◎					B076	B306
		4		VF-4MD NEW	 End mill, Medium cut length, 4 flute, For hardened materials	φ1 —φ20	○	◎	◎	◎					B078	B308
		4 6		VF-5D	 End mill, Short cut length, For hardened materials	φ1 —φ12	○	◎	◎	◎					B080	B322
				VF-MD	 End mill, Medium cut length, For hardened materials	φ1 —φ25	○	◎	◎	◎					B081	B322
				VC-MD-5C	 End mill, Medium cut length, 4—6 flute	φ0.5 —φ3	○	◎	◎	◎					B142	B335

END MILLS SELECTION CHART

CEMENTED CARBIDE

Type	Applications, Features	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	
SQUARE	For Machining of Hardened Steels	4 6	VC	VC-MD		φ1 —φ25	○	◎	◎	◎					B141	B335
		6	VC	VC-LD		φ6 —φ25	○	◎	◎	◎					B144	B336
			VC	VC-MDL		φ3 —φ25	○	◎	◎	◎					B143	B336
	For Machining of Copper Alloys	2	CRN	CRN-2MS		φ0.2 —φ12						◎	○	B162	B351	
		4	CRN	CRN-4JC		φ3 —φ12						◎	○	B165	B351	
	For Difficult-to-cut Materials	3 4	VC	VC-MH		φ3 —φ25	○	◎	○		◎	◎			B149	B337
		3	—	C-MH		φ6 —φ16	○	◎			○	○		○	B203	—
		4	VF	VF-MHV		φ6 —φ20	○	○	○		◎	◎			B079	B309
		6	VC	VC-6MH		φ6 —φ25	◎	◎	○		◎	◎			B150	B338
		8	VC	VC-8MH		φ20 —φ25	◎	◎	○		◎	◎			B151	B338
	For Machining of Aluminium Alloys	2	DLC	DLC-2MA		φ1 —φ20	GFRP, CFRP Suitable for graphite					○	◎	B174	B357	
			—	C-2MA		φ1 —φ20							◎	B197	B366	
			—	C-2LA		φ1 —φ20							◎	B198	B366	
			—	C-2MHA		φ3 —φ25							◎	B206	B369	
			—	C-2SA		φ3 —φ20							○	◎	B204	B369
			—	SEG2SA		φ6 —φ25							○	◎	B215	B375
		3	—	C-3SA		φ10 —φ26							○	◎	B205	B370
		4	—	SEG4SA		φ6 —φ25							○	◎	B216	B375

Type	Applications, Features	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		
SQUARE	For Small Automatic Lathes	2	MS	MS2ES	 End mill, 2 flute, For small automatic lathes	φ3 -φ12	◎	◎	○		○	○			B040	B296	
		3	MS	MS3ES	 End mill, 3 flute, For small automatic lathes	φ3 -φ12	◎	◎	○		○	○			B041	B296	
		4	MS	MS4EC	 End mill, 4 flute, For small automatic lathes	φ3 -φ14	◎	◎	○		○	○			B042	B296	
	For Key Way Slotting	2	MS	SED2KPG	 End mill, Medium cut length, 2 flute, + Tolerance	φ2 -φ16	◎	◎			○	○			B186	B363	
			MS	SED2KMG	 End mill, Medium cut length, 2 flute, - Tolerance	φ2 -φ16	◎	◎			○	○			B187	B363	
	Brazing	4	VC	VJ-2MS	 End mill, Medium cut length, 2 flute	φ20 -φ50	◎	◎	◎	○	○	○			B160	B350	
			VC	VJ-4MS	 End mill, Medium cut length, 4 flute	φ20 -φ50	◎	◎	◎	○	○	○			B161	B350	
	For Non-ferrous Metals		DC	DC-2MS-3	 Medium cut length, 2 flute, 3mm shank, For non-ferrous metals	φ0.5 -φ3	GFRP, CFRP Suitable for graphite					○		B176	B359		
LONG NECK SQUARE	For Rib Milling	2	MS	MS2XL	 End mill, Short cut length, 2 flute, Long neck	φ0.2 -φ6	◎	◎	○		○	○			B024	B288	
			MS	MS2XL6	 End mill, Short cut length, 2 flute, 6mm shank	φ0.3 -φ2.5	◎	◎	○		○	○			B027	B289	
		4	MS	MS4XL	 End mill, Short cut length, 4 flute, Long neck	φ1 -φ10	◎	◎	○		○	○			B037	B295	
			VC	VC-2XL	 End mill, Medium cut length, 2 flute, Long neck	φ0.8 -φ3	◎	◎	○		○	○			B110	B326	
	For Rib Milling of Hardened Steels		VF	VF-2XL	 End mill, 2 flute, Long neck	φ0.1 -φ3	○	◎	◎	◎					B077	B307	
			CRN	CRN-2XL	 End mill, Medium cut length, 2 flute, Long neck, For copper electrodes	φ0.2 -φ6							◎	○	B163	B352	
	BALL	For Profiling	2	MS	MS2SB	 Ball nose end mill, Short cut length, 2 flute	R0.1 -R6	◎	◎	○		○	○			B043	B297
				MS	MS2MB	 Ball nose end mill, Medium cut length, 2 flute	R0.25 -R6	◎	◎	○		○	○			B044	B297
For Precision Profiling			MS	BZD25G	 Ball nose end mill, Medium cut length, 2 flute	R0.2 -R12.5	○	◎	○		○	○			B188	B364	
			VC	VC-2ESB	 Ball nose, Extra short cut length, 2 flute, Short shank	R0.15 -R6	○	◎	◎	○	○	○			B114	B331	

END MILLS SELECTION CHART

CEMENTED CARBIDE

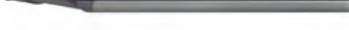
Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material								Page Number		
							P	H	M	S	N	Copper Alloy	Aluminium Alloy	Dimensions	Cutting Conditions		
							Carbon Steel, Alloy Steel, Cast Iron	Tool Steel, Pre-Hardened Steel, Hardened Steel	Hardened Steel (≤55HRC)	Hardened Steel (55HRC-)	Austenitic Stainless Steel					Titanium Alloy, Heat Resistant Alloy	
BALL	For Profiling	2	VC	VC-255B	 Ball nose, Short cut length, 2 flute, Short shank	R0.5 -R6	○	◎	◎	○	○	○			B115	B331	
			VC	VC-2MB	 Ball nose end mill, Medium cut length, 2 flute	R0.2 -R12.5	○		◎	◎	○	○	○			B119	B331
			—	C-2MB	 Ball nose end mill, Medium cut length, 2 flute	R0.5 -R10	◎	○			○	○	○	○	B202	B368	
	For High Efficiency Profiling	3	VC	VC-3MB	 Ball nose end mill, Medium cut length, 3 flute	R1 -R10	○	◎	◎	○	○	○			B128	B341	
		For Profiling Strong Geometry Type	2	VF	VF-25DB NEW	 Ball nose, Short cut length, 2 flute, Strong geometry type	R0.5 -R10	○	◎	◎	○					B087	B314
	VC			VC-2MDB	 Ball nose, Medium cut length, 2 flute, Strong geometry type	R1.5 -R12.5	○		◎	◎	○	○	○		B122	B331	
	VF			VF-255B	 Ball nose, Short cut length, 2 flute, Short shank	R0.5 -R6	○	◎	◎	◎	○	○			B085	B313	
	VF			VF-25B	 Ball nose, Short cut length, 2 flute, For hardened materials	R0.1 -R10	○	◎	◎	◎	○	○			B086	B313	
	VC			VC-25B	 Ball nose end mill, Short cut length, 2 flute, Relieved neck	R0.15 -R10	○	◎	◎	◎	○	○			B116	B329	
	For Profiling of Hardened Steels			4	VF	VF-4MB NEW	 Ball nose, Medium cut length, 4 flute	R0.5 -R6			◎	◎	◎	○	○		
		VC	VC-4MB		 Ball nose end mill, Medium cut length, 4 flute	R0.5 -R10	○	◎	◎	◎	○	○			B130	B342	
	For Precision Profiling	2	VC	VC-2P5B	 Ball nose end mill, Short cut length, 2 flute, High precision	R0.05 -R6	◎	◎	◎		○	○			B117	B330	
			VC	VC-2P5B-P	 Ball nose end mill, Short cut length, 2 flute, Ultra high precision	R0.02 -R6	◎	◎	◎		○	○			B118	B330	
	VF		VF-2WB NEW	 Wide ball nose, Medium cut length, 2 flute	R1 -R3	○	◎	○		◎	◎			B084	B312		
	VC		VC-2MB-OH	 Ball nose end mill, Medium cut length, 2 flute, Through coolant holes	R3 -R8	○	◎	◎	○	○	○			B121	B331		
	Long Shank		3	VC	VC-2LB	 Ball nose end mill, Medium cut length, 2 flute, Long shank	R1 -R12.5	○		◎	◎	○	○	○		B123	—
		VC		VC-3LB	 Ball nose, Medium cut length, 3 flute, Long shank	R2 -R10	○	◎	◎	○	○	○			B129	—	
		VF		VF-25DBL NEW	 Ball nose, Short cut length, 2 flute, Strong geometry type, Long shank	R0.5 -R10	○	◎	◎	○					B088	B314	

Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material							Page Number		
							P Carbon Steel, Alloy Steel, Cast Iron Tool Steel, Prehardened Steel, Hardened Steel	H Hardened Steel (55HRC)	M Hardened Steel (56HRC-)	S Austenitic Stainless Steel	N Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy	Dimensions	Cutting Conditions	
BALL	Slim Shank	2	VC	VC-2MB-55	 Ball nose end mill, Medium cut length, 2 flute, Slim shank	R3 -R6	○	◎	◎	○	○	○			B120	—
	Taper Neck	3	VF	VF-3XB	 Ball nose, Medium cut length, 3 flute, Taper neck	R0.4 -R2.5	○	◎	◎	◎	○	○			B095	B317
		2	MS	M52XB	 Ball nose end mill, 2 flute, Taper neck	R0.1 -R2	◎	◎	○		○	○			B051	B299
			VC	VC-XB	 Ball nose taper end mill, Medium cut length, Taper neck	R0.5 -R6	○	◎	◎	○	○	○			B126	B333
			CRN	CRN-2MB	 Ball nose, Medium cut length, 2 flute, For copper electrodes	R0.2 -R6							◎	○	B166	B353
			DLC	DLC-2MB	 Ball nose, Medium cut length, 2 flute	R0.1 -R10	GFRP, CFRP Suitable for graphite					○	◎	B175	B358	
			DC	DC-2MB-NF	 Ball nose, Medium cut length, 2 flute, For non-ferrous metals	R0.3 -R6							◎	○	B177	B360
			DC	DC-2MB	 Ball nose, Medium cut length, 2 flute, For graphite	R0.5 -R6	Also suitable for GFRP and CFRP							B178	B359	
			DC	DC-2LB	 Ball nose, Long cut length, 2 flute, For graphite	R1 -R6								B179	B359	
			DC	DC-XB	 Ball nose, Medium cut length, 2 flute, Taper neck, For graphite	R0.2 -R3								B181	B361	
LONG NECK BALL	For Deep Profiling		MS	M52XLB	 Ball nose end mill, Short cut length, 2 flute, Long neck	R0.1 -R3	◎	◎	○		○	○			B045	B298
			VC	VC-2XLB	 Ball nose end mill, Medium cut length, 2 flute, Long neck	R0.3 -R3	○	◎	◎	○	○	○			B124	B332
			VC	VC-2XLB-6	 Ball nose, Medium cut length, 2 flute, Long neck, 6mm shank	R0.3 -R1.25	○	◎	◎	○	○	○			B125	B332
			VF	VF-2XLB5	 Ball nose, Medium cut length, 2 flute, Short shank	R0.2 -R1	○	◎	◎	◎		○			B089	B316
	For Deep Profiling of Hardened Steels		VF	VF-2XLB	 Ball nose, Long cut length, 2 flute, For hardened materials	R0.1 -R3	○	◎	◎	◎		○			B090	B316
			CRN	CRN-2XLB	 Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes	R0.1 -R3							◎	○	B167	B354
			DC	DC-2XLB	 Ball nose, Medium cut length, 2 flute, Long neck, For graphite	R0.2 -R3	Also suitable for GFRP and CFRP							B180	B361	
			MS	M52MRB	 Corner radius end mill, Medium cut length, 2 flute	φ1 -φ12						◎	◎	○		○

END MILLS SELECTION CHART

CEMENTED CARBIDE

Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material								Page Number		
							P	H	M	S	N	Copper Alloy	Aluminium Alloy	Dimensions	Cutting Conditions		
							Carbon Steel, Alloy Steel, Cast Iron	Tool Steel, Pre-Hardened Steel, Hardened Steel	Hardened Steel (≤55HRC)	Hardened Steel (56HRC-)	Austenitic Stainless Steel					Titanium Alloy, Heat Resistant Alloy	
RADIUS	For Corner Radius	2	VC	VC-2JRB	 Corner radius end mill, Semi long cut length, 2 flute	φ3 -φ20	○	◎	◎	○	○	○			B136	B325	
		4	MS	MS4MRB	 Corner radius end mill, Medium cut length, 4 flute	φ3 -φ20	◎	◎	○		○	○			B058	B301	
			VC	VC-45RB	 Corner radius end mill, Short cut length, 4 flute	φ4 -φ12	○	◎	◎	○	○	○			B137	B327	
			VC	VC-4JRB	 Corner radius end mill, Semi long cut length, 4 flute	φ3 -φ20	○	◎	◎	○	○	○			B138	B328	
			MS	MSMHDRB	 High power, Corner radius, Medium cut length, 4 flute	φ2 -φ20	◎	◎	◎		◎	◎			B060	B302	
			VC	VC-MHDRB	 Corner radius end mill, Medium cut length, 4 flute, High helix angle	φ2 -φ25	○	◎	◎	○	◎	◎			B147	B334	
	For Corner Radius Machining of Hardened Steels	6	VF	VF-5DRB	 Corner radius, Extra short cut length, For hardened materials	φ3 -φ12	○	◎	◎	◎					B101	B322	
			VF	VF-MDRB	 Corner radius, Medium cut length, 6 flute, For hardened materials	φ3 -φ20	○	◎	◎	◎					B102	B322	
			VC	VC-5DRB	 Corner radius end mill, Short cut length	φ6 -φ12	○	◎	◎	◎					B145	B335	
			VC	VC-MDRB	 Corner radius end mill, Medium cut length	φ3 -φ22	○	◎	◎	◎					B146	B335	
	For Precision Profiling	2 4	VC	VC-P5RB	 Corner radius end mill, Short cut length, 2-4 flute, High precision	φ0.6 -φ12	◎	◎	◎	◎	○	○			B131	B347	
		For High Feed Machining	4	VC	VC-HFRB	 Corner radius, Short flute length, 4 flute, High feed machining	φ2 -φ16	◎	◎	◎	○		○			B139	B349
			For Corner Radius Machining of Copper Alloys	2	CRN	CRN-2MRB	 Corner radius, Medium cut length, 2 flute, For copper electrodes	φ6 -φ12						◎	○	B170	B355
		For Difficult-to-cut Materials		4	VF	VF-MHVRB	 Corner radius, Medium cut length, Irregular helix flutes	φ6 -φ20	◎	○	○		◎	◎			B099
			6	VF	VF-6MHVRB	 Corner radius, Medium cut length, 6 flute, Irregular helix flutes	φ6 -φ20	○	○	○		◎	◎			B100	B321
		For Corner Radius Machining of Aluminium Alloys	3	—	C-35ARB	 Corner radius, Short cut length, 3 flute, For aluminium alloy	φ12 -φ25							○	◎	B209	B370
LONG NECK CORNER RADIUS	2		MS	MS2XLRB	 Corner radius end mill, Short cut length, 2 flute, Long neck	φ1 -φ6	◎	◎	○		○	○			B057	B300	
		CRN	CRN-2XLRB	 Corner radius, Medium cut length, 2 flute, For copper electrodes	φ0.5 -φ6							◎	○	B171	B356		

Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material						Page Number				
							P Carbon Steel, Alloy Steel, Cast Iron Tool steel, Pre-Hardened Steel, Hardened Steel	H Hardened Steel(≤55HRC)	M Hardened Steel(55HRC-)	S Austenitic Stainless Steel	N Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy	Dimensions	Cutting Conditions		
RIB TAPER	For Rib Milling	4		M54LT	 Taper end mill, Long cut length, 4 flute	φ0.2 —φ3								B066	B304		
RIB TAPER BALL NOSE				M54LTB	 Ball nose, 4 flute, Taper, For rib milling	R0.3 —R1										B072	B305
TAPER	For Angled Face Machining	2		M52MT	 Taper end mill, Medium cut length, 2 flute	φ0.2 —φ10								B062	B303		
				VC-2MT	 Taper end mill, Medium cut length, 2 flute	φ1 —φ2.5										B153	B340
		4		VC-4MT	 Taper end mill, Medium cut length, 4 flute	φ3 —φ10										B154	B340
TAPER BALL	For Profiling and Angled Face Machining	2		M52MTB	 Ball nose taper end mill, Medium cut length, 2 flute	R0.2 —R1.5								B075	B297		
		4		VC-45TB	 Ball nose taper end mill, Short cut length, 4 flute	R0.3 —R4										B156	B343
ROUGHING	For Roughing	3 4		VF-5FPR NEW	 Roughing end mill, Short cut length, 3—4 flute	φ3 —φ20								B082	B310		
		4		VF-MFPR NEW	 Roughing end mill, Medium cut length, 4 flute	φ5 —φ20										B083	B311
		3 4		VC-5FPR	 Roughing end mill, Short cut length, 3—4 flute	φ3 —φ20										B152	B339
	For Roughing of Aluminium Alloys	3	—	C-5RA	 Roughing end mill, Short cut length, 3 flute, For aluminium alloy	φ10 —φ25								B207	B371		
			—	C-MRA	 Roughing end mill, Medium cut length, 3 flute, For aluminium alloy	φ3 —φ25									B208	B372	

END MILLS SELECTION CHART **CEMENTED CARBIDE**

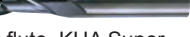
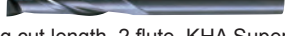
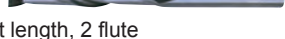
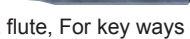
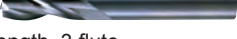
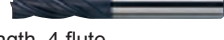
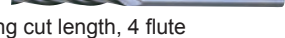
Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material						Page Number			
							P	H	M	S	N	Dimensions	Cutting Conditions			
ROUGHING	For Roughing of Aluminium Alloys	3	—	C-5RARB	 Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy	φ10 —φ25							◎	B210	B371	
CHAMFERING	For Chamfering	2	VC	VC-2C	 Chamfer cutter, 2 flute	φ2 —φ12	◎	◎	◎	○	◎	○	◎	○	B158	B345
CORNER RADIUS	For Radius Chamfering	3	VC	VC-RC NEW	 Corner rounding cutter, 3 flute	R0.5 —R5	◎	◎	◎	○	○	○	○	○	B159	B346

END MILLS SELECTION CHART **CBN/PCD**

Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material							Page Number	
							P	H	M	S	N	Dimensions	Cutting Conditions		
LONG NECK BALL	For High Precision Finishing	2	—	CBN-2XLB	 Ball nose, Short cut length, 2 flute, Long neck	R0.2 –R1	○	◎	◎	◎				B182	B362
LONG NECK CORNER RADIUS	For Precision Profiling		—	CBN-2XLRB NEW	 Corner radius end mill, Medium cut length, 2 flute, Long neck	φ0.5 –φ2	○	◎	◎	◎				B183	B362
BALL	For Profiling of Hardened Steels	1 2	—	BEM	 Ball nose, Sintered CBN	R3 –R15			◎	◎				B185	B185
SQUARE	For Machining of Hardened Steels	1	—	GBE	 End mill, 1 flute, Brazed type (CBN)	φ6 –φ12	○	◎	◎					B184	B184
	For Machining of Aluminium Alloys		—	GDE	 End mill, 1 flute, Brazed type (PCD)	φ6 –φ12						◎	B184	B184	

END MILLS SELECTION CHART **HSS**

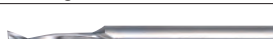
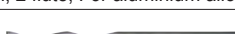
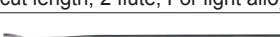
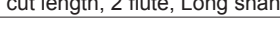
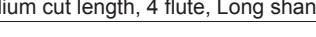
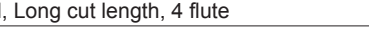
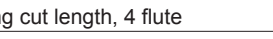
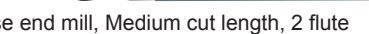
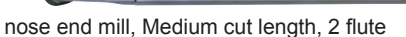
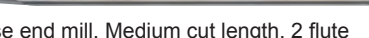
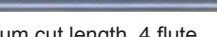
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Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material								Page Number	
							P	H	M	S	N	Dimensions	Cutting Conditions			
							Carbon Steel, Alloy Steel, Cast Iron	Tool Steel, Pre-Hardened Steel, Hardened Steel	Hardened Steel (-55HRC)	Hardened Steel (55HRC-)	Austenitic Stainless Steel			Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
SQUARE	General Use	2		VA-255	 End mill, Short cut length, 2 flute	φ3 -φ20	◎	○			○	○			B217	B376
				VA-2M5	 End mill, Medium cut length, 2 flute	φ3 -φ40	◎	○			○	○			B218	B376
				G-255	 End mill, Short cut length, 2 flute	φ1 -φ20	◎	○			○	○		○	B228	B385
				G-2M5	 End mill, Medium cut length, 2 flute	φ1 -φ40	◎	○			○	○		○	B238	B385
			—	S-2MD	 End mill, Short cut length, 2 flute, KHA Super	φ0.4 -φ50	◎	○			○	○		○	B234	B386
			—	S-2JS	 End mill, Semi long cut length, 2 flute, KHA Super	φ3 -φ40	◎	○			○	○		○	B242	B386
			—	255	 End mill, Short cut length, 2 flute	φ0.5 -φ20	◎	○			○	○		○	B229	B384
			—	2M5	 End mill, Medium cut length, 2 flute	φ1 -φ60	◎	○			○	○		○	B240	B387
			—	2LS	 End mill, Long cut length, 2 flute	φ1 -φ40	◎	○			○	○		○	B243	B387
			—	2MK	 End mill, Short cut length, 2 flute, For key ways	φ3 -φ20	◎	○			○			○	B245	—
	General Use	3	—	3M5	 End mill, Medium cut length, 3 flute	φ3 -φ40	◎	○			○	○		○	B248	B388
				VA-4MC	 End mill, Medium cut length, 4 flute	φ3 -φ30	◎	○			○	○			B219	B377
		4		G-4MC	 End mill, Medium cut length, 4 flute	φ3 -φ30	◎	○			○	○		○	B251	B390
				G-4LC	 End mill, Long cut length, 4 flute, Center cutting	φ3 -φ40	◎	○			○	○		○	B255	B390
			—	S-4MD	 End mill, Medium cut length, 4 flute	φ2.5 -φ50	◎	○			○	○		○	B249	B389
			—	S-4JC	 End mill, Semi long cut length, 4 flute	φ3 -φ40	◎	○			○	○		○	B254	B389
			—	4MC	 End mill, Medium cut length, 4 flute, Center cutting	φ2.5 -φ40	◎	○			○	○		○	B252	B391
			—	4LC	 End mill, Long cut length, 4 flute, Center cutting	φ3 -φ40	◎	○			○	○		○	B256	B391

SOLID
END MILLS

END MILLS SELECTION CHART

END MILLS SELECTION CHART

Type	Applications, Features	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
SQUARE	For Difficult-to-cut Materials	2 3 4		VA-MH	 End mill, Medium cut length, 2—4 flute	φ5 —φ30								B226	B383	
				VA-LH	 End mill, Long cut length, 2—4 flute, High helix	φ5 —φ30								B227	—	
			—	K-MH	 End mill, Medium cut length, 2—4 flute, High helix angle	φ5 —φ30								B270	B398	
		3 4	—	K-LH	 End mill, Long cut length, 3—4 flute, High helix angle	φ6 —φ30								B271	B398	
	For Machining of Aluminium Sashes	1	—	1MA	 End mill, Medium cut length, 1 flute	φ3 —φ8								B272	—	
			—	1LA	 End mill, Long cut length, 1 flute	φ4 —φ12								B273	—	
	For Machining of Aluminium Alloys	2	—	S-2SDA	 End mill, Short cut length, 2 flute, For aluminium alloy	φ3 —φ20								B274	B398	
			—	2MA	 End mill, Medium cut length, 2 flute, For light alloy	φ3 —φ20								B275	—	
			—	2ML	 End mill, Medium cut length, 2 flute, Long shank	φ12 —φ35									B277	—
		4	—	4ML	 End mill, Medium cut length, 4 flute, Long shank	φ12 —φ35									B278	—
			—	45X	 End mill, Long cut length, 4 flute	φ3 —φ50									B279	—
			—	4MX	 End mill, Extra long cut length, 4 flute	φ20 —φ50									B280	—
	LONG NECK SQUARE	—	—	K-2XL	 End mill, Short cut length, 2 flute, Long neck	φ3 —φ10									B276	—
BALL	For Profiling	2		VA-2MB	 Ball nose end mill, Medium cut length, 2 flute	R6 —R15									B220	B378
			—	S-2MB	 Ball nose end mill, Medium cut length, 2 flute	R0.5 —R25									B257	B392
			—	2FB	 Ball nose end mill, Medium cut length, 2 flute	R0.5 —R16									B258	B393
		4	—	K-4MB	 Ball nose end mill, Medium cut length, 4 flute	R3 —R20									B259	B394
ROUGHING BALL NOSE	For Rough Profiling	4	—	MRB	 Ball nose roughing end mill, Medium cut length, 4 flute	R4 —R25									B266	—

Type	Applications, Features	No. of Flutes	Coating	Product Code	Shape	Size Range	Work Material							Page Number				
							P Carbon Steel, Alloy Steel, Cast Iron	H Tool Steel, Pre-Hardened Steel, Hardened Steel	M Hardened Steel (≤55HRC)	S Hardened Steel (56HRC-)	N Austenitic Stainless Steel	Copper Alloy	Aluminium Alloy	Dimensions	Cutting Conditions			
RADIUS	General Use	2	—	RB	 Corner radius end mill, Medium cut length, 2 flute	φ6 —φ32	◎	○			○	○		○	B281	—		
ROUGHING	For Roughing	4 5 6	V	VA-SFPR	 Roughing end mill, Short cut length, 4—6 flute, Fine pitch form	φ5 —φ50	◎	○			◎	○				B221	B379	
			V	VA-MFPR	 Roughing end mill, Medium cut length, 4—6 flute, Fine pitch form	φ5 —φ50	◎	○			◎	○				B222	B380	
			V	VA-MR	 Roughing end mill, Medium cut length, 4—6 flute	φ5 —φ50	◎	○			◎	○				B223	B381	
			V	VA-JR	 Roughing end mill, Semi long cut length, 4—6 flute	φ10 —φ50	◎	○			◎	○				B224	B382	
			V	VA-LR	 Roughing end mill, Long cut length, 4—6 flute	φ10 —φ50	◎	○			◎	○				B225	B382	
		3 4 6	G	G-SFPR	 Roughing end mill, Short cut length, 3—6 flute, Fine pitch form	φ5 —φ50	◎	○				○	○				B261	B396
			G	G-MR	 Roughing end mill, Medium cut length, 4—6 flute	φ5 —φ50	◎	○				○	○				B262	B396
			—	SR	 Roughing end mill, Short cut length, 4—6 flute	φ10 —φ40	◎	○				○	○				B260	B395
			—	MR	 Roughing end mill, Medium cut length, 4—6 flute	φ5 —φ50	◎	○				○	○				B263	B395
			—	JR	 Roughing end mill, Semi long cut length, 4—6 flute	φ10 —φ50	◎	○				○	○				B264	B395
			—	LR	 Roughing end mill, Long cut length, 4—6 flute	φ10 —φ50	◎	○				○	○				B265	B395
	For Semi-finishing	4 6	G	G-MSF	 Semi finish end mill, Medium cut length, 4—6 flute	φ3 —φ50	◎	○				○	○				B267	B397
			—	MSF	 Semi finish end mill, Medium cut length, 4—6 flute	φ3 —φ50	◎	○				○	○				B269	B397
SLOTING	For Moulding	2	—	K-25L	 End mill, Long cut length, 2 flute, Straight flute geometry	φ2 —φ20	○	○				○				B247	—	
CORNER RADIUS	For Radius Chamfering	3 4	—	RC	 Corner radius cutter, 3—4 flute	R0.5 —R16	◎	○								B282	B399	

MSTAR END MILLS

MS2SS

End mill, Short cut length, 2 flute

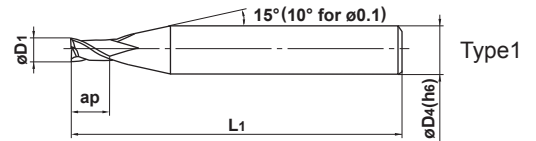


D1 = 0.1 0 - -0.010
D1 > 0.1 0 - -0.020



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

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

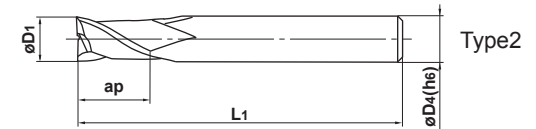


Type1



D1 < 3

D1 ≥ 3



Type2

● 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

B284



MS2MS

End mill, Medium cut length, 2 flute

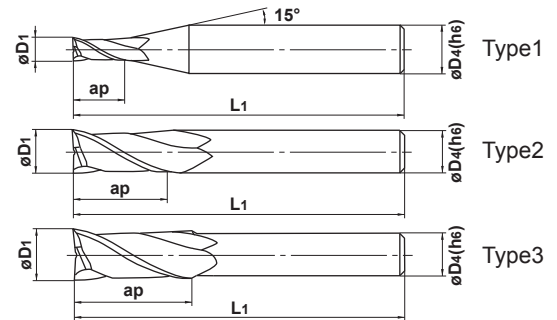

 $D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

 $4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



● 2 flute end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes	Stock	Type
	D1	ap	L1	D4	N		
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
D0360	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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B284

B019

MSTAR END MILLS

MS2MS

End mill, Medium cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

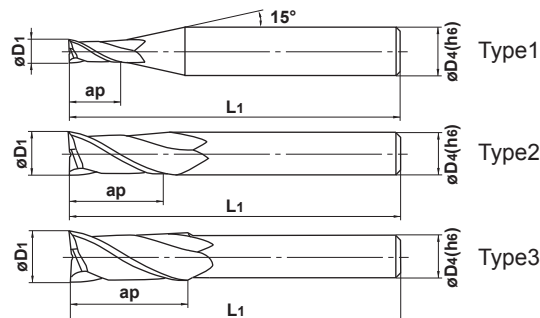


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 general use.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MS2MSD0400	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

B284

MS2MD**NEW**

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

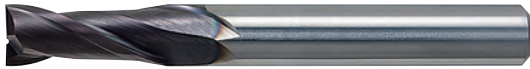


0 - 0.020



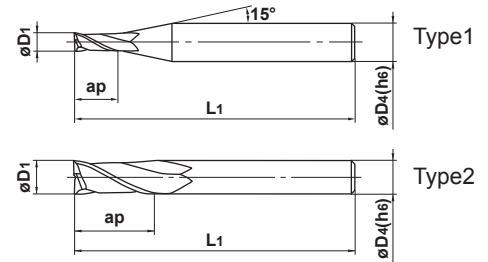
$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



D1 < 3

D1 ≥ 3



- 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B285

B021

MSTAR END MILLS

MS2JS

End mill, Semi long cut length, 2 flute

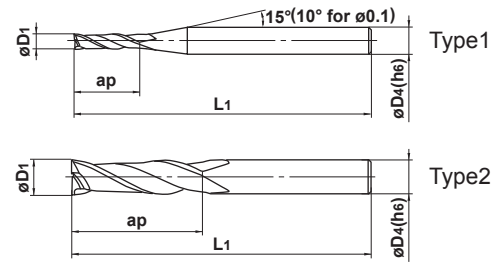


D₁ = 0.1 0 - -0.010
D₁ > 0.1 0 - -0.020



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

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 general use.

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
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



B286

MS2LS

End mill, Long cut length, 2 flute



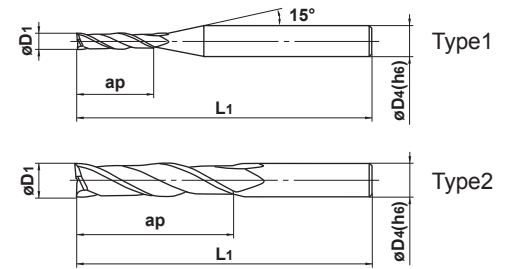
0 - -0.020



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○	○	○	○	○	○	○



● 2 flute end mill for general use.

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B287

B023

MSTAR END MILLS

MS2XL

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

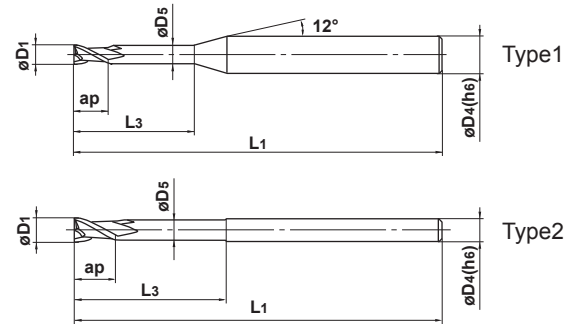


$D_1 < 0.5$ 0 - -0.010
 $D_1 \geq 0.5$ 0 - -0.020



$4 \leq D_4 \leq 6$ 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



● 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	0.18	45	4	2	●	1
D0020N010	0.2	0.3	1	0.18	45	4	2	●	1
D0020N015	0.2	0.3	1.5	0.18	45	4	2	●	1
D0030N010	0.3	0.4	1	0.28	45	4	2	●	1
D0030N020	0.3	0.4	2	0.28	45	4	2	●	1
D0030N030	0.3	0.4	3	0.28	45	4	2	●	1
D0030N060	0.3	0.4	6	0.28	45	4	2	●	1
D0030N090	0.3	0.4	9	0.28	45	4	2	●	1
D0040N020	0.4	0.6	2	0.37	45	4	2	●	1
D0040N030	0.4	0.6	3	0.37	45	4	2	●	1
D0040N040	0.4	0.6	4	0.37	45	4	2	●	1
D0040N080	0.4	0.6	8	0.37	45	4	2	●	1
D0040N120	0.4	0.6	12	0.37	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
D0080N100	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

● : Inventory maintained in Japan.

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
MS2XLD0090N060	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	0.95	50	4	2	●	1
D0100N060	1	1.5	6	0.95	50	4	2	●	1
D0100N080	1	1.5	8	0.95	50	4	2	●	1
D0100N100	1	1.5	10	0.95	50	4	2	●	1
D0100N120	1	1.5	12	0.95	50	4	2	●	1
D0100N160	1	1.5	16	0.95	60	4	2	●	1
D0100N200	1	1.5	20	0.95	60	4	2	●	1
D0100N250	1	1.5	25	0.95	70	4	2	●	1
D0100N300	1	1.5	30	0.95	70	4	2	●	1
D0120N060	1.2	1.8	6	1.15	50	4	2	●	1
D0120N080	1.2	1.8	8	1.15	50	4	2	●	1
D0120N100	1.2	1.8	10	1.15	50	4	2	●	1
D0120N120	1.2	1.8	12	1.15	50	4	2	●	1
D0120N160	1.2	1.8	16	1.15	60	4	2	●	1
D0120N200	1.2	1.8	20	1.15	60	4	2	●	1
D0150N060	1.5	2.3	6	1.45	50	4	2	●	1
D0150N080	1.5	2.3	8	1.45	50	4	2	●	1
D0150N100	1.5	2.3	10	1.45	50	4	2	●	1
D0150N120	1.5	2.3	12	1.45	50	4	2	●	1
D0150N140	1.5	2.3	14	1.45	60	4	2	●	1
D0150N160	1.5	2.3	16	1.45	60	4	2	●	1
D0150N180	1.5	2.3	18	1.45	60	4	2	●	1
D0150N200	1.5	2.3	20	1.45	60	4	2	●	1
D0150N250	1.5	2.3	25	1.45	70	4	2	●	1
D0150N300	1.5	2.3	30	1.45	70	4	2	●	1
D0150N380	1.5	2.3	38	1.45	80	4	2	●	1
D0150N450	1.5	2.3	45	1.45	80	4	2	●	1
D0200N060	2	3	6	1.94	50	4	2	●	1
D0200N080	2	3	8	1.94	50	4	2	●	1
D0200N100	2	3	10	1.94	50	4	2	●	1
D0200N120	2	3	12	1.94	50	4	2	●	1
D0200N140	2	3	14	1.94	60	4	2	●	1
D0200N160	2	3	16	1.94	60	4	2	●	1
D0200N180	2	3	18	1.94	60	4	2	●	1
D0200N200	2	3	20	1.94	60	4	2	●	1
D0200N250	2	3	25	1.94	70	4	2	●	1
D0200N300	2	3	30	1.94	70	4	2	●	1
D0200N350	2	3	35	1.94	80	4	2	●	1
D0200N400	2	3	40	1.94	90	4	2	●	1
D0200N500	2	3	50	1.94	100	4	2	●	1
D0200N600	2	3	60	1.94	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
D0250N200	2.5	3.7	20	2.4	60	4	2	●	1
D0250N250	2.5	3.7	25	2.4	70	4	2	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS2XL

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

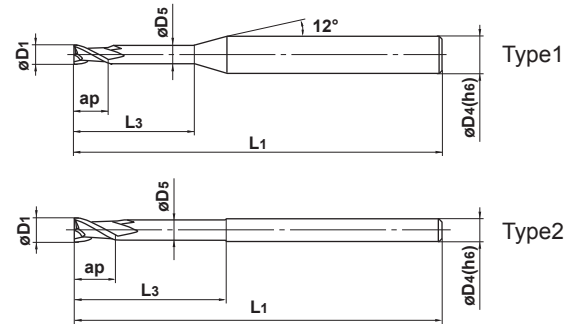


D1 < 0.5 0 - -0.010
D1 ≥ 0.5 0 - -0.020



4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
MS2XLD0250N300	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	2.85	50	6	2	●	1
D0300N120	3	4.5	12	2.85	50	6	2	●	1
D0300N160	3	4.5	16	2.85	60	6	2	●	1
D0300N200	3	4.5	20	2.85	60	6	2	●	1
D0300N250	3	4.5	25	2.85	70	6	2	●	1
D0300N300	3	4.5	30	2.85	70	6	2	●	1
D0300N400	3	4.5	40	2.85	90	6	2	●	1
D0300N500	3	4.5	50	2.85	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

B288

MS2XL6

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



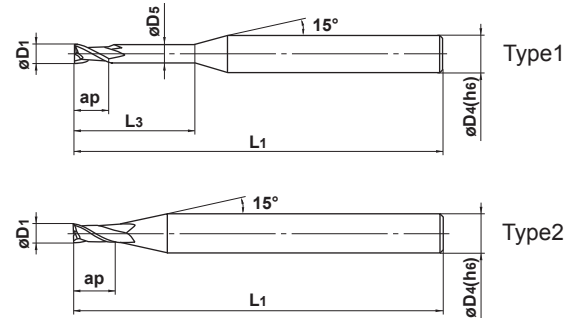
0 - -0.020



D4 = 6 0 - -0.008

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	○	○	○	○	○	○	○



Unit : mm

- 2 flute long neck end mill.
- Ø6 shank type.

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
D0200N050	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B289

B027

MSTAR END MILLS

MS2XL6

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

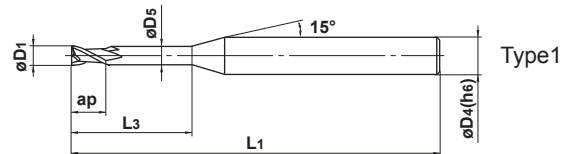


0 - 0.020

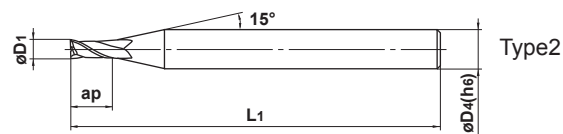


D4 = 6 0 - -0.008

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

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
MS2XL6D0220N055	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

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



SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B289

MSSHDD

High power, Short cut length, 4 flute



$D1 \leq 12$ 0 - -0.020
 $D1 > 12$ 0 - -0.030



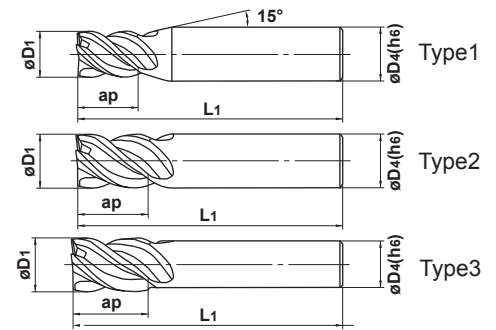
$D4 = 6$ 0 - -0.008
 $8 \leq D4 \leq 10$ 0 - -0.009
 $12 \leq D4 \leq 16$ 0 - -0.011
 $D4 = 20$ 0 - -0.013

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		◎	◎		



● 4 flute high power end mill.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B290

B029

MSTAR END MILLS

MSMHDD

High power, Medium cut length, 4 flute

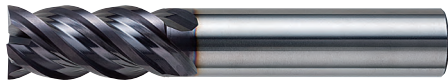


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

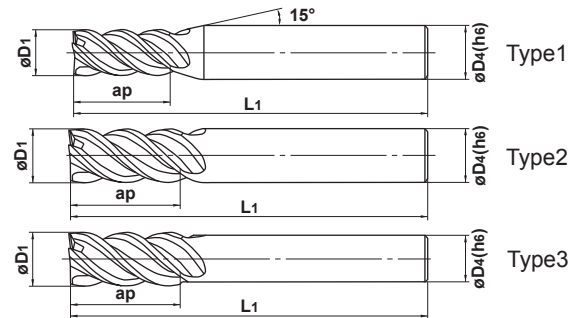


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
D0540	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
MSMHDD0580	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B290

B031

MSTAR END MILLS

MSJHD

High power, Semi long cut length, 4 flute

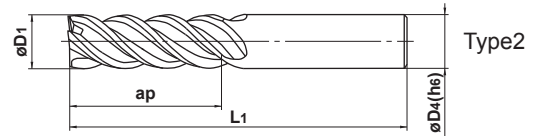
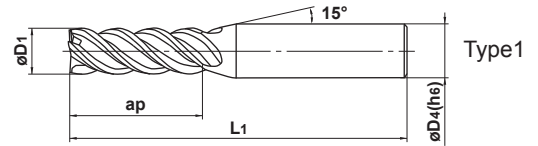
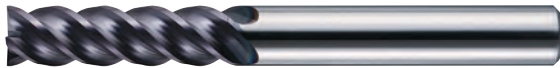


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



● 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B291



MSMHZD

Slotting, Medium cut length, 3 flute



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

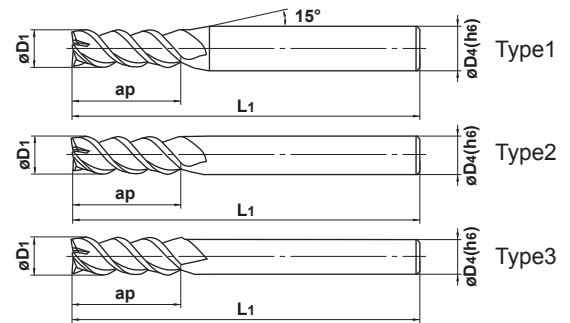


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		◎	○		



● A single end mill for both plunging and slotting.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CUTTING CONDITIONS

B292

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

B033

MSTAR END MILLS

MS45C

End mill, Short cut length, 4 flute

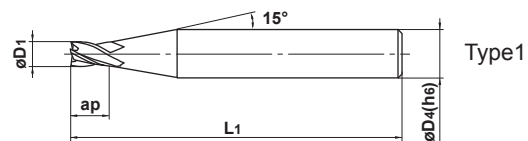


0 — -0.020

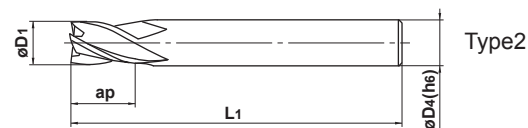


$4 \leq D_4 \leq 6$ 0 — -0.008
 $8 \leq D_4 \leq 10$ 0 — -0.009
 $D_4 = 12$ 0 — -0.011

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		○	○		



Type1



Type2



● 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



MSTAR END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B293

MS4MC

End mill, Medium cut length, 4 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



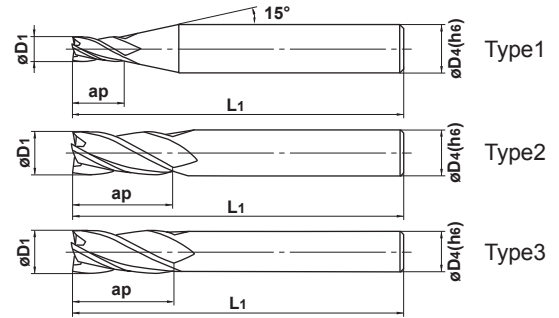
4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B293

B035

MSTAR END MILLS

MS4JC

End mill, Semi long cut length, 4 flute

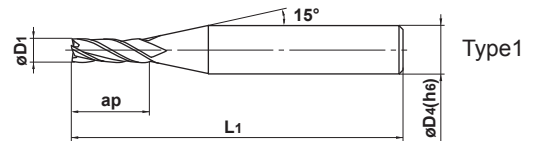


0 - -0.020



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



Type1



$D_1 < 3$



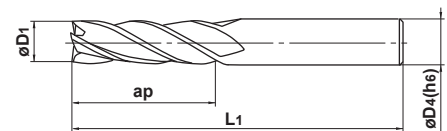
$D_1 \geq 3$



$D_1 \geq 3$



$D_1 < 3$



Type2

● 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

SOLID
END MILLS

MSTAR END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B294

MS4XL

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



0 - -0.020



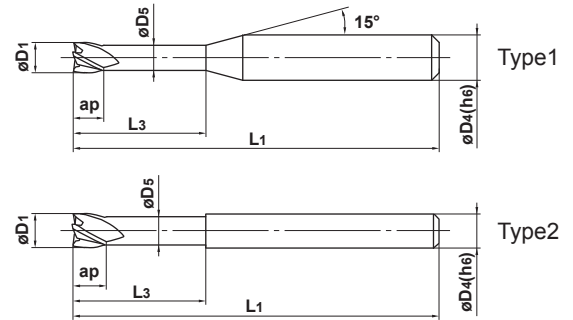
4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
D0160N100	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B295

B037

MSTAR END MILLS

MS4XL

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

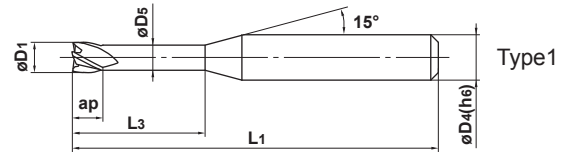


0 - -0.020

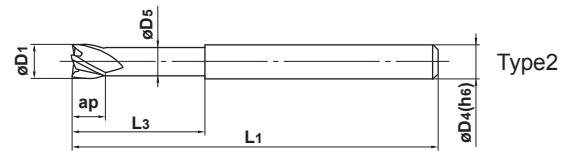


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
MS4XLD0160N180	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

● : Inventory maintained in Japan.

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
MS4XLD0300N300	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
D0400N400	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS2ES

End mill, 2 flute, For small automatic lathes

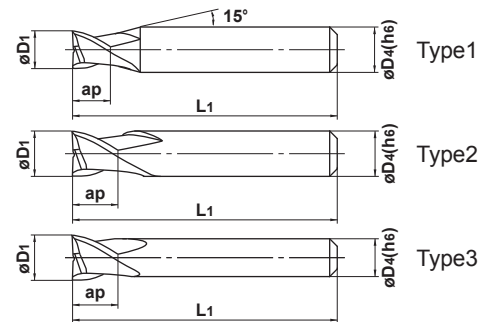


0 - -0.020



4 ≤ D4 ≤ 6 0 - -0.008
7 ≤ D4 ≤ 10 0 - -0.009

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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.

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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B296



MS3ES

End mill, 3 flute, For small automatic lathes



0 - -0.020


 $4 \leq D_4 \leq 6$ 0 - -0.008
 $7 \leq D_4 \leq 10$ 0 - -0.009

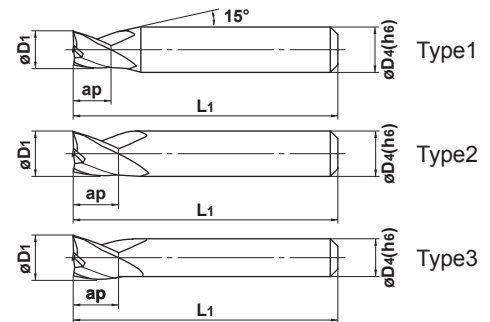
CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



● 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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B296

B041

MSTAR END MILLS

MS4EC

End mill, 4 flute, For small automatic lathes



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



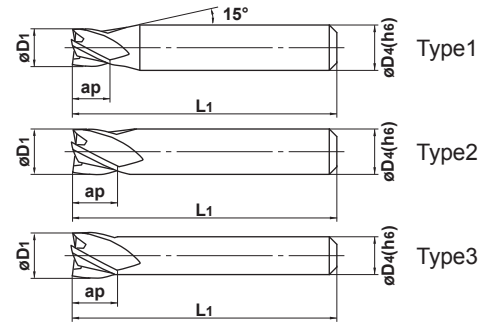
$4 \leq D_4 \leq 6$ 0 - -0.008
 $7 \leq D_4 \leq 10$ 0 - -0.009

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○	○	○	○	○		



● 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

B296



MS2SB

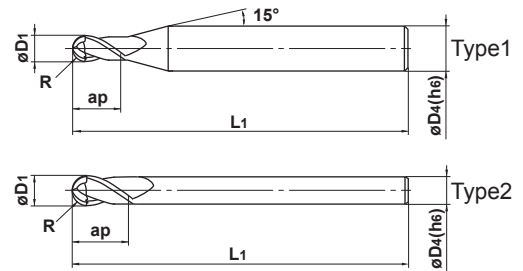
Ball nose end mill, Short cut length, 2 flute



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○	○	○	○		



● 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
R0400S08	4	8	12	90	8	2	●	2
R0500S10	5	10	15	100	10	2	●	2
R0600S12	6	12	18	110	12	2	●	2

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B297

B043

MSTAR END MILLS

MS2MB

Ball nose end mill, Medium cut length, 2 flute



±0.01

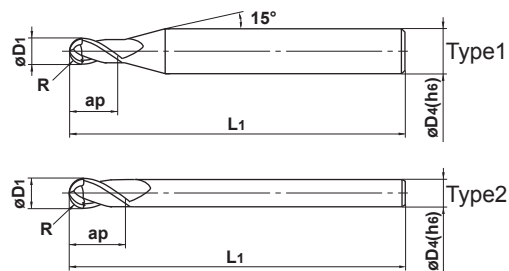


0 -- 0.020



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

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

B297

MS2XLB

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



±0.01



0 - -0.020



4 ≤ D4 ≤ 6 0 - -0.008

CARBIDE

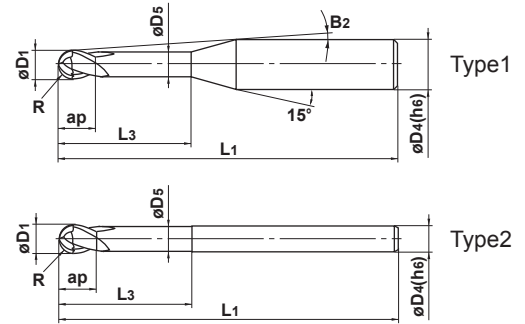
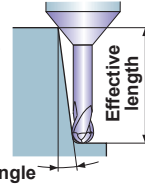
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○	○	○	○		



● 2 flute long neck ball nose end mill.

Effective length
for inclined angle

Inclined angle



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°
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
R0020N025S06	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B298

B045

MSTAR END MILLS

MS2XLB

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



±0.01



0 - -0.020

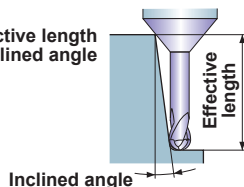


4 ≤ D4 ≤ 6 0 - -0.008

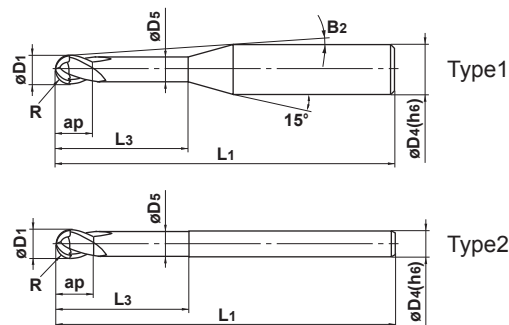
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○	○	○	○		



Effective length
for inclined angle



Inclined angle



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°
MS2XLBR0020N040	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Length of Cut	Neck Length	Neck Dia.	Cutting Edge to Shank Angle B2	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle			
	R	D1	ap	L3	D5		L1	D4	N			30°	1°	2°	3°
MS2XLBR0030N035	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
R0030N070	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS2XLB

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



±0.01



0 - -0.020

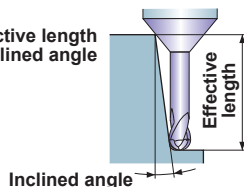


4 ≤ D4 ≤ 6 0 - -0.008

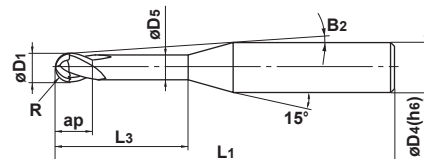
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○	○	○	○		



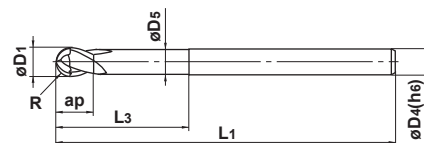
Effective length
for inclined angle



Inclined angle



Type1



Type2

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°
MS2XLBR0050N140	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
R0060N100S06	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	No interference
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

● : Inventory maintained in Japan.

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°
MS2XLBR0075N200	0.75	1.5	1.5	20	1.44	3°	55	4	2	●	1	20.9	21.6	23.2	No interference
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	No interference
R0075N300	0.75	1.5	1.5	30	1.44	2.1°	70	4	2	●	1	31.2	32.3	34.7	No interference
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	No interference
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	No interference
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
R0100N180	1	2	2	18	1.9	2.8°	55	4	2	●	1	18.7	19.4	20.7	No interference
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	No interference
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	No interference
R0100N250	1	2	2	25	1.9	2.1°	65	4	2	●	1	26	26.8	28.8	No interference
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	No interference	No interference
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	No interference	No interference
R0100N350S06	1	2	2	35	1.9	2.8°	80	6	2	●	1	36.3	37.5	40.3	No interference
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	No interference
R0125N350S06	1.25	2.5	2.5	35	2.4	2.5°	80	6	2	●	1	36.3	37.5	40.2	No interference
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS2XLB

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



±0.01



0 - -0.020

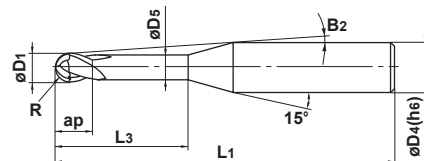
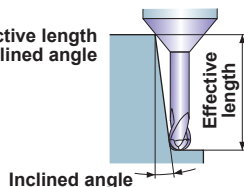


4 ≤ D4 ≤ 6 0 - -0.008

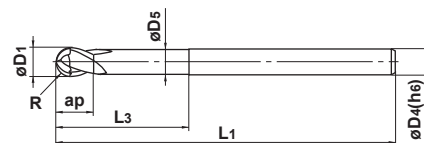
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○	○	○	○		



Effective length
for inclined angle



Type1



Type2

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°
MS2XLB 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	No interference
R0150N300	1.5	3	3	30	2.9	2.6°	70	6	2	●	1	31.1	32.2	34.5	No interference
R0150N350	1.5	3	3	35	2.9	2.2°	80	6	2	●	1	36.3	37.5	40.2	No interference
R0150N400	1.5	3	3	40	2.9	2°	90	6	2	●	1	41.5	42.9	No interference	No interference
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	No interference
R0200N250	2	4	4	25	3.9	2.2°	70	6	2	●	1	25.9	26.8	28.6	No interference
R0200N300	2	4	4	30	3.9	1.8°	70	6	2	●	1	31.1	32.1	No interference	No interference
R0200N350	2	4	4	35	3.9	1.6°	80	6	2	●	1	36.3	37.5	No interference	No interference
R0200N400	2	4	4	40	3.9	1.4°	90	6	2	●	1	41.4	42.8	No interference	No interference
R0200N450	2	4	4	45	3.9	1.3°	90	6	2	●	1	46.6	48.2	No interference	No interference
R0200N500	2	4	4	50	3.9	1.2°	100	6	2	●	1	51.8	53.5	No interference	No interference
R0250N200	2.5	5	5	20	4.9	1.5°	70	6	2	●	1	20.7	21.4	No interference	No interference
R0250N250	2.5	5	5	25	4.9	1.2°	70	6	2	●	1	25.9	26.7	No interference	No interference
R0250N300	2.5	5	5	30	4.9	1°	80	6	2	●	1	31.1	No interference	No interference	No interference
R0250N350	2.5	5	5	35	4.9	0.9°	80	6	2	●	1	36.3	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
R0300N500	3	6	6	50	5.85	—	120	6	2	●	2	No interference	No interference	No interference	No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B298

MS2XB

Ball nose end mill, 2 flute, Taper neck



±0.01

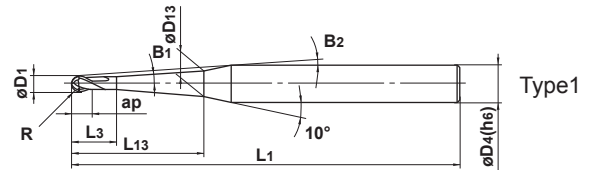


0 - -0.020


 $4 \leq D4 \leq 6$ 0 - -0.008
 $D4 = 8$ 0 - -0.009

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 taper neck ball nose end mill.

Inclined angle 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°
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
R0025T0030L050	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B299

B051

MSTAR END MILLS

MS2XB

Ball nose end mill, 2 flute, Taper neck



±0.01

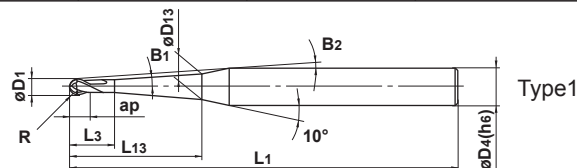


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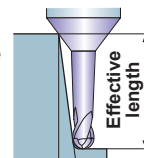


4 ≤ D4 ≤ 6 0 — -0.008
D4 = 8 0 — -0.009

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



Inclined angle

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°
MS2XBR0025T0130L050	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

● : 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	D1	B1	ap	L13	L3	B2	D13	L1	D4	N			30°	1°	2°	3°
MS2XBR0050T0300L200	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
R0060T0200L240	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	No interference
R0100T0030L400	1	2	30'	2	40	4	2.4°	2.53	80	6	2	●	1	40.7	42.8	48.0	No interference
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	No interference
R0100T0100L400	1	2	1°	2	40	4	2.5°	3.16	80	6	2	●	1	—	40.8	45.8	No interference
R0100T0100L500	1	2	1°	2	50	4	2.1°	3.51	90	6	2	●	1	—	50.8	57.0	No interference
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	No interference
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	No interference
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	—	—	—	No interference
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	No interference
R0150T0030L400	1.5	3	30'	3	40	6	1.9°	3.50	80	6	2	●	1	40.7	42.9	No interference	No interference
R0150T0030L500	1.5	3	30'	3	50	6	1.6°	3.67	90	6	2	●	1	50.7	53.4	No interference	No interference
R0150T0100L300	1.5	3	1°	3	30	6	2.5°	3.74	70	6	2	●	1	—	31.0	34.7	No interference
R0150T0100L400	1.5	3	1°	3	40	6	2.0°	4.09	80	6	2	●	1	—	41.0	45.9	No interference
R0150T0100L500	1.5	3	1°	3	50	6	1.7°	4.44	90	6	2	●	1	—	51.0	No interference	No interference
R0150T0130L300	1.5	3	1°30'	3	30	6	2.6°	4.16	70	6	2	●	1	—	—	33.1	No interference
R0150T0130L400	1.5	3	1°30'	3	40	6	2.1°	4.69	80	6	2	●	1	—	—	43.8	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS2XB

Ball nose end mill, 2 flute, Taper neck



±0.01

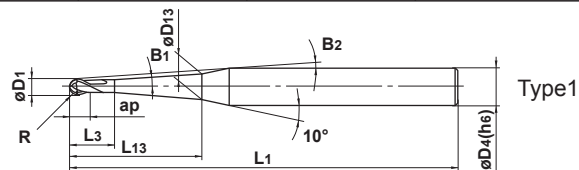


0 — -0.020

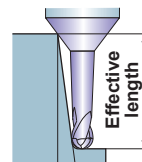


4 ≤ D4 ≤ 6 0 — -0.008
D4 = 8 0 — -0.009

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



Inclined angle

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°
MS2XBR0150T0130L500	1.5	3	1°30'	3	50	6	1.7°	5.21	90	6	2	●	1	—	—	No interference	No interference
R0150T0200L300	1.5	3	2°	3	30	6	2.7°	4.58	70	6	2	●	1	—	—	31.6	No interference
R0150T0200L480	1.5	3	2°	3	48	6	1.9°	5.84	90	6	2	●	1	—	—	No interference	No interference
R0150T0300L300	1.5	3	3°	3	30	6	2.9°	5.42	70	6	2	●	1	—	—	—	No interference
R0150T0300L500	1.5	3	3°	3	50	6	2.9°	7.52	90	8	2	●	1	—	—	—	No interference
R0200T0030L600	2	4	30°	4	60	7	1.0°	4.83	110	6	2	●	1	60.8	64.0	No interference	No interference
R0200T0100L600	2	4	1°	4	60	7	1.0°	5.76	110	6	2	●	1	—	61.1	No interference	No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B299

MS2MRB

Corner radius end mill, Medium cut length, 2 flute



0 - 0.020



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

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	◎	○	○	○	○		

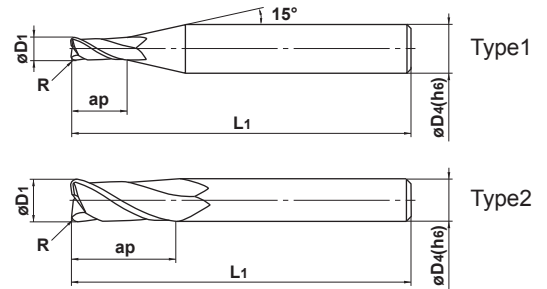


D1 < 3



D1 ≥ 3

● 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
NEW 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
NEW 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
NEW 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
NEW 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
NEW 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
NEW 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
NEW 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
NEW 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
D0600R100	6	1	12	50	6	2	●	2
D0600R150	6	1.5	12	50	6	2	●	2
D0600R200	6	2	12	50	6	2	●	2
NEW D0800R020	8	0.2	16	60	8	2	●	2

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B284

B055

MSTAR END MILLS

MS2MRB

Corner radius end mill, Medium cut length, 2 flute

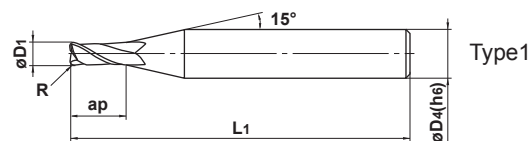


0 - -0.020

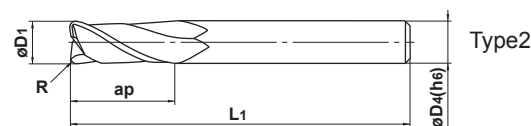


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
D4 = 12 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 < 3



D1 ≥ 3

● 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
NEW MS2MRBD0800R030	8	0.3	16	60	8	2	●	2
NEW D0800R050	8	0.5	16	60	8	2	●	2
NEW D0800R100	8	1	16	60	8	2	●	2
NEW D0800R150	8	1.5	16	60	8	2	●	2
NEW D0800R200	8	2	16	60	8	2	●	2
NEW D0800R250	8	2.5	16	60	8	2	●	2
NEW D0800R300	8	3	16	60	8	2	●	2
NEW D1000R020	10	0.2	20	70	10	2	●	2
NEW D1000R030	10	0.3	20	70	10	2	●	2
NEW D1000R050	10	0.5	20	70	10	2	●	2
NEW D1000R100	10	1	20	70	10	2	●	2
NEW D1000R150	10	1.5	20	70	10	2	●	2
NEW D1000R200	10	2	20	70	10	2	●	2
NEW D1000R250	10	2.5	20	70	10	2	●	2
NEW D1000R300	10	3	20	70	10	2	●	2
NEW D1200R020	12	0.2	24	75	12	2	●	2
NEW D1200R030	12	0.3	24	75	12	2	●	2
NEW D1200R050	12	0.5	24	75	12	2	●	2
NEW D1200R100	12	1	24	75	12	2	●	2
NEW D1200R150	12	1.5	24	75	12	2	●	2
NEW D1200R200	12	2	24	75	12	2	●	2
NEW D1200R250	12	2.5	24	75	12	2	●	2
NEW D1200R300	12	3	24	75	12	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B284

MS2XLRB

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



0 - -0.020

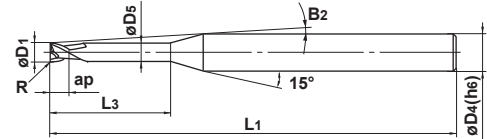
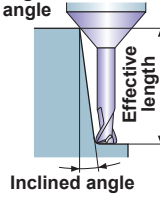


D4 = 6 0 - -0.008

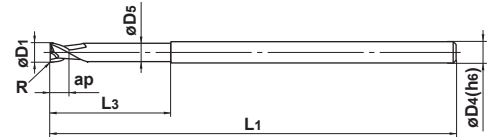
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○	○	○	○	○	○	○



Effective length
for inclined angle



Type1



Type2

● 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	No interference
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	No interference
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	No interference
D0600R010N120	6	0.1	6	12	5.85	—	50	6	2	●	1	No interference	No interference	No interference	No interference
D0600R010N300	6	0.1	6	30	5.85	—	70	6	2	●	1	No interference	No interference	No interference	No interference
D0600R030N120	6	0.3	6	12	5.85	—	50	6	2	●	1	No interference	No interference	No interference	No interference
D0600R030N300	6	0.3	6	30	5.85	—	70	6	2	●	1	No interference	No interference	No interference	No interference
D0600R050N120	6	0.5	6	12	5.85	—	50	6	2	●	2	No interference	No interference	No interference	No interference
D0600R050N300	6	0.5	6	30	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B300

B057

MSTAR END MILLS

MS4MRB

Corner radius end mill, Medium cut length, 4 flute

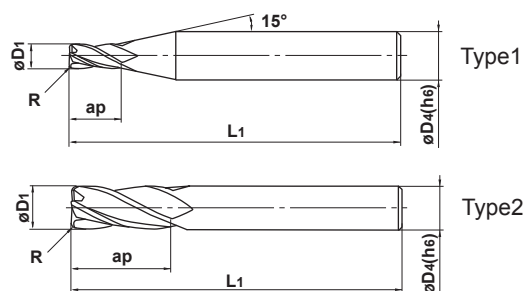


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
NEW MS4MRBD0300R010	3	0.1	8	45	6	4	●	1
NEW 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
NEW 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
NEW 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
NEW 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
D1000R150	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

● : Inventory maintained in Japan.

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
MS4MRBD1200R020	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B301

B059

MSTAR END MILLS

MSMHDRB

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



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

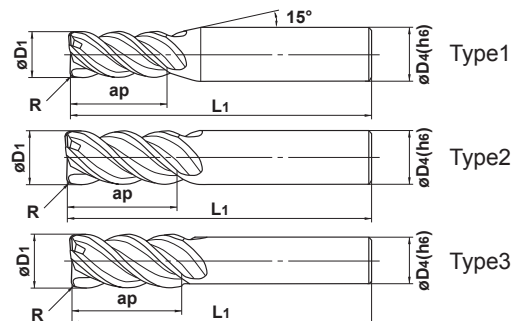


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
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
D1600R300	16	3	35	90	16	4	●	2

● : Inventory maintained in Japan.

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
MSMHDRBD1800R100	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

SQUARE

BALL

RADIUS

TAPER



MSTAR END MILLS

CUTTING CONDITIONS

B302

B061

MSTAR END MILLS

MS2MT

Taper end mill, Medium cut length, 2 flute



D1 < 0.5 0 - -0.020
D1 ≥ 0.5 0 - -0.030



±5'

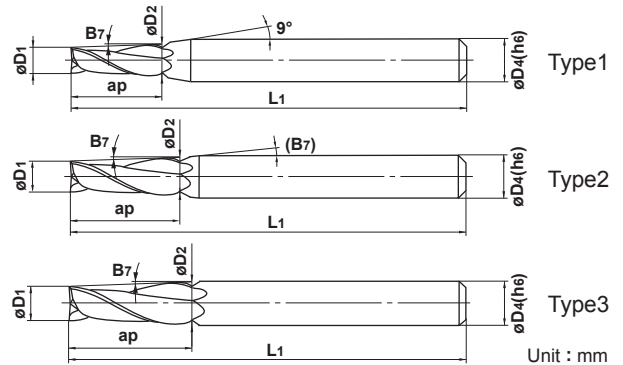


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
D0050T0700	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

● : Inventory maintained in Japan.

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
MS2MTD0060T0130	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
D0150T0130	1.5	1° 30'	5	1.76	45	4	2	●	1
D0150T0200	1.5	2°	5	1.85	45	4	2	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS2MT

Taper end mill, Medium cut length, 2 flute



D1 < 0.5 0 - -0.020
D1 ≥ 0.5 0 - -0.030



±5'

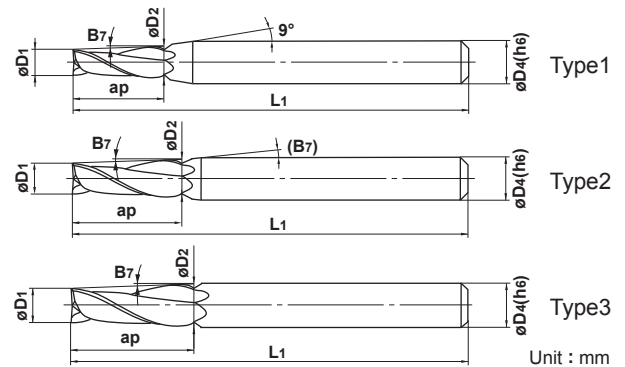


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
MS2MTD0150T0230	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

● : Inventory maintained in Japan.

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
MS2MTD0400T0200	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
D0500T0500	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

SQUARE

BALL

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TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS4LT

Taper end mill, Long cut length, 4 flute



D1 < 0.5 0 - -0.020
D1 ≥ 0.5 0 - -0.040

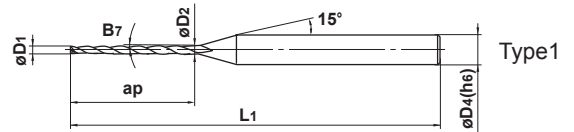


±5'



D4 = 3 0 - -0.006
4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
D0070T0200L06	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

● : Inventory maintained in Japan.

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
MS4LTD0080T0015L08	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
D0120T0015L16	1.2	15'	16	1.34	55	4	4	●	1
D0120T0030L06	1.2	30'	6	1.3	45	4	4	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B304

B067

MSTAR END MILLS

MS4LT

Taper end mill, Long cut length, 4 flute



D1 < 0.5 0 - -0.020
D1 ≥ 0.5 0 - -0.040

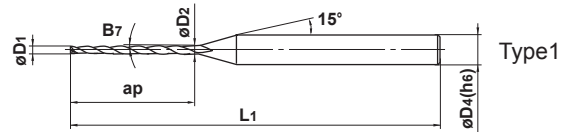


±5'



D4 = 3 0 - -0.006
4 ≤ D4 ≤ 6 0 - -0.008

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

● 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
MS4LTD0120T0030L10	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

● : Inventory maintained in Japan.

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
MS4LTD0150T0100L06	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
D0150T0130L20	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS4LT

Taper end mill, Long cut length, 4 flute



D1 < 0.5 0 - -0.020
D1 ≥ 0.5 0 - -0.040

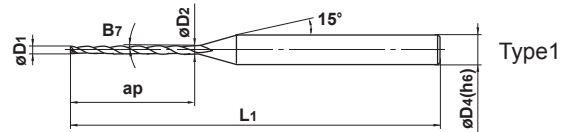


±5'



D4 = 3 0 - -0.006
4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
MS4LTD0180T0200L16	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
D0200T0030L30	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

● : Inventory maintained in Japan.

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
MS4LTD0200T0300L20	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
D0300T0130L40	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS4LTB

Ball nose, 4 flute, Taper, For rib milling



±0.03

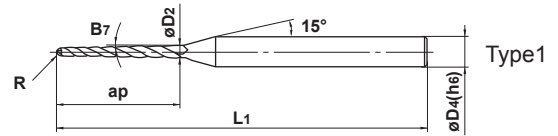


±5'



4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
R0050T0200L12	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

● : Inventory maintained in Japan.

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
MS4LTBR0060T0030L12	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
R0090T0130L20	0.9	1° 30'	20	2.80	60	4	4	●	1
R0090T0200L08	0.9	2°	8	2.30	50	4	4	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

MSTAR END MILLS

MS4LTB

Ball nose, 4 flute, Taper, For rib milling



±0.03

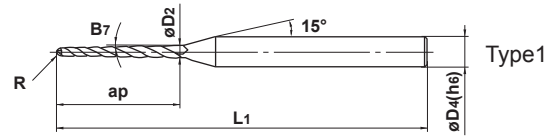


±5°



4 ≤ D4 ≤ 6 0 - -0.008

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



● 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
MS4LTBR0090T0200L10	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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B305

MS2MTB

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



±0.01



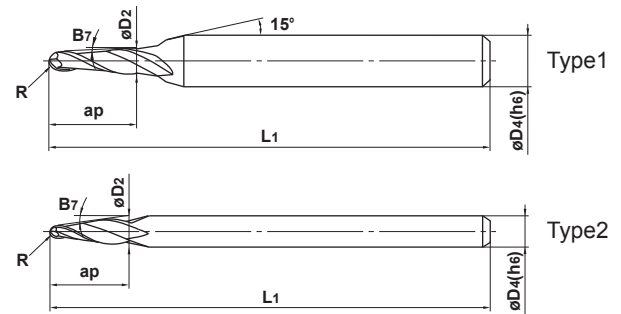
±5'

 $4 \leq D4 \leq 6$ 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
R0125T0400	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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MSTAR END MILLS

CUTTING CONDITIONS

B297

B075

IMPACT MIRACLE END MILLS

VF-2MD NEW

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

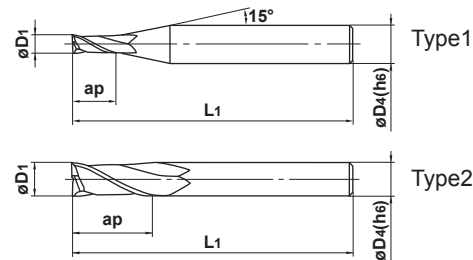


0 - 0.020



4 ≤ D4 ≤ 6 0 - 0.008

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

● 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



IMPACT MIRACLE END MILLS

● : Inventory maintained in Japan.

○ : Inventory maintained in Japan. (Available from spring 2009)

CUTTING CONDITIONS



B306

VF-2XL ^{NEW}

End mill, 2 flute, Long neck



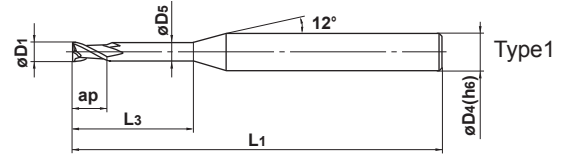
0 - -0.020



4 ≤ D4 ≤ 6 0 - -0.008

CARBIDE

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

- 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
D0200N160	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

SQUARE

BALL

RADIUS

TAPER



IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B307

B077

IMPACT MIRACLE END MILLS

VF-4MD NEW

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

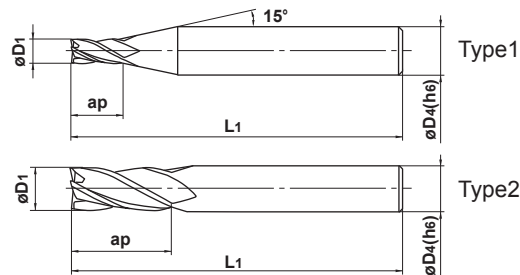


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

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

SOLID
END MILLS

IMPACT MIRACLE END MILLS

● : Inventory maintained in Japan.

VF-MHV NEW

End mill, Medium cut length, Irregular helix flutes

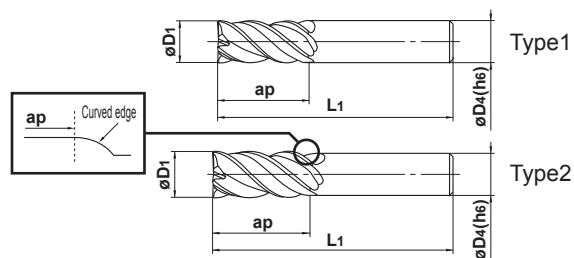


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○	○		◎	◎		



- Impact Miracle end mills with irregular helix flutes ensures stable machining on difficult-to-cut materials and with long overhangs.

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
VFMHVD0600	6	13	50	6	4	●	1
D0600A070	6	13	70	6	4	●	1
D0800	8	19	60	8	4	●	1
D0800A080	8	19	80	8	4	●	1
D1000A100S08	10	22	100	8	4	●	2
D1000	10	22	70	10	4	●	1
D1000A100	10	22	100	10	4	●	1
D1100	11	26	100	10	4	●	2
D1200A110S10	12	26	110	10	4	●	2
D1200	12	26	75	12	4	●	1
D1200A110	12	26	110	12	4	●	1
D1300	13	26	110	12	4	●	2
D1400A130S12	14	32	130	12	4	●	2
D1600	16	35	90	16	4	●	1
D1800A150S16	18	42	150	16	4	●	2
D2000	20	45	110	20	4	●	1

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B309

B079

IMPACT MIRACLE END MILLS

VF-SD

End mill, Short cut length, For hardened materials

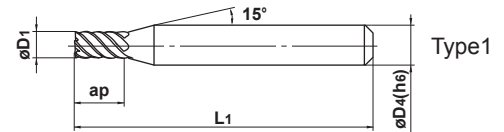


0 - -0.02



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

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

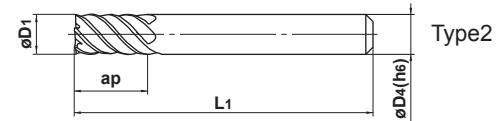


D1 < 3

D1 ≥ 3

D1 < 3

D1 ≥ 3



Type2

- 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
VFSD0100	1	2	45	6	4	●	1
D0150	1.5	3	45	6	4	●	1
D0200	2	4	45	6	4	●	1
D0250	2.5	5	45	6	4	●	1
D0300	3	6	45	6	6	●	1
D0350	3.5	7	45	6	6	●	1
D0400	4	8	45	6	6	●	1
D0500	5	10	50	6	6	●	1
D0600	6	12	50	6	6	●	2
D0800	8	16	60	8	6	●	2
D1000	10	20	70	10	6	●	2
D1200	12	24	75	12	6	●	2



IMPACT MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B322

B080

VF-MD

End mill, Medium cut length, For hardened materials



D1 ≤ 12 0 - -0.02
D1 > 12 0 - -0.03



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

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



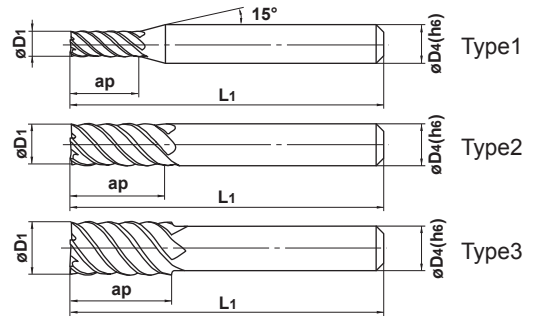
D1 < 3

D1 ≥ 3

D1 < 3

D1 ≥ 3

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



Unit : mm

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

SQUARE

BALL

RADIUS

TAPER



IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B322

B081

IMPACT MIRACLE END MILLS

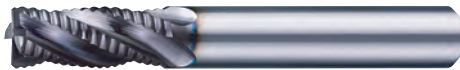
VF-SFPR NEW

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



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

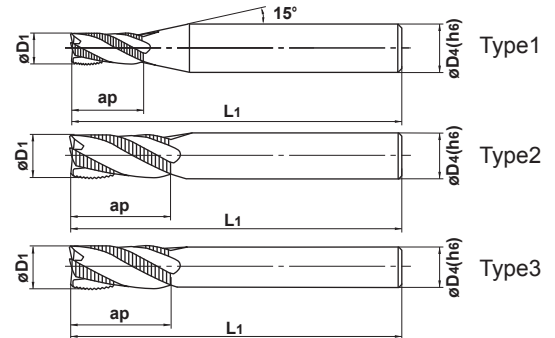
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	○		◎	◎		



D1 < 8

D1 ≥ 8

● 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B310

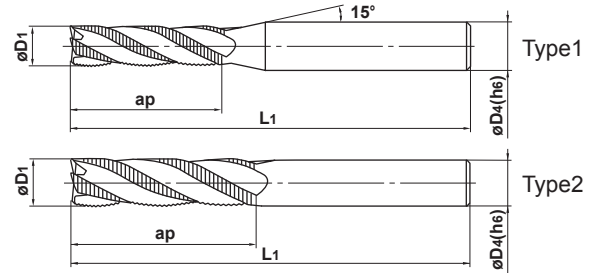
VF-MFPR NEW

Roughing end mill, Medium cut length, 4 flute



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	◎	○		◎	◎		



- 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER



IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B311

B083

IMPACT MIRACLE END MILLS

CARBIDE

VF-2WB NEW

Wide ball nose, Medium cut length, 2 flute

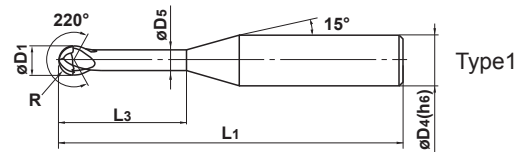


±0.01



D4 = 6 0 - -0.008

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



- 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

TAPER

RADIUS

BALL

SQUARE



IMPACT MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B312

B084

VF-255B

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



±0.005



0 - -0.01



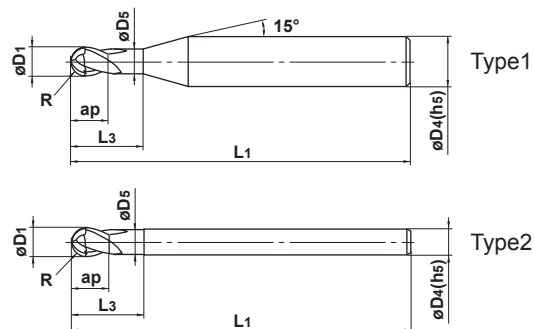
4 ≤ D4 ≤ 6 0 - -0.005
8 ≤ D4 ≤ 10 0 - -0.006
D4 = 12 0 - -0.008

CARBIDE

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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B313

B085

IMPACT MIRACLE END MILLS

VF-25B

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



R ≤ 6 ±0.005
R > 6 ±0.010



D₁ ≤ 12 0 - -0.01
D₁ > 12 0 - -0.02



h5: D₄ ≤ 12 D₄ = 3 0 - -0.004
4 ≤ D₄ ≤ 6 0 - -0.005
8 ≤ D₄ ≤ 10 0 - -0.006
D₄ = 12 0 - -0.008
D₄ = 16 0 - -0.011
D₄ = 20 0 - -0.013

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



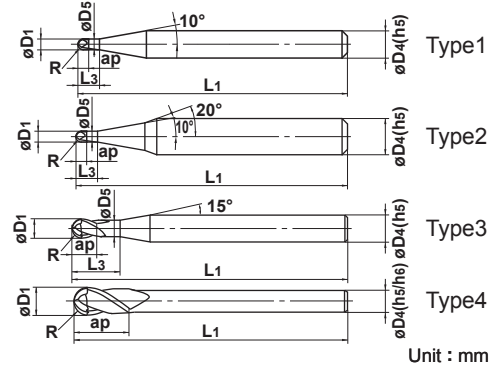
R < 0.3

R ≥ 0.3

R < 0.3

R ≥ 0.3

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



Unit : mm

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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B313

VF-25DB NEW

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



R ≤ 6.5 ±0.01
R > 6.5 ±0.02



D1 ≤ 12 0 - -0.02
D1 > 12 0 - -0.03



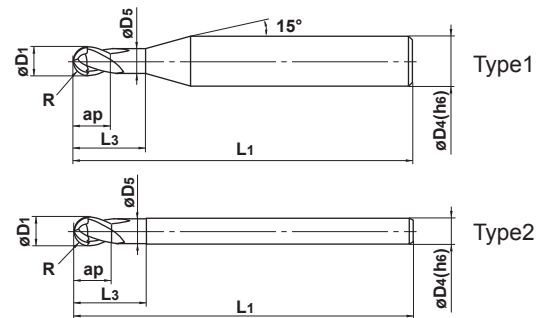
D4 = 3 0 - -0.006
4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

CARBIDE

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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B314

B087

IMPACT MIRACLE END MILLS

VF-25DBL

NEW



R ≤ 6.5 ±0.01
R > 6.5 ±0.02



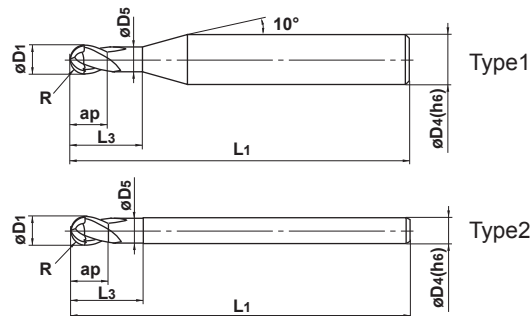
D1 ≤ 12 0 - -0.02
D1 > 12 0 - -0.03



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

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
○	◎	◎	○				



● 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

B314

VF-2XLBS NEW

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

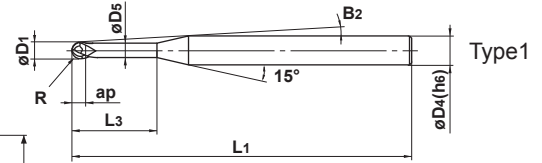
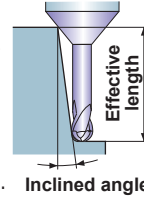


D4 = 4 0 - -0.008

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



Type1

● 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B316

B089

IMPACT MIRACLE END MILLS

VF-2XLB

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



R ≤ 1 ±0.007
R > 1 ±0.010



0 - -0.02

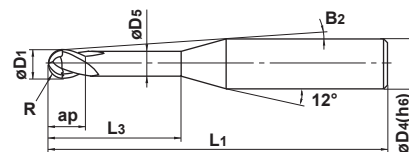
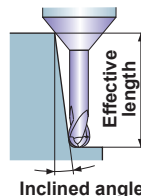


4 ≤ D4 ≤ 6 0 - -0.008

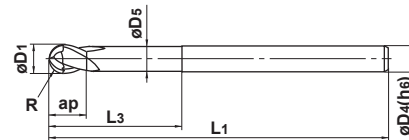
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎		○		



Effective length
for inclined angle



Type1



Type2

- 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
R0025N015S04	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

● : 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°
VF2XLBR0025N025S04	0.25	0.5	0.4	2.5	0.46	9.5°	50	4	2	●	1	2.6	2.7	2.9	3.2
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
R0050N080S04	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

IMPACT MIRACLE END MILLS

VF-2XLB

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



R ≤ 1 ±0.007
R > 1 ±0.010



0 - -0.02

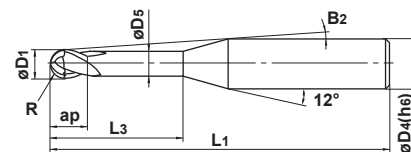
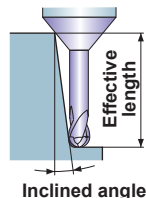


4 ≤ D4 ≤ 6 0 - -0.008

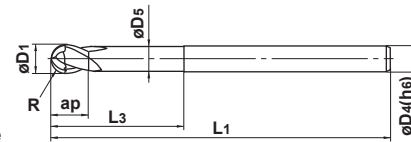
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎		○		



Effective length
for inclined angle



Type1



Type2

- 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°
VF2XLB 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

● : 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°
VF2XLBR0075N200S04	0.75	1.5	1.2	20	1.44	2.9°	60	4	2	●	1	21.0	21.9	23.9	No interference
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	No interference
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	No interference
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
R0100N080S04	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	No interference
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	No interference
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	No interference
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	No interference
R0100N250S04	1	2	1.6	25	1.9	2°	70	4	2	●	1	26.1	27.2	No interference	No interference
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	No interference	No interference
R0100N300S06	1	2	1.6	30	1.9	3°	80	6	2	●	1	31.3	32.6	35.8	No interference
R0100N350S04	1	2	1.6	35	1.9	1.5°	80	4	2	●	1	36.5	38.1	No interference	No interference
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	No interference
R0125N350S06	1.25	2.5	2	35	2.4	2.4°	80	6	2	●	1	36.5	38.1	41.7	No interference
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	No interference
R0150N300S06	1.5	3	2.4	30	2.9	2.5°	70	6	2	●	1	31.3	32.6	35.7	No interference
R0150N350S06	1.5	3	2.4	35	2.9	2.2°	80	6	2	●	1	36.5	38.0	41.7	No interference
R0150N400S06	1.5	3	2.4	40	2.9	1.9°	90	6	2	●	1	41.7	43.5	No interference	No interference
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	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

IMPACT MIRACLE END MILLS

VF-2XLB

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



R ≤ 1 ±0.007
R > 1 ±0.010



0 - -0.02

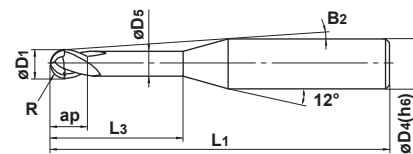
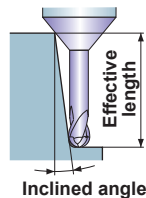


4 ≤ D4 ≤ 6 0 - -0.008

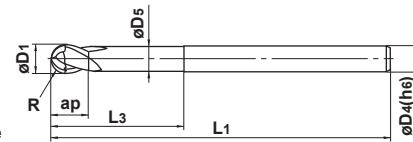
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎		○		



Effective length for inclined angle



Type1



Type2

- 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°
VF2XLBR0175N250S06	1.75	3.5	2.8	25	3.4	2.5°	70	6	2	●	1	26.0	27.1	29.6	No interference
R0175N300S06	1.75	3.5	2.8	30	3.4	2.1°	80	6	2	●	1	31.3	32.6	35.6	No interference
R0175N350S06	1.75	3.5	2.8	35	3.4	1.9°	80	6	2	●	1	36.5	38.0	No interference	No interference
R0175N400S06	1.75	3.5	2.8	40	3.4	1.7°	90	6	2	●	1	41.7	43.5	No interference	No interference
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	No interference
R0200N250S06	2	4	3.2	25	3.9	2.1°	70	6	2	●	1	26.0	27.1	29.6	No interference
R0200N300S06	2	4	3.2	30	3.9	1.8°	70	6	2	●	1	31.2	32.6	No interference	No interference
R0200N350S06	2	4	3.2	35	3.9	1.6°	80	6	2	●	1	36.5	38.0	No interference	No interference
R0200N400S06	2	4	3.2	40	3.9	1.4°	90	6	2	●	1	41.7	43.5	No interference	No interference
R0200N450S06	2	4	3.2	45	3.9	1.2°	90	6	2	●	1	46.9	48.9	No interference	No interference
R0200N500S06	2	4	3.2	50	3.9	1.1°	100	6	2	●	1	52.1	54.3	No interference	No interference
R0250N200S06	2.5	5	4	20	4.9	1.5°	70	6	2	●	1	20.8	21.6	No interference	No interference
R0250N250S06	2.5	5	4	25	4.9	1.2°	70	6	2	●	1	26.0	27.1	No interference	No interference
R0250N300S06	2.5	5	4	30	4.9	1°	80	6	2	●	1	31.2	No interference	No interference	No interference
R0250N350S06	2.5	5	4	35	4.9	0.9°	80	6	2	●	1	36.4	No interference	No interference	No interference
R0300N300S06	3	6	4.8	30	5.85	—	80	6	2	●	2	No interference	No interference	No interference	No interference
R0300N400S06	3	6	4.8	40	5.85	—	90	6	2	●	2	No interference	No interference	No interference	No interference
R0300N500S06	3	6	4.8	50	5.85	—	100	6	2	●	2	No interference	No interference	No interference	No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B316

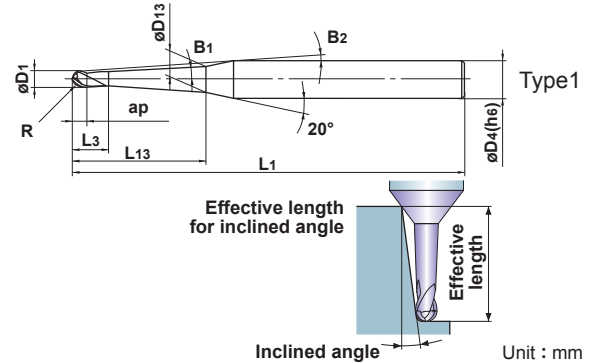
VF-3XB **NEW**

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


 $4 \leq D_4 \leq 6$ 0 - -0.008
 $D_4 = 8$ 0 - -0.009

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎	○	○		



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

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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B317

B095

IMPACT MIRACLE END MILLS

VF-3XB NEW

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



±0.01

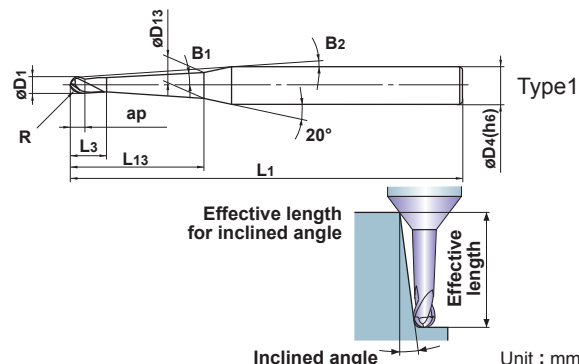


0 - -0.02



4 ≤ D4 ≤ 6 0 - -0.008
D4 = 8 0 - -0.009

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 flute ball end mill, high rigidity taper neck type.

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°
VF3XBR0075T0054L040	0.75	1.5	0.9°	1.3	40	2.8	3.0°	2.61	80	6	3	●	1	—	40.8	43.0	45.3
R0075T0130L015	0.75	1.5	1.5°	1.3	15	2.8	6.4°	2.08	60	6	3	●	1	—	—	16.1	17.0
R0075T0130L020	0.75	1.5	1.5°	1.3	20	2.8	5.2°	2.34	70	6	3	●	1	—	—	21.2	22.4
R0075T0130L030	0.75	1.5	1.5°	1.3	30	2.8	3.8°	2.86	80	6	3	●	1	—	—	31.5	33.2
R0100T0024L016	1	2	0.4°	1.6	16	3.6	5.5°	2.07	70	6	3	●	1	16.7	17.1	18.0	19.0
R0100T0024L020	1	2	0.4°	1.6	20	3.6	4.6°	2.13	70	6	3	●	1	20.7	21.3	22.3	23.5
R0100T0024L025	1	2	0.4°	1.6	25	3.6	3.9°	2.20	70	6	3	●	1	25.8	26.4	27.8	29.3
R0100T0024L030	1	2	0.4°	1.6	30	3.6	3.4°	2.27	80	6	3	●	1	30.8	31.6	33.2	35.0
R0100T0024L035	1	2	0.4°	1.6	35	3.6	2.9°	2.34	80	6	3	●	1	35.8	36.7	38.6	No interference
R0100T0024L040	1	2	0.4°	1.6	40	3.6	2.6°	2.41	80	6	3	●	1	40.8	41.9	44.0	No interference
R0100T0054L020	1	2	0.9°	1.6	20	3.6	4.7°	2.42	70	6	3	●	1	—	20.8	21.9	23.0
R0100T0054L025	1	2	0.9°	1.6	25	3.6	4.0°	2.57	70	6	3	●	1	—	25.8	27.2	28.6
R0100T0054L030	1	2	0.9°	1.6	30	3.6	3.4°	2.73	80	6	3	●	1	—	30.9	32.5	34.2
R0100T0054L035	1	2	0.9°	1.6	35	3.6	3.0°	2.89	80	6	3	●	1	—	35.9	37.7	39.8
R0100T0054L040	1	2	0.9°	1.6	40	3.6	2.7°	3.04	80	6	3	●	1	—	40.9	43.0	No interference
R0100T0054L050	1	2	0.9°	1.6	50	3.6	2.2°	3.36	110	6	3	●	1	—	51.0	53.6	No interference
R0100T0054L060	1	2	0.9°	1.6	60	3.6	1.9°	3.67	110	6	3	●	1	—	61.0	No interference	No interference
R0100T0054L070	1	2	0.9°	1.6	70	3.6	1.6°	3.99	110	6	3	●	1	—	71.1	No interference	No interference
R0100T0130L025	1	2	1.5°	1.6	25	3.6	4.1°	3.02	70	6	3	●	1	—	—	26.4	27.9
R0100T0130L030	1	2	1.5°	1.6	30	3.6	3.5°	3.28	80	6	3	●	1	—	—	31.6	33.3
R0100T0130L035	1	2	1.5°	1.6	35	3.6	3.1°	3.54	80	6	3	●	1	—	—	36.7	38.7
R0100T0130L040	1	2	1.5°	1.6	40	3.6	2.7°	3.81	80	6	3	●	1	—	—	41.8	No interference
R0125T0054L020	1.25	2.5	0.9°	2	20	4.5	4.3°	2.89	60	6	3	●	1	—	20.8	21.9	23.1
R0125T0054L030	1.25	2.5	0.9°	2	30	4.5	3.1°	3.20	80	6	3	●	1	—	30.9	32.5	34.2
R0125T0054L040	1.25	2.5	0.9°	2	40	4.5	2.4°	3.52	80	6	3	●	1	—	40.9	43.1	No interference
R0125T0130L020	1.25	2.5	1.5°	2	20	4.5	4.4°	3.21	60	6	3	●	1	—	—	21.4	22.5
R0125T0130L030	1.25	2.5	1.5°	2	30	4.5	3.1°	3.74	80	6	3	●	1	—	—	31.6	33.3
R0125T0130L040	1.25	2.5	1.5°	2	40	4.5	2.5°	4.26	80	6	3	●	1	—	—	41.9	No interference
R0150T0024L020	1.5	3	0.4°	2	20	5	3.8°	3.11	60	6	3	●	1	20.7	21.3	22.3	23.5
R0150T0024L025	1.5	3	0.4°	2	25	5	3.1°	3.18	80	6	3	●	1	25.8	26.4	27.7	29.2
R0150T0024L030	1.5	3	0.4°	2	30	5	2.7°	3.25	80	6	3	●	1	30.8	31.6	33.2	No interference
R0150T0024L040	1.5	3	0.4°	2	40	5	2.1°	3.39	80	6	3	●	1	40.9	41.9	44.0	No interference
R0150T0024L050	1.5	3	0.4°	2	50	5	1.7°	3.53	100	6	3	●	1	50.9	52.2	No interference	No interference
R0150T0054L020	1.5	3	0.9°	2	20	5	3.8°	3.37	60	6	3	●	1	—	20.9	21.9	23.0
R0150T0054L030	1.5	3	0.9°	2	30	5	2.7°	3.69	80	6	3	●	1	—	30.9	32.5	No interference
R0150T0054L040	1.5	3	0.9°	2	40	5	2.1°	4.00	80	6	3	●	1	—	41.0	43.1	No interference
R0150T0054L050	1.5	3	0.9°	2	50	5	1.7°	4.31	100	6	3	●	1	—	51.0	No interference	No interference
R0150T0054L060	1.5	3	0.9°	2	60	5	2.3°	4.63	110	8	3	●	1	—	61.1	64.2	No interference

● : 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	D1	B1	ap	L13	L3	B2	D13	L1	D4	N			30°	1°	2°	3°
VF3XBR0150T0054L070	1.5	3	0.9°	2	70	5	2.0°	4.94	120	8	3	●	1	—	71.1	74.8	No interference
R0150T0130L040	1.5	3	1.5°	2	40	5	2.2°	4.73	80	6	3	●	1	—	—	41.9	No interference
R0150T0130L050	1.5	3	1.5°	2	50	5	2.8°	5.26	110	8	3	●	1	—	—	52.2	No interference
R0150T0130L060	1.5	3	1.5°	2	60	5	2.4°	5.78	110	8	3	●	1	—	—	62.4	No interference
R0150T0130L070	1.5	3	1.5°	2	70	5	2.1°	6.30	120	8	3	●	1	—	—	72.7	No interference
R0200T0054L030	2	4	0.9°	3	30	6	3.5°	4.65	90	8	3	●	1	—	30.9	32.5	34.2
R0200T0054L040	2	4	0.9°	3	40	6	2.7°	4.97	90	8	3	●	1	—	41.0	43.0	No interference
R0200T0054L050	2	4	0.9°	3	50	6	2.2°	5.28	110	8	3	●	1	—	51.0	53.6	No interference
R0200T0054L060	2	4	0.9°	3	60	6	1.9°	5.60	110	8	3	●	1	—	61.1	No interference	No interference
R0250T0054L035	2.5	5	0.9°	3.5	35	6.5	2.4°	5.80	90	8	3	●	1	—	35.9	37.7	No interference
R0250T0054L040	2.5	5	0.9°	3.5	40	6.5	2.2°	5.95	90	8	3	●	1	—	41.0	43.0	No interference
R0250T0054L050	2.5	5	0.9°	3.5	50	6.5	1.8°	6.27	110	8	3	●	1	—	51.0	No interference	No interference
R0250T0054L060	2.5	5	0.9°	3.5	60	6.5	1.5°	6.58	110	8	3	●	1	—	61.1	No interference	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

IMPACT MIRACLE END MILLS

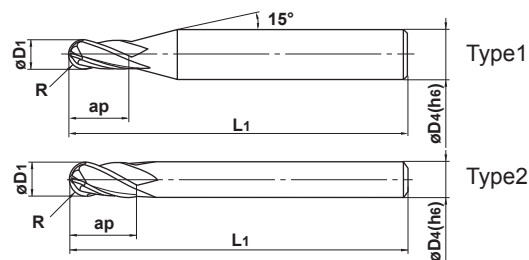
VF-4MB NEW

Ball nose, Medium cut length, 4 flute



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

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



IMPACT MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B319

B098

VF-MHVRB NEW

Corner radius, Medium cut length, Irregular helix flutes



±0.015

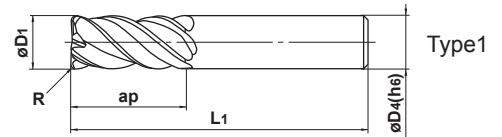


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
☉	○	○		☉	☉		



- Impact Miracle end mills with irregular helix flutes ensures stable machining on difficult-to-cut materials and with 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
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
D2000R100	20	1	45	110	20	4	●	1
D2000R200	20	2	45	110	20	4	●	1
D2000R300	20	3	45	110	20	4	●	1

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B320

B099

IMPACT MIRACLE END MILLS

VF-6MHVRB NEW

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



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

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



- 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



IMPACT MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B321

VF-SDRB

Corner radius, Extra short cut length, For hardened materials



0 - -0.02

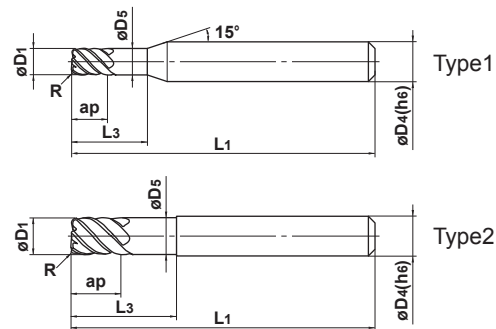


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
D4 = 12 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



- 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

IMPACT MIRACLE END MILLS

CUTTING CONDITIONS

B322

B101

IMPACT MIRACLE END MILLS

VF-MDRB

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



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

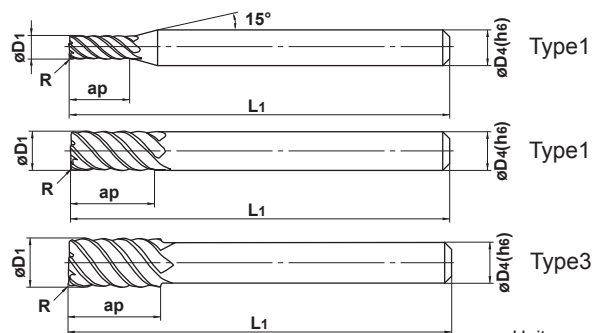


$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



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



Unit : mm

Order Number	Dia. D_1	Corner R R	Length of Cut a_p	Overall Length L_1	Shank Dia. D_4	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

B322

This image shows a full page of a notebook or ledger. At the top left, the word "Memo" is written in a large, bold, black font. Below it, there are approximately 30 horizontal dashed lines spaced evenly down the page, providing a guide for writing. The entire page is white, and the lines are light gray.

MIRACLE END MILLS

VC-255

End mill, Extra short cut length, 2 flute

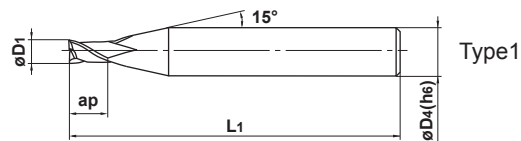


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎		○	○		

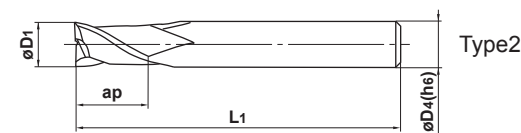


Type1



D1 < 3

D1 ≥ 3



Type2

● 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
D0800	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2SSD1500	15	23	80	16	2	●	1
D1600	16	24	90	16	2	●	2

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS



B323

B105

MIRACLE END MILLS

VC-2MS

End mill, Medium cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

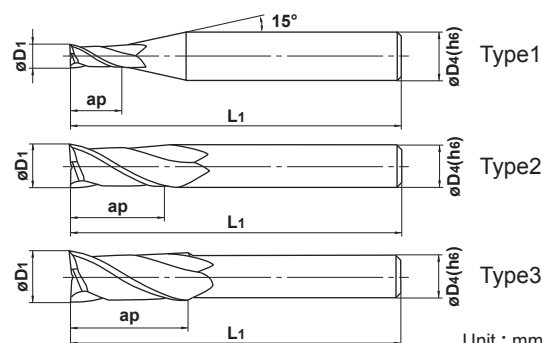


D4 = 3 0 - -0.006
4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D0650	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2MSD0850	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

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

MIRACLE END MILLS

VC-2MS-SS

End mill, Medium cut length, 2 flute, Slim shank

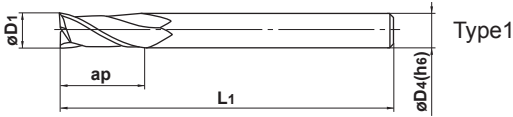


0 - -0.020



D4 = 5 0 - -0.008
7 ≤ D4 ≤ 9 0 - -0.009
D4 = 11 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 with shank size smaller than cutting diameter.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC2MSSSD0600	6	13	80	5	2	●	1
D0800	8	19	90	7	2	●	1
D1000	10	22	100	9	2	●	1
D1200	12	26	110	11	2	●	1



MIRACLE END MILLS

● : Inventory maintained in Japan.

VC-2JS

End mill, Semi long cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

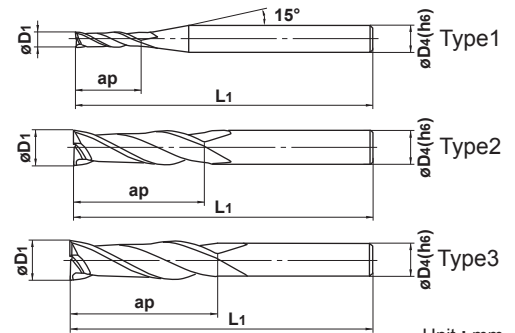


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 with longer cut length than standard.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B325

B109

MIRACLE END MILLS

VC-2XL

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

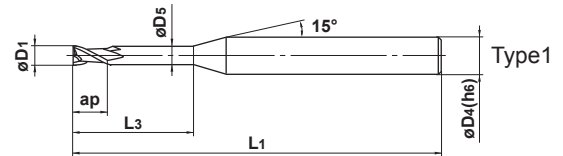


0 - -0.020



D4 = 4 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 rib milling.

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
VC2XLD0080N060	0.8	1.2	6	0.76	40	4	2	●	1
D0080N080	0.8	1.2	8	0.76	40	4	2	●	1
D0100N060	1	1.5	6	0.94	40	4	2	●	1
D0100N080	1	1.5	8	0.94	40	4	2	●	1
D0100N120	1	1.5	12	0.94	40	4	2	●	1
D0120N080	1.2	1.5	8	1.14	40	4	2	●	1
D0120N120	1.2	1.5	12	1.14	40	4	2	●	1
D0140N120	1.4	1.5	12	1.34	40	4	2	●	1
D0150N080	1.5	1.5	8	1.44	40	4	2	●	1
D0150N100	1.5	1.5	10	1.44	40	4	2	●	1
D0150N120	1.5	1.5	12	1.44	40	4	2	●	1
D0150N155	1.5	1.5	15.5	1.44	50	4	2	●	1
D0160N125	1.6	2	12.5	1.54	40	4	2	●	1
D0180N125	1.8	2	12.5	1.74	40	4	2	●	1
D0200N125	2	2	12.5	1.9	40	4	2	●	1
D0200N160	2	2	16	1.9	50	4	2	●	1
D0250N130	2.5	2.5	13	2.4	40	4	2	●	1
D0250N165	2.5	2.5	16.5	2.4	50	4	2	●	1
D0300N135	3	3	13.5	2.9	40	4	2	●	1
D0300N170	3	3	17	2.9	50	4	2	●	1

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B326

VC-4MC

End mill, Medium cut length, 4 flute



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

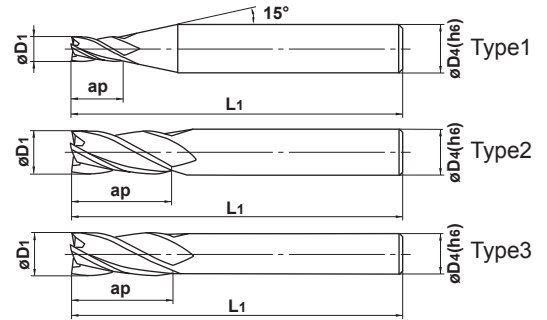


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



● 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B327

B111

MIRACLE END MILLS

CARBIDE

VC-4MC-55

End mill, Medium cut length, 4 flute, Slim shank

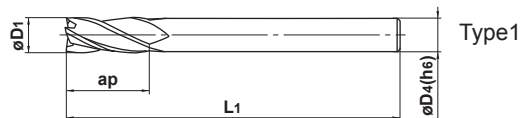


0 - -0.020



D4 = 5 0 - -0.008
7 ≤ D4 ≤ 9 0 - -0.009
D4 = 11 0 - -0.011

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



● 4 flute end mill with shank size smaller than cutting diameter.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VC4MCSSD0600	6	13	80	5	4	●	1
D0800	8	19	90	7	4	●	1
D1000	10	22	100	9	4	●	1
D1200	12	26	110	11	4	●	1

TAPER

RADIUS

BALL

SQUARE



MIRACLE END MILLS

● : Inventory maintained in Japan.

VC-4JC

End mill, Semi long cut length, 4 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

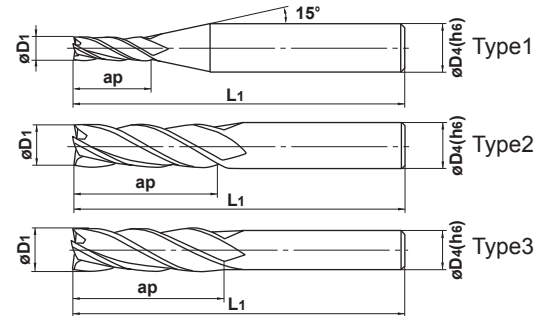


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B328

B113

MIRACLE END MILLS

VC-2ESB

Ball nose, Extra short cut length, 2 flute, Short shank



±0.01

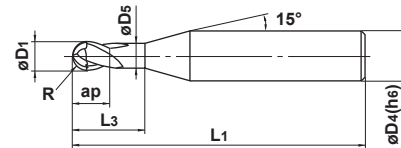


0 - 0.020

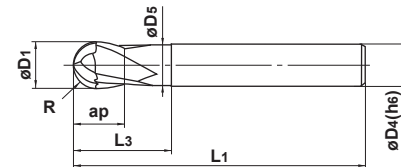


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
D4 = 12 0 - -0.011

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

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
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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B331

VC-255B

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



±0.01



0 - -0.020



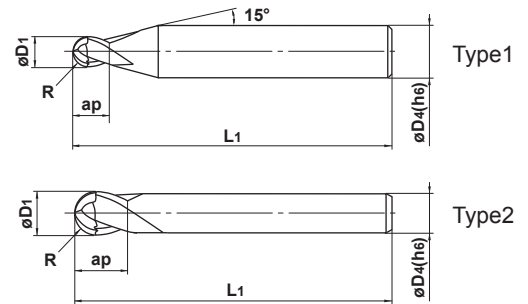
$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



● 2 flute ball nose end mill for high rigidity.



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
VC2SSBR0050	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
R0350	3.5	7	7	60	8	2	●	1
R0400	4	8	8	60	8	2	●	2
R0500	5	10	10	70	10	2	●	2
R0600	6	12	12	75	12	2	●	2

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B331

B115

MIRACLE END MILLS

VC-25B

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



R ≤ 6 ±0.01
R > 6 ±0.02

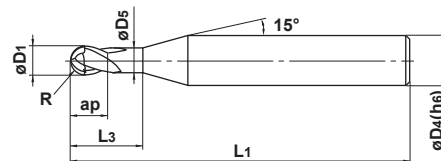


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

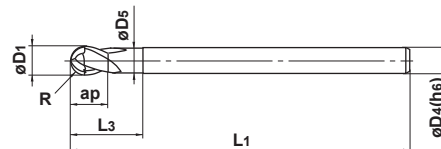


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

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

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
VC2SBR0015	0.15	0.3	0.3	0.6	0.27	50	6	2	●	1
R0020	0.2	0.4	0.4	0.8	0.36	50	6	2	●	1
R0030	0.3	0.6	0.6	1.2	0.56	50	6	2	●	1
R0040	0.4	0.8	0.8	1.6	0.76	50	6	2	●	1
R0050	0.5	1	1	2.5	0.94	50	6	2	●	1
R0060	0.6	1.2	1.2	3	1.14	50	6	2	●	1
R0070	0.7	1.4	1.4	3	1.34	50	6	2	●	1
R0075	0.75	1.5	1.5	4	1.44	50	6	2	●	1
R0080	0.8	1.6	1.6	4	1.54	50	6	2	●	1
R0090	0.9	1.8	1.8	5	1.74	50	6	2	●	1
R0100	1	2	2	6	1.9	60	6	2	●	1
R0125	1.25	2.5	2.5	6	2.4	60	6	2	●	1
R0150	1.5	3	3	8	2.9	60	6	2	●	1
R0175	1.75	3.5	3.5	8	3.4	60	6	2	●	1
R0200	2	4	4	8	3.9	60	6	2	●	1
R0225	2.25	4.5	4.5	10	4.4	60	6	2	●	1
R0250	2.5	5	5	12	4.9	60	6	2	●	1
R0275	2.75	5.5	5.5	12	5.4	60	6	2	●	1
R0300	3	6	6	13	5.85	60	6	2	●	2
R0400	4	8	8	14	7.85	90	8	2	●	2
R0500	5	10	10	18	9.7	100	10	2	●	2
R0600	6	12	12	22	11.7	110	12	2	●	2
R0800	8	16	16	30	15.5	140	16	2	●	2
R1000	10	20	20	38	19.5	160	20	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B329

VC-2PSB MIRACLE NOVA

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



D4 = 6 0 - -0.005
8 ≤ D4 ≤ 10 0 - -0.006
D4 = 12 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	◎	◎		○	○		



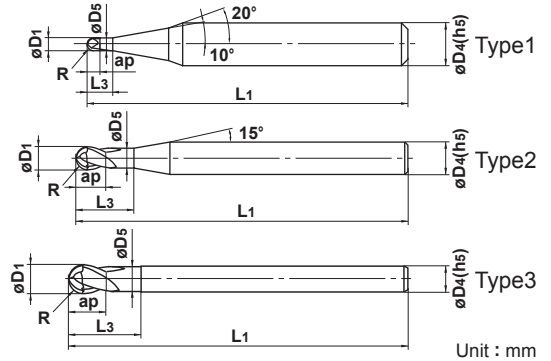
R < 0.5

R ≥ 0.5

R < 0.5

R ≥ 0.5

- 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B330

B117

MIRACLE END MILLS

VC-2PSB-P MIRACLE NOVA

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



±0.002



0 - 0.01



D4 = 6 0 - 0.005
8 ≤ D4 ≤ 10 0 - 0.006
D4 = 12 0 - 0.008

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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<0.5



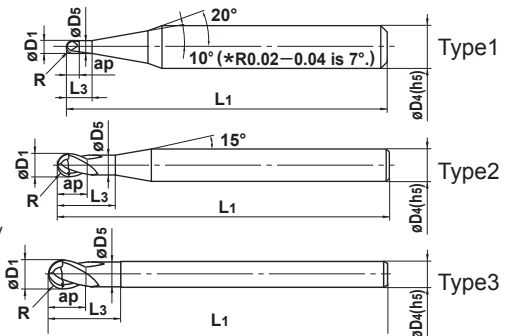
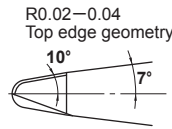
R≥0.5



R<0.5



R≥0.5



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



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

CUTTING CONDITIONS

B330

VC-2MB

Ball nose end mill, Medium cut length, 2 flute



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



$D_1 \leq 12 \quad 0 - -0.020$
 $D_1 > 12 \quad 0 - -0.030$



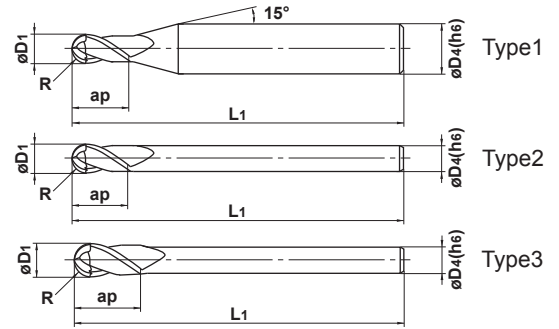
$D_4 = 3 \quad 0 - -0.006$
 $4 \leq D_4 \leq 6 \quad 0 - -0.008$
 $8 \leq D_4 \leq 10 \quad 0 - -0.009$
 $12 \leq D_4 \leq 16 \quad 0 - -0.011$
 $20 \leq D_4 \leq 25 \quad 0 - -0.013$

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



● 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

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B331

B119

MIRACLE END MILLS

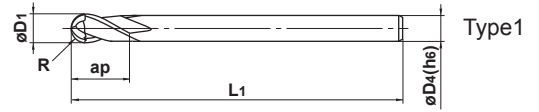
VC-2MB-SS

Ball nose end mill, Medium cut length, 2 flute, Slim shank



D4 = 5 0 - -0.008
7 ≤ D4 ≤ 9 0 - -0.009
D4 = 11 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 ball nose end mill with shank size smaller than cutting diameter.

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
VC2MBSSR0300	3	6	12	120	5	2	●	1
R0400	4	8	14	130	7	2	●	1
R0500	5	10	18	140	9	2	●	1
R0600	6	12	22	160	11	2	●	1



MIRACLE END MILLS

● : Inventory maintained in Japan.

VC-2MB-OH

Ball nose end mill, Medium cut length, 2 flute, Through coolant holes



R ≤ 6 ±0.01
R = 8 ±0.02

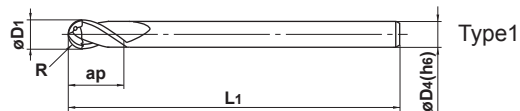


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 ball nose end mill ideal for use with through coolant machines.

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
VC2MBOHR0300	3	6	12	80	6	2	●	1
R0400	4	8	14	90	8	2	●	1
R0500	5	10	18	100	10	2	●	1
R0600	6	12	22	110	12	2	●	1
R0800	8	16	30	140	16	2	●	1

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B331

B121

MIRACLE END MILLS

VC-2MDB

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



R ≤ 6.5 ±0.01
R > 6.5 ±0.02



D₁ ≤ 12 0 - -0.020
D₁ > 12 0 - -0.030

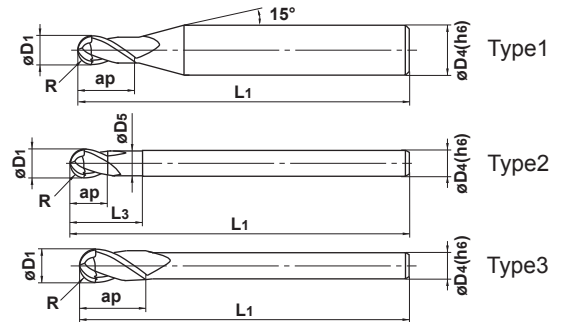


D₄ = 3 0 - -0.006
4 ≤ D₄ ≤ 6 0 - -0.008
8 ≤ D₄ ≤ 10 0 - -0.009
12 ≤ D₄ ≤ 16 0 - -0.011
20 ≤ D₄ ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 ball nose end mill with high edge strength resistant to chipping.



Unit : mm

Order Number	Radius of Ball Nose R	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
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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B331

VC-2LB

Ball nose end mill, Medium cut length, 2 flute, Long shank



R ≤ 6 ±0.01
R ≥ 8 ±0.02

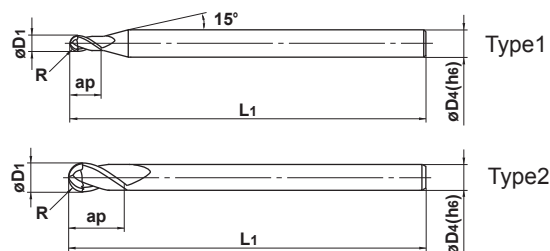


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

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

CARBIDE

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

MIRACLE END MILLS

VC-2XLB

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



±0.01



0 - -0.020

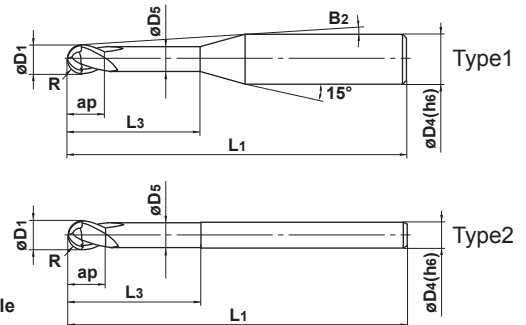
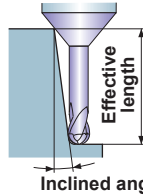


4 ≤ D4 ≤ 6 0 - -0.008

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



● 2 flute ball nose end mill with long neck for general use.

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°
VC2XLB0030N040	0.3	0.6	0.9	4	0.56	9.5°	50	4	2	●	1	4.2	4.3	4.6	5
R0030N060	0.3	0.6	0.9	6	0.56	8°	50	4	2	●	1	6.3	6.5	6.9	7.5
R0040N040	0.4	0.8	1.2	4	0.76	9.4°	50	4	2	●	1	4.2	4.3	4.6	5
R0040N060	0.4	0.8	1.2	6	0.76	7.8°	50	4	2	●	1	6.3	6.5	6.9	7.5
R0040N080	0.4	0.8	1.2	8	0.76	6.7°	50	4	2	●	1	8.3	8.6	9.2	10
R0050N040	0.5	1	1.5	4	0.94	9.1°	50	4	2	●	1	4.2	4.4	4.8	5.2
R0050N060	0.5	1	1.5	6	0.94	7.5°	50	4	2	●	1	6.3	6.6	7.1	7.7
R0050N080	0.5	1	1.5	8	0.94	6.4°	50	4	2	●	1	8.4	8.8	9.4	10.2
R0050N120	0.5	1	1.5	12	0.94	5°	50	4	2	●	1	12.6	13.1	14	15.1
R0060N080	0.6	1.2	1.2	8	1.14	6.2°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0060N120	0.6	1.2	1.2	12	1.14	4.8°	50	4	2	●	1	12.6	13.1	14	15.1
R0070N120	0.7	1.4	1.4	12	1.34	4.6°	50	4	2	●	1	12.6	13.1	14	15.1
R0075N060	0.75	1.5	1.5	6	1.44	7°	50	4	2	●	1	6.3	6.6	7.1	7.6
R0075N080	0.75	1.5	1.5	8	1.44	5.9°	50	4	2	●	1	8.4	8.8	9.4	10.1
R0075N120	0.75	1.5	1.5	12	1.44	4.4°	50	4	2	●	1	12.6	13.1	14	15.1
R0075N160	0.75	1.5	1.5	16	1.44	3.6°	55	4	2	●	1	16.8	17.3	18.6	20
R0080N160	0.8	1.6	2	16	1.54	3.5°	55	4	2	●	1	16.8	17.3	18.6	20
R0090N160	0.9	1.8	2	16	1.74	3.3°	55	4	2	●	1	16.8	17.3	18.6	20
R0100N080	1	2	2	8	1.9	5.3°	50	4	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
R0100N160	1	2	2	16	1.9	3.1°	55	4	2	●	1	16.7	17.2	18.4	19.9
R0100N200	1	2	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23	No interference
R0150N080	1.5	3	3	8	2.9	3.4°	50	4	2	●	1	8.3	8.6	9.2	9.8
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°	65	6	2	●	1	20.8	21.5	23	24.7
R0175N160	1.75	3.5	3.5	16	3.4	3.8°	60	6	2	●	1	16.6	17.2	18.3	19.7
R0200N080	2	4	4	8	3.9	5.7°	50	6	2	●	1	8.3	8.6	9.1	9.7
R0200N120	2	4	4	12	3.9	4.1°	55	6	2	●	1	12.5	12.9	13.7	14.6
R0200N160	2	4	4	16	3.9	3.2°	60	6	2	●	1	16.6	17.1	18.3	19.6
R0200N200	2	4	4	20	3.9	2.7°	65	6	2	●	1	20.8	21.4	22.9	No interference
R0250N200	2.5	5	5	20	4.9	1.5°	65	6	2	●	1	20.7	21.4	No interference	No interference
R0250N250	2.5	5	5	25	4.9	1.2°	70	6	2	●	1	25.9	26.7	No interference	No interference
R0300N300	3	6	6	30	5.85	—	80	6	2	●	2	No interference	No interference	No interference	No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B332

VC-2XLB-6

Ball nose, Medium cut length, 2 flute, Long neck, 6mm shank



±0.01



0 - -0.020

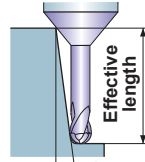


D4 = 6 0 - -0.008

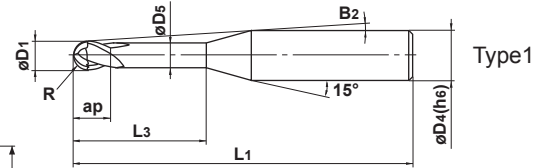
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



Effective length
for inclined angle



Inclined angle



- 2 flute ball nose end mill with long neck and 6mm 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	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°
VC2XLB6R0030N030	0.3	0.6	0.6	3	0.56	11.8°	55	6	2	●	1	3.1	3.3	3.5	3.8
R0040N040	0.4	0.8	0.8	4	0.76	11°	55	6	2	●	1	4.2	4.3	4.6	5
R0050N050	0.5	1	1	5	0.94	10.1°	55	6	2	●	1	5.3	5.5	6	6.4
R0060N060	0.6	1.2	1.2	6	1.14	9.3°	55	6	2	●	1	6.3	6.6	7.1	7.6
R0070N070	0.7	1.4	1.4	7	1.34	8.6°	55	6	2	●	1	7.4	7.7	8.2	8.9
R0075N075	0.75	1.5	1.5	7.5	1.44	8.3°	55	6	2	●	1	7.9	8.2	8.8	9.5
R0080N080	0.8	1.6	1.6	8	1.54	8°	55	6	2	●	1	8.4	8.8	9.4	10.1
R0090N090	0.9	1.8	1.8	9	1.74	7.4°	55	6	2	●	1	9.5	9.8	10.5	11.3
R0100N100	1	2	2	10	1.9	6.9°	60	6	2	●	1	10.4	10.8	11.5	12.4
R0125N125	1.25	2.5	2.5	12.5	2.4	5.6°	60	6	2	●	1	13	13.5	14.4	15.4

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B332

B125

MIRACLE END MILLS

VC-XB

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



±0.01



0 - -0.020

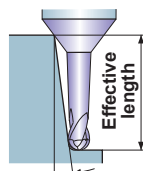


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011

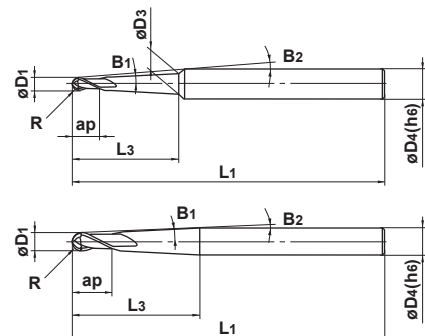
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



Effective length
for inclined angle



Inclined angle



Type1

Type2

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Taper Angle One Side	Length of Cut	Neck Length	Cutting Edge to Shank Angle	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle		
	R	D1	B1	ap	L3	B2	D3	L1	D4	N			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	No interference
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	—	—	No interference
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	No interference
R0150T0100L041	1.5	3	1°	6	41	2.1°	4.06	70	6	2	●	1	41.4	43.5	No interference
R0150T0100L051	1.5	3	1°	6	51	1.7°	4.41	80	6	2	●	1	51.4	No interference	No interference
R0150T0130	1.5	3	1°30'	6	52	1.7°	5.21	90	6	2	●	1	—	No interference	No interference
R0150T0300	1.5	3	3°	6	32	2.8°	5.56	70	6	2	●	1	—	—	No interference
R0200T0100L036	2	4	1°	8	36	1.7°	4.81	70	6	2	●	1	36.5	No interference	No interference
R0200T0100L046	2	4	1°	8	46	1.3°	5.16	80	6	2	●	1	46.5	No interference	No interference
R0200T0100L060	2	4	1°	8	60	1°	5.65	90	6	2	●	1	60.5	No interference	No interference
R0200T0130	2	4	1°30'	8	49	1.3°	5.95	90	6	2	●	1	—	No interference	No interference
R0200T0300	2	4	3°	8	28	2.2°	—	70	6	2	●	2	—	—	No interference
R0250T0100L036	2.5	5	1°	10	36	0.9°	5.71	80	6	2	●	1	No interference	No interference	No interference
R0250T0100L065	2.5	5	1°	10	65	1.4°	6.72	110	8	2	●	1	65.6	No interference	No interference
R0250T0130	2.5	5	1°30'	10	61	1.5°	7.42	110	8	2	●	1	—	No interference	No interference
R0250T0300	2.5	5	3°	10	41	2.3°	—	90	8	2	●	2	—	—	No interference
R0300T0100L051	3	6	1°	12	51	1.2°	7.11	90	8	2	●	1	51.8	No interference	No interference
R0300T0100L065	3	6	1°	12	65	1°	7.6	110	8	2	●	1	65.8	No interference	No interference
R0300T0100L092	3	6	1°	12	92	1.3°	8.54	140	10	2	●	1	92.8	No interference	No interference
R0300T0130	3	6	1°30'	12	53	1.2°	7.85	110	8	2	●	1	—	No interference	No interference
R0300T0300	3	6	3°	12	34	1.9°	—	90	8	2	●	2	—	—	No interference
R0400T0100L068	4	8	1°	14	68	0.9°	9.64	110	10	2	●	1	No interference	No interference	No interference
R0400T0100L092	4	8	1°	14	92	1.3°	10.47	140	12	2	●	1	92.8	No interference	No interference
R0400T0130	4	8	1°30'	14	55	1.2°	9.85	120	10	2	●	1	—	No interference	No interference
R0400T0300	4	8	3°	14	36	1.8°	—	100	10	2	●	2	—	—	No interference
R0500T0100L070	5	10	1°	18	70	0.9°	11.76	130	12	2	●	1	No interference	No interference	No interference
R0500T0100L100	5	10	1°	18	100	1.8°	12.8	160	16	2	●	1	100.7	No interference	No interference
R0500T0130	5	10	1°30'	18	59	1.1°	—	130	12	2	●	2	—	No interference	No interference

● : Inventory maintained in Japan.

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Taper Angle One Side	Length of Cut	Neck Length	Cutting Edge to Shank Angle	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle		
	R	D1	B1	ap	L3	B2	D3	L1	D4	N			1°	2°	3°
VCXBR0500T0300	5	10	3°	18	40	1.7°	—	110	12	2	●	2	—	—	No interference
R0600T0100L070	6	12	1°	22	70	1.8°	13.62	140	16	2	●	1	70.9	No interference	No interference
R0600T0100L100	6	12	1°	22	100	1.2°	14.66	160	16	2	●	1	100.9	No interference	No interference
R0600T0130	6	12	1° 30'	22	83	1.5°	15.08	160	16	2	●	1	—	No interference	No interference
R0600T0300	6	12	3°	22	63	2.1°	—	140	16	2	●	2	—	—	No interference

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

MIRACLE END MILLS

VC-3MB

Ball nose end mill, Medium cut length, 3 flute



$R \leq 6 \quad \pm 0.01$
 $R \geq 8 \quad \pm 0.02$

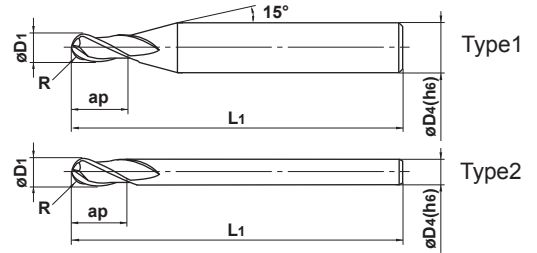


$D1 \leq 12 \quad 0 - -0.020$
 $D1 > 12 \quad 0 - -0.030$



$D4 = 6 \quad 0 - -0.008$
 $8 \leq D4 \leq 10 \quad 0 - -0.009$
 $12 \leq D4 \leq 16 \quad 0 - -0.011$
 $D4 = 20 \quad 0 - -0.013$

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



● 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
VC3MBR0100	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

B341

VC-3LB

Ball nose, Medium cut length, 3 flute, Long shank



$R \leq 6 \quad \pm 0.01$
 $R \geq 8 \quad \pm 0.02$

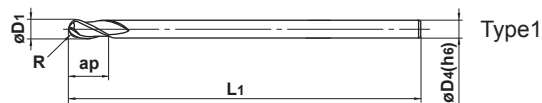


$D_1 \leq 12 \quad 0 - -0.020$
 $D_1 > 12 \quad 0 - -0.030$



$4 \leq D_4 \leq 6 \quad 0 - -0.008$
 $8 \leq D_4 \leq 10 \quad 0 - -0.009$
 $12 \leq D_4 \leq 16 \quad 0 - -0.011$
 $D_4 = 20 \quad 0 - -0.013$

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	○	○		



● 3 flute ball nose end mill with long shank 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
VC3LBR0200	2	4	8	120	4	3	●	1
R0300	3	6	12	140	6	3	●	1
R0400	4	8	14	150	8	3	●	1
R0500	5	10	18	180	10	3	●	1
R0600	6	12	22	200	12	3	●	1
R0800	8	16	30	230	16	3	●	1
R1000	10	20	38	250	20	3	●	1

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

MIRACLE END MILLS

VC-4MB

Ball nose end mill, Medium cut length, 4 flute



$R \leq 6 \quad \pm 0.01$
 $R \geq 7 \quad \pm 0.02$



$D1 \leq 12 \quad 0 - -0.020$
 $D1 > 12 \quad 0 - -0.030$

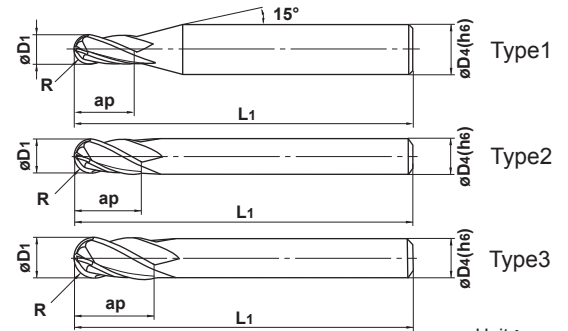


$D4 = 6 \quad 0 - -0.008$
 $8 \leq D4 \leq 10 \quad 0 - -0.009$
 $12 \leq D4 \leq 16 \quad 0 - -0.011$
 $D4 = 20 \quad 0 - -0.013$

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



- 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B342

VC-PSRB MIRACLE ORBIT

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



D4 = 6 0 - -0.005
8 ≤ D4 ≤ 10 0 - -0.006
D4 = 12 0 - -0.008

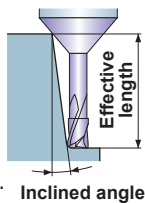
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	◎	◎	◎	○	○		



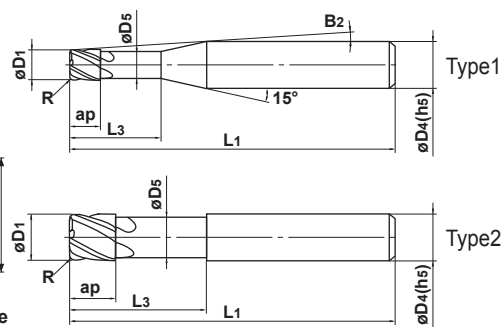
D1 ≤ 1.5

D1 ≥ 2

Effective length
for inclined angle



Inclined angle



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
D0150N06R05	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B347

B131

MIRACLE END MILLS

VC-PSRB MIRACLE ORBIT

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



±0.01



0 - -0.01



D4 = 6 0 - -0.005
8 ≤ D4 ≤ 10 0 - -0.006
D4 = 12 0 - -0.008

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

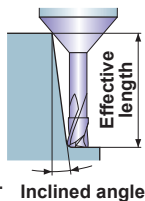


D1 ≤ 1.5

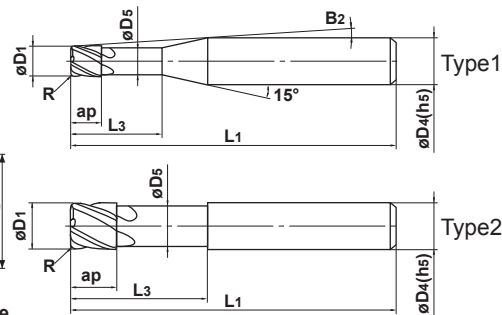


D1 ≥ 2

Effective length
for inclined angle



Inclined angle



- ±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.	Corner R	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			
	D1	R	ap	L3	D5	B2	L1	D4	N			30°	1°	2°	3°
VCPSRBD0150N10R05	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia.	Corner R	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			
	D1	R	ap	L3	D5	B2	L1	D4	N			30°	1°	2°	3°
VCPSRBD0300N15R03	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	No interference
D0300N30R05	3	0.5	3	30	2.9	2.6°	70	6	4	●	1	31.1	31.8	32.2	No interference
D0400N12R01	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	No interference
D0400N20R02	4	0.2	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	22	No interference
D0400N20R03	4	0.3	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	21.9	No interference
D0400N20R05	4	0.5	4	20	3.9	2.5°	60	6	4	●	1	20.8	21.4	21.7	No interference
D0400N20R10	4	1	4	20	3.9	2.6°	60	6	4	●	1	20.8	21.3	21.2	No interference
D0400N30R03	4	0.3	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	No interference	No interference
D0400N30R05	4	0.5	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	No interference	No interference
D0400N30R10	4	1	4	30	3.9	1.8°	70	6	4	●	1	31.1	31.8	No interference	No interference
D0500N15R05	5	0.5	5	15	4.9	1.6°	60	6	4	●	1	15.6	16.1	No interference	No interference
D0500N15R10	5	1	5	15	4.9	1.6°	60	6	4	●	1	15.6	16.1	No interference	No interference
D0500N30R05	5	0.5	5	30	4.9	0.9°	70	6	4	●	1	31.1	No interference	No interference	No interference
D0500N30R10	5	1	5	30	4.9	0.9°	70	6	4	●	1	31.1	No interference	No interference	No interference
D0600N18R01	6	0.1	6	18	5.85	—	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R02	6	0.2	6	18	5.85	—	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R03	6	0.3	6	18	5.85	—	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R05	6	0.5	6	18	5.85	—	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R10	6	1	6	18	5.85	—	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N18R20	6	2	6	18	5.85	—	70	6	4	●	2	No interference	No interference	No interference	No interference
D0600N41R05	6	0.5	6	41	5.85	—	90	6	4	●	2	No interference	No interference	No interference	No interference
D0600N50R10	6	1	6	50	5.85	—	90	6	4	●	2	No interference	No interference	No interference	No interference
D0800N24R01	8	0.1	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R02	8	0.2	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R03	8	0.3	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R05	8	0.5	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R10	8	1	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R20	8	2	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N24R30	8	3	8	24	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N50R10	8	1	8	50	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0800N50R30	8	3	8	50	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D1000N30R03	10	0.3	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R05	10	0.5	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R10	10	1	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R20	10	2	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R30	10	3	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N30R40	10	4	10	30	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

MIRACLE END MILLS

VC-PSRB MIRACLE ORBIT

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



±0.01



0 - -0.01



D4 = 6 0 - -0.005
8 ≤ D4 ≤ 10 0 - -0.006
D4 = 12 0 - -0.008

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

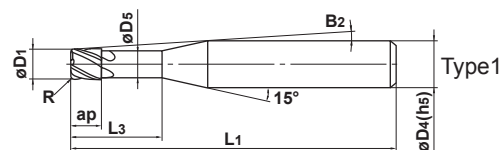
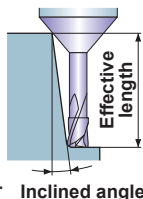


D1 ≤ 1.5

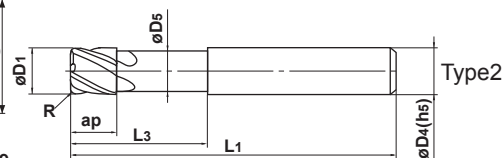


D1 ≥ 2

Effective length
for inclined angle



Type1



Type2

- ±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.	Corner R	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			
	D1	R	ap	L3	D5	B2	L1	D4	N			30°	1°	2°	3°
VCPSRBD1000N50R10	10	1	10	50	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1000N50R30	10	3	10	50	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1200N36R03	12	0.3	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1200N36R05	12	0.5	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1200N36R10	12	1	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1200N36R20	12	2	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1200N36R30	12	3	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1200N36R40	12	4	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1200N36R50	12	5	12	36	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference



MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B347

VC-PSRB MIRACLE ORBIT

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



±0.01



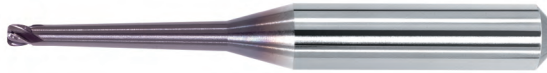
0 - -0.01



D4 = 6 0 - -0.005
8 ≤ D4 ≤ 10 0 - -0.006
12 ≤ D4 ≤ 16 0 - -0.008

CARBIDE

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

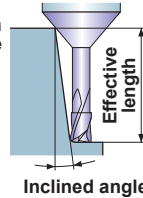


D1=1.5

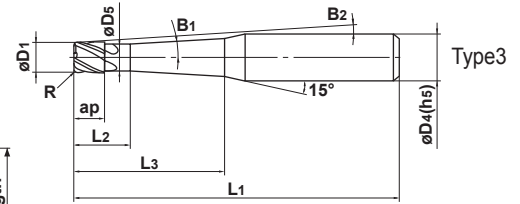


D1≥2

Effective length
for inclined angle



Inclined angle



- ±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	No interference
D0400N08L30R10	4	1	1° 30'	4	30	8	3.9	1.9°	70	6	4	●	3	—	No interference	No interference
D0500N08L40R05	5	0.5	1°	5	40	8	4.9	2°	90	8	4	●	3	41.2	No interference	No interference
D0500N08L60R05	5	0.5	1°	5	60	8	4.9	1.4°	110	8	4	●	3	61.2	No interference	No interference
D0500N08L40R10	5	1	1°	5	40	8	4.9	2°	90	8	4	●	3	41.7	No interference	No interference
D0500N08L60R10	5	1	1°	5	60	8	4.9	1.4°	110	8	4	●	3	61.7	No interference	No interference
D0600N08L40R20	6	2	1°	6	40	8	5.85	1.4°	70	8	4	●	3	42.8	No interference	No interference
D0600N08L60R20	6	2	1°	6	60	8	5.85	1°	100	8	4	●	3	No interference	No interference	No interference
D0800N10L53R20	8	2	1°	8	53	10	7.85	1.1°	90	10	4	●	3	55.9	No interference	No interference
D0800N10L70R20	8	2	1°	8	70	10	7.85	1.6°	130	12	4	●	3	72.9	No interference	No interference
D1000N12L55R30	10	3	1°	10	55	12	9.7	1.1°	100	12	4	●	3	59.4	No interference	No interference
D1000N12L70R30	10	3	1°	10	70	12	9.7	0.9°	130	12	4	●	3	No interference	No interference	No interference
D1200N24L70R30	12	3	1°	12	70	24	11.7	1.6°	130	16	4	●	3	75.2	No interference	No interference

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B347

B135

MIRACLE END MILLS

VC-2JRB

Corner radius end mill, Semi long cut length, 2 flute

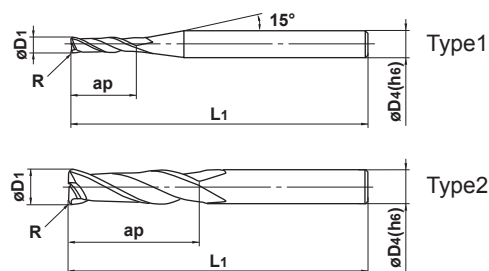


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
VC2JRBD0300R0030	3	0.3	12	50	6	2	●	1
D0400R0030	4	0.3	15	50	6	2	●	1
D0400R0050	4	0.5	15	50	6	2	●	1
D0500R0030	5	0.3	20	60	6	2	●	1
D0500R0050	5	0.5	20	60	6	2	●	1
D0600R0030	6	0.3	20	60	6	2	●	2
D0600R0050	6	0.5	20	60	6	2	●	2
D0600R0100	6	1	20	60	6	2	●	2
D0800R0030	8	0.3	25	70	8	2	●	2
D0800R0050	8	0.5	25	70	8	2	●	2
D0800R0100	8	1	25	70	8	2	●	2
D0800R0150	8	1.5	25	70	8	2	●	2
D0800R0200	8	2	25	70	8	2	●	2
D1000R0030	10	0.3	30	90	10	2	●	2
D1000R0050	10	0.5	30	90	10	2	●	2
D1000R0100	10	1	30	90	10	2	●	2
D1000R0150	10	1.5	30	90	10	2	●	2
D1000R0200	10	2	30	90	10	2	●	2
D1200R0050	12	0.5	30	90	12	2	●	2
D1200R0100	12	1	30	90	12	2	●	2
D1200R0150	12	1.5	30	90	12	2	●	2
D1200R0200	12	2	30	90	12	2	●	2
D1600R0050	16	0.5	50	110	16	2	●	2
D1600R0100	16	1	50	110	16	2	●	2
D1600R0150	16	1.5	50	110	16	2	●	2
D1600R0200	16	2	50	110	16	2	●	2
D2000R0050	20	0.5	55	110	20	2	●	2
D2000R0100	20	1	55	110	20	2	●	2
D2000R0150	20	1.5	55	110	20	2	●	2
D2000R0200	20	2	55	110	20	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B325

VC-45RB

Corner radius end mill, Short cut length, 4 flute



0 - -0.020

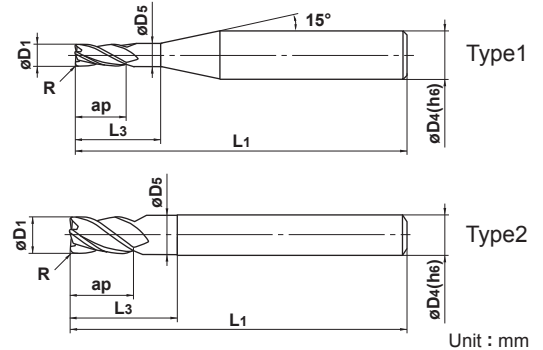


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
D4 = 12 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 corner radius end mill with relieved neck for 3×D length of reach.



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

CARBIDE

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B327

B137

MIRACLE END MILLS

VC-4JRB

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

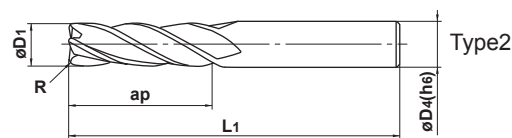
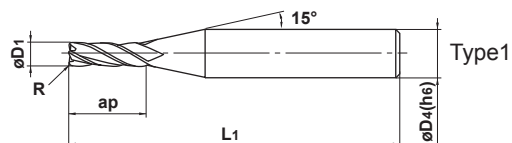


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

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

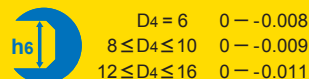
● : Inventory maintained in Japan.

CUTTING CONDITIONS

B328

VC-HFRB

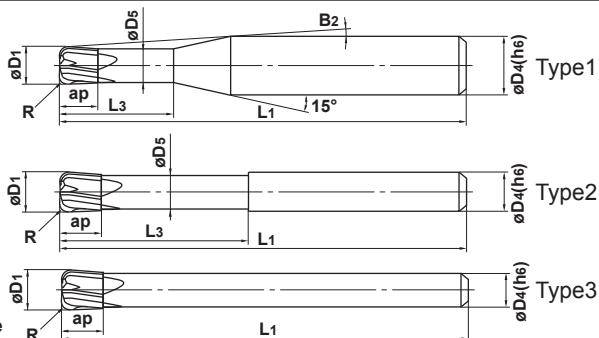
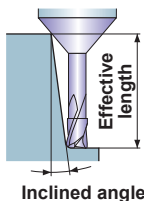
Corner radius, Short flute length, 4 flute, High feed machining



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



- 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	No interference
D0500R120N15	5	1.2	5	15	4.9	1.9°	70	6	4	●	1	15.5	16	No interference	No interference
D0600R150N18	6	1.5	6	18	5.85	—	50	6	4	●	2	No interference	No interference	No interference	No interference
D0600R150N30	6	1.5	6	30	5.85	—	90	6	4	●	2	No interference	No interference	No interference	No interference
D0700R150A050	7	1.5	7	—	—	—	50	6	4	●	3	No interference	No interference	No interference	No interference
D0700R150A080	7	1.5	7	—	—	—	80	6	4	●	3	No interference	No interference	No interference	No interference
D0800R200N24	8	2	8	24	7.85	—	60	8	4	●	2	No interference	No interference	No interference	No interference
D0800R200N40	8	2	8	40	7.85	—	90	8	4	●	2	No interference	No interference	No interference	No interference
D0900R200A065	9	2	9	—	—	—	65	8	4	●	3	No interference	No interference	No interference	No interference
D0900R200A100	9	2	9	—	—	—	100	8	4	●	3	No interference	No interference	No interference	No interference
D1000R200N30	10	2	10	30	9.7	—	70	10	4	●	2	No interference	No interference	No interference	No interference
D1000R200N50	10	2	10	50	9.7	—	100	10	4	●	2	No interference	No interference	No interference	No interference
D1100R200A070	11	2	11	—	—	—	70	10	4	●	3	No interference	No interference	No interference	No interference
D1100R200A110	11	2	11	—	—	—	110	10	4	●	3	No interference	No interference	No interference	No interference
D1200R300N36	12	3	12	36	11.7	—	75	12	4	●	2	No interference	No interference	No interference	No interference
D1200R300N60	12	3	12	60	11.7	—	110	12	4	●	2	No interference	No interference	No interference	No interference
D1300R300A075	13	3	13	—	—	—	75	12	4	●	3	No interference	No interference	No interference	No interference
D1300R300A120	13	3	13	—	—	—	120	12	4	●	3	No interference	No interference	No interference	No interference
D1600R300N80	16	3	16	80	15.5	—	140	16	4	●	2	No interference	No interference	No interference	No interference

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B349

B139

MIRACLE END MILLS

VC-HFRB

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



±0.015



D1 ≤ 12 0 - -0.02
D1 > 12 0 - -0.03



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

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



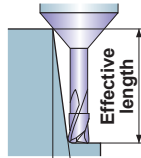
D1 ≤ 5



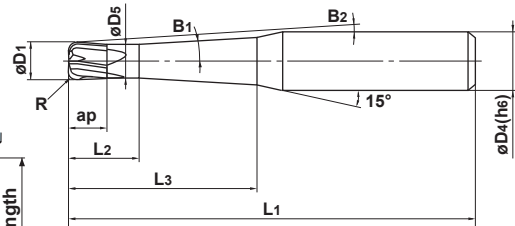
D1 ≥ 6



Effective length
for inclined angle



Inclined angle



Type4

- 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	No interference
D0300R075N30	3	0.75	1°	3	30	6	2.9	2.6°	80	6	4	●	4	31.3	33.6	No interference
D0400R100N24	4	1	1°	4	24	8	3.9	2.2°	90	6	4	●	4	25.7	27.6	No interference
D0400R100N32	4	1	1°	4	32	8	3.9	1.7°	90	6	4	●	4	33.7	No interference	No interference
D0400R100N40	4	1	1°	4	40	8	3.9	1.4°	90	6	4	●	4	41.7	No interference	No interference
D0500R120N30	5	1.2	1°	5	30	8	4.9	1°	90	6	4	●	4	No interference	No interference	No interference
D0500R120N40	5	1.2	1°	5	40	8	4.9	2°	90	8	4	●	4	41.9	No interference	No interference
D0500R120N50	5	1.2	1°	5	50	8	4.9	1.7°	110	8	4	●	4	51.9	No interference	No interference
D0600R150N50	6	1.5	1°	6	50	16	5.85	1.2°	110	8	4	●	4	52.9	No interference	No interference
D0600R150N67	6	1.5	1°	6	67	16	5.85	0.9°	130	8	4	●	4	No interference	No interference	No interference
D0800R200N70	8	2	1°	8	70	18	7.85	0.9°	120	10	4	●	4	No interference	No interference	No interference
D0800R200N90	8	2	1°	8	90	18	7.85	1.3°	150	12	4	●	4	93.5	No interference	No interference
D1000R200N80	10	2	1°	10	80	20	9.7	2°	140	16	4	●	4	83.9	No interference	No interference
D1000R200N110	10	2	1°	10	110	20	9.7	1.5°	160	16	4	●	4	113.9	No interference	No interference
D1200R300N110	12	3	1°	12	110	24	11.7	1.1°	160	16	4	●	4	115.2	No interference	No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B349

VC-MD

End mill, Medium cut length, 4—6 flute



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎				



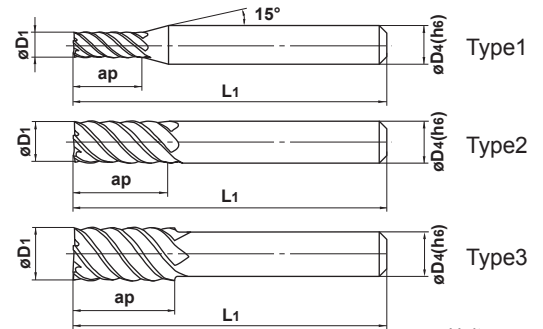
$D_1 < 3$

$D_1 \geq 3$

$D_1 < 3$

$D_1 \geq 3$

● 4—6 flute end mill for hardened steel milling.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
VCMD0100	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
D0350	3.5	10	45	6	6	●	1
D0400	4	11	45	6	6	●	1
D0450	4.5	11	50	6	6	●	1
D0500	5	13	50	6	6	●	1
D0550	5.5	13	50	6	6	●	1
D0600	6	13	50	6	6	●	2
D0800	8	19	60	8	6	●	2
D1000	10	22	70	10	6	●	2
D1200	12	26	75	12	6	●	2
D1400	14	26	75	12	6	●	3
D1500	15	30	80	16	6	●	1
D1600	16	32	90	16	6	●	2
D1800	18	32	90	16	6	●	3
D2000	20	38	100	20	6	●	2
D2200	22	38	100	20	6	●	3
D2500	25	60	160	25	6	●	2

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B335

B141

MIRACLE END MILLS

VC-MD-SC

End mill, Medium cut length, 4—6 flute

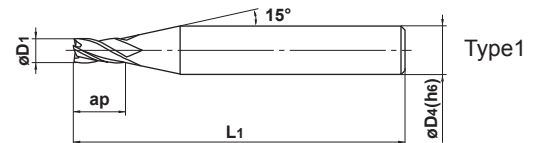


0 — 0.020

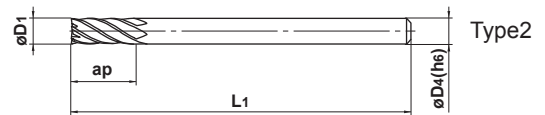


D4 = 6 0 — 0.008

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎				



Type1



Type2



D1 < 3

D1 = 3

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

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	●	2



MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



VC-MDL

End mill, Medium cut length, 6 flute, Long shank



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

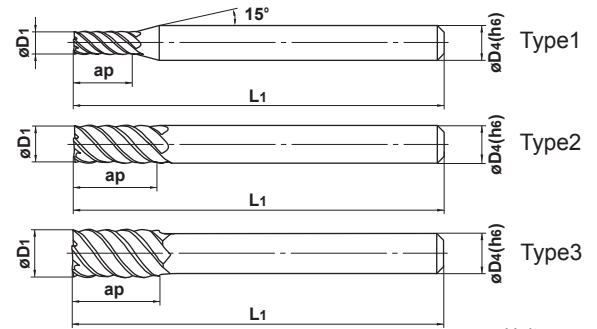


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



● 6 flute end mill with long shank for hardened steel milling.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCMDLD0300S06	3	8	60	6	6	●	1
D0400S06	4	11	60	6	6	●	1
D0500S06	5	13	70	6	6	●	1
D0600S06	6	13	70	6	6	●	2
D0800S08	8	19	90	8	6	●	2
D1000S08	10	22	100	8	6	●	3
D1000S10	10	22	100	10	6	●	2
D1200S10	12	26	110	10	6	●	3
D1200S12	12	26	110	12	6	●	2
D1600S16	16	32	130	16	6	●	2
D1800S16	18	32	130	16	6	●	3
D2000S20	20	38	140	20	6	●	2
D2200S20	22	38	140	20	6	●	3
D2500S25	25	60	180	25	6	●	2

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B336

B143

MIRACLE END MILLS

VC-LD

End mill, Long cut length, 6 flute

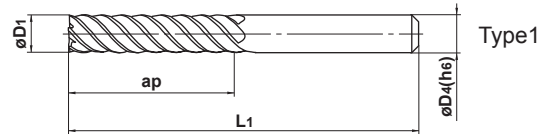


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



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

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



B336

VC-SDRB

Corner radius end mill, Short cut length

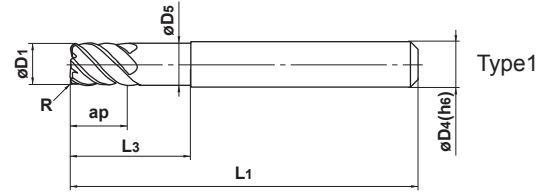


0 - 0.020



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



- 6 flute end mill with relieved neck for extra reach applications that require rigidity.

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
VCSDRBD0600R0050	6	0.5	6	18	5.8	50	6	6	●	1
D0800R0050	8	0.5	8	24	7.8	60	8	6	●	1
D1000R0100	10	1	10	30	9.7	70	10	6	●	1
D1200R0100	12	1	12	36	11.7	75	12	6	●	1

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B335

B145

MIRACLE END MILLS

VC-MDRB

Corner radius end mill, Medium cut length

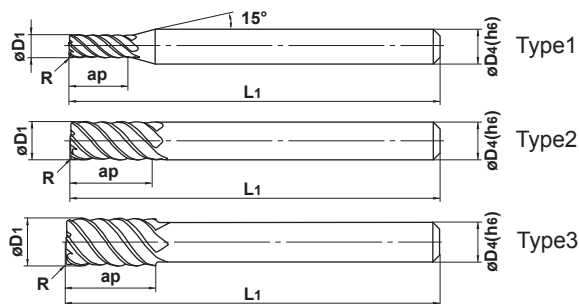


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



● 6 flute end mill with corner radius for hardened steel milling.

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
VCMDRBD0300R0030	3	0.3	8	60	6	6	●	1
D0400R0030	4	0.3	11	60	6	6	●	1
D0500R0030	5	0.3	13	70	6	6	●	1
D0600R0030	6	0.3	13	70	6	6	●	2
D0600R0050	6	0.5	13	70	6	6	●	2
D0700R0030	7	0.3	16	70	6	6	●	3
D0700R0050	7	0.5	16	70	6	6	●	3
D0800R0030	8	0.3	19	90	8	6	●	2
D0800R0050	8	0.5	19	90	8	6	●	2
D0900R0030	9	0.3	19	90	8	6	●	3
D0900R0050	9	0.5	19	90	8	6	●	3
D1000R0030	10	0.3	22	100	10	6	●	2
D1000R0050	10	0.5	22	100	10	6	●	2
D1000R0100	10	1	22	100	10	6	●	2
D1100R0050	11	0.5	22	100	10	6	●	3
D1100R0100	11	1	22	100	10	6	●	3
D1200R0050	12	0.5	26	110	12	6	●	2
D1200R0100	12	1	26	110	12	6	●	2
D1300R0050	13	0.5	26	110	12	6	●	3
D1300R0100	13	1	26	110	12	6	●	3
D1600R0100	16	1	32	130	16	6	●	2
D1600R0150	16	1.5	32	130	16	6	●	2
D1800R0100	18	1	32	130	16	6	●	3
D1800R0150	18	1.5	32	130	16	6	●	3
D2000R0100	20	1	38	140	20	6	●	2
D2000R0150	20	1.5	38	140	20	6	●	2
D2000R0200	20	2	38	140	20	6	●	2
D2200R0100	22	1	38	140	20	6	●	3
D2200R0150	22	1.5	38	140	20	6	●	3
D2200R0200	22	2	38	140	20	6	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B335

VC-MHDRB

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



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

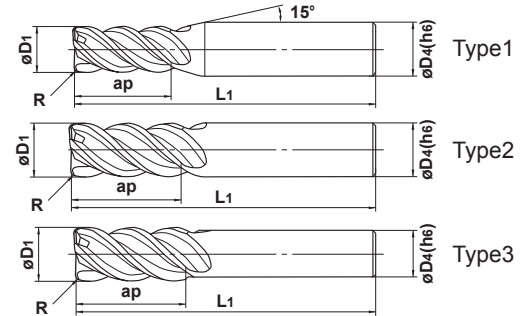


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	◎	◎		



- 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
D1200R050S12	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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B334

B147

MIRACLE END MILLS

VC-MHDRB

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

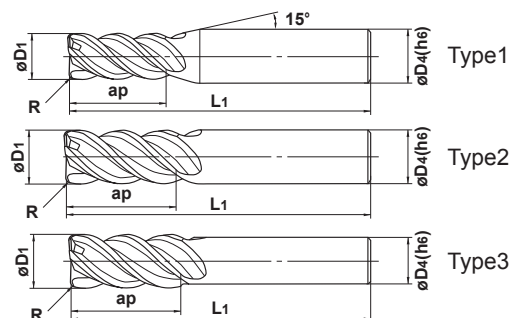


$D_1 \leq 12$ 0 - -0.02
 $D_1 > 12$ 0 - -0.03



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	○	◎	◎		



Unit : mm

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

Order Number	Dia. D1	Corner R R	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VCMHDRB 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B334

VC-MH

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



$D_1 \leq 12$ 0 — -0.020
 $D_1 > 12$ 0 — -0.030

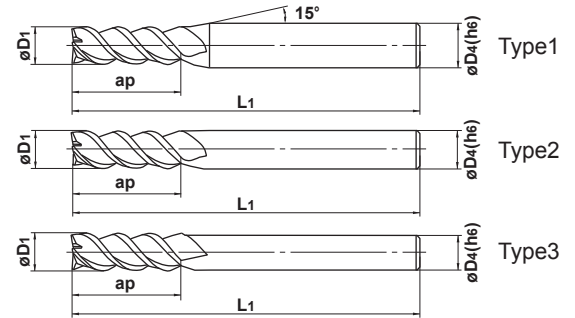


$D_4 = 6$ 0 — -0.008
 $8 \leq D_4 \leq 10$ 0 — -0.009
 $12 \leq D_4 \leq 16$ 0 — -0.011
 $20 \leq D_4 \leq 25$ 0 — -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	○		◎	◎		



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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
VCMD0300	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

CARBIDE

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B337

B149

MIRACLE END MILLS

VC-6MH

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

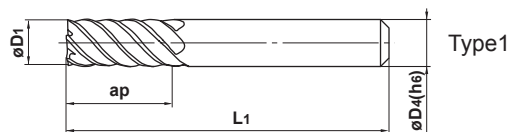


$D_1 \leq 12$ 0 - -0.02
 $D_1 > 12$ 0 - -0.03



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



Type1



● 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



MIRACLE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B338

VC-8MH

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

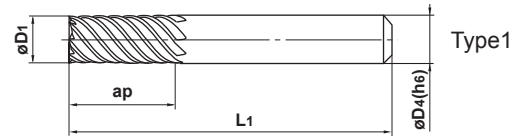


0 - 0.03



20 ≤ D4 ≤ 25 0 - 0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
☉	☉	○		☉	☉		



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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B338

B151

MIRACLE END MILLS

VC-SFPR

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



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	◎	○		◎	◎		

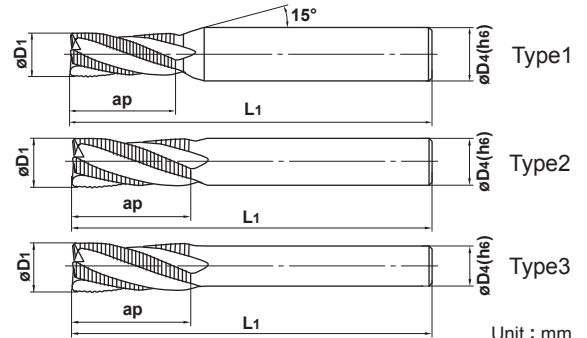


D1 < 8



D1 ≥ 8

- 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
NEW D1000S08	10	22	90	8	4	●	3
D1000	10	22	70	10	4	●	2
NEW 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

B339

VC-2MT

Taper end mill, Medium cut length, 2 flute



0 - 0.03



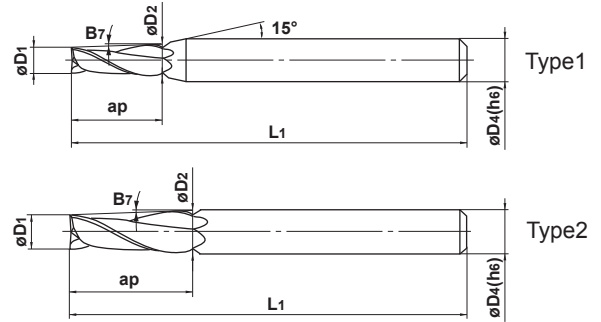
±5°



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

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	○	○	○		



- 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

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B340

B153

MIRACLE END MILLS

VC-4MT

Taper end mill, Medium cut length, 4 flute



0 - 0.03

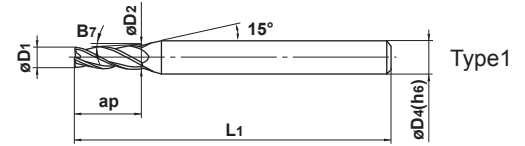


±5°

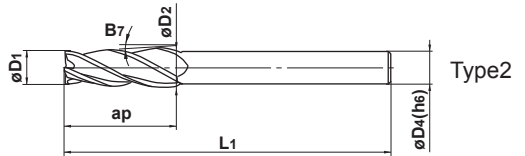


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

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

● 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
VC4MTD0300T0030	3	30°	10	3.17	50	6	4	●	1
D0300T0100	3	1°	10	3.35	50	6	4	●	1
D0300T0130	3	1° 30'	10	3.52	50	6	4	●	1
D0300T0200	3	2°	10	3.7	50	6	4	●	1
D0300T0300	3	3°	10	4.05	50	6	4	●	1
D0300T0500	3	5°	10	4.75	50	6	4	●	1
D0300T1000	3	10°	10	6.53	50	6	4	●	2
D0400T0030	4	30°	15	4.26	55	6	4	●	1
D0400T0100	4	1°	15	4.52	55	6	4	●	1
D0400T0130	4	1° 30'	15	4.79	55	6	4	●	1
D0400T0200	4	2°	15	5.05	55	6	4	●	1
D0400T0300	4	3°	15	5.57	55	6	4	●	1
D0400T0500	4	5°	15	6.62	60	6	4	●	2
D0400T1000	4	10°	15	9.29	70	8	4	●	2
D0500T0030	5	30°	20	5.35	60	6	4	●	1
D0500T0100	5	1°	20	5.7	60	6	4	●	1
D0500T0130	5	1° 30'	20	6.05	60	6	4	●	2
D0500T0200	5	2°	20	6.4	60	6	4	●	2
D0500T0300	5	3°	20	7.1	60	6	4	●	2
D0500T0500	5	5°	20	8.5	70	8	4	●	2
D0500T1000	5	10°	20	12.05	90	12	4	●	2
D0600T0030	6	30°	20	6.35	60	6	4	●	2
D0600T0100	6	1°	20	6.7	60	6	4	●	2
D0600T0130	6	1° 30'	20	7.05	60	6	4	●	2
D0600T0200	6	2°	20	7.4	60	6	4	●	2
D0600T0300	6	3°	20	8.1	70	8	4	●	2
D0600T0500	6	5°	20	9.5	70	8	4	●	2
D0600T1000	6	10°	20	13.05	90	12	4	●	2
D0800T0030	8	30°	25	8.44	70	8	4	●	2
D0800T0100	8	1°	25	8.87	70	8	4	●	2
D0800T0130	8	1° 30'	25	9.31	70	8	4	●	2
D0800T0200	8	2°	25	9.75	70	8	4	●	2
D0800T0300	8	3°	25	10.62	70	10	4	●	2
D0800T0500	8	5°	25	12.37	75	12	4	●	2
D0800T1000	8	10°	25	16.82	90	16	4	●	2
D1000T0030	10	30°	35	10.61	90	10	4	●	2
D1000T0100	10	1°	35	11.22	90	10	4	●	2
D1000T0130	10	1° 30'	35	11.83	90	10	4	●	2

● : Inventory maintained in Japan.

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
VC4MTD1000T0200	10	2°	35	12.44	90	12	4	●	2
D1000T0300	10	3°	35	13.67	90	12	4	●	2
D1000T0500	10	5°	35	16.12	90	16	4	●	2
D1000T1000	10	10°	35	22.34	110	20	4	●	2

SQUARE

BALL

RADIUS

TAPER



MIRACLE END MILLS

CUTTING CONDITIONS

B340

B155

MIRACLE END MILLS

VC-45TB

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



±0.01



D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009

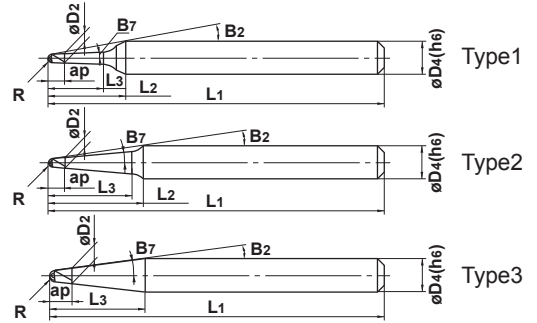
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	◎	◎	○	○		



R<0.5

R≥0.5

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



*Relief Neck type.

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
VC45TBR0030T0130N05	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	0.70	17.6°	60	6	4	●	1
R0030T1000N15	0.3	10°	1	15	—	0.90	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	2.20	14.4°	60	6	4	●	2
R0100T0200N10	1	2°	4	10	13.8	2.20	8.9°	60	6	4	●	1
R0100T0200N15	1	2°	4	15	17.5	2.20	6.9°	60	6	4	●	2
R0100T0500N10	1	5°	4	10	12.2	2.50	10.1°	60	6	4	●	2
R0100T0500N15	1	5°	4	15	16.8	2.50	7.2°	60	6	4	●	2
R0100T0500N23	1	5°	4	23	—	2.50	5.2°	60	6	4	●	3
R0100T0700N17	1	7°	7	17	—	3.49	7.1°	60	6	4	●	3
R0100T1000N12	1	10°	4	12	—	3.10	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

● : 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
VC4STBR0150T0130N20	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	3.50	8.3°	60	6	4	●	2
R0150T0500N18	1.5	5°	4	18	—	3.50	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	—	4.40	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B343

B157

MIRACLE END MILLS

VC-2C

Chamfer cutter, 2 flute

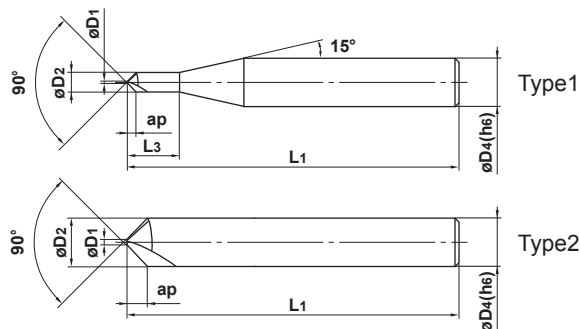


±0.02



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	○	○	○	○	○	○	○



- 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

TAPER

RADIUS

BALL

SQUARE

MIRACLE END MILLS

SOLID END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B345

VC-RC NEW

Corner rounding cutter, 3 flute

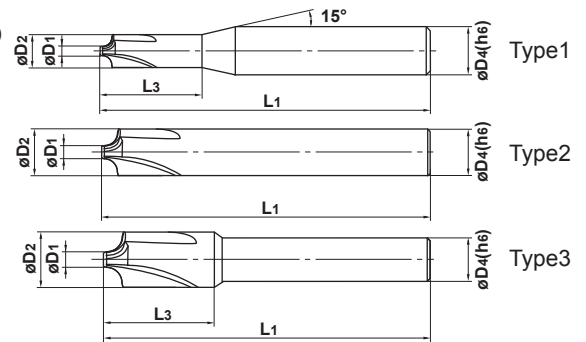
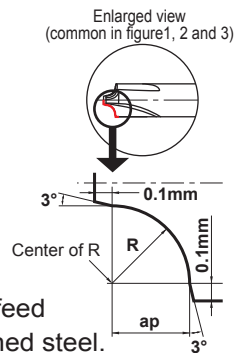


±0.02



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	○	○	○	○	○	○	○



Unit : mm

- Chamfering cutters for high efficiency, high feed machining of carbon steel through to hardened steel.

Order Number	Corner Radius R	Dia. D2	Overall Length L1	Tip Dia. D1	Length of Cut ap	Neck Length L3	Shank Dia. D4	No. of Flutes N	Stock	Type
VCRCR0050	0.5	4	50	2.8	0.5	12	6	3	●	1
R0100	1	5	50	2.8	1	15	6	3	●	1
R0150	1.5	6	50	2.8	1.5	—	6	3	●	2
R0200	2	8	60	3.8	2	—	8	3	●	2
R0250	2.5	9	70	3.8	2.5	27	10	3	●	1
R0300	3	10	70	3.8	3	—	10	3	●	2
R0400	4	12	75	3.8	4	—	12	3	●	2
R0500	5	14	75	3.8	5	26	12	3	●	3

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B346

B159

MIRACLE END MILLS

VJ-2MS

End mill, Medium cut length, 2 flute

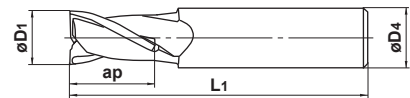


D1 = 20 0 - -0.03
D1 > 20 0 - -0.04

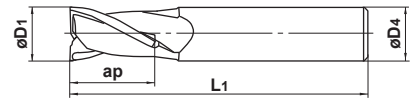
Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○	○	○	○	○		



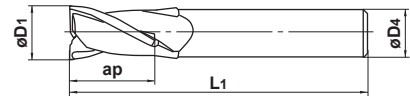
● 2 flute end mill for general use finishing.



Type1



Type2



Type3

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VJ2MSD2000	20	30	110	20	2	●	2
D2500	25	35	125	25	2	●	2
D3000	30	45	140	32	2	●	1
D3200	32	45	145	32	2	●	2
D3500	35	50	155	32	2	●	3
D4000	40	50	155	32	2	●	3
D5000	50	60	170	42	2	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B350

VJ-4MS

End mill, Medium cut length, 4 flute

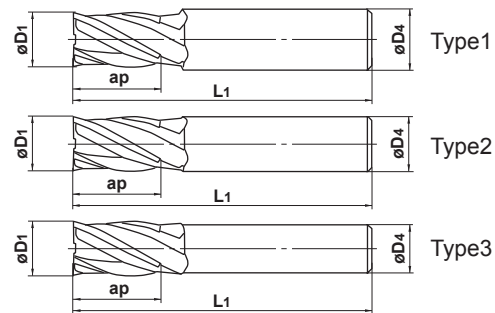


D1 = 20 0 - +0.03
D1 > 20 0 - +0.04

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 end mill for general use finishing.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
VJ4MSD2000	20	30	110	20	4	●	2
D2500	25	35	125	25	4	●	2
D3000	30	45	140	32	4	●	1
D3200	32	45	145	32	4	●	2
D3500	35	50	155	32	4	●	3
D4000	40	50	155	32	4	●	3
D5000	50	60	170	42	4	●	3

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MIRACLE END MILLS

CUTTING CONDITIONS

B350

B161

CRN COATED END MILLS

CRN-2MS

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

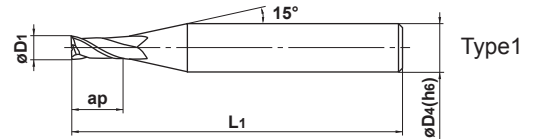


0 - 0.02

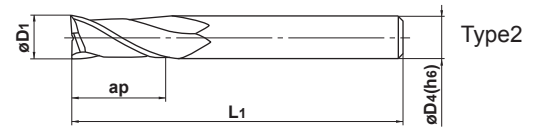


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
						◎	○



Type1



Type2



$D_1 < 3$

$D_1 \geq 3$

- 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B351

CRN-2XL

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



0 - -0.02

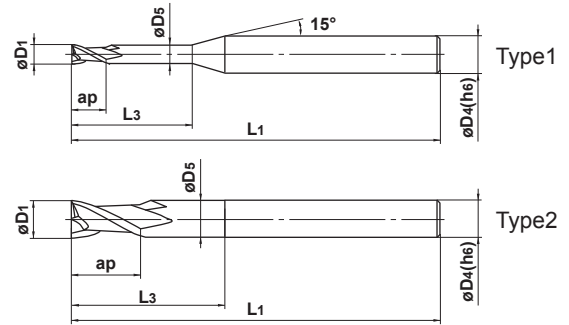


4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
D0100N080S04	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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CRN COATED END MILLS

CUTTING CONDITIONS

B352

B163

CRN COATED END MILLS

CRN-2XL

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

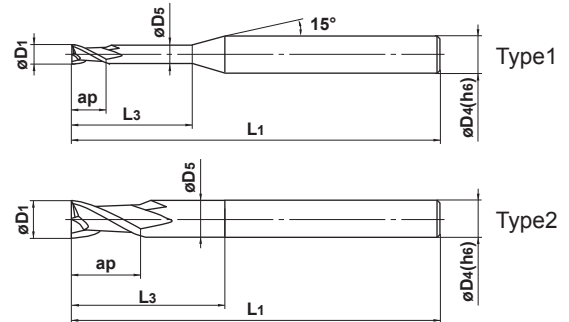


0 - -0.02



4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
CRN2XLD0100N120S04	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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B352

CRN-4JC

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



0 — -0.02

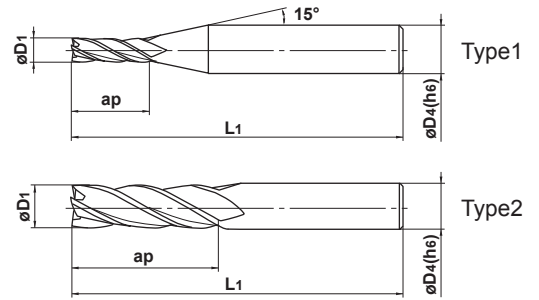


D4 = 6 0 — -0.008
8 ≤ D4 ≤ 10 0 — -0.009
D4 = 12 0 — -0.011

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

CARBIDE

SQUARE

BALL

RADIUS

TAPER



CRN COATED END MILLS

CUTTING CONDITIONS

B351

B165

CRN COATED END MILLS

CRN-2MB

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



±0.01

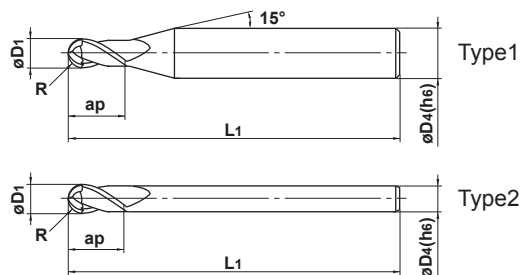


0 - -0.02



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

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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B353

CRN-2XLB

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



±0.01



0 - -0.02

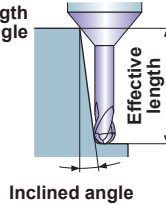


4 ≤ D4 ≤ 6 0 - -0.008

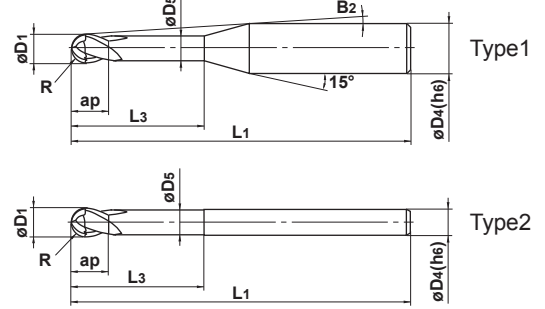
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (≥55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
						◎	○



Effective length
for inclined angle



Inclined angle



Unit : mm

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

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°
CRN2XLB0010N005S04	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
R0030N020S04	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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CRN COATED END MILLS

CUTTING CONDITIONS

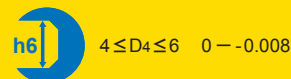
B354

B167

CRN COATED END MILLS

CRN-2XLB

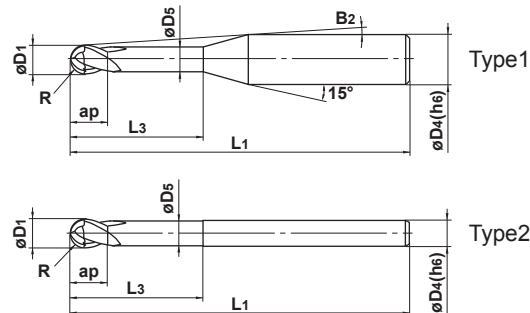
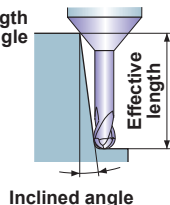
Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes



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
						◎	○



Effective length
for inclined angle



- 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°
CRN2XLB0030N060S04	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

● : Inventory maintained in Japan.

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°
CRN2XLBR0050N200S04	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
R0075N160S04	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	No interference
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	No interference
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	No interference
R0150N350S06	1.5	3	3	35	2.90	2.2°	80	6	2	●	1	36.3	37.5	40.2	No interference
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	No interference
R0200N300S06	2	4	4	30	3.90	1.8°	70	6	2	●	1	31.1	32.1	No interference	No interference
R0200N400S06	2	4	4	40	3.90	1.4°	90	6	2	●	1	41.4	42.8	No interference	No interference
R0200N500S06	2	4	4	50	3.90	1.2°	100	6	2	●	1	51.8	53.5	No interference	No interference
R0250N200S06	2.5	5	5	20	4.90	1.5°	70	6	2	●	1	20.7	21.4	No interference	No interference
R0250N300S06	2.5	5	5	30	4.90	1°	80	6	2	●	1	31.1	No interference	No interference	No interference
R0300N300S06	3	6	6	30	5.85	—	80	6	2	●	1	No interference	No interference	No interference	No interference
R0300N500S06	3	6	6	50	5.85	—	100	6	2	●	1	No interference	No interference	No interference	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CRN COATED END MILLS

CRN COATED END MILLS

CRN-2MRB

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

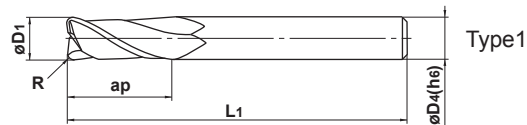


0.02



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

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



- 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B355

CRN-2XLRB

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



0 - -0.02



4 ≤ D4 ≤ 6 0 - -0.008

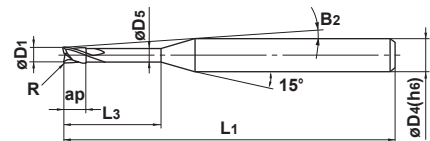
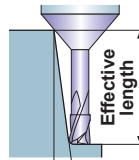
CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
						◎	○

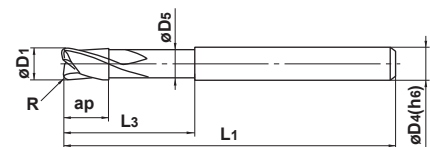


Effective length
for inclined angle

Inclined angle



Type1



Type2

Unit : mm

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

Order Number	Dia.	Corner R	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			
	D1	R	ap	L3	D5	B2	L1	D4	N			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	No interference
D0150R020N20	1.5	0.2	1.5	20	1.44	2.9°	60	4	2	●	1	20.9	21.7	23.3	No interference
D0150R030N20	1.5	0.3	1.5	20	1.44	3°	60	4	2	●	1	20.9	21.6	23.3	No interference
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	No interference
D0200R020N16	2	0.2	2	16	1.9	2.9°	55	4	2	●	1	16.7	17.3	18.6	No interference
D0200R030N16	2	0.3	2	16	1.9	3°	55	4	2	●	1	16.7	17.3	18.5	No interference
D0200R050N16	2	0.5	2	16	1.9	3°	55	4	2	●	1	16.7	17.2	18.5	No interference
D0200R010N20	2	0.1	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.6	23.2	No interference
D0200R020N20	2	0.2	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23.2	No interference
D0200R030N20	2	0.3	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23.1	No interference
D0200R050N20	2	0.5	2	20	1.9	2.5°	60	4	2	●	1	20.8	21.5	23.1	No interference
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
D0300R050N20	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	No interference
D0400R030N20	4	0.3	4	20	3.9	2.5°	65	6	2	●	1	20.8	21.5	23.1	No interference
D0400R050N20	4	0.5	4	20	3.9	2.5°	65	6	2	●	1	20.8	21.5	23.1	No interference

SQUARE

BALL

RADIUS

TAPER

SOLID END MILLS

CRN COATED END MILLS

CUTTING CONDITIONS

B356

B171

CRN COATED END MILLS

CRN-2XLRB

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



0 - -0.02



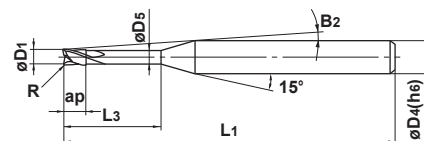
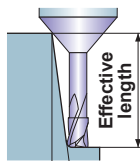
4 ≤ D4 ≤ 6 0 - -0.008

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
						◎	○

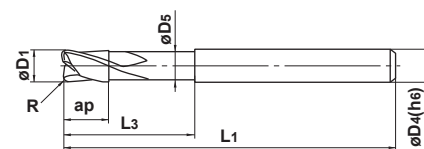


Effective length
for inclined angle

Inclined angle



Type1



Type2

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

Unit : mm

Order Number	Dia.	Corner R	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			
	D1	R	ap	L3	D5	B2	L1	D4	N			30°	1°	2°	3°
CRN2XLRBD0500R020N25	5	0.2	5	25	4.9	1.1°	65	6	2	●	1	26	26.9	No interference	No interference
D0500R030N25	5	0.3	5	25	4.9	1.1°	65	6	2	●	1	26	26.9	No interference	No interference
D0500R050N25	5	0.5	5	25	4.9	1.1°	65	6	2	●	1	26	26.9	No interference	No interference
D0600R020N30	6	0.2	6	30	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference
D0600R030N30	6	0.3	6	30	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference
D0600R050N30	6	0.5	6	30	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference
D0600R100N30	6	1	6	30	5.85	—	70	6	2	●	2	No interference	No interference	No interference	No interference



CRN COATED END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B356

This image shows a full page of a notebook or ledger. At the top left, the word "Memo" is printed in a large, bold, black font. A thick horizontal line runs across the entire width of the page just below the title. The rest of the page is filled with evenly spaced, thin horizontal lines, creating a series of rows for writing. There are no vertical margin lines, and the page is otherwise completely blank.

DLC COATED END MILLS

DLC-2MA

Slot drill, Medium cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

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



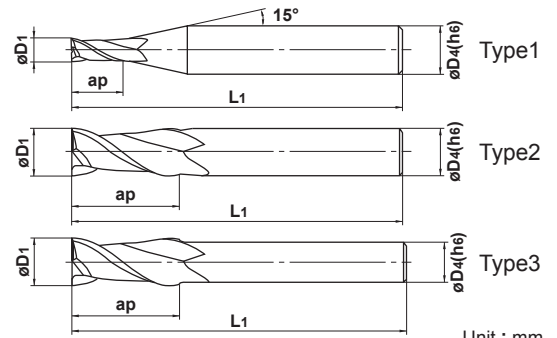
D1 < 3

D1 ≥ 3

D1 < 3

D1 ≥ 3

● 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

B357

DLC-2MB

Ball nose, Medium cut length, 2 flute



$R \leq 6 \pm 0.01$
 $R > 6 \pm 0.02$



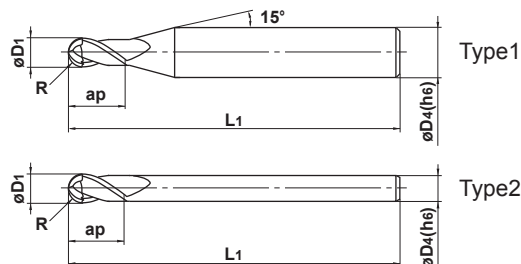
$D_1 \leq 12 \ 0 - -0.020$
 $D_1 > 12 \ 0 - -0.030$



$4 \leq D_4 \leq 6 \ 0 - -0.008$
 $8 \leq D_4 \leq 10 \ 0 - -0.009$
 $12 \leq D_4 \leq 16 \ 0 - -0.011$
 $D_4 = 20 \ 0 - -0.013$

CARBIDE

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



SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

DLC COATED END MILLS

- 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

CUTTING CONDITIONS

B358

B175

DIAMOND COATED END MILLS

DC-2MS-3

Medium cut length, 2 flute, 3mm shank, For non-ferrous metals

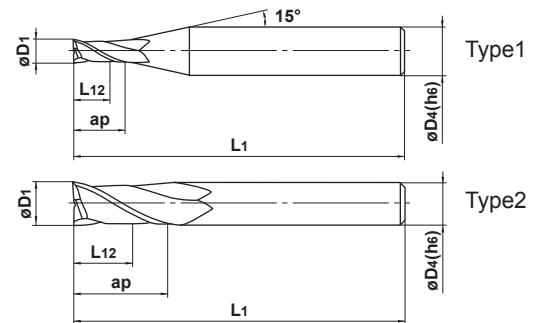


-0.005 — -0.028



D4 = 3 0 — -0.006

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	◎



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Effective Coating Length L12	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
DC2MS3D0050	0.5	1	1	38	3	2	●	1
D0100	1	2.5	1.5	38	3	2	●	1
D0150	1.5	4	2.5	38	3	2	●	1
D0200	2	6	3	45	3	2	●	1
D0250	2.5	8	4	45	3	2	●	1
D0300	3	8	4.5	45	3	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS



DC-2MB-NF

Ball nose, Medium cut length, 2 flute, For non-ferrous metals



$D_1 < 6$ 0 - -0.028
 $D_1 \geq 6$ 0 - -0.038

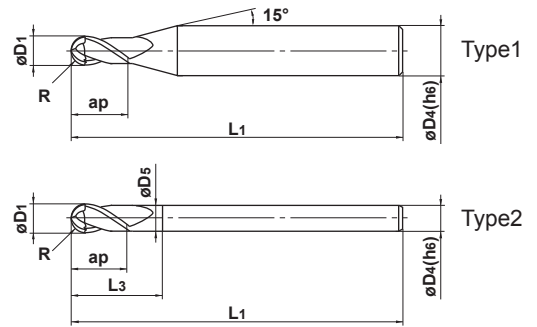


$D_4 = 3$ 0 - -0.006
 $4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

Copper Alloy	Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics



- 2 flute end mill for long life precision machining of non-ferrous metals.



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
DC2MBNFR0030	0.3	0.6	1.2	—	—	38	3	2	●	1
R0050	0.5	1	2.5	—	—	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	22	5.80	80	6	2	●	2
R0400	4	8	14	27	7.80	90	8	2	●	2
R0500	5	10	18	31	9.80	100	10	2	●	2
R0600	6	12	22	35	11.80	110	12	2	●	2

(Effective Coating Length : 1-1.5D1)

CARBIDE

SQUARE

BALL

RADIUS

TAPER



DIAMOND COATED END MILLS

CUTTING CONDITIONS

B360

B177

DIAMOND COATED END MILLS

DC-2MB

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



$D_1 < 6$ 0 - -0.028
 $D_1 \geq 6$ 0 - -0.038

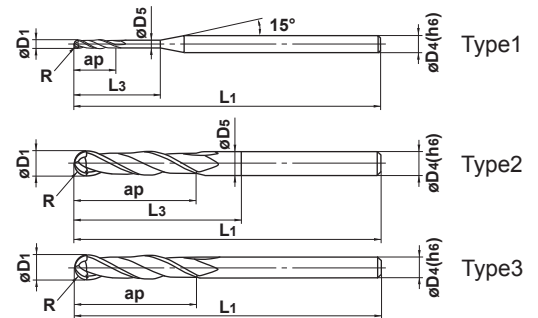


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○



- 2 flute end mill with original diamond coating technology with excellent coating adhesion strength to prevent flaking and chipping during 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
DC2MBR0050	0.5	1.0	3	10	0.96	60	4	2	●	1
R0100	1	2.0	10	20	1.96	80	4	2	●	1
R0150	1.5	3.0	15	25	2.96	80	4	2	●	1
R0200	2	4.0	20	30	3.96	80	4	2	●	2
R0250	2.5	5.0	30	50	4.96	100	6	2	●	1
R0300	3	6.0	30	50	5.85	100	6	2	●	2
R0350	3.5	7.0	30	—	—	100	6	2	●	3
R0400	4	8.0	40	60	7.85	110	8	2	●	2
R0450	4.5	9.0	40	—	—	110	8	2	●	3
R0500	5	10.0	50	70	9.85	120	10	2	●	2
R0600	6	12.0	55	75	11.85	130	12	2	●	2

(Effective Coating Length : 1-1.5D1)

DC-2LB

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



$D_1 < 6$ 0 - -0.028
 $D_1 \geq 6$ 0 - -0.038



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $D_4 = 12$ 0 - -0.011

CARBIDE

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○

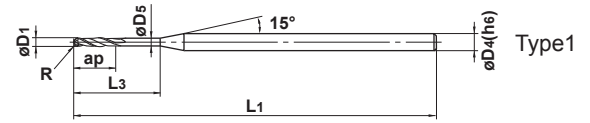


- 2 flute end mill with original diamond coating technology with excellent coating adhesion strength to prevent flaking and chipping during graphite machining.

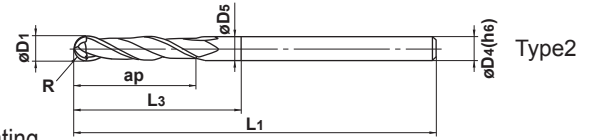
Unit : mm

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
DC2LBR0100	1	2.0	10	20	1.96	100	4	2	●	1
R0150	1.5	3.0	15	25	2.96	100	4	2	●	1
R0200	2	4.0	20	30	3.96	100	4	2	●	2
R0300	3	6.0	30	50	5.85	150	6	2	●	2
R0400	4	8.0	40	60	7.85	150	8	2	●	2
R0500	5	10.0	50	70	9.85	180	10	2	●	2
R0600	6	12.0	55	75	11.85	200	12	2	●	2

(Effective Coating Length : 1-1.5D1)



Type1



Type2

SQUARE

BALL

RADIUS

TAPER



DIAMOND COATED END MILLS

CUTTING CONDITIONS

B359

B179

DIAMOND COATED END MILLS

DC-2XLB

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



D1 < 6 0 - -0.028
D1 = 6 0 - -0.038

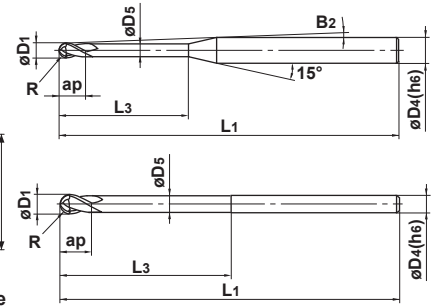
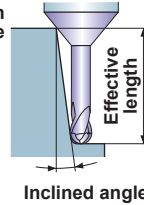


D4 = 6 0 - -0.008

Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○



Effective length
for inclined angle



Type 1

Type 2

- 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	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°
DC2XLB R0020N040	0.2	0.4	0.6	4	0.36	11.1°	50	6	2	●	1	4.1	4.3	4.6	4.9
R0020N060	0.2	0.4	0.6	6	0.36	9.8°	50	6	2	●	1	6.2	6.4	6.9	7.4
R0025N050	0.25	0.5	0.8	5	0.46	10.4°	50	6	2	●	1	5.2	5.3	5.7	6.2
R0025N075	0.25	0.5	0.8	7.5	0.46	8.9°	50	6	2	●	1	7.8	8	8.6	9.3
R0030N060	0.3	0.6	1	6	0.56	9.7°	50	6	2	●	1	6.3	6.5	6.9	7.5
R0030N090	0.3	0.6	1	9	0.56	8.2°	50	6	2	●	1	9.4	9.7	10.4	11.2
R0040N080	0.4	0.8	1.2	8	0.76	8.5°	50	6	2	●	1	8.3	8.6	9.2	10
R0040N120	0.4	0.8	1.2	12	0.76	7°	50	6	2	●	1	12.5	12.9	13.8	14.9
R0050N120	0.5	1	1.5	12	0.94	6.8°	60	6	2	●	1	12.6	13.1	14	15.1
R0050N160	0.5	1	1.5	16	0.94	5.7°	60	6	2	●	1	16.8	17.4	18.6	20.1
R0060N120	0.6	1.2	1.8	12	1.14	6.7°	60	6	2	●	1	12.6	13.1	14	15.1
R0060N180	0.6	1.2	1.8	18	1.14	5.2°	60	6	2	●	1	18.8	19.5	20.9	22.6
R0075N150	0.75	1.5	2.3	15	1.44	5.6°	60	6	2	●	1	15.7	16.3	17.4	18.8
R0075N230	0.75	1.5	2.3	23	1.44	4.2°	60	6	2	●	1	24	24.8	26.6	28.7
R0100N160	1	2	3	16	1.90	5.1°	70	6	2	●	1	16.7	17.2	18.4	19.9
R0100N200	1	2	3	20	1.90	4.3°	70	6	2	●	1	20.8	21.5	23	24.8
R0100N250	1	2	3	25	1.90	3.7°	70	6	2	●	1	26	26.8	28.8	31
R0100N300	1	2	3	30	1.90	3.2°	70	6	2	●	1	31.1	32.2	34.5	37.3
R0150N300	1.5	3	4.5	30	2.90	2.6°	80	6	2	●	1	31.1	32.2	34.5	No interference
R0150N400	1.5	3	4.5	40	2.90	2°	80	6	2	●	1	41.5	42.9	No interference	No interference
R0200N300	2	4	6	30	3.90	1.8°	100	6	2	●	1	31.1	32.1	No interference	No interference
R0200N500	2	4	6	50	3.90	1.2°	100	6	2	●	1	51.8	53.5	No interference	No interference
R0250N400	2.5	5	7.5	40	4.90	0.8°	100	6	2	●	1	41.4	No interference	No interference	No interference
R0250N600	2.5	5	7.5	60	4.90	0.5°	100	6	2	●	1	No interference	No interference	No interference	No interference
R0300N600	3	6	9	60	5.85	—	120	6	2	●	2	No interference	No interference	No interference	No interference
R0300N900	3	6	9	90	5.85	—	120	6	2	●	2	No interference	No interference	No interference	No interference

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B361

DC-XB

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



D1 < 6 0 - -0.028
D1 = 6 0 - -0.038



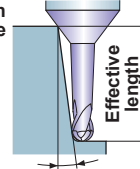
D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009

CARBIDE

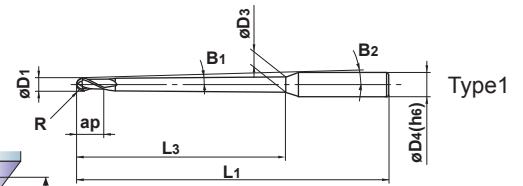
Aluminium Alloy	Graphite	GFRP CFRP	Machineable Ceramics
○	◎	◎	○



Effective length
for inclined angle



Inclined angle



SQUARE

BALL

Unit : mm

Order Number	Radius of Ball Nose	Dia.	Taper Angle One Side	Length of Cut	Neck Length	Cutting Edge to Shank Angle	Neck Dia.	Overall Length	Shank Dia.	No. of Flutes	Stock	Type	Effective length for inclined angle		
	R	D1	B1	ap	L3	B2	D3	L1	D4	N			1°	2°	3°
DCXBR0020T0100L008	0.2	0.4	1°	0.8	8	8.9°	0.6	50	6	2	●	1	8.1	8.7	9.4
R0025T0100L010	0.25	0.5	1°	1	10	8°	0.74	50	6	2	●	1	10.2	10.9	11.8
R0030T0100L012	0.3	0.6	1°	1.2	12	7.3°	0.91	50	6	2	●	1	12.2	13.1	14.1
R0040T0100L016	0.4	0.8	1°	1.6	16	6.1°	1.23	50	6	2	●	1	16.2	17.4	18.8
R0050T0100L020	0.5	1	1°	2	20	5.2°	1.52	60	6	2	●	1	20.3	21.8	23.5
R0060T0100L024	0.6	1.2	1°	2.4	24	4.5°	1.85	60	6	2	●	1	24.3	26.1	28.2
R0075T0100L030	0.75	1.5	1°	3	30	3.6°	2.34	60	6	2	●	1	30.3	32.6	35.1
R0100T0100L040	1	2	1°	4	40	2.6°	3.09	80	6	2	●	1	40.5	43.5	No interference
R0150T0100L060	1.5	3	1°	6	60	1.4°	4.44	100	6	2	●	1	61.2	No interference	No interference
R0200T0100L080	2	4	1°	8	80	1.5°	6.07	130	8	2	●	1	81.3	No interference	No interference
R0250T0100L100	2.5	5	1°	10	100	1.5°	7.7	150	10	2	●	1	101.4	No interference	No interference
R0300T0100L120	3	6	1°	12	120	1°	9.28	180	10	2	●	1	121.6	No interference	No interference

RADIUS

TAPER

SOLID
END MILLS

DIAMOND COATED END MILLS

CUTTING CONDITIONS

B361

B181

CBN END MILLS

CBN-2XLB

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



±0.005

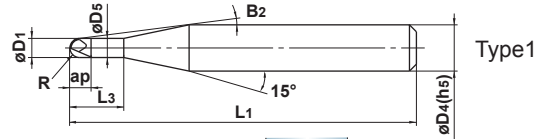


0 - -0.010

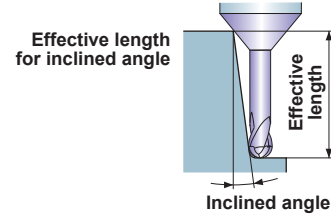


4 ≤ D4 ≤ 6 0 - -0.005

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



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



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°
CBN2XLB0020N010S04	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
NEW 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
NEW * 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
NEW * 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
NEW 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.

● : Inventory maintained in Japan.

○ : Inventory maintained in Japan. (Available from spring 2009)

CUTTING CONDITIONS

B362

CBN-2XLRB ^{NEW}

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



±0.005

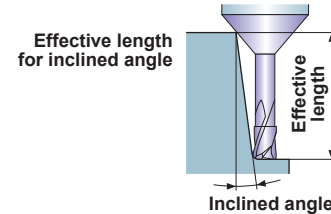
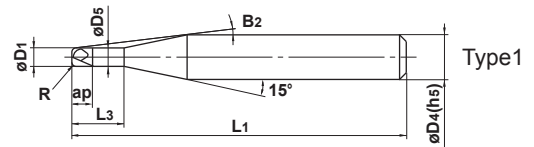


0 - -0.010



D4 = 4 0 - -0.005

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	◎	◎	◎				



Unit : mm

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

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

SQUARE

BALL

RADIUS

TAPER



CBN END MILLS

CUTTING CONDITIONS

B362

B183

BRAZED TYPE END MILLS

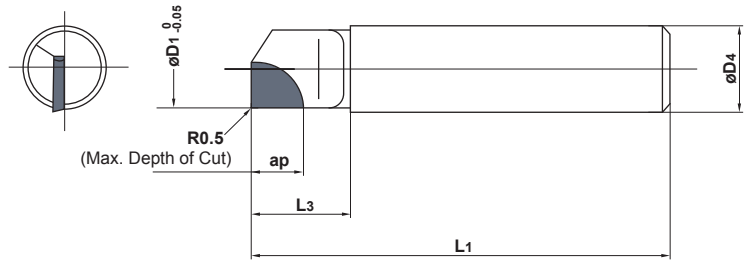
END MILL

Polycrystalline cutting tools

GBE, GDE



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



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

Right hand tool holder only.

Order Number	Number of Flutes	Stock		Dimensions (mm)				
		MB730	MD220	D1	L1	D4	L3	ap
GBE06S0640	1	●		6	40	6	8	3.5
08S0845	1	●		8	45	8	13	6.0
10S1050	1	●		10	50	10	13	6.0
12S1255	1	●		12	55	12	13	6.0
GDE06S0650	1		●	6	50	6	8	3.5
08S0855	1		●	8	55	8	10	6.0
10S1065	1		●	10	65	10	10	6.0
12S1265	1		●	12	65	12	10	6.0

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

RECOMMENDED CUTTING CONDITIONS FOR GDE TYPE

	Work Material	Grade	Cutting Speed (m/min)	Feed (mm/rev)
N	Aluminium Alloy	MD220	200 (100 – 300)	0.075 (0.05 – 0.10)

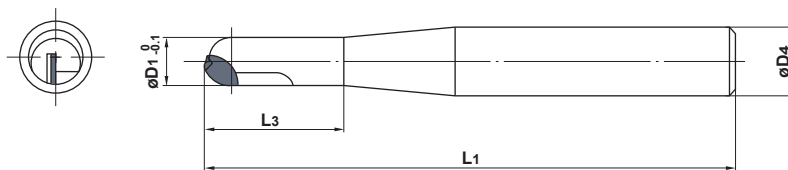
● : Inventory maintained in Japan.

BALL NOSE END MILL

Sintered CBN

CBN

SMALL TYPE



SHORT TYPE

Carbide Shank

Order Number	CBN		Dimensions (mm)			
	MB730	MB825	D1	L1	L3	D4
BEM0600S	●		6	112	15	16
1000S	●		10	120	20	16
1600S	●		16	125	35	16

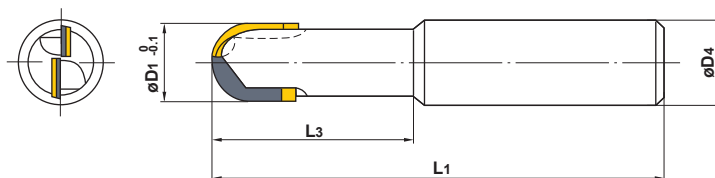
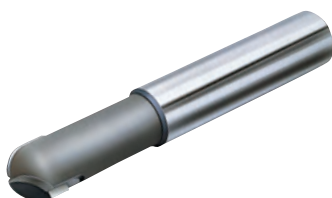
LONG TYPE (SPECIAL)

Carbide Shank

Order Number *	Dimensions (mm)			
	D1	L1	L3	D4
BEM0600L	6	162	15	16
1000L	10	170	20	16
1600L	16	175	35	16

* Non stock, produced to order only. Grade is MB730 or MB825.

LARGE TYPE



SHORT TYPE

Order Number	CBN		Dimensions (mm)			
	MB730		D1	L1	L3	D4
BEM2000S	●		20	150	40	25
2500S	●		25	180	60	32
3000S	●		30	200	81	32

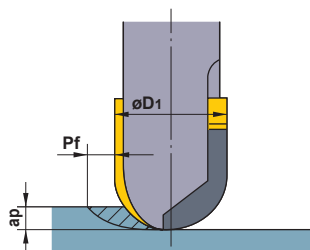
LONG TYPE (SPECIAL)

Order Number *	Dimensions (mm)			
	D1	L1	L3	D4
BEM2000L	20	250	40	25
2500L	25	300	60	32
3000L	30	350	81	32

* Non stock, produced to order only. Grade is MB730.

RECOMMENDED CUTTING CONDITIONS

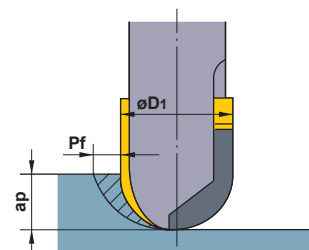
Cutting Mode : (A)



● Pick Feed (Pf : mm)

Cutting Mode	(A)	(B)
D.O.C (ap : mm)	0.5—1.5	0.8D1—1D1
Pick Feed (Pf : mm)	0.5—1.5	0.3—0.8

Cutting Mode : (B)



Work Material		H	Hardened Steel (45—60HRC)		K	Cast Iron (FC, FCD)	
Grade			MB825			MB730	
Cutting Mode			(A)	(B)		(A)	(B)
Tool Number							
BEM0600S/L 1000S/L 1600S/L	Spindle Speed (min ⁻¹)		4000 (2000—6000)	1500 (1000—2000)		4000 (2000—6000)	3000 (2000—4000)
	Table Feed (mm/min)		1200 (500—2000)	700 (500—1000)		2500 (1000—4000)	1500 (1000—2000)
BEM2000S/L 2500S/L 3000S/L	Spindle Speed (min ⁻¹)		—	—		6000 (4000—8000)	6000 (4000—8000)
	Table Feed (mm/min)		—	—		6000 (4000—8000)	4500 (3000—6000)

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

BALL NOSE, SINTERED CBN

MS END MILLS

SED2KPG

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

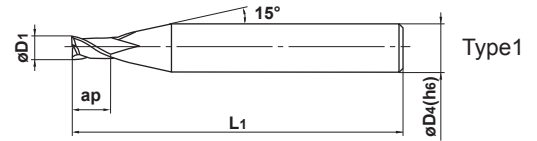
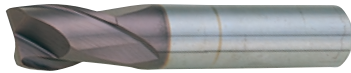


0 — +0.02



4 ≤ D4 ≤ 6 0 — -0.008
8 ≤ D4 ≤ 10 0 — -0.009
12 ≤ D4 ≤ 16 0 — -0.011

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 ≤ 10



D1 > 10



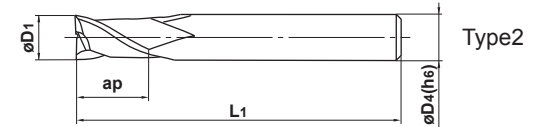
D1 < 3



3 ≤ D1 ≤ 10



D1 ≥ 11



Type2

- 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



MS END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B363

SED2KMG

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

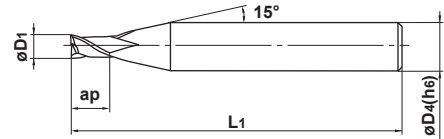
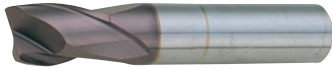


0 -0.02

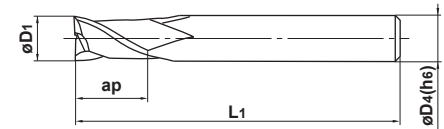


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○		



Type1



Type2



$D_1 \leq 10$



$D_1 > 10$



$D_1 < 3$



$3 \leq D_1 \leq 10$



$D_1 \geq 11$

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

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MS END MILLS

CUTTING CONDITIONS

B363

B187

MS END MILLS

BZD25G

Ball nose end mill, Medium cut length, 2 flute



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

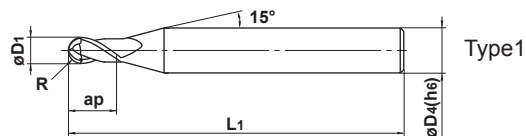


$D1 \leq 12 \quad 0 - -0.020$
 $D1 > 12 \quad 0 - -0.030$

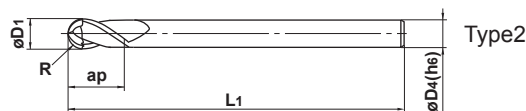


$D4 = 3 \quad 0 - -0.006$
 $4 \leq D4 \leq 6 \quad 0 - -0.008$
 $8 \leq D4 \leq 10 \quad 0 - -0.009$
 $12 \leq D4 \leq 16 \quad 0 - -0.011$
 $20 \leq D4 \leq 25 \quad 0 - -0.013$

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	◎	○		○	○		



Type1



Type2



● 2 flute ball nose end mill with (Al,Ti)N coating 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
BZD2004SG	0.2	0.4	0.8	40	3	2	●	1
2005SG	0.25	0.5	1	40	3	2	●	1
2006SG	0.3	0.6	1.2	40	3	2	●	1
2008SG	0.4	0.8	1.6	40	3	2	●	1
2010SG	0.5	1	2.5	45	4	2	●	1
2015SG	0.75	1.5	4	45	4	2	●	1
2020SG	1	2	6	60	6	2	●	1
2025SG	1.25	2.5	6	60	6	2	●	1
2030SG	1.5	3	8	60	6	2	●	1
2040SG	2	4	8	60	6	2	●	1
2050SG	2.5	5	12	60	6	2	●	1
2060SG	3	6	12	80	6	2	●	2
2070SG	3.5	7	14	90	8	2	●	1
2080SG	4	8	14	90	8	2	●	2
2090SG	4.5	9	18	100	10	2	●	1
2100SG	5	10	18	100	10	2	●	2
2110SG	5.5	11	22	110	12	2	●	1
2120SG	6	12	22	110	12	2	●	2
2130SG	6.5	13	26	160	16	2	●	1
2140SG	7	14	26	160	16	2	●	1
2150SG	7.5	15	30	160	16	2	●	1
2160SG	8	16	30	160	16	2	●	2
2180SG	9	18	34	170	20	2	●	1
2200SG	10	20	38	170	20	2	●	2
2250SG	12.5	25	55	180	25	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B364

SEE2SG

End mill, Short cut length, 2 flute, High helix



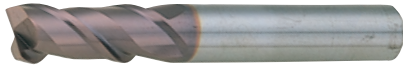
D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



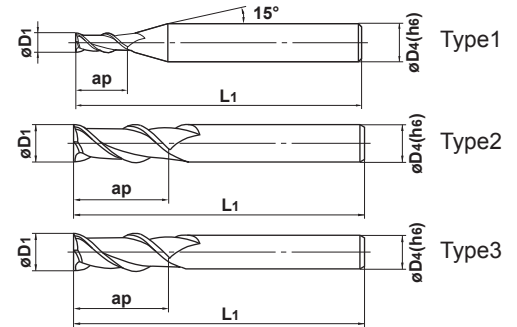
D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 with high helix for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes	Stock	Type
	D1	ap	L1	D4	N		
SEE2030SG	3	8	45	6	2	●	1
2031SG	3.1	8	45	6	2	●	1
2032SG	3.2	8	45	6	2	●	1
2033SG	3.3	8	45	6	2	●	1
2034SG	3.4	8	45	6	2	●	1
2035SG	3.5	8	45	6	2	●	1
2036SG	3.6	11	45	6	2	●	1
2037SG	3.7	11	45	6	2	●	1
2038SG	3.8	11	45	6	2	●	1
2039SG	3.9	11	45	6	2	●	1
2040SG	4	11	45	6	2	●	1
2041SG	4.1	12	45	6	2	●	1
2042SG	4.2	12	45	6	2	●	1
2043SG	4.3	12	45	6	2	●	1
2044SG	4.4	12	45	6	2	●	1
2045SG	4.5	12	45	6	2	●	1
2046SG	4.6	13	50	6	2	●	1
2047SG	4.7	13	50	6	2	●	1
2048SG	4.8	13	50	6	2	●	1
2049SG	4.9	13	50	6	2	●	1
2050SG	5	13	50	6	2	●	1
2051SG	5.1	13	50	6	2	●	1
2052SG	5.2	13	50	6	2	●	1
2053SG	5.3	13	50	6	2	●	1
2054SG	5.4	13	50	6	2	●	1
2055SG	5.5	13	50	6	2	●	1
2056SG	5.6	13	50	6	2	●	1
2057SG	5.7	13	50	6	2	●	1
2058SG	5.8	13	50	6	2	●	1
2059SG	5.9	13	50	6	2	●	1
2060SG	6	13	50	6	2	●	2
2065SG	6.5	13	50	6	2	●	3
2070SG	7	19	60	8	2	●	1
2075SG	7.5	19	60	8	2	●	1
2080SG	8	19	60	8	2	●	2
2085SG	8.5	19	60	8	2	●	3
2090SG	9	22	70	10	2	●	1
2095SG	9.5	22	70	10	2	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

MS END MILLS

CUTTING CONDITIONS

B363

B189

MS END MILLS

SEE2SG

End mill, Short cut length, 2 flute, High helix



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

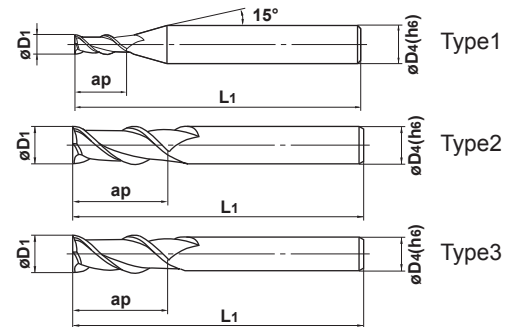


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 with high helix 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
SEE2100SG	10	22	70	10	2	●	2
2110SG	11	26	75	12	2	●	1
2120SG	12	26	75	12	2	●	2
2130SG	13	26	75	12	2	●	3
2140SG	14	30	90	16	2	●	1
2150SG	15	35	90	16	2	●	1
2160SG	16	35	90	16	2	●	2
2170SG	17	35	105	20	2	●	1
2180SG	18	40	105	20	2	●	1
2190SG	19	40	110	20	2	●	1
2200SG	20	45	110	20	2	●	2
2250SG	25	55	125	25	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B363

CARBIDE END MILLS

C-255

End mill, Short cut length, 2 flute



0 - -0.020



4 ≤ D4 ≤ 6 0 - -0.008

CARBIDE

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
☐	☐			☐	☐	☐	☐

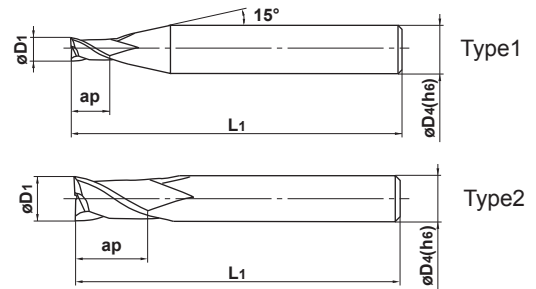


D1 < 3



D1 ≥ 3

● 2 flute end mill with short rigid geometry.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B365

B191

CARBIDE END MILLS

C-2MS

End mill, Medium cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
☐	☐			☐	☐	☐	☐

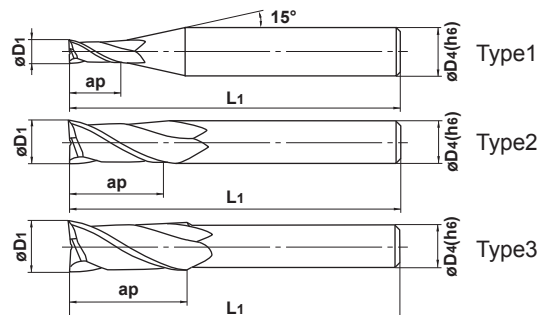


D1 < 3



D1 ≥ 3

● 2 flute end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D0440	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
C2MSD0480	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
D0960	9.6	22	70	10	2	●	1
D0970	9.7	22	70	10	2	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B365

B193

CARBIDE END MILLS

C-2MS

End mill, Medium cut length, 2 flute



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
☐	☐			☐	☐	☐	☐

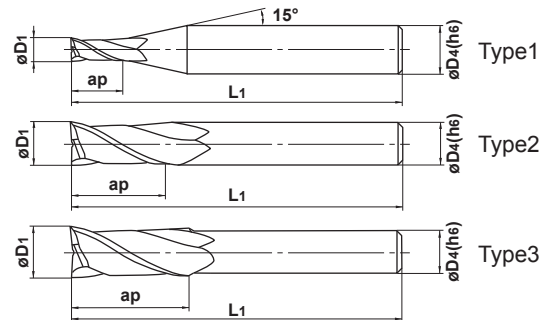


$D_1 < 3$



$D_1 \geq 3$

● 2 flute end mill for general use.



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
C2MSD0980	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



B365

C-2JS

End mill, Semi long cut length, 2 flute



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
☐	☐			☐	☐	☐	☐



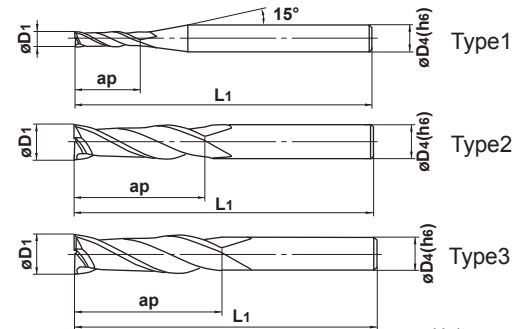
D1 < 3

D1 ≥ 3

D1 < 3

D1 ≥ 3

● 2 flute uncoated end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B365

B195

CARBIDE END MILLS

C-2LS

End mill, Long cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

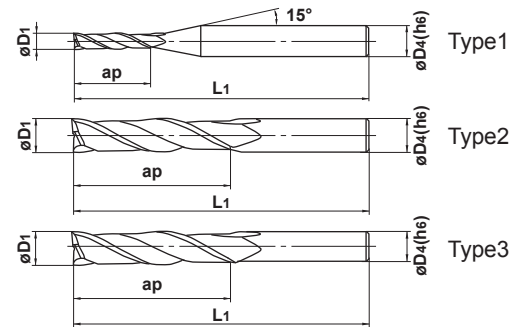


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

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

B365

C-2MA

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



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

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

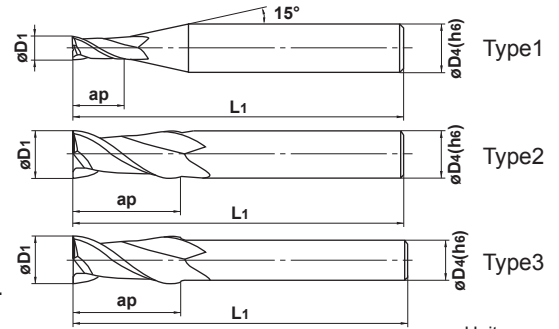


D1 < 3



D1 ≥ 3

● 2 flute uncoated end mill designed especially for aluminium alloys.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B366

B197

CARBIDE END MILLS

C-2LA

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

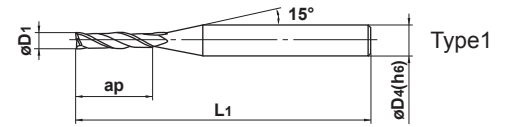


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

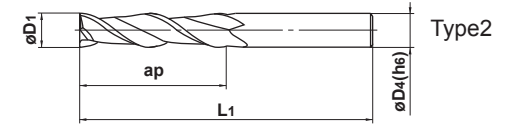


$4 \leq D_4 \leq 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



Type1



Type2



$D_1 < 3$



$D_1 \geq 3$



$D_1 < 3$



$D_1 \geq 3$

● 2 flute uncoated end mill designed especially for aluminium alloys.

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
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



B366

C-4MC

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



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

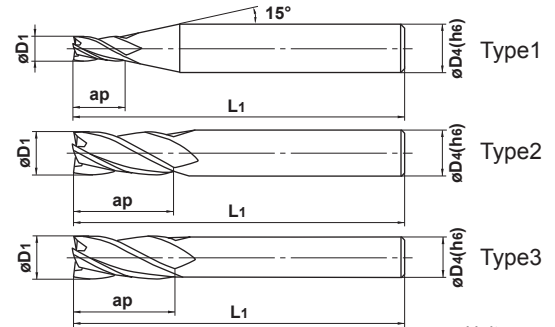


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 uncoated center cutting end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B367

B199

CARBIDE END MILLS

C-4JC

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



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

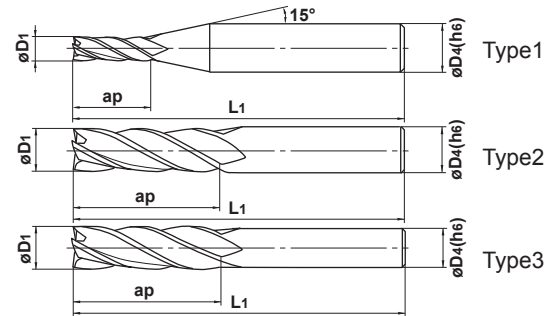


$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
☐	☐			☐	☐	☐	☐



● 4 flute uncoated end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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



B367

C-4LC

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



$D1 \leq 12$ 0 - -0.020
 $D1 > 12$ 0 - -0.030

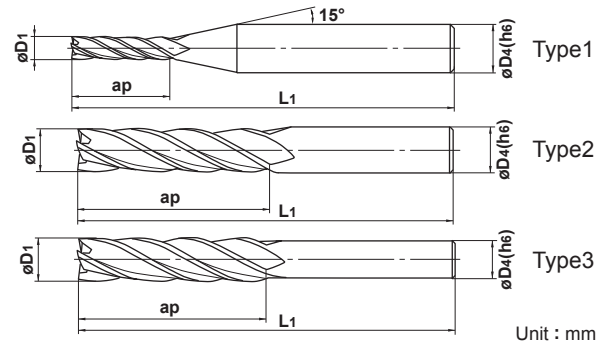


$D4 = 6$ 0 - -0.008
 $8 \leq D4 \leq 10$ 0 - -0.009
 $12 \leq D4 \leq 16$ 0 - -0.011
 $D4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B367

B201

CARBIDE END MILLS

C-2MB

Ball nose end mill, Medium cut length, 2 flute



R ≤ 6.5 ±0.01
R > 6.5 ±0.02



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

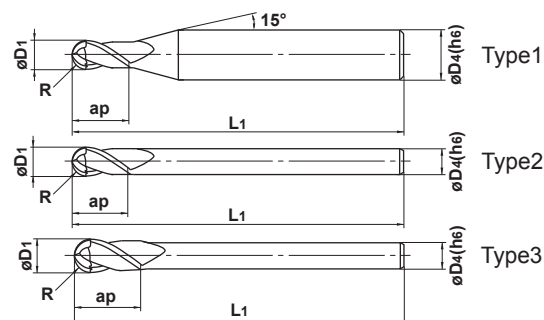


4 ≤ D4 ≤ 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

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

B368

C-MH

End mill, Medium cut length, 3 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

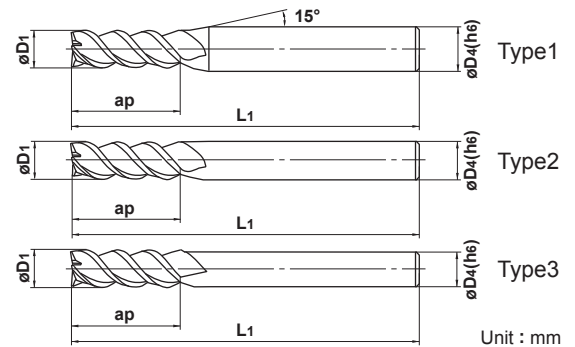


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011

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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CARBIDE END MILLS

C-25A NEW

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



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

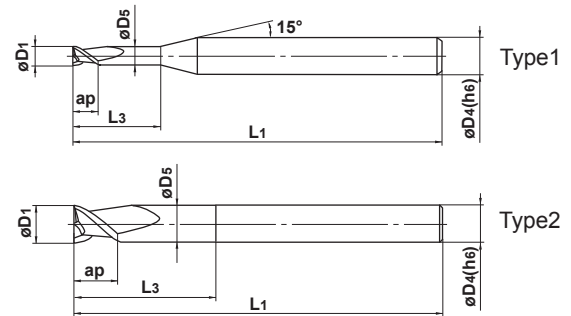


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
						○	◎



● 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B369

C-35A **NEW**

End mill, Short cut length, 3 flute, For aluminium alloy

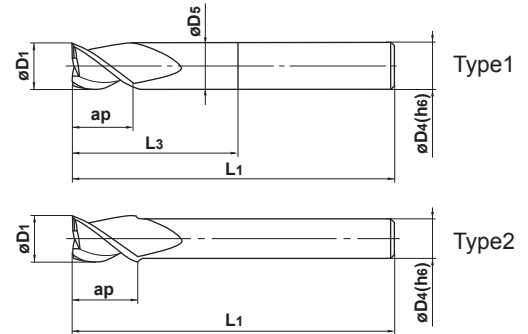

 $D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
						○	◎



● 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B370

B205

CARBIDE END MILLS

C-2MHA NEW

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

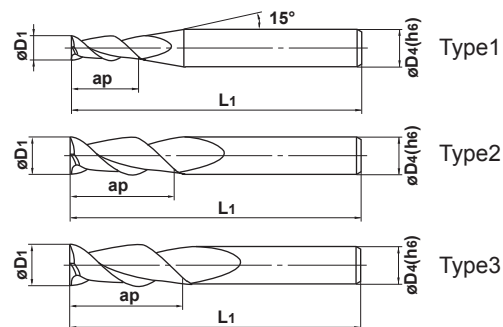


D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030



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

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
							☉



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



B369

C-SRA

Roughing end mill, Short cut length, 3 flute, For aluminium alloy

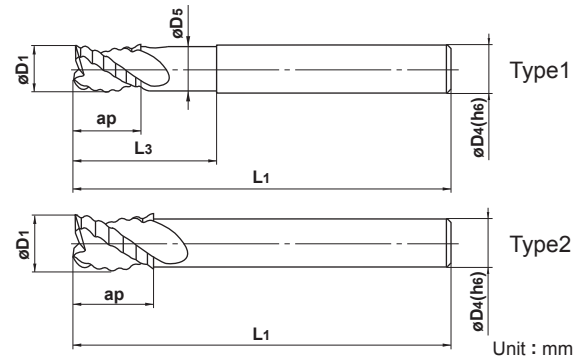


D4 = 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 flute uncoated end mill for roughing aluminium alloy.



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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B371

B207

CARBIDE END MILLS

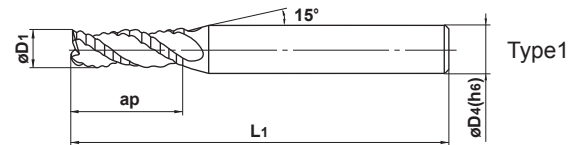
C-MRA

Roughing end mill, Medium cut length, 3 flute, For aluminium alloy

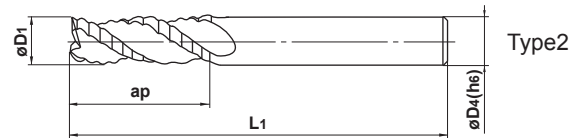


D4 = 6	0 - -0.008
8 ≤ D4 ≤ 10	0 - -0.009
12 ≤ D4 ≤ 16	0 - -0.011
20 ≤ D4 ≤ 25	0 - -0.013

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



CARBIDE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B372

C-3SARB ^{NEW}

Corner radius, Short cut length, 3 flute, For aluminium alloy



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

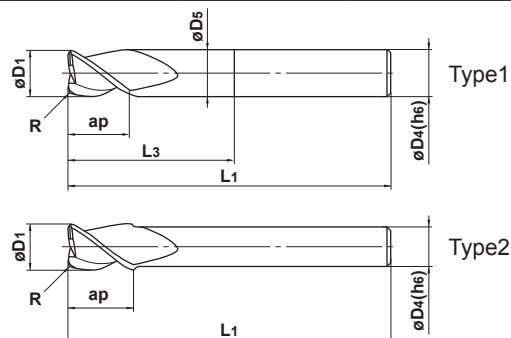


12 ≤ D4 ≤ 16 0 - -0.011
20 ≤ D4 ≤ 25 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
						○	◎



- 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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B370

B209

CARBIDE END MILLS

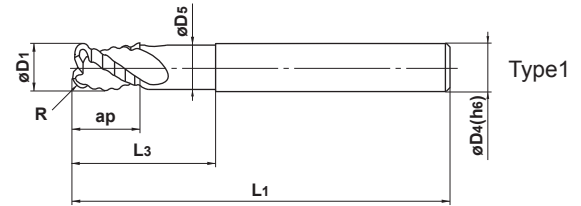
C-SRARB

Corner radius roughing end mill, Short cut length, 3 flute, For aluminium alloy



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

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



CARBIDE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B371

B210

SEE25

End mill, Short cut length, 2 flute



D1 ≤ 12 0 - -0.020
D1 > 12 0 - -0.030

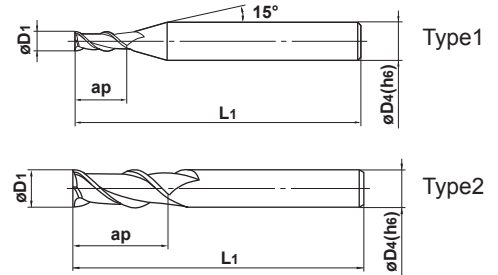


D4 = 6 0 - -0.008
8 ≤ D4 ≤ 10 0 - -0.009
12 ≤ D4 ≤ 16 0 - -0.011
D4 = 20 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 uncoated high helix end mill.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
SEE2030S	3	8	45	6	2	●	1
2031S	3.1	8	45	6	2	●	1
2032S	3.2	8	45	6	2	●	1
2033S	3.3	8	45	6	2	●	1
2034S	3.4	8	45	6	2	●	1
2035S	3.5	8	45	6	2	●	1
2036S	3.6	11	45	6	2	●	1
2037S	3.7	11	45	6	2	●	1
2038S	3.8	11	45	6	2	●	1
2039S	3.9	11	45	6	2	●	1
2040S	4	11	45	6	2	●	1
2041S	4.1	12	45	6	2	●	1
2042S	4.2	12	45	6	2	●	1
2043S	4.3	12	45	6	2	●	1
2044S	4.4	12	45	6	2	●	1
2045S	4.5	12	45	6	2	●	1
2046S	4.6	13	50	6	2	●	1
2047S	4.7	13	50	6	2	●	1
2048S	4.8	13	50	6	2	●	1
2049S	4.9	13	50	6	2	●	1
2050S	5	13	50	6	2	●	1
2055S	5.5	13	50	6	2	●	1
2058S	5.8	13	50	6	2	●	1
2059S	5.9	13	50	6	2	●	1
2060S	6	13	50	6	2	●	2
2070S	7	19	60	8	2	●	1
2080S	8	19	60	8	2	●	2
2090S	9	22	70	10	2	●	1
2100S	10	22	70	10	2	●	2
2120S	12	26	75	12	2	●	2
2150S	15	35	90	16	2	●	1
2160S	16	35	90	16	2	●	2
2200S	20	45	110	20	2	●	2

CUTTING CONDITIONS

B373

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

B211

CARBIDE END MILLS

SEE2L

End mill, Long cut length, 2 flute

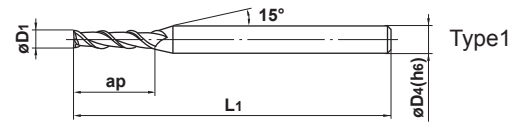


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

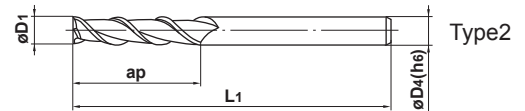


$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $D_4 = 20$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



Type1



Type2



● 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B373

SEE4L

End mill, Long cut length, 4 flute

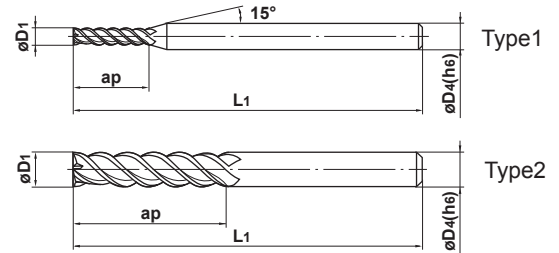


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



● 4 flute high helix end mill.

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B374

B213

CARBIDE END MILLS

SZE45

End mill, Medium cut length, 4 flute, Super Square geometry



$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030

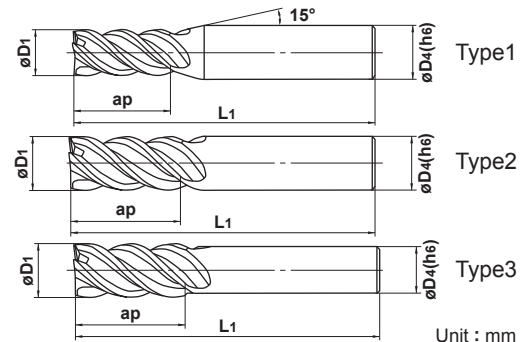


$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



- 4 flute uncoated Super Square end mill for general use and slotting.



Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
SZE4030S	3	8	45	6	4	●	1
4040S	4	11	45	6	4	●	1
4050S	5	13	50	6	4	●	1
4060S	6	13	50	6	4	●	2
4070S	7	19	60	8	4	●	1
4080S	8	19	60	8	4	●	2
4090S	9	22	70	10	4	●	1
4100S	10	22	70	10	4	●	2
4110S	11	26	75	12	4	●	1
4120S	12	26	75	12	4	●	2
4130S	13	26	75	12	4	●	3
4140S	14	30	90	16	4	●	1
4150S	15	35	90	16	4	●	1
4160S	16	35	90	16	4	●	2
4180S	18	40	105	20	4	●	1
4190S	19	40	110	20	4	●	1
4200S	20	45	110	20	4	●	2
4250S	25	55	125	25	4	●	2

● : Inventory maintained in Japan.

SEG2SA

End mill, Short cut length, 2 flute, Irregular spiral helix angle, For aluminium alloy

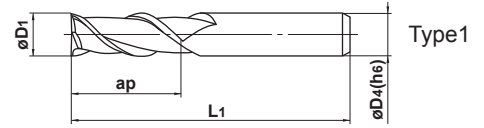


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
						○	◎



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

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
SEG2060SA	6	14	50	6	2	●	1
2080SA	8	19	60	8	2	●	1
2100SA	10	24	70	10	2	●	1
2120SA	12	29	75	12	2	●	1
2160SA	16	38	90	16	2	●	1
2200SA	20	48	110	20	2	●	1
2250SA	25	59	125	25	2	●	1

CARBIDE

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

CARBIDE END MILLS

CUTTING CONDITIONS

B375

B215

CARBIDE END MILLS

SEG4SA

End mill, Medium cut length, 4 flute, Irregular spiral helix angle, For aluminium alloy

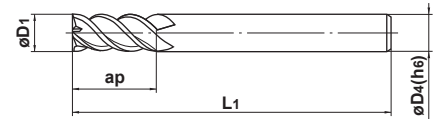


$D_1 \leq 12$ 0 - -0.020
 $D_1 > 12$ 0 - -0.030



$D_4 = 6$ 0 - -0.008
 $8 \leq D_4 \leq 10$ 0 - -0.009
 $12 \leq D_4 \leq 16$ 0 - -0.011
 $20 \leq D_4 \leq 25$ 0 - -0.013

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
						○	◎



Type 1



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

Unit : mm

Order Number	Dia. D_1	Length of Cut a_p	Overall Length L_1	Shank Dia. D_4	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



CARBIDE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B375

VIOLET END MILLS

VA-255

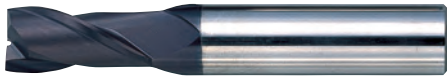
End mill, Short cut length, 2 flute



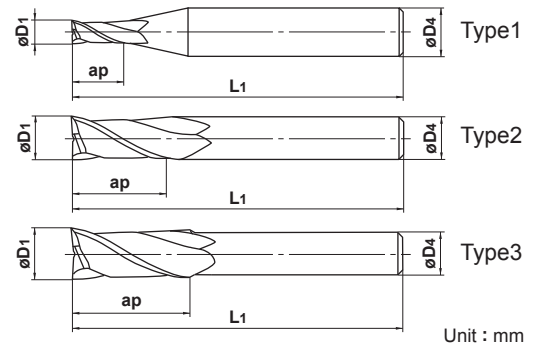
0 - -0.030

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 with high grade HSS substrate and Violet coating for general use.



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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

VIOLET END MILLS

CUTTING CONDITIONS

B376

B217

VIOLET END MILLS

VA-2MS

End mill, Medium cut length, 2 flute

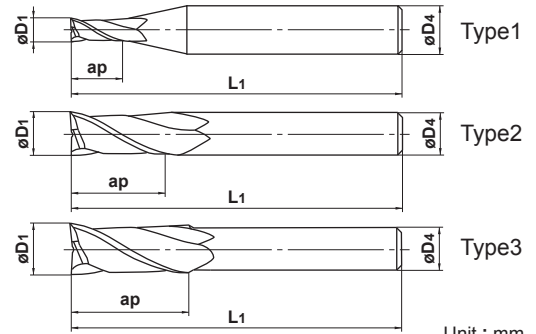


D1 ≤ 20 0 - -0.030
D1 > 20 0 - -0.040

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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B376

VA-4MC

End mill, Medium cut length, 4 flute



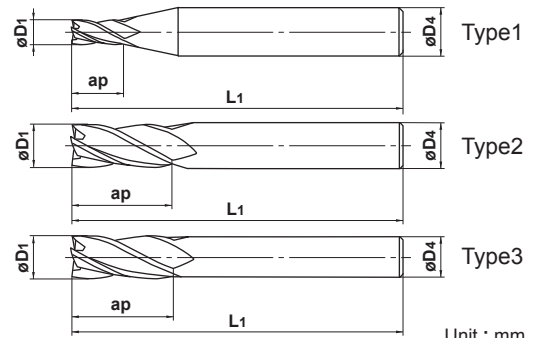
D1 ≤ 20 0 - +0.030
D1 > 20 0 - +0.040

HSS

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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

VIOLET END MILLS

CUTTING CONDITIONS

B377

B219

VIOLET END MILLS

HSS

VA-2MB

Ball nose end mill, Medium cut length, 2 flute



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

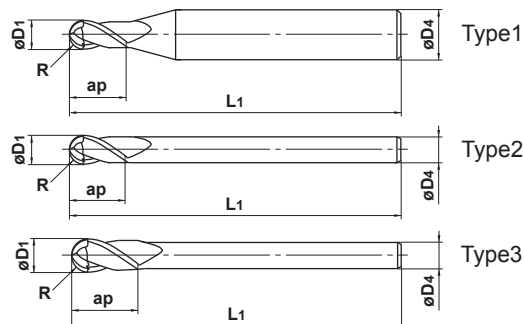


$D_1 \leq 3 \quad 0 - -0.02$
 $3 < D_1 \leq 13 \quad 0 - -0.03$
 $D_1 > 13 \quad 0 - -0.04$

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy



- 2 flute ball nose end mill with high grade HSS substrate and Violet coating 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
VA2MBR0600	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



VIOLET END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B378

B220

VA-SFPR

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

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	○			◎	○		



$D_1 \leq 24$

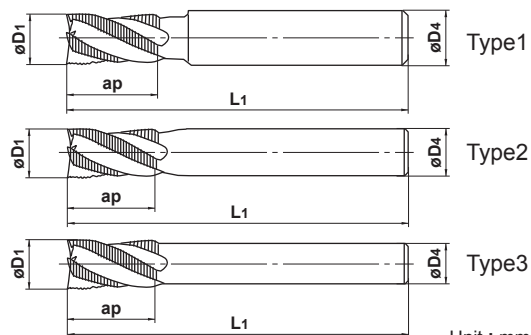


$25 \leq D_1 \leq 32$



$D_1 \geq 35$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

VIOLET END MILLS

CUTTING CONDITIONS

B379

B221

VIOLET END MILLS

VA-MFPR

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

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



$D_1 \leq 20$

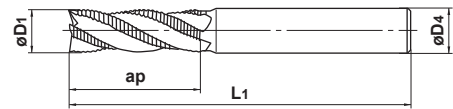


$22 \leq D_1 \leq 28$

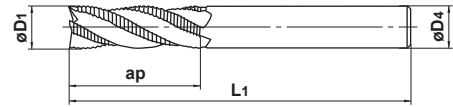


$D_1 \geq 30$

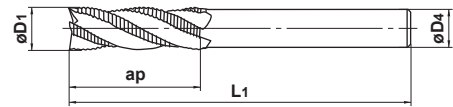
● 4—6 flute end mill with medium cut length.



Type1



Type2



Type3

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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B380

VA-MR

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

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	○			◎	○		



$D_1 \leq 15$



$16 \leq D_1 \leq 26$

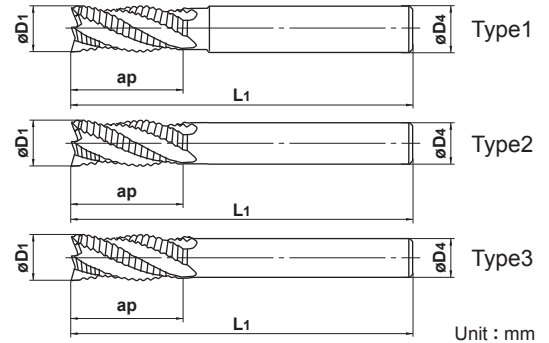


$28 \leq D_1 \leq 32$



$D_1 \geq 35$

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



Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

VIOLET END MILLS

CUTTING CONDITIONS

B381

B223

VIOLET END MILLS

VA-JR

Roughing end mill, Semi 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
◎	○			◎	○		



$D_1 \leq 15$



$16 \leq D_1 \leq 25$

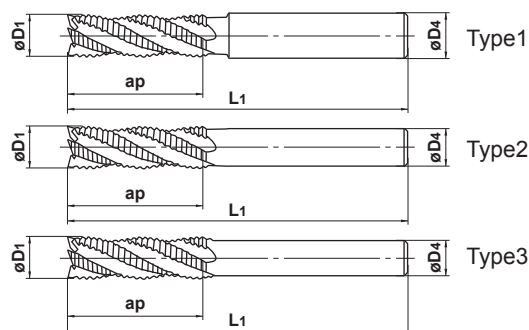


$D_1 = 30$



$D_1 \geq 35$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B382

VA-LR

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

HSS

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			◎	○		



$10 \leq D1 \leq 25$

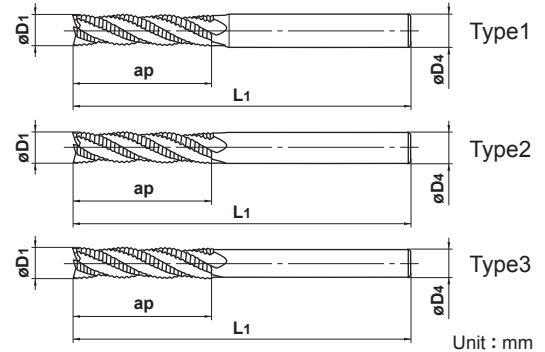


$28 \leq D1 \leq 32$



$D1 \geq 35$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

VIOLET END MILLS

CUTTING CONDITIONS

B382

B225

VIOLET END MILLS

HSS

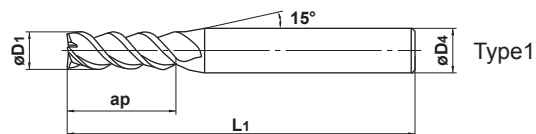
VA-MH

End mill, Medium cut length, 2—4 flute



0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 = 5



D1 ≥ 6



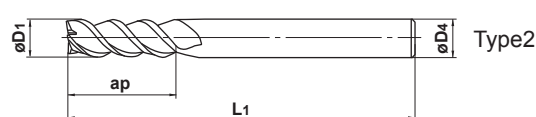
D1 = 5



D1 ≤ 20



D1 ≥ 21



Type2

- 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

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B383

VA-LH

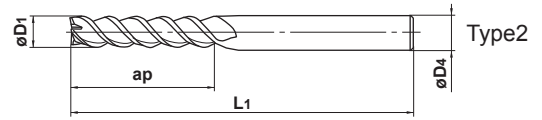
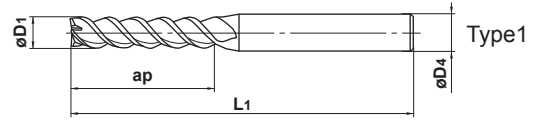
End mill, Long cut length, 2—4 flute, High helix



0 — -0.040

HSS

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
☉	○			☉	○		



$D_1 = 5$

$D_1 \geq 6$

$D_1 = 5$

$D_1 \leq 20$

$D_1 \geq 21$

● 2—4 flute end mill with long cut length.

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D_1	a_p	L_1	D_4			
VALHD0500	5	15	75	8	2	●	1
D0600	6	25	75	8	3	●	1
D0700	7	35	90	10	3	●	1
D0800	8	35	90	10	3	●	1
D0900	9	45	110	10	3	●	1
D1000	10	45	110	12	3	●	1
D1100	11	55	115	12	3	●	1
D1200	12	55	115	12	3	●	2
D1300	13	65	125	16	3	●	1
D1400	14	65	125	16	3	●	1
D1500	15	65	140	16	3	●	1
D1600	16	65	140	16	3	●	2
D1800	18	75	150	20	3	●	1
D2000	20	85	160	20	3	●	2
D2100	21	85	175	25	4	●	1
D2200	22	85	175	25	4	●	1
D2300	23	105	180	25	4	●	1
D2400	24	105	180	25	4	●	1
D2500	25	105	180	25	4	●	2
D2800	28	105	180	32	4	●	1
D3000	30	105	185	32	4	●	1

SQUARE

BALL

RADIUS

TAPER



VIOLET END MILLS

TWO-FLUTE END MILLS

G-255

End mill, Short cut length, 2 flute

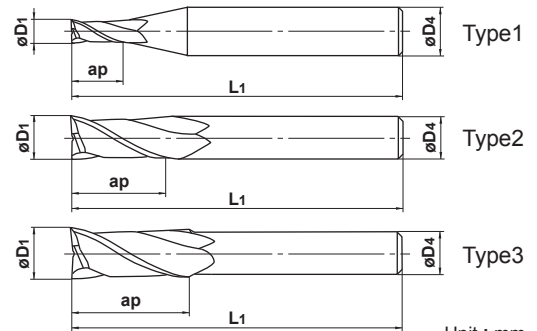


0 — -0.030

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 with TiN coating for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes	Stock	Type
	D1	ap	L1	D4	N		
G2SSD0100	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
D0950	9.5	20	75	12	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	90	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	115	20	2	●	1
D2000	20	38	115	20	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B385

255

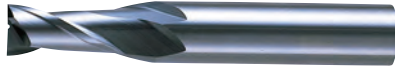
End mill, Short cut length, 2 flute



D1 ≤ 3 0 - -0.020
D1 > 3 0 - -0.030

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	○			○	○		○

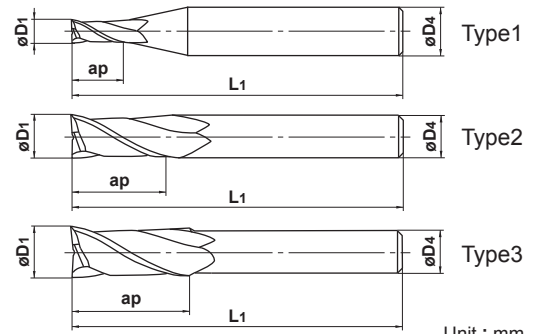


D1 < 3



D1 ≥ 3

● 2 flute HSS end mill with rigid design.

**SQUARE****BALL****RADIUS****TAPER****SOLID
END MILLS****TWO-FLUTE END MILLS**

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
2SSD0050	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	2	50	6	2	●	1
D0110	1.1	2	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	3.5	50	6	2	●	1
D0160	1.6	3.5	50	6	2	●	1
D0170	1.7	3.5	50	6	2	●	1
D0180	1.8	3.5	50	6	2	●	1
D0190	1.9	3.5	50	6	2	●	1
D0200	2	5	50	6	2	●	1
D0210	2.1	5	50	6	2	●	1
D0220	2.2	5	50	6	2	●	1
D0230	2.3	5	50	6	2	●	1
D0240	2.4	5	50	6	2	●	1
D0250	2.5	6	50	6	2	●	1
D0260	2.6	6	50	6	2	●	1
D0270	2.7	6	50	6	2	●	1
D0280	2.8	6	50	6	2	●	1
D0290	2.9	6	50	6	2	●	1
D0300	3	8	50	6	2	●	1
D0310	3.1	8	50	6	2	●	1
D0320	3.2	8	50	6	2	●	1
D0330	3.3	8	50	6	2	●	1
D0340	3.4	8	50	6	2	●	1
D0350	3.5	8	60	8	2	●	1
D0360	3.6	8	60	8	2	●	1
D0370	3.7	8	60	8	2	●	1
D0380	3.8	8	60	8	2	●	1
D0390	3.9	8	60	8	2	●	1
D0400	4	8	60	8	2	●	1
D0410	4.1	8	60	8	2	●	1
D0420	4.2	8	60	8	2	●	1

CUTTING CONDITIONS

B384

B229

TWO-FLUTE END MILLS

HSS

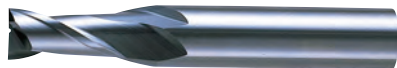
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End mill, Short cut length, 2 flute



D1 ≤ 3 0 - -0.020
D1 > 3 0 - -0.030

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

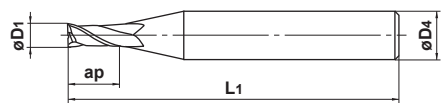


D1 < 3

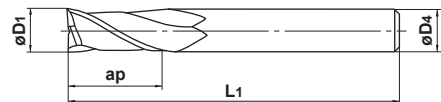


D1 ≥ 3

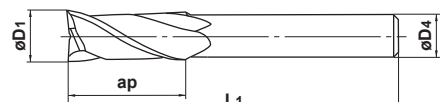
● 2 flute HSS end mill with rigid design.



Type1



Type2



Type3

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2SSD0430	4.3	8	60	8	2	●	1
D0440	4.4	8	60	8	2	●	1
D0450	4.5	10	60	8	2	●	1
D0460	4.6	10	60	8	2	●	1
D0470	4.7	10	60	8	2	●	1
D0480	4.8	10	60	8	2	●	1
D0490	4.9	10	60	8	2	●	1
D0500	5	10	60	8	2	●	1
D0510	5.1	10	60	8	2	●	1
D0520	5.2	10	60	8	2	●	1
D0530	5.3	10	60	8	2	●	1
D0540	5.4	10	60	8	2	●	1
D0550	5.5	12	60	8	2	●	1
D0560	5.6	12	60	8	2	●	1
D0570	5.7	12	60	8	2	●	1
D0580	5.8	12	60	8	2	●	1
D0590	5.9	12	60	8	2	●	1
D0600	6	12	60	8	2	●	1
D0610	6.1	12	60	8	2	●	1
D0620	6.2	12	60	8	2	●	1
D0630	6.3	12	60	8	2	●	1
D0640	6.4	12	60	8	2	●	1
D0650	6.5	15	65	10	2	●	1
D0660	6.6	15	65	10	2	●	1
D0670	6.7	15	65	10	2	●	1
D0680	6.8	15	65	10	2	●	1
D0690	6.9	15	65	10	2	●	1
D0700	7	15	65	10	2	●	1
D0710	7.1	15	65	10	2	●	1
D0720	7.2	15	65	10	2	●	1
D0730	7.3	15	65	10	2	●	1
D0740	7.4	15	65	10	2	●	1
D0750	7.5	15	65	10	2	●	1
D0760	7.6	15	65	10	2	●	1
D0770	7.7	15	65	10	2	●	1
D0780	7.8	15	65	10	2	●	1
D0790	7.9	15	65	10	2	●	1
D0800	8	15	65	10	2	●	1

● : Inventory maintained in Japan.

B230

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2SSD0810	8.1	15	65	10	2	●	1
D0820	8.2	15	65	10	2	●	1
D0830	8.3	15	65	10	2	●	1
D0840	8.4	15	65	10	2	●	1
D0850	8.5	20	75	10	2	●	1
D0860	8.6	20	75	10	2	●	1
D0870	8.7	20	75	10	2	●	1
D0880	8.8	20	75	10	2	●	1
D0890	8.9	20	75	10	2	●	1
D0900	9	20	75	10	2	●	1
D0910	9.1	20	75	10	2	●	1
D0920	9.2	20	75	10	2	●	1
D0930	9.3	20	75	10	2	●	1
D0940	9.4	20	75	10	2	●	1
D0950S10	9.5	20	75	10	2	●	1
D0950S12	9.5	20	75	12	2	●	1
D0960	9.6	20	75	10	2	●	1
D0970	9.7	20	75	10	2	●	1
D0980	9.8	20	75	10	2	●	1
D0990	9.9	20	75	10	2	●	1
D1000S10	10	20	75	10	2	●	2
D1000S12	10	20	75	12	2	●	1
D1010	10.1	20	75	12	2	●	1
D1020	10.2	20	75	12	2	●	1
D1030	10.3	20	75	12	2	●	1
D1040	10.4	20	75	12	2	●	1
D1050	10.5	22	85	12	2	●	1
D1060	10.6	22	85	12	2	●	1
D1070	10.7	22	85	12	2	●	1
D1080	10.8	22	85	12	2	●	1
D1090	10.9	22	85	12	2	●	1
D1100	11	22	85	12	2	●	1
D1110	11.1	22	85	12	2	●	1
D1120	11.2	22	85	12	2	●	1
D1130	11.3	22	85	12	2	●	1
D1140	11.4	22	85	12	2	●	1
D1150	11.5	22	85	12	2	●	1
D1160	11.6	22	85	12	2	●	1
D1170	11.7	22	85	12	2	●	1
D1180	11.8	22	85	12	2	●	1
D1190	11.9	22	85	12	2	●	1
D1200	12	22	85	12	2	●	2
D1210	12.1	22	85	12	2	●	3
D1220	12.2	22	85	12	2	●	3
D1230	12.3	22	85	12	2	●	3
D1240	12.4	22	85	12	2	●	3
D1250	12.5	26	90	12	2	●	3
D1260	12.6	26	90	12	2	●	3
D1270	12.7	26	90	12	2	●	3
D1280	12.8	26	90	12	2	●	3

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

TWO-FLUTE END MILLS

TWO-FLUTE END MILLS

HSS

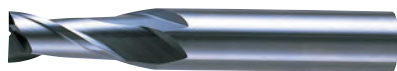
255

End mill, Short cut length, 2 flute



D1 ≤ 3 0 - -0.020
D1 > 3 0 - -0.030

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	○			○	○		○

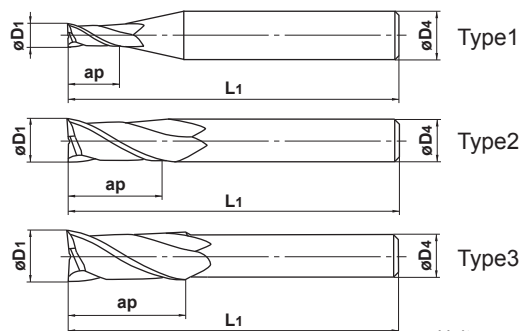


D1 < 3



D1 ≥ 3

● 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
2SSD1290	12.9	26	90	12	2	●	3
D1300	13	26	90	12	2	●	3
D1310	13.1	26	90	12	2	●	3
D1320	13.2	26	90	12	2	●	3
D1330	13.3	26	90	12	2	●	3
D1340	13.4	26	90	12	2	●	3
D1350	13.5	26	90	16	2	●	1
D1360	13.6	26	90	16	2	●	1
D1370	13.7	26	90	16	2	●	1
D1380	13.8	26	90	16	2	●	1
D1390	13.9	26	90	16	2	●	1
D1400	14	26	90	16	2	●	1
D1410	14.1	26	90	16	2	●	1
D1420	14.2	26	90	16	2	●	1
D1430	14.3	26	90	16	2	●	1
D1440	14.4	26	90	16	2	●	1
D1450	14.5	26	100	16	2	●	1
D1460	14.6	26	100	16	2	●	1
D1470	14.7	26	100	16	2	●	1
D1480	14.8	26	100	16	2	●	1
D1490	14.9	26	100	16	2	●	1
D1500	15	30	100	16	2	●	1
D1510	15.1	30	100	16	2	●	1
D1520	15.2	30	100	16	2	●	1
D1530	15.3	30	100	16	2	●	1
D1540	15.4	30	100	16	2	●	1
D1550	15.5	32	100	16	2	●	1
D1560	15.6	32	100	16	2	●	1
D1570	15.7	32	100	16	2	●	1
D1580	15.8	32	100	16	2	●	1
D1590	15.9	32	100	16	2	●	1
D1600	16	32	100	16	2	●	2
D1610	16.1	32	100	16	2	●	3
D1620	16.2	32	100	16	2	●	3
D1630	16.3	32	100	16	2	●	3
D1640	16.4	32	100	16	2	●	3
D1650	16.5	32	100	16	2	●	3
D1660	16.6	32	100	16	2	●	3

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2SSD1670	16.7	32	100	16	2	●	3
D1680	16.8	32	100	16	2	●	3
D1690	16.9	32	100	16	2	●	3
D1700	17	34	100	16	2	●	3
D1710	17.1	34	100	16	2	●	3
D1720	17.2	34	100	16	2	●	3
D1730	17.3	34	100	16	2	●	3
D1740	17.4	34	100	16	2	●	3
D1750	17.5	34	100	16	2	●	3
D1760	17.6	34	100	16	2	●	3
D1770	17.7	34	100	16	2	●	3
D1780	17.8	34	100	16	2	●	3
D1790	17.9	34	100	16	2	●	3
D1800	18	34	100	16	2	●	3
D1810	18.1	34	100	16	2	●	3
D1820	18.2	34	100	16	2	●	3
D1830	18.3	34	100	16	2	●	3
D1840	18.4	34	100	16	2	●	3
D1850	18.5	38	115	20	2	●	1
D1860	18.6	38	115	20	2	●	1
D1870	18.7	38	115	20	2	●	1
D1880	18.8	38	115	20	2	●	1
D1890	18.9	38	115	20	2	●	1
D1900	19	38	115	20	2	●	1
D1910	19.1	38	115	20	2	●	1
D1920	19.2	38	115	20	2	●	1
D1930	19.3	38	115	20	2	●	1
D1940	19.4	38	115	20	2	●	1
D1950	19.5	38	115	20	2	●	1
D1960	19.6	38	115	20	2	●	1
D1970	19.7	38	115	20	2	●	1
D1980	19.8	38	115	20	2	●	1
D1990	19.9	38	115	20	2	●	1
D2000	20	38	115	20	2	●	2

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

TWO-FLUTE END MILLS

TWO-FLUTE END MILLS

S-2MD

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



$D_1 \leq 3$ 0 - -0.020
 $3 < D_1 \leq 20$ 0 - -0.030
 $D_1 > 20$ 0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

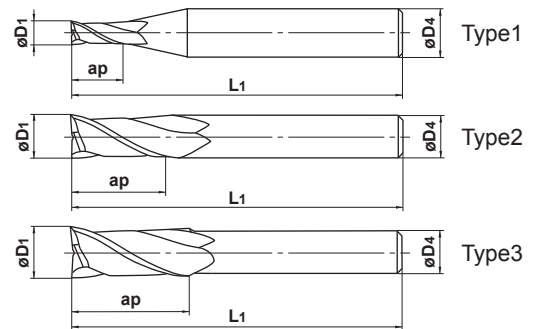


$D_1 < 3$



$D_1 \geq 3$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
S2MDD0040	0.4	0.6	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	2	50	6	2	●	1
D0110	1.1	2	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	3.5	50	6	2	●	1
D0160	1.6	3.5	50	6	2	●	1
D0170	1.7	3.5	50	6	2	●	1
D0180	1.8	3.5	50	6	2	●	1
D0190	1.9	3.5	50	6	2	●	1
D0200	2	5	50	6	2	●	1
D0210	2.1	5	50	6	2	●	1
D0220	2.2	5	50	6	2	●	1
D0230	2.3	5	50	6	2	●	1
D0240	2.4	5	50	6	2	●	1
D0250	2.5	6	50	6	2	●	1
D0260	2.6	6	50	6	2	●	1
D0270	2.7	6	50	6	2	●	1
D0280	2.8	6	50	6	2	●	1
D0290	2.9	6	50	6	2	●	1
D0300	3	8	50	6	2	●	1
D0310	3.1	8	50	6	2	●	1
D0320	3.2	8	50	6	2	●	1
D0330	3.3	8	50	6	2	●	1
D0340	3.4	8	50	6	2	●	1
D0350	3.5	8	60	8	2	●	1
D0360	3.6	8	60	8	2	●	1
D0370	3.7	8	60	8	2	●	1
D0380	3.8	8	60	8	2	●	1
D0390	3.9	8	60	8	2	●	1
D0400	4	8	60	8	2	●	1
D0410	4.1	8	60	8	2	●	1

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S2MDD0420	4.2	8	60	8	2	●	1
D0430	4.3	8	60	8	2	●	1
D0440	4.4	8	60	8	2	●	1
D0450	4.5	10	60	8	2	●	1
D0460	4.6	10	60	8	2	●	1
D0470	4.7	10	60	8	2	●	1
D0480	4.8	10	60	8	2	●	1
D0490	4.9	10	60	8	2	●	1
D0500	5	10	60	8	2	●	1
D0510	5.1	10	60	8	2	●	1
D0520	5.2	10	60	8	2	●	1
D0530	5.3	10	60	8	2	●	1
D0540	5.4	10	60	8	2	●	1
D0550	5.5	12	60	8	2	●	1
D0560	5.6	12	60	8	2	●	1
D0570	5.7	12	60	8	2	●	1
D0580	5.8	12	60	8	2	●	1
D0590	5.9	12	60	8	2	●	1
D0600	6	12	60	8	2	●	1
D0610	6.1	12	60	8	2	●	1
D0620	6.2	12	60	8	2	●	1
D0630	6.3	12	60	8	2	●	1
D0640	6.4	12	60	8	2	●	1
D0650	6.5	15	65	10	2	●	1
D0660	6.6	15	65	10	2	●	1
D0670	6.7	15	65	10	2	●	1
D0680	6.8	15	65	10	2	●	1
D0690	6.9	15	65	10	2	●	1
D0700	7	15	65	10	2	●	1
D0710	7.1	15	65	10	2	●	1
D0720	7.2	15	65	10	2	●	1
D0730	7.3	15	65	10	2	●	1
D0740	7.4	15	65	10	2	●	1
D0750	7.5	15	65	10	2	●	1
D0760	7.6	15	65	10	2	●	1
D0770	7.7	15	65	10	2	●	1
D0780	7.8	15	65	10	2	●	1
D0790	7.9	15	65	10	2	●	1
D0800S08	8	15	65	8	2	●	2
D0800S10	8	15	65	10	2	●	1
D0810	8.1	15	65	10	2	●	1
D0820	8.2	15	65	10	2	●	1
D0830	8.3	15	65	10	2	●	1
D0840	8.4	15	65	10	2	●	1
D0850	8.5	20	75	10	2	●	1
D0860	8.6	20	75	10	2	●	1
D0870	8.7	20	75	10	2	●	1
D0880	8.8	20	75	10	2	●	1
D0890	8.9	20	75	10	2	●	1
D0900	9	20	75	10	2	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

TWO-FLUTE END MILLS

TWO-FLUTE END MILLS

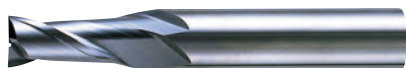
S-2MD

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



$D_1 \leq 3$ 0 - -0.020
 $3 < D_1 \leq 20$ 0 - -0.030
 $D_1 > 20$ 0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

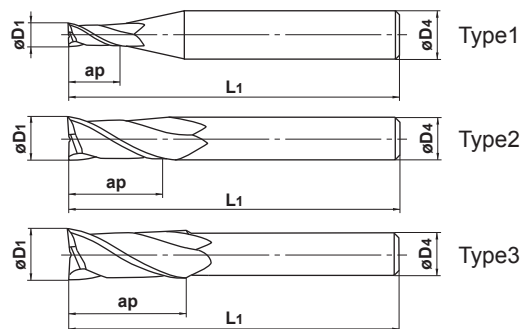


$D_1 < 3$



$D_1 \geq 3$

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



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
S2MDD0910	9.1	20	75	10	2	●	1
D0920	9.2	20	75	10	2	●	1
D0930	9.3	20	75	10	2	●	1
D0940	9.4	20	75	10	2	●	1
D0950	9.5	20	75	12	2	●	1
D0960	9.6	20	75	12	2	●	1
D0970	9.7	20	75	12	2	●	1
D0980	9.8	20	75	12	2	●	1
D0990	9.9	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
D1650	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
D2100	21	45	120	20	2	●	3
D2200	22	45	120	20	2	●	3
D2300	23	50	140	25	2	●	1
D2400	24	50	140	25	2	●	1
D2500	25	50	140	25	2	●	2
D2600	26	50	140	25	2	●	3
D2700	27	55	145	25	2	●	3

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S2MDD2800	28	55	145	25	2	●	3
D2900	29	55	145	25	2	●	3
D3000	30	55	145	25	2	●	3
D3100	31	60	160	32	2	●	1
D3200	32	60	160	32	2	●	2
D3300	33	60	160	32	2	●	3
D3400	34	60	160	32	2	●	3
D3500	35	60	160	32	2	●	3
D3600	36	65	165	32	2	●	3
D3700	37	65	165	32	2	●	3
D3800	38	65	165	32	2	●	3
D3900	39	65	165	32	2	●	3
D4000	40	65	165	32	2	●	3
D4200	42	70	165	42	2	●	2
D4500	45	70	165	42	2	●	3
D4800	48	70	165	42	2	●	3
D5000	50	70	165	42	2	●	3

SQUARE

BALL

RADIUS

TAPER



TWO-FLUTE END MILLS

CUTTING CONDITIONS

B386

B237

TWO-FLUTE END MILLS

G-2MS

End mill, Medium cut length, 2 flute

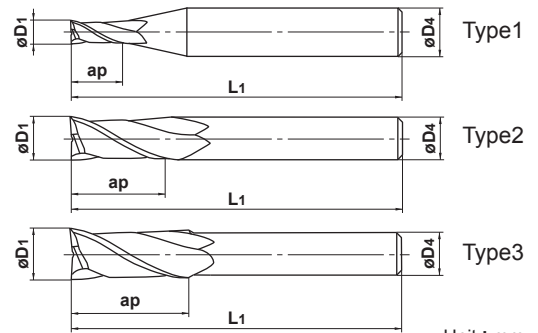


D1 ≤ 20 0 - -0.030
D1 > 20 0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 with high grade HSS substrate and TiN coating for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D2600	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
G2MSD3000	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

SQUARE

BALL

RADIUS

TAPER



TWO-FLUTE END MILLS

CUTTING CONDITIONS

B385

B239

TWO-FLUTE END MILLS

HSS

2MS

End mill, Medium cut length, 2 flute



$D_1 \leq 3$ 0 - -0.020
 $3 < D_1 \leq 20$ 0 - -0.030
 $D_1 > 20$ 0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

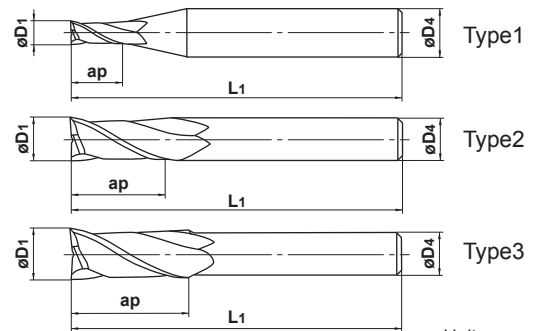


$D_1 < 3$



$D_1 \geq 3$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D2600	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

● : Inventory maintained in Japan.

B240

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2MSD3000	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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

TWO-FLUTE END MILLS

TWO-FLUTE END MILLS

S-2JS

End mill, Semi long cut length, 2 flute, KHA Super

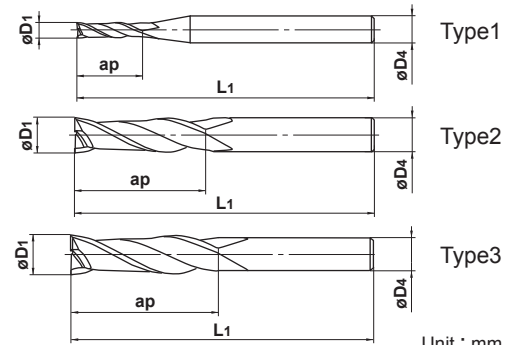


$D_1 \leq 3$ 0 - -0.020
 $3 < D_1 \leq 20$ 0 - -0.030
 $D_1 > 20$ 0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
S2JSD0300	3	12	60	6	2	●	1
D0400	4	15	65	8	2	●	1
D0500	5	20	75	8	2	●	1
D0600	6	20	75	8	2	●	1
D0700	7	25	80	10	2	●	1
D0800	8	25	80	10	2	●	1
D0900	9	35	90	10	2	●	1
D1000	10	35	90	10	2	●	2
D1100	11	45	110	12	2	●	1
D1200	12	45	110	12	2	●	2
D1300	13	45	110	12	2	●	3
D1400	14	55	125	16	2	●	1
D1500	15	55	125	16	2	●	1
D1600	16	55	125	16	2	●	2
D1700	17	55	125	16	2	●	3
D1800	18	55	125	16	2	●	3
D1900	19	65	145	20	2	●	1
D2000	20	65	145	20	2	●	2
D2100	21	65	145	20	2	●	3
D2200	22	65	145	20	2	●	3
D2300	23	75	165	25	2	●	1
D2400	24	75	165	25	2	●	1
D2500	25	75	165	25	2	●	2
D2600	26	75	165	25	2	●	3
D2700	27	75	165	25	2	●	3
D2800	28	75	165	25	2	●	3
D2900	29	75	165	25	2	●	3
D3000	30	75	165	25	2	●	3
D3100	31	85	190	32	2	●	1
D3200	32	85	190	32	2	●	2
D3300	33	85	190	32	2	●	3
D3400	34	85	190	32	2	●	3
D3500	35	85	190	32	2	●	3
D3600	36	95	200	32	2	●	3
D3700	37	95	200	32	2	●	3
D3800	38	95	200	32	2	●	3
D3900	39	95	200	32	2	●	3
D4000	40	95	200	32	2	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B386

2LS

End mill, Long cut length, 2 flute



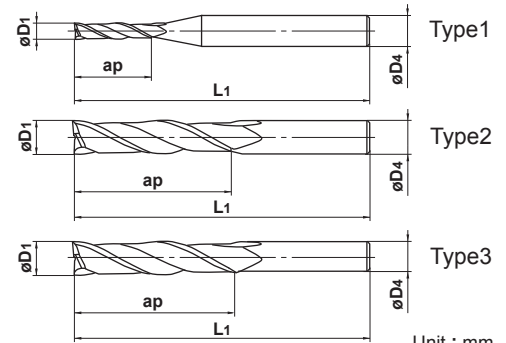
$D_1 \leq 3$ 0 — -0.020
 $3 < D_1 \leq 20$ 0 — -0.030
 $D_1 > 20$ 0 — -0.040

HSS

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

 $D_1 < 3$  $D_1 \geq 3$

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

**SQUARE****BALL****RADIUS****TAPER****SOLID
END MILLS****TWO-FLUTE END MILLS**

Order Number	Dia. D_1	Length of Cut a_p	Overall Length L_1	Shank Dia. D_4	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
D1800	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

CUTTING CONDITIONS

B387

B243

TWO-FLUTE END MILLS

HSS

2LS

End mill, Long cut length, 2 flute



$D_1 \leq 3$ 0 - -0.020
 $3 < D_1 \leq 20$ 0 - -0.030
 $D_1 > 20$ 0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

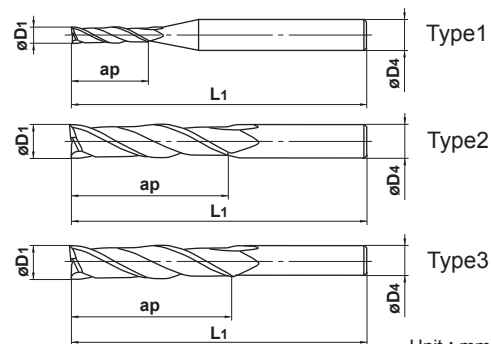


$D_1 < 3$



$D_1 \geq 3$

● 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
2LSD2000	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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

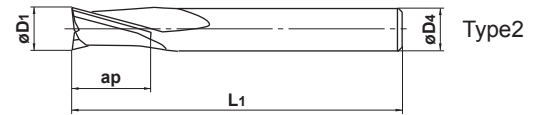
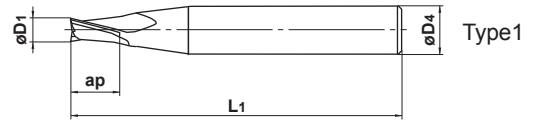


B387

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($D1^{+0.02}_0$)

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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($D1^{0}_{-0.02}$)

Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

HSS

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

TWO-FLUTE END MILLS

B245

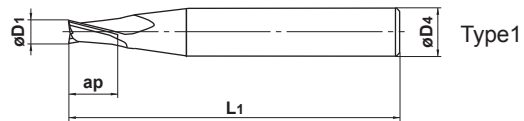
TWO-FLUTE END MILLS

HSS

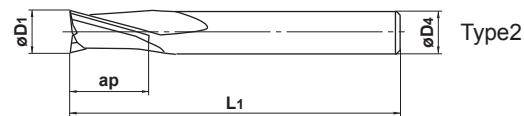
2MK

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

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○			○



Type1



Type2



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

2MK-NN(D1 $\begin{smallmatrix} -0.02 \\ -0.04 \end{smallmatrix}$)

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2MKNNND0300	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



TWO-FLUTE END MILLS

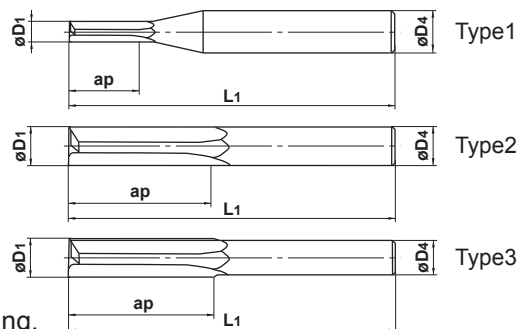
● : Inventory maintained in Japan.

K-25L

End mill, Long cut length, 2 flute, Straight flute geometry

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
○	○			○			○



Unit : mm

- 2 flute end mill with a square sectional geometry for easy grinding for different applications such as difficult-to-cut material milling.

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
K2SLD0200	2	10	60	6	2	●	1
D0250	2.5	10	60	6	2	●	1
D0300	3	15	70	8	2	●	1
D0350	3.5	15	70	8	2	●	1
D0400	4	15	70	8	2	●	1
D0500	5	20	75	8	2	●	1
D0600	6	25	80	8	2	●	1
D0700	7	25	80	10	2	●	1
D0800	8	25	80	10	2	●	1
D0900	9	35	85	10	2	●	1
D1000	10	35	85	10	2	●	2
D1100	11	40	90	12	2	●	1
D1200	12	40	90	12	2	●	2
D1300	13	40	90	12	2	●	3
D1400	14	45	120	16	2	●	1
D1500	15	45	120	16	2	●	1
D1600	16	45	120	16	2	●	2
D1700	17	45	120	16	2	●	3
D1800	18	45	120	16	2	●	3
D1900	19	55	135	20	2	●	1
D2000	20	55	135	20	2	●	2

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

TWO-FLUTE END MILLS

THREE-FLUTE END MILLS

HSS

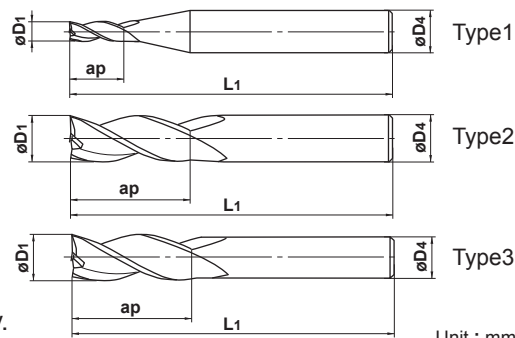
3MS

End mill, Medium cut length, 3 flute



D1 ≤ 20 0 - -0.030
D1 > 20 0 - -0.040

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



Unit : mm

- 3 flute end mill with large open flute geometry similar to that of a 2 flute design. It is suitable for heavy duty milling due to its high rigidity.

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
3MSD0300	3	10	50	6	3	●	1
D0400	4	12	50	6	3	●	1
D0500	5	15	55	6	3	●	1
D0600	6	15	55	6	3	●	2
D0700	7	20	65	8	3	●	1
D0800	8	20	65	8	3	●	2
D0900	9	25	75	10	3	●	1
D1000	10	25	75	10	3	●	2
D1100	11	30	85	12	3	●	1
D1200	12	30	85	12	3	●	2
D1300	13	35	90	12	3	●	3
D1400	14	35	95	16	3	●	1
D1500	15	40	100	16	3	●	1
D1600	16	40	100	16	3	●	2
D1700	17	40	100	16	3	●	3
D1800	18	40	100	16	3	●	3
D1900	19	45	115	20	3	●	1
D2000	20	45	115	20	3	●	2
D2100	21	45	115	20	3	●	3
D2200	22	45	115	20	3	●	3
D2300	23	50	120	25	3	●	1
D2400	24	50	120	25	3	●	1
D2500	25	50	120	25	3	●	2
D2600	26	50	120	25	3	●	3
D2700	27	55	125	25	3	●	3
D2800	28	55	125	25	3	●	3
D2900	29	55	125	25	3	●	3
D3000	30	55	125	25	3	●	3
D3500	35	60	145	32	3	●	3
D4000	40	65	150	32	3	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B388

FOUR-FLUTE END MILLS

S-4MD

End mill, Medium cut length, 4 flute



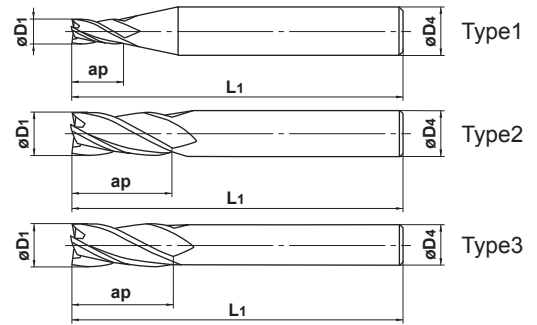
D1 ≤ 20 0 - +0.020
D1 > 20 0 - +0.030

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
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
D3100	31	60	145	32	4	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

FOUR-FLUTE END MILLS

CUTTING CONDITIONS

B389

B249

FOUR-FLUTE END MILLS

HSS

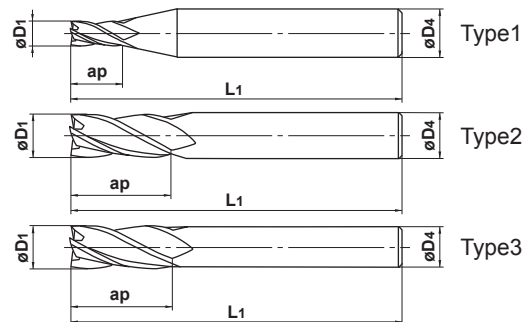
S-4MD

End mill, Medium cut length, 4 flute



D1 ≤ 20 0 - +0.020
D1 > 20 0 - +0.030

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



Unit : mm

● 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.

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
S4MDD3200	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
D4200	42	70	155	42	4	●	2
D4500	45	70	155	42	4	●	3
D4800	48	70	155	42	4	●	3
D5000	50	70	155	42	4	●	3



FOUR-FLUTE END MILLS

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B389

B250

G-4MC

End mill, Medium cut length, 4 flute



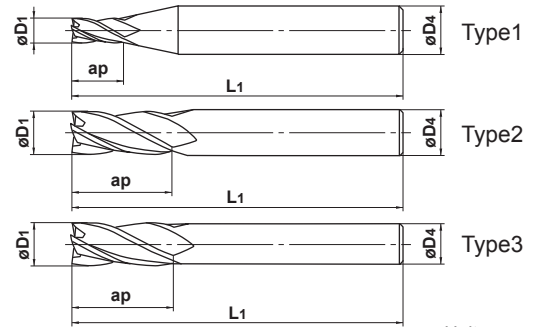
D1 ≤ 20 0 - +0.030
D1 > 20 0 - +0.040

HSS

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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

FOUR-FLUTE END MILLS

CUTTING CONDITIONS

B390

B251

FOUR-FLUTE END MILLS

4MC

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

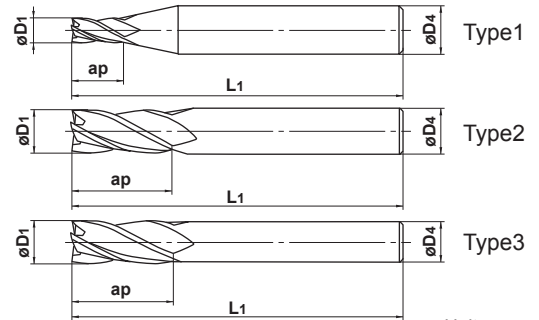


D1 ≤ 20 0 - +0.020
D1 > 20 0 - +0.030

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D2900	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

● : Inventory maintained in Japan.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
4MCD3300	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

SQUARE

BALL

RADIUS

TAPER



FOUR-FLUTE END MILLS

CUTTING CONDITIONS

B391

B253

FOUR-FLUTE END MILLS

S-4JC

End mill, Semi long cut length, 4 flute

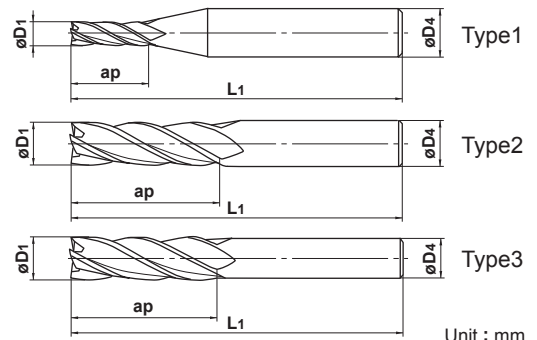


D1 ≤ 20 0 - +0.020
D1 > 20 0 - +0.030

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 end mill for general use.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D2100	21	65	145	20	4	●	3
D2200	22	65	145	20	4	●	3
D2300	23	75	165	25	4	●	1
D2400	24	75	165	25	4	●	1
D2500	25	75	165	25	4	●	2
D2600	26	75	165	25	4	●	3
D2700	27	75	165	25	4	●	3
D2800	28	75	165	25	4	●	3
D2900	29	75	165	25	4	●	3
D3000	30	75	165	25	4	●	3
D3100	31	85	190	32	4	●	1
D3200	32	85	190	32	4	●	2
D3300	33	85	190	32	4	●	3
D3400	34	85	190	32	4	●	3
D3500	35	85	190	32	4	●	3
D3600	36	95	200	32	4	●	3
D3700	37	95	200	32	4	●	3
D3800	38	95	200	32	4	●	3
D3900	39	95	200	32	4	●	3
D4000	40	95	200	32	4	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B389

G-4LC

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

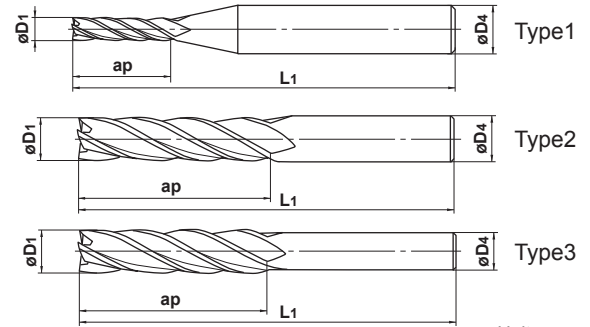


D1 ≤ 20 0 - +0.030
D1 > 20 0 - +0.040

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 end mill with long flute for deep cutting applications.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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
D3700	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

HSS

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

FOUR-FLUTE END MILLS

CUTTING CONDITIONS

B390

B255

FOUR-FLUTE END MILLS

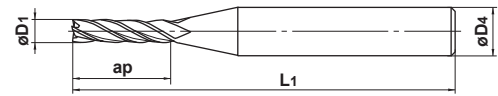
4LC

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

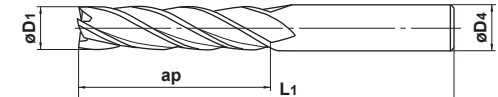


D1 ≤ 20 0 - +0.020
D1 > 20 0 - +0.030

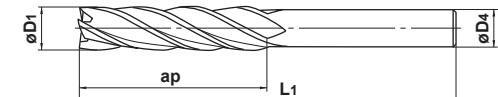
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



Type1



Type2



Type3

● 4 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
D3700	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



B391

BALL NOSE END MILLS

S-2MB

Ball nose end mill, Medium cut length, 2 flute



R ≤ 6.5 ±0.01
R > 6.5 ±0.02



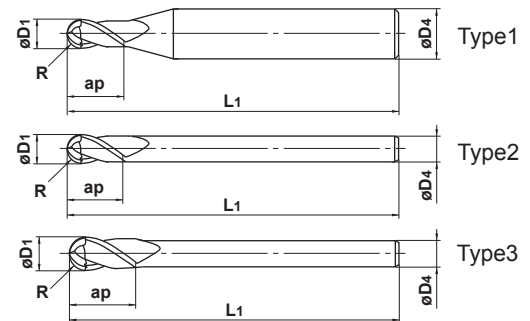
D1 ≤ 3 0 - -0.02
3 < D1 ≤ 13 0 - -0.03
D1 > 13 0 - -0.04

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
R1750	17.5	35	65	220	32	2	●	3
R2000	20	40	65	220	32	2	●	3
R2500	25	50	75	240	42	2	●	3

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

BALL NOSE END MILLS

CUTTING CONDITIONS

B392

B257

BALL NOSE END MILLS

2FB

Ball nose end mill, Medium cut length, 2 flute



R ≤ 6.5 ±0.01
R > 6.5 ±0.02

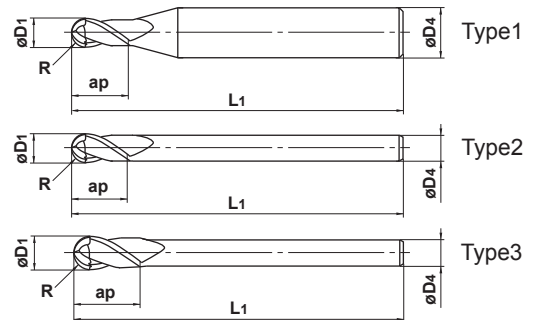


D1 ≤ 3 0 - -0.02
3 < D1 ≤ 13 0 - -0.03
D1 > 13 0 - -0.04

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
2FBR0050	0.5	1	2	50	6	2	●	1
R0075	0.75	1.5	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
R0200	2	4	8	70	6	2	●	1
R0250	2.5	5	10	90	6	2	●	1
R0300	3	6	12	100	6	2	●	2
R0350	3.5	7	14	100	6	2	●	3
R0400	4	8	14	100	8	2	●	2
R0450	4.5	9	18	120	8	2	●	3
R0500	5	10	18	120	10	2	●	2
R0600	6	12	22	120	12	2	●	2
R0700	7	14	26	120	12	2	●	3
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.

CUTTING CONDITIONS



B393

K-4MB

Ball nose end mill, Medium cut length, 4 flute

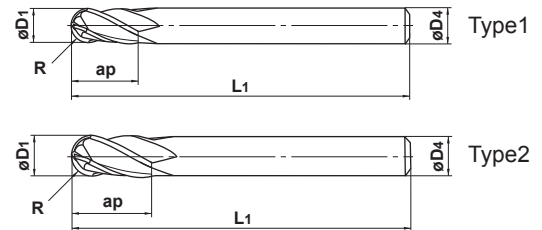


R ≤ 6.5 ±0.01
R > 6.5 ±0.02



D1 ≤ 13 0 - -0.03
D1 > 13 0 - -0.04

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 end mill with high rigidity 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
K4MBR0300	3	6	12	100	6	4	●	1
R0400	4	8	14	100	8	4	●	1
R0500	5	10	18	120	10	4	●	1
R0600	6	12	22	120	12	4	●	1
R0700	7	14	26	120	12	4	●	2
R0800	8	16	30	160	16	4	●	1
R0900	9	18	34	160	16	4	●	2
R1000	10	20	38	180	20	4	●	1
R1250	12.5	25	50	200	25	4	●	1
R1500	15	30	55	200	25	4	●	2
R1600	16	32	55	200	32	4	●	1
R1800	18	36	65	220	32	4	●	2
R2000	20	40	65	220	32	4	●	2

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

BALL NOSE END MILLS

CUTTING CONDITIONS

B394

B259

ROUGHING END MILLS

HSS

SR

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

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



$D1 \leq 25$

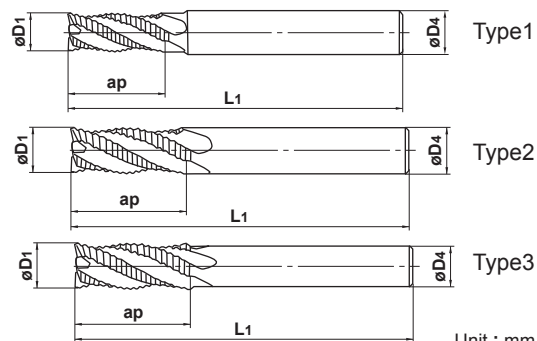


$28 \leq D1 \leq 32$



$D1 \geq 35$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B395

G-SFPR

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

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	○			○	○		○



$D_1 \leq 22$

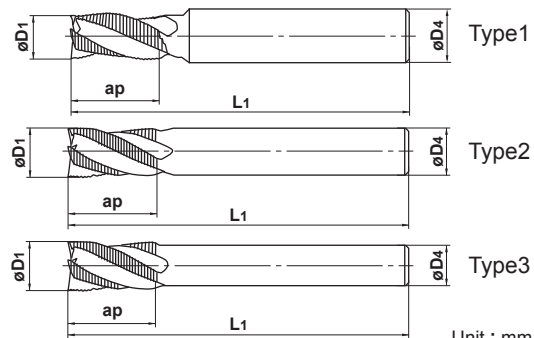


$24 \leq D_1 \leq 32$



$D_1 \geq 35$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

ROUGHING END MILLS

CUTTING CONDITIONS

B396

B261

ROUGHING END MILLS

G-MR

Roughing 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
◎	○			○	○		○



$D_1 \leq 15$



$16 \leq D_1 \leq 26$

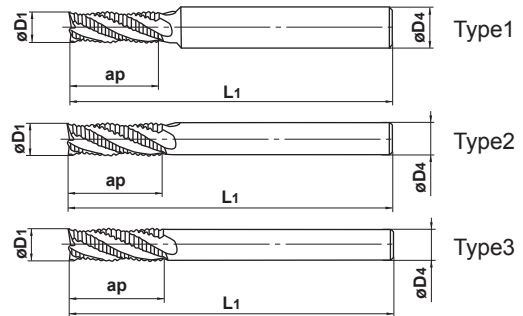


$28 \leq D_1 \leq 32$



$D_1 \geq 35$

- 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.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

B396

MR

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

HSS

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 ≤ 15



16 ≤ D1 ≤ 26

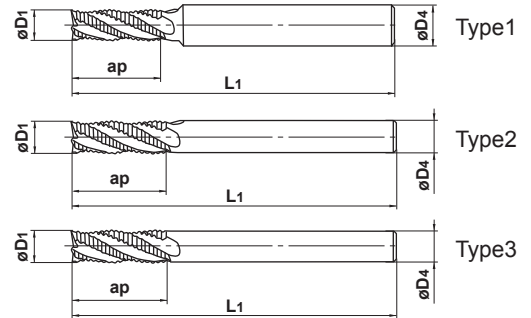


28 ≤ D1 ≤ 32



D1 ≥ 35

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE**BALL****RADIUS****TAPER****SOLID
END MILLS****ROUGHING END MILLS**

CUTTING CONDITIONS

B395

B263

ROUGHING END MILLS

JR

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

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○



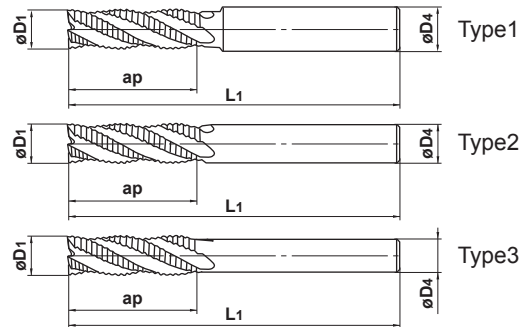
$D1 \leq 15$

$16 \leq D1 \leq 25$

$28 \leq D1 \leq 32$

$D1 \geq 35$

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



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes	Stock	Type
	D1	ap	L1	D4	N		
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

B395

LR

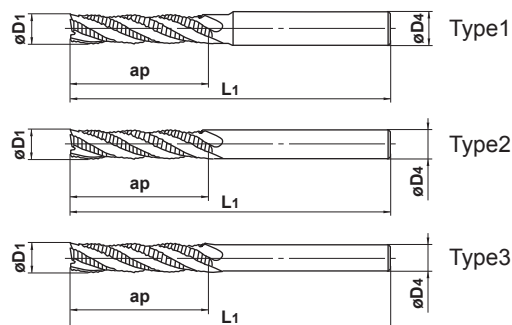
Roughing end mill, Long cut length, 4–6 flute

HSS

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

 $D1 \leq 25$  $28 \leq D1 \leq 32$  $D1 \geq 35$

- 4–6 flute end mill with longer cut length and overall length than standard.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
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

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

ROUGHING END MILLS

CUTTING CONDITIONS

B395

B265

ROUGHING END MILLS

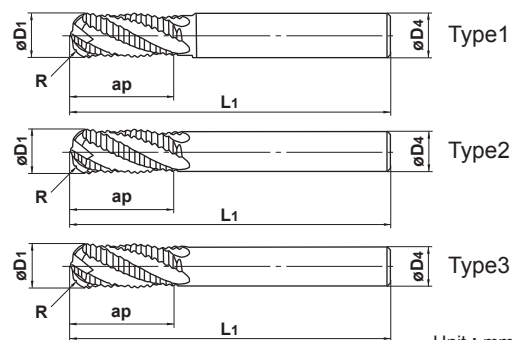
MRB

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

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	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.

SEMI-FINISHING END MILLS

G-MSF

Semi finish end mill, Medium cut length, 4—6 flute

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
◎	○			○	○		○

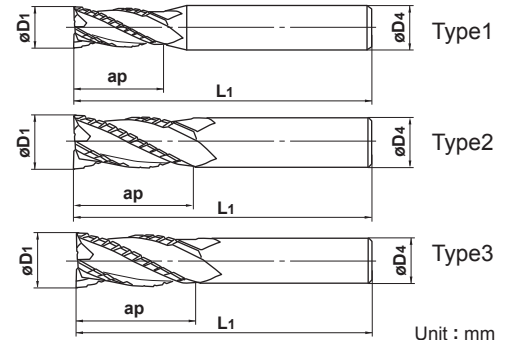


$D1 \leq 30$

$32 \leq D1 \leq 38$

$D1 \geq 40$

- 4—6 flute semi finish end mill with specially notched cutting edge geometry for reduced cutting resistance.



Unit : mm

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

SEMI-FINISHING END MILLS

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
GMSFD0300	3	10	50	6	4	●	1
D0350	3.5	12	50	6	4	●	1
D0400	4	12	50	6	4	●	1
D0450	4.5	15	55	6	4	●	1
D0500	5	15	55	6	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	12	4	●	1
D1000	10	25	75	12	4	●	1
D1050	10.5	30	85	12	4	●	1
D1100	11	30	85	12	4	●	1
D1150	11.5	30	85	12	4	●	1
D1200	12	30	85	12	4	●	2
D1250	12.5	35	90	12	4	●	3
D1300	13	35	90	12	4	●	3
D1350	13.5	35	105	16	4	●	1
D1400	14	35	105	16	4	●	1
D1450	14.5	40	110	16	4	●	1
D1500	15	40	110	16	4	●	1
D1600	16	40	110	16	4	●	2
D1700	17	40	115	16	4	●	3
D1800	18	40	115	16	4	●	3
D1900	19	45	120	20	4	●	1
D2000	20	45	120	20	4	●	2
D2100	21	45	120	20	4	●	3
D2200	22	45	120	20	4	●	3
D2300	23	50	130	25	4	●	1
D2400	24	50	130	25	4	●	1
D2500	25	50	130	25	4	●	2
D2600	26	50	130	25	4	●	3
D2700	27	55	135	25	4	●	3
D2800	28	55	135	25	4	●	3

CUTTING CONDITIONS

B397

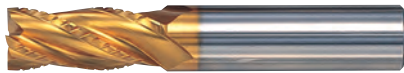
B267

SEMI-FINISHING END MILLS

G-MSF

Semi finish 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
◎	○			○	○		○



$D_1 \leq 30$

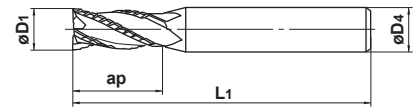


$32 \leq D_1 \leq 38$

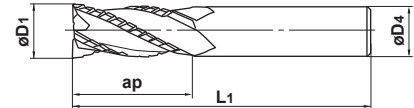


$D_1 \geq 40$

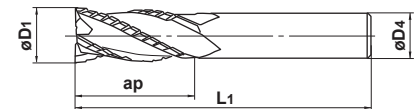
- 4—6 flute semi finish end mill with specially notched cutting edge geometry for reduced cutting resistance.



Type1



Type2



Type3

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
GMSFD2900	29	55	135	25	4	●	3
D3000	30	55	135	25	4	●	3
D3200	32	60	150	32	4	●	2
D3400	34	60	150	32	4	●	3
D3500	35	60	150	32	4	●	3
D3600	36	65	155	32	4	●	3
D3800	38	65	155	32	4	●	3
D4000	40	65	155	32	6	●	3
D4200	42	70	170	42	6	●	2
D4500	45	70	170	42	6	●	3
D4600	46	70	170	42	6	●	3
D4800	48	70	170	42	6	●	3
D5000	50	70	170	42	6	●	3

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B397

MSF

Semi finish end mill, Medium cut length, 4—6 flute

HSS

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($>55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○		○

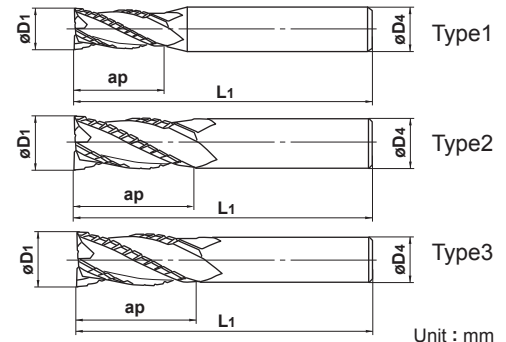


$D1 \leq 30$

$32 \leq D1 \leq 38$

$D1 \geq 40$

- 4—6 flute semi finish end mill with specially notched cutting edge geometry for reduced cutting resistance.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
MSFD0300	3	10	50	6	4	●	1
D0400	4	12	50	6	4	●	1
D0500	5	15	55	6	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	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	105	16	4	●	1
D1500	15	40	110	16	4	●	1
D1600	16	40	110	16	4	●	2
D1700	17	40	115	16	4	●	3
D1800	18	40	115	16	4	●	3
D1900	19	45	120	20	4	●	1
D2000	20	45	120	20	4	●	2
D2100	21	45	120	20	4	●	3
D2200	22	45	120	20	4	●	3
D2300	23	50	130	25	4	●	1
D2400	24	50	130	25	4	●	1
D2500	25	50	130	25	4	●	2
D2600	26	50	130	25	4	●	3
D2700	27	55	135	25	4	●	3
D2800	28	55	135	25	4	●	3
D2900	29	55	135	25	4	●	3
D3000	30	55	135	25	4	●	3
D3200	32	60	150	32	4	●	2
D3400	34	60	150	32	4	●	3
D3500	35	60	150	32	4	●	3
D3600	36	65	155	32	4	●	3
D3800	38	65	155	32	4	●	3
D4000	40	65	155	32	6	●	3
D4200	42	70	170	42	6	●	2
D4500	45	70	170	42	6	●	3
D5000	50	70	170	42	6	●	3

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

SEMI-FINISHING END MILLS

CUTTING CONDITIONS

B397

B269

HIGH HELIX END MILLS

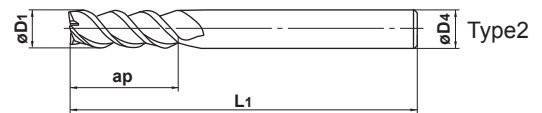
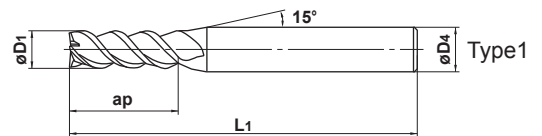
K-MH

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



0 - -0.040

Carbon Steel, Alloy Steel, Cast Iron ($<30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○	○	○



D1 = 5



D1 ≥ 6



D1 = 5



D1 ≤ 20



D1 ≥ 21

- 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
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
D3000	30	55	150	32	4	●	1

● : Inventory maintained in Japan.

CUTTING CONDITIONS



B398

K-LH

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



0 — -0.040

HSS

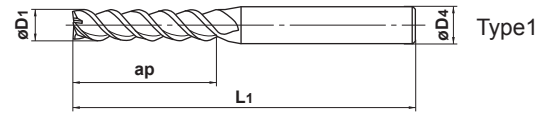
Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	Tool Steel, Pre-Hardened Steel, Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
◎	○			○	○	○	○



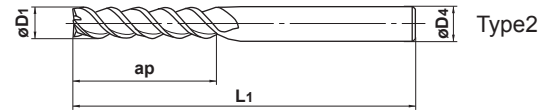
D1 ≤ 20



D1 ≥ 25



Type1



Type2

- 3—4 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
KLHD0600	6	25	75	8	3	●	1
D0800	8	35	85	10	3	●	1
D1000	10	45	110	12	3	●	1
D1200	12	55	115	12	3	●	2
D1400	14	65	125	16	3	●	1
D1500	15	65	140	16	3	●	1
D1600	16	65	140	16	3	●	2
D1800	18	75	150	20	3	●	1
D2000	20	85	160	20	3	●	2
D2500	25	105	180	25	4	●	2
D3000	30	105	185	32	4	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

HIGH HELIX END MILLS

CUTTING CONDITIONS

B398

B271

LIGHT ALLOY STEEL END MILLS

HSS

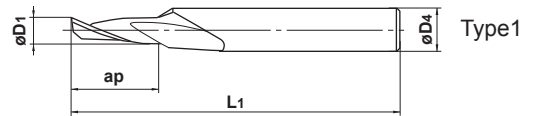
1MA

End mill, Medium cut length, 1 flute

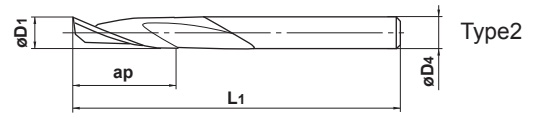


0 -0.050

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



● 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

SQUARE

BALL

RADIUS

TAPER



LIGHT ALLOY STEEL END MILLS

● : Inventory maintained in Japan.

B272

1LA

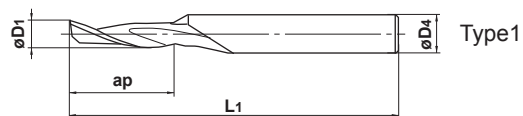
End mill, Long cut length, 1 flute



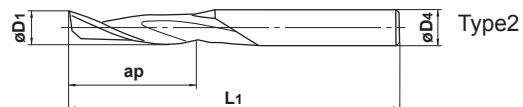
0 - -0.050

HSS

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
							◎



Type1



Type2

- 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

SQUARE

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RADIUS

TAPER



LIGHT ALLOY STEEL END MILLS

LIGHT ALLOY STEEL END MILLS

S-2SDA

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

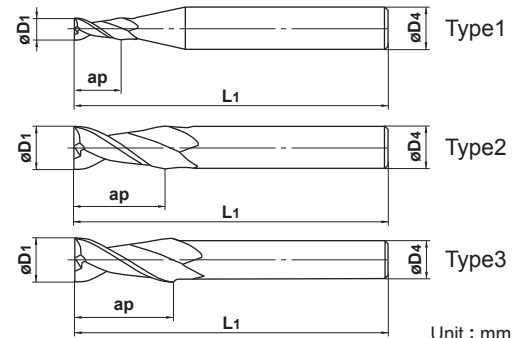


D1=3 0 - -0.020
D1>3 0 - -0.030

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 aluminium alloy and soft materials.



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
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	10	2	●	2
D1100	11	22	85	12	2	●	1
D1200	12	22	85	12	2	●	2
D1300	13	26	90	12	2	●	3
D1400	14	26	90	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	115	20	2	●	1
D2000	20	38	115	20	2	●	2

● : Inventory maintained in Japan.

CUTTING CONDITIONS



2MA

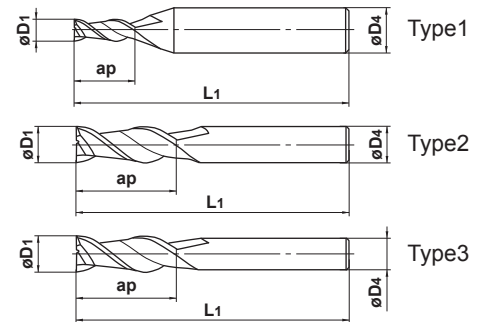
End mill, Medium cut length, 2 flute, For light alloy



0 — -0.030

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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
						○	◎



Unit : mm

● 2 flute end mill with high helix angle for aluminium alloy machining.

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
2MAD0300	3	10	50	6	2	●	1
D0400	4	12	50	6	2	●	1
D0500	5	15	55	6	2	●	1
D0600	6	15	55	6	2	●	2
D0700	7	20	65	8	2	●	1
D0800	8	20	65	8	2	●	2
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	115	20	2	●	1
D2000	20	45	115	20	2	●	2

SQUARE**BALL****RADIUS****TAPER****SOLID
END MILLS****LIGHT ALLOY STEEL END MILLS****B275**

DEEP SLOTTING END MILLS

HSS

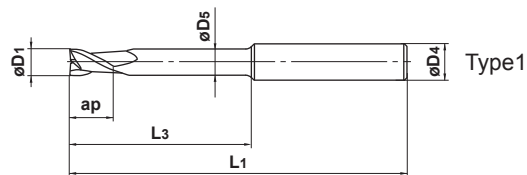
K-2XL

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



0 - -0.030

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 with long neck for long reach applications.

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
K2XLD0300	3	4.5	22	2.96	60	6	2	●	1
D0350	3.5	5	27	3.46	65	8	2	●	1
D0400	4	6	30	3.96	70	8	2	●	1
D0450	4.5	7	35	4.46	75	8	2	●	1
D0500	5	7.5	40	4.96	80	8	2	●	1
D0600	6	9	45	5.93	85	8	2	●	1
D0700	7	10.5	50	6.93	90	10	2	●	1
D0800	8	12	60	7.93	105	10	2	●	1
D0900	9	13.5	65	8.93	115	10	2	●	1
D1000	10	15	75	9.93	125	12	2	●	1



DEEP SLOTTING END MILLS

● : Inventory maintained in Japan.

B276

2ML

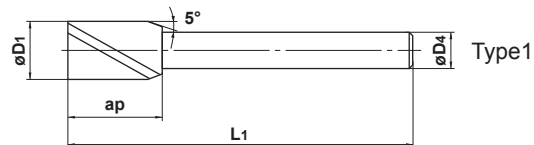
End mill, Medium cut length, 2 flute, Long shank



$D_1 \leq 20$ 0 - -0.030
 $D_1 > 20$ 0 - -0.040

HSS

Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
○	○			○	○	○	○



● 2 flute end mill for efficient slotting.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
2MLD1200A112	12	25	112	10	2	●	1
D1200A140	12	25	140	10	2	●	1
D1400A112	14	35	112	12	2	●	1
D1400A140	14	35	140	12	2	●	1
D1400A180	14	30	180	12	2	●	1
D1800A125	18	45	125	16	2	●	1
D1800A160	18	45	160	16	2	●	1
D1800A200	18	40	200	16	2	●	1
D1800A250	18	35	250	16	2	●	1
D2200A140	22	45	140	20	2	●	1
D2200A180	22	45	180	20	2	●	1
D2200A224	22	40	224	20	2	●	1
D2200A280	22	35	280	20	2	●	1
D2800A160	28	55	160	25	2	●	1
D2800A200	28	55	200	25	2	●	1
D2800A250	28	50	250	25	2	●	1
D2800A315	28	45	315	25	2	●	1
D3500A180	35	65	180	32	2	●	1
D3500A224	35	65	224	32	2	●	1
D3500A280	35	60	280	32	2	●	1
D3500A355	35	55	355	32	2	●	1

SQUARE**BALL****RADIUS****TAPER**
**SOLID
END MILLS**
DEEP SLOTTING END MILLS**B277**

DEEP SLOTTING END MILLS

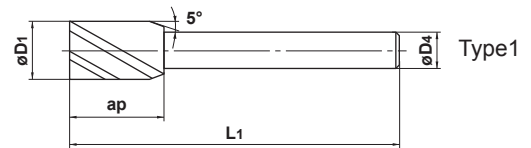
4ML

End mill, Medium cut length, 4 flute, Long shank



D1 ≤ 20 0 - +0.030
D1 > 20 0 - +0.040

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 end mill for efficient general use machining.

Unit : mm

Order Number	Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
4MLD1200A112	12	25	112	10	4	●	1
D1200A140	12	25	140	10	4	●	1
D1400A112	14	35	112	12	4	●	1
D1400A140	14	35	140	12	4	●	1
D1400A180	14	30	180	12	4	●	1
D1800A125	18	45	125	16	4	●	1
D1800A160	18	45	160	16	4	●	1
D1800A200	18	40	200	16	4	●	1
D1800A250	18	35	250	16	4	●	1
D2200A140	22	45	140	20	4	●	1
D2200A180	22	45	180	20	4	●	1
D2200A224	22	40	224	20	4	●	1
D2200A280	22	35	280	20	4	●	1
D2800A160	28	55	160	25	4	●	1
D2800A200	28	55	200	25	4	●	1
D2800A250	28	50	250	25	4	●	1
D2800A315	28	45	315	25	4	●	1
D3500A180	35	65	180	32	4	●	1
D3500A224	35	65	224	32	4	●	1
D3500A280	35	60	280	32	4	●	1
D3500A355	35	55	355	32	4	●	1

● : Inventory maintained in Japan.

45X

End mill, Long cut length, 4 flute

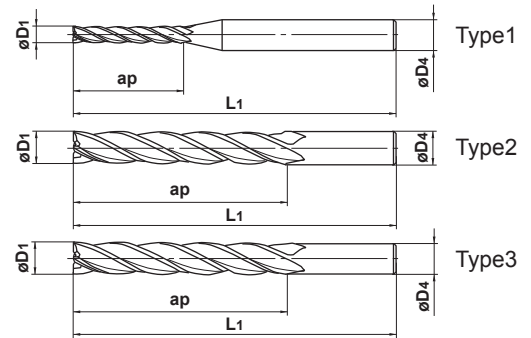


D1 = 3 0 - +0.020
3 < D1 ≤ 20 0 - +0.030
D1 > 20 0 - +0.040

Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	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 end mill for long reach finishing applications.



Unit : mm

Order Number	Dia.	Length of Cut	Overall Length	Shank Dia.	No. of Flutes N	Stock	Type
	D1	ap	L1	D4			
4SXD0300	3	30	75	6	4	●	1
D0400	4	30	75	6	4	●	1
D0500	5	30	75	6	4	●	1
D0600	6	50	95	6	4	●	2
D0700	7	50	95	8	4	●	1
D0800	8	50	95	8	4	●	2
D0900	9	60	110	10	4	●	1
D1000	10	60	110	10	4	●	2
D1100	11	80	140	12	4	●	1
D1200	12	80	140	12	4	●	2
D1300	13	80	140	12	4	●	3
D1400	14	100	160	16	4	●	1
D1500	15	100	160	16	4	●	1
D1600	16	100	160	16	4	●	2
D1800	18	100	160	16	4	●	3
D2000	20	130	205	20	4	●	2
D2200	22	130	205	20	4	●	3
D2500	25	130	210	25	4	●	2
D2600	26	130	210	25	4	●	3
D3000	30	130	210	25	4	●	3
D3200	32	130	215	32	4	●	2
D3500	35	130	215	32	4	●	3
D4000	40	130	215	32	4	●	3
D4500S32	45	130	220	32	4	●	3
D4500S42	45	130	220	42	4	●	3
D5000S32	50	130	225	32	4	●	3
D5000S42	50	130	225	42	4	●	3

HSS

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

DEEP SLOTTING END MILLS

DEEP SLOTTING END MILLS

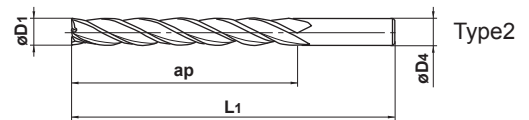
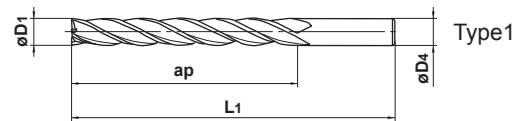
4MX

End mill, Extra long cut length, 4 flute



D1=20 0 - +0.030
D1>20 0 - +0.040

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
4MXD2000	20	160	235	20	4	●	1
D2500	25	160	240	25	4	●	1
D2600	26	160	240	25	4	●	2
D3000	30	160	240	25	4	●	2
D3200	32	160	245	32	4	●	1
D3500	35	160	245	32	4	●	2
D4000	40	160	245	32	4	●	2
D4500S32	45	160	250	32	4	●	2
D4500S42	45	160	250	42	4	●	2
D5000S32	50	160	255	32	4	●	2
D5000S42	50	160	255	42	4	●	2



DEEP SLOTTING END MILLS

● : Inventory maintained in Japan.

CORNER RADIUS END MILLS

RB

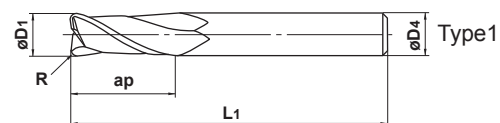
Corner radius end mill, Medium cut length, 2 flute



D1 ≤ 20 0 - -0.030
D1 > 20 0 - -0.040

HSS

Carbon Steel, Alloy Steel, Cast Iron (≤30HRC)	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 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
RBD0600R0050	6	0.5	15	55	6	2	●	1
D0600R0100	6	1	15	55	6	2	●	1
D0600R0150	6	1.5	15	55	6	2	●	1
D0600R0200	6	2	15	55	6	2	●	1
D0800R0050	8	0.5	20	65	8	2	●	1
D0800R0100	8	1	20	65	8	2	●	1
D0800R0150	8	1.5	20	65	8	2	●	1
D0800R0200	8	2	20	65	8	2	●	1
D0800R0250	8	2.5	20	65	8	2	●	1
D0800R0300	8	3	20	65	8	2	●	1
D1000R0050	10	0.5	25	75	10	2	●	1
D1000R0100	10	1	25	75	10	2	●	1
D1000R0150	10	1.5	25	75	10	2	●	1
D1000R0200	10	2	25	75	10	2	●	1
D1000R0250	10	2.5	25	75	10	2	●	1
D1000R0300	10	3	25	75	10	2	●	1
D1200R0050	12	0.5	30	85	12	2	●	1
D1200R0100	12	1	30	85	12	2	●	1
D1200R0150	12	1.5	30	85	12	2	●	1
D1200R0200	12	2	30	85	12	2	●	1
D1200R0250	12	2.5	30	85	12	2	●	1
D1200R0300	12	3	30	85	12	2	●	1
D1200R0400	12	4	30	85	12	2	●	1
D1200R0500	12	5	30	85	12	2	●	1
D1600R0400	16	4	40	100	16	2	●	1
D1600R0500	16	5	40	100	16	2	●	1
D2000R0600	20	6	45	115	20	2	●	1
D2500R0800	25	8	50	120	25	2	●	1
D3200R1000	32	10	60	145	32	2	●	1

SQUARE

BALL

RADIUS

TAPER

SOLID
END MILLS

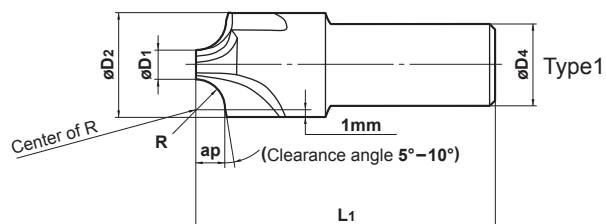
CORNER RADIUS END MILLS

CORNER RADIUS END MILLS

RC

Corner radius cutter, 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
◎	○						○



- Corner radius cutter with straight flutes for easy regrinding.

Unit : mm

Order Number	Corner Radius R	Dia. D2	Tip Dia. D1	Length of Cut ap	Overall Length L1	Shank Dia. D4	No. of Flutes N	Stock	Type
RCR0050	0.5	9	6	0.5	60	10	3	●	1
R0075	0.75	9.5	6	0.75	60	10	3	●	1
R0100	1	10	6	1	60	10	3	●	1
R0125	1.25	10.5	6	1.25	60	10	3	●	1
R0150	1.5	11	6	1.5	60	10	3	●	1
R0200	2	12	6	2	65	12	3	●	1
R0250	2.5	13	6	2.5	65	12	3	●	1
R0300	3	14	6	3	65	12	3	●	1
R0350	3.5	15	6	3.5	70	12	3	●	1
R0400	4	16	6	4	70	12	3	●	1
R0450	4.5	18	7	4.5	75	16	4	●	1
R0500	5	19	7	5	75	16	4	●	1
R0600	6	22	8	6	75	16	4	●	1
R0700	7	24	8	7	75	16	4	●	1
R0800	8	27	9	8	90	20	4	●	1
R0900	9	29	9	9	90	20	4	●	1
R1000	10	32	10	10	90	25	4	●	1
R1200	12	38	12	12	110	32	4	●	1
R1250	12.5	39	12	12.5	110	32	4	●	1
R1500	15	45	13	15	110	32	4	●	1
R1600	16	48	14	16	110	32	4	●	1

● : Inventory maintained in Japan.

CUTTING CONDITIONS

B399

Handwriting practice area with 20 sets of dashed lines for tracing on a solid background line.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

CARBIDE

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**

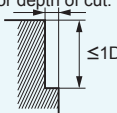
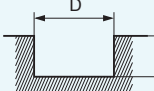
Work material	Carbon steel, Alloy steel Pre-hardened steel, Hardened steel (~45HRC) AISI 1049, AISI 4140, AISI H13			Hardened steel (45—55HRC) AISI H13, AISI 420		
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)
0.1	40000	40	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	1200	100	≤0.8
20	1900	320	≤4	1000	80	≤1

Depth of cut

≤Please refer to the list above for 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.
- 2) When slotting with end mills with $\phi 3$ 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.

Work material	Carbon steel, Alloy steel Pre-hardened steel, Hardened steel ($\sim 45\text{HRC}$) AISI 1049, AISI 4140, AISI H13			Hardened steel (45–55HRC) AISI H13, AISI 420			
	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	$\leq$Please refer to the list above for depth of cut.  						
	D: Dia.						

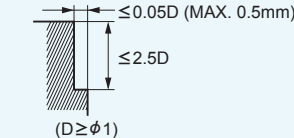
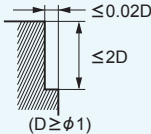
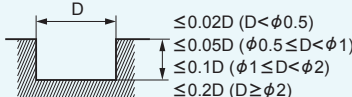
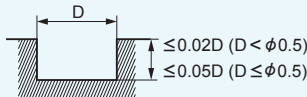
- 1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.
- 2) When slotting with end mills with $\phi 3$ or larger, reduce the revolution to 50—70% and the feed rate to 40—60%.
- 3)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

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS2JS

End mill, Semi long cut length, 2 flute

CARBIDE

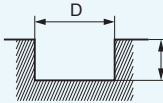
Work material	Carbon steel (~30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30~45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45~55HRC) AISI H13		
	Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	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.

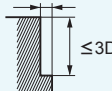
D: Dia.

- 1) Please use 4 fluted end mills for workpiece of 55—60HRC.
- 2) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
- 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.
- 4) When drilling, please set the feed rate at 1/3 or below the values above.

Slotting

Work material	Carbon steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35			Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, 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 (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35			Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, 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.  ≤ 3D D: Dia.					

- 1) Please use VC-LD for workpiece of 45HRC or above.
- 2) Vibration is liable to occur in the initial stages of machining, but after machining 1-2m the machining becomes stable and vibration could disappear.
- 3) Side milling with large depth of cuts with end mills less than $\phi 3$ is not recommended. When side milling, divide the cutting depth into several times paths.
- 4) If chattering and noise occur, reduce the revolution and the feed rate proportionately and also reduce the depth of cut.
- 5) When drilling, please set the feed rate at 1/3 or below the values above.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS2XL

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

Work material		Carbon steel AISI 1055 Pre-hardened steel AISI H13 (-HRC45)		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (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 AISI 1055 Pre-hardened steel AISI H13 (-HRC45)		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (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
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
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

- 1) The above table shows the revolution and feed rate for each neck length. Please reduce the feed rate when using end mills with a longer neck length.
- 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. Please reduce the feed rate when the surface finish is important.

Work material		Structural steel, Carbon steel AISI 1049, AISI 1055 Alloy steel AISI P20, Tool steel AISI W1-10 Pre-hardened steel AISI H13			Pre-hardened steel AISI H13, AISI 420 (40—45HRC)		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)
0.3	0.8	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

- 1) The above table shows the revolution and feed rate for each neck length. Please reduce the feed rate when using end mills with a longer neck length.
- 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. Please reduce the feed rate when the surface finish is important.
- 3) If the depth of cut is shallow or when rib milling, the revolution and feed rate can be increased.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

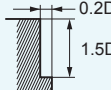
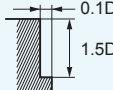
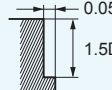
MSSH D

High power, Short cut length, 4 flute

MSMHD

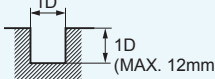
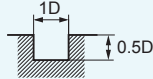
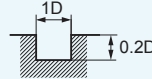
High power, Medium cut length, 4 flute

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI 4140 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P20		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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.

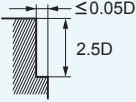
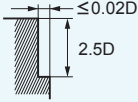
Slotting

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI 4140 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P20		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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 machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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 and heatproof alloys, the use of non-water-soluble cutting fluid is especially effective.
- 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.
- 3) Climb cutting is recommended.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MSMHZD

Slotting, Medium cut length, 3 flute

Side milling

Work material	Structural steel Carbon steel Alloy steel (-30HRC) AISI 1049, AISI P20		Hardened steel (30-45HRC) AISI H13		Stainless steel AISI 304, AISI 316 Titanium alloy		Heat resistant alloys Inconel	
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	$\leq 0.2D$ ($D > \phi 3$) $\leq 0.1D$ ($D \leq \phi 3$)		$\leq 0.2D$ ($D > \phi 3$) $\leq 0.1D$ ($D \leq \phi 3$)		$\leq 0.05D$			

D:Dia.

Plunging

Work material	Structural steel Carbon steel Alloy steel (-30HRC) AISI 1049, AISI P20		Hardened steel (30-45HRC) AISI H13		Stainless steel AISI 304, AISI 316 Titanium alloy	
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	$\leq 1D$ ($D \geq \phi 2$) $\leq 0.5D$ ($D < \phi 2$)		$\leq 0.5D$ ($D \geq \phi 2$) $\leq 0.2D$ ($D < \phi 2$)			

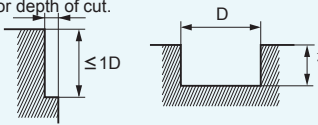
D:Dia.

Slotting

Work material	Structural steel Carbon steel Alloy steel (-30HRC) AISI 1049, AISI P20		Hardened steel (30-45HRC) AISI H13		Stainless steel AISI 304, AISI 316 Titanium alloy		Heat resistant alloys Inconel	
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	$\leq 1D$ ($D \geq \phi 2$) $\leq 0.5D$ ($D < \phi 2$)		$\leq 0.5D$ ($D \geq \phi 2$) $\leq 0.2D$ ($D < \phi 2$)		$\leq 0.2D$			

D:Dia.

- 1) The above table shows the standard recommended cutting conditions. Adjustments maybe needed according to the condition of the machine.
- 2) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 3) When plunging of materials such as austenitic stainless steels and titanium alloys, it is recommended to peck feed. (0.1D)

Work material	Carbon steel, Alloy steel, Tool steel Pre-hardened steel (~45HRC) AISI 1049, AISI H13, AISI P20			Alloy steel, Tool steel (45—55HRC) AISI H13, AISI 420		
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	1200	120	≤0.8
20	1900	480	≤4	1000	100	≤1
Depth of cut	≤ Please refer to the list above for 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.
- 2) When slotting with end mills with $\phi 3$ 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.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS4JC

End mill, Semi long cut length, 4 flute

CARBIDE

Work material	Carbon steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		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) 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 80% and the feed rate at 40% when slotting austenitic stainless steels.
- 2) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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.
- 4) When drilling, please set the feed rate at 1/3 or below the values above.

Work material		Structural steel, Carbon steel AISI 1049, AISI 1055 Alloy steel AISI P20, Tool steel AISI W1-10 Pre-hardened steel AISI P21		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (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		Structural steel, Carbon steel AISI 1049, AISI 1055 Alloy steel AISI P20, Tool steel AISI W1-10 Pre-hardened steel AISI P21		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (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

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. Please reduce the feed rate when the surface finish is important.

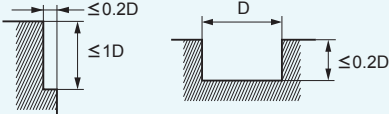
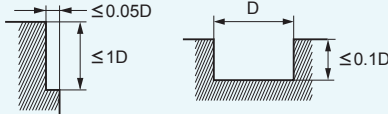
RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS2ES

End mill, 2 flute, For small automatic lathes

MS3ES

End mill, 3 flute, For small automatic lathes

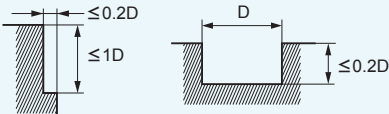
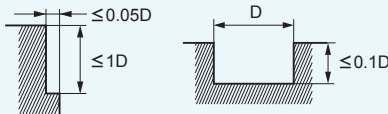
Work material	Carbon steel (~30HRC) AISI 1049, AISI P20 Cast iron AISI 35, Brass		Alloy steel, Tool steel Pre-hardened steel (30~45HRC) AISI P20, AISI H13		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45~55HRC) AISI H13	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻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) 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.
- 2) When drilling, please set the feed rate at 1/3 or below the values above.

MS4EC

End mill, 4 flute, For small automatic lathes

Work material	Carbon steel (~30HRC) AISI 1049, AISI P20 Cast iron AISI 35, Brass		Alloy steel, Tool steel Pre-hardened steel (30~45HRC) AISI P20, AISI H13		Austenitic stainless steel AISI 304, AISI 316		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.

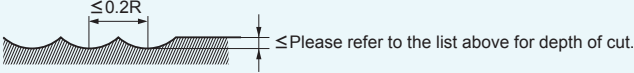
- 1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.
- 2) When drilling, please set the feed rate at 1/3 or below the values above.

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

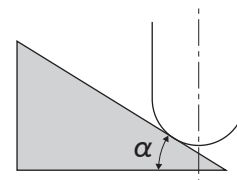
Ball nose end mill, Medium cut length, 2 flute **MS2MB**

Ball nose taper end mill, Medium cut length, 2 flute **MS2MTB**

CARBIDE

Work material	Carbon steel, Alloy steel, Pre-hardened steel, Hardened steel (-45HRC) AISI 1049, AISI H13					Hardened steel (45-55HRC) AISI H13				
R (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
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										

- 1) α is the inclination angle of the machined surface.
- 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. Please reduce the feed rate when the surface finish is important.
- 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.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.



SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

B297

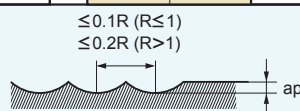
RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS2XLB

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

Work material		Carbon steel, Alloy steel Pre-hardened steel Hardened steel (-45HRC) AISI 1049, AISI 4140, AISI H13			Hardened steel (45-55HRC) AISI H13, AISI 420		
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, Alloy steel Pre-hardened steel Hardened steel (-45HRC) AISI 1049, AISI 4140, AISI H13			Hardened steel (45-55HRC) AISI H13, AISI 420		
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

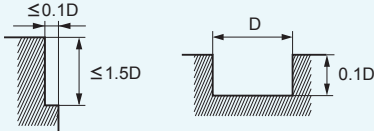
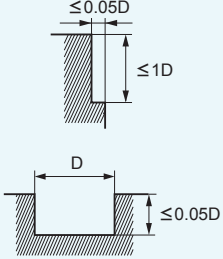


R:Radius

- 1) If the inclination of machining surface is very big, or cutting load is big, please reduce the revolution and the feed rate proportionately.
- 2) When using the smallest diameters, we recommended using mist coolant.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 4) Please use VF-2XLB for work materials of 55 HRC or above.

Work material				Carbon steel, Alloy steel Pre-hardened steel Hardened steel (-45HRC) AISI 1049, AISI 4140, AISI H13	
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		
	1°	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		
	Depth of cut				

- 1) Please reduce the cutting depth (especially ap) if chattering and noise are generated, and reduce the feed rate proportionately when the surface finish is important.
- 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.

Work material	Carbon steel (~30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30~45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		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.

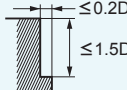
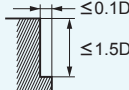
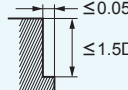
- 1) The above table shows cutting conditions for standard side milling. For slotting, please reduce the feed rate only to 80% of the table figure. Please set the revolution rate at 70% and the feed rate at 60% when slotting austenitic stainless steels.
- 2) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
- 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.
- 4) When drilling, please set the feed rate at 1/3 or below the values above.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MSMHDRB

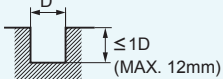
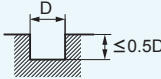
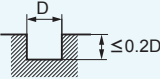
High power, Corner radius, Medium cut length, 4 flute

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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	640	100
20	1800	750	1100	460	1100	440	720	230	510	80
Depth of cut										

D: Dia.

Slotting

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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	290	40
20	1600	430	800	200	800	100	480	100	230	35
Depth of cut										

D: Dia.

- 1) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

Slotting

Work material	Carbon steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35			Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, 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 (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, 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	$\leq 0.05D$  $\leq 2.5D$			$\leq 0.03D$  $\leq 2.5D$		

D: End point diameter

- 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. Please reduce the feed rate when the surface finish is important.
- 2) Cutting conditions may differ considerably due to the taper angle, depth of cut and machine tool condition. Please use the above table as a start reference point.
- 3) For slot milling, use of coolant is recommended.

RECOMMENDED CUTTING CONDITIONS FOR MSTAR END MILLS

MS4LT

Taper end mill, Long cut length, 4 flute

CARBIDE

Work material		Carbon steel, Alloy steel, Pre-hardened steel, Hardened steel (-45HRC) AISI 1049, AISI H13, AISI P20			Hardened steel (45-55HRC) AISI H13, AISI 420		
Small mill dia. (mm)	Length of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (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

- 1) The above table shows the revolution and feed rate for each neck length. Please reduce the feed rate when using end mills with a longer neck length.
- 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. Please reduce the feed rate when the surface finish is important.

Work material		Carbon steel, Alloy steel, Pre-hardened steel, Hardened steel (~45HRC) AISI 1049, AISI H13, AISI P20			Hardened steel (45~55HRC) AISI H13, AISI 420		
R (mm)	Length of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (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

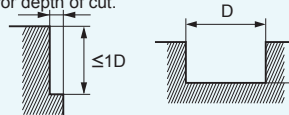
- 1) The above table shows the revolution and feed rate for each neck length. Please reduce the feed rate when using end mills with a longer neck length.
- 2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately. Please reduce the feed rate when the surface finish is important.

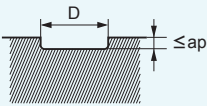
RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-2MD

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

CARBIDE

Work material	Carbon steel, Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI H13, AISI P21			Hardened steel (45-55HRC) AISI H13, AISI 420			Hardened steel (55HRC-) AISI D2, High-speed tool steel		
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.								
	 ≤Please refer to the list above for depth of cut. D: Dia.								

Work material		Hardened steel (40–55HRC) AISI P21, AISI H13, AISI 420			Hardened steel (55–65HRC) AISI D2, High-speed tool steel		
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.

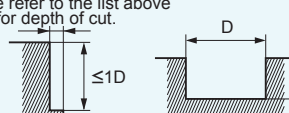
1) When using a reduced speed, the revolution and feed rate must be reduced proportionately.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

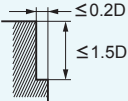
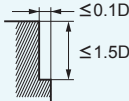
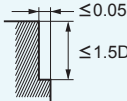
VF-4MD

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

CARBIDE

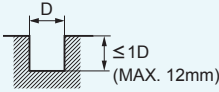
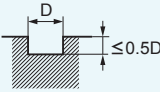
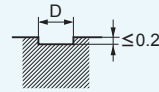
Work material	Carbon steel, Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI H13, AISI P21			Hardened steel (45-55HRC) AISI H13, AISI 420			Hardened steel (55HRC-) AISI D2, High-speed tool steel		
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (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	≤Please refer to the list above for depth of cut.  D: Dia.								

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened Steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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)
6	8000	2240	8000	2240	5300	1060	3700	440	2100	250
8	6000	1680	6000	1680	4000	960	2800	450	1600	260
10	4800	1440	4800	1440	3200	770	2200	440	1300	210
11	4400	1350	4400	1350	3000	760	2100	400	1200	180
12	4000	1200	4000	1200	2700	760	1900	380	1100	140
13	3700	1200	3700	1200	2500	700	1700	360	1000	130
16	3000	1140	3000	1140	2000	560	1400	340	800	110
20	2400	860	2400	860	1600	510	1100	350	600	100
Depth of cut										

D:Dia.

Slotting

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened Steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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)
6	6400	1280	3700	740	3700	440	1600	190	1300	160
8	4800	1150	2800	670	2800	340	1200	190	1000	120
10	3800	910	2200	530	2200	350	1000	160	800	130
11	3500	900	2100	530	2100	330	900	160	700	120
12	3200	900	1900	530	1900	300	800	160	700	110
13	3000	800	1700	500	1700	290	700	140	600	100
16	2400	670	1400	390	1400	280	600	120	500	80
20	1900	610	1100	350	1100	260	500	120	400	60
Depth of cut										

D:Dia.

- 1) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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 abnormal sound can occur. In this case, please reduce the revolution and feed rate proportionately, or set a lower depth of cut.
- 4) Climb cutting is recommended for side milling.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-SFPR

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

Side milling

Work material	Structural steel Carbon steel, Alloy steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy		Hardened Steel (45—55HRC) AISI H13		Heat resistant alloys Inconel	
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.

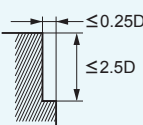
Slotting

Work material	Structural steel Carbon steel, Alloy steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy		Hardened Steel (45—55HRC) AISI H13		Heat resistant alloys Inconel	
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 machining austenitic stainless steels, titanium and heat resistant alloys, the use of coolant 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, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

Side milling

Work material	Structural steel Carbon steel, Alloy steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy		Hardened Steel (45—55HRC) AISI H13		Heat resistant alloys Inconel	
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										

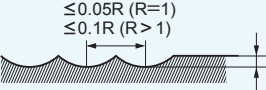
- 1) When machining austenitic stainless steels, titanium and heat resistant alloys, the use of coolant is effective.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.
- 4) Climb cutting is recommended.

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

CARBIDE

VF-2WB

Wide ball nose, Medium cut length, 2 flute

Work material	Structural steel Carbon steel, Alloy steel (~30HRC) AISI 1049, AISI P20 Cast iron AISI 35			Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21			Austenitic stainless steel AISI 304, AISI 316 Titanium alloy 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	$\leq 0.05R$ (R=1) $\leq 0.1R$ (R>1)  ≤ Please refer to the list above for depth of cut. R:Radius											

- 1) If the inclination of machining surface is very big, or cutting load is big, please reduce the revolution and the feed rate proportionately.
- 2) When using the smallest diameters, we recommended using mist coolant.
- 3) When machining undercut geometries, care should be taken to avoid neck interference.

VF-255B

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

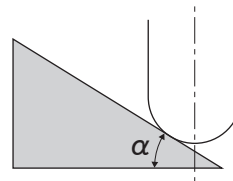
VF-25B

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

CARBIDE

Work material	Hardened steel (-55HRC) AISI P21, AISI H13					Hardened steel (55-62HRC) AISI D2					Hardened steel (62-70HRC) AISI W1, AISI M2				
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
R 0.1	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 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.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.



SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

B313

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

CARBIDE

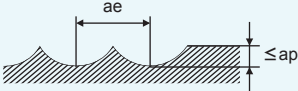
VF-25DB

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

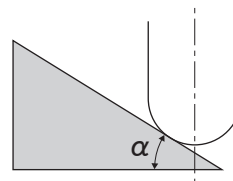
VF-25DBL

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

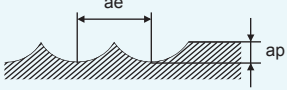
Overhang below 5D (D is end mill diameter)

Work material	Heat-treated steel, Pre-hardened steel (-45HRC) AISI P21						Hardened steel, Heat-treated steel (45-55HRC) AISI H13, AISI 420						Hardened steel (55-62HRC) AISI D2					
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		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 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.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.



Overhang 7D (D is end mill diameter)

Work material	Heat-treated steel, Pre-hardened steel (~45HRC) AISI P21				Hardened steel, Heat-treated steel (45–55HRC) AISI H13, AISI 420			
	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) The cutting conditions above are guide only for end mills whose cutting edge diameter is the same as shank diameter.
- 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. Please reduce the feed rate when the surface finish is important.
- 3) The above table should not be applied to hardened steels (over 55 HRC hardness)

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-2XLB5

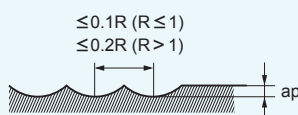
Ball nose, Medium cut length, 2 flute, Short shank

VF-2XLB

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

Work material		Hardened steel (40—55HRC) AISI P21, AISI H13 AISI 420			Hardened steel (55—62HRC) AISI D2, HSS		
R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Table feed (mm/min)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Table feed (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
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
R 0.25	1	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
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
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
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
R 0.6	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
R 0.7	20	13000	250	0.005	13000	200	0.004
	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
R 0.75	14	16000	850	0.01	16000	780	0.01
	16	15000	500	0.01	14000	400	0.006
	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 0.8	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
R 0.85	16	13000	1200	0.03	13000	1200	0.02

Work material		Hardened steel (40—55HRC) AISI P21, AISI H13 AISI 420			Hardened steel (55—62HRC) AISI D2, HSS		
R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Table feed (mm/min)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Table feed (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
	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
R 0.8	20	10000	750	0.02	8000	600	0.01
	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 0.9	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
R 1	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
R 1.25	30	10000	800	0.02	8000	800	0.015
	35	10000	500	0.02	8000	400	0.01
	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
R 1.5	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
	8	32000	6400	0.15	16000	3000	0.15
	10	32000	5100	0.15	16000	2200	0.15
R 1.5	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
R 1.75	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
	16	28000	4200	0.13	14000	1600	0.13
	20	26000	3800	0.13	13000	1600	0.11
R 2	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
	10	24000	4800	0.2	12000	2200	0.2
R 2.5	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
R 3	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 3	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
	40	16000	3500	0.2	8000	1000	0.2
R 3	45	16000	3000	0.15	8000	800	0.15
	50	16000	2700	0.15	6000	500	0.15



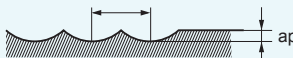
R:Radius

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

VF-3XB

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

CARBIDE

Work material			Carbon steel, Alloy steel (-30HRC) AISI 1055			Alloy steel Pre-hardened steel (30-45HRC) AISI P21			Hardened steel (45-55HRC) AISI H13, AISI 420			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 (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)
R0.4	0.4°	6	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		≤0.1R (R ≤ 1) ≤0.2R (R > 1)  R:Radius												

- 1) The above table shows depth of cut. Please control the pick feed (ae) according to machining conditions.
- 2) Please reduce the cutting depth if chattering and noise are generated, and reduce the feed rate proportionately when the surface finish is important.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

B317

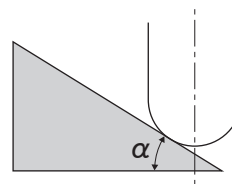
VF-4MB

Ball nose, Medium cut length, 4 flute

CARBIDE

Work material	Hardened steel (~55HRC) AISI P21, AISI D2, AISI H13					Hardened steel (55~62HRC) AISI D2, AISI 420					Hardened steel (62~70HRC) AISI W1, AISI M2				
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
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	≤ 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 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.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.



SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

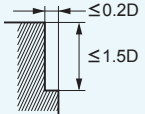
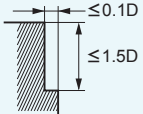
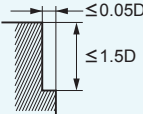
B319

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

VF-MHVRB

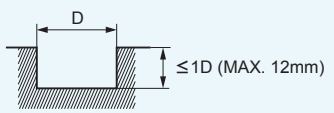
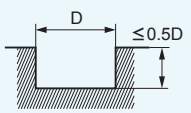
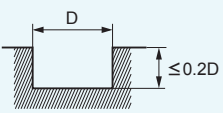
Corner radius, Medium cut length, Irregular helix flutes

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened Steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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)
6	5900	1100	3700	640	5,300	1060	2400	320	2100	230
8	4400	1100	2800	660	4,000	960	1800	330	1600	220
10	3500	1000	2300	640	3,200	770	1400	320	1300	200
12	2900	1000	1900	640	2,300	640	1200	320	1100	170
16	2200	800	1400	500	1,800	580	900	250	800	130
20	1800	750	1100	460	1,600	510	720	230	640	100
Depth of cut										

D:Dia.

Slotting

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened Steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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)
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
Depth of cut										

D:Dia.

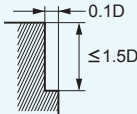
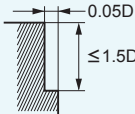
- 1) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

VF-6MHVRB

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

CARBIDE

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-45HRC) AISI 1049, AISI P20		Stainless steel AISI 304, AISI 316 Titanium alloy		Heat resistant alloys Inconel	
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 machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

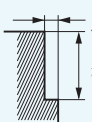
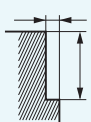
B321

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

CARBIDE

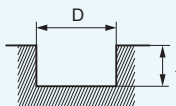
End mill, Short cut length, For hardened materials **VF-SD**
 Corner radius, Extra short cut length, For hardened materials **VF-SDRB**

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

Work material	Alloy steel, Hardened steel (-55HRC) AISI P21, AISI H13			Hardened steel (55-62HRC) AISI D2			Hardened steel (62-70HRC) 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. $\leq 1.5D$			 Please refer to the list above for depth of cut. $\leq 1.0D$					

D:Dia.

Slot milling with small diameter tools

Work material	Alloy steel, Hardened steel (-55HRC) AISI P21, AISI H13			Hardened steel (55-65HRC) AISI D2, 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)
1	15000	300	0.1	9500	110	0.05
2	8000	320	0.2	4800	190	0.1
Depth of cut	 Please refer to the list above for depth of cut. $\leq D$					

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.
- 2) Climb cutting is recommended for side milling.
- 3) Air blow recommended to disperse chips effectively.
- 4) For slot milling, use of coolant is recommended.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR IMPACT MIRACLE END MILLS

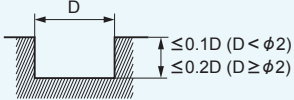
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-255

End mill, Extra short cut length, 2 flute

CARBIDE

Slotting

Work material	Carbon steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, 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) When side milling with a $\phi 4$ or larger cutter it is possible to increase the feed rate by 20%.
- 2) When using a reduced speed, the revolution and feed rate must be reduced proportionately.
- 3) Non-water-soluble cutting fluid is recommended when cutting hardened steels.

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END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

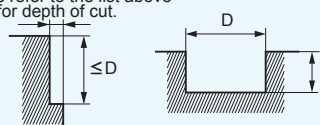
B323

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2MS

End mill, Medium cut length, 2 flute

CARBIDE

Work material	Carbon steel, Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI 1049, AISI P20			Alloy steel, Tool 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	1200	100	≤0.8
20	1900	320	≤4	1000	80	≤1
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) Please use VF-MD, VF-SDRB or VF-MDRB for workpiece of 55-60HRC.
- 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.
- 3) When slotting with end mills with $\phi 3$ or larger, reduce the revolution to 50-70% and the feed rate to 40-60%.
- 4) When drilling, please set the feed rate at 1/3 or below of the above value.

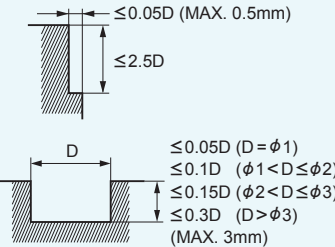
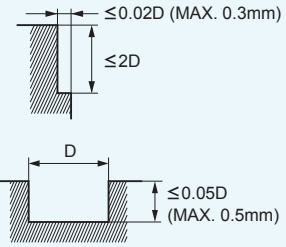
VC-2JS

End mill, Semi long cut length, 2 flute

VC-2JRB

Corner radius end mill, Semi long cut length, 2 flute

CARBIDE

Work material	Carbon steel, Alloy steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel, Pre-hardened steel (30—45HRC) AISI P20, AISI H13		Austenitic stainless steel AISI 304, AISI 316		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								

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

D: Dia.

- 1) Please use VC-4JC or VC-4JRB for workpiece of 55—60HRC.
- 2) When cutting austenitic stainless steels, the use of water-soluble cutting fluid is effective.
- 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.
- 4) When drilling, please set the feed rate at 1/3 or below the values above.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

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RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2XL

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

Work material		Carbon steel AISI 1055 Pre-hardened steel AISI P21, HAP		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)
0.5	2	40000	800	0.01
	6	40000	700	0.005
0.6	2	40000	1000	0.01
	6	40000	800	0.005
0.7	2	40000	1000	0.02
	6	40000	900	0.01
0.8	4	40000	1200	0.03
	8	40000	1000	0.02
0.9	6	40000	1300	0.04
	10	35000	1000	0.03
1	6	40000	1600	0.06
	8	40000	1600	0.04
	12	30000	1000	0.02
1.2	6	40000	1900	0.08
	8	40000	1900	0.06
	12	25000	1000	0.03
1.4	6	40000	2200	0.1
	10	32000	1800	0.05
	16	22000	1000	0.02
1.5	6	40000	2400	0.12
	10	30000	1800	0.05
	16	20000	1000	0.02
	20	16000	800	0.01
1.6	6	40000	2400	0.12
	10	30000	1800	0.05
	16	20000	1000	0.02
	20	16000	800	0.01
1.8	6	40000	2400	0.15
	10	30000	1800	0.1
	16	20000	1000	0.05
	20	16000	800	0.03
2	6	40000	2400	0.18
	10	30000	1800	0.15
	16	20000	1000	0.08
	20	16000	800	0.05
2.5	8	30000	3000	0.25
	16	21000	2100	0.15
	20	12000	1000	0.1
3	8	30000	3000	0.3
	16	21000	2100	0.2
	20	12000	1000	0.15
	25	10000	800	0.1

1) When using a reduced speed, the revolution and feed rate must be reduced proportionately.

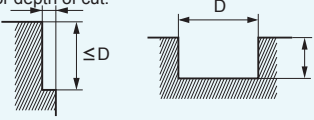
VC-4MC

End mill, Medium cut length, 4 flute

VC-4SRB

Corner radius end mill, Short cut length, 4 flute

CARBIDE

Work material	Aluminium alloy Except soft aluminium alloys			Carbon steel, Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI 1049, AISI P20			Alloy steel, Tool steel (45-55HRC) AISI H13, AISI 420		
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)
2	30000	5400	0.36	30000	4500	0.18	24000	3600	0.10
2.5	24000	4700	0.50	24000	3900	0.25	19000	3000	0.13
3	20000	4200	0.60	20000	3500	0.30	16000	2700	0.15
4	15000	3600	0.80	15000	3000	0.40	12000	2400	0.20
5	12000	2900	1.00	12000	2400	0.50	9000	1800	0.25
6	10000	2600	1.20	10000	2100	0.60	7000	1470	0.30
8	8000	1800	1.60	8000	1500	0.80	5600	1050	0.40
10	6400	1700	2.00	6400	1400	1.00	4500	950	0.50
12	5400	1500	2.00	5400	1200	1.00	3800	860	0.50
16	4800	1000	≤3	2400	550	≤2	1200	120	≤0.8
20	3800	800	≤4	1900	480	≤3	1000	100	≤1
Depth of cut	≤Please refer to the list above for depth of cut.  D: Dia.								

- 1) Please use VF-MD for workpiece of 55HRC or above.
- 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.
- 3) When slotting with end mills with $\phi 3$ or larger, reduce the revolution to 50-70% and the feed rate to 40-60%.
- 4) When drilling, please set the feed rate at 1/3 or below of the values above.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

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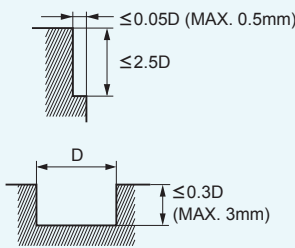
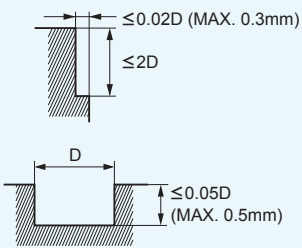
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

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, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45-55HRC) AISI H13		Hardened steel (55-60HRC) AISI D2 Heat resistant 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)
3	4200	110	3400	95	2600	70	2100	50	1800	30
4	3400	140	2700	110	2100	85	1700	60	1400	35
5	2900	170	2300	140	1800	100	1500	70	1200	40
6	2500	200	2000	170	1500	130	1300	85	1100	50
8	1900	220	1500	170	1200	150	1000	85	800	50
10	1600	220	1300	170	950	130	800	85	650	50
12	1300	170	1100	150	800	100	670	70	530	40
16	1000	140	820	110	600	80	500	50	400	30
20	800	110	650	85	480	70	400	40	320	25
25	650	85	520	70	380	50	320	35	250	20
Depth of cut										

D: Dia.

- 1) 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.
- 2) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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.
- 4) When drilling, please set the feed rate at 1/3 or below of the values above.

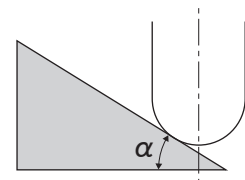
VC-25B

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

CARBIDE

Work material	Alloy steel, Tool steel, Pre-hardened steel, Hardened steel (-55HRC) AISI H13, AISI D2, AISI P20					Hardened steel (55-62HRC) AISI D2, AISI M2				
R (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
R 0.2	40000	1600	40000	1200	0.02	40000	1400	40000	1000	0.015
R 0.3	40000	3200	40000	1600	0.03	40000	2800	40000	1200	0.03
R 0.4	40000	6400	40000	2400	0.05	40000	4000	40000	1600	0.04
R 0.5	40000	8000	40000	3200	0.06	40000	5600	40000	2400	0.05
R 0.75	40000	9600	40000	4000	0.09	40000	7200	32000	2500	0.08
R 1	40000	9600	39000	4700	0.11	40000	8000	24000	2400	0.10
R 1.5	40000	12000	27000	4300	0.13	32000	7700	16000	2200	0.12
R 2	32000	11000	20000	3600	0.15	24000	6200	12000	1900	0.13
R 2.5	25000	9000	16000	2900	0.20	19000	5300	9600	1700	0.15
R 3	21000	8400	13000	2600	0.25	16000	4800	8000	1600	0.20
R 4	16000	6400	10000	2000	0.30	12000	3600	6000	1200	0.20
R 5	13000	5200	8000	1700	0.50	10000	3200	4800	960	0.20
R 6	9000	3600	6000	1300	0.50	7000	2200	3600	720	0.30
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 rigidity of the machine or the workpiece set up is very low, chattering and noise can occur. If the revolution cannot be increased, reduce the revolution and the feed rate proportionately. Please reduce the feed rate when the surface finish is important.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.



SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

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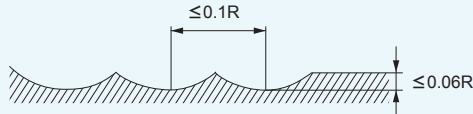
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

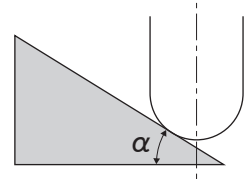
VC-2PSB-P MIRACLE NOVA

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

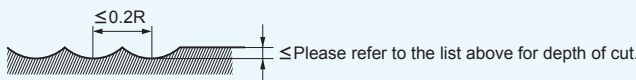
Work material	Alloy steel, Tool steel, Pre-hardened steel (-45HRC) AISI H13, AISI D2, AISI P20				Hardened steel (45-55HRC) AISI H13			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	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								



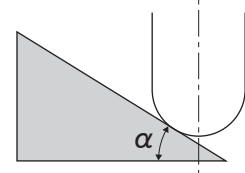
- 1) α is the inclination angle of the machined surface.
- 2) Please use VF-2SB for workpiece of 55HRC or above.
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately. Please reduce the feed rate when the surface finish is important.
- 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) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 6) When using the smallest diameters, we recommended using mist coolant.

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 end mill, Medium cut length, 2 flute, Through coolant holes **VC-2MB-OH**
 Ball nose, Short cut length, 2 flute, Short shank **VC-2SSB** Ball nose, Extra short cut length, 2 flute, Short shank **VC-2ESB**

CARBIDE

Work material	Carbon steel, Alloy steel, Pre-hardened steel, Hardened steel (-45HRC) AISI 1049, AISI P21, AISI H13					Hardened steel (45-55HRC) AISI H13				
R (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
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										

- 1) α is the inclination angle of the machined surface.
- 2) Please use VF-2SB or VC-4MB for workpiece of 55HRC or 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. Please reduce the feed rate when the surface finish is important.
- 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) If the depth of cut is shallow, the revolution and feed rate can be increased.



Using general machining center or NC milling machine.

Roughing (Depth of cut $\leq 0.8R$)				
Work material	Carbon steel, Alloy steel (-30HRC) AISI 1055, AISI P20		Carbon steel, Alloy steel Pre-hardened steel, Hardened steel (-45HRC) AISI 1049, AISI P21, AISI H13	
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

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

B331

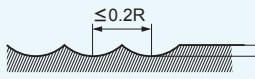
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2XLB

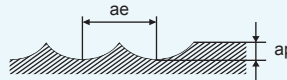
Ball nose end mill, Medium cut length, 2 flute, Long neck

VC-2XLB-6

Ball nose, Medium cut length, 2 flute, Long neck, 6mm shank

Work material		Carbon steel, Alloy steel, Pre-hardened steel, Hardened steel (—45HRC) AISI 1049, AISI P21, AISI H13			Hardened steel (45—55HRC) AISI H13		
R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut per pass (mm)
R0.3	6	40000	1000	0.008	30000	800	0.008
R0.4	6	40000	3000	0.02	30000	1600	0.02
	8	40000	1600	0.01	25000	1000	0.01
R0.5	6	40000	5600	0.03	40000	2400	0.03
	8	40000	4000	0.02	40000	2200	0.020
	12	33000	1000	0.015	33000	1000	0.010
R0.6	8	40000	8000	0.05	40000	4000	0.05
	12	25000	1600	0.03	16000	1000	0.03
R0.75	8	40000	9600	0.07	40000	5000	0.07
	12	35000	6000	0.04	30000	3400	0.04
	16	20000	2000	0.03	20000	1900	0.03
R1	10	40000	6400	0.08	40000	5000	0.06
	12	40000	5000	0.08	40000	5000	0.08
	16	30000	3500	0.05	30000	3500	0.05
	20	20000	2000	0.04	20000	2000	0.04
R1.5	8	40000	12000	0.15	32000	6400	0.15
	16, 20	30000	6000	0.10	27000	3800	0.10
R2	8, 12	32000	11000	0.20	25000	5000	0.20
	16, 20	32000	8000	0.15	25000	4000	0.15
R2.5	20, 25	25000	7000	0.20	20000	3600	0.20
R3	30	21000	7800	0.20	16000	3500	0.20
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. Please reduce the feed rate when the surface finish is important.
- 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.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.

Work material					Carbon steel, Alloy steel Pre-hardened steel, Hardened steel (—45HRC) AISI 1049, AISI P21, AISI H13		Hardened steel (45—55HRC) AISI H13	
R (mm)	Taper angle one side	Neck length (mm)	Depth of cut		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
			ap (mm)	ae (mm)				
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								

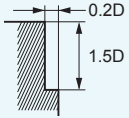
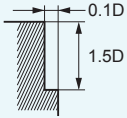
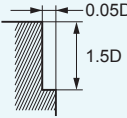
- 1) Please reduce the cutting depth (especially ap) if chattering and noise are generated, and reduce the feed rate proportionately.
- 2) Cutting condition may be considerably different due to the overhang (milling depth), depth of cut, and machine tools. Please see the above table as a standard.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-MHDRB

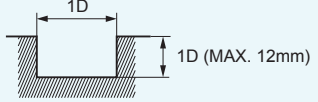
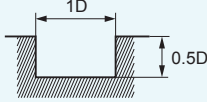
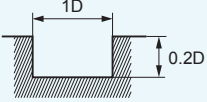
Corner radius end mill, Medium cut length, 4 flute, High helix angle

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened Steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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										

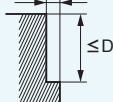
D:Dia.

Slotting

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened Steel (45-55HRC) AISI H13		Heat resistant alloys Inconel	
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										

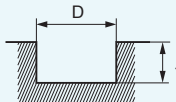
D:Dia.

- 1) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

Work material	Alloy steel, Tool steel, Pre-hardened steel, Hardened steel (—55HRC) AISI H13, AISI D2, AISI P20			Hardened steel (55—62HRC) AISI D2, 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)
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
4	26000	5600	0.2	10000	1800	0.12
5	22000	6200	0.25	8900	2100	0.15
6	20000	7200	0.3	8000	2900	0.18
8	15000	7200	0.4	6000	2900	0.24
10	12000	7100	0.5	4800	2900	0.3
12	10000	6000	0.6	4000	2400	0.3
16	6000	3600	0.6	3000	1800	0.3
20	4800	2900	0.6	2400	1400	0.3
25	3800	2300	0.6	1900	1100	0.3
Depth of cut	≤ Please refer to the list above for depth of cut.  D: Dia.					

- 1) The above cutting conditions are designed for side milling. For slotting $\phi 3$ or larger diameters, set the revolution, feed rate and depth of cut at 20—40% of the table figures.
- 2) If the rigidity of the machine or the workpiece installation is very low, the overhang length is three times larger than the end mill diameter, or chattering and noise are generated, please reduce the revolution and the feed rate proportionally.
- 3) Climb cutting is recommended for side milling.
- 4) It is recommended to use high-pressure coolant or air blow to forcibly discharge the chips.
- 5) For slot milling, use of coolant is recommended.

Slot milling with small diameter tools

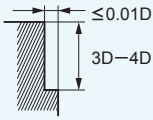
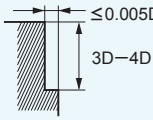
Work material	Alloy steel, Hardened steel (—55HRC) AISI P21, AISI H13			Hardened steel (55—65HRC) AISI D2, AISI M2		
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)
0.5	20000	200	0.05	15000	90	0.03
1	15000	300	0.1	11000	110	0.05
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) It is recommended to use high-pressure coolant or air blow to forcibly discharge the chips.
- 2) For slot milling, use of coolant is recommended.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-LD

End mill, Long cut length, 6 flute

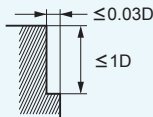
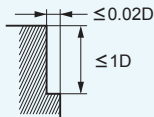
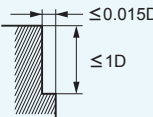
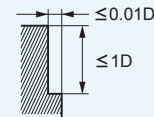
Work material	Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI P20, AISI H13, AISI D2, AISI P21		Hardened steel (45-55HRC) AISI H13, AISI D2, AISI 420		Hardened steel (55-60HRC) AISI D2, AISI M2, AISI W1		Hardened steel (60-65HRC) AISI D2, AISI M2, AISI W1	
Dia. (mm)	Revolution (min ⁻¹)	Feed 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 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.
- 2) Climb cutting is recommended.
- 3) Please reduce the depth of cut or feed rate when accuracy of the machined surface is important.
- 4) We recommend that you set the depth of cut as small as possible and divide the machining into several passes if the deflection is large.

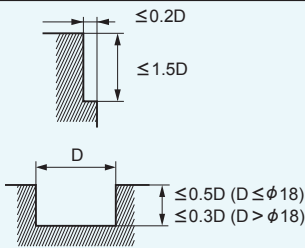
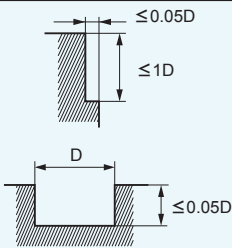
VC-MDL

End mill, Medium cut length, 6 flute, Long shank

Work material	Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI P20, AISI H13, AISI D2, AISI P21		Hardened steel (45-55HRC) AISI H13, AISI D2, AISI 420		Hardened steel (55-60HRC) AISI D2, AISI M2, AISI W1		Hardened steel (60-65HRC) AISI D2, AISI M2, AISI W1	
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	8500	700	6900	600	5800	500	5300	400
4	6400	900	5200	700	4400	600	4000	500
5	5100	900	4100	700	3500	600	3200	600
6	4200	1100	3400	800	2900	720	2700	670
8	3200	1000	2600	800	2200	680	2000	620
10	2500	900	2100	630	1800	540	1600	480
12	2100	870	1700	660	1500	590	1300	510
16	1600	750	1300	570	1090	480	990	440
20	1300	670	1000	490	880	430	800	390
25	1000	540	830	420	700	360	640	330
Depth of cut								

D:Dia.

- 1) The above table shows cutting conditions of approx. 5×d (d: shank length) depth.
- 2) If the overhang is shortened, the depth of cut, revolution and feed rate can be increased.
- 3) If using an end mill with a long overhang or the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please lessen the depth of cut and reduce the revolution and the feed rate proportionately.
- 4) Climb cutting, air blow and mist oil is recommended.

Work material	Structural steel Carbon steel, Alloy steel (~45HRC) AISI 1049, AISI P20		Stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Hardened steel (45—55HRC) AISI H13		Heat resistant alloy Inconel		
	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) 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.
- 2) The revolution and the feed rate can be further raised in case of a small depth of cut when side milling.
- 3) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 4) Climb cutting is recommended for side milling.

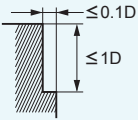
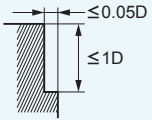
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-6MH

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

VC-8MH

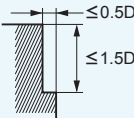
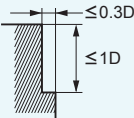
End mill, Medium cut length, 8 flute, High helix angle

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21, AISI 630		Austenitic stainless steel AISI 304, AISI 316 Titanium alloy Ti-6Al-4V		Heat resistant alloy Inconel	
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.

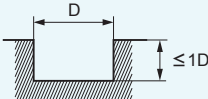
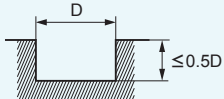
- 1) For VC-8MH, increase the feed rates above by 20%.
- 2) When machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 4) If 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, or set the depth of cut smaller.
- 5) Climb cutting is recommended for side milling.

Side milling

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45—55HRC) AISI H13		Heat resistant alloy Inconel	
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										

D:Dia.

Slotting

Work material	Structural steel Carbon steel, Alloy steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45—55HRC) AISI H13		Heat resistant alloy Inconel	
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 machining austenitic stainless steel use water soluble cutting fluids. For machining heat resistant alloys use non-water soluble cutting fluids.
- 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, or set the depth of cut smaller.
- 4) Climb cutting is recommended for side milling.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-2MT

Taper end mill, Medium cut length, 2 flute

Slotting

Work material	Carbon steel, Alloy steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35			Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI D2, 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

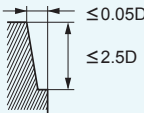
- 1) A high-speed spindle is recommended. When using a reduced speed, the revolution and feed rate must be reduced proportionately.
- 2) Non-water-soluble cutting fluid is recommended.

VC-4MT

Taper end mill, Medium cut length, 4 flute

Side milling

Work material	Carbon steel, Alloy steel (—30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30—45HRC) AISI H13, AISI D2, 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)
3	4200	110	3400	95	2300	60
4	3400	135	2700	110	1800	70
5	2900	170	2300	135	1500	80
6	2500	200	2000	170	1300	100
8	1900	220	1500	170	1000	100
10	1600	220	1300	170	800	100

Depth of cut	 $\leq 0.05D$ $\leq 2.5D$ 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.

VC-3MB

Ball nose end mill, Medium cut length, 3 flute

CARBIDE

Roughing

Work material	Carbon steel, Alloy steel, Pre-hardened steel Hardened steel (-45HRC) AISI 1049, AISI P21, AISI H13				Hardened steel (45-55HRC) AISI H13			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	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

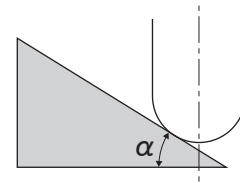
Finishing

Work material	Carbon steel, Alloy steel, Pre-hardened steel Hardened steel (-45HRC) AISI 1049, AISI P21, AISI H13				Hardened steel (45-55HRC) AISI H13			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	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) Please use VF-2SB or VC-4MB for workpiece of 55HRC or 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.
- 4) When machining accuracy is important, reducing the feed rate is recommended.
Especially for finishing, lower the feed rates and/or pick feeds according to the required accuracy.
- 5) 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.
- 6) If the depth of cut is shallow, the revolution and feed rate can be increased.



SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

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RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-4MB

Ball nose end mill, Medium cut length, 4 flute

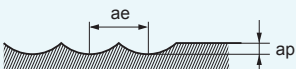
Work material	Alloy steel, Tool steel, Pre-hardened steel, Hardened steel (-55HRC) AISI H13, AISI P20					Hardened steel (55-62HRC) AISI D2, AISI M2				
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)		Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
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	≤ 0.2R ≤ Please refer to the list above for depth of cut. R: Radius									

- 1) Please use a machine with high rigidity. If the rigidity of the machine or the workpiece installation is very low, or chattering and noise are generated, please reduce the revolution and the feed rate proportionately.
- 2) The above table shows cutting conditions for side milling. For contour milling such as moulds, cutting conditions change considerably due to the machined shape, milling method and depth of cut (pick feed). The feed rate should be the upper limit of the range if the shape of the material is gentle, and reduced if large depths of cut are necessary.
- 3) When the overhang of the end mill (milling depth) is long, reduce the revolution and feed rate proportionally to prevent chattering.
- 4) It is recommended to use high-pressure coolant or air blow to forcibly discharge the chips.

VC-45TB

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

CARBIDE

Work material			Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI H13, AISI D2, AISI P20				Hardened steel (45-55HRC) AISI H13, AISI D2				Hardened steel (55-62HRC) AISI D2, AISI M2			
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 ae (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
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) The above standard cutting conditions are applicable for a high-speed machining center only. If a high-speed machining center is not used, the revolution and feed rate should be adjusted proportionately.

SOLID
END MILLS

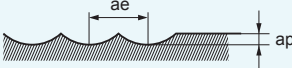
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

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RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-45TB

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

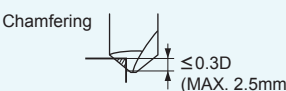
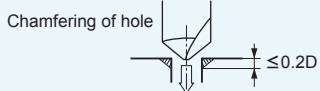
Work material			Alloy steel, Tool steel Pre-hardened steel (-45HRC) AISI H13, AISI D2, AISI P20				Hardened steel (45-55HRC) AISI H13, AISI D2				Hardened steel (55-62HRC) AISI D2, AISI M2			
R (mm)	Taper angle one side	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ap (mm)	Depth 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) The above standard cutting conditions are applicable for a high-speed machining center only. If a high-speed machining center is not used, the revolution and feed rate should be adjusted proportionately.

VC-2C

Chamfer cutter, 2 flute

CARBIDE

Work material	Carbon steel (-30HRC) AISI 1049, AISI P20 Cast iron AISI 35		Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304, AISI 316		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
Standard depth of cut	Chamfering  Chamfering of hole 							

D: Dia.

- 1) The cutting conditions above are a guide only to chamfering within the standard depth of cut. When V slotting, reduce the feed rates by 70% or more. When center drilling, reduce the feed rates by 80% or more.
- 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.
- 3) For austenitic stainless steels and hardened steels, the use of non-water-soluble cutting fluid is recommended.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

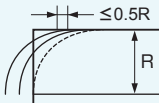
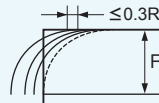
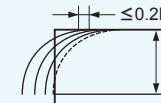
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RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-RC

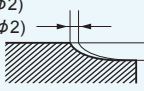
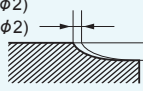
Corner rounding cutter, 3 flute

CARBIDE

Work material	Structural steel, Carbon steel Cast iron (~30HRC) AISI 1049, AISI 35		Alloy steel, Tool steel Pre-hardened steel (30~45HRC) AISI P20, AISI H13, AISI D2		Austenitic stainless steel AISI 304, AISI 316		Hardened steel (45~55HRC) AISI H13	
Corner radius (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)
R0.5	8000	300	5600	200	4800	150	4800	120
R1	6400	300	4500	200	3800	150	3800	120
R1.5	5300	300	3700	200	3200	150	3200	120
R2	4000	300	2800	200	2400	150	2400	120
R2.5	3600	300	2500	200	2100	150	2100	120
R3	3200	300	2300	200	1900	150	1900	120
R4	2700	300	1900	200	1600	150	1600	120
R5	2300	300	1600	200	1400	150	1400	120
Depth of cut								

R:Corner radius

- 1) When roughing, the material should be removed in several passes.
When finishing, a suitable minimum allowance should be removed to obtain the necessary finish.
- 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.
- 3) Coolant is recommended.

Work material		Alloy steel, Tool steel Pre-hardened steel (—45HRC) AISI P20, AISI H13, AISI D2, AISI P21		Hardened steel (45—55HRC) AISI H13, AISI D2, AISI 420		Hardened steel (55—62HRC) AISI D2, AISI M2, AISI W1	
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		$\leq 0.2R$ ($D \leq \phi 2$) $\leq 0.4R$ ($D > \phi 2$)  $\leq 0.1\text{mm}$ ($D \leq \phi 1.5$) $\leq 0.2\text{mm}$ ($D \leq \phi 4$) $\leq 0.5\text{mm}$ ($D \geq \phi 6$)			$\leq 0.1R$ ($D \leq \phi 2$) $\leq 0.2R$ ($D > \phi 2$)  $\leq 0.05\text{mm}$ ($D \leq \phi 1.5$) $\leq 0.1\text{mm}$ ($D \leq \phi 4$) $\leq 0.3\text{mm}$ ($D \geq \phi 6$)		

D: Dia.

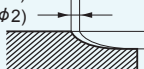
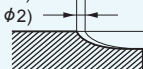
- 1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
- 2) Use a high rigidity machine.
- 3) When machining moulds, the cutting conditions change considerably according to the machined shape, milling method and the depth of cut.
- 4) When the overhang of the end mill (milling depth) is long, reduce the revolution and feed rate proportionally to prevent chattering.
- 5) Air blow or oil mist is recommended for good chip evacuation.

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VC-PSRB MIRACLE ORBIT

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

Taper neck type

Work material			Alloy steel, Tool steel Pre-hardened steel (~45HRC) AISI P20, AISI H13 AISI D2, AISI P21		Hardened steel (45—55HRC) AISI H13, AISI D2, AISI 420		Hardened steel (55—62HRC) AISI D2, AISI M2, AISI W1	
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			$\leq 0.2R$ ($D \leq \phi 2$) $\leq 0.4R$ ($D > \phi 2$)  $\leq 0.1\text{mm}$ ($D \leq \phi 1.5$) $\leq 0.2\text{mm}$ ($D \leq \phi 4$) $\leq 0.5\text{mm}$ ($D \geq \phi 6$)			$\leq 0.1R$ ($D \leq \phi 2$) $\leq 0.2R$ ($D > \phi 2$)  $\leq 0.05\text{mm}$ ($D \leq \phi 1.5$) $\leq 0.1\text{mm}$ ($D \leq \phi 4$) $\leq 0.3\text{mm}$ ($D \geq \phi 6$)		

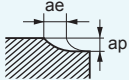
D: Dia.

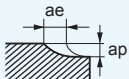
- 1) The cutting conditions above are a guide only to machining with cutting edges with a corner radius. When machining with peripheral cutting edges, use the minimum feed rate as a guide.
- 2) Use a high rigidity machine.
- 3) When machining moulds, the cutting conditions change considerably according to the machined shape, milling method and the depth of cut.
- 4) When the overhang of the end mill (milling depth) is long, reduce the revolution and feed rate proportionally to prevent chattering.
- 5) Air blow or oil mist is recommended for good chip evacuation.

VC-HFRB

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

CARBIDE

Work material		Carbon steel, Alloy steel, Cast iron (-30HRC) AISI 1049, AISI P20				Alloy steel, Tool steel, Pre-hardened steel (30-45HRC) AISI H13, AISI D2, AISI P21			
Dia. (mm)	Corner radius (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
2	R 0.5	33000	10000	0.8	0.08	27000	8400	0.8	0.05
3	R 0.75	22000	11000	1.2	0.12	18000	9000	1.2	0.08
4	R 1	17000	12000	1.5	0.15	14000	9500	1.5	0.12
5	R 1.2	13000	13000	2.0	0.20	11000	11000	2.0	0.15
6	R 1.5	11000	13000	2.5	0.25	9000	11000	2.5	0.15
7	R 1.5	9400	13000	3.0	0.25	7800	11000	3.0	0.15
8	R 2	8200	13000	3.0	0.30	7000	11000	3.0	0.20
9	R 2	7300	13000	4.0	0.30	6000	11000	4.0	0.20
10	R 2	6500	13000	4.5	0.30	5500	11000	4.5	0.20
11	R 2	6000	12000	5.5	0.30	5000	10000	5.5	0.20
12	R 3	5500	12000	4.5	0.45	4600	10000	4.5	0.30
13	R 3	5000	12000	5.5	0.45	4200	10000	5.5	0.30
16	R 3	4100	10000	7.5	0.45	3400	8800	7.5	0.30
Depth of cut									

Work material		Hardened steel (45-55HRC) AISI H13, AISI 420				Hardened steel (55-60HRC) AISI D2, AISI M2			
Dia. (mm)	Corner radius (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
2	R 0.5	24000	7500	0.8	0.04	16000	3000	0.8	0.03
3	R 0.75	16000	8500	1.2	0.06	11000	3300	1.2	0.05
4	R 1	12000	8800	1.5	0.08	8000	3500	1.5	0.07
5	R 1.2	9600	9500	2.0	0.10	6400	3800	2.0	0.08
6	R 1.5	8000	9600	2.5	0.10	5300	3800	2.5	0.10
7	R 1.5	6900	9600	3.0	0.10	4600	3800	3.0	0.10
8	R 2	6000	9600	3.0	0.15	4000	3800	3.0	0.13
9	R 2	5300	9500	4.0	0.15	3800	3800	4.0	0.13
10	R 2	4800	9500	4.5	0.15	3200	3800	4.5	0.13
11	R 2	4500	9000	5.5	0.15	2900	3500	5.5	0.13
12	R 3	4100	9000	4.5	0.25	2700	3500	4.5	0.20
13	R 3	3700	8900	5.5	0.25	2500	3500	5.5	0.20
16	R 3	3000	7800	7.5	0.25	2000	3200	7.5	0.20
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) 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) When machining inclinations in the Z direction, set the inclination angle at 2° and reduce the feed rate by 50%.
- 5) Air blow or oil mist is recommended for good chip evacuation.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

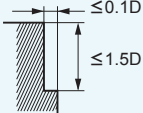
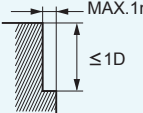
RECOMMENDED CUTTING CONDITIONS FOR MIRACLE END MILLS

VJ-2MS

End mill, Medium cut length, 2 flute

VJ-4MS

End mill, Medium cut length, 4 flute

Work material	Carbon steel, Alloy steel Cast iron ($\sim 30\text{HRC}$) AISI 1049, AISI P20, FC		Alloy steel, Tool steel ($30\sim 45\text{HRC}$) AISI H13, AISI D2		Hardened steel ($45\sim 55\text{HRC}$) 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)
20	1600	190 (290)	950	110 (170)	560	55 (85)
25	1300	170 (260)	750	90 (140)	450	45 (70)
30	1100	150 (230)	650	80 (120)	370	40 (60)
40	800	120 (180)	500	70 (110)	280	30 (45)
50	650	110 (170)	400	60 (90)	220	25 (40)
Depth of cut						

() is the standard feed rate of VJ-4MS.

D: Dia.

- 1) As small a radial depth of cut as possible when side milling is recommended.
- 2) Use a rigid machine and tool holder.
- 3) If chattering occurs, revolution and feed rate must be reduced proportionately.
- 4) When a small depth of cut is used, the revolution and feed rate can be increased.
- 5) Climb cutting is recommended.
- 6) Air blow or dry cutting is recommended.

CUTTING CONDITIONS FOR CRN COATED END MILLS

CRN-2MS

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

CARBIDE

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

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.
- 2) When drilling, please set the feed rate at 1/3 or below of the table value.

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

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.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) When cutting copper tungsten alloy, please set the revolution and the feed rate at under 70% of the table value.
- 4) Water-soluble cutting fluid is recommended.

SOLID
END MILLS

CUTTING CONDITIONS FOR CRN COATED END MILLS

CUTTING CONDITIONS FOR CRN COATED END MILLS

CRN-2XL

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

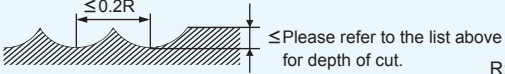
Work material		Copper, Copper alloys		
Dia. (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (mm)
0.2	0.5	40000	800	0.004
	1.0	40000	700	0.003
	1.5	40000	600	0.002
0.3	1	40000	800	0.007
	3	40000	600	0.002
0.4	2	40000	950	0.007
	4	40000	800	0.003
	6	40000	600	0.001
0.5	2	40000	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

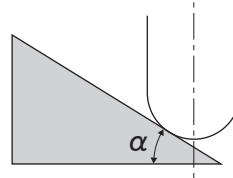
- 1) If chattering and noise occur, reduce the revolution and the feed rate proportionately.
- 2) Please reduce the feed rate when the surface finish is important. Cutting conditions may differ considerably due to the overhang (milling depth and neck length), depth of cut, and machine tool conditions. 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) Water-soluble cutting fluid is recommended.

CRN-2MB

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

CARBIDE

Work material	Copper, Copper alloys				
R (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut (mm)
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	
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					



- 1) α is the inclination angle of the machined surface.
- 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. Please reduce the feed rate when the surface finish is important.
- 3) When applying a lower revolution, reduce the revolution and the feed rate proportionately.
- 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.

SOLID
END MILLS

CUTTING CONDITIONS FOR CRN COATED END MILLS

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CUTTING CONDITIONS FOR CRN COATED END MILLS

CRN-2XLB

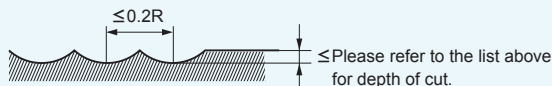
Ball nose, Medium cut length, 2 flute, Long neck, For copper electrodes

CARBIDE

Work material		Copper, Copper alloys		
R (mm)	Neck length (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut (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 (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 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.
- 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.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.

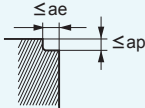
SOLID
END MILLS

CUTTING CONDITIONS FOR CRN COATED END MILLS

CRN-2MRB

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

CARBIDE

Work material		Copper, Copper alloys			
Dia. (mm)	Corner radius (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut	
				ap (mm)	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 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.
- 2) When applying a lower revolution, reduce the revolution and the feed rate proportionately.
- 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.

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END MILLS

CUTTING CONDITIONS FOR CRN COATED END MILLS

B355

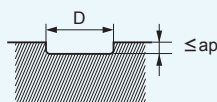
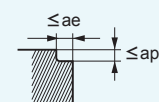
CUTTING CONDITIONS FOR CRN COATED END MILLS

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)	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 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.
- 2) When applying a lower revolution, reduce the revolution and the feed rate proportionately.
- 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.

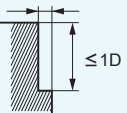
CUTTING CONDITIONS FOR DLC COATED END MILLS

DLC-2MA

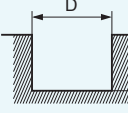
Slot drill, Medium cut length, 2 flute

CARBIDE

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	$\leq 0.2D$ ($D < \phi 3$) $\leq 0.5D$ ($D \geq \phi 3$)  $\leq 1D$ 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	 $\leq 1D$ (MAX. 12mm) 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.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) For milling of GFRP, please reduce the revolution and feed rate to 50% of the table figure of aluminium alloy.
Please adjust the depth of cut according to the quality of GFRP. (GFRP=Glass Fibre Reinforced Plastic)
- 4) Water-soluble cutting fluid is recommended.
- 5) Climb cutting is recommended for side milling.

SOLID
END MILLS

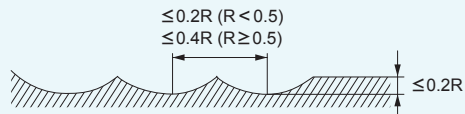
CUTTING CONDITIONS FOR DLC COATED END MILLS

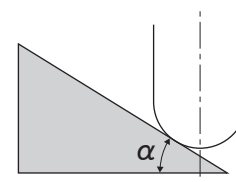
B357

CUTTING CONDITIONS FOR DLC COATED END MILLS

DLC-2MB

Ball nose, Medium cut length, 2 flute

Work material	Aluminium alloy				Aluminium cast Copper, Copper alloys			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	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	 R:Radius							



- 1) α is the inclination angle of the machined surface.
- 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.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 4) For milling of GFRP, please reduce the revolution and feed rate to 50% of the table figure of aluminium alloy.
Please adjust the depth of cut according to the quality of GFRP. (GFRP=Glass Fibre Reinforced Plastic)
- 5) Water-soluble cutting fluid is recommended.

CUTTING CONDITIONS FOR DIAMOND COATED END MILLS

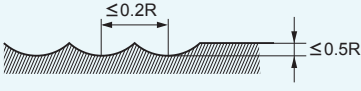
DC-2MB

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

DC-2LB

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

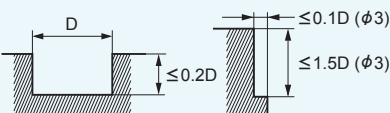
CARBIDE

Work material	Graphite (—65HS)		Graphite (65HS—)	
R (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
R0.5	40000	2000	40000	1600
R1	40000	2200	40000	1800
R1.5	30000	2400	30000	1900
R2	24000	2600	24000	2100
R2.5	19000	2600	19000	2100
R3	16000	2600	16000	2100
R3.5	14000	2600	14000	2100
R4	12000	2800	12000	2200
R4.5	11000	2900	11000	2300
R5	10000	3000	10000	2400
R6	8000	2400	8000	1900
Depth of cut	 R:Radius			

- 1) 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.
- 2) Machining at high speeds and high feeds is preferred. But when chipping occurs, reduce the feed rate.

DC-2MS-3

Medium cut length, 2 flute, 3mm shank, For non-ferrous metals

Work material	Aluminium alloy		Pure Copper, Copper alloys Graphite Machineable ceramics	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
0.5	20000	60	20000	60
1	20000	120	20000	120
2	20000	320	11000	180
3	17000	380	8500	200
Depth of cut	 D:Dia.			

- 1) When cutting a very hard workpiece, reduce the feed rate.
- 2) The revolution can be increased by using a high speed spindle.
- 3) When drilling, please set the feed rate at 1/3 or below of the values above.

SOLID
END MILLS

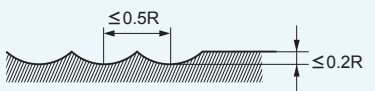
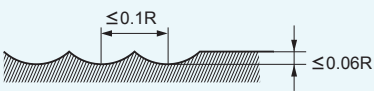
CUTTING CONDITIONS FOR DIAMOND COATED END MILLS

B359

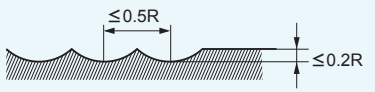
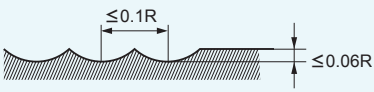
CUTTING CONDITIONS FOR DIAMOND COATED END MILLS

DC-2MB-NF

Ball nose, Medium cut length, 2 flute, For non-ferrous metals

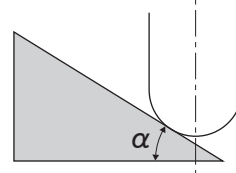
Work material	Graphite							
R (mm)	Roughing				Finishing			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
R0.5	20000	400	20000	380	20000	600	20000	520
R1	20000	480	20000	440	20000	700	20000	600
R2	18500	930	14500	640	20000	1400	20000	1200
R3	13000	1010	10000	700	20000	2200	15000	1500
R4	10000	1260	8000	800	15000	2700	11000	1500
R5	8000	1260	6500	820	13000	2900	9000	1500
R6	6600	1160	5300	740	10000	2500	7200	1500
Depth of cut								

R:Radius

Work material	Copper, Pure copper							
R (mm)	Roughing				Finishing			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	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	20000	360	20000	320	20000	480	20000	400
R1	18000	360	16000	290	20000	600	20000	450
R2	11100	440	9200	330	17000	900	13000	550
R3	7700	480	6400	360	13000	1000	10000	600
R4	6000	600	4800	380	10000	1300	7500	700
R5	4800	600	3800	450	8000	1400	6000	800
R6	4000	560	3200	410	6600	1400	5000	800
Depth of cut								

R:Radius

- 1) α is the inclination angle of the machined surface.
- 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. Cutting conditions may be differ considerably due to the overhang (milling depth), cutting stock, and machine tool conditions. Please see the table value as a standard.
- 3) When cutting a very hard workpiece, reduce the feed rate.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.



DC-2XLB

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

DC-XB

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

CARBIDE

Work material				Graphite	
R (mm)		Neck length (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
R0.2	DC-2XLB	4	0.1	40000	1300
		6	0.06		
	DC-XB	8	0.06		
R0.3	DC-2XLB	6	0.15	40000	1500
		9	0.1		
	DC-XB	12	0.1		
R0.4	DC-2XLB	8	0.15	40000	1100
		12	0.1		
	DC-XB	16	0.1		
R0.5	DC-2XLB	12	0.2	40000	2000
		16	0.12		
	DC-XB	20	0.12		
R0.75	DC-2XLB	15	0.2	35000	2000
		23	0.12		
	DC-XB	30	0.12		
R1	DC-2XLB	16	0.3	30000	2000
		30	0.15		
	DC-XB	40	0.15		
R1.5	DC-2XLB	30	0.35	20000	2000
		40	0.25		
	DC-XB	60	0.25		
R2	DC-2XLB	30	0.5	15000	2000
		50	0.3		
	DC-XB	80	0.3		
R2.5	DC-2XLB	40	0.6	12000	1800
		60	0.4		
	DC-XB	100	0.4		
R3	DC-2XLB	60	0.6	10000	1600
		90	0.4		
	DC-XB	120	0.4		
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. Please reduce the feed rate when the surface finish is important.
- 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.

SOLID
END MILLS

CUTTING CONDITIONS FOR DIAMOND COATED END MILLS

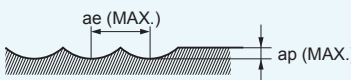
B361

RECOMMENDED CUTTING CONDITIONS FOR CBN END MILLS

CBN

CBN-2XLB

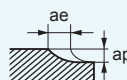
Ball nose, Short cut length, 2 flute, Long neck

Work material	Hardened steel (—55HRC) AISI P21, AISI H13, AISI 420				Hardened steel (55—62HRC) AISI D2, AISI M2, AISI W1				Hardened steel (62—70HRC) AISI M2, AISI W1 Powder high-speed steel etc.			
	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
R0.2	50000	1500	0.01	0.006	50000	1200	0.01	0.006	50000	1200	0.008	0.004
R0.3	50000	2000	0.02	0.01	50000	1500	0.02	0.01	50000	1500	0.015	0.008
R0.4	50000	3000	0.05	0.02	50000	2000	0.04	0.02	50000	2000	0.03	0.015
R0.5	50000	3000	0.06	0.03	50000	2000	0.05	0.03	50000	2000	0.03	0.02
R0.75	50000	3500	0.08	0.04	50000	2500	0.06	0.03	50000	2500	0.04	0.02
R1	50000	4000	0.1	0.05	50000	3000	0.07	0.04	50000	3000	0.05	0.03
Depth of cut												

- 1) The above table shows maximum cutting conditions. Please control the pick feed (ae) according to the surface finish required.
- 2) Oil mist coolant is recommended.
- 3) If the spindle speed is insufficient, the revolution and the feed rate should be reduced proportionately.

CBN-2XLRB

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

Work material	Hardened steel (—55HRC) AISI P21, AISI H13, AISI 420				Hardened steel (55—62HRC) AISI D2, AISI M2, AISI W1				Hardened steel (62—70HRC) AISI M2, AISI W1 Powder high-speed steel etc.			
	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Depth of cut ae (mm)	Depth of cut ap (mm)
0.5	50000	750	0.2	0.01	50000	600	0.1	0.01	40000	400	0.06	0.005
1	38000	1100	0.3	0.02	38000	760	0.2	0.01	25000	400	0.1	0.01
1.5	25000	900	0.5	0.03	25000	700	0.4	0.02	17000	340	0.2	0.02
2	20000	800	0.7	0.04	20000	600	0.6	0.03	12000	300	0.3	0.02
Depth of cut												

- 1) The above table shows maximum cutting conditions.
- 2) Oil mist coolant is recommended.
- 3) If the spindle speed is insufficient, the revolution and the feed rate should be reduced proportionately.

RECOMMENDED CUTTING CONDITIONS FOR MS END MILLS

End mill, Medium cut length, 2 flute, + Tolerance **SED2KPG** End mill, Medium cut length, 2 flute, - Tolerance **SED2KMG**
 End mill, Short cut length, 2 flute, High helix **SEE2SG**

CARBIDE

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 35	
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)
18	1400	310 (310)	1150	190 (150)	950	130 (100)	1100	110 (90)	2400	870 (870)
20	1300	300 (300)	1050	180 (140)	900	130 (100)	950	110 (85)	2200	840 (840)
25	1100	290 (290)	850	160 (130)	700	110 (90)	750	100 (80)	1700	750 (750)
Depth of cut	$\leq 0.1D$ $\leq 1.5D$ (SEE2SG) $\leq 1D$ (SED2KPG • SED2KMG) $\leq 0.25D$ ($D \leq \phi 3$) $\leq 0.5D$ ($D > \phi 3$) 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) 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.
- 4) When drilling, please set the feed rate at 1/3 or below of the values above.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR MS END MILLS

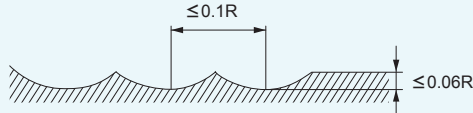
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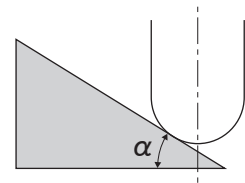
RECOMMENDED CUTTING CONDITIONS FOR MS END MILLS

BZD25G

Ball nose end mill, Medium cut length, 2 flute

CARBIDE

Work material	Carbon steel, Alloy steel, Pre-hardened steel Hardened steel (—45HRC) AISI 1049, AISI P21, AISI H13				Hardened steel (45—55HRC) AISI H13			
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
	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 0.2	40000	600	40000	450	40000	500	40000	380
R 1	35000	2400	25000	1400	25000	1500	20000	900
R 2	25000	2600	20000	1500	17000	1500	13000	900
R 3	20000	2600	15000	1500	13000	1500	10000	900
R 4	15000	2700	11000	1500	10000	1500	7500	900
R 5	12000	2700	9000	1500	8000	1500	6000	900
R 6	10000	2500	7500	1400	6600	1400	5000	800
R 8	7500	2400	5600	1300	5000	1200	3700	680
R10	6000	2400	4500	1300	4000	1000	3000	580
R12.5	4800	2000	3600	1100	3200	800	2400	480
Depth of cut	 R:Radius							



- 1) α is the inclination angle of the machined surface.
- 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. Please reduce the feed rate when the surface finish is important.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

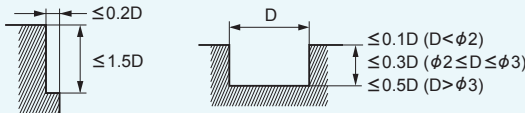
End mill, Short cut length, 2 flute **C-2SS**

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⁾

CARBIDE

Work material	Structural steel, Carbon steel (~20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20~30HRC) AISI 1049, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30~45HRC) AISI H13, AISI P21		Austenitic stainless steel AISI 304 Titanium 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)
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.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

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RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

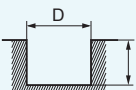
C-2MA

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	$\leq 0.2D$ ($D < \phi 3$) $\leq 0.5D$ ($D \geq \phi 3$)  $\leq 1D$ 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	 $\leq 1D$ (MAX. 12mm) 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.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) Water-soluble cutting fluid is recommended.
- 4) Climb cutting is recommended for side milling.

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	$\leq 0.05D$ ($D < \phi 3$) $\leq 0.1D$ ($D \geq \phi 3$)  $\leq 2.5D$ 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.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) Water-soluble cutting fluid is recommended.
- 4) Climb cutting is recommended for side milling.

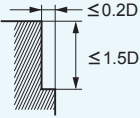
End mill, Medium cut length, 4 flute, Center cutting **C-4MC**

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⁾

CARBIDE

Side milling

Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1049, AISI 1055		Alloy steel, Tool steel (30—45HRC) AISI P20, AISI H13 Pre-hardened steel AISI P21		Austenitic stainless steel AISI 304, AISI 316 Titanium 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)
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.

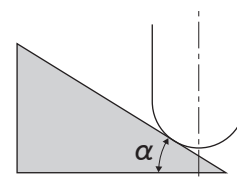
RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

C-2MB

Ball nose end mill, Medium cut length, 2 flute

	Roughing (Large depth of cut $\leq 0.8R$)				Finishing (Depth of cut $0.05R$)							
Work material	Carbon steel, Alloy steel ($\sim 30\text{HRC}$) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel ($30\sim 45\text{HRC}$) AISI H13, AISI P21		Carbon steel, Alloy steel ($\sim 30\text{HRC}$) AISI 1055, AISI P20				Alloy steel, Tool steel, Pre-hardened steel ($30\sim 45\text{HRC}$) AISI H13, AISI D2, AISI P21			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
					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) 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.
- 3) 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.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.

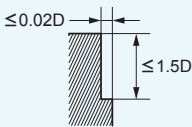


C-2MHA

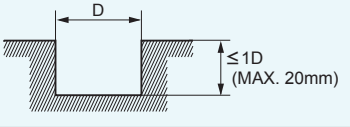
End mill, Medium cut length, 2 flute, For aluminium alloy

CARBIDE

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		

Slotting

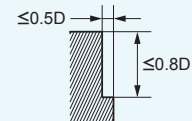
Work material	Aluminium alloy	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
3	40000	1500
4	36000	1800
5	30000	2800
6	27000	2800
8	20000	2800
10	16000	3200
12	13000	3200
16	10000	3200
20	8000	3000
25	6000	2500
Depth of cut		

- 1) Water-soluble cutting fluid is recommended.
- 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.
- 3) Climb cutting is recommended for side milling.
- 4) If tool clamping is poor, the tool can be pulled out of the holder. Ensure that the tool is sufficiently clamped.

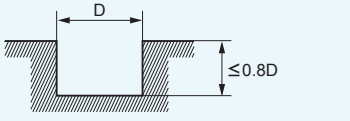
C-25A

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		

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		

- 1) Water-soluble cutting fluid is recommended.
- 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.
- 3) Climb cutting is recommended for side milling.
- 4) If tool clamping is poor, the tool can be pulled out of the holder. Ensure that the tool is sufficiently clamped.
- 5) 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.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

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RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

CARBIDE

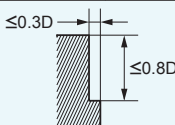
C-35A

End mill, Short cut length, 3 flute, For aluminium alloy

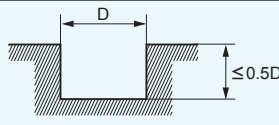
C-35ARB

Corner radius, Short cut length, 3 flute, For aluminium alloy

Side milling

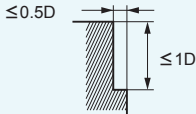
Work material	Aluminium alloy	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
12	13000	5400
16	10000	5400
18	9000	5000
20	8000	5000
25	6000	4500
Depth of cut		

Slotting

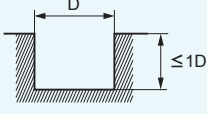
Work material	Aluminium alloy	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)
12	13000	3200
16	10000	3200
18	9000	3000
20	8000	3000
25	6000	2800
Depth of cut		

- 1) Water-soluble cutting fluid is recommended.
- 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, or set the depth of cut smaller.
- 3) Climb cutting is recommended for side milling.
- 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) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

Side milling

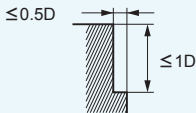
Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
10	19000	8600	9500	3400
12	16000	8200	8000	3200
16	12000	7600	6000	3100
18	10500	7200	5300	2900
20	9500	7100	4800	2900
22	8500	6900	4300	2800
25	7500	6800	3800	2700
Depth of cut				

Slotting

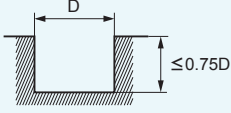
Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
10	19000	6800	9500	2700
12	16000	6500	8000	2600
16	12000	6100	6000	2400
18	10500	5800	5300	2400
20	9500	5700	4800	2300
22	8500	5500	4300	2200
25	7500	5400	3800	2200
Depth of cut				

- 1) Water-soluble cutting fluid is recommended.
- 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, or set the depth of cut smaller.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 4) Climb cutting is recommended for side milling.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

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				

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				

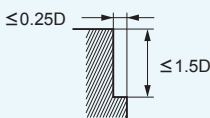
- 1) Water-soluble cutting fluid is recommended.
- 2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately, or set the depth of cut smaller.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 4) Climb cutting is recommended for side milling.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

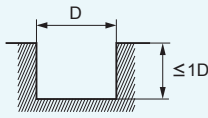
C-MRA

Roughing end mill, Medium cut length, 3 flute, For aluminium alloy

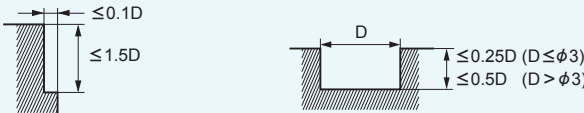
Side milling

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				

Slotting

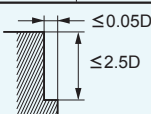
Work material	Aluminium alloy		Aluminium cast	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
3	30000	1800	16000	700
4	24000	2200	12000	900
5	19000	2300	10000	900
6	16000	2400	8000	1000
8	12000	2500	6000	1000
10	9500	2600	5000	1100
12	8000	2300	4000	900
16	6000	2100	3000	800
20	4800	2000	2400	800
25	3800	2000	1900	700
Depth of cut				

- 1) Water-soluble cutting fluid is recommended.
- 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, or set the depth of cut smaller.
- 3) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 4) Climb cutting is recommended for side milling.
- 5) These end mills do not have a centre cutting edge, therefore when entering a workpiece use a ramping process rather than vertical feed.

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 35	
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	4200	160 (160)	3700	70 (70)	2600	30 (30)	3200	60 (60)	6900	270 (270)
4	3000	180 (180)	2800	100 (80)	2000	50 (40)	2400	90 (70)	5200	300 (300)
5	2500	200 (200)	2200	100 (80)	1600	60 (50)	1900	90 (70)	4100	330 (330)
6	2000	200 (200)	1900	100 (80)	1300	60 (50)	1600	90 (75)	3500	350 (350)
8	1500	180 (180)	1400	100 (80)	1000	60 (50)	1200	90 (75)	2600	350 (350)
10	1200	170 (170)	1100	100 (80)	800	60 (50)	950	90 (75)	2050	350 (350)
12	1000	160 (160)	950	110 (90)	650	60 (50)	800	100 (80)	1700	350 (350)
16	750	150 (150)	700	110 (90)	500	60 (50)	600	110 (85)	1300	360 (360)
18	700	150 (150)	600	130 (100)	450	60 (50)	550	110 (90)	1200	370 (370)
20	600	140 (140)	550	130 (100)	400	60 (50)	500	110 (90)	1050	380 (380)
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) 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.
- 4) When drilling, please set the feed rate at 1/3 or below of the values above.

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 35	
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.									

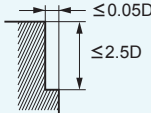
- 1) The cutting conditions above are a guide only to milling within the standard depth of cut.
- 2) Ductile cast iron milling has the same cutting conditions as carbon steel and alloy steel. (180—280HB)
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.
- 4) When drilling, please set the feed rate at 1/3 or below of the values above.

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

SEE4L

End mill, Long cut length, 4 flute

CARBIDE

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 35	
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	 $\leq 0.05D$ $\leq 2.5D$ D: Dia.									

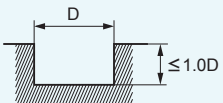
- 1) The cutting conditions above are a guide only to milling within the standard depth of cut.
- 2) Ductile cast iron milling has the same cutting conditions as carbon steel and alloy steel. (180—280HB)
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.
- 4) When drilling, please set the feed rate at 1/3 or below of the values above.

SEG25A

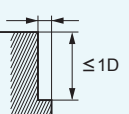
End mill, Short cut length, 2 flute, Irregular spiral helix angle, For aluminium alloy

CARBIDE

Slotting

Work material	Aluminium alloy Plastics		Pure copper	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
6	8000	500	4000	250
8	6000	500	3000	250
10	4800	530	2400	260
12	4000	530	2000	260
16	3000	540	1500	270
20	2400	540	1200	270
25	1900	540	950	270
Depth of cut	 D:Dia.			

Side milling

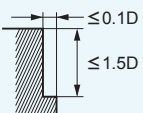
Work material	Aluminium alloy Plastics		Pure copper	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
6	9600	730	4800	360
8	7200	730	3600	360
10	5800	770	2900	380
12	4800	770	2400	380
16	3600	750	1800	370
20	2900	730	1400	350
25	2300	700	1100	330
Depth of cut	$\leq 0.2D$ ($D < \phi 3$) $\leq 0.5D$ ($D \geq \phi 3$)  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.

SEG45A

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	 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.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR CARBIDE END MILLS

B375

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

HSS

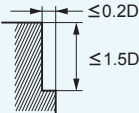
VA-255

End mill, Short cut length, 2 flute

VA-2MS

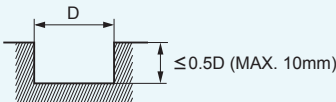
End mill, Medium cut length, 2 flute

Side milling

Work material	Structural steel, Carbon steel (~20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20~30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30~35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35~40HRC) 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)
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.

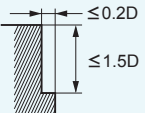
Slotting

Work material	Structural steel, Carbon steel (~20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20~30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30~35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35~40HRC) 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)
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) 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.
- 3) When drilling, please set the feed rate at 1/3 or below of the values above.

Side milling

Work material	Structural steel, Carbon steel (-20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20-30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30-35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35-40HRC) 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)
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

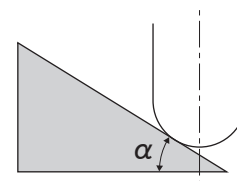
VA-2MB

Ball nose end mill, Medium cut length, 2 flute

HSS

	Roughing (Depth of cut $\leq 0.8R$)				Finishing (Depth of cut $0.05R$)							
Work material	Carbon steel, Alloy steel ($\sim 30\text{HRC}$) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel ($30\text{--}40\text{HRC}$) AISI H13, AISI P21		Carbon steel, Alloy steel ($\sim 30\text{HRC}$) AISI 1055, AISI P20				Alloy steel, Tool steel Pre-hardened steel ($30\text{--}40\text{HRC}$) AISI H13, AISI D2, AISI P21			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
					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 6	1100	160	530	70	2300	750	1600	420	1900	590	1300	350
R 7	910	150	450	65	2000	780	1300	420	1600	650	1200	390
R 8	800	140	400	65	1700	820	1200	470	1400	700	1000	410
R 9	710	130	350	60	1550	840	1050	450	1300	700	910	390
R10	640	120	320	55	1400	800	940	440	1150	650	780	390
R12.5	450	90	230	40	1100	720	780	420	920	580	650	370
R15	370	75	190	35	950	700	650	390	780	560	570	360

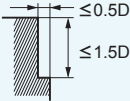
- 1) α is the inclination angle of the machined surface.
- 2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately. Please reduce the feed rate when the surface finish is important.
-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



SOLID
END MILLS

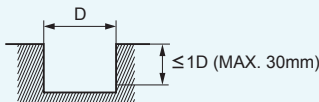
RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

Side milling

Work material	Structural steel, Carbon steel (-20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20-30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30-35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35-40HRC) 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	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, Carbon steel (-20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20-30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30-35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35-40HRC) 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	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.

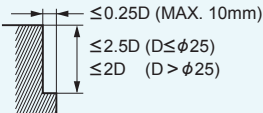
RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

HSS

VA-MFPR

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

Side milling

Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35—40HRC) 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	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	 $\leq 0.25D$ (MAX. 10mm) $\leq 2.5D$ ($D \leq \phi 25$) $\leq 2D$ ($D > \phi 25$) 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.

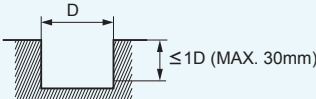
SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

Side milling

Work material	Structural steel, Carbon steel (−20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30−35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35−40HRC) 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	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	 ≤0.5D ≤1.5D D:Dia.							

Slotting

Work material	Structural steel, Carbon steel (−20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30−35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35−40HRC) 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	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.

RECOMMENDED CUTTING CONDITIONS FOR VIOLET END MILLS

HSS

VA-JR

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

Side milling

Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1049, AISI 1055		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) SCM, AISI H13, AISI D2		Alloy steel, Tool steel (35—40HRC) 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)
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	$\leq 0.25D$ (MAX. 10mm) $\leq 2.5D$ ($D \leq \phi 30$) $\leq 2D$ ($D > \phi 30$) D: Dia.							

VA-LR

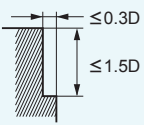
Roughing end mill, Long cut length, 4—6 flute

Side milling

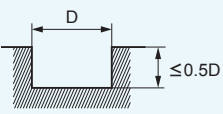
Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35—40HRC) Austenitic stainless steel AISI 304, AISI 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)
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	$\leq 0.1D$ $\leq 3D$ ($D \leq \phi 30$) $\leq 2.5D$ ($D > \phi 30$) (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.

Side milling

Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35—40HRC) 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	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								

Slotting

Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Alloy steel, Tool steel (35—40HRC) 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	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								

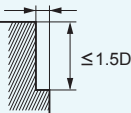
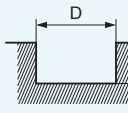
- 1) Supply cutting fluid sufficiently during slotting. When slotting with dry cut, decrease the revolution and feed rate proportionately by 20—30%.
- 2) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

HSS

255

End mill, Short cut length, 2 flute

Work material	Structural steel Carbon steel ($\sim 20\text{HRC}$) AISI 1045, AISI 1049		Carbon steel Alloy steel ($20\text{--}30\text{HRC}$) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel ($30\text{--}35\text{HRC}$) AISI H13		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI 35		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	$\leq 0.1D$ ($D \leq \phi 3$) $\leq 0.2D$ ($D > \phi 3$)  $\leq 1.5D$  $\leq 0.1D$ ($D < \phi 2$) $\leq 0.3D$ ($\phi 2 \leq D \leq \phi 3$) $\leq 0.5D$ ($D > \phi 3$) 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.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

B384

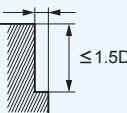
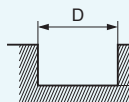
G-2SS ¹⁾

End mill, Short cut length, 2 flute

G-2MS

End mill, Medium cut length, 2 flute

HSS

Work material	Structural steel Carbon steel (~20HRC) AISI 1045, AISI 1049		Carbon steel Alloy steel (20—30HRC) AISI 1049, AISI 1055		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 35		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	(G-2MS) $\leq 0.1D$ ($D \leq \phi 3$) $\leq 0.2D$ ($D > \phi 3$)  $\leq 1.5D$  $\leq 0.1D$ ($D < \phi 2$) $\leq 0.3D$ ($\phi 2 \leq D \leq \phi 3$) $\leq 0.5D$ ($D > \phi 3$) D: Dia.											

() : Indicates standard feed rate for slotting.

1) Increase the feed rate by 10—20% for G-2SS.

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****RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS****B385**

RECOMMENDED CUTTING CONDITIONS FOR TWO-FLUTE END MILLS

HSS

S-2MD

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

S-2JS¹⁾

End mill, Semi long cut length, 2 flute, KHA Super

Work material	Structural steel Carbon steel (~20HRC) AISI 1045, AISI 1049		Carbon steel Alloy steel (20~30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30~35HRC) AISI H13		Alloy steel, Tool steel (35~40HRC) Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI 35		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)
25	600	145 (115)	430	100 (80)	320	65 (50)	260	50 (40)	480	150 (120)	1300	440 (350)
30	500	130 (100)	360	90 (70)	270	60 (50)	210	45 (35)	410	145 (115)	1100	410 (330)
40	360	100 (80)	260	70 (55)	200	50 (40)	150	35 (30)	300	110 (90)	820	320 (260)
50	270	85 (70)	200	60 (50)	150	40 (30)	120	30 (25)	230	95 (75)	650	270 (220)
Depth of cut	(S-2MD) $\leq 0.1D$ ($D \leq \phi 3$) $\leq 0.2D$ ($D > \phi 3$) $\leq 1.5D$ $\leq 0.1D$ ($D < \phi 2$) $\leq 0.3D$ ($\phi 2 \leq D \leq \phi 3$) $\leq 0.5D$ ($D > \phi 3$) D: Dia.											

() : Indicates standard feed rate for slotting.

1) Decrease the feed rate by 20—30% for S-2JS.

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.

Work material	Structural steel Carbon steel (~20HRC) AISI 1045, AISI 1049		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 35		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) $\leq 0.1D$ ($D \leq \phi 3$) $\leq 0.2D$ ($D > \phi 3$) 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.

RECOMMENDED CUTTING CONDITIONS FOR THREE-FLUTE END MILLS

HSS

3MS

End mill, Medium cut length, 3 flute

Work material	Structural steel Carbon steel (~20HRC) AISI 1045, AISI 1049		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 35		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	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 (25)	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)
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 FOUR-FLUTE END MILLS

S-4MD

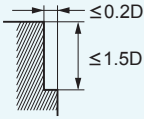
End mill, Medium cut length, 4 flute

S-4JC¹⁾

End mill, Semi long cut length, 4 flute

HSS

Side milling

Work material	Structural steel Carbon steel ($\sim 20\text{HRC}$) AISI 1045, AISI 1049		Carbon steel Alloy steel ($20\text{--}30\text{HRC}$) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel ($30\text{--}35\text{HRC}$) AISI H13		Alloy steel, Tool steel ($35\text{--}40\text{HRC}$) Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI 35		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
20	750	270	540	190	400	120	320	95	600	270	1600	810
25	600	230	430	160	320	105	260	80	480	240	1300	700
30	500	210	360	145	270	95	210	70	410	230	1100	660
40	360	160	260	110	200	80	150	55	300	175	820	510
50	270	135	200	95	150	65	120	50	230	150	650	430
Depth of cut	(S-4MD)  $\leq 0.2D$ $\leq 1.5D$ 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.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR FOUR-FLUTE END MILLS

B389

RECOMMENDED CUTTING CONDITIONS FOR FOUR-FLUTE END MILLS

HSS

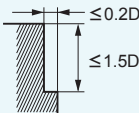
G-4MC

End mill, Medium cut length, 4 flute

G-4LC¹⁾

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

Side milling

Work material	Structural steel Carbon steel ($\sim 20\text{HRC}$) AISI 1045, AISI 1049		Carbon steel Alloy steel ($20\sim 30\text{HRC}$) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel ($30\sim 35\text{HRC}$) AISI H13		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI 35		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)  ≤ 0.2D ≤ 1.5D D: Dia.											

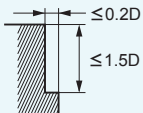
1) Decrease the revolution by 20—30% and the feed rate by 40—50% for G-4LC.

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.

SOLID
END MILLS

RECOMMENDED CUTTING CONDITIONS FOR FOUR-FLUTE END MILLS

Side milling

Work material	Structural steel Carbon steel (~20HRC) AISI 1045, AISI 1049		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 35		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.

RECOMMENDED CUTTING CONDITIONS FOR BALL NOSE END MILLS

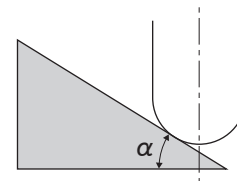
HSS

S-2MB

Ball nose end mill, Medium cut length, 2 flute

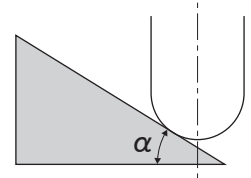
	Roughing (Large depth of cut ≤ 0.8R)				Finishing (Depth of cut 0.05R)							
Work material	Carbon steel Alloy steel (−30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30−40HRC) AISI H13, AISI P21		Carbon steel, Alloy steel (−30HRC) AISI 1055, AISI P20				Alloy steel, Tool steel 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) 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.
- 3) 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.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.



	Roughing (Large depth of cut $\leq 0.8R$)				Finishing (Depth of cut 0.05R)							
Work material	Carbon steel Alloy steel ($\sim 30\text{HRC}$) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13		Carbon steel, Alloy steel ($\sim 30\text{HRC}$) AISI 1055, AISI P20				Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13			
R (mm)	Revolution (min^{-1})	Feed rate (mm/min)	Revolution (min^{-1})	Feed rate (mm/min)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		$\alpha \leq 15^\circ$		$\alpha > 15^\circ$	
					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 3	950	60	750	50	1600	230	1200	140	1300	160	1000	120
R 4	730	70	600	55	1200	240	900	150	1050	200	800	130
R 5	600	75	480	60	1000	260	720	160	860	220	640	140
R 6	500	70	400	55	840	280	600	160	720	240	520	140
R 8	370	55	300	45	620	300	450	180	540	260	400	160
R10	300	50	240	40	500	300	360	170	420	240	320	150
R12.5	240	45	190	35	400	260	280	160	340	220	250	130
R15	200	40	160	35	340	250	240	150	280	200	210	120

- 1) α is the inclination angle of the machined surface.
- 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. Please reduce the feed rate when the surface finish is important.
- 3) 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.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.



RECOMMENDED CUTTING CONDITIONS FOR BALL NOSE END MILLS

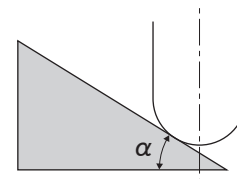
HSS

K-4MB

Ball nose end mill, Medium cut length, 4 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—35HRC) AISI H13		Carbon steel, Alloy steel (—30HRC) AISI 1055, AISI P20				Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13			
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 3	1200	75	940	60	2000	290	1500	175	1600	200	1250	150
R 4	910	90	750	70	1500	300	1100	190	1300	250	1000	160
R 5	750	95	600	75	1250	330	900	200	1100	280	800	175
R 6	630	90	500	70	1050	350	750	200	900	300	650	175
R 8	460	70	380	55	780	380	560	230	680	330	500	200
R10	380	60	300	50	630	380	450	210	530	300	400	190
R12.5	300	55	240	45	500	330	350	200	430	280	310	160
R15	250	50	200	40	410	300	290	190	350	250	260	150
R20	180	40	140	30	300	240	210	150	260	200	190	120

- 1) α is the inclination angle of the machined surface.
- 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. Please reduce the feed rate when the surface finish is important.
- 3) 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.
- 4) If the depth of cut is shallow, the revolution and feed rate can be increased.



RECOMMENDED CUTTING CONDITIONS FOR ROUGHING END MILLS

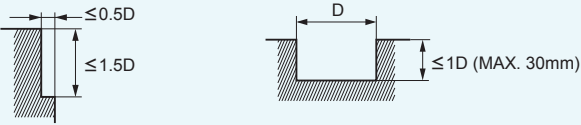
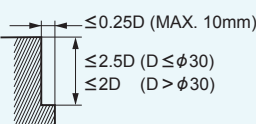
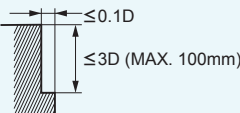
Roughing end mill, Short cut length, 4—6 flute **SR**

Roughing end mill, Semi long cut length, 4—6 flute **JR**¹⁾

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

Roughing end mill, Long cut length, 4—6 flute **LR**²⁾

HSS

Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		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

RECOMMENDED CUTTING CONDITIONS FOR ROUGHING END MILLS

B395

RECOMMENDED CUTTING CONDITIONS FOR ROUGHING END MILLS

HSS

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, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		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.

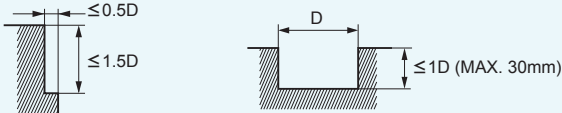
- 1) Supply cutting fluid sufficiently during cutting.
- 2) When the diameter exceeds 30 and the metal removal is less than the quantity shown in the table, the revolution and feed rate may be increased by 10—40%.
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

RECOMMENDED CUTTING CONDITIONS FOR SEMI-FINISHING END MILLS

G-MSF

Semi finish end mill, Medium cut length, 4—6 flute

HSS

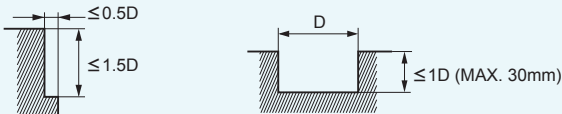
Work material	Structural steel Carbon steel (-20HRC) AISI 1045, AISI 1049		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Cast iron AISI 35, AISI SNG420112	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
5	1200	50	900	35	730	30	1080	60
6	1150	70	860	50	680	35	1030	75
8	960	80	720	60	600	50	860	90
10	770	100	580	70	480	60	700	115
12	640	90	480	70	400	60	580	115
16	480	90	360	70	300	60	430	110
20	380	90	290	70	240	60	350	110
25	310	80	230	60	190	50	270	95
30	255	70	190	55	160	40	230	85
40	160	60	120	45	100	35	140	65
50	120	50	90	35	70	30	110	60
Depth of cut								

- 1) Please reduce the both revolution and the feed rate by 20—30% when slotting.
- 2) If abnormal sounds occur when up cut milling, reduce the feed rate.

MSF

Semi finish end mill, Medium cut length, 4—6 flute

SOLID
END MILLS

Work material	Structural steel Carbon steel (-20HRC) AISI 1045, AISI 1049		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Cast iron AISI 35, AISI SNG420112	
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	40	760	30	610	25	900	50
6	960	55	720	40	570	30	860	65
8	800	65	600	50	500	40	720	75
10	640	80	480	60	380	45	580	95
12	530	80	400	60	320	45	480	95
16	400	80	300	60	240	45	360	95
20	320	80	240	60	190	45	290	90
25	250	70	190	50	150	40	230	85
30	210	60	160	45	130	35	190	70
40	135	50	100	40	80	30	120	60
50	100	40	75	30	60	25	90	50
Depth of cut								

- 1) Please reduce the both revolution and the feed rate by 20—30% when slotting.
- 2) If abnormal sounds occur when up cut milling, reduce the feed rate.

RECOMMENDED CUTTING CONDITIONS FOR SEMI-FINISHING END MILLS

B397

RECOMMENDED CUTTING CONDITIONS FOR HIGH HELIX/LIGHT ALLOY STEEL END MILLS

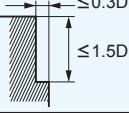
HSS

K-MH

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

K-LH¹⁾

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

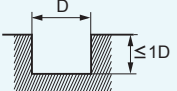
Work material	Structural steel, Carbon steel (—20HRC) AISI 1045, AISI 1049 Cast iron AISI 35		Carbon steel, Alloy steel (20—30HRC) AISI 1055, AISI P20		Alloy steel, Tool steel Pre-hardened steel (30—35HRC) AISI H13, AISI D2		Austenitic stainless steel AISI 304, AISI 316	
Dia. (mm)	Revolution (min ⁻¹)	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
25	350	100	250	70	190	50	150	40
30	290	90	210	65	160	45	120	35
Depth of cut	(K-MH)  D: Dia.							

1) Decrease the revolution and feed rate according to the processing mode of K-LH.

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-25DA

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

Work material	Cast aluminium AC, ADC Rolled aluminium A5052, A7075 Magnesium alloy resin	
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.

RECOMMENDED CUTTING CONDITIONS FOR CORNER RADIUS END MILLS

RC

Corner radius cutter, 3—4 flute

HSS

Work material		Structural steel Carbon steel (~20HRC) AISI 1045, AISI 1049		Alloy steel, Tool steel Pre-hardened steel (20—35HRC) AISI P20, AISI H13 AISI D2		Austenitic stainless steel AISI 304, AISI 316		Cast iron AISI 35		Aluminium alloy	
Corner radius (mm)	Depth of cut (mm)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)	Revolution (min ⁻¹)	Feed rate (mm/min)
R0.5—R1.5	≤ 0.5	1300	100	900	70	700	50	1400	150	2800	350
R2—R4	≤ 0.6	900	100	600	65	500	45	1000	130	2000	350
R4.5—R5	≤ 0.6	700	100	400	60	400	40	800	130	1600	350
R6—R7	≤ 0.8	550	100	300	60	350	40	650	130	1300	350
R8—R9	≤ 0.8	450	100	250	60	280	40	550	120	1100	300
R10	≤ 1	400	100	250	60	250	40	500	120	1000	300
R12—R12.5	≤ 1.2	350	90	230	60	200	35	400	120	800	250
R15	≤ 1.2	300	90	220	60	180	35	350	110	700	220
R16	≤ 1.4	300	90	200	60	170	35	330	110	650	200

- 1) Remove the machining allowance in several passes in reference to the above cutting depth.
- 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.
- 3) Coolant is recommended.