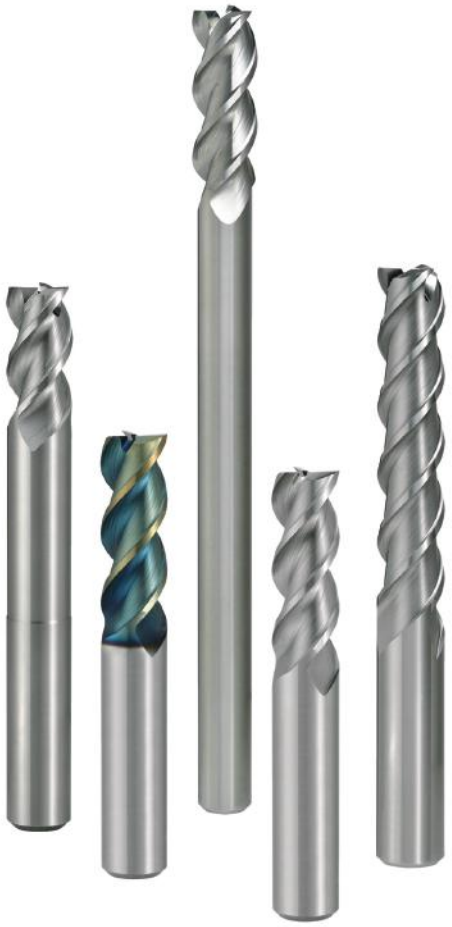
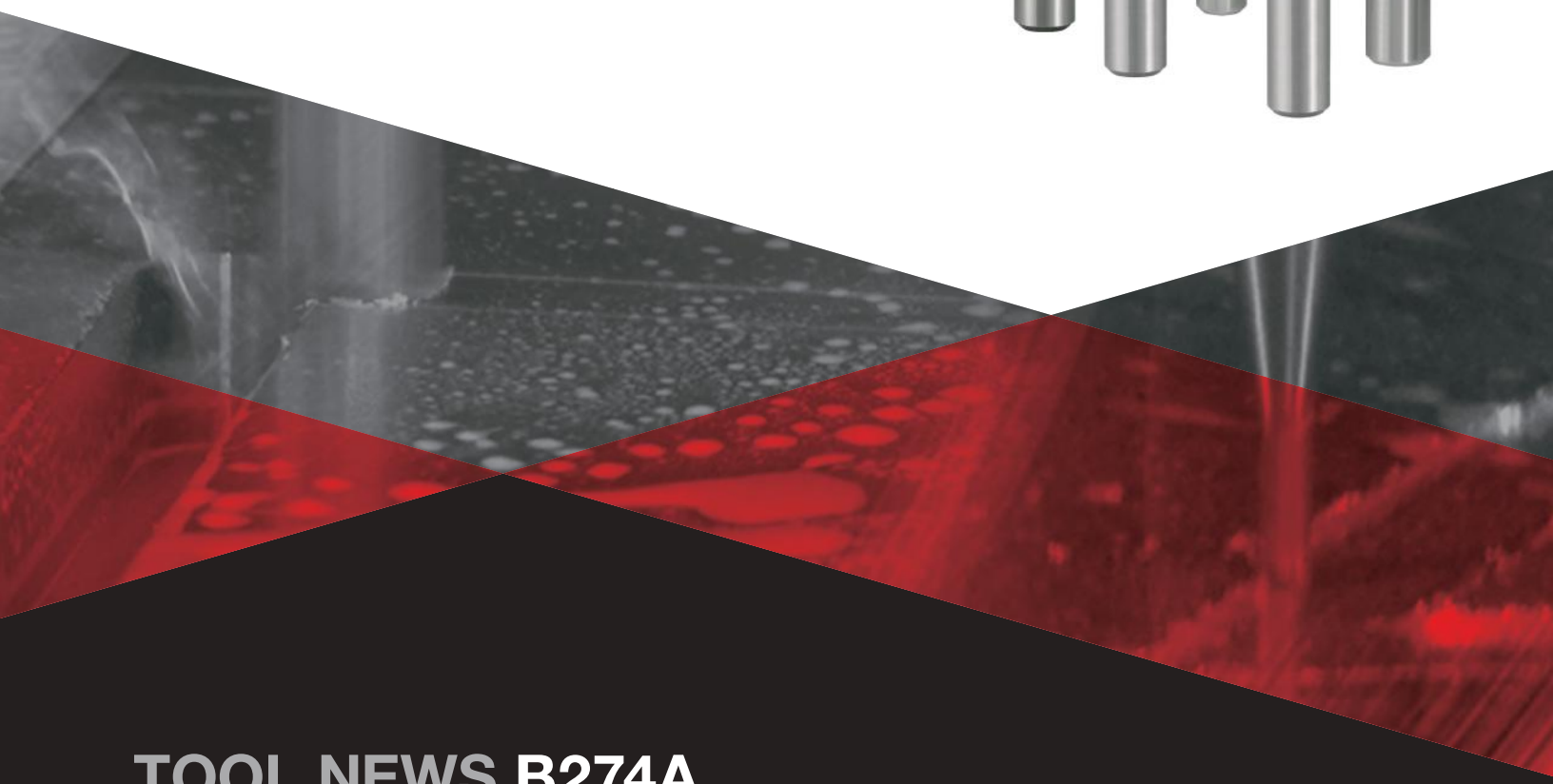
MITSUBISHI MATERIALS

C/DLC-AL

SOLID END MILL FOR ALUMINUM ALLOYS



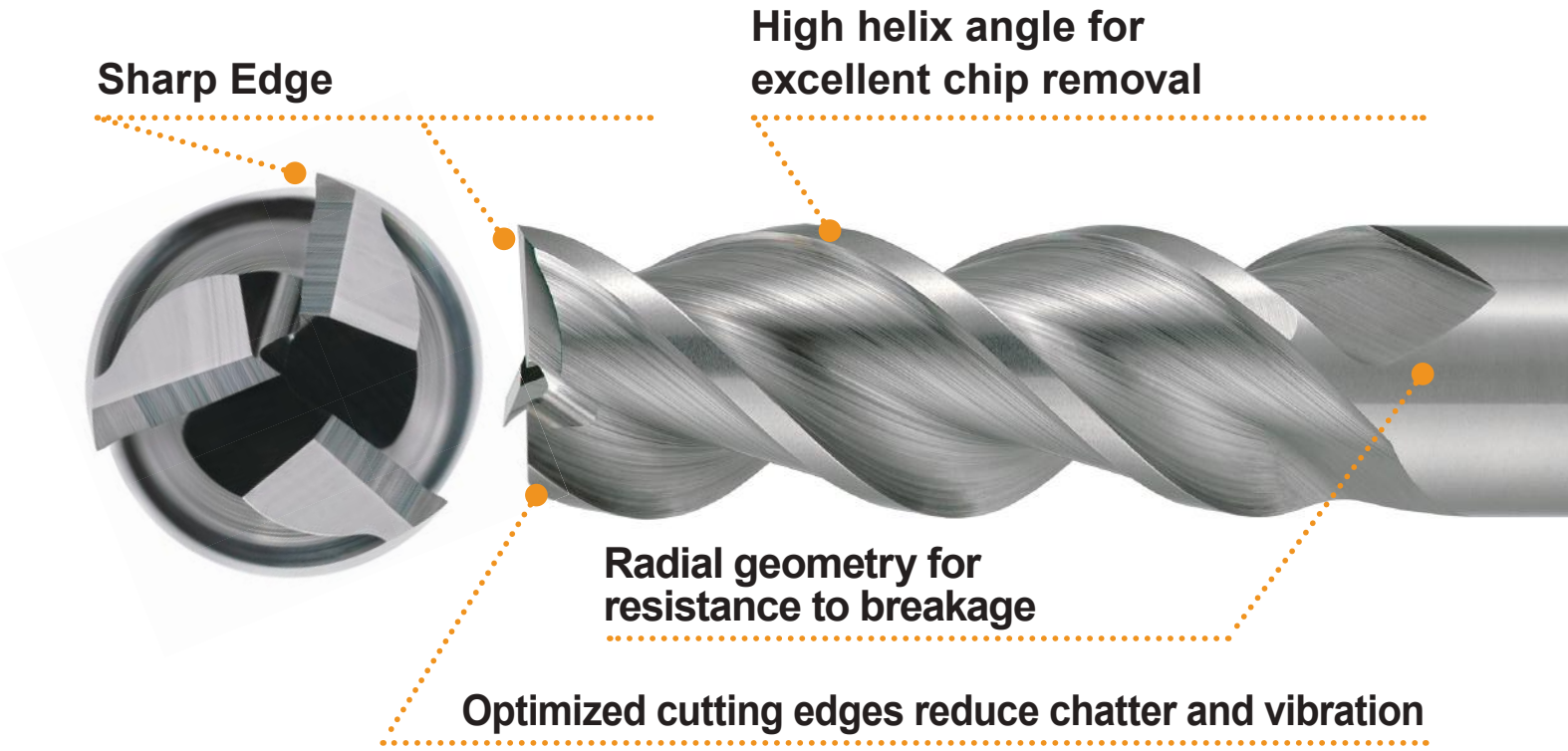


TOOL NEWS **B274A**

Solid End Mill for Aluminum Alloys

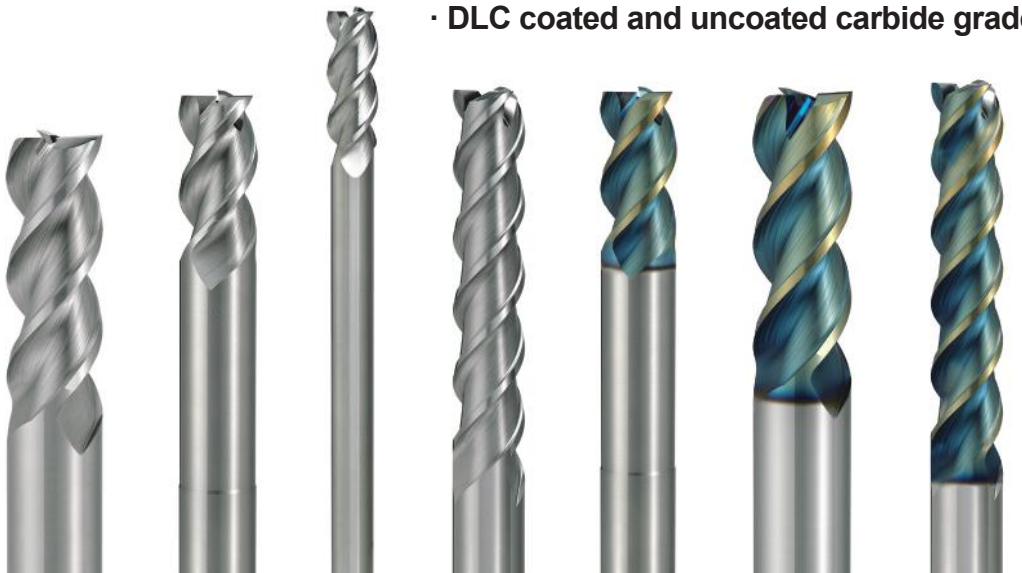
C/DLC-AL

Superior cutting edge quality and excellent chip evacuation suppresses vibrations and chatter to enable stable machining of non-ferrous materials.



A Wide Variety of Sizes

A versatile choice of end mills -
- 2 and 3 flutes
- Standard and long flutes
- Slim shank type
- DLC coated and uncoated carbide grades

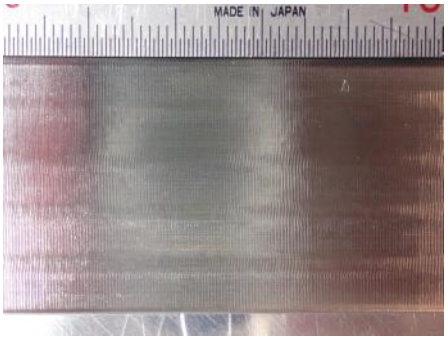


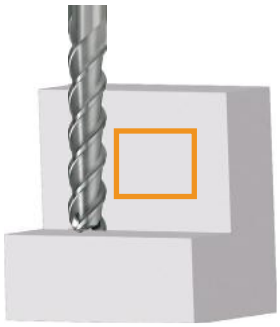
Machining Example

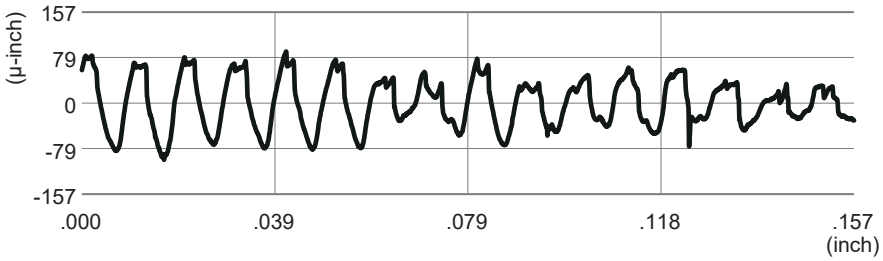
Side Milling - Component Surface Finish when Machining of Aluminum

Both rough and finish machining provided good surface finishes and a stable cutting performance.

Rough Machining

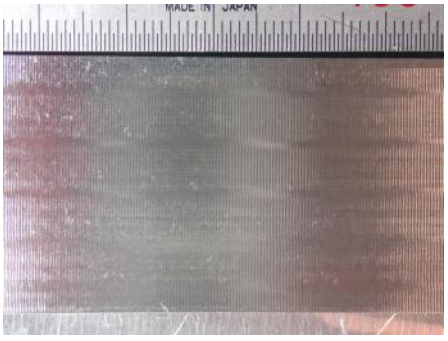


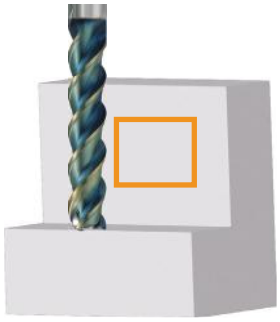


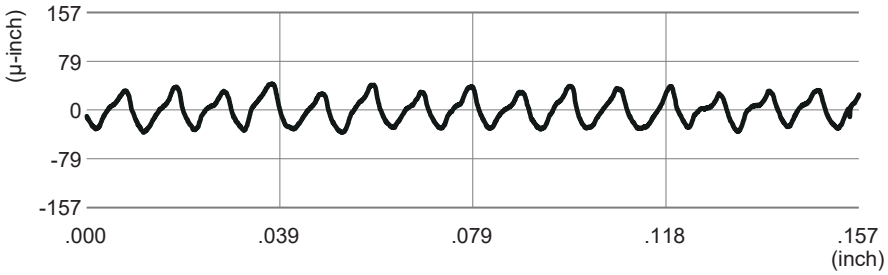


Ra: 37 µ-inch
Rz: 144 µ-inch

Finish Machining







Ra: 18 µ-inch
Rz: 72 µ-inch

Process	Tool	Depth of Cut **ap**(inch)	Depth of Cut **ae**(inch)
Rough Machining	C3SXALD0600	1.181	.020
Finish Machining	DLC3SXALD0600	1.181	.002

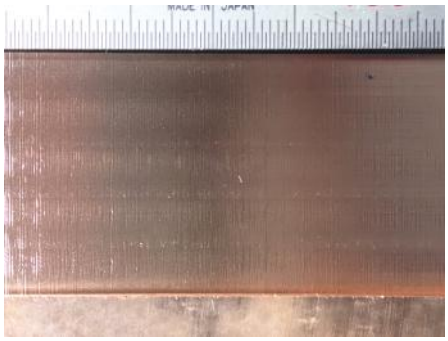
<Cutting Conditions>
Material : ASTM 5052
Cutting Speed : vc=740 SFM
Revolution : n=12000 min^{-1}
Table Feed : vf=118.1 IPM
Cutting Mode : Down Cut
Wet Cuting+Air Blow

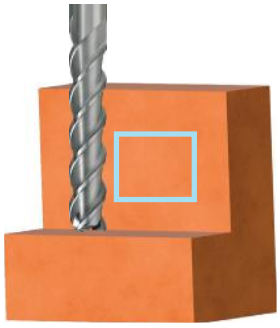
Machining Example

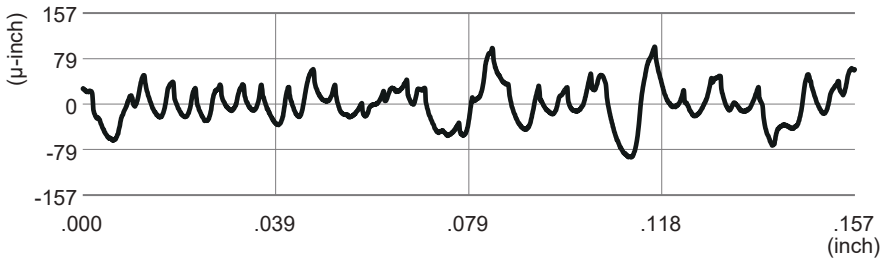
Side Milling of Copper Alloy

Excellent component surface finishes and stability also when machining copper alloys.

Rough Machining







Ra: 26 μ-inch
Rz: 137 μ-inch



Chip Condition

<Cutting Conditions>

Material	: ASTM C11000
Tool	: C3SXALD0600
Cutting Speed	: vc=370 SFM
Revolution	: n=6000 min^{-1}
Table Feed	: vf=14.2 IPM
Depth of Cut	: ap=1.181 inch ae=.020 inch
Overhang	: 1.575 inch
Cutting Mode	: Down Cut Wet Cuting+Air Blow

Type	No. of Flutes	Product Code	Features	Shape	Size Range DC Min.	Size Range DC Max.	APMX Max. DC	Number of Items	N Aluminum Alloy	N Aluminum Alloy Castings	N Copper Alloy	N Resin Material	Page
SQUARE	2	C2MAL	DC×2.5 flute length	Image shows 3 flutes 	1 mm .039"	2.5 mm .098"	6.3 mm .248"	4	◎	◎	○	○	P.6
SQUARE	3	C3MAL			1 mm .039"	12 mm .472"	30 mm 1.181"	11	◎	◎	○	○	P.6
SQUARE	3	C3MAL	Slim Shank		7 mm .276"	12 mm .472"	30 mm 1.181"	6	◎	◎	○	○	P.7
SQUARE	2	DLC2MAL	DC×2.5 flute length DLC Coating	Image shows 3 flutes 	1 mm .039"	2.5 mm .098"	6.3 mm .248"	4	◎	◎	○	○	P.8
SQUARE	3	DLC3MAL			1 mm .039"	12 mm .472"	30 mm 1.181"	11	◎	◎	○	○	P.8
SQUARE	3	C3SXAL	DC× 5 flute length		3 mm .118"	12 mm .472"	60 mm 2.362"	7	◎	◎	○	○	P.15
SQUARE	3	DLC3SXAL	DC×5 flute length DLC Coating		3 mm .118"	12 mm .472"	60 mm 2.362"	7	◎	◎	○	○	P.16
SQUARE	2	C2XLAL	DC×1.5 flute length Long Neck	Image shows 3 flutes 	1 mm .039"	2.5 mm .098"	3.8 mm .150"	8	◎	◎	○	○	P.18
SQUARE	3	C3XLAL			1 mm .039"	12 mm .472"	18 mm .709"	28	◎	◎	○	○	P.18
SQUARE	2	DLC2XLAL	DC×1.5 flute length Long Neck DLC Coating	Image shows 3 flutes 	1 mm .039"	2.5 mm .098"	3.8 mm .150"	8	◎	◎	○	○	P.20
SQUARE	3	DLC3XLAL			1 mm .039"	12 mm .472"	18 mm .709"	26	◎	◎	○	○	P.20

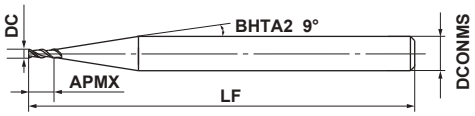
C2MAL/C3MAL

End mill, Medium cut length, 2 and 3 flute, For aluminum alloys

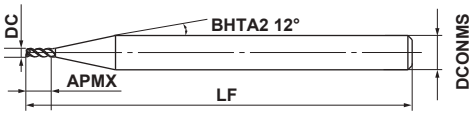
C2MAL C3MAL

Aluminum Alloy A1000 Series	Aluminum Alloy A2000 - A7000 Series	Aluminum Alloy Castings	Copper・Copper Alloy	Resin Material
◎	◎	◎	○	○

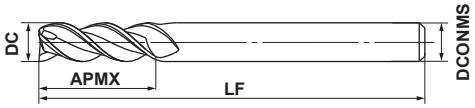




Type1



Type2



Type3

DC				
0 - 0.02				
DCONMS 4, 6	DCONMS 8, 10	DCONMS 12		
0 - 0.008	0 - 0.009	0 - 0.011		

- Flute length is DC x 2.5.
- The cutting edge suppresses chatter and vibration, resulting in superior component surface finishes.

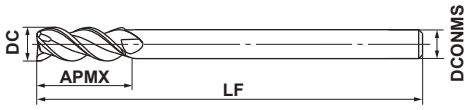
(mm)

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
C2MALD0100	1	2.5	45	4	2	★	1
C2MALD0150	1.5	3.7	45	4	2	★	1
C2MALD0200	2	5	45	4	2	★	1
C2MALD0250	2.5	6.3	45	4	2	★	1

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
C3MALD0100	1	2.5	45	4	3	★	2
C3MALD0150	1.5	3.7	45	4	3	★	2
C3MALD0200	2	5	45	4	3	★	2
C3MALD0250	2.5	6.3	45	4	3	★	2
C3MALD0300	3	7.5	50	6	3	★	2
C3MALD0400	4	10	50	6	3	★	2
C3MALD0500	5	12.5	55	6	3	★	2
C3MALD0600	6	15	55	6	3	★	3
C3MALD0800	8	20	70	8	3	★	3
C3MALD1000	10	25	75	10	3	★	3
C3MALD1200	12	30	80	12	3	★	3

★ : **Stocked in Japan**





Type4

Slim Shank Type

(mm)

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
C3MALD0700S06	7	17.5	80	6	3	★	4
C3MALD0800S06	8	20	110	6	3	★	4
C3MALD0900S08	9	22.5	110	8	3	★	4
C3MALD1000S08	10	25	130	8	3	★	4
C3MALD1100S10	11	28	130	10	3	★	4
C3MALD1200S10	12	30	150	10	3	★	4

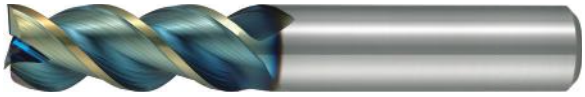
DC = Cutting dia.
APMX = Depth of cut max.
LF = Functional length
DCONMS = Connection (shank) dia.

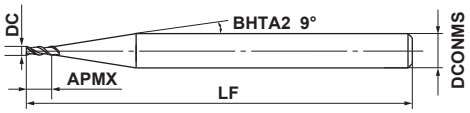
DLC2MAL/DLC3MAL

End mill, Medium cut length, 2 and 3 flute, For aluminum alloys

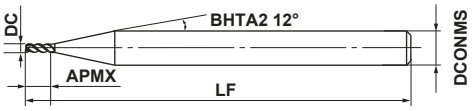
DLC2MAL DLC3MAL

Aluminum Alloy A1000 Series	Aluminum Alloy A2000 - A7000 Series	Aluminum Alloy Castings	Copper・Copper Alloy	Resin Material
◎	◎	◎	○	○

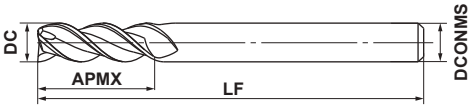




Type1



Type2



Type3

DC				
0 - 0.02				
DCONMS 4, 6	DCONMS 8, 10	DCONMS 12		
0 - 0.008	0 - 0.009	0 - 0.011		

- The cutting edge suppresses chatter and vibration, resulting in superior component surface finishes.
- DLC coating provides extreme resistance to welding.

(mm)

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
DLC2MALD0100	1	2.5	45	4	2	★	1
DLC2MALD0150	1.5	3.7	45	4	2	★	1
DLC2MALD0200	2	5	45	4	2	★	1
DLC2MALD0250	2.5	6.3	45	4	2	★	1

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
DLC3MALD0100	1	2.5	45	4	3	★	2
DLC3MALD0150	1.5	3.7	45	4	3	★	2
DLC3MALD0200	2	5	45	4	3	★	2
DLC3MALD0250	2.5	6.3	45	4	3	★	2
DLC3MALD0300	3	7.5	50	6	3	★	2
DLC3MALD0400	4	10	50	6	3	★	2
DLC3MALD0500	5	12.5	55	6	3	★	2
DLC3MALD0600	6	15	55	6	3	★	3
DLC3MALD0800	8	20	70	8	3	★	3
DLC3MALD1000	10	25	75	10	3	★	3
DLC3MALD1200	12	30	80	12	3	★	3

DC = Cutting dia. **LF** = Functional length
APMX = Depth of cut max. **DCONMS** = Connection (shank) dia.

★ : **Stocked in Japan**

C2MAL/DLC2MAL

End mill, Medium cut length, 2 flute, For aluminum alloys

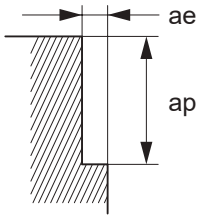
Recommended Cutting Conditions

Side Milling

Material		Aluminum Alloy A1000 Series, A2000 - A7000 Series					Aluminum Alloy Castings				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	inch										
1	**.039**	195	20000	17.3	.059	.008	195	20000	17.3	.059	.008
1.5	**.059**	295	20000	21.7	.091	.012	295	20000	21.7	.091	.012
2	**.079**	425	20000	26.0	.118	.016	425	20000	26.0	.118	.016
2.5	**.098**	525	20000	30.3	.150	.020	525	20000	30.3	.150	.020

Material		Copper, Copper Alloys, Resin Materials				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	inch					
1	**.039**	165	17000	86.6	.079	.008
1.5	**.059**	195	13300	84.6	.118	.012
2	**.079**	195	9900	74.8	.157	.016
2.5	**.098**	165	6600	66.9	.197	.020

Depth of Cut



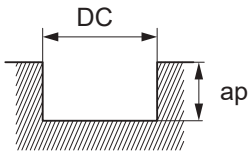
Slot Milling

(inch)

Material		Aluminum Alloy A1000 Series, A2000 - A7000 Series				Aluminum Alloy Castings			
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)
mm	inch								
1	**.039**	195	20000	13.0	.039	195	20000	13.0	.039
1.5	**.059**	295	20000	17.3	.059	295	20000	17.3	.059
2	**.079**	425	20000	17.3	.079	425	20000	17.3	.079
2.5	**.098**	525	20000	21.7	.098	525	20000	21.7	.098

Material		Copper, Copper Alloys, Resin Materials			
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)
mm	inch				
1	**.039**	165	17000	43.3	.039
1.5	**.059**	195	13300	42.1	.059
2	**.079**	195	9900	37.8	.079
2.5	**.098**	165	6600	33.5	.098

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) For side milling, down milling is recommended.

Note3) Water-soluble cutting fluid is recommended.

Note4) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

C3MAL/DLC3MAL

End mill, Medium cut length, 3 flute, For aluminum alloys

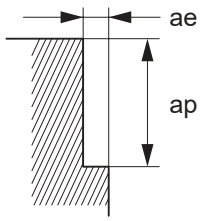
Recommended Cutting Conditions

Side Milling

Material		Aluminum Alloy A1000 Series					Aluminum Alloy A2000 - A7000 Series				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	inch										
1	**.039**	195	20000	52.0	.098	.012	195	20000	52.0	.098	.012
1.5	**.059**	295	20000	65.0	.150	.020	295	20000	65.0	.150	.020
2	**.079**	425	20000	78.0	.197	.024	425	20000	78.0	.197	.024
2.5	**.098**	525	20000	82.7	.248	.031	525	20000	82.7	.248	.031
3	**.118**	620	20000	86.6	.295	.035	620	20000	86.6	.295	.035
4	**.157**	820	20000	95.3	.394	.047	820	20000	95.3	.394	.047
5	**.197**	985	19000	95.3	.492	.059	1,015	20000	116.9	.492	.059
6	**.236**	985	16000	95.3	.591	.071	1,080	17500	129.9	.591	.071
8	**.315**	985	12000	95.3	.787	.094	1,080	13000	129.9	.787	.094
9	**.354**	985	10600	95.3	.886	.106	1,080	11700	135.8	.886	.106
10	**.394**	985	9500	95.3	.984	.118	1,080	10500	140.9	.984	.118
12	**.472**	985	8000	103.9	1.181	.142	1,080	9000	140.9	1.181	.142

Material		Aluminum Alloy Castings					Copper, Copper Alloys, Resin Materials				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	inch										
1	**.039**	195	20000	52.0	.098	.012	195	20000	37.8	.098	.012
1.5	**.059**	295	20000	65.0	.150	.020	295	20000	47.2	.150	.020
2	**.079**	425	20000	78.0	.197	.024	395	19100	37.8	.197	.024
2.5	**.098**	525	20000	82.7	.248	.031	395	15300	47.2	.248	.031
3	**.118**	620	20000	86.6	.295	.035	395	12800	37.8	.295	.035
4	**.157**	820	20000	95.3	.394	.047	395	9600	40.2	.394	.047
5	**.197**	820	16000	95.3	.492	.059	395	7700	42.5	.492	.059
6	**.236**	820	13500	95.3	.591	.071	395	6400	45.7	.591	.071
8	**.315**	820	10000	99.6	.787	.094	395	4800	51.2	.787	.094
9	**.354**	820	8900	103.9	.886	.106	395	4250	51.2	.886	.106
10	**.394**	820	8000	108.3	.984	.118	395	3840	55.9	.984	.118
12	**.472**	820	6500	112.6	1.181	.142	395	3200	61.0	1.181	.142

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) For side milling, down milling is recommended.

Note3) Water-soluble cutting fluid is recommended.

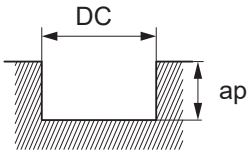
Note4) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

Slot Milling

Material		Aluminum Alloy A1000 Series				Aluminum Alloy A2000 - A7000 Series			
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)
mm	inch								
1	**.039**	195	20000	21.7	.039	195	20000	21.7	.039
1.5	**.059**	295	20000	26.0	.059	295	20000	26.0	.059
2	**.079**	425	20000	30.3	.079	425	20000	30.3	.079
2.5	**.098**	525	20000	36.6	.098	525	20000	36.6	.098
3	**.118**	620	20000	43.3	.118	620	20000	43.3	.118
4	**.157**	720	17500	47.6	.157	785	19000	47.6	.157
5	**.197**	720	14000	47.6	.197	785	15500	52.0	.197
6	**.236**	720	11500	47.6	.236	785	12500	56.3	.236
8	**.315**	720	9000	52.0	.315	785	9500	60.6	.315
9	**.354**	720	7800	53.9	.354	785	8500	63.0	.354
10	**.394**	720	7000	56.3	.394	785	7500	65.0	.394
12	**.472**	720	6000	60.6	.472	785	6500	69.3	.472

Material		Aluminum Alloy Castings				Copper, Copper Alloys, Resin Materials			
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)
mm	inch								
1	**.039**	195	20000	21.7	.039	195	20000	27.6	.039
1.5	**.059**	295	20000	26.0	.059	295	20000	28.3	.059
2	**.079**	425	20000	30.3	.079	395	19100	28.7	.079
2.5	**.098**	525	20000	33.9	.098	395	15300	29.5	.098
3	**.118**	525	17000	37.0	.118	395	12800	30.3	.118
4	**.157**	525	13000	37.0	.157	395	9600	32.3	.157
5	**.197**	525	10000	37.0	.197	395	7700	34.3	.197
6	**.236**	525	8500	37.0	.236	395	6400	36.6	.236
8	**.315**	525	6500	37.0	.315	395	4800	40.9	.315
9	**.354**	525	5700	37.0	.354	395	4200	43.3	.354
10	**.394**	525	5000	39.0	.394	395	3800	44.9	.394
12	**.472**	525	4000	43.3	.472	395	3200	49.2	.472

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) Water-soluble cutting fluid is recommended.

Note3) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

C3MAL/DLC3MAL

End mill, Medium cut length, 3 flute, For aluminum alloys

Recommended Cutting Conditions

Plunging

Material		Aluminum Alloy A1000 Series			Aluminum Alloy A2000 - A7000 Series			Aluminum Alloy Castings		
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)
mm	inch									
1	**.039**	195	20000	4.3	195	20000	4.3	195	20000	3.5
1.5	**.059**	295	20000	5.5	295	20000	5.5	295	20000	4.7
2	**.079**	425	20000	6.7	425	20000	6.7	425	20000	5.5
2.5	**.098**	525	20000	6.7	525	20000	6.7	525	20000	5.5
3	**.118**	620	20000	6.7	620	20000	6.7	525	17000	5.5
4	**.157**	720	17500	6.7	785	19000	8.7	525	13000	4.3
5	**.197**	720	14000	6.7	785	15500	8.7	525	10000	3.5
6	**.236**	720	11500	6.7	785	12500	8.7	525	8500	3.5
8	**.315**	720	9000	4.3	785	9500	8.7	525	6500	2.8
9	**.354**	720	7800	4.3	785	8500	8.7	525	5700	2.8
10	**.394**	720	7000	3.1	785	7500	6.7	525	5000	2.4
12	**.472**	720	6000	3.1	785	6500	6.7	525	4000	2.4

Material		Copper, Copper Alloys, Resin Materials		
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)
mm	inch			
1	**.039**	165	15900	3.1
1.5	**.059**	165	10600	3.1
2	**.079**	165	8000	3.1
2.5	**.098**	165	6400	3.5
3	**.118**	165	5300	3.9
4	**.157**	165	4000	3.9
5	**.197**	165	3200	3.9
6	**.236**	165	2700	4.3
8	**.315**	165	2000	4.7
9	**.354**	165	1800	4.7
10	**.394**	165	1600	4.7
12	**.472**	165	1300	4.7

Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) Water-soluble cutting fluid is recommended.

Note3) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

C3MAL Slim Shank Type

End mill, Medium cut length, 3 flute, For aluminum alloys

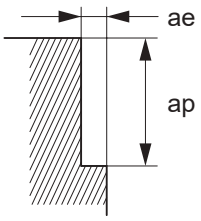
Recommended Cutting Conditions

Side Milling

Material		Aluminum Alloy A1000 Series					Aluminum Alloy A2000 - A7000 Series				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	**inch**										
7	**.276**	820	11400	61.0	.276	.028	985	13600	82.3	.276	.028
8	**.315**	820	10000	78.0	.315	.031	985	12000	108.3	.315	.031
9	**.354**	820	8800	78.0	.354	.035	985	10600	108.3	.354	.035
10	**.394**	820	8000	82.3	.394	.039	985	9500	108.3	.394	.039
11	**.433**	820	7200	82.3	.433	.043	985	8700	108.3	.433	.043
12	**.472**	820	6600	73.6	.472	.047	985	7900	121.3	.472	.047

Material		Aluminum Alloy Castings					Copper, Copper Alloys, Resin Materials				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	**inch**										
7	**.276**	655	9100	47.6	.276	.028	490	6800	39.4	.276	.028
8	**.315**	655	8000	65.0	.315	.031	490	6000	42.1	.315	.031
9	**.354**	655	7100	65.0	.354	.035	490	5300	42.1	.354	.035
10	**.394**	655	6300	73.6	.394	.039	490	4800	39.4	.394	.039
11	**.433**	655	5800	73.6	.433	.043	490	4300	34.3	.433	.043
12	**.472**	655	5300	69.3	.472	.047	490	4000	37.8	.472	.047

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) These recommended conditions are calculated based on a tool overhang of 4 x DC. If a longer overhang is required, please adjust the cutting conditions by referring to the values on page 14.

Note3) For side milling, down milling is recommended.

Note4) Water-soluble cutting fluid is recommended.

C3MAL Slim Shank Type

End mill, Medium cut length, 3 flute, For aluminum alloys

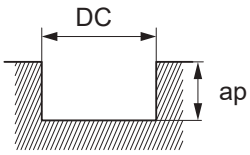
Recommended Cutting Conditions

Slot Milling

Material		Aluminum Alloy A1000 Series				Aluminum Alloy A2000 - A7000 Series			
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)
mm	**inch**								
7	**.276**	820	11400	43.3	.028	985	13600	60.6	.028
8	**.315**	820	10000	58.7	.063	985	12000	86.6	.063
9	**.354**	820	8800	58.7	.071	985	10600	86.6	.071
10	**.394**	820	8000	63.0	.118	985	9500	80.3	.118
11	**.433**	820	7200	63.0	.130	985	8700	80.3	.130
12	**.472**	820	6600	60.6	.142	985	7900	76.0	.142

Material		Aluminum Alloy Castings				Copper, Copper Alloys, Resin Materials			
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)
mm	**inch**								
7	**.276**	655	9100	39.0	.028	260	3600	16.9	.028
8	**.315**	655	8000	52.0	.063	260	3200	18.9	.063
9	**.354**	655	7100	52.0	.071	260	2800	16.9	.071
10	**.394**	655	6300	52.0	.118	330	3200	29.9	.118
11	**.433**	655	5800	52.0	.130	330	2900	27.6	.130
12	**.472**	655	5300	52.0	.142	330	2700	25.2	.142

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) These recommended conditions are calculated based on a tool overhang of 4 x DC. If a longer overhang is required, please adjust the cutting conditions by referring to the values in the following table.

Note3) Water-soluble cutting fluid is recommended.

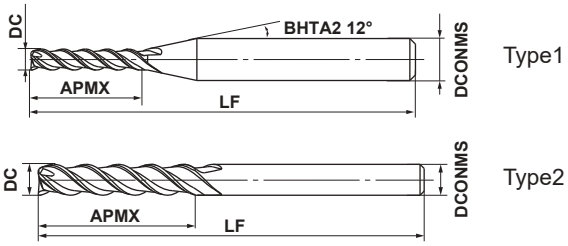
Overhang	Revolutions	Feed Rate		Depth of Cut	
		Side Milling	Slot Milling	Side Milling	Slot Milling
5D	70%	70%	70%	ap 1D x ae 0.05D	60%
6D	50%	50%	50%	ap 1D x ae 0.03D	40%
7D	30%	30%	30%	ap 1D x ae 0.015D	20%

C3SXAL

End mill, Long cut length, 3 flute, For aluminum alloys

Aluminum Alloy A1000 Series	Aluminum Alloy A2000 - A7000 Series	Aluminum Alloy Castings	Copper・Copper Alloy	Resin Material
◎	◎	◎	○	○





DC				
0 - 0.02				
DCONMS 6	DCONMS 8, 10	DCONMS 12		
0 - 0.008	0 - 0.009	0 - 0.011		

- The cutting edge suppresses chatter and vibration, resulting in superior component surface finishes.
- The flute length is DC x 5.

(mm)

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
C3SXALD0300	3	15	55	6	3	★	1
C3SXALD0400	4	20	60	6	3	★	1
C3SXALD0500	5	25	65	6	3	★	1
C3SXALD0600	6	30	75	6	3	★	2
C3SXALD0800	8	40	90	8	3	★	2
C3SXALD1000	10	50	100	10	3	★	2
C3SXALD1200	12	60	110	12	3	★	2

DC = Cutting dia. **LF** = Functional length
APMX = Depth of cut max. **DCONMS** = Connection (shank) dia.

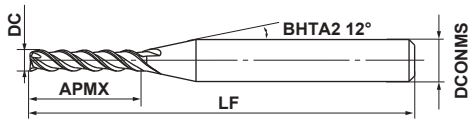
★ : **Stocked in Japan**

DLC3SXAL

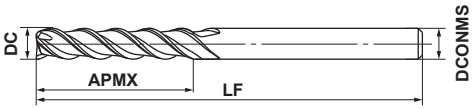
End mill, Long cut length, 3 flute, For aluminum alloys

Aluminum Alloy A1000 Series	Aluminum Alloy A2000 - A7000 Series	Aluminum Alloy Castings	Copper・Copper Alloy	Resin Material
◎	◎	◎	○	○





Type1



Type2

DC				
0 - 0.02				
DCONMS 6	DCONMS 8, 10	DCONMS 12		
0 - 0.008	0 - 0.009	0 - 0.011		

- With a long neck geometry DC x 3 and DC x 5.
- DLC coating provides extreme resistance to welding.

(mm)

Order Number	DC	APMX	LF	DCONMS	No. of Flutes	Stock	Type
DLC3SXALD0300	3	15	55	6	3	★	1
DLC3SXALD0400	4	20	60	6	3	★	1
DLC3SXALD0500	5	25	65	6	3	★	1
DLC3SXALD0600	6	30	75	6	3	★	2
DLC3SXALD0800	8	40	90	8	3	★	2
DLC3SXALD1000	10	50	100	10	3	★	2
DLC3SXALD1200	12	60	110	12	3	★	2

DC = Cutting dia. **LF** = Functional length
APMX = Depth of cut max. **DCONMS** = Connection (shank) dia.

★ : **Stocked in Japan**

C3SXAL/DLC3SXAL

End mill, Long cut length, 3 flute, For aluminum alloys

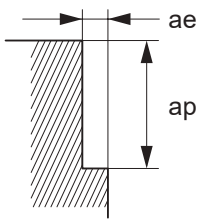
Recommended Cutting Conditions

Side Milling

Material		Aluminum Alloy A1000 Series					Aluminum Alloy A2000 - A7000 Series				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	inch										
3	**.118**	525	17000	26.8	.591	.012	620	20000	26.8	.591	.012
4	**.157**	525	12700	29.5	.787	.016	755	18000	41.3	.787	.016
5	**.197**	525	10000	38.6	.984	.020	755	14600	41.3	.984	.020
6	**.236**	525	8500	38.6	1.181	.024	755	12000	47.2	1.181	.024
8	**.315**	525	6400	38.6	1.575	.031	755	9100	53.1	1.575	.031
10	**.394**	525	5100	41.3	1.969	.039	755	7300	59.1	1.969	.039
12	**.472**	525	4300	51.2	2.362	.047	755	6100	53.1	2.362	.047

Material		Aluminum Alloy Castings					Copper, Copper Alloys, Resin Materials				
DC		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap**(inch)	Width of Cut **ae**(inch)
mm	inch										
3	**.118**	395	12700	23.6	.591	.012	165	5300	3.9	.591	.012
4	**.157**	395	9600	23.6	.787	.016	165	4000	3.9	.787	.016
5	**.197**	395	7600	23.6	.984	.020	165	3200	3.9	.984	.020
6	**.236**	395	6400	23.6	1.181	.024	165	2600	4.3	1.181	.024
8	**.315**	395	4800	29.5	1.575	.031	165	2000	4.7	1.575	.031
10	**.394**	395	3800	32.7	1.969	.039	165	1600	4.7	1.969	.039
12	**.472**	395	3200	35.4	2.362	.047	165	1300	4.7	2.362	.047

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.
Note2) For side milling, down milling is recommended.
Note3) Water-soluble cutting fluid is recommended.
Note4) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

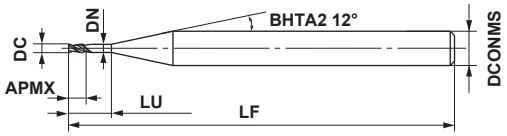
C2XLAL/C3XLAL

End mill, 2 and 3 flute, Long neck, For aluminum alloys

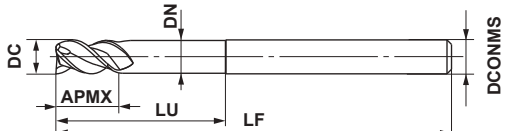


Aluminum Alloy A1000 Series	Aluminum Alloy A2000 - A7000 Series	Aluminum Alloy Castings	Copper・Copper Alloy	Resin Material
◎	◎	◎	○	○





Type1



Type2

DC				
0 - 0.02				
DCONMS 4, 6	DCONMS 8, 10	DCONMS 12		
0 - 0.008	0 - 0.009	0 - 0.011		

- The cutting edge suppresses chatter and vibration, resulting in superior component surface finishes.
- With a long neck geometry DC x 3 and DC x 5.

(mm)

Order Number	DC	APMX	LU	DN	LF	DCONMS	No. of Flutes	Stock	Type
C2XLALD0100N030	1	1.5	3	0.95	45	4	2	★	1
C2XLALD0100N050	1	1.5	5	0.95	45	4	2	★	1
C2XLALD0150N045	1.5	2.3	4.5	1.45	45	4	2	★	1
C2XLALD0150N080	1.5	2.3	8	1.45	45	4	2	★	1
C2XLALD0200N060	2	3	6	1.94	45	4	2	★	1
C2XLALD0200N100	2	3	10	1.94	45	4	2	★	1
C2XLALD0250N075	2.5	3.8	7.5	2.4	45	4	2	★	1
C2XLALD0250N125	2.5	3.8	12.5	2.4	45	4	2	★	1

★ : **Stocked in Japan**

(mm)

Order Number	DC	APMX	LU	DN	LF	DCONMS	No. of Flutes	Stock	Type
C3XLALD0100N030	1	1.5	3	0.95	45	4	3	★	1
C3XLALD0100N050	1	1.5	5	0.95	45	4	3	★	1
C3XLALD0150N045	1.5	2.3	4.5	1.45	45	4	3	★	1
C3XLALD0150N080	1.5	2.3	8	1.45	45	4	3	★	1
C3XLALD0200N060	2	3	6	1.94	45	4	3	★	1
C3XLALD0200N100	2	3	10	1.94	45	4	3	★	1
C3XLALD0250N075	2.5	3.8	7.5	2.4	45	4	3	★	1
C3XLALD0250N125	2.5	3.8	12.5	2.4	45	4	3	★	1
C3XLALD0300N090	3	4.5	9	2.85	55	6	3	★	1
C3XLALD0300N150	3	4.5	15	2.85	55	6	3	★	1
C3XLALD0400N120	4	6	12	3.8	60	6	3	★	1
C3XLALD0400N200	4	6	20	3.8	60	6	3	★	1
C3XLALD0500N150	5	7.5	15	4.8	65	6	3	★	1
C3XLALD0500N250	5	7.5	25	4.8	65	6	3	★	1
C3XLALD0600N180	6	9	18	5.8	70	6	3	★	2
C3XLALD0600N300	6	9	30	5.8	70	6	3	★	2
C3XLALD0700N210	7	10.5	21	6.8	75	8	3	★	1
C3XLALD0700N350	7	10.5	35	6.8	75	8	3	★	1
C3XLALD0800N240	8	12	24	7.8	80	8	3	★	2
C3XLALD0800N400	8	12	40	7.8	80	8	3	★	2
C3XLALD0900N270	9	13.5	27	8.8	85	10	3	★	1
C3XLALD0900N450	9	13.5	45	8.8	85	10	3	★	1
C3XLALD1000N300	10	15	30	9.8	90	10	3	★	2
C3XLALD1000N500	10	15	50	9.8	90	10	3	★	2
C3XLALD1100N330	11	16.5	33	10.8	95	12	3	★	1
C3XLALD1100N550	11	16.5	55	10.8	95	12	3	★	1
C3XLALD1200N360	12	18	36	11.8	100	12	3	★	2
C3XLALD1200N600	12	18	60	11.8	100	12	3	★	2

DC = Cutting dia.
APMX = Depth of cut max.
LU = Usable length
LF = Functional length
DCONMS = Connection (shank) dia.

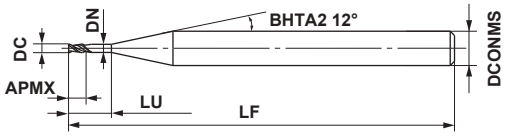
DLC2XLAL/DLC3XLAL

End mill, 2 and 3 flute, Long neck, For aluminum alloys

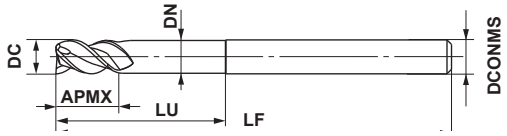
DLC2XLAL DLC3XLAL

Aluminum Alloy A1000 Series	Aluminum Alloy A2000 - A7000 Series	Aluminum Alloy Castings	Copper・Copper Alloy	Resin Material
◎	◎	◎	○	○





Type1



Type2

DC				
0 - 0.02				
DCONMS 4, 6	DCONMS 8, 10	DCONMS 12		
0 - 0.008	0 - 0.009	0 - 0.011		

- With a long neck geometry DC x 3 and DC x 5.
- DLC coating provides extreme resistance to welding.

(mm)

Order Number	DC	APMX	LU	DN	LF	DCONMS	No. of Flutes	Stock	Type
DLC2XLALD0100N030	1	1.5	3	0.95	45	4	2	★	1
DLC2XLALD0100N050	1	1.5	5	0.95	45	4	2	★	1
DLC2XLALD0150N045	1.5	2.3	4.5	1.45	45	4	2	★	1
DLC2XLALD0150N080	1.5	2.3	8	1.45	45	4	2	★	1
DLC2XLALD0200N060	2	3	6	1.94	45	4	2	★	1
DLC2XLALD0200N100	2	3	10	1.94	45	4	2	★	1
DLC2XLALD0250N075	2.5	3.8	7.5	2.4	45	4	2	★	1
DLC2XLALD0250N125	2.5	3.8	12.5	2.4	45	4	2	★	1

★ : **Stocked in Japan**

(mm)

Order Number	DC	APMX	LU	DN	LF	DCONMS	No. of Flutes	Stock	Type
DLC3XLALD0100N030	1	1.5	3	0.95	45	4	3	★	1
DLC3XLALD0100N050	1	1.5	5	0.95	45	4	3	★	1
DLC3XLALD0150N045	1.5	2.3	4.5	1.45	45	4	3	★	1
DLC3XLALD0150N080	1.5	2.3	8	1.45	45	4	3	★	1
DLC3XLALD0200N060	2	3	6	1.94	45	4	3	★	1
DLC3XLALD0200N100	2	3	10	1.94	45	4	3	★	1
DLC3XLALD0250N075	2.5	3.8	7.5	2.4	45	4	3	★	1
DLC3XLALD0250N125	2.5	3.8	12.5	2.4	45	4	3	★	1
DLC3XLALD0300N090	3	4.5	9	2.85	55	6	3	★	1
DLC3XLALD0300N150	3	4.5	15	2.85	55	6	3	★	1
DLC3XLALD0400N120	4	6	12	3.8	60	6	3	★	1
DLC3XLALD0400N200	4	6	20	3.8	60	6	3	★	1
DLC3XLALD0500N150	5	7.5	15	4.8	65	6	3	★	1
DLC3XLALD0500N250	5	7.5	25	4.8	65	6	3	★	1
DLC3XLALD0600N180	6	9	18	5.8	70	6	3	★	2
DLC3XLALD0600N300	6	9	30	5.8	70	6	3	★	2
DLC3XLALD0800N240	8	12	24	7.8	80	8	3	★	2
DLC3XLALD0800N400	8	12	40	7.8	80	8	3	★	2
DLC3XLALD0900N270	9	13.5	27	8.8	85	10	3	★	1
DLC3XLALD0900N450	9	13.5	45	8.8	85	10	3	★	1
DLC3XLALD1000N300	10	15	30	9.8	90	10	3	★	2
DLC3XLALD1000N500	10	15	50	9.8	90	10	3	★	2
DLC3XLALD1100N330	11	16.5	33	10.8	95	12	3	★	1
DLC3XLALD1100N550	11	16.5	55	10.8	95	12	3	★	1
DLC3XLALD1200N360	12	18	36	11.8	100	12	3	★	2
DLC3XLALD1200N600	12	18	60	11.8	100	12	3	★	2

DC = Cutting dia.
APMX = Depth of cut max.
LU = Usable length
LF = Functional length
DCONMS = Connection (shank) dia.

C2XLAL/DLC2XLAL

End mill, 2 flute, Long neck, For aluminum alloys

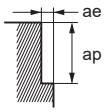
Recommended Cutting Conditions

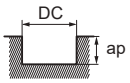
Side Milling

Material				Aluminum Alloy A1000 Series, A2000 - A7000 Series					Aluminum Alloy Castings					Copper, Copper Alloys, Resin Materials				
DC		LU		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Width of Cut **ae(inch)**	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Width of Cut **ae(inch)**	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Width of Cut **ae(inch)**
mm	inch	mm	inch															
1	.039	3	.118	195	20000	31.5	.039	.012	195	20000	31.5	.039	.012	195	20000	31.5	.039	.012
		5	.197	165	16000	26.0	.039	.012	165	16000	26.0	.039	.012	165	16000	26.0	.039	.012
1.5	.059	4.5	.177	295	20000	31.5	.059	.018	295	20000	31.5	.059	.018	295	20000	31.5	.059	.018
		8	.315	260	16000	26.0	.059	.018	260	16000	26.0	.059	.018	260	16000	26.0	.059	.018
2	.079	6	.236	425	20000	43.3	.079	.024	425	20000	43.3	.079	.024	425	20000	43.3	.079	.024
		10	.394	330	16000	34.6	.079	.024	330	16000	34.6	.079	.024	330	16000	34.6	.079	.024
2.5	.098	7.5	.295	525	20000	43.3	.098	.030	525	20000	43.3	.098	.030	525	20000	43.3	.098	.030
		12.5	.492	425	16000	34.6	.098	.030	425	16000	34.6	.098	.030	425	16000	34.6	.098	.030

Slot Milling

Material				Aluminum Alloy A1000 Series, A2000 - A7000 Series				Aluminum Alloy Castings				Copper, Copper Alloys, Resin Materials			
DC		LU		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**
mm	inch	mm	inch												
1	.039	3	.118	195	20000	17.3	.039	195	20000	17.3	.039	195	20000	17.3	.039
		5	.197	165	16000	14.2	.039	165	16000	14.2	.039	165	16000	14.2	.039
1.5	.059	4.5	.177	295	20000	17.3	.059	295	20000	17.3	.059	295	20000	17.3	.059
		8	.315	260	16000	14.2	.059	260	16000	14.2	.059	260	16000	14.2	.059
2	.079	6	.236	425	20000	26.0	.079	425	20000	26.0	.079	425	20000	26.0	.079
		10	.394	330	16000	22.8	.079	330	16000	22.8	.079	330	16000	22.8	.079
2.5	.098	7.5	.295	525	20000	26.0	.098	525	20000	26.0	.098	525	20000	26.0	.098
		12.5	.492	425	16000	22.8	.098	425	16000	22.8	.098	425	16000	22.8	.098





Plunging

Material				Aluminum Alloy A1000 Series, A2000 - A7000 Series			Aluminum Alloy Castings			Copper, Copper Alloys, Resin Materials		
DC		LU		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)
mm	inch	mm	inch									
1	.039	3	.118	195	20000	5.5	195	20000	4.3	195	20000	4.3
		5	.197	165	16000	4.7	165	16000	3.5	165	16000	3.5
1.5	.059	4.5	.177	295	20000	5.5	295	20000	4.3	295	20000	4.3
		8	.315	260	16000	4.7	260	16000	3.5	260	16000	3.5
2	.079	6	.236	425	20000	8.7	425	20000	7.5	425	20000	7.5
		10	.394	330	16000	7.1	330	16000	5.5	330	16000	5.5
2.5	.098	7.5	.295	525	20000	8.7	525	20000	7.5	525	20000	7.5
		12.5	.492	425	16000	7.1	425	16000	5.5	425	16000	5.5

Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.
Note2) For side milling, down milling is recommended.
Note3) Water-soluble cutting fluid is recommended.
Note4) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

C3XLAL/DLC3XLAL

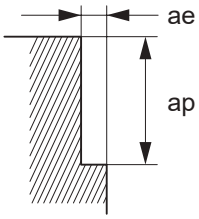
End mill, 3 flute, Long neck, For aluminum alloys

Recommended Cutting Conditions

Side Milling

Material				Aluminum Alloy A1000 Series					Aluminum Alloy A2000 - A7000 Series					Aluminum Alloy Castings Copper, Copper Alloys, Resin Materials				
DC		LU		Cutting Speed	Revolution	Feed Rate	Depth of Cut	Width of Cut	Cutting Speed	Revolution	Feed Rate	Depth of Cut	Width of Cut	Cutting Speed	Revolution	Feed Rate	Depth of Cut	Width of Cut
mm	inch	mm	inch	(SFM)	(min^{-1})	(IPM)	ap(inch)	ae(inch)	(SFM)	(min^{-1})	(IPM)	ap(inch)	ae(inch)	(SFM)	(min^{-1})	(IPM)	ap(inch)	ae(inch)
1	.039	3	.118	195	20000	47.6	.039	.012	195	20000	47.6	.039	.012	195	20000	47.6	.039	.012
		5	.197	165	16000	39.0	.039	.012	165	16000	39.0	.039	.012	165	16000	39.0	.039	.012
1.5	.059	4.5	.177	295	20000	47.6	.059	.018	295	20000	47.6	.059	.018	295	20000	47.6	.059	.018
		8	.315	260	16000	39.0	.059	.018	260	16000	39.0	.059	.018	260	16000	39.0	.059	.018
2	.079	6	.236	425	20000	65.0	.079	.024	425	20000	65.0	.079	.024	425	20000	65.0	.079	.024
		10	.394	330	16000	52.0	.079	.024	330	16000	52.0	.079	.024	330	16000	52.0	.079	.024
2.5	.098	7.5	.295	525	20000	65.0	.098	.030	525	20000	65.0	.098	.030	525	20000	65.0	.098	.030
		12.5	.492	425	16000	52.0	.098	.030	425	16000	52.0	.098	.030	425	16000	52.0	.098	.030
3	.118	9	.354	620	20000	65.0	.118	.035	620	20000	95.3	.118	.035	620	20000	95.3	.118	.035
		15	.591	490	16000	52.0	.118	.035	490	16000	78.0	.118	.035	490	16000	78.0	.118	.035
4	.157	12	.472	820	20000	86.6	.157	.047	820	20000	108.3	.157	.047	755	18300	99.6	.157	.047
		20	.787	655	16000	69.3	.157	.047	655	16000	86.6	.157	.047	590	14600	82.3	.157	.047
5	.197	15	.591	1,015	19700	95.3	.197	.059	1,015	20000	134.3	.197	.059	755	14600	90.9	.197	.059
		25	.984	820	15700	78.0	.197	.059	820	16000	108.3	.197	.059	590	11700	73.6	.197	.059
6	.236	18	.709	1,015	16500	108.3	.236	.071	1,150	18600	151.6	.236	.071	755	12200	90.9	.236	.071
		30	1.181	820	13200	86.6	.236	.071	920	14800	121.3	.236	.071	590	9700	73.6	.236	.071
7	.276	21	.827	1,015	14100	108.3	.276	.083	1,150	15900	151.6	.276	.083	755	10500	90.9	.276	.083
		35	1.378	820	11400	86.6	.276	.083	920	12700	121.3	.276	.083	590	8200	73.6	.276	.083
8	.315	24	.945	1,015	12300	108.3	.315	.094	1,150	13900	151.6	.315	.094	755	9200	95.3	.315	.094
		40	1.575	820	9800	86.6	.315	.094	920	11100	121.3	.315	.094	590	7300	78.0	.315	.094
9	.354	27	1.063	1,015	11000	108.3	.354	.106	1,150	12400	151.6	.354	.106	755	8100	95.3	.354	.106
		45	1.772	820	8800	78.7	.354	.106	920	9900	121.3	.354	.106	590	6400	78.0	.354	.106
10	.394	30	1.181	1,015	9900	108.3	.394	.118	1,150	11100	164.6	.394	.118	755	7300	95.3	.394	.118
		50	1.969	820	7900	86.6	.394	.118	920	8800	129.9	.394	.118	590	5800	78.0	.394	.118
11	.433	33	1.299	1,015	9000	112.6	.433	.130	1,150	10100	177.6	.433	.130	755	6700	95.3	.433	.130
		55	2.165	820	7200	82.7	.433	.130	920	8100	138.6	.433	.130	590	5200	78.0	.433	.130
12	.472	36	1.417	1,015	8200	116.9	.472	.142	1,150	9300	177.6	.472	.142	755	6100	95.3	.472	.142
		60	2.362	820	6500	86.6	.472	.142	920	7400	138.6	.472	.142	590	4800	78.0	.472	.142

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) For side milling, down milling is recommended.

Note3) Water-soluble cutting fluid is recommended.

Note4) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

C3XLAL/DLC3XLAL

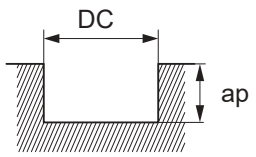
End mill, 3 flute, Long neck, For aluminum alloys

Recommended Cutting Conditions

Slot Milling

Material				Aluminum Alloy A1000 Series				Aluminum Alloy A2000 - A7000 Series				Aluminum Alloy Castings Copper, Copper Alloys, Resin Materials			
DC		LU		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Depth of Cut **ap(inch)**
mm	inch	mm	inch												
1	.039	3	.118	195	20000	26.0	.039	195	20000	26.0	.039	195	20000	26.0	.039
		5	.197	165	16000	21.7	.039	165	16000	21.7	.039	165	16000	21.7	.039
1.5	.059	4.5	.177	295	20000	26.0	.059	295	20000	26.0	.059	295	20000	26.0	.059
		8	.315	260	16000	21.7	.059	260	16000	21.7	.059	260	16000	21.7	.059
2	.079	6	.236	425	20000	39.0	.079	425	20000	39.0	.079	425	20000	39.0	.079
		10	.394	330	16000	34.6	.079	330	16000	34.6	.079	330	16000	34.6	.079
2.5	.098	7.5	.295	525	20000	39.0	.098	525	20000	39.0	.098	525	20000	39.0	.098
		12.5	.492	425	16000	34.6	.098	425	16000	34.6	.098	425	16000	34.6	.098
3	.118	9	.354	620	20000	52.0	.118	620	20000	60.6	.118	620	20000	52.0	.118
		15	.591	490	16000	43.3	.118	490	16000	52.0	.118	490	16000	43.3	.118
4	.157	12	.472	820	20000	60.6	.157	820	20000	78.0	.157	755	18300	60.6	.157
		20	.787	655	16000	52.0	.157	655	16000	65.0	.157	590	14600	52.0	.157
5	.197	15	.591	1,015	19700	65.0	.197	1,015	20000	95.3	.197	755	14600	60.6	.197
		25	.984	820	15700	52.0	.197	820	16000	78.0	.197	590	11700	52.0	.197
6	.236	18	.709	1,015	16500	69.3	.236	1,150	18600	108.3	.236	755	12200	60.6	.236
		30	1.181	820	13200	56.3	.236	920	14800	86.6	.236	590	9700	52.0	.236
7	.276	21	.827	1,015	14100	69.3	.276	1,150	15900	108.3	.276	755	10500	60.6	.276
		35	1.378	820	11400	56.3	.276	920	12700	86.6	.276	590	8200	52.0	.276
8	.315	24	.945	1,015	12300	73.6	.315	1,150	13900	112.6	.315	755	9200	60.6	.315
		40	1.575	820	9800	60.6	.315	920	11100	90.9	.315	590	7300	52.0	.315
9	.354	27	1.063	1,015	11000	73.6	.354	1,150	12400	112.6	.354	755	8100	60.6	.354
		45	1.772	820	8800	60.6	.354	920	9900	90.9	.354	590	6400	52.0	.354
10	.394	30	1.181	1,015	9900	73.6	.394	1,150	11100	112.6	.394	755	7300	60.6	.394
		50	1.969	820	7900	60.6	.394	920	8800	90.9	.394	590	5800	52.0	.394
11	.433	33	1.299	1,015	9000	78.0	.433	1,150	10100	112.6	.433	755	6700	60.6	.433
		55	2.165	820	7200	60.6	.433	920	8100	90.9	.433	590	5200	52.0	.433
12	.472	36	1.417	1,015	8200	82.3	.472	1,150	9300	112.6	.472	755	6100	65.0	.472
		60	2.362	820	6500	65.0	.472	920	7400	90.9	.472	590	4800	52.0	.472

Depth of Cut



Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) Water-soluble cutting fluid is recommended.

Note3) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

Plunging

Material				Aluminum Alloy A1000 Series			Aluminum Alloy A2000 - A7000 Series			Aluminum Alloy Castings Copper, Copper Alloys, Resin Materials		
DC		LU		Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)	Cutting Speed (SFM)	Revolution (min^{-1})	Feed Rate (IPM)
mm	inch	mm	inch									
1	.039	3	.118	195	20000	8.7	195	20000	8.7	195	20000	6.7
		5	.197	165	16000	7.1	165	16000	7.1	165	16000	5.1
1.5	.059	4.5	.177	295	20000	8.7	295	20000	8.7	295	20000	6.7
		8	.315	260	16000	7.1	260	16000	7.1	260	16000	5.1
2	.079	6	.236	425	20000	13.0	425	20000	13.0	425	20000	11.0
		10	.394	330	16000	10.2	330	16000	10.2	330	16000	8.7
2.5	.098	7.5	.295	525	20000	13.0	525	20000	13.0	525	20000	11.0
		12.5	.492	425	16000	10.2	425	16000	10.2	425	16000	8.7
3	.118	9	.354	620	20000	13.0	620	20000	13.0	620	20000	11.0
		15	.591	490	16000	10.2	490	16000	10.2	490	16000	8.7
4	.157	12	.472	820	20000	13.0	820	20000	17.3	755	18300	8.7
		20	.787	655	16000	10.2	655	16000	13.8	590	14600	7.1
5	.197	15	.591	1,015	19700	13.0	1,015	20000	17.3	755	14600	6.7
		25	.984	820	15700	10.2	820	16000	13.8	590	11700	5.1
6	.236	18	.709	1,015	16500	13.0	1,150	18600	17.3	755	12200	6.7
		30	1.181	820	13200	10.2	920	14800	13.8	590	9700	5.1
7	.276	21	.827	1,015	14100	8.7	1,150	15900	17.3	755	10500	5.9
		35	1.378	820	11400	7.1	920	12700	13.8	590	8200	4.3
8	.315	24	.945	1,015	12300	8.7	1,150	13900	17.3	755	9200	5.1
		40	1.575	820	9800	7.1	920	11100	13.8	590	7300	4.3
9	.354	27	1.063	1,015	11000	8.7	1,150	12400	13.0	755	8100	5.1
		45	1.772	820	8800	7.1	920	9900	10.2	590	6400	4.3
10	.394	30	1.181	1,015	9900	4.3	1,150	11100	13.0	755	7300	3.5
		50	1.969	820	7900	3.5	920	8800	10.2	590	5800	3.1
11	.433	33	1.299	1,015	9000	4.3	1,150	10100	13.0	755	6700	3.5
		55	2.165	820	7200	3.5	920	8100	10.2	590	5200	3.1
12	.472	36	1.417	1,015	8200	4.3	1,150	9300	13.0	755	6100	2.8
		60	2.362	820	6500	3.5	920	7400	10.2	590	4800	2.4

Note1) If the rigidity of the machine or the workpiece materials installation is very low, or chattering and noise are generated, adjust the speed and feed rate proportionally.

Note2) Water-soluble cutting fluid is recommended.

Note3) DLC coating is the first recommendation for resin materials. If the surface quality or tool life is reduced, use a non-coated product.

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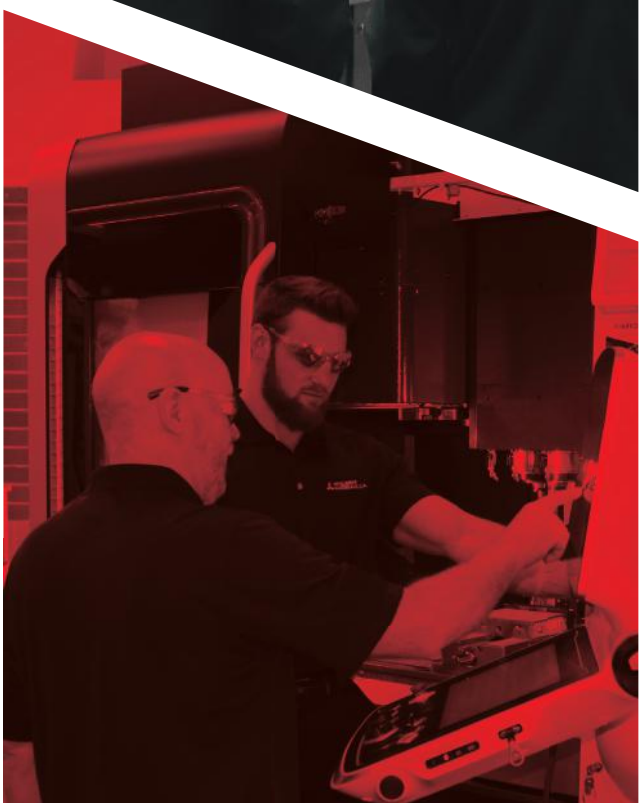
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MITSUBISHI MATERIALS U.S.A. CORPORATION

California Office
(Headquarters)

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

Chicago Office
(Engineering)

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

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

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

North Carolina-MTEC
(Marketing & Technical Center)

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

Toronto Office
(Canada Branch)

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

Detroit Office
(Moldino CS)

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

FOR YOUR SAFETY

- Don't handle inserts and chips without gloves.
- Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage.
- Please use safety covers and wear safety glasses.
- When using compounded cutting oils, please take fire precautions.
- When attaching inserts or spare parts, please use only the correct wrench or driver.
- When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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Tools specifications subject to change without notice.

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